


<b>TEST REPORT</b> <b>IEC 60947-5-1</b> <b>Part 5: Control circuit devices and switching elements</b> <b>Electromechanical control circuit devices</b>	
Report Number. ....:	181001337SHA-001
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Applicant's name.....:	Zhejiang Chint Electrics Co, Ltd.
Address .....	No.1, Chint Road, Chint Industrial Zone, North Baixiang, Yueqing, Zhejiang Province, P.R.China.325603
<b>Test specification:</b> Standard.....: EN 60947-5-1:2017 Test procedure .....	
CE Non-standard test method.....: N/A	
Test Report Form No.....:	IEC60947_5_1E
Test Report Form(s) Originator.....:	DEKRA Certification B.V.
Master TRF .....	Dated 2017-10-06
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Test item description .....: Shunt Release Trade Mark .....:  Manufacturer.....: Same as applicant Model/Type reference .....: S9 Ratings .....: See page 6	

<b>Responsible Testing Laboratory (as applicable), testing procedure and testing location(s):</b>		
<input checked="" type="checkbox"/>	<b>Testing Laboratory:</b>	Intertek Testing Services Shanghai
<b>Testing location/ address.....:</b>		Building No.86, 1198 Qinzhou Road (North), Shanghai 200233, China
<input checked="" type="checkbox"/>	<b>Associated Testing Laboratory:</b>	Inspection Center of Products' Quality of Low Voltage
<b>Testing location/ address.....:</b>		No. 400 Guangqiong Rd., Jiaxing, Zhejiang, CHINA
<b>Tested by (name, function, signature).....:</b>		Allen Wang
<b>Approved by (name, function, signature)....:</b>		Quiet Lin
<input type="checkbox"/>	<b>Testing procedure: CTF Stage 1:</b>	
<b>Testing location/ address.....:</b>		
<b>Tested by (name, function, signature).....:</b>		
<b>Approved by (name, function, signature)....:</b>		
<input type="checkbox"/>	<b>Testing procedure: CTF Stage 2:</b>	
<b>Testing location/ address.....:</b>		
<b>Tested by (name + signature) .....</b>		
<b>Witnessed by (name, function, signature) .:</b>		
<b>Approved by (name, function, signature)....:</b>		
<input type="checkbox"/>	<b>Testing procedure: CTF Stage 3:</b>	
<input type="checkbox"/>	<b>Testing procedure: CTF Stage 4:</b>	
<b>Testing location/ address.....:</b>		
<b>Tested by (name, function, signature).....:</b>		
<b>Witnessed by (name, function, signature) .:</b>		
<b>Approved by (name, function, signature)....:</b>		
<b>Supervised by (name, function, signature) :</b>		

**Summary of testing:**

Clause	Testing items	Testing location
8.3.3.2	Operating limits of contactor relays	Intertek Testing Services Shanghai  Inspection Center of Products' Quality of Low Voltage
8.3.3.3	temperature rise	
8.3.3.4	Dielectric properties	
8.2.4 of part 1	Mechanical properties of terminals	
8.3.3.5.2	Making and breaking capacities of switching elements under normal conditions	
8.3.3.5.5b	Dielectric verification	
8.3.3.5.3	Making and breaking capacities of switching elements under abnormal conditions	
8.3.3.5.5b	Dielectric verification	
8.3.4	Performance under conditional short-circuit current	
8.3.3.5.5b	Dielectric verification	

**Tests performed on Signal Lamp according to IEC/EN 60947-5-1:**

181001337SHA-001	Type	Seq. I	Seq. II <sup>b)</sup>	Seq. III <sup>b)</sup>	Seq. IV	Seq. V	Seq. VI
	S9	1+4 <sup>a)</sup>	2 <sup>b)</sup> +2 <sup>c)</sup>	-	1	1	1

**Note:**

a) Only Clause 8.3.3.2 tested for additional S9 with ratings  $U_s=AC400V, AC/DC48V, AC/DC24V, AC/DC12V$ .

b) Tests performed on AC6A/230V, AC3A/400V can cover all the AC-12 ratings on page 6.

c) Tests performed on DC3A/48V, DC6A/24V can cover all the DC-12 ratings on page 6.

