TEST REPORT

UTE C15-712-1

Photovoltaic installations connected to the public distribution network

Report reference number ..... :	**PVFR140508N005**
Date of issue ..... ……..:	2014-08-07
Total number of pages ..... ……..:	164
Testing laboratory name ..... :	**Bureau Veritas Shenzhen Co., Ltd. Dongguan Branch**
Address ..... :	No. 34, Chenwulu Section, Guantai Rd., Houjie Town, Dongguan City, Guangdong 523942, China
Applicant's name ..... :	**Shenzhen SOFARSOLAR Co., Ltd.**
Address ..... :	3A-1, Huake Building, East Technology Park, Qiaoxiang Road, Nanshan District, Shenzhen, China.
Test specification	
Standard ..... :	UTE C15-712-1:2010-07, UTE C 15-712-1Rec0:2010-09, UTE C 15-712-1Rec1:2012-02, UTE C15-712-1:2013-07 (Protections des installations de production raccordées Identification au réseau public de distribution, ERDF-NOI-RES_13E, Version 5, 01/05/2014)
Certificate ..... :	**Certificate of compliance**
Test report form number. ..... :	UTE C15-712-1
Master TRF ..... :	Bureau Veritas Consumer Products Services Germany GmbH
Test item description ..... :	**Grid-tied photovoltaic inverter**
Trademark ..... :	
Model / Type ..... :	SOFAR 1100TL, SOFAR 1600TL, SOFAR 2200TL, SOFAR 2700TL, SOFAR 3000TL

Ratings ..... :	SOFAR 1100TL	SOFAR 1600TL	SOFAR 2200TL	SOFAR 2700TL	SOFAR 3000TL
MPP DC voltage range [V] ..... :	110-380	165-380	170-450	210-450	230-450
Input DC voltage range [V] ..... :	90-400, max. 450		100-480, max. 500		
Input DC current [A] ..... :	Max.10		Max.13		
Output AC voltage [V] ..... :	230, 50Hz				
Output AC current [A] ..... :	Max.4,5	Max.7,0	Max.9,5	Max.11,5	Max.13,0
Output power [kW] ..... :	1,0	1,5	2,0	2,5	2,8

Testing Location ..... :	**Bureau Veritas Shenzhen Co., Ltd. Dongguan Branch**
Address ..... :	No. 34, Chenwulu Section, Guantai Rd., Houjie Town, Dongguan City, Guangdong 523942, China
Tested by (name and signature) ..... :	James Huang
Approved by (name and signature) ..... :	Ted Wu
Manufacturer's name ..... :	**Shenzhen SOFARSOLAR Co., Ltd.**
Factory address ..... :	No. 8, Fulong road, Qingxi town, Dongguan city, Guangdong, China.

Document History

Date	Internal reference	Modification / Change / Status	Revision
2014-08-07	James Huang	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]..... :	SOFAR 1100TL, SOFAR 1600TL, SOFAR 2200TL: 11kg SOFAR 2700TL, SOFAR 3000TL: 12kg

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..... :	2014-05-08
Date(s) of performance of test..... :	2014-05-08 to 2014-07-09

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.

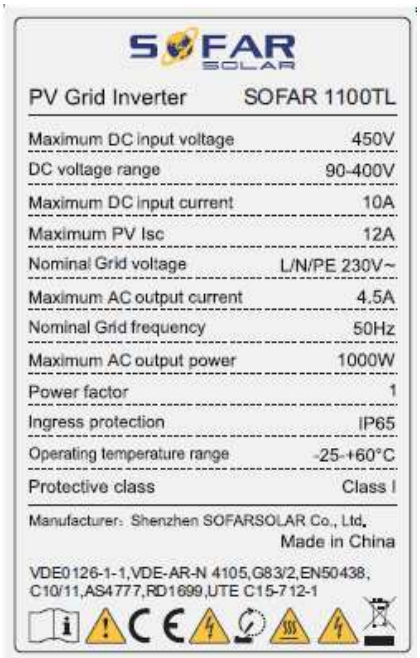
”(see Annex #)" refers to additional information appended to the report.
"(see appended table)" refers to a table appended to the report.

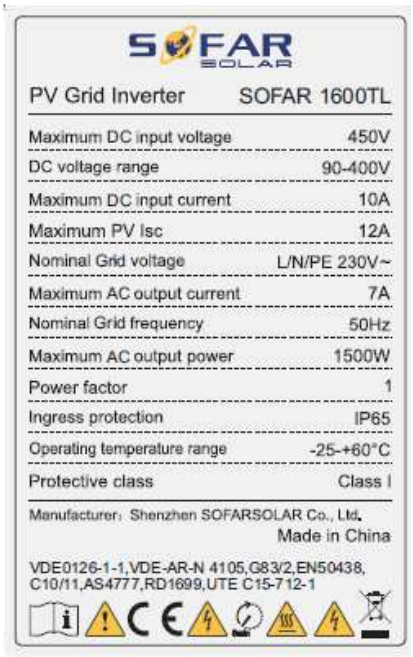
Throughout this report a comma is used as the decimal separator.

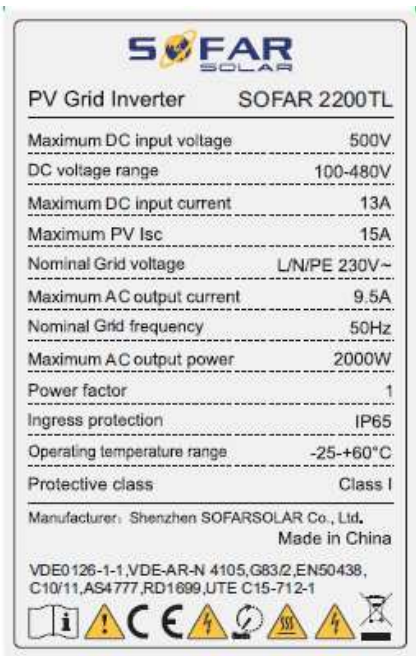
This Test Report consists of the following documents:

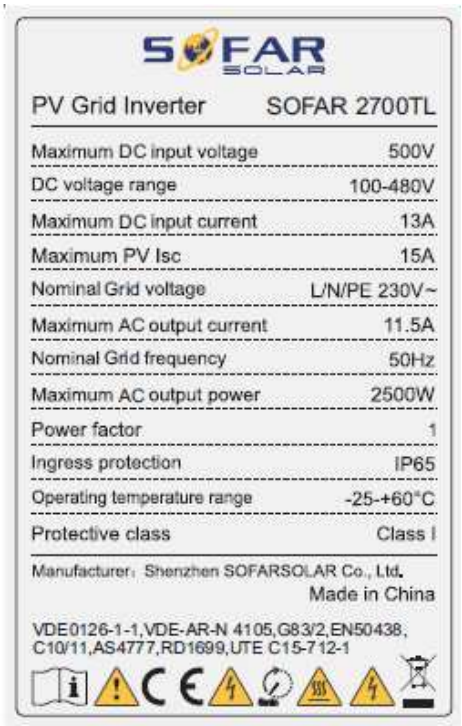
1. Test Results
2. Annex No. 1 – DIN V VDE V 0126-1-1:2006-02 Test Report
3. Annex No. 2 – IP test report
4. Annex No. 3 – EMC Test Report
5. Annex No. 4 – Pictures of the unit
6. Annex No. 5 – Test equipment list

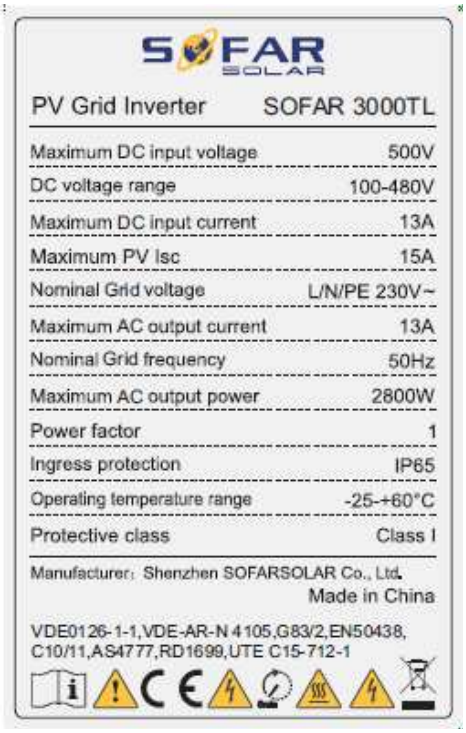
Copy of marking plate:











Required markings on the inverter

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 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 a single error.

Description of the electrical circuit:

The internal control is redundant built. It consists of Microcontroller Master DSP (UC34) and Slave DSP (UC35).

The Master DSP control the relays (RYP2-RYP5) by switching signals; measures the PV voltage, PV current, Bus voltage, grid voltage, frequency, AC current with injected DC and the array insulation resistance to ground. In addition it tests the current sensors and the RCMU circuit before each start up.

The Slave DSP (UC35) is measures the grid voltage, AC current, grid frequency and residual current, also can switch off the relays (RYP2-RYP5) independently, and communicate with Master DSP (UC34) each other.

The current is measured by a current sensor. The AC current signal and the injected DC current signal are sent to the Master DSP (UC34). The Master DSP (UC34) tests and calibrates before each start up all current sensors.

The unit provides two relays in series in all output conductors. When single fault applied to one relay, alarm an error code in display panel, another redundant relay provides basic insulation maintained between the PV array and the mains. All the relays are tested before each start up.

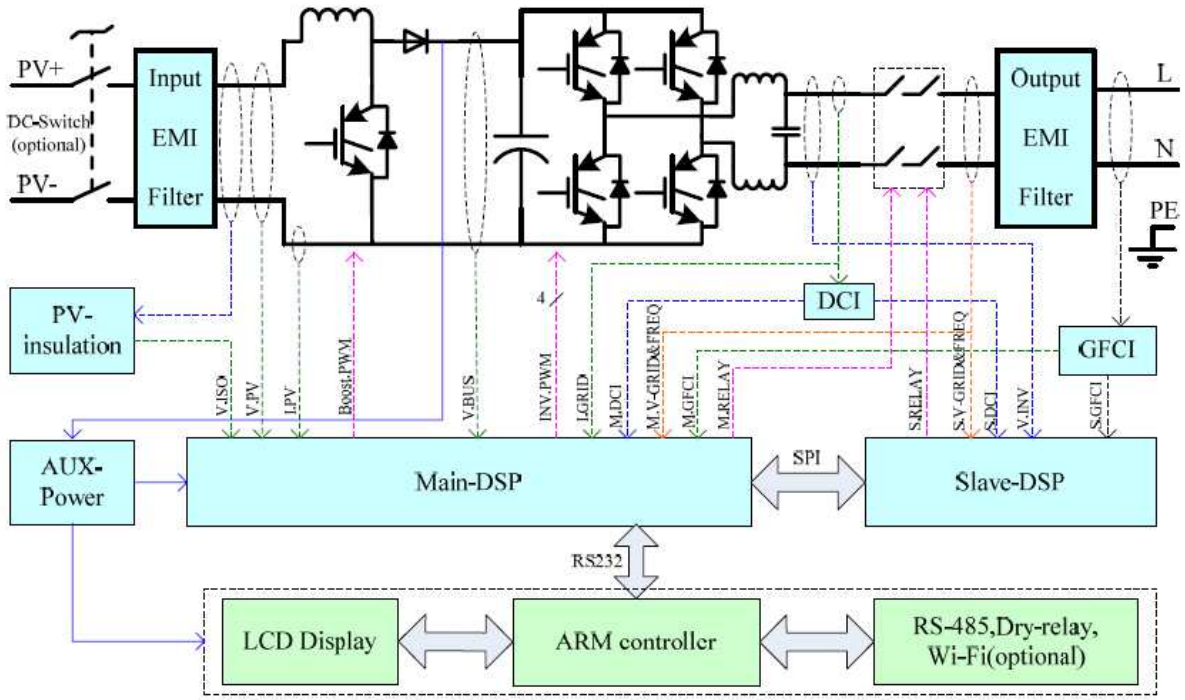


Figure 1 Block diagram

The product was tested on:

Hardware version: V1.00
Software version: V1.00

Description of the differences of the models within a series:

The models SOFAR 1100TL, SOFAR 1600TL, SOFAR 2200TL, SOFAR 2700TL and SOFAR 3000TL are same as in hardware except the components are in the different table. Identical in software the output power just adjusted by software.

Difference table					
	SOFAR 1100TL	SOFAR 1600TL	SOFAR 2500TL	SOFAR 2700TL	SOFAR 3000TL
Boost inductor	2,6mH	2,6mH	1,9mH	1,9mH	1,9mH
Resistor (RP105, RP108 /RP189,RP109)	220ohm / 10Kohm	220ohm / 10Kohm	200ohm / 7,5Kohm	200ohm / 7,5Kohm	200ohm / 7,5Kohm
BUS capacitor (ECP1, ECP2, ECP3, ECP4)	2 pcs	2 pcs	3 pcs	3 pcs	3 or 4 pcs
Inverter inductor	3,4mH	2,3mH	2,1mH	1,5mH	1,3mH
Resistor (RP118, RP119, RC18 /RP120, RP121,RC22)	499 Ω, 200 Ω, 200 Ω	1 KΩ, 200 Ω, 100 Ω	1 KΩ, 330 Ω, 330 Ω	2 KΩ, 100 Ω, 100 Ω	2 KΩ, 100 Ω, 100 Ω
DC switch and Wi-Fi module are optional.					

All tests were performed on EUT SOFAR 3000TL. Tests of the SOFAR 3000TL not applicable for the model(s) SOFAR 1100TL, SOFAR 1600TL, SOFAR 2200TL and SOFAR 2700TL were performed on the concerned model(s) and a statement is given at the relevant test.

The following deviations for France according DIN V VDE V 0126-1-1/A1 VFR2014 has been applied according Protections des installations de production raccordées Identification au réseau public de distribution, ERDF-NOI-RES_13E, Version 5, 01/05/2014.		
Parameter	**Max. clearance time**	**Trip setting**
Over voltage	200ms	264,5V
Under voltage	200ms	184,0V
Over frequency	200ms	50,60Hz
Under frequency	200ms	47,50Hz
Reconnection time	>=30s	>=30s

UTE C15-712-1			
Clause/§	**Requirement**	**Remark**	**Verdict**

1	**Introduction** The use of photovoltaic generators is growing for a variety of reasons, such as the generation of electricity in places that are difficult to access by public distribution networks or the development of renewable energy with production fed into the public network. The development of such generators requires the specification of implementation rules, which are the subject of this guide. The application of these rules does not remove the need to observe administrative regulations by which certain installations are bound.
2	**Applicability** This guide deals with low-voltage photovoltaic installations connected to the low-voltage or high-voltage public distribution network. The a.c. modules (PV module and associated inverter) are not included in this guide. The installation of these is subject to the regulations set down in NF C 15-100. The only issue covered in this guide is operation under voltage on the public distribution network.
3	**Normative references**
	NF EN 50380 (C 57-201)
	NF EN 50521 (CF57-339)
	NF EN 60269-1 (C 60-200-1)
	NF EN 60904-3 (C 57-323)
	NF EN 60947-1 (C 63-001)
	NF EN 60947-2 (C 63-120)
	NF EN 60947-3 (C 63-130)
	NF EN 61215 (C 57-105)
	NF EN 61439
	NF EN 61557-8 (C 42-198-8)
	NF EN 61643-11 (C 61-740)
	NF EN 61646 (C 57-109)
	NF EN 61730-1 (C 57-111-1)
	NF EN 61730-2 (C 57-111-2)
	NF EN 62262 (C 20-015)
	NF EN 62305-1 (C 17-100-1)
	NF EN 62305-2 (C 17-100-2)
	NF EN 62305-3 (C 17-100-3
	NF C 14-100
	NF C 15-100
	NF C 17-102
	UTE C 15-105

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Clause/§	**Requirement**	**Remark**	**Verdict**
	UTE C 15-400		
	UTE C 15-520		
	UTE C 32-502		
	UTE C 17-100-2		
	UTE C 61-740-51		
	UTE C 61-740-52		
	UTE C 17-108		
	DIN VDE 0126-1-1		
	DIN EN61000-6-3		
4	In addition to the definitions set out in NF C 15-100, the following definitions apply to this guide:	Noticed.	**P**
5	Description of PV installations	Noticed.	**P**
6.	**Earthing of the installation**		**P**
6.1	**Diagrams showing bonding of alternating current part with earth** The earthing system has been produced in accordance with the requirements of NF C 15-100.	Must be taken under consideration for the installation.	**N/A**
6.2	**Earthing of one polarity in the d.c. part** In a PV installation, the protection devices against indirect contact are independent of the principle of the earthing systems. The direct current part is created in accordance with the rules for class II or equivalent isolation.	Must be taken under consideration for the installation.	**N/A**
6.3	**Earthing of conductive masses and elements**		**P**
6.3.1	**Direct current part** To minimise the effects of induced overvoltages, the metal structures of the modules and the metal support structures (including the metal cable runs) must be connected to equipotential bonding, which in turn is connected to the earth.	Must be taken under consideration for the installation.	**N/A**
6.3.2	**Alternating current part** All chassis on the a.c. side must be connected to the earth via a protective conductor that meets the requirements of paragraph 411.3.1.2 and section 5-54 of NF C 15-100. If a transformer is installed outside the inverter (low voltage/low voltage or high voltage/low voltage transformer), equipotential bonding is required between these items of equipment.	Must be taken under consideration for the installation.	**N/A**

UTE C15-712-1			
Clause/§	**Requirement**	**Remark**	**Verdict**
6.3.3	**Inverter** The inverter body must be connected to the equipotential bonding via a conductor with a minimum cross-section of 6mm² Cu or equivalent and to the protective conductor of the a.c. part.	A minimum cross-section of the protective earthing wire of 4mm² is required in the manual.	**P**
7.	**Protection against electric shock**		**P**
7.1	**General points** The PV equipment of the direct current part must be treated as being under voltage, even if it is disconnected from the alternating current part.		**P**
7.2	**Protection against direct contact**		**P**
7.2.1	**General case** Electrical equipment must be fitted with a form of protection either by insulation of the live parts or through a casing	The unit is rated IP65.	**P**
7.2.2	**Particular case of safety extra-low voltage and protective extra-low voltage** If the nominal voltage of the safety extra-low voltage circuit is less than or equal to 25 V rms a.c. or 60 V d.c. without ripple, protection against direct contact through insulation of the live parts or a casing is not necessary.	An applicable test report must be provided by the manufacturer.	**N/A**
7.3	*Protection against indirect contact*		
7.3.1	**General points** The regulations for protection against indirect contact are set out in section 4-41 of NF C 15-100. The circuits covered by 411.3.3 of standard NF C 15-100 and, in particular, circuits in residential buildings must be protected with a differential device with a sensitivity of 30 mA or less.	Must be taken under consideration for the installation.	**N/A**
7.3.2	**Direct current part** For the direct current part (PV modules, junction boxes, chain cables, group cables, marshalling boxes or cabinets, etc.), protection against indirect contact must be ensured	Must be taken under consideration for the installation.	**N/A**
7.3.2.1	**Protection with safety extra-low voltage or protective extra-low voltage** The requirements of article 414 of standard NF C 15-100 must be applied. The voltage UocMAX must not exceed 120 V.	Unit is rated for PV voltages above 120V	**N/A**
7.3.2.2	**Protection with double or reinforced insulation** The requirements of article 412 of standard NF C 15-100 must be applied.	Must be taken under consideration for the installation.	**N/A**

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Clause/§	**Requirement**	**Remark**	**Verdict**
7.3.3	**Alternating current part** Protection against indirect contact is ensured through double or reinforced insulation or by an automatic cut-out of the supply, according to one of the following measures: • In a TT system: cut-out on the first fault; • In a TN system: cut-out on the first fault; • In an IT system: cut-out on the second fault.	The unit is only intended for TT or TN systems. The unit is rated class 1. In combination with the required differential device in clause 7.3.1 no hazard can occur in single fault.	**P**
8	**Overcurrent protection**		**N/A**
8.1	**Direct current part**		**N/A**
8.1.1	**General points** See figure 6 of this standard	Must be taken under consideration for the installation.	**N/A**
8.1.2	**Protection of PV modules** In an installation with several PV module chains in parallel, the modules must be protected against the effect of reverse currents that may be generated in the chains in the event of a fault.	Must be taken under consideration for the installation.	**N/A**
8.1.3	**Protection of PV chain cables** The sizing of the PV chain cables takes into account the choice of protection device for the PV modules adopted in 8.1.2.	Must be taken under consideration for the installation.	**N/A**
8.1.4	**Protection of PV group cables** In an installation with several PV groups in parallel, the cables for the groups must be protected against the effect of reverse currents caused by a short circuit in a group.	Must be taken under consideration for the installation.	**N/A**
8.1.5	**Protection of main PV cable** The main cable of a PV generator must be dimensioned with a permissible current Iz greater than or equal to 1.25 IscSTC_gen.	Must be taken under consideration for the installation.	**N/A**
8.1.6	**Characteristics of overcurrent protection devices** The overcurrent protection devices must be either fuses compliant with standard NF EN 60269-1 or circuit-breakers compliant with standard NF EN 60947-2. These devices must be implemented for both polarities, regardless of the configuration of the installation.	Must be taken under consideration for the installation.	**N/A**
8.2	**Alternating current part**		**N/A**

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Clause/§	**Requirement**	**Remark**	**Verdict**
8.2.1	**General points** In the case of an installation connected to the network via a branch line with limited power, the minimum cross-section of the conductors connected to the terminals downstream of the general isolating and protection device is 10 mm2 Cu.	Must be taken under consideration for the installation.	**N/A**
8.2.2	**Overload protection** Alternating current circuits are protected against surges in accordance with the requirements of article 433 of standard NF C 15-100.	Must be taken under consideration for the installation.	**N/A**
8.2.3	**Short-circuit protection** In the case of a short circuit in an inverter or its line, the inverter is regarded as the load and the public network as the source.	Must be taken under consideration for the installation.	**N/A**
9.	**Tripping device** This protection device is designed to disconnect generators in the event of: • a fault on the public distribution network; • a failure in the supply from the public distribution network; • fluctuations in the voltage or frequency greater than those specified by the distributor.	The unit provides a integral disconnection facility according to VDE 0126-1-1 an it is rated below 250kW	**P**
10	**Prevention of degradation of photovoltaic installations** In order to prevent the degradation of PV installations due to specific external influences and the presence of direct current, and despite the implementation of measures such as the installation of double insulation and monoconductor cables, additional measures must be implemented for the direct current part.	The inverter is applicable to be used for no galvanic insultion and PV array not earthed.	**P**
11	**Voltage drop**		
11.1	**General points** The objective of technical and commercial optimisations is to minimise voltage drops.	Must be taken under consideration for the installation.	**N/A**
11.2	**Direct current installation** The authorised maximum drop in voltage in the direct current part of the installation is between 3% and ImppSTC (STC: standard test conditions).	Must be taken under consideration for the installation.	**N/A**

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Clause/§	**Requirement**	**Remark**	**Verdict**
11.3	**Alternating current installation** For PV installations connected directly to the LV public distribution network, the maximum authorised drop in voltage between the a.c. terminals of the inverter and the point of delivery (NF C 14-100) is 3% at the nominal power of the inverter(s). It is recommended to limit this drop in voltage to 1% in order to be able to limit energy losses on the one hand and momentary disconnection of the inverter on the other, maintaining a margin between the average operating voltage of the inverter and the setting of its protection at maximum voltage.	Must be taken under consideration for the installation.	**N/A**
12.	**Disconnectors and circuit-breakers**		**N/A**
12.1	**General points** When choosing and installing circuit-breakers and disconnectors between the PV installation and the public distribution network, the network must be regarded as the source and the PV installation as the load.	Must be taken under consideration for the installation.	**N/A**
12.2	**Disconnectors** To facilitate maintenance of the PV inverters, disconnection mechanisms must be installed close to the inverter, on both direct current and alternating current sides.	Must be taken under consideration for the installation.	**N/A**
12.3	**Emergency circuit-breakers**	Must be taken under consideration for the installation.	**N/A**
12.3.1	**General points** To allow maintenance work on junction boxes fitted with protection devices, a circuit-breaker must be installed inside or immediately downstream of these protection devices	Must be taken under consideration for the installation.	**N/A**
12.3.2	**Direct current part**		**N/A**
12.3.2.1	**General measures** The emergency disconnection can be ensured by manual control of the circuit-breaker or via a remote control action.	Must be taken under consideration for the installation.	**N/A**
12.3.2.2	**Measures specific to residential buildings** In conformity with the regulations set down in article 771.463 of standard NF C 15-100, the emergency circuit-breakers must be tripped by a direct manual action.	Must be taken under consideration for the installation.	**N/A**
12.3.3	**Alternating current part**		**N/A**

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Clause/§	**Requirement**	**Remark**	**Verdict**
12.3.3.1	**General measures** The emergency disconnection can be ensured by manual control of the circuit-breaker or via a remote control action.	Must be taken under consideration for the installation.	**N/A**
12.3.3.2	**Measures specific to residential buildings** If the route between the inverter and the network passes through the residential part, the emergency circuit-breaker of the PV installation must be installed in the residential service duct of the building, if there is one, in accordance with articles 771.463 and 771.558 of standard NF C 15-100.	Must be taken under consideration for the installation.	**N/A**
12.3.3.3	**Cut-out for intervention by emergency services** If a cut-out is required to allow the intervention of the emergency services, this must be triggered by one of the following events:	Must be taken under consideration for the installation.	**N/A**
13	**Protection from surges emanating from the atmosphere or caused by operations1**		**N/A**
13.1	**General points** The information contained in this chapter refers to overvoltage protection for photovoltaic installations connected to the network and complements standard NF C 15-100 and guide UTE C 61-740-52.	Must be taken under consideration for the installation.	**N/A**
13.1.1	**Types of protection**		**N/A**
13.1.1.1	**Protection through equipotential bonding** As described in section 6.3, an equipotential bonding conductor must connect all the metal structures of the modules and the metal structures of the supports of the PV installation (including the metal cable runs) whether or not lightning conductors are present. This conductor must be connected to the earth.	Must be taken under consideration for the installation.	**N/A**
13.1.1.2	**Protection by lightning arresters** The installation conditions are described in 13.2.	Must be taken under consideration for the installation.	**N/A**
13.2	**Installation conditions for lightning arresters**		**N/A**
13.2.1	**Installation conditions for lightning arresterson a.c. side** Based on guide UTE C 61-740-52, protection by a lightning arrester is obligatory if there is a lightning conductor or if the lightning density (Ng) is greater than 2.5.	Must be taken under consideration for the installation.	**N/A**
13.2.2	**Installation conditions for lightning arresters on d.c. side**		**N/A**

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Clause/§	**Requirement**	**Remark**	**Verdict**
13.2.2.1	**Installation without lightning conductor** The length L is the accumulated distance between the inverter(s) and the furthest points of the photovoltaic modules comprising the chain, as a sum of the lengths of the routes in accordance with the principles shown in Figure 7.	Must be taken under consideration for the installation.	**N/A**
13.2.2.2	**Installation with lightning conductor** The installation of type 2 lightning conductor(s) is obligatory on the d.c. side.	Must be taken under consideration for the installation.	**N/A**
13.3	**Overvoltage protection for installations without lightning conductor**		**N/A**
13.3.1	**Choice and installation of lightning arresters on a.c. side** If a lightning arrester is prescribed for the a.c. part of a PV installation connected to the public low-voltage distribution network, it is always installed in the panel nearest to the installation origin of the installation. If this lightning arrester is located more than 10 metres away from the inverter, a second lightning arrester must be installed near the latter.	Must be taken under consideration for the installation.	**N/A**
13.3.2	**Choice and installation of lightning arresters on d.c. side** If a lightning arrester is prescribed for the d.c. part of a PV installation, it is always installed in the panel nearest to the inverter. If one of the chains is located more than 10 metres away from the inverter, the installation of a second lightning arrester near the chains is recommended.	Must be taken under consideration for the installation.	**N/A**
13.3.3	**Choice of I_n** The lightning arresters are type 2 with a minimum value for the nominal discharge current In of 5 kA. A higher nominal discharge current than the required value will prolong the service life of the lightning arrester.	Must be taken under consideration for the installation.	**N/A**
13.3.4	**Choice of I_{max}** This parameter is used to coordinate the energy of the lightning arresters: please refer to information from the manufacturer.	Must be taken under consideration for the installation.	**N/A**
13.3.5	**Choice of U_p** The value of U_p must be less than 80% of the surge withstand voltage of the equipment to be protected.	Must be taken under consideration for the installation.	**N/A**

UTE C15-712-1			
Clause/§	**Requirement**	**Remark**	**Verdict**
13.3.6	**Choice of U_{CPV}** The value of the maximum permissible voltage from the lightning arrester UCPV must be selected according to the maximum open-circuit voltage of the PV generator corresponding to the voltage UocSTC specified by the manufacturers of the PV modules. The voltage UCPV must be greater than or equal to the maximum voltage UocMAX of the photovoltaic generator. Whatever the protection methods of the lightning arrester, it must also withstand the maximum voltage UocMAX between these live terminals (+ and - terminals) and the earth.	Must be taken under consideration for the installation.	**N/A**
13.3.7	**Choice of I_{SCWPV} and protection device associated with the lightning arrester** The lightning arrester must be fitted with an external disconnection device, if specified by the manufacturer; this assembly must be sized to function regardless of the current produced by the PV modules.	Must be taken under consideration for the installation.	**N/A**
13.4	**Additional regulations for surge protection for installations with a lightning conductor** The regulations are set out in guide UTE C 61-740-52.	Must be taken under consideration for the installation.	**N/A**
14.	**Choice and installation of equipment**		**P**

UTE C15-712-1			
Clause/§	**Requirement**	**Remark**	**Verdict**
14.1	**General points** The rated operating voltage of all the equipment of the d.c. part must be equal to or greater than the voltage UOCMAX. In the case of buildings with multiple occupation (for tertiary or residential use) with photovoltaic production in communal parts, the lines coming from the PV modules must be routed round the outside of private areas to the junction boxes for the chain/group located in the communal areas or in the buildings or the electrical service site dedicated to this purpose. The equipment installed outside must have a minimum degree of protection of IP44. The degree of protection against mechanical impacts must be at least IK07 in compliance with standard NF EN 62262 (C 20-015). It must be possible to carry out work on the removable equipment, devices and connections in the utmost safety. If a transformer is installed, the inverters and any general low-voltage panel must be installed close to the transformer in the same room or in adjoining rooms. The location of equipment (junction box(es), inverter(s), cabinets with protection devices and meter cabinets etc.) must comply with article 513.1 of standard NF C 15-100. Special regulations for residential buildings are given in article 771. The equipment, including the ducts etc., must be arranged so that they can be operated, inspected and serviced easily and their connections can be accessed.	The inverter is rated IP65 and IK07. For IP see attached test report. For IK see test results below.	**P**
14.2	**Ducts etc.**		**N/A**
14.2.1	**Choice for the d.c. part** The ducts are sized in accordance with the regulations in standard NF C 15-100 on the basis of cables with reticulated polyethylene insulation.	Must be taken under consideration for the installation.	**N/A**
14.2.2	**Installation** The connections and the cables must be installed in a manner that will prevent any deterioration due to external influences. See the requirements set out in guide UTE C 15-520.	Must be taken under consideration for the installation.	**N/A**
14.3	**PV modules** The PV modules must comply with the standards in series NF EN 61730.	Must be taken under consideration for the installation.	**N/A**

UTE C15-712-1			
Clause/§	**Requirement**	**Remark**	**Verdict**
14.4	**Inverters** The level of the current for the inverter must be based on I_{mppSTC}.	Must be taken under consideration for the installation.	**N/A**
14.5	**Equipment** All equipment installed in the d.c. part must be adapted for operation in direct current and be selected and installed in accordance with the manufacturer's instructions. Equipment installed in the d.c. part must be of the industrial type, in other words compliant with the NF EN 60947 series of standards. • The characteristics of switches, switch-disconnectors and fuse-combination units must conform to the operating category DC21B. • The characteristics of disconnectors must conform to the operating category DC20. • The characteristics of contactors must conform to the operating category DC1.	The internal DC switch of the inverter is rated for operation category DC21B. Connectors in the DC lines are rated for operation category DC1	**P**
14.6	**Equipment assemblies** The direct current and alternating parts of the installation can be accommodated in the same panel if there is a physical separation of these two parts. For the d.c. part, it is imperative to protect all the connections or disconnection devices against accidental or unauthorised opening when live in accordance with 536.2.3 of standard NF C 15-100. To this end, a notice "Do not operate when live" must be placed inside the boxes or cabinets near these disconnection devices. Furthermore, in premises accessible to persons other than those with the requisite authorisation or qualification (BA4 or BA5): • The design or installation must be such that it is only possible to disassemble the connection devices with the aid of a tool; • Equipment that does not have an under load circuit-breaking feature must require the either the use of a key or tool or the direct operation of a device with an under load circuit-breaking feature.	The PV input connectors can not be removed with out a aid of a tool. In addition there is a marking adjent the connectors with states "Do not operate when live"	**P**

UTE C15-712-1			
Clause/§	**Requirement**	**Remark**	**Verdict**
14.7	**Connectors** In the d.c. part, the connectors used must comply with the standard NF EN 50521. To guarantee the quality of the connection and limit the risks of an electric arc that could spark a fire, each pair of male and female connectors to be assembled must be of the same type and the same brand.	The unit provides only one type and brand of connectors for DC with male and female plugs, which are not interchangeable. The plugs are according to EN 50521.	**P**
14.8	**Lightning arresters**		**N/A**
14.8.1	**Choice of lightning arresters** The lightning arresters installed in the a.c. part of the PV installation must comply with standard NF EN 61643-11. The lightning arresters installed in the d.c. part of the PV installation must meet the requirements of guide UTE C 61-740-51.	The surge arrestors incoperated in the inverter are not according EN 61643-11 or UTE C 61-740-51. Therefore an external lightning protection must be installed.	**N/A**
14.8.2	**Installation of lightning arresters** Alternating current and direct current lightning arresters are installed in accordance with the regulations set out in guide UTE C 61-740-52.	Must be taken under consideration for the installation.	**N/A**
15	**Markings**		**P**
15.1	**Identification of components** The main components comprising the photovoltaic installations must be identified and marked with clearly visible labels fixed permanently in accordance with the installation plans and diagrams:	The inverter provides permanent marking.	**P**
15.2	**Labelling** For safety reasons and to alert the different people carrying out work in and around the building (staff tasked with maintenance work, inspectors, public distribution network operators, emergency services, etc.), it is imperative that the presence of a photovoltaic installation on a building is indicated.		**P**
15.2.1	**Labelling on the a.c. part**	Must be taken under consideration for the installation.	**N/A**
15.2.2	**Labelling on the d.c. part** All the junction boxes (PV generator and PV groups) and d.c. ducts must carry a visible and permanent marking indicating that live parts within these boxes may remain under voltage even after the inverter has been disconnected on the direct current side.	Must be taken under consideration for the installation.	**N/A**

