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TEST REPORT

Product Name : INVERTER CHARGER

Model Number : PS 5KVA, PS PLUS 5KVA

Prepared for : ShenZhen Sunray Power Co., Ltd
Address : B16,Rd No.1,The First Industrial Zone, Bai Hua Dong,
Guang Ming New District, Shen Zhen, China


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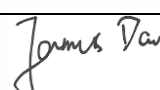
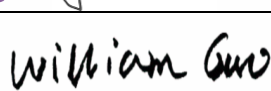

Report Number : ES200116062S



TEST REPORT IEC 61683 Photovoltaic systems – Power conditioners – Procedure for measuring efficiency	
Report Number.	ES200116062S
Date of issue	March 27, 2020
Total number of pages	18 pages
Name of Testing Laboratory preparing the Report	EMTEK (SHENZHEN) CO., LTD.
Applicant's name	ShenZhen Sunray Power Co., Ltd
Address	B16,Rd No.1,The First Industrial Zone, Bai Hua Dong, Guang Ming New District, Shen Zhen, China
Test specification:	
Standard	IEC 61683:1999, EN 61683:2000
Test procedure	IEC/EN report
Non-standard test method	N/A
Test Report Form No.	IEC61683B
Test Report Form(s) Originator	TÜV SÜD Product Service GmbH
Master TRF	Dated 2017-11-03
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Test item description :	INVERTER CHARGER
Trade Mark :	
Manufacturer	ShenZhen Sunray Power Co., Ltd B16,Rd No.1,The First Industrial Zone, Bai Hua Dong, Guang Ming New District, Shen Zhen, China
Model/Type reference	PS 5KVA, PS PLUS 5KVA
Ratings	See rating label



Responsible Testing Laboratory (as applicable), testing procedure and testing location(s):		
<input checked="" type="checkbox"/>	CB Testing Laboratory:	EMTEK (SHENZHEN) CO., LTD.
Testing location/ address.....:		Bldg 69, Majialong Industry Zone, Nanshan District, Shenzhen, Guangdong, China
Tested by (name, function, signature).....:		James Dan / Engineer 
Approved by (name, function, signature)....:		William Guo / Manager 
		
<input type="checkbox"/>	Testing procedure: CTF Stage 1:	
Testing location/ address.....:		
Tested by (name, function, signature).....:		
Approved by (name, function, signature)....:		
<input type="checkbox"/>	Testing procedure: CTF Stage 2:	
Testing location/ address.....:		
Tested by (name + signature)		
Witnessed by (name, function, signature) .:		
Approved by (name, function, signature)....:		
<input type="checkbox"/>	Testing procedure: CTF Stage 3:	
<input type="checkbox"/>	Testing procedure: CTF Stage 4:	
Testing location/ address.....:		
Tested by (name, function, signature).....:		
Witnessed by (name, function, signature) .:		
Approved by (name, function, signature)....:		
Supervised by (name, function, signature) :		

List of Attachments (including a total number of pages in each attachment): - Photos (1 pages)	
Summary of testing: The product has been tested according to standard IEC 61683:1999 and EN 61683:2000.	
Tests performed (name of test and test clause): Efficiency measurement (4) No-load loss (7.1) Standby loss (7.2)	Testing location: EMTEK (SHENZHEN) CO., LTD. Bldg 69, Majialong Industry Zone, Nanshan District, Shenzhen, Guangdong, China
Summary of compliance with National Differences (List of countries addressed): N/A	

Copy of marking plate:

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INVERTER CHARGER

Model Name: PS 5KVA

Color: Silver and Black

Operating Temperature Range: 0~55°C



Inverter Mode:

Rated Power: 5000VA/5000W

DC Input: 48VDC, 104A

AC Output: 230VAC, 50Hz, 22A, 1 ϕ

AC Charger Mode:

AC Input: 230VAC, 50Hz, 36A, 1 ϕ

DC Output: 54VDC, 10-60A

AC Output: 230VAC, 50Hz, 22A, 1 ϕ

Solar Charger Mode:

Rated Current: 50A

System Voltage: 48VDC

Min. Solar Voltage: 36VDC

Max. Solar Voltage(VOC): 105VDC



MADE IN CHINA

INVERTER CHARGER

Model Name: PS PLUS 5KVA

Operating Temperature Range: 0~55°C



Inverter Mode:

Rated Power: 5000VA/ 5000 W

DC Input: 48VDC, 104 A

AC Output: 230VAC, 50Hz, 22A, 1 ϕ

AC Charger Mode:

AC Input: 230VAC, 50Hz, 36A, 1 ϕ

DC Output: 54VDC, 10-60A

AC Output: 230VAC, 50Hz, 22A, 1 ϕ

Solar Charger Mode:

Rated Current: 50A

System Voltage: 48VDC

Min. Solar Voltage: 36VDC

Max. Solar Voltage(VOC): 105VDC

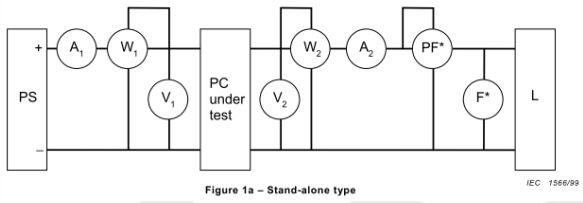
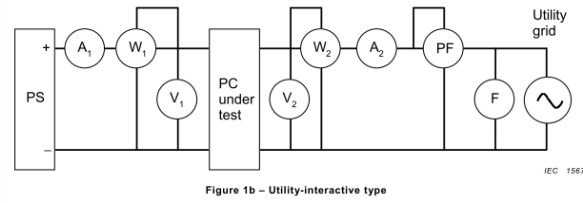


MADE IN CHINA

Test item particulars.....:	
Classification of installation and use.....:	<input checked="" type="checkbox"/> Class I <input type="checkbox"/> Class II <input type="checkbox"/> Class III <input type="checkbox"/> Not classified
Supply Connection	<input type="checkbox"/> pluggable equipment <input type="checkbox"/> direct plug-in <input checked="" type="checkbox"/> permanent connection <input type="checkbox"/> for building-in
Possible test case verdicts:	
- test case does not apply to the test object..... : N/A	
- test object does meet the requirement..... : P (Pass)	
- test object does not meet the requirement..... : F (Fail)	
Testing.....:	
Date of receipt of test item : February 20, 2020	
Date (s) of performance of tests : February 20, 2020 to February 24, 2020	
General remarks:	
"(See Enclosure #)" refers to additional information appended to the report. "(See appended table)" refers to a table appended to the report. Throughout this report a <input type="checkbox"/> comma / <input checked="" type="checkbox"/> point is used as the decimal separator.	
Manufacturer's Declaration per sub-clause 4.2.5 of IEC 60335-1:	
The application for obtaining a CB Test Certificate includes more than one factory location and a declaration from the Manufacturer stating that the sample(s) submitted for evaluation is (are) representative of the products from each factory has been provided :	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> Not applicable
When differences exist; they shall be identified in the General product information section.	
Name and address of factory (ies) : Same as manufacturer	
General product information:	
The unit is stand-alone inverter with non- sine-wave o/p, it can convert the DC voltage to AC voltage. All models have the similar constructions, circuit diagram and PCB layout. Unless otherwise stated, all tests were performed on model MPS PLUS 5KVA which means the typical model.	

IEC 61683:1999			
Clause	Requirement – Test	Measuring result – Remark	Verdict
4	Efficiency measurement conditions		P
	Efficiency is measured under the conditions in the following clauses.		P
	Specific conditions may be excluded by mutual agreement when those conditions are outside the manufacturer's allowable operating range.		P
4.1	DC power source for testing		P
	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.	DC power source used.	P
	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.		N/A
4.2	Temperature		P
	All measurements are to be made at an ambient temperature of $25^{\circ}\text{C} \pm 2^{\circ}\text{C}$.	(See appended table)	P
	Other ambient temperatures may be allowed by mutual agreement. However, the temperature used must be clearly stated in all documentation.		P
4.3	Output voltage and frequency		P
	The output voltage and frequency are maintained at the manufacturer's stated nominal values.		P
4.4	Input voltage		P
	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.		N/A
	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.		P
4.5	Ripple and distortion		P
	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.		P
4.6	Resistive loads/utility grid		P

IEC 61683:1999			
Clause	Requirement – Test	Measuring result – Remark	Verdict
	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.		N/A
	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.	(See appended table)	P
4.7	Reactive loads	The unit did not support inductive load	N/A
	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.		N/A
	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.		N/A
4.8	Resistive plus non-linear loads		P
	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.		P
	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.		P
	The type of non-linear load must be clearly stated in all documentation.	RCD non-linear load used	P
4.9	Complex loads	The unit did not support complex loads	N/A
	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.		N/A
	The type of complex load is clearly stated in all documentation.		N/A

