Prüfbericht - Produkte
Test Report - Products

TÜVRheinland®

Prüfbericht-Nr.: *Test report no.:*	**50189953 005**	**Auftrags-Nr.:** *Order no.*:	**244231858**	Seite 1 von 1 *Page 1 of **1***
Kunden-Referenz-Nr.: *Client reference no.:*	**N/A**	**Auftragsdatum:** *Order date:*	2020-05-15	
Auftraggeber: *Client:*	**HIMEL HONG KONG LIMITED 11/F KERRY CTR 683 KING'S RD QUARRY BAY HONGKONG**			
Prüfgegenstand: *Test item:*	**Moulded Case Circuit Breaker**			
Bezeichnung / Typ-Nr.: *Identification / Type no.:*	**HDM3E-1600M**			
Auftrags-Inhalt: *Order content*:	**Type test**			
Prüfgrundlage: *Test specification:*	**EN 60947-2:2017**			

Wareneingangsdatum: *Date of sample receipt:*	2020-08-05
Prüfmuster-Nr.: *Test sample no:*	**244231858#1 to #3**
Prüfzeitraum: *Testing period:*	2020-08-05 to 2021-01-15
Ort der Prüfung: *Place of testing:*	The Low Voltage Apparatus Laboratory of Zhejiang Testing & Inspection Institute for Mechanical and Electrical Products Quality (ZTME)
Prüflaboratorium: *Testing laboratory:*	same as above
Prüfergebnis*: *Test result*:*	Pass

geprüft von:
reviewed by:

Datum:
Date: 2021-02-04

Signed by: Ding Ye

Stellung / *Position:* Project Engineer

genehmigt von:
authorized by:

Ausstelldatum:
Issue date: 2021-02-04

Signed by: Wencai Zhang

Stellung / *Position:* Technical Certifier

Sonstiges / *Other:*
This report was based on CB report.
Attachment 1:CB license HU003325(2 pages)
Attachment 2: CB report (179 pages)

Zustand des Prüfgegenstandes bei Anlieferung: Prüfmuster vollständig und unbeschädigt
Condition of the test item at delivery: *Test item complete and undamaged*

* Legende:	1 = sehr gut	2 = gut	3 = befriedigend	4 = ausreichend	5 = mangelhaft
	P(ass) = entspricht o.g. Prüfgrundlage(n)		F(ail) = entspricht nicht o.g. Prüfgrundlage(n)	N/A = nicht anwendbar	N/T = nicht getestet
** Legend:*	*1 = very good*	*2 = good*	*3 = satisfactory*	*4 = sufficient*	*5 = poor*
	P(ass) = passed a.m. test specification(s)		*F(ail) = failed a.m. test specification(s)*	*N/A = not applicable*	*N/T = not tested*

V05

Ref. Certif. No.

HU-003325

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

CB TEST CERTIFICATE

Product	Moulded Case Circuit Breaker
Name and address of the applicant	HIMEL HONG KONG LIMITED 11/F KERRY CTR 683 KING'S RD QUARRY BAY, Hong Kong
Name and address of the manufacturer	DELIXI ELECTRIC LTD Delixi High Tech Industrial Park, Liushi Town, Yueqing City, 325604 Zhejiang, P.R. China
Name and address of the factory	See additional page(s)
Ratings and principal characteristics	Cat. B; 3P, 4P; Ue=400/415VAC; 690VAC, 50/60Hz; In= 630/800/1000/1250/1600A, electronic type; Ui=1000V; Uimp=12,0kV; Icu= 50kA(400/415V); 35kA(690V); Ics=100%Icu; Icw=42kA/1s(400/415V); 35kA/1s(690V);
Trademark (if any)	HIMEL
Customer's Testing Facility (CTF) Stage used	N/A
Model / Type Ref.	HDM3E-1600M
Additional information (if necessary may also be reported on page 2)	Detailed information refer to test report 60438070 002.
A sample of the product was tested and found to be in conformity with	IEC 60947-2:2016
As shown in the Test Report Ref. No. which forms part of this Certificate	60438070 002

This CB Test Certificate is issued by the National Certification Body

TÜVRheinland®

TÜV Rheinland InterCert Kft., MEEI Division
H-1143 Budapest, Gizella út 51-57., Hungary
Web:www.tuv.com

Date: 2021-02-23

Signature: Wencai Zhang

10/0861 CB 06/20v9 rk

1. DELIXI ELECTRIC LTD
   Delixi High Tech Industrial Park,
   Liushi Town, Yueqing City,
   325604 Zhejiang
   P.R. China

2. DELIXI ELECTRIC (WUHU) LTD
   Wuhu Machinery Industrial Park,
   Wuhu city
   241100 Anhui
   P.R. China

Additional information (if necessary) Report Ref. No. : 60438070 002

Date: 2021-02-23 Signature: Wencai Zhang

Test Report issued under the responsibility of:

TÜVRheinland®

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

Report Number. .....:	**60438070 002**
Date of issue .....:	**20.01.2021**
Total number of pages.....	**179**
Name of Testing Laboratory preparing the Report .....:	**The Low Voltage Apparatus Laboratory of Zhejiang Testing & Inspection Institute for Mechanical and Electrical Products Quality (ZTME)**
Applicant's name.....:	**HIMEL HONG KONG LIMITED**
Address .....:	**11/F KERRY CTR 683 KING'S RD QUARRY BAY HONGKONG**
Test specification:	
Standard .....:	IEC 60947-2:2016
Test procedure.....:	CB scheme
Non-standard test method.....:	N/A
Test Report Form No.....:	IEC60947_2H
Test Report Form(s) Originator.....:	DEKRA Certification B.V.
Master TRF.....:	Dated 2017-04

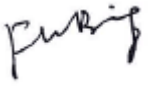
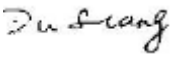
If this Test Report Form is used by non-IECEE members, the IECEE/IEC logo and the reference to the CB Scheme procedure shall be removed.

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

General disclaimer:

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

Test item description .....:	Moulded Case Circuit Breaker
Trade Mark .....:	Himel
Manufacturer.....:	DELIXI ELECTRIC LTD

Model/Type reference.....:		HDM3E-1600M	
Ratings .....:		Cat. B; 3P, 4P; Ue=400/415VAC; 690VAC, 50/60Hz; In= 630/800/1000/1250/1600A, electronic type; Ui=1000V; Uimp=12,0kV; Icu= 50kA(400/415V); 35kA(690V); Ics=100%Icu; Icw=42kA/1s(400/415V); 35kA/1s(690V);	
Responsible Testing Laboratory (as applicable), testing procedure and testing location(s):			
☒	**Testing Laboratory:**	**The Low Voltage Apparatus Laboratory of Zhejiang Testing & Inspection Institute for Mechanical and Electrical Products Quality (ZTME)**	
Testing location/ address ..... :		No 125 Miaohouwang Road Binjiang District Hangzhou, Zhejiang CHINA	
Tested by (name, function, signature) ..... :		Fu Bing(test engineer)	
Approved by (name, function, signature) .. :		Du Liang(Approver)	
☐	**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):

Attachment 1: Measuring equipment list (ZTME) – 2 pages

Attachment 2: Photo documentation – 3 pages

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**

Electrical construction of HDM3E-1600M (630/800/1000/1250A) was same as before except the electronic over-current release.

The products of HDM3E-1600Mare a series of MCCBs with the same frame size.
For the MCCBs with H type and R type, it's exactly the same except the different short-circuit capacity.
So all tests were performed on MCCBs as below tables according to table 9a, table 9c and table 10

Numbers of tests for test procedure, according to table 9a, table 9c and table 10.

Type	No. of Pole	Ue (V)	In (A)	Test current (kA)	Test sequence and number of samples							
					I	II/III	III	IV	VI	Annex C	Annex H	Annex F
HDM3E-1600M	4P	690	1600	-	1	-	-	-	-	-	-	-
HDM3E-1600M	4P	690	630	-	1[a]							
HDM3E-1600M	4P	415	1600	50	-	1	-	-	-	-	-	-
HDM3E-1600M	4P	415/√3	1600	0,6*50	-	-	1	-	-	-	-	-
HDM3E-1600M	4P	415	1600	42				1	-	-	-	-
HDM3E-1600M	4P	415/√3	1600	0,6*42	-	-	-	1	-	-	-	-
HDM3E-1600M	4P	690	1600	35	-	-	-	-	1	-	-	-
HDM3E-1600M	4P	690/√3	1600	0,6*35	-	-	-	1	-	-	-	-
HDM3E-1600M	3P	690	1600	-	1	-	-	-		-	-	-
HDM3E-1600M	3P	415	1600	50	-	-	1	-	-	-	-	-
HDM3E-1600M	4P	690	1600	-	-	-	-	-	-	-	-	1

Remark:a) only do the tests about tripping limits and characteristic

Tests performed (name of test and test clause):

Test sequence I

4P, 690V, 1600A, 1 sample	page 28
3P, 690V, 1600A, 1 sample	page 46
4P, 690V, 630A, 1 sample	page 54

Test sequence II/III

4P, 415V, 1600A, 50kA, 1 sample	page 68

Test sequence III

4P(N), 415/√3V, 1600A, 0,6*50kA, 1 sample	page 72
3P, 415V, 1600A, 50kA, 1 sample	page 75

Testing location:

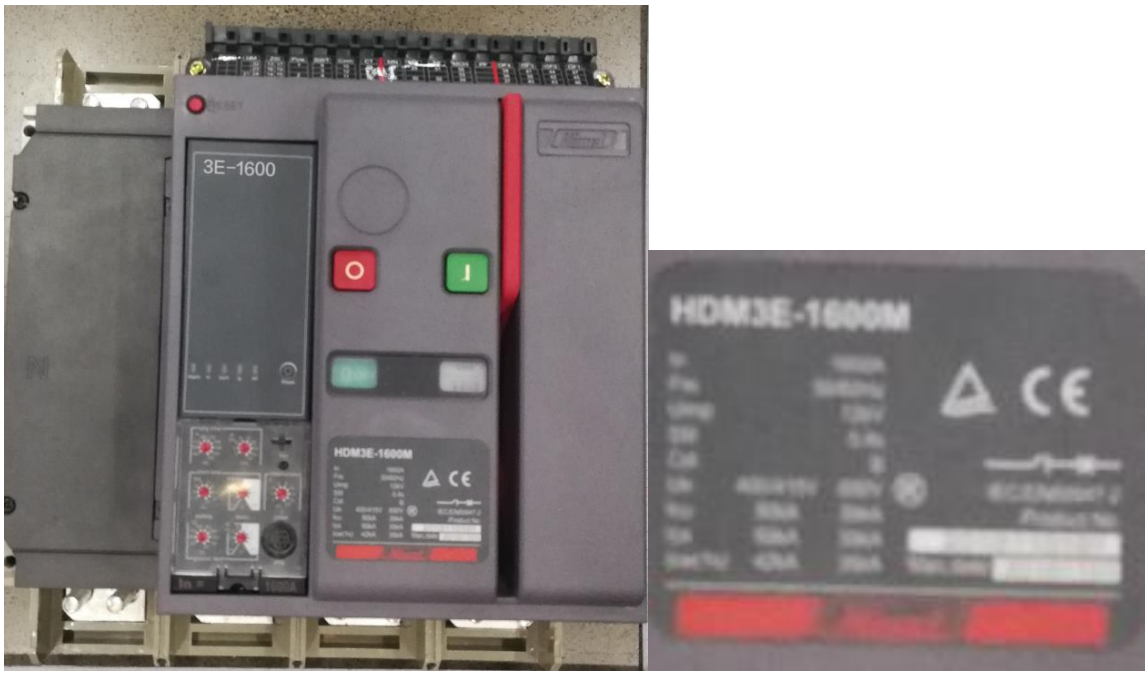
The Low Voltage Apparatus Laboratory of Zhejiang Testing & Inspection Institute for Mechanical and Electrical Products Quality (ZTME)

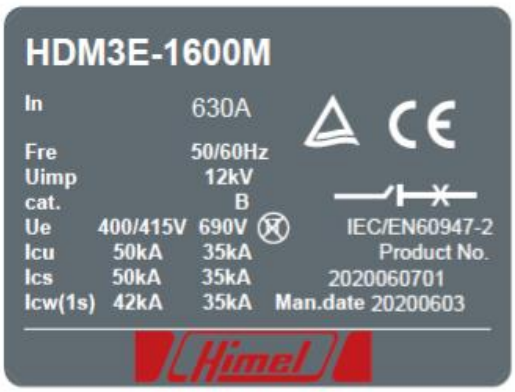
Test sequence IV 4P, 415V, 1600A, 42 kA /s, 1 sample page 78 4P(N), 415/√3V, 1600A, 0,6*42 kA /s, 1 sample page 80 4P(N), 690/√3V, 1600A, 0,6*35kA, 1 sample page 83 **Test sequence VI** 4P, 690V, 1600A, 35 kA /s, 1 sample page 93 **Annex F** 4P, 690V, 1600A, 1 sample page 124	

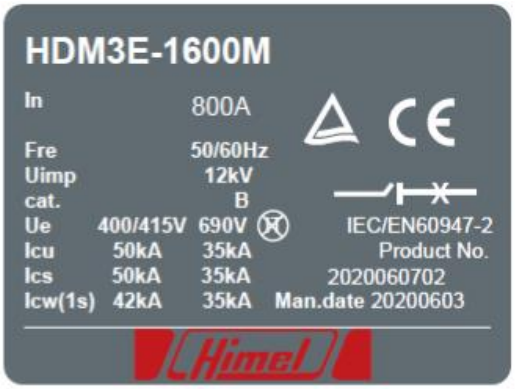
Summary of compliance with National Differences (List of countries addressed):

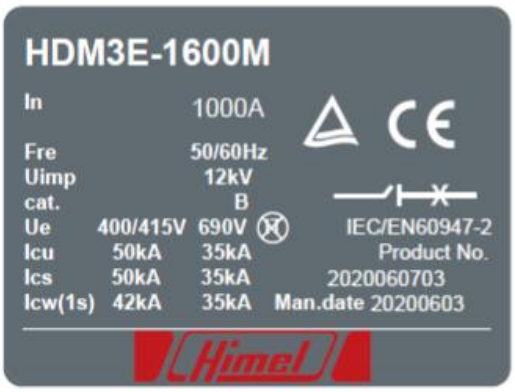
☒ **The product fulfils the requirements of EN 60947-2: 2017**

Copy of marking plate:




HDM3E-1600M
In 630A
Fre 50/60Hz
Uimp 12kV
cat. B
Ue 400/415V 690V
Icu 50kA 35kA
Ics 50kA 35kA
Icw(1s) 42kA 35kA
IEC/EN60947-2
Product No.
2020060701
Man.date 20200603
Himel


HDM3E-1600M
In 800A
Fre 50/60Hz
Uimp 12kV
cat. B
Ue 400/415V 690V
Icu 50kA 35kA
Ics 50kA 35kA
Icw(1s) 42kA 35kA
IEC/EN60947-2
Product No.
2020060702
Man.date 20200603
Himel


HDM3E-1600M
In 1000A
Fre 50/60Hz
Uimp 12kV
cat. B
Ue 400/415V 690V
Icu 50kA 35kA
Ics 50kA 35kA
Icw(1s) 42kA 35kA
IEC/EN60947-2
Product No.
2020060703
Man.date 20200603
Himel


HDM3E-1600M
In 1250A
Fre 50/60Hz
Uimp 12kV
cat. B
Ue 400/415V 690V
Icu 50kA 35kA
Ics 50kA 35kA
Icw(1s) 42kA 35kA
IEC/EN60947-2
Product No.
2020060704
Man.date 20200603
Himel

Test item particulars: test item vs. test requirements	
3. Classification	
3.1. Utilization category: (A or B). ..... :	B
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) ..... :	dependent 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
4.7. Type of release (thermo-magnetic / electronic) ..... :	electronic
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
Circuit-breaker for use on phase-earthed systems ..... :	Yes
Circuit-breaker for use in IT systems ..... :	NO
Rated and limiting values, main circuit .... :	
- rated operational voltage: U_e (V) ..... :	400/415VAC; 690VAC
- rated insulation voltage: U_i (V) ..... :	1000
- rated impulse withstand voltage: U_{imp} (kV) ..... :	12,0
- rated current: I_n (A) ..... :	630/800/1000/1250/1600
- kind of current..... :	AC
- conventional free air thermal current: I_{th} (A) ..... :	Same as In
- conventional enclosed thermal current: I_{the} (A)..... :	N/A
- current rating for four-pole circuit-breakers: (A) ..... :	100% In
- number of poles..... :	3P, 4P
- rated frequency: (Hz)..... :	50/60
- integral fuses (rated values)..... :	N/A
Rated duty :	
- eight-hour duty..... :	N/A
- uninterrupted duty: I_u (A) ..... :	Same as In

Short-circuit characteristic :	
rated short-time making capacity: I_{cm} (kA) ..... :	N/A
rated ultimate short-circuit breaking capacity: I_{cu} (kA) ... . :	50kA(400/415V); 35kA(690V);
rated service short-circuit breaking capacity: I_{cs} (kA)..... :	100%Icu
rated short-time withstand current: I_{cw} (kA/s) ..... :	N/A
Selectivity category (A or B) ..... :	N/A
Control circuits : **N/A**	
Electrical control circuits :	
- kind of current: (AC, DC)..... :	
- rated frequency: (Hz)..... :	
- rated control circuit voltage: U_c (nature, frequency, V) .... :	
- rated control supply voltage: U_s (nature, frequency V) .... :	
Air supply control circuits: (pneumatic or electro-pneumatic) :	
- rated pressure and its limit..... :	
- volumes of air, at atmospheric pressure, required for each closing and each opening operation ..... :	
Auxiliary circuits : **N/A**	
Rated and limiting values, auxiliary circuits..... :	
- rated operational voltage U_e (V)..... :	
- rated insulation voltage: U_i (V) ..... :	
- rated operational current: I_e (A)..... :	
- kind of current..... :	
- rated frequency: (Hz)..... :	
- number of circuits..... :	
- number and kind of contact elements..... :	
- rated uninterrupted current: I_u (A) ..... :	
- utilization category: (AC, DC, current and voltage)..... :	
Short-circuit characteristic :	
- Rated conditional short-circuit current (kA) ..... :	
- kind of protective device..... :	

Releases :	
1) shunt release ..... :	N/A
2) Over-current release ..... :	Yes
a) instantaneous ..... :	Yes
b) definite time delay..... :	Yes
c) inverse time delay..... :	Yes
- independent of previous load ..... :	Yes (electronic type)
- dependent on previous load; (for example thermal type release) ..... :	No
3) Undervoltage release (for opening) ..... :	N/A
4) Other releases..... :	N/A
Characteristics :	
1) Shunt release and undervoltage release (for opening) ... :	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 ..... :	See blow
- rated current ..... :	630/800/1000/1250/1600
- kind of current..... :	AC
- rated frequency: (if AC) ..... :	50/60Hz

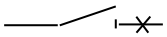
- current setting (or range of settings) ..... :	HDM3E-1600M 1600A： Long delay: IR=630A, 800A, 900A, 1000A, 1100A, 1250A, 1400A, 1500A, 1600A Short delay: Isd=1,5I_R, 2I_R, 3I_R,4I_R, 5I_R, 6I_R, 8I_R,10I_R,OFF Instantaneous: Ii=(2,3,4,6,8,10,12,15)In, OFF 1250A： Long delay: IR=500A, 630A, 700A, 800A, 900A, 1000A, 1100A, 1200A, 1250A Short delay: Isd=1,5I_R, 2I_R, 3I_R,4I_R, 5I_R, 6I_R, 8I_R,10I_R,OFF Instantaneous: Ii=(2,3,4,6,8,10,12,15)In, OFF 1000A： Long delay: IR=400A, 500A, 560A, 630A, 700A, 800A, 900A, 950A, 1000A Short delay: Isd=1,5I_R, 2I_R, 3I_R,4I_R, 5I_R, 6I_R, 8I_R,10I_R,OFF Instantaneous: Ii=(2,3,4,6,8,10,12,15)In, OFF 800A： Long delay: IR=320A, 350A, 400A, 450A, 500A, 560A, 630A, 700A, 800A Short delay: Isd=1,5I_R, 2I_R, 3I_R,4I_R, 5I_R, 6I_R, 8I_R,10I_R,OFF Instantaneous: Ii=(2,3,4,6,8,10,12,15)In, OFF 630A： Long delay: IR=250A, 315A, 350A, 400A, 450A, 500A, 560A, 600A, 630A Short delay: Isd=1,5I_R, 2I_R, 3I_R,4I_R, 5I_R, 6I_R, 8I_R,10I_R,OFF Instantaneous: Ii=(2,3,4,6,8,10,12,15)In, OFF
- time settings (or range of settings) ..... :	Long delay: TR(@6IR)=(1s, 2s, 4s, 8s, 12s, 16s, 20s, 24s, 30s)±10% Short delay: Tsd:（0,1s-0,2s-0,3s-0,4s）±20%

Classification of installation and use ..... :	N/A
Supply Connection ..... :	N/A
..... :	
Possible test case verdicts:	
- test case does not apply to the test object..... :	N/A
- test object does meet the requirement ..... :	P (Pass)
- test object does not meet the requirement ..... :	F (Fail)
Testing ..... :	
Date of receipt of test item ..... :	2020.11.20
Date (s) of performance of tests ..... :	2020.06.07 to 2021.01.15
General remarks:	
"(See Enclosure #)" refers to additional information appended to the report. "(See appended table)" refers to a table appended to the report. **Throughout this report a ☒ comma / ☐ point is used as the decimal separator.**	
Manufacturer's Declaration per sub-clause 4.2.5 of IECEE 02:	
The application for obtaining a CB Test Certificate includes more than one factory location and a declaration from the Manufacturer stating that the sample(s) submitted for evaluation is (are) representative of the products from each factory has been provided ..... :	☒ **Yes** ☐ **Not applicable**
When differences exist; they shall be identified in the General product information section.	
Name and address of factory (ies)1 ..... :	**DELIXI ELECTRIC LTD** / Delixi High Tech Industrial Park, Liushi Town, Yueqing City, Zhejiang Province, China 325604;
Name and address of factory (ies)2 ..... :	**DELIXI ELECTRIC (WUHU) LTD** / Wuhu Machinery Industrial Park, Wuhu city, Anhui Province, China 241100

General product information:

Type Designation: HDM3E-1600M
Utilization Category: B
Number of Poles: 3P, 4P
Number of Protection Poles: 3, 4
Rated Operation Voltage (Ue) : 400/415VAC, 690VAC 50/60Hz
Rated Current (Ie): 630/800/1000/1250/1600A
Rated Ultimate Short-circuit Breaking Capacity (Icu):50kA(400/415V); 35kA(690V);
Rated Service Short-circuit Breaking Capacity (Ics): 100%Icu
Rated Insulation Voltage (Ui): 1000V
Rated Impulse Withstand Voltage (Uimp): 12,0kV
Release type: Electronic
Pollution Degree: 3
Degree of Protection: IP20
Suitability for using in IT system: NO

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

5.2	**MARKING**		
a)	The following data shall be marked on the circuit-breaker itself or on a name plate or nameplates attached to the circuit-breaker, and located in a place such that they are visible and legible when the circuit-breaker is installed.		
	- rated current:	630/800/1000/1250/1600A	P
	- suitability for isolation, if applicable, with the symbol 		P
	- indication of the open and closed position: with ○ and I respectively, if symbols are used		P
b)	Marking on equipment not needed to be visible after mounting:		
	- manufacturer's name or trademark		P
	- type designation or serial number	HDM3E-1600M	P
	- IEC 60947-2 if the manufacturer claims compliance with this standard.		P
	- selectivity category	B	P
	- rated operational voltage(s) U_e	400/415VAC, 690VAC	P
	- Circuit-breaker for use in IT systems: Circuit-breaker for which all values of rated voltage have not been tested according to annex H or are not covered by such testing, shall be identified by the symbol  which shall be marked on the circuit-breaker immediately following these values of rated voltage	Not for IT system	P
	-rated impulse withstand voltage (U_{imp});	12kV	P
	- value (or range) of the rated frequency and/or the indication DC (or symbol)	AC 50/60Hz	P
	- rated service short-circuit breaking capacity. I_{cs}	100%Icu	P
	- rated ultimate short-circuit breaking capacity. I_{cu}	50kA(400/415V); 35kA(690V);	P
	- rated short-time withstand current, (Icw) and associated short-time delay, for utilization category B		N/A
	- line and load terminals, unless their connection is immaterial	Line Load	P
	- neutral pole terminals, if applicable, by the letter N		N/A
	- protective earth terminal, where applicable, by the symbol acc. 7.1.9.3 of part 1		N/A

IEC 60947-2			
Clause	Requirement + Test	Result - Remark	Verdict
	- ref. temperature for non-compensated thermal releases, if different from 30°C	electronic type	N/A
	- range of the current setting (I_r) of adjustable overload release	Ir=630,800,900,1000,1100,1250,1400,1500,1600A	P
	- value / range of the rated instantaneous short-circuit current setting (I_i), fixed or adjustable	Ii=(1,5-10)In	P
c)	Marked on the circuit-breaker as specified in item b), or shall be made available in the manufacturer's published information:		
	- rated short-circuit making capacity (I_{cm}) (if higher than specified in 4.3.5.1)		N/A
	- rated insulation voltage. (U_i) if higher than the maximum rated operational voltage)	1000V	P
	- rated impulse withstand voltage (U_{imp}), when declared.	12kV	P
	- pollution degree if other than 3	pollution degree 3	N/A
	- conventional enclosed thermal current (I_{the}) if different from the rated current:		N/A
	- IP Code, where applicable:	IP20	P
	- minimum enclosure size and ventilation data (if any) to which marked ratings apply:		N/A
	- details of minimum distance between circuit-breaker and earthed metal parts for circuit-breaker intended for use without enclosure:		N/A
	- suitability for environment A or B	A	N/A
	- r.m.s sensing if applicable, according to F.4.1.1		N/A
	- 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
	- values of tightening torque for the circuit-breaker terminals.		P
d)	The following data concerning the opening and closing devices of the circuit-breaker shall be placed either on their own nameplates or on the nameplate of the circuit-breaker:		
	- rated control circuit voltage of the closing device, and rated frequency for AC:		N/A
	- rated control circuit voltage of the shunt release and/or of the under-voltage release, and rated frequency:		N/A
	- rated current of indirect over-current releases:		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	- number and type of auxiliary contacts and kind of current, rated frequency (if AC) and rated voltages of the auxiliary switches, if different from those of the main circuit.		N/A
e)	Terminal shall be clearly and permanently identified in acc. with IEC 60445 and annex L :		
	- line terminal		P
	- load terminal		P
	- neutral pole terminal ”N”		N/A
	- protective earth terminal ⏚		N/A
	- terminal of coils (A/B)		N/A
	- terminal of shunt release (B)		N/A
	- 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

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Clause	Requirement + Test	Result - Remark	Verdict

7.1	**CONSTRUCTION**		
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
	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		N/A
	The colours of other push-buttons, illuminated push-buttons and indicator lights shall be in accordance with IEC 60073		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
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
	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 :		P
	minimum cross-sectional area of conductor (mm^2) :		N/A
	maximum cross-sectional area of conductor (mm^2) :	2*100*5	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/A
	protective earth terminal		N/A
	other terminals		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
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
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

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Clause	Requirement + Test	Result - Remark	Verdict
	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		P
	Sufficient space shall be provided inside the enclosure		P
	The fixed parts of a metal enclosure shall be electrically connected to the other exposed conductive parts of the equipment and connected to a terminal which enables them to be earthed or connected to a protective conductor		N/A
	Under no circumstances shall a removable metal part of the enclosure be insulated from the part carrying the earth terminal when the removable part is in place		N/A
	The removable parts of the enclosure shall be firmly secured to the fixed parts by a device such that they cannot be accidentally loosened or detached owing to the effects of operation of the equipment or vibrations		P
	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		P
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	
	Test for first characteristic.	IP2X	
	Test for first numeral (1, 2, 3, 4, 5, 6) .....:	2	P
	Test for second characteristic	IPX0	
	Test for second numeral (1, 2, 3, 4, 5, 6, 7, 8).....:		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
7.1.13 part 1	Conduit pull-out, torque and bending with metallic conduits		
	Polymeric enclosures of equipment, whether integral or not, provided with threaded conduit entries, intended for the connection of extra heavy duty, rigid threaded metal conduits complying with IEC 60981, shall withstand the stresses occurring during its installation such as pull-out, torque, bending		N/A
7.1.2	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 (Ue > 50 V):		
	Equipment suitable for isolation shall provide in the open position an isolation distance in acc. with the requirements necessary to satisfy the isolating function. Indication of the main contacts shall be provide by one or more of the following means:		
	- the position of the actuator		P
	- a separate mechanical indicator		N/A
	- visibility of the moving contacts		N/A
	When means are provided or to lock the equipment in the open position, locking only be possible when contacts are in the open position		N/A
	Actuator front-plate fitted to the equipment in a manner which ensures correct contact position indication and locking		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	The indicated open position is the only position in which the specified isolation distances between the contacts is ensured.		P
	- minimum clearances across open contacts (see Table XIII, Part 1) (mm) :	14	
	- measured clearances (mm) :	See table 7.1.4	P
	- test Uimp across gap (kV) :	18,5	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
	Alternatively, the design may provide padlockable means to prevent access to the actuator		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	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:	12,0kV	
	- max. value of rated operational voltage to earth	-	
	- nominal voltage of supply system:	1000V	
	- overvoltage category:	III	
	- pollution degree:	3	
	- field-in or homogeneous:	inhomogeneous	
	- minimum clearances (mm):	14	
	- measured clearances (mm):	See table 7.1.4	P
	Creepage distances:		
	- rated insulation voltage Ui (V)	1000	
	- pollution degree	3	
	- comparative tracking index (V)		
	- material group	IIIa	
	- minimum creepage distances (mm)	16	
	- measured creepage distances (mm)	See table 7.1.4	P
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/A
	A switched neutral pole shall break not before and shall make not after the other poles		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	For equipment having a value of conventional thermal current (free air or enclosed, see 4.3.2.1 and 4.3.2.2) not exceeding 63 A, this value shall be identical for all poles		N/A
	For higher conventional thermal current values, the neutral pole may have a value of conventional thermal current different from that of the other poles, but not less than half that value or 63 A, whichever is the higher		N/A
	If a pole with an appropriate making and breaking capacity is used as a neutral pole, then all poles, incl. the neutral pole, may operate substantially together.		N/A
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 mechanism, it is not possible to assign a short-circuit making capacity rating irrespective of the conditions of mechanical operation		P
	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 mechanism and incorporating an integral fast-acting opening release which causes the circuit-breaker to break safely, irrespective of the speed and firmness with which it is closed on to prospective peak currents exceeding 10 kA; in this case, a rated short-circuit making capacity can be assigned		P

