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TEST REPORT
IEC 60947-4-1
Low voltage switchgear and controlgear
Part 4: Contactors and motor-starters
Section 1 - Electromechanical contactors and motor-starters

Report Number. ..... :	180600074SHA-002
Date of issue ..... :	2018-10-08
Total number of pages ..... :	69
Name of Testing Laboratory preparing the Report ..... :	Intertek Testing Services Shanghai Building No.86, 1198 Qinzhou Road (North), Shanghai 200233, China
Applicant's name ..... :	Elmark Industries SC
Address ..... :	2 Dobrudzha blvd., Dobrich, BULGARIA
Test specification:	
Standard ..... :	IEC 60947-4-1:2009 + A1:2012
Test procedure ..... :	CB Scheme
Non-standard test method ..... :	N/A
Test Report Form No. ..... :	IEC60947_4_1C
Test Report Form(s) Originator .... :	DEKRA Certification B.V.
Master TRF ..... :	Dated 2017-06

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

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Test item description ..... :	AC Contactor
Trade Mark ..... :	ELMARK
Manufacturer ..... :	Same as applicant
Model/Type reference ..... :	LT1-D8011, LT1-D9511
Ratings ..... :	See General product information (Page 10)

Responsible Testing Laboratory (as applicable), testing procedure and testing location(s):			
☒	CB Testing Laboratory:	Intertek Testing Services Shanghai	
Testing location/ address.....:		Building No.86, 1198 Qinzhou Road (North), Shanghai 200233, China	
☒	Associated CB Laboratory:	Inspection Center of Products' Quality of Low Voltage Electric Apparatus in Zhejiang Province	
Testing location/ address.....:		No. 400 Guangqiong Rd., Jiaxing, Zhejiang, China	
Tested by (name, function, signature) .....:		Allen Wang	
Approved by (name, function, signature) .....:		Quiet Lin	
☐	Testing procedure: CTF Stage 1:		
Testing location/ address.....:			
	Tested by (name, function, signature).....:		
	Approved by (name, function, signature).:		
☐	Testing procedure: CTF Stage 2:		
Testing location/ address.....:			
	Tested by (name + signature).....:		
Witnessed by (name, function, signature):			
	Approved by (name, function, signature).:		
☐	Testing procedure: CTF Stage 3:		
☐	Testing procedure: CTF Stage 4:		
Testing location/ address.....:			
	Tested by (name, function, signature).....:		
	Witnessed by (name, function, signature):		
	Approved by (name, function, signature).:		
	Supervised by (name, function, signature)		

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

Summary of testing:

Clause	Testing items	Testing location
9.3.3.3	Verification of temperature rise	ACTL
9.3.3.1&9.3.3.2	Verification of operation and operating limits	ACTL
9.3.3.4	Verification of dielectric properties	ACTL
9.3.3.5	Verification of rated making and breaking capacities, change-over ability and reversibility, where applicable	ACTL
9.3.3.6	Verification of conventional operational performance	ACTL
9.3.4	Performance under short-circuit conditions	ACTL
9.3.5	Verification of ability to withstand overload current	ACTL
8.2.4 of part 1	Verification of mechanical properties of terminals	CBTL
Annex C of part 1	Verification of degrees of protection of enclosed contactors and starters	CBTL

Tests performed on main circuit according to IEC/EN 60947-4-1:

Report No.	Type	Seq. I	Seq. II	Seq. III	Seq. IV	Seq. V	-
180600074SHA-002	LT1-D9511	1+4[a)]	1	1	1	1	-

Tests performed on auxiliary circuit according to IEC/EN 60947-5-1:

180600074SHA-003	Type	Seq. I	Seq. II	Seq. III	Seq. IV	Seq. V	Seq. VI
	LT1-D9511	1	1	1	1	1	1

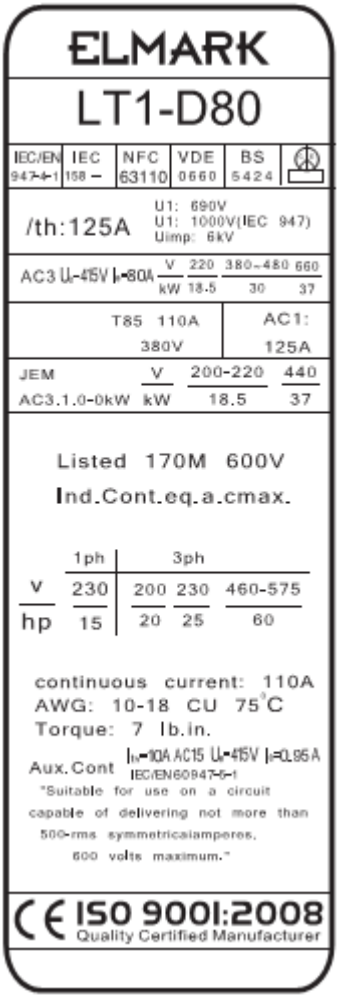
Note:

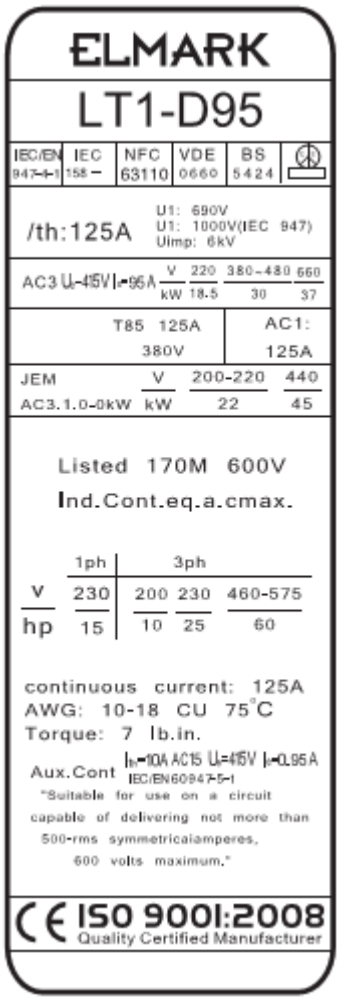
a) The additional 4 samples are tested for clause 9.3.3.2.1.2 and 9.3.3.2.1.3.

Summary of compliance with National Differences

☒ **The product fulfills the requirements of EN 60947-4-1:2010 + A1: 2012**

Copy of marking plate:





Test item particulars ..... :	
- kind of equipment ..... :	AC contactors
- number of poles..... :	3
- kind of current (a.c. or d.c.) ..... :	a.c.
- interrupting medium ..... :	air
- method of operation ..... :	Electromagnetic
- method of control..... :	Automatic
- method of change-over for particular types of starters..... :	N/A
- method of connecting for particular types of starters ..... :	N/A
- rated frequency..... :	50/60
- rated duties..... :	uninterrupted duty
-Utilization category ..... :	AC-3
Rated and limiting values, main circuit	
Rated voltages	
- rated operational voltage Ue (V) ..... :	415V
- rated stator operational voltage Ues (V) ..... :	N/A
- rated rotor operational voltage Uer (V) ..... :	N/A
- rated insulation voltage Ui (V) ..... :	690
- rated stator insulation voltage Uis (V) ..... :	N/A
- rated rotor insulation voltage Uir (V) ..... :	N/A
- rated impulse withstand voltage Uimp(kV) ..... :	6
- rated starting voltage of an auto-transformer starter ..... :	N/A
Currents or powers	
- conventional free air thermal current Ith (A) ..... :	125
- conventional enclosed thermal current Ithe (A)..... :	N/A
- conventional stator thermal current Iths (A) ..... :	N/A
- conventional rotor thermal current Ithr (A) ..... :	N/A
- rated operational current Ie (A) or rated operational powers :	See General product information on page 10
- rated stator operational current Ies (A) or rated stator operational powers ..... :	N/A
- rated rotor operational current Ier (A) ..... :	N/A
- rated uninterrupted current Iu (A)..... :	N/A
Normal load and overload characteristics	
- ability to withstand motor switching overload currents ..... :	8Ie/10s
-rated making capacity ..... :	10Ie (AC-3)
-rated breaking capacity..... :	8Ie (AC-3)
-conventional operational performance..... :	AC-3; 6000 cycles
Starting and stopping characteristics of starters..... :	N/A
-service conditions for starters ..... :	N/A

Rated conditional short-circuit current	
- rated prospective short-circuit current "r" (kA) :	5
- rated conditional short-circuit current Iq (kA) :	20
-type of co-ordination :	type 2
-Pole impedance of a contactor (Z) :	-
Control circuits	
The characteristics of electronic control circuits	
- kind of current :	a.c.
- rated frequency if a.c. :	50/60Hz
- rated control circuit voltage Uc (nature: a.c. ~~/ d.c.~~) :	415V / a.c. 50/60HZ
- rated control supply voltage Us (nature: a.c. ~~/ d.c.~~) :	415V / a.c. 50/60HZ
Rated and limiting values of air supply control circuit	
- rated pressure :	N/A
- volumes of air :	N/A
Auxiliary circuits:	
- rated operational voltage Ue (V) :	415Vac
- rated insulation voltage: Ui (V) :	690
- rated operational current: Ie (A) :	0,95
- kind of current :	a.c.
- rated frequency: (Hz) :	50/60
- number of circuits :	2 (1NC and 1NO)
- number and kind of contact elements :	2, figure 4 e)/Zb
- rated uninterrupted current: Iu (A) :	0,95A
- utilization category: (AC, DC, current and voltage) :	AC-15
Short-circuit characteristic	
- Rated conditional short-circuit current (kA) :	1kA
- kind of protective device :	Fuse, RT16-00, 10A/500V
Rated and limiting values of relays and releases	
- types of relay or release :	☐ a) release with shunt coil (shunt trip) ☐ b) under voltage and under–current opening relay or release ☐ c) overload time-delay relay the time-lag of which is: ☐ 1) substantially independent of previous load (e.g. time-delay magnetic overload relay) ☐ 2) dependent on previous load (e.g. thermal or electronic overload relay) ☐ 3) dependent on previous load (e.g. thermal or electronic overload relay) and also sensitive to phase loss ☐ d) instantaneous over-current relay or release (e.g jam sensitive, see 3.2.29)

	☐ e) other relays or releases (e.g., control relay associated with devices for the thermal protection of the motor ☐ f) Stall relay or release
characteristic values a) release with shunt coil, under–voltage (under–current) opening relay or release	
- rated voltage (current) ..... :	N/A
- rated frequency..... :	N/A
- operating voltage (current) ..... :	N/A
- operating time..... :	N/A
- inhibit time..... :	N/A
b) Overload relay	
-designation and current settings..... :	N/A
-rated frequency, when necessary (for example in case of a current transformer operated overload relay) ..... :	N/A
- time-current characteristics (or range of characteristics), when necessary..... :	N/A
- trip class according to classification in table 2, or the value of maximum tripping time, in seconds, under the conditions specified in 8.2.1.5.1, table 2, column D, when this time exceeds 40 s. ..... :	N/A
- number of poles..... :	N/A
- nature of the relay: thermal, magnetic, electronic without thermal memory ..... :	N/A
c) Release with residual current sensing relay	
- rated current ..... :	N/A
- operating current ..... :	N/A
- operating time or time-current characteristic according to Table T.1 of IEC 60947-1:2007, Amendment 1 ..... :	N/A
-inhibit time (when applicable) ..... :	N/A
-type designation (see Annex T of IEC 60947-1: 2007, Amendment 1) ..... :	N/A
Type and characteristics of automatic change-over devices and automatic acceleration control devices	
Types	☐ a) time delay, e.g. time delay contactor relays (see IEC 60947-5-1) applicable to control-devices or specified-time-or nothing relays (see IEC 61810-1) ☐ b) under current devices (undercurrent relays ☐ c) other devices for automatic control - ☐ devices dependent on voltage - ☐ devices on power - ☐ devices depending on speed
Characteristics a) the characteristics of time-delay devices are	
- the rated time-delay or its range, if adjustable..... :	N/A

- for time-delay devices fitted with a coil, the rated voltage, when it differs from the starter line voltage ..... :	N/A
b) the characteristics of the under voltage devices are	
- the rated current (thermal current and /or rated short-circuit withstand current, according to the indications given by the manufacturer) ..... :	N/A
- the current setting or its range, if adjustable..... :	N/A
c) the characteristics of the other devices shall be determined by agreement between manufacturer and user	N/A
Types and characteristics of auto-transformers for two-step auto-transformer starter Account being taken of the starting characteristics (see 5.3.5.5.3), starting auto-transformers shall be characterized by	
- rated voltage of auto-transformer ..... :	N/A
- the number of taps available for adjusting torque and current..... :	N/A
- the starting voltage, i.e. the voltage at the tapping terminals, as a percentage of the rated voltage of auto-transformer ..... :	N/A
- the current they can carry for a specified duration ..... :	N/A
-the rated duty(see 5.3.4) ..... :	N/A
-the method of cooling..... :	☐ air-cooling ☐ oil-cooling
-mounting design..... :	☐ built-in ☐ or provide separately
Types and characteristics of starting resistors for rheostatic starters Account being taken of the starting characteristics (see 5.3.5.5.1), the starting resistor shall be characterized by.:	
- the rated rotor insulation voltage (Uir).....	N/A
- their resistor value ..... :	N/A
- the mean thermal current, defined by the value of steady current they can carry for specified duration..... :	N/A
- the rated duty (see 5.3.4) ..... :	N/A
- the method of cooling..... :	☐ free air ☐ forced air ☐ foil immersion
-mounting design..... :	☐ built-in ☐ or provide separately
Classification of installation and use ..... :	N/A
Supply Connection..... :	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 ..... :	2018-06-12
Date (s) of performance of tests ..... :	From 2018-06-12 to 2018-08-05

General remarks:

The test results presented in this report relate only to the object tested.
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"(See Enclosure #)" refers to additional information appended to the report.
"(See appended table)" refers to a table appended to the report.

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

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The test report shall be used in conjunction with auxiliary contacts report: 180600074SHA-003

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

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

☐ **Yes**

☒ **Not applicable**

When differences exist; they shall be identified in the General Product Information section.

