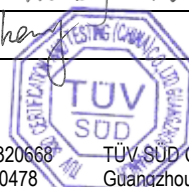





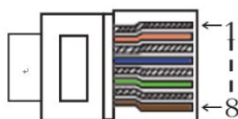
Product Service

TEST REPORT NTS V2.1:2021-07 TUV SUD Test Report for Technical standard for monitoring the conformity of electricity generation modules according to EU Regulation 2016/631	
Report No.:	64.290.22.30829.01
Date of issue:	2022-10-25
Project handler:	Wendy Zhao, Jenn Huang
Testing laboratory:	TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch
Address:	TÜV SÜD Testing Center, D1 building, No. 63 Chuangqi Road, Shilou Town, Panyu District, Guangzhou 511447, China
Testing location:	Same as above
Client:	AISWEI Technology (Shanghai) Co., Ltd.
Client number:	099567
Address:	Room 905B, 757 Mengzi Road Huangpu District 200023 Shanghai PEOPLE'S REPUBLIC OF CHINA
Contact person:	Sandy Gong
Standard:	This TUV SUD test report form is based on the following requirements: <i>NTS V2.1:2021-07</i>
TRF number and revision:	<i>TRF NTS V2.1:2021-07 rev.0</i>
eDoc_ID:	<i>TRF NTS V2.1:2021-07 rev.0</i>
TRF originated by:	TUV SUD Product Service, Mr. Billy Qiu
Copyright blank test report:	This test report is based on the content of the standard (see above). The test report considered selected clauses of the a.m. standard(s) and experience gained with product testing. It was prepared by TUV SUD Product Service. TUV SUD Group takes no responsibility for and will not assume liability for damages resulting from the reader's interpretation of the reproduced material due to its placement and context.
General disclaimer:	This test report may only be quoted in full. Any use for advertising purposes must be granted in writing. This report is the result of a single examination of the object in question and is not generally applicable evaluation of the quality of other products in regular production.
Scheme:	<input type="checkbox"/> TUV Mark <input type="checkbox"/> without certification <input type="checkbox"/> AoC/CoC for EU-Directive / EU-Regulation: <input type="checkbox"/> GS Mark <input type="checkbox"/> NRTL Mark <input checked="" type="checkbox"/> Type verification of conformity
Non-standard test method:	<input checked="" type="checkbox"/> No <input type="checkbox"/> Yes, see details under <i>Summary of testing</i>
National deviations:	N/A
Number of pages (Report):	13 pages
Number of pages (Attachments):	N/A
Compiled by:	Wendy Zhao, Jenn Huang <i>Wendy Zhao Jenn Huang</i>
Approved by:	Iris Zheng <i>Iris Zheng</i>



Test sample:	Hybrid Solar Inverter
Type of test object:	Hybrid Solar Inverter
Trademark:	
Model and/ or type reference:	ASW06kH-T1, ASW08kH-T1, ASW10kH-T1, ASW12kH-T1, ASW15kH-T1
Rating(s):	See page 4
Manufacturer:	Same as applicant
Manufacturer number:	Same as applicant
Address:	Same as applicant
Name and address of factory(ies) AISWEI New Energy Technology (Yangzhong) Co., Ltd. No.588 Gangxing Road, Economic Development Zone, 212200 Yangzhong PEOPLE'S REPUBLIC OF CHINA	
Sub-contractors / tests (clause):	N/A
Name:	N/A
Order description:	<input checked="" type="checkbox"/> Complete test according to TRF
	<input type="checkbox"/> Partial test according to manufacturer's specifications
	<input type="checkbox"/> Preliminary test
	<input type="checkbox"/> Spot check
	<input type="checkbox"/> Others:
Date of order:	2022-07-01; 2022-08-02
Date of receipt of test item:	2022-07-27; 2022-10-13
Date(s) of performance of test:	2022-07-28 to 2022-10-12; 2022-10-13 to 2022-10-25

