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Test
TS EN ISO/IEC 17025
AB-0386-T

TESTLA

Elektrik Laboratuvarları Tic. Ltd. Şti.

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AB-0386-T

1707.25.02

21.07.2017

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 10000 (MCB)
Marka / Tip / Seri No Brand / Type / Serial Number	BELD 10000
Talep/Kabul No Demand-Accept No	1707.25
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 In Charge Of Test	Laboratuvar Müdürü Laboratory Manager
	21.07.2017	 Mehmet ŞUMNU	 Caner EREN



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Hata! Başvuru kaynağı bulunamadı.

Test item description..... :	MCB
Trade Mark..... :	BETA
Manufacturer..... :	BETA ELECTRIC INDUSTRIES
Model/Type reference..... :	BELD10000
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 :
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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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Hata! Başvuru kaynağı bulunamadı.

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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Hata! Başvuru kaynağı bulunamadı.

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 IEC 60335-1:

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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Hata! Başvuru kaynağı bulunamadı.

Test item particulars	
Type of circuit-breaker	BELD10000
Number of poles	<input checked="" type="checkbox"/> 1-P <input type="checkbox"/> 1-P+N <input checked="" type="checkbox"/> 2-P <input checked="" type="checkbox"/> 3-P <input type="checkbox"/> 3-P+N <input checked="" type="checkbox"/> 4-P
Protection against external influences	<input type="checkbox"/> enclosed <input checked="" type="checkbox"/> unenclosed
Method of mounting	<input type="checkbox"/> surface <input type="checkbox"/> flush <input checked="" type="checkbox"/> panel board
Method of connection	<input checked="" type="checkbox"/> not associated with the mechanical mounting <input type="checkbox"/> associated with the mechanical mounting
Type of terminal	<input checked="" type="checkbox"/> screw ^{a) b)} <input type="checkbox"/> pillar ^{a) b)} <input type="checkbox"/> cage ^{a) b)} <input type="checkbox"/> lug <input type="checkbox"/> screw less ^{a)} <input type="checkbox"/> flat quick connect ^{a)} <input type="checkbox"/> plug-in <input type="checkbox"/> screw-in ^{a)} copper conductors ^{b)} aluminium conductors
Instantaneous tripping current	<input type="checkbox"/> B <input checked="" type="checkbox"/> C <input type="checkbox"/> D
I ² t characteristic	
Value of rated operational voltage (Ue)	<input type="checkbox"/> 120 V <input type="checkbox"/> 230 V <input type="checkbox"/> 240 V <input type="checkbox"/> 120/240 V <input checked="" type="checkbox"/> 230/400 V <input type="checkbox"/> 400 V <input type="checkbox"/> 240/415 V <input type="checkbox"/> 415 V
Value of rated current (In)	80-100-125___ A
Value of rated frequency	<input checked="" type="checkbox"/> 50 Hz <input checked="" type="checkbox"/> 60 Hz
Ambient air temperature (°C)	<input checked="" type="checkbox"/> 30°C <input type="checkbox"/> 40°C <input type="checkbox"/> Other ___°C
Rated short-circuit capacity (Icn)	<input type="checkbox"/> 1,5 kA <input type="checkbox"/> 3 kA <input type="checkbox"/> 4,5 kA <input type="checkbox"/> 6 kA <input checked="" type="checkbox"/> 10 kA <input type="checkbox"/> 15 kA <input type="checkbox"/> 20 kA <input type="checkbox"/> 25 kA
Rated impulse withstand voltage (Uimp)	<input type="checkbox"/> 2,5 kV <input type="checkbox"/> 4 kV <input checked="" type="checkbox"/> 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.....:	BELD10000	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).....:	10000	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 ² t characteristic (documentation)		P
	Symbols on supply and load terminal		NA
	Terminal for neutral conductor N		NA
	Earthing terminal if any (IEC 60417-5019)		NA



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	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



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	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)	<input checked="" type="checkbox"/> <input type="checkbox"/>	P
	Minimum clearances (see table 4)		
		minimum clearances [4mm]	P



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	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	<input type="checkbox"/> III _b <input checked="" type="checkbox"/> III _a <input type="checkbox"/> II <input type="checkbox"/> 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



