TEST REPORT
EN 60947-5-1

Low-voltage switchgear and control gear
Part 5: Control circuit devices and switching elements
Section 1: Electromechanical control circuit devices

Report Number..... :	18ZCTS0122009LR
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Applicant..... :	SHANGHAI BINJIE MECHANICAL AND ELECTRICAL CO.,LTD
Address..... :	NO. 1588, XIN GAO ROAD, QINGPU DISTRICT, SHANGHAI, CHINA
Manufacturer..... :	Same as applicant
Address..... :	
Factory..... :	Same as applicant
Address..... :	
Test specification:	
Standard..... :	EN 60947-5-1:2004+A1:2009
Test procedure..... :	CE
Non-standard test method…….. :	N/A
Test Report Form	
Test Report Form No..... :	IEC 60947_5_1B
TRF Originator..... :	ZCT
Master TRF ..... :	N/A
Test item description:	
Description :	Module
Trade Mark..... :	NGU
Model and/or type reference..... :	BJ03-Z02 BJ03-Z03, BJ03-Z04, BJ03-Z05, BJ03-Z06, BJ03-Z07, BJ03-Z08, BJ03-Z09, BJ03-SSR2404, BJ03-SSR2204
Ratings..... :	AC230V, 50Hz, 5A, 1100W

Copy of marking plate	
Module Model xxx AC230V, 50Hz, 5A, 1100W SHANGHAI BINJIE MECHANICAL AND ELECTRICAL CO.,LTD Made in China	xxx=BJ03-Z02 BJ03-Z03, BJ03-Z04, BJ03-Z05, BJ03-Z06, BJ03-Z07, BJ03-Z08, BJ03-Z09, BJ03-SSR2404, BJ03-SSR2204

Test item particulars:	
- kind of control circuit device .....:	
	☐ manual control switches, e.g. push-buttons, rotary switches, foot switches, ect.
	☒ 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. Push Buttons, ect
- kind of switching elements .....:	
	☒auxiliary contacts of a switching device (e.g. contactor, circuit-breaker, ect) 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 .....:	2
- kind of current .....:	
	☒ A.C.
- 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) .....:	230V
- rated insulation voltage Ui (V) .....:	
- rated impulse withstand voltage Uimp (kV).....:	
- currents:	
- conventional free air thermal current Ith (A).....: - conventional enclosed thermal current Ithe (A) : - rated operational current Ie (A) .....:	5A
- rated frequency (Hz) .....:	50Hz
- utilization category .....:	
- short-circuit characteristic: - rated conditional short-circuit current (kA) .....: - co-ordination of short-circuit protective devices : - kind of protective device.....:	kA type
- switching overvoltages .....:	
	see EN60947-1
- electrically separated contact elements .....:	
	(state by manufacturer)
- actuating quantities for pilot switches .....:	
- pilot switches having two or more contact elements.....:	
- indication of contact elements of same polarity	
-IP code , incase of an enclosed control device	IP20
- pollution degree	
Suitability for isolation, with the symbol 07-13-06 of EN60617-7	

Possible test case verdicts:	
- test case does not apply to the test object..... :	N(.A.)
- test object does meet the requirement..... :	P(ass)
- test object does not meet the requirement..... :	F(ail)
Testing	
Date of receipt of test item..... :	Jan. 08, 2018
Date (s) of performance of tests..... :	Jan. 08, 2018 to Jan. 22, 2018

General remarks:

"(see remark #)" refers to a remark 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.

The test results presented in this report relate only to the object tested.

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This test report includes the following:

Annex I: Photo Documentation, 2 page(s)

EN 60947-5-1			
Clause	Requirement – Test	Result - Remark	Verdict
5.2	**MARKING**		
5.2.1	Data shall be preferably marked on the equipment:		-
	a - manufacturer's name or trademark		P
	b - type designation or serial number		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	EN 60947-5-1	P
	d - rated operational voltages		P
	e - utilization category and rated operational currents, at the rated operational voltages of the control circuit device		P
	f - rated insulation voltage:		P
	g - rated impulse withstand voltage		P
	h - switching overvoltages, if applicable		N
	i - IP code, in case of enclosed control circuit device		N
	j - pollution degree		N
	k - type and maximum ratings of short-circuit protective device		N
	l - conditional short-circuit current if less than 1000 A		N
	m - suitability for isolation, where applicable, with the symbol 07-13-06 of EN60617-7		N
	n - indication of contact elements of same polarity		N
5.2.2	Terminal identification and marking		P
	Clearly and permanently identified according EN60445 and Annex L, unless superseded by relevant standard.		P
	Neutral terminal identified by letter :		P
	Protective earth terminal identified by letter		P
5.2.3	Functional markings		P
	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		P
	Letters or words may used where space is available		P
5.2.4	Emergency stop		N
	Control switches intended to be used as ”stop” control for emergency use shall be coloured red and in case of a push-button, be of mushroom shape		N
5.2.5	Operating diagram		P

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Clause	Requirement – Test	Result - Remark	Verdict
	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		P
5.2.5.1	The position indication shall be clear, and the associated text or symbols shall be indelible and easily legible		P
5.2.5.2	Terminal markings for operating diagrams		P
	Terminal markings shall be clearly identifiable with respect to the operating diagram		P
5.2.6	Time delay markings		N
	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
5.3	Instructions for installation, operation and maintenance		P
	The manufacture shall specify, in his documents or catalogues:		P
	- 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,		P
	- 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 taken adequate mitigation measures.	P
	- 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

6	**Normal service, mounting and transport conditions**		
6.1.1	Ambient temperature		P
	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

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Clause	Requirement – Test	Result - Remark	Verdict
6.1.2	Altitude of side of installation does not exceed 2000m		P
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		P
	Unless otherwise stated, equipment for: - industrial use shall have a degree 3, depending upon micro-environment - household and similar shall have degree 2		P
6.1.4	Shock and vibration		P
	Under consideration		P
6.2	Conditions during transport and storage		P
	Under consideration		P
6.3	Mounting		P
	According manufacturer's instruction	See user manual	P
6.3.1	Mounting of single hole mounted devices		P
	Dimensions according Table 2		P
6.3.1.1	Location of key recess(if any)		P
	Dimensions according Table 3		P
6.3.1.2	Range of panel thickness		P
	The device shall be capable of being mounted on any thickness between 1 and 6 mm		P
6.3.1.3	Grouping of devices		P
	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		P
7.1	**CONSTRUCTION**		-
7.1.1	Materials		P
7.1.2	Current-carrying parts and their connection		P
	No contact pressure through insulating materials		P
7.1.3	Clearances		P
	Clause 7.1.3 of EN60947 applies		-

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Clause	Requirement – Test	Result - Remark	Verdict
	Rated impulse withstand voltage	(see test sequence I)	-
	Case B (mm)	Required :……. mm	-
	Case A (mm)	Required :……. mm	-
		Measured: ……. mm	-
	Creepage distances		-
	Pollution degree ..... :		
	Comparative tracking index (V) ..... :		-
	Material group ..... :	III	-
	Rated insulation voltage Ui (V) ..... :		-
	Minimum creepage distances (mm) ..... :		-
	Measured creepage distances (mm) ..... :		-
	In case Uimp is not indicated, clearances and creepage distances in according with Annex D		-
7.1.4	Actuator		-
7.1.4.1	Insulation		P
7.1.4.2	Direction		P
7.1.4.3	Actuating force (or moment) :		P
7.1.4.4	Limitation of rotation (of rotary switch)		P
7.1.4.5	Emergency stop		N
7.1.5	Indication of the contact position		N
7.1.5.1	Indication means		P
7.1.5.2	Indication by the actuator		P
7.1.6	Conditions for control switches suitable for isolation		P
7.1.7	Class II control circuit devices		P
	Not provided with means for protective earthing and insulated by encapsulation,	See annex F	P
7.1.8	Requirements for control devices with integrally connected cables	See annex G	P
7.1.11	Degree of protection of enclosed equipment		-
	Degree of protection .....:	**IP20**	P
	Test for first characteristic		P

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Clause	Requirement – Test	Result - Remark	Verdict
	Test for first numeral .....:	☐ 1: ☑ 2: ☐ 3: ☐ 4: ☐ 5: ☐ 6:	-
	Test for second characteristic		-
	Test for second numeral .....:	☐ 1: ☐ 2: ☐ 3: ☐ 4: ☐ 5: ☐ 6: ☐ 7: ☐ 8: ☑ 0	-
7.2	**Performance requirements**		-
	Subclauses 7.2.1.1 and 7.2.2 of EN60947-1 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 EN60947-4-1	See clause 8.3.3.2	P
7.2.3	Dielectric properties		P
	Subclause 7.2.3 of EN60947-1 applies with the following addition	See clause 8.3.3.4	P
	For class II control circuit devices insulated by encapsulation	See Annex F	P
7.2.4	Ability to make and break under normal and abnormal load conditions		P
7.2.4.1	Making and breaking capacities		P
	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
7.2.4.2	Vacant		P
7.2.4.3	Durability		P
	Sub-clause 7.2.4.3 of EN60947-1 applies with the following additions:		P
	Mechanical durability	See Annex C	P
	Electrical durability	See Annex C	P

