



**BUREAU  
VERITAS**

# TEST REPORT IEC 61683

**Photovoltaic systems – Power conditioners – Procedure for  
measuring efficiency**

**Report reference number** ..... : **PV200511N080-R1**

**Date of issue** ..... : 2020-11-20

**Total number of pages** ..... : 36

**Testing laboratory name** ..... : **Bureau Veritas Shenzhen Co., Ltd. Dongguan Branch**

**Address** ..... : No. 96, Guantai Road (Houjie Section), Houjie Town, Dongguan City,  
Guangdong Province, 523942, People's Republic of China

**Accreditation** ..... :



**Applicant's name** ..... : **Shenzhen SOFARSOLAR Co., Ltd.**

**Address** ..... : 401, Building 4, AnTongDa Industrial Park, District 68, XingDong  
Community, XinAn Street, BaoAn District, Shenzhen, China

## Test specification

**Standard**..... : IEC 61683:1999

**Test Report Form No.** ..... : IEC61683 VER.1

**TRF Originator** ..... : Bureau Veritas Shenzhen Co., Ltd. Dongguan Branch

**Master TRF** ..... : Dated 2020-03-11

**Test item description** ..... : **Solar Grid-tied Inverter**

**Trademark**..... :



**Model / Type** ..... : SOFAR 15KTLX-G3, SOFAR 17KTLX-G3,  
SOFAR 20KTLX-G3, SOFAR 22KTLX-G3, SOFAR 24KTLX-G3

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Bureau Veritas Shenzhen Co., Ltd.  
Dongguan Branch

No. 96, Guantai Road (Houjie Section), Houjie  
Town, Dongguan City, Guangdong Province,  
523942, People's Republic of China

Tel: +86 769 89982098  
Fax: +86 769 85991080  
Email: [customerservice.dg@bureauveritas.com](mailto:customerservice.dg@bureauveritas.com)

<b>Ratings .....</b> :	SOFAR 15KTLX-G3	SOFAR 17KTLX-G3	SOFAR 20KTLX-G3
Input DC voltage [V] .....	Max. 1100Vd.c.		
MPP DC voltage range [V] .....	140-1000Vd.c.		
Input DC current [A] .....	Max. 26/26		
Output AC voltage [V] .....	3/N/P, 380/400Va.c., 50/60Hz		
Output AC current [A] .....	3*23,9	3*27,1	3*31,9
Nominal Output power [kW] .....	15,0	17,0	20,0
Maximum Output power [kVA] .....	16,5	18,7	22,0

<b>Ratings .....</b> :	SOFAR 22KTLX-G3	SOFAR 24KTLX-G3
Input DC voltage range [V] .....	Max. 1100Vd.c.	
MPP DC voltage range [V] .....	140-1000Vd.c.	
Input DC current [A] .....	Max. 26/26	
Output AC voltage [V] .....	3/N/P, 380/400Va.c., 50/60Hz	
Output AC current [A] .....	3*35,1	3*38,3
Nominal Output power [kW] .....	22,0	24,0
Maximum Output power [kVA] .....	24,2	26,4

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

<b>Document History</b>			
<b>Date</b>	<b>Internal reference</b>	<b>Modification / Change / Status</b>	<b>Revision</b>
2020-10-23	Lukes Lin	Initial report was written	0
2020-11-20	Lukes Lin	Updated the name of Applicant and Manufacturer.	R1
Supplementary information:			

<b>Test items particulars</b>	
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 15KTLX-G3: 20±1kg SOFAR 17KTLX-G3, SOFAR 20KTLX-G3: 22±1kg SOFAR 22KTLX-G3, SOFAR 24KTLX-G3: 23±1kg
<b>Test case verdicts</b>	
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)
<b>Testing</b>	
Date of receipt of test item .....	2020-05-11
Date(s) of performance of test .....	2020-05-11 to 2020-10-14
<b>General remarks:</b>	
<p>The test result presented in this report relate only to the object(s) tested.          This report must not be reproduced in part or in full, without the written approval of the issuing testing laboratory.          "(see Annex #)" refers to additional information appended to the report.          "(see appended table)" refers to a table appended to the report.</p> <p>Throughout this report a point is used as the decimal separator.          This report is to replace the earlier Test Report Ref. No. <b>PV200511N080</b> issued by Bureau Veritas Shenzhen Co., Ltd. Dongguan Branch, dated on 2020-10-23.</p>	
<b>This Test Report consists of the following documents:</b>	
<ol style="list-style-type: none"> <li>1. Test Results</li> <li>2. Annex No. 1 – Pictures of the unit</li> <li>3. Annex No. 2 – Test equipment list</li> </ol>	

**Copy of marking plate:**

**SOFAR SOLAR** Solar Grid-tied Inverter

Model No: SOFAR 15KTLX-G3

Max.DC Input Voltage ----- 1100V

Operating MPPT Voltage Range ----- 140~1000V

Max. Input Current ----- 26A/26A

Max. PV Isc ----- 36A/36A

Nominal Grid Voltage ----- 3/N/PE,380/400V

Max.Output Current ----- 3x23.9A

Nominal Grid Frequency ----- 50/60Hz

Nominal Output Power ----- 15000W

Max.Output Power ----- 16500VA

Power Factor ----- 1(adjustable+/-0.8)

Ingress Protection ----- IP65

Operating Temperature Range ----- -30°C~ +60°C

Protective Class ----- Class I

Made in China

Manufacturer : Shenzhen SOFAR SOLAR 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,G99,IEC61727   
IEC62116,UTE C15-712-1,AS4777

**SOFAR SOLAR** Solar Grid-tied Inverter

Model No: SOFAR 17KTLX-G3

Max.DC Input Voltage ----- 1100V

Operating MPPT Voltage Range ----- 140~1000V

Max. Input Current ----- 26A/26A

Max. PV Isc ----- 36A/36A

Nominal Grid Voltage ----- 3/N/PE,380/400V

Max.Output Current ----- 3x27.1A

Nominal Grid Frequency ----- 50/60Hz

Nominal Output Power ----- 17000W

Max.Output Power ----- 18700VA


Power Factor ----- 1(adjustable+/-0.8)








Ingress Protection ----- IP65

Operating Temperature Range ----- -30°C~ +60°C

Protective Class ----- Class I

Made in China

Manufacturer : Shenzhen SOFAR SOLAR 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,G99,IEC61727   
IEC62116,UTE C15-712-1,AS4777

**SOFAR SOLAR** Solar Grid-tied Inverter

Model No: SOFAR 20KTLX-G3

Max.DC Input Voltage ----- 1100V

Operating MPPT Voltage Range ----- 140~1000V

Max. Input Current ----- 26A/26A

Max. PV Isc ----- 36A/36A

Nominal Grid Voltage ----- 3/N/PE,380/400V

Max.Output Current ----- 3x31.9A

Nominal Grid Frequency ----- 50/60Hz

Nominal Output Power ----- 20000W

Max.Output Power ----- 22000VA


Power Factor ----- 1(adjustable+/-0.8)








Ingress Protection ----- IP65

Operating Temperature Range ----- -30°C~ +60°C

Protective Class ----- Class I

Made in China

Manufacturer : Shenzhen SOFAR SOLAR 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,G99,IEC61727   
IEC62116,UTE C15-712-1,AS4777

Copy of marking plate:


**SOFAR** Solar Grid-tied Inverter

Model No: **SOFAR 22KTLX-G3**

Max. DC Input Voltage	1100V
Operating MPPT Voltage Range	140~1000V
Max. Input Current	26A/26A
Max. PV Isc	36A/36A
Nominal Grid Voltage	3/N/PE, 380/400V
Max. Output Current	3x35.1A
Nominal Grid Frequency	50/60Hz
Nominal Output Power	22000W
Max. Output Power	24200VA
Power Factor	1 (adjustable +/- 0.8)
Ingress Protection	IP65
Operating Temperature Range	-30°C ~ +60°C
Protective Class	Class I

Made in China

Manufacturer : Shenzhen SOFAR SOLAR 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, G99, IEC61727  
IEC62116, UTE C15-712-1, AS4777



**SOFAR** Solar Grid-tied Inverter

Model No: **SOFAR 24KTLX-G3**

Max. DC Input Voltage	1100V
Operating MPPT Voltage Range	140~1000V
Max. Input Current	26A/26A
Max. PV Isc	36A/36A
Nominal Grid Voltage	3/N/PE, 380/400V
Max. Output Current	3x38.3A
Nominal Grid Frequency	50/60Hz
Nominal Output Power	24000W
Max. Output Power	26400VA
Power Factor	1 (adjustable +/- 0.8)
Ingress Protection	IP65
Operating Temperature Range	-30°C ~ +60°C
Protective Class	Class I

Made in China

Manufacturer : Shenzhen SOFAR SOLAR 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, G99, 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.

