


**VERIFICATION OF COMPLIANCE**

Release No.:  
1.1 (2023)


<b>Applicant:</b>	<b>Shenzhen Ateess Power Technology Co., Ltd.</b> 2nd Floor, No.23 Zhulongtian Road, Shuitian Community, Shiyan Street, Baoan District, Shenzhen, P.R. China
<b>Device Category:</b>	Inverter
<b>Device Type:</b>	Hybrid (PV with DC coupled Electricity Storage)
<b>PGM categories:</b>	<input checked="" type="checkbox"/> Type A   <input type="checkbox"/> Type B   <input type="checkbox"/> Type C   <input type="checkbox"/> Type D
<b>Model(s):</b>	<b>HPS30, HPS50</b>
<b>Trademark:</b>	
<b>Technical data:</b>	Product family: HPS30 ~ HPS50 Registered Capacity [kW]: 30.0 ~ 50.0 (For further details see A.2 <i>Technical data of the Generating Unit(s) on p.2</i> )
<b>Firmware version:</b>	HPS30K 150K HV3 SV4.1.14 APP
<b>Grid connection code:</b>	<b>Engineering Recommendation G99</b> Issue 1 – Amendment 9 3 October 2022 Requirements for the connection of generation equipment in parallel with public distribution networks on or after 27 April 2019
<b>Test report no.:</b>	<b>HC23072104-EG-UK-001 (2023-08-21)</b>

This verification confirms that the above-mentioned generating unit(s) with corresponding software meet the requirements of the referenced grid connection code at the time the tests were conducted.

This verification relates to type testing and does not imply LYNS's endorsement, approval, certification or on-going control of the product(s), either in terms of performance, design, manufacture or materials used. This verification and the results stated herein relate solely to the sample product(s) tested and to the specific tests undertaken.

The verification will remain valid for the stated period providing no changes are made to the product, production method etc. This certificate is only valid when this is also found at <http://www.huachuang-ts.com/plus/list.php?tid=62> or contact Lyns-tci Technology Guangdong Co., Ltd.

This verification is for the exclusive use of LYNS's Client and is provided pursuant to the agreement between LYNS and its Client. LYNS's responsibility and liability are limited to the terms and conditions of the agreement. LYNS assumes no liability to any party, other than to the Client in accordance with the agreement, for any loss, expense or damage occasioned using this verification.

  
**Jack Shi**  
Sr. Project Manager

**A.1 Revision history of the verification**

Revision	Date	Changes	Status
0 (HC23072104-EG-UK-V001)	2023-08-21	Initial issue	Active

**A.2 Technical data of the Generating Unit(s)**

Model	HPS30	HPS50
DC input (PV)		
Max. DC input voltage [V]	1000	
Operating MPPT voltage range [V]	480 ~ 800	
Input DC current [A]	max. 90	max. 136
Battery connection		
Battery voltage range [V]	352 ~ 600	
Battery charging current [V]	max. 100	max. 150
Battery discharging current [A]	max. 93	max. 156
Battery charging power [W]	45.0	75.0
Battery discharging power [W]	33.0	55.0
AC connection		
Nominal output AC voltage [V]	230/400 (3~ + N + PE, 50/60 Hz)	
Output AC current [A]	max. 47.0	max. 79.0
Nominal active output power P <sub>n</sub> [kW]	30.0	50.0
Registered Capacity <sup>1</sup> P <sub>max</sub> [kW]	30.0	50.0
Max. apparent power [kVA]	33.0	55.0
Operating temperature range	-25°C ~ +55°C	
Degree of protection	IP20 (according to EN 60529)	
Protection class	I (according to IEC 62109-1)	
Type of internal transformer	Internal transformer (transformerless)	
Firmware version	HPS30K 150K HV3 SV4.1.14 APP	
Manufacturer	<b>Shenzhen Ateess Power Technology Co., Ltd.</b> 2nd Floor, No.23 Zhulongtian Road, Shuitian Community, Shiyan Street, Baoan District, Shenzhen, P.R. China (The manufacturer has provided proof of certification of the quality management system of his production facility in accordance with ISO 9001)	
Testing laboratory	<b>Lyns-tci Technology Guangdong Co., Ltd.</b> 1201, Unit 2, Building 18, No. 7, Science and Technology Boulevard, Houjie Town, Dongguan City, Guangdong, 523960, P.R. China (Accredited acc. ISO/IEC 17025: A2LA Accreditation no. 5200.02)	
Testing location	Same as above	
Date(s) of performance of tests	2023-08-01 - 2023-08-19	

<sup>1</sup> The stated values of "registered capacity" related to single Generating Unit.