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	- 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



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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 (mm ²).....	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 (mm ²).....	25mm ²	P
	Max. cross-section solid / stranded / flexible (mm ²).....	50mm ²	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 (mm ²).....	25mm ²	P
	- max. cross-sectional area (mm ²).....	50mm ²	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 (mm ²).....	50mm ²	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



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Rated current (A) sections	Range of nominal cross to be clamped* (mm ²)		to	mm ²	
	Rigid (solid or stranded) conductors	Flexible conductors			
≤ 13	1 to 2,5	1 to 2,5			P
> 13 ≤ 16	1 to 4	1 to 4			
> 16 ≤ 25	1,5 to 6	1,5 to 6			
> 25 ≤ 32	2,5 to 10	2,5 to 6			
> 32 ≤ 50	4 to 16	4 to 10			
> 50 ≤ 80	10 to 25	10 to 16			
> 80 ≤ 100	16 to 35	16 to 25			
> 100 ≤ 125	24 to 50	25 to 35			
	*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 mm ² up to 6 mm ² 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



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	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



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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 = $(70 \pm 2)^{\circ}\text{C}$ or T = ___ $^{\circ}\text{C}$ = $(40 \pm 2)^{\circ}\text{C}$ + max. temperature rise of sub-clause 9.8 \varnothing 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



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	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



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	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				



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	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:		P
		[MΩ] [MΩ] [MΩ]	
	a) In off-position, between the terminals which are electrically connected together when the circuit-breaker is in the closed position $\geq 2 \text{ M}\Omega$	>2 >2 >2	P
	b) in off-position, between each pole in turn and the others connected together $\geq 2 \text{ M}\Omega$		NA
	c) in on-position, between all poles connected together and the frame $\geq 5 \text{ M}\Omega$	>5 >5 >5	P
	d) between metal parts of mechanism and the frame $\geq 5 \text{ M}\Omega$		NA



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	e) between the frame and metal foil in contact with the inner surface of the internal enclosure or lining of insulating material $\geq 5 \text{ M}\Omega$		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 ($\text{M}\Omega$) $\geq 2 \text{ M}\Omega$		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 ($\text{M}\Omega$) $\geq 2 \text{ M}\Omega$		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)	V
	≤ 30	600	
	$> 30 \leq 50$	1000	
	$> 50 \leq 110$	1500	
	$> 110 \leq 250$	2000	
	$> 250 \leq 500$	2500	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		



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	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 1,2 μ s, and a time to half-value of 50 μ s		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 $\leq 500\Omega$ 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 mm ²	P
9.8.2	Test current: I _N = (reach the steady-state value) Four-pole CB's: <input type="checkbox"/> 1) Three poles loaded 2) One pole and neutral pole loaded <input type="checkbox"/> 1) Four-poles loaded	I _N = __125A	P
	Ambient air temperature	T _{amb} = __30°C	
	Parts	Temperature rise [K] [K] [K] [K]	
	L1	52	P
	L2	52	
	L3	50	
	L4(N)	47	
	L3		
	N		
	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		



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	Max. power loss : _____20W	W	W	W	
	L1	16			P
	L2	17			
	L3	17			
	L4(N)	14			
	L3				
	N				
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 mm ²	$I_N =$ _____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	52	52	51	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 ($\leq 63 A$)				
	- 2h ($> 63 A$)	119	114	126	P



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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 ____50mm ²	233V 125,5A 0,87 (Ω) 50mm ²			P
9.11.2	Test procedure				
	The circuit-breaker is submitted to 4000 operating cycles with rated current.	4000			P
	- I _N ≤ 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 current2,55 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)	50	48	55	P
	Dielectric strength reduced to 2000 V				P