**Summary of compliance with National Differences :**

**N/A**

**Copy of marking plate:**

Us can be alternated to AC400V、AC/DC48V、AC/DC24V、AC/DC12V

Test item particulars .....	
Classification of installation and use .....	Shunt release with auxiliary circuit
Supply Connection.....	Cable connection
Kind of control circuit device.....	<input type="checkbox"/> manual control switches, e.g. push-buttons, rotary switches, foot switches, etc. <input type="checkbox"/> electromagnetically operated control switches, either time delayed or instantaneous, e.g. contactor relays <input type="checkbox"/> pilot switches, e.g. pressure switches, temperature sensitive switches (thermostats) <input type="checkbox"/> position switches <input checked="" type="checkbox"/> associated control equipment, e.g. indicator lights, etc.
Kind of switching elements .....	<input checked="" type="checkbox"/> 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 <input type="checkbox"/> interlocking contacts of enclosure doors <input type="checkbox"/> control circuit contacts of rotary switches <input type="checkbox"/> control circuit contacts of overload relays
Number of poles.....	1NC or 1NO
Kind of current.....	<input checked="" type="checkbox"/> ac and <del>or</del> <input checked="" type="checkbox"/> dc
Interrupting medium .....	<input checked="" type="checkbox"/> air, <input type="checkbox"/> oil, <input type="checkbox"/> gas, <input type="checkbox"/> vacuum, <input type="checkbox"/> N/A
Operating conditions .....	
Method of operations .....	<input type="checkbox"/> manual <input checked="" type="checkbox"/> electromagnetic <input type="checkbox"/> pneumatic <input type="checkbox"/> electro-pneumatic
Method of control .....	<input checked="" type="checkbox"/> automatic <input type="checkbox"/> non-automatic <input type="checkbox"/> semi-automatic
Rated and limiting values for switching elements:	
Voltages:	
- rated operational voltage $U_e$ (V) .....	AC230V, AC400V, AC/DC48V, AC/DC24V, AC/DC12V
- rated insulation voltage $U_i$ (V) .....	500
- rated impulse withstand voltage $U_{imp}$ (kV) .....	N/A
Currents:	
- conventional free air thermal current $I_{th}$ (A) .....	N/A
- conventional enclosed thermal current $I_{the}$ (A) .....	N/A
- rated operational current $I_e$ (A) .....	See page 5
Rated frequency (Hz).....	50Hz and d.c.
Utilization category.....	AC-12. DC-12
Short-circuit characteristic:	

- rated conditional short-circuit current (kA) .....	1
- kind of protective device .....	CBO, 230/400V, C6
Electrically separated contact elements.....	Yes
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 .....	IP 20 (normal installation)
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.....	2018-10-18
Date (s) of performance of tests.....	From 2018-10-18 to 2018-12-15
<b>General remarks:</b>	
<p>"(See Enclosure #)" refers to additional information appended to the report.</p> <p>"(See appended table)" refers to a table appended to the report.</p> <p>This report is for the exclusive use of Intertek's Client and is provided pursuant to the agreement between Intertek and its Client. Intertek's responsibility and liability are limited to the terms and conditions of the agreement. Intertek assumes no liability to any party, other than to the Client in accordance with the agreement, for any loss, expense or damage occasioned by the use of this report. Only the Client is authorized to permit copying or distribution of this report and then only in its entirety. Any use of the Intertek name or one of its marks for the sale or advertisement of the tested material, product or service must first be approved in writing by Intertek. The observations and test results in this report are relevant only to the sample tested. This report by itself does not imply that the material, product, or service is or has ever been under an Intertek certification program</p> <p><b>Throughout this report a <input checked="" type="checkbox"/> comma / <input type="checkbox"/> point is used as the decimal separator.</b></p>	

**Manufacturer's Declaration per sub-clause 4.2.5 of IEC 60947-2:**

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) .....** : Same as applicant

**General product information:**


S9

Us: AC230V、AC400V、AC/DC48V、AC/DC24V、AC/DC12V

Contact breaking capacity:

AC-12 DC-12

AC6A/230V、AC3A/400V、AC/DC3A/48V、AC/DC6A/24V、AC/DC6A/12V

IEC 60947-5-1			
Clause	Requirement + Test	Result - Remark	Verdict
<b>5</b>	<b>PRODUCT INFORMATION</b>		
5.2	Marking		
	Data shall be preferably marked on the equipment:		
	a - manufacturer's name or trademark		P
	b - type designation or serial number	S9	P
	Data shall be included on the nameplate, or on the equipment, or in the manufacturer's published literature:		P
	c - number of this standard	IEC/EN 60947-5-1	P
	d - rated operational voltages	See general information on page 6	P
	e - utilization category and rated operational currents, at the rated operational voltages of the control circuit device	See general information on page 6	P
	f - rated insulation voltage:	500V	N/A
	g - rated impulse withstand voltage	4kV	N/A
	h - vacant		N/A
	i - IP code, in case of enclosed control circuit device	IP20(normal installation)	N/A
	j - pollution degree	3	N/A
	k - type and maximum ratings of short-circuit protective device	CBO, 230/400V, C6	P
	l - conditional short-circuit current	400V/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.		N/A
	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
	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.	"C1, C2, 12, 14"	P



