



Certificate G83/1

Engineering Recommendation

Manufacturer: Hangzhou Zhejiang University Sunny Energy Science and Technology Co., Ltd
Address: West Area, A building, National University Science and Technology Park of Zhejiang University
Contact: TEL: +86-0571-89719569; Fax: +86-0571-87985981;
Email: sales@solar-sunny.com; WEB: http://www.solar-sunny.com
Postal code: 310013
Country: P.R.China
Test house details: Hangzhou Zhejiang University Sunny Energy Science and Technology Co., Ltd

Type reference:

Type reference	Max AC power	Max AC Current
ZDNY-TL10000-GB	10000W	3x16A

The results of the G83/1 tests are summarized in this certificate. Suntellite declares that all devices (with G83/1 setting) that are shipped to the UK comply with the requirements defined in engineering recommendation G83/1. These settings cannot be changed by an installer, user or by any other person without the use of a tool (password protected).

Test details

- Power quality
- Harmonic current emissions as per BS EN 61000-3-2, Class A
- Voltage fluctuations and flicker as per BS EN 61000-3-3
- Power factor/ DC injection
- Under / Over voltage switch off (based on requirement for LV connected)
- Under / Over frequency switch off
- Loss of mains test
- Reconnection time

**Hangzhou Zhejiang University Sunny Energy
Science and Technology Co., Ltd**

Hangzhou, 13.09.2012

Song Yuanbing
Research and Development Department Manager

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 Type reference number		Photovoltaic Grid-tied inverter	
SSEG Type		ZDNY-TL10000	
System Supplier name		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)-87979860	Fax	+86(0571)-89988190
E:mail	info@soalxpower.com	Web site	www.solaxpower.com
Maximum rated capacity, use separate sheet if more than one connection option.	Connection Option		
	10	kW three phase system	
	NA	kW single phase system	
	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	<i>Guo Huawei</i>	On behalf of	Solax power Co., Ltd
<p>Note that testing can be done by the manufacturer of an individual component, by an external test house, or by the supplier of the complete system, or any combination of them as appropriate.</p> <p>Where parts of the testing are carried out by persons or organisations other than the supplier then the supplier 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>			

Power Quality. Harmonics. The requirement is specified in section 5.4.1, test procedure in Annex A or B 1.4.1						
SSEG rating per phase (rpp)			3.3	kW	NV=MV*3.68/rpp	
Harmonic	At 50% of rated output		100% of rated output		Limit in BS EN 61000-3-2 in Amps	Higher limit for odd harmonics 21 and above
	Measured Value (MV) in Amps	Normalised Value (NV) in Amps	Measured Value (MV) in Amps	Normalised Value (NV) in Amps		
2	0.0235	0.0259	0.0416	0.0459	1.080	
3	0.0169	0.0187	0.0312	0.0344	2.300	
4	0.0175	0.0193	0.0311	0.0343	0.430	
5	0.2267	0.2503	0.2457	0.2713	1.140	
6	0.0043	0.0047	0.0278	0.0307	0.300	
7	0.1529	0.1688	0.1637	0.1807	0.770	
8	0.0059	0.0065	0.0297	0.0328	0.230	
9	0.0130	0.0144	0.0279	0.0308	0.400	
10	0.0124	0.0137	0.0286	0.0316	0.184	
11	0.0975	0.1076	0.1084	0.1197	0.330	
12	0.0375	0.0414	0.0285	0.0315	0.153	
13	0.0923	0.1019	0.0789	0.0871	0.210	
14	0.0217	0.0240	0.0293	0.0323	0.131	
15	0.0264	0.0291	0.0407	0.0449	0.150	
16	0.0036	0.0040	0.0279	0.0308	0.115	
17	0.0354	0.0391	0.0639	0.0705	0.132	
18	0.0032	0.0035	0.0279	0.0308	0.102	
19	0.0347	0.0383	0.0491	0.0542	0.118	
20	0.0062	0.0068	0.0276	0.0305	0.092	
21	0.0304	0.0336	0.0421	0.0465	0.107	

22	0.0037	0.0041	0.0255	0.0282	0.084	
23	0.0202	0.0223	0.0333	0.0368	0.098	
24	0.0028	0.0031	0.0118	0.0130	0.077	
25	0.0224	0.0247	0.0240	0.0265	0.090	
26	0.0034	0.0038	0.0045	0.0050	0.071	
27	0.0039	0.0043	0.0054	0.0060	0.083	
28	0.0023	0.0025	0.0044	0.0049	0.066	
29	0.0142	0.0157	0.0157	0.0173	0.078	
30	0.0023	0.0025	0.0045	0.0050	0.061	
31	0.0166	0.0183	0.0145	0.0160	0.073	
32	0.0022	0.0024	0.0068	0.0075	0.058	
33	0.0031	0.0034	0.0267	0.0295	0.068	
34	0.0025	0.0028	0.0365	0.0403	0.054	
35	0.0127	0.0140	0.0369	0.0407	0.064	
36	0.0024	0.0026	0.0358	0.0395	0.051	
37	0.0127	0.0140	0.0344	0.0380	0.061	
38	0.0023	0.0025	0.0335	0.0370	0.048	
39	0.0030	0.0033	0.0354	0.0391	0.058	
40	0.0025	0.0028	0.0330	0.0364	0.046	

Note the higher limits for odd harmonics 21 and above are only allowable under certain conditions, if these higher limits are utilised please state the exemption used as detailed in part 6.2.3.4 of BS EN 61000-3-2 in the box below.

