Ref. Certif. No.

SE-101974

IEC SYSTEM FOR MUTUAL RECOGNITION OF TEST CERTIFICATES FOR ELECTRICAL EQUIPMENT (IECEE) CB SCHEME

CB TEST CERTIFICATE

Product	Circuit-breakers for over current protection for household and similar installations
Name and address of the applicant	Hyundai Electric & Energy Systems Co., Ltd. Hyundai Building 75, Yulgok-ro, Jongno-gu, Seoul, Republic of Korea
Name and address of the manufacturer	Wenzhou Aoelec Electrical Co., Ltd. No. 7 Zhenxing road, Xinguang Industrial Zone, Liushi, Yueqing, Zhejiang, China
Name and address of the factory Note: *When more than one factory, please report on page 2*	Same as manufacturer
Ratings and principal characteristics	Un= 240/415V~(1P), 240V~(1P+N), 415V~(2P, 3P, 3P+N, 4P) In= 1, 2, 3, 4, 6, 10, 13, 16, 20, 25, 32, 40, 50, 63A Ics= 7500A, Icn=15000A B-, C-, D- type; 50/60Hz
Trademark (if any)	HYUNDAI
Customer's Testing Facility (CTF) Stage used	-
Model / Type Ref.	HGD 63U
Additional information (if necessary may also be reported on page 2)	-
A sample of the product was tested and found to be in conformity with	IEC 60898-1:2015
As shown in the Test Report Ref. No. which forms part of this Certificate	200700864SHA-001

This CB Test Certificate is issued by the National Certification Body

Intertek Semko AB
Torshamnsgatan 43
Box 1103
SE-164 22 Kista, Sweden

intertek

Signature:

Henrik Wikström

Date: 07 August, 2020

Test Report issued under the responsibility of:

intertek
Total Quality. Assured.

TEST REPORT
IEC 60898-1
Circuit-breakers for over current protection for household and similar installations
Part 1 - Circuit-breakers for a.c. operation

Report Number. ..... :	200700864SHA-001
Date of issue ..... :	2020-07-17
Total number of pages ..... :	121
Applicant's name ..... :	Hyundai Electric & Energy Systems Co., Ltd.
Address ..... :	Hyundai Building 75, Yulgok-ro, Jongno-gu, seoul, Republic of Korea
Test specification:	
Standard ..... :	IEC 60898-1:2015
Test procedure ..... :	CB Scheme
Non-standard test method ..... :	N/A
Test Report Form No. ..... :	IEC60898_1D
Test Report Form(s) Originator .... :	DEKRA Certification B.V.
Master TRF ..... :	Dated 2015-09

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

General disclaimer:

The test results presented in this report relate only to the object tested.
This report shall not be reproduced, except in full, without the written approval of the Issuing CB Testing Laboratory. The authenticity of this Test Report and its contents can be verified by contacting the NCB, responsible for this Test Report.

Test item description ..... :	Circuit-breakers with overcurrent protection
Trade Mark ..... :	HYUNDAI
Manufacturer ..... :	Wenzhou Aoelec Electrical Co., Ltd. No.7, Zhenxing Road, Xinguang Industrial Zone, Liushi, Yueqing, Zhejiang, China
Model/Type reference ..... :	HGD 63U
Ratings ..... :	U_n= 240/415V~(1P), 240V~(1P+N), 415V~(2P, 3P, 3P+N, 4P) In= 1, 2, 3, 4, 6, 10, 13, 16, 20, 25, 32, 40, 50, 63A

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

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

Summary of testing:
The products mentioned in this test report comply with IEC 60 898-1:2015.

Clause	Testing items	Testing location
6	Marking and other product information	CBTL
8.1.1	General	CBTL
8.1.2	Mechanism	CBTL
8.1.3	Clearances and creepage distances	CBTL
8.1.6	Non-interchangeability	CBTL
9.3	Test of Indelibility of marking	CBTL
9.4	Test of reliability of screws, current-carrying parts and connections.	CBTL
9.5	Reliability of terminals for external conductors	CBTL
9.6	Test of protection against electric shock	CBTL
9.7	Test of dielectric properties	
9.7.1	Resistance to humidity	CBTL
9.7.2	Insulation resistance of the main circuit	CBTL
9.7.3~9.7.6	Dielectric strength	CBTL
9.8	Test of temperature-rise	CBTL
9.9	28-days test	ACTL
9.10	Tripping characteristic	ACTL
9.11	Mechanical and electrical endurance	ACTL
9.12	short circuit	ACTL
9.13	Resistance to mechanical shock and impact	CBTL
9.14	Resistance to heat	CBTL
9.15	Resistance to abnormal heat and to fire	CBTL
9.16	Resistance to rust	CBTL

Summary of compliance with National Differences:

☒ **The product fulfils the requirements of EN 60898-1:2003 + A1:2004 + A11:2006 + A12:2008 + A13:2012**

See ATTACHMENT TO TEST REPORT IEC 60898-1 EUROPEAN GROUP DIFFERENCES AND NATIONAL DIFFERENCES on the page 97.

Copy of marking plate: (D63)

1P **1P+N**





Copy of marking plate: (D63)

2P



3P



Copy of marking plate: (D63)

3P+N



4P



REMARKS:

1. Test at service short-circuit capacity (Ics):
   For single-pole circuit-breakers of rated voltage 230/400V or 240/415V, an additional set of three samples is tested in a circuit according to figure 3. During the test the I2t values need not be measured.
   The test procedure is shown as below:

Operation	Samples		
	1	2	3
1	O	O	O
2	--	CO	O
3	O	--	CO
4	CO	O	--

2. Test at rated short-circuit capacity (Icn):
For single-pole circuit-breakers of rated voltage 230/400V or 240/415V, an additional set of four samples is tested in a circuit according to figure 3. During the test the I2t values need not be measured.
The test procedure is shown as below:

Operation	Samples			
	1	2	3	4
1	O	O	O	--
2	O	CO	--	--
3	--	--	CO	O

Classification of installation and use.....:	Flush installed
Supply Connection.....:	Cable connected
Possible test case verdicts:	
- test case does not apply to the test object.....:	N/A
- test object does meet the requirement.....:	P (Pass)
- test object does not meet the requirement.....:	F (Fail)
Testing.....:	
Date of receipt of test item .....:	2018-03-01
Date (s) of performance of tests.....:	From 2018-03-01 to 2018-07-05

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.

This report is for the exclusive use of Intertek's Client and is provided pursuant to the agreement between Intertek and its Client. Intertek's responsibility and liability are limited to the terms and conditions of the agreement. Intertek assumes no liability to any party, other than to the Client in accordance with the agreement, for any loss, expense or damage occasioned by the use of this report. Only the Client is authorized to permit copying or distribution of this report and then only in its entirety. Any use of the Intertek name or one of its marks for the sale or advertisement of the tested material, product or service must first be approved in writing by Intertek. The observations and test results in this report are relevant only to the sample tested. This report by itself does not imply that the material, product, or service is or has ever been under an Intertek certification program.

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

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

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

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

Name and address of factory (ies).....:	Wenzhou Aoelec Electrical Co., Ltd. No.7, Zhenxing Road, Xinguang Industrial Zone, Liushi, Yueqing, Zhejiang, China

General product information:

Un= 240/415V~(1P), 240V~(1P+N), 415V~(2, 3, 3P+N, 4P)

In= 1, 2, 3, 4, 6, 10, 13, 16, 20, 25, 32, 40, 50, 63A

Ics=7,5kA, Icn=15kA; B-, C-, D- type;

The interrupted protected neutral pole is identical with phase pole.

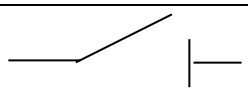
Test item particulars	
Type of circuit-breaker .....:	HGD 63U
Number of poles .....:	☒ 1-P ☒ 1-P+N ☒ 2-P ☒ 3-P ☒ 3-P+N ☒ 4-P
Protection against external influences .....:	☐ enclosed ☒ unenclosed
Method of mounting .....:	☐ surface ☒ flush ☒ panel board
Method of connection .....:	☒ .not associated with 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 .....:	N/A
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) .....:	1, 2, 3, 4, 6, 10, 13, 16, 20, 25, 32, 40, 50, 63A
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 ___kV

Number of tests for simplified test procedure, according to table C.3 and C.4

Report ref.No	No. of poles	I_n(A)	Type	Test sequence and number of samples								
				A_1/A_2	B	C_1	C_2	D_0+D_1	D_0	E_1	E_2	E_3 d)
200700864SHA-001	**1P**	**63**	**D**	**x**	**x**	**x**	**x**	**x**	**-**	**x**	**x**	**-**
	1P	**50**	**D**	**-**	**-**	**-**	**-**	**-**	**x**	**-**	**-**	**-**
	1P	**40**	**D**	**-**	**-**	**-**	**-**	**-**	**x**	**-**	**-**	**-**
	1P	**32**	**D**	**-**	**-**	**-**	**-**	**-**	**x**	**-**	**-**	**-**
	1P	**25**	**D**	**-**	**-**	**-**	**-**	**-**	**x**	**-**	**-**	**-**
	1P	**20**	**D**	**-**	**-**	**-**	**-**	**-**	**x**	**-**	**-**	**-**
	1P	**16**	**D**	**-**	**-**	**-**	**-**	**-**	**x**	**-**	**-**	**-**
	1P	**13**	**D**	**-**	**-**	**-**	**-**	**-**	**x**	**-**	**-**	**-**
	1P	**10**	**D**	**-**	**-**	**-**	**-**	**-**	**x**	**-**	**-**	**-**
	1P	**6**	**D**	**-**	**-**	**-**	**-**	**-**	**x**	**-**	**-**	**-**
	1P	**4**	**D**	**-**	**-**	**-**	**-**	**-**	**x**	**-**	**-**	**-**
	1P	**3**	**D**	**-**	**-**	**-**	**-**	**-**	**x**	**-**	**-**	**-**
	1P	**2**	**D**	**-**	**-**	**-**	**-**	**-**	**x**	**-**	**-**	**-**
	1P	**1**	**D**	**-**	**-**	**-**	**-**	**-**	**x**	**x**	**x**	**-**
	1P	**63**	**B**	**-**	**x** b)	**-**	**-**	**-**	**x** c)	**-**	**-**	**-**
	1P	**63**	**C**	**-**	**-**	**-**	**-**	**-**	**x** c)	**-**	**-**	**-**
	1P	**50**	**B, C**	**-**	**-**	**-**	**-**	**-**	**x** c)	**-**	**-**	**-**
	1P	**40**	**B, C**	**-**	**-**	**-**	**-**	**-**	**x** c)	**-**	**-**	**-**
	1P	**32**	**B, C**	**-**	**-**	**-**	**-**	**-**	**x** c)	**-**	**-**	**-**
	1P	**25**	**B, C**	**-**	**-**	**-**	**-**	**-**	**x** c)	**-**	**-**	**-**
	1P	**20**	**B, C**	**-**	**-**	**-**	**-**	**-**	**x** c)	**-**	**-**	**-**
	1P	**16**	**B, C**	**-**	**-**	**-**	**-**	**-**	**x** c)	**-**	**-**	**-**
	1P	**13**	**B, C**	**-**	**-**	**-**	**-**	**-**	**x** c)	**-**	**-**	**-**
	1P	**10**	**B, C**	**-**	**-**	**-**	**-**	**-**	**x** c)	**-**	**-**	**-**
	1P	**6**	**B, C**	**-**	**-**	**-**	**-**	**-**	**x** c)	**-**	**-**	**-**
	1P	**4**	**B, C**	**-**	**-**	**-**	**-**	**-**	**x** c)	**-**	**-**	**-**
	1P	**3**	**B, C**	**-**	**-**	**-**	**-**	**-**	**x** c)	**-**	**-**	**-**
	1P	**2**	**B, C**	**-**	**-**	**-**	**-**	**-**	**x** c)	**-**	**-**	**-**
	1P	**1**	**B, C**	**-**	**-**	**-**	**-**	**-**	**x** c)	**-**	**-**	**-**
	1P+N f)	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
	2P	**63**	**D**	**x** e)	**-**	**-**	**x**	**-**	**-**	**x**	**x**	**-**
	2P	**1**	**D**	**-**	**-**	**-**	**-**	**-**	**-**	**x**	**x**	**-**
	3P a)	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
	3P+N g)	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
	4P	**63**	**D**	**x**	**x**	**x**	**x**	**x**	**-**	**x**	**x**	**-**
	4P	**1**	**D**	**-**	**-**	**-**	**-**	**-**	**-**	**x**	**x**	**-**
	4P	**63**	**B**	**-**	**x** b)	**-**	**-**	**-**	**-**	**-**	**-**	**-**

Note:
a):The tests of three-pole circuit-breakers are omitted when four-pole circuit-breakers has been tested according to IEC/EN 60 898 Annex C.
b): For this test sequence only test of clause 9.8 is required according to table C.4.
c): For this test sequence only test of clause 9.10.3 is required according to table C.4.
d): Test sequence in EN 60898-1, due to $I_{cn1}=I_{cn}$, the test sequence is omitted.

e): Only clause 9.15 is required according to IEC/EN 60898-1 Annex C.
f): Tests on 1P+N samples can be covered by tests on 2P samples, because the neutral pole is identical with phase poles.
g): Tests on 3P+N samples can be covered by tests on 4P samples, because the neutral pole is identical with phase poles.

IEC 60898-1			
Clause	Requirement + Test	Result - Remark	Verdict
	TESTS "A" **1 SAMPLE, HGD 63U, D63, 1P** **1 SAMPLE, HGD 63U, D63, 4P**	**A_1 A_2**	
6	**MARKING AND OTHER INFORMATION**		
	Circuit-breaker marked with:		--
	a) Manufacturer's name or trade mark.....:	HYUNDAI	P
	b) Type designation, catalogue number or other serial number.....:	HGD 63U	P
	c) Rated voltage (V).....:	240/415~(1P), 415~(4P)	P
	d) Rated current without symbol "A", preceded by the symbol of instantaneous tripping.....:	D63	P
	e) Rated frequency (Hz) .....:		N/A
	f) Rated short circuit capacity (A) .....:	15000	P
	g) Wiring diagram		P
	h) Ambient air temperature, if different from 30°C		N/A
	i) Degree of protection, if different from IP20		N/A
	j) For D-type circuit-breakers: the maximum instantaneous tripping current, if higher than 20 In see table 2)		N/A
	k) Rated impulse withstand voltage Uimp if it is 2,5 kV		N/A
	l) Making and breaking capacity on an individual protected pole of multipole circuit-breakers (Icn1), if different from Icn		N/A
	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	a), b), c), d), f) on the front	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	g) on the front	P
	Any other information not marked shall be given in the manufacturer's documentation		P
	The suitability for isolation, which is provided by all circuit-breakers of this standard, may be indicated by the symbol on the device		P
	I^2t characteristic (documentation)		N/A
	Symbols on supply and load terminal	"1, 2" (1P) "1, 3, 5, 7", "2, 4, 6, 8"(4P)	P

IEC 60898-1			
Clause	Requirement + Test	Result - Remark	Verdict
	Terminal for neutral conductor N		N/A
	Earthing terminal if any (IEC 60417-5019)		N/A
	On - off position shall be clearly indicated - 0 I -	I ON , O OFF	P
	For push-button CB the off push-button shall either be red or be marked with the symbol ´0´		N/A
	Red not used for other push-button		N/A
	For CB with multiple current ratings, the maximum value is marked, the adjusted value indicated without ambiguity		N/A
	Marking shall be indelible and easily legible (not on removable parts), 15 s with water, 15 s with hexane (see cl. 9.3)		P
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		P
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		P
	The switched neutral shall close before and open after the protected pole (s)		N/A
	Neutral pole having adequate making and breaking capacity and CB with independent manual operation: all poles operate together including neutral pole		N/A
	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

IEC 60898-1			
Clause	Requirement + Test	Result - Remark	Verdict
	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		N/A
	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.	The clearance is not reduced	N/A
	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:		--
	-Tests according to 9.7.2 to 9.7.4 as applicable		N/A
	-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)		N/A
	If measurement does not show any reduced clearance, test 9.7.5.2 is not applied		N/A
	Compliance for item 3, checked by measurement	No such circuits	N/A
	The insulating materials are classified into Material Groups on the basis of their comparative tracking index (CTI) acc. to IEC 60664-1	IIIa	P
	Clearances [mm] U_{imp}		--
	4 kV (see table 4) 2,5 kV (see table 4)	☒ ☐	--

IEC 60898-1			
Clause	Requirement + Test	Result - Remark	Verdict
	Minimum clearances (see table 4)		
		minimum clearances [mm]	--
	1.between live parts (of the main circuits) which are separated when the CB is in off position .....:	5,2	P
	2.between live parts of different polarity.....:	8,9(4P)	P
	3.between circuits supplied from different sources, one of which being PELV or SELV.....:		N/A
	4. between live parts and		--
	- accessible surfaces of operating means.....:	>10	P
	- screws or other means for fixing covers .....:		N/A
	- surface on which the base is mounted.....:	>10	P
	- screws or other means for fixing the circuit breaker .....:		N/A
	- metal covers or boxes.....:		N/A
	- other accessible metal parts .....:		N/A
	- metal frames supporting the base (flush-type) .:	>10	P
	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 .....:	>8,0	P
	2.between live parts of different polarity.....:	8,9(4P)	P
	3.between circuits supplied from different sources, one of which being PELV or SELV.....:		N/A
	4. between live parts and		--
	- accessible surfaces of operating means.....:	>10	P
	- screws or other means for fixing covers .....:		N/A
	- surface on which the base is mounted.....:	>10	P
	- screws or other means for fixing the circuit breaker .....:		N/A
	- metal covers or boxes.....:		N/A
	- other accessible metal parts .....:		N/A
	- metal frames supporting the base (flush-type) .:	>10	P
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		P

IEC 60898-1			
Clause	Requirement + Test	Result - Remark	Verdict
	Test according to cl. 9.4:		--
	- 10 times (screw Ø / torque Nm)	Ø___mm___Nm (see table 11) Ø___mm___Nm	N/A
	- 5 times (screw Ø / torque Nm)	Ø4,8 mm / 2,0Nm (see table 11) Ø___mm___Nm	P
	Plug in connections tested by plugging in and pulling out five times		N/A
	After test connections have not become loose nor electrical function impaired		P
8.1.4.2	Screws with a thread of insulating material ensured correct introduction		N/A
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:		P
	- copper		N/A
	- alloy 58% copper for worked cold parts		P
	- alloy 50% copper for other parts		N/A
	- other metal		N/A
	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).		P
	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		P
8.1.5	**Terminals for external conductors**		--
	Compliance is checked by inspection and by the tests as relevant for the type of connection:		--
	by tests of clause 9.5 for screw-type terminals		P
	by specific tests for plug-in or bolt-on CBs included in the standard		N/A
	by the tests of Annexes J, K		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
8.1.5.1	Terminals ensure the necessary contact pressure		P
9.5	Torque test:		--
	- torque (Nm); diameter (mm).....:	2,0Nm, Ø4,8 mm	--
	- torque (Nm); diameter (mm).....:		--
	- torque (Nm); diameter (mm).....:		--
	- max. cross-sectional area (mm²).....:	25mm², rigid stranded conductor	--
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.		--
	Min. cross-section **solid** / ~~stranded / flexible~~ (mm²).....:	1,0mm²	--
	Max. cross-section **solid** / ~~stranded / flexible~~ (mm²).....:	16mm²	--
	Min. cross-section ~~solid~~ / **stranded** / ~~flexible~~ (mm²).....:	1,5mm²	--
	Max. cross-section ~~solid~~ / **stranded** / ~~flexible~~ (mm²).....:	25mm²	--
	Min. cross-section ~~solid / stranded~~ / **flexible** (mm²).....:	1,0mm²	--
	Max. cross-section ~~solid / stranded~~ / **flexible** (mm²).....:	16mm²	--
	Torque $^2/_3$ (Nm) .....:	1,33Nm	--
	Pull for 1 min **solid** ~~/ stranded / flexible~~ (N).....:	50/90N	P
	Pull for 1 min ~~solid~~ / **stranded** / ~~flexible~~ (N).....:	50/100N	P
	Pull for 1 min ~~solid / stranded~~ / **flexible** (N).....:	50/90N	P
	During the test no noticeable move of conductor		P
9.5.3	Torque test:		--
	- torque $^2/_3$ (Nm).....:	1,33Nm	--
	- min. cross-sectional area (mm²).....:	1,0mm², Solid conductor	--
	- max. cross-sectional area (mm²).....:	25mm², rigid stranded conductor	--
	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.		P
	Max. cross-section stranded (mm²).....:	25mm²	--

