



Test Report issued under the responsibility of:



TEST REPORT IEC 60947-2 Low-voltage switchgear and controlgear - Part 2: Circuit-breakers	
Report Number	3328818.50
Date of issue	2024-03-12
Total number of pages	116
Name of Testing Laboratory preparing the Report	DEKRA Testing Services (Zhejiang) Co., Ltd.
Applicant's name	HD Hyundai Electric Co., Ltd.
Address	477, Bundangsuseo-ro, Bundang-gu, 13553 Seongnam-Si, Gyeonggi-Do, Republic of Korea
Test specification:	
Standard	IEC 60947-2:2016, IEC 60947-2:2016/AMD1:2019, for use in conjunction IEC 60947-1:2007, IEC 60947-1:2007/AMD1:2010, IEC 60947-1:2007/AMD2:2014
Test procedure	CB Scheme
Non-standard test method	N/A
Test Report Form No.	IEC60947_2K
Test Report Form(s) Originator	DEKRA Certification B.V.
Master TRF	Dated 2023-09-14
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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.	
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Test item description	Moulded-Case Circuit-Breaker
Trade Mark(s).....	HYUNDAI
Manufacturer	HD Hyundai Electric Co., Ltd. 477, Bundangsuseo-ro, Bundang-gu, 13553 Seongnam-Si, Gyeonggi-Do, Republic of Korea
Model/Type reference.....	UPB 160D F, UPB 160D N, UPB 160D S, UPB 160D H, UPB 160D L, UPB 160D X, UPB 125D F, UPB 125D N, UPB 125D S, UPB 125D H, UPB 125D L, UPB 125D X, UPB 50D F, UPB 50D N, UPB 50D S, UPB 50D H, UPB 50D L, UPB 50D X, HGP 160D F, HGP 160D N, HGP 160D S, HGP 160D H, HGP 160D L, HGP 160D X, HGP 125D F, HGP 125D N, HGP 125D S, HGP 125D H, HGP 125D L, HGP 125D X, HGP 50D F, HGP 50D N, HGP 50D S, HGP 50D H, HGP 50D L and HGP 50D X
Ratings.....	3P and 3P+N (N pole with overcurrent protection) Ue: 380 / 415 / 440 / 460 / 480 / 500 Vac, Ui: 1000 V, Uimp: 8 kV, In: 15 A, 16 A, 20 A, 25 A, 30 A, 32 A, 40 A, 50 A, 63 A, 75 A, 80 A, 100 A, 125 A, 150 A, 160 A Icu: 50 kA at 380 / 415 Vac, 36 kA at 440 / 460 Vac, 25 kA at 480 / 500 Vac for UPB / HGP F series 65 kA at 380 / 415 Vac, 50 kA at 440 / 460 Vac, 35 kA at 480 / 500 Vac for UPB / HGP N series 85 kA at 380 / 415 Vac, 65 kA at 440 / 460 Vac, 50 kA at 480 / 500 Vac for UPB / HGP S series 100 kA at 380 / 415 Vac, 85 kA at 440 / 460 Vac, 65 kA at 480 / 500 Vac for UPB / HGP H series 130 kA at 380 / 415 / 440 / 460 Vac, 85 kA at 480 / 500 Vac for UPB / HGP L series 150 kA at 380 / 415 / 440 / 460 Vac, 100 kA at 480 / 500 Vac for UPB / HGP X series Ics = 100% Icu

Responsible Testing Laboratory (as applicable), testing procedure and testing location(s):		
☒	CB Testing Laboratory:	DEKRA Testing Services (Zhejiang) Co., Ltd.
Testing location/ address.....:		No.5, Changjiang Road, Great Bridge Industrial Park, North Baixiang, Wenzhou, Zhejiang, 325603, P. R. China
Tested by (name, function, signature).....:		Ray Zhu (Engineer)
		
Approved by (name, function, signature)....:		Eric Wang (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) :		

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

N/A

Summary of testing:

In case of alternative test programs for circuit breakers with a different number of poles, the following program is used:

☐ Programme 1 (three pole fully tested)

☒ Programme 2 (four pole fully tested)

☐ Alternative program not applicable

Tests performed (name of test and test clause):

The following tests were conducted according to table 9 and 10 of IEC 60947-2.

No.	Current	Number of poles	Voltage	Short circuit current	Test sequence
1#	160 A	3P+N	500 Vac	N/A	I
39#	160 A	3P	500 Vac	N/A	I
40#	160 A	3P+N	460 Vac	150 kA	II+III
4#	15 A	3P+N	460 Vac	150 kA	II+III
41#	160 A	3P+N	500 Vac	100 kA	II+III (reversed connection)
6#	160 A	3P	460 Vac	150 kA	III
7#	160 A	3P+N	460 Vac / $\sqrt{3}$	90 kA	III (N pole + adjacent phase pole)
8#	15 A	3P+N	460 Vac / $\sqrt{3}$	90 kA	
9#	160 A	3P+N	500 Vac / $\sqrt{3}$	60 kA	
10#	160 A	3P+N	500 Vac	1,92 kA	Annex H
42#	160 A	3P+N	500 Vac	85	II+III (reversed connection)
43#	160 A	3P+N	500 Vac	N/A	Clause 5.2

Notes:

- 1a. This report is based on test report no. 2218075.50 issued on 2018-05-04.
- 2a. This report is issued due to that:
 - A1:2019 of IEC 60947-2:2016 is considered.
 - The name and address of applicant, manufacturer and factory are changed.
 - Two additional factory locations are added.
- 3a. The tests on sample no. 42# (HGP 160D L) and 43# (HGP 160D X) are carried out to verify the compliance, and other test results are taken from 2218075.50.

Notes from 2218075.50:

1. The products of UPB 160D F, UPB 160D N, UPB 160D S, UPB 160D H, UPB 160D L, UPB 160D X, UPB 125D F, UPB 125D N, UPB 125D S, UPB 125D H, UPB 125D L, UPB 125D X, UPB 50D F, UPB 50D N, UPB 50D S, UPB 50D H, UPB 50D L, UPB 50D X, HGP 160D F, HGP 160D N, HGP 160D S, HGP 160D H, HGP 160D L, HGP 160D X, HGP 125D F, HGP 125D N, HGP 125D S, HGP 125D H, HGP 125D L, HGP 125D X, HGP 50D F, HGP 50D N, HGP 50D S, HGP 50D H, HGP 50D L and HGP 50D X are a series of MCCBs with same frame size.
2. UPB series and HGP series are identical.
3. There is no construction break within the frame size.
4. The N pole is fully identical to phase pole, N pole can be at right or left side of product.
5. As per manufacturer's declaration, the release with adjustable or fixed is for commercial reasons. The circuit breaker with adjustable release and fixed release are fully identical except the mark on the labels.
6. 160 refers to 100 A, 125 A, 150 A, 160 A,
 125 refers to 15 A, 16 A, 20 A, 25 A, 30 A, 32 A, 40 A, 50 A, 63 A, 75 A, 80 A, 100 A, 125 A,
 50 refers to 15 A, 16 A, 20 A, 25 A, 30 A, 32 A, 40 A, 50 A
7. F, N, S, H, L and X are fully identical except the short circuit capacities and type references marked on the labels.
 F refers to 25 kA at 480 / 500 Vac, 36 kA at 440 / 460 Vac, 50 kA at 380 / 415 Vac
 N refers to 35 kA at 480 / 500 Vac, 50 kA at 440 / 460 Vac, 65 kA at 380 / 415 Vac
 S refers to 50 kA at 480 / 500 Vac, 65 kA at 440 / 460 Vac, 85 kA at 380 / 415 Vac
 H refers to 65 kA at 480 / 500 Vac, 85 kA at 440 / 460 Vac, 100 kA at 380 / 415 Vac
 L refers to 85 kA at 480 / 500 Vac, 130 kA at 380 / 415 / 440 / 460 Vac
 X refers to 100 kA at 480 / 500 Vac, 150 kA at 380 / 415 / 440 / 460 Vac
8. The tests conducted on HGP 160D X (maximum rated current with maximum short-circuit breaking capacity) and HGP 50D X (minimum rated current with maximum short-circuit breaking capacity) are deemed to cover the tests of all other models listed above.

Testing location:

Short-circuit test sequence other than 42# and clause 8.3.3.4.4, 8.3.3.5 in sequence I were conducted in:
 Zhejiang Fangyuan Test Group Co., Ltd.
 No. 400, Guangqiong Road, Jiaxing City, Zhejiang, China

All other tests were conducted in:
 DEKRA Testing Services (Zhejiang) Co., Ltd.
 No. 5, Changjiang Road, Great Bridge Industrial Park, North Baixiang, Wenzhou, Zhejiang, 325603, China

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

N/A

Use of uncertainty of measurement for decisions on conformity (decision rule) :

☒ No decision rule is specified by the IEC standard, when comparing the measurement result with the applicable limit according to the specification in that standard. The decisions on conformity are made without applying the measurement uncertainty ("simple acceptance" decision rule, previously known as "accuracy method").

☐ Other: ... (to be specified, for example when required by the standard or client, or if national accreditation requirements apply)

Information on uncertainty of measurement:

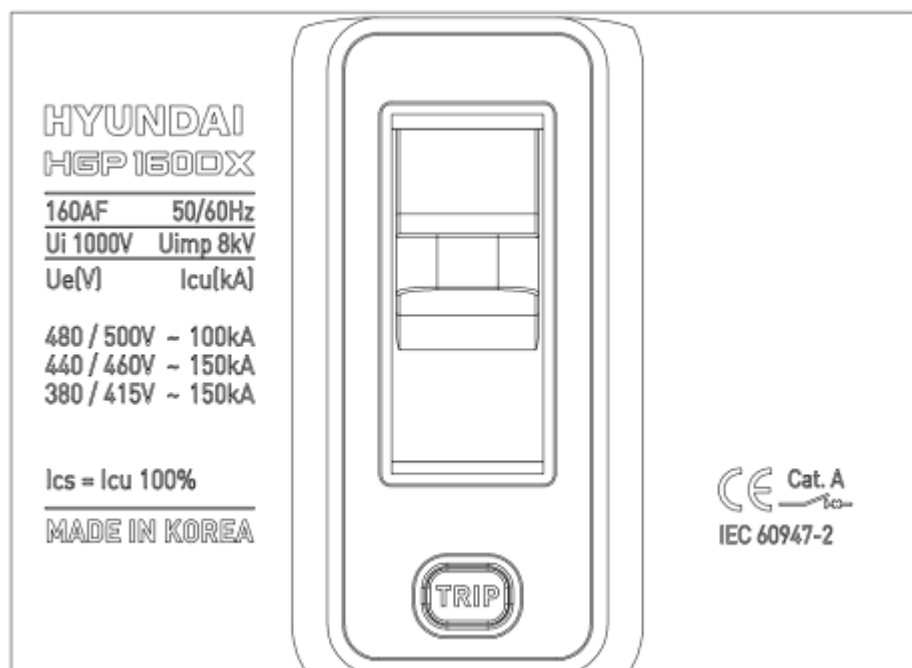
The uncertainties of measurement are calculated by the laboratory based on application of criteria given by OD-5014 for test equipment and application of test methods, decision sheets and operational procedures of IECEE.

IEC Guide 115 provides guidance on the application of measurement uncertainty principles and applying the decision rule when reporting test results within IECEE scheme, noting that the reporting of the measurement uncertainty for measurements is not necessary unless required by the test standard or customer.

Calculations leading to the reported values are on file with the NCB and testing laboratory that conducted the testing.

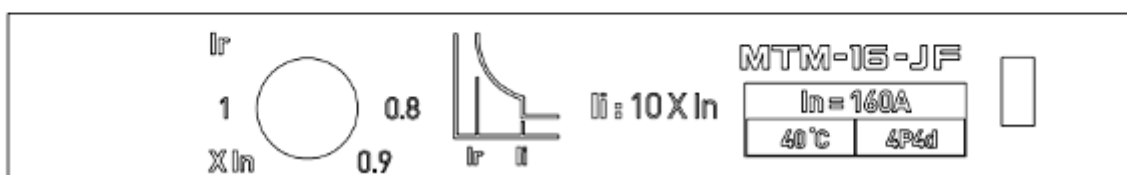
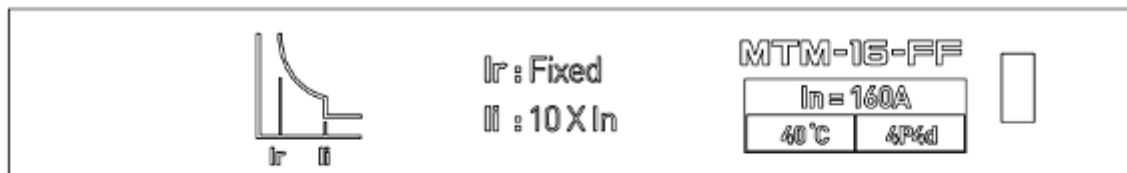
Copy of marking plate:

The artwork below may be only a draft. The use of certification marks on a product must be authorized by the respective NCBs that own these marks.



Copy of marking plate:

The artwork below may be only a draft. The use of certification marks on a product must be authorized by the respective NCBs that own these marks.



Test item particulars: test item vs. test requirements	
3. Classification	
3.1. Selectivity category: (A or B).....	A
3.2. Interruption medium: (air, vacuum, gas break).....	Air
3.3. Design: (open construction, moulded case).....	Moulded Case
3.4. Method of controlling the operation mechanism: (dependent manual, independent manual, dependent power, independent power, stored energy operation)	Independent manual
3.5. Suitability for isolation: (suitable, not suitable).....	Suitable
3.6. Provision for maintenance: (maintainable, non-maintainable)	Non-maintainable
3.7. Method of installation: (fixed, plug-in, withdrawable	Fixed
3.8. Degree of protection of enclosure: (IP code)	IP20 (only front side)
4.7. Type of release (thermo-magnetic / electronic).....	Thermo-magnetic
4.8. Integral fuses (integrally fused circuit-breakers) Type and characteristics of SCPD.....	N/A
7.3 Electromagnetic compatibility (EMC) Environment A or B	A and B
Circuit-breaker for use on phase-earthed systems	N/A
Circuit-breaker for use in IT systems	Yes, 1,92 kA at 500 Vac
Rated and limiting values, main circuit	
- rated operational voltage: U_e (V)	380 / 415 / 440 / 460 / 480 / 500 Vac
- rated insulation voltage: U_i (V).....	1000 V
- rated impulse withstand voltage: U_{imp} (kV)	8 kV
- rated current: I_n (A)	15 A, 16 A, 20 A, 25 A, 30 A, 32 A, 40 A, 50 A, 63 A, 75 A, 80 A, 100 A, 125 A, 150 A, 160 A
- kind of current	AC
- conventional free air thermal current: I_{th} (A)	Equal to I_n
- conventional enclosed thermal current: I_{the} (A)	N/A
- current rating for four-pole circuit-breakers: (A)	Equal to I_n
- number of poles	3P and 3P+N (N pole with overcurrent protection)
- rated frequency: (Hz).....	50 / 60 Hz
- integral fuses (rated values).....	N/A
Rated duty :	
- eight-hour duty	N/A
- uninterrupted duty: I_u (A).....	Equal to I_n

Short-circuit characteristic:

rated short-time making capacity: I_{cm} (kA).....: UPB / HGP 160D F, UPB / HGP 125D F,
 UPB / HGP 50D F:
 105 kA at 380 / 415 Vac,
 75,6 kA at 440 / 460 Vac,
 52,5 kA at 480 / 500 Vac

UPB / HGP 160D N, UPB / HGP 125D N,
 UPB / HGP 50D N:
 143 kA at 380 / 415 Vac,
 105 kA at 440 / 460 Vac,
 73,5 kA at 480 / 500 Vac

UPB / HGP 160D S, UPB / HGP 125D S,
 UPB / HGP 50D S:
 187 kA at 380 / 415 Vac,
 143 kA at 440 / 460 Vac,
 105 kA at 480 / 500 Vac

UPB / HGP 160D H, UPB / HGP 125D H,
 UPB / HGP 50D H:
 220 kA at 380 / 415 Vac,
 187 kA at 440 / 460 Vac,
 143 kA at 480 / 500 Vac

UPB / HGP 160D L, UPB / HGP 125D L,
 UPB / HGP 50D L:
 286 kA at 380 / 415 / 440 / 460 Vac,
 187 kA at 480 / 500 Vac

UPB / HGP 160D X, UPB / HGP 125D X,
 UPB / HGP 50D X:
 330 kA at 380 / 415 / 440 / 460 Vac,
 220 kA at 480 / 500 Vac

rated ultimate short-circuit breaking capacity: I_{cu} (kA): UPB / HGP 160D F, UPB / HGP 125D F,
UPB / HGP 50D F:
50 kA at 380 / 415 Vac,
36 kA at 440 / 460 Vac,
25 kA at 480 / 500 Vac

UPB / HGP 160D N, UPB / HGP 125D N,
UPB / HGP 50D N:
65 kA at 380 / 415 Vac,
50 kA at 440 / 460 Vac,
35 kA at 480 / 500 Vac

UPB / HGP 160D S, UPB / HGP 125D S,
UPB / HGP 50D S:
85 kA at 380 / 415 Vac,
65 kA at 440 / 460 Vac,
50 kA at 480 / 500 Vac

UPB / HGP 160D H, UPB / HGP 125D H,
UPB / HGP 50D H:
100 kA at 380 / 415 Vac,
85 kA at 440 / 460 Vac,
65 kA at 480 / 500 Vac

UPB / HGP 160D L, UPB / HGP 125D L,
UPB / HGP 50D L:
130 kA at 380 / 415 / 440 / 460 Vac,
85 kA at 480 / 500 Vac

UPB / HGP 160D X, UPB / HGP 125D X,
UPB / HGP 50D X:
150 kA at 380 / 415 / 440 / 460 Vac,
100 kA at 480 / 500 Vac

rated service short-circuit breaking capacity: I_{cs} (kA): $I_{cs} = 100\% I_{cu}$

rated short-time withstand current: I_{cw} (kA/s).....: N/A

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

Releases:	
1) shunt release	N/A
2) Over-current release.....	Yes
a) instantaneous.....	Yes
b) definite time delay.....	N/A
c) inverse time delay.....	Yes
- independent of previous load	N/A
- dependent on previous load; (for example thermal type release).....	Yes, thermo-magnetic release
3) Undervoltage release (for opening)	N/A
4) Closing releases.....	N/A
5) Other releases.....	N/A
Characteristics:	
1) Shunt release and undervoltage release (for opening), and closing release.....	N/A
- rated control circuit voltage: U_c (nature, frequency, V)	N/A
- kind of current	N/A
- rated frequency: (if AC).....	N/A
2) Over-current release.....	Yes
- rated current.....	15 A, 16 A, 20 A, 25 A, 30 A, 32 A, 40 A, 50 A, 63 A, 75 A, 80 A, 100 A, 125 A, 150 A, 160 A
- kind of current	AC
- rated frequency: (if AC).....	50 / 60 Hz
- current setting (or range of settings).....	Instantaneous tripping (short circuit condition): 2 poles in series: 400 A if $15 A \leq I_n \leq 40 A$, 10 I_n if $50 A \leq I_n \leq 160 A$ single pole: 480 A if $15 A \leq I_n \leq 40 A$, 12 I_n if $50 A \leq I_n \leq 160 A$ Inverse time delay tripping (overload condition): 0,8 I_n , 0,9 I_n , 1,0 I_n or fixed
- time settings (or range of settings).....	Instantaneous tripping: fixed Inverse time delay tripping: fixed trip time at 2 I_n : 1 min 38 s $\leq t \leq$ 8 min 30 s

Test item particulars..... : Moulded-Case Circuit-Breaker	
Classification of installation and use : Fixed	
Supply Connection..... : 3 phases and 3 phases with Neutral	
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 : 2017-10 (2218075.50) and 2023-12-05 Date (s) of performance of tests..... : 2017-10 - 2018-02 (2218075.50) and 2023-12-05 - 2023-12-28	
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. Though it is not mentioned on the first page, the following standards were also taken into consideration: EN 60947-2:2017 + A1:2020 EN 60947-1:2007 + A1:2011 + A2:2014	
Manufacturer's Declaration per sub-clause 4.2.5 of IEC 60947-2:	
The application for obtaining a CB Test Certificate includes more than one factory location and a declaration from the Manufacturer stating that the sample(s) submitted for evaluation is (are) representative of the products from each factory has been provided :	☒ Yes ☐ Not applicable
When differences exist; they shall be identified in the General product information section.	

