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SCM

SOUTH CHINA NATIONAL CENTER OF METROLOGY

GUANGDONG INSTITUTE OF METROLOGY

TEST REPORT

No. XNZ202102027

Name of Sample:	PZ Muli-function Power Meter
Model / Type:	PZ96(L)-E4 3×220/380 V 3×1(6) A 50 Hz
Sample Number:	00004099010116, 00004099010117, 00004099010118, 00004099010119, 00004099010120
Applicant:	Acrel Co., Ltd.
Manufacturer:	Jiangsu Acrel Electrical Manufacturing. Co., Ltd.
Test Type:	Commission
Date Issued:	2021-03-09

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(1) Basic Information

Name of Sample	PZ Muli-function Power Meter	Trade Mark	——
Model / Type	PZ96(L)-E4 3×220/380 V 3×1(6) A 50 Hz	Class	Class 0.5S (Active) Class 2 (Reactive)
Sample No.	00004099010116, 00004099010117, 00004099010118, 00004099010119, 00004099010120	Sample quantity	5
Applicant	Acrel Co., Ltd.		
Address	No.253, Yulv Road, Jiading District, Shanghai, China		
Manufacturer	Jiangsu Acrel Electrical Manufacturing. Co., Ltd.		
Test Site	Environment and EMC Lab of Dongguan Branch; Electromagnetic Lab of Guangzhou		
Test Conditions	Temperature: (20 ~ 27) ℃ Humidity: (40 ~ 60) %RH		
Date Received	Jan. 26, 2021	Commission No.	WT20212027
Test Date	Jan. 26, 2021 to Feb. 21, 2021	Test Type	Commission
Test Item	All Items		
Standard	IEC 62052-11 (Edition 1.0): 2003 Electricity metering equipment (a.c.) – General requirements, tests and tests conditions – Part 11:Metering equipment IEC 62053-22 (Edition 1.1): 2016 Electricity metering equipment(a.c.) – Particular requirements – Part 22: Static meters for active energy (classes 0,2 S and 0,5 S) IEC 62053-23 (Edition 1.1): 2016 Electricity metering equipment(a.c.) – Particular Requirements – Part 23: Static meters for reactive energy (classes 2 and 3)		
Conclusion	PASS		
Remarks	——		

(Seal of Report)

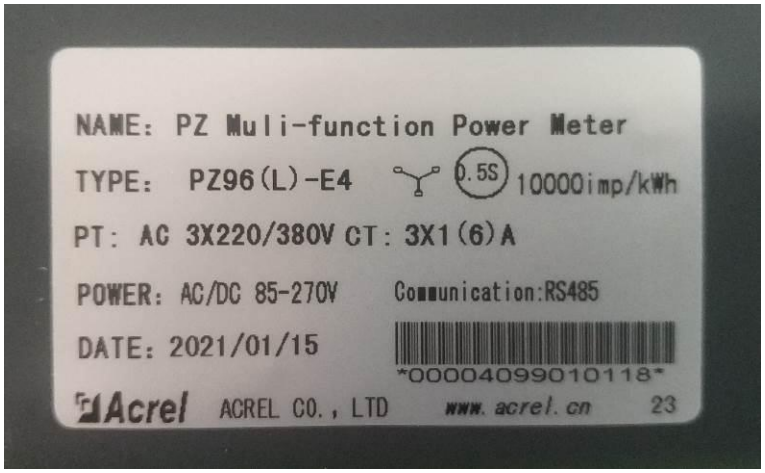
Tested by: Checked by: Approved by:

（2） Test Results Summary

No.	Test Item	Sample No.	Pass（P）	Fail（F）
1	Tests of insulation properties			
1.1	Impulse voltage tests	00004099010120	P	
1.2	AC voltage tests	00004099010120	P	
2	Tests of accuracy requirements			
2.1	Test of meter constants	00004099010116	P	
2.2	Test of Initial start-up of the meter	00004099010116	P	
2.3	Test of starting condition	00004099010116	P	
2.4	Test of no-load condition	00004099010116	P	
2.5	Limits of error due to variation of the current	00004099010116	P	
2.6	Test of influence quantities			
2.6.1	Test of influence of voltage variation	00004099010116	P	
2.6.2	Test of influence of frequency variation	00004099010116	P	
2.6.3	Test of influence of reversed phase sequence	00004099010116	P	
2.6.4	Test of influence of voltage unbalance	00004099010116	P	
2.6.5	Test of influence of auxiliary voltage	00004099010116	P	
2.6.6	Test of influence of harmonic	00004099010116	P	
2.6.7	Test of influence of continuous magnetic induction of external origin	00004099010116	P	
2.6.8	Test of influence of magnetic induction of external origin 0,5 mT	00004099010116	P	
2.6.9	Test of ambient temperature variation	00004099010119	P	
3	Tests of electrical requirements			
3.1	Test of power consumption	00004099010119	P	
3.2	Test of influence of supply voltage	00004099010116	P	
3.3	Test of influence of short-time overcurrents	00004099010116	P	

No.	Test Item	Sample No.	Pass（P）	Fail（F）
3.4	Test of influence of self-heating	00004099010116	P	
3.5	Test of influence of heating	00004099010120	P	
3.6	Test of immunity of earth fault	00004099010116	P	
4	Tests for electromagnetic compatibility (EMC)			
4.1	Radio interference suppression	00004099010120	P	
4.2	Fast transient burst test	00004099010118	P	
4.3	Damped oscillatory waves immunity test	00004099010118	P	
4.4	Test of immunity to electromagnetic RF fields	00004099010118	P	
4.5	Test of immunity to conducted disturbances, induced by	00004099010118	P	
4.6	Test of immunity to electrostatic discharges	00004099010118	P	
4.7	Surge immunity test	00004099010118	P	
5	Tests of the effect of the climatic environments			
5.1	Dry heat test, cold test and damp heat cyclic test	00004099010119 00004099010120	P	
6	Mechanical tests			
6.1	Vibration and shock test	00004099010117	P	
6.2	Spring hammer test	00004099010117	P	
6.3	Protection against penetration of dust and water	00004099010120	P	
6.4	Resistance to heat and fire	00004099010117	P	

（3） Sample Photo



（4） Main Metrology Instrument and Test Equipment

No.	Name of Instrument/Model	Serial No.	Certificate No. /Due Date	Technical Characteristic
1	Three phases watt-hour meter test bench/YC-1893D	0310010	DBN202100005 /2022-01-03	±0.05%
2	Three phase multi-function standard meter/SZ-03A-K6	15100010D	DBN202061426 /2021-11-29	±0.05%
3	Short-time overcurrents generator /XTS-16	2017	DCH201980120 /2021-09-19	U_{rel}=0.5% (k=2)
4	3m Semi-Anechoic Chamber /SAC-3	1019	XDdj2020-04205 /2021-05-19	NSA deviation <3.5dB VSWR≤5.5dB FU<5.5dB
5	Signal Generator/N5171B	MY59100134	WWS202000957 /2021-10-08	Frequency: $U_{rel}=1\times10^{-7}$ Level: U=0.20 dB, k=2
6	Power probe /NRP-Z91	101017	WWS202000266 /2021-04-06	U_{rel} =2%, k=2
7	Electric field probe and readout Equipment/CTR1002A	08000195&091 00580SN0-08	WWD202002806 /2021-11-05	±1.5dB
8	Signal Generator/IMS	1502.0009.12	WWS202110035 /2022-01-14	U=1.0 dB(k=2)
9	Electrostatic discharge tester /NSG 437	231	WWM202000500 /2021-06-16	Voltage: U_{rel}=1.3%, Current: U_{rel} =3.0% (k=2)
10	Fast transient burst generator /NSG 2025	26560	WWM202000144 /2021-03-24	Peak voltage: ±10%, Rise time: ±30%, Pulse width: (35~150)ns
11	Intelligent damped oscillating wave simulator/DOS 300	ES1311604	WWM202000500 /2021-06-16	Voltage: U_{rel}=2.0%, Rise time: U_{rel}=4.0%, Oscillation frequency: U_{rel}=0.2% (k=2)
12	Surge generator/NSG 2050	200124-049AR	WWM202000145 /2021-03-24	Peak voltage: U_{rel}=1.3%, Front time: U_{rel}=4.0%, Duration time: U_{rel}=2.5%, Peak current: U_{rel}=3.0% (k=2)

