



Test Report issued under the responsibility of:

Intertek

TEST REPORT
IEC 60947-2
Low-voltage switchgear and controlgear - Part 2: Circuit-breakers

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Testing Laboratory: Intertek Testing Services Shanghai
Address: Building No.86, 1198 Qinzhou Road (North),
Shanghai 200233, China

Applicant's name: ELMARK INDUSTRIES SC
Address: 2 Dobrudzha blvd., Dobrich, Bulgaria

Test specification:

Standard: IEC 60947-2:2006 (4th Edition) + amendment 1-2009
 EN 60947-2:2006 + A1:2009
Test procedure: CB+S
Non-standard test method: N/A

Test Report Form No.: IEC60947_2F
Test Report Form(s) Originator: KEMA Quality BV
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Test item description: Moulded case circuit-breakers with motor protection
Trade Mark: 
Manufacturer: Same as applicant
Model/Type reference: TM2
Ratings: See page 9

Testing procedure and testing location:	
<input checked="" type="checkbox"/> Testing Laboratory:	Intertek Testing Services Shanghai
Testing location/ address.....:	Building No.86, 1198 Qinzhou Road (North), Shanghai 200233, China
<input checked="" type="checkbox"/> Associated Laboratory:	Inspection Center of Products' Quality of Low Voltage Electric Apparatus in Zhejiang Province
Testing location/ address.....:	West Zhonghuan Road, Jiaxing City, Zhejiang Province, P.R.China
Tested by (name + signature).....:	Mathew Shen 
Approved by (+ signature)	Jim Hua 
<input type="checkbox"/> Testing procedure: TMP	
Tested by (name + signature).....:	
Approved by (+ signature)	
Testing location/ address.....:	
<input type="checkbox"/> Testing procedure: WMT	
Tested by (name + signature).....:	
Witnessed by (+ signature).....:	
Approved by (+ signature)	
Testing location/ address.....:	
<input type="checkbox"/> Testing procedure: SMT	
Tested by (name + signature).....:	
Approved by (+ signature)	
Supervised by (+ signature).....:	
Testing location/ address.....:	
<input type="checkbox"/> Testing procedure: RMT	
Tested by (name + signature).....:	
Approved by (+ signature)	
Supervised by (+ signature).....:	
Testing location/ address.....:	

Summary of testing:

Number of tests for test procedure, according to table 9a and table 10

No. of poles	Adjustable current rating (A)	In (A)	Test sequence and number of samples									
			I	II/II ^{a)}	II ^{a)}	III ^{a)}	IV	V	Annex B	Annex C	Annex H	Annex M
3P	24~32	32	1	-	1	1	-	-	-	-	1	-
3P	9~14	14	-	-	1	1	-	-	-	-	-	-
3P	6~10	10	-	1	-	-	-	-	-	-	-	-
3P	0,1~0,16	0,16	-	1	-	-	-	-	-	-	-	-

Note: a) Short-circuit capacity tests performed on different voltage and corresponding ratings.

Tests performed (name of test and test clause):		Testing location:
8.3.3.1	Tripping limits and characteristics	ACTL
8.3.3.2	Dielectric properties	ACTL
8.3.3.3	Operational performance capability	ACTL
8.3.3.4	Overload performance	ACTL
8.3.3.5	Verification of dielectric withstand	ACTL
8.3.3.6	Verification of temperature rise	ACTL
8.3.3.7	Verification of overload releases	ACTL
8.3.3.8	Verification of undervoltage and shunt releases (if applicable)	CBTL
8.3.3.9	Verification of main contact position (for circuit breakers suitable for isolation)	CBTL
8.3.4.1	Service short-circuit breaking capacity	ACTL
8.3.4.2	Verification of operational capability	ACTL
8.3.4.3	Verification of dielectric withstand	ACTL
8.3.4.4	Verification of temperature rise	ACTL
8.3.4.5	Verification of overload releases	ACTL
8.3.5.1	Verification of overload releases	ACTL
8.3.5.2	Ultimate short-circuit breaking capacity	ACTL
8.3.5.3	Verification of dielectric withstand	ACTL
	Annex B	ACTL

Summary of compliance with National Differences:

N/A

Copy of marking plate:**ELMARK****TM2-E32 24-32A****EN/IEC60947-1
EN/IEC60947-2
EN/IEC60947-4-1****Ue(max):415V~,50/60Hz
Ui:690V cat.A Uimp=6kV
Icu=10kA, Ics=5kA**

Test item particulars: test item vs. test requirements	
3 Classification	
3.1. Utilization category: (A or B)	A
3.2. Interruption medium: (air, vacuum, gas Break).....	Air
3.3. Design: (open construction, moulded case).....	Moulded case
3.4. Method of controlling the operation mechanism: (dependent manual, independent manual, dependent power, independent power)	Independent manual
3.5. Suitability for insulation: (suitable, not -suitable).....	Suitable
3.6. Provision for maintenance: (maintainable, non maintainable).....	Non-maintainable
3.7. Method of installation: (fixed, plug in, withdrawable:	Fixed
3.8. Degree of protection: (IP code)	IP20
4.7. Type of release (thermo-magnetic / electronic)	Thermo-magnetic
4.8. Integral fuses (integrally fused circuit-breakers) Type and characteristics of SCPD.....	N/A
7.3 Electromagnetic compatibility (EMC)	
Environment A or B.....	N/A
Circuit-breaker for use on phase-earthed systems.....	N/A
Circuit-breaker for use in IT systems.....	Yes
Rated and limiting values, main circuit	
- rated operational voltage: U_e (V).....	415
- rated insulation voltage: U_i (V).....	690
- rated impulse withstand voltage: U_{imp} (kV).....	6kV
- rated operational current: I_e (A).....	See page 9
- kind of current.....	AC
- conventional free air thermal current: I_{th} (A).....	See page 9
- conventional enclosed thermal current: I_{the} (A)	N/A
- current rating for four-pole circuit-breakers: (A).....	N/A
- number of poles	3
- rated frequency: (Hz)	50/60
- integral fuses (rated values)	N/A
Rated duty :	
- eight-hour duty	N/A
- uninterrupted duty: I_u (A)	See page 9
Short-circuit characteristic :	
rated short-time making capacity: I_{cm} (kA).....	N/A
rated ultimate short-circuit breaking capacity: I_{cu} (kA)	See page 9

rated service short-circuit breaking capacity: I_{cs} (kA).....:	See page 9
rated short-time withstand current: I_{cw} (kA/s).....:	N/A
Control circuits :	
Electrical control circuits :	
- kind of current: (AC, DC)	N/A
- rated frequency: (Hz)	N/A
- rated control circuit voltage: U_c (nature, frequency, V)	N/A
- rated control supply voltage: U_s (nature, frequency V)	N/A
Air supply control circuits: (pneumatic or electro-pneumatic) :	
- rated pressure and its limit ..	N/A
- volumes of air, at atmospheric pressure, required for each closing and each opening operation.....:	N/A
Auxiliary circuits :	
Rated and limiting values, auxiliary circuits.....:	
- rated operational voltage U_e (V).....:	N/A
- rated insulation voltage: U_i (V).....:	N/A
- rated operational current: I_e (A).....:	N/A
- kind of current	N/A
- rated frequency: (Hz)	N/A
- number of circuits	N/A
- number and kind of contact elements	N/A
- rated uninterrupted current: I_u (A)	N/A
- utilization category: (AC, DC, current and voltage)	N/A
Short-circuit characteristic :	
- Rated conditional short-circuit current (kA).....:	N/A
- kind of protective device	N/A




Releases :	
1) shunt release	N/A
2) Over-current release	
a) instantaneous	Yes
b) definite time delay	N/A
c) inverse time delay	Yes
- independent of previous load	N/A
- dependent on previous load; (for example thermal type release)	Yes
3) Undervoltage release (for opening)	N/A
4) Other releases	N/A
Characteristics :	
1) Shunt release and undervoltage release (for opening)	
- rated control circuit voltage: U_c (nature, frequency, V)	N/A
- kind of current	N/A
- rated frequency: (if AC)	N/A
2) Over-current release	
- rated current	See page 9
- kind of current	AC
- rated frequency: (if AC)	50/60Hz
- current setting (or range of settings)	Inverse time delay: I_n Instantaneous: $10I_n$
- time settings (or range of settings)	Inverse time delay: $1,05I_n$: $\geq 2h$, $1,30I_n$: $< 2h$ Instantaneous: $0,8 \times 10I_n$: $\geq 0,2s$, $1,2 \times 10I_n$: $< 0,2s$


Test item particulars	
Classification of installation and use.....	Installed by screws
Supply Connection	N/A
Possible test case verdicts:	
- test case does not apply to the test object	N/A
- test object does meet the requirement.....	P (Pass)
- test object does not meet the requirement.....	F (Fail)
Testing	
Date of receipt of test item.....	July 01, 2013
Date (s) of performance of tests.....	Form July 01, 2012 to October 18, 2012
General remarks:	
<p>The test results presented in this report relate only to the object tested. This report shall not be reproduced, except in full, without the written approval of the Issuing testing laboratory. "(See Enclosure #)" refers to additional information appended to the report. "(See appended table)" refers to a table appended to the report.</p> <p>Note: This TRF includes EN Group Differences together with National Differences and Special National Conditions, if any. All Differences are located in the Appendix to the main body of this TRF.</p> <p>Throughout this report a comma-(point) is used as the decimal separator.</p> <p>This test report is valid only being read together with the test reports of 130700026SHA-002</p> <p>Factory: Same as applicant.</p>	

General product information:

Ue=415V (3P), Ui=690V, Uimp=6kV, Cat. A

Rated Current (A)	415V	
	Icu (kA)	Ics (kA)
0.1~0.16	50	50
0.16~0.25	50	50
0.25~0.4	50	50
0.4~0.63	50	50
0.63~1	50	50
1~1.6	50	50
1.6~2.5	50	50
2.5~4	50	50
4~6.3	50	50
6~10	50	50
9~14	10	5
13~18	10	5
17~23	10	5
20~25	10	5
24~32	10	5

IEC 60947-2			
Clause	Requirement + Test	Result - Remark	Verdict
5.2	MARKING		
a)	The following data shall be marked on the circuit-breaker itself or on a name plate or nameplates attached to the circuit-breaker, and located in a place such that they are visible and legible when the circuit-breaker is installed.		
	- rated current:	24-32A	P
	- suitability for isolation, if applicable, with the symbol 		P
	- indication of the open and closed position: with O and I respectively, if symbols are used	I ON and O OFF	P
b)	Marking on equipment not needed to be visible after mounting:		
	- manufacturer's name or trademark		P
	- type designation or serial number	TM2	P
	- IEC 60947-2 if the manufacturer claims compliance with this standard.	IEC/EN 60947-2	P
	- utilization category	A	P
	- rated operational voltage(s) Ue	415V~	P
	- Circuit-breaker for use in IT systems: Circuit-breaker for which all values of rated voltage have not been tested according to annex H or are not covered by such testing, shall be identified by the symbol  which shall be marked on the circuit-breaker immediately following these values of rated voltage		N/A
	- value (or range) of the rated frequency and/or the indication DC (or symbol)	50/60Hz	P
	- rated service short-circuit breaking capacity, Ics	5kA	P
	- rated ultimate short-circuit breaking capacity, Icu	10kA	P
	- rated short-time withstand current, (Icw) and associated short-time delay, for utilization category B		N/A
	- line and load terminals, unless their connection is immaterial	"1L1,3L2,5L3", "2T1,4T2,6T3"	P
	- neutral pole terminals, if applicable, by the letter N		N/A
	- protective earth terminal, where applicable, by the symbol acc. 7.1.9.3 of part 1		N/A
	- ref. temperature for non-compensated thermal releases, if different from 30°C		N/A

IEC 60947-2			
Clause	Requirement + Test	Result - Remark	Verdict
c)	Marked on the circuit-breaker as specified in item b), or shall be made available in the manufacturer's published information:		
	- rated short-circuit making capacity (I _{cm}) (if higher than specified in 4.3.5.1)		N/A
	- rated insulation voltage. (U _i) if higher than the maximum rated operational voltage)	690V~	P
	- rated impulse withstand voltage (U _{imp}), when declared.	6kV	P
	- pollution degree if other than 3		N/A
	- conventional enclosed thermal current (I _{the}) if different from the rated current.		N/A
	- IP Code, where applicable:		N/A
	- minimum enclosure size and ventilation data (if any) to which marked ratings apply:		N/A
	- details of minimum distance between circuit-breaker and earthed metal parts for circuit-breaker intended for use without enclosure:		N/A
	- r.m.s sensing if applicable, according to F.4.1.1		N/A
	- suitability for environment A or B		N/A
d)	The following data concerning the opening and closing devices of the circuit-breaker shall be placed either on their own nameplates or on the nameplate of the circuit-breaker:		
	- rated control circuit voltage of the closing device, and rated frequency for AC:		N/A
	- rated control circuit voltage of the shunt release and/or of the under-voltage release, and rated frequency:		N/A
	- rated current of indirect over-current releases:		N/A
	- number and type of auxiliary contacts and kind of current, rated frequency (if AC) and rated voltages of the auxiliary switches, if different from those of the main circuit.		N/A
e)	Terminal shall be clearly and permanently identified in acc. with IEC 60445 and annex L:		
	- line terminal	"1L1,3L2,5L3"	P
	- load terminal	"2T1,4T2,6T3"	P
	- neutral pole terminal "N"		N/A
	- protective earth terminal 		N/A
	- terminal of coils (A/B)		N/A
	- terminal of shunt release (B)		N/A

IEC 60947-2			
Clause	Requirement + Test	Result - Remark	Verdict
	- terminals of under-voltage release (D)		N/A
	- terminals of interlocking electromagnets (E)		N/A
	- terminals of indicated light devices (X)		N/A
	- terminals of contact elements for switching devices (no)		N/A

7.1	CONSTRUCTION		
7.1.1	Withdrawable circuit-breaker		N/A
	In the disconnected position (main- and auxiliary circuits)		
	Isolating distances for circuit-breaker suitable for isolating warranted:		N/A
	Mechanism fitted with a reliable indicating device with indicates the position of the isolating contacts.		N/A
	Mechanism fitted with interlocks which only permit the isolating contacts to be separate or re-closed when main contacts are open		N/A
	Mechanism fitted with interlock, which only permit the main contacts to be closed when the isolating contacts are fully closed.		N/A
	Mechanism fitted with interlock, which only permit the main contacts to be closed when in disconnected position.		N/A
	The isolating distances between the isolating contacts cannot be inadvertently reduced.		N/A
7.1.2.1 part 1	Resistance to abnormal heat and fire		P
7.1.3 part 1	Current-carrying parts and their connection		P
7.1.4	Clearances and creepage distances:		
	For circuit-breakers for which the manufacturer has declared a value of rated impulse withstand voltage. (Uimp.)		
	Clearances distances:		
	- Uimp is given as:	6kV	
	- max. value of rated operational voltage to earth	-	
	- nominal voltage of supply system:	690V~	
	- overvoltage category:	III	
	- pollution degree:	3	
	- field-in or homogeneous:	Field-in	
	- minimum clearances (mm):	5,5	


IEC 60947-2			
Clause	Requirement + Test	Result - Remark	Verdict
	- measured clearances (mm);	>6 (by gauge)	P
	Creepage distances:		
	- rated insulation voltage UI (V)	690	
	- pollution degree	3	
	- comparative tracking index (V)	175	
	- material group	IIIa	
	- minimum creepage distances (mm)	10	
	- measured creepage distances (mm)	>12(by gauge)	P
7.1.5 part 1	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		P
	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	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		P
7.1.6 part 1	Indication of contact position		
7.1.6.1 part 1	Indicating means		
	When an equipment is provided with means for indicating the closed and open positions, these positions shall be unambiguous and clearly indicated		P
	This is done by means of a position indicating device (see 2.3.18)		N/A
	If symbols are used, they shall indicate the closed and open position respectively, in accordance with IEC 60417-2:		
	- 60417-2-IEC-5007 I On (power)	I ON	P

IEC 60947-2			
Clause	Requirement + Test	Result - Remark	Verdict
	- 60417-2-IEC-5007 O Off (power)	O OFF	P
	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"		P
	Red colour shall not be used for any other push-button		P
	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
7.1.7	Additional safety requirements for equipment suitable for isolation		
7.1.7.1	Additional constructional requirements for equipment suitable for isolation ($U_e > 50$ V):		
	Equipment suitable for isolation shall provide in the open position an isolation distance in acc. with the requirements necessary to satisfy the isolating function. Indication of the main contacts shall be provide by one or more of the following means:		
	- the position of the actuator		P
	- a separate mechanical indicator		N/A
	- visibility of the moving contacts		N/A
	When means are provided or to lock the equipment in the open position, locking only be possible when contacts are in the open position		N/A
	Actuator front-plate fitted to the equipment in a manner which ensures correct contact position indication and locking		P
	The indicated open position is the only position in which the specified isolation distances between the contacts is ensured.		P
	- minimum clearances across open contacts (see Table XIII, Part 1) (mm) :	5,5	
	- measured clearances (mm) :	>6 (by gauge)	P
	- test U_{imp} across gap (kV) :	12,3	P

IEC 60947-2			
Clause	Requirement + Test	Result - Remark	Verdict
7.1.7.2	Supplementary requirements for equipment with provision for electrical interlocking with contactors or circuit-breakers:		
	auxiliary switch shall be rated according to IEC 60 947-5-1		N/A
	If equipment suitable for isolation is provided with an auxiliary switch for the purpose of electrical interlocking with contactor (s) or circuit-breaker(s) and intended to be used in motor circuits, the following requirements shall apply unless the equipment is rated for AC-23 utilization category		N/A
	The time interval between the opening of the contacts of the auxiliary switch and the contacts of the main poles shall be sufficient to ensure that the associated contactor or circuit-breaker interrupts the current before the main poles of the equipment open		N/A
	Unless otherwise stated in the manufacturer's technical literature, the time interval shall be not less than 20 ms when the equipment is operated according to the manufacturer instructions		N/A
	Compliance shall be verified by measuring the time interval between the instant of opening of the auxiliary switch and the instant of opening of the main poles under no-load conditions when the equipment is operated according to the manufacturer's instructions		N/A
	During the closing operation the contacts of the auxiliary switch shall close after or simultaneously with the contacts of the main poles		N/A
	A suitable opening time interval may also be provided by an intermediate position (between the ON and OFF position) at which the interlocking contact(s) is (are) open and the main poles remain closed		N/A
7.1.7.3	Supplementary requirements for equipment provided with means for padlocking the open position:		
	the locking means shall be designed in such a way that it cannot be removed with the appropriate padlock(s) installed		N/A
	Alternatively, the design may provide padlockable means to prevent access to the actuator		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

