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Chairman of the Supervisory Board: Günther Cramer
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Certificate EN 50438

Type certification test result sheet

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

Test house details	**SMA Solar Technology AG**
Date of test	March/April 2012

Type reference	Max. AC power	Nominal AC power
SB 2500TLST-21	2,500 W	2,500 W
SB 3000TLST-21	3,000 W	3,000 W
SB 3000TL-21	3,000 W	3,000 W
SB 3600TL-21	3,680 W	3,680 W
WB 3600TL-21	3,680 W	3,680 W
SB 4000TL-21	4,000 W	4,000 W
SB 5000TL-21	5,000 W	4,600 W
WB 5000TL-21	5,000 W	4,600 W

The results of the EN 50438 tests are summarized in this certificate. This includes the standard requirements of the EN 50438 and additional the LoM requirement. Other country specific requirements (national deviations) are not covered by this certificate.
The complete documentation can be viewed at SMA (headquarters) after prior announcement.

Test Results

Power Quality

Harmonic current emissions as per EN 61000-3-2 Class A									
Harmonic		2nd	3rd	5th	7th	9th	11th	13th	15th ... 39th
EN 61000-3-2 Limit [A]		1.08	2.30	1.14	0.77	0.40	0.33	0.21	0.15 x (15/n)
Actual values [A] (at rated power)	SB 2500TLST-21	0.08	1.10	0.50	0.41	0.30	0.23	0.19	< limit
	SB 3000TLST-21	0.10	1.21	0.35	0.29	0.22	0.16	0.12	< limit
	SB 3000TL-21	0.01	1.13	0.04	0.04	0.04	0.02	0.02	< limit
	SB 3600TL-21	0.01	0.17	0.05	0.04	0.03	0.02	0.02	< limit
	WB 3600TL-21	0.01	0.17	0.05	0.04	0.03	0.02	0.02	< limit
	SB 4000TL-21	0.02	0.19	0.04	0.04	0.03	0.02	0.02	< limit
	SB 5000TL-21	0.01	0.24	0.04	0.04	0.03	0.03	0.02	< limit
	WB 5000TL-21	0.01	0.24	0.04	0.04	0.03	0.03	0.02	< limit

Voltage fluctuations and flicker as per EN 61000-3-3				
	Starting	Stopping	Running (at rated power)	
EN 61000-3-3 Limit	4%	4%	P_{st} = 1.0	P_{lt} = 0.65
Test value	0.00%	0.00%	0.27	0.27

Power factor			
EN 50438 Limit	0.95 lag – 0.95 lead		
Test level (AC voltage)	210 V	230 V	248 V
Test value (at rated power)	> 0.99	> 0.99	> 0.99

Fault level contribution (for electronic inverter)	
Device	Max. short circuit current
SB 2500TLST-21	0.017 kA
SB 3000TLST-21	0.017 kA
SB 3000TL-21	0.017 kA
SB 3600TL-21	0.019 kA
WB 3600TL-21	0.019 kA
SB 4000TL-21	0.021 kA
SB 5000TL-21	0.024 kA
WB 5000TL-21	0.024 kA

Note: The above mentioned inverters are equipped with a overcurrent protection system which trips the inverter in short time (e.g. < 1 ms)

Grid Monitoring*

Undervoltage test/overvoltage test				
	Undervoltage		Overvoltage	
Parameter	Voltage	Time	Voltage	Time
EN 50438 Limit	230 V - 15%	1.5 s	230 V + 15%	0.2 s
Actual setting	195.5 V	1.5 s	264.5 V	0.2 s
Trip value	196.3 V	1.48 s	263.3 V	0.17 s

Under/over frequency test				
	Under frequency		Over frequency	
Parameter	Frequency	Time	Frequency	Time
EN 50438 Limit	47 Hz	0.5 s	51 Hz	0.5 s
Actual setting	47 Hz	0.5 s	51 Hz	0.5 s
Trip value	47.06 Hz	0.45 s	50.96 Hz	0.45 s

Loss of mains tests**			
Method used	Escalating frequency shift (active loss of mains detection)		
Output power level	Min. (25% P_{nom})	Medium (50% P_{nom})	Max. (100% P_{nom})
Trip setting clearance time	As defined in Annex A (≤ 5 s)		
Trip value clearance time	0.31 s	0.28 s	0.29 s

* The testsresults are from the SB 3600TL-21 test. The test results from the other devices are also below the limits.
** The test results for loss of mains are from the VDE 0126-1-1/A1 type test. The defined LoM-test in this standard is nearly equal to the test defined in EN 62116 which is refered in EN 50438 C.2.3.