ref. REACT-UNO-4.6(3.6)-TL (UK G83/2 Type Verification Test Report)

ENA Engineering Recommendation G83/2
Appendix 4
Type Verification Test Report

Type Approval and manufacturer/supplier declaration of compliance with the requirements of Engineering Recommendation G83/2			
SSEG (Small-Scale Embedded Generator) Type reference number	REACT-UNO-4.6-TL (1) REACT-UNO-3.6-TL (1) (1): to be used in combination with Battery Unit model REACT-BATT-AP1		
SSEG Type	SOLAR GRID TIED INVERTER		
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	servicer.solarinverters@it.abb.com	Web site	www.abb.com/solarinverters www.abb.com

Nominal / Maximum rated capacity	Connection Option	
	4600 / 4600 W	W single phase (for REACT-UNO-4.6-TL)
	3600 / 3600 W	W single phase (for REACT-UNO-3.6-TL)

We, Power-One Italy S.p.A., as manufacturer/supplier of Small Scale Embedded Generators, certifies 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 products meet all the requirements of G83/2.

Attachment:
Extract of Test Report Ref. **28108834 001**, Determination of Electrical Properties,
released by TUeV Rheinland

Terranuova B.ni, 2016 February 12

Marcello Berlingozzi
(Leadperson Quality Control)

Cristiano Ensoli
(Manager Quality)

Extract of Test report: **28108834 001**
"Determination of electrical properties"

Appendix 4 Type Verification Test Report (G83/2)

Type of System:	Grid tied inverter
System Manufacturer: **Manufacturer data:**	**Power-One Italy S.p.A.** Via S. Giorgio 642, 52028 Terranuova Bracciolini (AR) - Italy
Reference test report:	**28108834 001** Issued by TÜV Rheinland Italia S.r.l. on 3rd February 2016
Measuring period:	From 20th April, 2015 to 30th June, 2015
Pacr: *(Rated AC Power)* **Pacmax:** *(Maximum AC output Power)*	

	REACT-UNO-4.6-TL	**REACT-UNO-3.6-TL**
Pacr	4600W	3600W
Pacmax	4600W	3600W

Software version	Bundle Firmware Update Version*: **not less than 1518C** with standard selection**: UK G83**
Rated Voltage:	Single-phase device 230 V (Phase/ Neutral)

Remarks:

Test performed on model REACT-UNO-3.6-TL and REACT-UNO-4.6-TL.

Tested model indicated in **bold** characters

Note *:

"Update version" identifies the Bundle Firmware Features by a sequential code: xxxxy where:

- xxxx is a number indicates Year (two digits) and Week (two digits)
- y is a letter from A to G indicates Day (form Sunday = A to Saturday=G)

Power Quality. Harmonics. The requirement is specified in section 5.4.1. test procedure in Annex A or B 1.4.1						
MODELs: **REACT-UNO-3.6-TL**; REACT-UNO-4.6-TL						
Harmonic	**At 45-55% of rated output**		**100% of rated output**		**Mono Phase**	
	Measured Value	**Normalised Value**	**Measured Value**	**Normalised Value**	**Limit in BS EN 61000-3-2**	**Higher limit for odd harmonics**
2	0.01	0.05	0.011	0.055	1.080	
3	0.032	0.16	0.049	0.245	2.300	
4	0.004	0.02	0.003	0.015	0.430	
5	0.012	0.06	0.004	0.02	1.140	
6	0.003	0.015	0.003	0.015	0.300	
7	0.01	0.05	0.006	0.03	0.770	
8	0.003	0.015	0.001	0.005	0.230	
9	0.015	0.075	0.012	0.06	0.400	
10	0.002	0.01	0.001	0.005	0.184	
11	0.009	0.045	0.005	0.025	0.330	
12	0.002	0.01	0.002	0.01	0.153	
13	0.007	0.035	0.005	0.025	0.210	
14	0.002	0.01	0.001	0.005	0.131	
15	0.006	0.03	0.004	0.02	0.150	
16	0.002	0.01	0.001	0.005	0.115	
17	0.004	0.02	0.004	0.02	0.132	
18	0.001	0.005	0.002	0.01	0.102	
19	0.004	0.02	0.004	0.02	0.118	
20	0.002	0.01	0.001	0.005	0.092	
21	0.003	0.015	0.003	0.015	0.107	
22	0.001	0.005	0.001	0.005	0.084	
23	0.004	0.02	0.004	0.02	0.098	0.147
24	0.002	0.01	0.001	0.005	0.077	
25	0.002	0.01	0.002	0.01	0.090	0.135
26	0.001	0.005	0.001	0.005	0.071	
27	0.003	0.015	0.002	0.01	0.083	0.124
28	0.001	0.005	0.001	0.005	0.066	
29	0.002	0.01	0.001	0.005	0.078	0.117
30	0.001	0.005	0.001	0.005	0.061	
31	0.002	0.01	0.002	0.01	0.073	0.109
32	0.001	0.005	0.001	0.005	0.058	
33	0.002	0.01	0.001	0.005	0.068	0.102
34	0.001	0.005	0.001	0.005	0.054	
35	0.002	0.01	0.002	0.01	0.064	0.096
36	0.001	0.005	0	0	0.051	
37	0.002	0.01	0.001	0.005	0.061	0.091
38	0.001	0.005	0.001	0.005	0.048	
39	0.002	0.01	0.002	0.01	0.058	0.087
40	0.001	0.005	0.001	0.005	0.046	

