

Declaration of Conformity

Manufacturer	Suzhou Hypontech Co., Ltd No. 1508 Xiangyang Road, 215011 Suzhou, P.R. China				
Product Description	Solar Inverter				
Type Tested Reference Number	HPK-1000	HPK-1500	HPK-2000	HPK-2500	HPK-3000
Registered Capacity	1100W	1650W	2200W	2750W	3300W
Connection Option	Single Phase				

Manufacturer Compliance Declaration:

I certify that all products supplied by the company with the above Type Tested Reference Number will be manufactured and tested to ensure that they perform as stated in this document, prior to shipment to site and that no site modifications are required to ensure that the product meets all the requirements of EREC G98.

Suzhou Hypontech Co.,Ltd

NO.1508 Xiangjiang Road, Suzhou, China

Phone: +86 512-80712199

Internet: <http://www.hypontech.com>

E-mail: info@hypontech.com

Signed:

Jack Tu

Suzhou

2021-04-06

On behalf of :

Suzhou Hypontech Co.,Ltd

Type Test Verification Report

Operating Range

Active power shall be recorded every second. The tests will verify that the Micro-generator can operate within the required ranges for the specified period of time.

The interface protection shall be disabled during the tests.

The primary source is a DC source with MPPT function for solar inverter.

Test 1

Voltage=85% of nominal (195.5V)

Frequency=47.5Hz

Power factor=1

Period of test 90 minutes

Operating

Test 2

Voltage=110% of nominal(253V)

Frequency=51.5Hz

Power factor=1

Period of test 90 minutes

Operating

Test 3

Voltage=110% of nominal (253V)

Frequency=52.0Hz

Power factor=1

Period of test 15 minutes

Operating

Power Quality – Harmonics

These tests should be carried out as specified in BS EN 61000-3-2. The chosen test should be undertaken with a fixed source of energy at two power levels a) between 45 and 55% and b) at 100% of Registered Capacity.

The test requirements are specified in Annex A1 A.1.3.1 (Inverter connected) .

Micro-generator tested to BS EN 61000-3-2

Micro-generator rating per phase (rpp)			3.3	kW		
Harmonic	At 45-55% of Registered Capacity		100% of Registered Capacity			
	Measured Value MV in Amps		Measured Value MV in Amps		Limit in BS EN 61000-3-2 in Amps	Higher limit for odd harmonics 21 and above
2	0.0211	0.2421	0.0227	0.2614	1.080	
3	0.0114	0.1305	0.0134	0.1544	2.300	
4	0.0064	0.0735	0.0076	0.0874	0.430	

5	0.0034	0.0396	0.0078	0.0903	1.140	
6	0.0046	0.0531	0.0042	0.0478	0.300	
7	0.0026	0.0304	0.0037	0.0429	0.770	
8	0.0090	0.1030	0.0048	0.0550	0.230	
9	0.0485	0.5568	0.0269	0.3098	0.400	
10	0.0138	0.1585	0.0033	0.0378	0.184	
11	0.0452	0.5187	0.0065	0.0754	0.330	
12	0.0137	0.1576	0.0052	0.0595	0.153	
13	0.0292	0.3353	0.0098	0.1124	0.210	
14	0.0081	0.0925	0.0068	0.0785	0.131	
15	0.0098	0.1128	0.0221	0.2550	0.150	
16	0.0063	0.0728	0.0107	0.1234	0.115	
17	0.0208	0.2386	0.0296	0.3408	0.132	
18	0.0058	0.0669	0.0095	0.1097	0.102	
19	0.0272	0.3115	0.0276	0.3176	0.118	
20	0.0086	0.0983	0.0104	0.1197	0.092	
21	0.0258	0.2968	0.0247	0.2851	0.107	0.160
22	0.0121	0.1394	0.0104	0.1199	0.084	
23	0.0170	0.1955	0.0191	0.2203	0.098	0.147
24	0.0264	0.3021	0.0309	0.3559	0.077	
25	0.0099	0.1137	0.0166	0.1910	0.090	0.135
26	0.0074	0.0845	0.0074	0.0856	0.071	
27	0.0092	0.1059	0.0067	0.0777	0.083	0.124
28	0.0034	0.0391	0.0042	0.0483	0.066	