IEC 60947-2			
Clause	Requirement + Test	Result - Remark	Verdict
7.1.8	Terminals		
7.1.8.1	All parts of terminals which maintain contact and carry current shall be of metal having adequate mechanical strength		P
	Terminal connections shall be such that necessary contact pressure is maintained		P
	Terminals shall be so constructed that the conductor is clamped between suitable surfaces without damage to the conductor and terminal		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		P
7.1.8.2	Connection capacity		
	type of conductors :	Rigid-solid or stranded or flexible cable	P
	minimum cross-sectional area of conductor (mm ²) :	1,0	P
	maximum cross-sectional area of conductor (mm ²) :	6,0	P
	number of conductors simultaneously connectable to the terminal :	2 for 1,0mm ² 2 for 6,0mm ²	P
7.1.8.3	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
7.1.8.4	Terminal identification and marking		
	terminal intended exclusively for the neutral conductor		N/A
	protective earth terminal		N/A
	other terminals	"1L1,3L2,5L3", "2T1,4T2,6T3"	P
7.1.9 part 1	Additional requirements for equipment provided with a neutral pole		
	When equipment is provided with a pole intended only for connecting the neutral, this pole shall be clearly identified to that effect by the letter N (see 7.1.7.4.).		N/A
	A switched neutral pole shall break not before and shall make not after the other poles		N/A
	For equipment having a value of conventional thermal current (free air or enclosed, see 4.3.2.1 and 4.3.2.2) not exceeding 63 A, this value shall be identical for all poles		N/A

IEC 60947-2			
Clause	Requirement + Test	Result - Remark	Verdict
	For higher conventional thermal current values, the neutral pole may have a value of conventional thermal current different from that of the other poles, but not less than half that value or 63 A, whichever is the higher		N/A
	if a pole with an appropriate making and breaking capacity is used as a neutral pole, then all poles, incl. the neutral pole, shall operate substantially together.		N/A
7.1.10	Provisions for protective earthing		
7.1.10.1	The exposed conductive parts (e.g. chassis, framework and fixed parts of metal enclosures) other than those which cannot constitute a danger shall be electrically interconnected and connected to a protective earth terminal for connection to an earth electrode or to an external protective conductor		N/A
part 1	This requirement can be met by the normal structural parts providing adequate electrical continuity and applies whether the equipment is used on its own or incorporated in an assembly		N/A
	Exposed conductive parts are considered not to constitute a danger if they cannot be touched on large areas or grasped with the hand or if they are of small size (approximately 50 mm x 50 mm) or are so located as to exclude any contact with live parts		N/A
7.1.10.2 part 1	Protective earth terminal		
	The protective earth terminal shall be readily accessible and so placed that the connection of the equipment to the earth electrode or to the protective conductor is maintained when the cover or any other removable part is removed		N/A
	The protective earth terminal shall be suitably protected against corrosion		N/A
	In the case of equipment with conductive structures, enclosures, etc., means shall be provided, if necessary, to ensure electrical continuity between the exposed conductive parts the equipment and the metal sheathing of connecting conductors		N/A
	The protective earth terminal shall have no other function, except when it is intended to be connected to a PEN conductor (see 2.1.1.5 – Note). In this case, it shall also have the function of a neutral terminal in addition to meeting the requirements applicable to the protective earth terminal		N/A
7.1.10.3	Protective earth terminal marking and identification		
	The protective earth terminal shall be clearly and permanently identified by its marking		N/A

IEC 60947-2			
Clause	Requirement + Test	Result - Remark	Verdict
	The identification shall be achieved by colour (green-yellow mark) or by the notation PE, or PEN, as applicable, in accordance with IEC 60445, subclause 5.3, or, in the case of PEN, by a graphical symbol for use on equipment		N/A
	Graphical symbol to be used: 60417-2-IEC-5019  Protective earth (ground) in accordance with IEC 60417-2		N/A
7.1.11	Enclosure for equipment		
7.1.11.1	Design		
	The enclosure, when it is opened, all parts requiring access for installation and maintenance are readily accessible		N/A
	Sufficient space shall be provided inside the enclosure		N/A
	The fixed parts of a metal enclosure shall be electrically connected to the other exposed conductive parts of the equipment and connected to a terminal which enables them to be earthed or connected to a protective conductor		N/A
	Under no circumstances shall a removable metal part of the enclosure be insulated from the part carrying the earth terminal when the removable part is in place		N/A
	The removable parts of the enclosure shall be firmly secured to the fixed parts by a device such that they cannot be accidentally loosened or detached owing to the effects of operation of the equipment or vibrations		N/A
	When an enclosure is so designed as to allow the covers to be opened without the use of tools, means shall be provided to prevent loss of the fastening devices		N/A
	If the enclosure is used for mounting push-buttons, it shall not be possible to remove the buttons from the outside of the enclosure		N/A
7.1.11.2	Insulation		
	If, in order to prevent accidental contact between a metallic enclosure and live parts, the enclosure is partly or completely lined with insulating material, then this lining shall be securely fixed to the enclosure		N/A
7.1.12	Degree of protection of enclosed equipment		
	Degree of protection.	IP20 (After normal installation)	
	Test for first characteristic.	IP2X	

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Clause	Requirement + Test	Result - Remark	Verdict
	Test for first numeral	1 2 3 4 5 6	N/A P N/A N/A N/A N/A
	Test for second characteristic	IPXX	
	Test for second numeral	1 2 3 4 5 6 7 8	N/A N/A N/A N/A N/A N/A N/A N/A
7.1.13 part 1	Conduit pull-out, torque and bending with metallic conduits		
	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		N/A
7.2	Performance requirements		
7.2.1	Operating condition		
7.2.1.1	Closing		
	For a circuit-breaker to be closed safely on to the making current corresponding to its rated short-circuit making capacity, it is essential that it should be operated with the same speed and the same firmness as during the type test for proving the short-circuit making capacity		P
7.2.1.1.1	Dependent manual closing		
	For a circuit-breaker having a dependent manual closing mechanism, it is not possible to assign a short-circuit making capacity rating irrespective of the conditions of mechanical operation		N/A
	Such a circuit-breaker should not be used in circuits having a prospective peak making current exceeding 10 kA		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	However, this does not apply in the case of a circuit-breaker having a dependent manual closing mechanism and incorporating an integral fast-acting opening release which causes the circuit-breaker to break safely, irrespective of the speed and firmness with which it is closed on to prospective peak currents exceeding 10 kA; in this case, a rated short-circuit making capacity can be assigned		N/A
7.2.1.1.2	Independent manual closing		
	A circuit-breaker having an independent manual closing mechanism can be assigned a short-circuit making capacity rating irrespective of the conditions of mechanical operation		P
7.2.1.1.3	Dependent power closing		
	At 110% of the rated control supply voltage, the closing operation performed on no-load shall not cause any damage to the circuit-breaker.		N/A
	At 85% of the rated control supply voltage, the closing operation shall be performed when the current established by the circuit-breaker is equal to its rated making capacity within the limits allowed by the operation of its relays or releases and, if a maximum time is stated for the closing operation, in a time not exceeding this maximum time limit.		N/A
7.2.1.1.4	Independent power closing		
	A circuit-breaker having an independent power closing operation can be assigned a rated short-circuit making capacity irrespective of the conditions of power closing		N/A
	Means for charging the operating mechanism, as well as the closing control components, shall be capable of operating in accordance with the manufacturer's specification		N/A
7.2.1.1.5	Stored energy closing		
	Capable ensuring closing of the circuit-breaker in any condition between no-load and its rated making capacity		N/A
	- when the stored energy is retained within the circuit-breaker, a device is provided which indicates when the storing mechanism is fully charged.		N/A
	- means for charging the operating mechanism and closing control components operates when auxiliary supply voltage is between 85% and 110% of the rated control supply voltage.		N/A
	- not possible for the moving contacts to move from the open position, unless the charge is sufficient for satisfactory completion of the closing operation.		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	- by manually operated circuit-breaker is the direction of operation indicated. (not for circuit-breaker with an independent manual closing operation.)		N/A
	- For trip free circuit-breaker it shall not be possible to maintain the contacts in the touching or closed position when the release is in the position to trip the circuit-breaker.		N/A
7.2.1.2	Opening		
7.2.1.2.1	Circuit-breakers which open automatically shall be trip-free and, unless otherwise agreed between manufacturer and user, shall have their energy for the tripping operation stored prior to the completion of the closing operation		
7.2.1.2.2	Opening by undervoltage releases		
7.2.1.3. a part 1	Operating voltage		
	An under-voltage relay or release, when associated with a switching device, shall operate to open the equipment even on a slowly falling voltage within the range between 70% and 35% of its rated voltage		P
	An under-voltage relay or release shall prevent the closing of the equipment when the supply voltage is below 35% of the rated voltage of the relay or release; it shall permit closing of the equipment at supply voltages equal to or above 85% of its rated value		P
	Unless otherwise stated in the relevant product standard, the upper limit of the supply voltage shall be 110% of its rated value		P
7.2.1.3. b part 1	Operating time		
	For a time-delay under-voltage relay or release, the time-lag shall be measured from the instant when the voltage reaches the operating value until the instant when the relay or release actuates the tripping device of the equipment		N/A
7.2.1.2.3	Opening by shunt releases		P
7.2.1.4 part 1	Limits of operation of shunt releases		
	A shunt release for opening shall cause tripping under all operating conditions of an equipment when the supply voltage of the shunt release measured during the tripping operation remains between 70% and 110% of the rated control supply voltage and, if a.c., at the rated frequency		P

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Clause	Requirement + Test	Result - Remark	Verdict
7.2.1.5 part 1	Limits of operation of current operated relays and released		
	Limits of operation of current operated relays and releases shall be stated in the relevant product standard		N/A
7.2.1.2.4	Opening by over-current releases		
a)	Opening under short-circuit conditions		
	The short-circuit release shall cause tripping of the circuit-breaker with an accuracy of 20% of the tripping current value of the current setting for all values of the current setting of the short-circuit current release		P
	Where necessary for over-current co-ordination the manufacturer shall provide information (usually curves) showing		N/A
	- maximum cut-off (let-through) peak current as a function of prospective current (r.m.s. symmetrical)		N/A
	- I^2t characteristics for circuit-breakers of utilization category A and, if applicable, B for circuit-breakers with instantaneous override (see note to 8.3.5)		N/A
b)	Opening under overload conditions		
1)	Instantaneous or definite time-delay operation		N/A
	The release shall cause tripping of the circuit-breaker with an accuracy of $\pm 10\%$ of the tripping current value of the current setting for all values of current setting of the overload release		N/A
2)	Inverse time-delay operation		
	At the reference temperature and at 1,05 times the current setting with the conventional non-tripping current, the opening release being energized on all poles, tripping shall not occur in less than the conventional time from the cold state, i.e. with the circuit-breaker at the reference temperature		P
	Moreover, when at the end of the conventional time the value of current is immediately raised to 1,30 times the current setting, i.e. with the conventional tripping current, tripping shall then occur in less than the conventional time later		P
	If a release is declared by the manufacturer as substantially independent of ambient temperature, the current values of table 6 shall apply within the temperature band declared by the manufacturer, within a tolerance of 0,3%/K		N/A
	The width of the temperature band shall be at least 10 K on either side of the reference temperature		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
7.2.4.2	Operational performance capability		
7.2.4.2 part 1	The operational performance off-load for which the tests are made with the control circuits energized and the main circuit not energized, in order to demonstrate that the equipment meets the operating conditions specified at the upper and lower limits of supply voltage and/or pressure specified for the control circuit during closing and opening operations		N/A
	The operational performance on-load during which the equipment shall make and break the specified current corresponding, where relevant, to its utilization category for the number of operations stated in the relevant product standard		P
8	TESTS		
8.2.4	Mechanical properties of terminals		
	Mechanical strength of terminals		
	maximum cross-sectional area of conductor (mm ²) :	6,0	
	diameter of thread (mm) :	3,9	
	torque (Nm) :	1,2	
	5 times on 2 separate clamping units		P
	Testing for damage to and accidental loosening of conductor (flexion test)		
	conductor of the smallest cross-sectional area (mm ²) :	1,0	
	number of conductors of the smallest cross section :	2	
	diameter of bushing hole (mm) :	6,5	
	height between the equipment and the platen :	260	
	mass at the conductor(s) (kg) :	0,4	
	135 continuous revolutions: the conductor shall neither slip out of the terminal nor break near the clamping unit		P
	Pull-out test		
	force (N) :	35	
	1 min, the conductor shall neither slip out of the terminal nor break near the clamping unit		P
	conductor of the largest cross-sectional area (mm ²) :	6,0	
	number of conductors of the largest cross section :	2	
	diameter of bushing hole (mm) :	9,5	
	height between the equipment and the platen :	280	

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Clause	Requirement + Test	Result - Remark	Verdict
	mass at the conductor(s) (kg) :	1,4	
	135 continuous revolutions: the conductor shall neither slip out of the terminal nor break near the clamping unit		P
	Pull-out test		
	force (N) :	80	
	1 min, the conductor shall neither slip out of the terminal nor break near the clamping unit		P
	conductor of the largest and smallest cross-sectional area (mm ²) :	6,0 / 1,0	
	number of conductors of the smallest cross section, number of conductors of the largest cross section :	2 / 2	
	diameter of bushing hole (mm) :	9,5 / 6,5	
	height between the equipment and the platen :	280 / 260	
	mass at the conductor(s) (kg) :	1,4 / 0,4	
	135 continuous revolutions: the conductor shall neither slip out of the terminal nor break near the clamping unit		P
	Pull-out test		
	force (N) :	80 / 35	
	1 min, the conductor shall neither slip out of the terminal nor break near the clamping unit		P

8.3.3	TEST SEQUENCE I: GENERAL PERFORMANCE CHARACTERISTICS - 1 sample: 3P, 24-32A		
8.3.3.1	Tripping limits and characteristic		
8.3.3.1.2	Opening under short-circuit conditions		
	Manufacturer's name or trademark	ELMARK	
	Type designation or serial number	TM2	
	Sample no:	I-1	
	Rated operational voltage: U _e (V)	415	
	Rated current: I _n (A)	32	
	Ambient temperature 10-40 °C :	27	P
	Value of the tripping current declared by the manufacturer for a single pole, at which value they shall operate.	10I _n	P

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Clause	Requirement + Test	Result - Remark	Verdict
	Range of adjustable setting current. (A)		N/A
	Time delay stated by the manufacturer, in the case of definite time delay releases.		N/A
	Electromagnetic overcurrent releases		
	Test current: 80% of the rated , or Maximum adjustable setting current: (A)	257	P
	Operating time: >0,2s in case of instantaneous releases: L1-L2: L1-L3: L2-L3: N-Lx:	>0,2s >0,2s >0,2s	P
	Operating time: > twice time delay stated by the manufacturer, in the case of definite time delay releases: L1-L2: L1-L3: L2-L3: N-Lx:		N/A
	Test current: 120% of the rated , or Maximum adjustable setting current: (A)	385	P
	Operating time: <0,2s in case of instantaneous releases: L1-L2: L1-L3: L2-L3: N-Lx:	34ms 31ms 35ms	P
	Operating time: < twice time delay stated by the manufacturer, in the case of definite time delay releases: L1-L2: L1-L3: L2-L3: N-Lx:		N/A
	Test current: 80% of the Minimum adjustable setting current: (A)	193	P
	Operating time: >0,2s in case of instantaneous releases: L1-L2: L1-L3: L2-L3: N-Lx:	>0,2s >0,2s >0,2s	P
	Operating time: > twice time delay stated by the manufacturer, in the case of definite time delay releases: L1-L2: L1-L3: L2-L3: N-Lx:		N/A
	Test current: 120% of the Minimum adjustable setting current: (A)	289	P

