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TESTLA
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AB-0386-T
1707.25.02/02
26.06.2018

DENEY RAPORU
TEST REPORT

Müşteri Adı ve Adresi *Client Name & Adress*	Beta Electric Industries INC. Block 56 cpc industrial zone, 6 of October city, Cairo, Egypt.
Numune Tanımı *Sample Description*	BEND 6000 (MCB)
Marka / Tip / Seri No *Brand / Type / Serial Number*	BEND 6000
Talep/Kabul No *Demand-Accept No*	1707.25.02/02
Numune Kabul Tarihi *Sample Acceptance Date*	05.07.2017
Deney Tarihleri *Test Date(s)*	05.07.2017-21.07.2017
Rapor Sayfa Sayısı *Num. Of Pages Of The Report*	57
Deney Standartları *Test Standard(s)*	IEC 60898-1:2015
Açıklamalar *Remarks*	

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The test and/or measurement results, the uncertainties (if applicable) with confidence probability and test methods are given on the following pages which are part of this report.

Mühür *Seal*	**Rapor Tarihi** *Report Date*	**Deney Sorumlusu** *Person İn Charge Of Test*	**Laboratuvar Müdürü** *Laboratory Manager*
TESTLA ELEKTRİK LABORATUVARLARI TESLAB •2010•	**26.06.2018**	**Mehmet ŞUMNU**	**Caner EREN**

Test item description..... :	MCB	
Trade Mark..... :	BETA	
Manufacturer..... :	BETA ELECTRIC INDUSTRIES	
Model/Type reference..... :	BEND6000	
Ratings..... :	80-125A	
Responsible Testing Laboratory (as applicable), testing procedure and testing location(s):		
☐ CB Testing Laboratory:		
Testing location/ address ..... :		
☐ Associated CB Testing Laboratory:		
Testing location/ address ..... :		
Tested by (name, function, signature)..... :		
Approved by (name, function, signature) .. :		
☒ Testing procedure: CTF Stage 1:		
Testing location/ address ..... :	TESTLA Elektrik Laboratuvarları Tic. Ltd. Şti. Kuzuluk Beldesi Topçusırtı Mah. Ankara Cad. No:34 Akyazı / SAKARYA / TÜRKİYE	
Tested by (name, function, signature)..... :	Mehmet ŞUMNU	
Approved by (name, function, signature) .. :	Caner EREN	
☐ Testing procedure: CTF Stage 2:		
Testing location/ address ..... :		
Tested by (name + signature)..... :		
Witnessed by (name, function, signature) . :	Amr İbrahim	
Approved by (name, function, signature) .. :		
☐ Testing procedure: CTF Stage 3:		
☐ Testing procedure: CTF Stage 4:		
Testing location/ address ..... :		
Tested by (name, function, signature)..... :		
Witnessed by (name, function, signature) . :		
Approved by (name, function, signature) .. :		
Supervised by (name, function, signature) :		

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

Tests performed (name of test and test clause):	Testing location:

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

☐ The product fulfils the requirements of _____ (insert standard number and edition and delete the text in parenthesis, leave it blank or delete the whole sentence, if not applicable)

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	Annex E		
	Special requirements for auxiliary circuits for safety extra-low voltage		
8.1.3	**Clearances and creepage distances**		NA
	Additional note to table 4 NOTE 4 live parts in auxiliary circuits intended to be connected to safety extra low voltages shall be separated from circuits with higher voltages in accordance with the requirements of 411.1.3.3 of IEC 60364-4-41		
	Compliance is checked by inspection		
9.7.4	**Dielectric strength of the auxiliary circuits**		NA
	Note: A test for circuits intended for connection to safety extra-low voltage is under consideration		

Classification of installation and use ..... :	
Supply Connection ..... :	
..... :	
Possible test case verdicts:	
- test case does not apply to the test object .....:	N/A
- test object does meet the requirement .....:	P (Pass)
- test object does not meet the requirement .....:	F (Fail)
Testing .....:	
Date of receipt of test item .....:	
Date (s) of performance of tests .....:	

General remarks:

"(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.

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

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

When differences exist; they shall be identified in the General product information section.

Name and address of factory (ies) .....:

General product information:

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Test item particulars	
Type of circuit-breaker .....:	SLD6000
Number of poles .....:	☒ 1-P ☐ 1-P+N ☒ 2-P ☒ 3-P ☐ 3-P+N ☒ 4-P
Protection against external influences .....:	☐ enclosed ☒ unenclosed
Method of mounting .....:	☐ surface ☐ flush ☒ panel board
Method of connection .....:	☒ not associated with the mechanical mounting ☐ associated with the mechanical mounting
Type of terminal .....:	☒ screw a) b) ☐ pillar a) b) ☐ cage a) b) ☐ lug ☐ screw less a) ☐ flat quick connect a) ☐ plug-in ☐ screw-in a) copper conductors b) aluminium conductors
Instantaneous tripping current .....:	☐ B ☒ C ☐ D
I^2t characteristic .....:	
Value of rated operational voltage (Ue) .....:	☐ 120 V ☐ 230 V ☐ 240 V ☐ 120/240 V ☒ 230/400 V ☐ 400 V ☐ 240/415 V ☐ 415 V
Value of rated current (In) .....:	80-100-125_____ A
Value of rated frequency .....:	☒ 50 Hz ☒ 60 Hz
Ambient air temperature (°C) .....:	☒ 30°C ☐ 40°C ☐ Other _____°C
Rated short-circuit capacity (Icn) .....:	☐ 1,5 kA ☐ 3 kA ☐ 4,5 kA ☒ 6 kA ☐ 10 kA ☐ 15 kA ☐ 20 kA ☐ 25 kA
Rated impulse withstand voltage (Uimp)	☐ 2,5 kV ☐ 4 kV ☒ declared _6__kV

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	TESTS „A“ 1 SAMPLE	A_1	
6	**MARKING AND OTHER INFORMATION**		
	Circuit-breaker marked with:		
	a) Manufacturer's name or trade mark.....:	BETA	P
	b) Type designation, catalogue number or other serial number.....:	BEND6000	P
	c) Rated voltage (V).....:	230 / 400 V	P
	d) Rated current without symbol "A", preceded by the symbol of instantaneous tripping.....:	80-100-125A	P
	e) Rated frequency (Hz) .....:	50-60Hz	P
	f) Rated short circuit capacity (A).....:	6000	P
	g) Wiring diagram		NA
	h) Ambient air temperature, if different from 30°C		NA
	i) Degree of protection, if different from IP20		NA
	j) For D-type circuit-breakers: the maximum instantaneous tripping current, if higher than 20 In see table 2)		NA
	k) Rated impulse withstand voltage Uimp if it is 2,5 kV		NA
	l) Making and breaking capacity on an individual protected pole of multipole circuit-breakers (Icn1), if different from Icn		P
	Marking d) shall be readily visible when the CB is installed	~	P
	If, for small devices, the available space is insufficient, markings a), b), c), e), f), h), j) and l) may be put on the side or on the back of the CB		P
	Marking g) may be on the inside of any cover which has to be removed in order to connect the supply wires but shall not be on a label loosely attached to the CB		P
	Any other information not marked shall be given in the manufacturer's documentation		NA
	The suitability for isolation, which is provided by all circuit-breakers of this standard, may be indicated by the symbol on the device		NA
	I^2t characteristic (documentation)		P
	Symbols on supply and load terminal		NA
	Terminal for neutral conductor N		NA
	Earthing terminal if any (IEC 60417-5019)		NA

	On - off position shall be clearly indicated - 0 I -		P
	For push-button CB the off push-button shall either be red or be marked with the symbol '0'		NA
	Red not used for other push-button		NA
	For CB with multiple current ratings, the maximum value is marked, the adjusted value indicated without ambiguity		NA
	Marking shall be indelible and easily legible (not on removable parts), 15 s with water, 15 s with hexane (see cl. 9.3)		NA
8.	**REQUIREMENTS FOR CONSTRUCTION AND OPERATION**		
8.1.1	**General**		
	Circuit-breakers shall be so designed and constructed that, in normal use, their performance is reliable and without danger to the user or surroundings		
8.1.2	**Mechanism**		
	The moving contact shall be mechanically coupled so that all poles make and break together, whether operated manually or automatically, even if an overload occurs on one pole only		NA
	The switched neutral shall close before and open after the protected pole (s)		NA
	Neutral pole having adequate making and breaking capacity and CB with independent manual operation: all poles operate together including neutral pole		NA
	CB shall have a trip free mechanism		P
	It shall be possible to switch the CB on and off by hand		P
	No intermediate position of the contacts		P
	Position of contacts shall be indicated		P
	Indication visible from the outside		P
	If the indication is on the actuating means, it shall, when released, automatically take up or stay in the position corresponding to that of the moving contacts; operating means shall have two different rest positions, except that, for automatic operation, a third distinct rest position may be provided		P
	If a separate mechanical indicator is used to indicate the position of the main contacts, colour red shall be used for the on position and green for the off position.		P

