



URS PRODUCTS AND TESTING PRIVATE LIMITED

A-29, Sector-5, Noida-201301
T +91 (120) 4516264-65 F +91 (120) 4750296
E info@urs-labs.com W www.urs-labs.com
CIN NO U21014UP1987PTC008956



SUMMARY OF TEST REPORT

TEST REPORT NO: SC24SPI00687_1

DATE: 04/06/2024

(Number of Pages in Test Report: Page no. 1 to 28)

TEST FORMAT AS PER IS 16169: 2014/IEC 62116:2008

- Name of the Manufacturer: KSOLARE ENERGY PVT LTD**
- Product: SOLAR GTI (Power Invertors for use in Photovoltaic Power Systems)**
- Model: Representative Model:KSY-6.5KW-1P-1MPPT**
Series Models: KSY-5.8KW-1P-1MPPT,KSY-5KW-1P-1MPPT, KSY-4.6KW-1P-1MPPT,KSY-4KW-1P-1MPPT, KSY-3.8KW-1P-1MPPT, KSY-3KW-1P-1MPPT,KSY-2.3KW-1P-1MPPT,KSY-1.8KW-1P-1MPPT, KSY-1.2KW-1P-1MPPT
- Model differences provided (if applicable): Yes**
- Model differences verified as per MNRE Guidelines for series formulation: Yes**
- Test Results:**

SL. NO.	TEST REQUIREMENT	CLAUSE	VERDICT
1.	Test for single or multi-phase inverter	6.0	P
2.	Islanding as it applies to PV systems(Informative)	Annex A	P
3.	Test for independent islanding detection device	Annex B	N/A

General Information:

1. The conformity certificates of critical components are verified to ensure complete testing of apparatus under test and details regarding harmonized IEC standards (where IEC standards are not available) are also provided in the list of critical components.

CONCLUSION:

- Sample meets all relevant requirements of IS 16169: 2014/IEC 62116:2008
- Sample fails to meet the following test requirements.

I, hereby undertake that the verdict stated in the test reports for all the test matches with the test results. The sample meets all relevant requirements of IS 16169:2014/IEC62116:2008 ~~does not meet the requirements stated above.~~



(Signature of Authorized person with Stamp)



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Test Report No: SC24SPI00687_1

TEST REPORT	
IS 16169: 2014/IEC 62116:2008	
Test Procedure of Islanding Prevention Measures for Utility-Interconnected-Photovoltaic Inverters	
Report Reference No.: SC24SPI00687_1	
Date of issue.....: 04/06/2024	
Total number of pages: 28	
Testing Laboratory.....: URS PRODUCTS AND TESTING PRIVATE LIMITED	
Address: A-29, Sector-5 Noida-201301	
Applicant's name:	KSOLARE ENERGY PVT LTD
Address.....:	SR NO.62, HISSA NO.3, MANGADEWADI, KATRAJ, PUNE SATARA ROAD, PUNE,MAHARASHTRA, PIN 411046
Test specification	
Standard	IS 16169: 2014/ IEC 62116:2008
Test procedure:	BIS Compliance Report
Non-standard test method	N/A
Test Report Form No.:	IS 16169/IEC 62116:2008_V1.0
Test Report Form Originator	BIS
MASTER TRF.....:	Dated: 05.04.2018
Test item description	SOLAR GTI (Power Invertors for use in Photovoltaic Power Systems)
Trade Mark	

TRF NO. IS 16169/ IEC 62116_V1.0





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Test Report No: SC24SPI00687_1

Manufacturer	KSOLARE ENERGY PVT LTD
Factory.....	SR NO.62, HISSA NO.3, MANGADEWADI, KATRAJ, PUNE SATARA ROAD, PUNE,MAHARASHTRA, PIN 411046
Model/Type reference.....	Representative Model: KSY-6.5KW-1P-1MPPT Series Models: KSY-5.8KW-1P-1MPPT,KSY-5KW-1P-1MPPT, KSY-4.6KW-1P-1MPPT,KSY-4KW-1P-1MPPT,KSY-3.8KW-1P-1MPPT, KSY-3KW-1P-1MPPT,KSY-2.3KW-1P-1MPPT,KSY-1.8KW-1P-1MPPT, KSY-1.2KW-1P-1MPPT
Ratings.....	Max Input Voltage: 580Vdc, MPPT Voltage Range: 80-550Vdc, Max Input Current: 16A, Max Short Circuit Current: 20A, Rated AC Power: 6500W, Nominal Grid Voltage: L/N/PE, 230V, Nominal Grid Frequency:50/60Hz Power Factor: 0.8Lead..1..0.8Lag, Max AC Output Current: 28.26A, Protective Class:Class I , IP Standard: IP65, Ambient Temp.: -25-60°C

TRF NO. IS 16169/ IEC 62116_V1.0





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Test Report No: SC24SPI00687_1

Testing Procedure and testing location:		
Testing Laboratory	URS PRODUCTS AND TESTING PRIVATE LIMITED	
Testing location/ address	A-29,Sector-5 Noida-201301	
Testing procedure:		
Tested by (name + signature):	PUJA KUMARI , Asst.Manager	 
Approved by (name + signature):	Paras Singh , General Manager	

Summary of testing:		
Tests performed (name of test and test clause):		Testing location: URS PRODUCTS AND TESTING PRIVATE LIMITED A-29,Sector-5 Noida-201301
All applicable tests		
Test for single or multi-phase inverter	6.0	
Documentation	7.0	
Unintentional Islanding		



Copy of marking plate of the equipment (Representative model)

K Solare Energy Pvt. Ltd. **ISO**

SG-PRO+
KSY-6.5KW-IP-1MPPT Solar GTI

Max Input Voltage	580Vdc
MPPT Voltage Range	80-550Vdc
Max Input Current	16A
Nominal Grid Frequency	50/60 Hz
Max Short Circuit Current	20A
Rated Ac Power	6500W
Nominal Grid Voltage	L/N/PE, 230V ac
MFG Date/Warranty	17-03-2024
Power Factor	0.8Lead...1...0.8Lag
Max AC Output Current	28.26A
Protective Class	Class I
IP standard	IP 65
Ambient Temp.	-25~ +60 degree C

SN: KSY0524HS0402

K SOLARE ENERGY PVT.LTD.
SR.NO.62, HISSA NO.3, MANGADÉWADI,
KATRAJ, PUNE SATARA ROAD,
MAHARASHTRA, INDIA - 411046
www.ksolare.com

K Solare Energy Pvt. Ltd. **ISO**

SG-PRO+
KSY-6.5KW-IP-1MPPT Solar GTI

Max Input Voltage	580Vdc
MPPT Voltage Range	80-550Vdc
Max Input Current	16A
Nominal Grid Frequency	50/60 Hz
Max Short Circuit Current	20A
Rated Ac Power	6500W
Nominal Grid Voltage	L/N/PE, 230V ac
MFG Date/Warranty	17-03-2024
Power Factor	0.8Lead...1...0.8Lag
Max AC Output Current	28.26A
Protective Class	Class I
IP standard	IP 65
Ambient Temp.	-25~ +60 degree C







SN: KSY0524HS0400

K SOLARE ENERGY PVT.LTD.
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KATRAJ, PUNE SATARA ROAD,
MAHARASHTRA, INDIA - 411046
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Copy of marking plate of the equipment (Series models):

 <p>5G-PRO KSY-5.5KW-1P-IMPPT Solz GTI</p> <table border="1"> <tr><td>Max Input Voltage</td><td>580Vdc</td></tr> <tr><td>MPPT Voltage Range</td><td>80-550Vdc</td></tr> <tr><td>Max Input Current</td><td>16A</td></tr> <tr><td>Nominal Grid Frequency</td><td>50/60 Hz</td></tr> <tr><td>Max Short Circuit Current</td><td>20A</td></tr> <tr><td>Rated Ac Power</td><td>5800W</td></tr> <tr><td>Nominal Grid Voltage</td><td>L/N/PE, 230V ac</td></tr> <tr><td>MFG Date/Warranty</td><td>17-03-2024</td></tr> <tr><td>Power Factor</td><td>0.8Lead...1...0.8Lag</td></tr> <tr><td>Max AC Output Current</td><td>25.2A</td></tr> <tr><td>Protective Class</td><td>Class I</td></tr> <tr><td>IP standard</td><td>IP 65</td></tr> <tr><td>Ambient Temp.</td><td>-25~ +60 degree C</td></tr> </table>  <p>SN: KSY0324HS0096</p>  <p>K SOLARE ENERGY PVT.LTD. SR.NO.62, HISSA NO.3, MANGADEWADI, KATRAJ, PUNE SATARA ROAD, MAHARASHTRA, INDIA - 411046 www.ksolare.com</p>	Max Input Voltage	580Vdc	MPPT Voltage Range	80-550Vdc	Max Input Current	16A	Nominal Grid Frequency	50/60 Hz	Max Short Circuit Current	20A	Rated Ac Power	5800W	Nominal Grid Voltage	L/N/PE, 230V ac	MFG Date/Warranty	17-03-2024	Power Factor	0.8Lead...1...0.8Lag	Max AC Output Current	25.2A	Protective Class	Class I	IP standard	IP 65	Ambient Temp.	-25~ +60 degree C	 <p>5G-PRO KSY-5KW-1P-IMPPT Solz GTI</p> <table border="1"> <tr><td>Max Input Voltage</td><td>580Vdc</td></tr> <tr><td>MPPT Voltage Range</td><td>80-550Vdc</td></tr> <tr><td>Max Input Current</td><td>16A</td></tr> <tr><td>Nominal Grid Frequency</td><td>50/60 Hz</td></tr> <tr><td>Max Short Circuit Current</td><td>20A</td></tr> <tr><td>Rated Ac Power</td><td>5000W</td></tr> <tr><td>Nominal Grid Voltage</td><td>L/N/PE, 230V ac</td></tr> <tr><td>MFG Date/Warranty</td><td>17-03-2024</td></tr> <tr><td>Power Factor</td><td>0.8Lead...1...0.8Lag</td></tr> <tr><td>Max AC Output Current</td><td>21.7A</td></tr> <tr><td>Protective Class</td><td>Class I</td></tr> <tr><td>IP standard</td><td>IP 65</td></tr> <tr><td>Ambient Temp.</td><td>-25~ +60 degree C</td></tr> </table>  <p>SN: KSY0324HS0095</p>  <p>K SOLARE ENERGY PVT.LTD. SR.NO.62, HISSA NO.3, MANGADEWADI, KATRAJ, PUNE SATARA ROAD, MAHARASHTRA, INDIA - 411046 www.ksolare.com</p>	Max Input Voltage	580Vdc	MPPT Voltage Range	80-550Vdc	Max Input Current	16A	Nominal Grid Frequency	50/60 Hz	Max Short Circuit Current	20A	Rated Ac Power	5000W	Nominal Grid Voltage	L/N/PE, 230V ac	MFG Date/Warranty	17-03-2024	Power Factor	0.8Lead...1...0.8Lag	Max AC Output Current	21.7A	Protective Class	Class I	IP standard	IP 65	Ambient Temp.	-25~ +60 degree C
Max Input Voltage	580Vdc																																																				
MPPT Voltage Range	80-550Vdc																																																				
Max Input Current	16A																																																				
Nominal Grid Frequency	50/60 Hz																																																				
Max Short Circuit Current	20A																																																				
Rated Ac Power	5800W																																																				
Nominal Grid Voltage	L/N/PE, 230V ac																																																				
MFG Date/Warranty	17-03-2024																																																				
Power Factor	0.8Lead...1...0.8Lag																																																				
Max AC Output Current	25.2A																																																				
Protective Class	Class I																																																				
IP standard	IP 65																																																				
Ambient Temp.	-25~ +60 degree C																																																				
Max Input Voltage	580Vdc																																																				
MPPT Voltage Range	80-550Vdc																																																				
Max Input Current	16A																																																				
Nominal Grid Frequency	50/60 Hz																																																				
Max Short Circuit Current	20A																																																				
Rated Ac Power	5000W																																																				
Nominal Grid Voltage	L/N/PE, 230V ac																																																				
MFG Date/Warranty	17-03-2024																																																				
Power Factor	0.8Lead...1...0.8Lag																																																				
Max AC Output Current	21.7A																																																				
Protective Class	Class I																																																				
IP standard	IP 65																																																				
Ambient Temp.	-25~ +60 degree C																																																				





Copy of marking plate of the equipment (Series models):

K Solare Energy Pvt. Ltd. **ISO**

5G-PRO+

KSY-4.6KW-1P-1MPPT Solar GTI

Max Input Voltage	580Vdc
MPPT Voltage Range	80-550Vdc
Max Input Current	16A
Nominal Grid Frequency	50/60 Hz
Max Short Circuit Current	20A
Rated Ac Power	4600W
Nominal Grid Voltage	L/N/PE, 230V ac
MFG Date/Warranty	17-03-2024
Power Factor	0.8Lead...1...0.8lag
Max AC Output Current	20A
Protective Class	Class I
IP standard	IP 65
Ambient Temp.	-25~ +60 degree C

SN: KSY0324HS0094

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K Solare Energy Pvt. Ltd. **ISO**

5G-PRO+

KSY-4KW-1P-1MPPT Solar GTI

Max Input Voltage	580Vdc
MPPT Voltage Range	80-550Vdc
Max Input Current	16A
Nominal Grid Frequency	50/60 Hz
Max Short Circuit Current	20A
Rated Ac Power	4000W
Nominal Grid Voltage	L/N/PE, 230V ac
MFG Date/Warranty	17-03-2024
Power Factor	0.8Lead...1...0.8lag
Max AC Output Current	17.3A
Protective Class	Class I
IP standard	IP 65
Ambient Temp.	-25~ +60 degree C

SN: KSY0324HS0093

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Copy of marking plate of the equipment (Series model):

Max Input Voltage	580Vdc
MPPT Voltage Range	80-550V dc
Max Input Current	16A
Nominal Grid Frequency	50/60 Hz
Max Short Circuit Current	20A
Rated Ac Power	3800W
Nominal Grid Voltage	L/N/PE, 230V ac
MFG Date/Warranty	17-03-2024
Power Factor	0.8Lead...1...0.8Lag
Max AC Output Current	16.5A
Protective Class	Class I
IP standard	IP 65
Ambient Temp.	-25~ +60 degree C

SN: KSY0324HS0092

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Max Input Voltage	580Vdc
MPPT Voltage Range	80-550V dc
Max Input Current	16A
Nominal Grid Frequency	50/60 Hz
Max Short Circuit Current	20A
Rated Ac Power	3000W
Nominal Grid Voltage	L/N/PE, 230V ac
MFG Date/Warranty	17-03-2024
Power Factor	0.8Lead...1...0.8Lag
Max AC Output Current	13A
Protective Class	Class I
IP standard	IP 65
Ambient Temp.	-25~ +60 degree C

SN: KSY0324HS0091

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Copy of marking plate of the equipment (Series model):

K Solare Energy Pvt. Ltd. **ISO**

SG-PRO
KSY-2.3KW-1P-IMPPT Solar GTI

Max Input Voltage	580Vdc
MPPT Voltage Range	80-550Vdc
Max Input Current	16A
Nominal Grid Frequency	50/60 Hz
Max Short Circuit Current	20A
Rated Ac Power	2300W
Nominal Grid Voltage	L/N/PE, 230V ac
MFG Date/Warranty	17-03-2024
Power Factor	0.8Lead...1...0.8Lag
Max AC Output Current	10A
Protective Class	Class I
IP standard	IP 65
Ambient Temp.	-25~ +60 degree C

Barcode
SN: KSY0324HS0090

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K Solare Energy Pvt. Ltd. **ISO**

SG-PRO
KSY-1.8KW-1P-IMPPT Solar GTI

Max Input Voltage	580Vdc
MPPT Voltage Range	80-550Vdc
Max Input Current	16A
Nominal Grid Frequency	50/60 Hz
Max Short Circuit Current	20A
Rated Ac Power	1800W
Nominal Grid Voltage	L/N/PE, 230V ac
MFG Date/Warranty	17-03-2024
Power Factor	0.8Lead...1...0.8Lag
Max AC Output Current	7.8A
Protective Class	Class I
IP standard	IP 65
Ambient Temp.	-25~ +60 degree C

Barcode
SN: KSY0524HS0402

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Test Report No: SC24SPI00687_1

Copy of marking plate of the equipment (Series model):

Max Input Voltage	580Vdc
MPPT Voltage Range	80-550V dc
Max Input Current	16A
Nominal Grid Frequency	50/60 Hz
Max Short Circuit Current	20A
Rated Ac Power	1200W
Nominal Grid Voltage	L/N/PE, 230V ac
MFG Date/Warranty	17-03-2024
Power Factor	0.8Lead...1...0.8lag
Max AC Output Current	5.2A
Protective Class	Class I
IP standard	IP 65
Ambient Temp.	-25~ +60 degree C

SN: KSY0524HS0402

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TRF NO. IS 16169/ IEC 62116_V1.0





Test case verdicts

Test case does not apply to the test object ...: N/A
Test item does meet the requirement.....: P(Pass)
Test item does not meet the requirement.....: F(Fail)

Testing

Date of receipt of test item.....: 29/04/2024
Date(s) of performance of test.....: 29/04/2024 to 04/06/2024

GENERAL INFORMATION	
Test item particulars:	See below
Accessories and detachable parts included in the evaluation	N/A
Options included	N/A
Abbreviations used in the report	See below
EUT – Equipment Under Test	MPPT – Maximum Power Point Tracking
Qf – Quality factor	W - Utility Real Power
Var – Utility Reactive Power	VDC – DC Voltage
VEUT – AC Voltage of EUT	tR – Run on time
IR – Resistive load current	IL – Inductive load current
IC – Capacitive load current	PAC – Utility Real Power
QAC – Utility Reactive Power	IAC – Utility Current
Possible test case verdicts:	N/A
test case does not apply to the test object	
test object does meet the requirement	Pass (P)
test object does not meet the requirement	Fail (F)





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CIN NO U21014UP1987PTC008956



ULR- TC646824100003799F

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Test Report No: SC24SPI00687_1

Manufacturer's Declaration per Standard:

Similarities between the models:

- 1) Same rated Input / Output voltage
- 2) Same frequency
- 3) Number of phases at output
- 4) Same PCB design and layout
- 5) Same Power Stage topology
- 6) Same Insulation Class
- 7) Same Control Algorithm/firmware
- 8) Same Cabinet Design
- 9) Class of construction

Differences between the models:

Model Designation and Electrical ratings (according to capacity)

General remarks:

The test results presented in this report relate only to the object tested.
This report shall not be reproduced, except in full, without the written approval of the Issuing testing laboratory.
The Management System is maintained in accordance with IS/ISO/IEC 17025:2017 and testing Standards/Instruments are traceable to National / International Standards.
"(See appended table)" refers to a table appended to the report. Throughout this report a point is used as the decimal separator.

TRF NO. IS 16169/ IEC 62116_V1.0





General Product Information:

Product Electrical Ratings

Parameter	Value		Remarks
1) Rating			
a) Maximum output power	W	6500	---
b) DC voltage range	Vdc	80-550 (MPPT input voltage range)	---
c) DC current limits	Idc	20A	---
d) AC voltage range	Vac	230V	---
e) Frequency range	Hz	50/60	---
f) AC current limits	A	28.26	---
g) Efficiency	%	99.5	---
h) Voltage trip settings (magnitude and timing)	V	185V (Under voltage) for <200ms 275V (Over voltage) for <200ms	---
i) Frequency trip settings (magnitude and timing)	Hz	47Hz (Under frequency) for <100ms 52Hz (Over frequency) for <100ms	---
i) Other software settings	---	Provided in user manual	---
j) Firmware version	---	Software version: V1.00 Hardware version: V1.00	---
2) Others	---	---	---
a) Displays	---	LCD	---
b) Temperature range	°C	-25°C to +60°C	---
c) Humidity	%	0% to 100%	---





IS 16169:2014 /IEC 62116:2008

Clause	Requirement + Test	Result – Remark	Verdict
4	Testing circuit	See below	P
	The testing circuit shown in Figure 1 is employed.	See below	P
	Similar circuits are used for three-phase output.	Single-phase output	N/A
	Parameters to be measured are shown in Table 1 and Figure 1. Parameters to be recorded in the test report are discussed in Clause 7.	Parameters to be measured according to clause 7 and recorded in the test report	P
5	Testing equipment	See below	P
5.1	Measuring instruments	See below	P
	The waveform measurement/capture device is able to record the waveform from the beginning of the islanding test until the EUT ceases to energize the island.	For waveform measurement digital oscilloscope is used.	P
	For multi-phase EUT, all phases are monitored.	Single-phase EUT	N/A
	A waveform monitor designed to detect and calculate the run-on time may be used.	Complies	P
	For multi-phase EUT, the test and measurement equipment is recorded each phase current and each phase-to-neutral or phase-to-phase voltage, as appropriate, to determine fundamental frequency active and reactive power flow over the duration of the test.	Single-phase EUT	N/A
	A sampling rate of 10 kHz or higher is recommended. The minimum measurement accuracy is 1 % or less of rated EUT nominal output voltage and 1 % or less of rated EUT output current	Complies	P
	Current, active power, and reactive power measurements through switch S1 used to determine the circuit balance conditions report the fundamental (50 Hz or 60 Hz) component.	Complies	P
5.2	DC power source	See below	P
5.2.1	General	See below	P
	A PV array or PV array simulator (preferred) may be used. If the EUT can operate in utility- interconnected mode from a storage battery, a DC power source may be used in lieu of a battery as long as the DC power source is not the limiting device as far as the maximum EUT input current is concerned.	PV array simulator is used	P
	The DC power source provides voltage and current necessary to meet the testing requirements described in Clause 6.	Complies	P





IS 16169:2014 /IEC 62116:2008

Clause	Requirement + Test	Result – Remark	Verdict
5.2.2	PV array simulator	See below	P
	The tests are conducted at the input voltage defined in Table 2 below, and the current is limited to 1.5 times the rated photovoltaic input current, except when specified otherwise by the test requirements.	Complies	P
	A PV array simulator is recommended, however, any type of power source may be used if it does not influence the test results.	PV array simulator is used	P
5.2.3	Current and voltage limited DC power supply with series resistance	Array simulator is used	N/A
	A DC power source used as the EUT input source is capable of EUT maximum input power (so as to achieve EUT maximum output power) at minimum and maximum EUT input operating voltage.	See above	N/A
	The power source provides adjustable current and voltage limit, set to provide the desired short circuit current and open circuit voltage when combined with the series and shunt resistance described below.	See above	N/A
	A series resistance (and, optionally, a shunt resistance) is selected to provide a fill factor within the range: Output power: Sufficient to provide maximum EUT output power and other levels specified by test conditions of table 5. Response speed: The response time of a simulator to a step in output voltage, due to a 5% load change, results in a settling of the output current to within 10% of its final value in less than 1ms. Stability: Excluding the variations caused by the EUT MPPT, simulator output power remains stable within 2 % of specified power level over the duration of the test: from the point where load balance is achieved until the island condition is cleared or the allowable run-on time is exceeded. Power factor: 0.25 to 0.8	See above	N/A
5.2.4	PV array	Array simulator is used	N/A
	A PV array used as the EUT input source is capable of EUT maximum input power at minimum and maximum EUT input operating voltage.	See above	N/A





