Test Report issued under the responsibility of:

NCB TÜV SÜD Product Service GmbH
Ridlerstr. 65
D – 80339 München
Germany

TEST REPORT
IEC 62109-1
Safety of Power Converter for use in Photovoltaic Power Systems
Part 1: General requirements

Report Number.....:	083-52008203-000 part 1 of 2
Date of issue.....:	2020-11-18
Total number of pages	96
CB Testing Laboratory .....:	CQC - Trusted(Jiangsu) Testing Technology Co., Ltd.
Address.....:	No.99, Wenlan Road, Xianlin University Zone, Xianlin Street, Qixia District, NanJing, China
Applicant's name .....:	Huawei Technologies Co., Ltd.
Address.....:	Administration Building Headquarters of Huawei Technologies Co., Ltd., Bantian, Longgang District, 518129 Shenzhen, PEOPLE'S REPUBLIC OF CHINA
Test specification:	
Standard .....:	IEC 62109-1:2010
Test procedure.....:	CB Scheme
Non-standard test method .....:	N/A
Test Report Form No. .....:	IEC62109_1B
Test Report Form(s) Originator ....:	VDE Testing and Certification Institute
Master TRF .....:	Dated 2016-04

This report is not valid as a CB Test Report unless signed by an approved CB Testing Laboratory and appended to a CB Test Certificate issued by an NCB in accordance with IECEE 02.

General disclaimer:

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 CB Testing Laboratory. The authenticity of this Test Report and its contents can be verified by contacting the NCB, responsible for this Test Report.

Test item description .....:	SOLAR INVERTER
Trade Mark .....:	HUAWEI
Manufacturer.....:	Huawei Technologies Co., Ltd. Administration Building Headquarters of Huawei Technologies Co., Ltd., Bantian, Longgang District, 518129 Shenzhen, PEOPLE'S REPUBLIC OF CHINA
Model/Type reference .....:	SUN2000-15KTL-M3, SUN2000-17KTL-M3, SUN2000-20KTL-M3, SUN2000-23KTL-M3, SUN2000-28KTL-M3, SUN2000-29.9KTL-M3, SUN2000-30KTL-M3, SUN2000-36KTL-M3, SUN2000-40KTL-M3, SUN2000-42KTL-M3
Ratings .....:	See rating labels on page 4 to 6

Responsible Testing Laboratory (as applicable), testing procedure and testing location(s):

☒	**CB Testing Laboratory:**	CQC - Trusted(Jiangsu) Testing Technology Co., Ltd.	
Testing location/ address .....:		No.99, Wenlan Road, Xianlin University Zone, Xianlin Street, Qixia District, NanJing, China	
Tested by (name, function, signature) .....:		Renjie Cao	Renjie Cao
Approved by (name, function, signature)..:		Yong Chen	Yong Chen
☐	**Testing procedure: CTF Stage 1:**		
Testing location/ address .....:			
Tested by (name, function, signature) .....:			
Approved by (name, function, signature)..:			
☐	**Testing procedure: CTF Stage 2:**		
Testing location/ address .....:			
Tested by (name + signature).....:			
Witnessed by (name, function, signature).:			
Approved by (name, function, signature)..:			
☐	**Testing procedure: CTF Stage 3:**		
☐	**Testing procedure: CTF Stage 4:**		
Testing location/ address .....:			
Tested by (name, function, signature) .....:			
Witnessed by (name, function, signature).:			
Approved by (name, function, signature)..:			
Supervised by (name, function, signature):			

List of Attachments (including a total number of pages in each attachment):

Total test reports contain 2 parts listed in below table:

Item	Description	Pages
Part 1	IEC 62109-1(ed.1) test report	96
Part 2	IEC 62109-2(ed.1) test report	28

Summary of testing:

All the tests results are confirmed to the requirements of the standard.

Tests performed (name of test and test clause):

Family products design, full tests were conducted on representative model **SUN2000-42KTL-M3**, additional test of electrical ratings on all other models and thermal test on model **SUN2000-40KTL-M3**.

☒ Visual inspection – clauses as available;
☒ Mains supply electrical data in normal condition & electrical ratings tests – 4.2.2.6 & 4.7;
☒ Durability and legibility of marking – 5.1.2;
☒ Thermal test and single fault test – 4.3 & 4.4;
☒ Humidity preconditioning – 4.5;
☒ Voltage Back-feed Protection, as combined with –4,4;
☒ Enclosure integrity – 6.3;
☒ Non-accessibility – 7.3.4.2.3;
☒ Protective bonding – 7.3.6.3.3;
☒ Capacitor discharge – 7.3.5.3.2 & 7.3.9;
☒ Clearance and creepage distances – 7.3.7;
☒ Capacitor discharge – 7.3.9 & 7.4;
☒ Energy hazards – 7.4;
☒ Electrical tests – 7.5;
☐ Stability test – 8.3;
☒ Provisions for lifting and carrying – 8.4;
☒ Wall mounting loading – 8.5;
☒ Material tests – 9.1.3;
☒ Limited power sources – 9.2;
☒ Sonic pressure hazards – 10;
☒ Actuating parts of controls (Knob pull and limitation of movement) – 13.1;
☐ Physical tests on power supply cords – 13.3.2.5;
☒ 8 mm stripping test – 13.3.3.6;
☐ Mould stress relief test – 13.6.2.1;
☒ Deformation tests – 13.7;
☐ Battery – 14.8;
☒ Annex B operational test as combined with 4,4;
Remark: Touch current test was conducted at nominal frequency 60Hz(considered more severity), and other tests were conducted at nominal frequency 50Hz.

Testing location:

CQC - Trusted(Jiangsu) Testing Technology Co., Ltd.

No.99, Wenlan Road, Xianlin University Zone, Xianlin Street, Qixia District, NanJing, China

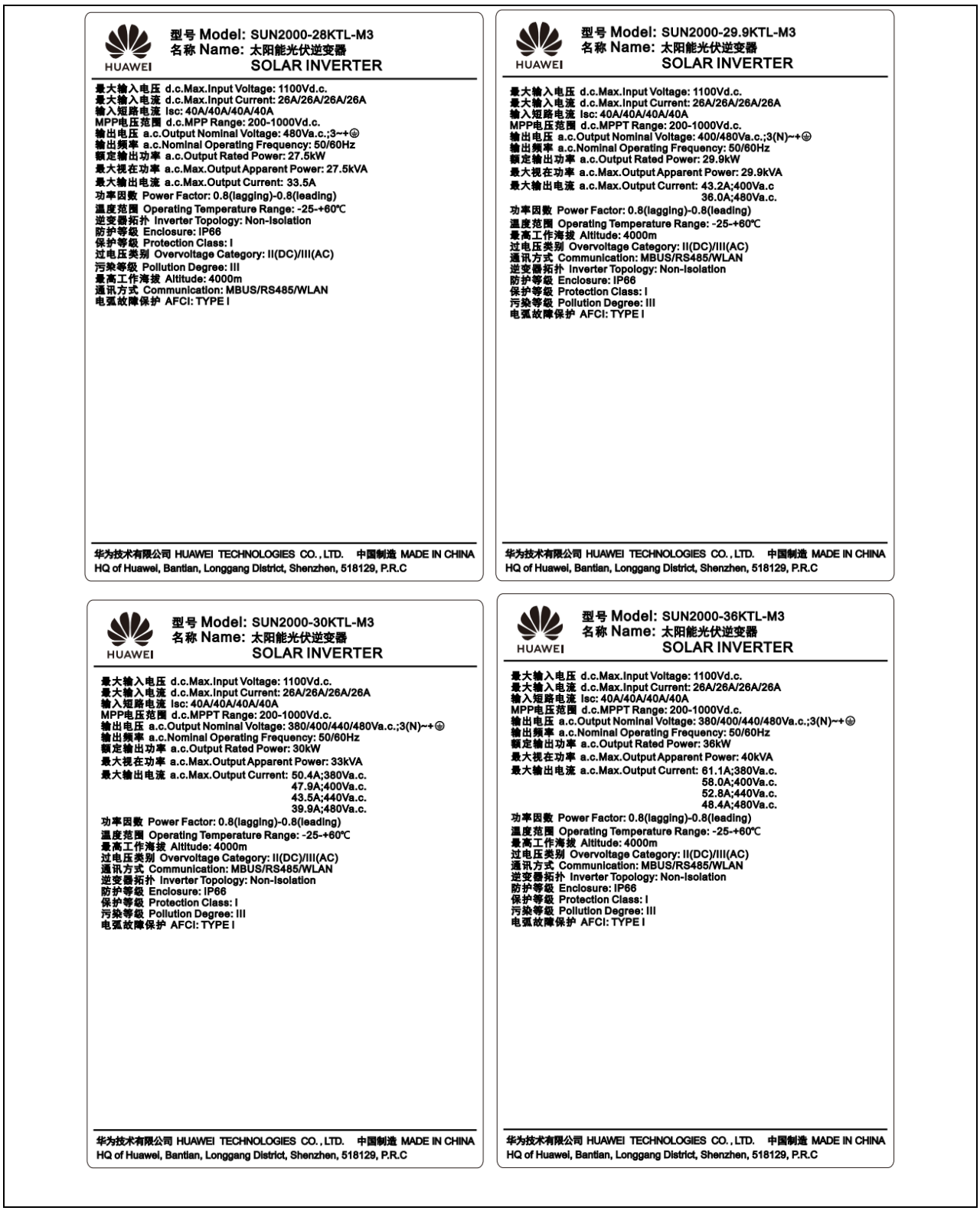
Summary of compliance with National Differences (List of countries addressed):

All tests were carried out according to IEC 62109-1(ed.1).

The text of IEC 62109-1:2010 was approved by CENELEC as a European Standard without any modification. Also, compliance with EN 62109-1:2010.

Copy of marking plate:

The artwork below may be only a draft. The use of certification marks on a product must be authorized by the respective NCB' s that own these marks.



型号 Model: SUN2000-28KTL-M3
名称 Name: 太阳能光伏逆变器
SOLAR INVERTER

最大输入电压 d.c.Max.Input Voltage: 1100Vd.c.
最大输入电流 d.c.Max.Input Current: 26A/26A/26A/26A
输入短路电流 Isc: 40A/40A/40A/40A
MPP电压范围 d.c.MPP Range: 200-1000Vd.c.
输出电压 a.c.Output Nominal Voltage: 480Va.c.;3~+⏚
输出频率 a.c.Nominal Operating Frequency: 50/60Hz
额定输出功率 a.c.Output Rated Power: 27.5kW
最大视在功率 a.c.Max.Output Apparent Power: 27.5kVA
最大输出电流 a.c.Max.Output Current: 33.5A
功率因数 Power Factor: 0.8(lagging)-0.8(leading)
温度范围 Operating Temperature Range: -25~+60℃
逆变器拓扑 Inverter Topology: Non-Isolation
防护等级 Enclosure: IP66
保护等级 Protection Class: I
过电压类别 Overvoltage Category: II(DC)/III(AC)
污染等级 Pollution Degree: III
最高工作海拔 Altitude: 4000m
通讯方式 Communication: MBUS/RS485/WLAN
电弧故障保护 AFCI: TYPE I

华为技术有限公司 HUAWEI TECHNOLOGIES CO., LTD. 中国制造 MADE IN CHINA
HQ of Huawei, Bantian, Longgang District, Shenzhen, 518129, P.R.C

型号 Model: SUN2000-29.9KTL-M3
名称 Name: 太阳能光伏逆变器
SOLAR INVERTER

最大输入电压 d.c.Max.Input Voltage: 1100Vd.c.
最大输入电流 d.c.Max.Input Current: 26A/26A/26A/26A
输入短路电流 Isc: 40A/40A/40A/40A
MPP电压范围 d.c.MPPT Range: 200-1000Vd.c.
输出电压 a.c.Output Nominal Voltage: 400/480Va.c.;3(N)~+⏚
输出频率 a.c.Nominal Operating Frequency: 50/60Hz
额定输出功率 a.c.Output Rated Power: 29.9kW
最大视在功率 a.c.Max.Output Apparent Power: 29.9kVA
最大输出电流 a.c.Max.Output Current: 43.2A;400Va.c
36.0A;480Va.c.
功率因数 Power Factor: 0.8(lagging)-0.8(leading)
温度范围 Operating Temperature Range: -25~+60℃
最高工作海拔 Altitude: 4000m
过电压类别 Overvoltage Category: II(DC)/III(AC)
通讯方式 Communication: MBUS/RS485/WLAN
逆变器拓扑 Inverter Topology: Non-Isolation
防护等级 Enclosure: IP66
保护等级 Protection Class: I
污染等级 Pollution Degree: III
电弧故障保护 AFCI: TYPE I

华为技术有限公司 HUAWEI TECHNOLOGIES CO., LTD. 中国制造 MADE IN CHINA
HQ of Huawei, Bantian, Longgang District, Shenzhen, 518129, P.R.C

型号 Model: SUN2000-30KTL-M3
名称 Name: 太阳能光伏逆变器
SOLAR INVERTER

最大输入电压 d.c.Max.Input Voltage: 1100Vd.c.
最大输入电流 d.c.Max.Input Current: 26A/26A/26A/26A
输入短路电流 Isc: 40A/40A/40A/40A
MPP电压范围 d.c.MPPT Range: 200-1000Vd.c.
输出电压 a.c.Output Nominal Voltage: 380/400/440/480Va.c.;3(N)~+⏚
输出频率 a.c.Nominal Operating Frequency: 50/60Hz
额定输出功率 a.c.Output Rated Power: 30kW
最大视在功率 a.c.Max.Output Apparent Power: 33kVA
最大输出电流 a.c.Max.Output Current: 50.4A;380Va.c.
47.9A;400Va.c.
43.5A;440Va.c.
39.9A;480Va.c.
功率因数 Power Factor: 0.8(lagging)-0.8(leading)
温度范围 Operating Temperature Range: -25~+60℃
最高工作海拔 Altitude: 4000m
过电压类别 Overvoltage Category: II(DC)/III(AC)
通讯方式 Communication: MBUS/RS485/WLAN
逆变器拓扑 Inverter Topology: Non-Isolation
防护等级 Enclosure: IP66
保护等级 Protection Class: I
污染等级 Pollution Degree: III
电弧故障保护 AFCI: TYPE I

华为技术有限公司 HUAWEI TECHNOLOGIES CO., LTD. 中国制造 MADE IN CHINA
HQ of Huawei, Bantian, Longgang District, Shenzhen, 518129, P.R.C

型号 Model: SUN2000-36KTL-M3
名称 Name: 太阳能光伏逆变器
SOLAR INVERTER

最大输入电压 d.c.Max.Input Voltage: 1100Vd.c.
最大输入电流 d.c.Max.Input Current: 26A/26A/26A/26A
输入短路电流 Isc: 40A/40A/40A/40A
MPP电压范围 d.c.MPPT Range: 200-1000Vd.c.
输出电压 a.c.Output Nominal Voltage: 380/400/440/480Va.c.;3(N)~+⏚
输出频率 a.c.Nominal Operating Frequency: 50/60Hz
额定输出功率 a.c.Output Rated Power: 36kW
最大视在功率 a.c.Max.Output Apparent Power: 40kVA
最大输出电流 a.c.Max.Output Current: 61.1A;380Va.c.
58.0A;400Va.c.
52.8A;440Va.c.
48.4A;480Va.c.
功率因数 Power Factor: 0.8(lagging)-0.8(leading)
温度范围 Operating Temperature Range: -25~+60℃
最高工作海拔 Altitude: 4000m
过电压类别 Overvoltage Category: II(DC)/III(AC)
通讯方式 Communication: MBUS/RS485/WLAN
逆变器拓扑 Inverter Topology: Non-Isolation
防护等级 Enclosure: IP66
保护等级 Protection Class: I
污染等级 Pollution Degree: III
电弧故障保护 AFCI: TYPE I

华为技术有限公司 HUAWEI TECHNOLOGIES CO., LTD. 中国制造 MADE IN CHINA
HQ of Huawei, Bantian, Longgang District, Shenzhen, 518129, P.R.C

HUAWEI

型号 Model: SUN2000-40KTL-M3
名称 Name: 太阳能光伏逆变器
SOLAR INVERTER

最大输入电压 d.c.Max.Input Voltage: 1100Vd.c.
最大输入电流 d.c.Max.Input Current: 26A/26A/26A/26A
输入短路电流 Isc: 40A/40A/40A/40A
MPP电压范围 d.c.MPPT Range: 200-1000Vd.c.
输出电压 a.c.Output Nominal Voltage: 380/400/440/480Va.c.;3(N)~+⏚
输出频率 a.c.Nominal Operating Frequency: 50/60Hz
额定输出功率 a.c.Output Rated Power: 40kW
最大视在功率 a.c.Max.Output Apparent Power: 44kVA
最大输出电流 a.c.Max.Output Current: 67.2A;380Va.c.
63.8A;400Va.c.
58.0A;440Va.c.
53.2A;480Va.c.
功率因数 Power Factor: 0.8(lagging)-0.8(leading)
温度范围 Operating Temperature Range: -25~+60℃
最高工作海拔 Altitude: 4000m
过电压类别 Overvoltage Category: II(DC)/III(AC)
通讯方式 Communication: MBUS/RS485/WLAN
逆变器拓扑 Inverter Topology: Non-Isolation
防护等级 Enclosure: IP66
保护等级 Protection Class: I
污染等级 Pollution Degree: III
电弧故障保护 AFCI: TYPE I

华为技术有限公司 HUAWEI TECHNOLOGIES CO., LTD. 中国制造 MADE IN CHINA
HQ of Huawei, Bantian, Longgang District, Shenzhen, 518129, P.R.C

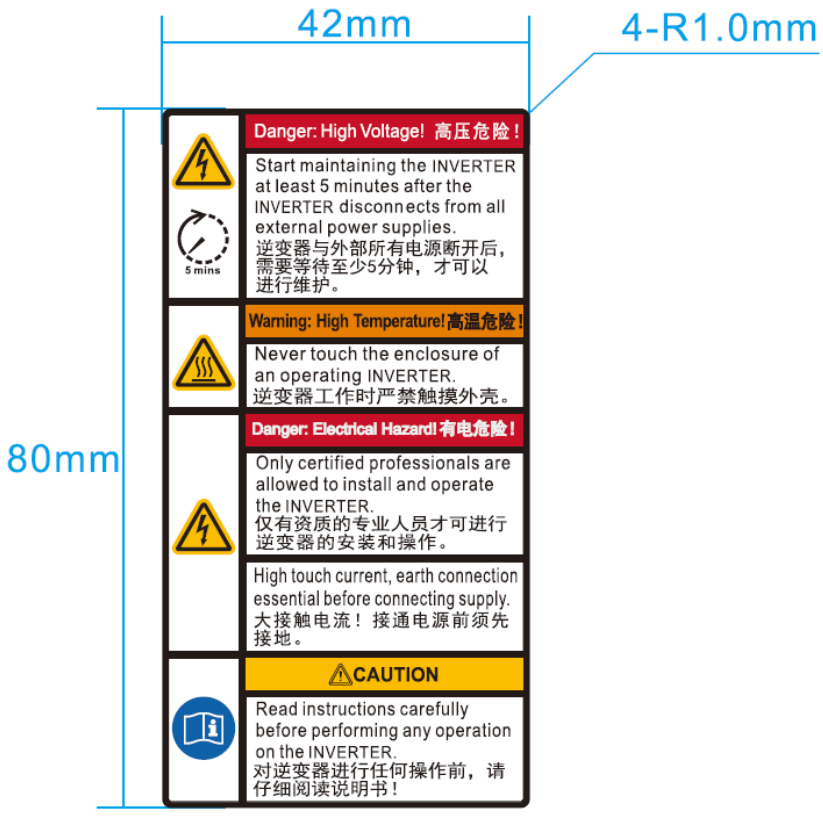
HUAWEI

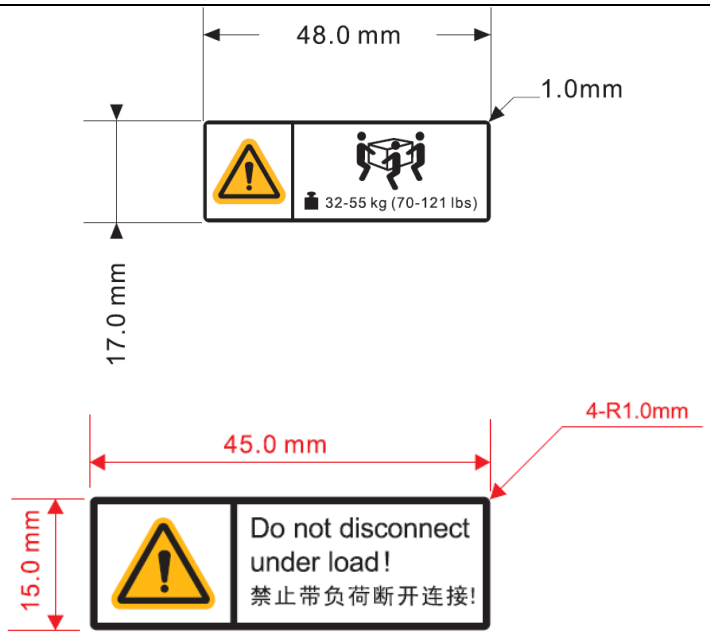
型号 Model: SUN2000-42KTL-M3
名称 Name: 太阳能光伏逆变器
SOLAR INVERTER

最大输入电压 d.c.Max.Input Voltage: 1100Vd.c.
最大输入电流 d.c.Max.Input Current: 26A/26A/26A/26A
输入短路电流 Isc: 40A/40A/40A/40A
MPP电压范围 d.c.MPP Range: 200-1000Vd.c.
输出电压 a.c.Output Nominal Voltage: 480Va.c.;3~+⏚
输出频率 a.c.Nominal Operating Frequency: 50/60Hz
额定输出功率 a.c.Output Rated Power: 42kW
最大视在功率 a.c.Max.Output Apparent Power: 47kVA
最大输出电流 a.c.Max.Output Current: 56.8A
功率因数 Power Factor: 0.8(lagging)-0.8(leading)
温度范围 Operating Temperature Range: -25~+60℃
逆变器拓扑 Inverter Topology: Non-Isolation
防护等级 Enclosure: IP66
保护等级 Protection Class: I
过电压类别 Overvoltage Category: II(DC)/III(AC)
污染等级 Pollution Degree: III
最高工作海拔 Altitude: 4000m
通讯方式 Communication: MBUS/RS485/WLAN
电弧故障保护 AFCI: TYPE I

华为技术有限公司 HUAWEI TECHNOLOGIES CO., LTD. 中国制造 MADE IN CHINA
HQ of Huawei, Bantian, Longgang District, Shenzhen, 518129, P.R.C

Additional warning labels:



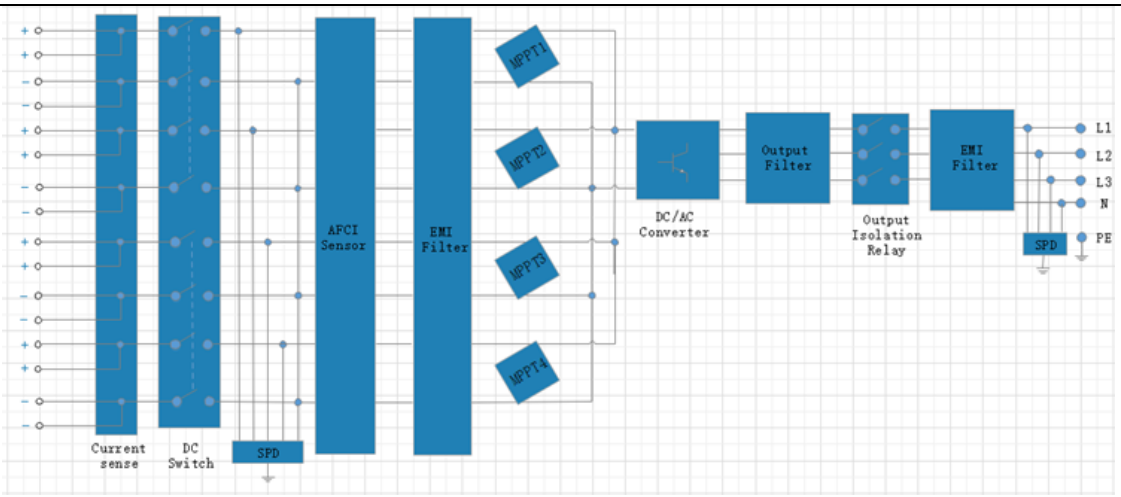


Marking plate material: pressure-sensitive unprinted label stocks stamped into aluminum surface; Suitable for outdoor use with respect to exposure to Ultraviolet Light, Water Exposure and thermal transfer printed label stock applications, -60°C to 95°C

An additional PET film provided to cover label.