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Clause	Requirement + Test	Result - Remark	Verdict
7.2.1.1.3	Independent manual closing		
	A circuit-breaker having an independent manual closing mechanism can be assigned a short-circuit making capacity rating irrespective of the conditions of mechanical operation		N/A
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
	- 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

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Clause	Requirement + Test	Result - Remark	Verdict
	- 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
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

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Clause	Requirement + Test	Result - Remark	Verdict
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 ± 10% of the tripping current value of the current setting for all values of current setting of the overload release		N/A
2)	Inverse time-delay operation		
	At the reference temperature and at 1,05 times the current setting with the conventional non-tripping current, the opening release being energized on all poles, tripping shall not occur in less than the conventional time from the cold state, i.e. with the circuit-breaker at the reference temperature		P
	Moreover, when at the end of the conventional time the value of current is immediately raised to 1,30 times the current setting, i.e. with the conventional tripping current, tripping shall then occur in less than the conventional time later		P
	If a release is declared by the manufacturer as substantially independent of ambient temperature, the current values of table 6 shall apply within the temperature band declared by the manufacturer, within a tolerance of 0,3%/K		P
	The width of the temperature band shall be at least 10 K on either side of the reference temperature		P

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Clause	Requirement + Test	Result - Remark	Verdict
7.2.4.2	Operational performance capability		
7.2.4.2 part 1	The operational performance off-load for which the tests are made with the control circuits energized and the main circuit not energized, in order to demonstrate that the equipment meets the operating conditions specified at the upper and lower limits of supply voltage and/or pressure specified for the control circuit during closing and opening operations		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	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		
	sections taken from the equipment; or	960°C, for base, no flame	
	any parts of identical material having representative cross-section.		
8.2.1.1.2	Flammability		
	flammability test, in accordance with IEC 60695-11-10;	-	
	hot wire ignition (HWI) test, as described in Annex M;	-	
	arc ignition (AI) test, as described in Annex M.	-	
8.2.4	Mechanical properties of terminals		
	Mechanical strength of terminals		
	maximum cross-sectional area of conductor (mm²) :	2*100*5 (prepared copper)	
	diameter of thread (mm) :	M10	
	torque (Nm) :	1,1×10,0	
	5 times on 2 separate clamping units	5 times	P
	Testing for damage to and accidental loosening of conductor (flexion test)		
	conductor of the smallest cross-sectional area (mm²) :		
	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
	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 (mm²) :		

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Clause	Requirement + Test	Result - Remark	Verdict
	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 (mm²) :		
	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 **4P, 690V, 1600A, 1 sample**		
8.3.3.2	Test of tripping limits and characteristic		
8.3.3.2.2	Short circuit releases		
	Manufacturer's name or trademark		
	Type designation or serial number	HDM3E-1600M	
	Sample no:	I-1	
	Rated operational voltage: Ue (V)	690	
	Rated current: In (A)	630/800/1000/1250/1600A	
	Ambient temperature 10-40 °C :	27,6°C	P
	Value of the tripping current declared by the manufacturer for a single pole, at which value they shall operate.	T_R (@2I_R)= 9s, 18s, 36s, 72s, 108s, 144s, 180s, 216s, 270s Tsd: Inverse time delay:0,1-0,4s, Definite time delay: 0,1-0,4s	P
	Range of adjustable setting current. (A)	I_R: 630A, 800A, 900A, 1000A, 1100A, 1400A, 1500A, 1600A, OFF adjustable; Isd=(1,5-10)I_R, OFF adjustiable Ii=(2-15)In, OFF adjstiable	P
	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)		N/A
	Operating time: >0,2s in case of instantaneous releases: L1-L2: L1-L3: L2-L3: N-Lx:		N/A
	Operating time: > twice time delay stated by the manufacturer, in the case of definite time delay releases: L1-L2: L1-L3: L2-L3: N-Lx:		N/A
	Test current: 120% of ~~the rated~~, or **minimum** adjustable setting current: (A)		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Operating time: <0,2s in case of instantaneous releases: L1-L2: L1-L3: L2-L3: N-Lx:		N/A
	Operating time: < twice time delay stated by the manufacturer, in the case of definite time delay releases: L1-L2: L1-L3: L2-L3: N-Lx:		N/A
	Test current: 80% of the **maximum** adjustable setting current: (A)		N/A
	Operating time: >0,2s in case of instantaneous releases: L1-L2: L1-L3: L2-L3: N-Lx:		N/A
	Operating time: > twice time delay stated by the manufacturer, in the case of definite time delay releases: L1-L2: L1-L3: L2-L3: N-Lx:		N/A
	Test current: 120% of the **maximum** adjustable setting current: (A)		N/A
	Operating time: <0,2s in case of instantaneous releases: L1-L2: L1-L3: L2-L3: N-Lx:		N/A
	Operating time: < twice time delay stated by the manufacturer, in the case of definite time delay releases: L1-L2: L1-L3: L2-L3: N-Lx:		N/A
	Test current: tripping current declared for single pole operation (A)		N/A
	Operating time: < 0,2 s in case of instantaneous release: L1: L2: L3: N:		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Operating time: < twice time delay stated by manufacturer in 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.		P
	Test current: 80% of the rated, or **minimum** adjustable setting current: (A)	80%×(Ii=2In)=2560A 80%×(Isd=1,5I_R)=756A	P
	Operating time: >0,2s in case of instantaneous releases: L1: L2: L3: N:	 >0,2s >0,2s >0,2s >0,2s	P
	Operating time: > twice time delay stated by the manufacturer, in the case of definite time delay releases: L1: L2: L3: N:	tsd=0,08 s >0,2s >0,2s >0,2s >0,2s	N/A
	Test current: 120% of the rated, or **minimum** adjustable setting current: (A)	120%×(Ii=2In)=3840A 120%×(Isd=1,5I_R)=1134A	P
	Operating time: <0,2s in case of instantaneous releases: L1: L2: L3: N:	 23,1ms 20,7ms 22,6ms 21,5ms	P
	Operating time: < twice time delay stated by the manufacturer, in the case of definite time delay releases: L1: L2: L3: N:	tsd=0,08s, operating time<0,16s 117ms 124ms 120ms 121ms	N/A
	Test current: 80% of the **maximum** adjustable setting current: (A)	80%×15×1600A=19,2kA 80%×10×1600A=12,8kA	P
	Operating time: >0,2s in case of instantaneous releases: L1: L2: L3: N:	 >0,2s >0,2s >0,2s >0,2s	P

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Clause	Requirement + Test	Result - Remark	Verdict
	Operating time: > twice time delay stated by the manufacturer, in the case of definite time delay releases: L1: L2: L3: N:		N/A
	Test current: 120% of the **maximum** adjustable setting current: (A)	120%×15×1600A=28,8kA 120%×10×1600A=19,2kA	P
	Operating time: <0,2s in case of instantaneous releases: L1: L2: L3: N:	 20,4ms 21,7ms 20,1ms 19,5ms	P
	Operating time: < twice time delay stated by the manufacturer, in the case of definite time delay releases: L1: L2: L3: N:	tsd=0,4s, operating time<0,8s 421ms 417ms 424ms 407ms	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)	690	
	Rated current: In (A)	1600	
	Ambient temperature 10-40 °C :	40-50	P
	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)	I_R: 500A, 600A, 700A, 800A, 900A, 1000A, 1100A, 1200A,	P
	Time delay stated by the manufacturer, in the case of definite time delay releases.	Tg:0,1s,-0,4s	P
	Test current: 90% of the rated, or minimum adjustable setting current: (A)	0,9*500=450A	P
	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.	>2*0,1s	P

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Clause	Requirement + Test	Result - Remark	Verdict
	Test current: 90% of the maximum adjustable setting current: (A)	0,9*1200	P
	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.	>2*0,4s	P
	Test current: 110% of the rated, or minimum adjustable setting current: (A) circuit-breaker with neutral pole: 1,2x110% (A)	1,1*500=550A 1,2*1,1*500=660A	P
	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.	<2*0,1s	P
	Test current: 110% of the maximum adjustable setting current: (A) circuit-breaker with neutral pole: 1,2x110% (A)	1,1*1200=1320A 1,2*1,1*1200=1580A	P
	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.	<2*0,4s	P
b)	Inverse time delay releases		
	Manufacturer's name or trademark	Himel	
	Type designation or serial number	HDM3E-1600M	
	Sample no:	I-1	
	Rated operational voltage: Ue (V)	690	
	Rated current: In (A)	1600	
	For releases dependent of ambient air temperature: Reference temperature	Independent of ambient air, however, the reference temperature declared by the manufacturer is 50°C	N/A
	Test ambient temperature (°C)		N/A
	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		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	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.		P
	Test ambient air temperature:	50,2°C, as deleared by the manufacturer	P
	Range of adjustable setting current: (A)	I_R=630A, 800A, 900A, 1000A, 1100A, 1250A, 1400A, 1500A,1600 A OFF adjustable	P
	Releases, dependent of ambient air temperature: Reference temperature (°C)		N/A
	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)	1,05×630A=662A	P
	Conventional non-tripping time: 1h when In < 63A, 2h when In > 63 A	>2h	P
	Test current: 130% of the rated, or **minimum** adjustable setting current: (A)	1,3×630A =819A	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.	1,3×1,2x630A =983A	P
	Conventional tripping time: <1h when In < 63A, <2h when In > 63 A	22,1s(@tr=1s) 15,4s	P
	Test current: 105% of the **maximum** adjustable setting current: (A)	1,05×1600A=1680A	P
	Conventional non-tripping time: 1h when In < 63A, 2h when In > 63 A	>2h	P
	Test current: 130% of the **maximum** adjustable setting current: (A)	1,3×1600A =2080A	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.	1,3x1,2x1600=2496A	P
	Conventional tripping time: <1h when In < 63A, <2h when In > 63 A	10min40s(@tr=30s) 7min26s	P
	Thermal Magnetic releases, independent of ambient air temperature: at 20°C or 40°C		
	Test ambient air temperature:		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Test current: 105% of the rated, or **minimum** adjustable setting current: (A)		N/A
	Conventional non-tripping time: 1h when In < 63A, 2h when In > 63 A		N/A
	Test current: 130% of the rated, or **minimum** adjustable setting current: (A)		N/A
	For circuit-breakers having an identified neutral pole provided with an overload release (see 8.3.3.1.1), the test current at the conventional tripping current shall be multiplied by the factor 1,2.		N/A
	Conventional tripping time: <1h when In < 63A, <2h when In > 63 A		N/A
	Test current: 105% of the **maximum** adjustable setting current: (A)		N/A
	Conventional non-tripping time: 1h when In < 63A, 2h when In > 63 A		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 In < 63A, <2h when In > 63 A		N/A
	An additional test, at a current specified by the manufacturer to verify the time/current characteristic of the releases conform to the curves provided by the manufacturer		
	Releases, dependent of ambient air temperature: Reference temperature (°C)		N/A
	Releases, independent of ambient air temperature: at 30°C	50,2°C, as deleared by the manufacturer	P
	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)	2×630=1260A; 2x1600=3200A; tr, min: 9s; tr, max: 270s	P
	Tripping time acc. time/current characteristic of the releases conform to the curves provided by the manufacturer. (within the stated tolerances)	9,08s 271s	P
	Releases, independent of ambient air temperature: at 20°C or 40°C		
	Test ambient air temperature:		P

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Clause	Requirement + Test	Result - Remark	Verdict
	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.		
	overload releases: (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
	short-circuit releases		P
	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.	L1	P
	Test current: 1,5 times of the rated, or **minimum** adjustable setting current: (A)	1,5×1,5x630=14175A	P
	Operating time, overload releases: (s)		N/A
	Time-delay: between the limits stated by the manufacturer:		N/A
	Operating time, short-circuit releases (electromagnetic): (s) L1-L2: L1-L3: L2-L3:		N/A
	Time-delay: between the limits stated by the manufacturer:	>0,08s	P
	Operating time, short-circuit releases (electronic): (s) L1 L2: L3:	105ms	P
	Time-delay: between the limits stated by the manufacturer:		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Test current: 1,5 times of the **maximum** adjustable setting current: (A)	1,5*10*1600=24kA	P
	Operating time, overload releases: (s)		N/A
	Time-delay: between the limits stated by the manufacturer:		N/A
	Operating time, short-circuit releases (electromagnetic): (s) L1-L2: L1-L3: L2-L3:		N/A
	Time-delay: between the limits stated by the manufacturer:	>0,35s	P
	Operating time, short-circuit releases (electronic): (s)L1 L2: L3:	407ms	P
	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.		
	overload releases: (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
	short-circuit releases		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.		P
	Test current: 1,5 times of the **minimum** adjustable setting current: (A)	1,5*1,5*630=1420A	P
	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)	>0,08s	P

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Clause	Requirement + Test	Result - Remark	Verdict
	Time duration of current when reduced to the rated current: shall be twice the delay-time stated by the manufacturer: (s)	>0,2s	P
	Rated current	1600A	P
	Operating time, overload releases: the circuit-breaker does not trip:		N/A
	Operating time, short-circuit releases (electromagnetic), shall not trip: (s) L1-L2: L1-L3: L2-L3:		N/A
	Operating time, short-circuit releases (electronic), shall not trip: (s) L1: L2: L3:	>0,2s	P
	Test current: 1,5 times of **maximum** adjustable setting current: (A)	1,5*10*1600=24kA	P
	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)	>0,35s	P
	Time duration of current when reduced to the rated current: shall be twice the delay-time stated by the manufacturer: (s)	>0,8s	P
	Rated current	1600A	P
	Operating time, overload releases: the circuit-breaker does not trip:		N/A
	Operating time, short-circuit releases (electromagnetic), shall not trip: (s) L1-L2: L1-L3: L2-L3:		N/A
	Operating time, short-circuit releases (electronic), shall not trip: (s) L1: L2: L3:	407ms	P
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) :	12,0	P
	- sea level of the laboratory:	20m	P
	- test Uimp main circuits (kV) :	14,8	P

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Clause	Requirement + Test	Result - Remark	Verdict
	- 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) :		N/A
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	P
	- main circuits, test voltage for 1 min (V)	1890V AC	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 .	1890V AC	P
	- between each pole and all the other poles connected to the frame of the circuit-breaker	1890V AC	P
2)	with the circuit-breaker in the open position and, additionally, in the tripped position, if any.	1890V AC	P

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Clause	Requirement + Test	Result - Remark	Verdict
	- between all live parts of all poles connected together and the frame of the circuit-breaker.	1890V AC	P
	- between the terminals of one side connected together and the terminals of the other side connected together.	1890V AC	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.		N/A
(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 Ue, and shall not exceed 0,5mA.		P
(v)	circuit-breakers having a rated insulation voltage greater than 1 000 V a.c. shall be tested at a voltage of Ui + 1 200 V a.c. r.m.s. or 2 Ui 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

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Clause	Requirement + Test	Result - Remark	Verdict
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		P
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

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Clause	Requirement + Test	Result - Remark	Verdict
	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
	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 ± 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	HDM3E-1600M	
	Sample no:	I-1	
	Rated current In (A)	1600	
	Rated operational voltage: Ue (V)	690	
	Rated control supply voltage of closing mechanism: Uc (V)		

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Clause	Requirement + Test	Result - Remark	Verdict
	Rated control supply voltage of shunt releases: Uc (V)	-	
	Rated control supply voltage undervoltage releases: Uc (V)	-	
	Ambient temperature 10-40 °C :	27°C	P
	Number of operating cycles per hour	20	P
	Number of cycles without current (total) (closing mechanism energized at the rated Uc)	2500	P
	Number of cycles without current (without releases)		N/A
	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 Uc		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 Uc		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.		N/A
8.3.3.4.4	Operational performance capability with current.		
	Rated current: In (A)	1600	
	Maximum rated operational voltage: Ue (V)	690V	
	Conductor cross-sectional area (mm²) :	2*100*5	P
	Number of operating cycles per hour	20	P
	Number of cycles with current (total) (closing mechanism energized at the rated Uc)	500	P
	Applied voltage: closing mechanism (V)		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	For circuit-breaker fitted with adjustable releases, test shall be made with the overload setting at maximum and short-circuit setting at minimum.		P
	Conditions, make/break operations:		P
	- test voltage U/Ue = 1,0 (V) ..... L1: ..... L2: L3:	692 693 692	P
	- test current I/Ie = 1,0 (A) ..... L1: ..... L2: L3:	1600 1600 1600	P
	- power factor/~~time constant~~:	0,81	P
	- frequency: (Hz)	50	N/A
	- on-time (ms):	100	P
	- off-time (s):	30	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		
	Sample no:		
	Rated current In (A)		
	Rated operational voltage: Ue (V)		
	Rated control supply voltage of closing mechanism: Uc (V)		
	Rated control supply voltage of shunt releases: Uc (V)		
	Rated control supply voltage undervoltage releases: Uc (V)		
	Ambient temperature 10-40 °C :		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Number of operating cycles per hour		N/A
	Maximum rated operational voltage: Ue (V)		N/A
	Number of operating cycles per hour		N/A
	Number of cycles with current (total) (closing mechanism energized at the rated Uc)		N/A
	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.		N/A
	Conditions, overload operations:		N/A
	- test voltage U/Ue = 1,05 (V) ..... L1: ..... L2: L3:		N/A
	- test current AC/~~DC~~: I/Ie = 6,0/~~2.5~~ (A) ..... L1: ..... L2: L3:		N/A
	- power factor/~~time constant~~:		N/A
	- Number of cycles manually opened: 9		N/A
	- Number of cycles automatically opened by an overload release: 3		N/A
	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		N/A
	- frequency: (Hz)		N/A
	- on-time max 2s:		N/A
	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	1380V, 5s	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 Ue, and shall not exceed 2 mA.	759V	P

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Clause	Requirement + Test	Result - Remark	Verdict
8.3.3.7	Verification of temperature-rise		
	- the values of temperature-rise do not exceed those specified in tab. 7.		P
	Temperature rise of main circuit terminals ≤ 80 K (K) :	See table I-1	P
	conductor cross-sectional area (mm²) :	2*100*5	P
	test current Ie (A) :	1600	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)	1,45×1600=1810A	P
	Conventional tripping time: <1h when In < 63A, <2h when In > 63 A	8min32s <2h	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) .....:	81,8N	—
	test force with blocked main contacts for 10 s (N) .:	400N, 10s	—
	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		P
	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 **3P, 690V, 1600A, 1 sample** **(only partial test was performed according to table 9c)**		
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) :	12,0	P
	- sea level of the laboratory:	20m	P
	- test Uimp main circuits (kV) :	14,8	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) :		N/A
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	P
	- main circuits, test voltage for 1 min (V)	1890V AC	P
	- auxiliary circuits, test voltage for 1 min (V)		N/A
	- control circuits, test voltage for 1 min (V)		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
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 .	1890V AC	P
	- between each pole and all the other poles connected to the frame of the circuit-breaker	1890V AC	P
2)	with the circuit-breaker in the open position and, additionally, in the tripped position, if any.	1890V AC	P
	- between all live parts of all poles connected together and the frame of the circuit-breaker.	1890V AC	P
	- between the terminals of one side connected together and the terminals of the other side connected together.	1890V AC	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.		N/A
(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 Ue, and shall not exceed 0,5mA.		P
(v)	circuit-breakers having a rated insulation voltage greater than 1 000 V a.c. shall be tested at a voltage of Ui + 1 200 V a.c. r.m.s. or 2 Ui 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

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Clause	Requirement + Test	Result - Remark	Verdict
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		P
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

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Clause	Requirement + Test	Result - Remark	Verdict
	The test for the lower limit is made without current in the main circuit and without previous heating of the release coil		N/A
	In the case of a release with a range of rated voltages, this test applies to the maximum voltage of the range		N/A
	The test for the upper limit is made starting from a constant temperature corresponding to the application of rated control supply voltage to the release and rated current in the main poles of the circuit-breaker		N/A
	This test may be combined with the temperature-rise test of 8.3.3.7		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
	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 ± 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

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Clause	Requirement + Test	Result - Remark	Verdict
8.3.3.4.3	Operational performance capability without current.		
	Type designation or serial number	HDM3E-1600M	
	Sample no:	I-2	
	Rated current In (A)	1600	
	Rated operational voltage: Ue (V)	690	
	Rated control supply voltage of closing mechanism: Uc (V)		
	Rated control supply voltage of shunt releases: Uc (V)	-	
	Rated control supply voltage undervoltage releases: Uc (V)	-	
	Ambient temperature 10-40 °C :	25°C	P
	Number of operating cycles per hour	20	P
	Number of cycles without current (total) (closing mechanism energized at the rated Uc)	2500	P
	Number of cycles without current (without releases)		N/A
	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 Uc		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 Uc		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.		N/A
8.3.3.4.4	Operational performance capability with current.		
	Rated current: In (A)	1600	

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Clause	Requirement + Test	Result - Remark	Verdict
	Maximum rated operational voltage: Ue (V)	690V	
	Conductor cross-sectional area (mm²) :	2*100*5	P
	Number of operating cycles per hour	20	P
	Number of cycles with current (total) (closing mechanism energized at the rated Uc)	500	P
	Applied voltage: closing mechanism (V)		N/A
	For circuit-breaker fitted with adjustable releases, test shall be made with the overload setting at maximum and short-circuit setting at minimum.		P
	Conditions, make/break operations:		P
	- test voltage U/Ue = 1,0 (V) ..... L1: ..... L2: L3:	692 693 692	P
	- test current I/Ie = 1,0 (A) ..... L1: ..... L2: L3:	1620 1620 1620	P
	- power factor/~~time constant~~:	0,83	P
	- frequency: (Hz)	50	N/A
	- on-time (ms):	100	P
	- off-time (s):	30	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		
	Sample no:		
	Rated current In (A)		
	Rated operational voltage: Ue (V)		

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Clause	Requirement + Test	Result - Remark	Verdict
	Rated control supply voltage of closing mechanism: Uc (V)		
	Rated control supply voltage of shunt releases: Uc (V)		
	Rated control supply voltage undervoltage releases: Uc (V)		
	Ambient temperature 10-40 °C :		N/A
	Number of operating cycles per hour		N/A
	Maximum rated operational voltage: Ue (V)		N/A
	Number of operating cycles per hour		N/A
	Number of cycles with current (total) (closing mechanism energized at the rated Uc)		N/A
	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.		N/A
	Conditions, overload operations:		N/A
	- test voltage U/Ue = 1,05 (V) ..... L1: ..... L2: L3:		N/A
	- test current AC/~~DC~~: I/Ie = 6,0/~~2.5~~ (A) ..... L1: ..... L2: L3:		N/A
	- power factor/~~time constant~~:		N/A
	- Number of cycles manually opened: 9		N/A
	- Number of cycles automatically opened by an overload release: 3		N/A
	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		N/A
	- frequency: (Hz)		N/A
	- on-time max 2s:		N/A
	Operating rate if different from Table 8		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
8.3.3.6	Verification of dielectric withstand		
	- equal to twice the rated operational voltage with a minimum of 1000 V for 5 seconds	1380V, 5s	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 Ue, and shall not exceed 2 mA.	759V,	P
8.3.3.7	Verification of temperature-rise		
	- the values of temperature-rise do not exceed those specified in tab. 7.		P
	Temperature rise of main circuit terminals ≤ 80 K (K) :	See table I-1	P
	conductor cross-sectional area (mm²) :	2*100*5	P
	test current Ie (A) :	1600	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)		P
	Conventional tripping time: <1h when In < 63A, <2h when In > 63 A	8min 30s	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) .....:	84,2	—
	test force with blocked main contacts for 10 s (N) .:	400N, 10s	—
	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		P

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Clause	Requirement + Test	Result - Remark	Verdict
	Three attempts to operate the equipment by the stored energy.		N/A
	Lock ability of driving mechanism in OFF-position at test force and blocked main contacts .....:		N/A
	Position indicator does not show OFF-position after capture of test force at blocked main contacts		P
8.3.3	TEST SEQUENCE I: GENERAL PERFORMANCE CHARACTERISTICS **4P, 690V, 630A, 1 sample** **Remark:only do the tests about tripping limits and characteristic**		
8.3.3.2	Test of tripping limits and characteristic		
8.3.3.2.2	Short circuit releases		
	Manufacturer's name or trademark		
	Type designation or serial number	HDM3E-1600M	
	Sample no:	I-1	
	Rated operational voltage: Ue (V)	690	
	Rated current: In (A)	630	
	Ambient temperature 10-40 °C :	27,6°C	P
	Value of the tripping current declared by the manufacturer for a single pole, at which value they shall operate.	T_R (@2I_R)= 9s, 18s, 36s, 72s, 108s, 144s, 180s, 216s, 270s Tsd: Inverse time delay:0,1-0,4s, Definite time delay: 0,1-0,4s	P
	Range of adjustable setting current. (A)	Long delay: I_R=250A, 315A, 350A, 400A, 450A, 500A, 560A, 600A, 630A Short delay: Isd=1,5I_R, 2I_R, 3I_R,4I_R, 5I_R, 6I_R, 8I_R,10I_R,OFF Instantaneous: Ii=(2,3,4,6,8,10,12,15)In, OFF	P
	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)		N/A

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

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Clause	Requirement + Test	Result - Remark	Verdict
	Operating time: < twice time delay stated by the manufacturer, in the case of definite time delay releases: L1-L2: L1-L3: L2-L3: N-Lx:		N/A
	Test current: tripping current declared for single pole operation (A)		N/A
	Operating time: < 0,2 s in case of instantaneous release: L1: L2: L3: N:		N/A
	Operating time: < twice time delay stated by manufacturer in 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.		P
	Test current: 80% of the rated, or **minimum** adjustable setting current: (A)	I_R=250A 80%×(Ii=2In)=400A 80%×(Isd=1,5I_R)=300A	P
	Operating time: >0,2s in case of instantaneous releases: L1: L2: L3: N:	 >0,2s >0,2s >0,2s	P
	Operating time: > twice time delay stated by the manufacturer, in the case of definite time delay releases: L1: L2: L3: N:		N/A
	Test current: 120% of the rated, or **minimum** adjustable setting current: (A)	I_R=250A 120%×(Ii=2In)=600A 120%×(Isd=1,5I_R)=450A	P
	Operating time: <0,2s in case of instantaneous releases: L1: L2: L3: N:	 121ms 119ms 114ms	P

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Clause	Requirement + Test	Result - Remark	Verdict
	Operating time: < twice time delay stated by the manufacturer, in the case of definite time delay releases: L1: L2: L3: N:		N/A
	Test current: 80% of the **maximum** adjustable setting current: (A)	I_R=630A 80%×(Ii=2In)=1008A 80%×(Isd=1,5I_R)=756A	P
	Operating time: >0,2s in case of instantaneous releases: L1: >0,2s L2: >0,2s L3: >0,2s N:		P
	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)	120%×(Ii=2In)=1512A 120%×(Isd=1,5I_R)=1134A	P
	Operating time: <0,2s in case of instantaneous releases: L1: 36ms L2: 39ms L3: 38ms N:		P
	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)	690	
	Rated current: In (A)	630	
	Ambient temperature 10-40 °C :	40-50	P

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Clause	Requirement + Test	Result - Remark	Verdict
	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)	I_R=250A, 315A, 350A, 400A, 450A, 500A, 560A, 600A, 630A	P
	Time delay stated by the manufacturer, in the case of definite time delay releases.	Tg:0,1s,-0,4s	P
	Test current: 90% of the rated, or minimum adjustable setting current: (A)	0,9*1,5*250=338A	P
	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.	>2*0,1s	P
	Test current: 90% of the maximum adjustable setting current: (A)	0,9*10*630=567A	P
	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.	>2*0,4s	P
	Test current: 110% of the rated, or minimum adjustable setting current: (A) circuit-breaker with neutral pole: 1,2x110% (A)	1,1*1,5*250=413A 1,2*1,1*250*1,5=496A	P
	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.	<2*0,1s	P
	Test current: 110% of the maximum adjustable setting current: (A) circuit-breaker with neutral pole: 1,2x110% (A)	1,1*10*630=693A 1,2*1,1*630*10=832A	P
	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.	<2*0,4s	P
b)	Inverse time delay releases		
	Manufacturer's name or trademark	Himel	
	Type designation or serial number	HDM3E-1600M	