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Clause	Requirement – Test	Result - Remark	Verdict
7.2.5	Conditional short-circuit current		P
	The switching element shall withstand the stresses resulting from short-circuit current under the conditions specified in 8.3.4		P
7.2.6	Switching overvoltage		P
	Subclause 7.2.6 of EN60947-1 applies		P
7.2.7	Additional requirements for control switches suitable for isolation		P
	Control switches suitable for isolation shall be tested according to 8.3.3.4 of EN60947-1 with a value of test voltage as specified in Table 14 or EN60947-1 corresponding to the rated impuls withstand voltage Uimp declared by the manufacturer.		P
	Other additional requirements applicable to such control switches are under consideration		P
7.3	Electromagnetic compatibility (EMC)		P
	Subclause 7.3 of EN60947-1 applies unless otherwise specified in this standard		P

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Clause	Requirement – Test	Result - Remark	Verdict
8.3.1.a	**TEST SEQUENCE I (sample No. 1)**		P
Test No. 1	- operating limits of contactor relays (8.3.3.2), if applicable		N
Test No. 2	- temperature rise (Clause 8.3.3.3.)		P
Test No. 3	- dielectric properties (Clause 8.3.3.4)		P
Test No. 4	- mechanical properties of terminals (8.2.4 of EN60947-1		N
8.3.3.2	**Operating limits of contactor relays**		N
9.3.3.2.1	Power-operated equipment:		N
8.2.1.2.1	Electromagnetic contactors and starters		N
	rated control supply voltage Us (V) .....:		N
	frequency (Hz) .....:		N
	declared ambient temperature(>40 °C) for 100% Us		N
	limits of close satisfactorily at any value between 85% and 110% of rated control supply voltage Us .....:		N
	limits of drop out and open fully are: 75% to 20% for a.c. and 75% to 10% for d.c. .....:		N
	ambient temperature(-5 °C) for 100% Us		N
	limits of close satisfactorily at any value between 85% and 110% of rated control supply voltage Us .....:		N
	Limits of drop out and open fully are: 75% to 20% for a.c. and 75% to 10% for d.c. .....:		N
8.2.1.2.2	Contactors and starters with electronically controlled electromagnet		N
	Rated control supply voltage Us (V) .....:		N
	Frequency (Hz) .....:		N
	Declared ambient temperature(>40 °C) for 100% Us		N

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Clause	Requirement – Test	Result - Remark	Verdict
	Limits of close satisfactorily at any value between 85% and 110% of rated control supply voltage Us .....:		N
	Limits of drop out and open fully are: 75% to 20% for a.c. and 75% to 10% for d.c. .....:		N
	Ambient temperature(-5 °C) for 100% Us		N
	Limits of close satisfactorily at any value between 85% and 110% of rated control supply voltage Us .....:		N
	Limits of drop out and open fully are: 75% to 20% for a.c. and 75% to 10% for d.c. .....:		N
8.2.1.2.3	Electro-pneumatic contactors and starters		N
	Rated air supply pressure(Bar) .....:		N
	Declared ambient temperature(>40 °C) for 100% of the rated air supply pressure(Bar)		N
	Limits of close satisfactorily at any value between 85% and 110% of rated air supply pressure(Bar) .....:		N
	Limits of drop out and open fully are: 75% to 10% of rated air supply pressure(Bar) .....:		N
	Ambient temperature(-5 °C) for 100% of the rated air supply pressure(Bar)		N
	Limits of close satisfactorily at any value between 85% and 110% of rated air supply pressure(Bar) .....:		N
	Limits of drop out and open fully are: 75% to 10% for the rated air supply pressure(Bar) .....:		N
8.3.3.3	**Temperature rise**		N
	ambient temperature 10-40 C .....:		N
	test enclosure W x H x D (mm x mm x mm) .....:		N
	material of enclosure .....:		N
	NO-contacts, test conditions:		N
	- rated operational current Ie (A) .....:		N
	- cable cross-section (mm²) .....:		N

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Clause	Requirement – Test	Result - Remark	Verdict
	- temperature rise of NO terminals (K) .....:	**See table 1**	N
	NC-contacts, test conditions:		N
	- rated operational current Ie (A) .....:		N
	- cable cross-section (mm²) .....:		N
	- temperature rise of NC terminals (K) .....:	**See table 1**	N
	Coils and electromagnets, test conditions:		N
	- rated control supply voltage Us (V) .....:		N
	- Class of insulating material .....:	**E**	N
	- temperature rise of coil and electromagnets (K) :	**See table 1**	N
8.3.3.4	**Test of dielectric properties, impulse withstand voltage (Uimp indicated):**		P
	- verification by measurement of clearances instead of testing		P
	- rated impulse withstand voltage (V) .....:		P
	- test Uimp auxiliary circuits (kV) .....:		P
	Test of dielectric properties, dielectric withstand voltage (Uimp not indicated):		P
	- rated insulation voltage (V) .....:		P
	- control and auxiliary circuits, test voltage (V) for 5 sec .....:		P
8.2.4	**Mechanical properties of terminals**		P
8.2.4.2	Mechanical strength of terminals		P
	maximum cross-sectional area of conductor (mm²) .....:		-
	diameter of thread (mm) .....:		-
	torque (Nm) .....:		-
	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) .....:		-
	number of conductor of the smallest cross section .....:		—
	diameter of bushing hole (mm) .....:		—
	height between the equipment and the platen (mm) .....:		—

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Clause	Requirement – Test	Result - Remark	Verdict
	mass at the conductor(s) (kg) .....:		—
	135 continuous revolutions: the conductor shall neither slip out of the terminal nor break near the clamping unit		-
8.2.4.4	Pull-out test		P
	force (N) .....:		—
	1 min, the conductor shall neither slip out of the terminal nor break near the clamping unit		P
	Flexion test		-
	conductor of the largest cross-sectional area (mm²) .....:		-
	number of conductor of the largest cross-section :		—
	diameter of bushing hole (mm) .....:		—
	height between the equipment and the platen (mm) .....:		—
	mass at the conductor(s) (kg) .....:		—
	135 continuous revolutions: the conductor shall neither slip out of the terminal nor break near the clamping unit		
	Pull-out test		P
	force (N) .....:		—
	1 min, the conductor shall neither slip out of the terminal nor break near the clamping unit		P
	Flexion test		-
	conductor of the largest and smallest cross-sectional area (mm²) .....:		—
	number of conductor of the smallest cross sectional, number of conductor of the largest cross sectional .....:		—
	diameter of bushing hole (mm) .....:		—
	height between the equipment and the platen (mm) .....:		—
	mass at the conductor(s) (kg) .....:		—

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Clause	Requirement – Test	Result - Remark	Verdict
	135 continuous revolutions: the conductor shall neither slip out of the terminal nor break near the clamping unit		P
	Pull-out test		P
	force (N) .....:		—
	1 min, the conductor shall neither slip out of the terminal nor break near the clamping unit		P
8.3.1.a	**TEST SEQUENCE II (sample No. 2)**		**-**
Test No. 1	- Making and breaking capacities of switching elements under normal conditions (8.3.3.5.2)		P
Test No. 2	- Dielectric verification (8.3.3.5.5.b)		P
8.3.3.5	**TEST SEQUENCE II**		P
8.3.3.5.2	Making and breaking capacities of switching elements under normal conditions		P
	contact element (figure / form)		-
	contact polarity		-
	utilization category .....:		-
	rated operational voltage Ue (V) .....:		-
	rated operational current Ie (A) or power (kW) ....:		-
Test No.1	- test voltage U/Ue = 1,1 (V) .....:		-
	- power factor/time constant .....:		-
	- make operations: test current I/Ie (A) .....:		-
	- break operations: test current I/Ie (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		-
	- on-time (ms) .....:		-
	- operating cycles per minute .....:	**6**	-
	- number of operating cycles .....:	**50**	P
	- test voltage U/Ue = 1,0 (V) .....:		P
	- power factor/time constant .....:		P