Flicker			
Parameter	Measured Value	Limit	Verdict
P_{st}	0.028	1.00	P
P_{lt}	0.028	0.65	P
d_c [%]	0.013	3.30	P
d_{max} [%]	0.057	4.00	P
dt [s]	0.000	0.50	P

Standard used:	EN/IEC 61000-3-3 Flicker
Short time (Pst):	10 min
Observation time:	120 min (12 Flicker measurements)
Flickermeter:	230V / 50Hz according IEC 61000-4-15 Ed.2
Flicker Impedance:	Zref (IEC 60725)

Power quality. DC injection. The requirement is specified in section 5.5, test procedure in Annex A or B 1.4.4 (of reference document G83/2)			
MODELs: **REACT-UNO-3.6-TL**; REACT-UNO-4.6-TL			
Test power level	10%	55%	100%
Recorded value(A)	0.004	0.003	0.005
as % of rated AC current	0.021%	0.015%	0.026%
Limit	0.25%	0.25%	0.25%

Power quality. Power Factor.				
MODELs: REACT-UNO-3.6-TL				
	250V	340V	480V	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	0.9999	0.9999	0.9999	
Limit	>0.95	>0.95	>0.95	

Protection. Frequency tests The requirement is specified in section 5.3.1, test procedure in Annex A or B 1.3.3 (of reference document G83/2)						
MODELs: **REACT-UNO-3.6-TL**; REACT-UNO-4.6-TL						
Function	Setting		Trip test		"No trip tests"	
	Frequency	Time delay	Frequency	Time delay	Frequency /time	Confirm no trip
U/F stage 1	47.5Hz	20.05s	47.45	20.03	47.7Hz/ 25s	No Trip
U/F stage 2	47Hz	0.55s	47.95	0.53	47.2Hz/ 19.98s	No Trip
O/F stage 1	51.5Hz	90.05s	51.55	90.01	51.3Hz/95s	No Trip
O/F stage 2	52Hz	0.55s	52.05	0.53	51.8Hz/ 89.98s	No Trip
					52.2Hz/ 0.48s	No Trip

Protection. Voltage tests The requirement is specified in section 5.3.1, test procedure in Annex A or B 1.3.2 (of reference document G83/2)						
MODELs: **REACT-UNO-3.6-TL**; REACT-UNO-4.6-TL						
Function	Setting		Trip test		"No trip tests"	
	Voltage	Time delay	Voltage	Time delay	Voltage/Time	Confirm no trip
U/V stage 1	200.1V	2.55s	199.4	2.52	204.1V/3.5s	No Trip
U/V stage 2	184V	0.55s	183.3	0.54	188V/2.48s	No Trip
O/V stage 1	262.2V	1.0s	262.2	1.03	258.2V/2.0s	No Trip
O/V stage 2	273.7V	0.5s	274.5	0.53	269.7V/0.98s	No Trip
					277.7V/ 0.48s	No Trip

Protection. Loss of Mains test. The requirement is specified in section 5.3.2. test procedure in Annex A or B 1.3.4

