TEST REPORT

Product Name : Solar Hybrid Inverter
Model Number : HESP4860S100-H

Prepared for	:	SRNE Solar Co.,Ltd
Address	:	4-5F,Building13A,Taihua Wutong Industrial Park ,Gushu Development Zone ,Hangcheng Street,Baoan, Shenzhen, China PR.
Prepared by	:	EMTEK (SHENZHEN) CO., LTD.
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Report Number	:	ENS2410100183P00102R
Date(s) of Tests	:	August 26, 2024 to September 20, 2024
Date of issue	:	September 20, 2024

TEST REPORT
Grid-connected Inverter Regulation of
Provincial Electricity Authority(PEA)

Report Reference No..... :	ENS2410100183P00102R
Compiled by (name + signature) .... :	Xavier Qiu / Engineer
Approved by (name + signature) .... :	Paladin Hu / Manager
Date of issue ..... :	September 20, 2024
Total number of pages	49 pages

Testing Laboratory name..... :	EMTEK(SHENZHEN) CO., LTD.
Address ..... :	Bldg 69, Majialong Industry Zone, Nanshan District, Shenzhen, Guangdong, China
Testing location/ address..... :	Same as above
Applicant's name ..... :	SRNE Solar Co.,Ltd
Address ..... :	4-5F,Building13A,Taihua Wutong Industrial Park ,Gushu Development Zone ,Hangcheng Street,Baoan, Shenzhen, China PR
Test specification:	
Standard ..... :	IEC 61727: 2004 IEC 62116: 2014
Test procedure ..... :	IEC report
Non-standard test method.....:	N/A
Test Report Form No...... :	IEC61727A IEC62116A
Test Report Form(s) Originator ..... :	EMTEK
Master TRF ..... :	Dated 2013-06
Test item description ..... :	Solar Hybrid Inverter
Trade Mark..... :	SRNE
Manufacturer ..... :	SRNE Solar Co.,Ltd
Address ..... :	4-5F,Building13A,Taihua Wutong Industrial Park ,Gushu Development Zone ,Hangcheng Street,Baoan, Shenzhen, China PR
Model/Type reference ..... :	HESP4860S100-H
Firmware Version ..... :	V2.85
Ratings ..... :	See the rating label.

Possible test case verdicts:

- test case does not apply to the test object.....: N(/A, Not applicable)
- test object does meet the requirement .....: P (Pass)
- test object does not meet the requirement .....: F (Fail)

Testing .....:

Date of receipt of test item.....: September 20, 2024

Date (s) of performance of tests.....: August 26, 2024 to September 20, 2024

General remarks:

"(see Attachment #)" refers to additional information appended to the report.

"(see table)" refers to a table appended to the report.

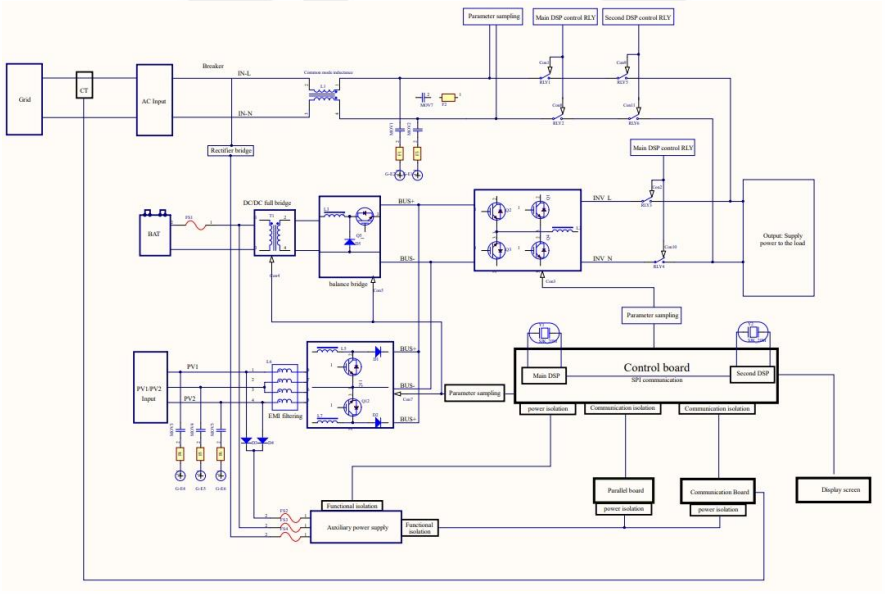
The tests results presented in this report relate only to the object tested.

This report shall not be **reproduced** except in full without the written approval of the testing laboratory. List of test equipment must be kept on file and available for review.

Additional test data and/or information provided in the attachments to this report. Throughout this report a comma /point is used as the decimal separator.

General product information:

In the inverter or grid-connected mode, the DC voltage of the energy storage battery and the DC voltage of the solar panel are boosted to a stable DC voltage through the DC-DC module, and then the DC voltage is converted to AC voltage through the DC-AC module. The input and output of each module have the EMC filtering function, and the AC output voltage is converted to a set of relays to supply power to the load. Or through three groups of relays for redundant switching to achieve the grid-connected function, this redundant design can ensure the reverse control of the machine under abnormal conditions; When the mains and solar panels charge the battery, the input and output are filtered by EMC, and the mains end is controlled by three sets of redundant relays. The AC voltage is converted to DC voltage by AC-DC module to charge and store energy for the battery. Meanwhile, the solar photovoltaic panel converts DC voltage to DC voltage by DC-DC module to charge and store energy for the battery. The reverse control integrated machine realizes the conversion and utilization of energy through the joint work of DC-DC, DC-AC and AC-DC functional modules.

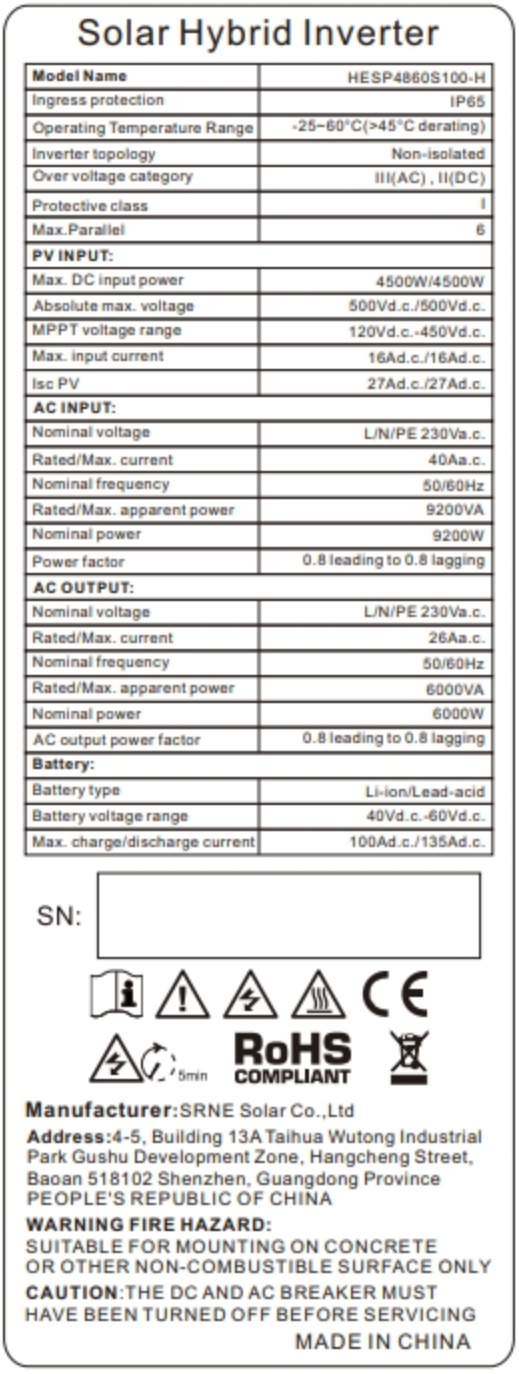


Block diagram

The electrical parameters are shown in Table 1:

PV INPUT:	
Max. DC input power	4500W/4500W
Absolute max. voltage	500Vd.c./500Vd.c.
MPPT voltage range	120Vd.c.-450Vd.c.
Max. input current	16Ad.c./16Ad.c.
Isc PV	27Ad.c./27Ad.c.
AC INPUT:	
Nominal voltage	L/N/PE 230Va.c.
Rated/Max. current	40Aa.c.
Nominal frequency	50/60Hz
Rated/Max. apparent power	9200VA
Nominal power	9200W
Power factor	0.8 leading to 0.8 lagging
AC OUTPUT:	
Nominal voltage	L/N/PE 230Va.c.
Rated/Max. current	26Aa.c.
Nominal frequency	50/60Hz
Rated/Max. apparent power	6000VA
Nominal power	6000W
AC output power factor	0.8 leading to 0.8 lagging
Efficiency	
Maximum conversion efficiency	97.5%
European efficiency	97%
Protect	
General parameters	
Dimensions (W×H×D)	556*345*182mm
Weight (including hanger)	22.1kg
Self-consumption at night	< 100W
Range of working temperature	-25~+60
Cooling method	Heat sink + intelligent fan cooling
Communication	RS485 / CAN / USB / Dry contact

Copy of marking plate:



Solar Hybrid Inverter

Model Name	HESP4860S100-H
Ingress protection	IP65
Operating Temperature Range	-25~60°C(>45°C derating)
Inverter topology	Non-isolated
Over voltage category	III(AC) , II(DC)
Protective class	I
Max.Parallel	6
PV INPUT:	
Max. DC input power	4500W/4500W
Absolute max. voltage	500Vd.c./500Vd.c.
MPPT voltage range	120Vd.c.-450Vd.c.
Max. input current	16Ad.c./16Ad.c.
Isc PV	27Ad.c./27Ad.c.
AC INPUT:	
Nominal voltage	L/N/PE 230Va.c.
Rated/Max. current	40Aa.c.
Nominal frequency	50/60Hz
Rated/Max. apparent power	9200VA
Nominal power	9200W
Power factor	0.8 leading to 0.8 lagging
AC OUTPUT:	
Nominal voltage	L/N/PE 230Va.c.
Rated/Max. current	26Aa.c.
Nominal frequency	50/60Hz
Rated/Max. apparent power	6000VA
Nominal power	6000W
AC output power factor	0.8 leading to 0.8 lagging
Battery:	
Battery type	Li-ion/Lead-acid
Battery voltage range	40Vd.c.-60Vd.c.
Max. charge/discharge current	100Ad.c./135Ad.c.

SN:

5min

RoHS COMPLIANT

Manufacturer:SRNE Solar Co.,Ltd

Address:4-5, Building 13A Taihua Wutong Industrial Park Gushu Development Zone, Hangcheng Street, Baoan 518102 Shenzhen, Guangdong Province PEOPLE'S REPUBLIC OF CHINA

WARNING FIRE HAZARD:
SUITABLE FOR MOUNTING ON CONCRETE OR OTHER NON-COMBUSTIBLE SURFACE ONLY

CAUTION:THE DC AND AC BREAKER MUST HAVE BEEN TURNED OFF BEFORE SERVICING

MADE IN CHINA

Summary of testing

Test result of Photovoltaic Grid-Tied Inverter model HESP4860S100-H, It was tested by SHENZHEN EMTEK CO., LTD and complied according to requirements on grid connection of Provincial Electricity Authority (PEA) as following

Clause	Item	Standard method	Result
1	Harmonics	IEC 61000-3-2	PASS
2	Voltage Fluctuation	IEC 61000-3-5	PASS
3	Direct Current Injection	IEC 61727	PASS
4	Reactive Power Control	PEA	PASS
5	Active Power Control	PEA	PASS
6	Low Voltage Fault Ride Through	PEA	PASS
7	Under and Over Voltage Protection	IEC 61727	PASS
8	Under and Over Frequency Protection	IEC 61727	PASS
9	Anti-Islanding	IEC 62116	PASS
10	Response to Utility Recovery	IEC 61727	PASS

Possible test case verdicts:

– test case does not apply to the test object ..... N/A
– test object does meet the requirement ..... Pass (P)
– test object does not meet the requirement .... Fail (F)

GRID-CONNECTED INVERTER REGULATION OF PROVINCIAL ELECTRICITY AUTHORITY (PEA)			
Clause	Requirement – Test	Result – Remark	Verdict
1	Harmonics		P
	The power generating system of VSPP must not inject harmonic current to the grid system exceeding the limit based on the PEA's rules concerning the Regulations of Grid Connection B.E.2559. In terms of verification at other levels of voltage beyond the aforementioned requirements, the appropriate standard of IEC must be applied.	See table 1	P
2	Voltage Fluctuation		P
	The power generating system of VSPP must not create voltage fluctuation exceeding the limit based on the PEA's rules concerning the Regulations on Grid Connection B.E.2559.		P
	Inverters shall not cause voltage fluctuation beyond the limits defined by the IEC 61000-3-3 (2008) for inverters with rated current ≤ 16 A		N
	IEC 61000-3-5 (2009) for inverters with rated currents greater than 75 A or	See table 2	P
	IEC 61000-3-11 (2000) for inverters with rated currents ≤75 A.		N
3	Direct Current Injection		P
	The power generating system of VSPP must not supply direct current to the grid system exceeding the limit based on the PEA's regulations concerning the Regulations on Grid Connection B.E.2559.	See table 3	P
4	Reactive Power Control		P
	The power generating system of VSPP must be able to control power factor (PF) or reactive power to maintain voltage level at PCC aligned with PEA's standards. The power generating system of service applicants must have capacity as stated in Table 1.	See table 4	P
4.1	Voltage Level at PCC is Low voltage Capacity in Adjusting Power Factor at 0.8 lagging to 0.8 leading as a minimum Reactive Power Control Methods: At least one method can control which is a fixed displacement factor cos θ	See table 4.1	P
4.2	Voltage Level at PCC is moderate voltage or high voltage (electrical installation not exceeding 500 kilowatt). Capacity in Adjusting Power Factor at 0.8 lagging to 0.8 leading as a minimum Reactive Power Control Methods: At least one method can control which is a fixed displacement factor cos θ		N

GRID-CONNECTED INVERTER REGULATION OF PROVINCIAL ELECTRICITY AUTHORITY (PEA)			
Clause	Requirement – Test	Result – Remark	Verdict

4.3	Voltage Level at PCC is Moderate voltage or high voltage (electrical installation exceeding 500 kilowatt). Capacity in Adjusting Power Factor at 0.80 lagging to 0.80 leading as a minimum	See table 4.3	P
	Reactive Power Control Methods: can control which a fixed displacement factor cos θ		P
	Reactive Power Control Methods: can control which a variable reactive power depending on the voltage Q(U)		P
5	Active Power Control		P
	The power generating system of VSPP must be capable of reducing electric power from 100% to zero by decreasing 10% electric power per one minute. In this regard, if there is any abnormality occurred in the grid system or any incident considered by PEA as an impact affecting safety and stability of the grid system, PEA would inform and/or give an order to the VSPP to reduce electric power as appropriate.	See table 5	P
6	Low Voltage Fault Ride Through		P
	The power system of VSPP must not disconnect itself from the grid system within the required period during temporary low voltage of the grid system. The voltage at PCC is determined as shown in Table 2. Table 2. Duration of Low Voltage Fault Ride Through	See table 6	P
7	Under and Over Voltage Protection		P

Voltage at PCC	Duration Time (Second)
1) Low voltage 2) Moderate voltage or high voltage (electrical installation not exceeding 500kilowatt)	Not required
3) Moderate voltage or high voltage (electrical installation exceeding 500kilowatt).	As shown in Picture 1.

GRID-CONNECTED INVERTER REGULATION OF PROVINCIAL ELECTRICITY AUTHORITY (PEA)			
Clause	Requirement – Test	Result – Remark	Verdict
	The power system of VSPP must disconnect itself from the grid system if voltage level of line to neutral in the utility system is out of ranges as stated in Table 3 Table 3. The Disconnect Duration of Falling Voltage Out of Rated Voltage Ranges	see table 7	P
8	Under and Over Frequency Protection		P
	The power generating system of VSPP must disconnect itself from the grid system within 0.1 seconds if the frequency at PCC is not in the range of 47Hz-52Hz.	See table 8	P
9	Anti-Islanding		P
	In order to prevent anti-islanding while there is no electricity in grid system to be supplied to the power system of VSPP, the power generating system of VSPP must disconnect itself from the utility system within 1 seconds	See table 9	P
10	Response to Utility Recovery		P
	After the power generating system of VSPP disconnect itself from the grid system because of power outage or voltage/frequency is out of the ranges, when the grid system is back to normal, the power system of VSPP must delay the time to reconnect itself to the grid system at a minimum of 20 seconds to 5 minutes.	See table 10	P

GRID-CONNECTED INVERTER REGULATION OF PROVINCIAL ELECTRICITY AUTHORITY (PEA)			
Clause	Requirement – Test	Result – Remark	Verdict

1	TABLE: Current Harmonics								P
	Condition of test						Power(kW)		
	supplying power to balance linear loads 33% ±5%						1.98		P
	supplying power to balance linear loads 66 %±5%						3.96		P
	supplying power to balance linear loads 100 %±5%						6.00		P
	Output Current Harmonics Measurement							Limit (% of output current)	Result
Order	33% of rated output current		66% of rated output current		100% of rated output current		Phase		
	(A)	(%)	(A)	(%)	(A)	(%)			
1	9.041	33.149	18.095	66.350	27.369	100.354	L1	-	P
2	0.019	0.071	0.042	0.156	0.057	0.211	L1	<1%	P
3	0.018	0.066	0.019	0.070	0.050	0.184	L1	<4%	P
4	0.005	0.019	0.010	0.037	0.022	0.080	L1	<1%	P
5	0.015	0.054	0.018	0.064	0.015	0.056	L1	<4%	P
6	0.006	0.022	0.007	0.026	0.014	0.051	L1	<1%	P
7	0.023	0.083	0.026	0.094	0.025	0.091	L1	<4%	P
8	0.006	0.021	0.008	0.029	0.012	0.045	L1	<1%	P
9	0.033	0.120	0.039	0.143	0.040	0.147	L1	<4%	P
10	0.005	0.020	0.007	0.027	0.009	0.032	L1	<1%	P
11	0.096	0.353	0.124	0.454	0.124	0.456	L1	<2%	P
12	0.005	0.020	0.008	0.028	0.009	0.033	L1	<0.5%	P
13	0.072	0.264	0.106	0.387	0.115	0.421	L1	<2%	P
14	0.005	0.020	0.007	0.025	0.009	0.032	L1	<0.5%	P
15	0.053	0.193	0.087	0.321	0.101	0.371	L1	<2%	P
16	0.005	0.018	0.006	0.023	0.008	0.028	L1	<0.5%	P
17	0.037	0.136	0.074	0.271	0.088	0.321	L1	<1.5%	P
18	0.005	0.018	0.006	0.023	0.007	0.026	L1	<0.375%	P
19	0.025	0.091	0.063	0.230	0.080	0.294	L1	<1.5%	P
20	0.005	0.017	0.006	0.023	0.008	0.028	L1	<0.375%	P
21	0.016	0.059	0.052	0.191	0.071	0.260	L1	<1.5%	P
22	0.004	0.016	0.006	0.022	0.008	0.028	L1	<0.375%	P
23	0.010	0.036	0.045	0.164	0.063	0.233	L1	<0.6%	P
24	0.004	0.015	0.006	0.021	0.007	0.027	L1	<0.15%	P
25	0.006	0.023	0.037	0.135	0.056	0.206	L1	<0.6%	P
26	0.004	0.015	0.006	0.021	0.007	0.026	L1	<0.15%	P
27	0.004	0.016	0.031	0.113	0.049	0.180	L1	<0.6%	P
28	0.004	0.014	0.006	0.020	0.007	0.026	L1	<0.15%	P
29	0.004	0.016	0.026	0.094	0.043	0.158	L1	<0.6%	P
30	0.004	0.014	0.005	0.019	0.007	0.025	L1	<0.15%	P
31	0.004	0.014	0.022	0.082	0.038	0.141	L1	<0.6%	P
32	0.004	0.013	0.005	0.018	0.007	0.026	L1	<0.15%	P
33	0.004	0.016	0.018	0.065	0.033	0.122	L1	<0.6%	P
34	0.003	0.013	0.005	0.017	0.007	0.025	L1	<0.15%	P
35	0.004	0.014	0.016	0.058	0.029	0.106	L1	<0.3%	P
36	0.003	0.013	0.005	0.017	0.007	0.024	L1	<0.075%	P
37	0.004	0.013	0.014	0.052	0.028	0.101	L1	<0.3%	P
38	0.003	0.013	0.005	0.017	0.006	0.023	L1	<0.075%	P
39	0.004	0.013	0.012	0.043	0.022	0.082	L1	<0.3%	P
40	0.003	0.013	0.004	0.015	0.006	0.020	L1	<0.075%	P
THDi	--	0.150	--	0.240	--	0.289	L1	≤ 5%	P
Supplementary information:									