Test item particulars:	
Equipment mobility	<input type="checkbox"/> movable <input type="checkbox"/> hand-held <input checked="" type="checkbox"/> stationary <input checked="" type="checkbox"/> fixed <input type="checkbox"/> transportable <input type="checkbox"/> for building-in
Connection to the mains	<input type="checkbox"/> pluggable equipment <input type="checkbox"/> direct plug-in <input checked="" type="checkbox"/> permanent connection <input type="checkbox"/> for building-in
Environmental category	<input checked="" type="checkbox"/> outdoor <input type="checkbox"/> indoor unconditional <input type="checkbox"/> indoor conditional
Over voltage category Mains	<input type="checkbox"/> OVC I <input type="checkbox"/> OVC II <input checked="" type="checkbox"/> OVC III <input type="checkbox"/> OVC IV
Over voltage category PV	<input type="checkbox"/> OVC I <input checked="" type="checkbox"/> OVC II <input type="checkbox"/> OVC III <input type="checkbox"/> OVC IV
Mains supply tolerance (%)	+/- 10%
Tested for power systems	TN system
IT testing, phase-phase voltage (V)	N/A
Class of equipment.....	<input checked="" type="checkbox"/> Class I <input type="checkbox"/> Class II <input type="checkbox"/> Class III <input type="checkbox"/> Not classified
Mass of equipment (kg).....	ASW06kH-T1:30kg, ASW08kH-T1:30kg, ASW10kH-T1:31kg, ASW12kH-T1:32kg, ASW15kH-T1:34kg
Pollution degree	External: PD3, Internal: PD2
IP protection class	IP65
Purpose of the product (description of intended use):	
<p>1. All the models are three phase non-isolated type multi-functions hybrid solar inverter which will be installed and connected to the grid network after installation, for indoor and outdoor use.</p> <p>2. If certain functions are not permitted by local regulation, the function shall be disabled by hardware or software setting (if applicable) by the manufacturer before putting into the market. For example, it's not permissible to draw electricity from the grid and then feed it back in order to claim statutory reimbursement in some nations.</p> <p>3. Low voltage electrical installations shall comply with national and local regulation. Only qualified electricians are allowed to install and maintain the converter.</p> <p>4. In order to protect the inverter, user and installer, external DC and AC circuit breaker shall be equipped for all source port (battery, AC grid) at the end-use application.</p> <p>5. The software version: ARM: V1.03.08, DSP: V1.02.11</p> <p>6. The PCE uses the DRM port for remote logic control, after receiving the signal, the inverter will decrease output active power to zero in 5 seconds. The DRM port is connected to pin 5 and pin 7 or 8 of the terminal.</p>	



1	2	3	4	5	6	7	8
DRM1/5	DRM2/6	DRM3/7	DRM4/8	+5V	DRM0	GND	GND

Characteristic data (not shown on the marking plate):

Model	ASW06kH-T1	ASW08kH-T1	ASW10kH-T1	ASW12kH-T1	ASW15kH-T1
Battery terminal parameters					
Rated battery DC voltage	200 Vd.c.	250 Vd.c.	300 Vd.c.	350 Vd.c.	400 Vd.c.
Battery DC voltage range	125-600 Vd.c.				
Max charging / discharging current	50 Ad.c.				
Battery type	Lithium-ion				
Maximum charge/discharge power	15000 W				
PV terminal parameters					
Max. Input Power	9000 W	12000 W	15000 W	18000 W	22500 W
Maximum DC input voltage	1000 Vd.c.				
MPPT Range	180~850 Vd.c.				
MPPT Range (full load)	250~850 Vd.c.	330~850 Vd.c.	430~850 Vd.c.	510~850 Vd.c.	620~850 Vd.c.
Max. Input Current	2*13 Ad.c.				
Isc PV	2*25 Ad.c.				
Grid terminal parameters					
Rated output Power	6000 W	8000 W	10000 W	12000 W	15000 W
Maximum continuous output apparent power	6600 VA	8800 VA	11000 VA	13200 VA	16500 VA
Max. AC output current	9.5 Aa.c.	12.7 Aa.c.	15.9 Aa.c.	19.1 Aa.c.	23.8 Aa.c.
Maximum continuous input apparent power	13200 VA	17600 VA	22000 VA	26400 VA	33000 VA
Max. AC input current	19 Aa.c.	25.5 Aa.c.	31.9 Aa.c.	38.2 Aa.c.	47.6 Aa.c.
Rated AC voltage	230/400 Va.c., 3W+N+PE				
Rated AC frequency	50 Hz				
Power factor	0.9lagging to 0.9leading				
Backup terminal parameters					
Rated apparent power	6000 VA	8000 VA	10000 VA	12000 VA	15000 VA
Maximum continuous output apparent power	6600 VA	8800 VA	11000 VA	13200 VA	16500 VA
Max. AC current	9.5 Aa.c.	12.7 Aa.c.	15.9 Aa.c.	19.1 Aa.c.	23.8 Aa.c.



