



## Certificate G83/2

### Engineering Recommendation

Manufacturer	<b>SMA Solar Technology AG</b>
Address	Sonnenallee 1, 34266 Niestetal (Germany)

Type Tested reference number	ZE_G83-2_SBxx00TL-21_en_10
Generating Unit technology	Single phase inverter
Test house details	<b>SMA Solar Technology AG</b>
Test period	From 24.03.2014 until 23.04.2014

Type reference	Max. apparent AC power (VA)	Rated AC power (W)	From FW Pack
SB 3000TLST-21	3000	3000	2.60.23.R
SB 2500TLST-21	2500	2500	2.60.23.R

The results of the G83/2 are summarized in this certificate. SMA declares that all units shipped to the UK, with at least the aforementioned FW version, are within the specifications and parameters set by the G83/2 Engineering Recommendation. These settings cannot be changed by an installer, user or by any person other than SMA. Note that all tests were carried out in the biggest inverter of the family under test. The results for the other inverters of the family are equivalent.



## Test Results

### Power quality

Harmonics as per BS EN 61000-3-2								
Order	Frequency [Hz]	Thresholds [A]	P/Pn [%]				Max. NV / Limit [%]	
			50		100			
			MV [A]	NV [A]	MV [A]	NV [A]		
2	100	1,08	0,003	0,004	0,034	0,042	3,87%	✓
3	150	2,3	0,089	0,109	0,117	0,143	6,22%	✓
4	200	0,43	0,004	0,005	0,010	0,012	2,89%	✓
5	250	1,14	0,033	0,040	0,040	0,050	4,35%	✓
6	300	0,3	0,003	0,004	0,006	0,008	2,53%	✓
7	350	0,77	0,024	0,029	0,034	0,042	5,42%	✓
8	400	0,23	0,002	0,002	0,003	0,004	1,77%	✓
9	450	0,4	0,019	0,023	0,027	0,033	8,20%	✓
10	500	0,184	0,003	0,004	0,003	0,004	2,23%	✓
11	550	0,33	0,015	0,018	0,019	0,023	7,01%	✓
12	600	0,153	0,002	0,002	0,003	0,004	2,34%	✓
13	650	0,21	0,012	0,015	0,014	0,017	8,21%	✓
14	700	0,131	0,002	0,002	0,003	0,004	2,95%	✓
15	750	0,15	0,010	0,012	0,012	0,014	9,57%	✓
16	800	0,115	0,002	0,002	0,003	0,003	3,02%	✓
17	850	0,132	0,010	0,012	0,012	0,014	10,80%	✓
18	900	0,102	0,002	0,002	0,003	0,004	3,86%	✓
19	950	0,118	0,010	0,012	0,012	0,015	12,47%	✓
20	1000	0,092	0,003	0,004	0,003	0,004	4,19%	✓
21	1050	0,107	0,010	0,012	0,011	0,014	12,76%	✓
22	1100	0,084	0,002	0,002	0,003	0,004	4,43%	✓
23	1150	0,098	0,008	0,010	0,010	0,013	12,97%	✓
24	1200	0,077	0,002	0,002	0,003	0,004	4,98%	✓
25	1250	0,09	0,008	0,010	0,011	0,013	14,34%	✓
26	1300	0,071	0,002	0,002	0,003	0,004	5,51%	✓
27	1350	0,083	0,008	0,010	0,011	0,013	15,91%	✓
28	1400	0,066	0,002	0,002	0,003	0,004	5,93%	✓
29	1450	0,078	0,008	0,010	0,010	0,013	16,33%	✓
30	1500	0,061	0,003	0,004	0,005	0,006	9,88%	✓
31	1550	0,073	0,008	0,010	0,012	0,015	20,00%	✓
32	1600	0,058	0,004	0,005	0,006	0,008	13,74%	✓
33	1650	0,068	0,007	0,009	0,008	0,010	15,07%	✓
34	1700	0,054	0,005	0,006	0,006	0,008	14,03%	✓
35	1750	0,064	0,006	0,007	0,010	0,012	18,96%	✓
36	1800	0,051	0,002	0,002	0,004	0,005	10,08%	✓
37	1850	0,061	0,006	0,007	0,007	0,008	13,85%	✓
38	1900	0,048	0,002	0,002	0,002	0,003	5,88%	✓
39	1950	0,058	0,005	0,006	0,006	0,007	12,35%	✓
40	2000	0,046	0,002	0,002	0,002	0,003	5,70%	✓

MV - Measured Value    NV - Normalized Value     $NV = MV * 3,68 / \text{power per phase}$