29	0.0110	0.1262	0.0042	0.0480	0.078	0.117
30	0.0046	0.0529	0.0030	0.0342	0.061	
31	0.0105	0.1200	0.0071	0.0821	0.073	0.109
32	0.0058	0.0671	0.0032	0.0363	0.058	
33	0.0062	0.0717	0.0084	0.0972	0.068	0.102
34	0.0046	0.0523	0.0040	0.0459	0.054	
35	0.0036	0.0417	0.0114	0.1315	0.064	0.096
36	0.0042	0.0481	0.0065	0.0744	0.051	
37	0.0030	0.0342	0.0111	0.1277	0.061	0.091
38	0.0021	0.0239	0.0046	0.0532	0.048	
39	0.0031	0.0360	0.0093	0.1070	0.058	0.087
40	0.0023	0.0264	0.0047	0.0540	0.046	

Power Quality – Voltage fluctuations and Flicker

These tests should be undertaken in accordance with EREC G98 Annex A1 A.1.3.3 (**Inverter** connected) or Annex A2 A.2.3.3 (Synchronous).

	Starting			Stopping			Running	
	d max	d c	d(t)	d max	d c	d(t)	P _{st}	P _{lt} 2 hours
Measured Values at test impedance	-2.62%	0.00%	0.28%	-1.25%	0.00%	0.31%	0.294	0.328
Limits set under BS EN 61000-3-11	4%	3.3%	3.3%	4%	3.3%	3.3%	1.0	0.65
Test Impedance	R	0.24	Ω	X	0.15	Ω		

Standard Impedance	R	0.24 * 0.4 ^	Ω	X	0.15 * 0.25 ^	Ω
<p>*Applies to three phase and split single phase Micro-generators.</p> <p>^ Applies to single phase Micro-generators and Micro-generators using two phases on a three phase system.</p> <p>For voltage change and flicker measurements the following formula is to be used to convert the measured values to the Normalised values where the power factor of the generation output is 0.98 or above.</p> <p>Normalised value = Measured value*reference source resistance/measured source resistance at test point.</p> <p>Single phase units reference source resistance is 0.4 Ω</p> <p>Two phase units in a three phase system reference source resistance is 0.4 Ω.</p> <p>Two phase units in a split phase system reference source resistance is 0.24 Ω.</p> <p>Three phase units reference source resistance is 0.24 Ω.</p> <p>Where the power factor of the output is under 0.98 then the X to R ratio of the test impedance should be close to that of the Standard Impedance.</p> <p>The stopping test should be a trip from full load operation.</p> <p>The duration of these tests need to conform to the particular requirements set out in the testing notes for the technology under test.</p> <p>Dates and location of the test need to be noted below.</p>						
Test start date		2020/11/9		Test end date		2020/11/10
Test location		Audix Technology (Wujiang) Co.,Ltd.				

Power quality – DC injection

This test should be carried out in accordance with EN 50438 Annex D.3.10

Test power level	20%	50%	75%	100%
Recorded value in Amps	0.0183	0.0175	0.0170	0.0079
as % of rated AC current	0.1407	0.1346	0.1308	0.0903
Limit	0.25%	0.25%	0.25%	0.25%
The rated output current is 13A.				

Power Quality – Power factor

This test shall be carried out in accordance with EN 50538 Annex D.3.4.1 but with nominal voltage -6% and +10%. Voltage to be maintained within $\pm 1.5\%$ of the stated level during the test.