UTE C15-712-1			
Clause/§	**Requirement**	**Remark**	**Verdict**
15.3.2	**Labelling on the inverter** All inverters must bear a marking indicating that before any work is carried out, the two sources of voltage must be isolated.	The unit is provided with the applicable marking	**P**
16.	**Technical file** The technical file must include the following items drawn up in French: • A circuit diagram of the photovoltaic system; • The list of installed equipment mentioning the characteristics and references to the replacement parts (fuses, lightning arrester cartridges etc.); • An installation diagram for the various photovoltaic components and modules as well as the corresponding connections (ducts); • A description of the procedure for working on the photovoltaic system and safety instructions.	The required information are stated in the manual.	**P**
17.	**Maintenance of photovoltaic installations**		**N/A**
17.1	**General points** The minimal technical maintenance work must be provided for during the life cycle of a photovoltaic installation to maintain or restore the installation to a state in which it can fulfil the function for which it was designed.	Must be taken under consideration for the installation.	**N/A**
17.2	**Levels and frequency of maintenance** A distinction is made between the following three levels of maintenance comprising: • Conditional maintenance based on monitoring of the key parameters of the installation; • Precautionary maintenance carried out according to the prognoses extrapolated from the analysis and evaluation of the key parameters concerning the degradation of the asset (e.g. corrosion); • Systematic maintenance carried out at predetermined intervals and without a prior check of the state of the product or its constituent components.	Must be taken under consideration for the installation.	**N/A**
17.3	**Technical areas covered during maintenance** A distinction is made between operations relating to the safety of persons and property, and actions relating to functional reliability.	Must be taken under consideration for the installation.	**N/A**

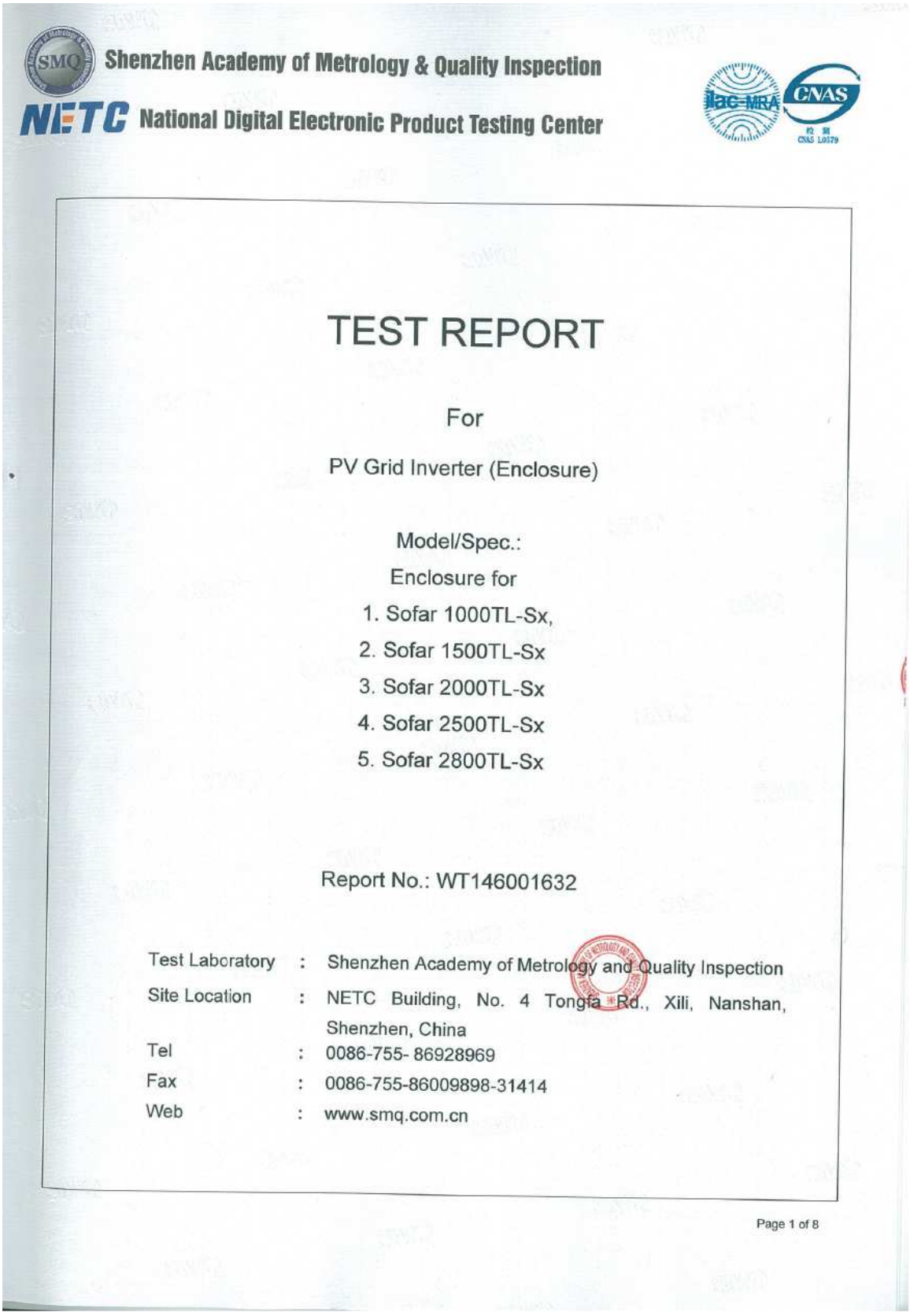
UTE C15-712-1			
Clause/§	**Requirement**	**Remark**	**Verdict**
Annex A **Agreements between the administrator of the public distribution network and the user/produce**			
A1	**Provisions for limiting effects adversely affecting supply quality** The study of the connection by the administrator of the public distribution network requires the communication of the characteristic data for the project, the generators and the provisions for connection to the network. The administrator of the public distribution network may disclose data sheets summarising the minimum list of data required to study the request.	Must be taken under consideration for the installation.	**N/A**
A2	**Choice of tripping device and approval** The installation or modification of a tripping device must be subject to an agreement with the administrator of the public distribution network. This process must take account of the situation and the features at the point of delivery and must therefore, where necessary, be coordinated with the connection study for the site.	Must be taken under consideration for the installation.	**N/A**
A3	**Start-up by the administrator of the public distribution network** For installations with a power of less than 250 kVA, this step is subject to prior submission of proof of conformity stamped by CONSUEL (Comité National pour la Sécurité des Usagers de l'Electricité, the National Committee for the Safety of Users of Electricity).	Must be taken under consideration for the installation.	**N/A**
Annex B **Cables for photovoltaic installations - values for permissible currents** (informative)			
	Specific cables for photovoltaic installations have been refined in order to meet the needs of these installations. The tables below, taken from document UTE C 32-502, give the values for the permissible currents for cables compliant with this guide.	Must be taken under consideration for the installation.	**N/A**
Annex C **Keraunic levels in France and in the overseas departments** (informative)			
	Note – To obtain the corresponding lightning density (Ng), simply divide Nk by 10.		**---**

Test Results

14.1 IEC 60068-2-75 (Hammer test)										**P**
Use methode	Swing hammer			Spring hammer			Vertical hammer			
	N/A			N/A			P			
	Severity									
Repeats	3 Hits unless otherwise specified									
Energy (J)	0,14	0,2	0,35	0,5	0,7	1	2	5	10	20
Mass (kg)	0,25						0,5	1,7	5	5
Radius (mm)	10						25	25	50	50
IK code	IK01	IK02	IK03	IK04	IK05	IK06	IK07	IK08	IK09	IK10
	N/A	N/A	N/A	N/A	N/A	N/A	P	N/A	N/A	N/A

Note:

The complete test results are based on test reports of the Shenzhen Academy of Metrology & Quality Inspection.



Shenzhen Academy of Metrology & Quality Inspection

NETC National Digital Electronic Product Testing Center

TEST REPORT

For

PV Grid Inverter (Enclosure)

Model/Spec.:

Enclosure for

1. Sofar 1000TL-Sx,
2. Sofar 1500TL-Sx
3. Sofar 2000TL-Sx
4. Sofar 2500TL-Sx
5. Sofar 2800TL-Sx

Report No.: WT146001632

Test Laboratory	:	Shenzhen Academy of Metrology and Quality Inspection
Site Location	:	NETC Building, No. 4 Tongfa Rd., Xili, Nanshan, Shenzhen, China
Tel	:	0086-755- 86928969
Fax	:	0086-755-86009898-31414
Web	:	www.smq.com.cn

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Shenzhen Academy of Metrology & Quality Inspection

National Digital Electronic Product Testing Center

Report No.: WT146001632

Test Report Declaration

Applicant	:	Shenzhen SOFARSOLAR Co., ltd
Address	:	3A-1, Huake Building, East Technology Park, Qiaoxiang Road, Nanshan District, Shenzhen, China
Manufacturer	:	N/A
Address	:	N/A
Factory	:	Shenzhen SOFARSOLAR Co., ltd
Address	:	3A-1, Huake Building, East Technology Park, Qiaoxiang Road, Nanshan District, Shenzhen, China
Product	:	PV Grid Inverter (Enclosure)
Model/Spec.	:	Enclosure for 1. Sofar 1000TL-Sx, 2. Sofar 1500TL-Sx, 3. Sofar 2000TL-Sx, 4. Sofar 2500TL-Sx, 5. Sofar 2800TL-Sx
Sample quantity	:	1pcs
Trade mark	:	SOFAR SOLAR
Serial No.	:	N/A
Specimen source	:	Submitted by applicant
Manufactured date	:	N/A
Received date	:	Jul.28,2014
Processed date	:	Aug.05,2014
Test criteria	:	IEC 62262：2002

The test report is valid for above tested sample only and shall not be reproduced in part without written approval of the laboratory.

Tested by:	Zhou Yang	Date:	Aug.05,2014
Checked by:	Zhang hua	Date:	Aug.05,2014
Approved by:	Zhujianhua	Date:	Aug.05,2014

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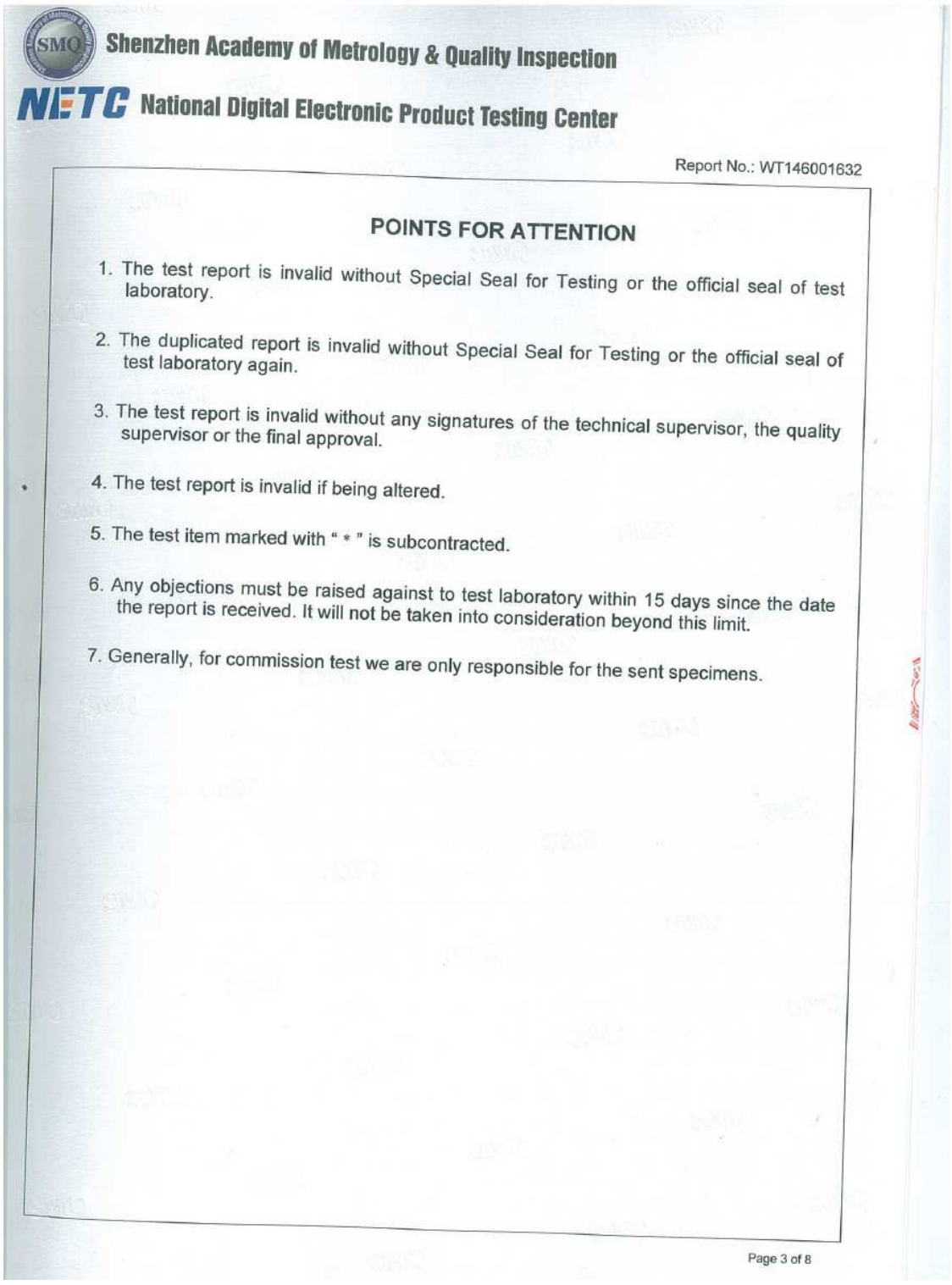

Shenzhen Academy of Metrology & Quality Inspection

NETC National Digital Electronic Product Testing Center

Report No.: WT146001632

POINTS FOR ATTENTION

1. The test report is invalid without Special Seal for Testing or the official seal of test laboratory.
2. The duplicated report is invalid without Special Seal for Testing or the official seal of test laboratory again.
3. The test report is invalid without any signatures of the technical supervisor, the quality supervisor or the final approval.
4. The test report is invalid if being altered.
5. The test item marked with " * " is subcontracted.
6. Any objections must be raised against to test laboratory within 15 days since the date the report is received. It will not be taken into consideration beyond this limit.
7. Generally, for commission test we are only responsible for the sent specimens.

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NETC National Digital Electronic Product Testing Center

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1. TEST ITEM AND CONDITION SUMMARY

Table 1 Test overview

Test Item	Specimen status	Specimen No.	Test conclusion	Processed date
IK07 test	Unpackaged	N/A	Pass	Aug.05,2014

2. AMBIENT CONDITION

Temperature: (22~25)℃

Relative Humidity: (55~60)%

Atmospheric Pressure: (99~102)kPa

3. INITIAL CHECK

Before the test, the specimen exhibited no mechanical damage.

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4. IK07 TEST

4.1. Test Requirement

Test criteria: IEC 62262：2002, Code IK07

Specimen status: Unpackaged

Test equipment: Pendulum harmer

Impact energy: 2J

Impact position: Front face

The number of impacts: 5 impacts

4.2. Acceptance Criteria

After test, the specimen should exhibit no mechanical damage.

4.3. Test Result

After test, the specimen exhibited no mechanical damage.

(Refer to the appendix A No.1～No.3)

4.4. Test Conclusion

Pass

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APPENDIX A PHOTO

No.	Depiction	Photo
1	Impact position (The red circle indicates the impact position)	
2	IK07 test	
3	Inspection after test	

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APPENDIX B EQUIPMENT USED FOR TEST

Table 2 Test equipments used

No.	Equipment	Equipment ID	Type	Manufacturer	Last Calib.	Next Calib.
1	Pendulum harmer	SB9884	PH-2	Hongtong	Nov.29,2013	Nov.28,2014

(The End)

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Annex 1

DIN V VDE V 0126-1-1/A1 VFR2013 Test Report

DIN V VDE V 0126-1-1/A1 VFR2014			
Clause/§	**Requirement**	**Remark**	**Verdict**
1	**Scope (Automatic disconnecting facility for photovoltaic installations)**		
2	**Normative references**		
	DIN EN 50160:2003-03		
	DIN EN 50178 (VDE 0160):1998-04		
	DIN EN 60664-1 (VDE 0110-1)		
	E DIN VDE 0664-100:2005-05		
	DIN EN 61000-6-2		
	DIN EN61000-6-3		
	DIN EN 61008-1 (VDE 0664-10):2000-09		
	DIN VDE 0105-100:2000-06		
4	**Requirements:** 1. Monitoring of voltage and frequency derivation 2. Monitoring of DC-Injection 3. Monitoring of accidental anti Islanding 4. Monitoring of intended anti Islanding 5. Residual Current Monitoring Unit –RCMU (only if no galvanic separation)		
4.1	Functional safety: Automatic disconnecting facility	Considered, see annex. The single fault safe system was reviewed. The theoretical investigation was verified by error simulation.	**P**
4.1.1	Single fault safety of the automatic disconnecting facility	Considered, see block diagram, functional explanation and table 6.1 below.	**P**
4.1.2	Disconnection device: At least two independent disconnection devices. At least one relay and one switch with overvoltage category 2. If without galvanic seperation then two relays are necessary	Disconnection takes place redundant through two relays and the IGBT-fullbridge in series. The relays and the IGBT-full bridge are able to switch the full current.	**P**
4.2	Monitoring of the voltage: Voltages <=80% and >=115% of V_{nom} cause a disconnection within 0,2s (reconnection after min. 5s if voltage fluctuation <=3s; min. 30s if voltage fluctuation >3s). Test voltage steps should not be below 77% and above 118% of V_{nom}. Continuous over voltage above 110% up to 115% (adjustable, default setting 110%) causes disconnection after max. 10min. Re-connection after min. 30s.	Tested with a variable AC-Power supply at the output. Inverter disconnects within the limits, see table 6.2 below.	**P**

DIN V VDE V 0126-1-1/A1 VFR2014			
Clause/§	**Requirement**	**Remark**	**Verdict**
4.3	Monitoring of frequency Disconnection at 47,5Hz and 51,5Hz within 0,2s **Addition requirement for DIN V VDE V 0126-1-1/A1:2012-02** NOTE 3 until publication of the VDE-AR-N 4105 can be a shutdown of all distributed power generation systems on the low voltage network within the specified upper frequency range of 50,2 Hz to 51,5 Hz . In this case, it is recommended that the uniform distribution of the cut-off frequency can be realized in a maximum of 0,1 Hz increments by the manufacturer for each type of plant.	Tested with an AC-Source at the output. See table 6.3 below.	**P**
4.4	Monitoring of DC-Injection: DC error or DC-Currents >= 1A cause disconnection within 0,2s (positive and negative polarity)	See table 6.4 below.	**P**
4.5	Detection of anti islanding: anti islanding causes disconnection within 5s (for multiple installations 0,2s if triggered external). For the detection of anti-islanding is only one of the following methods necessary: -6.5.1 Measurement of impedance or -6.5.2 Resonant circuit test or -6.5.3 3-phase grid-voltage monitoring	See table 6.5.2 below.	**P**
4.6	Marking: In case of an automatic disconnecting facility there is a note at the type plate necessary	Marking provided on the type label.	**P**
4.7	**Special requirements:**		
4.7.1	Photovoltaics: If without galvanic separation then a RCMU is necessary. Insulation resistance > 1kOhm/V, at least 500kOhm. Slowly increasing DC-Leaking currents up to 300mA cause disconnection within 0,3s / Surge dc-leakage currents should lead to a disconnection of: -30mA within 0,3s -60mA within 0,15s -150mA within 0,04s Before every connection to the grid, the d.c. array ground insulation has to be checked. (see 6.6.2.2.4).	For Residual Current Monitoring see table 6.6 below.	**P**
5	**General requirements:** Electromagnetic compatibility (EMC)		
	Emitted interference *DIN EN 61000-6-3 (VDE 0839-6-3)*	Covered by EMC report	**P**

DIN V VDE V 0126-1-1/A1 VFR2014			
Clause/§	**Requirement**	**Remark**	**Verdict**
	Interference resistance *DIN EN 61000-6-2 (VDE 0839-6-2)*	Covered by EMC report	**P**
6	**Type test :**	See following test report	
7.	**Routine test*:***	Routine testing described above	**P**
8	**Specification of installation:**		**P**
	Annex		
A.1	**Additional Methods of monitoring anti islanding:**	Additional Methods can be added	**N/A**
A.4	**Disconnection for a short period**	If frequency fluctuation of <=3s occur, the reconnection after min. 5s is permitted.	**P**

DIN V VDE V 0126-1-1/A1 VFR2014		
Clause	**Test**	**Result**
6.1 (4.1)	Functional safety	**P**
6.2 (4.2)	Monitoring of voltage	**P**
6.3 (4.3)	Monitoring of frequency	**P**
6.4 (4.4)	Monitoring of DC-Injection	**P**
6.5 (4.5)	Detection of anti-islanding (only one method is necessary!)	
	6.5.1 Measurement of impedance	**N/A**
	6.5.2 Resonant circuit test	**P**
	6.5.3 3-phase grid-voltage monitoring	**N/A**
6.6 (4.7)	Residual Current Monitoring	**P**
A1	Test cycle for adjustable/conditionally adjustable PGUs	**P**

Test Results

6.1 Functional safety - fault condition tests			P
	ambient temperature [°C] :	23,8	—
	model/type of power supply :	DC : 62150H-1000S AC : 61512	—
	manufacturer of power supply :	Chroma	—
	rated markings of power supply :	DC: 0-1000V, 15kW AC: 0-300V, 18kW	—

component No.	fault	test condition		test time	fuse No.	fault condition		result
		AC	DC			AC	DC	
PV voltage detect UC1C Pin 9	Open	230V 12,63A	450V 6,62A	2 Min.	--	230V 0,17A	450V 0,02A	PV inverter disconnected from grid immediately, error message: ID09. (PV voltage over range)
PV current detect UC1B Pin 5	Open	230V 12,63A	450V 6,6A	2 Min.	--	230V 0,16A	450V 0,02A	PV inverter disconnected from grid immediately, error message: ID14. (PV current over range)
GFCI detect UC2D Pin 12-13	Short	230V 12,63A	450V 6,62A	2 Min.	--	230V 0,16A	450V 0,02A	PV inverter disconnected from grid immediately, error message: ID12. (GFCI fault)
GFCI detect UC2C Pin 10	Short	230V 12,63A	450V 6,62A	2 Min.	--	230V 0,16A	450V 0,02A	PV inverter disconnected from grid immediately, error message: ID52. (GFCI fault)
Grid voltage detect UC2A Pin 3	Open	230V 12,64A	450V 6,67A	2 Min.	--	230V 0,17A	450V 0,02A	PV inverter disconnected from grid immediately, error message: ID15. (Grid current or voltage over range)
Grid voltage detect RC17	Open	230V 12,63A	450V 6,62A	2 Min.	--	230V 0,17A	450V 0,01A	PV inverter disconnected from grid immediately, error message: ID02, ID49, ID70. (Grid current or voltage under range)
Grid voltage detect RC25	Open	230V 12,64A	450V 6,62A	2 Min.	--	230V 0,18A	450V 0,01A	PV inverter disconnected from grid immediately, error message: ID55. (Relay fault)
Bus voltage detect RP3	Open	230V 12,61A	450V 6,63A	2 Min.	--	230V 0,6A	450V 0,02A	PV inverter disconnected from grid immediately, error message: ID23. (Bus voltage zero fault)
Bus voltage detect UC1A Pin2-3	Short	230V 12,56A	450V 6,65A	2 Min.	--	230V 0,17A	450V 0,02A	PV inverter disconnected from grid immediately, error message: ID66. (Bus voltage over range)

component No.	fault	test condition		test time	fuse No.	fault condition		result
		AC	DC			AC	DC	
Bus voltage detect RC82	Short	230V 12,56 A	450V 6,69A	2 Min.	--	230V 0,16A	450V 0,02A	PV inverter disconnected from grid immediately, error message: ID25. (Bus voltage under range)
ISO detect RC105	Open before start	230V 0,17A	450V 0,18A	2 Min.	--	230V 0,17A	450V 0,02A	PV inverter can not start up, error message: ID56. (ISO fault)
AC current detect RC22	Open	230V 12,56	450V 6,68	2 Min.	--	230V 0,17A	450V 0,02A	PV inverter disconnected from grid immediately, error message: ID15. (AC current over range), QP2， QP6，QP9， RP26， RP28， RP11 damaged.
AC current detect RC21	Open	230V 12,62 A	450V 6,63A	2 Min.	--	230V 0,16A	450V 0,02A	PV inverter disconnected from grid immediately, error message: ID15. (AC current over range).
DC current detect RC33	Open	230V 12,67 A	450V 6,69A	2 Min.	--	230V 0,17A	450V 0,02A	PV inverter disconnected from grid immediately, error message: ID28. (DC current over range).
DC current detect RC37	Open	230V 12,54 A	450V 6,67A	2 Min.	--	230V 0,17A	450V 0,02A	PV inverter disconnected from grid immediately, error message: ID28. (DC current over range).
DC current detect RC42	Open	230V 12,62 A	450V 6,66A	2 Min.	--	230V 0,16A	450V 0,02A	PV inverter disconnected from grid immediately, error message: ID51. (DC current fault).
AC current detect RC61	Open	230V 12,66 A	450V 6,7A	2 Min.	--	230V 0,16A	450V 0,02A	PV inverter disconnected from grid immediately, error message: ID15, ID65. (AC voltage or current over range).
AC current detect RC80	Open	230V 12,67 A	450V 6,8A	2 Min.	--	230V 0,16A	450V 0,02A	PV inverter disconnected from grid immediately, error message: ID15, ID65. (AC voltage or current over range).
GFCI detect RP70	Open	230V 12,63 A	450V 6,66A	2 Min.	--	230V 0,16A	450V 0,02A	PV inverter disconnected from grid immediately, error message: ID12. (GFCI fault).
GFCI detect RP80	Open	230V 12,63 A	450V 6,66	2 Min.	--	230V 0,16A	450V 0,02A	PV inverter disconnected from grid immediately, error message: ID12. (GFCI fault).
GFCI detect UP7A Pin2-3	Short	230V 12,56 A	450V 6,67A	2 Min.	--	230V 0,17A	450V 0,02A	PV inverter disconnected from grid immediately, error message: ID12. (GFCI fault).
PV voltage detect RP115	Open	230V 12,62 A	450V 6,67A	2 Min.	--	230V 0,16A	450V 0,02A	PV inverter disconnected from grid immediately, no display, and reconnect to grid, error message: ID56. (ISO fault).

component No.	fault	test condition		test time	fuse No.	fault condition		result
		AC	DC			AC	DC	
PV voltage detect RP115	Short	230V 12,63A	450V 6,63A	2 Min.	--	230V 0,16A	450V 0,02A	PV inverter disconnected from grid immediately, error message: ID09. (PV voltage over range)
ISO detect RP99	Open before start	230V 0,16A	450V 0,02A	2 Min.	--	230V 0,16A	450V 0,02A	PV inverter can not start up, error message: ID56. (ISO fault).
Relay detect RYP2 Pin3-4	Short before start	230V 0,16A	450V 0,02A	2 Min.	--	230V 016A	450V 0,02A	PV inverter can not start up, error message: ID55, ID77. (Relay fault).
Relay detect RYP3 Pin3-4	Short before start	230V 0,16A	450V 0,02A	2 Min.	--	230V 0,16A	450V 0,02A	PV inverter can not start up, error message: ID55, ID77. (Relay fault).
Relay detect RYP4 Pin3-4	Short before start	230V 0,16A	450V 0,02A	2 Min.	--	230V 0,16A	450V 0,02A	PV inverter can not start up, error message: ID55, ID77. (Relay fault).
Relay detect RYP5 Pin3-4	Short before start	230V 0,16A	450V 0,02A	2 Min.	--	230V 0,16A	450V 0,02A	PV inverter can not start up, error message: ID55, ID77. (Relay fault).
Grid voltage detect RP150	Open	230V 0,62A	450V 6,67A	2 Min.	--	230V 0,16A	450V 0,02A	PV inverter disconnected from grid immediately, error message: ID02. (Grid voltage under range)
Grid voltage detect RP150	Short	230V 12,64A	450V 6,66A	2 Min.	--	230V 0,16A	450V 0,02A	PV inverter disconnected from grid immediately, error message: ID01. (Grid voltage over range)
Grid voltage detect RP135	Short	230V 12,64A	450V 6,67A	2 Min.	--	230V 0,16A	450V 0,02A	PV inverter disconnected from grid immediately, error message: ID01. (Grid voltage over range)
Grid voltage detect RP135	Open	230V 12,61A	450V 6,66A	2 Min.	--	230V 0,16A	450V 0,02A	PV inverter disconnected from grid immediately, error message: ID02. (Grid voltage under range)
Loss of control CC100	Short	230V 12,61A	450V 6,67A	2 Min.	--	230V 0,16A	450V 0,02A	PV inverter disconnected from grid immediately, error message: DSP communicate fail
Loss of control XLC	Short	230V 12,63A	450V 6,65A	2 Min.	--	230V 0,16A	450V 0,02A	PV inverter disconnected from grid immediately, error message: DSP communicate fail
Communication microcontroller defect UC34 Pin 31	Open	230V 12,64A	450V 6,66A	2 Min.	--	230V 0.16A	450V 0.02A	PV inverter disconnected from grid immediately, error message: ID 53 (SPI Communication fault)
Communication microcontroller defect UC34 Pin 37	Open	230V 12,64A	450V 6,66A	2 Min.	--	230V 0.17A	450V 0.02A	PV inverter disconnected from grid immediately, error message: ID 53 (SPI Communication fault)

component No.	fault	test condition		test time	fuse No.	fault condition		result
		AC	DC			AC	DC	
Communication microcontroller defect UC34 Pin 44	Open	230V 12,63A	450V 6,66A	2 Min.	--	230V 0.17A	450V 0.02A	PV inverter disconnected from grid immediately, error message: ID 53 (SPI Communication fault)
Communication microcontroller defect UC34 Pin 47	Open	230V 12,64A	450V 6,67A	2 Min.	--	230V 0.17A	450V 0.02A	PV inverter disconnected from grid immediately, error message: ID 53 (SPI Communication fault)

Note:

The errors in the control circuit simulate that the safety is even ensured during single fault.

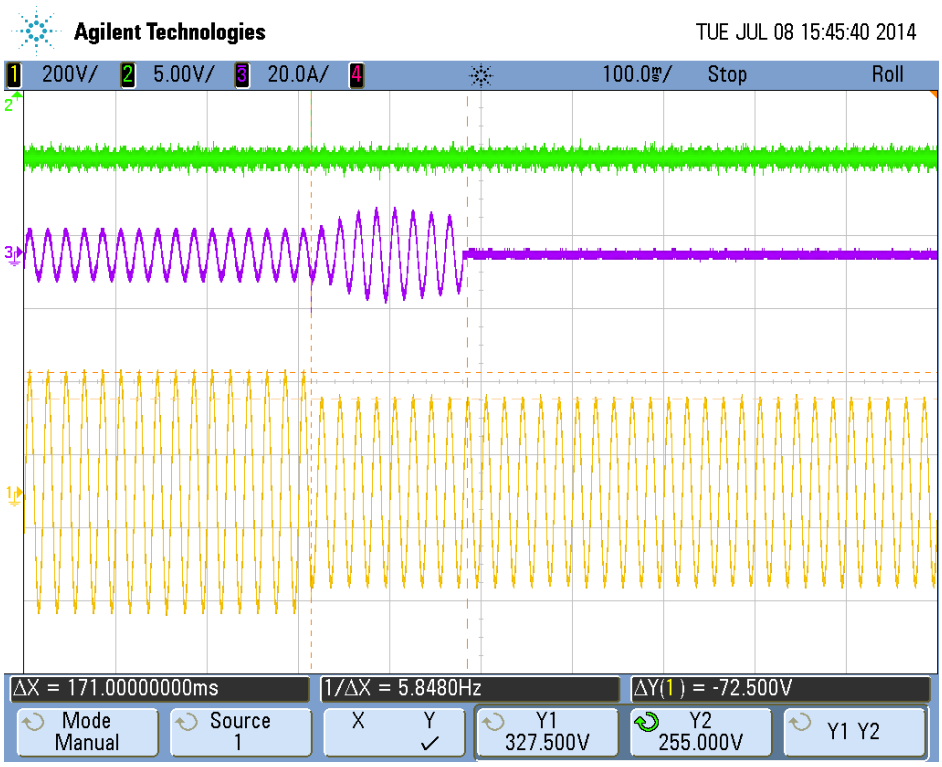
The tests had been performed on the SOFAR 3000TL is valid for the SOFAR 1100TL, SOFAR 1600TL, SOFAR 2200TL and SOFAR 2700TL, since it is same as in hardware and just power derated by software.