GRID-CONNECTED INVERTER REGULATION OF PROVINCIAL ELECTRICITY AUTHORITY (PEA)			
Clause	Requirement – Test	Result – Remark	Verdict

1	TABLE: Voltage Harmonics									P
	Condition of test						Power(kW)			
	supplying power to balance linear loads 33% ±5%						1.98			P
	supplying power to balance linear loads 66 %±5%						3.96			P
	supplying power to balance linear loads 100 %±5%						6.00			P
	Output Voltage Harmonics Measurement									
Order	33% of rated output current		66% of rated output current		100% of rated output current		Phase	Limit (% of output current)	Result	
	(V)	(%)	(V)	(%)	(V)	(%)				
1	220.557	100.253	220.279	100.127	220.010	100.005	L1	-	P	
2	0.011	0.005	0.010	0.005	0.010	0.004	L1	<2%	P	
3	0.033	0.015	0.070	0.032	0.041	0.019	L1	<4%	P	
4	0.012	0.006	0.011	0.005	0.011	0.005	L1	<2%	P	
5	0.072	0.033	0.011	0.005	0.009	0.004	L1	<4%	P	
6	0.010	0.005	0.009	0.004	0.009	0.004	L1	<2%	P	
7	0.030	0.014	0.011	0.005	0.008	0.004	L1	<4%	P	
8	0.012	0.005	0.009	0.004	0.009	0.004	L1	<2%	P	
9	0.016	0.007	0.009	0.004	0.009	0.004	L1	<4%	P	
10	0.012	0.005	0.010	0.004	0.009	0.004	L1	<2%	P	
11	0.016	0.007	0.017	0.008	0.013	0.006	L1	<4%	P	
12	0.011	0.005	0.010	0.004	0.010	0.005	L1	<2%	P	
13	0.024	0.011	0.016	0.007	0.013	0.006	L1	<4%	P	
14	0.009	0.004	0.009	0.004	0.009	0.004	L1	<2%	P	
15	0.016	0.007	0.016	0.007	0.011	0.005	L1	<4%	P	
16	0.010	0.005	0.009	0.004	0.009	0.004	L1	<2%	P	
17	0.019	0.009	0.016	0.007	0.011	0.005	L1	<4%	P	
18	0.011	0.005	0.012	0.006	0.011	0.005	L1	<2%	P	
19	0.019	0.009	0.017	0.008	0.012	0.005	L1	<4%	P	
20	0.009	0.004	0.009	0.004	0.009	0.004	L1	<2%	P	
21	0.015	0.007	0.014	0.006	0.009	0.004	L1	<4%	P	
22	0.010	0.005	0.010	0.004	0.009	0.004	L1	<2%	P	
23	0.018	0.008	0.014	0.006	0.009	0.004	L1	<4%	P	
24	0.009	0.004	0.010	0.005	0.009	0.004	L1	<2%	P	
25	0.016	0.007	0.014	0.006	0.010	0.004	L1	<4%	P	
26	0.010	0.004	0.009	0.004	0.009	0.004	L1	<2%	P	
27	0.016	0.007	0.012	0.006	0.009	0.004	L1	<4%	P	
28	0.009	0.004	0.009	0.004	0.009	0.004	L1	<2%	P	
29	0.014	0.007	0.011	0.005	0.009	0.004	L1	<4%	P	
30	0.009	0.004	0.009	0.004	0.009	0.004	L1	<2%	P	
31	0.013	0.006	0.012	0.005	0.009	0.004	L1	<4%	P	
32	0.009	0.004	0.009	0.004	0.008	0.004	L1	<2%	P	
33	0.013	0.006	0.010	0.005	0.009	0.004	L1	<4%	P	
34	0.009	0.004	0.009	0.004	0.009	0.004	L1	<2%	P	
35	0.012	0.005	0.010	0.005	0.009	0.004	L1	<4%	P	
36	0.009	0.004	0.010	0.004	0.009	0.004	L1	<2%	P	
37	0.012	0.006	0.012	0.005	0.010	0.004	L1	<4%	P	
38	0.009	0.004	0.009	0.004	0.009	0.004	L1	<2%	P	
39	0.012	0.005	0.009	0.004	0.009	0.004	L1	<4%	P	
40	0.009	0.004	0.010	0.004	0.009	0.004	L1	<2%	P	

GRID-CONNECTED INVERTER REGULATION OF PROVINCIAL ELECTRICITY AUTHORITY (PEA)			
Clause	Requirement – Test	Result – Remark	Verdict

THDv	--	0.115	--	0.0994	--	0.0721	L1	≤ 5%	P

2	TABLE: Voltage Fluctuation				P
Flicker measurement 1	EUT values			Limit	Result
	L1	L2	L3		
Pst	0.052	--	--	1.00	P
Plt	0.031	--	--	0.80	P
dc [%]	0.129	--	--	3.30	P
dmax [%]	0.195	--	--	4.00	P
dt [s]	0	--	--	--	--
Supplementary information:/					

3	TABLE: Direct Current Injection							P
	Condition of test						Output Power [kW]	
	supplying power to balance linear loads 33% ±5%						1.98	P
	supplying power to balance linear loads 66% ±5%						3.96	P
	supplying power to balance linear loads 100% ±5%						6.00	P
Phase	Output DC current Measurement						Limit [%]	Verdict [P/F]
	33% of rated output current		66% of rated output current		100% of rated output current			
	(A)	(%)	(A)	(%)	(A)	(%)		
L1	0.00256	0.01	0.0411	0.15	0.0381	0.14	≤0.5	P
L2	--	--	--	--	--	--	≤0.5	P
L3	--	--	--	--	--	--	≤0.5	P
Supplementary information:/								

4	TABLE : Reactive power control						P
-Q max							
Power Set [%]	Active Power		Reactive power		DC power		Power factor
	kW	p.u.	kVAR	p.u.	(kW)	p.u.	
1	0.04	0.61%	0.17	2.82%	0.06	1.01%	0.23
10	0.53	8.87%	-3.59	-59.90%	0.63	10.49%	0.16
20	1.16	19.36%	-3.57	-59.49%	1.26	20.97%	0.32
30	1.75	29.24%	-3.56	-59.29%	1.88	31.26%	0.45
40	2.40	39.93%	-3.57	-59.49%	2.50	41.75%	0.57
50	3.00	50.01%	-3.57	-59.49%	3.13	52.23%	0.62
60	3.62	60.30%	-3.58	-59.69%	3.75	62.52%	0.70

70	4.22	70.38%	-3.57	-59.49%	4.38	73.00%	0.75
80	4.82	80.26%	-3.56	-59.29%	5.00	83.29%	0.81
90	5.20	86.72%	-3.57	-59.49%	5.41	90.15%	0.82
100	5.20	86.72%	-3.58	-59.69%	5.40	89.94%	0.82
+Q max							
Power Set	Active Power [W]		Reactive power [Var]		DC power		Power factor
	kW	p.u.	kVAR	p.u.	(kW)	p.u.	
1	0.05	0.81%	-0.17	-2.82%	0.07	1.21%	0.27
10	0.58	9.68%	3.93	65.54%	0.63	10.49%	0.16
20	1.16	19.36%	3.61	60.10%	1.26	20.97%	0.30
30	1.79	29.85%	3.63	60.50%	1.89	31.46%	0.45
40	2.40	39.93%	3.68	61.31%	2.52	41.95%	0.53
50	3.01	50.22%	3.64	60.70%	3.13	52.23%	0.65
60	3.62	60.30%	3.63	60.50%	3.76	62.72%	0.71
70	4.22	70.38%	3.64	60.70%	4.38	73.00%	0.77
80	4.82	80.26%	3.64	60.70%	5.01	83.49%	0.81
90	5.40	89.94%	3.63	60.50%	5.61	93.57%	0.82
100	5.38	89.74%	3.65	60.90%	5.60	93.37%	0.83

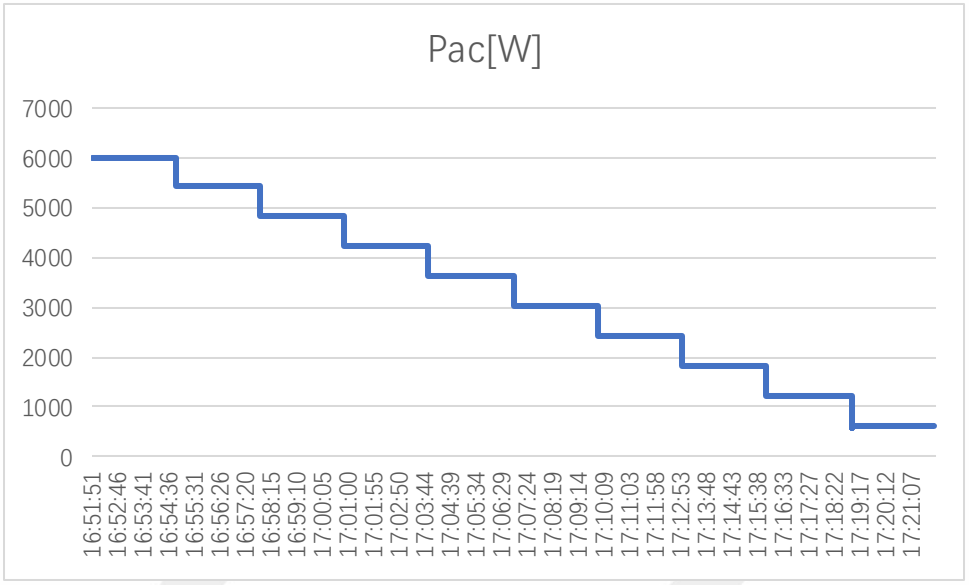
4.1	TABLE : Reactive power control				P
4.1 fixed displacement factor cos Ø					
P (setting)	PF (setting)	P (measuring)	Q (max measuring)	PF (measuring)	
P.F. setting 0.80 lagging					
0% (1%)	0.80 lagging	76.3	-300.4	-0.24	
10%	0.80 lagging	660.8	-506.4	-0.79	
20%	0.80 lagging	1146.1	-836.1	-0.8	
30%	0.80 lagging	1746.4	-1272.8	-0.8	
40%	0.80 lagging	2358.5	-1709.4	-0.8	
50%	0.80 lagging	2953.2	-2160.2	-0.8	
60%	0.80 lagging	3547.7	-2614.7	-0.8	
70%	0.80 lagging	4151.9	-3054.0	-0.8	
80%	0.80 lagging	4749.4	-3502.7	-0.8	
90%	0.80 lagging	4744.6	-3506.3	-0.8	
100%	0.80 lagging	4749.2	-3501.0	-0.8	
P.F. setting 0.80 leading					
0% (1%)	0.80 leading	57.3	222.9	0.24	
10%	0.80 leading	626.9	474.8	0.8	
20%	0.80 leading	1203.0	903.2	0.8	
30%	0.80 leading	1777.3	1333.7	0.8	
40%	0.80 leading	2346.8	1770.7	0.8	

GRID-CONNECTED INVERTER REGULATION OF PROVINCIAL ELECTRICITY AUTHORITY (PEA)			
Clause	Requirement – Test	Result – Remark	Verdict

50%	0.80 leading	2978.5	2230.1	0.8
60%	0.80 leading	3540.8	2677.4	0.8
70%	0.80 leading	4157.0	3119.3	0.8
80%	0.80 leading	4713.8	3549.8	0.8
90%	0.80 leading	5148.8	3888.5	0.8
100%	0.80 leading	5153.0	3881.3	0.8
P.F. setting PF 1.0				
0% (1%)	1.0	49.1	-168.2	0.28
10%	1.0	603.1	57.5	0.99
20%	1.0	1213.4	56.9	0.99
30%	1.0	1824.6	67.8	0.99
40%	1.0	2432.1	69.1	0.99
50%	1.0	3036.3	72.2	0.99
60%	1.0	3638.2	71.4	0.99
70%	1.0	4236.9	74.3	0.99
80%	1.0	4832.7	80.6	0.99
90%	1.0	5425.2	91.7	0.99
100%	1.0	6001.6	95.6	0.99

5	TABLE : Active power control			P
Power Setting		Power Measuring [kW]	Power Deviation of set point	
Power [%]	Power [kW]		Power [kW]	Power [%]
100%	6	6.00	0.00	0.00%
90%	5.4	5.42	0.02	0.40%
80%	4.8	4.84	0.04	0.60%
70%	4.2	4.24	0.04	0.60%
60%	3.6	3.64	0.04	0.60%
50%	3.0	3.04	0.04	0.60%
40%	2.4	2.44	0.04	0.60%
30%	1.8	1.82	0.02	0.40%
20%	1.2	1.21	0.01	0.20%
10%	0.6	0.60	0.00	0.00%
Supplementary information:				

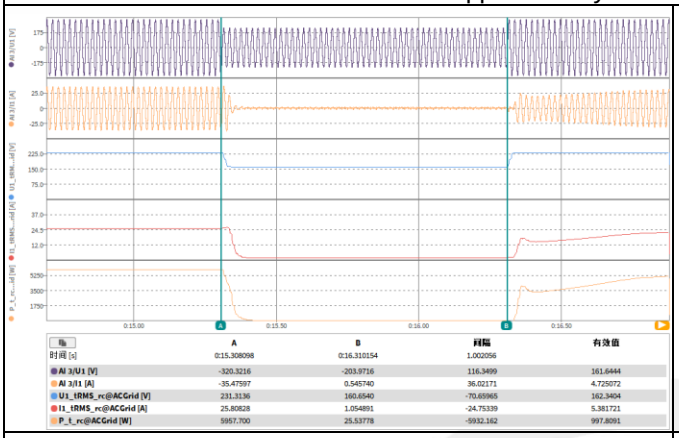
GRID-CONNECTED INVERTER REGULATION OF PROVINCIAL ELECTRICITY AUTHORITY (PEA)			
Clause	Requirement – Test	Result – Remark	Verdict



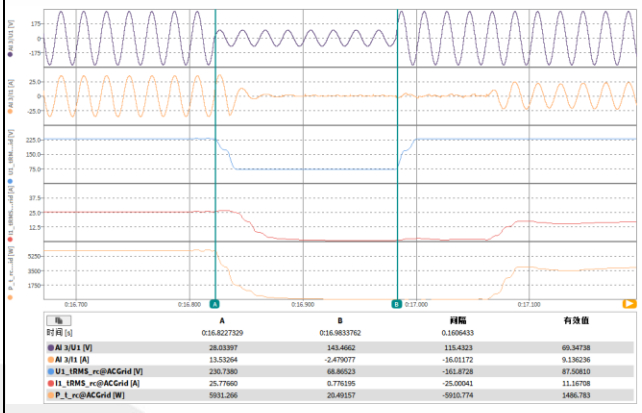
6	Low Voltage Fault Ride Through（90% Power）	P
List of tests	Residual amplitude of phase-to-phase voltage V/Vnom	Duration Time (s)
file:5- A-phasel faults	0.7-0.8 (V4/Vnom)	1.002
	0.3-0.5 (V5/Vnom)	0.160
	0-0.049 (V6/Vnom)	0.161
Low Voltage Fault Ride Through（30% Power）		
List of tests	Residual amplitude of phase-to-phase voltage V/Vnom	Duration Time (s)
file:5- A-phase faults	0.7-0.8 (V4/Vnom)	1.001
	0.3-0.5 (V5/Vnom)	0.161
	0-0.049 (V6/Vnom)	0.159
Low Voltage Fault Ride Through（10% Power）		
List of tests	Residual amplitude of phase-to-phase voltage V/Vnom	Duration Time (s)
file:5- A-phase faults	0.7-0.8 (V4/Vnom)	1.007
	0.3-0.5 (V5/Vnom)	0.163
	0-0.049 (V6/Vnom)	0.160

GRID-CONNECTED INVERTER REGULATION OF PROVINCIAL ELECTRICITY AUTHORITY (PEA)			
Clause	Requirement – Test	Result – Remark	Verdict

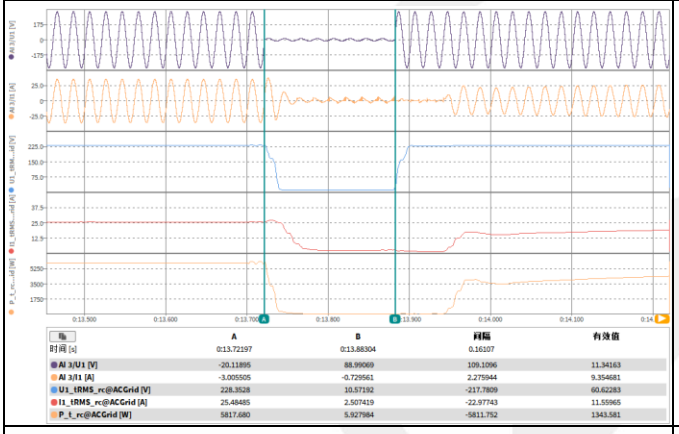
Supplementary information(90% Power):



A-phase symmetrical faults 0.7-0.8 Vn



A-phase symmetrical faults 0.3-0.5 Vn



A-phase symmetrical faults 0-0.049 Vn

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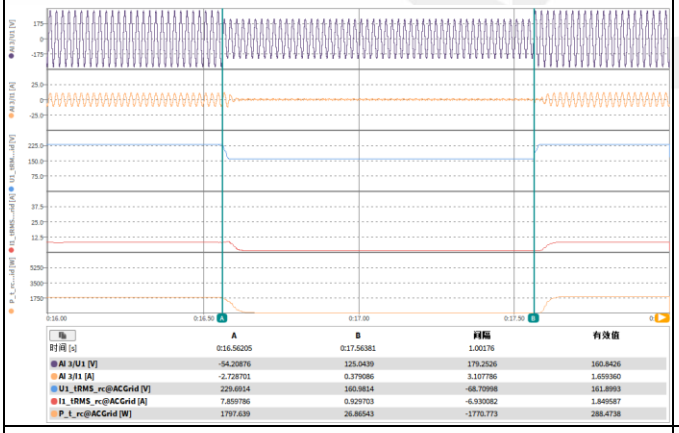
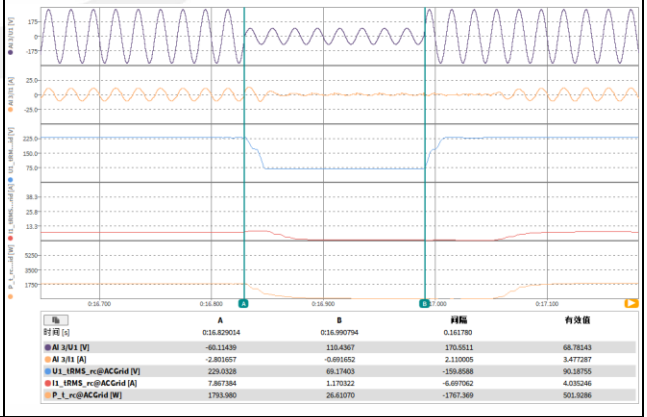
Supplementary information(30% Power):