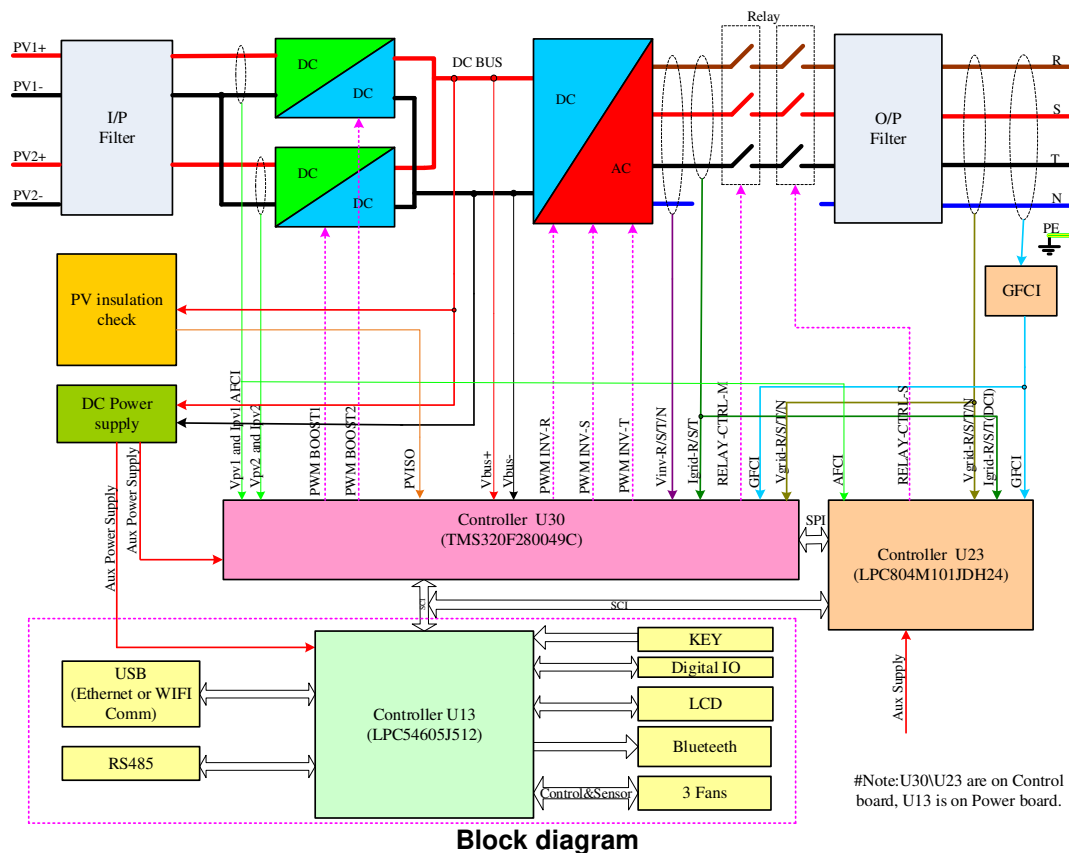
The Solar converter is a three-phase type.

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 two relays in each phase. This assures that the opening of the output circuit will also operate in case of one error.

The grid connected photovoltaic inverter has estimated Annex B only.

The grid connected photovoltaic inverter must be connected only to a circuit which provides with external interface protection system (external SPI) in accordance with the italian standard of CEI 0-21 and IEC/EN 61850.

### Description of the electrical circuit



The internal control is redundant built. It consists of Main DSP(U30) and slave DSP(U23).

The Main DSP(U30) can control the relays, measures voltage, and frequency, AC current with injected DC, insulation resistance and residual current, In addition it tests the array insulation resistance and the RCMU circuit before each start up.

The slave DSP(U23) is using for detect residual current, also can open the relays independently and communicate with Main DSP(U30).

The unit provides two relays in each phase. 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 start up. Both controllers (Main DSP(U30), Slave DSP(U23)) can open the relays.



**Differences of the models**

The model SOFAR 15KTLX-G3, SOFAR 17KTLX-G3, SOFAR 20KTLX-G3, SOFAR 22KTLX-G3 and SOFAR 24KTLX-G3 are almost identical in hardware, except the Communication control (CSB or COM), DC input channel and Fuse board for PV input. The difference as below.

	SOFAR 15KTLX-G3	SOFAR 17KTLX-G3	SOFAR 20KTLX-G3 SOFAR 22KTLX-G3 SOFAR 24KTLX-G3
BUS film capacitor	4 pcs 110uF/550V		6 pcs 110uF/550V
Inverter IGBT	6 pcs 40A/1200V		6 pcs 70A/1200V
fan		1 pcs	2 pcs

**The product was tested on**

Hardware version: V101

Software version: V010000

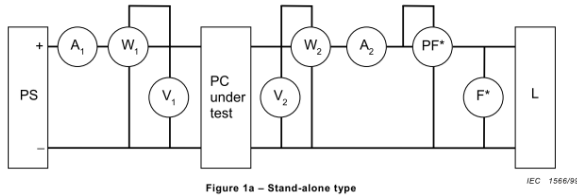


<b>IEC 61683</b>			
Clause	Requirement + Test	Result - Remark	Verdict
<b>4</b>	<b>Efficiency measurement conditions</b>	Considered.	<b>P</b>
	Efficiency shall be measured under the matrix of conditions as described in the following clauses and table 1. Specific conditions may be excluded by mutual agreement when those conditions are outside the manufacturer's allowable operating range. The resulting data shall be presented in tabular form and may also be presented graphically.	See below.	<b>P</b>
4.1	DC power source for testing		<b>P</b>
	For power conditioners operating with fixed input voltage, the d.c. power source is a storage battery or constant voltage power source to maintain the input voltage.		<b>N/A</b>
	For power conditioners that employ maximum power point tracking (MPPT) and shunt-type power conditioners, either a photovoltaic array or a photovoltaic array simulator is utilized.	Photovoltaic array simulator used.	<b>P</b>
4.2	Temperature		<b>P</b>
	All measurements are to be made at an ambient temperature of 25 °C ± 2 °C.	25°C	<b>P</b>
	Other ambient temperatures may be allowed by mutual agreement. However, the temperature used must be clearly stated in all documentation.		<b>N/A</b>
4.3	Output voltage and frequency		<b>P</b>
	The output voltage and frequency are maintained at the manufacturer's stated nominal values.	3/N/PE, 230Va.c., 50Hz	<b>P</b>
4.4	Input voltage		<b>P</b>
	Measurements performed in each of the following tests are repeated at three power conditioner input voltages: a) manufacturer's minimum rated input voltage; b) the inverter's nominal voltage or the average of its rated input range; c) 90 % of the inverter's maximum input voltage.	Input voltages: <b>a).</b> SOFAR 15KTLX-G3: 420Vd.c.; SOFAR 17KTLX-G3: 450Vd.c.; SOFAR 20KTLX-G3: 480Vd.c.; SOFAR 22KTLX-G3: 510Vd.c.; SOFAR 24KTLX-G3: 540Vd.c.; <b>b).</b> 650Vd.c.; <b>c).</b> 850Vd.c.* * The voltage value is defined by manufacturer because the value is the max value of full load MPP DC voltage range.	<b>P</b>