No.	Name of Instrument/Model	Serial No.	Certificate No. /Due Date	Technical Characteristic
13	Test Receiver/ESCI	101046	WWS202000196 /2021-03-24	Level: U=0.20 dB, Amplitude: U=0.3 dB, Impulse response: U=1.5 dB (k=2)
14	Artificial mains network/ESH2-Z5	100274	WWC202001840 /2021-10-27	Voltage distribution coeffcient: U=0.5 dB, k=2 Network impedence: U_{rel}=9% (10MHz) (k=2)
15	EMI Test Receiver/ESU	100258	WWS202000197 /2021-03-24	Level: U=0.20 dB, Amplitude: U=0.3 dB, Impulse response: U=1.5 dB (k=2)
16	10m Semi-Anechoic Chamber /SAC-10M	P24213	WWD202000792 /2023-04-14	NSA deviation <3.5dB VSWR≤5.5dB FU<5.5dB
17	Broadband Antenna/VULB-9160	3230	WWD202003132 /2021-10-17	U=1.2dB (k=2)
18	Three phase watt-hour meter tester bench/SD6300	281850	DBN202000397 /2021-06-10	±0.05%
19	Power frequency magnetic field generator/SCM-AMS8003/SCM-MFAC-001	AMS80030170 701	WWM202000504 /2021-06-08	Field strength: U=0.5 dB, k=2 Phase: U=3,0 °, k=2
20	Voltage Variations Simulator /NSG 2200-3	200215-002EK	WWM202000599 /2021-07-23	Voltage: U_{rel}=1.3%, Time: U_{rel} =0.2% (k=2)
21	Continuous magnetic induction generator/1000At	001	DCH202030293 /2021-06-23	U_{rel}=0.2(k=2)
22	Vibration test equipment /MPA102/L620M	SH1201003	SSD202002051 /2021-04-14	Acceleration: U_{rel}=3.0%,k=2 Displacement: U_{rel}=3.0%,k=2 Frequency: U_{rel}=0.1%,k=2
23	Adjustable spring hammer /0,14J～1,00J	2019072028	ZCL202040233 /2021-09-06	U_{rel}=1.4% (k =2)
24	Flaming thread test equipment/ZRS-H	2019ZRS-H062 503	RGW202100030 /2022-01-06	±10 ℃

No.	Name of Instrument/Model	Serial No.	Certificate No. /Due Date	Technical Characteristic
25	Small high and low temperature damp heat test chamber /WHTH-80L-40-880	ZH19261	RZD202009809 /2021-09-13	Temperature deviation : ±2℃ Humidity deviation : ±3%RH
26	Impulse voltage generator /LSG-255G	052119001J	WWM202000473 /2021-06-08	Pulse voltage: U_{rel}=2.0% Front time: U_{rel}=4% Duration time:U_{rel}=3.0% (k =2)
27	Withstanding voltage tester/7122	1240841	DYQ202000432 /2021-03-03	Class 5
28	Digital multimeter/34461A	MY53224109	DBS202000233 /2021-02-27	DCV: U_{rel}=0.001% DCI: U_{rel}=0.015% ACV: U_{rel}=0.01% ACI: U_{rel}=0.02% (k=2)
29	DIGITAL POWER METER/WT333	C2QM10026V	DBB202002260 /2021-03-05	ACV: U_{rel}=0.04% ACI: U_{rel}=0.04% AC Power: U_{rel}=0.04% (k=2)
30	Temperature data collector/34970A	MY44092149	RZD202006118 /2021-06-10	U=0.2 ℃, k=2
31	Shock test equipment/KRD11-50	12008	SSD202002052 /2021-04-14	±20%
32	Rain simulation chamber/LX-010	080823	HGX202050827 /2021-10-29	(1～3mm)/min
33	Sand dust chamber/SC-500	080821	HGX202050825 /2021-10-29	U=0.1s,k=2 2kg/m^3

（5） Test Result

1 Tests of insulation properties

1.1 Impulse voltage tests

1. Technical requirement: IEC 62052-11: 2003, item 7.3.2
2. Test method: The impulse voltage is applied 10 times with one polarity and then repeated with the other polarity. The minimum time between the impulses is 3 second. During this test no flashover, disruptive discharge or puncture shall occur.
3. Test equipment: LSG-255
4. Test result:

Test condition	Apply voltage between	Test result
		00004099010120
Impulse waveform: 1,2/50μs Impulse voltage: 6 kV Test times: 10	Circuits and earth	Pass
	Voltage circuits	Pass

Conclusion: Pass

1.2 AC voltage tests

1. Technical requirement: IEC 62053-22: 2016, item 7.4
2. Test method: The test voltage shall be applied between circuits and earth. During this test no flashover, disruptive discharge or puncture shall occur.
3. Test equipment: 7122
4. Test result:

Test condition	Apply voltage between	Test result
		00004099010120
Test Voltage: 2 kV （Current an voltage circuits）, 4 kV （C Ci and earth） sinusoidal, having a frequency between 45 Hz and 65 Hz Applied time: 1 min	Circuits and earth	Pass
	Current and voltage circuits	Pass

5. Conclusion: Pass

2 Tests of accuracy requirements

2.1 Test of meter constants

1. Technical requirement: IEC 62053-22: 2016, item 8.4 and IEC 62053-23: 2016, item 8.4
2. Test method: Check the relation between the test output and the indication on the display.
3. Test equipment: YC-1893D, SZ-03A-K6
4. Test result:

Technical requirement	Test result
	00004099010116
10000 imp/kWh	10000 imp/kWh
10000 imp/kvarh	10000 imp/kvarh

5. Conclusion: Pass

2.2 Test of Initial start-up of the meter

1. Technical requirement: IEC 62053-22: 2016, item 8.3.1 and IEC 62053-23: 2016, item 8.3.1
2. Test method: Check if the meter shall be functional within 5 s after the reference voltage is applied to the meter terminals.
3. Test equipment: YC-1893D, SZ-03A-K6
4. Test result:

Test condition	Technical requirement	Test result
		00004099010116
100% U_n	The meter shall be functional within 5 s after the reference voltage is applied to the meter terminals.	Pass

5. Conclusion: Pass

2.3 Test of starting condition

1. Technical requirement: IEC 62053-22: 2016, item 8.3.3 and IEC 62053-23: 2016, item 8.3.3
2. Test method: Check if the meter start and continue to register at 0,001I_n (Active) and 0,003I_n(Reactive).
3. Test equipment: YC-1893D, SZ-03A-K6
4. Test result:

Test condition		Technical requirement	Test result
Current	Power Factor	The meter shall start and continue to register.	00004099010116
0,001I_n	1,0		Pass
0,003I_n	1,0		Pass

5. Conclusion: Pass

2.4 Test of no-load condition

1. Technical requirement: IEC 62053-22: 2016, item 8.3.2 and IEC 62053-23: 2016, item 8.3.2
2. Test method: When voltage is applied with no current flowing in the current circuit, check if the test of output of the meter produce more than one pulse during the minimum test period.
3. Test equipment: YC-1893D, SZ-03A-K6
4. Test result:

Test condition	Technical requirement	Test result
		00004099010116
115% of U_n No current flowing in the current circuit	the meter shall not produce more than 1 pulse within the minimum test period.	Pass

5. Conclusion: Pass

2.5 Limits of error due to variation of the current

2.5.1 Active energy error

1. Technical requirement: IEC 62053-22: 2016, item 8.1
2. Test method: To determine relative error under different current by comparing with the reference standard.
3. Test equipment: YC-1893D, SZ-03A-K6
4. Test result:

Active energy Test conditions: with balanced loads

Power factor	Limits Error (%)	Current	Relative error (%)	
			00004099010116	
			Import	Export
1	±1,0	0,01I_n	+0,02	-0,09
	±0,5	0,05I_n	+0,10	+0,08
	±0,5	0,5I_n	+0,02	+0,05
	±0,5	I_n	+0,05	+0,04
	±0,5	0,5I_{max}	+0,06	+0,05
	±0,5	I_{max}	+0,05	+0,05
0,5L	±1,0	0,02I_n	+0,25	+0,11
	±0,6	0,1I_n	+0,17	+0,16
	±0,6	0,5I_n	+0,15	+0,15
	±0,6	I_n	+0,13	+0,13
	±0,6	0,5I_{max}	+0,11	+0,10
	±0,6	I_{max}	+0,06	+0,06
0,8C	±1,0	0,02I_n	+0,02	-0,02
	±0,6	0,1I_n	+0,02	+0,05
	±0,6	0,5I_n	+0,01	+0,01

	±0,6	I_n	+0,01	+0,01
	±0,6	$0,5I_{max}$	+0,03	+0,03
	±0,6	I_{max}	+0,02	+0,05

Active energy Test conditions: Carrying a single-phase load but with balanced voltages

Power factor	Limits Error (%)	Current	Relative error (%)					
			00004099010116					
			A		B		C	
			Import	Export	Import	Export	Import	Export
1	±0,6	$0,05I_n$	+0,10	+0,04	+0,17	+0,10	+0,09	+0,02
	±0,6	$0,5I_n$	+0,05	+0,05	+0,08	+0,07	+0,04	+0,04
	±0,6	I_n	+0,04	+0,04	+0,08	+0,11	+0,02	+0,03
	±0,6	I_{max}	+0,05	+0,06	+0,07	+0,07	+0,02	+0,03
0,5L	±1,0	$0,1I_n$	+0,16	+0,11	+0,18	+0,10	+0,26	+0,21
	±1,0	$0,5I_n$	+0,12	+0,12	+0,16	+0,16	+0,20	+0,20
	±1,0	I_n	+0,11	+0,12	+0,13	+0,13	+0,17	+0,18
	±1,0	I_{max}	+0,05	+0,03	+0,05	+0,03	+0,16	+0,06

5. Conclusion: Pass

2.5.2 Reactive energy error

1. Technical requirement: IEC 62053-23: 2016, item 8.1
2. Test method: To determine relative error under different current by comparing with the reference standard.
3. Test equipment: YC-1893D, SZ-03A-K6
4. Test result:

Reactive energy Test conditions: with balanced loads

Power factor	Limits Error (%)	Current	Relative error (%)	
			00004099010116	
			Import	Export
1	±2,5	$0,02I_n$	+0,05	+0,03
	±2,0	$0,05I_n$	+0,04	+0,06
	±2,0	$0,5I_n$	+0,02	-0,12
	±2,0	I_n	+0,02	+0,02
	±2,0	$0,5I_{max}$	+0,03	+0,03
	±2,0	I_{max}	+0,03	+0,03
0,5L	±2,5	$0,05I_n$	-0,15	-0,16
	±2,0	$0,1I_n$	-0,13	-0,13
	±2,0	$0,5I_n$	-0,11	-0,10
	±2,0	I_n	-0,10	-0,09

	±2,0	$0{,}5I_{max}$	-0,05	-0,06
	±2,0	I_{max}	+0,01	+0,01
0,25L	±2,5	$0{,}1I_n$	-0,23	-0,27
	±2,5	$0{,}5I_n$	-0,21	-0,29
	±2,5	I_n	-0,27	-0,26
	±2,5	$0{,}5I_{max}$	-0,16	-0,17
	±2,5	I_{max}	-0,02	-0,04
	±2,5	$0{,}02I_n$	+0,05	+0,03

Reactive energy Test conditions: Carrying a single-phase load but with balanced voltages

Power factor	Limits Error (%)	Current	Relative error (%)					
			00004099010116					
			A		B		C	
			Import	Export	Import	Export	Import	Export
1	±3,0	$0{,}05I_n$	+0,07	+0,02	+0,14	+0,09	+0,05	+0,01
	±3,0	$0{,}5I_n$	+0,03	+0,03	+0,06	+0,06	-0,03	+0,01
	±3,0	I_n	+0,02	+0,02	+0,05	+0,06	0,00	+0,01
	±3,0	I_{max}	+0,02	+0,05	+0,06	+0,06	+0,01	+0,02
0,5L	±3,0	$0{,}1I_n$	-0,09	-0,12	-0,01	-0,06	-0,21	-0,23
	±3,0	$0{,}5I_n$	-0,07	-0,08	-0,03	-0,05	-0,16	-0,19
	±3,0	I_n	-0,12	-0,33	-0,02	-0,02	-0,17	-0,18
	±3,0	I_{max}	+0,01	-0,01	+0,05	+0,04	-0,05	-0,03

5. Conclusion: Pass

2.6 Test of influence quantities

2.6.1 Test of influence of voltage variation

2.6.1.1 Test of influence of voltage variation (±10%)

1. Technical requirement: IEC 62053-22: 2016, item 8.2 and IEC 62053-23: 2016, item 8.2
2. Test method: To determine relative error at reference voltage and at ±10% voltage changes separately
3. Test equipment: YC-1893D, SZ-03A-K6
4. Test result:

Active energy

Power factor	Limits Error (%)	Current	Voltage	Relative error (%)
				00004099010116
1	0,2	$0{,}05I_n$	$1{,}1U_n$	+0,01
		I_n	$1{,}1U_n$	+0,01
		I_{max}	$1{,}1U_n$	+0,02
		$0{,}05I_n$	$0{,}9U_n$	0,00
		I_n	$0{,}9U_n$	0,00
		I_{max}	$0{,}9U_n$	0,00

0,5L	0,4	$0,1I_n$	$1,1U_n$	+0,02
		I_n	$1,1U_n$	+0,02
		I_{max}	$1,1U_n$	+0,01
		$0,1I_n$	$0,9U_n$	+0,01
		I_n	$0,9U_n$	0,00
		I_{max}	$0,9U_n$	-0,01