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Clause	Requirement + Test	Result - Remark	Verdict
	Torque $^2/_3$ (Nm) .....:	1,33Nm	--
	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)		--
	Rated current (A) / Range of nominal cross sections to be clamped* (mm²): Rigid (solid or stranded) conductors / Flexible conductors ≤ 13: 1 to 2,5 / 1 to 2,5 > 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	1,0 to 16mm², Solid 1,5 to 25mm², Stranded 1,0 to 16mm², Flexible	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.		N/A
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

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Clause	Requirement + Test	Result - Remark	Verdict
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		N/A
8.1.5.11	Pillar terminals shall allow full insertion and reliable clamping of the conductor		P
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		N/A
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		N/A
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		N/A
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		N/A
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		P
	Unless the live parts are within an internal enclosure of insulating material: Lining - reliable fixed, - adequate thickness and - mechanical strength		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	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		N/A
	For plug-in CB, external parts, other than screws and other means for fixing covers, which are accessible shall be in insulating material		N/A
	Metallic operating means insulated from live parts		N/A
	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		N/A
	Lacquer or enamel not considered		N/A
8.1.3	**Creepage distances [mm] (see table 4)**		--
	Internal parts only	See above	P
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		P
	Use of test finger so designed that each jointed can be turned through an angle of 90° with respect to the finger		P
	Circuit-breaker with enclosures of thermoplastic material are additional tested at 35 °C for 1 min with a force of 75 N		P
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	100°C	P
	- removable covers..... 1 h (70 ± 2) °C		N/A
	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: 1,2mm (Enclosure)	P

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Clause	Requirement + Test	Result - Remark	Verdict
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: 1,0mm (Handle)	P
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, HGD 63U, D63, 1P** **3 samples, HGD 63U, D63, 2P** **3 samples, HGD 63U, D63, 4P**	**A_{2-1} A_{2-2} A_{2-3}** **A_{2-4} A_{2-5} A_{2-6}** **A_{2-7} A_{2-8} A_{2-9}**	
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		P
	external parts retaining current-carrying parts and parts of the protective circuit in position ..... (960 ± 15)°C	960°C(Enclosure)	P
	all other external parts ..... (650 ± 10)°C	650°C (Handle)	P
	No visible flames, no sustained glowing, or	No visible flame (Handle)	P
	flames and glowing extinguish within 30 s after removal .....:	3,7s (Enclosure)	P
	No ignition of tissue paper or scorching of the pinewood board		P

	TESTS „B“ 3 samples, HGD 63U, D63, 1P	**B_1 B_2 B_3**	
8.3	**Dielectric properties and isolating capability**		--

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Clause	Requirement + Test	Result - Remark	Verdict
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.		P
	The test is carried out on an CB fixed on a metal support		P
	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		P
	The shape of the impulses is adjusted with the CB under test connected to the impulse generator.		P
	rated impulse withstand voltage [kV]:	4kV	--
	sea level of test laboratory [m]:	5m	--
	test voltage (acc. Table 15) [kV]:	6,2kV	--
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

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Clause	Requirement + Test	Result - Remark	Verdict
	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		N/A
	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.		N/A
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 = 92,8% T = 25,2°C	P
9.7.1.3	Test procedure.		--
	The sample is kept in the cabinet for 48 h.	48H	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]	--
	a) In off-position, between the terminals which are electrically connected together when the circuit-breaker is in the closed position ≥ 2 MΩ	>500 >500 >500	P
	b) in off-position, between each pole in turn and the others connected together ≥ 2 MΩ		N/A
	c) in on-position, between all poles connected together and the frame ≥ 5 MΩ	>500 >500 >500	P
	d) between metal parts of mechanism and the frame ≥ 5 MΩ		N/A
	e) between the frame and metal foil in contact with the inner surface of the internal enclosure or lining of insulating material ≥ 5 MΩ		N/A
9.7.3	Dielectric strength of the main circuit		--

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Clause	Requirement + Test	Result - Remark	Verdict
	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		N/A
	c) 2000 V		P
	d) 2000 V		N/A
	e) 2500 V		N/A
	No flashover or breakdown		P
9.7.4	Insulation resistance and dielectric strength of the auxiliary circuits	No such auxiliary circuits	--
	Insulation resistance of auxiliary circuits measured with 500 V DC after 1 min:		--
	1) between all auxiliary circuits and the frame ($M\Omega$) $\geq$ 2 $M\Omega$		N/A
	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 ($M\Omega$) $\geq$ 2 $M\Omega$		N/A
	Dielectric strength of auxiliary circuits measured with an AC voltage at rated frequency for 1 min:		--
	Rated voltage of auxiliary circuits (a.c. or d.c.) — Test voltage (V) $\leq$ 30 — 600 > 30 $\leq$ 50 — 1000 > 50 $\leq$ 110 — 1500 > 110 $\leq$ 250 — 2000 > 250 $\leq$ 500 — 2500	V	--
	1) between all auxiliary circuits and the frame		N/A
	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		N/A
	No flashover or perforation		N/A
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.		N/A
	The test is carried out on an CB fixed on a metal support and being in the closed position		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	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		N/A
	The shape of the impulses is adjusted with the CB under test connected to the impulse generator.		N/A
	test performed with:		--
	-surge impedance of the test apparatus ≤500Ω and surge protective devices disconnected before testing or		N/A
	-hybrid generator with an surge impedance of 2 Ω and surge protective devices not disconnected before testing		N/A
	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		N/A
	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		N/A
	A third series of tests is made applying the impulse voltage between (and not tested during the two first sequences described here above):		N/A
	b) between each pole and the others connected together		N/A
	c) between all poles connected together and the frame		N/A
	d) between metal parts of the mechanism and the frame		N/A
	e) between the frame and a metal foil in contact with the inner surface of the lining of insulating material		N/A
	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.		N/A
	no disruptive discharges during the test		N/A

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Clause	Requirement + Test	Result - Remark	Verdict

8.4	**Temperature rise**				--
	Temperature rise does not exceed the limiting values stated in table 6:	sect.16 mm²			--
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 = 63A			--
	Ambient air temperature.....:	Tamb= 21°C			--
	Parts .....Temperature rise [K]	[K]	[K]	[K]	--
	L1 L2 L3 L4(N) L3 N	46	46	45	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	13	14	13	P
	External metallic parts of operating means...25 K				N/A
	Other external parts, including that face of the circuit-breaker is in direct contact with the mounting surface.....60 K	43	44	43	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 = 63 A (reach the steady state value)				P
	Loaded one pole after the other				P
	Max. power loss : 13 W	W	W	W	--
	L1 L2 L3	6,13	6,26	6,06	P

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Clause	Requirement + Test	Result - Remark	Verdict
	L4(N) 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. 16 mm²	I_N = 63A	P
	During the test no tripping during the last period, temperature rise shall be measured		P
	Ambient air temperature.....:	21,5°C	--
	Parts .....Temperature rise [K]	[K] [K] [K]	--
	Terminals for external connections	51 50 50	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 =91,4A	91,4	P
	- Tripping within	[s] [s] [s]	--
	- 1h (≤ 63 A)	97 112 54	P
	- 2h (> 63 A)		N/A

	TESTS „B“ 3 samples, HGD 63U, B63, 1P	**B_4** **B_5** **B_6**	
8.4	**Temperature rise**		--
	Temperature rise does not exceed the limiting values stated in table 6:	sect.16 mm²	--
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 = 63A	--
	Ambient air temperature.....:	Tamb= 22,6°C	--
	Parts .....Temperature rise [K]	[K] [K] [K]	--
	L1 L2 L3 L4(N)	47 46 45	P

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Clause	Requirement + Test	Result - Remark			Verdict
	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	13	12	12	P
	External metallic parts of operating means...25 K				N/A
	Other external parts, including that face of the circuit-breaker is in direct contact with the mounting surface.....60 K	43	44	42	P
9.8.5	Measurement of power losses	B_4	B_5	B_6	--
	Power loss do not exceed the values stated in table 8				P
	Test current: I_N = 63 A (reach the steady state value)				P
	Loaded one pole after the other				P
	Max. power loss : 13 W	W	W	W	--
	L1 L2 L3 L4(N) L3 N	5,82	6,00	5,63	P

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Clause	Requirement + Test	Result - Remark	Verdict

	TESTS „B“ 3 samples, HGD 63U, D63, 4P	**B_7 B_8 B_9**	
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.		P
	The test is carried out on an CB fixed on a metal support		P
	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		P
	The shape of the impulses is adjusted with the CB under test connected to the impulse generator.		P
	rated impulse withstand voltage [kV]:	4kV	--
	sea level of test laboratory [m]:	5m	--
	test voltage (acc. Table 15) [kV]:	6,2kV	--
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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Clause	Requirement + Test	Result - Remark	Verdict
	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		N/A
	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.		N/A
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 = 92,8% T = 25,2°C	P
9.7.1.3	Test procedure.		--
	The sample is kept in the cabinet for 48 h.	48H	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]	--
	a) In off-position, between the terminals which are electrically connected together when the circuit-breaker is in the closed position ≥ 2 MΩ	>500 >500 >500	P
	b) in off-position, between each pole in turn and the others connected together ≥ 2 MΩ	>500 >500 >500	P
	c) in on-position, between all poles connected together and the frame ≥ 5 MΩ	>500 >500 >500	P

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Clause	Requirement + Test	Result - Remark	Verdict
	d) between metal parts of mechanism and the frame ≥ 5 MΩ		N/A
	e) between the frame and metal foil in contact with the inner surface of the internal enclosure or lining of insulating material ≥ 5 MΩ		N/A
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		P
	c) 2000 V		P
	d) 2000 V		N/A
	e) 2500 V		N/A
	No flashover or breakdown		P
9.7.4	Insulation resistance and dielectric strength of the auxiliary circuits	No such auxiliary circuits	--
	Insulation resistance of auxiliary circuits measured with 500 V DC after 1 min:		--
	1) between all auxiliary circuits and the frame (MΩ) ≥ 2 MΩ		N/A
	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		N/A
	Dielectric strength of auxiliary circuits measured with an AC voltage at rated frequency for 1 min:		--
	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	--
	1) between all auxiliary circuits and the frame		N/A
	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		N/A
	No flashover or perforation		N/A
9.7.5.2	Verification of clearances with the impulse withstand voltage		--

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Clause	Requirement + Test	Result - Remark	Verdict
	If the measurement of clearances of items 2 and 4 in Table 4 shows a reduction of the required length, this test applies.		N/A
	The test is carried out on an CB fixed on a metal support and being in the closed position		N/A
	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		N/A
	The shape of the impulses is adjusted with the CB under test connected to the impulse generator.		N/A
	test performed with:		--
	-surge impedance of the test apparatus ≤500Ω and surge protective devices disconnected before testing or		N/A
	-hybrid generator with an surge impedance of 2 Ω and surge protective devices not disconnected before testing		N/A
	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		N/A
	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		N/A
	A third series of tests is made applying the impulse voltage between (and not tested during the two first sequences described here above):		N/A
	b) between each pole and the others connected together		N/A
	c) between all poles connected together and the frame		N/A
	d) between metal parts of the mechanism and the frame		N/A
	e) between the frame and a metal foil in contact with the inner surface of the lining of insulating material		N/A

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Clause	Requirement + Test	Result - Remark	Verdict

	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.				N/A
	no disruptive discharges during the test				N/A
8.4	**Temperature rise**				--
	Temperature rise does not exceed the limiting values stated in table 6:	sect.16 mm²			--
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 = 63A			--
	Ambient air temperature.....:	Tamb= 21,0°C			--
	Parts .....Temperature rise [K]	[K]	[K]	[K]	--
	L1	52	51	53	P
	L2	50	49	50	
	L3	54	53	54	
	L4(~~N~~)	51	50	51	
	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	16	15	16	P
	External metallic parts of operating means...25 K				N/A
	Other external parts, including that face of the circuit-breaker is in direct contact with the mounting surface.....60 K	50	47	49	P
9.8.5	Measurement of power losses	B_7	B_8	B_9	--
	Power loss do not exceed the values stated in table 8				P
	Test current: I_N = 63 A (reach the steady state value)				P
	Loaded one pole after the other				P
	Max. power loss : 13 W	W	W	W	--

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Clause	Requirement + Test	Result - Remark			Verdict
	L1	6,43	5,80	5,80	P
	L2	6,62	6,07	6,07	
	L3	6,19	5,66	5,93	
	L4(N)	5,87	5,69	5,59	
	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. 16 mm²	I_N = 63A			P
	During the test no tripping during the last period, temperature rise shall be measured				P
	Ambient air temperature.....:	21,5°C			--
	Parts .....Temperature rise [K]	[K]	[K]	[K]	--
	Terminals for external connections	58	58	60	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 =91,4A	91,4			P
	- Tripping within	[s]	[s]	[s]	--
	- 1h (≤ 63 A)	93	57	76	P
	- 2h (> 63 A)				N/A

	TESTS „B“ 3 samples, HGD 63U, B63, 4P	**B_{10}**	**B_{11}**	**B_{12}**	
8.4	**Temperature rise**				--
	Temperature rise does not exceed the limiting values stated in table 6:	sect.16 mm²			--
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 = 63A			--
	Ambient air temperature.....:	Tamb= 22,6°C			--

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Clause	Requirement + Test	Result - Remark			Verdict
	Parts .....Temperature rise [K]	[K]	[K]	[K]	--
	L1	54	53	51	P
	L2	52	52	50	
	L3	50	55	54	
	L4(~~N~~)	52	53	52	
	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	15	16	16	P
	External metallic parts of operating means...25 K				N/A
	Other external parts, including that face of the circuit-breaker is in direct contact with the mounting surface.....60 K	50	52	51	P
9.8.5	Measurement of power losses	B_{10}	B_{11}	B_{12}	--
	Power loss do not exceed the values stated in table 8				P
	Test current: I_N = 63 A (reach the steady state value)				P
	Loaded one pole after the other				P
	Max. power loss : 13 W	W	W	W	--
	L1	6,62	6,13	5,83	P
	L2	6,43	6,55	6,62	
	L3	7,12	6,43	6,24	
	L4(~~N~~)	6,22	6,87	5,50	
	L3				
	N				

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Clause	Requirement + Test	Result - Remark	Verdict

	TESTS „C“ 3 +3 samples, HGD 63U, D63, 1P				
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 240/415V (rated voltage) Test Current 63A (rated current) Power factor (0,85-0,9) Par. resistor _____ (Ω) Cross sect. area 16mm²	242V 63,5A 0,88			P
9.11.2	Test procedure				--
	The circuit-breaker is submitted to 4000 operating cycles with rated current.	4000 cycles			--
	- $I_N \leq 32$ A: 2 s on - 13 s off				N/A
	- $I_N > 32$ A: 2 s on - 28 s off	I_N=63			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				N/A
	Moreover test current .....2,55 I_N=161A	161A			--
	Opening time not less 1 s or more than	[s]	[s]	[s]	--
	- 60 s (≤ 32 A)				N/A
	- 120 s (> 32 A)	17	15	16	P
	Dielectric strength reduced to 1500 V				P
9.12.11.2	**Test at reduced short-circuit currents**				--
9.12.11.2.1	Test on all circuit-breakers				--

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Clause	Requirement + Test	Result - Remark	Verdict

9.12.11.2.1	Test at reduced short-circuit currents: Fig. 3	Fig.3			--
	Test current:	Obtained			--
	- 500 A or 10 In	I test= 645A			P
	Test voltage 1,05 Un	Utest = 256V			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: _____x_____x_____mm			N/A
	I_{Peak} (A) max. value	915A			--
	Sequence: 6 x "O" and 3 x "CO"	[kA^2s]	[kA^2s]	[kA^2s]	--
	Max. $I^2t \leq$ _____kA^2s	408	426	550	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:				--
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.				P
	a) leakage current across open contacts, according to 9.7.5.3, each pole is supplied at a voltage 1,1 times Un.=457 V. The circuit – breaker is in the open position	**C_{1-1}** [µA]	**C_{1-2}** [µA]	**C_{1-3}** [µA]	--
	The leakage current shall not exceed 2 mA L1	2,78	2,26	2,92	P
	L2				N/A
	L3				N/A
	L4(N)				N/A
	Electric strength test:				--
	Test voltage 1500 V (see 9.7.2)				--
	a)				P
	b)				N/A
	c)				P

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Clause	Requirement + Test	Result - Remark	Verdict

	d)				N/A
	e) 2000 V				N/A
9.12.11.2.2	**Test „C_2“ Short-circuit test on circuit-breakers for use in IT systems**	**C_{2-1}**	**C_{2-2}**	**C_{2-3}**	--
	Test current:	Obtained			--
	- 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= 1,52x10^{3}A			--
	Test voltage 1,05 Un	Utest = 444V			--
	Power factor 0,93-0,98	0,95			--
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			--
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			--
	I_{Peak} (A) max. value	2,08kA			--
	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. I²t ≤ _____kA^{2}s L1	17,6	33,7	26,5	P
	L2	___	____	___	
	L3	___	___	___	
	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:				--
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.= 457 V. The circuit – breaker is in the open position	**C_{2-1}** [µA]	**C_{2-2}** [µA]	**C_{2-3}** [µA]	--
	The leakage current shall not exceed 2 mA L1	3,95	3,14	4,03	P
	L2				N/A
	L3				N/A

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Clause	Requirement + Test	Result - Remark			Verdict
	L4(N)				N/A
	Electric strength test:				--
	Test voltage 1500 V (see 9.7.2)				--
	a)				P
	b)				N/A
	c)				P
	d)				N/A
	e) 2000 V				N/A

9.12.11.2.2	**Test „C_2“ Short-circuit test on circuit-breakers for use in IT systems** **2 SAMPLES, HGD 63U, D63, 2P**	**C_{2-4}** **C_{2-5}**			--
	Test current:	Obtained			--
	- 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= 1,52x10^{3}A			--
	Test voltage 1,05 Un	Utest = 444V			--
	Power factor 0,93-0,98	0,95			--
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			--
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			--
	I_{Peak} (A) max. value	2,06kA			--
	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_{2-4}**	**C_{2-5}**		--
	Max. I²t ≤ _____kA²s L1 L2 L3 L4 (N)	18,1 18,7 ___ ___	32,1 21,3 ___ ___		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:				--

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Clause	Requirement + Test	Result - Remark	Verdict

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.= 457 V. The circuit – breaker is in the open position	**C_{2-4}** [µA]	**C_{2-5}** [µA]		--
	The leakage current shall not exceed 2 mA L1	3,78	4,16		P
	L2	3,09	3,52		P
	L3				N/A
	L4(N)				N/A
	Electric strength test:				--
	Test voltage 1500 V (see 9.7.2)				--
	a)				P
	b)				P
	c)				P
	d)				N/A
	e) 2000 V				N/A

	TESTS „C“ 3 samples, HGD 63U, D63, 4P				
8.7	**Test „C_1“ Mechanical and electrical endurance**	**C_{1-4}**	**C_{1-5}**	**C_{1-6}**	--
	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 415V (rated voltage) Test Current 63A (rated current) Power factor (0,85-0,9) Par. resistor _____ (Ω) Cross sect. area 16mm²	418V 63,9A 0,86			P
9.11.2	Test procedure				--
	The circuit-breaker is submitted to 4000 operating cycles with rated current.	4000 cycles			--
	- $I_N \leq 32$ A: 2 s on - 13 s off				N/A
	- $I_N > 32$ A: 2 s on - 28 s off	I_N=63			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