6.2 (4.2) Voltage monitoring									**P**
Test conditions:	Output power: 2600W Frequency: 50Hz								
	Under Voltage				**Over Voltage**				
Parameter	Voltage	Time [ms]			Voltage	Time [ms]			
Limit	**184,0V**	**<= 200ms**			**264,5V**	**<= 200 ms**			
Trip value	185,0V				264,1V				
Disconnection time	190V to 180V	149	146	153	259V to 269V	179	167	176	
	230V to 180V	164	171	166	230V to 269V	172	158	167	
Reconnection time (fluctuation <=3s):	>= 5s	N/A			>= 5s	N/A			
Reconnection time (fluctuation >3s):	>= 60s	74 s			>= 60s	74 s			

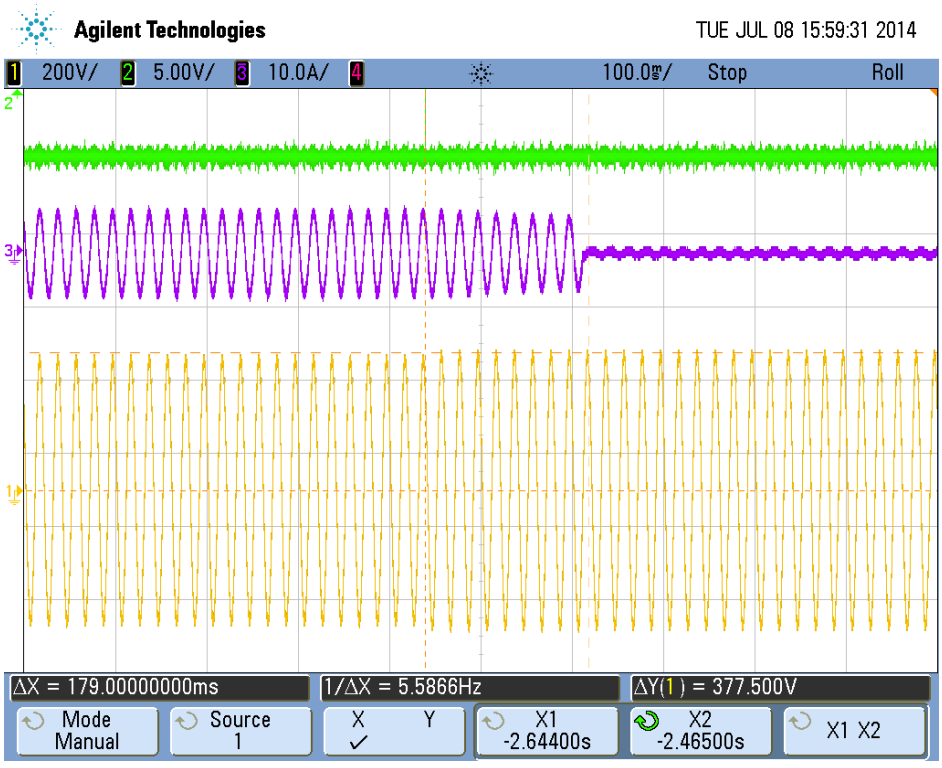
Note:

Lower and upper threshold voltage shall not fall or rise below or above 3% of the threshold voltage itself (min. 177,1V; max. 270,9V). The measurement shall take place at nominal frequency and any power.

Under voltage:



Over voltage:



6.2 (4.2.3) Overvoltage protection according to DIN EN 50160:2000-03, 2.3		**P**
Limit:	From 253V to 264,5V	within 10min
Trip value	257V	8,3min
Note: The tests had been performed on the SOFAR 3000TL is valid for the SOFAR 1100TL, SOFAR 1600TL, SOFAR 2200TL and SOFAR 2700TL, since it is same as in hardware and just power derated by software.		

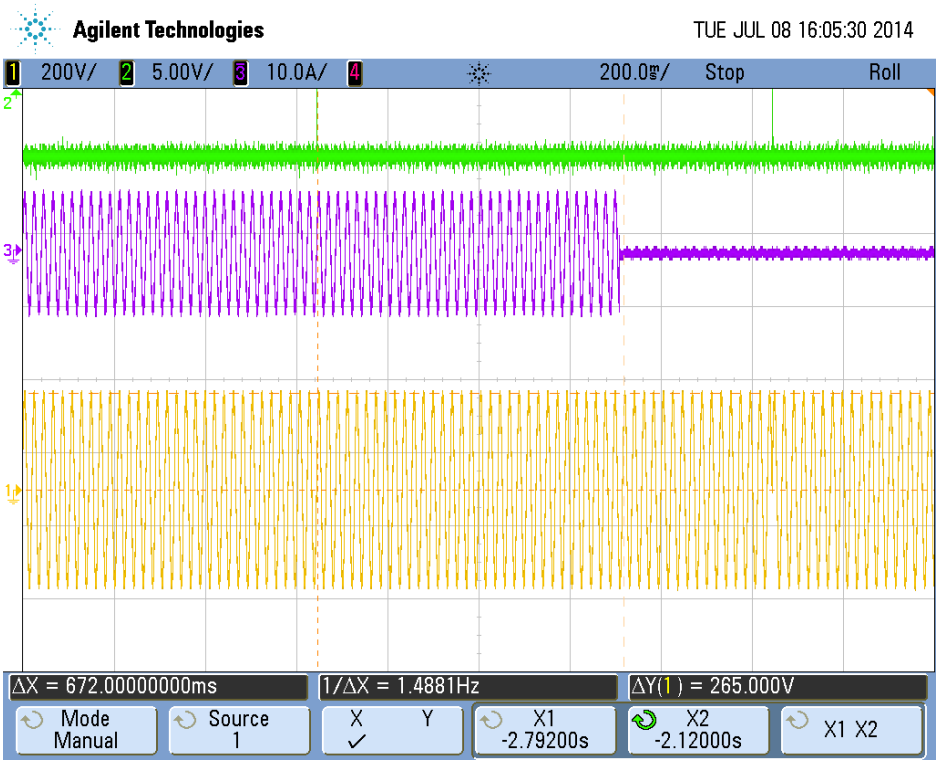
6.3 (4.3) Frequency monitoring **DIN V VDE V 0126-1-1/A1 VFR2014**									**P**
Test conditions:	Output power: 2600W								
	Under frequency				**Over frequency**				
Parameter	Frequency [Hz]	Time [ms]			Frequency [Hz]	Time [ms]			
Output Voltage		80%U_N	U_N	115%U_N		80%U_N	U_N	115%U_N	
Limit	47,5Hz	<= 200ms			50,6Hz	<= 200ms			
Trip value		47,50Hz	47,50Hz	47,50Hz		50,60Hz	50,60Hz	50,60Hz	
Disconnection time (ms)	48,00Hz to 47,00Hz	172	160	160	50,00Hz to 51,00Hz	182	181	178	
		156	168	162		172	180	186	
Reconnection time (fluctuation <=3s):	>= 5s	N/A			>= 5s	N/A			
Reconnection time (fluctuation >3s):	>= 60s	74 s			>= 60s	74 s			

Note:

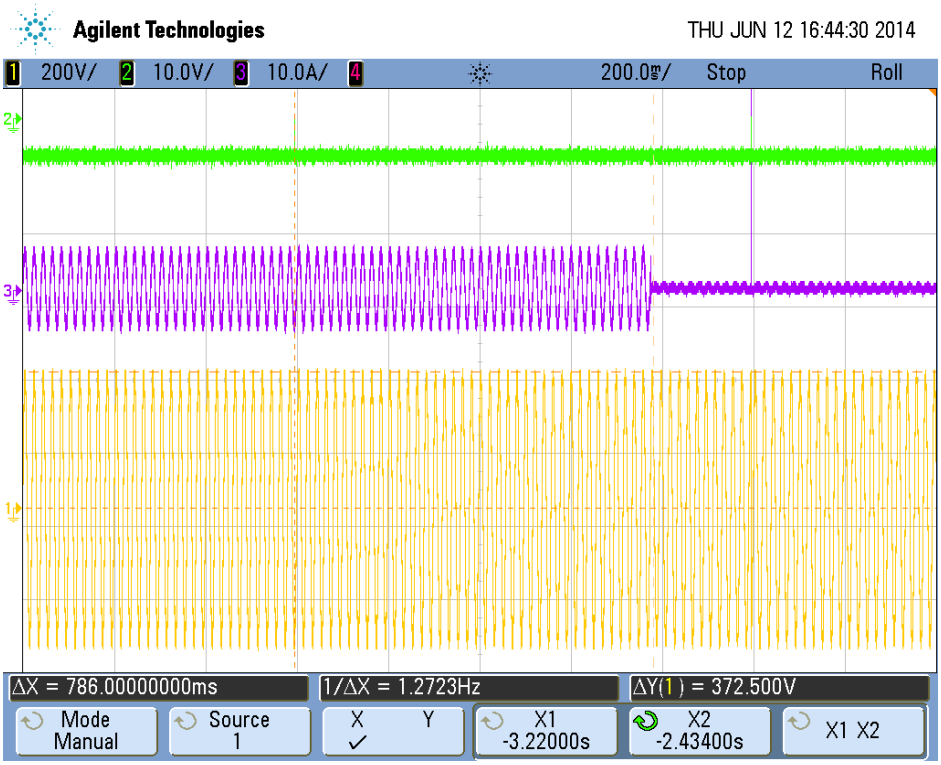
It was measured at a continuous change of frequency of 1Hz/s at lower, nominal and upper U_N and arbitary output power. The trip value was determined manually by reducing the frequency in 10mHz steps. When the trip value is known (e.g. 47,50Hz), the ac-source is programmed to run from e.g. 48,00Hz to 47,00Hz with 1Hz/s. The disconnection time is calculated by the measured time minus the 500ms from 48,00Hz to 47,50Hz.

The tests had been performed on the SOFAR 3000TL is valid for the SOFAR 1100TL, SOFAR 1600TL, SOFAR 2200TL and SOFAR 2700TL, since it is same as in hardware and just power derated by software.

Underfrequency:



Overfrequency:



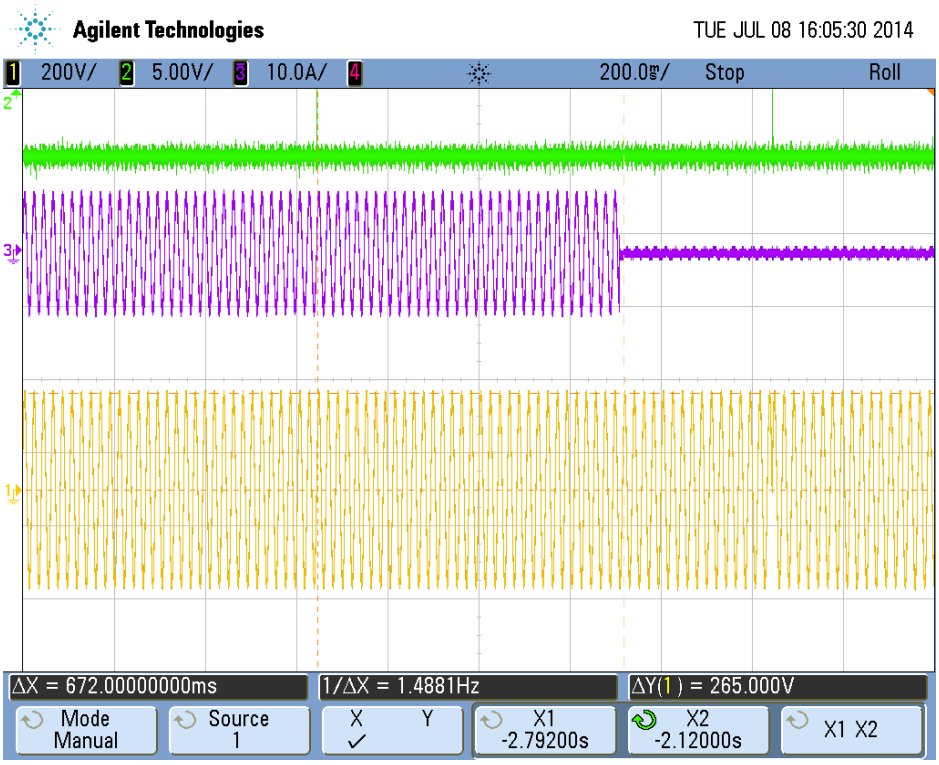
6.3 (4.3) Frequency monitoring **DIN V VDE V 0126-1-1:2006-02**									**P**
Test conditions:	Output power: 2600W								
	Under frequency				**Over frequency**				
Parameter	Frequency [Hz]	Time [ms]			Frequency [Hz]	Time [ms]			
Output Voltage		$80\%U_N$	U_N	$115\%U_N$		$80\%U_N$	U_N	$115\%U_N$	
Limit	47,5Hz	<= 200ms			51,5Hz	<= 200ms			
Trip value		47,50Hz	47,50Hz	47,50Hz		51,50Hz	51,50Hz	51,50Hz	
Disconnection time (ms)	48,00Hz to 47,00Hz	172	160	160	51,00Hz to 52,00Hz	148	172	176	
		156	168	162		154	178	158	
Reconnection time (fluctuation <=3s):	>= 5s	N/A			>= 5s	N/A			
Reconnection time (fluctuation >3s):	>= 60s	74 s			>= 60s	74 s			

Note:

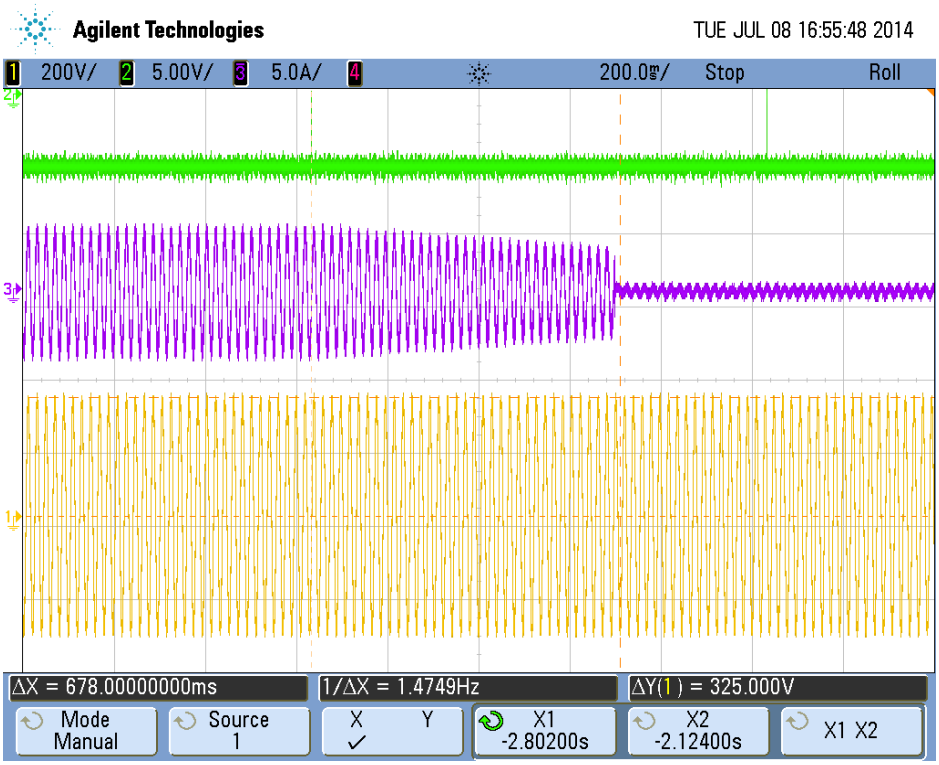
It was measured at a continuous change of frequency of 1Hz/s at lower, nominal and upper U_N and arbitary output power. The trip value was determined manually by reducing the frequency in 10mHz steps. When the trip value is known (e.g. 47,50Hz), the ac-source is programmed to run from e.g. 48,00Hz to 47,00Hz with 1Hz/s. The disconnection time is calculated by the measured time minus the 500ms from 48,00Hz to 47,50Hz.

The tests had been performed on the SOFAR 3000TL is valid for the SOFAR 1100TL, SOFAR 1600TL, SOFAR 2200TL and SOFAR 2700TL, since it is same as in hardware and just power derated by software.

Underfrequency:



Overfrequency:

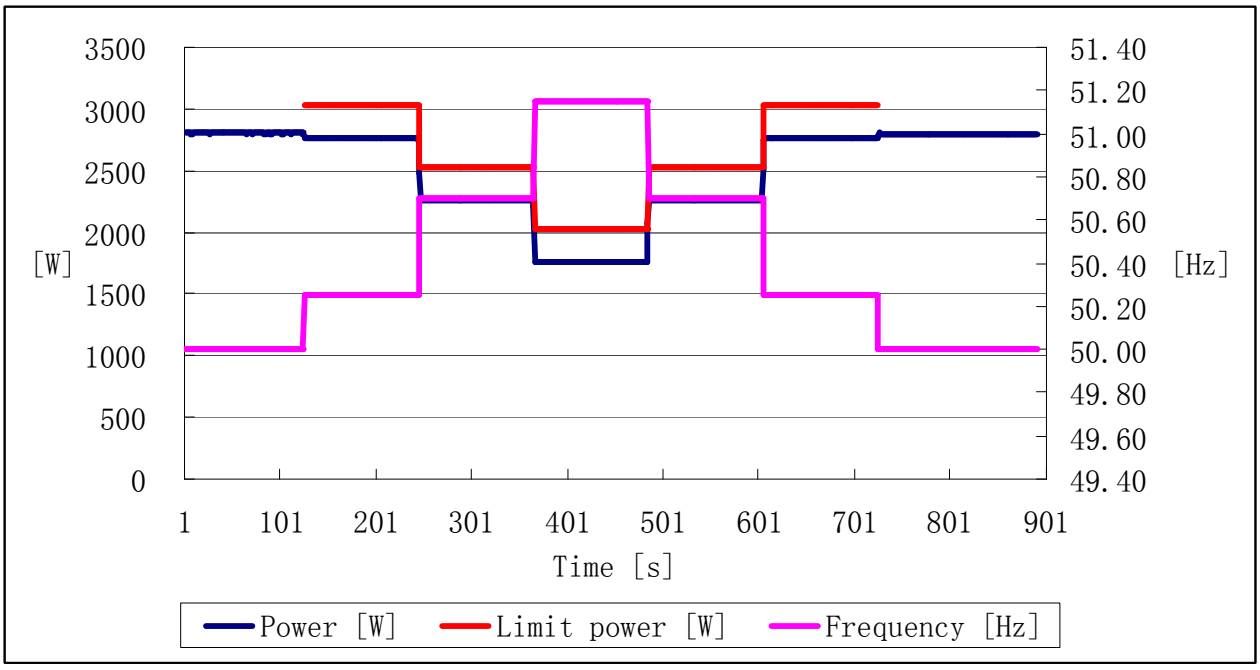


6.3 (4.3) Active power feed-in for overfrequency (For DIN V VDE V 0126-1-1/A1:2012-02) (these tests are designed to provide evidence that the requirements of VDE-AR-N 4105, 5.7.3.3 are met)	**P**

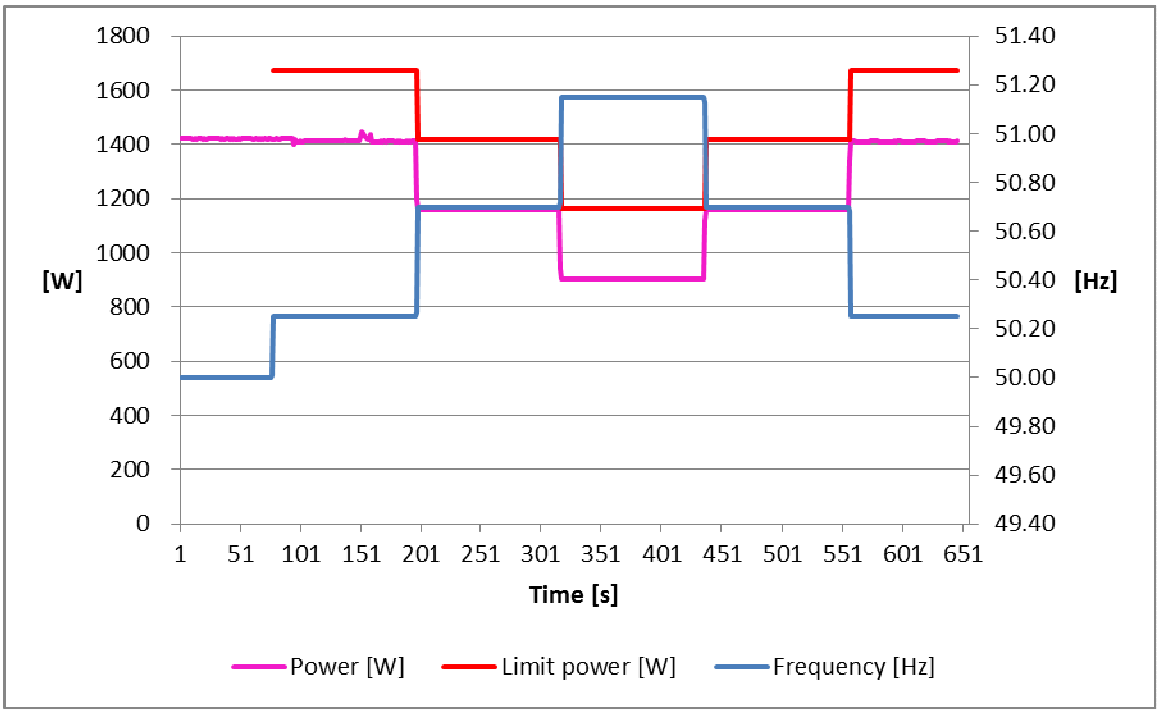
Test:

1-min mean value	a) 50,00 Hz	b) 50,25 Hz	c) 50,70 Hz	d) 51,15 Hz	e) 50,70 Hz	f) 50,25 Hz	g) 50,00 Hz
1. Measurement a) to g): Active power output > 80% P_{Emax}							
Frequency [Hz]:	50,00	50,25	50,70	51,15	50,70	50,25	50,00
$P_{setpoint}$ [kW]:	N/A	2,747	2,243	1,738	2,243	2,747	N/A
P_{E60} [kW]:	2,803	2,761	2,262	1,761	2,262	2,762	2,790
$\Delta P_{E60}/P_{Setpoint}$ [%]:	N/A	0,50	0,68	0,80	0,69	0,51	N/A
2. Measurement a) to g): Active power output 40% and 60% after freezing > 80% P_{Emax}							
Frequency [Hz]:	50,00	50,25	50,70	51,15	50,70	50,25	N/A
$P_{setpoint}$ [kW]:	N/A	1,393	1,137	0,881	1,137	1,393	N/A
P_{E60} [kW]:	1,421	1,415	1,158	0,903	1,157	1,411	N/A
$\Delta P_{E60}/P_{Setpoint}$ [%]:	N/A	0,81	0,73	0,78	0,73	0,65	N/A
Limit $\Delta P_{E60}/P_{Setpoint}$:	+ 10 % of P_{Emax}						

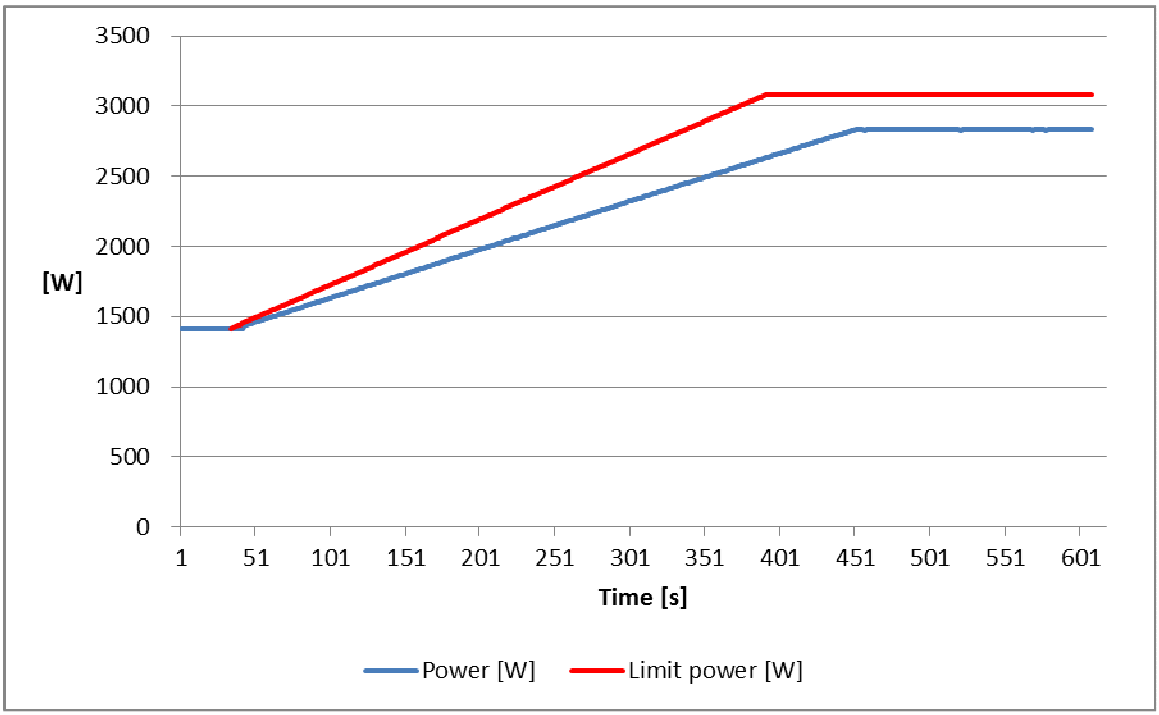
Graph of Measurement 1.: Active power output > 80% P_{Emax}:



Graph of Measurement 2.:Active power output 40% and 60% after freezing > 80% P_{Emax}:



Graph of power gradient:



Test:

The test is conducted for two powers. First, the test must start at a power > 80% PEmax ("Measurement 1"), and in a second test, for a power between 40% to 60% PEmax ("Measurement 2"). In the second test, after freezing of the PM, the available active power output must be increased to a value > 80% PEmax, and after the network frequency of 50,2 Hz is fallen below, the rise of the active power gradient must be recorded.

Point g) must be held until the PGU is again feeding in with the active power output available.

Assessment criterion:

For f=50,2 Hz, the value of the PM active power currently being generated is "frozen".

a) For adjustable PGUs when:

1) the active power reduces between measuring points b) and f) given above with a gradient of 40% PM per Hz for a decreasing frequency (or rises for a frequency decreasing again).

2) the maximum active power gradient occurring in point g) is lower than 10% of maximum active power PEmax every minute, and

3) the reaction value of the setpoint determined by the gradient characteristic curve does not differ from PEmax by more than ± 10%.

b) For conditionally adjustable PGUs

1) when they behave as in a) within their adjustment range, and

2) when, outside the adjustable range, the power fed in on leaving the adjustment range remains constant until shutdown. Shutdown must be no later than at 51,5 Hz.

The PGU must have disconnected from the network no later than 200ms after frequency h) is reached.

Note:

The tests had been performed on the SOFAR 3000TL is valid for the SOFAR 1100TL, SOFAR 1600TL, SOFAR 2200TL and SOFAR 2700TL, since it is same as in hardware and just power derated by software.

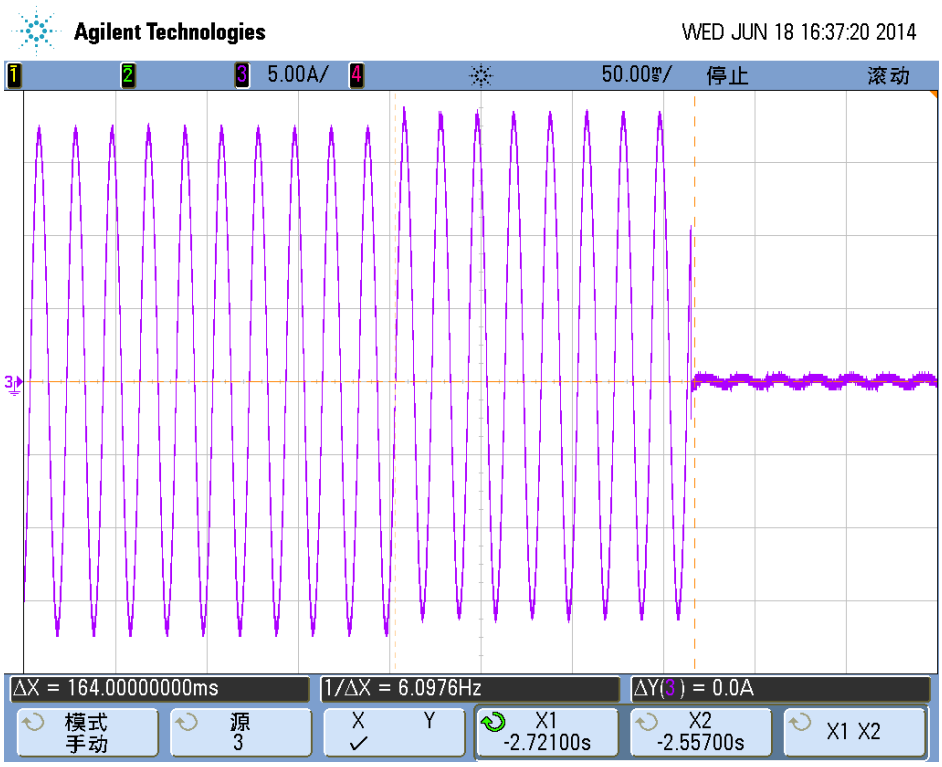
(4.4) Monitoring of DC-Injection				**P**
Test conditions:	U_N = 230Vac Uinput =450Vdc Rated Power: 2800W			
DC Injection [A]	**Limits**	**Trip Time [ms]**		
+1,0A	I_{DC}:>1A than disconnection within 0,2 sec	160	164	162
-1,0A	I_{DC}:>1A than disconnection within 0,2 sec	159	160	159

Note:

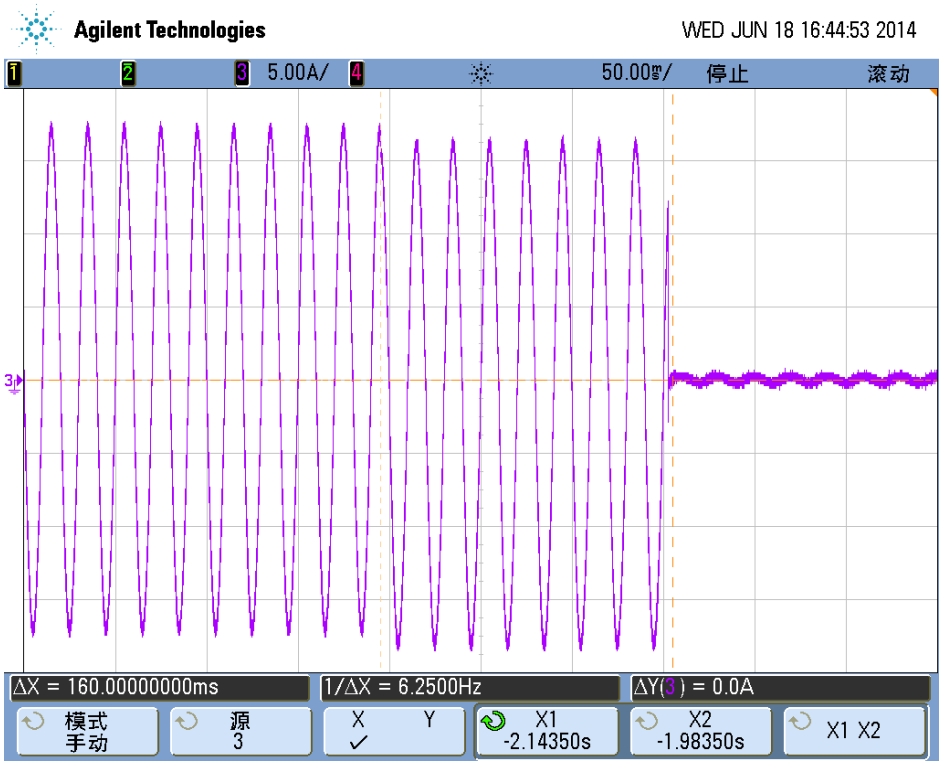
A dc-current of 1A is injected, disconnection time of max. 0,2s

The tests had been performed on the SOFAR 3000TL is valid for the SOFAR 1100TL, SOFAR 1600TL, SOFAR 2200TL and SOFAR 2700TL, since it is same as in hardware and just power derated by software.

