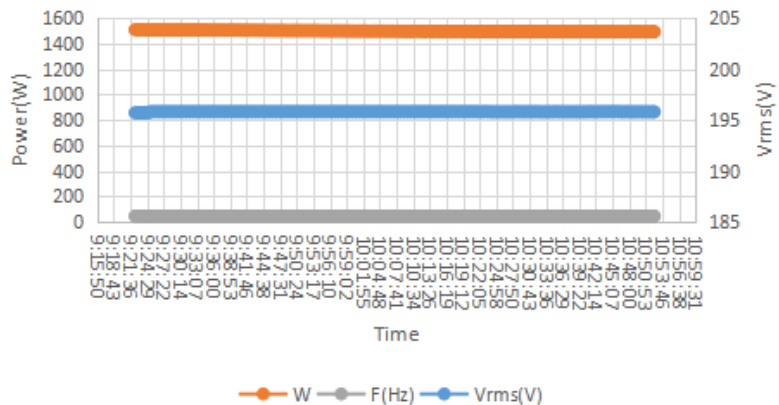


ENA EREC G99/NI

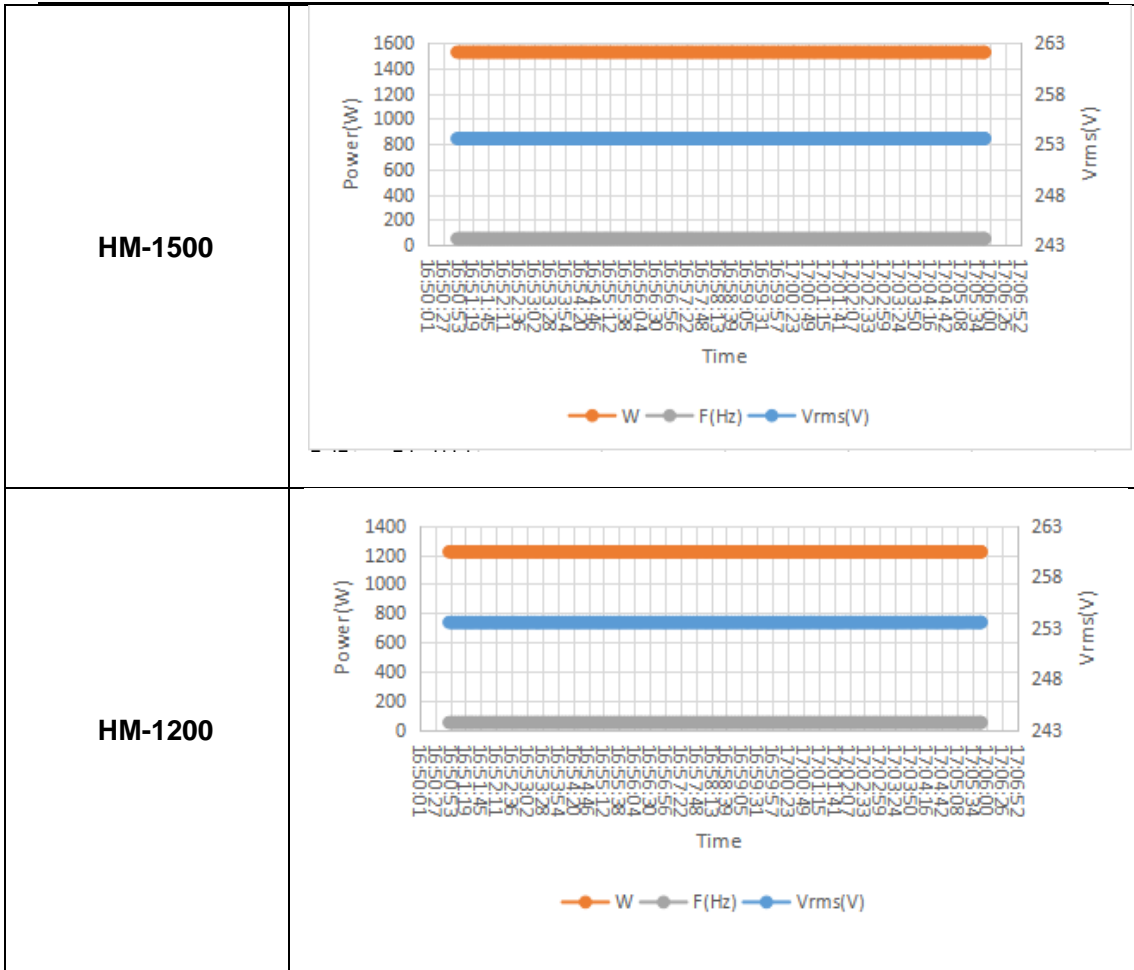
Type Test reference number		HM-1500, HM-1200	
Generating Unit technology		Photovoltaic Microinverter	
System Supplier name		Hoymiles Power Electronics Inc.	
Address		No.18 Kangjing Road, Hangzhou, Zhejiang Province, P.R. China.	
Tel	+86 571 28056101	Fax	+86 571 28056137
E:mail	zhangxingyao@hzconverter.com	Web site	www.hoymiles.com
Registered Capacity, use separate sheet if more than one connection option.	1.5/1.2 per Unit	kW single phase, single, split or three phase system	
	NA	kW three phase	
	NA	kW two phases in three phase system	
	N`A	kW two phases split phase system	
<p>Manufacturer compliance declaration. - I certify that all products supplied by the company with the above Type Tested Manufacturer's 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 G99/NI.</p>			
Signed		On behalf of	Hoymiles Power Electronics Inc.
<p>Note that testing can be done by the Manufacturer of an individual component or by an external test house.</p> <p>Where parts of the testing are carried out by persons or organisations other than the Manufacturer then that person or organisation shall keep copies of all test records and results supplied to them to verify that the testing has been carried out by people with sufficient technical competency to carry out the tests.</p>			