IS 16169:2014 /IEC 62116:2008															
Clause	Requirement + Test	Result – Remark	Verdict												
	Testing is limited to times when the irradiance varies by no more than 2 % over the duration of the test as measured by a silicon-type pyranometer or reference device. It may be necessary to adjust the array configuration to achieve the input voltage and power levels prescribed in 6.1.	See above	N/A												
5.3	AC power source	See below	P												
	The utility grid or other AC power source may be used as long as it meets the conditions specified in Table 4. <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th colspan="2">Table 4 – AC power source requirements</th> </tr> <tr> <th>Items</th> <th>Conditions</th> </tr> </thead> <tbody> <tr> <td>Voltage</td> <td>Nominal $\pm 2.0\%$</td> </tr> <tr> <td>Voltage THD</td> <td>$< 2.5\%$</td> </tr> <tr> <td>Frequency</td> <td>Nominal ± 1 Hz</td> </tr> <tr> <td>Phase angle distance¹⁾</td> <td></td> </tr> </tbody> </table> ¹⁾ Three-phase case only	Table 4 – AC power source requirements		Items	Conditions	Voltage	Nominal $\pm 2.0\%$	Voltage THD	$< 2.5\%$	Frequency	Nominal ± 1 Hz	Phase angle distance ¹⁾		Meets the conditions specified in Table 4.	P
Table 4 – AC power source requirements															
Items	Conditions														
Voltage	Nominal $\pm 2.0\%$														
Voltage THD	$< 2.5\%$														
Frequency	Nominal ± 1 Hz														
Phase angle distance ¹⁾															
5.4	AC loads	See below	P												
	On the AC side of the EUT, variable resistance, capacitance, and inductance are connected in parallel as loads between the EUT and the AC power source. Other sources of load, such as electronic loads, may be used if it can be shown that the source does not cause results that are different than would be obtained with passive resistors, inductors, and capacitors.	Variable RLC (AC) load used	P												
	All AC loads are rated for and adjustable to all test conditions. The equations for Qf are based upon an ideal parallel RLC circuit. For this reason, non- inductive resistors, low loss (high Qf) inductors, and capacitors with low effective series resistance and effective series inductance are utilized in the test circuit. Iron core inductors, if used, are not exceed a current THD of 2 % when operated at nominal voltage. Load components are conservatively rated for the voltage and power levels expected. Resistor power ratings are chosen so as to minimize thermally-induced drift in Resistance values during the course of the test.	Meeting the requirement	P												
	Active and reactive power is calculated (using the measurements provided in Table 1) in each of the R, L and C legs of the load so that these parasitic parameters (and parasitics introduced by variacs or autotransformers) are properly accounted for when calculating Qf.	Complies	P												





IS 16169:2014 /IEC 62116:2008

Clause	Requirement + Test	Result – Remark	Verdict
6	Test for single or multi-phase inverter	See below	P
6.1	Test procedure	See below	P
	The test uses an RLC load, resonant at the EUT nominal frequency (50 Hz or 60 Hz) and matched to the EUT output power.	Variable RLC (AC) load used`	P
	For multi-phase EUT, the load is balanced across all phases and the switch S1 as in Figure 1 opens all phases	Single-phase EUT	N/A
	This test is performed with the EUT conditions as in Table 5, where power and voltage values are given as a percent of EUT full output rating.	See below	P
	a) Determine EUT test output power	See appended table 6.1	P
	b) Adjusting the DC input source	See appended table 6.1	P
	c) Turn off the EUT and open S1	See appended table 6.1	P
	d) Adjust the RLC circuit to have $Q_f = 1.0 \pm 0.05$	See appended table 6.1	P
	e) Connect the RLC load configured in step d) to the EUT by closing S2	See appended table 6.1	P
	f) Open the utility-disconnect switch S1 to initiate the test, Run-on time is recorded.	See appended table 6.1	P
	g) For test condition A, adjust the real load and only one of the reactive load components to each of the load imbalance conditions shown in the shaded portion of table 6. If any of the recorded run-on times are longer than the one recorded for the rated balance condition, then the non-shaded parameter combinations also Require testing.	See appended table 6.1	P
	h) For test condition B and C, adjust the only one reactive load components by approximately 1.0% per test, within a total range of 95% to 105% of the operating point. If run-on times are still increasing at the 95% or 105% points, additional 1% increments have to be taken until run-on times begin decreasing.	See appended table 6.1	P
6.2	Pass/fail criteria	See below	P
	An EUT is considered to comply with the requirements for islanding protection when each case of recorded run-on time is less than 2 s or meets the requirements of local codes.	See appended table 6.1	P
7	Documentation	See below	P





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Test Report No: SC24SPI00687_1

	At a minimum, the following information is recorded and maintained in the test report.	See below	P
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IS 16169:2014 /IEC 62116:2008

Clause	Requirement + Test	Result – Remark	Verdict
--------	--------------------	-----------------	---------

	a) Specifications of EUT. Table 8 provides an example of the type of information that is provided.	Complies	P
	b) Measurement results. Table 9 provides an example of the type of information that is provided. Actual measured values are to be recorded.	See appended table 6.1	P
	c) Block diagram of test circuit.	Complies	P
	d) Specifications of the test and measurement equipment. Table 10 provides an example of the type of information that is provided.	Complies	P
	e) Any test configuration or procedure details such as methods of achieving specified load and EUT output conditions.	Complies	P
	f) Any additional information required by the testing laboratory's accreditation.	Nil	N/A
	g) Specify the evaluation criterion from clause 6.2 that was utilized to determine if the product passed or failed the test.	Comply with the criteria	P
Annex A	Islanding as it applies to PV systems(Informative)	Complies	P
A.1	General	See above Annex A	P
A.2	Impact of distortion on islanding	See above Annex A	P
Annex B	Test for independent islanding detection device (relay)(Informative)	No such application	N/A
B.1	Introduction	See above	N/A
B.2	Testing circuit	See above	N/A
B.3	Testing equipment	See above	N/A
B.4	Testing procedure	See above	N/A
B.5	Documentation	See above	N/A





IS 16169:2014 /IEC 62116:2008

Clause	Requirement + Test	Result – Remark	Verdict
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6.1 Table: Tested condition and run-on time												
Sr. No.	P _{EUT} (% of EUT rating)	Reactive load (% of Q _L)	P _{AC} (% of nominal)	Q _{AC} (% of nominal)	Run on time (ms)	P _{EUT} (W)	Pr (Resistive) (W)	PI (Inductive) (Var)	Pc (Capacitive) (Var)	Actual Q _r	VDC	Remarks
1	100	100	0	0	80.0	6500	6500	6546	6470	1.001	425	Test A at BL
2	66	66	0	0	90.2	4290	4340	4350	4312	0.998	272	Test B at BL
3	33	33	0	0	66.6	2145	2220	2210	2235	1.001	118	Test C at BL
4	100	100	-5	-5	106.1	6500	6825	6873	6470	0.977	425	Test A at IB
5	100	100	-5	0	99.8	6500	6786	6546	6470	0.959	425	Test A at IB
6	100	100	-5	5	112.3	6500	6675	6219	6470	0.950	425	Test A at IB
7	100	100	0	-5	110.1	6500	6500	6838	6470	1.023	425	Test A at IB
8	100	100	0	5	113.4	6500	6500	6205	6470	0.975	425	Test A at IB
9	100	100	5	-5	114.5	6500	6175	6843	6470	1.078	425	Test A at IB
10	100	100	5	0	115.6	6500	6150	6546	6470	1.058	425	Test A at IB
11	100	100	5	5	112.9	6500	6165	6220	6470	1.029	425	Test A at IB
12	100	100	-10	10	110.3	6500	6650	6291	6470	0.959	425	Test A at IB
13	100	100	-5	10	113.4	6500	6754	6316	6470	0.947	425	Test A at IB





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Clause	Requirement + Test										Result – Remark	Verdict
14	100	100	0	10	99.2	6500	6521	6319	6470	0.981	425	Test A at IB
15	100	100	10	10	87.3	6500	5835	5907	6470	1.060	425	Test A at IB
16	100	100	10	5	86.4	6500	5861	6241	6470	1.084	425	Test A at IB
17	100	100	10	0	89.2	6500	5842	6546	6470	1.114	425	Test A at IB
18	100	100	10	-5	92.1	6500	5853	6843	6470	1.137	425	Test A at IB
19	100	100	10	-10	94.5	6500	5825	6786	6470	1.137	425	Test A at IB
20	100	100	5	-10	95.6	6500	6250	6801	6470	1.061	425	Test A at IB
21	100	100	0	-10	97.3	6500	6500	6789	6470	1.020	425	Test A at IB
22	100	100	-5	-10	91.8	6500	6784	6806	6470	0.978	425	Test A at IB
23	100	100	-10	-10	92.4	6500	6665	6791	6470	0.995	425	Test A at IB
24	100	100	-10	-5	93.5	6500	6626	6859	6470	1.005	425	Test A at IB
25	100	100	-10	0	96.8	6500	6597	6546	6470	0.986	425	Test A at IB
26	100	100	-10	5	97.8	6500	6561	6276	6470	0.971	425	Test A at IB
27	66	66	0	-5	121.2	4290	4340	4583	4312	1.024	272	Test B at IB

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Clause		Requirement + Test					Result – Remark					Verdict
28	66	66	0	-4	67.8	4290	4340	4524	4312	1.018	272	Test B at IB
29	66	66	0	-3	97.4	4290	4340	4481	4312	1.013	272	Test B at IB
30	66	66	0	-2	66.5	4290	4340	4437	4312	1.008	272	Test B at IB
31	66	66	0	-1	66.8	4290	4340	4394	4312	1.003	272	Test B at IB
32	66	66	0	1	65.9	4290	4340	4307	4312	0.993	272	Test B at IB
33	66	66	0	2	110	4290	4340	4263	4312	0.988	272	Test B at IB
34	66	66	0	3	108	4290	4340	4220	4312	0.983	272	Test B at IB
35	66	66	0	4	98.6	4290	4340	4176	4312	0.978	272	Test B at IB
36	66	66	0	5	97.6	4290	4340	4133	4312	0.973	272	Test B at IB
37	33	33	0	-5	292.5	2145	2220	2321	2235	1.026	118	Test C at IB
38	33	33	0	-4	112.1	2145	2220	2298	2235	1.021	118	Test C at IB
39	33	33	0	-3	116.2	2145	2220	2276	2235	1.016	118	Test C at IB
40	33	33	0	-2	97.8	2145	2220	2254	2235	1.011	118	Test C at IB
41	33	33	0	-1	99.9	2145	2220	2232	2235	1.006	118	Test C at IB

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A-29, Sector-5, Noida-201301
T +91 (120) 4516264-65 F +91 (120) 4750296
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Clause	Requirement + Test	Result – Remark	Verdict
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42	33	33	0	1	100.1	2145	2220	2188	2235	0.996	118	Test C at IB
43	33	33	0	2	99.50	2145	2220	2166	2235	0.991	118	Test C at IB
44	33	33	0	3	98.6	2145	2220	2144	2235	0.986	118	Test C at IB
45	33	33	0	4	97.4	2145	2220	2122	2235	0.981	118	Test C at IB
46	33	33	0	5	96.1	2145	2220	2100	2235	0.976	118	Test C at IB

- a. PEUT: EUT output power.
b .PAC: Active power flow at S1 in figure 1. Positive means power from EUT to utility. Nominal is the 0% test condition value.
c. QAC: Reactive power flow at S1 in figure 1. Positive means power from EUT to utility. Nominal is the 0% test condition value.
BL: balance condition, IB: imbalance condition.

TRF NO. IS 16169/ IEC 62116_V1.0





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Clause	Requirement + Test	Result – Remark	Verdict
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Appendix A

Photograph



FRONT VIEW



REAR VIEW

TRF NO. IS 16169/ IEC 62116_V1.0





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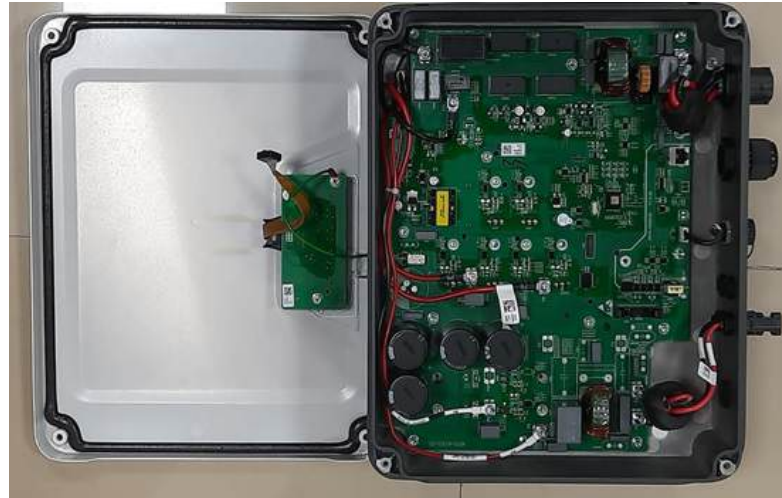
ULR- TC646824100003799F

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Test Report No: SC24SPI00687_1

IS 16169:2014 /IEC 62116:2008

Clause	Requirement + Test	Result – Remark	Verdict
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INTERNAL VIEW



PCB BOARD FRONT VIEW

TRF NO. IS 16169/ IEC 62116_V1.0





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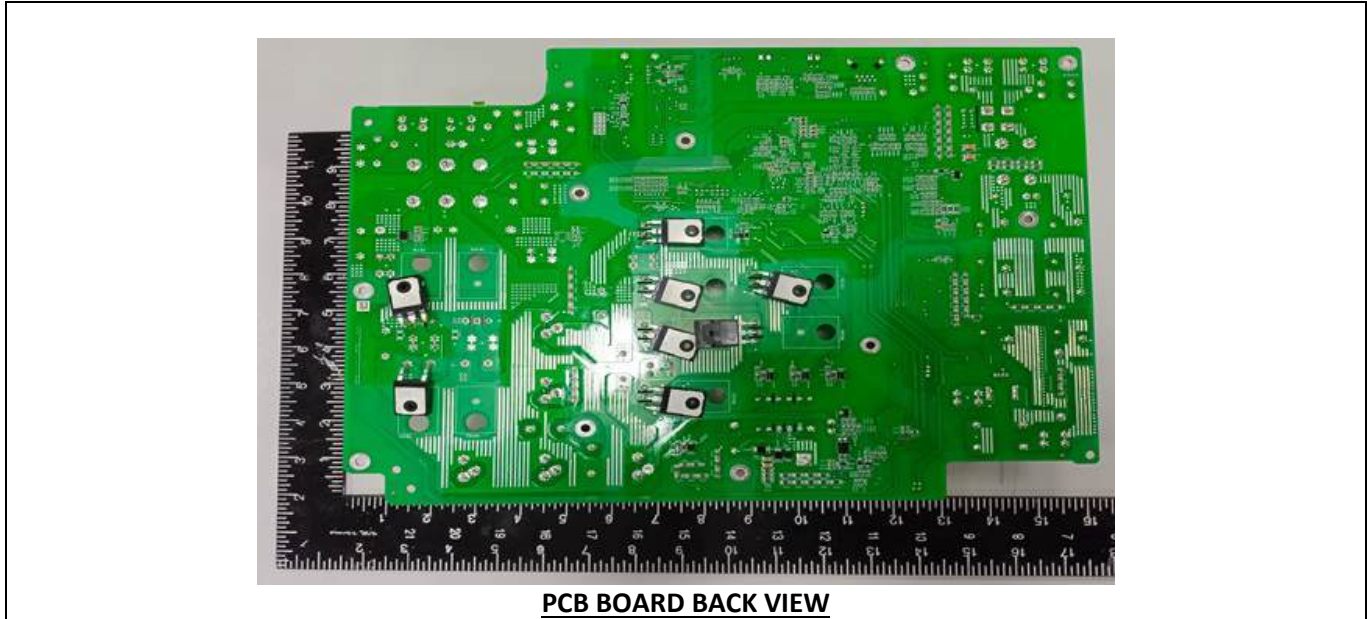


ULR- TC646824100003799F

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Test Report No: SC24SPI00687_1

IS 16169:2014 /IEC 62116:2008			
Clause	Requirement + Test	Result – Remark	Verdict



TRF NO. IS 16169/ IEC 62116_V1.0





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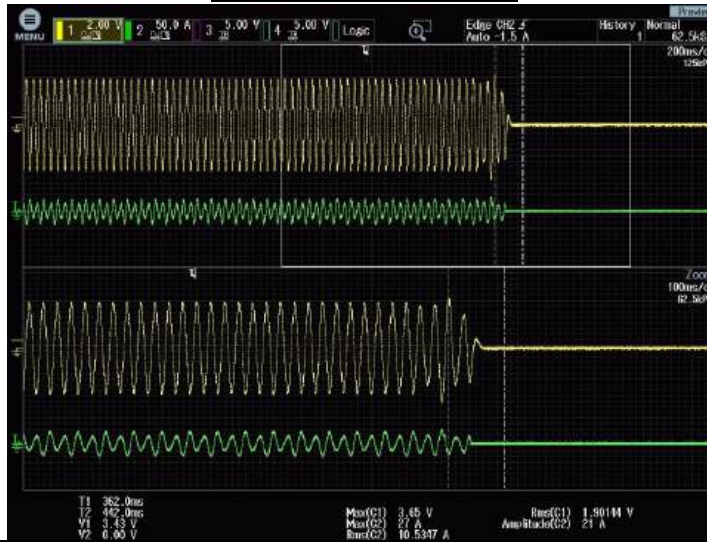
Test Report No: SC24SPI00687_1

IS 16169:2014 /IEC 62116:2008

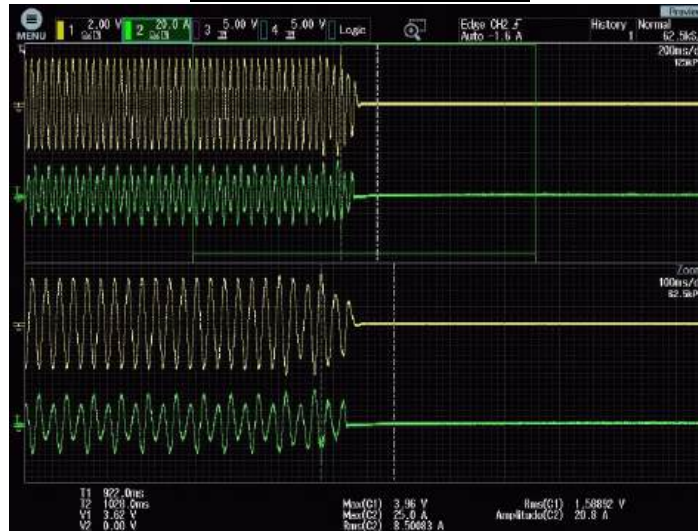
Clause	Requirement + Test	Result – Remark	Verdict
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Waveforms:

100% Balanced condition



100% Unbalanced condition

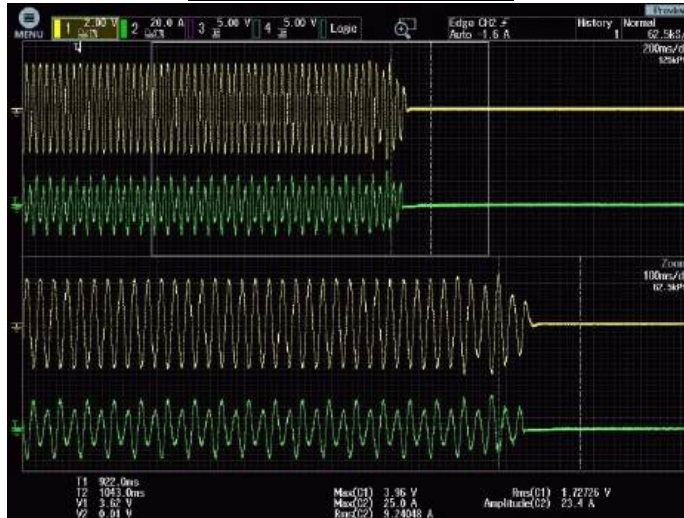




66% balanced condition



66% Unbalanced condition







IS 16169:2014 / IEC 62116:2008			
Clause	Requirement + Test	Result – Remark	Verdict

BLOCK DIAGRAM OF TEST CIRCUIT

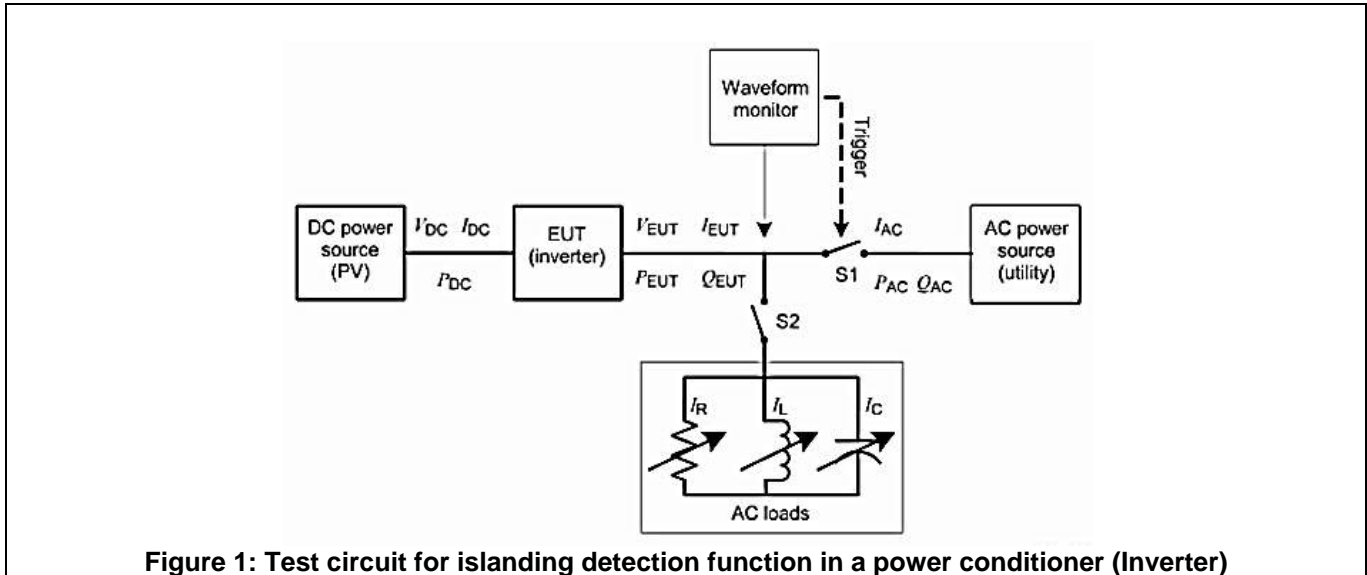


Figure 1: Test circuit for islanding detection function in a power conditioner (Inverter)

-----End of test Report-----





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SUMMARY OF TEST REPORT

TEST REPORT NO:SC24SPI00686_1

DATED:04/06/2024

(Number of pages in test report: Page no. 1 to 81)

TEST FORMAT AS PER IS 16221 (Part 2): 2015/IEC 62109-2 : 2011

1. Name of Manufacturer:KSOLARE ENERGY PVT LTD
2. Product:SOLAR GTI (Power Invertors for use in Photovoltaic Power Systems)
3. Model(s): Lead Model:KSY-6.5KW-1P-1MPPT
Series Models: KSY-5.8KW-1P-1MPPT, KSY-5KW-1P-1MPPT, KSY-4.6KW-1P-1MPPT, KSY-4KW-1P-1MPPT, KSY-3.8KW-1P-1MPPT, KSY-3KW-1P-1MPPT, KSY-2.3KW-1P-1MPPT, KSY-1.8KW-1P-1MPPT, KSY-1.2KW-1P-1MPPT
4. Model differences provided (if applicable):Yes
5. Model differences verified as per Guidelines for series formulation:Yes
6. Test Results:Refer below

PART A: GENERAL

S No.	TEST REQUIREMENT	CLAUSE	VERDICT
1.	General testing requirements	4	Pass
2.	Marking and documentation	5	Pass
3.	Environmental requirements and conditions	6	Pass
4.	Protection Against Electrical Shock and energy hazards	7	Pass
5.	Protection Against mechanical hazards	8	Pass
6.	Protection Against fire hazards	9	Pass
7.	Protection Against sonic pressure hazards	10	Pass
8.	Protection Against liquid hazards	11	N/A
9.	Protection Against chemical hazards	12	N/A
10.	Physical requirements	13	Pass
11.	Components	14	Pass





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CIN NO U21014UP1987PTC008956



General Information:

The conformity certificates of critical components are verified to ensure complete testing of apparatus under test and details regarding harmonized IEC standards (where IEC standards are not available) are also provided in the list of critical component.