IEC 61683:1999			
Clause	Requirement – Test	Measuring result – Remark	Verdict
5	Efficiency calculations		P
5.1	Rated output efficiency	(See appended table)	P
5.2	Partial output efficiency	(See appended table)	P
5.3	Energy efficiency	(See appended table)	P
5.4	Efficiency tolerances		P
6	Conditions of loading for output ports		P
6.1	Test circuit		P
	Figure 1a is applied to standard-alone power conditioners		P
	 <p>Figure 1a – Stand-alone type IEC 1566/99</p>		P
	Figure 1b is applied to utility-interactive power conditioners		N/A
	 <p>Figure 1b – Utility-interactive type IEC 1567/99</p> <p>PC power conditioner PS variable voltage-current d.c. power supply A₁ DC ammeter A₂ AC or d.c. ammeter W₁ DC wattmeter W₂ AC or d.c. wattmeter L load F frequency meter V₁ DC voltmeter V₂ AC or d.c. voltmeter PF power factor meter</p>		N/A
6.2	Measurement procedure		P
7	Loss measurement		P
7.1	No-load loss	(See appended table)	P
7.2	Standby loss	(See appended table)	P
Annex A	Power conditioner description		P
Annex B	Power efficiency and conversion factor		P
Annex C	Weighted-average energy efficiency		P

IEC 61683:1999			
Clause	Requirement – Test	Measuring result – Remark	Verdict

Annex D	Derivation of efficiency tolerance in table 2		P
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TABLE	Efficiency recording and efficient calculation sheet								N/A	
power conditioner type	Grid-connected									
Model:										
Parameters of power conditioner	Minimum rated input voltage: Nominal voltage: Maximum input voltage: Rated output voltage: Rated output frequency: Rated output power:									
PV input voltage	a) Manufacturer's minimum rated input voltage									
Temperature (°C)										
Operating period for energy measurement (min)										
Percentage of rated output VA	/	10%	25%	50%	75%	100%	120%*	/	/	
Input voltage (V)	/							/	/	
Input voltage ripple (V)	/							/	/	
Input current (A)	/							/	/	
Input current ripple (A)	/							/	/	
Input power (Pi) (W)	/							/	/	
Output power (Po) (W)	/							/	/	
Output efficiency	/							/	/	
Input energy (Wi) (kWh)	/							/	/	
Output energy (Wo) (kWh)	/							/	/	
Energy efficiency	/							/	/	
PV input voltage	b) The inverter's nominal voltage									
Temperature (°C)										
Operating period for energy measurement (min)										
Percentage of rated output VA	/	10%	25%	50%	75%	100%	120%*	/	/	
Input voltage (V)	/							/	/	
Input voltage ripple (V)	/							/	/	

Input current (A)	/							/	/
Input current ripple (A)	/							/	/
Input power (Pi) (W)	/							/	/
Output power (Po) (W)	/							/	/
Output efficiency	/							/	/
Input energy (Wi) (kWh)	/							/	/
Output energy (Wo) (kWh)	/							/	/
Energy efficiency	/							/	/
PV input voltage	c) 90% of the inverter's maximum input voltage								
Temperature (°C)									
Operating period for energy measurement (min)									
Percentage of rated output VA	/	10%	25%	50%	75%	100%	120%*	/	/
Input voltage (V)	/							/	/
Input voltage ripple (V)	/							/	/
Input current (A)	/							/	/
Input current ripple (A)	/							/	/
Input power (Pi) (W)	/							/	/
Output power (Po) (W)	/							/	/
Output efficiency	/							/	/
Input energy (Wi) (kWh)	/							/	/
Output energy (Wo) (kWh)	/							/	/
Energy efficiency	/							/	/
Remark:									
*If limited by design, inverter is not capable to operate with the 120% of rated output load, test under this condition is waived;									

TABLE	Efficiency recording and efficient calculation sheet	P
power conditioner type	Stand-alone	
Model:	MPS PLUS 5KVA	