Name and address of factory (ies)..... : Same as applicant

General product information:

Main circuit:

Type: LT1-D8011, LT1-D9511

Ue= 415V~(3-poles), AC-3: Ie= 80(LT1-D8011), 95A(LT1-D9511)

Ith= 125A, Ir= 5kA, Iq=20kA, Ui= 690V, Uimp= 6kV

Control circuit:

Us= 415V~

Auxiliary circuit:

Ith= 10A, Cat.: AC-15, Ue= 415V, Ie= 0,95A

LT1-D8011 and LT1-D9511 are the same frame size, all tests are performed on LT1-D9511

IEC 60947-4-1			
Clause	Requirement + Test	Result - Remark	Verdict
6.2	MARKING		
	Data shall be marked on the equipment (mandatory):		
	a – manufacturer's name or trade mark	ELMARK	P
	b – type designation or serial number	LT1-D9511	P
	Data preferably marked on the equipment:		
	c - number of this standard, if the manufacturer claims compliance	IEC/EN 60947-4-1	P
	k - IP code, in case of an enclosed equipment		N/A
	S2) Overload relays and releases: Characteristic values		N/A
	S2) Overload relays and releases: Designation and current settings of overload relays		N/A
	aa) - polarity of terminals, if applicable		N/A
	Data shall be included on the nameplate, or on the equipment, or in the manufacturer's published literature:		
	d - rated operational voltages	415V	P
	e - utilization category and rated operational currents (or rated powers), at the rated operational voltages of the equipment	AC-3: 95A	P
	f - either the value of the rated frequency/ies, or the indication d.c. (or symbol) .....:	50/60Hz	P
	g - rated duty with the indication of the class of intermittent duty, if any	Uninterrupted duty	P
	Associated values:		
	h - rated marking and breaking capacities (these indications may be replaced, where applicable, by the indication of the utilization category, see table 7)	AC-3	P
	Safety an installation:		
	i – rated insulation voltage	690V	P
	j – rated impulse withstand voltage (see 5.3.1.3)	6kV	P
	l – pollution degree	3	P
	m – rated conditional short-circuit current (see 5.3.6) and type of co-ordination of the contactor or starter (see 8.2.5.1) and the type, current rating and characteristics of the associated SCPD; rated conditional short-circuit current (see 5.3.6) of the combination starter, the combination switching device, the protected starter or the protected switching device and type of co-ordination (see 8.2.5.1)	Ir=5kA, Iq=20kA, type 2 SCPD: Fuse: RT16-00, 125A/500V~	P
	n - Void		
	Control circuits		
	The following information concerning control circuits shall be placed either on the coil or on the equipment:		
	o – rated control circuit voltage (Uc), nature of current and rated frequency	415Vac, 50/60Hz	P
	p - if necessary, nature of current, rated frequency and rated control supply voltages (Us)	415Vac, 50/60Hz	P
	Air supply systems for starter or contactors operated by compressed air		

IEC 60947-4-1			
Clause	Requirement + Test	Result - Remark	Verdict
	Q – rated supply systems of the compressed air and limits of variation of this pressure, if they are different from those specified in 8.2.1.2		N/A
	Auxiliary circuits:		
	r – ratings of auxiliary circuits	See General product information on page 10	P
	Overload relays and releases:		
	s – characteristics according to 5.7, specifying the electronic overload relay does not contain thermal memory		N/A
	Additional information for certain types of contactor and starter:		
	Rheostatic starters:		
	t – circuit diagram		N/A
	u – severity of start, see 5.3.5.5.1		N/A
	v – starting time, see 5.3.5.5.1		N/A
	Auto-transformer starters:		
	w – rated starting voltage(s), i.e. voltage(s) at the tapping terminals		N/A
	Vacuum contactors and starters:		
	x – maximum permissible altitude of the site of installation, if less than 2000 m		N/A
	EMC		
	y – environment A and/or B: see 7.3.1 of part 1	☐ A ☐ B	N/A
	z – special requirements, if applicable, for example shielded or twisted conductors		N/A
	Sub clause 5.2 of part 1 applies to contactors, starters and overload relays with the following additions:		
	Data under items d) to x in 6.1.2 shall be included on the nameplate or on the equipment or in the manufacturer's published literature:		P
	Data under items c) and k) in 6.1.2 shall preferably be marked on the equipment	c) marked	P
	In case of electronically controlled electromagnets, information other than given in o) and p) of 6.1.2 may also be necessary: see 5.5 and annex E		N/A
	If the manufacturer declares an electronic overload relay without thermal memory, this shall be marked on the device.		N/A
6.3	Instruction 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 60947-4-1			
Clause	Requirement + Test	Result - Remark	Verdict
	- equipment only suitable in environment A shall be provided with the following notice	NOTICE This product has been designed for environment A. Use of this product in 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
	- manufacturer advice on the measures to be taken in the event of a short-circuit		P
	In case of protected starters (see 3.2.8), the manufacturer shall also provide the necessary mounting and wiring instruction		N/A
8.1	Constructional requirements		
	The equipment with its enclosure, if any, whether integral or not, shall be designed and constructed to withstand the stresses occurring during installation and normal use and, in addition, shall provide a specified degree of resistance to abnormal heat and fire		P
8.1.2	Materials		
7.1.2.1 Part 1	Parts of insulating materials which might be exposed to thermal stresses due to electrical effects, and the deterioration of which might impair the safety of the equipment, shall not be adversely affected by abnormal heat and by fire.		P
	Alternatively, the manufacturer may provide data from the insulating material supplier to demonstrate compliance with the requirements		N/A
7.1.2.2 Part 1	Glow wire testing	(See 8.2.1.1.1 part 1 below)	
	When tests on the equipment or on sections taken from the equipment are used, parts of insulating materials necessary to retain current-carrying parts in position shall conform to the glow-wire tests of 8.2.1.1.1 of IEC 60947-1 at a test temperature of 850 °C	850 °C	P
7.1.2.3 Part 1	Test based on flammability category	(See 8.2.1.1.2 part 1 below)	
8.1.3	Current-carrying parts and their connection		
7.1. 3 Part 1	No contact pressure through insulating materials		
8.1.4	Clearances and creepage distances		
	Clearances		
	Rated impulse withstand voltage (see test sequence I)	U_{imp}= 6kV	P
	Creepage distances		
	Pollution degree .....:	3	
	Comparative tracking index (V) .....:	175	

IEC 60947-4-1			
Clause	Requirement + Test	Result - Remark	Verdict
	Material group .....:	IIIa	
	Rated insulation voltage Ui (V) .....:	690	
	Minimum creepage distances (mm) .....:	10	
	Measured creepage distances (mm) .....:	>15	P
	In case Uimp is not indicated		N/A
8.1.5	Actuator		
	Means for padlocking the operating handle of the manually operated switching device of a combination starter may be provided		N/A
7.1. 5.1 Part 1	Insulation		
	The actuator of the equipment shall be insulated from the live parts for the rated insulation voltage and, if applicable, the rated impulse withstands voltage. Moreover:		N/A
	- if it is made of metal, it shall be capable of being satisfactorily connected to a protective conductor unless it is provided with additional reliable insulation;		N/A
	- if it is made of or covered by insulating material, any internal metal part, which might become accessible in the event of insulation failure, shall also be insulated from live parts for the rated insulation voltage.		N/A
7.1. 5.2 Part 1	Direction of movement		
	The direction of operation for actuators of devices shall normally conform to IEC 60447.		N/A
	Where devices cannot conform to these requirements, e.g. due to special applications or alternative mounting positions, they shall be clearly marked such that there is no doubt as to the "I" and "O" positions and the direction of operation.		N/A
8.1.5.3	Mounting		
	Actuators mounted on removable panels or opening doors are so designed that when the panels are replaced or doors closed the actuator will engage correctly with the associated mechanism		N/A
8.1.6	INDICATION OF CONTACT POSITION		
7.1. 6.1 Part 1	Indication means, applies to manually operated starters		N/A
	When an equipment is provided with means for indicating the closed and open positions, these positions shall be unambiguous and clearly indicated. This is done by means of a position indicating device		N/A

IEC 60947-4-1			
Clause	Requirement + Test	Result - Remark	Verdict
	If symbols are used, they shall indicate the closed and open positions respectively, in accordance with IEC 60417-2: 60417-2-IEC-5007 I On (power) 60417-2-IEC-5008 O Off (power)		N/A
	For equipment operated by means of two push-buttons, only the push-button designated for the opening operation shall be red or marked with the symbol "O"		N/A
	Red colour shall not be used for any other push-button		N/A
	The colours of other push-buttons, illuminated push-buttons and indicator lights shall be in accordance with IEC 60073		N/A
7.1. 6.2 Part 1	Indication by the actuator		
	When the actuator is used to indicate the position of the contacts, it shall automatically take up or stay, when released, in the position corresponding to that of the moving contacts; in this case, the actuator shall have two distinct rest positions corresponding to those of the moving contacts, but for automatic opening a third distinct position of the actuator may be provided		N/A
8.1.7	Additional safety requirements for equipment suitable for isolation		
7.1.7.1 part 1	Additional constructional requirements:		
	Equipment suitable for isolation shall provide in the open position an isolation distance in accordance with the requirements necessary to satisfy the isolating function		
	- minimum clearances across open contacts (see Table XIII, Part 1) (mm) .....:		N/A
	- measured clearances (mm) .....:		N/A
	- test Uimp across gap (kV) .....:		N/A
	Indication of the position of the main contacts shall be provided by one or more of the following means		N/A
	- the position of the actuator		N/A
	- a separate mechanical indicator		N/A
	- visibility of the moving contacts		N/A
	The effectiveness of each of the means of indication provided on the equipment and its mechanical strength shall be verified	(See 8.2.5 part 1 below)	N/A
	When means are provided or specified by the manufacturer to lock the equipment in the open position, locking in that position shall only be possible when the main contacts are in the open position	(See 8.2.5 part 1 below)	N/A

IEC 60947-4-1			
Clause	Requirement + Test	Result - Remark	Verdict
	Equipment shall be designed so that the actuator, front plate or cover are fitted to the equipment in a manner which ensures correct contact position indication and locking, if provided		N/A
	For equipment provided with positions such as “tripped position” or “standby position”, which are not the indicated open position, those positions shall be clearly identified. The marking of such positions shall not include the symbols “I” or “O”		N/A
	An actuator having only one position of rest shall not be considered as appropriate to indicate the position of the main contact		N/A
7.1.7.2 part 1	Supplementary requirements for equipment with provision for electrical interlocking with contactors or circuit-breakers:		
	Auxiliary switch is rated according to IEC 60947-5-1 (unless the equipment is rated AC-23)		N/A
	Time interval between opening of the contacts of the auxiliary contact and the contacts of the main poles: ≥20 ms .....:		N/A
	Measured time interval (ms) .....:		N/A
	During the closing operation the contacts of the auxiliary switch closes after or simultaneously with the contacts of the main poles		N/A
7.1.7.3 part 1	Supplementary requirements for equipment provided with means for padlocking the open position:		
	The locking means is so designed that it cannot be removed with the appropriate padlock(s) installed		N/A
	Test force F applied to the actuator in an attempt to operate to the closed position (N) .....:		N/A
	Rated impulse withstand voltage (kV) .....:		
	Test Uimp on open main contacts at the test force		N/A
8.1.8	Terminals		
7.1.8.1 part 1	All parts of terminals which maintain contact and carry current shall be of metal having adequate mechanical strength	(see 8.2.4 part 1 below)	P
	Terminal connections shall be such that necessary contact pressure is maintained	(see 8.2.4 part 1 below)	P
	Terminals shall be so constructed that the conductor is clamped between suitable surfaces without damage to the conductor and terminal	(see 8.2.4 part 1 below)	P
	Terminal shall not allow the conductor to be displaced or to be displaced themselves in a manner detrimental to the operator of equipment and the insulation voltage shall not be reduced below the rated value	(see 8.2.4 part 1 below)	P
	If required by application, terminals and conductors may be connected by means of cable lugs for copper conductors only		P

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Clause	Requirement + Test	Result - Remark	Verdict
7.1.8.2 part 1	Connecting capacity		
	type of conductors .....:	Rigid or stranded	
	minimum cross-sectional area of conductor (mm²) .....:	4,0	
	maximum cross-sectional area of conductor (mm²) .....:	50,0	
	number of conductors simultaneously connectable to the terminal .....:	1(50mm²) / 1(4,0mm²)	
7.1.8.3 part 1	Connection		
	terminals for connection to external conductors shall be readily accessible during installation		P
	clamping screws and nuts shall not serve to fix any other component		N/A
8.1.8.1	Terminal identification and marking,		
	marking comply with Annex A		P
7.1.8.4 part 1	terminal intended exclusively for the neutral conductor		N/A
	protective earth terminal		N/A
	other terminals	1/L1, 3/L2, 5/L3 2/T1, 4/T2, 6/T3	P
8.1.9	Additional requirements for equipment provided with a neutral pole		
7.1.9 part 1	marking of neutral pole		N/A
	The switched neutral pole shall not break before and shall not make after the other poles		N/A
	Conventional thermal current of neutral pole		N/A
	If a pole having an appropriate short-circuit breaking and making capacity is used as a neutral pole, then all poles, including the neutral pole, may operate substantially together.		N/A
	Equipment having a value Ith < 63 A, this value shall be identical for all poles		N/A
	For Ith > 63 A, the neutral pole may have a value of Ith different from that of the other poles, but not less than the half that value or 63 A, whichever is the higher.		N/A
8.1.10	Provisions for earthing		
7.1.10.1 part 1	The exposed conductive parts shall be electrically interconnected and connected to a protective earth terminal		N/A
7.1.10.2 part 1	The protective earth terminal shall be readily accessible		N/A
	The protective earth terminal shall be suitably protected against corrosion		N/A
	The electrical continuity between the exposed conductive parts of the protective earth terminal and the metal sheathing of connecting conductors		N/A
	The protective earth terminal shall have no other functions		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
7.1.10.3 part1	Protective earth terminal marking and identification	⏚	N/A
8.1.11	Enclosure for equipment		
7.1.11.1 part1	Design		
	Starting resistors mounted within an enclosure shall be so located or guarded that issuing heat is not detrimental to other apparatus and materials within the enclosure.		N/A
	For the specified case of combination starters, the cover or door shall be interlocked so that it cannot be opened without manually operated device being in open position.		N/A
	However, provision may be made to open the door or cover with the manually operated switching device in the ON position by use of a tool.		N/A
	The enclosure, when it is opened: all parts requiring access for installation and maintenance are readily accessible		N/A
	Sufficient space shall be provided inside the enclosure		N/A
	The fixed parts of a metal enclosure shall be electrically connected to the other exposed conductive parts of the equipment and connected to a terminal which enables them to be earthed or connected to a protective conductor		N/A
	Under no circumstances shall a removable metal part of the enclosure be insulated from the part carrying the earth terminal when the removable part is in place		N/A
	The removable parts of the enclosure shall be firmly secured to the fixed parts by a device such that they cannot be accidentally loosened or detached owing to the effects of operation of the equipment or vibrations		N/A
	When an enclosure is so designed as to allow the covers to be opened without the use of tools, means shall be provided to prevent loss of the fastening devices		N/A
7.1.11.2 part1	Insulation		
	If, in order to prevent accidental contact between a metallic enclosure and live parts, the enclosure is partly or completely lined with insulating material, then this lining shall be securely fixed to the enclosure		N/A
8.1.12	Degree of protection of enclosed equipment		
7.1.12 part1	Degrees of protection of enclosed equipment and relevant tests are given in Annex C of IEC 60947-1	(see 8.2.3 part 1 below)	N/A
8.1.13	Conduit pull-out, torque and bending with metallic conduits		
7.1.13 part1	Polymeric enclosures of equipment, whether integral or not, provided with threaded conduit entries, intended for the connection of extra heavy duty, rigid threaded metal conduits complying with IEC 60981, shall withstand the stresses occurring during its installation such as pull-out, torque, bending	(see 8.2.7 part 1 below)	N/A