CONCLUSION:

- 1.) Sample meets all relevant requirements of IS 16221 (Part 2): 2015/IEC 62109-2 : 2011 Yes
- 2.) Sample fails to meet the following test requirements: N/A
- 3) I hereby, undertake that the verdict stated in the test report for all the tests matches with the test results.

(Signature of Authorized person with Stamp)



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Report No- SC24SPI00686_1

IS 16221 (Part 2) : 2015/ IEC 62109-2 : 2011

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Dated : 04/06/2024

Manufacturer	KSOLARE ENERGY PVT LTD SR NO.62, HISSA NO.3, MANGADEWADI, KATRAJ, PUNE SATARA ROAD, PUNE, MAHARASHTRA, PIN 411046	
Test item:	SOLAR GTI (Power Invertors for use in Photovoltaic Power Systems)	
Identification	Lead Model:KSY-6.5KW-1P-1MPPT Series Models: KSY-5.8KW-1P-1MPPT, KSY-5KW-1P-1MPPT, KSY-4.6KW-1P-1MPPT, KSY-4KW-1P-1MPPT, KSY-3.8KW-1P-1MPPT, KSY-3KW-1P-1MPPT, KSY-2.3KW-1P-1MPPT, KSY-1.8KW-1P-1MPPT, KSY-1.2KW-1P-1MPPT	Serial No.: KSY0524HS0400, KSY0524HS0402
Receipt No.:	URS/LAB/SPIV/24-25/BB6DBD33 / 24EA4FFN	Date of receipt: 29/04/2024
Testing laboratory and its address:	URS PRODUCTS AND TESTING PRIVATE LIMITED A-29, Sector 5, Noida-201301, India	
Test specification:	IS 16221 (Part 2) : 2015/ IEC 62109-2 : 2011	
Test Result:	The test item passed the test specification(s)	
Other Aspects:	NIL	
This test report relates to the test sample submitted and list of documents attached.		

Tested by:	Approved by / Authorized Signatory:	Issued by:
PUJA KUMARI , Asst.Manager	Paras Singh , General Manager	NILESH BALASAHEB ASWAR , Lab Manager
Date: 04/06/2024	Date: 04/06/2024	Date: 04/06/2024



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A-29, Sector-5, Noida-201301
T +91 (120) 4516264-65 F +91 (120) 4750296
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CIN NO U21014UP1987PTC008956



Report No- SC24SPI00686_1

IS 16221 (Part 2) : 2015/ IEC 62109-2 : 2011

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Dated : 04/06/2024

TEST REPORT IS 16221 (Part 2) : 2015/ IEC 62109-2 : 2011 Safety of Power Converter for use in Photovoltaic Power System Part 2:Particular requirements for Invertor

Report Reference No. :	SC24SPI00686_1
Date of issue :	04/06/2024
Total number of pages	81
Customer name :	KSOLARE ENERGY PVT LTD
Address	SR NO.62, HISSA NO.3, MANGADEWADI, KATRAJ, PUNE SATARA ROAD, PUNE, MAHARASHTRA, PIN 411046
Test specification:	
Standard	IS 16221 (Part 2) : 2015/ IEC 62109-2 : 2011
Test procedure	Compliance Report
Non-standard test method	N/A
Test Report Form No:	TRF No. IS 16221 (Part 2) : 2015_V1.0
Test Report Form(s) Originator	BIS
Master TRF	Dated: 03.10.2018
Test item description:	SOLAR GTI (Power Invertors for use in Photovoltaic Power Systems)
Trade Mark	
Model/Type reference	Lead Model:KSY-6.5KW-1P-1MPPT Series Models: KSY-5.8KW-1P-1MPPT, KSY-5KW-1P-1MPPT, KSY-4.6KW-1P-1MPPT, KSY-4KW-1P-1MPPT, KSY-3.8KW-1P-1MPPT, KSY-3KW-1P-1MPPT, KSY-2.3KW-1P-1MPPT, KSY-1.8KW-1P-1MPPT, KSY-1.2KW-1P-1MPPT
Ratings	Max Input Voltage: 580Vdc, MPPT Voltage Range: 80-550Vdc, Max Input Current: 16A, Nominal Grid Frequency: 50/60Hz, Max Short Circuit Current: 20A, Rated AC Power: 6500W, Rated Grid Voltage: L/N/PE, 230Vac, Power Factor: 0.8Lead..1..0.8Lag, Max AC Output Current: 28.26A, Protective Class: Class I, IP Standard: IP 65, Ambient Temp.: -25°C ~60°C
Other Documents submitted	Please refer to Table – List of Attachments at Page No. 4

Tested by:	Approved by / Authorized Signatory:	Issued by:
PUJA KUMARI , Asst.Manager	Paras Singh , General Manager	NILESH BALASAHEB ASWAR , Lab Manager
Date: 04/06/2024	Date: 04/06/2024	Date: 04/06/2024



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Report No- SC24SPI00686_1

IS 16221 (Part 2) : 2015/ IEC 62109-2 : 2011

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Dated : 04/06/2024

Testing Procedure and testing location:

Testing Laboratory	URS PRODUCTS AND TESTING PRIVATE LIMITED	
Testing location/ address	A-29, Sector 5, Noida-201301, India	
Testing procedure:		
Tested by (name + signature):	PUJA KUMARI , Asst.Manager	
Approved by (name + signature):	Paras Singh , General Manager	



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T +91 (120) 4516264-65 F +91 (120) 4750296
E info@urs-labs.com W www.urs-labs.com
CIN NO U21014UP1987PTC008956



Report No- SC24SPI00686_1

IS 16221 (Part 2) : 2015/ IEC 62109-2 : 2011

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Dated : 04/06/2024

Table – List of Attachments

Attachment No.	Attachment Description	No. of pages in Attachment
Attachment	Photo document	3pages (79-81)

Summary of Testing

<p>Tests performed (name of test and test clause):</p> <ul style="list-style-type: none"> Cl. 4 General testing requirements Cl. 5 Marking and documentation Cl. 6 Environmental requirements and conditions Cl. 7 Protection against electric shock and energy hazards Cl. 8 Protection against mechanical hazards Cl. 9 Protection against fire hazards Cl. 10 Protection against sonic pressure hazards Cl. 13 Physical requirements Cl. 14 Components 	<p>Testing location:</p> <p>URS PRODUCTS AND TESTING PRIVATE LIMITED A-29, Sector 5, Noida-201301, India</p>
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TC-6468

Report No- SC24SPI00686_1

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Dated : 04/06/2024

Copy of marking plate:

Copy of marking label:

K Solare Energy Pvt. Ltd.

5G-PRO
KSY- 6.5KW-IP-IMPPT Solar GTI

Max Input Voltage	580Vdc
MPPT Voltage Range	80-550V dc
Max Input Current	16A
Nominal Grid Frequency	50/60 Hz
Max Short Circuit Current	20A
Rated Ac Power	6500W
Nominal Grid Voltage	L/N/PE, 230V ac
MFG Date/Warranty	17-03-2024
Power Factor	0.8Lead...1...0.8Lag
Max AC Output Current	28.26A
Protective Class	Class I
IP standard	IP 65
Ambient Temp.	-25~ +60 degree C

SN: KSY0524HS0402

KSOLARE ENERGY PVT.LTD.
SR NO.62, HISSA NO.3,MANGADEWADI,
KATRAJ, PUNE SATARA ROAD,
MAHARASHTRA, INDIA - 411046
www.ksolare.com

Marking Label of Lead Model (SN:KSY0524HS0402)





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Dated : 04/06/2024

K Solare Energy Pvt. Ltd. **ISO**

5G-PRO
KSY- 6.5KW-IP-1MPPT Solar GTI

Max Input Voltage	580Vdc
MPPT Voltage Range	80-550Vdc
Max Input Current	16A
Nominal Grid Frequency	50/60 Hz
Max Short Circuit Current	20A
Rated Ac Power	6500W
Nominal Grid Voltage	L/N/PE, 230V ac
MFG Date/Warranty	17-03-2024
Power Factor	0.8Lead...1...0.8Lag
Max AC Output Current	28.26A
Protective Class	Class I
IP standard	IP 65
Ambient Temp.	-25~ +60 degree C

SN: KSY0524HS0400

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K Solare Energy Pvt. Ltd. **ISO**

SG-PRO
KSY-5.8KW-1P-IMPPT Solar GTI

Max Input Voltage	580Vdc
MPPT Voltage Range	80-550Vdc
Max Input Current	16A
Nominal Grid Frequency	50/60 Hz
Max Short Circuit Current	20A
Rated Ac Power	5800W
Nominal Grid Voltage	L/N/PE, 230V ac
MFG Date/Warranty	17-03-2024
Power Factor	0.8Lead...1...0.8Lag
Max AC Output Current	25.2A
Protective Class	Class I
IP standard	IP 65
Ambient Temp.	-25~ +60 degree C

Barcode
SN: KSY0324HS0096

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Marking Label of Series Model





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Dated : 04/06/2024

K Solare
Energy Pvt. Ltd.

5G-PRO
KSY-5KW-1P-IMPPT **Solar GTI**

Max Input Voltage	580Vdc
MPPT Voltage Range	80-550Vdc
Max Input Current	16A
Nominal Grid Frequency	50/60 Hz
Max Short Circuit Current	20A
Rated Ac Power	5000W
Nominal Grid Voltage	L/N/PE, 230V ac
MFG Date/Warranty	17-03-2024
Power Factor	0.8Lead...1...0.8lag
Max AC Output Current	21.7A
Protective Class	Class I
IP standard	IP 65
Ambient Temp.	-25~ +60 degree C

SN: KSY0324HS0095

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K Solare Energy Pvt. Ltd. **ISO**

5G-PRO+

KSY-4.6KW-1P-1MPPT Solar GTI

Max Input Voltage	580Vdc
MPPT Voltage Range	80-550Vdc
Max Input Current	16A
Nominal Grid Frequency	50/60 Hz
Max Short Circuit Current	20A
Rated Ac Power	4600W
Nominal Grid Voltage	L/N/PE, 230V ac
MFG Date/Warranty	17-03-2024
Power Factor	0.8Lead...1...0.8lag
Max AC Output Current	20A
Protective Class	Class I
IP standard	IP 65
Ambient Temp.	-25~ +60 degree C

SN: KSY0324HS0094

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K Solare Energy Pvt. Ltd. **ISO 9001**

SG-PRO4

KSY-4KW-1P-1MPPT Solar GI

Max Input Voltage	580Vdc
MPPT Voltage Range	80-550Vdc
Max Input Current	16A
Nominal Grid Frequency	50/60 Hz
Max Short Circuit Current	20A
Rate of Ac Power	4000W
Nominal Grid Voltage	L/N/PE, 230V ac
MFG Date/Warranty	17-03-2024
Power Factor	0.8Lead...1...0.8Lag
Max AC Output Current	17.3A
Protective Class	Class I
IP standard	IP 65
Ambient Temp.	-25~ +60 degree C


SN: KSY0324HS0093



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Marking Label of Series Model





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E info@urs-labs.com W www.urs-labs.com
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K Solare Energy Pvt. Ltd. **ISO**

3G-PRO
KSY-3.8KW-1P-IMPPT Solar GI

Max Input Voltage	580Vdc
MPPT Voltage Range	80-550Vdc
Max Input Current	16A
Nominal Grid Frequency	50/60 Hz
Max Short Circuit Current	20A
Rated Ac Power	3800W
Nominal Grid Voltage	L/N/PE, 230V ac
MFG Date/Warranty	17-03-2024
Power Factor	0.8Lead...1...0.8Lag
Max AC Output Current	16.5A
Protective Class	Class I
IP standard	IP 65
Ambient Temp.	-25~ +60 degree C

SN: KSY0324HS0092

KSOLARE ENERGY PVT.LTD.
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Marking Label of Series Model





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TC-6468

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Dated : 04/06/2024

K Solare Energy Pvt. Ltd. **ISO**

5G-PRO
KSY-3KW-1P-IMPPT **Solar GTI**

Max Input Voltage	580Vdc
MPPT Voltage Range	80-550Vdc
Max Input Current	16A
Nominal Grid Frequency	50/60 Hz
Max Short Circuit Current	20A
Rated Ac Power	3000W
Nominal Grid Voltage	L/N/PE, 230V ac
MFG Date/Warranty	17-03-2024
Power Factor	0.8Lead...1...0.8Lag
Max AC Output Current	13A
Protective Class	Class I
IP standard	IP 65
Ambient Temp.	-25~ +60 degree C

SN: KSY0324HS0091

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Dated : 04/06/2024

K Solare Energy Pvt. Ltd. **ISO**

SG-PRO
KSY-2.3KW-IP-IMPPT Solz GTI

Max Input Voltage	580Vdc
MPPT Voltage Range	80-550Vdc
Max Input Current	16A
Nominal Grid Frequency	50/60 Hz
Max Short Circuit Current	20A
Rated Ac Power	2300W
Nominal Grid Voltage	L/N/PE, 230V ac
MFG Date/Warranty	17-03-2024
Power Factor	0.8Lead...1...0.8Lag
Max AC Output Current	10A
Protective Class	Class I
IP standard	IP 65
Ambient Temp.	-25~ +60 degree C

SN: KSY0324HS0090

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T +91 (120) 4516264-65 F +91 (120) 4750296
E info@urs-labs.com W www.urs-labs.com
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Dated : 04/06/2024

K Solare Energy Pvt. Ltd. **ISO**

5G-PRO
KSY-1.8KW-1P-IMPPT Solar GTI

Max Input Voltage	580Vdc
MPPT Voltage Range	80-550Vdc
Max Input Current	16A
Nominal Grid Frequency	50/60 Hz
Max Short Circuit Current	20A
Rated Ac Power	1800W
Nominal Grid Voltage	L/N/PE, 230V ac
MFG Date/Warranty	17-03-2024
Power Factor	0.8Lead...1...0.8lag
Max AC Output Current	7.8A
Protective Class	Class I
IP standard	IP 65
Ambient Temp.	-25~ +60 degree C

SN: KSY0524HS0402

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www.ksolare.com

Marking Label of Series Model





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A-29, Sector-5, Noida-201301
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Dated : 04/06/2024

K Solare Energy Pvt. Ltd. **ISO**

5G-PRO
KSY-1.2KW-1P-IMPPT Solar GTI

Max Input Voltage	580Vdc
MPPT Voltage Range	80-550Vdc
Max Input Current	16A
Nominal Grid Frequency	50/60 Hz
Max Short Circuit Current	20A
Rated Ac Power	1200W
Nominal Grid Voltage	L/N/PE, 230V ac
MFG Date/Warranty	17-03-2024
Power Factor	0.8Lead...1...0.8Lag
Max AC Output Current	5.2A
Protective Class	Class I
IP standard	IP 65
Ambient Temp.	-25~ +60 degree C

Barcode
SN: KSY0524HS0402

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E info@urs-labs.com W www.urs-labs.com
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Warning Label





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Test item particulars	
Equipment mobility	<input type="checkbox"/> movable <input type="checkbox"/> hand-held <input type="checkbox"/> stationary <input checked="" type="checkbox"/> fixed <input type="checkbox"/> transportable <input type="checkbox"/> for_building_in
Connection to the mains	<input type="checkbox"/> pluggable equipment <input type="checkbox"/> direct plug in <input checked="" type="checkbox"/> permanent connection <input type="checkbox"/> for_building_in
Environmental category	<input checked="" type="checkbox"/> outdoor <input type="checkbox"/> indoor unconditional <input type="checkbox"/> indoor conditional
Over voltage category (OVC) mains	<input type="checkbox"/> OVC I <input type="checkbox"/> OVC II <input checked="" type="checkbox"/> OVC III <input type="checkbox"/> OVC IV
Over voltage category (PV)	<input type="checkbox"/> OVC I <input checked="" type="checkbox"/> OVC II <input type="checkbox"/> OVC III <input type="checkbox"/> OVC IV
Mains supply tolerance (%)	-90 / +110 %
Tested for power systems	Yes
IT testing, phase-phase voltage (V)	N/A
Class of equipment	<input checked="" type="checkbox"/> Class I <input type="checkbox"/> Class II <input type="checkbox"/> Class III <input type="checkbox"/> Not classified
Mass of equipment (kg)	8.8Kg (Approx)
Pollution degree (PD)	<input type="checkbox"/> PD 1 <input type="checkbox"/> PD 2 <input checked="" type="checkbox"/> PD 3
IP protection class	IP65
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 was not evaluated for the requirement :N/E	
- test object does not meet the requirement :F (Fail)	





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Dated : 04/06/2024

Testing:

Date of receipt of test item: 29/04/2024

Date(s) of performance of tests: 29/04/2024 to 04/06/2024

General remarks:

The test results presented in this report relate only to the object tested.
This report shall not be reproduced, except in full, without the written approval of the Issuing testing laboratory.

Manufacturer's Declaration per Standard:

Similarities between the models: Representative models and series models have following similarities

- 1) Same rated Input/ Output voltage, Input voltage
- 2) Same frequency
- 3) Number of Phases at output
- 4) Same PCB design and layout
- 5) Same Power Stage topology
- 6) Same Insulation Class
- 7) Same Control Algorithm/firmware
- 8) Same Cabinet Design
- 9) Class of construction

Differences between the models: Representative models and series models have following differences
Model name and electrical ratings.





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IS 16221 (Part 2) : 2015/ IEC 62109-2 : 2011

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Dated : 04/06/2024

General product information:

1) Application details / Description of the product:

The product covered under this test report is a SOLAR GTI (Power Invertors for use in Photovoltaic Power Systems).

The details of the product are stated below:

Manufacturer: KSOLARE ENERGY PVT LTD

Input rating: Max Input Voltage: 580Vdc, MPPT Voltage Range: 80-550Vdc, Max Input Current: 16A, Nominal Grid Frequency: 50/60Hz, Max Short Circuit Current: 20A, Rated AC Power: 6500W, Rated Grid Voltage: L/N/PE, 230Vac, Power Factor: 0.8Lead..1..0.8Lag, Max AC Output Current: 28.26A, Protective Class: Class I, IP Standard: IP 65, Ambient Temp.: -25°C ~60°C





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Clause	Requirement + Test	Result - Remark	Verdict
4	General testing requirements	See below	P
4.1 /RD	General	Test carried out under reference test conditions and under both normal & single fault conditions.	P
4.2/RD	General conditions for testing	See below	P
4.2.1/RD	Sequence of tests	Considered as per MNRE guidelines	P
4.2.2/RD	Reference test conditions	See below	P
4.2.2.1/RD	Environmental conditions	Temperature: 15 to 40°C Relative humidity: not more than 75% Air pressure: 75kPa to 106kPa No frost, dew, percolating water, rain, solar radiation	P
4.2.2.2/RD	State of equipment	All tests have been carried out on model which represent the future production unit with complete assemblies	P
4.2.2.3/RD	Position of equipment	The equipment were installed in accordance with the manufacturer's instructions	P
4.2.2.4/RD	Accessories	No accessories or operator Interchangeable parts used.	N/A
4.2.2.5/RD	Covers and removable parts	No covers and removable parts	N/A
4.2.2.6/RD	Mains supply a) Voltage: b) Frequency: c) Polarity: d) Earthing: e) Over-current Protection:	a) L/N/PE, 230V a.c. b) 50/60Hz c) Not pluggable equipment type A d) Earthed supply system used e) 45A	P
4.2.2.7/RD	Supply ports other than the mains	See below	P
4.2.2.7.1/RD	Photovoltaic supply sources a) Open circuit voltage: b) Short-circuit current:	PV array simulator used with suitable compatibility	P
4.2.2.7.2/RD	Battery inputs	No battery used	N/A
4.2.2.8/RD	Conditions of loading for output ports	DC to AC inverter. A.C. output port was loaded with linear loads to obtain the maximum rated output power. Continuous operation ratings, until steady conditions are established.	P
4.2.2.9 /RD	Earthing terminals	Protective conductor terminal was connected to earth. No functional earth terminal.	P
4.2.2.10/RD	Controls	No mains selection devices and No combinations of settings devices	N/A
4.2.2.11/RD	Available short circuit current	Considered	p
4.3/RD	Thermal testing	See appended table 4.3	P
4.3.1/RD	General	See appended table 4.3	P
4.3.2/RD	Maximum temperatures	Tests of equipment rated for use in ambient temperatures up to 60°C	P
4.3.2.1/RD	General	See appended table 4.3	P





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Dated : 04/06/2024

Clause	Requirement + Test	Result - Remark	Verdict
4.3.2.2/RD	Touch temperatures	See appended table 4.3	P
4.3.2.3/RD	Temperatures limits for mounting surfaces	See appended table 4.3	P
4.4/RD	Testing in single fault condition	See appended table 4.4	P
4.4.1/RD	General	See appended table 4.4	P
4.4.2/RD	Test conditions and duration for testing under fault conditions	See below	P
4.4.2.1/RD	General	Considered	P
4.4.2.2/RD	Duration of tests	Considered	P
4.4.3/RD	Pass/fail criteria for testing under fault conditions	See below	P
4.4.3.1/RD	Protection against shock hazard	No shock hazards	P
4.4.3.2/RD	Protection against the spread of fire	No spread of fire	P
4.4.3.3/RD	Protection against other hazards	No other hazards	P
4.4.3.4/RD	Protection against parts expulsion hazards	No expulsion hazards	P
4.4.4	Single fault conditions to be applied	See below	P
4.4.4.1/RD	Component fault tests	See appended table 4.4	P
4.4.4.2 /RD	Equipment or parts for short-term or intermittent operation	For continuous operation	N/A
4.4.4.3 /RD	Motors	See appended table 4.4.4	P
4.4.4.4/RD	Transformer short circuit tests	See appended table 4.4.4	P
4.4.4.5/RD	Output short circuit	See appended table 4.4.4	P
4.4.4.6/RD	Backfeed current test for equipment with more than one source of supply	Only single source of supply used	N/A
4.4.4.7/RD	Output overload	See appended table 4.4.4	P
4.4.4.8/RD	Cooling system failure	See appended table 4.4.4	P
4.4.4.9/RD	Heating devices	No heating devices used	N/A
4.4.4.10/RD	Safety interlock systems	No such system used	N/A
4.4.4.11/RD	Reverse d.c. connections	Instructions provide in installation manual	P
4.4.4.12/RD	Voltage selector mismatch	No voltage selector	N/A
4.4.4.13/RD	Mis-wiring with incorrect phase sequence or polarity	No hazards observed	P
4.4.4.14/RD	Printed wiring board short-circuit test	See appended table 4.4.4	P
4.4.4.15	Fault-tolerance of protection for grid-interactive inverters	See below	P
4.4.4.15.1	Fault-tolerance of residual current monitoring according to 4.8.3.5: the residual current monitoring system operates properly	See appended table 4.4.4.15.1	P
	a). - The inverter ceases to operate	See above clause 4.4.4.15.1	P
	- Indicates a fault in accordance with 13.9	See above clause 4.4.4.15.1	P
	- Disconnect from the mains	See above clause 4.4.4.15.1	P
	- not re-connect after any sequence of removing and reconnecting PV power	See above clause 4.4.4.15.1	P
	- not re-connect after any sequence of removing and reconnecting AC power	See above clause 4.4.4.15.1	P