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Clause	Requirement + Test	Result - Remark	Verdict
	Sample no:	I-1	
	Rated operational voltage: Ue (V)	690	
	Rated current: In (A)	630	
	For releases dependent of ambient air temperature: Reference temperature	Independent of ambient air, however, the reference temperature declared by the manufacturer is 50°C	N/A
	Test ambient temperature (°C)		N/A
	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		N/A
	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.		P
	Test ambient air temperature:	50,2°C, as deleared by the manufacturer	P
	Range of adjustable setting current: (A)	I_R=250A, 315A, 350A, 400A, 450A, 500A, 560A, 600A, 630A	P
	Releases, dependent of ambient air temperature: Reference temperature (°C)		N/A
	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)	I_{Rmin}=250A 1,05×250A=263A	P
	Conventional non-tripping time: 1h when In < 63A, 2h when In > 63 A	>2h	P
	Test current: 130% of the rated, or **minimum** adjustable setting current: (A)	1,3×250A =325A	P
	For circuit-breakers having an identified neutral pole provided with an overload release (see 8.3.3.1.1), the test current at the conventional tripping current shall be multiplied by the factor 1,2.		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Conventional tripping time: <1h when In < 63A, <2h when In > 63 A	21,7s(@tr=1s)	P
	Test current: 105% of the **maximum** adjustable setting current: (A)	1,05×630A=662A	P
	Conventional non-tripping time: 1h when In < 63A, 2h when In > 63 A	>2h	P
	Test current: 130% of the **maximum** adjustable setting current: (A)	1,3×630A =819A	P
	For circuit-breakers having an identified neutral pole provided with an overload release (see 8.3.3.1.1), the test current at the conventional tripping current shall be multiplied by the factor 1,2.		N/A
	Conventional tripping time: <1h when In < 63A, <2h when In > 63 A	11min24s(@tr=30s)	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 In < 63A, 2h when In > 63 A		N/A
	Test current: 130% of the rated, or **minimum** adjustable setting current: (A)		N/A
	For circuit-breakers having an identified neutral pole provided with an overload release (see 8.3.3.1.1), the test current at the conventional tripping current shall be multiplied by the factor 1,2.		N/A
	Conventional tripping time: <1h when In < 63A, <2h when In > 63 A		N/A
	Test current: 105% of the **maximum** adjustable setting current: (A)		N/A
	Conventional non-tripping time: 1h when In < 63A, 2h when In > 63 A		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 In < 63A, <2h when In > 63 A		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	An additional test, at a current specified by the manufacturer to verify the time/current characteristic of the releases conform to the curves provided by the manufacturer		
	Releases, dependent of ambient air temperature: Reference temperature (°C)		N/A
	Releases, independent of ambient air temperature: at 30°C	50,2°C, as deleared by the manufacturer	P
	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)	2×250=500A; 2x630=1260A; tr, min: 31,9s; tr, max: 34,2s	P
	Tripping time acc. time/current characteristic of the releases conform to the curves provided by the manufacturer. (within the stated tolerances)		P
	Releases, independent of ambient air temperature: at 20°C or 40°C		
	Test ambient air temperature:		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)		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.		
	overload releases: (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
	short-circuit releases		P
	Electromagnetic release: two poles in series carrying the test current, using successively all possible combinations of poles having a short-circuit release.		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Electronic releases: on one pole chosen at random.	L1	P
	Test current: 1,5 times of the rated, or **minimum** adjustable setting current: (A)	1,5×1,5x250=563A	P
	Operating time, overload releases: (s)		N/A
	Time-delay: between the limits stated by the manufacturer:		N/A
	Operating time, short-circuit releases (electromagnetic): (s) L1-L2: L1-L3: L2-L3:		N/A
	Time-delay: between the limits stated by the manufacturer:	>0,08s	P
	Operating time, short-circuit releases (electronic): (s)L1 L2: L3:	103ms	P
	Time-delay: between the limits stated by the manufacturer:		N/A
	Test current: 1,5 times of the **maximum** adjustable setting current: (A)	1,5*10*630=9450A	P
	Operating time, overload releases: (s)		N/A
	Time-delay: between the limits stated by the manufacturer:		N/A
	Operating time, short-circuit releases (electromagnetic): (s) L1-L2: L1-L3: L2-L3:		N/A
	Time-delay: between the limits stated by the manufacturer:	>0,35s	P
	Operating time, short-circuit releases (electronic): (s)L1 L2: L3:	408ms	P
	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.		
	overload releases: (all phase poles loaded)		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	for circuit-breakers having an identified neutral pole provided with an overload release, the test current for this release shall be 1,5 times the current setting;		N/A
	short-circuit releases		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.		P
	Test current: 1,5 times of the **minimum** adjustable setting current: (A)	1,5*1,5*250=563A	P
	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)	>0,08s	P
	Time duration of current when reduced to the rated current: shall be twice the delay-time stated by the manufacturer: (s)	>0,2s	P
	Rated current	630A	P
	Operating time, overload releases: the circuit-breaker does not trip:		N/A
	Operating time, short-circuit releases (electromagnetic), shall not trip: (s) L1-L2: L1-L3: L2-L3:		N/A
	Operating time, short-circuit releases (electronic), shall not trip: (s) L1: L2: L3:	>0,2s	P
	Test current: 1,5 times of **maximum** adjustable setting current: (A)	1,5*10*630=9450A	P
	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)	>0,35s	P
	Time duration of current when reduced to the rated current: shall be twice the delay-time stated by the manufacturer: (s)	>0,8s	P

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Clause	Requirement + Test	Result - Remark	Verdict
	Rated current	630A	P
	Operating time, overload releases: the circuit-breaker does not trip:		N/A
	Operating time, short-circuit releases (electromagnetic), shall not trip: (s) L1-L2: L1-L3: L2-L3:		N/A
	Operating time, short-circuit releases (electronic), shall not trip: (s) L1: L2: L3:	90s	P
8.3.4	TEST SEQUENCE II (Ics): Rated service short-circuit breaking capacity		
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		
	Sample no:		
	Rated current: In (A)		
	Rated operational voltage: Ue (V)		
	Rated service short-circuit breaking capacity: (kA)		
	Rated control supply voltage of closing mechanism: Uc (V)		
	Rated control supply voltage of shunt release: Uc (V)		
	For circuit-breaker fitted with adjustable releases, test shall be made with the current and time settings at maximum.		N/A
	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.		N/A
	Test made in free air:		N/A
	Distances of the metallic screen's: (all sides)		N/A
	The characteristics of the metallic screen:		
	- woven wire mesh		N/A
	- perforated metal		N/A
	- expanded metal		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	- ratio hole area/total area: 0,45-0,65		N/A
	- size of hole: <30mm^2		N/A
	- finish: bare or conductive plating		N/A
	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		N/A
	Circuit is earthed at: (load-star- or supply-star point)		N/A
	Conductor cross-sectional area (mm^2) :		N/A
	If terminals unmarked: line connected at: (underside/upside)		N/A
	Tightening torques: (Nm)		N/A
	Test sequence of operation: O – t – CO – t – CO		N/A
	- test voltage U/Ue = 1,05 (V).....L1: .....L2: L3:		N/A
	- r.m.s. test current AC/DC: (A) .....L1: .....L2: L3:		N/A
	power factor/time constant :		N/A
	- Factor ”n”		N/A
	- peak test current (A) :		N/A
	Test sequence ”O”		
	- max. let-through current: (kApeak) .....L1: .....L2: L3:		N/A
	- Joule integral I^{2}dt (A^{2}s) .....L1: .....L2: L3:		N/A
	Pause, t: (min)		N/A
	Test sequence ”CO”		
	- max. let-through current: (kApeak) .....L1: .....L2: L3:		N/A
	- Joule integral I^{2}dt (A^{2}s) .....L1: .....L2: L3:		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Pause, t: (min)		N/A
	Test sequence ”CO”		
	- max. let-through current: (kApeak) .....L1: .....L2: L3:		N/A
	- Joule integral I^2dt (A^2s) .....L1: .....L2: L3:		N/A
	Melting of the fusible element		N/A
	Damage to insulation on conductors		N/A
	Holes in the PE-sheet for test sequence ”O”		N/A
	Cracks observed		N/A
8.3.4.3	Operational performance capability with current.		
	Rated current: In (A)		
	Maximum rated operational voltage: Ue (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 Uc)		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/Ue = 1,0 (V) .....L1: .....L2: L3:		N/A
	- test current I/Ie = 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		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	- no breakdown or flashover		N/A
	- the leaking current for circuit-breaker suitable for isolation: (<2mA / 1.1 Ue)		N/A
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. ≤ 80 K (K) :		N/A
	conductor cross-sectional area (mm²) :		N/A
	test current Ie (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)		N/A
	Conventional tripping time: <1h when In < 63A, <2h when In > 63 A		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
8.3.4	TEST SEQUENCE II/III (Ics=Icu): **4P, 415V, 1600A, 50kA, 1 sample**		
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	HDM3E-1600M	
	Sample no:	II/III-1	
	Rated current: In (A)	1600	
	Rated operational voltage: Ue (V)	415V	
	Rated service short-circuit breaking capacity: (kA)	50	
	Rated control supply voltage of closing mechanism: Uc (V)	-	
	Rated control supply voltage of shunt release: Uc (V)	-	
	For circuit-breaker fitted with adjustable releases, test shall be made with the current and time settings at maximum.		P
	closing mechanism energized with 85% at the rated Uc: (V)		N/A
	The circuit-breaker is mounted complete on its own support or an equivalent support.		P
	Test made in free air:		P
	Distances of the metallic screen's: (all sides)	Front: 0mm back: 0mm Left: 25mm; right: 25mm Top: 0mm; bottom: 0mm	P
	The characteristics of the metallic screen:		
	- woven wire mesh		N/A
	- perforated metal		P
	- expanded metal		N/A
	- ratio hole area/total area: 0,45-0,65	0,5	P
	- size of hole: <30mm^2	25	P
	- finish: bare or conductive plating	Bare	P
	Test made in specified individual enclosure: Details of these tests, including the dimensions of the enclosure:		N/A
	Fuse "F": copper wire: diameter 0,8 mm, 50 mm long		P
	Circuit is earthed at: (load-star- or supply-star point)	supply-star point	P

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Clause	Requirement + Test	Result - Remark	Verdict
	Conductor cross-sectional area (mm²) :	2*100*5	P
	If terminals unmarked: line connected at: (underside/upside)	upside	P
	Tightening torques: (Nm)	10	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:		P
	- Operation time: (s) ..... L1: ..... L2: ..... L3: ..... N :	271 270 272	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/Ue = 1,05 (V) ..... L1: ..... L2: L3:	436 436 436	P
	- r.m.s. test current AC/~~DC:~~ (kA) ..... L1: ..... L2: L3:	 50,2 50,0 50,1	P
	power factor/~~time constant~~ :	0,20	P
	- Factor ”n”	2,2	P
	- peak test current (A) :	84,4	P
	Test sequence ”O”		
	- max. let-through current: (kApeak) ..... L1: ..... L2: L3:	55,2 84,4 83,4	P
	- Joule integral I²dt (MA²s) ..... L1: ..... L2: L3:	25,5 31,8 41,6	P
	Pause, t: (min)	3	P
	Test sequence ”CO”		
	- max. let-through current: (kApeak) ..... L1: ..... L2: L3:	89,9 90,2 69,9	P
	- Joule integral I²dt (MA²s) ..... L1: ..... L2: L3:	42,6 47,1 25,2	P

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Clause	Requirement + Test	Result - Remark	Verdict
	Pause, t: (min)	3	P
	Test sequence ”CO”		
	- max. let-through current: (kApeak) ..... L1: ..... L2: L3:	86,1 69,7 87,2	P
	- Joule integral I²dt (A²s) ..... L1: ..... L2: L3:	44,5 24,0 40,2	P
	Melting of the fusible element	No	P
	Damage to insulation on conductors	No	P
	Holes in the PE-sheet for test sequence ”O”	No	P
	Cracks observed	No cracks	P
8.3.4.3	Operational performance capability with current.		
	Rated current: In (A)	1600A	
	Maximum rated operational voltage: Ue (V)	415V	
	Conductor cross-sectional area (mm²) :	2*100*5	
	Number of operating cycles per hour	20 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 Uc)	25 cycles	P
	Applied voltage: closing mechanism (V)		N/A
	For circuit-breaker fitted with adjustable releases, test shall be made with the overload setting at maximum and short-circuit setting at minimum.		N/A
	Conditions, make/break operations:		
	- test voltage U/Ue = 1,0 (V) ..... L1: ..... L2: L3:	416 418 420	P
	- test current I/Ie = 1,0 (A) ..... L1: ..... L2: L3:	1620 1620 1620	P
	power factor/~~time constant~~ :	0,81	P
	- frequency: (Hz)	50.	P
	- on-time (ms):	Max. on-time: 402ms	P
	- off-time (s):	30	P

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Clause	Requirement + Test	Result - Remark	Verdict
8.3.4.4	Verification of dielectric withstand		
	- equal to twice the rated operational voltage with a minimum of 1000 V	1000V, 60s	P
	- no breakdown or flashover		P
	- the leaking current for circuit-breaker suitable for isolation: (<2mA / 1,1 Ue)	459V,	P
8.3.4.5	Verification of temperature-rise		
	- the values of temperature-rise do not exceed those specified in tab. 7.		P
	Temperature rise of main circuit terminals. ≤ 80 K (K) :	See table II/III-1	P
	conductor cross-sectional area (mm²) :	2*100*5	P
	test current Ie (A) :	1600	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)	1,45×1600=1810A	P
	Conventional tripping time: <1h when In < 63A, <2h when In > 63 A	8min 30s <2h	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:	2,5Ir,	P
	- Operation time: (s) ..... L1: ..... L2: ..... L3: ..... N :	174 173 175	P

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Clause	Requirement + Test	Result - Remark	Verdict
8.3.5	TEST SEQUENCE III (Icu): Rated ultimate short-circuit breaking capacity **4P(N), 415/√3V, 1600A, 0,6*50kA, 1 sample**		
	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	HDM3E-1600M	
	Sample no:	III-1	
	Rated current: In (A)	1600	
	Rated operational voltage: Ue (V)	415V	
	Rated ultimate short-circuit breaking capacity: (kA)	50	
	Rated control supply voltage of closing mechanism: Uc (V)	-	
	Rated control supply voltage of shunt release: Uc (V)	-	
	This test sequence need not be made when Icu = Ics		
8.3.5.2	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:		P
	- Operation time: (s) ..... L1: ..... L2: ..... L3: ..... N :	 270 271	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.		N/A
	closing mechanism energized with 85% at the rated Uc: (V)		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	The circuit-breaker is mounted complete on its own support or an equivalent support.		P
	Test made in free air:		N/A
	Distances of the metallic screen's: (all sides)	Front: 0mm back: 0mm Left: 25mm; right: 25mm Top: 0mm; bottom: 0mm	P
	The characteristics of the metallic screen:		
	- woven wire mesh		N/A
	- perforated metal		P
	- expanded metal		N/A
	- ratio hole area/total area: 0,45-0,65	0,5	P
	- size of hole: <30mm^2	25	P
	- finish: bare or conductive plating	Bare	P
	Test made in specified individual enclosure: Details of these tests, including the dimensions of the enclosure:		N/A
	Fuse "F": copper wire: diameter 0,8 mm, 50 mm long		P
	Circuit is earthed at: (load-star- or supply-star point)	Supply-star point	P
	Conductor cross-sectional area (mm²) :	2*100*5	P
	If terminals unmarked: line connected at: (underside/upside)		N/A
	Tightening, torques: (Nm)	10	P
	Test sequence of operation: O – t – CO		P
	- test voltage U/Ue = 1,05 (V) ..... L1: ..... L2: L3:	- - 255	P
	- r.m.s. test current AC/~~DC~~: (kA)..... L1: ..... L2: L3:	- - 30,8	P
	power factor/~~time constant~~ :	0,25	P
	- Factor "n"	2,1	P
	- peak test current (Amax) :	88,7	P
	Test sequence "O"		
	- max. let-through current: (kApeak) ..... L1: ..... L2: L3:	- - 53,1	P

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Clause	Requirement + Test	Result - Remark	Verdict
	- Joule integral I²dt (MA²s) ..... L1: ..... L2: L3:	- - 18,6	P
	Pause, t: (min)	3	P
	Test sequence ”CO”		
	- max. let-through current: (kApeak) ..... L1: ..... L2: L3:	- - 52,1	P
	- Joule integral I²dt (MA²s) ..... L1: ..... L2: L3:	- - 17,4	P
	Melting of the fusible element		P
	Damage to insulation on conductors		N/A
	Holes in the PE-sheet for test sequence ”O”		P
	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	1000V, 5s	P
	- no breakdown or flashover		P
	- the leaking current for circuit-breaker suitable for isolation: (<6mA / 1,1 Ue)	457V,	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:		P
	- Operation time: (s) ..... L1: ..... L2: ..... L3: ..... N :	- - 171 173	P

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Clause	Requirement + Test	Result - Remark	Verdict
8.3.5	TEST SEQUENCE III (Icu): Rated ultimate short-circuit breaking capacity **3P, 415V, 1600A, 50kA, 1 sample**		
	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	HDM3E-1600M	
	Sample no:	III-2	
	Rated current: In (A)	1600	
	Rated operational voltage: Ue (V)	415V	
	Rated ultimate short-circuit breaking capacity: (kA)	50	
	Rated control supply voltage of closing mechanism: Uc (V)	-	
	Rated control supply voltage of shunt release: Uc (V)	-	
	This test sequence need not be made when Icu = Ics		
8.3.5.2	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:	2In, <297s	P
	- Operation time: (s) ..... L1: ..... L2: ..... L3: ..... N :	271 273 270 -	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.		N/A
	closing mechanism energized with 85% at the rated Uc: (V)		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	The circuit-breaker is mounted complete on its own support or an equivalent support.		P
	Test made in free air:		N/A
	Distances of the metallic screen's: (all sides)	Front: 0mm back: 0mm Left: 25mm; right: 25mm Top: 0mm; bottom: 0mm	P
	The characteristics of the metallic screen:		
	- woven wire mesh		N/A
	- perforated metal		P
	- expanded metal		N/A
	- ratio hole area/total area: 0,45-0,65	0,5	P
	- size of hole: <30mm^2	25	P
	- finish: bare or conductive plating	Bare	P
	Test made in specified individual enclosure: Details of these tests, including the dimensions of the enclosure:		N/A
	Fuse "F": copper wire: diameter 0,8 mm, 50 mm long		P
	Circuit is earthed at: (load-star- or supply-star point)	Supply-star point	P
	Conductor cross-sectional area (mm²) :	2*100*5	P
	If terminals unmarked: line connected at: (underside/upside)		N/A
	Tightening, torques: (Nm)	10	P
	Test sequence of operation: O – t – CO		P
	- test voltage U/Ue = 1,05 (V) ..... L1: ..... L2: L3:	437 437 437	P
	- r.m.s. test current AC/~~DC~~: (kA)..... L1: ..... L2: L3:	51,3 51,3 51,3	P
	power factor/~~time constant~~ :	0,22	P
	- Factor "n"	2,1	P
	- peak test current (Amax) :	51,3	P
	Test sequence "O"		
	- max. let-through current: (kApeak) ..... L1: ..... L2: L3:	89,3 71,1 75,4	P

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Clause	Requirement + Test	Result - Remark	Verdict
	- Joule integral I²dt (MA²s) ..... L1: ..... L2: L3:	43,5 33,2 30,9	P
	Pause, t: (min)	3	P
	Test sequence ”CO”		
	- max. let-through current: (kApeak) ..... L1: ..... L2: L3:	90,4 69,5 74,4	P
	- Joule integral I²dt (MA²s) ..... L1: ..... L2: L3:	45,1 30,0 28,1	P
	Melting of the fusible element		P
	Damage to insulation on conductors		N/A
	Holes in the PE-sheet for test sequence ”O”		P
	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	1380V, 5s	P
	- no breakdown or flashover		P
	- the leaking current for circuit-breaker suitable for isolation: (<6mA / 1,1 Ue)	759V,	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:		P
	- Operation time: (s) ..... L1: ..... L2: ..... L3: ..... N :	270s 271s 272s -	P

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Clause	Requirement + Test	Result - Remark	Verdict
8.3.6.2	**TEST SEQUENCE IV (Icw): Rated short-time withstand current** **HDM3E-1600M, 4P, 415V, 1600A, 42 kA /1s, 1 sample**		
	Except where the combined test sequence applies, this test sequence applies to circuit-breakers of utilization category B and to those circuit-breaker of category A with an intentional short time delay at the assigned short time delay		
	Where integrally fused circuit-breaker are of utilization category B, they shall meet the requirements of this sequence.		
	Type designation or serial number	HDM3E-1600M	-
	Sample no:	IV-1	-
	Rated current: In (A)	1600A	-
	Rated operational voltage: Ue (V)	415V	-
	Rated short-time withstand current: (kA/s)	42	-
	Rated frequency: (Hz)	50	-
8.3.6.2	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:	2In at 50°C	P
	- Operation time: (s) ..... L1: ..... L2: ..... L3: ..... N :	272 270 271 272	P
8.3.6.3	Test of rated short-time withstand current.		
	For this test, any over-current release, including the instantaneous override, if any, likely to operate during the test, shall be rendered inoperative.		
	- test frequency: (Hz)	50	-
	- duration of the test: (s)	0,53	-
	- test frequency: (Hz)	50	-
	- power factor / time constant (ms):	2,1	-
	- factor ”n”	0,25	-
	- test voltage: (V) ..... L1: ..... L2: L3:	418 421 419	-
	- r.m.s. test current: (kA) ..... L1: ..... L2: L3:	43,1 43,5 41,6	-
	- highest peak current: (kA)	89,5	P

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Clause	Requirement + Test	Result - Remark	Verdict
8.3.6.4	Verification of temperature-rise		
	- the values of temperature-rise do not exceed those specified in tab. 7.		P
	Temperature rise of main circuit terminals. ≤ 80 K (K) :	See table IV-1	P
	conductor cross-sectional area (mm²) :	2*100*5	-
	test current Ie (A) :	1600	-
8.3.6.5	Test of short-circuit breaking capacity at the max. short-time withstand current.		
	Rated short-time withstand current: (kA/s)		
	Test sequence: O – t – CO		
	max. available time setting of the short–time delay short-circuit release. (s)		P
	- test voltage U/Ue = 1,05 (V) ..... L1: ..... L2: L3:	440 440 440	-
	- r.m.s. test current AC/DC: (kA) ..... L1: ..... L2: L3:	 42,4 42,4 42,4	-
	- test frequency: (Hz)	50	-
	- power factor / ~~time constant~~ (ms):	0,25	-
	- factor ”n”	2,1	-
	Test sequence ”O”		
	- max. let-through current: (kApeak) ..... L1: ..... L2: L3:	54,4 84,1 89,2	P
	- Joule integral I²dt (MA²s) ..... L1: ..... L2: L3:	701 705 721	P
	Pause, t: (min)	3	P
	- the circuit-breaker shall remain closed for the short-time corresponding to the max. available time setting of the short–time delay short-circuit release and -		P
	- the instantaneous override, if any, shall not operate.		P
	-pause: t (s)	3min	P
	Test sequence ”CO”		
	- max. let-through current: (kApeak) ..... L1: ..... L2: L3:	70,5 89,0 81,6	P

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Clause	Requirement + Test	Result - Remark	Verdict
	- Joule integral I²dt (MA²s) ..... L1: ..... L2: L3:	712 735 745	P
	Pause, t: (min)	3	P
	- the circuit-breaker shall remain closed for the short-time corresponding to the max. available time setting of the short–time delay short-circuit release and -		P
	- the instantaneous override, if any, shall not operate.		N/A
	- if the circuit-breaker has a making current release, this requirement does not apply to the CO operation, if the prospective current exceeds the pre-determined value, since it will then operate.		N/A
8.3.6.6	Verification of dielectric withstand		P
	- equal to twice the rated operational voltage with a minimum of 1000 V		
	- 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 Ue, and shall not exceed 2 mA.	457V	P
8.3.6.7	Verification of overload releases		P
	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 maximum value stated by the manufacturer for twice the value of the current setting, at the reference temperature, on a pole singly.		
	Time specified by the manufacturer:		
	- Operation time: (s) ..... L1: ..... L2: ..... L3: ..... N :	173 171 172 172	P

8.3.6.2	**TEST SEQUENCE IV (Icw): Rated short-time withstand current** **HDM3E-1600M, 4P, 415V, 1600A, 42 kA /1s, 1 sample** **Tested at the four pole and its adjacent pole**	

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Clause	Requirement + Test	Result - Remark	Verdict
	Except where the combined test sequence applies, this test sequence applies to circuit-breakers of utilization category B and to those circuit-breaker of category A with an intentional short time delay at the assigned short time delay		
	Where integrally fused circuit-breaker are of utilization category B, they shall meet the requirements of this sequence.		
	Type designation or serial number	HDM3E-1600M	-
	Sample no:	IV-2	-
	Rated current: In (A)	1600A	-
	Rated operational voltage: Ue (V)	415V	-
	Rated short-time withstand current: (kA/s)	42	-
	Rated frequency: (Hz)	50	-
8.3.6.2	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:	2In at 50°C	P
	- Operation time: (s) ..... L1: ..... L2: ..... L3: ..... N :	 270 271	P
8.3.6.3	Test of rated short-time withstand current.		
	For this test, any over-current release, including the instantaneous override, if any, likely to operate during the test, shall be rendered inoperative.		
	- test frequency: (Hz)	50	-
	- duration of the test: (s)	0,53	-
	- test frequency: (Hz)	50	-
	- power factor / time constant (ms):	2,1	-
	- factor ”n”	0,25	-
	- test voltage: (V) ..... L1: ..... L2: L3:	 242	-
	- r.m.s. test current: (kA) ..... L1: ..... L2: L3:	 26,2	-
	- highest peak current: (kA)	53,8	P

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Clause	Requirement + Test	Result - Remark	Verdict
8.3.6.4	Verification of temperature-rise		
	- the values of temperature-rise do not exceed those specified in tab. 7.		P
	Temperature rise of main circuit terminals. ≤ 80 K (K) :	See table 7 about IV-2	P
	conductor cross-sectional area (mm²) :	2*100*5	-
	test current Ie (A) :	1600	-
8.3.6.5	Test of short-circuit breaking capacity at the max. short-time withstand current.		
	Rated short-time withstand current: (kA/s)		
	Test sequence: O – t – CO		
	max. available time setting of the short–time delay short-circuit release. (s)		P
	- test voltage U/Ue = 1,05 (V) .....L1: .....L2: L3:	256	-
	- r.m.s. test current AC/DC: (kA) .....L1: .....L2: L3:	25,6	-
	- test frequency: (Hz)	50	-
	- power factor / ~~time constant~~ (ms):	0,23	-
	- factor ”n”	2,1	-
	Test sequence ”O”		
	- max. let-through current: (kApeak) .....L1: .....L2: L3:	53,9	P
	- Joule integral I²dt (MA²s) .....L1: .....L2: L3:	264	P
	Pause, t: (min)	3	P
	- the circuit-breaker shall remain closed for the short-time corresponding to the max. available time setting of the short–time delay short-circuit release and -		P
	- the instantaneous override, if any, shall not operate.		P
	-pause: t (s)	3min	P
	Test sequence ”CO”		
	- max. let-through current: (kApeak) .....L1: .....L2: L3:	53,5	P

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Clause	Requirement + Test	Result - Remark	Verdict
	- Joule integral I²dt (MA²s) .....L1: .....L2: L3:	265	P
	Pause, t: (min)	3	P
	- the circuit-breaker shall remain closed for the short-time corresponding to the max. available time setting of the short–time delay short-circuit release and -		P
	- the instantaneous override, if any, shall not operate.		N/A
	- if the circuit-breaker has a making current release, this requirement does not apply to the CO operation, if the prospective current exceeds the pre-determined value, since it will then operate.		N/A
8.3.6.6	Verification of dielectric withstand		P
	- equal to twice the rated operational voltage with a minimum of 1000 V		
	- 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 Ue, and shall not exceed 2 mA.	457V	P
8.3.6.7	Verification of overload releases		P
	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 maximum value stated by the manufacturer for twice the value of the current setting, at the reference temperature, on a pole singly.		
	Time specified by the manufacturer:		
	- Operation time: (s) .....L1: .....L2: .....L3: ..... N :	172 172	P

8.3.6.2	**TEST SEQUENCE IV (Icw): Rated short-time withstand current** **HDM3E-1600M, 4P, 690V, 1600A, 35 kA /1s, 1 sample** **Tested at the four pole and its adjacent pole**	

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Clause	Requirement + Test	Result - Remark	Verdict
	Except where the combined test sequence applies, this test sequence applies to circuit-breakers of utilization category B and to those circuit-breaker of category A with an intentional short time delay at the assigned short time delay		
	Where integrally fused circuit-breaker are of utilization category B, they shall meet the requirements of this sequence.		
	Type designation or serial number	HDM3E-1600M	-
	Sample no:	IV-3	-
	Rated current: In (A)	1600A	-
	Rated operational voltage: Ue (V)	690V	-
	Rated short-time withstand current: (kA/s)	35	-
	Rated frequency: (Hz)	50	-
8.3.6.2	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:	2In at 50°C	P
	- Operation time: (s) ..... L1: ..... L2: ..... L3: ..... N :	 272 273	P
8.3.6.3	Test of rated short-time withstand current.		
	For this test, any over-current release, including the instantaneous override, if any, likely to operate during the test, shall be rendered inoperative.		
	- test frequency: (Hz)	50	-
	- duration of the test: (s)	0,53	-
	- test frequency: (Hz)	50	-
	- power factor / time constant (ms):	0,22	-
	- factor ”n”	2,1	-
	- test voltage: (V) ..... L1: ..... L2: L3:	 405	-
	- r.m.s. test current: (kA) ..... L1: ..... L2: L3:	 21,6	-
	- highest peak current: (kA)	45,2	P

