





**BUREAU
VERITAS**

TEST REPORT SUMMARY


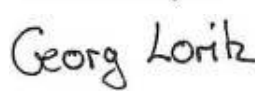
IEC 61727

Photovoltaic installations connected to the public distribution network with requirements according MEA and PEA

Report reference number	11TH0290-IEC61727_SUM_2			
Date of issue	2012-11-19			
Total number of pages	13			
Testing laboratory name	Bureau Veritas Consumer Products Services Germany GmbH		 Deutsche Akkreditierungsstelle D-PL-12024-03-01	
Address	Businesspark A96 86842 Türkheim Germany			
Applicant's name	SMA Solar Technology AG			
Address	Sonnenallee 1, 34266 Niestetal			
Test specification				
Standard	IEC 61727:2004 IEC 62116:2008 with deviations for Thailand according MEA and PEA			
Certificate	Certificate of compliance			
Test report form number	IEC61727			
Master TRF	Bureau Veritas Consumer Products Services Germany GmbH			
Test item description	Grid-tied photovoltaic and wind inverter			
Trademark				
Model / Type	SB 3000TL-21, SB 3600TL-21, SB 4000TL-21, SB 5000TL-21 SB 2500TLST-21, SB 3000TLST-21 WB 3000TL-21, WB 3600TL-21, WB 4000TL-21, WB 5000TL-21			
Ratings	SB 3000TL-21	SB 3600TL-21	SB 4000TL-21	SB 5000TL-21
MPP DC voltage range [V]	175V – 500V			
Input DC voltage range [V]	125V – 750V			
Input DC current [A]	2 x 15A			
Output AC voltage [V]	230 V / 50 Hz			
Output AC current [A]	nom. 13,1A max. 16A	nom. 16A max. 16A	nom. 17,4A max. 22A	nom. 20A max. 22A
Output power [VA]	nom. 3000W max. 3000VA	nom. 3680W max. 3680VA	nom. 4000W max. 4000VA	nom. 4600W max. 5000VA

Ratings	SB 2500TLST-21	SB 3000TLST-21
MPP DC voltage range [V]..... :	180V – 500V	213V – 500V
Input DC voltage range [V]	125V – 750V	
Input DC current [A]	15A	
Output AC voltage [V]	230 V / 50 Hz	
Output AC current [A]..... :	nom. 10,9A max. 10,9A	nom. 13,1A max. 13,1A
Output power [VA]..... :	nom. 2500W max. 2500VA	nom. 3000W max. 3000VA

Ratings	WB 3000TL-21	WB 3600TL-21	WB 4000TL-21	WB 5000TL-21
MPP DC voltage range [V]..... :	175V – 500V			
Input DC voltage range [V]	80V – 550V			
Input DC current [A]	2 x 15A			
Output AC voltage [V]	230 V / 50 Hz			
Output AC current [A]..... :	nom. 13,1A max. 16A	nom. 16A max. 16A	nom. 17,4A max. 22A	nom. 20A max. 22A
Output power [VA]..... :	nom. 3000W max. 3000VA	nom. 3680W max. 3680VA	nom. 4000W max. 4000VA	nom. 4600W max. 5000VA

Testing Location	Bureau Veritas Consumer Products Services Germany GmbH
Address	Businesspark A96, 86842 Türkheim, Germany
Tested by (name and signature).....	Urs Seifert 
Approved by (name and signature).....	Georg Loritz 
Manufacturer's name	SMA Solar Technology AG
Factory address	Sonnenallee 1, 34266 Niestetal

Document History			
Date	Internal reference	Modification / Change / Status	Revision
2012-05-09	Urs Seifert	Initial report was written	0
2012-10-24	Urs Seifert	Output power of unit SB 3000TLST-21 updated	1
2012-11-19	Urs Seifert	Windy Boy inverter models WB 3000TL-21, WB 3600TL-21, WB 4000TL-21, WB 5000TL-21 included	2
Supplementary information:			