	The action of the mechanism shall not be influenced by the position of enclosures		P
	If the cover is used as a guiding means for push-button, it shall not be possible to remove this button from the outside		NA
	Operating means securely fixed, not possible to remove them without a tool		P
	For the up-down operating means the contacts shall be closed by the up movement.		P
8.1.3	**Clearances and creepage distances**		
	The minimum required clearances and creepage distances are based on the CB being designed for operating in an environment with pollution degree 2		P
	Compliance for item 1 in Table 4 is checked by measurement and by the test of 9.7.5.4.1 and 9.7.5.4.2. The test is carried out with samples not submitted to the humidity treatment described in 9.7.1.		P
	The clearances of items 2 and 4 (except accessible surface after installation) may be reduced provided that the measured clearances are not shorter than the minimum allowed in IEC 60664-1 for homogenous field conditions.		NA
	In this case, after the humidity treatment in 9.7.1, compliance for item 2 and 4 and arrangements of 9.7.2 items b), c), d) and e) is checked:		NA
	-Tests according to 9.7.2 to 9.7.4 as applicable		P
	-Test according to 9.7.5.2 with test voltages acc. Table 13 with test arrangements of 9.7.2 items b), c), d), e)		P
	If measurement does not show any reduced clearance, test 9.7.5.2 is not applied		NA
	Compliance for item 3, checked by measurement		NA
	The insulating materials are classified into Material Groups on the basis of their comparative tracking index (CTI) acc. to IEC 60664-1		NA
	Clearances [mm] U_{imp}	6mm/4kV	P
	4 kV (see table 4) 2,5 kV (see table 4)	☒ ☐	P
	Minimum clearances (see table 4)		
		minimum clearances [4mm]	P

	1.between live parts (of the main circuits) which are separated when the CB is in off position.....:	>6mm	P
	2.between live parts of different polarity.....:		NA
	3.between circuits supplied from different sources, one of which being PELV or SELV.....:		NA
	4. between live parts and		NA
	- accessible surfaces of operating means.....:	>4mm	P
	- screws or other means for fixing covers .....:		NA
	- surface on which the base is mounted.....:	>4mm	P
	- screws or other means for fixing the circuit breaker .....:		NA
	- metal covers or boxes .....:		NA
	- other accessible metal parts .....:	>4mm	P
	- metal frames supporting the base (flush-type)..:		NA
	Minimum creepage distances (see table 4)		
	Material group	☐ III_b ☒ III_a ☐ II ☐ I	
		minimum creepage distances [mm]	
	1.between live parts (of the main circuits) which are separated when the CB is in off position.....:	>6mm	P
	2.between live parts of different polarity.....:		NA
	3.between circuits supplied from different sources, one of which being PELV or SELV.....:		NA
	4. between live parts and		NA
	- accessible surfaces of operating means.....:	>4mm	P
	- screws or other means for fixing covers .....:		NA
	- surface on which the base is mounted.....:	>4mm	P
	- screws or other means for fixing the circuit breaker .....:		NA
	- metal covers or boxes .....:		NA
	- other accessible metal parts .....:	>4mm	P
	- metal frames supporting the base (flush-type)..:		NA
8.1.4	**Screws, current-carrying parts and connections**		
8.1.4.1	Connections, withstand mechanical stresses occurring in normal use		P
	Screws for mounting of the CB not of the thread-cutting type		NA
	Test according to cl. 9.4:		NA

	- 10 times (screw Ø / torque Nm)	Ø6mm___Nm (see table 10) Ø___mm___Nm	NA
	- 5 times (screw Ø / torque Nm)	Ø6mm 2,5Nm (see table 10)	P
	Plug in connections tested by plugging in and pulling out five times		NA
	After test connections have not become loose nor electrical function impaired		NA
8.1.4.2	Screws with a thread of insulating material ensured correct introduction		NA
8.1.4.3	Electrical connection: contact pressure not transmitted through insulating material, unless there is sufficient resilience in the metallic parts		P
8.1.4.4	Current-carrying parts including parts intended for protective conductors, if any, shall be made of a metal having, under the conditions occurring in the equipment, mechanical strength, electrical conductivity and resistance to corrosion adequate for their intended use. Examples below:		NA
	- copper		P
	- alloy 58% copper for worked cold parts		NA
	- alloy 50% copper for other parts		NA
	- other metal		NA
	In case of using ferrous alloys or suitably coated ferrous alloys, compliance to resistance to corrosion is checked by a test of resistance to rusting (see 9.16).		NA
	The requirements of this subclause do not apply to contacts, magnetic circuits, heater elements, bimetals, shunts, parts of electronic devices or to screws, nuts, washers, clamping plates, similar parts of terminals and parts of the test circuit		NA
8.1.5	**Terminals for external conductors**		
	Compliance is checked by inspection and by the tests as relevant for the type of connection:		NA
	by tests of clause 9.5 for screw-type terminals		-NA
	by specific tests for plug-in or bolt-on CBs included in the standard		NA
	by the tests of Annexes J, K		NA
8.1.5.1	Terminals ensure the necessary contact pressure		NA

9.5	Torque test:		
	- torque (Nm); diameter (mm)..... :	2,5Nm, Ø 6mm	P
	- torque (Nm); diameter (mm)..... :		
	- torque (Nm); diameter (mm)..... :		
	- max. cross-sectional area (mm²)..... :	50	P
9.5.2	Pull test:		
	Terminal shall be suitable for all types of conductors: rigid (solid or stranded) and flexible, unless otherwise specified by the manufacturer.		P
	Min. cross-section solid / stranded / flexible (mm²)..... :	25mm²	P
	Max. cross-section solid / stranded / flexible (mm²)..... :	50mm²	P
	Torque 2/3 (Nm) ..... :	2,5Nm	P
	Pull for 1 min solid / stranded / flexible (N)..... :	N	P
	During the test no noticeable move of conductor		P
9.5.3	Torque test:		
	- torque 2/3 (Nm)..... :	2,5Nm	P
	- min. cross-sectional area (mm²)..... :	25mm²	P
	- max. cross-sectional area (mm²)..... :	50mm²	P
	The conductor shows no damage		P
	Terminals have not worked loose and no damage		P
9.5.4	Terminals fitted with the largest cross-section area specified in Table 5, for stranded copper conductor.		
	Max. cross-section stranded (mm²)..... :	50mm²	P
	Torque 2/3 (Nm) ..... :	2,5Nm	P
	After the test no strand of conductor escaped outside		P
8.1.5.2	Terminals allow the connection of conductors of the following cross-sectional areas: (table 5)		P

	Rated current (A) sections ≤ 13 > 13 ≤ 16 > 16 ≤ 25 > 25 ≤ 32 > 32 ≤ 50 > 50 ≤ 80 > 80 ≤ 100 > 100 ≤ 125 Range of nominal cross to be clamped* (mm²) Rigid (solid or stranded) conductors 1 to 2,5 1 to 4 1,5 to 6 2,5 to 10 4 to 16 10 to 25 16 to 35 24 to 50 Flexible conductors 1 to 2,5 1 to 4 1,5 to 6 2,5 to 6 4 to 10 10 to 16 16 to 25 25 to 35	to mm²	P
	*It is required that, for current ratings up to and including 50 A, terminals be designed to clamp solid conductors as well as rigid stranded conductors. Nevertheless, it is permitted that terminals for conductors having cross-sections from 1 mm² up to 6 mm² be designed to clamp solid conductors only.		P
	- or terminals for external untreated aluminium conductors and with aluminium screw-type terminals for use with copper or with aluminium conductors according to Annex L.		NA
8.1.5.3	Means for clamping the conductors in the terminals not serve to fix any other component (See test sub-clause 9.5)		P
8.1.5.4	Terminals for $I_N \leq 32$ A allow the connection of conductors without special preparation		P
8.1.5.5	Terminals shall have adequate mechanical strength; ISO thread or equivalent (See tests of sub-clause 9.4 and 9.5.2)		P
8.1.5.6	Clamping of conductor without damage to the conductor (See test of sub-clause 9.5.3)		P
8.1.5.7	Clamping of conductor between metal surfaces (See tests of sub-clause 9.4 and 9.5.2)		P
8.1.5.8	Conductor shall not slip-out when the clamping screw or nuts are tightened (See test of sub-clause 9.5.4)		P
8.1.5.9	Terminals shall be properly fixed. No work loose when the clamping screws or nuts are tightened or loosened (See test of sub-clause 9.4)		P
8.1.5.10	Clamping screws or nuts of terminals for protective conductors adequately secured against accidental loosening		NA