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Clause	Requirement + Test	Result - Remark	Verdict
8.3.6.4	Verification of temperature-rise		
	- the values of temperature-rise do not exceed those specified in tab. 7.		P
	Temperature rise of main circuit terminals. ≤ 80 K (K) :	See table 7 about IV-3	P
	conductor cross-sectional area (mm²) :	2*100*5	-
	test current Ie (A) :	1600	-
8.3.6.5	Test of short-circuit breaking capacity at the max. short-time withstand current.		
	Rated short-time withstand current: (kA/s)		
	Test sequence: O – t – CO		
	max. available time setting of the short–time delay short-circuit release. (s)		P
	- test voltage U/Ue = 1,05 (V) .....L1: .....L2: L3:	424	-
	- r.m.s. test current AC/DC: (kA) .....L1: .....L2: L3:	21,3	-
	- test frequency: (Hz)	50	-
	- power factor / ~~time constant~~ (ms):	0,23	-
	- factor ”n”	2,1	-
	Test sequence ”O”		
	- max. let-through current: (kApeak) .....L1: .....L2: L3:	45,0	P
	- Joule integral I²dt (MA²s) .....L1: .....L2: L3:	185	P
	Pause, t: (min)	3	P
	- the circuit-breaker shall remain closed for the short-time corresponding to the max. available time setting of the short–time delay short-circuit release and -		P
	- the instantaneous override, if any, shall not operate.		P
	-pause: t (s)	3min	P
	Test sequence ”CO”		
	- max. let-through current: (kApeak) .....L1: .....L2: L3:	43,7	P

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Clause	Requirement + Test	Result - Remark	Verdict
	- Joule integral I^2dt (MA^2s) ..... L1: ..... L2: L3:	190	P
	Pause, t: (min)	3	P
	- the circuit-breaker shall remain closed for the short-time corresponding to the max. available time setting of the short–time delay short-circuit release and -		P
	- the instantaneous override, if any, shall not operate.		N/A
	- if the circuit-breaker has a making current release, this requirement does not apply to the CO operation, if the prospective current exceeds the pre-determined value, since it will then operate.		N/A
8.3.6.6	Verification of dielectric withstand		P
	- equal to twice the rated operational voltage with a minimum of 1000 V		
	- 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 Ue, and shall not exceed 2 mA.	457V	P
8.3.6.7	Verification of overload releases		P
	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 maximum value stated by the manufacturer for twice the value of the current setting, at the reference temperature, on a pole singly.		
	Time specified by the manufacturer:		
	- Operation time: (s) ..... L1: ..... L2: ..... L3: ..... N :	171 172	P

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Clause	Requirement + Test	Result - Remark	Verdict

8.3.7	**TEST SEQUENCE V: Performance of integrally fused circuit-breakers**		
	STAGE 1		
	Type designation or serial number		
	Sample no:		
	Rated current: In (A)		
	Rated operational voltage: Ue (V)		
	Value of prospective current equal to the selectivity limit current, as declared by the manufacturer. (kA)		
	Type of integrated fuses (all details)		
	Rated control supply voltage of closing mechanism: Uc (V)		
	Rated control supply voltage of shunt release: Uc (V)		
8.3.7.2	Short-circuit at the selectivity limit current		
	Test sequences ”O”		
	Fuses shall be fitted		N/A
	For circuit-breaker fitted with adjustable releases, test shall be made with the current and time settings at maximum.		
	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.		N/A
	Test made in free air:		N/A
	Distances of the metallic screen’s: (all sides)		N/A
	The characteristics of the metallic screen:		
	- woven wire mesh		N/A
	- perforated metal		N/A
	- expanded metal		N/A
	- ratio hole area/total area: 0,45-0,65		N/A
	- size of hole: <30mm^2		N/A
	- finish: bare or conductive plating		N/A
	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		N/A
	Circuit is earthed at: (load-star- or supply-star point)		N/A
	Conductor cross-sectional area (mm²) :		N/A
	If terminals unmarked: line connected at: (underside/upside)		N/A
	Tightening torques: (Nm)		N/A
	- test voltage U/Ue = 1,05 (V) ..... L1: ..... L2: L3:		N/A
	- r.m.s. test current AC/DC: (A) ..... L1: ..... L2: L3:		N/A
	power factor/time constant :		N/A
	- factor ”n”		N/A
	- peak test current (Amax) :		N/A
	Test sequence ”O”		
	- max. let-through current: (kApeak) ..... L1: ..... L2: L3:		N/A
	- Joule integral I²dt (A²s) ..... L1: ..... L2: L3:		N/A
	- fuses shall still intact ..... L1: ..... L2: L3:		N/A
8.3.7.3	Verification of temperature-rise		N/A
	- the values of temperature-rise do not exceed those specified in tab. 7.		N/A
	Temperature rise of main circuit terminals. ≤ 80 K (K) :		N/A
	conductor cross-sectional area (mm²) :		N/A
	test current Ie (A) :		N/A
8.3.7.4	Verification of dielectric withstand		
	- equal to twice the rated operational voltage with a minimum of 1000 V		N/A
	- no breakdown or flashover		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	- the leaking current for circuit-breaker suitable for isolation: (<2mA / 1,1 Ue)		N/A
8.3.7	**TEST SEQUENCE V: Performance of integrally fused circuit-breakers**		
	STAGE 2		
	Type designation or serial number		
	Sample no:		
	Rated current: In (A)		
	Rated operational voltage: Ue (V)		
	1.1 time the value of prospective current equal to the selectivity limit current, as declared by the manufacturer. (kA)		
	Type of integrated fuses (all details)		
	Rated control supply voltage of closing mechanism: Uc (V)		
	Rated control supply voltage of shunt release: Uc (V)		
8.3.7.5	Verification of overload releases		N/A
	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:		
	- Operation time: (s) ..... L1: ..... L2: ..... L3: ..... N :		N/A
8.3.7.6	Short-circuit at 1,1 times the take-over current		
	Test sequences ”O”		
	Fuses shall be fitted		N/A
	For circuit-breaker fitted with adjustable releases, test shall be made with the current and time settings at maximum.		
	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.		N/A
	Test made in free air:		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Distances of the metallic screen's: (all sides)		N/A
	The characteristics of the metallic screen:		
	- woven wire mesh		N/A
	- perforated metal		N/A
	- expanded metal		N/A
	- ratio hole area/total area: 0,45-0,65		N/A
	- size of hole: <30mm^2		N/A
	- finish: bare or conductive plating		N/A
	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		N/A
	Circuit is earthed at: (load-star- or supply-star point)		N/A
	Conductor cross-sectional area (mm²) :		N/A
	If terminals unmarked: line connected at: (underside/upside)		N/A
	Tightening torques: (Nm)		N/A
	1.1 time the value of prospective current equal to the selectivity limit current, as declared by the manufacturer. (kA)		
	- test voltage U/Ue = 1,05 (V) ..... L1: ..... L2: L3:		N/A
	- r.m.s. test current AC/DC: (A) ..... L1: ..... L2: L3:		N/A
	power factor/time constant :		N/A
	- factor "n"		N/A
	- peak test current (Amax) :		N/A
	Test sequence "O"		
	- max. let-through current: (kApeak) ..... L1: ..... L2: L3:		N/A
	- Joule integral I²dt (A²s) ..... L1: ..... L2: L3:		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	- at least two of the fuses shall have blown ..... L1: ..... L2: L3:		N/A
8.3.7.7	Short-circuit at rated ultimate short-circuit breaking capacity		
	Type designation or serial number		
	Sample no:		
	Rated current: In (A)		
	Rated operational voltage: Ue (V)		
	Rated ultimate short-circuit breaking capacity. (kA)		
	Type of integrated fuses (all details)		
	Rated control supply voltage of closing mechanism: Uc (V)		
	Rated control supply voltage of shunt release: Uc (V)		
	Test sequences: O – t – CO		
	Fuses shall be fitted		N/A
	For circuit-breaker fitted with adjustable releases, test shall be made with the current and time settings at maximum.		
	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.		N/A
	Test made in free air:		N/A
	Distances of the metallic screen's: (all sides)		N/A
	The characteristics of the metallic screen:		
	- woven wire mesh		N/A
	- perforated metal		N/A
	- expanded metal		N/A
	- ratio hole area/total area: 0,45-0,65		N/A
	- size of hole: <30mm^2		N/A
	- finish: bare or conductive plating		N/A
	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		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Circuit is earthed at: (load-star- or supply-star point)		N/A
	Conductor cross-sectional area (mm²) :		N/A
	If terminals unmarked: line connected at: (underside/upside)		N/A
	Tightening torques: (Nm)		N/A
	- test voltage U/Ue = 1,05 (V) ..... L1: ..... L2: L3:		N/A
	- r.m.s. test current AC/DC: (A) ..... L1: ..... L2: L3:		N/A
	power factor/time constant :		N/A
	- factor ”n”		N/A
	- peak test current (A) :		N/A
	Test sequence ”O”		
	- max. let-through current: (kApeak) ..... L1: ..... L2: L3:		N/A
	- Joule integral I²dt (A²s) ..... L1: ..... L2: L3:		N/A
	Pause: t (s)		N/A
	new fitted fuses		N/A
	Test sequence ”CO”		
	- max. let-through current: (kApeak) ..... L1: ..... L2: L3:		N/A
	- Joule integral I²dt (A²s) ..... L1: ..... L2: L3:		N/A
8.3.7.8	Verification of dielectric withstand		
	- equal twice time rated operational voltage with a minimum of 1000 V (new fuses fitted)		N/A
	- no breakdown or flashover		N/A
	- the leaking current for circuit-breaker suitable for isolation: (< 6mA / 1,1 Ue)		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
8.3.7.9	Verification of overload releases		
	The operation of overload releases shall be verified at 2.5 times the value of their current setting on each pole separately.		
	The operating time shall not exceed the max. value stated by the manufacturer for twice the current setting at the reference temperature, on a pole singly.		
	Time specified by the manufacturer:		
	- Operation time: (s) ..... L1: ..... L2: ..... L3: ..... N :		N/A
8.3.8	**TEST SEQUENCE VI: Combined test sequence**		
	At the discretion of, or in agreement with the manufacturer, this sequence may be applied to circuit-breaker of utilization cat. B:		
	Type designation or serial number	HDM3E-1600M	-
	Sample no:	VI-1	-
	Rated current: In (A)	1600A	-
	Rated operational voltage: Ue (V)	690V	-
	Rated short-time withstand current: (kA/s)	35 kA/s	-
	Rated frequency: (Hz)	50Hz	-
8.3.8.2	Verification of overload releases		
	The operation of overload releases shall be verified twice 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: 2In at 50°C		
	- Operation time: (s) ..... L1: ..... L2: ..... L3: ..... N :	273 270 271	P
8.3.8.3	Test of rated short-time withstand current.		
	For this test, any over-current release, including the instantaneous override, if any, likely to operate during the test, shall be rendered inoperative.		
	- test frequency: (Hz)	50Hz	-
	- duration of the test: (s)	0,53s	-
	- test frequency: (Hz)	50Hz	-
	- power factor / ~~time constant~~ (ms):	0,25	-

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Clause	Requirement + Test	Result - Remark	Verdict
	- factor ”n”	2,1	-
	- test voltage: (V) ..... L1: ..... L2: L3:	704 705 702	-
	- r.m.s. test current: (kA) ..... L1: ..... L2: L3:	 35,9 36,1 35,5	-
	- highest peak current: (kA)	74,3	-
8.3.8.4	Test of rated service short-circuit breaking capacity		
	At the highest voltage applicable to the rated short-time current.		
	Test sequence of operation: O – t – CO – t – CO		
	Type designation or serial number	HDM3E-1600M	
	Sample no:	VI-1	
	Rated current: In (A)	1600A	
	Rated operational voltage: Ue (V)	690V	
	Rated service short-circuit breaking capacity: (kA)	35kA	
	Rated control supply voltage of closing mechanism: Uc (V)	-	
	Rated control supply voltage of shunt release: Uc (V)	-	
	For circuit-breaker fitted with adjustable releases, test shall be made with the current and time settings at maximum.		
	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: 0mm back: 0mm Left: 25mm; right: 25mm Top: 0mm; bottom: 0mm	P
	The characteristics of the metallic screen:		
	- woven wire mesh		N/A
	- perforated metal		P
	- expanded metal		N/A
	- ratio hole area/total area: 0,45-0,65	0,5	P
	- size of hole: <30mm^2	25	P

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Clause	Requirement + Test	Result - Remark	Verdict
	- finish: bare or conductive plating	Bare	P
	Test made in specified individual enclosure: Details of these tests, including the dimensions of the enclosure:		N/A
	Fuse ”F”: copper wire: diameter 0,8 mm, 50 mm long		P
	Circuit is earthed at: (load-star- or supply-star point)	supply-star point)	P
	Conductor cross-sectional area (mm²) :	2x100x5	P
	If terminals unmarked: line connected at: (underside/upside)		P
	Tightening torques: (Nm)	10	P
	Test sequence of operation: O – t – CO – t – CO		P
	The highest voltage applicable to the rated short-time current.		-
	- test voltage U/Ue = 1,05 (V) ..... L1: ..... L2: L3:	725 725 725	P
	- r.m.s. test current AC~~/DC~~: (A) ..... L1: ..... L2: L3:	 35,0kA 35,0kA 35,0kA	P
	power factor/~~time constant~~ :	0,22	-
	- Factor ”n”	2,1	-
	- peak test current (A) :	74,1 kA	-
	Test sequence ”O”		
	- max. let-through current: (kApeak ..... L1: ..... L2: L3:	53,3 69,1 73,9	P
	- Joule integral I²dt (MA²s) ..... L1: ..... L2: L3:	505 498 528	P
	Pause, t: (min)	3	P
	Test sequence ”CO”		
	- max. let-through current: (kApeak) ..... L1: ..... L2: L3:	70,2 54,3 73,5	P
	- Joule integral I²dt (MA²s) ..... L1: ..... L2: L3:	504 511 525	P

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Clause	Requirement + Test	Result - Remark	Verdict
	Pause, t: (min)	3	P
	Test sequence "CO"		
	- max. let-through current: (kApeak) ..... L1: ..... L2: L3:	70,1 54,0 73,8	P
	- Joule integral I^2dt (MA^2s) ..... L1: ..... L2: L3:	518 507 521	P
	The circuit-breaker shall remain closed for the short-time corresponding to the max. available time setting of the short-time delay short-circuit release.		P
	During this test the instantaneous override shall not operate		P
	- and the making current release shall operate		N/A
8.3.8.5	Operational performance capability with current.		
	Rated current: In (A)	1600A	-
	Maximum rated operational voltage: Ue (V)	690V	-
	Conductor cross-sectional area (mm^2) :	2x100x5	-
	Number of operating cycles per hour	20 cycles per hour	-
	Number (5% of the number given in column 4, tab. 8) of cycles with current (total) (closing mechanism energized at the rated Uc)	25 cycles	-
	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:		P
	- test voltage U/Ue = 1,0 (V) ..... L1: ..... L2: L3:	690 690 690	P
	- test current I/Ie = 1,0 (A) ..... L1: ..... L2: L3:	1600 1600 1600	P
	- power factor/~~time constant:~~	0,8	P
	- frequency: (Hz)	50	P
	- on-time (ms):	100	P
	- off-time (s):	30	P

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Clause	Requirement + Test	Result - Remark	Verdict
8.3.8.6	Verification of dielectric withstand		P
	- equal to twice the rated operational voltage with a minimum of 1000 V	1380V	
	- no breakdown or flashover		P
	- the leaking current for circuit-breaker suitable for isolation: (<2mA / 1,1 Ue)	759V	P
8.3.8.7	Verification of temperature-rise		
	- the values of temperature-rise do not exceed the those specified in tab. 7.		P
	Temperature rise of main circuit terminals. ≤ 80 K (K) :	Table 7 about VI-1	P
	conductor cross-sectional area (mm²) :	2X100X5	P
	test current Ie (A) :	1600	P
8.3.8.8	Verification of overload releases		
	Test current: 1,45 times the value of their current setting at the reference temperature: (A)	1,45*1600=4100	P
	Conventional tripping time: <1h when In < 63A, <2h when In > 63 A	8min 31s	P
	The operation of overload releases shall be verified at 2,5 times the value of their current setting on each pole separately.		
	The operating time shall not exceed the max. value stated by the manufacturer for twice the current setting at the reference temperature, on a pole singly.		
	Time specified by the manufacturer:		
	- Operation time: (s) ..... L1: ..... L2: ..... L3: ..... N :	172 171 172	P
8.3.9	**Critical d.c. load current test**		
	This test applies only to circuit-breakers with d.c. ratings.		
	The test shall be made at the maximum operational d.c. voltage (Ue max) assigned by the manufacturer to the circuit-breaker.		N/A
	Ue max :		N/A
	For circuit-breakers fitted with adjustable releases, the test shall be made with the releases set at the maximum.		N/A
	Direction of current flow as specified by manufacturer		
	Direction of current flow as specified by manufacturer as indicated by the polarity and line/load marking:		N/A
	The circuit-breaker is closed and opened 5 times:		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Direction of current flow is not specified by manufacturer		
	5 operations in the forward direction and 5 in the reverse direction		N/A
	During each CO cycle, the circuit-breaker shall remain closed for a time sufficient to ensure that the full current is established, but not exceeding 2 s.		N/A
	Time constant operational performance		N/A
	Number of operating cycles per hour		N/A
	Arcing time during the test (shall not exceed 1 s)		N/A
	Test currents to find critical d.c. load current		
	The test current values shall be: 4 A, 8 A, 16 A, 32 A and 63 A d.c., with ± 10 % tolerance, but not exceeding the rated current		N/A
	the critical value is determined by taking the maximum mean arcing time, for each direction of current if applicable		N/A
	The highest and lowest values of test current shall demonstrate shorter mean arcing times than the critical value		N/A
	the range of test currents (upwards or downwards) to find the critical value		N/A
	No critical value of current is found		N/A
	Forward direction		
	Critical value		N/A
	Maximum mean arcing time		N/A
	Reversed direction		
	Critical value :		N/A
	Maximum mean arcing time		N/A
	Operational performance verification of 50 operations with critical current.		
	Conductor cross-sectional area (mm²)..... :		N/A
	Direction of critical current flow :		N/A
	Conditions operational performance		
	- test voltage U/Ue = 1,0 (V) ..... :		N/A
	- critical test current (A)..... :		N/A
	- time constant ..... :		N/A
	- on-time (ms) ..... :		N/A
	- off-time (s) ..... :		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
8.3.3.6	Verification of dielectric withstand		
	- equal to twice the rated operational voltage with a minimum of 1415 Vdc for 5 seconds		N/A
	- no breakdown or flashover		N/A
	For circuit-breaker suitable for isolation, the leakage current shall be measured through each pole with the contacts in the open position, at a test voltage of 1,1 Ue, and shall not exceed 2 mA.		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
Annex B	Circuit-breakers incorporating residual current protection		
B.3	Classification		
B.3.1	Classification according to the method of operation of the residual current function		
B.3.1.1	CBR functionally independent of line voltage		
B.3.1.2	CBR functionally dependent on line voltage		
B.3.1.2.1	Opening automatically in the case of failure of the line voltage with or without delay.		
B.3.1.2.2	Not opening automatically in the case of failure of line voltage.		
B.3.2	Classification according to the possibility of adjusting the residual operating current		
B.3.2.1	CBR with single rated residual operating current		
B.3.2.2	CBR with multiple settings of residual operating current	Fixed steps/continuous	
B.3.3	Classification according to time-delay of the residual current function		
B.3.3.1	CBR without time-delay: non-time-delayed type		
B.3.3.2	CBR with time-delay: time-delayed type		
B.3.3.2.1	CBR with non-adjustable time-delay		
B.3.3.2.2	CBR with adjustable time-delay	Fixed steps/continuous	
B.3.4	Classification according to behaviour in presence of a d.c. component		
B.4	Characteristics of CBRs concerning their residual current function		
B.4.1.1	Rated residual operating current ($I\Delta_n$)		
B.4.1.2	Rated residual non-operating current ($I\Delta_{no}$)		
B.4.1.3	Rated residual short-circuit making and breaking capacity ($I\Delta_m$)		
B.4.2	Preferred and limiting values		
	Preferred values of the rated residual operating current ($I\Delta n$)		
	The minimum value of rated residual non-operating current is 0,5 $I\Delta n$.		
	Limiting value of the non-operating overcurrent in the case of a single-phase load in a multiphase circuit		
B.4.2.4	Operating characteristics		
	The value of the rated voltage of the voltage source of CBRs		

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Clause	Requirement + Test	Result - Remark	Verdict
	For a time-delay type, the limiting non-actuating time is defined at 2 $I\Delta n$ and shall be declared by the manufacturer.		N/A
	For CBR's having a limiting non-actuating time higher than 0,06 s, the manufacturer shall declare the maximum break time at $I\Delta n$, 2 $I\Delta n$, 5 $I\Delta n$, and 10 $I\Delta n$.		N/A
	In the case of a CBR having an inverse current/time characteristic, the manufacturer shall state the residual current/break time characteristic.		N/A
B.4.3	Value of the rated residual short-circuit making and breaking capacity ($I\Delta m$)		N/A
	The minimum value of $I\Delta m$ is 25 % of I_{cu}.		N/A
B.5.	Marking		N/A
	Data according B.5. section a) shall be marked on integral CBRs (see B.1.1), in addition to the marking specified in 5.2, and be clearly visible in the installed position		N/A
	Data according B.5. section b) shall be marked on r.c. units and be clearly visible in the installed Position		N/A
	Data according B.5. section c) shall be marked on r.c. units and be visible after assembly with the circuit-breaker:		N/A
	Data according B.5.section d) shall be marked on integral CBRs or r.c. units, as applicable, or made available in the manufacturer's literature:		N/A
	Data according section B.5. section e) shall be made available in the manufacturer’s literature:		N/A
B.8.	Tests		N/A
	This clause specifies tests for CBRs having a rated residual operating current $I\Delta n$ up to and including 30 A.		
	The applicability of the tests specified in this clause when $I\Delta n$ > 30 A is subject to agreement between manufacturer and user.		
	The instruments for the measurement of the residual current shall be at least class 0,5 (see IEC 60051) and shall show (or permit to determine) the true r.m.s. value.		N/A
	The instruments for the measurement of time shall have a relative error not greater than 10 % of the measured value.		N/A
B.8.1.1	Tests to be made during the test sequences of clause 8		N/A
B.8.1.1.1	Operational performance capability		

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Clause	Requirement + Test	Result - Remark	Verdict
	During the operating cycles with current a third of the breaking operations shall be performed by actuating the test device, and a further third by applying a residual current of value *I*Δn (or, if applicable, of the lowest setting of the residual operating current) to any one pole.		N/A
	In the case of a reset-CBR, it is not possible to reclose the CBR after tripping without the intentional resetting action. This verification shall take place at the beginning and at the end of the operational performance capability test with current		N/A
	No failure to trip shall be admitted.		N/A
			N/A
B.8.1.1.2	Verification of the withstand capability to short-circuit currents		
B.8.1.1.2.1	Rated service short-circuit breaking capacity (test sequence II)		
	Following the tests of 8.3.4, verification of the correct operation of the CBR in case of residual current shall be performed in accordance with B.8.2.4.2.		
B.8.2.4.2	Verification of operating in case of steady increase of the residual current (figure B.1)		
	Increase the residual current from 0,2 IΔn to IΔn in 30 sec. Required: value between IΔno and IΔn		N/A
	Min. setting IΔn.(mA): Interm. setting IΔn.(mA): Max. setting IΔn.(mA):		N/A
B.8.1.1.2.2	Rated ultimate short-circuit breaking capacity (test sequence III)		
	The correct operation of the overload releases of 8.3.5.2 and 8.3.5.5 by two-pole tests, on all possible combinations of phase poles in turn		N/A
	Following the tests of 8.3.5, verification of the correct operation of the CBR shall be performed in accordance with B.8.2.4.4.		N/A
B.8.2.4.4	Verification of operating in case of a sudden appearance of the residual current (figure B.1)		N/A
	A residual current is sudden appear on the CBR of IΔn Required : no value exceeds the specified limiting value of Table B1 (300 ms) or Table B2 (500 ms) and a non-actuating time of 60 ms		N/A
	Min. setting IΔn.(ms): Interm. setting IΔn.(ms): Max. setting IΔn.(ms):		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	A residual current is sudden appear on the CBR of 2 IΔn Required : no value exceeds the specified limiting value of Table B1 (150 ms) or Table B2 (200 ms) and a non-actuating time of 60 ms		N/A
	Min. setting IΔn.(ms): Interm. setting IΔn.(ms): Max. setting IΔn.(ms):		N/A
	A residual current is sudden appear on the CBR of ☐ 5 IΔn or ☐ 0,25 A Required : no value exceeds the specified limiting value of Table B1 (40ms) or Table B2 (150 ms) and a non-actuating time of 60 ms		N/A
	Min. setting IΔn.(ms): Interm. setting IΔn.(ms): Max. setting IΔn.(ms):		N/A
	A residual current is sudden appear on the CBR of ☐10 IΔn or ☐ 0,5 A Required : no value exceeds the specified limiting value of Table B1 (40 ms) or Table B2 (150 ms) and a non-actuating time of 60 ms		N/A
	Min. setting IΔn.(ms): Interm. setting IΔn.(ms): Max. setting IΔn.(ms):		N/A
B.8.1.1.2.3	Rated short-time withstand current (test sequence IV or test sequence VI (combined)		
	a) Behaviour during rated short-time withstand current test No tripping shall occur during the test of 8.3.6.3 or 8.3.8.3, as applicable.		N/A
	b) Verification of overload releases test sequence IV For the purpose of verifying the correct operation of the overload releases in accordance with 8.3.6.2 and 8.3.6.7, the single pole tests specified in 8.3.5.2 shall be replaced by two-pole tests, made on all possible combinations of phase poles in turn.		N/A
	b) Verification of overload releases for combined test sequence. For the purpose of verifying the correct operation of the overload releases in accordance with 8.3.8.2, the single pole test specified in 8.3.5.2 shall be replaced by two-pole tests made on all possible combinations of phase poles in turn.		N/A
	b) For the purpose of verifying the correct operation of overload releases in accordance with 8.3.8.6, the test specified in 8.3.8.7 shall be made using a three-phase supply.		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	c) Verification of the residual current tripping device Following the tests of 8.3.6 or 8.3.8, as applicable, verification of the residual current tripping device shall be performed in accordance with B.8.2.4.4.		N/A
B.8.2.4.4	Verification of operating in case of a sudden appearance of the residual current (figure B.1)		N/A
	A residual current is sudden appear on the CBR of IΔn Required : no value exceeds the specified limiting value of Table B1 (300 ms) or Table B2 (500 ms) and a non-actuating time of 60 ms		N/A
	Min. setting IΔn.(ms): Interm. setting IΔn.(ms): Max. setting IΔn.(ms):		N/A
	A residual current is sudden appear on the CBR of 2 IΔn Required : no value exceeds the specified limiting value of Table B1 (150 ms) or Table B2 (200 ms) and a non-actuating time of 60 ms		N/A
	Min. setting IΔn.(ms): Interm. setting IΔn.(ms): Max. setting IΔn.(ms):		N/A
	A residual current is sudden appear on the CBR of ☐ 5 IΔn or ☐ 0,25 A Required : no value exceeds the specified limiting value of Table B1 (40ms) or Table B2 (150 ms) and a non-actuating time of 60 ms		N/A
	Min. setting IΔn.(ms): Interm. setting IΔn.(ms): Max. setting IΔn.(ms):		N/A
	A residual current is sudden appear on the CBR of ☐10 IΔn or ☐ 0,5 A Required : no value exceeds the specified limiting value of Table B1 (40 ms) or Table B2 (150 ms) and a non-actuating time of 60 ms		N/A
	Min. setting IΔn.(ms): Interm. setting IΔn.(ms): Max. setting IΔn.(ms):		N/A
B.8.1.1.2.4	Integrally fused circuit-breakers (test sequence V)		