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## Test Results

### Power quality

Voltage fluctuations and flicker as per BS EN 61000-3-3								
	Starting			Stopping			Running	
	dmax	dc	d(t) in ms	dmax	dc	d(t) in ms	Pst	Plf (2hours)
Limit	4,0%	3,3%	500	4,0%	3,3%	500	1	0,65
MV	0,0%	0,0%	0	0,0%	0,0%	0	0,09	0,09
NV	0,0%	0,0%	0	0,0%	0,0%	0	0,11	0,11
Verification	✓	✓	✓	✓	✓	✓	✓	✓

DC injection			
	P/Pn [%]		
	10	55	100
Limit	0,25% In	0,25% In	0,25% In
MV	0,009 A	0,016 A	0,016 A
%Inom	0,07%	0,12%	0,12%
Verification	✓	✓	✓

Power factor			
	Voltage [V]		
	218,2	230	253
Limit	0,95	0,95	0,95
MV	1,00	1,00	1,00
Verification	✓	✓	✓

MV - Measured value

NV - Normalized value

### Protection - Grid monitoring and reconnection time

Trip Tests	G83/2		Setting		Measures Values		Verification
	Magnitude	Time	Magnitude	Time	Magnitude	Time	
Undervoltage stage 1	200,1 V	2,5 s	200,1 V	2,5 s	199,46 V	2,53 s	✓
Undervoltage stage 2	184 V	0,5 s	184 V	0,5 s	183,37 V	0,54 s	✓
Overvoltage stage 1	262,2 V	1 s	262,2 V	1 s	262,66 V	1,04 s	✓
Overvoltage stage 2	273,7 V	0,5 s	273,7 V	0,5 s	274,15 V	0,54 s	✓
Underfrequency stage 1	47,5 Hz	20 s	47,5 Hz	20 s	47,447 Hz	20,09 s	✓
Underfrequency stage 2	47 Hz	0,5 s	47 Hz	0,5 s	46,948 Hz	0,6 s	✓
Overfrequency stage 1	51,5 Hz	90 s	51,5 Hz	90 s	51,549 Hz	90,07 s	✓
Overfrequency stage 2	52 Hz	0,5 s	52 Hz	0,5 s	52,051 Hz	0,59 s	✓

No trip test	G83/2		Verification
	Magnitude	Time	
U/V 1	204,1 V	3,5 s	✓
U/V 2	188 V	2,48 s	✓
U/V 3	180 V	0,48 s	✓
O/V 1	258,2 V	2 s	✓
O/V 2	269,7 V	0,98 s	✓
O/V 3	277,7 V	0,48 s	✓

No trip test	G83/2		Verification
	Magnitude	Time	
U/F 1	47,7 Hz	25 s	✓
U/F 2	47,2 Hz	19,98 s	✓
U/F 3	46,8 Hz	0,48 s	✓
O/F 1	51,3 Hz	95 s	✓
O/F 2	51,8 Hz	89,98 s	✓
O/F 3	52,2 Hz	0,48 s	✓

Reconnection time			
Limit	Setting	MV	Verification
20 s	20 s	45,14 s	✓

No reconnection			
At 266,2 V	At 198,1 V	At 47,4 Hz	At 51,8 Hz
✓	✓	✓	✓

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## Test Results

### Protection

Loss of mains test according to the BS EN 62116						
	29 % -5%Q (Test 22)	58 % -5%Q (Test 12)	100 % -5%P (Test 5)	29 % +5%Q (Test 31)	58 % +5%Q (Test 21)	100 % +5%P (Test 10)
Trip time limit (s)	0,5	0,5	0,5	0,5	0,5	0,5
Measured Value L1 (s)	0,134	0,112	0,108	0,191	0,196	0,149
Measured Value L2 (s)	N/A	N/A	N/A	N/A	N/A	N/A
Measured Value L3 (s)	N/A	N/A	N/A	N/A	N/A	N/A
Measured Value L1L2L3 (s)*	N/A	N/A	N/A	N/A	N/A	N/A
Verification	✓	✓	✓	✓	✓	✓

\* Only applicable to three phase inverters

Frequency change - Stability test				
	Start frequency	Change	End frequency	Verification
Positive vector shift	49,5 Hz	+9 degrees	N/A	✓
Negative vector shift	50,5 Hz	-9 degrees	N/A	✓
Positive frequency drift	49,5 Hz	+0,19 Hz/s	51,5 Hz	✓
Negative frequency drift	50,5 Hz	-0,19 Hz/s	47,5 Hz	✓

Fault level contribution		
Time after fault	Voltage (V)	Current (A)
< 50 ms	230,52	15,04
100 ms	12,57	0,02
250 ms	10,69	0,02
500 ms	11,48	0,02
Time to Trip	0,52	in seconds

Self monitoring - solid state switching
Not applicable as electro-mechanical relays are used