Name and address of factory (ies).....: Factory 1:

HD Hyundai Electric Co., Ltd.
700, Bangeojinsunhwan-doro, Dong-gu, 44032
Ulsan (Main Factory), Republic of Korea

Factory 2:

HD Hyundai Electric Co., Ltd.
223, Sapyoung-ro, Nam-gu, 44786 Ulsan (Seonam
Factory), Republic of Korea

Factory 3:

Hyundai Heavy Industries (china) Electric Co., Ltd.
Xinba Scientific and Technologic Zone, 212212
Yangzhong City Jiangsu, China

Factory 4:

HD Hyundai Electric Co., Ltd.
53, je3gongdan 3-gil, Seoun-myeon, Anseong-si,
17605 Gyeonggi-Do, Republic of Korea

Factory 5:

Havells India Ltd.
Plot No. 6 Site IV Sahibabad Industrial Area,
201010 Sahibabad, Ghaziabad U.P, India

General product information and other remarks:

In: 100 A, 125 A, 150 A, 160 A for UPB / HGP 160D series,
15 A, 16 A, 20 A, 25 A, 30 A, 32 A, 40 A, 50 A, 63 A, 75 A, 80 A, 100 A, 125 A for UPB / HGP 125D series,
15 A, 16 A, 20 A, 25 A, 30 A, 32 A, 40 A, 50 A for UPB / HGP 50D series

IEC 60947-2			
Clause	Requirement + Test	Result - Remark	Verdict
5.2	MARKING HGP 160D X, 160 A, 4P, sample no. 22#		
	Visible from the front when the circuit-breaker is installed as in service and actuator is accessible:		
1.1	- rated current (I_n):	160 A	P
1.2	- suitability for isolation, if applicable, with the symbol 	 is marked	P
1.3	- indication of the open and closed position: with $\bigcirc$ and I respectively, if symbols are used	O/I	P
	Marked on the circuit-breaker:		
2.1	- manufacturer's name or trade mark	HYUNDAI	P
2.2	- type designation or catalogue reference	HGP 160D X	P
2.3	- IEC 60947-2, if the manufacturer claims compliance with this standard.	IEC 60947-2	P
2.4	- selectivity category A or B	A	P
2.5	- rated operational voltage(s) U_e	380 / 415 / 440 / 460 / 480 / 500 V~	P
2.6	- unsuitability for IT systems, if applicable, with the symbol 		N/A
2.7	- rated impulse withstand voltage (U_{imp});	8 kV	P
2.8	- value (or range) of the rated frequency and/or the indication "d.c." (or the symbol ---)	50 / 60 Hz	P
2.9	- rated service short-circuit breaking capacity (I_{cs}) at the corresponding rated voltage (U_e)	$I_{cs} = 100\% I_{cu}$	P
2.10	- rated ultimate short-circuit breaking capacity (I_{cu}) at the corresponding rated voltage (U_e)	150 kA at 380 / 415 V 150 kA at 440 / 460 V 100 kA at 480 / 500 V	P
2.11	- rated short-time withstand current (I_{cw}) and associated short-time delay, for selectivity category B		N/A
2.12	- range of the current setting (I_r) of the adjustable overload release (may be displayed)	$I_r = 0,8, 0,9, 1 I_n$	P
2.13	- range of the rated instantaneous short-circuit current setting (I_i), for adjustable overload releases (may be displayed)	$I_i = 10 I_n$, fixed	P

IEC 60947-2			
Clause	Requirement + Test	Result - Remark	Verdict
2.14	- ref. temperature for non-compensated thermal releases, if different from 30 °C	40 °C	P
2.15	- terminals identification, according to 7.1.8.4 of IEC 60947-1:2007:		N/A
	- terminal of coils (A/B)		N/A
	- terminal of shunt release (C)		N/A
	- terminals of under-voltage release (D)		N/A
	- terminals of interlocking electromagnets (E)		N/A
	- terminals of indicated light devices (X)		N/A
	- terminals of contact elements for switching devices (no.)		N/A
2.16	- line and load terminals, if applicable	Immaterial	N/A
2.17	- neutral pole terminals, if applicable, by the letter N	N is marked	P
2.18	- protective earth terminal, where applicable, by the symbol  (see 7.1.10.3 of part 1)		N/A
	Provided in the manufacture's literature:		
3.1	- rated short-circuit making capacity (I_{cm}), if higher than that specified in 4.3.6.1		N/A
3.2	- rated insulation voltage. (U_i), if higher than the maximum rated operational voltage	1000 V	P
3.3	- pollution degree if other than 3		N/A
3.4	- conventional enclosed thermal current (I_{the}) if different from the rated current:		N/A
3.5	- IP Code, where applicable:	IP20 (only front side)	P
3.6	- minimum enclosure size and ventilation data (if any) to which marked ratings apply:		N/A
3.7	- details of minimum distance between circuit-breaker and earthed metal parts for circuit-breaker intended for use without enclosure:	Front / Back: 0 mm, Left / Right: 10 mm, Up / Down: 50 mm	P
3.8	- suitability for environment A or B per annex J, as applicable	A and B	P
3.9	- RMS sensing, if applicable, accordance with F.4.1.1		N/A
3.10	- minimum cable cross-section, if different from Table 9 of IEC 60947-1, for ratings ≤ 20 A according to rated ultimate short-circuit breaking capacity I_{cu}		N/A

IEC 60947-2			
Clause	Requirement + Test	Result - Remark	Verdict
3.11	- values of tightening torque for the circuit-breaker terminals.	12 Nm	P
3.12	- current derating for terminals and connections, if applicable		N/A
	Marked on the auxiliaries or on the circuit-breaker, if marking space is sufficient; additionally, data shall be made available in the manufacturer's literature:		
4.1	- for closing releases (see 2.23) and/or motor-operators, rated control circuit voltage, kind of current and rated frequency for a.c		N/A
4.2	- rated control circuit voltage of the shunt release and/or of the under-voltage release (or of the no-voltage release), kind of current and rated frequency for a.c:		N/A
4.3	- rated current of indirect over-current releases:		N/A
4.4	- number and type of auxiliary contacts, rated operational currents at the rated operational voltages, and rated frequency for a.c.		N/A

IEC 60947-2			
Clause	Requirement + Test	Result - Remark	Verdict
7.1	CONSTRUCTION		
7.1.2 part 1	Materials		
7.1.2.2	Glow wire testing		
	The requirements of 7.1.2 of IEC 60947:2007/AMD1:2010/AMD2:2014 do not apply to parts with a mass lower than 2 g (insignificant mass, in accordance with 3.14 of IEC 60695-2-11:2014). For products containing a plurality of small parts, the total mass of non-tested parts located in close proximity to each other shall not exceed 10 g. Proximity shall be based on engineering judgment that takes into consideration the risk of propagation of fire.		P
	The suitability of materials used is verified by making tests on..... : or	See appended table 11	P
	- providing data from the insulating material supplier fulfilling the requirements according to IEC 60695-2-12		N/A
	Glow-wire test according to IEC 60695-2-10 and IEC 60695-2-11		
	Parts made of insulating material necessary to retain current-carrying parts in position: test temperature 960 °C for main circuit		P
	No visible flame and no sustained glowing		P
	Flames and glowing extinguish within 30 s		P
	No ignition of the tissue paper		P
	Parts made of insulating material necessary to retain current-carrying parts in position: test temperature 850 °C for other circuits		N/A
	No visible flame and no sustained glowing		N/A
	Flames and glowing extinguish within 30 s		N/A
	No ignition of the tissue paper		N/A
	Parts of insulating material not necessary to retain current-carrying parts in position, even though in contact with them: test temperature 650 °C		N/A
	No visible flame and no sustained glowing		N/A
	Flames and glowing extinguish within 30 s		N/A
	No ignition of the tissue paper		N/A
7.1.2.3	Test based on flammability category		

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Clause	Requirement + Test	Result - Remark	Verdict
	For parts of insulating materials, hot wire ignition and, where applicable, arc ignition tests as specified in 8.2.1.1.2, shall be made based on flammability category		N/A
	Tests on materials are made in accordance with Annex M		N/A
	The hot wire ignition (HWI) and arc ignition (AI) test value requirements related to the material flammability category shall conform to Table M.1 or M.2		N/A
	Alternatively, the manufacturer may provide data from the insulating material supplier fulfilling the requirements given in Annex M		N/A
7.1.3 part 1	Current-carrying parts and their connections		
	Current-carrying parts have the necessary mechanical strength and current-carrying capacity for their intended use		P
	For electrical connections, no contact pressure is transmitted through insulating material other than ceramic or other material with characteristics not less suitable, unless there is sufficient resiliency in the metallic parts to compensate for any possible shrinkage or yielding of the insulation material		P
7.1.5 part 1	Actuator		
7.1.5.1	Insulation		
	The actuator of the equipment shall be insulated from the live parts for the rated insulation voltage and, if applicable, the rated impulse withstand voltage		P
	If it is made of metal, it shall be capable of being satisfactorily connected to a protective conductor unless it is provided with additional reliable insulation		N/A
	If it is made of or covered by insulating material, any internal metal part, which might become accessible in the event of insulation failure, shall also be insulated from live parts for the rated insulation voltage		P
7.1.5.2	Direction of movement		
	The direction of operation for actuators of devices shall normally conform to IEC 60447.		P

IEC 60947-2			
Clause	Requirement + Test	Result - Remark	Verdict
	Where devices cannot conform to these requirements, e.g. due to special applications or alternative mounting positions, they shall be clearly marked such that there is no doubt as to the "I" and "O" positions and the direction of operation		P
7.1.6 part 1	Indication of contact position		
7.1.6.1	Indicating means		
	When an equipment is provided with means for indicating the closed and open positions, these positions shall be unambiguous and clearly indicated		P
	This is done by means of a position indicating device (see 2.3.18)		P
	If symbols are used, they shall indicate the closed and open position respectively, in accordance with IEC 60417-2:		
	- 60417-2-IEC-5007 I On (power)		P
	- 60417-2-IEC-5007 O Off (power)		P
	For equipment operated by means of two push-buttons, only the push-button designated for the opening operation shall be red or marked with the symbol "O"		N/A
	Red colour shall not be used for any other push-button		P
	The colours of other push-buttons, illuminated push-buttons and indicator lights shall be in accordance with IEC 60073		N/A
7.1.6.2	Indication by the actuator		
	When the actuator is used to indicate the position of the contacts, it shall automatically take up or stay, when released, in the position corresponding to that of the moving contacts; in this case, the actuator shall have two distinct rest positions corresponding to those of the moving contacts, but for automatic opening a third distinct position of the actuator may be provided		P
7.1.8 part 1	Terminals		
7.1.8.1	All parts of terminals which maintain contact and carry current shall be of metal having adequate mechanical strength		P
	Terminal connections shall be such that necessary contact pressure is maintained		P

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Clause	Requirement + Test	Result - Remark	Verdict
	Terminals shall be so constructed that the conductor is clamped between suitable surfaces without damage to the conductor and terminal		P
	Terminal shall not allow the conductor to be displaced or to be displaced themselves in a manner detrimental to the operator of equipment and the insulation voltage shall not be reduced below the rated value		P
7.1.8.2	Connection capacity		
	type of conductors :	Prepared cable (with cable lug)	P
	minimum cross-sectional area of conductor (mm ²) :	1,0 mm ²	P
	maximum cross-sectional area of conductor (mm ²) :	70 mm ²	P
	number of conductors simultaneously connectable to the terminal :	1	P
7.1.8.3	Connection		
	terminals for connection to external conductors shall be readily accessible during installation		P
	clamping screws and nuts shall not serve to fix any other component		P
7.1.8.4	Terminal identification and marking		
	terminal intended exclusively for the neutral conductor	N is marked	P
	protective earth terminal		N/A
	other terminals		N/A
7.1.10 part 1	Provisions for protective earthing		
7.1.10.1	The exposed conductive parts (e.g. chassis, framework and fixed parts of metal enclosures) other than those which cannot constitute a danger shall be electrically interconnected and connected to a protective earth terminal for connection to an earth electrode or to an external protective conductor		N/A
	This requirement can be met by the normal structural parts providing adequate electrical continuity and applies whether the equipment is used on its own or incorporated in an assembly		N/A
	Exposed conductive parts are considered not to constitute a danger if they cannot be touched on large areas or grasped with the hand or if they are of small size (approximately 50 mm x 50 mm) or are so located as to exclude any contact with live parts		N/A

IEC 60947-2			
Clause	Requirement + Test	Result - Remark	Verdict
7.1.10.2	Protective earth terminal		
	The protective earth terminal shall be readily accessible and so placed that the connection of the equipment to the earth electrode or to the protective conductor is maintained when the cover or any other removable part is removed		N/A
	The protective earth terminal shall be suitably protected against corrosion		N/A
	In the case of equipment with conductive structures, enclosures, etc., means shall be provided, if necessary, to ensure electrical continuity between the exposed conductive parts the equipment and the metal sheathing of connecting conductors		N/A
	The protective earth terminal shall have no other function, except when it is intended to be connected to a PEN conductor (see 2.1.1.5 – Note). In this case, it shall also have the function of a neutral terminal in addition to meeting the requirements applicable to the protective earth terminal		N/A
7.1.10.3	Protective earth terminal marking and identification		
	The protective earth terminal shall be clearly and permanently identified by its marking		N/A
	The identification shall be achieved by colour (green-yellow mark) or by the notation PE, or PEN, as applicable, in accordance with IEC 60445, subclause 5.3, or, in the case of PEN, by a graphical symbol for use on equipment		N/A
	Graphical symbol to be used: 60417-2-IEC-5019  Protective earth (ground) in accordance with IEC 60417-2		N/A
7.1.11 part 1	Enclosure for equipment		
7.1.11.1	Design		
	The enclosure, when it is opened: all parts requiring access for installation and maintenance are readily accessible		N/A
	Sufficient space shall be provided inside the enclosure		N/A
	The fixed parts of a metal enclosure shall be electrically connected to the other exposed conductive parts of the equipment and connected to a terminal which enables them to be earthed or connected to a protective conductor		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Under no circumstances shall a removable metal part of the enclosure be insulated from the part carrying the earth terminal when the removable part is in place		N/A
	The removable parts of the enclosure shall be firmly secured to the fixed parts by a device such that they cannot be accidentally loosened or detached owing to the effects of operation of the equipment or vibrations		N/A
	When an enclosure is so designed as to allow the covers to be opened without the use of tools, means shall be provided to prevent loss of the fastening devices		N/A
	If the enclosure is used for mounting push-buttons, it shall not be possible to remove the buttons from the outside of the enclosure		N/A
7.1.11.2	Insulation		
	If, in order to prevent accidental contact between a metallic enclosure and live parts, the enclosure is partly or completely lined with insulating material, then this lining shall be securely fixed to the enclosure		N/A
7.1.12 part 1	Degree of protection of enclosed equipment		
	Degree of protection.	IP20 Note: The MCCB is an un-enclosed equipment. This clause is therefore not applicable. But the IP20 was check on the front side of the MCCB.	
	Test for first characteristic.	IP20	
	Test for first numeral (1, 2, 3, 4, 5, 6) :	2 (only front side)	P
	Test for second characteristic	IPXX	
	Test for second numeral (1, 2, 3, 4, 5, 6, 7, 8)..... :		N/A
7.1.13 part 1	Conduit pull-out, torque and bending with metallic conduits		
	Polymeric enclosures of equipment, whether integral or not, provided with threaded conduit entries, intended for the connection of extra heavy duty, rigid threaded metal conduits complying with IEC 60981, shall withstand the stresses occurring during its installation such as pull-out, torque, bending		N/A

IEC 60947-2			
Clause	Requirement + Test	Result - Remark	Verdict
7.1.2	Withdrawable circuit-breaker		N/A
	In the disconnected position (main- and auxiliary circuits)		
	Isolating distances for circuit-breaker suitable for isolating comply with the requirements specified for the isolating function		N/A
	Mechanism fitted with a reliable indicating device with indicates the position of the isolating contacts.		N/A
	Mechanism fitted with interlocks which only permit the isolating contacts to be separate or re-closed when main contacts are open		N/A
	Mechanism fitted with interlock, which only permit the main contacts to be closed when the isolating contacts are fully closed.		N/A
	Mechanism fitted with interlock, which only permit the main contacts to be closed when in disconnected position.		N/A
	In disconnected position, the isolating distances between the isolating contacts cannot be inadvertently reduced.		N/A
7.1.3	Additional requirements for circuit-breakers suitable for isolation		P
7.1.7 part 1	Additional safety requirements for equipment suitable for isolation		
7.1.7.1	Additional constructional requirements for equipment suitable for isolation ($U_e > 50 \text{ V}$):		
	Equipment suitable for isolation shall provide in the open position an isolation distance in acc. with the requirements necessary to satisfy the isolating function. Indication of the main contacts shall be provide by one or more of the following means:		
	- the position of the actuator		P
	- a separate mechanical indicator		N/A
	- visibility of the moving contacts		N/A
	When means are provided or to lock the equipment in the open position, locking only be possible when contacts are in the open position		N/A
	Actuator front-plate fitted to the equipment in a manner which ensures correct contact position indication and locking		P
	The indicated open position is the only position in which the specified isolation distances between the contacts is ensured.		P

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Clause	Requirement + Test	Result - Remark	Verdict
	- minimum clearances across open contacts (see Table XIII, Part 1) (mm) :	8 mm	
	- measured clearances (mm) :	24,2 mm	P
	- test Uimp across gap (kV) :	12,3 kV	P
7.1.7.2	Supplementary requirements for equipment with provision for electrical interlocking with contactors or circuit-breakers:		
	auxiliary switch shall be rated according to IEC 60 947-5-1		N/A
	If equipment suitable for isolation is provided with an auxiliary switch for the purpose of electrical interlocking with contactor (s) or circuit-breaker(s) and intended to be used in motor circuits, the following requirements shall apply unless the equipment is rated for AC-23 utilization category		N/A
	The time interval between the opening of the contacts of the auxiliary switch and the contacts of the main poles shall be sufficient to ensure that the associated contactor or circuit-breaker interrupts the current before the main poles of the equipment open		N/A
	Unless otherwise stated in the manufacturer's technical literature, the time interval shall be not less than 20 ms when the equipment is operated according to the manufacturer instructions		N/A
	Compliance shall be verified by measuring the time interval between the instant of opening of the auxiliary switch and the instant of opening of the main poles under no-load conditions when the equipment is operated according to the manufacturer's instructions		N/A
	During the closing operation the contacts of the auxiliary switch shall close after or simultaneously with the contacts of the main poles		N/A
	A suitable opening time interval may also be provided by an intermediate position (between the ON and OFF position) at which the interlocking contact(s) is (are) open and the main poles remain closed		N/A
7.1.7.3	Supplementary requirements for equipment provided with means for padlocking the open position:		
	the locking means shall be designed in such a way that it cannot be removed with the appropriate padlock(s) installed		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Alternatively, the design may provide padlockable means to prevent access to the actuator		N/A
	test force F applied to the actuator in an attempt to operate to the closed position (N) :		N/A
	rated impulse withstand voltage (kV) :		N/A
	test Uimp on open main contacts at the test force		N/A
	If the tripped position is not the indicated open position, it should be clearly identified.		
7.1.4	Clearances and creepage distances:		
	For circuit-breakers for which the manufacturer has declared a value of rated impulse withstand voltage. (Uimp.)		
	Clearances distances:		
	- Uimp is given as:	8 kV	
	- max. value of rated operational voltage to earth	600 V	
	- nominal voltage of supply system:	380 / 415 / 440 / 460 / 480 / 500 Vac	
	- overvoltage category:	III	
	- pollution degree:	3	
	- field-in or homogeneous:	Inhomogeneous field	
	- minimum clearances (mm):	8 mm	
	- measured clearances (mm):	Min measured value: 14,1 mm See appended table 10	P
	Creepage distances:		
	- rated insulation voltage Ui (V)	1000 V	
	- pollution degree	3	
	- comparative tracking index (V)	175 V	
	- material group	IIIa	
	- minimum creepage distances (mm)	16 mm	
	- measured creepage distances (mm)	Min measured value: 16,6 mm See appended table 10	P

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Clause	Requirement + Test	Result - Remark	Verdict
7.1.5	Requirements for the safety of the operator		
	There shall be no path or opening which allows incandescent particles to be discharged from the area of the manual operating means:		P
7.1.7	Additional requirements for equipment provided with a neutral pole		
7.1.9 part 1	When equipment is provided with a pole intended only for connecting the neutral, this pole shall be clearly identified to that effect by the letter N (see 7.1.7.4.).	N is marked	P
	A switched neutral pole shall break not before and shall make not after the other poles	The neutral pole is protected	P
	For equipment having a value of conventional thermal current (free air or enclosed, see 4.3.2.1 and 4.3.2.2) not exceeding 63 A, this value shall be identical for all poles	The neutral pole current equal to I_n	P
	For higher conventional thermal current values, the neutral pole may have a value of conventional thermal current different from that of the other poles, but not less than half that value or 63 A, whichever is the higher	The neutral pole current equal to I_n	P
	If a pole with an appropriate making and breaking capacity is used as a neutral pole, then all poles, incl. the neutral pole, may operate substantially together.		P
7.1.8	Digital inputs and outputs for use with programmable logic controllers (PLCs)		
	Compliant with Annex S of IEC 60947-1:2007		N/A
	Annex S does not apply to digital inputs and outputs dedicated to devices other than PLCs		N/A
7.2	Performance requirements		
7.2.1	Operating condition		
7.2.1.1	Closing		
	For a circuit-breaker to be closed safely on to the making current corresponding to its rated short-circuit making capacity, it is essential that it should be operated with the same speed and the same firmness as during the type test for proving the short-circuit making capacity		P
7.2.1.1.2	Dependent manual closing		
	For a circuit-breaker having a dependent manual closing release, it is not possible to assign a short-circuit making capacity rating irrespective of the conditions of mechanical operation		N/A

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

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

IEC 60947-2			
Clause	Requirement + Test	Result - Remark	Verdict
7.2.1.4 part 1	Limits of operation of shunt releases		
	A shunt release for opening shall cause tripping under all operating conditions of an equipment when the supply voltage of the shunt release measured during the tripping operation remains between 70% and 110% of the rated control supply voltage and, if a.c., at the rated frequency		N/A
7.2.1.2.4	Opening by over-current releases		
a)	Opening under short-circuit conditions		
	The short-circuit release shall cause tripping of the circuit-breaker with an accuracy of 20% of the tripping current value of the current setting for all values of the current setting of the short-circuit current release		P
	Where necessary for over-current co-ordination the manufacturer shall provide information (usually curves) showing		N/A
	- maximum cut-off (let-through) peak current as a function of prospective current (r.m.s. symmetrical)		N/A
	- I^2t characteristics for circuit-breakers of utilization category A and, if applicable, B for circuit-breakers with instantaneous override (see note to 8.3.5)		N/A
b)	Opening under overload conditions		
1)	Instantaneous or definite time-delay operation		N/A
	The release shall cause tripping of the circuit-breaker with an accuracy of $\pm 10\%$ of the tripping current value of the current setting for all values of current setting of the overload release		N/A
2)	Inverse time-delay operation		
	At the reference temperature and at 1,05 times the current setting with the conventional non-tripping current, the opening release being energized on all poles, tripping shall not occur in less than the conventional time from the cold state, i.e. with the circuit-breaker at the reference temperature		P
	Moreover, when at the end of the conventional time the value of current is immediately raised to 1,30 times the current setting, i.e. with the conventional tripping current, tripping shall then occur in less than the conventional time later		P

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Clause	Requirement + Test	Result - Remark	Verdict
	If a release is declared by the manufacturer as substantially independent of ambient temperature, the current values of table 6 shall apply within the temperature band declared by the manufacturer, within a tolerance of 0,3%/K		N/A
	The width of the temperature band shall be at least 10 K on either side of the reference temperature		N/A
7.2.4.2	Operational performance capability		
7.2.4.2 part 1	The operational performance off-load for which the tests are made with the control circuits energized and the main circuit not energized, in order to demonstrate that the equipment meets the operating conditions specified at the upper and lower limits of supply voltage and/or pressure specified for the control circuit during closing and opening operations		P
	The operational performance on-load during which the equipment shall make and break the specified current corresponding, where relevant, to its utilization category for the number of operations stated in the relevant product standard		P

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Clause	Requirement + Test	Result - Remark	Verdict
8	TESTS		
8.2.1 part 1	Materials		
8.2.1.1	Test of resistance to abnormal heat and fire		
8.2.1.1.1	Glow wire test (on equipment)		
	The glow-wire test according to IEC 60695-2-10 and IEC 60695-2-11 are performed on		
	the equipment; or		N/A
	sections taken from the equipment; or	Sections taken from the equipment See appended table 11	P
	any parts of identical material having representative thickness		N/A
8.2.1.1.2	Flammability, hot wire ignition and arc ignition tests (on materials)		
	flammability test, in accordance with IEC 60695-11-10;		N/A
	hot wire ignition (HWI) test, as described in Annex M;		N/A
	arc ignition (AI) test, as described in Annex M.		N/A
8.2.4 part 1	Mechanical properties of terminals		
	Mechanical strength of terminals		
	maximum cross-sectional area of conductor (mm ²) :	70 mm ²	
	diameter of thread (mm) :	8 mm	
	torque (Nm) :	1,1 x 12 Nm = 13,2 Nm	
	5 times on 2 separate clamping units		P
	Testing for damage to and accidental loosening of conductor (flexion test) Test on upper terminal		
	conductor of the smallest cross-sectional area (mm ²) :		
	number of conductors of the smallest cross section :		
	diameter of bushing hole (mm) :		
	height between the equipment and the platen :		
	mass at the conductor(s) (kg) :		
	135 continuous revolutions: the conductor shall neither slip out of the terminal nor break near the clamping unit		N/A