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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= _____	1254A	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': <input type="checkbox"/> 0,12 mm / <input checked="" type="checkbox"/> 0,16 mm resistor R' : <input type="checkbox"/> 0,75 Ohm / <input checked="" type="checkbox"/> 1,5 Ohm	"a" = _____	35 mm	P
9.12.9.3	Test in enclosures copper wire F': <input type="checkbox"/> 0,12 mm / <input checked="" type="checkbox"/> 0,16 mm resistor R' : <input type="checkbox"/> 0,75 Ohm / <input checked="" type="checkbox"/> 1,5 Ohm	dimension of enclosure: 110x81x70mm		P
	I _{Peak} (A) max. value	_____A		
	Sequence: 6 x "O" and 3 x "CO"	[kA ² s]	[kA ² s]	[kA ² s]
	Max. I ² t ≤ _____ kA ² s	2987	2641	2255
	- 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		
	L2		<0,1	
	L3			<0,1
	L4(N)			
	Electric strength test:			
	Test voltage 2000 V (see 9.7.2)			



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



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9.12.11.2. 2	Test „C₂“ 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': <input type="checkbox"/> 0,12 mm / <input type="checkbox"/> 0,16 mm resistor R' : <input type="checkbox"/> 0,75 Ohm / <input type="checkbox"/> 1,5 Ohm	"a" = _____ mm		NA
9.12.9.3	Test in enclosures copper wire F': <input type="checkbox"/> 0,12 mm / <input type="checkbox"/> 0,16 mm resistor R' : <input type="checkbox"/> 0,75 Ohm / <input type="checkbox"/> 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 ² s]	[kA ² s]	[kA ² s]
	Shifted point 30 ° on the other protected pole	C ₂₋₁	C ₂₋₂	C ₂₋₃
	Max. I ² t ≤ _____kA ² s	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]
	The leakage current shall not exceed 2 mA L1			NA
	L2			NA
	L3			NA
	L4(N)			NA



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



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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 ₀₋₁ D ₀₋₂ D ₀₋₃	
	I _N (A)	125A	P
	Sect. (mm ²)	50mm ²	P
	Instantaneous tripping current	<input type="checkbox"/> B <input checked="" type="checkbox"/> C <input type="checkbox"/> 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 ≤ 63 A)		NA
	- 2 h (I _N > 63 A)	69s	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)	50 63 57	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 U _n (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	<input type="checkbox"/> For circuit-breakers of the B – Type		
	Test current 3I _N (A), starting from cold	_____A	



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	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	<input checked="" type="checkbox"/> 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	0,012	0,013	0,014	P
9.10.3.4	<input type="checkbox"/> 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



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	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



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	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)		1575A		P
	Power factor		0,97		P
	Test voltage 1,05 Un		243V		P
	Test circuit: figure		3		P
	T (min)		3min		P



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9.12.9.2	Test in free air copper wire F': <input type="checkbox"/> 0,12 mm / <input checked="" type="checkbox"/> 0,16 mm resistor R' : <input type="checkbox"/> 0,75 Ohm / <input checked="" type="checkbox"/> 1,5 Ohm	"a" = _____ 50mm				P
9.12.9.3	Test in enclosures copper wire F': <input type="checkbox"/> 0,12 mm / <input checked="" type="checkbox"/> 0,16 mm resistor R' : <input type="checkbox"/> 0,75 Ohm / <input checked="" type="checkbox"/> 1,5 Ohm	dimension of enclosure: 110x80x70				P
	Sequence	_____				
	I _{Peak} (A) max. value	_____ A				
	I ² t ≤ _____ kA ² s	[kA ² s]	[kA ² s]	[kA ² s]		
	Max. I ² t ≤ _____ kA ² s	L1 2,89	_____	_____		P
		L2 2,75	_____	_____		
		L3 1,42	_____	_____		
		L4(N)	_____	_____		
	- 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
		D₁₋₁ [min]	D₁₋₂ [min]	D₁₋₃ [min]	
	Tripping within <input type="checkbox"/> 1 hour / <input checked="" type="checkbox"/> 2 hour	_____2 -	_____2	_____2	P