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A-29, Sector-5, Noida-201301
 T +91 (120) 4516264-65 F +91 (120) 4750296
 E info@urs-labs.com W www.urs-labs.com
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Clause	Requirement + Test	Result - Remark	Verdict
	- not re-connect after any sequence of removing and reconnecting both PV and AC power	See above clause 4.4.4.15.1	P
	b). - The inverter continues to operate	Inverter ceases to operate	N/A
	- the residual current monitoring system operates properly under single fault condition	See above clause 4.4.4.15.1	N/A
	- Indicates a fault in accordance with 13.9	See above clause 4.4.4.15.1	N/A
	c). - The inverter continues to operate regardless of loss of residual current monitoring functionality	Inverter ceases to operate	N/A
	- not re-connect after any sequence of removing and reconnecting PV power	See above clause 4.4.4.15.1	N/A
	- not re-connect after any sequence of removing and reconnecting AC power	See above clause 4.4.4.15.1	N/A
	- not re-connect after any sequence of removing and reconnecting both PV and AC power	See above clause 4.4.4.15.1	N/A
	- Indicates a fault in accordance with 13.9	See above clause 4.4.4.15.1	N/A
4.4.4.15.2	Fault-tolerance of automatic disconnecting means	Considered	P
4.4.4.15.2.1	The means provided for automatic disconnection of a grid-interactive inverter from the mains shall:	See below	P
	- disconnect all grounded current-carrying conductors from the mains	Disconnected all grounded current carrying conductors from the mains	P
	- disconnect all ungrounded current-carrying conductors from the mains	Disconnected all ungrounded current carrying conductors from the mains	P
	- be such that with a single fault applied to the disconnection means or to any other location in the inverter, at least basic insulation or simple separation is maintained between the PV array and the mains when the disconnecting means is intended to be in the open state.	Basic insulation is maintained between PV array and mains	P
4.4.4.15.2.2	Design of insulation or separation complies with requirements of 7.3.7 of Part 1: report here Part 1 comment and verdict	Complies	P
4.4.4.15.2.3	For non-isolated inverter, automatic checking of the isolation provided by a disconnect means after single fault.	The inverter automatic checking of the isolation after single fault occurred	P
	If the check fail: - any still-functional disconnection means shall be left in the open position	Complies	P
	- at least basic or simple separation shall be maintained between the PV input and the mains	Basic insulation is maintained between PV array and mains	P
	- the inverter shall not start operation	Complies	P
	the inverter shall indicate a fault in accordance with 13.9	The screen shows error information	P
4.4.4.16	A stand-alone inverter with a transfer switch to transfer AC loads from the mains or other AC bypass source to the inverter output:	Not a stand-alone inverter	N/A





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Clause	Requirement + Test	Result - Remark	Verdict
	- shall continue to operate normally	See above clause no. 4.4.4.16	N/A
	- shall not present a risk of fire as the result of an out-of-phase transfer	See above clause no. 4.4.4.16	N/A
	shall not present a risk of shock as the result of an out-of-phase transfer	See above clause no. 4.4.4.16	N/A
	- for an inverter employing a bypass switch having a control preventing switching, the test is to be conducted under the condition of a component malfunction	See above clause no. 4.4.4.16	N/A
4.4.4.17	Cooling system failure – Blanketing test No hazards according to the criteria of sub-clause 4.4.3 of Part 1 shall result from blanketing the inverter This test is not required for inverters restricted to use only in closed electrical operating areas.	See appended table 4.4.4.17	P
	Test stop condition: time duration value or stabilized temperature	See appended table 4.4.4.17	P
4.5/RD	Humidity preconditioning	See below	P
4.5.1/RD	General	Considered	P
4.5.2/RD	Conditions	Humidity: 92.5±2.5%RH Temperature: 40±2°C Duration: 48h	P
4.6/RD	Backfeed voltage protection	See below	P
4.6.1/RD	Backfeed tests under normal conditions	Input side: Positive to negative 17mV	P
4.6.2/RD	Backfeed tests under single-fault conditions	Input side: Positive to negative 22mV	P
4.6.3/RD	Compliance with backfeed tests	No hazards present after 15s	P
4.7	Electrical ratings tests	See below	P
4.7.1/RD	Input ratings	See appended table 4.7	P
4.7.1.1/RD	Measurement requirements for DC input ports	See appended table 4.7	P
4.7.2/ RD	Output ratings	See appended table 4.7	P
4.7.3	Measurement requirements for AC output ports for standalone inverters	Not a standalone inverter	N/A
4.7.4	Stand-alone Inverter AC output voltage and frequency	Not a standalone inverter	N/A
4.7.4.1	General	See above clause no. 4.7.4	N/A
4.7.4.2	Steady state output voltage at nominal DC input The steady-state AC output voltage shall not be less than 90 % or more than 110 % of the rated nominal voltage with the inverter supplied with its nominal value of DC input voltage.	See above clause no. 4.7.4	N/A
4.7.4.3	Steady state output voltage across the DC input range The steady-state AC output voltage shall not be less than 85 % or more than 110 % of the rated nominal voltage with the inverter supplied with any value within the rated range of DC input voltage.	See above clause no. 4.7.4	N/A





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T +91 (120) 4516264-65 F +91 (120) 4750296
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Clause	Requirement + Test	Result - Remark	Verdict
4.7.4.4	Load step response of the output voltage at nominal DC input The AC output voltage shall not be less than 85 % or more than 110 % of the rated nominal voltage for more than 1,5 s after application or removal of a resistive load	See above clause no. 4.7.4	N/A
4.7.4.5	Steady state output frequency The steady-state AC output frequency shall not vary from the nominal value by more than +4 % or -6 %.	See above clause no. 4.7.4	N/A
4.7.5	Stand-alone inverter output voltage waveform	Not a standalone inverter	N/A
4.7.5.1	General	See above clause no. 4.7.5	N/A
4.7.5.2	The AC output voltage waveform of a sinusoidal output stand-alone inverter shall have a total harmonic distortion (THD) not exceeding of 10 % and no individual harmonic at a level exceeding 6 %.	See above clause no. 4.7.5	N/A
4.7.5.3	Non-sinusoidal output waveform requirements	Not a standalone inverter	N/A
4.7.5.3.1	General	See above clause no. 4.7.5.3	N/A
4.7.5.3.2	The total harmonic distortion (THD) of the voltage waveform shall not exceed 40 %.	See above clause no. 4.7.5.3	N/A
4.7.5.3.3	The slope of the rising and falling edges of the positive and negative half-cycles of the voltage waveform shall not exceed 10 V/ μ s measured between the points at which the waveform has a voltage of 10 % and 90 % of the peak voltage for that half-cycle.	See above clause no. 4.7.5.3	N/A
4.7.5.3.4	The absolute value of the peak voltage of the positive and negative half-cycles of the waveform shall not exceed 1,414 times 110 % of the RMS value of the rated nominal AC output voltage	See above clause no. 4.7.5.3	N/A
4.7.5.4	Information requirements for non-sinusoidal waveforms The instructions provided with a stand-alone inverter not complying with 4.7.5.2 shall include the information in 5.3.2.6.	See above clause no. 4.7.5.3	N/A
4.7.5.5	Output voltage waveform requirements for inverters for dedicated loads. For an inverter that is intended only for use with a known dedicated load, the following requirements may be used as an alternative to the waveform requirements in 4.7.5.2 to 4.7.5.3.	See above clause no. 4.7.5.3	N/A
	The combination of the inverter and dedicated load shall be evaluated to ensure that the output waveform does not cause any hazards in the load equipment and inverter, or cause the load equipment to fail to comply with the applicable product safety standards.	See above clause no. 4.7.5.3	N/A
	The inverter shall be marked with symbols 9 and 15 of Table C.1 of Part 1.	See above clause no. 4.7.5.3	N/A





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Clause	Requirement + Test	Result - Remark	Verdict
	The installation instructions provided with the inverter shall include the information in 5.3.2.13	See above clause no. 4.7.5.3	N/A
4.8	Additional tests for grid-interactive inverters	See below	P
4.8.1	General requirements regarding inverter isolation and array grounding	Non-isolation inverter	N/A
	- Type of Array grounding supported	The EUT is intended to be used with ungrounded array	N/A
	Inverter isolation	Non-isolation inverter	N/A
4.8.2	Array insulation resistance detection for inverters for ungrounded and functionally grounded arrays	See below	P
4.8.2.1	Array insulation resistance detection for inverters for ungrounded arrays	See appended table 4.8.2	P
	Inverter shall have means to measure DC insulation resistance from PV input (array) to ground before starting operation	Complies	P
	Or Inverter shall be provided with instruction in accordance with 5.3.2.11.	The inverter can measure DC insulation resistance from PV input array to ground before starting operation	N/A
	Measured DC insulation resistance:	See appended table 4.8.2	P
	Inverter measurement circuit shall be capable of detecting insulation resistance below the limit value $R = V_{max}/30mA$ under normal conditions	Complies	P
	Inverter measurement circuit shall be capable of detecting insulation resistance below the limit value $R = V_{max}/30mA$ with ground fault in the PV array	Complies	P
	Isolated inverters shall indicate a fault if the insulation resistance is less than the limit value	The EUT is non-isolated inverter	N/A
	Isolated inverter fault indication maintained until insulation resistance has recovered to a value higher than the limit value	The EUT is non-isolated inverter	N/A
	Non-isolated inverters, or inverters with isolation not complying with the leakage current limits in the minimum inverter isolation requirements in Table 30:	See below	P
	- shall indicate a fault in accordance with 13.9	The screen shows fault information	P
	- shall not connect to the mains	Not connect to the mains	P
4.8.2.2	Array insulation resistance detection for inverters for functionally grounded arrays	Not a functionally grounded array	N/A
	a-1) The value of the total resistance, including the intentional resistance for array functional grounding, the expected insulation resistance of the array to ground, and the resistance of any other networks connected to ground (for example measurement networks) must not be lower than $R =$	See above clause no. 4.8.2.2	N/A





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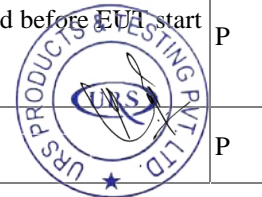
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Clause	Requirement + Test	Result - Remark	Verdict
	(VMAX PV/30 mA) ohms.		
	a-2) The installation instructions shall include the information required in 5.3.2.12.	See above clause no. 4.8.2.2	N/A
	b-1) As an alternative to a), or if a resistor value lower than in a) is used, the inverter shall incorporate means to detect, during operation, if the total current through the resistor and any networks (for example measurement networks) in parallel with it, exceeds the residual current values and times in Table 31	See above clause no. 4.8.2.2	N/A
	b-2) Inverter shall either disconnect the resistor or limit the current by other means	See above clause no. 4.8.2.2	N/A
	b-3) If the inverter is a non-isolated inverter, or has isolation not complying with the leakage current limits in the minimum inverter isolation requirements in Table 30, it shall also disconnect from the mains.	See above clause no. 4.8.2.2	N/A
	c) The inverter shall have means to measure the DC insulation resistance from the PV input to ground before starting operation, in accordance with 4.8.2.1.	See above clause no. 4.8.2.2	N/A
4.8.3	Array residual current detection	See below	P
4.8.3.1	General	General Complies	P
4.8.3.2	30 mA touch current type test for isolated inverters	The EUT is non-isolated inverter	N/A
4.8.3.3	Fire hazard residual current type test for isolated inverters	The EUT is non-isolated inverter	P
4.8.3.4	Protection by application of RCD's	The EUT provides an integral RCD	N/A
	- The requirement for additional protection in 4.8.3.1 can be met by provision of an RCD with a residual current setting of 30 mA, located between the inverter and the mains	See above clause no. 4.8.3.4	N/A
	- The selection of the RCD type to ensure compatibility with the inverter must be made according to rules for RCD selection in Part 1.	See above clause no. 4.8.3.4	N/A
	- The RCD provided integral to the inverter, or	See above clause no. 4.8.3.4	N/A
	- The RCD provided by the installer if details of the rating, type, and location for the RCD are given in the installation instructions per 5.3.2.9.	See above clause no. 4.8.3.4	N/A
4.8.3.5	Protection by residual current monitoring	See below	P
4.8.3.5.1	General	The EUT provides an integral RCD	P
	Where required by Table 30, the inverter shall provide residual current monitoring that functions whenever the inverter is connected to the mains with the automatic disconnection means closed.	The residual current measured before EUT start up	P
	The residual current monitoring means shall measure the total (both a.c. and d.c. components) RMS current	Complies	P





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T +91 (120) 4516264-65 F +91 (120) 4750296
E info@urs-labs.com W www.urs-labs.com
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Clause	Requirement + Test	Result - Remark	Verdict
	As indicated in Table 30 for different inverter types, array types, and inverter isolation levels, detection may be required for excessive continuous residual current, excessive sudden changes in residual current, or both, according to the following limits:	Considered	P
	a) Continuous residual current: The inverter shall disconnect within 0,3 s and indicate a fault in accordance with 13.9 if the continuous residual current exceeds:	See appended table 4.8.3.5	P
	- maximum 300 mA for inverters with continuous output power rating ≤ 30 kV;	Complies	N/A
	- maximum 10 mA per kVA of rated continuous output power for inverters with continuous output power rating > 30 kVA.	<30kVA	N/A
	The inverter may attempt to re-connect if the array insulation resistance meets the limit in 4.8.2.	Complies	P
	b) Sudden changes in residual current: The inverter shall disconnect from the mains within the time specified in Table 31	See appended table 4.8.3.5	P
	The inverter indicates a fault in accordance with 13.9, if a sudden increase in the RMS residual current is detected exceeding the value in the table	See appended table 4.8.3.5	P
	The inverter may attempt to re-connect if the array insulation resistance meets the limit in 4.8.2.	Complies	P
4.8.3.5.2	Test for detection of excessive continuous residual current: test repeated 5 times and time to disconnect shall not exceed 0,3 s	See appended table 4.8.3.5.2	P
4.8.3.5.3	Test for detection of sudden changes in residual current repeated 5 times and each of the 5 results shall not exceed the time limit indicated in for each row (30mA, 60mA and 150mA) of Table 31.	See appended table 4.8.3.5.3	P
4.8.3.6	Systems located in closed electrical operating areas	Not located in the closed electrical operating area	N/A
	The protection against shock hazard is not required if the installation information provided with the inverter indicates the restriction for use in a closed electrical operating area, and	See above clause no. 4.8.3.6	N/A
	Installation information indicates what forms of shock hazard protection are and are not provided integral to the inverter, in accordance with 5.3.2.7.	See above clause no. 4.8.3.6	N/A
	The inverter shall be marked as in 5.2.2.6.	See above clause no. 4.8.3.6	N/A
5	MARKING AND DOCUMENTATION	See below	P
	.	See below	P





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Clause	Requirement + Test	Result - Remark	Verdict
5.1	Marking	See below	P
5.1.1/RD General	General	See below	P
	Equipment shall bear markings as specified in 5.1 and 5.2	The marking plate is on the outer surface of enclosure	P
	Graphic symbols may be used and shall be in accordance with Annex C or IEC 60417 as applicable	All used graphical symbols are in accordance with annex C	P
	Graphic symbols shall be explained in the documentation provided with the PCE	The explanations are provided in the manual	P
5.1.2/RD	Durability of markings	See below	P
	Markings required by this clause to be located on the PCE shall remain clear and legible under conditions of NORMAL USE and resist the effects of cleaning agents specified by the manufacturer	The label was subjected to the permanence of marking test. The label was rubbed with cloth soaked with water for 30 sec. and then again for 30 sec. with the cloth soaked with petroleum spirit. After the test, the markings are clearly legible There was neither loose nor curling on the edge of the label.	P
5.1.3/RD	Identification	See below	P
	The equipment shall, as a minimum, be permanently marked with:	See below	P
	a) the name or trade mark of the manufacturer or supplier	Trade mark :“  ” marked on the label	P
	b) model number, name or other means to identify the equipment	Model no.: KSY-6.5KW-1P-1MPPT marked on the label	P
	c) a serial number, code or other marking allowing identification of manufacturing location and the manufacturing batch or date within a three month time period.	Serial no.: KSY0524HS0400, KSY0524HS0402 marked on the label	P
5.1.4	Equipment ratings	See below	P
	PV input ratings:	See below	P
	- Vmax PV (absolute maximum) (d.c. V)	580Vdc	P
	- Isc PV (absolute maximum) (d.c. A)	20A	P
	a.c. output ratings:	See below	P
	- Voltage (nominal or range) (a.c. V)	230Vac	P
	- Current (maximum continuous) (a.c. A)	28.26A	P
	- Frequency (nominal or range) (Hz)	50Hz/60Hz	P
	- Power (maximum continuous) (W or VA)	6500W	P
	- Power factor range	0.8Lead..1..0.8Lag	P





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Clause	Requirement + Test	Result - Remark	Verdict
	a.c input ratings:	No ac input used	P
	- Voltage (nominal or range) (a.c. V)	No ac input used	N/A
	- Current (maximum continuous) (a.c. A)	No ac input used	N/A
	- Frequency (nominal or range) (Hz)	No ac input used	N/A
	d.c. output ratings:	No dc output used	N/A
	- Voltage (nominal or range) (d.c. V)	No dc output used	N/A
	- Current (maximum continuous) (d.c. A)	No dc output used	N/A
	Protective class (I or II or III)	Class I	P
	Ingress protection (IP) rating per part 1	IP 65	P
	An inverter that is adjustable for more than one nominal output voltage shall be marked to indicate the particular voltage for which it is set when shipped from the factory.	No such application	N/A
5.1.5/RD	Fuse identification	No fuse used	N/A
	Marking shall be located adjacent to each fuse or fuseholder, or on the fuseholder, or in another location provided that it is obvious to which fuse the marking applies, giving the fuse current rating and where fuses of different voltage rating value could be fitted, the fuse voltage rating.	See above	N/A
	Where fuses with special fusing characteristics such as time delay or breaking capacity are necessary, the type shall also be indicated	See above	N/A
	For fuses not located in operator access areas and for soldered-in fuses located in operator access areas, it is permitted to provide an unambiguous cross-reference (for example, F1, F2, etc.) to the servicing instructions which shall contain the relevant information.	See above	N/A
5.1.6/RD	Terminals, Connections, and Controls	See below	P
	If necessary for safety, an indication shall be given of the purpose of Terminals, connectors, controls, and indicators, and their various positions, including any connections for coolant fluids such as water and drainage. The symbols in Annex C may be used, and where there is insufficient space, symbol 9 of Annex C may be used.	Symbol 9 are marked on the EUT and user manual indicate the installation and safety of connection of connector, control and indicator	P
	Push-buttons and actuators of emergency stop devices, and indicator lamps used only to indicate a warning of danger or the need for urgent action shall be coloured red	No such devices used	N/A
	A multiple-voltage unit shall be marked to indicate the particular voltage for which it is set when shipped from the factory. The marking is allowed to be in the form of a paper tag or any other nonpermanent material.	The EUT is not intended to connect to multiple-voltage and there is no voltage setting device	N/A
	A unit with d.c. terminals shall be plainly marked indicating the polarity of the connections, with:	See below	P





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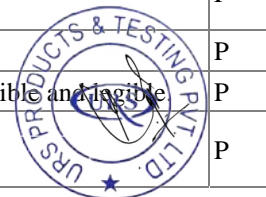
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Clause	Requirement + Test	Result - Remark	Verdict
	- the sign “+“ for positive and “-“, for negative; or	The “+” and “-” marking were provided adjacent to the DC input terminals	P
	- a pictorial representation illustrating the proper polarity where the correct polarity can be unambiguously determined from the representation	No pictorial representation illustration used	N/A
5.1.6.1/RD	Protective Conductor Terminals	See below	P
	The means of connection for the protective earthing conductor shall be marked with:	See below	P
	- symbol 7 of Annex C; or	The symbol 7 of Annex C was marked adjacent to the PE terminal	P
	- the letters “PE“; or	Symbol 7 of Annex C was used	N/A
	- the colour coding green-yellow	Complies	P
5.1.7/RD	Switches and circuit-breakers	See below	P
	The on and off-positions of switches and circuits breakers shall be clearly marked. If a push-button switch is used as the power switch, symbols 10 and 16 of Annex C may be used to indicate the on position, or symbols 11 and 17 to indicate the off position, with the pair of symbols (10 and 16, or 11 and 17) close together.	No such switches used	N/A
5.1.8/RD	Class II Equipment	Class I equipment	N/A
	Equipment using Class II protective means throughout shall be marked with symbol 12 of Annex C. Equipment which is only partially protected by DOUBLE INSULATION or REINFORCED INSULATION shall not bear symbol 12 of Table Annex C	See above cl. no. 5.1.8	N/A
	Where such equipment has provision for the connection of an earthing conductor for functional reasons (see 7.3.6.4) it shall be marked with symbol 6 of Annex C	See above cl. no. 5.1.8	N/A
5.1.9/RD	Terminal boxes for External Connections N	See below	P
	Where required by note 1 of Table 2 as a result of high temperatures of terminals or parts in the wiring compartment, there shall be a marking, visible beside the terminal before connection, of either:	Complies	P
	a) the minimum temperature Rating and size of the cable to be connected to the TERMINALS; or	See below b)	N/A
	b) a marking to warn the installer to consult the installation instruction. Symbol 9 of Table D-1 is an acceptable marking	Symbol 9 marked on label	P
5.2	Warning markings	See below	P
5.2.1/RD	Visibility and legibility requirements for warning markings	Warning markings are be Visible and legible	P
	Warning markings shall be legible, and shall have minimum dimensions as follows:	See below	P





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Clause	Requirement + Test	Result - Remark	Verdict
	- Printed symbols shall be at least 2,75 mm high	Complies	P
	- Printed text characters shall be at least 1.5 mm high and shall contrast in colour with the background	Complies	P
	- Symbols or text that are moulded, stamped or engraved in a material shall have a character height of at least 2,0 mm, and if not contrasting in colour from the background, shall have a depth or raised height of at least 0,5 mm	No such symbols.	N/A
	If it is necessary to refer to the instruction manual to preserve the protection afforded by the equipment, the equipment shall be marked with symbol 9 of Annex C	The manual provide necessary information for the warning marking	P
	Symbol 9 of Annex C is not required to be used adjacent to symbols that are explained in the manual	All symbols are explained in the manual	P
5.2.2	Content for warning markings	See below	P
5.2.2.1/RD	Ungrounded heat sinks and similar parts	Grounded heatsink and metal enclosure	N/A
	An ungrounded heat sink or other part that may be mistaken for a grounded part and involves a risk of electric shock in accordance with 7.3 shall be marked with symbol 13 of Annex C, or equivalent. The marking may be on or adjacent to the heat sink and shall be clearly visible when the PCE is disassembled to the extent that a risk of contact with the heat sink exists.	See above cl. no. 5.2.2.1	N/A
5.2.2.2/RD	Hot Surfaces	See below	P
	A part of the PCE that exceeds the temperature limits specified in 4.3.2 shall be marked with symbol 14 of Annex C or equivalent.	The symbol 14 of Annex C provided on the warning label	P
5.2.2.3/RD	Coolant	No coolant contained within the equipment	N/A
	A unit containing coolant that exceeds 70 °C shall be legibly marked externally where readily visible after installation with symbol 15 of Annex C. The documentation shall provide a warning regarding the risk of burns from hot coolant, and either	See above cl. no. 5.2.2.3	N/A
	a) statement that coolant system servicing is to be done only by SERVICE PERSONNEL, or	See above cl. no. 5.2.2.3	N/A
	b) instructions for safe venting, draining, or otherwise working on the cooling system, if these operations can be performed without OPERATOR access to HAZARDS internal to the equipment	See above cl. no. 5.2.2.3	N/A
5.2.2.4/RD	Stored energy	See below	P
	Where required by 7.3.9.2 or 7.4.2 the PCE shall be marked with Symbol 21 of Annex C and the time to discharge capacitors to safe voltage and energy levels shall accompany the symbol.	Symbol 21 of annex C and " 5min " were provided on the label	P