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Clause	Requirement + Test	Result - Remark	Verdict
	For the purpose of verifying the correct operation of the overload releases, the single-pole tests specified in 8.3.7.5 and 8.3.7.9 shall be replaced by two-pole tests, on all possible combinations of phase poles in turn, the test conditions being as specified in 8.3.7.5 and 8.3.7.9 but applicable to two poles.		N/A
	Following the tests of 8.3.8, verification of the correct operation of the CBR shall be performed in accordance with B.8.2.4.4.		N/A
B.8.2.4.4	Verification of operating in case of a sudden appearance of the residual current (figure B.1)		N/A
	A residual current is sudden appear on the CBR of IΔn Required : no value exceeds the specified limiting value of Table B1 (300 ms) or Table B2 (500 ms) and a non-actuating time of 60 ms		N/A
	Min. setting IΔn.(ms): Interm. setting IΔn.(ms): Max. setting IΔn.(ms):		N/A
	A residual current is sudden appear on the CBR of 2 IΔn Required : no value exceeds the specified limiting value of Table B1 (150 ms) or Table B2 (200 ms) and a non-actuating time of 60 ms		N/A
	Min. setting IΔn.(ms): Interm. setting IΔn.(ms): Max. setting IΔn.(ms):		N/A
	A residual current is sudden appear on the CBR of ☐ 5 IΔn or ☐ 0,25 A Required : no value exceeds the specified limiting value of Table B1 (40ms) or Table B2 (150 ms) and a non-actuating time of 60 ms		N/A
	Min. setting IΔn.(ms): Interm. setting IΔn.(ms): Max. setting IΔn.(ms):		N/A
	A residual current is sudden appear on the CBR of ☐10 IΔn or ☐ 0,5 A Required : no value exceeds the specified limiting value of Table B1 (40 ms) or Table B2 (150 ms) and a non-actuating time of 60 ms		N/A
	Min. setting IΔn.(ms): Interm. setting IΔn.(ms): Max. setting IΔn.(ms):		N/A
B.8.1.1.2.5	Test sequence VI (combined)		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Following the tests of 8.3.8, verification of the correct operation of the CBR shall be performed in accordance with B.8.2.4.4.		N/A
B.8.2.4.4	Verification of operating in case of a sudden appearance of the residual current (figure B.1)		N/A
	A residual current is sudden appear on the CBR of IΔn Required : no value exceeds the specified limiting value of Table B1 (300 ms) or Table B2 (500 ms) and a non-actuating time of 60 ms		N/A
	Min. setting IΔn.(ms): Interm. setting IΔn.(ms): Max. setting IΔn.(ms):		N/A
	A residual current is sudden appear on the CBR of 2 IΔn Required : no value exceeds the specified limiting value of Table B1 (150 ms) or Table B2 (200 ms) and a non-actuating time of 60 ms		N/A
	Min. setting IΔn.(ms): Interm. setting IΔn.(ms): Max. setting IΔn.(ms):		N/A
	A residual current is sudden appear on the CBR of ☐ 5 IΔn or ☐ 0,25 A Required : no value exceeds the specified limiting value of Table B1 (40ms) or Table B2 (150 ms) and a non-actuating time of 60 ms		N/A
	Min. setting IΔn.(ms): Interm. setting IΔn.(ms): Max. setting IΔn.(ms):		N/A
	A residual current is sudden appear on the CBR of ☐10 IΔn or ☐ 0,5 A Required : no value exceeds the specified limiting value of Table B1 (40 ms) or Table B2 (150 ms) and a non-actuating time of 60 ms		N/A
	Min. setting IΔn.(ms): Interm. setting IΔn.(ms): Max. setting IΔn.(ms):		N/A
			N/A
B I	**Test sequence B I**		
			N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Tests shall be made at the following values of voltage applied to the relevant terminals: - 0,85 times the minimum rated voltage for the tests specified in B.8.2.4 and B.8.2.5.2; - 1,1 times the maximum rated voltage for the tests specified in B.8.2.5.3.		N/A
	CBRs with more than one rated frequency or a range of rated frequencies shall be tested in each case at the highest and lowest rated frequency. However, for CBRs rated at 50 Hz and 60 Hz, tests at 50 Hz or 60 Hz are considered to cover the requirements.		N/A
B.8.2.4	Off-load test at 20 °C ± 5 °C		N/A
B.8.2.4.2	Verification of operating in case of steady increase of the residual current (figure B.1)		N/A
	Increase the residual current from 0,2 IΔn to IΔn in 30 sec. Required: value between IΔno and IΔn		N/A
	Min. setting IΔn.(mA): Interm. setting IΔn.(mA): Max. setting IΔn.(mA):		N/A
B.8.2.4.3	Verification of operating in case of closing on residual current (figure B.1)		N/A
	The CBR is closes on IΔn or each specified setting Required : no value exceeds the specified limiting value of Table B1 (300 ms) or Table B2 (500 ms) and a non-actuating time of 60 ms		N/A
	Min. setting IΔn.(ms): Interm. setting IΔn.(ms): Max. setting IΔn.(ms):		N/A
B.8.2.4.4	Verification of operating in case of a sudden appearance of the residual current (figure B.1)		N/A
	A residual current is sudden appear on the CBR of IΔn Required : no value exceeds the specified limiting value of Table B1 (300 ms) or Table B2 (500 ms) and a non-actuating time of 60 ms		N/A
	Min. setting IΔn.(ms): Interm. setting IΔn.(ms): Max. setting IΔn.(ms):		N/A
	A residual current is sudden appear on the CBR of 2 IΔn Required : no value exceeds the specified limiting value of Table B1 (150 ms) or Table B2 (200 ms) and a non-actuating time of 60 ms		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Min. setting IΔn.(ms): Interm. setting IΔn.(ms): Max. setting IΔn.(ms):		N/A
	A residual current is sudden appear on the CBR of ☐ 5 IΔn or ☐ 0,25 A Required : no value exceeds the specified limiting value of Table B1 (40ms) or Table B2 (150 ms) and a non-actuating time of 60 ms		N/A
	Min. setting IΔn.(ms): Interm. setting IΔn.(ms): Max. setting IΔn.(ms):		N/A
	A residual current is sudden appear on the CBR of ☐10 IΔn or ☐ 0,5 A Required : no value exceeds the specified limiting value of Table B1 (40 ms) or Table B2 (150 ms) and a non-actuating time of 60 ms		N/A
	Min. setting IΔn.(ms): Interm. setting IΔn.(ms): Max. setting IΔn.(ms):		N/A
B.8.2.4.5	Verification of the limiting non-operating time of time delayed type CBRs		N/A
	A residual current is sudden appear on the CBR of 2 IΔn for a time declared by the manufacturer Required : The CBR shall not operate		N/A
	Min. setting IΔn. Min. setting time delay (ms): Min. setting IΔn. Max. setting time delay (ms):		N/A
B.8.2.5	Tests at the temperature limits		N/A
	General		
	Minimum temperature (°C)		
	Maximum temperature (°C)		N/A
B.8.2.5.2	Verification of operating in case of a sudden appearance of the residual current at –5°C or minimum temperature limit		N/A
	A residual current is sudden appear on the CBR of IΔn Required : no value exceeds the specified limiting value of Table B1 (300 ms) or Table B2 (500 ms) and a non-actuating time of 60 ms		N/A
	Min. setting IΔn.(ms): Interm. setting IΔn.(ms): Max. setting IΔn.(ms):		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	A residual current is sudden appear on the CBR of 2 IΔn Required : no value exceeds the specified limiting value of Table B1 (150 ms) or Table B2 (200 ms) and a non-actuating time of 60 ms		N/A
	Min. setting IΔn.(ms): Interm. setting IΔn.(ms): Max. setting IΔn.(ms):		N/A
	A residual current is sudden appear on the CBR of ☐ 5 IΔn or ☐ 0,25 A Required : no value exceeds the specified limiting value of Table B1: (40ms) or Table B2 (150 ms) and a non-actuating time of 60 ms		N/A
	Min. setting IΔn.(ms): Interm. setting IΔn.(ms): Max. setting IΔn.(ms):		N/A
	A residual current is sudden appear on the CBR of ☐10 IΔn or ☐ 0,5 A Required : no value exceeds the specified limiting value of Table B1 (40 ms) or Table B2 (150 ms) and a non-actuating time of 60 ms		N/A
	Min. setting IΔn.(ms): Interm. setting IΔn.(ms): Max. setting IΔn.(ms):		N/A
	Verification of the limiting non-operating time of time delayed type CBRs at –5°C or minimum temperature limit		N/A
	A residual current is sudden appear on the CBR of 2 IΔn for a time declared by the manufacturer Required : The CBR shall not operate		N/A
	Min. setting IΔn. Min. setting time delay (ms): Min. setting IΔn. Max. setting time delay (ms):		N/A
B.8.3.5.3	Verification of operating in case of a sudden appearance of the residual current at +40°C		N/A
	A residual current is sudden appear on the CBR of IΔn Required : no value exceeds the specified limiting value of Table B1 (300 ms) or Table B2 (500 ms) and a non-actuating time of 60 ms		N/A
	Min. setting IΔn.(ms): Interm. setting IΔn.(ms): Max. setting IΔn.(ms):		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	A residual current is sudden appear on the CBR of 2 IΔn Required : no value exceeds the specified limiting value of Table B1 (150 ms) or Table B2 (200 ms) and a non-actuating time of 60 ms		N/A
	Min. setting IΔn.(ms): Interm. setting IΔn.(ms): Max. setting IΔn.(ms):		N/A
	A residual current is sudden appear on the CBR of ☐ 5 IΔn or ☐ 0,25 A Required : no value exceeds the specified limiting value of Table B1 (40ms) or Table B2 (150 ms) and a non-actuating time of 60 ms		N/A
	Min. setting IΔn.(ms): Interm. setting IΔn.(ms): Max. setting IΔn.(ms):		N/A
	A residual current is sudden appear on the CBR of ☐10 IΔn or ☐ 0,5 A Required : no value exceeds the specified limiting value of Table B1 (40 ms) or Table B2 (150 ms) and a non-actuating time of 60 ms		N/A
	Min. setting IΔn.(ms): Interm. setting IΔn.(ms): Max. setting IΔn.(ms):		N/A
	A residual current is sudden appear on the CBR of 2 IΔn for a time declared by the manufacturer Required : The CBR shall not operate		N/A
	Min. setting IΔn. Min. setting time delay (ms): Min. setting IΔn. Max. setting time delay (ms):		N/A
B.8.3	Verification of dielectric properties		N/A
B.8.3.3.3	Verification of rated impulse withstand voltage		N/A
	rated impulse withstand voltage		
	test impulse voltage (see table 12 part 1)		
	test impulse voltage for isolating (see table 14 part 1)		
B.8.4	Verification of the operation of the test device at the limits of the rated voltage		N/A
	For CBRs having an adjustable time-delay the test is made at the maximum setting of time-delay:	_____ s	
B.8.4.a	Setting IΔn or minimum setting of IΔn	_____ A	
	Test voltage (1,1 x Ue max)	_____ V	

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Clause	Requirement + Test	Result - Remark	Verdict
	Number of operations	25	
	Interval time	5 s	
	Tripping	☐ Yes / ☐ No	N/A
B.8.4.b	Setting IΔn or maximum setting of IΔn	_____ A	
	Test voltage (0,85 x Ue min)	_____ V	
	Number of operations	3	
	Interval time	5 s	
	Tripping	☐ Yes / ☐ No	N/A
B.8.4.c	Setting IΔn or minimum setting of IΔn	_____ A	
	Test voltage (1,1 x Ue max)	_____ V	
	Number of operations	1	
	Operating means of the test device held in close position	5 s	
	Tripping	☐ Yes / ☐ No	N/A
B.8.5	Verification of the limiting value of non-operating current under overcurrent conditions, in case of a single phase load.		N/A
	Setting IΔn or minimum setting of IΔn if adjustable	_____ A	
	Test current equal to the lower value of: ☐ 6 x In or ☐ 80 % of the maximum short-circuit release current setting	_____ A	
	Test voltage: ☐ rated voltage or ☐ any convenient voltage	_____ V	
	Test frequency	_____ Hz	
	Power factor (0,5)	_____	
	Current flow time	2 s	
	Interval time	60 s	
	Calibration plot number	_____	
	No tripping / change of state		N/A
B.8.6	Resistance against unwanted tripping due to surge currents resulting from impulse voltages		N/A
B.8.6.2	Verification of the resistance to unwanted tripping in case of loading of the network capacitance		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Current surge test for CBR (0,5 µs / 100kHz ring wave test)		
	One pole of the CBR is submitted to 10 applications of a surge current according to the following requirements:		
	- peak value: 200 A + 10/0%		
	- virtual front time: 0,5 µs ± 30%		
	- period of the following oscillatory wave: 10 µs ± 20%		
	- each successive peak: about 60% of the preceding peak		
	The polarity shall be inverted after every two applications		
	The interval between two consecutive applications shall be about 30 s		
	During the test the CBR shall not trip:	-	N/A
B.8.6.3	Verification of the resistance to unwanted tripping in case of flashover without follow-on current.		N/A
	Verification of behaviour at surge current up to 250 A (8/20 µs surge current test)		N/A
	One pole of the CBR is submitted to 10 applications of a surge current according to the following requirements:		
	- peak value: 250 A + 10/0%		
	- virtual front time: 8 µs ± 20%		
	- virtual time to half value: 20 µs ± 20%		
	- peak of reverse current:: less than 30% of peak value		
	The polarity shall be inverted after every two applications		
	The interval between two consecutive applications shall be about 30 s		
	During the test the CBR shall not trip:		N/A
B.8.7	Verification of the behaviour in case of an earth fault current comprising a d.c. component.		N/A
	Type A CBR		N/A
	For CBRs the operation of which depends on a voltage source the test are made at 1,1 and 0,85 times the rated voltage of the voltage source (Us).		
B.8.7.2.1	Verification of operation in case of a continuous rise of a residual pulsating direct current		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Rated voltage	_____ V	
	- steady increase from zero to: 1,4 IΔn for IΔn > 0,015 A with 1,4 IΔn/30 A/s (mA)	_____ mA	
	- steady increase from zero to: 2 IΔn for IΔn ≤ 0,015 A with 2 IΔn/30 A/s (mA)	_____ mA	
	- angle = 0 (+/-) :		
	- angle = 90 (+/-) :		
	- angle = 135 (+/-) :		
	No value exceeds the relevant specified limiting values		N/A
B.8.7.2.2	Verification of operation in case of a suddenly appearing residual pulsating direct current		N/A
	Verification of the correct operation in case of suddenly appearing residual pulsating direct currents by closing S2 (angle = 0°)		N/A
	Rated voltage	_____ V	
	RCCB's with IΔn > 0,015 A:		
	- maximum break time (ms) at: 1,4 IΔn (+/-) :		
	- maximum break time (ms) at: 2,8 IΔn (+/-) :		
	- maximum break time (ms) at: 7 IΔn (+/-) :		
	- maximum break time (ms) at: 14 IΔn (+/-) :		
	No value exceeds the relevant specified limiting value		N/A
	RCCB's with IΔn ≤ 0,015 A:		N/A
	- maximum break time (ms) at: 2 IΔn (+/-) :		
	- maximum break time (ms) at: 4 IΔn (+/-) :		
	- maximum break time (ms) at: 10IΔn (+/-) :		
	- maximum break time (ms) at: 20 IΔn (+/-) :		
	No value exceeds the relevant specified limiting value		N/A
B.8.7.2.3	Verification of operation with load at reference temperature		N/A
	Rated voltage	_____ **V**	
	- steady increase from zero to: 1,4 IΔn for IΔn > 0,015 A with 1,4 IΔn/30 A/s (mA)	_____ **mA**	
	- steady increase from zero to: 2 IΔn for IΔn ≤ 0,015 A with 2 IΔn/30 A/s (mA)	_____ **mA**	
	- angle = 0 (+/-) :		

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Clause	Requirement + Test	Result - Remark	Verdict
	- angle = 90 (+/-) :		
	- angle = 135 (+/-) :		
	No value exceeds the relevant specified limiting values		N/A
B.8.7.2.2	Verification of operation in case of a suddenly appearing residual pulsating direct current		N/A
	Verification of the correct operation in case of suddenly appearing residual pulsating direct currents by closing S2 (angle = 0°)		N/A
	Rated voltage	_____ V	
	RCCB's with IΔn > 0,015 A:		
	- maximum break time (ms) at: 1,4 IΔn (+/-) :		
	- maximum break time (ms) at: 2,8 IΔn (+/-) :		
	- maximum break time (ms) at: 7 IΔn (+/-) :		
	- maximum break time (ms) at: 14 IΔn (+/-) :		
	No value exceeds the relevant specified limiting value		N/A
	RCCB's with IΔn ≤ 0,015 A:		N/A
	- maximum break time (ms) at: 2 IΔn (+/-) :		
	- maximum break time (ms) at: 4 IΔn (+/-) :		
	- maximum break time (ms) at: 10IΔn (+/-) :		
	- maximum break time (ms) at: 20 IΔn (+/-) :		
	No value exceeds the relevant specified limiting value		N/A
B.8.7.2.4	Verification of operation of a residual pulsating direct current superimposed by a smooth direct current of 6 mA.		N/A
	Rated voltage	_____ V	
	- steady increase from zero to: 1,4 IΔn for IΔn > 0,015 A with 1,4 IΔn/30 A/s (mA) + 6 mA	_____ mA	
	-steady increase from zero to: 2 IΔn for IΔn ≤ 0,015 A with 2 IΔn/30 A/s (mA) + 6 mA	_____ mA	
	- angle = 0 (+/-) :		
	No value exceeds the relevant specified limiting values		N/A
B.8.8	Verification of the behaviour of CBRs functionally dependent on line voltage classified under B.3.1.2.1		N/A
	For CBRs having an adjustable residual operating current, the test is made at the lowest setting.		

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Clause	Requirement + Test	Result - Remark	Verdict
	For CBRs with an adjustable time-delay, the test is made at any one of the time-delay settings.		
B.8.8.2	Determination of the limiting value of the line voltage		N/A
	A voltage equal to the rated voltage is applied to the line terminals of the CBR and is then progressively lowered to zero over a time period corresponding to the longer of the two values given hereinafter until automatic opening occurs: – about 30 s; – a period long enough with respect to the delayed opening of the CBR, if any (see B.7.2.11).		
	Three measurements are made. All the values shall be less than 0,85 times the minimum rated voltage of the CBR.		N/A
	A residual current is sudden appear on the CBR of IΔn (_____ mA) at a value just above highest measured value Required : no value exceeds the specified limiting value of Table B1: 300 ms		N/A
	For any value of voltage less than the lowest value measured, it is not be possible to close the CBR by manual operating means.		N/A
B.8.8.3	Verification of the automatic opening in the case of failure of the line voltage		N/A
	The CBR being closed, a voltage equal to its rated voltage, or, in the case of a range of rated voltages, any one of the rated voltages is applied to its line terminals. The voltage is then switched off. The CBR shall trip. The time interval between the switching off and the opening of the main contacts is measured.		N/A
	for CBRs opening without delay no value shall exceed 0,2 s;		N/A
	for CBRs opening with delay the maximum and minimum values shall be situated within the range indicated by the manufacturer.		N/A
			N/A
B.8.9	Verification of the behaviour of CBRs functionally dependent on line voltage in the case of failure of line voltage		N/A
	For CBRs having an adjustable residual operating current, the test is made at the lowest setting. For CBRs having an adjustable time-delay the test is made at any one of the time-delay settings.		N/A
B.8.9.2	Case of loss of one phase in a 3-phase system (for 3-pole and 4-pole CBRs)		N/A
	The CBR is connected according to figure B.3 and is supplied on the line side at 0,85 times the rated voltage, or, in the case of a range of rated voltages, at 0,85 times the lowest value of rated voltage.		N/A
	Verification with one phase is switched off		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
B.8.2.4.4	Verification of operating in case of a sudden appearance of the residual current		N/A
	A residual current is sudden appear on the CBR of IΔn Required: no value exceeds the specified limiting value of Table B1: (300 ms) or Table B2 (500 ms) and a non-actuating time of 60 ms		N/A
	Min. setting IΔn.(ms): Interm. setting IΔn.(ms): Max. setting IΔn.(ms):		N/A
	A residual current is sudden appear on the CBR of 2 IΔn Required : no value exceeds the specified limiting value of Table B1 (150 ms) or Table B2 (200 ms) and a non-actuating time of 60 ms		N/A
	Min. setting IΔn.(ms): Interm. setting IΔn.(ms): Max. setting IΔn.(ms):		N/A
	A residual current is sudden appear on the CBR of ☐ 5 IΔn or ☐ 0,25 A Required : no value exceeds the specified limiting value of Table B1 (40ms) or Table B2 (150 ms) and a non-actuating time of 60 ms		N/A
	Min. setting IΔn.(ms): Interm. setting IΔn.(ms): Max. setting IΔn.(ms):		N/A
	A residual current is sudden appear on the CBR of ☐10 IΔn or ☐ 0,5 A Required : no value exceeds the specified limiting value of Table B1 (40 ms) or Table B2 (150 ms) and a non-actuating time of 60 ms		N/A
	Min. setting IΔn.(ms): Interm. setting IΔn.(ms): Max. setting IΔn.(ms):		N/A
			N/A
	Verification with other phase switched off		N/A
B.8.2.4.4	Verification of operating in case of a sudden appearance of the residual current (figure B.1)		N/A
	A residual current is sudden appear on the CBR of IΔn Required : no value exceeds the specified limiting value of Table B1 (300 ms) or Table B2 (500 ms) and a non-actuating time of 60 ms		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Min. setting IΔn.(ms): Interm. setting IΔn.(ms): Max. setting IΔn.(ms):		N/A
	A residual current is sudden appear on the CBR of 2 IΔn Required : no value exceeds the specified limiting value of Table B1 (150 ms) or Table B2 (200 ms) and a non-actuating time of 60 ms		N/A
	Min. setting IΔn.(ms): Interm. setting IΔn.(ms): Max. setting IΔn.(ms):		N/A
	A residual current is sudden appear on the CBR of ☐ 5 IΔn or ☐ 0,25 A Required : no value exceeds the specified limiting value of Table B1 (40ms) or Table B2 (150 ms) and a non-actuating time of 60 ms		N/A
	Min. setting IΔn.(ms): Interm. setting IΔn.(ms): Max. setting IΔn.(ms):		N/A
	A residual current is sudden appear on the CBR of ☐10 IΔn or ☐ 0,5 A Required : no value exceeds the specified limiting value of Table B1 (40 ms) or Table B2 (150 ms) and a non-actuating time of 60 ms		N/A
	Min. setting IΔn.(ms): Interm. setting IΔn.(ms): Max. setting IΔn.(ms):		N/A
	Test is repeated with resistor connected to other two phases in turn.		N/A
B.8.9.3	Case of voltage drop due to an overcurrent resulting from a low impedance fault to earth		N/A
	The CBR is connected according to figure B.3 and is supplied on the line side with the rated voltage or, in the case of a range of rated voltages, with the lowest rated voltage.		
	The supply is switched off. The CBR shall not trip.		N/A
	With supply connected the voltage is reduced as follows: a) for CBRs for use with a three-phase supply: to 70 % of the lowest rated voltage;		

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Clause	Requirement + Test	Result - Remark	Verdict
	b) for CBRs for use with a single phase supply: to 85 V applied as follows: – for single-pole and two-pole CBRs: between poles; – for three-pole and four-pole CBRs, declared as suitable for use with a single-phase supply (see B.5 e)): between each combination of two poles, connected according to the manufacturer's specification.		
	A current of value $I\Delta n$ is then applied to a) and/or b), as applicable. The CBR shall trip.		N/A
			N/A
BII	Test sequence BII		
B.8.10	Verification of the residual short-circuit making and breaking capacity		
B.8.10.2	Where applicable, the CBR is adjusted at the lowest setting of residual operating current and at the maximum setting of time-delay.		
	If the CBR has more than one value of I_{cu}, each one having a corresponding value of $I\Delta_{m}$, the test is made at the maximum value of $I\Delta_{m}$, at the corresponding phase-to-neutral voltage.		
	maximum value of $I\Delta_{m}$		
	Type designation or serial number		
	Sample no:		
	Point of test circuit which is directly earthed:		
	Grid distance "a" (mm):		
	Fine wire diameter (mm):		
	Prospective current (A):		
	Prospective current obtained (A):		
	Power factor / ratio *n*:		
	Power factor / ratio *n* obtained:		
	Plot no.		
B.8.10.3	Test sequence: O-t-CO		
	I^2t (kA^2s); Ip (kA):	O operation: Ip :_____kA I^2t; _____kA^2s Plot no. _____	

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Clause	Requirement + Test	Result - Remark	Verdict
		CO operation: Ip :_____kA I^2t; _____kA^2s Plot no.: _____	
	If tested at separate testing station see report		
	During tests no endangering of operator, no permanent arcing, no flashover and no melting of fuse F		N/A
B.8.10.4	Conditions of the CBR after test		N/A
	After the tests no damage impairing further use		N/A
	Dielectric strength test of the main circuit at test voltage of 2 Un for 5 s:		N/A
	Test voltage		N/A
	Making and breaking its rated current at its maximum rated operational voltage.		N/A
B.8.10.4.2	The CBR shall be capable of performing satisfactorily the tests specified in B.8.2.4.3, but at a value of 1,25 IΔn and without measurement of break time. The test is made on any one pole, taken at random.		N/A
	If the CBR has an adjustable residual operating current, the test is made at the lowest setting, at a current of a value of 1,25 times that setting.		N/A
B.8.10.4.3	Where applicable the CBR shall also be submitted to the test of B.8.2.4.4.		N/A
B.8.2.4.5	Verification of the limiting non-operating time of time delayed type CBRs		N/A
	A residual current is sudden appear on the CBR of 2 IΔn for a time declared by the manufacturer Required : The CBR shall not operate		N/A
	Min. setting IΔn. Min. setting time delay (ms): Min. setting IΔn. Max. setting time delay (ms):		N/A
B.8.10.4.4	CBRs functionally dependent on line voltage shall also satisfy the tests of B.8.8 or B.8.9, as applicable.		N/A
			N/A
B III	**Test sequence B III**		
			N/A
B.8.11	Verification of the effects of environmental conditions		N/A
	The test is carried out according to IEC 60068-2-30.		