8.1.5.11	Pillar terminals shall allow full insertion and reliable clamping of the conductor		NA
8.1.5.12	Screws and nuts of terminals for external conductors shall be in engagement with a metal thread, and the screws shall not be of tapping screw type		P
8.1.6	**Non-interchangeability**		
	For circuit-breakers intended to be mounted on bases forming a unit therewith (plug-in or screw-in type) it shall not be possible, without the aid of a tool, to replace a circuit-breaker when mounted as for normal use by another of the same make having a higher rated current, compliance is checked by inspection		NA
8.1.7	**Mechanical mounting of plug-in circuit-breakers**		
8.1.7.1	The mechanical mounting of plug-in circuit-breakers, the holding in position of which does not depend solely on their plug-in connection(s), shall be reliable and have adequate stability		NA
8.1.7.2	Plug-in type circuit-breakers, the holding in position of which does not depend solely on their plug-in connection(s) Compliance of the mechanical mounting is checked by the relevant test 9.13		NA
8.1.7.3	Plug-in type circuit-breakers, the holding in position of which does depend solely on their plug-in connection(s) Compliance of the mechanical mounting is checked by the relevant test 9.13		NA
8.2	**Protection against electric shock**		
	Live parts not accessible in normal use		P
	For CB, other than plug-in type, external parts, other than screws and other means for fixing covers, which are accessible shall be of insulating material		NA
	Unless the live parts are within an internal enclosure of insulating material: Lining - reliable fixed, - adequate thickness and - mechanical strength		P
	Inlet openings for cables shall be in insulating material or be provided with bushings or similar devices in insulating material Such device - shall be reliable fixed - shall have adequate mechanical strength		NA

	For plug-in CB, external parts, other than screws and other means for fixing covers, which are accessible shall be in insulating material		NA
	Metallic operating means insulated from live parts		NA
	Metal parts of the mechanism not accessible and insulated from accessible metal parts, metal frames (for flush-type), screws or other means for fixing the base		P
	Replacement of plug-in CB possible without touching live parts		NA
	Lacquer or enamel not considered		NA
8.1.3	**Creepage distances [mm] (see table 4)**		
	Internal parts only	See above	NA
9.6	**Test of protection against electric shock**		
	This verification is applicable to those parts of circuit breakers which are exposed to the operator when mounted as for normal use		
	Use of test finger so designed that each jointed can be turned through an angle of 90° with respect to the finger		
	Circuit-breaker with enclosures of thermoplastic material are additional tested at 35 °C for 1 min with a force of 75 N		
8.10	**Resistance to heat**		
	CB sufficiently resistant to heat		P
9.14	**Test of resistance to heat**		
9.14.1	Test:		
	- without removable covers ..... 1 h (100 ± 2) °C		P
	- removable covers..... 1 h (70 ± 2) °C		NA
	After the test no access to live parts, marking still legible		P
9.14.2	Ball pressure test for external parts of insulating material (parts retaining current-carrying parts and parts of the protective circuit in position) T = 125°C Ø of impression ≤ 2 mm	Impression: ≤2mm	P

9.14.3	Ball pressure test for external parts of insulating material (parts not retaining current-carrying parts and parts of the protective circuit in position T = (70 ± 2)°C or T = ___ °C = (40 ± 2)°C + max. temperature rise of sub-clause 9.8 Ø of impression ≤ 2 mm	Impression: mm	NA
8.12	**Resistance to rusting**		
	Ferrous parts adequately protected against rusting		P
9.16	**Test of resistance to rusting:**		
	- 10 min immersed in a cold chemical degreaser such as methyl-chloroform or refined petrol		P
	- 10 min immersed in a 10% solution of chloride in water at 20°C		P
	- 10 min at 95% humidity at 20°C		P
	- 10 min at 100°C		P
	No sign of rust		P

	TESTS „A_2" 3 samples	A_{2-1} A_{2-2} A_{2-3}	
8.11	**Resistance to abnormal heat and to fire**		
	External parts of insulating material shall not ignite or spread fire under fault or overload conditions		P
9.15	**Resistance to abnormal heat and to fire**		
	Test performed on a complete CB		
	external parts retaining current-carrying parts and parts of the protective circuit in position ..... (960 ± 15)°C		P
	all other external parts ..... (650 ± 10)°C		P
	No visible flames, no sustained glowing, or		P
	flames and glowing extinguish within 30 s after removal .....:		P
	No ignition of tissue paper or scorching of the pinewood board		P

	TESTS „B" 3 samples	B_1 B_2 B_3	
8.3	**Dielectric properties and isolating capability**		
8.3.1	CB shall have adequate dielectric properties and shall ensure isolation:		P
8.3.2	Dielectric strength at power frequency		
	Compliance is checked by the tests 9.7.1, 9.7.2 and 9.7.3 on circuit-breaker in new condition		P
8.3.3	Isolating capability		
	Circuit-breakers shall be suitable for isolation. Compliance is checked by the verification of compliance with the minimum clearances and creepage distances of item 1 of table 4 and by tests of 9.7.5.1 and 9.7.5.3.		P
8.3.4	Dielectric strength at rated impulse withstand voltage (Uimp)		
	Circuit-breakers shall adequately withstand impulse voltages. Compliance is checked by the tests of 9.7.5.2.		P
9.7	**Test of dielectric properties and isolating capability**		
9.7.5.4	Verification of resistance of the insulation of open contact and basic insulation against an impulse voltage in normal conditions		
	These tests are not preceded by the humidity treatment described in 9.7.1.		
	The test is carried out on an CB fixed on a metal support		
	The impulses are given by a generator producing positive and negative impulses having a front time of 1,2μs, and a time to half-value of 50μs		
	The shape of the impulses is adjusted with the CB under test connected to the impulse generator.		
	rated impulse withstand voltage [kV]:	6kV	
	sea level of test laboratory [m]:	200m	
	test voltage (acc. Table 15) [kV]:	6kV	
9.7.5.4.2	CB in open position (contacts in open position)		
	The impulses are applied between:		
	the line terminals connected together and the load terminals connected together		P
9.7.5.4.3	CB in closed position		

	A first series of tests is made applying the impulse voltage between the phase pole(s) and the neutral pole (or path) connected together and the metal support connected to the terminal(s) intended for the protective conductor(s), if any		P
	A second series of tests is made applying the impulse voltage between the phase pole(s), connected together, and the neutral pole (or path) of the CB		P
	Five positive impulses and five negative impulses are applied, the interval between consecutive impulses being at least 1 s for impulses of the same polarity and being at least 10 s for impulses of the opposite polarity.		P
	no disruptive discharges during the test		P
9.7.1	Resistance to humidity		
9.7.1.1	Preparation of the circuit-breaker for test		
	Inlet openings, if any, are left open; if knock-outs are provided, one of them is opened.		NA
9.7.1.2	Test conditions		
	The humidity treatment is carried out in humidity cabinet 91% to 95% and the temperature of the air between 20 °C and 30 °C	Rf = 93 % T = 25°C	P
9.7.1.3	Test procedure.		
	The sample is kept in the cabinet for 48 h.		P
9.7.1.4	Conditions of the circuit breaker after the tests.		
	The sample show no damage within the meaning of this standard and shall withstand the tests of 9.7.2 and 9.7.3, 9.7.4 and 9.7.5.2		P
9.7.2	Insulation resistance of the main circuit		
9.7.2	After an interval between 30 min and 60 min flowing this treatment, the insulation resistance is measured 5 s after application of a d.c. voltage of approximately 500 V, consecutively as follows:	[MΩ] [MΩ] [MΩ]	P
	a) In off-position, between the terminals which are electrically connected together when the circuit-breaker is in the closed position ≥ 2 MΩ	>2 >2 >2	P
	b) in off-position, between each pole in turn and the others connected together ≥ 2 MΩ		NA
	c) in on-position, between all poles connected together and the frame ≥ 5 MΩ	>5 >5 >5	P
	d) between metal parts of mechanism and the frame ≥ 5 MΩ		NA

	e) between the frame and metal foil in contact with the inner surface of the internal enclosure or lining of insulating material ≥ 5 MΩ		NA
9.7.3	Dielectric strength of the main circuit		
	After the circuit-breakers have passed the tests of 9.7.2 the test voltage specified is applied for 1 min between the parts indicated in 9.7.2		P
	a) 2000 V		P
	b) 2000 V		NA
	c) 2000 V		P
	d) 2000 V		NA
	e) 2500 V		NA
	No flashover or breakdown		P
9.7.4	Insulation resistance and dielectric strength of the auxiliary circuits		
	Insulation resistance of auxiliary circuits measured with 500 V DC after 1 min:		NA
	1) between all auxiliary circuits and the frame (MΩ) ≥ 2 MΩ		NA
	2) between each part of the auxiliary circuits which might be isolated from the other parts and the whole of the other parts connected together (MΩ) ≥ 2 MΩ		NA
	Dielectric strength of auxiliary circuits measured with an AC voltage at rated frequency for 1 min:		NA
	Rated voltage of auxiliary circuits (a.c. or d.c.) — Test voltage (V) ≤ 30 — 600 > 30 ≤ 50 — 1000 > 50 ≤ 110 — 1500 > 110 ≤ 250 — 2000 > 250 ≤ 500 — 2500	V	NA
	1) between all auxiliary circuits and the frame		NA
	2) between each part of the auxiliary circuits which might be isolated from the other parts and the whole of the other parts connected together		NA
	No flashover or perforation		NA
9.7.5.2	Verification of clearances with the impulse withstand voltage		