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Clause	Requirement + Test	Result - Remark	Verdict
8.2	Performance requirements		
A	Starters shall be so constructed that they:		
	a) are trip free;		N/A
	b) can be caused to open their contacts by the means provided when running and at any time during the starting sequence;		N/A
	c) will not function in other than the correct starting sequence.		N/A
B	Starters employing contactors shall not trip due to the shocks caused by operation of the contactors when tested according to 9.3.3.1, after the starter has carried its rated full load current at the reference ambient temperature (i.e. +20 °C) and has reached thermal equilibrium at both minimum and maximum settings of the overload relay, if adjustable	(see 9.3.3.1 below)	N/A
C	For rheostatic starters, the overload relay shall be connected in the stator circuit.		N/A
	Special arrangements may be made to protect the rotor contactors and resistors against overheating, if requested by the user		N/A
D	When starters are used in conditions in which the overheating of the starting resistors or transformers would represent an exceptional hazard, it is recommended that a suitable device be fitted to switch off the starter automatically before a dangerous temperature is reached.		N/A
E	The moving contacts of multipole equipment intended to make and break together shall be so coupled that all poles make and break substantially together, whether operated manually or automatically		N/A
8.2.1.2	Limits of operation of contactors and power-operated starters	(see 9.3.3.2 below)	P
8.2.1.3	Limits of operation of under-voltage relays and releases	(see 9.3.3.2 below)	N/A
8.2.1.4	Limits of operation of shunt-coil operated releases (shunt trip)	(see 9.3.3.2 below)	N/A
8.2.1.5	Limits of operation of current sensing relays and releases	(see 9.3.3.2 below)	N/A
8.2.2	Temperature rise	(see 9.3.3.3 below)	P
8.2.3	Dielectric properties	(see 9.3.3.4 below)	P
8.2.4	Normal load and overload performance requirements		P
8.2.4.1	Making and breaking capacities	(see 9.3.3.5 below)	P
8.2.4.2	Conventional operational performance	(see 9.3.3.6 below)	P
8.2.4.3	Durability	(see annex B below)	N/A
8.2.4.4	Overload current withstand capability of contactors	(see 9.3.5 below)	P
8.2.4.5	Coil power consumption	(see 9.3.3.2.1.2 below)	P
8.2.4.6	Pole impedance	(see 9.3.3.2.1.3 below)	P
8.2.5	Co-ordination with short-circuit protective devices	(see 9.3.4 below)	P

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Clause	Requirement + Test	Result - Remark	Verdict
8.3	Electromagnetic compatibility (EMC)		
	Environment A		N/A
	Environment B		N/A
	Power frequency magnetic field tests are not required because the devices are naturally submitted to such fields. Immunity is demonstrated by the successful completion of the operational performance capability tests (see 9.3.3.5 and 9.3.3.6)		N/A
	This equipment is inherently sensitive to voltage dips and short time interruptions on the control supply; it shall react within the limits of 8.2.1.2 and this is verified by the operating limits tests given in 9.3.3.2		N/A
8.3.2	Immunity	(see 9.4 below)	N/A
8.3.3	Emission	(see 9. 4 below)	N/A
9.2	Compliance with constructional requirements		
8.2.1 Part 1	Materials		
8.2.1.1.1 part 1	Glow wire test (on equipment)		
	The suitability of materials used is verified by making tests: a) on the equipment; or b) on sections taken from the equipment; or c) on samples of identical material		
	The suitability shall be determined with respect to resistance to abnormal heat and fire		
	The manufacturer shall indicate which tests, amongst a), b) and c), shall be used	☐ a) ☒ b) ☐ c)	P
	As described in IEC 60695-2-10 and –2-11		
	parts retaining current-carrying parts ..... Remark : a protective conductor is not considered as a current-carrying part	☒ 850 ± 15°C or ☐ 960 ± 15°C 3,4s	P
	all other parts	☒ 650 ± 10°C No visible flame	P
	No visible flame, no sustained glowing or flames and glowing extinguish within 30 s		P
	For the purpose of this test, a protective conductor is not considered as a current-carrying part.		P
8.2.1.1.2 part 1	Flammability, hot wire ignition and arc ignition tests (on materials)		
	Suitable specimens of material shall be subjected to the following tests: a) flammability tests, in accordance with IEC 60695-11-10 b) Hot wire ignition (HWI) test, as described in Annex M c) Arc ignition (AI) test, as described in Annex M		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	The test c) is required only if the material is located within the 13 mm of arcing parts or live parts which are subject to loosening of connections.		N/A
	Materials located within 13 mm of arcing arts are exempt from this test if the equipment is subjected to make/break testing.		N/A
a)	Flammability tests, in accordance with IEC 60695-11-10		
	Test method	☐ A) – Horizontal burning test ☐ B) – Vertical burning test	N/A
b)	Hot wire ignition (HWI) test, as described in Annex M		N/A
c)	Arc ignition (AI) test, as described in Annex M		N/A
8.2.3 part 1	Enclosure for equipment's		
	Degree of protection .....:	IP00	
	Test for first characteristic		
	Test for first numeral .....:	~~1:~~ ~~2:~~ ~~3:~~ ~~4:~~ ~~5:~~ ~~6:~~	N/A
	Test for second characteristic		
	Test for second numeral .....:	~~1:~~ ~~2:~~ ~~3:~~ ~~4:~~ ~~5:~~ ~~6:~~ ~~7:~~ ~~8:~~	N/A
8.2.4 part 1	Mechanical properties of terminals		
8.2.4.2 part 1	Mechanical strength of terminals		
	maximum cross-section of conductor (mm²) :	50	
	diameter of thread (mm) .....:	9,5	
	torque (Nm) .....:	4,0	
	5 times on 2 separate clamping units		P
8.2.4.3 part 1	Testing for damage to and accidental loosening of conductor (flexion test)		
	conductor of the minimum cross-section area (mm²) .....:	4,0	P
	number of conductor of the minimum cross-section .....:	1	P
	diameter of bushing hole (mm) .....:	9,5	P
	height between the equipment and the platen (mm) .....:	280	P
	mass at the conductor(s) (kg) .....:	0,9	P

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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
8.2.4.4 part 1	Pull-out test		
	force (N) .....:	60	P
	1 min, the conductor shall neither slip out of the terminal nor break near the clamping unit		P
8.2.4.3 part 1	Testing for damage to and accidental loosening of conductor (flexion test)		
	conductor of the maximum cross-section (mm²)...:	50	P
	number of conductor of the maximum cross-section .....:	1	P
	diameter of bushing hole (mm) .....:	15,9	P
	height between the equipment and the platen (mm) .....:	343	P
	mass at the conductor(s) (kg) .....:	9,5	P
	135 continuous revolutions: the conductor shall neither slip out of the terminal nor break near the clamping unit		P
8.2.4.4 part 1	Pull-out test		
	force (N) .....:	236	P
	1 min, the conductor shall neither slip out of the terminal nor break near the clamping unit		P
8.2.4.3 part 1	Testing for damage to and accidental loosening of conductor (flexion test)		
	conductor of the largest and minimum cross-section (mm²) .....:	50 / 4,0	P
	number of conductor of the minimum cross-section, number of conductor of the maximum cross-section .....:	1(50mm²) / 1(4,0mm²)	P
	diameter of bushing hole (mm) .....:	15,9 / 9,5	P
	height between the equipment and the platen (mm) .....:	343 / 280	P
	mass at the conductor(s) (kg) .....:	8,6 / 0,9	P
	135 continuous revolutions: the conductor shall neither slip out of the terminal nor break near the clamping unit		P
8.2.4.4 part 1	Pull-out test		
	force (N) .....:	236 / 60	P
	1 min, the conductor shall neither slip out of the terminal nor break near the clamping unit		P
8.2.4.5 part 1	Test for insertability of unprepared round copper conductors having the maximum cross-section		
	Test gauge .....:		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		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Alternatively, the test can be carried out by inserting the largest conductor of type and rated cross-section among those recommended by the manufacturer, after the insulation has been removed and the end has been reshaped .....:		N/A
	The stripped end of the conductor shall be able to enter completely within the clamping unit aperture, without use of undue force		N/A
9.2.2	Electrical performance of screwless-type clamping units	Test according to subclause 9.8 of IEC 60999-1 and 9.8 of IEC 60999-2 See report _____	N/A
	A suitable test arrangement is shown in Figure 10.		N/A
	If the measurement points cannot be positioned within the 10 mm to the point of contact, the voltage difference between the ideal and the actual measuring points shall be deducted from the voltage drop measured.		N/A
	This voltage difference within the part of the conductor shall be determined with a suitable measurement method on one specimen at a stabilised temperature.		N/A
	The test current is Ith		N/A
9.2.3	Ageing test for screwless-type clamping units	Test according to subclause 9.10 of IEC 60999-1 and 9.10 of IEC 60999-2 See report _____	N/A
	The test shall be done on the device equipped with the clamping units		N/A
	The test current is Ith		N/A
8.2.5 part 1	Verification of the effectiveness of indication of the main contact position of equipment suitable for isolation		
8.2.5.2.1 part 1	Dependent and independent manual operation		
	actuating force for opening (N) .....:		N/A
	means to keep the contact(s) closed and the number of contacts…… ….:		N/A
	test force for 10 s (N) .....:		N/A
	After the test, when the test force is no longer applied, the actuator being left free, the open position shall not be indicated by any of the means provided		N/A
	the equipment shall not show any damage such as to impair its normal operation		N/A
	When the equipment is provided with a means of locking in the open position, it shall not be possible to lock the equipment while the test force is applied		N/A
8.2.5.2.2 part 1	Dependent power operation		
	means to keep the contact(s) closed and the number of contacts…… ….:		N/A
	Supply voltage of 110% of rated voltage (V)…….:		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Three attempts of 5 s to operate the equipment at intervals of 5 min.		N/A
	During and after the test, the open position shall not be indicated by any of the means provided and the equipment shall not show any damage such as to impair its normal operation		N/A
	When the equipment is provided with means for locking in the open position, it shall not be possible to lock the equipment during the test		N/A
8.2.5.2.3 part 1	Independent power operation		
	means to keep the contact(s) closed and the number of contacts……..…:|		N/A
	Three attempts to operate the equipment by the stored energy.		N/A
	Lock ability of driving mechanism in OFF-position at test force and blocked main contacts .....:		N/A
	Position indicator does not show OFF-position after capture of test force at blocked main contacts		N/A
	During and after the test, the open position shall not be indicated by any of the means provided and the equipment shall not show any damage such as to impair its normal operation		N/A
	When the equipment is provided with means for locking in the open position, it shall not be possible to lock the equipment during the test		N/A
8.2.7 part 1	Conduit pull-out test, torque test and bending test with metallic conduits		
8.2.7.1 part 1	Pull-out test		
	Torque for screwing the conduit into the entry.....:		N/A
	Pull force (N) .....:		N/A
	5 min, the displacement of the conduit in relation with the entry shall be less than one thread depth		N/A
	There shall be no evidence of damage impairing further use of the enclosure		N/A
8.2.7.2 part 1	Bending test		
	A slowly increasing bending moment shall be applied without jerk to the free end of the conduit		N/A
	Bending moment is maintained at.....:		N/A
	1 min		N/A
	The test is then repeated in a perpendicular direction		N/A
	There shall be no evidence of damage impairing further use of the enclosure		N/A
8.2.7.3 part 1	Torque test		
	Torque (Nm) .....:		

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Clause	Requirement + Test	Result - Remark	Verdict
	it shall be possible to unscrew the conduit and there shall be no evidence of damage impairing further use of the enclosure		N/A
9.3.1	Compliance with performance requirements		
a)	**TEST SEQUENCE I** - 1 sample: LT1-D9511, U_s = 415V - 4 samples: LT1-D9511, U_s = 415V, for only clause 9.3.3.2.1.2 and 9.3.3.2.1.3		
	- verification of temperature rise (Clause 9.3.3.3.)		
	- verification of operation and operating limits (Clause 9.3.3.1 and 9.3.3.2)		
	- verification of dielectric properties (Clause 9.3.3.4)		
9.3.3.3	Temperature rise (I-1)		
	Sub clause 8.3.3.3. of part 1 applies		
	ambient temperature 10-40 °C .....:	23,7°C	
	Contactor		
	test enclosure W x H x D (mm x mm x mm) .....:	In free air	
	material of enclosure .....:	No enclosure	
9.3.3.3.4	Main circuits, test conditions:		
	Sub clause 8.3.3.3.4 of part 1 applies with following addition		
	loaded as stated in 8.2.2.4		
	- setting of the maximum current setting.....:	-	
	- setting overload relay.....:	-	
	- conventional thermal current Ith (A) .....:	125	
	- conventional enclosed thermal current Ithe (A) .:	-	
	- for equipment intended for utilization category AC-6b, the test current for the temperature rise test shall be equal to 1,35 times Ie (the rated capacitive current).	AC-3	
	- cable/~~busbar~~ cross-section (mm²) / (m) .....:	50 / 2	
	- temperature rise of main circuit terminals (K) ....:	< 70 K, see page 63	P
9.3.3.3.5	Control circuit, test conditions:		
	Sub clause 8.3.3.3.5. of part 1 applies with following addition		
	The temperature rise shall be measures during the test of 9.3.3.3.4		
	- conventional thermal current Ith (A) at their rated voltage.....:		
	- conventional enclosed thermal current Ithe (A) .:		
	- cable/busbar cross-section (mm²) / (mm) .....:		
	- temperature rise of control circuit (K) .....:	<_____ K see page ____	N/A

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Clause	Requirement + Test	Result - Remark	Verdict
9.3.3.3.6	Coils and electromagnets circuit, test conditions:		
	The coil with the highest power consumption, for a given frequency a.c. or d.c., according to 9.3.3.2.1.2.2 is deemed to be representative for all coils, for the same contactor, and shall be used for the temperature rise test.		
	a) Uninterrupted and eight-hour duty windings (8.2.2.6.1)		
	The temperature rise shall be measures during the test of 9.3.3.3.4		
	- rated control supply voltage Us (V) .....:	415Vac	
	- class of insulating material .....:	B	
	- uninterrupted or eight-hour duty windings	Uninterrupted duty	
	- temperature rise of control circuit terminals (K) .:	< 110 K, see page 63	P
	b) Intermittent duty windings (8.2.2.6.2)		
	- no current flowing though the main circuit		
	- rated control supply voltage Us (V) .....:		
	- class of insulating material .....:		
	- intermittent duty class .....:		
	- close open operating cycle.....:		
	- on-load factor .....:		
	- temperature rise of control circuit terminals (K) .:		N/A
	c) temporary or periodic duty (8.2.2.6.3)		
	- no current flowing though the main circuit		
	- rated control supply voltage Us (V) .....:		
	- class of insulating material .....:		
	- close open operating cycle.....:		
	- on-load time .....:		
	- temperature rise of control circuit terminals (K) .:	< ____ K see page ____	N/A
9.3.3.3.7	Auxiliary circuit, test conditions:		
	Normally loaded with their maximum rated operational current at any convenient voltage		
	The temperature rise shall be measures during the test of 9.3.3.3.4		
	- conventional thermal current Ith (A).....:	10	
	- conventional enclosed thermal current Ithe (A) .:	-	
	- cable/~~busbar~~ cross-section (mm²) / (mm) .....:	1,5/1	
	- cable cross-section (mm²) .....:	1,5	
	- temperature rise of auxiliary circuit terminals (K) :	< 70K see page 63	P
9.3.3.3.8	Starting resistors for rheostatic rotor starters test conditions:		
	Normally loaded with their current value I_m		