Test items particulars																					
Equipment mobility..... :	Permanent connection																				
Operating condition..... :	Continuous																				
Class of equipment..... :	Class I																				
Protection against ingress of water.. :	IP65 according to EN 60529																				
Mass of equipment [kg]..... :	<table border="0"> <tr><td>SB 3000TL-21</td><td>26kg</td></tr> <tr><td>SB 3600TL-21</td><td>26kg</td></tr> <tr><td>SB 4000TL-21</td><td>26kg</td></tr> <tr><td>SB 5000TL-21</td><td>26kg</td></tr> <tr><td>SB 2500TLST-21</td><td>23kg</td></tr> <tr><td>SB 3000TLST-21</td><td>23kg</td></tr> <tr><td>WB 3000TL-21</td><td>26kg</td></tr> <tr><td>WB 3600TL-21</td><td>26kg</td></tr> <tr><td>WB 4000TL-21</td><td>26kg</td></tr> <tr><td>WB 5000TL-21</td><td>26kg</td></tr> </table>	SB 3000TL-21	26kg	SB 3600TL-21	26kg	SB 4000TL-21	26kg	SB 5000TL-21	26kg	SB 2500TLST-21	23kg	SB 3000TLST-21	23kg	WB 3000TL-21	26kg	WB 3600TL-21	26kg	WB 4000TL-21	26kg	WB 5000TL-21	26kg
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WB 3600TL-21	26kg																				
WB 4000TL-21	26kg																				
WB 5000TL-21	26kg																				
Test case verdicts																					
Test case does not apply to the test object..... :	N/A																				
Test item does meet the requirement..... :	P(ass)																				
Test item does not meet the requirement..... :	F(ail)																				
Testing																					
Date of receipt of test item..... :	2012-04-04																				
Date(s) of performance of test..... :	2012-04-13 to 2012-04-20																				
General remarks:																					
<p>The test result presented in this report relate only to the object(s) tested. This report must not be reproduced in part or in full without the written approval of the issuing testing laboratory.</p> <p>"(see Annex #)" refers to additional information appended to the report. "(see appended table)" refers to a table appended to the report.</p> <p>Throughout this report a comma is used as the decimal separator.</p> <p>The IEC 61727 does not provide any limits for the accuray of the PV-system for the utility voltage, frequency measurement. Therefore the given tolerances of the EN50438 table 2 are applied.</p> <p>Tolerances on trip values tabel 2 EN50438:</p> <ul style="list-style-type: none"> - Voltage: +/- 1% of the nominal voltage; - Frequency: +/- 0,5% of the nominal frequency - Clearance time: +/- 10% 																					

Copy of marking plate:

<p>SMA Solar Technology AG Sonnentallee 1 34266 Niestetal Germany www.SMA.de</p> <p>SUNNY BOY Solar Inverter made in Germany by SMA Solar Technology AG Model SB 3000TL-21 Serial No. 0000000001 Date of manufacture 2012-11-08</p> <table border="1"> <tr><td>DC</td><td>V_{DC max}</td><td>750 V</td></tr> <tr><td></td><td>V_{DC MPP}</td><td>175 - 500 V</td></tr> <tr><td></td><td>I_{DC max}</td><td>2 x 15 A</td></tr> <tr><td rowspan="5">AC</td><td>V_{AC,r}</td><td>220/230/240 V</td></tr> <tr><td>P_{AC,r}</td><td>3000 W</td></tr> <tr><td>S_{max}</td><td>3000 VA</td></tr> <tr><td>f_{AC,r}</td><td>50 / 60 Hz</td></tr> <tr><td>I_{AC max}</td><td>16 A</td></tr> <tr><td colspan="2">COS(φ)</td><td>0.8 overexcited 0.8 underexcited</td></tr> </table> <p>IP65 max. 26 kg Safety class I Overvoltage protection III</p> <p>CE</p> <p>RAL N23114</p>	DC	V _{DC max}	750 V		V _{DC MPP}	175 - 500 V		I _{DC max}	2 x 15 A	AC	V _{AC,r}	220/230/240 V	P _{AC,r}	3000 W	S _{max}	3000 VA	f _{AC,r}	50 / 60 Hz	I _{AC max}	16 A	COS(φ)		0.8 overexcited 0.8 underexcited	Sunnydots.com Sunnydots.com *00000000001* *00000000001* *00000000001* *00000000001* SB 3000TL-21 \$BFR\$SRRE1/2012 0000000001	<p>SMA Solar Technology AG Sonnentallee 1 34266 Niestetal Germany www.SMA.de</p> <p>SUNNY BOY Solar Inverter made in Germany by SMA Solar Technology AG Model SB 3600TL-21 Serial No. 0000000001 Date of manufacture 2012-11-08</p> <table border="1"> <tr><td>DC</td><td>V_{DC max}</td><td>750 V</td></tr> <tr><td></td><td>V_{DC MPP}</td><td>175 - 500 V</td></tr> <tr><td></td><td>I_{DC max}</td><td>2 x 15 A</td></tr> <tr><td rowspan="5">AC</td><td>V_{AC,r}</td><td>220/230/240 V</td></tr> <tr><td>P_{AC,r}</td><td>3680 W</td></tr> <tr><td>S_{max}</td><td>3680 VA</td></tr> <tr><td>f_{AC,r}</td><td>50 / 60 Hz</td></tr> <tr><td>I_{AC max}</td><td>16 A</td></tr> <tr><td colspan="2">COS(φ)</td><td>0.8 overexcited 0.8 underexcited</td></tr> </table> <p>IP65 max. 26 kg Safety class I Overvoltage protection III</p> <p>CE</p> <p>RAL N23114</p>	DC	V _{DC max}	750 V		V _{DC MPP}	175 - 500 V		I _{DC max}	2 x 15 A	AC	V _{AC,r}	220/230/240 V	P _{AC,r}	3680 W	S _{max}	3680 VA	f _{AC,r}	50 / 60 Hz	I _{AC max}	16 A	COS(φ)		0.8 overexcited 0.8 underexcited	Sunnydots.com Sunnydots.com *00000000001* *00000000001* *00000000001* *00000000001* SB 3600TL-21 \$BFR\$SRRE1/2012 0000000001
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Germany
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SUNNY BOY
Solar Inverter * made in Germany
by SMA Solar Technology AG
Model
SB 2500TLST-21
Serial No.
0000000001
Date of manufacture
2012-11-08