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Clause	Requirement + Test	Result - Remark			Verdict
	- 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				N/A
	Moreover test current .....2,55 I_N=161A	161A			--
	Opening time not less 1 s or more than	[s]	[s]	[s]	--
	- 60 s (≤ 32 A)				N/A
	- 120 s (> 32 A)	12	14	11	P
	Dielectric strength reduced to 1500 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	Fig.3			--
	Test current:	Obtained			--
	- 500 A or 10 In	I test= 645A			P
	Test voltage 1,05 Un	Utest = 256V			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: _____x_____x_____mm			N/A
	I_{Peak} (A) max. value	915A			--
	Sequence: 6 x "O" and 3 x "CO"	[kA^2s]	[kA^2s]	[kA^2s]	--
	Max. $I^2t \leq$ _____kA^2s	515	444	511	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:				--

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Clause	Requirement + Test	Result - Remark	Verdict

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.				P
	a) leakage current across open contacts, according to 9.7.5.3, each pole is supplied at a voltage 1,1 times Un.=457 V. The circuit – breaker is in the open position	**C_{1-4}** [µA]	**C_{1-5}** [µA]	**C_{1-6}** [µA]	--
	The leakage current shall not exceed 2 mA L1	3,26	4,03	3,65	P
	L2	3,07	3,15	2,78	P
	L3	4,25	3,29	2,96	P
	L4~~(N)~~	1,98	1,83	1,74	P
	Electric strength test:				--
	Test voltage 1500 V (see 9.7.2)				--
	a)				P
	b)				P
	c)				P
	d)				N/A
	e) 2000 V				N/A

9.12.11.2.2	**Test „C_2“ Short-circuit test on circuit-breakers for use in IT systems** **1 SAMPLE, HGD 63U, D63, 4P**	**C_{2-6}**			--
	Test current:	Obtained			--
	- 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= 1,52x10^{3}A			--
	Test voltage 1,05 Un	Utest = 444V			--
	Power factor 0,93-0,98	0,95			--
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			--
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			--
	I_{Peak} (A) max. value	2,05kA			--
	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_{2-6}**			--

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Clause	Requirement + Test	Result - Remark			Verdict
	Max. $I^2t \leq$ _____kA^2s L1 L2 L3 L4 (N)	18,2 18,7 27,8 21,8			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:				--
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.= 457 V. The circuit – breaker is in the open position	**$C_{2\text{-}6}$** [µA]			--
	The leakage current shall not exceed 2 mA L1	5,18			P
	L2	3,68			P
	L3	4,22			P
	L4~~(N)~~	1,73			P
	Electric strength test:				--
	Test voltage 1500 V (see 9.7.2)				--
	a)				P
	b)				P
	c)				P
	d)				N/A
	e) 2000 V				N/A

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Clause	Requirement + Test	Result - Remark	Verdict

	TESTS „D“ 3 samples, HGD 63U, D63, 1P		
8.6	**Automatic operation**		--
8.6.1	Standard time-current zone		--
	Tripping characteristic of CB ensures adequate protection of the circuit, without premature operation.		P
9.10	**Tests „D_0“**	**D_{1-1} D_{1-2} D_{1-3}**	**--**
	I_N (A)	63A	--
	Sect. (mm²)	16 mm²	--
	Instantaneous tripping current	☐ B ☐ C ☒ D	--
9.10.2	Test of time-current characteristic		--
9.10.2.1	Test current 1,13 I_N (A) starting from cold for:	71,2 A	--
	- 1 h ($I_N \leq 63$ A)	>1h >1h >1h	P
	- 2 h ($I_N > 63$ A)		N/A
	No tripping		P
	Then steadily increased within 5 s to 1,45 I_N (A)	91,4	--
	- Tripping within	[min] [min] [mini]	--
	- 1h (≤ 63 A)	2,2 1,6 1,9	P
	- 2h (> 63 A)		N/A
9.10.2.2	Test current 2,55 I_N (A) starting from cold for:	161A	--
	opening time not less than 1 s or more than	[s] [s] [s]	--
	- 60 s (≤ 32 A)		N/A
	- 120 s (> 32 A)	14 16 19	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.		--
	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.		--
	The sequence of operation is : O-CO-CO-CO Interval time: > 3 min		--
	The tripping time of the O operation is measured		--
	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]	--

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Clause	Requirement + Test	Result - Remark	Verdict
	≥ 0,1 s		N/A
	Test current 5 I_N (A), starting from cold	_____A	--
	Tripping less than 0,1 s		N/A
9.10.3.3	☐ For circuit-breakers of the C – Type		--
	Test current 5I_N (A), starting from cold	A	--
	Opening time:	[s] [s] [s]	--
	≥ 0,1 s		N/A
	Test current 10 I_N (A), starting from cold	A	--
	Tripping less than 0,1 s		N/A
9.10.3.4	☒ For circuit-breakers of the D – Type		--
	Test current 10I_N (A), starting from cold	630A	P
	Opening time:	[s] [s] [s]	--
	≥ 0,1 s	1,21 1,45 1,36	P
	Test current 20 I_N (A) or to the maximum instantaneous tripping current(see cl. 6, item j), starting from cold	1,27kA	--
	Tripping less than 0,1 s	8,74ms 8,63ms 8,83ms	P
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	_____A	--
	Tripping within	[min] [min] [min]	--
	- 1h (≤ 63 A)		N/A
	- 2h (> 63 A)		N/A
	Test current 1,2 It (A), (three pole or four pole) starting from cold	_____A	--
	Tripping within	[min] [min] [min]	--
	- 1h (≤ 63 A)		N/A
	- 2h (> 63 A)		N/A
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 =-5 °C	--
	Test current 1,13 I_N (A)	71,2A	--
	- Passed for 1h	>1h >1h >1h	P
	- Passed for 2h		N/A
	Current is then steadily increased to 1,9 I_N (A) within 5s	120A	--

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Clause	Requirement + Test	Result - Remark	Verdict

	Tripping within	[s]	[s]	[s]	--
	- 1h (≤ 63 A)	97	69	81	P
	- 2h (> 63 A)				N/A
	b) Ambient temperature of (10 ± 2) K above the ambient air reference temperature	40°C			--
	Test current I_N (A)	63A			--
	No tripping within				--
	- 1h (≤ 63 A)	>1h	>1h	>1h	P
	- 2h (> 63 A)				N/A

	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				--
	- Vertical board turned 90°				--
	- 50 falls on two sides of vertical board C				--
	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				N/A
9.13.2.4	CB intended to be mounted on a rail				--
	- downward vertical 50 N for 1 min				P
	- upward vertical 50 N for 1 min, no damage				P
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				--
	A force of 20 N applied for 1min to the circuit-breaker (see fig 16).				--
	During this test the circuit-breaker part shall not become loose from the base and shall not show damage impairing further use.				N/A
9.12.11.3	**Test at 1500 A:**				--

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Clause	Requirement + Test	Result - Remark	Verdict

	Prospective current of 1500 A - power factor 0,93 to 0,98				
	Prospective current obtained (A)	$1,54x10^3$A			--
	Power factor	0,95			--
	Test voltage 1,05 Un	U_{test} = 256/444V			--
	Test circuit: figure	Figure 3			--
	T (min)	3 Min			--
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			--
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			--
	Sequence	6-O, 2-CO			--
	I_{Peak} (A) max. value	$2,05x10^3$A			--
	$I^2t \leq$ _____ kA^2s	[kA^2s]	[kA^2s]	[kA^2s]	--
	Max. $I^2t \leq$ _____kA^2s L1 L2 L3 L4(N)	8,67 ___ ___ ___	10,7 ____ ___ ___	10,4 ___ ___ ___	P
	Sequence	1-O			--
	I_{Peak} (A) max. value	$1,98x10^3$A			--
	$I^2t \leq$ _____ kA^2s	[kA^2s]	[kA^2s]	[kA^2s]	--
	Max. $I^2t \leq$ _____kA^2s L1 L2 L3 L4(N)	8,84 ___ ___ ___	8,97 ____ ___ ___	6,47 ___ ___ ___	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:				--
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.= 457 V. The circuit – breaker is in the open position	**D_{1-1}** [µA]	**D_{1-2}** [[µA]	**D_{1-3}** [[µA]	--

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Clause	Requirement + Test	Result - Remark			Verdict
	The leakage current shall not exceed 2 mA L1	3,26	2,78	2,34	P
	L2				N/A
	L3				N/A
	L4(N)				N/A
	Electric strength test:				--
	Test voltage 1500 V (see 9.7.2)				--
	a)				P
	b)				N/A
	c)				P
	d)				N/A
	e) 2000 V				N/A
	Test current 0.85x non-tripping current (1,13 I_N)	60,6A			--
	- Passed for 1h	>1h	>1h	>1h	P
	- Passed for 2h				N/A
	Current is then steadily increased to 1,1 x tripping current (1,45 I_N) within 5s	101A			--
		D_{1-1} [s]	**D_{1-2}** [s]	**D_{1-3}** [s]	--
	Tripping within ☒ 1 hour / ☐ 2 hour	104	66	63	P

	TESTS „D“ 3 samples, HGD 63U, D63, 4P				
8.6	**Automatic operation**				--
8.6.1	Standard time-current zone				--
	Tripping characteristic of CB ensures adequate protection of the circuit, without premature operation.				P
9.10	**Tests „D_0“**	**D_{1-4}**	**D_{1-5}**	**D_{1-6}**	**--**
	I_N (A)	63A			--
	Sect. (mm²)	16 mm²			--
	Instantaneous tripping current	☐ B	☐ C	☒ D	--
9.10.2	Test of time-current characteristic				--
9.10.2.1	Test current 1,13 I_N (A) starting from cold for:	71,2 A			--
	- 1 h ($I_N \leq 63$ A)	>1h	>1h	>1h	P
	- 2 h ($I_N > 63$ A)				N/A
	No tripping				P
	Then steadily increased within 5 s to 1,45 I_N (A)	91,4			--
	- Tripping within	[min]	[min]	[mini]	--

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Clause	Requirement + Test	Result - Remark	Verdict
	- 1h (≤ 63 A)	1,1 1,6 1,7	P
	- 2h (> 63 A)		N/A
9.10.2.2	Test current 2,55 I_N (A) starting from cold for:	161A	--
	opening time not less than 1 s or more than	[s] [s] [s]	--
	- 60 s (≤ 32 A)		N/A
	- 120 s (> 32 A)	14 16 15	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.		--
	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.		--
	The sequence of operation is : O-CO-CO-CO Interval time: > 3 min		--
	The tripping time of the O operation is measured		--
	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		N/A
	Test current 5 I_N (A), starting from cold	_____A	--
	Tripping less than 0,1 s		N/A
9.10.3.3	☐ For circuit-breakers of the C – Type		--
	Test current 5I_N (A), starting from cold	A	--
	Opening time:	[s] [s] [s]	--
	≥ 0,1 s		N/A
	Test current 10 I_N (A), starting from cold	A	--
	Tripping less than 0,1 s		N/A
9.10.3.4	☒ For circuit-breakers of the D – Type		--
	Test current 10I_N (A), starting from cold	630A	P
	Opening time:	[s] [s] [s]	--
	≥ 0,1 s	1,12 1,04 1,26	P
	Test current 20 I_N (A) or to the maximum instantaneous tripping current(see cl. 6, item j), starting from cold	1,27kA	--
	Tripping less than 0,1 s	8,76ms 9,02ms 8,92ms	P

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Clause	Requirement + Test	Result - Remark	Verdict
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	_____A	--
	Tripping within	[min] [min] [min]	--
	- 1h (≤ 63 A)		N/A
	- 2h (> 63 A)		N/A
	Test current 1,2 It (A), (three pole or four pole) starting from cold	110A	--
	Tripping within	[min] [min] [min]	--
	- 1h (≤ 63 A)	10,2 9,6 10,1	P
	- 2h (> 63 A)		N/A
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 =-5 °C	--
	Test current 1,13 I_N (A)	71,2A	--
	- Passed for 1h	>1h >1h >1h	P
	- Passed for 2h		N/A
	Current is then steadily increased to 1,9 I_N (A) within 5s	120A	--
	Tripping within	[s] [s] [s]	--
	- 1h (≤ 63 A)	46 63 56	P
	- 2h (> 63 A)		N/A
	b) Ambient temperature of (10 ± 2) K above the ambient air reference temperature	40°C	--
	Test current I_N (A)	63A	--
	No tripping within		--
	- 1h (≤ 63 A)	>1h >1h >1h	P
	- 2h (> 63 A)		N/A

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Clause	Requirement + Test	Result - Remark	Verdict

	Tests „D_1“	**D_{1-4} D_{1-5} D_{1-6}**	
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		--
	- Vertical board turned 90°		--
	- 50 falls on two sides of vertical board C		--
	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		N/A
9.13.2.4	CB intended to be mounted on a rail		--
	- downward vertical 50 N for 1 min		P
	- upward vertical 50 N for 1 min, no damage		P
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		--
	A force of 20 N applied for 1min to the circuit-breaker (see fig 16).		--
	During this test the circuit-breaker part shall not become loose from the base and shall not show damage impairing further use.		N/A
9.12.11.3	**Test at 1500 A:**		--
	Prospective current of 1500 A - power factor 0,93 to 0,98		--
	Prospective current obtained (A)	$1{,}54 \times 10^3$A	--
	Power factor	0,95	--
	Test voltage 1,05 Un	U_{test} = 444V	--
	Test circuit: figure	Figure 3	--
	T (min)	3 Min	--
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	--

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Clause	Requirement + Test	Result - Remark	Verdict

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			--
	Sequence	6-O, 3-CO			--
	I_{Peak} (A) max. value	2,01x10^{3}A			--
	$I^2t \leq$ _____ kA^{2}s	[kA^{2}s]	[kA^{2}s]	[kA^{2}s]	--
	Max. $I^2t \leq$ _____kA^{2}s L1 L2 L3 L4~~(N)~~	11,6 12,3 11,5 -	11,5 11,7 12,4 -	14,0 12,6 12,5 -	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:				--
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.= 457 V. The circuit – breaker is in the open position	**D_{1-4}** [µA]	**D_{1-5}** [[µA]	**D_{1-6}** [[µA]	--
	The leakage current shall not exceed 2 mA L1	4,56	3,82	4,08	P
	L2	3,17	4,14	3,65	P
	L3	4,05	4,95	3,27	P
	L4(N)	1,98	1,78	1,85	P
	Electric strength test:				--
	Test voltage 1500 V (see 9.7.2)				--
	a)				P
	b)				P
	c)				P
	d)				N/A
	e) 2000 V				N/A
	Test current 0.85x non-tripping current (1,13 I_N)	60,6A			--
	- Passed for 1h	>1h	>1h	>1h	P
	- Passed for 2h				N/A
	Current is then steadily increased to 1,1 x tripping current (1,45 I_N) within 5s	101A			--

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Clause	Requirement + Test	Result - Remark			Verdict
		D_{1-4} [s]	D_{1-5} [s]	D_{1-6} [s]	--
	Tripping within ☒ 1 hour / ☐ 2 hour	52	72	47	P

	Tests „D_1“ 3 Samples, HGD 63U, D63, 4P	D_{1-7}	D_{1-8}	D_{1-9}	
9.12.11.3	**Test at 1500 A:**	Using each pole as neutral in turn			--
	Prospective current of 1500 A - power factor 0,93 to 0,98				--
	Prospective current obtained (A)	$1{,}54 \times 10^3$A			--
	Power factor	0,95			--
	Test voltage 1,05 Un	U_{test} = 444V			--
	Test circuit: figure	Figure 3			--
	T (min)	3 Min			--
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			--
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			--
	Sequence	6-O, 3-CO			--
	I_{Peak} (A) max. value	$2{,}02 \times 10^3$A			--
	$I^2t \leq$ _____ kA^2s	[kA^2s]	[kA^2s]	[kA^2s]	--
	Max. $I^2t \leq$ _____kA^2s L1 L2 L3 L4~~(N)~~	- 12,0 13,6 11,8	11,7 - 16,1 11,4	10,6 11,7 - 12,6	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:				--
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.= 457 V. The circuit – breaker is in the open position	D_{1-7} [µA]	D_{1-8} [[µA]	D_{1-9} [[µA]	--

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Clause	Requirement + Test	Result - Remark			Verdict
	The leakage current shall not exceed 2 mA L1	3,65	4,05	5,24	P
	L2	2,27	3,12	2,26	P
	L3	2,98	3,73	2,54	P
	L4~~(N)~~	1,63	1,78	1,98	P
	Electric strength test:				--
	Test voltage 1500 V (see 9.7.2)				--
	a)				P
	b)				P
	c)				P
	d)				N/A
	e) 2000 V				N/A
	Test current 0.85x non-tripping current (1,13 I_N)	60,6A			--
	- Passed for 1h	>1h	>1h	>1h	P
	- Passed for 2h				N/A
	Current is then steadily increased to 1,1 x tripping current (1,45 I_N) within 5s	101A			--
		D_{1-7} [s]	**D_{1-8}** [s]	**D_{1-9}** [s]	--
	Tripping within ☒ 1 hour / ☐ 2 hour	68	51	49	P

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Clause	Requirement + Test	Result - Remark	Verdict

	TESTS „D“ 13 samples, HGD 63U, D1~D50, 1P					
8.6	**Automatic operation**					--
8.6.1	Standard time-current zone					--
	Tripping characteristic of CB ensures adequate protection of the circuit, without premature operation.					P
9.10	**Tests „D_0“**	**D_0-1**	**D_0-2**	**D_0-3**	**D_0-4**	**--**
	I_N (A)	1	2	3	4	--
	Sect. (mm²)	1,0	1,0	1,0	1,0	--
		D_0-5	**D_0-6**	**D_0-7**	**D_0-8**	--
	I_N (A)	6	10	13	16	--
	Sect. (mm²)	1,5	1,5	1,5	2,5	--
		D_0-9	**D_0-10**	**D_0-11**	**D_0-12**	--
	I_N (A)	20	25	32	40	--
	Sect. (mm²)	2,5	4,0	6,0	10	--
		D_0-13				--
	I_N (A)	50				--
	Sect. (mm²)	10				--
	Instantaneous tripping current	☐ B	☐ C	☒ D		--
9.10.2	Test of time-current characteristic					--
9.10.2.1	Test current 1,13 I_N (A) starting from cold for:	**D_0-1**	**D_0-2**	**D_0-3**	**D_0-4**	--
		1,13	2,26	3,39	4,52	--
		D_0-5	**D_0-6**	**D_0-7**	**D_0-8**	--
		6,78	11,3	14,7	18,1	--
		D_0-9	**D_0-10**	**D_0-11**	**D_0-12**	--
		22,6	28,3	36,2	45,2	--
		D_0-13				--
		56,5				--
	- 1 h ($I_N \leq 63$ A)	**D_0-1**	**D_0-2**	**D_0-3**	**D_0-4**	--
		>1h	>1h	>1h	>1h	P
		D_0-1	**D_0-2**	**D_0-3**	**D_0-4**	--
		>1h	>1h	>1h	>1h	P
		D_0-9	**D_0-10**	**D_0-11**	**D_0-12**	--
		>1h	>1h	>1h	>1h	P
		D_0-13				--
		>1h				P
	- 2 h ($I_N > 63$ A)					N/A