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

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Clause	Requirement + Test	Result - Remark	Verdict
8.3.3	TEST SEQUENCE I: GENERAL PERFORMANCE CHARACTERISTICS Test was conducted on HGP 160D X, In = 160 A, 3P+N, sample no. 39#		
8.3.3.2	Test of tripping limits and characteristic		
8.3.3.2.2	Short circuit releases		
	Manufacturer's name or trademark	HYUNDAI	
	Type designation or serial number	HGP 160D X / 3P+N	
	Sample no:	39#	
	Rated operational voltage: Ue (V)	Max. 500 Vac	
	Rated current: In (A)	160 A	
	Ambient temperature 10-40 °C :	27,5 °C	P
	Value of the tripping current declared by the manufacturer for a single pole, at which value they shall operate.	for two poles in series: 10In for a single pole: 12In	P
	Range of adjustable setting current. (A)		N/A
	Time delay stated by the manufacturer, in the case of definite time delay releases.		N/A
	Electromagnetic over current releases		
	Test current: 80% of the rated, or minimum adjustable setting current: (A)	0,8 x 10 x In L1-L2 1294 A L2-L3 1304 A L3-L1 1300 A N-L3 1310 A	P
	Operating time: >0,2s in case of instantaneous releases:	L1-L2 0,2 s non-tripping L2-L3 0,2 s non-tripping L3-L1 0,2 s non-tripping N-L3 0,2 s non-tripping	P
	Operating time: > twice time delay stated by the manufacturer, in the case of definite time delay releases:	L1-L2 L2-L3 L3-L1 N-Lx	N/A
	Test current: 120% of the rated, or minimum adjustable setting current: (A)		P

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Clause	Requirement + Test	Result - Remark	Verdict
	Operating time: <0,2s in case of instantaneous releases: L1-L2 1788 A L2-L3 1776 A L3-L1 1794 A N-L3 1758 A	1,2 x 10 x In	P
	Operating time: < twice time delay stated by the manufacturer, in the case of definite time delay releases: L1-L2 37 ms L2-L3 54 ms L3-L1 47 ms N-L3 28 ms		P
	Test current: 80% of the maximum adjustable setting current: (A)		N/A
	Operating time: >0,2s in case of instantaneous releases: L1-L2 L2-L3 L3-L1 N-Lx		N/A
	Operating time: > twice time delay stated by the manufacturer, in the case of definite time delay releases: L1-L2 L2-L3 L3-L1 N-Lx		N/A
	Test current: 120% of the maximum adjustable setting current: (A)		N/A
	Operating time: <0,2s in case of instantaneous releases: L1-L2 L2-L3 L3-L1 N-Lx		N/A
	Operating time: < twice time delay stated by the manufacturer, in the case of definite time delay releases: L1-L2 L2-L3 L3-L1 N-Lx		N/A
	Test current: tripping current declared for single pole operation (A)	12 x In	P

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Clause	Requirement + Test	Result - Remark	Verdict
	Operating time: <0,2s in case of instantaneous releases: L1 61 ms at test current 1850 A L2 59 ms at test current 1822 A L3 70 ms at test current 1804 A N 43 ms at test current 1842 A		P
	Operating time: < twice time delay stated by the manufacturer, in the case of definite time delay releases: L1 L2 L3 N		N/A
	Electronic over current releases		
	For circuit-breakers with an electronic over current release, the operation of the short-circuit releases shall be verified by one test only on each pole individually.		N/A
	Test current: 80% of the rated, or minimum adjustable setting current: (A)		N/A
	Operating time: >0,2s in case of instantaneous releases: L1 L2 L3 N		N/A
	Operating time: > twice time delay stated by the manufacturer, in the case of definite time delay releases: L1 L2 L3 N		N/A
	Test current: 120% of the rated, or minimum adjustable setting current: (A)		N/A
	Operating time: <0,2s in case of instantaneous releases: L1 L2 L3 N		N/A
	Operating time: < twice time delay stated by the manufacturer, in the case of definite time delay releases: L1 L2 L3 N		N/A
	Test current: 80% of the maximum adjustable setting current: (A)		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Operating time: >0,2s in case of instantaneous releases: L1 L2 L3 N		N/A
	Operating time: > twice time delay stated by the manufacturer, in the case of definite time delay releases: L1 L2 L3 N		N/A
	Test current: 120% of the maximum adjustable setting current: (A)		N/A
	Operating time: <0,2s in case of instantaneous releases: L1 L2 L3 N		N/A
	Operating time: < twice time delay stated by the manufacturer, in the case of definite time delay releases: L1 L2 L3 N		N/A
8.3.3.2.3	Overload releases		
a)	Instantaneous or definite time-delay releases		
	Manufacturer's name or trademark		
	Type designation or serial number		
	Sample no:		
	Rated operational voltage: Ue (V)		
	Rated current: In (A)		
	Ambient temperature 10-40 °C :		N/A
	Value of the tripping current declared by the manufacturer for a single pole, at which value they shall operate.		N/A
	Range of adjustable setting current. (A)		N/A
	Time delay stated by the manufacturer, in the case of definite time delay releases.		N/A
	Test current: 90% of the rated, or minimum adjustable setting current: (A)		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Operating time: >0,2s in case of instantaneous releases:		N/A
	Operating time: > twice time delay stated by the manufacturer, in the case of definite time delay releases.		N/A
	Test current: 90% of the maximum adjustable setting current: (A)		N/A
	Operating time: >0,2s in case of instantaneous releases		N/A
	Operating time: > twice time delay stated by the manufacturer, in the case of definite time delay releases.		N/A
	Test current: 110% of the rated, or minimum adjustable setting current: (A) circuit-breaker with neutral pole: 1,2x110% (A)		N/A
	Operating time: <0,2s in case of instantaneous releases:		N/A
	Operating time: < twice time delay stated by the manufacturer, in the case of definite time delay releases.		N/A
	Test current: 110% of the maximum adjustable setting current: (A) circuit-breaker with neutral pole: 1,2x110% (A)		N/A
	Operating time: <0,2s in case of instantaneous releases		N/A
	Operating time: < twice time delay stated by the manufacturer, in the case of definite time delay releases.		N/A
b)	Inverse time delay releases		
	Manufacturer's name or trademark	HYUNDAI	
	Type designation or serial number	HGP 160D X / 3P+N	
	Sample no:	39#	
	Rated operational voltage: Ue (V)	Max 500 Vac	
	Rated current: In (A)	160 A	
	For releases dependent of ambient air temperature: Reference temperature	40 °C	P
	Test ambient temperature (°C)	40 °C	P

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Clause	Requirement + Test	Result - Remark	Verdict
	For releases dependent on ambient air temperature, the operating characteristics shall be verified at the reference temperature, the release being energized on all phase poles. If the test made at a different ambient temperature, a correction shall be made in accordance with the manufacturer's correction temperature/current data		P
	For thermal-magnetic releases independent of ambient temperature: Tests shall be made at 30°C and 20°C or 40°C, the release being energized on all phase poles		N/A
	For electronic releases, the operating characteristic shall be verified at the ambient temperature of the test room (see 6.1.1 of IEC 60947-1), the release being energised on all phase poles.		N/A
	Test ambient air temperature:		N/A
	Range of adjustable setting current: (A)	I _r : 0,8 -1,0 I _n	P
	Releases, dependent of ambient air temperature: Reference temperature (°C)	40 °C	P
	Thermal Magnetic releases, independent of ambient air temperature: at 30°C		N/A
	Test current: 105% of the rated, or minimum adjustable setting current: (A)	134,4 A (1,05 x 0,8 x I _n) for phase poles and for N pole	P
	Conventional non-tripping time: 1h when I _n < 63A, 2h when I _n > 63 A	2 h non-tripping	P
	Test current: 130% of the rated, or minimum adjustable setting current: (A)	166,4 A (1,3 x 0,8 x I _n) for phase poles	P
	For circuit-breakers having an identified neutral pole provided with an overload release (see 8.3.3.1.1), the test current at the conventional tripping current shall be multiplied by the factor 1,2.	199,7 A (1,2 x 1,3 x 0,8 x I _n) for N pole	P
	Conventional tripping time: <1h when I _n < 63A, <2h when I _n > 63 A	2 min 25 s for phase poles 3 min 21 s for N pole	P
	Test current: 105% of the maximum adjustable setting current: (A)	168 A (1,05 x I _n) for phase pole and N pole	P
	Conventional non-tripping time: 1h when I _n < 63A, 2h when I _n > 63 A	2 h non-tripping	P
	Test current: 130% of the maximum adjustable setting current: (A)	208 A (1,3 x I _n) for phase poles	P
	For circuit-breakers having an identified neutral pole provided with an overload release (see 8.3.3.1.1), the test current at the conventional tripping current shall be multiplied by the factor 1,2.	249,6 A (1,2 x 1,3 x I _n) for N pole	P

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Clause	Requirement + Test	Result - Remark	Verdict
	Conventional tripping time: <1h when $I_n < 63A$, <2h when $I_n > 63A$	24 s for phase poles 8 min 52 s for N pole	P
	Thermal Magnetic releases, independent of ambient air temperature: at 20°C or 40°C		
	Test ambient air temperature:		N/A
	Test current: 105% of the rated, or minimum adjustable setting current: (A)		N/A
	Conventional non-tripping time: 1h when $I_n < 63A$, 2h when $I_n > 63A$		N/A
	Test current: 130% of the rated, or minimum adjustable setting current: (A)		N/A
	For circuit-breakers having an identified neutral pole provided with an overload release (see 8.3.3.1.1), the test current at the conventional tripping current shall be multiplied by the factor 1,2.		N/A
	Conventional tripping time: <1h when $I_n < 63A$, <2h when $I_n > 63A$		N/A
	Test current: 105% of the maximum adjustable setting current: (A)		N/A
	Conventional non-tripping time: 1h when $I_n < 63A$, 2h when $I_n > 63A$		N/A
	Test current: 130% of the maximum adjustable setting current: (A)		N/A
	For circuit-breakers having an identified neutral pole provided with an overload release (see 8.3.3.1.1), the test current at the conventional tripping current shall be multiplied by the factor 1,2.		N/A
	Conventional tripping time: <1h when $I_n < 63A$, <2h when $I_n > 63A$		N/A
	An additional test, at a current specified by the manufacturer to verify the time/current characteristic of the releases conform to the curves provided by the manufacturer		
	Releases, dependent of ambient air temperature: Reference temperature (°C)	40 °C	P
	Releases, independent of ambient air temperature: at 30°C		N/A
	Test ambient air temperature:	40 °C	P
	Test current: at current specified by the manufacturer to verify the time/current characteristic of the releases conform to the curves provided by the manufacturer. % at the rated, or minimum adjustable setting current: (% or A)	256 A ($2 \times 0,8 \times I_n$) for minimum adjustable setting current 320 A ($2 \times I_n$) for maximum adjustable setting current	P

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Clause	Requirement + Test	Result - Remark	Verdict
	Tripping time acc. time/current characteristic of the releases conform to the curves provided by the manufacturer. (within the stated tolerances)	7 min 16 s for minimum adjustable setting current 5 min 22 s for maximum adjustable setting current Tripping time specified by the manufacturer: $1 \text{ min } 38 \text{ s} \leq t \leq 8 \text{ min } 30 \text{ s}$	P
	Releases, independent of ambient air temperature: at 20°C or 40°C		
	Test ambient air temperature:		N/A
	Test current: at current specified by the manufacturer to verify the time/current characteristic of the releases conform to the curves provided by the manufacturer. % at the rated, or minimum adjustable setting current: (% or A)		N/A
	Tripping time acc. time/current characteristic of the releases conform to the curves provided by the manufacturer. (within the stated tolerances)		N/A
8.3.3.2.4	Additional test for definite time-delay releases		
a)	Time delay		
	Test is made at a current equal to 1,5 times the current setting. If the test current overlaps with another tripping characteristic (e.g. an instantaneous tripping characteristic), the trip setting and the test current shall be reduced as necessary to prevent premature tripping.		
	<u>overload releases</u> : (all phase poles loaded)		N/A
	for circuit-breakers having an identified neutral pole provided with an overload release, the test current for this release shall be 1,5 times the current setting;		N/A
	<u>short-circuit releases</u>		N/A
	Electromagnetic release: two poles in series carrying the test current, using successively all possible combinations of poles having a short-circuit release.		N/A
	Electronic releases: on one pole chosen at random.		N/A
	Test current: 1,5 times of the rated, or minimum adjustable setting current: (A)		N/A
	Operating time, <u>overload releases</u> : (s)		N/A
	Time-delay: between the limits stated by the manufacturer:		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Operating time, <u>short-circuit releases (electromagnetic)</u> : (s): L1-L2 L2-L3 L3-L1		N/A
	Time-delay: between the limits stated by the manufacturer:		N/A
	Operating time, <u>short-circuit releases (electronic)</u> : (s) L1 L2 L3		N/A
	Time-delay: between the limits stated by the manufacturer:		N/A
	Test current: 1,5 times of the maximum adjustable setting current: (A)		N/A
	Operating time, <u>overload releases</u> : (s)		N/A
	Time-delay: between the limits stated by the manufacturer:		N/A
	Operating time, <u>short-circuit releases (electromagnetic)</u> : (s): L1-L2 L2-L3 L3-L1		N/A
	Time-delay: between the limits stated by the manufacturer:		N/A
	Operating time, <u>short-circuit releases (electronic)</u> : (s) L1 L2 L3		N/A
	Time-delay: between the limits stated by the manufacturer:		N/A
b)	Non-tripping duration		
	Firstly, the test current equal to 1,5 times the current setting is maintained for a time interval equal to the non-tripping duration stated by the manufacturer.		
	Then, the current is reduced to the rated current and maintained at this value for twice the time-delay stated by the manufacturer. The circuit-breaker shall not trip.		
	<u>overload releases</u> : (all phase poles loaded)		N/A
	for circuit-breakers having an identified neutral pole provided with an overload release, the test current for this release shall be 1,5 times the current setting;		N/A
	<u>short-circuit releases</u>		N/A

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

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Clause	Requirement + Test	Result - Remark	Verdict
	Operating time, <u>overload releases</u> : the circuit-breaker does not trip:		N/A
	Operating time, <u>short-circuit releases</u> (electromagnetic), shall not trip: (s) L1-L2 L2-L3 L3-L1		N/A
	Operating time, <u>short-circuit releases (electronic)</u> , shall not trip: (s) L1-L2 L2-L3 L3-L1		N/A
8.3.3.3	Test of dielectric properties, impulse withstand voltage (Uimp indicated):		
8.3.3.4 part1	The 1,2/50µs impulse voltage shall be applied five times for each polarity at intervals of 1s minimum		
	- rated impulse withstand voltage (kV) :	8 kV	P
	- sea level of the laboratory:	Sea level	P
	- test Uimp main circuits (kV) :	9,8 kV	P
	- test Uimp auxiliary circuits (kV) :		N/A
	- test Uimp control circuits (kV) :		N/A
	- test Uimp on open main contacts (equipment suitable for isolating) (kV) :	12,3 kV	P
a)	Application of test voltage		P
	i) Between all terminals of the main circuit connected together (incl. control and auxiliary circuits connected to the main circuit) and the enclosure or mounting plate, with the contacts in all normal positions of operation.		P
	ii) Between each pole of the main circuit and the other poles connected together and to the enclosure or mounting plate, with the contacts in all normal positions of operation.		P
	iii) Between each control and auxiliary circuit not normally connected to the main circuit and: - the main circuit		N/A
	- other circuits		N/A
	- exposed conductive parts		N/A
	- enclosure of mounting plate		N/A
	iv) equipment suitable for isolation		P

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Clause	Requirement + Test	Result - Remark	Verdict
	equipment not suitable for isolation		N/A
	- no unintentional disruptive discharge during the test's		P
	Test of dielectric properties, dielectric withstand voltage (Uimp not indicated):		
	- rated insulation voltage (V) :	1000 V	P
	- main circuits, test voltage for 1 min (V)	2200 V, 60 s	P
	- auxiliary circuits, test voltage for 1 min (V)		N/A
	- control circuits, test voltage for 1 min (V)		N/A
8.3.3.2.2	Application of test voltage		
1)	with circuit-breaker in the closed position		
	- between all live parts of all poles connected together and the frame of the circuit-breaker .		P
	- between each pole and all the other poles connected to the frame of the circuit-breaker		P
2)	with the circuit-breaker in the open position and, additionally, in the tripped position, if any.		P
	- between all live parts of all poles connected together and the frame of the circuit-breaker.		P
	- between the terminals of one side connected together and the terminals of the other side connected together.		P
b)	Control and auxiliary circuits		
1)	- between all the control and auxiliary circuits which are not normally connected to the main circuit, connected together, and the frame of the circuit-breaker.		N/A
2)	- where appropriate, between each part of the control an auxiliary circuits which may be isolated from the other parts during normal operation and all the other parts connected together.		N/A
	No unintentional disruptive discharge during the tests		N/A
(i)	the normal positions of operation include the tripped position, if any;		P
(ii)	circuits incorporating solid-state devices connected to the main circuit shall be disconnected for the test;		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
(iii)	circuit-breakers not declared as suitable for isolation shall be tested with the test voltage applied across the poles of the main circuit, the line terminals being connected together and the load terminals being connected together.		P
(iv)	For circuit-breaker suitable for isolation, the leakage current shall be measured through each pole with the contacts in the open position, at a test voltage of 1,1 U _e , and shall not exceed 0,5mA.	L1: 0,005 mA L2: 0,005 mA L3: 0,005 mA N: 0,005 mA	P
(v)	circuit-breakers having a rated insulation voltage greater than 1 000 V a.c. shall be tested at a voltage of U _i + 1 200 V a.c. r.m.s. or 2 U _i whichever is the greater		N/A
(vi)	withdrawable circuit-breakers shall be subject to verification of impulse withstand voltage and shall be applied between the withdrawable unit's main contacts and their associated fixed contacts, in the disconnected position.		N/A
8.3.3.4	Mechanical operation and operational performance capability		
8.3.3.4.2	Construction and mechanical operation		
8.3.3.4.2.1	Construction		
	A withdrawable circuit-breaker shall be checked for the requirements stated in 7.1.2		N/A
	A circuit-breaker with stored energy operation shall be checked for compliance with 7.2.1.1.6, regarding the charge indicator and the direction of operation of manual energy storing		N/A
8.3.3.4.2.2	Mechanical operation		
	A circuit-breaker with dependent power operation shall comply with the requirements stated in 7.2.1.1.4		N/A
	A circuit-breaker with dependent power operation shall operate with the operating mechanism charged to the minimum and maximum limits stated by the manufacturer		N/A
	A circuit-breaker with stored energy operation shall comply with the requirements stated in 7.2.1.6 with the auxiliary supply voltage at 85% and 110% of the rated control supply voltage.		N/A
	It shall also be verified that the moving contacts cannot be moved from the open position when the operating mechanism is charged to slightly below the full charge as evidenced by the indicating device		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	For a trip-free circuit-breaker it shall not be possible to maintain the contacts in the touching or closed position when the tripping release is in the position to trip the circuit-breaker		P
	If the closing and opening times of a circuit-breaker are stated by the manufacturer, such times shall comply with the stated values		N/A
8.3.3.4.2.3	Undervoltage releases		
	Undervoltage releases shall comply with the requirements of 7.2.1.3 of Part 1. For this purpose, the release shall be fitted to a circuit-breaker having the maximum current rating for which the release is suitable		N/A
i)	Drop out voltage		
	It shall be verified that the release operates to open the circuit-breaker between the voltage limits specified		N/A
	The voltage shall be reduced from rated voltage at a rate to reach 0 V in approximately 30 s		N/A
	The test for the lower limit is made without current in the main circuit and without previous heating of the release coil		N/A
	In the case of a release with a range of rated voltages, this test applies to the maximum voltage of the range		N/A
	The test for the upper limit is made starting from a constant temperature corresponding to the application of rated control supply voltage to the release and rated current in the main poles of the circuit-breaker		N/A
	This test may be combined with the temperature-rise test of 8.3.3.7		N/A
	In the case of a release with a range of rated voltages, this test is made at both the minimum and maximum rated control supply voltages		N/A
ii)	Test for limits of operation		
	Starting with the circuit-breaker open, at the temperature of the test room, and with the supply voltage at 30% rated maximum control supply voltage, it shall be verified that the circuit-breaker cannot be closed by the operation of the actuator		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	When the supply voltage is raised to 85% of the minimum control supply voltage, it shall be verified that the circuit-breaker can be closed by the operation of the actuator		N/A
iii)	Performance under overvoltage conditions		
	With the circuit-breaker closed and without current in the main circuit, it shall be verified that the undervoltage release will withstand the application of 110% rated control supply voltage for 4 h without impairing its functions		N/A
8.3.3.4.2.4	Shunt releases		
	Shunt releases shall comply with the requirements of 7.2.1.4 of Part 1. For this purpose, the release shall be fitted to a circuit-breaker having the maximum rated current for which the release is suitable		N/A
	It shall be verified that the release will operate to open the circuit-breaker at 70% rated control supply voltage when tested at an ambient temperature of $+55\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$ without current in the main poles of the circuit-breaker		N/A
	In the case of a release having a range of rated control supply voltages, the test voltage shall be 70% of the minimum rated control supply voltage		N/A
8.3.3.4.3	Operational performance capability without current.		
	Type designation or serial number	HGP 160D X / 3P+N	
	Sample no:	39#	
	Rated current I_n (A)	160 A	
	Rated operational voltage: U_e (V)	Max. 500 Vac	
	Rated control supply voltage of closing mechanism: U_c (V)	No electric closing mechanism	
	Rated control supply voltage of shunt releases: U_c (V)	No shunt releases	
	Rated control supply voltage undervoltage releases: U_c (V)	No undervoltage releases	
	Ambient temperature 10-40 $^{\circ}\text{C}$:	26,9 $^{\circ}\text{C}$	P
	Number of operating cycles per hour	120 cycles per hour	P
	Number of cycles without current (total) (closing mechanism energized at the rated U_c)	7000 cycles	P
	Number of cycles without current (without releases)	7000 cycles	P