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Clause	Requirement – Test	Result - Remark	Verdict
	- make operations: test current I/Ie (A) .....:		P
	- break operations: test current I/Ie (A) .....:		P
Test No. 2	- on-time (ms) .....:		P
	- operating cycles per minute .....:	**Rapidly**	P
	- number of operating cycles .....:	**10**	P
Test No. 3	- on-time (ms) .....:		P
	- operating cycles per minute .....:	**60**	P
	- number of operating cycles .....:	**990**	P
Test No. 4	- on-time (ms) .....:		P
	- operating cycles per minute .....:	**6**	P
	- number of operating cycles .....:	**5000**	P
	Behaviour and condition during and after the test:		P
	- no electrical or mechanical failures		P
	- no contact welding or prolonged arcing		P
	- no blowing of the fusible element in the earth circuit		P
	Dielectric verification:		-
	dielectric test voltage (V) 2 xUe with a min.of 1000V.....:		P

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Clause	Requirement – Test	Result - Remark	Verdict
8.3.1.a	**TEST SEQUENCE III (sample No. 3)**		P
Test No. 1	- Making and breaking capacities of switching elements under abnormal conditions (8.3.3.5.3)		P
Test No. 2	- Dielectric verification (8.3.3.5.5.b)		P
8.3.3.5	**TEST SEQUENCE III**		
8.3.3.5.3	Making and breaking capacities of switching elements under abnormal conditions:		-
	contact element (figure / form)		P
	contact polarity		-
	utilization category .....:		—
	rated operational voltage Ue (V) .....:		—
	rated operational current Ie (A) or power (kW) ....:		—
	Conditions, make/break operations:		P
	- test voltage U/Ue = 1,1 (V) .....:		—
	- power factor/time constant .....:		—
	- make operations: test current I/Ie (A) .....:		—
	- break operations: test current I/Ie (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		P
	- on-time (ms) .....:		—
	- operating cycles per minute .....:	**6**	—
	- number of operating cycles .....:	**10**	P
	Behaviour and condition during and after the test:		P
	- no electrical or mechanical failures		P
	- no contact welding or prolonged arcing		P
	- no blowing of the fusible element in the earth circuit		P
	Dielectric verification:		P

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Clause	Requirement – Test	Result - Remark	Verdict
	dielectric test voltage (V) 2 xUe with min.of 1000V.....:		P
8.3.1.	**TEST SEQUENCE IV (sample No. 4)**		**-**
Test No. 1	- Performance under conditional short-circuit current (8.3.4)		P
Test No. 2	- Dielectric verification (8.3.3.5.5.b)		P
	TEST SEQUENCE IV		-
8.3.4	**Performance under conditional short-circuit current**		P
	contact element (figure / form)		-
	contact polarity		-
	type of SCPD .....:	**Fuse gL/gG**	—
	ratings of SCPD .....:		—
	prospective current (min- 1 kA) .....:		—
	test voltage (V) U/Ue = 1,1 (V) .....:		—
	r.m.s. test current obtained (kA) .....:		—
	power factor (max. 0,7)		-
	first CO operation by closing the separate making switch: test (Ip / I²dt (A / A²s) .....:		—
	time interval between test (min. 3 min) .....:		—
	second CO operation by closing the separate making switch: test (Ip / I²dt (A / A²s) .....:		—
	time interval between test (min. 3 min) .....:		—
	third making operation to closed switching elements: test I²dta (A²s) .....:		—
	Behaviour of the equipment during the test:		P
	switching elements open by the normal actuating system		P
	Dielectric verification:		P
	dielectric test voltage (V) 2 xUe with min.of 1000V.....:		P

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Clause	Requirement – Test	Result - Remark	Verdict

8.3.1.	**TEST SEQUENCE V (sample No. 5)**	P
Test No. 1	- Degree of protection of enclosed control circuit-devices (Annex C of EN60947-1)	P
Test No. 2	- Verification of actuation force or moment (8.2.5)	P

8.3.4	**TEST SEQUENCE V**		P
	Degree of protection of enclosed control circuit-devices		P
	The enclosed control circuit devices shall comply with the requirements of Annex C of IEC60947-1		P
	Verification of actuation force or moment		P
8.2.5	When required in 7.1.4.3, the minimum actuating force or moment shall be tested during sequence V of 8.3.1. The performance shall be as stated in 7.1.4.3		-
7.1.4.3	Actuating force (or moment)		P
	The force (or moment) required to operate the 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		P
	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.		P

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Clause	Requirement – Test	Result - Remark	Verdict

8.3.1.	**TEST SEQUENCE VI (sample No. 6)**	**-**
Test No. 1	- Measurement of clearances and creepage distances, if applicable (7.1.3)	P
Test No. 2	- Verification of limitation of rotation of a rotary switch (8.2.6)	P

8.3.4	**TEST SEQUENCE VI**		P
	Measurement of clearances and creepage distances, if applicable (7.1.3)		P
	Clearances and creepage distances according Annex D	See clause 7.1.3	P
	Verification of limitation of rotation of a rotary switch (8.2.6)		P
8.2.6	When this test is required in 7.1.4.4, it shall be tested during sequence VI of 8.3.1 The test sample shall be mounted according to the manufacturers instructions		P
7.1.4.4	**Limitation of rotation (of a rotary switch)**		P
	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		P
8.2.6	The operating moment shall be measured five times and the maximum value recorded.		P
	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.		P
	Means of limitation has not moved, become loose or prevented the actuator's normal operation		P

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Clause	Requirement – Test	Result - Remark	Verdict

	Annex C of EN60947-1	-

Annex C	**Degree of protection of enclosed control circuit-devices**		P
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”		-
C.2	**Object**		-
	Clause 2 of EN60529 applies with additional requirements of this annex		-
C.3	**Definitions**		-
	Clause 3 of EN60529 applies except that ”Enclosure” is replaced by the following:		-
	”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”		-
C.4	**Designation**		-
	Clause 4 of EN60529 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 EN60529 applies		P
C.6	**Degrees of protection against ingress of water indicated by the second characteristic numeral**		
	Clause 6 of EN60529 applies		-
C.7	**Degrees of protection against access to hazardous parts indicated by the additional letter**		P
	Clause7 of EN60529 applies		P
C.8	**Supplementary letters**		P
	Clause 8 of EN60529 applies		P
C.9	**Examples of designations with IP Code**		P
	Clause 9 of EN60529 applies		P
C.10	**Marking**		-
	Clause 10 of EN60529 applies with the following addition:		P

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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		P
C.11	**General requirements for the tests**		-
C.11.1	Clause 11.1 of EN60529 applies		P
C.11.2	Clause 11.2 of EN60529 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 mare than 5 K		P
	Where equipment is mounted in an empty enclosure which already has an IP code the following requirements apply:		P
	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		P
	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		P
C.11.3	Subclause 11.3 of EN60529 applies with the following addition:		P
	Drain and ventilating holes are treated as normal openings		P
C.11.4	Clause 11.4 of EN60529 applies		P
C11.5	Where an empty enclosure is used as a component of an enclosed equipment, Clause 11.5 of EN60529 applies		P
C.12	**Degrees of protection against access to hazardous parts indicated by the first characteristic numeral**		-
	Clause 12 of EN60529 applies except for 12.3.2		N
C.13	**Degrees of protection against ingress of solid foreign objects indicated by the first characteristic numeral**		N
	Clause 13 of EN60529 applies except for		N
C.13.4	**Dust test for first characteristic numerals 5 and 6**		N
	Enclosed equipment having a degree of protection IP5X shall be tested according to category 2 of 13.4 of EN60 529		N

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Clause	Requirement – Test	Result - Remark	Verdict
	Enclosed equipment having a degree of protection IP6X shall be tested according to category 1 of 13.4 of EN60 529		N
C.13.5.2	**Acceptance conditions for first characteristic numeral 5**		N
	The following text to be added:		N
	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
	The preconditioning, after dust test, shall be verified by test Ca: damp heat, steady state, according to EN60068-2-3, under the following conditions.		N
	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
	Before being placed in the chamber the equipment shall be stored at room temperature at least 4 h before the test		N
	The test duration shall be 24 consecutive hours		N
	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		N
C.14	**Tests for protection against ingress of water indicated by the second characteristic numeral**		N
C.14.1	Clause 14.1of EN60529 applies		N
C.14.2	Clause 14.2of EN60529 applies		N
C.14.3	Clause 14.3of EN60529 applies with following addition:		N
	The equipments then submitted to a power-frequency dielectric test for 1 min, the value being 2 Uemax with a minimum of 1000 V		N
C.15	**Tests for protection against access to hazardous parts indicated by additional letter**		N
	Clause 15.1of EN60529 applies		N
C.16	**Summary of responsibilities of relevant technical committees**		N

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Clause	Requirement – Test	Result - Remark	Verdict

