





# SUMMARY TEST REPORT

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<b>Report reference number</b> .....	<b>PVFR2102WDG0105-1</b>
Date of issue .....	2021-04-19
Total number of pages .....	17
<b>Testing laboratory name</b> .....	<b>Bureau Veritas Shenzhen Co., Ltd. Dongguan Branch</b>
Address .....	No. 96, Guantai Road (Houjie Section), Houjie Town, Dongguan City, Guangdong Province, 523942, People's Republic of China
<b>Applicant's name</b> .....	<b>Shenzhen SOFARSOLAR Co., Ltd.</b>
Address .....	401, Building 4, AnTongDa Industrial Park, District 68, XingDong Community, XinAn Street, BaoAn District, Shenzhen, China.
<b>Test specification</b>	
Standard.....	According client's requirement
Test Report Form No. ....	SUMMARY TEST REPORT VER.1
TRF Originator .....	Bureau Veritas Shenzhen Co., Ltd. Dongguan Branch
Master TRF .....	Dated 2021-03-26
<b>Test item description</b> .....	<b>Solar Grid-tied Inverter</b>
Trademark.....	
Model / Type .....	SOFAR 1100TL-G3, SOFAR 1600TL-G3, SOFAR 2200TL-G3, SOFAR 2700TL-G3, SOFAR 3000TL-G3, SOFAR 3300TL-G3.
<small>This report is governed by, and incorporates by reference, CPS Conditions of Service as posted at the date of issuance of this report at <a href="http://www.bureauveritas.com/home/about-us/our-business/cps/about-us/terms-conditions">http://www.bureauveritas.com/home/about-us/our-business/cps/about-us/terms-conditions</a> and is intended for your exclusive use. Any copying or replication of this report to or for any other person or entity, or use of our name or trademark, is permitted only with our prior written permission. This report sets forth our findings solely with respect to the test samples identified herein. The results set forth in this report are not indicative or representative of the quality or characteristics of the lot from which a test sample was taken or any similar or identical product unless specifically and expressly noted. Our report includes all of the tests requested by you and the results thereof based upon the information that you provided to us. Measurement uncertainty is only provided upon request for accredited tests. You have 60 days from date of issuance of this report to notify us of any material error or omission caused by our negligence or if you require measurement uncertainty; provided, however, that such notice shall be in writing and shall specifically address the issue you wish to raise. A failure to raise such issue within the prescribed time shall constitute your unqualified acceptance of the completeness of this report, the tests conducted and the correctness of the report contents.</small>	

<b>Ratings .....</b>	<b>SOFAR 1100TL-G3</b>	<b>SOFAR 1600TL-G3</b>	<b>SOFAR 2200TL-G3</b>
Input DC voltage [V] .....	Max. 500		
MPP DC voltage range [V] .....	50-500		
Input DC current [A] .....	12,0		
Isc PV [A] .....	15,0		
Output AC voltage [V] .....	L/N/PE, 230Vac		
Output AC current [A] .....	Max. 5,3	Max. 7,7	Max. 10,6
Max Output power [kVA] .....	1,1	1,6	2,2
<b>Ratings .....</b>	<b>SOFAR 2700TL-G3</b>	<b>SOFAR 3000TL-G3</b>	<b>SOFAR 3300TL-G3</b>
Input DC voltage range [V] .....	Max. 550		
MPPT DC voltage range [V] .....	50-500		
Input DC current [A] .....	12,0		
Isc PV [A] .....	15,0		
Output AC voltage [V] .....	L/N/PE, 230Vac		
Output AC current [A] .....	Max. 13,0	Max. 14,5	Max. 16,0
Max Output power [kVA] .....	2,7	3,0	3,3