	If the measurement of clearances of items 2 and 4 in Table 4 shows a reduction of the required length, this test applies.		NA
	The test is carried out on an CB fixed on a metal support and being in the closed position		NA
	The impulses are given by a generator producing positive and negative impulses having a front time of 1,2μs, and a time to half-value of 50μs		NA
	The shape of the impulses is adjusted with the CB under test connected to the impulse generator.		NA
	test performed with:		
	-surge impedance of the test apparatus ≤500Ω and surge protective devices disconnected before testing or		NA
	-hybrid generator with an surge impedance of 2 Ω and surge protective devices not disconnected before testing		NA
	rated impulse withstand voltage [kV]:	kV	
	see level of test laboratory [m]:	m	
	test voltage (acc. Table 14) [kV]:	kV	
	A first series of tests is made applying the impulse voltage between the phase pole(s) and the neutral pole (or path) connected together and the metal support connected to the terminal(s) intended for the protective conductor(s), if any		NA
	A second series of tests is made applying the impulse voltage between the phase pole(s), connected together, and the neutral pole (or path) of the CB		NA
	A third series of tests is made applying the impulse voltage between (and not tested during the two first sequences described here above):		NA
	b) between each pole and the others connected together		NA
	c) between all poles connected together and the frame		NA
	d) between metal parts of the mechanism and the frame		NA
	e) between the frame and a metal foil in contact with the inner surface of the lining of insulating material		NA

	Five positive impulses and five negative impulses are applied, the interval between consecutive impulses being at least 1 s for impulses of the same polarity and being at least 10 s for impulses of the opposite polarity.		NA
	no disruptive discharges during the test		NA

8.4	**Temperature rise**		
	Temperature rise does not exceed the limiting values stated in table 6:	sect. __50 mm²	P
9.8.2	Test current: I_N= (reach the steady-state value) Four-pole CB's: ☐ 1) Three poles loaded 2) One pole and neutral pole loaded ☐ 1) Four-poles loaded	I_N = __125A	P
	Ambient air temperature.....:	Tamb= ____30°C	
	Parts ..... Temperature rise [K]	[K] [K] [K]	
	L1 L2 L3 L4(N) L3 N	50 51 52 44	P
	Terminals for external connections ..... 60 K		P
	External parts liable to be touched during manual operation of the circuit-breaker, including operating means of insulating material and metallic means for coupling of insulating operating means of several poles ..... 40 K		P
	External metallic parts of operating means .. 25 K	-	-
	Other external parts, including that face of the circuit-breaker is in direct contact with the mounting surface..... 60 K		P
9.8.5	Measurement of power losses	B_1 B_2 B_3	
	Power loss do not exceed the values stated in table 8		P
	Test current: I_N = _125A (reach the steady state value)		
	Loaded one pole after the other		

	Max. power loss : _____20W	W W W	
	L1 L2 L3 L4(N) L3 N	16 17 17 14	P
8.5	**Uninterrupted duty**		
	Circuit-breakers operate reliable even after long service		P
9.9	**28 day test**		
	28 cycles - 21 h with current - 3 h without current Cross-sectional area. ____50 mm²	I_N = _____125A	P
	During the test no tripping during the last period, temperature rise shall be measured		P
	Ambient air temperature.....:	30°C	
	Parts .....Temperature rise [K]	[K] [K] [K]	
	Terminals for external connections 60	47 49 49	P
	The temperature rise does not exceed the value measured during the temperature rise test (sub-clause 9.8) by more than 15 K		P
	Test current 1,45 I_N =181,25A		
	- Tripping within	[s] [s] [s]	
	- 1h (≤ 63 A)		
	- 2h (> 63 A)	111 124 115	P

	TESTS „C“ 3 +3 samples				
8.7	**Test „C_1“ Mechanical and electrical endurance**	C_{1-1}	C_{1-2}	C_{1-3}	
	Circuit-breaker shall be capable to perform an adequate number of cycles with rated current				P
9.11.1	General test conditions				
	Test: Test Voltage ____230V (rated voltage) Test Current _____125A (rated current) Power factor _____0,87 (0,85-0,9) Par. resistor _____ (Ω) Cross sect. area ____50mm²	233V 126A 0,87 (Ω) 50mm²			P
9.11.2	Test procedure				
	The circuit-breaker is submitted to 4000 operating cycles with rated current.	4000			P
	- $I_N \leq 32$ A: 2 s on - 13 s off				NA
	- $I_N > 32$ A: 2 s on - 28 s off				P
	During the test the circuit-breaker shall be operated as in normal use.				P
9.11.3	Conditions of the circuit breaker after the tests.				
	Following the test 9.11.2 the sample shall not show:				
	- undue wear				P
	- discrepancy between the position of the moving contacts and corresponding position of the Indicating device				P
	- damage to the enclosure permitting access to live parts by test finger (see 9.6)				P
	- loosening of electrical or mechanical connections				P
	- seepage of sealing compound				NA
	Moreover test current .....2,55 I_N_____A	318,75A			
	Opening time not less 1 s or more than	[s]	[s]	[s]	
	- 60 s (≤ 32 A)				NA
	- 120 s (> 32 A)	47	51	45	P
	Dielectric strength reduced to 2000 V				P

9.12.11.2	**Test at reduced short-circuit currents**				
9.12.11.2.1	Test on all circuit-breakers				
9.12.11.2.1	Test at reduced short-circuit currents: Fig. 3				
	Test current:	Obtained			
	- 500 A or 10 In	I test= _____1255A			P
	Test voltage 1,05 Un	Un = ___421V			P
	Power factor 0,93-0,98	_____0,95			P
9.12.9.2	Test in free air copper wire F': ☐ 0,12 mm / ☒ 0,16 mm resistor R' : ☐ 0,75 Ohm / ☒ 1,5 Ohm	"a" = _____35 mm			P
9.12.9.3	Test in enclosures copper wire F': ☐ 0,12 mm / ☒ 0,16 mm resistor R' : ☐ 0,75 Ohm / ☒ 1,5 Ohm	dimension of enclosure: 110x81x70mm			P
	I_{Peak} (A) max. value	_____A			
	Sequence: 6 x "O" and 3 x "CO"	[kA^2s]	[kA^2s]	[kA^2s]	
	Max. $I^2t \leq$ _____kA^2s	1640	1723	1548	
	- No permanent arcing				P
	- No flash-over between poles or between poles and frame				P
	- No blowing of the fuses F and F'				P
	- Polyethylene foil shows no holes				P
	After the test:				P
9.12.12	Verification of the circuit-breaker after short-circuit tests				
9.12.12.1	The circuit-breakers shall show no damage impairing their further use and shall maintenance, withstand the following tests.				
	a) leakage current across open contacts, according to 9.7.5.3, each pole is supplied at a voltage 1,1 times Un.= _____ V. The circuit – breaker is in the open position	C_{1-1} [mA]	C_{1-2} [mA]	C_{1-3} [mA]	
	The leakage current shall not exceed 2 mA L1	<0,1			P
	L2		<0,1		P
	L3			<0,1	P
	L4(N)				
	Electric strength test:				
	Test voltage 2000 V (see 9.7.2)				

	a) 2000V		P
	b) 2000V		P
	c) 2000V		P
	d) 2000V		P
	e) 2500 V		NA

9.12.11.2.2	**Test „C_2“ Short-circuit test on circuit-breakers for use in IT systems**				
	Test current:				
	- 500 A or 1,2 times the upper limit of the standard range of instantaneous tripping (see table 2) whichever is the higher, but < 2500 A. When tripping exceed 20 In the current adjusted at 1,2 times the upper limit even when higher 2500 A	I test= _____A			NA
	Test voltage 1,05 Un	Un = _____V			NA
	Power factor 0,93-0,98	_____			NA
9.12.9.2	Test in free air copper wire F': ☐ 0,12 mm / ☐ 0,16 mm resistor R' : ☐ 0,75 Ohm / ☐ 1,5 Ohm	"a" = _____ mm			NA
9.12.9.3	Test in enclosures copper wire F': ☐ 0,12 mm / ☐ 0,16 mm resistor R' : ☐ 0,75 Ohm / ☐ 1,5 Ohm	dimension of enclosure: _____x_____x_____mm			NA
	I_{Peak} (A) max. value	_____A			NA
	Sequence: "O" + "CO" on each protected pole	[kA^2s]	[kA^2s]	[kA^2s]	NA
	Shifted point 30 ° on the other protected pole	C_{2-1}	C_{2-2}	C_{2-3}	NA
	Max. $I^2t \leq$ _____kA^2s L1 L2 L3 L4 (N)	___ ___ ___ ___	___ ___ ___ ___	___ ___ ___ ___	
	- No permanent arcing				NA
	- No flash-over between poles or between poles and frame				NA
	- No blowing of the fuses F and F'				NA
	- Polyethylene foil shows no holes				NA
	After the test:				NA
9.12.12.1	The circuit-breakers shall show no damage impairing their further use and shall maintenance, withstand the following tests.				
	a) leakage current across open contacts, according to 9.7.5.3, each pole is supplied at a voltage 1,1 times Un.= _____ V. The circuit – breaker is in the open position	C_{2-1} [mA]	C_{2-2} [mA]	C_{2-3} [mA]	NA
	The leakage current shall not exceed 2 mA L1				NA
	L2				NA
	L3				NA
	L4(N)				NA

