Certificate UK-G83 issue 2

The results of the G83/2 tests are summarized in this certificate.
Power-One Italy S.p.a. declares that the units installed in UK market and set for G83/2 operations are characterized by the following features:

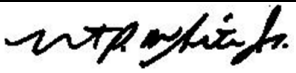
- The internal specification and parameters are set to be compliant with: Engineering Recommendation G83 issue 2, 2012.
- All units have internal parameters setting.
- These parameters cannot be changed by user, an installer or by any person other than the manufacturer (Password protected).
- All units are tested before shipping according to: Engineering Recommendation G83 issue 2, 2012.

SSEG Type reference number		PHOTO-VOLTAIC Microinverter	
SSEG Type		MICRO-0.3-I-OUTD-230 MICRO-0.25-I-OUTD-230	
System Supplier name		Power-One Italy S.p.a	
Address		Via S. Giorgio, 642 52028 Terranuova Bracciolini Arezzo - Italy	
Tel	+39-055-91951	**Fax**	+39-055-9195248
E:mail	service@power-one.com	**Web site**	www.power-one.com

Maximum rated capacity	**Connection Option**	
	0.3	kW single phase (MICRO-I-0.3-OUTD-230)
	0.25	kW single phase (MICRO-I-0.25-OUTD-230)
	NA	kW three phase
	NA	kW two phases in three phase system
	NA	kW two phases split phase system

SSEG manufacturer/supplier declaration

I certify on behalf of the company named above as a manufacturer/supplier of Small Scale Embedded Generators, that all products manufactured/supplied by the company with the above SSEG Type reference number will be manufactured and tested to ensure that they perform as stated in this Type Verification Test Report, prior to shipment to site and that no site modifications are required to ensure that the product meets all the requirements of G83/2.

Signed		**On behalf of**	Power-One, Renewable Energy Solutions

Power-One Italy Via S. Giorgio, 642 52028 Terranuova Bracciolini Arezzo – Italy Phone +39 055 9195 1 Fax +39 055 9195 248

power-one®
Changing the Shape of Power

UK-G83 issue 2 TEST RESULT DETAILS – TYPE VERIFICATION TEST SHEET

MICRO-0.3-I-OUTD-230

Power Quality. Harmonics.

SSEG rating per phase (rpp)			2.104 (7 units)	kW	NV=MV*3.68/rpp	
Harmonic	**At 45-55% of rated output**		**100% of rated output**			
	Measured Value (MV) in Amps	**Normalised Value (NV) in Amps**	**Measured Value (MV) in Amps**	**Normalised Value (NV) in Amps**	**Limit in BS EN 61000-3-2 in Amps**	**Higher limit for odd harmonics 21 and above**
2	0.028	0.049	0.061	0.107	1.080	
3	0.042	0.074	0.163	0.284	2.300	
4	0.010	0.018	0.012	0.021	0.430	
5	0.029	0.051	0.038	0.067	1.140	
6	0.008	0.014	0.006	0.010	0.300	
7	0.036	0.062	0.031	0.055	0.770	
8	0.008	0.013	0.010	0.017	0.230	
9	0.020	0.035	0.029	0.051	0.400	
10	0.006	0.011	0.004	0.007	0.184	
11	0.005	0.009	0.027	0.046	0.450	
12	0.005	0.009	0.004	0.007	0.153	
13	0.014	0.024	0.026	0.045	0.210	
14	0.005	0.008	0.005	0.009	0.131	
15	0.021	0.037	0.024	0.041	0.150	
16	0.002	0.004	0.004	0.006	0.115	
17	0.025	0.043	0.021	0.036	0.132	
18	0.002	0.004	0.006	0.010	0.102	
19	0.023	0.040	0.016	0.027	0.118	
20	0.004	0.007	0.005	0.008	0.092	
21	0.021	0.036	0.016	0.027	0.107	
22	0.003	0.005	0.004	0.007	0.084	
23	0.021	0.036	0.016	0.028	0.098	0.147
24	0.003	0.005	0.003	0.005	0.077	
25	0.018	0.032	0.022	0.038	0.090	0.135
26	0.002	0.004	0.003	0.005	0.071	
27	0.017	0.029	0.024	0.041	0.083	0.124
28	0.002	0.004	0.003	0.006	0.066	
29	0.010	0.017	0.027	0.047	0.078	0.117
30	0.002	0.004	0.002	0.004	0.061	
31	0.005	0.009	0.025	0.043	0.073	0.109
32	0.003	0.005	0.003	0.005	0.058	
33	0.004	0.007	0.024	0.041	0.068	0.102
34	0.002	0.003	0.003	0.005	0.054	
35	0.008	0.014	0.019	0.033	0.064	0.096
36	0.002	0.003	0.003	0.006	0.051	
37	0.010	0.017	0.013	0.022	0.061	0.091
38	0.003	0.004	0.003	0.006	0.048	
39	0.010	0.017	0.005	0.009	0.058	0.087
40	0.002	0.004	0.003	0.006	0.046	