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Clause	Requirement + Test	Result - Remark	Verdict
	Number of starts per hour .....:		
	Rated duty .....:		
	Starting characteristic	See page _____	
	- cable/busbar cross-section (mm²) / (mm) .....:		
	- cable cross-section (mm²) .....:		
	- temperature rise of starting resistor terminals (K):	See table 3 of part 1	N/A
	- temperature rise of starting resistor enclosure (K):	See table 3 of part 1	N/A
	- temperature rise of issuing air (K) .....:	See table 3 of part 1	N/A
9.3.3.3.9	Auto-transformers for two-step auto-transformers starters		
	Normally loaded with max. Starting current multiplied with 0,8 x $^{\text{starting voltage}}/_{\text{Ue}}$		
	Number of starts per hour .....:		
	Rated duty .....:		
	Starting characteristic.....:	See page	
	- cable/busbar cross-section (mm²) / (mm) .....:		
	Temperature rise of:		
	- windings (K), See table 5 (+15 K) .....:		
	- operating means (K) , See table 3 of part 1.....:		
	- parts intended to be touched but not hand held (K) , See table 3 of part 1		
	- parts which need not be touched during normal operation (K) , See table 3 of part 1		N/A
9.3.3	Performance under no load, normal load and overload conditions		
9.3.3.1	Operation		
	For starter only:		
	reference ambient temperature(i.e. +20 °C) :		
	Rated full load current (A) :		
	No tripping after 3 operations when stator has reached thermal equilibrium at minimum and maximum settings		N/A
	For overload relay with combined stop and reset actuating mechanism only		
	With closed contactor, the resetting mechanism shall be operated and this shall cause the contactor drop out		N/A
	For overload relay with either a reset or separate stop and reset mechanism only		
	With closed contactor and resetting mechanism in the reset position, the tripping mechanism shall be operated and the contactor shall have been caused to drop out		N/A
9.3.3.2	Operating limits		
9.3.3.2.1	Power-operated equipment:		

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Clause	Requirement + Test	Result - Remark	Verdict
8.2.1.2.1	Electromagnetic contactors and starters		
	rated control supply voltage Us (V) .....:	415	
	frequency (Hz) .....:	50/60	
	declared ambient temperature(>40 °C) for 100% Us	40°C	
	limits of close satisfactorily at any value between 85% and 110% of rated control supply voltage Us :	Us_{max}: 457V~ Us_{min}: 353V~	P
	limits of drop out and open fully are: 75% to 20% for a.c. and 75% to 10% for d.c. .....:		N/A
	ambient temperature(-5 °C) for 100% Us	-5°C	
	Drop out test method		
	Limits of drop out and open fully are: 75% to 20% for a.c. and 75% to 10% for d.c. .....:	164V~(39,5%)	P
8.2.1.2.2	Contactors and starters with electronically controlled electromagnet		
	Rated control supply voltage Us (V) .....:		
	Frequency (Hz) .....:		
	Declared ambient temperature(>40 °C) for 100% Us		
	Limits of close satisfactorily at any value between 85% and 110% of rated control supply voltage Us :		N/A
	Limits of drop out and open fully are: 75% to 20% for a.c. and 75% to 10% for d.c. .....:		N/A
	Ambient temperature(-5 °C) for 100% Us		
	Drop out test method		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) .....:		
	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)		N/A
	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
8.2.1.2.4	Capacitive drop out test		
	A capacitor shall be inserted in series in the supply circuit U_s, the total length of the connecting conductors being ≤ 3 m.		
	The capacitor is short-circuit by a switch of negligible impedance.		
	The supply voltage shall then be adjusted to 110 % U_s.....:		
	The value of the capacitor shall be calculated: C (nF) = 30 + 200000 / (f x U_s) .....:	_____nF	

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Clause	Requirement + Test	Result - Remark	Verdict
	Verification of the drop out of the contactor when the switch is operated to the open position .....:		N/A
9.3.3.2.1.2	Coil power consumption		
	A contactor coil is evaluated for both holding power and pick-up power		
	In the case where different coils cover a range of voltages, 5 coils shall be tested		P
	The coil with the lowest rated control supply voltage Us, the coil with the highest rated control supply voltage Us, plus 3 coils deemed to be representative of the coils with the highest calculated hold power at the discretion of the manufacturer		P
	The test shall be performed at ambient temperature +23 °C ± 3 °C	23,3°C	P
	The test shall be made without any load in the main and auxiliary circuits		P
	The coil shall be supplied with the rated control supply voltage Us and at the rated frequency	415Vac	P
	For a given coil, where a voltage range is declared, the test shall be made at the highest voltage at the respective frequency		P
	The measured values shall be obtained with a r.m.s. measurement method covering at least a bandwidth from 0 Hz to 10 kHz and the resulting power values shall be given within a measurement uncertainty better than 5 %		P
9.3.3.2.1.2.2	Holding power for conventional and electronically controlled electromagnet		
	The current measurement I(i) of the coil shall be performed after the coil has been energized and has reached a stable temperature		
	The holding power consumption is defined as follows		
	Sh(i) = Us(i) × I(i) [VA] for a.c. controlled contactor		N/A
	Pc(i) = Us(i) × I(i) [W] for d.c. controlled contactor	Ii=0,051A	P
	The published value shall be equal to the average value of the 5 tested coils		
	Sh = Σ (Us(i) × I(i)) / 5 [VA] respectively Pc = Σ (Us(i) × I(i)) / 5 [W]	Average value: 21,2 w	P
9.3.3.2.1.2.3	Pick-up power for a.c. controlled contactor or d.c. controlled contactor with separate pick-up and hold-on windings		
	The pick-up measurement shall be performed directly after the measurement of the hold current (see 9.3.3.2.1.2.2)		
	The current measurement I(i) of the coil shall be performed immediately after the coil has been de-energized, the contactor has been held in the Off position and re-energized		
	The pick-up power consumption is defined as follows		
	Sp(i) = Us × I(i) [VA] for a.c. controlled contactor		N/A
	Pp(i) = Us × I(i) [W] for d.c. controlled contactor with separate pick-up and hold windings	Ii=0,44A	P
	The published value shall be equal to the average value of the 5 tested coils		

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Clause	Requirement + Test	Result - Remark	Verdict
	Sp = Σ (Us(i) × I(i)) / 5 [VA] respectively Pp = Σ (Us(i) × I(i)) / 5 [W]	Average value: 183 w	P
9.3.3.2.1.3	Pole impedance		
	The pole impedance shall be determined during the test and with the conditions given in 9.3.3.3.4.		
	The test in an enclosure is not deemed necessary even if the contactor can be used in an individual enclosure		
	The voltage drop Ud shall be measured between the line and load terminals (terminals included) of the contactor preferably at the same time the temperature rise is measured		
	The impedance per pole is defined as follows		
	Z = Ud / Ith [Ω]	L1: 0,294mΩ (max.) L2: 0,307mΩ (max.) L3: 0,297mΩ (max.)	P
	Care should be taken that voltage drop measurement does not significantly affect the temperature rise nor affect significantly the impedance		P
9.3.3.2.2	Relays and releases		
8.2.1.3	a) Operation of under-voltage relays and releases		
	When associated with a switching device, the release shall be fitted to the switching device having the maximum current rating for which the release is suitable		
	1) Drop-out voltage		
	Rated control supply voltage(U).....:		
	Frequency (Hz).....:		
	Limits of drop out and fully open at slowly falling voltage are 70 % and 35 % of the rated voltage.....:		N/A
	The voltage shall be reduced from rated control supply voltage at a rate to reach 0 V in approximately 30 s		N/A
	The test for the lower limit is made without previous heating of the release coil		N/A
	In the case of a release with a range of rated control supply voltage, this test applies to the maximum voltage of the range		N/A
	When associated with a switching device, the test for the lower limit is made without current in the main circuit		N/A
	The test for the upper limit is made starting from a constant temperature corresponding to the application of rated control supply voltage to the release and rated current in the main poles.		N/A
	This test may be combined with the temperature-rise test of 9.3.3.3.		N/A
	In the case of a release with a range of rated control supply voltage, this test is made at the minimum rated control supply voltage		N/A
	2) Test for limits of operation when associated with a switching device		

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Clause	Requirement + Test	Result - Remark	Verdict
	Starting with the main circuit open, at the temperature of the test room, and with the supply voltage at 35 % rated maximum control supply voltage, it shall be verified that the switching device cannot be closed by the operation of its actuator		N/A
	When the supply voltage is raised to 85 % of the minimum control supply voltage, it shall be verified that the switching device can be closed by the operation of its actuator		N/A
	3) Performance under over-voltage conditions		
	When associated with a switching device, the test is made without current in the main circuit.		N/A
	The test at 110 % of the rated supply voltage shall be made for 30 min or until the temperature has reached thermal equilibrium and without impairing its functions. Verification shall be made according 2) above		N/A
8.2.1.4	b) Shunt-coil operated releases		
	When associated with a switching device, the release shall be fitted to the switching device having the maximum rated current for which the release is suitable		N/A
	Tripping of shunt release measured during the tripping operation between 70 % and 110 % of the rated control supply voltage and if a.c. at rated frequency.....:		N/A
8.2.1.5	Limits of operation of current sensing relays and releases		
8.2.1.5.1	Limits of operation of time-delay overload relays when all poles are energized		
8.2.1.5.1.1	Common requirements		
	type of time-delay overload relay .....:		
	trip class .....:		
	current setting .....:		
	ambient temperature °C) .....:		
	test enclosure W x H x D (mm x mm x mm) .....:		
	cable/busbar cross-section (mm²) / (mm) .....:		
	ambient temperature: - 5°C .....:		
	a) at A times of current setting, tripping shall not occur in less than 2 h starting from the cold state; test current .....:	No tripping; ……A	N/A
	b) when the current is subsequently raised to B times the current setting, tripping shall occur in less than 2 h; test current .....:	Tripping; …..A	N/A
	c) for class 2, 3, 5 and 10 A overload relays energized at *C* times the current setting, tripping shall occur in less than 2 min starting from thermal equilibrium, at the current setting, in accordance with 9.3.3 of IEC 60034-1; for class 10 A overload relays, for ambient air temperature –5 °C or below, the manufacturer may declare a longer tripping time but not longer than 2 times the values required for 20 °C	Class; ____ Tripping current___ A Trip-time: ____ s	N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	d) for class 10, 20 , 30 and 40 overload relays energized at C times the current, tripping shall occur in less than 4, 8 or 12 min, starting from thermal equilibrium at the current setting; class; test current; tripping time .....:	Class; ____ Tripping current___ A Trip-time: ____ s	N/A
	e) at D times the current setting, tripping shall occur within the limits given in Table 2 for the appropriate trip class and tolerance band, starting from the cold state; test current; tripping time Tp (s) .....:	Class; ____ Tripping current___ A Trip-time: ____ s	N/A
	ambient temperature: + 20 °C .....:		
	a) at A times of current setting, tripping shall not occur in less than 2 h starting from the cold state; test current .....:	Test current: ____ A	N/A
	b) when the current is subsequently raised to B times the current setting, tripping shall occur in less than 2 h; test current .....:	Test current Trip time: ____s	N/A
	c) for class 2, 3, 5 and 10A overload relays energized at C times the current, tripping shall occur in less than 2 min, starting from thermal equilibrium at the current setting; test current .....:	Test current Trip time: ____s	N/A
	d) for class 10, 20 , 30 and 40 overload relays energized at C times the current, tripping shall occur in less than 4, 8 or 12 min, starting from thermal equilibrium at the current setting; class; test current; tripping time .....:	Test current Trip time: ____s	N/A
	e) at D times the current setting, tripping shall occur within the limits given in Table 2 for the appropriate trip class and tolerance band, starting from the cold state; test current; tripping time Tp (s) .....:	Class; ____ Tripping current___ A Trip-time: ____ s	N/A
	ambient temperature: + 40 °C .....:		
	a) at A times of current setting, tripping shall not occur in less than 2 h starting from the cold state; test current .....:	Test current: ____ A	N/A
	b) when the current is subsequently raised to B times the current setting, tripping shall occur in less than 2 h; test current .....:	Test current Trip time: ____s	N/A
	c) for class 2, 3, 5 and 10A overload relays energized at C times the current, tripping shall occur in less than 2 min, starting from thermal equilibrium at the current setting; test current .....:	Test current Trip time: ____s	N/A
	d) for class 10, 20 or 30 overload relays energized at C times the current, tripping shall occur in less than 4, 8 or 12 min, starting from thermal equilibrium at the current setting; class; test current; tripping time .....:	Test current Trip time: ____s	N/A
	e) at D times the current setting, tripping shall occur within the tripping time (s) < Tp <, starting from the cold state; test current; tripping time Tp (s) .....:	Class; ____ Tripping current___ A Trip-time: ____ s	N/A
8.2.1.5.1.2	Thermal memory test verification		
	Unless the manufacturer has specified that the device does not contain thermal memory, electronic overload relays shall fulfil the following requirements(see figure 8)		N/A
	Apply a current equal to Ie until the device has reached the thermal equilibrium	Ie = _____ A	N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Interrupt a current for a duration of 2 x *Tp* (see Table 2) with a relative tolerance of 10% (where *Tp* is the time measured at the *D* current according to Table 3).	*Tp* = _____ *A* *D* = _____ A Measured time *Tp* = ____ s	N/A
	Apply a current equal to 7,2 x *Ie*	I test = _____ A	N/A
	The relay shall trip within 50% of the time *TP*	Trip time = _____ s	N/A
8.2.1.5.2	Limits of operation of three-pole time-delay overload relays energized on two poles:		
	ambient temperature (°C).....:		N/A
	In case of overload relays having an adjustable current setting, the characteristics shall apply both when the relay is carrying the current associated with the maximum setting and when the relay is carrying the current associated with the minimum setting		N/A
	a) the relay energized on three poles, at A times the current setting, tripping shall not occur in less than 2 h, starting from the cold state; test current	RT / S / RS / T / ST / R ( ) ( ) ( ) ( ) ( ) ( )	N/A
	b) when the value of the current flowing in two poles is increased to B times the current setting and the third pole de-energized, tripping shall occur in less than 2 h; current value; test current	RT / S / RS / T / ST / R ( ) ( ) ( ) ( ) ( ) ( )	N/A
8.2.1.5.3	Limits of operation of instantaneous magnetic overload relays		
	For all values of the current setting, instantaneous magnetic overload relays shall trip with an accuracy of ± 10% of the value of the published current value corresponding to the current setting		N/A
	Magnetic settings…….. :		N/A
	Accuracy ± 10% of the value……..:		N/A
8.2.1.5.4	Limits of operation of under-current relays and releases for automatic change over		
8.2.1.5.4.1	e) Limits of operation under-current relays		
	Under-current relays or release, when associated with a switching device, shall operate to open the switching device within 90% to 110 % of the set time when the current during run is below 0,9 times the under-current setting in all poles	Under current setting:_____A Test current:_____A Set time:_____s Measured:_____s	N/A
8.2.1.5.4.2	f) Limits of operation of automatic change over by under-current relays		
	- for star-delta starters from star to delta, and - for auto-transformer starters from the starting to the ON position		N/A
	The lowest drop-out of an under-current relay shall be not greater than 1,5, times the actual current setting of the overload relay which is active in the starting or star connection.	Lowest drop-out:…….A / Actual current setting: …..A = ≤ 1,5 times	N/A
	The under-current real shall be able to carry any value of current , from its lowest current setting to stalled current in the starting position or the star connection, for the tripping times determined by the overload relays at its highest current setting		N/A
8.2.1.5.5.	g) Stall relays		

