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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. ..... :	200300174SHA-007
Date of issue ..... :	2020-06-27
Total number of pages ..... :	150
Name of Testing Laboratory preparing the Report ..... :	Intertek Testing Services Shanghai Building No.86, 1198 Qinzhou Road (North), Shanghai 200233, China
Applicant's name ..... :	HIMEL HONG KONG LIMITED
Address ..... :	11/F Kerry Ctr 683 King's Rd Quarry Bay Hong Kong
Test specification:	
Standard ..... :	IEC 60947-4-1:2018 EN 60947-4-1:2019
Test procedure ..... :	CE
Non-standard test method ..... :	N/A
Test Report Form No. ..... :	IEC60947_4_1D
Test Report Form(s) Originator .... :	DEKRA Certification B.V.
Master TRF ..... :	Dated 2019-05-14

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

General disclaimer:

The test results presented in this report relate only to the object tested.
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Test item description ..... :	Magnetic Starter
Trade Mark ..... :	Himel
Manufacturer ..... :	DELIXI ELECTRIC LTD Delixi High Tech Industrial Park, Liushi Town, Yueqing City, Zhejiang Province, China 325604
Model/Type reference ..... :	HDS3-38
Ratings ..... :	See general product information (page 6)

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

☒	**Testing Laboratory:**	Intertek Testing Services Shanghai	
Testing location/ address.....:		Building No.86, 1198 Qinzhou Road (North), Shanghai 200233, China	
☐	**Associated Laboratory:**		
Testing location/ address.....:			
Tested by (name, function, signature).....:		Mark He (Engineer)	Mark He
Approved by (name, function, signature)...:		Allen Wang (Mandated Reviewer)	Allen Wang
☐	**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	**Intertek Testing Services Shanghai** Building No.86, 1198 Qinzhou Road (North), Shanghai 200233, China
9.3.3.1&9.3.3.2	Verification of operation and operating limits	
9.3.3.4	Verification of dielectric properties	
9.3.3.5	Verification of rated making and breaking capacities, change-over ability and reversibility, where applicable	
9.3.3.6	Verification of conventional operational performance	
9.3.4	Performance under short-circuit conditions	
9.3.5	Verification of ability to withstand overload current	
8.2.4 of part 1	Verification of mechanical properties of terminals	

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

Report No.	Type	Seq. I	Seq. II [d)]	Seq. III	Seq. IV [d)]	Seq. V
200300174SHA-007	HDS3-38	1+15[a)]	-	10 [b)]	-	1

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

Report No.	Type	Seq. I	Seq. II	Seq. III	Seq. IV	Seq. V	Seq. VI
200300174SHA-008	HDS3-38	1	1+2 [c)]	1+2 [c)]	1	-	1

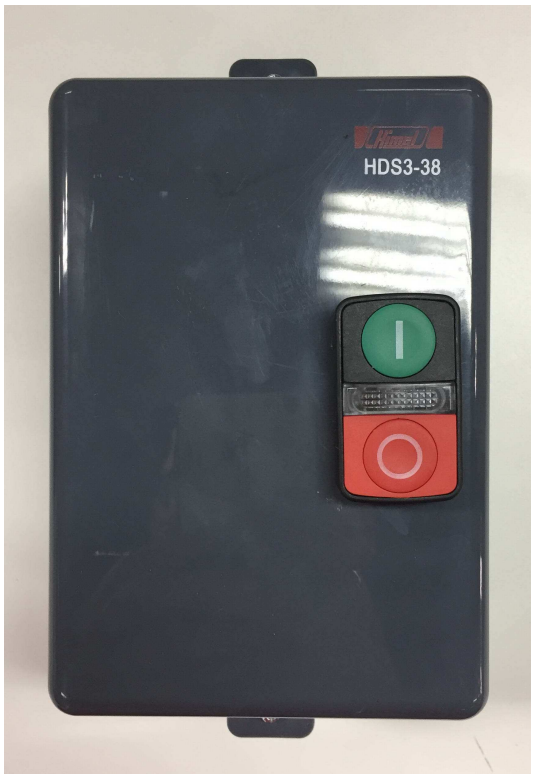
Note:

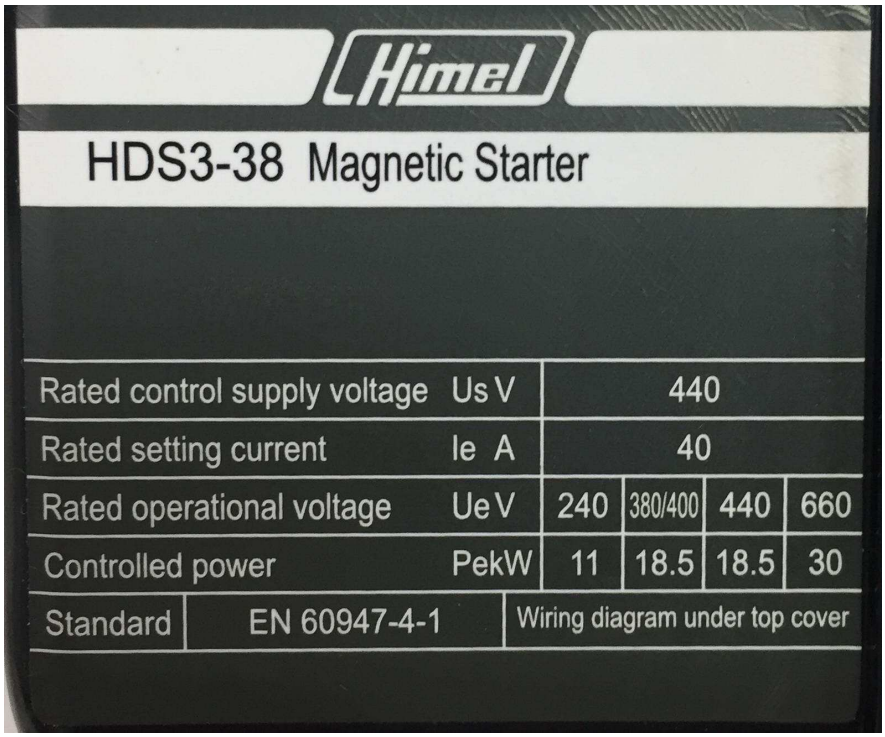
a) The other every current;
b) Tested on the min. current, middle current and the max. current;
c) Tested on NC & NO with voltage AC220V, AC380V and DC220V.
d) Tested information see report 170902156SHA-002, 170902156SHA-003.

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

☒ **The product fulfils the requirements of IEC60947-4-1:2018 and EN60947-4-1:2019.**

Copy of marking plate:





Test item particulars.....:	
Classification of installation and use.....:	fixed installation
Supply Connection.....:	Cable connection
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 .....:	2020-03-18
Date (s) of performance of tests.....:	From 2020-03-19 to 2020-05-28

General remarks:

"(See Enclosure #)" refers to additional information appended to the report.
"(See appended table)" refers to a table appended to the report.

This test report is valid only being read together with the test reports of 200300174SHA-008 and 170902156SHA-002, 170902156SHA-007, 170902156SHA-003, 170902156SHA-008,

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

Determination of the test conclusion is based on IEC Guide 115 in consideration of measurement uncertainty.

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) ..... :	**DELIXI ELECTRIC LTD** Delixi High Tech Industrial Park, Liushi Town, Yueqing City, Zhejiang Province, China 325604

General product information:

Type:	HDS3-38, with plastic enclosure			
Main circuit:				
Rating:	Ue=240Vac, 400Vac, 440Vac, 660Vac, Ui=690V, Uimp=6kV, 50/60Hz, IP54, Us=AC: 36V, 110V, 127V, 220/230V, 240V, 380/400V, 415V, 440V, AC-3			
Ie(A):	0,10-0,16	0,16-0,25	0,25-0,4	0,4-0,63
	0,63-1,0	1,0-1,6	1,6-2,5	2,5-4,0
	4,0-6,0	5,5-8,0	7,0-10	9,0-13
	12-18	17-25	23-32	30-40
Trip class	10A			
Ir(A)	1000A(0,1-0,16A to 9-13A), 3000A(12-18A to 30-40A)			
Iq(A)	50000A			
SPCD	RT16-00(NT00): 25A(0,1-0,16 to 9-13A), 50A(12-18A to 23-32A), 80A(30-40A)			
remark	AC contactor: HDC3-09, HDC3-12, HDC3-18(See report 170902156SHA-002, 170902156SHA-007); HDC3-25, HDC3-32, HDC3-38(See report 170902156SHA-003, 170902156SHA-008); Thermal Relay: HDR3s-25(0,1-0,16A to 17-25A), HDR3s-38(23-32A to 30-40A)			
Auxiliary circuit:				
Ue (V):	AC 220	AC 380	DC 220	
Ie (A):	AC-15: 1,64	AC-15: 0,95	DC-13: 0,15	
Ratings:	Ith=5A, conditional short-circuit current: 1kA,			

HD S 3 - 38
a) b) c) d)

a) Company Code
b) Magnetic Starter
c) Design Code
d) Current frame

Test item particulars ..... :	
- kind of equipment ..... :	Magnetic Starter
- 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 ..... :	50/60Hz
- rated duties ..... :	Uninterrupted
-Utilization category ..... :	AC-3
Rated and limiting values, main circuit	
Rated voltages	
- rated operational voltage Ue (V) ..... :	240Vac, 400Vac, 440Vac, 660Vac
- 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) ..... :	Same as max. rated current
- 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 ..... :	Max. 30-40A to min. 0,1-0,16A, See General product information(page 6)
- 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

-rated duty.....:	Uninterrupted
Normal load and overload characteristics	
- ability to withstand motor switching overload currents.....:	N/A
-rated making capacity .....:	N/A
-rated breaking capacity.....:	N/A
-conventional operational performance .....:	N/A
Starting and stopping characteristics of starters	
-service conditions for starters .....:	N/A
Short-circuit characteristics	
- rated ultimate short-circuit breaking capacity of a MPSD I_{cu} (kA).....:	N/A
- rated service short-circuit breaking capacity of a MPSD I_{cs} (kA) .....:	N/A
- rated prospective short-circuit current "r" (kA) .....:	3kA
- rated conditional short-circuit current Iq (kA).....:	50kA
- type of co-ordination.....:	type 1
- Pole impedance of a contactor (Z) .....:	N/A
Control circuits	
Characteristics of electrical and electronic control circuits	
- type of current.....:	ac.
- rated frequency or d.c. .....:	50/60Hz
- rated control circuit voltage Uc (a.c. / d.c.) .....:	N/A
- rated control circuit supply voltage Us (a.c. / d.c.) .....:	36V, 110V, 127V, 220/230V, 240V, 380/400V, 415V, 440V
- nature of external control circuit devices (contacts, sensors, optocouplers, electronic active components, etc):	N/A
- power consumption .....:	N/A
- limited energy (if the source is in accordance with 8.1.14):	N/A
- SELV (PELV) supply ……..:	N/A
- holding power ……..:	N/A
- pick-up power ……..:	N/A
Rated and limiting values of air supply control circuit	
- rated pressure and limits.....:	N/A
- volumes of air .....:	N/A

Auxiliary circuits:	
- rated operational voltage Ue (V) ..... :	220Vac, 380Vac, 220Vdc
- rated insulation voltage: Ui (V) ..... :	500
- rated operational current: Ie (A) ..... :	See General product information(page 6)
- kind of current ..... :	a.c./d.c.
- rated frequency: (Hz) ..... :	50/60
- number of circuits ..... :	2
- number and kind of contact elements ..... :	1NO and 1NC, Figure 4a) (IEC/EN60947-5-1)
- rated uninterrupted current: Iu (A) ..... :	N/A
- utilization category: (AC, DC, current and voltage) ..... :	AC-15, DC-13
Short-circuit characteristic	
- Rated conditional short-circuit current (kA) ..... :	1kA
- kind of protective device ..... :	Fuse, RT16-00(NT00), 6A
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 overload relay or release ☐ e) instantaneous short-circuit relays or releases. ☐ f) Stall relay or release ☐ g) other relays or releases (e.g., control relay associated with devices for the thermal protection of the motor
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 and release (including the overload function of MPSD)	
-designation and current settings.....:	See general product information(Page 6)
-rated frequency, when necessary (for example in case of a current transformer operated overload relay) .....:	50/60Hz
- 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. .....:	10A
- number of poles.....:	3
- nature of the relay: thermal, magnetic, electronic without thermal memory.....:	thermal
- nature of the reset .....:	Automatic
- tripping time of overload relays class 10A if longer than 2 min at –5 °C or below .....:	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, IEC 60947- 1 :2007 /AMD1:2010 ……..:	N/A
- inhibit time (when applicable) .....:	N/A
- type designation (see Annex T of IEC 60947-1:2007, IEC 60947- 1:2007 /AMD1:2010.....:	N/A
d) Short-circuit release of an MPSD:	
- rated operational currents (Ie) or rated operational powers	N/A
- rated frequency ……..:	N/A
- current setting (or range of settings) if applicable .....:	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

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	Himel	P
	b – type designation or serial number	HDS3-38	P
	Data preferably marked on the equipment:		
	c - number of this standard, if the manufacturer claims compliance	IEC/EN 60947-4-1	P
	n - IP code	IP54(front)	P
	S2) Overload relays and releases: Characteristic values		N/A
	S2) Overload relays and releases: Designation and current settings of overload relays		N/A
	e - 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	240V, 400V, 440V, 660V	P
	f - utilization category and rated operational currents (or rated powers), at the rated operational voltages of the equipment	See general product information(Page 6)	P
	g - either the value of the rated frequency/ies, or the indication d.c. (or symbol) .....:	50/60Hz	P
	h - rated duty with the indication of the class of intermittent duty, if any	Uninterrupted	P
	i – pole impedance of the switching device (*Z*);		N/A
	j - material declaration according to Annex W of IEC 60947-1:2007/AMD2:2014;		P
	Associated values:		
	k - 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:		
	l – rated insulation voltage	690V	P
	m – rated impulse withstand voltage (see 5.3.1.3)	6kV	P
	o – pollution degree	3	P

IEC 60947-4-1			
Clause	Requirement + Test	Result - Remark	Verdict
	- 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) - for MPSD, rated ultimate short-circuit breaking capacity (I_{cu}) and rated service short circuit breaking capacity (I_{cs}) (see 8.2.4.7).	Ir=1kA(0,1-0,16A to 9-13A), Ir=3kA(12-18A to 30-40A) Iq=50kA, 660V Co-ordination type 1 SCPD: Fuse: RT16-00(NT00), 25A(0,1-0,16 to 9-13A), 50A(12-18A to 23-32A), 80A(30-40A)	P
	p - maximum permissible altitude of the site of installation, if greater than 2 000 m. - length of insulation to be removed before insertion of the conductor into the terminal; - maximum number of conductors which may be clamped. for non-universal screwless terminals: - “s” or "sol" for terminals declared for rigid-solid conductors; - "r" for terminals declared for rigid (solid and stranded) conductors; - “f” for terminals declared for flexible conductors.		N/A
	q - reference of dedicated wiring accessories which can be used for wiring the starter or the combination of contactors;		N/A
	Control circuits		
	The following information concerning control circuits shall be placed either on the coil or on the equipment:		
	r – rated control circuit voltage (Uc), nature of current and rated frequency		N/A
	s - if necessary, nature of current, rated frequency and rated control supply voltages	Us= 440V, 415V, 380/400V, 240V, 220/230V, 127V, 110V, 36V	P
	Air supply systems for starter or contactors operated by compressed air		
	t - 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:		

IEC 60947-4-1			
Clause	Requirement + Test	Result - Remark	Verdict
	u – ratings of auxiliary circuits	See General product information(page 6)	P
	Over-current relays and releases:		
	v1 – characteristics according to 5.7.2, 5.7.5 and 5.7.6;		N/A
	v2 – characteristics according to 5.7.3 and 5.7.4;	Overload time-delay relay, dependent on previous load, sensitive to phase loss. Trip class: 10A	P
	Additional information for certain types of contactor and starter:		
	Rheostatic starters:		
	w – circuit diagram		N/A
	x – severity of start, see 5.3.5.6.1		N/A
	y – starting time, see 5.3.5.6.1		N/A
	Auto-transformer starters:		
	z – rated starting voltage(s), i.e. voltage(s) at the tapping terminals		N/A
	EMC		
	aa – environment A and/or B: see 7.3.1 of part 1	☐ A ☐ B	N/A
	ab – special requirements, if applicable, for example shielded or twisted conductors		N/A
	Sub clause 5.2 of IEC 60947-1:2007, IEC 60947-1:2007/AMD1:2010 applies to contactors, starters and overload relays with the following additions:		
	Data under items d) to ab) 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) in 6.1.1, e), n) (if the degree of protection is different than IP00) and x2) in 6.1.2 shall be marked on the equipment; time-current characteristics (or range of characteristics) may be provided in the manufacturer's published literature.	c) marked	P
	MPSD shall be marked in addition, in a place such that they are visible and legible when the MPSD is installed, for the: - suitability for isolation, if applicable. - indication of the open and closed positions		N/A

IEC 60947-4-1			
Clause	Requirement + Test	Result - Remark	Verdict
	The following data shall be marked externally on the MPSD in a place such they may be visible and legible when the MPSD is installed: – range of the rated instantaneous short-circuit current setting (I_i), for adjustable releases.		N/A
	For dedicated accessories used for wiring the starter or the combination of contactors, data under 6.1.1 c), 6.1.2 l) and the current I_{th}, if applicable, shall be provided in the manufacturer's published literature.		N/A
6.3	**Instruction for installation, operation and maintenance, decommissioning and dismantling**		
	Subclause 5.3 of IEC 60947-1:2007 and IEC 60947-1:2007/AMD2:2014 applies with the following addition.		
	The instructions shall also cover the dedicated wiring accessories.		P
	Additional information for the decommissioning and dismantling of the device shall be maintained available to the user in case of foreseeable hazardous condition of the device, for example due to stored energy, instability or falling of objects, etc.		P
	In case of protected starters, the manufacturer shall also provide the necessary mounting and wiring instruction		N/A
	The manufacturer of a starter incorporating an automatic reset overload relay capable of being connected to enable automatic restarting, shall provide, with the starter, that information necessary to alert the user to the possibility of automatic restarting.		P
	If the construction requires energization by an external source that is not a limited energy source as defined in 8.1.14, the manufacturer shall provide the appropriate information for short-circuit and overcurrent protection of the ports.		P
	For each relevant potential hazard, the manufacturer shall provide safety signs, graphical symbols or safety notes of the hazard for example by using e.g. IEC 60417-5036. Signal words shall be defined according to ISO 3864-2.		P
6.4	**Environmental information**		
	Subclause 5.4 of IEC 60947-1:2007/AMD2:2014 applies.		