Power-One Italy Via S. Giorgio, 642 52028 Terranuova Bracciolini Arezzo – Italy Phone +39 055 9195 1 Fax +39 055 9195 248

power-one®
Changing the Shape of Power

MICRO-0.25-I-OUTD-230						
Power Quality. Harmonics.						
SSEG rating per phase (rpp)			2.042(0.25)	**kW**		
Harmonic	**At 45-55% of rated output**		**100% of rated output**		**NV=MV*3.68/rpp**	
	Measured Value (MV) in Amps	**Normalised Value (NV) in Amps**	**Measured Value (MV) in Amps**	**Normalised Value (NV) in Amps**	**Limit in BS EN 61000-3-2 in Amps**	**Higher limit for odd harmonics 21 and above**
2	0.024	0.043	0.077	0.139	1.080	
3	0.041	0.074	0.130	0.233	2.300	
4	0.009	0.015	0.020	0.036	0.430	
5	0.063	0.114	0.043	0.077	1.140	
6	0.003	0.005	0.010	0.018	0.300	
7	0.036	0.065	0.032	0.057	0.770	
8	0.004	0.007	0.011	0.019	0.230	
9	0.038	0.068	0.028	0.050	0.400	
10	0.003	0.006	0.007	0.013	0.184	
11	0.033	0.060	0.025	0.046	0.450	
12	0.005	0.009	0.007	0.013	0.153	
13	0.019	0.033	0.025	0.045	0.210	
14	0.005	0.009	0.004	0.006	0.131	
15	0.012	0.021	0.022	0.040	0.150	
16	0.002	0.004	0.006	0.010	0.115	
17	0.022	0.040	0.021	0.037	0.132	
18	0.002	0.004	0.005	0.009	0.102	
19	0.024	0.043	0.018	0.032	0.118	
20	0.003	0.005	0.007	0.012	0.092	
21	0.013	0.024	0.015	0.026	0.107	
22	0.002	0.004	0.005	0.008	0.084	
23	0.008	0.015	0.014	0.025	0.098	0.147
24	0.002	0.003	0.004	0.007	0.077	
25	0.020	0.036	0.029	0.052	0.090	0.135
26	0.003	0.006	0.003	0.005	0.071	
27	0.018	0.032	0.028	0.051	0.083	0.124
28	0.004	0.006	0.005	0.009	0.066	
29	0.012	0.022	0.027	0.048	0.078	0.117
30	0.002	0.003	0.004	0.008	0.061	
31	0.011	0.019	0.026	0.047	0.073	0.109
32	0.002	0.004	0.004	0.007	0.058	
33	0.008	0.015	0.024	0.043	0.068	0.102
34	0.002	0.004	0.003	0.005	0.054	
35	0.003	0.006	0.018	0.033	0.064	0.096
36	0.002	0.003	0.004	0.008	0.051	
37	0.011	0.020	0.016	0.028	0.061	0.091
38	0.003	0.005	0.004	0.007	0.048	
39	0.015	0.026	0.005	0.009	0.058	0.087
40	0.003	0.006	0.003	0.006	0.046	