<b>Testing Location</b> .....	<b>Bureau Veritas Shenzhen Co., Ltd. Dongguan Branch</b>
Address .....	No. 96, Guantai Road (Houjie Section), Houjie Town, Dongguan City, Guangdong Province, 523942, People's Republic of China
Tested by (name and signature) .....	Jack Shi 
Approved by (name and signature) .....	Ken Chan 
<b>Manufacturer's name</b> .....	<b>Shenzhen SOFARSOLAR Co., Ltd.</b>
Manufacturer address .....	401, Building 4, AnTongDa Industrial Park, District 68, XingDong Community, XinAn Street, BaoAn District, Shenzhen, China.
<b>Factory's name</b> .....	<b>Dongguan SOFAR SOLAR Co.,Ltd.</b>
Factory address .....	1F - 6F, Building E, No. 1 JinQi Road, Bihu Industrial Park, Wulian Village, Fenggang Town, Dongguan City.

<b>Document History</b>			
<b>Date</b>	<b>Internal reference</b>	<b>Modification / Change / Status</b>	<b>Revision</b>
2021-04-15	Jack Shi	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] ..... : Approx. 5,5 kg(SOFAR 1100TL-G3, SOFAR 1600TL-G3,  
 SOFAR 2200TL-G3)  
 Approx. 6,3 kg(SOFAR 2700TL-G3, SOFAR 3000TL-G3,  
 SOFAR 3300TL-G3)

### 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 ..... : 2021-03-19  
 Date(s) of performance of test ..... : 2021-03-19 to 2021-03-27

### General remarks:

The test result presented in this report relate only to the object(s) tested. This report shall 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.



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Report No. PVFR2102WDG0105-1:

**This Test Report consists of the following documents:**

1. Test Report
2. Annex No. 1 – Pictures of the unit
3. Annex No. 2 – Test equipment list


Copy of marking plate

**SOFAR SOLAR** Solar Grid-tied Inverter

Model No.	SOFAR 1100TL-G3
Max.DC Input Voltage	500V
Operating MPPT Voltage Range	50~500V
Max. Input Current	12A
Max. PV Isc	15A
Nominal Grid Voltage	L/N/PE, 230Vac
Max. Output Current	5.3A
Nominal Grid Frequency	50/60Hz
Max. Output Power	1100VA
Power Factor	1(adjustable+/-0.8)
Ingress protection	IP65
Operating Temperature Range	-30~+60°C
Topology	Non-isolated
Protective Class	Class I

Manufacturer:Shenzhen SOFARSOLAR Co., Ltd.  
Address: 401, Building 4, AnTongDa Industrial Park, District 68, XingDong Community, XinAn Street, BaoAn District, Shenzhen, China

VDE0126-1-1, VDE-AR-N4105, IEC61727, IEC62116, UTE C15-712-1, AS4777




**SOFAR SOLAR** Solar Grid-tied Inverter

Model No.	SOFAR 1600TL-G3
Max.DC Input Voltage	500V
Operating MPPT Voltage Range	50~500V
Max. Input Current	12A
Max. PV Isc	15A
Nominal Grid Voltage	L/N/PE, 230Vac
Max. Output Current	7.7A
Nominal Grid Frequency	50/60Hz
Max. Output Power	1600VA
Power Factor	1(adjustable+/-0.8)
Ingress protection	IP65
Operating Temperature Range	-30~+60°C
Topology	Non-isolated
Protective Class	Class I

Manufacturer:Shenzhen SOFARSOLAR Co., Ltd.  
Address: 401, Building 4, AnTongDa Industrial Park, District 68, XingDong Community, XinAn Street, BaoAn District, Shenzhen, China

VDE0126-1-1, VDE-AR-N4105, IEC61727, IEC62116, UTE C15-712-1, AS4777




**SOFAR SOLAR** Solar Grid-tied Inverter

Model No.	SOFAR 2200TL-G3
Max.DC Input Voltage	500V
Operating MPPT Voltage Range	50~500V
Max. Input Current	12A
Max. PV Isc	15A
Nominal Grid Voltage	L/N/PE, 230Vac
Max. Output Current	10.6A
Nominal Grid Frequency	50/60Hz
Max. Output Power	2200VA
Power Factor	1(adjustable+/-0.8)
Ingress protection	IP65
Operating Temperature Range	-30~+60°C
Topology	Non-isolated
Protective Class	Class I