	Annex C	

Annex C	**Special tests -------- Durability tests**		-
C.1.1	**Durability declaration**		-
	The special durability tests described in this annex are conducted at the discretion of the manufacturer		-
	Declared number of operating cycles by the manufacturer:		-
	- mechanical		-
	- electrical		-
C.1.2	**Test procedures**		-
	As stated in 8.3.2.1 and at a rate equal or higher than that declared by the manufacturer		-
	The moving parts of the device shall reach their maximum operating positions in both directions, as recommended by the manufacturer		-
C.1.2.2	**Single 8 test**		-
	Eight control circuit devices shall be tested to the declared number of operating cycles		-
	If the number of failed devices does not exceed two, the test is considered passed		-
C.1.2.3	**Double 3 test**		-
	Three control circuit devices shall be tested to the declared number of operating cycles		-
	The test is considered passed if there is no failure, and failed if there is more than one failure.		-
	Should there be only one failure, then three additional control devices are tested to the declared number of operating cycles and providing there is no additional failure, the test is considered passed.		-
C.1.3	**Failure criteria**		-
	During the tests described in C.2.2 and C.3.2, there shall be no electrical and/or mechanical failures		-
	Following the tests, the switching element shall pass the dielectric test of 8.3.3.4 with a rated test voltage equal to 2 Ue with a minimum of 1000 V		-
C.2	**Mechanical durability**		-
C.2.1	**General**		-

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Clause	Requirement – Test	Result - Remark	Verdict
	The mechanical durability of a control circuit device is defined as the number of no-load operating cycles which will be attained or exceeding by 90 % of all devices tested without repair or replacement of any part.		P
C.2.2	**Test procedures**		-
	Test are carried out according to C.1.2.		P
	During the test, periodically the contacts shall be checked at any voltage and current, selected by the manufacturer, and there shall be no failure	**(see C.1.3)**	P
C.3	**Electrical durability**		-
C.3.1	**General**		-
	Electrical durability of a control device is defined as the number of on-load operating cycles which will be attained or exceeded by 90% of all devices tested, without repair or replacement of any part		P
C.3.2	**Test procedures**		-
	Electrical durability tests are carried out by operating the device under the conditions defined in table C.1, in accordance with C.3.2.1 for a.c. or with c.3.2.2. for d.c		-
	Each mechanical operation cycle shall include an interruption of the test current		P
	The ON- duration of the current shall not more 50% and not-less than 10% of an operating cycle.		P
	If the test circuit shown in figure C.1 is used, the ON-duration of current at 10 times Ie shall not cause overheating		P
	Alternatively these test may be performed on the actual load for which the control switch is intended		P
C.3.2.1	**AC test**		-
	Used circuit:		-
	The circuit to be used as shown in fig C.1:		-
	- Making circuit consisting air-cored inductor, in series with resistor, power factor of 0,7		P
	- Breaking circuit consisting air-cored inductor, in series with resistor, parallel damping resistor in which flows 3 % of breaking current, power factor of 0,4		P
	If the contact element has a bounce time less than 3 ms, the test may be made with the simplified circuit shown in Figure C.2		P
C.3.2.2	**D.C Tests**		-
	Used inductor		-

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Clause	Requirement – Test	Result - Remark	Verdict
	The circuit to be used as shown in fig C.1:		-
	- circuit consisting air-cored inductor, in series with resistor, parallel damping resistor across the complete circuit in which flows 1 % of test current power factor of T 0,95 or		P
	-circuit consisting iron-cored inductor, in series with resistor, power factor of T0,95 T 0,95 = 6 x P for P< 50 W T 0,95 = 300 ms for P = 50 W		P
	Annex D		**-**
Annex D	**Clearance and creepage distances of control circuit devices**		P
D3	**General**		-
D3.1		**See clause 7.1.3**	-
	Annex E		**-**
Annex E	**Items subject to agree between manufacturer and user**		-
	Annex J of EN60947-1 applies, as far as covered by clauses and of this standard, with the following additions		-
5.2.5	Relationship between the positions of the actuator of rotary switches and the associated contact element positions in the operating diagram (indication by the manufacturer)		P
5.2.6	Characteristics of the delay of time contact elements with adjustable delay of contactors relays (indication by manufacturer)		P
6.1.1 (Annex K)	Choice of connecting conductors for position switches with direct opening action		P
8.3.1	Test sequences made on one sample only (at manufacturer's request)		P
8.3.4.3	Conditional short-circuit current test:		P
	- adjustment of the test current if the prospective current is different from 1000 A (to be specified by the manufacturer)		P
	- power factor of the test circuit less than 0,5 (with manufacturer's consent		P

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Clause	Requirement – Test	Result - Remark	Verdict

	Annex F	**-**

Annex F	**Class II control circuit devices insulated by encapsulation** **Requirements and tests**		-
F.1	**General**		P
	This annex specifies constructional requirements and tests for class II control circuit devices or parts of devices in which insulation of class II according to EN61140 is archived by encapsulation		P
	All non-encapsulated parts shall have clearances and creepage distances double to those specified in 7.1.3		P
F.5	**Marking**		-
	Control devices according to this annex shall be marked with the following symbol		P
F.7	**Instructional and functional requirements**		-
F.7.1	**Choice of compound**		-
	The compound shall be chosen so that the encapsulated control devices comply with the tests defined in F.8.		P
F.7.2	**Adhesion of the compound**		-
	The adhesion of the compound shall be sufficient to prevent the ingress of moisture between the compound and all encapsulated parts and to prevent movement of the encapsulated portion of cable if any.		-
	Compliance shall be verified by tests of F.8.2.5 and F.8.1.2.2.		P
F.7.3	**Dielectric properties**		-
	Sub-clause 7.2.3 applies with the following changes:		-
	For the verification of the impulse withstand voltage, the test voltage Uimp shall be the next higher category of the maximum rated operational voltage in the first column of Table H.1 of EN60947-1 for stated overvoltage category.		P
	For verification of the power frequency withstand voltage, the test voltage shall be the sum of the voltage stated in Table 12A of EN60947-1 plus 1000 V.		P
F.8	**Tests**		-
F.8.1	**Kind of tests**		-

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Clause	Requirement – Test	Result - Remark	Verdict
F.8.1.1	**General**		-
	Subclause 8.1.1 of EN60947-1 applies		P
F.8.1.2	**Type test**		-
	The following sequence of 6 tests shall be applied to each of 3 samples in the specified order		-
F.8.1.2.1	**Dielectric tests in new conditions**		-
	Subclause 8.3.3.4 of EN60947-1 applies with the exception that the values of voltages shall be applied between the stripped joined ends of the cable or the shorted terminals and any point of the surface (or metallic foil on the surface) of the encapsulated device (see fig F.1)		-
	No breakdown of the insulation shall occur		P
F.1.2.2	**Cable tests (if applicable)**		**-**
	Control circuit devices provided with integrally connected cables shall comply with the requirements of Annex G		P
F.8.1.2.3	**Rapid change of temperature test**		-
	Test Na shall be performed in accordance with EN60068-2-14 with the following values:		-
	T_a and T_b are the minimum and the maximum temperatures stated in f.2.3		-
	Transition time t_2	t_2 = 2 to 3 min	-
	Number of cycles	*5*	-
	Exposure time t_1	t_1 = 3 h	-
	After the test no visible damage shall be observed		-
F.8.1.2.4	**Impact test**		-
	The test is performed as follow:		-
	Thee impacts of 0,5 Joule shall applied near the centre of the largest surface or the longest axis (for cylindrical shape) of the encapsulated device		-
	The impacts are provided by dropping a steel ball of 0,25 kg from a height of 0,20 m		-
	The support is consired sufficiently rigid if its displacement under the impact energy is lower than 0,1 mm		-
	After the test no visible damage shall be observed		-
F.8.1.2.5	**Damp heat, cyclic**		-
	Test Db shall be performed in accordance with EN60068-2-30 with the following values:	-	-
	Upper temperature	-	-