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Clause	Requirement + Test	Result - Remark	Verdict
	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 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		P
	The position indication shall be clear, and the associated text or symbols shall be indelible and easily legible		P
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		
	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

IEC 60947-5-1			
Clause	Requirement + Test	Result - Remark	Verdict
	- equipment only suitable in environment A shall provided with the following notice	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

<b>6</b>	<b>Normal service, mounting and transport conditions</b>		
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	3	P
6.1.4	Shock and vibration		
	Under consideration		N/A
6.2	Conditions during transport and storage		
	Under consideration		N/A
6.3	Mounting		
	According manufacturer's instruction	see	N/A
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		

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

<b>7</b>	<b>CONSTRUCTIONAL AND PERFORMANCE REQUIREMENTS</b>		
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:		
7.1.2	Materials		
7.1.2.2	Glow-wire testing		
		See Table on page 36	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	4kV	
	Minimum clearance - Case B (mm)	Required : __ mm	
	Minimum clearance - Case A (mm)	Required : 3,0 mm	
	Measured clearances (mm) .....	Measured: 4,0 mm	P
	Creepage distances		
	Pollution degree .....	3	
	Comparative tracking index (V) .....	300	
	Material group .....	IIIa	
	Rated insulation voltage Ui (V) .....	500	
	Minimum creepage distances (mm) .....	4,0	
	Measured creepage distances (mm) .....	7,0	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)		

IEC 60947-5-1			
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	N/A
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 (normal installation)		
	Test for first characteristic		
	Test for first numeral ..... : <input type="checkbox"/> 1: <input checked="" type="checkbox"/> 2: <input type="checkbox"/> 3: <input type="checkbox"/> 4: <input type="checkbox"/> 5: <input type="checkbox"/> 6:		P
	Test for second characteristic		

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Clause	Requirement + Test	Result - Remark	Verdict
	Test for second numeral ..... :	<input type="checkbox"/> 1: <input type="checkbox"/> 2: <input type="checkbox"/> 3: <input type="checkbox"/> 4: <input type="checkbox"/> 5: <input type="checkbox"/> 6: <input type="checkbox"/> 7: <input type="checkbox"/> 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	
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:		
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 8.3.3.5.2	P
	Making and breaking capacities under abnormal conditions as state in table 5	See clause 8.3.3.5.3	P
7.2.4.3	Durability		
	Sub-clause 7.2.4.3 of IEC 60947-1 applies with the following additions:		
	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		N/A
7.2.7	Additional requirements for control switches suitable for isolation		

IEC 60947-5-1			
Clause	Requirement + Test	Result - Remark	Verdict
	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		N/A
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:		N/A
	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.		N/A
	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.		N/A
	Maintenance or replacement of parts during or after a testing cycle is not permitted.		N/A
	The products covered by this standard are intended for use in environment A.		N/A
	Contactors 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
<b>8.3.1</b>	<b>TEST SEQUENCE I (sample No. 1)</b>		
	-5 samples: S9 I-1(230V), I-2(400V), I-3(AC/DC48V), I-4(AC/DC24V), I-5(AC/DC12V)		
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)		
<b>8.3.3.2</b>	<b>Operating limits of contactor relays</b>		
9.3.3.2.1	Power-operated equipment:		
8.2.1.2.1	Electromagnetic contactors and starters		
	rated control supply voltage $U_s$ (V) ..... :	AC230V、AC400V、 AC/DC48V、AC/DC24V、 AC/DC12V	
	frequency (Hz) ..... :	50Hz and d.c.	
	declared ambient temperature(>40 °C) for 100% $U_s$	See 8.3.3.3.2 according to EN60947-2 on page 16	
	limits of close satisfactorily at any value between 85% and 110% of rated control supply voltage $U_s$ . :		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% $U_s$		
	limits of close satisfactorily at any value between 85% and 110% of rated control supply voltage $U_s$ . :		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 $U_s$ (V) ..... :		
	Frequency (Hz) ..... :		
	Declared ambient temperature(>40 °C) for 100% $U_s$		
	Limits of close satisfactorily at any value between 85% and 110% of rated control supply voltage $U_s$ . :		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% $U_s$		
	Limits of close satisfactorily at any value between 85% and 110% of rated control supply voltage $U_s$ . :		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) ..... :		

