TEST REPORT

IEC 62109-1

Safety of Power Converter for use in Photovoltaic Power Systems Part 1: General requirements

Report Number. ..... :	64.290.22.30840.01 part 1 of 2
Date of issue ..... :	2023-06-16
Total number of pages ..... :	96 pages
Name of Testing Laboratory preparing the Report..... :	TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch TÜV SÜD Testing Center, D1 building, No. 63 Chuangqi Road, Shilou Town, Panyu District, Guangzhou 511447, P.R. China
Applicant's name ..... :	EAST Group Co., Ltd.
Address..... :	No.6 Northern Industry Road, Songshan Lake Sci. & Tech. Industry Park, 523808 DongGuan City, Guangdong Province, PEOPLE'S REPUBLIC OF CHINA
Test specification:	
Standard..... :	EN 62109-1:2010
Test procedure ..... :	CE_LVD
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

If this Test Report Form is used by non-IECEE members, the IECEE/IEC logo and the reference to the CB Scheme procedure shall be removed.

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.

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Test item description ..... :	Hybrid Inverter		
Trade Mark ..... :	EAST		
Manufacturer ..... :	Same as the applicant		
Model/Type reference ..... :	EAHI-6000-SL, EAHI-5000-SL, EAHI-3600-SL, EAHI-3000-SL		
Ratings ..... :	See page 7-8		
Responsible Testing Laboratory (as applicable), testing procedure and testing location(s):			
☒	**Testing Laboratory:**	TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch	
Testing location/ address.....:		TÜV SÜD Testing Center, D1 building, No. 63 Chuangqi Road, Shilou Town, Panyu District, Guangzhou 511447, P.R. China	
Tested by (name, function, signature).....:		Amy Feng (Project Handler)	Amy Feng
Approved by (name, function, signature)...:		Vincent Liang (Designated Reviewer)	Vincent Liang

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

This test report contains 2 parts listed in below table:

Item	Description	Pages
Part 1	IEC 62109-1:2010, EN 62109-1:2010 test report	96
Part 2	IEC 62109-2:2011, EN 62109-2:2011 test report	29

This test report shall be also used in conjunction with 32 pages of photo documentation and 38 pages CDF.

Summary of testing:

All tests were carried out according to IEC 62109-1:2010. The text of IEC 62109-1:2010 was approved by CENELEC as a European Standard without any modification.

Tests performed (name of test and test clause):

Clause	Requirement
4.3	Thermal testing
4.4	Testing in single fault condition
4.5	Humidity preconditioning
4.6	Backfeed voltage protection
4.7	Electrical ratings tests
5.1.2	Durability of markings
6.3	Ingress protection
7.3	Protection against electric shock
7.4	Protection against energy hazards
7.5	Electrical tests related to shock hazard
8.5	Wall mounting
13.6.2.1	Stress relief test
13.7	Mechanical resistance to deflection, impact, or drop

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

☒ The product fulfils the requirements of __EN 62109-1:2010__

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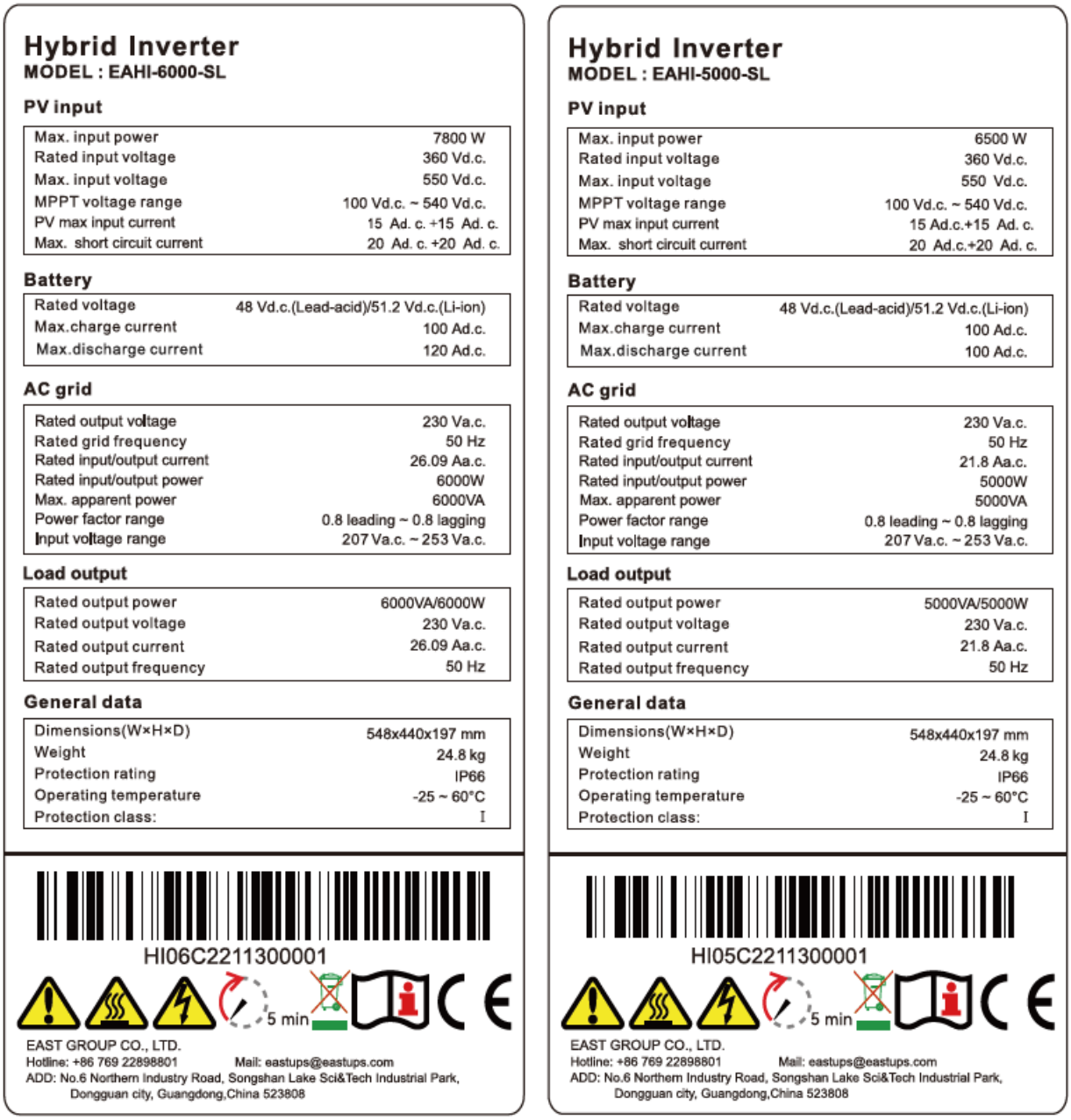
Copy of marking plate:

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

Below electric ratings and warnings are silk-screen on label and affixed side of enclosure.



Hybrid Inverter
MODEL : EAHI-6000-SL

PV input

Max. input power	7800 W
Rated input voltage	360 Vd.c.
Max. input voltage	550 Vd.c.
MPPT voltage range	100 Vd.c. ~ 540 Vd.c.
PV max input current	15 Ad. c. +15 Ad. c.
Max. short circuit current	20 Ad. c. +20 Ad. c.

Battery

Rated voltage	48 Vd.c.(Lead-acid)/51.2 Vd.c.(Li-ion)
Max.charge current	100 Ad.c.
Max.discharge current	120 Ad.c.

AC grid

Rated output voltage	230 Va.c.
Rated grid frequency	50 Hz
Rated input/output current	26.09 Aa.c.
Rated input/output power	6000W
Max. apparent power	6000VA
Power factor range	0.8 leading ~ 0.8 lagging
Input voltage range	207 Va.c. ~ 253 Va.c.

Load output

Rated output power	6000VA/6000W
Rated output voltage	230 Va.c.
Rated output current	26.09 Aa.c.
Rated output frequency	50 Hz

General data

Dimensions(W×H×D)	548x440x197 mm
Weight	24.8 kg
Protection rating	IP66
Operating temperature	-25 ~ 60°C
Protection class:	I

HI06C2211300001

5 min

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ADD: No.6 Northern Industry Road, Songshan Lake Sci&Tech Industrial Park, Dongguan city, Guangdong,China 523808

Hybrid Inverter
MODEL : EAHI-5000-SL

PV input

Max. input power	6500 W
Rated input voltage	360 Vd.c.
Max. input voltage	550 Vd.c.
MPPT voltage range	100 Vd.c. ~ 540 Vd.c.
PV max input current	15 Ad.c.+15 Ad. c.
Max. short circuit current	20 Ad.c.+20 Ad. c.

Battery

Rated voltage	48 Vd.c.(Lead-acid)/51.2 Vd.c.(Li-ion)
Max.charge current	100 Ad.c.
Max.discharge current	100 Ad.c.

AC grid

Rated output voltage	230 Va.c.
Rated grid frequency	50 Hz
Rated input/output current	21.8 Aa.c.
Rated input/output power	5000W
Max. apparent power	5000VA
Power factor range	0.8 leading ~ 0.8 lagging
Input voltage range	207 Va.c. ~ 253 Va.c.

Load output

Rated output power	5000VA/5000W
Rated output voltage	230 Va.c.
Rated output current	21.8 Aa.c.
Rated output frequency	50 Hz

General data

Dimensions(W×H×D)	548x440x197 mm
Weight	24.8 kg
Protection rating	IP66
Operating temperature	-25 ~ 60°C
Protection class:	I

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Hybrid Inverter
MODEL : EAHI-3600-SL

PV input

Max. input power	4680 W
Rated input voltage	360 Vd.c.
Max. input voltage	550 Vd.c.
MPPT voltage range	100 Vd.c. ~ 540 Vd.c.
PV max input current	15 Ad.c.
Max. short circuit current	20 Ad.c.

Battery

Rated voltage	48 Vd.c.(Lead-acid)/51.2 Vd.c.(Li-ion)
Max.charge current	75 Ad.c.
Max.discharge current	75 Ad.c.

AC grid

Rated output voltage	230 Va.c.
Rated grid frequency	50 Hz
Rated input/output current	15.7 Aa.c.
Rated input/output power	3600W
Max. apparent power	3600VA
Power factor range	0.8 leading ~ 0.8 lagging
Input voltage range	207 Va.c. ~ 253 Va.c.

Load output

Rated output power	3600VA/3600W
Rated output voltage	230 Va.c.
Rated output current	15.7 Aa.c.
Rated output frequency	50 Hz

General data

Dimensions(W×H×D)	548x440x197 mm
Weight	21.4 kg
Protection rating	IP66
Operating temperature	-25 ~ 60°C
Protection class:	I

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Hybrid Inverter
MODEL : EAHI-3000-SL

PV input

Max. input power	4680 W
Rated input voltage	360 Vd.c.
Max. input voltage	550 Vd.c.
MPPT voltage range	100 Vd.c. ~ 540 Vd.c.
PV max input current	15 Ad.c.
Max. short circuit current	20 Ad.c.

Battery

Rated voltage	48 Vd.c.(Lead-acid)/51.2 Vd.c.(Li-ion)
Max.charge current	66 Ad.c.
Max.discharge current	66 Ad.c.

AC grid

Rated output voltage	230 Va.c.
Rated grid frequency	50 Hz
Rated input/output current	13.05 Aa.c.
Rated input/output power	3000W
Max. apparent power	3000VA
Power factor range	0.8 leading ~ 0.8 lagging
Input voltage range	207 Va.c. ~ 253 Va.c.

Load output

Rated output power	3000VA/3000W
Rated output voltage	230 Va.c.
Rated output current	13.05 Aa.c.
Rated output frequency	50 Hz

General data

Dimensions(W×H×D)	548x440x197 mm
Weight	21.4 kg
Protection rating	IP66
Operating temperature	-25 ~ 60°C
Protection class:	I

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5 min

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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
Enviromental 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 system
IT testing, phase-phase voltage (V)..... :	N/A
Class of equipment ..... :	☒ Class I ☐ Class II ☐ Class III ☐ Not classified
Mass of equipment (kg) ..... :	Approx. 24.8 kg for models EAHI-6000-SL and EAHI-5000-SL, 21.4 kg for models EAHI-3600-SL and EAHI-3000-SL
Pollution degree ..... :	PD 3 (External), PD 2 (Internal)
IP protection class ..... :	IP 66

Testing

Date of receipt of test item(s) ..... :	2022-12-21
Dates tests performed ..... :	2022-12-21 to 2023-06-16

Possible test case verdicts:

– test case does not apply to the test object ..... :	N/A
– test object does meet the requirement..... :	Pass (P)
– test object was not evaluated for the requirement :	N/E
– test object does not meet the requirement..... :	Fail (F)

General remarks:

"(see Attachment #)" refers to additional information appended to the report.
"(see appended table)" refers to a table appended to the report.
The tests 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 testing laboratory.
Additional test data and/or information provided in the attachments to this report.
Throughout this report a ☐ comma / ☒ point is used as the decimal separator.

This TRF was modified by TUV SUD Guangzhou branch by adding Cl.4 and Annex A to J.

Abbreviations used in the report:

Basic insulation (BI); Supplementary insulation (SI); Double insulation (DI); Reinforced insulation (RI); Functional insulation (FI); Single fault condition (SFC); Normal condition (NC); Mains overvoltage category (OVC); Pollution degree (PD), CDF (Construction Data form)

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)	☐ **Yes** ☒ **Not applicable**

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submitted for evaluation is (are) representative of the products from each factory has been provided .....:	

When differences exist; they shall be identified in the General product information section.

Name and address of factory (ies).....:

Factory name: EAST Group Co., Ltd.

Address: No.6 Northern Industry Road, Songshan Lake Sci. & Tech. Industry Park, 523808 DongGuan City, Guangdong Province, PEOPLE'S REPUBLIC OF CHINA

General product information:

(1) The unit is non-isolated (transformerless) hybrid solar inverter, it is intended to be connected with household generation systems with battery to store energy.

(2) The unit has three operating modes: grid-tied mode, anti-reflux mode and off-grid mode. The difference between anti-reflux mode and grid-tied mode is that energy will not be delivered to the grid in anti-reflux mode.

(3) The unit has 4 connection terminals: PV input terminal, grid terminal, battery terminal and AC load terminal. It's intended to use solar power, utility power and battery power to ensure continuous power supply.

(4) The unit shall be used at specified ambient conditions. Outdoor, temperature range: -25 °C to 60 °C (derating above 45 °C). Relative humidity range: 4 - 100 %.

(5) The requirement for the unit used at altitude above 2000m are not considered in this report except that clearances for use at altitudes up to 4000m are considered.

(6) If certain functions are not permitted by local regulation, the function shall be disabled by hardware or software setting (if applicable) by the manufacturer before putting into the market. For example, it's not permissible to draw electricity from the grid and then feed it back in order to claim statutory reimbursement in some nations.

(7) Low voltage electrical installations shall comply with national and local regulation. Only qualified electricians are allowed to install and maintain the converter.

(8) In order to protect the PCE, user and installer, external DC and AC circuit breaker shall be equipped at the end-use application.

(9) The unit provides four disconnection relays, two for line conductor and another two for neutral conductor.

(10) Firmware version: DSP: V1002, ARM: V1005.

Model differences:

All models are similar, with similar schematic diagram and structure. The number of MPPT string and some components of models EAHI-6000-SL and EAHI-5000-SL are different from those of models EAHI-3600-SL and EAHI-3000-SL. Please refer to CDF for details.

All models have two kinds of enclosure structure, but the internal PCB board is the same except the display board, please refer to photo documentation for details.

Ratings:

Model	EAHI-3000-SL	EAHI-3600-SL	EAHI-5000-SL	EAHI-6000-SL
PV input rating				
Max. input power	4680W	4680W	6500W	7800W
Rated input voltage	360Vd.c.			
Max. input voltage	550Vd.c.			

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MPPT voltage range	100Vd.c. – 540Vd.c.			
MPPT voltage range (full load)	250Vd.c. – 450Vd.c.			
Max. input current	15Ad.c.		15Ad.c.*2	
PV short circuit current	20Ad.c.		20Ad.c.*2	
Battery input / output rating				
Battery type	Li-ion, Lead-acid battery			
Rated voltage	48Vd.c / 51.2Vd.c.			
Battery voltage range	42Vd.c. – 58Vd.c.			
Max. charging power	3000W	3600W	5000W	5000W
Max. charging current	66Ad.c.	75Ad.c.	100Ad.c.	100Ad.c.
Max. discharging power	3000W	3600W	5000W	6000W
Max. discharging current	66Ad.c.	75Ad.c.	100Ad.c.	120Ad.c.
Grid input rating				
Rated input voltage	230Va.c.			
Rated grid frequency	50Hz			
Max. input power	3000W	3600W	5000W	6000W
Rated input current	13.05 Aa.c.	15.7 Aa.c.	21.8 Aa.c.	26.09 Aa.c.
Max. input current	13.05 Aa.c.	15.7 Aa.c.	21.8 Aa.c.	26.09 Aa.c.
Grid output rating				
Rated output power	3000W	3600W	5000W	6000W
Max. output power	3000W	3600W	5000W	6000W
Rated output voltage	230Va.c.			
Rated output frequency	50Hz			
Rated output current	13.05 Aa.c.	15.7 Aa.c.	21.8 Aa.c.	26.09 Aa.c.
Max. output current	13.05 Aa.c.	15.7 Aa.c.	21.8 Aa.c.	26.09 Aa.c.
Power factor	0.8 leading – 0.8 lagging			
AC load output rating				
Rated output power	3000W	3600W	5000W	6000W
Max. output power	3000W	3600W	5000W	6000W
Rated output voltage	230Va.c.			
Rated output frequency	50Hz			
Rated output current	13.05 Aa.c.	15.7 Aa.c.	21.8 Aa.c.	26.09 Aa.c.
Max. output current	13.05 Aa.c.	15.7 Aa.c.	21.8 Aa.c.	26.09 Aa.c.
General parameter				
Ingress protection rating	IP66			
Ambient temperature range	-25°C to 60°C (> 45°C derating)			
Protective class	Class I			

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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
	Unless otherwise specified, the following ambient environmental conditions shall exist in the test location: a) temperature of 15 °C to 40 °C b) a relative humidity of not more than 75 % and not less than 5% c) an air pressure of 75 kPa to 106 kPa. d) no frost, dew, percolating water, rain, solar radiation, etc.		P
4.2.2.2	State of equipment		P
4.2.2.3	Position of equipment	The units were 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	No accessories or operator interchangeable parts	N/A
4.2.2.5	Covers and removable parts	No such covers and removable parts.	N/A
4.2.2.6	Main supply	230 Va.c. (90% to 110% tolerance), 50Hz, TN system considered.	P
4.2.2.7	Supply ports other than the mains	DC input	P
4.2.2.7.1	Photovoltaic supply sources	PV input	P
4.2.2.7.2	Battery inputs	External battery pack can connect to the unit.	P
4.2.2.8	Conditions of loading for output ports		P
4.2.2.9	Earthing terminals	Protective conductor terminal was connected to earth. No functional earth terminal.	P
4.2.2.10	Controls		P
	Controls which the operator can adjust shall be set to any position except that	Control is set to max. AC output power. But it is not intended for user	P

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IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
	a) mains selection devices shall be set to the correct value unless otherwise noted in this standard;	No mains selection devices.	N/A
	b) Combinations of settings shall not be made if they are prohibited by the manufacturer's instructions provided with the equipment.	No combinations of settings devices	N/A
4.2.2.11	Available short circuit current		N/A
4.3	Thermal testing		P
4.3.1	General		P
4.3.2	Maximum temperature	Tests of equipment rated for use in ambient temperatures up to 60 °C	P
4.3.2.1	General		P
	Materials and components shall be selected so that under the most severe rated operating conditions, the temperatures do not exceed the temperature limits.		P
	Conformity is verified by measuring temperatures under the conditions given in 4.2 for each rated operating condition or mode of the PCE that could affect the resulting temperatures.		P
	The temperature limits specified below are total temperature limits (not temperature rise limits).		P
	Tests of equipment rated for use in ambient temperatures up to 50°C may be conducted at any ambient temperature in the range given in 4.2.2.1, in which case the difference between the maximum rated ambient temperature and the test ambient is to be subtracted from or added to (as appropriate) the measured temperatures for comparison to the limits specified below.	Maximum rated ambient temperature of the unit: 60 °C. (see appended table)	P
	PCE rated for use in ambient temperatures more than 50°C shall be tested at the maximum rated ambient temperature +/- 5°C. the difference between the maximum rated ambient temperature and the test ambient is to be subtracted from or added to the measured temperatures for comparison to the limits specified.		N/A
	PCE with different output ratings or with automatic derating for different ambient temperatures shall be tested under as many conditions as are necessary to record worst-case temperatures, including at least the maximum ambient before derating, and the maximum ambient with derating.		N/A
	During thermal testing within NORMAL CONDITIONS protective devices shall not operate.		P

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Clause	Requirement – Test	Result – Remark	Verdict
	Temperatures are to be measured by thermocouples, except that for coils the change of resistance method may be used.	Method of thermocouples is used, including transformers, inductors, and other coils. Multiple embedded thermocouples, where the thermocouples are attached during winding of the part, are more likely to record hot-spot temperatures.	P
	Limits: - for coils and their insulation systems, the temperature limits in Table 1 apply.		P
	- for other components the measured temperatures shall not exceed the lower of:	(see appended table)	P
	- the applicable IEC component standards		P
	- the component or material's rated manufacturer's operating temperature		P
	- if neither of the above exists, temperature limits are given in Table 2.		P
4.3.2.2	Touch temperatures		P
	The maximum temperature for accessible parts of the PCE shall be in compliance with table 3		P
	It is permitted that accessible parts that are required to get hot as part of their intended function (for example heatsinks) may have temperatures up to 100 °C, if the parts are marked with the hot surface marking of symbol 14 of Annex C. For products only for use in a closed electrical operating area the 100 °C limit does not apply.		P
4.3.2.3	Temperature limits for mounting surfaces		P
	In order to protect against long-term degradation of building materials, surfaces of the PCE that will be in contact with the mounting surface shall not exceed a maximum total temperature of 90 °C.		P
4.4	Testing in single fault condition		P
4.4.1	General		P
	Testing in single fault conditions is done to determine that no hazards result from reasonably expected fault conditions that may arise in normal service or from reasonably expected misuse.		P
	Fault testing shall be done unless it can be conclusively demonstrated that no hazards could arise from a particular fault condition, or unless alternative methods of checking conformity are specified in this standard in place of fault testing.		P
4.4.2	Test conditions and duration for testing under fault conditions		P

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IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
4.4.2.1	General		P
	The equipment shall be operated under the combination of conditions in 4.2, which is least favourable for the particular fault test being performed.		P
	Fault conditions are to be applied only one at a time and shall be applied in turn in any convenient order. Multiple simultaneous faults shall not be applied, but a subsequent fault may arise as a consequence from an applied fault. Separate samples of the EUT may be used for each separate fault test applied, or the same sample may be used for many tests if damage from previous fault tests has been repaired or will not affect the results of further tests.		P
4.4.2.2	Duration of tests		P
	The equipment shall be operated until further change as a result of the applied fault is unlikely, as determined by (for example) opening of a device that removes the influence of the fault, stabilization of temperatures, etc.		P
	If a non-resettable, manual, or automatically resetting protective device or circuit operates in such a way as to interrupt or mitigate the fault condition, the test duration is as follows:		P
	- automatic reset devices or circuits: allow the protection to cycle on and off until no further change as a result of the applied fault is likely, until the ultimate result is obtained, or until temperatures stabilize		P
	- manual reset devices or circuits: three cycles, with the device or circuit reset as soon as possible after tripping		N/A
	- non-resettable devices or circuits: one cycle		N/A
4.4.3	Pass/fail criteria for testing under fault conditions		P
4.4.3.1	Protection against shock hazard		P
	Compliance with requirements for protection against electric shock is checked after the application of single faults as follows:		P
	a) by making measurements to check that no accessible DVC-A circuits have become shock-hazardous using the steady state limits for DVC-A in Table 6 and the short-term limits of 7.3.2.3, and that such circuits remain separated from live parts at voltages greater than DVC A with at least basic insulation. Compliance is checked by the test of 7.5.2 (without humidity preconditioning) for basic insulation; and		P

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	b) by performing a dielectric strength test as per 7.5.2 (without humidity preconditioning) in the following cases:		P
	i) on reinforced or double Insulation, using the test level for Basic insulation, and		P
	ii) on basic insulation in Protective Class I equipment, using the test level for Basic insulation, unless it can be determined that the fault did not result in any damage to the protective earthing conductor or terminal, or to protective bonding means; and		P
	c) by inspection to ensure a fuse connected between the protective earthing terminal and the protective earthing conductor in the test setup has not opened; the fuse shall be rated 3A non-time-delay (for equipment rated for use on circuits protected by overcurrent protection rated 30A or less) or 30A to 35A non-time-delay(for equipment rated for use on circuits protected by overcurrent protection rated more than 30A); the enclosure is not to be contacting earth in any other location during the testing; and		P
	d) by inspection of the enclosure to ensure that no damage has resulted that allows access to parts that are hazardous live.		P
4.4.3.2	Protection against the spread of fire		P
	Compliance with requirements for protection against the spread of fire is checked by placing the equipment on white tissue-paper covering a softwood surface and covering the equipment with cheesecloth or surgical cotton during the fault testing. As an alternative, the cheesecloth or surgical cotton may be placed only over the openings of large equipment.		P
	There shall be no emission of molten metal, burning insulation, or flaming or glowing particles from the fire enclosure, and there shall be no charring, glowing, or flaming of the tissue paper, cheesecloth, or glowing or flaming of surgical cotton.		P
4.4.3.3	Protection against other hazards		P
	Conformity with requirements for protection against other HAZARDS after application of the fault tests is checked as specified elsewhere in this standard.		P
4.4.3.4	Protection against parts expulsion hazards		P

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Clause	Requirement – Test	Result – Remark	Verdict
	Failure of any component within the PCE shall not release parts outside the PCE enclosure with sufficient energy to lead to a hazard, for example, expulsion of material into an area occupied by personnel.		P
4.4.4	Single Fault conditions to be applied		P
4.4.4.1	Component fault tests	(see appended table)	P
	The following faults are simulated:		P
	a) Short circuit or open circuit of relevant components		P
	b) Short circuit or open circuit of any components or insulation where failure could adversely affect supplementary insulation or reinforced insulation.		P
	c) In addition, where required by Method 2 of 9.1.1, components that could result in a fire hazard are to be overloaded unless they comply with the requirements of 9.1.3		P
4.4.4.2	Equipment or parts for short-term or intermittent operation	Not for short-term or intermittent operation	N/A
	Components such as motors, relays, other electromagnetic devices and heaters, which are normally operated only intermittently, shall be operated continuously if continuous operation could occur in a single fault conditions.	No components normally operated only intermittently	N/A
4.4.4.3	Motors		P
	Motors shall be stopped while fully energized or prevented from starting, whichever is less favourable.	DC fans are tested.	P
4.4.4.4	Transformer short circuit tests	(see appended table)	P
	The output windings of transformers shall be short-circuited one at a time. A transformer damaged during one test may be repaired or replaced before the next test.		P
4.4.4.5	Output short circuit		P