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Clause	Requirement + Test	Result - Remark	Verdict
	Applied voltage of closing mechanism (V)		N/A
	10% of total cycles for circuit-breaker with fitted shunt release: (50% at the beginning- and 50% at the end of the test.) Energized at the rated U_c		N/A
	Applied voltage: shunt releases (V)		N/A
	10% of total cycles for circuit-breaker with undervoltage releases: (50% at the beginning- and 50% at the end of the test.) Energized at the minimum rated U_c		N/A
	10 attempts to close the breaker without applied voltage at the undervoltage releases. (Shall not possible to close the circuit-breaker.)		N/A
	Applied voltage: undervoltage releases (V)		N/A
	In the case of circuit-breakers fitted with electrical or pneumatic closing devices, these devices shall be supplied at their rated control supply voltage or at their rated pressure.		N/A
	Precautions shall be taken to ensure that the temperature rises of the electrical components do not exceed the value indicated in tab. 7.		P
8.3.3.4.4	Operational performance capability with current.		
	Rated current: I_n (A)	160 A	
	Maximum rated operational voltage: U_e (V)	500 Vac	
	Conductor cross-sectional area (mm ²) :	70 mm ²	P
	Number of operating cycles per hour	120 cycles per hour	P
	Number of cycles with current (total) (closing mechanism energized at the rated U_c)	1000 cycles (no electric closing mechanism)	P
	Applied voltage: closing mechanism (V)		N/A
	For circuit-breaker fitted with adjustable releases, test shall be made with the overload setting at maximum and short-circuit setting at minimum.	Overload: 1,0 I_n Short-circuit: fixed	P
	Conditions, make/break operations:		P
	- test voltage $U/U_e = 1,0$ (V) L1-L3: L1-L2: L2-L3:	502 Vac 503 Vac 502 Vac	P

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Clause	Requirement + Test	Result - Remark	Verdict
	- test current $I/I_e = 1,0$ (A)..... L1: L2: L3:	163 A 163 A 163 A	P
	- power factor/time constant:	0,81	P
	- frequency: (Hz)	50 Hz	P
	- on-time (ms):	Min. 412 ms	P
	- off-time (s):	Max. 29,6 s	P
	In the case of circuit-breakers fitted with electrical or pneumatic closing devices, these devices shall be supplied at their rated control supply voltage or at their rated pressure.		N/A
	Precautions shall be taken to ensure that the temperature rises of the electrical components do not exceed the value indicated in tab. 7.		P
8.3.3.4.5	Additional test of operational performance capability without current for withdrawable circuit-breaker.		
	Number of operations cycles : 100		N/A
	After test, the isolating contacts, withdrawable mechanism and interlocks shall be suitable for further service.		N/A
8.3.3.5	Overload performance		
	this test applies to circuit-breaker of rated current up to and including 630 A		
	Type designation or serial number	HGP 160D X / 3P+N	
	Sample no:	39#	
	Rated current I_n (A)	160 A	
	Rated operational voltage: U_e (V)	Max. 500 Vac	
	Rated control supply voltage of closing mechanism: U_c (V)	No electric closing mechanism	
	Rated control supply voltage of shunt releases: U_c (V)	No shunt releases	
	Rated control supply voltage undervoltage releases: U_c (V)	No undervoltage releases	
	Ambient temperature 10-40 °C :	15,8 °C	P
	Number of operating cycles per hour	120 cycles per hour	P
	Maximum rated operational voltage: U_e (V)	500 Vac	P
	Number of operating cycles per hour	120 cycles per hour	P

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Clause	Requirement + Test	Result - Remark	Verdict
	Number of cycles with current (total) (closing mechanism energized at the rated U_c)	15 cycles (no electric closing mechanism)	P
	Applied voltage: closing mechanism (V)		N/A
	For circuit-breaker fitted with adjustable releases, test shall be made with the overload/short-circuit settings at maximum.	Overload: 1,0 I_n Short-circuit: fixed	P
	Conditions, overload operations:		P
	- test voltage $U/U_e = 1,05$ (V) L1-L3: L1-L2: L2-L3:	527 Vac 527 Vac 528 Vac	P
	- test current AC/DC: $I/I_e = 6,0/2.5$ (A) L1: L2: L3:	968 A 962 A 976 A	P
	- power factor/time constant:	0,48	P
	- Number of cycles manually opened: 9	12 manual operations at 1,05 U_e	P
	- Number of cycles automatically opened by an overload release: 3	3 (at convenient voltage)	P
	for circuit-breakers having a short-circuit release of a maximum setting less than the test current		
	all 12 operations automatic		N/A
	If the testing means do not withstand the let-through energy occurring during the automatic operation		
	- 12 manual operations - three additional operations with automatic opening, made at any convenient voltage		P
	- frequency: (Hz)	50 Hz	P
	- on-time max 2s:	Min. 195 ms Max. 197 ms	P
	Operating rate if different from Table 8		N/A
8.3.3.6	Verification of dielectric withstand		
	- equal to twice the rated operational voltage with a minimum of 1000 V for 5 seconds	See appended table 6	P
	- no breakdown or flashover		P

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Clause	Requirement + Test	Result - Remark	Verdict
	For circuit-breaker suitable for isolation, the leakage current shall be measured through each pole with the contacts in the open position, at a test voltage of 1,1 U _e , and shall not exceed 2 mA.	L1: 0,005 mA L2: 0,005 mA L3: 0,005 mA N: 0.005 mA	P
8.3.3.7	Verification of temperature-rise		
	- the values of temperature-rise do not exceed those specified in tab. 7.	See appended table 1 All phase poles are loaded See appended table 2 N pole and adjacent phase pole are loaded	P
	Temperature rise of main circuit terminals ≤ 80 K (K) :	Max: 62 K	P
	conductor cross-sectional area (mm ²) :	70 mm ²	P
	test current I _e (A) :	160 A	P
8.3.3.8	Verification of overload releases		
	Test current: 1.45 times the value of their current setting at the reference temperature: (A)	232 A (1,45 x I _n) Tested at ambient air temperature of 40 °C	P
	Conventional tripping time: <1h when I _n < 63A, <2h when I _n > 63 A	4 min 26 s	P
8.3.3.9	Verification of undervoltage and shunt releases		
	Circuit-breaker fitted with undervoltage releases. The release shall not operate at 70% of the minimum control supply voltage -		N/A
	and shall operate at 35% of the maximum control supply voltage.		N/A
	Circuit-breaker fitted with shunt releases. The release shall operate at 70% of the minimum rated control supply voltage. Test made at room temperature.		N/A
8.3.3.10	Verification of the main contact position for circuit-breakers for isolation		P
	actuating force for opening (N)	48 N	—
	test force with blocked main contacts for 10 s (N) :	144 N for 10 s	—
	Dependent power operation		N/A
	Supply voltage of 110% of rated voltage (V).....:		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Three attempts of 5 s to operate the equipment at intervals of 5 min.		N/A
	Independent power operation		N/A
	Three attempts to operate the equipment by the stored energy.		N/A
	Lock ability of driving mechanism in OFF-position at test force and blocked main contacts :		N/A
	Position indicator does not show OFF-position after capture of test force at blocked main contacts		P

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Clause	Requirement + Test	Result - Remark	Verdict
8.3.3	TEST SEQUENCE I: GENERAL PERFORMANCE CHARACTERISTICS Test was conducted on HGP 160D X, In = 160 A, 3P, sample no. 2#		
8.3.3.2	Test of tripping limits and characteristic		N/A
8.3.3.3	Test of dielectric properties, impulse withstand voltage (Uimp indicated):		
8.3.3.4 part1	The 1,2/50µs impulse voltage shall be applied five times for each polarity at intervals of 1s minimum		
	- rated impulse withstand voltage (kV) :	8 kV	P
	- sea level of the laboratory:	Sea level	P
	- test Uimp main circuits (kV) :	9,8 kV	P
	- test Uimp auxiliary circuits (kV) :		N/A
	- test Uimp control circuits (kV) :		N/A
	- test Uimp on open main contacts (equipment suitable for isolating) (kV) :	12,3 kV	P
a)	Application of test voltage		P
	i) Between all terminals of the main circuit connected together (incl. control and auxiliary circuits connected to the main circuit) and the enclosure or mounting plate, with the contacts in all normal positions of operation.		P
	ii) Between each pole of the main circuit and the other poles connected together and to the enclosure or mounting plate, with the contacts in all normal positions of operation.		P
	iii) Between each control and auxiliary circuit not normally connected to the main circuit and: - the main circuit		N/A
	- other circuits		N/A
	- exposed conductive parts		N/A
	- enclosure of mounting plate		N/A
	iv) equipment suitable for isolation		P
	equipment not suitable for isolation		N/A
	- no unintentional disruptive discharge during the test's		P
	Test of dielectric properties, dielectric withstand voltage (Uimp not indicated):		
	- rated insulation voltage (V) :	1000 V	P
	- main circuits, test voltage for 1 min (V)	2200 V, 60 s	P

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Clause	Requirement + Test	Result - Remark	Verdict
	- auxiliary circuits, test voltage for 1 min (V)		N/A
	- control circuits, test voltage for 1 min (V)		N/A
8.3.3.2.2	Application of test voltage		
1)	with circuit-breaker in the closed position		
	- between all live parts of all poles connected together and the frame of the circuit-breaker .		P
	- between each pole and all the other poles connected to the frame of the circuit-breaker		P
2)	with the circuit-breaker in the open position and, additionally, in the tripped position, if any.		P
	- between all live parts of all poles connected together and the frame of the circuit-breaker.		P
	- between the terminals of one side connected together and the terminals of the other side connected together.		P
b)	Control and auxiliary circuits		
1)	- between all the control and auxiliary circuits which are not normally connected to the main circuit, connected together, and the frame of the circuit-breaker.		N/A
2)	- where appropriate, between each part of the control an auxiliary circuits which may be isolated from the other parts during normal operation and all the other parts connected together.		N/A
	No unintentional disruptive discharge during the tests		N/A
(i)	the normal positions of operation include the tripped position, if any;		P
(ii)	circuits incorporating solid-state devices connected to the main circuit shall be disconnected for the test;		N/A
(iii)	circuit-breakers not declared as suitable for isolation shall be tested with the test voltage applied across the poles of the main circuit, the line terminals being connected together and the load terminals being connected together.		P
(iv)	For circuit-breaker suitable for isolation, the leakage current shall be measured through each pole with the contacts in the open position, at a test voltage of 1,1 U _e , and shall not exceed 0,5mA.	L1: 0,005 mA L2: 0,005 mA L3: 0,005 mA	P
(v)	circuit-breakers having a rated insulation voltage greater than 1 000 V a.c. shall be tested at a voltage of U _i + 1 200 V a.c. r.m.s. or 2 U _i whichever is the greater		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
(vi)	withdrawable circuit-breakers shall be subject to verification of impulse withstand voltage and shall be applied between the withdrawable unit's main contacts and their associated fixed contacts, in the disconnected position.		N/A
8.3.3.4	Mechanical operation and operational performance capability		
8.3.3.4.2	Construction and mechanical operation		
8.3.3.4.2.1	Construction		
	A withdrawable circuit-breaker shall be checked for the requirements stated in 7.1.2		N/A
	A circuit-breaker with stored energy operation shall be checked for compliance with 7.2.1.1.6, regarding the charge indicator and the direction of operation of manual energy storing		N/A
8.3.3.4.2.2	Mechanical operation		
	A circuit-breaker with dependent power operation shall comply with the requirements stated in 7.2.1.1.4		N/A
	A circuit-breaker with dependent power operation shall operate with the operating mechanism charged to the minimum and maximum limits stated by the manufacturer		N/A
	A circuit-breaker with stored energy operation shall comply with the requirements stated in 7.2.1.6 with the auxiliary supply voltage at 85% and 110% of the rated control supply voltage.		N/A
	It shall also be verified that the moving contacts cannot be moved from the open position when the operating mechanism is charged to slightly below the full charge as evidenced by the indicating device		N/A
	For a trip-free circuit-breaker it shall not be possible to maintain the contacts in the touching or closed position when the tripping release is in the position to trip the circuit-breaker		P
	If the closing and opening times of a circuit-breaker are stated by the manufacturer, such times shall comply with the stated values		N/A
8.3.3.4.2.3	Undervoltage releases		
	Undervoltage releases shall comply with the requirements of 7.2.1.3 of Part 1. For this purpose, the release shall be fitted to a circuit-breaker having the maximum current rating for which the release is suitable		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
i)	Drop out voltage		
	It shall be verified that the release operates to open the circuit-breaker between the voltage limits specified		N/A
	The voltage shall be reduced from rated voltage at a rate to reach 0 V in approximately 30 s		N/A
	The test for the lower limit is made without current in the main circuit and without previous heating of the release coil		N/A
	In the case of a release with a range of rated voltages, this test applies to the maximum voltage of the range		N/A
	The test for the upper limit is made starting from a constant temperature corresponding to the application of rated control supply voltage to the release and rated current in the main poles of the circuit-breaker		N/A
	This test may be combined with the temperature-rise test of 8.3.3.7		N/A
	In the case of a release with a range of rated voltages, this test is made at both the minimum and maximum rated control supply voltages		N/A
ii)	Test for limits of operation		
	Starting with the circuit-breaker open, at the temperature of the test room, and with the supply voltage at 30% rated maximum control supply voltage, it shall be verified that the circuit-breaker cannot be closed by the operation of the actuator		N/A
	When the supply voltage is raised to 85% of the minimum control supply voltage, it shall be verified that the circuit-breaker can be closed by the operation of the actuator		N/A
iii)	Performance under overvoltage conditions		
	With the circuit-breaker closed and without current in the main circuit, it shall be verified that the undervoltage release will withstand the application of 110% rated control supply voltage for 4 h without impairing its functions		N/A
8.3.3.4.2.4	Shunt releases		
	Shunt releases shall comply with the requirements of 7.2.1.4 of Part 1. For this purpose, the release shall be fitted to a circuit-breaker having the maximum rated current for which the release is suitable		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	It shall be verified that the release will operate to open the circuit-breaker at 70% rated control supply voltage when tested at an ambient temperature of + 55 °C $\pm$ 2 °C without current in the main poles of the circuit-breaker		N/A
	In the case of a release having a range of rated control supply voltages, the test voltage shall be 70% of the minimum rated control supply voltage		N/A
8.3.3.4.3	Operational performance capability without current.		
	Type designation or serial number	HGP 160D X / 3P	
	Sample no:	2#	
	Rated current I _n (A)	160 A	
	Rated operational voltage: U _e (V)	Max. 500 Vac	
	Rated control supply voltage of closing mechanism: U _c (V)	No electric closing mechanism	
	Rated control supply voltage of shunt releases: U _c (V)	No shunt releases	
	Rated control supply voltage undervoltage releases: U _c (V)	No undervoltage releases	
	Ambient temperature 10-40 °C :	27,5 °C	P
	Number of operating cycles per hour	120 cycles per hour	P
	Number of cycles without current (total) (closing mechanism energized at the rated U _c)	7000 cycles	P
	Number of cycles without current (without releases)	7000 cycles	P
	Applied voltage of closing mechanism (V)		N/A
	10% of total cycles for circuit-breaker with fitted shunt release: (50% at the beginning- and 50% at the end of the test.) Energized at the rated U _c		N/A
	Applied voltage: shunt releases (V)		N/A
	10% of total cycles for circuit-breaker with undervoltage releases: (50% at the beginning- and 50% at the end of the test.) Energized at the minimum rated U _c		N/A
	10 attempts to close the breaker without applied voltage at the undervoltage releases. (Shall not possible to close the circuit-breaker.)		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Applied voltage: undervoltage releases (V)		N/A
	In the case of circuit-breakers fitted with electrical or pneumatic closing devices, these devices shall be supplied at their rated control supply voltage or at their rated pressure.		N/A
	Precautions shall be taken to ensure that the temperature rises of the electrical components do not exceed the value indicated in tab. 7.		P
8.3.3.4.4	Operational performance capability with current.		
	Rated current: I_n (A)	160 A	
	Maximum rated operational voltage: U_e (V)	500 Vac	
	Conductor cross-sectional area (mm^2) :	70 mm^2	P
	Number of operating cycles per hour	120 cycles per hour	P
	Number of cycles with current (total) (closing mechanism energized at the rated U_c)	1000 cycles (no electric closing mechanism)	P
	Applied voltage: closing mechanism (V)		N/A
	For circuit-breaker fitted with adjustable releases, test shall be made with the overload setting at maximum and short-circuit setting at minimum.	Overload: 1,0 I_n Short-circuit: fixed	P
	Conditions, make/break operations:		P
	- test voltage $U/U_e = 1,0$ (V) L1-L3: L1-L2: L2-L3:	502 Vac 503 Vac 502 Vac	P
	- test current $I/I_e = 1,0$ (A)..... L1: L2: L3:	163 A 163 A 163 A	P
	- power factor/time constant:	0,81	P
	- frequency: (Hz)	50 Hz	P
	- on-time (ms):	Min. 412 ms	P
	- off-time (s):	Max. 29,6 s	P
	In the case of circuit-breakers fitted with electrical or pneumatic closing devices, these devices shall be supplied at their rated control supply voltage or at their rated pressure.		N/A
	Precautions shall be taken to ensure that the temperature rises of the electrical components do not exceed the value indicated in tab. 7.		P

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Clause	Requirement + Test	Result - Remark	Verdict
8.3.3.4.5	Additional test of operational performance capability without current for withdrawable circuit-breaker.		
	Number of operations cycles : 100		N/A
	After test, the isolating contacts, withdrawable mechanism and interlocks shall be suitable for further service.		N/A
8.3.3.5	Overload performance		
	this test applies to circuit-breaker of rated current up to and including 630 A		
	Type designation or serial number	HGP 160D X / 3P	
	Sample no:	2#	
	Rated current I_n (A)	160 A	
	Rated operational voltage: U_e (V)	Max. 500 Vac	
	Rated control supply voltage of closing mechanism: U_c (V)	No electric closing mechanism	
	Rated control supply voltage of shunt releases: U_c (V)	No shunt releases	
	Rated control supply voltage undervoltage releases: U_c (V)	No undervoltage releases	
	Ambient temperature 10-40 °C :	15,8 °C	P
	Number of operating cycles per hour	120 cycles per hour	P
	Maximum rated operational voltage: U_e (V)	500 Vac	P
	Number of operating cycles per hour	120 cycles per hour	P
	Number of cycles with current (total) (closing mechanism energized at the rated U_c)	15 cycles (no electric closing mechanism)	P
	Applied voltage: closing mechanism (V)		N/A
	For circuit-breaker fitted with adjustable releases, test shall be made with the overload/short-circuit settings at maximum.	Overload: 1,0 I_n Short-circuit: fixed	P
	Conditions, overload operations:		P
	- test voltage $U/U_e = 1,05$ (V) L1-L3: L1-L2: L2-L3:	527 Vac 527 Vac 528 Vac	P
	- test current AC/DC: $I/I_e = 6,0/2.5$ (A) L1: L2: L3:	968 A 962 A 976 A	P
	- power factor/time constant:	0,48	P

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Clause	Requirement + Test	Result - Remark	Verdict
	- Number of cycles manually opened: 9	12 manual operations at 1,05 U _e	P
	- Number of cycles automatically opened by an overload release: 3	3 (at convenient voltage)	P
	for circuit-breakers having a short-circuit release of a maximum setting less than the test current		
	all 12 operations automatic		N/A
	If the testing means do not withstand the let-through energy occurring during the automatic operation		
	– 12 manual operations – three additional operations with automatic opening, made at any convenient voltage		P
	- frequency: (Hz)	50 Hz	P
	- on-time max 2s:	Min. 184 ms Max. 198 ms	P
	Operating rate if different from Table 8		N/A
8.3.3.6	Verification of dielectric withstand		
	- equal to twice the rated operational voltage with a minimum of 1000 V for 5 seconds	See appended table 6	P
	- no breakdown or flashover		P
	For circuit-breaker suitable for isolation, the leakage current shall be measured through each pole with the contacts in the open position, at a test voltage of 1,1 U _e , and shall not exceed 2 mA.	L1: 0,005 mA L2: 0,005 mA L3: 0,005 mA	P
8.3.3.7	Verification of temperature-rise		
	- the values of temperature-rise do not exceed those specified in tab. 7.	See appended table 3 All phase poles are loaded	P
	Temperature rise of main circuit terminals ≤ 80 K (K) :	Max: 70 K	P
	conductor cross-sectional area (mm ²) :	70 mm ²	P
	test current I _e (A) :	160 A	P
8.3.3.8	Verification of overload releases		
	Test current: 1.45 times the value of their current setting at the reference temperature: (A)		N/A
	Conventional tripping time: <1h when I _n < 63A, <2h when I _n > 63 A		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
8.3.3.9	Verification of undervoltage and shunt releases		
	Circuit-breaker fitted with undervoltage releases. The release shall not operate at 70% of the minimum control supply voltage -		N/A
	and shall operate at 35% of the maximum control supply voltage.		N/A
	Circuit-breaker fitted with shunt releases. The release shall operate at 70% of the minimum rated control supply voltage. Test made at room temperature.		N/A
8.3.3.10	Verification of the main contact position for circuit-breakers for isolation		P
	actuating force for opening (N) :	53,8 N	—
	test force with blocked main contacts for 10 s (N) :	162 N for 10 s	—
	Dependent power operation		N/A
	Supply voltage of 110% of rated voltage (V).....:		N/A
	Three attempts of 5 s to operate the equipment at intervals of 5 min.		N/A
	Independent power operation		N/A
	Three attempts to operate the equipment by the stored energy.		N/A
	Lock ability of driving mechanism in OFF-position at test force and blocked main contacts :		N/A
	Position indicator does not show OFF-position after capture of test force at blocked main contacts		P

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Clause	Requirement + Test	Result - Remark	Verdict

8.3.4	TEST SEQUENCE II (Ics): Rated service short-circuit breaking capacity		N/A
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Clause	Requirement + Test	Result - Remark	Verdict
8.3.4	TEST SEQUENCE II/III (Ics=Icu): Test was conducted on HGP 160D X, In = 160 A, 3P+N, sample no. 40#		
8.3.4.2	Test of rated service short-circuit breaking capacity		
	Test sequence of operation: O – t – CO – t – CO		
	Type designation or serial number	HGP 160D X / 3P+N	
	Sample no:	40#	
	Rated current: In (A)	160 A	
	Rated operational voltage: Ue (V)	460 Vac	
	Rated service short-circuit breaking capacity: (kA)	150 kA	
	Rated control supply voltage of closing mechanism: Uc (V)	No electric closing mechanism	
	Rated control supply voltage of shunt release: Uc (V)	No shunt releases	
	For circuit-breaker fitted with adjustable releases, test shall be made with the current and time settings at maximum.	Overload: 1,0 In Short-circuit: fixed	P
	closing mechanism energized with 85% at the rated Uc: (V)		N/A
	The circuit-breaker is mounted complete on its own support or an equivalent support.		P
	Test made in free air:		P
	Distances of the metallic screen's: (all sides)	Front / Back: 0 mm, Left / Right: 10 mm, Up / Down: 50 mm	P
	The characteristics of the metallic screen:		
	- woven wire mesh		N/A
	- perforated metal		P
	- expanded metal		N/A
	- ratio hole area/total area: 0,45-0,65		P
	- size of hole: <30mm ²		P
	- finish: bare or conductive plating		P
	Test made in specified individual enclosure: Details of these tests, including the dimensions of the enclosure:		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Fuse "F": copper wire: diameter 0,8 mm, 50 mm long		P
	Circuit is earthed at: (load-star- or supply-star point)	Load-star	P
	Conductor cross-sectional area (mm ²) :	70 mm ²	P
	If terminals unmarked: line connected at: (underside/upside)	Upside	P
	Tightening torques: (Nm)	12 Nm	P
8.3.5.2	The operation of overload releases shall be verified at twice the value of their current setting on each pole separately.		
	The operating time shall not exceed the max. value stated by the manufacturer for twice the current setting at the reference temperature, on a pole singly.		
	Time specified by the manufacturer:	1 min 38 s ≤ t ≤ 8 min 30 s	P
	- Operation time: (s) L1: L2: L3: N :	4 min 51 s 4 min 29 s 5 min 17 s	P
8.3.4.2	Test of rated service short-circuit breaking capacity		P
	Test sequence of operation: O – t – CO – t – CO		P
	- test voltage U/U _e = 1,05 (V) L1-L3: L1-L2: L2-L3:	492 Vac 493 Vac 492 Vac	P
	- r.m.s. test current AC/DC: (A) L1: L2: L3:	154 kA 152 kA 153 kA	P
	power factor/time constant :	0,19	P
	- Factor "n"	2,2	P
	- peak test current (A) :	339 kA	P
	Test sequence "O"		
	- max. let-through current: (kA _{peak}) L1: L2: L3:	21,9 kA 9,08 kA 15,0 kA	P
	- Joule integral I ² dt (A ² s) L1: L2: L3:	455 kA ² s 61,8 kA ² s 225 kA ² s	P
	Pause, t: (min)	5 min	P