<b>IEC 61683</b>			
<b>Clause</b>	<b>Requirement + Test</b>	<b>Result - Remark</b>	<b>Verdict</b>
	In the case where a power conditioner is to be connected with a battery at its input terminals, only the nominal or rated input voltage may be applied.		<b>N/A</b>
4.5	Ripple and distortion		<b>P</b>
	Record input voltage and current ripple for each measurement. Also record output voltage and current distortion (if a.c.) or ripple (if d.c.). Ensure that these measurements remain within the manufacturer's specified values.	The ripple of the input voltage had no influence on the measurements. (see appended table)	<b>P</b>
4.6	Resistive loads/utility grid		<b>P</b>
	At unity power factor, or at the intrinsic power factor of grid-connected inverters without power factor adjustment, measure the efficiency for power levels of 10 %, 25 %, 50 %, 75 %, 100 % and 120 % of the inverter's rating.	The efficiency measurement was performed at 10 %, 25 %, 50 %, 75 % and 100 %, because the unit does not provide 120% of the inverter's rating overload function.	<b>P</b>
	Stand-alone inverters are also measured at a power level of 5 % of rated. The power conditioner test is conducted with a specified resistive and reactive grid impedance.	Grid-connected inverters.	<b>N/A</b>
4.7	Reactive loads		<b>N/A</b>
	For stand-alone inverters, measure the efficiency with a load which provides a power factor equal to the manufacturer's specified minimum level (or 0,25, whichever is greater) and at power levels of 25 %, 50 % and 100 % of rated VA.	Grid-connected inverters.	<b>N/A</b>
	Repeat for power factors of 0,5 and 0,75 (do not go below the manufacturer's specified minimum PF) and power levels of 25 %, 50 %, and 100 % of rated VA.		<b>N/A</b>
4.8	Resistive plus non-linear loads		<b>N/A</b>
	For stand-alone inverters, measure the efficiency with a fixed non-linear load (total harmonic distortion (THD) = $(80 \pm 5) \%$ ) equal to $(25 \pm 5) \%$ of the inverter's rated VA plus sufficient resistive load in parallel to achieve a total load of 25 %, 50 % and 100 % of rated VA.	Grid-connected inverters.	<b>N/A</b>
	Repeat the measurements with a fixed non-linear load equivalent to $(50 \pm 5) \%$ of the inverter's rated VA plus sufficient resistive load in parallel to achieve a total load of 50% and 100% of rated VA.		<b>N/A</b>
	The type of non-linear load must be clearly stated in all documentation.		<b>N/A</b>
4.9	Complex loads		<b>N/A</b>

IEC 61683			
Clause	Requirement + Test	Result - Remark	Verdict
	When a non-linear plus a sufficient reactive load condition is specified for stand-alone inverters, measure the efficiency with a fixed non-linear load (THD = $(80 \pm 5) \%$ ) equal to $(50 \pm 5) \%$ of the inverter's rated VA plus a sufficient reactive load (PF = 0,5) in parallel to achieve a total load of 50 % and 100 % of rated VA.	Grid-connected inverters.	N/A
	The type of complex load is clearly stated in all documentation.		N/A

<b>5.</b>	<b>Efficiency calculations</b>	See below.	<b>P</b>
5.1	Rated output efficiency		<b>P</b>
	Rated output efficiency shall be calculated from measured data as follows: $\eta_R = (P_o / P_i) \times 100$	Considered.	<b>P</b>
5.2	Partial output efficiency		<b>N/A</b>
	Partial output efficiency shall be calculated from measured data as follows: $\eta_{par} = (P_{op} / P_{ip}) \times 100$	No derating during testing.	<b>N/A</b>
5.3	Energy efficiency		<b>P</b>
	Energy efficiency shall be calculated from measured data as follows: $\eta_E = (W_o / W_i) \times 100$	Considered.	<b>P</b>
5.4	Efficiency tolerances		<b>P</b>
	When an efficiency value has been guaranteed, the tolerance of this value shall be within: $-0,2(1-\eta)\eta (\%)$	Considered.	<b>P</b>

<b>6.</b>	<b>Efficiency test circuits</b>	See below.	<b>P</b>
6.1	Test circuits	Considered.	<b>P</b>
	Figure 1a is applied to standard-alone power conditioners	Figure 1b used.	<b>N/A</b>
			<b>N/A</b>
	Figure 1b is applied to utility-interactive power conditioners	Considered.	<b>P</b>

IEC 61683			
Clause	Requirement + Test	Result - Remark	Verdict
	<p>Figure 1b – Utility-interactive type</p> <p>PC power conditioner  PS variable voltage-current d.c. power supply  A<sub>1</sub> DC ammeter  A<sub>2</sub> AC or d.c. ammeter  W<sub>1</sub> DC wattmeter  W<sub>2</sub> AC or d.c. wattmeter  L load  F frequency meter  V<sub>1</sub> DC voltmeter  V<sub>2</sub> AC or d.c. voltmeter  PF power factor meter</p>		<b>P</b>
6.2	Measurement procedure	Considered.	<b>P</b>
	a) Efficiency is calculated with equation (1) or (2) using measured P <sub>i</sub> , P <sub>o</sub> or P <sub>ip</sub> , P <sub>op</sub> . DC input power P <sub>i</sub> , P <sub>ip</sub> can be measured by wattmeter W <sub>1</sub> , or determined by multiplying the d.c. voltmeter V <sub>1</sub> and d.c. ammeter A <sub>1</sub> readings. Output power P <sub>o</sub> , P <sub>op</sub> is measured with wattmeter W <sub>2</sub> .	Considered.	<b>P</b>
	b) DC input voltage, which is measured by d.c. voltmeter V <sub>1</sub> , shall be varied in the defined range where the output current, which is measured with a.c. ammeter A <sub>2</sub> , is varied from low output to the rated output.	Considered.	<b>P</b>
	c) An average indicating instrument shall be used for the d.c. voltmeter and d.c. ammeter. A true r.m.s. type of indicating instrument shall be used for the a.c. voltmeter and a.c. ammeter. The d.c. wattmeter W <sub>1</sub> shall be a d.c. measuring type. The wattmeter W <sub>2</sub> shall be an a.c. or d.c. measuring type according to the output.	Considered.	<b>P</b>
	d) Power factor (PF in per cent) can be measured by a power factor meter PF, or calculated from the readings of V <sub>2</sub> , A <sub>2</sub> , W <sub>2</sub> and as follows: $PF = (W_2 / (V_2 \times A_2)) \times 100$	Considered.	<b>P</b>
	e) Each meter may be an analogue type or a digital type. The measurement accuracy shall be better than ± 0,5 % of the full-scale value for each power measured. Digital power instruments for W <sub>1</sub> and W <sub>2</sub> are also recommended.	Digital measurement devices were used for testing. The accuracy of the measurement devices fulfills the requirements.	<b>P</b>
	f) An MPPT dynamically adjusts the input voltage so as to maximize the output power. In principle, the monitoring equipment shall sample all of the electrical parameters, such as input voltage and current, output power and current, within the update period of the MPPT. If the MPPT and input source (PV array or PV array simulator) interact in such a way that the input voltage varies by less than 5 %, then averaging of readings is acceptable. The averaging period shall be 30 s or longer.	The dynamic MPPT was deactivated, the 60s average was used anyway.	<b>P</b>

<b>IEC 61683</b>			
Clause	Requirement + Test	Result - Remark	Verdict
<b>7.</b>	<b>Loss measurement</b>	See below.	<b>P</b>
7.1	No-load loss		<b>P</b>
	Stand-alone inverters: reading of d.c. input voltage, output voltage and frequency is given with meters $V_1$ , $V_2$ and $F$ respectively in figure 1a, and shall be adjusted to the rated values.	Grid-connected inverters.	<b>N/A</b>
	Utility-interactive inverters: reading of d.c. input voltmeter $V_1$ , a.c. output voltmeter $V_2$ and frequency meter $F$ in figure 1b shall be adjusted to meet the specified voltages and frequency.	See appended table.	<b>P</b>
7.2	Standby loss		<b>P</b>
	Stand-alone inverters: Consumption of utility power when the power conditioner is not operating but is under standby condition.	No such inverters.	<b>N/A</b>
	Utility-interactive inverters: consumption from the d.c. source when the power conditioner is not operating but is under standby condition.	See appended table.	<b>P</b>