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Clause	Requirement + Test	Result - Remark	Verdict
	Operating time: <0,2s in case of instantaneous releases: L1-L2: L1-L3: L2-L3: N-Lx:	30ms 29ms 27ms	P
	Operating time: < twice time delay stated by the manufacturer, in the case of definite time delay releases: L1-L2: L1-L3: L2-L3: N-Lx:		N/A
	Test current: tripping current declared for single pole operation (A)	385 (Max)	P
	Operating time: < 0,2 s in case of instantaneous release: L1: L2: L3: N:	21ms 24ms 22ms	P
	Operating time: < twice time delay stated by manufacturer in case of definite time delay releases L1: L2: L3: N:		N/A
	Test current: tripping current declared for single pole operation (A)	289 (Min)	P
	Operating time: < 0,2 s in case of instantaneous release: L1: L2: L3: N:	20ms 19ms 20ms	P
	Operating time: < twice time delay stated by manufacturer in case of definite time delay releases L1: L2: L3: N:		N/A
	Electronic overcurrent releases		
	For circuit-breakers with an electronic overcurrent release, the operation of the short-circuit releases shall be verified by one test only on each pole individually.		N/A
	Test current: 80% of the rated, or minimum adjustable setting current: (A)		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Operating time: >0,2s in case of instantaneous releases: L1: L2: L3: N:		N/A
	Operating time: > twice time delay stated by the manufacturer, in the case of definite time delay releases: L1: L2: L3: N:		N/A
	Test current: 120% of the rated, or minimum adjustable setting current: (A)		N/A
	Operating time: <0,2s in case of instantaneous releases: L1: L2: L3: N:		N/A
	Operating time: < twice time delay stated by the manufacturer, in the case of definite time delay releases: L1: L2: L3: N:		N/A
	Test current: 80% of the maximum adjustable setting current: (A)		N/A
	Operating time: >0,2s in case of instantaneous releases: L1: L2: L3: N:		N/A
	Operating time: > twice time delay stated by the manufacturer, in the case of definite time delay releases: L1: L2: L3: N:		N/A
	Test current: 120% of the maximum adjustable setting current: (A)		N/A
	Operating time: <0,2s in case of instantaneous releases: L1: L2: L3: N:		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Operating time: < twice time delay stated by the manufacturer, in the case of definite time delay releases: L1: L2: L3: N:		N/A
8.3.3.1.3	Opening under overload conditions		
a)	Instantaneous or definite time-delay releases		
	Manufacturer's name or trademark		
	Type designation or serial number		
	Sample no:		
	Rated operational voltage: U_e (V)		
	Rated current: I_n (A)		
	Ambient temperature 10-40 °C :		N/A
	Value of the tripping current declared by the manufacturer for a single pole, at which value they shall operate.		N/A
	Range of adjustable setting current. (A)		N/A
	Time delay stated by the manufacturer, in the case of definite time delay releases.		N/A
	Test current: 90% of the rated, or minimum adjustable setting current. (A)		N/A
	Operating time: >0,2s in case of instantaneous releases:		N/A
	Operating time: > twice time delay stated by the manufacturer, in the case of definite time delay releases.		N/A
	Test current: 90% of the maximum adjustable setting current. (A)		N/A
	Operating time: >0,2s in case of instantaneous releases		N/A
	Operating time: > twice time delay stated by the manufacturer, in the case of definite time delay releases.		N/A
	Test current: 110% of the rated, or minimum adjustable setting current. (A) circuit-breaker with neutral pole: 1,2x110% (A)		N/A
	Operating time: <0,2s in case of instantaneous releases:		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Operating time: < twice time delay stated by the manufacturer, in the case of definite time delay releases		N/A
	Test current: 110% of the maximum adjustable setting current (A) circuit-breaker with neutral pole: 1,2x110% (A)		N/A
	Operating time: <0,2s in case of instantaneous releases		N/A
	Operating time: < twice time delay stated by the manufacturer, in the case of definite time delay releases.		N/A
b)	Inverse time delay releases		
	Manufacturer's name or trademark	ELMARK	
	Type designation or serial number	TM2	
	Sample no:	I-1	
	Rated operational voltage: Ue (V)	415	
	Rated current: In (A)	32	
	For releases dependent of ambient air temperature: Reference temperature		P
	Test ambient temperature (°C)	31	P
	For releases dependent on ambient air temperature, the operating characteristics shall be verified at the reference temperature, the release being energized on all phase poles. If the test made at a different ambient temperature, a correction shall be made in accordance with the manufacturer's correction temperature/current data		P
	For thermal-magnetic releases independent of ambient temperature Tests shall be made at 30°C and 20°C or 40°C, the release being energized on all phase poles		N/A
	For electronic releases, the operating characteristic shall be verified at the ambient temperature of the test room (see 6.1.1 of IEC 60947-1), the release being energised on all phase poles.		N/A
	Test ambient air temperature:	31	P
	Range of adjustable setting current: (A)	24~32	P
	Releases, dependent of ambient air temperature: Reference temperature (°C)	31	P
	Thermal Magnetic releases, independent of ambient air temperature: at 30°C		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Test current: 105% of the rated , or minimum adjustable setting current: (A)	25,2	P
	Conventional non-tripping time: 1h when $I_n < 63A$, 2h when $I_n > 63 A$	>1h	P
	Test current: 130% of the rated , or minimum adjustable setting current: (A)	31,2	P
	For circuit-breakers having an identified neutral pole provided with an overload release (see 8.3.3.1.1), the test current at the conventional tripping current shall be multiplied by the factor 1,2.		N/A
	Conventional tripping time: <1h when $I_n < 63A$, <2h when $I_n > 63 A$	34s	P
	Test current: 105% of the maximum adjustable setting current: (A)	33,6	P
	Conventional non-tripping time: 1h when $I_n < 63A$, 2h when $I_n > 63 A$	>1h	P
	Test current: 130% of the maximum adjustable setting current: (A)	41,6	P
	For circuit-breakers having an identified neutral pole provided with an overload release (see 8.3.3.1.1), the test current at the conventional tripping current shall be multiplied by the factor 1,2.		N/A
	Conventional tripping time: <1h when $I_n < 63A$, <2h when $I_n > 63 A$	10min13s	P
	Thermal Magnetic releases, independent of ambient air temperature: at 20°C or 40°C		
	Test ambient air temperature:		N/A
	Test current: 105% of the rated, or minimum adjustable setting current: (A)		N/A
	Conventional non-tripping time: 1h when $I_n < 63A$, 2h when $I_n > 63 A$		N/A
	Test current: 130% of the rated, or minimum adjustable setting current: (A)		N/A
	For circuit-breakers having an identified neutral pole provided with an overload release (see 8.3.3.1.1), the test current at the conventional tripping current shall be multiplied by the factor 1,2.		N/A
	Conventional tripping time: <1h when $I_n < 63A$, <2h when $I_n > 63 A$		N/A
	Test current: 105% of the maximum adjustable setting current: (A)		N/A
	Conventional non-tripping time: 1h when $I_n < 63A$, 2h when $I_n > 63 A$		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Test current: 130% of the maximum adjustable setting current (A)		N/A
	For circuit-breakers having an identified neutral pole provided with an overload release (see 8.3.3.1.1), the test current at the conventional tripping current shall be multiplied by the factor 1,2.		N/A
	Conventional tripping time: <1h when $I_n < 63A$, <2h when $I_n > 63 A$		N/A
	An additional test, at a current specified by the manufacturer to verify the time/current characteristic of the releases conform to the curves provided by the manufacturer		
	Releases, dependent of ambient air temperature: Reference temperature (°C)		N/A
	Releases, independent of ambient air temperature: at 30°C		N/A
	Test ambient air temperature:		N/A
	Test current: at current specified by the manufacturer to verify the time/current characteristic of the releases conform to the curves provided by the manufacturer. % at the rated, or minimum adjustable setting current (% or A)		N/A
	Tripping time acc. time/current characteristic of the releases conform to the curves provided by the manufacturer. (within the stated tolerances)		N/A
	Releases, independent of ambient air temperature: at 20°C or 40°C		
	Test ambient air temperature:		N/A
	Test current: at current specified by the manufacturer to verify the time/current characteristic of the releases conform to the curves provided by the manufacturer. % at the rated, or minimum adjustable setting current (% or A)		N/A
	Tripping time acc. time/current characteristic of the releases conform to the curves provided by the manufacturer. (within the stated tolerances)		N/A
8.3.3.1.4	Additional test for definite time-delay releases		
a)	Time delay		
	Test is made at a current equal to 1,5 times the current setting. If the test current overlaps with another tripping characteristic (e.g. an instantaneous tripping characteristic), the trip setting and the test current shall be reduced as necessary to prevent premature tripping.		
	<u>overload releases</u> : (all phase poles loaded)		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	for circuit-breakers having an identified neutral pole provided with an overload release, the test current for this release shall be 1,5 times the current setting;		N/A
	<u>short-circuit releases</u>		N/A
	Electromagnetic release: two poles in series carrying the test current, using successively all possible combinations of poles having a short-circuit release.		N/A
	Electronic releases: on one pole chosen at random.		N/A
	Test current: 1,5 times of the rated, or minimum adjustable setting current: (A)		N/A
	Operating time, <u>overload releases</u> : (s)		N/A
	Time-delay: between the limits stated by the manufacturer:		N/A
	Operating time, <u>short-circuit releases (electromagnetic)</u> : (s) L1-L2: L1-L3: L2-L3:		N/A
	Time-delay: between the limits stated by the manufacturer:		N/A
	Operating time, <u>short-circuit releases (electronic)</u> : (s) L1: L2: L3:		N/A
	Time-delay: between the limits stated by the manufacturer:		N/A
	Test current: 1,5 times of the maximum adjustable setting current: (A)		N/A
	Operating time, <u>overload releases</u> : (s)		N/A
	Time-delay: between the limits stated by the manufacturer:		N/A
	Operating time, <u>short-circuit releases (electromagnetic)</u> : (s) L1-L2: L1-L3: L2-L3:		N/A
	Time-delay: between the limits stated by the manufacturer:		N/A
	Operating time, <u>short-circuit releases (electronic)</u> : (s) L1: L2: L3:		N/A
	Time-delay: between the limits stated by the manufacturer:		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
b)	Non-tripping duration		
	Firstly, the test current equal to 1,5 times the current setting is maintained for a time interval equal to the non-tripping duration stated by the manufacturer.		
	Then, the current is reduced to the rated current and maintained at this value for twice the time-delay stated by the manufacturer. The circuit-breaker shall not trip.		
	<u>overload releases</u> : (all phase poles loaded)		N/A
	for circuit-breakers having an identified neutral pole provided with an overload release, the test current for this release shall be 1,5 times the current setting;		N/A
	<u>short-circuit releases</u>		N/A
	Electromagnetic release: two poles in series carrying the test current, using successively all possible combinations of poles having a short-circuit release.		N/A
	Electronic releases: on one pole chosen at random.		N/A
	Test current: 1,5 times of the minimum adjustable setting current: (A)		N/A
	non-tripping duration stated by the manufacturer for overload release: (s)		N/A
	non-tripping duration stated by the manufacturer for short-circuit release thermal magnetic: (s)		N/A
	non-tripping duration stated by the manufacturer for short-circuit release electronic: (s)		N/A
	Time duration of current when reduced to the rated current: shall be twice the delay-time stated by the manufacturer: (s)		N/A
	Rated current		N/A
	Operating time, <u>overload releases</u> : the circuit-breaker does not trip:		N/A
	Operating time, <u>short-circuit releases</u> (electromagnetic), shall not trip: (s)	L1-L2: L1-L3: L2-L3:	N/A
	Operating time, <u>short-circuit releases</u> (electronic), shall not trip: (s)	L1: L2: L3:	N/A
	Test current: 1,5 times of maximum adjustable setting current: (A)		N/A
	non-tripping duration stated by the manufacturer for overload release: (s)		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	non-tripping duration stated by the manufacturer for short-circuit release thermal magnetic: (s)		N/A
	non-tripping duration stated by the manufacturer for short-circuit release electronic: (s)		N/A
	Time duration of current when reduced to the rated current: shall be twice the delay-time stated by the manufacturer: (s)		N/A
	Rated current		N/A
	Operating time, <u>overload releases</u> : the circuit-breaker does not trip:		N/A
	Operating time, <u>short-circuit releases (electromagnetic), shall not trip</u> : (s) L1-L2: L1-L3: L2-L3:		N/A
	Operating time, <u>short-circuit releases (electronic), shall not trip</u> : (s) L1: L2: L3:		N/A
8.3.3.2	Test of dielectric properties, impulse withstand voltage (Uimp indicated):		
8.3.3.4 part1	The 1,2/50µs impulse voltage shall be applied five times for each polarity at intervals of 1s minimum		
	- rated impulse withstand voltage (kV) :	6	P
	- sea level of the laboratory	5	P
	- test Uimp main circuits (kV) :	9,8	P
	- test Uimp auxiliary circuits (kV) :		N/A
	- test Uimp control circuits (kV) :	9,8	P
	- test Uimp on open main contacts (equipment suitable for isolating) (kV) :	12,3	P
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		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	- exposed conductive parts		N/A
	- enclosure of mounting plate		N/A
	iv) equipment suitable for isolation		P
	equipment not suitable for isolation		N/A
	- no unintentional disruptive discharge during the test's		P
	Test of dielectric properties, dielectric withstand voltage (Uimp not indicated):		
	- rated insulation voltage (V) :	690	P
	- main circuits, test voltage for 1 min (V)	1890	P
	- auxiliary circuits, test voltage for 1 min (V)		N/A
	- control circuits, test voltage for 1 min (V)	1890	P
8.3.3.2.2	Application of test voltage		
1)	with circuit-breaker in the closed position		
	- between all live parts of all poles connected together and the frame of the circuit-breaker .		P
	- between each pole and all the other poles connected to the frame of the circuit-breaker		P
2)	with the circuit-breaker in the open position and, additionally, in the tripped position, if any.		
	- between all live parts of all poles connected together and the frame of the circuit-breaker.		P
	- between the terminals of one side connected together and the terminals of the other side connected together.		P
b)	Control and auxiliary circuits		
1)	- between all the control and auxiliary circuits which are not normally connected to the main circuit, connected together, and the frame of the circuit-breaker.		P
2)	- where appropriate, between each part of the control an auxiliary circuits which may be isolated from the other parts during normal operation and all the other parts connected together.		N/A
	No unintentional disruptive discharge during the tests		P
8.3.3.2	For circuit-breaker 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 0,5mA.	457V 20,7x10 ⁻³ mA(maximum)	P

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Clause	Requirement + Test	Result - Remark	Verdict
8.3.3.3	Mechanical operation and operational performance capability		
8.3.3.3.2	Construction and mechanical operation		
a)	Construction		
	A withdrawable circuit-breaker shall be checked for the requirements stated in 7.1.1		N/A
	A circuit-breaker with stored energy operation shall be checked for compliance with 7.2.1.1.5, regarding the charge indicator and the direction of operation of manual energy storing		N/A
b)	Mechanical operation		
	A circuit-breaker with dependent power operation shall comply with the requirements stated in 7.2.1.1.3		N/A
	A circuit-breaker with dependent power operation shall operate with the operating mechanism charged to the minimum and maximum limits stated by the manufacturer		N/A
	A circuit-breaker with stored energy operation shall comply with the requirements stated in 7.2.1.5 with the auxiliary supply voltage at 85% and 110% of the rated control supply voltage.		N/A
	It shall also be verified that the moving contacts cannot be moved from the open position when the operating mechanism is charged to slightly below the full charge as evidenced by the indicating device		N/A
	For a trip-free circuit-breaker it shall not be possible to maintain the contacts in the touching or closed position when the tripping release is in the position to trip the circuit-breaker		N/A
	If the closing and opening times of a circuit-breaker are stated by the manufacturer, such times shall comply with the stated values		N/A
c)	Undervoltage releases		
	Undervoltage releases shall comply with the requirements of 7.2.1.3 of Part 1. For this purpose, the release shall be fitted to a circuit-breaker having the maximum current rating for which the release is suitable		N/A
i)	Drop out voltage		
	It shall be verified that the release operates to open the circuit-breaker between the voltage limits specified		N/A
	The voltage shall be reduced from rated voltage at a rate to reach 0 V in approximately 30 s		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	The test for the lower limit is made without current in the main circuit and without previous heating of the release coil		N/A
	In the case of a release with a range of rated voltages, this test applies to the maximum voltage of the range		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 of the circuit-breaker		N/A
	This test may be combined with the temperature-rise test of 8.3.3.5		N/A
	In the case of a release with a range of rated voltages, this test is made at both the minimum and maximum rated control supply voltages		N/A
ii)	Test for limits of operation		
	Starting with the circuit-breaker open, at the temperature of the test room, and with the supply voltage at 30% rated maximum control supply voltage, it shall be verified that the circuit-breaker cannot be closed by the operation of the actuator		N/A
	When the supply voltage is raised to 85% of the minimum control supply voltage, it shall be verified that the circuit-breaker can be closed by the operation of the actuator		N/A
iii)	Performance under overvoltage conditions		
	With the circuit-breaker closed and without current in the main circuit, it shall be verified that the undervoltage release will withstand the application of 110% rated control supply voltage for 4 h without impairing its functions		N/A
d)	Shunt releases		
	Shunt releases shall comply with the requirements of 7.2.1.4 of Part 1. For this purpose, the release shall be fitted to a circuit-breaker having the maximum rated current for which the release is suitable		N/A
	It shall be verified that the release will operate to open the circuit-breaker at 70% rated control supply voltage when tested at an ambient temperature of $+55\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$ without current in the main poles of the circuit-breaker		N/A
	In the case of a release having a range of rated control supply voltages, the test voltage shall be 70% of the minimum rated control supply voltage		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
8.3.3.3.3	Operational performance capability without current.		
	Type designation or serial number	TM2	
	Sample no.	I-1	
	Rated current I_n (A)	32	
	Rated operational voltage: U_e (V)	415	
	Rated control supply voltage of closing mechanism: U_c (V)	-	
	Rated control supply voltage of shunt releases: U_c (V)	-	
	Rated control supply voltage undervoltage releases: U_c (V)	-	
	Ambient temperature 10-40 °C :	24	P
	Number of operating cycles per hour	120	P
	Number of cycles without current (total) (closing mechanism energized at the rated U_c)		N/A
	Number of cycles without current (without releases)	8500	P
	Applied voltage: closing mechanism (V)		N/A
	10% of total cycles for circuit-breaker with fitted shunt release: (50% at the beginning- and 50% at the end of the test.) Energized at the rated U_c		N/A
	Applied voltage: shunt releases (V)		N/A
	10% of total cycles for circuit-breaker with undervoltage releases: (50% at the beginning- and 50% at the end of the test.) Energized at the minimum rated U_c		N/A
	10 cycles without applied voltage at the undervoltage releases. (Shall not possible to close the circuit-breaker.)		N/A
	Applied voltage: undervoltage releases (V)		N/A
	Electrical components do not exceed the value indicated in tab. 7,		N/A
8.3.3.3.4	Operational performance capability with current.		
	Rated current: I_n (A)	32	
	Maximum rated operational voltage: U_e (V)	415	
	Conductor cross-sectional area (mm ²) :	6,0	P
	Number of operating cycles per hour	120	P

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Clause	Requirement + Test	Result - Remark	Verdict
	Number of cycles with current (total) (closing mechanism energized at the rated U_c)	1500	P
	Applied voltage: closing mechanism (V)		N/A
	For circuit-breaker fitted with adjustable releases, test shall be made with the overload setting at maximum and short-circuit setting at minimum.		P
	Conditions, make/break operations:		
	- test voltage $U/U_e = 1,0$ (V) L1:	418	P
	..... L2:	418	
	..... L3:	418	
	- test current $I/I_e = 1,0$ (A) L1:	32,8	P
	..... L2:	32,8	
	..... L3:	32,8	
	- power factor/time constant:	0,81	P
	- frequency: (Hz)	50	P
	- on-time (ms):	<2s	P
	- off-time (s):	30	P
	Electrical components do not exceed the value indicated in tab. 7.		P
8.3.3.3.5	Additional test of operational performance capability without current for withdrawable circuit-breaker.		
	Number of operations cycles : 100		N/A
	After test, the isolating contacts, withdrawable mechanism and interlocks shall be suitable for further service.		N/A
8.3.3.4	Overload performance		
	this test applies to circuit-breaker of rated current up to and including 630 A		
	Type designation or serial number	TM2	
	Sample no:	I-1	
	Rated current I_n (A)	32	
	Rated operational voltage: U_e (V)	415	
	Rated control supply voltage of closing mechanism: U_c (V)	-	
	Rated control supply voltage of shunt releases: U_c (V)	-	
	Rated control supply voltage undervoltage releases: U_c (V)	-	
	Ambient temperature 10-40 °C :	25°C	P

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Clause	Requirement + Test	Result - Remark	Verdict
	Number of operating cycles per hour	120	P
	Maximum rated operational voltage: U_e (V)	415	P
	Number of operating cycles per hour	120	P
	Number of cycles with current (total) (closing mechanism energized at the rated U_c)	12	P
	Applied voltage: closing mechanism (V)		N/A
	For circuit-breaker fitted with adjustable releases, test shall be made with the overload/short-circuit settings at maximum.		P
	Conditions, overload operations:		P
	- test voltage $U/U_e = 1,05$ (V) L1:	438	P
	..... L2:	438	
	..... L3:	438	
	- test current AC/DC: $I/I_e = 6,0/2,5$ (A) L1:	194	P
	..... L2:	194	
	..... L3:	194	
	- power factor/time constant:	0,48	P
	- Number of cycles manually opened: 9	9	P
	- Number of cycles automatically opened by an overload release: 3	3	P
	- frequency: (Hz)	50	P
	- on-time max 2s:	<2s	P
8.3.3.5	Verification of dielectric withstand		
	- equal to twice the rated operational voltage with a minimum of 1000 V for 5 seconds	1000V	P
	- no breakdown or flashover		P
	For circuit-breaker suitable for isolation, the leakage current shall be measured through each pole with the contacts in the open position, at a test voltage of $1,1 U_e$, and shall not exceed 2 mA.	457V $27,3 \times 10^{-3}$ mA (maximum)	P
8.3.3.6	Verification of temperature-rise		
	- the values of temperature-rise do not exceed those specified in tab. 7		P
	Temperature rise of main circuit terminals ≤ 80 K (K) :	Max.41	P
	conductor cross-sectional area (mm ²) :	6,0	P
	test current I_e (A) :	32	P

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Clause	Requirement + Test	Result - Remark	Verdict
8.3.3.7	Verification of overload releases		
	Test current: 1,45 times the value of their current setting at the reference temperature: (A)	46,4	P
	Conventional tripping time: <1h when $I_n < 63A$, <2h when $I_n > 63 A$	23s	P
8.3.3.8	Verification of undervoltage and shunt releases		
	Circuit-breaker fitted with undervoltage releases. The release shall not operate at 70% of the minimum control supply voltage -		N/A
	and shall operate at 35% of the maximum control supply voltage.		N/A
	Circuit-breaker fitted with shunt releases. The release shall operate at 70% of the minimum rated control supply voltage. Test made at room temperature.		N/A
8.3.3.9	Verification of the main contact position for circuit-breakers for isolation		
	actuating force for opening (N) :	15	P
	test force with blocked main contacts for 10 s (N) :	50	P
	Dependent power operation		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
	Independent power operation		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		P