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Clause	Requirement + Test	Result - Remark	Verdict
	Test sequence "CO"		
	- max. let-through current: (kA _{peak}) L1: L2: L3:	8,90 kA 20,1 kA 20,3 kA	P
	- Joule integral I ² dt (A ² s) L1: L2: L3:	155 kA ² s 500 kA ² s 362 kA ² s	P
	Pause, t: (min)	5 min	P
	Test sequence "CO"		
	- max. let-through current: (kA _{peak}) L1: L2: L3:	20,9 kA 7,59 kA 19,9 kA	P
	- Joule integral I ² dt (A ² s) L1: L2: L3:	406 kA ² s 159 kA ² s 544 kA ² s	P
	Melting of the fusible element	No melting of the fusible element	P
	Damage to insulation on conductors		P
	Holes in the PE-sheet for test sequence "O"	No holes	P
	Cracks observed	No cracks observed	P
8.3.4.3	Operational performance capability with current.		
	Rated current: I _n (A)	160 A	
	Maximum rated operational voltage: U _e (V)	460 Vac	
	Conductor cross-sectional area (mm ²) :	70 mm ²	
	Number of operating cycles per hour	120 cycles per hour	P
	Number (5% of the number given in column 4, tab. 8) of cycles with current (total) (closing mechanism energized at the rated U _c)	50 cycles (no electric closing mechanism)	P
	Applied voltage: closing mechanism (V)		N/A
	For circuit-breaker fitted with adjustable releases, test shall be made with the overload setting at maximum and short-circuit setting at minimum.	Overload: 1,0 I _n Short-circuit: fixed	P
	Conditions, make/break operations:		
	- test voltage U/U _e = 1,0 (V) L1-L3: L1-L2: L2-L3:	464 Vac 463 Vac 463 Vac	P

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Clause	Requirement + Test	Result - Remark	Verdict
	- test current $I/I_e = 1,0$ (A)..... L1: L2: L3:	160 A 161 A 161 A	P
	- power factor/time constant:	0,78	P
	- frequency: (Hz)	50 Hz	P
	- on-time (ms):	Min. 407 ms	P
	- off-time (s):	Max. 29,6 s	P
8.3.4.4	Verification of dielectric withstand		
	- equal to twice the rated operational voltage with a minimum of 1000 V	1000 V, 5 s	P
	- no breakdown or flashover	See appended table 7	P
	- the leaking current for circuit-breaker suitable for isolation: ($<2\text{mA} / 1,1 U_e$)	L1: 8,79 μA L2: 7,29 μA L3: 9,11 μA	P
8.3.4.5	Verification of temperature-rise		
	- the values of temperature-rise do not exceed those specified in tab. 7.	See appended table 4	P
	Temperature rise of main circuit terminals. $\leq 80 \text{ K}$ (K) :	Max: 73 K	P
	conductor cross-sectional area (mm^2) :	70 mm^2	P
	test current I_e (A) :	160 A	P
8.3.4.6	Verification of overload releases		
	Test current: 1,45 times the value of their current setting at the reference temperature: (A)	232 A ($1,45 \times I_n$)	P
	Conventional tripping time: $<1\text{h}$ when $I_n < 63\text{A}$, $<2\text{h}$ when $I_n > 63 \text{ A}$	3 min 04 s	P
8.3.5.5	Verification of overload releases		
	The operation of overload releases shall be verified at 2,5 times the value of their current setting on each pole separately.		
	The operating time shall not exceed the max. value stated by the manufacturer for twice the current setting at the reference temperature, on a pole singly.		
	Time specified by the manufacturer:	$t \leq 8 \text{ min } 30 \text{ s}$	P
	- Operation time: (s) L1: L2: L3: N :	3 min 54 s 3 min 23 s 4 min 07 s	P

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Clause	Requirement + Test	Result - Remark	Verdict
8.3.4	TEST SEQUENCE II/III (Ics=Icu): Test was conducted on HGP 50D X, In = 15 A, 3P+N, sample no. 4#		
8.3.4.2	Test of rated service short-circuit breaking capacity		
	Test sequence of operation: O – t – CO – t – CO		
	Type designation or serial number	HGP 50D X / 3P+N	
	Sample no:	4#	
	Rated current: In (A)	15 A	
	Rated operational voltage: Ue (V)	460 Vac	
	Rated service short-circuit breaking capacity: (kA)	150 kA	
	Rated control supply voltage of closing mechanism: Uc (V)	No electric closing mechanism	
	Rated control supply voltage of shunt release: Uc (V)	No shunt releases	
	For circuit-breaker fitted with adjustable releases, test shall be made with the current and time settings at maximum.	Overload: 0,8 In Short-circuit: fixed	P
	closing mechanism energized with 85% at the rated Uc: (V)		N/A
	The circuit-breaker is mounted complete on its own support or an equivalent support.		P
	Test made in free air:		P
	Distances of the metallic screen's: (all sides)	Front / Back: 0 mm, Left / Right: 10 mm, Up / Down: 50 mm	P
	The characteristics of the metallic screen:		
	- woven wire mesh		N/A
	- perforated metal		P
	- expanded metal		N/A
	- ratio hole area/total area: 0,45-0,65		P
	- size of hole: <30mm ²		P
	- finish: bare or conductive plating		P
	Test made in specified individual enclosure: Details of these tests, including the dimensions of the enclosure:		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Fuse "F": copper wire: diameter 0,8 mm, 50 mm long		P
	Circuit is earthed at: (load-star- or supply-star point)	Load-star	P
	Conductor cross-sectional area (mm ²) :	2,5 mm ²	P
	If terminals unmarked: line connected at: (underside/upside)	Upside	P
	Tightening torques: (Nm)	12 Nm	P
8.3.5.2	The operation of overload releases shall be verified at twice the value of their current setting on each pole separately.		
	The operating time shall not exceed the max. value stated by the manufacturer for twice the current setting at the reference temperature, on a pole singly.		
	Time specified by the manufacturer:	1 min 38 s ≤ t ≤ 8 min 30 s	P
	- Operation time: (s) L1: L2: L3: N :	4 min 54 s 6 min 16 s 4 min 17 s	P
8.3.4.2	Test of rated service short-circuit breaking capacity		P
	Test sequence of operation: O – t – CO – t – CO		P
	- test voltage U/U _e = 1,05 (V) L1-L3: L1-L2: L2-L3:	492 Vac 493 Vac 492 Vac	P
	- r.m.s. test current AC/DC: (A) L1: L2: L3:	154 kA 152 kA 153 kA	P
	power factor/time constant :	0,19	P
	- Factor "n"	2,2	P
	- peak test current (A) :	339 kA	P
	Test sequence "O"		
	- max. let-through current: (kA _{peak}) L1: L2: L3:	12,0 kA 7,48 kA 7,49 kA	P
	- Joule integral I ² dt (A ² s) L1: L2: L3:	158 kA ² s 151 kA ² s 202 kA ² s	P
	Pause, t: (min)	5 min	P

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Clause	Requirement + Test	Result - Remark	Verdict
	Test sequence "CO"		
	- max. let-through current: (kA _{peak}) L1: L2: L3:	11,5 kA 9,49 kA 9,21 kA	P
	- Joule integral I ² dt (A ² s) L1: L2: L3:	198 kA ² s 182 kA ² s 179 kA ² s	P
	Pause, t: (min)	4 min	P
	Test sequence "CO"		
	- max. let-through current: (kA _{peak}) L1: L2: L3:	12,0 kA 8,21 kA 8,17 kA	P
	- Joule integral I ² dt (A ² s) L1: L2: L3:	188 kA ² s 148 kA ² s 173 kA ² s	P
	Melting of the fusible element	No melting of the fusible element	P
	Damage to insulation on conductors		P
	Holes in the PE-sheet for test sequence "O"	The music wire of 0,26 mm diameter cannot be inserted the arc chamber area	N/A
	Cracks observed	No cracks observed	P
8.3.4.3	Operational performance capability with current.		
	Rated current: I _n (A)		
	Maximum rated operational voltage: U _e (V)		
	Conductor cross-sectional area (mm ²) :		
	Number of operating cycles per hour		N/A
	Number (5% of the number given in column 4, tab. 8) of cycles with current (total) (closing mechanism energized at the rated U _c)		N/A
	Applied voltage: closing mechanism (V)		N/A
	For circuit-breaker fitted with adjustable releases, test shall be made with the overload setting at maximum and short-circuit setting at minimum.		N/A
	Conditions, make/break operations:		
	- test voltage U/U _e = 1,0 (V) L1-L3: L1-L2: L2-L3:		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	- test current $I/I_e = 1,0$ (A)..... L1: L2: L3:		N/A
	- power factor/time constant:		N/A
	- frequency: (Hz)		N/A
	- on-time (ms):		N/A
	- off-time (s):		N/A
8.3.4.4	Verification of dielectric withstand		
	- equal to twice the rated operational voltage with a minimum of 1000 V	1000 V, 5 s	P
	- no breakdown or flashover	See appended table 7	P
	- the leaking current for circuit-breaker suitable for isolation: ($<2\text{mA} / 1,1 U_e$)	L1: 11,2 μA L2: 7,38 μA L3: 6,54 μA	P
8.3.4.5	Verification of temperature-rise		
	- the values of temperature-rise do not exceed those specified in tab. 7.		N/A
	Temperature rise of main circuit terminals. $\leq 80 \text{ K (K)}$:		N/A
	conductor cross-sectional area (mm^2) :		N/A
	test current I_e (A) :		N/A
8.3.4.6	Verification of overload releases		
	Test current: 1,45 times the value of their current setting at the reference temperature: (A)	17,4 A ($1,45 \times 0,8 \times I_n$)	P
	Conventional tripping time: $<1\text{h}$ when $I_n < 63\text{A}$, $<2\text{h}$ when $I_n > 63 \text{ A}$	38 min 43 s	P
8.3.5.5	Verification of overload releases		
	The operation of overload releases shall be verified at 2,5 times the value of their current setting on each pole separately.		
	The operating time shall not exceed the max. value stated by the manufacturer for twice the current setting at the reference temperature, on a pole singly.		
	Time specified by the manufacturer:	$t \leq 8 \text{ min } 30 \text{ s}$	P
	- Operation time: (s) L1: L2: L3: N :	3 min 29 s 3 min 11 s 3 min 54 s	P

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Clause	Requirement + Test	Result - Remark	Verdict
8.3.4	TEST SEQUENCE II/III (Ics=Icu): Test was conducted on HGP 160D X, In = 160 A, 3P+N, sample no. 41#		
8.3.4.2	Test of rated service short-circuit breaking capacity		
	Test sequence of operation: O – t – CO – t – CO		
	Type designation or serial number	HGP 160D X / 3P+N	
	Sample no:	41#	
	Rated current: In (A)	160 A	
	Rated operational voltage: Ue (V)	500 Vac	
	Rated service short-circuit breaking capacity: (kA)	100 kA	
	Rated control supply voltage of closing mechanism: Uc (V)	No electric closing mechanism	
	Rated control supply voltage of shunt release: Uc (V)	No shunt releases	
	For circuit-breaker fitted with adjustable releases, test shall be made with the current and time settings at maximum.	Overload: 1,0 In Short-circuit: fixed	P
	closing mechanism energized with 85% at the rated Uc: (V)		N/A
	The circuit-breaker is mounted complete on its own support or an equivalent support.		P
	Test made in free air:		P
	Distances of the metallic screen's: (all sides)	Front / Back: 0 mm, Left / Right: 10 mm, Up / Down: 50 mm	P
	The characteristics of the metallic screen:		
	- woven wire mesh		N/A
	- perforated metal		P
	- expanded metal		N/A
	- ratio hole area/total area: 0,45-0,65		P
	- size of hole: <30mm ²		P
	- finish: bare or conductive plating		P
	Test made in specified individual enclosure: Details of these tests, including the dimensions of the enclosure:		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Fuse "F": copper wire: diameter 0,8 mm, 50 mm long		P
	Circuit is earthed at: (load-star- or supply-star point)	Load-star	P
	Conductor cross-sectional area (mm ²) :	70 mm ²	P
	If terminals unmarked: line connected at: (underside/upside)	Underside	P
	Tightening torques: (Nm)	12 Nm	P
8.3.5.2	The operation of overload releases shall be verified at twice the value of their current setting on each pole separately.		
	The operating time shall not exceed the max. value stated by the manufacturer for twice the current setting at the reference temperature, on a pole singly.		
	Time specified by the manufacturer:	1 min 38 s ≤ t ≤ 8 min 30 s	P
	- Operation time: (s) L1: L2: L3: N :	4 min 11 s 4 min 29 s 4 min 39 s	P
8.3.4.2	Test of rated service short-circuit breaking capacity		P
	Test sequence of operation: O – t – CO – t – CO		P
	- test voltage U/U _e = 1,05 (V) L1-L3: L1-L2: L2-L3:	532 Vac 532 Vac 533 Vac	P
	- r.m.s. test current AC/DC: (A) L1: L2: L3:	102 kA 103 kA 102 kA	P
	power factor/time constant :	0,19	P
	- Factor "n"	2,2	P
	- peak test current (A) :	227 kA	P
	Test sequence "O"		
	- max. let-through current: (kA _{peak}) L1: L2: L3:	20,7 kA 8,25 kA 14,3 kA	P
	- Joule integral I ² dt (A ² s) L1: L2: L3:	413 kA ² s 49,4 kA ² s 210 kA ² s	P
	Pause, t: (min)	5 min	P

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Clause	Requirement + Test	Result - Remark	Verdict
	Test sequence "CO"		
	- max. let-through current: (kA _{peak}) L1: L2: L3:	19,3 kA 19,0 kA 9,79 kA	P
	- Joule integral I ² dt (A ² s) L1: L2: L3:	489 kA ² s 289 kA ² s 149 kA ² s	P
	Pause, t: (min)	6 min	P
	Test sequence "CO"		
	- max. let-through current: (kA _{peak}) L1: L2: L3:	9,16 kA 23,5 kA 16,6 kA	P
	- Joule integral I ² dt (A ² s) L1: L2: L3:	124 kA ² s 574 kA ² s 232 kA ² s	P
	Melting of the fusible element	No melting of the fusible element	P
	Damage to insulation on conductors		P
	Holes in the PE-sheet for test sequence "O"	The music wire of 0,26 mm diameter cannot be inserted the arc chamber area	N/A
	Cracks observed	No cracks observed	P
8.3.4.3	Operational performance capability with current.		
	Rated current: I _n (A)	160 A	
	Maximum rated operational voltage: U _e (V)	500 Vac	
	Conductor cross-sectional area (mm ²) :	70 mm ²	
	Number of operating cycles per hour	120 cycles per hour	P
	Number (5% of the number given in column 4, tab. 8) of cycles with current (total) (closing mechanism energized at the rated U _c)	50 cycles (no electric closing mechanism)	P
	Applied voltage: closing mechanism (V)		N/A
	For circuit-breaker fitted with adjustable releases, test shall be made with the overload setting at maximum and short-circuit setting at minimum.	Overload: 1,0 I _n Short-circuit: fixed	P
	Conditions, make/break operations:		
	- test voltage U/U _e = 1,0 (V) L1-L3: L1-L2: L2-L3:	502 Vac 503 Vac 502 Vac	P

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Clause	Requirement + Test	Result - Remark	Verdict
	- test current $I/I_e = 1,0$ (A)..... L1: L2: L3:	163 A 163 A 163 A	P
	- power factor/time constant:	0,81	P
	- frequency: (Hz)	50 Hz	P
	- on-time (ms):	Min. 406 ms	P
	- off-time (s):	Max. 29,6 s	P
8.3.4.4	Verification of dielectric withstand		
	- equal to twice the rated operational voltage with a minimum of 1000 V	1000 V, 5 s	P
	- no breakdown or flashover	See appended table 7	P
	- the leaking current for circuit-breaker suitable for isolation: ($<2\text{mA} / 1,1 U_e$)	L1: 9,34 μA L2: 7,21 μA L3: 6,54 μA	P
8.3.4.5	Verification of temperature-rise		
	- the values of temperature-rise do not exceed those specified in tab. 7.	See appended table 5	P
	Temperature rise of main circuit terminals. $\leq 80 \text{ K}$ (K) :	Max: 72 K	P
	conductor cross-sectional area (mm^2) :	70 mm^2	P
	test current I_e (A) :	160 A	P
8.3.4.6	Verification of overload releases		
	Test current: 1,45 times the value of their current setting at the reference temperature: (A)	232 A ($1,45 \times I_n$)	P
	Conventional tripping time: $<1\text{h}$ when $I_n < 63\text{A}$, $<2\text{h}$ when $I_n > 63 \text{ A}$	2 min 31 s	P
8.3.5.5	Verification of overload releases		
	The operation of overload releases shall be verified at 2,5 times the value of their current setting on each pole separately.		
	The operating time shall not exceed the max. value stated by the manufacturer for twice the current setting at the reference temperature, on a pole singly.		
	Time specified by the manufacturer:	$t \leq 8 \text{ min } 30 \text{ s}$	P
	- Operation time: (s) L1: L2: L3: N :	3 min 19 s 2 min 34 s 2 min 49 s	P

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Clause	Requirement + Test	Result - Remark	Verdict
8.3.4	TEST SEQUENCE II/III ($I_{cs}=I_{cu}$): HGP 160D L, 160 A, 4 poles, sample no. 42#		
8.3.4.2	Test of rated service short-circuit breaking capacity		
	Test sequence of operation: O – t – CO – t – CO		
	Type designation or serial number catalogue reference	HGP 160D L	
	Sample no:	42#	
	Rated current: I_n (A)	160 A	
	Corresponding rated voltage: U_e (V)	380 / 415 / 440 / 460 / 480 / 500 Vac	
	Rated service short-circuit breaking capacity: (kA)	85 kA	
	Rated control supply voltage of closing releases: U_c (V)	No electric closing release	
	Rated control supply voltage of shunt release: U_c (V)	No shunt releases	
	Rated control supply voltage of undervoltage releases: U_c (V)	No undervoltage release	
	For circuit-breaker fitted with adjustable releases, test shall be made with the current and time settings at maximum.	$I_r = 1 I_n$	P
	Closing releases energized with 85% at the rated U_c : (V)		N/A
	The circuit-breaker is mounted complete on its own support or an equivalent support.		P
	Test made in free air:		P
	Distances of the metallic screen's: (all sides)	Front / Back: 0 mm, Left / Right: 10 mm, Up / Down: 50 mm	P
	The characteristics of the metallic screen:		
	- woven wire mesh		N/A
	- perforated metal		P
	- expanded metal		N/A
	- ratio hole area/total area: 0,45-0,65		P
	- size of hole: $<30\text{mm}^2$		P
	- finish: bare or conductive plating		P

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Clause	Requirement + Test	Result - Remark	Verdict
	Test made in specified individual enclosure: Details of these tests, including the dimensions of the enclosure:		N/A
	Fuse "F": copper wire: diameter 0,8 mm, 50 mm long		P
	Circuit is earthed at: (load-star- or supply-star point)	Load-star	P
	Conductor cross-sectional area (mm ²) :	70 mm ²	P
	If terminals unmarked: line connected at: (underside/upside)	underside	P
	Tightening torques: (Nm)	12 Nm	P
8.3.5.2	The operation of overload releases shall be verified at twice the value of their current setting on each pole separately.		
	The operating time shall not exceed the max. value stated by the manufacturer for twice the current setting at the reference temperature, on a pole singly.		
	Time specified by the manufacturer:	1 min 38 s ≤ t ≤ 8 min 30 s	P
	- Operation time: (s) L1: L2: L3: N :	5 min 59 s 4 min 56 s 5 min 14 s -	P
8.3.4.2	Test of rated service short-circuit breaking capacity		P
	Test sequence of operation: O – t – CO – t – CO		P
	- test voltage U/U _e = 1,05 (V) L1: L2: L3:	526,4 Vac 526,0 Vac 525,6 Vac	P
	- r.m.s. test current AC/DC: (A) L1: L2: L3:	85,6 kA 85,0 kA 85,1 kA	P
	power factor/time constant :	0,15	P
	- Factor "n"	2,2	P
	- peak test current (A) :	196,1 kA	P
	Test sequence "O"		
	- max. let-through current: (kA _{peak}) L1: L2: L3:	9,3 kA 20,8 kA 17,1 kA	P
	- Joule integral I ² dt (A ² s) L1: L2: L3:	158,3 kA ² s 532,2 kA ² s 254,2 kA ² s	P
	Pause, t: (min)	188 s	P

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Clause	Requirement + Test	Result - Remark	Verdict
	Test sequence "CO"		
	- max. let-through current: (kA _{peak}) L1: L2: L3:	18,4 kA 10,1 kA 20,8 kA	P
	- Joule integral I ² dt (A ² s) L1: L2: L3:	317,0 kA ² s 211,4 kA ² s 663,2 kA ² s	P
	Pause, t: (min)	187 s	P
	Test sequence "CO"		
	- max. let-through current: (kA _{peak}) L1: L2: L3:	12,0 kA 20,9 kA 15,5 kA	P
	- Joule integral I ² dt (A ² s) L1: L2: L3:	177,7 kA ² s 558,4 kA ² s 216,4 kA ² s	P
	Melting of the fusible element	No melting	P
	Damage to insulation on conductors	No damage	P
	Holes in the PE-sheet for test sequence "O"	No hole	P
	Cracks observed	No crack	P
8.3.4.3	Operational performance capability with current.		
	Rated current: I _n (A)	160 A	
	Maximum rated operational voltage: U _e (V)	500 Vac	
	Conductor cross-sectional area (mm ²) :	70 mm ²	
	Number of operating cycles per hour	120 cycles per hour	P
	Number (5% of the number given in column 4, tab. 8) of cycles with current (total) (closing releases energized at the rated U _c)	50 cycles	P
	Applied voltage: closing releases (V)		N/A
	For circuit-breaker fitted with adjustable releases, test shall be made with the overload setting at maximum and short-circuit setting at minimum.	I _r = 1 x I _n	P
	Conditions, make/break operations:		
	- test voltage U/U _e = 1,0 (V) L1: L2: L3:	501,2 Vac 501,5 Vac 501,5 Vac	P
	- test current I/I _e = 1,0 (A)..... L1: L2: L3:	162,0 A 163,3 A 161,4 A	P