IEC 60947-4-1			
Clause	Requirement + Test	Result - Remark	Verdict
7	NORMAL SERVICE, MOUNTING AND TRANSPORT CONDITIONS		
	Clause 6 of IEC 60947-1:2007 applies with the following addition.		
	Unless otherwise stated by the manufacturer, a contactor or a starter is for use in pollution degree 3 environmental conditions, as defined in 6.1.3.2 of IEC 60947-1:2007. However, other pollution degrees may be considered to apply, depending upon the micro-environment.		P
	Rail mounting shall be specified according to IEC 60715:2017, when relevant.		P
	Standard conditions of vibration are defined in footnote b of Table Q.1 of IEC 60947-1:2007/AMD2:2014.		P
	Altitude above 2 000 m are subjected to agreement between manufacturer and user.		P
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, within the equipment, shall not be adversely affected by abnormal heat and by fire.		P
	Test method used:		
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 60947-1:2007 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)	

IEC 60947-4-1			
Clause	Requirement + Test	Result - Remark	Verdict
8.1.3	Current-carrying parts and their connection		
7.1. 3 Part 1	No contact pressure through insulating materials		P
8.1.4	Clearances and creepage distances		
	Clearances		
	Rated impulse withstand voltage (see test sequence I)	U_{imp}= 6kV(main circuit) U_{imp}= 6kV(auxiliary circuit)	P
	Creepage distances		
	Pollution degree ..... :	3	
	Comparative tracking index (V) ..... :	175	
	Material group ..... :	IIIa	
	Rated insulation voltage Ui (V) ..... :	690V(main circuit) 500V(auxiliary circuit)	
	Minimum creepage distances (mm) ..... :	10mm(main circuit) 8,0mm(auxiliary circuit)	
	Measured creepage distances (mm) ..... :	16,0mm(main circuit) 11,2mm(auxiliary circuit)	P
8.1.5	Actuator		
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 withstand 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

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Clause	Requirement + Test	Result - Remark	Verdict
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
8.1.5.4	Protection		
	There shall be no path or opening which allows incandescent particles to be discharged from the area of the manual operating means.		N/A
8.1.6	Indication of contact position		
7.1. 6.1 Part 1	Indication means, applies to manually operated starters		
	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
	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		
	If the tripped position of the MPSD is not the indicated open position, it should be clearly visible that it is not the open position. The verification of the main contact position for a manual starter and a MPSD suitable for isolation shall be tested according to 9.3.3.2.3.		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	MPSDs and manual motor starter suitable for isolation shall be provided with means for locking in the open position.		N/A
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		N/A
	- 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 all moving main 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
	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)		

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Clause	Requirement + Test	Result - Remark	Verdict
	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) .....:		N/A
	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
	Screwless-type clamping units, unless otherwise specified by the manufacturer, shall accept rigid and flexible conductors as indicated in Table 1.		N/A
7.1.8.2 part 1	Connecting capacity		
	type of conductors .....:	Rigid-stranded or flexible cable	
	minimum cross-sectional area of conductor (mm²) .....:	Main circuit; 1,0 mm² Auxiliary circuit: 1,0 mm²	P
	maximum cross-sectional area of conductor (mm²) .....:	Main circuit; 10 mm² Auxiliary circuit: 2,5 mm²	P

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Clause	Requirement + Test	Result - Remark	Verdict
	number of conductors simultaneously connectable to the terminal .....:	2 / 1	P
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		P
8.1.8.2	Terminal identification and marking,		
	marking comply with Annex A		P
7.1.8.4 part 1	terminal intended exclusively for the neutral conductor		
	protective earth terminal		N/A
	other terminals	1/L1, 3/L2, 5/L3, 2/T1, 4/T2, 6/T3, 95/NC, 96/NC, 97/NO, 98/NO, 13/NO, 14/NO, A1, A2	P
8.1.9	Additional requirements for equipment provided with a neutral pole		
7.1.9 part 1	marking of neutral pole		
	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 protective earthing		
7.1.10.1 part 1	The exposed conductive parts shall be electrically interconnected and connected to a protective earth terminal		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
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
7.1.10.3 part1	Protective earth terminal marking and identification		
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.		P
	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		P
	Sufficient space shall be provided inside the enclosure		P
	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		P
	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		

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Clause	Requirement + Test	Result - Remark	Verdict
	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 60947-1:2007	(see 8.2.3 part 1 below)	P
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
8.1.14	Limited energy source		
8.1.14.2	Limited energy source with galvanic separation		
	The output is inherently limited in compliance with Table 19;		
	A linear or non-linear impedance limits the output in compliance with Table 19. If a positive temperature coefficient device (e.g. PTC) is used, it shall pass the applicable tests specified in IEC 60730-1;		N/A
	A regulating network limits the output in compliance with Table 19, both with and without a single fault in the regulating network;		N/A
	An over-current protective device is used and the output is limited in compliance with Table 20.		N/A
	Type of overcurrent protection device ……:		N/A
8.1.14.3	Limited energy source with current limiting impedance		
	The output voltage is limited in compliance with Table 21 and a linear or non-linear impedance limits the output in compliance with Table 21 both with and without a single fault.		N/A
8.1.15	Stored charge energy circuit		
	Parts including stored charge (capacitors) that are removable for servicing (such as coil replacement), installation, or disconnection shall present no risk of electric energy hazard after disconnection.		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Capacitors connected to accessible hazardous live parts shall be discharged to an energy level less than 0,5 mJ within 5 s after the removal of power.		N/A
8.1.16	Fault and abnormal conditions		
	The product shall be designed to avoid operating modes or sequences that can cause a fault condition or component failure leading to a hazard.		N/A
8.1.17	Short-circuit and overload protection of ports		
	Where the power source for a signal port or power port that is external to the device does not comply with the requirements for limited energy sources in 8.1.14, the product shall not present a hazard under short-circuit or overload conditions. Instructions for the installation of external overcurrent protection shall be made available in accordance with 6.3.		N/A
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

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Clause	Requirement + Test	Result - Remark	Verdict
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 9.3.3.2.2 below)	N/A
8.2.1.4	Limits of operation of shunt-coil operated releases (shunt trip)	(see 9.3.3.2.2 below)	N/A
8.2.1.5	Limits of operation of current sensing relays and releases	(see 9.3.3.2.2 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
8.2.4.7	Ability of a MPSD to make and break under short-circuit conditions	(see annex P below)	N/A
8.2.5	Co-ordination with short-circuit protective devices	(see 9.3.4 below)	P
8.3	**Electromagnetic compatibility (EMC)**		

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Clause	Requirement + Test	Result - Remark	Verdict
	Environment A		N/A
	Environment B		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 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 2,5s	P
	all other parts	☒ 650 ± 10°C No visible flame, 0s	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.		
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
	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

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Clause	Requirement + Test	Result - Remark	Verdict
	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 .....:	IP54	P
	Test for first characteristic		
	Test for first numeral .....:	~~1:~~ ~~2:~~ ~~3:~~ ~~4:~~ **5:** ~~6:~~	P
	Test for second characteristic		
	Test for second numeral .....:	~~1:~~ ~~2:~~ ~~3:~~ **4:** ~~5:~~ ~~6:~~ ~~7:~~ ~~8:~~	P
8.2.4 part 1	Mechanical and electrical properties of terminals		
8.2.4.2 part 1	Test of mechanical strength of terminals		
	maximum cross-section of conductor (mm²) :	10 mm² (main circuit) 2,5 mm² (auxiliary circuit)	
	diameter of thread (mm) .....:	3,9mm(main circuit) 3,4mm(auxiliary circuit)	
	torque (Nm) .....:	1,7Nm(main circuit) 1,2Nm(auxiliary circuit)	

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Clause	Requirement + Test	Result - Remark	Verdict
	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) .....:	1,0	P
	number of conductor of the minimum cross-section .....:	2	P
	diameter of bushing hole (mm) .....:	9,5	P
	height between the equipment and the platen (mm) .....:	260	P
	mass at the conductor(s) (kg) .....:	0,4	P
	135 continuous revolutions: the conductor shall neither slip out of the terminal nor break near the clamping unit	135	P
8.2.4.4 part 1	Pull-out test		
	force (N) .....:	35	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) ..:	10	P
	number of conductor of the maximum 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) .....:	2,0	P
	135 continuous revolutions: the conductor shall neither slip out of the terminal nor break near the clamping unit	135	P
8.2.4.4 part 1	Pull-out test		
	force (N) .....:	90	P

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Clause	Requirement + Test	Result - Remark	Verdict
	1 min, the conductor shall neither slip out of the terminal nor break near the clamping unit		P
8.2.4.3 part 1	Testing for damage to and accidental loosening of conductor (flexion test)		
	conductor of the largest and minimum cross-section (mm^2) .....:	10,0/1,0	P
	number of conductor of the minimum cross-section, number of conductor of the maximum cross-section .....:	1/1	P
	diameter of bushing hole (mm) .....:	9,5/9,5	P
	height between the equipment and the platen (mm) .....:	280/260	P
	mass at the conductor(s) (kg) .....:	2,0/0,4	P
	135 continuous revolutions: the conductor shall neither slip out of the terminal nor break near the clamping unit	135	P
8.2.4.4 part 1	Pull-out test		
	force (N) .....:	90/35	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
	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

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Clause	Requirement + Test	Result - Remark	Verdict
	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
	The number of specimens shall be at least 4.		N/A
	Test current is I_{th}.		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
	Test current is I_{th}.		N/A
9.2.4	Limited energy source test		
	Equipment operating under normal conditions		N/A
	In case the limited energy source requirement depends on over-current protective device(s), the device(s) shall be short-circuited.		N/A
	Maintain the limited VA energy for a period specified in 8.1.14……..:		N/A
	Maintain the limit of apparent energy for the time period indicated in Table 19, Table 20, or Table 21, as applicable……..:		N/A
	Available apparent energy does not exceed the limits indicated in Table 19, Table 20, or Table 21, as applicable……..:		N/A
	In case the limited energy source requirement depends on over-current protective device(s), the current rating of at least one of the protective device(s) in the current path shall not exceed the limit in Table 20.		N/A
	Test conducted under the most unfavourable combination		N/A
9.2.5	Breakdown of components		
	Tested with the product operating with the load creating the more severe condition		N/A
	Each identified component shall be subjected to a breakdown of components test in open- and or short-circuit failure modes, whichever is most severe		N/A
	no emission of flame or molten metal		N/A
	no ignition of cotton		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	no opening of the fusible element F (according to subclause 8.3.4.1.2 d) of IEC 60947-1:2007)		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
	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

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Clause	Requirement + Test	Result - Remark	Verdict
	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) .....:		N/A
	it shall be possible to unscrew the conduit and there shall be no evidence of damage impairing further use of the enclosure		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
9.3.1	Compliance with performance requirements		
a)	TEST SEQUENCE 1 16 Samples: HDS3-38, Ie=30-40A to Ie=0,1-0,16A		
	- 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, Ie=30-40, I-2, Ie=23-32A, I-3, Ie=17-25A)		
	Sub clause 8.3.3.3. of IEC 60947-1 applies		
	ambient temperature 10-40 °C ..... :	20°C	P
	Contactor		
	test enclosure W x H x D (mm x mm x mm) ..... :	In free air	P
	material of enclosure ..... :	plastic	P
9.3.3.3.4	Main circuits, test conditions:		
	Sub clause 8.3.3.3.4 of IEC 60947-1 applies with following addition		
	loaded as stated in 8.2.2.4		
	- setting of the maximum current setting ..... :	40A(HDS3-38, I-1) 32A(HDS3-38, I-2) 25A(HDS3-38, I-3) 13A(HDS3-38, I-5)	P
	- setting overload relay ..... :	-	N/A
	- conventional thermal current Ith (A) ..... :	40A(HDS3-38, I-1) 32A(HDS3-38, I-2) 25A(HDS3-38, I-3) 13A(HDS3-38, I-5)	P
	- conventional enclosed thermal current Ithe (A) :		N/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	N/A
	- cable/busbar cross-section (mm²) / (mm) ..... :	10,0 / 1 (HDS3-38: I-1) 6,0 / 1 (HDS3-38: I-2) 4,0 / 1 (HDS3-38: I-3) 2,5 / 1 (HDS3-38: I-5)	P
	- temperature rise of main circuit terminals (K) ... :	< 65 K, see page 140-143	P
9.3.3.3.5	Control circuit, test conditions:		

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Clause	Requirement + Test	Result - Remark	Verdict
	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		N/A
	- conventional thermal current Ith (A) at their rated voltage ..... :		N/A
	- conventional enclosed thermal current Ithe (A) :		N/A
	- cable/busbar cross-section (mm²) / (mm) ..... :		N/A
	- temperature rise of control circuit (K) ..... :	<_____ K see page ____	N/A
9.3.3.3.6	Coils and electromagnets circuit, test conditions:		
	The coil with the highest measured holding 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) ..... :	AC: 36V, 110V, 127V, 220/230V, 240V, 380/400V, 415V, 440V	
	- class of insulating material ..... :	B	
	- uninterrupted or eight-hour duty windings	uninterrupted duty	
	- temperature rise of control circuit terminals (K) :	< 110 K, see page 140-143	P
	b) Intermittent duty windings (8.2.2.6.2)		
	- no current flowing though the main circuit		N/A
	- rated control supply voltage Us (V) ..... :		N/A
	- class of insulating material ..... :		N/A
	- intermittent duty class ..... :		N/A
	- close open operating cycle..... :		N/A
	- on-load factor ..... :		N/A
	- temperature rise of control circuit terminals (K) :	< ____K, see page ____	P
	c) temporary or periodic duty (8.2.2.6.3)		
	- no current flowing though the main circuit		N/A
	- rated control supply voltage Us (V) ..... :		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	- class of insulating material ..... :		N/A
	- close open operating cycle..... :		N/A
	- on-load time ..... :		N/A
	- 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		P
	The temperature rise shall be measures during the test of 9.3.3.3.4		P
	- conventional thermal current Ith (A)..... :	5	P
	- conventional enclosed thermal current Ithe (A) :	-	N/A
	- cable/busbar cross-section (mm²) / (mm) ..... :	1,0/1	P
	- cable cross-section (mm²) ..... :	1,0	P
	- temperature rise of auxiliary circuit terminals (K) :	< 65K, see page 140-143	P
9.3.3.3.8	Starting resistors for rheostatic rotor starters test conditions:		
	Normally loaded with their current value I_m		N/A
	Number of starts per hour ..... :		N/A
	Rated duty ..... :		N/A
	Starting characteristic	See page _____	N/A
	- cable/busbar cross-section (mm²) / (mm) ..... :		N/A
	- cable cross-section (mm²) ..... :		N/A
	- temperature rise of starting resistor terminals (K) ..... :	See table 3 of IEC 60947-1	N/A
	- temperature rise of starting resistor enclosure (K)	See table 3 of IEC 60947-1	N/A
	- temperature rise of issuing air (K) ……:	See table 3 of IEC 60947-1	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 $^{\text{starting voltage}}/_{Ue}$		N/A
	Number of starts per hour ..... :		N/A
	Rated duty ..... :		N/A
	Starting characteristic..... :	See page	N/A
	- cable/busbar cross-section (mm²) / (mm) ..... :		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Temperature rise of:		
	- windings (K), See table 5 (+15 K) ..... :		N/A
	- operating means (K) , See table 3 of part 1..... :		N/A
	- parts intended to be touched but not hand held (K) , See table 3 of part 1		N/A
	- 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) :		N/A
	Rated full load current (A) :		N/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:		
8.2.1.2	Limits of operation of contactors and power-operated starters		
7.2.1.2 Part 1	Limits of operation of power operated equipment		
	rated control circuit supply voltage Us (V) ..... :	440Vac 415Vac 380/400Vac 220/230Vac 127Vac 110Vac 36Vac 240Vac	