	Electric strength test:		
	Test voltage 2000 V (see 9.7.2)		
	a)		NA
	b)		NA
	c)		NA
	d)		NA
	e) 2500 V		NA

	TESTS „D" 3 samples		
8.6	**Automatic operation**		
8.6.1	Standard time-current zone		
	Tripping characteristic of CB ensures adequate protection of the circuit, without premature operation.		
9.10	**Tests „D_0"**	D_{O-1} D_{O-2} D_{O-3}	
	I_N (A)	125A	P
	Sect. (mm²)	50mm²	P
	Instantaneous tripping current	☐ B ☒ C ☐ D	P
9.10.2	Test of time-current characteristic		
9.10.2.1	Test current 1,13 I_N (A) starting from cold for:	141,25A	P
	- 1 h ($I_N \leq 63$ A)		NA
	- 2 h ($I_N > 63$ A)	62s	P
	No tripping		
	Then steadily increased within 5 s to 1,45 I_N (A)	181,25A	
	- Tripping within	[min] [min] [mini]	
	- 1h (≤ 63 A)		
	- 2h (> 63 A)	1 1 1	P
9.10.2.2	Test current 2,55 I_N (A) starting from cold for:	_____A	
	opening time not less than 1 s or more than	[s] [s] [s]	
	- 60 s (≤ 32 A)		
	- 120 s (> 32 A)	58 51 54	P
9.10.3	Test of instantaneous tripping and of correct opening of the contacts		
9.10.3.1	General test conditions		
	For the lower values of the test current the test is made once, at any convenient voltage.	<10V	P
	For the upper values of the test current the test is made at rated voltage Un(phase to neutral) with a power factor between 0,95 and 1.	241V COSØ:0,98	P
	The sequence of operation is : O-CO-CO-CO Interval time: > 3 min		P
	The tripping time of the O operation is measured		P
	After each operation the indicating means shall show the open position of the contacts		P
9.10.3.2	☒ For circuit-breakers of the B – Type		
	Test current 3I_N (A), starting from cold	_____A	

	Opening time:	[s]	[s]	[s]	
	≥ 0,1 s				
	Test current 5 I_N (A), starting from cold	_____A			
	Tripping less than 0,1 s				
9.10.3.3	☒ For circuit-breakers of the C – Type				
	Test current 5I_N (A), starting from cold	625A			
	Opening time:	[s]	[s]	[s]	
	≥ 0,1 s	1	1	2	P
	Test current 10 I_N (A), starting from cold	1250A			
	Tripping less than 0,1 s	0,015	0,011	0,012	P
9.10.3.4	☐ For circuit-breakers of the D – Type				
	Test current 10I_N (A), starting from cold	_____A			NA
	Opening time:	[s]	[s]	[s]	
	≥ 0,1 s				
	Test current 20 I_N (A) or to the maximum instantaneous tripping current(see cl. 6, item j), starting from cold	_____A			
	Tripping less than 0,1 s				
9.10.4	Test of effect of single pole loading on the tripping characteristic of multi-pole circuit-breakers:				
	Test current 1,1 It (A), (two pole) starting from cold	137,5A			
	Tripping within	[min]	[min]	[min]	
	- 1h (≤ 63 A)				
	- 2h (> 63 A)				P
	Test current 1,2 It (A), (three pole or four pole) starting from cold	150A			
	Tripping within	[min]	[min]	[min]	
	- 1h (≤ 63 A)				
	- 2h (> 63 A)	2	2	2	P
9.10.5	Test of effect of ambient temperature on the tripping characteristics				
	a) Ambient temperature of (35 ± 2) K below the ambient air reference temperature	T =_____35°C			
	Test current 1,13 I_N (A)	_____141,25A			
	- Passed for 1h				
	- Passed for 2h				P

	Current is then steadily increased to 1,9 I_N (A) within 5s	_____237,5A	
	Tripping within	[min] [min] [mini]	
	- 1h (≤ 63 A)		
	- 2h (> 63 A)	1 1 1	P
	b) Ambient temperature of (10 ± 2) K above the ambient air reference temperature		
	Test current I_N (A)	_____125A	
	No tripping within		
	- 1h (≤ 63 A)		
	- 2h (> 63 A)	----	P

	Tests „D_1“	D_{1-1} D_{1-2} D_{1-3}	
8.9	**Resistance to mechanical shock and impact**		
	CB shall have adequate mechanical behaviour so as to withstand the stresses imposed during installation and use		P
9.13.1	Mechanical shock		
	- 50 falls on two sides of vertical board C		P
	- Vertical board turned 90°		
	- 50 falls on two sides of vertical board C		P
	During the test the circuit-breakers shall not open		P
9.13.2	Mechanical impact		
9.13.2.2	All types:		
	- Impact test: 10 blows-height 10 cm, no damage		P
9.13.2.3	Screw-in types:		
	- Torque 2,5 Nm for 1 min, no damage		NA
9.13.2.4	CB intended to be mounted on a rail		
	- downward vertical 50 N for 1 min		NA
	- upward vertical 50 N for 1 min, no damage		NA
9.13.2.5	Plug-in types		
	The circuit-breaker are mounted in their normal position, complete with plug-in base but without cables and any cover plate		NA
	A force of 20 N applied for 1min to the circuit-breaker (see fig 16).		NA
	During this test the circuit-breaker part shall not become loose from the base and shall not show damage impairing further use.		NA
9.12.11.3	**Test at 1500 A:**		
	Prospective current of 1500 A - power factor 0,93 to 0,98		
	Prospective current obtained (A)	_____1590A	P
	Power factor	_____0,97	P
	Test voltage 1,05 Un	_____245V	P
	Test circuit: figure	_____3	P
	T (min)	_____3min	P

9.12.9.2	Test in free air copper wire F': ☐ 0,12 mm / ☒ 0,16 mm resistor R' : ☐ 0,75 Ohm / ☒ 1,5 Ohm	"a" = _____ 35mm			P
9.12.9.3	Test in enclosures copper wire F': ☐ 0,12 mm / ☒ 0,16 mm resistor R' : ☐ 0,75 Ohm / ☒ 1,5 Ohm	dimension of enclosure: 110x80x70			P
	Sequence	_____			
	I_{Peak} (A) max. value	_____A			
	$I^2t \leq$ _____ kA^2s	[kA^2s]	[kA^2s]	[kA^2s]	
	Max. $I^2t \leq$ _____kA^2s L1 L2 L3 L4(N)	2,14 2,17 18,8	___ ___ ___ ___	___ ___ ___ ___	P
	- No permanent arcing				P
	- No flash-over between poles or between poles and frame				P
	- No blowing of the fuses F and F'				P
	- Polyethylene foil shows no holes				P
	After the test:				P
9.12.12.1	The circuit-breakers shall show no damage impairing their further use and shall maintenance, withstand the following tests.				
	a) leakage current across open contacts, according to 9.7.5.3, each pole is supplied at a voltage 1,1 times Un.= _____ V. The circuit – breaker is in the open position	D_{1-1} [mA]	D_{1-2} [mA]	D_{1-3} [mA]	
	The leakage current shall not exceed 2 mA L1	<0,1			P
	L2		<0,1		P
	L3			<0,1	P
	L4(N)				
	Electric strength test:				
	Test voltage 2000 V (see 9.7.2)				
	a) 2000V				P
	b) 2000V				P
	c) 2000V				P
	d) 2000V				P
	e) 2500 V				NA
	Test current 0.85x non-tripping current (1,13 I_N)	120A			P
	- Passed for 1h				

	- Passed for 2h				P
	Current is then steadily increased to 1,1 x tripping current (1,45 I_N) within 5s	199A			P
		D_{1-1} [min]	D_{1-2} [min]	D_{1-3} [min]	
	Tripping within ☐ 1 hour / ☒ 2 hour	_____2 _	_____2	_____2	P