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TESTS „E1“ 3 + 4 samples					
9.12.11.4.2	Test E1: Test at service short-circuit capacity	E ₁₋₁	E ₁₋₂	E ₁₋₃	
	Service short-circuit capacity (Ics).....:	_____ 10kA			
	Test circuit: figure	_____ 10			
	Test voltage 1,05 Un	_____ 243V			
	Prospective current	_____ 10000A			
	Prospective current obtained.....:	_____ L1:10000A			
	Power factor	_____ 0,93-0,98			
	Power factor obtained	_____ 0,95			
	Sequence	_____			
	T (min)	_____ 3min			
9.12.9.2	Test in free air copper wire F': <input type="checkbox"/> 0,12 mm / <input checked="" type="checkbox"/> 0,16 mm resistor R' : <input type="checkbox"/> 0,75 Ohm / <input checked="" type="checkbox"/> 1,5 Ohm	"a" = _____ 100mm			
9.12.9.3	Test in enclosures copper wire F': <input type="checkbox"/> 0,12 mm / <input checked="" type="checkbox"/> 0,16 mm resistor R' : <input type="checkbox"/> 0,75 Ohm / <input checked="" type="checkbox"/> 1,5 Ohm	dimensions of enclosure: 110x80x70mm			P
	I _{Peak} (A) max. value	_____ A			
	I ² t ≤ _____ kA ² s	[kA ² s]	[kA ² s]	[kA ² s]	
	Max. I ² t ≤ _____ kA ² s	L1	3,14	_____	_____
		L2	2,75	_____	_____
		L3	2,67	_____	_____
		L4(N)	_____	_____	_____
	- 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



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	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 <input type="checkbox"/> 1 hour / <input checked="" type="checkbox"/> 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).....:	_____ 10kA			
	Test circuit: figure	_____ 10			
	Test voltage 1,05 Un	_____ 243V			
	Prospective current.....:	_____ 10000A			
	Prospective current obtained.....:	_____ 10040A			
	Power factor	_____ 0,93-0,98			
	Power factor obtained	_____ 0,95			
	Sequence	_____			
	T (min)	_____ 3min			
9.12.9.2	Test in free air copper wire F': <input type="checkbox"/> 0,12 mm / <input checked="" type="checkbox"/> 0,16 mm resistor R' : <input type="checkbox"/> 0,75 Ohm / <input checked="" type="checkbox"/> 1,5 Ohm	"a" = 100mm			
9.12.9.3	Test in enclosures copper wire F': <input type="checkbox"/> 0,12 mm / <input type="checkbox"/> 0,16 mm resistor R' : <input type="checkbox"/> 0,75 Ohm / <input type="checkbox"/> 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



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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 <input type="checkbox"/> 1 hour / <input checked="" type="checkbox"/> 2 hour		__2	__2	__1	P



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TESTS „E2“ 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 (I _{cn}).....:	_____10kA			P
	Test circuit: figure	_____10			P
	Test voltage 1,05 Un	_____243V			P
	Prospective current	_____10000A			P
	Prospective current obtained.....:	_____10040A			P
	Power factor	_____0,93-0,98			P
	Power factor obtained	_____0,95			P
	Sequence	_____			P
	T (min)	_____3min			P
9.12.9.2	Test in free air copper wire F': <input type="checkbox"/> 0,12 mm / <input checked="" type="checkbox"/> 0,16 mm resistor R' : <input type="checkbox"/> 0,75 Ohm / <input checked="" type="checkbox"/> 1,5 Ohm	"a" = 100mm			P
9.12.9.3	Test in enclosures copper wire F': <input type="checkbox"/> 0,12 mm / <input checked="" type="checkbox"/> 0,16 mm resistor R' : <input type="checkbox"/> 0,75 Ohm / <input checked="" type="checkbox"/> 1,5 Ohm	dimensions of enclosure: 110x80x70mm			P
	I _{Peak} (A) max. value	_____A			
	I ² t ≤ _____ kA ² s	[kA ² s]	[kA ² s]	[kA ² s]	
	Max. I ² t ≤ _____ kA ² s	L1 2,21	_____	_____	
		L2 2,47	_____	_____	
		L3 3,12	_____	_____	
		L4(N)	_____	_____	
	- 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