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Clause	Requirement + Test	Result - Remark	Verdict
	frequency (Hz) ..... :	50/60Hz	
	rated air supply pressure ……..:		
	ambient temperature ……:	40°C	
	operation range……..:		
	close at any value between 85% and 110% (V or bar) ..... :	374V/484V 353V/457V 323V/440V 187V/253V 108V/140V 93,5V/121V 30,6V/39,6V 204V/264V	P
	drop out voltage: 75% to 20% (or 10% if specified by manufacturer) for a.c. and 75% to 10% for d.c. (V) ..... :		N/A
	drop out pressure (bar) 75% to 10% of rated pressure……:		N/A
	In the case of coils, the limiting drop-out values apply when the coil circuit resistance is equal to that obtained at –5 °C……..:	-5°C	
	Calculated values……:	185V(42,0%, Us=440V) 160V(38,6%, Us=415V) 168V(44,2%, Us=380/400V) 93,6V(42,5%, Us=220/230V) 48,4V(38,1%, Us=127V) 54,8V(49,8%, Us=110V) 19,0V(52,8%, Us=36V) 82,0V(34,2%, Us=240V)	P
	Drop out time (if applicable)……..:		N/A
	For latched contactors, the device shall drop out and open fully when a de-latching voltage between 85 % and 110 % of the rated de-latching voltage is applied……..:		N/A
8.3.3.2.1 part 1	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.		N/A
	The capacitor is short-circuit by a switch of negligible impedance.		N/A
	The supply voltage shall then be adjusted to 110 % U_s. ..... :		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	The value of the capacitor shall be calculated: C (nF) = 30 + 200000 / (f x U_s) ..... :	_____nF	N/A
	Verification of the drop out of the contactor when the switch is operated to the open position ..... :		N/A
	The test voltage is the highest value of the declared rated supply voltage range *U*s.		N/A
9.3.3.2.1.2.1	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		N/A
	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		N/A
	The test shall be performed at ambient temperature +23 °C ± 3 °C	23°C	N/A
	The test shall be made without any load in the main and auxiliary circuits		N/A
	The coil shall be supplied with the rated control supply voltage Us and at the rated frequency		N/A
	For a given coil, where a voltage range is declared, the test shall be made at the highest voltage at the respective frequency		N/A
	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 %		N/A
9.3.3.2.1.2.2	Holding power for conventional and electronically controlled electromagnet		

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Clause	Requirement + Test	Result - Remark	Verdict
	The current measurement I(i) of the coil shall be performed after the coil has been energized and has reached a stable temperature		N/A
	The holding power consumption is defined as follows		
	Sh(i) = Us(i) × I(i) [VA] for a.c. controlled electromagnet	Us= 440V~: 10,1W Us= 380/400V~: 9,6W Us= 220/230V~: 9,4W Us= 110V~: 8,8W Us= 36V~: 8,6W Us=240V~: 8,7W	P
	Pc(i) = Us(i) × I(i) [W] for d.c. controlled electromagnet		N/A
	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]	9,2W	P
	For electronically controlled electromagnet with alternating current and direct current ratings, the measurement should be performed for both ratings		N/A
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)		N/A
	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		N/A
	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		N/A
	The published value shall be equal to the average value of the 5 tested coils		
	Sp = Σ (Us(i) × I(i)) / 5 [VA] respectively Pp = Σ (Us(i) × I(i)) / 5 [W]		N/A
9.3.3.2.1.3	Pole impedance		

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Clause	Requirement + Test	Result - Remark	Verdict
	The pole impedance shall be determined during the test and with the conditions given in 9.3.3.3.4.		N/A
	The test in an enclosure is not deemed necessary even if the contactor can be used in an individual enclosure		N/A
	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		N/A
	The impedance per pole is defined as follows		
	Z = Ud / Ith [Ω]	L1: 3,56mΩ L2: 3,45mΩ L3: 3,53mΩ(I-1) L1: 3,34mΩ L2: 3,29mΩ L3: 3,17mΩ(I-5)	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		N/A
	1) Drop-out voltage		
	Rated control supply voltage(U)..... :		N/A
	Frequency (Hz)..... :		N/A
	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

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Clause	Requirement + Test	Result - Remark	Verdict
	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		
	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
	In the case of a release having a range of rated control circuit supply voltages, the test voltages shall be 70 % of the minimum rated control circuit supply voltage and 110 % of the maximum rated control voltage		N/A
	c) Thermal, electronic and time-delay magnetic overload relays		

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Clause	Requirement + Test	Result - Remark	Verdict
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 .....:	Thermal overload relay	
	trip class .....:	10A	
	current setting .....:	30-40A (**I-1**)	
	ambient temperature °C) .....:	20	
	test enclosure W x H x D (mm x mm x mm) .....:	No enclosure	
	cable/busbar cross-section (mm²) / (mm) .....:	10,0 / 1000	
	ambient temperature: - 5°C .....:	- 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 .....:	2h No tripping; 31,5A / 42,0A	P
	b) when the current is subsequently raised to B times the current setting, tripping shall occur in less than 2 h; test current .....:	Tripping; 39,0A / 52,0A Trip-time: 2min32s / 1min39s	P
	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; 10A Tripping current: 45,0A / 60,0A Trip-time: 55,4s / 50,3s	P
	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 .....:	+ 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 :	2h No tripping; 31,5A / 42,0A	P
	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: 36,0A / 48,0A Trip time: 1min27s / 2min28s	P

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Clause	Requirement + Test	Result - Remark	Verdict
	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 :	Class; 10A Tripping current: 45,0A / 60,0A Trip-time: 7,4s / 12,4s	P
	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; 10A Tripping current: 216A / 288A Trip-time: 2,3s / 2,5s	P
	ambient temperature: + 40 °C ..... :	+ 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 :	2h No tripping; Test current: 30,0A / 40,0A	P
	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: 36,0A / 48,0A Trip time: 2min31s / 1min40s	P
	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 :	Class; 10A Tripping current: 45,0A / 60,0A Trip-time: 1min04s / 53,1s	P
	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
	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

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Clause	Requirement + Test	Result - Remark	Verdict
	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)..... :	+ 20 °C	
	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	Min. setting current: 30A	P
	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 30,0 / 27,0 / 30,0 / 27,0 / 30,0 / 27,0 >2h / >2h / >2h	P
	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 34,5 / 0 / 34,5 / 0 / 34,5 / 0 4min28s / 5min13s / 4min39s	P
	ambient temperature (°C)..... :	+ 20 °C	
	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	Max. setting current: 40A	P
	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 40,0 / 36,0 / 40,0 / 36,0 / 40,0 / 36,0 >2h / >2h / >2h	P
	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 46,0 / 0 / 46,0 / 0 / 46,0 / 0 2min05s / 2min54s / 2min28s	P
	d) Instantaneous magnetic overload relays		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

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Clause	Requirement + Test	Result - Remark	Verdict
	e) Short-circuit releases		
	ambient temperature ..... :		N/A
	MPSD mounted in accordance with 8.2.2 …….:		N/A
	Test at minimum current setting:		N/A
	cable/busbar cross-section (mm²) / (mm) :		N/A
	test current equal to 80 % of the short-circuit current setting (A) ……..:		N/A
	No operation within 0,2 s		N/A
	test current equal to 120 % of the short-circuit current setting (A) ……..:		N/A
	Operating time (s) ……..:		N/A
	Test at maximum current setting:		N/A
	cable/busbar cross-section (mm²) / (mm) :		N/A
	Test current equal to 80 % of the short-circuit current setting (A) ……..:		N/A
	No operation within 0,2 s		N/A
	Test current equal to 120 % of the short-circuit current setting (A) ……..:		N/A
	Operating time (s) ……..:		N/A
	Additional single pole test for MPSD with electromagnetic over-current releases:		N/A
	Test current equal to 120 % of the short-circuit current setting (A) ……..:		N/A
	Operating time (s) ……..:		N/A
	Value declared by the manufacturer……:		N/A
	f) Under-current relays		
8.2.1.5.4.1	Limits of operation under-current relays		N/A
	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

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Clause	Requirement + Test	Result - Remark	Verdict
	g) Under-current relays in automatic change-over		N/A
8.2.1.5.4.2	Limits of operation of automatic change over by under-current relays		N/A
	- 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.	h) Stall relays		
	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		

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Clause	Requirement + Test	Result - Remark	Verdict
	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.	i) 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:		N/A
	- 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
	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

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Clause	Requirement + Test	Result - Remark	Verdict
	maximum current setting / maximum set stall inhibit time Test current 1,2 times	_____ A _____ s Trip time = _____s	N/A
9.3.3.2.3	Verification of main contact position for manual starter and MPSD suitable for isolation		
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	Dependent and independent manual operation		
	- actuating force for opening (N) :		N/A
	- test force with blocked main contacts (N) :		N/A
	- used method to keep the contact closed :		N/A
	During and after the test, open position not indicated :		N/A
	Equipment with locking mean, no locking in the open position while test force is applied :		N/A
8.2.5.2.2	Dependent power operation		
	- main contacts fixed together in the closed position :		N/A
	- used method to keep the contact closed :		N/A
	- 110% of the rated supply voltage applied to the equipment (3 times) :		N/A
	During and after the test, open position not indicated :		N/A
	Equipment show no damage impairing its normal operation :		N/A
	Equipment with locking mean, no locking in the open position while test force is applied :		N/A
8.2.5.2.3	Independent power operation		
	- main contacts fixed together in the closed position :		N/A
	- used method to keep the contact closed :		N/A
	- stored energy of the power operator released (3 times) :		N/A
	During and after the test, open position not indicated :		N/A
	Equipment show no damage impairing its normal operation :		N/A
	Equipment with locking mean, no locking in the open position while test force is applied :		N/A
9.3.3.4	Test of dielectric properties		
8.3.3.4.1 Part 1	2) Verification of impulse withstand voltage		

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Clause	Requirement + Test	Result - Remark	Verdict
	The 1,2/50µs impulse voltage shall be applied five times for each polarity at intervals of 1s minimum		P
	- rated impulse withstand voltage (kV) :	6kV(main circuit) 6kV(auxiliary circuit)	P
	- sea level of the laboratory:	5m	P
	- test Uimp main circuits (kV) :	7,3	P
	- test Uimp auxiliary circuits (kV) :	7,3	P
	- test Uimp control circuits (kV) :		N/A
	Application of test voltage		
	i) Between all terminals of the main circuit connected together (incl. 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
	ii) 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.		P
	iii) Between each control and auxiliary circuit not normally connected to the main circuit and: - the main circuit		P
	- other circuits		P
	- exposed conductive parts		N/A
	- enclosure of mounting plate		N/A
	iv) equipment suitable for isolation		
	Across the poles of the main circuit, the line terminals being connected together and the load terminals connected together.		N/A
	- test Uimp on open main contacts (equipment suitable for isolation) (kV) :		N/A
	No unintentional disruptive discharge during the tests		P
8.3.3.4.1 Part 1	3) Power-frequency withstand verification of solid insulation		
	- rated insulation voltage (V) :	690V(main circuit) 500V(auxiliary circuit)	P
	- main circuits, test voltage for 1 min (V)	1890V/60s	P
	- auxiliary circuits, test voltage for 1 min (V)	1890V/60s	P
	- control circuits, test voltage for 1 min (V)		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Application of test voltage		
	i) Between all terminals of the main circuit connected together (incl. 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
	ii) 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.		P
	iii) Between each control and auxiliary circuit not normally connected to the main circuit and: - the main circuit		P
	- other circuits		P
	- exposed conductive parts		N/A
	- enclosure of mounting plate		N/A
	No flashover, breakdown of insulation either internally (puncture) or externally (tracking) or any other manifestation of disruptive discharge shall occur		P
	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

8.2.1.5	Limits of operation of current sensing relays and releases **(I-2, Ie= 23-32A)**		
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 .....:	Thermal overload relay	
	trip class .....:	10A	
	current setting .....:	23-32A (**I-2**)	
	ambient temperature °C) .....:	20	
	test enclosure W x H x D (mm x mm x mm) .....:	No enclosure	
	cable/busbar cross-section (mm²) / (mm) .....:	6,0 / 1000	
	ambient temperature: - 5°C .....:	- 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 .....:	2h No tripping; 24,2A / 33,6A	P
	b) when the current is subsequently raised to B times the current setting, tripping shall occur in less than 2 h; test current .....:	Tripping; 29,9A / 41,6A Trip-time: 6min47s / 4min53s	P

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Clause	Requirement + Test	Result - Remark	Verdict
	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; 10A Tripping current: 34,5A / 48,0A Trip-time: 1min42s / 1min40s	P
	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 .....:	+ 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 .....:	2h No tripping; 24,2A / 33,6A	P
	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: 27,6A / 38,4A Trip time: 5min32s / 4min50s	P
	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 .....:	Class; 10A Tripping current: 34,5A / 48,0A Trip-time: 1min42s / 1min28s	P
	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; 10A Tripping current: 166A / 231A Trip-time: 2,3s / 2,2s	P
	ambient temperature: + 40 °C .....:	+ 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 .....:	2h No tripping; Test current: 23,0A / 32,0A	P
	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: 27,6A / 38,4A Trip time: 4min56s / 3min59s	P
	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 .....:	Class; 10A Tripping current: 34,5A / 48,0A Trip-time: 1min28s / 1min06s	P

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Clause	Requirement + Test	Result - Remark	Verdict
	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
	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) .....:	+ 20 °C	
	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	Min. setting current: 23A	
	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 23,0 / 20,7 / 23,0 / 20,7 / 23,0 / 20,7 >2h / >2h / >2h	P
	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 26,4 / 0 / 26,4 / 0 / 26,4 / 0 2min53s / 2min37s / 2min44s	P
	ambient temperature (°C) .....:	+ 20 °C	
	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	Max. setting current: 32A	
	a) the relay energized on three poles, at A times	RT / S / RS / T / ST / R	P

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Clause	Requirement + Test	Result - Remark	Verdict
	the current setting, tripping shall not occur in less than 2 h, starting from the cold state; test current	32,0 / 28,8 / 32,0 / 28,8 / 32,0 / 28,8 >2h / >2h / >2h	
	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 36,8 / 0 / 36,8 / 0 / 36,8 / 0 1min27s / 2min01s / 1min48s	P

8.2.1.5	Limits of operation of current sensing relays and releases **(I-3, Ie= 17-25A)**		
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 .....:	Thermal overload relay	
	trip class .....:	10A	
	current setting .....:	17-25A (**I-3**)	
	ambient temperature °C) .....:	20	
	test enclosure W x H x D (mm x mm x mm) .....:	No enclosure	
	cable/busbar cross-section (mm^2) / (mm) .....:	4,0 / 1000	
	ambient temperature: - 5°C .....:	- 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 .....:	2h No tripping; 17,9A / 26,3A	P
	b) when the current is subsequently raised to B times the current setting, tripping shall occur in less than 2 h; test current .....:	Tripping; 22,1A / 32,5A Trip-time: 5min57s / 4min54s	P
	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; 10A Tripping current: 25,5A / 37,5A Trip-time: 1min51s / 1min07s	P
	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 .....:	+ 20 °C	

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Clause	Requirement + Test	Result - Remark	Verdict
	a) at A times of current setting, tripping shall not occur in less than 2 h starting from the cold state; test current .....:	2h No tripping; 17,9A / 26,3A	P
	b) when the current is subsequently raised to B times the current setting, tripping shall occur in less than 2 h; test current .....:	Tripping; 20,4A / 30,0A Trip-time: 3min54s / 5min40s	P
	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 .....:	Class; 10A Tripping current: 25,5A / 37,5A Trip-time: 1min42s / 1min41s	P
	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; 10A Tripping current: 123A / 180A Trip-time: 4,1s / 2,4s	P
	ambient temperature: + 40 °C .....:	+ 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 .....:	2h No tripping; Test current: 17,0A / 25,0A	P
	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: 20,4A / 30,0A Trip time: 3min19s / 2min50s	P
	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 .....:	Class; 10A Tripping current: 25,5A / 37,5A Trip-time: 1min48s / 1min29s	P
	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
	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

