TEST REPORT SUMMARY

EN 50438

Requirements for the connection of micro-generators in parallel with public low-voltage distribution networks

Report reference number	**:**	**12TH0525-EN50438_SUM_0**	
Date of issue	:	2013-03-11	
Total number of pages	:	12	
Testing laboratory name	**:**	**Bureau Veritas Consumer Products Services Germany GmbH**	
Address	:	Businesspark A96 86842 Türkheim Germany	
Applicant's name	**:**	**SMA Solar Technology AG**	
Address	:	Sonnenallee 1, 34266 Niestetal	
Test specification			
Standard	:	EN 50438:2007, DIN EN 50438:2008 DIN V VDE V 0126-1-1:2006-02	
Certificate	**:**	**Certificate of compliance**	
Test report form number.	:	EN50438	
Master TRF	:	Bureau Veritas Consumer Products Services Germany GmbH	
Test item description	:	**Grid-tied photovoltaic inverter**	
Trademark	:	SMA	
Model / Type	:	SMC 9000TLRP-10, SMC 10000TLRP-10, SMC 11000TLRP-10	
Ratings	**:**	**SMC 9000TLRP-10**	**SMC 10000TLRP-10**	**SMC 11000TLRP-10**
MPP DC voltage range [V]	:	333V - 500V		
Input DC voltage range [V]	:	max. 700V		
Input DC current [A]	:	28A	31A	34A
Output AC voltage [V]	:	nom. 230V / 50Hz		
Output AC current [A]	:	max. 40A	max. 44A	max. 48A
Output power [VA]	:	nom. 9000W max. 9000VA	nom. 10000W max. 10000VA	nom. 11000W max. 11000VA

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

Document History

Date	Internal reference	Modification / Change / Status	Revision
2012-11-19	Georg Loritz	Initial report was written	0

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]	:	SMC 9000TLRP-10 35kg
		SMC 10000TLRP-10 35kg
		SMC 11000TLRP-10 35kg

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	:	2012-10-16
Date(s) of performance of test	:	2012-10-29 to 2013-02-28

General remarks:

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.