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Clause	Requirement – Test	Result – Remark	Verdict
	Testing is required to be performed on all combinations of terminals for the port under consideration, two at a time, including neutral and earth terminals, and one test with all current-carrying terminals of the port shorted together at once.	(1) Grid output (2) Battery output (3) Load output Above three combinations of output terminals are tested one a time. The grid output short-circuit current is 157Apeak impulse (1.8ms, duration) when single fault (1) was applied. The battery output short-circuit current is 726Apeak impulse (4.65ms, duration) when single fault (2) was applied. The load output short-circuit current is 171Apeak impulse (108ms, duration) when single fault (3) was applied.	P
	the short-circuit currents are to be recorded and if they exceed the maximum rated current of the circuit, the maximum measured current shall be provided in the installation manual for the purpose of coordination of overcurrent protection of the external circuit conductors.		P
4.4.4.6	Backfeed current test		P
	For equipment intended to be connected simultaneously to more than one source of supply, each input of the PCE shall be tested one at a time, to determine if hazardous conditions can result from current from one source of supply flowing into the wiring for another source under fault conditions.	DC (PV and battery) and AC consider as source of supply.	P
	With the PCE operating under normal conditions, a short circuit shall be applied at the field wiring terminals of the circuit under consideration, with all intended other sources connected to the PCE through the over current protective devices (if any) intended to be present in the installation.		P
	the short-circuit currents are to be recorded and if they exceed the maximum rated current for the port, the maximum measured current shall be provided in the installation manual for the purpose of coordination of overcurrent protection of the external circuit conductors	The grid input short-circuit current is 988.5Apeak impulse (7.3ms). The battery input short-circuit current is 561.3Apeak impulse (4.4ms). The PV input short-circuit current is max. 723Apeak impulse (1.9ms).	P
4.4.4.7	Output overload		P

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Clause	Requirement – Test	Result – Remark	Verdict
	Each output of the PCE, and each section of a tapped output, shall be overloaded in turn, one at a time. The other windings are loaded or not loaded, whichever load condition of normal use is less favorable. Overloading is carried out by connecting a variable resistor across the winding. The resistor is adjusted as quickly as possible and readjusted, if necessary, after 1 min to maintain the applicable overload. No further readjustments are then permitted.		P
	If over-current protection is provided by a current-sensitive device or circuit, the overload test current is the maximum current which the over-current protection device is just capable of passing for 1 h. If this value cannot be derived from the specification, it is to be established by test. Before the test, the device is made inoperative or replaced by a link with negligible impedance.		N/A
	For equipment in which the output voltage is designed to collapse when a specified overload current is reached, the overload is slowly increased to the point of maximum output power before the point which causes the output voltage to collapse.		P
	In all other cases, the loading is the maximum power output obtainable from the output.		P
4.4.4.8	Cooling system failure		P
4.4.4.9	Heating devices	No heating devices used	N/A
	In equipment incorporating heating devices, the following faults shall be applied one at a time: a) timers which limit the heating period shall be overridden to energize the heating circuit continuously; b) temperature control devices or circuits shall have single fault conditions applied such that control over the heater is lost. Over-temperature protection devices meeting the requirements of 14.3 are left operational during the test.		N/A
4.4.4.10	Safety interlock	No safety interlock	N/A
4.4.4.11	Reverse d.c. connections	(see appended table)	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	(see appended table)	P
4.4.4.14	PWB short-circuit test		P
4.5	Humidity preconditioning		P
4.5.1	General		P
4.5.2	Conditions		P

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Clause	Requirement – Test	Result – Remark	Verdict
	Relative humidity (%), temperature (°C)	92.5% RH., 40 °C, 48 h	P
4.6	Voltage Backfeed protection		P
4.6.1	Backfeed tests under normal conditions	The PV input terminal is not accessible to people after installation. For service access, the unit was marked with discharge time	P
4.6.2	Backfeed tests under single-fault condtions		P
4.6.3	Compliance with backfeed tests		P
	The PCE is compliant with the requirements if during the tests in 4.6.1 and 4.6.2 no hazardous voltage or energy is present on the PCE terminals for the source under test. Measurements are taken 15 s or 1 s after the source is de-energized or disconnected, as follows:		P
	- 15 s for sources that are connected by fixed wiring		P
	- 1 s for sources that are cord-connected or use connectors that can be opened without the use of a tool		N/A
4.7	Electrical ratings tests		P
4.7.1	Input ratings	(see appended table)	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		P
	Equipment shall bear markings as specified in 5.1 and 5.2	Label are marked on the PCE and graphic symbol is explained in user manual	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.		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		P
5.1.3	Identification		P

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Clause	Requirement – Test	Result – Remark	Verdict
	The equipment shall, as a minimum, be permanently marked with:		P
	a) the name or trade mark of the manufacturer or supplier	Trade mark	P
	b) model number, name or other means to identify the equipment	Model number	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.	See marking label	P
5.1.4	Equipment ratings	See below	P
	Unless otherwise specified in another part of IEC 62109, the following ratings, as applicable shall be marked on the equipment:	Special requirement as per IEC 62109-2.	P
	– input voltage, type of voltage (a.c. or d.c.), frequency, and max. continuous current for each input	Refer to the marking label	P
	– 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	Refer to the marking label	P
	– the ingress protection (IP) rating as in 6.3 below	IP66	P
5.1.5	Fuse identification		N/A
	Marking shall be located adjacent to each fuse or fuseholder, or on the fuseholder, or in another location provided that it is obvious to which fuse the marking applies, giving the fuse current rating and where fuses of different voltage rating value could be fitted, the fuse voltage rating.		N/A
	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.		N/A
5.1.6	Terminals, Connections, and Controls	PV input, grid connection, load connection, battery connection and communication interface	P

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Clause	Requirement – Test	Result – Remark	Verdict
	If necessary for safety, an indication shall be given of the purpose of Terminals, connectors, controls, and indicators, and their various positions, including any connections for coolant fluids such as water and drainage. The symbols in Annex C may be used, and where there is insufficient space, symbol 9 of Annex C may be used.	Symbol 9 are marked on the PCE and user manual indicate the installation and safety of connection of connector, control and indicator.	P
	Push-buttons and actuators of emergency stop devices, and indicator lamps used only to indicate a warning of danger or the need for urgent action shall be coloured red.	No emergency stop	N/A
	A multiple-voltage unit shall be marked to indicate the particular voltage for which it is set when shipped from the factory. The marking is allowed to be in the form of a paper tag or any other nonpermanent material.	No setting is accessible to user	N/A
	A unit with d.c. terminals shall be plainly marked indicating the polarity of the connections, with:	See below	P
	– the sign “+“ for positive and “-„ for negative; or	The PV input and battery terminals for each module and whole unit are silk-screen with sign “+” for positive and “-” for negative	P
	– a pictorial representation illustrating the proper polarity where the correct polarity can be unambiguously determined from the representation	Not provided	N/A
5.1.6.1	Protective Conductor Terminals		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.		P
5.1.7	Switches and circuit-breakers		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.		P
5.1.8	Class II Equipment	Class I	N/A

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Clause	Requirement – Test	Result – Remark	Verdict
	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	No such terminal boxes.	N/A
	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:		N/A
	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 installation instruction. Symbol 9 of Table D-1 is an acceptable marking		N/A
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 depht or raised height of at least 0,5 mm.		N/A
	If it is necessary to refer to the instruction manual to preserve the protection afforded by the equipment, the equipment shall be marked with symbol 9 of Annex C	The manual provides necessary information for the warning marking.	P
	Symbol 9 of Annex C is not required to be used adjacent to symbols that are explained in the manual		P
5.2.2	Content for warning markings		P
5.2.2.1	Ungrounded heatsinks and similar parts	Ungrounded heatsink	P

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Clause	Requirement – Test	Result – Remark	Verdict
	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 heatsink and shall be clearly visible when the PCE is disassembled to the extent that a risk of contact with the heatsink exists.	Symbol 13 marked on heatsink	P
5.2.2.2	Hot Surfaces		N/A
	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.		N/A
5.2.2.3	Coolant	Coolant is not used	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 done only by SERVICE PERSONNEL, or		N/A
	b) instructions for safe venting, draining, or otherwise working on the cooling system, if these operations can be performed without OPERATOR access to HAZARDS internal to the equipment		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 21 is marked on PCE	P
5.2.2.5	Motor guarding		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).		N/A
5.2.3	Sonic hazard markings and instructions	No sonic 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

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	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 array, battery and AC mains.	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 provided on PCE	P
	The symbol shall be located on the outside of the unit or shall be prominently visible behind any cover giving access to hazardous parts.		P
5.2.5	Excessive touch current		N/A
	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.		N/A
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:		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	outdoor	P
	– WET LOCATIONS classification fort he intended external environment as per 6.1	Suitable for wet location	P
	– POLLUTION DEGREE classification for the intended external environment as per 6.2	External: PD3, Internal: PD2	P
	– INGRESS PROTECTION rating as per 6.3	IP66	P

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	– Ambient temperature and relative humidity ratings	Max. 60 °C and 100%RH	P
	– MAXIMUM altitude rating	Up to 4000 m	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;	OVC II (PV), OVC III (Mains)	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 provided	P
	Instructions related to safety shall be in a language that is acceptable in the country where the equipment is to be installed.	For other country language, further evaluation is needed.	N/A
5.3.1.2	Format		P
	In general, the documentation must be provided in printed form and is to be delivered with the equipment.	Printed form provided and is to be delivered with 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.		P
5.3.2	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

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	e) ventilation requirements;		P
	f) requirements for special services, for example cooling liquid;	No cooling liquid or other special service	N/A
	g) instructions and information relating to sound pressure level if required by 10.2.1;		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 battery	N/A
	i) tightening torque to be applied to wiring terminals;		P
	j) values of backfeed short-circuit currents available from the PCE on input and output conductors under fault conditions, if those currents exceeds 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;		N/A
	m) instructions for protective earthing, including the information required by 7.3.6.3.7 if a second protective earthing conductor is to be installed:	Provided in the installation manual.	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		P
	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		P
	Instructions for use shall include any operating instructions necessary to ensure safe operation, including the following, as applicable:		P

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	– 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 impaired.		P
5.3.4	Information related to maintenance		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;	No replaceable parts	N/A
	– 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	No energy storage battery inside	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

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IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
	– 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
	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	outdoor use	P
	– Suitability for WET LOCATIONS or not	Suitability for wet locations	P
	– POLLUTION DEGREE rating in 6.2 below	External: PD3, Internal: PD2	P
	– INGRESS PROTECTION (IP) rating, as in 6.3 below	IP66	P
	– Ultraviolet (UV) exposure rating, as in 6.4 below		P
	– Ambient temperature and relative humidity ratings, as in 6.5 below		P
6.1	Environmental categories and minimum environmental conditions		P
6.1.1	Outdoor		P

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IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
6.1.2	Indoor, unconditioned		N/A
6.1.3	Indoor, conditioned		N/A
6.2	Pollution degree	External: PD3, Internal: PD2	P
6.3	Ingress Protection	IP66	P
6.4	UV exposure		P
6.5	Temperature and humidity	Max. 60 °C and 100%RH	P
7	**PROTECTION AGAINST ELECTRIC SHOCK AND ENERGY HAZARDS**		P
7.1	General		P
7.2	Fault conditions	Normal and single fault condition are considered	P
7.3	Protection against electric shock		P
7.3.1	General	In the PCE the earthed metal enclosure is evaluated by means of basic insulation from DVC C circuit. DVC A circuit and unearthed accessible parts are evaluated by means of double insulation or reinforced insulation from DVC C circuit. DVC C: The PV input and grid output, AC load output. DVC A: the communication interface and battery circuit.	P
7.3.2	Decisive voltage classification		P
7.3.2.1	Use of decisive voltage class (DVC)	Working voltage and protective measures are considered.	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)	Single fault condition is considered. Accessible earthed conductive parts are separated from DVC-C circuits by basic insulation. Accessible unearthed conductive parts separated from DVC C circuit by double insulation or reinforced insulation.	P
7.3.2.5	Connection to PELV and SELV circuits	The external signal communication interface is considered as SELV	P

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Clause	Requirement – Test	Result – Remark	Verdict
7.3.2.6	Working voltage and DVC		P
7.3.2.6.1	General	Transients and voltage fluctuations are disregarded. And worst case normal operating condition is considered	P
7.3.2.6.2	AC working voltage (see Figure 2)	230 Vr.m.s considered	P
7.3.2.6.3	DC working voltage (see Figure 3)	Max. DC open voltage: 550 V	P
7.3.2.6.4	Pulsating working voltage (see Figure 4)		N/A
7.3.3	Protective separation	See description in Cl. 7.3.1	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		N/A
	▪ 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
	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		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).	Enclosure provided	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.	End use product	N/A
	Product intended for installation in CLOSED ELECTRICAL OPERATING AREAS, (see 3.9) need not have protective measures against direct contact, except as required by 7.3.4.2.4.	No use under this condition	N/A
7.3.4.2	Protection by means of enclosures and barriers		P

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Clause	Requirement – Test	Result – Remark	Verdict
	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.	Enclosure provided to prevent access to inside live parts	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).	Secured by screws	P
	Polymeric materials used to meet these requirements shall also meet the requirements of 13.6		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	The communication interface is considered as DVC A	P
	b) decisive voltage classification B, (DVC B) - the probe must not touch bare live parts	The DVC B circuit is not accessible by probe	P
	c) decisive voltage classification C, (DVC C) – the probe must have adequate clearance to live parts, based on the clearance for Basic insulation using the recurring peak working voltage involved,	The DVC C circuit is not accessible by probe	P
7.3.4.2.3	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 unfavorable position.		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

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Clause	Requirement – Test	Result – Remark	Verdict
	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.		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.		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.		N/A
7.3.4.2.4	Service access areas		P
7.3.4.3	Protection by means of insulation of live parts	The earthed enclosure is with basic insulation from the live parts inside	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	The communication interface is direct contact and evaluated with double or reinforced insulation from live parts	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:	Considered	P
	– is of decisive voltage class A and complies with 7.3.5.2, or	The communication interface is DVC A and double or reinforced insulation from the live parts by means of isolation transformer with isolation power supply and optocoupler.	P

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Clause	Requirement – Test	Result – Remark	Verdict
	– 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.	Considered	P
	Conformity is checked by visual inspection and trial insertion.		P
7.3.5.2	Protection using decisive voltage class A	The communication interface is DVC A and double or reinforced insulation from the live parts by means of isolation transformer with isolation power supply and optocoupler.	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 circuits of DVC-B or DVC-C according 7.3.3.		N/A
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	No such design	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

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Clause	Requirement – Test	Result – Remark	Verdict
	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)		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	The earthed metal enclosure meets this requirement	P
	That part of a PCE meets the requirements of 7.3.6.4 is defined as protective class II.	The communication interface is double or reinforced insulated from live parts inside.	P
	That part of PCE which meets the requirements of decisive voltage class A and in which no hazardous voltages are derived, is defined as protective class III. No shock hazard is present in such circuits.		N/A
	Where protection against indirect contact is dependent on means provided during installation, the installation instructions shall provide details of the required means and shall indicate the associated hazards.	The manual requires the PCE must be securely earthed	P
7.3.6.2	Insulation between live parts and accessible conductive parts	See Cl. 7.3.7.4 and Cl. 7.3.7.5	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:		P
	a) accessible conductive parts that are protected by one of the measures in 7.3.5.2 to 7.3.5.4, or		N/A

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Clause	Requirement – Test	Result – Remark	Verdict
	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:	The PCE provide internal and external optional earthing screws for protective earthing.	P
	a) through direct metallic contact;		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.		P
	For moving or removable parts, hinges or sliding contacts designed and maintained to have a low resistance are examples of acceptable means if they comply with the requirements of 7.3.6.3.3.	No such design	N/A
	Metal ducts of flexible or rigid construction and metallic sheaths shall not be used as protective bonding conductors, unless the device or material has been investigated as suitable for protective bonding purposes.	No such design	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

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Clause	Requirement – Test	Result – Remark	Verdict
	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.		P
	As alternative to a) and b) the protective bonding may designed according to the requirements for the external protective earthing conductor in 7.3.6.3.5, in which case no testing is required.		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:		P
	a) For pluggable equipment type A, the overcurrent protective device is that provided external to the equipment (for example, in the building wiring, in the mains plug or in an equipment rack);		N/A
	b) For pluggable equipment type B and fixed equipment, the maximum rating of the overcurrent protective device specified in the equipment installation instructions to be provided external to the equipment;	Fixed equipment	P
	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.	Measured from the farthest part of earthed metal enclosure to the input earth terminal	P

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Clause	Requirement – Test	Result – Remark	Verdict
	On equipment where the protective earth conncection 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.		P
7.3.6.3.3.1	Test current, duration, and acceptance criteria		P
	The test current, duration of the test and acceptance criteria are as follows:		P
	a) For PCE with an overcurrent protective device rating of 16 A or less, the test current is 200% of the overcurrent protective device rating, but not less than 32 A, applied for 120s. The impedance of the protective bonding means during and at the end of the test shall not exceed 0,1 Ω.		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.	Test current: 80A@4min, test result: 0.912 V.	P
	c) During and after the test, there shall be no melting, loosening, or other damage that would impair the effectiveness of the protective bonding means.		P
	The test current is derived from an a.c or d.c supply source, the output of which is not earthed.	DC supply	P
	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.		P
7.3.6.3.4	Protective bonding impedance (routine test)		N/A

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Clause	Requirement – Test	Result – Remark	Verdict
	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:	Declared by Manufacturer and working instruction checked during factory inspection	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		N/A
	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.		N/A
	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:		N/A
	▪ 2,5 mm² if mechanical protection is provided;		N/A
	▪ 4 mm² if mechanical protection is not provided.		N/A
	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.		N/A
7.3.6.3.6	Means of connection for the external protective earthing conductor		P
7.3.6.3.6.1	General		P

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Clause	Requirement – Test	Result – Remark	Verdict
	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		P
	Marking shall not be done on easily changeable parts such as screws.		N/A
7.3.6.3.7	Touch current in case of failure of the protective earthing conductor		P
	The requirements of this sub-clause shall be satisfied to maintain safety in case of damage to or disconnection of the protective earthing conductor.	The measured touch current is max. 0.22 mA.	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.		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.		N/A
	a) Permanently connected wiring, and:		N/A
	• a cross-section of the protective earthing conductor of at least 10 mm² Cu or 16 mm² Al; or		N/A
	• automatic disconnection of the supply in case of discontinuity of the protective earthing conductor; or		N/A

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Clause	Requirement – Test	Result – Remark	Verdict
	• 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		N/A
	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.		N/A
	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.		N/A
	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)		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		N/A
	Equipment or parts of equipment designed for protective class II shall have insulation between live parts and accessible surfaces in accordance with 7.3.4.3. The following requirements also apply:		N/A
	• equipment designed to protective class II shall not have means of connection for the external protective earthing conductor. However this does not apply if the external protective earthing conductor is passed through the equipment to equipment series-connected beyond it. In the latter event, the external protective earthing conductor and its means for connection shall be insulated with basic insulation from the accessible surface of the equipment and from circuits that employ protective separation, extra-low voltage, protective impedance and limited discharging energy, according to 7.3.5. This basic insulation shall correspond to the rated voltage of the series-connected equipment;		N/A
	• metal-encased equipment of protective class II may have provision on its enclosure for the connection of an equipotential bonding conductor;		N/A

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Clause	Requirement – Test	Result – Remark	Verdict
	• 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.		N/A
7.3.7	Insulation Including Clearance and Creepage Distance		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	External: PD3, Internal: PD2	P
	• overvoltage category	PV (OVC II), Mains (OVC III)	P
	• supply earthing system	TN considered.	P
	• insulation voltage	PV input: max. 550 Vd.c. and Mains: 230 Va.c.	P
	• location of insulation	See table 7.3.7.4 and 7.3.7.5 for detail	P
	• type of insulation	See table 7.3.7.4 and 7.3.7.5 for detail	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:	Inverter is intended to install in TN system.	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;		N/A

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Clause	Requirement – Test	Result – Remark	Verdict
	• IT sytem: 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.		N/A
7.3.7.1.4	Insulation voltages	See table 7.3.7.4 and 7.3.7.5 for detail	P
	Table 12 makes use of the circuit system voltage and overvoltage category to define the impulse withstand voltage and the temporary overvoltage.		P
7.3.7.2	Insulation between a circuit and its surroundings		P
7.3.7.2.1	General Basic, supplementary and reinforced insulation between a circuit and its surroundings shall be designed according to: Impulse voltage; temporary overvoltage; working voltage of the circuit;	230Va.c., OVC III (4000 V impulse voltage, 1500 Vrms temporary overvoltage) for the AC mains output. 550 Vd.c. system voltage, OVC II (4000 V impulse voltage, no temporary overvoltage) for the PV input. No insulation between PV and AC output. Double or reinforced insulation between PV input / AC output and battery terminal.	P
7.3.7.2.2	Circuit connected directly to the mains Clearance and solid insulation between circuit connected directly to the mains and their surroundings shall be designed according to the impulse voltage, temporary overvoltage, or working voltage, whichever gives the most severe requirement	System voltage for mains is 300 Vrms according to table 12. 4000 V impulse voltage gives the most severe requirement	P
7.3.7.2.3	Circuit other than mains circuit Clearance and solid insulation between circuit other than the mains and their surroundings shall be designed according to impulse voltage and recurring peak voltage	System voltage for PV is 550 Vd.c.	P
7.3.7.2.4	Insulation between circuits a) For clearances and insulation, the requirements are determined by the circuit having the higher impulse voltage; b) For creepages, r.m.s. working voltage across the insulation determines the requirements.	Impulse voltage (4000 V) is calculated from table 12 for clearance before basic isolation transformer for PV and AC side. Working voltage (550 Vd.c.) across insulation is used for creepage.	P

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Clause	Requirement – Test	Result – Remark	Verdict
7.3.7.3	Functional insulation For parts or circuit in OVC I, functional insulation shall be designed according to the working voltage across the insulation For parts or circuit in OVC II, functional insulation shall be designed according to the applicable impulse voltage as determined by 7.3.7.1.4		P
7.3.7.4	Clearance distances		P
7.3.7.4.1	Determination Table 13 defines the minimum clearance distances required to provide functional, basic, or supplementary insulation		P
	Clearance for use in altitudes above 2000 m shall be calculated with correction factor according to Table A.2 of IEC 60664-1		P
	For reinforced insulation, the value corresponding to the next higher impulse voltage, or 1.6 times the temporary overvoltage, or 1.6 times the working voltage shall be used, whichever results in the most severe requirement		P
7.3.7.4.2	Electric field homogeneity For homogeneous electric field and impulse voltage is equal to or greater than 6000V for a circuit connected directly to the mains or 4000V within a circuit, the clearance may be reduced to the requirement by Table F.2 Case B of IEC 60664-1. In this case, impulse voltage test shall be performed on the clearance	Inhomogeneous electric field is considered for PCE	N/A
7.3.7.4.3	Clearance to conductive enclosures Clearance shall be measured following the deformation test of 13.7 for conductive enclosures		P
7.3.7.5	Creeage distances		P
7.3.7.5.1	General Creepage distances shall be large enough to prevent long-term degradation of the surface of solid insulators. For reinforced insulation, the value is doubled. If less than clearance, it shall be increased to that clearance	PV Maximum 550 Vd.c. system voltage is used for the RMS voltage across insulation	P
7.3.7.5.2	Voltage r.m.s. value of working voltage is used. Interpolation is permitted		P
7.3.7.5.3	Materials		P
7.3.7.6	Coating		N/A

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Clause	Requirement – Test	Result – Remark	Verdict
7.3.7.7	PWB spacings for functional insulation	PWB rated V-0 and has a minimum CTI of 175, short-circuit test are considered	P
7.3.7.8	Solid insulation		P
7.3.7.8.1	General Material for solid insulation shall be able to withstand mechanical, electrical, thermal and climatic stresses in normal use and ageing during the expected lifetime. Compliance is evaluated by test and inspection.	Insulation tape, sheet, optical Isolator and transformer.	P
7.3.7.8.2	Requirements for electrical withstand capability of solid insulation		P
7.3.7.8.2.1	Basic and supplementary, reinforced, and double insulation. Solid insulation shall withstand the impulse voltage test 7.5.1 and voltage test 7.5.2.		P
	In addition, if recurring peak working voltage across the insulation is greater than 700 V and voltage stress on insulation is greater than 1kV/mm, double and reinforced insulation shall withstand the partial discharge test according to 7.5.3		N/A
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 Insulation of thin sheet or tape less than 0,7 mm is subject to this requirement		P
7.3.7.8.3.2	Material thickness not less than 0,2 mm		P
	Basic or supplementary insulation shall consist of at least one layer of material and shall meet the impulse and a.c. or d.c. voltage test requirements of 7.3.7.8.2.1 for basic or supplementary insulation.		P
	Double insulation shall consist of at least two layers of material. Each layer shall meet the impulse and a.c. or d.c. voltage test requirements of 7.3.7.8.2.1 for basic insulation, and the partial discharge requirements of 7.3.7.8.2.1. The two or more layers together shall meet the impulse and a.c. or d.c. voltage test requirements of 7.3.7.8.2.1 for double insulation.		P
	Reinforced insulation shall consist of a single layer of material, which will meet the impulse, a.c. or d.c. voltage, and partial discharge test requirements 7.3.7.8.2.1 for reinforced insulation.		P
7.3.7.8.3.3	Material thickness less than 0,2 mm		P

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Clause	Requirement – Test	Result – Remark	Verdict
	Basic or supplementary insulation shall consist of at least one layer of material, and shall meet the impulse and a.c. or d.c. voltage test requirements of 7.3.7.8.2.1 for basic or supplementary insulation.		P
	Double insulation shall consist of at least three layers of material. Each layer shall meet the impulse and a.c. or d.c. voltage test requirements of 7.3.7.8.2.1 for basic insulation any two layers together shall meet the impulse, a.c. or d.c. voltage, and partial discharge test requirements of 7.3.7.8.2.1 for double insulation.		P
	Reinforced insulation consisting of a single layer of material less than 0,2 mm thick is not permitted.		N/A
7.3.7.8.3.4	Compliance Component, sub-assembly, or material is checked by applicable tests 7.5.1 to 7.5.3 according to 7.3.7.8.		P
7.3.7.8.4	Printed wiring boards (PWBs)		P
7.3.7.8.4.1	General Insulation between conductor layers in double-sided single-layer PWBs, multi-layer PWBs and metal core PWBs, shall meet the requirements for solid insulation in 7.3.7.8.		P
	For the inner layers of multi-layer PWBs, the insulation between adjacent tracks on the same layer shall be treated as either:		P
	a creepage distance for pollution degree 1 and a clearance as in air (see Annex A, figure A.13); or		P
	as solid insulation, in which case it shall meet the requirements of 7.3.7.8.		N/A
7.3.7.8.4.2	Use of coating materials		N/A
	A coating material used to provide a microenvironment or to provide functional, basic, supplementary and reinforced insulation shall meet the requirement as specified below.		N/A
	Type 1 protection (as defined in IEC 60664-3) improves the microenvironment (Pollution Degree) of the parts under protection. The clearance and creepage distance of Table 13 and Table 14 for pollution degree 1 apply under the protection. Between two conductive parts, it is a requirement that one or both conductive parts, together with all the spacing between them, are covered by the protection.		N/A