Positive DC-Injection:



Negative DC-Injection:



6.5 (4.5) Detection of Anti-Islanding	N/A

6.5.1 Measurement of impedance		N/A
Test conditions:	Output power: Frequency: U_N= Apparent power to the grid <5%	
Disconnection time limit:	5s	
Z_N (R2 +L2)	Trip value T_1	Trip value T_2
0,00 Ohm	--	--
0,25 Ohm	--	--
0,50 Ohm	--	--
0,75 Ohm	--	--
1,00 Ohm	--	--
0,25 Ohm + j0,17 Ohm	--	--
0,25 Ohm + j0,33 Ohm	--	--
0,25 Ohm + j0,50 Ohm	--	--
Note:		

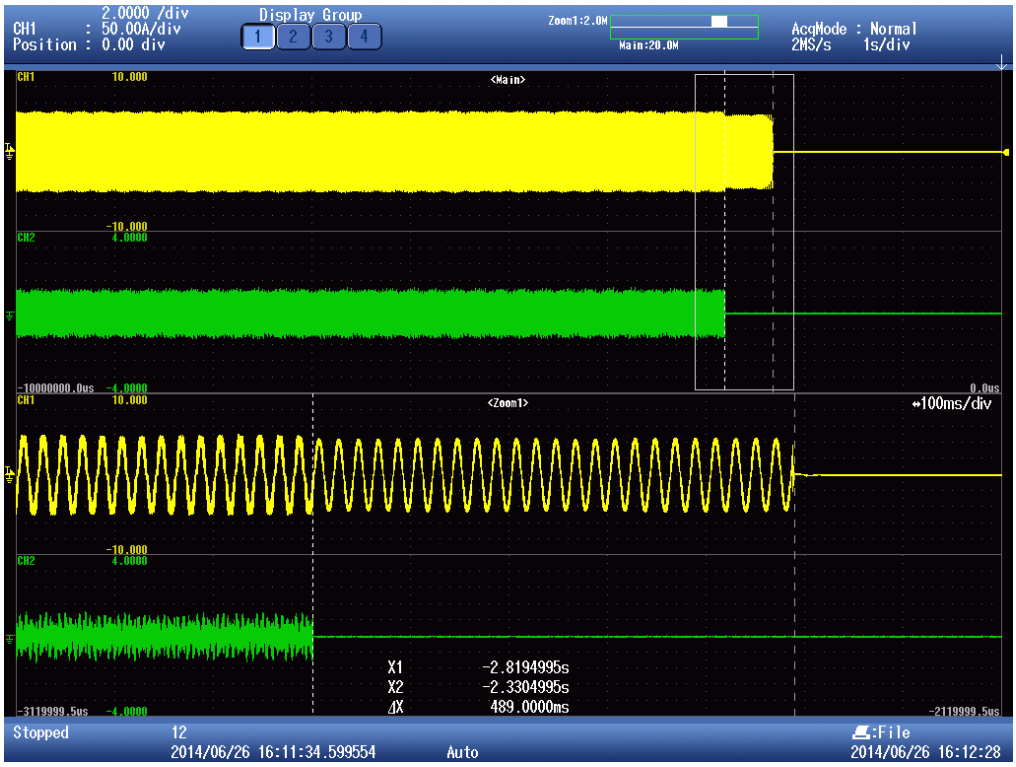
6.5.2 Resonant circuit test			**P**
Test conditions:	Frequency: 50+/-0,2Hz U_N=230+/-3Vac RLC consumes inverter real power within +/-3% Distortion factor of chokes <3% Quality Q>2		
Disconnection limit:	5s		
Output power: / Osc. Parameter	25%	50%	100%
- 5%	0,158	0,204	0,180
- 4%	0,146	0,128	0,071
- 3%	0,202	0,108	0,104
- 2%	0,235	0,384	0,391
- 1%	0,420	0,394	0,452
0 %	0,489	0,378	0,468
+1 %	0,422	0,431	0,485
+2 %	0,130	0,115	0,109
+3 %	0,190	0,202	0,111
+4 %	0,167	0,203	0,140
+5 %	0,170	0,048	0,100
Parameter at 0%	L=120,02 mH R=76,12 Ω C=84,66 uF	L=59,48 mH R=37,84 Ω C=169,75 uF	L=29,87 mH R=18,93 Ω C=338,59 uF

Note:

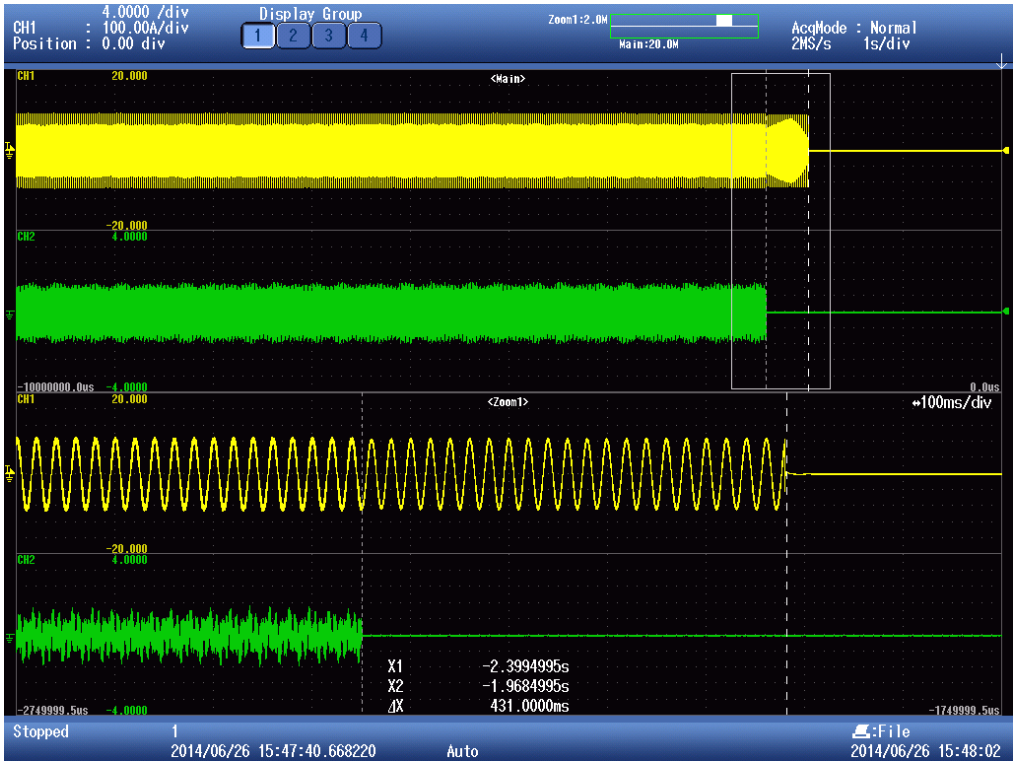
The capacitors and the Chokes of the resonant circuit were adjusted in order to reach a quality of >2. $P_{QC}+P_{QL}=-P_{Q,WR}$. The resitors of the resonant circuit consumed the real power of the inverter (P_{WR}) within +/-3%.

The tests had been performed on the SOFAR 3000TL is valid for the SOFAR 1100TL, SOFAR 1600TL, SOFAR 2200TL and SOFAR 2700TL, since it is same as in hardware and just power derated by software.

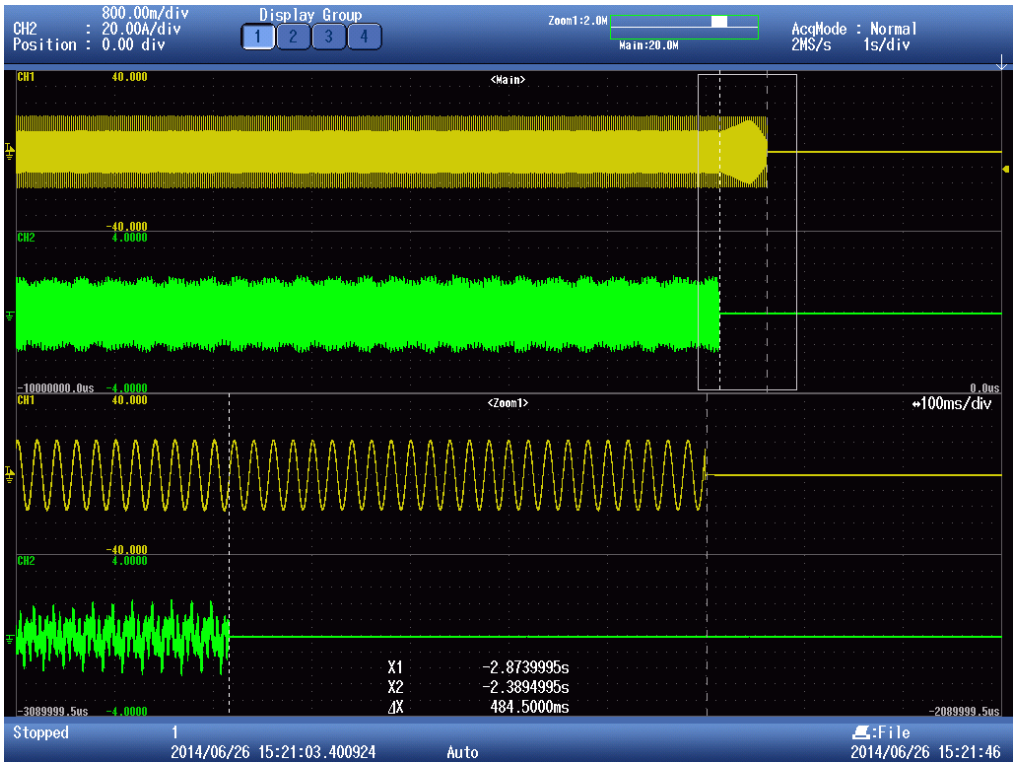
25% Power



50% Power



100% Power


800.00m/div
CH2 : 20.00A/div
Position : 0.00 div
Display Group
1 2 3 4
Zoom1:2.0M
Main:20.0M
AcqMode : Normal
2MS/s 1s/div
CH1 40.000
<Main>
-40.000
CH2 4.0000
-10000000.0us -4.0000
0.0us
CH1 40.000
<Zoom1>
↔100ms/div
-40.000
CH2 4.0000
X1 -2.8739995s
X2 -2.3894995s
ΔX 484.5000ms
-3099999.5us -4.0000
-2089999.5us
Stopped 1
2014/06/26 15:21:03.400924 Auto
:File
2014/06/26 15:21:46

6.5.3 3-phase grid-voltage monitoring							N/A
Test Condition:			Frequency: 50+/-0,2Hz U_N=230Vac				
Phase	**Limit:**	**Voltage step: (to min. 177,1 or max. 270,9)**	**Trip value [V]:**	**Reconnection time if <=3s [s]:**	**Reconnection time if >3s [s]:**	**Disconnection time [ms]:**	**Limit [ms]:**
L1	80% of Un	--	--	--	--	--	**200**
		--				--	
	115% of Un	--	--	--	--	--	**200**
		--				--	
L2	80% of Un	--	--	--	--	--	**200**
		--				--	
	115% of Un	--	--	--	--	--	**200**
		--				--	
L3	80% of Un	--	--	--	--	--	**200**
		--				--	
	115% of Un	--	--	--	--	--	**200**
		--				--	

Note:

Lower and upper threshold voltage shall not fall or rise below or above 3% of the threshold voltage itself (min. 177,1V; max. 270,9V). The measurement shall take place at nominal frequency and any power.

6.6 (4.7) Residual current monitoring				**P**
Test conditions:	Output power: V_{DC}: 450 Frequency: 50Hz Current measuring devices: min. class 0,5			
6.6.2.2.2 Test for correct disconnection in case of a continuously rising residual current				**P**
+ PV to N:				
	Fault Current [mA]			
Limit [mA]	~0,85U_N	U_N	~1,15U_N	
<=300	230	227	230	
<=300	231	230	228	
<=300	230	230	239	
<=300	229	229	230	
<=300	231	229	231	
- PV to N:				
	Fault Current [mA]			
Limit [mA]	~0,85U_N	U_N	~1,15U_N	
<=300	229	232	230	
<=300	232	231	231	
<=300	230	231	233	
<=300	228	231	227	
<=300	228	230	230	

Note:

Comparing test circuit at 6.6.2.1, pic. 4. Fault current will rise up to 300mA within 30s. 5 values will be measured and listed.

The tests had been performed on the SOFAR 3000TL is valid for the SOFAR 1100TL, SOFAR 1600TL, SOFAR 2200TL and SOFAR 2700TL, since it is same as in hardware and just power derated by software.

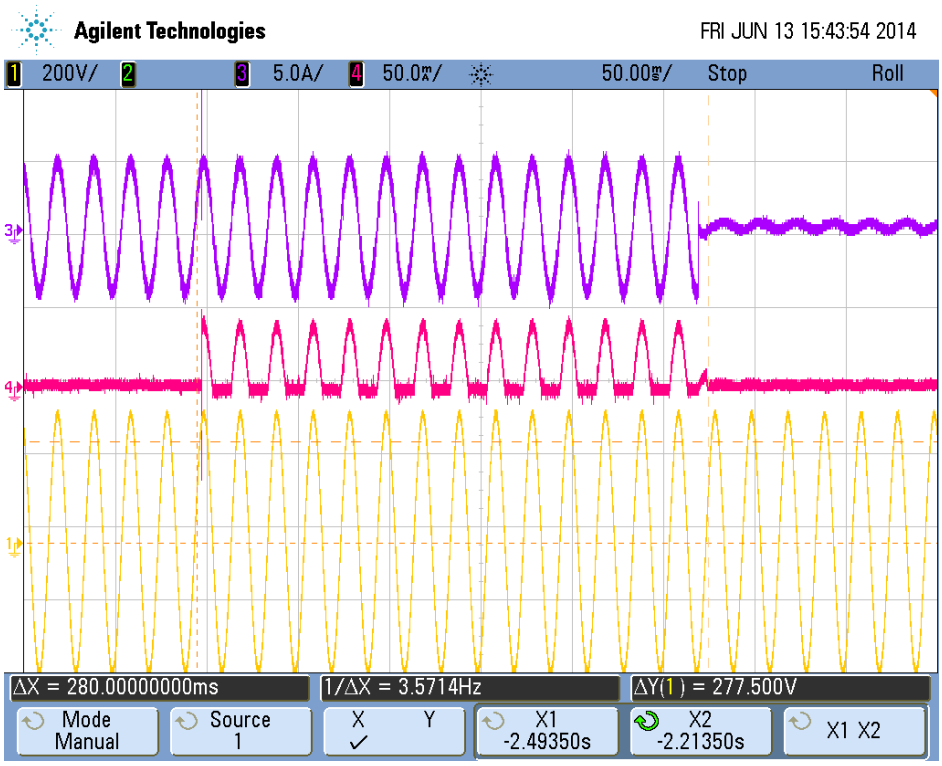
6.6.2.2.2 Test for correct disconnection in case of an abrupt appearing residual current >300mA			P
+ PV to N:			
Fault Current > 300mA			
Limit [ms]	~0,85U_N	U_N	~1,15U_N
300	284	270	280
- PV to N:			
Fault Current > 300mA			
Limit [ms]	~0,85U_N	U_N	~1,10U_N
300	256	275	261

Note:

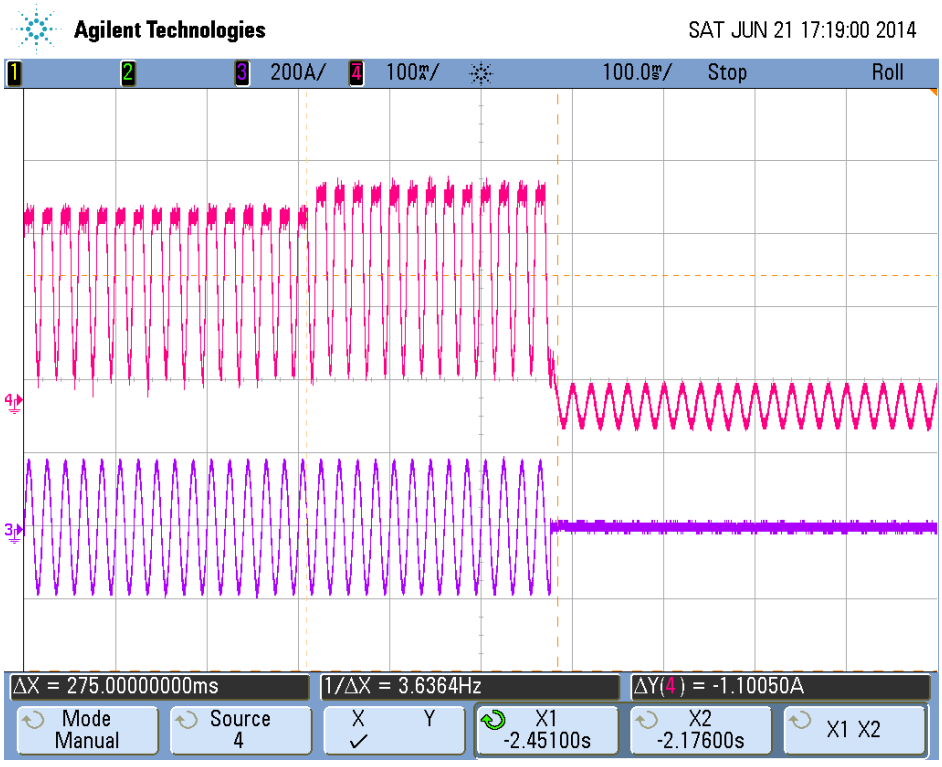
To test the trip time, the test resistance is then adjusted to set the residual current to a value approximately 10 mA below the actual trip level. A second external resistance, adjusted to cause approximately 20 mA of residual current to flow, is connected through a switch from ground to the same PV input terminal as the first resistance. The switch is closed, increasing the residual current to a level above the trip level determined above. The time shall be measured from the moment the second resistance is connected until the moment the inverter disconnects from the mains, as determined by observing the inverter output current and measuring the time until the current drops to zero.

The tests had been performed on the SOFAR 3000TL is valid for the SOFAR 1100TL, SOFAR 1600TL, SOFAR 2200TL and SOFAR 2700TL, since it is same as in hardware and just power derated by software.

Scope picture: + PV to N



Scope picture: - PV to N



6.6.2.2.3 Test for correct disconnection in case of a suddenly occuring residual current				P
+PV to N				
Limit [mA]	~0,85U_N Disconnection time [ms]	U_N Disconnection time [ms]	~1,15U_N Disconnection time [ms]	Limit [ms]
30	218	197	210	300
30	213	232	210	300
30	212	219	204	300
30	208	216	218	300
30	205	208	203	300
60	107	110	105	150
60	107	104	114	150
60	107	104	114	150
60	101	117	113	150
60	123	107	104	150
150	25	24	26	40
150	37	39	39	40
150	34	38	38	40
150	24	34	35	40
150	37	31	28	40
-PV to N				
Limit [mA]	~0,85U_N Disconnection time [ms]	U_N Disconnection time [ms]	~1,15U_N Disconnection time [ms]	Limit [ms]
30	203	217	218	300
30	219	204	220	300
30	222	226	231	300
30	210	223	216	300
30	201	225	216	300
60	127	124	110	150
60	112	111	116	150
60	120	103	104	150
60	100	96	109	150
60	105	102	105	150
150	28	38	36	40
150	25	37	36	40
150	34	31	26	40
150	37	27	32	40
150	26	34	29	40

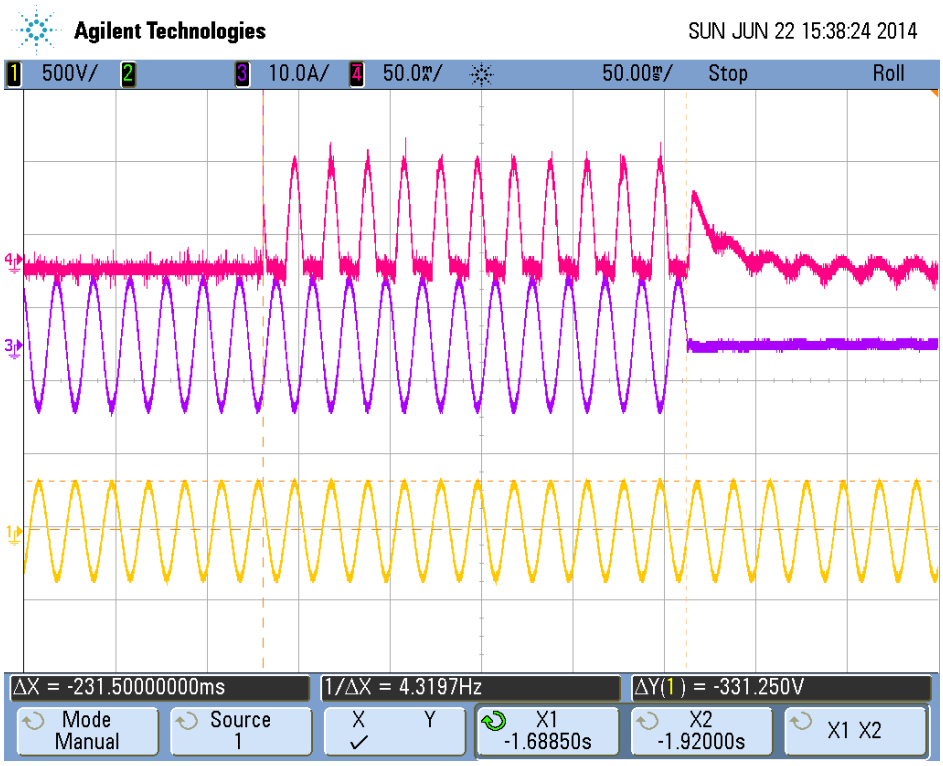
Note:

The capacitive current is risen until disconnection.

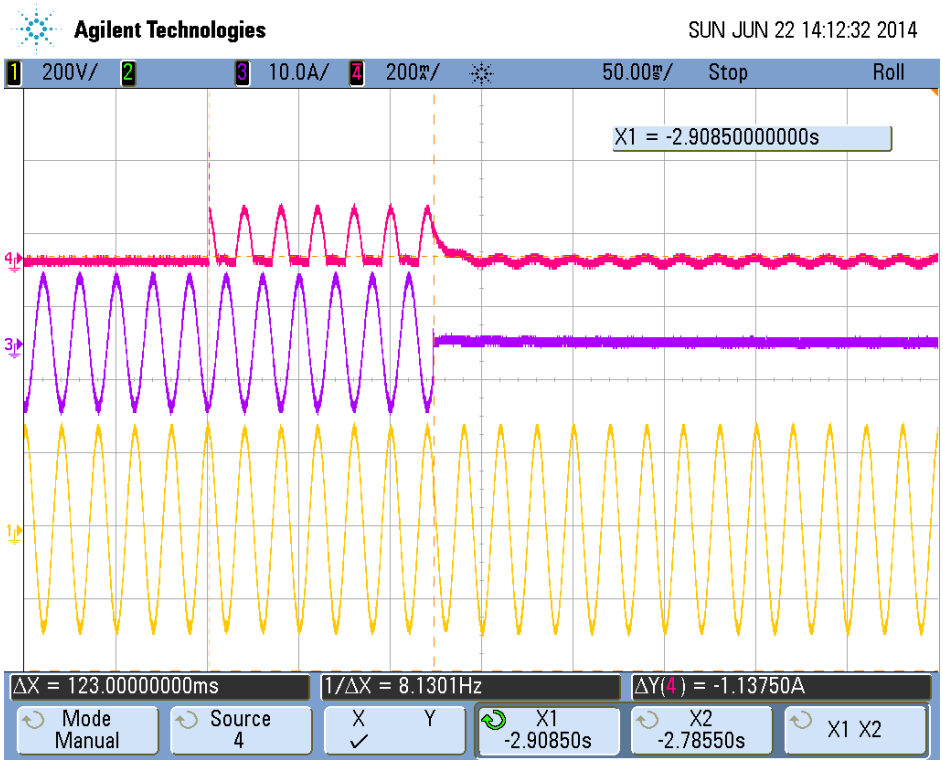
Test condition: I_c + 30/60/150mA <= I_{cmax}. R_1 is set that 30/60/150mA Flow and switch S is closed.

The tests had been performed on the SOFAR 3000TL is valid for the SOFAR 1100TL, SOFAR 1600TL, SOFAR 2200TL and SOFAR 2700TL, since it is same as in hardware and just power derated by software.

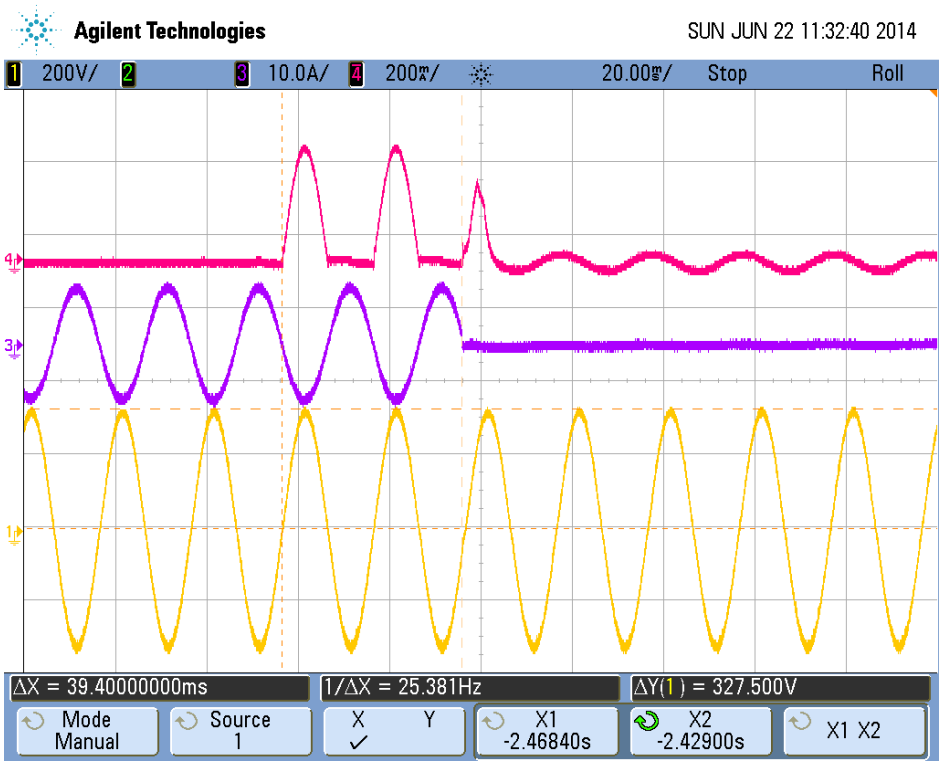
Scope picture: + PV to N; 100%U_N; 30mA



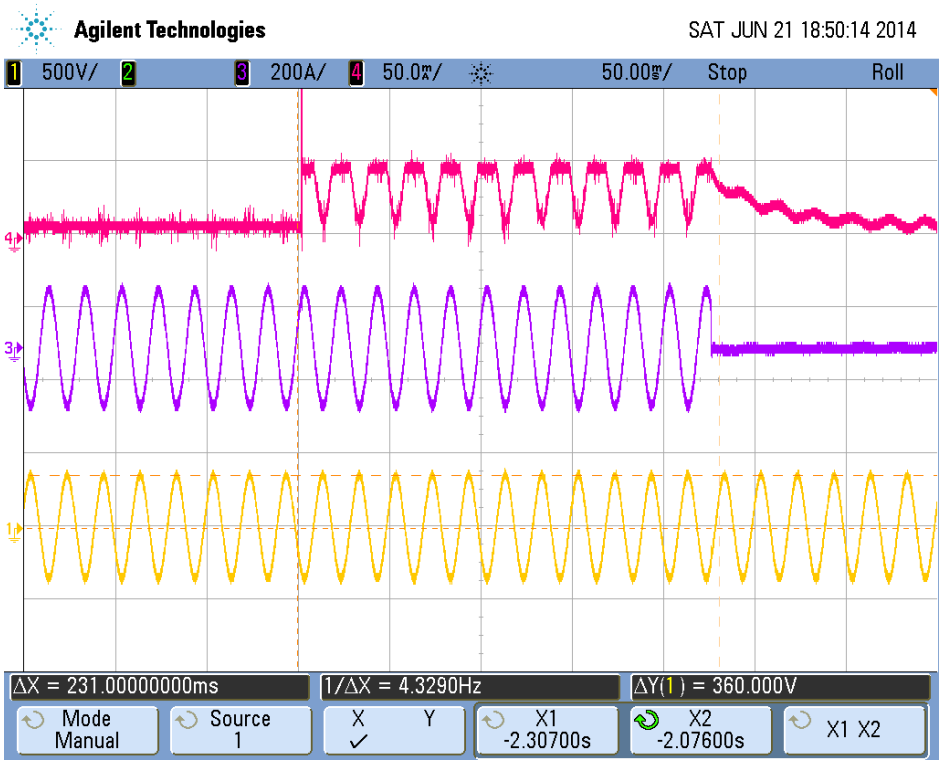
Scope picture: + PV to N; 85%U_N; 60mA



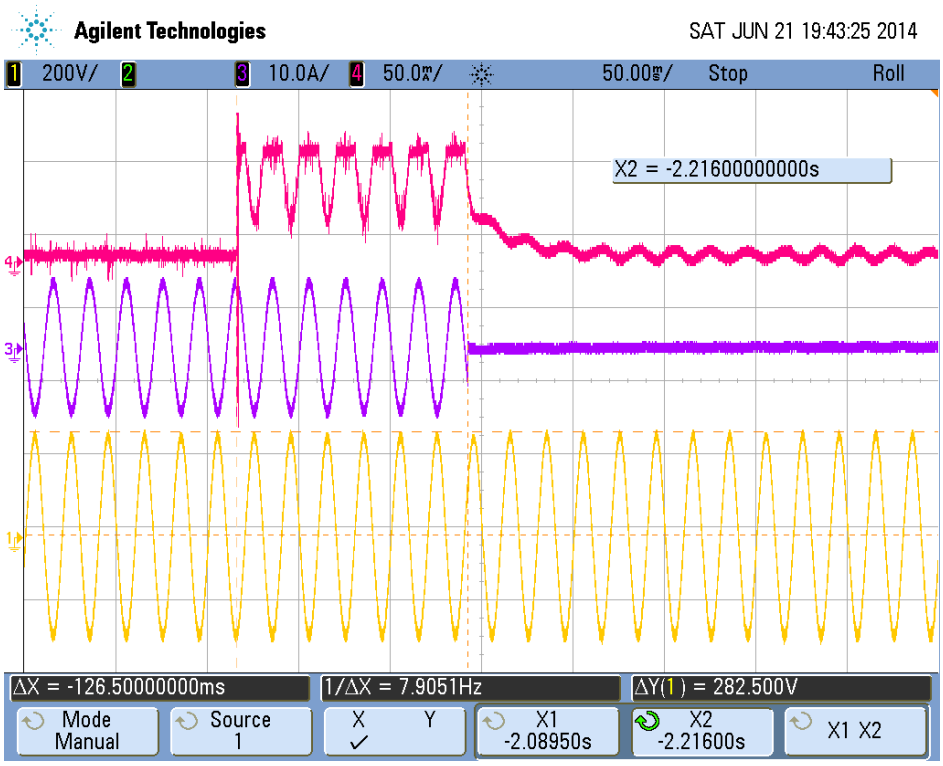
Scope picture: + PV to N; 100%U_N; 150mA



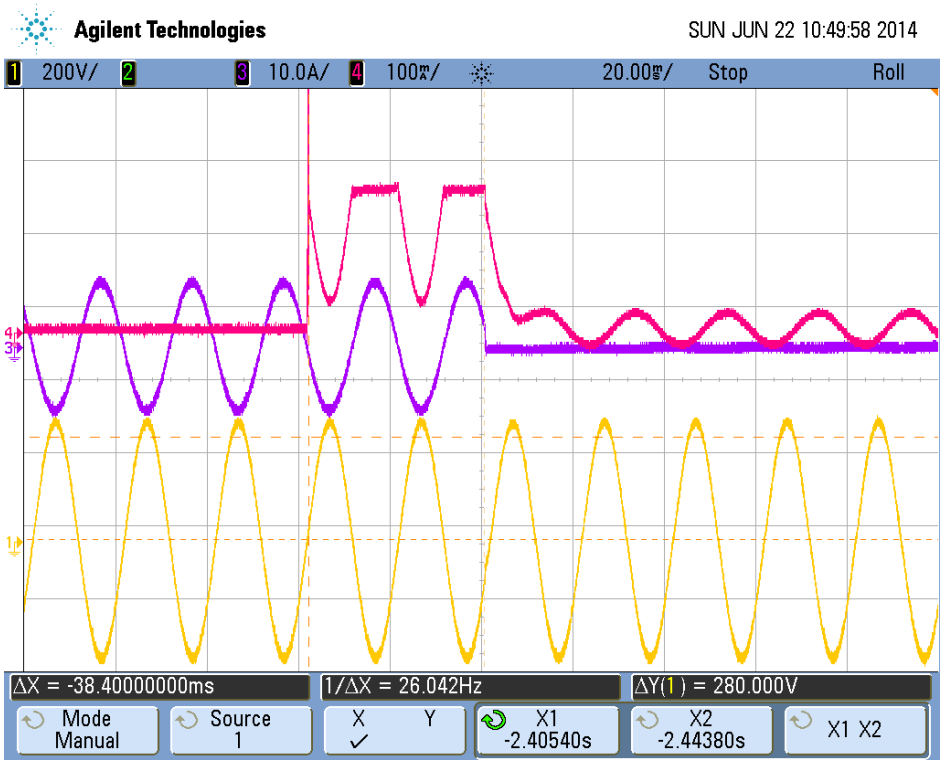
Scope picture: - PV to N; 115%U_N; 30mA



Scope picture: - PV to N; 85%U_N; 60mA



Scope picture: - PV to N; 100%U_N; 150mA



6.6.2.2.4 Isolation measurement before feeding in			P
Condition	DC Voltage [V]	Required Insulation resistance (kOhm)	Result
DC+			
V+, the higher array voltage	500	600	PV inverter can not start up, error message: ID56. (ISO fault)
Vcritical, the voltage level analyzed to be difficult to detect	450		
Varbitrary, any voltage within the range V- V+	230		
V-, the lower array voltage	90		
DC-			
V+, the higher array voltage	500	600	PV inverter can not start up, error message: ID56. (ISO fault)
Vcritical, the voltage level analyzed to be difficult to detect	450		
Varbitrary, any voltage within the range V- V+	230		
V-, the lower array voltage	90		

Note:

The array insulation resistance to ground shall be not less than 1 kΩ/V with respect to the maximum dc input voltage as specified by the manufacturer, with a minimum of 500 KΩ.

The tests had been performed on the SOFAR 3000TL is valid for the SOFAR 1100TL, SOFAR 1600TL, SOFAR 2200TL and SOFAR 2700TL, since it is same as in hardware and just power derated by software.

Annex 2
IP test report

TEST REPORT Nº: BVCZ14JU267STZS

TEST REPORT

To:	Shenzhen SOFARSOLAR Co., Ltd.	To:	-
Attn:	Rex Liu	Attn:	-
Address:	3A-1, Huake Building, East Technology Park, Qiaoxiang Road, Nanshan District, Shenzhen, China	Address:	-
Fax:	--	Fax:	-
E-mail:	--	E-mail:	-

This document includes: 3s pages

Factory name:	Dongguan dingqiang Machinery &Electric Co., Ltd.	Offer:	BVCZ14JU30-01STZS-A1
Location:	--	Sample No:	SZ140715/016
		Start date:	16/Jul/2014
		Finish date:	21/Jul/2014
		Standards used: (Date):	IEC60529:2013
		Sections examined:	IEC60529:2013(Clauses 13.6 and 14.2.5) IP65 test
PV Grid Inverter **Model:** SOFAR1100TL,SOFAR1600TL,SOFAR2200TL, SOFAR2700TL,SOFAR3000TL		Note:	None

The results given in this report are related to the tested specimen of the described electrical apparatus.