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Clause	Requirement – Test	Result - Remark	Verdict
	Number of cycles	-	-
	Variant	-	-
	After the test no visible damage shall be observed		-
F.8.1.2.6	**Dielectric test after stresses**		-
	Test of dielectric properties, dielectric withstand voltage (Uimp not indicated):		-
	- rated insulation voltage (V) - test voltage (V) for 5 sec ....:		P
	Leakage current measurements at 1,1 Ui		P
	Annex G		**-**
Annex G	**Additional requirements for control circuit devices with integrally connected cables**		-
G.1	**General**		-
	This annex gives additional requirements applying to control circuit devices with integrally connected cables for electrical connection to other equipment and / or to the power source.		-
	The cable integrally connected to such control devices is not considered replaceable by the user.		P
	This annex states the constructional and performance requirements for the cable, the cable anchorage and the cable entrance seal		-
G.7	**Constructional and performance requirements**		-
G.7.1	**Constructional requirements**		-
G.7.1.1	**Cable material**		-
	The control device shall provided with flexible cable of appropriate voltage, current and temperature rating and environmental condition		P
G.7.1.2	**Cable anchorage**		-
	The cable anchorage shall be such that a force being applied to the cable is not transmitted to electrical connections integral to the device		P
	Movement of the cable intro or out of the control circuit device shall not cause damage to the connection or internal parts of the device		P
G.7.1.3	**Cable entrance sealing means**		-

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Clause	Requirement – Test	Result - Remark	Verdict
	A sealing means shall provided at the cable entrance to the control circuit device suitable for the degree of protection or internal parts of the device		P
G.7.2	**Performance requirements**		-
	The cable and the cable entrance sealing means shall be capable of withstanding the tests given in G.8		P
G.8	**Tests**		-
	The purpose of these tests is to ensure integrity of the cable anchorage during handling and installation. Once installed, the control circuit device and cable should be fixed relative to each other		-
G.8.1	**Type test**		-
	The following sequence of four test shall be performed on a representive sample in the specified order		-
G.8.1.1	**Pull test**		-
	The cable shall be subjected to a steady pull along the axis of the cable entry, applied to the insulating jacket of the cable for a duration of 1 min		-
	The pull force for a cable diameter greater than or equal to 8 mm	**F= 160 N**	P
	The pull force for cable diameters of less than 8 mm shall be of a value of 20 times the external cable diameter		P
G.8.1.2	**Torque test**		-
	The cable shall be subjected to a torque of 0,1 Nm or limited to the value giving an angle of torque of 360°		-
	The torque shall be applied clockwise and then counter-clockwise for 1 min, to the cable at a distance of 100 mm from the control circuit device entrance		P
G.8.1.3	**Push test**		-
	The push force shall be applied along the axis of the cable as close as possible to the cable entrance		-
	The force is increased to 20 N. The force shall be applied for 1 min for each time and with 1 min pause between applications		P
	After the tests, no visible damage of the cable entrance sealing means and no displacement of the cable shall be observed		P
G.8.1.4	**Bend test**		-
	The cable shall beloaded and bent in the following manner:		-

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Clause	Requirement – Test	Result - Remark	Verdict
	a) suspend a 3 kg mass by attaching it to the cable, 1 m from the cable entrance and with the axis of the cable entrance vertical		P
	b) tilt the control circuit device 90° to cause a 90° bend in the cable, maintaining that position for 1 min		P
	c) tilt the contral device 90° in the opposite direction relative to vertical so as to cause an opposite 90° bend in the cable, maintaining the posisiton for a duration of 1 min.		P
G.8.2	**Results to be obtained**		-
	There shall be no damage to the cable, cable sealing means, cable entrance or the electrical connecting means of the control circuit device.		P
	This will be verified by visual examination and verification of compliance with the stated IP designation	**See 7.1. 11**	P

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Clause	Requirement – Test	Result - Remark	Verdict

	Annex H	**-**

Annex H	**Additional requirements for semiconductor switching elements for control circuit devices**		P
H.3	**Classification**		P
H.3.1	**Semiconductor switching elements**		P
	1) Utilization categories (see 4.4. and H.4.2)		P
	2) Electrical ratings based on utilization categories (see annex A)		P
			P
H.5	**Product information**		-
	The following information shall be given by the manufacturer:		-
	Clause 5.1 applies with the following additions:		-
	Basic rated values and utilization		-
	a) Voltage drop (H.7.1.1)		-
	b) Minimum operational current		-
	c) Off-state current		-
	d) Making and breaking capacities		-
	e) Conditional short-circuit current	**Normal 1000 A at Ue**	-
	f) Electromagnetic compability, EMC		-
H.8	**Tests**		-
H.8.1	**Type test**		-
	Subclause 8.1.2 applies with the following additions:		-
H.8.2	**Voltage drop (U_d)**		-
	The voltage drop is measured across the active output of the switching element in the ON state and carrying the current range of I_m and I_e at an ambient temperature of 23°C ± 5 °C and at rated frequency.		-
	The measurement is performed with the circuit in figure H.2, with the switch S closed. The loads shall be resistive and R_2 is adjusted to obtain the test current with the supply voltage		-
	Voltage drop at I_m		-
	Voltage drop at I_e		-

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Clause	Requirement – Test	Result - Remark	Verdict
	The measured voltage drop exceed not the specified value in H.7.1.1		P
H.8.3	**Minimum operational current (I_m)**		-
	The test is performed with the switching element connected to a test circuit shown in fig H.2. With supply voltage (Ue), the switch open and the switching element in ON-state conduction, the resistive load R_1 is adjusted to obtain the current I_m		-
	The measured value shall be according to H.7.1.2		P
H.8.4	**OFF-state current (I_r)**		-
	With the circuit in Figure H.2, and the S switch closed, the load R_2 is adjusted to obtain the rated operational current (I_e) when the highest supply voltage (U_e) is connected to the circuit. The switching element is then turned off and the OFF-state current is measured.		-
	The measured value shall be according to H.7.1.3		P
H.8.5	**Making and breaking capacities**		-
	Subclause 8.3.3.5 applies		-
8.3.3.5.2	**Making and breaking capacities of switching elements under normal conditions**		P
	contact element (figure / form)		-
	contact polarity		-
	utilization category .....:		-
	rated operational voltage Ue (V) .....:		-
	rated operational current Ie (A) or power (kW) ....:		-
Test No.1	- test voltage U/Ue = 1,1 (V) .....:		-
	- power factor/time constant .....:		-
	- make operations: test current I/Ie (A) .....:		-
	- break operations: test current I/Ie (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		-
	- on-time (ms) .....:		-
	- operating cycles per minute .....:	**6**	-
	- number of operating cycles .....:	**50**	P

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Clause	Requirement – Test	Result - Remark	Verdict
	- test voltage U/Ue = 1,0 (V) .....:		P
	- power factor/time constant .....:		P
	- make operations: test current I/Ie (A) .....:		P
	- break operations: test current I/Ie (A) .....:		P
Test No. 2	- on-time (ms) .....:		P
	- operating cycles per minute .....:	**Rapidly**	P
	- number of operating cycles .....:	**10**	P
Test No. 3	- on-time (ms) .....:		P
	- operating cycles per minute .....:	**60**	P
	- number of operating cycles .....:	**990**	P
Test No. 4	- on-time (ms) .....:		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		-
	Dielectric verification:		-
	dielectric test voltage (V) 2 xUe with a min.of 1000V.....:		P
8.3.3.5.3	**Making and breaking capacities of switching elements under abnormal conditions:**		-
	contact element (figure / form)		P
	contact polarity		P
	utilization category .....:		—
	rated operational voltage Ue (V) .....:		—
	rated operational current Ie (A) or power (kW) ....:		—
	Conditions, make/break operations:		
	- test voltage U/Ue = 1,1 (V) .....:		—
	- power factor/time constant .....:		—
	- make operations: test current I/Ie (A) .....:		—
	- break operations: test current I/Ie (A) .....:		—

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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		P
	- on-time (ms) .....:		—
	- operating cycles per minute .....:	**6**	—
	- number of operating cycles .....:	**10**	P
	Behaviour and condition during and after the test:		P
	- no electrical or mechanical failures		P
	- no contact welding or prolonged arcing		P
	- no blowing of the fusible element in the earth circuit		P
	Dielectric verification:		P
	dielectric test voltage (V) 2 xUe with min.of 1000V.....:		P
H.8.6	**Performance under short-circuit conditions**		-
8.3.4	**Performance under conditional short-circuit current**		P
	contact element (figure / form)		-
	contact polarity		-
	Maximum cable length	**2 m**	-
	type of SCPD .....:	**Fuse gL/gG**	—
	ratings of SCPD .....:		—
	prospective current (min- 1 kA) .....:		—
	test voltage (V) 1,1 x Ue .....:		—
	r.m.s. test current obtained (kA) .....:	**L1: 1 kA**	—
	power factor (0,5- 0,7) / $T_{0,95}$		P
	first CO operation by closing the separate making switch: test (Ip / I^2dt (A / A^2s) .....:		—
	time interval between test (min. 3 min) .....:		—
	second CO operation by closing the separate making switch: test (Ip / I^2dt (A / A^2s) .....:		—
	time interval between test (min. 3 min) .....:		—

