



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 5000TL-20/WTP 5000TL-20	5,000 VA	5,000 W
STP 6000TL-20/WTP 6000TL-20	6,000 VA	6,000 W
STP 7000TL-20/WTP 7000TL-20	7,000 VA	7,000 W
STP 8000TL-20/WTP 8000TL-20	8,000 VA	8,000 W
STP 9000TL-20/WTP 9000TL-20	9,000 VA	9,000 W

The results of the G59/2-1 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 G59/2-1. 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.

SMA Solar Technology AG
 Niestetal, 2013-05-24

ppa. Frank Greizer

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 (Vice President MPTPD)

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 5000TL-20/WTP 5000TL-20					0.165 MVA		
			STP 6000TL-20/WTP 6000TL-20					0.198 MVA		
			STP 7000TL-20/WTP 7000TL-20					0.231 MVA		
			STP 8000TL-20/WTP 8000TL-20					0.264 MVA		
			STP 9000TL-20/WTP 9000TL-20					0.297 MVA		
Description			Harmonic current % = $100 I_v/I_1$						Harmonic current distortion factors (%)	
Harmonic			3 rd	5 th	7 th	9 th	11 th	13 th	THD	PWHD
Limit BS EN 61000-3-12 Table 2 - 4			21.6	10.7	7.2	3.8	3.1	2	23 (13)	23 (22)
Actual values	STP 5000TL-20/ WTP 5000TL-20	L1	0.55	0.92	0.65	0.11	0.55	0.59	1.91	3.23
		L2	0.65	0.92	0.57	0.19	0.54	0.57	1.97	3.16
		L3	0.47	0.95	0.68	0.12	0.54	0.61	1.85	3.25
	STP 6000TL-20/ WTP 6000TL-20	L1	0.77	0.87	0.58	0.14	0.53	0.75	1.84	2.98
		L2	0.59	0.76	0.61	0.09	0.48	0.67	1.76	2.95
		L3	0.41	0.81	0.75	0.13	0.48	0.70	1.88	3.03
	STP 7000TL-20/ WTP 7000TL-20	L1	0.48	0.31	0.47	0.11	0.32	0.35	1.26	2.60
		L2	0.60	0.38	0.57	0.14	0.32	0.36	1.58	2.47
		L3	0.33	0.44	0.52	0.13	0.35	0.37	1.45	2.63
	STP 8000TL-20/ WTP 8000TL-20	L1	0.47	0.19	0.44	0.10	0.27	0.33	1.13	2.39
		L2	0.62	0.36	0.47	0.11	0.24	0.36	1.34	2.32
		L3	0.28	0.40	0.42	0.11	0.26	0.36	1.33	2.40
	STP 9000TL-20/ WTP 9000TL-20	L1	0.44	0.24	0.28	0.12	0.29	0.28	1.08	2.21
		L2	0.52	0.25	0.40	0.09	0.25	0.27	1.13	2.13
		L3	0.27	0.34	0.38	0.12	0.29	0.31	1.25	2.24

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 value	0.39%	0.35%	0.07	0.07

DC injection			
G59/2 Limit	0.25 % of the rated AC current		
Test level (% of rated power)	10%	55%	100%
Test value	0.03%	0.06%	0.03%

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

Overvoltage/Undervoltage

Overvoltage test						
	G59/2 Limit		Setting		Test results	
	Voltage	Time	Voltage	Time	Voltage	Time
Overvoltage stage 1						
L1-N	253 V	1 s	264 V	1 s	262.18 V	957 ms
L2-N					261.19 V	967 ms
L3-N					262.17 V	977 ms
L1-L2	440 V	1 s	457.3 V	1 s	452.73 V	968 ms
L1-L3					452.09 V	966 ms
L2-L3					452.23 V	957 ms
Overvoltage stage 2						
L1-N	264.5 V	0.5 s	276 V	0.5 s	273.82 V	26 ms
L2-N					273.78 V	467 ms
L3-N					273.80 V	467 ms
L1-L2	460 V	0.5 s	478 V	0.5 s	474.17 V	28 ms
L1-L3					474.21 V	27 ms
L2-L3					474.16 V	27 ms

Undervoltage test						
	G59/2 Limit		Setting		Test results	
	Voltage	Time	Voltage	Time	Voltage	Time
Undervoltage stage 1						
L1-N	200.1 V	2.5 s	208.8 V	2.5 s	211.78 V	2457 ms
L2-N					211.48 V	2457 ms
L3-N					211.40 V	2467 ms
L1-L2	348 V	2.5 s	361.7 V	2.5 s	366.04 V	2467 ms
L1-L3					364.99 V	2457 ms
L2-L3					366.22 V	2467 ms
Undervoltage stage 2						
L1-N	184 V	0.5 s	192 V	0.5 s	194.01 V	477 ms
L2-N					194.53 V	477 ms
L3-N					193.86 V	477 ms
L1-L2	320 V	0.5 s	332.6 V	0.5 s	338.32 V	477 ms
L1-L3					335.81 V	477 ms
L2-L3					335.19 V	477 ms

Over/Under Frequency

Over/under frequency test						
	G59/2 Limit		Setting		Test results	
	Frequency	Time	Frequency	Time	Frequency	Time
Over frequency stage 1	51.5 Hz	90 s	51.5 Hz	90 s	51.48 Hz	89.93 s
Over frequency stage 2	52 Hz	0.5 s	52 Hz	0.5 s	51.96 Hz	0.48 s
Under frequency stage 1	47.5 Hz	20 s	47.5 Hz	20 s	47.56 Hz	19.9 s
Under frequency stage 2	47 Hz	0.5 s	47 Hz	0.5 s	47.06 Hz	0.48 s

Loss of Mains Tests

Loss of mains tests (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 value	0.3 s	0.3 s	0.7 s

Reconnection Times

Reconnection times			
Test level (% of rated power)	Overtoltage/Undervoltage	Over/under frequency	Loss of mains
G59/2 Limit	180 s	180 s	180 s
Actual setting	180 s	180 s	180 s
Recorded value	187 s	187 s	187 s

Fault Level Contribution

As SSEGs (small-scale embedded generators) for PV or wind turbine systems 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.