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Clause	Requirement + Test	Result - Remark	Verdict
	The limits of operation shall be verified accordance with cl. 8.2.1.5.5		N/A
	For currents sensing stall relays , the verification shall be made for the minimum and for the maximum set current values and for the minimum and maximum stall inhibit time(four settings)		N/A
	For stall relays operating in conjunction with a rotation sensing mean, the verification shall be made for the minimum and maximum stall inhibit time. The sensor can be simulated by an appropriate signal on the sensor input of the stall relay		N/A
	a) current sensing relays		
	minimum current setting / minimum set stall inhibit time Test current 1,2 times	_____ A _____ s Trip time = _____s	N/A
	minimum current setting / maximum set stall inhibit time Test current 1,2 times	_____ A _____ s Trip time = _____s	N/A
	maximum current setting / minimum set stall inhibit time Test current 1,2 times	_____ A _____ s Trip time = _____s	N/A
	maximum current setting / maximum set stall inhibit time Test current 1,2 times	_____ A _____ s Trip time = _____s	N/A
	b) rotation sensing relays: an input signal indicating no rotation exits		
	minimum set stall inhibit time	_____ s Trip time = _____s	N/A
	maximum set stall inhibit time	_____ s Trip time = _____s	N/A
8.2.1.5.6.	h) Jam relays		
	The limits of operation shall be verified accordance with cl. 8.2.1.5.6		N/A
	The verification shall be made for the minimum and for the maximum set current values and for the minimum and maximum stall inhibit time (four settings)		N/A
	For each of the four settings, the test shall be made under the following conditions:		
	- apply a test current of 95% of the set current value. The jam relay shall not trip		N/A
	- increase the test current to 120 % of the set current value. The jam relay shall trip according to the requirements given in 8.2.1.5.6		N/A
	minimum current setting / minimum set stall inhibit time Test current 95 % of set value	_____ s _____ A no trip	N/A
	minimum current setting / minimum set stall inhibit time Test current increase to 1,2 times	_____ A _____ s Trip time = _____s	N/A
	minimum current setting / maximum set stall inhibit time Test current 95 % of set value	_____ s _____ A no trip	N/A
	minimum current setting / maximum set stall inhibit time Test current 1,2 times	_____ A _____ s Trip time = _____s	N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	maximum current setting / minimum set stall inhibit time Test current 95 % of set value	_____ s _____ A no trip	N/A
	maximum current setting / minimum set stall inhibit time Test current 1,2 times	_____ A _____ s Trip time = _____s	N/A
	maximum current setting / maximum set stall inhibit time Test current 95 % of set value	_____ s _____ A no trip	N/A
	maximum current setting / maximum set stall inhibit time Test current 1,2 times	_____ A _____ s Trip time = _____s	N/A
9.3.3.4	Test of dielectric properties, impulse withstand voltage (Uimp indicated):		
	- verification by measurement of clearances instead of testing		
	Any actuator of insulating material and any integral non-metallic enclosure of equipment intended to be used without an additional enclosure shall be covered by a metal foil and connected to the frame or the mounting plate.		
	Tests are also carried out according Annex R of IEC 60947-1, Ed. 5, application of the metal foil for dielectric testing on accessible parts during operation or adjustment		
	Terminal holes covered	☒ yes ☐ no	P
	- rated impulse withstand voltage (V) .....:	6kV	
	- test Uimp main circuits (kV) .....:	7,3	P
	- test Uimp auxiliary circuits (kV) .....:	7,3	P
	Test of dielectric properties, dielectric withstand voltage (Uimp not indicated):		
	- rated insulation voltage (V) .....:		N/A
	- main circuits, test voltage for 5 s (V) .....:		N/A
	- control and auxiliary circuits, test voltage for 5-s (V) .....:		N/A
	- circuits of equipment include devices such as motors, instruments ect, test voltage for 5 s (V) ..:		N/A
	Equipment suitable for isolation		
	The leakage current shall be measured through each pole with the contacts in open position (< 0,5 mA)	1,1 times U_e= ___V	N/A

9.3.1	**Compliance with performance requirements**	
b)	**TEST SEQUENCE II** - 1 sample: LT1-D9511, U_s = 415V	
	Verification of rated making and breaking capacities, change-over ability and reversibility, where applicable (Clause 9.3.3.5.)	
	- verification of conventional operational performance (Clause 9.3.3.6)	
9.3.3.5	Making and breaking capacity (II-1)	

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Clause	Requirement + Test	Result - Remark	Verdict
	Conditions, make operations only.....:	make operations	
	Type of product .....:	LT1-D9511	
	utilization category .....:	AC-3	
	Control voltage 25 times at 110% and 25 times at 85% for AC-3 and AC-4	Yes	
	rated operational voltage Ue (V) .....:	415	
	rated operational current Ie (A) or power (kW) ....:	95A	
	- test voltage (V) U/Ue = 1,05.....:	L1: 438 L2: 438 L3: 438	P
	- test current (A) I/Ie = 10 .....:	L1: 956 L2: 960 L3: 955	P
	- power factor~~/time constant~~ .....:	L1: 0,45 L2: 0,45 L3: 0,45	P
	- on-time (ms) .....:	174	P
	- off-time (s) .....:	10	P
	- number of make operations .....:	50	P
	Behaviour and condition during and after the test:		
	- no permanent arcing		P
	- no flash-over between poles		P
	- no blowing of the fusible element in the earth circuit		P
	- no welding of the contacts		P
	- the contacts shall operate when the contactor or starter is switched by the applicable method of control		P
	Conditions, make/break operations only.....:	make/break operations	
	Type of product .....:	LT1-D9511	
	utilization category .....:	AC-3	
	rated operational voltage Ue (V) .....:	415	
	rated operational current Ie (A) ~~or power (kW)~~ ....:	95A	
	For starters incorporated two contactors, 2 contactor shall be used with the following sequence: Close A – open A – close B – open B- off period		N/A
	- test voltage (V) U/Ue = 1,05.....:	L1: 438 L2: 438 L3: 438	P
	- test current (A)I/Ie = 8 .....:	L1: 767 L2: 773 L3: 766	P
	- power factor~~/time constant~~ .....:	L1: 0,44 L2: 0,44 L3: 0,44	P
	- on-time (ms) .....:	174	P

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Clause	Requirement + Test	Result - Remark	Verdict
	- off-time (s) .....:	10	P
	- number of operations	☐ 50 make ☒ 50 make/ break	P
	Number of operation energized simultaneously		N/A
	Characteristic of transient recovery voltage for AC-3 and AC-4 only:		
	oscillatory frequency (kHz) .....:	60,8	
	Measured oscillatory frequency (kHz) .....:	L1: 60,8 L2: 60,8 L3: 60,8	P
	Factor y .....:	L1: 1,12 L2: 1,12 L3: 1,12	P
	Behaviour and condition during and after the test:		
	- no permanent arcing		P
	- no flash-over between poles		P
	- no blowing of the fusible element in the earth circuit		P
	- no welding of the contacts		P
	- the contacts shall operate when the contactor or starter is switched by the applicable method of control		P
9.3.3.6	Operational performance capability:		
	Type of product .....:	LT1-D9511	
	utilization category .....:	AC-3	
	rated operational voltage Ue (V) .....:	415	
	rated operational current Ie (A) or power (kW) ....:	95A	
	Conditions, make/break operations:		
	- test voltage (V) U/Ue = 1,05.....:	L1: 440 L2: 440 L3: 440	P
	- test current (A) I/Ie = 2 .....:	L1: 193 L2: 193 L3: 193	P
	- power factor~~/time constant~~ .....:	L1: 0,42 L2: 0,42 L3: 0,42	P
	- on-time (ms) .....:	61	P
	- off-time (s) .....:	10	P
	- number of operations	☐ 6000 make ☒ 6000 make/ break	P
	Number of operation energized simultaneously		N/A
	Characteristic of transient recovery voltage for AC-3 and AC-4 only:		
	oscillatory frequency (kHz) .....:	46,0	

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Clause	Requirement + Test	Result - Remark	Verdict
	Measured oscillatory frequency (kHz) .....:	L1: 46,0 L2: 46,0 L3: 46,0	P
	Factor y .....:	L1: 1,12 L2: 1,12 L3: 1,12	P
	Behaviour and condition during and after the test:		
	- no permanent arcing		P
	- no flash-over between poles		P
	- no blowing of the fusible element in the earth circuit		P
	- no welding of the contacts		P
	- the contacts shall operate when the contactor or starter is switched by the applicable method of control		P
8.3.3.4	Dielectric verification		
	test voltage (2 Ui), min 1000 V for 5 s. (V) .....:	Test voltage: 1000V	
	No flashover or breakdown		P
8.3.3.5	Leakage current equipment suitable for isolation		
	test voltage (1,1 Ue) (V) .....:		N/A
	Leakage current: ≤ 2 mA /pole .....:		N/A

9.3.1	**Compliance with performance requirements**		
c)	**TEST SEQUENCE III** - 1 sample: LT1-D9511, U_s = 415V		
	- Performance under short-circuit conditions (Clause 9.3.4)		
9.3.4	Performance under short-circuit conditions		
	If devices tested in free air may also be used in an individual enclosure, they shall be additionally tested in the smallest of such enclosures stated by the manufacturer.		P
	For devices tested only in free air, information shall be provided to indicate that the device has not been evaluated for use in an individual enclosure.		P
	The individual enclosure shall be in accordance with the manufacturer specifications. In case of multiple enclosure options are provided, the individual enclosure with the smallest volume shall be taken		N/A
	Maximum Ie and maximum Ue for AC-3 are covered	415V/95A	P
	Sub clause 8.3.4.1.2 of part 1 applies except that, for type "1" co-ordination, the fusible element F and resistor are replaced by a solid 6 mm^2 wire of 1,2 m to 1,8 m length connected to the neutral, or with the agreement of the manufacturer, to one of the phases	☒ neutral ☐ phase ____	P
	Rated control supply voltage .....:	415Vac	P

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Clause	Requirement + Test	Result - Remark	Verdict
9.3.4.2.1	Test at the prospective current "r":		
	type of product.....:	LT1-D9511	
	test circuit, figure 9, 10, 11, 12 .....:	Figure 11	
	type of SCPD .....:	RT16-00	
	ratings of SCPD, co-ordination type 1 .....:	-	
	ratings of SCPD, co-ordination type 2 .....:	Fuse, RT16-00 125A	
	rated operational current Ie (A) AC-3 .....:	95	
	rated operational voltage (V).....:	415	
	prospective current "r" (kA) (table 12).....:	5kA	
	Wire size (mm^2) type 1		N/A
	Wire size (mm^2) type 2	35 mm^2	P
	test voltage (V) .....:	L1: 438 L2: 438 L3: 438	P
	r.m.s. test current (kA) .....:	L1: 5,02 L2: 5,01 L3: 5,05	P
	peak current (kA) .....:	L1: 7,13 L2: 7,09 L3: 7,17	P
	power factor	0,67	P
	1. one breaking operation of SCPD with all the switching devices closed prior to the test I^2dt and Ip (A^2s / A) :	L1: 63,8 kA^2s, 5,01kA L2: 37,8 kA^2s, 4,01kA L3: 69,0 kA^2s, 4,53kA	P
	2. one breaking operation of SCPD by closing the contactor or starter on to the short-circuit I^2dt and Ip (A^2s / A)	L1: 118kA^2s, 5,38A L2: 130 kA^2s, 5,93kA L3: 81,8 kA^2s, 4,57kA	P
9.3.4.2.3	Behaviour of the equipment during the test		
	Both types of co-ordination (all devices):		
	A - the fault current has been successfully interrupted by the SCPD, the combination starter or the combination switching device and the fuse or fusible element, or solid connection between the enclosure and supply shall not have melted		P
	B - the door or cover of the enclosure has not been blown open and it is possible to open the door or cover. Degree of protection by the enclosure is not less than IP2X		P
	C - there is no damage to the conductors or terminals and the conductors have not been separated from the terminals		P
	D – there is no cracking or breaking of an insulating base to the extent that the integrity of mounting of a live part is impaired		P
	Both types of co-ordination (combination starters and protected starters only):		
	E – the circuit breaker or switch is capable of being opened manually by its operating means		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	F - neither end of the SCPD is completely separated from its mounting means to an exposed conductive part		N/A
	G - if a circuit breaker with rated ultimate short-circuit breaking capacity less than the rated conditional short-circuit current assigned to the combination starter, the combination switching device, the protected starter or the protected switching device is employed, the circuit breaker shall be tested to trip as follows:		
	a) circuit breaker with instantaneous trip relays or releases, at 120% of the trip current		N/A
	b) circuit breaker with overload relays or releases, at 250% of the rated current of the circuit breaker		N/A
	Type 1 co-ordination (all devices):		
	H - there has been no discharge of parts beyond the enclosure. Damage to the contactor and the overload relay is acceptable. The starter may be inoperative after each operation. The starter shall therefore be inspected and the contactor and/or the overload relay and the release of the circuit-breaker shall be reset if necessary and, in the case of fuse protection, all fuse-links shall be replaced.		N/A
	Type 1 co-ordination (combination and protected starters only):		
	I - The adequacy of insulation in according with 8.3.3.4.1, item 4), of part 1 is verified after each operation (at currents “r” and “Iq” by a dielectric test on the complete unit under test (SCPD plus contactor/starter but before replacement of parts). The test voltage shall be applied to the incoming supply terminals, with the switch or circuit-breaker in open position, as follows:		N/A
	I - dielectric verification test voltage (2 Ue) for 5 s (V) but not less than 1000V .....:	Test voltage:	N/A
	- between each pole and all other poles connected to the frame of the starter		N/A
	- between all live parts of all poles connected together and the frame of the starter		N/A
	- between the terminals of the line side connected together and terminals of the other side connected together		N/A
	For equipment suitable for isolation, the leakage current shall be measured through each pole, with the contacts in open position, at test voltage of 1,1 Ue and shall not exceed 6 mA	Test voltage: _____ V L1: _____ mA L2: _____ mA L3: _____ mA	N/A
	Type 2 co-ordination (all devices)		
	J - no damage to the overload relay or other parts has occurred, except that welding of contactor or starter contacts is permitted, if they are easily separated (e.g. by a screwdriver) without significant deformation, but no replacement of parts is permitted during the test, except that , in case of fuse protection, all fuse shall be replaced.	Contacts welded ☐ yes ☒ no	P
	In the case of welded contact as described above, the functionally of the device shall be verified by carrying out 10 operations under the conditions of table 8 for the applicable utilization category.		N/A