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Clause	Requirement – Test	Result - Remark	Verdict
	third CO operation by closing the separate making switch: test (Ip / I²dt (A / A²s) .....:		—
8.3.4.4	**Condition of the switching element after the test**		-
	switching elements open by the normal actuating system		P
	Dielectric verification:		-
	dielectric test voltage (V) 2 xUe with min.of 1000V.....:		P
H.8.7	**Verification of electromagnetic compability**		-
H.8.7.1	**General**		-
	Emission and immunity tests are type tests and shall be carried out under the following common conditions		-
	The switching element is mounted in free air connected to a load corresponding to the rated operational current (Ie) and is supplied with its rated operational voltage (Ue), or the maximum voltage of its voltage range		-
	The connecting leads shall be 2 m length		-
	The tests shall be performed: a) with the switching element in the ON–state b) with the switching element in the OFF-state		-
H.8.7.2	**Immunity**		-
H.8.7.2.1	**General**		-
	Performance criteria are based on the acceptance criteria in table 24 of EN60947-1		P
H.8.7.2.2	**Electrostatic dicharges**		-
	The test shall be performed according to EN61000-4-2 and Table H.1		P
H.8.7.2.3	**Radiated radio-frequence electromagnetic fields**		-
	The test shall be performed according to EN61000-4-3 and Table H.1		P
H.8.7.2.4	**Electrical fast transients/bursts**		-
	The test shall be performed according to EN61000-4-4 and Table H.1, with the connecting leads of the device placed in the capacitive clamp		P
H.8.7.2.5	**Surges**		-

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Clause	Requirement – Test	Result - Remark	Verdict
	The test shall be performed according to EN61000-4-5 and Table H.1, with the following additional requirements in order to simplify the test procedure without impairing the validity of the verification of the EMC requirements:		-
	- the switching element is powered during the test - the tes impulse shall be applied: - a) between terminals intended to be connected to the power supply - b) between each output terminal and each terminal intended to be connected to the power supply		-
	Three positive and three negative impulses shall be applied between each two points at intervals of not less than 5 s		P
H.8.7.2.6	**Conducted disturbances induced by radio-frequency fields**		-
	The test shall be performed according to EN61000-4-6 and Table H.1.		P
H.8.7.2.7	**Power-frequency magnetic fields**		-
	The test shall be performed according to EN61000-4-8 and Table H.1. Applicable only to equipment cantaining devices susceptible to power-frequence magnetic fields		P
H.8.7.2.8	**Voltage dips and interruptions**		-
	The test shall be performed according to EN61000-4-11 and Table H.1. Applicable only to a.c. switching elements		P
H.8.7.3	**Emission**		-
	The test shall be performed under worst case conditions according to CISPR 11 Group 1, Class A, and 7.3.3.2 of EN60947-1		P
	These limits are given for switching elements exclusively intended for use in industrial environment A. When they can be used in domestic environment B, the following notice shall be included in the instructions for use	NOTICE This is a Class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures	P

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Clause	Requirement – Test	Result - Remark	Verdict

	Annex J	**-**

Annex J	**Special requirements for Push Buttons and indicating towers**		-
J.3	**Classification**		-
	Push Buttons may be classified by:		-
	rated electrical power		-
	colour		-
	Fixing hole diameter		-
	Means of connection		-
	Nature of current and frequence		-
	Type of lamp socket		-
J.4	**Characteristics**		-
J.4.1	Rated operational voltage of an Push Button		-
J.4.2	Rated thermal power of an Push Button		-
J.4.3	Rated values of the lamp		-
J.5	**Product information**		-
	a - manufacturer's name or trademark		-
	b - type designation or serial number		-
	c – the following markings shall appear on the Push Button		-
	1 rated voltage of Push Button		-
	2 rated voltage of the lamp		-
	3 rated power of the lamp or its type designation, or rated current for a LED		-
J.6	**Normal service, mounting and transport conditions**		-
	There are no supplementary requirements		N
J.7	**Constructional and performance requirements**		-
	Clause 7 applies with the following additions		P
J.7.1.12	**Push Buttons with build-in transformers**		-
	The transformer shall have separate windings		-
	It is assumed that this condition is fulfilled if the Push Button passes the test described in 8.3.3.4.1		-

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Clause	Requirement – Test	Result - Remark	Verdict
J.7.1.13	**Colour of the lens**		-
	It is recommended that the colour of the lens be chosen among those mentioned in EN60073 and also inPublication No. 2 of the International Commision of Illumination (CIE)		P
	The colour shall be remain essentially unchanged in spirit of the adverse environment, including the effect of ultra-violet light		P
	Colours used for identification shall bright and easily distinguishable		P
J.7.2.1.6	**Limits of operation**		-
	The limit value of the supply voltage at the terminals of the Push Button shall be 1,1, times the rated operational voltage		P
	This requirement is verified only for Push Buttons with built-in transformer accordingthe test described in J.8.3.3.3		P
J.7.2.5.1	**Short-circuit withstandability of build-in transformer**		-
	The transformer shall be able to withstand the short-circuit of its secondary winding.		P
\	It is assumed that this condition is fulfilled if the Push Button passes the testdescribed in 8.3.3.3.		P
J.8	**Tests**		-
J.8.3	**Tests for Push Buttons and indicator towers**		-
	The tests are type tests. No additional test(routine test or special test) is described inthis annex		P
	Each of the tests in J 8.3.3.3, -3.4, -4, and j.8.4 shall be made on new apparatus		P
J.8.3.3.3	**Temperature-rise test**		-
	a) If the Push Button has the same rated thermal power (see J.4.2) regardless of mounting conditions , a single test is made in an ensulated enclosure.		P
	b) If the rated thermal power (see J.4.2) is dependent on themounting conditions, two tests are made: - on a steel plate, and - in an insulated enclosure		P

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Clause	Requirement – Test	Result - Remark	Verdict
	c) Mounting on a steel plate Five Push Buttons fitted with green lenses are fixed in accordance with the following diagram on a steel plate 2 mm thick, painted black		P
	The plate is located vertically on a table and the Push Buttons are supplied at their rated voltage		P
	The duration of the test shall besuch that a steady-state temperature is reached		P
	d) Mounting in a insulating enclosure The test decribed in item c) is carried out again. With the lights into an enclosure of insulating material, such as bakelite-coated paper 2 mm thick		P
	The plate is located vertically on a table and the Push Buttons are supplied at their rated voltage		P
	The duration of the test shall besuch that a steady-state temperature is reached		P
	Results obtained on the follow points:		P
	- on the body of the Push Button		P
	- on the terminals		P
	- on the accessible part of the lens		P
	f) For indicating towers, an arrangement of 5 units shall be mounting in vertical position. The shall be loaded maximum power of the lanp at the nominal voltage		P
	The duration of the test shall besuch that a steady-state temperature is reached		P
	- on the accessible part of the centre lens of the tower		P
	None of the corresponding temperature rises exceed the limits of 7.2.2 of IEC60947-1		P
J.8.3.3.4	**Dielectric tests**		-
	Clause 8.3.3.4 applies		P
J.8.3.3.4.3	**Push Buttons with build-in transformers**		-
	Two additional dielectric tests shall be made, the duration of each being 1 min		P
	- between the primary and secondary windings of the transformer with the test voltage value specified in 8.3.3.4		P
	- between the secondary windings of the transformer and the frame of the Push Button wit a testvoltage of 1000 V		P
J.8.3.4	**Short-circuit test (on built-in transformer, if any)**		-
	The test are made unter the following conditions:		P
	- primary voltage: 1,1 x Ue		P

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Clause	Requirement – Test	Result - Remark	Verdict
	- ambient air temperature: 20 °C ± 5 °C		P
	- duration: 1 h		P
	The transformer shall be short-circuit by a conductor of negligible impedance		P
	After the test and after cooling to ambient, temperature, the transformer withstand the dielectric test defined in J.8.3.3.4.3		P
J.8.3.3.4.3	**Push Buttons with build-in transformers**		-
	Two additional dielectric tests shall be made, the duration of each being 1 min		P
	- between the primary and secondary windings of the transformer with the test voltage value specified in 8.3.3.4		P
	- between the secondary windings of the transformer and the frame of the Push Button wit a testvoltage of 1000 V		P
J.8.4	**Shock and vibration**		-
J.8.4.1	Direct mounting		P
J.8.4.1.1	General		P
	An indicating tower with five signaling units shall be mounted as stated by the manufacturer without exension poles and the upper three units powered at the rated voltage		P
	The test shall be performed as follows		P
J.8.4.1.2	**Shock**		-
	In accordance with EN60068-2-27 with the follow conditions		P
	Six shocks applied in each direction along three perpendicular axes (a total od 36 shocks:	- pulse shape :half-sine - peak acceleration: 15 g_n - duration of pulse: 11 ms	P
J.8.4.1.3	**Vibration**		**-**
	In accordance with EN60068-2-6 with the following conditions, along three mutually perpendicular axes:	- frequency range:10 to 55 Hz - amplitude: 0,5 mm - sweep cyle duration: 5 min - duration at resonant frequency or at 55 Hz: 30 min in each of the 3 axes (90 min in total)	P
J.8.4.2	**Indirect support mounting**		P
	If the product literature includes other allowable mounting conditions (e.g. pole mounting), the manufacturer shall state the severity level for shock and vibration tests at which the requirements of J.8.4.3 are met		-
J.8.4.3	**Results to be obtained**		-
	After the tests, no visible damage shall be observed and the signaling shall not be impaired		P