CONCLUSION: **The sample satisfies to the sections examined.**

Test done by,	Approved by,
Engineer: Sky TAN	Senior Engineer: Shadow LIU
Date: July 21, 2014	Date: July 21, 2014

Bureau Veritas Shenzhen Co., Ltd
Electrical & Electronic Division

1&4th Floor, B Building, Min Li Da Industrial Building, Honghualing Industrial Park, Liu Xian Road, Xili Town,Nanshan District, Shenzhen, Guangdong

Tel: +86 755 8600 0151
Fax: +86 755 8600 0159
Email: bvcps.electrical@hk.bureauveritas.com

TEST REPORT N°: BVCZ14JU267STZS

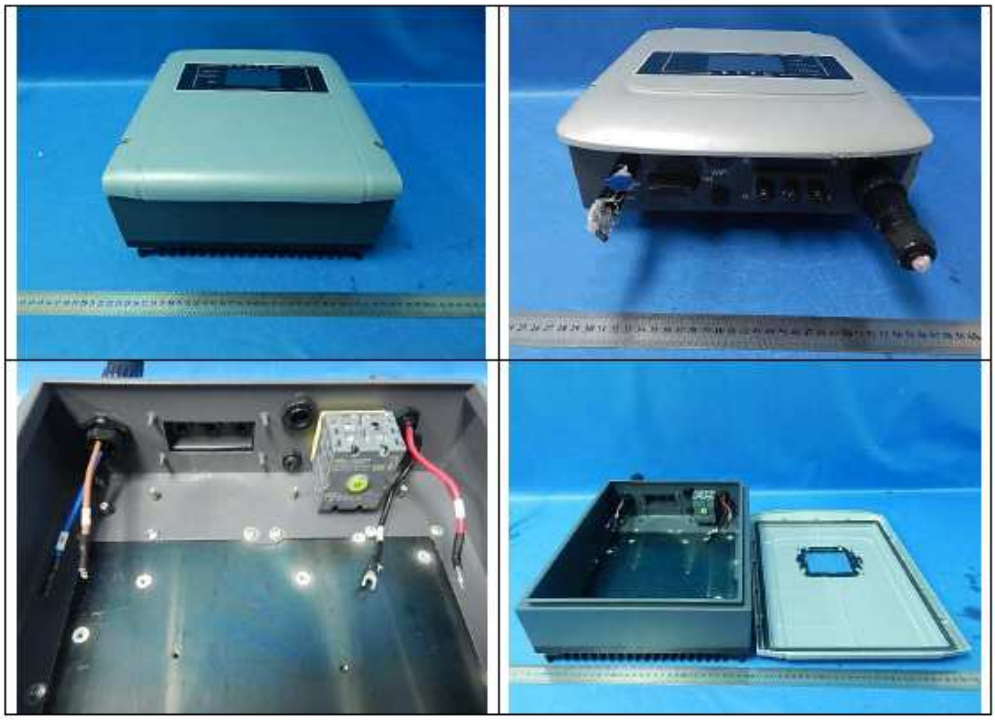
NOTE

Enclosure of models SOFAR1600TL, SOFAR2200TL, SOFAR2700TL and SOFAR3000TL are identical with model SOFAR1100TL except model name. The tests were performed on model SOFAR1100TL.

HISTORICAL OF SAMPLE RECEIVED

LABORATORY	RECORDED N°	DETAIL OF THE SAMPLE	SPECIAL REMARK
SZ	SZ140715/016	Original	None

PICTURES OF THE SAMPLE TESTED:



TEST REPORT N°: BVCZ14JU267STZS

TABLE OF RESULTS

CLAUSES	TITLE	REMARK	NOTE	PASS	FAIL	N.A
13.6	DUST TEST FOR FIRST CHARACTERISTIC NUMERAL 6	No deposit of dust is observable inside the enclosure		X		
14.2.5	TEST FOR SECOND CHARACTERISTIC NUMERAL 5	No deposit of water is observable inside the enclosure		X		
N.A: Not applicable						

Annex 3

EMC Test Report

ATTESTATION
of conformity with European Directives

Attestation Number: **1488AB0508N005R1001**
Product: **PV Grid Inverter**
Brand Name: **SOFAR SOLAR**
Model: **SOFAR 3000TL, SOFAR 1100TL, SOFAR 2200TL**
Additional Model: **SOFAR 1600TL, SOFAR 2700TL**
Applicant: **Shenzhen SOFARSOLAR Co., Ltd.**
Address: **3A-1, Huake Building, East Technology Park, Qiaoxiang Road, Nanshan District, Shenzhen, China.**
Technical Characteristics: **DC Input: DC 110 - 380V Max. 10A For SOFAR 1100TL;**
DC Input: DC 165 - 380V Max. 10A For SOFAR 1600TL ;
DC Input: DC 170 - 450V Max. 13A For SOFAR 2200TL;
DC Input: DC 210 - 450V Max. 13A For SOFAR 2700TL;
DC Input: DC 230 - 450V Max. 13A For SOFAR 3000TL
Output: AC 230V, 50/60Hz, Power: 1000W / 1500W / 2000W / 2500W / 2800W
Output Voltage/Current: SOFAR 1100TL:230V/4.5A; SOFAR 1600TL:230V/7.0A; SOFAR 2200TL:230V/9.5A; SOFAR 2700TL:230V/11.5A; SOFAR 3000TL:230V/13.0A

The submitted sample of the above equipment has been tested for CE marking according to following European Directive and standards:

- **Electromagnetic Compatibility Directive 2004/108/EC**

Standards	Report Number	Report date
EN 61000-6-3:2007 + A1:2011 EN 61000-3-2:2006 + A1 :2009 + A2:2009 EN 61000-3-3:2013 EN 61000-6-2:2005	CE140508N005R1	Jul. 21, 2014

The referred test report(s) show that the product complies with standard(s) recognized as giving presumption of compliance with the essential requirements in the specified European Directive.

This verification does not imply assessment of the production of the product. The CE marking may be affixed if all relevant and effective European Directives with CE are applicable.

CE

Supervisor
EMC Department

Name: Madison Luo
Date: Jul. 21, 2014

Bureau Veritas Shenzhen Co., Ltd. Dongguan Branch
No. 34, Chenwulu Section, Guantai Rd., Houjie Town, Dongguan City, Guangdong 523942, China
Tel.: +86 769 8593 5656
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Email:customerservice.dg@cn.bureauveritas.com

Test Report No.: CE140508N005R1

Test Lab Cert 2951.01

TEST REPORT

Applicant	Shenzhen SOFARSOLAR Co., Ltd.
Address	3A-1, Huake Building, East Technology Park, Qiaoxiang Road, Nanshan District, Shenzhen, China.

Manufacturer or Supplier	Shenzhen SOFARSOLAR Co., Ltd.
Address	3A-1, Huake Building, East Technology Park, Qiaoxiang Road, Nanshan District, Shenzhen, China.
Product	PV grid-interactive inverter
Brand Name	SOFAR SOLAR
Model	SOFAR 3000TL, SOFAR 1100TL, SOFAR 2200TL
Additional Model & Model Difference	SOFAR 1600TL, SOFAR 2700TL See item 2.1
Date of tests	May 08, 2014 ~ Jun. 30, 2014

The submitted sample of the above equipment has been tested for according to following European Directive - Electromagnetic directive 2004/108/EC and the tests have been carried out according to the requirements of the following standards:

☒ EN 61000-6-3:2007 + A1:2011
☒ EN 61000-3-2:2006 + A1:2009 + A2:2009
☒ EN 61000-3-3:2013
☒ EN 61000-6-2:2005

CONCLUSION: The submitted sample was found to COMPLY with the test requirement

Tested by Breeze Jiang Project Engineer / EMC Department	Approved by Madison Luo Manager / EMC Department
	Date: Jul. 21, 2014

Bureau Veritas Shenzhen Co., Ltd. Dongguan Branch
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Test Report No.: CE140508N005R1

RELEASE CONTROL RECORD

ISSUE NO.	REASON FOR CHANGE	DATE ISSUED
CE140508N005	Original release	Jul. 10, 2014
CE140508N005R1	Based on the original report CE140508N005 change power supply information, model and technical characteristics.	Jul. 21, 2014

Bureau Veritas Shenzhen Co., Ltd.
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Email: customerservice.dg@cn.bureauveritas.com

Test Report No.: CE140508N005R1

1 SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specifications:

EMISSION			
Standard	**Test Type**	**Result**	**Remarks**
EN61000-6-3:2007+ A1:2011	Conducted test	PASS	Meets requirement limit Minimum passing margin is –3.00 dB at 0.36094MHz
	Radiated test (30MHz~1GHz)	PASS	Meets limits minimum passing margin is –5.08 dB at 191.02MHz
EN 61000-3-2:2006 + A1:2009 + A2:2009	Harmonic current emissions	PASS	Meets the requirements.
EN 61000-3-3:2013	Voltage fluctuations & flicker	PASS	Meets the requirements.

IMMUNITY (EN 61000-6-2:2005)			
Standard	**Test Type**	**Result**	**Remarks**
IEC 61000-4-2:2008	Electrostatic discharge immunity test	PASS	Electrostatic Discharge – ESD: 8kV Air discharge, 4kV Contact discharge, Performance Criterion A
IEC 61000-4-3:2005 + A1:2007+A2:2010	Radiated, radio-frequency, electromagnetic field immunity test	PASS	Radio-Frequency Electromagnetic Field Susceptibility Test – RS: 80-1000 MHz, 10V/m, 80% AM (1kHz), 1400-2000 MHz, 3V/m, 80% AM (1kHz) 2000-2700 MHz, 1V/m, 80% AM (1kHz) Performance Criterion A
IEC 61000-4-4:2012	Electrical fast transient / burst immunity test.	PASS	Electrical Fast Transient/Burst - EFT AC Power line: 2kV, DC Power line: 2kV, Performance Criterion A
IEC 61000-4-5:2005	Surge immunity test	PASS	Surge Immunity Test: 1.2/50 us Open Circuit Voltage, 8 /20 us Short Circuit Current, AC Power Line: line to line 1 kV, Line to earth 2kV , DC Power Line: line to line 0.5 kV Performance Criterion B
IEC 61000-4-6:2008	Immunity to conducted disturbances, induced by radio-frequency fields	PASS	Conducted Radio Frequency Disturbances Test – CS: 0.15-80 MHz, 10Vrms, 80% AM, 1kHz, Performance Criterion A
IEC 61000-4-8:2009	Power frequency magnetic field immunity test.	PASS	Power Frequency Magnetic Field Test, 50 Hz / 60Hz, 30A/m, Performance Criterion A

1.1 MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

MEASUREMENT	FREQUENCY	UNCERTAINTY
Mains Terminal Disturbance Voltage Test	0.15MHz ~ 30MHz	+ /-2.67 dB
Radiated Disturbance Test	30MHz ~ 1000MHz	+ /-4.36 dB

2 GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF EUT

PRODUCT	PV Grid Inverter
MODEL NO.	SOFAR 3000TL, SOFAR 1100TL, SOFAR 2200TL
ADDITIONAL MODEL	SOFAR 1600TL, SOFAR 2700TL
POWER SUPPLY	DC Input: DC 110 - 380V Max. 10A For SOFAR 1100TL; DC Input: DC 165 - 380V Max. 10A For SOFAR 1600TL ; DC Input: DC 170 - 450V Max. 13A For SOFAR 2200TL; DC Input: DC 210 - 450V Max. 13A For SOFAR 2700TL; DC Input: DC 230 - 450V Max. 13A For SOFAR 3000TL Output: AC 230V, 50/60Hz, Power: 1000W / 1500W / 2000W / 2500W / 2800W Output Voltage/Current: SOFAR 1100TL:230V/4.5A; SOFAR 1600TL:230V/7.0A; SOFAR 2200TL:230V/9.5A; SOFAR 2700TL:230V/11.5A; SOFAR 3000TL:230V/13.0A
SOFTWARE VERSION	V1.00
HARDWARE VERSION	V1.00
THE HIGHEST OPERATING FREQUENCY	Below 108MHz
DATA CABLE SUPPLIED	DC Cable: Shielded; Detachable 1.8m; AC Cable: Shielded; Detachable 1.8m

NOTE:

1. This report CE140508N005R1 supersedes the previous one with the report number CE140508N005 dated on Jul. 10, 2014.

2. For the test results, the EUT had been tested with all conditions. But only the worst case was showed in test report.

3. For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual.

4. RS485 port on the product is for client to collect data, according to client requirements, no need to test.

5. All models shell include red, blue, white and other colors. All models of DC switch and WIFI module is optional accessories, optional installation according to the need of client.

6. This is a series of PV Grid Inverter with the same as in hardware except the amount of BUS capacitor, inverter inductor, Boost and IGBT component and DC switch are different. Identical in software the output power just adjusted by software; models SOFAR 3000TL, SOFAR 1100TL, SOFAR 2200TL are selected to test. full test was performed for the model SOFAR 3000TL, and partial test for the models SOFAR 1100TL, SOFAR 2200TL.

Ratings .....:	SOFAR 1100TL	SOFAR 1600TL	SOFAR 2200TL	SOFAR 2700TL	SOFAR 3000TL
MPP DC voltage range [V] .....:	110-380	165-380	170-450	210-450	230-450
Input DC voltage range [V].....:	90-400, max. 450		100-480, max. 500		
Input DC current [A].....:	10		13		
Output AC voltage [V].....:	230V, 50Hz				
Output AC current [A].....:	4,5	7,0	9,5	11,5	13,0
Output power [W] .....:	1000	1500	2000	2500	2800

7. Model Difference:

Difference:	SOFAR 3000TL	SOFAR 2700TL	SOFAR 2200TL	SOFAR 1600TL	SOFAR 1100TL
Boost inductor	1.9mH	1.9mH	1.9mH	2.6mH	2.6mH
Input sampling resistor (RP105,RP108 /RP189,RP109)	200ohm / 7.5Kohm	200ohm / 7.5Kohm	200ohm / 7.5Kohm	220ohm / 10Kohm	220ohm / 10Kohm
Bus capacitor	3pcs	3pcs	3pcs	2pcs	2pcs
Inverter inductor	1.3mH	1.5mH	2.1mH	2.3mH	3.4mH
Output sampling resistor (RP118, RP119, RC18 /RP120, RP121,RC22)	2Kohm,100ohm,100ohm	2Kohm,100ohm,100ohm	1.0Kohm,330ohm,330ohm	1.0Kohm,200ohm,100ohm	499ohm,200ohm,200ohm

2.2 DESCRIPTION OF TEST MODES

The EUT was tested under the following modes' the final worst mode were marked in boldface and recorded in this report.

◆ For Conducted Emission Test

Test Mode	TEST VOLTAGE	Model
Full Load	DC 380V	SOFAR 2200TL
Full Load	DC 380V	SOFAR 1100TL
Full Load	DC 230V	SOFAR 3000TL
Full Load	**DC 360V**	
Full Load	DC 450V	

◆ For Radiated Emission Test

Test Mode	TEST VOLTAGE	Model
Full Load	DC 380V	SOFAR 2200TL
Full Load	DC 380V	SOFAR 1100TL
Full Load	DC 230V	SOFAR 3000TL
Full Load	**DC 360V**	
Full Load	DC 450V	

◆ For Harmonics and Flicker Tests

Test Mode	TEST VOLTAGE	Model
Full Load	**DC 380V**	**SOFAR 1100TL**
Full Load	**DC 380V**	**SOFAR 3000TL**

◆ For Immunity Test

Test Mode	TEST VOLTAGE	Model
10% Load	**DC 300V**	**SOFAR 3000TL**

2.3 GENERAL DESCRIPTION OF APPLIED STANDARDS

The EUT has been tested and complied with the requirements of the following standards:

EN 61000-6-3:2007 + A1:2011
EN 61000-3-2:2006 + A1:2009 + A2:2009
EN 61000-3-3:2013
EN 61000-6-2:2005
IEC 61000-4-2:2008
IEC 61000-4-3:2005 + A1:2007 + A2:2010
IEC 61000-4-4:2012
IEC 61000-4-5:2005
IEC 61000-4-6:2008
IEC 61000-4-8:2009

Notes: The above IEC basic standards are applied with latest version if customer has no special requirement

2.4 DESCRIPTION OF SUPPORT UNITS

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

NO.	PRODUCT	BRAND	MODEL NO.	SERIAL NO.	FCC ID
1	DC Source	Chroma	62150H-1000S	62150EF00488	N/A

NO.	SIGNAL CABLE DESCRIPTION OF THE ABOVE SUPPORT UNITS
1	AC Line: Unshielded, Detachable 2.0m, DC Line: Unshielded, Detachable 2.0m;

3 EMISSION TEST

3.1 CONDUCTED EMISSION MEASUREMENT

3.1.1 LIMITS OF CONDUCTED EMISSION MEASUREMENT

FREQUENCY (MHz)	Class A (dBuV)		Class B (dBuV)	
	Quasi-peak	Average	Quasi-peak	Average
0.15 - 0.5	79	66	66 - 56	56 - 46
0.50 - 5.0	73	60	56	46
5.0 - 30.0	73	60	60	50

Note: (1) The lower limit shall apply at the transition frequencies.
(2) The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50 MHz.
(3) All emanations from a class A/B digital device or system, including any network of conductors and apparatus connected thereto, shall not exceed the level of field strengths specified above.

3.1.2 TEST INSTRUMENTS

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
EMI Test Receiver	Rohde&Schwarz	ESCS30	100199	May 17,14	May 16,15
Pulse Limiter	Rohde&Schwarz	ESH3-Z2	100168	Oct. 12,13	Oct. 11,14
Artificial Mains Network	Rohde&Schwarz	ESH2-Z5	100071	May 13,14	May 12,15
Test software	ADT	ADT_Cond_ V7.3.7	N/A	N/A	N/A

NOTE: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to CEPREI/CHINA, GRGT/CHINA and NIM/CHINA.
2. The test was performed in shielding room 843.

3.1.3 TEST PROCEDURE

a. The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 Ohm/ 50uH of coupling impedance for the measuring instrument.

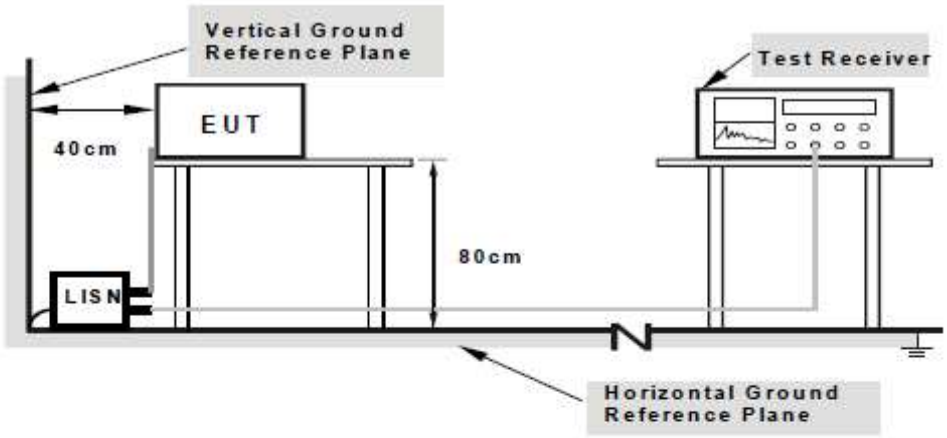
b. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.

c. The frequency range from 150 kHz to 30 MHz was searched. Emission levels under (Limit – 20dB) were not recorded.

3.1.4 DEVIATION FROM TEST STANDARD

No deviation

3.1.5 TEST SETUP



Note: 1.Support units were connected to second LISN.
2.Both of LISNs (AMN) are 80cm from EUT and at least 80cm from other units and other metal planes support units.

3.1.6 EUT OPERATING CONDITIONS

a. Turned on the power of all equipment.
b. EUT was operated according to the type description in manufacturer's specifications or the User's Manual.

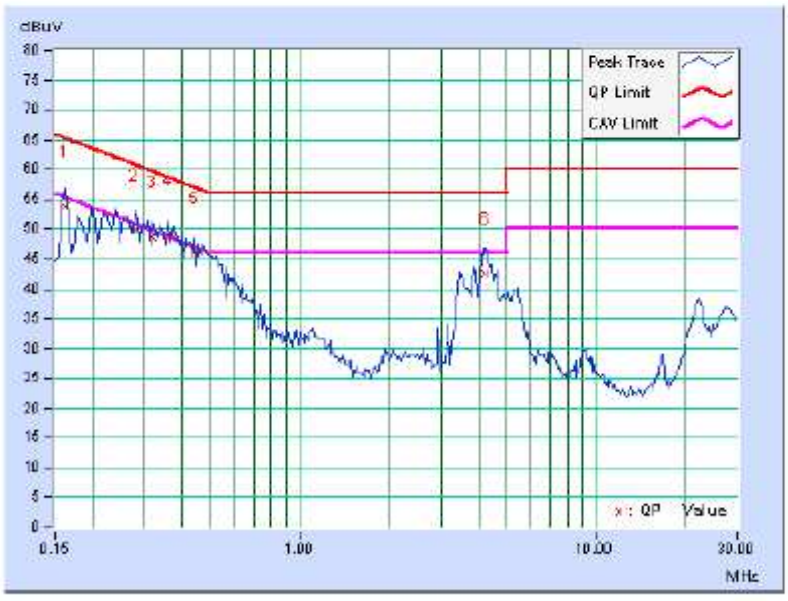
Test Report No.: CE140508N005R1

3.1.7 TEST RESULTS

TEST MODE	SOFAR 3000TL Grid Mode	6dB BANDWIDTH	9 kHz
TEST VOLTAGE	DC 360V	PHASE	Line (L)
ENVIRONMENTAL CONDITIONS	23 deg. C, 42% RH	TESTED BY: Heise	

No	Freq.	Corr. Factor	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.16172	5.20	48.57	45.49	53.77	50.69	65.38	55.38	-11.60	-4.68
2	0.27891	9.16	40.76	37.52	49.92	46.68	60.85	50.85	-10.93	-4.17
3	0.31797	9.23	39.58	36.34	48.81	45.57	59.76	49.76	-10.95	-4.19
4	0.36094	9.32	39.63	36.39	48.95	45.71	58.71	48.71	-9.76	-3.00
5	0.43906	9.47	36.61	34.20	46.08	43.67	57.08	47.08	-11.00	-3.41
6	4.25000	10.01	32.52	25.58	42.53	35.59	56.00	46.00	-13.47	-10.41

REMARKS: The emission levels of other frequencies were very low against the limit.

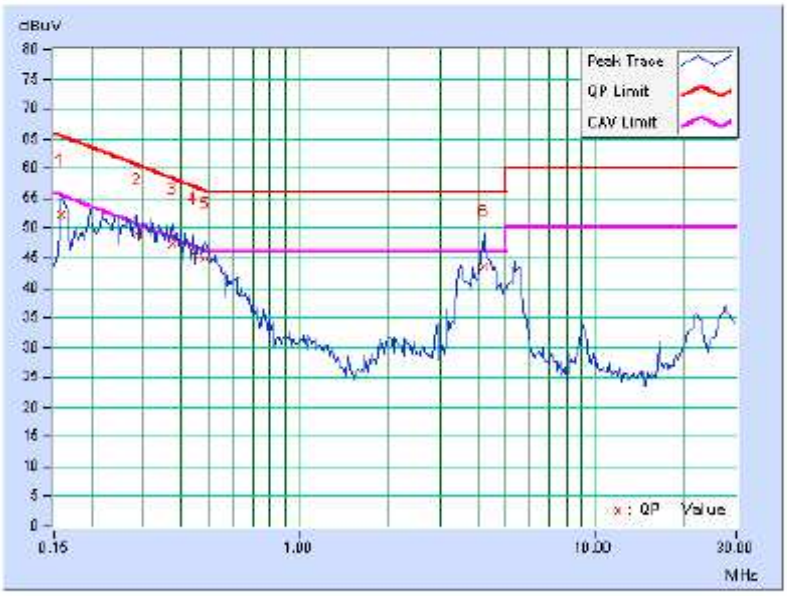


Test Report No.: CE140508N005R1

TEST MODE	SOFAR 3000TL Grid Mode	6dB BANDWIDTH	9 kHz
TEST VOLTAGE	DC 360V	PHASE	Neutral (N)
ENVIRONMENTAL CONDITIONS	23 deg. C, 42% RH	TESTED BY: Heise	

No	Freq.	Corr. Factor	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15781	4.85	47.50	43.90	52.35	48.75	65.58	55.58	-13.22	-6.82
2	0.28281	9.19	39.88	36.67	49.07	45.86	60.73	50.73	-11.67	-4.88
3	0.37656	9.35	38.15	35.11	47.50	44.46	58.35	48.35	-10.85	-3.89
4	0.43906	9.46	36.24	33.89	45.70	43.35	57.08	47.08	-11.38	-3.73
5	0.48203	9.54	35.42	33.03	44.96	42.57	56.30	46.30	-11.35	-3.74
6	4.22266	10.05	33.58	25.62	43.63	35.67	56.00	46.00	-12.37	-10.33

REMARKS: The emission levels of other frequencies were very low against the limit.



3.2 RADIATED EMISSION MEASUREMENT

3.2.1 LIMITS OF RADIATED EMISSION MEASUREMENT

TEST STANDARD: EN 61000-6-3

FOR FREQUENCY BELOW 1000 MHz

FREQUENCY (MHz)	Class A (at 10m) dBuV/m	Class B (at 10m) dBuV/m
30 – 230	40	30
230 – 1000	47	37

FREQUENCY RANGE OF RADIATED MEASUREMENT (For unintentional radiators)

Highest frequency generated or Upper frequency of measurement used in the device or on which the device operates or tunes (MHz)	Range (MHz)
Below 108	1000
108 – 500	2000
500 – 1000	5000
Above 1000	Up to 5 times of the highest frequency or 6 GHz, whichever is less

FOR FREQUENCY ABOVE 1000 MHz

FREQUENCY (GHz)	Class A (dBuV/m) (at 3m)		Class B (dBuV/m) (at 3m)	
	PEAK	AVERAGE	PEAK	AVERAGE
1 to 3	76	56	70	50
3 to 6	80	60	74	54

NOTE: (1) The lower limit shall apply at the transition frequencies.
(2) Emission level (dBuV/m) = 20 log Emission level (uV/m).
(3) All emanation from a class A/B digital device or system, including any network of conductors and apparatus connected thereto, shall not exceed the level of field strengths specified above.

3.2.2 TEST INSTRUMENTS

Frequency Range 30MHz-1GHz

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
EMI Test Receiver	Rohde&Schwarz	ESCI	100962	Mar. 06,14	Mar. 05,15
Bilog Antenna	Teseq	CBL 6111D	27089	Jul. 27, 13	Jul. 26, 14
Trilog-Broadband Antenna	SCHWARZBECK	VULB 9168	9168-554	Dec. 03, 13	Dec. 02, 14
Trilog-Broadband Antenna	SCHWARZBECK	VULB 9168	9168-555	Dec. 03, 13	Dec. 02, 14
10m Semi-anechoic Chamber	CHANGLING	21.4m*12.1m*8.8m	NSEMC006	Jun. 11, 13	Jun. 10, 14
Amplifier (9kHz-1GHz)	SONOMA	310D	186955	Mar. 05,14	Mar. 04, 15
Test Software	ADT	ADT_Radiated_V7.6.15.9.2	N/A	N/A	N/A

Frequency Range Above1GHz

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
Horn Antenna	ETS-Lindgren	3117	00062558	Oct. 18,12	Oct. 17,14
EMI Test Receiver	Rohde&Schwarz	ESCI	100962	Mar. 06,14	Mar. 05,15
Spectrum Analyzer	Rohde&Schwarz	FSV40	101003	Apr. 09,14	Apr. 08,15
Pre-Amplifier (100MHz-26.5GHz)	EMCI	EMC 012645	980077	Nov. 07,13	Nov. 06,14
Pre-Amplifier (18GHz-40GHz)	EMCI	EMC 184045	980102	Nov. 04,13	Nov. 03,14
Test Software	ADT	ADT_Radiated_V7.6.15.9.2	N/A	N/A	N/A

NOTE: 1. The calibration interval of the above test instruments is 12 months. And the calibrations are traceable to CEPREI/CHINA and NIM/CHINA.
2. The test was performed in Chamber 10m.

3.2.3 TEST PROCEDURE

<Frequency Range below 1GHz>

a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 10 meter chamber room. The table was rotated 360 degrees to determine the position of the highest radiation.

b. The EUT was set 10 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

c. The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the turn table was turned from 0 degrees to 360 degrees to find the maximum reading.

e. The test-receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1 GHz.

NOTE:

1. The resolution bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. Emission level(dBuV/m)=Raw Value(dBuV) + Correction Factor(dB/m)
3. Correction Factor(dB/m) = Antenna Factor (dB/m) + Cable Factor (dB)
4. Margin value = Emission level – Limit value.

<Frequency Range above 1GHz>

a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 10 meter Semi-anechoic chamber room. The table was rotated 360 degrees to determine the position of the highest radiation.

b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

c. The height of antenna can be varied from one meter to four meters, the height of adjustment depends on the EUT height and the antenna 3dB beamwidth both, to detect the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.

e. The test receiver/spectrum was set to peak and average detect function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz.

NOTE:

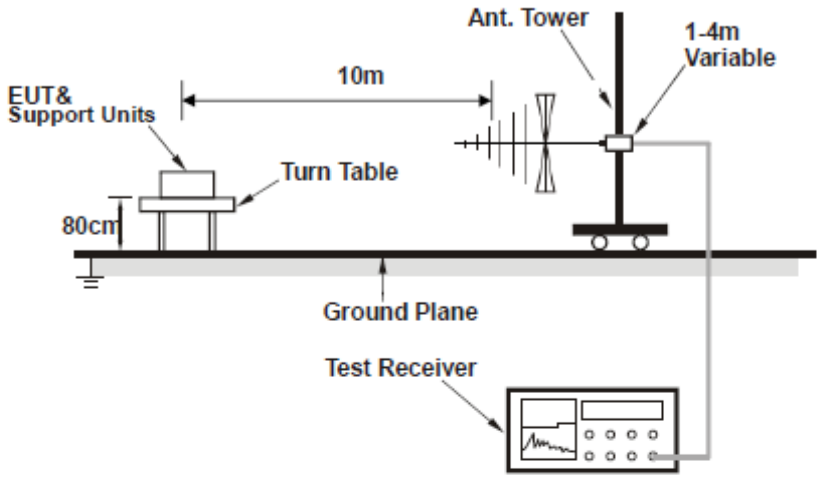
1. The resolution bandwidth is 1MHz and video bandwidth of test receiver/spectrum analyzer is 3MHz for Peak detection at frequency above 1GHz. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz for Average detection (AV) at frequency above 1GHz.
2. For measurement of frequency above 1000 MHz, the EUT was set 3 meters away from the receiver antenna.

3.2.4 DEVIATION FROM TEST STANDARD

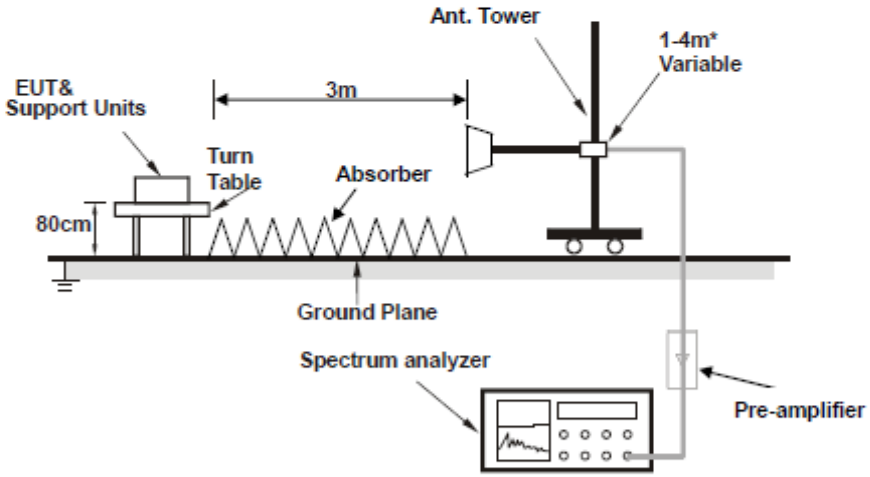
No deviation

3.2.5 TEST SETUP

<Frequency Range below 1GHz>



<Frequency Range above 1GHz>



* : depends on the EUT height and the antenna 3dB beamwidth both, refer to section 7.3 of CISPR 16-2-3.

3.2.6 EUT OPERATING CONDITIONS

Same as item 3.1.6

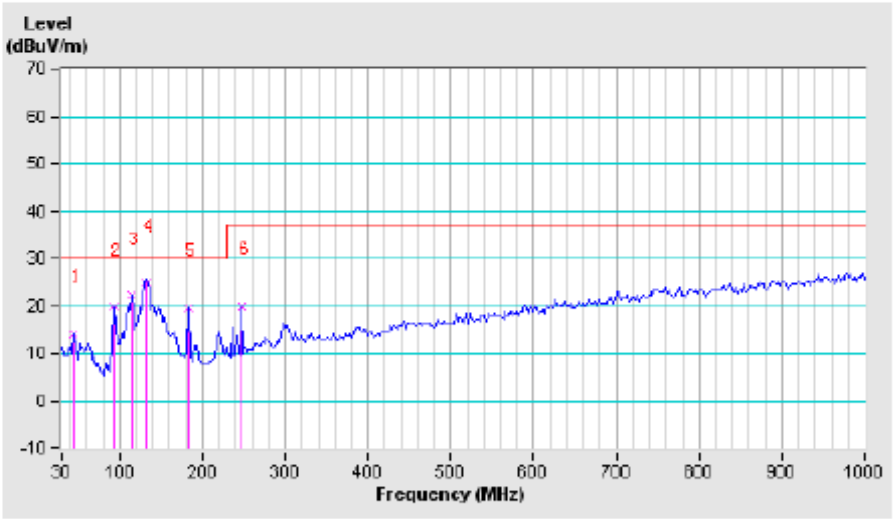
Test Report No.: CE140508N005R1

3.2.7 TEST RESULTS

TEST MODE	SOFAR 3000TL Grid Mode	FREQUENCY RANGE	30-1000 MHz
TEST VOLTAGE	DC 360V	DETECTOR FUNCTION & BANDWIDTH	Quasi-Peak, 120kHz
ENVIRONMENTAL CONDITIONS	25 deg. C, 50% RH	TESTED BY: Robert	

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 10 M								
No.	Freq. (MHz)	Correction Factor (dB/m)	Raw Value (dBuV)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Table Angle (Degree)
1	43.58	14.96	-0.74	14.22	30.00	-15.78	143	12
2	92.08	10.26	9.47	19.73	30.00	-10.27	400	31
3	113.42	12.35	9.75	22.10	30.00	-7.90	400	313
4	130.88	13.26	11.50	24.76	30.00	-5.24	400	122
5	183.26	12.88	6.59	19.47	30.00	-10.53	219	132
6	247.28	14.09	5.71	19.80	37.00	-17.20	100	13

REMARKS: The emission levels of other frequencies were very low against the limit..