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Clause	Requirement + Test	Result - Remark	Verdict
	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) .....:	+ 20 °C	
	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	Min. setting current: 17A	
	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 17,0 / 15,3 / 17,0 / 15,3 / 17,0 / 15,3 >2h / >2h / >2h	P
	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 19,6 / 0 / 19,6 / 0 / 19,6 / 0 4min24s / 4min03s / 3min45s	P
	ambient temperature (°C) .....:	+ 20 °C	
	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	Max. setting current: 25A	
	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 25,0 / 22,5 / 25,0 / 22,5 / 25,0 / 22,5 >2h / >2h / >2h	P
	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 28,8 / 0 / 28,8 / 0 / 28,8 / 0 1min54s / 2min34s / 1min59s	P

8.2.1.5	Limits of operation of current sensing relays and releases **(I-4, Ie= 12-18A)**		
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 .....:	Thermal overload relay	
	trip class .....:	10A	
	current setting .....:	12-18A (**I-4**)	

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Clause	Requirement + Test	Result - Remark	Verdict
	ambient temperature °C) .....:	20	
	test enclosure W x H x D (mm x mm x mm) .....:	No enclosure	
	cable/busbar cross-section (mm²) / (mm) .....:	2,5 / 1000	
	ambient temperature: - 5°C .....:	- 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 .....:	2h No tripping; 12,6A / 18,9A	P
	b) when the current is subsequently raised to B times the current setting, tripping shall occur in less than 2 h; test current .....:	Tripping; 15,6A / 23,4A Trip-time: 11min50s / 8min52s	P
	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; 10A Tripping current: 18,0A / 27,0A Trip-time: 1min42s / 1min04s	P
	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 .....:	+ 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 .....:	2h No tripping; 12,6A / 18,9A	P
	b) when the current is subsequently raised to B times the current setting, tripping shall occur in less than 2 h; test current .....:	Tripping; 14,4A / 21,6A Trip-time: 12min40s/10min02s	P
	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 .....:	Class; 10A Tripping current: 18,0A / 27,0A Trip-time: 1min52s / 1min05s	P
	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; 10A Tripping current: 86,4A / 130A Trip-time: 2,4s / 2,2s	P

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Clause	Requirement + Test	Result - Remark	Verdict
	ambient temperature: + 40 °C .....:	+ 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 .....:	2h No tripping; Test current: 12,0A / 18,0A	P
	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: 14,4A / 21,6A Trip time: 10min05s/10min19s	P
	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 .....:	Class; 10A Tripping current: 18,0A / 27,0A Trip-time: 1min23s / 1min26s	P
	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
	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) .....:	+ 20 °C	
	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	Min. setting current: 12A	
	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 12,0 / 10,8 / 12,0 / 10,8 / 12,0 / 10,8 >2h / >2h / >2h	P
	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 13,8 / 0 / 13,8 / 0 / 13,8 / 0 6min45s / 6min11s / 5min07s	P

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Clause	Requirement + Test	Result - Remark	Verdict

	ambient temperature (°C) .....:	+ 20 °C									
	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	Max. setting current: 18A									
	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	P
		18,0	16,2	18,0	16,2	18,0	16,2	
		>2h		>2h		>2h		
	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	P
		20,7	0	20,7	0	20,7	0	
		4min57s		2min41s		4min29s		

8.2.1.5	Limits of operation of current sensing relays and releases **(I-5, Ie= 9,0-13A)**		
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 .....:	Thermal overload relay	
	trip class .....:	10A	
	current setting .....:	9,0-13A (**I-5**)	
	ambient temperature °C) .....:	20	
	test enclosure W x H x D (mm x mm x mm) .....:	No enclosure	
	cable/busbar cross-section (mm²) / (mm) .....:	1,0 / 1000	
	ambient temperature: - 5°C .....:	- 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 .....:	2h No tripping; 9,45A / 13,7A	P
	b) when the current is subsequently raised to B times the current setting, tripping shall occur in less than 2 h; test current .....:	Tripping; 11,7A / 16,9A Trip-time: 8min48s / 6min57s	P
	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; 10A Tripping current: 13,5A / 19,5A Trip-time: 1min44s / 1min40s	P

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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 .....:	+ 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 .....:	2h No tripping; 9,45A / 13,7A	P
	b) when the current is subsequently raised to B times the current setting, tripping shall occur in less than 2 h; test current .....:	Tripping; 10,8A / 15,6A Trip-time: 9min41s / 8min42s	P
	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 .....:	Class; 10A Tripping current: 13,5A / 19,5A Trip-time: 1min37s / 1min44s	P
	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; 10A Tripping current: 64,8A / 93,6A Trip-time: 2,8s / 2,5s	P
	ambient temperature: + 40 °C .....:	+ 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 .....:	2h No tripping; Test current: 9,0A / 13,0A	P
	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: 10,8A / 15,6A Trip time: 7min03s / 6min51s	P
	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 .....:	Class; 10A Tripping current: 13,5A / 19,5A Trip-time: 1min28s / 1min31s	P
	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		

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Clause	Requirement + Test	Result - Remark	Verdict
	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
	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) ..... :	+ 20 °C	
	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	Min. setting current: 9,0A	
	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 9,0 / 8,1 / 9,0 / 8,1 / 9,0 / 8,1 >2h / >2h / >2h	P
	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 11,7 / 0 / 11,7 / 0 / 11,7 / 0 4min55s / 6min02s / 5min50s	P
	ambient temperature (°C) ..... :	+ 20 °C	
	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	Max. setting current: 13,0A	
	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 13,0 / 11,7 / 13,0 / 11,7 / 13,0 / 11,7 >2h / >2h / >2h	P
	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 15,0 / 0 / 15,0 / 0 / 15,0 / 0 2min33s / 3min58s / 3min15s	P

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Clause	Requirement + Test	Result - Remark	Verdict

8.2.1.5	Limits of operation of current sensing relays and releases **(I-6, Ie= 7,0-10A)**		
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 .....:	Thermal overload relay	
	trip class .....:	10A	
	current setting .....:	7,0-10A (**I-6**)	
	ambient temperature °C) .....:	20	
	test enclosure W x H x D (mm x mm x mm) .....:	No enclosure	
	cable/busbar cross-section (mm²) / (mm) .....:	1,0 / 1000	
	ambient temperature: - 5°C .....:	- 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 .....:	2h No tripping; 7,35A / 10,5A	P
	b) when the current is subsequently raised to B times the current setting, tripping shall occur in less than 2 h; test current .....:	Tripping; 9,1A / 13,0A Trip-time: 9min54s / 7min13s	P
	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; 10A Tripping current: 10,5A / 15,0A Trip-time: 1min45s / 1min46s	P
	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 .....:	+ 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 .....:	2h No tripping; 7,35A / 10,5A	P
	b) when the current is subsequently raised to B times the current setting, tripping shall occur in less than 2 h; test current .....:	Tripping; 8,4A / 12,0A Trip-time: 10min27s / 8min01s	P
	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 .....:	Class; 10A Tripping current: 10,5A / 15,0A Trip-time: 1min54s / 1min38s	P

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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 .....:	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; 10A Tripping current: 50,4A / 72,0A Trip-time: 2,7s / 2,4s	P
	ambient temperature: + 40 °C .....:	+ 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 .....:	2h No tripping; Test current: 7,0A / 10,0A	P
	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: 8,4A / 12,0A Trip time: 9min49s / 6min44s	P
	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 .....:	Class; 10A Tripping current: 10,5A / 15,0A Trip-time: 1min41s / 1min29s	P
	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
	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) .....:	+ 20 °C	

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Clause	Requirement + Test	Result - Remark	Verdict

	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	Min.setting current: 7,0A									
	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				P
		7,0	6,3	7,0	6,3	7,0	6,3				
		>2h		>2h		>2h					
	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				P
		8,05	0	8,05	0	8,05	0				
		5min05s		4min39s		4min46s					
	ambient temperature (°C) .....:	+ 20 °C									
	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	Max. setting current: 10A									
	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				P
		10,0	9,0	10,0	9,0	10,0	9,0				
		>2h		>2h		>2h					
	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				P
		11,5	0	11,5	0	11,5	0				
		3min41s		3min19s		3min25s					

8.2.1.5	Limits of operation of current sensing relays and releases **(I-7, Ie= 5,5-8,0A)**	
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 .....:	Thermal overload relay
	trip class .....:	10A
	current setting .....:	5,5-8,0A (**I-7**)
	ambient temperature °C) .....:	20
	test enclosure W x H x D (mm x mm x mm) .....:	No enclosure
	cable/busbar cross-section (mm²) / (mm) .....:	1,0 / 1000
	ambient temperature: - 5°C .....:	- 5°C

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Clause	Requirement + Test	Result - Remark	Verdict
	a) at A times of current setting, tripping shall not occur in less than 2 h starting from the cold state; test current .....:	2h No tripping; 5,78A / 8,40A	P
	b) when the current is subsequently raised to B times the current setting, tripping shall occur in less than 2 h; test current .....:	Tripping; 7,15A / 10,4A Trip-time: 8min09s / 6min13s	P
	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; 10A Tripping current: 8,25A / 12,0A Trip-time: 1min39s / 1min37s	P
	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 .....:	+ 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 .....:	2h No tripping; 5,78A / 8,40A	P
	b) when the current is subsequently raised to B times the current setting, tripping shall occur in less than 2 h; test current .....:	Tripping; 6,6A / 9,6A Trip-time: 8min14s / 6min38s	P
	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 .....:	Class; 10A Tripping current: 8,25A / 12,0A Trip-time: 1min46s / 1min50s	P
	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; 10A Tripping current: 39,6A / 57,6A Trip-time: 2,7s / 2,4s	P
	ambient temperature: + 40 °C .....:	+ 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 .....:	2h No tripping; Test current: 5,50A / 8,0A	P

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Clause	Requirement + Test	Result - Remark	Verdict
	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: 6,6A / 9,6A Trip time: 7min04s / 5min56s	P
	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 .....:	Class; 10A Tripping current: 8,25A / 12,0A Trip-time: 1min28s / 1min32s	P
	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
	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) .....:	+ 20 °C	
	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	Min. setting current: 5,5A	
	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 5,5 / 4,95 / 5,5 / 4,95 / 5,5 / 4,95 >2h / >2h / >2h	P
	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 6,33 / 0 / 6,33 / 0 / 6,33 / 0 6min13s / 5min41s / 6min02s	P
	ambient temperature (°C) .....:	+ 20 °C	

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Clause	Requirement + Test	Result - Remark	Verdict

	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	Max. setting current: 8,0A							
	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		P
		8,0	7,2	8,0	7,2	8,0	7,2		
		>2h		>2h		>2h			
	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		P
		9,20	0	9,20	0	9,20	0		
		4min24s		4min05s		4min31s			

8.2.1.5	Limits of operation of current sensing relays and releases **(I-8, Ie= 4,0-6,0A)**			
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 .....:	Thermal overload relay		
	trip class .....:	10A		
	current setting .....:	4,0-6,0A (**I-8**)		
	ambient temperature °C) .....:	20		
	test enclosure W x H x D (mm x mm x mm) .....:	No enclosure		
	cable/busbar cross-section (mm²) / (mm) .....:	1,0 / 1000		
	ambient temperature: - 5°C .....:	- 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 .....:	2h No tripping; 4,20A / 6,30A		P
	b) when the current is subsequently raised to B times the current setting, tripping shall occur in less than 2 h; test current .....:	Tripping; 5,20A / 7,80A Trip-time: 5min46s / 4min35s		P
	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; 10A Tripping current: 6,00A / 9,00A Trip-time: 1min06s / 1min36s		P

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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 .....:	+ 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 .....:	2h No tripping; 4,20A / 6,30A	P
	b) when the current is subsequently raised to B times the current setting, tripping shall occur in less than 2 h; test current .....:	Tripping; 4,80 / 7,20A Trip-time: 6min32s / 5min54s	P
	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 .....:	Class; 10A Tripping current: 6,00A / 9,00A Trip-time: 1min34s / 1min46s	P
	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; 10A Tripping current: 28,8 / 43,2A Trip-time: 2,4s / 2,3s	P
	ambient temperature: + 40 °C .....:	+ 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 .....:	2h No tripping; Test current: 4,00A / 6,00A	P
	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: 4,80A / 7,20A Trip time: 6min03s / 5min49s	P
	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 .....:	Class; 10A Tripping current: 6,00A / 9,00A Trip-time: 1min22s / 1min07s	P
	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		

IEC 60947-4-1			
Clause	Requirement + Test	Result - Remark	Verdict
	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
	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) ..... :	+ 20 °C	
	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	Min. setting current: 4,0A	
	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 4,0 3,6 4,0 3,6 4,0 3,6 >2h >2h >2h	P
	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 4,60 0 4,60 0 4,60 0 4min32s 4min48s 4min15s	P
	ambient temperature (°C) ..... :	+ 20 °C	
	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	Max. setting current: 6,0A	
	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 6,0 5,4 6,0 5,4 6,0 5,4 >2h >2h >2h	P
	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 6,90 0 6,90 0 6,90 0 3min51s 4min04s 3min17s	P
8.2.1.5	Limits of operation of current sensing relays and releases **(I-9, Ie= 2,5-4,0A)**		

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Clause	Requirement + Test	Result - Remark	Verdict
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 .....:	Thermal overload relay	
	trip class .....:	10A	
	current setting .....:	2,5-4,0A (**I-9**)	
	ambient temperature °C) .....:	20	
	test enclosure W x H x D (mm x mm x mm) .....:	No enclosure	
	cable/busbar cross-section (mm²) / (mm) .....:	1,0 / 1000	
	ambient temperature: - 5°C .....:	- 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 .....:	2h No tripping; 2,63A / 4,20A	P
	b) when the current is subsequently raised to B times the current setting, tripping shall occur in less than 2 h; test current .....:	Tripping; 3,25A / 5,20A Trip-time: 9min58s / 6min35s	P
	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; 10A Tripping current: 3,75A / 6,00A Trip-time: 1min37s / 1min48s	P
	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 .....:	+ 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 .....:	2h No tripping; 2,63A / 4,20A	P
	b) when the current is subsequently raised to B times the current setting, tripping shall occur in less than 2 h; test current .....:	Tripping; 3,00 / 4,80A Trip-time: 7min01s / 6min13s	P
	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 .....:	Class; 10A Tripping current: 3,75A / 6,00A Trip-time: 1min41s / 1min35s	P

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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 .....:	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; 10A Tripping current: 18,0 / 28,8A Trip-time: 2,5s / 2,3s	P
	ambient temperature: + 40 °C .....:	+ 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 .....:	2h No tripping; Test current: 2,50A / 4,00A	P
	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: 3,00A / 4,80A Trip time: 6min26s / 5min56s	P
	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 .....:	Class; 10A Tripping current: 3,75A / 6,00A Trip-time: 1min32s / 1min18s	P
	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
	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) .....:	+ 20 °C	

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Clause	Requirement + Test	Result - Remark	Verdict

	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	Min. setting current: 2,5A										
	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	P
		2,50	2,25	2,50	2,25	2,50	2,25	
		>2h		>2h		>2h		
	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	P
		2,88	0	2,88	0	2,88	0	
		4min02s		3min43s		3min51s		
	ambient temperature (°C) .....:	+ 20 °C						
	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	Max. setting current: 4,0A						
	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	P
		4,0	3,6	4,0	3,6	4,0	3,6	
		>2h		>2h		>2h		
	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	P
		4,60	0	4,60	0	4,60	0	
		2min51s		2min29s		2min34s		

8.2.1.5	Limits of operation of current sensing relays and releases **(I-10, Ie= 1,6-2,5A)**		
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 .....:	Thermal overload relay	
	trip class .....:	10A	
	current setting .....:	1,6-2,5A (**I-10**)	
	ambient temperature °C) .....:	20	
	test enclosure W x H x D (mm x mm x mm) .....:	No enclosure	
	cable/busbar cross-section (mm²) / (mm) .....:	1,0 / 1000	
	ambient temperature: - 5°C .....:	- 5°C	

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Clause	Requirement + Test	Result - Remark	Verdict
	a) at A times of current setting, tripping shall not occur in less than 2 h starting from the cold state; test current .....:	2h No tripping; 1,68A / 2,63A	P
	b) when the current is subsequently raised to B times the current setting, tripping shall occur in less than 2 h; test current .....:	Tripping; 2,08A / 3,25A Trip-time: 8min05s / 9min24s	P
	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; 10A Tripping current: 2,40A / 3,75A Trip-time: 1min40s / 1min41s	P
	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 .....:	+ 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 .....:	2h No tripping; 1,68A / 2,63A	P
	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: 1,92A / 3,00A Trip time: 5min03s / 4min52s	P
	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 .....:	Class; 10A Tripping current: 2,40A / 3,75A Trip-time: 1min30s / 1min18s	P
	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; 10A Tripping current: 11,6 / 18,0A Trip-time: 2,3s / 2,2s	P
	ambient temperature: + 40 °C .....:	+ 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 .....:	2h No tripping; Test current: 1,60A / 2,50A	P