IEC 60947-4-1			
Clause	Requirement + Test	Result - Remark	Verdict
	Operational performance capability (9.3.3.6):		
	Type of product .....:		
	utilization category .....:		
	rated operational voltage Ue (V) .....:		
	rated operational current Ie (A) or power (kW) ....:		
	Conditions, make/break operations:		
	- test voltage U/Ue = 1,05 (V) .....:		
	- test current (A) I/Ie = 6 .....:		
	- power factor/time constant .....:		
	- on-time (ms) .....:		
	- off-time (s) .....:		
	- number of make/break operations .....:		
	Characteristic of transient recovery voltage for AC-3 and AC-4 only:		
	oscillatory frequency (kHz) .....:		N/A
	Measured oscillatory frequency (kHz) .....:	L1: L2: L3:	N/A
	Factor y .....:	L1: L2: L3:	N/A
	Behaviour and condition during and after the test:		
	- no permanent arcing		N/A
	- no flash-over between poles		N/A
	- no blowing of the fusible element in the earth circuit		N/A
	- no welding of the contacts		N/A
	- the contacts shall operate when the contactor or starter is switched by the applicable method of control		N/A
9.3.4.2.3	K The tripping of the overload relay shall be verified at a multiple of the current setting and shall conform to the published tripping characteristics, according to 5.7.5, both before and after the short-circuit test.	Test current:_____A Measured:_____s	N/A
	L The adequacy of insulation in according with 8.3.3.4.1, item 4), of part 1 shall be verified by a dielectric test on the contactor , starter, the combination starter, the combination switching device , the protected starter or protected switching device as follows:		
	L - dielectric verification test voltage (2 Ue) for 5 s (V) but not less than 1000V :	1000V	
	- between all the terminals of the main circuit connected together (including the control and auxiliary circuits connected to the main circuit) and the enclosure or mounting plate, with the contacts in all normal positions of operation		P

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Clause	Requirement + Test	Result - Remark	Verdict
	- between each pole of the main circuit and the other poles connected together and to the enclosure ore mounting plate with the contacts in all normal positions of operation		P
	- between each control and auxiliary circuit not normally connected to the main circuit and: - the main circuit - the other circuits - the exposed conductive parts - the enclosure or mounting plate		P
	In case of combination starters, combination switching devices, protected starters and protecting switching devices, additional tests according to 8.3.3.4.1, item 3) of part 1 shall be made as follows:		N/A
	Dielectric verification test voltage according table 12A of part 1) for 5 s (V)	Test voltage: _____ V	
	across the main poles of the device with the contacts of the switch or of the circuit- breaker open and the contacts of the starter closed		N/A
	For equipment suitable for isolation, the leakage current shall be measured through each pole, with the contacts in the open position, at a test voltage of 1,1 Ue and shall not exceed 2 mA	Test voltage: _____ V L1: _____ mA L1: _____ mA L1: _____ mA	N/A
9.3.4.2.2	Test at the rated conditional short-circuit current "Iq"		
	Type of product .....:	LT1-D9511	
	Test circuit, figure 9, 10, 11, 12.....:	Figure 11	
	type of SCPD .....:	RT16-00 125A	
	ratings of SCPD, co-ordination type 1 .....:		
	ratings of SCPD, co-ordination type 2 .....:	125A/500V	
	rated operational current Ie (A) AC-3 .....:	95A	
	rated operational voltage (V)	415	
	prospective current "Iq" (kA) .....:	20	
	Wire size (mm^2) type 1	____ mm^2	N/A
	Wire size (mm^2) type 2	35 mm^2	P
	test voltage (V) .....:	L1: 438 L2: 438 L3: 438	P
	r.m.s. test current (kA) .....:	L1: 20,4 L2: 20,3 L3: 20,3	P
	peak current (kA) .....:	L1: 41,5 L2: 36,2 L3: 30,5	P
	power factor	0,28	P
	1. one breaking operation of SCPD with all the switching devices closed prior to the test I^2t and Ip (kA^2s / kA) .....:	L1: 5,31 kA^2s, 1,86kA L2: 55,6 kA^2s, 7,39kA L3: 61,0 kA^2s, 8,23kA	P
	2. one breaking operation of SCPD by closing the contactor or starter on to the short-circuit I^2t and Ip (A^2s / A) .....:	L1: 2,44kA^2s, 0,895A L2: 67,1 kA^2s, 8,25kA L3: 61,0 kA^2s, 8,01kA	P

IEC 60947-4-1			
Clause	Requirement + Test	Result - Remark	Verdict
	3. one breaking operation of SCPD by closing the switching device on to the short-circuit I²t and Ip (A²s / A) .....:	L1: L2: L3:	N/A
	Behaviour of the equipment during the test		
	Both types of co-ordination (all devices):		
	A - the fault current has been successfully interrupted by the SCPD, the combination starter or the combination switching device and the fuse or fusible element, or solid connection between the enclosure and supply shall not have melted		P
	B - the door or cover of the enclosure has not been blown open and it is possible to open the door or cover. Degree of protection by the enclosure is not less than IP2X		P
	C - there is no damage to the conductors or terminals and the conductors have not been separated from the terminals		P
	D – there is no cracking or breaking of an insulating base to the extent that the integrity of mounting of a live part is impaired		P
	Both types of co-ordination (combination starters and protected starters only):		
	E – the circuit breaker or switch is capable of being opened manually by its operating means		N/A
	F - neither end of the SCPD is completely separated from its mounting means to an exposed conductive part		N/A
	G - if a circuit breaker with rated ultimate short-circuit breaking capacity less than the rated conditional short-circuit current assigned to the combination starter, the combination switching device, the protected starter or the protected switching device is employed, the circuit breaker shall be tested to trip as follows:		
	a) circuit breaker with instantaneous trip relays or releases, at 120% of the trip current		N/A
	b) circuit breaker with overload relays or releases, at 250% of the rated current of the circuit breaker		N/A
	Type 1 co-ordination (all devices):		
	H - there has been no discharge of parts beyond the enclosure. Damage to the contactor and the overload relay is acceptable. The starter may be inoperative after each operation. The starter shall therefore be inspected and the contactor and/or the overload relay and the release of the circuit-breaker shall be reset if necessary and, in the case of fuse protection, all fuse-links shall be replaced.		N/A
	Type 1 co-ordination (combination and protected starters only):		
	I - The adequacy of insulation in according with 8.3.3.4.1, item 4), of part 1 is verified after each operation (at currents “r” and “Iq” by a dielectric test on the complete unit under test (SCPD plus contactor/starter but before replacement of parts). The test voltage shall be applied to the incoming supply terminals, with the switch or circuit-breaker in open position, as follows:		

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Clause	Requirement + Test	Result - Remark	Verdict
	I - dielectric verification test voltage (2 Ue) for 5 s (V) but not less than 1000V .....:	Test voltage: _____ V	
	- between each pole and all other poles connected to the frame of the starter		N/A
	- between all live parts of all poles connected together and the frame of the starter		N/A
	- between the terminals of the line side connected together and terminals of the other side connected together		N/A
	For equipment suitable for isolation, the leakage current shall be measured through each pole, with the contacts in open position, at test voltage of 1,1 Ue and shall not exceed 6 mA	Test voltage: _____ V L1: _____ mA L2: _____ mA L3: _____ mA	
	Type 2 co-ordination (all devices)		
	J - no damage to the overload relay or other parts has occurred, except that welding of contactor or starter contacts is permitted, if they are easily separated (e.g. by a screwdriver) without significant deformation, but no replacement of parts is permitted during the test, except that , in case of fuse protection, all fuse shall be replaced.	Contacts welded ☐ yes ☒ no	P
	In the case of welded contact as described above, the functionally of the device shall be verified by carrying out 10 operations under the conditions of table 8 for the applicable utilization category.		N/A
	Operational performance capability (9.3.3.6):		
	Type of product .....:		
	utilization category .....:		
	rated operational voltage Ue (V) .....:		
	rated operational current Ie (A) or power (kW) ....:		
	Conditions, make/break operations:		
	- test voltage U/Ue = 1,05 (V) .....:		
	- test current (A) I/Ie = ___ .....:		
	- power factor/time constant .....:		
	- on-time (ms) .....:		
	- off-time (s) .....:		
	- number of make/break operations .....:		
	Characteristic of transient recovery voltage for AC-3 and AC-4 only:		
	oscillatory frequency (kHz) .....:		N/A
	Measured oscillatory frequency (kHz) .....:		N/A
	Factor y .....:		N/A
	Behaviour and condition during and after the test:		
	- no permanent arcing		N/A
	- no flash-over between poles		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	- no blowing of the fusible element in the earth circuit		N/A
	- no welding of the contacts		N/A
	- the contacts shall operate when the contactor or starter is switched by the applicable method of control		N/A
9.3.4.2.3	K The tripping of the overload relay shall be verified at a multiple of the current setting and shall conform to the published tripping characteristics, according to 5.7.5, both before and after the short-circuit test.	Test current:_____A Measured:_____s	N/A
	L The adequacy of insulation in according with 8.3.3.4.1, item 4), of part 1 shall be verified by a dielectric test on the contactor , starter, the combination starter, the combination switching device , the protected starter or protected switching device as follows:		N/A
	L - dielectric verification test voltage (2 Ue) for 5 s (V) but not less than 1000V :	1000V	
	- between all the terminals of the main circuit connected together (including the control and auxiliary circuits connected to the main circuit) and the enclosure or mounting plate, with the contacts in all normal positions of operation		P
	- between each pole of the main circuit and the other poles connected together and to the enclosure ore mounting plate with the contacts in all normal positions of operation		P
	- between each control and auxiliary circuit not normally connected to the main circuit and: - the main circuit - the other circuits - the exposed conductive parts - the enclosure or mounting plate		P
	In case of combination starters, combination switching devices, protected starters and protecting switching devices, additional tests according to 8.3.3.4.1, item 3) of part 1 shall be made as follows:		
	Dielectric verification test voltage according table 12A of part 1) for 5 s (V)	Test voltage: _____ V	N/A
	across the main poles of the device with the contacts of the switch or of the circuit- breaker open and the contacts of the starter closed		N/A
	For equipment suitable for isolation, the leakage current shall be measured through each pole, with the contacts in the open position, at a test voltage of 1,1 Ue and shall not exceed 2 mA	Test voltage: _____ V L1: _____ mA L2: _____ mA L3: _____ mA	N/A

9.3.1	**Compliance with performance requirements**	
d)	**TEST SEQUENCE IV** -1 sample: LT1-D9511, U_s = 415V	
	- Verification of ability to withstand overload currents: Clause 9.3.5 (applicable for contactors only)	

IEC 60947-4-1			
Clause	Requirement + Test	Result - Remark	Verdict
9.3.5	Verification of ability to withstand overload currents		
	Overload current withstand capability of contactors AC-3 and AC-4:		
	ambient temperature (°C) .....:	22	
	rated operational current Ie (A) max. AC-3 .....:	95	
	test current (Ie) (A) .....:	763	
	duration of test: 10 s .....:	10s	
	After the test, the contactor shall be substantially in the same condition as before the test (visual inspection)		P

IEC 60947-4-1			
Clause	Requirement + Test	Result - Remark	Verdict
9.3.1	**Compliance with performance requirements**		
e)	**TEST SEQUENCE V** -1 sample: LT1-D9511, U_s = 415V		
	- Verification of mechanical properties of terminals: Clause 8.2.4 of IEC 6947-1:2007, 9.2.1 and 9.2.2 - Verification of degrees of protection of enclosed contactors and starters (see annex C of part 1)		
8.2.4 part 1	Verification of mechanical properties of terminals	(see 8.2.4 part 1 above)	P
Annex C Part 1	Verification of degrees of protection of enclosed contactors and starters	(see 8.2.3 part 1 above)	P
	EMC tests		
	Sub. Clause 8.3.2.1, 8.3.2.3 and 8.3.2.4 of part 1 apply		
	In agreement with the manufacturer one EMC test or all EMC may conducted on one sample		N/A
	The test sample shall be in the open or closed position, whichever is the worse, and shall be operated with the rated supply.		N/A
9.4	ELECTROMAGNETIC COMPATIBILITY TESTS		
9.4.2	Immunity (for equipment incorporating electronic circuits)		
	Test levels of IEC60947-4-1: table 13.....: Special requirements are specified in clause 9.4.2.1 to 9.4.2.6		N/A
9.4.2.1	Performance of the test sample during and after the test		
	Unless otherwise specified, performance criterion 2 applies, see clause 8.3.2.2	Criterion : _____	N/A
9.4.2.2	Electrostatic discharges		
	The test shall be conducted using the method of IEC 61000-4-2		
	No loss of performance during the tests	See _____	N/A
9.4.2.3	Electromagnetic field		
	The test shall be conducted using the method of IEC 61000-4-3		
	No loss of performance during the tests	See _____	N/A
9.4.2.4	Fast transient bursts		
	The test shall be conducted using the method of IEC 61000-4-4		
	No loss of performance during the tests	See _____	N/A
9.4.2.5	Surges (1,2/50 µs – 8/20 µs)		
	The test shall be conducted using the method of IEC 61000-4-5		
	No loss of performance during the tests	See _____	N/A

IEC 60947-4-1			
Clause	Requirement + Test	Result - Remark	Verdict
9.4.3	Emission		
	Test levels of IEC60947-4-1: table 15 and 16 .....: Special requirements are specified in clause 9.4.3.1 to 9.4.3.2		N/A
	For equipment designed for environment A, a suitable warning shall be given to the user (for example in the instruction manual) stipulating that the use of this equipment in environment B may cause radio interference in which case the user may be required to employ additional mitigation methods		N/A
9.4.3.1	Conducted radio-frequency emission tests		
	The test shall be conducted using the method of CISPR 11		N/A
	The equipment shall not exceed the levels given in table 14 and no loss of performance during the tests	See _____	N/A
9.4.3.2	Radiated radio-frequency emission tests		
	The test shall be conducted using the method of CISPR 11		N/A
	The equipment shall not exceed the levels given in table 15 and no loss of performance during the tests	See _____	N/A
	TEST SEQUENCE Annex B		
	Special tests		
Annex B2	**Mechanical durability**		
	By convention, the mechanical durability of a design of contactor or starter is defined as the number of no-load operating cycles which would be attained or exceeded by 90 % of all the apparatus of this design before it becomes necessary to service or replace any mechanical parts; however, normal maintenance including replacement of contacts as specified in B.2.2.1 and B.2.2.3 is permitted		
	numbers of no-load operating cycles		N/A
B.2.2.1	Condition of the contactor or starter for tests		
	The contactor or starter shall be installed as for normal service; in particular, the conductors shall be connected in the same manner as for normal use		N/A
	During the test, there shall be no voltage or current in the main circuit		N/A
	The contactor or starter may be lubricated before the test if lubrication is prescribed in normal service		N/A
B.2.2.2	Operating conditions		
	The coils of the control electromagnets shall be supplied at their rated voltage and, if applicable, at their rated frequency		N/A
	If a resistance or an impedance is provided in series with the coils, whether short-circuited during the operation or not, the tests shall be carried out with these elements connected as in normal operation		N/A