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Clause	Requirement – Test	Result - Remark	Verdict
J.8.5	**Degree of protection for indicating towers**		-
	If the manufacturer declares a degree of protection, the test shall be conducted according to Annex C of EN60947-1 with all removable parts equipped as in normal service.		P
	Annex K		-
Annex K	**Special requirements for control switches with direct opening action**		-
K.1	**General**		-
K.1.1	**Scope**		-
	All control switches with direct opening action shall also comply with the relevant requirements of the standard and, where applicable. To those given in Annexes F, G, H and/or J		-
K.3	**Classification**		-
	There are two types of control switches with direct opening action:		-
K4	**Characteristics**		-
K.4.3.1.2	Rated insulation voltage (= 250 V)		P
K.4.3.2.1	Conventional free air thermal current (= 10 A)		P
K.4.4	Utilization categories for switching elements (AC-15 or DC–13)		P
K.5	**Product information**		-
	Clause 5 is applies with the following additions		-
K.5.2	**Marking**		-
K.5.2.7	Every contact element with direct action shall be marked on the out side by the symbol	→	-
K.5.2.8	**Electrical separation for change-over contact element**		-
	Change-over contact elements with four terminal shall be indelibly and legibly marked with the relevant form Zap or Zebu as state in Figure 4.		-
K.5.2	**Additional product information**		-
K.5.4.1	**Actuator travel and operation force**		-
	The manufacturer shall state the following		-
	a) the minimum direct opening force		-
	b) the minimum force to achieve direct opening action of all break contacts		-
	c) the maximum travel including travel beyond the minimum travel position		-

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Clause	Requirement – Test	Result - Remark	Verdict
	d) for limit switches only the maximum speed of actuation		-
	e)for limit switches only the maximum frequency of actuation		-
	These statements shall appear in the marking or on the circuit diagram or other documents		P
K.5.4.2	**Short-circuit protection**		-
	Type of short-circuit protective device shall stated either as marking on the switch or in the installation instruction		P
K.6	**Normal service, mounting and transport conditions**		-
	Clause 6 applies, with the following additions:		P
K.6.1.1	**Ambient air temperature**		-
\	Subclause 6.1.1 of EN60947-1 applies, except for position switches with direct opening action, for which the upper and lower limits of temperature are respectively +70 °C and +25 °C, and the average temperature, measured over a period of 24 h, does not exceed +35 °C		P
K.7	**Constructional and performance requirements**		**-**
	Clause 7 applies with following additions:		-
K.7.1.4.3.1	**Robustness of the actuating system**		-
	The actuating system shall pass the test described in K.8.3.7		P
K.7.1.4.3.2	**Directness of the opening action**		-
	The control switch with direct opening action shall pass the tests K.8.3.4, K.8.3.5 and K.83.7 without any deformation that would reduce the impulse voltage withstand across the contact gap.		P
K.1.4.5	**Automatic opening of called operated control switches**		-
	In case of failure of the cable or its anchorage automatic return to open position		P
K.7.1.4.6	**Conditions for direct opening action**		-
	Parts of travel that separates the contacts, shall have no resilient member (springs) between the moving contacts and the point of the actuator to which the actuating force is applied		P
K.7.1.4.6.1	**Contact elements types**		-
	Control switches with direct opening action may provided with snap-on or dependent action contact elements		P
	Break-contact shall be electrically separated from each other and from the operating make-contact element		P

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Clause	Requirement – Test	Result - Remark	Verdict
	If C or Za change-over contact elements, only 1 contact element shall be used, and in case of Zebu change-over, both may be used		P
K.7.1.5.3	**Actuator travel indication**		-
	In order to facilitate the setting-up of the switch actuator in relation to the external operating means, the switch may include means for indicting the minimum travel		P
K8	**Tests**		-
	In addition to clause 8, and Annex, the following applies		-
K.8.3.1	**Test sequences**		-
	Clause 8.3.1 applies with the following additions:		-
			-
	TEST SEQUENCE VII (Sample 7)		-
	Mechanical operation of position switches with direct opening action		-
K.8.3.5	**Test no.1 - Mechanical operation of position switches at limits of temperature.**		-
K.8.3.6	**Test no.2 – Verification of direct opening action**		-
			-
K.8.3.5	**Mechanical operation of position switches at limits of temperature**.		P
	The position switch shall be conditioned at 70°C for 8 hours ..... :		P
	After 8 hours the contact shall be loaded with the maximum rated operational current for 10 min. :		P
	The contact then be operated 10 times by the application of the force stated by the manufacturer ..... :		p
	The test shall be repeated, the switch shall be conditioned at - 25 °C for 8 hours ..... :		P
	The contact then be operated 10 times by the application of the force stated by the manufacturer ..... :		P
K8.3.6	**Verification of direct opening action**		-
	Impulse voltage test over the open position of the contacts at 2500 V or for position switches for isolation in accordance with table 14 of EN60 947-1 or as declared Uimp by the manufacturer :		P
	5 positive and 5 negative impulses are applied ..... :		P

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Clause	Requirement – Test	Result - Remark	Verdict
	TEST SEQUENCE VIII (Sample 8)		-
K.8.3.7	**Verification of robustness of the actuating system**		-
K.8.3.7	**Verification of robustness of the actuating system**		-
	Closed break contact(s)shall be loaded with a force F1 of 10 N ..... :		P
	Stated openings force shall be applied to the actuator through the direct opening travel ... :		P
	After the test the actuating system and / or contacts shall remain functional..... :		P
	Impulse voltage test in accordance with K.8.3.6		-
	Impulse voltage test over the open position of the contacts at 2500 V or for position switches for isolation in accordance with table 14 of EN60 947-1 or as declared Uimp by the manufacturer :		P
	5 positive and 5 negative impulses are applied ..... :		P
K.8.3.4	**Performance under conditional short circuit current**		-
	Subclause 8.3.4 applies with the following additions:		-
K.3.4.2.1	**Verification of the conditional short-circuit current samples 4, 9 10**		-
	The test shall be made as state in .3.4.2, except that the current is made by a positive opening contact and not by the additional switching device and the test is made on each of the tree devices by making the current three times by the same contact element in a single phase circuit		-
	For type 2 control switches, the contact element shall be chosen at random		-
	Performance under conditional short-circuit current		-
	contact element (figure / form)		-
	contact polarity		-
	type of SCPD .....:	**Fuse gL/gG**	—
	ratings of SCPD .....:		-
	prospective current (min- 1 kA) .....:		-
	test voltage (V) U/Ue = 1,1 (V) .....:		-
	r.m.s. test current obtained (kA) .....:		-
	power factor (max. 0,7)		-
	Sample 4		-

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Clause	Requirement – Test	Result - Remark	Verdict
	first C operation by closing the switch element (Ip / I²dt (A / A²s) .....:		P
	time interval between test (min. 3 min) .....:		-
	second C operation by closing the switch element (Ip / I²dt (A / A²s) .....:		P
	time interval between test (min. 3 min) .....:		-
	third C operation by closing the switch element: (Ip / I²dt (A / A²s) .....::		P
	Sample 9		-
	first C operation by closing the switch element (Ip / I²dt (A / A²s) .....:		P
	time interval between test (min. 3 min) .....:		-
	second C operation by closing the switch element (Ip / I²dt (A / A²s) .....:		P
	time interval between test (min. 3 min) .....:		-
	third C operation by closing the switch element: (Ip / I²dt (A / A²s) .....::		P
	Sample 10		-
	first C operation by closing the switch element (Ip / I²dt (A / A²s) .....:		P
	time interval between test (min. 3 min) .....:		-
	second C operation by closing the switch element (Ip / I²dt (A / A²s) .....:		P
	time interval between test (min. 3 min) .....:		-
	third C operation by closing the switch element: (Ip / I²dt (A / A²s) .....::		P
	After the test the actuating system and / or contacts shall remain functional..... :		P
	Impulse voltage test in accordance with K.8.3.6		-
	Impulse voltage test over the open position of the contacts at 2500 V or for position switches for isolation in accordance with table 14 of EN60 947-1 or as declared Uimp by the manufacturer :		-
	5 positive and 5 negative impulses are applied ..... :		P