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Clause	Requirement – Test	Result – Remark	Verdict
	Type 2 protection is considered to be similar to solid insulation. Under the protection, the requirements for solid insulation specified in 7.3.7.8 are applicable and spacings shall not be less than those specified in Table 1 of IEC 60664-3. The requirements for clearance and creepage in Table 13 and Table 14 do not apply. Between two conductive parts, it is a requirement that both conductive parts, together with the spacing between them, are covered by the protection so that no airgap exists between the protective material, the conductive parts and the printed wiring boards.		N/A
	The coating material used to provide Type 1 and Type 2 protection shall be designed to withstand the stresses anticipated to occur during the expected lifetime of the PCE.		N/A
	Compliance is checked by a type test on representative PWB's, conducted according to IEC 60664-3 Clause 5.		N/A
	For the Cold test (5.7.1), a temperature of –25 °C shall be used, and for the rapid change of temperature test (5.7.3): –25 °C to +125 °C, except that if the temperature rating of the PCE is lower than –25 °C, the low temperature limit for the test is reduced to the rating of the PCE.		N/A
7.3.7.8.5	Wound components		P
	Varnish or enamel insulation of wires shall not be used for basic, supplementary, double or reinforced insulation.	Varnish is not considered as insulation and voltage test performed as routine test. See also Cl.7.3.7.8.1 to Cl.7.3.7.8.2	P
	Wound components shall meet the requirements of 7.3.7.8.1 and 7.3.7.8.2.		N/A
	The component itself shall pass the requirements given in 7.3.7.8.1 and 7.3.7.8.2. If the component has reinforced or double insulation, the voltage test in 7.5.2 shall be performed as a routine test.		P
7.3.7.8.6	Potting materials		N/A
	A potting material may be used to provide solid insulation or to act as a coating to protect against pollution. If used as solid insulation, it shall comply with the requirements of 7.3.7.8.1 and 7.3.7.8.2. If used to protect against pollution, the requirements for Type 1 protection in 7.3.7.8.4.2 apply.		N/A
7.3.7.9	Insulation requirements above 30 kHz		N/A

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Clause	Requirement – Test	Result – Remark	Verdict
	Where voltages across insulation have fundamental frequencies greater than 30 kHz, further considerations apply. Requirements for this are provided in IEC 60664-4, and the more severe of these and the requirements of 7.3.7.1 to 7.3.7.8 shall be applied.		N/A
	Annex G contains flow-charts for the determination of clearance and creepage distances under these circumstances. For convenience, Tables 1 and 2 of IEC 60664-4 are also included in Annex G.		N/A
7.3.8	Residual Current-operated protective (RCD) or monitoring (RCM) device compatibility.	Internal RCM is used according to IEC 62109-2 test.	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.		N/A
7.3.9	Protection against shock hazard due to stored energy		P
7.3.9.1	Operator access area	Accessible communication interface is DVC A	P
	In the case of plugs, connectors, or similar devices that can be disconnected without the use of a tool, the withdrawal of which results in the exposure of conductors (e.g. pins), the discharge time to reduce the voltage to DVC A (see 7.3.2.2) or, for capacitors, to a stored charge level below the limits specified in 7.3.5.3.2, shall not exceed 1 s.		P
7.3.9.2	Service access areas		P
	Capacitors and other energy storage devices located behind panels that are removable for servicing, installation, or disconnection shall present no risk of electric shock or energy hazard from stored charge after disconnection of the PCE.		P
	Capacitors within a PCE shall be discharged to a voltage less than DVC A (see 7.3.2.2), or an energy level below the limits specified in 7.3.5.3.2, within 10 s after the removal of power from the PCE. If this requirement is not achievable for functional or other reasons, the warning symbol 21 of Annex C and an indication of the discharge time shall be placed in a clearly visible position on the enclosure, the capacitor protective barrier, or at a point close to the capacitor(s) concerned (depending on the construction) (see 5.2.2.4).	4.36s@60 V bus after disconnecting DC side. Inside capacitor discharge to DVC A and no energy hazard level within 60 seconds.	P

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Clause	Requirement – Test	Result – Remark	Verdict
	For energy storage devices (such as batteries or ultra capacitors) the intended function of which is to maintain charge even with the PCE off and disconnected from external sources, a barrier or insulation shall be provided so that unintentional contact with hazardous live parts is prevented. The warning symbol 21 of Annex C shall be placed in a clearly visible position on or adjacent to the barrier or insulation, where it will be seen before removal of the barrier or insulation.	Warning symbol 21 of Annex C is marked on PCE	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	Condition b is considered	P
	a) The voltage is 2 V or more, and power available after 60 s exceeds 240 VA.		N/A
	b) The stored energy in a capacitor is at a voltage. U of 2 V or more, and the stored energy. E, calculated from the following equation, exceeds 20J: $E = 0,5\ CU^2$	See below Cl.7.4.3 C=2350.44 µF U=130.5 Vpeak@20 J	P
7.4.2	Operator Access Areas	No energized parts accessible by user	P
	Equipment shall be so designed that there is no risk of energy hazard in operator access areas from accessible circuits.		P
7.4.3	Services Access Areas		P
	Energy storage devices located behind panels that are removable for servicing, installation or disconnection shall present no risk of electric energy hazard from charge stored after disconnection of the PCE.		P
	Energy storage devices within a PCE shall be discharged to an energy level less than 20 J, as in 7.4.1, within 10 s after the removal	Warning symbol 21 of Annex C is marked	P
7.5	Electrical tests related to shock hazard		P
7.5.1	Impulse voltage test (type test)		P
7.5.2	Voltage test (dielectric strength test) (type test)		P
7.5.3	Partial discharge test (type test or sample test)		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.	Measured touch current is max. 0.22 mA. See clause 7.3.6.3.7	P

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Clause	Requirement – Test	Result – Remark	Verdict
	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 cause injury during normal use of the equipment.		P
	Conformity is checked as specified in 8.2 to 8.6.		P
8.2	Moving parts		P
	Moving parts shall not be able to crush, cut or pierce parts of the body of an OPERATOR likely to contact them, nor severely pinch the OPERATOR's skin. Hazardous moving parts of equipment, that is moving parts which have the potential to cause injury, shall be so arranged, enclosed or guarded as to provide adequate protection against the risk of personal injury.	Fan is inside the enclosure.	P
8.2.1	Protection of service persons		P
	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.	The fan stopped operating during servicing.	P
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 mounted	N/A
8.4	Provisions for lifting and carrying		N/A
	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.		N/A
	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.		N/A
8.5	Wall mounting		P

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Clause	Requirement – Test	Result – Remark	Verdict
	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.	It is intended to be mounted on concrete wall	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.		N/A
9	**PROTECTION AGAINST FIRE HAZARDS**		P
9.1	Resistance to fire		P
	This subclause specifies requirements intended to reduce the risk of ignition and the spread of flame, both within the equipment and to the outside, by the appropriate use of materials and components and by suitable construction.	Components are witnessed at normal condition and abnormal tests are verified	P
9.1.1	Reducing the risk of ignition and spread of flame		P
	For equipment or a portion of equipment, there are two alternative methods of providing protection against ignition and spread of flame that could affect materials, wiring, wound components and electronic components such as integrated circuits, transistors, thyristors, diodes, resistors and capacitors.	Method 1 used	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;		P
	– components in SECONDARY CIRCUITS supplied by a LIMITED POWER SOURCE as specified in 9.2, but not mounted on a material of FLAMMABILITY CLASS V-1;		N/A

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Clause	Requirement – Test	Result – Remark	Verdict
	– 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;		P
	– components having unenclosed arcing parts, such as open switch and relay contacts and commutators, in a circuit at HAZARDOUS VOLTAGE or at a HAZARDOUS ENERGY LEVEL; and	Certified relay with fire enclosure	N/A
	– insulated wiring, except as permitte in 9.1.2.2.	PVC wire	N/A
9.1.2.2	Parts not requiring a fire enclosure	Fire enclosure used	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.		P
9.1.3.3	Materials for components and other parts inside fire enclosures	At least V-1 material used inside fire enclosure, PCB rated V-0 and internal wire rated VW-1	P
9.1.3.4	Materials for air filter assemblies		N/A
9.1.4	Openings in fire enclosures		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

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Clause	Requirement – Test	Result – Remark	Verdict
9.1.4.3	Openings in the bottom of a fire enclosure		N/A
	The bottom of a FIRE ENCLOSURE or individual barriers, shall provide protection against emission of flaming or molten material under all internal parts, including partially enclosed components or assemblies, for which Method 2 of 9.1.1 has not been fully applied and complied with.		N/A
9.1.4.4	Equipment for use in a CLOSED ELECTRICAL OPERATING AREA	Not intend use at this area	N/A
	The requirements of 9.1.4.3 do not apply to FIXED EQUIPMENT intended only for use in a CLOSED ELECTRICAL OPERATING AREA and to be mounted on a concrete floor or other 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	No door or cover operated by user.	N/A
9.1.4.6	Additional requirements for openings in transportable equipment		N/A
9.2	LIMITED POWER SOURCES		P
9.2.1	General	LED and LCD circuit are considered limited power source.	P
9.2.2	Limited power source tests		P
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

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Clause	Requirement – Test	Result – Remark	Verdict
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.	External circuit breaker shall be used for AC side.	P
10	**PROTECTION AGAINST SONIC PRESSURE HAZARDS**		N/A
10.1	General		N/A
	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.		N/A
10.2	Sonic pressure and Sound level		N/A
10.2.1	Hazardous Noise Levels		N/A
11	**PROTECTION AGAINST LIQUID HAZARDS**		N/A
11.1	Liquid Containment, Pressure and Leakage	No 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		N/A
12	**CHEMICAL HAZARDS**		N/A
12.1	General		N/A
13	**PHYSICAL REQUIREMENTS**		P

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Clause	Requirement – Test	Result – Remark	Verdict
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 selfhardening 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.		P
13.1.1	Adjustable controls		N/A
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	permanent connection to the supply.	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		P
13.3.2.3	Appliance inlets		N/A
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		P
13.3.3.1	Wiring terminals		P

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Clause	Requirement – Test	Result – Remark	Verdict
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		P
13.3.3.6	Stranded wire		N/A
13.3.4	Supply wiring space		P
13.3.5	Wire bending space for wires 10 mm² and greater		P
13.3.6	Disconnection from supply sources	Installation manual instruct the disconnect device shall be provided before connecting AC mains, PV array and battery.	P
13.3.7	Connectors, plugs and sockets		P
13.3.8	Direct plug-in equipment		N/A
13.4	Internal wiring and connections		P
13.4.1	General		P
13.4.2	Routing	Internal wire is routed to avoid sharp edge and overheat	P
13.4.3	Colour coding	Green-yellow wire used as protective bonding only	P
13.4.4	Splices and connections		P
13.4.5	Interconnections between parts of the PCE	No such interconnections	N/A
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		P
13.6.1.1	Thermal index or capability		P
13.6.2	Polymers serving as enclosures or barriers preventing access to hazards	Polymers serving as barriers preventing access to hazards	P
13.6.2.1	Stress relief test		P
13.6.3	Polymers serving as solid insulation		P
13.6.3.1	Resistance to arcing	Arcing parts are enclosed inside certified relay	N/A
13.6.4	UV resistance		P

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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		P
13.7.4	Drop test		N/A
13.8	Thickness requirements for metal enclosures		P
13.8.1	General		P
13.8.2	Cast metal		N/A
13.8.3	Sheet metal		P
14	**COMPONENTS**		P
14.1	General		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
	1. 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
	2. the requirements of this standard and, where necessary for the application, any additional applicable safety requirements of the relevant IEC component standard;		P
	3. if there is no relevant IEC standard, the requirements of this standard;		P
	4. 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

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Clause	Requirement – Test	Result – Remark	Verdict
	Components such as optocouplers, capacitors, transformers, and relays connected across basic, supplemental, reinforced, or double insulation shall comply with the requirements applicable for the grade of insulation being bridged, and if not previously certified to the applicable component safety standard shall be subjected to the voltage test of 7.5.2 as routine test.		P
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	Overtemperature protection devices		N/A
14.4	Fuse holders		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.	V-0	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.		N/A
14.7	Circuits or components used as transient overvoltage limiting devices		N/A
	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.		N/A
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.	No battery used.	N/A
14.8.1	Battery Enclosure Ventilation		N/A

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Clause	Requirement – Test	Result – Remark	Verdict
14.8.1.1	Ventilation requirements		N/A
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 nonmetallic 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		P

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IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
Annex A	Measurement of clearances and creepage distances (see 7.3.7.4 and 7.3.7.5)		P
Annex B	Programmable Equipment		P
B.1	Software or firmware that perform safety critical functions		P
B.1.1	Firmware or software that performs a critical safety function/s, the failure of which can result in a risk of fire, electric shock or other hazard as specified by this standard, shall be evaluated by one of the following means.		P
	a) All software or firmware limits or controls shall be disabled before the test to evaluate the hardware circuitry during the abnormal test condition related to the safety function.		P
	b) Protective controls employing software or firmware to perform their function(s), shall be so constructed that they comply with IEC 60730-1 Annex H to address the risks identified in B.2.1.		N/A
B.2	Evaluation of controls employing software		P
Annex C	Symbols to be used in equipment markings		P
Annex D	Test Probes for Determining Access		P
Annex E	RCDs		N/A
Annex F	Altitude correction for clearances		N/A
Annex G	Clearance and creepage distance determination for frequencies greater than 30 kHz		N/A
Annex H	Measuring Instrument for Touch Current Measurements		P
H.1	Measuring instrument		P
H.2	Alternative measuring instrument		N/A
Annex I	Examples of Protection, Insulation, and Overvoltage Category Requirements for PCE		P
Annex J	Ultraviolet light conditioning test		N/A

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4.7 1#	TABLE: mains supply electrical data in normal condition					P
Model	PV			Grid		
	U (V) DC	I (A) DC	P (kW) DC	U (V) AC	I (A) AC	P (kW) AC
EAHI-3000-SL	100	14.11	1.41	207	6.34	1.31
	250	11.24	2.81	207	12.89	2.67
	450	6.14	2.76	207	12.86	2.66
	540	5.23	2.76	207	12.86	2.66
	100	14.26	1.46	230	5.96	1.36
	250	12.43	3.11	230	12.89	2.96
	450	6.85	3.08	230	12.93	2.97
	540	5.89	3.11	230	13.07	3.00
	100	14.33	1.44	253	5.35	1.35
	250	13.15	3.26	253	12.33	3.12
	450	7.31	3.24	253	12.46	3.15
	540	6.00	3.13	253	12.00	3.03
Remark: Grid-interactive mode, PV to grid, no load.						

4.7 #2	TABLE: mains supply electrical data in normal condition								P
Model	PV			Grid			Load		
	U (V) DC	I (A) DC	P (kW) DC	U (V) AC	I (A) AC	P (kW) AC	U (V) AC	I (A) AC	P (kW) AC
EAHI-3000-SL	100	14.87	1.52	207	6.85	1.41	230	0.00	0.00
	250	11.23	2.81	207	12.89	2.67	230	0.00	0.00
	450	6.13	2.76	207	12.85	2.66	230	0.00	0.00
	540	5.23	2.76	207	12.86	2.66	230	0.00	0.00
	100	14.86	1.52	230	6.17	1.41	230	0.00	0.00
	250	12.61	3.16	230	13.10	3.02	230	0.00	0.00
	450	12.61	3.16	230	13.10	3.02	230	0.00	0.00
	540	6.01	3.17	230	13.30	3.06	230	0.00	0.00
	100	14.85	1.52	253	5.63	1.42	230	0.00	0.00
	250	12.50	3.12	253	11.82	3.00	230	0.00	0.00
	450	6.88	3.10	253	11.89	3.01	230	0.00	0.00
	540	5.95	3.14	253	12.00	3.04	230	0.00	0.00
Remark: Grid-interactive mode, PV to grid and load.									

4.7 #3	TABLE: mains supply electrical data in normal condition		P
Model	PV	Load	

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	U (V) DC	I (A) DC	P (kW) DC	U (V) AC	I (A) AC	P (kW) AC
EAHI-3000-SL	100	14.40	1.48	230	6.00	1.37
	250	12.77	3.18	230	13.34	3.05
	450	7.00	3.13	230	13.25	3.03
	540	5.98	3.13	230	13.29	3.04
Remark: Stand-alone mode, PV to load.						

4.7 #4	**TABLE: mains supply electrical data in normal condition**					P
Model	PV			Battery		
	U (V) DC	I (A) DC	P (kW) DC	U (V) DC	I (A) DC	P (kW) DC
EAHI-3000-SL	100	14.86	1.50	48	27.19	1.36
	250	14.17	3.54	48	65.66	3.28
	450	7.73	3.48	48	65.52	3.28
	540	6.53	3.53	48	66.09	3.30
Remark: Stand-alone mode, PV to Battery.						

4.7 #5	**TABLE: mains supply electrical data in normal condition**					P
Model	Battery			Load		
	U (V) DC	I (A) DC	P (kW) DC	U (V) AC	I (A) AC	P (kW) AC
EAHI-3000-SL	48	65.29	3.13	230	12.54	2.87
Remark: Stand-alone mode, Battery to load.						

4.7 #6	**TABLE: mains supply electrical data in normal condition**					P
	Battery			Grid		
Model	U (V) DC	I (A) DC	P (kW) DC	U (V) AC	I (A) AC	P (kW) AC
EAHI-3000-SL	48	66.49	3.19	230	12.74	2.93
Remark: Battery to Grid (House load).						

4.7 #7	**TABLE: mains supply electrical data in normal condition**								P
Model	PV			Load			Battery		
	U (V) DC	I (A) DC	P (kW) DC	U (V) AC	I (A) AC	P (kW) AC	U (V) DC	I (A) DC	P (kW) DC
EAHI-3000-SL	100	14.56	1.48	230	6.01	1.38	48	0.08	0.00
	250	15.17	3.80	230	13.12	3.00	48	13.40	0.64
	310	14.91	4.63	229	13.14	3.01	48	28.55	1.36
	450	10.22	4.54	230	13.15	3.01	48	29.22	1.39
	540	8.56	4.47	230	13.26	3.03	48	27.18	1.30

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Remark: PV to load and battery.

4.7 #8	TABLE: mains supply electrical data in normal condition								P
Model	PV			Grid			Battery		
	U (V) DC	I (A) DC	P (kW) DC	U (V) AC	I (A) AC	P (kW) AC	U (V) DC	I (A) DC	P (kW) DC
EAHI-3000-SL	100	15.04	1.47	207	6.63	1.37	48	0	0
	250	14.92	3.72	207	13.09	2.71	48	16.56	0.80
	310	14.79	4.59	207	12.85	2.66	48	35.26	1.69
	450	10.36	4.66	207	13.08	2.71	48	36.54	1.76
	540	8.85	4.68	207	12.85	2.66	48	37.67	1.81
	100	14.91	1.49	230	5.88	1.35	48	0	0
	250	14.89	3.71	230	12.88	2.96	48	11.47	0.55
	310	14.90	4.63	230	13.09	3.00	48	29.00	1.38
	450	10.38	4.66	230	12.92	2.97	48	31.32	1.50
	540	8.84	4.67	230	13.07	3.00	48	30.58	1.47
	100	15.04	1.49	253	5.51	1.39	48	0	0
	250	14.83	3.70	253	11.88	3.00	48	10.53	0.51
	310	14.90	4.63	253	11.80	2.98	48	29.56	1.41
	450	10.34	4.65	253	11.92	3.01	48	30.32	1.46
	540	8.80	4.65	253	11.81	2.98	48	30.68	1.47
Remark: PV to grid and battery.									

4.7 #9	TABLE: mains supply electrical data in normal condition					P
Model	Grid			Load		
	U (V) AC	I (A) AC	P (kW) AC	U (V) AC	I (A) AC	P (kW) AC
EAHI-3000-SL	230	13.24	3.03	230	13.24	3.01
Remark: Grid to load.						

4.7 #10	TABLE: mains supply electrical data in normal condition								P
Model	PV			Battery			Load		
	U (V) DC	I (A) DC	P (kW) DC	U (V) DC	I (A) DC	P (kW) DC	U (V) AC	I (A) AC	P (kW) AC
EAHI-3000-SL	100	14.90	1.54	48	35.25	1.69	230	13.20	3.02
	250	12.61	3.14	48	0.42	0.02	230	13.16	3.00
	450	6.92	3.09	48	0.40	0.02	230	13.08	2.99
	540	5.86	3.09	48	0.35	0.02	230	13.07	2.98

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Remark: PV and battery to load.

4.7 1#	TABLE: mains supply electrical data in normal condition						P
Model	PV			Grid			
	U (V) DC	I (A) DC	P (kW) DC	U (V) AC	I (A) AC	P (kW) AC	
EAHI-3600-SL	100	14.69	1.51	207	6.77	1.40	
	250	13.68	3.42	207	15.68	3.25	
	450	7.49	3.36	207	15.63	3.24	
	540	6.31	3.33	207	15.47	3.20	
	100	14.69	1.48	230	5.99	1.37	
	250	14.81	3.68	230	15.22	3.50	
	450	8.30	3.68	230	15.42	3.55	
	540	7.28	3.79	230	15.90	3.66	
	100	14.52	1.49	253	5.52	1..39	
	250	14.92	3.69	253	13.98	3.54	
	450	8.34	3.69	253	14.18	3.59	
	540	7.21	3.76	253	14.40	3.63	
Remark: Grid-interactive mode, PV to grid, no load.							

4.7 #2	TABLE: mains supply electrical data in normal condition								P
Model	PV			Grid			Load		
	U (V) DC	I (A) DC	P (kW) DC	U (V) AC	I (A) AC	P (kW) AC	U (V) AC	I (A) AC	P (kW) AC
EAHI-3600-SL	102	14.82	1.52	207	6.83	1.41	207	0.00	0.00
	250	13.68	3.42	207	15.68	3.25	207	0.00	0.00
	450	7.50	3.37	207	15.65	3.24	207	0.00	0.00
	540	6.31	3.33	207	15.47	3.20	207	0.00	0.00
	102	14.81	1.51	230	6.17	1.41	230	0.00	0.00
	247	15.06	3.71	231	15.43	3.55	231	0.00	0.00
	449	8.39	3.76	231	15.79	3.64	231	0.00	0.00
	529	7.24	3.82	230	16.00	3.68	231	0.00	0.00
	102	14.92	1.52	253	5.64	1.42	253	0.00	0.00
	246	14.99	3.70	253	14.00	3.55	254	0.00	0.00
	451	8.27	3.72	253	14.28	3.61	254	0.00	0.00
	529	7.18	3.79	253	14.50	3.66	254	0.00	0.00
Remark: Grid-interactive mode, PV to grid and load.									

4.7 #3	TABLE: mains supply electrical data in normal condition	P

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Model	PV			Load		
	U (V) DC	I (A) DC	P (kW) DC	U (V) AC	I (A) AC	P (kW) AC
EAHI-3600-SL	100	14.42	1.48	230	6.01	1.38
	250	14.84	3.70	230	15.47	3.53
	450	8.23	3.67	230	15.56	3.55
	540	7.02	3.68	230	15.60	3.56
Remark: Stand-alone mode, PV to load.						

4.7 #4	**TABLE: mains supply electrical data in normal condition**					P
Model	PV			Battery		
	U (V) DC	I (A) DC	P (kW) DC	U (V) DC	I (A) DC	P (kW) DC
EAHI-3600-SL	100	14.87	1.49	48	26.98	1.35
	250	15.10	3.78	48	70.04	3.50
	450	8.43	3.78	48	70.99	3.55
	540	6.95	3.74	48	70.02	3.50
Remark: Stand-alone mode, PV to Battery.						

4.7 #5	**TABLE: mains supply electrical data in normal condition**					P
Model	Battery			Load		
	U (V) DC	I (A) DC	P (kW) DC	U (V) AC	I (A) AC	P (kW) AC
EAHI-3600-SL	48	75.44	3.59	230	14.66	3.35
Remark: Stand-alone mode, Battery to load.						

4.7 #6	**TABLE: mains supply electrical data in normal condition**					P
	Battery			Grid		
Model	U (V) DC	I (A) DC	P (kW) DC	U (V) AC	I (A) AC	P (kW) AC
EAHI-3600-SL	48	75.34	3.61	230	14.36	3.30
Remark: Battery to Grid (House load).						

4.7 #7	**TABLE: mains supply electrical data in normal condition**								P
Model	PV			Load			Battery		
	U (V) DC	I (A) DC	P (kW) DC	U (V) AC	I (A) AC	P (kW) AC	U (V) DC	I (A) DC	P (kW) DC
EAHI-3600-SL	100	14.09	1.43	230	5.77	1.32	48	0.25	0.01
	250	14.87	3.67	230	15.40	3.52	48	0.09	0.00
	310	14.89	4.62	229	15.70	3.59	48	16.22	0.78
	450	10.33	4.58	230	15.38	3.51	48	19.46	0.93
	540	8.55	4.46	230	15.34	3.50	48	17.10	0.82

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Remark: PV to load and battery.

4.7 #8	TABLE: mains supply electrical data in normal condition								P
Model	PV			Grid			Battery		
	U (V) DC	I (A) DC	P (kW) DC	U (V) AC	I (A) AC	P (kW) AC	U (V) DC	I (A) DC	P (kW) DC
EAHI-3600-SL	100	14.37	1.48	207	6.62	1.37	48	0	0
	250	14.88	3.71	207	15.65	3.24	48	5.27	0.25
	310	14.84	4.60	207	15.65	3.24	48	23.49	1.13
	450	10.37	4.66	207	15.64	3.24	48	25.47	1.22
	540	8.80	4.64	207	15.47	3.20	48	25.68	1.23
	100	15.04	1.49	230	6.03	1.38	48	0	0
	250	15.09	3.69	230	15.30	3.52	48	0	0
	310	14.89	4.62	230	15.70	3.61	48	15.92	0.76
	450	10.36	4.65	230	15.53	3.57	48	18.54	0.89
	540	8.82	4.65	230	15.68	3.61	48	17.73	0.85
	100	14.92	1.51	253	5.31	1.42	48	0	0
	250	15.12	3.68	253	13.95	3.53	48	0	0
	310	14.90	4.62	253	14.20	3.59	48	16.88	0.81
	450	10.39	4.66	253	14.04	3.55	48	19.45	0.93
	540	8.81	4.64	253	14.19	3.59	48	18.17	0.87
Remark: PV to grid and battery.									

4.7 #9	TABLE: mains supply electrical data in normal condition					P
Model	Grid			Load		
	U (V) AC	I (A) AC	P (kW) AC	U (V) AC	I (A) AC	P (kW) AC
EAHI-3600-SL	230	15.90	3.64	230	15.90	3.62
Remark: Grid to load.						

4.7 #10	TABLE: mains supply electrical data in normal condition								P
Model	PV			Battery			Load		
	U (V) DC	I (A) DC	P (kW) DC	U (V) DC	I (A) DC	P (kW) DC	U (V) AC	I (A) AC	P (kW) AC
EAHI-3600-SL	100	14.86	1.54	48	51.53	2.47	230	16.34	3.73
	250	14.82	3.68	48	0.13	0.01	230	15.22	3.50
	450	8.30	3.68	48	0.19	0.01	230	15.44	3.55
	540	7.28	3.79	48	0.04	0.00	230	15.90	3.66

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Remark: PV and battery to load.