Operating Range

Test 1: 195.5V~47.5Hz, PF=1

HM-1500


<p>HM-1200</p>	<p>Power(W) vs Time vs Vrms(V)</p> <p>Legend: W (Power), F(Hz) (Frequency), Vrms(V) (Voltage)</p>
<p>Test 2:253V~51.5Hz,PF=1</p>	
<p>HM-1500</p>	<p>Power(W) vs Time vs Vrms(V)</p> <p>Legend: W (Power), F(Hz) (Frequency), Vrms(V) (Voltage)</p>
<p>HM-1200</p>	<p>Power(W) vs Time vs Vrms(V)</p> <p>Legend: W (Power), F(Hz) (Frequency), Vrms(V) (Voltage)</p>
<p>Test 3:253V~52Hz,PF=1</p>	



1. Power Quality - Harmonic Generation						
Generating Unit tested to BS EN 61000-3-12						
Generating Unit rating per phase (rpp)			1.5	kW	Harmonic % = Measured Value (Amps) x 23/rating per phase (kVA)	
Harmonic	At 45-55% of rated output		100% of rated output		Limit in BS EN 61000-3-12	
	Measured Value MV in Amps	%	Measured Value MV in Amps	%	1 phase	3 phase
2	0.0111	0.0284	0.0032	0.0484	8%	8%
3	0.0421	0.1076	0.0086	0.1314	21.6%	Not stated
4	0.0084	0.0214	0.0014	0.0209	4%	4%
5	0.0241	0.0617	0.0035	0.0532	10.7%	10.7%
6	0.0035	0.0090	0.001	0.0155	2.67%	2.67%
7	0.0089	0.0227	0.0025	0.0387	7.2%	7.2%

8	0.0031	0.0080	0.0009	0.0137	2%	2%
9	0.0096	0.0245	0.0017	0.0263	3.8%	Not stated
10	0.0033	0.0085	0.0008	0.0119	1.6%	1.6%
11	0.0054	0.0137	0.0015	0.0232	3.1%	3.1%
12	0.0025	0.0065	0.0004	0.0059	1.33%	1.33%
13	0.0033	0.0085	0.001	0.0145	2%	2%
THD		2.6029		2.8401	23%	13%
PWHD		4.3901		5.4591	23%	22%
system size is scalable ;this is the system size tested by 1Unit (HM-1500).						

2. Power Quality. Voltage fluctuations and Flicker								
Test to BS EN 61000-3-11								
	Starting			Stopping			Running	
	dmax [%]	dc [%]	d(t) [%]	dmax [%]	dc [%]	d(t) [%]	Pst	Plt 2 hours
Measured Values at test impedance	0.1	0	0	0.1	0	0	0.064	0.064
Normalised to standard impedance	0.1	0	0	0.1	0	0	0.064	0.064
Normalised to required maximum impedance	0.1	0	0	0.1	0	0	0.064	0.064
Limits set under BS EN 61000-3-11	4%	3.3%	3.3%	4%	3.3%	3.3%	1	0.65
Test impedance	R	0.4		Ω	XI	0.25		Ω
Standard impedance	R	0.24* 0.4^		Ω	XI	0.15* 0.25^		Ω
Maximum impedance	R	0.4		Ω	XI	0.25		Ω
Test start date		2017-06-14		Test end date		2017-06-14		
Test location	No.8 Chunxin East Road, Wuxi, Jiangsu							

3. Power quality. DC injection				
Test power level	10%	55%	100%	

Recorded value(mA)	1.146	4.974	2.869	
as % of rated AC current	0.02%	0.08%	0.045%	
Limit	0.25%	0.25%	0.25%	

4. Power Quality. Power factor				
	216.2V	230V	253V	Measured at three voltage levels and at full output. Voltage to be maintained within $\pm 1.5\%$ of the stated level during the test.
Measured value	0.9985	0.9976	0.9955	
Limit (Leading)	>0.95	>0.95	>0.95	
Limit (Lagging)	>0.98	>0.98	>0.98	