<b>Annex A</b>	<b>Power conditioner description (informative)</b>	See below.	<b>P</b>
	A power conditioner is defined in IEC 61277	Figure A.2	<b>P</b>

<b>Annex B</b>	<b>Power efficiency and conversion factor (informative)</b>	See below.	<b>P</b>
	There are two types of efficiencies shown in IEC 60146-2; one is a power efficiency, the other is a conversion factor. Power efficiency is defined as the ratio of active output power and active input power. Conversion factor is the ratio between output and input fundamental power levels.	Power efficiency used.	<b>P</b>

<b>Annex C</b>	<b>Weighted-average energy efficiency (informative)</b>	See below.	<b>P</b>
	The energy of a power conditioner depends on both the irradiance profile and the load profile. The energy efficiency of a power conditioner shall be calculated by the ratio of the output to the input energy actually measured over a certain period	Considered.	<b>P</b>
C.1	$\eta_{WT}$ of power conditioner for utility-interactive PV systems	Considered.	<b>P</b>
	Utility-interactive PV systems, which have no storage and for which reverse-power flow is accepted, are described. In this case, d.c. power generated by the PV array is supplied direct into the power conditioner (PC). Almost all of the input power to the PC is converted to a.c. power. A part of it is dissipated as the PC loss.	Considered.	<b>P</b>

IEC 61683			
Clause	Requirement + Test	Result - Remark	Verdict
C.2	$\eta_{WT}$ of power conditioner for stand-alone PV systems	Grid-connected inverters.	N/A
	In stand-alone PV systems with a storage subsystem, power generated from the PV array is stored and stabilized by the batteries. DC power is converted into regulated d.c. power or constant-voltage and constant-frequency a.c. power by a power conditioner (PC) and supplied to the load. In this case, some fraction of the generated power is dissipated as a loss in the batteries and power conditioner.		N/A
<b>Annex D</b>	<b>Derivation of efficiency tolerance in table 2 (informative)</b>	Considered.	<b>P</b>

IEC 61683			
Clause	Requirement + Test	Result - Remark	Verdict

TABLE	Efficiency recording and efficient calculation sheet								
<b>power conditioner type</b>	<b>Grid-connected</b>								
<b>Model:</b>	<b>SOFAR 15KTLX-G3</b>								
Parameters of power conditioner	Minimum rated input voltage: 420Vd.c. Nominal voltage: 650Vd.c. Maximum input voltage: 1100Vd.c. Rated output voltage: 230Va.c. Rated output frequency: 50Hz Output apparent power:15,0kW Max output apparent power:16,5kVA								
<b>PV input voltage</b>	<b>a) Manufacturer's minimum rated input voltage(420Vd.c.)</b>								
Temperature (°C)	25,0								
Operating period for energy measurement (min)	1,0								
Percentage of rated output VA	/	10%	25%	50%	75%	100%	/	/	/
Input voltage (V)	/	420,64	418,33	418,33	418,35	418,43	/	/	/
Input voltage ripple (V)	/	24,10	8,15	8,15	8,14	8,14	/	/	/
Input current (A)	/	3,719	9,284	18,506	27,707	36,881	/	/	/
Input current ripple (A)	/	0,214	0,177	0,355	0,543	0,739	/	/	/
Input power (Pi) (kW)	/	1,562	3,883	7,741	11,590	15,431	/	/	/
Output power (Po) (kW)	/	1,487	3,754	7,538	11,292	15,025	/	/	/
Output efficiency	/	95,19%	96,69%	97,38%	97,43%	97,37%	/	/	/
Input energy (Wi) (kWh)	/	0,026	0,065	0,129	0,193	0,257	/	/	/
Output energy (Wo) (kWh)	/	0,025	0,063	0,126	0,188	0,250	/	/	/
Energy efficiency	/	95,19%	96,69%	97,38%	97,43%	97,37%	/	/	/
<b>PV input voltage</b>	<b>b) The inverter's nominal voltage(650Vd.c.)</b>								
Temperature (°C)	25,0								
Operating period for energy measurement (min)	1,0								
Percentage of rated output VA	/	10%	25%	50%	75%	100%	/	/	/
Input voltage (V)	/	651,01	649,68	648,77	649,72	649,57	/	/	/
Input voltage ripple (V)	/	24,41	8,11	12,124	8,20	12,18	/	/	/
Input current (A)	/	2,391	5,926	11,816	17,672	23,545	/	/	/

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Clause	Requirement + Test						Result - Remark		Verdict
Input current ripple (A)	/	0,095	0,080	0,214	0,230	0,434	/	/	/
Input power (Pi) (W)	/	1,555	3,850	7,665	11,481	15,293	/	/	/
Output power (Po) (W)	/	1,514	3,796	7,555	11,313	15,058	/	/	/
Output efficiency	/	97,35%	98,60%	98,57%	98,54%	98,47%	/	/	/
Input energy (Wi) (kWh)	/	0,026	0,064	0,128	0,191	0,255	/	/	/
Output energy (Wo) (kWh)	/	0,025	0,063	0,126	0,189	0,251	/	/	/
Energy efficiency	/	97,35%	98,60%	98,57%	98,54%	98,47%	/	/	/
<b>PV input voltage</b>	<b>c) 90% of the inverter's maximum input voltage**(850Vd.c.)</b>								
Temperature (°C)	25,0								
Operating period for energy measurement (min)	1,0								
Percentage of rated output VA	/	10%	25%	50%	75%	100%	/	/	/
Input voltage (V)	/	852,31	852,32	848,84	852,13	847,19	/	/	/
Input voltage ripple (V)	/	16,31	16,24	24,119	16,34	24,56	/	/	/
Input current (A)	/	1,847	4,558	9,102	13,577	18,189	/	/	/
Input current ripple (A)	/	0,045	0,095	0,252	0,289	0,514	/	/	/
Input power (Pi) (W)	/	1,572	3,882	7,722	11,564	15,402	/	/	/
Output power (Po) (W)	/	1,498	3,782	7,555	11,310	15,047	/	/	/
Output efficiency	/	95,32%	97,43%	97,84%	97,80%	97,69%	/	/	/
Input energy (Wi) (kWh)	/	0,026	0,065	0,129	0,193	0,257	/	/	/
Output energy (Wo) (kWh)	/	0,025	0,063	0,126	0,188	0,251	/	/	/
Energy efficiency	/	95,32%	97,43%	97,84%	97,80%	97,69%	/	/	/
Remark:									
** The EUT can't start up at 990Vdc.									



IEC 61683			
Clause	Requirement + Test	Result - Remark	Verdict

TABLE	Efficiency recording and efficient calculation sheet								
<b>power conditioner type</b>	<b>Grid-connected</b>								
<b>Model:</b>	<b>SOFAR 17KTLX-G3</b>								
Parameters of power conditioner	Minimum rated input voltage: 450Vd.c. Nominal voltage: 650Vd.c. Maximum input voltage: 1100Vd.c. Rated output voltage: 230Va.c. Rated output frequency: 50Hz Output apparent power:17,0kW Max output apparent power:18,7kVA								
<b>PV input voltage</b>	<b>a) Manufacturer's minimum rated input voltage(450Vd.c.)</b>								
Temperature (°C)	25,0								
Operating period for energy measurement (min)	1,0								
Percentage of rated output VA	/	10%	25%	50%	75%	100%	120%*	/	/
Input voltage (V)	/	447,81	450,16	449,25	447,53	447,24	/	/	/
Input voltage ripple (V)	/	23,97	12,02	12,018	12,04	8,07	/	/	/
Input current (A)	/	3,965	9,799	19,569	29,419	39,195	/	/	/
Input current ripple (A)	/	0,232	0,262	0,536	0,818	0,686	/	/	/
Input power (Pi) (kW)	/	1,773	4,410	8,790	13,165	17,528	/	/	/
Output power (Po) (kW)	/	1,696	4,281	8,572	12,840	17,076	/	/	/
Output efficiency (%)	/	95,62%	97,07%	97,52%	97,54%	97,42%	/	/	/
Input energy (Wi) (kWh)	/	0,030	0,073	0,147	0,219	0,292	/	/	/
Output energy (Wo) (kWh)	/	0,028	0,071	0,143	0,214	0,285	/	/	/
Energy efficiency	/	95,62%	97,07%	97,52%	97,54%	97,42%	/	/	/
<b>PV input voltage</b>	<b>b) The inverter's nominal voltage(650Vd.c.)</b>								
Temperature (°C)	25,0								
Operating period for energy measurement (min)	1,0								
Percentage of rated output VA	/	10%	25%	50%	75%	100%	120%*	/	/
Input voltage (V)	/	648,28	650,19	651,05	649,87	650,22	/	/	/
Input voltage ripple (V)	/	24,17	24,07	16,318	12,29	12,33	/	/	/
Input current (A)	/	2,715	6,702	13,338	20,027	26,661	/	/	/