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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
8.3.3.3.2	Shunt Releases (according to EN 60947-2)		
d)	-5 samples: S9 I-1(AC230V), I-2(AC400V), I-3(AC/DC48V), I-4(AC/DC24V), I-5(AC/DC12V)		
	Shunt releases shall comply with the requirements of 7.2.1.4 of Part 1. For this purpose, the release shall be fitted to a circuit-breaker having the maximum rated current for which the release is suitable		P
	It shall be verified that the release will operate to open the circuit-breaker at 70% rated control supply voltage when tested at an ambient temperature of + 55 °C + 2 °C without current in the main poles of the circuit-breaker	55.3 °C I-1 Utest=161Vac I-2 Utest=280Vac I-3 Utest=33,6Vac/dc I-4 Utest=16,8Vac/dc I-5 Utest=8,4Vac/dc	P
	In the case of a release having a range of rated control supply voltages, the test voltage shall be 70% of the minimum rated control supply voltage		N/A



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Clause	Requirement + Test		Verdict
8.3.3.3	Temperature rise (I-1)		
	ambient temperature 10-40 °C .....	15°C	
	test enclosure W x H x D (mm x mm x mm) .....	-	
	material of enclosure .....	-	
	NO-contacts, test conditions:		
	- rated operational current I <sub>e</sub> (A) .....	6	
	- conventional free air thermal current I <sub>th</sub> (A) .....	6	
	- cable cross-section (mm <sup>2</sup> ) .....	1,0	
	- cable length (m) .....	1	
	- temperature rise of NO terminals (K) .....	20	P
	NC-contacts, test conditions:		
	- rated operational current I <sub>e</sub> (A) .....	6	
	- cable cross-section (mm <sup>2</sup> ) .....	1,0	
	- cable length (m) .....	1	
	- temperature rise of NC terminals (K) .....	19	P
	Coils and electromagnets, test conditions:		
	- rated control supply voltage U <sub>s</sub> (V / Hz) .....		
	- Class of insulating material .....		
	- temperature rise of coil and electromagnets (K) ...	See table	N/A
8.3.3.4	<b>Dielectric properties</b>		
	<b>Test of dielectric properties, impulse withstand voltage (U<sub>imp</sub> indicated):</b>		
	- verification by measurement of clearances instead of testing		
	- rated impulse withstand voltage (kV) .....		
	- test U <sub>imp</sub> auxiliary circuits (kV) .....		N/A
	Test of dielectric properties, dielectric withstand voltage (U <sub>imp</sub> not indicated):		
	- rated insulation voltage (V) .....	500	
	- control and auxiliary circuits, test voltage (V) for 60 sec .....	AC1890V/DC2120V	P
8.2.4	<b>Mechanical and electrical properties of terminals</b>		
8.2.4.2	Mechanical strength of terminals		
	maximum cross-sectional area of conductor (mm <sup>2</sup> ) :	2,5	
	diameter of thread (mm) .....	2,4	
	torque (Nm) .....	0,4	
	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 (mm <sup>2</sup> ) .....	1,0 mm <sup>2</sup>	

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Clause	Requirement + Test	Result - Remark	Verdict
	number of conductor of the smallest cross section : 1		
	diameter of bushing hole (mm) ..... : 6,4 mm		
	height between the equipment and the platen (mm) ..... : 260 mm		
	mass at the conductor(s) (kg) ..... : 0,4 kg		
	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) ..... : 35		
	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 (mm <sup>2</sup> ) : 2,5 mm <sup>2</sup>		
	number of conductor of the largest cross-section ... : 1		
	diameter of bushing hole (mm) ..... : 9,5 mm		
	height between the equipment and the platen (mm) ..... : 280 mm		
	mass at the conductor(s) (kg) ..... : 0,7 kg		
	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		
	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 (mm <sup>2</sup> ) ..... : 1,0/ 2,5 mm <sup>2</sup>		
	number of conductor of the smallest cross sectional, number of conductor of the largest cross sectional : 1/1		
	diameter of bushing hole (mm) ..... : 6,5/9,5mm		
	height between the equipment and the platen (mm) ..... : 260/280mm		
	mass at the conductor(s) (kg) ..... : 0,4/0,7 kg		
	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) ..... : 35/50		

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Clause	Requirement + Test	Result - Remark	Verdict
	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.		N/A
	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).		N/A
	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
	<ul style="list-style-type: none"> <li>– The test shall be done on the connecting device equipped with the clamping units;</li> <li>– The number of specimens shall be at least 8;</li> <li>– The test shall be done as a single 8 test: <ul style="list-style-type: none"> <li>• Eight clamping units shall be tested to the declared voltage drop;</li> <li>• If the number of failed clamping units does not exceed two, the test is considered passed.</li> </ul> </li> </ul>		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