## Annex to the Verification No.: HC23072104-EG-UK-V001

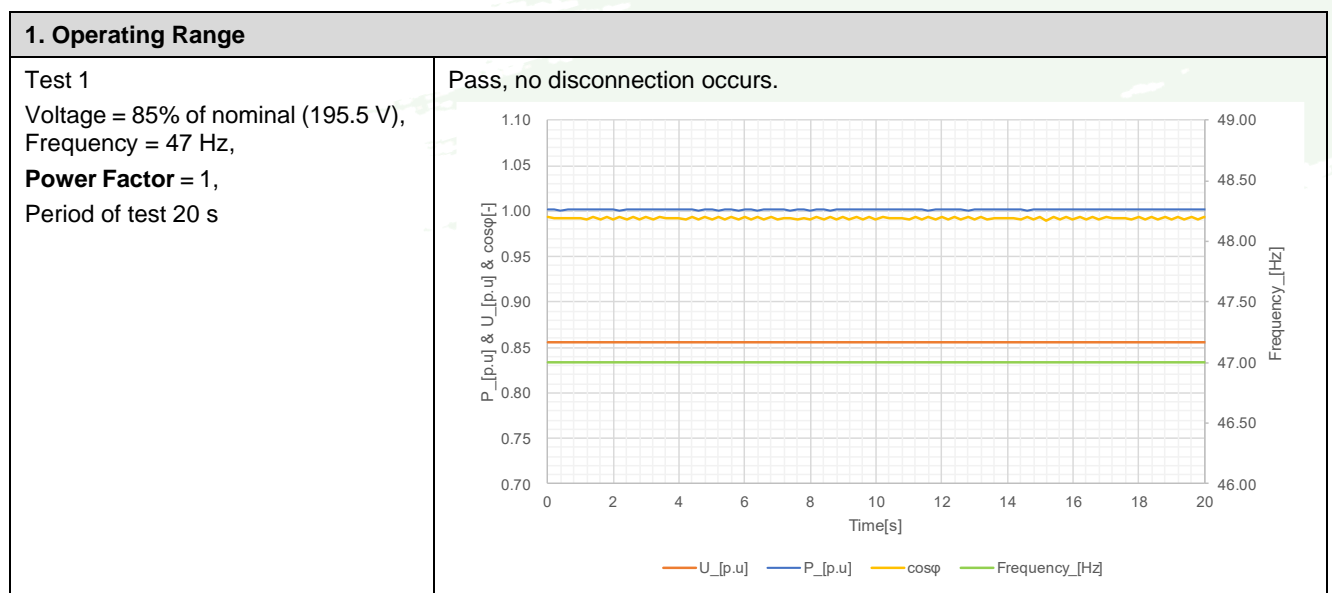
### Note:

- The Power Park Modules (Generating Units):  
*HPS30* and *HPS50* are designed to be capable of operating within the range  $\pm 0.95$  Power Factor at Registered Capacity.  
 Max. operating range of Power Factor at Registered Capacity: 0.909 lagging to 0.909 leading.
- Setting range of the Power Factor:  
 0.800 lagging to 0.800 leading