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Clause	Requirement + Test	Result - Remark				Verdict
	No tripping					P
	Then steadily increased within 5 s to 1,45 I_N (A)	**D_0-1**	**D_0-2**	**D_0-3**	**D_0-4**	--
		1,45	2,90	4,35	5,80	P
		D_0-5	**D_0-6**	**D_0-7**	**D_0-8**	--
		8,70	14,5	18,9	23,2	P
		D_0-9	**D_0-10**	**D_0-11**	**D_0-12**	--
		29,0	36,3	46,4	58,0	P
		D_0-13				--
		72,5				P
		[s]	[s]	[s]	[s]	--
	- Tripping within	**D_0-1**	**D_0-2**	**D_0-3**	**D_0-4**	--
	- 1h (≤ 63 A)	112	139	90	146	P
		D_0-5	**D_0-6**	**D_0-7**	**D_0-8**	--
	- 1h (≤ 63 A)	116	96	207	106	P
		D_0-9	**D_0-10**	**D_0-11**	**D_0-12**	--
		138	168	115	87	P
		D_0-13				--
		103				P
	- 2h (> 63 A)					N/A
9.10.2.2	Test current 2,55 I_N (A) starting from cold for:	**D_0-1**	**D_0-2**	**D_0-3**	**D_0-4**	--
		2,55	5,10	7,65	10,2	--
		D_0-5	**D_0-6**	**D_0-7**	**D_0-8**	--
		15,3	25,5	33,2	40,8	--
		D_0-9	**D_0-10**	**D_0-11**	**D_0-12**	--
		51,0	63,8	81,6	102	--
		D_0-13				--
		128				--
		[s]	[s]	[s]	[s]	--
	opening time not less than 1 s or more than	**D_0-1**	**D_0-2**	**D_0-3**	**D_0-4**	--
	- 60 s (≤ 32 A)	15	17	14	19	P
		D_0-5	**D_0-6**	**D_0-7**	**D_0-8**	--
		17	16	21	16	P
		D_0-9	**D_0-10**	**D_0-11**		--
		19	17	14		P
	- 120 s (> 32 A)	**D_0-12**	**D_0-13**			--
		15	17			P

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Clause	Requirement + Test	Result - Remark	Verdict

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.					--
	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.					--
	The sequence of operation is : O-CO-CO-CO Interval time: > 3 min					--
	The tripping time of the O operation is measured					--
	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					N/A
	Test current 5 I_N (A), starting from cold	_____A				--
	Tripping less than 0,1 s					N/A
9.10.3.3	☐ For circuit-breakers of the C – Type					--
	Test current $5I_N$ (A), starting from cold	_____A				--
	Opening time:	[s]	[s]	[s]		--
	≥ 0,1 s					N/A
	Test current 10 I_N (A), starting from cold	_____A				--
	Tripping less than 0,1 s					N/A
9.10.3.4	☒ For circuit-breakers of the D – Type					--
	Test current $10I_N$ (A), starting from cold	**D_0-1**	**D_0-2**	**D_0-3**	**D_0-4**	--
		10,0	20,0	30,0	40,0	--
		D_0-5	**D_0-6**	**D_0-7**	**D_0-8**	--
		60,0	100	130	160	--
		D_0-9	**D_0-10**	**D_0-11**	**D_0-12**	--
		200	250	320	400	--
		D_0-13				--
		500				--
	Opening time:	[s]	[s]	[s]	[s]	--
	≥ 0,1 s	**D_0-1**	**D_0-2**	**D_0-3**	**D_0-4**	--
		2,04	1,78	1,62	1,51	P
		D_0-5	**D_0-6**	**D_0-7**	**D_0-8**	--
		1,47	1,36	1,49	1,31	P

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Clause	Requirement + Test	Result - Remark				Verdict
		D_0-9	**D_0-10**	**D_0-11**	**D_0-12**	--
		1,52	1,28	1,49	1,12	P
		D_0-13				--
		1,37				P
	Test current 20 I_N (A), starting from cold	**D_0-1**	**D_0-2**	**D_0-3**	**D_0-4**	--
		20,8	42,0	62,0	82,3	--
		D_0-5	**D_0-6**	**D_0-7**	**D_0-8**	--
		122	204	263	321	--
		D_0-9	**D_0-10**	**D_0-11**	**D_0-12**	--
		403	502	644	805	--
		D_0-13				--
		1,03k				--
	Tripping less than 0,1 s	[ms]	[ms]	[ms]	[ms]	--
		D_0-1	**D_0-2**	**D_0-3**	**D_0-4**	--
		9,13	8,97	9,05	9,23	P
		D_0-5	**D_0-6**	**D_0-7**	**D_0-8**	--
		9,16	9,11	9,43	8,79	P
		D_0-9	**D_0-10**	**D_0-11**	**D_0-12**	--
		8,87	8,93	9,04	8,55	P
		D_0-13				--
		9,10				P
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	_____A				--
	Tripping within	[min] [min] [min]				--
	- 1h (≤ 63 A)					N/A
	- 2h (> 63 A)					N/A
	Test current 1,2 It (A), (three pole or four pole) starting from cold	_____A				--
	Tripping within	[min] [min] [min]				--
	- 1h (≤ 63 A)					N/A
	- 2h (> 63 A)					N/A
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 =-5 °C				--

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Clause	Requirement + Test	Result - Remark				Verdict
	Test current 1,13 I_N (A)	**D_0-1**	**D_0-2**	**D_0-3**	**D_0-4**	--
		1,13	2,26	3,39	4,52	--
		D_0-5	**D_0-6**	**D_0-7**	**D_0-8**	--
		6,78	11,3	14,7	18,1	--
		D_0-9	**D_0-10**	**D_0-11**	**D_0-12**	--
		22,6	28,3	36,2	45,2	--
		D_0-13				--
		56,5				--
	- Passed for 1h	**D_0-1**	**D_0-2**	**D_0-3**	**D_0-4**	--
		>1h	>1h	>1h	>1h	P
		D_0-1	**D_0-2**	**D_0-3**	**D_0-4**	--
		>1h	>1h	>1h	>1h	P
		D_0-9	**D_0-10**	**D_0-11**	**D_0-12**	--
		>1h	>1h	>1h	>1h	P
		D_0-13				--
		>1h				P
	- Passed for 2h					N/A
	Current is then steadily increased to 1,9 I_N (A) within 5s	**D_0-1**	**D_0-2**	**D_0-3**	**D_0-4**	--
		1,9	3,8	5,7	7,6	--
		D_0-5	**D_0-6**	**D_0-7**	**D_0-8**	--
		11,4	19,0	24,7	30,4	--
		D_0-9	**D_0-10**	**D_0-11**	**D_0-12**	--
		38,0	47,5	60,8	76,0	--
		D_0-13				--
		95,0				--
		[s]	[s]	[s]	[s]	--
	Tripping within	**D_0-1**	**D_0-2**	**D_0-3**	**D_0-4**	--
	- 1h (≤ 63 A)	54	86	68	43	P
		D_0-5	**D_0-6**	**D_0-7**	**D_0-8**	--
	- 1h (≤ 63 A)	72	99	57	81	P
		D_0-9	**D_0-10**	**D_0-11**	**D_0-12**	--
	- 1h (≤ 63 A)	49	51	89	48	P
		D_0-13				--
		67				P
	- 2h (> 63 A)					N/A

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Clause	Requirement + Test	Result - Remark				Verdict
	b) Ambient temperature of (10 ± 2) K above the ambient air reference temperature	40°C				--
	Test current I_N (A)	**D_0-1**	**D_0-2**	**D_0-3**	**D_0-4**	--
		1	2	3	4	--
		D_0-5	**D_0-6**	**D_0-7**	**D_0-8**	--
		6	10	13	16	--
		D_0-9	**D_0-10**	**D_0-11**	**D_0-12**	--
		20	25	32	40	--
		D_0-13				--
		50				--
	No tripping within					--
		D_0-1	**D_0-2**	**D_0-3**	**D_0-4**	--
	- 1h (≤ 63 A)	>1h	>1h	>1h	>1h	P
		D_0-5	**D_0-6**	**D_0-7**	**D_0-8**	--
	- 1h (≤ 63 A)	>1h	>1h	>1h	>1h	P
		D_0-9	**D_0-10**	**D_0-11**	**D_0-12**	--
	- 1h (≤ 63 A)	>1h	>1h	>1h	>1h	P
		D_0-13				--
	- 1h (≤ 63 A)	>1h				P
	- 2h (> 63 A)					N/A

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Clause	Requirement + Test	Result - Remark	Verdict

	TESTS „D“ 14 samples, HGD 63U, C1~C63, 1P					
8.6	**Automatic operation**					--
8.6.1	Standard time-current zone					--
	Tripping characteristic of CB ensures adequate protection of the circuit, without premature operation.					P
9.10	**Tests „D_0“**	**D_0-14**	**D_0-15**	**D_0-16**	**D_0-17**	**--**
	I_N (A)	1	2	3	4	--
	Sect. (mm²)	1,0	1,0	1,0	1,0	--
		D_0-18	**D_0-19**	**D_0-20**	**D_0-21**	--
	I_N (A)	6	10	13	16	--
	Sect. (mm²)	1,5	1,5	1,5	2,5	--
		D_0-22	**D_0-23**	**D_0-24**	**D_0-25**	--
	I_N (A)	20	25	32	40	--
	Sect. (mm²)	2,5	4,0	6,0	10	--
		D_0-26	**D_0-27**			--
	I_N (A)	50	63			--
	Sect. (mm²)	10	16			--
	Instantaneous tripping current	☐ B	☒ C	☐ D		--
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.					--
	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.					--
	The sequence of operation is : O-CO-CO-CO Interval time: > 3 min					--
	The tripping time of the O operation is measured					--
	After each operation the indicating means shall show the open position of the contacts					P
9.10.3.3	☒ For circuit-breakers of the C – Type					--
	Test current $5I_N$ (A), starting from cold	**D_0-14**	**D_0-15**	**D_0-16**	**D_0-17**	--
		5	10	15	20	--
		D_0-18	**D_0-19**	**D_0-20**	**D_0-21**	--
		30	50	65	80	--
		D_0-22	**D_0-23**	**D_0-24**	**D_0-25**	--
		100	125	160	200	--

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Clause	Requirement + Test	Result - Remark				Verdict
		D_0-26	**D_0-27**			--
		250	315			--
	Opening time:	[s]	[s]	[s]	[s]	--
	≥ 0,1 s	**D_0-14**	**D_0-15**	**D_0-16**	**D_0-17**	--
		3,47	3,26	3,19	3,04	P
		D_0-18	**D_0-19**	**D_0-20**	**D_0-21**	--
		2,87	2,62	2,47	2,79	P
		D_0-22	**D_0-23**	**D_0-24**	**D_0-25**	--
		2,16	2,45	2,48	2,07	P
		D_0-26	**D_0-27**			--
		1,84	1,96			P
	Test current 10 I_N (A), starting from cold	**D_0-14**	**D_0-15**	**D_0-16**	**D_0-17**	--
		10,2	20,8	30,7	40,6	--
		D_0-18	**D_0-19**	**D_0-20**	**D_0-21**	--
		61,3	102	132	163	--
		D_0-22	**D_0-23**	**D_0-24**	**D_0-25**	--
		204	253	324	401	--
		D_0-26	**D_0-27**			--
		508	637			--
		[ms]	[ms]	[ms]	[ms]	--
	Tripping less than 0,1 s	**D_0-14**	**D_0-15**	**D_0-16**	**D_0-17**	--
		8,71	9,17	8,75	8,91	P
		D_0-18	**D_0-19**	**D_0-20**	**D_0-21**	--
		9,13	8,48	8,56	9,03	P
		D_0-22	**D_0-23**	**D_0-24**	**D_0-25**	--
		8,67	8,77	8,93	8,82	P
		D_0-26	**D_0-27**			--
		8,64	8,54			P

IEC 60898-1			
Clause	Requirement + Test	Result - Remark	Verdict

	TESTS „D“ 14 samples, HGD 63U, B1~B63, 1P					
8.6	**Automatic operation**					--
8.6.1	Standard time-current zone					--
	Tripping characteristic of CB ensures adequate protection of the circuit, without premature operation.					P
9.10	**Tests „D_0“**	**D_0-28**	**D_0-29**	**D_0-30**	**D_0-31**	**--**
	I_N (A)	1	2	3	4	--
	Sect. (mm²)	1,0	1,0	1,0	1,0	--
		D_0-32	**D_0-33**	**D_0-34**	**D_0-35**	--
	I_N (A)	6	10	13	16	--
	Sect. (mm²)	1,5	1,5	1,5	2,5	--
		D_0-36	**D_0-37**	**D_0-38**	**D_0-39**	--
	I_N (A)	20	25	32	40	--
	Sect. (mm²)	2,5	4,0	6,0	10	--
		D_0-40	**D_0-41**			--
	I_N (A)	50	63			--
	Sect. (mm²)	10	16			--
	Instantaneous tripping current	☒ B	☐ C	☐ D		--
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.					--
	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.					--
	The sequence of operation is : O-CO-CO-CO Interval time: > 3 min					--
	The tripping time of the O operation is measured					--
	After each operation the indicating means shall show the open position of the contacts					P
9.10.3.3	☒ For circuit-breakers of the B – Type					--
	Test current $3I_N$ (A), starting from cold	**D_0-28**	**D_0-29**	**D_0-30**	**D_0-31**	--
		3,0	6,0	9,0	12,0	--
		D_0-32	**D_0-33**	**D_0-34**	**D_0-35**	--
		18	30	39	48	--
		D_0-36	**D_0-37**	**D_0-38**	**D_0-39**	--
		60	75	96	120	--

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Clause	Requirement + Test	Result - Remark				Verdict
		D_0-40	**D_0-41**			--
		150	189			--
	Opening time:	[s]	[s]	[s]	[s]	--
	≥ 0,1 s	**D_0-28**	**D_0-29**	**D_0-30**	**D_0-31**	--
		6,98	7,45	7,12	6,46	P
		D_0-32	**D_0-33**	**D_0-34**	**D_0-35**	--
		7,84	8,16	7,39	6,51	P
		D_0-36	**D_0-37**	**D_0-38**	**D_0-39**	--
		6,26	7,40	7,92	6,04	P
		D_0-40	**D_0-41**			--
		7,62	6,91			P
	Test current 5 I_N (A), starting from cold	**D_0-28**	**D_0-29**	**D_0-30**	**D_0-31**	--
		5,12	10,2	15,4	20,8	--
		D_0-32	**D_0-33**	**D_0-34**	**D_0-35**	--
		30,6	50,3	66,3	82,6	--
		D_0-36	**D_0-37**	**D_0-38**	**D_0-39**	--
		102	127	163	204	--
		D_0-40	**D_0-41**			--
		253	318			--
		[ms]	[ms]	[ms]	[ms]	--
	Tripping less than 0,1 s	**D_0-28**	**D_0-29**	**D_0-30**	**D_0-31**	--
		8,34	8,21	8,54	8,63	P
		D_0-32	**D_0-33**	**D_0-34**	**D_0-35**	--
		8,74	8,56	8,83	8,81	P
		D_0-36	**D_0-37**	**D_0-38**	**D_0-39**	--
		8,94	8,13	8,49	8,72	P
		D_0-40	**D_0-41**			--
		8,93	8,33			P

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Clause	Requirement + Test	Result - Remark	Verdict

	TESTS „E_1“ 3 + 3 samples, HGD 63U, D63, 1P				
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) .....:	7500A			--
	Test circuit: figure .....:	Figure 3			--
	Test voltage 1,05 Un	256V			--
	Prospective current .....:	7500A			--
	Prospective current obtained .....:	7,56x10^{3}A			--
	Power factor .....:	0,45~0,50			--
	Power factor obtained .....:	0,47			--
	Sequence .....:	O - O - CO			--
	T (min) .....:	3 min			--
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” = 45 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	dimensions of enclosure: _____x_____x_____mm			--
	I_{Peak} (A) max. value.....:	5,36kA			--
	$I^2t \leq$ _____ kA^{2}s	[kA^{2}s]	[kA^{2}s]	[kA^{2}s]	--
	Max. $I^2t \leq$ _____kA^{2}s L1	68,2	56,8	48,1	P
	L2	___	____	___	
	L3	___	___	___	
	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:				--
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.= 264 V. The circuit – breaker is in the open position	**E_{1-1}** [µA]	**E_{1-2}** [µA]	**E_{1-3}** [µA]	--
	The leakage current shall not exceed 2 mA L1	4,16	2,95	3,17	P
	L2	-	-	-	N/A

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Clause	Requirement + Test	Result - Remark			Verdict
	L3	-	-	-	N/A
	L4(N)	-	-	-	N/A
	Electric strength test:				--
	Test voltage 1500 V (see 9.7.2)				--
	a)				P
	b)				N/A
	c)				P
	d)				N/A
	e) 2000 V				N/A
	Test current 0.85x non-tripping current (1,13 I_N)	60,6A			--
	- Passed for 1h	>1h	>1h	>1h	P
	- Passed for 2h				N/A
	Current is then steadily increased to 1,1 x tripping current (1,45 I_N) within 5s	101A			--
		E_{1-1} [min]	**E_{1-2}** [min]	**E_{1-3}** [min]	--
	Tripping within ☒ 1 hour / ☐ 2 hour	1,6	2,2	1,8	P

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) .....:	7500A			--
	Test circuit: figure .....:	Figure 3			--
	Test voltage 1,05 Un	444V			--
	Prospective current .....:	7500A			--
	Prospective current obtained.....:	7,58x10^{3}A			--
	Power factor .....:	0,45~0,50			--
	Power factor obtained .....:	0,47			--
	Sequence .....:	See remark			--
	T (min) .....:	3 min			--
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” = 45 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	dimensions of enclosure: _____x_____x_____mm			--
	I_{Peak} (A) max. value .....:	4,86x10^{3}A			--
	- No permanent arcing				P

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Clause	Requirement + Test	Result - Remark			Verdict
	- 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:				--
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.=457 V. The circuit – breaker is in the open position	**E_{1-4}** [µA]	**E_{1-5}** [µA]	**E_{1-6}** [µA]	--
	The leakage current shall not exceed 2 mA L1	5,16	3,05	3,17	P
	L2				N/A
	L3				N/A
	L4(N)				N/A
	Electric strength test:				--
	Test voltage 1500 V (see 9.7.2)				--
	a)				P
	b)				N/A
	c)				P
	d)				N/A
	e) 2000 V				N/A
	Test current 0.85x non-tripping current (1,13 I_N)	60,6A			--
	- Passed for 1h	>1h	>1h	>1h	P
	- Passed for 2h				N/A
	Current is then steadily increased to 1,1 x tripping current (1,45 I_N) within 5s	101A			--
		E_{1-4} [min]	**E_{1-5}** [min]	**E_{1-6}** [min]	--
	Tripping within ☒ 1 hour / ☐ 2 hour	1,3	2,1	0,9	P

	TESTS „E_1“ 3 + 3 samples, HGD 63U, D1, 1P				
9.12.11.4.2	**Test E_1: Test at service short-circuit capacity**	**E_{1-7}**	**E_{1-8}**	**E_{1-9}**	**--**
	Service short-circuit capacity (Ics) .....:	7500A			--
	Test circuit: figure .....:	Figure 3			--
	Test voltage 1,05 Un	256V			--
	Prospective current .....:	7500A			--

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Clause	Requirement + Test	Result - Remark	Verdict

	Prospective current obtained ..... :	7,56x10^{3}A			--
	Power factor ..... :	0,45~0,50			--
	Power factor obtained ..... :	0,47			--
	Sequence ..... :	O - O - CO			--
	T (min) ..... :	3 min			--
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" = 45 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	dimensions of enclosure: _____x_____x_____mm			--
	I_{Peak} (A) max. value ..... :	485A			--
	$I^2t \leq$ _____ kA^{2}s	[kA^{2}s]	[kA^{2}s]	[kA^{2}s]	--
	Max. $I^2t \leq$ _____kA^{2}s L1	0,388	0,172	0,434	P
	L2	___	____	___	
	L3	___	___	___	
	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:				--
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.= 264 V. The circuit – breaker is in the open position	**E_{1-7}** [µA]	**E_{1-8}** [µA]	**E_{1-9}** [µA]	--
	The leakage current shall not exceed 2 mA L1	2,26	3,16	2,84	P
	L2	-	-	-	N/A
	L3	-	-	-	N/A
	L4(N)	-	-	-	N/A
	Electric strength test:				--
	Test voltage 1500 V (see 9.7.2)				--
	a)				P
	b)				N/A
	c)				P

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Clause	Requirement + Test	Result - Remark			Verdict
	d)				N/A
	e) 2000 V				N/A
	Test current 0.85x non-tripping current (1,13 I_N)	0,96A			--
	- Passed for 1h	>1h	>1h	>1h	P
	- Passed for 2h				N/A
	Current is then steadily increased to 1,1 x tripping current (1,45 I_N) within 5s	1,60A			--
		E_{1-7} [s]	**E_{1-8}** [s]	**E_{1-9}** [s]	--
	Tripping within ☒ 1 hour / ☐ 2 hour	97	125	57	P