Test item particulars.....	
Equipment mobility	☐ movable ☐ hand-held ☐ stationary ☒ fixed ☐ transportable ☐ for building-in
Connection to the mains	☒ pluggable equipment ☐ direct plug-in ☐ permanent connection ☐ for building-in
Environmental category	☒ outdoor ☐ indoor unconditional ☐ indoor conditional
Over voltage category Mains	☐ OVC I ☐ OVC II ☒ OVC III ☐ OVC IV
Over voltage category PV.....	☐ OVC I ☒ OVC II ☐ OVC III ☐ OVC IV
Mains supply tolerance (%).....	±10 %
Tested for power systems.....	TN / TT / IT
Testing of phase-phase voltage (V)	380/400/440/480V
Class of equipment.....	☒ Class I ☐ Class II ☐ Class III ☐ Not classified
Mass of equipment (kg)	43kg
Pollution degree.....	3(external environment), 2(internal environment)
IP protection class.....	IP66
.....	
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)
Testing.....	
Date of receipt of test item	2020-11-05
Date (s) of performance of tests.....	2020-11-05 to 2020-11-16

General remarks:	
"(See Enclosure #)" refers to additional information appended to the report. "(See appended table)" refers to a table appended to the report. **Throughout this report a ☒ comma / ☐ point is used as the decimal separator.**	
Manufacturer's Declaration per sub-clause 4.2.5 of IECEE 02:	
The application for obtaining a CB Test Certificate includes more than one factory location and a declaration from the Manufacturer stating that the sample(s) submitted for evaluation is (are) representative of the products from each factory has been provided	☒ **Yes** ☐ **Not applicable**
When differences exist; they shall be identified in the General product information section.	
Name and address of factory (ies)	1) Huawei Machine Co., Ltd. No. 2, New City Avenue, Songshan Lake Sci. & Tech. Industry Park, 523808 Dongguan, Guangdong, PEOPLE'S REPUBLIC OF CHINA 2) Dongguan Yang Tian Electronic Technology Co., Ltd. (i-Brights) No.152, Luyuan Rd., Keyuancheng, Tangxia Town 523710 Dongguan City, Guangdong Province PEOPLE'S REPUBLIC OF CHINA 3) DongGuan Fuyi Precision Industry Co.,Ltd. Floor 1st-4th, Building 12, No.6, Songshui Road, Songmu Village, Weifeng Industrial City, Dalang Town 523770 Dongguan, Guangdong PEOPLE'S REPUBLIC OF CHINA 4) Shenzhen Fugui Precision Industry Co., Ltd. F8d District, Foxconn Science and Technology Industrial Park, East side of Min Qing Road Longhua District, Longhua Subdistrict, Longhua District 518110 Shenzhen PEOPLE'S REPUBLIC OF CHINA
General product information: The PCE under test (EUT) is Grid-connected Inverter which utilizes the advanced power electronics conversion components such as MOSFET, IGBT, IPM, etc. to convert the variable DC power generated from the photovoltaic (PV) arrays or battery banks to the stable utility AC power which can be fed to the electrical grid. It can also charge the battery banks from the DC power generated from the photovoltaic (PV) arrays. They are intended for professional incorporation into PV system, and they are assessed on a component test basis. The external circuit breakers or protective devices for PV array connection and Grid connection are required which statements are provided in user installation manual. The end user shall refer to the installation manual in final installation. Firmware Version: V100R001 Topological diagram:	



The following documentations are retained on file:
- Photograph;
- Circuit diagrams;
- PCB layout drawing;
- Specification sheets for components;
- Instruction manual.
- Manufacturer's work instruction and declaration for 100% routing test as required by IEC 62109-1:2010, IEC 62109-2:2011.

Model Difference:
The models family of SUN2000-42KTL-M3 are identical on topological schematic circuit diagram and control solution codes except for the type designation, the input/output rating and an internal integrated cooling fan. pls. see as in table below (exact from user manual directly for reference):

DC Input

Technical Specifications	SUN2000-29.9KTL-M3	SUN2000-30KTL-M3	SUN2000-36KTL-M3	SUN2000-40KTL-M3	SUN2000-42KTL-M3
Maximum input DC power	44,850 W	45,000 W	54,000 W	60,000 W	47,900 W
Maximum input voltage	1100 V	1100 V	1100 V	1100 V	1100 V
Maximum input current (per MPPT)	26 A	26 A	26 A	26 A	26 A
Maximum short-circuit current (per MPPT)	40 A	40 A	40 A	40 A	40 A
Minimum startup voltage	200 V	200 V	200 V	200 V	200 V
MPP voltage range	200-1000 V	200-1000 V	200-1000 V	200-1000 V	200-1000 V

Full power MPPT voltage range	500-800 V (400 VAC) 625-850 V (480 VAC)	500-800 V (380/400 AC) 625-850 V (480 VAC)	520-800 V (380/400 VAC) 625-850 V (480 VAC)	540-800 V (380/400 VAC) 625-850 V (480 VAC)	580-850 V
Rated input voltage	600 V	600 V (380/400 VAC) 650 V (440 VAC) 720 V (480 VAC)	600 V (380/400 VAC) 650 V (440 VAC) 720 V (480 VAC)	600 V (380/400 VAC) 650 V (440 VAC) 720 V (480 VAC)	600 V (380/400 VAC) 650 V (440 VAC) 720 V (480 VAC)
Maximum number of inputs	8	8	8	8	8
Number of MPPTs	4	4	4	4	4

Technical Specifications	SUN2000-15KTL-M3	SUN2000-17KTL-M3	SUN2000-20KTL-M3	SUN2000-23KTL-M3	SUN2000-28KTL
Maximum input DC power	17,000W	19,100W	22,500W	23,600W	28,200W
Maximum input voltage	1100V	1100V	1100V	1100V	1100V
Maximum input current (per MPPT)	26A	26A	26A	26A	26A
Maximum short-circuit current (per MPPT)	40A	40A	40A	40A	40A
Minimum startup voltage	200V	200V	200V	200V	200V
MPP voltage range	200-1000 V	200-1000 V	200-1000 V	200-1000 V	200-1000 V
Full power MPPT voltage range	400-800 V	400-800 V	480-800 V	480-800 V	520-800 V
Rated input voltage	600 V	600 V	600 V	600 V	720 V
Maximum number of	8	8	8	8	8

inputs					
Number of MPPTs	4	4	4	4	4

AC Output

Technical Specifications	SUN2000-29.9KTL-M3	SUN2000-30KTL-M3	SUN2000-36KTL-M3	SUN2000-40KTL-M3	SUN2000-42KTL-M3
Rated output power	29,900 W	30,000 W	36,000 W	40,000 W	42,000 W
Maximum apparent power	29,900 VA	33,000 VA	39,600 VA	44,000 VA	47,000 VA
Maximum active power (cosφ = 1)	29,900 W	33,000 W	39,600 W	44,000 W	47,000 W
Rated output voltage	400V 3W+N+PE 480V 3W+PE	380/400/440V 3W+N+PE 480V 3W+PE	380/400/440V 3W+N+PE 480V 3W+PE	380/400/440V 3W+N+PE 480V 3W+PE	480V 3W+PE
Rated output current	43,2 A (400 VAC) 36,0 A (480 VAC)	45,6 A (380 V AC) 43,3 A (400 V AC) 39,4 A (440 V AC) 36,1 A (480 V AC)	54,7 A (380 VAC) 52,0 A (400 VAC) 47,3 A (440 VAC) 43,3 A (480 VAC)	60,8 A (380 VAC) 57,8 A (400 VAC) 52,5 A (440 VAC) 48,1 A (480 VAC)	50,5 A
Maximum output current	43,2 A (400 VAC) 36,0 A (480 VAC)	50,4 A (380 VAC) 47,9 A (400 VAC) 43,5 A (440 VAC) 39,9 A (480 VAC)	61,1 A (380 VAC) 58,0 A (400 VAC) 52,8 A (440 VAC) 48,4 A (480 VAC)	67,2 A (380 VAC) 63,8 A (400 VAC) 58,0 A (440 VAC) 53,2 A (480 VAC)	56,8 A
Output voltage frequency	50 Hz/60 Hz	50 Hz/60 Hz	50 Hz/60 Hz	50 Hz/60 Hz	50 Hz/60 Hz
Power factor	0,8 leading–0,8 lagging	0,8 leading–0,8 lagging	0,8 leading–0,8 lagging	0,8 leading–0,8 lagging	0,8 leading–0,8 lagging
Maximum total	< 3%	< 3%	< 3%	< 3%	< 3%

harmonic distortion (THD)					

Technical Specifications	SUN2000-15KTL-M3	SUN2000-17KTL-M3	SUN2000-20KTL-M3	SUN2000-23KTL-M3	SUN2000-28KTL
Rated output power	15000W	17000W	20,000 W	23000W	27500W
Maximum apparent power	16500VA	18700VA	22,000 VA	23000VA	27500VA
Maximum active power (cosφ = 1)	16500W	18700W	22,000 W	23000W	27500W
Rated output voltage	380/400V 3W+N+PE	380/400V 3W+N+PE	380/400V 3W+N+PE	380/400V 3W+N+PE	480V 3W+PE
Rated output current	22,8 A (380 VAC) 21,7 A (400 VAC)	25,8 A (380 VAC) 24,5 A (400 VAC)	30,4 A (380 VAC) 28,9 A (400 VAC)	34,9 A (380 VAC) 33,2 A (400 VAC)	33,1 A
Maximum output current	25,2 A	28,5 A	33,5 A	35,1 A	33,5 A
Output voltage frequency	50/60 Hz	50/60 Hz	50/60 Hz	50 Hz/60 Hz	50/60 Hz
Power factor	0,8 leading–0,8 lagging	0,8 leading–0,8 lagging	0,8 leading–0,8 lagging	0,8 leading–0,8 lagging	0,8 leading–0,8 lagging
Maximum total harmonic distortion (THD)	< 3%	< 3%	< 3%	< 3%	< 3%

Protection

Technical Specifications	For all models
AFCI	Yes
Input DC switch	Yes
Anti-islanding protection	Yes
Output overcurrent protection	Yes
Output short-circuit protection	Yes
Output overvoltage protection	Yes

Input reverse connection protection	Yes
PV string fault detection	Yes
DC surge protection	Yes
AC surge protection	Yes
Insulation resistance detection	Yes
Residual current monitoring unit (RCMU)	Yes

Display and Communication

Technical Specifications	For all models
Display	LED indicators; WLAN + app
RS485	Yes
Communications expansion module	(Optional) WLAN-FE/4G
Remote dry contact scheduling	Yes

General Data

Technical Specifications	For all models
Dimensions (W x H x D)	640 mm x 530 mm x 270 mm
Net weight	43 kg
Operating temperature	-25°C to +60°C (derated when the temperature is above +45°C)
Cooling mode	Natural convection
Highest operating altitude	4000 m
Relative humidity	0%–100% RH
Output terminal	Waterproof quick-connect terminal
IP rating	IP66
Topology	Transformerless

The following safety parameters are factory set and fixed per IEC 62109-2:2011.

Default interface protection settings

Parameters	Normative requirements		Internal threshold setting	
	Maximum clearance time	Trip limit	Maximum clearance time (factory setting)	Factory setting trip value

PV array Insulation resistance measurement before starting operation	-	≥1100V/30mA= 36,7kΩ	-	37 kΩ as default Adjustable range: 37 kΩ - 1500 kΩ
Continuous residual current monitoring(functional)	300 ms	10 mA/kVA	300 ms	10 mA RMS per kVA based on inverter ratings
Sudden changes in residual current(functional)	300 ms	30 mA	300 ms	30 mA
	150 ms	60 mA	150 ms	60 mA
	40 ms	150 mA	40 ms	150 mA

Alteration of the above settings or full setting range of the interface protection may cause a breach of the type-certificate marking.

Unauthorised access to factory safety parameters setting and software should be prohibited.

A reset to the factory safety parameters requires retesting and verification in conjunction with the end-use system.

IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
4	**GENERAL TESTING REQUIREMENTS**		P
4.1	General		P
4.2	General conditions for testing		P
4.2.1	Sequence of tests		P
4.2.2	Reference test conditions		P
4.2.2.1	Environmental conditions		P
4.2.2.2	State of equipment		P
4.2.2.3	Position of equipment	Installed in accordance with the manufacturer's instructions, in the configuration that results in the worst-case test conditions	P
4.2.2.4	Accessories		P
4.2.2.5	Covers and removable parts	No accessories or operator interchangeable parts	N/A
4.2.2.6	Mains supply a) Voltage: b) Frequency: c) Polarity: d) Earthing: e) Over-current Protection:		P
4.2.2.7	Supply ports other than the mains	PV input	P
4.2.2.7.1	Photovoltaic supply sources a) Open circuit voltage: b) Short-circuit current:		P
4.2.2.7.2	Battery inputs	No batteries for energy storage	N/A
4.2.2.8	Conditions of loading for output ports	DC-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	Earthing terminals		P
4.2.2.10	Controls		P
4.2.2.11	Available short circuit current		P
4.3	Thermal testing	(see appended table 4.3)	P
4.3.1	General		P
4.3.2	Maximum temperatures		P
4.3.2.1	General		P

IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
4.3.2.2	Touch temperatures		P
4.3.2.3	Temperature limits for mounting surfaces		P
4.4	Testing in single fault condition	(see appended table 4.4)	P
4.4.1	General		P
4.4.2	Test conditions and duration for testing under fault conditions		P
4.4.2.1	General		P
4.4.2.2	Duration of tests		P
4.4.3	Pass/fail criteria for testing under fault conditions		P
4.4.3.1	Protection against shock hazard		P
4.4.3.2	Protection against the spread of fire		P
4.4.3.3	Protection against other hazards		P
4.4.3.4	Protection against parts expulsion hazards		P
4.4.4	Single fault conditions to be applied		P
4.4.4.1	Component fault tests		P
4.4.4.2	Equipment or parts for short-term or intermittent operation	Not for short-term or intermittent operation	N/A
4.4.4.3	Motors	Internal fan	P
4.4.4.4	Transformer short circuit tests		P
4.4.4.5	Output short circuit		P
4.4.4.6	Backfeed current test for equipment with more than one source of supply		P
4.4.4.7	Output overload		P
4.4.4.8	Cooling system failure		P
4.4.4.9	Heating devices	No heating device	N/A
4.4.4.10	Safety interlock systems	No safety interlock	N/A
4.4.4.11	Reverse d.c. connections		P
4.4.4.12	Voltage selector mismatch	No voltage selector	N/A
4.4.4.13	Mis-wiring with incorrect phase sequence or polarity		P
4.4.4.14	Printed wiring board short-circuit test		P
4.5	Humidity preconditioning	(see appended table 7.5)	P
4.5.1	General		P
4.5.2	Conditions		P
4.6	Backfeed voltage protection		P
4.6.1	Backfeed tests under normal conditions		P
4.6.2	Backfeed tests under single-fault conditions		P

IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
4.6.3	Compliance with backfeed tests		P
4.7	Electrical ratings tests	(see appended table 4.7)	P
4.7.1	Input ratings		P
4.7.1.1	Measurement requirements for DC input ports		P
4.7.2	Output ratings		P
5	**MARKING AND DOCUMENTATION**		P
5.1	Marking		P
5.1.1	General	The markings on external surface of enclosure, side enclosure with rating label and warning substance, warning symbols, and installation indication or switch position provided at close up of external connection interface. Graphic symbols per Annex C or IEC 60417, refer to section “copy of marking plate”	P
	Equipment shall bear markings as specified in 5.1 and 5.2		P
	Graphic symbols may be used and shall be in accordance with Annex C or IEC 60417 as applicable.		P
	Graphic symbols shall be explained in the documentation provided with the PCE.	The explanations are provided in the user manual	P
5.1.2	Durability of markings		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	Tested with Isopropyl alcohol for 30s	P
5.1.3	Identification		P
	The equipment shall, as a minimum, be permanently marked with:		P
	a) the name or trade mark of the manufacturer or supplier	refer to section “copy of marking plate”	P
	b) model number, name or other means to identify the equipment	refer to section “copy of marking plate”	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.	Marking on equipment	P
5.1.4	Equipment ratings	Replaced, refer to IEC 62109-2:2011 test report	N/A

IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
	Unless otherwise specified in another part of IEC 62109, the following ratings, as applicable shall be marked on the equipment:		N/A
	– input voltage, type of voltage (a.c. or d.c.), frequency, and max. continuous current for each input		N/A
	– output voltage, type of voltage (a.c. or d.c.), frequency, max. continuous current, and for a.c. outputs, either the power or power factor for each output		N/A
	– the ingress protection (IP) rating as in 6.3 below		N/A
5.1.5	Fuse identification		P
	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.		P
	Where fuses with special fusing characteristics such as time delay or breaking capacity are necessary, the type shall also be indicated		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.		P
5.1.6	Terminals, Connections, and Controls		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.	Relevant symbol, indicator and information on inverter are available.	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.	Indicator lamps used for dangerous failure	P
	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 non-permanent material.		N/A
	A unit with d.c. terminals shall be plainly marked indicating the polarity of the connections, with:		P
	– the sign “+“ for positive and “-„ for negative; or	The “+” and “-” marking	P

IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
		provided adjacent to the PV input terminal	
	– a pictorial representation illustrating the proper polarity where the correct polarity can be unambiguously determined from the representation		N/A
5.1.6.1	Protective Conductor Terminals	Symbol 7 of Annex C adjacent to earth terminal	P
	The means of connection for the protective earthing conductor shall be marked with:		P
	– symbol 7 of Annex C; or		P
	– the letters “PE“; or		N/A
	– the colour coding green-yellow.		N/A
5.1.7	Switches and circuit-breakers	The components DC switch is integrated in inverter. Output overcurrent protection maybe provided by external circuit breaker specified in user manual in additional to the internal protection of inverter.	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.	The letter “ON” and “OFF” is clearly marked for DC switch	P
5.1.8	Class II Equipment	Class I	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.		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		N/A
5.1.9	Terminal boxes for External Connections		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:		P
	a) the minimum temperature Rating and size of the cable to be connected to the TERMINALS; or		N/A
	b) a marking to warn the installer to consult the	Symbol 9 of Table C marked on label	P

IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
	installation instruction. Symbol 9 of Table D-1 is an acceptable marking		
5.2	Warning markings		P
5.2.1	Visibility and legibility requirements for warning markings		P
	Warning markings shall be legible, and shall have minimum dimensions as follows:		P
	– Printed symbols shall be at least 2,75 mm high		P
	– Printed text characters shall be at least 1.5 mm high and shall contrast in colour with the background		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.		P
	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		P
	Symbol 9 of Annex C is not required to be used adjacent to symbols that are explained in the manual	Explained in the manual	P
5.2.2	Content for warning markings	See warning marking and user manual	P
5.2.2.1	Ungrounded heat sinks and similar parts	With grounded heat sink and similar metal parts	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.		N/A
5.2.2.2	Hot Surfaces		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.	“hot surface” symbol used in warning marking	P
5.2.2.3	Coolant	Air cooling	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:		N/A
	a) statement that coolant system servicing is to be		N/A

IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
	done only by SERVICE PERSONNEL, or		
	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		N/A
5.2.2.4	Stored energy		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  used for warning on marking plate for installation, operation and maintenance	P
5.2.2.5	Motor guarding	No energy with power source removed for internal cooling fan	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).		P
5.2.3	Sonic hazard markings and instructions	Measured <<80dBA@1m, no hazard	N/A
	If required by 10.2.1 a PCE shall:		N/A
	a) be marked to warn the operator of the sonic pressure hazard; or		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.		N/A
5.2.4	Equipment with multiple sources of supply	PV and mains as sources of supply	P
	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.	Symbol 13 of Annex C used, and with the following substance in manual: Both ac and dc voltage sources are terminated inside this equipment. Each circuit must be individually disconnected before servicing. When the photovoltaic array is exposed to light, it supplies a dc voltage to this equipment.	P
	The symbol shall be located on the outside of the unit or shall be prominently visible behind any cover	Located outside of the unit	P

IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
	giving access to hazardous parts.		
5.2.5	Excessive touch current		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 marked information refer to user manual	P
5.3	Documentation		P
5.3.1	General		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:	All related information provided in the user's manual	P
	a) explanations of equipment makings, including symbols used		P
	b) location and function of terminals and controls		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:		P
	– ENVIRONMENTAL CATEGORY as per 6.1	Meet requirements for outdoor use	P
	– WET LOCATIONS classification fort he intended external environment as per 6.1	Meet requirements for wet location use	P
	– POLLUTION DEGREE classification for the intended external environment as per 6.2	3	P
	– INGRESS PROTECTION rating as per 6.3	IP66	P
	– Ambient temperature and relative humidity ratings	-25˚C...+60˚C Relative humidity:0…100%	P
	– MAXIMUM altitude rating	4000m	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: II Mains: III	P
	d) a warning that when the photovoltaic array is exposed to light, it supplies a d.c. voltage to the PCE		P
5.3.1.1	Language	English	P
	Instructions related to safety shall be in a language that is acceptable in the country where the equipment is to be installed.		P

IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
5.3.1.2	Format	Documentation provided in printed form and is to be delivered with the equipment	P
	In general, the documentation must be provided in printed form and is to be delivered 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.		N/A
5.3.2	Information related to installation	As specified in user manual, refer to information related to installation	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:		P
	a) assembly, location, and mounting requirements:		P
	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;		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;		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)		P
	e) ventilation requirements;		P
	f) requirements for special services, for example cooling liquid;		P
	g) instructions and information relating to sound pressure level if required by 10.2.1;	Measured <<80dBA@1m	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 valve-regulated batteries is located, to prevent the accumulation of hazardous gases;	No such components	N/A
	i) tightening torque to be applied to wiring terminals;		P

IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
	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;		P
	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		P
	l) compatibility with RCD and RCM;	RCD integrated in PCE	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:		P
	n) where required by 7.3.8, the installation instructions shall include the following or equivalent wording:		N/A
	"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."		N/A
	o) for PCE intended to charge batteries, the battery nominal voltage rating, size, and type	No charged battery	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.		P
5.3.3	Information related to operation	As specified in user manual, refer to information related to operation	P
	Instructions for use shall include any operating instructions necessary to ensure safe operation, including the following, as applicable:		P
	– Instructions for adjustment of controls including the effects of adjustment;		P
	– Instructions for interconnection to accessories and other equipment, including indication of suitable accessories, detachable parts and any special materials;		P
	– Warnings regarding the risk of burns from surfaces permitted to exceed the temperature limits of 4.3.2 and required operator actions to reduce the risk; and		P
	– Instructions, that if the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be		P

IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
	impaired.		
5.3.4	Information related to maintenance	Maintenance made only by professional service personal who is familiar with product	P
	Maintenance instructions shall include the following:		P
	– Intervals and instructions for any preventive maintenance that is required to maintain safety (for example air filter replacement or periodic re-tightening of terminals);		P
	– Instructions for accessing operator access areas, if any are present, including a warning not to enter other areas of the equipment;		P
	– Part numbers and instructions for obtaining any required operator replaceable parts;		P
	– Instructions for safe cleaning (if recommended)		P
	– Where there is more than one source of supply energizing the PCE, information shall be provided in the manual to indicate which disconnect device or devices are required to be operated in order to completely isolate the equipment.		P
5.3.4.1	Battery maintenance	Without battery	N/A
	Where required by 14.8.5, the documentation shall include the applicable items from the following list of instructions regarding maintenance of batteries:		N/A
	– Servicing of batteries should be performed or supervised by personnel knowledgeable about batteries and the required precautions		N/A
	– When replacing batteries, replace with the same type and number of batteries or battery packs		N/A
	– General instructions regarding removal and installation of batteries		N/A
	– CAUTION: Do not dispose of batteries in a fire. The batteries may explode.		N/A
	– CAUTION: Do not open or damage batteries. Released electrolyte is harmful to the skin and eyes. It may be toxic.		N/A
	– CAUTION: A battery can present a risk of electrical shock and high short-circuit current. The following precautions should be observed when working on batteries:		N/A
	a) Remove watches, rings, or other metal objects.		N/A
	b) Use tools with insulated handles.		N/A

IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
	c) Wear rubber gloves and boots.		N/A
	d) Do not lay tools or metal parts on top of batteries		N/A
	e) Disconnect charging source prior to connecting or disconnecting battery terminals		N/A
	f) Determine if battery is inadvertently grounded. If inadvertently grounded, remove source from ground. Contact with any part of a grounded battery can result in electrical shock. The likelihood of such shock can be reduced if such grounds are removed during installation and maintenance (applicable to equipment and remote battery supplies not having a grounded supply circuit).		N/A
6	**ENVIRONMENTAL REQUIREMENTS AND CONDITIONS**		P
	The manufacturer shall rate the PCE for the following environmental conditions:		P
	– ENVIRONMENTAL CATEGORY, as in 6.1 below	Meet requirements for outdoor use	P
	– Suitability for WET LOCATIONS or not	Meet requirements for wet location use	P
	– POLLUTION DEGREE rating in 6.2 below	PD 3 external, PD 2 internal	P
	– INGRESS PROTECTION (IP) rating, as in 6.3 below	IP66	P
	– Ultraviolet (UV) exposure rating, as in 6.4 below	Metal enclosure used except with plastic window, DC switch, DC connector, AC cable gland, communication coupler with polymeric material UV resistant	P
	– Ambient temperature and relative humidity ratings, as in 6.5 below	-25˚C...+60˚C Relative humidity:0…100%	P
6.1	Environmental categories and minimum environmental conditions		P
6.1.1	Outdoor		P
6.1.2	Indoor, unconditioned		P
6.1.3	Indoor, conditioned		P
6.2	Pollution degree		P
6.3	Ingress Protection		P
6.4	UV exposure		P
6.5	Temperature and humidity		P
7	**PROTECTION AGAINST ELECTRIC SHOCK AND ENERGY HAZARDS**		P

IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
7.1	General	The proper construction of PCE is available for protection against shock and energy hazards during installation, operation and maintenance under normal and single fault conditions.	P
7.2	Fault conditions	Refer to subclause and table 4.4.4.	P
7.3	Protection against electric shock		P
7.3.1	General		P
7.3.2	Decisive voltage classification	Accessible communication circuit: DVC A; Power circuit and other circuits: DVC B, DVC C	P
7.3.2.1	Use of decisive voltage class (DVC)		P
7.3.2.2	Limits of DVC (according table 6)		P
7.3.2.3	Short-terms limits of accessible voltages under fault conditions		P
7.3.2.4	Requirements for protection (according table 7)	See 7.3.7 Table: Clearance and creepage distance measurement “insulation diagram”	P
7.3.2.5	Connection to PELV and SELV circuits		P
7.3.2.6	Working voltage and DVC		P
7.3.2.6.1	General		P
7.3.2.6.2	AC working voltage (see Figure 2)	AC Vmax: 480V considered for insulation with tolerance ±10%	P
7.3.2.6.3	DC working voltage (see Figure 3)	DC Vmax: 1100V considered for insulation	P
7.3.2.6.4	Pulsating working voltage (see Figure 4)		N/A
7.3.3	protective separation		P
	Protective separation shall be achieved by:		P
	▪ double or reinforced insulation, or		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		P
	▪ protective impedance comprising limitation of current per 7.3.5.3 and of discharged energy per 7.3.5.4, or		N/A
	▪ limitation of voltage according to 7.3.5.4.		N/A

IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
	The protective separation shall be fully and effectively maintained under all conditions of intended use of the PCE		P
7.3.4	Protection against direct contact	Protection against eclectic shock by means of earthed metal enclosure. Any access to touch live parts is impossible	P
7.3.4.1	General		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).		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.		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.		N/A
7.3.4.2	Protection by means of enclosures and barriers	Protection against eclectic shock by means of earthed metal enclosure	P
	The following requirements apply where protection against contact with live parts is provided by enclosures or barriers, not by insulation in accordance with 7.3.4.3.		P
7.3.4.2.1	General		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).		P
	Polymeric materials used to meet these requirements shall also meet the requirements of 13.6	Plastic panel for light indicator	P
7.3.4.2.2	Access probe criteria		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:		P
	a) decisive voltage classification A, (DVC A) - the probe may touch the live parts	Communication interface	P
	b) decisive voltage classification B, (DVC B) - the probe must not touch bare live parts	No DVC-B in the PCE	N/A

IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
	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,	Not accessible	P
7.3.4.2.3	Access probe tests		P
	Compliance with 7.3.4.2.1 is checked by all of the following:		P
	a) Inspection; and		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.	IP66 without openings on enclosure, for mechanical enclosure test finger cannot access to live parts and approved external connecting device used	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.		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 intended for built-in or rack mounting	N/A
	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.	No openings	N/A
	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 ±5 ° only.	No openings	N/A
7.3.4.2.4	Service access areas	The manufacturer's manual with the following substance: It is not allowed to remove the	N/A

IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
		cover during installation and maintenance when PCE is energized	
7.3.4.3	Protection by means of insulation of live parts	See 7.3.7 Table: Clearance and creepage distance measurement “insulation diagram”	P
	Where the requirements of 7.3.4.2 are not met, live parts shall be provided with insulation if:		P
	– their working voltage is greater than the maximum limit of decisive voltage class A, or		P
	– for a DVC A or B circuit, protective separation from adjacent circuit of DVC C is not provided (see note “‡“ under Table 7)		P
7.3.5	Protection in case of direct contact		P
7.3.5.1	General		P
	Protection in case of direct contact is required to ensure that contact with live parts does not produce a shock hazard.		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:		P
	– is of decisive voltage class A and complies with 7.3.5.2, or		P
	– is provided with protective impedance according to 7.3.5.3, or		N/A
	– is limited in voltage according to 7.3.5.4		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.		P
	Conformity is checked by visual inspection and trial insertion.		P
7.3.5.2	Protection using decisive voltage class A	Communication interface	P
7.3.5.3	Protection by means of protective impedance		N/A
	Circuits and conductive parts do not require protection against direct contact if any connection to circuits of DVC-B or DVC-C is through protective impedance, and the accessible circuit or part is otherwise provided with protective separation from		N/A

IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
	circuits of DVC-B or DVC-C according 7.3.3.		
7.3.5.3.1	Limitation of current through protective impedance		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.		N/A
7.3.5.3.2	Limitation of discharging energy through protective impedance		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.		N/A
7.3.5.4	Protection by means of limited voltages		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 DVC-C according to 7.3.3, does not require protection against direct contact.		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.		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.		N/A
7.3.6	Protection against indirect contact		P
7.3.6.1	General		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 part: basic insulation plus protective earthing. protective class II part(PV/AC connector, DC switch, LED cover): reinforced insulation protective class III part (operator access communication port): DVC A	P
	That part of a PCE meets the requirements of 7.3.6.2 and 7.3.6.3 is defined as protective class I		P
	That part of a PCE meets the requirements of 7.3.6.4 is defined as protective class II.	Plastic window, DC switch and PV/AC connector	P
	That part of PCE which meets the requirements of decisive voltage class A and in which no hazardous		P

IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
	voltages are derived, is defined as protective class III. No shock hazard is present in such circuits.		
	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.		N/A
7.3.6.2	Insulation between live parts and accessible conductive parts	See 7.3.7 Table: Clearance and creepage distance measurement “insulation diagram”	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		P
7.3.6.3	Protective class I – Protective bonding and earthing		P
7.3.6.3.1	General		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:	PE arrangement: external protective earthing is to be connected to terminal near AC connector	P
	a) accessible conductive parts that are protected by one of the measures in 7.3.5.2 to 7.3.5.4, or		P
	b) accessible conductive parts are separated from live parts of DVC-B or -C using double or reinforced insulation.		P
7.3.6.3.2	Requirements for protective bonding		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:		P
	a) through direct metallic contact;	As tightening with torque specified in user manual	P
	b) through other conductive parts which are not removed when the PCE or sub-units are used as intended ;		N/A
	c) through a dedicated protective bonding conductor;		P
	d) through other metallic components of the PCE		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 ensure metal to metal contact.	The paint removed in the area of contact	P

IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
	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.		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.		N/A
7.3.6.3.3	Rating of protective bonding		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.		P
	Protective bonding shall meet following requirements:		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.		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.		N/A
	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.		P
	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:		N/A
	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);		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		N/A

IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
	provided external to the equipment;		
	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.		N/A
	Voltages are measured from the protective earthing terminal to all parts whose protective bonding means are being considered. The impedance of the protective earthing conductor is not included in the measurement. However, if the protective earthing conductor is supplied with the equipment, it is permitted to include the conductor in the test circuit but the measurement of the voltage drop is made only from the main protective earthing terminal to the accessible part required to be earthed.		N/A
	On equipment where the protective earth connection to a subassembly or to a separate unit is part of a cable that also supplies power to that subassembly or unit, the resistance of the protective bonding conductor in that cable is not included in the protective bond impedance measurements for the subassembly or separate unit, as shown in Figure 11. However, this option is only permitted if the cab le is protected by a suitably rated protective device that takes into account the size of the conductor. Otherwise the impedance of the protective bonding conductor between the separate units is to be included, by measuring to the protective earthing terminal where the power source enters the first unit in the system, as shown in Figure 12.		N/A
7.3.6.3.3.1	Test current, duration, and acceptance criteria		N/A
	The test current, duration of the test and acceptance criteria are as follows:	(see appended table 7.3.6.3.3)	N/A
	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.		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.		N/A
	c) During and after the test, there shall be no melting, loosening, or other damage that would		N/A

IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
	impair the effectiveness of the protective bonding means.		
	The test current is derived from an a.c or d.c supply source, the output of which is not earthed.		N/A
	As an alternative to Table 10, where the time-current 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.		N/A
7.3.6.3.4	Protective bonding impedance (routine test)	Manufacturer's work instruction and declaration based on this clause	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:		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 means:		N/A
	▪ the test duration may be reduced to no less than 2 s		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.		N/A
	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).		N/A
7.3.6.3.5	External protective earthing conductor	Required ≥16 mm^2 (copper) or ≥25 mm^2 (Aluminum or Aluminum Alloy) detail refer to user manual	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.		P

IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
	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.		N/A
	The cross-sectional area of every external protective earthing conductor which does not form part of the supply cable or cable enclosure shall, in any case, be not less than:	External cable prepared by Installer, should follow with this rule and user manual	P
	▪ 2,5 mm² if mechanical protection is provided;		N/A
	▪ 4 mm² if mechanical protection is not provided.		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.		P
7.3.6.3.6	Means of connection for the external protective earthing conductor	Connection means for main earthing conductor: separate terminal provided near the AC terminal block	P
7.3.6.3.6.1	General		P
	The means of connection for the external protective earthing conductor shall be located near the terminals for the respective live conductors. The means of connections shall be corrosion-resistant and shall be suitable for the connection of cables according to 7.3.6.3.5. The means of connection for the protective earthing conductor shall not be used as a part of the mechanical assembly of the equipment or for other connections. A separate means of connection shall be provided for each external protective earthing conductor. Connection and bonding points shall be so designed that their current-carrying capacity is not impaired by mechanical, chemical, or electrochemical influences. Where enclosures and/or conductors of aluminium or aluminium alloys are used, particular attention should be given to the problems of electrolytic corrosion.		P
	The means of connection for the protective earthing conductor shall be permanently marked with:		P
	• symbol 7 of Annex C; or		P
	• the colour coding green-yellow		N/A
	Marking shall not be done on easily changeable parts such as screws.		P
7.3.6.3.7	Touch current in case of failure of the protective		P

IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
	earthing conductor		
	The requirements of this sub-clause shall be satisfied to maintain safety in case of damage to or disconnection of the protective earthing conductor.		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 type A equipment	N/A
	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.	Max. measured >3,5mA r.m.s. after IP test, thermal testing, single fault, and humidity preconditioning, See 7.3.6.3.7 Table	P
	a) Permanently connected wiring, and:		P
	• a cross-section of the protective earthing conductor of at least 10 mm² Cu or 16 mm² Al; or		P
	• automatic disconnection of the supply in case of discontinuity of the protective earthing conductor; or		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	A second protective earthing terminal provided on the enclosure	P
	b) Connection with an industrial connector according to IEC 60309 and a minimum protective earthing conductor cross-section of 2,5 mm² as part of a multi-conductor power cable. Adequate strain relief shall be provided.	For AC output wiring	P
	In addition, the caution symbol 15 of Annex C shall be fixed to the product and the installation manual shall provide details of the protective earthing measures required in the installation as required in 5.3.2.	Symbol 15 used in warning marking	P
	When it is intended and allowed to connect two or more PCEs in parallel using one common PE conductor, the above touch current requirements apply to the maximum number of the PCEs to be connected in parallel, unless one of the measures in a)	Not allowed	N/A
	or b) above is used. The maximum number of parallel PCEs is used in the testing and has to be stated in the installation manual.		N/A
7.3.6.4	Protective Class II – Double or Reinforced Insulation		P

IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
	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:		P
	• 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 series-connected equipment;		P
	• metal-encased equipment of protective class II may have provision on its enclosure for the connection of an equipotential bonding conductor;		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;		N/A
	• equipment employing protective class II shall be marked according to 5.1.8.	Class I equipment	N/A
7.3.7	Insulation Including Clearance and Creepage Distance	See 7.3.7 Table: Clearance and creepage distance measurement “insulation diagram”	P
7.3.7.1	General		P
	This subclause gives minimum requirements for insulation, based on the principles of IEC 60664.		P
	Manufacturing tolerances shall be taken into account during measurement of creepage, clearance, and insulation distance in the PCE.		P
	Insulation shall be selected after consideration of the following influences:		P
	• pollution degree	PD 3 external, PD 2 internal	P
	• overvoltage category	PV: II; Mains: III	P
	• supply earthing system	TN, TT, IT	P
	• insulation voltage	1100VDC(PV) and 480VAC(Mains)	P

IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
	• location of insulation	See 7.3.7 Table: Clearance and creepage distance measurement “insulation diagram”	P
	• type of insulation	See 7.3.7 Table: Clearance and creepage distance measurement “insulation diagram”	P
	Compliance of insulation, creepage distances, and clearance distances, shall be verified by measurement or visual inspection, and the tests of 7.5.		P
7.3.7.1.3	Supply earthing systems		P
	Three basic types of earthing system are described in IEC 60364-1. They are:		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.		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;		P
	• 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.		P
7.3.7.1.4	Insulation voltages		P
	Table 12 makes use of the circuit system voltage and overvoltage category to define the impulse withstands voltage and the temporary overvoltage.		P
7.3.7.2	Insulation between a circuit and its surroundings		P
7.3.7.2.1	General		P
7.3.7.2.2	Circuits connected directly to the mains		P
7.3.7.2.3	Circuits other than mains circuits		P
7.3.7.2.4	Insulation between circuits		P
7.3.7.3	Functional insulating		P
7.3.7.4	Clearance distances		P
7.3.7.4.1	Determination		P
7.3.7.4.2	Electric field homogeneity	Inhomogeneous electric field	N/A

IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
		is considered for PCE	
7.3.7.4.3	Clearance to conductive enclosures		P
7.3.7.5	Creepage distances	(see appended table 7.3.7)	P
7.3.7.5.1	General		P
7.3.7.5.2	Voltage		P
7.3.7.5.3	Materials	Certified PWB used. Other material are considered IIIb The inside parts are considered pollution degree 2	P
7.3.7.6	Coating	No coating provided insulation	N/A
7.3.7.7	PWB spacings for functional insulating		P
7.3.7.8	Solid insulating	(see appended table 7.3.7)	P
7.3.7.8.1	General		P
7.3.7.8.2	Requirements for electrical withstand capability of solid insulation		P
7.3.7.8.2.1	Basic, supplemental, reinforced, and double insulation		P
7.3.7.8.2.2	Functional insulation		P
7.3.7.8.3	Thin sheet or tape material		P
7.3.7.8.3.1	General		P
7.3.7.8.3.2	Material thickness not less than 0,2 mm		P
7.3.7.8.3.3	Material thickness less than 0,2 mm		P
7.3.7.8.3.4	Compliance		P
7.3.7.8.4	Printed wiring boards		P
7.3.7.8.4.1	General		P
7.3.7.8.4.2	Use of coating materials		N/A
7.3.7.8.5	Wound components		P
7.3.7.8.6	Potting materials	For potting material used cover protective optocoupler, used as solid insulation	P
7.3.7.9	Insulation requirements above 30 kHz	Evaluated according to Annex G	P
7.3.8	Residual Current-operated protective (RCD) or monitoring (RCM) device compatibility	RCD integrated for PV side protection, refer to IEC 62109-2:2011 test report	P
	RCD and RCM are used to provide protection against insulation faults in some domestic and industrial installations, additional to that provided by the installed equipment.	If an external RCD or residual current breaker is required, must follow with local regulation, type B should be used for main side.	P
7.3.9	Capacitor discharge		P

IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
7.3.9.1	Operator access area		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.	Not access for operator from outside. Symbol  used for warning on marking plate for installation, operation and maintenance.	P
7.3.9.2	Service access areas		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.	For repairing and internal maintenance, only by professional service personal who is familiar with product. Symbol  used for warning on marking plate for installation, operation and maintenance.	P
7.4	Protection against energy hazards		P
7.4.1	Determination of hazardous energy level		P
	A hazardous energy level is considered to exist if		P
	a) The voltage is 2 V or more, and power available after 60 s exceeds 240 VA.	Access to internal power circuit, tool required. No user serviceable parts inside the device per manufacturer's manual. Operator access: communication interface circuit, external connecting device for PV generator and MAINs connection	P
	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: $E = 0,5\ CU^2$		P
7.4.2	Operator Access Areas		P
	Equipment shall be so designed that there is no risk of energy hazard in operator access areas from accessible circuits.	Only access DVC A circuit(communication interface), no risk of energy hazard in operator access area from accessible circuits.	P
7.4.3	Services Access Areas	For repairing and internal maintenance, only by professional service personal who is familiar with product.	P

IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
		Symbol  used for warning on marking plate for installation, operation and maintenance. <20J after 15 min inside	
7.5	Electrical tests related to shock hazard	(see appended table 7.5)	P
7.5.1	Impulse voltage test (type test)		P
7.5.2	Voltage test (dielectric strength test)		P
7.5.2.1	Purpose of test		P
7.5.2.2	Value and type of test voltage		P
7.5.2.3	Humidity pre-conditioning		P
7.5.2.4	Performing the voltage test		P
7.5.2.5	Duration of the a.c. or d.c. voltage test		P
7.5.2.6	Verification of the a.c. or d.c. voltage test		P
7.5.3	Partial discharge test	No double or reinforced solid insulation used. No voltage stress on the insulation is greater than 1 kV/mm. (see appended table 7.5)	N/A
7.5.4	Touch current measurement (type test)		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.	Max. measured > 3,5mA r.m.s. after IP66, thermal testing, single fault, and humidity preconditioning, special measures of protection as given in 7.3.6.3.7 are required in user manual (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 pre-conditioning of 4.5 shall be performed immediately prior to the touch current test.		P
7.5.5	Equipment with multiple sources of supply		P

8	**PROTECTION AGAINST MECHANICAL HAZARDS**		P
8.1	General		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 and rounded so as not to	Edges, projections, corners, openings, guards, handles and the like, that are accessible to the OPERATOR are smooth and rounded	P

IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
	cause injury during normal use of the equipment.		
	Conformity is checked as specified in 8.2 to 8.6.		P
8.2	Moving parts		N/A
	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	Protection of service persons	Power sources need to be removed when servicing and no moving part inside	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.		N/A
8.3	Stability		N/A
	Equipment and assemblies of equipment not secured to the building structure before operation shall be physically stable in NORMAL USE.	Wall mounting	N/A
8.4	Provisions for lifting and carrying		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.	Weight: 43kg×4 for from zero to full load in 5 s to 10 s, then maintained for 1 min, handles/grips not break loose from the equipment and 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.		P
8.5	Wall mounting		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.	Weight: 43kg×4 for from zero to full load in 5 s to 10 s, then maintained for 1 min, no damage to mounting brackets	P
8.6	Expelled parts		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

IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
9	**PROTECTION AGAINST FIRE HAZARDS**		P
9.1	Resistance to fire	Suitable and appropriate materials, components and construction are used to reduce the risk of ignition and the spread of flame.	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.		P
9.1.1	Reducing the risk of ignition and spread of flame	Method 1 used	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.		P
9.1.2	Conditions for a fire enclosure		P
	A FIRE ENCLOSURE is required for equipment or parts of equipment for which Method 2 is not fully applied and complied with.		P
9.1.2.1	Parts requiring a fire enclosure		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:		P
	– components in PRIMARY CIRCUITS		P
	– components in SECONDARY CIRCUITS supplied by power sources which exceed the limits for a LIMITED POWER SOURCE as specified in 9.2;		N/A
	– 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;		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;		N/A
	– components having unenclosed arcing parts, such as open switch and relay contacts and commutators, in a circuit at HAZARDOUS	DC switch with open-contacts and plastic components of fire enclosure located more than	P

IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
	VOLTAGE or at a HAZARDOUS ENERGY LEVEL; and	13 mm through air from parts that arc under normal conditions	
	– insulated wiring, except as permitted in 9.1.2.2.		P
9.1.2.2	Parts not requiring a fire enclosure		N/A
9.1.3	Materials requirements for protection against fire hazard		P
9.1.3.1	General		P
	ENCLOSURES, components and other parts shall be so constructed, or shall make use of such materials, that the propagation of fire is limited.		P
9.1.3.2	Materials for fire enclosures		P
	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.		N/A
9.1.3.3	Materials for components and other parts outside fire enclosures	V-0 material 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.	Fire enclosure also as mechanical enclosure and electrical enclosure	P
9.1.3.4	Materials for components and other parts inside fire enclosures	All internal components are rated V-2 or better or mounded on PCB rated V-0.	P
9.1.3.5	Materials for air filter assemblies		N/A
9.1.4	Openings in fire enclosures	IP66 electrical enclosure without openings	N/A
9.1.4.1	General		N/A
	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.		N/A
	These requirements are in addition to those in the following sections:		N/A
	– 7.3.4, Protection against direct contact;		N/A
	– 7.4, Protection against energy hazards;		N/A
	– 13.5, Openings in enclosures		N/A
9.1.4.2	Side openings treated as bottom openings		N/A
9.1.4.3	Openings in the bottom of a fire enclosure		N/A
	The bottom of a FIRE ENCLOSURE or individual		N/A

IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
	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.		
9.1.4.4	Equipment for use in a CLOSED ELECTRICAL OPERATING 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 non-combustible surface. Such equipment shall be marked as follows:		N/A
	WARNING: FIRE HAZARD SUITABLE FOR MOUNTING ON CONCRETE OR OTHER NON-COMBUSTIBLE SURFACE ONLY		N/A
9.1.4.5	Doors or covers in fire enclosures		P
9.1.4.6	Additional requirements for openings in transportable equipment		N/A
9.2	LIMITED POWER SOURCES		N/A
9.2.1	General		N/A
9.2.2	Limited power source tests	(see appended table 9.2.2)	N/A
9.3	Short-circuit and overcurrent protection		P
9.3.1	General		P
	The PCE shall not present a hazard, under short-circuit 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.		P
9.3.2	Protection against short-circuits and overcurrents 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 overcurrent hazard is presented by short-circuits and overloads.		P
9.3.3	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.		P

IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
10	**PROTECTION AGAINST SONIC PRESSURE HAZARDS**		P
10.1	General		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.		P
10.2	Sonic pressure and Sound level	Measured <<80dBA@1m	P
10.2.1	Hazardous Noise Levels		N/A
11	**PROTECTION AGAINST LIQUID HAZARDS**		N/A
11.1	Liquid Containment, Pressure and Leakage	Without liquid containment system	N/A
	The liquid containment system components shall be compatible with the liquid to be used.		N/A
	There shall be no leakage of liquid onto live parts as a result of:		N/A
	a) Normal operation, including condensation;		N/A
	b) Servicing of the equipment; or		N/A
	c) Inadvertent loosening or detachment of hoses or other cooling system parts over time.		N/A
11.2	Fluid pressure and leakage		N/A
11.2.1	Maximum pressure		N/A
11.2.2	Leakage from parts		N/A
11.2.3	Overpressure safety device		N/A
11.3	Oil and grease	Not used	N/A
12	**CHEMICAL HAZARDS**		N/A
12.1	General		N/A
13	**PHYSICAL REQUIREMENTS**		P
13.1	Handles and manual controls		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.	DC switch, PV/AC connector and Communication connector on bottom and cable gland	P
13.1.1	Adjustable controls	Without adjustable controls	N/A

IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
13.2	Securing of parts		P
13.3	Provisions for external connections		P
13.3.1	General		P
13.3.2	Connection to an a.c. Mains supply		P
13.3.2.1	General		P
	For safe and reliable connection to a MAINS supply, equipment shall be provided with one of the following:		P
	– terminals or leads or a non-detachable power supply cord for permanent connection to the supply; or		P
	– a non-detachable power supply cord for connection to the supply by means of a plug		N/A
	– an appliance inlet for connection of a detachable power supply cord; or		N/A
	– a mains plug that is part of direct plug-in equipment as in 13.3.8		N/A
13.3.2.2	Permanently connected equipment		N/A
13.3.2.3	Appliance inlets		P
13.3.2.4	Power supply cord		N/A
13.3.2.5	Cord anchorages and strain relief		N/A
	For equipment with a non-detachable power supply cord, a cord anchorage shall be supplied such that:		N/A
	– the connecting points of the cord conductors are relieved from strain; and		N/A
	– the outer covering of the cord is protected from abrasion.		N/A
13.3.2.6	Protection against mechanical damage		P
13.3.3	Wiring terminals for connection of external conductors	Integrated in approved coupler	P
13.3.3.1	Wiring terminals		P
13.3.3.2	Screw terminals		P
13.3.3.3	Wiring terminal sizes		P
13.3.3.4	Wiring terminal design		P
13.3.3.5	Grouping of wiring terminals	3/N/PE or 3/PE	P
13.3.3.6	Stranded wire		P
13.3.4	Supply wiring space		P
13.3.5	Wire bending space for wires 10 mm² and greater	No wire exceeds 10 mm²	N/A
13.3.6	Disconnection from supply sources	Disconnect the unit from the	P

IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
		MAINS by automatic disconnecting relays in all live conductor and PV supply by the DC integrated switches	
13.3.7	Connectors, plugs and sockets	Approved PV connector used	P
13.3.8	Direct plug-in equipment		P
13.4	Internal wiring and connections		P
13.4.1	General		P
13.4.2	Routing		P
13.4.3	Colour coding	Conductor having green-and-yellow insulation is used only for protective earthing and bonding connection	P
13.4.4	Splices and connections	All splices and connections are mechanically adequate secure and provided electrical continuity. The likelihood of loose is impossible	P
13.4.5	Interconnections between parts of the PCE		P
13.5	Openings in enclosures		N/A
13.5.1	Top and side openings		N/A
	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.		N/A
13.6	Polymeric Materials		P
13.6.1	General	UL approved material used. plastic cover of LED cover, DC switch, AC/DC connector, communication port coupler, cable gland: V-0, suitable for outdoor use with respect to exposure to Ultraviolet Light, Water Exposure and Immersion in accordance with UL 746C	P
13.6.1.1	Thermal index or capability	Thermal index of Polymeric Materials used higher than the maximum measured operating temperature in heating test	P
13.6.2	Polymers serving as enclosures or barriers preventing access to hazards		N/A
13.6.2.1	Stress relief test		N/A
13.6.3	Polymers serving as solid insulation		P
13.6.3.1	Resistance to arcing		P
13.6.4	UV resistance		P

IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
	Polymeric parts of an OUTDOOR ENCLOSURE required for compliance with this standard shall be sufficiently resistance to degradation by ultra-violet (UV) radiation		P
13.7	Mechanical resistance to deflection, impact, or drop		P
13.7.1	General		P
13.7.2	250-N deflection test for metal enclosures		P
13.7.3	7-J impact test for polymeric enclosures	LED cover	P
13.7.4	Drop test		N/A
13.8	Thickness requirements for metal enclosures		P
13.8.1	General	Conformity is checked by the test as specified in clause 13.7	P
13.8.2	Cast metal		P
13.8.3	Sheet metal		N/A
14	**COMPONENTS**		P
14.1	General	(see appended table 14)	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:		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;		P
	b) the requirements of this standard and, where necessary for the application, any additional applicable safety requirements of the relevant IEC component standard;		P
	c) if there is no relevant IEC standard, the requirements of this standard;		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.		P
	Components such as optocouplers, capacitors, transformers, and relays connected across basic, supplemental, reinforced, or double insulation shall		P

IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
	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 routine test.		
14.2	Motor Over Temperature Protection		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.		N/A
14.3	Over temperature protection devices	Power limited by temperature control in single fault condition or high temperature environment condition	P
14.4	Fuse holders	Not replaced by operator	N/A
14.5	MAINS voltage selecting devices		N/A
14.6	Printed circuit boards		P
	Printed circuit boards shall be made of material with a flammability classification of V-1 of IEC 60707 or better.	PCB material approved by UL with UL94 V-0 rating	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.		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.		P
14.7	Circuits or components used as transient overvoltage limiting devices		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.		P
14.8	Batteries		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.		N/A
14.8.1	Battery Enclosure Ventilation		N/A
14.8.1.1	Ventilation requirements		N/A

IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
14.8.1.2	Ventilation testing		N/A
14.8.1.3	Ventilation instructions		N/A
14.8.2	Battery Mounting		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 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.		N/A
14.8.3	Electrolyte spillage		N/A
	Battery trays and cabinets shall have an electrolyte-resistant coating.		N/A
	The ENCLOSURE or compartment housing a VENTED BATTERY shall be constructed so that spillage or leakage of the electrolyte from one battery will be contained within the ENCLOSURE and be prevented from:		N/A
	a) reaching the PCE outer surfaces that can be contacted by the USER		N/A
	b) contaminating adjacent electrical components or materials; and		N/A
	c) bridging required electrical distances		N/A
14.8.4	Battery Connections		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		N/A
14.8.5	Battery maintenance instructions		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.		N/A
14.8.6	Battery accessibility and maintainability		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.		N/A
15	Software and firmware performing safety functions	(see appended table 15)	P

4.7	TABLE: : Electrical ratings tests					P
Type	U dc (V)	I dc (A)	P dc (W)	U ac (V)	I ac (A)	P ac (W/VA)
SUN2000-15KTL-M3@380V						
Min. full load MPP voltage	402,24	38,30	15505	220,31	22,76	14964
				219,98	22,78	
				220,15	23,02	
Max. full load MPP voltage	808,93	19,38	15524	220,16	22,81	15032
				220,08	22,59	
				220,11	22,71	
Rated MPP voltage at max. power	609,01	25,36	15398	220,13	22,85	15123
				220,18	22,67	
				220,21	23,03	
Verification for Idc max and max. active power indicated on marking plate	403,69	40,88	16975	220,41	24,85	16614
				220,09	25,17	
				220,35	25,03	
Verification for Iac max and max. apparent power indicated on marking plate	624,57	26,96	16932	220,71	25,17	16625
				220,39	25,12	
				220,43	25,13	
SUN2000-15KTL-M3@400V						
Min. full load MPP voltage	402,35	38,21	15493	230,33	21,81	15063
				230,41	21,79	
				230,26	21,77	
Max. full load MPP voltage	800,36	19,03	15396	230,06	21,78	15041
				230,11	21,80	
				230,19	21,77	
Rated MPP voltage at max. power	601,25	25,63	15463	230,37	21,75	15112
				230,41	21,80	
				230,31	21,79	
Verification for Idc max and max. active power indicated on marking plate	401,21	40,37	16993	230,17	21,83	16651
				230,11	21,74	
				230,01	21,79	
Verification for Iac max and max. apparent power indicated on marking plate	598,86	28,13	16894	230,17	23,83	16525
				230,11	23,74	
				230,01	24,03	
SUN2000-17KTL-M3@380V						
Min. full load MPP voltage	400,24	43,55	17363	220,31	22,76	16986
				219,98	22,78	
				220,15	23,02	
Max. full load MPP voltage	801,53	21,95	17365	220,16	22,81	17013
				220,08	22,59	
				220,11	22,71	
Rated MPP voltage at	601,16	29,23	17443	220,13	22,85	17041

max. power				220,18	22,67	
				220,21	23,03	
Verification for Idc max and max. active power indicated on marking plate	403,69	47,26	19412	220,41	28,85	18816
				220,09	28,17	
				220,35	28,36	
Verification for Iac max and max. apparent power indicated on marking plate	600,31	31,97	19341	220,31	28,51	18839
				219,98	28,43	
				220,15	28,39	
SUN2000-17KTL-M3@400V						
Min. full load MPP voltage	401,23	43,21	17451	230,14	24,65	17091
				230,21	24,73	
				230,31	24,81	
Max. full load MPP voltage	798,36	22,09	17395	229,89	24,71	17039
				230,51	25,03	
				230,18	24,64	
Rated MPP voltage at max. power	599,68	28,63	17395	230,22	24,59	17054
				230,09	24,77	
				230,14	25,01	
Verification for Idc max and max. active power indicated on marking plate	403,69	46,96	19212	230,05	27,21	18851
				230,13	27,13	
				230,17	27,31	
Verification for Iac max and max. apparent power indicated on marking plate	600,31	31,97	19341	230,11	27,36	18843
				230,07	27,28	
				230,12	23,34	
SUN2000-20KTL-M3@380V						
Min. full load MPP voltage	479,53	43,86	21231	220,18	30,31	20053
				220,03	30,53	
				219,97	30,47	
Max. full load MPP voltage	802,51	26,51	21189	220,11	30,41	19989
				220,08	30,53	
				220,23	30,61	
Rated MPP voltage at max. power	602,31	34,68	21156	220,13	31,03	20043
				220,01	30,54	
				220,06	30,19	
Verification for Idc max and max. active power indicated on marking plate	480,05	46,63	22486	220,30	33,45	22017
				220,03	33,29	
				220,15	33,21	
Verification for Iac max and max. apparent power indicated on marking plate	600,42	37,2	22427	220,06	33,43	22131
				220,17	33,62	
				220,09	33,24	
SUN2000-20KTL-M3@400V						
Min. full load MPP voltage	480,21	44,01	21131	229,68	29,09	20321
				230,51	29,31	
				230,19	29,06	
Max. full load MPP voltage	800,56	26,74	21259	230,17	29,01	20123
				230,01	28,97	
				230,03	29,11	
Rated MPP voltage at max. power	600,35	35,36	21143	230,13	29,07	20097
				230,07	28,68	
				230,16	29,21	
Verification for Idc max and max. active power indicated	480,62	46,78	22468	230,15	31,24	22084
				230,17	31,79	

on marking plate				230,08	31,89	
Verification for Iac max and max. apparent power indicated on marking plate	601,51	37,01	22308	230,16	31,96	22064
				230,07	31,91	
				230,09	32,04	
SUN2000-23KTL-M3@380V						
Min. full load MPP voltage	480,36	49,23	23536	220,03	35,01	23056
				220,51	34,93	
				220,36	35,21	
Max. full load MPP voltage	801,42	29,21	23493	220,12	35,29	23071
				220,19	34,91	
				220,06	34,99	
Rated MPP voltage at max. power	600,47	39,82	23451	220,17	34,96	23061
				220,41	35,12	
				220,31	35,43	
Verification for Idc max and max. active power indicated on marking plate	481,27	48,61	23498	220,06	34,83	23023
				220,13	34,86	
				220,21	34,81	
Verification for Iac max and max. apparent power indicated on marking plate	600,71	38,95	23486	220,05	35,01	23084
				220,29	34,89	
				220,18	34,84	
SUN2000-23KTL-M3@400V						
Min. full load MPP voltage	479,56	48,86	23483	230,18	33,41	23015
				230,15	33,52	
				230,08	32,97	
Max. full load MPP voltage	800,31	29,04	23471	230,07	33,26	23151
				230,01	33,38	
				230,21	33,41	
Rated MPP voltage at max. power	599,27	39,51	23408	230,10	33,39	23086
				230,00	33,51	
				230,06	33,19	
Verification for Idc max and max. active power indicated on marking plate	480,21	48,83	23448	230,17	33,43	23051
				230,13	33,28	
				230,21	33,29	
Verification for Iac max and max. apparent power indicated on marking plate	600,36	39,28	23451	230,06	33,48	23068
				230,14	33,43	
				230,23	33,39	
SUN2000-28KTL-M3@480V						
Min. full load MPP voltage	522,14	53,92	28165	277,12	33,23	27686
				277,03	33,09	
				277,19	33,17	
Max. full load MPP voltage	800,53	34,91	28134	277,11	33,26	27451
				277,18	33,25	
				277,21	33,18	
Rated MPP voltage at max. power	719,58	38,98	28256	277,09	33,23	27596
				277,04	33,09	
				277,13	33,07	
Verification for Idc max and max. active power indicated on marking plate	520,18	53,56	28151	277,07	33,19	27631
				277,14	33,26	
				277,16	33,18	
Verification for Iac max and max. apparent power indicated on marking plate	720,17	38,81	28130	277,02	33,23	27589
				277,08	33,19	
				277,13	33,16	

SUN2000-29.9KTL-M3@400V						
Min. full load MPP voltage	500,68	60,85	30548	230,06	43,28	29851
				230,03	43,26	
				230,14	43,21	
Max. full load MPP voltage	801,23	37,95	30556	230,10	43,23	29906
				230,15	43,18	
				230,21	43,19	
Rated MPP voltage at max. power	600,75	50,69	30576	230,17	43,27	29891
				230,21	43,14	
				230,13	43,19	
Verification for Idc max and max. active power indicated on marking plate	501,36	60,81	30513	230,07	43,16	29934
				230,06	43,21	
				230,14	43,19	
Verification for Iac max and max. apparent power indicated on marking plate	600,34	50,83	30564	230,09	43,29	29961
				230,61	43,21	
				230,71	43,31	
SUN2000-29.9KTL-M3@480V						
Min. full load MPP voltage	623,62	48,93	30516	277,12	35,94	29936
				277,03	36,02	
				277,19	36,13	
Max. full load MPP voltage	850,61	35,97	30583	277,11	36,23	29958
				277,18	36,08	
				277,21	35,99	
Rated MPP voltage at max. power	720,38	42,36	30549	277,09	36,31	29907
				277,04	36,29	
				277,13	36,08	
Verification for Idc max and max. active power indicated on marking plate	625,23	48,86	30517	277,07	36,03	29916
				277,14	36,17	
				277,16	36,12	
Verification for Iac max and max. apparent power indicated on marking plate	720,58	42,31	30586	277,02	36,14	29943
				277,08	36,03	
				277,13	36,06	
SUN2000-30KTL-M3@380V						
Min. full load MPP voltage	500,23	60,93	30709	220,03	45,41	30036
				220,01	45,48	
				220,06	45,50	
Max. full load MPP voltage	800,16	38,32	30756	220,31	45,53	30093
				220,26	45,48	
				220,24	45,46	
Rated MPP voltage at max. power	600,53	50,92	30786	220,06	45,43	30029
				219,96	45,62	
				220,14	45,53	
Verification for Idc max and max. active power indicated on marking plate	501,36	66,93	33731	220,09	50,41	33057
				220,03	50,39	
				220,04	50,37	
Verification for Iac max and max. apparent power indicated on marking plate	600,34	55,86	33704	220,03	50,13	33026
				220,07	50,25	
				220,31	50,22	
SUN2000-30KTL-M3@400V						
Min. full load MPP voltage	500,31	60,87	30709	230,12	43,51	30054

				230,06	43,49	
				230,13	43,53	
Max. full load MPP voltage	800,23	38,26	30756	230,01	43,46	30023
				230,07	43,51	
				230,08	43,49	
Rated MPP voltage at max. power	600,15	50,82	30786	230,06	43,48	30061
				230,12	43,46	
				230,14	43,47	
Verification for Idc max and max. active power indicated on marking plate	500,21	66,93	33731	230,21	47,91	33058
				230,13	47,88	
				230,19	47,92	
Verification for Iac max and max. apparent power indicated on marking plate	600,76	55,96	33704	230,17	47,91	33031
				230,03	47,93	
				230,15	47,88	
SUN2000-30KTL-M3@480V						
Min. full load MPP voltage	625,21	48,86	30716	277,12	36,13	30043
				277,03	36,15	
				277,19	36,21	
Max. full load MPP voltage	850,16	35,92	30779	277,11	36,14	30056
				277,18	36,08	
				277,21	36,17	
Rated MPP voltage at max. power	720,38	42,30	30749	277,09	36,20	30072
				277,04	36,13	
				277,13	36,19	
Verification for Idc max and max. active power indicated on marking plate	625,06	53,85	33709	277,07	39,81	33084
				277,14	39,68	
				277,16	39,76	
Verification for Iac max and max. apparent power indicated on marking plate	720,81	46,81	33786	277,02	39,73	33069
				277,08	39,81	
				277,13	39,78	
SUN2000-36KTL-M3@380V						
Min. full load MPP voltage	519,56	69,25	36796	220,03	54,63	36062
				220,13	54,52	
				220,17	54,51	
Max. full load MPP voltage	800,23	45,52	36774	220,11	54,62	36047
				220,01	54,58	
				220,04	54,54	
Rated MPP voltage at max. power	600,38	61,35	36781	220,06	54,59	36076
				220,30	54,56	
				220,41	54,60	
Verification for Idc max and max. active power indicated on marking plate	520,31	78,96	40996	220,06	60,72	40046
				220,05	60,71	
				220,03	60,73	
Verification for Iac max and max. apparent power indicated on marking plate	600,39	67,96	40918	220,12	60,76	40027
				220,15	60,69	
				220,16	60,68	
SUN2000-36KTL-M3@400V						
Min. full load MPP voltage	520,21	71,48	37171	230,12	52,21	36043
				230,06	52,26	
				230,08	52,23	