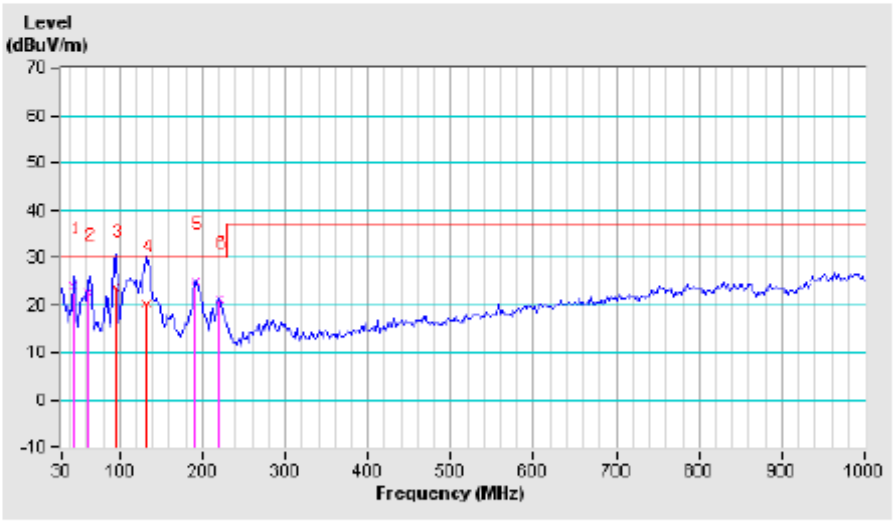


Test Report No.: CE140508N005R1

TEST MODE	SOFAR 3000TL Grid Mode	FREQUENCY RANGE	30-1000 MHz
TEST VOLTAGE	DC 360V	DETECTOR FUNCTION & BANDWIDTH	Quasi-Peak, 120kHz
ENVIRONMENTAL CONDITIONS	25 deg. C, 50% RH	TESTED BY: Robert	

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 10 M								
No.	Freq. (MHz)	Correction Factor (dB/m)	Raw Value (dBuV)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Table Angle (Degree)
1	43.58	14.96	9.04	24.00	30.00	-6.00	195	129
2	61.04	13.28	9.31	22.59	30.00	-7.41	165	104
3	94.00	10.50	12.90	23.40	30.00	-6.60	100	20
4	130.88	13.26	6.84	20.10	30.00	-9.90	100	20
5	**191.02**	**12.37**	**12.55**	**24.92**	**30.00**	**-5.08**	**128**	**72**
6	220.12	12.64	8.38	21.02	30.00	-8.98	231	160

REMARKS: The emission levels of other frequencies were very low against the limit.



3.3 HARMONICS CURRENT MEASUREMENT (<16A)

3.3.1 LIMITS OF HARMONICS CURRENT MEASUREMENT

TEST STANDARD: EN 61000-3-2

Limits for Class A equipment	
Harmonic Order n	Max. permissible harmonics current A
Odd harmonics	
3	2.30
5	1.14
7	0.77
9	0.40
11	0.33
13	0.21
15<=n<=39	0.15x15/n
Even harmonics	
2	1.08
4	0.43
6	0.30
8<=n<=40	0.23x8/n

Limits for Class D equipment		
Harmonic Order n	Max. permissible harmonics current per watt mA/W	Max. permissible harmonics current A
Odd Harmonics only		
3	3.4	2.30
5	1.9	1.14
7	1.0	0.77
9	0.5	0.40
11	0.35	0.33
13	0.30	0.21
15<=n<=39	3.85/n	0.15x15/n

NOTE: 1.Class A and Class D are classified according to section 5 of EN 61000-3-2.

2.According to section 7 of EN 61000-3-2, the above limits for all equipment except for lighting equipment having an active power input> 75 W and no limits apply for equipment with an active power input up to and including 75 W.

- **Limits for Class B equipment:**

For class B equipment, the harmonics of the input current shall not exceed the maximum permissible values given for class A equipment multiplied by a factor of 1.5.

Limits for Class C equipment	
Harmonic Order n	Max. permissible harmonics current expressed as a percentage of the input current at the fundamental frequency %
2	2
3	30· λ
5	10
7	7
9	5
11<=n<=39 (odd harmonics only)	3
λ is the circuit power factor	

NOTE: Discharge lighting equipment having an active TEST VOLTAGE smaller than or equal to 25W, the harmonic currents shall not exceed the power related limits of Class D.

3.3.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
PRECISION POWER ANALYZER	YOKOGAWA	WT3000	91M210852	Mar. 12,14	Mar. 11,15
Test Software	YOKOGAWA	IEC61000	N/A	N/A	N/A
PEFERENCE IMPEDANCE NETWORK	Voltech	EUR	3018	N/A	N/A

NOTE: 1. The test was performed in PV Room.
2. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to CEPREI/CHINA, GRGT/CHINA and NIM/CHINA.

3.3.3 TEST PROCEDURE

a. The EUT was placed on the top of a wooden table 0.8 meters above the ground and operated to produce the maximum harmonic components under normal operating conditions for each successive harmonic component in turn.

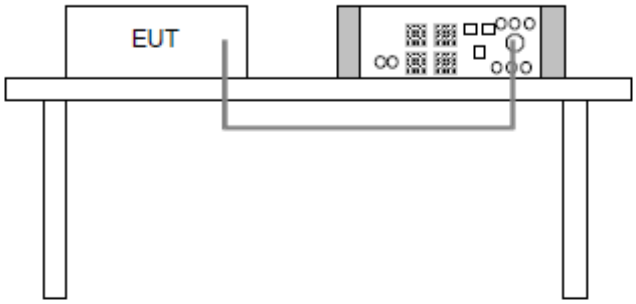
b. The classification of EUT is according to section 5 of EN 61000-3-2:2006 + A1:2009 + A2:2009.
The EUT is classified as follows:
Class A: Balanced three-phase equipment, Household appliances excluding equipment as Class D, Tools excluding portable tools, Dimmers for incandescent lamps, audio equipment, equipment not specified in one of the three other classes.
Class B: Portable tools. ; Arc welding equipment which is not professional equipment
Class C: Lighting equipment.
Class D: Equipment having a specified power less than or equal to 600 W of the following types: Personal computers and personal computer monitors and television receivers.

c. The correspondent test program of test instrument to measure the current harmonics emanated from EUT is chosen. The measure time shall be not less than the time necessary for the EUT to be exercised.

3.3.4 DEVIATION FROM TEST STANDARD

No deviation

3.3.5 TEST SETUP



3.3.6 EUT OPERATING CONDITIONS

Same as item 3.1.6

Test Report No.: CE140508N005R1

3.3.7 TEST RESULTS

SOFAR 1100TL

******* appliances (Average)**

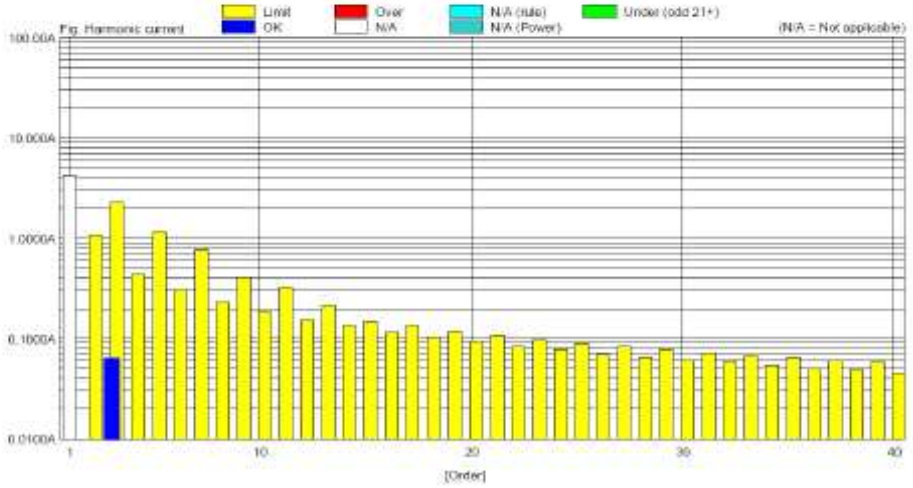
Print Date	Mon May 26 14:15:38 2014
MeasureDate	Mon May 26 14:15:34 2014
Comment	Experimental model Pattern A

Regulation	IEC61000-3-2 Ed3.0 am2 IEC61000-4-7 Ed2.0 A1
Class	CLASS A
MeasureTime	150.00sec
Model	YOKOGAWA WT3000
Rating Voltage	230.00 V
Wiring	single-phase 2-wire
Element	1
Range	300V/30A
Current(rms)	4.2800 A
Voltage(rms)	230.42 V
Frequency	50.000 Hz
Power Factor	0.9957
PCHC Limit	0.2514 A
PCHC Max	0.0040 A
THC	0.0658 A

PASS

Set Fundamental I	:	--------
Set Power Factor	:	--------
Set P	:	--------
Sigma W Max	:	982.9105 W
Sigma PF	:	0.9957
Distortion factor(V)	:	0.05 %
V THDS	:	0.05 %
V THDG	:	0.05 %
Distortion factor(A)	:	1.53 %
A THDS	:	1.53 %
A THDG	:	1.64 %
P THD	:	0.00 %
Power Limit	:	75 W

Order	Measure[A]	Limit[A]	Margin[%]	Order	Measure[A]	Limit[A]	Margin[%]
1	4.2796			2	0.0082	1.0800	99.1
3	0.0632	2.3000	97.3	4	0.0045	0.4300	99.0
5	0.0036	1.1400	99.2	6	0.0031	0.3000	99.0
7	0.0061	0.7700	99.2	8	0.0022	0.2300	99.0
9	0.0038	0.4000	99.1	10	0.0023	0.1840	98.8
11	0.0023	0.3300	99.4	12	0.0023	0.1533	98.5
13	0.0018	0.2100	99.1	14	0.0018	0.1314	98.6
15	0.0016	0.1500	99.0	16	0.0016	0.1150	98.6
17	0.0014	0.1324	99.0	18	0.0018	0.1022	98.3
19	0.0016	0.1184	98.8	20	0.0016	0.0920	98.3
21	0.0017	0.1071	98.4	22	0.0015	0.0836	98.4
23	0.0014	0.0978	98.6	24	0.0012	0.0767	98.4
25	0.0016	0.0900	98.3	26	0.0014	0.0708	98.0
27	0.0012	0.0833	98.6	28	0.0011	0.0657	98.3
29	0.0012	0.0776	98.5	30	0.0010	0.0613	98.4
31	0.0016	0.0726	98.7	32	0.0011	0.0575	98.1
33	0.0013	0.0682	98.4	34	0.0013	0.0541	97.6
35	0.0011	0.0643	98.3	36	0.0012	0.0511	97.7
37	0.0009	0.0608	98.5	38	0.0012	0.0484	97.6
39	0.0009	0.0577	98.5	40	0.0015	0.0460	96.9



Test Report No.: CE140508N005R1

***** appliances (Maximum)

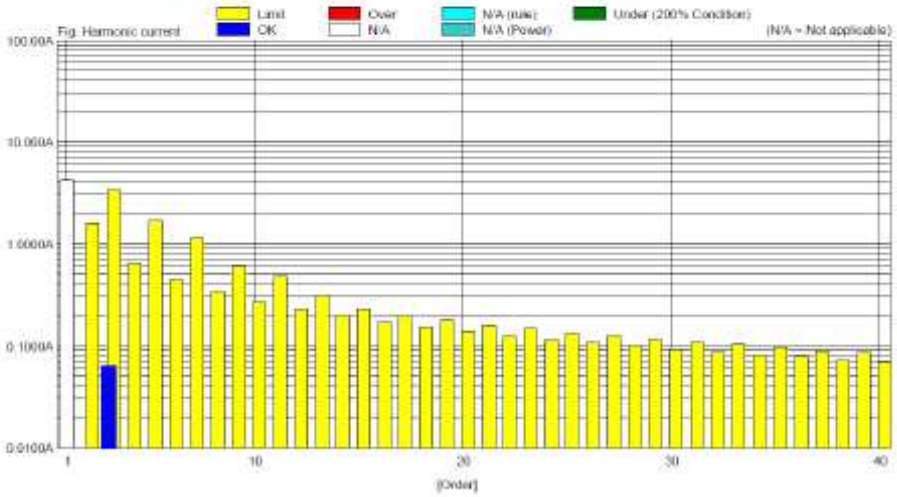
Print Date	:	Mon May 26 14:15:38 2014
MeasureDate	:	Mon May 26 14:15:34 2014
Comment	:	Experimental model Pattern A

Regulation	:	IEC61000-3-2 Ed3.0 am2 IEC61000-4-7 Ed2.0 A1
Class	:	CLASS A
MeasureTime	:	150.00sec
Model	:	YOKOGAWA WT3000
Rating Voltage	:	230.00 V
Wiring	:	single-phase 2-wire
Element	:	1
Range	:	300V/30A
Current(rms)	:	4.2840 A
Voltage(rms)	:	230.42 V
Frequency	:	50.004 Hz
Power Factor	:	0.9657
Beyond Limit Time	:	15.0000 s
Beyond Total Time	:	0.0000 s
THC	:	0.0661 A

PASS

Set Fundamental I	:	--------
Set Power Factor	:	--------
Set P	:	--------
Sigma W Max	:	982.9105 W
Sigma PF	:	0.9957
Distortion factor(V)	:	0.05 %
V THDS	:	0.05 %
V THDG	:	0.05 %
Distortion factor(A)	:	1.55 %
A THDS	:	1.55 %
A THDG	:	1.56 %
P THD	:	0.00 %
Power Limit	:	75 W

Order	Measure[A]	Limit[A]	Margin[%]	Order	Measure[A]	Limit[A]	Margin[%]
1	4.2835			2	0.0100	1.6200	99.4
3	0.0635	3.4500	98.2	4	0.0047	0.8450	99.3
5	0.0089	1.7100	99.4	6	0.0033	0.4500	99.3
7	0.0053	1.1550	99.5	8	0.0024	0.3450	99.3
9	0.0039	0.8000	99.4	10	0.0025	0.2760	99.1
11	0.0022	0.4950	99.5	12	0.0025	0.2300	98.9
13	0.0021	0.3150	99.3	14	0.0029	0.1971	99.0
15	0.0010	0.2250	99.3	16	0.0019	0.1725	99.0
17	0.0015	0.1985	99.2	18	0.0019	0.1533	98.8
19	0.0016	0.1776	99.1	20	0.0017	0.1380	98.7
21	0.0019	0.1607	98.8	22	0.0015	0.1255	98.8
23	0.0016	0.1467	98.9	24	0.0013	0.1150	98.8
25	0.0016	0.1350	98.8	26	0.0016	0.1062	98.6
27	0.0013	0.1250	98.9	28	0.0012	0.0986	98.8
29	0.0013	0.1184	98.9	30	0.0010	0.0920	98.9
31	0.0011	0.1089	99.0	32	0.0012	0.0862	98.6
33	0.0013	0.1023	98.8	34	0.0014	0.0812	98.3
35	0.0012	0.0964	98.7	36	0.0013	0.0767	98.4
37	0.0010	0.0912	98.9	38	0.0013	0.0726	98.3
39	0.0010	0.0885	98.9	40	0.0010	0.0690	97.7



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Test Report No.: CE140508N005R1

SOFAR 3000TL

***** appliances (Average)

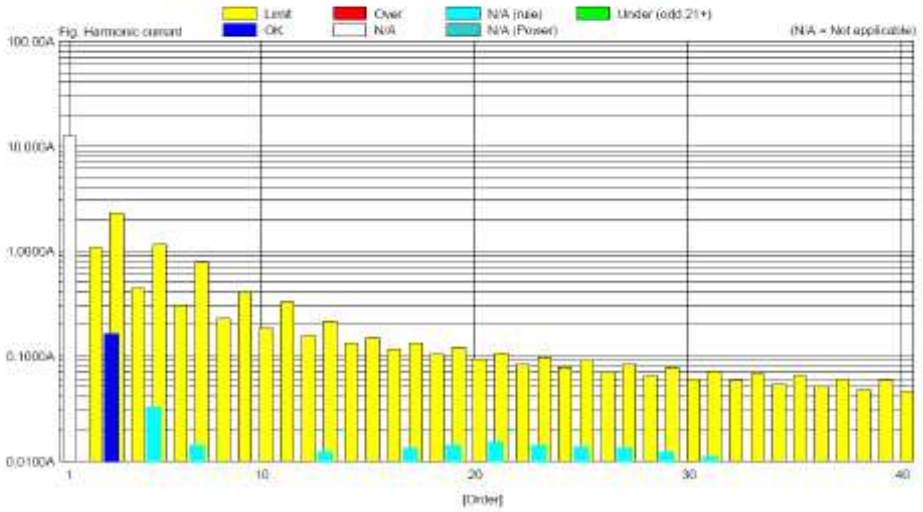
Print Date	Wed Jun 11 11:32:38 2014
MeasureDate	Wed Jun 11 11:31:38 2014
Comment	Experimental model Pattern A

Regulation	IEC61000-3-2 Ed3.0 am2 IEC61000-4-7 Ed2.0 A1
Class	CLASS A
MeasureTime	150.00sec
Model	YOKOGAWA WT3000
Rating Voltage	230.00 V
Wiring	single-phase 2-wire
Element	2
Range	300V/30A
Current(rms)	12.1893 A
Voltage(rms)	229.99 V
Frequency	49.999 Hz
Power Factor	0.9998
POHC Limit	0.2514 A
POHC Max	0.0365 A
THC	0.1683 A

PASS

Set Fundamental I	---------
Set Power Factor	---------
Set P	---------
Sigma W Max	2804.014 W
Sigma PF	0.9998
Distortion factor(V)	0.04 %
V THDS	0.04 %
V THDG	0.04 %
Distortion factor(A)	1.38 %
A THDS	1.38 %
A THDG	1.38 %
P THD	0.00 %
Power Limit	75 W

Order	Measure[A]	Limit[A]	Margin[%]	Order	Measure[A]	Limit[A]	Margin[%]
1	12.1882			2	0.0091	1.0800	99.2
3	0.1680	2.3000	93.1	4	0.0062	0.4300	98.6
5	0.0310	1.1400	97.2	6	0.0031	0.3000	99.0
7	0.0138	0.7700	98.2	8	0.0031	0.2300	98.7
9	0.0054	0.4000	98.6	10	0.0042	0.1840	97.7
11	0.0039	0.3300	98.2	12	0.0037	0.1533	97.6
13	0.0121	0.2100	94.3	14	0.0040	0.1314	96.9
15	0.0102	0.1500	93.2	16	0.0032	0.1150	97.3
17	0.0129	0.1324	90.3	18	0.0024	0.1022	97.7
19	0.0138	0.1184	88.3	20	0.0028	0.0920	97.2
21	0.0148	0.1071	86.3	22	0.0018	0.0836	97.8
23	0.0137	0.0978	86.0	24	0.0016	0.0767	97.9
25	0.0133	0.0900	85.2	26	0.0015	0.0708	97.3
27	0.0130	0.0833	84.4	28	0.0017	0.0657	97.3
29	0.0119	0.0776	84.7	30	0.0013	0.0613	97.8
31	0.0107	0.0726	85.3	32	0.0012	0.0575	98.0
33	0.0094	0.0682	86.1	34	0.0012	0.0541	97.7
35	0.0091	0.0643	85.9	36	0.0011	0.0511	97.8
37	0.0079	0.0608	87.1	38	0.0013	0.0484	97.2
39	0.0077	0.0577	86.6	40	0.0012	0.0460	97.4



Test Report No.: CE140508N005R1

***** appliances (Maximum)

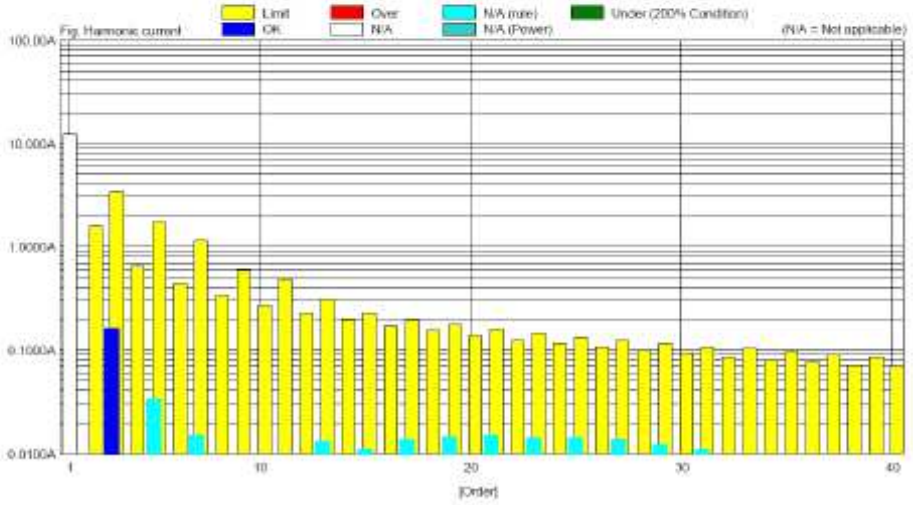
Print Date	:	Wed Jun 11 11:32:39 2014
MeasureDate	:	Wed Jun 11 11:31:38 2014
Comment	:	Experimental model Pattern A

Regulation	:	IEC61000-3-2 Ed3.0 am2 IEC61000-4-7 Ed2.0 A1
Class	:	CLASS A
MeasureTime	:	150.00sec
Model	:	YOKOGAWA WT3000
Rating Voltage	:	230.00 V
Wiring	:	single-phase 2-wire
Element	:	2
Range	:	300V/30A
Current(rms)	:	12.1941 A
Voltage(rms)	:	228.89 V
Frequency	:	50.018 Hz
Power Factor	:	0.9998
Beyond Limit Time	:	15.0002 s
Beyond Total Time	:	0.0000 s
THC	:	0.1694 A

PASS

Set Fundamental I	:	--------
Set Power Factor	:	--------
Set P	:	--------
Sigma W Max	:	2804.014 W
Sigma PF	:	0.9998
Distortion factor(V)	:	0.04 %
V THDS	:	0.04 %
V THDG	:	0.04 %
Distortion factor(A)	:	1.40 %
A THDS	:	1.40 %
A THDG	:	1.40 %
P THD	:	0.00 %
Power Limit	:	75 W

Order	Measure[A]	Limit[A]	Margin[%]	Order	Measure[A]	Limit[A]	Margin[%]
1	12.1929			2	0.0067	1.6200	99.5
3	0.1691	3.4500	95.4	4	0.0067	0.6480	99.0
5	0.0228	1.7100	98.1	6	0.0035	0.4800	99.2
7	0.0145	1.1550	98.7	8	0.0054	0.3450	99.0
9	0.0068	0.9000	99.0	10	0.0041	0.2760	98.3
11	0.0065	0.4950	98.7	12	0.0042	0.2300	98.2
13	0.0129	0.3150	95.9	14	0.0061	0.1971	97.4
15	0.0109	0.2250	95.2	16	0.0035	0.1725	98.0
17	0.0134	0.1985	93.3	18	0.0027	0.1533	98.2
19	0.0142	0.1776	92.0	20	0.0028	0.1380	97.9
21	0.0150	0.1607	90.7	22	0.0021	0.1255	98.4
23	0.0139	0.1467	90.5	24	0.0018	0.1150	98.4
25	0.0135	0.1350	89.9	26	0.0022	0.1062	98.0
27	0.0132	0.1250	89.4	28	0.0020	0.0986	98.0
29	0.0121	0.1164	89.6	30	0.0015	0.0920	98.4
31	0.0106	0.1089	90.3	32	0.0013	0.0862	98.5
33	0.0097	0.1023	90.6	34	0.0014	0.0812	98.3
35	0.0092	0.0964	90.4	36	0.0012	0.0767	98.4
37	0.0081	0.0912	91.1	38	0.0010	0.0726	97.9
39	0.0078	0.0865	90.8	40	0.0014	0.0690	97.9



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3.4 VOLTAGE FLUCTUATION AND FLICKS MEASUREMENT

3.4.1 LIMITS OF VOLTAGE FLUCTUATION AND FLICKS MEASUREMENT

TEST STANDARD: EN 61000-3-3

TEST ITEM	LIMIT	NOTE
P_{st}	1.0	P_{st} means short-term flicker indicator.
P_{lt}	0.65	P_{lt} means long-term flicker indicator.
$T_{d(t)}$ (ms)	500	$T_{d(t)}$ means maximum time that d(t) exceeds 3.3%.
d_{max} (%)	4	dmax means maximum relative voltage change.
dc (%)	3.3	dc means relative steady-state voltage change

3.4.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
PRECISION POWER ANALYZER	YOKOGAWA	WT3000	91M210852	Mar. 12,14	Mar. 11,15
Test Software	YOKOGAWA	IEC61000	N/A	N/A	N/A
PEFERENCE IMPEDANCE NETWORK	Voltech	EUR	3018	N/A	N/A

NOTE: 1. The test was performed in PV Room.
2. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to CEPREI/CHINA, GRGT/CHINA and NIM/CHINA.

3.4.3 TEST PROCEDURE

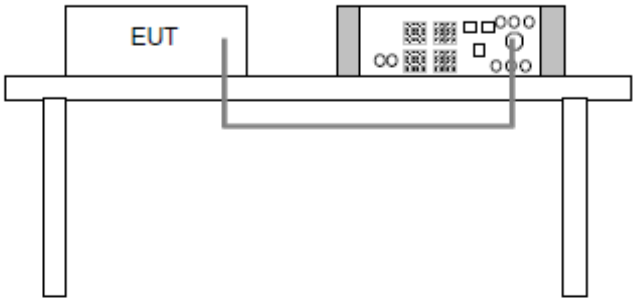
a. The EUT was placed on the top of a wooden table 0.8 meters above the ground and operated to produce the most unfavorable sequence of voltage changes under Normal Operating conditions.

b. During the flick measurement, the measure time shall include that part of whole operation cycle in which the EUT produce the most unfavorable sequence of voltage changes. The observation period for short-term flicker indicator is 120 minutes

3.4.4 DEVIATION FROM TEST STANDARD

No deviation

3.4.5 TEST SETUP



3.4.6 EUT OPERATING CONDITIONS

Same as item 3.1.6.

Test Report No.: CE140508N005R1

3.4.7 TEST RESULTS

SOFAR 1100TL

PV Inverter

Print Date : Mon May 26 16:26:18 2014
MeasureDate : Mon May 26 16:25:54 2014
Comment : Experimental model Pattern A

Regulation : IEC61000-3-3 Ed2.0
IEC61000-4-15 Ed1.1
Interval : 10Min0Sec
Model : YOKOGAWA WT3000
Wiring : single-phase 2wire
Voltage Range : 300.00V
Voltage U1 : 231.61V
Set Frequency : 50Hz
Frequency U1 : 50.000Hz
Element : 1
dmin : 0.10%

PASS(Under dmin)

Element1 : Pass(Under dmin)
dc (3.30%) : Pass
dmax (4.00%) : Pass
d(t) (500ms) : Pass
Pst (1.00) : Pass
Plt (0.65) : Pass

No.	dc[%]	dmax[%]	d(t)[ms]	Pst
1	0.00	0.00	0.00	0.07
2	0.00	0.00	0.00	0.07
3	0.00	0.00	0.00	0.07
4	0.00	0.00	0.00	0.07
5	0.00	0.00	0.00	0.07
6	0.00	0.00	0.00	0.07
7	0.00	0.00	0.00	0.07
8	0.00	0.00	0.00	0.07
9	0.00	0.00	0.00	0.07
10	0.00	0.00	0.00	0.07
11	0.00	0.00	0.00	0.07
12	0.00	0.00	0.00	0.07

Plt
0.07

Test Report No.: CE140508N005R1

SOFAR 3000TL

PV Inverter

Print Date : Fri Jun 13 11:17:38 2014
MeasureDate : Fri Jun 13 11:17:28 2014
Comment : Experimental model Pattern A

Regulation : IEC61000-3-3 Ed2.0
IEC61000-4-15 Ed1.1
Interval : 10Min0Sec
Model : YOKOGAWA WT3000
Wiring : single-phase 2-wire
Voltage Range : 300.00V
Voltage U1 : 234.15V
Set Frequency : 50Hz
Frequency U1 : 50.000Hz
Element : 1
dmin : 0.10%

PASS(Under dmin)

Element1 : Pass(Under dmin)
dc (3.30%) : Pass
dmax (4.00%) : Pass
d(t) (500ms) : Pass
Pst (1.00) : Pass
Plt (0.65) : Pass

No.	dc[%]	dmax[%]	d(t)[ms]	Pst
1	0.00	0.00	0.00	0.07
2	0.00	0.00	0.00	0.07
3	0.00	0.00	0.00	0.07
4	0.00	0.00	0.00	0.07
5	0.00	0.00	0.00	0.07
6	0.00	0.00	0.00	0.07
7	0.00	0.00	0.00	0.07
8	0.00	0.00	0.00	0.07
9	0.00	0.00	0.00	0.07
10	0.00	0.00	0.00	0.07
11	0.00	0.00	0.00	0.07
12	0.00	0.00	0.00	0.07

Plt
0.07

4 IMMUNITY TEST

4.1 GENERAL DESCRIPTION

4.1.1 GENERAL DESCRIPTION OF EN 61000-6-2

Product Standard:	EN 61000-6-2:2005	
Basic Standard, specification requirement, and Performance Criteria:	IEC 61000-4-2	Electrostatic Discharge – ESD: 4kV Contact discharge, 8kV air discharge, Performance Criterion B
	IEC 61000-4-3	Radio-Frequency Electromagnetic Field Susceptibility Test – RS: 80-1000 MHz, 10V/m, 80% AM (1kHz), 1400-2000 MHz, 3V/m, 80% AM (1kHz) 2000-2700 MHz, 1V/m, 80% AM (1kHz) Performance Criterion A
	IEC 61000-4-4	Electrical Fast Transient/Burst - EFT AC Power line: 2kV, DC Power line: 2kV Signal line: 1kV Performance Criterion B
	IEC 61000-4-5	Surge Immunity Test: 1.2/50 us Open Circuit Voltage, 8 /20 us Short Circuit Current, AC Power Line: line to line 1 kV, line to earth 2kV DC Power Line: line to line 0.5kV line to earth 0.5kV Signal line: 1kV Performance Criterion B
	IEC 61000-4-6	Conducted Radio Frequency Disturbances Test – CS: 0.15-80 MHz, 10Vrms, 80% AM, 1kHz, Performance Criterion A
	IEC 61000-4-8	Power Frequency Magnetic Field Test, 50 Hz, 30A/m, Performance Criterion A

4.1.2 PERFORMANCE CRITERIA

According to Clause 4 of EN 61000-6-2:2005 standard, the following describes the general performance criteria.

CRITERION A	The apparatus shall continue to operate as intended during and after the test. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the apparatus is used as intended. The performance level may be replaced by a permissible loss of performance. If the minimum performance level or the permissible performance loss is not specified by the manufacturer, either of these may be derived from the product description and documentation and what the user may reasonably expect from the apparatus if used as intended.
CRITERION B	The apparatus shall continue to operate as intended after the test. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the apparatus is used as intended. The performance level may be replaced by a permissible loss of performance. During the test, degradation of performance is however allowed. No change of operating state or stored data is allowed. If the minimum performance level or the permissible performance loss is not specified by the manufacturer, either of these may be derived from the product description and documentation and what the user may reasonably expect from the apparatus if used as intended.
CRITERION C	Temporary loss of function is allowed, provided the function is self-recoverable or can be restored by the operation of the controls.

4.1.3 EUT OPERATING CONDITION

Same as item 3.1.6

4.2 ELECTROSTATIC DISCHARGE IMMUNITY TEST (ESD)

4.2.1 TEST SPECIFICATION

Basic Standard:	IEC 61000-4-2
Discharge Impedance:	330 ohm / 150 pF
Discharge Voltage:	Air Discharge: 8 kV (Direct) Contact Discharge: 4 kV (Indirect)
Polarity:	Positive & Negative
Number of Discharge:	20 times at each test point
Discharge Mode:	Single Discharge
Discharge Period:	1 second

4.2.2 TEST INSTRUMENTS

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
ESD Generator	TESEQ	NSG 437	279	Oct. 12, 13	Oct. 11, 14
Test Software	TESEQ	V03.03	N/A	N/A	N/A
ESD Generator	EM TEST	Dito	V1211112265	Jun. 19,14	Jun. 18,15
Test Software	EM TEST	V 2.31	N/A	N/A	N/A

NOTE: 1. The test was performed in ESD Room.
2. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to CEPREI/CHINA, GRGT/CHINA and NIM/CHINA.

4.2.3 TEST PROCEDURE

The basic test procedure was in accordance with IEC 61000-4-2:

a. Electrostatic discharges were applied only to those points and surfaces of the EUT that are accessible to users during normal operation.

b. The test was performed with at least ten single discharges on the pre-selected points in the most sensitive polarity.

c. The time interval between two successive single discharges was at least 1 second.

d. The ESD generator was held perpendicularly to the surface to which the discharge was applied and the return cable was at least 0.2 meters from the EUT.

e. Contact discharges were applied to the non-insulating coating, with the pointed tip of the generator penetrating the coating and contacting the conducting substrate.

f. Air discharges were applied with the round discharge tip of the discharge electrode approaching the EUT as fast as possible (without causing mechanical damage) to touch the EUT. After each discharge, the ESD generator was removed from the EUT and re-triggered for a new single discharge. The test was repeated until all discharges were complete.

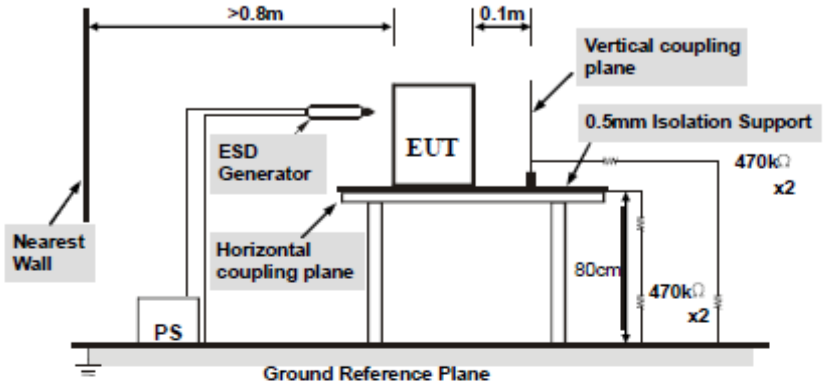
g. At least ten single discharges (in the most sensitive polarity) were applied to the Horizontal Coupling Plane at points on each side of the EUT. The ESD generator was positioned horizontal at a distance of 0.1 meters from the EUT with the discharge electrode touching the HCP.

h. At least ten single discharges (in the most sensitive polarity) were applied to the center of one vertical edge of the Vertical Coupling Plane in sufficiently different positions that the four faces of the EUT were completely illuminated. The VCP (dimensions 0.5m x 0.5m) was placed vertically to and 0.1 meters from the EUT.