	216.2 V	230 V	253 V
20% of Registered Capacity	0.953	0.958	0.957
50% of Registered Capacity	0.959	0.963	0.964
75% of Registered Capacity	0.973	0.978	0.976
100% of Registered Capacity	0.980	0.981	0.983
Limit	>0.95	>0.95	>0.95

Protection – Frequency tests

These tests should be carried out in accordance with EN 50438 Annex D.2.4 and the notes in EREC G98 Annex A1 A.1.2.3 (**Inverter** connected) or Annex A2 A.2.2.3 (Synchronous)

Function	Setting		Trip test		"No trip tests"	
	Frequency	Time delay	Frequency	Time delay	Frequency /time	Confirm no trip
U/F stage 1	47.5 Hz	20 s	47.51Hz	20.05s	47.7 Hz 30 s	No trip
U/F stage 2	47 Hz	0.5 s	47.01Hz	0.51s	47.2 Hz 19.5 s	No trip
					46.8 Hz 0.45 s	No trip
O/F stage 1	52 Hz	0.5 s	51.99Hz	0.51s	51.8 Hz 120.0 s	No trip
					52.2 Hz 0.45 s	No trip

Note. For frequency trip tests the frequency required to trip is the setting ± 0.1 Hz. In order to measure the time delay a larger deviation than the minimum required to operate the protection can be used. The "No trip tests" need to be carried out at the setting ± 0.2 Hz and for the relevant times as shown in the table above to ensure that the protection will not trip in error.

Protection – Voltage tests

These tests should be carried out in accordance with EN 50438 Annex D.2.3 and the notes in EREC G98 Annex A1 A.1.2.2 (**Inverter** connected) or Annex A2 A.2.2.2 (Synchronous)

Function	Setting		Trip test		"No trip tests"	
	Voltage	Time delay	Voltage	Time delay	Voltage /time	Confirm no trip
U/V	184 V	2.5 s	184.5V	2.52s	188 V 5.0 s	No trip
					180 V 2.45 s	No trip
O/V stage 1	262.2 V	1.0 s	261.8V	1.03s	258.2 V 5.0 s	No trip
O/V stage 2	273.7 V	0.5 s	273.4	0.48s	269.7 V 0.95 s	No trip
					277.7 V 0.45 s	No trip

Note for Voltage tests the Voltage required to trip is the setting ± 3.45 V. The time delay can be measured at a larger deviation than the minimum required to operate the protection. The No trip tests need to be carried out at the setting ± 4 V and for the relevant times as shown in the table above to ensure that the protection will not trip in error.

Protection – Loss of Mains test

For PV **Inverters** shall be tested in accordance with BS EN 62116. Other **Inverters** should be tested in accordance with EN 50438 Annex D.2.5 at 10%, 55% and 100% of rated power.

For **Inverters** tested to BS EN 62116 the following sub set of tests should be recorded in the following table.

Test Power and imbalance	33% -5% Q Test 22	66% -5% Q Test 12	100% -5% P Test 5	33% +5% Q Test 31	66% +5% Q Test 21	100% +5% P Test 10
Trip time. Limit is 0.5 s	0.235	0.189	0.267	0.259	0.191	0.289

Protection – Frequency change, Vector Shift Stability test

This test should be carried out in accordance with EREC G98 Annex A1 A.1.2.6 (**Inverter** connected) or Annex A2 A.2.2.6 (Synchronous).

	Start Frequency	Change	Confirm no trip
Positive Vector Shift	49.0 Hz	+50 degrees	No trip

Negative Vector Shift	50.0 Hz	- 50 degrees	No trip
-----------------------	---------	--------------	---------

Protection – Frequency change, RoCoF Stability test

The requirement is specified in section 11.3, test procedure in Annex A.1.2.6 (**Inverter** connected) or Annex A2 A.2.2.6 (Synchronous).

Ramp range	Test frequency ramp:	Test Duration	Confirm no trip
49.0 Hz to 51.0 Hz	+0.95 Hz/s	2.1 s	No trip
51.0 Hz to 49.0 Hz	-0.95 Hz/s	2.1 s	No trip

Limited Frequency Sensitive Mode – Overfrequency test

This test should be carried out in accordance with EN 50438 Annex D.3.3 Power response to over- frequency. The test should be carried out using the specific threshold frequency of 50.4 Hz and **Droop** of 10%.