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Clause	Requirement + Test	Result - Remark	Verdict
	- power factor/time constant:	0,78	P
	- frequency: (Hz)	50 Hz	P
	- on-time (ms):	Min. 681,6 ms	P
	- off-time (s):	29,3 s	P
8.3.4.4	Verification of dielectric withstand		
	- equal to twice the rated operational voltage with a minimum of 1000 V	1000 Vac, 5 s	P
	- no breakdown or flashover	See appended table 13	P
	- the leaking current for circuit-breaker suitable for isolation: ($<2\text{mA} / 1.1 U_e$)	550 Vac L1: $< 1,4\text{ mA}$ L2: $< 1,4\text{ mA}$ L3: $< 1,4\text{ mA}$	P
8.3.4.5	Verification of temperature-rise		
	- the values of temperature-rise do not exceed those specified in tab. 7.	See appended table 14	P
	Temperature rise of main circuit terminals. $\leq 80\text{ K (K)}$:	Max: 76 K	P
	conductor cross-sectional area (mm^2) :	70 mm^2	P
	test current I_e (A) :	160 A	P
8.3.4.6	Verification of overload releases		
	Test current: 1.45 times the value of their current setting at the reference temperature: (A)	232,0 A ($1,45 \times 1 \times 160\text{ A}$)	P
	Conventional tripping time: $<1\text{h}$ when $I_n < 63\text{A}$, $<2\text{h}$ when $I_n > 63\text{ A}$	1 min 59 s	P
8.3.5.5	Verification of overload releases		
	The operation of overload releases shall be verified at 2,5 times the value of their current setting on each pole separately.		
	The operating time shall not exceed the max. value stated by the manufacturer for twice the current setting at the reference temperature, on a pole singly.		
	Time specified by the manufacturer:	$t \leq 8\text{ min } 30\text{ s}$	P
	- Operation time: (s) L1: L2: L3: N :	3 min 07 s 2 min 46 s 3 min 02 s -	P

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Clause	Requirement + Test	Result - Remark	Verdict
8.3.5	TEST SEQUENCE III (Icu): Rated ultimate short-circuit breaking capacity Test was conducted on HGP 160D X, In = 160 A, 3P, sample no. 6#		
	Rated ultimate short-circuit breaking		
	Except where the combined test sequence applies, this test sequence applies to circuit-breaker of utilization category A and to circuit-breaker of utilization B having a rated ultimate short-circuit breaking capacity higher than the rated short-time withstand current.		
	For circuit-breakers of utilization B having a rated short-time withstand current equal to their rated ultimate short-circuit breaking capacity, this test sequence need not be made, since, in this case, the ultimate short-circuit breaking capacity, is verified when carrying out test sequence IV.		
	For integrally fused circuit-breakers, test sequence V applies in place of this sequence.		
	Type designation or serial number	HGP 160D X / 3P	
	Sample no:	6#	
	Rated current: In (A)	160 A	
	Rated operational voltage: Ue (V)	460 Vac	
	Rated ultimate short-circuit breaking capacity: (kA)	150 kA	
	Rated control supply voltage of closing mechanism: Uc (V)	No electric closing mechanism	
	Rated control supply voltage of shunt release: Uc (V)	No shunt releases	
	This test sequence need not be made when Icu = Ics		
8.3.5.2	Verification of overload releases		
	The operation of overload releases shall be verified at twice the value of their current setting on each pole separately.		
	The operating time shall not exceed the max. value stated by the manufacturer for twice the current setting at the reference temperature, on a pole singly.		
	Time specified by the manufacturer:	1 min 38 s ≤ t ≤ 8 min 30 s	P
	- Operation time: (s) L1: L2: L3: N :	4 min 49 s 4 min 16 s 4 min 27 s	P
8.3.5.3	Test of rated ultimate short-circuit breaking capacity		
	The test sequence of operations is O – t – CO		
	For circuit-breaker fitted with adjustable releases, test shall be made with the current and time settings at maximum.	Overload: 1,0 In Short-circuit: fixed	P

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Clause	Requirement + Test	Result - Remark	Verdict
	closing mechanism energized with 85% at the rated U_c : (V)		N/A
	The circuit-breaker is mounted complete on its own support or an equivalent support.		P
	Test made in free air:		P
	Distances of the metallic screen's: (all sides)	Front / Back: 0 mm, Left / Right: 10 mm, Up / Down: 50 mm	P
	The characteristics of the metallic screen:		
	- woven wire mesh		N/A
	- perforated metal		P
	- expanded metal		N/A
	- ratio hole area/total area: 0,45-0,65		P
	- size of hole: <30mm ²		P
	- finish: bare or conductive plating		P
	Test made in specified individual enclosure: Details of these tests, including the dimensions of the enclosure:		N/A
	Fuse "F": copper wire: diameter 0,8 mm, 50 mm long		P
	Circuit is earthed at: (load-star- or supply-star point)	Load-star	P
	Conductor cross-sectional area (mm ²) :	70 mm ²	P
	If terminals unmarked: line connected at: (underside/upside)	Upside	P
	Tightening, torques: (Nm)	12 Nm	P
	Test sequence of operation: O – t – CO		P
	- test voltage $U/U_e = 1,05$ (V) L1-L3: L1-L2: L2-L3:	493 Vac 492 Vac 492 Vac	P
	- r.m.s. test current AC/DC: (A) L1: L2: L3:	154 kA 152 kA 153 kA	P
	power factor/time constant :	0,19	P
	- Factor "n"	2,2	P
	- peak test current (A_{max}) :	339 kA	P

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Clause	Requirement + Test	Result - Remark	Verdict
	Test sequence "O"		
	- max. let-through current: (kA _{peak}) L1: L2: L3:	23,4 kA 12,5 kA 14,6 kA	P
	- Joule integral I ² dt (A ² s) L1: L2: L3:	552 kA ² s 114 kA ² s 242 kA ² s	P
	Pause, t: (min)	5 min	P
	Test sequence "CO"		
	- max. let-through current: (kA _{peak}) L1: L2: L3:	24,4 kA 15,2 kA 13,3 kA	P
	- Joule integral I ² dt (A ² s) L1: L2: L3:	631 kA ² s 170 kA ² s 224 kA ² s	P
	Melting of the fusible element	No melting of the fusible element	P
	Damage to insulation on conductors		P
	Holes in the PE-sheet for test sequence "O"	No holes	P
	Cracks observed	No cracks observed	P
8.3.5.4	Verification of dielectric withstand		
	- equal to twice the rated operational voltage with a minimum of 1000 V for 5 seconds	1000 V, 5 s	P
	- no breakdown or flashover	See appended table 8	P
	- the leaking current for circuit-breaker suitable for isolation: (<6mA / 1,1 U _e)	L1: 6,27 µA L2: 8,47 µA L3: 5,07 µA	P
8.3.5.5	Verification of overload releases		
	The operation of overload releases shall be verified at 2,5 times the value of their current setting on each pole separately.		
	The operating time shall not exceed the max. value stated by the manufacturer for twice the current setting at the reference temperature, on a pole singly.		
	Time specified by the manufacturer:	t ≤ 8 min 30 s	P
	- Operation time: (s) L1: L2: L3: N :	3 min 46 s 3 min 28 s 4 min 11 s	P

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Clause	Requirement + Test	Result - Remark	Verdict
8.3.5	TEST SEQUENCE III (Icu): Rated ultimate short-circuit breaking capacity Test was conducted on HGP 160D X, In = 160 A, 3P + N, sample no. 7#		
	Rated ultimate short-circuit breaking		
	Except where the combined test sequence applies, this test sequence applies to circuit-breaker of utilization category A and to circuit-breaker of utilization B having a rated ultimate short-circuit breaking capacity higher than the rated short-time withstand current.		
	For circuit-breakers of utilization B having a rated short-time withstand current equal to their rated ultimate short-circuit breaking capacity, this test sequence need not be made, since, in this case, the ultimate short-circuit breaking capacity, is verified when carrying out test sequence IV.		
	For integrally fused circuit-breakers, test sequence V applies in place of this sequence.		
	Type designation or serial number	HGP 160D X / 3P + N	
	Sample no:	7#	
	Rated current: In (A)	160 A	
	Rated operational voltage: Ue (V)	460 Vac	
	Rated ultimate short-circuit breaking capacity: (kA)	90 kA (60% Icu) at 460 V / $\sqrt{3}$	
	Rated control supply voltage of closing mechanism: Uc (V)	No electric closing mechanism	
	Rated control supply voltage of shunt release: Uc (V)	No shunt releases	
	This test sequence need not be made when Icu = Ics		
8.3.5.2	Verification of overload releases		
	The operation of overload releases shall be verified at twice the value of their current setting on each pole separately.		
	The operating time shall not exceed the max. value stated by the manufacturer for twice the current setting at the reference temperature, on a pole singly.		
	Time specified by the manufacturer:	1 min 38 s $\leq t \leq$ 8 min 30 s	P
	- Operation time: (s) L1: L2: L3: N :	5 min 09 s 5 min 27 s	P

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Clause	Requirement + Test	Result - Remark	Verdict
8.3.5.3	Test of rated ultimate short-circuit breaking capacity		
	The test sequence of operations is O – t – CO		
	For circuit-breaker fitted with adjustable releases, test shall be made with the current and time settings at maximum.	Overload: 1,0 In Short-circuit: fixed	P
	closing mechanism energized with 85% at the rated U_c : (V)		N/A
	The circuit-breaker is mounted complete on its own support or an equivalent support.		P
	Test made in free air:		P
	Distances of the metallic screen's: (all sides)	Front / Back: 0 mm, Left / Right: 10 mm, Up / Down: 50 mm	P
	The characteristics of the metallic screen:		
	- woven wire mesh		N/A
	- perforated metal		P
	- expanded metal		N/A
	- ratio hole area/total area: 0,45-0,65		P
	- size of hole: <30mm ²		P
	- finish: bare or conductive plating		P
	Test made in specified individual enclosure: Details of these tests, including the dimensions of the enclosure:		N/A
	Fuse "F": copper wire: diameter 0,8 mm, 50 mm long		P
	Circuit is earthed at: (load-star- or supply-star point)	Load-star	P
	Conductor cross-sectional area (mm ²) :	70 mm ²	P
	If terminals unmarked: line connected at: (underside/upside)	Upside	P
	Tightening, torques: (Nm)	12 Nm	P
	Test sequence of operation: O – t – CO		P
	- test voltage $U/U_e = 1,05$ (V) L3-N:	284 Vac	P
	- r.m.s. test current AC/DC: (A) L1: L2: L3:	90,5 kA	P
	power factor/time constant :	0,19	P

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Clause	Requirement + Test	Result - Remark	Verdict
	- Factor "n"	2,2	P
	- peak test current (Amax) :	202 kA	P
	Test sequence "O"		
	- max. let-through current: (kA _{peak}) L1: L2: L3:	7,29 kA	P
	- Joule integral I ² dt (A ² s) L1: L2: L3:	214 kA ² s	P
	Pause, t: (min)	5 min	P
	Test sequence "CO"		
	- max. let-through current: (kA _{peak}) L1: L2: L3:	10,6 kA	P
	- Joule integral I ² dt (A ² s) L1: L2: L3:	120 kA ² s	P
	Melting of the fusible element	No melting of the fusible element	P
	Damage to insulation on conductors		P
	Holes in the PE-sheet for test sequence "O"	No holes	P
	Cracks observed	No cracks observed	P
8.3.5.4	Verification of dielectric withstand		
	- equal to twice the rated operational voltage with a minimum of 1000 V for 5 seconds	1000 V, 5 s	P
	- no breakdown or flashover	See appended table 8	P
	- the leaking current for circuit-breaker suitable for isolation: (<6mA / 1,1 U _e)	L3: 8,45 µA N: 6,28 µA	P
8.3.5.5	Verification of overload releases		
	The operation of overload releases shall be verified at 2,5 times the value of their current setting on each pole separately.		
	The operating time shall not exceed the max. value stated by the manufacturer for twice the current setting at the reference temperature, on a pole singly.		
	Time specified by the manufacturer:	t ≤ 8 min 30 s	P
	- Operation time: (s) L1: L2: L3: N :	4 min 36 s 4 min 13 s	P

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Clause	Requirement + Test	Result - Remark	Verdict
8.3.5	TEST SEQUENCE III (Icu): Rated ultimate short-circuit breaking capacity Test was conducted on HGP 50D X, In = 15 A, 3P + N, sample no. 8#		
	Rated ultimate short-circuit breaking		
	Except where the combined test sequence applies, this test sequence applies to circuit-breaker of utilization category A and to circuit-breaker of utilization B having a rated ultimate short-circuit breaking capacity higher than the rated short-time withstand current.		
	For circuit-breakers of utilization B having a rated short-time withstand current equal to their rated ultimate short-circuit breaking capacity, this test sequence need not be made, since, in this case, the ultimate short-circuit breaking capacity, is verified when carrying out test sequence IV.		
	For integrally fused circuit-breakers, test sequence V applies in place of this sequence.		
	Type designation or serial number	HGP 50D X / 3P + N	
	Sample no:	8#	
	Rated current: In (A)	15 A	
	Rated operational voltage: Ue (V)	460 Vac	
	Rated ultimate short-circuit breaking capacity: (kA)	90 kA (60% Icu) at 460 V / $\sqrt{3}$	
	Rated control supply voltage of closing mechanism: Uc (V)	No electric closing mechanism	
	Rated control supply voltage of shunt release: Uc (V)	No shunt releases	
	This test sequence need not be made when Icu = Ics		
8.3.5.2	Verification of overload releases		
	The operation of overload releases shall be verified at twice the value of their current setting on each pole separately.		
	The operating time shall not exceed the max. value stated by the manufacturer for twice the current setting at the reference temperature, on a pole singly.		
	Time specified by the manufacturer:	1 min 38 s $\leq t \leq$ 8 min 30 s	P
	- Operation time: (s) L1: L2: L3: N :	5 min 19 s 4 min 51 s	P

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Clause	Requirement + Test	Result - Remark	Verdict
8.3.5.3	Test of rated ultimate short-circuit breaking capacity		
	The test sequence of operations is O – t – CO		
	For circuit-breaker fitted with adjustable releases, test shall be made with the current and time settings at maximum.	Overload: 0,8 In Short-circuit: fixed	P
	closing mechanism energized with 85% at the rated U_c : (V)		N/A
	The circuit-breaker is mounted complete on its own support or an equivalent support.		P
	Test made in free air:		P
	Distances of the metallic screen's: (all sides)	Front / Back: 0 mm, Left / Right: 10 mm, Up / Down: 50 mm	P
	The characteristics of the metallic screen:		
	- woven wire mesh		N/A
	- perforated metal		P
	- expanded metal		N/A
	- ratio hole area/total area: 0,45-0,65		P
	- size of hole: $<30\text{mm}^2$		P
	- finish: bare or conductive plating		P
	Test made in specified individual enclosure: Details of these tests, including the dimensions of the enclosure:		N/A
	Fuse "F": copper wire: diameter 0,8 mm, 50 mm long		P
	Circuit is earthed at: (load-star- or supply-star point)	Load-star	P
	Conductor cross-sectional area (mm^2) :	2,5 mm^2	P
	If terminals unmarked: line connected at: (underside/upside)	Upside	P
	Tightening, torques: (Nm)	12 Nm	P
	Test sequence of operation: O – t – CO		P
	- test voltage $U/U_e = 1,05$ (V) L3-N:	284 Vac	P
	- r.m.s. test current AC/DC: (A) L1: L2: L3:	90,5 kA	P
	power factor/time constant :	0,19	P

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Clause	Requirement + Test	Result - Remark	Verdict
	- Factor "n"	2,2	P
	- peak test current (Amax) :	202 kA	P
	Test sequence "O"		
	- max. let-through current: (kA _{peak}) L1: L2: L3:	4,74 kA	P
	- Joule integral I ² dt (A ² s) L1: L2: L3:	115 kA ² s	P
	Pause, t: (min)	6 min	P
	Test sequence "CO"		
	- max. let-through current: (kA _{peak}) L1: L2: L3:	6,14 kA	P
	- Joule integral I ² dt (A ² s) L1: L2: L3:	74,1 kA ² s	P
	Melting of the fusible element	No melting of the fusible element	P
	Damage to insulation on conductors		P
	Holes in the PE-sheet for test sequence "O"	No holes	P
	Cracks observed	No cracks observed	P
8.3.5.4	Verification of dielectric withstand		
	- equal to twice the rated operational voltage with a minimum of 1000 V for 5 seconds	1000 V, 5 s	P
	- no breakdown or flashover	See appended table 8	P
	- the leaking current for circuit-breaker suitable for isolation: (<6mA / 1,1 U _e)	L3: 7,59 µA N: 9,21 µA	P
8.3.5.5	Verification of overload releases		
	The operation of overload releases shall be verified at 2,5 times the value of their current setting on each pole separately.		
	The operating time shall not exceed the max. value stated by the manufacturer for twice the current setting at the reference temperature, on a pole singly.		
	Time specified by the manufacturer:	t ≤ 8 min 30 s	P
	- Operation time: (s) L1: L2: L3: N :	3 min 24 s 3 min 13 s	P

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Clause	Requirement + Test	Result - Remark	Verdict
8.3.5	TEST SEQUENCE III (Icu): Rated ultimate short-circuit breaking capacity Test was conducted on HGP 160D X, In = 160 A, 3P + N, sample no. 9#		
	Rated ultimate short-circuit breaking		
	Except where the combined test sequence applies, this test sequence applies to circuit-breaker of utilization category A and to circuit-breaker of utilization B having a rated ultimate short-circuit breaking capacity higher than the rated short-time withstand current.		
	For circuit-breakers of utilization B having a rated short-time withstand current equal to their rated ultimate short-circuit breaking capacity, this test sequence need not be made, since, in this case, the ultimate short-circuit breaking capacity, is verified when carrying out test sequence IV.		
	For integrally fused circuit-breakers, test sequence V applies in place of this sequence.		
	Type designation or serial number	HGP 160D X / 3P + N	
	Sample no:	9#	
	Rated current: In (A)	160 A	
	Rated operational voltage: Ue (V)	500 Vac	
	Rated ultimate short-circuit breaking capacity: (kA)	60 kA (60% Icu) at 500 V / $\sqrt{3}$	
	Rated control supply voltage of closing mechanism: Uc (V)	No electric closing mechanism	
	Rated control supply voltage of shunt release: Uc (V)	No shunt releases	
	This test sequence need not be made when Icu = Ics		
8.3.5.2	Verification of overload releases		
	The operation of overload releases shall be verified at twice the value of their current setting on each pole separately.		
	The operating time shall not exceed the max. value stated by the manufacturer for twice the current setting at the reference temperature, on a pole singly.		
	Time specified by the manufacturer:	1 min 38 s $\leq t \leq$ 8 min 30 s	P
	- Operation time: (s) L1: L2: L3: N :	4 min 47 s 4 min 26 s	P

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Clause	Requirement + Test	Result - Remark	Verdict
8.3.5.3	Test of rated ultimate short-circuit breaking capacity		
	The test sequence of operations is O – t – CO		
	For circuit-breaker fitted with adjustable releases, test shall be made with the current and time settings at maximum.	Overload: 1,0 In Short-circuit: fixed	P
	closing mechanism energized with 85% at the rated U_c : (V)		N/A
	The circuit-breaker is mounted complete on its own support or an equivalent support.		P
	Test made in free air:		P
	Distances of the metallic screen's: (all sides)	Front / Back: 0 mm, Left / Right: 10 mm, Up / Down: 50 mm	P
	The characteristics of the metallic screen:		
	- woven wire mesh		N/A
	- perforated metal		P
	- expanded metal		N/A
	- ratio hole area/total area: 0,45-0,65		P
	- size of hole: $<30\text{mm}^2$		P
	- finish: bare or conductive plating		P
	Test made in specified individual enclosure: Details of these tests, including the dimensions of the enclosure:		N/A
	Fuse "F": copper wire: diameter 0,8 mm, 50 mm long		P
	Circuit is earthed at: (load-star- or supply-star point)	Load-star	P
	Conductor cross-sectional area (mm^2) :	70 mm^2	P
	If terminals unmarked: line connected at: (underside/upside)	Underside	P
	Tightening, torques: (Nm)	12 Nm	P
	Test sequence of operation: O – t – CO		P
	- test voltage $U/U_e = 1,05$ (V) L3-N:	307 Vac	P
	- r.m.s. test current AC/DC: (A) L1: L2: L3:	60,4 kA	P
	power factor/time constant :	0,19	P

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Clause	Requirement + Test	Result - Remark	Verdict
	- Factor "n"	2,2	P
	- peak test current (Amax) :	134 kA	P
	Test sequence "O"		
	- max. let-through current: (kA _{peak}) L1: L2: L3:	6,85 kA	P
	- Joule integral I ² dt (A ² s) L1: L2: L3:	195 kA ² s	P
	Pause, t: (min)	4 min	P
	Test sequence "CO"		
	- max. let-through current: (kA _{peak}) L1: L2: L3:	11,8 kA	P
	- Joule integral I ² dt (A ² s) L1: L2: L3:	150 kA ² s	P
	Melting of the fusible element	No melting of the fusible element	P
	Damage to insulation on conductors		P
	Holes in the PE-sheet for test sequence "O"	No holes	P
	Cracks observed	No cracks observed	P
8.3.5.4	Verification of dielectric withstand		
	- equal to twice the rated operational voltage with a minimum of 1000 V for 5 seconds	1000 V, 5 s	P
	- no breakdown or flashover	See appended table 8	P
	- the leaking current for circuit-breaker suitable for isolation: (<6mA / 1,1 U _e)	L3: 8,21 µA N: 7,84 µA	P
8.3.5.5	Verification of overload releases		
	The operation of overload releases shall be verified at 2,5 times the value of their current setting on each pole separately.		
	The operating time shall not exceed the max. value stated by the manufacturer for twice the current setting at the reference temperature, on a pole singly.		
	Time specified by the manufacturer:	t ≤ 8 min 30 s	P