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Clause	Requirement + Test	Result - Remark	Verdict
	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: 1,92A / 3,00A Trip time: 4min34s / 6min03s	P
	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 .....:	Class; 10A Tripping current: 2,40A / 3,75A Trip-time: 1min25s / 1min47s	P
	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
	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) .....:	+ 20 °C	
	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	Min. setting current: 1,6A	
	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 1,60 / 1,44 / 1,60 / 1,44 / 1,60 / 1,44 >2h / >2h / >2h	P
	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 1,84 / 0 / 1,84 / 0 / 1,84 / 0 2min47s / 2min41s / 2min29s	P
	ambient temperature (°C) .....:	+ 20 °C	

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Clause	Requirement + Test	Result - Remark	Verdict

	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	Max. setting current: 2,5A									
	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	P
		2,50	2,25	2,50	2,25	2,50	2,25	
		>2h		>2h		>2h		
	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	P
		2,88	0	2,88	0	2,88	0	
		1min55s		1min46s		1min48s		

8.2.1.5	Limits of operation of current sensing relays and releases **(I-11, Ie= 1,0-1,6A)**		
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 .....:	Thermal overload relay	
	trip class .....:	10A	
	current setting .....:	1,0-1,6A (**I-11**)	
	ambient temperature °C) .....:	20	
	test enclosure W x H x D (mm x mm x mm) .....:	No enclosure	
	cable/busbar cross-section (mm²) / (mm) .....:	1,0 / 1000	
	ambient temperature: - 5°C .....:	- 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 .....:	2h No tripping; 1,05A / 1,68A	P
	b) when the current is subsequently raised to B times the current setting, tripping shall occur in less than 2 h; test current .....:	Tripping; 1,30A / 2,08A Trip-time: 7min012 / 5min57s	P
	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; 10A Tripping current: 1,50A / 2,40A Trip-time: 1min31s / 1min24s	P

IEC 60947-4-1			
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 .....:	+ 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 .....:	2h No tripping; 1,05A / 1,68A	P
	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: 1,20A / 1,92A Trip time: 6min58s / 4min51s	P
	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 .....:	Class; 10A Tripping current: 1,50A / 2,40A Trip-time: 1min45s / 1min26s	P
	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; 10A Tripping current: 7,2 / 11,6A Trip-time: 2,5s / 2,6s	P
	ambient temperature: + 40 °C .....:	+ 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 .....:	2h No tripping; Test current: 1,00A / 1,60A	P
	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: 1,20A / 1,92A Trip time: 4min57s / 3min39s	P
	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 .....:	Class; 10A Tripping current: 1,50A / 2,40A Trip-time: 1min24s / 1min19s	P
	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		

IEC 60947-4-1			
Clause	Requirement + Test	Result - Remark	Verdict
	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
	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) ..... :	+ 20 °C	
	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	Min. setting current: 1,0A	
	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 1,00 / 0,90 / 1,00 / 0,90 / 1,00 / 0,90 >2h / >2h / >2h	P
	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 1,15 / 0 / 1,15 / 0 / 1,15 / 0 4min06s / 3min45s / 3min34s	P
	ambient temperature (°C) ..... :	+ 20 °C	
	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	Max. setting current: 1,6A	
	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 1,60 / 1,44 / 1,60 / 1,44 / 1,60 / 1,44 >2h / >2h / >2h	P
	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 1,84 / 0 / 1,84 / 0 / 1,84 / 0 2min23s / 2min19s / 2min45s	P

IEC 60947-4-1			
Clause	Requirement + Test	Result - Remark	Verdict

8.2.1.5	Limits of operation of current sensing relays and releases **(I-12, Ie= 0,63-1,0A)**		
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 .....:	Thermal overload relay	
	trip class .....:	10A	
	current setting .....:	0,63-1,0A (**I-12**)	
	ambient temperature °C) .....:	20	
	test enclosure W x H x D (mm x mm x mm) .....:	No enclosure	
	cable/busbar cross-section (mm²) / (mm) .....:	1,0 / 1000	
	ambient temperature: - 5°C .....:	- 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 .....:	2h No tripping; 0,67A / 1,05A	P
	b) when the current is subsequently raised to B times the current setting, tripping shall occur in less than 2 h; test current .....:	Tripping; 0,82A / 1,30A Trip-time: 8min43s / 6min25s	P
	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; 10A Tripping current: 0,95A / 1,50A Trip-time: 1min34s / 1min26s	P
	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 .....:	+ 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 .....:	2h No tripping; 0,67A / 1,05A	P
	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: 0,76A / 1,20A Trip time: 9min48s / 8min36s	P

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Clause	Requirement + Test	Result - Remark	Verdict
	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 .....:	Class; 10A Tripping current: 0,95A / 1,50A Trip-time: 1min19s / 1min11s	P
	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; 10A Tripping current: 4,54 / 7,20A Trip-time: 2,5s / 2,2s	P
	ambient temperature: + 40 °C .....:	+ 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 .....:	2h No tripping; Test current: 0,63A / 1,00A	P
	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: 0,76A / 1,20A Trip time: 7min47s / 6min11s	P
	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 .....:	Class; 10A Tripping current: 0,95A / 1,50A Trip-time: 1min05s / 59s	P
	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
	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) .....:	+ 20 °C	

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Clause	Requirement + Test	Result - Remark	Verdict

	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	Min. setting current: 0,63A									
	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	P			
		0,63	0,57	0,63	0,57	0,63	0,57				
		>2h		>2h		>2h					
	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	P			
		0,73	0	0,73	0	0,73	0				
		2min05s		2min09s		1min58s					
	ambient temperature (°C) .....:	+ 20 °C									
	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	Max. setting current: 1,0A									
	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	P			
		1,00	0,90	1,00	0,90	1,00	0,90				
		>2h		>2h		>2h					
	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	P			
		1,15	0	1,15	0	1,15	0				
		1min47s		1min45s		1min38s					

8.2.1.5	Limits of operation of current sensing relays and releases **(I-13, Ie= 0,40-0,63A)**		
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 .....:	Thermal overload relay	
	trip class .....:	10A	
	current setting .....:	0,4-0,63A (**I-13**)	
	ambient temperature °C) .....:	20	
	test enclosure W x H x D (mm x mm x mm) .....:	No enclosure	
	cable/busbar cross-section (mm²) / (mm) .....:	1,0 / 1000	
	ambient temperature: - 5°C .....:	- 5°C	

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Clause	Requirement + Test	Result - Remark	Verdict
	a) at A times of current setting, tripping shall not occur in less than 2 h starting from the cold state; test current .....:	2h No tripping; 0,42A / 0,67A	P
	b) when the current is subsequently raised to B times the current setting, tripping shall occur in less than 2 h; test current .....:	Tripping; 0,52A / 0,82A Trip-time: 9min49s/10min07s	P
	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; 10A Tripping current: 0,60A / 0,95A Trip-time: 1min16s / 1min03s	P
	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 .....:	+ 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 .....:	2h No tripping; 0,42A / 0,67A	P
	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: 0,48A / 0,76A Trip time: 8min38s/10min01s	P
	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 .....:	Class; 10A Tripping current: 0,60A / 0,95A Trip-time: 1min19s / 1min14s	P
	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; 10A Tripping current: 2,88 / 4,54A Trip-time: 3,6s / 2,7s	P
	ambient temperature: + 40 °C .....:	+ 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 .....:	2h No tripping; Test current: 0,40A / 0,63A	P

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Clause	Requirement + Test	Result - Remark	Verdict
	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: 0,48A / 0,76A Trip time: 10min05s/9min36s	P
	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 .....:	Class; 10A Tripping current: 0,60A / 0,95A Trip-time: 1min07s / 1min18s	P
	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
	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) .....:	+ 20 °C	
	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	Min. setting current: 0,40A	
	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 0,40 / 0,36 / 0,40 / 0,36 / 0,40 / 0,36 >2h / >2h / >2h	P
	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 0,46 / 0 / 0,46 / 0 / 0,46 / 0 2min14s / 2min17s / 1min58s	P
	ambient temperature (°C) .....:	+ 20 °C	

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Clause	Requirement + Test	Result - Remark	Verdict

	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	Max. setting current: 0,63A									
	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	P
		0,63	0,57	0,63	0,57	0,63	0,57	
		>2h		>2h		>2h		
	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	P
		0,73	0	0,73	0	0,73	0	
		1min38s		1min45s		2min07s		

8.2.1.5	Limits of operation of current sensing relays and releases **(I-14, Ie= 0,25-0,4A)**		
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 .....:	Thermal overload relay	
	trip class .....:	10A	
	current setting .....:	0,25-0,4A (**I-14**)	
	ambient temperature °C) .....:	20	
	test enclosure W x H x D (mm x mm x mm) .....:	No enclosure	
	cable/busbar cross-section (mm²) / (mm) .....:	1,0 / 1000	
	ambient temperature: - 5°C .....:	- 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 .....:	2h No tripping; 0,27A / 0,42A	P
	b) when the current is subsequently raised to B times the current setting, tripping shall occur in less than 2 h; test current .....:	Tripping; 0,33A / 0,52A Trip-time: 7min49s / 6min41s	P
	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; 10A Tripping current: 0,38A / 0,60A Trip-time: 1min21s / 1min32s	P

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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 .....:	+ 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 .....:	2h No tripping; 0,27A / 0,42A	P
	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: 0,30A / 0,48A Trip time: 7min53s / 6min01s	P
	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 .....:	Class; 10A Tripping current: 0,38A / 0,60A Trip-time: 1min09s / 1min15s	P
	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; 10A Tripping current: 1,80 / 2,88A Trip-time: 3,4s / 2,7s	P
	ambient temperature: + 40 °C .....:	+ 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 .....:	2h No tripping; Test current: 0,25A / 0,40A	P
	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: 0,30A / 0,48A Trip time: 5min26s / 5min43s	P
	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 .....:	Class; 10A Tripping current: 0,38A / 0,60A Trip-time: 59,8s / 1min19s	P
	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		

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Clause	Requirement + Test	Result - Remark	Verdict
	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
	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) .....:	+ 20 °C	
	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	Min. setting current: 0,25A	
	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 0,25 0,23 0,25 0,23 0,25 0,23 >2h >2h >2h	P
	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 0,29 0 0,29 0 0,29 0 3min14s 2min49s 2min51s	P
	ambient temperature (°C) .....:	+ 20 °C	
	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	Max. setting current: 0,40A	
	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 0,40 0,36 0,40 0,36 0,40 0,36 >2h >2h >2h	P
	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 0,46 0 0,46 0 0,46 0 1min25s 2min07s 2min11s	P
8.2.1.5	Limits of operation of current sensing relays and releases **(I-15, Ie= 0,16-0,25A)**		

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Clause	Requirement + Test	Result - Remark	Verdict
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 .....:	Thermal overload relay	
	trip class .....:	10A	
	current setting .....:	0,16-0,25A (**I-15**)	
	ambient temperature °C) .....:	20	
	test enclosure W x H x D (mm x mm x mm) .....:	No enclosure	
	cable/busbar cross-section (mm²) / (mm) .....:	1,0 / 1000	
	ambient temperature: - 5°C .....:	- 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 .....:	2h No tripping; 0,17A / 0,21A	P
	b) when the current is subsequently raised to B times the current setting, tripping shall occur in less than 2 h; test current .....:	Tripping; 0,21A / 0,33A Trip-time: 8min42s / 7min41s	P
	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; 10A Tripping current: 0,24A / 0,38A Trip-time: 1min30s / 1min24s	P
	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 .....:	+ 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 .....:	2h No tripping; 0,17A / 0,27A	P
	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: 0,19A / 0,30A Trip time: 9min37s / 8min59s	P
	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 .....:	Class; 10A Tripping current: 0,24A / 0,38A Trip-time: 1min19s / 1min25s	P

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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 .....:	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; 10A Tripping current: 1,16 / 1,80A Trip-time: 3,3s / 2,7s	P
	ambient temperature: + 40 °C .....:	+ 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 .....:	2h No tripping; Test current: 0,16A / 0,25A	P
	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: 0,19A / 0,30A Trip time: 7min48s / 5min56s	P
	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 .....:	Class; 10A Tripping current: 0,24A / 0,38A Trip-time: 1min06s / 1min01s	P
	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
	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) .....:	+ 20 °C	

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Clause	Requirement + Test	Result - Remark	Verdict

	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	Min. setting current: 0,16A										
	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	P
		0,16	0,15	0,16	0,15	0,16	0,15	
		>2h		>2h		>2h		
	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	P
		11,7	0	11,7	0	11,7	0	
		4min11s		3min59s		4min02s		
	ambient temperature (°C) .....:	+ 20 °C						
	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	Max. setting current: 0,25A						
	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	P
		0,25	0,23	0,25	0,23	0,25	0,23	
		>2h		>2h		>2h		
	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	P
		0,29	0	0,29	0	0,29	0	
		3min14s		2min54s		2min58s		

8.2.1.5	Limits of operation of current sensing relays and releases **(I-16, Ie= 0,1-0,16A)**		
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 .....:	Thermal overload relay	
	trip class .....:	10A	
	current setting .....:	0,1-0,16A (**I-16**)	
	ambient temperature °C) .....:	20	
	test enclosure W x H x D (mm x mm x mm) .....:	No enclosure	
	cable/busbar cross-section (mm²) / (mm) .....:	1,0 / 1000	

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Clause	Requirement + Test	Result - Remark	Verdict
	ambient temperature: - 5°C .....:	- 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 .....:	2h No tripping; 0,11A / 0,17A	P
	b) when the current is subsequently raised to B times the current setting, tripping shall occur in less than 2 h; test current .....:	Tripping; 0,13A / 0,21A Trip-time: 9min58s/10min09s	P
	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; 10A Tripping current: 0,15A / 0,24A Trip-time: 1min19s / 1min34s	P
	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 .....:	+ 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 .....:	2h No tripping; 0,11A / 0,17A	P
	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: 0,12A / 0,19A Trip time: 11min23s/13min38s	P
	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 .....:	Class; 10A Tripping current: 0,15A / 0,24A Trip-time: 59,2s / 1min28s	P
	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; 10A Tripping current: 0,72 / 1,16A Trip-time: 3,6s / 2,8s	P
	ambient temperature: + 40 °C .....:	+ 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 .....:	2h No tripping; Test current: 0,10A / 0,16A	P

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Clause	Requirement + Test	Result - Remark	Verdict
	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: 0,12A / 0,19A Trip time: 10min42s/10min58s	P
	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 .....:	Class; 10A Tripping current: 0,15A / 0,24A Trip-time: 59,0s / 1min12s	P
	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
	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) .....:	+ 20 °C	
	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	Min. setting current: 0,1A	
	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 0,10 / 0,09 / 0,10 / 0,09 / 0,10 / 0,09 >2h / >2h / >2h	P
	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 0,12 / 0 / 0,12 / 0 / 0,12 / 0 5min40s / 6min13s / 6min09s	P
	ambient temperature (°C) .....:	+ 20 °C	

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Clause	Requirement + Test	Result - Remark	Verdict

	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	Max. setting current: 0,16A							
	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		P
		0,16	0,15	0,16	0,15	0,16	0,15		
		>2h		>2h		>2h			
	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		P
		0,19	0	0,19	0	0,19	0		
		3min52s		4min26s		3min59s			

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Clause	Requirement + Test	Result - Remark	Verdict