IEC 60947-4-1			
Clause	Requirement + Test	Result - Remark	Verdict
	Pneumatic and electro-pneumatic contactors or starters shall be supplied with compressed air at the rated pressure		N/A
	Manual starters shall be operated as in normal service		N/A
B.2.2.3	Test procedure		
	a) The tests are carried out at the frequency of operations corresponding to the class of intermittent duty. However, if the manufacturer considers that the contactor or starter can satisfy the required conditions when using a higher frequency of operations, he may do so.		N/A
	b) In the case of electromagnetic and electro-pneumatic contactors or starters, the duration contactor or starter and the time for which the coil is not energized shall be of such a duration that the contactor or starter can come to rest at both extreme positions.		N/A
	The number of operating cycles to be carried out shall be not less than the number of no-load operating cycles stated by the manufacturer		N/A
	The verification of mechanical durability may be made separately on the various components of the starter which are not mechanically linked together, unless a mechanical interlock not previously tested with its contactor is involved		N/A
	c) For contactors or starters fitted with releases with shunt coils or under voltage releases, at least 10 % of the total number of opening operations shall be performed by these releases		N/A
	d) After each tenth of the total number of operating cycles given in B.2.1 has been carried out, it is permissible before carrying on with the test:		N/A
	- to clean the whole contactor or starter without dismantling;		N/A
	- to lubricate parts for which lubrication is prescribed by the manufacturer for normal service;		N/A
	- to adjust the travel and the pressure of the contacts if the design of the contactor or starter enables this to be done		N/A
	e) This maintenance work shall not include any replacement of parts.		N/A
	f) In the case of star-delta starters, the built-in device causing time-delay between closing on star connection and closing on delta connection, if adjustable, may be set at its lowest value.		N/A
	g) In the case of rheostatic starters, the built-in device causing time-delay between closing of the rotor switching devices, if adjustable, may be set at its lowest value.		N/A
	h) In the case of auto-transformer starters, the built-in device causing time-delay between closing on the starting position and closing on the ON position, if adjustable, may be set at its lowest value.		N/A
B.2.2.4	Results to be obtained		

IEC 60947-4-1			
Clause	Requirement + Test	Result - Remark	Verdict
	Following the tests of mechanical durability, the contactor or starter shall still be capable of complying with the operating conditions specified in 8.2.1.2 and 9.3.3.2 at room temperature.		N/A
	There shall be no loosening of the parts used for connecting the conductors		N/A
	Any timing relays or other devices for the automatic control shall still be operating		N/A
B.2.2.5	Statistical analysis of test results for contactors or starters		
	The mechanical durability of a design of a contactor or starter is assigned by the manufacturer and verified by a statistical analysis of the results of the tests		N/A
	For contactors or starters which are produced in small quantities, the tests described in B.2.2.6 and B.2.2.7 do not apply		N/A
	However, for contactors or starters which are produced in small quantities and which also differ from a basic design only by minor variations without notable influence on characteristics, the manufacturer may assign mechanical durability on the basis of experience with similar designs, analysis, properties of materials, etc., and on the basis of the analysis of test results on large quantity production of the same basic design		N/A
	After this assignment, one of the two tests described below shall be performed. It should be selected by the manufacturer as being the most suitable in each case, for example according to the quantities of planned production or according to the conventional thermal current		N/A
B.2.2.6	Single 8 test		
	Eight contactors or starters shall be tested to the assigned mechanical durability		N/A
	If the number of failures does not exceed two, the test is considered passed		N/A
B.2.2.7	Double 3 test		
	Three contactors or starters shall be tested to the assigned mechanical durability		N/A
	The test is considered passed if there is no failure, and failed if there is more than one failure. Should there be one failure, then three additional contactors or starters are tested up to assigned mechanical durability and, providing there is no additional failure, the test is considered passed. The test is failed if at any time there is a total of two or more failures		N/A
B.2.2.8	Other methods		
	Other methods given in IEC 60410 can also be used. The maximum acceptance quality level shall be 10 %.		N/A
Annex B3	**Electrical durability**		

IEC 60947-4-1			
Clause	Requirement + Test	Result - Remark	Verdict
	With respect to its resistance to electrical wear, a contactor or starter is by convention characterized by the number of on-load operating cycles corresponding to the different utilization categories given in Table B.1 which can be made without repair or replacement		N/A
	Since, for star-delta, two-step auto-transformer and rheostatic rotor starters, the operation is subjected to large variations in the service conditions, it is deemed convenient not to give standard values for the test conditions		N/A
	However, it is recommended that the manufacturer indicate the electrical durability of the starter for stated service conditions; this electrical durability may be estimated from the results of tests on the component parts of the starter		N/A
	For categories AC-3 and AC-4, the test circuit shall comprise inductors and resistors so arranged as to give the appropriate values of current, voltage and power factor given in Table B.1; moreover, for AC-4, the test circuit testing the making and breaking capacity shall be used, see 9.3.3.5.2		N/A
	In all cases, the speed of operation shall be chosen by the manufacturer		
	The tests shall be taken as valid if the values recorded in the test report differ from the values specified only within the following tolerances: - current: ±5 %; - voltage: ±5 %		N/A
	Tests shall be carried out with the contactor or the starter under the appropriate conditions of B.2.2.1 and B.2.2.2 using the test procedure, where applicable, of B.2.2.3, except that replacement of contacts is not permitted		N/A
	In the case of starters, if the associated contactor has already satisfied an equivalent test, the test need not be repeated on the starter		N/A
	Type of product .....:		N/A
	utilization category .....:		N/A
	rated operational voltage Ue (Vac) .....:		N/A
	rated operational current Ie (A) or power (kW) ....:		N/A
	Conditions, make/break operations:		
	- test voltage U/Ue = 1,05 :	L1: L2: L3:	N/A
	- test current I/Ie = ...:	L1: L2: L3:	N/A
	- power factor/time constant .....:	L1: L2: L3:	N/A
	- operating cycles (ops/h)		N/A
	- on-time (ms) .....:		N/A

IEC 60947-4-1			
Clause	Requirement + Test	Result - Remark	Verdict
	- number of make/break operations .....:		N/A
	Characteristic of transient recovery voltage for AC-3 and AC-4 only:		
	oscillatory frequency (kHz) .....:		N/A
	Measured oscillatory frequency (kHz) .....:		N/A
	Factor y .....:		N/A
	Behaviour and condition during and after the test:		
	- no permanent arcing		N/A
	- no flash-over between poles		N/A
	- no blowing of the fusible element in the earth circuit		N/A
	- no welding of the contacts		N/A
	- the contacts shall operate when the contactor or starter is switched by the applicable method of control		N/A
8.3.3.4.1 4) b) part 1	Dielectric verification		
	test voltage (2 Ue, min 1000V) for 5 sec. (Vac) .....:	Test voltage: _____ Vac	N/A
	No flashover or breakdown		N/A
B.3.3	Statistical analysis of test results for contactors or starters		
	The electrical durability of a design of a contactor or starter is assigned by the manufacturer and verified by a statistical analysis of the results of the tests. One of the three test methods shall be selected by the manufacturer between B.3.3.1, B.3.3.2 and B.3.3.3 as being the most suitable for example according to the quantities of planned production or according to the conventional thermal current		N/A
	For contactors or starters which are produced in small quantities, the tests described in B.3.3.1 and B.3.3.2 do not apply. However, for contactors or starters which are produced in small quantities and which also differ from a basic design only by minor variations without notable influence on characteristics, the manufacturer may assign electrical durability on the basis of experience with similar designs, analysis, properties of materials, etc., and on the basis of the analysis of test results on large quantity production of the same basic design		N/A
B.3.3.1	Single 8 test		
	Eight contactors or starters shall be tested to the assigned electrical durability.		N/A
	If the number of failures does not exceed two, the test is considered passed		N/A
B.3.3.2	Double 3 test		

IEC 60947-4-1			
Clause	Requirement + Test	Result - Remark	Verdict
	Three contactors or starters shall be tested to the assigned electrical durability		N/A
	The test is considered passed if there is no failure, and failed if there is more than one failure.		N/A
	Should there be one failure, then three additional contactors or starters are tested up to assigned electrical durability and, providing there is no additional failure, the test is considered passed.		N/A
	The test is failed if at any time there is a total of two or more failures		N/A
B.3.3.3	Other methods		
	Other methods given in IEC 60410 can also be used. The maximum acceptance quality level shall be 10 %.		N/A
Annex B4	**Co-ordination at the crossover current between the starter and associated SCPD**		
B.4.2	Condition for the test for the verification of co-ordination at the crossover current by a direct method		
B.4.3	Test at lower current		
	- test current = ...:		N/A
	- test voltage = ...:		N/A
	- power factor = ...:		N/A
	- supplied voltage for coil = ...:		N/A
	Test at higher current		
	- test current = ...:		N/A
	- test voltage = ...:		N/A
	- power factor = ...:		N/A
	- supplied voltage for coil = ...:		N/A
B.4.1	With the starter and the SCPD closed, the test currents stated in B.4.3 shall be applied by a separate closing device. In each case, the device tested shall be at room temperature.		N/A
	After each test, it is necessary to inspect the SCPD, reset the overload relay and the release of the circuit-breaker, if necessary, or to replace all fuses if at least one of them has melted		N/A
B.4.4.2	After the test at the lower current (i) in B.4.3, the SCPD shall not have operated and the overload relay or release shall have operated to open the starter. There shall be no damage to the starter		N/A
	After the test at the higher current (ii) in B.4.3, the SCPD shall have operated before the starter. The starter shall meet the conditions of 9.3.4.2.3 for the type of co-ordination stated by the manufacturer		N/A
B.4.5	Verification of co-ordination at the crossover current by an indirect method		

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Clause	Requirement + Test	Result - Remark	Verdict
	The indirect method consists in verifying on a diagram (see Figure B.1) that the following conditions for the verification of co-ordination at the crossover current are met:		N/A
	- the time-current characteristic of the overload relay/release, starting from cold state, supplied by the manufacturer, shall indicate how the tripping time varies with the current up to a value of at least I_{co}; this curve has to lie below the time-current characteristic of the SCPD up to I_{co};		N/A
	- I_{cd} of the starter, tested as in B.4.5.1, shall be higher than I_{co};		N/A
	- the time-current withstand characteristic of the contactor, tested as in B.4.5.2, shall be above the time-current characteristic (starting from cold state) of the overload relay up to I_{co}.		N/A
B.4.5.1	Test for Icd		
	The contactor or starter shall make and break the test current (I_{cd}) for the number of operating cycles given in Table B.2. This is made without the SCPD in the circuit.		N/A
	During the test, there shall be no permanent arcing, no flash-over between poles, no blowing of the fusible element in the earth circuit (see 9.3.4.1.2) and no welding of contacts;		N/A
	after the test the contacts shall operate correctly when the contactor or starter is switched by the applicable method of control		N/A
	the dielectric properties of the contactors and starters shall be verified by a dielectric test on the contactor or starter using an essentially sinusoidal test voltage of twice the rated operational voltage U_e used for the I_{cd} test, with a minimum of 1 000 V. The test voltage shall be applied for 60 s, as specified in 8.3.3.4.1 of IEC 60947-1, items 2) c) i) and 2) c) ii.		N/A
B.4.5.2	Time –current characteristic withstand capability		
	This characteristic is issued by the manufacturer and the values are obtained according to the test procedure specified in 9.3.5 but with combinations of overload currents and durations to establish the characteristic at least up to I_{co}, in addition to those stated in 8.2.4.4.		N/A
	This characteristic is valid for overload currents, starting with the contactor at room temperature. The minimum cooling duration required by the contactor between two such overload tests should be stated by the manufacturer.		N/A
9.3.5	**Verification of ability to withstand overload currents**		
	Overload current withstand capability of contactors AC-3 and AC-4:		
	ambient temperature (°C) .....:		N/A
	rated operational current Ie (A) max. AC-3 .....:		N/A
	test current (Ie) (A) .....:		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	duration of test: 10 s .....:		N/A
	After the test, the contactor shall be substantially in the same condition as before the test (visual inspection)		N/A
	TEST SEQUENCE Annex F		
	Requirements for auxiliary contact linked with power contact (mirror contact)		
F 7.2 a)	Contact		
F 7.2 a)	Contacts kept in closed position by		
	Measurement method		
Table F.1	Test voltage (kV)		N/A
	Type of products:		N/A
	with		N/A
	with		N/A
F 7.3	Test after conventional operational performance		
	with		N/A
	with		N/A
	TEST SEQUENCE Annex H		
	Extended functions within electronic overload relays		
T.3 Part 1	Classification of electronic overload relays :	☐ Current and voltage asymmetry relay or release. ☐ Over-voltage relay or release. ☐ Ground/earth fault sensing relay or release. ☐ Phase reversal relay or release.	
T.4 Part 1	Types of relays with ground/earth fault detection function	☐ Type CI-A and CI-B ☐ Type CII-A and CII-B	
T.5 Part 1	Performance requirements		
T.5.1 Part 1	Limits of operation of ground/earth fault electronic overload relays		
	A ground/earth fault overload relay, when associated with a switching device, shall operate to open the switching device according to the requirements given in Table T.1.		N/A
	For relays or releases with a ground/earth fault current setting range, the limit of operation of the relay shall be verified at the lowest and highest settings.		N/A
T.5.2 Part 1	Limits of operation of ground/earth fault current sensing electronic relays Type CII(-A and –B)		

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Clause	Requirement + Test	Result - Remark	Verdict
	A ground/earth fault current sensing electronic relay CII, when associated with a switching device, shall not initiate operation of the switching device, in the presence of a ground/earth fault current, when the fault current in any phase reaches or exceeds 95 % the current setting Iic (see T.4) and shall operate to open the equipment when the fault current in any phase is 75 % or less of Iic		N/A
T.5.3 Part 1	Limits of operation of voltage asymmetry relays		
	A voltage asymmetry relay, when associated with a switching device, shall operate to open the switching device within 120 % of the time setting and shall operate to prevent the closing of the switching device when the voltage asymmetry is above 1,2 times the voltage asymmetry setting.		N/A
T.5.4 Part 1	Limits of operation of phase reversal relays		
	A phase reversal relay, when associated with a switching device, shall permit the closing of the equipment when the voltage sequence of phases on the line side of the starter is the same as the voltage sequence setting. After interchanging two phases, the phase reversal relay shall prevent the completion of the closing operation of the switching device.		N/A
T.5.5 Part 1	Limits of operation of current imbalance relays		
	A current imbalance relay, when associated with a switching device, shall operate to open the equipment within 80 % to 120 % of the time setting where the current imbalance, defined as the ratio between the maximum current deviation of any phase from average current and the average current Iavg, is above 1,2 times the current imbalance setting, the general tripping requirements of overload relays given in the product standard being maintained.		N/A
T.5.6 Part 1	Limits of operation of over-voltage relays and releases		
	a) Operating voltage An over-voltage relay or release, when associated with a switching device, shall operate to open the equipment and shall operate to prevent the closing of the equipment when the supply voltage is above the set value, if any, or above 110 % of the rated voltage of the relay or release for a defined duration		N/A
	b) Operating time For a time-delay over-voltage relay or release, the time-lag shall be measured from the instant when the voltage reaches the operating value until the instant when the relay or release actuates the tripping device of the equipment.		N/A
T.6 Part 1	Tests		