Max. full load MPP voltage	800,16	46,53	37215	230,10	52,22	36054
				230,06	52,23	
				230,08	52,24	
Rated MPP voltage at max. power	600,25	61,89	37104	230,11	52,31	36084
				230,12	52,34	
				230,16	52,28	
Verification for Idc max and max. active power indicated on marking plate	520,81	78,95	41056	230,01	58,08	40043
				230,03	58,06	
				230,04	58,01	
Verification for Iac max and max. apparent power indicated on marking plate	600,45	68,09	40852	230,06	58,07	40056
				230,12	58,06	
				230,04	58,06	
SUN2000-36KTL-M3@480V						
Min. full load MPP voltage	624,68	59,25	36954	277,12	43,32	36041
				277,06	43,26	
				277,08	43,31	
Max. full load MPP voltage	850,52	43,62	37021	277,12	43,41	36046
				277,14	43,45	
				277,16	43,42	
Rated MPP voltage at max. power	720,36	51,35	36912	277,05	43,50	36059
				277,14	43,48	
				277,06	43,53	
Verification for Idc max and max. active power indicated on marking plate	520,71	78,82	40986	277,12	48,26	40053
				277,05	48,31	
				277,06	48,29	
Verification for Iac max and max. apparent power indicated on marking plate	720,51	56,83	40852	277,03	48,36	40047
				277,21	48,34	
				277,26	48,31	
SUN2000-40KTL-M3@380V						
Min. full load MPP voltage	540,21	76,75	41438	220,06	60,68	40051
				220,12	60,71	
				220,13	60,72	
Max. full load MPP voltage	800,53	51,62	41296	220,04	60,66	40023
				220,06	60,72	
				220,14	60,69	
Rated MPP voltage at max. power	600,41	68,38	41023	220,13	60,56	40036
				220,06	60,75	
				220,01	60,66	
Verification for Idc max and max. active power indicated on marking plate	540,56	87,62	45543	220,15	66,79	44061
				220,13	66,72	
				220,21	66,73	
Verification for Iac max and max. apparent power indicated on marking plate	600,96	75,45	45214	220,16	66,78	44053
				220,18	66,77	
				220,13	66,79	
SUN2000-40KTL-M3@400V						
Min. full load MPP voltage	540,34	76,81	41438	230,36	58,03	40023
				230,21	57,96	
				230,26	58,21	
Max. full load MPP voltage	800,23	51,73	41316	230,23	58,01	40031
				230,13	57,98	

				230,05	58,03	
Rated MPP voltage at max. power	600,61	68,29	41031	230,26	58,06	40041
				230,23	58,04	
				230,13	58,01	
Verification for Idc max and max. active power indicated on marking plate	540,56	87,73	45561	230,13	63,85	44053
				230,05	64,09	
				230,26	64,23	
Verification for Iac max and max. apparent power indicated on marking plate	600,96	75,45	45214	230,24	63,95	44039
				230,16	64,23	
				230,14	64,19	
SUN2000-40KTL-M3@480V						
Min. full load MPP voltage	626,08	66,42	41452	277,13	48,41	40053
				277,16	48,29	
				277,18	48,36	
Max. full load MPP voltage	851,56	48,76	41385	277,21	48,46	40037
				277,09	48,32	
				277,06	48,29	
Rated MPP voltage at max. power	720,49	57,43	41018	277,05	48,31	40019
				277,06	48,46	
				277,03	48,25	
Verification for Idc max and max. active power indicated on marking plate	625,31	72,86	45527	277,09	53,11	44067
				277,06	53,09	
				277,05	53,16	
Verification for Iac max and max. apparent power indicated on marking plate	720,15	62,78	45184	277,15	53,26	44032
				277,19	53,28	
				277,21	53,35	
SUN2000-42KTL-M3@480V						
Min. full load MPP voltage	575,9	75,52	43495	277,23	50,71	42466
				277,13	50,69	
				277,08	50,68	
Max. full load MPP voltage	850,16	51,12	43395	277,11	50,76	42034
				277,19	50,74	
				277,03	50,79	
Rated MPP voltage at max. power	720,23	59,72	42981	277,05	50,80	42076
				277,06	50,71	
				277,03	50,69	
Verification for Idc max and max. active power indicated on marking plate	580,31	83,81	48607	277,29	56,62	47023
				277,15	56,64	
				277,31	56,59	
Verification for Iac max and max. apparent power indicated on marking plate	720,15	62,78	45184	277,15	57,02	47101
				277,19	56,86	
				277,21	56,89	
Supplementary information:						

4.3	**TABLE: heating temperature rise measurements (SUN2000-42KTL-M3)**								P
Test voltage(PV Input) :	625V	720V	850V	625V	720V	720V	720V	720V	---
Test voltage(AC Output) :	480V	480V	480V	480V	480V	480V	480V	480V	

Test frequency(Hz):	50	50	50	50	50	50	50	50	---
Output power(kW):	46,84	46,95	33,75	41,03	41,19	32,22	44,39	26,76	---
maximum temperature T of part/at:	T (°C)								allowed Tmax (°C)
Ambient Temperature	30,0	40,0	40,0	40,0	50,0	60,0	25,0	25,0	-
CPU (U3)	70,6	67,8	67,2	67,6	70,5	73,3	48,1	60,8	125
CPLD (U0701)	91,1	88,6	87,8	88,1	90,9	93,0	69,7	79,5	125
L4 FLASH (U203)	72,0	68,8	68,4	68,5	71,6	74,6	41,8	61,2	85
Bus ground power arrester (F301)	79,2	76,4	75,9	76,7	78,4	80,2	48,0	66,8	85
Bus ground power arrester (F306)	73,4	70,1	69,8	69,7	72,7	75,8	38,5	62,1	85
Gas Discharge Tube (D306)	80,5	77,2	76,6	78,4	79,1	80,6	48,8	68,1	125
Y Cap (C422)	79,4	78,3	77,0	77,5	81,0	82,0	54,5	64,9	100
X Cap (C606)	72,4	68,8	68,3	68,8	71,9	74,1	40,0	58,4	110
Current Hall (U401)	78,2	76,7	75,3	75,7	79,1	80,6	53,0	65,7	85
Grid relay coil(K503)	80,7	80,3	78,3	79,2	83,0	83,8	55,8	67,1	130
EMI Com-mode Inductor (T601)	83,2	83,1	79,2	82,7	86,5	84,0	56,4	65,2	110
Power Arrester (F607)	74,7	70,9	70,5	71,3	73,7	75,7	40,0	58,5	85
Power Arrester (F604)	73,9	71,2	70,1	72,5	71,4	74,6	40,6	59,3	85
Gas Discharge Tube (D601)	76,1	72,7	71,8	73,0	75,1	76,7	40,8	60,1	90
High Frequency Transformer (T701)	80,4	76,4	76,8	76,2	79,0	81,9	49,6	67,1	130
DC Aux Transformer MOS (Q702)	93,3	90,1	96,8	89,4	93,5	96,6	71,0	82,5	130
THT Film Capacitor (C710)	72,9	70,6	69,9	70,1	73,7	76,0	47,1	63,0	105
Driver Transformer (T801)	77,8	74,5	74,4	74,4	77,1	79,5	48,5	65,1	130
High Frequency Transformer (T1101)	82,8	79,4	79,1	79,3	82,0	84,3	57,2	69,6	130
MOSFET (Q1101)	78,4	74,8	74,4	74,7	77,5	80,1	49,0	65,2	130
THT Film Capacitor (C1104)	80,4	77,5	76,8	78,7	78,9	80,3	45,6	67,2	105
AC AUX source PWM Controller (U1204)	81,4	78,4	77,9	78,2	81,0	83,1	57,4	68,5	130
Driver Transformer (T1201)	78,9	75,9	75,3	75,8	78,5	80,3	53,4	65,0	130
Optical Coupler (U1904)	86,3	85,9	85,1	85,6	87,4	87,2	61,6	75,8	125
Electromagnetic Relay (K1001)	78,6	75,7	75,4	76,0	77,8	79,8	45,5	66,3	85
Gas Discharge Tube (D2309)	73,4	69,6	69,4	69,8	72,0	74,9	37,9	60,9	90
THT Film Capacitor (C1104)	80,4	77,5	76,8	78,7	78,9	80,3	45,6	67,2	105
HF Current Transformer (T302)	79,7	76,2	75,5	77,6	77,3	79,2	42,6	65,3	130

THT Film Capacitor (C302)	78,3	75,1	74,9	75,5	76,8	79,0	41,8	64,6	105
Power Arrester (F301)	79,2	76,4	75,9	76,7	78,4	80,2	48,0	66,8	85
Discharge Tube (D309)	80,5	77,2	76,6	78,4	79,1	80,6	48,8	68,1	90
Semiconductor Sensor (U908)	82,3	78,8	77,6	81,7	79,3	80,5	45,1	67,3	85
Electromagnetic Relay (K1001)	76,3	74,8	73,9	76,4	80,1	80,4	46,1	67,1	85
THT Film Capacitor (C1429)	79,6	76,8	76,5	77,0	78,7	80,6	47,1	66,1	105
Driver Transformer (T2101)	83,7	81,9	82,4	82,0	83,6	84,6	55,1	70,8	110
PV terminal	71,1	70,7	72,1	68,9	75,7	78,2	42,7	62,1	85
AC terminal	42,9	41,0	41,0	40,1	47,4	54,9	26,3	28,8	100
Rotary Switch	72,5	69,4	69,2	69,2	72,1	74,6	37,8	61,8	105
Enclosure (front)	40,1	46,4	48,2	47,8	49,3	57,8	28,4	48,6	100
Enclosure (side)	58,6	55,0	55,1	55,4	58,5	63,4	31,6	53,9	100
Enclosure (top)	57,4	56,1	57,8	52,9	60,3	62,8	29,4	49,7	100
Heat-sink	70,5	65,6	66,5	70,5	68,1	71,2	42,4	67,3	100
Mounting Surface	43,3	41,0	41,1	40,2	47,3	54,9	26,3	28,9	90
Handle	73,7	69,4	70,6	73,9	71,7	73,9	44,6	70,9	100
DC switch internal	69,1	71,6	73,1	68,7	67,8	76,1	40,9	59,6	85
DC switch knob	58,9	72,5	68,7	71,4	73,8	70,3	39,6	55,4	85
MPPT wire	72,6	69,4	69,1	69,4	71,9	74,3	39,3	61,3	125
BST Inductor wire	77,3	68,2	69,9	83,8	62,4	65,3	33,3	52,5	105
INV Inductor wire	84,1	84,4	82,6	83,3	85,9	85,3	60,0	72,4	105
BST Inductor	82,6	76,7	76,3	82,2	77,4	79,1	43,9	66,5	130
INV Inductor	92,8	96,1	98,0	91,3	100,2	98,0	58,3	75,7	130
AC internal wire	55,5	51,9	51,3	50,7	55,9	61,3	30,9	47,5	125

Supplementary information:

1) Lowest full load MPP voltage with rated power output @30°C (without power derating)
2) Rated full load MPP voltage with rated power output @40°C (without power derating)
3) Highest full load MPP voltage with rated power output @40°C (power derating to thermal steady)
4) Maximum output current with rated power output @40°C (without power derating)
5) Rated full load MPP voltage with rated power output @50°C (without power derating)
6) Rated full load MPP voltage with rated power output @60°C (power derating to thermal steady)
7) Rated full load MPP voltage and cooling fan disconnected with rated power output @25°C (without power derating)
8) Rated full load MPP voltage and blanketing with rated power output @25°C (power derating to thermal steady)

4.3	**TABLE: heating temperature rise measurements (SUN2000-40KTL-M3)**								P
Test voltage(PV Input) :	540V	600V	800V	560V	600V	600V	600V	600V	-
Test voltage(AC Output) :	380V	380V	380V	380V	380V	380V	380V	380V	-
Test frequency(Hz) :	50	50	50	50	50	50	50	50	-
Output power(kW):	43,9	44,0	37,9	43,6	38,5	31,5	20,2	10,9	-

maximum temperature T of part/at:	T (°C)								allowed Tmax (°C)
Ambient Temperature	30,0	40,0	40,0	40,0	50,0	60,0	25,0	25,0	-
CPU (U3)	98,1	98,2	93,7	94,0	100,2	102,9	90,5	98,0	125
CPLD (U0701)	112,7	112,7	108,5	108,8	114,7	117,6	109,2	111,2	125
L4 FLASH (U203)	75,0	75,2	69,8	72,0	76,7	79,6	60,0	76,8	85
Bus ground power arrester (F301)	79,3	79,3	74,6	77,1	82,0	83,6	70,1	82,4	85
Bus ground power arrester (F306)	79,0	79,4	74,6	77,0	82,2	83,6	70,1	82,4	85
Gas Discharge Tube (D306)	76,9	77,0	73,0	74,3	79,6	82,4	60,6	79,6	125
Y Cap (C422)	81,4	81,4	76,4	75,6	81,9	84,3	67,9	80,5	100
X Cap (C606)	74,9	75,0	68,8	71,5	76,0	78,5	57,2	71,9	110
Current Hall (U401)	81,1	81,1	76,8	76,4	82,8	82,5	68,8	80,5	85
Grid relay coil(K503)	82,8	82,9	77,6	77,1	83,3	85,7	69,7	80,5	130
EMI Com-mode Inductor (T601)	98,6	98,5	87,3	87,2	91,9	91,6	66,1	75,9	110
Power Arrester (F607)	76,2	76,2	70,4	72,7	77,4	79,7	58,6	73,5	85
Power Arrester (F604)	76,2	76,3	70,3	72,7	77,2	79,2	58,6	73,2	85
Gas Discharge Tube (D601)	77,9	77,9	71,7	74,5	78,8	80,8	58,4	74,1	90
High Frequency Transformer (T701)	82,4	82,4	78,3	79,7	84,6	87,1	70,6	82,5	130
DC Aux Transformer MOS (Q702)	92,1	92,5	95,0	90,8	94,6	99,4	88,6	100,7	130
THT Film Capacitor (C710)	81,3	81,4	77,6	78,0	83,3	85,8	56,2	71,5	105
Driver Transformer (T801)	79,5	79,6	75,7	76,3	81,8	84,6	68,4	79,7	130
High Frequency Transformer (T1101)	83,1	83,2	79,7	80,8	85,0	87,5	74,9	81,7	130
MOSFET (Q1101)	107,1	107,2	102,9	104,7	108,9	111,4	95,8	105,3	130
THT Film Capacitor (C1104)	79,2	79,2	74,3	79,0	82,2	83,4	66,3	78,6	105
AC AUX source PWM Controller (U1204)	83,6	83,7	79,4	80,1	85,5	87,9	76,9	82,0	130
Driver Transformer (T1201)	81,4	81,5	76,8	77,5	82,9	85,2	72,5	78,6	130
Optical Coupler (U1904)	92,4	92,2	86,6	88,7	93,2	93,9	76,3	81,4	125
Electromagnetic Relay (K1001)	78,3	78,3	73,9	76,3	81,3	83,0	67,5	80,4	85
Gas Discharge Tube (D2309)	72,0	72,0	67,7	71,1	75,5	78,1	57,3	76,2	90
THT Film Capacitor (C1104)	79,2	79,2	74,3	79,0	82,2	83,4	66,3	78,6	105
HF Current Transformer (T302)	77,6	77,5	72,9	76,3	80,5	82,2	64,4	80,4	130
THT Film Capacitor (C302)	76,6	76,6	72,6	74,0	79,4	82,0	66,2	81,4	105
Power Arrester (F301)	79,3	79,3	74,6	77,1	82,0	83,6	70,1	82,4	85
Discharge Tube (D309)	81,5	81,2	75,4	79,3	83,6	84,1	70,1	81,4	90
Semiconductor Sensor (U908)	81,7	81,3	74,7	82,2	84,3	83,9	66,0	77,9	85

Electromagnetic Relay (K1001)	78,3	78,3	73,9	76,3	81,3	83,0	67,5	80,4	85
THT Film Capacitor (C1429)	79,5	79,6	74,9	76,9	82,3	83,8	71,6	83,5	105
Driver Transformer (T2101)	84,7	84,9	80,4	81,9	86,8	88,1	75,4	84,8	110
PV terminal	54,3	53,9	50,2	54,7	60,5	65,5	45,1	52,8	85
AC terminal	79,2	79,2	71,9	74,3	78,8	80,7	57,9	68,2	100
Rotary Switch	75,6	75,7	71,6	73,4	78,5	81,2	57,7	77,5	105
Enclosure (front)	37,8	38,0	37,7	37,9	47,0	56,2	25,6	22,4	100
Enclosure (side)	67,5	67,2	66,4	66,4	72,2	75,2	40,6	66,7	100
Enclosure (top)	60,6	60,5	56,3	66,0	67,9	70,2	56,2	68,2	100
Heat-sink	74,9	73,5	66,1	75,3	78,8	78,3	64,7	75,3	100
Mounting Surface	38,3	38,4	38,1	38,3	47,4	56,2	39,2	41,2	90
Handle	75,5	74,1	66,5	76,8	79,7	78,4	62,1	69,7	100
DC switch internal	75,6	75,7	71,6	73,4	78,5	81,2	57,7	77,5	85
DC switch knob	51,9	52,1	50,5	51,5	59,2	65,5	45,6	60,0	85
MPPT wire	72,4	72,3	67,9	71,2	75,9	78,5	56,5	72,3	125
BST Inductor wire	80,9	80,0	72,3	81,0	83,2	81,9	66,8	78,5	105
INV Inductor wire	87,5	87,5	81,8	82,2	87,4	88,4	69,6	80,0	105
BST Inductor	67,6	66,2	54,2	93,6	78,8	68,7	61,3	70,0	130
INV Inductor	97,7	100,2	112,4	95,1	87,4	107,0	69,6	107,0	130
AC internal wire	73,9	74,0	67,3	70,5	74,6	77,4	56,3	66,9	125

Supplementary information:

1) Lowest full load MPP voltage with rated power output @30°C (without power derating)
2) Rated full load MPP voltage with rated power output @40°C (without power derating)
3) Highest full load MPP voltage with rated power output @40°C (power derating to thermal steady)
4) Maximum output current with rated power output @40°C (without power derating)
5) Rated full load MPP voltage with rated power output @50°C (power derating to thermal steady)
6) Rated full load MPP voltage with rated power output @60°C (power derating to thermal steady)
7) Rated full load MPP voltage and cooling fan disconnected with rated power output @25°C (power derating to thermal steady)
8) Rated full load MPP voltage and blanketing with rated power output @25°C (power derating to thermal steady)

4.4	**TABLE: fault condition tests**						P
	ambient temperature (°C) .....:				25		—
No.	component No.	fault	test voltage (V)	test time	fuse No.	fuse current (A)	result
Component failure							
1	BUS Capacitor J401/J403	SC	800Vdc/ 480Vac	10 min	-	30	FID: EUT shut down, Bus-capacitor break down, 30A fuse not open. SD: ☒ Yes /☐ No, GD: ☒ Yes/ ☐ No RO: ☐ Yes /☒ No, NCD: ☐ Yes /☒ No NH: ☒ Yes /☐ No ,DST: ☒ Yes /☐ No

2	PV Current Hall circuit C219	SC	600Vdc/ 480Vac	10 min	-	30	FID: EUT normal work. No hazards. SD: ☐ Yes /☒ No, GD: ☐ Yes/ ☒ No RO: ☒Yes /☐ No, NCD: ☒ Yes /☐ No NH: ☒ Yes /☐ No, DST: ☒ Yes /☐ No.
3	PV Current Hall circuit C228	SC	600Vdc/ 480Vac	10 min	-	30	FID: EUT normal work with fault indication. No hazards. SD: ☐ Yes /☒ No, GD: ☐ Yes/ ☒ No RO: ☒Yes /☐ No, NCD: ☒ Yes /☐ No NH: ☒ Yes /☐ No, DST: ☒ Yes /☐ No.
4	SPD F301, F302, F303, F304, Pin 3-4	SC	600Vdc/ 480Vac	10 min	-	30	FID: EUT shut down with fault indication. No hazards. SD: ☒ Yes /☐ No, GD: ☒ Yes/ ☐ No RO: ☒ Yes /☐ No, NCD: ☒ Yes /☐ No NH: ☒ Yes /☐ No ,DST: ☒ Yes /☐ No
5	C186 (+3.3V power)	SC	600Vdc/ 480Vac	10 min	-	30	FID: EUT shut down with fault indication. No hazards. SD: ☒ Yes /☐ No, GD: ☒ Yes/ ☐ No RO: ☒ Yes /☐ No, NCD: ☒ Yes /☐ No NH: ☒ Yes /☐ No ,DST: ☒ Yes /☐ No
6	MPPT Current Hall circuit C908	SC	600Vdc/ 480Vac	10 min	-	30	FID: EUT shut down with fault indication. No hazards. MT: N/A SD: ☒ Yes /☐ No, GD: ☒ Yes/ ☐ No RO: ☒ Yes /☐ No, NCD: ☒ Yes /☐ No NH: ☒ Yes /☐ No ,DST: ☒ Yes /☐ No
7	D1002	SC	800Vdc/ 480Vac	10 min	-	30	FID: EUT shut down. MT: N/A SD: ☒ Yes /☐ No, GD: ☒ Yes /☐ No RO: ☒ Yes /☐ No, NCD: ☒ Yes /☐ No NH: ☒ Yes /☐ No ,DST: ☒ Yes /☐ No
8	INV IGBT Q1418, C-E	SC	800Vdc/ 480Vac	10 min	-	30	FID: EUT shut down immediately after SC. SD: ☒ Yes /☐ No, GD: ☒ Yes/ ☐ No RO: ☐Yes /☒ No, NCD: ☐ Yes /☒ No NH: ☒ Yes /☐ No, DST: ☒ Yes /☐ No
9	Q701, D-S	SC	1000Vdc/ 480Vac	10 min	-	30	FID: EUT shut down, INV U1/U2/U3, Relay break down, 30A fuse not open. SD: ☒ Yes /☐ No, GD: ☒ Yes/ ☐ No RO: ☐ Yes /☒ No, NCD: ☐ Yes /☒ No NH: ☒ Yes /☐ No ,DST: ☒ Yes /☐ No
10	Q1101, D-S	SC	600Vdc/ 480Vac	10 min	-	30	FID: EUT normal work. R442/R443/R444/Q1 break down. SD: ☒ Yes /☐ No, GD: ☒ Yes/ ☐ No RO: ☐Yes /☒ No, NCD: ☐ Yes /☒ No NH: ☒ Yes /☐ No, DST: ☒ Yes /☐ No.