URS PRODUCTS AND TESTING PRIVATE LIMITED

A-29, Sector-5, Noida-201301
 T +91 (120) 4516264-65 F +91 (120) 4750296
 E info@urs-labs.com W www.urs-labs.com
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Clause	Requirement + Test	Result - Remark	Verdict
5.2.2.5/RD	Motor guarding	No such devices	N/A
	Where required by 8.2 a marking shall be provided where it is visible to service personnel before removal of a guard, warning of the hazard and giving instructions for safe servicing (for example disconnection of the source before removing the guard).	See above	N/A
5.2.2.6	Inverters for closed electrical operating areas	Not located in closed electrical operating area	N/A
	Where required by 4.8.3.6, an inverter not provided with full protection against shock hazard on the PV array shall be marked with a warning that the inverter is only for use in a closed electrical operating area, and referring to the installation instructions.	See above cl. no. 5.2.2.6	N/A
5.2.3/RD	Sonic hazard markings and instructions	No sonic hazard	N/A
	If required by 10.2.1 a PCE shall:	See above cl. no. 5.2.3	N/A
	a) be marked to warn the operator of the sonic pressure hazard; o	See above cl. no. 5.2.3	N/A
	b) be provided with installation instructions that specify how the installer can ensure that the sound pressure level from equipment at its point of use after installation, will not reach a value, which could cause a hazard. These instructions shall include the measured sound pressure level, and shall identify readily available and practicable protective materials or measures which may be used.	User manual provided that noise emission ≤ 30 dBA	N/A
5.2.4/RD	Equipment with multiple sources of supply	No multiple source of supply used	N/A
	A PCE with connections for multiple energy sources shall be marked with symbol 13 of Annex C and the manual shall contain the information required in 5.3.4	See above cl. no. 5.2.4	N/A
	The symbol shall be located on the outside of the unit or shall be prominently visible behind any cover giving access to hazardous parts.	See above cl. no. 5.2.4	N/A
5.2.5/RD	Excessive touch current	See below	P
	Where required by 7.3.6.3.7 the PCE shall be marked with symbol 15 of Annex C. See also 5.3.2 for information to be provided in the installation manual.	Symbol 15 of Annex C Provided on the marking plate	P
5.3	Documentation	See below	P
5.3.1/RD	General	All related information's Provided in the user's manual.	P
	The documentation provided with the PCE shall provide the information needed for the safe operation, installation, and (where applicable) maintenance of the equipment. The documentation shall include the items required in 5.3.2 through 5.3.4, and the following:	See above cl. no. 5.3.1	P





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Clause	Requirement + Test	Result - Remark	Verdict
	a) explanations of equipment makings, including symbols used	See above cl. no. 5.3.1	P
	b) location and function of terminals and controls	See above cl. no. 5.3.1	P
	c) all ratings or specifications that are necessary to safely install and operate the PCE, including the following environmental ratings along with an explanation of their meaning and any resulting installation requirements:	See above cl. no. 5.3.1	P
	– ENVIRONMENTAL CATEGORY as per 6.1	Outdoor used	P
	– WET LOCATIONS classification for the intended external environment as per 6.1	Yes	P
	– POLLUTION DEGREE classification for the intended external environment as per 6.2	PD3	P
hh	– INGRESS PROTECTION rating as per 6.3	IP65	P
	– Ambient temperature and relative humidity ratings	(-)30°C-(+)60°C, (0%-100%)	P
	– MAXIMUM altitude rating	2000m	P
	– OVERVOLTAGE CATEGORY assigned to each input and output port as per 7.3.7.1.2, accompanied by guidance regarding how to ensure that the installation complies with the required overvoltage categories;	PV side (OVCI), AC side (OVCI)	P
	d) a warning that when the photovoltaic array is exposed to light, it supplies a d.c. voltage to the PCE	Considered	P
5.3.1.1/RD	Language	Instructions related to safety provided in english.	P
	Instructions related to safety shall be in a language that is acceptable in the country where the equipment is to be installed.	See above cl. No. 5.3.1.1	P
5.3.1.2/RD	Format	See below	P
	In general, the documentation must be provided in printed form and is to be delivered with the equipment.	Hardcopy provided with the equipment	P
	For equipment which requires the use of a computer for both installation and operation, documentation may be provided in electronic format without accompanying printed format.	Also provided in electronic format	P
5.3.2/RD	Information related to installation	All below related information's Provided in the user's manual.	P
	The documentation shall include installation and where applicable, specific commissioning instructions and, if necessary for safety, warnings against hazards which could arise during installation or commissioning of the equipment. The information provided shall include:	See above cl. no. 5.3.2	P
	a) assembly, location, and mounting requirements:	See above cl. no. 5.3.2	P





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	b) ratings and means of connection to each source of supply and any requirements related to wiring and external controls, colour coding of leads, disconnection means, or overcurrent protection needed, including instructions that the installation position shall not prevent access to the disconnection means;	See above cl. no. 5.3.2	P
	c) ratings and means of connection of any outputs from the PCE, and any requirements related to wiring and externals controls, colour coding of leads, or overcurrent protection needed;	See above cl. no. 5.3.2	P
	d) explanation of the pin-out of connectors for external connections, unless the connector is used for a standard purpose (e.g. RS 232)	See above cl. no. 5.3.2	P
	e) ventilation requirements;	See above cl. no. 5.3.2	P
	f) requirements for special services, for example cooling liquid;	No special service	N/A
	g) instructions and information relating to sound pressure level if required by 10.2.1;	No sound pressure hazard	N/A
	h) where required by 14.8.1.3, instructions for the adequate ventilation of the room or location in which PCE containing vented or valveregulated batteries is located, to prevent the accumulation of hazardous gases;	No battery used	N/A
	i) tightening torque to be applied to wiring terminals;	Provided	P
	j) values of backfeed short-circuit currents available from the PCE on input and output conductors under fault conditions, if those currents exceed the max. rated current of the circuit, as per 4.4.4.6	No backfeed short-circuit current	N/A
	k) for each input to the PCE, the max value of short-circuit current available from the source, for which the PCE is designed; and	Considered	P
	l) compatibility with RCD and RCM;	Provided	P
	m) instructions for protective earthing, including the information required by 7.3.6.3.7 if a second protective earthing conductor is to be installed:	Provided	P
	n) where required by 7.3.8, the installation instructions shall include the following or equivalent wording:	RCD is build in the EUT	P
	“This product can cause a d.c. current in the external protective earthing conductor. Where a residual current-operated protective (RCD) or monitoring (RCM) device is used for protection in a case of direct or indirect contact, only an RCD or RCM of Type B is allowed on the supply side of this product.”	See above	N/A





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Clause	Requirement + Test	Result - Remark	Verdict
	o) for PCE intended to charge batteries, the battery nominal voltage rating, size, and type	No battery used	N/A
	p) PV array configuration information, such as ratings, whether the array is to be grounded or floating, any external protection devices needed, etc.	Information given in user manual	P
5.3.2.1	Ratings : Subclause 5.3.2 of Part 1 requires the documentation to include ratings information for each input and output. For inverters this information shall be as in Table 33 below. Only those ratings that are applicable based on the type of inverter are required.	See below	P
	PV input quantities :	See below	P
	- Vmax PV (absolute maximum) (d.c. V)	580Vdc	P
	- PV input operating voltage range (d.c. V)	80-550Vdc	P
	- Maximum operating PV input current (d.c. A)	16A	P
	- Isc PV (absolute maximum) (d.c. A)	20A	P
	- Isc PV (absolute maximum) (d.c. A)	20A	P
	- Max. inverter backfeed current to the array (a.c. or d.c. A)	0A	P
	a.c. output quantities:	See below	P
	- Voltage (nominal or range) (a.c. V)	230Vac	P
	- Current (maximum continuous) (a.c. A)	28.26A	P
	- Current (inrush) (a.c. A, peak and duration)	29.6 A @ 1.24 ms	P
	- Frequency (nominal or range) (Hz)	50/60Hz	P
	- Power (maximum continuous) (W or VA)	6500W	P
	- Power factor range	0.8Lead..1..0.8Lag	P
	- Maximum output fault current (a.c. A, peak and duration or RMS)	45A @ 0.13ms	P
	- Maximum output overcurrent protection (a.c. A)	45A	P
	a.c. input quantities:	No a.c input	N/A
	- Voltage (nominal or range) (a.c. V)	See above	N/A
	- Current (maximum continuous) (a.c. A)	See above	N/A
	- Current (inrush) (a.c. A, peak and duration)	See above	N/A
	- Frequency (nominal or range) (Hz)	See above	N/A
	d.c input (other than PV) quantities:	No d.c input	N/A
	- Voltage (nominal or range) (d.c. V)	See above	N/A
	- Nominal battery voltage (d.c. V)	See above	N/A
	- Current (maximum continuous) (d.c. A)	See above	N/A
	d.c. output quantities:	No d.c output	N/A
	- Voltage (nominal or range) (d.c. V)	See above	N/A
	- Nominal battery voltage (d.c. V)	See above	N/A





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Clause	Requirement + Test	Result - Remark	Verdict
	- Current (maximum continuous) (d.c. A)	See above	N/A
	Protective class (I or II or III)	Class I	P
	Ingress protection (IP) rating per part 1	IP65	P
5.3.2.2	Grid-interactive inverter setpoints	See below	N/A
	For a grid-interactive unit with field adjustable trip points, trip times, or reconnect times, the presence of such controls, the means for adjustment, the factory default values, and the limits of the ranges of adjustability shall be provided in the documentation for the PCE or in other format such as on a website. Provided solution:	No adjustable setting available. Only the factory default values	N/A
	The setting of field adjustable setpoints shall be accessible from the PCE	See above	N/A
5.3.2.3	Transformers and isolation	Transformerless EUT	N/A
	whether an internal isolation transformer is provided, and if so, what level of insulation (functional, basic, reinforced, or double) is provided by that transformer. The instructions shall also indicate what the resulting installation requirements are regarding such things as earthing or not earthing the array, providing external residual current detection devices, etc	See above cl. no. 5.3.2.3	N/A
	An inverter shall be provided with information to the installer regarding:	See above cl. no. 5.3.2.3	N/A
	- providing of internal isolation transformer	See above cl. no. 5.3.2.3	N/A
	- the level of insulation (functional, basic, reinforced, or double)	See above cl. no. 5.3.2.3	N/A
	The instructions shall also indicate what the resulting installation requirements are regarding:	See above cl. no. 5.3.2.3	N/A
	- earthing or not earthing the array	See above cl. no. 5.3.2.3	N/A
	- providing external residual current detection devices	See above cl. no. 5.3.2.3	N/A
	- requiring an external isolation transformer,	See above cl. no. 5.3.2.3	N/A
5.3.2.4	Transformers required but not provided	Transformer less EUT	N/A
	An inverter that requires an external isolation transformer not provided with the unit, shall be provided with instructions that specify, and for the external isolation transformer with which it is intended to be used:	See above cl. no. 5.3.2.4	N/A
	- the configuration type	See above cl. no. 5.3.2.4	N/A
	- electrical ratings	See above cl. no. 5.3.2.4	N/A
	- environmental ratings	See above cl. no. 5.3.2.4	N/A
5.3.2.5	PV modules for non-isolated inverters	See below	P





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Clause	Requirement + Test	Result - Remark	Verdict
	Non-isolated inverters shall be provided with installation instructions that require PV modules that have an IEC 61730 Class A rating	Complies	P
	If the maximum AC mains operating voltage is higher than the PV array maximum system voltage then the instructions shall require PV modules that have a maximum system voltage rating based upon the AC mains voltage.	AC mains voltage not more than PV array maximum system voltage	N/A
5.3.2.6	Non-sinusoidal output waveform information	Grid connected inverter	N/A
	The instruction manual for a stand-alone inverter not complying with 4.7.5.2 shall include a warning that:	See above cl. no. 5.3.2.6	N/A
	- the waveform is not sinusoidal,	See above cl. no. 5.3.2.6	N/A
	- some loads may experience increased heating,	See above cl. no. 5.3.2.6	N/A
	- the user should consult the manufacturers of the intended load equipment before operating that load with the inverter	See above cl. no. 5.3.2.6	N/A
	The inverter manufacturer shall provide information regarding:	See above cl. no. 5.3.2.6	N/A
	- what types of loads may experience increased heating	See above cl. no. 5.3.2.6	N/A
	- recommendations for maximum operating times with such loads	See above cl. no. 5.3.2.6	N/A
	The inverter manufacturer shall specify for the waveforms as determined by the testing in 4.7.5.3.2 through 4.7.5.3.4.:	See above cl. no. 5.3.2.6	N/A
	- THD	See above cl. no. 5.3.2.6	N/A
	- slope	See above cl. no. 5.3.2.6	N/A
	- peak voltage	See above cl. no. 5.3.2.6	N/A
5.3.2.7	Systems located in closed electrical operating areas	Not located in the closed electrical operating area	N/A
	Where required by 4.8.3.6, an inverter not provided with full protection against shock hazard on the PV array shall be provided with installation instructions:	See above cl. no. 5.3.2.7	N/A
	- requiring that the inverter and the array must be installed in closed electrical operating areas	See above cl. no. 5.3.2.7	N/A
	- indicating which forms of shock hazard protection are and are not provided integral to the inverter (for example the RCD, isolation transformer complying with the 30 mA touch current limit, or residual current monitoring for sudden changes)	See above cl. no. 5.3.2.7	N/A
5.3.2.8	Stand-alone inverter output circuit bonding	Grid connected inverter	N/A
	Where required by 7.3.10, the documentation for an inverter shall include the following:	See above cl. no. 5.3.2.8	N/A
	- if output circuit bonding is required but is not provided integral to the inverter, the required means shall be described	See above cl. no. 5.3.2.8	N/A





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	in the installation instructions, including which conductor is to be bonded and the required current carrying capability or cross-section of the bonding means;		
	- if the output circuit is intended to be floating, the documentation for the inverter shall indicate that the output is floating.	See above cl. no. 5.3.2.8	N/A
5.3.2.9	Protection by application of RCD's	See below	N/A
	Where the requirement for additional protection in 4.8.3.1 is met by requiring an RCD that is not provided integral to the inverter, as allowed by 4.8.3.4, the installation instructions shall state the need for the RCD,.	The RCD protection is integrated with inverter	N/A
	and shall specify its rating, type, and required circuit location	The RCD protection is integrated with inverter	N/A
5.3.2.10	Remote indication of faults	See below	P
	The installation instructions shall include an explanation of how to properly make connections to (where applicable), and use, the electrical or electronic fault indicatio	RS485 connectivity provided	P
5.3.2.11	External array insulation resistance measurement and response	Clause 4.8.2.1 complies	N/A
	The installation instructions for an inverter for use with ungrounded arrays that does not incorporate all the aspects of the insulation resistance measurement and response requirements in 4.8.2.1, must include:	EUT incorporates array insulation resistance measurement	N/A
	- for isolated inverters: an explanation of what aspects of array insulation resistance measurement and response are not provided, and	See above cl. no. 5.3.2.11	N/A
	- an instruction to consult local regulations to determine if any additional functions are required or not;	See above cl. no. 5.3.2.11	N/A
	- for non-isolated inverters: an explanation of what external equipment must be provided in the system, and	See above cl. no. 5.3.2.11	N/A
	- what the setpoints and response implemented by that equipment must be, and:	See above cl. no. 5.3.2.11	N/A
	- how that equipment is to be interfaced with the rest of the system.	See above cl. no. 5.3.2.11	N/A
5.3.2.12	Array functional grounding information	No functional grounding	N/A
	Where approach a) of 4.8.2.2 is used, the installation instructions for the inverter shall include all of the following:	See above cl. no. 5.3.2.12	N/A
	a) the value of the total resistance between the PV circuit and ground integral to the inverter	See above cl. no. 5.3.2.12	N/A
	b) the minimum array insulation resistance to ground that system designer or installer must meet when selecting the PV panel and system design, based on the minimum value that the design of the PV functional grounding in the inverter was	See above cl. no. 5.3.2.12	N/A





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	based on		
	c) the minimum value of the total resistance $R = V_{MAX} / 30 \text{ mA}$ that the system must meet, with an explanation of how to calculate the total	See above cl. no. 5.3.2.12	N/A
	d) a warning that there is a risk of shock hazard if the total minimum resistance requirement is not met.	See above cl. no. 5.3.2.12	N/A
5.3.2.13	Stand-alone inverters for dedicated loads	Grid connected inverter	N/A
	Where the approach of 4.7.5.5 is used, the installation instructions for the inverter shall include a warning that the inverter is only to be used with the dedicated load for which it was evaluated, and	See above cl. no. 5.3.2.13	N/A
	shall specify the dedicated load.	See above cl. no. 5.3.2.13	N/A
5.3.2.14	Identification of firmware version(s)	The firmware version is displayed on LCD display	P
	An inverter utilizing firmware for any protective functions shall provide means to identify the firmware version.	See above cl. no. 5.3.2.14	P
	This can be a marking, but the information can also be provided by a display panel, communications port or any other type of user interface.....	See above cl. no. 5.3.2.14	P
6	Environmental requirements and conditions	See below	P
6.1/RD	Environmental categories and minimum environmental conditions	See below	P
6.1.1/RD	Outdoor	EUT is for outdoor use	P
6.1.2/RD	Indoor, unconditioned	EUT is for outdoor use	N/A
6.1.3/RD	Indoor, conditioned	EUT is for outdoor use	N/A
6.2/RD	Pollution degree	PD3	P
6.3/RD	Ingress Protection	IP65	P
6.4/RD	UV exposure	Certified connector used outside the enclosure	P
6.5/RD	Temperature and humidity	(-30°C to 60°C), (0%-100%)	P
7	Protection against electric shock and energy hazards	See below	P
7.1/RD	General	Both normal and single fault condition considered	P
7.2/RD	Fault conditions	See below	P
7.3	Protection against electric shock	See below	P
7.3.1/RD	General	See cl. no. 7.3.2.1	P
7.3.2/RD	Decisive voltage classification	See below	P
7.3.2.1/RD	Use of decisive voltage class (DVC)	Working voltage and protective measures are considered.	P
7.3.2.2/RD	Limits of DVC (according table 6)	Considered	P





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7.3.2.3/RD	Short-terms limits of accessible voltages under fault conditions	Voltage not exceeding at DVC under fault	N/A
7.3.2.4/RD	Requirements for protection (according table 7)	Complies	P
7.3.2.5/RD	7.3.2.5/RD Connection to PELV and SELV circuits	The external signal communication interface are considered as SELV	P
7.3.2.6/RD	Working voltage and DVC	See below	P
7.3.2.6.1/RD	General	Considered	P
7.3.2.6.2/RD	AC working voltage (see Figure 2)	Considered	P
7.3.2.6.3/RD	DC working voltage (see Figure 3)	Considered	P
7.3.2.6.4/RD	Pulsating working voltage (see Figure 4)	Not considered	N/A
7.3.3/RD	Protective separation	See below	P
	Protective separation shall be achieved by:	See below	P
	- double or reinforced insulation, or	Double or reinforced insulation was provided	P
	- protective screening, i.e. by a conductive screen connected to earth by protective bonding in the PCE, or connected to the protective earth conductor itself, whereby the screen is separated from live parts by at least basic insulation, or	All accessible metal parts were earthed and separated from live parts by at least basic insulation	P
	- protective impedance comprising limitation of current per 7.3.5.3 and of discharged energy per 7.3.5.4, or	No such device	N/A
	- limitation of voltage according to 7.3.5.4.	No such device	N/A
	The protective separation shall be fully and effectively maintained under all conditions of intended use of the PCE	Complies	P
7.3.4/RD	Protection against direct contact	See below	P
7.3.4.1/RD	General	See below	P
	Protection against direct contact is employed to prevent persons from touching live parts that do not meet the requirements of 7.3.5 and shall be provided by one or more of the measure given in 7.3.4.2 (enclosures and barriers) and 7.3.4.3 (insulation).	Complies with the required of cl. No. 7.3.4.2 and 7.3.4.3.	P
	Open type sub-assemblies and devices do not require protective measures against direct contact but the instruction provided with the equipment must indicate that such measures must be provided in the end equipment or in the installation.	No such device	N/A
	Product intended for installation in CLOSED ELECTRICAL OPERATING AREAS, (see 3.9) need not have protective measures against direct contact, except as required by 7.3.4.2.4.	No such device	N/A
7.3.4.2/RD	Protection by means of enclosures and barriers	See below	P
	The following requirements apply where protection against contact with live parts is provided by enclosures or barriers,	Enclosure provided	P





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A-29, Sector-5, Noida-201301
 T +91 (120) 4516264-65 F +91 (120) 4750296
 E info@urs-labs.com W www.urs-labs.com
 CIN NO U21014UP1987PTC008956



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	not by insulation in accordance with 7.3.4.3		
7.3.4.2.1/RD	General	See below	P
	Parts of enclosures and barriers that provide protection in accordance with these requirements shall not be removable without the use of a tool (see 7.3.4.2.3).	Not removable without a tool and secured by screw.	P
	Polymeric materials used to meet these requirements shall also meet the requirements of 13.6	Certified connector used outside the enclosure and meeting the requirements of cl. 13.6.	P
7.3.4.2.2 / RD	Access probe criteria	See below	P
	Protection is considered to be achieved when the separation between the test probes and live parts, when tested as described below, is as follows:	Complies	P
	a) decisive voltage classification A, (DVC A) - the probe may touch the live parts	The communication interface is considered as DVC A and probe may touch such parts.	P
	b) decisive voltage classification B, (DVC B) - the probe must not touch bare live parts	The DVC B circuit is not accessible by probe.	P
	c) decisive voltage classification C, (DVC C) – the probe must have adequate clearance to live parts, based on the clearance for Basic insulation using the recurring peak working voltage involved,	The DVC C circuit is not accessible by probe	P
7.3.4.2.3/RD	Access probe tests	See below	P
	Compliance with 7.3.4.2.1 is checked by all of the following:	Complies	P
	a) Inspection; and	Complies	P
	b) Tests with the test finger (Figure D.1) and test pin (Figure D.2) of 0E, the results of which shall comply with the requirements of 7.3.4.2.1 a), b), and c) as applicable. Probe tests are performed on openings in the enclosures after removal of parts that can be detached or opened by an operator without the use of a tool, including fuseholders, and with operator access doors and covers open. It is permitted to leave lamps in place for this test. Connectors that can be separated by an operator without use of a tool, shall also be tested during and after disconnection. Any movable parts are to be put in the most unfavourable position.	Complies	P
	The test finger and the test pin are applied as above, without appreciable force, in every possible position, except that floor-standing equipment having a mass exceeding 40 kg is not tilted	Complies	P
	Equipment intended for building-in or rack mounting, or for incorporation in larger equipment, is tested with access to the equipment limited according to the method of mounting detailed in the installation instructions.	Not a building-in and rack mounting equipment	N/A