Test sequence at Registered Capacity >80%	Measured Active Power Output (W)	Frequency (Hz)	Primary Power Source (W)	Active Power Gradient
Step a) 50.00 Hz ±0.01 Hz	3010.0	50.00	3094	-
Step b) 50.45 Hz ±0.05 Hz	2984.2	50.45		-
Step c) 50.70 Hz ±0.10 Hz	2824.4	50.70		10.3%
Step d) 51.15 Hz ±0.05 Hz	2572.3	51.15		9.69%
Step e) 50.70 Hz ±0.10 Hz	2833.1	50.70		9.80%
Step f) 50.45 Hz ±0.05 Hz	2986.9	50.45		-
Step g) 50.00 Hz ±0.01 Hz	3008.3	50.00		
Test sequence at Registered Capacity 40% - 60%	Measured Active Power Output (W)	Frequency (Hz)	Primary Power Source (W)	Active Power Gradient
Step a) 50.00 Hz ±0.01 Hz	1495.0	50.00Hz	1588	-
Step b) 50.45 Hz ±0.05 Hz	1475.2	50.45Hz		-
Step c) 50.70 Hz ±0.10 Hz	1400.3	50.70Hz		10.56%
Step d) 51.15 Hz ±0.05 Hz	1274.6	51.15Hz		9.83%

Step e) 50.70 Hz ± 0.10 Hz	1401.9	50.70Hz		10.38%
Step f) 50.45 Hz ± 0.05 Hz	1482.3	50.45Hz		-
Step g) 50.00 Hz ± 0.01 Hz	1495.4	50.00Hz		

Power output with falling frequency test

This test should be carried out in accordance with EN 50438 Annex D.3.2 active power feed-in at under-frequency.

Test sequence	Measured Active Power Output	Frequency	Primary power source
Test a) 50 Hz ± 0.01 Hz	3006.5W	50.00Hz	3104.0W
Test b) Point between 49.5 Hz and 49.6 Hz	3007.2W	49.50Hz	3105.3W
Test c) Point between 47.5 Hz and 47.6 Hz	3007.5W	47.50Hz	3105.6W

Re-connection timer

Test should prove that the reconnection sequence starts after a minimum delay of 20 s for restoration of voltage and frequency to within the stage 1 settings of Table 2.

Time delay setting	Measured delay	Checks on no reconnection when voltage or frequency is brought to just outside stage 1 limits of table 2.			
30s	35s	At 266.2 V	At 180.0 V	At 47.4 Hz	At 52.1 Hz
Confirmation that the Micro-generator does not re-connect.		No re-connect	No re-connect	No re-connect	No re-connect

Fault level contribution

These tests shall be carried out in accordance with EREC G98 Annex A1 A.1.3.5 (**Inverter** connected) and Annex A2 A.2.3.4 (Synchronous).

For machines with electro-magnetic output			For Inverter output		
Parameter	Symbol	Value	Time after fault	Volts	Amps
Peak Short Circuit current	i_p	-	20 ms	85V	20.3A

Initial Value of aperiodic current	A	-	100 ms	63V	10.4A
Initial symmetrical short-circuit current*	I_k	-	250 ms	42V	8.3A
Decaying (aperiodic) component of short circuit current*	i_{DC}	-	500 ms	24V	6.4A
Reactance/Resistance Ratio of source*	X/R	-	Time to trip	0.18	In seconds

For rotating machines and linear piston machines the test should produce a 0 s – 2 s plot of the short circuit current as seen at the **Micro-generator** terminals.

* Values for these parameters should be provided where the short circuit duration is sufficiently long to enable interpolation of the plot

Logic Interface.	Yes
Self-Monitoring solid state switching: No specified test requirements. Refer to EREC G98 Annex A1 A.1.3.6 (Inverter connected).	Yes/or NA
It has been verified that in the event of the solid state switching device failing to disconnect the Micro-generator , the voltage on the output side of the switching device is reduced to a value below 50 V within 0.5 s.	Yes