8.3.4	TEST SEQUENCE II/III ($I_{cs}=I_{cu}$): (1 Sample 0,1-0,16A 3P)		
8.3.4.1	Test of rated service short-circuit breaking capacity		
	Test sequence of operation: O – t – CO – t – CO		
	Type designation or serial number	TM2	
	Sample no:	II/III-1	
	Rated current: I_n (A)	0,16	
	Rated operational voltage: U_e (V)	415	

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Clause	Requirement + Test	Result - Remark	Verdict
	Rated service short-circuit breaking capacity: (kA)	50kA	
	Rated control supply voltage of closing mechanism: Uc (V)		
	Rated control supply voltage of shunt release: Uc (V)		
	For circuit-breaker fitted with adjustable releases, test shall be made with the current and time settings at maximum.		P
	closing mechanism energized with 85% at the rated Uc (V)		N/A
	The circuit-breaker is mounted complete on its own support or an equivalent support.		P
	Test made in free air:		P
	Distances of the metallic screen's: (all sides)	Back: 0mm Front: 0mm Top: 45mm Bottom: 45mm Left: 10mm Right: 10mm	P
	The characteristics of the metallic screen:		
	- woven wire mesh		N/A
	- perforated metal		P
	- expanded metal		N/A
	- ratio hole area/total area: 0,45-0,65	0,50	P
	- size of hole: <math><30\text{mm}^2</math>	25	P
	- finish: bare or conductive plating	Bare	P
	Test made in specified individual enclosure: Details of these tests, including the dimensions of the enclosure:		
	Fuse "F": copper wire: diameter 0,8 mm, 50 mm long		P
	Circuit is earthed at: (load-star- or supply-star point)	Supply-star point	P
	Conductor cross-sectional area (mm ²):	1,0	P
	If terminals unmarked: line connected at: (underside/upside)		N/A
	Tightening torques: (Nm)	1,2	P
8.3.5.1	The operation of overload releases shall be verified at twice the value of their current setting on each pole separately.		
	The operating time shall not exceed the max. value stated by the manufacturer for twice the current setting at the reference temperature, on a pole singly.		
	Time specified by the manufacturer:		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	- Operation time: (s) L1: L2: L3: N :	19s 23s 21s	P
8.3.4.1	Test of rated service short-circuit breaking capacity		
	Test sequence of operation: O – t – CO – t – CO		
	- test voltage U/Ue = 1,05 (V) L1: L2: L3:	436 436 436	P
	- r.m.s. test current AC/DC: (kA) L1: L2: L3:	50,3 50,3 50,3	P
	power factor/time constant :	0,23	P
	- Factor "n"	2,22	P
	- peak test current (KA) :	110	P
	Test sequence "O"		
	- max. let-through current: (A _{peak}) L1: L2: L3:	363 171 430	P
	- Joule integral I ² dt (A ² s) L1: L2: L3:	111 68,8 270	P
	Pause, t (min)	3	P
	Test sequence "CO"		
	- max. let-through current: (A _{peak}) L1: L2: L3:	255 441 284	P
	- Joule integral I ² dt (A ² s) L1: L2: L3:	112 304 65,7	P
	Pause, t (min)	3	P
	Test sequence "CO"		
	- max. let-through current: (A _{peak}) L1: L2: L3:	365 413 84,9	P
	- Joule integral I ² dt (A ² s) L1: L2: L3:	216 238 5,13	P
	Melting of the fusible element	No	P
	Holes in the PE-sheet for test sequence "O"	No	P
	Cracks observed	No	P

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Clause	Requirement + Test	Result - Remark	Verdict
8.3.4.2	Operational performance capability with current.		
	Rated current: In (A)	0,16	
	Maximum rated operational voltage: Ue (V)	415	
	Conductor cross-sectional area (mm ²) :	1,0	
	Number of operating cycles per hour	120	P
	Number (5% of the number given in column 4, tab. 8) of cycles with current (total) (closing mechanism energized at the rated Uc)	75	P
	Applied voltage: closing mechanism (V)		N/A
	For circuit-breaker fitted with adjustable releases, test shall be made with the overload setting at maximum and short-circuit setting at minimum.		N/A
	Conditions, make/break operations:		
	- test voltage U/Ue = 1,0 (V)	L1: 418	P
	.....	L2: 418	
	.....	L3: 418	
	- test current I/ie = 1,0 (A)	L1: 0,16	P
	.....	L2: 0,16	
	.....	L3: 0,16	
	- power factor/time constant:	0,81	P
	- frequency: (Hz)	50	P
	- on-time (ms):	377	P
	- off-time (s):	30	P
8.3.4.3	Verification of dielectric withstand		
	- equal to twice the rated operational voltage with a minimum of 1000 V	1000V	P
	- no breakdown or flashover		P
	- the leaking current for circuit-breaker suitable for isolation. (<2mA / 1,1 Ue)	457V 30,9×10 ⁻³ mA(maximum)	P
8.3.4.4	Verification of temperature-rise		
	- the values of temperature-rise do not exceed those specified in tab. 7.		P
	Temperature rise of main circuit terminals. ≤ 80 K (K) :	Max.30	P
	conductor cross-sectional area (mm ²) :	1,0	P
	test current Ie (A) :	0,16	P

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Clause	Requirement + Test	Result - Remark	Verdict
8.3.4.5	Verification of overload releases		
	Test current: 1,45 times the value of their current setting at the reference temperature: (A)	0,232	P
	Conventional tripping time: <1h when $I_n < 63A$, <2h when $I_n > 63 A$	16min21s	P
8.3.5.4	Verification of overload releases		
	The operation of overload releases shall be verified at 2,5 times the value of their current setting on each pole separately.		
	The operating time shall not exceed the max. value stated by the manufacturer for twice the current setting at the reference temperature, on a pole singly.		
	Time specified by the manufacturer:		N/A
	- Operation time: (s) .....L1:	15s	P
	.....L2:	17s	
	.....L3:	18s	
	.....N:		
8.3.4	TEST SEQUENCE II/III ($I_{cs}=I_{cu}$): (1 Sample 6,0-10A 3P)		
8.3.4.1	Test of rated service short-circuit breaking capacity		
	Test sequence of operation: O - t - CO - t - CO		
	Type designation or serial number	TM2	
	Sample no:	II/II-2	
	Rated current: I_n (A)	10	
	Rated operational voltage: U_e (V)	415	
	Rated service short-circuit breaking capacity: (kA)	50	
	Rated control supply voltage of closing mechanism: U_c (V)		
	Rated control supply voltage of shunt release: U_c (V)		
	For circuit-breaker fitted with adjustable releases, test shall be made with the current and time settings at maximum.		P
	closing mechanism energized with 85% at the rated U_c : (V)		N/A
	The circuit-breaker is mounted complete on its own support or an equivalent support.		P
	Test made in free air:		P
	Distances of the metallic screen's: (all sides)	Back: 0mm Front: 0mm Top: 45mm Botton: 45mm Left: 10mm Right: 10mm	P

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Clause	Requirement + Test	Result - Remark	Verdict
	The characteristics of the metallic screen:		
	- woven wire mesh		N/A
	- perforated metal		P
	- expanded metal		N/A
	- ratio hole area/total area: 0,45-0,65	0,50	P
	- size of hole: <math> < 30\text{mm}^2 </math>	25	P
	- finish: bare or conductive plating	Bare	P
	Test made in specified individual enclosure: Details of these tests, including the dimensions of the enclosure:		
	Fuse "F": copper wire: diameter 0,8 mm, 50 mm long		P
	Circuit is earthed at: (load-star- or supply-star point)	Supply-star point	P
	Conductor cross-sectional area (mm ²):	1,5	P
	If terminals unmarked: line connected at: (underside/upside)		N/A
	Tightening torques: (Nm)	1,2	P
8.3.5.1	The operation of overload releases shall be verified at twice the value of their current setting on each pole separately.		
	The operating time shall not exceed the max. value stated by the manufacturer for twice the current setting at the reference temperature, on a pole singly.		
	Time specified by the manufacturer:		N/A
	- Operation time: (s) L1:	23	P
	..... L2:	27	
	..... L3:	25	
	..... N :		
8.3.4.1	Test of rated service short-circuit breaking capacity		
	Test sequence of operation: O – t – CO – t – CO		
	- test voltage U/U _e = 1,05 (V) L1:	436	P
	..... L2:	436	
	..... L3:	436	
	- r.m.s. test current AC/DC: (kA) L1:	50,3	P
	..... L2:	50,3	
 L3:	50,3	
	power factor/time constant :	0,23	P
	- Factor "n"	2,2	P
	- peak test current (kA) :	110	P

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Clause	Requirement + Test	Result - Remark	Verdict
	Test sequence "O"		
	- max. let-through current: (kA _{peak})L1:L2:L3:	2,86 5,41 3,02	P
	- Joule integral I ² dt (kA ² s) .....L1: .....L2: .....L3:	19,2 44,6 9,96	P
	Pause, t: (min)	3	P
	Test sequence "CO"		
	- max. let-through current: (kA _{peak}) .....L1: .....L2: .....L3:	2,47 5,06 3,99	P
	- Joule integral I ² dt (kA ² s) .....L1: .....L2: .....L3:	6,66 31,4 16,3	P
	Pause, t: (min)	3	P
	Test sequence "CO"		
	- max. let-through current: (kA _{peak}) .....L1: .....L2: .....L3:	3,02 5,15 2,79	P
	- Joule integral I ² dt (kA ² s) .....L1: .....L2: .....L3:	9,80 27,7 7,41	P
	Melting of the fusible element	No	P
	Holes in the PE-sheet for test sequence "O"	No	P
	Cracks observed	No	P
8.3.4.2	Operational performance capability with current.		
	Rated current: I _n (A)	10	
	Maximum rated operational voltage: U _e (V)	415	
	Conductor cross-sectional area (mm ²):	1,5	
	Number of operating cycles per hour	120	P
	Number (5% of the number given in column 4, tab. 8) of cycles with current (total) (closing mechanism energized at the rated U _c)	75	P
	Applied voltage: closing mechanism (V)		N/A
	For circuit-breaker fitted with adjustable releases, test shall be made with the overload setting at maximum and short-circuit setting at minimum.		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Conditions, make/break operations:		
	- test voltage $U/U_e = 1,0$ (V)	L1: 419	P
	.....	L2: 419	
	.....	L3: 419	
	- test current $I/I_e = 1,0$ (A)	L1: 10,2	P
	.....	L2: 10,2	
	.....	L3: 10,2	
	- power factor/time constant:	0,81	P
	- frequency: (Hz)	50	P
	- on-time (ms):	377	P
	- off-time (s):	30	P
8.3.4.3	Verification of dielectric withstand		
	- equal to twice the rated operational voltage with a minimum of 1000 V	1000V	P
	- no breakdown or flashover		P
	- the leaking current for circuit-breaker suitable for isolation. ($<2\text{mA} / 1,1 U_e$)	457V $29,3 \times 10^{-3}\text{mA}(\text{maximum})$	P
8.3.4.4	Verification of temperature-rise		
	- the values of temperature-rise do not exceed those specified in tab. 7.		P
	Temperature rise of main circuit terminals. $\leq 80 \text{ K (K)}$:	Max.35	P
	conductor cross-sectional area (mm^2) :	1,5	P
	test current I_e (A) :	10	P
8.3.4.5	Verification of overload releases		
	Test current: 1,45 times the value of their current setting at the reference temperature: (A)	14,5	P
	Conventional tripping time: $<1\text{h}$ when $I_n < 63\text{A}$, $<2\text{h}$ when $I_n > 63 \text{ A}$	3min16s	P
8.3.5.4	Verification of overload releases		
	The operation of overload releases shall be verified at 2,5 times the value of their current setting on each pole separately.		
	The operating time shall not exceed the max. value stated by the manufacturer for twice the current setting at the reference temperature, on a pole singly.		
	Time specified by the manufacturer:		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	- Operation time: (s)L1:L2:L3:N:	19 21 18	P
8.3.4	TEST SEQUENCE II (Ics): - 1 sample: 9-14A 3P		
8.3.4.1	Test of rated service short-circuit breaking capacity		
	Test sequence of operation: O – t – CO – t – CO		
	Type designation or serial number	TM2	
	Sample no:	II-1	
	Rated current: In (A)	14	
	Rated operational voltage: Ue (V)	415	
	Rated service short-circuit breaking capacity: (kA)	5	
	Rated control supply voltage of closing mechanism: Uc (V)		
	Rated control supply voltage of shunt release: Uc (V)		
	For circuit-breaker fitted with adjustable releases, test shall be made with the current and time settings at maximum.		P
	closing mechanism energized with 85% at the rated Uc: (V)		N/A
	The circuit-breaker is mounted complete on its own support or an equivalent support.		P
	Test made in free air:		P
	Distances of the metallic screen's: (all sides)	Back: 0mm Front: 0mm Top: 45mm Bottom: 45mm Left: 0mm Right: 0mm	P
	The characteristics of the metallic screen:		
	- woven wire mesh		N/A
	- perforated metal		P
	- expanded metal		N/A
	- ratio hole area/total area: 0,45-0,65	0,50	P
	- size of hole: <30mm ²	25	P
	- finish: bare or conductive plating	Bare	P
	Test made in specified individual enclosure: Details of these tests, including the dimensions of the enclosure:		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Fuse "F"; copper wire: diameter 0,8 mm, 50 mm long		P
	Circuit is earthed at: (load-star- or supply-star point)	Supply-star point	P
	Conductor cross-sectional area (mm ²) :	2,5	P
	If terminals unmarked: line connected at: (underside/upside)		N/A
	Tightening torques: (Nm)	1,2	P
	Test sequence of operation: O – t – CO – t – CO		P
	- test voltage U/U _e = 1,05 (V).....L1: .....L2: .....L3:	436 436 436	P
	- r.m.s. test current AC/DG: (kA) .....L1: .....L2: .....L3:	5,02 5,02 5,02	P
	power factor/time constant :	0,67	P
	- Factor "n"	1,5	P
	- peak test current (kA) :	7,5	P
	Test sequence "O"		
	- max. let-through current: (kA _{peak}) .....L1: .....L2: .....L3:	3,00 1,63 2,68	P
	- Joule integral I ² dt (kA ² s) .....L1: .....L2: .....L3:	24,1 3,98 14,0	P
	Pause, t (min)	3	P
	Test sequence "CO"		
	- max. let-through current: (kA _{peak}) .....L1: .....L2: .....L3:	1,58 2,78 1,83	P
	- Joule integral I ² dt (kA ² s) .....L1: .....L2: .....L3:	4,27 13,5 4,27	P
	Pause, t (min)	3	P
	Test sequence "CO"		
	- max. let-through current: (kA _{peak})L1:L2:L3:	3,15 1,91 1,52	P
	- Joule integral I ² dt (kA ² s)L1:L2:L3:	20,1 6,05 5,98	P

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Clause	Requirement + Test	Result - Remark	Verdict
	Melting of the fusible element	No	P
	Holes in the PE-sheet for test sequence "O"	No	P
	Cracks observed	No	P
8.3.4.2	Operational performance capability with current.		
	Rated current: In (A)	14	
	Maximum rated operational voltage: Ue (V)	415	
	Conductor cross-sectional area (mm ²):	2,5	
	Number of operating cycles per hour	120	P
	Number (5% of the number given in column 4, tab. 8) of cycles with current (total) (closing mechanism energized at the rated Uc)	75	P
	Applied voltage: closing mechanism (V)		N/A
	For circuit-breaker fitted with adjustable releases, test shall be made with the overload setting at maximum and short-circuit setting at minimum.		N/A
	Conditions, make/break operations:		
	- test voltage U/Ue = 1,0 (V) L1: L2: L3:	418 418 418	P
	- test current I/Ie = 1,0 (A) L1: L2: L3:	14,2 14,2 14,2	P
	- power factor/time constant:	0,80	P
	- frequency: (Hz)	50	P
	- on-time (ms):	377	P
	- off-time (s):	50	P
8.3.4.3	Verification of dielectric withstand		
	- equal to twice the rated operational voltage with a minimum of 1000 V	1000V	P
	- no breakdown or flashover		P
	- the leaking current for circuit-breaker suitable for isolation; (<2mA / 1.1 Ue)	457V 20,7x10 ⁻³ mA(maximum)	P
8.3.4.4	Verification of temperature-rise		
	- the values of temperature-rise do not exceed those specified in tab. 7.		P
	Temperature rise of main circuit terminals. ≤ 80 K (K) :	Max 35K	P
	conductor cross-sectional area (mm ²):	2,5	P

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Clause	Requirement + Test	Result - Remark	Verdict
	test current I_e (A) :	14	P
8.3.4.5	Verification of overload releases		
	Test current: 1.45 times the value of their current setting at the reference temperature: (A)	20,3	P
	Conventional tripping time: <1h when $I_n < 63A$, <2h when $I_n > 63 A$	26s	P
8.3.4	TEST SEQUENCE II (Ics): - 1 sample: 24-32A 3P		
8.3.4.1	Test of rated service short-circuit breaking capacity		
	Test sequence of operation: O - t - CO - t - CO		
	Type designation or serial number	TM2	
	Sample no:	II-2	
	Rated current: I_n (A)	32	
	Rated operational voltage: U_e (V)	415	
	Rated service short-circuit breaking capacity: (kA)	5	
	Rated control supply voltage of closing mechanism: U_c (V)		
	Rated control supply voltage of shunt release: U_c (V)		
	For circuit-breaker fitted with adjustable releases, test shall be made with the current and time settings at maximum.		P
	closing mechanism energized with 85% at the rated U_c : (V)		N/A
	The circuit-breaker is mounted complete on its own support or an equivalent support.		P
	Test made in free air:		P
	Distances of the metallic screen's: (all sides)	Back: 0mm Front: 0mm Top: 45mm Bottom: 45mm Left: 0mm Right: 0mm	P
	The characteristics of the metallic screen:		
	- woven wire mesh		N/A
	- perforated metal		P
	- expanded metal		N/A
	- ratio hole area/total area: 0,45-0,65	0,50	P
	- size of hole: <30mm ²	25	P
	- finish: bare or conductive plating	Bare	P