9.3.1	Compliance with performance requirements		
b)	**TEST SEQUENCE II**		
	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		
	Conditions, make operations only.....:	make operations	N/A
	Type of product .....:		N/A
	utilization category .....:		N/A
	Control supply voltage at 110% Us for half the number of operation cycles and 85% Us for the other half, for AC-3, AC-3e and AC-4,		N/A
	rated operational voltage Ue (V) …….. :		N/A
	rated operational current Ie (A) or power (kW) ....:		N/A
	- test voltage (V) U/Ue = 1,05 .....:	L1: L2: L3:	N/A
	- test current (A) I/Ie = 10_ .....:	L1: L2: L3:	N/A
	- power factor/~~time constant~~ .....:	L1: L2: L3:	N/A
	- on-time (ms) .....:		N/A
	- off-time (s) .....:		N/A
	- number of make operations .....:		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
	Conditions, make/break operations only.....:	make/break operations	N/A
	Type of product .....:		N/A
	utilization category .....:		N/A
	rated operational voltage Ue (V) .....:		N/A
	rated operational current Ie (A) or power (kW) ....:		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	- test voltage (V) U/Ue = 1,05 .....:	L1: L2: L3:	N/A
	- test current (A) I/Ie = _8_ .....:	L1: L2: L3:	N/A
	- power factor~~/time constant~~ .....:	L1: L2: L3:	N/A
	- on-time (ms) .....:		N/A
	- off-time (s) .....:		N/A
	- number of operations	☐ 50 make ☐ 50 make/ break	N/A
	Characteristic of transient recovery voltage for AC-2, AC-3, AC-3e, AC-4, AC-8a and AC-8b 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
	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
	Number of operation energized simultaneously	10	N/A
9.3.3.6	Operational performance capability:		
	Type of product .....:		N/A
	utilization category .....:		N/A
	rated operational voltage Ue (V) .....:		N/A
	rated operational current Ie (A) or power (kW) ....:		N/A
	Conditions, make/break operations:		
	- test voltage (V) U/Ue = 1,05 .....:	L1: L2: L3:	N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	- test current (A) I/Ie = 2 .....:	L1: L2: L3:	N/A
	- power factor~~/time constant~~ .....:	L1: L2: L3:	N/A
	- on-time (ms) .....:		N/A
	- off-time (s) .....:		N/A
	- number of operations	☐ …… make ☒ 6000 make/ break	P
	Characteristic of transient recovery voltage for AC-2, AC-3, AC-3e, AC-4, AC-8a and AC-8b 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
	Dielectric verification		
	test voltage (2 Ui), min 1000 V for 60 s. (V) .....:	Test voltage: __ V	N/A
	No flashover, breakdown of insulation either internally (puncture) or externally (tracking) or any other manifestation of disruptive discharge shall occur.		N/A
	Leakage current equipment suitable for isolation		
	test voltage (1,1 Ue) (V) .....:		N/A
	Leakage current: ≤ 2 mA /pole .....:		N/A
	Equipment provided with mirror contacts		
	the mirror contact shall withstand its rated insulation voltage *U*i. Ui (V)……:	Test voltage: _____ V	N/A

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Clause	Requirement + Test	Result - Remark	Verdict
9.3.1	Compliance with performance requirements		
c)	TEST SEQUENCE 3 - 2 Samples: HDS3-38, III-1, III-2, Ie=30-40A		
	- Performance under short-circuit conditions (Clause 9.3.4)		
9.3.4	Performance under short-circuit conditions		
	For MPSD	See Annex P	
	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.		N/A
	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.		N/A
	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
	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 ____	N/A
	Maximum motor current Ie and maximum Ue are covered	40A, 660V	P
	Rated control supply voltage.....:	Us=415V	P
9.3.4.2.1	Test at the prospective current "r":		
	type of product.....:	HDS3-38(III-1)	P
	test circuit, figure 9, 10, 11, 12.....:	Figure 11	P
	type of SCPD .....:	Fuse, RT16-00(NT00), 80A	P
	ratings of SCPD, co-ordination type 1 .....:	80A/690V	P
	ratings of SCPD, co-ordination type 2 .....:		N/A
	rated operational current Ie (A) AC-3 .....:	40A	P
	rated operational voltage (V).....:	660V	P
	prospective current "r" (kA) (table 13 or 14).....:	3kA	P
	Wire size (mm^2) type 1	10 mm^2	P
	Wire size (mm^2) type 2	____ mm^2	N/A
	test voltage (V) .....:	L1: 710 L2: 710 L3: 710	P

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Clause	Requirement + Test	Result - Remark	Verdict
	r.m.s. test current (A) .....:	L1: 3,07 L2: 3,06 L3: 3,07	P
	peak current (A) .....:	L1: 4,28 L2: 4,35 L3: 4,48	P
	power factor	0,76	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: 2,34 kA^2s / 1,03kA L2: 5,48 kA^2s / 1,79kA L3: 2,31 kA^2s / 1,59kA	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: 5,06 kA^2s / 1,18kA L2: 5,61 kA^2s / 1,84kA L3: 3,41 kA^2s / 0,99kA	P
9.3.4.2.4	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:		
	1) circuit breaker with instantaneous trip relays or releases, at 120% of the trip current		N/A
	2) 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):		

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Clause	Requirement + Test	Result - Remark	Verdict
	H - There has been no discharge of parts beyond the enclosure. Damage to the contactor and the overload relay is acceptable. The starter other than MPSD 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.		P
	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:		
	Dielectric verification test voltage (2 Ue) but not less than 1000V for 60 s (V).....:	Test voltage: _1320_ V	P
	- between each pole and all other poles connected to the frame of the starter		P
	- between all live parts of all poles connected together and the frame of the starter		P
	- between the terminals of the line side connected together and terminals of the other side connected together		P
	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 other than MPSD contacts is permitted, if they are easily separated 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.		N/A
	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 10 for the applicable utilization category.	Contacts welded ☐ yes ☒ no	N/A
	Operational performance capability (9.3.3.6):		N/A
	Type of product :		N/A
	utilization category :		N/A
	rated operational voltage Ue (V) :		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	rated operational current Ie (A) or power (kW) :		N/A
	Conditions, make/break operations:		
	- test voltage U/Ue = 1,05 (V) :		N/A
	- test current (A) I/Ie = 6 :		N/A
	- power factor/time constant :		N/A
	- on-time (ms) :		N/A
	- off-time (s) :		N/A
	- number of make/break operations :	10	N/A
	Characteristic of transient recovery voltage for AC-2, AC-3, AC-3e, AC-4, AC-8a and AC-8b 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
	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:		
	Dielectric verification test voltage (2 Ue) for 60 s (V) but not less than 1000V :	Test voltage: _____ V	N/A
	- 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		N/A
	- 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		N/A
	- between each control and auxiliary circuit not		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	normally connected to the main circuit and: - the main circuit - the other circuits - the exposed conductive parts - the enclosure or mounting plate		
	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 60 s (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	Test voltage: _____ V	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
9.3.4.2.3	Test at the rated conditional short-circuit current "Iq"		
	Type of product .....:	HDS3-38(III-2)	
	Test circuit, figure 9, 10, 11, 12.....:	figure 11	
	type of SCPD .....:	Fuse, RT16-00(NT00), 80A	
	ratings of SCPD, co-ordination type 1 .....:	80A/690V	
	ratings of SCPD, co-ordination type 2 .....:		N/A
	rated operational current Ie (A) AC-3 .....:	40A	P
	rated operational voltage (V)	660V	P
	prospective current "Iq" (kA) .....:	50kA	P
	Wire size (mm^2) type 1	10 mm^2	P
	Wire size (mm^2) type 2	___ mm^2	N/A
	test voltage (V) .....:	L1: 710 L2: 710 L3: 710	P
	r.m.s. test current (kA) .....:	L1: 51,6 L2: 51,6 L3: 51,6	P
	peak current (kA) .....:	L1: 109 L2: 109 L3: 109	P
	power factor	0,21	P
	1. one breaking operation of SCPD with all the switching devices closed prior to the test I^2t and Ip (A^2s / A) .....:	L1: 22,2 kA^2s / 4,39kA L2: 33,5 kA^2s / 8,38kA L3: 14,2 kA^2s / 4,04kA	P

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Clause	Requirement + Test	Result - Remark	Verdict
	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: 12,4 kA^2s / 4,21kA L2: 18,9 kA^2s / 5,62kA L3: 10,1 kA^2s / 3,87kA	P
	3. one breaking operation of SCPD by closing the switching device on to the short-circuit I^2t and Ip (A^2s / 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:		N/A
	1) circuit breaker with instantaneous trip relays or releases, at 120% of the trip current		N/A
	2) 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):		

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Clause	Requirement + Test	Result - Remark	Verdict
	H - There has been no discharge of parts beyond the enclosure. Damage to the contactor and the overload relay is acceptable. The starter other than MPSD 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.		P
	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:		
	Dielectric verification test voltage (2 Ue) but not less than 1000V for 60 s (V).....:	Test voltage: 1320 V	P
	- between each pole and all other poles connected to the frame of the starter		P
	- between all live parts of all poles connected together and the frame of the starter		P
	- between the terminals of the line side connected together and terminals of the other side connected together		P
	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 other than MPSD contacts is permitted, if they are easily separated 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.		N/A
	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 10 for the applicable utilization category.	Contacts welded ☐ yes ☒ no	N/A
	Operational performance capability (9.3.3.6):		
	Type of product :		N/A
	utilization category :		N/A
	rated operational voltage Ue (V) :		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	rated operational current Ie (A) or power (kW) :		N/A
	Conditions, make/break operations:		N/A
	- test voltage U/Ue = 1,05 (V) :		N/A
	- test current (A) I/Ie = 6 :		N/A
	- power factor/time constant :		N/A
	- on-time (ms) :		N/A
	- off-time (s) :		N/A
	- number of make/break operations :	10	N/A
	Characteristic of transient recovery voltage for AC-2, AC-3, AC-3e, AC-4, AC-8a and AC-8b 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
	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:		
	Dielectric verification test voltage (2 Ue) for 60 s (V) but not less than 1000V :	Test voltage: _____ V	N/A
	- 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		N/A
	- 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		N/A
	- between each control and auxiliary circuit not		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	normally connected to the main circuit and: - the main circuit - the other circuits - the exposed conductive parts - the enclosure or mounting plate		
	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 60 s (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	Test voltage: _____ V	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
9.3.1	Compliance with performance requirements		
c)	TEST SEQUENCE 3 - 2 Samples: HDS3-38, III-3, III-4, Ie=23-32A		
	- Performance under short-circuit conditions (Clause 9.3.4)		
9.3.4	Performance under short-circuit conditions		
	For MPSD	See Annex P	
	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.		N/A
	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.		N/A
	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
	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 ____	N/A
	Maximum motor current Ie and maximum Ue are covered	32A, 660V	P
	Rated control supply voltage.....:	Us=110V	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.....:	HDS3-38(III-3)	
	test circuit, figure 9, 10, 11, 12.....:	Figure 11	
	type of SCPD .....:	Fuse, RT16-00(NT00), 50A	
	ratings of SCPD, co-ordination type 1 .....:	50A/690V	
	ratings of SCPD, co-ordination type 2 .....:		
	rated operational current Ie (A) AC-3 .....:	32A	
	rated operational voltage (V).....:	660V~	
	prospective current "r" (kA) (table 13 or 14).....:	3kA	
	Wire size (mm^2) type 1	6,0 mm^2	P
	Wire size (mm^2) type 2	____ mm^2	N/A
	test voltage (V) .....:	L1: 710 L2: 710 L3: 710	P
	r.m.s. test current (A) .....:	L1: 3,07 L2: 3,06 L3: 3,07	P
	peak current (A) .....:	L1: 4,28 L2: 4,35 L3: 4,48	P
	power factor	0,76	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: 2,49 kA^2s / 1,05kA L2: 6,04 kA^2s / 1,73kA L3: 2,85 kA^2s / 1,70kA	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: 3,68 kA^2s / 1,81kA L2: 2,77 kA^2s / 1,20kA L3: 6,44 kA^2s / 1,57kA	P
9.3.4.2.4	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

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Clause	Requirement + Test	Result - Remark	Verdict
	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:		
	1) circuit breaker with instantaneous trip relays or releases, at 120% of the trip current		N/A
	2) 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 other than MPSD 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.		P
	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:		
	Dielectric verification test voltage (2 Ue) but not less than 1000V for 60 s (V).....:	Test voltage: 1320 V	P
	- between each pole and all other poles connected to the frame of the starter		P
	- between all live parts of all poles connected together and the frame of the starter		P
	- between the terminals of the line side connected together and terminals of the other side connected together		P

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Clause	Requirement + Test	Result - Remark	Verdict
	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 other than MPSD contacts is permitted, if they are easily separated 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.		N/A
	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 10 for the applicable utilization category.	Contacts welded ☐ yes ☒ no	N/A
	Operational performance capability (9.3.3.6):		N/A
	Type of product :		N/A
	utilization category :		N/A
	rated operational voltage Ue (V) :		N/A
	rated operational current Ie (A) or power (kW) :		N/A
	Conditions, make/break operations:		
	- test voltage U/Ue = 1,05 (V) :		N/A
	- test current (A) I/Ie = 6 :		N/A
	- power factor/time constant :		N/A
	- on-time (ms) :		N/A
	- off-time (s) :		N/A
	- number of make/break operations :	10	N/A
	Characteristic of transient recovery voltage for AC-2, AC-3, AC-3e, AC-4, AC-8a and AC-8b 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

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Clause	Requirement + Test	Result - Remark	Verdict
	- the contacts shall operate when the contactor or starter is switched by the applicable method of control		N/A
	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 / ___A Measured: __s / __s before Test current: __A / __A Measured: __s / __s after	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:		
	Dielectric verification test voltage (2 Ue) for 60 s (V) but not less than 1000V :	Test voltage: ____V	N/A
	- 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		N/A
	- 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		N/A
	- 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		N/A
	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 60 s (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	Test voltage: _____ V	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
9.3.4.2.3	Test at the rated conditional short-circuit current "Iq"		
	Type of product .....:	HDS3-38(III-4)	
	Test circuit, figure 9, 10, 11, 12.....:	figure 11	
	type of SCPD .....:	Fuse, RT16-00(NT00), 50A	

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Clause	Requirement + Test	Result - Remark	Verdict
	ratings of SCPD, co-ordination type 1 .....:	50A/690V	
	ratings of SCPD, co-ordination type 2 .....:		
	rated operational current Ie (A) AC-3 .....:	32A	
	rated operational voltage (V)	660V	
	prospective current "Iq" (kA) .....:	50kA	
	Wire size (mm^2) type 1	6,0 mm^2	P
	Wire size (mm^2) type 2	____ mm^2	N/A
	test voltage (V) .....:	L1: 710 L2: 710 L3: 710	P
	r.m.s. test current (A) .....:	L1: 51,6 L2: 51,6 L3: 51,6	P
	peak current (A) .....:	L1: 109 L2: 109 L3: 109	P
	power factor	0,21	P
	1. one breaking operation of SCPD with all the switching devices closed prior to the test I^2t and Ip (A^2s / A) .....:	L1: 7,95 kA^2s / 4,78kA L2: 2,40 kA^2s / 2,28kA L3: 3,68 kA^2s / 2,32kA	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: 5,22 kA^2s / 3,71kA L2: 3,21 kA^2s / 1,62kA L3: 8,02 kA^2s / 3,69kA	P
	3. one breaking operation of SCPD by closing the switching device on to the short-circuit I^2t and Ip (A^2s / 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

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Clause	Requirement + Test	Result - Remark	Verdict
	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:		N/A
	1) circuit breaker with instantaneous trip relays or releases, at 120% of the trip current		N/A
	2) 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 other than MPSD 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.		P
	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:		
	Dielectric verification test voltage (2 Ue) but not less than 1000V for 60 s (V).....	Test voltage: 1320 V	P
	- between each pole and all other poles connected to the frame of the starter		P
	- between all live parts of all poles connected together and the frame of the starter		P
	- between the terminals of the line side connected together and terminals of the other side connected together		P
	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

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Clause	Requirement + Test	Result - Remark	Verdict
	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 other than MPSD contacts is permitted, if they are easily separated 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.		N/A
	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 10 for the applicable utilization category.	Contacts welded ☐ yes ☒ no	N/A
	Operational performance capability (9.3.3.6):		
	Type of product :		N/A
	utilization category :		N/A
	rated operational voltage Ue (V) :		N/A
	rated operational current Ie (A) or power (kW) :		N/A
	Conditions, make/break operations:		N/A
	- test voltage U/Ue = 1,05 (V) :		N/A
	- test current (A) I/Ie = 6 :		N/A
	- power factor/time constant :		N/A
	- on-time (ms) :		N/A
	- off-time (s) :		N/A
	- number of make/break operations :	10	N/A
	Characteristic of transient recovery voltage for AC-2, AC-3, AC-3e, AC-4, AC-8a and AC-8b 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

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Clause	Requirement + Test	Result - Remark	Verdict
	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:		
	Dielectric verification test voltage (2 Ue) for 60 s (V) but not less than 1000V :	Test voltage: _____ V	N/A
	- 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		N/A
	- 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		N/A
	- 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		N/A
	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 60 s (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	Test voltage: _____ V	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

9.3.1	Compliance with performance requirements	
c)	TEST SEQUENCE 3 - 2 Samples: HDS3-38, III-5, III-6, Ie=12-18A	
	- Performance under short-circuit conditions (Clause 9.3.4)	
9.3.4	Performance under short-circuit conditions	