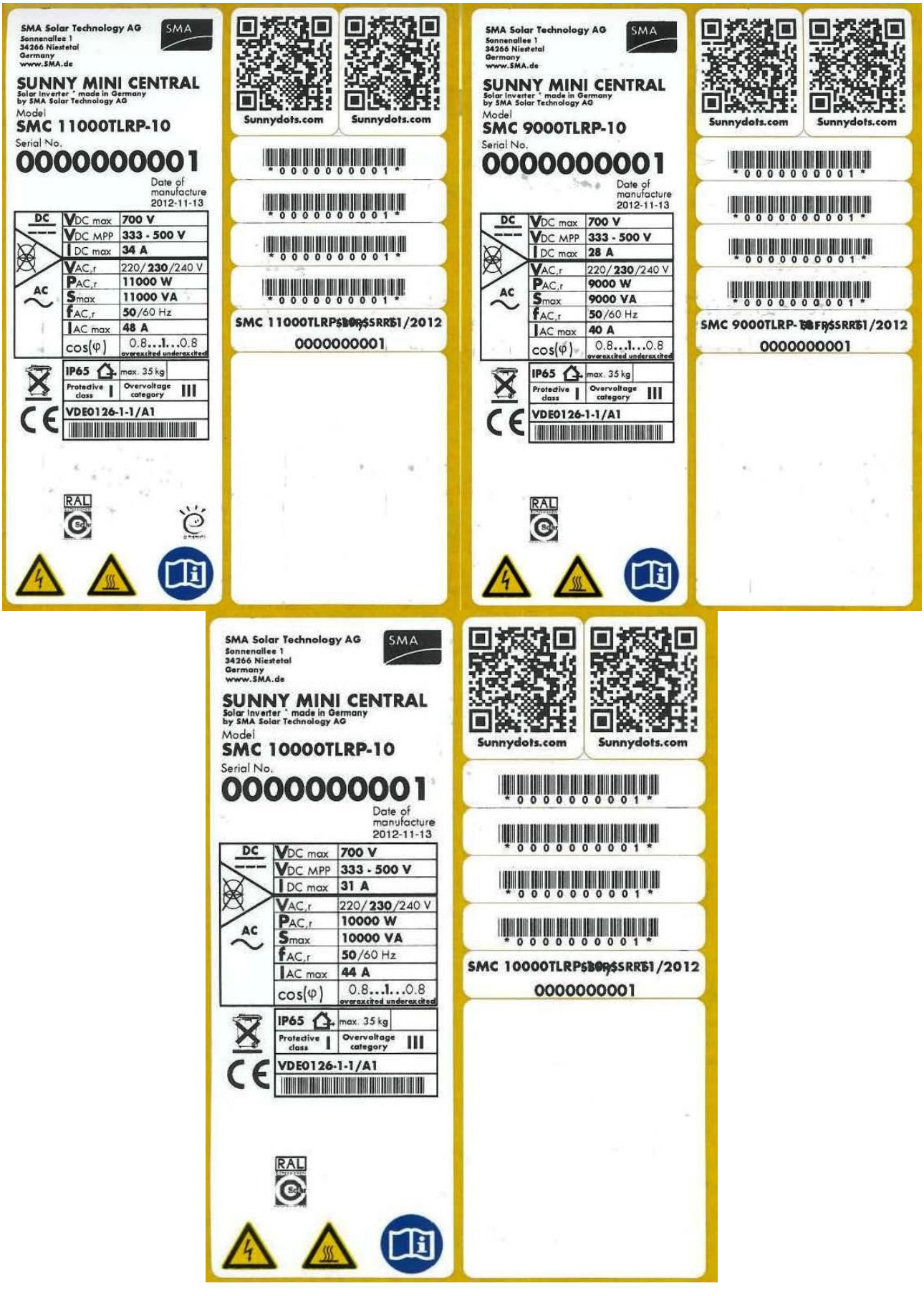
”(see Annex #)" refers to additional information appended to the report.
"(see appended table)" refers to a table appended to the report.

Throughout this report a comma is used as the decimal separator.

This Test Report consists of the following documents:

1. Test Results
2. Annex No. 1 – EMC Test Report
3. Annex No. 2 – Pictures of the units
4. Annex No. 3 – Test equipment list

Copy of marking plate:



General product information:

The Solar Inverter converts DC voltage into AC voltage.

The input and output are protected by Varistors to Earth. The unit is providing EMC filtering at the output toward mains. The unit does not provide galvanic separation from input to output (no transformer). The output is switched off redundant by the high power switching bridge and a two relays in series in line and neutral. This assures that the opening of the output circuit will also operate in case of one error.

Differences of the models

The inverter series consist of three inverter models. The SMC 9000TLRP-10, SMC 10000TLRP-10 and SMC 11000TLRP-10. The inverters are hardware identical and only power derated by software.

The product with serial number 2002231959 was tested on
software version: 2.07

All tests were performed on EUT SMC 11000TLRP-10. Tests of the EUT SMC 11000TLRP-10 not applicable for the model(s) SMC 9000TLRP-10 and SMC 10000TLRP-10 were performed on the concerned model(s) and a statement is given at the relevant test.

Default interface protection settings according EN 50438:2007:		
Parameter	**Max. clearance time**	**Trip setting**
Over voltage	0,2s	230V +15% (264,5V)
Under voltage	1,5s	230V -15% (195,5V)
Over frequency	0,5s	50Hz +2% (51,0Hz)
Under frequency	0,5s	50Hz -6% (47,0Hz)
Reconnection time	>=20s	
Permanent DC-injection	0,5% of rated inverter output current	
Loss of main DIN V VDE V 0126-1-1:2006	Inverter shall detect and disconnect within 5s	
The stated currents and voltages are 'true r.m.s.'-values. The voltages in this table are - phase-to-neutral in 230 V single phase systems and 230/400 V systems, - phase-to-phase in a multiphase 230 V system.		
*Over voltage – stage1: 10min mean value corrsponding to EN 50160 Tolerances on trip values: - Voltage: +/- 1% of the nominal voltage; - Frequency: +/- 0,5% of the nominal frequency - Clearance time: +/- 10%		