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	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		77	71	65	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 (I _{cn}).....:	_____ 10kA				P
	Test circuit: figure	_____ 10				P
	Test voltage 1,05 Un	_____ 243V				P
	Prospective current.....:	_____ 10000A				P
	Prospective current obtained.....:	_____ 10040A				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': <input type="checkbox"/> 0,12 mm / <input checked="" type="checkbox"/> 0,16 mm resistor R' : <input type="checkbox"/> 0,75 Ohm / <input checked="" type="checkbox"/> 1,5 Ohm	"a" = 100mm				P
9.12.9.3	Test in enclosures copper wire F': <input type="checkbox"/> 0,12 mm / <input checked="" type="checkbox"/> 0,16 mm resistor R' : <input type="checkbox"/> 0,75 Ohm / <input checked="" type="checkbox"/> 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 U _n . = _____ 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



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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	73	65	60		P



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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	_____ 10kA			P
	Test circuit: figure	_____ 10			P
	Test voltage 1,05 Un	_____ 243V			P
	Prospective current	_____ 10000A			P
	Prospective current obtained.....	_____ 10040A			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': <input type="checkbox"/> 0,12 mm / <input checked="" type="checkbox"/> 0,16 mm resistor R' : <input type="checkbox"/> 0,75 Ohm / <input checked="" type="checkbox"/> 1,5 Ohm	"a" = 100mm			P
9.12.9.3	Test in enclosures copper wire F': <input type="checkbox"/> 0,12 mm / <input checked="" type="checkbox"/> 0,16 mm resistor R' : <input type="checkbox"/> 0,75 Ohm / <input checked="" type="checkbox"/> 1,5 Ohm	dimensions of enclosure: 110x80x70mm			P
	I _{Peak} (A) max. value	_____ A			
	I ² t ≤ _____ kA ² s	[kA ² s]	[kA ² s]	[kA ² s]	
	Max. I ² t ≤ _____ kA ² s	L1 2,47	_____	_____	
		L2 2,22	_____	_____	
		L3 2,76	_____	_____	
		L4	_____	_____	
	- 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



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	L3			<0,1	P
	L4				
Electric strength test:					
Test voltage 2000 V (see 9.7.2)					
a) 2000V					
b) 2000V					
c) 2000V					
d) 2000V					
e) 2500 V					
Test current 2,8 I _N					
_____ 350A					
Tripping within > 0,1 s up to					
[s] [s] [s]					
- 60 s					
- 120 s					
61 69 66 P					



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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	



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



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	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 _____mm ² max. cross-section _____mm ²		
	3 flexible conductors min. cross-section _____mm ² max. cross-section _____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		



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	rigid conductors	min. cross-section	_____ mm ²	
		max. cross-section	_____ mm ²	
	flexible conductors	min. cross-section	_____ mm ²	
		max. cross-section	_____ mm ²	
	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	_____ mm ² / _____ N	
		max. cross-section	_____ mm ² / _____ N	
	flexible conductors	min. cross-section	_____ mm ² / _____ N	
		max. cross-section	_____ mm ² / _____ 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.			



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	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 192 nd 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	



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	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	_____	



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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	<input type="checkbox"/> None <input type="checkbox"/> "Al" <input type="checkbox"/> "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 _____ mm ²
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	



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	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 25 th 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		



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Type :BELD10000			
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	81	<60	51
Line L2	82	<60	52
Line L3	82	<60	52
Line L4	75	<60	45
side body	72	<60	42
front body	77	<60	47
Handle	50	<40	20

Type :BELD10000			
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	81	<60	51
Line L4	76	<60	44
side body	74	<60	44
front body	76	<60	36
Handle	50	<40	20

Type	Test Voltage	Phase - Phase	Phase - Body	Phase - Frame	MCB OFF Line-Load
BELD10000 1P 125A	2000V	---	OK	OK	OK

Type	Test Voltage	Phase - Phase	Phase - Body	Phase - Frame	MCB OFF Line-Load
BELD10000 4P 125A	2000V	OK	OK	OK	OK



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Type	Test Voltage	Phase - Phase	Phase - Body	Phase - Frame	MCB OFF Line-Load
BELD10000 1P 80A	2000V	---	OK	OK	OK

TABLE: Ball Pressure Test of Thermoplastics

TABLE: Ball Pressure Test of Thermoplastics			
Allowed impression diameter (mm)			---
Object/ Part No./ Material	Manufacturer/ trademark	Test temperature (°C)	Impression diameter (mm)
BELD10000	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