4.7 1#	TABLE: mains supply electrical data in normal condition						P
Model	PV			Grid			
	U (V) DC	I (A) DC	P (kW) DC	U (V) AC	I (A) AC	P (kW) AC	
EAHI-5000-SL	100	29.17	2.93	207	13.01	2.70	
	250	19.10	4.76	207	21.80	4.52	
	450	10.49	4.70	207	21.79	4.52	
	540	8.88	4.68	207	21.70	4.49	
	100	29.22	2.94	230	11.80	2.71	
	250	21.49	5.33	230	21.96	5.06	
	450	11.70	5.17	230	21.65	4.99	
	540	10.30	5.33	230	22.30	5.14	
	100	29.24	2.94	253	10.71	2.71	
	250	20.84	5.20	253	19.60	4.97	
	450	11.50	5.15	253	19.70	4.98	
	540	9.90	5.21	253	19.90	5.04	
Remark: Grid-interactive mode, PV to grid, no load.							

4.7 #2	TABLE: mains supply electrical data in normal condition								P
Model	PV			Grid			Load		
	U (V) DC	I (A) DC	P (kW) DC	U (V) AC	I (A) AC	P (kW) AC	U (V) AC	I (A) AC	P (kW) AC
EAHI-5000-SL	100	29.96	3.05	207	13.60	2.82	230	0.00	0.00
	250	19.10	4.77	207	21.80	4.52	230	0.00	0.00
	450	10.50	4.70	207	21.80	4.52	230	0.00	0.00
	540	8.88	4.67	207	21.62	4.49	230	0.00	0.00
	100	29.95	3.06	230	12.30	2.83	230	0.00	0.00
	250	21.40	5.35	230	22.10	5.09	230	0.00	0.00
	450	11.80	5.26	230	22.05	5.09	230	0.00	0.00
	540	10.20	5.36	230	22.40	5.15	230	0.00	0.00
	100	29.98	3.04	253	11.20	2.83	230	0.00	0.00
	250	21.20	5.29	253	19.98	5.06	230	0.00	0.00
	450	11.69	5.22	253	19.97	5.06	230	0.00	0.00
	540	10.10	5.31	253	20.29	5.12	230	0.00	0.00
Remark: Grid-interactive mode, PV to grid and load.									

4.7 #3	TABLE: mains supply electrical data in normal condition	P

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Model	PV			Load		
	U (V) DC	I (A) DC	P (kW) DC	U (V) AC	I (A) AC	P (kW) AC
EAHI-5000-SL	100	29.93	3.06	230	12.21	2.79
	250	21.65	5.41	230	21.80	4.97
	450	11.72	5.23	230	22.12	5.05
	540	9.98	5.22	230	22.08	5.03
Remark: Stand-alone mode, PV to load.						

4.7 #4	**TABLE: mains supply electrical data in normal condition**					P
Model	PV			Battery		
	U (V) DC	I (A) DC	P (kW) DC	U (V) DC	I (A) DC	P (kW) DC
EAHI-5000-SL	100	22.92	3.08	48	57.96	2.78
	250	20.70	5.16	48	99.54	4.76
	450	11.33	5.10	48	99.67	4.76
	540	9.77	5.12	48	99.95	4.77
Remark: Stand-alone mode, PV to Battery.						

4.7 #5	**TABLE: mains supply electrical data in normal condition**					P
Model	Battery			Load		
	U (V) DC	I (A) DC	P (kW) DC	U (V) AC	I (A) AC	P (kW) AC
EAHI-5000-SL	48	101.5	4.84	230	19.46	4.44
Remark: Stand-alone mode, Battery to load.						

4.7 #6	**TABLE: mains supply electrical data in normal condition**					P
	Battery			Grid		
Model	U (V) DC	I (A) DC	P (kW) DC	U (V) AC	I (A) AC	P (kW) AC
EAHI-5000-SL	48	97.99	4.68	230	18.69	4.30
Remark: Battery to Grid (House load).						

4.7 #7	**TABLE: mains supply electrical data in normal condition**								P
Model	PV			Load			Battery		
	U (V) DC	I (A) DC	P (kW) DC	U (V) AC	I (A) AC	P (kW) AC	U (V) DC	I (A) DC	P (kW) DC
EAHI-5000-SL	100	29.93	3.06	230	12.21	2.79	48	0.49	0.02
	250	24.52	6.56	230	21.60	4.92	48	29.46	1.30
	450	14.88	6.59	230	21.60	4.93	48	29.73	1.41
	540	12.16	6.32	230	21.78	4.96	48	23.52	1.12

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Remark: PV to load and battery.

4.7 #8	TABLE: mains supply electrical data in normal condition								P
Model	PV			Grid			Battery		
	U (V) DC	I (A) DC	P (kW) DC	U (V) AC	I (A) AC	P (kW) AC	U (V) DC	I (A) DC	P (kW) DC
EAHI-5000-SL	100	29.10	2.93	207	13.10	2.68	48	0	0
	250	25.96	6.47	207	21.80	4.52	48	32.89	1.58
	450	14.39	6.46	207	21.76	4.51	48	35.01	1.68
	540	12.30	6.47	207	21.70	4.49	48	35.36	1.70
	100	29.20	2.94	230	11.80	2.71	48	0	0
	250	26.00	6.49	230	21.40	4.94	48	24.91	1.20
	450	14.54	6.51	230	21.72	5.01	48	25.98	1.25
	540	12.20	6.44	230	21.70	5.00	48	24.44	1.18
	100	29.10	2.94	253	10.70	2.71	48	0	0
	250	26.00	6.49	253	19.40	4.91	48	25.87	1.24
	450	14.60	6.50	253	19.41	4.92	48	27.95	1.34
	540	12.30	6.49	253	19.64	4.98	48	26.39	1.27
Remark: PV to grid and battery.									

4.7 #9	TABLE: mains supply electrical data in normal condition					P
Model	Grid			Load		
	U (V) AC	I (A) AC	P (kW) AC	U (V) AC	I (A) AC	P (kW) AC
EAHI-5000-SL	230	21.53	4.91	230	21.53	4.88
Remark: Grid to load.						

4.7 #10	TABLE: mains supply electrical data in normal condition								P
Model	PV			Battery			Load		
	U (V) DC	I (A) DC	P (kW) DC	U (V) DC	I (A) DC	P (kW) DC	U (V) AC	I (A) AC	P (kW) AC
EAHI-5000-SL	100	29.94	3.05	48	49.82	2.39	230	22.06	5.03
	250	21.03	5.24	48	0.41	0.02	230	21.91	4.99
	450	11.63	5.16	48	0.41	0.02	230	21.87	4.98
	540	9.98	5.22	48	0.13	0.01	230	22.08	5.03
Remark: PV and battery to load.									

4.7 1#	TABLE: mains supply electrical data in normal condition	P

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Model	PV			Grid		
	U (V) DC	I (A) DC	P (kW) DC	U (V) AC	I (A) AC	P (kW) AC
EAHI-6000-SL	100	29.17	2.93	207	13.01	2.70
	250	22.91	5.74	207	26.10	5.42
	450	12.70	5.67	207	26.20	5.44
	540	10.78	5.74	207	26.37	5.50
	100	29.22	2.94	230	11.80	2.71
	250	25.20	6.30	230	25.90	5.98
	450	13.93	6.23	230	25.99	5.99
	540	11.83	6.30	230	26.15	6.06
	100	29.24	2.94	253	10.71	2.71
	250	24.91	6.24	253	23.46	5.94
	450	13.80	6.17	253	23.49	5.96
	540	11.71	6.24	253	23.63	6.02
Remark: Grid-interactive mode, PV to grid, no load.						

4.7 #2	**TABLE: mains supply electrical data in normal condition**								P
Model	PV			Grid			Load		
	U (V) DC	I (A) DC	P (kW) DC	U (V) AC	I (A) AC	P (kW) AC	U (V) AC	I (A) AC	P (kW) AC
EAHI-6000-SL	100	29.26	2.94	207	13.03	2.70	230	0.00	0.01
	250	22.91	5.74	207	26.10	5.42	230	0.00	0.00
	450	12.70	5.67	207	26.20	5.43	230	0.00	0.00
	540	10.79	5.74	207	26.32	5.49	230	0.00	0.03
	100	29.26	2.94	230	11.79	2.71	230	0.00	0.01
	250	25.10	6.29	230	25.88	5.96	230	0.00	0.00
	450	13.90	6.21	230	25.91	5.98	230	0.00	0.00
	540	11.89	6.30	230	26.30	6.06	230	0.00	0.03
	100	29.33	2.94	253	10.76	2.72	230	0.00	0.01
	250	24.90	6.23	253	23.40	5.93	230	0.00	0.00
	450	13.79	6.16	253	23.49	5.95	230	0.00	0.00
	540	11.76	6.24	253	23.79	6.03	230	0.00	0.03
Remark: Grid-interactive mode, PV to grid and load.									

4.7 #3	**TABLE: mains supply electrical data in normal condition**					P
Model	PV			Load		
	U (V) DC	I (A) DC	P (kW) DC	U (V) AC	I (A) AC	P (kW) AC
EAHI-6000-SL	100	29.31	2.94	230	11.80	2.71

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	250	25.10	6.29	230	25.87	5.96
	450	13.91	6.22	230	25.92	5.98
	540	11.87	6.30	230	26.18	6.06
Remark: Stand-alone mode, PV to load.						

4.7 #4	**TABLE: mains supply electrical data in normal condition**					P
Model	PV			Battery		
	U (V) DC	I (A) DC	P (kW) DC	U (V) DC	I (A) DC	P (kW) DC
EAHI-6000-SL	100	29.00	2.93	48	54.42	2.64
	250	22.01	5.52	48	102.00	5.09
	450	12.10	5.45	48	102.58	5.10
	540	10.30	5.53	48	104.00	5.18
Remark: Stand-alone mode, PV to Battery.						

4.7 #5	**TABLE: mains supply electrical data in normal condition**					P
Model	Battery			Load		
	U (V) DC	I (A) DC	P (kW) DC	U (V) AC	I (A) AC	P (kW) AC
EAHI-6000-SL	48	118.20	6.06	230	23.80	5.49
Remark: Stand-alone mode, Battery to load.						

4.7 #6	**TABLE: mains supply electrical data in normal condition**					P
	Battery			Grid		
Model	U (V) DC	I (A) DC	P (kW) DC	U (V) AC	I (A) AC	P (kW) AC
EAHI-6000-SL	48	118.00	6.05	230	23.72	5.47
Remark: Battery to Grid (House load).						

4.7 #7	**TABLE: mains supply electrical data in normal condition**								P
Model	PV			Load			Battery		
	U (V) DC	I (A) DC	P (kW) DC	U (V) AC	I (A) AC	P (kW) AC	U (V) DC	I (A) DC	P (kW) DC
EAHI-6000-SL	100	29.07	2.93	230	11.71	2.69	48	0.63	0.03
	250	29.25	7.33	230	25.83	5.96	48	21.63	0.95
	450	17.90	8.03	230	25.85	5.99	48	36.22	1.70
	540	15.40	8.15	230	26.23	6.06	48	37.29	1.76
Remark: PV to load and battery.									

4.7 #8	**TABLE: mains supply electrical data in normal condition**	P

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Model	PV			Grid			Battery		
	U (V) DC	I (A) DC	P (kW) DC	U (V) AC	I (A) AC	P (kW) AC	U (V) DC	I (A) DC	P (kW) DC
EAHI-6000-SL	100	29.20	2.94	207	13.10	2.69	48	0	0
	250	29.08	7.26	207	26.00	5.40	48	29.77	1.43
	450	17.48	7.76	207	26.09	5.42	48	41.73	2.01
	540	14.80	7.79	207	26.40	5.48	48	40.91	1.97
	100	29.30	2.95	230	11.80	2.71	48	0	0
	250	29.14	7.26	230	25.78	5.95	48	18.91	0.91
	450	17.50	7.77	230	25.89	5.97	48	30.93	1.49
	540	14.80	7.77	230	26.20	6.04	48	29.19	1.40
	100	29.20	2.94	253	10.70	2.71	48	0	0
	250	29.00	7.23	253	23.40	5.93	48	19.05	0.92
	450	17.50	7.76	253	23.41	5.94	48	31.89	1.53
	540	14.77	7.75	253	23.70	6.01	48	30.16	1.45
Remark: PV to grid and battery.									

4.7 #9	TABLE: mains supply electrical data in normal condition					P
Model	Grid			Load		
	U (V) AC	I (A) AC	P (kW) AC	U (V) AC	I (A) AC	P (kW) AC
EAHI-6000-SL	230	25.97	5.93	230	25.91	5.85
Remark: Grid to load.						

4.7 #10	TABLE: mains supply electrical data in normal condition								P
Model	PV			Battery			Load		
	U (V) DC	I (A) DC	P (kW) DC	U (V) DC	I (A) DC	P (kW) DC	U (V) AC	I (A) AC	P (kW) AC
EAHI-6000-SL	100	29.87	3.03	48	73.83	3.54	230	26.50	6.03
	250	24.88	6.21	48	0.21	0.01	230	25.86	5.89
	450	14.14	6.29	48	0.25	0.01	230	26.59	6.05
	540	11.96	6.24	48	0.03	0.00	230	26.36	6.00
Remark: PV and battery to load.									

4.3	Thermal testing (by thermocouples)	P
Model: EAHI-6000-SL	(1) 45°C, PV input rating is 250Vd.c. and 7.8kW, the combined output is 6kW to grid (output voltage is 230Va.c.) and 1.8kW to battery	
	(2) 45°C, PV input rating is 250Vd.c. and 7.8kW, the combined output is 6kW to grid (output voltage is 253Va.c.) and 1.8kW to battery	
	(3) 45°C, PV input rating is 450Vd.c. and 7.8kW, the combined output is 6kW to grid (output voltage is 230Va.c.) and 1.8kW to battery	

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	(4) 45°C, PV input rating is 450Vd.c. and 7.8kW, the combined output is 6kW to grid (output voltage is 253Va.c.) and 1.8kW to battery
	(5) 45°C, PV input rating is 250Vd.c., the combined output is 5kW to battery and 2.8kW to load.
	(6) 45°C, PV input rating is 450Vd.c., the combined output is 6kW to load and 1.8kW to battery.
	(7) 45°C, Max. Battery discharging power 6kW, Max AC load output power 6kW.

No.	Ambient (°C)	Humidity (RH)	Test time	Input			Ouput					
				Vdc	Adc	kW	Vac	Aac	kW	Vdc	Adc	kW
(1)	45	--	3h49 min	249.13	29.40	7.32	231.20	25.62	5.92	48.03	20.97	1.01
(2)	45	--	3h31 min	250.19	29.43	7.36	253.82	23.25	5.90	48.03	22.72	1.09
(3)	45	--	3h42 min	448.84	17.33	7.75	231.00	26.08	5.93	48.00	31.36	1.48
(4)	45	--	3h28 min	449.36	17.28	7.72	253.77	23.35	5.92	48.04	31.36	1.51
(5)	45	--	3h07 min	249.19	29.22	7.26	230.22	9.02	2.06	48.04	99.71	4.79
(6)	45	--	3h34 min	449.30	17.14	7.66	227.49	24.48	5.57	48.02	36.92	1.77
(7)	45	--	3h21 min	48.02	118.76	5.70	227.71	22.28	5.07	--	--	--

No.	Temperature (°C) of part at:	Measured temperature (°C)							Limits (°C)
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	
1.	Ambient temperature	45.6	45.1	45.2	45.1	45.2	44.5	45.9	--
2.	Front of enclosure	48.1	47.4	47.1	46.6	49.6	46.4	49.6	70
3.	Button surface	47.2	47.2	48.3	47.7	50.6	45.8	51.1	85
4.	Left of enclosure	45.3	44.7	44.9	44.6	46.7	44.3	46.3	70
5.	Right of enclosure	46.3	45.8	46.4	45.7	52.0	45.6	53.4	70
6.	BuckBoost inductor enclosure - rear of enclosure	49.2	49.4	49.2	48.3	51.7	47.8	54.3	100
7.	Boost inductor enclosure - rear of enclosure	45.2	45.1	45.0	45.2	47.3	44.4	45.6	100
8.	Inverter inductor enclosure - rear of enclosure	46.3	46.2	45.9	45.8	46.6	45.2	47.4	100
9.	Mounting surface	57.1	54.6	51.2	50.7	60.6	51.1	52.6	90
10.	Heat sink	49.9	49.0	48.5	47.9	50.9	87.9	49.6	100
11.	Top of enclosure	55.0	52.5	54.2	52.2	61.2	52.3	61.8	70
12.	Bottom of enclosure	51.4	50.7	50.9	50.0	55.8	49.8	58.8	70
13.	Cover of terminal	54.0	53.8	53.0	52.2	56.3	51.5	59.1	70
14.	PV terminal surface	52.4	51.9	49.4	48.7	56.0	48.8	54.1	85

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15.	Grid terminal surface	54.6	53.3	48.1	47.5	59.7	51.0	58.6	105
16.	Load terminal surface	54.4	53.2	51.1	50.0	53.1	55.1	58.5	105
17.	Battery terminal	51.1	51.4	50.3	49.1	56.0	49.9	62.1	120
18.	DC switch (outside)	50.6	49.8	48.6	47.9	51.6	48.2	54.1	70
19.	DC switch (inside)	61.4	58.8	54.5	53.5	61.0	56.6	65.4	70
	Battery board								
20.	BAT+ cable	57.6	56.7	59.3	55.4	69.3	59.5	88.4	105
21.	C59	59.9	59.1	62.3	58.2	67.3	61.8	85.9	105
22.	U5	69.2	66.9	63.4	61.6	67.3	65.2	80.7	125
23.	U4	81.6	79.8	78.7	76.5	74.3	77.5	91.4	125
24.	U6	66.0	63.9	60.4	58.7	63.5	62.2	77.6	105
25.	Q3	57.2	56.9	57.7	54.9	67.3	55.4	80.2	130
26.	TX1 coil	69.9	68.3	67.1	65.5	65.4	66.0	78.7	110
27.	TX1 core	69.8	68.0	67.4	65.4	64.7	66.0	77.7	110
28.	P4 wire (battery boost transformer outgoing wire)	60.9	60.5	63.5	59.5	64.5	61.4	79.8	105
29.	PCB near by P2	62.9	62.8	66.5	62.0	65.8	63.7	80.8	130
	Battery boost trans-former								
30.	Battery boost trans-former 1 coil	76.8	73.7	66.0	64.9	66.4	63.8	54.0	130
31.	Battery boost trans-former 1 core	69.6	69.9	77.2	71.7	99.9	74.6	124.6	130
32.	Battery boost trans-former 2 coil	62.3	62.3	64.0	60.8	82.3	61.4	92.8	130
33.	Battery boost trans-former 2 core	72.2	72.0	78.5	72.9	96.8	75.3	122.1	130
	Buck-Boost board								
34.	P5 wire (battery boost transformer outgoing wire)	56.1	56.3	59.0	56.9	67.4	56.5	73.6	105
35.	C4	55.7	56.2	59.3	56.9	69.7	56.3	76.7	105
36.	C66	53.8	54.2	55.2	54.0	63.6	52.8	62.0	105
37.	C42	54.2	54.4	55.2	54.0	66.0	52.8	64.2	105
38.	Q21	68.5	67.9	67.3	65.7	69.1	65.1	74.8	130
39.	HCT1	56.5	56.4	57.6	56.1	60.5	55.4	70.0	105
40.	TX1 coil	66.0	65.7	66.7	65.2	66.4	64.1	74.9	110
41.	TX1 core	65.1	64.9	65.8	64.4	68.2	63.2	73.2	110
42.	TX3 coil	68.3	69.1	68.6	67.1	72.4	66.5	77.2	110
43.	TX3 core	65.9	66.2	65.4	64.2	69.9	63.7	74.7	110

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44.	TX4 coil	68.3	69.0	68.8	67.1	68.7	66.0	74.6	110
45.	TX4 core	66.5	67.5	67.5	65.9	67.5	64.7	73.1	110
46.	U10	69.6	69.2	70.3	68.2	72.4	67.4	75.6	100
47.	IGBT Q6	63.3	63.1	65.7	61.8	79.4	62.5	72.5	130
48.	BuckBoost inductor wire+	59.7	59.7	59.4	57.6	66.7	58.2	71.5	105
49.	PCB near by P15	60.0	60.4	61.8	59.4	71.5	59.6	77.8	130
50.	BuckBoost inductor coil	61.7	62.1	56.2	55.5	64.9	54.3	71.2	110
	PV-INV board								
51.	Bus capacitor C69	67.5	66.7	62.3	60.8	64.6	59.6	67.9	105
52.	Y capacitor C88	65.9	64.2	61.7	59.9	67.3	59.1	70.0	125
53.	L3 core	76.0	74.4	74.2	73.2	60.6	70.4	73.5	105
54.	L3 coil	76.9	75.1	75.2	74.5	72.0	71.5	74.7	105
55.	Inverter inductor coil	58.1	60.7	52.4	52.5	61.9	51.4	66.1	110
56.	Inverter inductor coil	48.3	44.5	53.6	51.8	70.9	52.1	84.9	110
57.	Boost inductor coil	62.2	62.2	61.9	59.2	72.7	59.5	83.4	110
58.	Boost inductor coil	51.2	47.5	55.9	54.1	57.4	61.7	93.4	110
59.	Q6	75.2	73.6	71.7	69.4	64.1	67.9	71.5	130
60.	TX2 coil	80.2	80.0	79.5	79.0	74.4	75.9	77.9	110
61.	TX2 core	75.5	74.8	73.9	73.3	70.3	70.9	72.4	110
62.	D4	71.1	70.3	70.0	69.6	64.4	67.7	72.4	130
63.	TX1 coil	77.4	76.7	76.4	75.8	72.3	72.0	75.9	110
64.	TX1 core	69.2	68.3	68.3	68.0	70.3	65.7	69.9	110
65.	U5	70.1	90.3	88.7	96.0	94.2	97.5	79.8	130
66.	HCT4	68.8	66.2	66.8	64.3	57.9	63.0	65.0	105
67.	HCT1	73.8	69.5	69.9	66.2	59.6	65.6	65.7	105
68.	U11	76.1	73.1	72.3	70.2	61.7	69.1	71.4	100
69.	U14	73.5	71.3	70.8	69.8	64.4	67.4	71.3	110
70.	TX5 coil	69.9	67.9	66.8	65.5	62.2	64.0	69.2	110
71.	TX5 core	72.3	69.2	67.8	66.3	65.4	65.1	69.6	110
72.	Q19	88.9	98.2	78.8	87.0	94.7	84.8	87.9	130
73.	Q10	82.5	80.8	64.0	61.4	76.1	61.5	66.3	130
74.	HCT3	74.3	71.7	63.4	61.7	62.5	64.1	72.8	105
75.	L2 coil	66.7	65.7	56.4	55.0	64.5	70.1	77.7	110
76.	L2 core	54.8	53.9	51.6	50.4	60.3	52.0	64.3	110
77.	L4 coil	96.0	87.7	94.0	85.1	58.3	55.1	61.0	110
78.	L4 core	92.9	84.6	90.4	81.8	57.2	55.5	60.4	110
79.	L7 coil	59.8	57.7	53.6	52.3	65.4	104.9	91.7	130

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80.	L7 core	59.9	57.6	53.9	52.6	63.9	110.1	97.1	130
81.	L8 coil	102.8	90.2	94.7	85.0	56.2	50.1	57.9	130
82.	L8 core	43.7	43.2	43.3	43.3	46.2	43.0	44.2	130
83.	X capacitor C255	56.3	64.1	51.7	50.6	49.1	49.9	54.5	110
84.	P8 wire (boost inductor)	76.1	74.6	65.4	62.9	66.0	63.6	69.2	105
85.	P12 wire (INV inductor)	82.0	79.0	74.2	70.2	64.6	71.9	74.4	105
86.	P24 wire (INV inductor)	74.1	71.1	72.0	68.4	62.1	67.5	68.8	105
87.	P5 wire (grid L)	49.6	53.1	48.0	47.5	59.1	47.5	53.4	105
88.	P7 wire (load L)	77.6	65.1	65.6	62.2	56.2	50.2	57.9	105
	Communication board								
89.	U43	68.3	66.9	65.4	64.1	65.1	64.6	74.5	110
90.	U2	65.0	65.2	63.6	62.1	61.4	62.9	73.3	100
91.	U7	71.5	70.7	67.5	65.9	66.6	68.7	75.5	125
92.	U3	66.3	65.1	61.1	59.9	66.0	63.7	73.4	130
93.	U5	67.2	64.3	60.8	59.3	61.6	64.6	72.7	105
	Relay board								
94.	K5 ambient temperature	67.4	65.3	66.5	63.9	64.1	58.5	71.3	85
95.	K6 ambient temperature	69.8	65.3	66.5	62.0	62.2	60.6	69.6	85
96.	Grid L wire surface	73.4	68.8	68.3	63.9	63.1	56.1	69.6	105
97.	Load L wire surface	70.9	66.3	63.5	60.5	63.7	69.8	71.8	105
98.	PCB surface between Grid terminals	69.6	64.3	61.1	58.3	62.8	54.2	69.0	130
	Control board								
99.	U7	69.0	68.0	65.2	63.8	63.2	64.5	72.9	85
100.	U19	78.1	77.8	75.9	74.6	67.0	74.0	79.9	105
Supplementary information:									

4.3	**Thermal testing (by thermocouples)**	P
Model: EAHI-6000-SL	(8) 60°C, PV input rating is 250Vd.c., output to grid (voltage 230Va.c.) and battery, automatic derating.	
	(9) 60°C, PV input rating is 450Vd.c., output to grid (voltage 253Va.c.) and battery, automatic derating.	
	(10) 60°C, PV input rating is 250Vd.c., output to battery, automatic derating.	
	(11) 60°C, Battery discharging to AC load, automatic derating.	