Reactive energy

Power factor	Limits Error (%)	Current	Voltage	Relative error (%)
				00004099010116
1	1,0	$0,02I_n$	$1,1U_n$	0,00
		I_n	$1,1U_n$	+0,03
		I_{max}	$1,1U_n$	+0,02
		$0,02I_n$	$0,9U_n$	-0,01
		I_n	$0,9U_n$	+0,01
		I_{max}	$0,9U_n$	+0,01
0,5L	1,5	$0,05I_n$	$1,1U_n$	+0,04
		I_n	$1,1U_n$	+0,02
		I_{max}	$1,1U_n$	+0,02
		$0,05I_n$	$0,9U_n$	+0,02
		I_n	$0,9U_n$	+0,01
		I_{max}	$0,9U_n$	0,00

5. Conclusion: Pass

2.6.1.2 Test of influence of voltage variation (-20% and +15%)

1. Technical requirement: IEC 62053-22: 2016, item 8.2 and IEC 62053-23: 2016, item 8.2
2. Test method: To determine relative error at reference voltage and at -20% and at +15% voltage changes separately
3. Test equipment: YC-1893D, SZ-03A-K6
4. Test result:

Active energy

Power factor	Limits Error (%)	Current	Voltage	Relative error (%)
				00004099010116
1	0,6	$0,05I_n$	$1,15U_n$	+0,01
		I_n	$1,15U_n$	+0,01
		I_{max}	$1,15U_n$	+0,01
		$0,05I_n$	$0,8U_n$	-0,02
		I_n	$0,8U_n$	-0,01
		I_{max}	$0,8U_n$	-0,01
0,5L	1,2	$0,1I_n$	$1,15U_n$	+0,01
		I_n	$1,15U_n$	+0,01
		I_{max}	$1,15U_n$	0,00
		$0,1I_n$	$0,8U_n$	-0,02
		I_n	$0,8U_n$	-0,01
		I_{max}	$0,8U_n$	-0,03

Reactive energy

Power factor	Limits Error (%)	Current	Voltage	Relative error (%)
				00004099010116
1	3,0	$0,02I_n$	$1,15U_n$	+0,02
		I_n	$1,15U_n$	+0,02
		I_{max}	$1,15U_n$	+0,02
		$0,02I_n$	$0,8U_n$	-0,01
		I_n	$0,8U_n$	0,00
		I_{max}	$0,8U_n$	0,00
0,5L	4,5	$0,05I_n$	$1,15U_n$	+0,04
		I_n	$1,15U_n$	+0,02
		I_{max}	$1,15U_n$	+0,01
		$0,05I_n$	$0,8U_n$	+0,01
		I_n	$0,8U_n$	0,00
		I_{max}	$0,8U_n$	-0,01

5. Conclusion: Pass

2.6.1.3 Test of influence of voltage variation (< $0.8U_n$)

1. Technical requirement: IEC 62053-22: 2016, item 8.2 and IEC 62053-23: 2016, item 8.2
2. Test method: To determine relative error when voltage is below $0.8U_n$
3. Test equipment: YC-1893D, SZ-03A-K6
4. Test result:

Power factor	Limits Error (%)	Current	Voltage	Relative error (%)	
				00004099010116	
				active	reactive
1	-100~10	I_n	$0,7U_n$	-0,02	+0,01
			$0,6U_n$	-0,02	0,00
			$0,5U_n$	-0,03	0,00
			$0,4U_n$	-0,03	-0,01
			$0,3U_n$	-0,04	-0,01
			$0,2U_n$	-0,04	-0,02
			$0,1U_n$	-0,05	-0,01

5. Conclusion: Pass

2.6.2 Test of influence of frequency variation

1. Technical requirement: IEC 62053-22: 2016, item 8.2 and IEC 62053-23: 2016, item 8.2
2. Test method: To determine relative error at rated frequency and at ±2% frequency changes separately.
3. Test equipment: YC-1893D, SZ-03A-K6
4. Test result:

Active energy

Power factor	Limits Error (%)	Current	Frequency	Relative error (%)
				00004099010116
1	0,2	$0,05I_n$	1,02*f*	0,00
		I_n	1,02*f*	0,00
		I_{max}	1,02*f*	+0,01
		$0,05I_n$	0,98*f*	-0,01
		I_n	0,98*f*	-0,05
		I_{max}	0,98*f*	0,00
0,5L	0,2	$0,1I_n$	1,02*f*	0,00
		I_n	1,02*f*	-0,01
		I_{max}	1,02*f*	-0,02
		$0,1I_n$	0,98*f*	+0,01
		I_n	0,98*f*	+0,01
		I_{max}	0,98*f*	-0,01

Reactive energy

Power factor	Limits Error (%)	Current	Voltage	Relative error (%)
				00004099010116
1	2,5	$0,02I_n$	1,02*f*	+0,01
		I_n	1,02*f*	+0,02
		I_{max}	1,02*f*	+0,02
		$0,02I_n$	0,98*f*	0,00
		I_n	0,98*f*	+0,01
		I_{max}	0,98*f*	+0,01
0,5L	2,5	$0,05I_n$	1,02*f*	+0,04
		I_n	1,02*f*	+0,02
		I_{max}	1,02*f*	+0,01
		$0,05I_n$	0,98*f*	0,00
		I_n	0,98*f*	0,00
		I_{max}	0,98*f*	0,00

5. Conclusion: Pass

2.6.3 Test of influence of reversed phase sequence

1. Technical requirement: IEC 62053-22: 2016, item 8.2
2. Test method: To determine relative error at normal phase sequence and at reversed phase sequence separately.
3. Test equipment: YC-1893D, SZ-03A-K6
4. Test result:

Power factor	Limits Error Change (%)	Current	Influence quantity	Max. Relative error change (%)
				00004099010116
1	0,1	$0,1I_n$	Reversed phase sequence	-0,01

5. Conclusion: Pass

2.6.4 Test of influence of voltage unbalance

1. Technical requirement: IEC 62053-22: 2016, item 8.2
2. Test method: To determine relative error at voltage balance and at voltage unbalance separately.
3. Test equipment: YC-1893D, SZ-03A-K6
4. Test result:

Power factor	Limits Error Change (%)	Current	Influence quantity	Max. Relative error change (%)
				00004099010116
1	1,0	I_n	Voltage unbalance	+0,02

5. Conclusion: Pass

2.6.5 Test of influence of auxiliary voltage

1. Technical requirement: IEC 62053-22: 2016, item 8.2
2. Test method: Test method: To determine relative error at rated auxiliary voltage and at ±15% auxiliary voltage changes separately.
3. Test equipment: YC-1893D, SZ-03A-K6
4. Test result:

Power factor	Limits Error Change (%)	Current	Auxiliary voltage	Max. Relative error change (%)
				00004099010116
1	0,1	$0.01I_n$	+15%	-0,03
		$0.01I_n$	-15%	-0,05

5. Conclusion: Pass

2.6.6 Test of influence of harmonic

1. Technical requirement: IEC 62053-22: 2016, item 8.2
2. Test method: Test relative error separately at power with harmonic wave and without harmonic wave.
3. Test equipment: YC-1893D, SZ-03A-K6
4. Test result:

Power factor	Limits Error Change (%)	Current	Influence quantity	Relative error change (%)
				00004099010116
1	0,5	$0,5I_{max}$	U_5 = 10 % of Un I_5 = 40% of fundamental current	-0,01
	1,5	$0,5I_n$	Sub-harmonics in the a,c,current circuits	+0,02