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Clause	Requirement + Test						Result - Remark		Verdict
Input current ripple (A)	/	0,106	0,237	0,356	0,383	0,518	/	/	/
Input power (Pi) (W)	/	1,759	4,357	8,682	13,013	17,334	/	/	/
Output power (Po) (W)	/	1,711	4,296	8,557	12,819	17,054	/	/	/
Output efficiency	/	97,27%	98,60%	98,56%	98,51%	98,39%	/	/	/
Input energy (Wi) (kWh)	/	0,029	0,073	0,145	0,217	0,289	/	/	/
Output energy (Wo) (kWh)	/	0,029	0,072	0,143	0,214	0,284	/	/	/
Energy efficiency	/	97,27%	98,60%	98,56%	98,51%	98,39%	/	/	/
<b>PV input voltage</b>	<b>c) 90% of the inverter's maximum input voltage**(850Vd.c.)</b>								
Temperature (°C)	25,0								
Operating period for energy measurement (min)	1,0								
Percentage of rated output VA	/	10%	25%	50%	75%	100%	120%*	/	/
Input voltage (V)	/	846,76	846,59	849,06	847,93	846,76	/	/	/
Input voltage ripple (V)	/	16,48	24,27	24,176	16,36	16,48	/	/	/
Input current (A)	/	20,632	5,190	10,312	15,462	20,632	/	/	/
Input current ripple (A)	/	0,370	0,127	0,329	0,292	0,370	/	/	/
Input power (Pi) (W)	/	17,463	4,391	8,751	13,104	17,463	/	/	/
Output power (Po) (W)	/	17,047	4,284	8,561	12,812	17,047	/	/	/
Output efficiency	/	97,62%	97,57%	97,82%	97,76%	97,62%	/	/	/
Input energy (Wi) (kWh)	/	0,291	0,073	0,146	0,218	0,291	/	/	/
Output energy (Wo) (kWh)	/	0,284	0,071	0,143	0,214	0,284	/	/	/
Energy efficiency	/	97,62%	97,57%	97,82%	97,76%	97,62%	/	/	/
<b>Remark:</b> *If limited by design, inverter is not capable to operate with the 120% of rated output load, test under this condition is waived; ** The EUT can't start up at 990Vdc.									

IEC 61683			
Clause	Requirement + Test	Result - Remark	Verdict

TABLE	Efficiency recording and efficient calculation sheet								
<b>power conditioner type</b>	<b>Grid-connected</b>								
Model:	<b>SOFAR 20KTLX-G3</b>								
Parameters of power conditioner	Minimum rated input voltage: 480Vd.c. Nominal voltage: 650Vd.c. Maximum input voltage: 1100Vd.c. Rated output voltage: 230Va.c. Rated output frequency: 50Hz Output apparent power:20,0kW Max output apparent power:22,0kVA								
<b>PV input voltage</b>	<b>a) Manufacturer's minimum rated input voltage(480Vd.c.)</b>								
Temperature (°C)	25,0								
Operating period for energy measurement (min)	1,0								
Percentage of rated output VA	/	10%	25%	50%	75%	100%	120%*	/	/
Input voltage (V)	/	479,48	480,29	477,27	477,71	476,83	/	/	/
Input voltage ripple (V)	/	11,94	7,97	11,951	11,97	11,93	/	/	/
Input current (A)	/	4,340	10,770	21,610	32,323	43,111	/	/	/
Input current ripple (A)	/	0,105	0,186	0,533	0,821	1,107	/	/	/
Input power (Pi) (kW)	/	2,079	5,171	10,312	15,440	20,556	/	/	/
Output power (Po) (kW)	/	2,000	5,037	10,073	15,075	20,034	/	/	/
Output efficiency (%)	/	96,24%	97,41%	97,67%	97,64%	97,46%	/	/	/
Input energy (Wi) (kWh)	/	0,035	0,086	0,172	0,257	0,343	/	/	/
Output energy (Wo) (kWh)	/	0,033	0,084	0,168	0,251	0,334	/	/	/
Energy efficiency	/	96,24%	97,41%	97,67%	97,64%	97,46%	/	/	/
<b>PV input voltage</b>	<b>b) The inverter's nominal voltage(650Vd.c.)</b>								
Temperature (°C)	25,0								
Operating period for energy measurement (min)	1,0								
Percentage of rated output VA	/	10%	25%	50%	75%	100%	120%*	/	/
Input voltage (V)	/	649,35	648,64	648,69	648,61	648,60	/	/	/
Input voltage ripple (V)	/	24,30	16,38	16,384	16,53	8,43	/	/	/
Input current (A)	/	3,182	7,907	15,774	23,629	31,485	/	/	/

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Clause	Requirement + Test						Result - Remark		Verdict
Input current ripple (A)	/	0,130	0,200	0,395	0,605	0,417	/	/	/
Input power (Pi) (kW)	/	2,066	5,128	10,232	15,324	20,419	/	/	/
Output power (Po) (kW)	/	2,017	5,058	10,084	15,089	20,077	/	/	/
Output efficiency (%)	/	97,66%	98,63%	98,55%	98,47%	98,32%	/	/	/
Input energy (Wi) (kWh)	/	0,034	0,085	0,171	0,255	0,340	/	/	/
Output energy (Wo) (kWh)	/	0,034	0,084	0,168	0,251	0,335	/	/	/
Energy efficiency	/	97,66%	98,63%	98,55%	98,47%	98,32%	/	/	/
<b>PV input voltage</b>	<b>c) 90% of the inverter's maximum input voltage**(850Vd.c.)</b>								
Temperature (°C)	25,0								
Operating period for energy measurement (min)	1,0								
Percentage of rated output VA	/	10%	25%	50%	75%	100%	120%*	/	/
Input voltage (V)	/	849,43	849,41	849,24	849,14	849,03	/	/	/
Input voltage ripple (V)	/	16,33	16,36	16,391	16,55	8,53	/	/	/
Input current (A)	/	2,466	6,099	12,155	18,212	24,272	/	/	/
Input current ripple (A)	/	0,053	0,116	0,235	0,357	0,245	/	/	/
Input power (Pi) (kW)	/	2,092	5,178	10,318	15,458	20,599	/	/	/
Output power (Po) (kW)	/	2,013	5,054	10,093	15,100	20,070	/	/	/
Output efficiency (%)	/	96,21%	97,61%	97,82%	97,69%	97,44%	/	/	/
Input energy (Wi) (kWh)	/	0,035	0,086	0,172	0,258	0,343	/	/	/
Output energy (Wo) (kWh)	/	0,034	0,084	0,168	0,252	0,335	/	/	/
Energy efficiency	/	96,21%	97,61%	97,82%	97,69%	97,44%	/	/	/
<b>Remark:</b> *If limited by design, inverter is not capable to operate with the 120% of rated output load, test under this condition is waived; ** The EUT can't start up at 990Vdc.									