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	c) Openings preventing the entry of the jointed test finger (Figure E-1 of 0E) during test b) above, are further tested by means of straight unjointed test finger (Figure E-3 of 0E), applied with a force of 30 N. If the unjointed finger enters, the test with the jointed finger is repeated except that the finger is applied using any necessary force up to 30 N.	Complies	P
	d) In addition to a) – c) above, top surfaces of enclosure shall be tested with the IP3X probe of IEC 60529. The test probe shall not penetrate the top surface of the enclosure when probed from the vertical direction $\pm 5^\circ$ only.	No opening in top surfaces	N/A
7.3.4.2.4/RD	Service access areas	The EUT is not allowed to remove the covers during installation and maintenance when EUT energized. Symbol 21 of Annex C are marked on EUT and explained in user manual.	N/A
7.3.4.3/RD	Protection by means of insulation of live parts	Complies	P
	Where the requirements of 7.3.4.2 are not met, live parts shall be provided with insulation if:	Communication ports provided with decisive voltage class A.	P
	– their working voltage is greater than the maximum limit of decisive voltage class A, or	See above	P
	– for a DVC A or B circuit, protective separation from adjacent circuit of DVC C is not provided (see note “†” under Table 7)	See above	P
7.3.5/RD	Protection in case of direct contact	See below	P
	Protection in case of direct contact is required to ensure that contact with live parts does not produce a shock hazard.	Complies	P
	The protection against direct contact according to 7.3.4 is not required if the circuit contacted is separated from other circuits according to 7.3.2.3, and:	See below	P
	– is of decisive voltage class A and complies with 7.3.5.2, or	Only DVC-A classified circuits can be touch directly	P
	– is provided with protective impedance according to 7.3.5.3, or	No such parts	N/A
	– is limited in voltage according to 7.3.5.4	No such parts	N/A
	In addition to the measures as given in 7.3.5.2 to 7.3.5.4, it shall be ensured that in the event of error or polarity reversal of connectors no voltages that exceed DVC A can be connected into a circuit with protective separation. This applies for example to plug-in-sub-assemblies or other plug-in devices which can be plugged-in without the use of a tool (key) or which are accessible without the use of a tool.	Complies	P
	Compliance is checked by visual inspection and trial insertion.	Complies	P





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7.3.5.2/RD	Protection using decisive voltage class A	Complies	P
7.3.5.3/RD	Protection by means of protective impedance	No such parts	N/A
	Circuits and conductive parts do not require protection against direct contact if any connection to circuits of DVCB or DVC-C is through protective impedance, and the accessible circuit or part is otherwise provided with protective separation from circuits of DVC-B or DVC-C according 7.3.3	See above cl. no. 7.3.5.3	N/A
7.3.5.3.1/RD	Limitation of current through protective impedance	No such parts	N/A
	The current available through protective impedance to earth and between simultaneously accessible parts, measured at the accessible live parts, shall not exceed a value of 3,5 mA a.c. or 10 mA d.c. under normal and single-fault conditions.	See above cl. no. 7.3.5.3.1	N/A
7.3.5.3.2 /RD	Limitation of discharging energy through protective impedance	No such parts	N/A
	The discharging energy available between simultaneously accessible parts protected by protective impedance shall not exceed the charging voltage and capacitance limits given in Table 9, which applies to both wet and dry locations, under normal and single fault conditions. Refer to figure 8	See above cl. no. 7.3.5.3.2	N/A
7.3.5.4/RD	Protection by means of limited voltages	No such parts	N/A
	That portion of a circuit that has its voltage reduced to DVC-A by a voltage divider that complies with the following requirements, and that is otherwise provided with protective separation from circuits of DVC-B or DVCC according to 7.3.3, does not require protection against direct contact.	See above cl. no. 7.3.5.4	N/A
	The voltage divider shall be designed so that under normal and single fault conditions, including faults in the voltage division circuit, the voltage across the output of the voltage divider does not exceed the limit for DVC-A.	See above cl. no. 7.3.5.4	N/A
	This type of protection shall not be used in case of protective class II or unearthed circuits, because it relies on protective earth being connected.	See above cl. no. 7.3.5.4	N/A
7.3.6/ RD	Protection against indirect contact	See below	P
7.3.6.1/ RD	General	See below	P
	Protection against indirect contact is required to prevent shock- hazardous current being accessible from conductive parts during an insulation failure. This protection shall comply with the requirements for protective class I (basic insulation plus protective earthing), class II (double or reinforced insulation) or class III (limitation of voltages)	Protective Class I	P





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Clause	Requirement + Test	Result - Remark	Verdict
	That part of a PCE meets the requirements of 7.3.6.2 and 7.3.6.3 is defined as protective class I	Class I	P
	That part of a PCE meets the requirements of 7.3.6.4 is defined as protective class II.	Class I	N/A
	That part of PCE which meets the requirements of decisive voltage class A and in which no hazardous voltages are derived, is defined as protective class III. No shock hazard is present in such circuits	Class I	N/A
	Where protection against indirect contact is dependent on means provided during installation, the installation instructions shall provide details of the required means and shall indicate the associated hazards.	Information provided	P
7.3.6.2/ RD	Insulation between live parts and accessible conductive parts	See below	P
	Accessible conductive parts of equipment shall be separated from live parts by insulation meeting the requirements of Table 7 or by clearances as specified in 7.3.7.4 and creepages as specified in 7.3.7.5	Complies. See Cl. 7.3.7.4 and Cl. 7.3.7.5	P
7.3.6.3 / RD	Protective class I – Protective bonding and earthing	See below	P
7.3.6.3.1/ RD	General	See below	P
	Equipment of protective class I shall be provided with protective earthing, and with protective bonding to ensure electrical contact between accessible conductive parts and the means of connection for the external protective earthing conductor, except bonding is not required for:	External protective earthing is to be connected to terminal near AC terminal block, refer to installation manual	P
	a) accessible conductive parts that are protected by one of the measures in 7.3.5.2 to 7.3.5.4, or	DVC A circuit considered	P
	b) accessible conductive parts are separated from live parts of DVC-B or -C using double or reinforced insulation.	Communication circuit are separated from live parts used doubled or reinforced insulation	P
7.3.6.3.2/RD	Requirements for protective bonding	See below	P
	Electrical contact with the means of connection of the external protective earthing conductor shall be achieved by one or more of the following means:	See below	P
	a) through direct metallic contact;	The connection of external protective earthing conductor is direct metal contact via terminal with screw.	P
	b) through other conductive parts which are not removed when the PCE or sub-units are used as intended ;	See above a)	N/A
	c) through a dedicated protective bonding conductor;	Complies	P
	d) through other metallic components of the PCE	See above a)	N/A
	Where direct metallic contact is used and one or both of the parts involved is painted or coated, the paint or coating shall be removed in the area of contact, or reliably penetrated, to	No painted and coated	N/A





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Clause	Requirement + Test	Result - Remark	Verdict
	ensure metal to metal contact.		
	For moving or removable parts, hinges or sliding contacts designed and maintained to have a low resistance are examples of acceptable means if they comply with the requirements of 7.3.6.3.3.	No such parts	N/A
	Metal ducts of flexible or rigid construction and metallic sheaths shall not be used as protective bonding conductors, unless the device or material has been investigated as suitable for protective bonding purposes.	No such parts	N/A
7.3.6.3.3/ RD	Rating of protective bonding	See below	P
	Protective bonding shall withstand the highest thermal and dynamic stresses that can occur to the PCE item(s) concerned when they are subjected to a fault connecting live parts to accessible conductive parts. The protective bonding shall remain effective for as long as a fault to the accessible conductive parts persists or until an upstream protective device removes power from the part.	Complies	P
	Protective bonding shall meet following requirements:	See below	P
	a) For PCE with an overcurrent protective device rating of 16 A or less, the impedance of the protective bonding means shall not exceed 0,1 Ω during or at the end of the test below	>16A	N/A
	b) For PCE with an overcurrent protective device rating of more than 16 A, the voltage drop in the protective bonding test shall not exceed 2,5 V during or at the end of the test below.	Complies	P
	As alternative to a) and b) the protective bonding may designed according to the requirements for the external protective earthing conductor in 7.3.6.3.5, in which case no testing is required.	Above test is carried out	N/A
	The impedance of protective bonding means shall be checked by passing a test current through the bond for a period of time as specified below. The test current is based on the rating of the overcurrent protection for the equipment or part of the equipment under consideration, as follows:	Complies	P
	a) For pluggable equipment type A, the overcurrent protective device is that provided external to the equipment (for example, in the building wiring, in the mains plug or in an equipment rack);	Not pluggable equipment type A	N/A
	b) For pluggable equipment type B and fixed equipment, the maximum rating of the overcurrent protective device specified in the equipment installation instructions to be provided external to the equipment;	Not pluggable equipment type B	N/A





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Clause	Requirement + Test	Result - Remark	Verdict
	c) For a circuit or part of the equipment for which an overcurrent protective device is provided as part of the equipment, the rating of the provided overcurrent device.	Complies	P
7.3.6.3.3.1/RD	Test current, duration, and acceptance criteria	See below	P
	The test current, duration of the test and acceptance criteria are as follows:	See below	P
	The test current, duration of the test and acceptance criteria are as follows:	See below	P
	a) For PCE with an overcurrent protective device rating of 16 A or less, the test current is 200% of the overcurrent protective device rating, but not less than 32 A, applied for 120s. The impedance of the protective bonding means during and at the end of the test shall not exceed 0,1 Ω .	See below b	N/A
	b) For PCE with an overcurrent protective device rating of more than 16 A, the test current is 200% of the overcurrent protective device rating and the duration of the test is as shown in Table 10 below. The voltage drop in the protective bonding means, during and at the end of the test, shall not exceed 2,5 V.	Complies (see appended table 7.3.6.3.3)	P
	c) During and after the test, there shall be no melting, loosening, or other damage that would impair the effectiveness of the protective bonding means.	The EUT passed the test after the requirements of this standard.	P
	The test current is derived from an a.c or d.c supply source, the output of which is not earthed.	Complies	P
	As an alternative to Table 10, where the timecurrent characteristic of the overcurrent protective device that limits the fault current in the protective bonding means is known because the device is either provided in the equipment or fully specified in the installation instructions, the test duration may be based on that specific device's time-current characteristic,. The tests are conducted for a duration corresponding to the 200% current value on the time-current characteristic	No such application	N/A
7.3.6.3.4/RD	Protective bonding impedance (routine test)	See above	N/A
	If the continuity of the protective bonding is achieved at any point by a single means only (for example a single conductor or single fastener), or if the PCE is assembled at the installation location, then the impedance of the protective bonding shall also be tested as a routine test. The test shall be as in 7.3.6.3.3, except for the following:	See above	N/A
	- the test current may be reduced to any convenient value greater than 10 A sufficient to allow measurement or calculation of the impedance of the protective bonding	See above	N/A





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Clause	Requirement + Test	Result - Remark	Verdict
	means:		
	- the test duration may be reduced to no less than 2 s	See above	N/A
	For equipment subject to the type test in 7.3.6.3.3.1a), the impedance during the routine test shall not exceed 0,1Ω.	See above	N/A
7.3.6.3.4/RD 5	For equipment subject to the type test in 7.3.6.3.3.1b) the impedance during the routine test shall not exceed 2,5 V divided by the test current required by 7.3.6.3.3.1b).	See above	N/A
7.3.6.3.5/ RD	External protective earthing conductor	See below	P
	A protective earthing conductor shall be connected at all times when power is supplied to PCE of protective class I. Unless local wiring regulations state otherwise, the protective earthing conductor cross-sectional area shall be determined from Table 11 or by calculation according to IEC 60364-5-54.	Instruction regarding connection of earthing conductor provided in user manual.	P
	If the external protective earthing conductor is routed through a plug and socket or similar means of disconnection, it shall not be possible to disconnect it unless power is simultaneously removed from the part to be protected.	No such construction.	N/A
	- 2,5 mm ² if mechanical protection is provided;	See below	N/A
	- 4 mm ² if mechanical protection is not provided.	Refer user manual.	P
	For cord-connected equipment, provisions shall be made so that the external protective earthing conductor in the cord shall, in the case of failure of the strain-relief mechanism, be the last conductor to be interrupted	Not a cord-connected equipment	N/A
7.3.6.3.6/ RD	Means of connection for the external protective earthing conductor	External protective earthing conductor connected to enclosure body	P
7.3.6.3.6.1 / RD	General	Properly connected	P
	The means of connection for the protective earthing conductor shall be permanently marked with:	See below	P
	- symbol 7 of Annex C; or	Earthing symbol marked	P
	- the colour coding green-yellow	See above	N/A
	Marking shall not be done on easily changeable parts such as screws.	Complies	P
7.3.6.3.7/ RD	Touch current in case of failure of the protective earthing conductor	See below	P
	For pluggable equipment type A, the touch current measured in accordance with 7.5.4 shall not exceed 3,5 mA a.c. or mA d.c.	Not a pluggable equipment type A	P
	For all other PCE, one or more of the following measure shall be applied, unless the touch current measured in accordance with 7.5.4 using the test network of IEC 60990 test figure 4 shall not exceed 3,5 mA a.c. or 10 mA d.c.	Not exceeding the limit of 3.5mA a.c. (See appended table 7.3.6.3.7)	P





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	a) Permanently connected wiring, and:	See above	N/A
	- a cross-section of the protective earthing conductor of at least 10 mm ² Cu or 16 mm ² Al; or	See above	N/A
	- automatic disconnection of the supply in case of discontinuity of the protective earthing conductor; or	See above	N/A
	- provision of an additional terminal for a second protective earthing conductor of the same cross-sectional area as the original protective earthing conductor and installation instruction requiring a second protective earthing conductor to be installed or	See above	N/A
	b) Connection with an industrial connector according to IEC 60309 and a minimum protective earthing conductor cross-section of 2,5 mm ² as part of a multi-conductor power cable. Adequate strain relief shall be provided.	See above	N/A
7.3.6.4/ RD	Protective Class II – Double or Reinforced Insulation	Protective Class I	N/A
	Equipment or parts of equipment designed for protective class II shall have insulation between live parts and accessible surfaces in accordance with 7.3.4.3. The following requirements also apply:	No such application	N/A
	- Equipment designed to protective class II shall not have means of connection for the external protective earthing conductor. However this does not apply if the external protective earthing conductor is passed through the equipment to equipment series-connected beyond it. In the latter event, the external protective earthing conductor and its means for connection shall be insulated with basic insulation from the accessible surface of the equipment and from circuits that employ protective separation, extra-low voltage, protective impedance and limited discharging energy, according to 7.3.5. This basic insulation shall correspond to the rated voltage of the seriesconnected equipment;	No such application	N/A
	- metal-encased equipment of protective class II may have provision on its enclosure for the connection of an equipotential bonding conductor;	No such application	N/A
	- equipment of protective class II may have provision for the connection of an earthing conductor for functional reasons or for damping of overvoltages; it shall, however, be insulated as though it is a live part;	No such application	N/A
	- equipment employing protective class II shall be marked according to 5.1.8.	No such application	N/A
7.3.7/RD	Insulation Including Clearance and Creepage Distance	See below	P
7.3.7.1/RD	General	Considered	P





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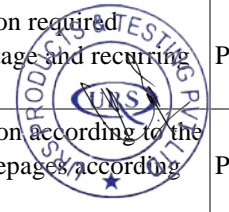
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	Insulation shall be selected after consideration of the following influences:	Considered	P
	pollution degree	PD3	P
	overvoltage category	The mains circuit: III, PV circuit : II	P
	supply earthing system	For TN system only.	P
	insulation voltage	insulation voltage Considered	P
	location of insulation	Considered	P
	type of insulation	Considered	P
	Compliance of insulation, creepage distances, and clearance distances, shall be verified by measurement or visual inspection, and the tests of 7.5.	Considered	P
7.3.7.1.3/RD	Supply earthing systems	See below	P
	Three basic types of earthing system are described in IEC 60364-1. They are:	See below	P
	TN system: has one point directly earthed, the accessible conductive parts of the installation being connected to that point by protective conductors. Three types of TN systems, TN-C, TN-S and TN-C-S, are defined according to the arrangement of the neutral and protective conductor.	For TN system only	P
	TT system: has one point directly earthed, the accessible conductive parts of the installation being connected to earth electrodes electrically independent of the earth electrodes of the power system;	See above	N/A
	IT system: has all live parts isolated from earth or one point connected to earth through an impedance, the accessible conductive parts of the installation being earthed independently or collectively to the earthing system.	See above	N/A
7.3.7.1.4 /RD	Insulation voltages	PV supply circuits: 6000V (VMAX PV : 1100VDC) AC mains circuits: 4000V (Rated: 230Vac)	P
7.3.7.2/RD	Insulation between a circuit and its surroundings	See below	P
7.3.7.2.1 / RD	General	Considered	P
7.3.7.2.2 / RD	Circuits connected directly to the mains	Clearances and solid insulation required according to the impulse voltage, temporary overvoltage, or working voltage, whichever gives the most severe requirement.	P
7.3.7.2.3/ RD	Circuits other than mains circuits	Clearances and solid insulation required according to the impulse voltage and recurring peak voltage.	P
7.3.7.2.4/RD	Insulation between circuits	Clearances and solid insulation according to the higher impulse voltages. Creepages according to the r.m.s. working voltage	P





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7.3.7.3/ RD	Functional insulating	Considered	P
7.3.7.4/RD	Clearance distances	See appended table 7.3.7.4	P
7.3.7.4.1/RD	Determination	Altitude: 2000m.	P
7.3.7.4.2 /RD	Electric field homogeneity	Not considered	N/A
7.3.7.4.3/RD	Clearance to conductive enclosures	Refer to subclause 7.3.7.4.1 and 13.7.	P
7.3.7.5/RD	Creepage distances	See appended table 7.3.7.5	P
7.3.7.5.1 /RD	General	See below	P
7.3.7.5.2 / RD	Voltage	The max. voltage: (230V)/1100Vdc	P
7.3.7.5.3/ RD	Materials	Insulating material group IIIb	P
7.3.7.6/ RD	Coating	No such parts	N/A
7.3.7.7/ RD	PWB spacings for functional insulating	Certified PCB used	P
7.3.7.8/ RD	Solid insulating	Certified component used	P
7.3.7.8.1/ RD	General	See above cl. no. 7.3.7.8	P
7.3.7.8.2/ RD	Requirements for electrical withstand capability of solid insulation	See below	P
7.3.7.8.2.1/ RD	Basic, supplemental, reinforced, and double insulation	Passed the impulse withstand voltage and a.c. or d.c. voltage tests.(See appended table 7.5.1, 7.5.2 & 7.5.3)	P
7.3.7.8.2.2/ RD	Functional insulation	Complies	P
7.3.7.8.3/ RD	Thin sheet or tape material	See below	P
7.3.7.8.3.1/RD	General	The transformer primary and secondary windings were separated by thin insulation sheet	P
7.3.7.8.3.2/ RD	Material thickness not less than 0,2 mm	See appended table 7.3.7	P
7.3.7.8.3.3/ RD	Material thickness less than 0,2 mm	Not used.	N/A
7.3.7.8.3.4/ RD	Compliance	See appended table 7.5.1, 7.5.2 & 7.5.3	P
7.3.7.8.4/ RD	Printed wiring boards	Certified PCB used	P
7.3.7.8.4.1/ RD	General	See above cl. no. 7.3.7.8.4	P
7.3.7.8.4.2/ RD	Use of coating materials	No coating material used.	N/A
7.3.7.8.5/ RD	Wound components	No such wound components.	N/A
7.3.7.8.6/ RD	Potting materials	No potting material used	N/A
7.3.7.9/ RD	Insulation requirements above 30 kHz	Considered	P
7.3.8/ RD	Residual Current-operated protective (RCD) or monitoring (RCM) device compatibility	The RCD is inbuilt within EUT	P
7.3.9/ RD	Protection against shock hazard due to stored energy	Considered	P
7.3.9.1/ RD	Operator access area	See below	P
	Equipment shall be so designed that there is no risk of electric shock in operator access areas from charge stored on capacitors after disconnection of the PCE.	The pins of connector cannot be touch by finger due to design protection	P





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A-29, Sector-5, Noida-201301
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Clause	Requirement + Test	Result - Remark	Verdict
7.3.9.2/RD	Service access areas	See below	P
	Capacitors located behind panels that are removable for servicing, installation, or disconnection shall present no risk of electric shock or energy hazard from charge stored on capacitors after disconnection of the PCE.	The symbol 21 of annex C with 5min was provided on the label.	P
7.3.10	Additional requirements for stand-alone inverters	Not a stand-alone inverter	N/A
	One circuit conductor bonded to earth to create a grounded conductor and an earthed system.	See above cl. no. 7.3.10	N/A
	The means used to bond the grounded conductor to protective earth provided within the inverter or	See above cl. no. 7.3.10	N/A
	as part of the installation	See above cl. no. 7.3.10	N/A
	If not provided integral to the inverter, the required means shall be described in the installation instructions as per 5.3.2.8.	See above cl. no. 7.3.10	N/A
	The means used to bond the grounded conductor to protective earth shall comply with the requirements for protective bonding in Part 1,	See above cl. no. 7.3.10	N/A
	If the bond can only ever carry fault currents in standalone mode, the maximum current for the bond is determined by the inverter maximum output fault current.	See above cl. no. 7.3.10	N/A
	Output circuit bonding arrangements shall ensure that in any mode of operation, the system only has the grounded circuit conductor bonded to earth in one place at a time..	See above cl. no. 7.3.10	N/A
	Switching arrangements may be used, in which case the switching device used is to be subjected to the bond impedance test along with the rest of the bonding path	See above cl. no. 7.3.10	N/A
	Inverters intended to have a circuit conductor bonded to earth shall not impose any normal current on the bond except for leakage current.	See above cl. no. 7.3.10	N/A
	Outputs that are intentionally floating with no circuit conductor bonded to ground, must not have any voltages with respect to ground that are a shock hazard in accordance with Clause 7 of Parts 1 and 2.	See above cl. no. 7.3.10	N/A
	The documentation for the inverter shall indicate that the output is floating as per 5.3.2.8.	See above cl. no. 7.3.10	N/A
7.3.11	Functionally grounded arrays	No such parts	N/A
	All PV conductors in a functionally grounded array shall be treated as being live parts with respect to protection against electric shock.	No such parts	N/A
7.4/RD	Protection against energy hazards	See below	P
7.4.1/RD	Determination of hazardous energy level	Hazardous energy level not present	N/A
	A hazardous energy level is considered to exist if	See below	N/A





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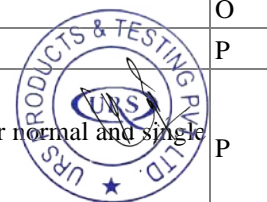
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Clause	Requirement + Test	Result - Remark	Verdict
	a) The voltage is 2 V or more, and power available after 60 s exceeds 240 VA.	No such hazardous energy level exist.	N/A
	b) The stored energy in a capacitor is at a voltage. U of 2 V or more, and the stored energy. E, calculated from the following equation, exceeds 20J: $E = 0,5 CU^2$	No such hazardous energy level exist.	N/A
7.4.2/ RD	Operator Access Areas	See below	P
	Equipment shall be so designed that there is no risk of energy hazard in operator access areas from accessible circuits.	All hazardous energy parts were enclosed within earthed heat sink	P
7.4.3/ RD	Services Access Areas	The symbol 21 of annex C with 5 min was provided on the label	P
7.5/ RD	Electrical tests related to shock hazard	See below	P
7.5.1/ RD	Impulse voltage test (type test)	During the test no puncture, flashover, or spark over occurs. (See appended table 7.5)	P
7.5.2/ RD	Voltage test (dielectric strength test)	See below	P
7.5.2.1 / RD	Purpose of test	To verify the clearances and solid insulation and of assembled PCE has adequate dielectric strength to resist overvoltage's	P
7.5.2.2/ RD	Value and type of test voltage	See appended table 7.5	P
7.5.2.3/ RD	Humidity pre-conditioning	Test performed as per cl. no. 4.5	P
7.5.2.4 / RD	Performing the voltage test	See appended table 7.5	P
7.5.2.5/ RD	Duration of the a.c. or d.c. voltage test	Tested for 60s	P
7.5.2.6/ RD	Verification of the a.c. or d.c. voltage test	No electrical breakdown occurs and no abnormal current flow during the test	P
7.5.3/ RD	Partial discharge test	Certified component used	P
7.5.3/ RD	Partial discharge test	Certified component used	P
7.5.4/ RD	Touch current measurement (type test)	See below	P
	The touch current shall be measured if required by 7.3.6.3.7 and shall not be greater than 3.5 mA a.c. or 10 mA d.c. or special measures of protection as given in 7.3.6.3.7 are required.	See appended table 7.3.6.3.7	P
	For type tests on PCE for which wet locations requirements apply according to 6.1, the humidity preconditioning of 4.5 shall be performed immediately prior to the touch current test	See appended table 7.3.6.3.7	P
7.5.5/RD	Equipment with multiple sources of supply	No multiple source of supply used	N/A
8	Protection against mechanical hazards	See below	O
8.1/ RD	General	See below	P
	Operation shall not lead to a mechanical HAZARD in NORMAL CONDITION or SINGLE FAULT CONDITION. Edges, projections, corners, openings, guards, handles and the like, that are accessible to the operator shall be smooth	No mechanical hazards under normal and single Fault condition	P