5. Conclusion: Pass

2.6.7 Test of influence of continuous magnetic induction of external origin

1. Technical requirement: IEC 62053-22: 2016, item 8.2 and IEC 62053-23: 2016, item 8.2
2. Test method: Test relative error before and when magnetic induction applied to meters separately
3. Test equipment: YC-1893D, SZ-03A-K6, Continuous magnetic induction generator
4. Test result:

Active energy

Power factor	Limits Error Change (%)	Current	Influence quantity	Max. Relative error change (%)
				00004099010116
1	2,0	I_n	The magneto-motive force: 1000 At(ampere-turns)	+0,01

Reactive energy

Power factor	Limits Error Change (%)	Current	Influence quantity	Max. Relative error change (%)
				00004099010116
1	3,0	I_n	The magneto-motive force: 1000 At(ampere-turns)	-0,01

5. Conclusion: Pass

2.6.8 Test of influence of magnetic induction of external origin 0, 5 mT

1. Technical requirement: IEC 62053-22: 2016, item 8.2 and IEC 62053-23: 2016, item 8.2
2. Test method: Test relative error before and after magnetic induction applied to meters separately
3. Test equipment: YC-1893D, SZ-03A-K6, ZHZ-26
4. Test result:

Active energy

Power factor	Limits Error Change %	Current	Influence quantity	Max. Relative error change (%)
				00004099010116
1	1,0	I_n	Magnetic induction of external origin 0,5 mT	-0,03

Reactive energy

Power factor	Limits Error Change %	Current	Influence quantity	Max. Relative error change (%)
				00004099010116
1	3,0	I_n	Magnetic induction of external origin 0,5 mT	-0,02

5. Conclusion: Pass

2.6.9 Test of ambient temperature variation

1. Technical requirement: IEC 62053-22: 2016, item 8.2 and IEC 62053-23: 2016, item 8.2
2. Test method: IEC 62053-22: 2016, item 8.2 and IEC 62053-23: 2016, item 8.2
3. Test equipment: WHTH-80L-40-880,SD6300
4. Test result:

Active energy

Power factor	Mean temperature coefficient %/K	Current	temperature (℃)	00004099010119	
				(%)	(%/K)
1	0,03	I_{max}	-10	+0,299	--
			+10	+0,001	0,011
			+30	-0,178	0,009
			+25	-0,152	--
			+45	-0,251	0,005
		I_n	-10	+0,199	--
			+10	-0,014	0,011
			+30	-0,194	0,009
			+25	-0,164	--
			+45	-0,267	0,005
		$0,05I_n$	-10	+0,203	--
			+10	+0,018	0,009
			+30	-0,171	0,009
			+25	-0,145	--
			+45	-0,253	0,005
0,5L	0,05	I_{max}	-10	+0,236	--
			+10	+0,006	0,012
			+30	-0,139	0,007
			+25	-0,126	--
			+45	-0,183	0,003
		I_n	-10	+0,312	--
			+10	+0,112	0,010
			+30	-0,029	0,007
			+25	-0,017	--
			+45	-0,067	0,003
		$0,1I_n$	-10	+0,359	--
			+10	+0,170	0,009
			+30	+0,039	0,007
			+25	+0,061	--
			+45	+0,026	0,002

Reactive energy

Power factor	Mean temperature coefficient %/K	Current	temperature (℃)	00004099010119	
				(%)	(%/K)
1	0,10	I_{max}	-10	+0,192	--
			+10	+0,005	0,009
			+30	-0,179	0,009
			+25	-0,146	--
			+45	-0,253	0,005
		I_n	-10	+0,177	--
			+10	-0,005	0,009
			+30	-0,191	0,009
			+25	-0,154	--
			+45	-0,268	0,006
		$0,05I_n$	-10	+0,162	--
			+10	+0,006	0,008
			+30	-0,177	0,009
			+25	-0,151	--
			+45	-0,261	0,006
0,5L	0,15	I_{max}	-10	+0,147	--
			+10	-0,043	0,012
			+30	-0,250	0,010
			+25	-0,196	--
			+45	-0,344	0,007
		I_n	-10	+0,018	--
			+10	-0,166	0,009
			+30	-0,389	0,011
			+25	-0,341	--
			+45	-0,507	0,008
		$0,1I_n$	-10	-0,006	--
			+10	-0,204	0,010
			+30	-0,433	0,011
			+25	-0,373	--
			+45	-0,565	0,010

5. Conclusion: Pass

3 Tests of electrical requirements

3.1 Test of power consumption

1. Technical requirement: IEC 62053-22: 2016, item 7.1
2. Test method: Measure the active power and apparent power consumption in each voltage and in each current circuit at reference temperature and reference frequency
3. Test equipment: 34461A,WT333,SD6300

4. Test result:

Test item	Limits of power consumption	Test result
		00004099010119
Voltage Circuit	Apparent power≤0,5 VA	0,03VA
Current Circuit	Apparent power≤1 VA	0,01VA
Auxiliary power supply	Apparent power≤10 VA	2,36VA

5. Conclusion: Pass

3.2 Test of influence of supply voltage

3.2.1 Test of Voltage

1. Technical Requirement: IEC 62052-11: 2003, item 7.1.1
2. Test Method: To check if the meter shall work normally and the mermory status
3. Test equipment: YC-1893D, SZ-03A-K6
4. Test result:

Extended operating range	Technical requirement	Test result
		00004099010116
From 0,8U_n to 1,15U_n	Meter shall work normally and memory shall not be in disorder or lost when the voltage of meter is within extended operating range, and all data shall display properly.	Pass

5. Conclusion: Pass

3.2.2 Test of the effect of voltage dips and short interruptions

1. Technical Requirement: IEC 62052-11: 2003, item 7.1.2
2. Test Method: To check the effect of voltage dips and short interruptions; to check whether these voltage dips and short interruptions produce a change in the register of more than x kWh and the test output produce a signal equivalent of more than x kWh. (Formula for x, see item 7.1.2)
3. Test equipment: NSG 2200-3
4. Test Result:

Test conditions	Test item	Limits of change	Test result
			00004099010116
Voltage interruptions of $\Delta U = 100\%$ Interrupt ion Time: 1 s	Register	≤0,00396 kWh/kvarh	Pass

Number of interruption: 3 Restore time between interruptions: 50 ms	Output pulse	≤39 imp	Pass
Voltage interruptions of $\Delta U = 100\%$ Interruption Time: 20 ms Number of interruption: 1	Register	≤0,00396 kWh/kvarh	Pass
	Output pulse	≤39 imp	Pass
Voltage dip of $\Delta U = 50\%$ Dip time: 1 min Number of dip: 1	Register	≤0,00396 kWh/kvarh	Pass
	Output pulse	≤39 imp	Pass

5. Conclusion: Pass

3.3 Test of influence of short-time overcurrents

1. Technical Requirement: IEC 62053-22: 2016, item 7.2 and IEC 62053-23: 2016, item 7.2
2. Test Method: IEC 62053-22: 2016, item 7.2
3. Test equipment: YC-1893D, SZ-03A-K6, XTS-16
4. Test Result:

Active energy

Power factor	Limits of Error Change (%)	Current	Test requirement	Max. relative error change (%)
				00004099010116
1	0,05	I_n	No damage; Perform correctly; The variation of error shall not exceed the limitserror change	+0,01