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Clause	Requirement + Test	Result - Remark	Verdict
	maximum temperature for the temperature cycles shall be 40°C. Max. temperature (°C) .....		N/A
	voltage drop $\leq 22,5$ mV or 1,5 times the value measured after the 24th cycle. (V) .....		N/A
8.3.1	TEST SEQUENCE II		
	4 samples: S9 II-1(6A/AC230V), II-2(3A/AC400V), II-3(3A/DC48V), II-4(6A/DC24V)		
	Auxiliary Contact (NO&NC) , II-1 (6A/AC230V)		
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) .....	Figure 4e)	
	contact polarity.....		
	utilization category (AC / DC).....	AC-12	
	rated operational voltage $U_e$ (V) .....	230V	
	rated operational current $I_e$ (A) or power (kW) .....	6A	
No.1	- test voltage $U/U_e = 1,1$ (V) .....	L1: 254 L2: - L3: -	P
	- power factor/time constant .....	L1: 0,90 L2: - L3: -	P
	- make operations: test current $I/I_e$ (A) .....	L1: 6,7 L2: - L3: -	P
	- break operations: test current $I/I_e$ (A) .....	L1: 6,7 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	a.c. test	--
	- on-time (ms) .....	440	--
	- operating cycles per minute .....	6	--
	- number of operating cycles .....	50	P
	- test voltage $U/U_e = 1,0$ (V) .....	L1: 231 L2: - L3: -	--
	- power factor/time constant .....	L1: 0,90 L2: - L3: -	--
	- make operations: test current $I/I_e$ (A) .....	L1: 6,1 L2: - L3: -	--

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Clause	Requirement + Test	Result - Remark	Verdict
	- break operations: test current I/le (A) .....	L1: 6,1 L2: - L3: -	--
No. 2	- on-time (ms) .....	468	--
	- operating cycles per minute .....	Rapidly as possible	--
	- number of operating cycles .....	10	P
No. 3	- on-time (ms) .....	445	--
	- operating cycles per minute .....	60	--
	- number of operating cycles .....	990	P
No. 4	- on-time (ms) .....	445	--
	- operating cycles per minute .....	6	--
	- 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:	1000V	P

	Auxiliary Contact (NO&NC) , II-2 (3A/AC400V)		
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) .....	Figure 4e)	
	contact polarity.....		
	utilization category (AC / DC).....	AC-12	
	rated operational voltage Ue (V) .....	400V	
	rated operational current Ie (A) or power (kW) .....	3A	
No.1	- test voltage U/Ue = 1,1 (V) .....	L1: 441 L2: - L3: -	P
	- power factor/time constant .....	L1: 0,90 L2: - L3: -	P
	- make operations: test current I/le (A) .....	L1: 3,4 L2: - L3: -	P
	- break operations: test current I/le (A) .....	L1: 3,4 L2: - L3: -	P

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Clause	Requirement + Test	Result - Remark	Verdict
	- 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	a.c. test	--
	- on-time (ms) ..... :	393	--
	- operating cycles per minute ..... :	6	--
	- number of operating cycles ..... :	50	P
	- test voltage $U/U_e = 1,0$ (V) ..... :	L1: 401 L2: - L3: -	--
	- power factor/time constant ..... :	L1: 0,90 L2: - L3: -	--
	- make operations: test current $I/I_e$ (A) ..... :	L1: 3,1 L2: - L3: -	--
	- break operations: test current $I/I_e$ (A) ..... :	L1: 3,1 L2: - L3: -	--
No. 2	- on-time (ms) ..... :	379	--
	- operating cycles per minute ..... :	Rapidly as possible	--
	- number of operating cycles ..... :	10	P
No. 3	- on-time (ms) ..... :	402	--
	- operating cycles per minute ..... :	60	--
	- number of operating cycles ..... :	990	P
No. 4	- on-time (ms) ..... :	402	--
	- operating cycles per minute ..... :	6	--
	- 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) $2 \times U_e$ with a min.of 1000V:	1000V	P

