



中国认可  
国际互认  
检测  
TESTING  
CNAS LD503

Test Report issued under the responsibility of:

ZhongJian Quality Test and Certification Research

检测专用章

**TEST REPORT**  
**IEC 60947-2**

**Low-voltage switchgear and controlgear - Part 2: Circuit-breakers**

Report Number.....: WT-DC220999

Date of issue.....: 2022.08.23

Total number of pages.....: 27 pages

Name of Testing Laboratory preparing the Report.....: ZhongJian Quality Test and Certification Research Institute Co.,Ltd.

Applicant's name.....: Zhejiang Deling Science&Technology Co., Ltd.

Address.....: No.36, Punan 2nd Road, Leqing Economic Development Zone, Zhejiang Province

**Test specification:**

Standard.....: IEC 60947-2:2017/A1:2020

Test procedure.....: CCA

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

**Copyright © 2017 IEC System of Conformity Assessment Schemes for Electrotechnical Equipment and Components (IECEE System). All rights reserved.**

This publication may be reproduced in whole or in part for non-commercial purposes as long as the IECEE is acknowledged as copyright owner and source of the material. IECEE takes no responsibility for and will not assume liability for damages resulting from the reader's interpretation of the reproduced material due to its placement and context.

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.....: Universal circuit breaker

Trade Mark.....: /

Manufacturer.....: Zhejiang Deling Science&Technology Co., Ltd.

Model/Type reference.....: CBRW1-2000 \ CBRW1-2000H

<b>Ratings</b> .....:		Uimp:12kV;Ui:1000V; Ue:AC400V(CBRW1-2000) \ AC400V/690V(CBRW1-2000H); In:630A/800A/1000A/1250A/1600A/2000A; CBRW1-2000 :Ics:50kA;Icu:65kA;Icw:50kA/1s; CBRW1-2000H:Ics:65kA(AC400V);50kA(AC690V); Icu:80kA(AC400V)/50kA(AC690V);Icw:65kA/1s(AC400V) \ 50kA/1s(AC690V);CAT:B;Pole:3P/4P	
<b>Responsible Testing Laboratory (as applicable), testing procedure and testing location(s):</b>			
<input checked="" type="checkbox"/>	<b>CB Testing Laboratory:</b>	ZhongJian Quality Test and Certification Research Institute Co.,Ltd.	
<b>Testing location/ address</b> .....:		No.352 Banshan Road Hangzhou,Zhejiang,P.R .CHINA	
<b>Tested by (name, function, signature)</b> .....:		Wei Yisong <i>Wei Yi song</i>	Manager of technology department
<b>Approved by (name, function, signature)</b> ....:		Zena Zhenan <i>Zeng zhenan</i>	Deputy director
<input type="checkbox"/>	<b>Testing procedure: CTF Stage 1:</b>		
<b>Testing location/ address</b> .....:			
<b>Tested by (name, function, signature):</b>			
<b>Approved by (name, function, signature)</b> ....:			
<input type="checkbox"/>	<b>Testing procedure: CTF Stage 2:</b>		
<b>Testing location/ address</b> .....:			
<b>Tested by (name + signature)</b> ..... :			
<b>Witnessed by (name, function, signature)..:</b>			
<b>Approved by (name, function, signature)</b> ....:			
<input type="checkbox"/>	<b>Testing procedure: CTF Stage 3:</b>		
<input type="checkbox"/>	<b>Testing procedure: CTF Stage 4:</b>		
<b>Testing location/ address</b> .....:			
<b>Tested by (name, function, signature):</b>			
<b>Witnessed by (name, function, signature)..:</b>			
<b>Approved by (name, function, signature)</b> ....:			
<b>Supervised by (name, function, signature) :</b>			

**List of Attachments (including a total number of pages in each attachment):****Attachment 1: Photo documentation – 2 pages****Attachment 2: List of test equipment used – 1 page****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