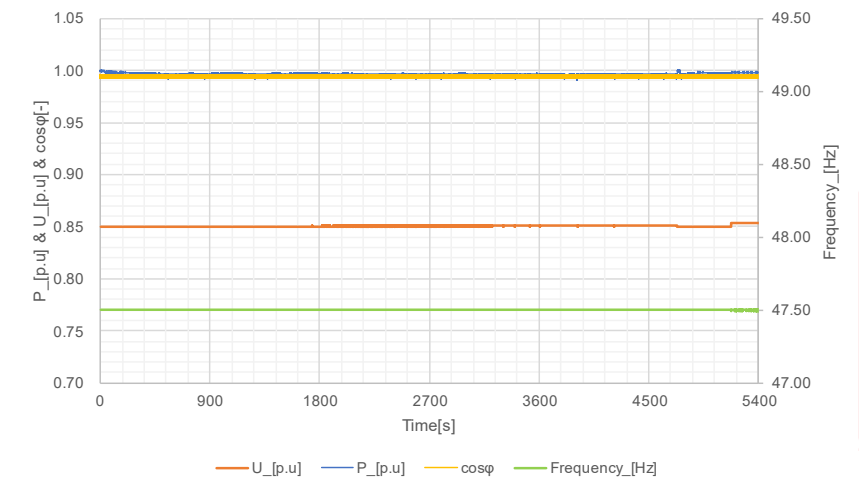
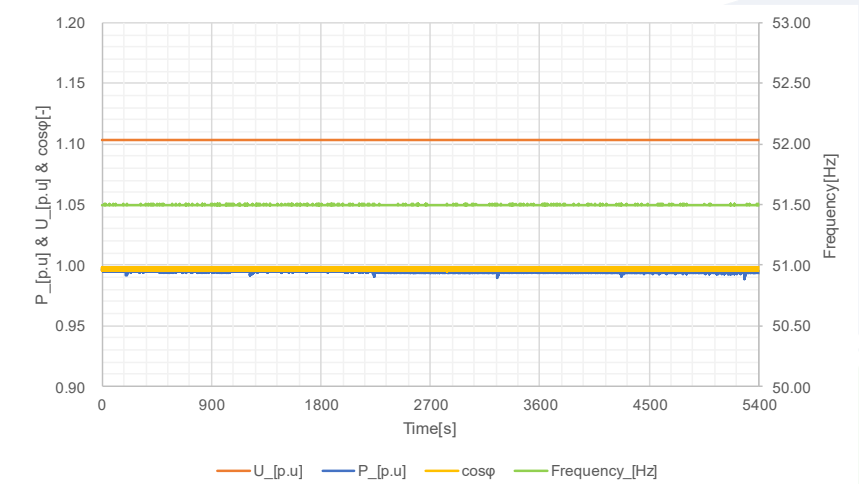
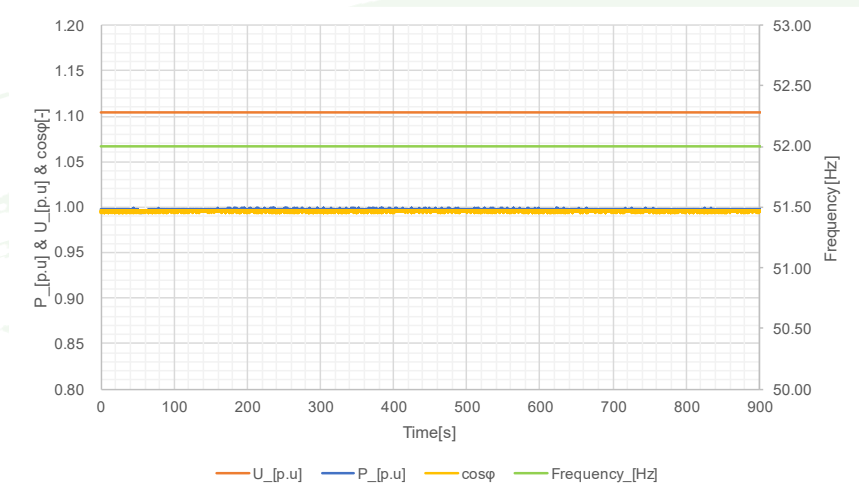
### A.3 Extract of the test report no. HC23072104-EG-UK-001 (EREC G99, Form A2-3)

#### Note:

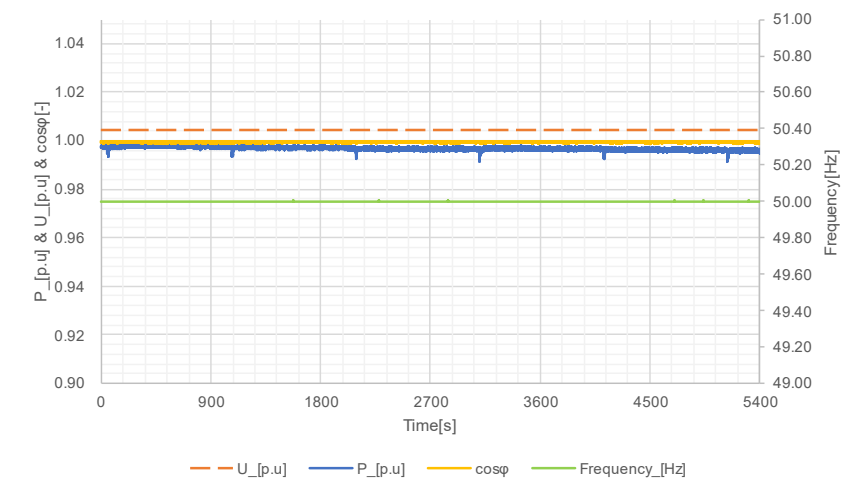
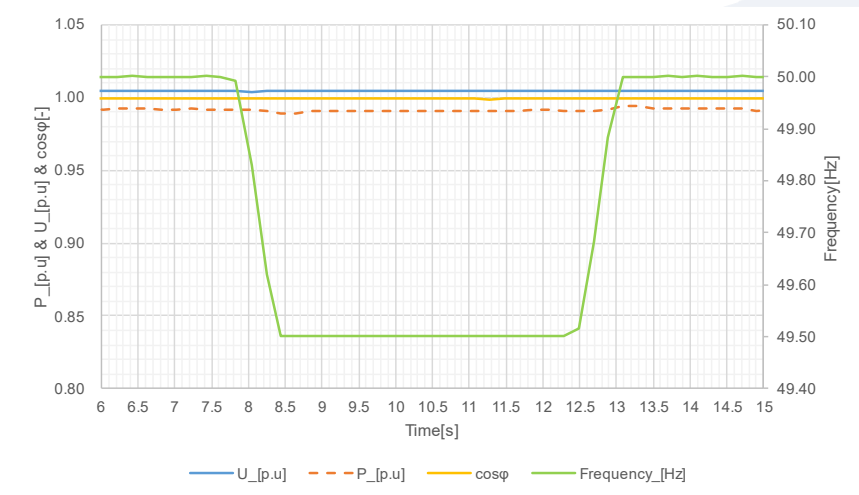
- The (full) tests were performed on EUT HPS50.
- The product was tested on:
  - HPS50 (full testing)
    - Serial No.: TPC0C270BD
    - Hardware version: SSCP HW V1.1.1
    - Firmware version: HPS30K 150K HV3 SV4.1.14 APP
- According to EREC G99, section 15.6.1 the following applies:  
 since the rated power of *HPS30* is between  $1/\sqrt{10} \cdot P_{n, HPS50}$  and  $2 \cdot P_{n, HPS50}$ , a family approach to type testing is acceptable.
- A transfer of measurement results from the HPS50 to other units in the product series according to EREC G99, section 15.6.2 is allowed.  
 According to EREC G99, section 15.6.2 the following applies:  
*All absolute values (e.g. operating range tests) shall be transferred directly in the compliance forms of an assumed compliant Generating Unit of the same family. All relative results related to design Active Power or current (e.g. power quality fluctuation and flicker) from the tested Generating Unit shall be transferred to the compliance form of a Generating Unit in the same family according to the ratio of the respective nameplate rating (W) of the tested Generating Unit and the assumed compliant Generating Unit. For the avoidance of doubt, the Manufacturer shall register each Generating Unit in the family on the Energy Networks Association Type Test register.*  
 In general, the **relative results** of EUT HPS50 can be applied to other units in the product series scaled by the factor  $P_{n, HPS50} / P_{n, \text{unit-not-tested}}$ . Exceptions are detailed in the results table below.
- Technical justification for transferability of measurement results:  
 The units in der product series:
  - sharing the same control electronics,
  - with the same implemented control and firmware,
  - with the same construction solutions including the power part,
  - with the same number of phases,
  - with the power electronics, filters and transducers designed for different sizes of voltage and current ratings.
 The differences between the units in the product series are documented in detail in the test report no. *HC23072104-EG-UK-001*.