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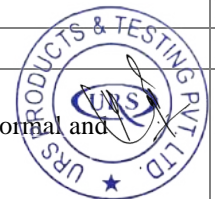
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Clause	Requirement + Test	Result - Remark	Verdict
	and rounded so as not to cause injury during normal use of the equipment.		
	Conformity is checked as specified in 8.2 to 8.6	See 8.2 to 8.6	P
8.2/ RD	Moving parts	See below	P
	Moving parts shall not be able to crush, cut or pierce parts of the body of an OPERATOR likely to contact them, nor severely pinch the OPERATOR's skin. Hazardous moving parts of equipment, that is moving parts which have the potential to cause injury, shall be so arranged, enclosed or guarded as to provide adequate protection against the risk of personal injury.	No moving parts are accessible from outside	P
8.2.1/ RD	Protection of service persons	No such parts	N/A
	Protection shall be provided such that unintentional contact with hazardous moving parts is unlikely during servicing operations. If a guard over a hazardous moving part may need to be removed for servicing, the marking of symbol 15 of Table D-1 shall be applied on or near the guard.	See above cl. no. 8.2.1	N/A
8.3/ RD	Stability	The EUT for wall mounting	N/A
	Equipment and assemblies of equipment not secured to the building structure before operation shall be physically stable in NORMAL USE.	See above cl. no. 8.3	N/A
8.4/ RD	Provisions for lifting and carrying	See below	P
	If carrying handles or grips are fitted to, or supplied with, the equipment, they shall be capable of withstanding a force of four times the weight of the equipment	After the test there shall not be break loose from the equipment and there shall not be any permanent distortion, cracking or other evidence of failure	P
	Equipment or parts having a mass of 18 kg or more shall be provided with a means for lifting and carrying or directions shall be given in the manufacturer's documentation.	Refer user manual	P
8.5/ RD	Wall mounting	See below	P
	Mounting brackets on equipment intended to be mounted on a wall or ceiling shall withstand a force of four times the weight of the equipment.	No any damage after the test	P
8.6/RD	Expelled parts	See below	N/A
	Equipment shall contain or limit the energy of parts that could cause a HAZARD if expelled in the event of a fault.	No such parts	N/A
9	Protection against fire hazards	See below	P
9.1/ RD	Resistance to fire	Considered	P
	This subclause specifies requirements intended to reduce the risk of ignition and the spread of flame, both within the equipment and to the outside, by the appropriate use of materials and components and by suitable construction.	Components are verified at normal and abnormal tests	P





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Clause	Requirement + Test	Result - Remark	Verdict
9.1.1/RD	Reducing the risk of ignition and spread of flame	Use of material with required flammability classes	P
	For equipment or a portion of equipment, there are two alternative methods of providing protection against ignition and spread of flame that could affect materials, wiring, wound components and electronic components such as integrated circuits, transistors, thyristors, diodes, resistors and capacitors.	Method 1 is used	P
9.1.2/RD	Conditions for a fire enclosure	See below	P
	A FIRE ENCLOSURE is required for equipment or parts of equipment for which Method 2 is not fully applied and complied with.	Fire enclosure is used	P
9.1.2.1/ RD	Parts requiring a fire enclosure	See below	P
	Except where Method 2 is used, or as permitted in 9.1.2.2, the following are considered to have a risk of ignition and, therefore, require a FIRE ENCLOSURE:	Considered	P
	- components in PRIMARY CIRCUITS	Considered	P
	- components in SECONDARY CIRCUITS supplied by power sources which exceed the limits for a LIMITED POWER SOURCE as specified in 9.2;	Considered	P
	- components in SECONDARY CIRCUITS supplied by a LIMITED POWER SOURCE as specified in 9.2, but not mounted on a material of FLAMMABILITY CLASS V-1;	No such devices	N/A
	- components within a power supply unit or assembly having a limited power output complying with the criteria for a LIMITED POWER SOURCE as specified in 9.2, including overcurrent protective devices, limiting impedances, regulating networks and wiring, up to the point where the LIMITED POWER SOURCE output criteria are met;	No such devices	N/A
	- components having unenclosed arcing parts, such as open switch and relay contacts and commutators, in a circuit at HAZARDOUS VOLTAGE or at a HAZARDOUS ENERGY LEVEL; and	No such devices	N/A
	- insulated wiring, except as permitted in 9.1.2.2	No such devices	N/A
9.1.2.2/ RD	Parts not requiring a fire enclosure	Connectors.	P
9.1.3/RD	Materials requirements for protection against fire hazard	See below	P
9.1.3.1/RD	General	See below	P
9.1.3.1/RD 1	ENCLOSURES, components and other parts shall be so constructed, or shall make use of such materials, that the propagation of fire is limited.	Metal enclosure and certified components used.	P
9.1.3.2/ RD	Materials for fire enclosures	Metal enclosure is used.	P





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Clause	Requirement + Test	Result - Remark	Verdict
	If an enclosure material is not classified as specified below, a test may be performed on the final enclosure or part of the enclosure, in which case the material shall additionally be subjected to periodic SAMPLE testing.	See above cl. no. 9.1.3.2	P
9.1.3.3/ RD	Materials for components and other parts outside fire enclosures	Certified component used	P
	Except as otherwise noted below, materials for components and other parts (including MECHANICAL ENCLOSURES, ELECTRICAL ENCLOSURES and DECORATIVE PARTS); located outside FIRE ENCLOSURES, shall be of FLAMMABILITY CLASS HB.	No such parts	N/A
9.1.3.4/ RD	Materials for components and other parts inside fire enclosures	Components and materials have adequate flammability classification, V-0 class PCB used	P
9.1.3.5/ RD	Materials for air filter assemblies	No such material used	N/A
9.1.4/ RD	Openings in fire enclosures	See below	P
9.1.4.1/ RD	General	Complies	P
	For equipment that is intended to be used or installed in more than one orientation as specified in the product documentation, the following requirements apply in each orientation.	Information related to Installation provided in user manual	P
	These requirements are in addition to those in the following sections:	See below	P
	- 7.3.4, Protection against direct contact;	Refer cl 7.3.4	P
	- 7.4, Protection against energy hazards;	Refer cl 7.4	P
	13.5, Openings in enclosures	No such openings	N/A
9.1.4.2 / RD	Side openings treated as bottom openings	No side opening	N/A
9.1.4.3/ RD	Openings in the bottom of a fire enclosure	No bottom opening	N/A
	The bottom of a FIRE ENCLOSURE or individual barriers, shall provide protection against emission of flaming or molten material under all internal parts, including partially enclosed components or assemblies, for which Method 2 of 9.1.1 has not been fully applied and complied with.	See above cl. no. 9.1.4.3	N/A
9.1.4.4/ RD	Equipment for use in a CLOSED ELECTRICAL OPERATING AREA	Not intend use at this area	N/A
	The requirements of 9.1.4.3 do not apply to FIXED EQUIPMENT intended only for use in a CLOSED ELECTRICAL OPERATING AREA and to be mounted on a concrete floor or other noncombustible surface. Such equipment shall be marked as follows:	See above 9.1.4.4	N/A
	WARNING: FIRE HAZARD SUITABLE FOR MOUNTING ON CONCRETE OR OTHER NONCOMBUSTIBLE SURFACE ONLY	See above 9.1.4.4	N/A





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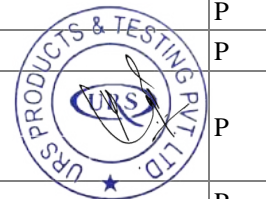
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Clause	Requirement + Test	Result - Remark	Verdict
9.1.4.5/ RD	Doors or covers in fire enclosures	No any door or covers in fire enclosure	N/A
9.1.4.6/ RD	Additional requirements for openings in transportable equipment	Not a transportable equipment	N/A
9.2/ RD	LIMITED POWER SOURCES	No limited power source used.	N/A
9.2/ RD	LIMITED POWER SOURCES	No limited power source used.	N/A
9.2.1/ RD	General	See above cl. no. 9.2	N/A
9.2.2/ RD	Limited power source tests	See above cl. no. 9.2	N/A
9.3	Short-circuit and overcurrent protection	See below	P
9.3.1/ RD	General	Considered	P
	The PCE shall not present a hazard, under shortcircuit or overcurrent conditions at any port, including phase-to-phase, phase-to-earth and phase-to-neutral, and adequate information shall be provided to allow proper selection of external wiring and external protective devices.	The short circuit and over current are protected by circuit design. When short-circuit or over current of components occurred, the EUT will shut down from grid immediately	P
9.3.2/ RD	Protection against short-circuits and over currents shall be provided for all input circuits, and for output circuits that do not comply with the requirements for limited power sources in 9.2, except for circuits in which no over current hazard is presented by short circuits and overloads.	See above cl. no. 9.3	P
9.3.3/ RD	Protective devices provided or specified shall have adequate breaking capacity to interrupt the maximum short circuit current specified for the port to which they are connected. If protection that is provided integral to the PCE for an input port is not rated for the short-circuit current of the circuit in which it is used, the installation instructions shall specify that an upstream protective device, rated for the prospective short-circuit current of that port, shall be used to provide backup protection.	See above cl. no. 9.3	P
9.3.4	Inverter backfeed current onto the array	See below	P
	The backfeed current testing and documentation requirements in Part 1 apply, including but not limited to the following.	See below	P
	Inverter backfeed current onto the PV array maximum value	<0A	P
	This inverter backfeed current value shall be provided in the installation instructions regardless of the value of the current, in accordance with Table 33.	0A, Provided in user manual	P
10	Protection against sonic pressure hazards	See below	P
10.1/RD	General	See below	P
	The equipment shall provide protection against the effect of sonic pressure. Conformity tests are carried out if the equipment is likely to cause such HAZARDS.	No sonic pressure hazards.	P
10.2/ RD	Sonic pressure and Sound level	See below	P





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Clause	Requirement + Test	Result - Remark	Verdict
10.2.1/ RD	Hazardous noise levels	Less than ≤ 30 dB.	P
11	Protection against liquid hazards	No liquid containment system used	N/A
11.1/RD	Liquid Containment, Pressure and Leakage	See above cl. no. 11	N/A
	The liquid containment system components shall be compatible with the liquid to be used.	See above cl. no. 11	N/A
	There shall be no leakage of liquid onto live parts as a result of:	See above cl. no. 11	N/A
	a) Normal operation, including condensation;	See above cl. no. 11	N/A
	b) Servicing of the equipment; or	See above cl. no. 11	N/A
	c) Inadvertent loosening or detachment of hoses or other cooling system parts over time.	See above cl. no. 11	N/A
11.2/RD	Fluid pressure and leakage	See above cl. no. 11	N/A
11.2.1/RD	Maximum pressure	See above cl. no. 11	N/A
11.2.2/RD	Leakage from parts	See above cl. no. 11	N/A
11.2.3/RD	Overpressure safety device	See above cl. no. 11	N/A
11.3/ RD	Oil and grease	See above cl. no. 11	N/A
12	Protection against Chemical Hazards	No chemical hazards	N/A
12.1/ RD	General	See above cl. no. 12	N/A
13	Physical requirements	See below	P
13.1/RD	Handles and manual controls	Complies	P
	Handles, knobs, grips, levers and the like shall be reliably fixed so that they will not work loose in normal use, if this might result in a hazard. Sealing compounds and the like, other than self-hardening resins, shall not be used to prevent loosening. If handles, knobs and the like are used to indicate the position of switches or similar components, it shall not be possible to fix them in a wrong position if this might result in hazard.	Complies	P
13.1.1/ RD	Adjustable controls	No adjustable control	N/A
13.2/RD	Securing of parts	All screws locked with star washer	P
13.3/RD	Provisions for external connections	See below	P
13.3.1/ RD	General	Complies	P
13.3.2/RD	Connection to an a.c. Mains supply	An industrial AC connector used and it is detachable with tool	P
13.3.2.1/RD	General	Certified PV connector are used. Installation manual provide information for the disconnection means	P
	For safe and reliable connection to a MAINS supply, equipment shall be provided with one of the following:	See below	P





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	– terminals or leads or a non-detachable power supply cord for permanent connection to the supply; or	Screw terminal for permanent connection to supply	P
	– an appliance inlet for connection of a detachable power supply cord; or	See above	N/A
	– a mains plug that is part of direct plug-in equipment as in 13.3.8	See above	N/A
13.3.2.2/ RD	Permanently connected equipment	Terminal block with junction box is used for AC connection	P
13.3.2.3/ RD	Appliance inlets	No appliance inlet used	N/A
13.3.2.4/ RD	Power supply cord	No such supply cord used	N/A
13.3.2.5/RD	Cord anchorages and strain relief	No such supply cord used	N/A
	For equipment with a non-detachable power supply cord, a cord anchorage shall be supplied such that:	See above cl. no. 13.3.2.5	N/A
	– the connecting points of the cord conductors are relieved from strain; and	See above cl. no. 13.3.2.5	N/A
	– the outer covering of the cord is protected from abrasion.	See above cl. no. 13.3.2.5	N/A
13.3.2.6/ RD	Protection against mechanical damage	See above cl. no. 13.3.2.5	N/A
13.3.3/RD	Wiring terminals for connection of external conductors	See below	P
13.3.3.1/ RD	Wiring terminals	The terminal can accommodate the conductors which specified in the user manual and the temperature rise did not exceed manufacturer's rating.	P
13.3.3.2/ RD	Screw terminals	A ring terminal washer used to each external power supply conductor	P
13.3.3.3/ RD	Wiring terminal sizes	Complies	P
13.3.3.4/ RD	Wiring terminal design	Terminal design with appropriate fixing hardware for conductor so that can't slip out	P
13.3.3.5/ RD	Grouping of wiring terminals	Input and output terminals located in proximity to each other.	P
13.3.3.6/ RD	Stranded wire	Not used.	N/A
13.3.4/ RD	Supply wiring space	Complies	P
13.3.5/RD	Wire bending space for wires 10 mm ² and greater	No such application	N/A
13.3.6/RD	Disconnection from supply sources	Installation manual instruct the disconnect device shall be provided before connecting AC mains and PV array	P
13.3.7/RD	Connectors, plugs and sockets	Certified PV connector used. Plug and sockets not used.	P
13.3.8/RD	Direct plug-in equipment	Not a direct plug-in equipment	N/A
13.4/RD	Internal wiring and connections	See below	P





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13.4.1/RD	General	All wires were used suitably and are fixed well to prevent mechanical damaged during installation	P
13.4.2/RD	Routing	All wires were routed away from all parts which would abrade the insulation of wires	P
13.4.3/RD	Colour coding	Green/yellow wire only used for protective earthing conductor	P
13.4.4/RD	Splices and connections	All wire with core cable ends.	P
13.4.5/RD	Interconnections between parts of the PCE	Special construction of connectors to prevent from misconnection.	P
13.5/RD	Openings in enclosures	See below	P
	Openings in the top and sides of ENCLOSURES shall be so located or constructed that it is unlikely that objects will enter the openings and create hazards by contacting bare conductive parts	Complies	P
13.6/RD	Polymeric Materials	Metal enclosure used and Certified connector, DC Switch outside the enclosure.	P
13.6.1/RD	General	See above cl. no. 13.6	P
13.6.1.1/RD	Thermal index or capability	See above cl. no. 13.6	P
13.6.2/RD	Polymers serving as enclosures or barriers preventing access to hazards	See above cl. no. 13.6	N/A
13.6.2.1/RD	Stress relief test	No shrinkage or distortion observed after the test	P
13.6.3/RD	Polymers serving as solid insulation	See above cl. no. 13.6	P
13.6.3.1/RD	Resistance to arcing	See above cl. no. 13.6	P
13.6.4/RD	UV resistance	Certified PV connector used outside the enclosure	P
	Polymeric parts of an OUTDOOR ENCLOSURE required for compliance with this standard shall be sufficiently resistance to degradation by ultra-violet (UV) radiation	See above cl. no. 13.6.4	P
13.7/RD	Mechanical resistance to deflection, impact, or drop	See below	P
13.7.1/RD	General	Complies	P
13.7.2/RD	250-N deflection test for metal enclosures	No hazard occurred	P
13.7.3/RD	7-J impact test for polymeric enclosures	No such enclosure	N/A
13.7.4/RD	Drop test	Not a hand-held, direct-plug in and transportable equipment	N/A
13.8/RD	Thickness requirements for metal enclosures	Complies with 13.7	N/A
13.8.1/RD	General	See above cl. no. 13.8	N/A
13.8.2/RD	Cast metal	See above cl. no. 13.8	N/A
13.8.3/RD	Sheet metal	See above cl. no. 13.8	N/A





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 T +91 (120) 4516264-65 F +91 (120) 4750296
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Clause	Requirement + Test	Result - Remark	Verdict
13.9	Fault indication	See below	P
	Where this Part 2 requires the inverter to indicate a fault, both of the following shall be provided:	LCD and interface connected to PC as fault indication	P
	a) a visible or audible indication, integral to the inverter, and detectable from outside the inverter, and	LCD and interface connected to PC as fault indication	P
	b) an electrical or electronic indication that can be remotely accessed and used.	LCD display shows fault indication	P
	The installation instructions shall include information regarding how to properly make connections (where applicable) and use the electrical or electronic means in b) above, in accordance with 5.3.2.10.	The instructions are specified in the manual	P
	– a non-detachable power supply cord for connection to the supply by means of a plug	See above	N/A
14	Components	See below	P
14.1/RD	General	Considered	P
	Where safety is involved, components shall be used in accordance with their specified RATINGS unless a specific exception is made. They shall conform to one of the following:	See below	P
	a) applicable safety requirements of a relevant IEC standard. Conformity with other requirements of the component standard is not required. If necessary for the application, components shall be subjected to the test of this standard, except that it is not necessary to carry out identical or equivalent tests already performed to check conformity with the component standard;	Certified component used according to their relevant safety standards. (see list of critical component)	P
	b) the requirements of this standard and, where necessary for the application, any additional applicable safety requirements of the relevant IEC component standard;	Certified component used (see list of critical component)	P
	c) if there is no relevant IEC standard, the requirements of this standard;	Certified component used and also verified/tested according to this standard. (see list of critical component)	P
	d) applicable safety requirements of a non-IEC standard which are at least as high as those of the applicable IEC standard, provided that the component has been approved to the non-IEC standard by a recognized testing authority.	Certified component used which are harmonized to relevant IEC standards. (see list of critical component)	P
	Components such as optocouplers, capacitors, transformers, and relays connected across basic, supplemental, reinforced, or double insulation shall comply with the requirements applicable for the grade of insulation being bridged, and if not previously certified to the applicable component safety standard shall be subjected to the voltage test of 7.5.2 as	Certified component used (see list of critical component)	P





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Clause	Requirement + Test	Result - Remark	Verdict
	routine test.		
14.2/ RD	Motor Over temperature Protection	No motor used	N/A
	Motors which, when stopped or prevented from starting (see 4.4.4.3), would present an electric shock HAZARD, a temperature HAZARD, or a fire HAZARD, shall be protected by an over temperature or thermal protection device meeting the requirements of 14.3.	See above	N/A
14.3/RD	Over temperature protection devices	See above	N/A
14.4/RD	Fuse holders	No such device	N/A
14.5/RD	MAINS voltage selecting devices	See below	P
14.6/RD	Printed circuit boards	V-0 class of PCBs used	P
	Printed circuit boards shall be made of material with a flammability classification of V-1 of IEC 60707 or better	See above	P
	This requirement does not apply to thin-film flexible printed circuit boards that contain only circuits powered from limited power sources meeting the requirements of 9.2.	No such PCBs used	N/A
	Conformity of the flammability RATING is checked by inspection of data on the materials. Alternatively, conformity is checked by performing the V-1 tests specified in IEC 60707 on three samples of the relevant parts.	See cl. no. 14.6	P
14.7/RD	Circuits or components used as transient overvoltage limiting devices	Certified components used.	P
	If control of transient overvoltage is employed in the equipment, any overvoltage limiting component or circuit shall be tested with the applicable impulse withstand voltage of Table 7-10 using the test method from 7.5.1 except 10 positive and 10 negative impulses are to be applied and may be spaced up to 1 min apart.	See above	N/A
14.8/RD	Batteries	No battery used	N/A
	Equipment containing batteries shall be designed to reduce the risk of fire, explosion and chemical leaks under normal conditions and after a single fault in the equipment including a fault in circuitry within the equipment battery pack.	See above cl. no. 14.8	N/A
14.8.1/RD	Battery Enclosure Ventilation	See above cl. no. 14.8	N/A
14.8.1.1/RD	Ventilation requirements	See above cl. no. 14.8	N/A
14.8.1.2/RD	Ventilation testing	See above cl. no. 14.8	N/A
14.8.1.3/RD	Ventilation instructions	See above cl. no. 14.8	N/A
14.8.2/ RD	Battery Mounting	See above cl. no. 14.8	N/A
	Compliance is verified by the application of the force to the battery's mounting surface. The test force is to be increased gradually so as to reach the required value in 5 to 10 s, and	See above cl. no. 14.8	N/A





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Clause	Requirement + Test	Result - Remark	Verdict
	is to be maintained at that value for 1 min. A non-metallic rack or tray shall be tested at the highest normal condition operating temperature		
14.8.3/RD	Electrolyte spillage	See above cl. no. 14.8	N/A
	Battery trays and cabinets shall have an electrolyte resistant coating.	See above cl. no. 14.8	N/A
14.8.4/RD	Battery Connections	See above cl. no. 14.8	N/A
	Reverse battery connection of the terminals shall be prevented if reverse connection could result in a hazard within the meaning of this Standard	See above cl. no. 14.8	N/A
14.8.5/RD	Battery maintenance instructions	See above cl. no. 14.8	N/A
	The information and instructions listed in 5.3.4.1 shall be included in the operator manual for equipment in which battery maintenance is performed by the operator, or in the service manual if battery maintenance is to be performed by service personnel only.	See above cl. no. 14.8	N/A
14.8.6/RD	Battery accessibility and maintainability	See above cl. no. 14.8	N/A
	Battery terminals and connectors shall be accessible for maintenance with the correct TOOLS. Batteries with liquid electrolyte, requiring maintained shall be so located that the battery cell caps are accessible for electrolyte tests and readjusting of electrolyte levels.	See above cl. no. 14.8	N/A





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4.2.2.6/4.7 RD	TABLE: mains supply electrical data in normal condition/ Electrical ratings tests						P
Type	U (V) DC	I (A) DC	P (kW) DC	U (V) AC	I (A) AC	P (kW) AC	
KSY-6.5KW-1P-1MPPT	360	12.45	4.482	207	22.84	4.035	
		12.46	4.485	230	21.93	4.003	
		12.47	4.489	253	21.92	4.436	
	510	11.88	6.059	207	28.20	5.782	
		11.93	6.084	230	26.26	5.974	
		11.98	6.110	253	23.91	5.982	
Supplementary information: Nil							