ISO check circuit							
11	Q2003, C-E, B-E	SC before start-up	600Vdc/ 480Vac	10 min	-	30	FID: EUT work normally with ISO checking function normal. MT: N/A SD: ☒ Yes /☐ No, GD: ☒ Yes /☐ No RO: ☒ Yes /☐ No, NCD: ☒ Yes /☐ No NH: ☒ Yes /☐ No ,DST: ☒ Yes /☐ No
12	Q2003, C-E, B-E	SC	600Vdc/ 480Vac	10 min	-	30	FID: EUT work normally with ISO checking function normal. MT: N/A SD: ☒ Yes /☐ No, GD: ☒ Yes /☐ No RO: ☒ Yes /☐ No, NCD: ☒ Yes /☐ No NH: ☒ Yes /☐ No ,DST: ☒ Yes /☐ No
13	D2006	OC before start-up	600Vdc/ 480Vac	10 min	-	30	FID: EUT work normally with ISO checking function normal. MT: N/A SD: ☒ Yes /☐ No, GD: ☒ Yes /☐ No RO: ☒ Yes /☐ No, NCD: ☒ Yes /☐ No NH: ☒ Yes /☐ No ,DST: ☒ Yes /☐ No
14	D2006	OC	600Vdc/ 480Vac	10 min	-	30	FID: EUT work normally with ISO checking function normal. MT: N/A SD: ☒ Yes /☐ No, GD: ☒ Yes /☐ No RO: ☒ Yes /☐ No, NCD: ☒ Yes /☐ No NH: ☒ Yes /☐ No ,DST: ☒ Yes /☐ No
15	R2023	OC before start-up	600Vdc/ 480Vac	10 min	-	30	FID: EUT work normally with ISO checking function normal. SD: ☒ Yes /☐ No, GD: ☒ Yes /☐ No RO: ☒ Yes /☐ No, NCD: ☒ Yes /☐ No NH: ☒ Yes /☐ No ,DST: ☒ Yes /☐ No
16	R2023	OC	600Vdc/ 480Vac	10 min	-	30	FID: EUT work normally with ISO checking function normal. SD: ☒ Yes /☐ No, GD: ☒ Yes /☐ No RO: ☒ Yes /☐ No, NCD: ☒ Yes /☐ No NH: ☒ Yes /☐ No ,DST: ☒ Yes /☐ No
RCD check circuit							
17	Q601, C-E	SC before start-up	600Vdc/ 480Vac	10 min	-	30	FID: EUT could not start up. AC relays in open. SD: ☒ Yes /☐ No, GD: ☒ Yes /☐ No RO: ☒ Yes /☐ No, NCD: ☒ Yes /☐ No NH: ☒ Yes /☐ No ,DST: ☒ Yes /☐ No
18	Q601, C-E	SC	600Vdc/ 480Vac	10 min	-	30	FID: EUT normal work. SD: ☒ Yes /☐ No, GD: ☒ Yes /☐ No RO: ☒ Yes /☐ No, NCD: ☒ Yes /☐ No NH: ☒ Yes /☐ No ,DST: ☒ Yes /☐ No

19	C501 (+5V power)	SC	600Vdc/ 480Vac	10 min	-	30	FID: EUT shut down with fault indication. SD: ☒ Yes /☐ No, GD: ☒ Yes /☐ No RO: ☒ Yes /☐ No, NCD: ☒ Yes /☐ No NH: ☒ Yes /☐ No ,DST: ☒ Yes /☐ No
20	R626	OC before start-up	600Vdc/ 480Vac	10 min	-	30	FID: EUT could not start up with fault indication. AC relays in open. SD: ☒ Yes /☐ No, GD: ☒ Yes /☐ No RO: ☒ Yes /☐ No, NCD: ☒ Yes /☐ No NH: ☒ Yes /☐ No ,DST: ☒ Yes /☐ No
21	R626	OC	600Vdc/ 480Vac	10 min	-	30	FID: EUT work normally without fault indication. SD: ☐ Yes /☒ No, GD: ☐ Yes /☒ No RO: ☒ Yes /☐ No, NCD: ☒ Yes /☐ No NH: ☒ Yes /☐ No ,DST: ☒ Yes /☐ No
22	R1427	OC before start-up	600Vdc/ 480Vac	10 min	-	30	FID: EUT could not start up with fault indication. AC relays in open. SD: ☒ Yes /☐ No, GD: ☒ Yes /☐ No RO: ☒ Yes /☐ No, NCD: ☒ Yes /☐ No NH: ☒ Yes /☐ No ,DST: ☒ Yes /☐ No
23	R1427	OC	600Vdc/ 480Vac	10 min	-	30	FID: EUT shut down with fault indication. AC relays in open. SD: ☐ Yes /☒ No, GD: ☐ Yes /☒ No RO: ☒ Yes /☐ No, NCD: ☒ Yes /☐ No NH: ☒ Yes /☐ No ,DST: ☒ Yes /☐ No
24	L601, Pin 7-8	SC before start-up	600Vdc/ 480Vac	10 min	-	30	FID: EUT could not start up with fault indication. AC relays in open. SD: ☒ Yes /☐ No, GD: ☒ Yes /☐ No RO: ☒ Yes /☐ No, NCD: ☒ Yes /☐ No NH: ☒ Yes /☐ No ,DST: ☒ Yes /☐ No
25	L601, Pin 7-8	SC	600Vdc/ 480Vac	10 min	-	30	FID: EUT shut down with fault indication. AC relays in open. SD: ☐ Yes /☒ No, GD: ☐ Yes /☒ No RO: ☒ Yes /☐ No, NCD: ☒ Yes /☐ No NH: ☒ Yes /☐ No ,DST: ☒ Yes /☐ No
Relay check circuit							
26	AC relay K504/K503, contacts	SC before start-up	600Vdc/ 480Vac	10 min	-	30	FID: EUT could not start up. Start-up again with same result. SD: ☒ Yes /☐ No, GD: ☒ Yes /☐ No RO: ☒ Yes /☐ No, NCD: ☒ Yes /☐ No NH: ☒ Yes /☐ No ,DST: ☒ Yes /☐ No
27	C503	SC before start-up	600Vdc/ 480Vac	10 min	-	30	FID: EUT could not start up. AC relays in open. SD: ☒ Yes /☐ No, GD: ☒ Yes /☐ No RO: ☒ Yes /☐ No, NCD: ☒ Yes /☐ No NH: ☒ Yes /☐ No ,DST: ☒ Yes /☐ No

28	R540	SC before start-up	600Vdc/ 480Vac	10 min	-	30	FID: EUT could not star up.AC relays in open. SD: ☒ Yes /☐ No, GD: ☒ Yes /☐ No RO: ☒ Yes /☐ No, NCD: ☒ Yes /☐ No NH: ☒ Yes /☐ No ,DST: ☒ Yes /☐ No
29	R540	SC	600Vdc/ 480Vac	10 min	-	30	FID: EUT shut down. SD: ☒ Yes /☐ No, GD: ☒ Yes /☐ No RO: ☒ Yes /☐ No, NCD: ☒ Yes /☐ No NH: ☒ Yes /☐ No ,DST: ☒ Yes /☐ No
30	Q505, C-E	OC before start-up	600Vdc/ 480Vac	10 min	-	30	FID: EUT shut down after start up with fault indication. SD: ☒ Yes /☐ No, GD: ☒ Yes /☐ No RO: ☒ Yes /☐ No, NCD: ☒ Yes /☐ No NH: ☒ Yes /☐ No ,DST: ☒ Yes /☐ No
31	Q505, B-E	OC before start-up	600Vdc/ 480Vac	10 min	-	30	FID: EUT shut down after start up with fault indication. SD: ☒ Yes /☐ No, GD: ☒ Yes /☐ No RO: ☒ Yes /☐ No, NCD: ☒ Yes /☐ No NH: ☒ Yes /☐ No ,DST: ☒ Yes /☐ No
32	R539	OC before start-up	600Vdc/ 480Vac	10 min	-	30	FID: EUT could not start up. SD: ☒ Yes /☐ No, GD: ☒ Yes /☐ No RO: ☒ Yes /☐ No, NCD: ☒ Yes /☐ No NH: ☒ Yes /☐ No ,DST: ☒ Yes /☐ No
33	U3, +3,3V - GND	SC	600Vdc/ 480Vac	10min	-	30	FID: EUT shut down. SD: ☒ Yes /☐ No, GD: ☒ Yes /☐ No RO: ☒ Yes /☐ No, NCD: ☒ Yes /☐ No NH: ☒ Yes /☐ No, DST: ☒ Yes /☐ No
34	U33, +3,3V - GND	SC	600Vdc/ 480Vac	10min	-	30	FID: EUT shut down. SD: ☒ Yes /☐ No, GD: ☒ Yes /☐ No RO: ☒ Yes /☐ No, NCD: ☒ Yes /☐ No NH: ☒ Yes /☐ No, DST: ☒ Yes /☐ No
Source failure							
35	PV input	Over-voltage	1150Vdc/ 480Vac	10 min	-	30	FID: EUT shut down. SD: ☒ Yes /☐ No, GD: ☒ Yes /☐ No RO: ☒ Yes /☐ No, NCD: ☒ Yes /☐ No NH: ☒ Yes /☐ No ,DST: ☒ Yes /☐ No
36	PV input	SC	600Vdc/ 480Vac	10 min	-	30	FID: EUT shut down. No backfeed current. SD: ☒ Yes /☐ No, GD: ☒ Yes /☐ No RO: ☒ Yes /☐ No, NCD: ☒ Yes /☐ No NH: ☒ Yes /☐ No ,DST: ☒ Yes /☐ No

37	Output, L-L ,L-N & L-PE	SC	600Vdc/ 480Vac	10 min	-	30	FID: EUT shut down and software alarm “Phase fault” after SC. Restart after failure recovery. AC Max. current: 207,3A peak @5,2ms duration. No backfeed current. No hazards. SD: ☒ Yes /☐ No, GD: ☒ Yes /☐ No RO: ☒ Yes /☐ No, NCD: ☒ Yes /☐ No NH: ☒ Yes /☐ No ,DST: ☒ Yes /☐ No
38	AC Output	LP	600Vdc/ 480Vac	10 min	-	30	FID: EUT shut down and software alarm “Grid fault” after SC. Restart after failure recovery. No hazards. SD: ☒ Yes /☐ No, GD: ☒ Yes /☐ No RO: ☒ Yes /☐ No, NCD: ☒ Yes /☐ No NH: ☒ Yes /☐ No ,DST: ☒ Yes /☐ No
39	AC Output	Over-voltage	600Vdc/ 550Vac	10 min	-	30	FID: EUT shut down and software alarm “output voltage over-voltage” after SC. Restart after failure recovery.No hazards. SD: ☒ Yes /☐ No, GD: ☒ Yes /☐ No RO: ☒ Yes /☐ No, NCD: ☒ Yes /☐ No NH: ☒ Yes /☐ No, DST: ☒ Yes /☐ No
40	PV input	OC	0Vdc/ 480Vac	10 min	-	30	FID: EUT shut down and no backfeed voltage. No hazards. SD: ☒ Yes /☐ No, GD: ☒ Yes /☐ No RO: ☒ Yes /☐ No, NCD: ☒ Yes /☐ No NH: ☒ Yes /☐ No, DST: ☒ Yes /☐ No
41	AC Output	OC	600Vdc/ 0Vac	10 min	-	30	FID: EUT shut down and no backfeed voltage. No hazards. SD: ☒ Yes /☐ No, GD: ☒ Yes /☐ No RO: ☒ Yes /☐ No, NCD: ☒ Yes /☐ No NH: ☒ Yes /☐ No, DST: ☒ Yes /☐ No
Transformer failure							
42	DC Aux Transformer T701, Pin 1-3, 4-6, 9-10, 19-20, 14-15, 12-13, 11-12	SC	600Vdc/ 480Vac	10 min	-	30	FID: EUT shut down. No hazards. SD: ☒ Yes /☐ No, GD: ☒ Yes/ ☐ No RO: ☒ Yes /☐ No, NCD: ☒ Yes /☐ No NH: ☒ Yes /☐ No ,DST: ☒ Yes /☐ No
43	C3133, +12V-AGND	SC	600Vdc/ 480Vac	10 min	-	30	FID: EUT shut down. SD: ☒ Yes /☐ No, GD: ☒ Yes/ ☐ No RO: ☒ Yes /☐ No, NCD: ☒ Yes /☐ No NH: ☒ Yes /☐ No ,DST: ☒ Yes /☐ No
44	AC Aux Transformer T1101, Pin 1-3, 4-6, 9-10, 19-20, 17-18, 12-13, 11-12	SC	600Vdc/ 480Vac	10 min	-	30	FID: EUT normal work without fault indication. SD: ☐ Yes /☒ No, GD: ☐ Yes/ ☒ No RO: ☒ Yes /☐ No, NCD: ☒ Yes /☐ No NH: ☒ Yes /☐ No ,DST: ☒ Yes /☐ No

45	D1120	SC	600Vdc/ 480Vac	10 min	-	30	FID: EUT normal work without fault indication. SD: ☐ Yes /☒ No, GD: ☐ Yes/ ☒ No RO: ☒ Yes /☐ No, NCD: ☒ Yes /☐ No NH: ☒ Yes /☐ No ,DST: ☒ Yes /☐ No

Legend (Special evaluation for PV Inverter abnormal test)			
FID	Fault Indication	MT	Max. Temperature
SD	PCE Shut Down	DG	Disconnection To Grid
RO	Recovered to Operate after removing the single fault setting	NCD	No comp. or parts damaged
NH	No hazards occurred	DST	Dielectric strength test
SC	Short-circuited	OC	Open-circuited
OL	Over-load.	LP	Loss of phase
Supplementary information			

7.3.6.3.7	**TABLE: touch current measurement**	P (Note 2)

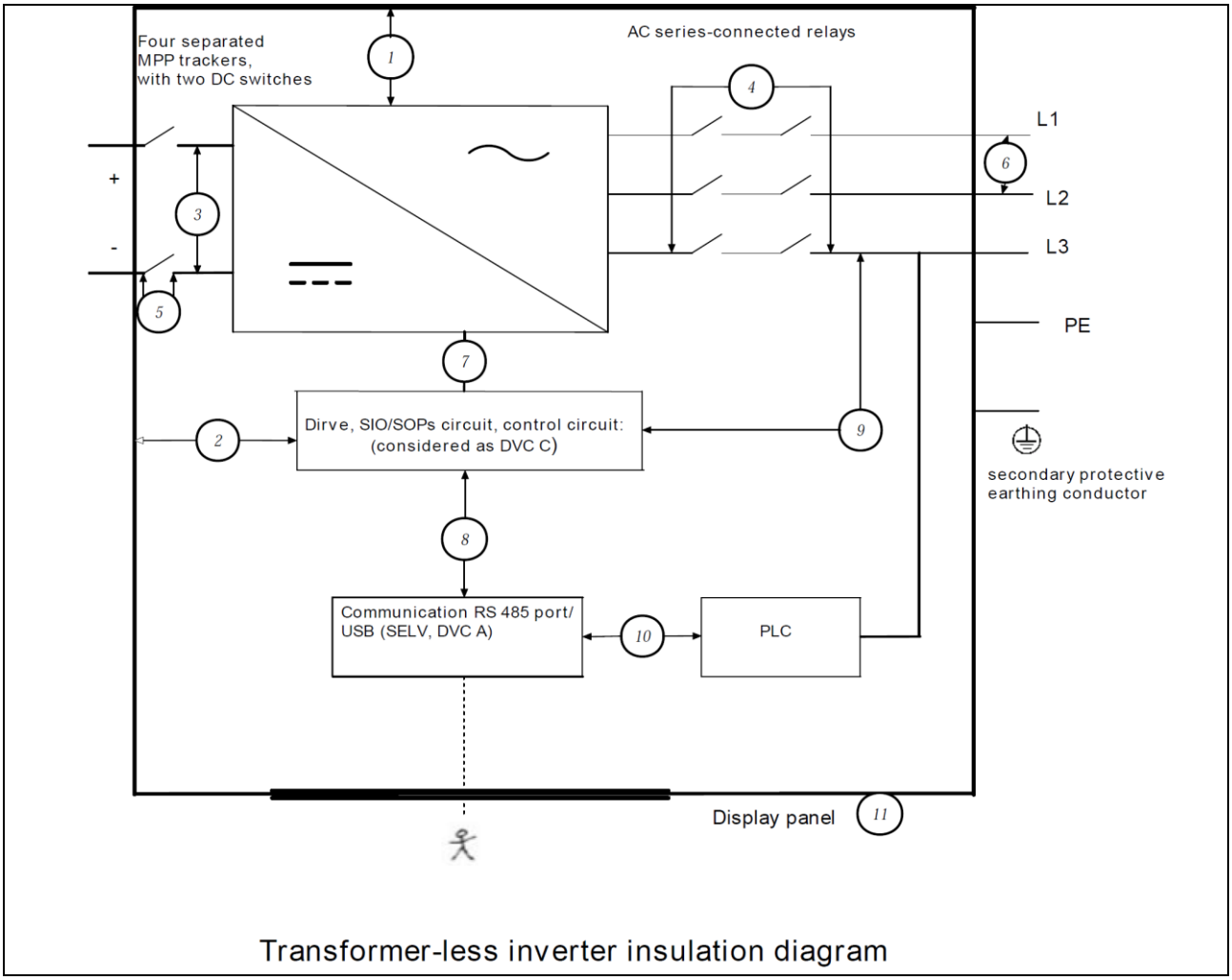
Measured between:	Measured (mA)	Limit (mA)	Comments/conditions
means of connection for the external protective earthing conductor and the external protective earthing conductor itself	6,6	3,5	Max. current recorded after clause 4.3, thermal testing and 4.5, single fault condition test, humidity pre-conditioning and IP66 test

supplementary information:

Note 1: Max. current recorded after all models test. For a PCE to be connected to an isolated system or impedance system, the neutral shall be connected through a resistance of 1 kΩ to the external protective earthing conductor, which shall be connected to each input phase in turn. The highest value will be taken as the definitive result.

Note 2: External protective earthing conductor cross-section required in user manual as >16 mm^2 (copper) or >25 mm^2 (Aluminum).

7.3.7	**TABLE: clearance and creepage distance measurements**	P
Insulation diagram		



Transformer-less inverter insulation diagram

Isolation components and areas:

Area	Insulation related information					
Insulation area 1: Across power circuit(DC/AC) to earth(BI);		OVC	System voltage(V)	Impulse voltage to determine cl. (V)	Max. working voltage to determine cr. (V)	
	PV	II	1100	4772	1100	
	Mains	III	277(rated voltage 480V, IT system)	4000	277+550	
Insulation area 2: Across drive, SIO/SOPs circuit, control circuit to earth(BI);		OVC	System voltage(V)	Impulse voltage to determine cl. (V)	Max. working voltage to determine cr. (V)	
	PV	II	1100	4772	1100	
	Mains	III	277(rated voltage 480V, IT system)	4000	277+550	
Insulation area 3: Between PV different polarities (FI)		OVC	System voltage(V)	Impulse voltage to determine cl. (V)	Max. working voltage to determine cr. (V)	
	PV	I	1100	3078	1100	
	Mains	II	277(rated voltage 480V, IT system)	2500	-	
Insulation area 4: Across contacts of relays (BI+SI)		OVC	System voltage(V)	Impulse voltage to determine cl. (V)	Max. working voltage to determine cr. (V)	
	PV	II	1100	4772	1100	
	Mains	III	-	-	-	
Insulation area 6: Across contacts of DC switch (BI/SI)		OVC	System voltage(V)	Impulse voltage to determine cl. (V)	Max. working voltage to determine cr. (V)	
	PV	II	1100	4772	1100	
	Mains	III	277(rated voltage 480V, IT system)	4000	-	
Insulation area 7: Between PV circuit and Drive, SIO/SOPs circuit, control circuit (FI)		OVC	System voltage(V)	Impulse voltage to determine cl. (V)	Max. working voltage to determine cr. (V)	
	PV	I	1100	3078	1100	
	Mains	II	277(rated voltage 480V, IT system)	2500	-	

Insulation area 8: Between drive, SIO/SOPs circuit, control circuit and communication RS485 port/USB (DI/RI)		OVC	System voltage(V)	Impulse voltage to determine cl. (V)	Max. working voltage to determine cr. (V)
	PV	II	1100	6772	1100
	Mains	III	277(rated voltage 480V, IT system)	6000	528
Insulation area 9: Between drive, SIO/SOPs circuit, control circuit and AC circuit after AC relay (FI)		OVC	System voltage(V)	Impulse voltage to determine cl. (V)	Max. working voltage to determine cr. (V)
	PV	I	1100	3078	-
	Mains	II	277(rated voltage 480V, IT system)	2500	528
Insulation area 10: Between AC live conductors and communication RS485 port/USB (RI)		OVC	System voltage(V)	Impulse voltage to determine cl. (V)	Max. working voltage to determine cr. (V)
	PV	II	1100	6772	-
	Mains	III	277(rated voltage 480V, IT system)	6000	528
Insulation area 11: Between internal live parts to Display panel/LED cover (RI)		OVC	System voltage(V)	Impulse voltage to determine cl. (V)	Max. working voltage to determine cr. (V)
	PV	II	1100	6772	1100
	Mains	III	277(rated voltage 480V, IT system)	6000	528

clearance cl and creepage distance dcr at / of:	Up (V)	U r.m.s. (V)	Most severe required cl (mm)	cl (mm)	Most severe required dcr (mm)	dcr (mm)
Insulation area 1 and 2: Across power circuit(DC/AC)/ drive, SIO/SOPs circuit, control circuit to earth(BI);	Refer to above table	Refer to above table	5,2	↓	PV side: PCB: 5,5 other insulator:11,0 Mains side: PCB: 5,2 other insulator:8,3	↓
- PV circuit to earthed metal enclosure and accessible surface(not on PCB)	↑	↑	↑	>10	↑	>11
- Mains circuit to earthed metal enclosure and accessible surface(not	↑	↑	↑	>10	↑	>11