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Clause	Requirement + Test	Result - Remark	Verdict
	The upper temperature shall be 55 °C ± 2 °C (variant 1) and the number of cycles shall be – 6 for IΔn > 1 A – 28 for IΔn□≤□1 A		
	At the end of the cycles the CBR shall be capable of complying with the tests of B.8.2.4.3, but with a residual operating current of 1,25 IΔn and without measurement of break time. Only one verification need be made.		N/A
	Where applicable the CBR shall also comply with the test of B.8.2.4.4. Only one verification need be made.		N/A
B.8.2.4.4	Verification of the limiting non-operating time of time delayed type CBRs		N/A
	A residual current is sudden appear on the CBR of 2 IΔn for a time declared by the manufacturer Required : The CBR shall not operate		N/A
	Min. setting IΔn. Min. setting time delay (ms): Min. setting IΔn. Max. setting time delay (ms):		N/A
B.8.12	**Verification of electromagnetic compatibility (EMC)**		
	See report:		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
Annex C	**Individual pole short-circuit test sequence**		
	Circuit-breaker for use on phase-earthed systems		
C.2	Test of individual pole short-circuit breaking capacity		
	A short-circuit test is made with a value of prospective current (Isu) equal to 25% of the ultimate rated short-circuit breaking capacity (Icu)		
	Type designation or serial number		
	Sample no:		
	Rated current: In (A)		
	Rated operational voltage: Ue (V)		
	Rated ultimate short-circuit breaking capacity: (kA)		
	Rated control supply voltage of closing mechanism: Uc (V)		
	Rated control supply voltage of shunt release: Uc (V)		
	The test sequence of operations is O – t - CO		
	For circuit-breaker fitted with adjustable releases, test shall be made with the current and time settings at maximum.		N/A
	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.		N/A
	Test made in free air:		N/A
	Distances of the metallic screen's: (all sides)		N/A
	The characteristics of the metallic screen:		
	- woven wire mesh		N/A
	- perforated metal		N/A
	- expanded metal		N/A
	- ratio hole area/total area: 0,45-0,65		N/A
	- size of hole: <30mm^2		N/A
	- finish: bare or conductive plating		N/A
	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		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Circuit is earthed at: (load-star- or supply-star point)		N/A
	Conductor cross-sectional area (mm²):		N/A
	If terminals unmarked: line connected at: (underside/upside)		N/A
	Tightening torques: (Nm)		N/A
	Test sequence of operation: O – t – CO		N/A
	Test circuit according figure: 9		N/A
	- test voltage U/Ue = 1,05 (V) ..... L1: ..... L2: L3:		N/A
	short-circuit test current (Isu): equal to 25% of the ultimate rated short-circuit breaking capacity (Icu)		N/A
	- r.m.s. test current AC/DC: (A):		N/A
	power factor/~~time constant:~~		N/A
	- Factor ”n”		N/A
	- peak test current (Amax):		N/A
	Test sequence ”O” L1		
	- max. let-through current: (kApeak) L1:		N/A
	- Joule integral I²dt (A²s) L1:		N/A
	Pause, t: (min)		N/A
	Test sequence ”CO” L1		
	- max. let-through current: (kApeak) L1:		N/A
	- Joule integral I²dt (A²s) L1:		N/A
	Test sequence ”O” L2		
	- max. let-through current: (kApeak) L2:		N/A
	- Joule integral I²dt (A²s) L2:		N/A
	Pause, t: (min)		N/A
	Test sequence ”CO” L2		
	- max. let-through current: (kApeak) L2:		N/A
	- Joule integral I²dt (A²s) L2:		N/A
	Test sequence ”O” L3		
	- max. let-through current: (kApeak) L3:		N/A
	- Joule integral I²dt (A²s) L3:		N/A
	Pause, t: (min)		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Test sequence ”CO” L3		
	- max. let-through current: (kApeak) L3:		N/A
	- Joule integral I^2dt (A^2s) L3:		N/A
	Melting of the fusible element		N/A
	Damage to insulation on conductors		N/A
	Holes in the PE-sheet for test sequence ”O”		N/A
	Cracks observed		N/A
C.3	Verification of dielectric withstand		
	- equal to twice the rated operational voltage with a minimum of 1000 V		N/A
	- no breakdown or flashover		N/A
C.4	Verification of overload releases		
	The operation of overload releases shall be verified at 2.5 times the value of their current setting on each pole separately.		
	The operating time shall not exceed the max. value stated by the manufacturer for twice the current setting at the reference temperature, on a pole singly.		
	Time specified by the manufacturer:		
	- Operation time: (s) ..... L1: ..... L2: ..... L3: .....N:		N/A

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Clause	Requirement + Test	Result - Remark	Verdict

Annex F	**Additional tests for circuit-breakers with electronic over-current protection** 4P, 690V, 1600A, 1 sample		P
F4 and F5	Verification of electromagnetic compatibility (EMC)		
F4	Immunity tests		
F.4.1	Harmonic currents		
	Type designation or serial number	HDM3E-1600M	
	Sample no:	Annex F-1	
	Rated current: In (A)	1600	
	Rated operational voltage: Ue (V)	690	
	Rated control supply voltage of closing mechanism: Uc (V)	-	
	Rated control supply voltage of shunt release: Uc (V)	-	
	No tripping time (10×tripping time at 2×Ir) t1:	Ir=630A, tr=9s(@2Ir) t1=10tr=90s	-
	Tripping time t2=0,9×tmin at at 2×Ir:	0,9×9=8,1s	-
	Tripping time t3=1,1×tmax at at 2×Ir:	1,1×270=297s	-
	The tests shall be performed at the rated frequency(Hz)	50Hz	P
	Test of option b	b	P
	Test current 0,90×Ir (true r.m.s)	567A (I_r=630A)	P
	Amplitude of third harmonic>60%	76,32%	P
	Amplitude of fifth harmonic>14%	37,21%	P
	Amplitude of seventh harmonic>7%	7,81%	P
	Peak factor Ip/Irms ≥2,1	2,31	P
	Current conduction time, for each half-wave is ≤ 21% of the period	21%	P
	No tripping t≥t1	>58s	P
	Test current 2×Ir (true r.m.s)	1260A (I_r=630A)	P
	Amplitude of third harmonic>60%	76,32%	P
	Amplitude of fifth harmonic>14%	37,21%	P
	Amplitude of seventh harmonic>7%	7,81%	P
	Peak factor Ip/Irms ≥2,1	2,31	P

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Clause	Requirement + Test	Result - Remark	Verdict
	Current conduction time, for each half-wave is ≤ 21% of the period	21%	P
	Tripping t2≤t≤t3	8,91s	P
	Performance criterion A of F.2.1.2	A	P
F.4.2	Electrostatic discharges		
	Type designation or serial number	HDM3E-1600M	
	Sample no:	Annex F-1	
	Rated current: In (A)	1600	
	Rated operational voltage: Ue (V)	690	
	Rated control supply voltage of closing mechanism: Uc (V)	-	
	Rated control supply voltage of shunt release: Uc (V)	-	
	Discharge test voltage 8kV contact 8kV air	8kV contact 8kV air	P
	Polarity of discharges positive/negative	positive/negative	P
	Number of application points	20 points	P
	Performance criterion B of F.2.1.2	B	P
	Test current 0,90×Ir (true r.m.s)	567A (I_r=630A)	P
	No tripping		P
	After the test:		P
	Test current 2×Ir (true r.m.s)	1260A (I_r=630A)	P
	Tripping tr±10%	8,68s	P
F.4.3	Radiated radio-frequency electromagnetic fields		
	Type designation or serial number	CDM6i-1600M	
	Sample no:	Annex F-1	
	Test level	10V/m	
	For step 1, the frequency shall be swept over the ranges of 80MHz to 1000MHz and 1400MHz to 2000MHz, in accordance with Clause 8 of IEC 61000-4-3	80MHz to 1000MHz and 1400MHz to 2000MHz	P
	The dwell time of the amplitude modulated carrier for each frequency shall be between 500ms and 1000ms, and the step size shall be 1% of the precious frequency	800ms	P

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Clause	Requirement + Test	Result - Remark	Verdict
	For step 2, the test shall be performed at each of the following frequencies: 80; 100; 120; 180; 240; 320; 480; 640; 960; 1400 and 1920MHz, the operation being verified after the field at each frequency has stabilized.	0,15; 0,3; 0,45; 0,6; 0,9; 1,2; 1,8; 2,4; 3,6; 4,8; 7,2; 9,6; 12,0;19,2;27,0; 49,4; 72,0; 80 MHz	P
	Performance criterion A of F.2.1.2	A	P
	Test current 0,90×Ir (true r.m.s)	567A (I_r=630A)	P
	No tripping		P
	After the test:		P
	Test current 2×Ir (true r.m.s)	1260A (I_r=630A)	P
	Tripping t2≤t≤t3	Min. 8,68s; Max. 9,39s	P
F.4.4	Electrical fast transient/burst(EFT/B)		
	Type designation or serial number	HDM3E-1600M	
	Sample no:	Annex F-1	
	Test level of power port	4kV/4kHz	P
	Performance criterion A of F.2.1.2	A	P
	However, temporary changes to the monitoring functions during the tests are acceptable, in which case the correct functioning of the monitoring shall be verified after the tests		N/A
	Test current 0,90×Ir (true r.m.s)	567A (I_r=630A)	P
	No tripping		P
	After the test:		P
	Test current 2×Ir (true r.m.s)	1260A (I_r=630A)	P
	Tripping t2≤t≤t3	8,69s	P
F.4.5	Surges		
	Type designation or serial number	HDM3E-1600M	
	Sample no:	Annex F-1	
	Test level of power port	4kV line to earth 2kV line to line	P
	Pulses with both positive and negative polarity shall be applied, the phase angles being 0° to 90°		P
	A series of five pulses is applied for each polarity and each phase angel (total number of pulses: 20), the interval between two pulses being approximately 1min.		P

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Clause	Requirement + Test	Result - Remark	Verdict
	Performance criterion B of F.2.1.2	B	P
	Test current 0,90×Ir (true r.m.s)	567A (I_r=630A)	P
	No tripping		P
	After the test:		P
	Test current 2×Ir (true r.m.s)	1260A (I_r=630A)	P
	Tripping t2≤t≤t3	8,73s	P
F.4.6	Conducted disturbances induced by RF fields (common mode)		
	Type designation or serial number	HDM3E-1600M	
	Sample no:	Annex F-1	
	Test level of power port	10V	P
	For step 1, the frequency shall be swept over the ranges of 150kHz to 80MHz, in accordance with Clause 8 of IEC 61000-4-3	0,15MHz to 80MHz	P
	The dwell time of the amplitude modulated carrier for each frequency shall be between 500ms and 1000ms, and the step size shall be 1% of the precious frequency		P
	For step 2, the test shall be performed at each of the following frequencies: 0,150; 0,300; 0,450; 0,600; 0,900; 1,20; 1,80; 2,40; 3,60; 4,80; 7,20; 9,60; 12,0; 19,2; 27,0; 49,4; 72,0 and 80,0MHz, the operation being verified after the field at each frequency has stabilized.	0,150; 0,300; 0,450; 0,600; 0,900; 1,20; 1,80; 2,40; 3,60; 4,80; 7,20; 9,60; 12,0; 19,2; 27,0; 49,4; 72,0 and 80,0MHz	P
	Performance criterion A of F.2.1.2	A	P
	Test current 0,90×Ir (true r.m.s)	567A (I_r=630A)	P
	No tripping		P
	After the test:		P
	Test current 2×Ir (true r.m.s)	1260A (I_r=630A)	P
	Tripping t2≤t≤t3	Min. 8,82s; Max. 9,29s	P
F.4.7	Current dips		
	Type designation or serial number	HDM3E-1600M	
	Sample no:	Annex F-1	
	Rated current: In (A)	1600	
	Rated operational voltage: Ue (V)	690	

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Clause	Requirement + Test	Result - Remark	Verdict
	Rated control supply voltage of closing mechanism: Uc (V)	-	
	Rated control supply voltage of shunt release: Uc (V)	-	
	Maximum tripping time (at 2×Ir):	270s	-
	Test duration		-
	Test no. 1 with I_D =0 and Δt=0,5T		-
	No tripping (Yes/No)	No	P
	Test no. 2 with I_D =0 and Δt=1T		-
	No tripping (Yes/No)	No	P
	Test no. 3 with I_D =0 and Δt=5T		-
	No tripping (Yes/No)	No	P
	Test no. 4 with I_D =0 and Δt=25T		-
	No tripping (Yes/No)	No	P
	Test no. 5 with I_D =0 and Δt=50T		-
	No tripping (Yes/No)	No	P
	Test no. 6 with I_D =0,4Ir and Δt=10T		-
	No tripping (Yes/No)	No	P
	Test no. 7 with I_D =0,4Ir and Δt=25T		-
	No tripping (Yes/No)	No	P
	Test no. 8 with I_D =0,4Ir and Δt=50T		-
	No tripping (Yes/No)	No	P
	Test no. 9 with I_D =0,7Ir and Δt=10T		-
	No tripping (Yes/No)	No	P
	Test no. 10 with I_D =0,7Ir and Δt=25T		-
	No tripping (Yes/No)	No	P
	Test no. 11 with I_D =0,7Ir and Δt=50T		-
	No tripping (Yes/No)	No	P
F.5	Emission tests		
F.5.1	Harmonics		
	The electronic control circuits operate at very low power and hence create negligible disturbances; therefore no tests and required.		N/A
F.5.2	Voltage fluctuations		

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Clause	Requirement + Test	Result - Remark	Verdict
	The electronic control circuits operate at very low power and hence create negligible disturbances; therefore no tests and required.		N/A
F.5.3	Conducted RF disturbances (150kHz～30MHz)		
	Circuit-breakers covered by this annex are independent of line voltage or of any auxiliary supply and have no direct coupling to the supply; the electronic circuits operate at very low power. These circuit-breakers create negligible disturbances and therefore no tests are required.		N/A
F.5.4	Radiated RF disturbances (30MHz～1GHz)		
	Type designation or serial number	HDM3E-1600M	
	Sample no:	Annex F-1	
	CISPR 11/CISPR 22		P
F6	Suitability for multiple frequencies		N/A
	The tests shall be performed at each rated frequency or, when a range of rated frequencies is declared, at the lowest and the highest rated frequencies.		N/A
F.6.2	Tests shall be performed on any pair of phase-poles chosen at random at any convenient voltage. Under-voltage releases, if any, shall either be energized or disabled. All other auxiliaries shall be disconnected during the test.		N/A
	The short-time and instantaneous trip current settings shall each, if relevant, be adjusted to 2,5 times the current setting. If this setting is not available, the next closest higher setting shall be used.		
	A current of 0,95 times the conventional non-tripping current (see Table 6) is applied for a time equal to 10 times the tripping time which corresponds to 2,0 times the current setting.		
	Immediately following the test of a), a current of 1,05 times the conventional tripping current (see Table 6) is applied.		
	A further test starting from the cold state is made at 2,0 times the current setting.		
	For each test frequency, the overload tripping characteristics shall comply with the following requirements: – for test a) no tripping shall occur; – for test b) tripping shall occur within the conventional time (see Table 6); – for test c) tripping shall occur within 1,1 times the maximum and 0,9 times the minimum values of the manufacturer's stated time-current characteristic.		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
F.7.	Dry heat test		P
F.7.1	The test shall be performed on the circuit-breaker in accordance with 7.2.2 at the maximum rated current for a given frame size, on all phase poles, at an ambient temperature of 40 °C	In= 1600A	
	The duration of the test, once temperature equilibrium is reached, shall be 168 h		
	Tightening torques applied to the terminals shall be in accordance with the manufacturers' instructions. In absence of such instructions, table 4 of IEC 60947-1 shall apply	Torque= 10Nm	
	As an alternative, the test may be performed as follows:		
	- measure and record the highest temperature rise of the air surrounding the electronic components, during the temperature rise verification of test sequence 1	Ambient temperature during temperature rise test: 15 °C	
	- install the electronic controls in the chamber		
	- supply the electronic controls which there input energizing value		
	- adjust the temperature of the test chamber to a value of 40 K above the temperature rise recorded for the surrounding the electronic components and maintain this temperature for 168 h	Chamber temperature: 40°C	
	Test carried out…..…..:	☒ normal ☐ alternative	
F.7.2	Test results		P
	The circuit-breaker and the electronic controls shall meet the following requirements:		
	- no tripping of the circuit-breaker shall occur		P
	- no operating of the electronic controls which would cause the circuit-breaker to trip shall occur		P
F.7.3	Verification of the overload releases		P
	Following the test F.7.1, the operation of the overload releases of the circuit-breaker shall be verified in accordance with 7.2.1.2.4, item b).	I test: Ir=0,4*1600=630A; Ir=1*1600=1600A Ambient temperature: 15°C	P
7.2.1.2.4	Opening by over-current releases		P
b)	Opening under overload conditions		

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Clause	Requirement + Test	Result - Remark	Verdict
1)	Instantaneous or definite time-delay operation		N/A
	The release shall cause tripping of the circuit-breaker with an accuracy of + 10% of the tripping current value of the current setting for all values of current setting of the overload release		N/A
2)	Inverse timer-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	1,05*630=662A 1,05*1600=1680A >2h, no tripping	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	1,3*630=650A tripping time: 22,5s 1,3*1600=2080A tripping time: 10min41s	P
	If a release is declared by the manufacturer as substantially independent of ambient temperature, the current values of table 6 shall apply within the temperature band declared by the manufacturer, within a tolerance of 0,3%/K		N/A
	The width of the temperature band shall be at least 10 K on either side of the reference temperature		N/A
F.8.	Damp heat test		P
F.8.1	Test procedure		P
	The test shall be performed according to IEC 60068-2-30 (12 +12 hours cycle)		
	Test Db temperature cycle between 25°C and upper temperature		
	The upper temperature shall be 55°C ± 2 °C (variant 1) and number of cycles shall be six.		
	The relative humidity is maintained at a high level at the upper temperature		
	The test may be performed with only the electronic controls in the test chamber		
	Test result……:		P
F.8.2	Verification of the overload releases		P
	Following the test F.8.1, the operation of the overload releases of the circuit-breaker shall be verified in accordance with 7.2.1.2.4, item b).	I test: Ir=630A; Ir=1*1600=1600A Ambient temperature: 15°C	P
7.2.1.2.4	Opening by over-current releases		P

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Clause	Requirement + Test	Result - Remark	Verdict
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 + 10% of the tripping current value of the current setting for all values of current setting of the overload release		N/A
2)	Inverse timer-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	1,05*630=667A 1,05*1600=1680A >2h, no tripping	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	1,3*630=650A tripping time: 14,1s 1,3*1600=2080A tripping time: 10min41s	P
	If a release is declared by the manufacturer as substantially independent of ambient temperature, the current values of table 6 shall apply within the temperature band declared by the manufacturer, within a tolerance of 0,3%/K		N/A
	The width of the temperature band shall be at least 10 K on either side of the reference temperature		N/A
F.9.	Temperature variation cycles at a specified rate of change		P
F.9.1	Test conditions		P
	Each design of electronic controls shall be submitted to temperature variation cycles in according with figure F.15		
	The rise and fall of temperature during the rate of variation shall be 1 K/min ± 0,2 K/min.		
	Their temperature, once reached, shall be maintained for at least 2 h.		
	The number of cycles shall be 28.		
F.9.2	Test procedure		P
	The test shall be carried out according IEC 60068-2-14.		
	For the these test, the electronic controls may be mounted inside the circuit-breaker or separately.		
	The electronic controls shall be energized to simulate service conditions.		

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Clause	Requirement + Test	Result - Remark	Verdict
	Where the electronics controls are mounted inside the circuit-breaker, the main circuit shall not be energized.		
F.9.3	Test results		P
	The electronic controls shall meet the following requirement.		P
	No operation of the electronic controls which would cause the circuit-breaker to trip during the 28 cycles shall occur.		P
F.9.4	Verification of overload releases		P
	Following the test F.8.1, the operation of the overload releases of the circuit-breaker shall be verified in accordance with 7.2.1.2.4, item b).	I test: Ir=630A; Ir=1*1600=1600A Ambient temperature: 15°C	P
7.2.1.2.4	Opening by over-current releases		P
b)	Opening under overload conditions		P
1)	Instantaneous or definite time-delay operation		N/A
	The release shall cause tripping of the circuit-breaker with an accuracy of + 10% of the tripping current value of the current setting for all values of current setting of the overload release		N/A
2)	Inverse timer-delay operation		P
	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	1,05*630=662A 1,05*1600=1680A >2h, no tripping	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	1,3*630=650A tripping time: 23,2s 1,3*1600=2080A tripping time: 10min40s	P
	If a release is declared by the manufacturer as substantially independent of ambient temperature, the current values of table 6 shall apply within the temperature band declared by the manufacturer, within a tolerance of 0,3%/K		N/A
	The width of the temperature band shall be at least 10 K on either side of the reference temperature		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
Annex H	Individual pole short-circuit test sequence		
	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		
	Sample no:		
	Rated current: In (A)		
	Rated operational voltage: Ue (V)		
	Rated ultimate short-circuit breaking capacity: (kA)		
	Rated control supply voltage of closing mechanism: Uc (V)		
	Rated control supply voltage of shunt release: Uc (V)		
	The test sequence of operations is O – t - CO		
	For circuit-breaker fitted with adjustable releases, test shall be made with the current and time settings at maximum.		N/A
	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.		N/A
	Test made in free air:		N/A
	Distances of the metallic screen's: (all sides)		N/A
	The characteristics of the metallic screen:		
	- woven wire mesh		N/A
	- perforated metal		N/A
	- expanded metal		N/A
	- ratio hole area/total area: 0,45-0,65		N/A
	- size of hole: <30mm^2		N/A
	- finish: bare or conductive plating		N/A

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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		N/A
	Circuit is earthed at: (load-star- or supply-star point)		N/A
	Conductor cross-sectional area (mm^2):		N/A
	If terminals unmarked: line connected at: (underside/upside)		N/A
	Tightening torques: (Nm)		N/A
	Test sequence of operation: O – t – CO		N/A
	Test circuit according figure: 9		N/A
	- test voltage U/Ue = 1,05 (V) ..... L1: ..... L2: L3:		N/A
	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,		N/A
	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)		N/A
	power factor/~~time constant~~:		N/A
	- Factor ”n”		N/A
	- peak test current (kAmax) :		N/A
	Test sequence ”O” L1		
	- max. let-through current: (kApeak) L1:		N/A
	- Joule integral I^2dt (A^2s) L1:		N/A
	Pause, t: (min)		N/A
	Test sequence ”CO” L1		
	- max. let-through current: (kApeak) L1:		N/A
	- Joule integral I^2dt (A^2s) L1:		N/A
	Test sequence ”O” L2		
	- max. let-through current: (kApeak) L2:		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	- Joule integral I²dt (A²s) L2:		N/A
	Pause, t: (min)		N/A
	Test sequence ”CO” L2		
	- max. let-through current: (kApeak) L2:		N/A
	- Joule integral I²dt (A²s) L2:		N/A
	Test sequence ”O” L3		
	- max. let-through current: (kApeak) L3:		N/A
	- Joule integral I²dt (A²s) L3:		N/A
	Pause, t: (min)		N/A
	Test sequence ”CO” L3		
	- max. let-through current: (kApeak) L3:		N/A
	- Joule integral I²dt (A²s) L3:		N/A
	For 4-pole circuit-breakers with a protected neutral pole, the test voltage for that pole shall be phase-to-phase voltage divided by √3. This test is applicable only where the construction of the protected neutral pole differs from that of the phase poles.		N/A
	Test sequence ”O” N		
	- max. let-through current: (kApeak) .....N:		N/A
	- Joule integral I²dt (A²s) .....N:		N/A
	Pause, t: (min)		N/A
	Test sequence ”CO” N		
	- max. let-through current: (kApeak) .....N:		N/A
	- Joule integral I²dt (A²s) .....N:		N/A
	Melting of the fusible element		N/A
	Damage to insulation on conductors		N/A
	Holes in the PE-sheet for test sequence ”O”		N/A
	Cracks observed		N/A
H.3	Verification of dielectric withstand		
	- equal to twice the rated operational voltage with a minimum of 1000 V		N/A
	- no breakdown or flashover		N/A

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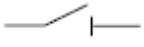
Clause	Requirement + Test	Result - Remark	Verdict
H.4	Verification of overload releases		
	The operation of overload releases shall be verified at 2.5 times the value of their current setting on each pole separately.		
	The operating time shall not exceed the max. value stated by the manufacturer for twice the current setting at the reference temperature, on a pole singly.		
	Time specified by the manufacturer:		N/A
	- Operation time: (s) ..... L1: ..... L2: ..... L3: .....N :		N/A
H.5	Marking		
	Circuit-breaker for which all values of rated voltage have not been tested according to this annex or are not covered by such testing, shall be identified by the symbol  which shall be market on the circuit-breaker immediately following these values of rated voltage		N/A
Annex J	Electromagnetic compatibility (EMC) – Requirements and test methods for circuit-breakers		N/A
	See report:		
Annex L	Circuit-breakers not fulfilling the requirements for overcurrent protection		
L.3	Classification		
	- class X: with integral non-adjustable instantaneous short-circuit releases for self-protection; - class Y: without integral short-circuit releases.		
L.4	Rated values		
	Rated current: In (A)		
	Rated conditional short-circuit current (Icc)		
L.5	Product information		
	A CBI shall be marked according to 5.2, as relevant, except that the symbol of suitability for isolation, if applicable, shall be  , replacing the symbol shown in the second dashed item of 5.2 a).		
	for 5.2, item a): with the symbol according to the classification:		

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Clause	Requirement + Test	Result - Remark	Verdict
	for 5.2, item c): with the following items: rated conditional short-circuit-current (Icc); the OCPD, if specified.		
L.6	Constructional and performance requirements		
	A CBI, being derived from the equivalent circuit-breaker (see L.2.1), complies with all the applicable construction and performance requirements of Clause 7, except 7.2.1.2.4. NOTE A CBI may additionally comply with IEC 60947-3 and be marked accordingly.		
L.7	Tests		
L.7.2.2	OCPD specified		
L.7.2.2.2	Verification of Icc		
	The test shall be made with a prospective current equal to I_{cc} of the CBI.		
	Each test shall consist of a O – t – CO sequence of operations made in accordance with 8.3.5.2, the CO operation being made by closing the CBI.		
	After each operation, the CBI shall be manually closed and opened three times.		
L.7.2.2.3	Verification of dielectric withstand		
	Following the test of L.7.2.2.2, the dielectric withstand shall be verified in accordance with 8.3.5.3		
L.7.2.3	OCPD not specified		
L.7.2.3.2	Verification of Icc		
	The test shall be made with a prospective current equal to I_{cc} of the CBI.		
	Each test shall consist of a O – t – CO sequence of operations made in accordance with 8.3.5.2, the CO operation being made by closing the CBI.		
	During the test, the current shall be maintained for three cycles and then disconnected at the power supply.		
	After each operation, the CBI shall be manually closed and opened three times.		
L.7.2.3.3	Verification of dielectric withstand		
	Following the test of L.7.2.3.2, the dielectric withstand shall be verified in accordance with 8.3.5.3		

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Clause	Requirement + Test	Result - Remark	Verdict
Annex M	Modular residual current devices (without integral current breaking device)		
M.4.1	General characteristics		
	Rated frequency range (Hz)		
	Rated voltage: Ue (V)		
	Rated current: In (A)		
	Terminal type or through conductor type		
	MRCD with sensing means and processing device combined or separate	Combined/separate	
	MRCD with voltage source		
	Operating automatically in case of failure of the voltage source.	Yes/no	
	Rated insulation voltage (*U*i)		
	Rated impulse withstand voltage (*U*imp)		
M.4.1.2	Characteristics of the voltage source of MRCDs		
	Rated values of the voltage source of MRCDs (*U*s)		
	Rated values of the frequencies of the voltage source of MRCDs		
	Rated insulation voltage (*U*i)		
	Rated impulse withstand voltage (*U*imp)		
M.4.1.3	Characteristics of auxiliary contacts		
M.4.2	Characteristics of MRCDs concerning their residual current function		
M.4.2.2	Operating characteristic in case of residual current with d.c. component		
	Type AC MRCD		
	Type A MRCD		
	Type B MRCD		
M.4.3	Behaviour under short-circuit conditions		
	Rated conditional short-circuit current (*I*cc)		
	Rated conditional residual short-circuit current (*I*Δc)		
	Rated short-time withstand current (*I*cw)		
	Peak withstand current		
	Rated residual short-time withstand current (*I*Δw)		
M.4.4	Preferred and limiting values		

