



Certificate G59/2

Engineering Recommendation

Manufacturer:	SMA Solar Technology AG
Address:	Sonnenallee 1
Postal code, place:	34266 Niestetal
Country:	Germany

Test house details:	SMA Solar Technology AG
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Type reference:	Max. AC power:	Nominal AC power:
STP 17000TL-10	17000 VA	17000 VA
STP 15000TL-10	15000 VA	15000 VA
STP 12000TL-10	12000 VA	12000 VA
STP 10000TL-10	10000 VA	10000 VA
STP 8000TL-10	8000 VA	8000 VA

The results of the G59/2 tests are summarized in this certificate. SMA declares that all devices (with G59 setting) that are shipped to the UK comply with the requirements defined in engineering recommendation G59/2. These settings cannot be changed by an installer, user or by any other person without the use of a tool (password protected). The complete documentation can be viewed at SMA (headquarters) after prior announcement.

Test details

- Power quality
- Harmonic current emissions as per BS EN 61000-3-12
- Voltage fluctuations and flicker as per BS EN 61000-3-3
- DC injection / Power factor
- Under / Over voltage switch off (based on requirement for LV connected)
- Under / Over frequency switch off
- Loss of mains test
- Reconnection time

SMA Solar Technology AG

Niestetal, 07.02.2011

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Director T M PM

Test results

Power quality

Harmonic current emissions as per BS EN 61000-3-12										
								Minimal Short Circuit Ratio R_{SCE} : 33 Ohm		
Value of Short Circuit Power S_{SC} corresponding to R_{SCE} :			STP 17000TL-10					0.561 MVA		
			STP 15000TL-10					0.495 MVA		
			STP 12000TL-10					0.396 MVA		
			STP 10000TL-10					0.330 MVA		
			STP 8000TL-10					0.264 MVA		
Description			Harmonic Current % = $100 I_n / I_1$					Harmonic Current Distortion Factors (%)		
Harmonic			3rd	5th	7th	9th	11th	13th	THD	PWHD
Limit BS EN 6100-3-12 Table 2 - 4			21.6	10.7	7.2	3.8	3.1	2	23 (13)	23 (22)
Actual Values:	STP 17000TL-10	L1	0.14	0.61	0.46	0.01	0.15	0.34	0.99	2.27
		L2	0.20	0.68	0.45	0.04	0.15	0.28	1.01	2.02
		L3	0.16	0.58	0.47	0.04	0.14	0.30	0.94	2.13
	STP 15000TL-10	L1	0.08	0.48	0.74	0.01	0.10	0.35	1.06	2.00
		L2	0.23	0.59	0.71	0.03	0.09	0.31	1.08	1.98
		L3	0.19	0.59	0.70	0.02	0.14	0.32	1.09	1.96
	STP 12000TL-10	L1	0.19	0.58	0.45	0.07	0.19	0.28	0.94	2.02
		L2	0.06	0.60	0.47	0.04	0.10	0.26	0.95	2.05
		L3	0.15	0.51	0.40	0.05	0.17	0.22	0.84	1.97
	STP 10000TL-10	L1	0.10	0.47	0.76	0.02	0.08	0.36	1.07	1.81
		L2	0.14	0.62	0.66	0.06	0.11	0.34	1.08	1.96
		L3	0.16	0.47	0.74	0.03	0.07	0.35	1.05	1.90
STP 8000TL-10	L1	0.15	0.53	1.00	0.04	0.12	0.45	1.32	1.92	
	L2	0.16	0.45	1.01	0.12	0.12	0.41	1.28	1.81	
	L3	0.08	0.51	0.95	0.06	0.14	0.36	1.23	1.73	

Voltage Fluctuations and Flicker				
	starting	stopping	running (at rated power)	
BS EN 61000-3-3 Limit	4 %	4 %	$P_{st} = 1.0$	$P_{it} = 0.65$
Test values	0.00 %	0.00 %	0.090	0.094

DC Injection			
G59/2 Limit	20 mA		
Test level (% of rated power)	10 %	55 %	100 %
Test values	< 10 mA	< 7 mA	< 11 mA

Power factor			
G59/2 Limit	0.95 lag – 0.95 lead		
Test level (AC voltage)	212 V	230 V	248 V
Test values (at rated power)	> 0.99	> 0.99	> 0.99

Under / Over voltage

Over voltage test						
	G59/2 Limit		Setting		Test Results	
	Voltage	Time	Voltage	Time	Voltage	Time
Over voltage Stage 1						
L1 – N	253 V	1 s	253 V	1 s	250.7 V	0.98 s
L2 – N					250.8 V	0.98 s
L3 – N					250.7 V	0.98 s
L1 – L2	440 V	1 s	438.2 V	1 s	434.4 V	0.98 s
L1 – L3					434.4 V	0.98 s
L2 – L3					434.4 V	0.98 s
Over voltage Stage 2						
L1 – N	264.5 V	0.5 s	264.5 V	0.5 s	262.2 V	0.48 s
L2 – N					262.2 V	0.49 s
L3 – N					262.2 V	0.48 s
L1 – L2	460 V	0.5 s	458.1 V	0.5 s	454.2 V	0.48 s
L1 – L3					454.2 V	0.49 s
L2 – L3					454.2 V	0.48 s

Under voltage test						
	G59/2 Limit		Setting		Test Results	
	Voltage	Time	Voltage	Time	Voltage	Time
Under voltage Stage 1						
L1 – N	200.1 V	2.5 s	200.1 V	2.5 s	202.4 V	2.47 s
L2 – N					202.4 V	2.47 s
L3 – N					202.4 V	2.48 s
L1 – L2	348 V	2.5 s	346.6 V	2.5 s	350.6 V	2.48 s
L1 – L3					350.5 V	2.48 s
L2 – L3					350.5 V	2.47 s
Under voltage Stage 2						
L1 – N	184 V	0.5 s	184 V	0.5 s	186.3 V	0.48 s
L2 – N					186.3 V	0.49 s
L3 – N					186.3 V	0.49 s
L1 – L2	320 V	0.5 s	318.7 V	0.5 s	322.6 V	0.48 s
L1 – L3					322.6 V	0.48 s
L2 – L3					322.6 V	0.49 s

Under / Over frequency

Under / Over frequency test						
	G59/2 Limit		Setting		Test Results	
	Frequency	Time	Frequency	Time	Frequency	Time
Under frequency Stage 1	47.5 Hz	20 s	47.5 Hz	20 s	47.56 Hz	19.99 s
Under frequency Stage 2	47 Hz	0.5 s	47 Hz	0.5 s	47.04 Hz	0.48 s
Over frequency Stage 1	51.5 Hz	90 s	51.5 Hz	10 s	51.46 Hz	9.98 s
Over frequency Stage 2	52 Hz	0.5 s	52 Hz	0.5 s	51.96 Hz	0.49 s

Loss of mains test

Loss of mains test (method used: frequency shift)			
Test level (% of rated power)	10 %	55 %	100 %
G59/2 Limit	2.5 s	2.5 s	2.5 s
Actual setting	1.0 s	1.0 s	1.0 s
Trip values	0.43 s	0.76 s	0.45 s

Reconnection time

Reconnection time			
	Under/Over Voltage	Under/Over Frequency	Loss of mains
G59/2 Limit	180 s	180 s	180 s
Actual setting	180 s	180 s	180 s
Recorded values	183 s	184 s	186 s

Fault level contribution

As SSEGs (small-scale embedded generators) for PV are inverter-connected, they are deemed to automatically comply with regulations and no further tests are required.

Self monitoring – solid state switching

Not applicable as electro-mechanical relays used.