Manufacturer:Shenzhen SOFARSOLAR Co., Ltd.  
Address: 401, Building 4, AnTongDa Industrial Park, District 68, XingDong Community, XinAn Street, BaoAn District, Shenzhen, China

VDE0126-1-1, VDE-AR-N4105, IEC61727, IEC62116, UTE C15-712-1, AS4777




**SOFAR SOLAR** Solar Grid-tied Inverter

Model No.	SOFAR 2700TL-G3
Max.DC Input Voltage	550V
Operating MPPT Voltage Range	50~550V
Max. Input Current	12A
Max. PV Isc	15A
Nominal Grid Voltage	L/N/PE, 230Vac
Max. Output Current	13A
Nominal Grid Frequency	50/60Hz
Max. Output Power	2700VA
Power Factor	1(adjustable+/-0.8)
Ingress protection	IP65
Operating Temperature Range	-30~+60°C
Topology	Non-isolated
Protective Class	Class I

Manufacturer:Shenzhen SOFARSOLAR Co., Ltd.  
Address: 401, Building 4, AnTongDa Industrial Park, District 68, XingDong Community, XinAn Street, BaoAn District, Shenzhen, China

VDE0126-1-1, VDE-AR-N4105, IEC61727, IEC62116, UTE C15-712-1, AS4777




**SOFAR SOLAR** Solar Grid-tied Inverter

Model No.	SOFAR 3000TL-G3
Max.DC Input Voltage	550V
Operating MPPT Voltage Range	50~550V
Max. Input Current	12A
Max. PV Isc	15A
Nominal Grid Voltage	L/N/PE, 230Vac
Max. Output Current	14.5A
Nominal Grid Frequency	50/60Hz
Max. Output Power	3000VA
Power Factor	1(adjustable+/-0.8)
Ingress protection	IP65
Operating Temperature Range	-30~+60°C
Topology	Non-isolated
Protective Class	Class I

Manufacturer: Shenzhen SOFARSOLAR Co., Ltd.  
Address: 401, Building 4, AnTongDa Industrial Park, District 68, XingDong Community, XinAn Street, BaoAn District, Shenzhen, China

VDE0126-1-1, VDE-AR-N4105, IEC61727, IEC62116, UTE C15-712-1, AS4777




**SOFAR SOLAR** Solar Grid-tied Inverter

Model No.	SOFAR 3300TL-G3
Max.DC Input Voltage	550V
Operating MPPT Voltage Range	50~550V
Max. Input Current	12A
Max. PV Isc	15A
Nominal Grid Voltage	L/N/PE, 230Vac
Max. Output Current	16A
Nominal Grid Frequency	50/60Hz
Max. Output Power	3300VA
Power Factor	1(adjustable+/-0.8)
Ingress protection	IP65
Operating Temperature Range	-30~+60°C
Topology	Non-isolated
Protective Class	Class I

Manufacturer: Shenzhen SOFARSOLAR Co., Ltd.  
Address: 401, Building 4, AnTongDa Industrial Park, District 68, XingDong Community, XinAn Street, BaoAn District, Shenzhen, China