	TESTS „E_1" 3 + 4 samples				
9.12.11.4.2	**Test E_1: Test at service short-circuit capacity**	E_{1-1}	E_{1-2}	E_{1-3}	
	Service short-circuit capacity (Ics)..... :	_____6kA			
	Test circuit: figure ..... :	_____3			
	Test voltage 1,05 Un	_____243V			
	Prospective current ..... :	_____ 6000A			
	Prospective current obtained..... :	_____ L1:6090A			
	Power factor ..... :	_____0,93-0,98			
	Power factor obtained ..... :	_____0,94			
	Sequence ..... :	_____			
	T (min) ..... :	_____3min			
9.12.9.2	Test in free air copper wire F': ☐ 0,12 mm / ☒ 0,16 mm resistor R' : ☐ 0,75 Ohm / ☒ 1,5 Ohm	"a" = _____ 100mm			
9.12.9.3	Test in enclosures copper wire F': ☐ 0,12 mm / ☒ 0,16 mm resistor R' : ☐ 0,75 Ohm / ☒ 1,5 Ohm	dimensions of enclosure: 110x80x70mm			P
	I_{Peak} (A) max. value ..... :	_____A			
	$I^2t \leq$ _____ kA^2s	[kA^2s]	[kA^2s]	[kA^2s]	
	Max. $I^2t \leq$ _____kA^2s L1 L2 L3 L4(N)	3,35 2,85 2,95	___ ___ ___ ___	___ ___ ___ ___	
	- No permanent arcing				P
	- No flash-over between poles or between poles and frame				P
	- No blowing of the fuses F and F'				P
	- Polyethylene foil shows no holes				P
	After the test:				P
9.12.12.1	The circuit-breakers shall show no damage impairing their further use and shall maintenance, withstand the following tests.				
	a) leakage current across open contacts, according to 9.7.5.3, each pole is supplied at a voltage 1,1 times Un.= _____ V. The circuit – breaker is in the open position	E_{1-1} [mA]	E_{1-2} [mA]	E_{1-3} [mA]	
	The leakage current shall not exceed 2 mA L1	<0,1			P
	L2		<0,1		P

	L3			<0,1	P
	L4(N)				
	Electric strength test:				
	Test voltage 2000 V (see 9.7.2)				
	a) 2000V				P
	b) 2000V				P
	c) 2000V				P
	d) 2000V				P
	e) 2500 V				NA
	Test current 0.85x non-tripping current (1,13 I_N)	_____120A			
	- Passed for 1h				
	- Passed for 2h				P
	Current is then steadily increased to 1,1 x tripping current (1,45 I_N) within 5s	_____191A			
		E_{1-1} [min]	E_{1-2} [min]	E_{1-3} [min]	
	Tripping within ☐ 1 hour / ☒ 2 hour	____1__	___1___	__1____	P

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9.12.11.4.2	**Test „E_1"(Test at service short-circuit capacity) three phase tests for single circuit-breakers**	E_{1-4}	E_{1-5}	E_{1-6}	
	Service short-circuit capacity (Ics)..... :	6kA			
	Test circuit: figure ..... :	3			
	Test voltage 1,05 Un	243V			
	Prospective current..... :	6000A			
	Prospective current obtained..... :	6090A			
	Power factor ..... :	0,93-0,98			
	Power factor obtained ..... :	0,94			
	Sequence ..... :				
	T (min) ..... :	3min			
9.12.9.2	Test in free air copper wire F': ☐ 0,12 mm / ☒ 0,16 mm resistor R' : ☐ 0,75 Ohm / ☒ 1,5 Ohm	"a" = 100mm			
9.12.9.3	Test in enclosures copper wire F': ☐ 0,12 mm / ☐ 0,16 mm resistor R' : ☐ 0,75 Ohm / ☐ 1,5 Ohm	dimensions of enclosure: 110x80x70mm			
	I_{Peak} (A) max. value ..... :	2,55A			P
	- No permanent arcing				P
	- No flash-over between poles or between poles and frame				P
	- No blowing of the fuses F and F'				P
	- Polyethylene foil shows no holes				P
	After the test:				P
9.12.12.1	The circuit-breakers shall show no damage impairing their further use and shall maintenance, withstand the following tests.				
	a) leakage current across open contacts, according to 9.7.5.3, each pole is supplied at a voltage 1,1 times Un.= _____ V. The circuit – breaker is in the open position	E_{1-4} [mA]	E_{1-5} [mA]	E_{1-6} [mA]	--
	The leakage current shall not exceed 2 mA L1	<0,1			P
	L2		<0,1		P
	L3			<0,1	P
	L4(N)				
	Electric strength test:				
	Test voltage 2000 V (see 9.7.2)				
	a) 2000V				P

	b) 2000V				P
	c) 2000V				P
	d) 2000V				P
	e) 2500 V				NA
	Test current 0.85x non-tripping current (1,13 I_N)	120A			
	- Passed for 1h				
	- Passed for 2h				P
	Current is then steadily increased to 1,1 x tripping current (1,45 I_N) within 5s	199A			
		E_{1-4} [min]	E_{1-5} [min]	E_{1-6} [min]	
	Tripping within ☐ 1 hour / ☒ 2 hour	__2	__2	___1	P

	TESTS „E_2" 3 + 4 samples				
9.12.11.4.3	**Test: E2 (Test at rated short-circuit capacity)**	E_{2-1}	E_{2-2}	E_{2-3}	
	Rated short-circuit capacity (Icn)..... :	6kA			P
	Test circuit: figure ..... :	3			P
	Test voltage 1,05 Un	243V			P
	Prospective current ..... :	6000A			P
	Prospective current obtained..... :	6090A			P
	Power factor ..... :	0,93-0,98			P
	Power factor obtained ..... :	0,94			P
	Sequence ..... :				P
	T (min) ..... :	3min			P
9.12.9.2	Test in free air copper wire F': ☐ 0,12 mm / ☒ 0,16 mm resistor R' : ☐ 0,75 Ohm / ☒ 1,5 Ohm	"a" = 100mm			P
9.12.9.3	Test in enclosures copper wire F': ☐ 0,12 mm / ☒ 0,16 mm resistor R' : ☐ 0,75 Ohm / ☒ 1,5 Ohm	dimensions of enclosure: 110x80x70mm			P
	I_{Peak} (A) max. value ..... :	A			
	$I^2t \leq$ _____ kA^2s	[kA^2s]	[kA^2s]	[kA^2s]	
	Max. $I^2t \leq$ _____ kA^2s L1 L2 L3 L4(N)	2,95 2,95 3,35	— — — —	— — — —	
	- No permanent arcing				P
	- No flash-over between poles or between poles and frame				P
	- No blowing of the fuses F and F'				P
	- Polyethylene foil shows no holes				P
	After the test:				P
9.12.12.2	The circuit-breakers shall show no damage impairing their further use and shall maintenance, withstand the following tests.				
	a) leakage current across open contacts, according to 9.7.5.3, each pole is supplied at a voltage 1,1 times Un.= _____ V. The circuit – breaker is in the open position	E_{2-1} [mA]	E_{2-2} [mA]	E_{2-3} [mA]	
	The leakage current shall not exceed 2 mA L1	<0,1			P
	L2		<0,1		P

	L3			<0,1	P
	L4(N)				
	Electric strength test:				
	Test voltage 2000 V (see 9.7.2)				
	a) 2000V				P
	b) 2000V				P
	c) 2000V				P
	d) 2000V				P
	e) 2500 V				NA
	Test current 2,8 I_N	_____350A			
	Tripping within > 0,1 s up to	[s]	[s]	[s]	
	- 60 s				
	- 120 s	71	70	66	P

9.12.11.4.3	**Test „E_2"(Test at rated short-circuit capacity) three phase tests for single circuit-breakers**	**E_{2-4}**	**E_{2-5}**	**E_{2-6}**	**E_{2-7}**	
	Rated short-circuit capacity (Icn)..... :	_____6kA				P
	Test circuit: figure ..... :	_____3				P
	Test voltage 1,05 Un	_____243V				P
	Prospective current..... :	_____6000A				P
	Prospective current obtained..... :	_____6090A				P
	Power factor ..... :	_____0,93-0,98				P
	Power factor obtained ..... :	_____0,94				P
	Sequence ..... :	_____				P
	T (min) ..... :	_____3min				P
9.12.9.2	Test in free air copper wire F': ☐ 0,12 mm / ☒ 0,16 mm resistor R' : ☐ 0,75 Ohm / ☒ 1,5 Ohm	"a" = 100mm				P
9.12.9.3	Test in enclosures copper wire F': ☐ 0,12 mm / ☒ 0,16 mm resistor R' : ☐ 0,75 Ohm / ☒ 1,5 Ohm	dimensions of enclosure: 110x80x70mm				P
	I_{Peak} (A) max. value ..... :	_____A				
	- No permanent arcing					P
	- No flash-over between poles or between poles and frame					P
	- No blowing of the fuses F and F'					P
	- Polyethylene foil shows no holes					P
	After the test:					P
9.12.12.2	The circuit-breakers shall show no damage impairing their further use and shall maintenance, withstand the following tests.					
	a) leakage current across open contacts, according to 9.7.5.3, each pole is supplied at a voltage 1,1 times Un.= _____ V. The circuit – breaker is in the open position	**E_{2-4}** [mA]	**E_{2-5}** [mA]	**E_{2-6}** [mA]	**E_{2-7}** [mA]	
	The leakage current shall not exceed 2 mA L1	<0,1				P
	L2		<0,1			P
	L3			<0,1		P
	L4(N)					
	Electric strength test:					
	Test voltage 2000 V (see 9.7.2)					
	a) 2000V					P

	b) 2000V					P
	c) 2000V					P
	d) 2000V					P
	e) 2500 V					NA
	Test current 2,8 I_N	_____350A				
	Tripping within > 0,1 s up to	[s]	[s]	[s]	[s]	
	- 60 s					
	- 120 s	66	52	70		P