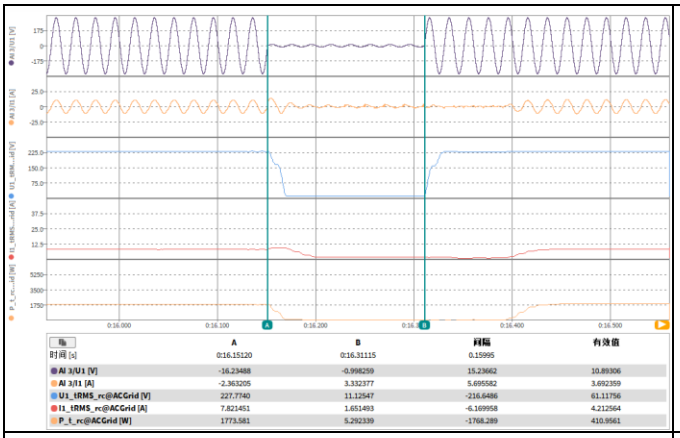


A-phase symmetrical faults 0.7-0.8 Vn



A-phase symmetrical faults 0.3-0.5 Vn

GRID-CONNECTED INVERTER REGULATION OF PROVINCIAL ELECTRICITY AUTHORITY (PEA)			
Clause	Requirement – Test	Result – Remark	Verdict



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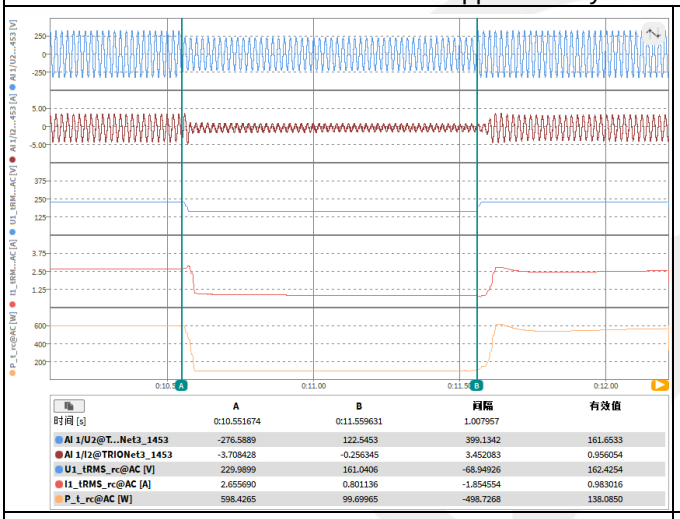
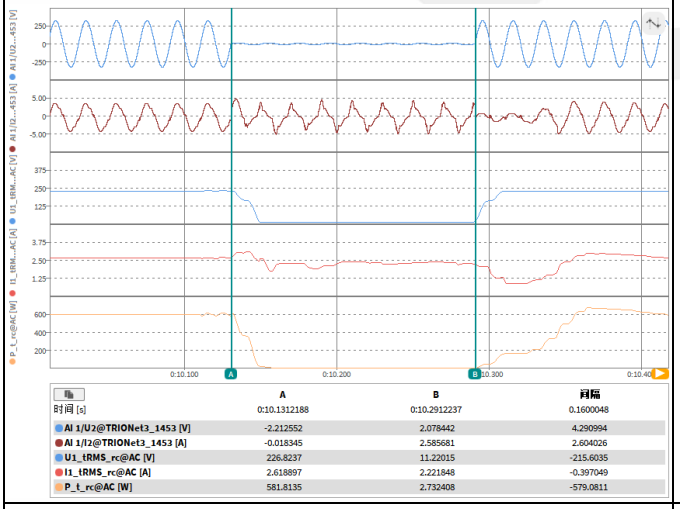
A-phase symmetrical faults 0-0.049 Vn	--
Supplementary information(10% Power):	



A-phase symmetrical faults 0.7-0.8 Vn	A-phase symmetrical faults 0.3-0.5 Vn



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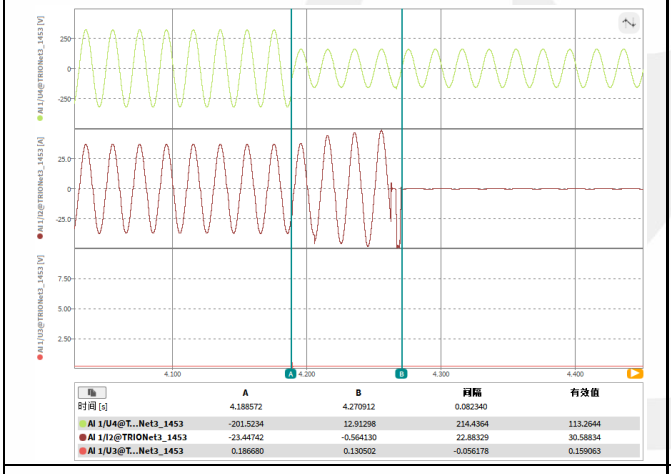
A-phase symmetrical faults 0-0.049 Vn	--

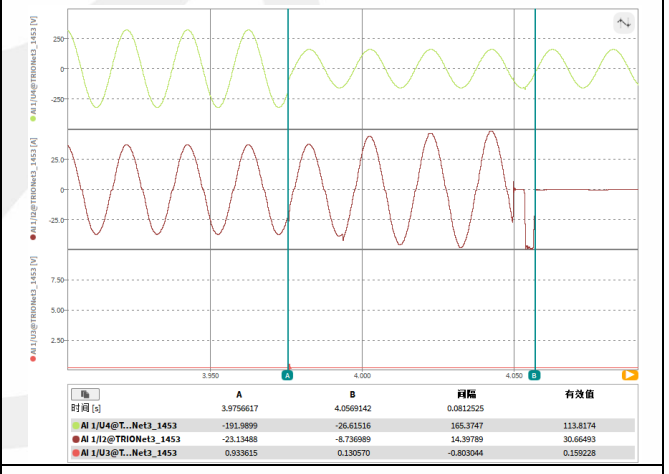
7	TABLE: Operating Voltage Range	P

GRID-CONNECTED INVERTER REGULATION OF PROVINCIAL ELECTRICITY AUTHORITY (PEA)			
Clause	Requirement – Test	Result – Remark	Verdict

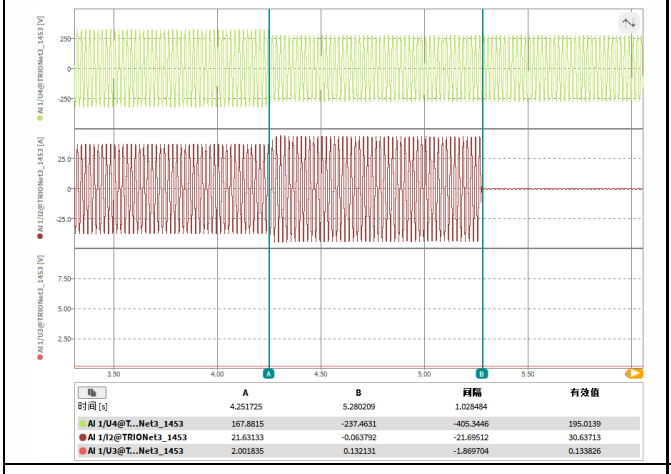
No.	Voltage Range (V)	Setting Voltage (V)	Setting time (s)	Test Voltage (V)	Disconnecting Time (S)	Max. Disconnecting Time (S)	Result
1	V<50%	114	0.2	113	0.08	0.3	P
2	V<50%	114	0.2	113	0.08	0.3	P
3	50%≤V<90%	195.5	1.5	195	1.02	2.0	P
4	50%≤V<90%	195.5	1.5	195	1.02	2.0	P
5	90%≤V≤110%	198	--	200	CONTINUE	CONTINUE	P
6	90%≤V≤110%	198	--	200	CONTINUE	CONTINUE	P
7	90%≤V≤110%	241	--	240	CONTINUE	CONTINUE	P
8	90%≤V≤110%	241	--	240	CONTINUE	CONTINUE	P
9	110%<V<120%	253	0.9	254	0.17	1.0	P
10	110%<V<120%	253	0.9	254	0.16	1.0	P
11	V≥120%	280	0.1	265	0.04	0.16	P
12	V≥120%	280	0.1	265	0.04	0.16	P



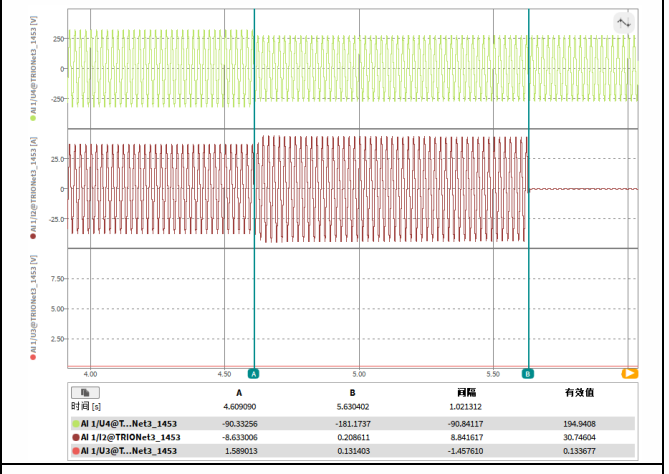
V < 50%,114V



V < 50%,114V

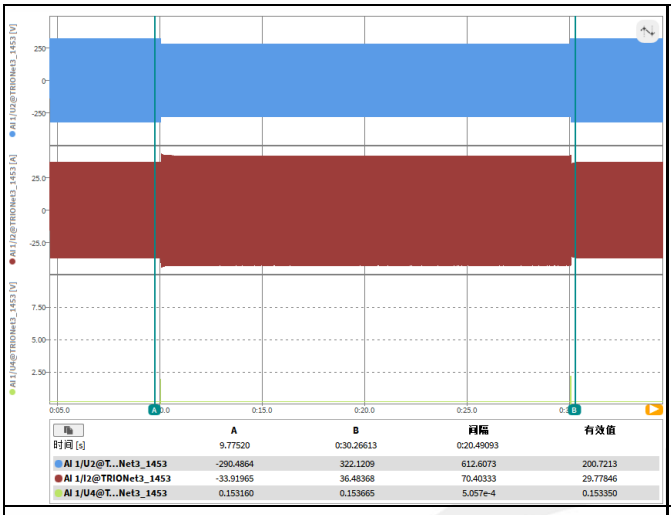


50%≤V<90%, 195.5V

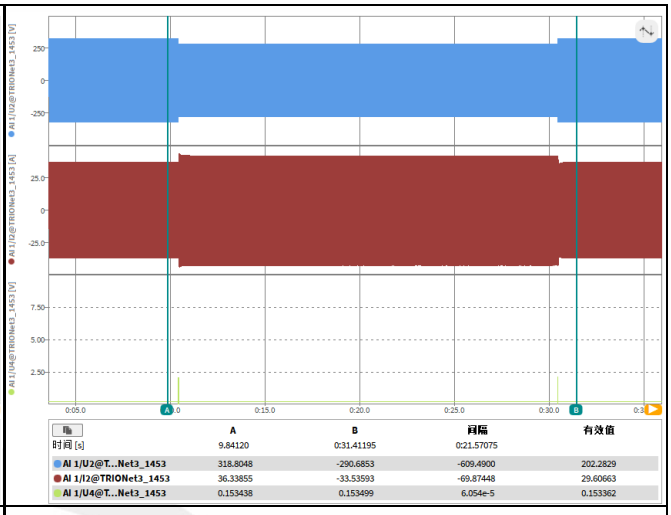


50%≤V<90%, 195.5V

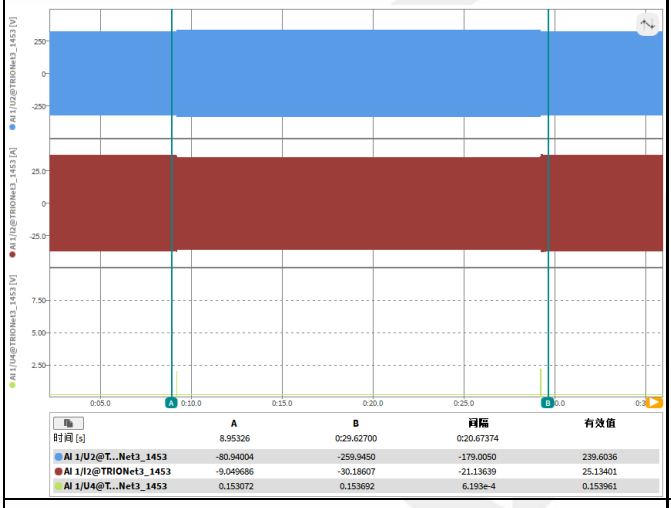
GRID-CONNECTED INVERTER REGULATION OF PROVINCIAL ELECTRICITY AUTHORITY (PEA)			
Clause	Requirement – Test	Result – Remark	Verdict



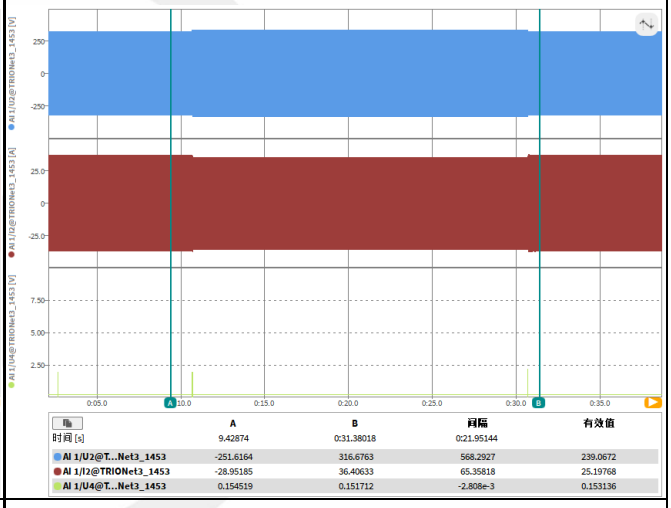
90%≤V≤110%，198V



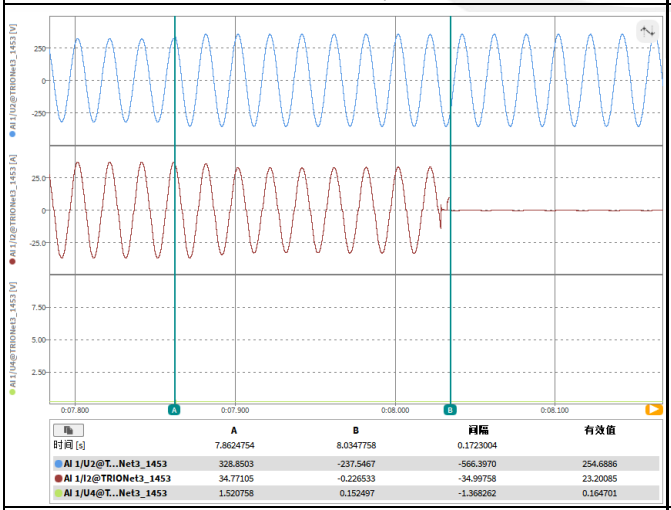
90%≤V≤110%，198V



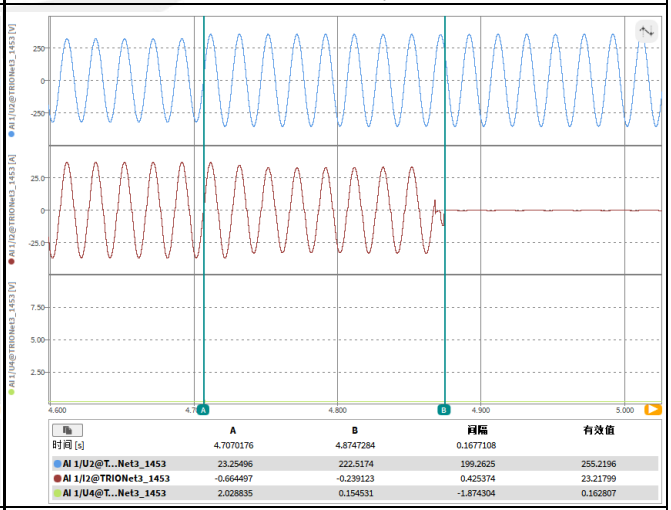
90%≤V≤110%，241V



90%≤V≤110%，241V

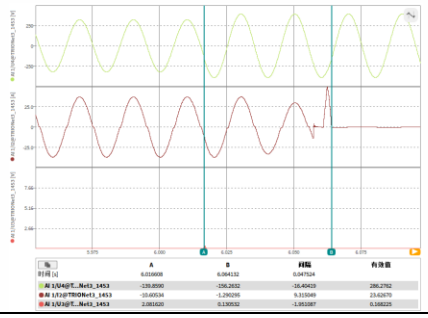
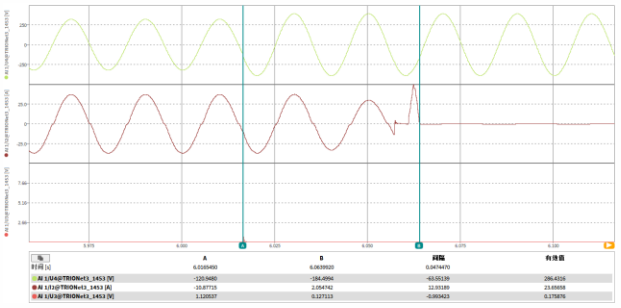


110%<V<120%,253V



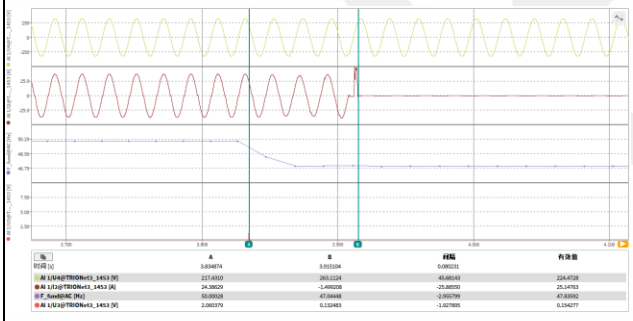
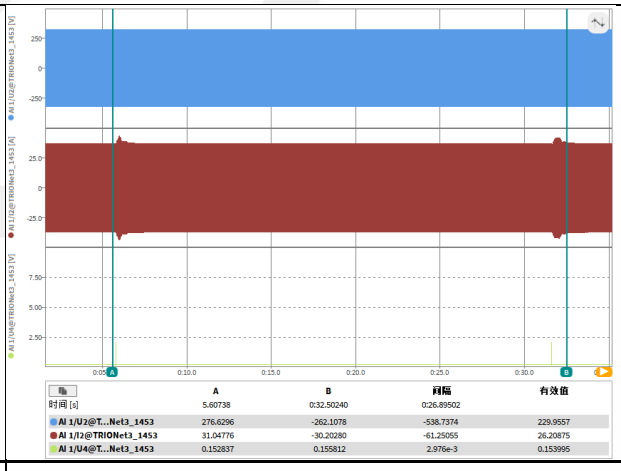
110%<V<120%,253V