No.	Ambient (°C)	Humidity (RH)	Test time	Input			Ouput					
				Vdc	Adc	kW	Vac	Aac	kW	Vdc	Adc	kW
(8)	60	--	3h23 min	249.00	26.20	6.52	230.00	17.10	3.90	48.10	45.60	2.19

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(9)	60	--	3h9 min	442.11	17.40	7.69	253.48	19.90	5.04	48.05	48.42	2.33
(10)	60	--	3h43 min	248.65	16.69	4.15	--	--	--	48.04	79.27	3.81
(11)	60	--	3h43 min	48.00	96.08	4.61	231.00	18.08	4.16	--	--	--

No.	Temperature (°C) of part at:	Measured temperature (°C)						Limits (°C)
		(8)	(9)	(10)	(11)	--	--	
1.	Ambient temperature	60.6	60.9	59.6	60.4	--	--	--
2.	Front of enclosure	62.1	62.5	59.9	61.4	--	--	70
3.	Button surface	59.9	60.1	60.8	62.1	--	--	85
4.	Left of enclosure	68.5	68.9	57.2	58.7	--	--	70
5.	Right of enclosure	62.2	62.2	61.2	62.4	--	--	70
6.	BuckBoost inductor enclosure - rear of enclosure	71.7	70.0	65.5	66.6	--	--	100
7.	Boost inductor enclosure - rear of enclosure	61.4	61.3	59.3	60.4	--	--	100
8.	Inverter inductor enclosure - rear of enclosure	65.9	65.4	60.5	61.5	--	--	100
9.	Mounting surface	67.7	70.0	66.7	65.3	--	--	90
10.	Heat sink	63.7	63.6	61.5	62.9	--	--	100
11.	Top of enclosure	69.4	69.1	69.2	68.6	--	--	70
12.	Bottom of enclosure	69.2	69.2	67.8	69.2	--	--	70
13.	Cover of terminal	69.3	68.8	69.7	69.5	--	--	70
14.	PV terminal surface	63.0	62.8	65.0	65.1	--	--	85
15.	Grid terminal surface	62.2	63.2	67.2	69.3	--	--	105
16.	Load terminal surface	63.2	64.3	66.1	68.2	--	--	105
17.	Battery terminal	66.0	65.8	68.5	69.8	--	--	120
18.	DC switch (outside)	61.0	61.5	64.1	64.9	--	--	70
19.	DC switch (inside)	67.0	68.4	68.4	69.3	--	--	70
	Battery board							
20.	BAT+ cable	81.7	80.8	85.0	88.7	--	--	105
21.	C59	84.0	82.9	82.8	87.3	--	--	105
22.	U5	83.0	80.8	81.6	84.9	--	--	125
23.	U4	98.5	95.6	89.6	94.2	--	--	125
24.	U6	79.4	76.9	78.7	82.2	--	--	105
25.	Q3	79.2	76.7	80.5	83.7	--	--	130
26.	TX1 coil	87.4	84.2	79.7	83.2	--	--	110

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27.	TX1 core	87.5	84.3	78.9	82.3	--	--	110
28.	P4 wire (battery boost transformer outgoing wire)	85.8	83.2	79.5	83.5	--	--	105
29.	PCB near by P2	89.7	87.3	80.7	84.6	--	--	130
	Battery boost trans-former							
30.	Battery boost trans-former 1 coil	79.2	73.8	68.6	68.3	--	--	130
31.	Battery boost trans-former 1 core	100.0	98.3	112.1	119.2	--	--	130
32.	Battery boost trans-former 2 coil	86.4	83.8	90.5	94.0	--	--	130
33.	Battery boost trans-former 2 core	99.9	97.0	111.1	116.8	--	--	130
	Buck-Boost board							
34.	P5 wire (battery boost transformer outgoing wire)	75.1	73.9	77.6	80.3	--	--	105
35.	C4	73.9	72.8	78.5	81.9	--	--	105
36.	C66	69.1	67.9	70.3	72.2	--	--	105
37.	C42	69.4	68.1	71.3	73.8	--	--	105
38.	Q21	83.8	80.5	79.7	81.5	--	--	130
39.	HCT1	75.1	73.7	75.4	78.4	--	--	105
40.	TX1 coil	83.2	81.2	81.1	82.9	--	--	110
41.	TX1 core	82.0	79.9	79.5	81.3	--	--	110
42.	TX3 coil	85.6	83.4	82.6	84.4	--	--	110
43.	TX3 core	82.6	80.9	79.7	82.1	--	--	110
44.	TX4 coil	86.6	84.4	81.3	82.4	--	--	110
45.	TX4 core	84.7	82.5	79.9	80.9	--	--	110
46.	U10	89.9	87.5	86.8	83.3	--	--	100
47.	IGBT Q6	94.5	91.6	98.9	80.8	--	--	130
48.	BuckBoost inductor wire+	80.4	78.8	78.1	80.1	--	--	105
49.	PCB near by P15	83.9	81.8	82.9	85.3	--	--	130
50.	BuckBoost inductor coil	83.2	75.4	77.6	77.8	--	--	110
	PV-INV board							
51.	Bus capacitor C69	78.8	74.2	72.4	76.2	--	--	105
52.	Y capacitor C88	80.9	76.7	75.6	77.9	--	--	125
53.	L3 core	88.7	87.8	82.6	85.5	--	--	105
54.	L3 coil	89.4	88.8	83.6	86.4	--	--	105

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55.	Inverter inductor coil	84.6	80.9	84.5	87.1	--	--	110
56.	Inverter inductor coil	59.9	72.9	76.9	93.7	--	--	110
57.	Boost inductor coil	60.1	69.9	80.4	75.3	--	--	110
58.	Boost inductor coil	81.3	72.4	74.7	86.4	--	--	110
59.	Q6	85.0	83.6	73.8	79.1	--	--	130
60.	TX2 coil	80.1	83.4	87.1	89.7	--	--	110
61.	TX2 core	88.0	87.4	81.4	84.1	--	--	110
62.	D4	83.4	83.8	80.4	83.5	--	--	130
63.	TX1 coil	68.5	77.2	85.2	88.8	--	--	110
64.	TX1 core	81.6	81.9	77.6	80.9	--	--	110
65.	U5	84.7	81.7	75.0	96.0	--	--	130
66.	HCT4	77.6	78.5	69.6	74.9	--	--	105
67.	HCT1	77.8	80.2	69.7	75.5	--	--	105
68.	U11	84.9	84.7	72.2	80.2	--	--	100
69.	U14	86.2	85.0	79.9	82.7	--	--	110
70.	TX5 coil	82.3	81.0	76.9	80.2	--	--	110
71.	TX5 core	82.0	80.5	73.2	78.7	--	--	110
72.	Q19	88.9	90.0	89.6	91.0	--	--	130
73.	Q10	97.2	79.3	82.2	74.8	--	--	130
74.	HCT3	86.9	79.8	76.4	78.8	--	--	105
75.	L2 coil	72.0	72.0	69.9	72.5	--	--	110
76.	L2 core	77.8	61.0	71.5	72.8	--	--	110
77.	L4 coil	90.6	95.0	68.2	82.4	--	--	110
78.	L4 core	89.5	94.1	66.6	80.5	--	--	110
79.	L7 coil	68.9	69.5	68.3	71.1	--	--	130
80.	L7 core	69.9	69.9	68.6	71.2	--	--	130
81.	L8 coil	99.6	98.8	66.1	87.0	--	--	130
82.	L8 core	60.2	60.8	56.5	58.3	--	--	130
83.	X capacitor C255	67.2	67.8	65.0	68.4	--	--	110
84.	P8 wire (boost inductor)	90.3	80.6	73.7	74.1	--	--	105
85.	P12 wire (INV inductor)	89.5	86.1	75.2	80.4	--	--	105
86.	P24 wire (INV inductor)	81.0	81.5	69.7	77.6	--	--	105
87.	P5 wire (grid L)	62.1	62.9	63.3	65.2	--	--	105
88.	P7 wire (load L)	72.1	75.6	67.7	79.4	--	--	105
	Communication board							
89.	U43	84.1	80.9	77.4	80.8	--	--	110

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90.	U2	82.4	79.5	76.9	79.6	--	--	100
91.	U7	84.1	82.7	79.0	81.7	--	--	125
92.	U3	81.7	77.7	76.5	79.8	--	--	130
93.	U5	80.1	78.2	76.2	78.9	--	--	105
	Relay board					--	--	
94.	K5 ambient temperature	79.1	80.1	75.2	78.5	--	--	85
95.	K6 ambient temperature	79.7	81.4	73.1	76.6	--	--	85
96.	Grid L wire surface	75.7	78.4	73.3	79.0	--	--	105
97.	Load L wire surface	74.4	76.3	73.2	76.7	--	--	105
98.	PCB surface between Grid terminals	71.5	73.8	72.3	77.9	--	--	130
	Control board							
99.	U7	82.0	79.4	76.9	80.0	--	--	85
100.	U19	91.1	88.8	85.0	88.4	--	--	105
Supplementary information:								

4.3	**Thermal testing (by thermocouples) (Alternative IGBT and MOS)**	P
Model: EAHI-6000-SL	(12) 45°C, PV input rating is 250Vd.c. and 7.8kW, the combined output is 6kW to grid (output voltage is 230Va.c.) and 1.8kW to battery (With alternative IGBT Q10 and Q19 (model CRG75T65AK5SD) on the PV-INV board, aternative IGBT Q6 (model CRG75T65AK5SD) and MOS Q1 (model NCE65NF036T) on the Buck-Boost board, alternative MOS Q3 (model NCEP023N10T) on the battery board)	
	(13) 60°C, PV input rating is 250Vd.c., output to grid (voltage 230Va.c.) and battery, automatic derating. (With alternative IGBT Q10 and Q19 (model CRG75T65AK5SD) on the PV-INV board, aternative IGBT Q6 (model CRG75T65AK5SD) and MOS Q1 (model NCE65NF036T) on the Buck-Boost board, alternative MOS Q3 (model NCEP023N10T) on the battery board)	
	(14) 45°C, PV input rating is 250Vd.c., the combined output is 5kW to battery and 2.8kW to load. (With alternative IGBT Q10 and Q19 (model CRG75T65AK5SD) on the PV-INV board, aternative IGBT Q6 (model CRG75T65AK5SD) and MOS Q1 (model NCE65NF036T) on the Buck-Boost board, alternative MOS Q3 (model NCEP023N10T) on the battery board)	
	(15) 60°C, PV input rating is 250Vd.c., output to battery, automatic derating. (With alternative IGBT Q10 and Q19 (model CRG75T65AK5SD) on the PV-INV board, aternative IGBT Q6 (model CRG75T65AK5SD) and MOS Q1 (model NCE65NF036T) on the Buck-Boost board, alternative MOS Q3 (model NCEP023N10T) on the battery board)	
	(16) 45°C, PV input rating is 250Vd.c., the combined output is 5kW to battery and 2.8kW to load. (With aternative MOS Q1 (model CRJQ41N65GCF) on the Buck-Boost board)	
	(17) 60°C, PV input rating is 250Vd.c., output to battery, automatic derating. (With aternative MOS Q1 (model CRJQ41N65GCF) on the Buck-Boost board)	
	(18) 45°C, PV input rating is 250Vd.c., the combined output is 5kW to battery and 2.8kW to load. (With aternative MOS Q1 (model OSG65R038HTZF) on the Buck-Boost board)	
	(19) 60°C, PV input rating is 250Vd.c., output to battery, automatic derating. (With aternative MOS Q1 (model OSG65R038HTZF) on the Buck-Boost board)	

No.	Ambient	Humidi-	Test	Input	Ouput

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	(°C)	ty (RH)	time	Vdc	Adc	kW	Vac	Aac	kW	Vdc	Adc	kW
(12)	45	--	3h	249.94	29.28	7.27	230.89	25.46	5.88	48.05	22.29	1.07
(13)	60	--	3h14 min	249.69	26.34	6.55	230.09	17.14	3.95	48.02	46.14	2.21
(14)	45	--	2h58 min	250.07	29.26	7.32	230.34	9.04	2.08	48.02	99.78	4.74
(15)	60	--	3h6min	250.00	16.31	4.07	--	--	--	48.00	77.37	3.71
(16)	45	--	3h5min	249.18	29.42	7.33	230.20	8.87	2.04	48.03	99.17	4.77
(17)	60	--	3h11 min	249.42	16.48	4.11	--	--	--	48.01	77.73	3.72
(18)	45	--	3h11 min	249.25	29.51	7.36	230.55	8.90	2.05	48.05	99.92	4.80
(19)	60	--	3h9min	249.46	16.25	4.06	--	--	--	48.02	76.86	3.68

No.	Temperature (°C) of part at:	Measured temperature (°C)								Limits (°C)
		(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	
1.	Ambient temperature	45.3	61.6	45.5	61.3	45.4	60.8	45.4	61.9	--
2.	Front of enclosure	50.6	62.5	51.9	63.1	50.1	63.0	50.5	63.2	70
3.	Button surface	48.7	60.5	52.8	63.8	51.0	63.7	51.4	63.9	85
4.	Left of enclosure	47.4	68.7	48.5	61.1	46.6	61.0	47.0	61.2	70
5.	Right of enclosure	48.0	62.5	53.0	63.3	51.2	63.1	51.6	63.4	70
6.	BuckBoost inductor enclosure - rear of enclosure	50.0	73.0	50.8	72.8	49.2	72.1	49.2	73.5	100
7.	Boost inductor enclosure - rear of enclosure	46.5	62.3	48.3	62.2	50.3	61.5	46.8	62.7	100
8.	Inverter inductor enclosure - rear of enclosure	46.4	67.8	47.4	67.6	47.7	66.9	45.9	68.2	100
9.	Mounting surface	58.6	67.2	59.3	67.0	57.6	66.3	57.8	67.6	90
10.	Heat sink	51.5	64.4	52.5	64.2	50.7	63.5	51.1	64.7	100
11.	Top of enclosure	56.8	69.9	63.5	69.7	61.8	69.0	62.0	69.9	70
12.	Bottom of enclosre	53.0	69.8	58.0	69.6	55.9	68.9	56.3	69.4	70
13.	Cover of terminal	55.8	69.9	57.7	69.8	56.5	69.1	57.2	69.5	70
14.	PV terminal surface	46.5	62.3	48.3	62.2	50.3	61.5	46.8	62.7	85
15.	Grid terminal surface	56.7	62.8	58.4	69.9	56.5	69.7	56.8	70.0	105
16.	Load terminal surface	57.2	63.6	55.3	68.7	53.5	68.6	53.8	68.9	105
17.	Battery terminal	54.5	66.7	57.7	66.5	56.0	65.9	56.5	67.1	120
18.	DC switch (outside)	54.3	61.9	54.6	61.7	53.2	61.0	53.2	62.2	70
19.	DC switch (inside)	61.3	67.9	63.4	67.7	61.7	67.1	61.9	68.3	70

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	Battery board									
20.	BAT+ cable	60.0	82.7	66.4	86.4	64.6	85.5	64.9	87.1	105
21.	C59	65.2	84.3	65.8	82.6	64.1	82.4	64.4	82.8	105
22.	U5	66.1	83.0	64.5	81.9	62.7	81.7	63.1	82.1	125
23.	U4	78.7	98.1	76.0	89.2	74.3	89.0	73.3	89.3	125
24.	U6	63.9	79.3	62.3	79.5	60.5	79.3	60.8	79.6	105
25.	Q3	58.7	79.3	68.4	81.0	66.7	80.1	67.2	81.7	130
26.	TX1 coil	67.9	87.3	64.1	80.3	62.3	79.4	62.6	81.0	110
27.	TX1 core	66.7	87.4	62.6	79.6	60.8	78.8	61.1	80.3	110
28.	P4 wire (battery boost transformer outgoing wire)	61.4	86.4	63.3	79.9	61.5	79.1	61.9	80.6	105
29.	PCB near by P2	62.6	90.4	63.5	81.2	61.7	80.3	62.0	81.9	130
	Battery boost trans-former									
30.	Battery boost trans-former 1 coil	75.0	79.5	64.7	71.4	62.6	70.7	62.8	72.0	130
31.	Battery boost trans-former 1 core	71.6	101.6	97.7	113.7	97.1	112.6	96.1	114.7	130
32.	Battery boost trans-former 2 coil	62.1	86.7	80.5	90.9	77.8	89.9	78.9	91.7	130
33.	Battery boost trans-former 2 core	72.3	101.1	94.8	112.9	93.2	111.8	93.2	113.9	130
	Buck-Boost board									
34.	P5 wire (battery boost transformer outgoing wire)	56.7	75.2	65.4	78.6	68.1	77.8	63.8	79.3	105
35.	C4	55.6	73.8	67.4	79.1	69.2	78.3	65.9	79.8	105
36.	C66	52.6	69.2	65.7	72.3	63.8	71.6	64.3	72.9	105
37.	C42	58.0	69.4	67.9	72.8	69.6	72.1	66.6	73.5	105
38.	Q21	66.2	83.6	66.8	80.7	64.9	79.9	65.3	81.4	130
39.	HCT1	55.0	75.0	62.6	76.9	60.7	76.1	60.9	77.6	105
40.	TX1 coil	63.2	81.8	64.6	80.6	62.6	79.8	62.7	81.3	110
41.	TX1 core	62.5	83.1	66.4	82.2	64.4	81.3	64.6	82.9	110
42.	TX3 coil	63.9	85.4	69.4	83.5	67.5	82.7	67.8	84.2	110
43.	TX3 core	64.8	83.0	66.6	81.2	68.6	80.4	65.4	81.9	110
44.	TX4 coil	66.9	86.3	65.3	82.2	63.6	82.0	63.9	82.3	110
45.	TX4 core	64.9	84.4	66.5	80.7	64.8	80.6	65.1	80.9	110
46.	U10	67.6	89.6	69.1	87.3	67.3	87.1	67.6	87.5	100
47.	IGBT Q6	78.6	93.9	77.7	98.3	75.9	98.1	73.1	98.5	130
48.	BuckBoost inductor wire+	60.5	80.2	67.1	79.1	65.4	78.9	65.7	79.2	105

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49.	PCB near by P15	60.5	80.2	67.1	79.1	65.4	78.9	65.7	79.2	130
50.	BuckBoost inductor coil	61.1	83.1	62.6	78.6	60.7	77.8	60.9	79.3	110
51.	MOS Q1	77.1	93.4	76.2	97.7	74.4	97.3	71.8	98.1	130
	PV-INV board									
52.	Bus capacitor C69	67.9	78.9	66.6	73.4	65.2	72.7	65.1	74.1	105
53.	Y capacitor C88	67.7	80.7	68.9	76.9	67.4	76.1	67.4	77.6	125
54.	L3 core	73.9	88.4	59.5	84.4	57.6	84.2	58.0	84.6	105
55.	L3 coil	70.3	89.4	74.0	85.6	72.5	84.7	72.4	86.4	105
56.	Inverter inductor coil	54.4	61.5	57.4	75.9	59.2	75.1	55.8	76.5	110
57.	Inverter inductor coil	60.0	81.1	73.2	81.5	71.5	80.7	71.9	82.2	110
58.	Boost inductor coil	62.4	84.6	74.6	84.6	71.8	83.8	73.0	85.4	110
59.	Boost inductor coil	58.3	60.7	59.5	78.6	56.8	77.8	57.9	79.3	110
60.	Q6	72.5	84.9	66.0	75.3	64.5	74.6	64.5	76.0	130
61.	TX2 coil	75.9	80.2	77.4	89.0	78.8	88.1	75.8	89.8	110
62.	TX2 core	78.0	88.1	68.5	83.4	67.0	82.6	66.9	84.2	110
63.	D4	66.8	83.5	68.8	82.6	67.3	81.7	67.3	83.3	130
64.	TX1 coil	75.0	76.6	70.3	87.5	71.8	86.6	68.7	88.3	110
65.	TX1 core	65.5	81.6	64.2	79.4	65.8	78.6	62.8	80.1	110
66.	U5	68.7	84.7	96.7	74.8	98.4	74.1	95.3	75.5	130
67.	HCT4	67.4	77.7	59.4	71.6	57.7	70.9	58.1	72.3	105
68.	HCT1	75.5	77.9	61.5	71.6	59.6	70.9	60.0	72.2	105
69.	U11	74.5	85.0	60.1	74.2	58.2	73.5	58.5	74.9	100
70.	U14	71.6	86.2	62.5	82.0	60.7	81.2	61.0	82.7	110
71.	TX5 coil	66.9	82.3	63.0	78.9	61.1	78.1	61.5	79.6	110
72.	TX5 core	70.8	82.3	66.3	75.0	64.5	74.3	64.8	75.7	110
73.	Q19	91.7	87.9	92.2	90.0	94.0	89.1	90.8	90.8	130
74.	Q10	85.7	97.2	77.9	83.2	76.0	82.3	76.3	83.9	130
75.	HCT3	71.3	86.6	64.0	77.3	62.2	76.5	62.5	78.0	105
76.	L2 coil	65.3	72.4	63.4	71.4	61.5	71.3	62.1	71.6	110
77.	L2 core	56.7	78.2	61.5	72.8	59.9	72.7	60.3	72.9	110
78.	L4 coil	92.7	90.0	60.6	69.8	58.8	69.6	59.2	69.9	110
79.	L4 core	91.2	89.0	60.5	68.4	58.7	68.2	59.2	68.5	110
80.	L7 coil	63.2	68.9	64.0	70.0	62.1	69.9	62.6	70.1	130
81.	L7 core	63.9	69.5	65.2	70.1	63.4	70.0	63.7	70.2	130
82.	L8 coil	99.9	99.0	57.9	68.2	56.2	68.1	56.5	68.3	130
83.	L8 core	45.1	59.8	47.8	61.6	46.0	61.5	46.5	61.7	130
84.	X capacitor C255	57.6	67.3	50.5	67.4	48.8	67.2	49.1	67.5	110

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85.	P8 wire (boost inductor)	74.2	89.7	64.7	74.6	62.9	74.4	63.3	74.7	105
86.	P12 wire (INV inductor)	79.4	89.0	65.6	76.7	63.8	76.6	64.1	76.9	105
87.	P24 wire (INV inductor)	71.5	80.9	63.1	71.7	61.3	71.5	61.7	71.8	105
88.	P5 wire (grid L)	51.6	62.8	58.1	67.1	56.3	67.0	56.7	67.3	105
89.	P7 wire (load L)	66.8	77.4	55.2	69.5	53.3	69.3	53.7	69.6	105
	Communication board									
90.	U43	65.7	83.8	63.9	79.1	62.0	78.9	62.5	79.2	110
91.	U2	64.3	82.1	62.8	78.1	61.1	77.9	61.3	78.2	100
92.	U7	66.0	83.9	65.1	79.9	63.3	79.7	63.7	80.0	125
93.	U3	62.0	81.2	64.2	78.1	62.4	77.9	62.9	78.2	130
94.	U5	64.6	79.8	63.6	77.2	61.8	77.0	62.1	77.3	105
	Relay board									
95.	K5 ambient temperature	67.1	79.0	62.1	76.1	60.1	76.0	60.6	76.3	85
96.	K6 ambient temperature	67.7	79.5	63.5	74.3	61.7	74.1	62.0	74.4	85
97.	Grid L wire surface	75.2	76.7	65.2	74.3	63.4	74.1	63.7	74.4	105
98.	Load L wire surface	72.6	74.5	65.1	74.2	63.4	74.0	63.7	74.3	105
99.	PCB surface between Grid terminals	72.4	72.0	63.5	73.5	61.7	73.4	62.0	73.7	130
	Control board									
100.	U7	67.8	81.7	61.3	78.3	59.5	78.2	59.8	78.5	85
101.	U19	71.4	90.8	65.2	86.5	63.5	86.3	63.9	86.7	105
Supplementary information:										

4.3	**Thermal testing (by thermocouples)**	P
Model: EAHI-3600-SL	(1) 45°C, PV input rating is 310Vd.c. and 4.68kW, the combined output is 3.6kW to grid (output voltage is 230Va.c.) and 1.08kW to battery	
	(2) 45°C, PV input rating is 450Vd.c. and 4.68kW, the combined output is 3.6kW to grid (output voltage is 253Va.c.) and 1.08kW to battery	
	(3) 45°C, PV input rating is 310Vd.c. and 4.68kW, the combined output is 3.75kW to battery and 0.93kW to load.	
	(4) 45°C, Max. Battery discharging power 3.75kW, Max AC load output power 3.6kW.	
	(5) 60°C, PV input rating is 310Vd.c., output to grid (voltage is 230Va.c.) and battery, automatic derating.	
	(6) 60°C, PV input rating is 310Vd.c., output to battery, automatic derating.	
	(7) 60°C, Battery discharging to AC load, automatic derating.	

No.	Ambient (°C)	Humidity (RH)	Test time	Input			Ouput					
				V	I	P	V	I	P	V	I	P
(1)	45.0	--	3h37 min	307.10	14.90	4.57	230.00	15.70	3.61	47.70	14.80	0.70

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(2)	45.0	--	3h6 min	449.23	10.31	4.61	253.00	14.13	3.58	47.63	19.46	0.93
(3)	45.0	--	3h57 min	309.07	14.94	4.60	230.00	3.02	0.69	47.62	74.72	3.56
(4)	45.0	--	3h59 min	47.93	76.36	3.66	228.84	14.48	3.31	--	--	--
(5)	60.0	--	3h3 min	308.75	13.90	4.29	230.01	7.76	1.78	48.05	46.51	2.24
(6)	60.0	--	4h	311.37	9.91	3.07	--	--	--	47.89	58.76	2.81
(7)	60.0	--	2h2 min	47.89	61.55	2.95	230.15	11.66	2.67	--	--	--

No.	Temperature (°C) of part at:	Measured temperature (°C)							Limits (°C)
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	
1.	Ambient temperature	44.7	45.0	44.9	44.7	61.2	60.2	60.9	--
2.	Front of enclosure	51.2	48.2	56.6	56.8	65.6	69.5	68.8	70
3.	Button surface	44.8	44.3	44.9	44.9	65.5	62.4	61.4	85
4.	Left of enclosure	61.3	51.3	66.7	67.9	65.4	68.6	67.8	70
5.	Right of enclosure	66.2	59.8	67.3	65.9	67.5	68.1	66.4	70
6.	BuckBoost & Inverter combined inductor enclosure - rear of enclosure	48.9	46.2	48.2	49.0	66.2	65.0	65.7	100
7.	Boost & Inverter combined inductor enclosure - rear of enclosure	51.0	47.8	54.5	54.9	66.8	69.5	69.7	100
8.	Mounting surface	49.3	46.9	52.1	52.6	66.1	67.6	67.6	90
9.	Heat sink	49.8	47.0	52.8	53.4	66.5	68.3	68.4	100
10.	Top of enclosure	44.6	44.2	44.6	44.8	61.7	62.1	61.6	70
11.	Bottom of enclosre	55.7	53.2	63.7	64.7	69.3	69.6	70.0	70
12.	Cover of terminal	44.7	48.7	44.9	44.8	63.3	62.2	61.8	70
13.	PV terminal surface	62.1	62.5	78.4	82.0	83.7	83.8	83.0	85
14.	Grid terminal surface	66.4	60.0	79.1	82.5	83.0	87.5	94.1	105
15.	Load terminal surface	50.7	47.3	51.2	51.9	65.9	67.3	67.4	105
16.	Battery terminal	67.3	63.2	64.4	69.9	85.2	104.6	110.1	120
17.	DC switch (outside)	68.8	65.6	61.1	68.4	66.4	69.0	69.1	70
18.	DC switch (inside)	58.7	53.6	63.4	63.0	66.2	69.4	63.8	70
	Battery board								
19.	BAT+ cable	57.1	54.1	68.5	70.4	77.4	79.9	82.4	105
20.	C59	56.0	53.7	72.1	75.3	79.2	82.6	86.1	105
21.	U5	59.9	55.0	63.6	65.1	77.3	76.4	78.1	125
22.	U4	62.3	59.8	65.1	66.6	82.7	77.8	79.5	125