	TESTS „E_3“ 3 samples				
9.12.11.4.4	**Test: E_3 (Test at making and breaking capacity on an individual pole (Icn1)**	**E_{3-1}**	**E_{3-2}**	**E_{3-3}**	
	Icn1 ..... :	6kA			P
	Test circuit: figure ..... :	3			P
	Test voltage 1,05 Un	243V			P
	Prospective current ..... :	6000A			P
	Prospective current obtained..... :	6090A			P
	Power factor ..... :	0,93-0,98			P
	Power factor obtained ..... :	0,94			P
	Sequence ..... :				
	T (min) ..... :	3min			P
9.12.9.2	Test in free air copper wire F': ☐ 0,12 mm / ☒ 0,16 mm resistor R' : ☐ 0,75 Ohm / ☒ 1,5 Ohm	"a" = 100mm			P
9.12.9.3	Test in enclosures copper wire F': ☐ 0,12 mm / ☒ 0,16 mm resistor R' : ☐ 0,75 Ohm / ☒ 1,5 Ohm	dimensions of enclosure: 110x80x70mm			P
	I_{Peak} (A) max. value ..... :	A			
	$I^2t \leq$ _____ kA^2s	[kA^2s]	[kA^2s]	[kA^2s]	
	Max. $I^2t \leq$ _____kA^2s L1 L2 L3 L4	3,35 2,83 2,75	— — — —	— — — —	
	- No permanent arcing				P
	- No flash-over between poles or between poles and frame				P
	- No blowing of the fuses F and F'				P
	- Polyethylene foil shows no holes				P
	After the test:				P
9.12.12.2	The circuit-breakers shall show no damage impairing their further use and shall maintenance, withstand the following tests.				
	a) leakage current across open contacts, according to 9.7.5.3, each pole is supplied at a voltage 1,1 times Un.= _____ V. The circuit – breaker is in the open position	E_{3-1} [mA]	E_{3-2} [mA]	E_{3-3} [mA]	
	The leakage current shall not exceed 2 mA L1	<0,1			P
	L2		<0,1		P

	L3			<0,1	P
	L4				
	Electric strength test:				
	Test voltage 2000 V (see 9.7.2)				
	a) 2000V				P
	b) 2000V				P
	c) 2000V				P
	d) 2000V				P
	e) 2500 V				NA
	Test current 2,8 I_N	350A			
	Tripping within > 0,1 s up to	[s]	[s]	[s]	
	- 60 s				
	- 120 s	66	63	70	P

	Annex J		
	Particular requirements for circuit-breakers with screw less type terminals for external copper conductors (In not exceeding 20 A, cross-sectional area up to 4 mm^2		
J.6	**Marking**		**NA**
	Universal terminals		
	- no marking		
	Non-universal		
	- declared for rigid-solid conductors	marked with: "sol"	
	- declared for rigid(solid and stranded) .....:	marked with: "r"	
	- declared for flexible conductors .....:	Marked with: "f"	
	The markings should appear on the circuit-breaker or, if available space is not sufficient, on smallest package unit or in technical information .....:		
	Indication of length of insulation to be removed on the circuit-breaker.....:	_____mm	
J.7	**Standard conditions for operation in service**		NA
	Clause 7 applies		
J.8	**Constructional requirements**		NA
	Clause 8 applies with the follow modifications:		
	In clause 8.1.5 only –5.1, -5.2. –5.3, - 5.6 and - 5.7 apply		
	Compliance is checked by inspection and by the tests of J.9.1 and J.9.2		
J.8.1	**Connection or disconnection of conductors**		NA
	The connection or disconnection shall be made by:		
	A general purpose tool or by a convenient device integral with the terminal or		
	for rigid conductors by simple insertion		
	For disconnection an operation other than a pull shall be necessary (push-wire terminals)		
	Universal terminals shall accept rigid (solid or stranded and flexible unprepared conductors		
	Non-universal terminals shall accept conductors declared by the manufacturer		
	Compliance is checked by inspection and by the tests of J.9.1 and J.9.2		
J.8.2	**Dimensions of connectable conductors**		NA

	The dimensions of connectable conductors are given in table J.1		
	The ability to connect these conductors shall be checked by inspection and by the tests of J.9.1 and J.9.2		
J.8.3	**Connectable cross-sectional areas**		NA
	The nominal cross-sections to be clamped are given in table J.2		
	Compliance is checked by inspection and by the tests of J.9.1 and J.9.2		
J.8.4	**Insertion and connection of conductors**		NA
	The insertion and disconnection of the conductors shall be made in accordance with the manufacturer's instructions		
J.8.5	**Design and construction of terminals**		NA
	Terminals shall be designed and constructed that:		
	- each conductor is clamped individually		
	- connection or disconnection connectors connected or disconnected separate or same		
	- inadequate insertion of the conductor is avoided		
	Compliance is checked by inspection and by the tests of J.9.1 and J.9.2		
J.8.6	**The terminals shall be resistant to ageing**		NA
	Compliance is checked by the tests of J.9.3		
J.9	**Tests**		NA
	Clause 9 applies, by replacing 9.4 and 9.5 by the follow		
J.9.1	**Test of reliability of screw less terminals**		
J.9.1.1	**Reliability of screw less system**		NA
	5 times connection and disconnection		
	3 rigid conductors min. cross-section max. cross-section	_____mm^2 _____mm^2	
	3 flexible conductors min. cross-section max. cross-section	_____mm^2 _____mm^2	
	After tests, the terminal shall not be damage in such a way as to impair its further use		
J.9.1.2	**Test of reliability of connection**		NA
	3 terminals of poles of new sample are fitted with new copper conductors according table J.2		

	rigid conductors	min. cross-section max. cross-section	_____mm² _____mm²	
	flexible conductors	min. cross-section max. cross-section	_____mm² _____mm²	
	Each conductor is either pushed as far as possible into the terminal or shall be inserted so that adequate connection is obvious			
	After tests, no wire of the conductor shall have escaped outside the terminals			
J.9.2	**Tests of reliability of terminals for external conductors: Mechanical strength**			NA
	Three terminals of new samples are fitted with new conductors of the type and of the minimum and maximum cross sectional area according table J.2.			
	Each conductor is subjected to a pull force of value shown in table J.3. for 1 min			
	Terminal screw torque : $^2/_3$ of table 11		_____ Nm	
	rigid conductors	min. cross-section max. cross-section	_____ mm² / _____N _____ mm² / _____N	
	flexible conductors	min. cross-section max. cross-section	_____ mm² / _____N _____ mm² / _____N	
	During the test the conductor shall not slip out of the terminal			
J.9.3	**Cycling test**			NA
	The test is carried out with new copper conductors having a cross sectional area according table 10		_____ mm ²	
	The test is carried out on new samples(a sample is one pole, the number of which is defined below, according the type of terminal			
	- universal terminals for rigid (solid and stranded) and flexible conductors		3 + 3 samples	
	- non-universal terminals for solid conductors only		3 samples	
	-- non- universal terminals for rigid (solid and stranded) conductors		3 + 3 samples	
	- non-universal terminals for flexible conductors only		3 samples	
	The conductors are connected in series as in normal use to each of the three samples as defined on fig. J.1.			

	The sample is provided with a hole or equivalent in order to measure the voltage drop on the terminal				
	The test arrangement is placed in a heating cabinet which is initially on 20°C				
	Except the cooling period the test current (rated current) is applied to the circuit	I test _____ A			
	The samples shall be subjected to 192 temperature cycles, each cycle having a duration of +/- 1 hour				
	Description of the temperature cycle: In 20 min raised to 40°C, maintained for 10 min, then cool down in 20 min to 30 °C, maintained for 10 min. For measurement of the voltage drop it is allowed to cool down to 20 °C				
	The maximum voltage drop, measured on each terminal, at the end of the 192nd cycle, with Inom. shall not exceed the smaller of the two following values - either 22,5 mV - or 1,5 times the value measured after the 24 cycle	Uv max. _____ mV			
	Sample after 24 cycles: rigid conductors (mV) flexible conductors (mV)	J_1 _____ _____	J_2 _____ _____	J_3 _____ _____	
	Sample after 192 cycles: rigid conductors (mV) flexible conductors (mV)	J_1 _____ _____	J_2 _____ _____	J_3 _____ _____	
	After this test the samples shall show no changes evidently impairing further use, such as cracks, deformations or like				