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Clause	Requirement + Test	Result - Remark	Verdict
T.6.1 Part 1	Limits of operation of ground/earth fault current sensing electronic relays Type CI and CII (-A and -B)		
	For overload relays with an adjustable ground/earth fault current setting, the test shall be made at the minimum and at the maximum current settings.		N/A
	The test circuit shall be in accordance with Figure T.1.		N/A
	The test shall be made at any convenient voltage and power factor.		N/A
	The test circuit being calibrated at each of the values of the ground/earth fault operating current specified in the Table T.1, as applicable, and the switch S1 being in the closed position, the test current is suddenly established by closing switch S2.		N/A
	For ground fault current sensing electronic relay type CII, the inhibit current shall be set to a value at least 30 % higher than the maximum ground/earth fault current setting.		N/A
T.6.2 Part 1	Verification of inhibit function of ground/earth fault current sensing electronic relays Type CII (-A and -B)		
	For overload relays with an adjustable ground/earth fault current setting, the test shall be made at the lowest setting.		N/A
	For overload relays with an adjustable inhibit current setting Iic, the test shall be made at the minimum and at the maximum Iic settings.		N/A
	Each phase has to be tested separately		N/A
	The impedance Z is adjusted so as to let a current flow in the circuit equal to:		
	a) 95 % the inhibit current Iic The switch S1 being in the closed position, the test current is established by closing switch S2.		N/A
	The overload relay shall not initiate the opening of the switching device.		N/A
	b) 75 % the inhibit current Iic The switch S1 being in the closed position, the test current is established by closing switch S2.		N/A
	The overload relay shall initiate the opening of the switching device.		N/A
T.6.3 Part 1	Current asymmetry relays		
	80 % < Trip time < 120% of time setting	Itest: _____A, tripping after _____s	N/A
T.6.4 Part 1	Voltage asymmetry relays		
	Test voltage setting : 1,0 times the voltage asymmetry setting Trip time < 120% of time setting Test voltage >1,2 times the voltage asymmetry setting	Test voltage: _____V, tripping after _____s ☐ prevent to close ☐ did not prevent to close	N/A
T.6.5 Part 1	Phase reversal relays		

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Clause	Requirement + Test	Result - Remark	Verdict
	Voltage sequence of the line side of the starter are the same as voltage sequence setting	The phase reversal relay permits to close the equipment	N/A
	After interchange of two phases	The phase reversal relay prevents closing of the equipment	N/A
T.6.6 Part 1	Over-voltage relays		
	a) operating voltage: shall operated to open or prevent the closing if U supply > Uset or > 110 % Un or > time setting	U supply=____V U set =____V Time setting= ____s	N/A
	b) operating time: time lag shall be measured from the instant when the voltage reaches the operating value until the instant when the relay or release actuates the device of the equipment	Time setting= ____s Voltage operating Value = _____V Time lag = _____s	N/A
H.3.2	Limits of electronic overload relay with main circuit under-voltage restarting function		
	When under-voltage or loss of voltage occurs in the main circuit, the relay will operate. The following applies		
	a) if the voltage resumes within T1 (off-time for immediate reset), the overload relay shall control the starter circuit to immediately restore the running condition;		N/A
	b) if the voltage resumes between T1 and T2 (off-time for reset), the relay shall reset to the starting sequence;		N/A
	c) if the voltage resumes after T2, the relay shall not reset automatically.		N/A
	T1 and T2 are adjustable, and the value of T2 is greater than T1.		N/A
	The tolerance of the threshold voltage and of the time settings shall be specified by the manufacturer but no more than ±10 %. If the time setting value is lower than 1 s, the manufacturer shall state the tolerances.		N/A
H.4	Test of the control functions		
	The test of the control functions shall be verified according to H.3, and each control function should be verified at least 3 times.		N/A
	For restart functions, the detection time for a voltage dip and the delay of restarting shall be verified according to H.3.		N/A

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Clause	Requirement + Test	Result - Remark	Verdict

	TEST SEQUENCE Annex K		
	Procedure to determine data for electromechanical contactors used in functional safety applications.		
		See	N/A

	TEST SEQUENCE Annex M (part 1)		
	Hot wire ignition (HWI) test		
M.1.1	Five samples of each material shall be tested. The samples shall be 150 mm long by 13 mm wide, and of uniform thickness stated by the material manufacturer. Edges shall be free from burrs, fins ect.		N/A
M.1.2	A (250 ±5 mm) length of nichrome wire (80% nickel, 20% chromium , iron free) approximately 0,5 mm diameter and having a cold resistance of approximate. 5,28 Ω/m shall be used. The wire shall be connected in a straight length to a variable source of power which is adjusted to cause a power dissipation of 0,26 W/mm in the wire for a period of 8 to 12 s. After cooling, the wire shall wrapped around a sample to form five complete turns spaced 6 mm apart		N/A
M.1.3	The wrapped sample shall be supported in a horizontal position and the ends of the wire connected to the variable power source, which is again adjusted to dedicate 0,26 W/mm In the wire (see fig M.1)		N/A
M.1.4	Start the test by energizing the circuit so that a current is passed through the heater wire yielding a linear power density of 0,26 W/mm		N/A
M.1.5	Continue heating until the test specimen ignites. When ignition occurs, shut of power and record time to ignite Discontinue the test if ignition does occur within 120 s. For specimens that melt through the wire without ignition, discontinue the test when the specimen is no longer in intimate contact with all five turns of the heater wire.	IGNITED AFTER: 1) _____s 2) _____s 3) _____s 4) _____s 5) _____s Melt trough all 5 turns: 1) _____s 2) _____s 3) _____s 4) _____s 5) _____s	N/A

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Clause	Requirement + Test	Result - Remark	Verdict
M.1.6	The test shall be repeated on remaining samples	Ignited after: 1) _____s 2) _____s 3) _____s 4) _____s 5) _____s Melt trough all 5 turns: 1) _____s 2) _____s 3) _____s 4) _____s **5)** _____s	N/A
	The follow information shall be recorded: Material: Thickness: Colour: The average ignition time	_____ _____ mm _____ _____ s(☐≤15 s ☐ >15 s)	N/A
M.2	Arc ignition test		
M.2.1	Three samples of each material shall be tested. The samples shall be 150 mm long by 13 mm wide and of uniform thickness stated by the material manufacturer. Edges shall be free from burrs, fins, act.		N/A
M.2.2	The tests shall be made with a pair of test electrodes and a variable inductive impedance load connected in series to a source of 230 Vac, 50 Hz or 60 Hz (see Figure M.2)		N/A
M.2.3	One electrode shall be stationary and the other movable. The stationary electrode consist of a 8 mm^2 to 10 mm^2 solid copper conductor having a horizontal chisel point with a total angle of 30 °.The movable electrode shall be a 3 mm diameter stainless steel rod having a symmetrical conical point with a total angle of 60°, and shall be capable of being moved along its own axis. The radius of curvature for the electrode tips shall not exceed 0,1 mm at the start of a given test. The electrodes shall be located opposing each other, at an angle of 45° to the horizontal. With the electrodes short-circuited, the variable inductive impedance load shall be adjusted until the current is 33 A at a power factor of 0,5.		N/A
M.2.4	The sample under test shall be supported horizontally in air so that the electrodes, when toughing each other, are in contact with the surface of the sample. The movable electrode shall be manually or otherwise controlled so that it can be withdrawn along its axis from contact with the stationary electrode to break the circuit, lowered to remake the circuit, so as to produce a series of arcs at a rate of approximately 40 arcs/min, with a separation speed of (250 ± 25 mm/s)		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
M.2.5	The test is to be continued until ignition of the sample occurs, a hole is burned through the sample, or a total of 200 cycles has elapsed.	Material: _____ Ignitions or hole burns 1) ___ ___ 2) ___ ___ 3) ___ ___	N/A
		Material: _____ Ignitions or hole burns 1) ___ ___ 2) ___ ___ 3) ___ ___	N/A
M.2.6	The average number of arcs to ignition and thickness of each set of specimen shall be recorded The hot wire ignition (HWI) and arc ignition (AI) test value requirements related to the material's flammability category are indicated in Table M.1	Material: _____ Thickness: ____ mm Average number of arcs: ___ Flammability category: ____	N/A
		Material: _____ Thickness: ____ mm Average number of arcs: ___ Flammability category:	N/A

9.1.5.2	**TEST SEQUENCE Special tests – damp heat, salt mist, vibration and shock**		
	For these special tests, Annex Q of IEC 60947-1 applies with the following additions.		
	Where Table Q.1 of IEC 60947-1 calls for verification of operational capability, this shall be done according to 9.3.6.2 of this standard.		N/A
	The vibration tests shall be done on the equipment in the open and closed positions..		N/A
	The overload relay shall not trip during the vibration test		N/A
	To check the behaviour of main and auxiliary contacts, vibration tests can be done under any current /voltage value.		N/A
	The shock test on the equipment shall be done in the open position.		N/A
	For the dry heat test, the equipment shall be in the close position during the conditioning period (see 5.3.3 of IEC 60068-2-2)		N/A
	For the dry heat test categories A, B and C, the test may be done without current in the poles and for categories D, E and F, the test shall be done under the maximum rated AC-3 current, but may be limited to 100 A for practical reasons. During the last hour, the contactor shall be operated 5 times. During the whole test the overload relay may trip.		N/A
	For the low temperature test, the test Ad is to be chosen instead of the test Ab and the equipment shall be in the open position during the cooling period. It shall then be energized for the last hour.		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	For the low temperature test categories A, B and C, the test may be done without current in the poles and for categories D, E and F, the test is done under the maximum rated AC-3 current which may be limited to 100 A for practical reasons. During this last hour the contactor shall be operated 5 times. During the whole test the overload relay shall not trip.		N/A
	For the damp heat test, for categories A, B and C, the test may be done without current in the poles. For categories D, E and F the equipment shall be energized under the maximum rated AC-3 current for the first cycle and de-energized for the second cycle. The current may be limited to 100 A for practical reasons. After stabilization of the temperature, during the first 2 h of the first cycle and during the last 2 h of the second cycle, the contactor shall be operated 5 times. The overload relay may trip only if it is permitted according to its temperature characteristic.		N/A

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Clause	Requirement + Test	Result - Remark	Verdict

	TABLE: Heating Test (I-1)		P
	Test voltage (V)..... :	Us=415Vac	—
	Ambient (°C)..... :	23,7 °C	—

Thermocouple Locations	max. temperature rise measured (K)	max. temperature rise limit (K)
Terminal L1	66	70
Terminal L2	68	70
Terminal L3	65	70
Terminal T1	67	70
Terminal T2	66	70
Terminal T3	60	70
Auxiliary Terminal 14	34	70
Auxiliary Terminal 13	32	70
Enclosure	36	40
Supplementary information:		

	TABLE: Heating test, resistance method (I-1)		P
	Test voltage (V) .....:	415Vac	—
	Ambient, t_1 (°C) .....:	26,4 °C	—
	Ambient, t_2 (°C) .....:	26,4 °C	—

Temperature rise of winding	R_1 (Ω)	R_2 (Ω)	ΔT (K)	Max. dT (K)	Insulation class
Coil (Uninterrupted duty)	481	573	53	110	B
Supplementary information:					

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	TABLE: Clearance And Creepage Distance Measurements					
clearance cl and creepage distance dcr at/of:	**Uimp (kV)**	**Ui (V)**	**Required cl (mm)**	**cl (mm)**	**required dcr (mm)**	**dcr (mm)**
1.between live parts (of the main circuits) which are separated when the switch is in off position	6	690	8,0	>15	10	>15
2.between live parts of different polarity	6	690	8,0	>15	10	>15
3. between live parts and accessible surfaces of operating means	6	690	8,0	>15	10	>15
Supplementary information:						

	TABLE: Dielectric Strength(I-1)	P
Test voltage applied between:	**Test potential applied (V)**	**Breakdown / flashover (Yes/No)**
1,between all the terminals of the main circuit connected together (including the control and auxiliary circuits connected to the main circuit) and the enclosure or mounting plate, with the contacts in all normal positions of operation (the main contacts of the device are closed and open)	Main:1890 Auxiliary:1890	NO
2,between each pole of the main circuit and the other poles connected together and to the enclosure or mounting plate with the contacts in all normal positions of operation (the main contacts of the device are closed and open)	Main:1890 Auxiliary:1890	NO
3,between each control and auxiliary circuit not normally connected to the main circuit and: - the main circuit - the other circuits - the exposed conductive parts - the enclosure or mounting plate	Main:1890 Auxiliary:1890	NO
Supplementary information:		

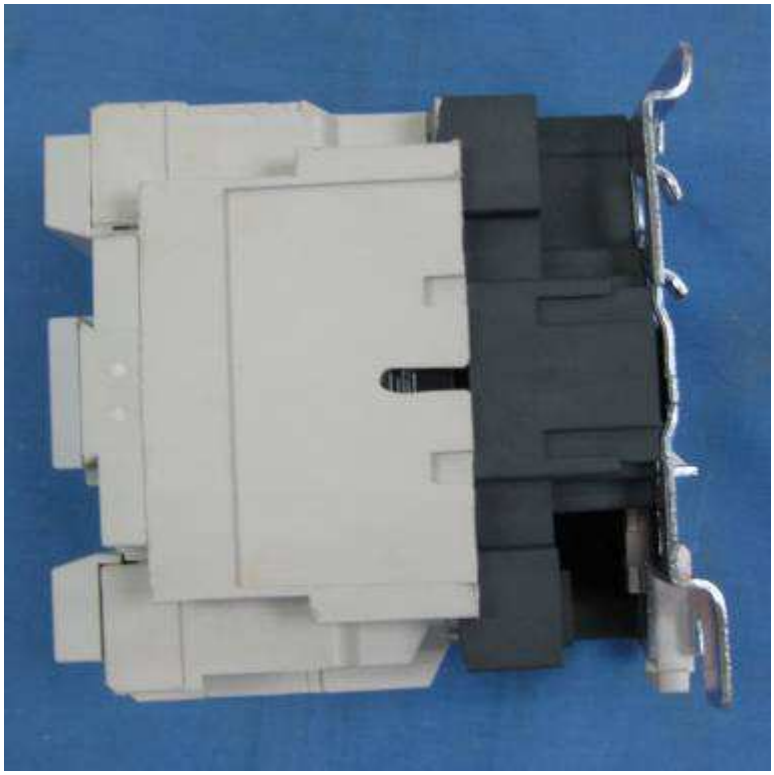
TABLE: RESISTANCE TO HEAT (BALL PRESSURE TEST)						
no.	Specimen					Verdict
	Description	Colour	Temp. °C	Impress diam. mm	Result diam. mm	
1	Cover	White	125	2,0	1,5	P
2	base	Grey	125	2,0	1,6	P
3	Contact support	Blue	125	2,0	1,4	P
4	Cover of Indicator	Transparent	70	2,0	1,5	P

TABLE: GLOW WIRE TEST							
Part	Colour	Thick (mm)	Temp. °C	burning after t (s)	drops	support burning	Comments
Cover	White	1,3	850	8	No	No	OK
base	Grey	1,3	850	4,9	No	No	OK
Contact support	Blue	1,3	850	3,4s	No	No	OK
Cover of Indicator	Transparent	1,3	650	-	No	No	OK

TABLE: Resistance to tracking (tracking test)								
no.	Specimen							Verdict
	Description	Colour	Drops (no.)	Voltage (V)	Burning	Current (A)	Result	
1	Cover	Grey	>50	175	-	-	No flashovers	P
2	base	Black	>50	175	-	-	No flashovers	P
3	Contact support	Blue	>50	175	-	-	No flashovers	P
4	Cover of Indicator	Transparent	>50	175	-	-	No flashovers	P

Photos of sample: (LT1-D9511)

Photos of sample: (LT1-D9511)



Photos of sample: (LT1-D9511)

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