DC	V _{DC max}	750 V
	V _{DC MPP}	180 - 500 V
	I _{DC max}	15 A
AC	V _{AC,r}	220 / 230 / 240 V
	P _{AC,r}	2500 W
	S _{max}	2500 VA
	f _{AC,r}	50 / 60 Hz
	I _{AC max}	10.9 A
cos(φ)		0.8 <small>overexcited</small> 0.8 <small>underexcited</small>

IP65 max. 23 kg
Safety class I III

N23114

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Germany
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SUNNY BOY
Solar Inverter * made in Germany
by SMA Solar Technology AG
Model
SB 3000TLST-21
Serial No.
0000000001
Date of manufacture
2012-11-08

DC	V _{DC max}	750 V
	V _{DC MPP}	213 - 500 V
	I _{DC max}	15 A
AC	V _{AC,r}	220 / 230 / 240 V
	P _{AC,r}	3000 W
	S _{max}	3000 VA
	f _{AC,r}	50 / 60 Hz
	I _{AC max}	13.1 A
cos(φ)		0.8 <small>overexcited</small> 0.8 <small>underexcited</small>

IP65 max. 23 kg
Safety class I III

N23114

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WINDY BOY
Wind Inverter * made in Germany
by SMA Solar Technology AG
Model
WB 5000TL-21
Serial No.
0123456789
Date of manufacture
2012-09-06

DC	V _{DC max}	550 V
	V _{DC MPP}	175 - 500 V
	I _{DC max}	2 x 15 A
AC	V _{AC,r}	230 V
	P _{AC,r}	4600 W
	S _{max}	5000 VA
	f _{AC,r}	50 / 60 Hz
	I _{AC max}	22 A
cos(φ)		0.8 <small>overexcited</small> 0.8 <small>underexcited</small>

IP65 max. 26 kg
Safety class I III

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WINDY BOY
Wind Inverter * made in Germany
by SMA Solar Technology AG
Model
WB 4000TL-21
Serial No.
0123456789
Date of manufacture
2012-09-06

DC	V _{DC max}	550 V
	V _{DC MPP}	175 - 500 V
	I _{DC max}	2 x 15 A
AC	V _{AC,r}	230 V
	P _{AC,r}	4000 W
	S _{max}	4000 VA
	f _{AC,r}	50 / 60 Hz
	I _{AC max}	22 A
cos(φ)		0.8 <small>overexcited</small> 0.8 <small>underexcited</small>

IP65 max. 26 kg
Safety class I III

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34266 Niestetal
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WINDY BOY
Wind Inverter * made in Germany
by SMA Solar Technology AG
Model
WB 3600TL-21
Serial No.
0123456789
Date of manufacture
2012-09-06