Product Service

Rated AC voltage	230/400 Va.c., 3W+N+PE
Rated AC frequency	50 Hz

Model differences:

N o	Component	Usage amount		
		ASW06kH-T1, ASW08kH-T1, ASW10kH-T1,	ASW12kH-T1	ASW15kH-T1
1	IGBT (ST#STGWA40H120DF2)	Quantity 2 (IGBT2-IGBT3)	Quantity 4 (IGBT1-IGBT4)	Quantity 4 (IGBT1-IGBT4)
2	IGB (IKW40N120CS6)	Quantity 6 (IGBT10, IGBT13, IGBT14, IGBT16, IGBT19, IGBT20)		Quantity 12 (IGBT10-IGBT21)
3	Inductor	PV: 1.2mH±10%@0A"0.7mH ±10%@15A0.7mH±10% @15A" INV: 1.5mH±10%@0A0.77mH ±10%@20.4Apk BAT: 0.44mH±10%@0A0.21m H±10%@50A*2PCS		PV:1.5mH±10%@0A0.6mH±10%@25A INV:1mH±10%@0A0.42mH±10%@30A BAT:0.44mH±10%@0A0.21mH±10% 50A

Attachments:

N/A

Copy of marking plate:

Model: ASW06kH-T1

PV input port	Max. PV input power	9kW
	Max. PV input voltage	dc,1000V
	MPPT voltage range	dc,180-850V
	Full Power MPPT voltage range	dc,250-850V
	Max. PV input current	dc,2*13A
dc PV (absolute maximum)	dc,2*25A	
Battery input port	Rated battery voltage	200V
	Battery voltage range	125V-600V
	Rated battery charge /discharge current	dc,40/40A
	Max. battery charge /discharge current	dc,50/50A
	Battery type	Lithium-Ion
Grid output/input port	Rated grid voltage	3W+N+PE,230/400V
	Rated grid frequency	50Hz/60Hz
	Rated output power	6000W
	Max. grid output apparent power	6600VA
	Max. grid output current	ac,9.5A
Backup output port	Max. grid input apparent power	13200VA
	Max. grid input current	ac,19A
	Rated BACK-UP voltage	3W+N+PE,230/400V
	Rated BACK-UP frequency	50Hz/60Hz
	Max. BACK-UP output apparent power	6600VA
Max. BACK-UP output current	ac,9.5A	
General information	Adjustable cos (φ)	0.8ind...0.8cap
	Operating temperature range	-25...+60°C
	Inverter topology	Non-Isolated
	Ingress protection	IP65
	Protective class	I
Overvoltage category	II(PV),III(MAINS)	

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Model: ASW08kH-T1

PV input port	Max. PV input power	12kW
	Max. PV input voltage	dc,1000V
	MPPT voltage range	dc,180-850V
	Full Power MPPT voltage range	dc,330-850V
	Max. PV input current	dc,2*13A
dc PV (absolute maximum)	dc,2*25A	
Battery input port	Rated battery voltage	250V
	Battery voltage range	125V-600V
	Rated battery charge /discharge current	dc,40/40A
	Max. battery charge /discharge current	dc,50/50A
	Battery type	Lithium-Ion
Grid output/input port	Rated grid voltage	3W+N+PE,230/400V
	Rated grid frequency	50Hz/60Hz
	Rated output power	8000W
	Max. grid output apparent power	8800VA
	Max. grid output current	ac,12.7A
Backup output port	Max. grid input apparent power	17600VA
	Max. grid input current	ac,25.5A
	Rated BACK-UP voltage	3W+N+PE,230/400V
	Rated BACK-UP frequency	50Hz/60Hz
	Max. BACK-UP output apparent power	8800VA
Max. BACK-UP output current	ac,12.7A	
General information	Adjustable cos (φ)	0.8ind...0.8cap
	Operating temperature range	-25...+60°C
	Inverter topology	Non-Isolated
	Ingress protection	IP65
	Protective class	I
Overvoltage category	II(PV),III(MAINS)	