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Clause	Requirement – Test	Result - Remark	Verdict
	Annex L		**-**
Annex L	**Special requirements for mechanically linked contact elements**		-
L.1	**General**		-
	This annex applies to mechanically linked auxiliary contact elements included in control circuit devices where actuating force is provided internally, such as contactor relais		-
	Linkage betreen the auxiliary and main contacts is not covered by this annex		-
L.5	**Product information**		-
	Clause 5 applies with the following addition		-
L.5.2.7	**Mechanically linked contact elements indentification and marking**		-
	Mechanically linked contact elements shall be cleary idenfied:		-
	- on the control circuit device itself; - or in the manufacturers documentation - or both		P
	The mechanical linkage shall be identified in circuit diagrams by a double parallel line connecting a filled circle on each of the mechanically linked contact symbols.		-
	If the devices containing some or all mechanically linked contacts are marked, the symbol shown shall be used		P
L.7	**Constructional and performance requirements**		-
	Clause 7 applies with the following addition:		P
L.7.1.9	**Requirements for mechnically linked contact elements**		-
	While any of the n Make contact element(s) is closed, none of the m Breake contacts element(s) shall be closed		P
	While any of the m Breake contact element(s) is closed, none of the n Make contacts element(s) shall be closed		P
L.8	**Tests**		-
	Clause 8 applies with following addition:		P
L.8.4.	**Special test for mechnically linked contact elements**		P
	This special test shall be carried out on a sample of (m+n) products where m is the number of break contacts elements and n is the number of make elements		-
	A different sample is used for each test		P
	The test shall be carried out on products in new and clean condition		-

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Clause	Requirement – Test	Result - Remark	Verdict
	The test procedure shall be as follows:		P
	a) test of NC contact:		P
	1) the NC contact elements shall be maintained in the closed position e.g. by welding or gluing each point of contact (e.g. for double breaking contact, welding is done at the two contact points) The thickness of welding or gluing shall be such that the distance between contacts is not modified by more than 0,02 mm		P
	2)an actuating force shall be applied by energising the operating coil at 110 % of its rated voltage		P
	3) while applying the force, an impulse test voltage of 2,5 kV (1,2/50 µs at sea level; correction should be made according to table 12 of IEC60947-1 shall be applied across every NC contact. There shall be no disruptive discharge		P
	b) test of NO contact:		-
	1) the NO contact elements shall be maintained in the closed position e.g. by welding or gluing each point of contact (e.g. for double breaking contact, welding is done at the two contact points) The thickness of welding or gluing shall be such that the distance between contacts is not modified by more than 0,02 mm		P
	2)an actuating force shall be applied by de-energising the operating coil		P
	3) while applying the force, an impulse test voltage of 2,5 kV (1,2/50 µs at sea level; correction should be made according to table 12 of IEC60947-1 shall be applied across every NO contact. There shall be no disruptive discharge		P

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Clause	Requirement – Test	Result - Remark	Verdict

	TABLE 1: temperature rise measurements on		-
temperature rise dT of part:	phase	dT (K)	required dT (K)
1:Auxiliary terminal	L1	-	-
2:Auxiliary terminal	L2	-	-
3:Auxiliary terminal	L3	-	-
4:Auxiliary terminal	L4	-	-
5:Auxiliary terminal	T1	-	-
6:Auxiliary terminal	T2	-	-
7:Auxiliary terminal	T3	-	-
8:Auxiliary terminal	T4	-	-
9:Surface of side wall		-	-
10:Surface of top cover		-	-
11:Ambient temperature		-	-
Coil		-	-

Photo Documentation

Type of equipment, model: Protector, PS-1601, PS-1602, PS-1603, PS-1604, PS-1605

Details of: PS-1601

View:

[X] general

[ ] front

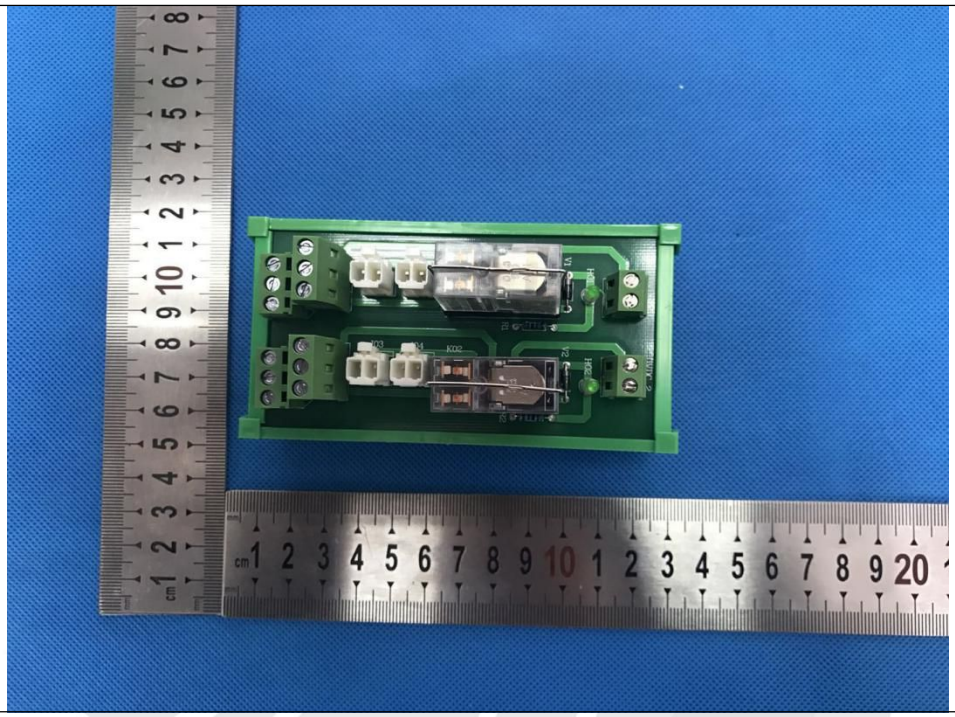
[ ] rear

[ ] right

[ ] left

[ ] top

[ ] bottom



Details of: PS-1601

View:

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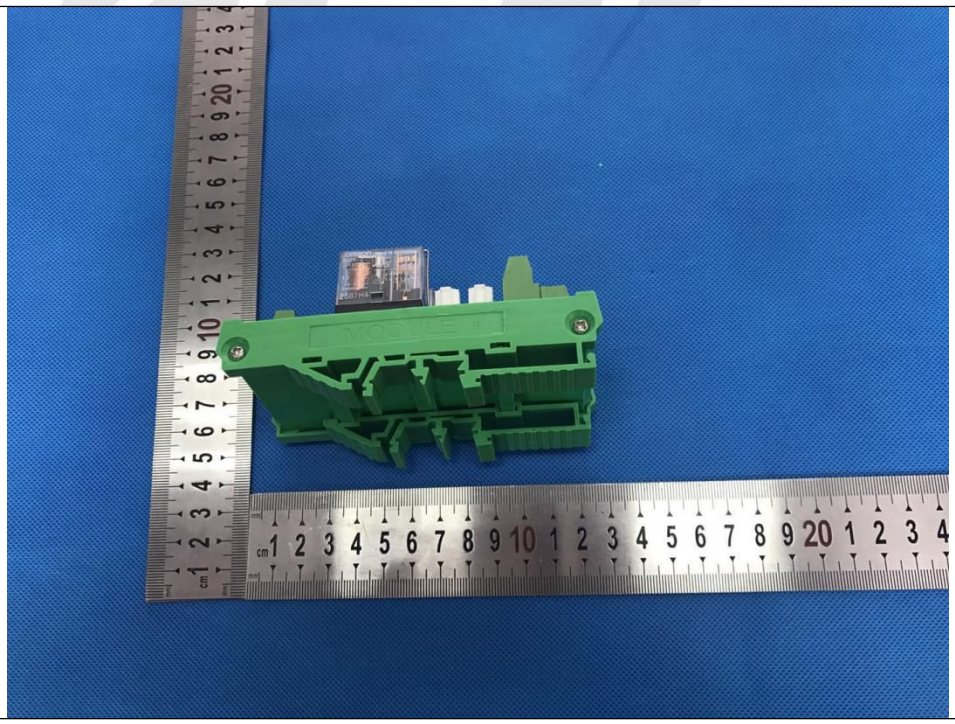

- End of Report -