MODELs: **REACT-UNO-4.6-TL** REACT-UNO-3.6-TL

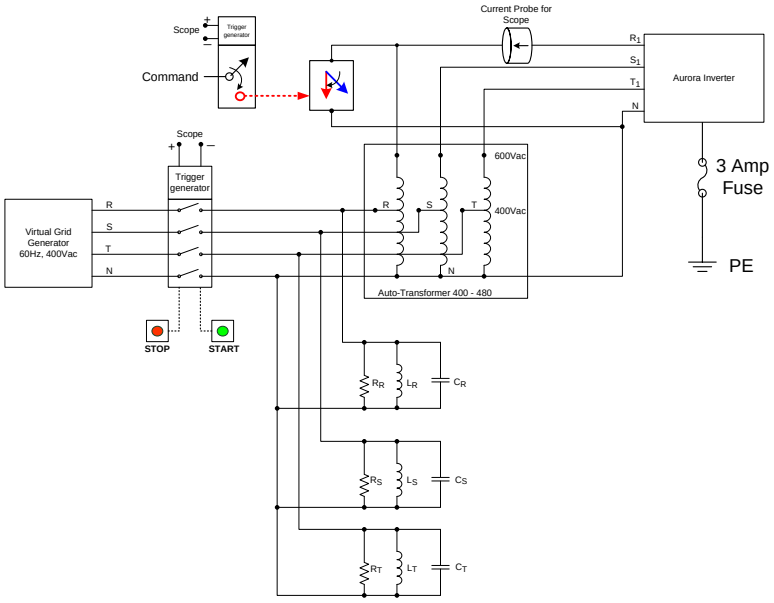
No.	P_{EUT} (% of EUT rating)	Reactive load (% of Q_L in 6.1.d)	P_{AC} (% of nominal)	Q_{AC} (% of nominal)	Run on time (ms)	P_{EUT} (W)	V_{DC} (V)	Remarks	Verdict
1	100	100	0	0	941.4	3000	440	Test A at BL	P
2	66	66	0	0	857.6	1980	334	Test B at BL	P
3	33	33	0	0	888.8	660	225	Test C at BL	P
4	100	100	-5	-5	681.3	3000	440	Test A at IB	P
5	100	100	-5	0	908.2	3000	440	Test A at IB	P
6	100	100	-5	+5	660.3	3000	440	Test A at IB	P
7	100	100	0	-5	680.7	3000	440	Test A at IB	P
8	100	100	0	+5	662.0	3000	440	Test A at IB	P
9	100	100	+5	-5	679.5	3000	440	Test A at IB	P
10	100	100	+5	0	920.0	3000	440	Test A at IB	P
11	100	100	+5	+5	660.3	3000	440	Test A at IB	P
12	66	66	0	-5	676.8	1980	334	Test B at IB	P
13	66	66	0	-4	698.8	1980	334	Test B at IB	P
14	66	66	0	-3	704.0	1980	334	Test B at IB	P
15	66	66	0	-2	701.2	1980	334	Test B at IB	P
16	66	66	0	-1	721.0	1980	334	Test B at IB	P
17	66	66	0	1	729.8	1980	334	Test B at IB	P
18	66	66	0	2	675.9	1980	334	Test B at IB	P
19	66	66	0	3	699.9	1980	334	Test B at IB	P
20	66	66	0	4	667.1	1980	334	Test B at IB	P
21	66	66	0	5	674.2	1980	334	Test B at IB	P
22	33	33	0	-5	700.4	660	225	Test C at IB	P
23	33	33	0	-4	803.2	660	225	Test C at IB	P
24	33	33	0	-3	772.6	660	225	Test C at IB	P
25	33	33	0	-2	749.8	660	225	Test C at IB	P
26	33	33	0	-1	760.3	660	225	Test C at IB	P
27	33	33	0	1	772.0	660	225	Test C at IB	P
28	33	33	0	2	750.0	660	225	Test C at IB	P
29	33	33	0	3	730.0	660	225	Test C at IB	P
30	33	33	0	4	724.0	660	225	Test C at IB	P
31	33	33	0	5	704.0	660	225	Test C at IB	P
32	100	100	-10	-10	656.5	3000	440	Test A at IB	P
33	100	100	-10	-5	681.4	3000	440	Test A at IB	P
34	100	100	-10	0	891.4	3000	440	Test A at IB	P
35	100	100	-10	+5	675.0	3000	440	Test A at IB	P
36	100	100	-10	+10	636.8	3000	440	Test A at IB	P
37	100	100	-5	+10	635.5	3000	440	Test A at IB	P
38	100	100	0	+10	626.4	3000	440	Test A at IB	P
39	100	100	+5	+10	632.0	3000	440	Test A at IB	P
40	100	100	-5	-10	659.7	3000	440	Test A at IB	P
41	100	100	0	-10	668.7	3000	440	Test A at IB	P
42	100	100	+5	-10	657.4	3000	440	Test A at IB	P
43	100	100	+10	-10	656.2	3000	440	Test A at IB	P
44	100	100	+10	-5	683.4	3000	440	Test A at IB	P
45	100	100	+10	0	877.2	3000	440	Test A at IB	P
46	100	100	+10	+5	660.4	3000	440	Test A at IB	P
47	100	100	+10	+10	642.2	3000	440	Test A at IB	P

Protection. Frequency change, Stability test The requirement is specified in section 5.3.3, test procedure in Annex A or B 1.3.6 (of reference document G83/2)				
MODELs: **REACT-UNO-3.6-TL**; REACT-UNO-4.6-TL				
	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

Protection. Re-connection timer. The requirement is specified in section 5.3.4, test procedure in Annex A or B 1.3.5 (of reference document G83/2)					
MODELs: **REACT-UNO-3.6-TL**; REACT-UNO-4.6-TL					
Time delay setting	Measured delay	Checks on no reconnection when voltage or frequency is brought to just outside stage 1 limits of table 1.			
20s	22.81s	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

Fault level contribution. The requirement is specified in section 5.7, test procedure in Annex A or B 1.4.6 (of reference document G83/2)		
MODELs: **REACT-UNO-4.6-TL** REACT-UNO-3.6-TL		
For a Inverter SSEG		
Time after fault	Volts	Amps
20ms	38.4237	25.3920
100ms	20.3545	24.3881
250ms	13.4233	18.1949
500ms	9.8010	12.8778
Time to trip	1s	

Scheme of Short Circuit Test applied from Phase to Neutral



This extract from the test report is only valid in conjunction with the test report no.: **28108834 001**

Reviewed by:

03.02.2016	Marco Piva / BFM	
Datum *Date*	**Name/Stellung** *Name/Position*	**Unterschrift** *Signature*