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Model: ASW10kH-T1

PV input port	Max. PV input power	15kW
	Max. PV input voltage	dc,1000V
	MPPT voltage range	dc,180-850V
	Full Power MPPT voltage range	dc,430-850V
	Max. PV input current	dc,2*13A
dc PV (absolute maximum)	dc,2*25A	
Battery input port	Rated battery voltage	300V
	Battery voltage range	125V-600V
	Rated battery charge /discharge current	dc,40/40A
	Max. battery charge /discharge current	dc,50/50A
	Battery type	Lithium-Ion
Grid output/input port	Rated grid voltage	3W+N+PE,230/400V
	Rated grid frequency	50Hz/60Hz
	Rated output power	10000W
	Max. grid output apparent power	11000VA
	Max. grid output current	ac,13.9A
Backup output port	Max. grid input apparent power	22000VA
	Max. grid input current	ac,31.9A
	Rated BACK-UP voltage	3W+N+PE,230/400V
	Rated BACK-UP frequency	50Hz/60Hz
	Max. BACK-UP output apparent power	11000VA
Max. BACK-UP output current	ac,13.9A	
General information	Adjustable cos (φ)	0.8ind...0.8cap
	Operating temperature range	-25...+60°C
	Inverter topology	Non-Isolated
	Ingress protection	IP65
	Protective class	I
Overvoltage category	II(PV),III(MAINS)	

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Model: ASW12kH-T1

PV input port	Max. PV input power	18kW
	Max. PV input voltage	dc,1000V
	MPPT voltage range	dc,180-850V
	Full Power MPPT voltage range	dc,510-850V
Battery input port	Max. PV input current	dc,2*13A
	IsC PV(absolute maximum)	dc,2*25A
	Rated battery voltage	350V
	Battery voltage range	125V-600V
Grid output/input port	Rated battery charge /discharge current	dc,40/40A
	Max. battery charge /discharge current	dc,50/50A
	Battery type	Lithium-ion
	Rated grid voltage	3W+N+PE,230/400V
Back-up port	Rated grid frequency	50Hz/60Hz
	Rated output power	12000W
	Max. grid output apparent power	13200VA
	Max. grid output current	ac,19.1A
General information	Max. grid input apparent power	26400VA
	Max. grid input current	ac,38.2A
	Rated BACK-UP voltage	3W+N+PE,230/400V
	Rated BACK-UP frequency	50Hz/60Hz
Overvoltage category	Max. BACK-UP output apparent power	13200VA
	Max. BACK-UP output current	ac,19.1A
	Adjustable cos (φ)	0.8ind...0.8cap
	Operating temperature range	-25...+60°C
Protective class	Inverter topology	Non-Isolated
	Ingress protection	IP65
	Protective class	I
	Overvoltage category	II(PV),III(MAINS)



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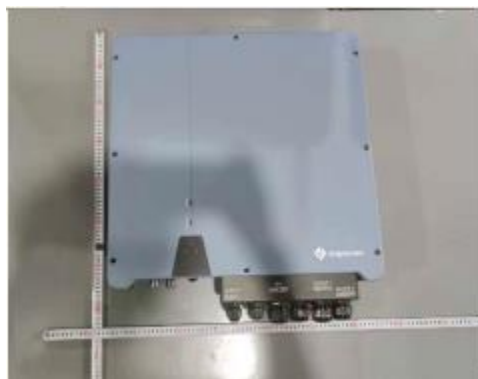
Model: ASW15kH-T1