VDE0126-1-1, VDE-AR-N4105, IEC61727, IEC62116, UTE C15-712-1, AS4777

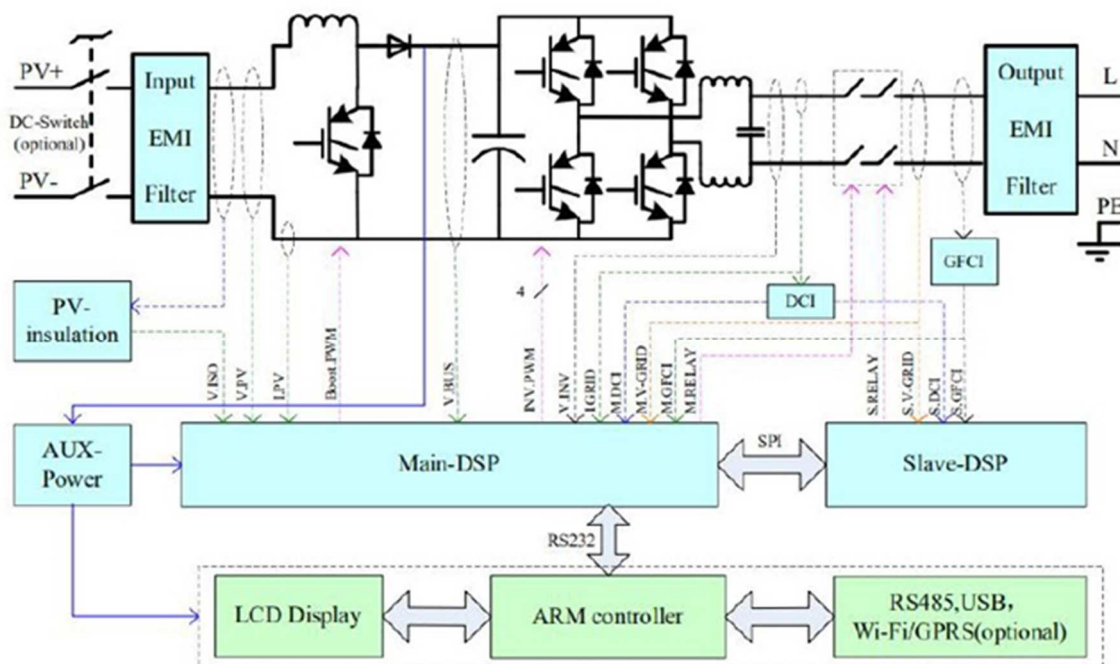


### General product information:

The Solar converter converts DC voltage into AC voltage.

The DC input of Solar converter can be supplied from PV array.

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



**Figure 1-Block diagram**

The internal control is redundant built. It consists of Microcontroller main DSP (UC34) and Slave DSP (U03).

The man DSP (CU34) control the relays 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 (U03) is measures the grid voltage, grid frequency, DCI and residual current, also can switch off the relays independently, and communicate with the DSP (U03) each other.

The current is measured by a current sensor. The AC current signal and the injected DC current signal are sent to the main DSP (UC34). The Slave DSP (U03) 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.





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Report No. PVFR2102WDG0105-1:

**Differences of the models:**

The models SOFAR 1100TL-G3, SOFAR 1600TL-G3, SOFAR 2200TL-G3, SOFAR 2700TL-G3, SOFAR 3000TL-G3 and SOFAR 3300TL-G3 are completely identical hardware platform and control system which to each other except the output power derated by software.

**The product was tested on:**

Hardware version: V1.1

Software version: V1.0

Per client requested, all tests were performed on EUT of SOFAR 3300TL-G3.

## TECHNOLGY

Nominal output power of the inverter	3,30 kW
Nominal current - $I_n$	14,34 A
Maximum apparent power of the inverter	3,30 kVA
Power electronics type	<input type="checkbox"/> Assisted switching (Thyristors) <input checked="" type="checkbox"/> Forced switching (IGBT-MLI)
Rated output voltage	230 V
Connection type	<input checked="" type="checkbox"/> Single phase <input type="checkbox"/> Three phase

## IMPEDANCE AT 175 Hz

Impedance of the converter at 175 Hz - R and X in ohm, give the values on the LV side (not taken into account of the transformer)	<input checked="" type="checkbox"/> Serial equivalent schema	$R_{175Hz}=5,42 \quad \Omega$
	<input type="checkbox"/> Parallel equivalent schema	$X_{175H}=4,57 \quad \Omega$

## BEHAVIOR IN CASE OF SHORT INVERTER OUTPUT CIRCUIT

Values measured at the output of the aero generator, give the values on the LV side (not taken into account of the transformer)	$I_p=35,0 \quad A$
	$I_{k''}=20,8 \quad A$