## Annex to the Verification No.: HC23072104-EG-UK-V001

<p>Test 2</p> <p>Voltage = 85% of nominal (195.5 V), Frequency = 47.5 Hz, <b>Power Factor = 1</b>, Period of test 90 minutes</p>	<p>Pass, no disconnection occurs.</p>  <p>The graph for Test 2 shows four data series over a 5400-second period. The left y-axis represents P [p.u] &amp; U [p.u] &amp; cosφ [-], ranging from 0.70 to 1.05. The right y-axis represents Frequency [Hz], ranging from 47.00 to 49.50. The x-axis is Time [s], ranging from 0 to 5400. The series are: U [p.u] (orange line) constant at 0.85; P [p.u] (blue line) constant at 1.00; cosφ (yellow line) constant at 1.00; and Frequency [Hz] (green line) constant at 47.5.</p>
<p>Test 3</p> <p>Voltage = 110% of nominal (253 V), Frequency = 51.5 Hz, <b>Power Factor = 1</b>, Period of test 90 minutes</p>	<p>Pass, no disconnection occurs.</p>  <p>The graph for Test 3 shows four data series over a 5400-second period. The left y-axis represents P [p.u] &amp; U [p.u] &amp; cosφ [-], ranging from 0.90 to 1.20. The right y-axis represents Frequency [Hz], ranging from 50.00 to 53.00. The x-axis is Time [s], ranging from 0 to 5400. The series are: U [p.u] (orange line) constant at 1.10; P [p.u] (blue line) constant at 1.00; cosφ (yellow line) constant at 1.00; and Frequency [Hz] (green line) constant at 51.5.</p>
<p>Test 4</p> <p>Voltage = 110% of nominal (253 V), Frequency = 52.0 Hz, <b>Power Factor = 1</b>, Period of test 15 minutes</p>	<p>Pass, no disconnection occurs.</p>  <p>The graph for Test 4 shows four data series over a 900-second period. The left y-axis represents P [p.u] &amp; U [p.u] &amp; cosφ [-], ranging from 0.80 to 1.20. The right y-axis represents Frequency [Hz], ranging from 50.00 to 53.00. The x-axis is Time [s], ranging from 0 to 900. The series are: U [p.u] (orange line) constant at 1.10; P [p.u] (blue line) constant at 1.00; cosφ (yellow line) constant at 1.00; and Frequency [Hz] (green line) constant at 52.0.</p>