DC	V _{DC max}	550 V
	V _{DC MPP}	175 - 500 V
	I _{DC max}	2 x 15 A
AC	V _{AC,r}	230 V
	P _{AC,r}	3680 W
	S _{max}	3680 VA
	f _{AC,r}	50 / 60 Hz
	I _{AC max}	16 A
cos(φ)		0.8 <small>overexcited</small> 0.8 <small>underexcited</small>

IP65 max. 26 kg
Safety class I III

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WINDY BOY
 Wind inverter, made in Germany
 by SMA Solar Technology AG

Model
WB 3000TL-21

Serial No.
0123456789

Date of manufacture
 2012-09-06

DC	V _{DC max}	550 V
	V _{DC MPP}	175 - 500 V
	I _{DC max}	2 x 15 A
AC	V _{AC,r}	230 V
	P _{AC,r}	3000 W
	S _{max}	3000 VA
	f _{AC,r}	50 / 60 Hz
	I _{AC max}	16 A
cos(φ)		0.8 overexcited / 0.8 underexcited

IP65 max. 26 kg
 Safety class I Overvoltage protection III

CE

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WB 3000TL-21 / 09/2012

0123456789

General product information:

Description of the power circuit:

The input and output are protected by varistors to Earth. The unit is providing EMC filtering at the PV input and output toward mains. The unit does not provide galvanic separation from input to output (transformerless). The output is switched off redundantly by the high power switching bridge and two relays. This assures that the opening of the output circuit will also operate in case of one error.

Description of the differences of the models within a series:

The units are identical in the control circuit and the internal supply. Generally the units provide the same hardware except of some components:

- Group 1) SB 3000TL-21, SB 3600TL-21, SB 4000TL-21, SB 5000TL-21, WB 3000TL-21, WB 3600TL-21, WB 4000TL-21, WB 5000TL-21
- Group 2) SB 2500TLST-21, SB 3000TLST-21,

All models within one group provide the same hardware. The models with lower power are derated via software.

Group 1 provides two MPP-Tracker

Group 2 provides one MPP-Tracker. The EMV-Filter, the boost converter and the DC-connections have been omitted of the second MPP-Tracker.

The different configurations have no influence on the device behaviour. All types have the same software.

IEC61727:2004-12			
Clause	Requirement – Test	Result – Remark	Verdict
SECTION 4: Utility compatibility			
4	<p>General The quality of power provided by the PV system for the on-site AC loads and for power delivered to the utility is governed by practices and standards on voltage, flicker, frequency, harmonics and power factor. Deviation from these standards represents out-of-bounds conditions and may require the PV system to sense the deviation and properly disconnect from the utility system.</p> <p>All power quality parameters (voltage, flicker, frequency, harmonics, and power factor) must be measured at the utility interface/ point of common coupling unless otherwise specified.</p>	Noticed	P
4.1	<p>Voltage, current and frequency The PV system AC voltage, current and frequency shall be compatible with the utility system.</p>	Derived from tests	P
4.2	<p>Normal voltage operating range Utility-interconnected PV systems do not normally regulate voltage; they inject current into the utility. Therefore, the voltage operating range for PV inverters is selected as a protection function that responds to abnormal utility conditions, not as a voltage regulation function.</p>	Derived from tests	P
4.3	<p>Flicker The operation of the PV system should not cause voltage flicker in excess of limits stated in the relevant sections of IEC 61000-3-3 for systems less than 16 A or IEC 61000-3-5 for systems with current of 16 A and above.</p>	See EMC Report (Annex 1)	P
4.4	<p>DC injection The PV system shall not inject DC current greater than 1 % of the rated inverter output current, into the utility AC interface under any operating condition.</p>	See table 4.4	P
4.5	<p>Normal frequency operating range The PV system shall operate in synchronism with the utility system, and within the frequency trip limits defined in 5.2.2.</p>	See table 5.2.2	P