**Copy of marking plate:**

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

D&T		CCC	
Universal circuit breaker			
CBRW1-2000H			
Rated current In:	2000 A	3P	
Isolation voltage rated Ui:	1000V		
Rated frequency:	50Hz		
Rated impact withstand voltage Uimp:	12kV		
Usage category:	B		
Therated working voltage Ue:	400V 690V		
Breaking capacity			
Icu (kA)	80	50	
Ics (kA)	65	50	
Icw (kA)1s	65	50	
Compliance:	GB/T14048.2 IEC60947-2		
Isolation function:	 <input checked="" type="checkbox"/>		
Shunt trip voltage	AC230 V	long delay	1 s
Energy storage voltage	AC230 V	short delay	8 s
Emergency stop voltage	AC230 V	instantaneous	12 s
Intelligent controller voltage	AC230 V	grounded	OFF
Under-voltage tripping voltage		v	delay
Factory number:			
Zhejiang Deling Science & Technology Co., Ltd.			

D&T		CCC	
Universal circuit breaker			
CBRW1-2000H			
Rated current In:	2000 A	4P	
Isolation voltage rated Ui:	1000V		
Rated frequency:	50Hz		
Rated impact withstand voltage Uimp:	12kV		
Usage category:	B		
Therated working voltage Ue:	400V 690V		
Breaking capacity			
Icu (kA)	80	50	
Ics (kA)	65	50	
Icw (kA)1s	65	50	
Compliance:	GB/T14048.2 IEC60947-2		
Isolation function:	 <input checked="" type="checkbox"/>		
Shunt trip voltage	AC230 V	long delay	1 s
Energy storage voltage	AC230 V	short delay	8 s
Emergency stop voltage	AC230 V	instantaneous	12 s
Intelligent controller voltage	AC230 V	grounded	OFF
Under-voltage tripping voltage		v	delay
Factory number:			
Zhejiang Deling Science & Technology Co., Ltd.			

**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).....	: open construction
3.4. Method of controlling the operation mechanism: (dependent manual, independent manual, dependent power, independent power, stored energy operation ).....	: independent manual
3.5. Suitability for isolation: (suitable, not suitable).....	: suitable
3.6. Provision for maintenance: (maintainable, non- maintainable).....	: maintainable
3.7. Method of installation: (fixed, plug-in, withdrawable.....)	: fixed
3.8. Degree of protection of enclosure: (IP code).....	: N/A
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.....	: B
Circuit-breaker for use on phase-earthed systems.....	: N/A
Circuit-breaker for use in IT systems.....	: N/A
Rated and limiting values, main circuit .....	:
- rated operational voltage: $U_e$ (V).....	: AC400V(CBRW1-2000) 、 AC400V/690V(CBRW1-2000H)
- rated insulation voltage: $U_i$ (V).....	: 1000V
- rated impulse withstand voltage: $U_{imp}$ (kV).....	: 12kV
- rated current: $I_n$ (A).....	: 630A/800A/1000A/1250A/1600A/2000A
- kind of current.....	: AC
- conventional free air thermal current: $I_{th}$ (A).....	: N/A
- conventional enclosed thermal current: $I_{the}$ (A).....	: N/A
- current rating for four-pole circuit-breakers: (A).....	: N/A
- number of poles.....	: 3P,4P
- rated frequency: (Hz).....	: 50Hz
- integral fuses (rated values).....	: N/A



<b>Rated duty :</b>	
- eight-hour duty.....	: N/A
- uninterrupted duty: $I_u$ (A).....	: N/A
<b>Short-circuit characteristic :</b>	
rated short-time making capacity: $I_{cm}$ (kA).....	: N/A
rated ultimate short-circuit breaking capacity: $I_{cu}$ (kA).....	: CBRW1-2000:65kA; CBRW1-2000H:AC400V:80kA; CBRW1-2000H:AC690V:50kA
rated service short-circuit breaking capacity: $I_{cs}$ (kA).....	: CBRW1-2000:50kA; CBRW1-2000H:AC400V:65kA; CBRW1-2000H:AC690V:50kA;
rated short-time withstand current: $I_{cw}$ (kA/s).....	: CBRW1-2000:50kA/1s; CBRW1-2000H:AC400V:65kA/1s; CBRW1-2000H:AC690V:50kA/1s
Selectivity category (A or B).....	: B
<b>Control circuits :</b>	
<b>Electrical control circuits :</b>	
- kind of current: (AC, DC).....	: AC/DC
- rated frequency: (Hz).....	: 50Hz
- rated control circuit voltage: $U_c$ ( nature, frequency, V) .....	: N/A
- rated control supply voltage: $U_s$ (nature, frequency V) .....	: AC230V/AC400V/DC220V/DC110V
<b>Air supply control circuits: (pneumatic or electro-pneumatic) :</b>	
- rated pressure and its limit.....	: N/A
- volumes of air, at atmospheric pressure, required for each closing and each opening operation.....	: N/A
<b>Auxiliary circuits :</b>	
Rated and limiting values, auxiliary circuits.....	
- rated operational voltage $U_e$ (V).....	: N/A
- rated insulation voltage: $U_i$ (V).....	: N/A
- rated operational current: $I_e$ (A).....	: N/A
- kind of current.....	: N/A
- rated frequency: (Hz).....	: N/A
- number of circuits.....	: N/A
- number and kind of contact elements.....	: N/A
- rated uninterrupted current: $I_u$ (A).....	: N/A
- utilization category: (AC, DC, current and voltage).....	: N/A

Short-circuit characteristic :	N/A
- Rated conditional short-circuit current (kA).....	N/A
- kind of protective device.....	N/A
<b>Releases :</b>	
1) shunt release.....	P
2) Over-current release.....	P
a) instantaneous.....	P
b) definite time delay.....	P
c) inverse time delay.....	P
- independent of previous load.....	P
- dependent on previous load; (for example thermal type release).....	N/A
3) Undervoltage release (for opening).....	P
4) Other releases.....	N/A
<b>Characteristics :</b>	
1) Shunt release and undervoltage release (for opening)....	P
- rated control circuit voltage: $U_c$ ( nature, frequency, V).....	N/A
- kind of current.....	AC/DC
- rated frequency: (if AC).....	50Hz
2) Over-current release.....	P
- rated current.....	N/A
- kind of current.....	AC
- rated frequency: (if AC).....	50Hz
- current setting (or range of settings).....	$I_R=(0.4\sim 1.0)I_n\pm 10\%$ $I_{sd}=(0.4\sim 15)I_n\pm 10\%$ $I_i=1.0I_n\sim 50kA\pm 20\%$ $I_g=(0.2\sim 0.8)I_n\pm 10\%$
- time settings (or range of settings).....	$I_R=1.5I_n, t_{R1}=15s\sim 480s\pm 10\%$ $I_R=2.0I_n, t_{R2}=8.4s\sim 270s\pm 10\%$ $t_{sd1}:0.1s\sim 0.4s\pm 10\%$ $t_g:0.1s\sim 0.4s\pm 10\%$



Classification of installation and use.....	N/A
Supply Connection.....	N/A
.....	
.....	
<b>Possible test case verdicts:</b>	
- 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)
<b>Testing</b> .....	
Date of receipt of test item.....	2021.07.05
Date (s) of performance of tests.....	2021.07.05~2021.07.17
<b>General remarks:</b>	
"(See Enclosure #)" refers to additional information appended to the report. "(See appended table)" refers to a table appended to the report.	
1. The original report No. V-14201-DC212996 2. This report only conducts the version change test	
Throughout this report a <input type="checkbox"/> comma / <input checked="" type="checkbox"/> point is used as the decimal separator.	
<b>Manufacturer's Declaration per sub-clause 4.2.5 of IEC60947-2:</b>	
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.....	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> Not applicable
<b>When differences exist; they shall be identified in the General product information section.</b>	
<b>Name and address of factory (ies).....</b>	<b>Zhejiang Deling Science&amp;Technology Co., Ltd. No.36, Punan 2nd Road, Leqing Economic Development Zone, Zhejiang Province</b>
<b>General product information:</b> #1: CBRW1-2000H 4P 2000A #2~#3: CBRW1-2000H 3P 2000A	

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

<b>5.2</b>	<b>MARKING</b>		
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:	630A/800A/1000A/1250A/1600A/2000A	P
	- suitability for isolation, if applicable, with the symbol 		P
	- indication of the open and closed position: with O and I respectively, if symbols are used		P
b)	Marking on equipment not needed to be visible after mounting:		
	- manufacturer's name or trademark	Zhejiang Deling Science&Technology Co., Ltd.	P
	- type designation or serial number	CBRW1-2000 \ CBRW1-2000H	P
	- IEC 60947-2 if the manufacturer claims compliance with this standard.	IEC 60947-2	P
	- selectivity category	B	P
	- rated operational voltage(s) $U_e$	AC400V(CBRW1-2000) \ AC400V/690V(CBRW1-2000H)	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		N/A
	-rated impulse withstand voltage ( $U_{imp}$ );	12kA	P
	- value (or range) of the rated frequency and/or the indication DC (or symbol)		N/A
	- rated service short-circuit breaking capacity. $I_{cs}$	CBRW1-2000:50kA; CBRW12000H: AC400V:65kA; CBRW12000H: AC690V:50kA;	P

IEC 60947-2			
Clause	Requirement + Test	Result - Remark	Verdict
	- rated ultimate short-circuit breaking capacity. $I_{cu}$	CBRW1-2000:65kA; CBRW12000H: AC400V:80kA; CBRW12000H: AC690V:50kA	P
	- rated short-time withstand current, ( $I_{cw}$ ) and associated short-time delay, for utilization category B	CBRW1-2000:50kA/1s; CBRW12000H: AC400V:65kA/1s; CBRW12000H: AC690V:50kA/1s	P
	- line and load terminals, unless their connection is immaterial		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
	- ref. temperature for non-compensated thermal releases, if different from 30°C		N/A
	- range of the current setting ( $I_r$ ) of adjustable overload release		N/A
	- value / range of the rated instantaneous short-circuit current setting ( $I_i$ ), fixed or adjustable	fixed	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		N/A
	- conventional enclosed thermal current ( $I_{the}$ ) if different from the rated current:		N/A
	- IP Code, where applicable:		N/A
	- 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

IEC 60947-2			
Clause	Requirement + Test	Result - Remark	Verdict
	- suitability for environment A or B		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 $\leq 20$ A according to rated ultimate short-circuit breaking capacity $I_{cu}$		N/A
	- values of tightening torque for the circuit-breaker terminals.		N/A
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
	- 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 $\oplus$		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

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

<b>7.1</b>	<b>CONSTRUCTION</b>		
7.1.5 part 1	Actuator		
7.1.5.1	Insulation		
7.1.5.2	Direction of movement		
7.1.6 part 1	Indication of contact position		
7.1.6.1	Indicating means		
7.1.6.2	Indication by the actuator		
7.1.8 part 1	Terminals		
7.1.8.3	Connection		
7.1.8.4	Terminal identification and marking		
7.1.10 part 1	Provisions for protective earthing		
7.1.11 part 1	Enclosure for equipment		
7.1.11.1	Design		
7.1.11.2	Insulation		
7.1.12 part 1	Degree of protection of enclosed equipment		
7.1.13 part 1	Conduit pull-out, torque and bending with metallic conduits		
7.1.2	Withdrawable circuit-breaker		N/A
7.1.3	Additional requirements for circuit-breakers suitable for isolation		N/A

IEC 60947-2			
Clause	Requirement + Test	Result - Remark	Verdict
7.1.7 part 1	Additional safety requirements for equipment suitable for isolation		
7.1.7.1	Additional constructional requirements for equipment suitable for isolation ( $U_e > 50$ V):		
7.1.7.2	Supplementary requirements for equipment with provision for electrical interlocking with contactors or circuit-breakers:		
7.1.7.3	Supplementary requirements for equipment provided with means for padlocking the open position:		
7.1.4	Clearances and creepage distances:		
7.1.5	Requirements for the safety of the operator		
7.1.7	Additional requirements for equipment provided with a neutral pole		
7.1.8	Digital inputs and outputs for use with programmable logic controllers (PLCs)		
7.2	Performance requirements		
7.2.1	Operating condition		
7.2.1.1	Closing		
7.2.1.1.2	Dependent manual closing		
7.2.1.1.3	Independent manual closing		
7.2.1.1.4	Dependent power closing		
7.2.1.1.5	Independent power closing		
7.2.1.1.6	Stored energy closing		
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		
7.2.1.3. b	Operating time		
	For a time-delay under-voltage relay or release, the time-lag shall be measured from the instant when the voltage reaches the operating value until the instant when the relay or release actuates the tripping device of the equipment		N/A
7.2.1.2.3	Opening by shunt releases		N/A

IEC 60947-2			
Clause	Requirement + Test	Result - Remark	Verdict
7.2.1.4 part 1	Limits of operation of shunt releases		
7.2.1.2.4	Opening by over-current releases		

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

<b>8</b>	<b>TESTS</b>		
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)		
8.2.1.1.2	Flammability		
8.2.4	Mechanical properties of terminals		

8.3.3	TEST SEQUENCE I: GENERAL PERFORMANCE CHARACTERISTICS		
8.3.3.2	Test of tripping limits and characteristic		
8.3.3.2.2	Short circuit releases		
8.3.3.2.3	Overload releases		
8.3.3.3	Test of dielectric properties, impulse withstand voltage (U <sub>imp</sub> indicated): #1#6#8		
8.3.3.4 part1	The 1,2/50 $\mu$ s impulse voltage shall be applied five times for each polarity at intervals of 1s minimum		
	- rated impulse withstand voltage (kV) :	12kV	P
	- sea level of the laboratory:	30m	P
	- test U <sub>imp</sub> main circuits (kV) :	14.8.kV	P
	- test U <sub>imp</sub> auxiliary circuits (kV) :	/	N/A
	- test U <sub>imp</sub> control circuits (kV) :	9.8kV	P
	- test U <sub>imp</sub> on open main contacts (equipment suitable for isolating) (kV) :	18.5kV	P
a)	Application of test voltage		P
	i) Between all terminals of the main circuit connected together (incl. control and auxiliary circuits connected to the main circuit) and the enclosure or mounting plate, with the contacts in all normal positions of operation.		P
	ii) Between each pole of the main circuit and the other poles connected together and to the enclosure or mounting plate, with the contacts in all normal positions of operation.		P
	iii) Between each control and auxiliary circuit not normally connected to the main circuit and: - the main circuit		P



IEC 60947-2			
Clause	Requirement + Test	Result - Remark	Verdict
	- other circuits		N/A
	- exposed conductive parts		P
	- enclosure of mounting plate		P
	iv) equipment suitable for isolation		P
	equipment not suitable for isolation		P
	- no unintentional disruptive discharge during the test's		P
	Test of dielectric properties, dielectric withstand voltage (Uimp not indicated):		
	- rated insulation voltage (V) :	1000V	P
	- main circuits, test voltage for 1 min (V)	2200V	P
	- auxiliary circuits, test voltage for 1 min (V)	/	P
	- control circuits, test voltage for 1 min (V)	1890V	P
8.3.3.2.2	Application of test voltage		
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		
8.3.3.4.2.2	Mechanical operation		
8.3.3.4.2.3	Undervoltage releases		
8.3.3.4.2.4	Shunt releases		
8.3.3.4.3	Operational performance capability without current.		
	Type designation or serial number	CBRW1-2000H	
	Sample no:	#2	
	Rated current In (A)	2000A	
	Rated operational voltage: Ue (V)	AC690V	
	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 :	23 °C	P
	Number of operating cycles per hour	20	P

IEC 60947-2			
Clause	Requirement + Test	Result - Remark	Verdict
	Number of cycles without current (total) (closing mechanism energized at the rated $U_c$ )	/	N/A
	Number of cycles without current (without releases)	2500	P
	Applied voltage of closing mechanism (V)	/	N/A
	10% of total cycles for circuit-breaker with fitted shunt release: (50% at the beginning- and 50% at the end of the test.) Energized at the rated $U_c$	/	N/A
	Applied voltage: shunt releases (V)		N/A
	10% of total cycles for circuit-breaker with undervoltage releases: (50% at the beginning- and 50% at the end of the test.) Energized at the minimum rated $U_c$		N/A
	10 attempts to close the breaker without applied voltage at the undervoltage releases. (Shall not possible to close the circuit-breaker.)		N/A
	Applied voltage: undervoltage releases (V)		N/A
	In the case of circuit-breakers fitted with electrical or pneumatic closing devices, these devices shall be supplied at their rated control supply voltage or at their rated pressure.		N/A
	Precautions shall be taken to ensure that the temperature rises of the electrical components do not exceed the value indicated in tab. 7.		P
8.3.3.4.4	Operational performance capability with current.		
	Rated current: $I_n$ (A)	2000A	
	Maximum rated operational voltage: $U_e$ (V)	AC690V	
	Conductor cross-sectional area ( $mm^2$ ):	100 $mm^2$	P
	Number of operating cycles per hour	20	P
	Number of cycles with current (total) (closing mechanism energized at the rated $U_c$ )	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.	/	N/A
	Conditions, make/break operations:		P

IEC 60947-2			
Clause	Requirement + Test	Result - Remark	Verdict
	- test voltage $U/U_e = 1,0$ (V) ..... L1: ..... L2: ..... L3:	696V 695V 696V	P
	- test current $I/I_e = 1,0$ (A)..... L1: ..... L2: ..... L3:	2.03kA 2.02kA 20.3kA	P
	- power factor/time constant:	0.82	P
	- frequency: (Hz)	50Hz	P
	- on-time (ms):	1.62~1.63s	P
	- off-time (s):	30s	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		P
	After test, the isolating contacts, withdrawable mechanism and interlocks shall be suitable for further service.		P
8.3.3.5	Overload performance		
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	P
	- no breakdown or flashover		P
	For circuit-breaker suitable for isolation, the leakage current shall be measured through each pole with the contacts in the open position, at a test voltage of $1,1 U_e$ , and shall not exceed 2 mA.		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 $\leq 80$ K (K) :	55.4K	P
	conductor cross-sectional area (mm <sup>2</sup> ) :	100mm <sup>2</sup>	P
	test current $I_e$ (A) :	2000A	P

IEC 60947-2			
Clause	Requirement + Test	Result - Remark	Verdict
8.3.3.8	Verification of overload releases		
	Test current: 1.45 times the value of their current setting at the reference temperature: (A)		N/A
	Conventional tripping time: <1h when $I_n < 63A$ , <2h when $I_n > 63 A$		N/A
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 -		P
	and shall operate at 35% of the maximum control supply voltage.		P
	Circuit-breaker fitted with shunt releases. The release shall operate at 70% of the minimum rated control supply voltage. Test made at room temperature.		P
8.3.3.10	Verification of the main contact position for circuit-breakers for isolation		P
	actuating force for opening (N) .....		—
	test force with blocked main contacts for 10 s (N) . :		—
	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.		P
	Lock ability of driving mechanism in OFF-position at test force and blocked main contacts .....		P
	Position indicator does not show OFF-position after capture of test force at blocked main contacts		P
8.3.4	TEST SEQUENCE II (Ics): Rated service short-circuit breaking capacity		
8.3.4	TEST SEQUENCE II/III (Ics=Icu):		

IEC 60947-2			
Clause	Requirement + Test	Result - Remark	Verdict
8.3.5	TEST SEQUENCE III (Icu): Rated ultimate short-circuit breaking capacity		
	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	CBRW1-2000H	
	Sample no:	#3	
	Rated current: In (A)	2000A	
	Rated operational voltage: Ue (V)	AC690V	
	Rated ultimate short-circuit breaking capacity: (kA)	50kA	
	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:	270s±10%	P
	- Operation time: (s) ..... L1:	4min34s	P
	..... L2:	4min31s	
	..... L3:	4min37s	
	..... N :		
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

IEC 60947-2			
Clause	Requirement + Test	Result - Remark	Verdict
	closing mechanism energized with 85% at the rated $U_c$ : (V)		N/A
	The circuit-breaker is mounted complete on its own support or an equivalent support.		P
	Test made in free air:		P
	Distances of the metallic screen's: (all sides)		P
	The characteristics of the metallic screen:		
	- woven wire mesh		P
	- perforated metal		N/A
	- expanded metal		N/A
	- ratio hole area/total area: 0,45-0,65	0.55	P
	- size of hole: <30mm <sup>2</sup>	28	P
	- finish: bare or conductive plating	conductive plating	P
	Test made in specified individual enclosure: Details of these tests, including the dimensions of the enclosure:		P
	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 (mm <sup>2</sup> ):	100	P
	If terminals unmarked: line connected at: (underside/upside)	underside	P
	Tightening, torques: (Nm)		N/A
	Test sequence of operation: O – t – CO		P
	- test voltage $U/U_e = 1,05$ (V) ..... L1: ..... L2: ..... L3:	731V 730V 731V	P
	- r.m.s. test current AC/DC: (A) ..... L1: ..... L2: ..... L3:	50.5kA 50.6kA 50.5kA	P
	power factor/time constant :	0.23	P
	- Factor "n"		P
	- peak test current ( $A_{max}$ ) :	106kA	P

IEC 60947-2			
Clause	Requirement + Test	Result - Remark	Verdict
	Test sequence "O"		
	- max. let-through current: (kA <sub>peak</sub> ) ..... L1: ..... L2: ..... L3:	97.5kA	P
	- Joule integral I <sup>2</sup> dt (A <sup>2</sup> s) ..... L1: ..... L2: ..... L3:	81.8MA <sup>2</sup> s	P
	Pause, t: (min)	3min	P
	Test sequence "CO"		
	- max. let-through current: (kA <sub>peak</sub> ) ..... L1: ..... L2: ..... L3:	94.2kA	P
	- Joule integral I <sup>2</sup> dt (A <sup>2</sup> s) ..... L1: ..... L2: ..... L3:	83.9MA <sup>2</sup> s	P
	Melting of the fusible element		P
	Damage to insulation on conductors		P
	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	P
	- no breakdown or flashover		P
	- the leaking current for circuit-breaker suitable for isolation: (<6mA / 1,1 U <sub>e</sub> )		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:	173s±10%	P
	- Operation time: (s) ..... L1: ..... L2: ..... L3: ..... N :	176s 173s 177s	P

IEC 60947-2			
Clause	Requirement + Test	Result - Remark	Verdict
8.3.6.2	TEST SEQUENCE IV (I <sub>cw</sub> ): Rated short-time withstand current		
8.3.7	TEST SEQUENCE V: Performance of integrally fused circuit-breakers		
8.3.7	TEST SEQUENCE V: Performance of integrally fused circuit-breakers		
8.3.8	TEST SEQUENCE VI: Combined test sequence		
Annex B	Circuit-breakers incorporating residual current protection		
Annex C	Individual pole short-circuit test sequence		
Annex F	Additional tests for circuit-breakers with electronic over-current protection		P
F4 and F5	Verification of electromagnetic compatibility (EMC)		
	See report:		P
Annex H	Individual pole short-circuit test sequence		
Annex J	Electromagnetic compatibility (EMC) – Requirements and test methods for circuit-breakers		
Annex L	Circuit-breakers not fulfilling the requirements for overcurrent protection		
Annex M	Modular residual current devices (without integral current breaking device)		
Annex N	Electromagnetic compatibility (EMC) – Additional requirements and test methods for devices not covered by Annexes B, F and M		
Annex O	Instantaneous trip circuit-breakers (ICB)		
Annex P	DC circuit-breakers for use in photovoltaic (PV) applications		



## IEC 60947-2

## List of test equipment used:

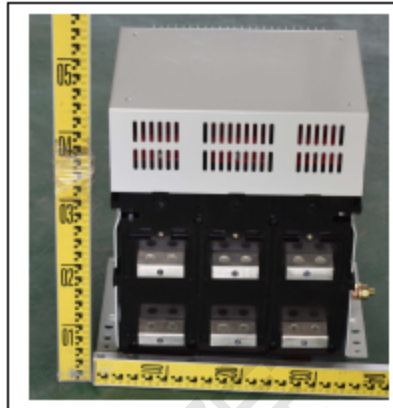
A completed list of used test equipment shall be provided in the Test Reports when a Manufacturer Testing Laboratory according to CTF stage 1 or CTF stage 2 procedure has been used.

Note: This page may be removed when CTF stage 1 or CTF stage 2 are not used. See also clause 4.8 in OD 2020 for more details.

Clause	Measurement / testing	Testing / measuring equipment / material used, (Equipment ID)	Range used	Last Calibration date	Calibration due date
8.2.4	Digital caliper	CD-8/ (0-200)mm	0-200mm	2022.02.04	2023.02.03
8.3.3.4 8.3.3.5 8.3.5.2	Digital desktop multimeter	QT-12/ 34401A	0~1000V, 2W	2023.03.04	2023.03.03
8.3.3.4 8.3.3.5 8.3.5.2	Data acquisition system	QT-44/synergy-p	0-200kA	2023.03.04	2023.03.03
8.3.3.3	Impulse voltage tester	QT-40/GC-20	/	2022.03.01	2023.02.28
8.3.5.6	Sand and dust test device	QT-124/INHL	/	2021.12.14	2022.12.13
8.3.3.3 8.3.5.4	Voltage insulation analyzer	QT-127/AN9635HS	Ac voltage output: range (100~5000) V, resolution: 1V;Accuracy: (2%x setting +5V);Output frequency: 50Hz/60Hz, short circuit current > 200mA;Ac voltage measurement range: (0.10~5.00) kV, resolution: 0.01kV,	2021.11.23	2022.11.22
8.3.3.7	Multichannel temperature tester	WD-36 /AT4320	- 200°C~400°C	2023.03.04	2023.03.03
8.3.3.3 8.3.3.10	USB temperature and humidity recorder	WD-106/Cos-03	10-99RH%, -20~+70°C	2021.09.01	2022.08.31
8.3.4.6	USB temperature and humidity recorder	WD-109/Cos-03	10-99RH%, -20~+70°C	2021.09.01	2022.08.31
8.3.3.4 8.3.3.5 8.3.5.2	USB temperature and humidity recorder	WD-112/Cos-03	10-99RH%, -20~+70°C	2021.09.01	2022.08.31
		Blank below			

IEC 60947-2

### Photographs



IEC 60947-2

### Photographs