Power-One Italy Via S. Giorgio, 642 52028 Terranuova Bracciolini Arezzo – Italy Phone +39 055 9195 1 Fax +39 055 9195 248

MICRO-0.3-I-OUTD-230								
Power Quality. Voltage fluctuations and Flicker.								
	Starting			**Stopping**			**Running**	
	dmax [%]	**dc [%]**	**d(t) [%]**	**dmax [%]**	**dc [%]**	**d(t) [%]**	**Pst**	**Plt 2 hours**
Measured Values	0.39	0.28	0.32	1.81	0.28	0.32	0.235	0.188
Normalised to standard impedance and 3.68kW for multiple units	0.68	0.49	0.56	3.17	0.49	0.56	0.41	0.329
Limits set under BS EN 61000-3-3	**4%**	**3.30%**	**3.3% 500ms**	**4%**	**3.30%**	**3.3% 500ms**	**1**	**0.65**
Test start date	10\10\2012			**Test end date**	10\10\2012			
Test location	Power One Italy S.p.a. Via S.Giorgio, 642 52028 Terranuova Bracciolini Arezzo - Italy							

MICRO-0.25-I-OUTD-230								
Power Quality. Voltage fluctuations and Flicker.								
	Starting			**Stopping**			**Running**	
	dmax [%]	**dc [%]**	**d(t) [%]**	**dmax [%]**	**dc [%]**	**d(t) [%]**	**Pst**	**Plt 2 hours**
Measured Values	1.22	0.47	1.08	1.94	1.68	0.47	0.47	0.309
Normalised to standard impedance and 3.68kW for multiple units	2.19	0.84	1.93	3.48	3.01	0.84	0.847	0.556
Limits set under BS EN 61000-3-2	**4%**	**3.30%**	**3.3% 500ms**	**4%**	**3.30%**	**3.3% 500ms**	**1**	**0.65**
Test start date	25\09\2012			**Test end date**	25\09\2012			
Test location	Power One Italy S.p.a. Via S.Giorgio, 642 52028 Terranuova Bracciolini Arezzo - Italy							

Power-One Italy Via S. Giorgio, 642 52028 Terranuova Bracciolini Arezzo – Italy Phone +39 055 9195 1 Fax +39 055 9195 248

MICRO-0.3-I-OUTD-230				
Power quality. DC injection.				
Test power level	**10%**	**55%**	**100%**	
Recorded value(A)	0.01963	0.00955	0.00276	
as % of rated AC current	0.21%	0.10%	0.03%	
Limit	**0.25%**	**0.25%**	**0.25%**	

MICRO-0.25-I-OUTD-230				
Power quality. DC injection.				
Test power level	**10%**	**55%**	**100%**	
Recorded value(A)	0.01547	0.00756	0.00771	
as % of rated AC current	0.17%	0.09%	0.09%	
Limit	**0.25%**	**0.25%**	**0.25%**	

MICRO-0.3-I-OUTD-230				
Power Quality. Power factor.				
	216.2V	**230V**	**253V**	**Measured at three voltage levels and at full output. Voltage to be maintained within ±1.5% of the stated level during the test.**
Measured value	0.9979	0.9974	0.9969	
Limit	**>0.95**	**>0.95**	**>0.95**	

MICRO-0.25-I-OUTD-230				
Power Quality. Power factor.				
	216.2V	**230V**	**253V**	**Measured at three voltage levels and at full output. Voltage to be maintained within ±1.5% of the stated level during the test.**
Measured value	0.9979	0.9977	0.9969	
Limit	**>0.95**	**>0.95**	**>0.95**	

Power-One Italy Via S. Giorgio, 642 52028 Terranuova Bracciolini Arezzo – Italy Phone +39 055 9195 1 Fax +39 055 9195 248