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Clause	Requirement + Test	Result - Remark	Verdict
8.3.6	TEST SEQUENCE IV (I _{cw}): Rated short-time withstand current		N/A
8.3.7	TEST SEQUENCE V: Performance of integrally fused circuit-breakers		N/A
8.3.8	TEST SEQUENCE VI: Combined test sequence		N/A
8.3.9	Critical d.c. load current test		N/A
Annex B	Circuit-breakers incorporating residual current protection		N/A
Annex C	Individual pole short-circuit test sequence		N/A
Annex D	Additional requirements for circuit-breakers intended for connection of aluminium conductors		N/A
Annex F	Additional tests for circuit-breakers with electronic over-current protection		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
Annex H	Individual pole short-circuit test sequence Test was conducted on HGP 160D X, In = 160 A, 3P+N, sample no. 10#		
	Circuit-breaker for use in IT systems		
H.2	Test of individual pole short-circuit breaking capacity		
	A short-circuit test is made on the individual poles of a multipole circuit-breaker at a value of prospective current (I_{IT}) equal to 1,2 times the maximum setting of the short-time delay release tripping current or, in the absence of such a release, 1,2 time the max. setting of the tripping current of the instantaneous release, or, where relevant 1,2 times the maximum setting of the definite time delay release tripping current, but not less than 500 A nor exceeding 50kA.		
	Type designation or serial number	HGP 160D X / 3P + N	
	Sample no:	10#	
	Rated current: In (A)	160 A	
	Rated operational voltage: Ue (V)	500 Vac	
	Rated ultimate short-circuit breaking capacity: (kA)	100 kA	
	Rated control supply voltage of closing mechanism: Uc (V)	No electric closing mechanism	
	Rated control supply voltage of shunt release: Uc (V)	No shunt releases	
	The test sequence of operations is O – t - CO		
	For circuit-breaker fitted with adjustable releases, test shall be made with the current and time settings at maximum.	overload: 1,0 In Short-circuit: fixed	P
	closing mechanism energized with 85% at the rated Uc: (V)		N/A
	The circuit-breaker is mounted complete on its own support or an equivalent support.		P
	Test made in free air:		P
	Distances of the metallic screen's: (all sides)	Front / Back: 0 mm, Left / Right: 10 mm, Up / Down: 50 mm	P
	The characteristics of the metallic screen:		
	- woven wire mesh		N/A
	- perforated metal		P
	- expanded metal		N/A
	- ratio hole area/total area: 0,45-0,65		P
	- size of hole: <30mm ²		P

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Clause	Requirement + Test	Result - Remark	Verdict
	- finish: bare or conductive plating		P
	Test made in specified individual enclosure: Details of these tests, including the dimensions of the enclosure:		N/A
	Fuse "F": copper wire: diameter 0,8 mm, 50 mm long		P
	Circuit is earthed at: (load-star- or supply-star point)	Load-star	P
	Conductor cross-sectional area (mm ²):	70 mm ²	P
	If terminals unmarked: line connected at: (underside/upside)	Upside	P
	Tightening torques: (Nm)	12 Nm	P
	Test sequence of operation: O – t – CO		P
	Test circuit according figure: 9		P
	- test voltage $U/U_e = 1,05$ (V) L-L:	532 Vac	P
	Short-circuit test current (I_{IT}): equal to 1,2 times the max. setting of the short-time delay release tripping current,		N/A
	or, in the absence of such a release, 1,2 time the max. setting of the tripping current of the instantaneous release,	$1,2 \times 10 I_n = 1920$ A	P
	or, where relevant 1,2 times the max. setting of the definite time delay release tripping current, but not exceeding 50kA.		N/A
	- r.m.s. test current AC/DC: (A)	1,98 kA	P
	power factor/time constant:	0,87	P
	- Factor "n"	1,42	P
	- peak test current (A_{max}) :	2,85 kA	P
	Test sequence "O" L1		
	- max. let-through current: (kA_{peak}) L1:	2,82 kA	P
	- Joule integral I^2dt (A ² s) L1:	51,8 kA ² s	P
	Pause, t: (min)	3 min	P
	Test sequence "CO" L1		
	- max. let-through current: (kA_{peak}) L1:	2,81 kA	P
	- Joule integral I^2dt (A ² s) L1:	53,8 kA ² s	P

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Clause	Requirement + Test	Result - Remark	Verdict
	Test sequence "O" L2		
	- max. let-through current: (kA _{peak}) L2:	2,82 kA	P
	- Joule integral I ² dt (A ² s) L2:	59,7 kA ² s	P
	Pause, t: (min)	3 min	P
	Test sequence "CO" L2		
	- max. let-through current: (kA _{peak}) L2:	2,82 kA	P
	- Joule integral I ² dt (A ² s) L2:	65,1 kA ² s	P
	Test sequence "O" L3		
	- max. let-through current: (kA _{peak}) L3:	2,82 kA	P
	- Joule integral I ² dt (A ² s) L3:	56,4 kA ² s	P
	Pause, t: (min)	3 min	P
	Test sequence "CO" L3		
	- max. let-through current: (kA _{peak}) L3:	2,81 kA	P
	- Joule integral I ² dt (A ² s) L3:	66,2 kA ² s	P
	For 4-pole circuit-breakers with a protected neutral pole, the test voltage for that pole shall be phase-to-phase voltage divided by $\sqrt{3}$. This test is applicable only where the construction of the protected neutral pole differs from that of the phase poles.	Protected neutral is same as the phase poles	N/A
	Test sequence "O" N		
	- max. let-through current: (kA _{peak})N:		N/A
	- Joule integral I ² dt (A ² s)N:		N/A
	Pause, t: (min)		N/A
	Test sequence "CO" N		
	- max. let-through current: (kA _{peak})N:		N/A
	- Joule integral I ² dt (A ² s)N:		N/A
	Melting of the fusible element	No melting of the fusible element	P
	Damage to insulation on conductors		P
	Holes in the PE-sheet for test sequence "O"	No holes	P
	Cracks observed	No cracks observed	P

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Clause	Requirement + Test	Result - Remark	Verdict
H.3	Verification of dielectric withstand		
	- equal to twice the rated operational voltage with a minimum of 1000 V	1000 V, 5 s	P
	- no breakdown or flashover	See appended table 9	P
	- the leaking current for circuit-breaker suitable for isolation: (<6mA / 1,1 Ue)	L1: 7,21 µA L2: 4,38 µA L3: 5,69 µA	P
H.4	Verification of overload releases		
	The operation of overload releases shall be verified at 2.5 times the value of their current setting on each pole separately.		
	The operating time shall not exceed the max. value stated by the manufacturer for twice the current setting at the reference temperature, on a pole singly.		
	Time specified by the manufacturer:	$t \leq 8 \text{ min } 30 \text{ s}$	P
	- Operation time: (s) L1: L2: L3: N :	4 min 39 s 4 min 11 s 3 min 52 s	P
H.5	Marking		
	Rated voltage(s) not suitable for IT system, as follows: immediately following each corresponding rated voltage, e.g. 690 V  or immediately following the rated voltages, e.g. 415 V } 500 V } 	Suitable for IT system	N/A

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Clause	Requirement + Test	Result - Remark	Verdict
Annex J	Electromagnetic compatibility (EMC) – Requirements and test methods for circuit-breakers		N/A
Annex L	Circuit-breakers not fulfilling the requirements for overcurrent protection		N/A
Annex M	Modular residual current devices (without integral current breaking device)		N/A
Annex N	Electromagnetic compatibility (EMC) – Additional requirements and test methods for devices not covered by Annexes B, F and M		N/A
Annex O	Instantaneous trip circuit-breakers (ICB)		N/A
Annex P	DC circuit-breakers for use in photovoltaic (PV) applications		N/A

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Clause	Requirement + Test	Result - Remark	Verdict

	TABLE 1: Heating Test (Seq I, 8.3.3.7, sample number 39#)		P
	Test current (A):	160 A	—
	Ambient (°C):	25 °C	—
Thermocouple Locations	max. temperature rise measured, (K)	max. temperature limit, (K)	
Terminal of top left phase pole	62 K	80 K	
Terminal of top centre phase pole	47 K	80 K	
Terminal of top right phase pole	58 K	80 K	
Terminal of bottom left phase pole	54 K	80 K	
Terminal of bottom centre phase pole	56 K	80 K	
Terminal of bottom right phase pole	51 K	80 K	
Actuator	29 K	35 K	
Front side	32 K	50 K	
Side	42 K	60 K	

	TABLE 2: Heating Test (Seq I, 8.3.3.7, sample number 39#)		P
	Test current (A):	160 A	—
	Ambient (°C):	25 °C	—
Thermocouple Locations	max. temperature rise measured, (K)	max. temperature limit, (K)	
Terminal of top right phase pole	57 K	80 K	
Terminal of top N pole	51 K	80 K	
Terminal of bottom right phase pole	55 K	80 K	
Terminal of bottom N pole	48 K	80 K	

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Clause	Requirement + Test	Result - Remark	Verdict

	TABLE 3: Heating Test (Seq I, 8.3.3.7, sample number 2#)		P
	Test current (A):	160 A	—
	Ambient (°C):	27 °C	—
Thermocouple Locations	max. temperature rise measured, (K)	max. temperature limit, (K)	
Terminal of top left phase pole	70 K	80 K	
Terminal of top centre phase pole	62 K	80 K	
Terminal of top right phase pole	66 K	80 K	
Terminal of bottom left phase pole	56 K	80 K	
Terminal of bottom centre phase pole	65 K	80 K	
Terminal of bottom right phase pole	58 K	80 K	
Actuator	26 K	35 K	
Front side	27 K	50 K	
Side	47 K	60 K	

	TABLE 4: Heating Test (Seq II+III, 8.3.4.5, sample number 40#)		P
	Test current (A):	160 A	—
	Ambient (°C):	23 °C	—
Thermocouple Locations	max. temperature rise measured, (K)	max. temperature limit, (K)	
Terminal of top left phase pole	69 K	80 K	
Terminal of top centre phase pole	72 K	80 K	
Terminal of top right phase pole	73 K	80 K	
Terminal of bottom left phase pole	69 K	80 K	
Terminal of bottom centre phase pole	70 K	80 K	
Terminal of bottom right phase pole	68 K	80 K	

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Clause	Requirement + Test	Result - Remark	Verdict

	TABLE 5: Heating Test (Seq II+III, 8.3.4.5, sample number 41#)		P
	Test current (A):	160 A	—
	Ambient (°C):	22 °C	—
Thermocouple Locations	max. temperature rise measured, (K)	max. temperature limit, (K)	
Terminal of top left phase pole	68 K	80 K	
Terminal of top centre phase pole	70 K	80 K	
Terminal of top right phase pole	69 K	80 K	
Terminal of bottom left phase pole	72 K	80 K	
Terminal of bottom centre phase pole	68 K	80 K	
Terminal of bottom right phase pole	72 K	80 K	

	TABLE 6: dielectric strength (Seq I, 8.3.3.6, sample number 39# and 2#)		P
test voltage applied between:	test potential applied (V)	breakdown / flashover (Yes/No)	
Between all the terminals of the main circuit connected together and the enclosure or mounting plate, with the contacts in all normal positions of operation	1000 V	No	
Between each pole of the main circuit and the other poles connected together and to the enclosure or mounting plate, with the contacts in all normal positions of operation	1000 V	No	
Between the incoming and outgoing terminals with the circuit-breaker open	1000 V	No	
supplementary information: N/A			

IEC 60947-2			
Clause	Requirement + Test	Result - Remark	Verdict

	TABLE 7: dielectric strength (Seq II+III, 8.3.4.4, sample number 40#, 41# and 4#)		P
test voltage applied between:	test potential applied (V)	breakdown / flashover (Yes/No)	
Between all the terminals of the main circuit connected together and the enclosure or mounting plate, with the contacts in all normal positions of operation	1000 V	No	
Between each pole of the main circuit and the other poles connected together and to the enclosure or mounting plate, with the contacts in all normal positions of operation	1000 V	No	
Between the incoming and outgoing terminals with the circuit-breaker open	1000 V	No	
supplementary information: N/A			

	TABLE 8: dielectric strength (Seq III, 8.3.5.4, sample number 6#, 7#, 8#, and 9#)		P
test voltage applied between:	test potential applied (V)	breakdown / flashover (Yes/No)	
Between all the terminals of the main circuit connected together and the enclosure or mounting plate, with the contacts in all normal positions of operation	1000 V	No	
Between each pole of the main circuit and the other poles connected together and to the enclosure or mounting plate, with the contacts in all normal positions of operation	1000 V	No	
Between the incoming and outgoing terminals with the circuit-breaker open	1000 V	No	
supplementary information: N/A			

	TABLE 9: dielectric strength (Annex H, H.3, sample number 10#)		P
test voltage applied between:	test potential applied (V)	breakdown / flashover (Yes/No)	
Between all the terminals of the main circuit connected together and the enclosure or mounting plate, with the contacts in all normal positions of operation	1000 V	No	
Between each pole of the main circuit and the other poles connected together and to the enclosure or mounting plate, with the contacts in all normal positions of operation	1000 V	No	
Between the incoming and outgoing terminals with the circuit-breaker open	1000 V	No	
supplementary information: N/A			

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Clause	Requirement + Test	Result - Remark	Verdict

TABLE 10: clearance and creepage distance measurements							P
clearance cl and creepage distance dcr at/of:	Ui (V)	Uimp (kV)	required cl (mm)	cl (mm)	required dcr (mm)	dcr (mm)	
Between poles	1000 V	8 kV	8 mm	14,1 mm	16 mm	23,7 mm	
Between live parts and parts intended to be earthed	1000 V	8 kV	8 mm	18,8 mm	16 mm	22,8 mm	
Between the contacts in the open position	1000 V	8 kV	8 mm	24,2 mm	16 mm	29,0 mm	
Between live parts and actuator	1000 V	8 kV	8 mm	16,6 mm	16 mm	16,6 mm	

TABLE 11: Resistance to fire (Glow wire test)							P
No.	Description	Colour	Temp. °C	burning after t (s)	drops	support burning	—
1	Front cover	Grey	960 °C	3 s	No	No	P
2	Middle cover	Black	960 °C	4 s	No	No	P
3	Base	Black	960 °C	4 s	No	No	P
4	Handle	Grey	960 °C	3 s	No	No	P
5	Axis of moving contact	Brown	960 °C	0 s	No	No	P
6	Box of contact	Black	960 °C	0 s	No	No	P

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Clause	Requirement + Test	Result - Remark	Verdict

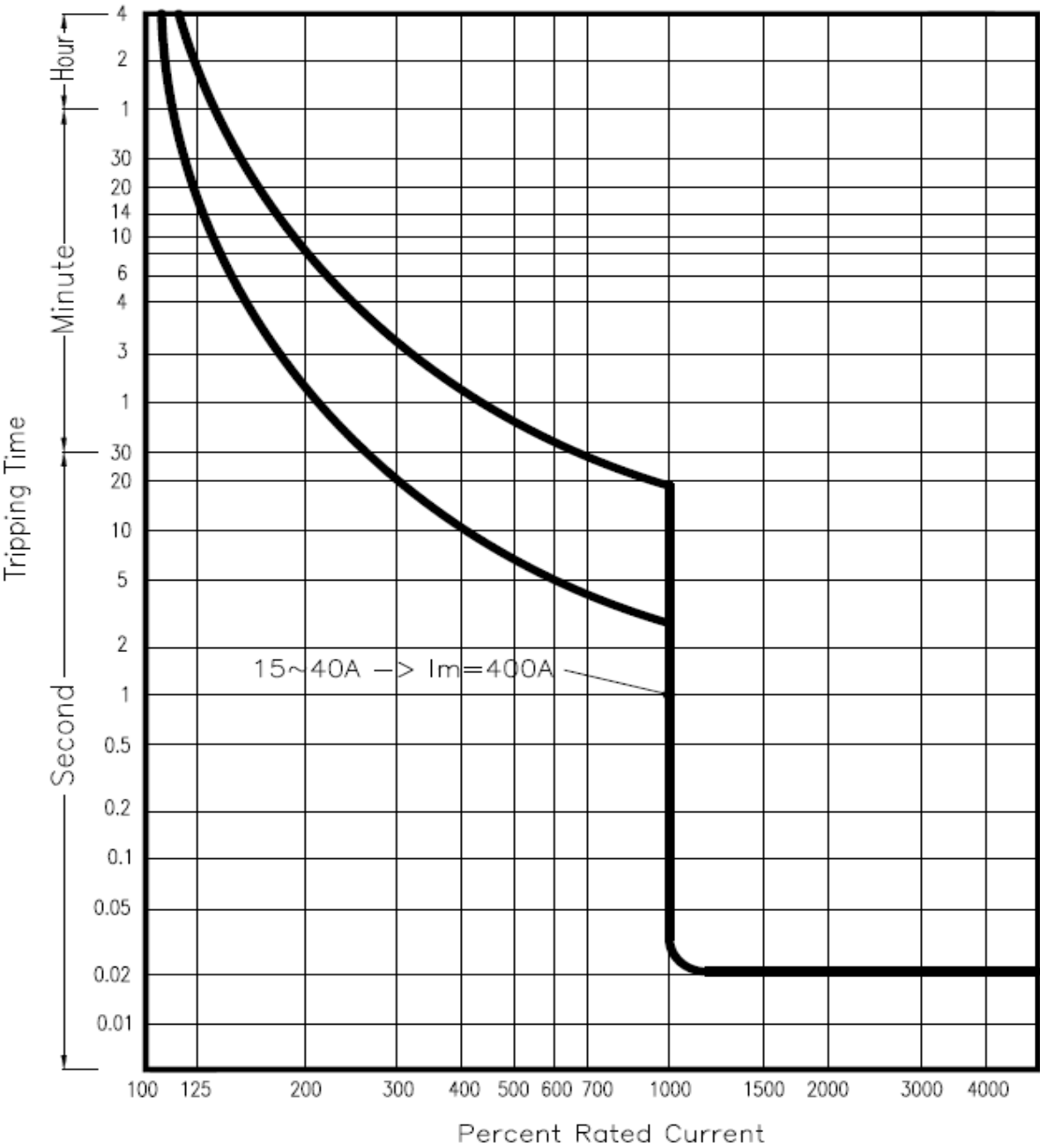
TABLE 12: Resistance to tracking (tracking test)							P
Specimen							Verdict
Description	Colour	Drops (no.)	Thick (mm)	Burning	Current (A)	Test voltage (V)	
Front cover	Grey	50	3 mm	N	< 0,5 A	175 V	P
Middle cover	Black	50	3 mm	N	< 0,5 A	175 V	P
Base	Black	50	3 mm	N	< 0,5 A	175 V	P
Handle	Grey	50	3 mm	N	< 0,5 A	250 V	P
Axis of moving contact	Brown	50	3 mm	N	< 0,5 A	250 V	P
Box of contact	Black	50	3 mm	N	< 0,5 A	300 V	P

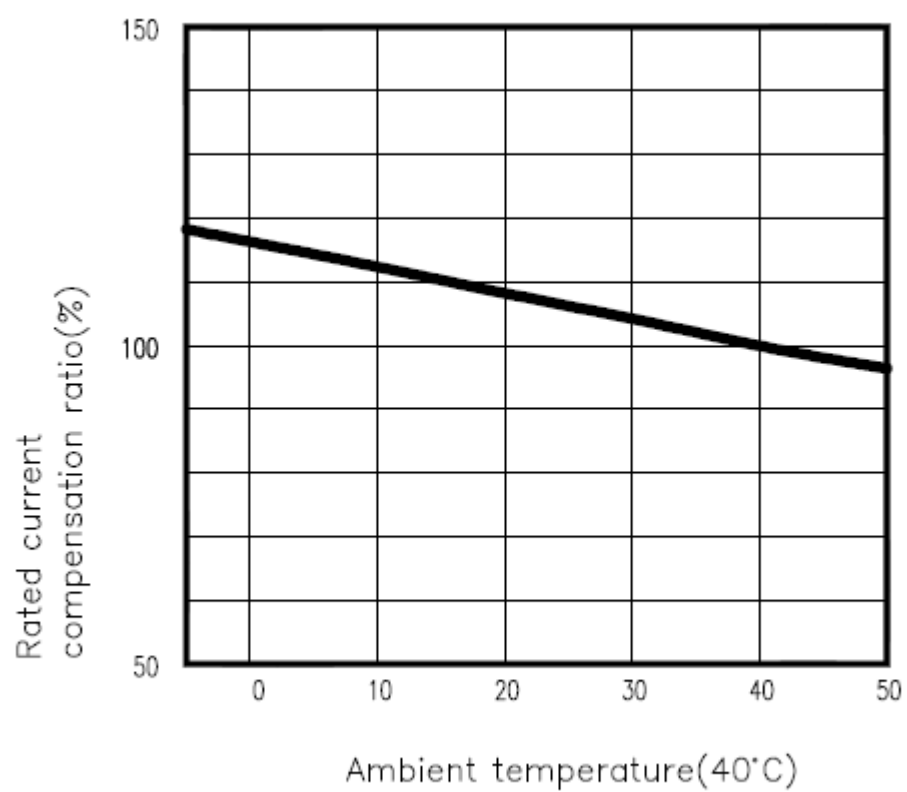
TABLE 13: dielectric strength (Seq. II+III, 8.3.4.4, sample number 42#)			P
test voltage applied between:	test potential applied (V)	breakdown / flashover (Yes/No)	
between all the terminals of the main circuit connected together (including the control and auxiliary circuits connected to the main circuit) and the enclosure or mounting plate, with the contacts in all normal positions of operation	1000 Vac	No	
between each pole of the main circuit and the other poles connected together and to the enclosure or mounting plate, with the contacts in all normal positions of operation	1000 Vac	No	
between each control and auxiliary circuit not normally connected to the main circuit and the main circuit	N/A	N/A	
between each control and auxiliary circuit not normally connected to the main circuit and the other circuits	N/A	N/A	
between each control and auxiliary circuit not normally connected to the main circuit and the exposed conductive parts	N/A	N/A	
between each control and auxiliary circuit not normally connected to the main circuit and the enclosure or mounting plate	N/A	N/A	
across the poles of the main circuit, the line terminals being connected together and the load terminals connected together	1000 Vac	No	
supplementary information: N/A			

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Clause	Requirement + Test	Result - Remark	Verdict
	TABLE 14: Heating Test (Seq. II+III, 8.3.4.5, sample number 42#)		P
	Test current (A):	160 A	—
	Ambient (°C):	27 °C	—
Thermocouple Locations		max. temperature rise measured, (K)	max. temperature limit, (K)
Terminal of top left phase pole		76	80
Terminal of top centre phase pole		75	80
Terminal of top right phase pole		73	80
Terminal of bottom left phase pole		64	80
Terminal of bottom centre phase pole		66	80
Terminal of bottom right phase pole		63	80
Supplementary information: N/A			

Time current characteristics:

1 60AF



Temperature compensation factor for ambient temperature:

Photographs:



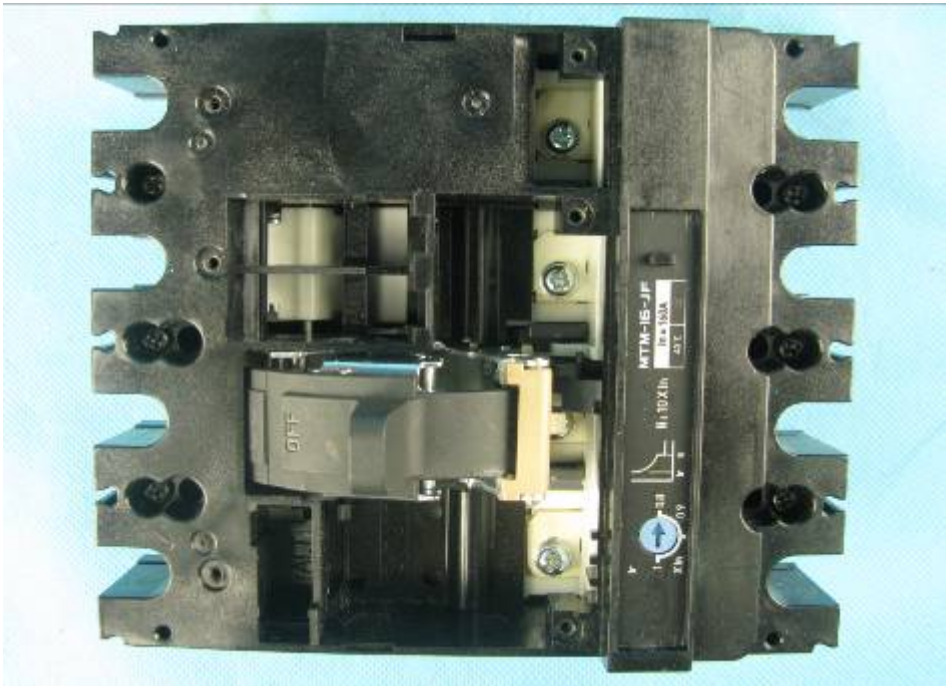
Front view, 4P (N pole at right), MCCB



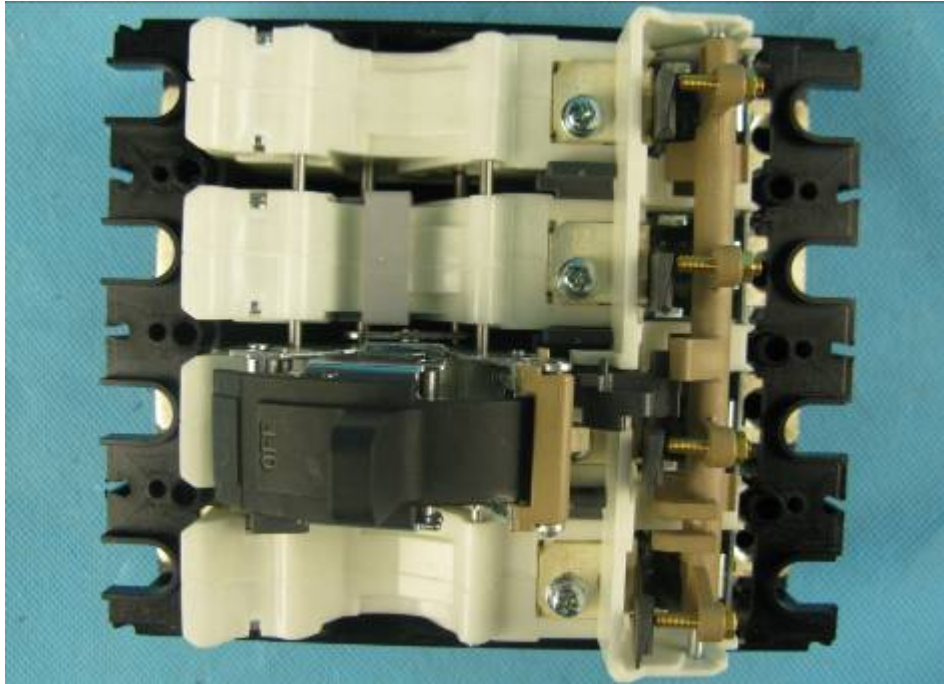
Front view, 4P (N pole at left), MCCB



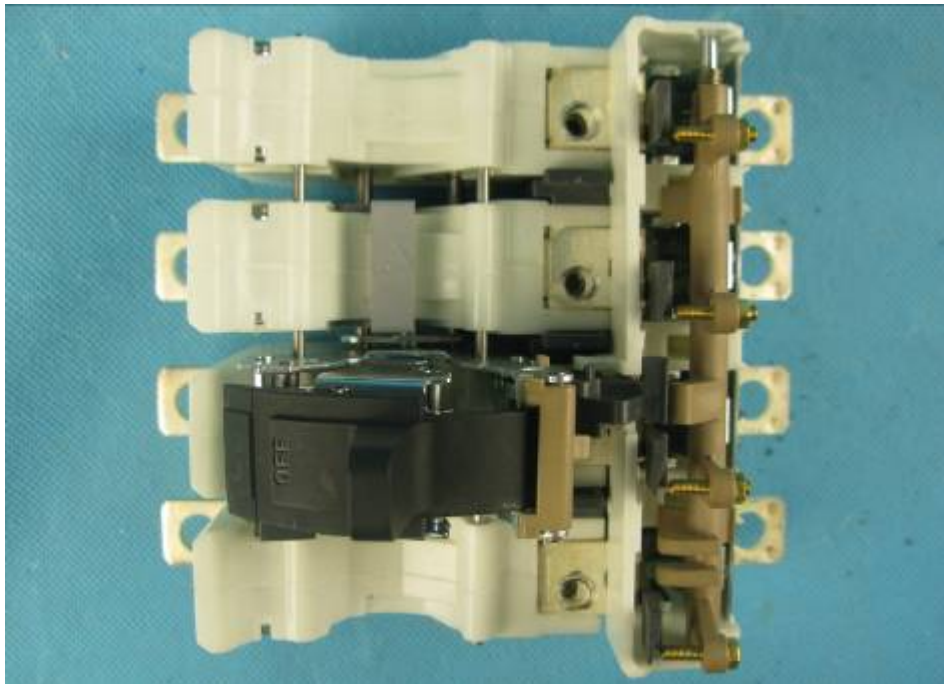
Front view, 3P, MCCB



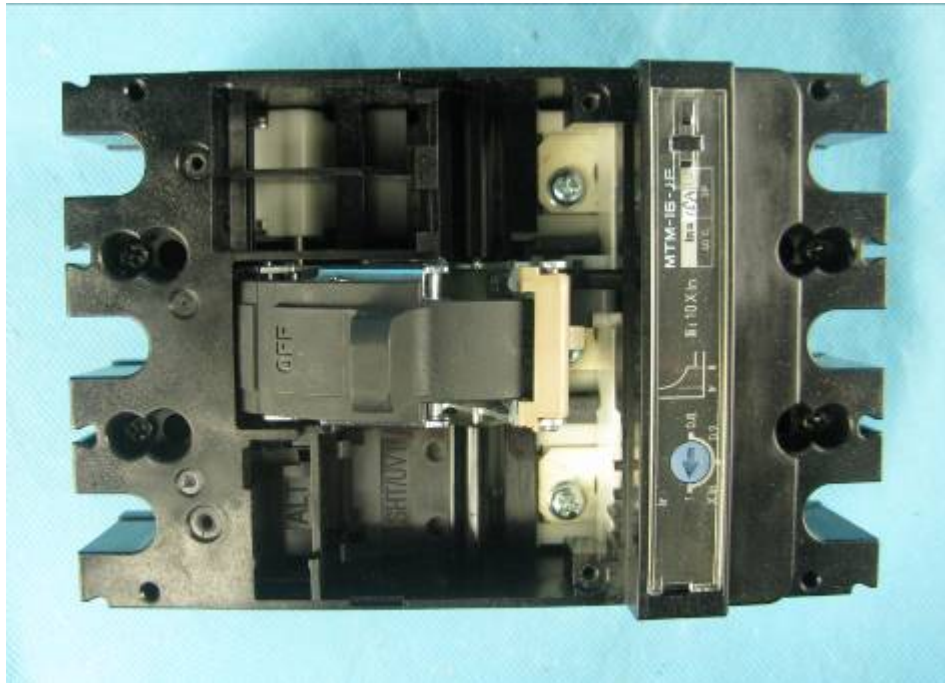
Open view, 4P, MCCB



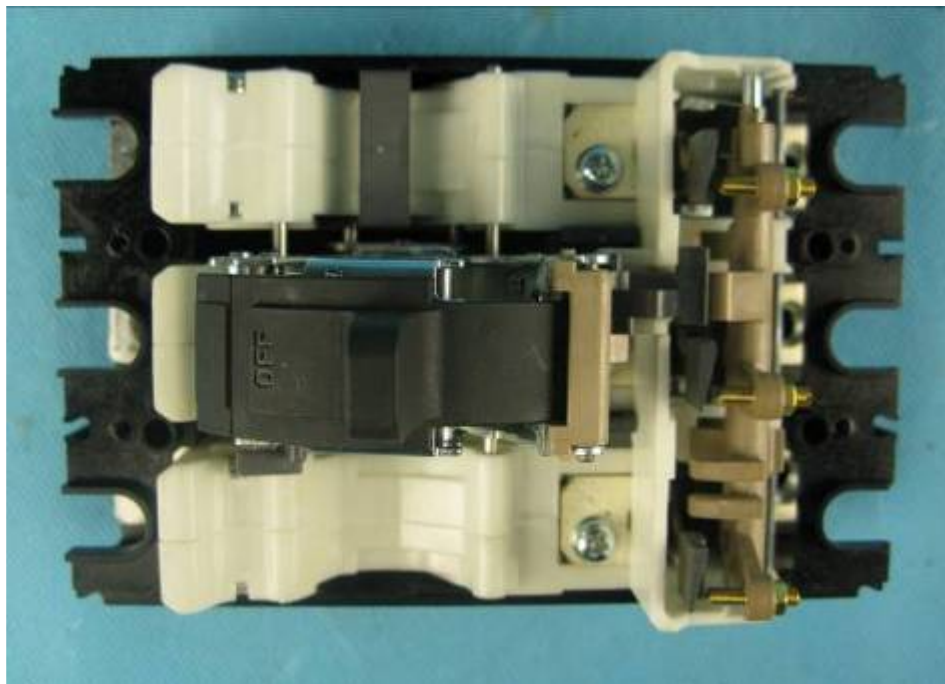
Open view, 4P, MCCB



Open view, 4P, MCCB



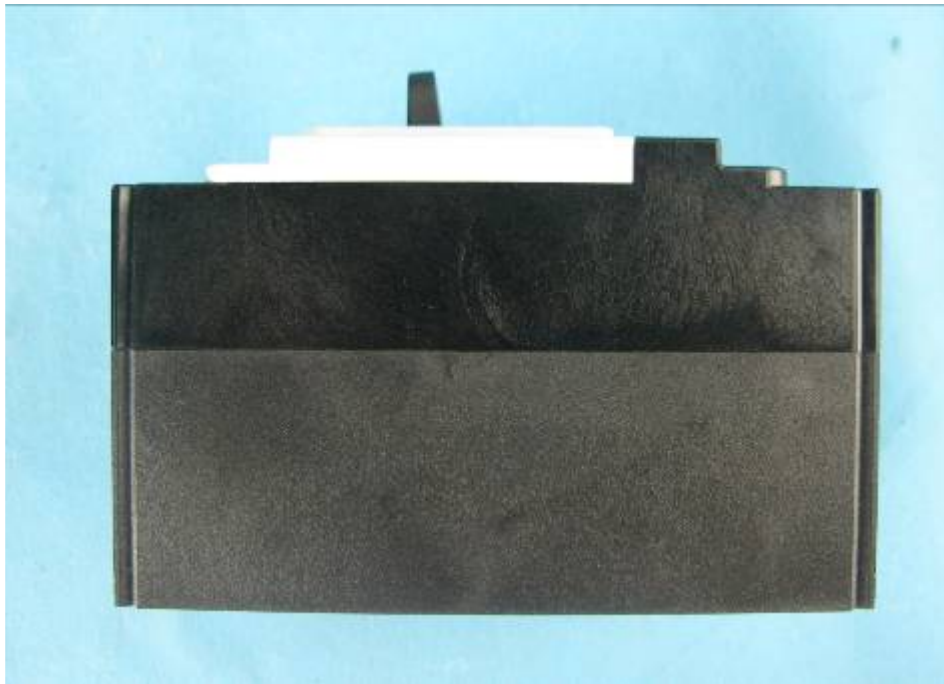
Open view, 3P, MCCB



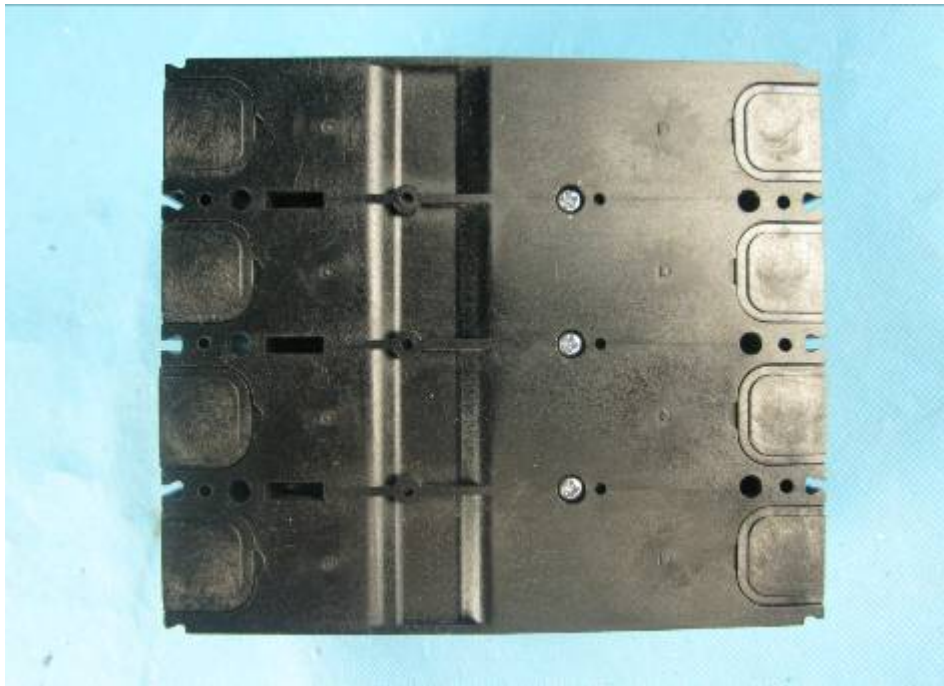
Open view, 3P, MCCB



Open view, 3P, MCCB



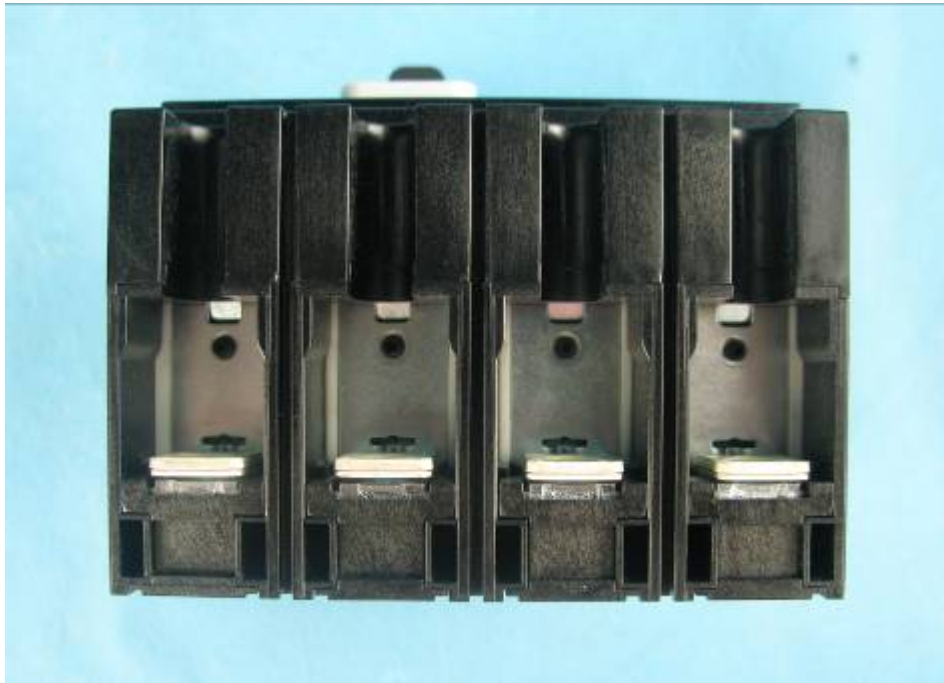
Side view, 4P, MCCB



Back view, 4P, MCCB



Upside terminal view, 4P, MCCB



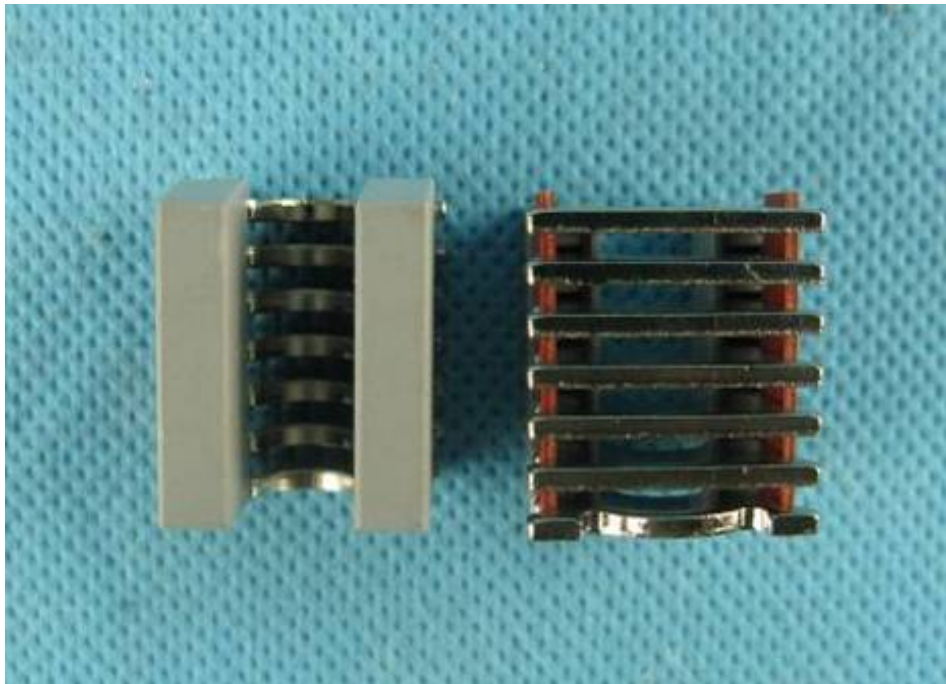
Underside terminal view, 4P, MCCB



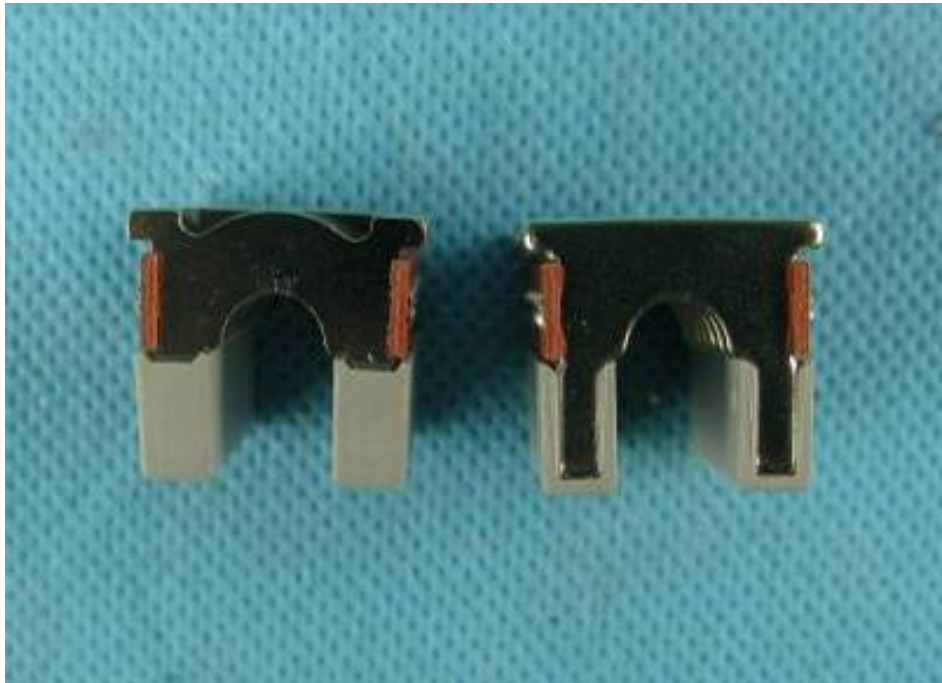
Box of contact



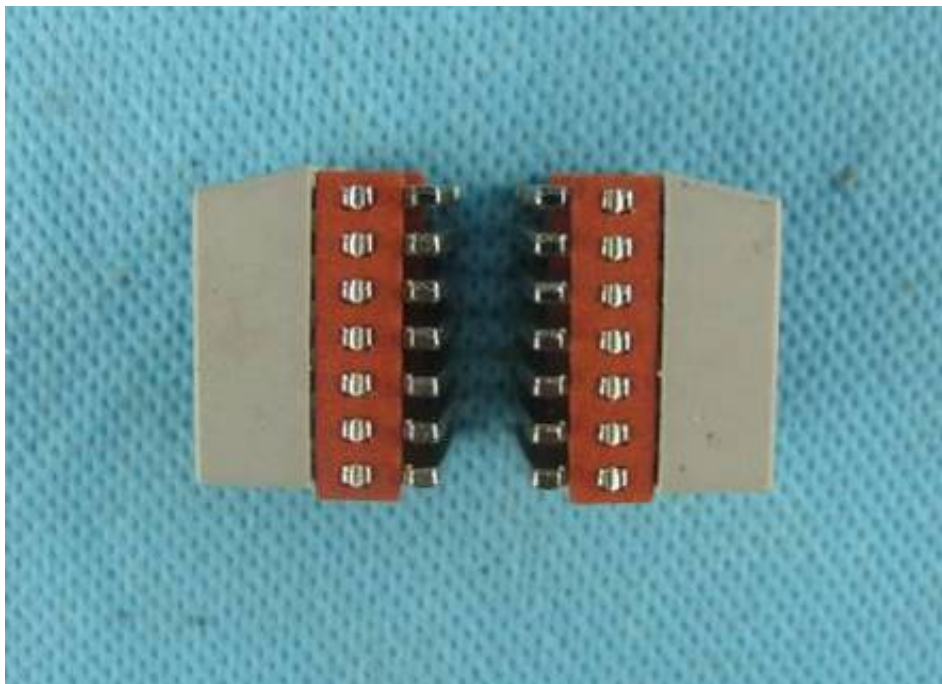
Box of contact



Arc chamber



Arc chamber



Arc chamber