Vojenský technický ústav, s.p.
odštěpný závod VTÚPV
Víta Nejedlého 691, 682 01 Vyškov, Czech Republic

CERTIFICATE
Nº VTÚPV – 081/ 2022 / ZAHR

Applicant: **Shanghai Matis Electric Co., Ltd.**
上海麦豆电气有限公司
Room 320, 83 Huanhu West Third Road, Pudong New Area, Shanghai, China

Product: **Smart Metering MCCB**

Tested Model: MT88M
Derived Models: M5EL

Manufacturer: **Shanghai Matis Electric Co., Ltd.**
Room 320, 83 Huanhu West Third Road, Pudong New Area, Shanghai, China

Rating and principal characteristics: Power supply: 400 V;
Rated Current: 630 A;
Frequency: 50 Hz

Test results are described in the Test Reports No.:
B-S2206A1958 (tests made by Beide (Shenzhen) Product Service Limited)

The sample of tested product conforms with the requirements of the following standards harmonized with LVD Directive No. 2014/35/EU

- EN 60947-2:2017+A1:2020

This certificate is valid until: **18. 08. 2027**

After preparation of the necessary technical documentation as well as the conformity declaration the required CE marking can be affixed on the product. Other relevant directives have to be observed.
The CE mark shall appear according to this sample:

CE

odštěpný závod VTÚPV
VTÚPV
VOJENSKÝ TECHNICKÝ ÚSTAV, s.p.

Vyškov 18. 08. 2022

Tel./Fax: +420 910 105 580
e-mail: milan.bezdek@vtusp.cz
http://www.vtusp.cz

Milan Bezděk
Certification Head

APPLICATION FOR LOW VOLTAGE DIRECTIVE

On Behalf of

SHANGHAI MATIS ELECTRIC CO.,LTD.

Smart Metering MCCB

Model: M5EL,MT88M

Prepared For : **SHANGHAI MATIS ELECTRIC CO.,LTD.**

Room 320, 83 Huanhu West Third Road, Pudong New Area, Shanghai

Prepared By : **Beide (Shenzhen) Product Service Limited**

China: 6F, Bldg E, Hourui 3rd Ind Zone, Xixiang, Bao'an Dist, Shenzhen, China

Date of Test	**:**	**2022-06-13 to 2022-06-22**
Date of Report	**:**	**2022-06-22**
Report Number	**:**	**B-S2206A1958**

TEST REPORT
EN 60947
Low-voltage switchgear and controlgear---
Part 1:General rules
Part 2: Circuit-breakers

Testing laboratory ……..……..:	Beide (Shenzhen) Product Service Limited
Address …… ……..:	6F, Bldg E, Hourui 3rd Ind Zone, Xixiang, Bao'an Dist, Shenzhen, China
Report body.....…….. :	Beide (Shenzhen) Product Service Limited
Address (China) …… :	6F, Bldg E, Hourui 3rd Ind Zone, Xixiang, Bao'an Dist, Shenzhen, China
Applicant ……..……..…..:	SHANGHAI MATIS ELECTRIC CO.,LTD.
Address ……..……..:	Room 320, 83 Huanhu West Third Road, Pudong New Area, Shanghai
Client ID……:	CA7430
Report Query……:	CERTIFICATE QUERY
Standard ……..……..:	EN 60947-2:2017+A1:2020
Test Result ……..:	Compliance with EN 60947-2:2017+A1:2020
Procedure deviation …… ……..:	N.A.
Non-standard test method ……..:	N.A.
Type of test object ……..:	Smart Metering MCCB
Trademark ……..:	/
Model/type reference ……..……..:	MT88M
Rating ……..……..:	Rated Voltage Ue: 230/400VAC,50Hz Rated Current: 125 A, 250 A, 400 A, 630 A, 800A Curve: C, D Poles: 2P, 4P Residual Current: 50 mA, 100 mA, 200 mA, 300 mA, 400 mA, 500 mA, 600 mA, 800 mA, 1000mA Type: AC, A Accuracy: Class 1.0
Manufacturer ……..:	SHANGHAI MATIS ELECTRIC CO.,LTD.
Address ……..:	Room 320, 83 Huanhu West Third Road, Pudong New Area, Shanghai

Possible test case verdicts :	
test case does not apply to the test object …….. :	N(.A.)
test object does meet the requirement …….. :	P(ass)
test object does not meet the requirement ……. :	F(ail)

Name and address of the testing laboratory : **Beide (Shenzhen) Product Service Limited**
6F, Bldg E, Hourui 3rd Ind Zone, Xixiang,
Bao'an Dist, Shenzhen, China

Reported by : Austin.Zhong — 2022-06-22
Signature / Austin.Zhong — Date

Checked by : Anna Deng — 2022-06-22
Signature / Anna.Deng — Date

Approved by : Matin.Wang — 2022-06-22
Signature / Matin.Wang — Date

BEIDE (SHENZHEN) PRODUCT SERVICE LIMITED Beide Compliance Laboratory * CERTIFICATION *

General remarks:	
"(see remark #)" refers to a remark appended to the report. "(refer to table X)" refers to a table appended to the report. Throughout this report a comma is used as the decimal separator. 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 testing laboratory. Until otherwise specified, all tests are done under normal ambient condition 25℃±5℃, RH: 65%±20% and air pressure of 860 mbar to 1060mbar.	Attached with: A. 1 pages of photograph

Marking Label:

Smart Metering MCCB
Model: MT88M

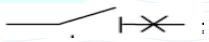
Rated Voltage Ue: 400VAC,50Hz
Rated Current: 630 A,
Curve: C
Poles: 4P

SHANGHAI MATIS ELECTRIC CO.,LTD
.Made In China

EN 60947-2			
Clause	**Requirement – Test**	**Result - Remark**	**Verdict**
3	Classification		P
3.1	According to their utilization category, A or B	B	P
3.2	According to the interrupting medium		P
3.3	According to the design		P
3.4	According to the method of controlling the operating mechanism,	dependent power operation	P
3.5	According to the suitability for isolation:	suitable for isolation;	P
3.6	According to the provision for maintenance:	maintainable	P
3.7	According to the method of installation,	fixed	P
3.8	According to the degree of protection provided by the enclosure (see 7.1.11 ofIEC 60947-1).	IPX0	P
4	Characteristics of circuit-breakers		P
4.1	Summary of characteristics		P
	The characteristics of a circuit-breaker shall be stated in terms of the following,		P
	– type of circuit-breaker (4.2);		P
	– rated and limiting values of the main circuit (4.3);		P
	– utilization categories (4.4);		P
	– control circuits (4.5);		P
	– auxiliary circuits (4.6);		P
	– releases (4.7);		P
	– integral fuses (integrally fused circuit-breakers) (4.8);		N
4.2	Type of circuit-breaker		P
	Number of poles		P
	Kind of current	AC	P
4.3	Rated and limiting values of the main circuit		P
4.3.2	Rated voltages		P
4.3.2.1	Rated operational voltage (Ue)		P
4.3.2.2	Rated insulation voltage (Ui)	1000V~	P
4.3.2.3	Rated impulse withstand voltage (Uimp)	8kV	P
4.3.3	Currents		P
4.3.3.1	Conventional free-air thermal current (Ith)		P
4.3.3.2	Conventional enclosed thermal current (Ithe)		P
4.3.3.3	Rated current (In)		P

EN 60947-2			
Clause	**Requirement – Test**	**Result - Remark**	**Verdict**
4.3.3.4	Current rating for four-pole circuit-breakers		N
4.3.4	Rated frequency	50Hz	P
4.3.5	Rated duty		P
	Eight-hour duty		N
	Uninterrupted duty		P
4.3.6	Short-circuit characteristics		P
4.3.6.1	Rated short-circuit making capacity (Icm)		P
	The rated short-circuit making capacity of a circuit-breaker is the value of short-circuit making capacity assigned to that circuit-breaker by the manufacturer for the rated operational voltage at rated frequency and at a specified power factor for a.c., or time constant for d.c. It is expressed as the maximum prospective peak current.		P
	For a.c. the rated short-circuit making capacity of a circuit-breaker shall be not less than its rated ultimate short-circuit breaking capacity, multiplied by the factor n of Table 2 (see 4.3.5.3).		P
	For d.c., the rated short-circuit making capacity of a circuit-breaker shall be not less than its rated ultimate short-circuit breaking capacity.		N
	A rated short-circuit making capacity implies that the circuit-breaker shall be able to make the current corresponding to that rated capacity at the appropriate applied voltage related to the rated operational voltage.		P
4.3.6.2	Rated short-circuit breaking capacities		P
4.3.6.2.1	General		P
	The rated short-circuit breaking capacities of a circuit-breaker are the values of short-circuit breaking capacity assigned to that circuit-breaker by the manufacturer for the rated operational voltage, under specified conditions.		P
	– for a.c., at any power factor not less than that of Table 11 (see 8.3.2.2.4);		P
	– for d.c., with any time constant not greater than that of Table 11 (see 8.3.2.2.5).		N
4.3.6.2.2	Rated ultimate short-circuit breaking capacity (Icu)		P
4.3.6.2.3	Rated service short-circuit breaking capacity (Ics)		P
4.3.6.3	Standard relationship between short-circuit making and breaking capacities and related power factor, for a.c. circuit-breakers		P
	The standard relationship between short-circuit		P

EN 60947-2			
Clause	**Requirement – Test**	**Result - Remark**	**Verdict**
	breaking capacity and short-circuit making capacity is given in Table 2.		
4.3.6.4	Rated short-time withstand current (Icw)		P
	The rated short-time withstand current of a circuit-breaker is the value of short-time withstand current assigned to that circuit-breaker by the manufacturer under the test conditions specified in 8.3.6.2.		P
	For a.c., the value of this current is the r.m.s. value of the a.c. component of the prospective short-circuit current, assumed constant during the short-time delay.		P
4.4	Selectivity categories	B	P
4.5	Control circuits		P
4.5.1	Electrical control circuits		P
4.5.2	Air-supply control circuits (pneumatic or electro-pneumatic)		P
4.6	Auxiliary circuits		P
4.7	Releases		N
4.7.1	Types		N
4.7.2	Characteristics		N
1)	Shunt release and undervoltage release (for opening):		N
	– rated control circuit voltage (Uc);		N
	– kind of current;		N
	– rated frequency, if a.c.		N
2)	Over-current release:		N
	– rated current (In);		N
	– kind of current;		N
	– rated frequency, if a.c.;		N
	– current setting (or range of settings);		N
	– time setting (or range of settings).		N
4.7.3	Current setting of over-current releases		N
4.7.4	Tripping time setting of over-current releases		N
	1) Definite time-delay over-current releases		N
	2) Inverse time-delay over-current releases		N
4.8	Integral fuses (integrally fused circuit-breakers)		N

EN 60947-2			
Clause	**Requirement – Test**	**Result - Remark**	**Verdict**
5	Product information		P
5.1	Nature of the information		P
	The following information shall be given by the manufacturer, when required by the relevant product standard:		P
	– manufacturer's name or trademark;		P
	– type designation or serial number;		P
	– number of the relevant product standard, if the manufacturer claims compliance.		P
	– rated operational voltages (see 4.3.1.1 and note to 5.2);		P
	– utilization category and rated operational currents	B	P
	– the value of the rated frequency/frequencies, e.g.: 50 Hz, 50 Hz/60 Hz, and/or the indication "d.c." or the symbol ⎓;	50Hz	P
	– rated duty, with the indication of the class of intermittent duty, if any (see 4.3.4);		P
	– rated making and/or breaking capacities. These indications may be replaced, where applicable, by the indication of the utilization category;		P
5.2	Marking		P
a)	rated current (In);		P
	suitability for isolation,		P
b)	manufacturer's name or trade mark;		P
	type designation or serial number;		P
	utilization category;	B	P
	rated operational voltage(s) Ue		P
	rated impulse withstand voltage (Uimp);		P
	value (or range) of the rated frequency	50Hz	P
	rated service short-circuit breaking capacity (Ics)		P
	rated ultimate short-circuit breaking capacity (Icu)		P
	rated short-time withstand current (Icw), and associated short-time delay, for utilization category B;		N
	line and load terminals, unless their connection is immaterial;		P
	neutral pole terminals, if applicable, by the letter N;		P
	protective earth terminal,		P

EN 60947-2			
Clause	**Requirement – Test**	**Result - Remark**	**Verdict**
c)	rated short-circuit making capacity (Icm),		P
	rated insulation voltage (Ui),		P
	IP Code, where applicable		N
	conventional enclosed thermal current (Ithe) if different from the rated current;		P
	details of minimum distance between circuit-breaker and earthed metal parts for circuit breakers intended for use without enclosures;		P
	suitability for environment A or environment B, as applicable	B	P
	r.m.s. sensing, if applicable		N
d)	rated control circuit voltage of the closing device (see 7.2.1.2 of IEC 60947-1) and rated frequency for a.c.;		N
	rated control circuit voltage of the shunt release (see 7.2.1.4 of IEC 60947-1) and/or of the under-voltage release (or of the no-voltage release) (see 7.2.1.3 of IEC 60947-1), and rated frequency for a.c.;		N
	rated current of indirect over-current releases;		N
	number and type of auxiliary contacts and kind of current, rated frequency (if a.c.) and rated voltages of the auxiliary switches, if different from those of the main circuit.		N
e)	Terminal marking		P
5.3	Instructions for installation, operation and maintenance		P
	Additional information for the decommissioning and dismantling of the circuit-breaker shall be provided to the user in the case of a foreseeable hazardous condition, for example due to stored energy or hazardous substances.		P

6	Normal service, mounting and transport conditions		P
6.1.1	Ambient air temperature	40°C	P
	The ambient air temperature does not exceed +40 °C and its average over a period of 24 h does not exceed +35 °C.		N
	The lower limit of the ambient air temperature is –5 °C.		N
6.1.2	Altitude	<2000m	P
6.1.3	Atmospheric conditions		P
6.1.3.1	Humidity	<95%	P
6.1.3.2	Pollution degree	Pollution degree 3	P
6.1.4	Shock and vibration		P

EN 60947-2			
Clause	**Requirement – Test**	**Result - Remark**	**Verdict**
6.2	Conditions during transport and storage	See instrutions	P
6.3	Mounting	See instrutions	P
7	Constructional and performance requirements		P
7.1	Constructional requirements		P
7.1.1	**General**		P
7.1.2	Withdrawable circuit-breakers		N
	In the disconnected position, the isolating contacts of the main circuit and, where applicable, auxiliary circuits of withdrawable circuit-breakers shall have isolating distances which comply with the requirements specified for the isolating function, taking account of manufacturing tolerances and changes in dimensions due to wear.		N
	The withdrawable mechanism shall be fitted with a reliable indicating device which indicates unambiguously the positions of the isolating contacts.		N
	The withdrawable mechanism shall be fitted with interlocks which only permit the isolating contacts to be separated or re-closed when the main contacts of the circuit-breaker are open.		N
	In addition, the withdrawable mechanism shall be fitted with interlocks which only permit the main contacts to be closed – when the isolating contacts are fully closed, or – when the specified isolating distance is achieved between the fixed and moving parts of the isolating contacts (disconnected position).		N
7.1.3	Additional requirements for circuit-breakers suitable for isolation		N

EN 60947-2			
Clause	**Requirement – Test**	**Result - Remark**	**Verdict**
7.1.4	Clearances and creepage distances		P
7.1.5	Requirements for the safety of the operator		P
	There shall be no path or opening which allows incandescent particles to be discharged from the area of the manual operating means.		P
7.1.6	List of construction breaks		P
	Circuit-breakers of a given frame size are considered to have a construction break (see 2.1.2),if any one of the following features are not the same:		P
	– material, finish and dimensions of internal current-carrying parts, admitting, however, the variations listed in a), b) and c) below;		P
	– size, material, configuration and method of attachment of the main contacts;		P
	– any integral manual operating mechanism, its materials and physical characteristics;		P
	– moulding and insulating materials;		P
	– the principle of operation, materials and construction of the arc extinction device;		P
	– the basic design of the over-current tripping devices, admitting, however, the variations detailed in a), b) and c) below.		P
	Variations in the following do not constitute a construction break:		P
	a) dimensions of terminals, provided that creepage and clearance distances are not reduced;		P
	b) in the case of thermal and magnetic releases those dimensions and materials of the release components, including flexible connections, which determine the current rating;		P
	c) secondary windings of current transformer operated releases;		P
	d) external operating means, additional to the integral operating means;		P
	e) type designation and/or purely aesthetic features (e.g. labels).		P
	f) in the case of the 2-pole and 4-pole variants, replacement of the trip unit in one pole by a link, to provide an unprotected neutral;		N
	g) creating a 2-pole breaker from a 3-pole breaker by removing the centre current path;		N
	h) difference in embedded software (firmware) in electronic trip units, which has no impact on the required performance, in particular the tripping function;		N
	i) electronic trip unit hardware, due to omitted		N

EN 60947-2			
Clause	**Requirement – Test**	**Result - Remark**	**Verdict**
	components on identical printed circuit board layout (e.g. rotary knobs, display, etc.).		
7.1.7	Additional requirements for circuit-breakers provided with a neutral pole		P
	If a pole with an appropriate making and breaking capacity is used as a neutral pole, then all poles, including the neutral pole, may operate substantially together.		P
7.1.8	Digital inputs and outputs for use with programmable logic controllers (PLCs)		N
7.2	Performance requirements		P
7.2.1	Operating conditions		P
7.2.1.1	Closing		P
7.2.1.1.1	**General**		P
	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		P
	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
7.2.1.1.3	Independent manual closing		N
	A circuit-breaker having an independent manual closing mechanism can be assigned a shortcircuit making capacity rating irrespective of the conditions of mechanical operation.		N
7.2.1.1.4	Dependent power closing		N
7.2.1.1.5	Independent power closing		N
7.2.1.1.6	Stored energy closing		N
7.2.1.2	Opening		N
7.2.1.2.1	General		N
7.2.1.2.2	Opening by undervoltage releases		N
7.2.1.2.3	Opening by shunt releases		N
7.2.1.2.4	Opening by over-current releases		N
	a) Opening under short-circuit conditions		N
	b) Opening under overload conditions		N

EN 60947-2			
Clause	**Requirement – Test**	**Result - Remark**	**Verdict**
7.2.2	Temperature-rise		P
7.2.2.1	Temperature-rise limits		P
7.2.2.2	Ambient air temperature		P
7.2.2.3	Main circuit		P
7.2.2.4	Control circuits		P
7.2.2.5	Auxiliary circuits		P
7.2.3	Dielectric properties		P
7.2.3.1	Type tests shall be made in accordance with 8.3.3.3.		P
7.2.3.2	Impulse withstand voltage		P
7.2.3.3	Power-frequency withstand voltage of the main, auxiliary and control circuits		P
	Power-frequency tests are used in the following cases:		P
	– dielectric tests as type tests for the verification of solid insulation;		P
	– dielectric withstand verification, as a criterion of failure, after switching or short-circuit type tests;		P
	– routine tests.		N
7.2.3.4	Clearances		P
7.2.3.5	Creepage distances		P
7.2.3.6	Solid insulation		P
7.2.3.7	Spacing between separate circuits		N
7.2.4	Ability to make and break under no load, normal load and overload conditions		P
7.2.4.1	Overload performance		P
7.2.4.2	Operational performance capability		P
	The circuit-breaker shall be capable of meeting the requirements of Table 8:		P
	– for the test of operational performance without current in the main circuit under the test conditions specified in 8.3.3.4.3;		P
	– for the test of operational performance with current in the main circuit under the test conditions specified in 8.3.3.4.4.		P
7.2.5	Ability to make and break under short-circuit conditions		P
	The rated short-circuit making capacity shall be in accordance with 4.3.6.1 and 4.3.6.3		P

EN 60947-2			
Clause	**Requirement – Test**	**Result - Remark**	**Verdict**
	The rated short-circuit breaking capacity shall be in accordance with 4.3.6.2		P
	The rated short-time withstand current shall be in accordance with 4.3.6.4		P
7.2.6	Vacant		--
7.2.7	Additional requirements for circuit-breakers suitable for isolation		P
7.2.8	Specific requirements for integrally fused circuit-breakers		N
7.2.9	Co-ordination between a circuit-breaker and another short-circuit protective device		N
7.3	Electromagnetic compatibility (EMC)		N
8	Tests		P
8.1	Kind of tests		P
8.1.1	The tests to verify the characteristics of circuit-breakers are:		P
	– type tests (see 8.3);		P
	– routine tests (see 8.4).		N
	– special tests (see 8.5).		N
8.1.2	Type tests		P
8.1.3	Routine tests		N
8.2	Compliance with constructional requirements		P
8.3	Type tests		P
8.3.1	Test sequences		P
8.3.1.1	General		P
8.3.1.2	Tests omitted from sequence I and made separately		P
8.3.1.3	Applicability of sequences according to the relationship between short-circuit ratings		P
8.3.1.4	Alternative test programmes for a.c. circuit-breakers having a different number of poles		P
8.3.2	General test conditions		P
8.3.2.1	General test conditions		P
8.3.2.2	Test quantities		P
8.3.2.2.1	Values of test quantities		P
8.3.2.2.2	Tolerances on test quantities		P
	The test recorded in the test report shall be within the tolerances given in Table 8, unless otherwise		P

EN 60947-2			
Clause	**Requirement – Test**	**Result - Remark**	**Verdict**
	specified in the relevant subclauses. However, with the agreement of the manufacturer, the tests may be made under more severe conditions than those specified.		
8.3.2.2.3	Frequency of the test circuit for a.c.		P
	All tests shall be made at the rated frequency of the circuit-breaker. For all short-circuit tests, if the rated breaking capacity is essentially dependent on the value of the frequency, the tolerance shall not exceed ±5 %.		P
8.3.2.2.4	Power factor of the test circuit		P
8.3.2.2.5	Time constant of the test circuit		P
8.3.2.2.6	Power-frequency recovery voltage		P
8.3.2.2.7	Ripple of the test current for d.c.		N
8.3.2.3	Evaluation of test results		P
	The case shall not be broken but hairline cracks are acceptable.		P
8.3.2.4	Test reports		P
	Test values and parameters shall form part of the test report		P
8.3.2.5	Test conditions for temperature-rise test		P
	Ambient air temperature		P
	The ambient air temperature shall be recorded during the last quarter of the test period by at least two temperature sensing means, e.g. thermometers or thermocouples, equally distributed around the equipment at about half its height and at a distance of about 1 m from the equipment. The temperature sensing means shall be protected against air currents, heat radiation and indicating errors due to rapid temperature changes.		P
	During the tests, the ambient air temperature shall be between +10 °C and +40 °C and shall not vary by more than 10 K.		P
	Measurement of the temperature of parts		P
	For parts other than coils, the temperature of the different parts shall be measured by suitable temperature sensing means at those points most likely to attain the maximum temperature; these points shall be stated in the test report.		P
	The oil temperature of oil-immersed equipment shall be measured at the upper part of the oil; this measurement may be made by means of a thermometer.		P

EN 60947-2			
Clause	**Requirement – Test**	**Result - Remark**	**Verdict**
	The temperature sensing means shall not significantly affect the temperature-rise.		P
	Good thermal conductivity between the temperature sensing means and the surface of the part under test shall be ensured.		P
	For electromagnet coils, the method of measuring the temperature by variation of resistance shall generally be used. Other methods are permitted only if it is impracticable to use the resistance method.		P
	The temperature of the coils before beginning the test shall not differ from that of the surrounding medium by more than 3 K.		P
	Temperature-rise of a part		P
	The temperature-rise of a part is the difference between the temperature of the part measured in accordance with 8.3.3.3.2, and the ambient air temperature measured in accordance with 8.3.3.3.1.		P
	Temperature-rise of the main circuit		P
	The equipment shall be mounted as specified in 8.3.2.1 and shall be protected against abnormal external heating or cooling.		P
	For the conventional thermal current test (free air or enclosed), equipment having an integral enclosure and equipment only intended for use with a specified type of enclosure shall be tested in its enclosure.		P
	Temperature-rise of control circuits		N
	The temperature-rise tests of control circuits shall be made with the specified current and, in the case of a.c., at the rated frequency. Control circuits shall be tested at their rated voltage		N
	Circuits intended for continuous operation shall be tested for a sufficient time for the temperature-rise to reach a steady-state value.		N
	Temperature-rise of coils of electromagnets		N
	Coils and electromagnets shall be tested according to the conditions given in 7.2.2.6.		N
	Temperature-rise of auxiliary circuits		N
	The temperature-rise tests of auxiliary circuits shall be made under the same conditions as those specified in 8.3.3.3.5, but may be carried out at any convenient voltage.		N
8.3.2.6	Test conditions for short-circuit tests		P
8.3.2.6.1	General requirements		P
8.3.2.6.2	Test circuit		P
8.3.2.6.3	Calibration of the test circuit		P

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Clause	**Requirement – Test**	**Result - Remark**	**Verdict**
8.3.2.6.4	Test procedure		P
8.3.2.6.5	Behaviour of the circuit-breaker during short-circuit making and breaking tests		P
8.3.2.6.6	Interpretation of records		P
8.3.2.6.7	Verification after short-circuit tests		P
	After the opening operations of the short-circuit making and breaking capacity tests of 8.3.4.2, 8.3.5.3, 8.3.6.5, 8.3.7.2, 8.3.7.7, 8.3.8.4, as applicable, the following conditions shall be met: – there shall be no damage to the insulation on conductors used to wire the device; – the polyethylene sheet, where applicable, shall show no holes visible with normal or corrected vision without additional magnification. Minuscule holes of less than 0,26 mm diameter can be ignored; – the case shall not be broken but hairline cracks are acceptable.		P
	Additionally, after the short-circuit tests, the circuit-breaker shall comply with the verifications specified for each test sequence, as applicable.		P
8.3.3	Test sequence I: General performance characteristics		P
8.3.3.1	General		P
8.3.3.2	Test of tripping limits and characteristics		P
8.3.3.2.1	General		P
8.3.3.2.2	Short-circuit releases		P
8.3.3.2.3	Overload releases		P
8.3.3.2.4	Additional tests for definite time-delay releases		P
8.3.3.3	Test of dielectric properties		P
8.3.3.4	Tests of mechanical operation and of operational performance capability		P
8.3.3.5	Overload performance		P
8.3.3.6	Verification of dielectric withstand		P
8.3.3.6.1	General		P
8.3.3.6.2	Test voltage		P
8.3.3.6.3	Application of the test voltage		P
	For circuit-breakers suitable for isolation the leakage current shall be measured in accordance with 8.3.3.2, item (iv), except that the leakage current shall not exceed 2 mA.		P

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Clause	**Requirement – Test**	**Result - Remark**	**Verdict**
8.3.3.6.4	Acceptance criteria		P
8.3.3.7	Verification of temperature-rise		P
8.3.3.8	Verification of overload releases		P
	The operating time shall not exceed the conventional tripping time.		P
8.3.3.9	Verification of undervoltage and shunt releases		P
8.3.3.10	Verification of the main contact position		P
8.3.4	Test sequence II: Rated service short-circuit breaking capacity		P
	Except when the test sequence VI (combined) applies (see 8.3.8), this test sequence applies to all circuit-breakers and comprises the following tests:		P
8.3.4.2	Test of rated service short-circuit breaking capacity		P
8.3.4.3	Verification of operational performance capability		P
8.3.4.4	Verification of dielectric withstand		P
8.3.4.5	Verification of temperature-rise		P
8.3.4.6	Verification of overload releases		P
8.3.5	Test sequence III: Rated ultimate short-circuit breaking capacity		P
8.3.5.1	General		P
	Except where the test sequence VI (combined) applies (see 8.3.8), this test sequence applies to circuit-breakers of utilization category A and to circuit-breakers of utilization category B having a rated ultimate short-circuit breaking capacity higher than the rated short-time withstand current.		P
	For circuit-breakers of utilization category 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.		N
8.3.5.2	Verification of overload releases		P
	The operation of overload releases shall be verified at twice the value of their current setting on each pole separately. This test may be made at any convenient voltage.		P
8.3.5.3	Test of rated ultimate short-circuit breaking		P

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Clause	**Requirement – Test**	**Result - Remark**	**Verdict**
	capacity		
8.3.5.4	Verification of dielectric withstand		P
	Following the test according to 8.3.5.2 the dielectric withstand shall be verified according to 8.3.3.5. For circuit breakers suitable for isolation, the leakage current shall not exceed 6 mA.		P
8.3.5.5	Verification of overload releases		P
	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.		P
8.3.6	Test sequence IV: Rated short-time withstand current		N
8.3.6.1	Except where the test sequence VI (combined) applies (see 8.3.8), this test sequence applies to circuit-breakers of utilization category B and to those circuit-breakers of category A covered by note 3 of Table 4; it comprises the following tests.		N
8.3.6.2	Verification of overload releases		N
8.3.6.3	Test of rated short-time withstand current		N
8.3.6.4	Verification of temperature-rise		N
8.3.6.5	Test of short-circuit breaking capacity at the maximum short-time withstand current		N
8.3.6.6	Verification of dielectric withstand		N
8.3.6.7	Verification of overload releases		N
8.3.7	Test sequence V: Performance of integrally fused circuit-breakers		N
8.3.7.1	This test sequence applies to integrally fused circuit-breakers. It replaces test sequence III and comprises the following tests:		N
8.3.7.2	Short-circuit at the selectivity limit current		N
8.3.7.3	Verification of temperature-rise		N
8.3.7.4	Verification of dielectric withstand		N
8.3.7.5	Verification of overload releases		N
8.3.7.6	Short-circuit at 1,1 times the take-over current		N
8.3.7.7	Short-circuit at ultimate short-circuit breaking capacity		N
8.3.7.8	Verification of dielectric withstand		N
8.3.7.9	Verification of overload releases		N

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Clause	**Requirement – Test**	**Result - Remark**	**Verdict**
8.3.8	Test sequence VI: combined test sequence		N
8.3.8.1	At the discretion of, or in agreement with the manufacturer, this test sequence may be applied to circuit-breakers of utilization category B:		N
8.3.8.2	Verification of overload releases		N
8.3.8.3	Test of rated short-time withstand current		N
8.3.8.4	Test of rated service short-circuit breaking capacity		N
8.3.8.5	Verification of operational capability		N
8.3.8.6	Verification of dielectric withstand		N
8.3.8.7	Verification of temperature-rise		N
8.3.8.8	Verification of overload releases		N
8.3.9	Critical d.c. load current test		N
8.4	Routine tests		N
8.4.1	General		N
8.4.2	Mechanical operation tests		N
	The following tests shall be made on manually-operated circuit-breakers		N
	– two close-open operations		N
	– two trip-free operations		N
	The following tests shall be made on power-operated circuit-breakers at 110 % of the maximum rated control supply voltage and/or of the rated supply pressure, and at 85 % of the minimum rated control supply voltage and/or of the rated supply pressure:		N
	– two close-open operations;		N
	– two trip-free operations;		N
	– for automatic reclosing circuit-breakers, two automatic reclosing operations.		N
8.4.3	Verification of the calibration of overcurrent releases		N
8.4.3.1	Inverse time-delay releases		N
8.4.3.2	Instantaneous and definite time-delay releases		N
8.4.4	Verification of the operation of undervoltage and shunt releases		N
8.4.4.1	Undervoltage releases		N
	a) Hold-in voltage		N

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Clause	**Requirement – Test**	**Result - Remark**	**Verdict**
	b) Drop-out voltage		N
8.4.4.2	Shunt releases (for opening)		N
8.4.5	Additional tests for CBRs		N
	a) Operation of the test device		N
	b) Verification of the calibration of the residual current tripping device of the CBR		N
8.4.6	Dielectric tests		N
8.4.7	Test for the verification of clearances less than those corresponding to case A of Table 13 of IEC 60947-1:2007		N
8.5	Special tests – Damp heat, salt mist, vibration and shock		N
Annex A	Co-ordination between a circuit-breaker and another short-circuit protective device associated in the same circuit		P
A.1	General		P
A.2	Scope and object		P
A.3	General requirements for the co-ordination of a circuit-breaker with another SCPD		P
A.3.1	General considerations		P
A.3.2	Take-over current		P
A.3.3	Behaviour of C1 in association with another SCPD		P
A.4	Type and characteristics of the associated SCPD		P
A.5	Verification of selectivity		P
A.5.1	General		P
A.5.2	Consideration of selectivity by desk study		P
A.5.3	Selectivity determined by test		P
A.6	Verification of back-up protection		P
A.6.1	Determination of the take-over current		P
A.6.2	Verification of back-up protection		P
A.6.3	Tests for verification of back-up protection		P
A.6.4	Results to be obtained		P
Annex B	Circuit-breakers incorporating residual current protection		N
B.1	General		N
B.2	Terms and definitions		N

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Clause	**Requirement – Test**	**Result - Remark**	**Verdict**
B.3	Classification		N
B.3.1	Classification according to the method of operation of the residual current function		N
B.3.2	Classification according to the possibility of adjusting the residual operating current		N
B.3.3	Classification according to time-delay of the residual current function		N
B.3.4	Classification according to behaviour in presence of a d.c. component		N
B.4	Characteristics of CBRs concerning their residual current function		N
B.4.1	Rated values		N
B.4.2	Preferred and limiting values		N
B.4.3	Value of the rated residual short-circuit making and breaking capacity (IΔm)		N
B.4.4	Operating characteristics in case of an earth fault current in the presence or absence of a d.c. component		N
B.5	Marking		N
B.6	Normal service, mounting and transport conditions		N
B.7	Design and operating requirements		N
B.7.1	Design requirements		N
B.7.2	Operating requirements		N
B.7.3	Electromagnetic compatibility		N
B.8	Tests		N
B.8.1	**Test sequences**		N
B.8.2	Verification of the operating characteristic		N
B.8.3	Verification of dielectric properties		N
B.8.4	Verification of the operation of the test device at the limits of rated voltage		N
B.8.5	Verification of the limiting value of the non-operating current under over-current conditions		N
B.8.6	Verification of the resistance against unwanted tripping due to surge currents resulting from impulse voltages		N
B.8.7	Additional verifications for CBRs of types A and B.		N
B.8.8	Additional verifications for CBRs of type B		N
B.8.9	Verification of the behaviour of CBRs functionally dependent on line voltage classified under B.3.1.2.1		N

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Clause	**Requirement – Test**	**Result - Remark**	**Verdict**
B.8.10	Verification of the behaviour of CBRs functionally dependent on line voltage classified under B.3.1.2.2		N
B.8.11	Verification of the residual short-circuit making and breaking capacity		N
B.8.12	Verification of the effects of environmental conditions		N
B.8.13	Verification of electromagnetic compatibility		N
B.8.14	Test for variations or interruptions of voltage and for voltage dips		N

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Clause	**Requirement – Test**	**Result - Remark**	**Verdict**

	TABLE: Heating test		P
	Test Voltage (V)..... :	400V	—
	Ambient (°C)..... :	23.5°C	—

Thermocouple locations:	**Max. temperature rise measured, Δ T (K)**	**Max. temperature rise limit, Δ T (K)**
Terminal	46.9	80
Enclosure	9.8	50
Switch	12.1	40
Supplementary information:		

	TABLE: Dielectric strength	P
Test voltage applied between:	**Test potential applied (V)**	**Breakdown / flashover (Yes/No)**
Between live parts of the switching element and parts of the control switch intended to be earthed	2000VAC	No
Between live parts of the switching element and surfaces of the control switch likely to be touched in service, conductive or made conductive by a metal foil;	2000 VAC	No
Supplementary information:		

	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**	
			te	**ti**	**te**	**ti**		
Enclosure	/	--	--	--	--	--	P	P

Object/ Part No./ Material	**Manufacturer / trademark**	**Glow-wire flammability index (GWFI), °C**				**GW ignition temp. (GWIT), °C**		**Verdict**
		550	**650**	**750**	**850**	**675**	**775**	
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The test specimen passed the glow wire test (GWT) with no ignition [(t_e – t_i) ≤ 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)? .....:	No
Ignition of the specified layer placed underneath the test specimen (Yes/No).....:	No

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Clause	**Requirement – Test**	**Result - Remark**	**Verdict**

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 A	TABLE: list of critical components				P
Object/part No.	Manufacturer/ trademark	Type/ model	Technical data	Standard	Mark(s) of conformity
Enclosure	SABIC INNOVATIVE PLASTICS CHINA CO LTD	923 (f1)	V-0, 125 degree	UL 94 UL748C	UL

ANNEX A:
Photo-documentation

Photo 1 View: [ ] front [ ] rear [ ] right side [ ] left side [√] top [ ] bottom [ ] internal	

EU Declaration of Conformity

We, **Shanghai Matis Electric Co., Ltd.**
Room 320, 83 Huanhu West Third Road, Pudong New Area, Shanghai, China

Declare that the product described below is in conformity with the Directive:

2014/35/EU Low Voltage Directive

Product: **Smart Metering MCCB**
Models: **MT88M, M5EL**

Having been examined to the requirements of the following standards:

EN 60947-2:2017+A1:2020

CE

Representative: Yuki
(signature & stamp)

Place/Date: 2022.07