9.12.11.4.2	**Test „E_1“(Test at service short-circuit capacity) three phase tests for single circuit-breakers**	**E_{1-10}**	**E_{1-11}**	**E_{1-12}**	**--**
	Service short-circuit capacity (Ics) .....:	7500A			--
	Test circuit: figure .....:	Figure 3			--
	Test voltage 1,05 Un	444V			--
	Prospective current .....:	7500A			--
	Prospective current obtained.....:	7,58x10^{3}A			--
	Power factor .....:	0,45~0,50			--
	Power factor obtained .....:	0,47			--
	Sequence .....:	See remark			--
	T (min) .....:	3 min			--
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” = 45 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	dimensions of enclosure: _____x_____x_____mm			--
	I_{Peak} (A) max. value .....:	358A			--
	- 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:				--
9.12.12.1	The circuit-breakers shall show no damage impairing their further use and shall maintenance, withstand the following tests.				--

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Clause	Requirement + Test	Result - Remark			Verdict
	a) leakage current across open contacts, according to 9.7.5.3, each pole is supplied at a voltage 1,1 times Un.=457 V. The circuit – breaker is in the open position	**E_{1-10}** [µA]	**E_{1-11}** [µA]	**E_{1-12}** [µA]	--
	The leakage current shall not exceed 2 mA L1	3,95	4,21	5,07	P
	L2				N/A
	L3				N/A
	L4(N)				N/A
	Electric strength test:				--
	Test voltage 1500 V (see 9.7.2)				--
	a)				P
	b)				N/A
	c)				P
	d)				N/A
	e) 2000 V				N/A
	Test current 0.85x non-tripping current (1,13 I_N)	0,96A			--
	- Passed for 1h	>1h	>1h	>1h	P
	- Passed for 2h				N/A
	Current is then steadily increased to 1,1 x tripping current (1,45 I_N) within 5s	1,60A			--
		E_{1-10} [s]	**E_{1-11}** [s]	**E_{1-12}** [s]	--
	Tripping within ☒ 1 hour / ☐ 2 hour	76	105	48	P

	TESTS „E_1“ 3 samples, HGD 63U, D63, 2P				
9.12.11.4.2	**Test E_1: Test at service short-circuit capacity**	**E_{1-13}**	**E_{1-14}**	**E_{1-15}**	**--**
	Service short-circuit capacity (Ics) .....:	7500A			--
	Test circuit: figure .....:	Figure 3			--
	Test voltage 1,05 Un	444V			--
	Prospective current .....:	7500A			--
	Prospective current obtained .....:	7,55x10^3A			--
	Power factor .....:	0,45~0,50			--
	Power factor obtained .....:	0,47			--
	Sequence .....:	O - O - CO			--
	T (min) .....:	3 min			--
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” = 45 mm			P

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Clause	Requirement + Test	Result - Remark	Verdict

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: _____x_____x_____mm			--
	I_{Peak} (A) max. value.....:	4,96kA			--
	$I^2t \leq$ _____ kA^2s	[kA^2s]	[kA^2s]	[kA^2s]	--
	Max. $I^2t \leq$ _____kA^2s L1 L2 L3 L4(N)	49,6 49,6 ___ ___	65,4 65,4 ___ ___	37,0 37,0 ___ ___	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:				--
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.= 457 V. The circuit – breaker is in the open position	**E_{1-13}** [µA]	**E_{1-14}** [µA]	**E_{1-15}** [µA]	--
	The leakage current shall not exceed 2 mA L1	3,68	5,05	3,14	P
	L2	2,73	4,92	2,98	P
	L3	-	-	-	N/A
	L4(N)	-	-	-	N/A
	Electric strength test:				--
	Test voltage 1500 V (see 9.7.2)				--
	a)				P
	b)				P
	c)				P
	d)				N/A
	e) 2000 V				N/A
	Test current 0.85x non-tripping current (1,13 I_N)	61,0A			--
	- Passed for 1h	>1h	>1h	>1h	P
	- Passed for 2h				N/A
	Current is then steadily increased to 1,1 x tripping current (1,45 I_N) within 5s	101A			--

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Clause	Requirement + Test	Result - Remark			Verdict
		E_{1-13} [min]	E_{1-14} [min]	E_{1-15} [min]	--
	Tripping within ☒ 1 hour / ☐ 2 hour	1,5	1,1	2,1	P
	TESTS „E_1“ 3 samples, HGD 63U, D1, 2P				
9.12.11.4.2	**Test E_1: Test at service short-circuit capacity**	E_{1-16}	E_{1-17}	E_{1-18}	--
	Service short-circuit capacity (Ics) .....:	7500A			--
	Test circuit: figure .....:	Figure 3			--
	Test voltage 1,05 Un	444V			--
	Prospective current .....:	7500A			--
	Prospective current obtained .....:	7,55x10^{3}A			--
	Power factor .....:	0,45~0,50			--
	Power factor obtained .....:	0,47			--
	Sequence .....:	O - O - CO			--
	T (min) .....:	3 min			--
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” = 45 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	dimensions of enclosure: _____x_____x_____mm			--
	I_{Peak} (A) max. value .....:	238A			--
	$I^2t \leq$ _____ kA^{2}s	[kA^{2}s]	[kA^{2}s]	[kA^{2}s]	--
	Max. $I^2t \leq$ _____kA^{2}s L1 L2 L3 L4(N)	0,119 0,119 ___ ___	0,131 0,131 ___ ___	0,145 0,145 ___ ___	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:				--
9.12.12.1	The circuit-breakers shall show no damage impairing their further use and shall maintenance, withstand the following tests.				--

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Clause	Requirement + Test	Result - Remark			Verdict
	a) leakage current across open contacts, according to 9.7.5.3, each pole is supplied at a voltage 1,1 times Un.= 457 V. The circuit – breaker is in the open position	**E_{1-16}** [µA]	**E_{1-17}** [µA]	**E_{1-18}** [µA]	--
	The leakage current shall not exceed 2 mA L1	4,21	5,19	4,42	P
	L2	3,65	2,28	2,87	P
	L3	-	-	-	N/A
	L4(N)	-	-	-	N/A
	Electric strength test:				--
	Test voltage 1500 V (see 9.7.2)				--
	a)				P
	b)				P
	c)				P
	d)				N/A
	e) 2000 V				N/A
	Test current 0.85x non-tripping current (1,13 I_N)	0,96A			--
	- Passed for 1h	>1h	>1h	>1h	P
	- Passed for 2h				N/A
	Current is then steadily increased to 1,1 x tripping current (1,45 I_N) within 5s	1,60A			--
		E_{1-16} [min]	**E_{1-17}** [min]	**E_{1-18}** [min]	--
	Tripping within ☒ 1 hour / ☐ 2 hour	2,1	1,2	1,8	P

	TESTS „E_1“ 3 samples, HGD 63U, D63, 4P				
9.12.11.4.2	**Test E_1: Test at service short-circuit capacity**	**E_{1-19}**	**E_{1-20}**	**E_{1-21}**	**--**
	Service short-circuit capacity (Ics) .....:	7500A			--
	Test circuit: figure .....:	Figure 3			--
	Test voltage 1,05 Un	444V			--
	Prospective current .....:	7500A			--
	Prospective current obtained .....:	7,58x10^{3}A			--
	Power factor .....:	0,45~0,50			--
	Power factor obtained .....:	0,47			--
	Sequence .....:	O - CO - CO			--
	T (min) .....:	3 min			--
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” = 45 mm			P

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Clause	Requirement + Test	Result - Remark	Verdict

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: _____x_____x_____mm			--
	I_{Peak} (A) max. value.....:	5,37kA			--
	$I^2t \leq$ _____ kA^2s	[kA^2s]	[kA^2s]	[kA^2s]	--
	Max. $I^2t \leq$ _____kA^2s L1 L2 L3 L4(N)	27,7 44,3 41,6 ___	45,3 36,6 30,5 ___	15,7 36,6 54,5 ____	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:				--
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.= 457 V. The circuit – breaker is in the open position	**E_{1-19}** [µA]	**E_{1-20}** [µA]	**E_{1-21}** [µA]	--
	The leakage current shall not exceed 2 mA L1	5,63	4,05	5,14	P
	L2	4,05	3,14	2,87	P
	L3	2,98	3,02	2,04	P
	L4(N)	1,76	1,95	1,52	P
	Electric strength test:				--
	Test voltage 1500 V (see 9.7.2)				--
	a)				P
	b)				P
	c)				P
	d)				N/A
	e) 2000 V				N/A
	Test current 0.85x non-tripping current (1,13 I_N)	61,0A			--
	- Passed for 1h	>1h	>1h	>1h	P
	- Passed for 2h				N/A
	Current is then steadily increased to 1,1 x tripping current (1,45 I_N) within 5s	101A			--

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Clause	Requirement + Test	Result - Remark			Verdict
		E_{1-19} [min]	E_{1-20} [min]	E_{1-21} [min]	--
	Tripping within ☒ 1 hour / ☐ 2 hour	0,8	1,4	1,1	P

	TESTS „E_1“ 3 samples, HGD 63U, D1, 4P				
9.12.11.4.2	**Test E_1: Test at service short-circuit capacity**	E_{1-22}	E_{1-23}	E_{1-24}	**--**
	Service short-circuit capacity (Ics) .....:	7500A			--
	Test circuit: figure .....:	Figure 3			--
	Test voltage 1,05 Un	444V			--
	Prospective current .....:	7500A			--
	Prospective current obtained .....:	7,58x10^{3}A			--
	Power factor .....:	0,45~0,50			--
	Power factor obtained .....:	0,47			--
	Sequence .....:	O - CO - CO			--
	T (min) .....:	3 min			--
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” = 45 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	dimensions of enclosure: _____x_____x_____mm			--
	I_{Peak} (A) max. value .....:	392A			--
	$I^2t \leq$ _____ kA^{2}s	[kA^{2}s]	[kA^{2}s]	[kA^{2}s]	--
	Max. $I^2t \leq$ _____kA^{2}s L1 L2 L3 L4(N)	0,126 0,159 0,128 ___	0,208 0,174 0,159 ___	0,098 0,359 0,396 ____	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:				--
9.12.12.1	The circuit-breakers shall show no damage impairing their further use and shall maintenance, withstand the following tests.				--

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Clause	Requirement + Test	Result - Remark			Verdict
	a) leakage current across open contacts, according to 9.7.5.3, each pole is supplied at a voltage 1,1 times Un.= 457 V. The circuit – breaker is in the open position	**E_{1-22}** [µA]	**E_{1-23}** [µA]	**E_{1-24}** [µA]	--
	The leakage current shall not exceed 2 mA L1	5,26	4,22	3,78	P
	L2	3,92	2,98	3,51	P
	L3	4,19	3,26	3,24	P
	L4(N)	2,05	1,78	1,96	P
	Electric strength test:				--
	Test voltage 1500 V (see 9.7.2)				--
	a)				P
	b)				P
	c)				P
	d)				N/A
	e) 2000 V				N/A
	Test current 0.85x non-tripping current (1,13 I_N)	0,96A			--
	- Passed for 1h	>1h	>1h	>1h	P
	- Passed for 2h				N/A
	Current is then steadily increased to 1,1 x tripping current (1,45 I_N) within 5s	1,60A			--
		E_{1-22} [min]	**E_{1-23}** [min]	**E_{1-24}** [min]	--
	Tripping within ☒ 1 hour / ☐ 2 hour	1,6	1,8	1,2	P

	TESTS „E_2“ 3 + 4 samples HGD 63U, D63, 1P				
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)..... :	15000A			--
	Test circuit: figure ..... :	Figure 3			--
	Test voltage 1,05 Un	256V			--
	Prospective current ..... :	15000A			--
	Prospective current obtained ..... :	15,3x10^3A			--
	Power factor ..... :	0,20~0,25			--
	Power factor obtained ..... :	0,22			--
	Sequence ..... :	O-CO			--
	T (min) ..... :	3 min			--

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Clause	Requirement + Test	Result - Remark			Verdict
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" = 45 mm			--
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: _____x_____x_____mm			--
	I_{Peak} (A) max. value.....:	5,78kA			--
	$I^2t \leq$ _____ kA^2s	[kA^2s]	[kA^2s]	[kA^2s]	--
	Max. $I^2t \leq$ _____kA^2s L1	37,7	49,9	51,2	P
	L2	___	____	___	
	L3	___	___	___	
	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:				--
9.12.12.2	The circuit-breakers shall show no damage impairing their further use and shall maintenance, withstand the following tests.				P
	a) leakage current across open contacts, according to 9.7.5.3, each pole is supplied at a voltage 1,1 times Un.= 264 V. The circuit – breaker is in the open position	**E_{2-1}** [µA]	**E_{2-2}** [µA]	**E_{2-3}** [µA]	--
	The leakage current shall not exceed 2 mA L1	3,42	2,95	4,05	P
	L2				N/A
	L3				N/A
	L4(N)				N/A
	Electric strength test:				--
	Test voltage 900 V (see 9.7.3)				P
	a)				P
	b)				N/A
	c)				P
	d)				N/A
	e)				N/A
	Test current 2,8 I_N	177A			P
	Tripping within > 0,1 s up to	[s]	[s]	[s]	--
	- 60 s				N/A

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Clause	Requirement + Test	Result - Remark			Verdict
	- 120 s	12	15	13	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}**	P
	Rated short-circuit capacity (Icn)..... :	15000A				--
	Test circuit: figure ..... :	Figure 3				--
	Test voltage 1,05 Un	444V				--
	Prospective current ..... :	15000A				--
	Prospective current obtained ..... :	15,3x10^{3}A				--
	Power factor ..... :	0,20~0,25				--
	Power factor obtained ..... :	0,23				--
	Sequence ..... :	O-CO				--
	T (min) ..... :	3 min				--
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” = 45 mm				--
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: _____x_____x_____mm				--
	I_{Peak} (A) max. value ..... :	6,88kA				--
	- 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:					--
9.12.12.2	The circuit-breakers shall show no damage impairing their further use and shall maintenance, withstand the following tests.					P
	a) leakage current across open contacts, according to 9.7.5.3, each pole is supplied at a voltage 1,1 times Un.= 457 V. The circuit – breaker is in the open position	**E_{2-4}** [µA]	**E_{2-5}** [µA]	**E_{2-6}** [µA]]	**E_{2-7}** [µA]	--
	The leakage current shall not exceed 2 mA L1	3,05	2,96	2,78	4,02	P
	L2					N/A
	L3					N/A
	L4(N)					N/A
	Electric strength test:					--
	Test voltage 900 V (see 9.7.3)					P

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Clause	Requirement + Test	Result - Remark				Verdict
	a)					P
	b)					N/A
	c)					P
	d)					N/A
	e)					N/A
	Test current 2,8 I_N	177A				P
	Tripping within > 0,1 s up to	[s]	[s]	[s]	[s]	--
	- 60 s					N/A
	- 120 s	14	12	11	13	P

	TESTS „E_2“ 3 + 4 samples HGD 63U, D1, 1P				
9.12.11.4.3	**Test: E2 (Test at rated short-circuit capacity)**	**E_{2-8}**	**E_{2-9}**	**E_{2-10}**	--
	Rated short-circuit capacity (Icn)....:	15000A			--
	Test circuit: figure....:	Figure 3			--
	Test voltage 1,05 Un	256V			--
	Prospective current....:	15000A			--
	Prospective current obtained....:	15,3x10^{3}A			--
	Power factor....:	0,20~0,25			--
	Power factor obtained....:	0,22			--
	Sequence....:	O-CO			--
	T (min)....:	3 min			--
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” = 45 mm			--
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: _____x_____x_____mm			--
	I_{Peak} (A) max. value....:	548A			--
	$I^2t \leq$ _____ kA^2s	[kA^2s]	[kA^2s]	[kA^2s]	--
	Max. $I^2t \leq$ _____kA^2s L1	0,178	0,763	0,323	P
	L2	___	____	___	
	L3	___	___	___	
	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

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Clause	Requirement + Test	Result - Remark			Verdict
	- Polyethylene foil shows no holes				P
	After the test:				--
9.12.12.2	The circuit-breakers shall show no damage impairing their further use and shall maintenance, withstand the following tests.				P
	a) leakage current across open contacts, according to 9.7.5.3, each pole is supplied at a voltage 1,1 times Un.= 264 V. The circuit – breaker is in the open position	**E_{2-8}** [µA]	**E_{2-9}** [µA]	**E_{2-10}** [µA]	--
	The leakage current shall not exceed 2 mA L1	2,78	3,64	3,14	P
	L2				N/A
	L3				N/A
	L4(N)				N/A
	Electric strength test:				--
	Test voltage 900 V (see 9.7.3)				P
	a)				P
	b)				N/A
	c)				P
	d)				N/A
	e)				N/A
	Test current 2,8 I_N	2,8A			P
	Tripping within > 0,1 s up to	[s]	[s]	[s]	--
	- 60 s	12	14	13	P
	- 120 s				N/A

9.12.11.4.3	**Test „E_2“(Test at rated short-circuit capacity) three phase tests for single circuit-breakers**	**E_{2-11}**	**E_{2-12}**	**E_{2-13}**	**E_{2-14}**	P
	Rated short-circuit capacity (Icn).....:	15000A				--
	Test circuit: figure .....:	Figure 3				--
	Test voltage 1,05 Un	444V				--
	Prospective current .....:	15000A				--
	Prospective current obtained .....:	15,3x10^3A				--
	Power factor .....:	0,20~0,25				--
	Power factor obtained .....:	0,23				--
	Sequence .....:	O-CO				--
	T (min) .....:	3 min				--
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” = 45 mm				--

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Clause	Requirement + Test	Result - Remark				Verdict
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: _____x_____x_____mm				--
	I_{Peak} (A) max. value.....:	386A				--
	- 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:					--
9.12.12.2	The circuit-breakers shall show no damage impairing their further use and shall maintenance, withstand the following tests.					P
	a) leakage current across open contacts, according to 9.7.5.3, each pole is supplied at a voltage 1,1 times Un.= 457 V. The circuit – breaker is in the open position	**E_{2-11}** [µA]	**E_{2-12}** [µA]	**E_{2-13}** [µA]]	**E_{2-14}** [µA]	--
	The leakage current shall not exceed 2 mA L1	4,65	5,27	3,98	2,65	P
	L2					N/A
	L3					N/A
	L4(N)					N/A
	Electric strength test:					--
	Test voltage 900 V (see 9.7.3)					P
	a)					P
	b)					N/A
	c)					P
	d)					N/A
	e)					N/A
	Test current 2,8 I_N	2,8A				P
	Tripping within > 0,1 s up to	[s]	[s]	[s]	[s]	--
	- 60 s	11	12	13	10	P
	- 120 s					N/A

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Clause	Requirement + Test	Result - Remark	Verdict

	TESTS „E_2“ 3 + 4 samples HGD 63U, D63, 2P				
9.12.11.4.3	**Test: E2 (Test at rated short-circuit capacity)**	**E_{2-15}**	**E_{2-16}**	**E_{2-17}**	--
	Rated short-circuit capacity (Icn)..... :	15000A			--
	Test circuit: figure ..... :	Figure 3			--
	Test voltage 1,05 Un	444V			--
	Prospective current ..... :	15000A			--
	Prospective current obtained ..... :	15,3x10^{3}A			--
	Power factor ..... :	0,20~0,25			--
	Power factor obtained ..... :	0,22			--
	Sequence ..... :	O-CO			--
	T (min) ..... :	3 min			--
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” = 45 mm			--
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: _____x_____x_____mm			--
	I_{Peak} (A) max. value..... :	7,67kA			--
	$I^2t \leq$ _____ kA^{2}s	[kA^{2}s]	[kA^{2}s]	[kA^{2}s]	--
	Max. $I^2t \leq$ _____kA^{2}s L1	60,0	63,4	44,6	P
	L2	___	____	___	
	L3	___	___	___	
	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:				--
9.12.12.2	The circuit-breakers shall show no damage impairing their further use and shall maintenance, withstand the following tests.				P
	a) leakage current across open contacts, according to 9.7.5.3, each pole is supplied at a voltage 1,1 times Un.= 457 V. The circuit – breaker is in the open position	**E_{2-15}** [µA]	**E_{2-16}** [µA]	**E_{2-17}** [µA]	--
	The leakage current shall not exceed 2 mA L1	5,14	3,22	2,67	P
	L2	3,92	2,87	3,05	P