**HARMONIC:**

Order	Harmonic current	Order	Harmonic current
	%In		%In
2	0,047	3	1,226
4	0,019	5	0,815
6	0,022	7	0,755
8	0,020	9	0,656
10	0,023	11	0,572
12	0,028	13	0,504
14	0,021	15	0,396
16	0,028	17	0,294
18	0,026	19	0,210
20	0,021	21	0,140
22	0,016	23	0,084
24	0,018	25	0,053
26	0,021	27	0,052
28	0,017	29	0,041
30	0,014	31	0,034
32	0,014	33	0,030
34	0,013	35	0,027
36	0,014	37	0,022
38	0,012	39	0,023
40	0,014	41	0,021
42	0,013	43	0,030
44	0,013	45	0,027
46	0,059	47	0,021
48	0,062	49	0,022
50	0,015	--	--

**Note:**

The tests should be based on the limits of the EN 61000-3-2 for less than 16A.

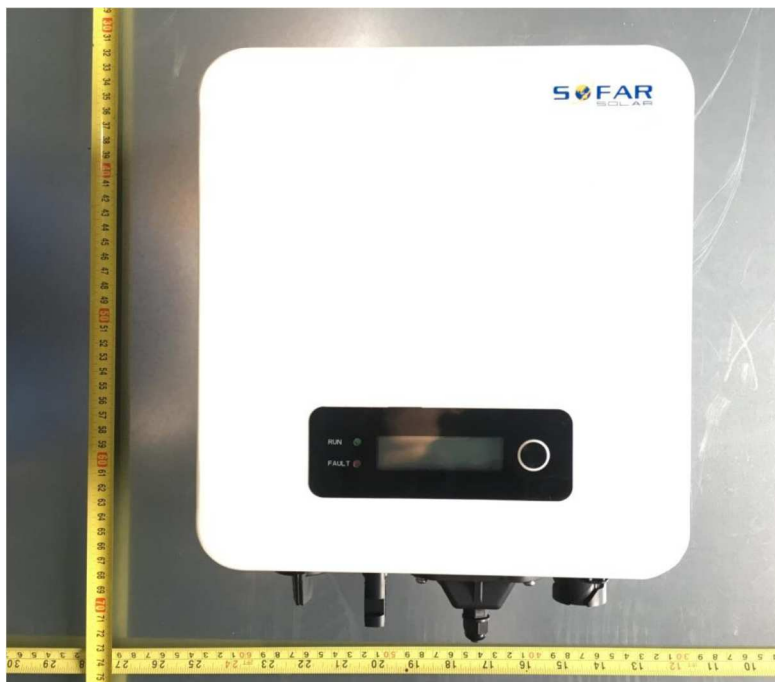


Report No. PVFR2102WDG0105-1:

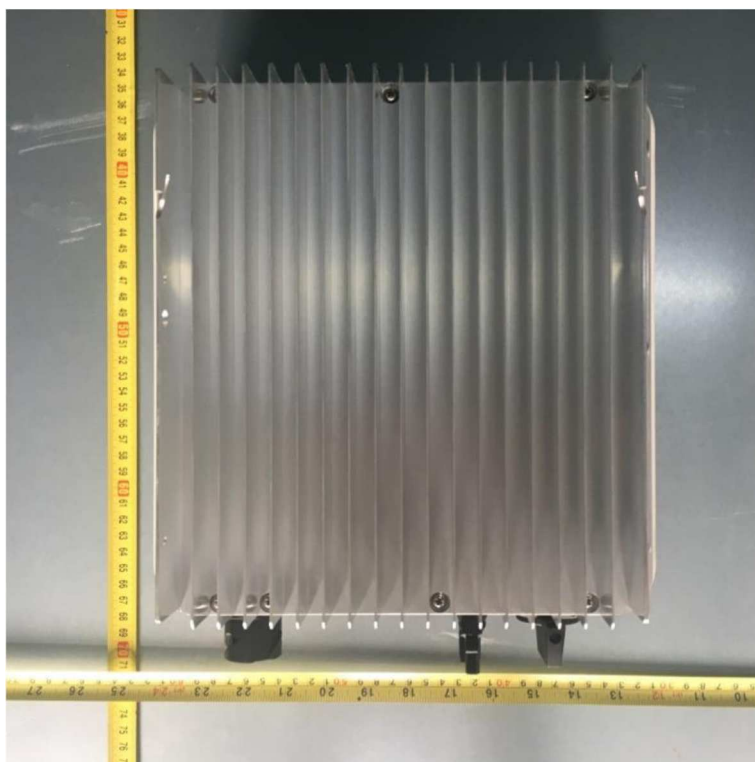
# Annex No. 1

## Pictures of the unit

**Enclosure front view**  
**(SOFAR 2700TL-G3, SOFAR 3000TL-G3, SOFAR 3300TL-G3)**



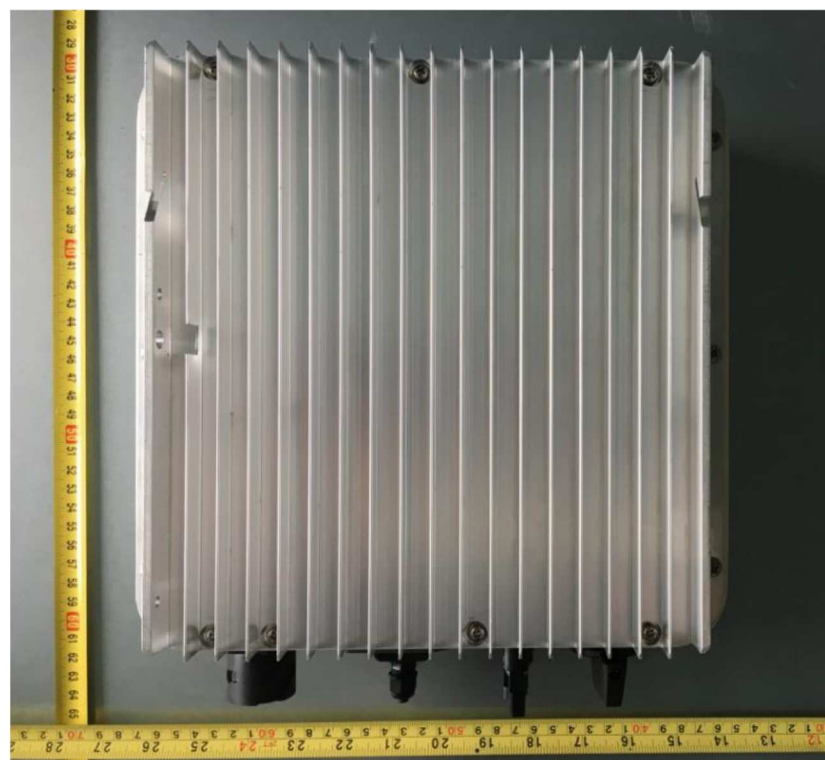
**Enclosure rear view**  
**(SOFAR 2700TL-G3, SOFAR 3000TL-G3, SOFAR 3300TL-G3)**