SECTION 4: Utility compatibility

<p>4.6</p>	<p>Harmonics and waveform distortion Low levels of current and voltage harmonics are desirable; the higher harmonic levels increase the potential for adverse effects on connected equipment. Acceptable levels of harmonic voltage and current depend upon distribution system characteristics, type of service, connected loads/apparatus, and established utility practice. The PV system output should have low current-distortion levels to ensure that no adverse effects are caused to other equipment connected to the utility system. Total harmonic current distortion shall be less than 5 % at rated inverter output. Each individual harmonic shall be limited to the percentages listed in Table 1. Even harmonics in these ranges shall be less than 25 % of the lower odd harmonic limits listed. (see Clause 4.6 Table 1 – Current distortion limits)</p>	<p>See EMC Report (Annex 1)</p>	<p>P</p>
<p>4.7</p>	<p>Power factor The PV system shall have a lagging power factor greater than 0,9 when the output is greater than 50 % of the rated inverter output power.</p>	<p>See table 4.7</p>	<p>P</p>

IEC61727:2004-12			
Clause	Requirement – Test	Result – Remark	Verdict
SECTION 5: Personnel safety and equipment protection			
5	General This Clause provides information and considerations for the safe and proper operation of the utility-connected PV systems.	Noticed	P
5.1	Loss of utility voltage To prevent islanding, a utility connected PV system shall cease to energize the utility system from a de-energized distribution line irrespective of connected loads or other generators within specified time limits. A utility distribution line can become de-energized for several reasons. For example, a substation breaker opening due to fault conditions or the distribution line switched out during maintenance. If inverters (single or multiple) have DC SELV input and have accumulated power below 1 kW then no mechanical disconnect (relay) is required.	See table 5.3	P
5.2	Over/under voltage and frequency Abnormal conditions can arise on the utility system that requires a response from the connected photovoltaic system. This response is to ensure the safety of utility maintenance personnel and the general public, as well as to avoid damage to connected equipment, including the photovoltaic system. The abnormal utility conditions of concern are voltage and frequency excursions above or below the values stated in this Clause, and the complete disconnection of the utility, presenting the potential for a distributed resource island.	See table 5.2.1 and 5.2.2	P
5.2.1	Over/under voltage When the interface voltage deviates outside the conditions specified in Table 2, the photovoltaic system shall cease to energize the utility distribution system. This applies to any phase of a multiphase system. All discussions regarding system voltage refer to the local nominal voltage. The system shall sense abnormal voltage and respond. The following conditions should be met, with voltages in RMS and measured at the point of utility connection. (see clause 5.2.1 Table 2 – Response to abnormal voltages) The purpose of the allowed time delay is to ride through short-term disturbances to avoid excessive nuisance tripping. The unit does not have to cease to energize if the voltage returns to the normal utility continuous operation condition within the specified trip time.	See table 5.2.1	P
5.2.2	Over/under frequency When the utility frequency deviates outside the specified conditions the photovoltaic system shall cease to energize the utility line. The unit does not have to cease to energize if the frequency returns to the normal utility continuous operation condition within the specified trip time. When the utility frequency is outside the range of ± 1 Hz, the system shall cease to energize the utility line within 0,2 s. The purpose of the allowed range and time delay is to allow continued operation for short-term disturbances and to avoid excessive nuisance tripping in weak-utility system conditions.	See table 5.2.2	P

IEC61727:2004-12			
Clause	Requirement – Test	Result – Remark	Verdict
SECTION 5: Personnel safety and equipment protection			
5.3	Islanding protection The PV system must cease to energize the utility line within 2 s of loss of utility.	See table 5.3 (1) and 5.3 (2)	P
5.4	Response to utility recovery Following an out-of-range utility condition that has caused the photovoltaic system to cease energizing, the photovoltaic system shall not energize the utility line for 20 s to 5 min after the utility service voltage and frequency have recovered to within the specified ranges.		P
5.5	Earthing The utility interface equipment shall be earthed/grounded in accordance with IEC 60364-7-712.	Stated in the manual.	P
5.6	Short circuit protection The photovoltaic system shall have short-circuit protection in accordance with IEC 60364-7-712.	Stated in the manual.	P
5.7	Isolation and switching A method of isolation and switching shall be provided in accordance with IEC 60364-7-712.	Stated in the manual.	N/A

Test overview:		
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Clause	Test	Result
4	Type test:	
4.4	Monitoring of DC-Injection	P
4.5	Normal frequency operating range	P
4.6	Harmonics and waveform distortion	P
4.7	Power factor	P
5.2.1	Voltage monitoring	P
5.2.2	Frequency monitoring	P
5.3	Islanding protection	P