GRID-CONNECTED INVERTER REGULATION OF PROVINCIAL ELECTRICITY AUTHORITY (PEA)			
Clause	Requirement – Test	Result – Remark	Verdict

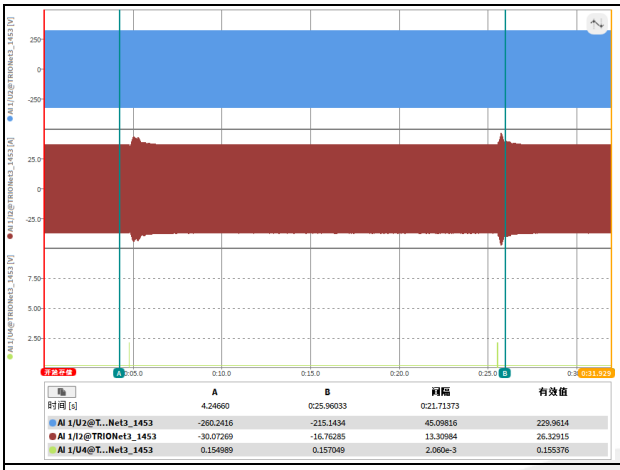
	
V≥120%, 280V	V≥120%, 280V

8	TABLE: Operating Frequency Range						P
No.	Frequency Range (Hz)	Setting Frequency (Hz)	Setting time (s)	Test Frequency (Hz)	Disconnecting Time (S)	Max. Disconnecting Time (S)	Result
1	93.8%UFT	46.9	0.08	46.9	0.08	0.1	P
2	94.2%UFT	47.1	--	47.1	Cont.	Cont.	P
3	103.8%OFT	51.9	--	51.9	Cont.	Cont.	P
4	104.2%OFT	52.1	0.08	52.1	0.07	0.1	P

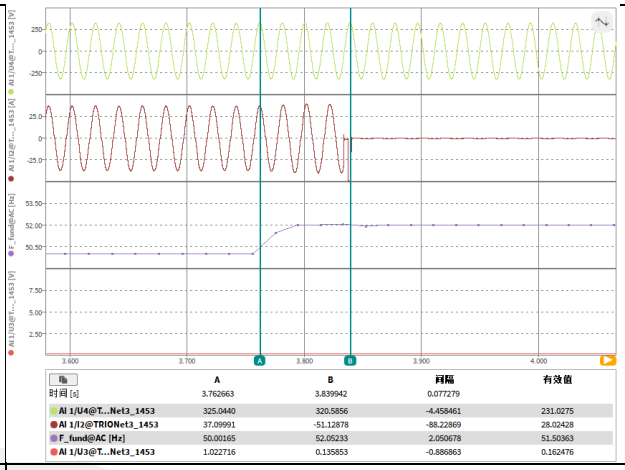
Supplementary information:
OFT: Over frequency Trip Setting
UFT: Under frequency Trip Setting
Cont.: Continuous operated

	
Under frequency ⩽ 46.9 Hz	Over frequency > 51.8 Hz

GRID-CONNECTED INVERTER REGULATION OF PROVINCIAL ELECTRICITY AUTHORITY (PEA)			
Clause	Requirement – Test	Result – Remark	Verdict



Under frequency < 47.2 Hz



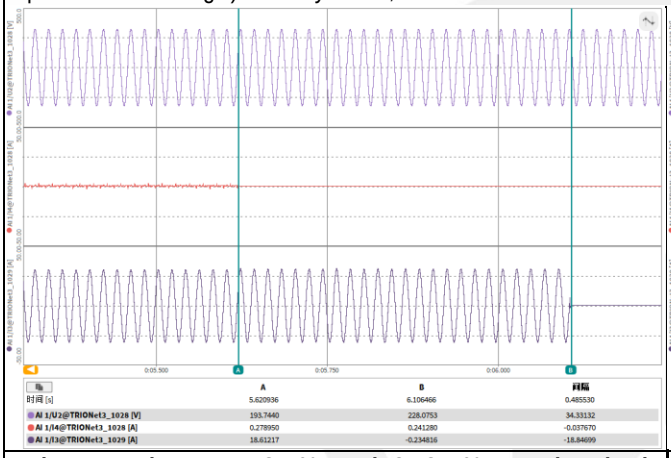
Over frequency ⩾52.1Hz

9	TABLE: Islanding protection (EUT output = 100%)								P
Test conditions		Frequency: 50+/-0.1Hz UN=230+/-3Vac Distortion factor of chokes < 2% Quality =1							
Disconnection limit		2s for MEA							
No	1) PEUT (% of EUT rating)	Reactive load (% of QL in 6.1.d) 1)	2) PAC (% of nominal)	3) QAC (% of nominal)	Run on Time (ms)	PEUT (kW)	Actual Qf	V (V)	Remarks5)
1	100	100	0	0	0.48	6.00	1.00	380	BL
2	100	100	-5	-5	0.12	6.00	1.02	380	IB
3	100	100	-5	0	0.47	6.00	1.03	380	IB
4	100	100	-5	5	0.10	6.00	1.06	380	IB
5	100	100	0	-5	0.13	6.00	0.96	380	IB
6	100	100	0	5	0.13	6.00	1.01	380	IB
7	100	100	5	-5	0.12	6.00	0.93	380	IB
8	100	100	5	0	0.26	6.00	0.94	380	IB
9	100	100	5	5	0.13	6.00	0.97	380	IB

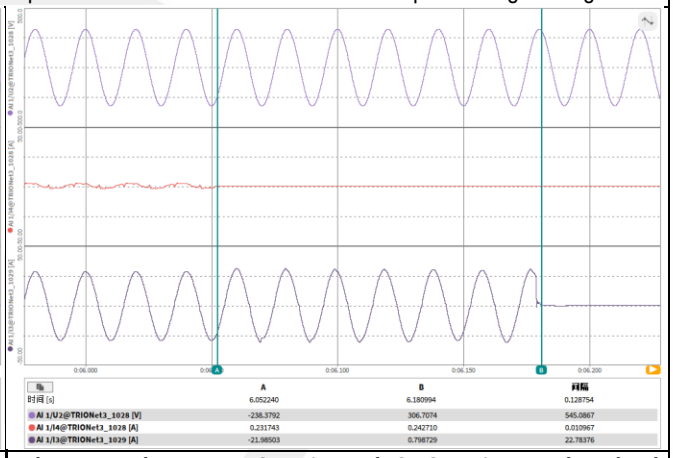
Parameter at 0% per phase	L= 0.214mH	R= 0.129Ω	C= 1439.8μF
IAC fundamental current at balance condition	L1: 0.12A	L2: 0.09A	L3: 0.12A

GRID-CONNECTED INVERTER REGULATION OF PROVINCIAL ELECTRICITY AUTHORITY (PEA)			
Clause	Requirement – Test	Result – Remark	Verdict

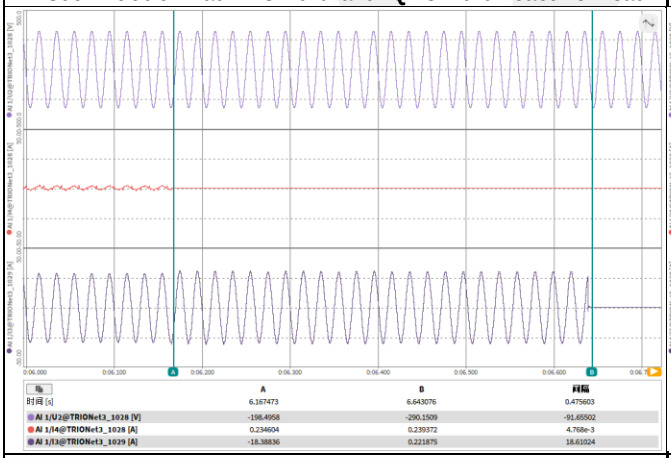
Note:
RLC is adjusted to min. +/-1% of the inverter rated output power
1) PEUT: EUT output power
2) PAC: Real power flow at S1 in Figure 1. Positive means power from EUT to utility. Nominal is the 0 % test condition value.
3) QAC: Reactive power flow at S1 in Figure 1. Positive means power from EUT to utility. Nominal is the 0 % test condition value.
4) BL: Balance condition, IB: Imbalance condition.
Condition A:
EUT output power PEUT = Maximum5)
EUT input voltage 6) = 100% of rated input voltage range
5) Maximum EUT output power condition should be achieved using the maximum allowable input power. Actual output power may exceed nominal rated output.
6) Based on EUT rated input operating range. For example, If range is between X volts and Y volts, 90 % of range =X + 0.9 × (Y – X). Y shall not exceed 0.8 × EUT maximum system voltage (i.e., maximum allowable array open circuit voltage). In any case, the EUT should not be operated outside of its allowable input voltage range.



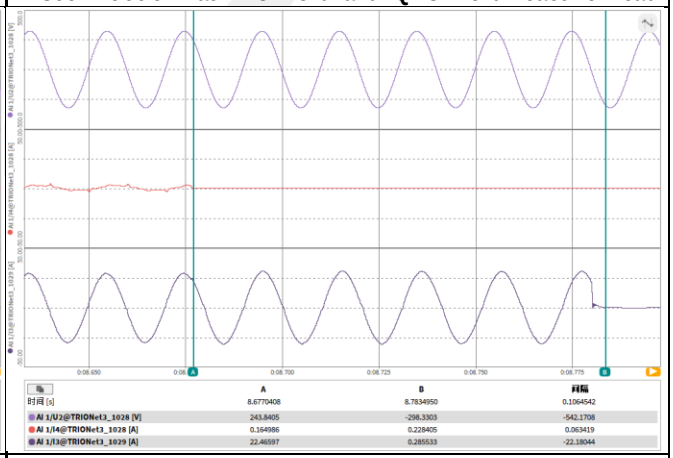
Disconnection at PAC 0% and QAC 0% reactive load



Disconnection at PAC -5% and QAC -5% reactive load

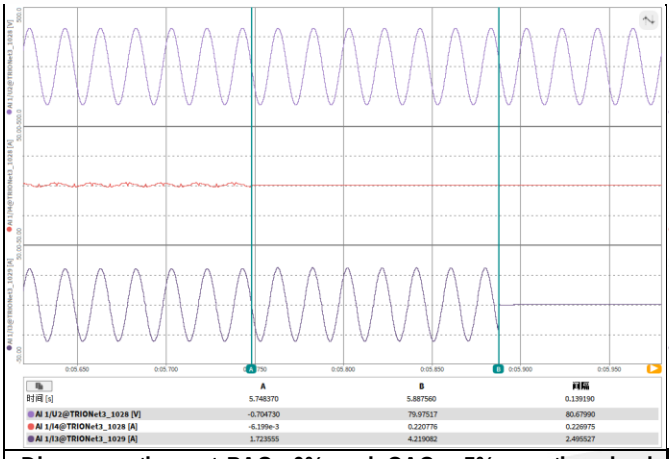


Disconnection at PAC -5% and QAC 0% reactive load

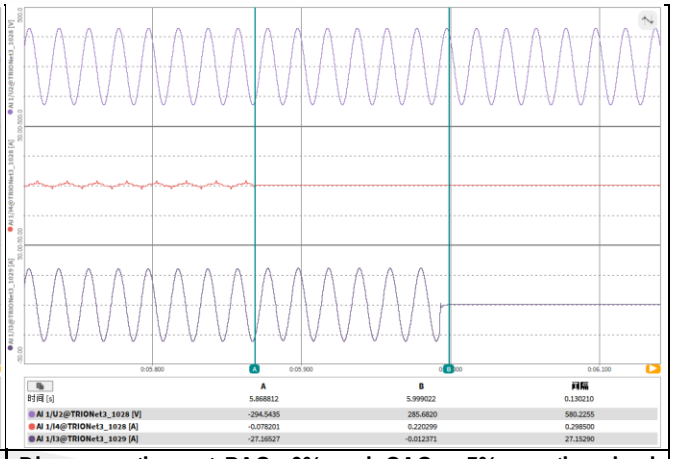


Disconnection at PAC -5% and QAC +5% reactive load

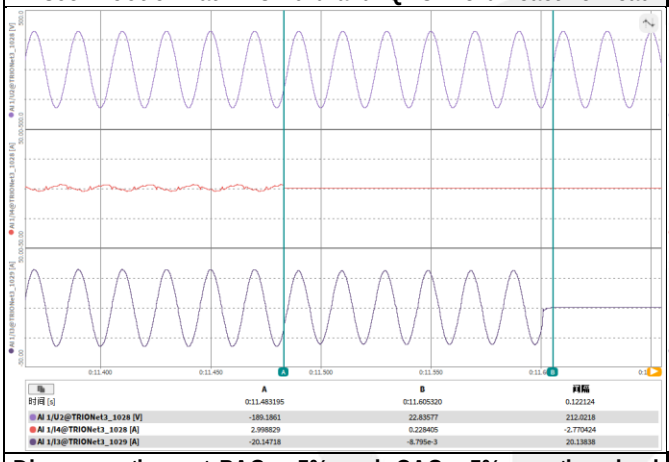
GRID-CONNECTED INVERTER REGULATION OF PROVINCIAL ELECTRICITY AUTHORITY (PEA)			
Clause	Requirement – Test	Result – Remark	Verdict



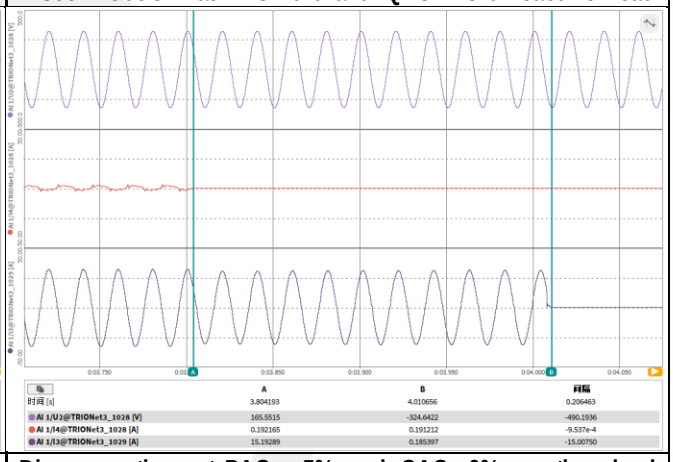
Disconnection at PAC 0% and QAC -5% reactive load



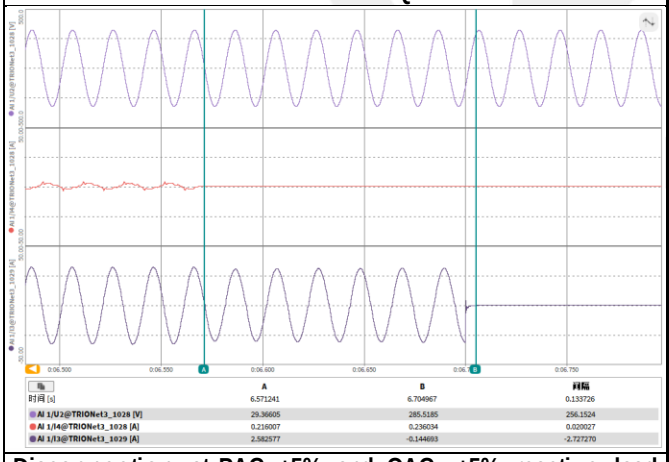
Disconnection at PAC 0% and QAC +5% reactive load



Disconnection at PAC +5% and QAC -5% reactive load



Disconnection at PAC +5% and QAC 0% reactive load



Disconnection at PAC +5% and QAC +5% reactive load

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Attention:

For Thailand only picture with all three current phases L1. L2 and L3 are accepted

All relays are direct coupled and open directly by receiving the islanding signal from the controller.

Note:

U1(V): voltage of EUT; I1(A). I4(A): current of EUT; I2(A) Grid side EUT current

9	TABLE: **Islanding protection (EUT output = 66%)**	**P**

GRID-CONNECTED INVERTER REGULATION OF PROVINCIAL ELECTRICITY AUTHORITY (PEA)			
Clause	Requirement – Test	Result – Remark	Verdict

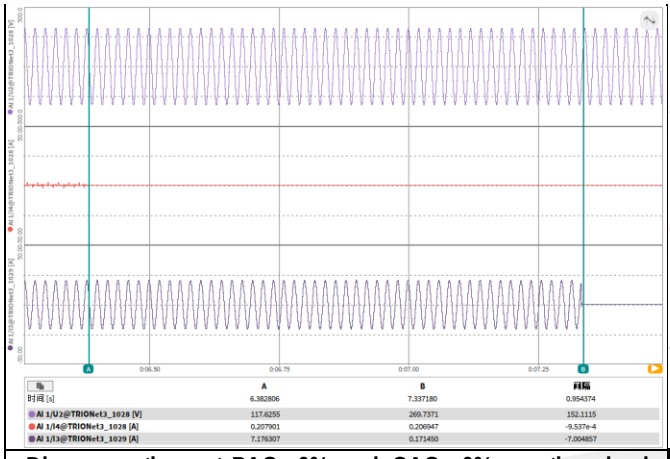
Test conditions	Frequency: 50+/-0.1Hz UN=230+/-3Vac Distortion factor of chokes < 2% Quality =1
Disconnection limit	2s for MEA

No	1) PEUT (% of EUT rating)	Reactive load (% of QL in 6.1.d) 1)	2) PAC (% of nominal)	3) QAC (% of nominal)	Run on Time (ms)	PEUT (kW)	Actual Qf	V (V)	Remarks5)
1	66	66	0	-5	0.13	3.96	0.97	290	IB
2	66	66	0	-4	0.16	3.96	0.97	290	IB
3	66	66	0	-3	0.22	3.96	0.98	290	IB
4	66	66	0	-2	0.27	3.96	0.98	290	IB
5	66	66	0	-1	0.36	3.96	0.99	290	IB
6	66	66	0	0	0.95	3.96	1.00	290	BL
7	66	66	0	1	0.27	3.96	1.00	290	IB
8	66	66	0	2	0.21	3.96	1.00	290	IB
9	66	66	0	3	0.16	3.96	1.01	290	IB
10	66	66	0	4	0.14	3.96	1.01	290	IB
11	66	66	0	5	0.12	3.96	1.01	290	IB

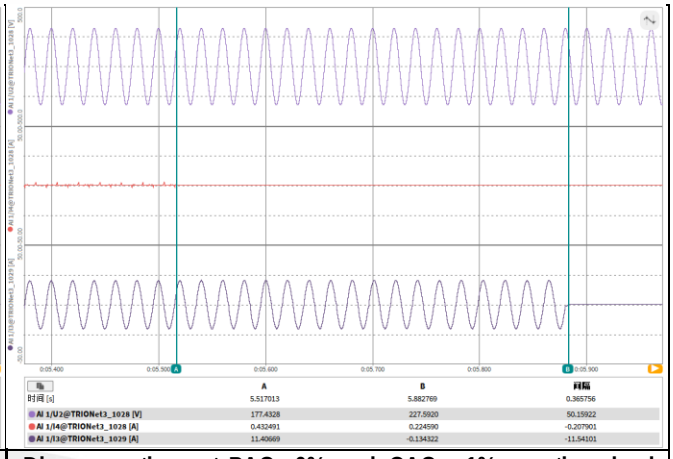
Parameter at 0% per phase	L= 0.177mH	R= 0.15Ω	C=2642µF
IAC fundamental current at balance condition	L1: 0.15A	L2: 0.15A	L3: 0.13A

Note:
RLC is adjusted to min. +/-1% of the inverter rated output power
1) PEUT: EUT output power
2) PAC: Real power flow at S1 in Figure 1. Positive means power from EUT to utility. Nominal is the 0 % test condition value.
3) QAC: Reactive power flow at S1 in Figure 1. Positive means power from EUT to utility. Nominal is the 0 % test condition value.
4) BL: Balance condition, IB: Imbalance condition.
Condition A:
EUT output power PEUT = Maximum 5)
EUT input voltage 6) = 66% of rated input voltage range
5) Maximum EUT output power condition should be achieved using the maximum allowable input power. Actual output power may exceed nominal rated output.
6) Based on EUT rated input operating range. For example, If range is between X volts and Y volts, 90 % of range =X + 0.9 × (Y – X). Y shall not exceed 0.8 × EUT maximum system voltage (i.e., maximum allowable array open circuit voltage). In any case, the EUT should not be operated outside of its allowable input voltage range.