Reactive energy

Power factor	Limits of Error Change (%)	Current	Test requirement	Max. relative error change (%)
				00004099010116
1	0,05	I_n	No damage; Perform correctly; The variation of error shall not exceed the limitserror change	+0,01

5. Conclusion: Pass

3.4 Test of influence of self-heating

1. Technical Requirement: IEC 62053-22: 2016, item 7.3 and IEC 62053-23: 2016, item 7.2
2. Test Method: IEC 62053-22: 2016, item 7.2

3. Test equipment: YC-1893D, SZ-03A-K6

4. Test result:

Active energy

Power factor	Limits of Error Change %	Current	Relative error change (%)
			00004099010116
1	0,2	I_{max}	-0,06
0,5L	0,2	I_{max}	-0,01

Reactive energy

Power factor	Limits of Error Change %	Current	Relative error change (%)
			00004099010116
1	1,0	I_{max}	-0,04
0,5L	1,5	I_{max}	-0,07

5. Conclusion: Pass

3.5 Test of influence of heating

1. Technical Requirement: IEC 62052-11: 2003, item 7.2

2. Test Method: IEC 62052-11: 2003, item 7.2

3. Test equipment: WHTH-80L-40-880,34970A,SD6300,LSG-255G,7122

4. Test result:

Power factor	Voltage (% 0f U_b)	Current	Test requirement	Change value
				00004099010120
1	115	I_{max}	The temperature rise of the external surface shall not exceed 25 K.	3,6 K
			No damage; Comply with the dielectric strength test of item 7.3	Pass

5. Conclusion: Pass

3.6 Test of immunity to earth fault

1. Technical Requirement: IEC 62052-11: 2003, item 7.4

2. Test Method: For a test under a simulated earth fault condition in one of the three lines, all voltages are increased to 1,1 times the nominal voltages during 4 h. The neutral terminal of the meter under test is disconnected from the ground terminal of the meter test equipment (MTE) and is connected to the MTE's line terminal at which the earth fault has to be simulated. In this way, the two voltage terminals of the meter under test which are not affected by the earth fault

are connected to 1,9 times the nominal phase voltages. For this test the current circuits are set to 50 % of the rated current I_n, power factor 1 and symmetrical load.

3. Test equipment: YC-1893D, SZ-03A-K6

4. Test result:

Power factor	Voltage (% 0f U_b)	Current	Test requirement		Change value
					00004099010116
1	115	I_{max}	Relative error change (%)	Active: 0,3	-0,02
				Reactive: 1,0	+0,02
			No damage; Perform correctly;		Pass

5. Conclusion: Pass

4 Tests for electromagnetic compatibility (EMC)

4.1 Radio interference suppression

4.1.1 Mains terminal disturbance voltage

1. Technical requirement: IEC 62052-11: 2003, item 7.5.8
2. Test Method: CISPR22-2006 Information technology equipment- Radio disturbance characteristics- limits and methods of measurement
3. Test equipment: ESCI, ESH2-Z5
4. Test picture:

5. Test result:

Frequency Range (150kHz ~ 30MHz)	Technical requirement		
	Frequency (MHz)	Limits(dBμV)	
		QuasiPeak	Average

Meter in operating condition: -voltage circuits energized with reference voltage; -with 0,1I_n～0,2I_n in current circuit.	0,15 ~ 0,50	66 ~ 56	56 ~ 46
	0,50~5,00	56	46
	5,00~30,0	60	50
Test figure	See fig. 1		

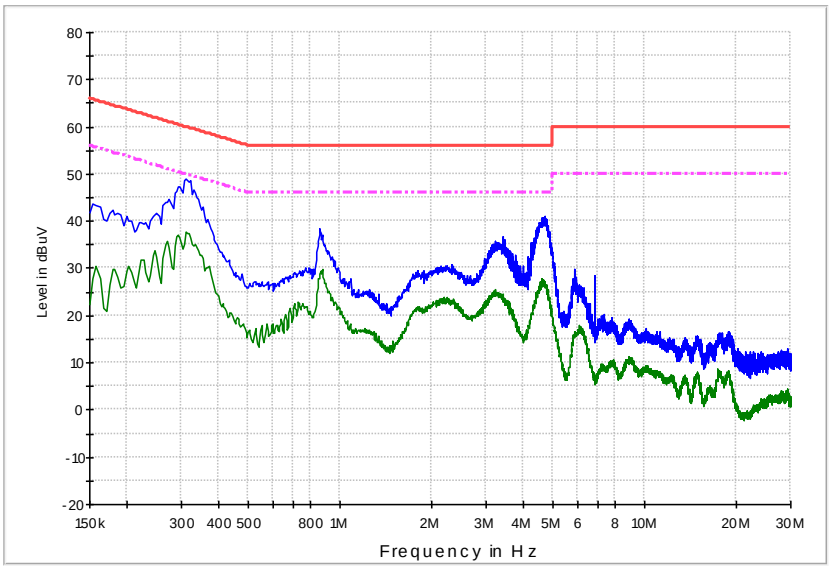
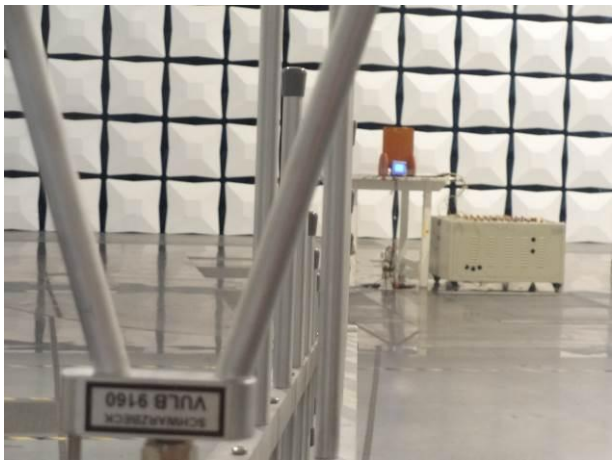


Fig. 1

6. Conclusion: Pass

4.1.2 Radiated Emission

1. Technical requirement: IEC 62052-11: 2003, item 7.5.8
2. Test Method: CISPR22-2006 Information technology equipment- Radio disturbance characteristics- Limits and methods of measurement
3. Test equipment: SAC-10M, ESU, VULB-9160
4. Test picture:



5. Test result:

Frequency Range (30MHz ~ 1000MHz)	Technical requirement	
	Frequency (MHz)	Limits(dBμV) QuasiPeak
Meter in operating condition: -voltage circuits energized with reference voltage; -with 0,1I_n～0,2$_n$ in current circuit;	30～230	30
	230~1000	37
Test figure	See fig. 2	