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Clause	Requirement + Test	Result - Remark	Verdict
	Test made in specified individual enclosure: Details of these tests, including the dimensions of the enclosure:		N/A
	Fuse "F": copper wire: diameter 0,8 mm, 50 mm long		P
	Circuit is earthed at: (load-star- or supply-star point)	Supply-star point	P
	Conductor cross-sectional area (mm ²):	6,0	P
	If terminals unmarked: line connected at: (underside/upside)		N/A
	Tightening torques: (Nm)	1,2	P
	Test sequence of operation: O – t – CO – t – CO		P
	- test voltage U/U _e = 1,05 (V)..... L1: L2: L3:	436 436 436	P
	- r.m.s. test current AC/DC: (kA) L1: L2: L3:	5,02 5,02 5,02	P
	power factor/time constant :	0,67	P
	- Factor "n"	1,5	P
	- peak test current (kA) :	7,5	P
	Test sequence "O"		
	- max. let-through current: (kA _{peak}) L1: L2: L3:	3,61 2,10 2,46	P
	- Joule integral I ² dt (kA ² s) L1: L2: L3:	31,4 8,33 12,4	P
	Pause, t: (min)	3	P
	Test sequence "CO"		
	- max. let-through current: (kA _{peak}) L1: L2: L3:	2,01 2,52 3,57	P
	- Joule integral I ² dt (kA ² s) L1: L2: L3:	8,00 18,3 37,4	P
	Pause, t: (min)	3	P
	Test sequence "CO"		
	- max. let-through current: (kA _{peak}) L1: L2: L3:	3,83 2,27 2,93	P

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Clause	Requirement + Test	Result - Remark	Verdict
	- Joule integral I^2dt (kA ² s) L1: L2: L3:	39,1 8,75 17,6	P
	Melting of the fusible element	No	P
	Holes in the PE-sheet for test sequence "O"	No	P
	Cracks observed	No	P
8.3.4.2	Operational performance capability with current.		
	Rated current: In (A)	32	
	Maximum rated operational voltage: Ue (V)	415	
	Conductor cross-sectional area (mm ²) :	6	
	Number of operating cycles per hour	120	P
	Number (5% of the number given in column 4, tab. 8) of cycles with current (total) (closing mechanism energized at the rated Uc)	75	P
	Applied voltage: closing mechanism (V)		N/A
	For circuit-breaker fitted with adjustable releases, test shall be made with the overload setting at maximum and short-circuit setting at minimum.		N/A
	Conditions, make/break operations:		
	- test voltage $U/U_e = 1,0$ (V) L1: L2: L3:	419 419 419	P
	- test current $I/I_e = 1,0$ (A) L1: L2: L3:	32,2 32,2 32,2	P
	- power factor/time constant	0,81	P
	- frequency: (Hz)	50	P
	- on-time (ms):	377	P
	- off-time (s):	50	P
8.3.4.3	Verification of dielectric withstand		
	- equal to twice the rated operational voltage with a minimum of 1000 V	1000V	P
	- no breakdown or flashover		P
	- the leaking current for circuit-breaker suitable for isolation: (<2mA / 1.1 Ue)	457V 35,7x10 ⁻³ mA(maximum)	P
8.3.4.4	Verification of temperature-rise		
	- the values of temperature-rise do not exceed those specified in tab. 7.		P

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Clause	Requirement + Test	Result - Remark	Verdict
	Temperature rise of main circuit terminals. ≤ 80 K (K) :	Max.41K	P
	conductor cross-sectional area (mm ²) :	6	P
	test current I _e (A) :	32	P
8.3.4.5	Verification of overload releases		
	Test current: 1.45 times the value of their current setting at the reference temperature: (A)	46,4	P
	Conventional tripping time: <1h when I _n < 63A, <2h when I _n > 63 A	26s	P
8.3.5	TEST SEQUENCE III (I _{cu}) - 1 sample: 9-14A 3P		
	Rated ultimate short-circuit breaking		
	Except where the combined test sequence applies, this test sequence applies to circuit-breaker of utilization category A and to circuit-breaker of utilization B having a rated ultimate short-circuit breaking capacity higher than the rated short-time withstand current.		
	For circuit-breakers of utilization B having a rated short-time withstand current equal to their rated ultimate short-circuit breaking capacity, this test sequence need not be made, since, in this case, the ultimate short-circuit breaking capacity, is verified when carrying out test sequence IV.		
	For integrally fused circuit-breakers, test sequence V applies in place of this sequence.		
	Type designation or serial number	TM2	
	Sample no:	III-1	
	Rated current: I _n (A)	14	
	Rated operational voltage: U _e (V)	415	
	Rated ultimate short-circuit breaking capacity: (kA)	10	
	Rated control supply voltage of closing mechanism: U _c (V)		
	Rated control supply voltage of shunt release: U _c (V)		
	This test sequence need not be made when I _{cu} = I _{cs}		
8.3.5.1	The operation of overload releases shall be verified at twice the value of their current setting on each pole separately.		
	The operating time shall not exceed the max. value stated by the manufacturer for twice the current setting at the reference temperature, on a pole singly.		
	Time specified by the manufacturer:		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	- Operation time: (s) L1: L2: L3: N :	31s 32s 26s -	P
8.3.5.2	Test of rated ultimate short-circuit breaking capacity		
	The test sequence of operations is O – t – CO		
	For circuit-breaker fitted with adjustable releases, test shall be made with the current and time settings at maximum.		P
	closing mechanism energized with 85% at the rated U _c : (V)		N/A
	The circuit-breaker is mounted complete on its own support or an equivalent support.		P
	Test made in free air:		P
	Distances of the metallic screen's: (all sides)	Back: 0mm Front: 0mm Top: 45mm Bottom: 45mm Left: 0mm Right: 0mm	P
	The characteristics of the metallic screen:		
	- woven wire mesh		N/A
	- perforated metal		P
	- expanded metal		N/A
	- ratio hole area/total area: 0,45–0,65	0,50	P
	- size of hole: <30mm ²	25	P
	- finish: bare or conductive plating	Bare	P
	Test made in specified individual enclosure: Details of these tests, including the dimensions of the enclosure:		N/A
	Fuse "F": copper wire: diameter 0,8 mm, 50 mm long		P
	Circuit is earthed at: (load-star- or supply-star point)	Supply-star point	P
	Conductor cross-sectional area (mm ²):	2,5	P
	If terminals unmarked: line connected at: (underside/upside)		N/A
	Tightening, torques: (Nm)	1,2	P
	Test sequence of operation: O – t – CO		P
	- test voltage U/U _e = 1,05 (V) L1: L2: L3:	436 436 436	P

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Clause	Requirement + Test	Result - Remark	Verdict
	- r.m.s. test current AC/DC: (kA) L1: L2: L3:	10,2 10,2 10,2	P
	power factor/time constant :	0,48	P
	- Factor "n"	1,9	P
	- peak test current (kA _{max}) :	19,0	P
	Test sequence "O"		
	- max. let-through current: (kA _{peak}) L1: L2: L3:	4,21 1,71 3,31	P
	- Joule integral I ² dt (kA ² s) L1: L2: L3:	29,7 3,50 15,9	P
	Pause, t (min)	3	P
	Test sequence "CO"		
	- max. let-through current: (kA _{peak}) L1: L2: L3:	3,76 0,34 3,68	P
	- Joule integral I ² dt (kA ² s) L1: L2: L3:	21,8 - 20,0	P
	Melting of the fusible element	No	P
	Holes in the PE-sheet for test sequence "O"	No	P
	Cracks observed	No	P
8.3.5.3	Verification of dielectric withstand		
	- equal to twice the rated operational voltage with a minimum of 1000 V for 5 seconds	1000V	P
	- no breakdown or flashover		P
	- the leaking current for circuit-breaker suitable for isolation: (<6mA / 1,1 U _e)	457V 27,6x10 ⁻³ mA(maximum)	P
8.3.5.4	Verification of overload releases		
	The operation of overload releases shall be verified at 2,5 times the value of their current setting on each pole separately.		
	The operating time shall not exceed the max. value stated by the manufacturer for twice the current setting at the reference temperature, on a pole singly.		
	Time specified by the manufacturer:		N/A
	- Operation time: (s) L1: L2: L3: N :	17s 19s 17s -	P

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Clause	Requirement + Test	Result - Remark	Verdict
8.3.5	TEST SEQUENCE III (Icu) - 1 sample: 24-32A 3P		
	Rated ultimate short-circuit breaking		
	Except where the combined test sequence applies, this test sequence applies to circuit-breaker of utilization category A and to circuit-breaker of utilization B having a rated ultimate short-circuit breaking capacity higher than the rated short-time withstand current.		
	For circuit-breakers of utilization B having a rated short-time withstand current equal to their rated ultimate short-circuit breaking capacity, this test sequence need not be made, since, in this case, the ultimate short-circuit breaking capacity, is verified when carrying out test sequence IV.		
	For integrally fused circuit-breakers, test sequence V applies in place of this sequence.		
	Type designation or serial number	TM2	
	Sample no:	III-2	
	Rated current: In (A)	32	
	Rated operational voltage: Ue (V)	415	
	Rated ultimate short-circuit breaking capacity: (kA)	10	
	Rated control supply voltage of closing mechanism: Uc (V)		
	Rated control supply voltage of shunt release: Uc (V)		
	This test sequence need not be made when Icu = Ics		
8.3.5.1	The operation of overload releases shall be verified at twice the value of their current setting on each pole separately.		
	The operating time shall not exceed the max. value stated by the manufacturer for twice the current setting at the reference temperature, on a pole singly.		
	Time specified by the manufacturer:		N/A
	- Operation time: (s)	L1: 51s L2: 40s L3: 52s N: -	P
8.3.5.2	Test of rated ultimate short-circuit breaking capacity		
	The test sequence of operations is O – t – CO		
	For circuit-breaker fitted with adjustable releases, test shall be made with the current and time settings at maximum.		P
	closing mechanism energized with 85% at the rated Uc: (V)		N/A


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Clause	Requirement + Test	Result - Remark	Verdict
	The circuit-breaker is mounted complete on its own support or an equivalent support.		P
	Test made in free air:		P
	Distances of the metallic screen's: (all sides)	Back: 0mm Front: 0mm Top: 45mm Bottom: 45mm Left: 0mm Right: 0mm	P
	The characteristics of the metallic screen:		
	- woven wire mesh		N/A
	- perforated metal		P
	- expanded metal		N/A
	- ratio hole area/total area: 0,45-0,65	0,50	P
	- size of hole: <math><30\text{mm}^2</math>	25	P
	- finish: bare or conductive plating	Bare	P
	Test made in specified individual enclosure: Details of these tests, including the dimensions of the enclosure:		N/A
	Fuse "F"; copper wire: diameter 0,8 mm, 50 mm long		P
	Circuit is earthed at: (load-star- or supply-star point)	Supply-star point	P
	Conductor cross-sectional area (mm ²):	6,0	P
	If terminals unmarked: line connected at: (underside/upside)		N/A
	Tightening, torques: (Nm)	1,2	P
	Test sequence of operation: O – t – CO		P
	- test voltage $U/U_e = 1,05$ (V)	L1: 436 L2: 436 L3: 436	P
	- r.m.s. test current AC/DC: (kA)	L1: 10,2 L2: 10,2 L3: 10,2	P
	power factor/time constant :	0,48	P
	- Factor "n"	1,9	P
	- peak test current (kA _{max}):	19,0	P
	Test sequence "O"		
	- max. let-through current: (kA _{peak})	L1: 3,60 L2: 4,48 L3: 4,72	P

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Clause	Requirement + Test	Result - Remark	Verdict
	- Joule integral I^2dt (kA ² s) L1: L2: L3:	31,9 66,6 35,4	P
	Pause, t (min)	3	P
	Test sequence "CO"		
	- max. let-through current: (kA _{peak}) L1: L2: L3:	4,35 0,035 4,31	P
	- Joule integral I^2dt (kA ² s) L1: L2: L3:	33,2 - 32,8	P
	Melting of the fusible element	No	P
	Holes in the PE-sheet for test sequence "O"	No	P
	Cracks observed	No	P
8.3.5.3	Verification of dielectric withstand		
	- equal to twice the rated operational voltage with a minimum of 1000 V for 5 seconds	1000V	P
	- no breakdown or flashover		P
	- the leaking current for circuit-breaker suitable for isolation: (<6mA / 1,1 U _e)	457V 36,2x10 ⁻³ mA(maximum)	P
8.3.5.4	Verification of overload releases		
	The operation of overload releases shall be verified at 2,5 times the value of their current setting on each pole separately.		
	The operating time shall not exceed the max. value stated by the manufacturer for twice the current setting at the reference temperature, on a pole singly.		
	Time specified by the manufacturer:		N/A
	- Operation time: (s) L1: L2: L3: N:	37s 34s 35s -	P

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Clause	Requirement + Test	Result - Remark	Verdict
8.3.6	TEST SEQUENCE IV		N/A
8.3.7	TEST SEQUENCE V		N/A
8.3.8	TEST SEQUENCE VI: Combined test sequence		N/A
Annex B	Circuit-breakers incorporating residual current protection		N/A
Annex C	Individual pole short-circuit test sequence		N/A
Annex F	Additional tests for circuit-breakers with electronic over-current protection		N/A
Annex H	Individual pole short-circuit test sequence 1 sample, 24-32A, 3P		
	Circuit-breaker for use in IT systems		
H.2	Test of individual pole short-circuit breaking capacity		
	A short-circuit test is made on the individual poles of a multipole circuit-breaker at a value of prospective current (I_{pr}) equal to 1,2 times the max. setting of the short-time delay release tripping current or, in the absence of such a release, 1,2 time the max. setting of the tripping current of the instantaneous release, or, where relevant 1,2 times the max. setting of the definite time delay release tripping current, but not exceeding 50kA.		
	Type designation or serial number	TM2	
	Sample no:	H-1	
	Rated current: In (A)	32	
	Rated operational voltage: Ue (V)	415	
	Rated ultimate short-circuit breaking capacity: (kA)	10	
	Rated control supply voltage of closing mechanism: Uc (V)	-	
	Rated control supply voltage of shunt release: Uc (V)	-	
	The test sequence of operations is O – t - CO		
	For circuit-breaker fitted with adjustable releases, test shall be made with the current and time settings at maximum.		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	closing mechanism energized with 85% at the rated U_c : (V)		N/A
	The circuit-breaker is mounted complete on its own support or an equivalent support.		P
	Test made in free air:		P
	Distances of the metallic screen's: (all sides)	Back: 0mm Front: 0mm Top: 30mm Bottom: 30mm Left: 0mm Right: 0mm	P
	The characteristics of the metallic screen:		
	- woven wire mesh		N/A
	- perforated metal		N/A
	- expanded metal		N/A
	- ratio hole area/total area: 0,45-0,65	0,50	P
	- size of hole: <math> < 30\text{mm}^2 </math>	25	P
	- finish: bare or conductive plating	Bare	P
	Test made in specified individual enclosure: Details of these tests, including the dimensions of the enclosure:		N/A
	Fuse "F": copper wire: diameter 0,8 mm, 50 mm long		P
	Circuit is earthed at: (load-star- or supply-star point)	Supply-star point	P
	Conductor cross-sectional area (mm^2):	6,0	P
	If terminals unmarked: line connected at: (underside/upside)		N/A
	Tightening torques: (Nm)	1,2	P
	Test sequence of operation: O – t – CO		P
	Test circuit according figure: 9		P
	- test voltage $U/U_e = 1,05$ (V) L1: L2: L3:	436 - -	P
	Short-circuit test current (I_{IT}): equal to 1,2 times the max. setting of the short-time delay release tripping current,		N/A
	or, in the absence of such a release, 1,2 time the max. setting of the tripping current of the instantaneous release,	385A	P
	or, where relevant 1,2 times the max. setting of the definite time delay release tripping current, but not exceeding 50kA.		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	- r.m.s. test current AC/DC: (A)	385	P
	power factor/time constant:	0,88	P
	- Factor "n"	1,42	P
	- peak test current (A _{max}) :	546	P
	Test sequence "O" L1		
	- max. let-through current: (A _{peak}) L1:	494	P
	- Joule integral I ² dt (A ² s) L1:	1030	P
	Pause, t (min)	3	P
	Test sequence "CO" L1		
	- max. let-through current: (A _{peak}) L1:	491	P
	- Joule integral I ² dt (A ² s) L1:	908	P
	Test sequence "O" L2		
	- max. let-through current: (A _{peak}) L2:	513	P
	- Joule integral I ² dt (A ² s) L2:	942	P
	Pause, t (min)	3	P
	Test sequence "CO" L2		
	- max. let-through current: (A _{peak}) L2:	474	P
	- Joule integral I ² dt (A ² s) L2:	661	P
	Test sequence "O" L3		
	- max. let-through current: (A _{peak}) L3:	512	P
	- Joule integral I ² dt (A ² s) L3:	926	P
	Pause, t (min)	3	P
	Test sequence "CO" L3		
	- max. let-through current: (kA _{peak}) L3:	341	P
	- Joule integral I ² dt (kA ² s) L3:	339	P
	For 4-pole circuit-breakers with a protected neutral pole, the test voltage for that pole shall be phase-to-phase voltage divided by $\sqrt{3}$. This test is applicable only where the construction of the protected neutral pole differs from that of the phase poles.		
	Test sequence "O" N		
	- max. let-through current: (kA _{peak}) N:		N/A
	- Joule integral I ² dt (A ² s) N:		N/A
	Pause, t (min)		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Test sequence "CO" N		
	- max. let-through current: (kA _{peak}) N:		N/A
	- Joule integral I ² dt (A ² s) N:		N/A
	Melting of the fusible element	No	P
	Holes in the PE-sheet for test sequence "O"	No	P
	Cracks observed	No	P
H.3	Verification of dielectric withstand		
	- equal to twice the rated operational voltage with a minimum of 1000 V	1000V	P
	- no breakdown or flashover		P
H.4	Verification of overload releases		
	The operation of overload releases shall be verified at 2.5 times the value of their current setting on each pole separately.		
	The operating time shall not exceed the max. value stated by the manufacturer for twice the current setting at the reference temperature, on a pole singly.		
	Time specified by the manufacturer:		
	- Operation time: (s) L1: L2: L3: N:	27s 29s 29s	P
H.5	Marking		
	Circuit-breaker for which all values of rated voltage have not been tested according to this annex or are not covered by such testing, shall be identified by the symbol  which shall be marked on the circuit-breaker immediately following these values of rated voltage		N/A
Annex J	Electromagnetic compatibility (EMC) – Requirements and test methods for circuit-breakers		N/A
Annex L	Circuit-breakers not fulfilling the requirements for overcurrent protection		N/A
Annex M	Modular residual current devices (without integral current breaking device)		N/A
Annex N	Electromagnetic compatibility (EMC) – Additional requirements and test methods for devices not covered by Annexes B, F and M		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
Annex O	Instantaneous trip circuit-breakers (ICB)		N/A

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TABLE 1: temperature rise measurements

temperature rise dT of part		phase	dT (K)	required dT (K)
For clause 8.3.3.6 (32A/415V~) I-1				
1	Terminals for external connections	Max for all	41	80
2	Enclosure	Max for all	23	50
3	Non-metallic handle	Max for all	16	35
For clause 8.3.4.4 (0,16A/415V~) II/III-1				
1	Terminals for external connections	Max for all	30	80
2	Enclosure	Max for all	19	50
3	Non-metallic handle	Max for all	17	35
For clause 8.3.4.4 (10A/415V~) II/III-2				
1	Terminals for external connections	Max for all	35	80
2	Enclosure	Max for all	26	50
3	Non-metallic handle	Max for all	19	35
For clause 8.3.4.4 (14A/415V~) II-1				
1	Terminals for external connections	Max for all	35	80
2	Enclosure	Max for all	20	50
3	Non-metallic handle	Max for all	14	35
For clause 8.3.4.4 (32A/415V~) II-2				
1	Terminals for external connections	Max for all	41	80
2	Enclosure	Max for all	23	50
3	Non-metallic handle	Max for all	16	35