**Enclosure front view**  
**(SOFAR 1100TL-G3, SOFAR 1600TL-G3, SOFAR 2200TL-G3)**



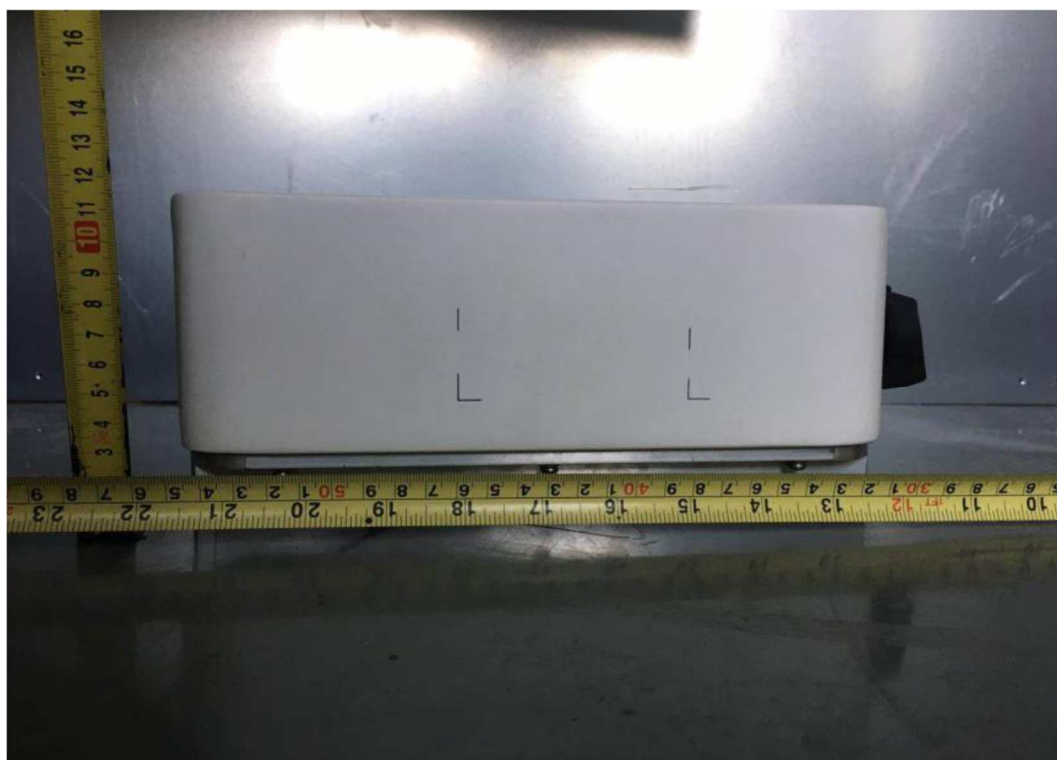
**Enclosure rear view**  
**(SOFAR 1100TL-G3, SOFAR 1600TL-G3, SOFAR 2200TL-G3)**



**Enclosure side view  
(SOFAR 2700TL-G3, SOFAR 3000TL-G3, SOFAR 3300TL-G3)**



**Enclosure side view  
(SOFAR 1100TL-G3, SOFAR 1600TL-G3, SOFAR 2200TL-G3)**





Report No. PVFR2102WDG0105-1:

# Annex No. 2

## Test Equipment list



**Dates of performance test: 2021-03-19 to 2021-03-27**

Equipment	Internal No.	Manufacturer	Type	Serial No.	Next Calibration date
Power Analyzer	A4080002DG	YOKOGAWA	WT3000	91M210852	Jun, 16, 2021
AC Source	A7040019DG	Chroma	61512	61512000439	Monitored by Power Analyzer
	A7040020DG	Chroma	61512	61512000438	
DC Simulation Power Supply	A7040016DG	Chroma	62150H-1000S	62150EF00490	
	A7040017DG	Chroma	620028	620028EF00120	
RLC Load	A7150027DG	Qunling	ACLT-3803H	93VOO2869	
Eight Channel	A4089017DG	YOKOGAWA	DL850	91N726247	Sep. 23, 2021
Oscilloscope	//	KEYSIGHT	DSOX3014T	MY59243036	Jan. 04, 2022
Oscilloscope probel	A4089008DG	Tektronix	TPP1000	C008230	Aug. 10, 2021
	A4089010DG	Tektronix	TPP1000	C008228	Aug. 10, 2021
	A4089011DG	Tektronix	TPP1000	C008229	Aug. 10, 2021
Current transducer	A1060007DG	YOKOGAWA	CT200	1130700012	Sep. 02, 2021
	A1060008DG	YOKOGAWA	CT200	1130700017	Sep. 02, 2021
	A1060012DG	YOKOGAWA	CT200	1130700018	Sep. 02, 2021