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23.	U6	67.1	60.1	65.8	68.2	78.2	78.5	80.7	105
24.	Q3	67.1	59.8	65.7	68.0	78.3	78.7	80.9	130
25.	TX1 coil	69.7	68.2	73.9	75.5	87.7	87.6	88.4	110
26.	TX1 core	61.1	59.0	66.5	71.9	79.7	80.2	81.2	110
27.	P4 wire (battery boost transformer outgoing wire)	49.9	48.6	52.7	53.2	66.9	66.4	67.5	105
28.	PCB near by P2	59.5	56.9	63.2	64.9	75.8	76.6	78.3	130
	Battery boost trans-former								
29.	Battery boost trans-former 1 coil	49.1	48.8	52.4	52.9	66.4	66.2	67.6	130
30.	Battery boost trans-former 1 core	47.5	46.8	48.3	48.8	63.9	63.1	64.0	130
31.	Battery boost trans-former 2 coil	51.9	50.8	52.9	55.5	66.7	66.1	68.4	130
32.	Battery boost trans-former 2 core	48.5	48.1	49.1	47.3	67.6	62.9	63.0	130
	Buck-Boost board								
33.	P5 wire (battery boost transformer outgoing wire)	96.1	97.4	73.5	94.9	92.9	81.9	103.3	105
34.	C4	62.6	56.6	64.9	66.3	77.1	77.8	79.0	105
35.	C66	65.9	59.7	67.6	69.4	78.7	80.1	81.9	105
36.	C42	66.3	60.0	68.8	70.0	79.5	81.2	82.7	105
37.	Q21	58.7	54.3	63.5	65.4	75.1	76.6	78.5	130
38.	HCT1	63.2	56.7	65.8	66.5	78.0	78.4	79.6	105
39.	TX1 coil	56.1	52.9	60.8	62.3	72.9	74.3	74.9	110
40.	TX1 core	56.1	52.7	60.3	61.6	73.0	74.0	75.0	110
41.	TX3 coil	75.5	68.0	73.2	79.8	87.0	82.9	91.1	110
42.	TX3 core	56.8	53.5	63.5	65.4	74.3	76.3	77.7	110
43.	TX4 coil	58.1	55.5	65.4	66.5	77.2	78.2	79.5	110
44.	TX4 core	55.6	53.2	65.1	65.5	75.7	78.3	79.2	110
45.	U10	62.1	58.8	70.4	71.9	81.1	82.9	84.6	100
46.	IGBT Q6	64.2	57.5	66.2	67.4	78.1	78.8	80.1	130
47.	Boost inductor wire+	93.6	94.6	72.4	93.4	91.5	81.1	102.1	105
48.	PCB near by P15	61.0	58.2	68.3	69.2	79.8	80.9	82.1	130
49.	BuckBoost & Inverter combined inductor core 1	59.4	55.1	66.4	67.9	76.5	78.4	80.7	130
50.	BuckBoost & Inverter combined inductor coil 1	93.6	66.0	79.4	75.7	103.7	97.1	82.0	130

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	PV-INV board								
51.	Bus capacitor C69	63.1	56.2	61.6	64.3	73.4	72.6	75.5	105
52.	Y capacitor C88	62.1	55.2	62.7	64.7	73.4	74.2	76.5	125
53.	L3 core	83.8	70.4	82.5	84.9	85.1	94.9	97.5	105
54.	L3 coil	85.3	69.8	83.9	86.2	84.4	96.4	99.0	105
55.	Boost & Inverter combined inductor coil 1	92.7	65.8	97.5	70.6	102.3	95.7	82.1	110
56.	Boost & Inverter combined inductor core 1	58.6	54.0	62.9	64.5	74.3	75.4	77.6	110
57.	BuckBoost & Inverter combined inductor coil 2	107.5	93.8	72.4	93.0	91.4	81.6	102.3	130
58.	BuckBoost & Inverter combined inductor core 2	110.6	97.7	73.6	95.4	93.0	82.6	104.1	130
59.	Boost & Inverter combined inductor coil 2	84.9	68.8	93.1	78.3	97.6	96.3	89.0	110
60.	Boost & Inverter combined inductor core 2	83.5	66.9	71.8	77.0	95.9	93.6	87.4	110
61.	Q6	85.8	79.7	83.4	85.6	93.0	97.0	100.2	130
62.	TX2 coil	89.7	74.4	87.7	89.5	88.2	100.0	103.3	110
63.	TX2 core	81.5	70.6	80.2	81.7	84.6	91.9	95.1	110
64.	D4	94.0	71.7	90.7	92.1	86.6	101.4	105.3	130
65.	TX1 coil	58.6	55.3	64.8	64.5	76.1	75.7	76.2	110
66.	TX1 core	67.7	65.0	65.5	68.7	79.6	78.3	82.0	110
67.	U5	70.0	66.6	67.8	70.6	80.7	80.4	84.3	130
68.	HCT4	76.7	68.9	74.5	77.3	83.3	87.3	90.8	105
69.	HCT1	71.1	62.8	63.0	69.5	77.3	74.8	82.4	105
70.	U11	68.3	63.4	58.8	63.8	73.7	71.5	80.1	100
71.	U14	64.4	60.0	58.8	63.7	73.0	72.0	77.5	110
72.	TX5 coil	85.0	81.4	83.2	86.1	95.6	95.5	98.9	110
73.	TX5 core	69.1	66.5	68.7	70.5	81.5	81.6	83.7	110
74.	Q19	79.7	62.4	71.3	85.5	76.9	74.7	81.4	130
75.	Q9	85.0	57.7	83.2	62.7	98.6	90.0	76.7	130
76.	HCT3	72.4	67.1	71.5	73.6	82.2	85.2	87.1	105
77.	L2 coil	55.9	52.7	62.2	63.1	72.6	75.2	76.3	110
78.	L2 core	70.4	63.5	55.8	57.8	70.3	70.0	82.5	110
79.	L4 coil	71.3	64.9	56.0	57.8	70.1	70.1	83.5	110
80.	L4 core	72.7	65.8	55.7	57.5	69.5	70.0	84.0	110
81.	L7 coil	56.4	53.0	61.1	72.3	69.0	73.5	74.3	130
82.	L7 core	56.5	53.1	61.0	72.9	68.1	73.3	74.3	130

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83.	L8 coil	68.7	67.6	58.5	62.4	70.3	72.1	82.3	130
84.	L8 core	75.2	72.3	56.9	60.5	70.1	70.7	85.7	130
85.	X capacitor C255	59.6	54.0	64.7	62.8	72.6	75.7	74.8	110
86.	P8 wire (Boost &Inverter combined inductor)	73.5	67.4	59.5	65.5	77.1	73.1	87.2	105
87.	P12 wire (Boost&Inverter combined inductor)	64.9	62.0	59.6	70.5	75.5	73.1	80.9	105
88.	P24 wire (BuckBoost & Inverter combined inductor)	71.5	69.5	59.9	62.5	76.5	73.6	85.7	105
89.	P5 wire (grid L)	63.3	66.0	55.4	60.0	78.8	69.8	79.7	105
90.	P7 wire (load L)	58.8	61.0	60.4	62.2	77.6	74.0	77.7	105
	Communication board								
91.	U43	59.2	57.7	64.5	65.7	77.2	77.7	78.7	110
92.	U2	60.8	57.9	64.8	66.3	77.3	78.3	79.9	100
93.	U7	59.9	57.7	64.9	66.0	77.0	77.9	79.0	125
94.	U3	61.0	58.4	66.1	67.1	77.9	78.9	80.1	130
95.	U5	57.9	54.5	65.8	67.0	76.3	78.2	79.8	105
	Relay board								
96.	K5 ambient temperature	56.3	52.5	61.2	64.7	71.2	74.5	75.6	85
97.	K6 ambient temperature	61.5	54.6	55.6	57.2	69.1	70.5	76.6	85
98.	Grid L wire surface	65.3	61.6	59.2	65.5	74.5	73.3	79.6	105
99.	Load L wire surface	73.2	62.6	65.0	73.5	78.8	76.3	86.2	105
100.	PCB surface between Grid terminals	65.9	58.2	67.6	66.1	80.6	78.8	79.4	130
	Control board								
101.	U7	59.1	56.1	66.1	67.3	77.8	78.9	80.5	85
102.	U19	59.2	56.3	66.4	67.7	72.0	79.2	80.6	105
Supplementary information:									

4.4	**TABLE: fault condition tests**		P
	Ambient temperature(°C) …… :	25	—
	Relative humidity……:	40%	—

No.	component No.	fault	Input (V)	Output (V, kW)	Test time	Observation

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Clause 4.4.4.1 Component fault tests						
INV board						
1.	R478 (Resistance of PV voltage sampling circuit)	O-C	420	230, 6000	3min	The fault was applied before operation. After the unit applied the fault, the PV voltage sampling value was incorrect, no fault was detected. No hazard. No damage. Recoverable.
2.	C and E of Q10 (Switch device of PV2 boost circuit)	S-C	420	230, 6000	3min	The fault was applied before operation. After the unit applied the fault, the LED was steady red, “PV2 over current” fault was detected. No output voltage. Q10 was damaged, No hazards. Unrecoverable.
3.	R57 (Drive resistance of Q10 of PV2 drive circuit)	S-C	420	230, 6000	3min	The fault was applied before operation. After the unit applied the fault, PV2 circuit was not operated. The unit operated normally. No hazard. No damage. Recoverable.
4.	C and E of Q19 (Switch device of INV circuit)	S-C	420	230, 6000	3min	The fault was applied before operation. After the unit applied the fault, the LED was steady red, “INV overcurrent, Grid fast check abnormal, INV inductor current limited, leakage current exceeded” faults were detected. No output voltage. Q18 and Q20 were damaged, no hazards. Unrecoverable.
5.	R25 (Drive resistance of Q19)	S-C	420	230, 6000	3min	The fault was applied before operation. After the unit applied the fault, the LED was steady red, “Inverter self-test failed” fault was detected. No output voltage. No hazard. No damage. Recoverable.
6.	R468 (Resistance of bus capacitor voltage sampling circuit)	S-C	420	230, 6000	3min	The fault was applied before operation. After the unit applied the fault, the LED was steady red, “Bus fast over voltage, Bus over voltage, Bus hardware over voltage” faults were detected. No output voltage. No hazard. No damage. Recoverable.
7.	R213 (Resistance of grid voltage sampling circuit)	S-C	420	230, 6000	3min	The fault was applied before operation. After the unit applied the fault, the LCD was normal. No fault was detected. No hazard. No damage. Recoverable.
8.	R155 (Resistance of load voltage sampling circuit)	S-C	420	230, 6000	3min	The fault was applied before operation. After the unit applied the fault, the LCD was normal. No fault was detected. No hazard. No damage. Recoverable.

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9.	R102 of HCT3 (PV1 current sampling circuit)	O-C	420	230, 6000	3min	The fault was applied before operation. After the unit applied the fault, the LCD was normal. The inverter could not detect the PV1 current. No fault was detected. No hazard. No damage. Recoverable.
10.	R73 of HCT2 (Load current sampling circuit)	O-C	420	230, 6000	3min	The fault was applied before operation. After the unit applied the fault, the LED was steady red. “Output over current” fault was detected. No output voltage. No hazard. No damage. Recoverable.
11.	R93 of HCT4 (Grid current sampling circuit)	S-C	420	230, 6000	3min	The fault was applied before operation. After the unit applied the fault, the LCD was normal. No fault was detected. No hazard. No damage. Recoverable.
12.	D4 (Diode of transformer TX2 of secondary winding)	S-C	420	230, 6000	3min	The fault was applied before operation. After the unit applied the fault, the unit could not operate. No hazard. No damage. Recoverable.
13.	R11 (Drive resistance of Q6 of TX2 primary winding)	O-C	420	230, 6000	3min	The fault was applied before operation. After the unit applied the fault, the unit could not operate. No hazard. No damage. Recoverable.
14.	Q6 (Drive circuit of TX2 transformer)	S-C	420	230, 6000	3min	The fault was applied before operation. After the unit applied the fault, the unit could not operate. Q6, R6, R11, R14, R29 were damaged. No hazard. Unrecoverable.
15.	R520 (Insulation impedance detection circuit)	S-C	420	230, 6000	3min	The fault was applied before operation. After the unit applied the fault, the LED was steady red. “Insulation impedance fault” was detected. No output voltage. No hazard. No damage. Recoverable.
16.	Contact of K7 (Insulation impedance detection circuit)	S-C	420	230, 6000	3min	The fault was applied before operation. After the unit applied the fault, the LCD was normal. No fault was detected. No hazard. No damage. Recoverable.
Battery board						
17.	R3 (Drive resistance of Q3 and Q1 drive circuit)	O-C	420	230, 6000	3min	The fault was applied before operation. After the unit applied the fault, the LCD was normal. No fault was detected. No hazard. No damage. Recoverable.

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18.	D and S of Q7 (Switch of LLC circuit)	S-C	420	230, 6000	3min	The fault was applied before operation. After the unit applied the fault, the red LED blinked. “Battery without connection” fault was detected. Q8 was damaged. No output voltage. No hazard. Unrecoverable.
19.	C47 (Bus capacitor)	S-C	420	230, 6000	3min	The fault was applied before operation. After the unit applied the fault, the red LED was blinked. “Battery without connection” fault was detected. No damage. No hazard.
20.	R72 (Resistance of battery voltage sampling circuit)	S-C	420	230, 6000	3min	The fault was applied before operation. After the unit applied the fault, the LED was steady red. “Battery over voltage” fault was detected. No damaged. No hazard. Recoverable.
Boost board						
21.	R65 (Drive resistance of Q21 of TX3 primary winding)	S-C	420	230, 6000	3min	The fault was applied before operation. After the unit applied the fault, the LCD was normal. No fault was detected. No hazard. No damage. Recoverable.
22.	R31 (Drive resistance of U1 of drive IC of Q1)	S-C	420	230, 6000	3min	The fault was applied before operation. After the unit applied the fault, the LCD was normal. No fault was detected. No hazard. No damage. Recoverable.
23.	R18 (Drive resistance of U11 of drive IC of Q6)	S-C	420	230, 6000	3min	The fault was applied before operation. After the unit applied the fault, the LCD was normal. No fault was detected. No hazard. No damage. Recoverable.
Clause 4.4.4.3 Motors						
24.	Internal Fan	disconnect	420	230, 6000	3min	The fault was applied before operation. After the unit applied the fault, the red LED was blinked. “Fan abnormal” fault was detected. No hazard. No damage. Recoverable.
Clause 4.4.4.4 Transformer short circuit tests						
25.	Secondary winding of TX2 of battery board	S-C	420	230, 6000	3min	The fault was applied before operation. After the unit applied the fault, the communication was abnormal. “Auxiliary power abnormal” fault was detected. No hazard. No damage. Recoverable.
26.	Secondary winding 1 of TX2 of INV board	S-C	420	230, 6000	3min	The fault was applied before operation. After the unit applied the fault, the LCD was normal. No fault was detected. No hazard. No damage. Recoverable.

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27.	Secondary winding 2 of TX2 of INV board	S-C	420	230, 6000	3min	The fault was applied before operation. After the unit applied the fault, the communication was abnormal. “Auxiliary power abnormal” fault was detected. No hazard. No damage. Recoverable.
28.	Secondary winding 1 of TX1 of INV board	S-C	420	230, 6000	3min	The fault was applied before operation. After the unit applied the fault, The unit could not operate. TX1 was damaged. No output voltage. No hazard. Unrecoverable.
29.	Secondary winding 2 of TX1 of INV board	S-C	420	230, 6000	3min	The fault was applied before operation. After the unit applied the fault, The unit could not operate. TX1 was damaged. No output voltage. No hazard. Unrecoverable.
30.	Secondary winding of TX3 of INV board	S-C	420	230, 6000	3min	The fault was applied before operation. After the unit applied the fault, the LED was steady red. “Inverter self-check failure” fault was detected. TX3 was damaged. No hazard. Unrecoverable.
31.	Secondary winding of TX6 of INV board	S-C	420	230, 6000	3min	The fault was applied before operation. After the unit applied the fault, PV circuits was abnormal. TX6 was damaged. No fault was detected. No hazard. Unrecoverable.
32.	Secondary winding of TX3 of boost board	S-C	420	230, 6000	3min	The fault was applied before operation. After the unit applied the fault, the LCD was normal. No fault was detected. No hazard. No damage. Recoverable.
33.	Secondary winding of TX1 of boost board	S-C	420	230, 6000	3min	The fault was applied before operation. After the unit applied the fault, the LCD was normal. No fault was detected. No hazard. TX1 was damaged. Unrecoverable.
Clause 4.4.4.7 Output overload						
34.	Grid output	Overload	420	230, 6240	3min	The fault was applied before operation. After the unit applied the fault, the LCD was normal. No fault was detected. No hazard. No damage. Recoverable.
35.	Load output	Overload	420	230, 6240	3min	The fault was applied before operation. After the unit applied the fault, the LCD was normal. No fault was detected. No hazard. No damage. Recoverable.
Clause 4.4.4.11 Reverse d.c. connections						

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36.	BAT output	R	420	230, 6000	3min	The fault was applied before operation. After the unit applied the fault, the red LED blinked. “Battery without connection” fault was detected. No hazard. No damage. Recoverable.
Clause 4.4.4.13 Mis-wiring with incorrect phase sequence or polarity						
37.	L and N of AC output terminal	R	420	230, 6000	3min	The fault was applied before operation. After the unit applied the fault, the red LED blinked. “Neutral and ground voltage abnormal” fault was detected. No hazard. No damage. Recoverable.
supplementary information: S-C: short circuit, O-C: open circuit, O-L: overload, R: reversed						

7.3.7	**TABLE: Creepage distances and clearances for appliances**						P
clearnace cl and creepage distance dcr at / of:	System voltage (V)	OVC	U impulse (V)	required cl (mm)	cl (mm)	required dcr (mm)	dcr (mm)
AC circuit to PE on the terminal (BI)	PV: 550 V d.c. BAT: 58 V d.c. AC: 230 V a.c.	PV: II BAT: II AC: III	4000V	3.9	5.1	5.5	7.5
Between primary and secondary of battery boost transformer (RI)	PV: 550 V d.c. BAT: 58 V d.c. AC: 230 V a.c.	PV: II BAT: II AC: III	6000V	7.1	11.0	11.0	11.0
Battery boost transformer primary circuit to PE (BI)	PV: 550 V d.c. BAT: 58 V d.c. AC: 230 V a.c.	PV: II BAT: II AC: III	4000V	3.9	7.1	5.5	7.1
EAHI-6K-BAT PCB							
DVC C and PE screw H3 (BI)	PV: 550 V d.c. BAT: 58 V d.c. AC: 230 V a.c.	PV: II BAT: II AC: III	4000 V	3.9	4.7	3.9	4.7
DVC C and PE screw H4 (BI)	PV: 550 V d.c. BAT: 58 V d.c. AC: 230 V a.c.	PV: II BAT: II AC: III	4000 V	3.9	4.8	3.9	4.8
Insulation width of pin 1 of U3 and D9 (SI)	PV: 550 V d.c. BAT: 58 V d.c. AC: 230 V a.c.	PV: II BAT: II AC: III	4000 V	3.9	5.1	3.9	5.1
Insulation width of U1, U2, U3, U4 (SI)	PV: 550 V d.c. BAT: 58 V d.c. AC: 230 V a.c.	PV: II BAT: II AC: III	4000 V	3.9	8.0	3.9	8.0
Insulation width of U5 (SI)	PV: 550 V d.c. BAT: 58 V d.c. AC: 230 V a.c.	PV: II BAT: II AC: III	4000 V	3.9	8.0	3.9	8.0
Insulation width of pin 4 and pin 2 of U6 (SI)	PV: 550 V d.c. BAT: 58 V d.c. AC: 230 V a.c.	PV: II BAT: II AC: III	4000 V	3.9	4.0	3.9	4.0
Insulation width of primary and secondary pin of TX1, TX2 (SI)	PV: 550 V d.c. BAT: 58 V d.c. AC: 230 V a.c.	PV: II BAT: II AC: III	4000 V	3.9	8.5	3.9	8.5

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Insulation width of inner layer PCB close to R6 (SI)	PV: 550 V d.c. BAT: 58 V d.c. AC: 230 V a.c.	PV: II BAT: II AC: III	4000 V	3.9	4.6	3.9	4.6
Insulation width of inner layer PCB close to C31 (SI)	PV: 550 V d.c. BAT: 58 V d.c. AC: 230 V a.c.	PV: II BAT: II AC: III	4000 V	3.9	4.2	3.9	4.2
EAHI-6K-BUCK-BOOST PCB							
Insulation width of U6 (BI)	PV: 550 V d.c. BAT: 58 V d.c. AC: 230 V a.c.	PV: II BAT: II AC: III	4000 V	3.9	6.5	3.9	6.5
Insulation width of R63 and R77 (BI)	PV: 550 V d.c. BAT: 58 V d.c. AC: 230 V a.c.	PV: II BAT: II AC: III	4000 V	3.9	4.8	3.9	4.8
Insulation width of C68 (RI)	PV: 550 V d.c. BAT: 58 V d.c. AC: 230 V a.c.	PV: II BAT: II AC: III	4000 V	7.1	8.0	7.1	8.0
Insulation width of primary and secondary pin of TX3 (RI)	PV: 550 V d.c. BAT: 58 V d.c. AC: 230 V a.c.	PV: II BAT: II AC: III	4000 V	7.1	15.2	7.1	15.2
Insulation width P5 and PE screw H2 (BI)	PV: 550 V d.c. BAT: 58 V d.c. AC: 230 V a.c.	PV: II BAT: II AC: III	4000 V	3.9	5.9	3.9	5.9
Insulation width P2 and PE screw H4 (BI)	PV: 550 V d.c. BAT: 58 V d.c. AC: 230 V a.c.	PV: II BAT: II AC: III	4000 V	3.9	5.4	3.9	5.4
Insulation width DVC C circuit and PE screw H3 (BI)	PV: 550 V d.c. BAT: 58 V d.c. AC: 230 V a.c.	PV: II BAT: II AC: III	4000 V	3.9	6.3	3.9	6.3
Insulation width of U1, U2, U3, U4 (BI)	PV: 550 V d.c. BAT: 58 V d.c. AC: 230 V a.c.	PV: II BAT: II AC: III	4000 V	3.9	8.0	3.9	8.0
Insulation width under U1 (BI)	PV: 550 V d.c. BAT: 58 V d.c. AC: 230 V a.c.	PV: II BAT: II AC: III	4000 V	3.9	7.2	3.9	7.2
Insulation width under U2 (BI)	PV: 550 V d.c. BAT: 58 V d.c. AC: 230 V a.c.	PV: II BAT: II AC: III	4000 V	3.9	5.7	3.9	5.7
Insulation width under U3 (BI)	PV: 550 V d.c. BAT: 58 V d.c. AC: 230 V a.c.	PV: II BAT: II AC: III	4000 V	3.9	5.3	3.9	5.3
Insulation width under U4 (BI)	PV: 550 V d.c. BAT: 58 V d.c. AC: 230 V a.c.	PV: II BAT: II AC: III	4000 V	3.9	5.3	3.9	5.3
Insulation width of U10, U11 (BI)	PV: 550 V d.c. BAT: 58 V d.c. AC: 230 V a.c.	PV: II BAT: II AC: III	4000 V	3.9	7.1	3.9	7.1
Insulation width of Bus voltage sampling circuit through high resistance (BI)	PV: 550 V d.c. BAT: 58 V d.c. AC: 230 V a.c.	PV: II BAT: II AC: III	4000 V	3.9	1.4*4 =5.6	3.9	1.4*4 =5.6
Insulation width of primary and secondary pin of TX1, TX2 (BI)	PV: 550 V d.c. BAT: 58 V d.c. AC: 230 V a.c.	PV: II BAT: II AC: III	4000 V	3.9	8.6	3.9	8.6
Insulation width of primary and secondary pin of TX4 (BI)	PV: 550 V d.c. BAT: 58 V d.c. AC: 230 V a.c.	PV: II BAT: II AC: III	4000 V	3.9	6.6	3.9	6.6

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Insulation width of close R25 and control signal (BI)	PV: 550 V d.c. BAT: 58 V d.c. AC: 230 V a.c.	PV: II BAT: II AC: III	4000 V	3.9	4.0	3.9	4.0
Insulation width of metal part of IGBT and heatsink (BI)	PV: 550 V d.c. BAT: 58 V d.c. AC: 230 V a.c.	PV: II BAT: II AC: III	4000 V	3.9	4.7	3.9*	4.7
EAHI-6K-PV-INV PCB							
Insulation width of BUS+ terminal and PE screw H3 (BI)	PV: 550 V d.c. BAT: 58 V d.c. AC: 230 V a.c.	PV: II BAT: II AC: III	4000 V	3.9	5.6	3.9	5.6
Insulation width under C263, C262 (BI)	PV: 550 V d.c. BAT: 58 V d.c. AC: 230 V a.c.	PV: II BAT: II AC: III	4000 V	3.9	6.6	3.9	6.6
Insulation width of PV1 circuit and PE screw H1 (BI)	PV: 550 V d.c. BAT: 58 V d.c. AC: 230 V a.c.	PV: II BAT: II AC: III	4000 V	3.9	5.2	3.9	5.2
Insulation width of Load N terminal and C57 (BI)	PV: 550 V d.c. BAT: 58 V d.c. AC: 230 V a.c.	PV: II BAT: II AC: III	4000 V	3.9	6.9	3.9	6.9
Insulation width of Load L terminal and H15 (BI)	PV: 550 V d.c. BAT: 58 V d.c. AC: 230 V a.c.	PV: II BAT: II AC: III	4000 V	3.9	8.0	3.9	8.0
Insulation width of Load PE terminal and Grid N (BI)	PV: 550 V d.c. BAT: 58 V d.c. AC: 230 V a.c.	PV: II BAT: II AC: III	4000 V	3.9	5.7	3.9	5.7
Insulation width of P5 and P9 terminal (BI)	PV: 550 V d.c. BAT: 58 V d.c. AC: 230 V a.c.	PV: II BAT: II AC: III	4000 V	3.9	6.7	3.9	6.7
Insulation width of C130 and H2 (BI)	PV: 550 V d.c. BAT: 58 V d.c. AC: 230 V a.c.	PV: II BAT: II AC: III	4000 V	3.9	5.2	3.9	5.2
Insulation width of C100 and H5 (BI)	PV: 550 V d.c. BAT: 58 V d.c. AC: 230 V a.c.	PV: II BAT: II AC: III	4000 V	3.9	5.5	3.9	5.5
Insulation width of C42 and H6 (BI)	PV: 550 V d.c. BAT: 58 V d.c. AC: 230 V a.c.	PV: II BAT: II AC: III	4000 V	3.9	5.5	3.9	5.5
Insulation width of Load.N circuit and H12 (BI)	PV: 550 V d.c. BAT: 58 V d.c. AC: 230 V a.c.	PV: II BAT: II AC: III	4000 V	3.9	5.2	3.9	5.2
Insulation width of Y capacitor C141, C147 (BI)	PV: 550 V d.c. BAT: 58 V d.c. AC: 230 V a.c.	PV: II BAT: II AC: III	4000 V	3.9	5.4	3.9	5.4
Insulation width of primary and secondary pin of TX1 (BI)	PV: 550 V d.c. BAT: 58 V d.c. AC: 230 V a.c.	PV: II BAT: II AC: III	4000 V	3.9	10.1	3.9	10.1
Insulation width of primary and secondary pin of TX2 (BI)	PV: 550 V d.c. BAT: 58 V d.c. AC: 230 V a.c.	PV: II BAT: II AC: III	4000 V	3.9	15.2	3.9	15.2
Insulation width of U14, U17 (BI)	PV: 550 V d.c. BAT: 58 V d.c. AC: 230 V a.c.	PV: II BAT: II AC: III	4000 V	3.9	6.5	3.9	6.5
Insulation width of C5 and D5 (BI)	PV: 550 V d.c. BAT: 58 V d.c. AC: 230 V a.c.	PV: II BAT: II AC: III	4000 V	3.9	5.5	3.9	5.5