TABLE. Resistance to heat (Ball pressure test)

no.	Specimen					Verdict
	Description	Colour	Temp °C	Impress diam. mm	Result diam. mm	
1	Enclosure	Black	125	2,0	1,5	P
2	Contacteur support	Black	125	2,0	1,2	P
3	Button	Black	70	2,0	1,0	P
4	Button	Red	70	2,0	1,0	P

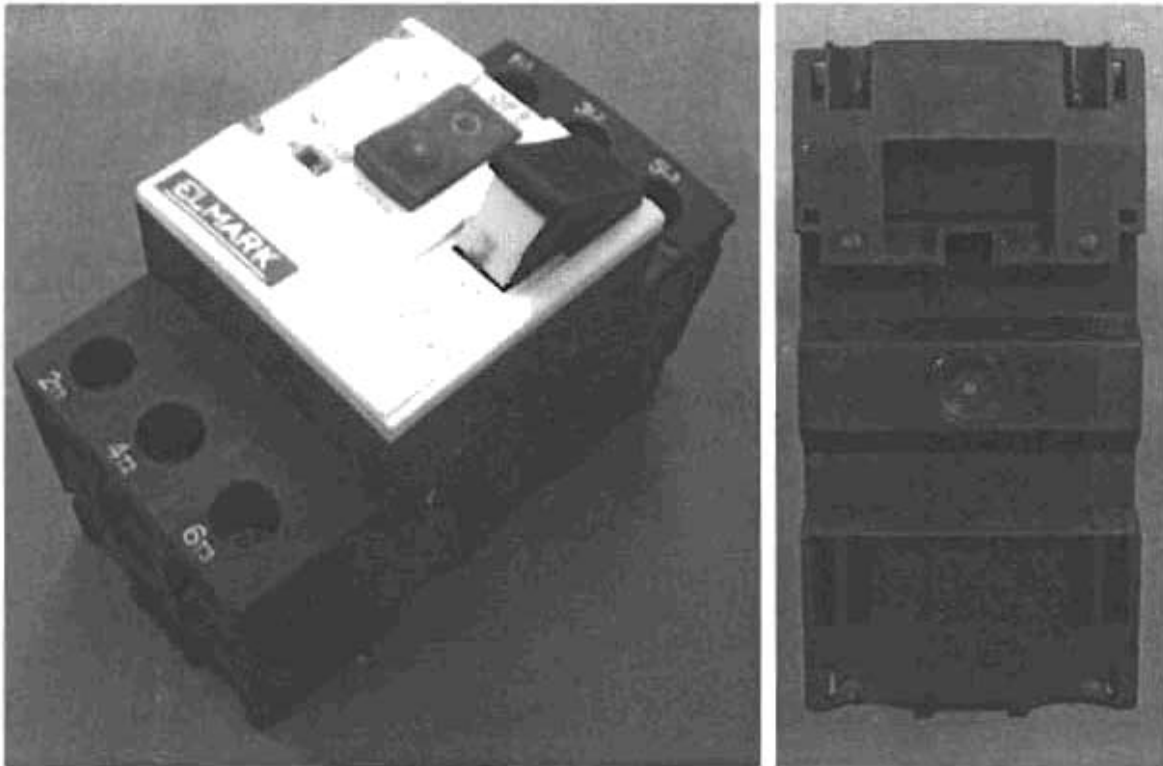
IEC 60947-2

TABLE: Resistance to fire (Glow wire test)

no.	Specimen							Verdict
	Description	Colour	Thick (mm)	Temp. °C	burning after t (s)	drops	support burning	
1	Enclosure	Black	2,5	960	10,1	No	No	P
2	Contacteur support	Black	2,5	960	8,7	No	No	P
3	Button	Black	2,5	650	-	No	No	P
4	Button	Red	2,5	650	-	No	No	P

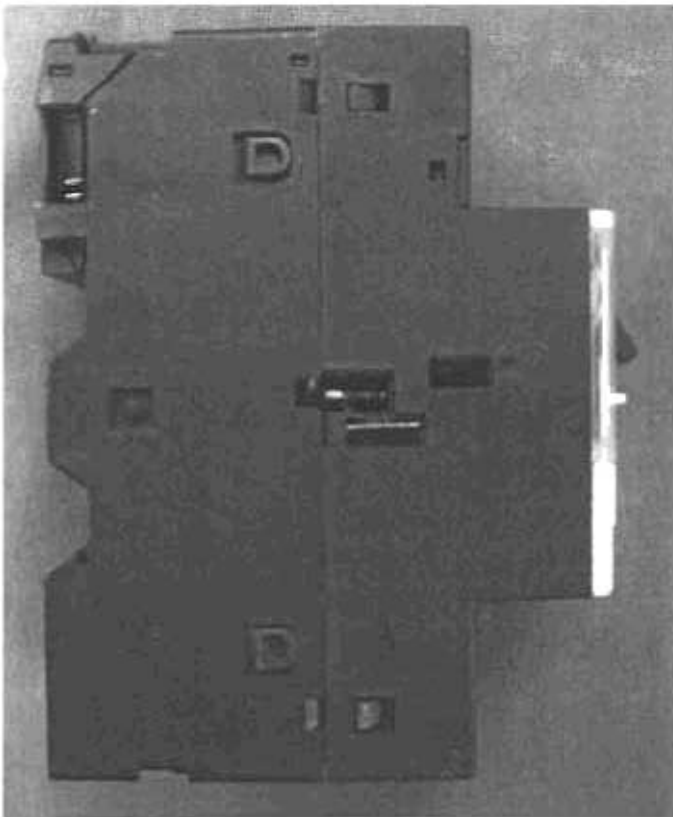
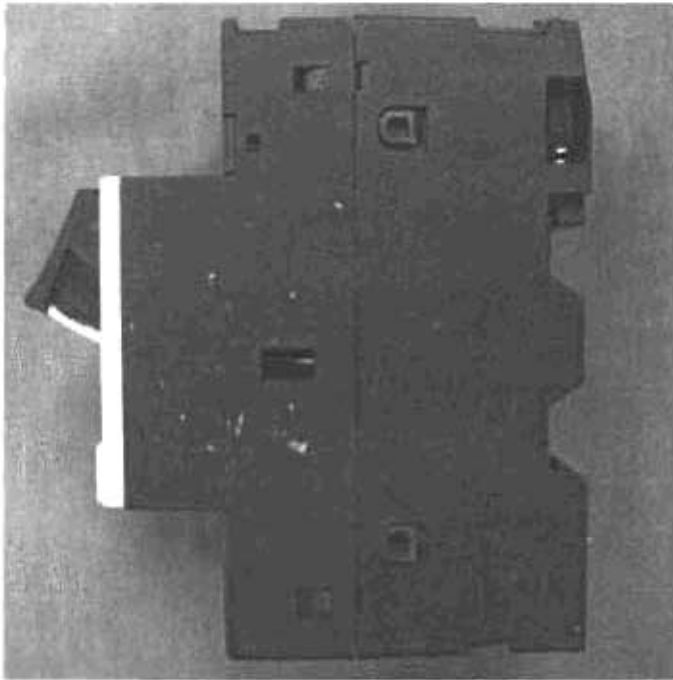
IEC 60947-2

Photos of sample:



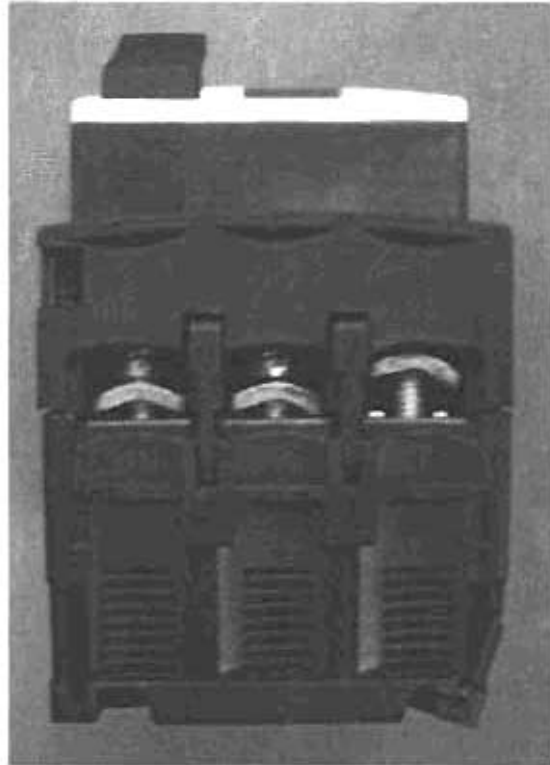
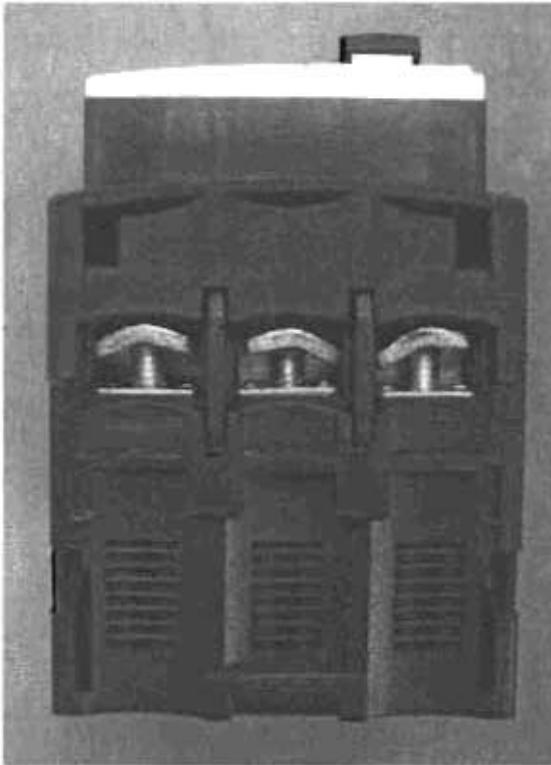
IEC 60947-2

Photos of sample:



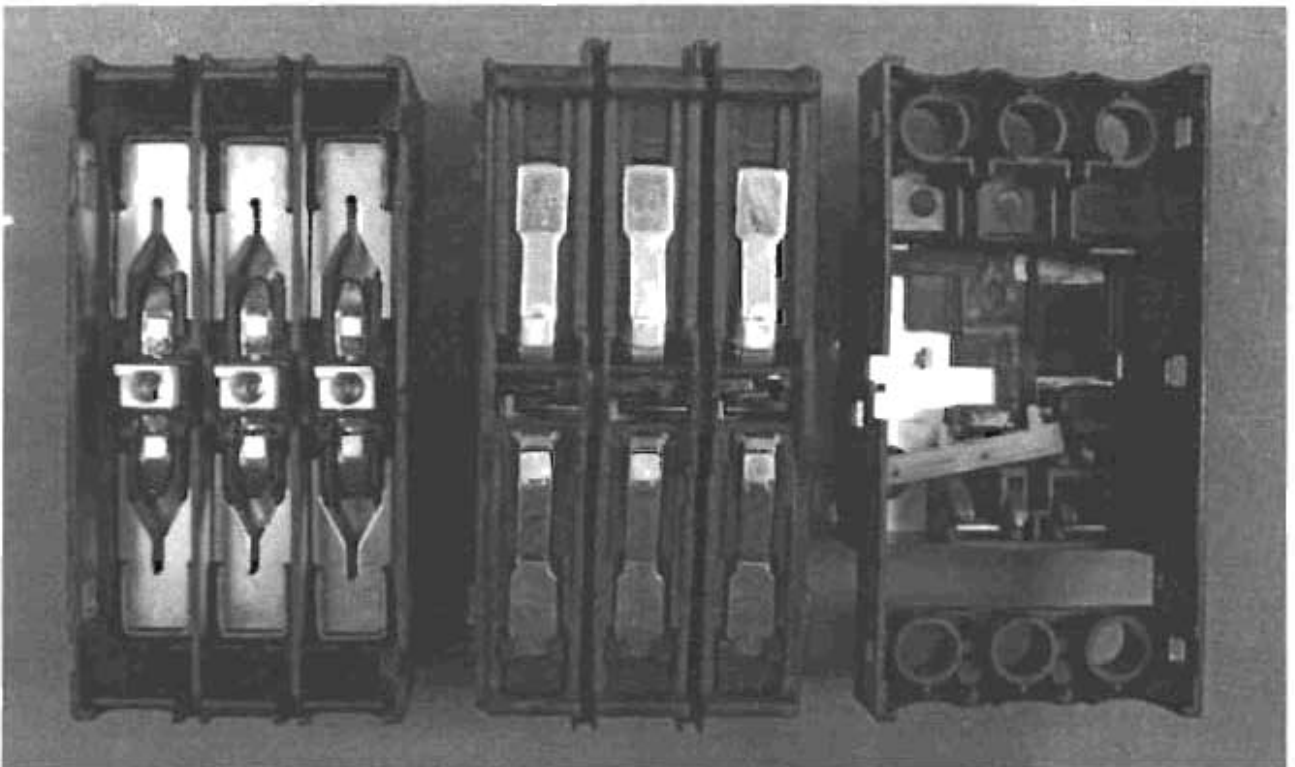
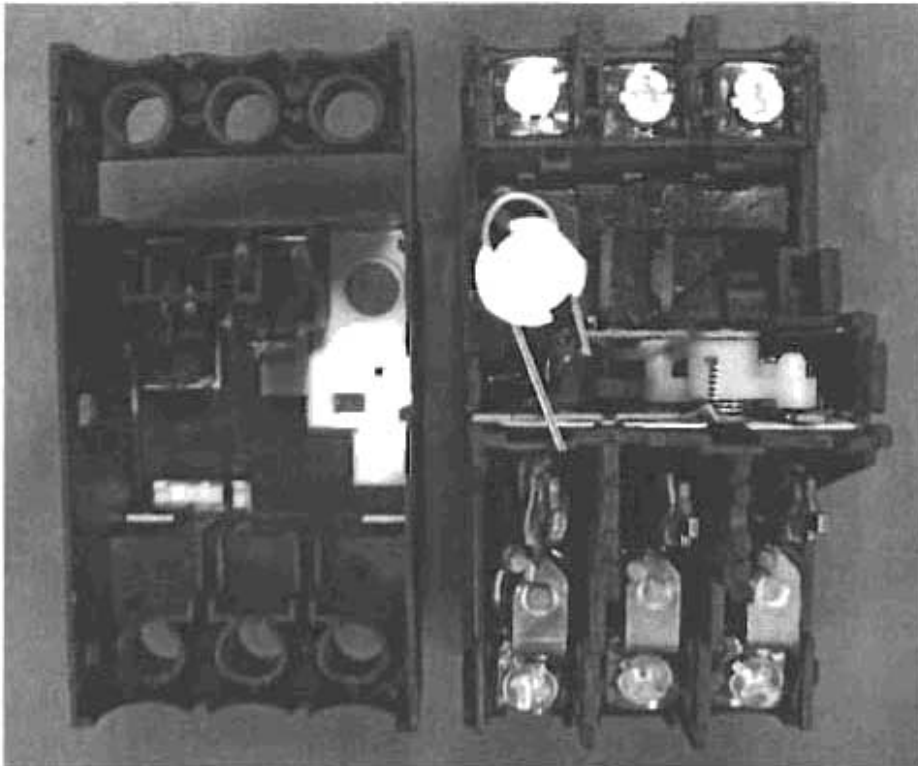
IEC 60947-2

Photos of sample:



IEC 60947-2

Photos of sample:



IEC**IECEE**

Test Report issued under the responsibility of:

TEST REPORT
IEC 60947-4-1
Contactors and motor-starters
Electromechanical contactors and motor-starters

Report Number.....: 130700026SHA-002
 Date of issue.....: October 18, 2013
 Total number of pages.....: 38

CB Testing Laboratory.....: Intertek Testing Services Shanghai
 Address.....: Building No.86, 1198 Qinzhou Road (North), Shanghai 200233, China

Applicant's name.....: ELMARK INDUSTRIES SC
 Address.....: 2 Dobrudzha blvd., Dobrich, Bulgaria

Test specification:

Standard.....: IEC 60947-4-1:2009 (3rd Edition) + A1 :2012
 EN 60947-4-1:2010 + A1 :2012
 Test procedure.....: CB+S
 Non-standard test method.....: N/A

Test Report Form No.....: IEC60947_4_1A
 Test Report Form(s) Originator.....: KEMA Quality BV
 Master TRF.....: Dated 2010-01

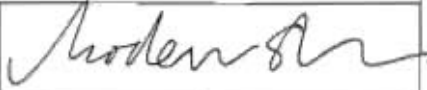
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This report is not valid as a CB Test Report unless signed by an approved CB Testing Laboratory and appended to a CB Test Certificate issued by an NCB in accordance with IECEE 02.

Test item description.....: Moulded case circuit-breakers with motor protection
 Trade Mark.....: **ELMARK**
 Manufacturer.....: Same as applicant
 Model/Type reference.....: TM2
 Ratings.....: See page 9

Testing procedure and testing location:		
<input checked="" type="checkbox"/>	CB Testing Laboratory:	Intertek Testing Services Shanghai
Testing location/ address		Building No.86, 1198 Qinzhou Road (North), Shanghai 200233, China
<input checked="" type="checkbox"/>	Associated CB Laboratory:	Inspection Center of Products' Quality of Low Voltage Electric Apparatus in Zhejiang Province
Testing location/ address		West Zhonghuan Road, Jiaxing City, Zhejiang Province, P.R.China
Tested by (name + signature)		Mathew Shen 
Approved by (+ signature)		Jim Hua 
<input type="checkbox"/>	Testing procedure: TMP	
Testing location/ address		
Tested by (name + signature)		
Approved by (+ signature)		
<input type="checkbox"/>	Testing procedure: WMT	
Testing location/ address		
Tested by (name + signature) :		
Witnessed by (+ signature) :		
Approved by (+ signature) :		
<input type="checkbox"/>	Testing procedure: SMT	
Testing location/ address		
Tested by (name + signature)		
Approved by (+ signature)		
Supervised by (+ signature)		
<input type="checkbox"/>	Testing procedure: RMT	
Testing location/ address		
Tested by (name + signature)		
Approved by (+ signature)		
Supervised by (+ signature)		

Summary of testing:							
Clause	Testing items						Testing location
9.3.3.3	Verification of temperature rise						CBTL
9.3.3.1&9.3.3.2	Verification of operation and operating limits						ACTL
9.3.3.4	Verification of dielectric properties						ACTL
9.3.3.5	Verification of rated making and breaking capacities, change-over ability and reversibility, where applicable						ACTL
9.3.3.6	Verification of conventional operational performance						ACTL
9.3.4	Performance under short-circuit conditions						ACTL
9.3.5	Verification of ability to withstand overload current						ACTL
8.2.4 of part 1	Verification of mechanical properties of terminals						CBTL
Annex C of part 1	Verification of degrees of protection of enclosed contactors and starters						CBTL
Tests performed on main circuit according to IEC/EN 60947-4-1:							
Report No.	Type	Adjustable current range	I	II	III	IV	V
130700026SHA-002	TM2	24-32A	1	-	-	-	-
	TM2	0,1-0,16A	1	-	-	-	-
Notes:							
Summary of compliance with National Differences:							
N/A							

Copy of marking plate:

See main test report 130700026SHA-001.