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Clause	Requirement + Test	Result - Remark	Verdict
	Preferred values of the rated residual operating current (*I*Δn)		
	Minimum value of the rated residual non-operating current (*I*Δno)		
	Limiting value of the non-operating overcurrent in the case of a single-phase load in a multiphase circuit		
	Preferred values of rated voltage of the voltage source of MRCDs		
	Compliance with constructional requirements		N/A
MI	**Test sequence MI**		
M.8.3.4	Off-load tests at 20 °C ± 5 °C		N/A
M.8.3.4.2	Verification of operating in case of steady increase of the residual current (figure M.1)		N/A
	Increase the residual current from 0,2 IΔn to IΔn in 30 sec. Required: value between 0,2 IΔn and IΔn		N/A
	Min. setting IΔn.(mA): Interm. setting IΔn.(mA): Max. setting IΔn.(mA):		N/A
M.8.3.4.3	Verification of operating in case of closing on residual current (figure M.2)		N/A
	The MRCD is closes on IΔn or each specified setting Required : no value exceeds the specified limiting value of Table B1 (300 ms) or Table B2 (500 ms) and a non-actuating time of 60 ms		N/A
	Min. setting IΔn.(ms): Interm. setting IΔn.(ms): Max. setting IΔn.(ms):		N/A
M.8.3.4.4	Verification of operating in case of a sudden appearance of the residual current (figure M.2 and M3)		N/A
	A residual current is sudden appear on the MRCD of IΔn Required : no value exceeds the specified limiting value of Table B1 (300 ms) or Table B2 (500 ms) and a non-actuating time of 60 ms		N/A
	Min. setting IΔn.(ms): Interm. setting IΔn.(ms): Max. setting IΔn.(ms):		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	A residual current is sudden appear on the MRCD of 2 IΔn Required : no value exceeds the specified limiting value of Table B1 (150 ms) or Table B2 (200 ms) and a non-actuating time of 60 ms		N/A
	Min. setting IΔn.(ms): Interm. setting IΔn.(ms): Max. setting IΔn.(ms):		N/A
	A residual current is sudden appear on the MRCD of ☐ 5 IΔn or ☐ 0,25 A Required : no value exceeds the specified limiting value of Table B1 (40ms) or Table B2 (150 ms) and a non-actuating time of 60 ms		N/A
	Min. setting IΔn.(ms): Interm. setting IΔn.(ms): Max. setting IΔn.(ms):		N/A
	A residual current is sudden appear on the MRCD of ☐10 IΔn or ☐ 0,5 A Required : no value exceeds the specified limiting value of Table B1 (40 ms) or Table B2 (150 ms) and a non-actuating time of 60 ms		N/A
	Min. setting IΔn.(ms): Interm. setting IΔn.(ms): Max. setting IΔn.(ms):		N/A
	A residual current is sudden appear on the MRCD of IΔn: 5 A Required : no value exceeds the specified limiting value of Table B1 (40 ms)		N/A
	Min. setting IΔn.(ms): Interm. setting IΔn.(ms): Max. setting IΔn.(ms):		N/A
	A residual current is sudden appear on the MRCD of IΔn: 10 A Required : no value exceeds the specified limiting value of Table B1 (40 ms) or Table B2 (150 ms) and a non-actuating time of 60 ms		N/A
	Min. setting IΔn.(ms): Interm. setting IΔn.(ms): Max. setting IΔn.(ms):		N/A
	A residual current is sudden appear on the MRCD of IΔn: 20 A Required : no value exceeds the specified limiting value of Table B1 (40 ms) or Table B2 (150 ms) and a non-actuating time of 60 ms		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Min. setting IΔn.(ms): Interm. setting IΔn.(ms): Max. setting IΔn.(ms):		N/A
	A residual current is sudden appear on the MRCD of IΔn: 50 A Required : no value exceeds the specified limiting value of Table B1 (40 ms) or Table B2 (150 ms) and a non-actuating time of 60 ms		N/A
	Min. setting IΔn.(ms): Interm. setting IΔn.(ms): Max. setting IΔn.(ms):		N/A
	A residual current is sudden appear on the MRCD of IΔn: 100 A Required : no value exceeds the specified limiting value of Table B1 (40 ms) or Table B2 (150 ms) and a non-actuating time of 60 ms		N/A
	Min. setting IΔn.(ms): Interm. setting IΔn.(ms): Max. setting IΔn.(ms):		N/A
	A residual current is sudden appear on the MRCD of IΔn: 200 A Required : no value exceeds the specified limiting value of Table B1 (40 ms) or Table B2 (150 ms) and a non-actuating time of 60 ms		N/A
	Min. setting IΔn.(ms): Interm. setting IΔn.(ms): Max. setting IΔn.(ms):		N/A
	A residual current is sudden appear on the MRCD of IΔn: 500 A Required : no value exceeds the specified limiting value of Table B1 (40 ms) or Table B2 (150 ms) and a non-actuating time of 60 ms		N/A
	Min. setting IΔn.(ms): Interm. setting IΔn.(ms): Max. setting IΔn.(ms):		N/A
M.8.3.4.5	Verification of the limiting non-operating time of time delayed type MRCDs (figure M3)		N/A
	A residual current is sudden appear on the MRCD of 2 IΔn for a time declared by the manufacturer Required : The MRCD shall not operated		N/A
	Min. setting IΔn. Min. setting time delay (ms): Min. setting IΔn. Max. setting time delay (ms):		N/A
M.8.3.5	Tests at the temperature limits		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
M.8.3.5.1	General (clause B.8.2.5 applies)		
	Minimum temperature (°C)		
	Maximum temperature (°C)		
M.8.3.5.2	Off load tests at –5°C or minimum temperature limit (figure M.2 and M3)		
	A residual current is sudden appear on the MRCD of IΔn Required : no value exceeds the specified limiting value of Table B1 (300 ms) or Table B2 (500 ms) and a non-actuating time of 60 ms		N/A
	Min. setting IΔn.(ms): Interm. setting IΔn.(ms): Max. setting IΔn.(ms):		N/A
	A residual current is sudden appear on the MRCD of 2 IΔn Required : no value exceeds the specified limiting value of Table B1 (150 ms) or Table B2 (200 ms) and a non-actuating time of 60 ms		N/A
	Min. setting IΔn.(ms): Interm. setting IΔn.(ms): Max. setting IΔn.(ms):		N/A
	A residual current is sudden appear on the MRCD of ☐ 5 IΔn or ☐ 0,25 A Required : no value exceeds the specified limiting value of Table B1 (40ms) or Table B2 (150 ms) and a non-actuating time of 60 ms		N/A
	Min. setting IΔn.(ms): Interm. setting IΔn.(ms): Max. setting IΔn.(ms):		N/A
	A residual current is sudden appear on the MRCD of ☐10 IΔn or ☐ 0,5 A Required : no value exceeds the specified limiting value of Table B1 (40 ms) or Table B2 (150 ms) and a non-actuating time of 60 ms		N/A
	Min. setting IΔn.(ms): Interm. setting IΔn.(ms): Max. setting IΔn.(ms):		N/A
	Verification of the limiting non-operating time of time delayed type MRCDs at –5°C or minimum temperature limit (figure M3)		N/A
	A residual current is sudden appear on the MRCD of 2 IΔn for a time declared by the manufacturer Required : The MRCD shall not operated		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Min. setting IΔn. Min. setting time delay (ms): Min. setting IΔn. Max. setting time delay (ms):		N/A
M.8.3.5.3	Of load tests at +40°C or maximum temperature limit (figure M.2 and M3)		N/A
	A residual current is sudden appear on the MRCD of IΔn Required : no value exceeds the specified limiting value of Table B1 (300 ms) or Table B2 (500 ms) and a non-actuating time of 60 ms		N/A
	Min. setting IΔn.(ms): Interm. setting IΔn.(ms): Max. setting IΔn.(ms):		N/A
	A residual current is sudden appear on the MRCD of 2 IΔn Required : no value exceeds the specified limiting value of Table B1 (150 ms) or Table B2 (200 ms) and a non-actuating time of 60 ms		N/A
	Min. setting IΔn.(ms): Interm. setting IΔn.(ms): Max. setting IΔn.(ms):		N/A
	A residual current is sudden appear on the MRCD of ☐ 5 IΔn or ☐ 0,25 A Required : no value exceeds the specified limiting value of Table B1 (40ms) or Table B2 (150 ms) and a non-actuating time of 60 ms		N/A
	Min. setting IΔn.(ms): Interm. setting IΔn.(ms): Max. setting IΔn.(ms):		N/A
	A residual current is sudden appear on the MRCD of ☐10 IΔn or ☐ 0,5 A Required : no value exceeds the specified limiting value of Table B1 (40 ms) or Table B2 (150 ms) and a non-actuating time of 60 ms		N/A
	Min. setting IΔn.(ms): Interm. setting IΔn.(ms): Max. setting IΔn.(ms):		N/A
	A residual current is sudden appear on the MRCD of 2 IΔn for a time declared by the manufacturer Required : The MRCD shall not operated		N/A
	Min. setting IΔn. Min. setting time delay (ms): Min. setting IΔn. Max. setting time delay (ms):		N/A
M.8.4.	Verification of dielectric properties		N/A
M.8.4.1	Verification of rated impulse withstand voltage		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	rated impulse withstand voltage		
	test impulse voltage (see table 12 part 1)		
	test impulse voltage for isolating (see table 14 part 1)		
M.8.4.1.2	Verification of rated impulse withstand voltage with respect to the monitored circuit		N/A
M.8.4.1.2.1	Test for terminal type MRCD		N/A
M.8.4.1.2.2	Tests for MRCDs of through-conductor type		N/A
M.8.4.1.3	Verification of rated impulse withstand voltage of the voltage source circuit (if applicable)		N/A
M.8.5	Verification of the operation of the test device at the limits of the rated voltage		N/A
	For MRCDs having an adjustable time-delay the test is made at the maximum setting of time-delay:	_____ s	
M.8.5.a	Setting IΔn or minimum setting of IΔn	_____ A	
	Test voltage (1,1 x Ue max)	_____ V	
	Number of operations	25	
	Interval time	5 s	
	Tripping	☐ Yes / ☐ No	N/A
M.8.5.b	Setting IΔn or minimum setting of IΔn	_____ A	
	Test voltage (0,85 x Ue max)	_____ V	
	Number of operations	3	
	Interval time	5 s	
	Tripping	☐ Yes / ☐ No	N/A
M.8.5.c	Setting IΔn or minimum setting of IΔn	_____ A	
	Test voltage (1,1 x Ue max)	_____ V	
	Number of operations	1	
	Operating means of the test device held in close position	5 s	
	Tripping	☐ Yes / ☐ No	N/A
M.8.6	Verification of the limiting value of non-operating current under overcurrent conditions, in case of a single phase load.		N/A
	Circuit diagram	Fig. M4 ____	
	Setting IΔn or minimum setting of IΔn if adjustable	_____ A	

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Clause	Requirement + Test	Result - Remark	Verdict
	Test current equal to the lower value of: ☐ 6 x In or ☐ 80 % of the maximum short-circuit release current setting	_____ A	
	Test voltage: ☐ rated voltage or ☐ any convenient voltage	_____ V	
	Test frequency	_____ Hz	
	Power factor (0,5)	_____	
	Current flow time	2 s	
	Interval time	60 s	
	Calibration plot number	_____	
	No tripping / change of state		N/A
M.8.7	Resistance against unwanted tripping due to surge currents resulting from impulse voltages		N/A
M.8.7.2	Verification of the resistance to unwanted tripping in case of loading of the network capacitance		N/A
B.8.6.2	Current surge test for RMCDs (0,5 µs / 100kHz ring wave test)		
	One pole of the MRCD is submitted to 10 applications of a surge current according to the following requirements:		
	- peak value: 200 A + 10/0%		
	- virtual front time: 0,5 µs ± 30%		
	- period of the following oscillatory wave: 10 µs ± 20%		
	- each successive peak: about 60% of the preceding peak		
	The polarity shall be inverted after every two applications		
	The interval between two consecutive applications shall be about 30 s		
	During the test the MRCD shall not trip:	-	N/A
M.8.7.3	Verification of the resistance to unwanted tripping in case of flashover without follow-on current.		N/A
B.8.6.3	Verification of behaviour at surge current up to 250 A (8/20 µs surge current test)		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	One pole of the MRCD is submitted to 10 applications of a surge current according to the following requirements:		
	- peak value: 250 A + 10/0%		
	- virtual front time: 8 µs ± 20%		
	- virtual time to half value: 20 µs ± 20%		
	- peak of reverse current:: less than 30% of peak value		
	The polarity shall be inverted after every two applications		
	The interval between two consecutive applications shall be about 30 s		
	During the test the MRCD shall not trip:		N/A
M.8.8	Verification of the behaviour in case of an earth fault current comprising a d.c. component.		N/A
M.8.8.2	Type A MRCD		N/A
	For MRCDs the operation of which depends on a voltage source the test are made at 1,1 and 0,85 times the rated voltage of the voltage source (Us).		
M.8.8.2.2	Verification of operation in case of a continuous rise of a residual pulsating direct current		N/A
	Rated voltage	_____ V	
B.8.7.2.1	- steady increase from zero to: 1,4 IΔn for IΔn > 0,015 A with 1,4 IΔn/30 A/s (mA)	_____ mA	
	- steady increase from zero to: 2 IΔn for IΔn ≤ 0,015 A with 2 IΔn/30 A/s (mA)	_____ mA	
	- angle = 0 (+/-) :		
	- angle = 90 (+/-) :		
	- angle = 135 (+/-) :		
	No value exceeds the relevant specified limiting values		N/A
M.8.8.2.3	Verification of operation in case of a suddenly appearing residual pulsating direct current		N/A
B.8.7.2.2	Verification of the correct operation in case of suddenly appearing residual pulsating direct currents by closing S2 (angle = 0°)		N/A
	Rated voltage	_____ V	
	RCCB's with IΔn > 0,015 A:		
	- maximum break time (ms) at: 1,4 IΔn (+/-) :		

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Clause	Requirement + Test	Result - Remark	Verdict
	- maximum break time (ms) at: 2,8 IΔn (+/-) :		
	- maximum break time (ms) at: 7 IΔn (+/-) :		
	- maximum break time (ms) at: 14 IΔn (+/-) :		
	No value exceeds the relevant specified limiting value		N/A
	RCCB's with IΔn ≤ 0,015 A:		N/A
	- maximum break time (ms) at: 2 IΔn (+/-) :		
	- maximum break time (ms) at: 4 IΔn (+/-) :		
	- maximum break time (ms) at: 10IΔn (+/-) :		
	- maximum break time (ms) at: 20 IΔn (+/-) :		
	No value exceeds the relevant specified limiting value		N/A
M.8.8.2.4	Verification of operation with load at reference temperature		N/A
	Rated voltage	_____ **V**	
B.8.7.2.1	- steady increase from zero to: 1,4 IΔn for IΔn > 0,015 A with 1,4 IΔn/30 A/s (mA)	_____ **mA**	
	- steady increase from zero to: 2 IΔn for IΔn ≤ 0,015 A with 2 IΔn/30 A/s (mA)	_____ **mA**	
	- angle = 0 (+/-) :		
	- angle = 90 (+/-) :		
	- angle = 135 (+/-) :		
	No value exceeds the relevant specified limiting values		N/A
M.8.8.2.5	Verification of operation of a residual pulsating direct current superimposed by a smooth direct current of 6 mA.		N/A
	Rated voltage	_____ V	
B.8.7.2.1	- steady increase from zero to: 1,4 IΔn for IΔn > 0,015 A with 1,4 IΔn/30 A/s (mA) + 6 mA	_____ mA	
	-steady increase from zero to: 2 IΔn for IΔn ≤ 0,015 A with 2 IΔn/30 A/s (mA) + 6 mA	_____ mA	
	- angle = 0 (+/-) :		
	No value exceeds the relevant specified limiting values		N/A
M.8.8.3	Type B MRCD		N/A
M.8.8.3.2	Verification of operation in case of a slowly rising residual smooth direct current		
	Rated voltage (1,1*Un**)**	_____ V	

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Clause	Requirement + Test	Result - Remark	Verdict
	- steady increase from zero to: 2 IΔn A with 1,4 IΔn/30 A/s (mA)	_____ mA	
	- angle = 90 (+/-) :		
	Operation shall occur between 0,5 and 2Idn		N/A
	Rated voltage (0,85*Un)	_____ V	
	- steady increase from zero to: 2 IΔn A with 1,4 IΔn/30 A/s (mA)		
	- angle = 90 (+/-) :		
	Operation shall occur between 0,5 and 2Idn		N/A
M.8.8.3.3	Verification of operation in case of a suddenly appearing residual smooth direct current		N/A
	Verification of the correct operation in case of suddenly appearing a smooth residual direct currents by closing S2		
	Rated voltage (1,1*Un)	_____ V	
	RCCB's with IΔn > 0,015 A:		
	- maximum break time (ms) at: 2 IΔn (+/-) :		
	- maximum break time (ms) at: 4 IΔn (+/-) :		
	- maximum break time (ms) at: 10 IΔn (+/-) :		
	- maximum break time (ms) at: 20 IΔn (+/-) :		
	No value exceeds the relevant specified limiting value		N/A
	Verification of the correct operation in case of suddenly appearing a smooth residual direct currents by closing S2		N/A
	Rated voltage (0,85*Un)	_____ V	
	RCCB's with IΔn > 0,015 A:		
	- maximum break time (ms) at: 2 IΔn (+/-) :		
	- maximum break time (ms) at: 4 IΔn (+/-) :		
	- maximum break time (ms) at: 10 IΔn (+/-) :		
	- maximum break time (ms) at: 20 IΔn (+/-) :		
	No value exceeds the relevant specified limiting value		N/A
M.8.8.3.4	Verification of operation in case of a slowly rising residual current resulting from a fault in a circuit fed by a three-pulse star or a six-pulse connection.		N/A
	Rated voltage (1,1*Un)	_____ V	
	- steady increase from zero to: 2 IΔn A with 1,4 IΔn/30 A/s (mA)	_____ mA	

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Clause	Requirement + Test	Result - Remark	Verdict
	- angle = 90 (+/-) :		
	Operation shall occur between 0,5 and 2Idn		N/A
	Rated voltage (0,85*Un)	_____ V	
	- steady increase from zero to: 2 IΔn A with 1,4 IΔn/30 A/s (mA)	_____ mA	
	- angle = 90 (+/-) :		
	Operation shall occur between 0,5 and 2Idn		N/A
M.8.8.3.5.	Verification of operation in case of a slowly rising residual current resulting from a fault in a circuit fed by two-pulse bridge connection line-to-line.		N/A
	Rated voltage (Un)	_____ V	
	- steady increase from zero to: 2 IΔn A with 1,4 IΔn/30 A/s (mA)	_____ mA	
	- angle = 0 (+/-) :		
	Operation shall occur between 0,5 and 1,4Idn		N/A
M.8.8.3.6	Verification of operation with load at the reference temperature		N/A
M.8.8.3.6-M.8.8.3.2	Verification of operation in case of a slowly rising residual smooth direct current		N/A
	Rated voltage (1,1*Un)	_____ V	
	- steady increase from zero to: 2 IΔn A with 1,4 IΔn/30 A/s (mA)	_____ mA	
	- angle = 90 (+/-) :		
	Operation shall occur between 0,5 and 2Idn		N/A
	Rated voltage (0,85*Un)	_____ V	
	- steady increase from zero to: 2 IΔn A with 1,4 IΔn/30 A/s (mA)	_____ mA	
	- angle = 90 (+/-) :		
	Operation shall occur between 0,5 and 2Idn		N/A
M.8.8.3.6-M.8.8.3.4	Verification of operation in case of a slowly rising residual current resulting from a fault in a circuit fed by a three-pulse star or a six-pulse connection		N/A
	Rated voltage (1,1*Un)	_____ V	
	- steady increase from zero to: 2 IΔn A with 1,4 IΔn/30 A/s (mA)	_____ mA	
	- angle = 90 (+/-) :		
	Operation shall occur between 0,5 and 2Idn		N/A
	Rated voltage (0,85*Un)	_____ V	

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Clause	Requirement + Test	Result - Remark	Verdict
	- steady increase from zero to: 2 IΔn A with 1,4 IΔn/30 A/s (mA)	_____ mA	
	- angle = 90 (+/-) :		
	Operation shall occur between 0,5 and 2Idn		N/A
M.8.8.3.6-M.8.8.3.5.	Verification of operation in case of a slowly rising residual current resulting from a fault in a circuit fed by two-pulse bridge connection line-to-line.		N/A
	Rated voltage (Un)	_____ V	
	- steady increase from zero to: 2 IΔn A with 1,4 IΔn/30 A/s (mA)	_____ mA	
	- angle = 0 (+/-) :		
	Operation shall occur between 0,5 and 1,4Idn		N/A
M.8.9.	Verification of the behaviour of MRCDs with separate sensing means in case of a failure of the sensing means connection		N/A
M.8.9.2	Test method 1		N/A
	Rated voltage of the sensing means		
	Interval time Required <5 sec		N/A
M.8.9.3	Test method 2		N/A
	Test shall be carried out as follows: - The test device is activated - The sensing means are disconnected and the test device is activated. The MRCD shall not operate		
	Rated voltage of the sensing means		
	Test device activated MRCD shall operate		N/A
	Rated voltage of the sensing means		
	Sensing device disconnected and Test device activated MRCD shall not operate		N/A
M.8.10	Verification of temperature-rise of terminal type MRCDs		N/A
M.8.10.2	Tambient: _____°C		
	Main circuits		
	Conventional thermal current I_{th}	_____ A	
	Conventional thermal current for enclosure I_{the}	_____ A	
	Conventional thermal current for the neutral pole	_____ A	
	Cabling characteristics		

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Clause	Requirement + Test	Result - Remark	Verdict
	Cable	_____ mm^2	
	Bar / number / length	_____ mm / ___ / ____ m	
	Arrangement	☐ 3 phase - ☐ poles in series	
	Tightening torque	_____ Nm	
	Neutral pole (if applicable)		
	Cable	_____ mm^2	
	Bar / number / length	_____ mm / ___ / ____ m	
	Tightening torque	_____ Nm	
	Terminals(see table 2)		
	Manual operating means		
	Parts which need not be touched but not hand held		
	Parts which need not be touched during normal operation		
M.8.11	Verification of mechanical and electrical endurance		N/A
	For MRCDs having more than one output rating, two tests shall be made: - a test at the highest rated current at the corresponding voltage; - a test at the highest rated voltage at the corresponding current.		
	500 off-load operations controlled by the test device		
	Rated voltage:	_____ V ☐ ac ☐ dc	
	Result:	after___ operations,	N/A
	500 off load operations by passing the rated residual operating current IΔn through one current path		
	Rated voltage:	_____ V ☐ ac ☐ dc	
	Rated residual current	____ mA	
	Result:	after___ operations,	N/A
	500 on-load operations controlled by the test device		
	Rated voltage:	_____ V ☐ ac ☐ dc	
	Test current	_____ A	
	Power factor	_____	
	Result:	after___ operations,	

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Clause	Requirement + Test	Result - Remark	Verdict
	500 on-load operations by passing the rated residual operating current IΔn through one current path.		
	Rated voltage:	_____ V ☐ ac ☐ dc	
	Test current	_____ A	
	Power factor	_____	
	Rated residual current	____ mA	
	Result:	after___ operations,	N/A
	Show no damage		N/A
	High voltage test: twice rated voltage	Test voltage: _____ V	N/A
	A residual current is sudden appear on the MRCD of IΔn (_____ mA) Required : no value exceeds the specified limiting value of Table B1 (300 ms) or Table B2 (500 ms) and a non-actuating time of 60 ms		N/A
M.8.12.	Verification of the behaviour of MRCDs in case of failure of the voltage source for MRCDs classified under M.3.2.2.1		N/A
M.8.12.2	Determination of the limiting value of the voltage source		N/A
	Source voltage (Us)	Max Us: _____ V ☐ac ☐dc	
		Min Us: _____ V ☐ac ☐dc	
	Adjustable residual current setting	_____ mA (lowest)	
	Adjustable time-delay setting	_____ s	
	Time period of voltage decreasing	30 s or a period enough with respect to delayed opening	
	Min voltage to automatic opening (U > 0,85 x Us)		
	A residual current is sudden appear on the MRCD of IΔn (_____ mA) at a value just above highest measured value Required : no value exceeds the specified limiting value of Table B1: 300 ms		N/A
	It's not possible to switch "ON" by manual operating means at a lower value than the lower measured value.		N/A
M.8.12.3	Verification of automatic opening in case of voltage source failure		N/A
	Source voltage (Us)	Max Us: _____ V ☐ac ☐dc	
		Min Us: _____ V ☐ac ☐dc	
	Adjustable residual current setting	_____ mA (lowest)	

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Clause	Requirement + Test	Result - Remark	Verdict
	Adjustable time-delay setting	_____ s	
	Time period	Max 1 s or max. 1 s + time delay setting	
	Time period to automatic opening		
	No value exceeds the relevant specified limiting value		N/A
M.8.13	Verification of the behaviour of MRCDs with voltage source as classified under M.3.2.2.2 in case of failure of the voltage source.		N/A
	Source voltage (Us)	Max Us: _____ V ☐ac ☐dc	
		Min Us: _____ V ☐ac ☐dc	
	Adjustable residual current setting	_____ mA (lowest)	
	Adjustable time-delay setting	_____ s	
	Switch off and reclosed Sa or S1 and reduced the source voltage to 70 %	70% Us = _____ V ☐ac ☐dc	N/A
	Time period to automatic opening		N/A
MII	Test sequence MII		N/A
M.8.14	Verification of the behaviour of the MRCD under short-circuit conditions		N/A
	Type designation or serial number		
	Sample no:		
M.8.14.3	Verification of the rated conditional short-circuit current (I_{cc})		N/A
	Verification of the coordination between the MRCD and the SCPD		
	Test circuit according to figure:		
	Point of test circuit which is directly earthed:		
	Grid distance “a” (mm):		
	Silver wire diameter (mm):		
	Used SCPD during the tests		
	Prospective current (A):		
	Prospective current obtained (A):		
	Power factor / ratio *n*:		
	Power factor / ratio *n* obtained:		
	Plot no.		
	Test sequence: O-t-O		

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Clause	Requirement + Test	Result - Remark	Verdict
	I^2t (kA^2s); Ip (kA):	First O: Ip :_____kA I^2t; _____kA^2s Plot no. _____	
		Second O: Ip :_____kA I^2t; _____kA^2s Plot no.: _____	
	If tested at separate testing station see report	No.: _____ of _____ testing station _____	
	During tests no endangering of operator, no permanent arcing, no flashover and no melting of fuse F		N/A
	After the tests no damage impairing further use		N/A
8.3.3.6	Dielectric strength test of the main circuit at test voltage of 2 Un for 1 min:		N/A
	Test voltage		N/A
B.8.10.4.2	The RCCB shall trip with a test current of 1,25 IΔn (ms) in minimum setting:	I test: _____ mA trip time: ____ ms	N/A
M.8.12.3	Verification of automatic opening in case of voltage source failure		N/A
	Source voltage (Us)	Max Us: _____ V ☐ac ☐dc	
		Min Us: _____ V ☐ac ☐dc	
	Adjustable residual current setting	_____ mA (lowest)	
	Adjustable time-delay setting	_____ s	
	Time period	Max 1 s or max. 1 s + time delay setting	
	Time period to automatic opening		N/A
	No value exceeds the relevant specified limiting value		N/A
	The polyethylene sheet shows no holes		N/A
M.8.14.4	Verification of rated short-time withstand current (I_{cw})		N/A
	Test circuit according to figure:		
	Point of test circuit which is directly earthed:		
	Grid distance “a” (mm):		

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Clause	Requirement + Test	Result - Remark	Verdict
	Prospective current (A):		
	Prospective current obtained (A):		
	Power factor / ratio *n*:		
	Power factor / ratio *n* obtained:		
	Plot no.		
	Test sequence: O		
	I^2t (kA^2s); Ip (kA):	Ip :_____kA I^2t; _____kA^2s Test duration: _____ms Plot no. _____	
	If tested at separate testing station see report	No.: _____ of _____ testing station _____	
	During tests no endangering of operator, no permanent arcing, no flashover and no melting of fuse F		N/A
	After the tests no damage impairing further use		N/A
8.3.3.6	Dielectric strength test of the main circuit at test voltage of 2 Un for 1 min:		N/A
	Test voltage	-	N/A
B.8.10.4.2	The RCCB shall trip with a test current of 1,25 IΔn (ms) in minimum setting:	I test: _____ mA trip time: ____ ms	N/A
			N/A
M.8.12.3	Verification of automatic opening in case of voltage source failure		N/A
	Source voltage (Us)	Max Us: _____ V ☐ac ☐dc	
		Min Us: _____ V ☐ac ☐dc	
	Adjustable residual current setting	_____ mA (lowest)	
	Adjustable time-delay setting	_____ s	
	Time period	Max 1 s or max. 1 s + time delay setting	
	Time period to automatic opening		N/A
	No value exceeds the relevant specified limiting value		N/A
	The polyethylene sheet shows no holes		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
M.8.14.5	Verification of the rated conditional residual short-circuit current (IΔc)		N/A
	Test circuit according to figure:		
	Point of test circuit which is directly earthed:		
	Grid distance “a” (mm):		
	Silver wire diameter (mm):		
	Used SCPD during the tests		
	Prospective current (A):		
	Prospective current obtained (A):		
	Power factor / ratio *n*:		
	Power factor / ratio *n* obtained:		
	Plot no.		
	Test sequence: O-t-O		
	I^2t (kA^2s); Ip (kA):	First O: Ip :_____kA I^2t; _____kA^2s Plot no. _____	
		Second O: Ip :_____kA I^2t; _____kA^2s Plot no.: _____	
	If tested at separate testing station see report	No.: _____ of _____ testing station _____	
	During tests no endangering of operator, no permanent arcing, no flashover and no melting of fuse F		N/A
	After the tests no damage impairing further use		N/A
8.3.3.6	Dielectric strength test of the main circuit at test voltage of 2 Un for 1 min:		N/A
	Test voltage	-	N/A
B.8.10.4.2	The RCCB shall trip with a test current of 1,25 IΔn (ms) in minimum setting:	I test: _____ mA trip time: ____ ms	N/A
M.8.12.3	Verification of automatic opening in case of voltage source failure		N/A
	Source voltage (Us)	Max Us: _____ V ☐ac ☐dc	
		Min Us: _____ V ☐ac ☐dc	

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Clause	Requirement + Test	Result - Remark	Verdict
	Adjustable residual current setting	_____ mA (lowest)	
	Adjustable time-delay setting	_____ s	
	Time period	Max 1 s or max. 1 s + time delay setting	
	Time period to automatic opening		N/A
	No value exceeds the relevant specified limiting value		N/A
	The polyethylene sheet shows no holes		N/A
M.8.14.6	Verification of rated residual short-time withstand current (IΔw)		N/A
	Test circuit according to figure:		
	Point of test circuit which is directly earthed:		
	Grid distance “a” (mm):		
	Prospective current (A):		
	Prospective current obtained (A):		
	Power factor / ratio *n*:		
	Power factor / ratio *n* obtained:		
	Plot no.		
	Test sequence: O		
	I^2t (kA^2s); Ip (kA):	Ip :_____kA I^2t; _____kA^2s Test duration: _____ms Plot no. _____	
	If tested at separate testing station see report	No.: _____ of _____ testing station _____	
	During tests no endangering of operator, no permanent arcing, no flashover and no melting of fuse F		N/A
	After the tests no damage impairing further use		N/A
8.3.3.6	Dielectric strength test of the main circuit at test voltage of 2 Un for 1 min:		N/A
	Test voltage	-	N/A
B.8.10.4.2	The RCCB shall trip with a test current of 1,25 IΔn (ms) in minimum setting:	I test: _____ mA trip time: ____ ms	N/A

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Clause	Requirement + Test	Result - Remark	Verdict
M.8.12.3	Verification of automatic opening in case of voltage source failure		N/A
	Source voltage (Us)	Max Us: _____ V ☐ac ☐dc	
		Min Us: _____ V ☐ac ☐dc	
	Adjustable residual current setting	_____ mA (lowest)	
	Adjustable time-delay setting	_____ s	
	Time period	Max 1 s or max. 1 s + time delay setting	N/A
	Time period to automatic opening		N/A
	No value exceeds the relevant specified limiting value		N/A
	The polyethylene sheet shows no holes		N/A
M.III	Test sequence MIII		N/A
M.8.15	Verification of effects of environmental conditions		N/A
	Type designation or serial number		
	Sample no:		
B.8.10.4.2	The RCCB shall trip with a test current of 1,25 IΔn (ms) in minimum setting:	I test: _____ mA trip time: ____ ms	N/A
M.IV	Test sequence MIV		N/A
M.8.16	Verification of electromagnetic compatibility		
	See report		N/A
Annex N	Electromagnetic compatibility (EMC) – Additional requirements and test methods for devices not covered by Annexes B, F and M		
	See report		N/A
Annex O	Instantaneous trip circuit-breakers (ICB)		
O.3.2	Rated current (In)		
O.3.3	Rated short-circuit making capacity		
O.3.4	Rated short-circuit breaking capacities		