	Annex K		
	Particular requirements for circuit-breakers with flat quick-connect terminations		--
K.6	**Marking**		NA
	The whole of clause 6 applies		
	Addition after the lettered item k		--
	The following information regarding the female connector according to IEC 61210 and the type of conductor to be used shall be given in the manufacturer's instructions		
	a) manufacturers name or trade mark		--
	b) type reference		
	c) information on cross-sections of conductors and colour code of insulating female connectors (see table K.1)		
	d) the use of only silver or tin-plated copper alloys		
K.7	**Standard conditions for operation in service**		NA
	Clause 7 applies		
K.8	**Constructional requirements**		NA
	Clause 8 applies with the follow modifications:		
	replacement of 8.1.3 by:		
K.8.1	**Clearances and creepage distances (see annex B)**		NA
	Subclause 8.1.3 applies, the female connectors being fitted to the male tabs of the circuit-breaker		
	Replacement of 8.1.5 by:		
K.8.2	**Terminals for external conductors**		NA
K.8.2.1	Male tabs and female connectors shall be of a metal having mechanical strength, electrical conductivity and resistance to corrosion adequate for their intended use		
K.8.2.2	The nominal width of male tab is 6,3 mm and the thickness 0,8 mm, applicable to rated currents up to and including 16 A NOTE 1: The use for rated currents up to and including 20 A is accepted in BE, FR, IT, PT, ES and US		
	The dimensions of the male tab shall comply with those specified in table K.3 and in figures K.2, K3, K4, K5, where the dimensions A, B, C, D, E, F, J, M, N and Q are mandatory		
	The dimensions of the female connector which may be fitted-on are given in figure K.6 and in table K.4		

	Compliance is checked by inspection and by measurement	See table on page _____	
K.8.2.3	**Male tabs shall be securely retained**		NA
	Compliance is checked by the mechanical overload test of K.9.1		
K.9	**Tests**		NA
	Clause 9 applies, with follow modifications:		
	Replacement of 9.5 by:		
K.9.1	**Mechanical overload-force**		NA
	10 terminals of circuit-breakers, mounted as normal use are subjected to a axial push force and successively the axial pull force specified in table K2 applied to male tab once	push force 96 N pull force 88 N	
	No damage which could impair further use shall occur to the tab or to the circuit-breaker in which the tab is integrated		
	Addition to 9.8.3:		
	Fine –wire thermocouples shall be placed in such a way as not to influence the contact or the connection area. An example of placement is shown in fig K.1		

		Dimensions of tabs according Table K.3		Measured in mm	Verdict
		Minimum	Maximum		
A	Dimple	0,7	1,0	_____	
	Hole	0,5	1,0	_____	
B	Dimple	7,8 min		_____	
	Hole	7,8 min		_____	
C	Dimple	0,77	0,84	_____	
	Hole	0,77	0,84	_____	
D	Dimple	6,20	6,40	_____	
	Hole	6,20	6,40	_____	
E	Dimple	3,6	4,1	_____	
	Hole	4,3	4,7	_____	
F	Dimple	1,6	2,0	_____	
	Hole	1,6	2,0	_____	
J	Dimple	8°	12°	_____	
	Hole	8°	12°	_____	
M	Dimple	2,2	2,5	_____	
	Hole	---	---	---	
N	Dimple	1,8	2,0	_____	
	Hole	---	---	---	
P	Dimple	0,7	1,8	_____	
	Hole	0,7	1,8	_____	
Q	Dimple	8,9 min	---	_____	
	Hole	8,9 min	---	_____	
B3			7,8 max	_____	
L2			3,5 max	_____	

	Annex L		
	Specific requirements for circuit-breakers with screw-type terminals for external untreated aluminium conductors and with aluminium screw-type terminals for use with copper or with aluminium conductors		
L.6	**Marking**		**NA**
	In addition to clause 6 the following apply:		
	Terminal marking according table L.1, on the circuit breaker, near the terminals		--
	Conductor types accepted: Copper only Aluminium only Aluminium and copper	 ☐ None ☐ "Al" ☐ "Al/Cu"	
	Other information concerning the number of conductors, screw torque (if different from table 11) and cross-section shall be indicated on the circuit-breaker	_____ Nm _____ mm²	
L.7	**Standard conditions for operation in service**		NA
	Clause 7 applies		
L.8	**Constructional requirements**		NA
	Clause 8 applies with the following exceptions:		
8.1.5.2	is completed by:		
	For connection of aluminium conductors, circuit-breakers shall be provided with screw-type terminals allowing the connection of conductors having nominal cross-sections as shown in table L.2		
	Terminals for the connection of aluminium conductors and terminals of aluminium for the connection of copper or aluminium conductors shall have mechanical strength adequate to withstand the tests of 9.4, with the test conductors tightened with the torque indicated in table 11, or with the torque specified by the manufacturer, which shall never be lower than that specified in table 11.		
	Compliance is checked by inspection, by measurement and by fitting in turn one conductor of the smallest and one of the largest cross-section areas as specified		
8.1.5.4	Terminals shall allow the conductors to be connected without special preparation		

	Compliance is checked by inspection and by the tests of L.9		
L.9	**Tests**		NA
	Clause 9 applies with the following modifications/additions:		
	For the tests which are influenced by the material of the terminal and the type of conductor that can be connected, the test conditions of table L.3 are applied		
	Additionally the test of L.9.2 is carried out on terminals separated from the circuit-breaker		
L.9.2	**Current cycling test**		NA
	This test is carried out on separate terminals		
	The general arrangement of the samples shall be as shown in figure L.1		
	90 % of torque stated by the manufacturer or selected in table 11 used for the specimens	torque:_____Nm	
	The test is carried out with conductors according to table L.5. The length of the test conductor from the point of entry to the screw-type terminal specimens to the equalizer shall be as in table L.6	cross-section:_____mm^2 minimum conductor length:_____mm	
	Cross section of equalizer not greater than that given in table L.7	max. crosssection_____mm^2	
L.9.2.5	Test method and acceptance criteria		
	Test loop subjected to 500 cycles of 1h current-on and 1h current-off, starting at an a.c. current value of 1,12 times the test current value determined in table L.8	test current:_____A	
	Near the end of each current-on period of the first 24 cycles, the current shall subsequently be adjusted to raise the temperature of the reference conductor to 75°C		
	At the end of the 25th cycle the test current shall be adjusted the last time and the stable temperature shall be recorded as the first measurement. No further adjustment of test current for the remainder of the test		
	Temperatures recorded for at least one cycle of each working day, and after approximately 25, 50, 75, 100, 125, 175, 225, 350, 425 and 500 cycles		
	For each screw-type terminal		
	- the temperature rise shall not exceed 110 K		

	- the stability factor Sf shall not exceed ± 10 °C			
	ambient air temperature: _____°C	max. temperature rise [K]	max. stability factor Sf [°C]	
	Terminal 1			
	Terminal 2			
	Terminal 3			
	Terminal 4			
	Terminal 5			
	Terminal 6			
	Terminal 7			
	Terminal 8			

Type :BEND6000			
Current (I_{th}) (A) :125A 4P			
cable section (mm) :50			
ambient temperature: (°C) :30			
Sections	The measured temperature rise (**K**)	according to the standard (**K**)	Increase in Temperature Difference
Line L1	80	<60	50
Line L2	81	<60	51
Line L3	82	<60	52
Line L4	74	<60	44
side body	71	<60	41
front body	76	<60	46
Handle	49	<40	19

Type :BEND6000			
Current (I_{th}) (A) :125A 4P			
cable section (mm) :50			
ambient temperature: (°C) :30			
Sections	The measured temperature rise (**K**)	according to the standard (**K**)	Increase in Temperature Difference
Line L1	77	<60	47
Line L2	79	<60	49
Line L3	79	<60	49
Line L4	71	<60	41
side body	71	<60	41
front body	76	<60	46
Handle	49	<40	19

Type	Test Voltage	Phase - Phase	Phase - Body	Phase - Frame	MCB OFF Line-Load
BEND 6000 1P 125A	2000V	---	OK	OK	OK

Type	Test Voltage	Phase - Phase	Phase - Body	Phase - Frame	MCB OFF Line-Load
BEND 6000 4P 125A	2000V	OK	OK	OK	OK

Type	Test Voltage	Phase - Phase	Phase - Body	Phase - Frame	MCB OFF Line-Load
BEND 6000 1P 80A	2000V	---	OK	OK	OK

	TABLE: Ball Pressure Test of Thermoplastics		
Allowed impression diameter (mm) ..... :			—
Object/ Part No./ Material	Manufacturer/ trademark	Test temperature (°C)	Impression diameter (mm)
BEND6000	sigma	30	2
Supplementary information:			

	TABLE: Threaded Part Torque Test		
Threaded part identification	**Diameter of thread (mm)**	**Column number (I, II, or III)**	**Applied torque (Nm)**
screw	6	II	2,5
Supplementary information:			

List of test equipment used:

A completed list of used test equipment shall be provided in the Test Reports when a Manufacturer Testing Laboratory according to CTF stage 1 or CTF stage 2 procedure has been used.
Note: This page may be removed when CTF stage 1 CTF stage 2 are not used. See also clause 4.8 in OD 2020 for more details.

Clause	Measurement / testing	Testing / measuring equipment / material used, (Equipment ID)	Range used	Last Calibration date	Calibration due date

END OF REPORT