IEC 61683			
Clause	Requirement + Test	Result - Remark	Verdict

TABLE	Efficiency recording and efficient calculation sheet
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power conditioner type	Grid-connected								
Model:	SOFAR 22KTLX-G3								
Parameters of power conditioner	Minimum rated input voltage: 510Vd.c. Nominal voltage: 650Vd.c. Maximum input voltage: 1100Vd.c. Rated output voltage: 230Va.c. Rated output frequency: 50Hz Rated output power: 22,0kW Max output apparent power: 24,2kVA								
<b>PV input voltage</b>	<b>a) Manufacturer's minimum rated input voltage(510Vd.c.)</b>								
Temperature (°C)	25,0								
Operating period for energy measurement (min)	1,0								
Percentage of rated output VA	/	10%	25%	50%	75%	100%	120%*	/	/
Input voltage (V)	/	506,44	508,45	508,29	507,94	505,65	/	/	/
Input voltage ripple (V)	/	12,24	12,23	12,222	16,15	12,21	/	/	/
Input current (A)	/	4,514	11,186	22,311	33,429	44,705	/	/	/
Input current ripple (A)	/	0,098	0,247	0,506	1,104	1,057	/	/	/
Input power (Pi) (kW)	/	2,284	5,687	11,339	16,978	22,603	/	/	/
Output power (Po) (kW)	/	2,206	5,553	11,092	16,591	22,040	/	/	/
Output efficiency (%)	/	96,56%	97,66%	97,81%	97,72%	97,51%	/	/	/
Input energy (Wi) (kWh)	/	0,038	0,095	0,189	0,283	0,377	/	/	/
Output energy (Wo) (kWh)	/	0,037	0,093	0,185	0,277	0,367	/	/	/
Energy efficiency	/	96,56%	97,66%	97,81%	97,72%	97,51%	/	/	/
<b>PV input voltage</b>	<b>b) The inverter's nominal voltage (650Vd.c.)</b>								
Temperature (°C)	25,0								
Operating period for energy measurement (min)	1,0								
Percentage of rated output VA	/	10%	25%	50%	75%	100%	120%*	/	/
Input voltage (V)	/	649,92	648,31	649,07	649,20	647,36	/	/	/
Input voltage ripple (V)	/	16,44	12,16	24,404	12,37	12,54	/	/	/
Input current (A)	/	3,496	8,709	17,335	25,979	34,696	/	/	/

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Clause	Requirement + Test						Result - Remark		Verdict
Input current ripple (A)	/	0,091	0,157	0,683	0,488	0,670	/	/	/
Input power (Pi) (kW)	/	2,271	5,646	11,250	16,864	22,459	/	/	/
Output power (Po) (kW)	/	2,223	5,570	11,086	16,599	22,069	/	/	/
Output efficiency (%)	/	97,88%	98,66%	98,54%	98,43%	98,26%	/	/	/
Input energy (Wi) (kWh)	/	0,038	0,094	0,187	0,281	0,374	/	/	/
Output energy (Wo) (kWh)	/	0,037	0,093	0,185	0,277	0,368	/	/	/
Energy efficiency	/	97,88%	98,66%	98,54%	98,43%	98,26%	/	/	/
<b>PV input voltage</b>	<b>c) 90% of the inverter's maximum input voltage**(850Vd.c.)</b>								
Temperature (°C)	25,0								
Operating period for energy measurement (min)	1,0								
Percentage of rated output VA	/	10%	25%	50%	75%	100%	120%*	/	/
Input voltage (Vd.c.)	/	848,39	852,66	849,88	850,05	849,59	/	/	/
Input voltage ripple (Vd.c.)	/	24,34	11,97	12,294	12,43	12,60	/	/	/
Input current (Ad.c.)	/	2,710	6,679	13,356	20,005	26,661	/	/	/
Input current ripple (Ad.c.)	/	0,083	0,110	0,202	0,308	0,418	/	/	/
Input power (Pi) (kW)	/	2,297	5,692	11,346	16,998	22,642	/	/	/
Output power (Po) (kW)	/	2,215	5,558	11,099	16,598	22,043	/	/	/
Output efficiency (%)	/	96,42%	97,65%	97,82%	97,65%	97,36%	/	/	/
Input energy (Wi) (kWh)	/	0,038	0,095	0,189	0,283	0,377	/	/	/
Output energy (Wo) (kWh)	/	0,037	0,093	0,185	0,277	0,367	/	/	/
Energy efficiency	/	96,42%	97,65%	97,82%	97,65%	97,36%	/	/	/
<b>Remark:</b> *If limited by design, inverter is not capable to operate with the 120% of rated output load, test under this condition is waived; ** The EUT can't start up at 990Vdc.									

IEC 61683			
Clause	Requirement + Test	Result - Remark	Verdict

TABLE	Efficiency recording and efficient calculation sheet								
<b>power conditioner type</b>	<b>Grid-connected</b>								
Model:	<b>SOFAR 24KTLX-G3</b>								
Parameters of power conditioner	Minimum rated input voltage: 540Vd.c. Nominal voltage: 650Vd.c. Maximum input voltage: 1100Vd.c. Rated output voltage: 230Va.c. Rated output frequency: 50Hz Rated output power: 24,0kW Max output apparent power: 26,4kVA								
<b>PV input voltage</b>	<b>a) Manufacturer's minimum rated input voltage(540Vd.c.)</b>								
Temperature (°C)	25,0								
Operating period for energy measurement (min)	1,0								
Percentage of rated output VA	/	10%	25%	50%	75%	100%	120%*	/	/
Input voltage (V)	/	539,88	538,78	538,45	538,11	538,17	/	/	/
Input voltage ripple (V)	/	16,19	12,15	12,138	8,11	8,08	/	/	/
Input current (A)	/	4,607	11,484	22,914	34,338	45,709	/	/	/
Input current ripple (A)	/	0,131	0,267	0,547	0,519	0,705	/	/	/
Input power (Pi) (kW)	/	2,485	6,186	12,337	18,477	24,598	/	/	/
Output power (Po) (kW)	/	2,410	6,056	12,083	18,071	24,001	/	/	/
Output efficiency (%)	/	96,97%	97,88%	97,94%	97,80%	97,57%	/	/	/
Input energy (Wi) (kWh)	/	0,041	0,103	0,206	0,308	0,410	/	/	/
Output energy (Wo) (kWh)	/	0,040	0,101	0,201	0,301	0,400	/	/	/
Energy efficiency	/	96,97%	97,88%	97,94%	97,80%	97,57%	/	/	/
<b>PV input voltage</b>	<b>b) The inverter's nominal voltage (650Vd.c.)</b>								
Temperature (°C)	25,0								
Operating period for energy measurement (min)	1,0								
Percentage of rated output VA	/	10%	25%	50%	75%	100%	120%*	/	/
Input voltage (V)	/	651,68	649,90	651,74	648,31	647,76	/	/	/
Input voltage ripple (V)	/	16,38	24,24	16,291	12,34	8,50	/	/	/
Input current (A)	/	3,803	9,469	18,832	28,373	37,818	/	/	/

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Clause	Requirement + Test						Result - Remark		Verdict
Input current ripple (A)	/	0,104	0,345	0,522	0,562	0,494	/	/	/
Input power (Pi) (kW)	/	2,478	6,153	12,272	18,393	24,495	/	/	/
Output power (Po) (kW)	/	2,431	6,072	12,091	18,097	24,054	/	/	/
Output efficiency (%)	/	98,10%	98,69%	98,52%	98,39%	98,20%	/	/	/
Input energy (Wi) (kWh)	/	0,041	0,103	0,205	0,307	0,408	/	/	/
Output energy (Wo) (kWh)	/	0,041	0,101	0,202	0,302	0,401	/	/	/
Energy efficiency	/	98,10%	98,69%	98,52%	98,39%	98,20%	/	/	/
<b>PV input voltage</b>	<b>c) 90% of the inverter's maximum input voltage**(850Vd.c.)</b>								
Temperature (°C)	25,0								
Operating period for energy measurement (min)	1,0								
Percentage of rated output VA	/	10%	25%	50%	75%	100%	120%*	/	/
Input voltage (Vd.c.)	/	854.01	850.02	846.40	848.40	845.94	/	/	/
Input voltage ripple (Vd.c.)	/	16.24	8.15	12.308	12.49	24.84	/	/	/
Input current (Ad.c.)	/	2.931	7.304	14.614	21.851	29.179	/	/	/
Input current ripple (Ad.c.)	/	0.069	0.070	0.201	0.306	0.894	/	/	/
Input power (Pi) (kW)	/	2.501	6.205	12.364	18.531	24.673	/	/	/
Output power (Po) (kW)	/	2.415	6.063	12.092	18.076	23.988	/	/	/
Output efficiency (%)	/	96.56%	97.70%	97.80%	97.55%	97.22%	/	/	/
Input energy (Wi) (kWh)	/	0.042	0.103	0.206	0.309	0.411	/	/	/
Output energy (Wo) (kWh)	/	0.040	0.101	0.202	0.301	0.400	/	/	/
Energy efficiency	/	96.56%	97.70%	97.80%	97.55%	97.22%	/	/	/
<b>Remark:</b> *If limited by design, inverter is not capable to operate with the 120% of rated output load, test under this condition is waived; ** The EUT can't start up at 990Vdc.									