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Clause	Requirement + Test	Result - Remark	Verdict
	ICBs may be assigned rated short-circuit breaking capacities different to the equivalent circuit breaker. NOTE ICBs may be assigned a rated short-circuit breaking capacity equal to or greater than I_{cu} of the equivalent circuit-breaker when associated with specified motor starters or overload relays, and tested according to the relevant clauses of IEC 60947-4-1 (see O.6.2).		N/A
O.4	Product information		
	An ICB shall be marked according to 5.2 as relevant.		N/A
	Rated short-circuit making and breaking capacities shall be marked, where applicable (see O.6.1.1). When the ICB is only rated for short-circuit performance in association with a motor starter or overload relay (see O.6.2), the short-circuit ratings of the association shall not be marked on the ICB.		N/A
	for 5.2, item a), add the marking “ICB”;		N/A
	for 5.2, item b), add the rated instantaneous short-circuit current settings I_i (see 2.20) (actual values or multiples of rated current).		N/A
O.5	Constructional and performance requirements		
	An ICB, being derived from the equivalent circuit-breaker (see O.2.1), complies with all the applicable construction and performance requirements of Clause 7, except 7.2.1.2.4, item b).		N/A
O.6	Tests		
O.6.1	O.6.1 Test sequence of the ICB alone		
	The tests of this subclause are not required if - the short-circuit characteristics of the short-circuit releases and the main current paths of the ICB are the same as those of the equivalent circuit-breaker, or - the ICB is only rated and tested as an association (see O.6.2).		N/A
O.6.1.2	Test sequences		
	Tests shall be made according to sequences II and III of this standard without the verification of overload releases.		N/A
O.6.1.3	Verification of short-circuit releases		
	Following the test of O.6.1.2, a tripping test is made in accordance with 8.3.3.1.2 on each phase pole in turn, at the maximum setting of the rated instantaneous short-circuit current. The test is made at the value of the tripping current declared by the manufacturer for individual poles . The ICB shall trip.		N/A
O.6.2	ICB associated with a specified protected device (i.e. motor starter or overload relay)		

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Clause	Requirement + Test	Result - Remark	Verdict
	The applicable test requirements for these associations are covered in the relevant sections of IEC 60947-4-1, specifically the following clauses: - co-ordination with short-circuit protective devices; - additional requirements for combination starters and protected starters suitable for isolation; - performance under short-circuit conditions; - co-ordination at the crossover current between the starter and associated SCPD. NOTE The symbol SCPD in IEC 60947-4-1 applies to various short-circuit protective devices, including the ICB.		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
Annex P	**DC circuit-breakers for use in photovoltaic (PV) applications**		
P.4	Characteristics of PV circuit breakers		
	A PV circuit-breaker rated for use not only in PV applications shall have only one rated current.		N/A
	Rated operational voltage (V)		
	impulse withstand voltage (Uimp)		
P.5	Product information		
	PV circuit-breaker is marked “IEC 60947-2, Annex P” under the conditions of item 5.2 b).		N/A
	A circuit-breaker rated for use not only in PV applications has the ratings Ue and corresponding Icu / Ics according to this annex clearly separated from the other ratings		N/A
	PV circuit-breaker has method and diagram of series connection of poles (as necessary for each rating) marked under the conditions of item 5.2 c).		N/A
P.8	Tests		
P 8.2	Compliance with constructional requirements		
	See subclause 8.2		N/A
P.8.3	Type tests		
	Type designation or serial number		
	Sample no:		
P.8.3.1	PV circuit-breaker is derived from a circuit-breaker on which identical or more severe tests have already been conducted		N/A
	With reference to 8.3.1.2, following tests are omitted from test sequence I		
	Tripping characteristics d.c. characteristics conducted		N/A
P.8.3.2	General test conditions		
	the series connection of poles of the circuit-breaker is in accordance with the manufacturer instructions		N/A
	Samples are selected and tested according to column "Terminals marked line/load-No" of Table 10.		N/A
	For 8.3.2.2.5 the time constant for operational performance capability, shortcircuit tests and critical d.c. load current test is equal to 1 ms.		N/A
P.8.3.9	Critical d.c. load current test		
	Type designation or serial number		
	Sample no:		

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Clause	Requirement + Test	Result - Remark	Verdict
	The circuit-breaker is closed and opened 10 times on to each of the test currents, 5 times with the current flowing in the forward direction, and 5 times with the current flowing in the reverse direction.		N/A
	The time constant shall comply with P.8.3.2.		N/A
	If applicable, during the operational performance verification the breaker is subjected to 100 operations instead of 50.		N/A
P.8.3.10	Thermal cycling test		
	Type designation or serial number		
	Sample no:		
	PV circuit-breakers shall be subjected to temperature cycling according to IEC 60068-2-14, test Nb, consisting of 50 cycles, each cycle consisting of - 1 h at – 40 °C - followed by 1 h at + 85 °C. - Temperature change rate shall be 1 K/min.		N/A
	After the 50 cycles, the devices are returned to room temperature of 25 ± 5 °C for a minimum of 3 h.		N/A
	No distortion or damage to parts affect normal operation and protection		N/A
	Verification of overload releases according to 8.3.3.2.3		N/A
	Verification of temperature rise at the main terminals in accordance with 8.3.2.5		N/A
	Temperature rise does not exceed the values given in Table 7;		N/A
	Verification of dielectric withstand according to 8.3.3.6		N/A
P.8.3.11	Climatic tests		
	Type designation or serial number		
	Sample no:		
	PV circuit-breakers shall be subjected to the climatic tests of IEC 60947-1:2007/AMD1:2010/AMD2:2014 Annex Q, category B (dry heat test and the low temperature test are not required)		N/A
	During the damp heat test a functional test (mechanical operation according 8.4.2)) is done during the first 2 h of the first cycle at the test temperature and during the last 2 h of the second cycle at the test temperature		N/A
	verification of operational performance capability: routine tests to clause 8.4 excluding dielectric tests of 8.4.6:	-	N/A
	Verification of the calibration of overcurrent releases (8.4.3)		N/A
	Verification of the operation of undervoltage and shunt releases (8.4.4)		N/A

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Clause	Requirement + Test	Result - Remark	Verdict

	Additional tests for CBRs to Annex B (8.4.5)		N/A
	Verification of clearances (8.4.7)		N/A
	Number of samples tested in accordance with the requirements of Table 10		N/A

	TABLE: Heating Test (sample no. I-1)		P
	Test voltage (V) ..... :	50V	—
	Ambient (˚C) ..... :	20,5˚C	—

Thermocouple Locations	Max. temperature measured, (K)	Max. temperature limit, (K)
Incoming terminal 1	60,3	80
Incoming terminal 2	62,5	80
Incoming terminal 3	59,4	80
Incoming terminal N	60,5	80
Outing terminal 1	58,4	80
Outing terminal 2	60,3	80
Outing terminal 3	61,1	80
Outing terminal N	56,5	80
Handle	4,4	35
Enclosure	18,5	50
Base	44,1	60
Supplementary information: test current : 1600A, 4P, test sequence I		

	TABLE: Heating Test (sample no. I-2)		P
	Test voltage (V) ..... :	50V	—
	Ambient (˚C) ..... :	20,5˚C	—

Thermocouple Locations	Max. temperature measured, (K)	Max. temperature limit, (K)
Incoming terminal 1	61,3	80
Incoming terminal 2	63,1	80
Incoming terminal 3	60,4	80
Outing terminal 1	60,5	80
Outing terminal 2	59,8	80
Outing terminal 3	57,3	80
Handle	4,8	35
Enclosure	17,7	50
Base	40,2	60
Supplementary information: test current : 1600A, 3P, test sequence I		

	TABLE: Heating Test (sample no. II/III-1)		**P**
	Test voltage (V) ..... :	**50V**	**—**
	Ambient (˚C) ..... :	**15˚C**	**—**

Thermocouple Locations	**Max. temperature measured, (K)**	**Max. temperature limit, (K)**
Incoming terminal 1	61,5	80
Incoming terminal 2	63,1	80
Incoming terminal 3	60,8	80
Outing terminal 1	59,6	80
Outing terminal 2	59,9	80
Outing terminal 3	57,3	80
Incoming terminal N	61,6	80
Outing terminal N	59,8	80
Supplementary information: test current : 1600A, 4P, test sequence II/III		

	TABLE: Heating Test (sample no. IV-1)		**P**
	Test voltage (V) ..... :	**50V**	**—**
	Ambient (˚C) ..... :	**20˚C**	**—**

Thermocouple Locations	**Max. temperature measured, (K)**	**Max. temperature limit, (K)**
Incoming terminal 1	60,4	80
Incoming terminal 2	64,3	80
Incoming terminal 3	62,5	80
Outing terminal 1	59,8	80
Outing terminal 2	61,7	80
Outing terminal 3	58,3	80
Incoming terminal N	60,6	80
Outing terminal N	59,9	80
Supplementary information: test current : 1600A, 4P, 415V, test sequence IV-1		

	TABLE: Heating Test (sample no. IV-2)		**P**
	Test voltage (V) ..... :	**50V**	**—**
	Ambient (˚C) ..... :	**20 ˚C**	**—**

Thermocouple Locations	**Max. temperature measured, (K)**	**Max. temperature limit, (K)**
Incoming terminal 1	61,3	80
Incoming terminal 2	63,7	80
Incoming terminal 3	60,5	80
Outing terminal 1	57,8	80
Outing terminal 2	59,6	80
Outing terminal 3	58,7	80
Incoming terminal N	56,8	80
Outing terminal N	59,7	80
Supplementary information: test current : 1600A, 4P, 690V, test sequence IV-2		

	TABLE: Heating Test (sample no. IV-3)		**P**
	Test voltage (V) ..... :	**50V**	**—**
	Ambient (˚C) ..... :	**20 ˚C**	**—**

Thermocouple Locations	**Max. temperature measured, (K)**	**Max. temperature limit, (K)**
Incoming terminal 1	60,4	80
Incoming terminal 2	61,1	80
Incoming terminal 3	59,8	80
Outing terminal 1	57,6	80
Outing terminal 2	58,3	80
Outing terminal 3	56,9	80
Incoming terminal N	60,5	80
Outing terminal N	57,9	80
Supplementary information: test current : 1600A, 4P, 690V, test sequence IV-3		

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	TABLE: Heating Test (sample no. VI-1)		**P**
	Test voltage (V) ..... :	**50V**	**—**
	Ambient (˚C) ..... :	**20˚C**	**—**

Thermocouple Locations	**Max. temperature measured, (K)**	**Max. temperature limit, (K)**
Incoming terminal 1	61,3	80
Incoming terminal 2	65,4	80
Incoming terminal 3	60,2	80
Outing terminal 1	57,8	80
Outing terminal 2	59,6	80
Outing terminal 3	58,3	80
Supplementary information: test current : 1600A, 4P, 690V, test sequence VI-1		

	TABLE: Heating test, resistance method		N/A
	Test voltage (V) :		**—**
	Ambient, t1 (°C) :		**—**
	Ambient, t2 (°C) :		**—**

Temperature rise of winding	**R1 (Ω)**	**R2 (Ω)**	**ΔT (K)**	**Max. dT (K)**	**Insulation class**
Supplementary information:					

	TABLE: Dielectric Strength (impulse withstand voltage)		**P**
Test voltage applied between:		**Test potential applied (V)**	**Breakdown / flashover (Yes/No)**
Between the line and load terminals of the equipment with the contacts in the open position		18,5kV	No
Between all the terminals of the main circuit connected (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;		14,8kV	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		14,8kV	No

Supplementary information:		

	TABLE: Dielectric Strength (frequency withstand voltage)	P

Test voltage applied between:	Test potential applied (V)	Breakdown / flashover (Yes/No)
Between the line and load terminals of the equipment with the contacts in the open position	1890V a.c.	No
Between all the terminals of the main circuit connected (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;	1890V a.c..	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	1890V a.c.	No
Supplementary information:		

	TABLE: Electrical Data (in normal conditions)	N/A

fuse #	I rated (A)	U (V)	P (W)	I (mA)	I fuse (mA)	condition/status
Supplementary information:						

	TABLE: Power Input Deviation	N/A

Input deviation of/at:	P rated (W)	P measured (W)	Δ P	Required Δ P	Remark
Supplementary information:					

	TABLE: insulation resistance measurements	N/A

Insulation resistance R between:	R (MΩ)	Required R (MΩ)
Between mains poles (primary fuse disconnected)		

Between parts separated by basic or supplementary insulation		
Between parts separated by double or reinforced insulation		
Supplementary information:		

	TABLE: Impact Resistance		N/A
Impacts per surface	**Surface tested**	**Impact energy (Nm)**	**Comments**
Supplementary information:			

	TABLE: Clearance And Creepage Distance Measurements					P
clearance cl and creepage distance dcr at/of:	**Up (V)**	**U r.m.s. (V)**	**Required cl (mm)**	**cl (mm)**	**required dcr (mm)**	**dcr (mm)**
Between each pole and the other poles	12,0kV	1000	14	16	16	39
Between live part and exposed conductive parts	12,0kV	1000	14	45	16	67
Between open contacts	12,0kV	1000	14	28	-	-
Supplementary information:						

	TABLE: Distance Through Insulation Measurements			N/A
Distance through insulation di at/of:	**U r.m.s. (V)**	**Test voltage (V)**	**Required di (mm)**	**di (mm)**
Supplementary information:				

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

	TABLE: Needle- flame test (NFT)				N/A
Object/ Part No./ Material	Manufacturer/ trademark	Duration of application of test flame (ta); (s)	Ignition of specified layer Yes/No	Duration of burning (tb) (s)	Verdict
Supplementary information: **NFT not relevant (or applicable) for Parts of material classified as V-0 or V-1** **NFT not relevant (or applicable) for Base material of PCBs classified as V-0 or if relevant VTM-0**					

	TABLE: Resistance to heat and fire - Glow wire tests							P
Object/ Part No./ Material	Manufacturer / trademark	Glow wire test (GWT); (°C)						Verdict
		550	650		750		~~850~~ 960	
			te	ti	te	ti		
Base/ BMC	/	-	-	-	-	-	960°C	No flame
Shaft / BMC	/	-	-	-	-	-	960°C	No flame
Cover / SMC	/	-	-	-	-	-	960°C	No flame
Handle / PA66	/	-	650°C	-	-	-	-	No flame
Object/ Part No./ Material	Manufacturer / trademark	Glow-wire flammability index (GWFI), °C				GW ignition temp. (GWIT), °C		Verdict
		550	650	750	850	675	775	

The test specimen passed the glow wire test (GWT) with no ignition [(te – ti) ≤ 2s] (Yes/No) :								Yes
If no, then surrounding parts passed the needle-flame test of annex E (Yes/No) :								N/A
The test specimen passed the test by virtue of most of the flaming material being withdrawn with the glow-wire (Yes/No)? :								N/A
Ignition of the specified layer placed underneath the test specimen (Yes/No) :								N/A
Supplementary information: 550 °C GWT not relevant (or applicable) to parts of material classified at least HB40 or if relevant HBF The GWIT pre-selection option, the 850 °C GWFI pre-selection option, and the 850 °C GWT are not relevant (or applicable) for attended appliances.								

	TABLE: Threaded Part Torque Test		P
Threaded part identification	**Diameter of thread (mm)**	**Column number (I, II, or III)**	**Applied torque (Nm)**
Terminals	M10	III	10,0
Supplementary information:			

	TABLE: Over-voltage and Under-voltage Test					N/A
Test	**Operating condition**	**Rated voltage (V)**	**Test voltage (V)**	**Temperature (oC)**	**Comments**	
Supplementary information:						

IEC 60947-2

	TABLE: Critical components information				N/A
Object / part No.	**Manufacturer/ trademark**	**Type / model**	**Technical data**	**Standard**	**Mark(s) of conformity1)**
- Description:					
- Description:					
- Description:					
Supplementary information: 1) Provided evidence ensures the agreed level of compliance. See OD-CB2039.					

Additional examples of tables for TRF originators to be used as needed.

	TABLE:					
Supplementary information:						

	TABLE:						
							Comments
Supplementary information:							

	TABLE:		
	..... :		—
	..... :		—
	..... :		—
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Supplementary information:			

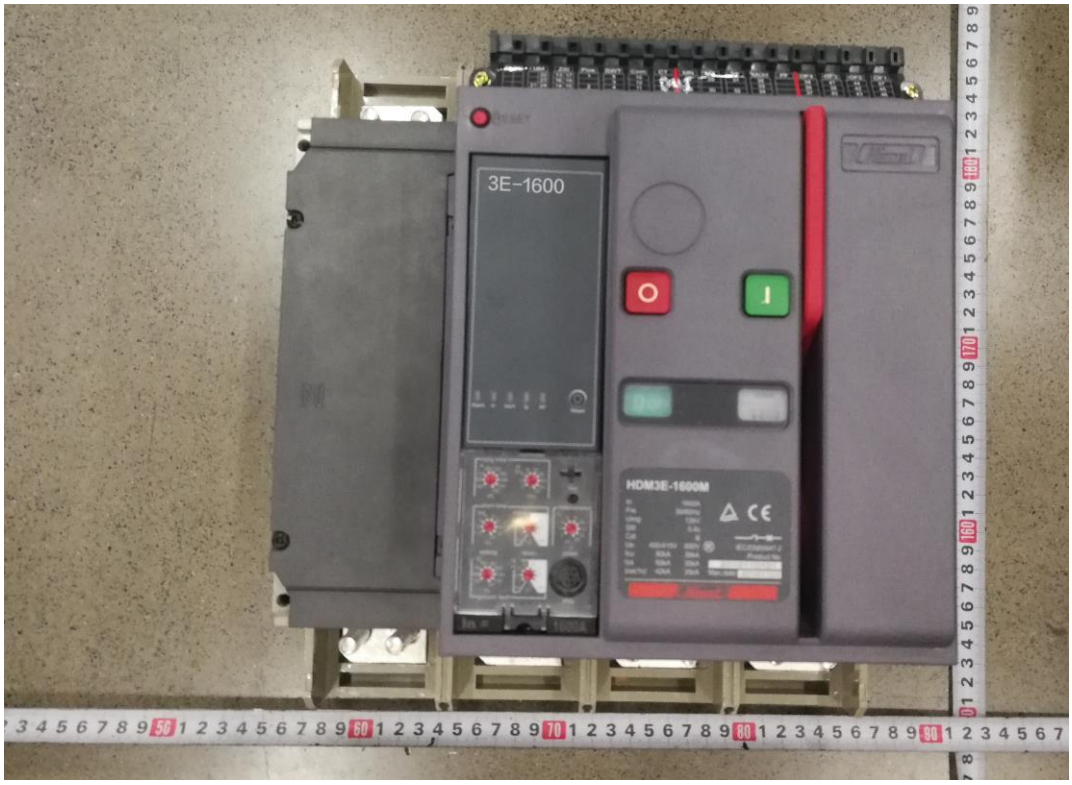
Attachment 1

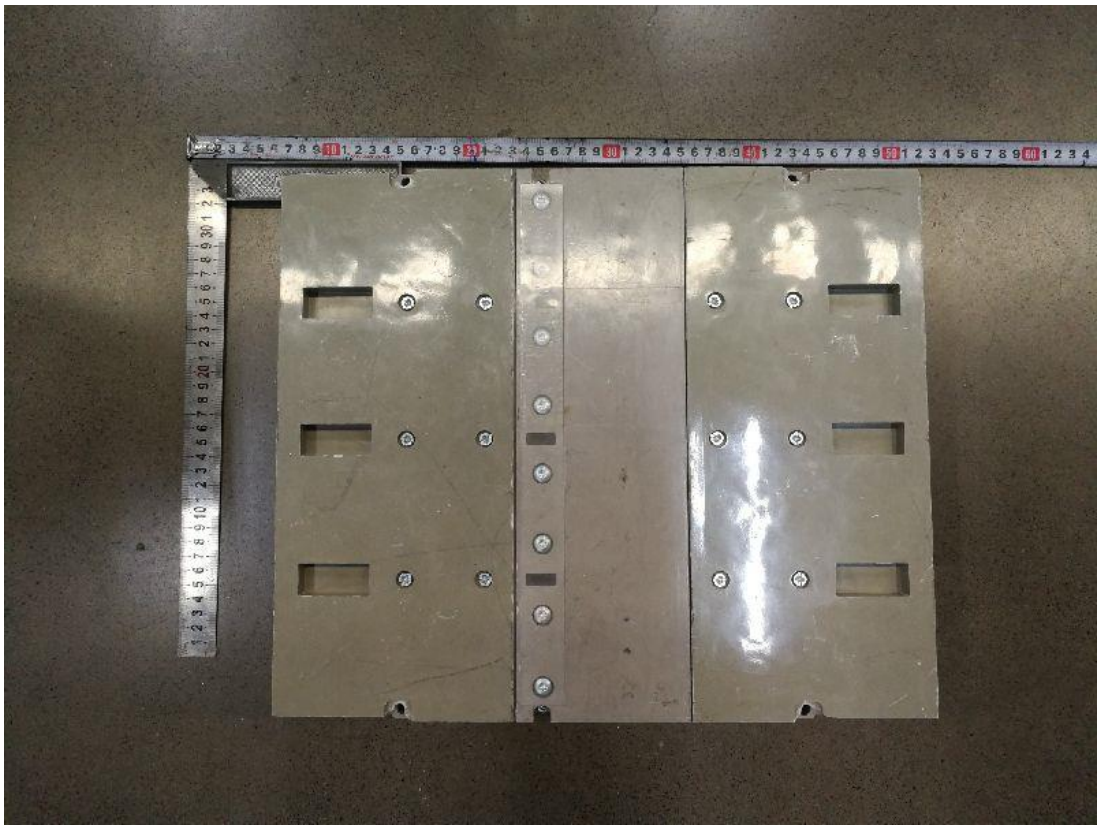
Measuring equipment list (Test location: The Low Voltage Apparatus Laboratory of Zhejiang Testing & Inspection Institute for Mechanical and Electrical Products Quality (ZTME)):

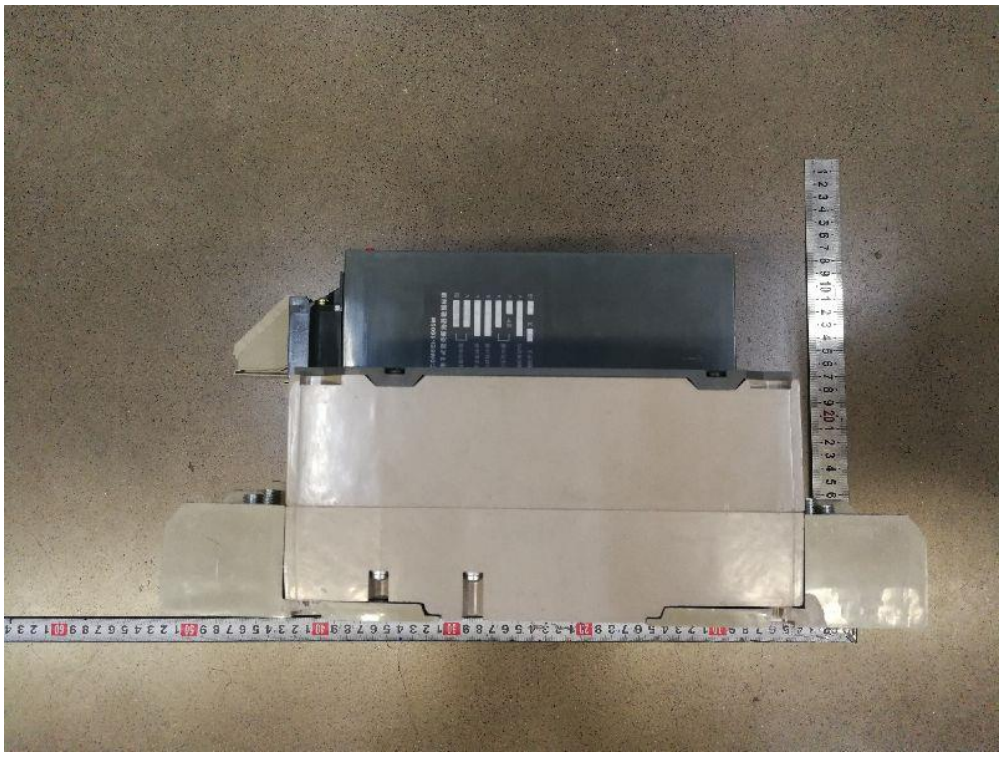
Measuring equipment	Type	Inventory / Serial No.	Next Calibration
Ampere meter	C31/1	SB-Ⅰ-A011	2021-06-22
Digital Thermometer	HC-02	SB-Ⅰ-C018	2021-03-19
Digital millisecond meter	DTM-3	SB-Ⅰ-D002	2021-05-25
Electronic stopwatch	JD-2Ⅱ	SB-Ⅰ-D004	2021-03-10
Digital timer	CSY-5E	SB-Ⅰ-D009	2021-03-19
Digital timer	CSY-5E	SB-Ⅰ-D010	2021-03-19
Digital timer	CSY-5E	SB-Ⅰ-D011	2021-03-19
Digital timer	CSY-5E	SB-Ⅰ-D016	2021-09-24
Vernier caliper	0-100mm	SB-Ⅰ-E003	2021-09-24
Digital force gauge	HG-500	SB-Ⅰ-F006	2021-09-24
Current transformer	HL55	SB-Ⅰ-M006	2021-05-06
Current transformer	HL23-1	SB-Ⅰ-M010	2021-06-23
Current transformer	HL23-1	SB-Ⅰ-M011	2021-06-23
Current transformer	HL23-1	SB-Ⅰ-M013	2021-06-23
Current transformer	HL23-5	SB-Ⅰ-M038	2021-10-07
Current transformer	HL23-5	SB-Ⅰ-M040	2021-10-07
Current transformer	HL23-5	SB-Ⅰ-M041	2021-10-07
Current transformer	HL23-5	SB-Ⅰ-M042	2021-10-07
Current transformer	HL23-5	SB-Ⅰ-M045	2021-10-07
Glow-wire tester	GW-A	SB-Ⅰ-S010	2021-03-19
Torque wrench	QL12N	SB-Ⅰ-S011	2021-09-24
Torque wrench	QL25N	SB-Ⅰ-S012	2021-09-24
Electrical parameter meter	GDW305B	SB-Ⅰ-S018	2021-09-24
Electrical parameter meter	GDW305B	SB-Ⅰ-S019	2021-09-24
Torque screwdriver	NQ-4	SB-Ⅰ-S022	2021-09-24
Impulse voltage tester	GC-20	SB-Ⅰ-S035	2021-03-19
Digital acquisition / switch unit	34970A	SB-Ⅰ-S040	2021-09-24
Digital acquisition	GENESIS	SB-Ⅰ-S041	2021-08-19
Digital acquisition	SYNERGY 16	SB-Ⅰ-S045	2021-05-29
Digital acquisition	SATURN-BE12	SB-Ⅰ-S046	2021-08-19

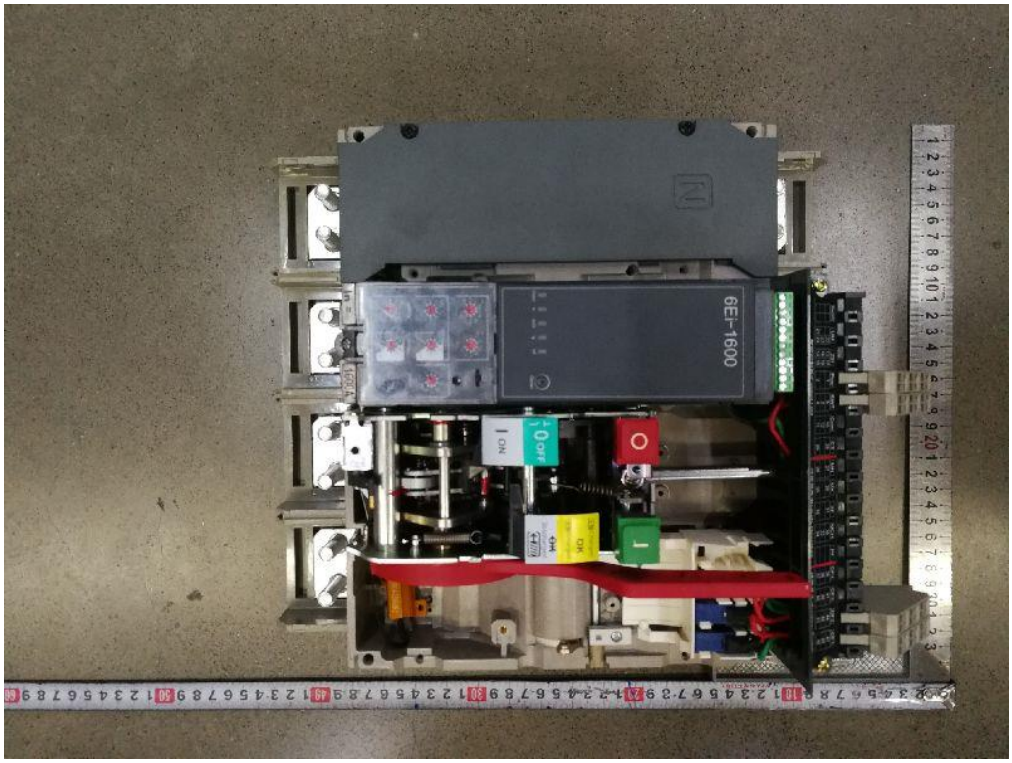
High current coil	FK-6920 FK-6921 FK-6922	SB-Ⅰ-S049	2021-05-29
High current coil	FK-6914 FK-6915 FK-6916	SB-Ⅰ-S051	2021-05-29
Voltage withstand tester	VG2672F	SB-Ⅰ-S058	2021-05-05
Impulse voltage tester	GC-20B	SB-Ⅰ-S059	2021-03-19
Multi-range variable temperature chamber	GD-V180M40P60	SB-Ⅰ-S060	2021-09-24
Multi-range variable temperature chamber	HW-V160P15P60	SB-Ⅰ-S062	2021-09-24
Damp heat tester	EL-10KA	SB-Ⅰ-S067	2021-09-24
DC electric parameter test instrument	GDW1206A	SB-Ⅰ-S068	2021-09-24
Leakage current tester	WB2675	SB-Ⅱ-S032	2021-09-16
Digital universal meter	HP34401A	SB-Ⅱ-S002	2021-09-11

Attachment 2 Photo documentation









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