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Clause	Requirement + Test	Result - Remark	Verdict
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4.3/RD	TABLE: Thermal Testing			P
Type/Model:	KSY-6.5KW-1P-1MPPT			---
Temperature t of part/at	t 1(°C): 54, t 2(°C): 55			Permitted t (°C)
Test Condition	DC Input: 360Vdc AC Output:207Vac	DC Input:360Vdc AC Output:230Vac	DC Input:360Vdc AC Output:253Vac	---
Ambient (°C)	54	54	54	----
PV connector	60	60	61	85
AC connector	61	61	62	95
Printed circuit board	68	69	69	130
Metal enclosure	60	60	61	70
Transformer (EC401)	70	71	71	110
Transformer (L601)	71	72	72	110
Line Filter (CT501)	67	67	68	110
Line Filter (CT702)	69	69	70	110
AC output relay (RY501)	68	68	69	85
Relay (K701)	63	65	64	85
Internal wires	62	62	63	105
X capacitor (C508)	66	66	67	125
Y capacitor (C513)	65	64	66	110
Heat sink	63	63	64	100

Supplementary information: Temperature test of transformer winding is determined by thermocouple t1 is start temperature t2 is end temperature





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Clause	Requirement + Test	Result - Remark	Verdict
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4.3/RD	TABLE: Thermal Testing			P
Type/Model:	KSY-6.5KW-1P-1MPPT			---
Temperature t of part/at	t 1(°C): 54, t 2(°C): 54			Permitted t (°C)
Test Condition	DC Input: 510Vdc AC Output:207Vac	DC Input:510Vdc AC Output:230Vac	DC Input:510Vdc AC Output:253Vac	---
Ambient (°C)	54	54	54	----
PV connector	62	64	65	85
AC connector	63	65	66	95
Printed circuit board	70	72	73	130
Metal enclosure	62	64	65	70
Transformer (EC401)	72	74	75	110
Transformer (L601)	73	75	76	110
Line Filter (CT501)	69	71	72	110
Line Filter (CT702)	71	73	74	110
Relay (RY501)	70	72	73	85
Relay (K701)	65	67	68	85
Internal wires	64	66	67	105
X capacitor (C508)	68	70	71	125
Y capacitor (C513)	67	69	70	110
Heat sink	65	67	68	100

Supplementary information: Temperature test of transformer winding is determined by thermocouple t1 is start temperature t2 is end temperature





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4.4.4	TABLE: Single fault condition to be applied					P
	Ambient temperature (°C)..... :		25		---	
	Power source for EUT: Manufacturer, model/type, output rating..... :		KSOLARE ENERGY PVT LTD, KSY-6.5KW-1P-1MPPT,6500W		---	
4.4.4.15.1	Fault-tolerance of residual current monitoring					
Component No.	Fault	Supply voltage (V)	Test time	Fuse #	Fuse current (A)	Observation
Output	Overload	PV input: 360Vdc	15 min.	---	---	Unit shutdown, No damage, no hazard, no fire.
Transformer (EC401)	Short-circuited	PV input: 360Vdc	5 min.	---	---	Unit shutdown, No damage, no hazard, no fire
DC connection	Reversed	PV input: 510Vdc	5 min.	---	---	The unit is protected immediately & grid disconnected. Fault LED Glow, no damage, no hazards, no fire occurred.
Relay (K701)	Short-circuited	PV input: 510Vdc	5 min.	---	---	Fault LED Glow, unit does not start-up the inverter did not connect to grid. No damage, no hazards, no fire occurred.
Printed circuit board	Short circuited	PV input: 510Vdc	5min	---	---	Unit shutdown, No damage, no hazard, no fire.
Check that the residual current monitoring operates properly						Yes
Supplementary information: Nil						





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4.4.4.17	Cooling system failure – Blanketing test		P
	Test voltage (Vdc).....:	510	---
	Test current (Idc)	11.86	---
	Test voltage (Vac).....:	230	---
	Test current (Iac)-----:	26.27	---
	t _{amb1} (°C).....:	25	---
	t _{amb2} (°C).....:	25	---
maximum temperature T of part/at::	T (°C)		T_{max} (°C)
Enclosure top	65		90
Enclosure side	67		90
Enclosure bottom	69		90
Mounting surface	64		90
Supplementary information: Nil			





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4.7.4	TABLE: Steady state Inverter AC output voltage and frequency		N/A
	Nominal DC input (V)		----
	Nominal output AC voltage (V) :		
AC output U (V)	Frequency (Hz)	Condition/status	Comments
----	----	Without load	----
----	----	Resistive load application	----
----	----	Resistive load removal	----
Supplementary information: The PCE is not a standalone unit; therefore, the Steady State Inverter AC output voltage and frequency is not deemed applicable.			





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4.8.2	TABLE: Array insulation resistance detection for inverters for ungrounded and functionally grounded arrays				P
4.8.2.1	Array insulation resistance detection for inverters for ungrounded arrays				P
DC Voltage below minimum operating voltage (V)	DC Voltage for inverter begin operation (V)	Resistance between ground and PV input terminal (kΩ)	Required Insulation resistance $R = (V_{MAX PV} / 30mA)$ (kΩ)	Result	
DC+					
75	360	17.39	19.33	Unit can't start up, Error message on display Isolation fault	
75	450	17.39	19.33	Unit can't start up, Error message on display Isolation fault	
75	510	17.39	19.33	Unit can't start up, Error message on display Isolation fault	
DC-					
75	360	17.39	19.33	Unit can't start up, Error message on display Isolation fault	
75	450	17.39	19.33	Unit can't start up, Error message on display Isolation fault	
75	510	17.39	19.33	Unit can't start up, Error message on display Isolation fault	
<p>Note: For isolated inverters, shall indicate a fault in accordance with 13.9 (operation is allowed); the fault indication shall be maintained until the array insulation resistance has recovered to a value higher than the limit above For non-isolated inverters, or inverters with isolation not complying with the leakage current limits in the minimum inverter isolation requirements in Table 30, shall indicate a fault in accordance with 13.9, and shall not connect to the mains; the inverter may continue to make the measurement, may stop indicating a fault and may connect to the mains if the array insulation resistance has recovered to a value higher than the limit above. It is not required to test all PV input terminals if analysis of the design indicates that one or more terminals can be expected to have the same result, for example where multiple PV string inputs are in parallel.</p>					
Supplementary information: Nil					





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4.8.3.2	TABLE: 30mA touch current type test for isolated inverters		N/A
	Condition	Current (mA)	Limit (30mA)
	DC+ to PE	---	---
	DC- to PE	---	---
Supplementary information:			
<ul style="list-style-type: none"> The touch current measurement circuit of IEC60990, Figure 4 is connected from each terminal of the array to ground, one at a time. 			





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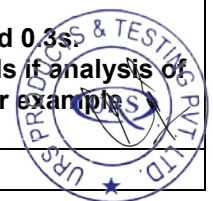
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4.8.3.3	TABLE: Fire hazard residual current type test for isolated inverters	N/A
	Condition	Current (mA)
	DC+ to PE	---
	DC- to PE	---
Limit (300mA or 10mA per kVA)		
Supplementary information:		

4.8.3.5	TABLE: Protection by residual current monitoring	P
Test conditions:	Output power (W): 6500 Input voltage (V _{DC}): 360 Frequency (Hz): 50 Output AC Voltage (V _{AC}): 230	
4.8.3.5.2	Test for detection of excessive continuous residual current	P
	Fault Current (mA)	Disconnection time (ms)
Measured Fault Current	Limit 300mA for output power ≤30 kVA 10mA per kVA for output power > 30 kVA	Measured Disconnection time Limit
+ V to N:		
150	300	62
160	300	56
162	300	64
152	300	55
160	300	93
- PV to N:		
160	300	62
165	300	58
170	300	56
162	300	74
164	300	64
Note: – maximum 300mA for inverters with continuous output power rating ≤30kVA; – maximum 10mA per kVA of rated continuous output power for inverters with continuous output power rating > 30kVA. This test shall be repeated 5 times, and for all 5 tests the time to disconnect shall not exceed 0.3s. The test is repeated for each PV input terminal. It is not required to test all PV input terminals if analysis of the design indicates that one or more terminals can be expected to have the same result, for example where multiple PV string inputs are in parallel.		
Supplementary information: Nil		





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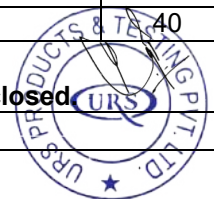
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4.8.3.5.3	TABLE: Test for detection of sudden changes in residual current	P
+PV to N		
Limit (mA)	U _N Disconnection time (ms)	Limit (ms)
30	225	300
30	232	300
30	235	300
30	239	300
30	240	300
60	120	150
60	141	150
60	114	150
60	135	150
60	123	150
150	28	40
150	33	40
150	27	40
150	29	40
150	28	40
-PV to N		
Limit (mA)	U _N Disconnection time (ms)	Limit (ms)
30	249	300
30	237	300
30	244	300
30	250	300
30	238	300
60	124	150
60	138	150
60	127	150
60	132	150
60	131	150
150	29	40
150	24	40
150	34	40
150	33	40
150	35	40
<p>Note: The capacitive current is risen until disconnection. Test condition: $I_c + 30/60/150mA \leq I_{cmax}$. R₁ is set that 30/60/150mA Flow and switch S is closed. Supplementary information: EUT is off-grid, therefore this test is not deemed applicable.</p>		





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7.3.6.3.3/RD	TABLE: Protective equipotential bonding				N/A
Measured between	Test Current (A)	Voltage drop (V)	Resistance (mΩ)	Result	
Earth Terminal to heat sink	90	0.95	10.5	No melting, no loosening, no damage	
Supplementary information: Nil					

7.3.6.3.7/RD	TABLE: Touch current measurement			P
Measured between	Measured (mA)	Limit (mA)	Comments/Conditions	
External protective earthing conductor and earthing terminal of PCE	1.16	3.5	Pass	
Supplementary information: Nil				

7.3.7/RD	TABLE: Clearance and creepage measurements						P
Measured between	Up (V)	U r.m.s (V)	Required cl (mm)	cl (mm)	Required cr (mm)	Cr (mm)	
Line to ground (BI)	326	230	3.0	7.22	3.0	7.22	
PV circuit to ground (BI)	500	---	3.0	12.27	3.0	12.27	
Line to neutral (FI)	325	229	3.0	4.02	3.0	4.02	
PV1+ to PV1-(FI)	500	---	3.0	8.67	3.0	8.67	
PV circuit to Comm circuit (RI)	500	---	5.5	9.89	5.5	9.89	
Supplementary information: FI: Functional insulation, BI: Basic insulation, RI: Reinforced insulation							





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7.3.7/RD	TABLE: Distance through insulation measurement				P
Distance through insulation	U r.m.s (V)	Test volatge (V)	Required di (mm)	Di (mm)	
Two layers of insulation Tape	230	3000	>0.2	>0.4	
Supplementary information: Nil					

7.5/RD	TABLE: electric strength measurements, impulse voltage test and partial discharge test				P
Test voltage applied between	Test volatge (V)	Impulse withstand voltage (V)	Partial discharge voltage (V)	Results	
PV terminal to ground (BI)	1500Vac	4000	---	Pass	
AC terminal to ground (BI)	1500Vac	4000	---	Pass	
LN (Input side) shorted together and accessible panel (RI)	3000Vac	6000	---	Pass	
PV circuit to SELV circuit (RI)	3000Vac	6000	---	Pass	
Supplementary information: BI: Basic insulation, RI: Reinforced insulation					

9.2/RD	TABLE: Limited power sources				N/A
Circuit output tested					
Components	Uoc (V)	Isc (A)		VA	
		Meas.	Limit		
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Supplementary information: No such circuit					





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 T +91 (120) 4516264-65 F +91 (120) 4750296
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14.	TABLE: List of critical components				P
Object/Part No.	Manufacturer/ Trademark	Type/Model	Type/Model	Standard	Mark(s) of Conformity ¹
PCB Material	TONGLING ONBOLE PCB CO LTD	D1	V-0, 130°C	UL 796 (Harmonized IEC standard not available)	UL E488128
Current Transducer (HTC501)	TAMURA CORP	F02P Series	Maximum current: - 85A to 85A, Operation temperature: -40°C to 125°C	UL 508 (Harmonized IEC standard not available)	UL E243511
Alternate	LEM International SA	CASR 25NP	Primary current: -85A to 85A, Operation temperature: -40°C to 125°C	UL 508 (Harmonized IEC standard not available)	UL E189713
Boost IGBT (Q101,Q102)	Fairchild Semiconductor Corporation	FGA40N65SMD	VCES= 650V, IC = 40 A, Maximum junction temperature Tjmax = 175°C	IS 16221 (Part 2) : 2015/ IEC 62109- 2 : 2011	Tested with Equipment
Boost IGBT (TR705 - TR710)	Infineon	K40EH5	VCE = 650 V, IC = 46 A, Maximum junction temperature Tvjmax = 175°C	IS 16242 (Part1): 2014/ IEC 62040- 1: 2017	Tested with Equipment
AC output relay (RY501 - RY504)	Xiamen Hongfa Electroacoustic Co., Ltd.	HF161F-W Series	250Vac, 26A	IEC/EN 61810-1	VDE 40031410
Alternate	FCL COMPONENTS LIMITED	FTR-K3 Series	250Vac, 32A	IEC/EN 61810-1	VDE 40011330
Y capacitor (C513, C514)	XIAMEN FARATRONIC CO LTD	MKP63	Y2, Capacitance :47 nF, Min. 300 Vac, 125°C	IEC/EN/UL 60384-14	UL E186600
Y capacitor (C521 - C524)	XIAMEN FARATRONIC CO LTD	MKP63	Y2, Capacitance :22 nF, Min. 300 Vac, 125°C	IEC/EN/UL 60384-14	UL E186600
Y capacitor (C115)	XIAMEN FARATRONIC CO LTD	MKP63	Y2, Capacitance :1.0 nF, Min. 300 Vac, 125°C	IEC/EN/UL 60384-14	UL E186600
Y capacitor (C608, C212, C202, C103)	XIAMEN FARATRONIC CO LTD	MKP63	Y2, Capacitance :10 nF, Min. 300 Vac, 125°C	IEC/EN/UL 60384-14	UL E186600





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Y capacitor (C105, C117)	XIAMEN FARATRONIC CO LTD	MKP63	Y2, Capacitance :4.7 nF, Min. 300 Vac, 125°C	IEC/EN/UL 60384-14	UL E186600
X capacitor (C508,C509)	XIAMEN FARATRONIC CO LTD	MKP65	X1, Capacitance :330 nF, Min. 440Vac, 125°C	IEC/EN/UL 60384-14	UL E186600
X capacitor (C510)	XIAMEN FARATRONIC CO LTD	C6A	5.0uF, 1200VDC	UL 810, IEC/EC 61881-1	UL E256238 TUV Rh R 50266136
X capacitor (C106)	XIAMEN FARATRONIC CO LTD	C3D	1.0uF, 1200VDC	UL 810, IEC/EC 61881-1	UL E256238 TUV Rh R 50266108
X capacitor (C107)	XIAMEN FARATRONIC CO LTD	C3D	14uF, 1200VDC	UL 810, IEC/EC 61881-1	UL E256238 TUV Rh R 50266108
X capacitor (C520)	XIAMEN FARATRONIC CO LTD	C4B	3.3uF, 1200VDC	UL 810 (Harmonized IEC standard not available)	UL E186600
Transformer(EC401)	WUXI JINGLEI ELECTRONIC CO., LTD	H560-00000-00	Class B	IS 16221 (Part 2) : 2015/ IEC62109-2 : 2011	Tested with Equipment
Bobbin	SUMITOMO BAKELITE CO LTD	PM-9820	V-0, 130°C	UL 94 (Harmonized with IEC 60695-11-10)	UL E41429
Magnet Wire	JIANGSU DARTONG M & E CO LTD	xUEW	130°C	UL 1446 (Harmonized IEC standard not available)	UL E237377
Insulation Tape	JINGJIANG YAHUA PRESSURE SENSITIVE GLUE CO LTD	CT (b)(g)	130°C	UL 510A (Harmonized IEC standard not available)	UL E165111
Varnish	WUJIANG TAIHU INSULATING MATERIAL CO.,LTD	T-4260(a)	155°C	UL 1446 (Harmonized IEC standard not available)	UL E228349





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Line Filter (CT501)	WUXI JINGLEI ELECTRONIC CO., LTD.	561-11001-00	0.602mH, Class B	IS 16221 (Part 2) : 2015/ IEC 62109-2 : 2011	Tested with Equipment
Bobbin	KINGBOARD LAMINATES HOLDINGS LTD	KB-6155	V-0, 155°C	UL 94 (Harmonized with IEC 60695-11-10)	UL E123995
Magnet Wire	JIANGSU DARTONG M & E CO LTD	xEI/AIW 200	200°C	UL 1446 (Harmonized IEC standard not available)	UL E237377
Varnish	WUJIANG TAIHU INSULAING MATERIAL CO.,LTD	T-4260(a)	155°C	UL 1446 (Harmonized IEC standard not available)	UL E228349
Line Filter (CT702)	WUXI JINGLEI ELECTRONIC CO., LTD.	H560-20003-01	Class B	IS 16221 (Part 2) : 2015/ IEC 62109-2 : 2011	Tested with Equipment
Bobbin	SUMITOMO BAKELITE CO LTD	PM-9820	V-0, 130°C	UL 94 (Harmonized with IEC 60695-11-10)	UL E41429
Magnet Wire	JIANGSU DARTONG M & E CO LTD	xUEW	130°C	UL 1446 (Harmonized IEC standard not available)	UL E237377
Epoxy	DONGGUAN EATTO ELECTRONIC MATERIAL CO LTD	3300A-1/3300B-1	V-0, 130°C	UL 94 (Harmonized with IEC 60695-11-10)	UL E218090
Transformer (L601)	WUXI JINGLEI ELECTRONIC CO., LTD.	560-00001-00	55uH, Class B	IS 16221 (Part 2) : 2015/ IEC 62109-2 : 2011	Test with Equipment
Bobbin	CHANG CHUN PLASTICS CO LTD	T375HF	V-0, 150°C	UL 94 (Harmonized with IEC 60695-11-10)	UL E59481
TIW	KBI COSMOLINK CO.,LTD.	TIW-M	130°C	UL 2353 (Harmonized IEC standard not available)	UL E213764
Varnish	WUJIANG TAIHU INSULAING MATERIAL CO.,LTD	T-4260(a)	155°C	UL 1446 (Harmonized IEC standard not available)	UL E228349





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RELAY (K701)	XIAMEN HONGFA ELECTROACOUSTIC CO LTD	HFD3-VI	Max. Switching Voltage: 1100VAC/1500VDC, Max. Switching Current:	IEC/EN 61810-1	TUV Rh R50433438
Optocoupler (U1202, U1203, U807, U808)	Vishay Semiconductors	SFH615A	Isolation voltage: 5.3kVac Creepage: 8.16 ± 0.8mm	UL 1577 (Harmonized IEC standard not available)	UL E52744
Thermistor (J201)	THINKING ELECTRONIC INDUSTRIAL CO LTD	NTSA0153JZ191	125°C, Resistance at 25°C: 15KΩ	UL 1434 (Harmonized IEC standard not available)	UL E138827
AC connector	Shanghai Vaconn Electronic Technology Co. Ltd	VPAC07EW-3S6	Voltage: 300Vac, Current: 30A, Operating Temperature: -40°C ~ 90°C	IEC/EN 61984	TUV Rh R50235418
MC4 Connectors	Dongguan Vaconn Electronics Technology Co Ltd	VP-D4Xa-bcdef	1000 V dc, 30 A max	IEC/EN/UL 62852:2015	UL E529142 TUV Rh R50482263
Internal Wire	GUANGDONG HAERKN NEW ENERGY CO LTD	10183	4.0mm ² X 1 CORE, 1100V	UL 758 (Harmonized IEC standard not available)	UL E300956
Internal Wire	DANYANG WINPOWER WIRE & CABLE MFG CO LTD	1015	6.0mm ² X 1 CORE, 1100V	UL 758 (Harmonized IEC standard not available)	UL E341104

Supplementary information: 1. Evidence provided by the manufacturer for the listed components are verified by us and the evidence are conforming to the requirement of relevant standard.





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Attachment-1



Front View



Rear View





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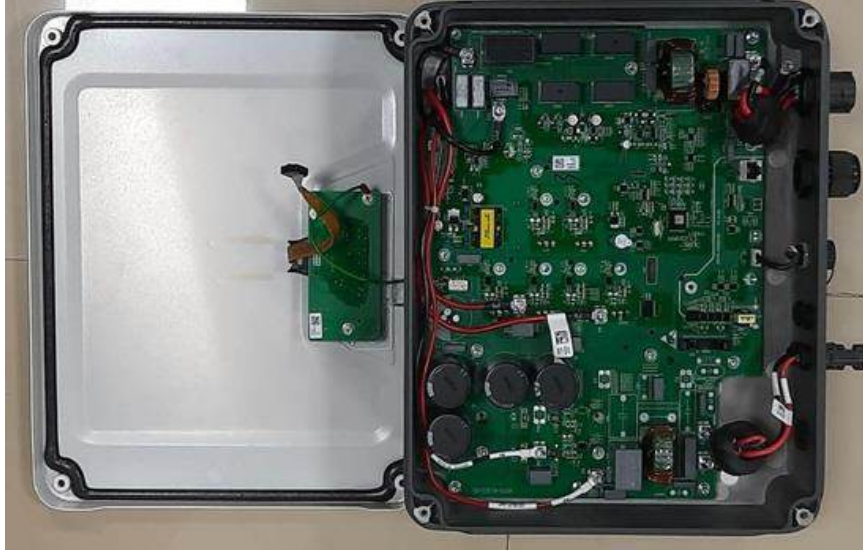
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Internal View



Connector View





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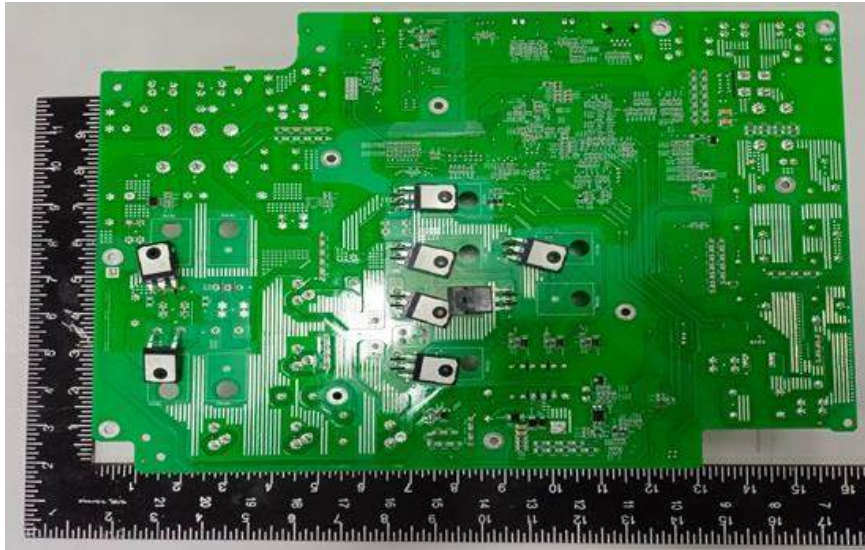
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PCB Front View



PCB Rear View

--End of report--