PV input port	Max. PV input power	22.5kW
	Max. PV input voltage	dc,1000V
	MPPT voltage range	dc,180-850V
	Full Power MPPT voltage range	dc,620-850V
Battery input port	Max. PV input current	dc,2*13A
	IsC PV(absolute maximum)	dc,2*25A
	Rated battery voltage	400V
	Battery voltage range	125V-600V
Grid output/input port	Rated battery charge /discharge current	dc,40/40A
	Max. battery charge /discharge current	dc,50/50A
	Battery type	Lithium-ion
	Rated grid voltage	3W+N+PE,230/400V
Back-up port	Rated grid frequency	50Hz/60Hz
	Rated output power	15000W
	Max. grid output apparent power	16500VA
	Max. grid output current	ac,23.8A
General information	Max. grid input apparent power	33000VA
	Max. grid input current	ac,47.6A
	Rated EPS voltage	3W+N+PE,230/400V
	Rated EPS frequency	50Hz/60Hz
Overvoltage category	Max. EPS output apparent power	16500VA
	Max. EPS output current	ac,23.8A
	Adjustable cos (φ)	0.8ind...0.8cap
	Operating temperature range	-25...+60°C
Protective class	Inverter topology	Non-Isolated
	Ingress protection	IP65
	Protective class	I
	Overvoltage category	II(PV),III(MAINS)



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Pictures of the product:



Front view



Inside view



Terminal view

Summary of testing:

The tests were performed according to NTS V2.1:2021-07. The unit considered as Type A module.

- ☐ deviation(s) found
☒ no deviations found

Tests performed :

Clause	Requirement
5.1	Overfrequency limited power-frequency regulation mode (MRPFL-O)

Remark: If no special indicates, all the test is applied for model: ASW15kH-T1.

Additional information on non-standard test method(s)

Sub clause: N/A
Page: N/A
Rational: N/A



Product Service

Possible test case verdicts:

test case does not apply to the test object: N/A (not applicable / not included in the order)

test object does meet the requirement: P (Pass)

test object does not meet the requirement: F (Fail)

General remarks:

"(see remark #)" refers to a remark appended to the report.

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

*Throughout this report a **dot** is used as the decimal separator.*

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

This report shall not be reproduced except in full without the written approval of the testing laboratory.

Clause	Requirement + Test	Result – Remark	Verdict
NTS V2.1:2021-07			
5	TEST METHODOLOGY AND SIMULATIONS FOR THE EVALUATION OF TECHNICAL REQUIREMENTS		P
5.1	Overfrequency limited power-frequency regulation mode (MRPFL-O)	See below table The unit considered as Type A module	P
5.2	Limited-subfrequency power-frequency regulation mode (MRPFL-U)		N/A
5.3	Frequency Power Dimming Mode (MRPF)		N/A
5.4	Power-frequency control capability		N/A
5.5	Active power control capacity and range		N/A
5.6	Inertia Emulation		N/A
5.7	Reactive power capacity at maximum capacity and below maximum capacity		N/A
5.8	Reactive power control in MPE		N/A
5.8.1	Objective		N/A
5.8.2	UGE-level evaluation for obtaining a CERTIFICATE from the UGE		N/A
5.8.2.1	UGE reactive power control mode		N/A
5.8.2.2	Voltage control mode		N/A
5.8.2.3	Power factor control mode		N/A
5.9	Damping of power oscillations in MGES		N/A
5.10	Damping of power oscillations in MPE		N/A
5.11	Robustness Requirements: Recovery of active power after a fault, ability to withstand voltage dips and rapid injection capacity of faulty current		N/A
5.12	Autonomous start-up		N/A
5.13	Operation on Island		N/A
5.14	Quick resynchronization		N/A
6	VALIDATION OF THE SIMULATION MODEL		N/A
6.1	General aspects and objective of the validation of the model		N/A
6.2	Validation of the UGE model		N/A
6.3	Validation of the CAMGE model		N/A

5.1	Limited power-frequency regulation mode – overfrequency (MRPFL-O)								P
Table 3. MRPFL-O test. Droop 2% and frequency threshold 50.2 Hz.									
OS2F2: test point	f (Hz)	f fin(Hz)	ΔP_{test} /P _{max} (%) Expected	ΔP_{test} (%) Register ed	Deviation (%)(<5% Pmax)	90% ΔP_{test} (%) Register ed(%Pmax)	t _r (s) (a 90% ΔP_{test} (%) Register ed)	t _a (s)	t _e (s)(range ±5% ΔP_{test} Register ed)
1	50.00	50.10	0%	0.05%	0.05%	N/A	N/A	N/A	N/A
2	50.10	50.50	-30%	-29.35%	-0.65%	-26.42%	0.8	0.1	0.8
3	50.50	50.70	-20%	-17.01%	-2.99%	-15.31%	0.6	0.1	0.6
4	50.70	50.50	+20%	20.66%	0.66%	18.59%	0.6	0.1	0.6
5	50.50	50.10	+30%	30.09%	0.09%	N/A	N/A	N/A	N/A
6b MPE	50.10	50.70	-50%	-50.56%	-0.56%	-45.50%	0.6	0.1	0.6