Remark:

The products are circuit-breakers integral with protective function of thermal relay.

Test item particulars	
- kind of equipment	Thermal Relay
- number of poles	3
- kind of current (a.c. or d.c.)	a.c.
- interrupting medium	N/A
- method of operation	manual
- method of control	Automatic & manual
- method of change-over for particular types of starters	N/A
- method of connecting for particular types of starters:	N/A
-Rated and limiting values, main circuit:	
- rated operational voltage U_e (V).....	415
- rated stator operational voltage U_{es} (V)	N/A
- rated rotor operational voltage U_{er} (V).....	N/A
- rated insulation voltage U_i (V).....	690
- rated stator insulation voltage U_{is} (V)	N/A
- rated rotor insulation voltage U_{ir} (V)	N/A
- rated impulse withstand voltage U_{imp} (kV)	6
- rated starting voltage of an auto-transformer starter(V)	N/A
- conventional free air thermal current I_{th} (A)	N/A
- conventional enclosed thermal current I_{the} (A)	N/A
- conventional stator thermal current I_{ths} (A)	N/A
- conventional rotor thermal current I_{thr} (A)	N/A
- rated operational current I_e (A) or rated operational powers	See page 9
- rated stator operational current I_{es} (A) or rated stator operational powers	N/A
- rated rotor operational current I_{er} (A)	N/A
- rated uninterrupted current I_u (A)	N/A
- rated frequency.....	50/60Hz
- rated duties.....	Uninterrupted
Short-circuit characteristic:	
- rated prospective short-circuit current "r" (kA)	N/A
- rated conditional short-circuit current I_q (kA)	N/A

Rated and limiting values of the electronically controlled electro-magnet		
- kind of current	:	N/A
- power consumption	:	N/A
- rated frequency (or d.c.)	:	N/A
- rated control circuit voltage U_c (nature: a.c. / d.c.)	:	N/A
- rated control supply voltage U_s (nature: a.c. / d.c.)	:	N/A
- nature of external control circuit devices	:	N/A
Rated and limiting values of air supply control circuit		
- rated pressure	:	N/A
- volumes of air	:	N/A
Rated and limiting values of relays and releases (overload relays)		
- types of relay or release	:	<input checked="" type="checkbox"/> a) release with shunt coil (shunt trip) <input checked="" type="checkbox"/> b) under voltage and under-current opening relay or release <input checked="" type="checkbox"/> c) overload time-delay relay the time-lag of which is: <input type="checkbox"/> 1) substantially independent of previous load (e.g. time-delay magnetic overload relay) <input type="checkbox"/> 2) dependent on previous load (e.g. thermal or electronic overload relay) <input checked="" type="checkbox"/> 3) dependent on previous load (e.g. thermal or electronic overload relay) and also sensitive to phase loss <input type="checkbox"/> d) instantaneous over-current relay or release (e.g. jam sensitive, see 3.2.29) <input type="checkbox"/> e) other relays or releases (e.g., control relay associated with devices for the thermal protection of the motor) <input type="checkbox"/> f) Stall relay or release
- characteristic values		
a) release with shunt coil, under-voltage (under-current) opening relay or release		
- rated voltage (current)	:	N/A
- rated frequency	:	N/A
- operating voltage (current)	:	N/A
- operating time	:	N/A
- inhibit time	:	N/A
b) Overload relay:		
- designation and current settings	:	See general product information
- 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
c) Release with residual current sensing relay:		
- rated current		
- operating current		
- operating time or time-current characteristic according to Table H.1.		N/A
Type and characteristics of automatic change-over devices and automatic acceleration control devices		
Types		<input type="checkbox"/> 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) <input type="checkbox"/> b) under current devices (undercurrent relays) <input type="checkbox"/> c) other devices for automatic control - <input type="checkbox"/> devices dependent on voltage - <input type="checkbox"/> devices on power - <input type="checkbox"/> 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	:	<input type="checkbox"/> air-cooling <input type="checkbox"/> oil-cooling
Mounting design	:	<input type="checkbox"/> built-in <input type="checkbox"/> 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 (U _{ir})	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 :	<input type="checkbox"/> free air <input type="checkbox"/> forced air <input type="checkbox"/> foil immersion
Mounting design :	<input type="checkbox"/> built-in <input type="checkbox"/> or provide separately
Rated and limiting values, auxiliary circuits:	
- rated operational voltage U _e (V).....	N/A
- rated insulation voltage: U _i (V).....	N/A
- rated operational current: I _e (A).....	N/A
- kind of current.....	N/A
- rated frequency: (Hz).....	N/A
- number of circuits.....	N/A
- number and kind of contact elements.....	N/A
- rated uninterrupted current: I _u (A).....	N/A
- utilization category: (AC, DC, current and voltage).....	N/A
Short-circuit characteristic :	
- Rated conditional short-circuit current (kA).....	N/A
- kind of protective device.....	Integral with a circuit breaker
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.....	July 01, 2013
Date (s) of performance of tests.....	From July 01, 2012 to October 18, 2012

General remarks:

The test results presented in this report relate only to the object tested.
 This report shall not be reproduced, except in full, without the written approval of the Issuing testing laboratory.
 "(see Enclosure #)" refers to additional information appended to the report.
 "(see appended table)" refers to a table appended to the report.

Throughout this report a comma / point is used as the decimal separator.
 This test report is valid only being read together with the test reports of 130700026SHA-001

Manufacturer's Declaration per Sub-clause 6.2.5 of IEC 60947-2:

The application for obtaining a CB Test Certificate includes more than one factory location and a declaration from the Manufacturer stating that the sample(s) submitted for evaluation is (are) representative of the products from each factory has been provided: **Yes/Not applicable**

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

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

General product information:

$U_e=415V$ (3P), $U_i=690V$, $U_{imp}=6kV$, Cat. A

Rated Current (A)	415V	
	I _{cu} (kA)	I _{cs} (kA)
0.1~0.16	50	50
0.16~0.25	50	50
0.25~0.4	50	50
0.4~0.63	50	50
0.63~1	50	50
1~1.6	50	50
1.6~2.5	50	50
2.5~4	50	50
4~6.3	50	50
6~10	50	50
9~14	10	5
13~18	10	5
17~23	10	5
20~25	10	5
24~32	10	5

6.2	MARKING		
Data shall be marked on the equipment (mandatory):			
a – manufacturer's name or trade mark	ELMARK	P	
b – type designation or serial number	TM2	P	
Data preferably marked on the equipment:			
c - number of this standard, if the manufacturer claims compliance	IEC/EN 60947-4-1	P	
k - IP code, in case of an enclosed equipment		N/A	
Data shall be included on the nameplate, or on the equipment, or in the manufacturer's published literature:			
d - rated operational voltages	415V	P	
e - utilization category and rated operational currents (or rated powers), at the rated operational voltages of the equipment		N/A	
f - either the value of the rated frequency/ies, or the indication d.c. (or symbol)	50/60Hz	P	
g - rated duty with the indication of the class of intermittent duty, if any		N/A	
Associated values:			
h - rated marking and breaking capacities (these indications may be replaced, where applicable, by the indication of the utilization category, see table 7)		N/A	
Safety an installation:			
i – rated insulation voltage	690V	P	
j – rated impulse withstand voltage (see 5.3.1.3)	6kV	P	
l – pollution degree	3	P	
m – rated conditional short-circuit current (see 5.3.6) and type of co-ordination of the contactor or starter (see 8.2.5.1) and the type, current rating and characteristics of the associated SCPD; rated conditional short-circuit current (see 5.3.6) of the combination starter, the combination switching device, the protected starter or the protected switching device and type of co-ordination (see 8.2.5.1)		N/A	
n - Void			
Control circuits			
The following information concerning control circuits shall be placed either on the coil or on the equipment:			
o – rated control circuit voltage (U _c), nature of current and rated frequency		N/A	
p - if necessary, nature of current, rated frequency and rated control supply voltages (U _s)		N/A	
Air supply systems for starter or contactors operated by compressed air			

IEC 60947-4-1			
Clause	Requirement + Test	Result - Remark	Verdict
	q – rated supply systems of the compressed air and limits of variation of this pressure, if they are different from those specified in 8.2.1.2		N/A
	Auxiliary circuits:		
	r – ratings of auxiliary circuits	See general product information	P
	Overload relays and releases:		
	s – characteristics according to 5.7, specifying the electronic overload relay does not contain thermal memory	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:		
	t – circuit diagram		N/A
	u – severity of start, see 5.3.5.5.1		N/A
	v – starting time, see 5.3.5.5.1		N/A
	Auto-transformer starters:		
	w – rated starting voltage(s), i.e. voltage(s) at the tapping terminals		N/A
	Vacuum contactors and starters:		
	x – maximum permissible altitude of the site of installation, if less than 2000 m		N/A
	EMC		
	y – environment A and/or B: see 7.3.1 of part 1	<input type="checkbox"/> A <input type="checkbox"/> B	N/A
	z – special requirements, if applicable, for example shielded or twisted conductors		N/A
	Sub clause 5.2 of part 1 applies to contactors, starters and overload relays with the following additions:		
	Data under items d) to x in 6.1.2 shall be included on the nameplate or on the equipment or in the manufacturer's published literature:		P
	Data under items c) and k) in 6.1.2 shall preferably be marked on the equipment	c) marked	P
	In case of electronically controlled electromagnets, information other than given in o) and p) of 6.1.2 may also be necessary: see 5.5 and annex E		N/A
	If the manufacturer declares an electronic overload relay without thermal memory, this shall be marked on the device.		N/A
6.3	Instruction for installation, operation and maintenance		

IEC 60947-4-1			
Clause	Requirement + Test	Result - Remark	Verdict
	The manufacture shall specify, in his documents or catalogues:		
	- the conditions for installation, operation and maintenance, if any, of the equipment during operation and after a fault		P
	- the specify the measures to be taken with regard to EMC, if any,		N/A
	- equipment only suitable in environment A shall provided with the following notice	<p style="text-align: center;">NOTICE</p> This product has been designed for environment A. Use of this product in environment B may cause unwanted electromagnetic disturbances in which case the user may be required to taken adequate mitigation measures.	N/A
	- if necessary, the instructions for transport, installation and operation of the equipment shall indicate the measures that are particular importance for the proper and correct installation, commissioning and operation of the equipment.		P
	- manufacturer advice on the measures to be taken in the event of a short-circuit		P
	In case of protected starters (see 3.2.8), the manufacturer shall also provide the necessary mounting and wiring instruction		N/A
8.1	Construction 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
8.1.1	MATERIALS		
	Sub clause of 7.1.1 of part 1 applies with the following additions		
	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	b) on sections taken from the equipment	P
	The suitability shall determined with respect to resistance to abnormal heat and fire		P
	The manufacturer shall indicate which tests, amongst a), b) and c), shall be used	<input type="checkbox"/> a) <input checked="" type="checkbox"/> b) <input type="checkbox"/> c)	P
	Resistance to abnormal heat and to fire		
	Glow wire test (on equipment), according Cl. 7.1.1.1 of part 1		
	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	<input type="checkbox"/> 850 ± 15°C or <input checked="" type="checkbox"/> 960 ± 15°C	P

IEC 60947-4-1			
Clause	Requirement + Test	Result - Remark	Verdict
	all other parts	<input checked="" type="checkbox"/> 650 ± 10°C	P
	No visible flame, no sustained glowing or flames and glowing extinguish within 30 s		P
	Flammability, hot wire ignition and arc ignition tests (on materials)), according Cl. 7.1.1.1 of part 1		
	When tests on materials are used, they shall be made according to the tests for flammability classification, hot wire ignition and, where applicable, arc ignition, as specified in 8.2.1.1.2. The materials used shall comply with the values given in table M.1 of part 1 according to the manufacturer's chosen flammability category (see IEC 60695-11-10)		N/A
	Flammability, hot wire ignition an arc ignition tests (on materials) according 8.2.1.1.2 of part 1		
	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		
	a) Flammability tests, in accordance with IEC 60695-11-10		
	Test method	<input type="checkbox"/> A) – Horizontal burning test <input type="checkbox"/> 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
8.1.2	Current-carrying parts and their connection (see 7.1.2)		
	No contact pressure through insulating materials		P
8.1.3	Clearances and creepage distances		
	CLAUSE 7.1.3 OF PART 1 APPLIES		
	Clearances		
	Rated impulse withstand voltage (see test sequence I)	U _{imp} = 6kV	P
	Creepage distances		
	Pollution degree	3	
	Comparative tracking index (V)	175	
	Material group	IIIa	
	Rated insulation voltage U _i (V)	690	

IEC 60947-4-1			
Clause	Requirement + Test	Result - Remark	Verdict
	Minimum creepage distances (mm) : 10		
	Measured creepage distances (mm) : >12(by gauge)		P
	In case Uimp is not indicated		N/A
8.1.4	Actuator		
	Sub-clause 7.1.4 of part 1 applies when the actuator is manually operated with the following addition:		
	The operating handle of the manually operated switching device of combination starter shall be provided with means for padlocking it in the OFF position.		N/A
8.1.4.3	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	Indication of contact position		
8.1.5.1	Indication means, see 7.1.5.1 part 1 applies to manually operated starters	I On 0 off	P
8.1.5.2	Indication by the actuator, see 7.1.5.1 part 1		P
8.1.6	Additional safety requirements for equipment suitable for isolation, see clause 7.1.6.1 part 1 applies and the additions marked with *)		
7.1.6.1 part 1	Additional constructional requirements:		
	- marking according to 5.2.		P
	- indication of the position of the contacts		P
	- construction of the actuating mechanism		P
	- minimum clearances across open contacts (see Table XIII, Part 1) (mm) : 5,5		P
	- measured clearances (mm) : >6 (by gauge)		P
	- test Uimp across gap (kV) : 12,3		P
	*) Devices provided with positions like trip position or stand-by positions which are not the indicated open position shall be clearly marked.		N/A
	*) An indicator having only one position of rest shall not be considered as appropriate to indicate the position of the main contact.		N/A
7.1.6.2 part 1	Supplementary requirements for equipment with provision for electrical interlocking with contactors or circuit-breakers:		

IEC 60947-4-1			
Clause	Requirement + Test	Result - Remark	Verdict
	Auxiliary switch is rated according to IEC 60947-5-1 (unless the equipment is rated AC-23)		N/A
	Time interval between opening of the contacts of the auxiliary contact and the contacts of the main poles: ≥ 20 ms		N/A
	Measured time interval (ms)		N/A
	During the closing operation the contacts of the auxiliary switch closes after or simultaneously with the contacts of the main poles		N/A
7.1.6.3 part 1	Supplementary requirements for equipment provided with means for padlocking the open position:		
	The locking means is so designed that it cannot be removed with the appropriate padlock(s) installed		N/A
	Test force F applied to the actuator in an attempt to operate to the closed position (N)		N/A
	Rated impulse withstand voltage (kV)		
	Test Uimp on open main contacts at the test force		N/A
8.1.7	Terminals		
	clause 7.1.7 1 part 1 applies		
7.1.7.1 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
8.2.4 part 1	Mechanical properties of terminals		
	see clause 8.2.4 part 1 applies		
8.2.4.2	Mechanical strength of terminals		
	maximum cross-sectional area of conductor (mm ²)	6,0	

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Clause	Requirement + Test	Result - Remark	Verdict
	diameter of thread (mm)	3,9	
	torque (Nm)	1,2	
	5 times on 2 separate clamping units		P
8.2.4.3	Testing for damage to and accidental loosening of conductor (flexion test)		
	conductor of the smallest cross-sectional area (mm ²)	1,0	
	number of conductor of the smallest cross section	2	
	diameter of bushing hole (mm)	6,5	
	height between the equipment and the platen (mm)	260	
	mass at the conductor(s) (kg)	0,4	
	135 continuous revolutions: the conductor shall neither slip out of the terminal nor break near the clamping unit		P
8.2.4.4	Pull-out test		
	force (N)	35	
	1 min, the conductor shall neither slip out of the terminal nor break near the clamping unit		P
	Flexion test		
	conductor of the largest cross-sectional area (mm ²)	6,0	
	number of conductor of the largest cross-sectional	2	
	diameter of bushing hole (mm)	9,5	
	height between the equipment and the platen (mm)	280	
	mass at the conductor(s) (kg)	1,4	
	135 continuous revolutions: the conductor shall neither slip out of the terminal nor break near the clamping unit		P
	Pull-out test		
	force (N)	80	
	1 min, the conductor shall neither slip out of the terminal nor break near the clamping unit		P
	Flexion test		
	conductor of the largest and smallest cross-sectional area (mm ²)	6,0 / 1,0	
	number of conductor of the smallest cross sectional, number of conductor of the largest cross sectional	2 / 2	
	diameter of bushing hole (mm)	9,5 / 6,5	

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Clause	Requirement + Test	Result - Remark	Verdict
	height between the equipment and the platen (mm)	280 / 260	
	mass at the conductor(s) (kg)	1,4 / 0,4	
	135 continuous revolutions: the conductor shall neither slip out of the terminal nor break near the clamping unit		P
	Pull-out test		
	force (N)	80 / 35	
	1 min, the conductor shall neither slip out of the terminal nor break near the clamping unit		P
7.1.7.2	Connecting capacity		
	type of conductors	Rigid-solid or stranded or flexible cable	
	minimum cross-sectional area of conductor (mm ²)	1,0	
	maximum cross-sectional area of conductor (mm ²)	6,0	
	number of conductors simultaneously connectable to the terminal	2 for 1,0mm ² 2 for 6,0mm ²	
7.1.7.3	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
8.1.7.4	Terminal identification and marking,		
8.1.7.4	Subclause 7.1.7.4 of part 1 applies with the additional requirements of annex A		P
	terminal intended exclusively for the neutral conductor		N/A
	protective earth terminal		N/A
	other terminals	1/L1, 3/L2, 5/L3, 2/T1, 4/T2, 6/T3,	P
8.1.8	Additional requirements for equipment provided with a neutral pole		
	Sub clause 7.1.8 of part 1 applies		
	marking of neutral pole		N/A
	The switched neutral pole shall not break before and shall not make after the other poles		N/A
	Conventional thermal current of neutral pole		N/A
	If a pole having an appropriate short-circuit breaking and making capacity is used as a neutral pole, then all poles, including the neutral pole, may operate substantially together.		N/A
	Equipment having a value I _{th} < 63 A, this value shall be identical for all poles		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	For $I_{th} > 63$ A, the neutral pole may have a value of I_{th} different from that of the other poles, but not less than the half that value or 63 A, whichever is the higher.		N/A
8.1.9	Provisions for earthing		
	Sub clause 7.1.9 of part 1 applies		
7.1.9.1 part 1	The exposed conductive parts shall be electrically interconnected and connected to a protective earth terminal		N/A
7.1.9.2 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
7.1.9.3 part1	Protective earth terminal marking and identification		N/A
8.1.10	Enclosure for equipment		
7.1.10.1 part1	Design		
	Sub clause 7.1.10 of part 1 applies with the follow additions		
	Starting resistors mounted within an enclosure shall be so located or guarded that issuing heat is not detrimental to other apparatus and materials within the enclosure.		N/A
	For the specified case of combination starters, the cover or door shall be interlocked so that it cannot be opened without manually operated device being in open position.		N/A
	However, provision may be made to open the door or cover with the manually operated switching device in the ON position by use of a tool.		N/A
	The enclosure, when it is opened: all parts requiring access for installation and maintenance are readily accessible		N/A
	Sufficient space shall be provided inside the enclosure		N/A
	The fixed parts of a metal enclosure shall be electrically connected to the other exposed conductive parts of the equipment and connected to a terminal which enables them to be earthed or connected to a protective conductor		N/A
	Under no circumstances shall a removable metal part of the enclosure be insulated from the part carrying the earth terminal when the removable part is in place		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	The removable parts of the enclosure shall be firmly secured to the fixed parts by a device such that they cannot be accidentally loosened or detached owing to the effects of operation of the equipment or vibrations		N/A
	When an enclosure is so designed as to allow the covers to be opened without the use of tools, means shall be provided to prevent loss of the fastening devices		N/A
7.1.10.2 part1	Insulation		
	If, in order to prevent accidental contact between a metallic enclosure and live parts, the enclosure is partly or completely lined with insulating material, then this lining shall be securely fixed to the enclosure		N/A
8.1.11	Degree of protection of enclosed contactors and starters		
	Sub clause 7.1.11 of part 1 applies		
	Degree of protection	IP20	P
	Test for first characteristic		
	Test for first numeral	1: 2: 3: 4: 5: 6:	N/A P N/A N/A N/A N/A
	Test for second characteristic		
	Test for second numeral	1: 2: 3: 4: 5: 6: 7: 8:	N/A N/A N/A N/A N/A N/A N/A N/A

9.3.1.a	TEST SEQUENCE I	
- 2 samples: TM2, Ie= 24-32A(I-1), 0,1-0,16A(I-2) 3P		
	- verification of temperature rise (Clause 9.3.3.3.)	