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<p>Test 5</p> <p>Voltage = 100% of nominal (230 V), Frequency = 50.0 Hz, <b>Power Factor = 1</b>, Period of test = 90 minutes</p>	<p>Pass, no disconnection occurs.</p>  <p>The graph for Test 5 plots four variables over a 5400-second period. The left y-axis represents <math>P_{[p.u]}</math> and <math>U_{[p.u]}</math> &amp; <math>\cos\phi_{[ ]}</math> ranging from 0.90 to 1.04. The right y-axis represents Frequency [Hz] ranging from 49.00 to 51.00. The x-axis is Time [s] from 0 to 5400. The legend indicates: <math>U_{[p.u]}</math> (orange dashed line), <math>P_{[p.u]}</math> (blue solid line), <math>\cos\phi</math> (yellow solid line), and Frequency [Hz] (green solid line). All parameters remain constant and within their respective limits throughout the test.</p>
<p>Test 6 RoCoF withstand</p> <p>Confirm that the Power Generating Module is capable of staying connected to the Distribution Network and operate at rates of change of frequency up to 1 Hz/s-1 as measured over a period of 500 ms. Note that this is not expected to be demonstrated on site.</p>	<p>Pass, no disconnection occurs.</p>  <p>The graph for Test 6 shows a transient event over a 15-second interval. The left y-axis represents <math>P_{[p.u]}</math> and <math>U_{[p.u]}</math> &amp; <math>\cos\phi_{[ ]}</math> ranging from 0.80 to 1.05. The right y-axis represents Frequency [Hz] ranging from 49.40 to 50.10. The x-axis is Time [s] from 6 to 15. The legend indicates: <math>U_{[p.u]}</math> (blue solid line), <math>P_{[p.u]}</math> (orange dashed line), <math>\cos\phi</math> (yellow solid line), and Frequency [Hz] (green solid line). The frequency (green line) drops from 50.00 Hz to approximately 49.50 Hz between 8 and 12.5 seconds, while the other parameters remain stable.</p>
<p>Note:</p> <p>The verified operating range of the HPS50 can be applied to other units in the product series directly.</p>	

2. Power Quality – Harmonics								
Power Generating Module tested to BS EN 61000-3-12								
Power Generating Module rating per phase (rpp)			16.667			kVA	Harmonic % = Measured Value (A) x 23/rating per phase (kVA)	
Single or three phase measurements (for single phase measurements, only complete L1 columns below).			three phases					
Harmonic	At 45-55% of Registered Capacity						Limit in BS EN 61000-3-12	
	Measured Value (MV) in Amps			Measured Value (MV) in %			1-phase	3-phases
Order	L <sub>1</sub>	L <sub>2</sub>	L <sub>3</sub>	L <sub>1</sub>	L <sub>2</sub>	L <sub>3</sub>		
2	0.8160	0.9455	1.0527	1.1261	1.3049	1.4528	8%	8%
3	0.4362	1.2896	0.8565	0.6019	1.7796	1.1820	21.6%	Not stated
4	0.5651	0.5624	0.6528	0.7798	0.7760	0.9009	4%	4%
5	0.4421	0.3839	0.7407	0.6101	0.5298	1.0222	10.7%	10.7%
6	0.4117	0.0585	0.4701	0.5682	0.0808	0.6488	2.67%	2.67%
7	0.3504	0.1817	0.2245	0.4836	0.2507	0.3098	7.2%	7.2%
8	0.0989	0.1127	0.1119	0.1365	0.1556	0.1545	2%	2%
9	0.0625	0.1031	0.0417	0.0862	0.1423	0.0576	3.8%	Not stated
10	0.0885	0.0892	0.0799	0.1221	0.1231	0.1102	1.6%	1.6%
11	0.1028	0.0748	0.0803	0.1419	0.1032	0.1108	3.1%	3.1%
12	0.0549	0.0105	0.0640	0.0758	0.0144	0.0883	1.33%	1.33%
13	0.0287	0.0502	0.0319	0.0397	0.0693	0.0440	2%	2%
THD	--	--	--	1.8015	2.4298	2.4399	23%	13%
PWHD	--	--	--	0.4098	0.3476	0.4559	23%	22%