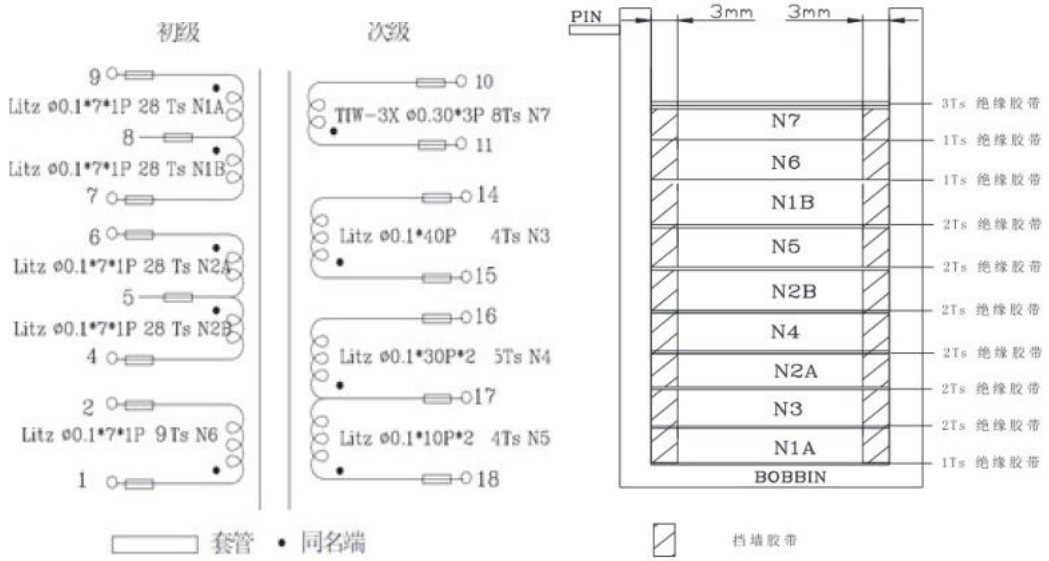
on PCB)						
- PV circuit to earthed metal enclosure(on PCB)	↑	↑	↑	5,6	↑	5,6
- Mains circuit to earthed metal enclosure(on PCB)	↑	↑	↑	5,6	↑	5,6
On boost inductor	↑	↑	↑	potting material filled, verified by impulse and dielectric strength test	↑	potting material filled, verified by impulse and dielectric strength test
On conversion inductor	↑	↑	↑	potting material filled, verified by impulse and dielectric strength test	↑	potting material filled, verified by impulse and dielectric strength test
IGBT module	↑	↑	↑	verified by impulse and dielectric strength test	↑	verified by impulse and dielectric strength test
Insulation area 3: Between PV different polarities (FI)	Refer to above table	Refer to above table	2,7	↓	PCB: 5,5 other insulator:11,0	↓
- on DC switch body	↑	↑	↑	15,0	↑	≥15,0
Remark: DC switch approved by third party, outer cl. and cr. was checked and inner cl. and cr. was not checked						
- PV circuit (on PCB)	↑	↑	↑	≥5,5	↑	≥5,5
Insulation area 4: Across contacts of series connected relays (BI+SI)	Refer to above table	Refer to above table	5,2 (BI/SI)	↓	5,5	↓
- on AC relays	↑	↑	↑	cl.=3,0mm between each pair contacts Approved by third party	↑	cr.>5,5 mm Approved by third party
Insulation area 5: Across contacts of DC switch (BI/SI)	Refer to above table	Refer to above table	5,2 (BI/SI)	↓	11,0	↓
- on DC switch	↑	↑	↑	Approved	↑	Approved

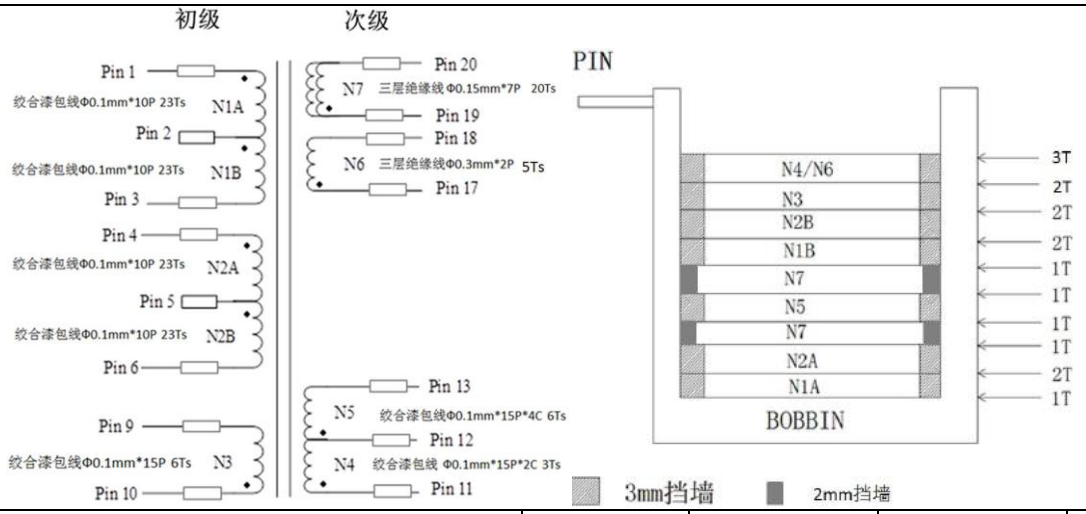
				by third party		by third party
Insulation area 6: Between AC live conductors (FI)	Refer to above table	Refer to above table	2,7	↓	Mains side: PCB: 2,7 other insulator: 5,5	↓
- shortest distance across AC live conductors (Mains side, not on PCB)	↑	↑	↑	>20	↑	>20
- shortest distance PCB foil trace and on components (Mains side, on PCB)	↑	↑	↑	4,0	↑	4,0
Insulation area 7: Between PV circuit and Drive, SIO/SOPs circuit, control circuit (FI)	Refer to above table	Refer to above table	2,7	↓	PCB: 5,5 other insulator:11,0	↓
Insulation area 9: Between drive, SIO/SOPs circuit, control circuit and AC circuit after AC relay (BI)	Refer to above table	Refer to above table	5,2	↓	PCB: 5,5 other insulator:11,0	↓
Remark: the insulation between PV circuit and AC circuit after AC relay shall be at least basic insulation and provided by insulation area 7 plus insulation area 9, and passed the impulse and hi-pot test of basic insulation requirements						
Insulation area 8: Between drive, SIO/SOPs circuit, control circuit and communication RS485 port/USB (DI/RI)	Refer to above table	Refer to above table	8,4	↓	PV side: PCB: 11,0	↓
- shortest distance PCB foil trace and on components on PCB (control to SELV)	↑	↑	↑	11,2	↑	11,2
Remark: Potted optocoupler was evaluated according to type 1 and type 2 requirement of IEC 60664-3:2016.						
Insulation area 10: Between AC live conductors and communication RS485 port/USB (RI)	Refer to above table	Refer to above table	8,4	↓	Mains side: PCB: 8,4	↓
- shortest distance PCB foil trace and on components on PCB (Mains to SELV)	↑	↑	↑	11,2	↑	11,2
Insulation area 11: Between internal live parts to Display	Refer to above table	Refer to above table	8,4	↓	22,0	↓

panel/LED cover (RI)						
- internal live parts to Display panel/LED cover	↑	↑	↑	>8,4 verified by impulse and dielectric strength test	↑	>22,0 verified by impulse and dielectric strength test

Supplementary information:

1) Maximum operation altitude: 4000 m was taken into consideration, because requirements specified in IEC 62109-1:2010 are only included for adjustment of clearance distances for higher elevations, but not for other factors related to elevation, such as thermal considerations.
2) Symbol ↑means to refer to cell above this arrow, symbol ↓means to refer to cell under this arrow.
3) For Cl. and Cr. in circuit of insulation above 30 kHz are found less severity of above table by evaluating according to Annex G, and harmonized to above table.
4) Spacings for functional insulation on a PWB which do not comply with 7.3.7.4 and 7.3.7.5 are permitted because of all the following are satisfied:
   - the PWB has flammability rating of V-0 (see IEC 60695-11-10)
   - the PWB base material has a minimum CTI of 175
   - the equipment complies with the PWB short-circuit test

7.3.7	**TABLE: distance through insulation measurement**			P
distance through insulation di at/of:	U r.m.s. (V)	test voltage (V)	required di (mm)	di (mm)
LED cover(RI)	<DC1100 <AC480/277	AC 3000/ DC 4242	0,2	3,0
Insulation sheet between primary winding and secondary winding of isolating transformer T1101(DI, three layers insulation sheet + triple insulated winding)	<DC1100 <AC480/277	Ditto	-	-
				
Insulation sheet between primary winding and secondary winding of isolating transformer T701(DI, three layers insulation sheet + triple insulated winding)	<DC1100 <AC480/277	Ditto	-	-



Potting material filling protection area of optocoupler	<DC1100 <AC480/277	Ditto	0,2	>0,4
Epoxy resin used to fill inverter and boost inductor(BI)	<DC1100 <AC480/277	AC 1500/ DC 2121	-	-
Insulation sheet cover inverter and boost inductor(BI)	<DC1100 <AC480/277	Ditto	-	-
Insulation sheet between IGBT, MOSFET, DIODE body and heatsink(BI)	<DC1100 <AC480/277	Ditto	-	-
Supplementary information: other components, such as optocoupler, power module are checked by certificates and specification.				

7.5	**TABLE: electric strength measurements, impulse voltage test and partial discharge test**	P

test voltage applied between:	test voltage (V)	impulse withstand voltage (V)	partial discharge extinction voltage (V)	result
Insulation area 1: Across power circuit(DC/AC) to earth(BI), note 1	AC 1500/ DC 2121, note 6, note 3	4772(for cl. verification and components test), note 6, note 3	N/A, note 4	P
Insulation area 2: Across drive, SIO/SOPs circuit, control circuit to earth(BI); note 1	AC 1500/ DC 2121, note 6, note 3	4772(for cl. verification and components test), note 6, note 3	N/A, note 4	P
Insulation area 3: Between PV different polarities (FI); note 1	N/A, note 5	N/A, note 5	N/A, note 5	N/A, note 5

Insulation area 4: Across contacts of relays (BI+SI); note 1	AC 1500/ DC 2121, note 6, note 3	4772(for cl. verification and components test), note 6, note 3	N/A, note 4	P
Insulation area 5: Across contacts of DC switch (BI/SI); note 1	AC 3000/ DC 4242, note 6, note 3	4772(for cl. verification and components test), note 6, note 3	N/A, note 4	P
Insulation area 6: Between AC live conductors (FI); note 1	N/A, note 5	N/A, note 5	N/A, note 5	N/A, note 5
Insulation area 7: Between PV circuit and Drive, SIO/SOPs circuit, control circuit (FI); note 1	N/A, note 5	N/A, note 5	N/A, note 5	N/A, note 5
Insulation area 8: Between drive, SIO/SOPs circuit, control circuit and communication RS485 port/USB (DI/RI); note 1	AC 3000/ DC 4242, note 6, note 3	6772(for cl. verification and components test), note 2, note 3	Upd:1100V for isolating components, note 4	P
Insulation area 9: Between drive, SIO/SOPs circuit, control circuit and AC circuit after AC relay (FI); note 1	N/A, note 5	N/A, note 5	N/A, note 5	N/A, note 5
Insulation area 10: Between AC live conductors and communication RS485 port/USB (RI); note 1	AC 3000/ DC 4242, note 6, note 3	6772(for cl. verification and components test), note 2, note 3	N/A, note 4	P
Insulation area 11: Between internal live parts to Display panel/LED cover (RI); note 1	AC 3000/ DC 4242, note 6, note 3	6772(for cl. verification and components test), note 2, note 3	N/A, note 4	P

Supplementary information:

Note 1: See also insulation diagram incorporated in table clearance and creepage distance measurements.

Note 2: Impulse withstand voltage is 6772(for cl. verification and components test), and dielectric strength test voltage is AC 3000V/DC 4242V, the test voltage in above table shows the actual voltage applied for described insulation barriers.

Note 3: Voltage test (dielectric strength test) was performed after:

1) Humidity pre-conditioning as specified in clause 4.5 of IEC 62109-1:2010;
   The device is classed IP66 for outdoor use. The Voltage test was performed immediately after the humidity pre-conditioning.
2) Thermal testing as specified in clause 4.3 of IEC 62109-1:2010;
3) Testing in single fault condition as specified in clause 4.4 of IEC 62109-1:2010;
4) IP66 test as specified in clause 6.3 of IEC 62109-1:2010;
5) Mechanical resistance to deflection, impact, or drop as specified in clause 13.7 of IEC 62109-1:2010.

Note 4: Protection separation shall withstand the partial discharge test according to 7.5.3, only if the recurring peak working voltage across the insulation is greater than 700 V and the voltage stress on the insulation is greater than 1 kV/mm, so rated discharge voltage is equal to sum of the recurring peak voltages in each of the circuits separated by the insulation.

Note 5: Functional insulation shall comply with the requirements of clause 7.3.7.3. For parts or circuits in overvoltage category II, III, or IV, functional insulation is designed according to the applicable impulse voltage as determined by 7.3.7.1.4. Testing is not required. See cl. and cr. distance for functional insulation.

Note 6: Impulse withstand voltage is 4772(for cl. verification and components test), and dielectric strength test voltage is AC 1500V/DC 2121V, the test voltage in above table shows the actual voltage applied for described insulation barriers.

Note 7: To make sure that this voltage in not stress on basic or supplementary insulation barriers and non-applied insulating area are accidentally tested, this test is applied on individual parts only.

9.2.2	**TABLE: Limited power sources**					P
Components	Sample No.	Uoc (V)	I_{sc} (A)		VA	
			Meas.	Limit	Meas.	Limit
USB power	1	5,25	2,5	8	12,3	5*Uoc
supplementary information: not applicable						

14	**TABLE: list of critical components**				P
object/part No.	manufacturer/ trademark	type/model	technical data	standard	mark(s) of conformity[1])
Enclosure	--	--	Aluminum, type 5052, min 2.0mm thick, painted coating type RAL9006, 640*465*270mm	IEC/EN 62109-1:2010	Test with unit
Heat-sink (the rear side of enclosure)	--	--	Aluminum, type AL-6063, min 1.2mm thick, 504*270*110mm	IEC/EN 62109-1:2010	Test with unit
Plastic window	COVESTRO	6557+(z)(f1)	3.0mm thick,	UL 94	UL E41613

14	TABLE: list of critical components				P
object/part No.	manufacturer/ trademark	type/model	technical data	standard	mark(s) of conformity[1])
	DEUTSCHLAND AG [PC RESINS]		115°C, V-0		
Wall Bracket	Various	Steel	2.5mm, 651*260*42mm	IEC/EN 62109-1:2010	Test with unit
AC protection box	Various	Aluminum	Aluminum，type DC01，3.5mm thick, 264*184*120mm	IEC/EN 62109-1:2010	UL E41613
AC output cable gland	Shanghai Found Automatic Equipment	FCS-K series,	V-0, IP68, -40°C-100°C, UV resistant	UL 514	UL E325535
PV input connector	Staubli Co., Ltd.	PV-KST4/6II-UR	1500Vdc, 30A, 90°C	IEC 62852:2014 UL 6703	TUVRh R60111354 UL E343181
AC Output Terminal Block	PHOENIX CONTACT GmbH & Co. KG	HW 50/5-FT-74A	600V,74A, Base material PA6, B63, V0, f1, 100°C	IEC/EN 62109-1:2010	Test with unit
	Shanghai Huntec Electrical Technology CO.,LTD	RBH200A-3P	600V, 74A, Base material PA66, RG251(fff)(f1), V-0, 115°C	IEC/EN 62109-1:2010	Test with unit
DC switch	Santon Switchgear Ltd	XBHP+3810/4	1200Vdc, 8P, 20A, 70°C	IEC 60947-3:2009	DEKRA 71-107727
Internal Cooling Fan	ASIA VITAL COMPONENTS CO., LTD.	DBPK1238B2MP001	12Vdc, 30W	EN 60950-1:2006 UL 507	TUV SUD E8A1801273082 0 UL E158191
Electromagnetic Relay (K501, K502, K503, K504, K505, K506)	Xiamen Hongfa Electroacoustic Co., Ltd	HF167F-200/12-H3F	288Vac, 90A, 85°C	IEC 61810-1:2015	VDE 40031410
	PANASONIC	HE1aN-W-DC12V-Y6	288Vac, 90A, 85°C	IEC 61810-1:2015	VDE 40006681
Connecting wires	Various	10267	2000V, 22AWG	UL 758	UL
	Various	3817	3000V, 10/8/6AWG	UL 758	UL
	Various	1015	600V, 10AWG	UL 758	UL
	Various	1569	300V, 18AWG	UL 758	UL
PCB material	Various	Various	130°C, V-0	UL 94	UL
PCB coatings	LACKWERKE PETERS GMBH CO KG	1301ECO	V-0	UL 746E UL 94	UL E80315
Boost inductor	EAGLERISE ELECTRIC&ELECTRONIC(CHINA) Co., Ltd	BP063012	640uH, 20A, Magnet Wire Class H	IEC/EN 62109-1:2010	Test with unit
	ShenZhen	LB61U15139R	640uH, 20A,	IEC/EN 62109-	Test with unit

14	TABLE: list of critical components				P
object/part No.	manufacturer/ trademark	type/model	technical data	standard	mark(s) of conformity[1])
	Highlight Electronic Co., LTD		Magnet Wire Class H	1:2010	
	SHENZHEN JINGQUANHUA ELECTRONICS CO.,LTD	TPDG-UU61-0919	640uH, 20A, Magnet Wire Class H	IEC/EN 62109-1:2010	Test with unit
Invert inductor	TIANGU ELECTRIC&ELECTRONIC(CHINA)Co., Ltd	65H6022-L	220uH, 100A, Magnet Wire Class H	IEC/EN 62109-1:2010	Test with unit
	ShenZhen Highlight Electronic Co., LTD	LB65H8592R	220uH, 100A, Magnet Wire Wire Class H	IEC/EN 62109-1:2010	Test with unit
	SHENZHEN JINGQUANHUA ELECTRONICS CO., LTD	J407036851	220uH, 100A, Magnet Wire Wire Class H	IEC/EN 62109-1:2010	Test with unit
IGBT module (BST)	Infineon	IKQ40N120CH3	1200V,40A, 175°C	IEC/EN 62109-1:2010	Test with unit
IGBT module (INV)	Infineon	IKQ50N120CH3	1200V, 50A, 175°C	IEC/EN 62109-1:2010	Test with unit
	Infineon	IKW75N65ES5	650V, 75A, 175°C	IEC/EN 62109-1:2010	Test with unit
Film Capacitor (C1420, C1421, C1425, C1429, C1430, C1431)	EPCOS (China) Investment Ltd.	B32776G5506KZ1, B32776G5506K5Z 1	600V, 50uF, 105°C	IEC/EN 62109-1:2010	Test with unit
	XIAMEN FARATRONIC CO., LTD.	C3D1U506KFAAC00 C3D1U506KFAA382	600V, 50uF, 105°C	UL 810	UL E256238
Aluminum Electrolytic Capacitors(C401, C402, C403, C404, C406, C407, C409, C410)	NANTONG JIANGHAI Capacitor Co. LTD.	ECSW2BB431 MLB350060E	550V, 430uF, 105°C	IEC/EN 62109-1:2010	Test with unit
	EPCOS (China) Investment Ltd.	B43545S7437M001X01	550V, 430uF, 105° C	IEC/EN 62109-1:2010	Test with unit
AC X capacitor (C604, C605, C606)	XIAMEN FARATRONIC CO., LTD.	C46U3105MF3C450	1uF, 660Vac. 110°C	UL 60384-14	UL E186600
Power Arrester (F301, F302, F303, F304, F604 END5FLTA ; F301 END5PWRA)	SHENZHEN HAIPENGXIN ELECTRONICS CO.,LTD.	PV20K510-MH	Minimum 510Vac/670Vdc, 20kA	EN 61643-11:2012	TUV R 50274155
	Sichuan Zhongguang Lightning Protection Technologies	PV20K510-ZG-01	Minimum 510Vac/670Vdc, 20kA	EN 61643-11:2012	TUV R50342738

14	TABLE: list of critical components				P
object/part No.	manufacturer/ trademark	type/model	technical data	standard	mark(s) of conformity[1])
	Co., Ltd.				
	Xiamen SET Electronics Co., Ltd.	TFMOV10M510	Minimum 510Vac/670Vdc, 20kA	EN 61643-11:2012	TUV R50438698
Power Arrester (F305, F306, F605, F606, F607)	SHENZHEN HAIPENGXIN ELECTRONICS CO.,LTD.	PV20K385-MH	Minimum 385Vac/500Vdc, 20kA	EN 61643-11:2012	TUV R 50274155
	Sichuan Zhongguang Lightning Protection Technologies Co., Ltd.	PV20K385-ZG:	Minimum 385Vac/500Vdc, 20kA	EN 61643-11:2012	TUV R50342738
	Xiamen SET Electronics Co., Ltd.	TFMOV10M385	Minimum 385Vac/500Vdc, 20kA	EN 61643-11:2012	TUV R50438698
Film Capacitor (C1423 END5PWRA; C1304,C2501,C601,C602,C603,C629,C630,C631,C732 ; C134,C136,C173,C174,C175,C176,C177,C178,C179,C180,C181,C182,C183,C184,C185,C186,C187,C188 END5FLTB)	XIAMEN FARATRONIC CO., LTD.	C43Q1333M62C000	0.033uF, 300Vac, 110°C	UL 60384-14	UL E186600
	EPCOS	B32032A4333M501	0,033uF, 300Vac., 110°C	UL 60384-14	UL E97863
Film Capacitor (C420, C421, C422, C423, C424, C425)	PANASONIC	EZPQ38805LTA	8,0uF, 380Vac, 105°C	IEC/EN 62109-1:2010	Test with unit
	XIAMEN FARATRONIC CO., LTD.	C6AR8805KF30382, C6AR8805KF10382-01	8,0uF, 380Vac, 105°C	UL 810	UL E256238
Film Capacitor (C709, C710)	XIAMEN FARATRONIC CO., LTD.	C322J104K60C000, C322J104J60C000	0,1uF, 630V., 110°C	IEC/EN 62109-1:2010	Test with unit
	KEMET CO., LTD.	R75PI3100JM30K, R75PI3100JM30JV807	0,1uF, 630V., 110°C	IEC/EN 62109-1:2010	Test with unit
Film Capacitor (C301,C302,C303,C304)	XIAMEN FARATRONIC CO., LTD	C3D1M156KF12382	15uF, 1100V., 105°C	IEC/EN 62109-1:2010	Test with unit
	EPCOS (China) Investment Ltd.	B32776S156K509	15uF, 1100V., 105°C	IEC/EN 62109-1:2010	Test with unit
Film Capacitor	XIAMEN	C823C333K90C	0,033uF, 1600V	IEC/EN 62109-	Test with unit

14	TABLE: list of critical components				P
object/part No.	manufacturer/ trademark	type/model	technical data	standard	mark(s) of conformity[1])
(C1015, C1018, C1104, C1115)	FARATRONIC CO., LTD.	000	105°C	1:2010	
	KEMET	R76TN2330CK40KV807, R76TN2330CK40K	0,033uF, 1600V 105°C	IEC/EN 62109-1:2010	Test with unit
Y Capacitor (C302,C304,C306,C308 END5FLTA; C141,C143,C146,C148,C150,C152,C153,C155,C157,C159,C161,C164,C166,C168,C169,C170 END5FLTB)	WALSIN TECHNOLOGY CORP	YP1AH471K070DAMD0W, YP5AH471K070DAMD0W	0,00047uF, 400 Vac/1500Vdc, 125°C	UL 60384-14	UL E146544
Y Capacitor (C1126,C1129, C1135,C314,C315,C316,C613, C617,C618,C619,C620,C625 END5FLTA; C305,C306,C307,C308,C309,C310,C311,C312, C313,C314,C315,C316,C317,C318,C319,C320 END5PWRA)	WALSIN TECHNOLOGY CORP	YV5AC103M140DAMD0W YV1AC103M140DAMD0W	0,01uF, 300Vac/ 1500Vdc, 125°C	UL 60384-14	UL E146544
Y Capacitor (C1401,C1402, C1403 END5PWRA; C1107,C1109,C301,C705,C707 END5FLTA; C201 END5FLTB)	WALSIN TECHNOLOGY CORP	YU1AH472M130DAMD0W, YU5AH472M130DAMD0W	0,0047uF, 500Vac/1500Vdc, 125°C	UL 60384-14	UL E146544
EMI Differential-mode Inductor (T602)	ShenZhen Highlight Electronic Co., LTD	LB92F15670R	20uH, 100A, Class H	IEC/EN 62109-1:2010	Test with unit
	SHENZHEN JINGQUANHUA ELECTRONICS CO.,LTD	TPDG-QT-1138	20uH, 100A, Class H	IEC/EN 62109-1:2010	Test with unit
	EAGLERISE ELECTRIC&ELECTRONIC(CHINA) Co., Ltd	ES092023	20uH, 100A, Class H	IEC/EN 62109-1:2010	Test with unit