Response curve:

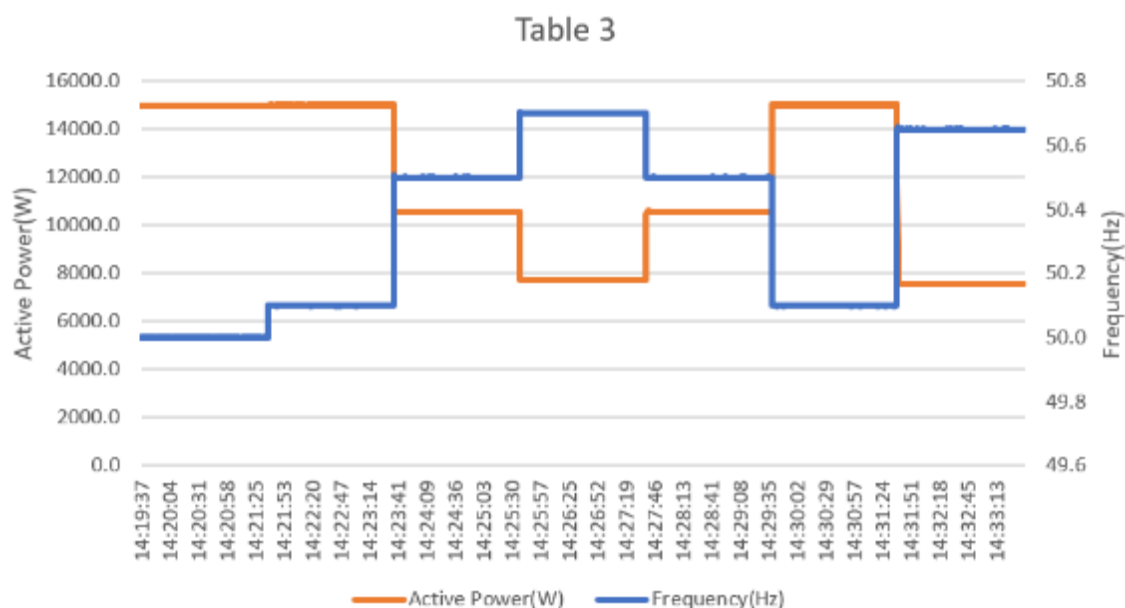
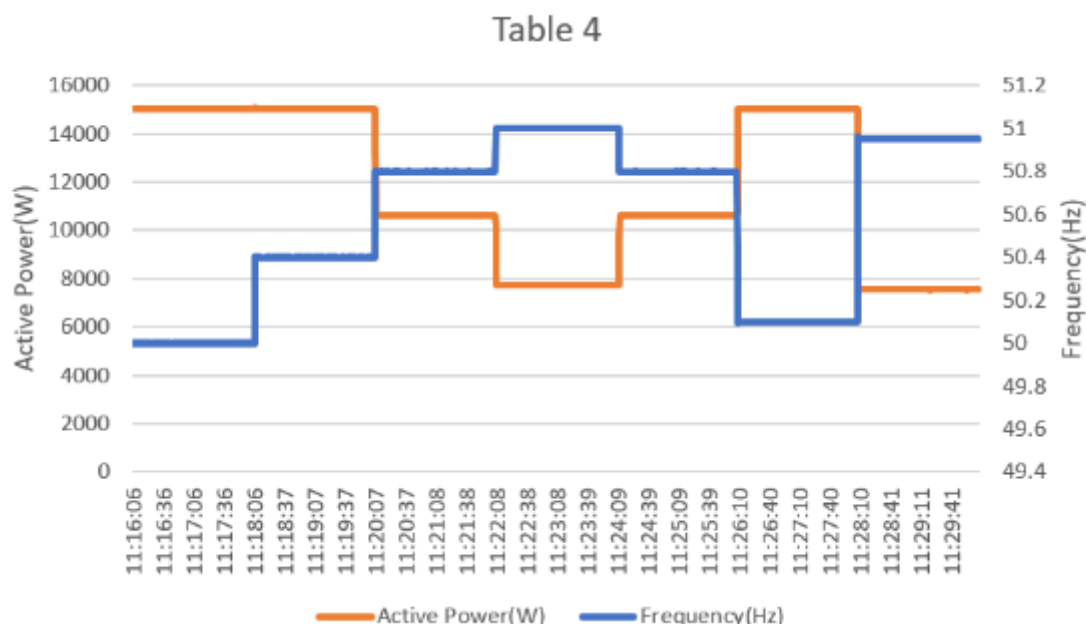