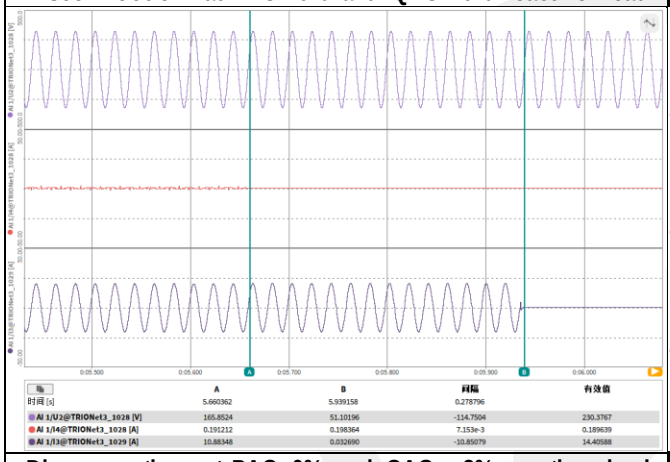
GRID-CONNECTED INVERTER REGULATION OF PROVINCIAL ELECTRICITY AUTHORITY (PEA)			
Clause	Requirement – Test	Result – Remark	Verdict



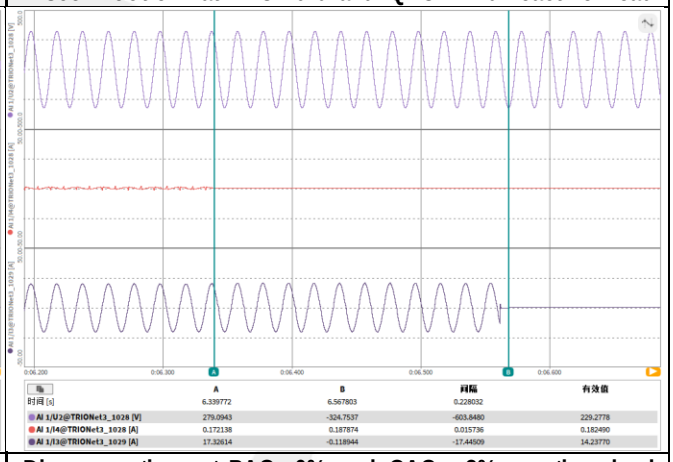
Disconnection at PAC 0% and QAC 0% reactive load



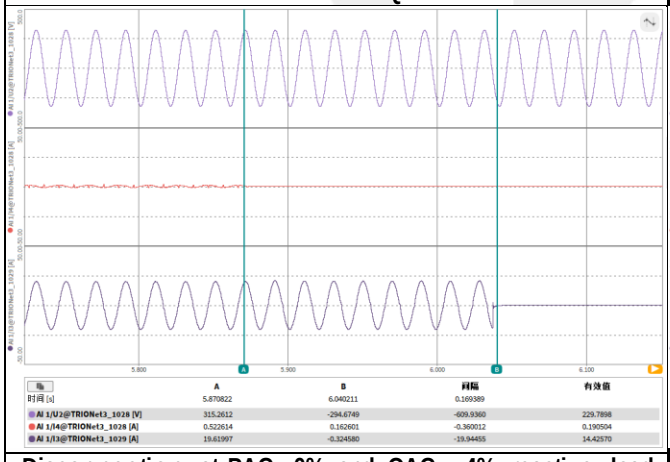
Disconnection at PAC 0% and QAC -1% reactive load



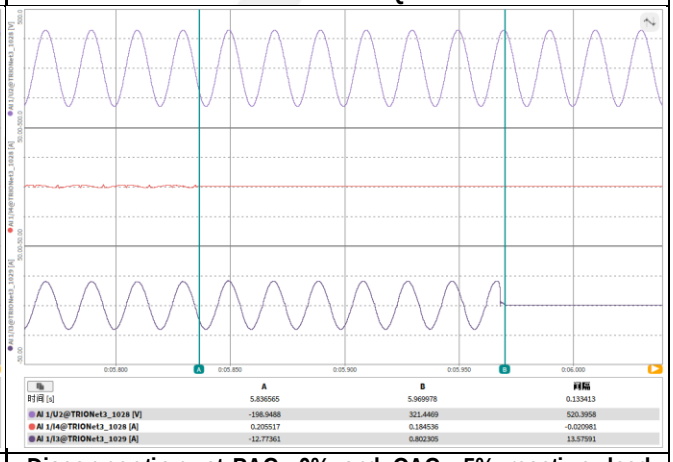
Disconnection at PAC 0% and QAC -2% reactive load



Disconnection at PAC 0% and QAC -3% reactive load

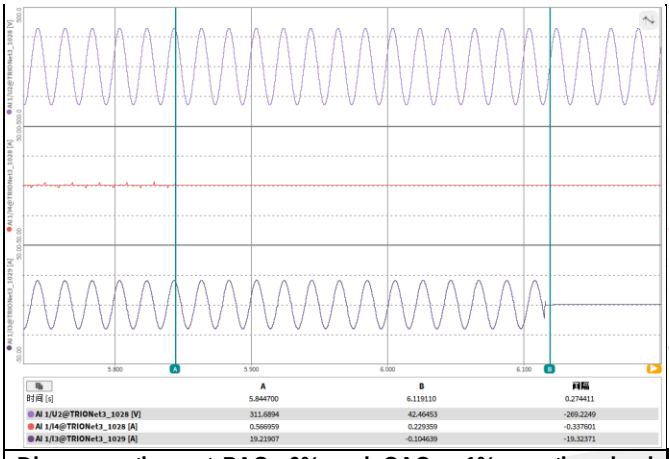


Disconnection at PAC 0% and QAC -4% reactive load

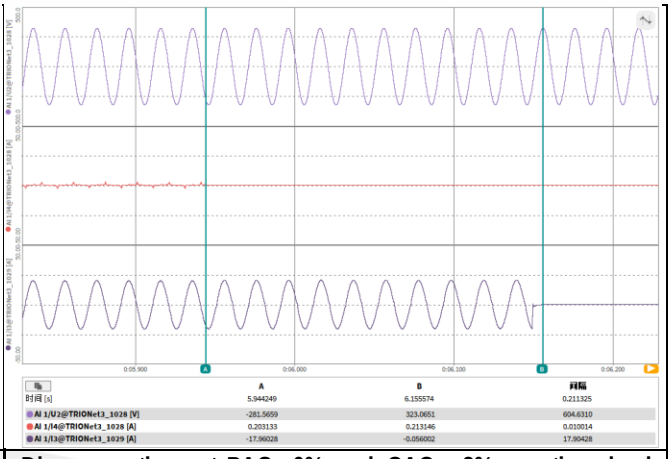


Disconnection at PAC 0% and QAC -5% reactive load

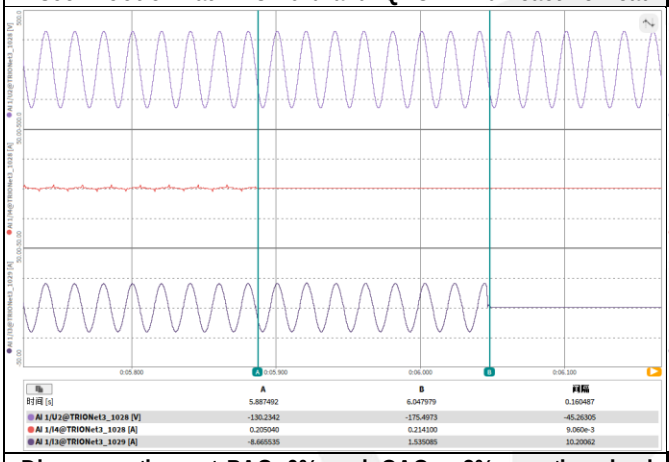
GRID-CONNECTED INVERTER REGULATION OF PROVINCIAL ELECTRICITY AUTHORITY (PEA)			
Clause	Requirement – Test	Result – Remark	Verdict



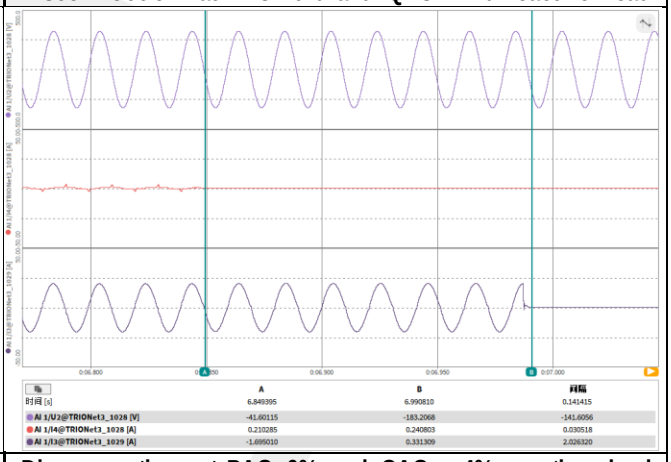
Disconnection at PAC 0% and QAC +1% reactive load



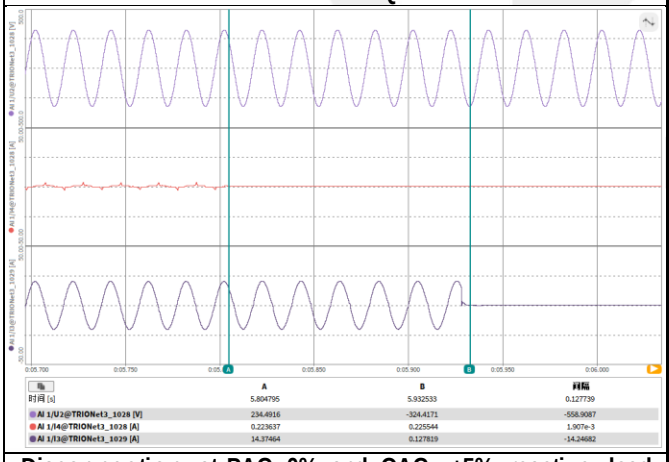
Disconnection at PAC 0% and QAC +2% reactive load



Disconnection at PAC 0% and QAC +3% reactive load



Disconnection at PAC 0% and QAC +4% reactive load



Disconnection at PAC 0% and QAC +5% reactive load

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Attention:
For Thailand only picture with all three current phases L1. L2 and L3 are accepted
All relays are direct coupled and open directly by receiving the islanding signal from the controller.

Note:
U1(V): voltage of EUT; I1(A). I4(A): current of EUT; I2(A) Grid side EUT current

9	TABLE: **Islanding protection (EUT output = 33%)**	**P**

GRID-CONNECTED INVERTER REGULATION OF PROVINCIAL ELECTRICITY AUTHORITY (PEA)			
Clause	Requirement – Test	Result – Remark	Verdict

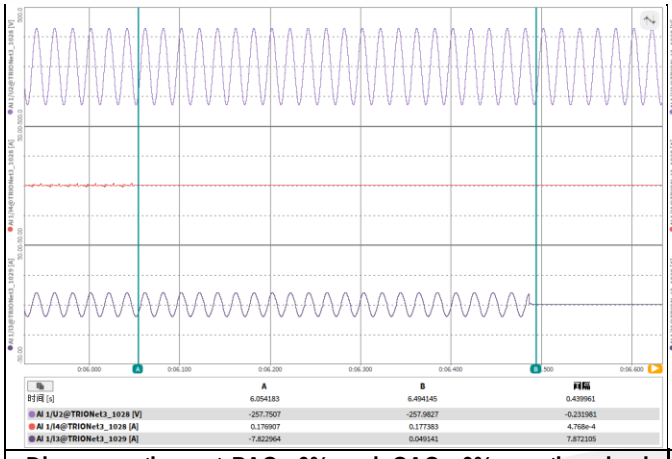
Test conditions	Frequency: 50+/-0.1Hz UN=230+/-3Vac Distortion factor of chokes < 2% Quality =1
Disconnection limit	2s for MEA

No	1) PEUT (% of EUT rating)	Reactive load (% of QL in 6.1.d) 1)	2) PAC (% of nominal)	3) QAC (% of nominal)	Run on Time (ms)	PEUT (kW)	Actual Qf	V (V)	Remarks5)
1	33	33	0	-5	0.19	1.98	0.97	180	IB
2	33	33	0	-4	0.23	1.98	0.97	180	IB
3	33	33	0	-3	0.25	1.98	0.98	180	IB
4	33	33	0	-2	0.33	1.98	0.98	180	IB
5	33	33	0	-1	0.43	1.98	0.99	180	IB
6	33	33	0	0	0.44	1.98	1.00	180	BL
7	33	33	0	1	0.17	1.98	1.00	180	IB
8	33	33	0	2	0.16	1.98	1.01	180	IB
9	33	33	0	3	0.14	1.98	1.01	180	IB
10	33	33	0	4	0.12	1.98	1.02	180	IB
11	33	33	0	5	0.11	1.98	1.02	180	IB

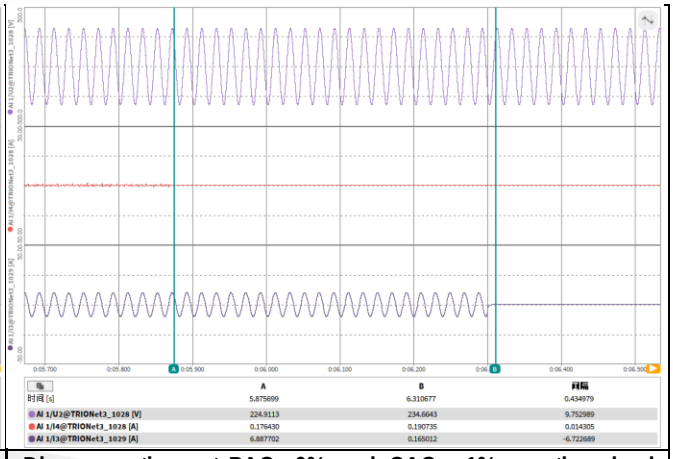
Parameter at 0% per phase	L= 0.415mH	R= 0.135Ω	C= 1284μF
IAC fundamental current at balance condition	L1: 0.08A	L2: 0.12A	L3: 0.15A

Note:
RLC is adjusted to min. +/-1% of the inverter rated output power
1) PEUT: EUT output power
2) PAC: Real power flow at S1 in Figure 1. Positive means power from EUT to utility. Nominal is the 0 % test condition value.
3) QAC: Reactive power flow at S1 in Figure 1. Positive means power from EUT to utility. Nominal is the 0 % test condition value.
4) BL: Balance condition, IB: Imbalance condition.
Condition A:
EUT output power PEUT = Maximum 5)
EUT input voltage 6) = 33% of rated input voltage range
5) Maximum EUT output power condition should be achieved using the maximum allowable input power. Actual output power may exceed nominal rated output.
6) Based on EUT rated input operating range. For example, If range is between X volts and Y volts, 90 % of range =X + 0.9 × (Y – X). Y shall not exceed 0.8 × EUT maximum system voltage (i.e., maximum allowable array open circuit voltage). In any case, the EUT should not be operated outside of its allowable input voltage range.

