Manufacture Declaration for EN50438:2013

Micro-generator Type reference		X1-1.1-S-D X1-1.1-S-N	X1-1.5-S-D X1-1.5-S-N	X1-2.0-S-D X1-2.0-S-N
Maximum continuous rating		1100VA	1500VA	2000VA
Manufacturer		Solax power Co., Ltd		
Address		Room 220, West Buliding A, National University Science and Technology Park of Zhejiang University 525, Xixi Rd, Hangzhou, Zhejiang Province, China, 310007		
Tel		+86(0571)-56260011		
Fax		+86(0571)-56075753		
Email		info@soalxpower.com		
Web site		www.solaxpower.com		
Reference standard No.		BS EN 50438:2013		
Signed	Guo Huawei	On behalf of	Solax power Co., Ltd	

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 EN50438:2013

Under/over frequency

	Under frequency		Over frequency	
Parameter	Frequency	Time	Frequency	Time
Protection limit (EN 50438 Annex A)	48Hz	0.5s	50.5Hz	0.5s
Actual Setting	48Hz	0.5s	50.5Hz	0.5s
Trip value (test result)	48.01 Hz	0.11s	50.51 Hz	0.271s

Under /Over voltage

	Under Voltage		Over Voltage	
Parameter	Voltage	Time	Voltage	Time
Protection limit (EN 50438 Annex A)	230V-10%	0.5s	230V+10%	0.5s
Actual Setting	207.0V	0.5s	253.0V	0.5s
Trip value(test result)	207.2V	0.289s	252.7V	0.284s

Loss of Mains test

Method used	inverters can be tested according to BS EN 62116		
Output power level (a	Min.	Medium	Max.
Trip setting clearance time	0.5s	0.5s	0.5s
Trip value clearance time	0.376s	0.298s	0.151s
(a Indicative values are shown for minimum, medium and maximum power levels			

Operating Range

Test sequence	Voltage	Frequency	Output power	Primary power source
Test 1	195.5V	47.5Hz	2000W	DC source
Test 2	253V	51.5Hz	2000W	DC source

Active power at under-frequency

Test sequence	Output Power	Frequency	Primary power source
Test a)	2000W	50.00Hz	DC source
Test b)	2000W	49.55Hz	DC source
Test c)	2000W	47.55Hz	DC source

Power response to over-frequency

Test sequence at power level >80%	Output Power(W)	Frequency(Hz)	Primary Power source	Power gradient
Step a)	2015	49.999	DC source	100%Pm/Hz
Step b)	1917.1	50.249	DC source	100%Pm/Hz
Step c)	1010.4	50.699	DC source	100%Pm/Hz
Step d)	103.5	51.149	DC source	100%Pm/Hz
Step e)	1008.7	50.699	DC source	100%Pm/Hz
Step f)	1915.8	50.249	DC source	100%Pm/Hz
Step g)	2013	49.999	DC source	100%Pm/Hz

Test sequence at power level 40%-60%	Output Power(W)	Frequency(Hz)	Primary Power source	Power gradient
Step a)	1012	49.999	DC source	100%Pm/Hz
Step b)	962.8	50.249	DC source	100%Pm/Hz
Step c)	506.7	50.699	DC source	100%Pm/Hz
Step d)	52.3	51.149	DC source	100%Pm/Hz
Step e)	507.4	50.699	DC source	100%Pm/Hz
Step f)	961.9	50.249	DC source	100%Pm/Hz
Step g)	1009	49.999	DC source	100%Pm/Hz

Uncontrollable reactive power

	Power factor		
Limit	+ 0,95 - 0,95 at three voltage levels and four power levels		
	210V	230V	250V
20% of nominal active power	0.996	0.996	0.996
50% of nominal active power	0.996	0.997	0.996
75% of nominal active power	0.997	0.998	0.997
100% of nominal active power	0.997	0.998	0.998