4.2.4 DEVIATION FROM TEST STANDARD

No Deviation

4.2.5 TEST SETUP



NOTE:

TABLE-TOP EQUIPMENT

The configuration consisted of a wooden table 0.8 meters high standing on the Ground Reference Plane. The GRP consisted of a sheet of aluminum at least 0.25mm thick, and 2.5 meters square connected to the protective grounding system. A Horizontal Coupling Plane (1.6m x 0.8m) was placed on the table and attached to the GRP by means of a cable with 940kΩ total impedance. The equipment under test, was installed in a representative system as described in section 7 of IEC 61000-4-2, and its cables were placed on the HCP and isolated by an insulating support of 0.5mm thickness. A distance of 1-meter minimum was provided between the EUT and the walls of the laboratory and any other metallic structure.

FLOOR-STANDING EQUIPMENT

The equipment under test was installed in a representative system as described in section 7 of IEC 61000-4-2, and its cables were isolated from the Ground Reference Plane by an insulating support of 0.1-meter thickness. The GRP consisted of a sheet of aluminum that is at least 0.25mm thick, and 2.5 meters square connected to the protective grounding system and extended at least 0.5 meters from the EUT on all sides.

4.2.6 TEST RESULTS

TEST MODE	See item 2.2	TEST VOLTAGE	DC 300V
ENVIRONMENTAL CONDITIONS	21.2deg. C, 51% RH 101.3kPa	TESTED BY: Heise	

Direct Discharge Application				
Test Level (kV)	Polarity	Test Point	Test Result of Contact Discharge	Test Result of Air Discharge
4	+/-	All Metal Part	A	N/A
8	+/-	All Non-metal Part	N/A	A

Indirect Discharge Application				
Discharge Level (kV)	Polarity	Test Point	Test Result of HCP	Test Result of VCP
4	+/-	HCP&VCP	A	A

NOTE: A: There was no change compared with initial operation during the test.

4.3 RADIATED, RADIO-FREQUENCY, ELECTROMAGNETIC FIELD IMMUNITY TEST (RS)

4.3.1 TEST SPECIFICATION

Basic Standard:	IEC 61000-4-3
Frequency Range:	80-1000MHz, 1400-2000MHz, 2000-2700MHz
Field Strength:	10V/m, 3V/m, 1V/m
Modulation:	1kHz Sine Wave, 80%, AM Modulation
Frequency Step:	1 % of fundamental
Polarity of Antenna:	Horizontal and Vertical
Antenna Height:	1.5m
Dwell Time:	at least 3 seconds

4.3.2 TEST INSTRUMENTS

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
Signal Generator	Agilent	N5181A	MY50142530	Nov. 01,13	Oct. 31,14
Antenna Log-Periodic	CORAD	ATR80M6G	0337307	N/A	N/A
Antenna Log-Periodic	CORAD	ATS700M11G	0336821	N/A	N/A
Switch Controller	CORAD	SC1000	0337343	N/A	N/A
RF Power Meter	ESE	4242	13984	Nov. 04,13	Nov. 03,14
Power Sensor	ESE	51011EMC	35716	Nov. 04,13	Nov. 03,14
Power Sensor	ESE	51011EMC	35715	Nov. 04,13	Nov. 03,14
E-Field probe	Narda	NBM-520	2403/01B	May 07,14	May 06,15
Power Amplifier	TESEQ	CBA 1G-150	T44029	N/A	N/A
Power Amplifier	TESEQ	CBA 3G-100	T44030	N/A	N/A
Power Amplifier	TESEQ	CBA 6G-050	1041204	N/A	N/A
Dual Directional Coupler	TESEQ	C5982	95208	Dec. 23,13	Dec. 22,14
Dual Directional Coupler	TESEQ	C6187	95175	Dec. 23,13	Dec. 22,14
Dual Directional Coupler	TESEQ	CPH-274F	M251304-01	Dec. 23,13	Dec. 22,14
Test Software	ADT	BVADT_RS_V7.6.4-DG	N/A	N/A	N/A

NOTE: 1. The test was performed in RS chamber.
2. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to CEPREI/CHINA, GRGT/CHINA and NIM/CHINA.

4.3.3 TEST PROCEDURE

The test procedure was in accordance with IEC 61000-4-3

a. The testing was performed in a fully-anechoic chamber.

b. The frequency range is swept from 80 MHz to 1000 MHz, 1400MHz to 2000MHz, 2000MHz to 2700MHz with the signal 80% amplitude modulated with a 1kHz sine wave.

c. The dwell time at each frequency shall not be less than the time necessary for the EUT to be exercised and to respond, but shall in no case be less than 0,5s.

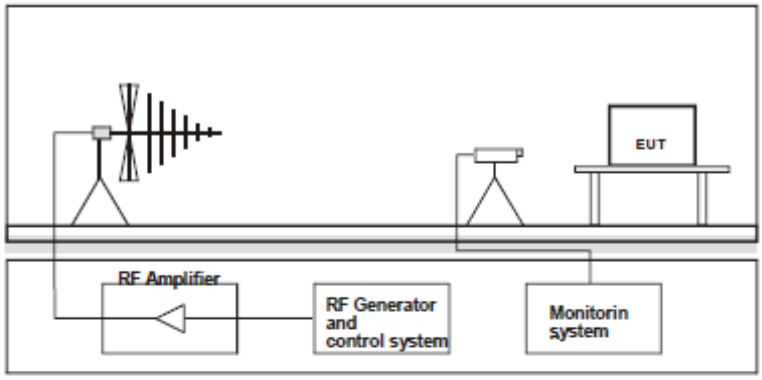
d. The field strength levels were 10V/m, 3V/m, 1V/m.

e. The test was performed with the EUT exposed to both vertically and horizontally polarized fields on each of the four sides.

4.3.4 DEVIATION FROM TEST STANDARD

No Deviation

4.3.5 TEST SETUP



NOTE:

TABLETOP EQUIPMENT
The EUT installed in a representative system as described in section 7 of IEC 61000-4-3 was placed on a non-conductive table 0.8 meters in height. The system under test was connected to the power and signal wire according to relevant installation instructions.

FLOOR STANDING EQUIPMENT
The EUT installed in a representative system as described in section 7 of IEC 61000-4-3 was placed on a non-conductive wood support 0.1 meters in height. The system under test was connected to the power and signal wire according to relevant installation instructions.

Test Report No.: CE140508N005R1

4.3.6 TEST RESULTS

TEST MODE	See item 2.2	TEST VOLTAGE	DC 300V
ENVIRONMENTAL CONDITIONS	21.6deg. C, 57.5% RH	TESTED BY: Heise	

Field Strength (V/m)	Test Frequency Note#1 (MHz)	Polarization of antenna (Horizontal / Vertical)	Test Distance (m)	Test Result	Remark
10	80 - 1000	H&V	3	A	N/A
3	1400 - 2000	H&V	3	A	N/A
1	2000 - 2700	H&V	3	A	N/A

Note#1:

Tested Israel SII Frequencies 89,100,107,144,163,196,244,315,434,460,600,825,845,880 MHz

NOTE: A: There was no change compared with initial operation during the test.

4.4 ELECTRICAL FAST TRANSIENT/BURST IMMUNITY TEST (EFT)

4.4.1 TEST SPECIFICATION

Basic Standard:	IEC 61000-4-4
Test Voltage:	Power Line: 2kV
Polarity:	Positive & Negative
Impulse Frequency:	5 kHz
Impulse Waveshape :	5/50 ns
Burst Duration:	15 ms
Burst Period:	300 ms
Test Duration:	1 min.

4.4.2 TEST INSTRUMENTS

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
EFT Tester	HAEFELY	PEFT4010	150546	May 17,14	May 16,15
EFT Coupling Clamp	HAEFELY	IP4A	150407	May 17,14	May 16,15
Test Software	HAEFELY	SWPE4010 1.22	N/A	N/A	N/A

NOTE: 1. The test was performed in EMS Room 1.
2. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to CEPREI/CHINA, GRGT/CHINA and NIM/CHINA.

4.4.3 TEST PROCEDURE

a. Both positive and negative polarity discharges were applied.

b. The length of the "hot wire" from the coaxial output of the EFT generator to the terminals on the EUT should not exceed 0.5 meter ± 0.05 meter.

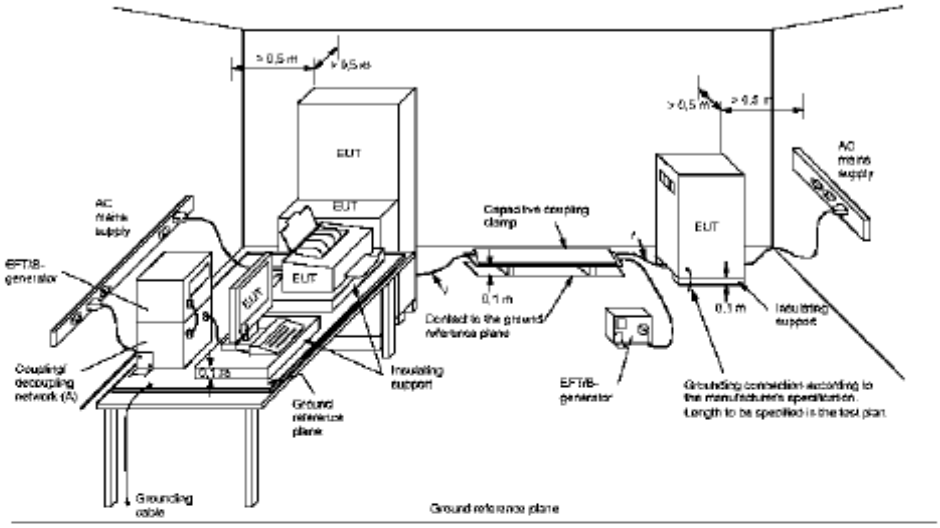
c. The duration time of each test sequential was 1 minute.

d. The transient/burst waveform was in accordance with IEC 61000-4-4, 5/50ns.

4.4.4 DEVIATION FROM TEST STANDARD

No deviation.

4.4.5 TEST SETUP



NOTE:
TABLETOP EQUIPMENT
The configuration consisted of a wooden table standing on the Ground Reference Plane and should be located 0.1m +/- 0.01m above the Ground Reference Plane.
The GRP consisted of a sheet of aluminum (at least 0.25mm thick and 2.5m square) connected to the protective grounding system. A minimum distance of 0.5m was provided between the EUT and the walls of the laboratory or any other metallic structure.

FLOOR STANDING EQUIPMENT
The EUT installed in a representative system as described in section 7 of IEC 61000-4-4 and its cables, were isolated from the Ground Reference Plane by an insulating support that is 0.1-meter thick. The GRP consisted of a sheet of aluminum (at least 0.25mm thick and 2.5m square) connected to the protective grounding system.

Test Report No.: CE140508N005R1

4.4.6 TEST RESULTS

TEST MODE	See item 2.2	TEST VOLTAGE	DC 300V
ENVIRONMENTAL CONDITIONS	21.5 deg. C, 58.2% RH	TESTED BY: Heise	

Pulse Voltage	2 kV		___ kV		___ kV		___ kV	
Pulse Polarity	+	–	+	–	+	–	+	–
L	A	A	/	/	/	/	/	/
N	A	A	/	/	/	/	/	/
PE	A	A	/	/	/	/	/	/
L+N	A	A	/	/	/	/	/	/
L+PE	A	A	/	/	/	/	/	/
N+PE	A	A	/	/	/	/	/	/
L+N+PE	A	A	/	/	/	/	/	/
DC Line	A	A	/	/	/	/	/	/

NOTE: A: There was no change compared with initial operation during the test.

4.5 SURGE IMMUNITY TEST

4.5.1 TEST SPECIFICATION

Basic Standard:	IEC 61000-4-5
Wave-Shape:	Combination Wave
	1.2/50 us Open Circuit Voltage
	8 /20 us Short Circuit Current
Test Voltage:	AC Power Line: Line to Line:1kV
	Line to PE:2kV
	Signal Line: 1kV
	DC Power Line: Line to Line:0.5kV
	Line to PE:0.5kV
Surge Input/Output:	L-N&L-PE&N-PE, RJ 45 Line
Generator Source Impedance:	2 ohm between networks 12 ohm between network and ground
Polarity:	Positive/Negative
Phase Angle:	0° /90°/180°/270°
Pulse Repetition Rate:	1 time / 60 sec.
Number of Tests:	5 positive and 5 negative at selected points

4.5.2 TEST INSTRUMENTS

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
Combination wave Module	TESEQ AG	CDN 3061	1361	Feb. 17,14	Feb. 16,15
Telecom Surge Module	TESEQ AG	NSG 3060 Mainframe	1404	Feb. 17,14	Feb. 16,15
CDN	TESEQ	CDN HSS-2	34275	Nov.06, 13	Nov.05, 14
CDN	TESEQ	CDN 118	30741	Nov.06, 13	Nov.05, 14
Test Software	TESEQ	CDM 3061_0002.30	1361	N/A	N/A
Test Software	TESEQ	HVM 3060_0002.30	293	N/A	N/A

NOTE: 1. The test was performed in EMS Room 1.
2. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to CEPREI/CHINA, GRGT/CHINA and NIM/CHINA.

4.5.3 TEST PROCEDURE

a. For EUT power supply:

The surge is to be applied to the EUT power supply terminals via the capacitive coupling network. Decoupling networks are required in order to avoid possible adverse effects on equipment not under test that may be powered by the same lines, and to provide sufficient decoupling impedance to the surge wave. The power cord between the EUT and the coupling/decoupling networks shall be 2 meters in length (or shorter).

b. For test applied to unshielded unsymmetrically operated interconnection lines of EUT:

The surge is applied to the lines via the capacitive coupling. The coupling / decoupling networks shall not influence the specified functional conditions of the EUT. The interconnection line between the EUT and the coupling/decoupling networks shall be 2 meters in length (or shorter).

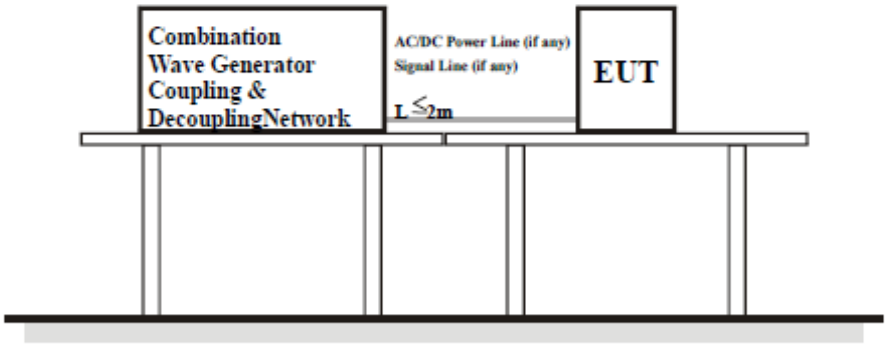
c. For test applied to unshielded symmetrically operated interconnection / telecommunication lines of EUT:

The surge is applied to the lines via gas arrestors coupling. Test levels below the ignition point of the coupling arrestor cannot be specified. The interconnection line between the EUT and the coupling/decoupling networks shall be 2 meters in length (or shorter).

4.5.4 DEVIATION FROM TEST STANDARD

No deviation.

4.5.5 TEST SETUP



4.5.6 TEST RESULTS

TEST MODE	See item 2.2	TEST VOLTAGE	DC 300V
ENVIRONMENTAL CONDITIONS	21.5deg. C, 59.2% RH	TESTED BY: Heise	

AC/DC Power port:

\Phase angle \ Test result \Voltage (kV) \ Test point\ Polarity			0°	90°	180°	270°	DC Power Port
1	L-N	+	B	B	B	B	N/A
		−	B	B	B	B	N/A
2	L-PE	+	B	B	B	B	N/A
		−	B	B	B	B	N/A
2	N-PE	+	B	B	B	B	N/A
		−	B	B	B	B	N/A

Signal ports and telecommunication ports:

Voltage (kV)	Test Point	Polarity	Test result	Voltage (kV)	Test Point	Polarity	Test result
/	/	+/-	/	/	/	+/-	/

NOTE: A: There was no change compared with initial operation during the test.
B: During test, EUT stopped grid, and could automatically return to normal after test.

4.6 IMMUNITY TO CONDUCTED DISTURBANCES INDUCED BY RF FIELDS (CS)

4.6.1 TEST SPECIFICATION

Basic Standard:	IEC 61000-4-6
Frequency Range:	0.15 MHz - 80 MHz
Field Strength:	$10V_{r.m.s}$
Modulation:	1kHz Sine Wave, 80%, AM Modulation
Frequency Step:	1 % of fundamental
Coupled Cable:	Power Mains & DC Power Line
Coupling Device:	CDN-M3(3 wires) & Clamp

4.6.2 TEST INSTRUMENTS

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
Signal Generator	Rohde&Schwarz	SME06	829498/006	Oct.15,13	Oct.14, 14
CDN	Luthi	L-801M2/M3	2015	Oct.18,13	Oct. 17,14
CDN(AUX)	TESEQ	CDN M016	27452	Nov. 20,13	Nov. 19,14
CDN	TESEQ	T200A	26944	Apr. 08,14	Apr. 07,15
CDN	TESEQ	T400A	26536	Apr. 08,14	Apr. 07,15
CDN	TESEQ	ST08A	32256	Apr. 08,14	Apr. 07,15
6dB 50Watt Attenuator	HUBER+SUHNER	5906.17.0005	303688	Oct.15,13	Oct.14,14
Signal Amplifier	HAEFELY	PAMP250	149594	NA	NA
Electromagnetic Injection Clamp	Luthi	EM101	35640	Oct.16,13	Oct.15,14
C/S Test System	HAEFELY	WinPAMP	NSEMC002	N/A	N/A
Test Software	ADT	BVADT_CS_V7.5.1	N/A	N/A	N/A

NOTE: 1. The test was performed in CS test room.
2. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to CEPREI/CHINA, GRGT/CHINA and NIM/CHINA.

4.6.3 TEST PROCEDURE

a. The EUT shall be tested within its intended operating and climatic conditions.

b. An artificial hand was placed on the hand-held accessory and connected to the ground reference plane.

c. The test shall be performed with the test generator connected to each of the coupling and decoupling devices in turn, while the other non-excited RF input ports of the coupling devices are terminated by a 50-ohm load resistor.

d. The frequency range is swept from 150 kHz to 80 MHz, using the signal level established during the setting process and with a disturbance signal of 80 % amplitude. The signal is modulated with a 1 kHz sine wave, pausing to adjust the RF signal level or the switch coupling devices as necessary. Where the frequency is swept incrementally, the step size shall not exceed 1 % of the preceding frequency value.

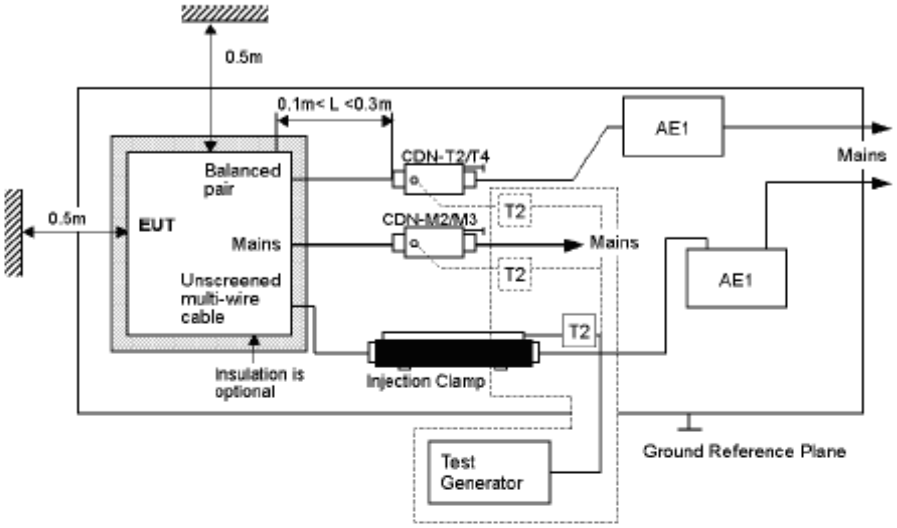
e. The dwell time of the amplitude modulated carrier at each frequency shall not be less than the time necessary for the EUT to be exercised and to respond, but shall in no case be less than 0,5 s. The sensitive frequencies (e.g. clock frequencies) shall be analyzed separately.

f. Attempts should be made to fully exercise the EUT during testing, and to fully interrogate all exercise modes selected for susceptibility.

4.6.4 DEVIATION FROM TEST STANDARD

No deviation.

4.6.5 TEST SETUP



NOTE: The EUT clearance from any metallic obstacles shall be at least 0.5m.
All non-excited input ports of the CDNs shall be terminated by 50Ω loads.

NOTE:

FLOOR-STANDING EQUIPMENT
The equipment to be tested is placed on an insulating support of 0.1 meters height above a ground reference plane. All relevant cables shall be provided with the appropriate coupling and decoupling devices at a distance between 0.1 meters and 0.3 meters from the projected geometry of the EUT on the ground reference plane.

4.6.6 TEST RESULTS

TEST MODE	See Item 2.2	TEST VOLTAGE	DC 300V
ENVIRONMENTAL CONDITIONS	22.5deg. C, 56.6% RH	TESTED BY: Heise	

Voltage (V)	Test Frequency Note#1 (MHz)	Tested Line	Injection Method.	Test Result	Remark
10	0.15 – 80	AC Mains	CDN-M3	A	N/A
10	0.15 – 80	DC line	Clamp	A	N/A

Note#1: Tested Israel SII Frequencies 0.2,0.53,1,1.5,7.1,13.56,21,27.12,40.68,65,68 MHz

NOTE: A: There was no change compared with initial operation during the test.

4.7 POWER FREQUENCY MAGNETIC FIELD IMMUNITY TEST

4.7.1 TEST SPECIFICATION

Basic Standard:	IEC 61000-4-8
Frequency Range:	50Hz, 60Hz
Field Strength:	30A/m
Observation Time:	5 minute
Inductance Coil:	Rectangular type, 1mx1m

4.7.2 TEST INSTRUMENTS

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
Magnetic Field Tester	HAEFELY	MAG100.1	150579	Oct.18,13	Oct.17,14
Test Software	N/A	N/A	N/A	N/A	N/A

NOTE: 1. The test was performed in Shielding Room 843.
2. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to CEPREI/CHINA, GRGT/CHINA and NIM/CHINA.

4.7.3 TEST PROCEDURE

a. The equipment is configured and connected to satisfy its functional requirements.

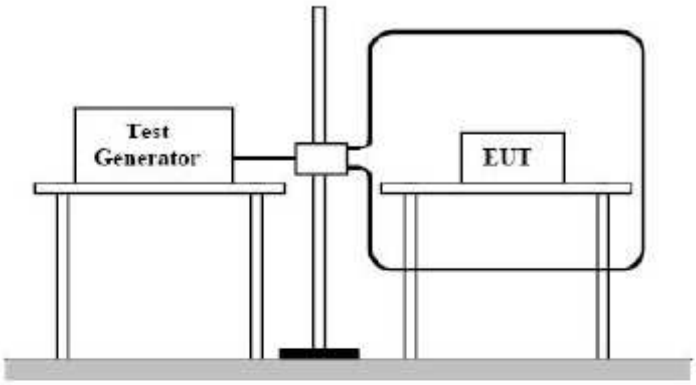
b. The power supply, input and output circuits shall be connected to the sources of power supply, control and signal.

c. The cables supplied or recommended by the equipment manufacturer shall be used. 1 meter of all cables used shall be exposed to the magnetic field.

4.7.4 DEVIATION FROM TEST STANDARD

No Deviation

4.7.5 TEST SETUP



NOTE:

TABLETOP EQUIPMENT
The equipment shall be subjected to the test magnetic field by using the induction coil of standard dimension (1 m x 1 m). The induction coil shall then be rotated by 90 degrees in order to expose the EUT to the test field with different orientations.

FLOOR-STANDING EQUIPMENT
The equipment shall be subjected to the test magnetic field by using induction coils of suitable dimensions. The test shall be repeated by moving and shifting the induction coils, in order to test the whole volume of the EUT for each orthogonal direction. The test shall be repeated with the coil shifted to different positions along the side of the EUT, in steps corresponding to 50 % of the shortest side of the coil. The induction coil shall then be rotated by 90 degrees in order to expose the EUT to the test field with different orientations.

4.7.6 TEST RESULTS

TEST MODE	See Item 2.2	TEST VOLTAGE	DC 300V
ENVIRONMENTAL CONDITIONS	22deg. C, 59% RH	TESTED BY: Heise	

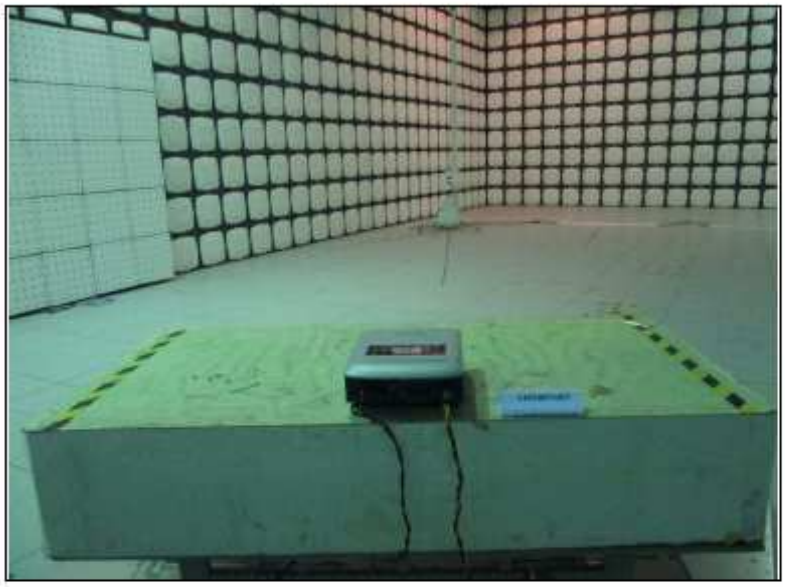
MAGNETIC FIELD DIRECTION	TESTING RESULT	REMARK
X - Axis	A	30A/ m
Y - Axis	A	30A/ m
Z - Axis	A	30A/ m

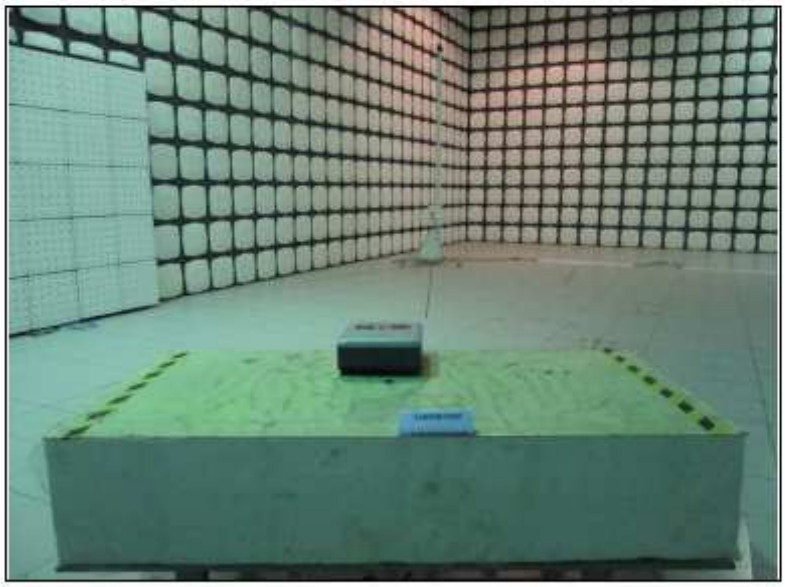
NOTE: A: There is no change compared with the initial operation during the test.

5 PHOTOGRAPHS OF THE TEST CONFIGURATION

CONDUCTED EMISSION TEST

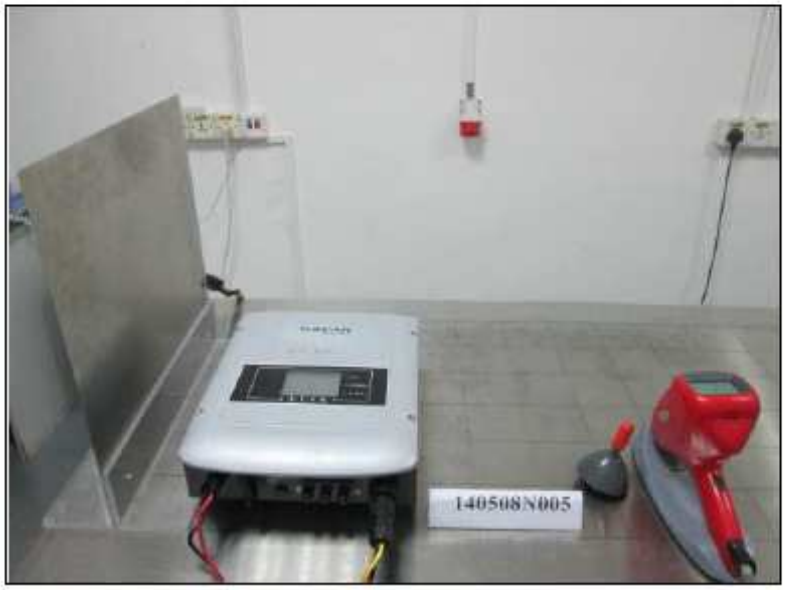
RADIATED EMISSION TEST



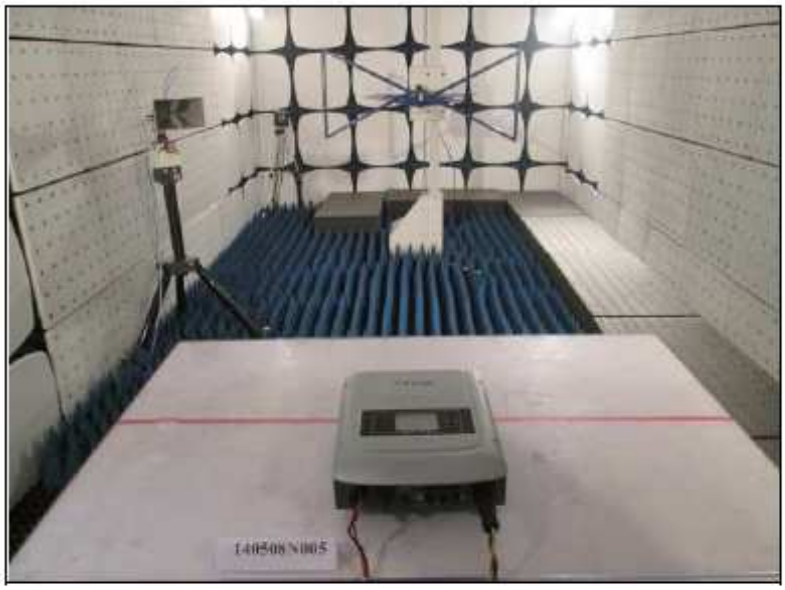


HARMONICS EMISSION TEST &
VOLTAGE FLUCTUATIONS AND FLICKER TEST

ESD TEST



RS TEST



EFT TEST(AC Mains)

Test Report No.: CE140508N005R1

EFT TEST (DC Port)

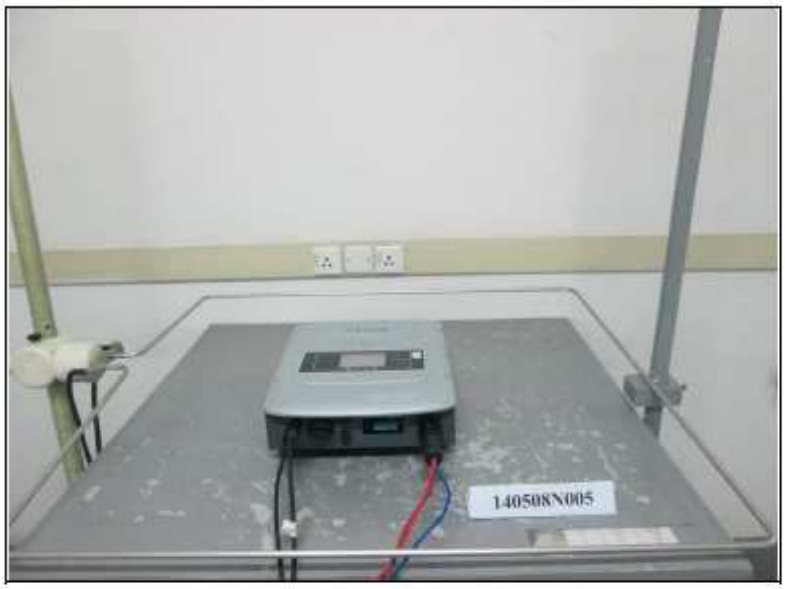
SURGE TEST

CONDUCTED SUSCEPTIBILITY TEST (AC Mains)

CONDUCTED SUSCEPTIBILITY TEST (DC Cable)

Test Report No.: CE140508N005R1

POWER-FREQUENCY MAGNETIC FIELDS TEST



6 APPENDIX A – MODIFICATIONS RECORDERS FOR ENGINEERING CHANGES TO THE EUT BY THE LAB

No any modifications were made to the EUT by the lab during the test.