14	TABLE: list of critical components				P
object/part No.	manufacturer/ trademark	type/model	technical data	standard	mark(s) of conformity[1])
EMI Com-mode Inductor (T601)	SHENZHEN JINGQUANHUA ELECTRONICS CO.,LTD	J407036851	200uH, 55A, Class H	IEC/EN 62109-1:2010	Test with unit
	ShenZhen Highlight Electronic Co., LTD	LB65H8592R	200uH, 55A, Class H	IEC/EN 62109-1:2010	Test with unit
	TianGu Co., LTD	65H6022-L	200uH, 55A, Class H	IEC/EN 62109-1:2010	Test with unit
Current sensor (U903,U905,U906,U908)	LEM Electronics (China) Co. Ltd	HLSR 20-P	IPN: 50A, VC: 5V, 105°C	IEC/EN 62109-1:2010	Test with unit
Current sensor (U405, U406, U407)	LEM Electronics (China) Co. Ltd	LZSR 150-P/SP1	IPN:150A, VC: 5±0.25V, 85°C	IEC/EN 62109-1:2010	Test with unit
Drive Optocoupler (U1202, U1204, U1302, U1304, U1502, U1504, U1602, U1604, U1702, U1704, U1802, U1804, U1902, U1904, U2002, U2004 END5PWRA,)	ON	FOD8342TR2	VISO:5000Vr.m.s., 100°C	EN 60747-5-5:2007 UL 1577	VDE 40043666 UL E90700
	AVAGO	ACPL-W341-560E	VISO:5000Vr.m.s., 105°C	UL 1577	UL E90700
	LITEON	LTV-341W-TA1-H-HW	VISO:5000Vr.m.s., 105°C	UL 1577	UL E55361
Optocoupler (U2201 END5PWRA)	LITEON	LTV816STPC-V-HW, LTV816STPC-V	VISO:5000Vr.m.s., 105°C	EN 60747-5-5:2007 UL 1577	VDE 40015248 UL E113898
Optocoupler (U1203)	EVERLIGHT	EL1018(TA)(HW)-VG	VISO:5000Vr.m.s., 110°C	UL 1577 EN 60747-5-5:2007	UL E214129 VDE 40028391
	RENESAS	PS2381-1Y-V-F3-AX	VISO:5000Vr.m.s., 115°C	UL 1577	UL E72422
AC auxiliary transformer (T1101)	Goldriver Co., LTD	PTBD28-206	Electrical Insulation Systems designated SBI5.1, Class F	UL 1446	UL E344299
	SiBiTe Co., LTD	28C10552-T	Electrical Insulation Systems designated SBI5.1, Class F	UL 1446	UL E344299
	DONGGUAN PULSE ELECTRONICS CO LTD ZHUHAI BRANCH	TTERL29-1160DG	Electrical Insulation Systems designated EB-55-1, Class F	UL 1446	UL E345249
DC auxiliary	ShenZhen	KB28C8902R	Electrical	UL 1446	UL E344299

14	TABLE: list of critical components				P
object/part No.	manufacturer/ trademark	type/model	technical data	standard	mark(s) of conformity[1])
transformer (T701)	Highlight Electronic Co., LTD		Insulation Systems designated SBI5.1, Class F		
	Goldriver Co., LTD	BDK28-187	Electrical Insulation Systems designated SBI5.1, Class F	UL 1446	UL E344299
PID transformer (T1301)	ShenZhen Highlight Electronic Co., LTD	KB20Q8092R	Electrical Insulation Systems designated SBI5.1, Class F	UL 1446	UL E344299
	ChengDu JinChuan Electronic Co., Ltd.	BDK28-187	Electrical Insulation Systems designated SBI5.1, Class F	UL 1446	UL E344299
Drive transformer(T2101)	TianGu Co., LTD	BCK28C1889	Electrical Insulation Systems designated SBI4.2, Class B	UL 1446	UL E344299
	Shenzhen Jingquanhua Electronic Co., LTD	J401083241	Electrical Insulation Systems designated SBI4.2, Class B	UL 1446	UL E344299
	Goldriver Co., LTD	BDK28-176	Electrical Insulation Systems designated SBI4.2, Class B	UL 1446	UL E344299
Drive Transformer (T1201, T801)	ShenZhen Highlight Electronic Co., LTD	KB13P5823R	Electrical Insulation Systems designated SBI5.1, Class F	UL 1446	UL E344299
	Goldriver Co., LTD	BD13-13	Electrical Insulation Systems designated SBI5.1, Class F	UL 1446	UL E344299
Potted optocoupler (U2201,U2202, U2203,U2204,U2208,U2209,U2301,U2302,U2303,U2304,U2305)	EVERLIGHT	EL1018(TA)(HW)-VG	VISO:5000Vr.m.s., 110°C	UL 1577 EN 60747-5-5:2007	UL E214129 VDE 40028391
	RENESAS	PS2381-1Y-V-F3-AX	VISO:5000Vr.m.s., 115°C	UL 1577	UL E72422

14	TABLE: list of critical components				P
object/part No.	manufacturer/ trademark	type/model	technical data	standard	mark(s) of conformity[1])
Potting material cover optocoupler	Dow Corning	SE9186	23kV/mm, -45°C-200°C	IEC 60664-3:2016 IEC/EN 62109-1:2010	Test with unit
	Huitian	9313	23kV/mm, -45°C-150°C	IEC 60664-3:2016 IEC/EN 62109-1:2010	Test with unit
Potting material cover Boost inductors & Invert inductors	DONGGUAN CITY JIA DI NEW MATERIALS CO LTD	JD505	0.7W/(m*K), V-0, 150°C	UL 94	UL E485392
Bypass Relay (K001 END5PWRA)	HONGFA	HF161F-W/12-HT(456)(414)	277Vac, 31A	UL 60947-1 IEC 61810-1:2015	UL E134517 VDE 40031410
	FUJITSU	FTR-k3AB012W-PV		UL 60947-1 IEC 61810-1:2015	UL E63614 VDE 40011330
ISO Relay (K1301,K1302,K1303,K1501,K2001,K2002,K2003)	Fujitsu	FTR-B4GA4.5Z-B05	125VAC, 1A	UL 60950-1	UL E63615
	NEC	UB2-4.5NU-L5		UL 60950-1	UL E73266
	OMRON	G6J-2FL-Y-TR 4.5VDC		UL 60950-1	UL E41515
	PANASONIC	AGN200A4HZ P3K		UL 60950-1	UL E43149
AFCI Transformer (T301,T302,T303,T304)	PULSE	PG2008NL	Electrical Insulation Systems designated F1, Class F	UL 1446	UL E119132
	ShenZhen Highlight Electronic Co., LTD	GL22E592R	Electrical Insulation Systems designated SBI5.1, Class F	UL 1446	UL E344299
	Goldriver Co., LTD	BD26-157	Electrical Insulation Systems designated SBI5.1, Class F	UL 1446	UL E344299
MCU U3	ST	STM32H727	480MHz,40nm 32bit, 3.3V, 2048KB, -40°C-125°C	IEC/EN 62109-1	Test with unit
MCU U33	ST	STM32F427	256MHz,40nm 32bit, 3.3V, 2048KB, -40°C-125°C	IEC/EN 62109-1	Test with unit
[1]) an asterisk indicates a mark which assures the agreed level of surveillance					

15	**Software and firmware performing safety functions according to Annex B**				P
Subclause	Operation conditions description	Test result description	PEC description	Final result	Risks Addressed State (safe or risk of hazard)
4.4.4.1 - Components fault test	See single fault test	See single fault test	N/A	Pass	No risk of hazard
4.4.4.2 - Equipment or parts for short-term or intermittent operation	N/A	N/A	N/A	N/A	N/A
4.4.4.3 - Motors	N/A	N/A	N/A	N/A	N/A
4.4.4.4 - Transformer short circuit tests	See single fault test	See single fault test	N/A	Pass	No risk of hazard
4.4.4.5 - Output short circuit	Software control for peak current limitation disabled	Circuit breaker or fuse specified in installation manual broken	N/A	Pass	No risk of hazard
4.4.4.6 - Backfeed current test for equipment with more than one source of supply	Software control for energy transfer control disabled (one group of relays control disabled)	PCE disconnection from grid	Duplicated disconnection actuated (CPU+the other group of relays)	Pass	No risk of hazard
4.4.4.7 - Output overload	Software control of power limited disabled	PCE derating operated to power below 5% and until thermal steady	Power control by thermal sensor reading activated	Pass	No risk of hazard
4.4.4.8 - Cooling system failure	Temperature sensor in a fixed value	PCE derating operated to power below 5% and until thermal steady	Protection and derating operated by other thermal sensor	Pass	No risk of hazard
4.4.4.9 - Heating device	N/A	N/A	N/A	N/A	N/A
4.4.4.10 - Safety interlock system	N/A	N/A	N/A	N/A	N/A
4.4.4.11 - Reverse d.c. connection	See single fault test	See single fault test	N/A	Pass	No risk of hazard
4.4.4.12 - Voltage selector mismatch	N/A	N/A	N/A	N/A	N/A
4.4.4.13 - Mis-wiring with incorrect phase sequence or polarity	synchronization signal disabled	Self-check failed without start-up operation	PCE self-check before start-up	Pass	No risk of hazard
4.4.4.14 - Printed wiring board short-circuit test	See single fault test	See single fault test	N/A	Pass	No risk of hazard

4.4.4.15.1 - Fault-tolerance of residual current monitoring	RCMU sensor disabled before start-up operation	Self-check failed without start-up operation	PCE self-check before start-up	Pass	No risk of hazard
	RCMU sensor disabled during normal operation	Normal operation without disconnection before next start-up	PCE self-check before start-up, failure during operation and RCM protection function deactivated before “next start-up” is accepted by IEC 62109-2, please see noted in clause 4.4.4.15.1 of IEC 62109-2	Pass	Risk accepted by IEC 62109-2
4.4.4.15.2 - Fault-tolerance of automatic disconnecting means	Software control for energy transfer control disabled (one group of relays control disabled)	PCE disconnection from grid	Duplicated disconnection actuated (CPU+the other group of relays)	Pass	No risk of hazard
4.4.4.16 - Stand-alone inverters – Load transfer test	N/A	N/A	N/A	N/A	N/A
4.4.4.17 - Cooling system failure – Blanketing test	Temperature sensor in a fixed value	PCE derating operated to power below 5% and until thermal steady	Protection and derating operated by other thermal sensor	Pass	No risk of hazard

Attachment 1. Photo documentation

The representative model SUN2000-42KTL-M3.

Photo-1: Front view

Photo-2: Side view (and second protective earthing screw)

Photo-3: Bottom view

Photo-4: Side view

Photo-5: Back view

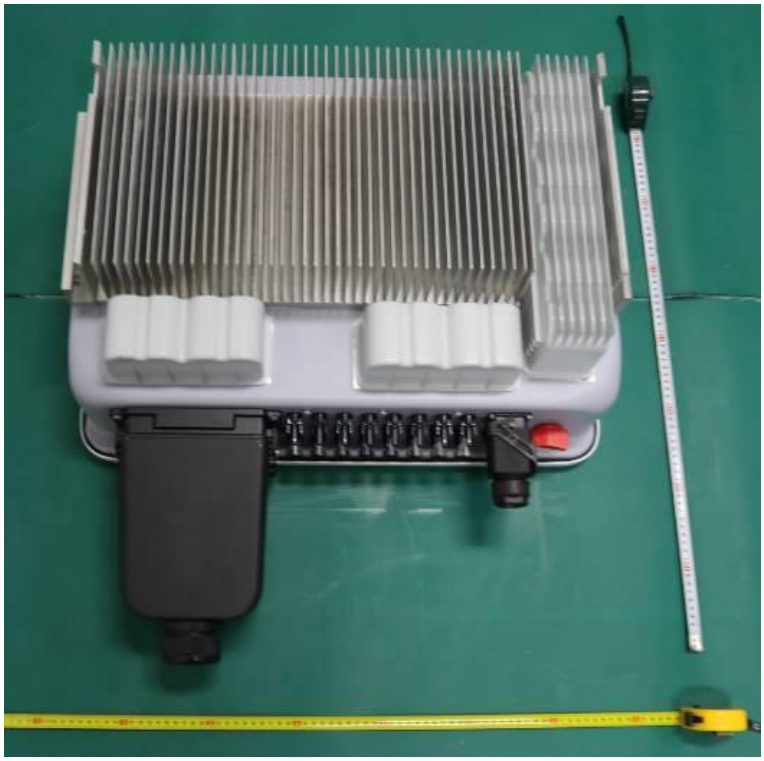


Photo-6: Internal view

Photo-7: Internal view

Photo-8: Internal view

Photo-9: PCB END5FLTA

Photo-10: PCB END5FLTA

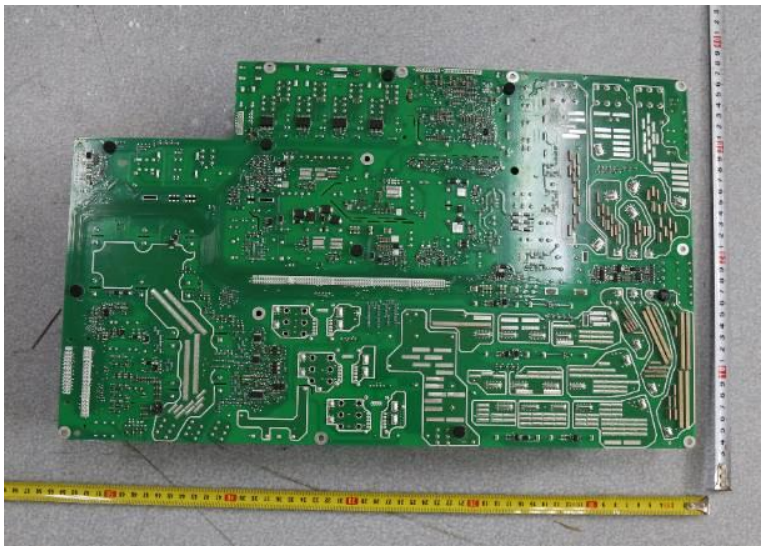


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Photo-11: PCB END5PWRA

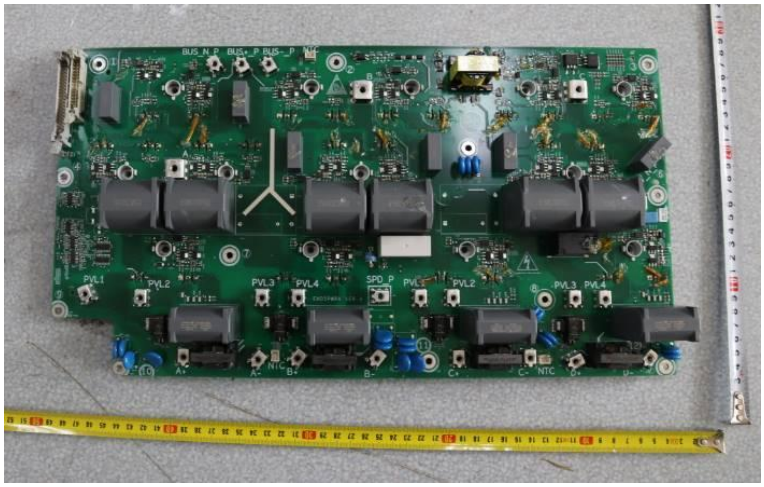


Photo-12: PCB END5PWRA

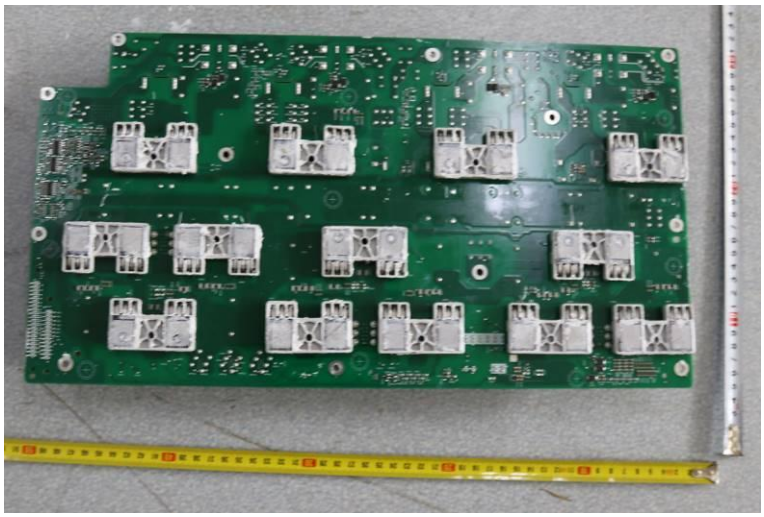


Photo-13: PCB END4COMA

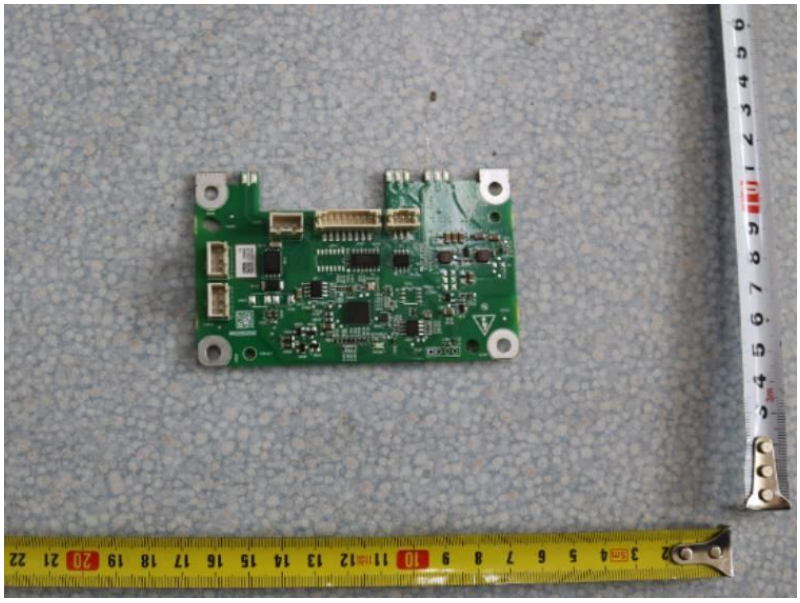


Photo-14: PCB END4COMA

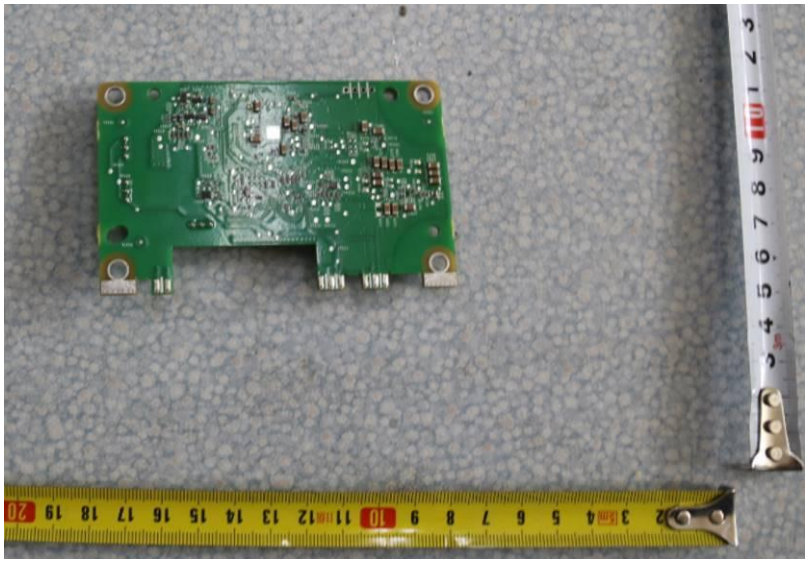
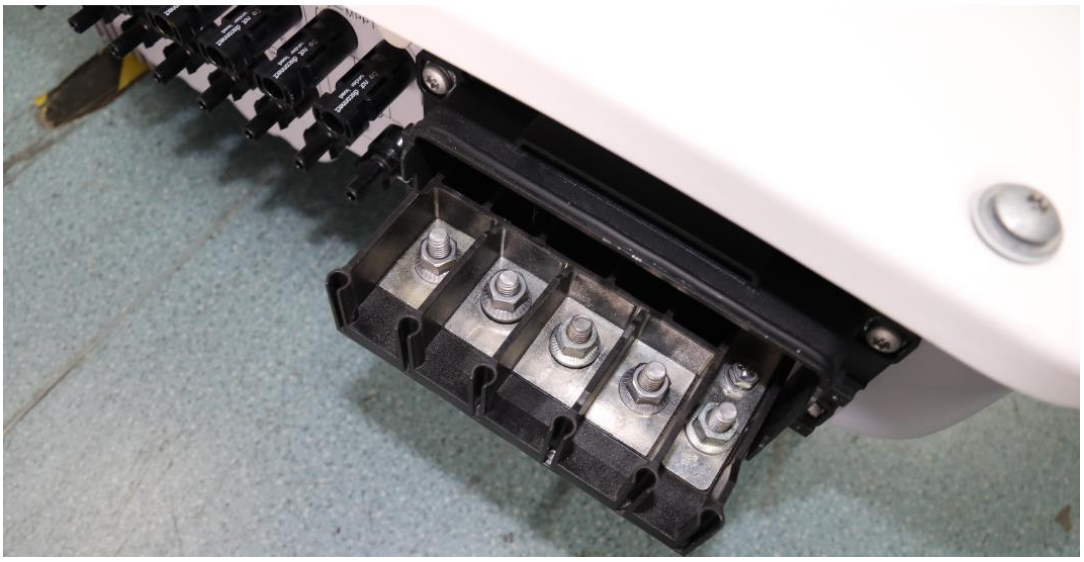


Photo-15: AC connection compartment



……**End of test report**……