Controllable reactive power

Test sequence start of generation	Output power[W]	Set reactive power[Var]	Measured reactive power[Var]	Tolerance[Var]
10%	176	-50%Pn	-1038	-69.4
20%	383	-50%Pn	-1037	-68.4
30%	590	-50%Pn	-1036	-67.4
40%	795	-50%Pn	-1033	-64.4
50%	998	-50%Pn	-1032	-63.4
60%	1203	-50%Pn	-1032	-63.4
70%	1405	-50%Pn	-1031	-62.4
80%	1606	-50%Pn	-1031	-62.4
90%	1803	-50%Pn	-1037	-68.4
100%	1934	-50%Pn	-1057	-88.4

Test sequence start of generation	Output power[W]	Set reactive power[Var]	Measured reactive power[Var]	Tolerance[Var]
10%	179	50%Pn	1038	69.4
20%	387	50%Pn	1039	70.4
30%	593	50%Pn	1042	73.4
40%	799	50%Pn	1045	76.4
50%	1003	50%Pn	1046	77.4
60%	1204	50%Pn	1048	79.4
70%	1407	50%Pn	1051	82.4
80%	1606	50%Pn	1053	84.4
90%	1810	50%Pn	1055	86.4
100%	2009	50%Pn	1059	90.4

Test sequence start of generation	Output power[W]	Set reactive power[Var]	Measured reactive power[Var]	Tolerance[Var]
10%	193	0	0.77	0.77
20%	399	0	2.64	2.64
30%	604	0	4.79	4.79
40%	809	0	6.57	6.57
50%	1013	0	8.39	8.39
60%	1215	0	10.28	10.28
70%	1471	0	12	12
80%	1618	0	13.90	13.90
90%	1817	0	15.69	15.69
100%	2016	0	16.78	16.78

Connection and starting to generate electrical power

Test sequence start of generation	connection	connection allowed	Primary power source	Power gradient after connection
Step a)	47.95Hz	No	DC source	
Step b)	48.05Hz	Yes	DC source	10%Pn/min
Step c)	50.55 Hz	No	DC source	
Step d)	50.45 Hz	Yes	DC source	10%Pn/min
Step e)	205V	No	DC source	
Step f)	208V	Yes	DC source	10%Pn/min
Step g)	256V	No	DC source	
Step h)	253V	Yes	DC source	10%Pn/min

Connection after trip of interface protection

Test sequence start of generation	connection	connection allowed	Primary power source	Power gradient after connection
Step a)	47.95Hz	No	DC source	
Step b)	48.05Hz	Yes	DC source	10%Pn/min
Step c)	50.55 Hz	No	DC source	
Step d)	50.45 Hz	Yes	DC source	10%Pn/min
Step e)	205V	No	DC source	
Step f)	208V	Yes	DC source	10%Pn/min
Step g)	256V	No	DC source	
Step h)	253V	Yes	DC source	10%Pn/min

Short-circuit current parameters

Parameter	Symbol	Value	Time after fault	Volts	Amps
Peak Short Circuit current	i_p	NA	20ms	159 V	3.02 A
Initial Value of aperiodic current	A	NA	100ms	NA	NA
Initial symmetrical short-circuit current*	I_k	NA	250ms	NA	NA
Decaying (aperiodic) component of short circuit current*	i_{DC}	NA	500ms	NA	NA
Reactance/Resistance Ratio of source*	$^X/_R$	NA	Time to trip	8.7 ms	In seconds

Harmonic current emission

	Maximum permissible harmonic current as per EN 61000-3-2, Class A										
	Odd							Even harmonics			
Harmonic order n	3	5	7	9	11	13	15 ≤ n ≤ 39	2	4	6	8 ≤ n ≤ 40
Limit	2,30	1,14	0,77	0,40	0,33	0,21	0,15 (15/n)	1,08	0,43	0,30	0,23 (8/n)
Test value	0.078	0.048	0.019	0.012	0.008	0.009	0.011	0.066	0.009	0.003	0.004

Voltage fluctuations and flicker

	Maximum permissible flicker and voltage fluctuation as per EN 61000-3-3				
Value	P_{st}	P_{lt}	d(t) – 500ms	d_c	d_{max} x
Limit	1,0	0,65	3,3%	3,3%	4%
Test value	0.08	0.08	0	0.43	0.48

Additional comments