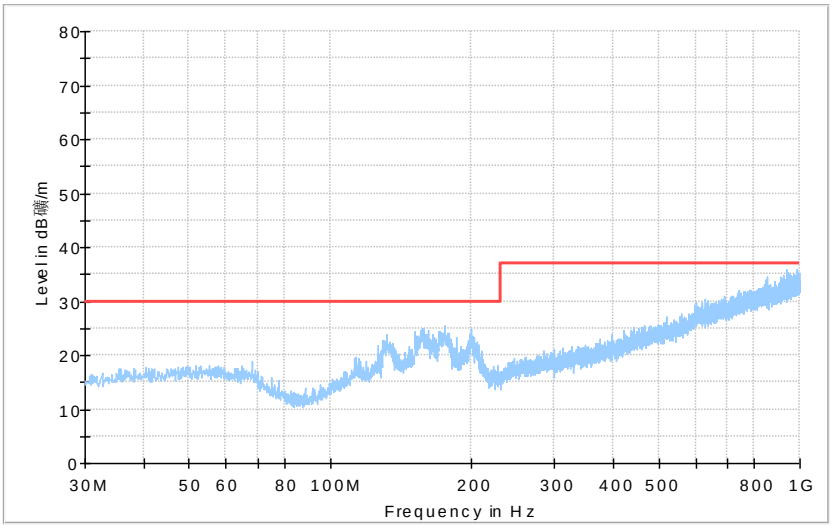


Fig. 2

6. Conclusion: Pass

4.2 Fast transient burst test

1. Technical requirement: IEC 62052-11: 2003, item 7.5.4
2. Test Method: IEC 62052-11: 2003, item 7.5.4
3. Test equipment: NSG 2025, SD6300
4. Test picture:

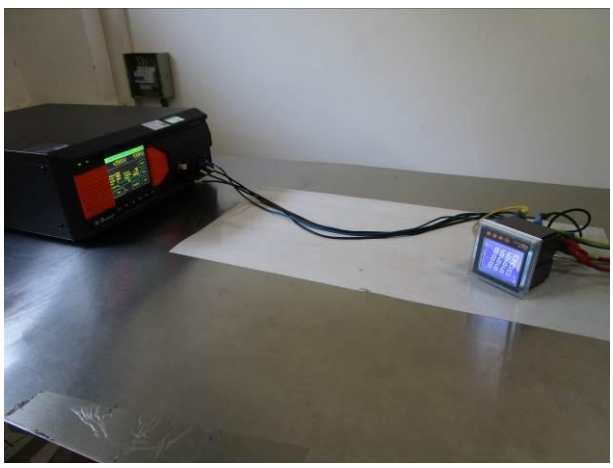
5. Test Result:

Test condition	Relative error change (%)	Test result (or Max. variation %)
		00004099010118
According to IEC 61000-4-4; Meter in operating condition: -voltage circuits energized with reference voltage; -with rate current I_n, and power factor equal to 1; 4kV on the current and voltage circuit; Duration of the test: 60 s at each polarity	Active: 1,0	-0,07
	Reactive: 4,0	-0,18

6. Conclusion: Pass

4.3 Damped oscillatory waves immunity test

1. Technical requirement: IEC 62052-11: 2003, item 7.5.7
2. Test Method: IEC 62052-11: 2003, item 7.5.7
3. Test equipment: DOS300, SD6300
4. Test picture:



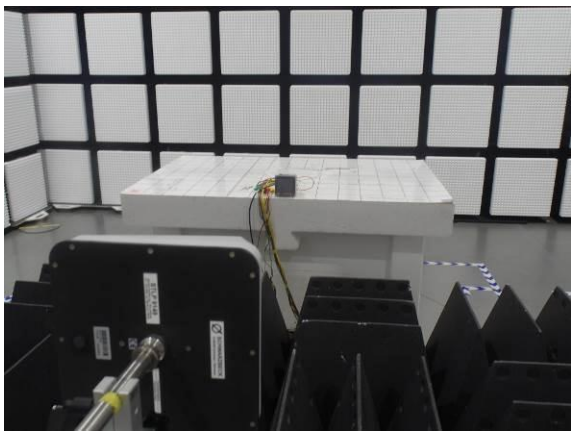
5. Test Result:

Test condition	Relative error change (%)	Test result (or Max. variation %)
		00004099010118
According to IEC 61000-4-12; Meter in operating condition: -voltage circuits energized with reference voltage; -with rate current I_n, and power factor equal to 1;	Active: 2,0	-0,01
2,5kV (common mode) and 1,0kV (different mode) on the voltage circuit; Test frequency: -100kHz, repetition rate: 40Hz; -1MHz, repetition rate: 400Hz; Test duration: 60 s (15 cycles with 2 s on, 2 s off, for each frequency)	Reactive: 4,0	-0,03

6. Conclusion: Pass

4.4 Test of immunity to electromagnetic RF fields

1. Technical requirement: IEC 62052-11: 2003, item 7.5.3
2. Test Method: IEC 62052-11: 2003, item 7.5.3
3. Test equipment: SAC-3, N5171B, NRP-Z91, CTR1002A
4. Test picture:



5. Test result:

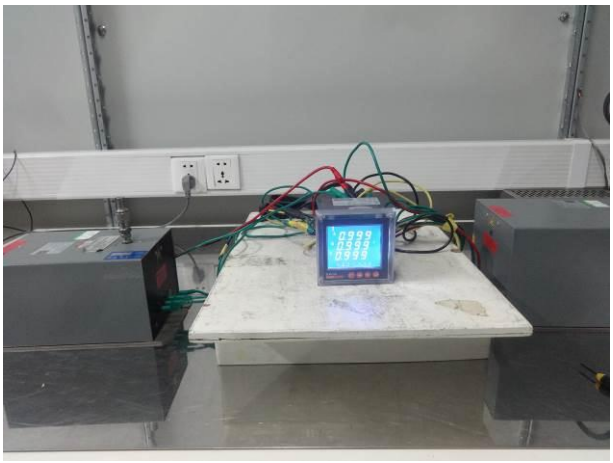
Test condition	Frequency (MHz)	Limits of Variation (%)	Test result (%)			
			00004099010118			
			Active		Reactive	
			V	H	V	H

According to IEC 61000 -4-3; Frequency band: 80 MHz to 2000 MHz Test field strength: 10 V/m Voltage(% 0f U_n): 100 Current: I_n Power factor: 1	Reference	Active 2.0 Reactive 3.0	-0,11	-0,11	-0,12	-0,12
	80.0~2000.0		-0,15	-0,15	-0,15	-0,16
	Max. variation（%）		-0,04	-0,04	-0,03	-0,04
Frequency band: 80 MHz to 2000 MHz Test field strength: 30 V/m Voltage(% 0f U_n): 100 Current: none	The change in register : ≤0,00396 kWh/kvarh		0.00 kWh/kvarh			
	The test output: ≤25 imp		0 imp			

6. Conclusion: Pass

4.5 Test of immunity to conducted disturbances, induced by radio-frequency fields

1. Technical requirement: IEC 62052-11: 2003, item 7.5.5
2. Technical method: IEC 62052-11: 2003, item 7.5.5
3. Test equipment: IMS, NRP-Z91, SD6300
4. Test picture:



5. Test result:

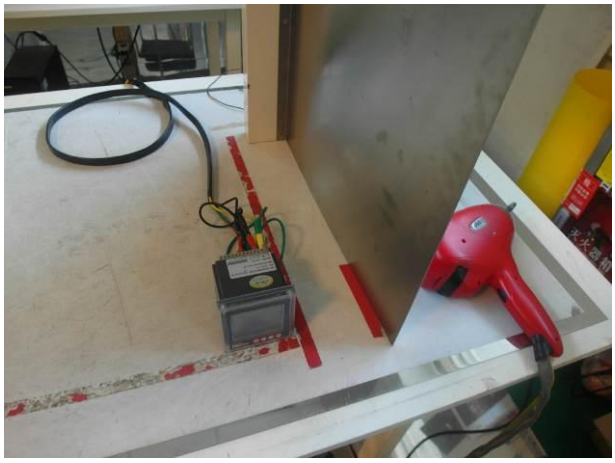
Test condition	Relative error change (%)	Test result (or Max. variation %)
		00004099010118
According to IEC 61000-4-6; Frequency range: 150 kHz to 80 MHz;	Active: 2,0	+0,18