EN 50438:2007			
Clause/§	**Requirement:**	**Remark:**	**Verdict**
1	**Scope (Micro-generators up to 16A on the public low-voltage grid)**		
2	**Normative references**		
	EN 50110 series		
	EN 50160		
	EN 60255-6		
	EN 60664-1		
	EN 61000-3-2		
	EN 61000-3-3		
	EN 61000-6-1		
	EN 61000-6-3:2001 + A11:2004		
	HD 384 / HD 60364 series		
	IEC 60364-5-55		
3	**Terms and definitions**		
4	**Connection requirements:**		
4.1	The electrical installation.....:	The installation shall be in compliance with HD 384 series and national and local regulation.	**P**
4.1.1	Installation instructions.....:	Maintenance in accordance with the instructions issued by the manufacturer	**P**
4.1.2	Over-current protection……..:	The manufacturer recommends an over-current protection device in the manual	**P**
4.1.3	Earthing……....:	Earthing shall be according to HD 384.5.54 / IEC 60364-5-55 and the relevant national standards.	**P**
4.2	Interface protection		**P**
4.2.1	General……:	The interface protection, monitoring and control functions are integral part of the inverter.	**P**
4.2.1.1	Default settings versus national settings……:	Default settings of table 2 are applied	**P**

EN 50438:2007			
Clause/§	**Requirement:**	**Remark:**	**Verdict**
4.2.1.2	Response to protection operation……:	Response to protection operation was tested by “BGFE Berufsgenossenschaft der Feinmechanik und Elektrotechnik“ Report No.: UB.010.17/07-3625-127 Adress: Berufsgenossenschaft der Feinmechanik und Elektrotechnik Gustav-Heinemann-Ufer 130 50968 Köln The requirements of functional safety with regard to the changeover to be met. The VDE0126-1-1 test report is stored on Server Bureau Veritas Consumer Products Services Germany Server. Project: 12TH0525.	**P**
4.2.1.3	Accessibility of isolation switching devices…….:	The unit is transformerless and provides two relays in series in line and neutral.	**P**
4.2.1.4	Place of the interface protection……..:	The interface protection is integral part of the inverter and conform to EN 60255-6 or equivalent. The manufacturer declares conformity of his product to this standard within the CE declaration of conformity.	**P**
4.2.1.5	Changing settings of the interface protection……:	It is not possible for the user to alter the interface protection settings	**P**
4.2.1.6	Combined protection devices for multiple generators……:	The proper combined working of the protection is ensured	**P**
4.2.2	Interface protection settings……..:	Default interface protection settings are applied, see table 4.2.2 below	**P**

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Clause/§	**Requirement:**	**Remark:**	**Verdict**
4.2.3	Loss of Mains protection……..:	Response to protection operation was tested by “BGFE Berufsgenossenschaft der Feinmechanik und Elektrotechnik“ Report No.: UB.010.17/07-3625-127 Adress: Berufsgenossenschaft der Feinmechanik und Elektrotechnik Gustav-Heinemann-Ufer 130 50968 Köln 3.7 Recognition of an isolated operation. A recognition of the island formation is the process of "escalating frequency drift” (report V3) or impedance measurement (report V2). Here is an algorithm in the control ensured that a frequency drift is increased (up or down) in the current direction. This leads to an activation of the monitoring frequency. In addition, the phase angle of voltages to + - 30 ° monitored. The tests performed are documented in (1) Section 6 and Annex 9. The trip time was under 500ms in all test cases. The limit of 5 seconds is observed. The VDE0126-1-1 test report is stored on Server Bureau Veritas Consumer Products Services Germany Server. Project: 12TH0525.	**P**
4.2.4	Automatic reconnection after a network outage…:	>20s, see table 4.2.2 below	**P**
4.2.5	Synchronisation……..:	Automatic synchronisation of the inverter	**P**
5	Power quality:		
5.1	Electromagnetic emission / immunity……..:	The inverter complies with the requirements of the EMC directive, see attached EMC report in Annex 1	**P**
	EN 61000-6-1 (immunity)		**P**
	EN 61000-6-3 + A11 (emission)		**P**
	EN 61000-3-2 (harmonics)		**P**
	EN 61000-3-3 (voltage fluctuations and flicker)		**P**