IEC 61683			
Clause	Requirement + Test	Result - Remark	Verdict

TABLE	No load loss: SOFAR 15KTLX-G3		
power conditioner type	Utility-interactive		
Measure input voltage (V)	650,34		
Measured input power(W)	6,47		
Remark: No load loss is measured when the power conditioner works at rated input voltage and it's load is disconnected.			

TABLE	No load loss: SOFAR 17KTLX-G3		
power conditioner type	Utility-interactive		
Measure input voltage (V)	650,35		
Measured input power(W)	6,48		
Remark: No load loss is measured when the power conditioner works at rated input voltage and it's load is disconnected.			

TABLE	No load loss: SOFAR 20KTLX-G3		
power conditioner type	Utility-interactive		
Measure input voltage (V)	650,35		
Measured input power(W)	6,41		
Remark: No load loss is measured when the power conditioner works at rated input voltage and it's load is disconnected.			

TABLE	No load loss: SOFAR 22KTLX-G3		
power conditioner type	Utility-interactive		
Measure input voltage (V)	650,35		
Measured input power(W)	6,47		
Remark: No load loss is measured when the power conditioner works at rated input voltage and it's load is disconnected.			

TABLE	No load loss: SOFAR 24KTLX-G3		
power conditioner type	Utility-interactive		
Measure input voltage (V)	650,34		
Measured input power(W)	6,35		
Remark: No load loss is measured when the power conditioner works at rated input voltage and it's load is disconnected.			

IEC 61683			
Clause	Requirement + Test	Result - Remark	Verdict

TABLE	Standby loss: SOFAR 15KTLX-G3		
power conditioner type	Utility-interactive		
Measure output voltage (V)	230,13		
Measured output power(W)	-0,687		
Remark: Standby loss is measured when the power conditioner works at rated input voltage and in standby mode.			

TABLE	Standby loss: SOFAR 17KTLX-G3		
power conditioner type	Utility-interactive		
Measure output voltage (V)	230,13		
Measured output power(W)	-0,687		
Remark: Standby loss is measured when the power conditioner works at rated input voltage and in standby mode.			

TABLE	Standby loss: SOFAR 20KTLX-G3		
power conditioner type	Utility-interactive		
Measure output voltage (V)	230,13		
Measured output power(W)	-0,687		
Remark: Standby loss is measured when the power conditioner works at rated input voltage and in standby mode.			

TABLE	Standby loss: SOFAR 22KTLX-G3		
power conditioner type	Utility-interactive		
Measure output voltage (V)	230,13		
Measured output power(W)	-0,687		
Remark: Standby loss is measured when the power conditioner works at rated input voltage and in standby mode.			

TABLE	Standby loss: SOFAR 24KTLX-G3		
power conditioner type	Utility-interactive		
Measure output voltage (V)	230,13		
Measured output power(W)	-0,687		
Remark: Standby loss is measured when the power conditioner works at rated input voltage and in standby mode.			

# Annex 1

## Pictures of the unit

Front view



Rear view



Bottom view (SOFAR 15KTLX-G3, SOFAR 17KTLX-G3)



Bottom view (SOFAR 20KTLX-G3, SOFAR 22KTLX-G3, SOFAR 22KTLX-G3)