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Clause	Requirement + Test	Result - Remark			Verdict
	L3				N/A
	L4(N)				N/A
	Electric strength test:				--
	Test voltage 900 V (see 9.7.3)				P
	a)				P
	b)				P
	c)				P
	d)				N/A
	e)				N/A
	Test current 2,8 I_N	177A			P
	Tripping within > 0,1 s up to	[s]	[s]	[s]	--
	- 60 s				N/A
	- 120 s	14	12	13	P

	TESTS „E_2“ 3 + 4 samples HGD 63U, D1, 2P				
9.12.11.4.3	**Test: E2 (Test at rated short-circuit capacity)**	**E_{2-18}**	**E_{2-19}**	**E_{2-20}**	--
	Rated short-circuit capacity (Icn)..... :	15000A			--
	Test circuit: figure ..... :	Figure 3			--
	Test voltage 1,05 Un	444V			--
	Prospective current ..... :	15000A			--
	Prospective current obtained ..... :	15,3x10^{3}A			--
	Power factor ..... :	0,20~0,25			--
	Power factor obtained ..... :	0,22			--
	Sequence ..... :	O-CO			--
	T (min) ..... :	3 min			--
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” = 45 mm			--
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: _____x_____x_____mm			--
	I_{Peak} (A) max. value..... :	254A			--
	$I^2t \leq$ _____ kA^{2}s	[kA^{2}s]	[kA^{2}s]	[kA^{2}s]	--
	Max. $I^2t \leq$ _____kA^{2}s L1	0,135	0,146	0,105	P
	L2	___	____	___	
	L3	___	___	___	
	L4(N)	___	___	___	

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Clause	Requirement + Test	Result - Remark			Verdict
	- 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:				--
9.12.12.2	The circuit-breakers shall show no damage impairing their further use and shall maintenance, withstand the following tests.				P
	a) leakage current across open contacts, according to 9.7.5.3, each pole is supplied at a voltage 1,1 times Un.= 457 V. The circuit – breaker is in the open position	**$E_{2\text{-}18}$** [µA]	**$E_{2\text{-}19}$** [µA]	**$E_{2\text{-}20}$** [µA]	--
	The leakage current shall not exceed 2 mA L1	3,86	4,62	5,41	P
	L2	2,83	3,14	2,95	P
	L3				N/A
	L4(N)				N/A
	Electric strength test:				--
	Test voltage 900 V (see 9.7.3)				P
	a)				P
	b)				P
	c)				P
	d)				N/A
	e)				N/A
	Test current 2,8 I_N	2,8A			P
	Tripping within > 0,1 s up to	[s]	[s]	[s]	--
	- 60 s	15	13	14	P
	- 120 s				N/A

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Clause	Requirement + Test	Result - Remark	Verdict

	TESTS „E_2“ 3 + 4 samples HGD 63U, D63, 4P				
9.12.11.4.3	**Test: E2 (Test at rated short-circuit capacity)**	**E_{2-21}**	**E_{2-22}**	**E_{2-23}**	--
	Rated short-circuit capacity (Icn)..... :	15000A			--
	Test circuit: figure ..... :	Figure 3			--
	Test voltage 1,05 Un	444V			--
	Prospective current ..... :	15000A			--
	Prospective current obtained ..... :	15,3x10^{3}A			--
	Power factor ..... :	0,20~0,25			--
	Power factor obtained ..... :	0,23			--
	Sequence ..... :	O-CO			--
	T (min) ..... :	3 min			--
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” = 45 mm			--
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: _____x_____x_____mm			--
	I_{Peak} (A) max. value..... :	5,64kA			--
	$I^2t \leq$ _____ kA^{2}s	[kA^{2}s]	[kA^{2}s]	[kA^{2}s]	--
	Max. $I^2t \leq$ _____kA^{2}s L1	147	41,8	46,3	P
	L2	___	____	___	
	L3	___	___	___	
	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:				--
9.12.12.2	The circuit-breakers shall show no damage impairing their further use and shall maintenance, withstand the following tests.				P
	a) leakage current across open contacts, according to 9.7.5.3, each pole is supplied at a voltage 1,1 times Un.= 457 V. The circuit – breaker is in the open position	**E_{2-21}** [µA]	**E_{2-22}** [µA]	**E_{2-23}** [µA]	--
	The leakage current shall not exceed 2 mA L1	3,65	4,37	5,05	P
	L2	2,27	2,65	4,65	P

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Clause	Requirement + Test	Result - Remark			Verdict
	L3	3,42	2,98	2,78	P
	L4~~(N)~~	1,73	1,82	2,04	P
	Electric strength test:				--
	Test voltage 900 V (see 9.7.3)				P
	a)				P
	b)				P
	c)				P
	d)				N/A
	e)				N/A
	Test current 2,8 I_N	177A			P
	Tripping within > 0,1 s up to	[s]	[s]	[s]	--
	- 60 s				N/A
	- 120 s	12	9	10	P

	TESTS „E_2“ 3 + 4 samples HGD 63U, D1, 4P				
9.12.11.4.3	**Test: E2 (Test at rated short-circuit capacity)**	**E_{2-24}**	**E_{2-25}**	**E_{2-26}**	--
	Rated short-circuit capacity (Icn)..... :	15000A			--
	Test circuit: figure ..... :	Figure 3			--
	Test voltage 1,05 Un	444V			--
	Prospective current ..... :	15000A			--
	Prospective current obtained ..... :	15,3x10^{3}A			--
	Power factor ..... :	0,20~0,25			--
	Power factor obtained ..... :	0,22			--
	Sequence ..... :	O-CO			--
	T (min) ..... :	3 min			--
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” = 45 mm			--
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: _____x_____x_____mm			--
	I_{Peak} (A) max. value..... :	284A			--
	$I^2t \leq$ _____ kA^{2}s	[kA^{2}s]	[kA^{2}s]	[kA^{2}s]	--
	Max. $I^2t \leq$ _____kA^{2}s L1	0,198	0,175	0,147	P
	L2	___	____	___	
	L3	___	___	___	
	L4(N)	___	___	___	

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Clause	Requirement + Test	Result - Remark			Verdict
	- 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:				--
9.12.12.2	The circuit-breakers shall show no damage impairing their further use and shall maintenance, withstand the following tests.				P
	a) leakage current across open contacts, according to 9.7.5.3, each pole is supplied at a voltage 1,1 times Un.= 457 V. The circuit – breaker is in the open position	**$E_{2\text{-}24}$** [µA]	**$E_{2\text{-}25}$** [µA]	**$E_{2\text{-}26}$** [µA]	--
	The leakage current shall not exceed 2 mA L1	5,65	4,69	6,05	P
	L2	3,74	3,26	4,28	P
	L3	4,16	3,14	3,16	P
	L4(N)	2,05	1,82	1,95	P
	Electric strength test:				--
	Test voltage 900 V (see 9.7.3)				P
	a)				P
	b)				P
	c)				P
	d)				N/A
	e)				N/A
	Test current 2,8 I_N	2,8A			P
	Tripping within > 0,1 s up to	[s]	[s]	[s]	--
	- 60 s	14	11	12	P
	- 120 s				N/A

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Clause	Requirement + Test	Result - Remark	Verdict

	Annex E		
	Special requirements for auxiliary circuits for safety extra-low voltage		--
8.1.3	**Clearances and creepage distances**		--
	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		N/A
9.7.4	**Dielectric strength of the auxiliary circuits**		--
	Note: A test for circuits intended for connection to safety extra-low voltage is under consideration		N/A

	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**		--
	Universal terminals		--
	- no marking		N/A
	Non-universal		--
	- declared for rigid-solid conductors	marked with: “sol”	N/A
	- declared for rigid(solid and stranded) .....:	marked with: “r”	N/A
	- declared for flexible conductors .....:	Marked with: “f”	N/A
	The markings should appear on the circuit-breaker or, if available space is not sufficient, on smallest package unit or in technical information .....:		N/A
	Indication of length of insulation to be removed on the circuit-breaker.....:	_____mm	N/A
J.7	**Standard conditions for operation in service**		--
	Clause 7 applies		N/A
J.8	**Constructional requirements**		--
	Clause 8 applies with the follow modifications:		N/A
	In clause 8.1.5 only –5.1, -5.2. –5.3, - 5.6 and - 5.7 apply		N/A
	Compliance is checked by inspection and by the tests of J.9.1 and J.9.2		N/A
J.8.1	**Connection or disconnection of conductors**		--

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Clause	Requirement + Test	Result - Remark	Verdict
	The connection or disconnection shall be made by:		N/A
	A general purpose tool or by a convenient device integral with the terminal or		N/A
	for rigid conductors by simple insertion		N/A
	For disconnection an operation other than a pull shall be necessary (push-wire terminals)		N/A
	Universal terminals shall accept rigid (solid or stranded and flexible unprepared conductors		N/A
	Non-universal terminals shall accept conductors declared by the manufacturer		N/A
	Compliance is checked by inspection and by the tests of J.9.1 and J.9.2		N/A
J.8.2	**Dimensions of connectable conductors**		--
	The dimensions of connectable conductors are given in table J.1		N/A
	The ability to connect these conductors shall be checked by inspection and by the tests of J.9.1 and J.9.2		N/A
J.8.3	**Connectable cross-sectional areas**		--
	The nominal cross-sections to be clamped are given in table J.2		N/A
	Compliance is checked by inspection and by the tests of J.9.1 and J.9.2		N/A
J.8.4	**Insertion and connection of conductors**		--
	The insertion and disconnection of the conductors shall be made in accordance with the manufacturer’s instructions		N/A
J.8.5	**Design and construction of terminals**		--
	Terminals shall be designed and constructed that:		N/A
	- each conductor is clamped individually		N/A
	- connection or disconnection connectors connected or disconnected separate or same		N/A
	- inadequate insertion of the conductor is avoided		N/A
	Compliance is checked by inspection and by the tests of J.9.1 and J.9.2		N/A
J.8.6	**The terminals shall be resistant to ageing**		--
	Compliance is checked by the tests of J.9.3		N/A
J.9	**Tests**		--

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Clause	Requirement + Test	Result - Remark	Verdict
	Clause 9 applies, by replacing 9.4 and 9.5 by the follow		N/A
J.9.1	**Test of reliability of screw less terminals**		--
J.9.1.1	**Reliability of screw less system**		--
	5 times connection and disconnection		N/A
	3 rigid conductors min. cross-section max. cross-section	_____mm^2 _____mm^2	N/A
	3 flexible conductors min. cross-section max. cross-section	_____mm^2 _____mm^2	N/A
	After tests, the terminal shall not be damage in such a way as to impair its further use		N/A
J.9.1.2	**Test of reliability of connection**		--
	3 terminals of poles of new sample are fitted with new copper conductors according table J.2		N/A
	rigid conductors min. cross-section max. cross-section	_____mm^2 _____mm^2	N/A
	flexible conductors min. cross-section max. cross-section	_____mm^2 _____mm^2	N/A
	Each conductor is either pushed as far as possible into the terminal or shall be inserted so that adequate connection is obvious		N/A
	After tests, no wire of the conductor shall have escaped outside the terminals		N/A
J.9.2	**Tests of reliability of terminals for external conductors: Mechanical strength**		--
	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.		N/A
	Each conductor is subjected to a pull force of value shown in table J.3. for 1 min		N/A
	Terminal screw torque : $^2/_3$ of table 11	_____ Nm	N/A
	rigid conductors min. cross-section max. cross-section	_____ mm^2 / _____N _____ mm^2 / _____N	N/A
	flexible conductors min. cross-section max. cross-section	_____ mm^2 / _____N _____ mm^2 / _____N	N/A
	During the test the conductor shall not slip out of the terminal		N/A
J.9.3	**Cycling test**		--
	The test is carried out with new copper conductors having a cross sectional area according table 10	_____ mm^2	N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	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		N/A
	- universal terminals for rigid (solid and stranded) and flexible conductors	3 + 3 samples	N/A
	- non-universal terminals for solid conductors only	3 samples	N/A
	-- non- universal terminals for rigid (solid and stranded) conductors	3 + 3 samples	N/A
	- non-universal terminals for flexible conductors only	3 samples	N/A
	The conductors are connected in series as in normal use to each of the three samples as defined on fig. J.1.		N/A
	The sample is provided with a hole or equivalent in order to measure the voltage drop on the terminal		N/A
	The test arrangement is placed in a heating cabinet which is initially on 20°C		N/A
	Except the cooling period the test current (rated current) is applied to the circuit	I test _____ A	N/A
	The samples shall be subjected to 192 temperature cycles, each cycle having a duration of +/- 1 hour		N/A
	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		N/A
	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	N/A
	Sample after 24 cycles: rigid conductors (mV) flexible conductors (mV)	J_1 N/A J_3 _____ _____ _____ _____	
	Sample after 192 cycles: rigid conductors (mV) flexible conductors (mV)	J_1 N/A J_3 _____ _____ _____ _____	
	After this test the samples shall show no changes evidently impairing further use, such as cracks, deformations or like		N/A

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Clause	Requirement + Test	Result - Remark	Verdict

	Annex K		
	Particular requirements for circuit-breakers with flat quick-connect terminations		--
K.6	**Marking**		--
	The whole of clause 6 applies		N/A
	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		N/A
	a) manufacturers name or trade mark		--
	b) type reference		N/A
	c) information on cross-sections of conductors and colour code of insulating female connectors (see table K.1)		N/A
	d) the use of only silver or tin-plated copper alloys		N/A
K.7	**Standard conditions for operation in service**		--
	Clause 7 applies		N/A
K.8	**Constructional requirements**		--
	Clause 8 applies with the follow modifications:		N/A
	replacement of 8.1.3 by:		--
K.8.1	**Clearances and creepage distances (see annex B)**		--
	Subclause 8.1.3 applies, the female connectors being fitted to the male tabs of the circuit-breaker		N/A
	Replacement of 8.1.5 by:		N/A
K.8.2	**Terminals for external conductors**		--
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		N/A
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		N/A
	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		N/A
	The dimensions of the female connector which may be fitted-on are given in figure K.6 and in table K.4		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Compliance is checked by inspection and by measurement	See table on page _____	N/A
K.8.2.3	**Male tabs shall be securely retained**		--
	Compliance is checked by the mechanical overload test of K.9.1		N/A
K.9	**Tests**		--
	Clause 9 applies, with follow modifications:		N/A
	Replacement of 9.5 by:		N/A
K.9.1	**Mechanical overload-force**		--
	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	N/A
	No damage which could impair further use shall occur to the tab or to the circuit-breaker in which the tab is integrated		N/A
	Addition to 9.8.3:		N/A
	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		N/A

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Clause	Requirement + Test	Result - Remark	Verdict

		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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Clause	Requirement + Test	Result - Remark	Verdict

	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**		**--**
	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"	N/A
	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	N/A
L.7	**Standard conditions for operation in service**		--
	Clause 7 applies		N/A
L.8	**Constructional requirements**		--
	Clause 8 applies with the following exceptions:		N/A
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		N/A
	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.		N/A
	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		N/A
8.1.5.4	Terminals shall allow the conductors to be connected without special preparation		N/A
	Compliance is checked by inspection and by the tests of L.9		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
L.9	**Tests**		--
	Clause 9 applies with the following modifications/additions:		N/A
	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		N/A
	Additionally the test of L.9.2 is carried out on terminals separated from the circuit-breaker		N/A
L.9.2	**Current cycling test**		--
	This test is carried out on separate terminals		N/A
	The general arrangement of the samples shall be as shown in figure L.1		N/A
	90 % of torque stated by the manufacturer or selected in table 11 used for the specimens	torque:_____Nm	N/A
	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	N/A
	Cross section of equalizer not greater than that given in table L.7	max. crosssection_____mm^2	N/A
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	N/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		N/A
	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		N/A
	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		N/A
	For each screw-type terminal		N/A
	- the temperature rise shall not exceed 110 K		N/A
	- the stability factor Sf shall not exceed ± 10 °C		N/A

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Clause	Requirement + Test	Result - Remark		Verdict
	ambient air temperature: _____°C	max. temperature rise [K]	max. stability factor Sf [°C]	N/A
	Terminal 1			N/A
	Terminal 2			N/A
	Terminal 3			N/A
	Terminal 4			N/A
	Terminal 5			N/A
	Terminal 6			N/A
	Terminal 7			N/A
	Terminal 8			N/A

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Clause	Requirement + Test	Result - Remark	Verdict

ATTACHMENT TO TEST REPORT IEC 60898-1
EUROPEAN GROUP DIFFERENCES AND NATIONAL DIFFERENCES
Circuit-breakers for over current protection for household and similar installations

Part 1 - Circuit-breakers for a.c. operation

Differences according to ..... EN 60898-1:2003+A1:2004+A11:2006+A12:2008+A13:2012

Attachment Form No. ..... EU_GD_IEC60898_1C

Attachment Originator ..... DEKRA

Master Attachment 2014-03

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	CENELEC COMMON MODIFICATIONS (EN)	
Test item particulars.....		
Type of circuit-breaker .....:	HGD 63U	
Energy limiting class .....:	☐ Class 1 ☐ Class 3	
Value of rated operational voltage (Ue) .....:	☐ 230 V ☒ 240 V ☐ 230/400 V ☐ 400 V ☒ 240/415 V ☒ 415 V	
Rated impulse withstand voltage (Uimp)	4 kV	

	Requirements for construction and operation		
9.6	**Test of protection against electric shock**		--
	In case of knock-outs the test finger is applied with a force of 10 N		P

	GENERAL		
9.12	**Short-circuit tests**		
9.12.2	Value of the power frequency recovery voltage shall be equal to 110 % of the rated voltage.		P
9.12.3	Tolerances on test quantities		
	voltage (including recovery voltage) : 0, -5%		P

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Clause	Requirement + Test	Result - Remark	Verdict
	TESTS „A“ 1 sample: **1 SAMPLE, HGD 63U, D63, 1P** **1 SAMPLE, HGD 63U, D63, 4P**		
6	**MARKING AND OTHER INFORMATION**		**--**
6.1	***Standard marking:***		--
	f) Rated short circuit capacity in A within a rectangle, without symbol “A”	HGD 63U 15000 within a rectangle	P
	h) calibration temperature, if different from 30°C		N/A
	j) Energy limiting class in a square in accordance with annex ZA.		N/A
	k) Making and breaking capacity on an individual protected pole of multipole circuit-breakers (Icn1), if different from Icn		N/A
6.2	***Additional marking***		
	Additional marking to other standards (EN or IEC or other) is allowed under the follow conditions:		--
	- the circuit-breaker shall comply with all the requirements of the additional standard;		--
	- the relevant standard to which the additional marking refers shall be indicated adjacent to this marking and shall be clearly differentiated or separated from the standard marking according to cl. 6.1		-
	Compliance is checked by inspection and by carrying out all the test sequences required by the relevant standard. Equivalent or less severe test sequences need not be repeated.		P
6.3	**Guidance table for marking**		
	Each MCB shall be marked in a durable manner with all or, for small apparatus, according table for marking		P

	TESTS „C“ 3 samples: HGD 63U, D63, 1P	**C_{1-1} C_{1-2} C_{1-3}**	
9.11.3	Dielectric strength reduced to 900 V		P

	TESTS „C“ 3 samples: HGD 63U, D63, 4P	**C_{1-4} C_{1-5} C_{1-6}**	
9.11.3	Dielectric strength reduced to 900 V		P

9.12.11.2.2	**Test C_2 : Short-circuit test on circuit-breakers for use in IT systems** **3 samples: HGD 63U, D63, 1P**	**C_{2-1} C_{2-2} C_{2-3}**	--
	Test voltage 105 % of 400 V	444V	P