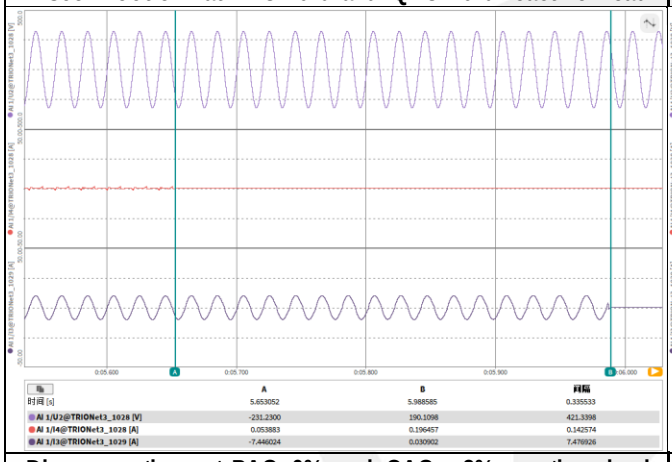
GRID-CONNECTED INVERTER REGULATION OF PROVINCIAL ELECTRICITY AUTHORITY (PEA)			
Clause	Requirement – Test	Result – Remark	Verdict



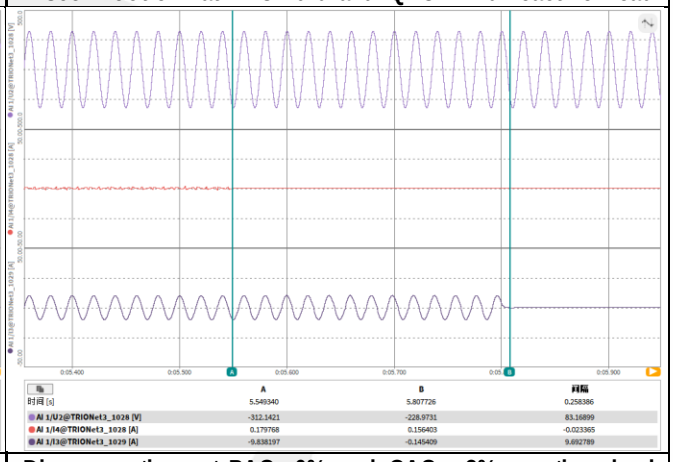
Disconnection at PAC 0% and QAC 0% reactive load



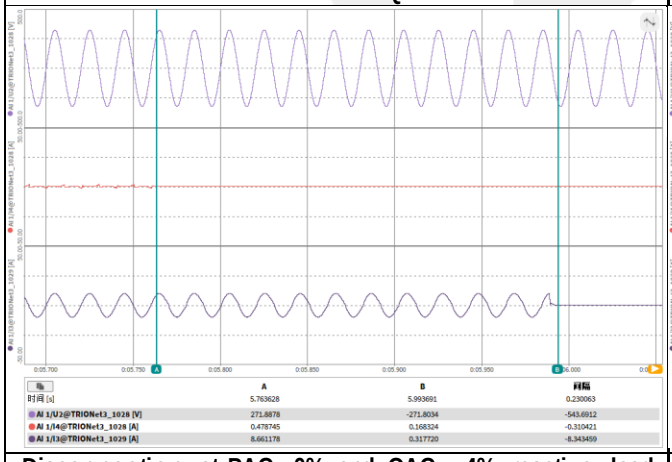
Disconnection at PAC 0% and QAC -1% reactive load



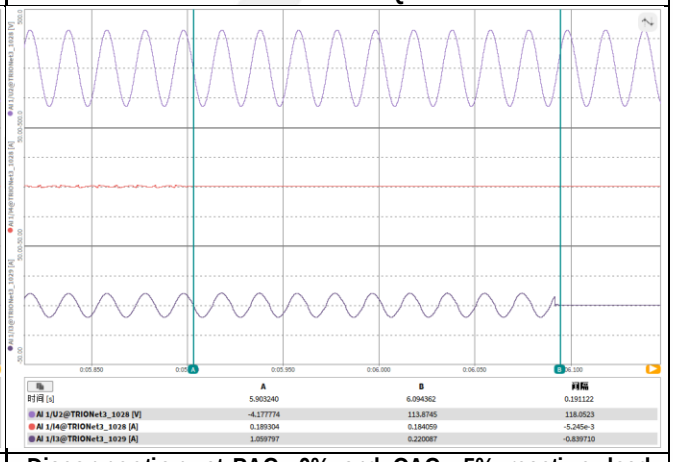
Disconnection at PAC 0% and QAC -2% reactive load



Disconnection at PAC 0% and QAC -3% reactive load

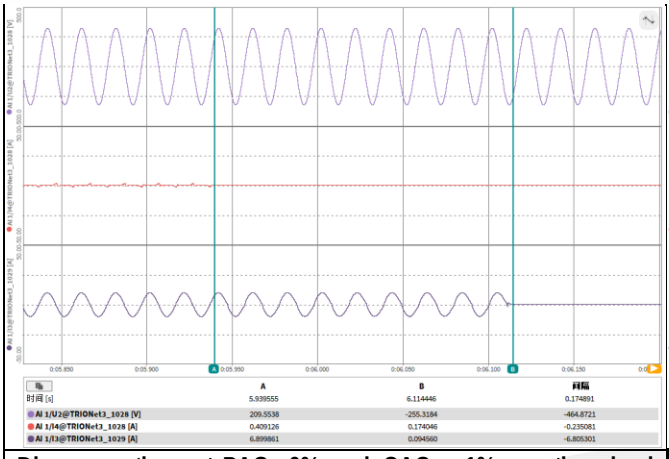


Disconnection at PAC 0% and QAC -4% reactive load

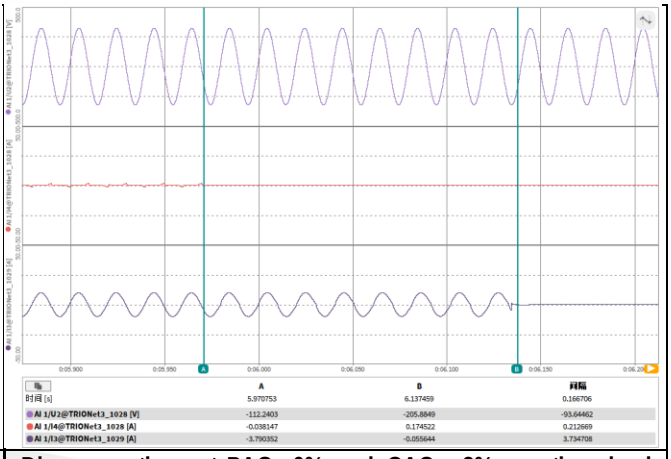


Disconnection at PAC 0% and QAC -5% reactive load

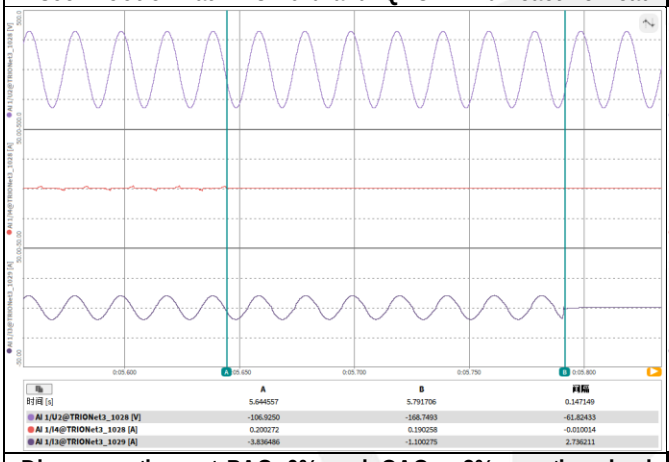
GRID-CONNECTED INVERTER REGULATION OF PROVINCIAL ELECTRICITY AUTHORITY (PEA)			
Clause	Requirement – Test	Result – Remark	Verdict



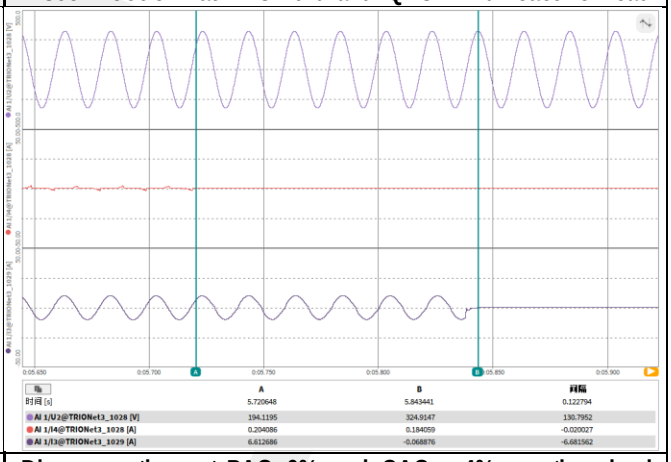
Disconnection at PAC 0% and QAC +1% reactive load



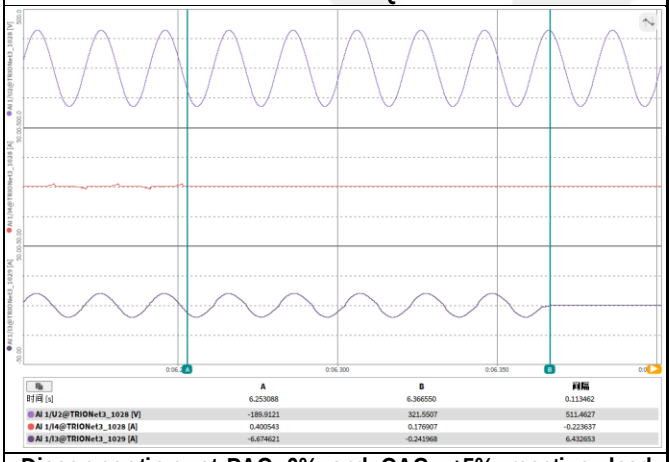
Disconnection at PAC 0% and QAC +2% reactive load



Disconnection at PAC 0% and QAC +3% reactive load



Disconnection at PAC 0% and QAC +4% reactive load



Disconnection at PAC 0% and QAC +5% reactive load

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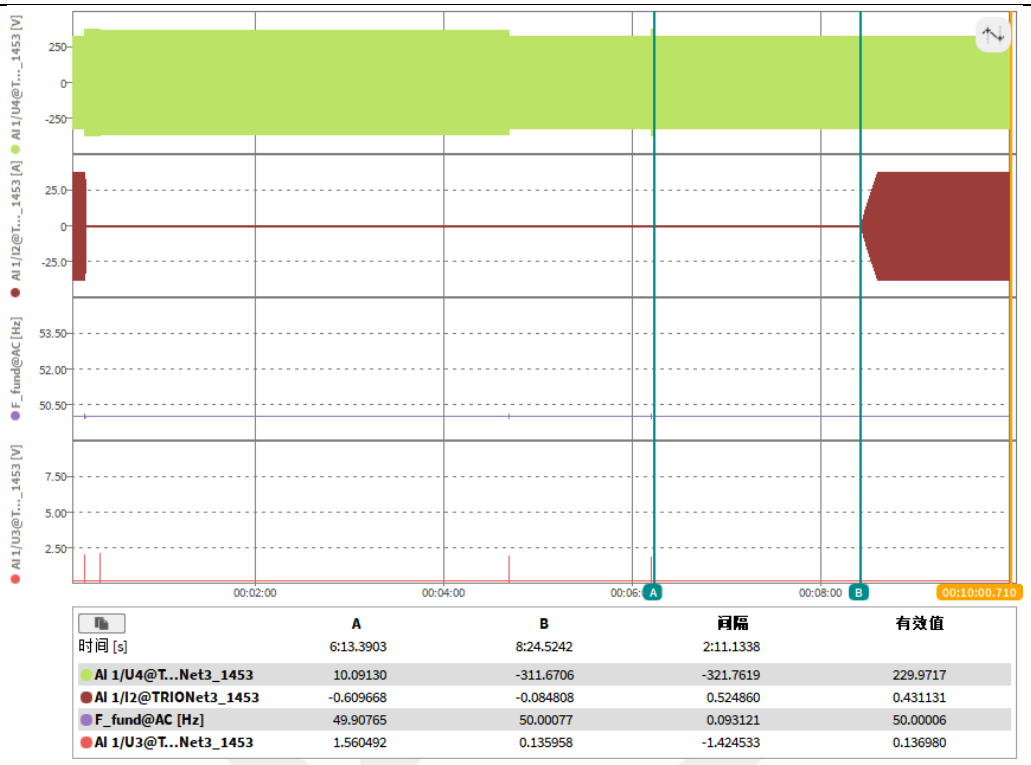
Attention:
For Thailand only picture with all three current phases L1. L2 and L3 are accepted
All relays are direct coupled and open directly by receiving the islanding signal from the controller.

Note:
U1(V): voltage of EUT; I1(A). I4(A): current of EUT; I2(A) Grid side EUT current

10	Table: Response to Utility recovery test			P
Test condition	Limit (sec)	Actual Setting (sec)	Test Result (sec)	Result

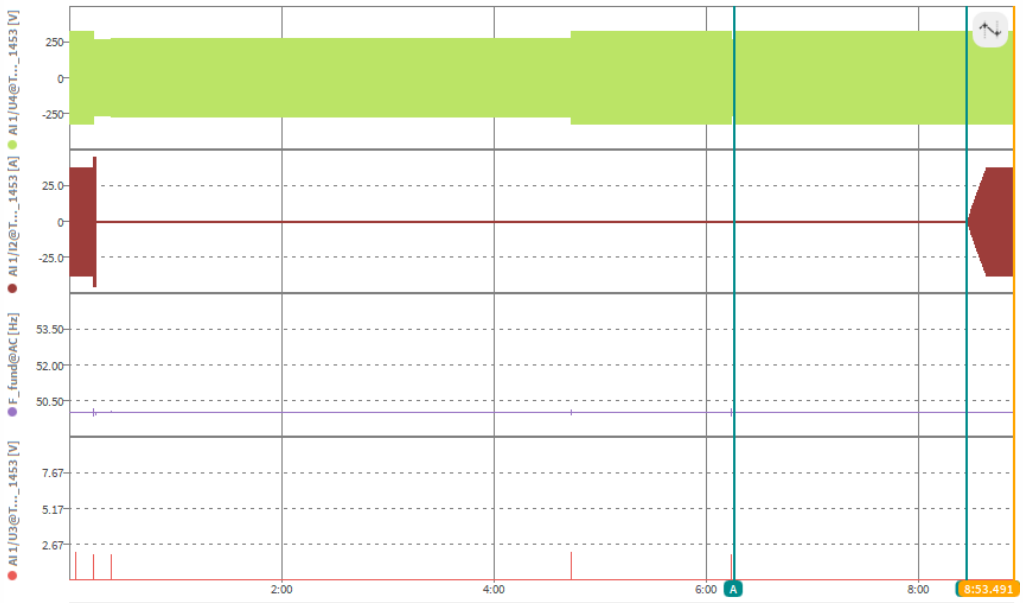
Under frequency (46.99Hz)	20 - 300	131	131.1	P
Over frequency (52.01 Hz)		131	131.2	P
Under voltage level 1 (195V)		131	131.1	P
Over voltage level 1 (253V)		131	131.1	P

Supplementary



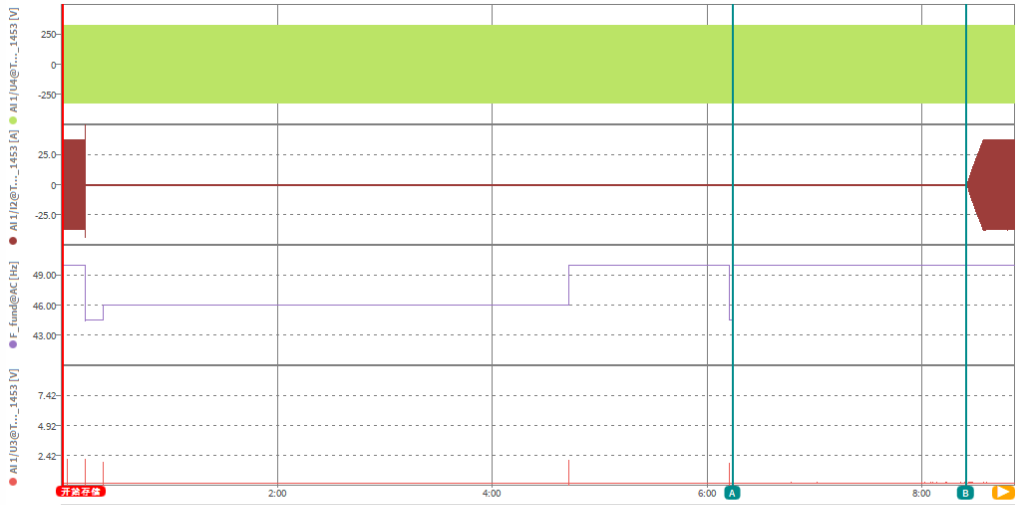
	A	B	间隔	有效值
时间 [s]	6:13.3903	8:24.5242	2:11.1338	
AI 1/U4@T...Net3_1453	10.09130	-311.6706	-321.7619	229.9717
AI 1/I2@TRIONet3_1453	-0.609668	-0.084808	0.524860	0.431131
F_fund@AC [Hz]	49.90765	50.00077	0.093121	50.00006
AI 1/U3@T...Net3_1453	1.560492	0.135958	-1.424533	0.136980

Response to utility recovery over voltage level 1



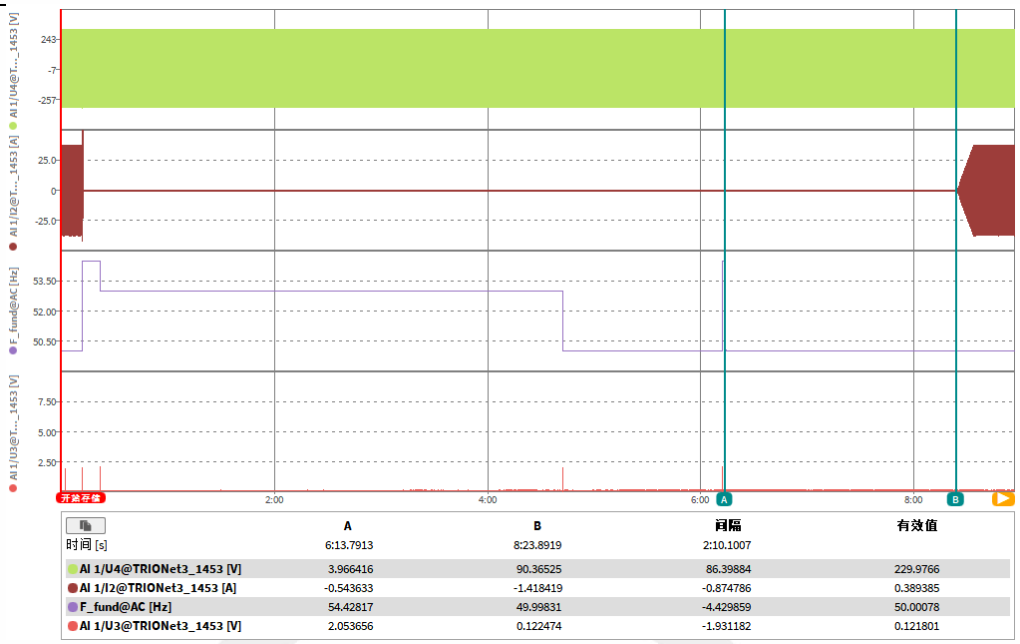
	A	B	间隔	有效值
时间 [s]	6:15.8139	8:26.9742	2:11.1603	
AI 1/U4@T...Net3_1453	-1.117334	45.05430	46.17163	229.9728
AI 1/I2@TRIONet3_1453	-0.607241	-1.489772	-0.882531	0.456300
F_fund@AC [Hz]	50.13803	50.00097	-0.137062	50.00006
AI 1/U3@T...Net3_1453	1.566906	0.137736	-1.429169	0.137211

Response to utility recovery under voltage level 1



	A	B	间隔	有效值
时间 [s]	6:14.6272	8:24.8842	2:10.2570	
AI 1/U4@TRIONet3_1453 [V]	0.125950	-252.6043	-252.7303	229.9762
AI 1/I2@TRIONet3_1453 [A]	-0.542534	-0.487057	0.055477	0.379010
F_fund@AC [Hz]	44.56428	50.00065	5.436367	49.99927
AI 1/U3@TRIONet3_1453 [V]	1.777068	0.118977	-1.658090	0.119905

Response to utility recovery under Frequency



	A	B	间隔	有效值
时间 [s]	6:13.7913	8:23.8919	2:10.1007	
AI 1/U4@TRIONet3_1453 [V]	3.966416	90.36525	86.39884	229.9766
AI 1/I2@TRIONet3_1453 [A]	-0.543633	-1.418419	-0.874786	0.389385
F_fund@AC [Hz]	54.42817	49.99831	-4.429859	50.00078
AI 1/U3@TRIONet3_1453 [V]	2.053656	0.122474	-1.931182	0.121801

Response to utility recovery over Frequency

7	TABLE: list of critical components				
Item	Name	Manufacturer/ trademark[2]	Type / model[2]	Technical data and securement means	Mark(s) of conformity[3]
1	Adhesive-Type Label (not shown)	3M COMPANY	PS32(L)	Adhesive-Type, Min. 80°C	cURus
2	Enclosure of 48V main part	NanGongHuiLi	SR-HESP4860S100-H	345*500*177.8 mm thickness:1.2mm. made of SGCC	NR
		FoShanShi KeTu			NR
		HuiZhou DeHai			NR
		DongGuan DiYe			NR
3	Heat-sink	Dongguan Hailiang Precision Hardware Co., Ltd.	HESP4860S100-H	240x86x368_AL6063_V1.0	NR
		DongGuan World JiXie			NR
4	Heat-sink (Transformer Inductance Box)	Shenzhen Zhengqin Hardware Products Co., Ltd.	HESP4860S100-H	HESP4860S100-H _105X76.5X290 _AL6063_106142_V1.0	NR
5	AC input overload protector	topstone	98-40-P1B1PRBNB	_40A	cURus
6	AC terminal	Dongguan Telian Electronics Co., Ltd.	PA12DS	WTA65-05-6P	cURus
7	PV terminal	Dongguan Telian Electronics Co., Ltd. UL 94 V-0	PA12DS	WTA65-05-6P	cURus
8	heat shrink tube	CHANGYUAN ELECTRONICS GROUP CO LTD	Various	600V ,125℃, VW-1	cURus
9	All PCB	Various	Various	PCB_SR-HESP4860S100-H(230V)_6.0KW(MPPT*2)_2.0mm_2_288*365mm_288*365mm_V2.0	cURus cETLus
		interchangeable	Various	PCB_SR-HESP4860S100	cURus