Power Quality. Voltage fluctuations and Flicker. The requirement is specified in section 5.4.2, test procedure in Annex A or B 1.4.3								
	Starting			Stopping			Running	
	d _{max}	d _c	d _(t)	d _{max}	d _c	d _(t)	P _{st}	P _{lt} 2 hours
Measured Values	2.00	1.86	0	1.98	1.83	0	0.11	0.08
Normalised to standard impedance and 3.68kW for multiple units	NA	NA	NA	NA	NA	NA	NA	NA
Limits set under BS EN 61000-3-3	4%	3.3%	3.3% 500ms	4%	3.3%	3.3% 500ms	1.0	0.65
Test start date		2014-10-31			Test end date		2014-10-31	
Test location		Room 220, West Buliding A, National University Science and Technology Park of Zhejiang University 525, Xixi Rd, Hangzhou, Zhejiang Province, China, 310007						

Power quality. DC injection. The requirement is specified in section 5.5, test procedure in Annex A or B 1.4.4						
Test power level	10%		55%		100%	
Recorded value	3.1 mA		4.4 mA		6.2 mA	
as % of rated AC current	0.02%		0.03%		0.04%	
Limit	0.25%		0.25%		0.25%	

Power Quality. Power factor. The requirement is specified in section 5.6, test procedure in Annex A or B 1.4.2				
	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	0.999	0.999	0.998	
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						
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	47.5Hz	20.067s	47.7Hz 25s	No trip
U/F stage 2	47Hz	0.5s	47Hz	0.554s	47.2Hz 19.98s	No trip
					46.8Hz 0.48s	No trip
O/F stage 1	51.5Hz	90s	51.5Hz	90.065s	51.3Hz 95s	No trip
O/F stage 2	52Hz	0.5s	52Hz	0.540s	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						
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	199V	2.544s	204.1V 3.5s	No trip
U/V stage 2	184V	0.5s	184V	0.535s	188V 2.48s	No trip
					180V 0.48s	No trip
O/V stage 1	262.2V	1.0s	262.2V	1.056s	258.2V 2.0s	No trip
O/V stage 2	273.7V	0.5s	273.7V	0.526s	269.7V 0.98s	No trip
					277.7V 0.48s	No trip

Note for Voltage tests the Voltage required to trip is the setting $\pm 3.45V$. The time delay can be measured at a larger deviation than the minimum required to operate the protection. The No trip tests need to be carried out at the setting $\pm 4V$ and for the relevant times as shown in the table above to ensure that the protection will not trip in error.

Protection. Loss of Mains test. The requirement is specified in section 5.3.2, test procedure in Annex A or B 1.3.4						
To be carried out at three output power levels with a tolerance of plus or minus 5% in Test Power levels.						
For Multi phase SSEGs confirm that the device shuts down correctly after the removal of a single fuse as well as operation of all phases.						
Test Power	10%	55%	100%	10%	55%	100%
Balancing load on islanded network	95% of SSEG output	95% of SSEG output	95% of SSEG output	105% of SSEG output	105% of SSEG output	105% of SSEG output
Trip time. Ph1 fuse removed	0.262s	0.415s	0.345s	0.256s	0.424s	0.370s
Test Power	10%	55%	100%	10%	55%	100%
Balancing load on islanded network	95% of SSEG output	95% of SSEG output	95% of SSEG output	105% of SSEG output	105% of SSEG output	105% of SSEG output
Trip time. Ph2 fuse removed	0.268s	0.397s	0.351s	0.264s	0.429s	0.375s
Test Power	10%	55%	100%	10%	55%	100%
Balancing load on islanded network	95% of SSEG output	95% of SSEG output	95% of SSEG output	105% of SSEG output	105% of SSEG output	105% of SSEG output
Trip time. Ph3 fuse removed	0.273s	0.423s	0.356s	0.253s	0.434s	0.378s
Note for technologies which have a substantial shut down time this can be added to the 0.5 seconds in establishing that the trip occurred in less than 0.5s. Maximum shut down time could therefore be up to 1.0 seconds for these technologies.						
Indicate additional shut down time included in above results.					ms	

Protection. Frequency change, Stability test The requirement is specified in section 5.3.3, test procedure in Annex A or B 1.3.6				
	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					
Test should prove 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.					
Time delay setting	Measured delay	Checks on no reconnection when voltage or frequency is brought to just outside stage 1 limits of table 1.			
30 s	30 s	At 266.2V	At 196.1V	At 47.4Hz	At 51.6Hz
Confirmation that the SSEG does not re-connect.		No re-connection	No re-connection	No re-connection	No re-connection

Fault level contribution. The requirement is specified in section 5.7, test procedure in Annex A or B 1.4.6					
For a directly coupled SSEG			For a Inverter SSEG		
Parameter	Symbol	Value	Time after fault	Volts	Amps
Peak Short Circuit current	i_p		20ms	75.4	18.3
Initial Value of aperiodic current	A		100ms	73.6	22.5
Initial symmetrical short-circuit current*	I_k		250ms	70.8	21.7
Decaying (aperiodic) component of short circuit current*	i_{DC}		500ms	69.1	20.4
Reactance/Resistance Ratio of source*	X/R		Time to trip	0.468s	In seconds

Self-Monitoring solid state switching The requirement is specified in section 5.3.1, No specified test requirements.	Yes/or NA
ZDNY-TL10000	NA
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.	

Additional comments