Table 4. MRPFL-O test. Droop 2% and frequency threshold 50.5 Hz.									
OS2F5: test point	f (Hz)	f fin(Hz)	$\Delta P_{test} / P_{max}(\%)$ Expected	$\Delta P_{test}(\%)$ Registered	Deviation (%)(<5% Pmax)	90% $\Delta P_{test}(\%)$ Registered(%Pmax)	t _r (s) (a 90% $\Delta P_{test}(\%)$ Registered)	t _a (s)	t _e (s)(range $\pm 5\%$ ΔP_{test} Registered)
1	50.00	50.40	0%	0.03%	0.03%	N/A	N/A	N/A	N/A
2	50.40	50.80	-30%	-29.25%	0.75%	-26.33%	0.6	0.1	0.6
3	50.80	51.00	-20%	-19.98%	0.02%	-17.98%	0.6	0.1	0.6
4	51.00	50.80	+20%	20.01%	0.01%	18.01%	0.6	0.1	0.6
5	50.80	50.10	+30%	30.00%	0%	N/A	N/A	N/A	N/A
6b MPE	50.10	51.00	-50%	50.34%	0.34%	45.31%	0.6	0.1	0.6

Response curve:


Table 5. MRPFL-O test. Droop 12% and frequency threshold 50.2 Hz.

OS12F2: test point	f (Hz)	f fin(Hz)	ΔP_{test} /P _{max} (%) Expected	ΔP_{test} (%) Register ed	Deviation (%)(<5% Pmax)	90% ΔP_{test} (%) Register ed(%Pm ax)	t _r (s) (a 90% ΔP_{test} (%) Register ed)	t _a (s)	t _e (s)(rang e $\pm 5\%$ ΔP_{test} Register ed)
1	50.00	50.10	0%	0.15%	0.15%	N/A	N/A	N/A	N/A
2	50.10	51.40	-20%	-18.83%	-1.17%	16.95%	0.6	0.1	0.6
3	51.40	50.30	+18.33%	17.15%	1.18%	15.44%	0.6	0.1	0.6

Response curve:

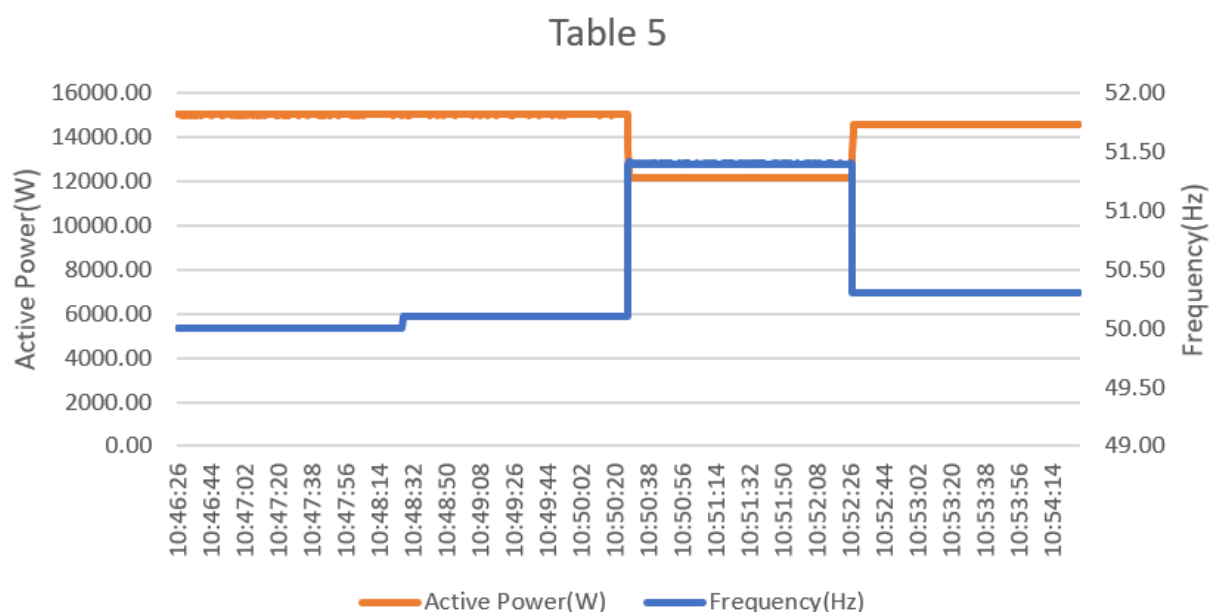
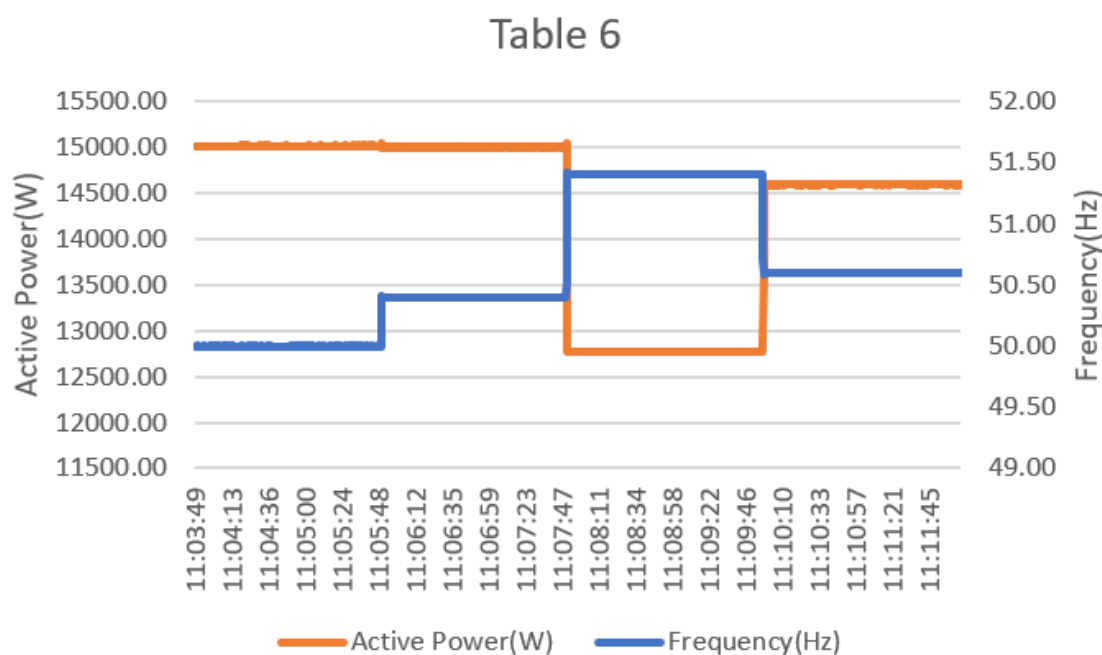


Table 6. MRPFL-O test. Droop 12% and frequency threshold 50.5 Hz.

OS12F5: test point	f (Hz)	f fin(Hz)	ΔP_{test} /P _{max} (%) Expected	ΔP_{test} (%) Register ed	Deviation (%)(<5% Pmax)	90% ΔP_{test} (%) Register ed(%Pm ax)	t _r (s) (a 90% ΔP_{test} (%) Register ed)	t _a (s)	t _e (s)(rang e $\pm 5\%$ ΔP_{test} Register ed)
1	50.00	50.40	0%	0.02	0.02	N/A	N/A	N/A	N/A
2	50.40	51.40	-15%	-14.84%	-0.16%	13.36%	0.6	0.1	0.6
3	51.40	50.60	+13.33%	12.28%	1.05%	11.05%	0.6	0.1	0.6

Response curve:



.....End of test report.....