Voltage level(e.m.f): 10V; Voltage(% 0f U_n): 100; Current: I_n; Power factor: 1	Reactive: 4,0	+0,05

5. Conclusion: Pass

4.6 Test of immunity to electrostatic discharges

1. Technical requirement: IEC 62052-11: 2003, item 7.5.2
2. Technical method: IEC 62052-11: 2003, item 7.5.2
3. Test equipment: NSG 437
4. Test picture:



5. Test result:

Test condition	Test requirement	Test result
		00004099010118
Meter in operating condition: Voltage circuit energized with reference voltage; Without any current in the current circuits(open circuit); Contact discharge: 8 kV; Air discharge:15 kV; Number of discharges:10	The change in register: ≤0,00396 kWh/kvarh	0,00 kWh/kvarh
	The test output: ≤39 imp	0imp
	The meter shall show no damage.	Pass

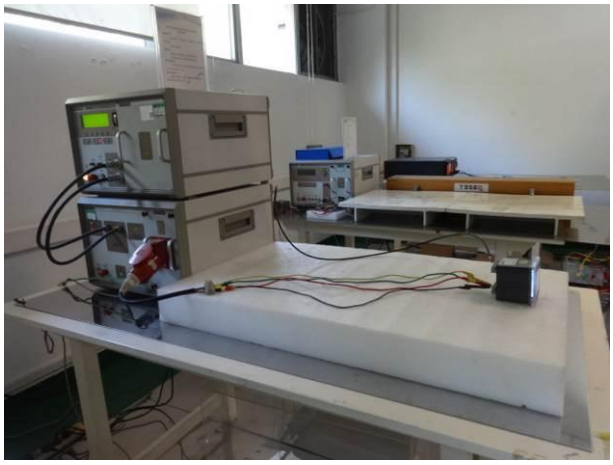
5. Conclusion: Pass

4.7 Surge immunity test

1. Technical requirement: IEC 62052-11: 2003, item 7.5.6
2. Test Method: IEC 62052-11: 2003, item 7.5.6

3. Test equipment: NSG 2050

4. Test picture:



5. Test result:

Test condition	Test requirement	Test result
		00004099010118
According to IEC 61000-4-5; Meter in operating condition: -voltage circuits energized with reference voltage; -without any current in the current circuits; 4kV on the current and voltage circuit; Number of tests: 5 positive and 5 negative; Repetition rate: maximum 1/min.	The change in register: ≤0,00396 kWh/kvarh	0,00 kWh/kvarh
	The test output: ≤39 imp	0imp

6. Conclusion: Pass

5 Tests of the effect of the climatic environments

5.1 Dry heat test, cold test and damp heat cyclic test

1. Technical requirement: IEC 62052-11: 2003, item 6.3.1, item6.3.2, item 6.3.3
2. Test method: IEC 62052-11: 2003, item 6.3.1, item 6.3.2, item 6.3.3
3. Test equipment: WHTH-80L-40-880, LSG-255G, LSG-255G
4. Test result:

Test condition	Test requirement	Test result
		Heat and cold test: 00004099010119
		Damp heat cyclic test: 00004099010120
Dry heat test shall be carried out according to IEC 60068-2-2, under the following conditions: meter in non-operating conditions; temperature：+70℃±2℃； duration of the test：72 h	The meter shall show no damage or change of information and shall operate correctly.	Pass

Test condition	Test requirement	Test result
		Heat and cold test: 00004099010119
		Damp heat cyclic test: 00004099010120
Cold test shall be carried out according to IEC 60068-2-1,under the following conditions: meter in non-operating conditions; temperature：-25℃±3℃； duration of the test：72 h	The meter shall show no damage or change of information and shall operate correctly.	Pass
Damp heat cyclic test shall be carried out according to IEC 60068-2-30, under the following conditions: Voltage and auxiliary circuits energized with reference voltage; Without any current in the current circuits. Variant 1 Upper temperature：+40℃±2℃； Duration of the test：6 cycles	24 h after the end of this test, the meter should pass the Impulse voltage and AC voltage test, the impulse voltage shall be multiplied by a factor of 0,8.	Pass

5. Conclusion: Pass

6 Mechanical tests

6.1 Shock and vibration test

1. Technical requirement: IEC 62052-11: 2003, item 5.2.2.2, item5.2.2.3
2. Test method: IEC 62052-11: 2003, item 5.2.2.2, item5.2.2.3
3. Test equipment: KRD11-50,MPA102/L620M
4. Test result:

Test condition	Test requirement	Test result
		00004099010117
Shock test shall be carried out according to IEC60068-2-27, under the following conditions: meter in non-operating conditions, without the package; half-sine pulse; peak acceleration: 30 g_n(300 m/s^2) duration of the pulse: 18 ms	After the test, the meter shall show no damage or change of information and shall operate correctly.	Pass

Test condition	Test requirement	Test result
		00004099010117
Vibration test shall be carried out according to IEC60068-2-6, under the following conditions: meter in non-operating conditions, without the package; frequency range: 10 Hz～150 Hz; transition frequency: 60Hz; f < 60 Hz, constant of amplitude of movement 0,075 mm; f > 60 Hz, constant acceleration 9,8 m/s^2 (1 *g*); single point control; number of sweep cycles per axis: 10	After the test, the meter shall show no damage or change of information and shall operate correctly.	Pass

5. Conclusion: Pass

6.2 Spring hammer test

1. Technical requirement: IEC 62052-11: 2003, item 5.2.2.1
2. Test method: IEC 62052-11: 2003, item 5.2.2.1
3. Test equipment: 0.14J～1.00J
4. Test result:

Test condition	Test requirement	Test result
		00004099010117
The meter shall be mounted in its normal working position and the spring hammer shall act on the outer surface of the meter cover(including windows) and on the terminal cover with kinetic energy of 0,2 J±0,02 J	The result of the test is satisfactory if the meter case and cover do not sustain damage which could affect the function of the meter and if it is not possible to touch live parts.	Pass

5. Conclusion: Pass

6.3 Protection against penetration of dust and water

1. Technical requirement: IEC 62052-11: 2003, item 5.9
2. Test method: IEC 62052-11: 2003, item 5.9
3. Test equipment: LSG-255G, 7122, LX-010, SC-500
4. Test result:

Test condition	Test requirement	Test result
		00004099010120
The meter shall conform to the degree of protection given in IEC 60529. Place the meter in the analog cabinet. Indoor meter: IP51.	Any ingress of dust and water shall be only in a quantity not impairing the operation of the meter and its dielectric strength	Pass

5. Conclusion: Pass

6.4 Resistance to heat and fire

1. Technical requirement: IEC 62052-11: 2003, item 5.8
2. Test method: IEC 62052-11: 2003, item 5.8
3. Test equipment: ZRS-H
4. Test result:

Test condition	Test requirement	Test result
		00004099010117
The test shall be carried out according to IEC 60695-2-11, with the following temperature: Terminal block: 960℃ ±15℃ Terminal cover and meter case: 650℃ ±10℃ Duration of application: 30 s±1 s	During the test, the meter or the meter sample should not burn; if it burns, it should be extinguished within 30s after the glow wire is removed, and the silk paper on the bottom layer should not ignite.	Pass

5. Conclusion: Pass