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Clause	Requirement + Test	Result - Remark	Verdict
	Auxiliary Contact (NO&NC) , II-3 (3A/DC48V)		
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) ..... : Figure 4e)		
	contact polarity..... :		
	utilization category (AC / DC)..... : DC-12		
	rated operational voltage Ue (V) ..... : 48V		
	rated operational current Ie (A) or power (kW) ..... : 3A		
No.1	- test voltage U/Ue = 1,1 (V) ..... : L1: 53 L2: - L3: -		P
	- <del>power factor</del> /time constant ..... : L1: 1,04ms L2: - L3: -		P
	- make operations: test current I/Ie (A) ..... : L1: 3,4 L2: - L3: -		P
	- break operations: test current I/Ie (A) ..... : L1: 3,4 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	d.c. test	--
	- on-time (ms) ..... : 390		--
	- operating cycles per minute ..... : 6		--
	- number of operating cycles ..... : 50		P
	- test voltage U/Ue = 1,0 (V) ..... : L1: 48 L2: - L3: -		--
	- <del>power factor</del> /time constant ..... : L1: 1,04ms L2: - L3: -		--
	- make operations: test current I/Ie (A) ..... : L1: 3,1 L2: - L3: -		--
	- break operations: test current I/Ie (A) ..... : L1: 3,1 L2: - L3: -		--
No. 2	- on-time (ms) ..... : 390		--
	- operating cycles per minute ..... : Rapidly as possible		--
	- number of operating cycles ..... : 10		P

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Clause	Requirement + Test	Result - Remark	Verdict
No. 3	- on-time (ms) ..... :	396	--
	- operating cycles per minute ..... :	60	--
	- number of operating cycles ..... :	990	P
No. 4	- on-time (ms) ..... :	423	--
	- operating cycles per minute ..... :	6	--
	- 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:	1000V	P
	Auxiliary Contact (NO&NC) , II-4 (3A/DC24V)		
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) ..... :	Figure 4e)	
	contact polarity..... :		
	utilization category (AC / DC)..... :	DC-12	
	rated operational voltage Ue (V) ..... :	24V	
	rated operational current Ie (A) or power (kW) ..... :	6A	
No.1	- test voltage U/Ue = 1,1 (V) ..... :	L1: 27,5 L2: - L3: -	P
	- <del>power factor</del> /time constant ..... :	L1: 1,04ms L2: - L3: -	P
	- make operations: test current I/Ie (A) ..... :	L1: 6,71 L2: - L3: -	P
	- break operations: test current I/Ie (A) ..... :	L1: 6,71 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	d.c. test	--
	- on-time (ms) ..... :	390	--
	- operating cycles per minute ..... :	6	--



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Clause	Requirement + Test	Result - Remark	Verdict
	- number of operating cycles .....	50	P
	- test voltage $U/U_e = 1,0$ (V) .....	L1: 25 L2: - L3: -	--
	- <del>power factor</del> /time constant .....	L1: 1,05ms L2: - L3: -	--
	- make operations: test current $I/I_e$ (A) .....	L1: 6,1 L2: - L3: -	--
	- break operations: test current $I/I_e$ (A) .....	L1: 6,1 L2: - L3: -	--
No. 2	- on-time (ms) .....	390	--
	- operating cycles per minute .....	Rapidly as possible	--
	- number of operating cycles .....	10	P
No. 3	- on-time (ms) .....	391	--
	- operating cycles per minute .....	60	--
	- number of operating cycles .....	990	P
No. 4	- on-time (ms) .....	421	--
	- operating cycles per minute .....	6	--
	- 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) $2 \times U_e$ with a min.of 1000V:	1000V	P

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Clause	Requirement + Test	Result - Remark	Verdict
8.3.1	TEST SEQUENCE III (sample No. 3)		
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) .....		
	contact polarity.....		
	utilization category (AC / DC).....		
	rated operational voltage $U_e$ (V) .....		
	rated operational current $I_e$ (A) or power (kW) .....		
	Conditions, make/break operations:		
	- test voltage $U/U_e = 1,1$ (V) .....	L1: L2: L3:	N/A
	- power factor/time constant .....	L1: L2: L3:	N/A
	- make operations: test current $I/I_e$ (A) .....	L1: L2: L3:	N/A
	- break operations: test current $I/I_e$ (A) .....	L1: L2: L3:	N/A
	- 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		N/A
	- on-time (ms) .....		N/A
	- operating cycles per minute .....	6	N/A
	- number of operating cycles .....	10	N/A
	Behaviour and condition during and after the test:		
	- no electrical or mechanical failures		N/A
	- no contact welding or prolonged arcing		N/A
	- no blowing of the fusible element in the earth circuit		N/A
8.3.3.5.6.b	Dielectric verification:		
	dielectric test voltage (V) $2 \times U_e$ with min.of 1000V.. :		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
8.3.1	TEST SEQUENCE IV (sample No. 4)		
	-1 sample: S9, IV-1(400V/3A)(NO)		
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) ..... : Figure 4e)		
	contact polarity..... :		
	type of SCPD ..... : CBO		
	ratings of SCPD (A / V) ..... : 230/400V C6		
	prospective current (kA) ..... : 1kA		
	test voltage (V) $U/U_e = 1,1$ (V) ..... : 448		P
	r.m.s. test current obtained (kA) ..... : 1,05		P
	power factor (max. 0,7) ..... : 0,65		P
	first O operation by closing the separate making switch: test $I_p / I^2dt$ (kA / kA <sup>2</sup> s) ..... : L1: 618 /1,40		P
	time interval between test (min. 3 min) ..... : 3		--
	second O operation by closing the separate making switch: test $I_p / I^2dt$ (kA / kA <sup>2</sup> s) ..... : L1: 620 /1,40		P
	time interval between test (min. 3 min) ..... : 3		--
	second O operation by closing the separate making switch: test $I_p / I^2dt$ (kA / kA <sup>2</sup> s) ..... : L1: 620 /1,40		P
	NC		
	first O operation by closing the separate making switch: test $I_p / I^2dt$ (kA / kA <sup>2</sup> s) ..... : L1: 612/1,35		P
	time interval between test (min. 3 min) ..... : 3		--
	second O operation by closing the separate making switch: test $I_p / I^2dt$ (kA / kA <sup>2</sup> s) ..... : L1: 621 /1,44		P
	time interval between test (min. 3 min) ..... : 3		--
	third O operation to closed switching elements: test $I_p / I^2dt$ (kA / kA <sup>2</sup> s) ..... : L1: 623 /1,47		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) $2 \times U_e$ with min.of 1000V.. :		