Harmonic	At 100% of Registered Capacity						Limit in BS EN 61000-3-12	
	Measured Value (MV) in Amps			Measured Value (MV) in %			1-phase	3-phases
Order	L <sub>1</sub>	L <sub>2</sub>	L <sub>3</sub>	L <sub>1</sub>	L <sub>2</sub>	L <sub>3</sub>		
2	0.8111	1.0810	1.3300	1.1193	1.4918	1.8354	8%	8%
3	0.3731	1.6405	1.2668	0.5148	2.2638	1.7482	21.6%	Not stated
4	0.7203	0.7278	0.9590	0.9940	1.0043	1.3234	4%	4%
5	0.5419	0.2494	0.7454	0.7478	0.3441	1.0287	10.7%	10.7%
6	0.5224	0.1311	0.6529	0.7209	0.1809	0.9010	2.67%	2.67%
7	0.2277	0.0420	0.1878	0.3143	0.0580	0.2592	7.2%	7.2%
8	0.1442	0.1537	0.1524	0.1990	0.2121	0.2103	2%	2%
9	0.0421	0.0712	0.0305	0.0580	0.0983	0.0421	3.8%	Not stated
10	0.0875	0.0644	0.0478	0.1207	0.0889	0.0660	1.6%	1.6%
11	0.1423	0.1656	0.1460	0.1964	0.2285	0.2014	3.1%	3.1%
12	0.0293	0.0055	0.0338	0.0404	0.0076	0.0467	1.33%	1.33%
13	0.0833	0.0575	0.0740	0.1150	0.0793	0.1021	2%	2%
THD	--	--	--	1.9525	2.9413	3.1990	23%	13%
PWHD	--	--	--	0.5898	0.5657	0.5777	23%	22%

Note:

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The percentage harmonics results of the HPS50 can be applied to other units in the product series scaled by the factor  $P_n$ ,  $HPS50 / P_n$ , unit-not-tested.  
(The transferred results are below the required limit values according to BS EN 61000-3-12.)

3. Power Quality – Voltage fluctuations and Flicker									
Test start date		2023-08-18			Test end date			2023-08-18	
Test location		Lyns-tci Technology Guangdong Co., Ltd. (see <i>Testing location</i> on p.2)							
	Phase no.	Starting			Stopping			Running	
		$d_{max}$ [%]	$d_c$ [%]	$d(t)$ [ms]	$d_{max}$ [%]	$d_c$ [%]	$d(t)$ [ms]	$P_{st}$	$P_{it}$ 2 hours
Measured Values at test impedance	L1	0.309	0.058	0.000	1.906	0.339	0.000	0.014	0.013
	L2	0.247	0.031	0.000	0.507	0.199	0.000	0.014	0.014
	L3	0.259	0.012	0.000	1.884	0.435	0.000	0.019	0.014
	Overall worst case	0.259	0.058	0.000	1.906	0.435	0.000	0.019	0.014
Measured Values at test impedance	L1	0.309	0.058	0.000	1.906	0.339	0.000	0.014	0.013
	L2	0.247	0.031	0.000	0.507	0.199	0.000	0.014	0.014
	L3	0.259	0.012	0.000	1.884	0.435	0.000	0.019	0.014
	Overall worst case	0.259	0.058	0.000	1.906	0.435	0.000	0.019	0.014
Measured Values at test impedance	L1	--	--	--	--	--	--	--	--
	L2	--	--	--	--	--	--	--	--
	L3	--	--	--	--	--	--	--	--
	Overall worst case	--	--	--	--	--	--	--	--
Limits set under BS EN 61000-3-11		4	3.3	500 (3.3%)	4	3.3	500 (3.3%)	1.0	0.65
Test Impedance	R:	0.24 $\Omega$			X:		0.15 $\Omega$		
Standard Impedance	R:	<input checked="" type="checkbox"/> 0.24 * $\Omega$ <input type="checkbox"/> 0.4 ^ $\Omega$			X:		<input checked="" type="checkbox"/> 0.15 * $\Omega$ <input type="checkbox"/> 0.25 ^ $\Omega$		
Maximum Impedance	R:	2.553 $\Omega$			X:		1.596 $\Omega$		
* <input checked="" type="checkbox"/> three-phase <b>Power Generating Modules</b> <input type="checkbox"/> split single phase <b>Power Generating Modules</b> ^ <input type="checkbox"/> single phase <b>Power Generating Module</b> <input type="checkbox"/> <b>Power Generating Modules</b> using two phases on a three-phase system									
Note: The Flicker results of the HPS50 can be applied to other units in the product series scaled by the factor $P_n$ , $HPS50 / P_n$ , unit-not-tested. (The transferred results (values at test and standard impedance) are below the required limit values according to BS EN 61000-3-11.)									



4. Power Quality – DC injection			
Test power level	10%	55%	100%
Recorded DC value in Amps	--	--	--
as % of rated AC current	--	--	--
Limit [%]	--	--	--
Note: The unit is equipped with a build-in transformer on the AC side of the inverter. Tests are omitted (see also EREC G99, section 9.4.6.2).			

5. Power Factor			
Voltage	0.94 pu (216.2 V)	1 pu (230 V)	1.1 pu (253 V)
Measured value	0.997	0.996	0.992
<b>Power Factor Limit</b>	>0.95	>0.95	>0.95
Note: The Power Factor results of the HPS50 can be applied to other units in the product series directly.			