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Clause	Requirement + Test	Result - Remark	Verdict
9.12.11.2.2	**Test C_2 : Short-circuit test on circuit-breakers for use in IT systems 2 samples: HGD 63U, D63, 2P**	**C_{2-4} C_{2-5}**	--
	Test voltage 105 % of 400 V	444V	P
9.12.11.2.2	**Test C_2 : Short-circuit test on circuit-breakers for use in IT systems 1 sample: HGD 63U, D63, 4P**	**C_{2-6}**	--
	Test voltage 105 % of 400 V	444V	P
	TESTS „D“ 3 samples: HGD 63U, D63, 1P		
9.10	***Tests: D_O***	**D_{1-1} D_{1-2} D_{1-3}**	
	If the tests are made in a test chamber, it shall be made in still air; the volume of the chamber shall not affect the test results.		
9.10.2.2	☐ For circuit-breakers of the B – Type		
	Test current $3I_N$ (A), starting from cold	_____ A	
	Opening time:	[S] [S] [S]	
	- 0,1s ≤ t ≤ 45s (≤ 32A)		N/A
	- 0,1s ≤ t ≤ 90s (> 32A)		N/A
	Moreover the CB shall perform following test:		
9.10.1.2	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)		N/A
	- 120 s (> 32 A)		N/A
9.10.2.3	☐ For circuit-breakers of the C – Type		
	Test current $5I_N$ (A), starting from cold	A	
	Opening time:	[S] [S] [S]	
	- 0,1s ≤ t ≤ 15 s (≤ 32A)		N/A
	- 0,1s ≤ t ≤ 30 s (> 32A)		N/A
	Moreover the CB shall perform following test:		
9.10.1.2	Test current 2,55 I_N (A) starting from cold for:		
	opening time not less than 1 s or more than	[s] [s] [s]	
	- 60 s (≤ 32 A)		N/A
	- 120 s (> 32 A)		N/A
9.10.2.4	☒ For circuit-breakers of the D – Type		
	Test current $10I_N$ (A), starting from cold	630A	

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Clause	Requirement + Test	Result - Remark	Verdict

	Opening time:	[S]	[S]	[S]	
	- 0,1s ≤ t ≤ 4s (In ≤ 32 A)				N/A
	- 0,1s ≤ t ≤ 8s (In≤ 10A or In > 32A)	1,21	1,45	1,36	P
	Test current 20 I_N (A) starting from cold	1,27kA			P
	Tripping less than 0,1 s	8,74ms	8,63ms	8,83ms	P
	Moreover the CB shall perform following test:				
9.10.1.2	Test current 2,55 I_N (A) starting from cold for:				
	opening time not less than 1 s or more than	[s]	[s]	[s]	
	- 60 s (≤ 32 A)				N/A
	- 120 s (> 32 A)	13	17	14	P

	TESTS „D“ 3 samples: HGD 63U, D63, 4P				
9.10	***Tests: D_O***	**D_{1-4}**	**D_{1-5}**	**D_{1-6}**	
	If the tests are made in a test chamber, it shall be made in still air; the volume of the chamber shall not affect the test results.				
9.10.2.2	☐ For circuit-breakers of the B – Type				
	Test current 3I_N (A), starting from cold	_____ A			
	Opening time:	[S]	[S]	[S]	
	- 0,1s ≤ t ≤ 45s (≤ 32A)				N/A
	- 0,1s ≤ t ≤ 90s (> 32A)				N/A
	Moreover the CB shall perform following test:				
9.10.1.2	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)				N/A
	- 120 s (> 32 A)				N/A
9.10.2.3	☐ For circuit-breakers of the C – Type				
	Test current 5I_N (A), starting from cold	A			
	Opening time:	[S]	[S]	[S]	
	- 0,1s ≤ t ≤ 15 s (≤ 32A)				N/A
	- 0,1s ≤ t ≤ 30 s (> 32A)				N/A
	Moreover the CB shall perform following test:				
9.10.1.2	Test current 2,55 I_N (A) starting from cold for:				
	opening time not less than 1 s or more than	[s]	[s]	[s]	
	- 60 s (≤ 32 A)				N/A
	- 120 s (> 32 A)				N/A

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Clause	Requirement + Test	Result - Remark	Verdict

9.10.2.4	☒ For circuit-breakers of the D – Type				
	Test current $10I_N$ (A), starting from cold	630A			
	Opening time:	[S]	[S]	[S]	
	- 0,1s ≤ t ≤ 4s (In ≤ 32 A)				N/A
	- 0,1s ≤ t ≤ 8s (In≤ 10A or In > 32A)	1,12	1,04	1,26	P
	Test current 20 I_N (A) starting from cold	1,27kA			P
	Tripping less than 0,1 s	8,76ms	9,02ms	8,92ms	P
	Moreover the CB shall perform following test:				
9.10.1.2	Test current 2,55 I_N (A) starting from cold for:				
	opening time not less than 1 s or more than	[s]	[s]	[s]	
	- 60 s (≤ 32 A)				N/A
	- 120 s (> 32 A)	12	15	13	P

	TESTS „D“ 13 samples: HGD 63U, D1~D50, 1P					
9.10	***Tests: D_O***					
	If the tests are made in a test chamber, it shall be made in still air; the volume of the chamber shall not affect the test results.					
9.10.2.4	☒ For circuit-breakers of the D – Type					
	Test current $10I_N$ (A), starting from cold	**D_0-1**	**D_0-2**	**D_0-3**	**D_0-4**	--
		10,0	20,0	30,0	40,0	--
		D_0-5	**D_0-6**	**D_0-7**	**D_0-8**	--
		60,0	100	130	160	--
		D_0-9	**D_0-10**	**D_0-11**	**D_0-12**	--
		200	250	320	400	--
		D_0-13				
		500				
	Opening time:	[s]	[s]	[s]	[s]	--
	- 0,1s ≤ t ≤ 15s (≤ 32A)	**D_0-1**	**D_0-2**	**D_0-3**	**D_0-4**	--
		2,04	1,78	1,62	1,51	P
		D_0-5	**D_0-6**	**D_0-7**	**D_0-8**	--
		1,47	1,36	1,49	1,31	P
		D_0-9	**D_0-10**	**D_0-11**		--
		1,52	1,28	1,49		P
	- 0,1s ≤ t ≤ 30s (> 32A)	**D_0-12**	**D_0-13**			--
		1,12	1,37			P

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Clause	Requirement + Test	Result - Remark				Verdict
	Moreover the CB shall perform following test:					--
9.10.1.2	Test current 2,55 I_N (A) starting from cold for:	**D_0-1**	**D_0-2**	**D_0-3**	**D_0-4**	--
		2,55	5,10	7,65	10,2	--
		D_0-5	**D_0-6**	**D_0-7**	**D_0-8**	--
		15,3	25,5	33,2	40,8	--
		D_0-9	**D_0-10**	**D_0-11**	**D_0-12**	--
		51,0	63,8	81,6	102	--
		D_0-13				
		128				
	opening time not less than 1 s or more than	[S]				--
	- 60 s (≤ 32 A)	**D_0-1**	**D_0-2**	**D_0-3**	**D_0-4**	--
		16	14	15	13	P
		D_0-5	**D_0-6**	**D_0-7**	**D_0-8**	--
		16	14	16	15	P
		D_0-9	**D_0-10**	**D_0-11**		
		17	13	15		
	- 120 s (> 32 A)	**D_0-12**	**D_0-13**			--
		16	13			P

	TESTS „D“ 14 samples: HGD 63U, C1~C63, 1P					
9.10	***Tests: D_O***					
	If the tests are made in a test chamber, it shall be made in still air; the volume of the chamber shall not affect the test results.					
9.10.2.3	☒ For circuit-breakers of the C – Type					
	Test current 5I_N (A), starting from cold	**D_0-14**	**D_0-15**	**D_0-16**	**D_0-17**	--
		5	10	15	20	--
		D_0-18	**D_0-19**	**D_0-20**	**D_0-21**	--
		30	50	65	80	--
		D_0-22	**D_0-23**	**D_0-24**	**D_0-25**	--
		100	125	160	200	--
		D_0-26	**D_0-27**			--
		250	315			--
	Opening time:	[s]	[s]	[s]	[s]	--
	- 0,1s ≤ t ≤ 45s (≤ 32A)	**D_0-14**	**D_0-15**	**D_0-16**	**D_0-17**	--
		3,47	3,26	3,19	3,04	P

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Clause	Requirement + Test	Result - Remark				Verdict
		D_0-18	**D_0-19**	**D_0-20**	**D_0-21**	--
		2,87	2,62	2,47	2,79	P
		D_0-22	**D_0-23**	**D_0-24**		--
		2,16	2,45	2,48		P
	- 0,1s ≤ t ≤ 90s (> 32A)	**D_0-25**	**D_0-26**	**D_0-27**		--
		2,07	1,84	1,96		P
9.10.1.2	Test current 2,55 IN (A) starting from cold for:	**D_0-14**	**D_0-15**	**D_0-16**	**D_0-17**	--
		2,55	5,10	7,65	10,2	--
		D_0-18	**D_0-19**	**D_0-20**	**D_0-21**	--
		15,3	25,5	33,2	40,8	--
		D_0-22	**D_0-23**	**D_0-24**	**D_0-25**	--
		51,0	63,8	81,6	102	--
		D_0-26	**D_0-27**			--
		128	161			--
	opening time not less than 1 s or more than	[S]				--
	- 60 s (≤ 32 A)	**D_0-14**	**D_0-15**	**D_0-16**	**D_0-17**	--
		15	13	14	16	P
		D_0-18	**D_0-19**	**D_0-20**	**D_0-21**	--
		11	12	19	14	P
		D_0-22	**D_0-23**	**D_0-24**		--
		16	13	12		P
	- 120 s (> 32 A)	**D_0-25**	**D_0-26**	**D_0-27**		--
		17	14	12		P

	TESTS „D“ 14 samples: HGD 63U, B1~B63, 1P					
9.10	***Tests: D_O***					
	If the tests are made in a test chamber, it shall be made in still air; the volume of the chamber shall not affect the test results.					
9.10.2.3	☒ For circuit-breakers of the B – Type					
	Test current $3I_N$ (A), starting from cold	**D_0-28**	**D_0-29**	**D_0-30**	**D_0-31**	--
		3,0	6,0	9,0	12,0	--
		D_0-32	**D_0-33**	**D_0-34**	**D_0-35**	--
		18	30	39	48	--
		D_0-36	**D_0-37**	**D_0-38**	**D_0-39**	--
		60	75	96	120	--

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Clause	Requirement + Test	Result - Remark				Verdict
		D_0-40	**D_0-41**			--
		150	189			--
	Opening time:	[s]	[s]	[s]	[s]	--
	- 0,1s ≤ t ≤ 45s (≤ 32A)	**D_0-28**	**D_0-29**	**D_0-30**	**D_0-31**	--
		6,98	7,45	7,12	6,46	P
		D_0-32	**D_0-33**	**D_0-34**	**D_0-35**	--
		7,84	8,16	7,39	6,51	P
		D_0-36	**D_0-37**	**D_0-38**		--
		6,26	7,40	7,92		P
	- 0,1s ≤ t ≤ 90s (> 32A)	**D_0-39**	**D_0-40**	**D_0-41**		--
		6,04	7,62	6,91		P
9.10.1.2	Test current 2,55 IN (A) starting from cold for:	**D_0-28**	**D_0-29**	**D_0-30**	**D_0-31**	--
		2,55	5,10	7,65	10,2	--
		D_0-32	**D_0-33**	**D_0-34**	**D_0-35**	--
		15,3	25,5	33,2	40,8	--
		D_0-36	**D_0-37**	**D_0-38**	**D_0-39**	--
		51,0	63,8	81,6	102	--
		D_0-40	**D_0-41**			--
		128	161			--
	opening time not less than 1 s or more than	[S]				--
	- 60 s (≤ 32 A)	**D_0-28**	**D_0-29**	**D_0-30**	**D_0-31**	--
		17	18	16	15	P
		D_0-32	**D_0-33**	**D_0-34**	**D_0-35**	--
		17	15	19	18	P
		D_0-36	**D_0-37**	**D_0-38**		--
		16	17	14		P
	- 120 s (> 32 A)	**D_0-39**	**D_0-40**	**D_0-41**		--
		16	14	15		P

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Clause	Requirement + Test	Result - Remark	Verdict

	TESTS „E_3“				
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}**	
	Service short-circuit capacity.....:	_____ A			--
	Test circuit: figure .....:	*(Simplification of the figures for short circuit tests in IEC 60898-1:2015)*			--
	Test voltage.....:	V			
	Prospective current.....:	_____ A			--
	Prospective current obtained.....:	_____ A			--
	Power factor.....:	_____			--
	Power factor obtained.....:	_____			--
	Sequence.....:	O – t –CO 15° 45° 75°			--
	T (min) .....:	_____ min			--
9.12.9.1	Test in free air copper wire F': ☐ 0,12 mm / ☐ 0,16 mm resistor R' : ☐ 0,75 Ohm / ☐ 1,5 Ohm	"a" = _____ mm			
9.12.9.2	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			
	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				N/A
	- No permanent arcing				N/A
	- No flash-over between poles or between poles and frame				N/A
	- No blowing of the fuses F and F′				N/A
	- Polyethylene foil shows no holes				N/A
	After the test:				--
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 9.7.6.3, each pole is supplied at a voltage 1,1 times Un.= _____ V. The circuit –breaker is in the open position The leakage current shall not exceed 2 mm	**E_{3-1}** [µA]	**E_{3-2}** [µA]	**E_{3-3}** [µA]	

EN 60898-1			
Clause	Requirement + Test	Result - Remark	Verdict

	L1				N/A
	L2				N/A
	L3				N/A
	L4(N)				N/A
	Electric strength test:				
	Test voltage 900 V (see 9.7.3)				
	a)				N/A
	b)				N/A
	c)				N/A
	d)				N/A
	e) 2000 V				N/A
	Test current 2,8 I_N	_____ A			
	Tripping within > 0,1 s up to	[S]	[S]	[S]	
	- 60 s				N/A
	- 120 s				N/A

EN 60898-1			
Clause	Requirement + Test	Result - Remark	Verdict

Annex ZA
EN 60898-1:2003/A13:2012
(normative)

EN 60898-1

Classification of circuit-breakers into energy limiting classes

Circuit-breakers of B-type and C-type, when classified into energy limiting classes 1, 2, 3 in accordance with tables ZA1 or ZA2, as applicable, shall be marked with the number of the energy limiting class in a square adjoining the symbol given in f) of clause 6. — P

Table ZA.1 – Permissible I^2t (let-through) values for circuit-breakers type B with rated current up to and including 63 A — P

Rated shortcircuit capacity A	Type B				
	Class 1	Class 3			
	≤ 63 A	≤ 16 A	20 A, 25 A, 32 A	40 A	50 A, 63 A
3 000	No limits specified	15 000	18 000	21 600	**28 000**
4 500		25 000	32 000	38 400	**48 000**
6 000		35 000	45 000	54 000	**65 000**
10 000		70 000	90 000	108 000	**135 000**

Table ZA.2 – Permissible I^2t (let-through) values for circuit breakers type C with rated current up to and including 63 A

Rated shortcircuit capacity A	Type C				
	Class 1	Class 3			
	≤ 63 A	≤ 16 A	20 A, 25 A, 32 A	40 A	50 A, 63 A
3 000	No limits specified	**17 000**	**20 000**	**24 000**	**30 000**
4 500		**28 000**	**37 000**	**45 000**	**55 000**
6 000		**40 000**	**52 000**	**63 000**	**75 000**
10 000		**80 000**	**100 000**	**120 000**	**145 000**

The maximum I^2t values measured during the test of I cn (test sequence E_1 or E_2 as applicable) in accordance with 9.12.11.4 serve as reference values for the classification. — P

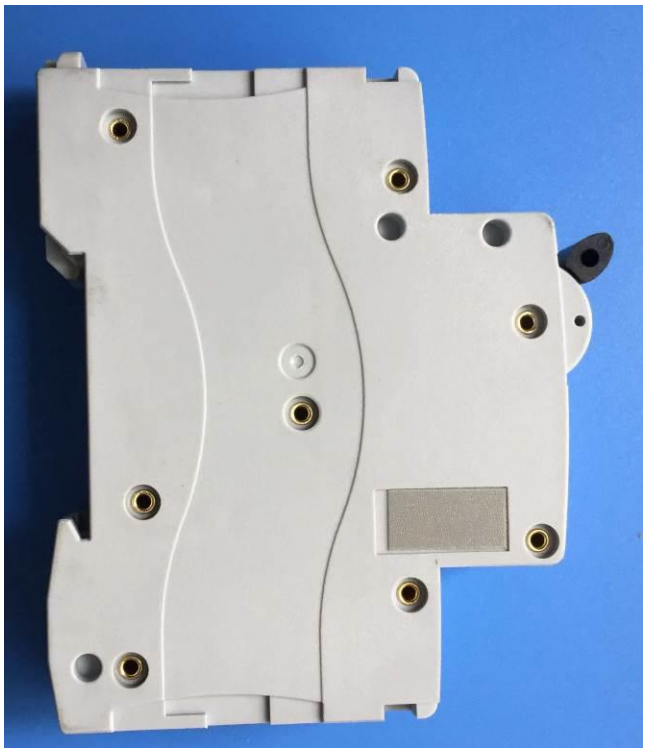
EN 60898-1			
Clause	Requirement + Test	Result - Remark	Verdict
	Compliance with the requirements of Tables ZA.1 and ZA.2 is checked on the circuit-breakers with the highest rated current available within the range covered by each of these tables.		P
	If these current ratings are not included in the samples submitted to test sequence E_1 or E_2 of Annex C, the appropriate number of samples of these ratings shall be additionally submitted to that test sequence. None of the values measured shall exceed the permissible I^2t value of the proposed energy limiting class in accordance with Tables ZA.1 and ZA.2.		P
	If circuit-breakers rated 40 A are submitted with the range of circuit-breakers with rating exceeding 16 A and their measured I^2t values are lower than those indicated in Table ZA.1 or Table ZA.2 for rating 32 A, no relevant test is necessary for the circuit-breakers rated 32 A.		P
	If circuit-breakers rated 50 A or 63 A are submitted with the range of circuit-breakers with rating exceeding 32 A and their measured I 2 t values are lower than those indicated in Table ZA.1 or Table ZA.2 for rating 40 A, no relevant test is necessary for the circuit-breakers rated 40 A.		P
	Annex ZC (Informative)		
	EN 60898-1 **Special national conditions**		
	For the countries in which the relevant special national conditions apply these provisions are normative, for other countries they are informative.		
J.1	**Austria, Czech Republic, Denmark, Netherlands, Norway and Switzerland**		
	The upper limit of current for use of screw less terminals is 16 A		
J.3.3	**Austria, Belgium, Denmark, France, Germany, Italy, Portugal, Spain, Sweden, Switzerland, and United Kingdom**		
	Only universal screwless type terminals are accepted.		
K1	**Belgium, France, Italy, Portugal, Spain, and United Kingdom**		
	The use of circuit-breakers with flat quick-connect terminations for rated currents up to and including 20 A is accepted.		
K.8.2.2	**Belgium, France, Italy, Portugal, Spain, and United Kingdom**		
	The use for rated currents up to and including 20 A		
	Annex ZD **EN 60898-1:2003/A13:2012** (normative)		
	Based on EN 60898-1:2003, A1:2004, A11:2005 and A12:2008, the following tests and/or requirements have been technically modified and may require retesting or inspection as applicable: - **6.3 Guidance table for marking, line j) of the table (including the comparison of already measured i^2t values with new Tables ZA.1 and ZA.2**		