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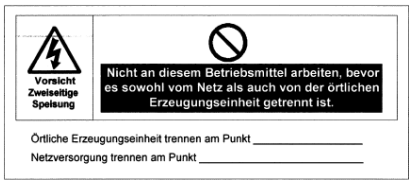
Clause/§	**Requirement:**	**Remark:**	**Verdict**
5.2	DC injection……:	Response to protection operation was tested by “BGFE Berufsgenossenschaft der Feinmechanik und Elektrotechnik“ Report No.: UB.010.17/07-3625-127 Adress: Berufsgenossenschaft der Feinmechanik und Elektrotechnik Gustav-Heinemann-Ufer 130 50968 Köln 3.6 DC monitoring The disconnection takes place through both channels with a DC current from exceeding <1A within 200 ms. The estimated measurement uncertainty of the DC component was 100mA. The VDE0126-1-1 test report is stored on Server Bureau Veritas Consumer Products Services Germany Server. Project: 12TH0525. The permanent DC injection see below table 5.2.	**P**
5.3	Power factor……:	See table 5.3 below	**P**
6	**Operation and safety of the micro-generator**		
6.1	General……:	The unit operates safely over the declared operating range	**P**
6.2	Safety……:	This standard does not cover safety of DNO personnel.	**P**
6.3	Information plate……:	At least information of manufacturers name, identification, rated power, nom. voltage, nom. frequency, phases and power factor, see above marking plate.	**P**
6.4	Labelling……..:	The unit provides the following warning label:  	**P**
6.5	Maintainance and routine testing……:	The manufacturer provides information for maintainance in the manual. The units are routine tested in the factory.	**P**

EN 50438:2007			
Clause/§	**Requirement:**	**Remark:**	**Verdict**
7	**Commissioning**		
7.1	General		**P**
	The micro-generator (including the interface protection) shall fulfil the requirements of this standard and the other applicable standards…….:	Noticed	**-**
	The manufacturer shall provide an installation instruction in accordance with this standard and national or regional requirements……:	Verified, see manual.	**-**
	Access to the interface protection shall be tamper-proof……:	Access just via password, provided by the manufacturer	**-**
	The micro-generator shall be type tested against the interface requirements of this standard……:	Noticed, see test tables below	**-**
	The installation shall be carried out by installer with recognised and approved qualification	Not scope of investigation	**-**
7.2	Installation	Not scope of investigation	**N/A**
7.3	Notification		**N/A**
7.4	Decommissioning arrangements		**N/A**
7.5	Replacement arrangements		**N/A**
	Annex		
A (normative)	**Interface protection settings, national deviations**	No specific national settings are supplied, the default settings in 4.2.2, table 2 are applicable	**N/A**
B (informative)	**Notification sheets**		**N/A**
C (informative)	**Interface protection**	Noticed	**P**
D (informative)	**Type certification test results sheet**	Noticed	**P**
E (informative)	**Countries allowing extensions of the scope >16A**		**N/A**
F (informative)	**Abbreviations**	Noticed	**P**
G (informative)	**A-deviations**		**N/A**

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Clause	**Test**	**Result**
4.2.1.2	Response to protection operation	**P**
4.2.2	Interface protection settings	**P**
4.2.3	Loss of Mains protection	**P**
4.2.4	Automatic reconnection after a network outage	**P**
5.1	Harmonic current emission	**P**
5.1	Voltage fluctuation and flicker	**P**
5.2	DC injection	**P**
5.3	Power factor	**P**