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Insulation width of primary and secondary pin of TX3, TX4, TX5, TX6 (BI)	PV: 550 V d.c. BAT: 58 V d.c. AC: 230 V a.c.	PV: II BAT: II AC: III	4000 V	3.9	7.0	3.9	7.0
Insulation width of U7, U10, U6, U11, U9, U8, U32, U59 (BI)	PV: 550 V d.c. BAT: 58 V d.c. AC: 230 V a.c.	PV: II BAT: II AC: III	4000 V	3.9	7.1	3.9	7.4
Sampling signal and DVC C circuit of HCT3, HCT5 (BI)	PV: 550 V d.c. BAT: 58 V d.c. AC: 230 V a.c.	PV: II BAT: II AC: III	4000 V	3.9	5.3	3.9	5.3
Sampling signal and DVC C circuit of HCT2, HCT4 (BI)	PV: 550 V d.c. BAT: 58 V d.c. AC: 230 V a.c.	PV: II BAT: II AC: III	4000 V	3.9	4.3	3.9	4.3
Sampling signal and DVC C circuit of HCT1 (BI)	PV: 550 V d.c. BAT: 58 V d.c. AC: 230 V a.c.	PV: II BAT: II AC: III	4000 V	3.9	4.1	3.9	4.1
Insulation width of Bus+, Bus- insulation impedance sampling through high re-sistance R128 (BI)	PV: 550 V d.c. BAT: 58 V d.c. AC: 230 V a.c.	PV: II BAT: II AC: III	4000 V	3.9	1.3*4 =5.2	3.9	1.3*4 =5.2
Insulation width of PV volt-age sampling circuit through high resistance R479 (BI)	PV: 550 V d.c. BAT: 58 V d.c. AC: 230 V a.c.	PV: II BAT: II AC: III	4000 V	3.9	1.3*5 =6.5	3.9	1.3*5 =6.5
Insulation width of INV volt-age sampling circuit through high resistance R95 (BI)	PV: 550 V d.c. BAT: 58 V d.c. AC: 230 V a.c.	PV: II BAT: II AC: III	4000 V	3.9	1.0*5 =5.0	3.9	1.0*5 =5.0
Insulation width of N and PE voltage sampling circuit through high resistance R270 (BI)	PV: 550 V d.c. BAT: 58 V d.c. AC: 230 V a.c.	PV: II BAT: II AC: III	4000 V	3.9	1.3*6 =7.8	3.9	1.3*6 =7.8
Insulation width of middle part of grid relay voltage sampling circuit through high resistance R234 (BI)	PV: 550 V d.c. BAT: 58 V d.c. AC: 230 V a.c.	PV: II BAT: II AC: III	4000 V	3.9	1.0*5 =5.0	3.9	1.0*5 =5.0
Insulation width of Grid volt-age sampling circuit through high resistance R203 (BI)	PV: 550 V d.c. BAT: 58 V d.c. AC: 230 V a.c.	PV: II BAT: II AC: III	4000 V	3.9	1.0*5 =5.0	3.9	1.0*5 =5.0
Insulation width of Load volt-age sampling circuit through high resistance R170 (BI)	PV: 550 V d.c. BAT: 58 V d.c. AC: 230 V a.c.	PV: II BAT: II AC: III	4000 V	3.9	1.0*5 =5.0	3.9	1.0*5 =5.0
Insulation width of Bus+, Bus- voltage sampling circuit through high resistance R472 (BI)	PV: 550 V d.c. BAT: 58 V d.c. AC: 230 V a.c.	PV: II BAT: II AC: III	4000 V	3.9	1.0*5 =5.0	3.9	1.0*5 =5.0
Insulation width of CN4 and P22 circuit (RI)	PV: 550 V d.c. BAT: 58 V d.c. AC: 230 V a.c.	PV: II BAT: II AC: III	6000 V	7.1	9.9	7.1	9.9
Insulation width of TP6 and D26 (RI)	PV: 550 V d.c. BAT: 58 V d.c. AC: 230 V a.c.	PV: II BAT: II AC: III	6000 V	7.1	10.7	7.1	10.7
Insulation width of TP6 and HCT4 (RI)	PV: 550 V d.c. BAT: 58 V d.c. AC: 230 V a.c.	PV: II BAT: II AC: III	6000 V	7.1	7.5	7.1	7.5

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Insulation width of metal part of IGBT and heatsink (BI)	PV: 550 V d.c. BAT: 58 V d.c. AC: 230 V a.c.	PV: II BAT: II AC: III	4000 V	3.9	4.7	3.9*	4.7
EAHI-6K-PV-COMM PCB							
Insulation width of U43 (SI)	PV: 550 V d.c. BAT: 58 V d.c. AC: 230 V a.c.	PV: II BAT: II AC: III	4000 V	3.9	6.5	3.9	6.5
Insulation width of U2 ((SI)	PV: 550 V d.c. BAT: 58 V d.c. AC: 230 V a.c.	PV: II BAT: II AC: III	4000 V	3.9	7.1	3.9	7.4
Insulation width of U3 (SI)	PV: 550 V d.c. BAT: 58 V d.c. AC: 230 V a.c.	PV: II BAT: II AC: III	4000 V	3.9	6.5	3.9	6.5
Insulation width of U5 (SI)	PV: 550 V d.c. BAT: 58 V d.c. AC: 230 V a.c.	PV: II BAT: II AC: III	4000 V	3.9	7.4	3.9	7.4
Insulation width of U7 (SI)	PV: 550 V d.c. BAT: 58 V d.c. AC: 230 V a.c.	PV: II BAT: II AC: III	4000 V	3.9	7.2	3.9	7.2
Insulation width of inner layer PCB close R397 (SI)	PV: 550 V d.c. BAT: 58 V d.c. AC: 230 V a.c.	PV: II BAT: II AC: III	4000 V	3.9	4.2	3.9	4.2
EAHI-6K-RELAY PCB							
Insulation width of INV.L2 and PE screw H3 (BI)	PV: 550 V d.c. BAT: 58 V d.c. AC: 230 V a.c.	PV: II BAT: II AC: III	4000 V	3.9	7.6	3.9	7.6
The short insulation width of Relay control signal circuit and AC circuit (BI)	PV: 550 V d.c. BAT: 58 V d.c. AC: 230 V a.c.	PV: II BAT: II AC: III	4000 V	3.9	5.3	3.9	5.3
The short insulation width of J2 and J3 (BI)	PV: 550 V d.c. BAT: 58 V d.c. AC: 230 V a.c.	PV: II BAT: II AC: III	4000 V	3.9	5.6	3.9	5.6
Between the contacts of 2 grid relays in series (BI)	PV: 550 V d.c. BAT: 58 V d.c. AC: 230 V a.c.	PV: II BAT: II AC: III	4000 V	3.9	4.0**	3.9	4.0**
EAHI-6K-LCD PCB							
Insulation width of hazardous circuit and PE (BI)	PV: 550 V d.c. BAT: 58 V d.c. AC: 230 V a.c.	PV: II BAT: II AC: III	4000 V	3.9	4.8	3.9	4.8
EAHI-6K-LED PCB							
Insulation width of hazardous circuit and PE (BI)	PV: 550 V d.c. BAT: 58 V d.c. AC: 230 V a.c.	PV: II BAT: II AC: III	4000 V	3.9	10.6	3.9	10.6

Note: Altitude ≤ 4000m,

Remark:

*The ceramic chips are used for providing basic insulation between IGBT and heatsink, the creepage distance requirement is considered to equal the associated clearance requirement.

** The air gap of the grid relay contact is 2 mm, the required basic insulation is provided by the total of the air gaps in two relays in series.

In the inner layer of PCB, the pollution degree is considered as PD 1 to calculate the creepage distance requirement.

Supplementary information:

BI: Basic insulation, SI: Supplementary insulation, RI: Reinforced insulation.

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

test voltage applied between:	test voltage (V)	impulse with-stand voltage (V)	partial discharge extinction voltage (V)	result
PV input / grid / AC load to PE (BI)	2120Vd.c.	4720V	--	Pass
Battery terminal to PE (BI)	110Vd.c.	560V	--	Pass
PV input / grid / AC load to all com-munication ports (RI)	4240Vd.c.	7280V	--	Pass
PV input / grid / AC load to battery terminal (RI)	4240Vd.c.	7280V	--	Pass
Battery terminal to all communication ports (RI)	220Vd.c.	940V	--	Pass
Supplementary information: Relays are closed before applying these tests.				

9.2	TABLE: Limited power sources	P

Circuit output tested:

Note: Measured Uoc (V) with all load circuits disconnected:

Components	Sample No.	Uoc (V)	I_{sc} (A)		VA	
			Meas.	Limit	Meas.	Limit
CN1 pin 24 and pin 26 on the EAHI-6K-LCD board	--	3.30Vdc	7.41A	≤8.0	4.12VA	≤5·Uoc
CON1 pin 1 and pin 2 on the EAHI-6K-LED board	--	12.29Vdc	7.60A	≤8.0	43.93VA	≤5·Uoc

supplementary information:

Sc=Short circuit, Oc=Open circuit

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list of critical components					
Object / part No.	Manufacturer/ trademark	Type / model	Technical data	Standard	Mark(s) of conformity
Refer to CDF document					

…….... End of test report ……..

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TEST REPORT
IEC 62109-2:2011
Safety of power converters for use in photovoltaic power systems – Part 2: Particular requirements for inverters

Report Number..... :	64.290.22.30840.01 part 2 of 2
Date of issue ..... :	2023-06-16
Total number of pages ..... :	29 pages

Applicant's name ..... :	EAST Group Co., Ltd.
Address..... :	No.6 Northern Industry Road, Songshan Lake Sci. & Tech. Industry Park, 523808 DongGuan City, Guangdong Province, PEOPLE'S REPUBLIC OF CHINA

Test specification:

Standard ..... :	EN 62109-2:2011
Test procedure..... :	CE_LVD
Non-standard test method……..:	N/A

Test Report Form No. ..... :	IEC62109_2B
Test Report Form(s) Originator .... :	LCIE - Laboratoire Central des Industries Electriques
Master TRF ..... :	Dated 2016-08

If this Test Report Form is used by non-IECEE members, the IECEE/IEC logo and the reference to the CB Scheme procedure shall be removed.

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.
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Test item description ..... :	Hybrid Inverter	
Trade Mark ..... :	EAST	
Manufacturer ..... :	Same as the applicant	
Model/Type reference ..... :	EAHI-6000-SL, EAHI-5000-SL, EAHI-3600-SL, EAHI-3000-SL	
Ratings ..... :	64.290.22.30840.01 part 1 of 2, page 7-8	
Responsible Testing Laboratory (as applicable), testing procedure and testing location(s):		
☒ **Testing Laboratory:**	TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch	
Testing location/ address..... :	TÜV SÜD Testing Center, D1 building, No. 63 Chuangqi Road, Shilou Town, Panyu District, Guangzhou 511447, P.R. China	
Tested by (name, function, signature) ..... :	Amy Feng (Project Handler)	Amy Feng
Approved by (name, function, signature)... :	Vincent Liang (Designated Reviewer)	Vincent Liang

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

This test report contains 2 parts listed in below table:

Item	Description	Pages
Part 1	IEC 62109-1:2010, EN 62109-1:2010 test report	96
Part 2	IEC 62109-2:2011, EN 62109-2:2011 test report	29

This test report shall be also used in conjunction with 32 pages of photo documentation and 38 pages CDF.

Summary of testing:

All tests were carried out according to IEC 62109-2:2011. The text of IEC 62109-2:2011 was approved by CENELEC as a European Standard without any modification.

Tests performed (name of test and test clause):

Clause	Requirement
4.4.4.15	Fault-tolerance of protection for grid-interactive inverters
4.4.4.16	Stand-alone inverters – Load transfer test
4.4.4.17	Cooling system failure – Blanketing test
4.7.4.2	Steady state output voltage at nominal DC input
4.7.4.3	Steady state output voltage across the DC input range
4.7.4.4	Load step response of the output voltage at nominal DC input
4.7.4.5	Steady state output frequency
4.7.5.2	Sinusoidal output voltage waveform requirements
4.8.2.1	Array insulation resistance detection for inverters for ungrounded arrays
4.8.3.5	Protection by residual current monitoring

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

☒ The product fulfils the requirements of _EN 62109-2:2011_

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 NCBs that own these marks.

See Report No.: 64.290.22.30840.01 part 1 of 2.

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Guangzhou, 501656, P.R.China

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 system
IT testing, phase-phase voltage (V) ..... :	N/A
Class of equipment..... :	☒ Class I ☐ Class II ☐ Class III ☐ Not classified
Mass of equipment (kg) ..... :	Approx. 24.8 kg for models EAHI-6000-SL and EAHI-5000-SL, 21.4 kg for models EAHI-3600-SL and EAHI-3000-SL
Dimensions (Width x High x Depth mm)……..:	548×440×197
Pollution degree..... :	PD 3 (External), PD 2 (Internal)
IP protection class ..... :	IP 66
Testing..... :	
Date of receipt of test item ..... :	2022-12-21
Date (s) of performance of tests..... :	2022-12-21 to 2023-06-16
Possible test case verdicts:	
- test case does not apply to the test object..... :	N/A
- test object does meet the requirement..... :	P (Pass)
- test object was not evaluated for the requirement . :	N/E
- test object does not meet the requirement..... :	F (Fail)

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General remarks:

"(See Enclosure #)" refers to additional information appended to the report.
"(See appended table)" refers to a table appended to the report.
The tests result presented in this report relate only to the object tested.

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List of test equipment must be kept on file and available for review.

Additional test data and/or information provided in the attachments to this report.
Throughout this report a ☐ comma / ☒ point is used as the decimal separator.

Abbreviations used in the report:
Basic insulation (BI); Supplementary insulation (SI); Double insulation (DI); Reinforced insulation (RI); Functional insulation (FI); Single fault condition (SFC); Normal condition (NC); Supply overvoltage category (OVC); Pollution degree (PD), CDF (Data form for electrical equipment and machinery)

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).....:

Factory name: EAST Group Co., Ltd.
Address: No.6 Northern Industry Road, Songshan Lake Sci. & Tech. Industry Park, 523808 DongGuan City, Guangdong Province, PEOPLE'S REPUBLIC OF CHINA

General product information:
See Report No.: 64.290.22.30840.01 part 1 of 2

Model different:
See Report No.: 64.290.22.30840.01 part 1 of 2

Electrical Ratings:
See Report No.: 64.290.22.30840.01 part 1 of 2

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IEC 62109-2			
Clause	Requirement – Test	Result – Remark	Verdict

4	General testing requirements		P
4.4.4	Single fault conditions to be applied		P
4.4.4.15	Fault-tolerance of protection for grid-interactive inverters		P
4.4.4.15.1	Fault-tolerance of residual current monitoring according to 4.8.3.5: the residual current monitoring system operates properly		P
	a)..- The inverter ceases to operate	(see appended table) 4.4.4.15.1	P
	- Indicates a fault in accordance with §13.9		P
	- Disconnect from the mains		P
	- not re-connect after any sequence of removing and reconnecting PV power		P
	- not re-connect after any sequence of removing and reconnecting AC power		P
	- not re-connect after any sequence of removing and reconnecting both PV and AC power		P
	b)..- The inverter continues to operate		P
	- the residual current monitoring system operates properly under single fault condition		P
	- Indicates a fault in accordance with §13.9		P
	c)..- The inverter continues to operate regardless of loss of residual current monitoring functionality		N/A
	- not re-connect after any sequence of removing and reconnecting PV power		N/A
	- not re-connect after any sequence of removing and reconnecting AC power		N/A
	- not re-connect after any sequence of removing and reconnecting both PV and AC power		N/A
	- Indicates a fault in accordance with §13.9		N/A
4.4.4.15.2	Fault-tolerance of automatic disconnecting means		P
4.4.4.15.2.1	The means provided for automatic disconnection of a grid-interactive inverter from the mains shall:		P
	- disconnect all grounded current-carrying		P

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Clause	Requirement – Test	Result – Remark	Verdict
	conductors from the mains		
	- disconnect all ungrounded current-carrying conductors from the mains		P
	- be such that with a single fault applied to the disconnection means or to any other location in the inverter, at least basic insulation or simple separation is maintained between the PV array and the mains when the disconnecting means is intended to be in the open state.	See appended table 4.4.4.15.2 Fault-tolerance of automatic disconnecting	P
4.4.4.15.2.2	Design of insulation or separation complies with requirements of 7.3.7 of Part 1: report here Part 1 comment and verdict.		P
4.4.4.15.2.3	For non-isolated inverter, automatic checking of the isolation provided by a disconnect means after single fault.	(see appended table)	P
	If the check fail: - any still-functional disconnection means shall be left in the open position		P
	- at least basic or simple separation shall be maintained between the PV input and the mains		P
	- the inverter shall not start operation		P
	- the inverter shall indicate a fault in accordance with 13.9		P
4.4.4.16	A stand-alone inverter with a transfer switch to transfer AC loads from the mains or other AC bypass source to the inverter output:	Stand-alone mode was checked by the tests accordingly for model: EAHI-6000-SL	P
	- shall continue to operate normally		P
	- shall not present a risk of fire as the result of an out-of-phase transfer		P
	- shall not present a risk of shock as the result of an out-of-phase transfer		P
	- And having control preventing switching: components for malfunctioning ……..…:		P
4.4.4.17	Cooling system failure – Blanketing test No hazards according to the criteria of sub-clause 4.4.3 of Part 1 shall result from blanketing the inverter. This test is not required for inverters restricted to use only in closed electrical operating areas.	See appended test table Cooling system failure – Blanketing test.	P

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Clause	Requirement – Test	Result – Remark	Verdict
	Test stop condition: time duration value or stabilized temperature ……..:		P
4.7	Electrical ratings tests		P
4.7.4	Stand-alone Inverter AC output voltage and frequency		P
4.7.4.1	General		P
4.7.4.2	Steady state output voltage at nominal DC input The steady-state AC output voltage shall not be less than 90 % or more than 110 % of the rated nominal voltage with the inverter supplied with its nominal value of DC input voltage.	(See attached table)	P
4.7.4.3	Steady state output voltage across the DC input range The steady-state AC output voltage shall not be less than 85 % or more than 110 % of the rated nominal voltage with the inverter supplied with any value within the rated range of DC input voltage.	(See attached table)	P
4.7.4.4	Load step response of the output voltage at nominal DC input The AC output voltage shall not be less than 85 % or more than 110 % of the rated nominal voltage for more than 1,5 s after application or removal of a resistive load.	(See attached table)	P
4.7.4.5	Steady state output frequency The steady-state AC output frequency shall not vary from the nominal value by more than +4 % or – 6 %.	(See attached table)	P
4.7.5	Stand-alone inverter output voltage waveform		P
4.7.5.1	General		P
4.7.5.2	The AC output voltage waveform of a sinusoidal output stand-alone inverter shall have a total harmonic distortion (THD) not exceeding of 10 % and no individual harmonic at a level exceeding 6 %.	(See attached table)	P
4.7.5.3	Non-sinusoidal output waveform requirements		N/A
4.7.5.3.1	General		N/A
4.7.5.3.2	The total harmonic distortion (THD) of the voltage waveform shall not exceed 40 %.		N/A
4.7.5.3.3	The slope of the rising and falling edges of the positive and negative half-cycles of the voltage waveform shall not exceed 10 V/µs measured		N/A

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Clause	Requirement – Test	Result – Remark	Verdict
	between the points at which the waveform has a voltage of 10 % and 90 % of the peak voltage for that half-cycle.		
4.7.5.3.4	The absolute value of the peak voltage of the positive and negative half-cycles of the waveform shall not exceed 1,414 times 110 % of the RMS value of the rated nominal AC output voltage.		N/A
4.7.5.4	Information requirements for non-sinusoidal waveforms The instructions provided with a stand-alone inverter not complying with 4.7.5.2 shall include the information in 5.3.2.6.		N/A
4.7.5.5	Output voltage waveform requirements for inverters for dedicated loads. For an inverter that is intended only for use with a known dedicated load, the following requirements may be used as an alternative to the waveform requirements in 4.7.5.2 to 4.7.5.3.		N/A
	The combination of the inverter and dedicated load shall be evaluated to ensure that the output waveform does not cause any hazards in the load equipment and inverter, or cause the load equipment to fail to comply with the applicable product safety standards.		N/A
	The inverter shall be marked with symbols 9 and 15 of Table C.1 of Part 1.		N/A
	The installation instructions provided with the inverter shall include the information in 5.3.2.13.		N/A
4.8	Additional tests for grid-interactive inverters		P
4.8.1	General requirements regarding inverter isolation and array grounding		P
	- Type of Array grounding supported ……:	Ungrounded.	P
	- Inverter isolation ……..:	Transformer-less type.	P
4.8.2	Array insulation resistance detection for inverters for ungrounded and functionally grounded arrays		P
4.8.2.1	Array insulation resistance detection for inverters for ungrounded arrays		P
	Inverter shall have means to measure DC insulation resistance from PV input (array) to ground before starting operation		P
	Or Inverter shall be provided with instruction in accordance with 5.3.2.11.		N/A
	Measured DC insulation resistance: ……:		P

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Clause	Requirement – Test	Result – Remark	Verdict
	Inverter measurement circuit shall be capable of detecting insulation resistance below the limit value R= Vmax/30mA under normal conditions	The limit of the PV array insulation resistance: Vmax PV =550 Vd.c. (see appended table)	P
	Inverter measurement circuit shall be capable of detecting insulation resistance below the limit value R= Vmax/30mA with ground fault in the PV array		P
	Isolated inverters shall indicate a fault if the insulation resistance is less than the limit value		P
	Isolated inverter fault indication maintained until insulation resistance has recovered to a value higher than the limit value		P
	Non-isolated inverters, or inverters with isolation not complying with the leakage current limits in the minimum inverter isolation requirements in Table 30:		P
	- shall indicate a fault in accordance with 13.9		P
	- shall not connect to the mains		P
4.8.2.2	Array insulation resistance detection for inverters for functionally grounded arrays		N/A
	a-1)The value of the total resistance, including the intentional resistance for array functional grounding, the expected insulation resistance of the array to ground, and the resistance of any other networks connected to ground (for example measurement networks) must not be lower than R = (VMAX PV/30 mA) ohms.		N/A
	a-2) The installation instructions shall include the information required in 5.3.2.12.		N/A
	b-1) As an alternative to a), or if a resistor value lower than in a) is used, the inverter shall incorporate means to detect, during operation, if the total current through the resistor and any networks (for example measurement networks) in parallel with it, exceeds the residual current values and times in Table 31		N/A
	b-2) Inverter shall either disconnect the resistor or limit the current by other means ……:		N/A
	b-3) If the inverter is a non-isolated inverter, or has isolation not complying with the leakage current limits in the minimum inverter isolation requirements in Table 30, it shall also disconnect from the mains.		N/A
	c) The inverter shall have means to measure the DC insulation resistance from the PV input to ground before starting operation, in accordance		N/A

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IEC 62109-2			
Clause	Requirement – Test	Result – Remark	Verdict
	with 4.8.2.1.		
4.8.3	Array residual current detection		P
4.8.3.1	General		P
4.8.3.2	30 mA touch current type test for isolated inverters	Transformer- less type	N/A
4.8.3.3	Fire hazard residual current type test for isolated inverters	Transformer- less type	N/A
4.8.3.4	Protection by application of RCD's		N/A
	- The requirement for additional protection in 4.8.3.1 can be met by provision of an RCD with a residual current setting of 30 mA, located between the inverter and the mains.		N/A
	- The selection of the RCD type to ensure compatibility with the inverter must be made according to rules for RCD selection in Part 1.		N/A
	- The RCD provided integral to the inverter, or		N/A
	- The RDC provided by the installer if details of the rating, type, and location for the RCD are given in the installation instructions per 5.3.2.9.		N/A
4.8.3.5	Protection by residual current monitoring		P
4.8.3.5.1	General		P
	Where required by Table 30, the inverter shall provide residual current monitoring that functions whenever the inverter is connected to the mains with the automatic disconnection means closed.		P
	The residual current monitoring means shall measure the total (both a.c. and d.c. components) RMS current.		P
	As indicated in Table 30 for different inverter types, array types, and inverter isolation levels, detection may be required for excessive continuous residual current, excessive sudden changes in residual current, or both, according to the following limits:		P
	a) Continuous residual current: The inverter shall disconnect within 0,3 s and indicate a fault in accordance with 13.9 if the continuous residual current exceeds:		P
	- maximum 300 mA for inverters with continuous ouput power rating ≤30kV;		P
	- maximum 10 mA per kVA of rated continuous output power for inverters with continuous output power rating > 30 kVA.		N/A
	The inverter may attempt to re-connect if the array		P

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Clause	Requirement – Test	Result – Remark	Verdict
	insulation resistance meets the limit in 4.8.2.		
	b) Sudden changes in residual current: The inverter shall disconnect from the mains within the time specified in Table 31		P
	The inverter indicates a fault in accordance with 13.9, if a sudden increase in the RMS residual current is detected exceeding the value in the table.		P
	The inverter may attempt to re-connect if the array insulation resistance meets the limit in 4.8.2.		P
4.8.3.5.2	Test for detection of excessive continuous residual current: test repeated 5 times and time to disconnect shall not exceed 0,3 s.		P
4.8.3.5.3	Test for detection of sudden changes in residual current repeated 5 times and each of the 5 results shall not exceed the time limit indicated in for each row (30mA, 60mA and150mA) of Table 31.		P
4.8.3.6	Systems located in closed electrical operating areas		N/A
	The protection against shock hazard is not required if the installation information provided with the inverter indicates the restriction for use in a closed electrical operating area, and		N/A
	Installation information indicates what forms of shock hazard protection are and are not provided integral to the inverter, in accordance with 5.3.2.7.		N/A
	The inverter shall be marked as in 5.2.2.6.		N/A
5	MARKING AND DOCUMENTATION		P
5.1	Marking		P
5.1.4	Equipment ratings		P
	PV input ratings:	See marking label.	P
	- Vmax PV (absolute maximum) (d.c. V)		P
	- Isc PV (absolute maximum) (d.c. A)		P
	a.c. output ratings:	See marking label.	P
	- Voltage (nominal or range) (a.c. V)		P
	- Current (maximum continuous) (a.c. A)		P
	- Frequency (nominal or range) (Hz)		P
	- Power (maximum continuous) (W or VA)		P
	- Power factor range		P
	a.c input ratings:	See marking label.	P

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Clause	Requirement – Test	Result – Remark	Verdict

	- Voltage (nominal or range) (a.c. V)		P
	- Current (maximum continuous) (a.c. A)		P
	- Frequency (nominal or range) (Hz)		P
	d.c. output ratings:		P
	- Voltage (nominal or range) (d.c. V)		P
	- Current (maximum continuous) (d.c. A)		P
	Protective class (I or II or III)	Class I	P
	Ingress protection (IP) rating per part 1	IP 66	P
	An inverter that is adjustable for more than one nominal output voltage shall be marked to indicate the particular voltage for which it is set when shipped from the factory.		N/A
5.2	Warning markings		P
5.2.2	Content for warning markings		P
5.2.2.6	Inverters for closed electrical operating areas		N/A
	Where required by 4.8.3.6, an inverter not provided with full protection against shock hazard on the PV array shall be marked with a warning that the inverter is only for use in a closed electrical operating area, and referring to the installation instructions.		N/A
5.3	Documentation		P
5.3.2	Information related to installation		P
5.3.2.1	Ratings. Subclause 5.3.2 of Part 1 requires the documentation to include ratings information for each input and output. For inverters this information shall be as in Table 33 below. Only those ratings that are applicable based on the type of inverter are required.		P
	PV input quantities:	See user manual	P
	- Vmax PV (absolute maximum) (d.c. V)		P
	- PV input operating voltage range (d.c. V)		P
	- Maximum operating PV input current (d.c. A)		P
	- Isc PV (absolute maximum) (d.c. A)		P
	- Max. inverter backfeed current to the array (a.c. or d.c. A)		P
	a.c. output quantities:		P
	- Voltage (nominal or range) (a.c. V)		P
	- Current (maximum continuous) (a.c. A)		P