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Clause	Requirement + Test	Result - Remark	Verdict
	- verification of operation and operating limits (Clause 9.3.3.1 and 9.3.3.2)		
	- verification of dielectric properties (Clause 9.3.3.4)		
9.3.3.3	Temperature rise	I-1	
	Sub clause 8.3.3.3. of part 1 applies		
	ambient temperature 10-40 °C	21	
	Contactor		
	test enclosure W x H x D (mm x mm x mm)	In free air	
	material of enclosure	No enclosure	
9.3.3.3.4	Main circuits, test conditions:		
	Sub clause 8.3.3.3.4 of part 1 applies with following addition		
	loaded as stated in 8.2.2.4		
	- setting of the maximum current setting	32A	
	- setting overload relay	-	
	- conventional thermal current Ith (A)	-	
	- conventional enclosed thermal current Ithe (A) ..	-	
	- cable/busbar cross-section (mm ²) / (mm)	6,0 / 1000	
	- temperature rise of main circuit terminals (K)	See page 37	P
9.3.3.3.5	Control circuit, test conditions:		
	Sub clause 8.3.3.3.5. of part 1 applies with following addition		
	The temperature rise shall be measures during the test of 9.3.3.3.4		
	- conventional thermal current Ith (A) at their rated voltage		
	- conventional enclosed thermal current Ithe (A) ..		
	- cable/busbar cross-section (mm ²) / (mm)		
	- temperature rise of control circuit (K)	< K see page	N/A
9.3.3.3.6	Coils and electromagnets circuit, test conditions:		
	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		

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Clause	Requirement + Test	Result - Remark	Verdict
	- rated control supply voltage U_s (V)		
	- class of insulating material		
	- uninterrupted or eight-hour duty windings		
	- temperature rise of control circuit terminals (K) : < K see page		N/A
	b) Intermittent duty windings (8.2.2.6.2)		
	- no current flowing though the main circuit		
	- rated control supply voltage U_s (V)		
	- class of insulating material		
	- intermittent duty class		
	- close open operating cycle.....		
	- on-load factor		
	- temperature rise of control circuit terminals (K) : < K see page		N/A
	c) temporary or periodic duty (8.2.2.6.3)		
	- no current flowing though the main circuit		
	- rated control supply voltage U_s (V)		
	- class of insulating material		
	- close open operating cycle.....		
	- on-load time		
	- temperature rise of control circuit terminals (K) : < K see page		N/A
9.3.3.3.7	Auxiliary circuit, test conditions:		
	Normally loaded with their maximum rated operational current at any convenient voltage		
	The temperature rise shall be measures during the test of 9.3.3.3.4		
	- conventional thermal current I_{th} (A)		
	- conventional enclosed thermal current I_{the} (A) :		
	- cable/busbar cross-section (mm ²) / (mm)		
	- cable cross-section (mm ²)		
	- temperature rise of auxiliary circuit terminals (K) :		N/A
9.3.3.3.8	Starting resistors for rheostatic rotor starters test conditions:		
	Normally loaded with their current value I_m		
	Number of starts per hour		

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Clause	Requirement + Test	Result - Remark	Verdict
	Rated duty		
	Starting characteristic	See page _____	
	- cable/busbar cross-section (mm ²) / (mm)		
	- cable cross-section (mm ²)		
	- temperature rise of starting resistor terminals (K)		
	- temperature rise of starting resistor enclosure (K)		
	- temperature rise of issuing air (K)		N/A
9.3.3.3.9	Auto-transformers for two-step auto-transformers starters		
	Normally loaded with max. Starting current multiplied with $0,8 \times \frac{\text{starting voltage}}{U_{IE}}$		
	Number of starts per hour		
	Rated duty		
	Starting characteristic		
	- cable/busbar cross-section (mm ²) / (mm)		
	Temperature rise of:		
	- windings (K), See table 5 (+15 %)		
	- operating means (K), See table 3 of part 1		
	- parts intended to be touched but not hand held (K), See table 3 of part 1		
	- parts which need not be touched during normal operation (K), See table 3 of part 1		N/A
9.3.3	Performance under no load, normal load and overload conditions		
9.3.3.1	Operation		
	For starter only:		
	reference ambient temperature (i.e. +20 °C) :		
	Rated full load current (A) :		
	No tripping after 3 operations when stator has reached thermal equilibrium at minimum and maximum settings		N/A
	For overload relay with combined stop and reset actuating mechanism only		
	With closed contactor, the resetting mechanism shall be operated and this shall cause the contactor drop out		N/A
	For overload relay with either a reset or separate stop and reset mechanism only		

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Clause	Requirement + Test	Result - Remark	Verdict
	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:		
8.2.1.2.1	Electromagnetic contactors and starters		
	rated control supply voltage U_s (V)		
	frequency (Hz)		
	declared ambient temperature(>40 °C) for 100% U_s		
	limits of close satisfactorily at any value between 85% and 110% of rated control supply voltage U_s	U_{smax} U_{smin}	N/A
	limits of drop out and open fully are: 75% to 20% for a.c. and 75% to 10% for d.c.		N/A
	ambient temperature(-5 °C) for 100% U_s		
	Drop out test method		N/A
	Limits of drop out and open fully are: 75% to 20% for a.c. and 75% to 10% for d.c.		N/A
8.2.1.2.2	Contactors and starters with electronically controlled electromagnet		
	Rated control supply voltage U_s (V)		
	Frequency (Hz)		
	Declared ambient temperature(>40 °C) for 100% U_s		
	Limits of close satisfactorily at any value between 85% and 110% of rated control supply voltage U_s		N/A
	Limits of drop out and open fully are: 75% to 20% for a.c. and 75% to 10% for d.c.		N/A
	Ambient temperature(-5 °C) for 100% U_s		
	Drop out test method		N/A
	Limits of drop out and open fully are: 75% to 20% for a.c. and 75% to 10% for d.c.		N/A
8.2.1.2.3	Electro-pneumatic contactors and starters		
	Rated air supply pressure (Bar)		
	Declared ambient temperature(>40 °C) for 100% of the rated air supply pressure (Bar)		

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Clause	Requirement + Test	Result - Remark	Verdict
	Limits of close satisfactorily at any value between 85% and 110% of rated air supply pressure (Bar) :		N/A
	Limits of drop out and open fully are: 75% to 10% of rated air supply pressure(Bar).....		N/A
	Ambient temperature(-5 °C) for 100% of the rated air supply pressure(Bar)		N/A
	Limits of close satisfactorily at any value between 85% and 110% of rated air supply pressure(Bar:		N/A
	Limits of drop out and open fully are: 75% to 10% for the rated air supply pressure(Bar)		N/A
8.2.1.2.4	Capacitive drop out test		
	A capacitor shall be inserted in series in the supply circuit U_s , the total length of the connecting conductors being ≤ 3 m.		
	The capacitor is short-circuit by a switch of negligible impedance.		
	The supply voltage shall then be adjusted to 110 % U_s		
	The value of the capacitor shall be calculated: C (nF) = $30 + 200000 / (f \times U_s)$	_____nF	
	Verification of the drop out of the contactor when the switch is operated to the open position		N/A
9.3.3.2.2	Relays and releases		
8.2.1.3	a) Operation of under-voltage relays and releases		
	type of under-voltage relay		
	Rated control supply voltage(U)		
	Frequency (Hz).....		
	Limits of drop out and fully open at slowly falling voltage are 70 % and 35 % of the rated voltage.....		N/A
	Prevent to close if supply voltage < 35 % of the rated voltage		N/A
	Limits of close satisfactorily at any value between 85 % and 110 %		N/A
8.2.1.4	b) Shunt-coil operated releases (shunt trip)		
	Tripping of shunt release measured during the tripping operation between 70 % and 110 % of the rated control supply voltage and if a.c. at rated frequency		N/A
8.2.1.5	Limits of operation of current sensing relays and releases		

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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	24-32A (I-1)	
	ambient temperature (°C)	21,0	
	test enclosure W x H x D (mm x mm x mm)	No enclosure	
	cable/busbar cross-section (mm ²) / (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; 25,2A / 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; 31,2A / 41,6A Trip-time: 4min37s / 4min26s	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: 36A / 48A Trip-time: 1min21s / 1min27s	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

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Clause	Requirement + Test	Result - Remark	Verdict
	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; 25,2A / 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: 28,8A / 38,4A Trip time: 2min45s / 4min16s	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: 36A / 48A Trip-time: 1min3s / 2min6s	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 T_p (s)	Class; 10A Tripping current: 173A / 231A Trip-time: 2,8s / 4,1s	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: 24A / 32A	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: 28,8A / 38,2A Trip time: 3min16s / 3min19s	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: 36A / 48A Trip-time: 47s / 1min03s	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) < T_p <, starting from the cold state; test current; tripping time T_p (s)	Class; ____ Tripping current ____A Trip-time: ____s	N/A

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Clause	Requirement + Test	Result - Remark	Verdict

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 I_e until the device has reached the thermal equilibrium	$I_e = \text{_____ A}$	N/A
	Interrupt a current for a duration of $2 \times T_p$ (see Table 2) with a relative tolerance of 10% (where T_p is the time measured at the D current according to Table 3).	$T_p = \text{_____ A}$ $D = \text{_____ A}$ Measured time $T_p = \text{_____ s}$	N/A
	Apply a current equal to $7,2 \times I_e$	$I_{\text{test}} = \text{_____ A}$	N/A
	The relay shall trip within 50% of the time TP	Trip time = _____ s	N/A

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Clause	Requirement + Test	Result - Remark					Verdict	
8.2.1.5.2	Limits of operation of three-pole time-delay overload relays energized on two poles:							
	ambient temperature (°C)	+ 21 °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: 24A						
	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
		24	21,6	24	21,6	24	21,6	
		>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 deenergized, tripping shall occur in less than 2 h; current value; test current :	RT	S	RS	T	ST	R	P
		31,7	0	31,7	0	31,7	0	
		2min7s		1min56s		1min53s		P
	ambient temperature (°C)	+ 21 °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 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
		32	28,8	32	28,8	32	28,8	
		>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 deenergized, tripping shall occur in less than 2 h; current value; test current :	RT	S	RS	T	ST	R	P
		42,3	0	42,3	0	42,3	0	
		3min27s		3min16s		3min19s		P

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Clause	Requirement + Test	Result - Remark	Verdict
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 $\pm 10\%$ of the value of the published current value corresponding to the current setting		N/A
	Magnetic settings.....		
	Accuracy $\pm 10\%$ of the value.....		N/A
8.2.1.5.4	Limits of operation of under-current relays and releases for automatic change over		
8.2.1.5.4.1	e) Limits of operation under-current relays		
	Under-current relays or release, when associated with a switching device, shall operate to open the switching device within 90% to 110 % of the set time when the current during run is below 0,9 times the under-current setting in all poles	Under current setting: _____ A Test current: _____ A Set time: _____ s Measured: _____ s	N/A
8.2.1.5.4.2	f) Limits of operation of automatic change over by under-current relays		
	- for star-delta starters from star to delta, and - for auto-transformer starters from the starting to the ON position		N/A
	The lowest drop-out of an under-current relay shall be not greater than 1,5, times the actual current setting of the overload relay which is active in the starting or star connection.	Lowest drop-out: A / Actual current setting: A = $\leq 1,5$ times	N/A
	The under-current relay shall be able to carry any value of current , from its lowest current setting to stalled current in the starting position or the star connection, for the tripping times determined by the overload relays at its highest current setting		N/A
8.2.1.5.5.	g) Stall relays		
	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		

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

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Clause	Requirement + Test	Result - Remark	Verdict
	maximum current setting / maximum set stall inhibit time Test current 95 % of set value	_____ s _____ A no trip	N/A
	maximum current setting / maximum set stall inhibit time Test current 1,2 times	_____ A _____ s Trip time = _____ s	N/A
9.3.3.4	Test of dielectric properties, impulse withstand voltage (Uimp indicated):		
	- verification by measurement of clearances instead of testing		
	Any actuator of insulating material and any integral non-metallic enclosure of equipment intended to be used without an additional enclosure shall be covered by a metal foil and connected to the frame or the mounting plate.		
	Tests are also carried out according Annex R of IEC 60947-1, Ed 5, application of the metal foil for dielectric testing on accessible parts during operation or adjustment		
	Terminal holes covered	<input type="checkbox"/> yes <input checked="" type="checkbox"/> no	P
	- rated impulse withstand voltage (V)	6000	
	- test Uimp main circuits (kV)	7,3	P
	- test Uimp auxiliary circuits (kV)	7,3	P
	Test of dielectric properties, dielectric withstand voltage (Uimp not indicated):		
	- rated insulation voltage (V)		
	- main circuits, test voltage for 5 s (V)		N/A
	- control and auxiliary circuits, test voltage for 5-s (V)		N/A
	- circuits of equipment include devices such as motors, instruments ect, test voltage for 5 s (V) ...		N/A
	Equipment suitable for isolation		
	The leakage current shall be measured through each pole with the contacts in open position (< 0,5 mA)	1,1 times $U_e = \text{---} V$	N/A

Testing on other current rating			
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 Note 1 The thermal protection of motors submitted to harmonics is under consideration		
	type of time-delay overload relay	Thermal overload relay	
	trip class	10A	

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Clause	Requirement + Test	Result - Remark	Verdict
	current setting	0,1-0,16A (I-2)	
	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)	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; 0,11A / 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: 4min31s / 4min52s	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: 1min27s / 1min20s	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 toerance 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 / 0,20A Trip time: 4min17s / 4min19s	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: 1min01s / 56s	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 T_p (s)	Class; 10A Tripping current: 0,72A / 1,16A Trip-time: 3,2s / 4,2s	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: 0,1A / 0,16A	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 / 0,20A Trip time: 3min20s / 3min32s	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: 43s / 47s	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) < T_p <, starting from the cold state; test current; tripping time T_p (s)	Class; ____ Tripping current ____ A Trip-time: ____ s	N/A
8.2.1.5.1.1	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 I_e until the device has reached the thermal equilibrium	$I_e = \text{____} \text{ A}$	N/A
	Interrupt a current for a duration of $2 \times T_p$ (see Table 2) with a relative tolerance of 10% (where T_p is the time measured at the D current according to Table 3).	$T_p = \text{____} \text{ A}$ $D = \text{____} \text{ A}$ Measured time $T_p = \text{____} \text{ s}$	N/A
	Apply a current equal to $7,2 \times I_e$	$I_{\text{test}} = \text{____} \text{ A}$	N/A
	The relay shall trip within 50% of the time T_P	Trip time = ____ s	N/A
	Limits of operation of three-pole thermal- time-delay overload relays energized on two poles:		

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Clause	Requirement + Test	Result - Remark	Verdict

8.2.1.5.2	Limits of operation of three-pole time-delay overload relays energized on two poles:							
	ambient temperature (°C)	+ 21 °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						
	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
		0,1	0,09	0,1	0,09	0,1	0,09	
		>2h		>2h		>2h		P
	when the value of the current flowing in two poles is increased to B times the current setting and the third pole deenergized, tripping shall occur in less than 2 h; current value; test current	RT	S	RS	T	ST	R	P
		0,14	0	0,14	0	0,14	0	
		3min19s		3min47s		3min21s		P
	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						
	ambient temperature (°C)	+ 21 °C						
	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		P
	b) when the value of the current flowing in two poles is increased to B times the current setting and the third pole deenergized, 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	
		3min36s		3min21s		3min51s		P

9.3.1.b	TEST SEQUENCE II	N/A
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9.3.1.c	TEST SEQUENCE III	N/A
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9.3.1.d	TEST SEQUENCE IV	N/A
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Clause	Requirement + Test	Result - Remark	Verdict
9.3.1.e	TEST SEQUENCE V		N/A
	EMC tests		N/A
9.4	ELECTROMAGNETIC COMPATIBILITY TESTS		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
	TEST SEQUENCE Annex M (part 1)		N/A
9.1.5.2	TEST SEQUENCE Special tests – damp heat, salt mist, vibration and shock		N/A

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Clause	Requirement + Test	Result - Remark	Verdict

	Flame tests according IEC 60695-11-10		
	Test method A		
a)			
b)			
c)			
d)			
e)			
f)			
g)			
h)			
i)			
j)			
k)			
l)			
m)			
n)	<input type="checkbox"/> HB <input type="checkbox"/> HB40 <input type="checkbox"/> HB 75		
	Flame tests according IEC 60695-11-10		
	Test method B		
a)			
b)			
c)			
d)			
e)			
f)			
g)			
h)			
i)			
j)			
k)			
l)			
m)			
n)	<input type="checkbox"/> V-0 <input type="checkbox"/> V-1 <input type="checkbox"/> V-2		

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Clause	Requirement + Test	Result - Remark	Verdict

TABLE: Heating Test			P
Test voltage (V).....		-	—
Ambient (°C).....		16 °C	—
Thermocouple Locations	temperature rise measured (K)	temperature rise limit, (K)	
Terminal L1	33	65	
Terminal L2	41	65	
Terminal L3	33	65	
Terminal T1	31	65	
Terminal T2	41	65	
Terminal T3	35	65	
Enclosure	23	40	
supplementary information:			

Photos of samples:

See photos of samples on report 130700026SHA-001