6. Protection – Frequency tests						
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	47.51 Hz	20.051s	47.7 Hz 30 s	No trip occurred
U/F stage 2	47 Hz	0.5 s	47.03 Hz	0.595 s	47.2 Hz 19.5 s	No trip occurred
					46.8 Hz 0.45 s	No trip occurred
O/F	52 Hz	0.5 s	52.02 Hz	0.517 s	51.8 Hz 120.0 s	No trip occurred
					52.2 Hz 0.45 s	No trip occurred
Note: The measurement results of the HPS50 can be applied to other units in the product series directly.						



7. Protection – Voltage tests							
Function		Setting		Trip test		“No trip tests”	
		Voltage	Time delay	Voltage	Time delay	Voltage / time	Confirm no trip
U/V	L1-N	0.8 pu (184 V)	2.5 s	183.9 V	2.516 s	188 V 5.0 s	No trip occurred
	L2-N			183.7 V	2.517 s		No trip occurred
	L3-N			184.5 V	2.514 s		No trip occurred
						180 V 2.45 s	No trip occurred
O/V stage 1	L1-N	1.14 pu (262.2 V)	1.0 s	263.1 V	1.009 s	258.2 V 5.0 s	No trip occurred
	L2-N			262.8 V	1.044 s		No trip occurred
	L3-N			263.8 V	1.004 s		No trip occurred
O/V stage 2	L1-N	1.19 pu (273.7 V)	0.5 s	273.2 V	0.545 s	269.7 V 0.95 s	No trip occurred
	L2-N			273.2 V	0.542 s		No trip occurred
	L3-N			274.2 V	0.531 s		No trip occurred
						277.7 V 0.45 s	No trip occurred
Note: The measurement results of the HPS50 can be applied to other units in the product series directly.							

8. Protection – Loss of Mains test						
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 [s]	0.044	0.027	0.247	0.038	0.033	0.208
Trip time limit [s]	0.5					
Loss of Mains Protection, Vector Shift Stability test						
	Start Frequency		Change		Confirm no trip	
Positive Vector Shift	49.5 Hz		+50 degrees		No trip occurred	
Negative Vector Shift	50.5 Hz		- 50 degrees		No trip occurred	
Loss of Mains Protection, RoCoF Stability test						
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 occurred	
51.0 Hz to 49.0 Hz	-0.95 Hz/s		2.1 s		No trip occurred	
Note: The measurement results of the HPS50 can be applied to other units in the product series directly.						

9. Limited Frequency Sensitive Mode – Overfrequency test				
<b>Active Power</b> response to rising frequency/time plots are attached if frequency injection tests are undertaken in accordance with Annex A.7.2.4.				<b>N</b>
Alternatively, test results should be noted below:				
Test sequence at Registered Capacity >80%	Measured Active Power Output [W]	Frequency [Hz]	Primary Power Source [W]	Active Power Gradient Droop
Step a) 50.00Hz ± 0.01Hz	50105	50.00	25500	---
Step b) 50.45Hz ± 0.05Hz	49575	50.45		9.43% <sup>1)</sup>
Step c) 50.70Hz ± 0.10Hz	46980	50.70		9.63% <sup>2)</sup>
Step d) 51.15Hz ± 0.05Hz	42493	51.15		10.03% <sup>3)</sup>
Step e) 50.70Hz ± 0.10Hz	46958	50.70		10.08% <sup>4)</sup>
Step f) 50.45Hz ± 0.05Hz	49519	50.45		9.76% <sup>5)</sup>
Step g) 50.00Hz ± 0.01Hz	49988	50.00		---
	1 <sup>st</sup> Droop (calculated using frequency and power between steps d) & b))			9.88%
	2 <sup>nd</sup> Droop (calculated using frequency and power between steps f) & d))			9.96%
Test sequence at Registered Capacity 40% - 60%	Measured Active Power Output [W]	Frequency [Hz]	Primary Power Source [W]	Active Power Gradient Droop
Step a) 50.00Hz ± 0.01Hz	25020	50.00	13000	---
Step b) 50.45Hz ± 0.05Hz	24518	50.45		9.96% <sup>1)</sup>
Step c) 50.70Hz ± 0.10Hz	21985	50.70		9.87% <sup>2)</sup>
Step d) 51.15Hz ± 0.05Hz	17503	51.15		10.04% <sup>3)</sup>
Step e) 50.70Hz ± 0.10Hz	21991	50.70		10.03% <sup>4)</sup>
Step f) 50.45Hz ± 0.05Hz	24525	50.45		9.87% <sup>5)</sup>
Step g) 50.00Hz ± 0.01Hz	25017	50.00		---
	1 <sup>st</sup> Droop (calculated using frequency and power between steps d) & b))			9.98%
	2 <sup>nd</sup> Droop (calculated using frequency and power between steps f) & d))			9.97%
Note: 1) Droop calculated using frequency and power between steps b) & threshold frequency of 50.4 Hz 2) Droop calculated using frequency and power between steps c) & b) 3) Droop calculated using frequency and power between steps d) & c) 4) Droop calculated using frequency and power between steps e) & d)				

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5) Droop calculated using frequency and power between steps f) & e)

The determined droops of the HPS50 can be applied to other units in the product series directly.