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Clause	Requirement + Test	Result - Remark	Verdict

<b>8.3.1</b>	<b>TEST SEQUENCE V (sample No. 5)</b>		
	-1 sample S9, V-1		
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

<b>8.3.1.</b>	<b>TEST SEQUENCE VI (sample No. 6)</b>		
	-1 sample S9, VI-1		
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
	Verification of limitation of rotation of a rotary switch (8.2.6)		N/A
8.2.6	Verification of limitation of rotation of a rotary switch		

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Clause	Requirement + Test	Result - Remark	Verdict
	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		
8.4.1.	General		
	Control circuit devices having only passive components are not required to be tested.		N/A
	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.		N/A
	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.		N/A
	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.		N/A
	The dimension of the square metal plate shall be $(300 \pm 50)$ mm and the thickness $1,5_{0+0,5}$ mm.		N/A
	If not required otherwise by horizontal standard the connecting leads shall be $2_{0+0,5}$ m. If the length of the connecting leads is other than 2 m. Cable length (m).....:		N/A
	For control circuit devices not having integral cables, the type of cable or wire used shall be specified by the manufacturer: Type of cable.....:		N/A
	The test sample shall be in the ON-status or in the OFF-status, whichever is the worse. Tested state :	ON / OFF	N/A
	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.		N/A
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 .....	N/A
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 .....	N/A
8.4.2.3	Electrical fast transients/bursts		
	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 .....	N/A

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Clause	Requirement + Test	Result - Remark	Verdict
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:	See .....	N/A
	a) between terminals intended to be connected to the power supply;		N/A
	b) between each output terminal and each terminal intended to be connected to the power supply		N/A
	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).....:		N/A
	The repetition rate shall be one surge per minute, with the number of pulses being five positive and five negative.		N/A
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 .....	N/A
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 .....	N/A
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 .....	N/A
8.4.2	Emission		
	The test shall be performed according to CISPR 11, group 1, class A, and 7.3.3.	See .....	N/A

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Clause	Requirement + Test	Result - Remark	Verdict
<b>Annex C of IEC 60947-1</b>	<b>DEGREE OF PROTECTION OF ENCLOSED CONTROL CIRCUIT-DEVICES</b>		
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		P
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	IP2X	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		
	Clause 7 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:		--
	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	IP20	P
C.11	General requirements for the tests		
C.11.1	Clause 11.1 of IEC 60529 applies		N/A



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Clause	Requirement + Test	Result - Remark	Verdict
C.11.2	Clause 11.2 of IEC 60529 applies with the following additions:		--
	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		P
	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:		--
	Drain and ventilating holes are treated as normal openings		N/A
C.11.4	Clause 11.4 of IEC 60529 applies		N/A
C.11.5	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	IP2x	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		N/A
C.13.4	Dust test for first characteristic numerals 5 and 6		
	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:		