---END---

Reference No.: 140508N005R1

PHOTOGRAPHS OF THE EUT

SOFAR 1100TL:

Bureau Veritas Shenzhen Co., Ltd.
Dongguan Branch

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Tel.: +86 769 8593 5656
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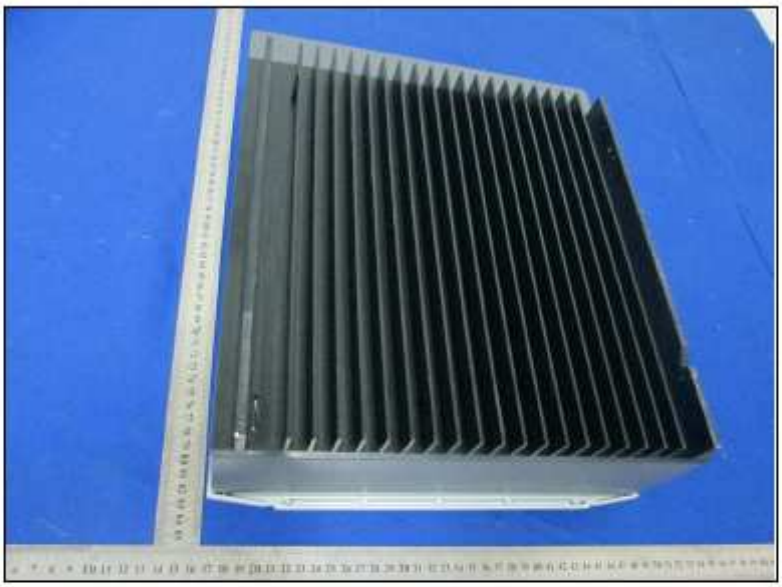
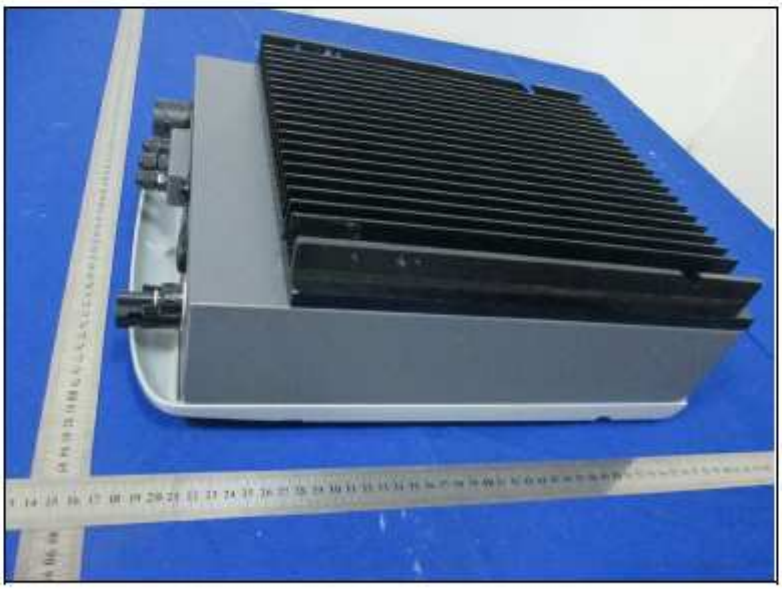
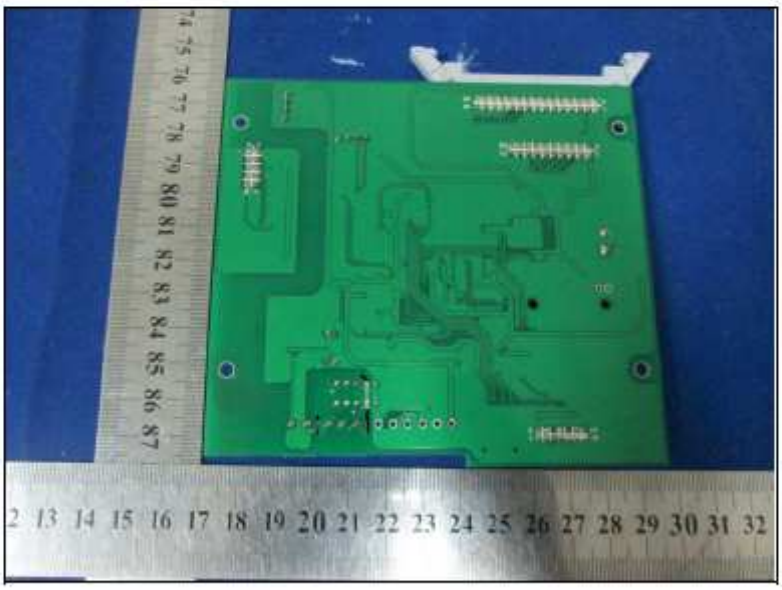
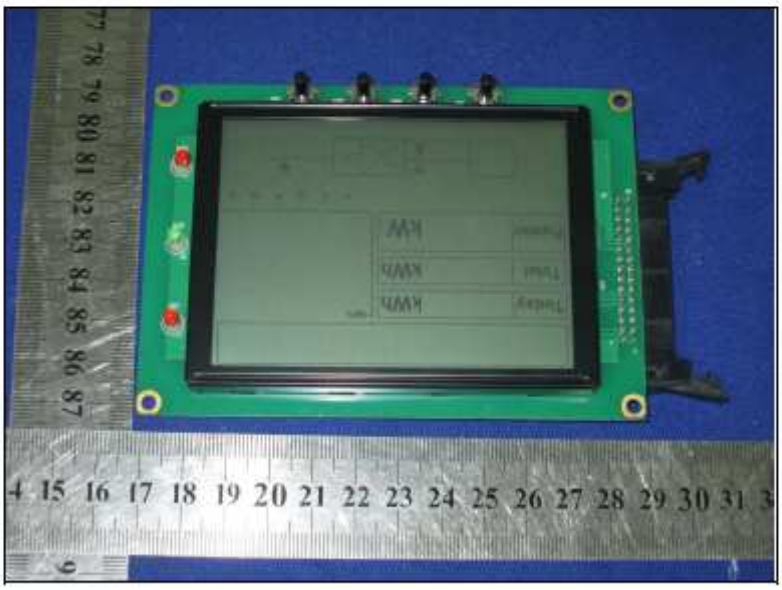
Reference No.: 140508N005R1



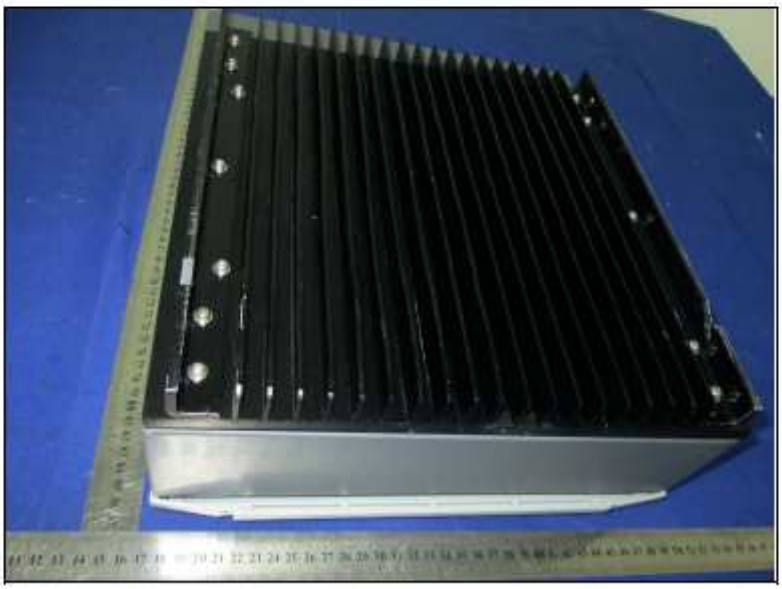






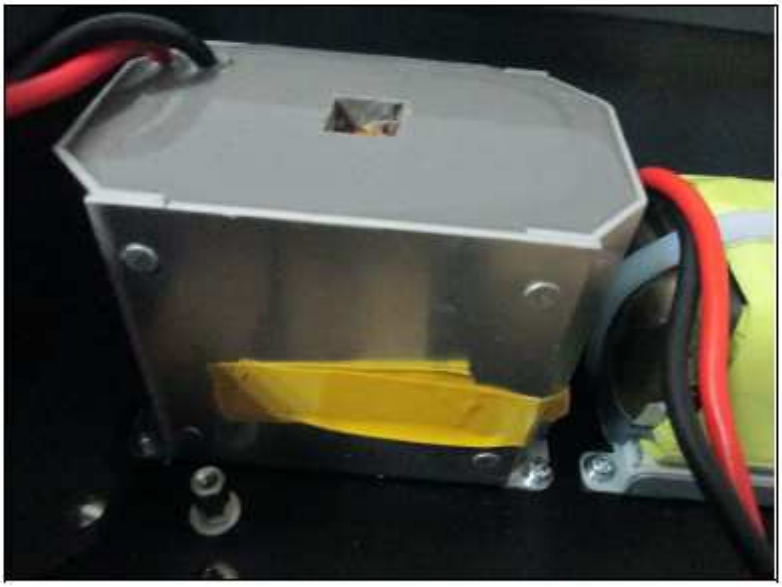
Reference No.: 140508N005R1

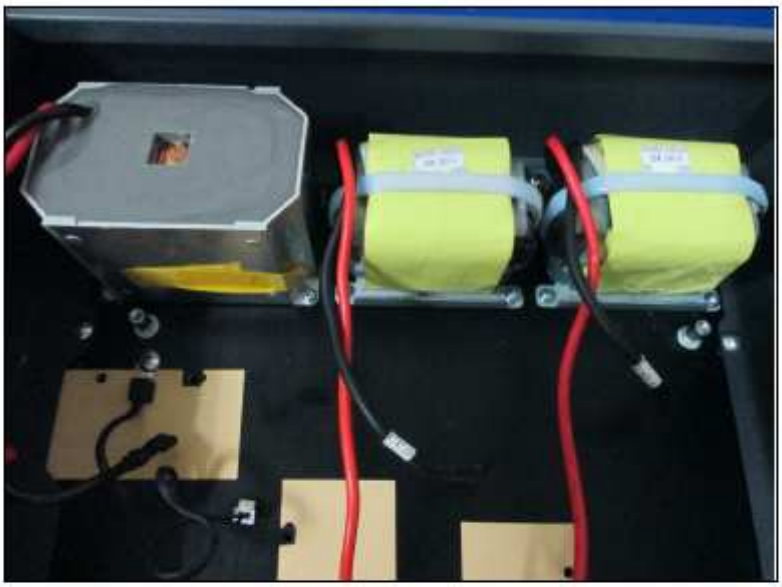
SOFAR 2200TL:



Reference No.: 140508N005R1


DG1892-14013A
2KW INV-L
1420





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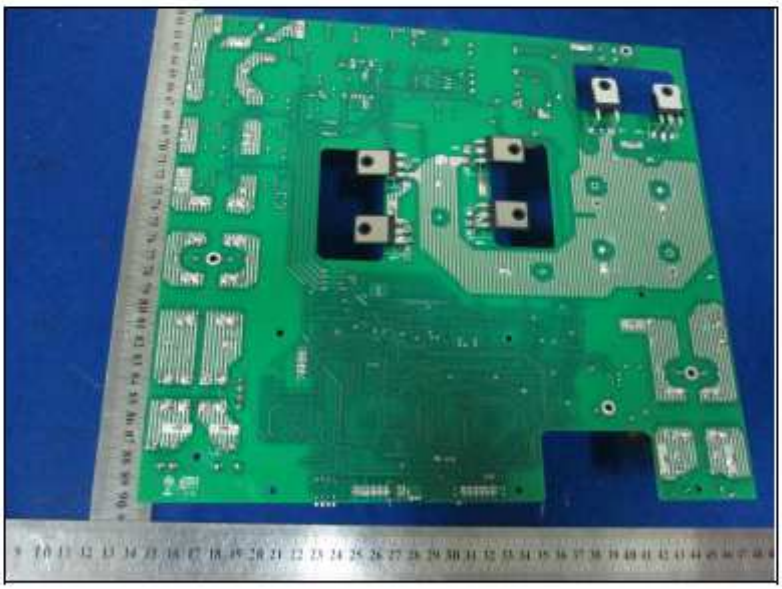
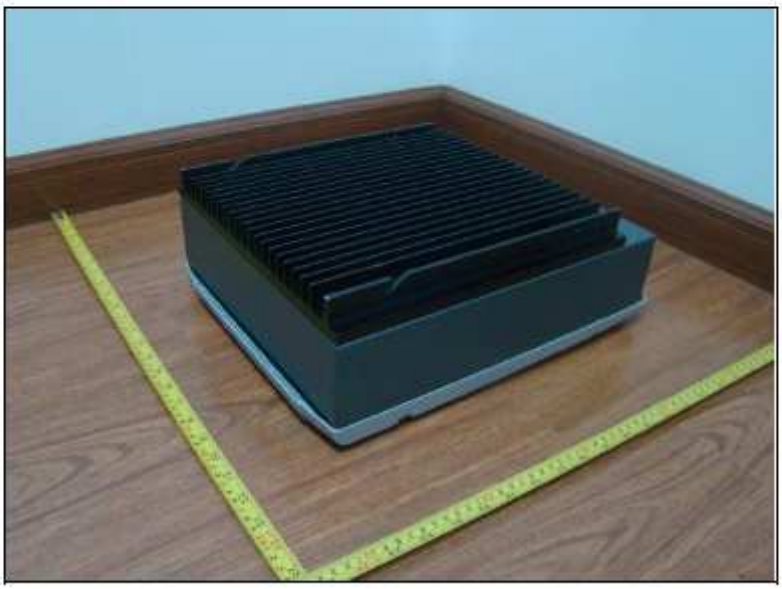


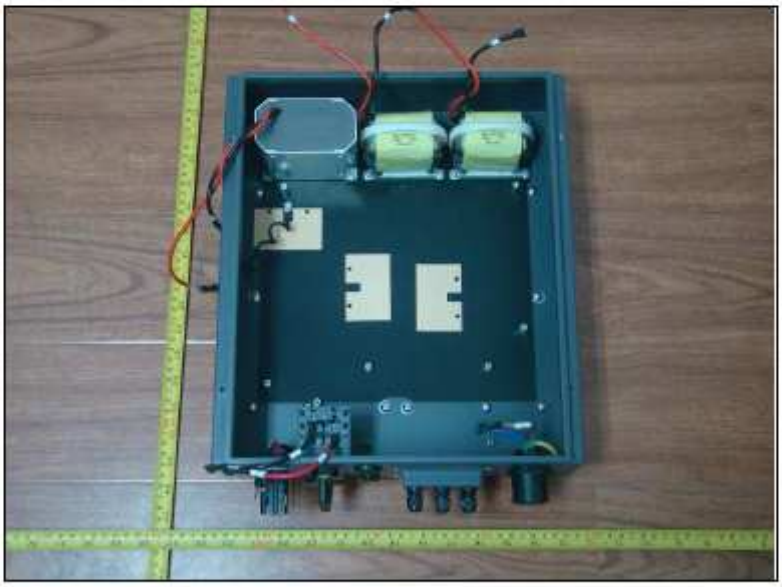
Reference No.: 140508N005R1

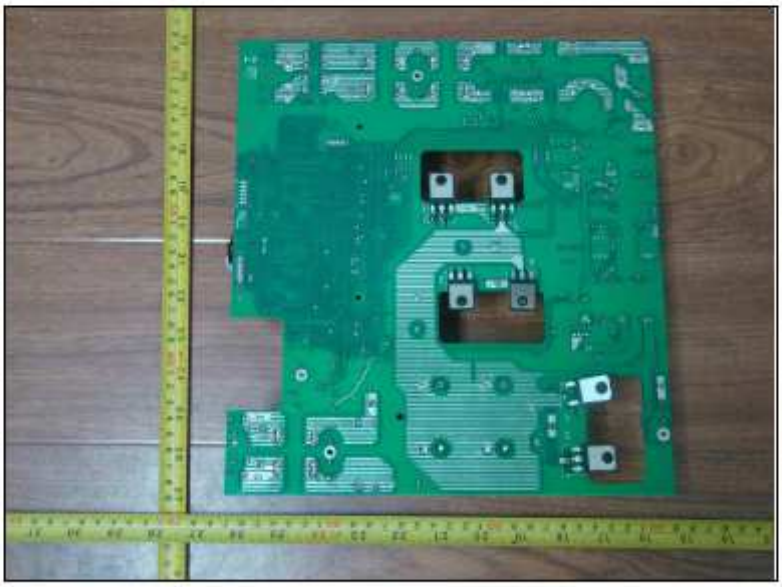
SOFAR 3000TL:




OFF
WiFi
ON
AC

Reference No.: 140508N005R1



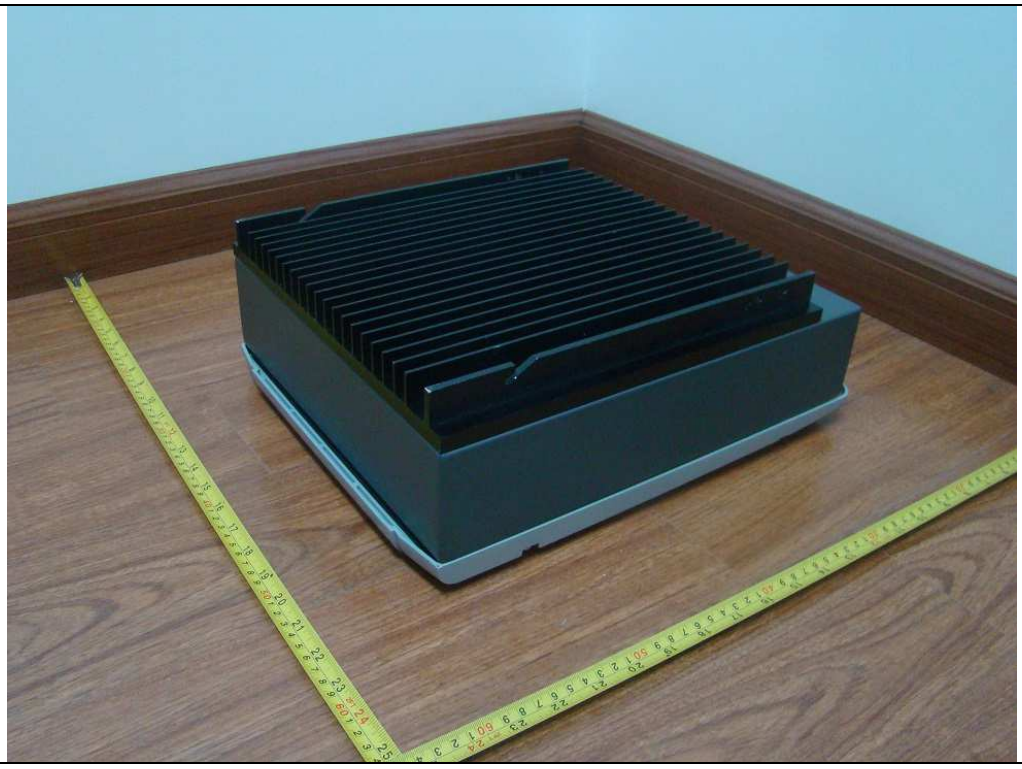


Annex 4

Pictures of the unit

Enclosure front view

Enclosure rear view

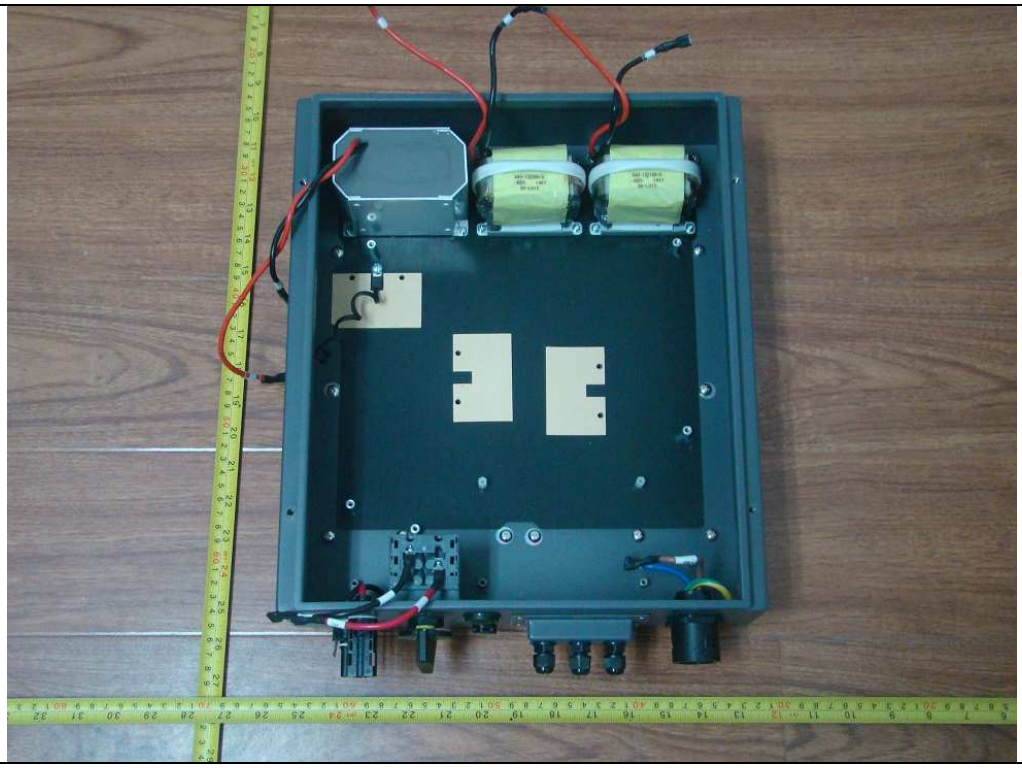


Enclosure bottom view

Internal view-1

Internal view-2

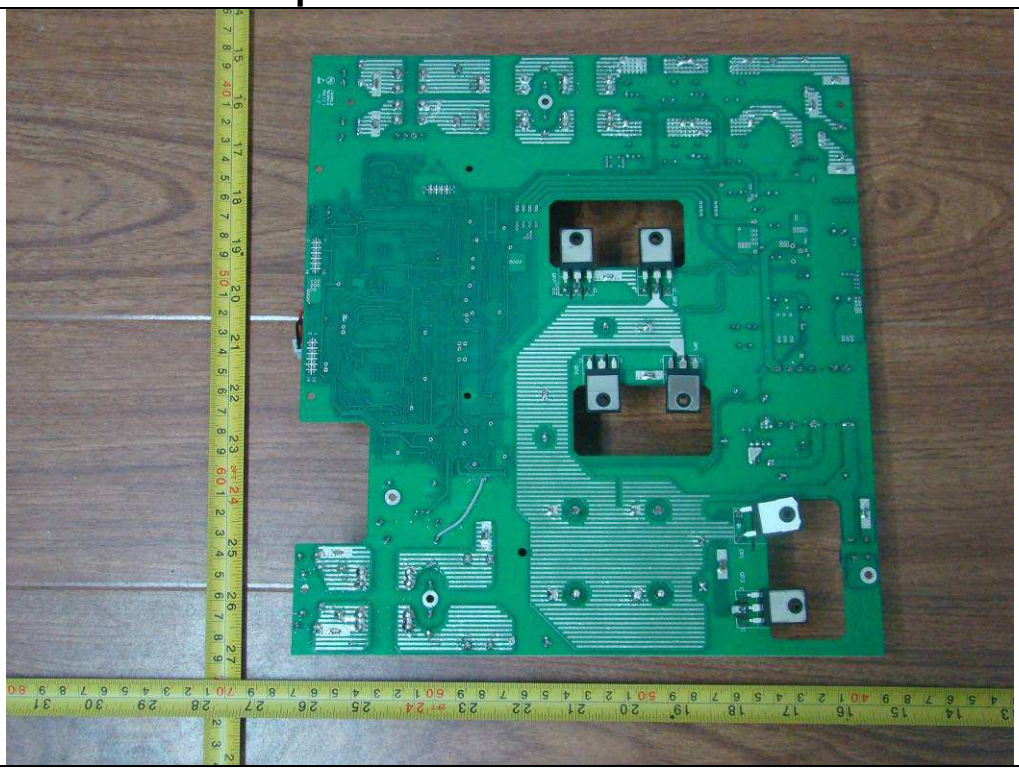
Internal view-3



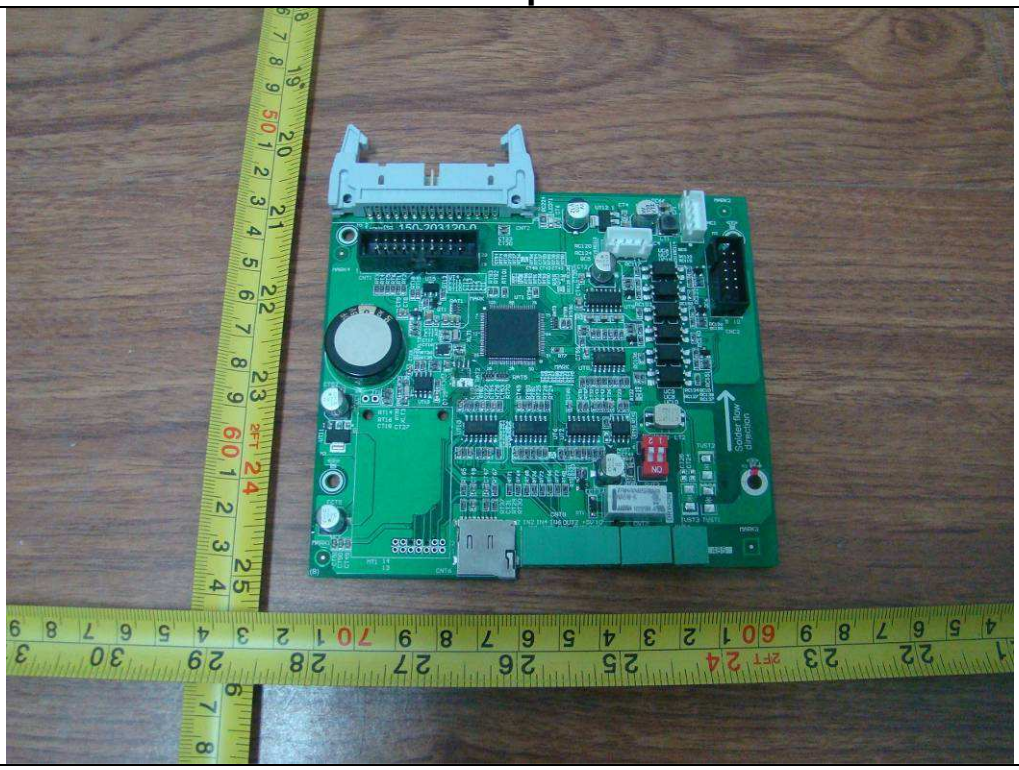
Internal view-4

Main power board component side view

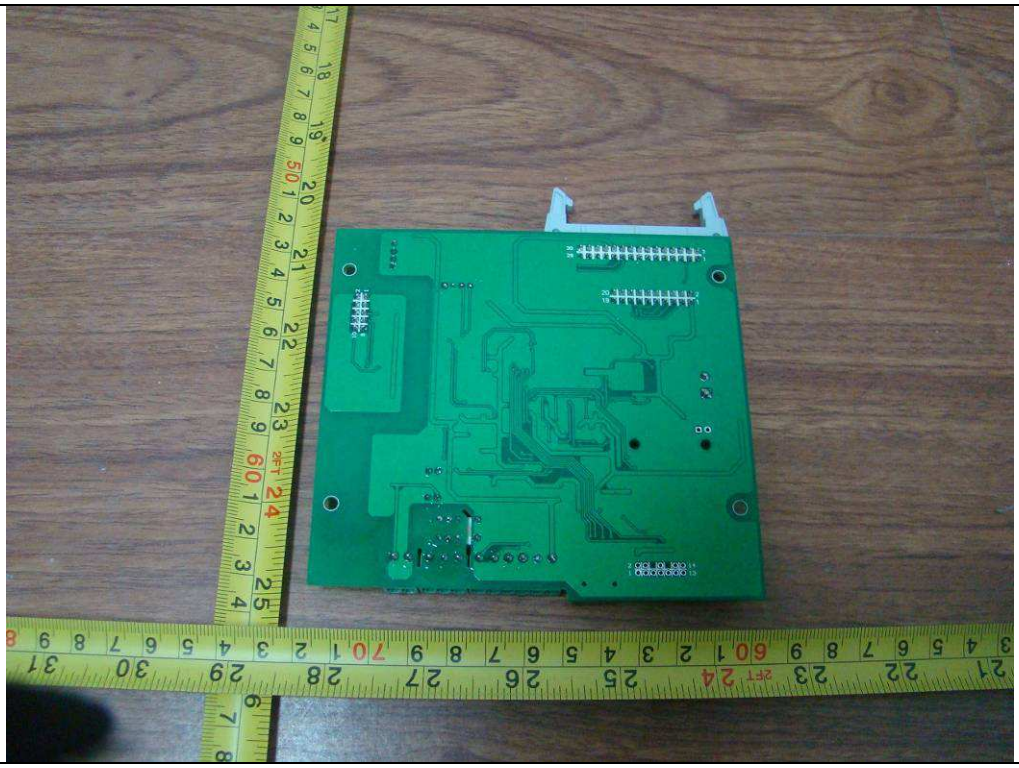
Main power board solder side view



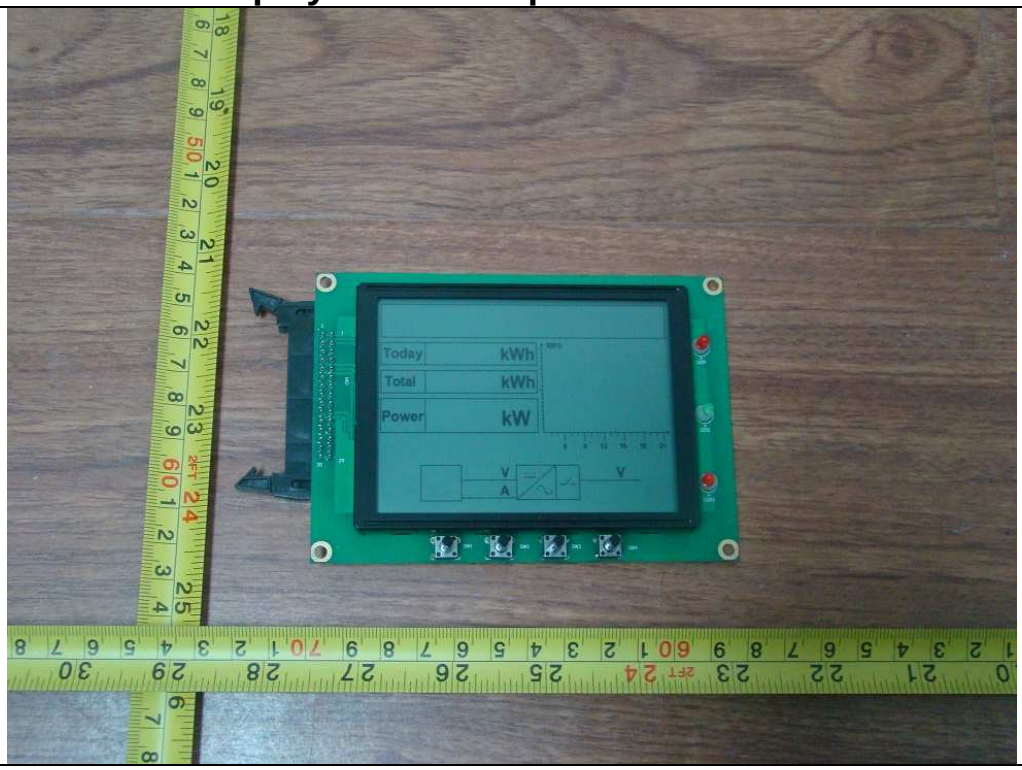
Control board component side view



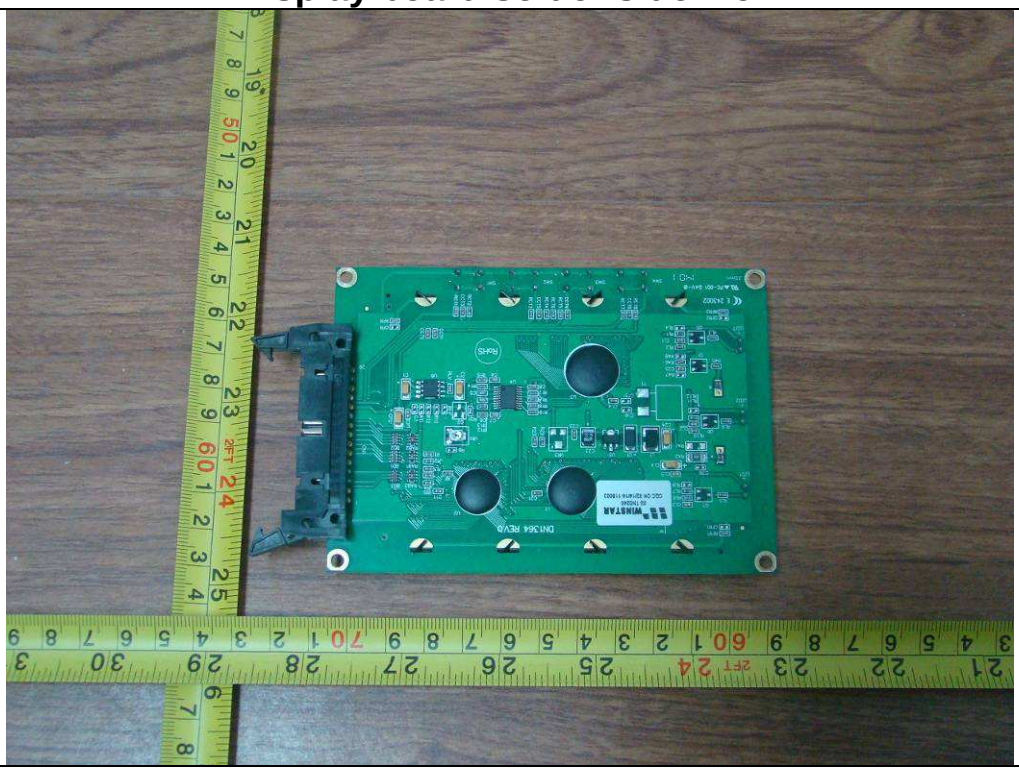
Control board solder side view



Display board component side view



Display board solder side view



Annex 5

Test equipment list

Equipment	Internal No.	Manufacturer	Type	Serial No.	Last Calibration
Power Analyzer	A4080002DG	YOKOGAWA	WT3000	91M210852	Mar. 12, 2014
AC Source	A7040019DG	Chroma	61512	61512000439	Monitored by Power Analyzer
AC Source	A7040020DG	Chroma	61512	61512000438	
DC Simulation Power Supply	A7040015DG	Chroma	62150H-1000S	62150EF00488	
DC Simulation Power Supply	A7040016DG	Chroma	62150H-1000S	62150EF00490	
Four Channel Digital Phosphor Oscilloscope	A4089003DG	Tektronix	DPO4104B	C010624	Oct. 17, 2013
Current transducer	A1060007DG	YOKOGAWA	CT200	1130700012	Jan 20, 2014
RLC Load	A7150027DG	Qunling	ACLT-3803H	93VOO2869	Monitored by Power Analyzer
Oscilloscope probel	A4089010DG	Tektronix	TPP1000	C008228	Dec. 20, 2013
Oscilloscope probel	A4089011DG	Tektronix	TPP1000	C008229	Dec. 20, 2013
LCR Hitester	A1060006DG	HIOKI	3535	120112505	Mar. 06, 2014