				-H(230V)_6.0KW_PV INPUT(MPPT*2)_1.6mm_1123*86mm_4256*176mm_V4.0	
10	Grouding wire	Shenzhen Mingmou	1015	10AWG 600V 105℃	cURus
11	AC wire	Shenzhen Mingmou	1015	10AWG 600V 105℃	cURus
12	PV wire	Shenzhen Mingmou	1015	10AWG 600V 105℃	cURus
13	Control board communication board cable layout	Shenzhen Mingmou	1007	24AWG 600V 105℃	cURus
14	insulation sheet on heat sink	SABIC JAPAN L L C	FR60	UL94V-0, 130°C Film	cURus
15	Fan on enclosure	Shenzhen Huaxia Hengtai Electronic Co Ltd	08025VE12MCLD2	12V_2.76W_5000RPM-RD_80*80*25mm_IP68_NMB	cURus
		CROWN ELECTRONICS. CO.,LTD	NDH3649_06025SA12NBLD1	12V_1.8W_4700RPM-RD_60*60*25mm_NMB	cURus
16	CPU 1 on control board	Texas Instrument	TMS320F28069_PZT_LQFP-100	60MHz,3.3V, -40~105℃ U50	NR
17	Optocoupler on control board	Texas Instrument	ISO1050DUBR	Viso: 5000Vrms, Cl 6.1mm, Cr 6.8mm, DUB-8,105℃ U25	cURus
18	Optocoupler on control board	LITE ONTECHNOLOGY CORPORATION	LTV-816S-TP-C	200-400%_5000V U32, U33, U35, U36, U37, U39	cURus
19	Transformer on com board	SRNE Sloar Co., Ltd.	high-frequency transformer EE19	22*18*19.5mm, 90℃(105℃) T1	See 5.0
20	Relay on com board	Xiamen Hongfa	HF32FA-005-ZS2	250Vac, 5A, 5000Vac,85℃ RY2	cURus
		Panasonic	DSP2a-DC5V	250Vac, 5A, 5000Vac,85℃ RY2	cURus
21	Relay for grid disconnection	Xiamen Hongfa	HF165FD-G/12-	DC12V_77.4mA_40A	cURus

	(RLY1-6)	VDE 40043143	HY1STF	(RLY1-6)	
		Xiamen Hongfa VDE 40043143	AHES3191Q	DC12V_77.4mA_40A (RLY1-6)	cURus
22	Relay on PV board(RLY1-2)	Xiamen Hongfa VDE 40043143	HF36F/012-HST	DC12V_44.4mA_10A	cURus
23	Y capacitor on Main board	SHENZHEN SHI HONG VDE 40043430	Y213Y5V1D103M	Y2_0.01uF_300VAC_M_P=10mm(C2,C4,C17,C40,C16,C39)	Subassembly
		Various	Various	Y2_0.01uF_300VAC_M_P=10mm(C2,C4,C17,C40,C16,C39)	cURus
24	X Capacitor on Main board	SHENZHEN SHI HON VDE 40044173	HMKP474K310NFAD_HMKP	474K310V_26.5*19*10mm_P=22.5mm(C269,C150)	cURus
		Xiamen Faratronic Co.,Ltd. VDE 40044173	MKP62 474K310V	474K310V_26.5*19*10mm_P=22.5mm(C269,C150)	cURus
25	Fuse for AC APS	Xiamen SET Electronics Co.,Ltd.	Y3	Thermal-link(Radial Shape) GP Y3 125 ℃5 A 250 Vac,Tinned Copper Wire, Total Length 70 mm, Outside of Lead Wire 63 mm(F1,F2,F3)	cURus
26	Fuse- battery for 48V series	HOLLYLAND CO LTD VDE 40017057	L63A	65V 63A, interrupting 500A, 125℃	cURus
27	FUSE for MOV	Xiamen SET Electronics Co.,Ltd. VDE 40017057	CAH0412501	5A/250VAC F2,F3,F4	cURus
28	MOV fuse on PV small board	Xiamen SET Electronics Co.,Ltd. VDE 40017057	CAH0412501	5A/250VAC F1,F2,F3,F5	cURus
29	Electrolytic capacitor at the battery	SamYoung Electronics Co., Ltd.	ALUMINUM ELECTROLYTIC CAPACITORS	2200uF_M_63V_Φ18*40_P=7.5mm_105℃_10000HNXA	
30	The MOV for AC input is on the motherboard	Brightking 40027827	20D561K	102KD20-P10_1000V_P=10mm	cURus

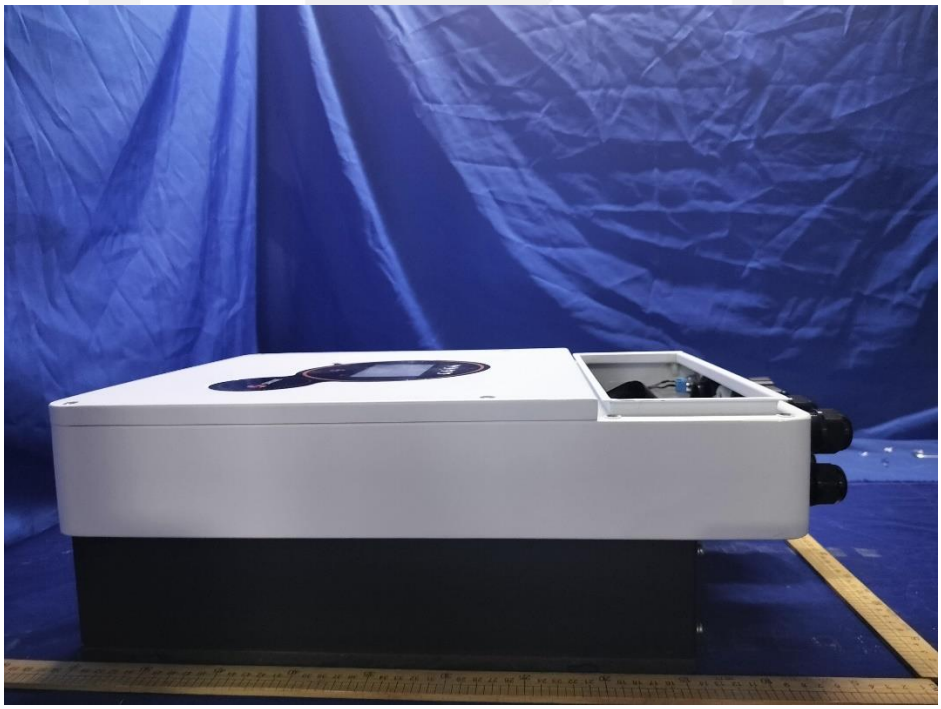
		Xiamen SET Electronics Co., Ltd. VDE 40027827	MOV20D561KT	102KD20-P10_1000V_P=10mm	cURus
31	Electrolytic capacitor on bus	SamYoung Electronics Co.,Ltd.	LELON ELECTRONICS CORP	470uF_M_500V_105℃_35*50_P=10mm_2000H_1.75A	NR
		AISHI	ELH2WM681R50LT LH	470uF_M_500V_105℃_35*50_P=10mm_2000H_1.75A	NR
32	Film capability	Hongfarad Electronics Co.. L td	HAPK256J180V HAPK	180V,25uF, -40-105℃ C35	NR
		Xiamen FaratronicCo.,Ltd.	C6AE2156	180V,25uF, -25-105℃ C35	NR
33	IGBT- INV Circuit	Wuxi NCE Power Co., Ltd	NCE80TD65BT	80A_650V_1.7V_TO-247	NR
		Wuxi China Resources Huajing Microelectronics Co., Ltd	NCE80TD65BT	80A_650V_1.7V_TO-247	NR
34	Diode- INV Circuit	Wuxi NCE Power Co., Ltd	APT60DQ60B	600V_60A_S(G)_TO247(D27,D94)(D25)	NR
35	MOS- DC Circuit	Wuxi NCE Power Co., Ltd	IRFP4468	190A_100V_R002_ N_TO-247(Q5,Q6,Q11,Q16,Q38,Q39,Q40,Q41)	NR
		China Resources Microelectronics (Chongqing) Co., Ltd	IRFP4468	190A_100V_R002_ N_TO-247(Q5,Q6,Q11,Q16,Q38,Q39,Q40,Q41)	NR
36	IGBT- PV Circuit	IR WORLD HEADQUARTERS: 233 Kansas St.	NCE80TD65BT	80A_650V_1.7V_TO-247(Q48,Q37)	NR
		Onsemi	NCE80TD65BT	80A_650V_1.7V_TO-247(Q48,Q37)	NR
37	Diode- PV Circuit	IR WORLD HEADQUARTERS: 233 Kansas St.	APT60DQ60B	600V_60A_S(G)_TO247(D27,D94)	NR

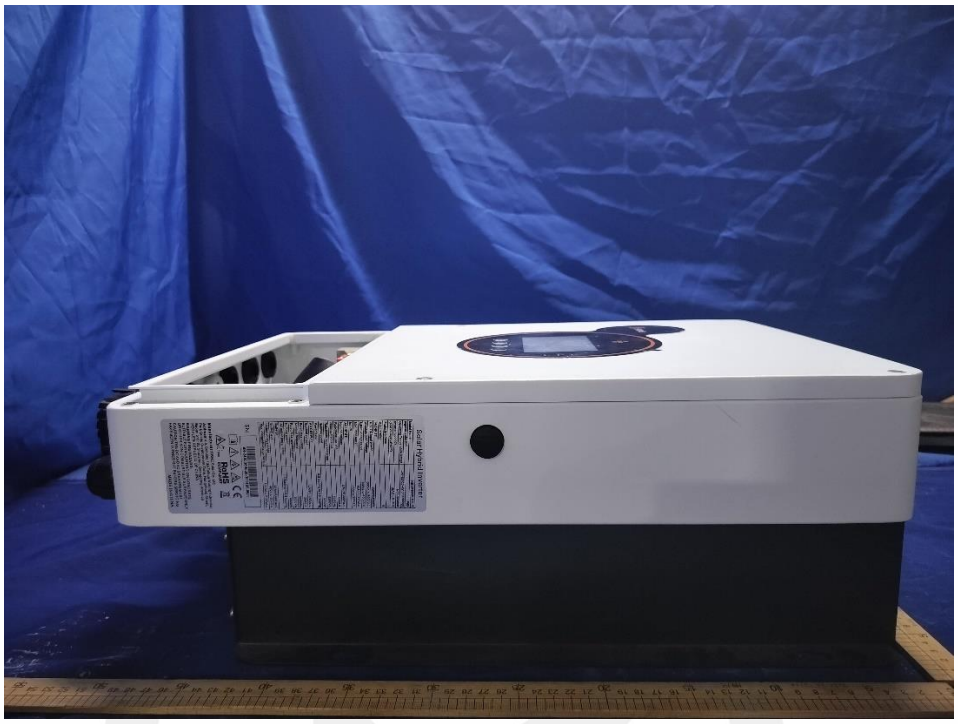
		Xi'an Huayi Microelectronics Co., Ltd.	APT60DQ60B	600V_60A_S(G)_TO247(D27,D94)	NR
38	Transformer BATT on transformer inductance box	Renesas Electronics Corporation	EE5525*2P	35uH_5%_2:8_DMR40_55*55*67mm_HES4855_NTC	NR
		DaXin Electronic Technology Co., Ltd	EE5525*2P	35uH_5%_2:8_DMR40_55*55*67mm_HES4855	NR
39	Inductor on transformer inductance box (L4A)	SRNE Sloar Co., Ltd.	NPF226060*2P	500uH_0%_14.5mR_1.5mm*3P*45T_73*52*72mm_HES4855-H	NR
		DaXin Electronic Technology Co., Ltd	NPH226060	500uH_0%_14.5mR_1.5mm*3P*45T_73*52*72mm_HES4855-H	NR
40	Inductor (L4) on Main board	SRNE Sloar Co., Ltd.	NPF141060	760uH ±8%_1.3mm*2*75T_20*31*56mm_HES4855	NR
		HuiZhou DeLi Technology Co., Ltd	NPF141062	760uH ±8%_1.3mm*2*75T_20*31*56mm	NR
41	Inductor on transformer inductance box (PV1)	SRNE Sloar Co., Ltd.	NPF226060*2P	1.08mH_1.5mm*2P*63T_66*68*43mm__HES4860-H_PV1	NR
		DaXin Electronic Technology Co., Ltd	NPF226060*2P	1.08mH_1.5mm*2P*63T_66*68*43mm__HES4860-H_PV1	NR
42	Inductor on transformer inductance box (PV2)	SRNE Sloar Co., Ltd.	NPF226060*2P	1.08mH_1.5mm*2P*63T_66*68*43mm_HES4860-H_PV2	NR
		DaXin Electronic Technology Co., Ltd	NPF226060*2P	1.08mH_1.5mm*2P*63T_66*68*43mm_HES4860-H_PV2	NR
43	Common mode inductance on the motherboard(L5)	Endela Electronics (Shenzhen) Co.,Ltd	L-28-0044	777uHMIN_7TS_0℃～130℃;42A_B_ROHS(L5)	NR
44	The main auxiliary power	Endela Electronics	EC28	47uH_±5%_9:9:5:4:9:9_PC40_3	NR

	transformer(T2) is located on the motherboard	(Shenzhen) Co.,Ltd		0.5*25*31.5mm _HES4855	
45	AC auxiliary power transformer(T1) on the motherboard	Endela Electronics (Shenzhen) Co.,Ltd	EC28	290uH_±8%_ R_42：40： 22： 8_PC44_30.5*2 5*31.5mm	NR
46	PV auxiliary power transformer(T12) on the motherboard	Endela Electronics (Shenzhen) Co.,Ltd	EC28	290uH_±8%_ R_40：22： 8_PC40_30.5*2 5*31.5mm	NR
NOTES:					

1) Not all item numbers are indicated (called out) in the photos, as their location is obvious.
2) Various“ means any type, from any manufacturer that complies with the "Technical data and securement means" and meets the "Mark(s) of conformity" can be used.
3) Indicates specific marks to be verified, which assures the agreed level of surveillance for the component. "NR" - indicates Unlisted and only visual examination is necessary. "See 5.0" indicates Unlisted components or assemblies to be evaluated periodically refer to section 5.0 for details.

Picture

Overall view

Side view 1

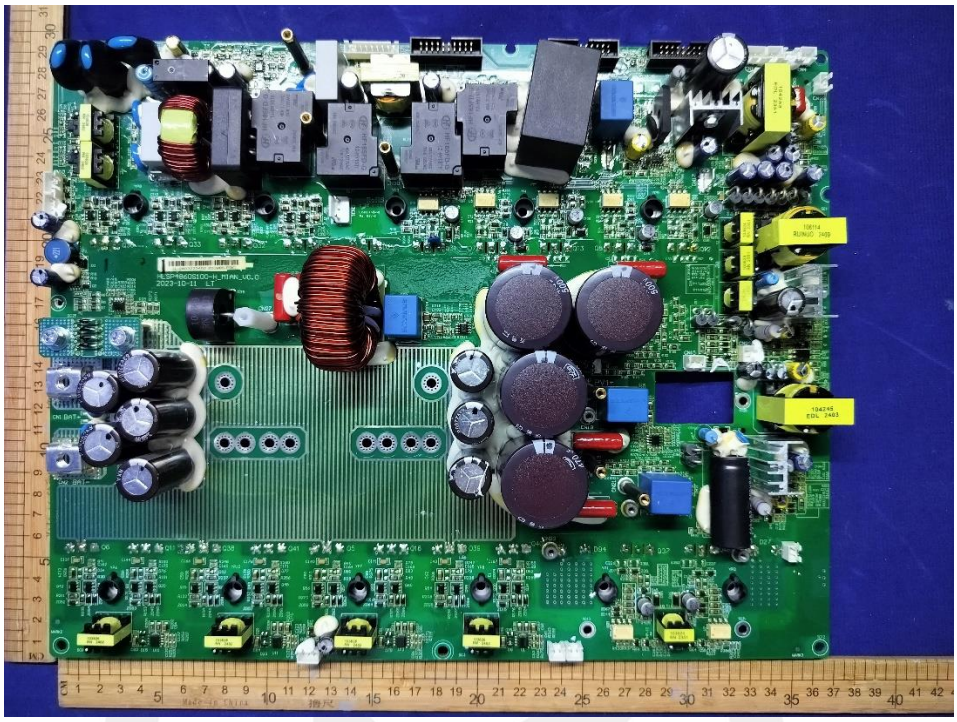
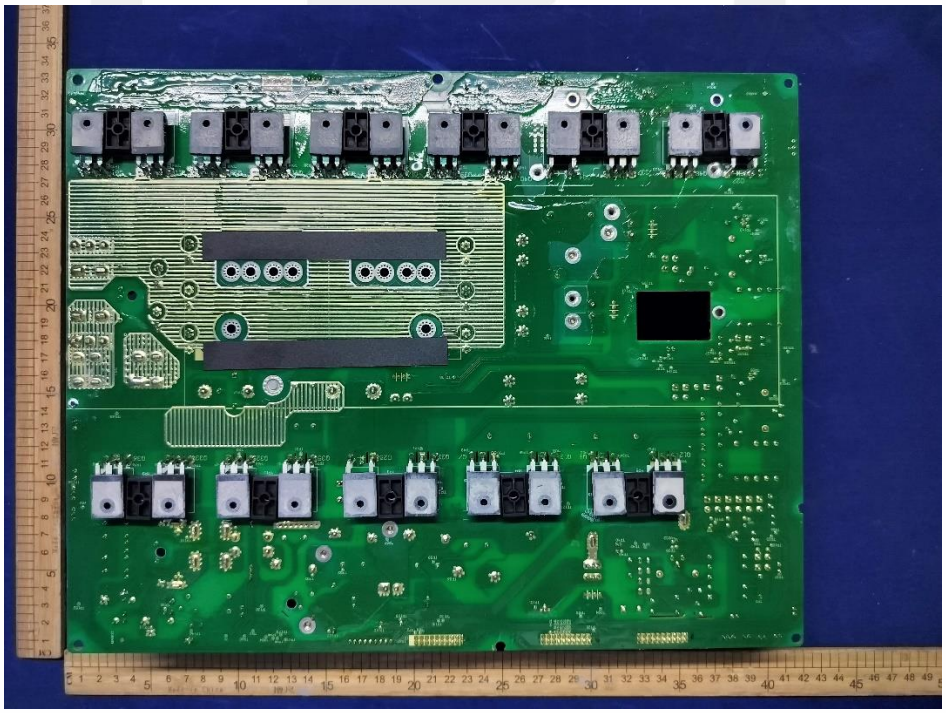
Picture