5. Protection. Frequency tests						
Function	Setting		Trip test		"No trip tests"	
	Frequency	Time delay	Frequency	Time delay	Frequency /time	Confirm no trip
U/F	48Hz	0.5s	48Hz	0.52s	48.2Hz/ 25s	Confirmed
					47.8Hz/ 0.45s	Confirmed
O/F	52Hz	1.0s	52Hz	1.03s	51.8Hz/120s	Confirmed
					52.2Hz/ 0.98s	Confirmed

6. Protection. Voltage tests						
Function	Setting		Trip test		"No trip tests"	
	Voltage	Time delay	Voltage	Time delay	Voltage /time	Confirm no trip
U/V stage 1	195.5V	3s	195.2V	3.03s	199.5V/5s	Confirmed
U/V stage 2	138V	2s	138.3V	2.06s	142V/2.5s	Confirmed
					134V/1.95s	Confirmed
O/V stage 1	253V	0.5s	252.7V	0.56s	249V/5.0s	Confirmed
					257V/0.45s	Confirmed

7. Power Park Modules - Protection – Loss of Mains test						
Note: Inverter tested according to BS EN 62116.						
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 0.5s	84.6ms	178.3ms	232.4ms	86.5ms	174.6ms	233.5ms

8. Loss of Mains Protection, Vector Shift Stability test and RoCoF Stability test				
	Start Frequency	Change	End Frequency	Confirm no trip
Positive Vector Shift	49.5Hz	+50 degrees		Confirmed
Negative Vector Shift	50.5Hz	- 50 degrees		Confirmed
	Ramp range	Test frequency ramp	Test Duration	Confirm no trip
Positive Frequency drift	49Hz to 51Hz	+0.95Hz/sec	2.1s	Confirmed
Negative Frequency drift	51Hz to 49Hz	-0.95Hz/sec	2.1s	Confirmed

9. Limited Frequency Sensitive Mode – Over frequency test				
Active Power response to rising frequency/time plots are attached if frequency injection tests are undertaken in accordance with Annex A.8.2.4				N
Test sequence at Registered Capacity >80 %	Measured Active Power Output	Frequency	Primary Power Source	Active Power Gradient
Step a) 50.00Hz ±0.01Hz	1499.25 W	50Hz		-
Step b) 50.25Hz ±0.01Hz	1484.50 W	50.25Hz		-
Step c) 50.70Hz ±0.10Hz	1351.32W	50.7Hz		-
Step d) 51.15Hz ±0.05Hz	1216.67W	51.15Hz		-
Step e) 50.70Hz ±0.10Hz	1352.21W	50.7Hz		-
Step f) 50.25Hz ±0.05Hz	1485.05W	50.25Hz		-
Step g) 50.00Hz ±0.01Hz	1498.25W	50Hz		-
Test sequence at Registered Capacity 40%~60%	Measured Active Power Output	Frequency	Primary Power Source	Active Power Gradient
Step a) 50.00Hz	766.50W	50Hz		-

±0.01Hz				
Step b) 50.25Hz ±0.05Hz	759.25W	50.25Hz		-
Step c) 50.70Hz ±0.10Hz	690.03W	50.7Hz		-
Step d) 51.15Hz ±0.05Hz	621.58 W	51.15Hz		-
Step e) 50.70Hz ±0.10Hz	689.84W	50.7Hz		-

10. Protection. Re-connection timer					
Test should prove that the reconnection sequence starts in no less than 20s for restoration of voltage and frequency to within the stage 1 settings of table 10.5.7.1					
Time delay setting	Measured delay	Checks on no reconnection when voltage or frequency is brought to just outside stage 1 limits of table 10.5.7.1.			
60s	90s	At 257V	At 191.5V	At 47.9Hz	At 52.1Hz
Confirmation that the Generating Unit does not re-connect.		Confirmed	Confirmed	Confirmed	Confirmed

11. Fault level contribution					
For machines with electro-magnetic output			For Inverter output		
Parameter	Symbol	Value	Time after fault	Volts	Amps
Peak Short Circuit current	i_p	N/A	20ms	15.4V	0.421A
Initial Value of aperiodic current	A	N/A	100ms	7.57V	0.176A
Initial symmetrical short-circuit current*	I_k	N/A	250ms	6.28V	0.126A
Decaying (aperiodic) component of short circuit current*	i_{DC}	N/A	500ms	5.93V	0.117A
Reactance/Resistance Ratio of source*	X/R	N/A	Time to trip	0.0039s	(in seconds)
For rotating machines and linear piston machines the test should produce a 0s – 2s plot of the short circuit current as seen at the Generating Unit terminals. * Values for these parameters should be provided where the short circuit duration is sufficiently long to enable interpolation of the plot					

12. Self-Monitoring solid state switching	Yes/or NA
It has been verified that in the event of the solid state switching device failing to disconnect the Generating Unit , the voltage on the output side of the switching device is reduced to a value below 50 Volts within 0.5 seconds	N/A
13. Wiring functional tests: If required by para 15.2.1	Yes/or NA
Confirm that the relevant test schedule is attached (tests to be undertaken at time of commissioning).	N/A
14. Logic interface (input port)	Yes/or NA
Confirm that an input port is provided and can be used to shut down the module.	Yes