MICRO-0.3-I-OUTD-230 and MICRO-0.25-I-OUTD-230						
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	**47.5Hz**	**20s**	47.49Hz	22s	**47.7Hz/ 25s**	No trip
U/F stage 2	**47Hz**	**0.5s**	46.98Hz	0.542s	**47.2Hz/ 19.98s**	No trip
					46.8Hz/ 0.48s	No trip
O/F stage 1	**51.5Hz**	**90s**	51.51Hz	92s	**51.3Hz/95s**	No trip
O/F stage 2	**52Hz**	**0.5s**	52.01Hz	0.558s	**51.8Hz/ 89.98s**	No trip
					52.2Hz/ 0.48s	No trip

MICRO-0.3-I-OUTD-230 and MICRO-0.25-I-OUTD-230						
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	**200.1V**	**2.5s**	199.5V	2.57s	**204.1V/3.5s**	No trip
U/V stage 2	**184V**	**0.5s**	183.1V	0.558s	**188V/2.48s**	No trip
					180V/0.48s	No trip
O/V stage 1	**262.2V**	**1.0s**	261.6V	1.07s	**258.2V/2.0s**	No trip
O/V stage 2	**273.7V**	**0.5s**	273.1V	0.558s	**269.7V/0.98s**	No trip
					277.7V/0.48s	No trip

Power-One Italy Via S. Giorgio, 642 52028 Terranuova Bracciolini Arezzo – Italy Phone +39 055 9195 1 Fax +39 055 9195 248

MICRO-0.3-I-OUTD-230						
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	495ms	265ms	245ms	301ms	341ms	165ms

MICRO-0.25-I-OUTD-230						
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	323ms	331ms	315ms	303ms	267ms	293ms

MICRO-0.3-I-OUTD-230 and MICRO-0.25-I-OUTD-230				
Protection. Frequency change, Stability test				
	Start Frequency	**Change**	**End Frequency**	**Confirm no trip**
Positive Vector Shift	**49.5Hz**	**+9 degrees**		No trip
Negative Vector Shift	**50.5Hz**	**- 9 degrees**		No trip
Positive Frequency drift	**49.5Hz**	**+0.19Hz/sec**	**51.5Hz**	No trip
Negative Frequency drift	**50.5Hz**	**-0.19Hz/sec**	**47.5Hz**	No trip

Fault level contribution.					
MICRO-0.3-I-OUTD-230			**MICRO-0.25-I-OUTD-230**		
For a Inverter SSEG			**For a Inverter SSEG**		
Time after fault	**Volts**	**Amps**	**Time after fault**	**Volts**	**Amps**
20ms	-31.797	0.58	**20ms**	33.98	0.52
100ms	-31.836	0.36	**100ms**	34.06	0.32
250ms	33.828	0.23	**250ms**	-31.68	0.24
500ms	-31.367	0.17	**500ms**	33.68	0.24
Time to trip	0.0874	(in seconds)	**Time to trip**	0.238	(in seconds)

Power-One Italy Via S. Giorgio, 642 52028 Terranuova Bracciolini Arezzo – Italy Phone +39 055 9195 1 Fax +39 055 9195 248

MICRO-0.3-I-OUTD-230 and MICRO-0.25-I-OUTD-230					
Protection. Re-connection timer.					
Test proves that the reconnection sequence starts after a minimum delay of 20 seconds for restoration of voltage and frequency to within the stage 1 settings of table 1 of the subject normative.					
Time delay setting	**Measured delay**	**No reconnection when voltage or frequency is brought to just outside stage 1 limits of table 1.**			
20s	43.2s	**At 266.2V**	**At 196.1V**	**At 47.4Hz**	**At 51.6Hz**
Confirmation that the SSEG does not re-connect.		No reconnection	No reconnection	No reconnection	No reconnection

MICRO-0.3-I-OUTD-230 and MICRO-0.25-I-OUTD-230
Self-Monitoring solid state switching.
It has been verified that in the event of the solid state switching device failing to disconnect the SSEG, the voltage on the output side of the switching device is reduced to a value below 50 volts within 0.5 seconds.

– End of Document –

Power-One Italy Via S. Giorgio, 642 52028 Terranuova Bracciolini Arezzo – Italy Phone +39 055 9195 1 Fax +39 055 9195 248