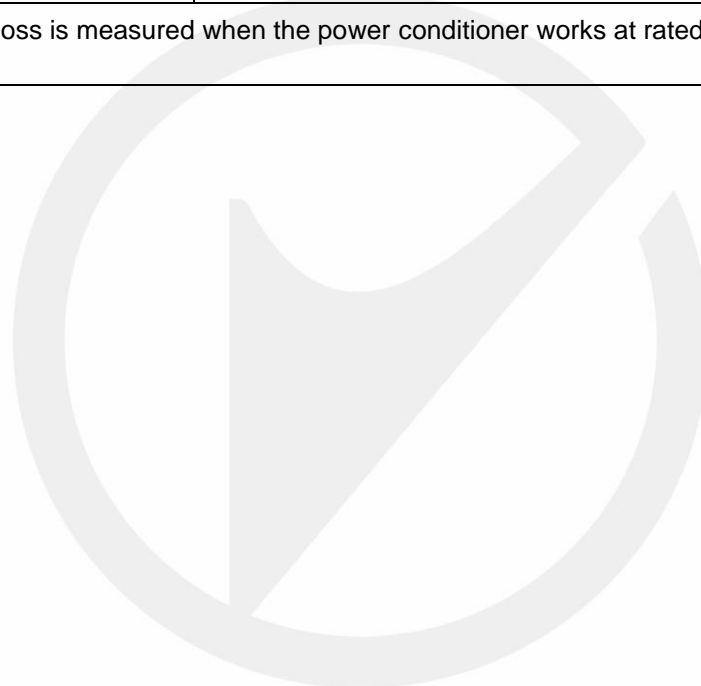
Parameters of power conditioner	Minimum rated input voltage: N/A Nominal voltage: 48Vdc Maximum input voltage: N/A Rated output voltage: 230Vac Rated output frequency: 50Hz Rated output power: 5000VA/5000W								
PV input voltage	a) Manufacturer's nominal voltage								
Temperature (°C)	25.2								
Operating period for energy measurement (min)	5min								
Resistive load									
Percentage of rated output VA	5%	10%	25%	50%	75%	100%	120%*	/	/
Input voltage (V)	48	48	48	48	48	48	/	/	/
Input voltage ripple (V)	1.2	1.6	2.3	2.8	3.1	3.3	/	/	/
Input current (A)	6.1	10.65	25.57	53.075	92.8	103.82	/	/	/
Input current ripple (A)	11.5	20.6	32.1	58.8	75.3	84.5	/	/	/
Input power (Pi) (W)	292.8	511.2	1227.6	2547.6	4454.4	4983.6	/	/	/
Output power (Po) (W)	258	445.2	1052.4	2413.2	4621.2	4783.2	/	/	/
Output efficiency	88.11%	87.08%	85.72%	94.72%	96.39%	95.97%	/	/	/
Input energy (Wi) (kWh)	24.4	42.6	102.3	212.3	385.1	415.3	/	/	/
Output energy (Wo) (kWh)	21.5	37.1	87.7	201.1	371.2	398.6	/	/	/
Energy efficiency	88.11%	87.08%	85.72%	94.72%	96.39%	95.97%	/	/	/
Reactive load									
PF	0.25 or minimum			0.50(>minimum)			0.75(>minimum)		
Percentage of rated output VA	25%	50%	100%	25%	50%	100%	25%	50%	100%
Input voltage (V)	/	/	/	/	/	/	/	/	/
Input voltage ripple (V)	/	/	/	/	/	/	/	/	/
Input current (A)	/	/	/	/	/	/	/	/	/
Input current ripple (A)	/	/	/	/	/	/	/	/	/
Input power (Pi) (W)	/	/	/	/	/	/	/	/	/
Output power (Po) (W)	/	/	/	/	/	/	/	/	/
Output efficiency	/	/	/	/	/	/	/	/	/
Input energy (Wi) (kWh)	/	/	/	/	/	/	/	/	/