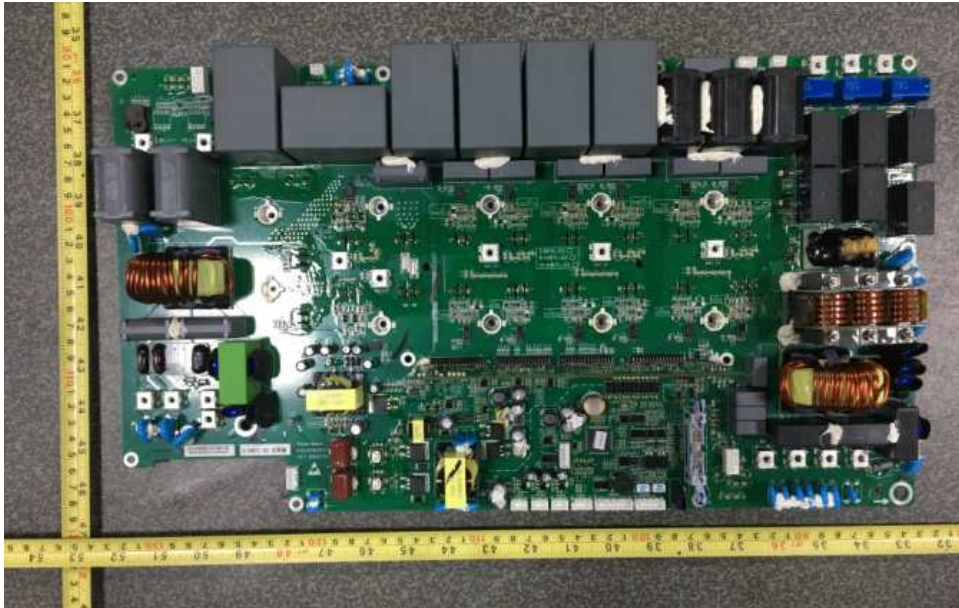
**Right view**



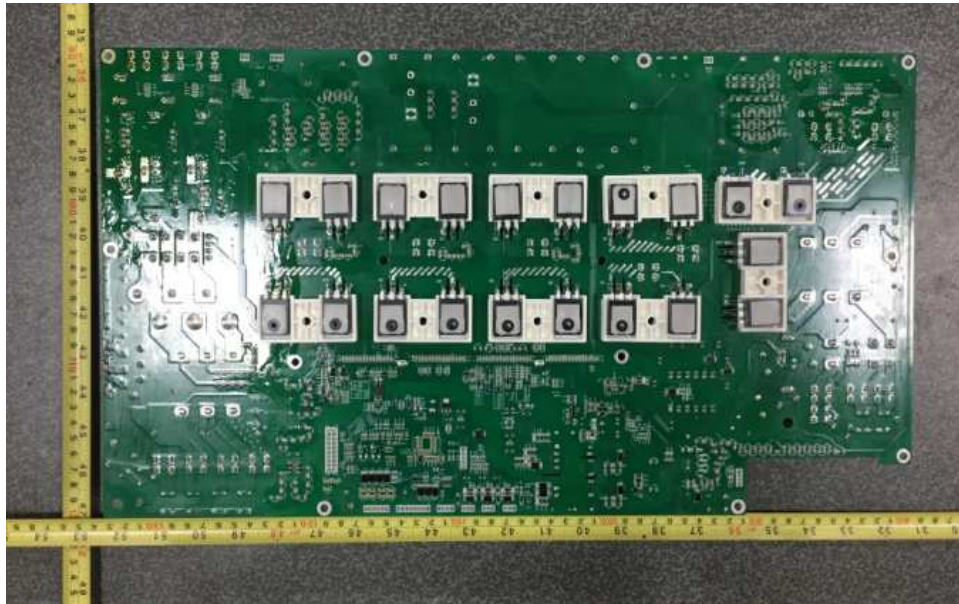
**Internal view**



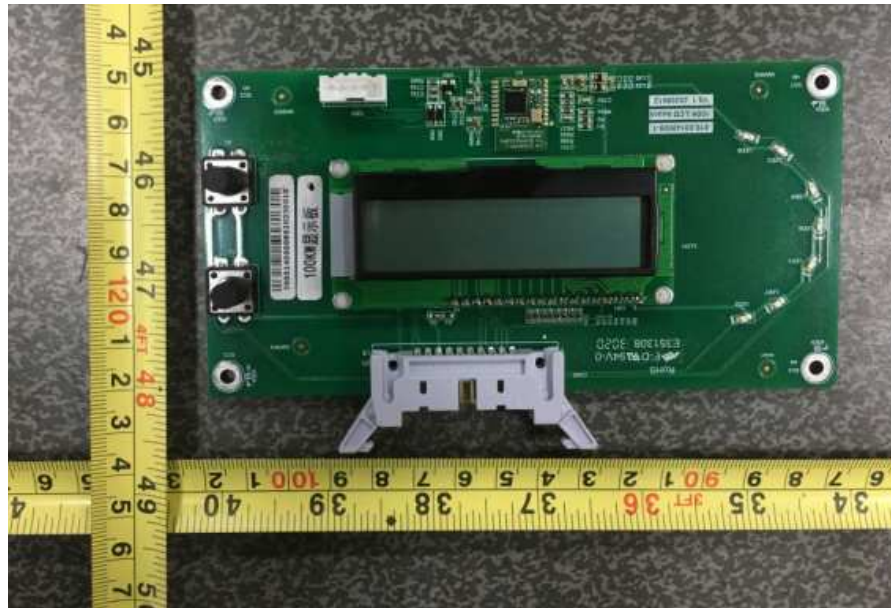
Power board component side view



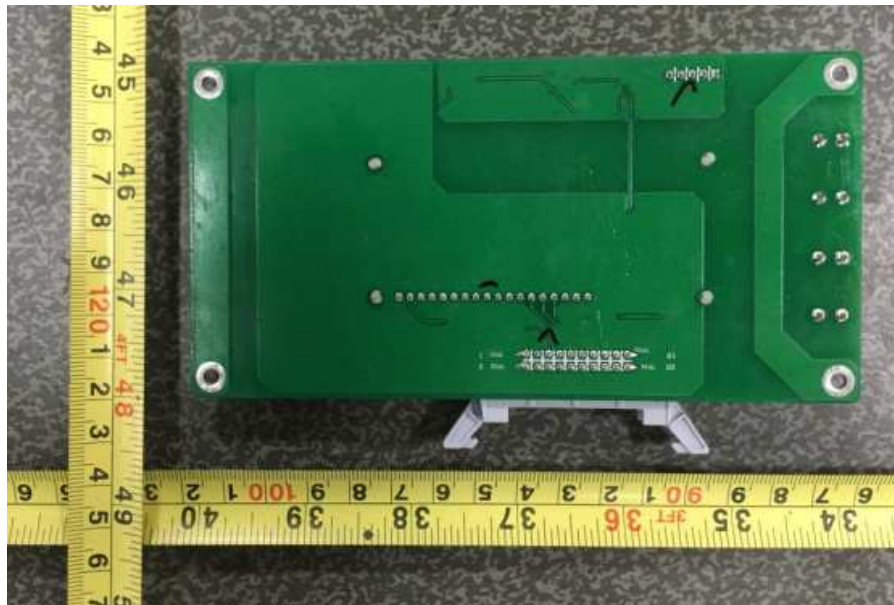
Power board solder side view



LCD board component side view



LCD board solder side view

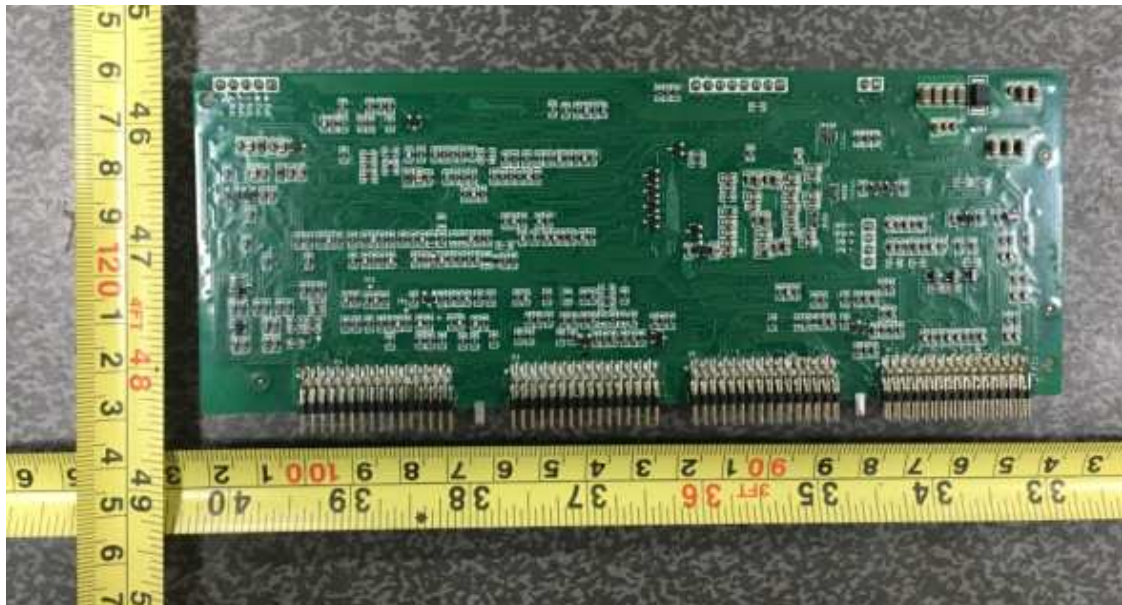




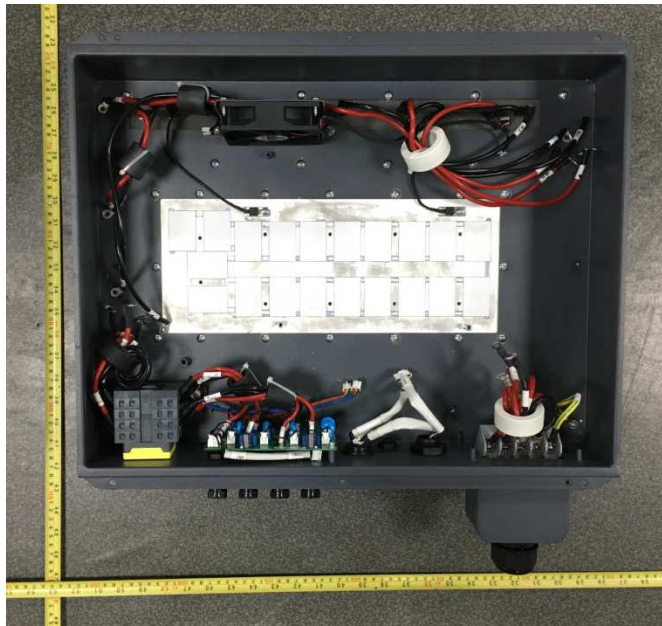
Control board component side view



Control power board solder side view



### Internal view



### Earthing terminal



# Annex 2

## Test equipment list

**Date(s) of performance test: 2020-06-08 to 2020-10-14**

<b>Equipment</b>	<b>Internal No ,</b>	<b>Manufacturer</b>	<b>Type</b>	<b>Serial No ,</b>	<b>Last Calibration</b>
Power Analyzer	A4080002DG	YOKOGAWA	WT3000	91M210852	Jun. 18, 2020
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	
Oscilloscope probel	A1490008DG	YOKOGAWA	701901	//	Sep. 24, 2020
	A1490009DG	YOKOGAWA	701901	//	Sep. 24, 2020
	A1490010DG	YOKOGAWA	701901	//	Sep. 24, 2020