### 10. Protection – Re-connection timer

Time delay setting	Measured delay	Checks on no reconnection when voltage or frequency is brought to just outside stage 1 limits of Table 10.1.			
60 s	64 s	At 1.16 pu (266.2 V LV connection)	At 0.78 pu (180.0 V LV connection)	At 47.4 Hz	At 52.1 Hz
Confirmation that the <b>Power Generating Module</b> does not re-connect.		No reconnection occurred	No reconnection occurred	No reconnection occurred	No reconnection occurred
Note: The measurement results of the HPS50 can be applied to other units in the product series directly.					

### 11. Fault level contribution

For **Inverter** output

Time after fault	Volts	Amps
20 ms	L1: 153.5	L1: 30.6
	L2: 144.8	L2: 33.1
	L3: 243.3	L3: 5.2
100 ms	L1: 36.2	L1: 0.07
	L2: 17.6	L2: 0.08
	L3: 16.6	L3: 0.06
250 ms	L1: 35.6	L1: 0.07
	L2: 17.6	L2: 0.08
	L3: 17.1	L3: 0.07
500 ms	L1: 35.6	L1: 0.07
	L2: 17.4	L2: 0.09
	L3: 17.6	L3: 0.07
Time to trip	0.004	In seconds

Note:

The measurement results of the HPS50 can be applied to other units in the product series directly.

### 12. Self-Monitoring solid state switching

It has been verified that in the event of the solid-state switching device failing to disconnect the **Power Park Module**, the voltage on the output side of the switching device is reduced to a value below 50 volts within 0.5 s.

N/A

### 13. Wiring functional tests

Confirm that the relevant test schedule is attached (tests to be undertaken at time of commissioning)

N/A

14. Logic interface (input port)	
Confirm that an input port is provided and can be used to shut down the module	Yes
Provide high level description of logic interface, e.g. details in 11.1.3.1 such as AC or DC signal (the additional comments box below can be used)	Yes For details see "Additional comments." Below.
<p>Note:</p> <p>The measurement results of the HPS50 can be applied to other units in the product series directly.</p> <p>The high-level description of logic interface applies to the whole product series.</p>	

15. Cyber security	
Confirm that the <b>Power Generating Module</b> has been designed to comply with cyber security requirements, as detailed in 9.1.7.	Yes.
<p>Note:</p> <p>Manufacturer's declaration provided.</p>	

Additional comments:				
<p>High level description of logic interface:</p> <p>The PGU equipped with a logic interface for ceasing active power output within 5 s following an instruction being received. The following is a possible configuration (if another configuration is required, this can be agreed with the manufacturer):</p>				
<p>EMS mode RS485 command (EMS mode is DRM mode)</p>				
Power on command	01 06 00 00 00 01 48 0A			
Power off command	01 06 00 00 00 00 89 CA			
Turn on EMS mode	01 06 00 20 00 01 49 C0			
Turn off EMS mode	01 06 00 20 00 00 88 00			
Rectify AC→DC	01 06 00 22 00 01 E8 00			
Inverter DC→AC	01 06 00 22 00 00 29 C0			
0% rater DC/AC power	01 06 00 23 00 00 78 00			
25% rater DC/AC power	01 06 00 23 00 0D B9 C5	01 06 00 23 00 19 B9 CA	01 06 00 23 00 1E F8 08	01 06 00 23 00 26 F9 DA
50% rater DC/AC power	01 06 00 23 00 19 B9 CA	01 06 00 23 00 32 F9 D5	01 06 00 23 00 3C 78 11	01 06 00 23 00 4B 38 37
75% rater DC/AC power	01 06 00 23 00 26 F9 DA	01 06 00 23 00 4B 38 37	01 06 00 23 00 5A F8 3B	01 06 00 23 00 71 B8 24
50% rated PV power	01 06 00 21 00 19 18 0A	01 06 00 21 00 32 58 15	01 06 00 21 00 3C D9 D1	01 06 00 21 00 4B 99 F7
100% rated PV power	01 06 00 21 00 32 58 15	01 06 00 21 00 64 D8 2B	01 06 00 21 00 78 D9 E2	01 06 00 21 00 96 59 AE
<p>Rs485 instruction formula description            AB CD EF GH IJ KL MN OP            AB:485 communication address            CD:Function code            EF GH:Register address            IJ KM:Value            MN OP:CRC check value of the first 6 bits</p>				
<p>The appendix only shows part of the power section instructions. Please write the required instructions according to the 485 instruction formula and control the ATESS Modbus RTU protocol.</p>				
<p>Logic for remote shutdown:</p> <p>The server sends instructions to the monitoring box, which is sent to the control board through a 485 command. The control board sends a hardware signal to shut down the device.</p>				