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Clause	Requirement + Test	Result - Remark	Verdict
	For MPSD	See Annex P	
	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.		N/A
	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.		N/A
	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
	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 ____	N/A
	Maximum motor current Ie and maximum Ue are covered	18A, 660V	P
	Rated control supply voltage.....:	Us=220/230V	P
9.3.4.2.1	Test at the prospective current "r":		
	type of product.....:	HDS3-38(III-5)	
	test circuit, figure 9, 10, 11, 12.....:	Figure 11	
	type of SCPD .....:	Fuse, RT16-00(NT00), 50A	
	ratings of SCPD, co-ordination type 1 .....:	50A/690V	
	ratings of SCPD, co-ordination type 2 .....:		
	rated operational current Ie (A) AC-3 .....:	18A	
	rated operational voltage (V).....:	660V~	
	prospective current "r" (kA) (table 13 or 14).....:	3kA	
	Wire size (mm^2) type 1	2,5 mm^2	P
	Wire size (mm^2) type 2	____ mm^2	N/A
	test voltage (V) .....:	L1: 710 L2: 710 L3: 710	P
	r.m.s. test current (A) .....:	L1: 3,07 L2: 3,06 L3: 3,07	P
	peak current (A) .....:	L1: 4,28 L2: 4,35 L3: 4,48	P
	power factor	0,76	P

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Clause	Requirement + Test	Result - Remark	Verdict
	1. one breaking operation of SCPD with all the switching devices closed prior to the test I^2dt and Ip (A^2s / A) .....:	L1: 2,46 kA^2s / 0,99kA L2: 6,32 kA^2s / 1,77kA L3: 6,32 kA^2s / 1,70kA	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: 4,19 kA^2s / 1,53kA L2: 3,18 kA^2s / 1,07kA L3: 6,76 kA^2s / 1,84kA	P
9.3.4.2.4	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:		
	1) circuit breaker with instantaneous trip relays or releases, at 120% of the trip current		N/A
	2) 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):		

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Clause	Requirement + Test	Result - Remark	Verdict
	H - There has been no discharge of parts beyond the enclosure. Damage to the contactor and the overload relay is acceptable. The starter other than MPSD 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.		P
	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:		
	Dielectric verification test voltage (2 Ue) but not less than 1000V for 60 s (V).....:	Test voltage: 1320 V	P
	- between each pole and all other poles connected to the frame of the starter		P
	- between all live parts of all poles connected together and the frame of the starter		P
	- between the terminals of the line side connected together and terminals of the other side connected together		P
	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 other than MPSD contacts is permitted, if they are easily separated 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.		N/A
	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 10 for the applicable utilization category.	Contacts welded ☐ yes ☒ no	N/A
	Operational performance capability (9.3.3.6):		N/A
	Type of product :		N/A
	utilization category :		N/A
	rated operational voltage Ue (V) :		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	rated operational current Ie (A) or power (kW) :		N/A
	Conditions, make/break operations:		
	- test voltage U/Ue = 1,05 (V) :		N/A
	- test current (A) I/Ie = 6 :		N/A
	- power factor/time constant :		N/A
	- on-time (ms) :		N/A
	- off-time (s) :		N/A
	- number of make/break operations :	10	N/A
	Characteristic of transient recovery voltage for AC-2, AC-3, AC-3e, AC-4, AC-8a and AC-8b 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
	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 / ___A Measured: __s / __s before Test current: __A / __A Measured: __s / __s after	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:		
	Dielectric verification test voltage (2 Ue) for 60 s (V) but not less than 1000V :	Test voltage: ____V	N/A
	- 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		N/A
	- 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		N/A
	- between each control and auxiliary circuit not		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	normally connected to the main circuit and: - the main circuit - the other circuits - the exposed conductive parts - the enclosure or mounting plate		
	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 60 s (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	Test voltage: _____ V	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
9.3.4.2.3	Test at the rated conditional short-circuit current "Iq"		
	Type of product .....:	HDS3-38(III-6)	
	Test circuit, figure 9, 10, 11, 12.....:	figure 11	
	type of SCPD .....:	Fuse, RT16-00(NT00), 50A	
	ratings of SCPD, co-ordination type 1 .....:	50A/690V	
	ratings of SCPD, co-ordination type 2 .....:		
	rated operational current Ie (A) AC-3 .....:	18A	
	rated operational voltage (V)	660V	
	prospective current "Iq" (kA) .....:	50kA	
	Wire size (mm^2) type 1	2,5 mm^2	P
	Wire size (mm^2) type 2	____ mm^2	N/A
	test voltage (V) .....:	L1: 710 L2: 710 L3: 710	P
	r.m.s. test current (A) .....:	L1: 51,6 L2: 51,6 L3: 51,6	P
	peak current (A) .....:	L1: 109 L2: 109 L3: 109	P
	power factor	0,21	P
	1. one breaking operation of SCPD with all the switching devices closed prior to the test I^2t and Ip (A^2s / A) .....:	L1: 7,49 kA^2s / 4,20kA L2: 3,27 kA^2s / 2,34kA L3: 4,81 kA^2s / 2,34kA	P

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Clause	Requirement + Test	Result - Remark	Verdict
	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: 0,77 kA^2s / 0,47kA L2: 2,08 kA^2s / 2,34kA L3: 5,70 kA^2s / 2,73kA	P
	3. one breaking operation of SCPD by closing the switching device on to the short-circuit I^2t and Ip (A^2s / 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:		N/A
	1) circuit breaker with instantaneous trip relays or releases, at 120% of the trip current		N/A
	2) 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):		

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Clause	Requirement + Test	Result - Remark	Verdict
	H - There has been no discharge of parts beyond the enclosure. Damage to the contactor and the overload relay is acceptable. The starter other than MPSD 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.		P
	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:		
	Dielectric verification test voltage (2 Ue) but not less than 1000V for 60 s (V).....:	Test voltage: 1320 V	P
	- between each pole and all other poles connected to the frame of the starter		P
	- between all live parts of all poles connected together and the frame of the starter		P
	- between the terminals of the line side connected together and terminals of the other side connected together		P
	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 other than MPSD contacts is permitted, if they are easily separated 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.		N/A
	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 10 for the applicable utilization category.	Contacts welded ☐ yes ☒ no	N/A
	Operational performance capability (9.3.3.6):		
	Type of product :		N/A
	utilization category :		N/A
	rated operational voltage Ue (V) :		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	rated operational current Ie (A) or power (kW) :		N/A
	Conditions, make/break operations:		N/A
	- test voltage U/Ue = 1,05 (V) :		N/A
	- test current (A) I/Ie = 6 :		N/A
	- power factor/time constant :		N/A
	- on-time (ms) :		N/A
	- off-time (s) :		N/A
	- number of make/break operations :	10	N/A
	Characteristic of transient recovery voltage for AC-2, AC-3, AC-3e, AC-4, AC-8a and AC-8b 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
	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:		
	Dielectric verification test voltage (2 Ue) for 60 s (V) but not less than 1000V :	Test voltage: _____ V	N/A
	- 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		N/A
	- 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		N/A
	- between each control and auxiliary circuit not		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	normally connected to the main circuit and: - the main circuit - the other circuits - the exposed conductive parts - the enclosure or mounting plate		
	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 60 s (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	Test voltage: _____ V	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
9.3.1	Compliance with performance requirements		
c)	TEST SEQUENCE 3 - 2 Samples: HDS3-38, III-7, III-8, Ie=9-13A		
	- Performance under short-circuit conditions (Clause 9.3.4)		
9.3.4	Performance under short-circuit conditions		
	For MPSD	See Annex P	
	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.		N/A
	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.		N/A
	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
	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 ____	N/A
	Maximum motor current Ie and maximum Ue are covered	13A, 660V	P
	Rated control supply voltage.....:	Us=240V	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.....:	HDS3-38(III-7)	
	test circuit, figure 9, 10, 11, 12.....:	Figure 11	
	type of SCPD .....:	Fuse, RT16-00(NT00), 25A	
	ratings of SCPD, co-ordination type 1 .....:	25A/690V	
	ratings of SCPD, co-ordination type 2 .....:		
	rated operational current Ie (A) AC-3 .....:	13A	
	rated operational voltage (V).....:	660V~	
	prospective current "r" (kA) (table 13 or 14).....:	1kA	
	Wire size (mm^2) type 1	2,5 mm^2	P
	Wire size (mm^2) type 2	____ mm^2	N/A
	test voltage (V) .....:	L1: 710 L2: 710 L3: 710	P
	r.m.s. test current (kA) .....:	L1: 1,02 L2: 1,02 L3: 1,02	P
	peak current (kA) .....:	L1: 1,46 L2: 1,46 L3: 1,46	P
	power factor	0,78	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: 0,27 kA^2s / 0,33kA L2: 1,78 kA^2s / 1,06kA L3: 1,02 kA^2s / 0,86kA	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: 1,68 kA^2s / 0,93kA L2: 1,34 kA^2s / 0,79kA L3: 1,75 kA^2s / 1,10kA	P
9.3.4.2.4	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

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Clause	Requirement + Test	Result - Remark	Verdict
	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:		
	1) circuit breaker with instantaneous trip relays or releases, at 120% of the trip current		N/A
	2) 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 other than MPSD 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.		P
	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:		
	Dielectric verification test voltage (2 Ue) but not less than 1000V for 60 s (V).....:	Test voltage: 1320 V	P
	- between each pole and all other poles connected to the frame of the starter		P
	- between all live parts of all poles connected together and the frame of the starter		P
	- between the terminals of the line side connected together and terminals of the other side connected together		P

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Clause	Requirement + Test	Result - Remark	Verdict
	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 other than MPSD contacts is permitted, if they are easily separated 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.		N/A
	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 10 for the applicable utilization category.	Contacts welded ☐ yes ☒ no	N/A
	Operational performance capability (9.3.3.6):		N/A
	Type of product :		N/A
	utilization category :		N/A
	rated operational voltage Ue (V) :		N/A
	rated operational current Ie (A) or power (kW) :		N/A
	Conditions, make/break operations:		
	- test voltage U/Ue = 1,05 (V) :		N/A
	- test current (A) I/Ie = 6 :		N/A
	- power factor/time constant :		N/A
	- on-time (ms) :		N/A
	- off-time (s) :		N/A
	- number of make/break operations :	10	N/A
	Characteristic of transient recovery voltage for AC-2, AC-3, AC-3e, AC-4, AC-8a and AC-8b 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

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Clause	Requirement + Test	Result - Remark	Verdict
	- the contacts shall operate when the contactor or starter is switched by the applicable method of control		N/A
	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 / ___A Measured: __s / __s before Test current: __A / __A Measured: __s / __s after	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:		
	Dielectric verification test voltage (2 Ue) for 60 s (V) but not less than 1000V :	Test voltage: ____V	N/A
	- 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		N/A
	- 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		N/A
	- 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		N/A
	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 60 s (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	Test voltage: _____ V	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
9.3.4.2.3	Test at the rated conditional short-circuit current "Iq"		
	Type of product .....:	HDS3-38(III-8)	
	Test circuit, figure 9, 10, 11, 12.....:	figure 11	
	type of SCPD .....:	Fuse, RT16-00(NT00), 25A	

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Clause	Requirement + Test	Result - Remark	Verdict
	ratings of SCPD, co-ordination type 1 .....:	25A/690V	
	ratings of SCPD, co-ordination type 2 .....:		
	rated operational current Ie (A) AC-3 .....:	13A	
	rated operational voltage (V)	660V	
	prospective current "Iq" (kA) .....:	50kA	
	Wire size (mm^2) type 1	2,5 mm^2	P
	Wire size (mm^2) type 2	____ mm^2	N/A
	test voltage (V) .....:	L1: 710 L2: 710 L3: 710	P
	r.m.s. test current (A) .....:	L1: 51,6 L2: 51,6 L3: 51,6	P
	peak current (A) .....:	L1: 109 L2: 109 L3: 109	P
	power factor	0,21	P
	1. one breaking operation of SCPD with all the switching devices closed prior to the test I^2t and Ip (A^2s / A) .....:	L1: 3,59 kA^2s / 3,50kA L2: 2,71 kA^2s / 1,42kA L3: 3,07 kA^2s / 1,53kA	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: 1,41 kA^2s / 2,71kA L2: 0,57 kA^2s / 0,58kA L3: 2,40 kA^2s / 2,82kA	P
	3. one breaking operation of SCPD by closing the switching device on to the short-circuit I^2t and Ip (A^2s / 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

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Clause	Requirement + Test	Result - Remark	Verdict
	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:		N/A
	1) circuit breaker with instantaneous trip relays or releases, at 120% of the trip current		N/A
	2) 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 other than MPSD 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.		P
	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:		
	Dielectric verification test voltage (2 Ue) but not less than 1000V for 60 s (V).....	Test voltage: 1320 V	P
	- between each pole and all other poles connected to the frame of the starter		P
	- between all live parts of all poles connected together and the frame of the starter		P
	- between the terminals of the line side connected together and terminals of the other side connected together		P
	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

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Clause	Requirement + Test	Result - Remark	Verdict
	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 other than MPSD contacts is permitted, if they are easily separated 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.		N/A
	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 10 for the applicable utilization category.	Contacts welded ☐ yes ☒ no	N/A
	Operational performance capability (9.3.3.6):		
	Type of product :		N/A
	utilization category :		N/A
	rated operational voltage Ue (V) :		N/A
	rated operational current Ie (A) or power (kW) :		N/A
	Conditions, make/break operations:		N/A
	- test voltage U/Ue = 1,05 (V) :		N/A
	- test current (A) I/Ie = 6 :		N/A
	- power factor/time constant :		N/A
	- on-time (ms) :		N/A
	- off-time (s) :		N/A
	- number of make/break operations :	10	N/A
	Characteristic of transient recovery voltage for AC-2, AC-3, AC-3e, AC-4, AC-8a and AC-8b 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

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Clause	Requirement + Test	Result - Remark	Verdict
	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:		
	Dielectric verification test voltage (2 Ue) for 60 s (V) but not less than 1000V :	Test voltage: _____ V	N/A
	- 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		N/A
	- 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		N/A
	- 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		N/A
	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 60 s (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	Test voltage: _____ V	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

9.3.1	Compliance with performance requirements	
c)	TEST SEQUENCE 3 - 2 Samples: HDS3-38, III-9, III-10, Ie=0,1-0,16A	
	- Performance under short-circuit conditions (Clause 9.3.4)	
9.3.4	Performance under short-circuit conditions	

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Clause	Requirement + Test	Result - Remark	Verdict
	For MPSD	See Annex P	
	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.		N/A
	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.		N/A
	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
	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 ____	N/A
	Maximum motor current Ie and maximum Ue are covered	0,16A, 660V	P
	Rated control supply voltage.....:	Us=240V	P
9.3.4.2.1	Test at the prospective current "r":		
	type of product.....:	HDS3-38(III-9)	
	test circuit, figure 9, 10, 11, 12.....:	Figure 11	
	type of SCPD .....:	Fuse, RT16-00(NT00), 25A	
	ratings of SCPD, co-ordination type 1 .....:	25A/690V	
	ratings of SCPD, co-ordination type 2 .....:		
	rated operational current Ie (A) AC-3 .....:	0,16A	
	rated operational voltage (V).....:	660V~	
	prospective current "r" (kA) (table 13 or 14).....:	1kA	
	Wire size (mm^2) type 1	1,5 mm^2	P
	Wire size (mm^2) type 2	____ mm^2	N/A
	test voltage (V) .....:	L1: 710 L2: 710 L3: 710	P
	r.m.s. test current (kA) .....:	L1: 1,02 L2: 1,02 L3: 1,02	P
	peak current (kA) .....:	L1: 1,46 L2: 1,46 L3: 1,46	P
	power factor	0,78	P

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Clause	Requirement + Test	Result - Remark	Verdict
	1. one breaking operation of SCPD with all the switching devices closed prior to the test I^2dt and Ip (A^2s / A) .....:	L1: 0,88 kA^2s / 0,53kA L2: 2,89 kA^2s / 1,04kA L3: 1,26 kA^2s / 0,90kA	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: 3,41 kA^2s / 1,16kA L2: 2,69 kA^2s / 1,06kA L3: 0,84 kA^2s / 0,50kA	P
9.3.4.2.4	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:		
	1) circuit breaker with instantaneous trip relays or releases, at 120% of the trip current		N/A
	2) 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):		