Output energy (Wo) (kWh)	/	/	/	/	/	/	/	/	/
Energy efficiency	/	/	/	/	/	/	/	/	/
Non-linear load									
Non-linear load	25% of rated VA			50% of rated VA			/		
Percentage of rated output VA	25%	50%	100%	25%	50%	100%	/	/	/
Input voltage (V)	48	48	48	/	48	48			
Input voltage ripple (V)	2.6	2.9	3.2	/	3.0	3.4	/	/	/
Input current (A)	24.98	50.32	99.65	/	50.31	99.66	/	/	/
Input current ripple (A)	76.1	94.4	106.9	/	94.7	106.8	/	/	/
Input power (Pi) (W)	1198.9	2415.3	4783.1	/	2415.4	4783.8	/	/	/
Output power (Po) (W)	1094.4	2254.8	4495.2	/	2254.3	4495.4	/	/	/
Output efficiency	91.29%	93.35%	93.97%	/	93.3%	94.0%	/	/	/
Input energy (Wi) (kWh)	99.9	201.27	398.6	/	201.31	398.3	/	/	/
Output energy (Wo) (kWh)	91.2	187.9	374.6	/	187.8	374.7	/	/	/
Energy efficiency	91.29%	93.35%	93.97%	/	93.3%	94.1%	/	/	/
Complex load									
Percentage of rated output VA	50%	100%	/	/	/	/	/	/	/
Input voltage (V)	/	/	/	/	/	/	/	/	/
Input voltage ripple (V)	/	/	/	/	/	/	/	/	/
Input current (A)	/	/	/	/	/	/	/	/	/
Input current ripple (A)	/	/	/	/	/	/	/	/	/
Input power (Pi) (W)	/	/	/	/	/	/	/	/	/
Output power (Po) (W)	/	/	/	/	/	/	/	/	/
Output efficiency	/	/	/	/	/	/	/	/	/
Input energy (Wi) (kWh)	/	/	/	/	/	/	/	/	/
Output energy (Wo) (kWh)	/	/	/	/	/	/	/	/	/
Energy efficiency	/	/	/	/	/	/	/	/	/
Remark:									
*If limited by design, inverter is not capable to operate with the 120% of rated output load, test under this condition is waived;									

TABLE	No load loss	P
-------	--------------	---

power conditioner type	Stand-alone
Measure input voltage (V)	47.954VDC
Measured input power(W)	89.769W
Remark: No load loss is measured when the power conditioner works at rated input voltage and it's load is disconnected.	

TABLE	Standby loss	P
power conditioner type	Stand-alone	
Measure input voltage (V)	48.033VDC	
Measured input power(W)	0.08064W	
Remark: Standby loss is measured when the power conditioner works at rated input voltage and in standby mode.		



Attachment - Photos

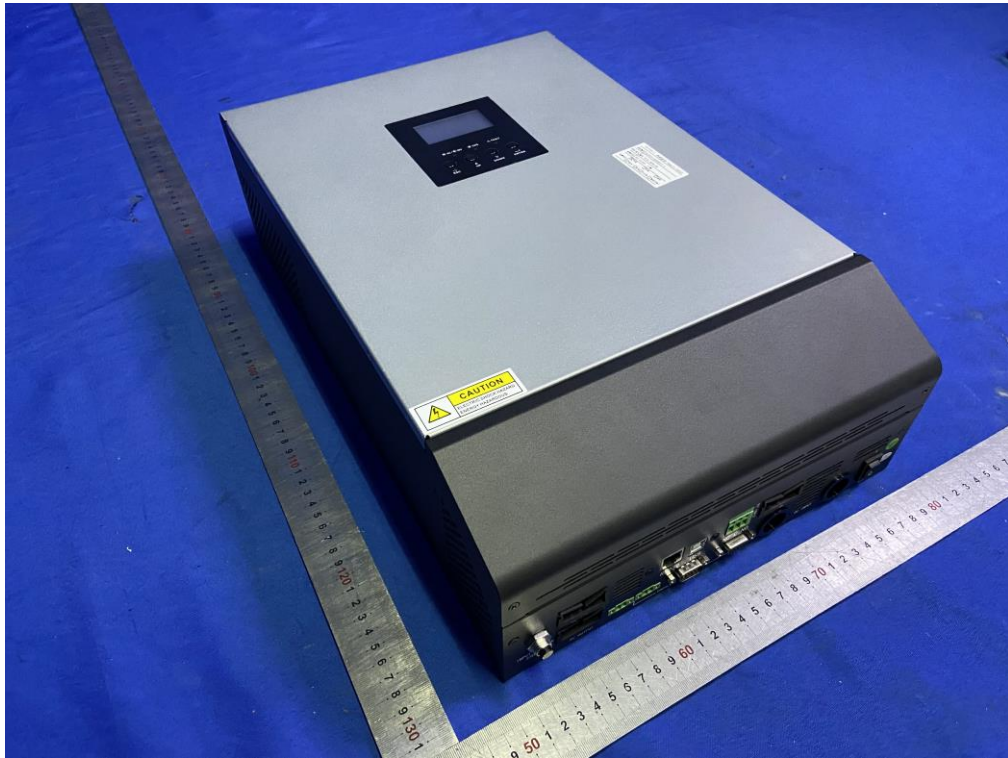


Fig. 1 Overview 1



Fig. 2 Overview 2

*** End of Report ***

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