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Clause	Requirement – Test	Result – Remark	Verdict
	- Current (inrush) (a.c. A, peak and duration)		P
	- Frequency (nominal or range) (Hz)		P
	- Power (maximum continuous) (W or VA)		P
	- Power factor range		P
	- Maximum output fault current (a.c. A, peak and duration or RMS)		P
	- Maximum output overcurrent protection (a.c. A)		P
	a.c. input quantities:		P
	- Voltage (nominal or range) (a.c. V)		P
	- Current (maximum continuous) (a.c. A)		P
	- Current (inrush) (a.c. A, peak and duration)		P
	- Frequency (nominal or range) (Hz)		P
	d.c input (other than PV) quantities:		P
	- Voltage (nominal or range) (d.c. V)		P
	- Nominal battery voltage (d.c. V)		P
	- Current (maximum continuous) (d.c. A)		P
	d.c. output quantities:		P
	- Voltage (nominal or range) (d.c. V)		P
	- Nominal battery voltage (d.c. V)		P
	- Current (maximum continuous) (d.c. A)		P
	Protective class (I or II or III)	Class I	P
	Ingress protection (IP) rating per part 1	IP66	P
5.3.2.2	Grid-interactive inverter setpoints	Non-adjustable to operator, setting by manufacture before shipment	N/A
	For a grid-interactive unit with field adjustable trip points, trip times, or reconnect times, the presence of such controls, the means for adjustment, the factory default values, and the limits of the ranges of adjustability shall be provided in the documentation for the PCE or in other format such as on a website. Provided solution: …….		N/A
	The setting of field adjustable setpoints shall be accessible from the PCE		N/A
5.3.2.3	Transformers and isolation	Transformer-less	N/A

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Clause	Requirement – Test	Result – Remark	Verdict
	whether an internal isolation transformer is provided, and if so, what level of insulation (functional, basic, reinforced, or double) is provided by that transformer. The instructions shall also indicate what the resulting installation requirements are regarding such things as earthing or not earthing the array, providing external residual current detection devices, etc.		N/A
	An inverter shall be provided with information to the installer regarding:		N/A
	- providing of internal isolation transformer		N/A
	- the level of insulation (functional, basic, reinforced, or double)		N/A
	The instructions shall also indicate what the resulting installation requirements are regarding:		N/A
	- earthing or not earthing the array	Not earthing	N/A
	- providing external residual current detection devices		N/A
	- requiring an external isolation transformer,		N/A
5.3.2.4	Transformers required but not provided		N/A
	An inverter that requires an external isolation transformer not provided with the unit, shall be provided with instructions that specify, and for the external isolation transformer with which it is intended to be used:		N/A
	- the configuration type		N/A
	- electrical ratings		N/A
	- environmental ratings		N/A
5.3.2.5	PV modules for non-isolated inverters		P
	Non-isolated inverters shall be provided with installation instructions that require PV modules that have an IEC 61730 Class A rating		P
	If the maximum AC mains operating voltage is higher than the PV array maximum system voltage then the instructions shall require PV modules that have a maximum system voltage rating based upon the AC mains voltage.		N/A
5.3.2.6	Non-sinusoidal output waveform information		N/A
	The instruction manual for a stand-alone inverter not complying with 4.7.5.2 shall include a warning that:		N/A
	- the waveform is not sinusoidal,		N/A

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Clause	Requirement – Test	Result – Remark	Verdict
	- some loads may experience increased heating,		N/A
	- the user should consult the manufacturers of the intended load equipment before operating that load with the inverter		N/A
	The inverter manufacturer shall provide information regarding:		N/A
	- what types of loads may experience increased heating		N/A
	- recommendations for maximum operating times with such loads		N/A
	The inverter manufacturer shall specify for the waveforms as determined by the testing in 4.7.5.3.2 through 4.7.5.3.4.:		N/A
	- THD		N/A
	- slope		N/A
	- peak voltage		N/A
5.3.2.7	Systems located in closed electrical operating areas		N/A
	Where required by 4.8.3.6, an inverter not provided with full protection against shock hazard on the PV array shall be provided with installation instructions:		N/A
	- requiring that the inverter and the array must be installed in closed electrical operating areas		N/A
	- indicating which forms of shock hazard protection are and are not provided integral to the inverter (for example the RCD, isolation transformer complying with the 30 mA touch current limit, or residual current monitoring for sudden changes)		N/A
5.3.2.8	Stand-alone inverter output circuit bonding		P
	Where required by 7.3.10, the documentation for an inverter shall include the following:		P
	- if output circuit bonding is required but is not provided integral to the inverter, the required means shall be described in the installation instructions, including which conductor is to be bonded and the required current carrying capability or cross-section of the bonding means;		P
	- if the output circuit is intended to be floating, the documentation for the inverter shall indicate that the output is floating.		N/A

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IEC 62109-2			
Clause	Requirement – Test	Result – Remark	Verdict
5.3.2.9	Protection by application of RCD's		N/A
	Where the requirement for additional protection in 4.8.3.1 is met by requiring an RCD that is not provided integral to the inverter, as allowed by 4.8.3.4, the installation instructions shall state the need for the RCD.		N/A
	and shall specify its rating, type, and required circuit location		N/A
5.3.2.10	Remote indication of faults		P
	The installation instructions shall include an explanation of how to properly make connections to (where applicable), and use, the electrical or electronic fault indication required by 13.9.		P
5.3.2.11	External array insulation resistance measurement and response		N/A
	The installation instructions for an inverter for use with ungrounded arrays that does not incorporate all the aspects of the insulation resistance measurement and response requirements in 4.8.2.1, must include:		N/A
	- for isolated inverters: an explanation of what aspects of array insulation resistance measurement and response are not provided, and		N/A
	- an instruction to consult local regulations to determine if any additional functions are required or not;		N/A
	- for non-isolated inverters: an explanation of what external equipment must be provided in the system, and		N/A
	- what the setpoints and response implemented by that equipment must be, and:		N/A
	- how that equipment is to be interfaced with the rest of the system.		N/A
5.3.2.12	Array functional grounding information		N/A
	Where approach a) of 4.8.2.2 is used, the installation instructions for the inverter shall include all of the following:		N/A
	a) the value of the total resistance between the PV circuit and ground integral to the inverter ……		N/A

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IEC 62109-2			
Clause	Requirement – Test	Result – Remark	Verdict
	b) the minimum array insulation resistance to ground that system designer or installer must meet when selecting the PV panel and system design, based on the minimum value that the design of the PV functional grounding in the inverter was based on ……;		N/A
	c) the minimum value of the total resistance R = VMAX PV/30 mA that the system must meet, with an explanation of how to calculate the total ……;		N/A
	d) a warning that there is a risk of shock hazard if the total minimum resistance requirement is not met.		N/A
5.3.2.13	Stand-alone inverters for dedicated loads		N/A
	Where the approach of 4.7.5.5 is used, the installation instructions for the inverter shall include a warning that the inverter is only to be used with the dedicated load for which it was evaluated, and		N/A
	shall specify the dedicated load.		N/A
5.3.2.14	Identification of firmware version(s)		P
	An inverter utilizing firmware for any protective functions shall provide means to identify the firmware version.		P
	This can be a marking, but the information can also be provided by a display panel, communications port or any other type of user interface…….	The firmware version can be identified on the display panel.	P
7	Protection against electric shock and energy hazards		P
7.3	Protection against electric shock		P
7.3.10	Additional requirements for stand-alone inverters		P
	One circuit conductor bonded to earth to create a grounded conductor and an earthed system.		P
	The means used to bond the grounded conductor to protective earth provided within the inverter or		P
	as part of the installation		N/A
	If not provided integral to the inverter, the required means shall be described in the installation instructions as per 5.3.2.8.		N/A

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Clause	Requirement – Test	Result – Remark	Verdict
	The means used to bond the grounded conductor to protective earth shall comply with the requirements for protective bonding in Part 1,		P
	If the bond can only ever carry fault currents in stand-alone mode, the maximum current for the bond is determined by the inverter maximum output fault current.		P
	Output circuit bonding arrangements shall ensure that in any mode of operation, the system only has the grounded circuit conductor bonded to earth in one place at a time.		P
	Switching arrangements may be used, in which case the switching device used is to be subjected to the bond impedance test along with the rest of the bonding path		N/A
	Inverters intended to have a circuit conductor bonded to earth shall not impose any normal current on the bond except for leakage current.		P
	Outputs that are intentionally floating with no circuit conductor bonded to ground, must not have any voltages with respect to ground that are a shock hazard in accordance with Clause 7 of Parts 1 and 2.		N/A
	The documentation for the inverter shall indicate that the output is floating as per 5.3.2.8.		N/A
7.3.11	Functionally grounded arrays		N/A
	All PV conductors in a functionally grounded array shall be treated as being live parts with respect to protection against electric shock.		N/A
9	Protection against fire hazards		P
9.3	Short-circuit and overcurrent protection		P
9.3.4	Inverter backfeed current onto the array		P
	The backfeed current testing and documentation requirements in Part 1 apply, including but not limited to the following.		P
	Inverter backfeed current onto the PV array maximum value……		P
	This inverter backfeed current value shall be provided in the installation instructions regardless of the value of the current, in accordance with Table 33.		P

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IEC 62109-2			
Clause	Requirement – Test	Result – Remark	Verdict

13	Physical requirements		P
13.9	Fault indication		P
	Where this Part 2 requires the inverter to indicate a fault, both of the following shall be provided:		P
	a) a visible or audible indication, integral to the inverter, and detectable from outside the inverter, and		P
	b) an electrical or electronic indication that can be remotely accessed and used.		P
	The installation instructions shall include information regarding how to properly make connections (where applicable) and use the electrical or electronic means in b) above, in accordance with 5.3.2.10.		P

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4.4.4	**TABLE: Single fault condition to be applied**		P
	Ambient temperature (°C) .....:	25 °C	—
	Power source for EUT: Manufacturer, model/type, output rating .....:	--	—
4.4.4.15.1	Fault-tolerance of residual current monitoring		

Component No.	Fault	Supply voltage (V)	Test time	Fuse #	Fuse current (A)	Observation
HCT1 pin1 and pin 2 on the PVINV board	S-C	PV: 420Vd.c. AC: 230Va.c.	3min	--	--	The fault was applied after the unit operation. After the unit applied the fault, the unit shutdown. No hazard. No damage. After removed the fault, the unit operated normally.
R253 on the PVINV board	O-C	PV: 420Vd.c. AC: 230Va.c.	3min	--	--	The fault was applied after the unit operation. After the unit applied the fault, the unit operated as normal, and the leakage current detection function was normal. No hazard. No damage.
R375 on the CNTL board	S-C	PV: 420Vd.c. AC: 230Va.c.	3min	--	--	The fault was applied after the unit operation. After the unit applied the fault, the unit operated as normal, and the leakage current detection function was normal. No hazard. No damage.
R386 on the CNTL board	S-C	PV: 420Vd.c. AC: 230Va.c.	3min	--	--	The fault was applied after the unit operation. After the unit applied the fault, the unit shutdown, and the LED was steady red, leakage current abnormal fault was detected. No hazard. No damage. After removed the fault, the unit operated normally.
U9 pin 1 and pin 3 on the CNTL board	S-C	PV: 420Vd.c. AC: 230Va.c.	3min	--	--	The fault was applied after the unit operation. After the unit applied the fault, the unit shutdown. No hazard. No damage. After removed the fault, the unit operated normally.
Supplementary information:						

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4.4.4	**TABLE: Single fault condition to be applied**		P
	Ambient temperature (°C) .....:	25 °C	—
	Power source for EUT: Manufacturer, model/type, output rating .....:	--	—
4.4.4.15.2	Fault-tolerance of automatic disconnecting means		

Component No.	Fault	Grid voltage (V)	Test time	Fuse #	Fuse current (A)	Observation
K1	Relay contact short-circuit before operating	PV: 420Vd.c. AC: 230Va.c.	3min	--	--	The fault was applied before the unit operation, after applied the fault, the unit could not start up, and the LED was steady red, INV relay fault was detected. No hazard. No damage. After removed the fault, the unit operated normally.
K2		PV: 420Vd.c. AC: 230Va.c.	3min	--	--	The fault was applied before the unit operation, after applied the fault, the unit could not start up, and the LED was steady red, INV relay fault was detected. No hazard. No damage. After removed the fault, the unit operated normally.
K3		PV: 420Vd.c. AC: 230Va.c.	3min	--	--	The fault was applied before the unit operation, after applied the fault, the unit could not start up, and the LED was steady red, grid relay fault was detected. No hazard. No damage. After removed the fault, the unit operated normally.
K4		PV: 420Vd.c. AC: 230Va.c.	3min	--	--	The fault was applied before the unit operation, after applied the fault, the unit could not start up, and the LED was steady red, grid relay fault was detected. No hazard. No damage. After removed the fault, the unit operated normally.
K5		PV: 420Vd.c. AC: 230Va.c.	3min	--	--	The fault was applied before the unit operation, after applied the fault, the unit could not start up, and the LED was steady red, grid relay fault was detected. No hazard. No damage. After removed the fault, the unit operated normally.

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K6		PV: 420Vd.c. AC: 230Va.c.	3min	--	--	The fault was applied before the unit operation, after applied the fault, the unit could not start up, and the LED was steady red, grid relay fault was detected. No hazard. No damage. After removed the fault, the unit operated normally.
K7		PV: 420Vd.c. AC: 230Va.c.	3min	--	--	The fault was applied before the unit operation, after applied the fault, the unit could not start up, and the LED was steady red, load relay fault was detected. No hazard. No damage. After removed the fault, the unit operated normally.
K8		PV: 420Vd.c. AC: 230Va.c.	3min	--	--	The fault was applied before the unit operation, after applied the fault, the unit could not start up, and the LED was steady red, load relay fault was detected. No hazard. No damage. After removed the fault, the unit operated normally.
Check that the relays fulfil the basic insulation or simple separation based on the PV circuit working voltage.						Yes L distance: 2 mm N distance: 2 mm
Each active phase can be switched. (L and N)						Yes
Supplementary information: The investor can disconnect from grid during a relay occurred a single failure.						

4.4.4.16	**Stand-alone inverters – Load transfer test**							P
Battery / PV			**Back up load**			**Grid**		
P (W)	I(Ad.c.)	U (Vd.c.)	P (W)	I(Aa.c.)	U (Va.c.)	P (W)	I(Aa.c.)	U (Va.c.)
0	0	250	5777.70	25.32	228.22	5807.44	25.34	230
6087.13	24.63	250	5801.17	25.37	228.68	0	0	230
0	0	450	5776.26	25.31	228.21	5808.32	25.35	230
6003.38	14.93	450	5798.06	25.36	228.63	0	0	230
0	0	51.2	5775.05	25.31	228.19	5815.55	25.38	230
6278.93	124.75	51.2	5792.68	25.35	228.53	0	0	230

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4.4.4.17	Cooling system failure – Blanketing test		P
	Test voltage (Vd.c.).....	358.63 Vd.c.	—
	Test current (Id.c.)	17.32 Ad.c.	—
	Test voltage (Va.c.).....	236.37 Va.c.	—
	Test current (Ia.c.)	25.40 Aa.c.	—
	t_{amb1} (°C)	24.8	—
	t_{amb2} (°C)	--	—
	Test duration……..	7h	
maximum temperature T of part/at::			T_{max} (°C)
External top surface		75.9 °C	90
External side surface		73.9 °C	90
Top cover surface		69.3 °C	90
Mounted surface		41.2 °C	90
Supplementary information: Test model was EAHI-6000-SL.			

4.4.4.17	Cooling system failure – Blanketing test		P
	Test voltage (Vd.c.).....	358.80 Vd.c.	—
	Test current (Id.c.)	10.50 Ad.c.	—
	Test voltage (Va.c.).....	234.84 Va.c.	—
	Test current (Ia.c.)	15.55 Aa.c.	—
	t_{amb1} (°C)	24.7	—
	t_{amb2} (°C)	--	—
	Test duration……..	7h	
maximum temperature T of part/at::			T_{max} (°C)
External top surface		59.9 °C	90
External side surface		57.5 °C	90
Top cover surface		54.9 °C	90
Mounted surface		52.9 °C	90
Supplementary information: Test model was EAHI-3600-SL.			

4.7.4.2 & 4.7.4.3 & 4.7.4.4 & 4.7.4.5	Steady state output voltage at nominal DC input & Steady state output voltage across the DC input range & Load step response of the output voltage at nominal DC input & Steady state output frequency	P

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AC output U (Va.c.)			Frequency (Hz)			Condition/status	Comments
L1	L2	L3	L1	L2	L3		
229.30	--	--	50	--	--	Without load	PV supply the AC load, at PV voltage: *250Vd.c..*
228.61	--	--	50	--	--	Resistive load application	
229.35	--	--	50	--	--	Resistive load removal	
228.82	--	--	50	--	--	Without load	PV supply the AC load, at PV voltage: *360Vd.c..*
227.90	--	--	50	--	--	Resistive load application	
228.72	--	--	50	--	--	Resistive load removal	
229.37	--	--	50	--	--	Without load	PV supply the AC load, at PV voltage: *450Vd.c.*.
228.65	--	--	50	--	--	Resistive load application	
229.47	--	--	50	--	--	Resistive load removal	
229.30	--	--	50	--	--	Without load	Battery supply the AC load, at battery supply: *42Vd.c..*
228.75	--	--	50	--	--	Resistive load application	
229.40	--	--	50	--	--	Resistive load removal	
229.63	--	--	50	--	--	Without load	Battery supply the AC load, at battery supply: *48Vd.c..*
228.60	--	--	50	--	--	Resistive load application	
229.55	--	--	50	--	--	Resistive load removal	
229.44	--	--	50	--	--	Without load	Battery supply the AC load, at battery supply: *58Vd.c..*
228.53	--	--	50	--	--	Resistive load application	
229.39	--	--	50	--	--	Resistive load removal	
Supplementary information:							

4.7.5.2	**TABLE: Harmonics and inter-harmonics (u)**									P
Harmon. Nr.(U)	P/Prated									Limit
	5%			50%			100%			
2	0.01%	0.01%	0.01%	0.02%	0.01%	0.01%	0.02%	0.01%	0.01%	6%
3	0.37%	0.33%	0.23%	1.80%	1.85%	1.83%	1.92%	1.92%	1.90%	6%
4	0.00%	0.01%	0.01%	0.00%	0.01%	0.01%	0.00%	0.01%	0.01%	6%
5	0.49%	0.52%	0.81%	1.09%	1.11%	1.09%	1.16%	1.16%	1.15%	6%
6	0.00%	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%	0.00%	0.01%	6%
7	0.52%	0.52%	0.44%	0.76%	0.77%	0.76%	0.81%	0.80%	0.80%	6%
8	0.01%	0.01%	0.01%	0.01%	0.00%	0.00%	0.01%	0.00%	0.01%	6%
9	0.17%	0.14%	0.09%	0.57%	0.59%	0.57%	0.61%	0.61%	0.60%	6%
10	0.01%	0.01%	0.01%	0.00%	0.01%	0.01%	0.01%	0.00%	0.00%	6%
11	0.08%	0.10%	0.22%	0.45%	0.46%	0.45%	0.48%	0.48%	0.48%	6%
12	0.00%	0.01%	0.01%	0.00%	0.01%	0.02%	0.01%	0.01%	0.01%	6%
13	0.20%	0.21%	0.20%	0.37%	0.38%	0.37%	0.38%	0.38%	0.38%	6%
14	0.01%	0.01%	0.01%	0.01%	0.01%	0.00%	0.01%	0.01%	0.01%	6%
15	0.15%	0.11%	0.06%	0.31%	0.32%	0.31%	0.31%	0.31%	0.31%	6%
16	0.01%	0.01%	0.01%	0.02%	0.01%	0.01%	0.01%	0.01%	0.00%	6%
17	0.06%	0.04%	0.12%	0.26%	0.27%	0.26%	0.26%	0.26%	0.26%	6%

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18	0.01%	0.01%	0.01%	0.00%	0.01%	0.01%	0.00%	0.01%	0.01%	6%
19	0.11%	0.13%	0.14%	0.22%	0.23%	0.21%	0.22%	0.22%	0.21%	6%
20	0.01%	0.01%	0.01%	0.00%	0.01%	0.00%	0.00%	0.01%	0.01%	6%
21	0.18%	0.20%	0.13%	0.18%	0.19%	0.18%	0.18%	0.18%	0.17%	6%
22	0.01%	0.01%	0.01%	0.02%	0.01%	0.01%	0.01%	0.01%	0.00%	6%
23	0.16%	0.19%	0.21%	0.15%	0.16%	0.15%	0.15%	0.14%	0.14%	6%
24	0.03%	0.02%	0.01%	0.02%	0.01%	0.01%	0.01%	0.01%	0.01%	6%
25	0.19%	0.22%	0.20%	0.12%	0.13%	0.12%	0.12%	0.12%	0.12%	6%
26	0.03%	0.02%	0.02%	0.01%	0.01%	0.01%	0.00%	0.01%	0.01%	6%
27	0.20%	0.23%	0.18%	0.09%	0.10%	0.09%	0.10%	0.10%	0.09%	6%
28	0.02%	0.02%	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%	6%
29	0.17%	0.19%	0.17%	0.07%	0.08%	0.07%	0.08%	0.08%	0.08%	6%
30	0.02%	0.02%	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%	0.00%	6%
31	0.13%	0.17%	0.14%	0.05%	0.05%	0.04%	0.07%	0.07%	0.06%	6%
32	0.02%	0.01%	0.01%	0.01%	0.01%	0.01%	0.00%	0.01%	0.01%	6%
33	0.10%	0.13%	0.11%	0.03%	0.04%	0.03%	0.06%	0.06%	0.05%	6%
34	0.02%	0.01%	0.01%	0.00%	0.01%	0.01%	0.01%	0.01%	0.01%	6%
35	0.06%	0.09%	0.08%	0.02%	0.03%	0.02%	0.05%	0.05%	0.05%	6%
36	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%	6%
37	0.04%	0.06%	0.05%	0.02%	0.02%	0.02%	0.04%	0.04%	0.04%	6%
38	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%	6%
39	0.02%	0.04%	0.03%	0.01%	0.02%	0.01%	0.04%	0.04%	0.04%	6%
40	0.01%	0.00%	0.00%	0.00%	0.01%	0.01%	0.00%	0.01%	0.01%	6%
THD (2-40)	0.99%	1.03%	1.12%	2.44%	2.51%	2.46%	2.60%	2.59%	2.57%	10%
Supplementary information: PV supply.										

4.8.2	**TABLE: Array insulation resistance detection for inverters for ungrounded and functionally grounded arrays**	P
4.8.2.1	Array insulation resistance detection for inverters for ungrounded arrays	P

DC Voltage below minimum operating voltage (V)	DC Voltage for inverter begin operation (V)	Resistance between ground and PV input terminal (Ω)	Required Insulation resistance $R = (V_{MAX\ PV} / 30mA)$ (Ω)	Result
PV+, (tracker 1)				

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100	150	16500	18333	The fault was applied before the unit operation, after applied the fault, the unit could not connect to grid, and the LED was steady red, "insulation impedance to ground" fault was detected. No hazard. No damage. After removed the fault, the unit operated normally.
PV+, (tracker 2)				
100	150	16500	18333	The fault was applied before the unit operation, after applied the fault, the unit could not connect to grid, and the LED was steady red, "insulation impedance to ground" fault was detected. No hazard. No damage. After removed the fault, the unit operated normally.
PV-, (tracker 1)				
100	150	16500	18333	The fault was applied before the unit operation, after applied the fault, the unit could not connect to grid, and the LED was steady red, "insulation impedance to ground" fault was detected. No hazard. No damage. After removed the fault, the unit operated normally.
PV-, (tracker 2)				
100	150	16500	18333	The fault was applied before the unit operation, after applied the fault, the unit could not connect to grid, and the LED was steady red, "insulation impedance to ground" fault was detected. No hazard. No damage. After removed the fault, the unit operated normally.

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Note:

For isolated inverters, shall indicate a fault in accordance with 13.9 (operation is allowed); the fault indication shall be maintained until the array insulation resistance has recovered to a value higher than the limit above

For non-isolated inverters, or inverters with isolation not complying with the leakage current limits in the minimum inverter isolation requirements in Table 30, shall indicate a fault in accordance with 13.9, and shall not connect to the mains; the inverter may continue to make the measurement, may stop indicating a fault and may connect to the mains if the array insulation resistance has recovered to a value higher than the limit above.

It is not required to test all PV input terminals if analysis of the design indicates that one or more terminals can be expected to have the same result, for example where multiple PV string inputs are in parallel.

Supplementary information:

1. All above tests indicate a fault in accordance with clause 13.9

4.8.3.5	**TABLE: Protection by residual current monitoring**	P
Test conditions:	See below	
4.8.3.5.2	Test for detection of excessive continuous residual current	P

Tracker No.	PV (+ or -)	Input (Vd.c.)	Output (Va.c., kW)	Baseline trigger current (mA)	Measured trigger time (ms), shall < 300 ms (repeat 5 times)				
PV1	+	360	230	280	254	237	239	258	239
PV2	+	360	230	280	273	249	267	262	270
PV1	-	360	230	270	250	273	241	269	259
PV2	-	360	230	270	255	263	263	270	248

Note:

– maximum 300mA for inverters with continuous output power rating ≤30 kVA;
– maximum 10mA per kVA of rated continuous output power for inverters with continuous output power rating > 30 kVA.

This test shall be repeated 5 times, and for all 5 tests the time to disconnect shall not exceed 300 ms. The test is repeated for each PV input terminal. It is not required to test all PV input terminals if analysis of the design indicates that one or more terminals can be expected to have the same result, for example where multiple PV string inputs are in parallel.

Supplementary information:

All above tests indicate a fault in accordance with clause 13.9.

4.8.3.5	**TABLE: Protection by residual current monitoring**	P
Test conditions:	See below	
4.8.3.5.3	TABLE: Test for detection of sudden changes in residual current	P

Tracker No.	PV (+ or -)	Input (Vd.c.)	Output (Va.c., kW)	Baseline trigger	Measured trigger time (ms), shall < 300 ms for (30 mA); <150 ms for (60 mA); <40 ms

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				current (mA)	for (150 mA) (repeat 5 times)				
30 mA sudden changes in residual current									
PV1	+	360	230	280	262.2	254.7	275.7	241.2	270.0
PV2	+	360	230	280	240.0	263.0	241.0	257.0	234.0
PV1	-	360	230	270	264.2	245.2	252.7	235.7	270.2
PV2	-	360	230	270	246.7	275.2	259.2	260.2	239.2
60 mA sudden changes in residual current									
PV1	+	360	230	280	129.5	128.5	116.5	138.5	118.0
PV2	+	360	230	280	119.0	100.5	123.5	111.0	139.5
PV1	-	360	230	270	127.5	100.5	119.0	115.0	117.5
PV2	-	360	230	270	110.5	127.0	102.5	138.0	118.0
150 mA sudden changes in residual current									
PV1	+	360	230	280	11.5	39.5	38.5	32.0	37.0
PV2	+	360	230	280	34.5	19.0	39.0	35.0	33.0
PV1	-	360	230	270	29.5	33.0	31.5	25.5	37.0
PV2	-	360	230	270	24.5	28.0	36.5	31.5	36.0
Note: The capacitive current is risen until disconnection. Test condition: I_c + 30/60/150mA <= I_{cmax}. R_1 is set that 30/60/150mA Flow and switch S is closed.									
Supplementary information:									

……End of test report……..

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