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Clause	Requirement + Test	Result - Remark	Verdict
	H - There has been no discharge of parts beyond the enclosure. Damage to the contactor and the overload relay is acceptable. The starter other than MPSD 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.		P
	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:		
	Dielectric verification test voltage (2 Ue) but not less than 1000V for 60 s (V).....:	Test voltage: 1320 V	P
	- between each pole and all other poles connected to the frame of the starter		P
	- between all live parts of all poles connected together and the frame of the starter		P
	- between the terminals of the line side connected together and terminals of the other side connected together		P
	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 other than MPSD contacts is permitted, if they are easily separated 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.		N/A
	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 10 for the applicable utilization category.	Contacts welded ☐ yes ☒ no	N/A
	Operational performance capability (9.3.3.6):		N/A
	Type of product :		N/A
	utilization category :		N/A
	rated operational voltage Ue (V) :		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	rated operational current Ie (A) or power (kW) :		N/A
	Conditions, make/break operations:		
	- test voltage U/Ue = 1,05 (V) :		N/A
	- test current (A) I/Ie = 6 :		N/A
	- power factor/time constant :		N/A
	- on-time (ms) :		N/A
	- off-time (s) :		N/A
	- number of make/break operations :	10	N/A
	Characteristic of transient recovery voltage for AC-2, AC-3, AC-3e, AC-4, AC-8a and AC-8b 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
	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 / ___A Measured: __s / __s before Test current: __A / __A Measured: __s / __s after	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:		
	Dielectric verification test voltage (2 Ue) for 60 s (V) but not less than 1000V :	Test voltage: ____V	N/A
	- 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		N/A
	- 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		N/A
	- between each control and auxiliary circuit not		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	normally connected to the main circuit and: - the main circuit - the other circuits - the exposed conductive parts - the enclosure or mounting plate		
	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 60 s (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	Test voltage: _____ V	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
9.3.4.2.3	Test at the rated conditional short-circuit current "Iq"		
	Type of product .....:	HDS3-38(III-10)	
	Test circuit, figure 9, 10, 11, 12.....:	figure 11	
	type of SCPD .....:	Fuse, RT16-00(NT00), 25A	
	ratings of SCPD, co-ordination type 1 .....:	25A/690V	
	ratings of SCPD, co-ordination type 2 .....:		
	rated operational current Ie (A) AC-3 .....:	0,16A	
	rated operational voltage (V)	660V	
	prospective current "Iq" (kA) .....:	50kA	
	Wire size (mm^2) type 1	1,5 mm^2	P
	Wire size (mm^2) type 2	____ mm^2	N/A
	test voltage (V) .....:	L1: 710 L2: 710 L3: 710	P
	r.m.s. test current (A) .....:	L1: 51,6 L2: 51,6 L3: 51,6	P
	peak current (A) .....:	L1: 109 L2: 109 L3: 109	P
	power factor	0,21	P
	1. one breaking operation of SCPD with all the switching devices closed prior to the test I^2t and Ip (A^2s / A) .....:	L1: 0,56 kA^2s / 0,42kA L2: 2,12 kA^2s / 1,45kA L3: 1,53 kA^2s / 1,46kA	P

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Clause	Requirement + Test	Result - Remark	Verdict
	2. one breaking operation of SCPD by closing the contactor or starter on to the short-circuit I²t and Ip (A²s / A) .....:	L1: 2,55 kA²s / 3,06kA L2: 0,27 kA²s / 0,51kA L3: 6,66 kA²s / 3,59kA	P
	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:		N/A
	1) circuit breaker with instantaneous trip relays or releases, at 120% of the trip current		N/A
	2) 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):		

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Clause	Requirement + Test	Result - Remark	Verdict
	H - There has been no discharge of parts beyond the enclosure. Damage to the contactor and the overload relay is acceptable. The starter other than MPSD 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.		P
	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:		
	Dielectric verification test voltage (2 Ue) but not less than 1000V for 60 s (V).....:	Test voltage: 1320 V	P
	- between each pole and all other poles connected to the frame of the starter		P
	- between all live parts of all poles connected together and the frame of the starter		P
	- between the terminals of the line side connected together and terminals of the other side connected together		P
	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 other than MPSD contacts is permitted, if they are easily separated 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.		N/A
	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 10 for the applicable utilization category.	Contacts welded ☐ yes ☒ no	N/A
	Operational performance capability (9.3.3.6):		
	Type of product :		N/A
	utilization category :		N/A
	rated operational voltage Ue (V) :		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	rated operational current Ie (A) or power (kW) :		N/A
	Conditions, make/break operations:		N/A
	- test voltage U/Ue = 1,05 (V) :		N/A
	- test current (A) I/Ie = 6 :		N/A
	- power factor/time constant :		N/A
	- on-time (ms) :		N/A
	- off-time (s) :		N/A
	- number of make/break operations :	10	N/A
	Characteristic of transient recovery voltage for AC-2, AC-3, AC-3e, AC-4, AC-8a and AC-8b 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
	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:		
	Dielectric verification test voltage (2 Ue) for 60 s (V) but not less than 1000V :	Test voltage: _____ V	N/A
	- 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		N/A
	- 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		N/A
	- between each control and auxiliary circuit not		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	normally connected to the main circuit and: - the main circuit - the other circuits - the exposed conductive parts - the enclosure or mounting plate		
	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 60 s (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	Test voltage: _____ V	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

IEC 60947-4-1			
Clause	Requirement + Test	Result - Remark	Verdict
9.3.1	Compliance with performance requirements		
d)	TEST SEQUENCE 4		
	- Verification of ability to withstand overload currents: Clause 9.3.5 (applicable for contactors only)		
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
	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

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Clause	Requirement + Test	Result - Remark	Verdict

9.3.1	Compliance with performance requirements		
e)	TEST SEQUENCE 5 -1 samples: HDS3-38, Ie=30-40A, Sample No. V-1		
	1) verification of mechanical properties of terminals according to 8.2.4 of IEC 60947-1:2007, IEC 60947-1:2007/AMD1:2010, IEC 60947-1:2007/AMD2:2014, 9.2.2 and 9.2.3; 2) verification of degrees of protection of enclosed contactors and starters (see Annex C of IEC 60947-1:2007, IEC 60947-1:2007/AMD1:2010).		
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)	N/A

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Clause	Requirement + Test	Result - Remark	Verdict
9.4	EMC		N/A
	TEST SEQUENCE Annex B		N/A
	TEST SEQUENCE Annex F		N/A
	TEST SEQUENCE Annex H		N/A
	TEST SEQUENCE Annex K		N/A
	Procedure to determine data for electromechanical contactors used in functional safety applications.		
		See	N/A
	TEST SEQUENCE Annex L		N/A
	Assessment procedure for electromechanical overload protection used in safety applications and especially in explosive atmospheres		
		See	N/A
	TEST SEQUENCE Annex M		N/A
	TEST SEQUENCE Annex N		
	Additional requirements and tests for equipment with protective separation		
		See	N/A
	TEST SEQUENCE Annex P		
	TEST SEQUENCE Annex Q		N/A

	TABLE: Heating Test (I-1, HDS3-38, Ie=30-40A)		**P**
	Test voltage (V).....:	Ith=40A(Ie=30-40A)	—
	Ambient (°C).....:	17 °C	—

Thermocouple Locations	**max. temperature measured, (K)**	**max. temperature limit, (K)**
Terminal L1(contactor)	59	65
Terminal L2(contactor)	58	65
Terminal L3(contactor)	56	65
Terminal T1(connector of contactor and thermal relay)	54	65
Terminal T2(connector of contactor and thermal relay)	53	65
Terminal T3(connector of contactor and thermal relay)	52	65
Terminal T1(thermal relay)	52	65
Terminal T2(thermal relay)	52	65
Terminal T3(thermal relay)	53	65
Auxiliary Terminal NC(contactor)	28	65
Auxiliary Terminal NC(contactor)	27	65
Auxiliary Terminal NO(contactor)	34	65
Auxiliary Terminal NO(contactor)	35	65
Auxiliary Terminal NC(thermal relay)	35	65
Auxiliary Terminal NC(thermal relay)	37	65
Auxiliary Terminal NO(thermal relay)	28	65
Auxiliary Terminal NO(thermal relay)	27	65
Enclosure	14	40
Supplementary information:		

	TABLE: Heating test, resistance method		**P**
	Test voltage (V) :	Us=440Vac	—
	Ambient, t_1 (°C) :	16	—
	Ambient, t_2 (°C) :	16	—

Temperature rise of winding	**R_1 (Ω)**	**R_2 (Ω)**	**ΔT (K)**	**Max. dT (K)**	**Insulation class**
Us=440V	2195	2700	58	110	B
Supplementary information: with HDC3-38					

	TABLE: Heating Test (I-2, Ie=23-32A)		**P**
	Test voltage (V).....:		**—**
	Ambient (ºC).....:	18 °C	**—**

Thermocouple Locations	**max. temperature rise measured (K)**	**max. temperature rise limit (K)**
Terminal L1(contactor)	51	65
Terminal L2(contactor)	56	65
Terminal L3(contactor)	47	65
Terminal T1(connector of contactor and thermal relay)	54	65
Terminal T2(connector of contactor and thermal relay)	50	65
Terminal T3(connector of contactor and thermal relay)	42	65
Terminal T1(thermal relay)	42	65
Terminal T2(thermal relay)	49	65
Terminal T3(thermal relay)	50	65
Auxiliary Terminal NC(contactor)	25	65
Auxiliary Terminal NC(contactor)	24	65
Auxiliary Terminal NO(contactor)	31	65
Auxiliary Terminal NO(contactor)	34	65
Auxiliary Terminal NC(thermal relay)	22	65
Auxiliary Terminal NC(thermal relay)	24	65
Auxiliary Terminal NO(thermal relay)	33	65
Auxiliary Terminal NO(thermal relay)	36	65
Enclosure	9	40
Supplementary information:		

	TABLE: Heating test, resistance method		**P**
	Test voltage (V) :		**—**
	Ambient, t_1 (°C) :	17	**—**
	Ambient, t_2 (°C) :	17	**—**

Temperature rise of winding	**R_1 (Ω)**	**R_2 (Ω)**	**ΔT (K)**	**Max. dT (K)**	**Insulation class**
Us=380/400V	1607	1936	51	110	B
Supplementary information: with HDC3-32					

	TABLE: Heating Test (I-3, Ie=17-25A)		**P**
	Test voltage (V).....:		**—**
	Ambient (ºC).....:	18 °C	**—**

Thermocouple Locations	**max. temperature rise measured (K)**	**max. temperature rise limit (K)**
Terminal L1(contactor)	48	65
Terminal L2(contactor)	53	65
Terminal L3(contactor)	46	65
Terminal T1(connector of contactor and thermal relay)	51	65
Terminal T2(connector of contactor and thermal relay)	54	65
Terminal T3(connector of contactor and thermal relay)	50	65
Terminal T1(thermal relay)	44	65
Terminal T2(thermal relay)	50	65
Terminal T3(thermal relay)	47	65
Auxiliary Terminal NC(contactor)	25	65
Auxiliary Terminal NC(contactor)	24	65
Auxiliary Terminal NO(contactor)	32	65
Auxiliary Terminal NO(contactor)	34	65
Auxiliary Terminal NC(thermal relay)	21	65
Auxiliary Terminal NC(thermal relay)	23	65
Auxiliary Terminal NO(thermal relay)	32	65
Auxiliary Terminal NO(thermal relay)	34	65
Enclosure	9	40
Supplementary information:		

	TABLE: Heating test, resistance method		**P**
	Test voltage (V) :		**—**
	Ambient, t_1 (°C) :	17	**—**
	Ambient, t_2 (°C) :	17	**—**

Temperature rise of winding	**R_1 (Ω)**	**R_2 (Ω)**	**ΔT (K)**	**Max. dT (K)**	**Insulation class**
Us=220/230V	540	679	65	110	B
Supplementary information: with HDC3-25					

	TABLE: Heating Test (I-5, HDS3-38, Ie=9-13A)		**P**
	Test voltage (V).....:	Ith=13A(Ie=9-13A)	**—**
	Ambient (°C).....:	17 °C	**—**

Thermocouple Locations	**max. temperature measured, (K)**	**max. temperature limit, (K)**
Terminal L1(contactor)	54	65
Terminal L2(contactor)	50	65
Terminal L3(contactor)	45	65
Terminal T1(connector of contactor and thermal relay)	49	65
Terminal T2(connector of contactor and thermal relay)	56	65
Terminal T3(connector of contactor and thermal relay)	43	65
Terminal T1(thermal relay)	41	65
Terminal T2(thermal relay)	47	65
Terminal T3(thermal relay)	44	65
Auxiliary Terminal NC(contactor)	25	65
Auxiliary Terminal NC(contactor)	24	65
Auxiliary Terminal NO(contactor)	30	65
Auxiliary Terminal NO(contactor)	36	65
Auxiliary Terminal NC(thermal relay)	20	65
Auxiliary Terminal NC(thermal relay)	22	65
Auxiliary Terminal NO(thermal relay)	26	65
Auxiliary Terminal NO(thermal relay)	27	65
Enclosure	10	40
Supplementary information:		

	TABLE: Heating test, resistance method		**P**
	Test voltage (V) :		**—**
	Ambient, t_1 (°C) :	17	**—**
	Ambient, t_2 (°C) :	17	**—**

Temperature rise of winding	**R_1 (Ω)**	**R_2 (Ω)**	**ΔT (K)**	**Max. dT (K)**	**Insulation class**
Us=380/400V	2119	2594	55	110	B
Us=110V	169	197	43	110	B
Us=220/230V	724	859	47	110	B
Us=36V	17,9	22,1	60	110	B

	TABLE: insulation resistance measurements		P
Insulation resistance R between:	**R (MΩ)**	**Required R (MΩ)**	
Between mains poles (primary fuse disconnected)	>100MΩ	≥5 MΩ	
Between parts separated by basic or supplementary insulation	>100MΩ	≥5 MΩ	
Between parts separated by double or reinforced insulation	>100MΩ	≥5 MΩ	
Supplementary information:			

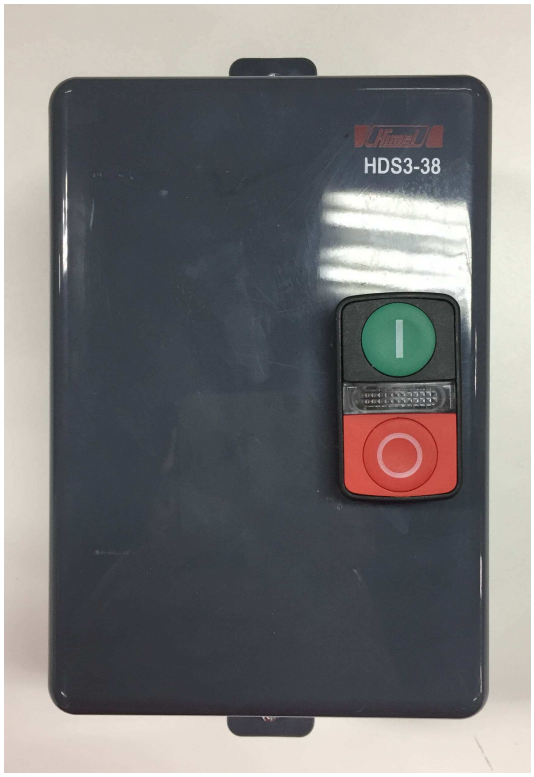
	TABLE: Clearance And Creepage Distance Measurements					P
clearance cl and creepage distance dcr at/of:	**Uimp (kV)**	**Ui (V)**	**Required cl (mm)**	**cl (mm)**	**required dcr (mm)**	**dcr (mm)**
1.between live parts (of the main circuits) which are separated when the switch is in off position	6	690	5,5	>10	10	16,0
2.between live parts of different polarity	6	690	5,5	>10	10	>16
3. between live parts and accessible surfaces of operating means	6	690	5,5	>10	10	>16
Supplementary information:						

	TABLE: Dielectric Strength(I-1, I-2)		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:7300 Auxiliary:7300	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:7300 Auxiliary:7300	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:7300 Auxiliary:7300	NO
Supplementary information:			

	TABLE: Ball Pressure Test of Thermoplastics		P
Allowed impression diameter (mm) .....:	**2,0**		**—**
Part	**Test temperature (°C)**	**Impression diameter (mm)**	
Base (Black)	125	0,8	
Enclosure (Grey)	125	0,9	
Push button (Red)	125	0,9	
Supplementary information:			

	TABLE 9: Critical components information					
Object/part No.	**Manufacturer /trademark**	**Type/model**	**Technical data**		**Standard**	**Mark(s) of conformity[1)]**
Contactor	**HIMEL**	**HDC3-09**	**230/400V, AC-3: 9A**	**660/690V, AC-3: 6,6A**	**EN60947-4-1**	**CE 170902156SHA-002 170902156SHA-007**
Contactor	**HIMEL**	**HDC3-12**	**230/400V, AC-3: 12A**	**660/690V, AC-3: 8,9A**		
Contactor	**HIMEL**	**HDC3-18**	**230/400V, AC-3: 18A**	**660/690V, AC-3: 12A**		
Contactor	**HIMEL**	**HDC3-32**	**230/400V, AC-3: 32A**	**660/690V, AC-3: 22A**	**EN60947-4-1**	**CE 170902156SHA-003 170902156SHA-008**
Contactor	**HIMEL**	**HDC3-38**	**230/400V, AC-3: 38A**	**660/690V, AC-3: 22A**		
Contactor	**HIMEL**	**HDC3-25**	**230/400V, AC-3: 25A**	**660/690V, AC-3: 18A**		
Supplementary information:						

Photos of samples: HDS3-38(30-40A)



Photos of samples: HDS3-38(30-40A)

Photos of samples: HDS3-38(30-40A)

Photos of samples: