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检测
TESTING
CNAS L0779

TEST REPORT

№WJ241103

Name of product: Single Phase Smart Energy Meter

Type and current range: CA168-M 230V 5(80)A 50Hz
Class: Active 1

Manufacturer: ShenZhen Calinmeter Co.,ltd.
Floor 6,Block A,Qiaode Tech Park,No.7 Guangming High-tech Zone,Tianliao Community,Yutang Sub-district,Guangming District,Shenzhen

Type of test:Proxy test

SIGEM

Harbin Research Institute of Electrical Instruments Co.,Ltd

检验检测专用章

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SICEM

TEST REPORT

Name of product	Single Phase Smart Energy Meter		
Type and current range	CA168-M 230V 5(80)A 50Hz	Class of sample	Active 1
Entrust unit	ShenZhen Calinmeter Co.,Ltd. Floor 6,Block A,Qiaode Tech Park,No.7 Guangming High-tech Zone,Tianliao Community, Yutang Sub-district,Guangming District,Shenzhen Tel: 0755-23707749		
Manufacturer	ShenZhen Calinmeter Co.,Ltd. Floor 6,Block A,Qiaode Tech Park,No.7 Guangming High-tech Zone,Tianliao Community, Yutang Sub-district,Guangming District,Shenzhen Tel: 0755-23707749		
Number of samples and state	3 normal	Sample No.	№1：47004042983 №2：47004043007 №3：47004043015
Sample arrival date	Nov.14,2024	Test time	Nov.14,2024 to Jan.14,2025
Test type	Proxy Test	Test item	46
Address of the test	No. 2000 Chuangxin Rd., Songbei District, Harbin,China		
Test standard	IEC62053-21:2020 Electricity metering equipment-Particular requirements-Part 21:Static meters for AC active energy(classes 0.5,1and 2) IEC62052-11:2020 Electricity metering equipment – General requirements, tests and test conditions-Part 11: Metering equipment		
Judge standard	/		
Test conclusion	The Single Phase Smart Energy Meter meets the requirements of IEC62053-21:2020 and IEC62052-11:2020. Date: 2025.1.14 Total pages: 25		
Note			

Test Persons: 丛宪廷 孙久强 Verifier: 王瑜 Ratify: 孙庆辉

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Test condition:

Ambient temperature: (21～24)℃ Relative humidity: (40～60) %

1. Test of safety requirements

1.1 Tests related to safety

1.1.1 AC voltage test

1. Requirement: IEC62053-21:2020 IEC62052-11:2020
2. Test method: The test voltage shall be substantially sinusoidal, having a frequency between 45Hz and 65Hz, and applied for 1 min. During this test no flashover, disruptive discharge or puncture shall occur.
3. Test equipment: Tester 860A (4540688)
4. Test result:

Test Voltage r.m.s	Test Result		
	№1	№2	№3
Between circuit and earth:3kV	Pass	Pass	Pass
Test conclusion	**Pass**	**Pass**	**Pass**

1.1.2 Impulse voltage test

1. Requirement: IEC62053-21:2020 IEC62052-11:2020
2. Test method: The impulse voltage is applied ten times with one polarity and then repeated with the other polarity. The minimum time between the impulses shall be 3s.
3. Test equipment: Tester XTS-11A (03052)
4. Test result:

Impulse Voltage	Test result		
	№1	№2	№3
Impulse waveform 1.2/50μs, 6.4kV	Pass	Pass	Pass
cosΦ=1.0 , I_n, error(%)	0.06	0.10	0.12
Test conclusion	**Pass**	**Pass**	**Pass**

1.1.3 Temperature limits and resistance to heat

1. Requirement: IEC62053-21:2020 IEC62052-11:2020
2. Test method: With each current circuit of the meter carrying maximum current and with each voltage circuit carrying 1.15 times the reference voltage, the temperature rise of the external surface shall not exceed85℃, with an ambient temperature of 40℃.
3. Test equipment: Digital thermometer WMY-01(212)
4. Test result:

Power factor:cosΦ= 1.0 Voltage: 264.5V Reference frequency:50Hz Current:80A Temperature :23℃

Test condition		Limits of temperature rise (℃)	Test result (K)		
			№1	№2	№3
With each current circuit of the meter carrying maximum current and with each voltage circuit carrying 1.15 times the reference voltage, with an ambient temperature of 23℃.	Surface temperature limits for protection against burns	100	72	73	72
	Temperature limits for terminals	120	85	86	86
Test conclusion			**Pass**	**Pass**	**Pass**

1.1.4 Spring hammer test

1. Requirement: IEC62053-21:2020 IEC62052-11:2020
2. Test method: The meter shall be mounted in its normal working position and the spring hammer shall act on the outer surfaces of the meter cover (including windows) and on the terminal cover with a kinetic energy of 0.2J±0.02J.
3. Test equipment: Impact test bench TY2(027)
4. Test result:

Test part	Test requirement	Test result		
		№1	№2	№3
Outside surface	No damage	Pass	Pass	Pass
Terminal cover	No damage	Pass	Pass	Pass
Test conclusion		**Pass**	**Pass**	**Pass**

1.1.5 Test of resistance to heat and fire

1. Requirement: IEC62053-21:2020 IEC62052-11:2020
2. Test method: The contact with the glow wire may occur at any random location.If the terminal block is integral with the meter base,It is sufficient to carry out the test only on the terminal block.
3. Test equipment: Hot wire test device ZHZ13 (35093)
4. Test result:

Location	Temperature (℃)	Requirement	Test result		
			№1	№2	№3
Terminal block	960±15	No burn	Pass	Pass	Pass
Terminal Cover	650±10	No burn	Pass	Pass	Pass
Case	650±10	No burn	Pass	Pass	Pass
Test conclusion			**Pass**	**Pass**	**Pass**

1.1.6 Test of protection against penetration of dust

1. Requirement: IEC62053-21:2020 IEC62052-11:2020
2. Test method: IEC62053-21:2020 IEC62052-11:2020
3. Test equipment: Dust test chamber SC-500 （990122）
4. Test result:

Test condition	Requirement	Test result		
		№1	№2	№3
IP5X	Any ingress of dust shall be only in a quantity not impairing the operation of the meter and its dielectric strength (insulating strength)	Pass	Pass	Pass
Test conclusion		**Pass**	**Pass**	**Pass**

1.1.7Test of protection against penetration of water

1. Requirement: IEC62053-21:2020 IEC62052-11:2020
2. Test method: IEC62053-21:2020 IEC62052-11:2020
3. Test equipment: rain test device CNW0115-034WS (THS20212038OS)
4. Test result:

Test condition	Requirement	Test result		
		№1	№2	№3
IPX6	Any ingress of dust shall be only in a quantity not impairing the operation of the meter and its dielectric strength (insulating strength)	Pass	Pass	Pass
Test conclusion		**Pass**	**Pass**	**Pass**

2. Tests of mechanical requirements

2.1 Shock test

1. Requirement: IEC62053-21:2020 IEC62052-11:2020
2. Test method: The meter shall show no damage or change of the information and shall operate correctly in accordance with the requirements of this standard after the test.
3. Test equipment: Shock test bench CP-100(120807)and Meter calibration device ST9001D5 (7131019)
4. Test result:

Reference frequency :50Hz Current: 5(80)A Reference voltage :230V

Current	Power factor (cosΦ)	Percentage error limits (%)	Test result (%)		
			№1	№2	№3
I_n	1.0	±1.0	0.07	0.10	0.12
Test conclusion			**Pass**	**Pass**	**Pass**

2.2 Vibration test

1. Requirement: IEC62053-21:2020 IEC62052-11:2020
2. Test method: The meter shall show no damage or change of the information and shall operate correctly in accordance with the requirements of this standard after the test.
3. Test equipment: Vibration test bench D-1000-5(920407)and Meter calibration device ST9001D5 (7131019)
4. Test result:

Reference frequency :50Hz Current: 5(80)A Reference voltage :230V

Current	Power factor (cosΦ)	Percentage error limits (%)	Test result (%)		
			№1	№2	№3
I_n	1.0	±1.0	0.09	0.12	0.10
Test conclusion			**Pass**	**Pass**	**Pass**

2.3 Terminals – Terminal block(s) (No requirement)

3.Tests of general requirements

3.1 Power consumption

1. Requirement: IEC62053-21:2020 IEC62052-11:2020
2. Test method: The power consumption in the voltage and current circuit at reference values of the influence quantities.
3. Test equipment: Low power factor wattmeter D5-W (20149) and DMM 7150(303645)
4. Test result:

Power factor :cosΦ=1.0 Reference frequency:50Hz Current: 5(80)A Reference voltage: 230V

Test item	Specified range of power consumption (active)	Test result (%)		
		№1	№2	№3
Voltage circuit	5 W	0.58W	0.60W	0.58W
	25VA	0.92VA	0.95VA	0.95VA
Current circuit	1VA	0.15VA	0.14VA	0.14VA
Test conclusion		**Pass**	**Pass**	**Pass**

3.2 Meter marking

1. Requirement: IEC62053-21:2020 IEC62052-11:2020
2. Test method: It shall be verified that the relation between the test output and the indication on the display complies with the marking on the name-plate.
3. Test equipment: Meter calibration device ST9001D5 (7131019)
4. Test result:

Test condition	Test result		
	№1	№2	№3
A meter shall bear all of the markings required by local regulations. In addition, and if not already required by the local regulations, the meter shall also bear the following information as applicable: IEC62052-11:2020 6.2 a)~ p)	**Pass**	**Pass**	**Pass**
Test conclusion	**Pass**	**Pass**	**Pass**

4 Tests of accuracy requirements

4.1 Meter constant

1. Requirement: IEC62053-21:2020 IEC62052-11:2020
2. Test method: It shall be verified that the relation between the test output and the indication on the display complies with the marking on the name-plate.
3. Test equipment: Meter calibration device ST9001D5 (7131019)
4. Test result:

Reference frequency: 50Hz Current: 80A Reference voltage :230V

Power factor (cosΦ)	Test result (imp/kWh)		
	№1	№2	№3
1.0	1000	1000	1000
Test conclusion	**Pass**	**Pass**	**Pass**

4.2 Initial start-up of the meter

1. Requirement: IEC62053-21:2003 IEC62052-11: 2003
2. Test method: IEC62053-21:2003 IEC62052-11: 2003
3. Test equipment: Meter calibration device ST9001D5 (7131019)
4. Test result:

Reference frequency: 50Hz Current :5(80)A Reference voltage :230V

Test item	Test result		
	№1	№2	№3
Initial start-up	Pass	Pass	Pass
Test conclusion	**Pass**	**Pass**	**Pass**

4.3 Test of no-load condition

1. Requirement: IEC62053-21:2020 IEC62053-23:2020 IEC62052-11;2020
2. Test method: The current circuit shall be open circuit and a voltage of 110% of the reference voltage shall be applied to the voltage circuits.
3. Test equipment: Meter calibration device ST9001D5 (7131019)
4. Test result:

Power factor:cosΦ=1.0 Reference frequency: 50Hz Current: 5(80)A Reference voltage :230V

Voltage	Test result		
	№1	№2	№3
110% of the reference voltage	Pass	Pass	Pass
Test conclusion	**Pass**	**Pass**	**Pass**

4.4 Starting current test

1. Requirement: IEC62053-21:2020 IEC62052-11:2020
2. Test method: The meter shall start and continue to register $0.004I_n$.
3. Test equipment: Meter calibration device ST9001D5 (7131019)
4. Test result:

Reference frequency: 50Hz Current :5(80)A Reference voltage: 230V

Power factor (cosΦ)	Current	Test Result		
		№1	№2	№3
1.0	$0.004I_n$	Pass	Pass	Pass
Test conclusion		**Pass**	**Pass**	**Pass**

4.5 Repeatability test

1. Requirement: IEC62053-21:2020 IEC62052-11:2020
2. Test method: When the meter is under the reference conditions, the percentage errors shall not exceed the limits.
3. Test equipment: Meter calibration device ST9001D5 (7131019)
4. Test result:

Reference frequency: 50Hz Current: 5(80)A Reference voltage :230V

Current	Power factor (cosΦ)	Percentage error limits (%)	Test result (%)		
			№1	№2	№3
I_{min}	1.0	±0.3	0.03	0.04	0.02
$0.1I_n$	1.0	±0.2	0.01	0.02	0.02
I_n	1.0	±0.2	0.01	0.02	0.02
I_{max}	1.0	±0.2	0.01	0.02	0.01
$0.1I_n$	0.5L	±0.3	-0.01	0.01	-0.01
I_n	0.5L	±0.2	-0.02	0.01	0.02
I_{max}	0.5L	±0.2	0.00	0.02	0.03
$0.1I_n$	0.8C	±0.3	0.03	0.02	0.02
I_n	0.8C	±0.2	0.04	0.01	0.02
I_{max}	0.8C	±0.2	0.02	0.04	0.01
Test conclusion			**Pass**	**Pass**	**Pass**

4.6 Limits of error due to variation of the current

1. Requirement: IEC62053-21:2020 IEC62052-11:2020
2. Test method: When the meter is under the reference conditions, the percentage errors shall not exceed the limits.
3. Test equipment: Meter calibration device ST9001D5 (7131019)
4. Test result:

Reference frequency: 50Hz Current: 5(80)A Reference voltage :230V

Current	Power factor (cosΦ)	Percentage error limits (%)	Test result (%)		
			№1	№2	№3
I_{min}	1.0	±1.5	0.23	0.30	0.28
$0.1I_n$	1.0	±1.0	0.12	0.15	0.10
$0.5I_n$	1.0	±1.0	0.07	0.07	0.09
I_n	1.0	±1.0	0.13	0.09	0.10
$0.5I_{max}$	1.0	±1.0	0.05	0.08	0.06
I_{max}	1.0	±1.0	0.06	0.07	0.04
$0.1I_n$	0.5L	±1.5	0.12	0.15	0.11
$0.2I_n$	0.5L	±1.0	0.07	0.10	0.03
$0.5I_n$	0.5L	±1.0	0.04	0.05	0.01
I_n	0.5L	±1.0	0.04	0.06	0.01
$0.5I_{max}$	0.5L	±1.0	0.03	0.01	-0.06
I_{max}	0.5L	±1.0	-0.03	-0.04	-0.08
$0.1I_n$	0.8C	±1.5	0.12	0.10	0.15
$0.2I_n$	0.8C	±1.0	0.07	0.12	0.11
$0.5I_n$	0.8C	±1.0	0.13	0.11	0.14
I_n	0.8C	±1.0	0.12	0.16	0.14
$0.5I_{max}$	0.8C	±1.0	0.07	0.02	0.11
I_{max}	0.8C	±1.0	0.09	-0.18	0.10
Test conclusion			**Pass**	**Pass**	**Pass**

4.7 Test of time keeping accuracy

1. Requirement: IEC62053-21:2020 IEC62052-11:2020
2. Test method: IEC62053-21:2020 IEC62052-11:2020
3. Test equipment: Meter calibration device ST9001D5 (7131019)
4. Test result:

Test requirements	Test result		
	№1	№2	№3
At reference voltage and reference temperature,crystal-controlled time switches shall have a time-keeping accuracy better than ±0,5 s/day.	**Pass**	**Pass**	**Pass**
The variation of the time-keeping accuracy with the temperature shall be less than(±0,15 s/C/24h).	**Pass**	**Pass**	**Pass**
On operation reserve,at reference temperature, the time-keeping accuracy shall be better than ±1 s /day.	**Pass**	**Pass**	**Pass**
Test conclusion	**Pass**	**Pass**	**Pass**

5 Tests for electromagnetic compatibility (EMC) and limits of error due to influence quantities

5.1 Limits of percentage error due to influence quantities

See details 5.2~5.13

5.2 Voltage dips and short interruptions

1. Requirement: IEC62053-21:2020 IEC62052-11:2020
2. Test method: IEC62053-21:2020 IEC62052-11:2020
3. Test equipment: Cycle drop device VDS-1132A(VDS-1132A0130101)and Meter calibration device ST9001D5 (7131019)
4. Test result:

Reference frequency :50Hz Reference voltage :230V

Interrupt and interruption voltage and time	The function of judgment	Limits of change in the register	Test result		
			№1	№2	№3
ΔU=100% 5 cycle	Register Function	≤0.0184kWh	Pass	Pass	Pass
	Output pulse	No output	Pass	Pass	Pass
ΔU=100% 50 cycle	Register Function	≤0.0184kWh	Pass	Pass	Pass
	Output pulse	No output	Pass	Pass	Pass
ΔU=100% 1 cycle	Register Function	≤0.0184kWh	Pass	Pass	Pass
	Output pulse	No output	Pass	Pass	Pass
ΔU=95% 250 cycle	Register Function	≤0.0184kWh	Pass	Pass	Pass
	Output pulse	No output	Pass	Pass	Pass
ΔU=60% 5 cycle	Register Function	≤0.0184kWh	Pass	Pass	Pass
	Output pulse	No output	Pass	Pass	Pass
ΔU=60% 50 cycle	Register Function	≤0.0184kWh	Pass	Pass	Pass
	Output pulse	No output	Pass	Pass	Pass
ΔU=30% 0.5 cycle	Register Function	≤0.0184kWh	Pass	Pass	Pass
	Output pulse	No output	Pass	Pass	Pass
ΔU=30% 1 cycle	Register Function	≤0.0184kWh	Pass	Pass	Pass
	Output pulse	No output	Pass	Pass	Pass
ΔU=50% 3000 cycle	Register Function	≤0.0184kWh	Pass	Pass	Pass
	Output pulse	No output	Pass	Pass	Pass
I_n cosΦ=1.0	The error (%) after the test		0.11	0.09	0.12
Test conclusion			**Pass**	**Pass**	**Pass**

5.3 Electrostatic discharge immunity test

1. Requirement: IEC62053-21:2020 IEC62052-11:2020
2. Test method: IEC62053-21:2020
3. Test equipment: Electrostatic discharge generator ESD-203A(ESD-203A0130102)
4. Test result:

Reference frequency :50Hz Reference voltage: 230V

Test conditions	The function of judgment	Limits of change in the register	Test result		
			№1	№2	№3
Indirect discharge 8kV, contact discharge 8kV, air discharge 15kV	Register Function	≤0.0184kWh	Pass	Pass	Pass
I_n cosΦ=1.0	The error (%) after the test		0.12	0.15	0.14
Test conclusion			**Pass**	**Pass**	**Pass**

5.4 Radiated, radio-frequency,electromagnetic field immunity test

1. Requirement: IEC62053-21:2020 IEC62052-11:2020
2. Test method: IEC62052-11:2020
3. Test equipment: Signal generator SMB100A (115554)
   Power amplifier AS0104-200/200 (1034148)
   Power amplifier A P32MT255 (S/N:0906-943)
   Broadband horn antennaBBHA9120J(S/N:00180)
   Log periodic antennaSTLP9128E(N#1155)
4. Test result:

Test without current

Frequency: 50Hz Reference voltage: 230V

Test conditions	Criteria B	Test result		
		№1	№2	№3
Frequencyband:80MHz-2GHz, unmodulated field strength 30 V/m; Frequency band: 2 GHz MHz to 6 GHz, unmodulated field strength of 10 V/m; carrier modulated with 80 % AM, at 1 kHz sine wave; The dwell time:3 s	Limits of change in the register ≤0.0184kWh	Pass	Pass	Pass
	indicating display	Pass	Pass	Pass
Test conclusion		**Pass**	**Pass**	**Pass**

Test with current

Frequency: 50Hz Current :5A Reference voltage: 230V

Test conditions	Criteria A	The maximum variationin in percentage error		
		№1	№2	№3
Frequency band:80 MHz to 2 GHz, unmodulated field strength of 10 V/m; Frequency band: 2GHz MHz to 6GHz, unmodulated field strength of 3V/m; carrier modulated with 80 % AM at 1 kHz sine wave; The frequency step :1 %;	Limits of the variation(%): 2.0 (cosΦ=1.0)	0.21	0.30	0.31
	indicating display	Pass	Pass	Pass
Test conclusion		**Pass**	**Pass**	**Pass**

5.5 Electrical fast transient/burst immunity test

1. Requirement: IEC62053-21:2020 IEC62052-11:2020
2. Test method: IEC62052-11:2020
3. Test equipment: Burst generator EFT-406N (EFT0460905)
4. Test result:

Frequency :50Hz Reference voltage :230V Current :5A

Test conditions	Criteria A		Test result		
			№1	№2	№3
Test Voltage: 4kV Repetition rate: 100 kHz	I_n cosΦ=1.0	Acceptable limit of the variation (%): 4.0	0.13	0.21	0.15
	Criteria B	indicating display	Pass	Pass	Pass
Test conclusion			**Pass**	**Pass**	**Pass**

5.6 Immunity to conducted disturbances, induced by radio-frequency fields

1. Requirement: IEC62053-21:2020 IEC62052-11:2020
2. Test method: IEC62053-21:2020 IEC62052-11:2020
3. Test equipment: NSG4070-75 Conducted disturbances test system (35761)
4. Test result:

Reference voltage: 230V Power factor: cosΦ=1.0 Reference frequency :50Hz Current :5(80)A

Test voltage	Frequency (MHz)	Limits of variation (%)	Test result		
			№1	№2	№3
10V	0.15	2.0	0.05	0.08	0.12
	0.5		0.10	0.13	0.12
	1.0		0.05	0.12	0.10
	2.0		0.07	0.08	0.12
	5.0		0.12	0.05	0.07
	10.0		0.10	0.05	0.08
	20.0		0.12	0.12	0.10
	30.0		0.13	0.11	0.12
	50.0		0.08	0.02	0.13
	80.0		0.10	0.05	0.10
Test conclusion			**Pass**	**Pass**	**Pass**

Reference voltage: 230V Reference frequency:50Hz

Test content	Limits of charge in the register	Test result		
		№1	№2	№3
Frequency range: 150kHz~80MHz	≤0.0184kWh	Pass	Pass	Pass
	No output	Pass	Pass	Pass
Test conclusion		**Pass**	**Pass**	**Pass**

5.7 Test for Immunity to conducted, differential mode disturbances and signalling in the frequency range 2 kHz to 150 kHz at AC power ports

1. Requirement: IEC62053-21:2020 IEC62052-11:2020
2. Test method: IEC62052-11:2020
3. Test equipment: Differential-mode conduction harassment simulator IMU-MGS-SMART (109938-1583)、IMUSLAVE EXT-SMART II (107128-1501)
4. Test result:

Frequency :50Hz voltage: 230V Current :5A

Test conditions	Criteria A		Test result		
			№1	№2	№3
2 kHz to 30 kHz: I diff = 3 A, 30 kHz to 150 kHz: I diff = 1,5 A. Frequency step: 1%	I_n cosΦ=1.0	Acceptable limit of the variation (%): 4.0	0.10	0.20	0.17
	Criteria B	indicating display	Pass	Pass	Pass
Test conclusion			**Pass**	**Pass**	**Pass**

5.8 Surge immunity test

1. Requirement: IEC62053-21:2020 IEC62052-11:2020
2. Test method: IEC62052-11:2020
3. Test equipment: Surge generator LSG-510A (LSG05100905)
4. Test result:

Reference frequency :50Hz Reference voltage: 230V

Test conditions	The function of judgment	Requirements	Test result		
			№1	№2	№3
Test Voltage: 4kV phase angles: 0°, 90°, 180°, 270°	Register Function	≤0.0184kWh	Pass	Pass	Pass
	indicating display	permit display quality degradation	Pass	Pass	Pass
I_n cosΦ=1	The percentage error after the test		0.12	0.08	0.10
Test conclusion			**Pass**	**Pass**	**Pass**

5.9 Ring wave immunity test

1. Requirement: IEC62052-11:2020 IEC62053-23:2020
2. Test method: IEC62052-11:2020
3. Test equipment: Ring wave generator OCS500N (P180621438)
4. Test result:

Reference frequency :50Hz Reference voltage: 220V

Test conditions	The function of judgment	Requirements	Test result		
			№1	№2	№3
line to ground:4kV differential mode:2kV phase angles: 0°, 90°, 180°, 270°	Register Function	≤0.0184kWh	Pass	Pass	Pass
	indicating display	Permit display quality degradation	Pass	Pass	Pass
I_n cosΦ=1	The percentage error after the test		0.15	0.07	0.11
Test conclusion			**Pass**	**Pass**	**Pass**

5.10 Damped oscillatory wave immunity test(not applicable)

5.11 External static magnetic fields

1. Requirement: IEC62053-21:2003 IEC62052-11:2020
2. Test method: IEC62052-11:2020
3. Test equipment: DC steady current source YJ-10A(6102) and Meter calibration device ST9001D5 (7131019).
4. Test result:

Reference frequency :50Hz Current: 5A Reference voltage :230V

Test conditions	Location	Power factor (cosΦ)	Limits of variation (%)	Test result (%)		
				№1	№2	№3
the magneto-motive force: 1000 At	Front	1.0	2.0	0.09	0.09	0.11
	Up	1.0	2.0	0.08	0.08	0.08
	Left	1.0	2.0	0.14	0.09	0.06
	Right	1.0	2.0	0.08	0.09	0.08
	indicating display			Pass	Pass	Pass
Test conclusion				**Pass**	**Pass**	**Pass**

5.12 Power frequency magnetic field immunity test

1. Requirement: IEC62053-21:2003 IEC62052-11:2020
2. Test method: IEC62052-11:2020
3. Test equipment: Meter calibration device ST9001D5 (7131019) and External magnetic field test bench ZHZ26A(09021)
4. Test result:

Reference frequency: 50Hz Current: 5A Reference voltage :230V

Test conditions	Power factor (cosΦ)	Dimension of magnetic	Limits of variation (%)	Test result (%)		
				№1	№2	№3
field strength 0.5 mT (400 A/m)	1.0	X-axis	2.0	0.10	0.12	0.07
			2.0	0.09	0.09	0.05
		Y-axis	2.0	0.04	0.12	0.10
			2.0	0.04	0.09	0.11
		Z-axis	2.0	0.12	0.10	0.08
			2.0	0.15	0.05	0.03
		indicating display		Pass	Pass	Pass
Test conclusion				**Pass**	**Pass**	**Pass**

5.13 Emission requirements

1. Requirement:IEC62052-11:2020
2. Test method: IEC62052-11:2020
3. Test equipment: Electromagnetic disturbance test receiver PMM9010 (696WX21006)
   Electromagnetic disturbance test receiver PMM9030 (121WX10404)
   Log periodic antenna LP-02 (0011X51001)
   Biconical dipole antenna BC-01 (0011X20703)
   Three-phase power supply network of artificial L3-32 (0120X90108)
4. Test result:

a. Limit value of conducted disturbances:

Reference voltage : 230V Power factor: 1.0 Reference frequency: 50Hz Current: 0.5A

Frequency (MHz)	Limits of quasi peak value dB(μV)	Limits of average value dB(μV)	Test result of average value(μV)
			№1
0.15~0.50	66~56	56~46	≤31
0.50~5	56	46	≤26
5~30	60	50	≤28
Test conclusion			**Pass**

b. Limit value of radiation disturbances:

Reference voltage: 230V Power factor: 1.0 Reference frequency: 50Hz Current :0.5A

Frequency (MHz)	Limits of quasi peak value dB(dBμV/m)	Test result of peak value(dBμV/m)
		№1
30~230	40	≤25
230~1000	47	≤33
Test conclusion		**Pass**

6 Tests of immunity to other influence quantities

6.1 Limits of error due to influence quantities

See details 6.2~6.16

6.2 Harmonics in the current and voltage circuits 5th harmonic test

1. Requirement: IEC62053-21:2020 IEC62052-11:2020
2. Test method: Test the variation in percentage errors at power with harmonic.
3. Test equipment:Meter calibration device ST9001D5 (7131019)
4. Test result:

Reference frequency :50Hz Current: 5(80)A Reference voltage: 230V

Influence quantity	Current	Power factor (cosΦ)	Limits of variation (%)	Test result (%)		
				№1	№2	№3
Harmonics in the current and voltage circuits 5th harmonic test	$0.5I_{max}$	1.0	0.8	0.02	0.03	0.03
Test conclusion				**Pass**	**Pass**	**Pass**

6.3 Interharmonics in the current circuit – burst fired waveform test

1. Requirement: IEC62053-21:2020 IEC62052-11:2020
2. Test method: Test the variation in percentage errors at power with harmonic.
3. Test equipment:Meter calibration device ST9001D5 (7131019)
4. Test result:

Reference frequency :50Hz Current: 5(80)A Reference voltage: 230V

Influence quantity	Current	Power factor (cosΦ)	Limits of variation (%)	Test result (%)		
				№1	№2	№3
Interharmonics in the current circuit – burst fired waveform	$0.5I_n$	1.0	3.0	0.02	0.01	0.04
Test conclusion				**Pass**	**Pass**	**Pass**

6.4 Odd harmonics in the current circuit

1. Requirement: IEC62053-21:2020 IEC62052-11:2020
2. Test method: Test the variation in percentage errors at power with harmonic.
3. Test equipment:Meter calibration device ST9001D5 (7131019)
4. Test result:

Reference frequency :50Hz Current: 5(80)A Reference voltage: 230V

Influence quantity	Phase fired waveforms	Current	Power factor (cosΦ)	Limits of variation (%)	Test result (%)		
					№1	№2	№3
odd-harmonics in the A.C. Current circuit	45°	$0.5I_n$	1.0	3.0	0.14	0.16	0.14
odd-harmonics in the A.C. Current circuit	90°	$0.5I_n$	1.0	3.0	0.12	0.10	0.12
odd-harmonics in the A.C. Current circuit	135°	$0.5I_n$	1.0	3.0	0.11	0.15	0.13
Test conclusion					**Pass**	**Pass**	**Pass**

6.5 DC and even harmonics – half wave rectified waveform test

1. Requirement: IEC62053-21:2020 IEC62052-11:2020
2. Test method: Test the variation in percentage errors at power with harmonic.
3. Test equipment:Meter calibration device ST9001D5 (7131019)
4. Test result:

Reference frequency :50Hz Current: 5(80)A Reference voltage: 230V

Influence quantity	Current	Power factor (cosΦ)	Limits of variation (%)	Test result (%)		
				№1	№2	№3
DC and even harmonics in the current circuit	$\frac{I_{max}}{\sqrt{2}}$	1.0	3.0	0.15	0.20	0.18
		0.5	3.0	0.23	0.25	0.24
Test conclusion				**Pass**	**Pass**	**Pass**

6.6 Voltage variation

1. Requirement: IEC62053-21:2020 IEC62052-11:2020
2. Test method: Test the variation in percentage errors when voltage variation.
3. Test equipment:Meter calibration device ST9001D5 (7131019)
4. Test result:

Reference frequency :50Hz Current :5(80)A Reference voltage: 230V

Current	Power factor (cosΦ)	Voltage (V)	Limits of variation (%)	Test result (%)		
				№1	№2	№3
I_{min}	1.0	207	0.5	0.01	-0.02	-0.02
I_n	1.0	207	0.5	-0.03	0.04	-0.03
I_{max}	1.0	207	0.5	0.05	-0.13	-0.01
$0.1I_n$	0.5L	207	1.0	0.03	-0.02	0.00
I_n	0.5L	207	1.0	0.02	-0.01	-0.02
I_{max}	0.5L	207	1.0	-0.05	-0.17	0.01
I_{min}	1.0	253	0.5	0.02	-0.02	-0.02
I_n	1.0	253	0.5	-0.06	0.09	-0.02
I_{max}	1.0	253	0.5	0.07	-0.16	0.01
$0.1I_n$	0.5L	253	1.0	0.03	0.01	-0.01
I_n	0.5L	253	1.0	0.02	0.05	0.01
I_{max}	0.5L	253	1.0	0.03	-0.11	-0.01
I_{min}	1.0	184	1.5	0.02	0.02	0.01
I_n	1.0	184	1.5	-0.01	0.01	0.06
I_{max}	1.0	184	1.5	0.02	-0.10	-0.07
$0.1I_n$	0.5L	184	3.0	0.03	0.03	0.00
I_n	0.5L	184	3.0	0.02	0.04	0.02
I_{max}	0.5L	184	3.0	0.04	-0.13	0.01
I_{min}	1.0	264.5	1.5	0.04	0.03	0.03
I_n	1.0	264.5	1.5	0.01	-0.02	0.03
I_{max}	1.0	264.5	1.5	0.05	-0.15	0.02
$0.1I_n$	0.5L	264.5	3.0	0.05	0.05	0.03
I_n	0.5L	264.5	3.0	0.04	0.03	0.04
I_{max}	0.5L	264.5	3.0	0.08	-0.10	0.06
I_{min}	1.0	<184	-100 ~ 10	Pass	Pass	Pass
I_n	1.0	<184	-100 ~ 10	Pass	Pass	Pass
I_{max}	1.0	<184	-100 ~ 10	Pass	Pass	Pass
$0.1I_n$	0.5L	<184	-100 ~ 10	Pass	Pass	Pass
I_n	0.5L	<184	-100 ~ 10	Pass	Pass	Pass
I_{max}	0.5L	<184	-100 ~ 10	Pass	Pass	Pass
Test conclusion				**Pass**	**Pass**	**Pass**

6.7 Ambient temperature variation

1. Requirement: IEC62053-21:2020 IEC62052-11:2020
2. Test method: The determination of the mean temperature coefficient for a given temperature shall be made over a temperature range 10K above and 10 K below that temperature, but in no case shall the temperature be outside the specified operating temperature range.
3. Test equipment: High and low temperature test chambers PL-2GT(920218)and Meter calibration device ST9001D5 (7131019)
4. Test result:

Reference frequency :50Hz Current: 5(80)A Reference voltage :230V

Current	Power factor (cosΦ)	Temperature (K)	Limits of mean temperature coefficient (%/K)	Test result (%/K)		
				№1	№2	№3
I_{min}	1.0	-25℃~-5℃	0.05	0.004	0.006	0.004
I_n	1.0		0.05	-0.008	-0.006	0.002
I_{max}	1.0		0.05	-0.004	0.007	0.006
$0.2I_n$	0.5L		0.07	-0.008	-0.010	0.010
I_n	0.5L		0.07	0.010	0.004	-0.012
I_{max}	0.5L		0.07	0.018	0.008	-0.016
I_{min}	1.0	-5℃~15℃	0.05	-0.006	0.006	0.007
I_n	1.0		0.05	-0.010	-0.007	0.009
I_{max}	1.0		0.05	-0.006	-0.012	-0.005
$0.2I_n$	0.5L		0.07	0.006	0.013	-0.006
I_n	0.5L		0.07	0.005	-0.004	-0.006
I_{max}	0.5L		0.07	-0.012	-0.005	-0.008
I_{min}	1.0	15℃~35℃	0.05	0.006	0.011	0.006
I_n	1.0		0.05	0.005	-0.008	-0.004
I_{max}	1.0		0.05	-0.008	0.007	-0.006
I_{min}	0.5L		0.07	0.008	0.014	-0.004
I_n	0.5L		0.07	0.002	-0.008	-0.006
I_{max}	0.5L		0.07	-0.004	-0.005	-0.004
I_{min}	1.0	35℃~55℃	0.05	-0.006	0.007	0.007
I_n	1.0		0.05	0.010	0.008	0.011
I_{max}	1.0		0.05	0.012	-0.004	0.006
$0.2I_n$	0.5L		0.07	-0.005	0.008	-0.006
I_n	0.5L		0.07	-0.007	-0.009	-0.007
I_{max}	0.5L		0.07	-0.003	-0.005	-0.004
Test conclusion				**Pass**	**Pass**	**Pass**

6.8 Interruption of phase voltage（Not applicable）

6.9 Frequency variation

1. Requirement: IEC62053-21:2020 IEC62052-11:2020
2. Test method: Test the variation in percentage errors when frequency variation at ±2%.
3. Test equipment: Meter calibration device ST9001D5 (7131019)
4. Test result:

Reference frequency :50Hz Current :5(80)A Reference voltage: 230V

Current	Power factor (cosΦ)	Frequency (Hz)	Limits of variation (%)	Test result (%)		
				№1	№2	№3
I_{min}	1.0	49	0.5	0.02	0.00	0.00
I_n	1.0	49	0.5	-0.02	0.00	0.00
I_{max}	1.0	49	0.5	0.05	-0.11	-0.08
$0.1I_n$	0.5L	49	0.7	0.04	-0.08	-0.07
I_n	0.5L	49	0.7	0.03	-0.06	0.00
I_{max}	0.5L	49	0.7	-0.03	-0.01	-0.02
I_{min}	1.0	51	0.5	0.02	0.00	0.03
I_n	1.0	51	0.5	-0.01	0.00	0.00
I_{max}	1.0	51	0.5	0.04	-0.09	0.00
$0.1I_n$	0.5L	51	0.7	-0.02	-0.01	0.00
I_n	0.5L	51	0.7	0.02	-0.01	0.03
I_{max}	0.5L	51	0.7	-0.03	-0.01	0.04
Test conclusion				**Pass**	**Pass**	**Pass**

6.10 Reversed phase sequence（Not applicable）

6.11 Auxiliary voltage variation （Not applicable）

6.12 Operation of auxiliary devices（Not applicable）

6.13 Short time overcurrents

1. Requirement: IEC62053-21:2020 IEC62052-11:2020
2. Test method: After the application of the short- time over current, the meter shall perform correctly when back to its initial working.
3. Test equipment: Pulse current test bench XTS-12D(03017) and Meter calibration device ST9001D5 (7131019)
4. Test result:

Reference frequency: 50Hz Current: Current: 5(80)A Reference voltage: 230V

Current	Power factor (cosΦ)	Limits of variation (%)	Test result (%)		
			№1	№2	№3
I_n	1.0	1.5	0.02	0.02	0.04
Test conclusion			**Pass**	**Pass**	**Pass**

6.14 Self-heating

1. Requirement: IEC62053-21:2020 IEC62052-11:2020
2. Test Method: After the voltage circuits have been energized at reference voltage for at least 2h for class 1, without any current in the current circuits, the maximum current shall be applied to the current circuits, the meter error shall be measured at unity power factor immediately after the current is applied.
3. Test Equipment: Meter calibration device ST9001D5 (7131019)
4. Test Result:

Reference frequency: 50Hz Current :80A Reference voltage: 230V

Current	Power factor (cosΦ)	Limits of variation (%)	Maximum change (%)		
			№1	№2	№3
I_{max}	1.0	0.7	0.07	0.09	0.08
I_{max}	0.5L	1.0	0.07	0.07	0.09
Test conclusion			**Pass**	**Pass**	**Pass**

6.15 Fast load current variations

1. Requirement: IEC62053-21:2020 IEC62052-11:2020
2. Test Method: IEC62053-21:2020 IEC62052-11:2020
3. Test Equipment: Meter calibration device ST9001D5 (7131019)
4. Test Result:

Reference frequency: 50Hz Current: 5(80)A Reference voltage: 230V

Current	Requirement	Power factor (cosΦ)	Limits of variation (%)	Maximum change (%)		
				№1	№2	№3
I_n	t_{on} = 10 s t_{off} = 10 s	1.0	2.0	0.09	0.05	0.08
I_n	t_{on} = 5s t_{off} = 5s	1.0	2.0	0.11	0.04	0.09
I_n	t_{on} = 5s t_{off} = 0.5s	1.0	2.0	0.07	0.09	0.10
Test conclusion				**Pass**	**Pass**	**Pass**

6.16 Earth fault（Not applicable）

7 Tests of the effect of the climatic environments

7.1 Dry heat test

1. Requirement: IEC62053-21:2020 IEC62052-11:2020
2. Test method: After dry heat test, the meter shall show no damage or change of the information and shall operate correctly .
3. Test equipment: High and low temperature test chambers PL-2G(920218)and Meter calibration device ST9001D5 (7131019)
4. Test result:

Reference frequency :50Hz Current: 5(80)A Reference voltage :230V

Current	Power factor (cosΦ)	Percentage error limits (%)	Test result (%)		
			№1	№2	№3
I_n	1.0	±0.5	0.10	0.05	0.12
Test conclusion			**Pass**	**Pass**	**Pass**

7.2 Cold test

1. Requirement: IEC62053-21:2020 IEC62052-11:2020
2. Test method: After cold test, the meter shall show no damage or change of the information and shall operate correctly.
3. Test equipment: High and low temperature test chambers PL-2G(920218)and Meter calibration device ST9001D5 (7131019)
4. Test result:

Reference frequency :50Hz Current: 5(80)A Reference voltage :230V

Current	Power factor (cosΦ)	Percentage error limits (%)	Test result (%)		
			№1	№2	№3
I_n	1.0	±0.5	0.05	0.08	0.11
Test conclusion			**Pass**	**Pass**	**Pass**

7.3 Damp heat, cyclic test

1. Requirement: IEC62053-21:2003 IEC62052-11: 2003
2. Test method: After damp heat cyclic test, the meter shall show no damage or change of the information and shall operate correctly.
3. Test equipment: Damp heat cyclic test chambers SETH-101U/P(634003) and Meter calibration device ST9001D5 (7131019)
4. Test result:

Reference frequency :50Hz Current: 5(80)A Reference voltage :230V

Current	Power factor (cosΦ)	Percentage error limits (%)	Test result (%)		
			№1	№2	№3
I_n	1.0	±0.5	0.14	0.15	0.08
Test conclusion			**Pass**	**Pass**	**Pass**

7.4 Protection against solar radiation

1. Requirement: IEC62053-21:2020 IEC62052-11:2020
2. Test method: IEC62053-21:2020 IEC62052-11:2020
3. Test equipment: Xenon climate test chamber TET080D (030117)
4. Test result:

Test condition	Requirement	Test result		
		№1	№2	№3
8h irradiation and16h darkness 3cycles Temperature:55℃	The appearance and, in particular, the legibility of markings shall not be altered. The function of meter shall not be impaired.	Pass	Pass	Pass
Test conclusion		**Pass**	**Pass**	**Pass**

7.5 Durability (No requirement)

--END OF REPORT--

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