Side view 2

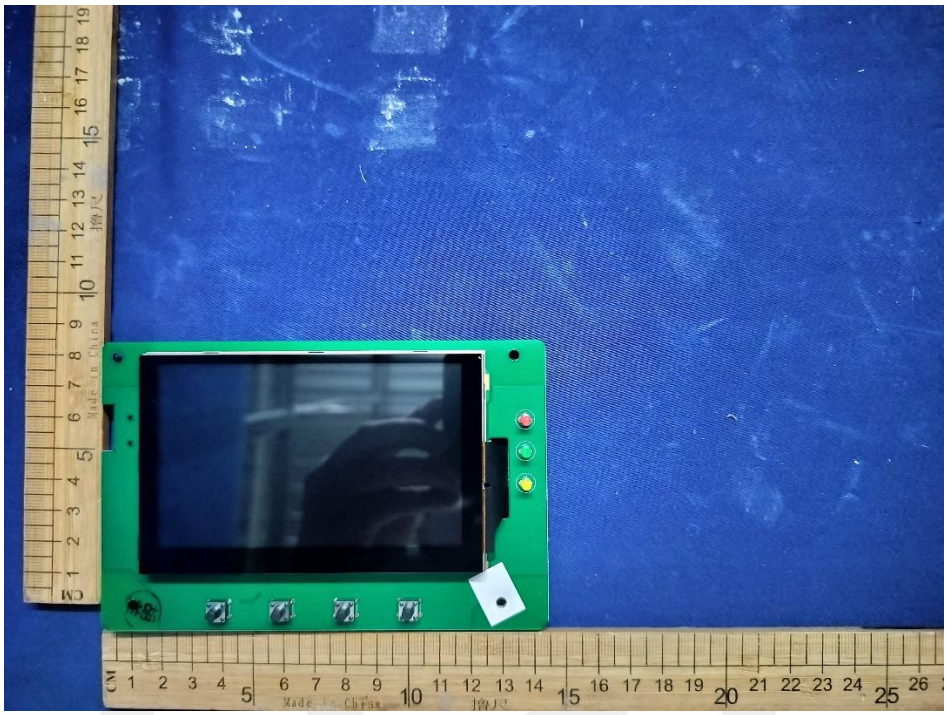
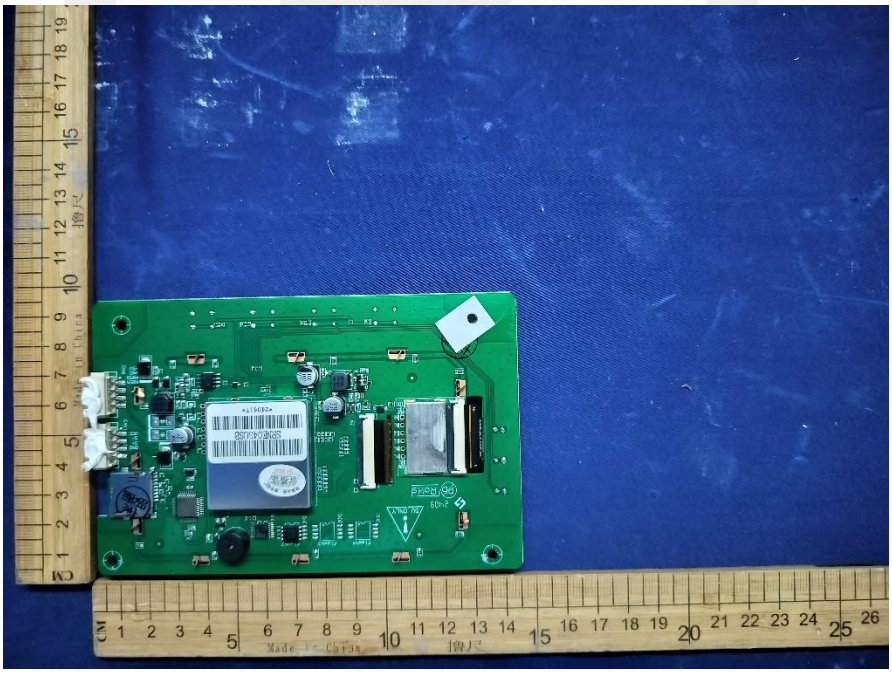
Bottom view

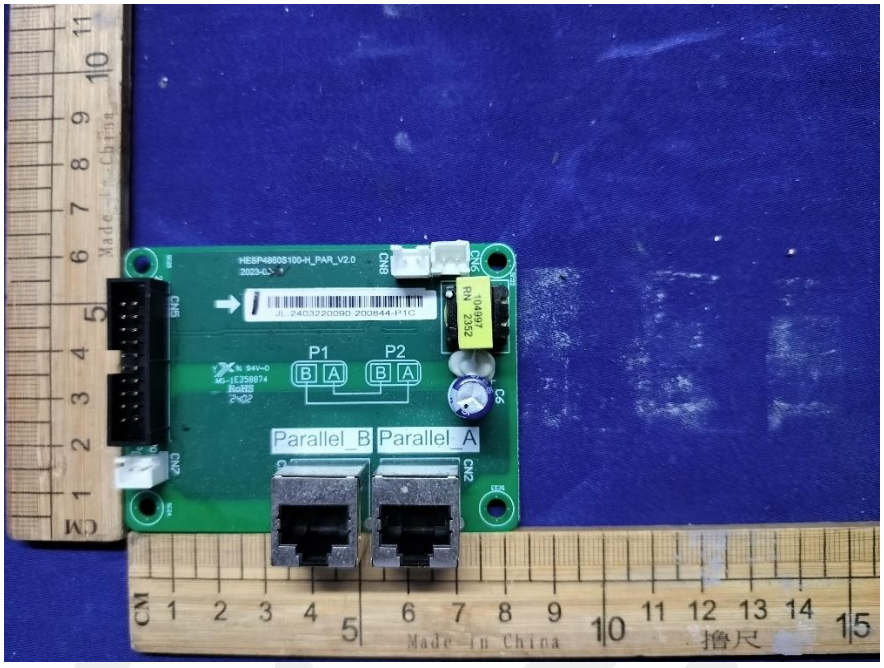
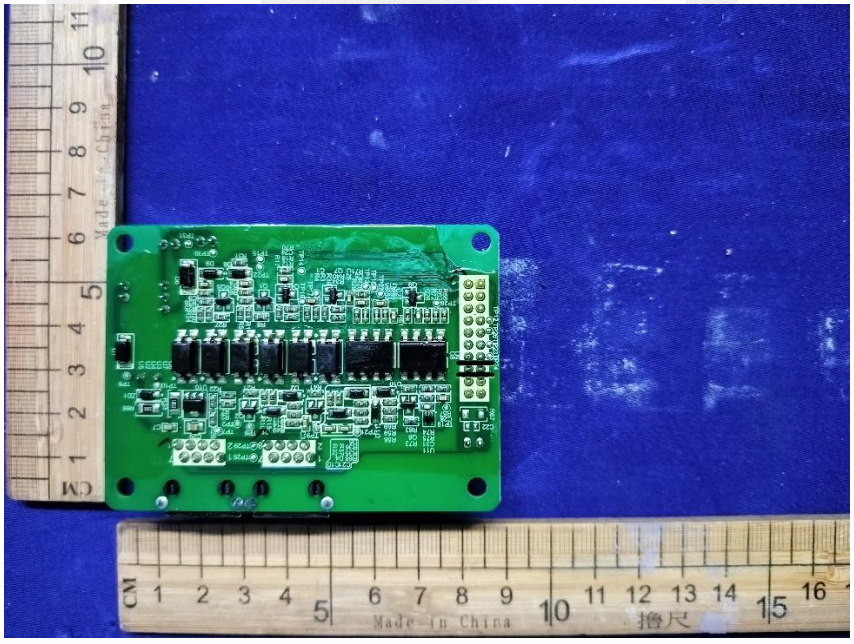
Picture

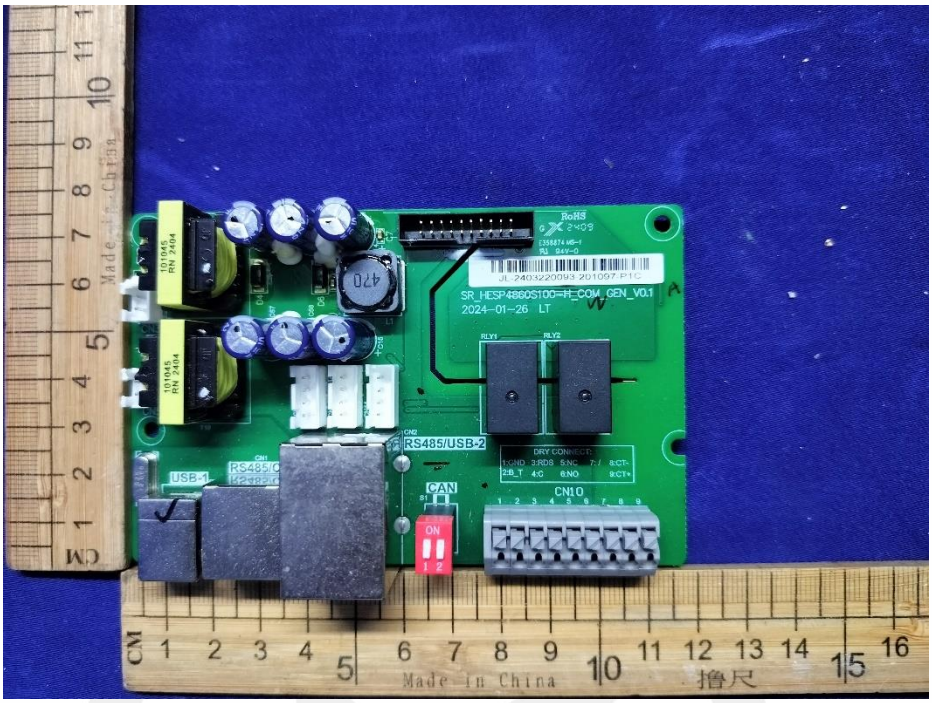
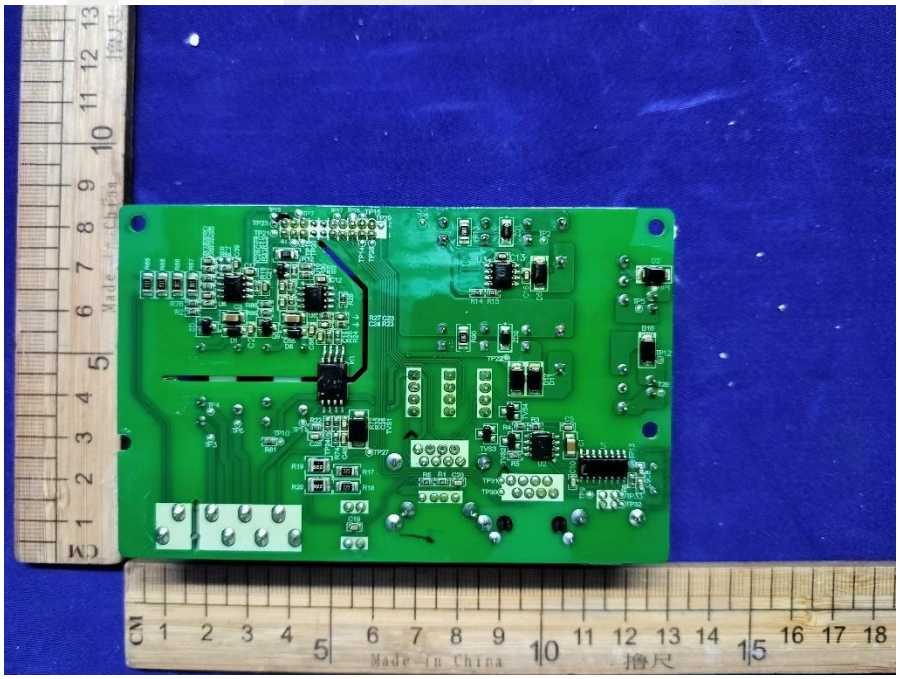
Back view

Top view

Picture

PCB view 1

PCB view 2

Picture

LCD view 1

LCD view 2

Picture

Communication board 1

Communication board 2

Picture

PCB view 3

PCB view 4

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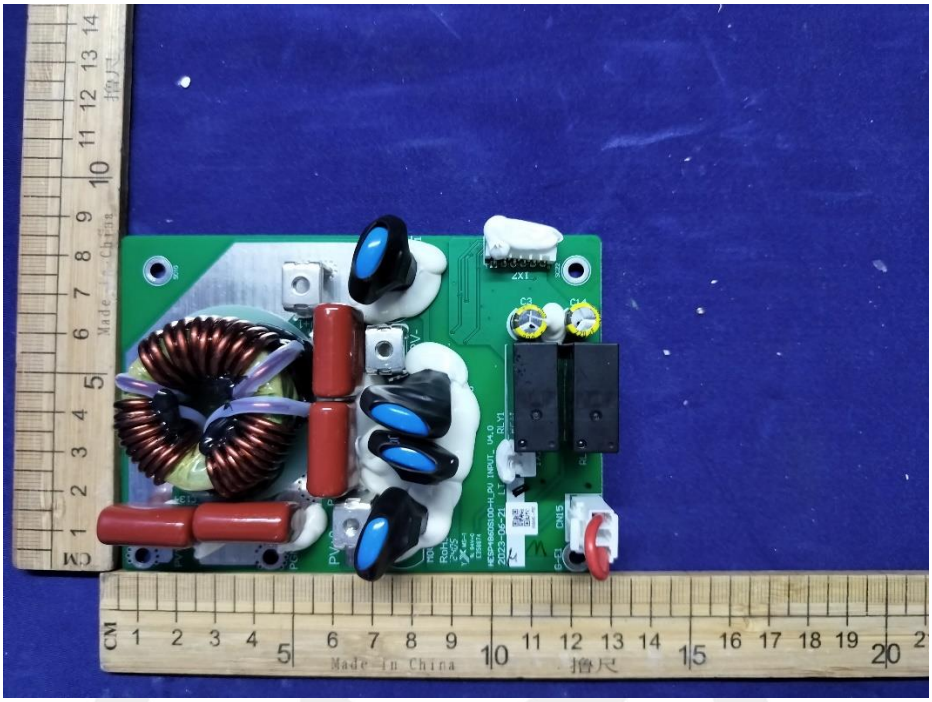
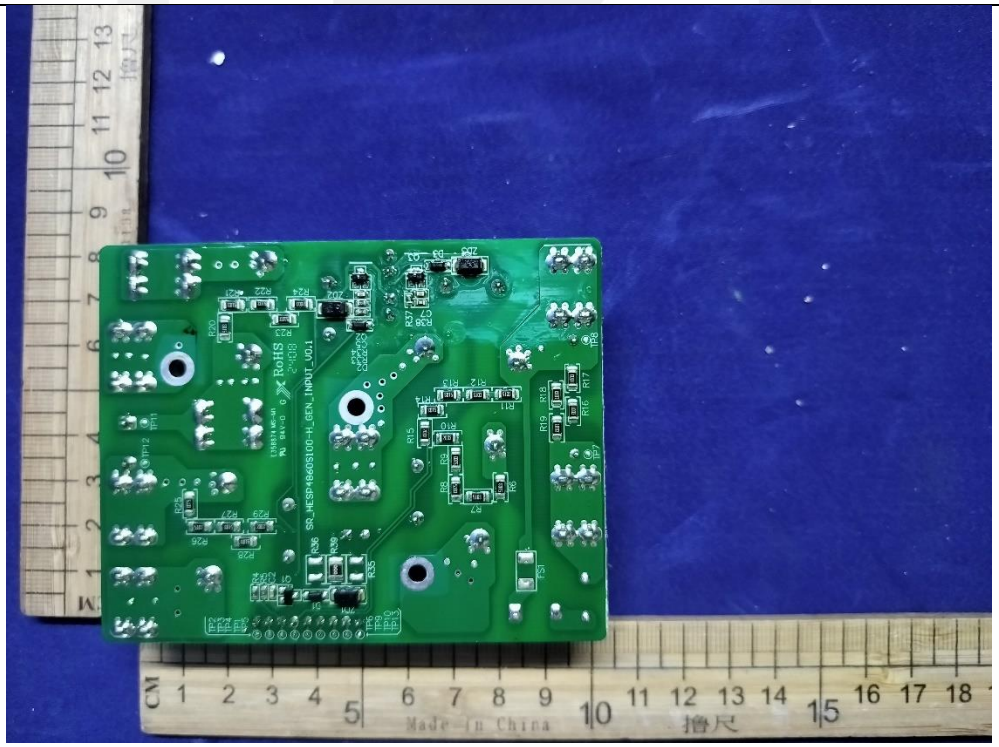

PCB view 5

PCB view 6

Equipment of test				
Equipment name	Trade name	Model	S/N	Cal. Due. Date
Power Analyzer	YOKOGAVA	WT3000	EP-011	2025/09/28
Programmable DC Power supply	Kewell	TVS-630kW	EP-027	--
Programmable AC Source	APC	AFG-S-33800	EP-026	--
Programmable RLC Load	Qunling	ACLT-38160H	EP-028	--
Digital oscilloscope	YOKOGAVA	DL850	EP-001	2025/10/06
Differential probe	CYBERTEK	VP5200	EP-003	2025/10/06
Current probe	YOKOGAVA	CT-1000	EP-012	2025/10/06
Current probe	YOKOGAVA	CT-1000	EP-013	2025/10/06
Current probe	YOKOGAVA	CT-1000	EP-014	2025/10/06
Three phase impedance network	Teseq	CCN 1000-3	EE206-1	2025/10/06
Signal conditioning Unit	Teseq/Germany	INA2197/37A	EE206-2	N/A
Three phase impedance network	Teseq/Germany	INA 2196/75A	EE206-3	N/A

Annex IV
Laboratory Accreditation Certificate

China National Accreditation Service for Conformity Assessment

LABORATORY ACCREDITATION CERTIFICATE

(Registration No. CNAS L2291)

EMTEK (Shenzhen) Co., Ltd.

(Legal Entity: EMTEK (Shenzhen) Co., Ltd.)

Building 69, Majialong Industry Zone,

Nanshan District, Shenzhen, Guangdong, China

is accredited in accordance with ISO/IEC 17025: 2017 General Requirements for the Competence of Testing and Calibration Laboratories(CNAS-CL01 Accreditation Criteria for the Competence of Testing and Calibration Laboratories) for the competence to undertake the service described in the schedule attached to this certificate.

The scope of accreditation is detailed in the attached schedule bearing the same registration number as above. The schedule forms an integral part of this certificate.

Effective Date：2022-10-29

Expiry Date：2028-10-28

Signed on behalf of China National Accreditation Service for Conformity Assessment

China National Accreditation Service for Conformity Assessment (CNAS) is authorized by Certification and Accreditation Administration of the People's Republic of China (CNCA) to operate the national accreditation schemes for conformity assessment. CNAS is a signatory of the International Laboratory Accreditation Cooperation Mutual Recognition Arrangement (ILAC MRA) and the Asia Pacific Accreditation Cooperation Mutual Recognition Arrangement (APLAC MRA).

The validity of the certificate can be checked on CNAS website at http://www.cnas.org.cn/english/findaccreditedbody/index.shtml

Finger 3 Laboratory Accreditation Certificate

End of report

声 明
Statement

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This report is invalid without the signature of the authorized approver and "special seal for testing".

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3．本报告的检测结果仅对送测样品有效，委托方对样品的代表性和资料的真实性负责；

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The observations or tests with special mark fall outside the scope of accreditation, and are only used for purpose of commission, research, training, internal quality control etc.

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6．对本检验报告若有异议，请于收到报告之日起 20 日内提出。

Objections shall be raised within 20 days from the date receiving the report.