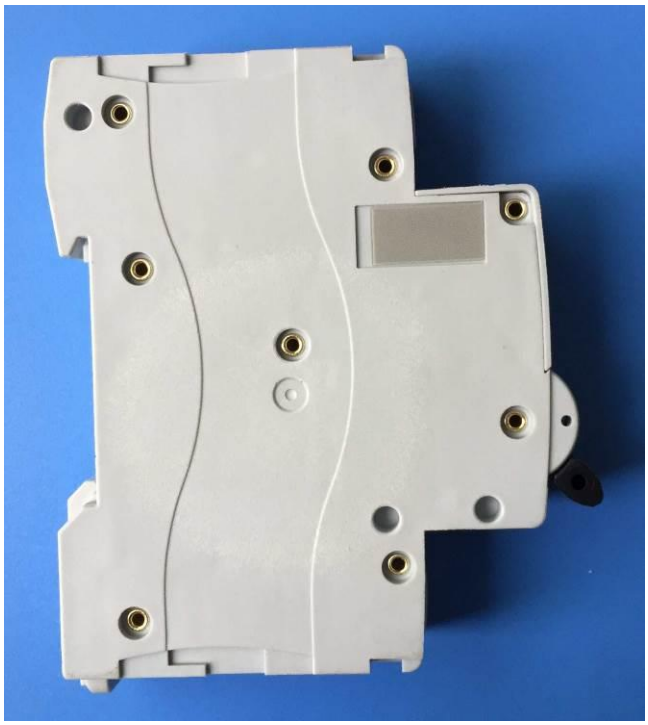
Photos of Sample: D63, 1P





Photos of Sample: D63, 1P

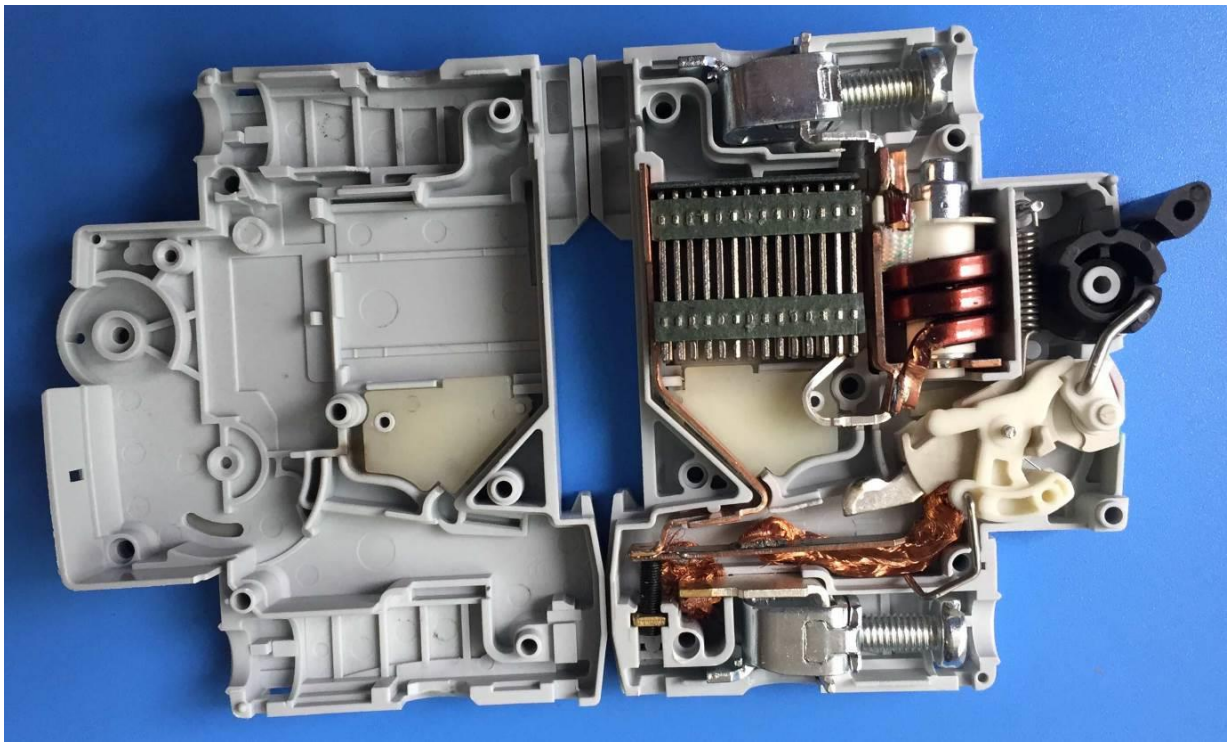




Photos of Sample: D63, 1P



Photos of Sample: D63, 1P



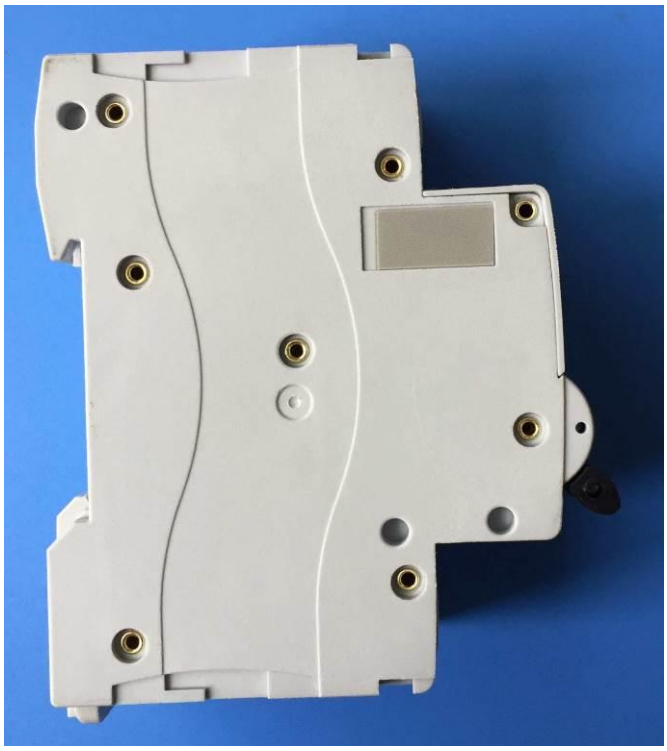
Photos of Sample: D63, 1P+N





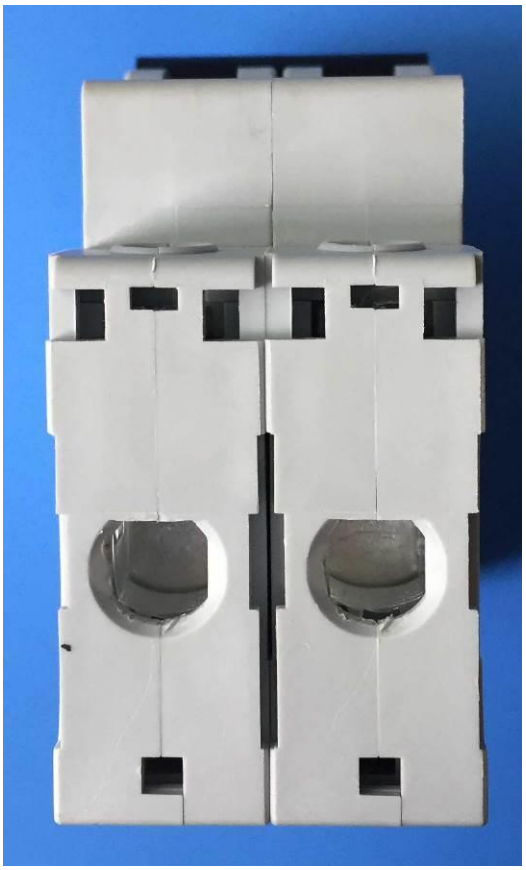
Photos of Sample: D63, 1P+N





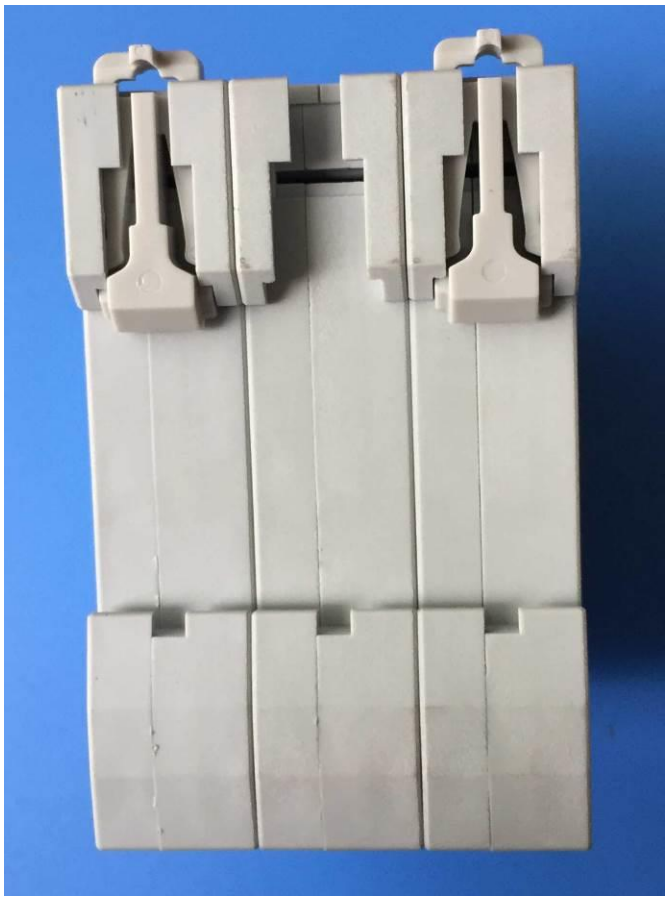
Photos of Sample: D63, 1P+N



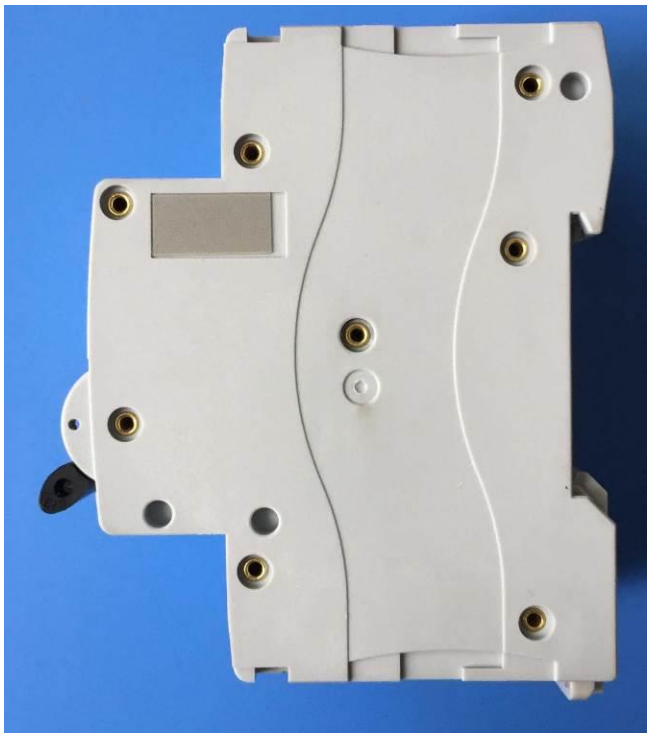


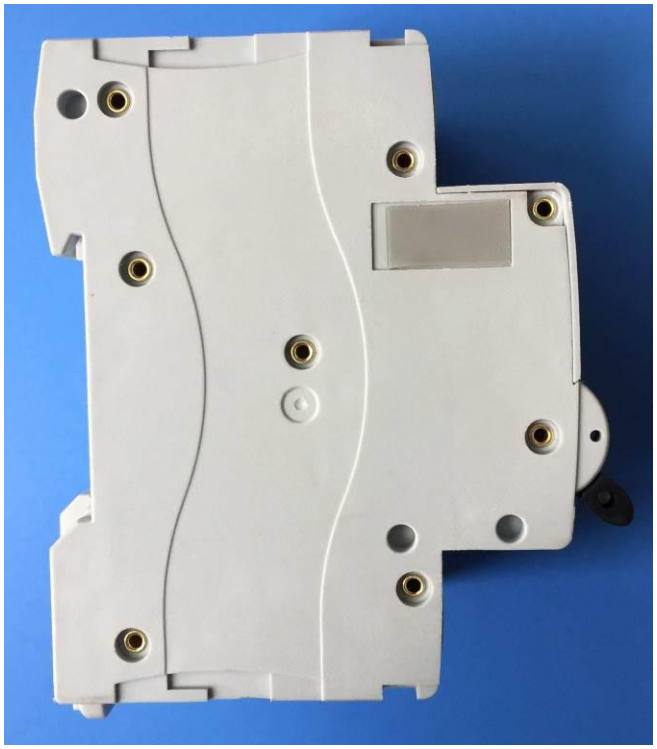
Photos of Sample: D63, 3P



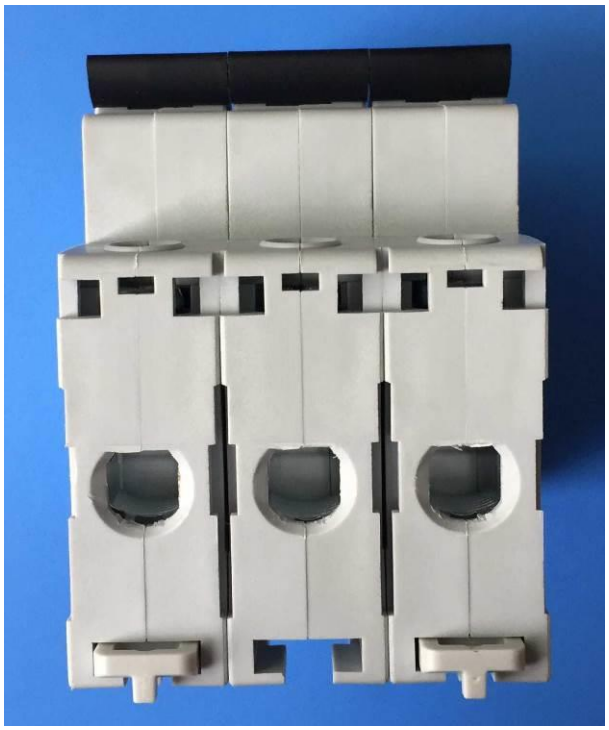


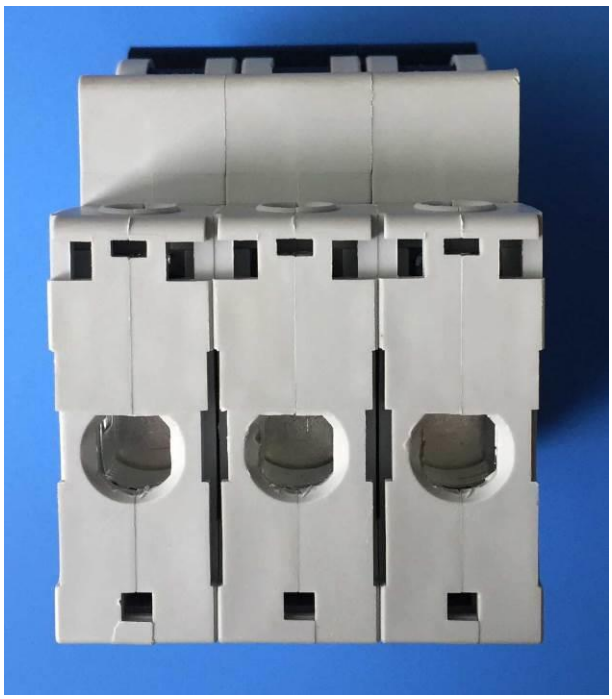
Photos of Sample: D63, 3P





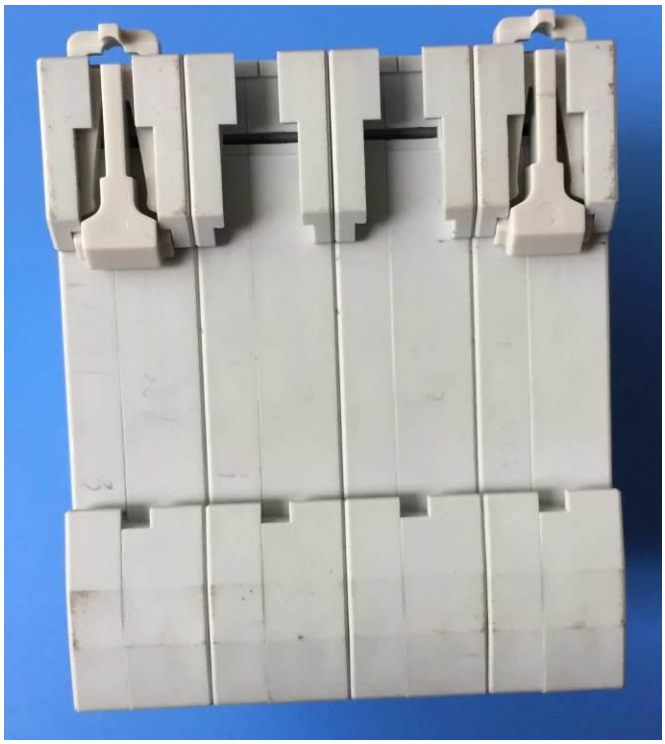
Photos of Sample: D63, 3P



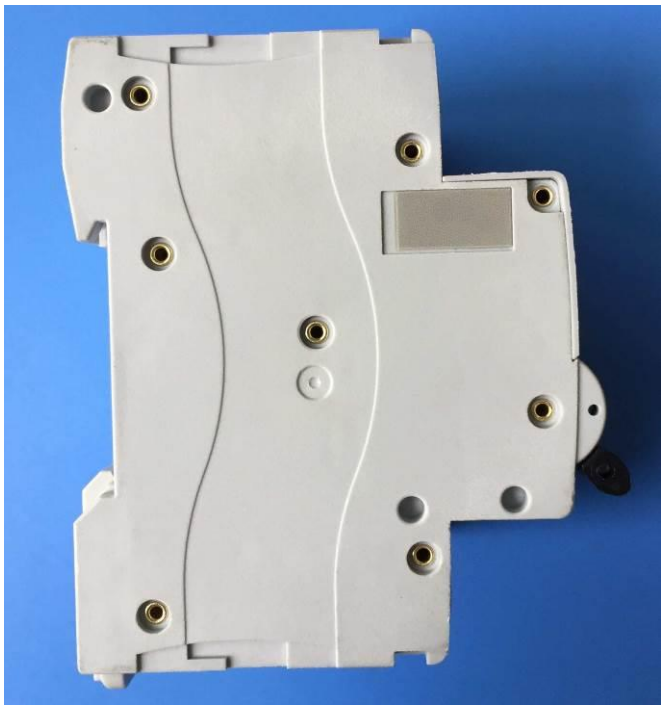


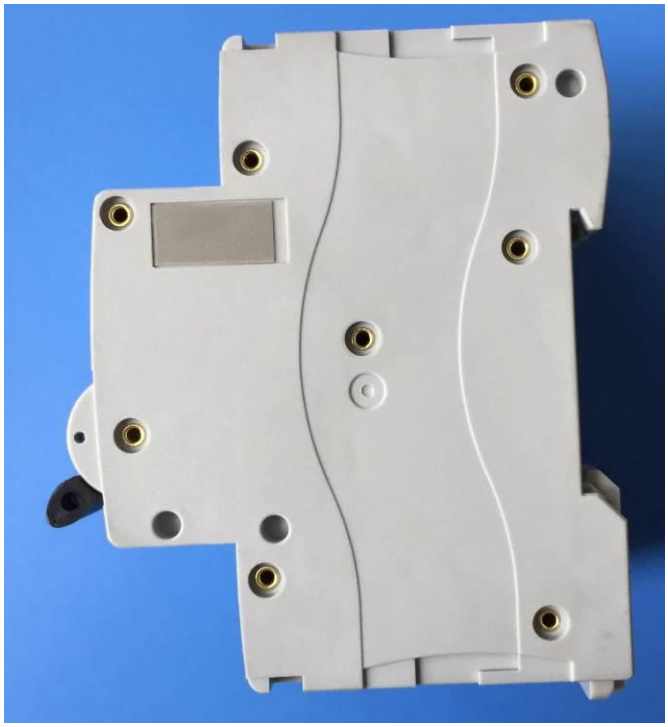
Photos of Sample: D63, 4P





Photos of Sample: D63, 4P





Photos of Sample: D63, 4P