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Clause	Requirement + Test	Result - Remark	Verdict
	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 U <sub>max</sub> with a minimum of 1000 V (V)..... :	U <sub>test</sub> (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 U <sub>max</sub> with a minimum of 1000 V (V) ..... :	U <sub>test</sub> (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
<b>Annex C</b>	<b>SPECIAL TESTS - DURABILITY TESTS</b>		
<b>Annex F</b>	<b>CLASS II CONTROL CIRCUIT DEVICES INSULATED BY ENCAPSULATION REQUIREMENTS AND TESTS</b>		
<b>Annex G</b>	<b>ADDITIONAL REQUIREMENTS FOR CONTROL CIRCUIT DEVICES WITH INTEGRALLY CONNECTED CABLES</b>		
<b>Annex H</b>	<b>ADDITIONAL REQUIREMENTS FOR SEMICONDUCTOR SWITCHING ELEMENTS FOR CONTROL CIRCUIT DEVICES</b>		
<b>Annex J</b>	<b>SPECIAL REQUIREMENTS FOR INDICATOR LIGHTS AND INDICATING TOWERS</b>		
<b>Annex K</b>	<b>SPECIAL REQUIREMENTS FOR CONTROL SWITCHES WITH DIRECT OPENING ACTION</b>		
<b>Annex L</b>	<b>SPECIAL REQUIREMENTS FOR MECHANICALLY LINKED CONTACT ELEMENTS</b>		
<b>Annex M</b>	<b>TERMINAL MARKING, DISTINCTIVE NUMBER AND DISTINCTIVE LETTER FOR CONTROL CIRCUIT DEVICES</b>		
<b>Annex N</b>	<b>Procedure to determine reliability data for electromechanical devices in control circuits used in functional safety applications</b>		

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TABLE: Resistance to heat (Ball pressure test)

no.	Specimen					Verdict
	Description	Colour	Temp. °C	Impress diam. mm	Result diam. mm	
1	Enclosure	White	125	2,0	1,5	P
2	Handle	blue	70	2,0	1,0	P
3	Mechanical part	Grey	70	2,0	1,0	P

TABLE: Resistance to fire (Glow wire test)

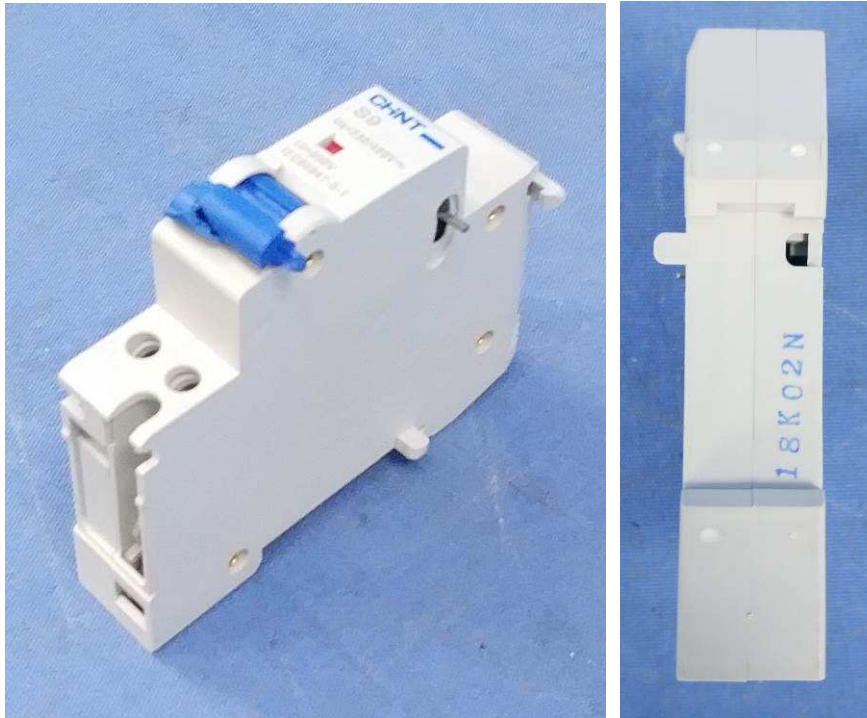
no.	Specimen							Verdict
	Description	Colour	Thick (mm)	Temp. °C	burning after t (s)	drops	support burning	
1	Enclosure	White	2,5	960	4,1	No	No	P
2	Handle	blue	2,5	650	-	No	No	P
3	Mechanical part	Grey	2,5	650	-	No	No	P

TABLE: Resistance to tracking (tracking test)

no.	Specimen							Verdict
	Description	Colour	Drops (no.)	Voltage (V)	Burning	Current (A)	Result	
1	Enclosure	White	>50	300	-	-	No flashovers	P
2	Handle	blue	>50	300	-	-	No flashovers	P
3	Mechanical part	Grey	>50	300	-	-	No flashovers	P

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Photo of samples:



**IEC 60947-5-1**

Photo of samples:



Photo of samples:



Photo of samples:

