Produkte
Products

Prüfbericht - Nr.: *Test Report No.:*	50255491 001	**Auftrags-Nr.:** *Order No.:*	164143376	**Seite 1 von 69** *Page 1 of 69*
Kunden-Referenz-Nr.: *Client Reference No.:*	632179	**Auftragsdatum:** *Order date:*	Sep. 19th, 2018	
Auftraggeber: *Client:*	**EAST Group Co., Ltd.** No.6 Northern Industry Road, Songshan Lake Sci.& Tech. industrial zone, Dongguan City, Guangdong province, China			
Prüfgegenstand: *Test item:*	Grid-connected PV inverter			
Bezeichnung / Typ-Nr.: *Identification / Type No.:*	EA2KSI, EA2.5KSI, EA3KSI, EA3KSI-D, EA3.68KSI, EA4KSI, EA4.6KSI, EA5KSI, EA6KSI			
Auftrags-Inhalt: *Order content:*	Safety approval			
Prüfgrundlage: *Test specification:*	IEC/EN 62109-1: 2010, IEC/EN 62109-2: 2011			
Wareneingangsdatum: *Date of receipt::*	Sep. 20th, 2018			
Prüfmuster-Nr.: *Test sample No.:*	201808150001			
Prüfzeitraum: *Testing period:*	Sep. 20th, 2018–Jan. 04th, 2019			
Ort der Prüfung: *Place of testing:*	TÜV Rheinland (Shanghai) Co., Ltd.			
Prüflaboratorium: *Testing Laboratory:*	TÜV Rheinland (Shanghai) Co., Ltd.			
Prüfergebnis*: *Test result*:*	Pass			

geprüft/ *tested by:*			**kontrolliert/** *reviewed by:*		
Jan. 18th, 2019	Corney Zhang / PE		Jan. 18th, 2019	John Dai / Reviewer	
Datum *Date*	**Name/Stellung** *Name/Position*	**Unterschrift** *Signature*	**Datum** *Date*	**Name/Stellung** *Name/Position*	**Unterschrift** *Signature*

Sonstiges/ *Other Aspects:*

Zustand des Prüfgegenstandes bei Anlieferung:
Condition of test item at delivery:

Prüfmuster vollständig und unbeschädigt
Test item complete and undamaged

* Legende:	1 = sehr gut	2 = gut	3 = befriedigend	4 = ausreichend	5 = mangelhaft
	P(ass) = entspricht o.g. Prüfgrundlage(n)		F(ail) = entspricht nicht o.g. Prüfgrundlage(n)	N/A = nicht anwendbar	N/T = nicht getestet
Legend:	*1 = very good*	*2 = good*	*3 = satisfactory*	*4 = sufficient*	*5 = poor*
	P(ass) = passed a.m. test specification(s)		*F(ail) = failed a.m. test specification(s)*	*N/A = not applicable*	*N/T = not tested*

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Test Report issued under the responsibility of:

TÜVRheinland®

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

Report Number. ..... :	50255491 001
Date of issue ..... :	See cover page
Total number of pages ..... :	See cover page
Name of Testing Laboratory preparing the Report ..... :	TÜV Rheinland (Shanghai) Co., Ltd. TÜV Rheinland Building, No. 177, Lane 777, West Guangzhong Road, Jingan District,Shanghai 200072, P.R. China.
Applicant's name ..... :	EAST Group Co., Ltd.
Address ..... :	No.6 Northern Industry Road, Songshan Lake Sci.& Tech. industrial zone, Dongguan City, Guangdong province, China
Test specification:	
Standard ..... :	EN 62109-1:2010 (First Edition)
Test procedure ..... :	Safety approval
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.

Test item description..... :	Grid-connected PV inverter
Trade Mark..... :	
Manufacturer ..... :	Same as applicant
Model/Type reference..... :	See model list.
Ratings..... :	See model list.

Responsible Testing Laboratory (as applicable), testing procedure and testing location(s):			
☒	**CB Testing Laboratory:**	See cover page	
Testing location/ address .....:		See cover page	
☐	**Associated CB Testing Laboratory:**		
Testing location/ address .....:			
Tested by (name, function, signature).....:			
Approved by (name, function, signature)...:			
☐	**Testing procedure: CTF Stage 1:**		
Testing location/ address .....:			
Tested by (name, function, signature).....:			
Approved by (name, function, signature)...:			
☐	**Testing procedure: CTF Stage 2:**		
Testing location/ address .....:			
Tested by (name + signature).....:			
Witnessed by (name, function, signature) .:			
Approved by (name, function, signature)...:			
☐	**Testing procedure: CTF Stage 3:**		
☐	**Testing procedure: CTF Stage 4:**		
Testing location/ address .....:			
Tested by (name, function, signature).....:			
Witnessed by (name, function, signature) .:			
Approved by (name, function, signature)...:			
Supervised by (name, function, signature) :			

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

- ATTACHMENT 1 – Test report of IEC 62109-2: 2011 (15 pages)
- ATTACHMENT 2 – Photo Documentation (10 pages)
- ATTACHMENT 3 – CRITICAL COMPONENTS DOCUMENTATION (CDF, 11 pages)

Summary of testing:

Tests performed (name of test and test clause):	**Testing location:**
The critical tests were performed for this equipment included clauses 4.3, 4.4, 4.5, 4.6, 4.7, 4.8, 5.1.2, 6.3, 6.4, 7.3.2.2, 7.3.2.3, 7.3.4.2.3, 7.3.7.4, 7.3.7.5, 7.3.9, 7.5.1, 7.5.2, 7.5.4, 8.2, 8.5, 10.2, 13.6.2.1, 13.7 in scope of this standard, for temperature test the thermocouples method used, regarding fault condition test simulated faults applied.	**See cover page.**

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

N/A

☒ The product fulfils the requirements of IEC/EN 62109-1: 2010 and IEC/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.

EAST

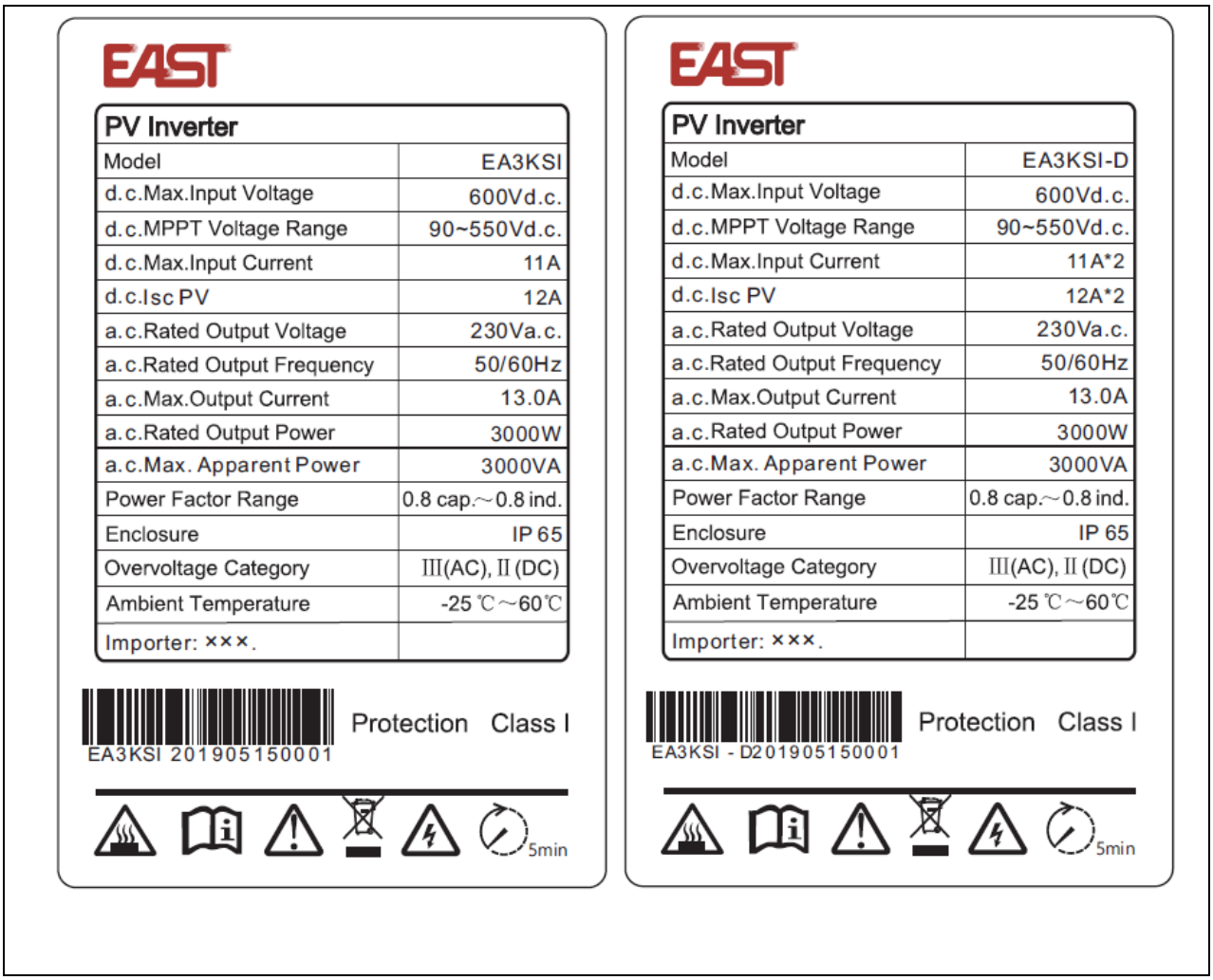
PV Inverter	
Model	EA2KSI
d.c.Max.Input Voltage	600Vd.c.
d.c.MPPT Voltage Range	90~550Vd.c.
d.c.Max.Input Current	11A
d.c.Isc PV	12A
a.c.Rated Output Voltage	230Va.c.
a.c.Rated Output Frequency	50/60Hz
a.c.Max.Output Current	8.7A
a.c.Rated Output Power	2000W
a.c.Max. Apparent Power	2000VA
Power Factor Range	0.8 cap.~0.8 ind.
Enclosure	IP 65
Overvoltage Category	III(AC), II (DC)
Ambient Temperature	-25 ℃~60℃
Importer: ×××.	

EA2KSI 201905150001 Protection Class I

EAST

PV Inverter	
Model	EA2.5KSI
d.c.Max.Input Voltage	600Vd.c.
d.c.MPPT Voltage Range	90~550Vd.c.
d.c.Max.Input Current	11A
d.c.Isc PV	12A
a.c.Rated Output Voltage	230Va.c.
a.c.Rated Output Frequency	50/60Hz
a.c.Max.Output Current	10.9A
a.c.Rated Output Power	2500W
a.c.Max. Apparent Power	2500VA
Power Factor Range	0.8 cap.~0.8 ind.
Enclosure	IP 65
Overvoltage Category	III(AC), II (DC)
Ambient Temperature	-25 ℃~60℃
Importer: ×××.	

EA2. 5KSI 201905150001 Protection Class I



EAST

PV Inverter	
Model	EA3KSI
d.c.Max.Input Voltage	600Vd.c.
d.c.MPPT Voltage Range	90~550Vd.c.
d.c.Max.Input Current	11A
d.c.Isc PV	12A
a.c.Rated Output Voltage	230Va.c.
a.c.Rated Output Frequency	50/60Hz
a.c.Max.Output Current	13.0A
a.c.Rated Output Power	3000W
a.c.Max. Apparent Power	3000VA
Power Factor Range	0.8 cap.~0.8 ind.
Enclosure	IP 65
Overvoltage Category	III(AC), II (DC)
Ambient Temperature	-25℃~60℃
Importer: ×××.	

EA3KSI 201905150001 Protection Class I

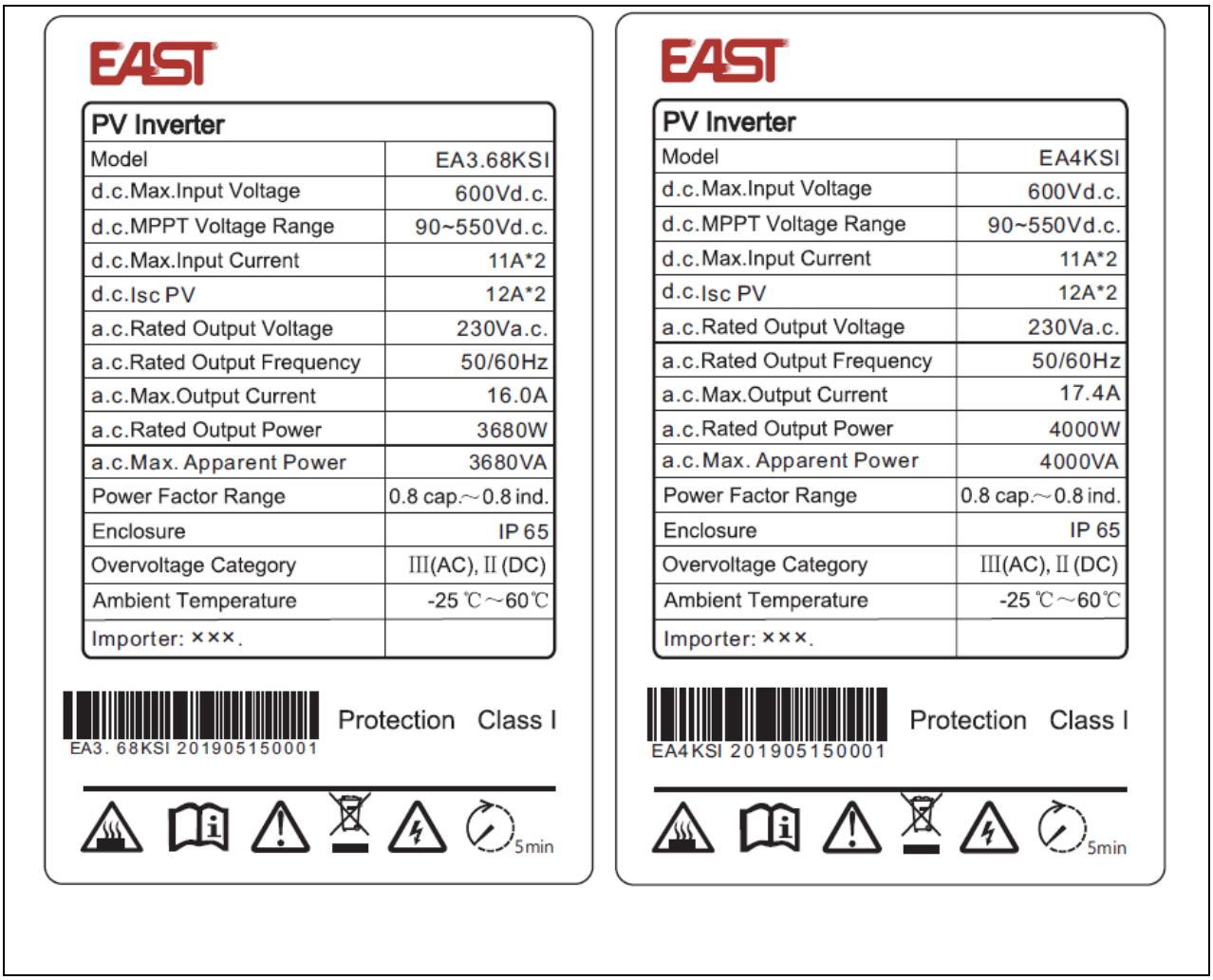
5min

EAST

PV Inverter	
Model	EA3KSI-D
d.c.Max.Input Voltage	600Vd.c.
d.c.MPPT Voltage Range	90~550Vd.c.
d.c.Max.Input Current	11A*2
d.c.Isc PV	12A*2
a.c.Rated Output Voltage	230Va.c.
a.c.Rated Output Frequency	50/60Hz
a.c.Max.Output Current	13.0A
a.c.Rated Output Power	3000W
a.c.Max. Apparent Power	3000VA
Power Factor Range	0.8 cap.~0.8 ind.
Enclosure	IP 65
Overvoltage Category	III(AC), II (DC)
Ambient Temperature	-25℃~60℃
Importer: ×××.	

EA3KSI - D201905150001 Protection Class I

5min



EAST

PV Inverter	
Model	EA3.68KSI
d.c.Max.Input Voltage	600Vd.c.
d.c.MPPT Voltage Range	90~550Vd.c.
d.c.Max.Input Current	11A*2
d.c.Isc PV	12A*2
a.c.Rated Output Voltage	230Va.c.
a.c.Rated Output Frequency	50/60Hz
a.c.Max.Output Current	16.0A
a.c.Rated Output Power	3680W
a.c.Max. Apparent Power	3680VA
Power Factor Range	0.8 cap.~0.8 ind.
Enclosure	IP 65
Overvoltage Category	III(AC), II (DC)
Ambient Temperature	-25℃~60℃
Importer: ×××.	

EA3. 68KSI 201905150001

Protection Class I

5min

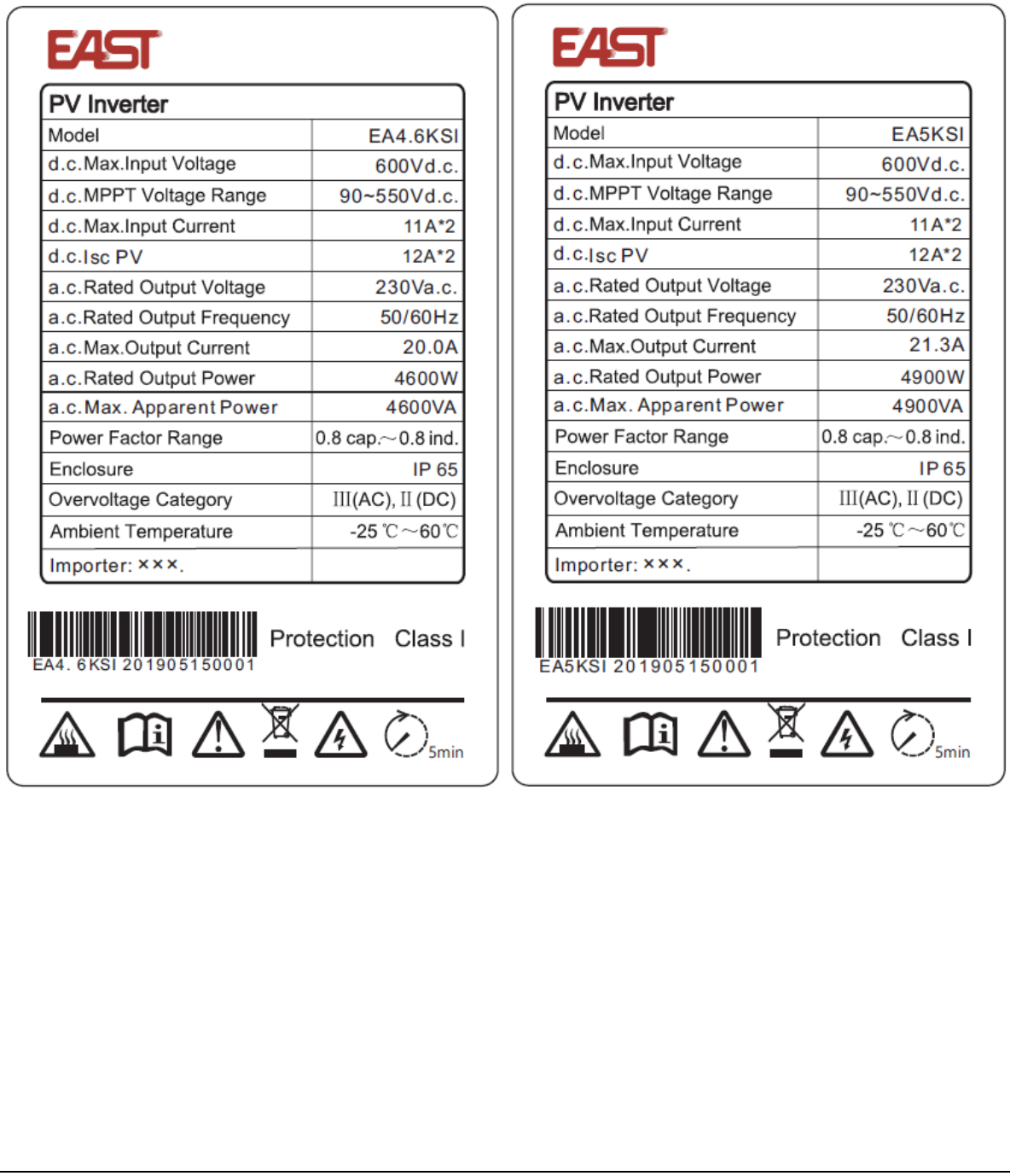
EAST

PV Inverter	
Model	EA4KSI
d.c.Max.Input Voltage	600Vd.c.
d.c.MPPT Voltage Range	90~550Vd.c.
d.c.Max.Input Current	11A*2
d.c.Isc PV	12A*2
a.c.Rated Output Voltage	230Va.c.
a.c.Rated Output Frequency	50/60Hz
a.c.Max.Output Current	17.4A
a.c.Rated Output Power	4000W
a.c.Max. Apparent Power	4000VA
Power Factor Range	0.8 cap.~0.8 ind.
Enclosure	IP 65
Overvoltage Category	III(AC), II (DC)
Ambient Temperature	-25℃~60℃
Importer: ×××.	

EA4KSI 201905150001

Protection Class I

5min



EAST

PV Inverter	
Model	EA4.6KSI
d.c.Max.Input Voltage	600Vd.c.
d.c.MPPT Voltage Range	90~550Vd.c.
d.c.Max.Input Current	11A*2
d.c.Isc PV	12A*2
a.c.Rated Output Voltage	230Va.c.
a.c.Rated Output Frequency	50/60Hz
a.c.Max.Output Current	20.0A
a.c.Rated Output Power	4600W
a.c.Max. Apparent Power	4600VA
Power Factor Range	0.8 cap.~0.8 ind.
Enclosure	IP 65
Overvoltage Category	III(AC), II (DC)
Ambient Temperature	-25℃~60℃
Importer: ×××.	

EA4. 6KSI 201905150001

Protection Class I

5min

EAST

PV Inverter	
Model	EA5KSI
d.c.Max.Input Voltage	600Vd.c.
d.c.MPPT Voltage Range	90~550Vd.c.
d.c.Max.Input Current	11A*2
d.c.Isc PV	12A*2
a.c.Rated Output Voltage	230Va.c.
a.c.Rated Output Frequency	50/60Hz
a.c.Max.Output Current	21.3A
a.c.Rated Output Power	4900W
a.c.Max. Apparent Power	4900VA
Power Factor Range	0.8 cap.~0.8 ind.
Enclosure	IP 65
Overvoltage Category	III(AC), II (DC)
Ambient Temperature	-25℃~60℃
Importer: ×××.	

EA5KSI 201905150001

Protection Class I

5min

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 (%).....:	According to the specified supply range
Tested for power systems.....:	TN
IT testing, phase-phase voltage (V).....:	- - -
Class of equipment.....:	☒ Class I ☐ Class II ☐ Class III ☐ Not classified
Mass of equipment (kg) .....:	See model list.
Pollution degree.....:	☐ PD 1 ☐PD 2 ☒ PD 3 (internal reduced to PD 2)
IP protection class.....:	IP65
.....:	
Possible test case verdicts:	
- test case does not apply to the test object.....:	N/A
- test object does meet the requirement.....:	P (Pass)
- test object was not evaluated for the requirement .....:	N/E
- test object does not meet the requirement.....:	F (Fail)
Testing.....:	
Date of receipt of test item .....:	See cover page
Date (s) of performance of tests.....:	See cover page

General remarks:	
"(See Enclosure #)" refers to additional information appended to the report. "(See appended table)" refers to a table appended to the report. **Throughout this report a ☐ comma / ☒ point is used as the decimal separator.**	
Manufacturer's Declaration per sub-clause 4.2.5 of IECEE 02:	
The application for obtaining a CB Test Certificate includes more than one factory location and a declaration from the Manufacturer stating that the sample(s) submitted for evaluation is (are) representative of the products from each factory has been provided ..... :	☐ **Yes** ☒ **Not applicable**
When differences exist; they shall be identified in the General product information section.	
Name and address of factory (ies) ..... :	**EAST Group Co., Ltd.** No.6 Northern Industry Road, Songshan Lake Sci.& Tech. industrial zone, Dongguan City, Guangdong province, China

General product information:

The equipment with model names EA2KSI, EA2.5KSI, EA3KSI, EA3KSI-D, EA3.68KSI, EA4KSI, EA4.6KSI, EA5KSI and EA6KSI are single phase un-isolated type grid-connected PV inverters which will be installed and connected to the grid network after installation. In final installation the equipment shall be fixed to suitable manner as specified in the installation instruction.

The EUT contains filters for smoothing the output voltage and for EMC, switching and control circuits. Electronic circuits are mounted on a number of PCBs interconnected by appropriate connectors and wires. Power board including electronics components is mounted on the heat sink to earthing by metal screw and spring washer.
The PV input combine with 1 or 2 string MPPT tracer and PV input terminals. AC output direct connected to grid and Protective Earthing are provided by dedicated earthing terminals. Grid is protected combination with a two series of relays as redundant build for ensure the inverter can independent disconnected from gird while a relay was fault.

During fault condition defined in this standard, after the DSP receives the abnormal signal from the relevant protective detection circuit, the relays will operate to disconnect the PV inverter line and neutral from grid automatically.

The master DSP and slaver DSP has capacity independent disconnected from gird, when any grid fault had happened.

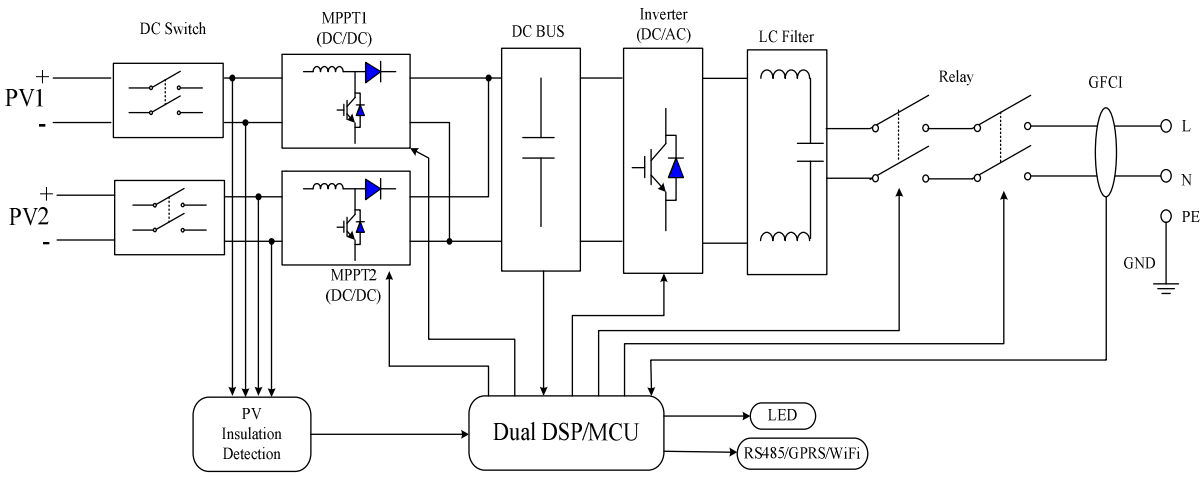
The maximum ambient temperature permitted by the manufacturer's specification is 60°C and derate the output power from 45°C.

Models EA2KSI, EA2.5KSI and EA3KSI are identical on hardware except the rated power changed by the software.
Models EA3KSI-D, EA3.68KSI, EA4KSI, EA4.6KSI and EA5KSI are identical on hardware except the rated power changed by the software.
Models EA5KSI identical to model EA6KSI on hardware except the rated power changed by the software and one internal fan assembled in model EA6KSI.

The model EA3KSI and model EA5KSI are the same on software and hardware, excepted below components are different:

Table 1

Model / Components	EA2KSI, EA2.5KSI, EA3KSI	EA3KSI-D, EA3.68KSI, EA4KSI EA4.6KSI, EA5KSI, EA6KSI
Max. input current	11A	11A×2
Output current sensor	HLSR 20-P/LEM	HLSR 32-P/LEM
MPPT string	1	2
Boost induct	580uH(11A)*1	580uH(11A)*2
BUS capacitor	1200uF(315V)*4	1200uF(315V)*6
IGBT/MOSFET	IKW40N65H5*5, IKW40N120H3*2	IKW40N65H5*6, IKW40N120H3*2
Power board size	262mm*216mm	322mm*231.5mm
Overall size (WxDxH) [mm]	308x116.5x353	370x126.5x420



Block diagram

1) Definition of circuits inside of the PV inverter

I. PV input circuits

PV input circuits are directly connected to the PV array and the voltage can be up to 600Vdc. Decisive voltage C considered for the PV voltage side.

II. AC output to the AC mains

AC output will be 230Vac.
Decisive voltage C considered for the AC voltage side.

III. Communication

The communication terminal (RS485) and WIFI module can be communicated to COM-port (RS485) of a PC for monitoring via the host monitoring software.

Decisive voltage A considered for the communication side.

2) Isolation used in the product

Protective separation applied between decisive voltage A and decisive voltage C with corresponding overvoltage category.

3) Cooling method

Physical cooling by metal heat sink and fans.

4) Isolation between decisive voltage A and decisive voltage C

Double insulation provided in the product to separate those two parts.

Table 2

MODEL LIST 1		EA2KSI	EA2.5KSI	EA3KSI	EA3KSI-D
INPUT(PV)	V_{MAX} PV [Vdc]	600			
	I_{SC} PV [A]	12			2x12
	MPP Voltage Range V_{MPP}[Vdc]	90-550			
	Max. PV Input Current [A]	11			11x2
	MPP Full Power Voltage Range [Vdc]	200-480	250-480	300-480	150-480
	Input PV Operating Voltage Range [Vdc]	90-600			
	Start PV Voltage [Vdc]	120			
	Backfeed Current [A]	0			
	Overvoltage Category (OVC)	OVC II			
GRID CONNECTION	Rated Output Voltage Ur [Vac]	230			
	Normal Operating Voltage Range Un [Vac]	180-280			
	Rated Output Frequency F_{NETZ} [Hz]	50/60			
	Normal Operating Frequency Range Fn [Hz]	45-55 / 55-65			
	Rated Output Power P_E [W]	2000	2500	3000	3000
	Max. Output Current Imax [A]	8.7	10.9	13	13
	Power Factor cosφ [λ]	0.8 cap-0.8ind adjustable (defaut: 1)			
	Efficiency max. η_{max}[%]	97.8			
	Night Power Consumption [W]	< 0.5			
	THD [V / I] (100% full power)	< 3%			
	Acoustic Noise [dB]	< 40			
	Overvoltage Category (OVC)	OVC III			
SYSTEM	Type of inverter	Non-transformer			
	Firmware [DSP/MCU]	MDSP: V009, MCU: V009			
	Separated by	Transformerless			
	MPPT strings	1			2

	MPPT tracking	1	2
	Protective Class	1	
	Enclosure Protection (IP)	IP65	
	Operating Temperature Range [ºC]	-25-60 (derating after 45ºC)	
	Pollution degree (PD)	PD3 for outside, PD2 for inside	
	Altitude [m]	4000 (> 2000 derating power)	
	Weight [kg]	< 9	< 11.5
	Size (WxDxH) [mm]	308x116.5x353	370x126.5x420
Note:			

MODEL LIST 2		**EA3.68KSI**	**EA4KSI**	**EA4.6KSI**	**EA5KSI**	**EA6KSI**
INPUT(PV)	V_{MAX} PV [Vdc]	600				
	I_{SC} PV [A]	2x12				
	MPP Voltage Range V_{MPP}[Vdc]	90-550				
	Max. PV Input Current [A]	11x2				
	MPP Full Power Voltage Range [Vdc]	200-480		230-480	250-480	300-480
	Input PV Operating Voltage Range [Vdc]	90-600				
	Start PV Voltage [Vdc]	120				
	Backfeed Current [A]	0				
	Overvoltage Category (OVC)	OVC II				
GRID CONNECTION	Rated Output Voltage Ur [Vac]	230				
	Normal Operating Voltage Range Un [Vac]	180-280				
	Rated Output Frequency F_{NETZ} [Hz]	50/60				
	Normal Operating Frequency Range Fn [Hz]	45-55 / 55-65				
	Rated Output Power P_E [W]	3680	4000	4600	4900	6000
	Max. Output Current Imax [A]	16	17.4	20	21.3	26.1
	Power Factor cosφ [λ]	0.8 cap-0.8ind adjustable (defaut: 1)				
	Efficiency max. η_{max}[%]	97.8				
	Night Power Consumption [W]	< 0.5				
	THD [V / I] (100% full power)	< 3%				
	Acoustic Noise [dB]	< 40				
	Overvoltage Category (OVC)	OVC III				
S Y	Type of inverter	Non-transformer				

	Firmware [DSP/MCU]	MDSP: V009, MCU: V009
	Separated by	Transformerless
	MPPT strings	2
	MPPT tracking	2
	Protective Class	1
	Enclosure Protection (IP)	IP65
	Operating Temperature Range [ºC]	-25-60 (derating after 45ºC)
	Pollution degree (PD)	PD3 for outside, PD2 for inside
	Altitude [m]	4000 (> 2000 derating power)
	Weight [kg]	< 11.5
	Size (WxDxH) [mm]	370x126.5x420
Note:		

General Test Conditions are:

All tests of PV inverter were carried out under the most unfavorable combination within the manufacturer's operating specifications of the following parameters:

-DC input voltage Max. 600Vd.c.
-operating temperature, Max. Ambient temperature 60°C declared by the client.
-operating mode: continuous.
- AC output: the AC output: the highest output is 100% of rated voltage.
All the tests are conducted on model EA6KSI to represent all the models.

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	Considered.	P
4.2.2	Reference test conditions	Considered.	P
4.2.2.1	Environmental conditions		P
4.2.2.2	State of equipment		P
4.2.2.3	Position of equipment		P
4.2.2.4	Accessories	Considered.	P
4.2.2.5	Covers and removable parts		P
4.2.2.6	Mains supply a) Voltage: b) Frequency: c) Polarity: d) Earthing: e) Over-current Protection:	(see appended table 4.2.2.6)	P
4.2.2.7	Supply ports other than the mains	Considered.	P
4.2.2.7.1	Photovoltaic supply sources a) Open circuit voltage: b) Short-circuit current:	(see appended table 4.2.2.7)	P
4.2.2.7.2	Battery inputs	No battery input.	N/A
4.2.2.8	Conditions of loading for output ports		P
4.2.2.9	Earthing terminals		P
4.2.2.10	Controls		P
4.2.2.11	Available short circuit current	Considered.	P
4.3	Thermal testing	(see appended table 4.3)	P
4.3.1	General		P
4.3.2	Maximum temperatures		P
4.3.2.1	General	Maximum environment temperature of EUT is 60°C.	P
4.3.2.2	Touch temperatures		P
4.3.2.3	Temperature limits for mounting surfaces		P
4.4	Testing in single fault condition	(see appended table 4.4)	P
4.4.1	General		P

4.4.2	Test conditions and duration for testing under fault conditions		P
4.4.2.1	General		P
4.4.2.2	Duration of tests	Considered.	P
4.4.3	Pass/fail criteria for testing under fault conditions		P
4.4.3.1	Protection against shock hazard		P
4.4.3.2	Protection against the spread of fire		P
4.4.3.3	Protection against other hazards		P
4.4.3.4	Protection against parts expulsion hazards		P
4.4.4	Single fault conditions to be applied		P
4.4.4.1	Component fault tests		P
4.4.4.2	Equipment or parts for short-term or intermittent operation		P
4.4.4.3	Motors	No such device.	N/A
4.4.4.4	Transformer short circuit tests		P
4.4.4.5	Output short circuit		P
4.4.4.6	Backfeed current test for equipment with more than one source of supply		P
4.4.4.7	Output overload		P
4.4.4.8	Cooling system failure		P
4.4.4.9	Heating devices	No such device.	N/A
4.4.4.10	Safety interlock systems	No such device.	N/A
4.4.4.11	Reverse d.c. connections		P
4.4.4.12	Voltage selector mismatch	No such device.	N/A
4.4.4.13	Mis-wiring with incorrect phase sequence or polarity	Single phase.	N/A
4.4.4.14	Printed wiring board short-circuit test		P
4.5	Humidity preconditioning	(see appended table 7.5)	P
4.5.1	General		P
4.5.2	Conditions		P
4.6	Backfeed voltage protection		P
4.6.1	Backfeed tests under normal conditions		P
4.6.2	Backfeed tests under single-fault conditions		P
4.6.3	Compliance with backfeed tests		P
4.7	Electrical ratings tests	(see appended table 4.2.2.6)	P
4.7.1	Input ratings		P
4.7.1.1	Measurement requirements for DC input ports		P
4.7.2	Output ratings		P

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Clause	Requirement – Test	Result – Remark	Verdict

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		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	The label was subjected to the permanence of marking test. The label was rubbed with cloth soaked with water for 30 sec. And then again for 30 sec. With the cloth soaked with petroleum spirit. After this test there was no damage to the label. The marking on the label did not fade. There was no curling or lifting of the label edge.	P
5.1.3	Identification		P
	The equipment shall, as a minimum, be permanently marked with:		P
	a) the name or trade mark of the manufacturer or supplier	See copy of marking plate	P
	b) model number, name or other means to identify the equipment	See copy of marking plate	P
	c) a serial number, code or other marking allowing identification of manufacturing location and the manufacturing batch or date within a three month time period.	See copy of marking plate	P
5.1.4	Equipment ratings		P
	Unless otherwise specified in another part of IEC 62109, the following ratings, as applicable shall be marked on the equipment:	See copy of marking plate	P
	– input voltage, type of voltage (a.c. or d.c.), frequency, and max. continuous current for each input	See copy of marking plate	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	See copy of marking plate	P

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Clause	Requirement – Test	Result – Remark	Verdict
	– the ingress protection (IP) rating as in 6.3 below	IP65	P
5.1.5	Fuse identification		P
	Marking shall be located adjacent to each fuse or fuseholder, or on the fuseholder, or in another location provided that it is obvious to which fuse the marking applies, giving the fuse current rating and where fuses of different voltage rating value could be fitted, the fuse voltage rating.	No such device.	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.	Fuses used and not located in operator access areas. The fuse information contain in the maintenance manual	N/A
5.1.6	Terminals, Connections, and Controls		P
	If necessary for safety, an indication shall be given of the purpose of Terminals, connectors, controls, and indicators, and their various positions, including any connections for coolant fluids such as water and drainage. The symbols in Annex C may be used, and where there is insufficient space, symbol 9 of Annex C may be used.		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.	DC switch acts as an emergency stop device.	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 non-permanent material.		N/A
	A unit with d.c. terminals shall be plainly marked indicating the polarity of the connections, with:		P
	– the sign “+“ for positive and “-„ for negative; or		P
	– a pictorial representation illustrating the proper polarity where the correct polarity can be unambiguously determined from the representation	See only above.	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	The colour coding green-yellow.	P
	– the letters “PE“; or		N/A

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Clause	Requirement – Test	Result – Remark	Verdict
	– 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.	The DC/AC breaker has marked the “ON” position denote for running mode, “OFF” position denote for stopping mode.	P
5.1.8	Class II Equipment	Class I equipment	N/A
	Equipment using Class II protective means throughout shall be marked with symbol 12 of Annex C. Equipment which is only partially protected by DOUBLE INSULATION or REINFORCED INSULATION shall not bear symbol 12 of Table Annex C.		N/A
	Where such equipment has provision for the connection of an earthing conductor for functional reasons (see 7.3.6.4) it shall be marked with symbol 6 of Annex C		N/A
5.1.9	Terminal boxes for External Connections		P
	Where required by note 1 of Table 2 as a result of high temperatures of terminals or parts in the wiring compartment, there shall be a marking, visible beside the terminal before connection, of either:	No such high temperature of terminals or parts	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	Considered.	P
	– Printed text characters shall be at least 1.5 mm high and shall contrast in colour with the background	Considered.	P
	– Symbols or text that are moulded, stamped or engraved in a material shall have a character height of at least 2,0 mm, and if not contrasting in colour from the background, shall have a depth or raised height of at least 0,5 mm.	Considered.	P
	If it is necessary to refer to the instruction manual to	Considered.	P

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Clause	Requirement – Test	Result – Remark	Verdict
	preserve the protection afforded by the equipment, the equipment shall be marked with symbol 9 of Annex C		
	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 heat sinks and similar parts		N/A
	An ungrounded heat sink or other part that may be mistaken for a grounded part and involves a risk of electric shock in accordance with 7.3 shall be marked with symbol 13 of Annex C, or equivalent. The marking may be on or adjacent to the heat sink and shall be clearly visible when the PCE is disassembled to the extent that a risk of contact with the heat sink exists.	No such heatsink.	N/A
5.2.2.2	Hot Surfaces		P
	A part of the PCE that exceeds the temperature limits specified in 4.3.2 shall be marked with symbol 14 of Annex C or equivalent.	Symbol 14 of Annex C used.	P
5.2.2.3	Coolant	No coolant used inside.	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.	Marked with symbol 21 of Annex C and the time to discharge capacitors to safety voltage and energy levels.	P
5.2.2.5	Motor guarding	No motor used in the appliance.	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

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Clause	Requirement – Test	Result – Remark	Verdict
	If required by 10.2.1 a PCE shall:		N/A
	a) be marked to warn the operator of the sonic pressure hazard; or		N/A
	b) be provided with installation instructions that specify how the installer can ensure that the sound pressure level from equipment at its point of use after installation, will not reach a value, which could cause a hazard. These instructions shall include the measured sound pressure level, and shall identify readily available and practicable protective materials or measures which may be used.		N/A
5.2.4	Equipment with multiple sources of supply		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.	 used and related information specified.	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		P
	– WET LOCATIONS classification fort he intended external environment as per 6.1		P
	– POLLUTION DEGREE classification for the intended external environment as per 6.2		P

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Clause	Requirement – Test	Result – Remark	Verdict
	– INGRESS PROTECTION rating as per 6.3		P
	– Ambient temperature and relative humidity ratings		P
	– MAXIMUM altitude rating	2000m	P
	– OVERVOLTAGE CATEGORY assigned to each input and output port as per 7.3.7.1.2, accompanied by guidance regarding how to ensure that the installation complies with the required overvoltage categories;	OVC III for AC connection. OVC II for DC connection.	P
	d) a warning that when the photovoltaic array is exposed to light, it supplies a d.c. voltage to the PCE	Provided in the instruction manual.	P
5.3.1.1	Language	English version specification and instruction provided	P
	Instructions related to safety shall be in a language that is acceptable in the country where the equipment is to be installed.		P
5.3.1.2	Format		P
	In general, the documentation must be provided in printed form and is to be delivered with the equipment.	Paper version and electronic version will be sent to the customer once sold to end client.	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	Provided in the instruction manual	P
	The documentation shall include installation and where applicable, specific commissioning instructions and, if necessary for safety, warnings against hazards which could arise during installation or commissioning of the equipment. The information provided shall include:		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		P

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Clause	Requirement – Test	Result – Remark	Verdict
	of leads, or overcurrent protection needed;		
	d) explanation of the pin-out of connectors for external connections, unless the connector is used for a standard purpose (e.g. RS 232)	Standard connector used.	N/A
	e) ventilation requirements;		N/A
	f) requirements for special services, for example cooling liquid;	No such special services.	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;		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 exceed the max. rated current of the circuit, as per 4.4.4.6;		N/A
	k) for each input to the PCE, the max value of short-circuit current available from the source, for which the PCE is designed; and		P
	l) compatibility with RCD and RCM;	Integrated RCMUs.	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:	Second protective earthing conductor not used.	N/A
	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	Instruction provided.	P
	p) PV array configuration information, such as ratings, whether the array is to be grounded or floating, any external protection devices needed, etc.		N/A
5.3.3	Information related to operation	All below related informations provided in the user’s manual.	P

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Clause	Requirement – Test	Result – Remark	Verdict
	Instructions for use shall include any operating instructions necessary to ensure safe operation, including the following, as applicable:		P
	– Instructions for adjustment of controls including the effects of adjustment;		P
	– Instructions for interconnection to accessories and other equipment, including indication of suitable accessories, detachable parts and any special materials;		P
	– Warnings regarding the risk of burns from surfaces permitted to exceed the temperature limits of 4.3.2 and required operator actions to reduce the risk; and	Symbol 14 of Annex C used.	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	All below related informations provided in the service manual.	P
	Maintenance instructions shall include the following:		P
	– Intervals and instructions for any preventive maintenance that is required to maintain safety (for example air filter replacement or periodic re-tightening of terminals);		P
	– Instructions for accessing operator access areas, if any are present, including a warning not to enter other areas of the equipment;		P
	– Part numbers and instructions for obtaining any required operator replaceable parts;		P
	– Instructions for safe cleaning (if recommended)		N/A
	– 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		P
	Where required by 14.8.5, the documentation shall include the applicable items from the following list of instructions regarding maintenance of batteries:		P
	– Servicing of batteries should be performed or supervised by personnel knowledgeable about batteries and the required precautions		P
	– When replacing batteries, replace with the		P

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Clause	Requirement – Test	Result – Remark	Verdict
	same type and number of batteries or battery packs		
	– General instructions regarding removal and installation of batteries		P
	– CAUTION: Do not dispose of batteries in a fire. The batteries may explode.		P
	– CAUTION: Do not open or damage batteries. Released electrolyte is harmful to the skin and eyes. It may be toxic.		P
	– 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:		P
	a) Remove watches, rings, or other metal objects.		P
	b) Use tools with insulated handles.	DVC-A circuit.	N/A
	c) Wear rubber gloves and boots.	DVC-A circuit.	N/A
	d) Do not lay tools or metal parts on top of batteries		P
	e) Disconnect charging source prior to connecting or disconnecting battery terminals		P
	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).	DVC-A 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		P
	– Suitability for WET LOCATIONS or not		P
	– POLLUTION DEGREE rating in 6.2 below	See clause 6.2 below	P
	– INGRESS PROTECTION (IP) rating, as in 6.3 below	See clause 6.3 below	P
	– Ultraviolet (UV) exposure rating, as in 6.4 below	See clause 6.4 below	P
	– Ambient temperature and relative humidity ratings, as in 6.5 below	See clause 6.5 below	
6.1	Environmental categories and minimum environmental conditions		P
6.1.1	Outdoor	Outdoor use.	P

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Clause	Requirement – Test	Result – Remark	Verdict
6.1.2	Indoor, unconditioned		N/A
6.1.3	Indoor, conditioned		N/A
6.2	Pollution degree	Pollution degree 2	P
6.3	Ingress Protection	IP65	P
6.4	UV exposure		P
6.5	Temperature and humidity	-25-60°C, 4%-100% humidity	P
7	**PROTECTION AGAINST ELECTRIC SHOCK AND ENERGY HAZARDS**		P
7.1	General		P
7.2	Fault conditions	Suitable protection provided against electric shock under fault conditions.	P
7.3	Protection against electric shock		P
7.3.1	General	See below	P
7.3.2	Decisive voltage classification	Considered.	P
7.3.2.1	Use of decisive voltage class (DVC)		P
7.3.2.2	Limits of DVC (according table 6)	DVC-C for >50Vrms/71Vpeak. DVC-C for >120Vdc. DVC-A for <25Vrms or 35.4Vpeak. DVC-A for <60Vdc.	P
7.3.2.3	Short-terms limits of accessible voltages under fault conditions	No parts were exceed DVC-A level.	P
7.3.2.4	Requirements for protection (according table 7)		P
7.3.2.5	Connection to PELV and SELV circuits	Considered.	P
7.3.2.6	Working voltage and DVC	DVC-A and DVC-C circuits within PCE.	P
7.3.2.6.1	General		P
7.3.2.6.2	AC working voltage (see Figure 2)	Max. 280 Va.c.	P
7.3.2.6.3	DC working voltage (see Figure 3)	Max. 600 Vd.c.	P
7.3.2.6.4	Pulsating working voltage (see Figure 4)		P
7.3.3	protective separation		P
	Protective separation shall be achieved by:		P
	▪ double or reinforced insulation, or	Protective separation applied between decisive voltage C and accessible unearthed parts with corresponding overvoltage category.	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	Protective separation applied between decisive voltage C and accessible earthed metal enclosure with corresponding overvoltage category.	P

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Clause	Requirement – Test	Result – Remark	Verdict
	basic insulation, or		
	▪ protective impedance comprising limitation of current per 7.3.5.3 and of discharged energy per 7.3.5.4, or	Controlled high impedance resistors used.	P
	▪ limitation of voltage according to 7.3.5.4.		P
	The protective separation shall be fully and effectively maintained under all conditions of intended use of the PCE		
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).	Earthed metal enclosure used.	P
	Open type sub-assemblies and devices do not require protective measures against direct contact but the instruction provided with the equipment must indicate that such measures must be provided in the end equipment or in the installation.		N/A
	Product intended for installation in CLOSED ELECTRICAL OPERATING AREAS, (see 3.9) need not have protective measures against direct contact, except as required by 7.3.4.2.4.		N/A
7.3.4.2	Protection by means of enclosures and barriers		P
	The following requirements apply where protection against contact with live parts is provided by enclosures or barriers, not by insulation in accordance with 7.3.4.3.		P
7.3.4.2.1	General		P
	Parts of enclosures and barriers that provide protection in accordance with these requirements shall not be removable without the use of a tool (see 7.3.4.2.3).	Barrier can't be removed without use of tools	P
	Polymeric materials used to meet these requirements shall also meet the requirements of 13.6	Approved plastic material used as part of the fire enclosure.	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	Considered.	P
	b) decisive voltage classification B, (DVC B) - the probe must not touch bare live parts	Considered.	P

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Clause	Requirement – Test	Result – Remark	Verdict
	c) decisive voltage classification C, (DVC C) – the probe must have adequate clearance to live parts, based on the clearance for Basic insulation using the recurring peak working voltage involved,	Considered.	P
7.3.4.2.3	Access probe tests	No access with test finger and test pin to any hazardous parts.	P
	Compliance with 7.3.4.2.1 is checked by all of the following:	IP65 appliance.	P
	a) Inspection; and		P
	b) Tests with the test finger (Figure D.1) and test pin (Figure D.2) of 0E, the results of which shall comply with the requirements of 7.3.4.2.1 a), b), and c) as applicable. Probe tests are performed on openings in the enclosures after removal of parts that can be detached or opened by an operator without the use of a tool, including fuseholders, and with operator access doors and covers open. It is permitted to leave lamps in place for this test. Connectors that can be separated by an operator without use of a tool, shall also be tested during and after disconnection. Any movable parts are to be put in the most unfavourable position.		P
	The test finger and the test pin are applied as above, without appreciable force, in every possible position, except that floor-standing equipment having a mass exceeding 40 kg is not tilted.		P
	Equipment intended for building-in or rack mounting, or for incorporation in larger equipment, is tested with access to the equipment limited according to the method of mounting detailed in the installation instructions.		N/A
	c) Openings preventing the entry of the jointed test finger (Figure E-1 of 0E) during test b) above, are further tested by means of straight unjointed test finger (Figure E-3 of 0E), applied with a force of 30 N. If the unjointed finger enters, the test with the jointed finger is repeated except that the finger is applied using any necessary force up to 30 N.	No such openings	N/A
	d) In addition to a) – c) above, top surfaces of enclosure shall be tested with the IP3X probe of IEC 60529. The test probe shall not penetrate the top surface of the enclosure when probed from the vertical direction ±5 ° only.		P
7.3.4.2.4	Service access areas	PCE is not energized since DC input and AC output are	P

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Clause	Requirement – Test	Result – Remark	Verdict
		disconnected before servicing	
7.3.4.3	Protection by means of insulation of live parts		P
	Where the requirements of 7.3.4.2 are not met, live parts shall be provided with insulation if:	Considered.	P
	– their working voltage is greater than the maximum limit of decisive voltage class A, or		P
	– for a DVC A or B circuit, protective separation from adjacent circuit of DVC C is not provided (see note "‡" under Table 7)		P
7.3.5	Protection in case of direct contact		P
7.3.5.1	General		P
	Protection in case of direct contact is required to ensure that contact with live parts does not produce a shock hazard.		P
	The protection against direct contact according to 7.3.4 is not required if the circuit contacted is separated from other circuits according to 7.3.2.3, and:		P
	– is of decisive voltage class A and complies with 7.3.5.2, or		P
	– is provided with protective impedance according to 7.3.5.3, or		P
	– is limited in voltage according to 7.3.5.4		N/A
	In addition to the measures as given in 7.3.5.2 to 7.3.5.4, it shall be ensured that in the event of error or polarity reversal of connectors no voltages that exceed DVC A can be connected into a circuit with protective separation. This applies for example to plug-in-sub-assemblies or other plug-in devices which can be plugged-in without the use of a tool (key) or which are accessible without the use of a tool.		P
	Conformity is checked by visual inspection and trial insertion.		P
7.3.5.2	Protection using decisive voltage class A	For communication terminal applied.	P
7.3.5.3	Protection by means of protective impedance	Protection used as voltage detecting circuit.	P
	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.		P
7.3.5.3.1	Limitation of current through protective impedance		P
	The current available through protective impedance		P

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Clause	Requirement – Test	Result – Remark	Verdict
	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.		
7.3.5.3.2	Limitation of discharging energy through protective impedance		P
	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.		P
7.3.5.4	Protection by means of limited voltages		N/A
	That portion of a circuit that has its voltage reduced to DVC-A by a voltage divider that complies with the following requirements, and that is otherwise provided with protective separation from circuits of DVC-B or DVC-C according to 7.3.3, does not require protection against direct contact.		N/A
	The voltage divider shall be designed so that under normal and single fault conditions, including faults in the voltage division circuit, the voltage across the output of the voltage divider does not exceed the limit for DVC-A.		N/A
	This type of protection shall not be used in case of protective class II or unearthed circuits, because it relies on protective earth being connected.		N/A
7.3.6	Protection against indirect contact		P
7.3.6.1	General		P
	Protection against indirect contact is required to prevent shock- hazardous current being accessible from conductive parts during an insulation failure. This protection shall comply with the requirements for protective class I (basic insulation plus protective earthing), class II (double or reinforced insulation) or class III (limitation of voltages)		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	See cl. 7.3.6.2 and 7.3.6.3	P
	That part of a PCE meets the requirements of 7.3.6.4 is defined as protective class II.	See cl. 7.3.6.4	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		N/A

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	associated hazards.		
7.3.6.2	Insulation between live parts and accessible conductive parts		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	Basic insulation used to such parts except those covered by 7.3.6.3.	P
7.3.6.3	Protective class I – Protective bonding and earthing	Earthed metal enclosure used.	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		P
	b) accessible conductive parts are separated from live parts of DVC-B or -C using double or reinforced insulation.		P
7.3.6.3.2	Requirements for protective bonding		P
	Electrical contact with the means of connection of the external protective earthing conductor shall be achieved by one or more of the following means:		P
	a) through direct metallic contact;		P
	b) through other conductive parts which are not removed when the PCE or sub-units are used as intended ;	Applied for connection of top, front, and back of enclosure	P
	c) through a dedicated protective bonding conductor;	Green/Yellow wire used	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.	See cl. 7.3.6.3.3	P
	Metal ducts of flexible or rigid construction and metallic sheaths shall not be used as protective bonding conductors, unless the device or material has been investigated as suitable for protective bonding purposes.	No such parts used	P

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7.3.6.3.3	Rating of protective bonding		P
	Protective bonding shall withstand the highest thermal and dynamic stresses that can occur to the PCE item(s) concerned when they are subjected to a fault connecting live parts to accessible conductive parts. The protective bonding shall remain effective for as long as a fault to the accessible conductive parts persists or until an upstream protective device removes power from the part.		P
	Protective bonding shall meet following requirements:		P
	a) For PCE with an overcurrent protective device rating of 16 A or less, the impedance of the protective bonding means shall not exceed 0,1 Ω during or at the end of the test below.		N/A
	b) For PCE with an overcurrent protective device rating of more than 16 A, the voltage drop in the protective bonding test shall not exceed 2,5 V during or at the end of the test below.		N/A
	As alternative to a) and b) the protective bonding may designed according to the requirements for the external protective earthing conductor in 7.3.6.3.5, in which case no testing is required.	The cross-sectional area of protective earthing conductor is the same as the cross-sectional area of the phase conductor.	P
	The impedance of protective bonding means shall be checked by passing a test current through the bond for a period of time as specified below. The test current is based on the rating of the overcurrent protection for the equipment or part of the equipment under consideration, as follows:		N/A
	a) For pluggable equipment type A, the overcurrent protective device is that provided external to the equipment (for example, in the building wiring, in the mains plug or in an equipment rack);		N/A
	b) For pluggable equipment type B and fixed equipment, the maximum rating of the overcurrent protective device specified in the equipment installation instructions to be provided external to the equipment;		N/A
	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		N/A

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Clause	Requirement – Test	Result – Remark	Verdict
	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.		
	On equipment where the protective earth connection to a subassembly or to a separate unit is part of a cable that also supplies power to that subassembly or unit, the resistance of the protective bonding conductor in that cable is not included in the protective bond impedance measurements for the subassembly or separate unit, as shown in Figure 11. However, this option is only permitted if the cab le is protected by a suitably rated protective device that takes into account the size of the conductor. Otherwise the impedance of the protective bonding conductor between the separate units is to be included, by measuring to the protective earthing terminal where the power source enters the first unit in the system, as shown in Figure 12.		N/A
7.3.6.3.3.1	Test current, duration, and acceptance criteria		N/A
	The test current, duration of the test and acceptance criteria are as follows:	(see appended table 7.3.6.3.3)	N/A
	a) For PCE with an overcurrent protective device rating of 16 A or less, the test current is 200% of the overcurrent protective device rating, but not less than 32 A, applied for 120s. The impedance of the protective bonding means during and at the end of the test shall not exceed 0,1 Ω.		N/A
	b) For PCE with an overcurrent protective device rating of more than 16 A, the test current is 200% of the overcurrent protective device rating and the duration of the test is as shown in Table 10 below. The voltage drop in the protective bonding means, during and at the end of the test, shall not exceed 2,5 V.		N/A
	c) During and after the test, there shall be no melting, loosening, or other damage that would impair the effectiveness of the protective bonding means.		N/A
	The test current is derived from an a.c or d.c supply source, the output of which is not earthed.		N/A
	As an alternative to Table 10, where the time-current characteristic of the overcurrent protective device that limits the fault current in the protective bonding means is known because the device is either provided in the equipment or fully specified in the installation instructions, the test duration may be based on that specific device's time-current		N/A

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	characteristic,. The tests are conducted for a duration corresponding to the 200% current value on the time-current characteristic.		
7.3.6.3.4	Protective bonding impedance (routine test)		P
	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:	Considered.	P
	▪ 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:	Considered.	P
	▪ the test duration may be reduced to no less than 2 s	Considered.	P
	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).		P
7.3.6.3.5	External protective earthing conductor	External protective earthing terminal with symbol 7 of Annex C.	P
	A protective earthing conductor shall be connected at all times when power is supplied to PCE of protective class I. Unless local wiring regulations state otherwise, the protective earthing conductor cross-sectional area shall be determined from Table 11 or by calculation according to IEC 60364-5-54.		P
	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:		P
	▪ 2,5 mm² if mechanical protection is provided;		P
	▪ 4 mm² if mechanical protection is not provided.		N/A
	For cord-connected equipment, provisions shall be made so that the external protective earthing		N/A

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Clause	Requirement – Test	Result – Remark	Verdict
	conductor in the cord shall, in the case of failure of the strain-relief mechanism, be the last conductor to be interrupted.		
7.3.6.3.6	Means of connection for the external protective earthing conductor		P
7.3.6.3.6.1	General		P
	The means of connection for the external protective earthing conductor shall be located near the terminals for the respective live conductors. The means of connections shall be corrosion-resistant and shall be suitable for the connection of cables according to 7.3.6.3.5. The means of connection for the protective earthing conductor shall not be used as a part of the mechanical assembly of the equipment or for other connections. A separate means of connection shall be provided for each external protective earthing conductor. Connection and bonding points shall be so designed that their current-carrying capacity is not impaired by mechanical, chemical, or electrochemical influences. Where enclosures and/or conductors of aluminium or aluminium alloys are used, particular attention should be given to the problems of electrolytic corrosion.		P
	The means of connection for the protective earthing conductor shall be permanently marked with:		P
	• symbol 7 of Annex C; or		P
	• the colour coding green-yellow		P
	Marking shall not be done on easily changeable parts such as screws.	Not marked on changeable parts.	P
7.3.6.3.7	Touch current in case of failure of the protective earthing conductor	Maximum 0.29mA<3.5mA	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.		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.	Permanently connected equipment.	N/A
	For all other PCE, one or more of the following measure shall be applied, unless the touch current measured in accordance with 7.5.4 using the test network of IEC 60990 test figure 4 shall not exceed 3,5 mA a.c. or 10 mA d.c.	Not exceed 3,5 mA a.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		N/A

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Clause	Requirement – Test	Result – Remark	Verdict
	Al; or		
	• automatic disconnection of the supply in case of discontinuity of the protective earthing conductor; or		N/A
	• provision of an additional terminal for a second protective earthing conductor of the same cross-sectional area as the original protective earthing conductor and installation instruction requiring a second protective earthing conductor to be installed or		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	Class I equipment.	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		N/A

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Clause	Requirement – Test	Result – Remark	Verdict
	series-connected equipment;		
	• metal-encased equipment of protective class II may have provision on its enclosure for the connection of an equipotential bonding conductor;		N/A
	• equipment of protective class II may have provision for the connection of an earthing conductor for functional reasons or for damping of overvoltages; it shall, however, be insulated as though it is a live part;		N/A
	• equipment employing protective class II shall be marked according to 5.1.8.		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	Pollution degree 2 internally	P
	• overvoltage category	For DC input circuits: Overvoltage Category II - For AC output circuits: Overvoltage Category III	P
	• supply earthing system	TN system considered.	P
	• insulation voltage	Considered	P
	• location of insulation	Considered	P
	• type of insulation	Considered	P
	Compliance of insulation, creepage distances, and clearance distances, shall be verified by measurement or visual inspection, and the tests of 7.5.		P
7.3.7.1.3	Supply earthing systems		P
	Three basic types of earthing system are described in IEC 60364-1. They are:		P
	• TN system: has one point directly earthed, the accessible conductive parts of the installation being connected to that point by protective conductors. Three types of TN systems, TN-C, TN-S and TN-C-S, are defined according to the arrangement of the neutral and protective		P

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Clause	Requirement – Test	Result – Remark	Verdict
	conductor.		
	• 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
	• IT system: has all live parts isolated from earth or one point connected to earth through an impedance, the accessible conductive parts of the installation being earthed independently or collectively to the earthing system.		N/A
7.3.7.1.4	Insulation voltages	Considered	P
	Table 12 makes use of the circuit system voltage and overvoltage category to define the impulse withstands voltage and the temporary overvoltage.		P
7.3.7.2	Insulation between a circuit and its surroundings		P
7.3.7.2.1	General		P
7.3.7.2.2	Circuits connected directly to the mains	Considered	P
7.3.7.2.3	Circuits other than mains circuits	Considered	P
7.3.7.2.4	Insulation between circuits	Considered	P
7.3.7.3	Functional insulating	Considered	P
7.3.7.4	Clearance distances	(see appended table 7.3.7)	P
7.3.7.4.1	Determination		P
7.3.7.4.2	Electric field homogeneity		P
7.3.7.4.3	Clearance to conductive enclosures		P
7.3.7.5	Creepage distances	(see appended table 7.3.7)	P
7.3.7.5.1	General		P
7.3.7.5.2	Voltage		P
7.3.7.5.3	Materials	Considered	P
7.3.7.6	Coating	No such coating used.	N/A
7.3.7.7	PWB spacings for functional insulating		P
7.3.7.8	Solid insulating	(see appended table 7.3.7)	P
7.3.7.8.1	General		P
7.3.7.8.2	Requirements for electrical withstand capability of solid insulation		P
7.3.7.8.2.1	Basic, supplemental, reinforced, and double insulation	Approved plastic material used as reinforced.	P
7.3.7.8.2.2	Functional insulation		N/A
7.3.7.8.3	Thin sheet or tape material		N/A
7.3.7.8.3.1	General		N/A

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Clause	Requirement – Test	Result – Remark	Verdict
7.3.7.8.3.2	Material thickness not less than 0,2 mm		N/A
7.3.7.8.3.3	Material thickness less than 0,2 mm		N/A
7.3.7.8.3.4	Compliance		N/A
7.3.7.8.4	Printed wiring boards		N/A
7.3.7.8.4.1	General		N/A
7.3.7.8.4.2	Use of coating materials		N/A
7.3.7.8.5	Wound components		N/A
7.3.7.8.6	Potting materials	No such material.	N/A
7.3.7.9	Insulation requirements above 30 kHz	Considered.	P
7.3.8	Residual Current-operated protective (RCD) or monitoring (RCM) device compatibility		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.	RCM used for detection.	P
7.3.9	Capacitor discharge		P
7.3.9.1	Operator access area		P
	Equipment shall be so designed that there is no risk of electric shock in operator access areas from charge stored on capacitors after disconnection of the PCE.		P
7.3.9.2	Service access areas		P
	Capacitors located behind panels that are removable for servicing, installation, or disconnection shall present no risk of electric shock or energy hazard from charge stored on capacitors after disconnection of the PCE.	Symbol 21 of Annex C and an indication of the discharge time used in a clearly visible position.	P
7.4	Protection against energy hazards	No such kind of hazard.	N/A
7.4.1	Determination of hazardous energy level		P
	A hazardous energy level is considered to exist if		P
	a) The voltage is 2 V or more, and power available after 60 s exceeds 240 VA.		P
	b) The stored energy in a capacitor is at a voltage. U of 2 V or more, and the stored energy. E, calculated from the following equation, exceeds 20J: $E = 0,5\ CU^2$		P
7.4.2	Operator Access Areas	No risk of energy hazard in operator access areas from accessible circuits	N/A
	Equipment shall be so designed that there is no risk of energy hazard in operator access areas from accessible circuits.		

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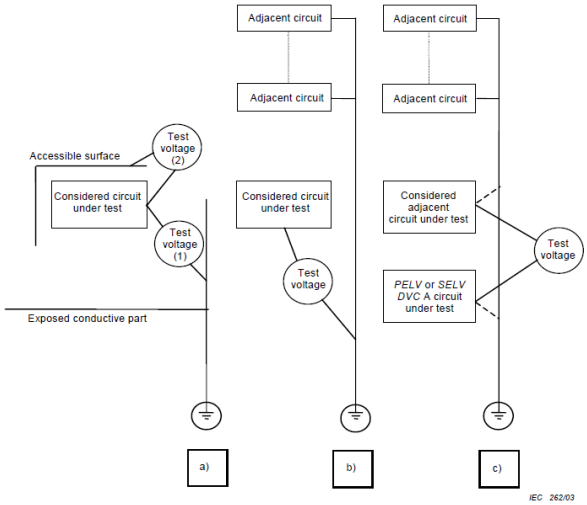
Clause	Requirement – Test	Result – Remark	Verdict
7.4.3	Services Access Areas	Symbol 21 of Annex C and an indication of the discharge time used in a clearly visible position.	P
7.5	Electrical tests related to shock hazard	(see appended table 7.5)	P
7.5.1	Impulse voltage test (type test)		P
7.5.2	Voltage test (dielectric strength test)		P
7.5.2.1	Purpose of test		P
7.5.2.2	Value and type of test voltage		P
7.5.2.3	Humidity pre-conditioning		P
7.5.2.4	Performing the voltage test The test shall be applied as follows, according to Figure 13:  **Figure 13 – Voltage test procedures**		P
7.5.2.5	Duration of the a.c. or d.c. voltage test The duration of the test shall be at least 60 s for the type test and 1 s for the routine test. The test voltage may be applied with increasing and/or decreasing ramp voltage, and the ramp times are not specified, but regardless of the ramp time, the dwell time at full voltage shall be 60 s and 1 s respectively for type and routine tests.		P
7.5.2.6	Verification of the a.c. or d.c. voltage test		P
7.5.3	Partial discharge test	(see appended table 7.5)	P
7.5.4	Touch current measurement (type test)	Maximum 0.29mA<3.5mA	P
	The touch current shall be measured if required by 7.3.6.3.7 and shall not be greater than 3.5 mA a.c. or 10 mA d.c. or special measures of protection as given in 7.3.6.3.7 are required.	(see appended table 7.3.6.3.7)	P
	For type tests on PCE for which wet locations		P

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	requirements apply according to 6.1, the humidity pre-conditioning of 4.5 shall be performed immediately prior to the touch current test.		
7.5.5	Equipment with multiple sources of supply	Considered.	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.	No moving part.	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.		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.	Fixed appliance.	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.	Fixed appliance.	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.	Fixed appliance.	N/A
8.5	Wall mounting		P
	Mounting brackets on equipment intended to be mounted on a wall or ceiling shall withstand a force		P

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	of four times the weight of the equipment.		
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.		P
9.1.1	Reducing the risk of ignition and spread of flame	Considered.	P
	For equipment or a portion of equipment, there are two alternative methods of providing protection against ignition and spread of flame that could affect materials, wiring, wound components and electronic components such as integrated circuits, transistors, thyristors, diodes, resistors and capacitors.		P
9.1.2	Conditions for a fire enclosure	Fire enclosure is required	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;		P
	– 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

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	– 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		P
	– insulated wiring, except as permitted in 9.1.2.2.		P
9.1.2.2	Parts not requiring a fire enclosure		N/A
9.1.3	Materials requirements for protection against fire hazard		P
9.1.3.1	General		P
	ENCLOSURES, components and other parts shall be so constructed, or shall make use of such materials, that the propagation of fire is limited.		P
9.1.3.2	Materials for fire enclosures	Metal enclosure used.	P
	If an enclosure material is not classified as specified below, a test may be performed on the final enclosure or part of the enclosure, in which case the material shall additionally be subjected to periodic SAMPLE testing.		N/A
9.1.3.3	Materials for components and other parts outside fire enclosures		N/A
	Except as otherwise noted below, materials for components and other parts (including MECHANICAL ENCLOSURES, ELECTRICAL ENCLOSURES and DECORATIVE PARTS); located outside FIRE ENCLOSURES, shall be of FLAMMABILITY CLASS HB.		N/A
9.1.3.4	Materials for components and other parts inside fire enclosures	Internal components except small parts are V-2, HF-2 or better.	P
9.1.3.5	Materials for air filter assemblies	No such materials used	N/A
9.1.4	Openings in fire enclosures	IP65 appliance, no openings.	N/A
9.1.4.1	General		N/A
	For equipment that is intended to be used or installed in more than one orientation as specified in the product documentation, the following requirements apply in each orientation.		N/A
	These requirements are in addition to those in the following sections:		N/A
	– 7.3.4, Protection against direct contact;		N/A
	– 7.4, Protection against energy hazards;		N/A
	– 13.5, Openings in enclosures		N/A
9.1.4.2	Side openings treated as bottom openings		N/A
9.1.4.3	Openings in the bottom of a fire enclosure		N/A

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Clause	Requirement – Test	Result – Remark	Verdict
	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		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		N/A
9.1.4.6	Additional requirements for openings in transportable equipment		N/A
9.2	LIMITED POWER SOURCES		N/A
9.2.1	General		N/A
9.2.2	Limited power source tests	(see appended table 9.2)	N/A
9.3	Short-circuit and overcurrent protection		N/A
9.3.1	General		N/A
	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.		N/A
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.		N/A
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.		N/A

IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
10	**PROTECTION AGAINST SONIC PRESSURE HAZARDS**		P
10.1	General		P
	The equipment shall provide protection against the effect of sonic pressure. Conformity tests are carried out if the equipment is likely to cause such HAZARDS.	Sound pressure less than 80dBA, no hazards	P
10.2	Sonic pressure and Sound level	See above.	P
10.2.1	Hazardous Noise Levels		P
11	**PROTECTION AGAINST LIQUID HAZARDS**	No liquid used.	N/A
11.1	Liquid Containment, Pressure and Leakage		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
13.1	Handles and manual controls		N/A
	Handles, knobs, grips, levers and the like shall be reliably fixed so that they will not work loose in normal use, if this might result in a hazard. Sealing compounds and the like, other than self-hardening resins, shall not be used to prevent loosening. If handles, knobs and the like are used to indicate the position of switches or similar components, it shall not be possible to fix them in a wrong position if this might result in hazard.	No such device.	N/A
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

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Clause	Requirement – Test	Result – Remark	Verdict
13.3.2	Connection to an a.c. Mains supply		P
13.3.2.1	General		P
	For safe and reliable connection to a MAINS supply, equipment shall be provided with one of the following:		P
	– terminals or leads or a non-detachable power supply cord for permanent connection to the supply; or		P
	– a non-detachable power supply cord for connection to the supply by means of a plug		N/A
	– an appliance inlet for connection of a detachable power supply cord; or		N/A
	– a mains plug that is part of direct plug-in equipment as in 13.3.8		N/A
13.3.2.2	Permanently connected equipment		P
13.3.2.3	Appliance inlets		N/A
13.3.2.4	Power supply cord	No such device.	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	Sizes specified in instruction manual	P
13.3.3.1	Wiring terminals		P
13.3.3.2	Screw terminals		P
13.3.3.3	Wiring terminal sizes		P
13.3.3.4	Wiring terminal design		P
13.3.3.5	Grouping of wiring terminals		P
13.3.3.6	Stranded wire		P
13.3.4	Supply wiring space		P
13.3.5	Wire bending space for wires 10 mm² and greater		N/A
13.3.6	Disconnection from supply sources	Approved DC switch supplied.	P
13.3.7	Connectors, plugs and sockets	Approved standard connectors used.	P
13.3.8	Direct plug-in equipment		N/A
13.4	Internal wiring and connections		P

IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
13.4.1	General	Internal wiring is PVC insulated, rated VW-1. Internal wiring gauge is suitable for current intended to be carried.	P
13.4.2	Routing		P
13.4.3	Colour coding		P
13.4.4	Splices and connections		P
13.4.5	Interconnections between parts of the PCE		P
13.5	Openings in enclosures		N/A
13.5.1	Top and side openings	No 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		N/A
13.6.2.1	Stress relief test		P
13.6.3	Polymers serving as solid insulation		N/A
13.6.3.1	Resistance to arcing		N/A
13.6.4	UV resistance		P
	Polymeric parts of an OUTDOOR ENCLOSURE required for compliance with this standard shall be sufficiently resistance to degradation by ultra-violet (UV) radiation	Considered and approved material used.	P
13.7	Mechanical resistance to deflection, impact, or drop		P
13.7.1	General	Metal enclosure used.	P
13.7.2	250-N deflection test for metal enclosures	Applied for external of metal enclosure	P
13.7.3	7-J impact test for polymeric enclosures	Complied.	P
13.7.4	Drop test		N/A
13.8	Thickness requirements for metal enclosures		N/A
13.8.1	General	PCE compliance with re-quirements of 13.7	N/A
13.8.2	Cast metal		N/A
13.8.3	Sheet metal		N/A

14	**COMPONENTS**	P

IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
14.1	General	(see appended table 14)	P
	Where safety is involved, components shall be used in accordance with their specified RATINGS unless a specific exception is made. They shall conform to one of the following:		P
	a) applicable safety requirements of a relevant IEC standard. Conformity with other requirements of the component standard is not required. If necessary for the application, components shall be subjected to the test of this standard, except that it is not necessary to carry out identical or equivalent tests already performed to check conformity with the component standard;		P
	b) the requirements of this standard and, where necessary for the application, any additional applicable safety requirements of the relevant IEC component standard;		P
	c) if there is no relevant IEC standard, the requirements of this standard;		P
	d) applicable safety requirements of a non-IEC standard which are at least as high as those of the applicable IEC standard, provided that the component has been approved to the non-IEC standard by a recognized testing authority.		P
	Components such as optocouplers, capacitors, transformers, and relays connected across basic, supplemental, reinforced, or double insulation shall 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	No motor used.	N/A
	Motors which, when stopped or prevented from starting (see 4.4.4.3), would present an electric shock HAZARD, a temperature HAZARD, or a fire HAZARD, shall be protected by an over temperature or thermal protection device meeting the requirements of 14.3.		
14.3	Over temperature protection devices		P
14.4	Fuse holders	No fuse holder used.	N/A
14.5	MAINS voltage selecting devices	No such device.	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.		P

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Clause	Requirement – Test	Result – Remark	Verdict
	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.	V-0 min. PCB used	P
14.7	Circuits or components used as transient overvoltage limiting devices		P
	If control of transient overvoltage is employed in the equipment, any overvoltage limiting component or circuit shall be tested with the applicable impulse withstand voltage of Table 7-10 using the test method from 7.5.1 except 10 positive and 10 negative impulses are to be applied and may be spaced up to 1 min apart.	Certified components used	P
14.8	Batteries	No batteries.	N/A
	Equipment containing batteries shall be designed to reduce the risk of fire, explosion and chemical leaks under normal conditions and after a single fault in the equipment including a fault in circuitry within the equipment battery pack.		N/A
14.8.1	Battery Enclosure Ventilation		N/A
14.8.1.1	Ventilation requirements		N/A
14.8.1.2	Ventilation testing		N/A
14.8.1.3	Ventilation instructions		N/A
14.8.2	Battery Mounting		N/A
	Compliance is verified by the application of the force to the battery's mounting surface. The test force is to be increased gradually so as to reach the required value in 5 to 10 s, and is to be maintained at that value for 1 min. A non-metallic rack or tray shall be tested at the highest normal condition operating temperature.		N/A
14.8.3	Electrolyte spillage		N/A
	Battery trays and cabinets shall have an electrolyte-resistant coating.		N/A
	The ENCLOSURE or compartment housing a VENTED BATTERY shall be constructed so that spillage or leakage of the electrolyte from one battery will be contained within the ENCLOSURE and be prevented from:		N/A
	a) reaching the PCE outer surfaces that can be contacted by the USER		N/A
	b) contaminating adjacent electrical components		N/A

IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
	or materials; and		
	c) bridging required electrical distances		N/A
14.8.4	Battery Connections	No batteries.	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	Single fault tests simulated for equipment, no critical hazard listed in this standard occur.	P

4.2.2.6/4.2.2.7	TABLE: electrical data					P
Input			Output			
U (V)	I (A)	P (kW)	U (V)	I (A)	P (kW)	PF
EA6KSI						
Tested at 50Hz						
485.8	6.251	3.037	231.0	25.70	5.910	0.995
485.9	6.240	3.032				
368.3	8.418	3.101	231.0	25.74	5.945	0.998
368.5	8.116	2.988				
306.1	9.938	3.040	231.0	25.60	5.914	0.998
306.2	10.027	3.070				
Tested at 60Hz						
489.1	6.325	3.093	231.0	25.86	5.953	0.995
489.2	6.169	3.017				
372.9	8.352	3.108	231.0	25.80	5.960	0.998
373.1	8.046	2.994				
306.3	9.884	3.030	231.0	25.50	5.891	0.998
306.4	9.972	3.056				
EA5KSI						
Tested at 50Hz						
485.9	5.237	2.545	231.0	21.56	4.957	0.995
486.1	5.190	2.522				
367.9	7.047	2.592	231.0	21.69	5.004	0.998
368.0	6.836	2.514				
253.9	9.970	2.531	231.0	21.37	4.929	0.998
254.0	10.064	2.556				
Tested at 60Hz						
486.5	5.283	2.571	231.0	21.70	4.988	0.995
486.8	5.189	2.525				
368.2	6.988	2.573	231.0	21.54	4.973	0.998
368.3	6.792	2.499				

254.3	9.971	2.537	231.0	21.40	4.932	0.998
254.3	10.058	2.560				
EA4.68KSI						
Tested at 50Hz						
487.0	4.839	2.356	231.0	19.89	4.57	0.995
487.2	4.735	2.306				
367.2	6.475	2.378	231.0	19.90	4.58	0.998
367.2	6.241	2.292				
233.4	9.937	2.320	231.0	19.59	4.51	0.998
233.6	10.031	2.340				
Tested at 60Hz						
487.7	4.826	2.354	231.0	19.85	4.57	0.995
487.9	4.743	2.313				
368.3	6.440	2.372	231.0	19.89	4.59	0.998
368.5	6.254	2.304				
234.0	9.971	2.334	231.0	19.70	4.54	0.998
234.2	10.071	2.359				
EA4KSI						
Tested at 50Hz						
486.2	4.150	2.018	231.0	17.20	3.949	0.995
486.5	4.127	2.007				
368.4	5.573	2.053	231.0	17.28	3.983	0.998
368.6	5.430	2.001				
203.4	9.969	2.030	231.0	17.10	3.940	0.998
203.6	10.082	2.050				
Tested at 60Hz						
486.7	4.169	2.028	231.0	17.24	3.964	0.995
486.8	4.136	2.013				
368.2	5.582	2.056	231.0	17.29	3.984	0.998
368.7	5.426	1.999				
203.0	9.931	2.019	231.0	17.00	3.920	0.998
203.2	10.037	2.040				

EA3.68KSI						
Tested at 50Hz						
499.2	3.644	1.819	231.0	15.52	3.564	0.994
499.5	3.628	1.811				
368.4	5.128	1.889	231.0	15.90	3.669	0.998
368.5	4.993	1.840				
202.8	9.136	1.850	231.0	15.65	3.609	0.998
203.1	9.245	1.878				
Tested at 60Hz						
497.9	3.675	1.829	231.0	15.61	3.584	0.994
498.1	3.659	1.822				
368.5	5.124	1.887	231.0	15.90	3.670	0.998
368.7	4.996	1.842				
203.3	9.171	1.866	231.0	15.76	3.633	0.998
203.6	9.282	1.890				
EA3KSI-D						
Tested at 50Hz						
487.3	3.098	1.510	231.0	12.94	2.976	0.994
487.4	3.110	1.516				
368.7	4.154	1.532	231.0	13.00	2.990	0.998
368.9	4.076	1.504				
152.2	9.916	1.510	231.0	12.70	2.926	0.998
152.4	10.036	1.530				
Tested at 60Hz						
498.7	3.052	1.475	231.0	12.33	2.823	0.994
495.6	2.857	1.397				
369.3	4.377	1.615	231.0	13.00	2.990	0.998
369.3	3.845	1.419				
153.8	10.067	1.540	231.0	12.82	2.955	0.998
154.0	10.015	1.533				
EA3KSI						
Tested at 50Hz						

486.8	6.214	3.024	231.0	12.95	2.978	0.994
367.6	8.254	3.030	231.0	13.00	2.990	0.997
307.5	9.989	3.074	231.0	13.04	3.004	0.997
Tested at 60Hz						
486.9	6.214	3.024	231.0	13.00	2.977	0.993
367.8	8.252	3.032	231.0	13.00	2.990	0.997
307.6	9.988	3.072	231.0	13.02	3.003	0.997
EA2.5KSI						
Tested at 50Hz						
487.0	5.152	2.507	231.0	10.81	2.472	0.994
368.6	6.846	2.519	231.0	10.81	2.491	0.997
256.1	10.001	2.556	231.0	10.81	2.492	0.997
Tested at 60Hz						
486.3	5.167	2.512	230.8	10.79	2.473	0.993
368.2	6.871	2.530	230.8	10.84	2.495	0.997
255.0	10.035	2.559	230.8	10.82	2.490	0.997
EA2KSI						
Tested at 50Hz						
487.3	4.145	2.020	230.7	8.727	1.995	0.991
364.2	5.521	2.010	230.7	8.620	1.980	0.995
204.6	9.923	2.023	230.7	8.543	1.963	0.996
Tested at 60Hz						
487.9	4.177	2.038	230.8	8.804	2.013	0.991
368.8	5.511	2.032	230.8	8.748	2.010	0.996
205.1	10.008	2.046	230.8	8.638	1.985	0.996
Supplementary information:						

4.3	**TABLE: heating temperature rise measurements**		P
	test voltage (V) ..... :	See below	—
	t1 (°C)..... :	See below	—
	t2 (°C) ..... :	See below	—

Thermocouple Locations	Max. temperature measured (°C)		Max. temperature limit, (°C)
	Condition 1	Condition 2	
PV input connector	47.3	62.5	85
Internal wire to PV input	62.2	78.1	105
DC switch	61.7	77.9	85
PV input inductor L4	63.1	79.2	150
PV input Y cap C95	60.4	76.6	110
PV input X cap	59.3	75.3	110
PV input boost inductor	72.9	90.2	110
Internal wire to Boost inductor	60.7	76.8	105
BUS cap C92	59.5	75.3	105
Inverter IGBT Q2	90.1	107.3	130
Boost triode Q8	76.1	93.6	130
Output X cap C100	64.9	81.3	110
Output relay K4	77.4	84.7	85
Output varistor RV3	83.5	84.9	85
Output common mode choke L3	103.5	117.0	150
Output filter cap C23	68.9	85.6	110
Output inverter inductor L2	102.7	120.7	150
Output X cap C9	73.2	90.1	110
Output Y cap	67.0	83.5	110
Internal wire output terminal	73.9	88.6	105
Isolated opto-coupler U4	64.5	80.5	110
Output terminal	50.0	65.4	105
PV input cap	56.5	72.4	110
Internal wire to inverter output inductor	77.8	94.9	105
Display	49.9	65.2	95
Front enclosure	52.7	68.0	70
Heatsink	67.4	83.9	--
Side enclosure	52.7	68.2	70
Ambient	45.5	60.3	--
Note:			

Condition 1: for PV inverter input with 300Vdc at ambient 45 degree. Condition 2: for PV inverter input with 300Vdc at ambient 60 degree after derating power.

4.3	**TABLE: heating temperature rise measurements**		P
	test voltage (V) ..... :	See below	—
	t1 (°C)..... :	See below	—
	t2 (°C) ..... :	See below	—

Thermocouple Locations	Max. temperature measured (°C)		Max. temperature limit, (°C)
	Condition 3	Condition 4	
PV input connector	46.6	61.4	85
Internal wire to PV input	62.4	77.1	105
DC switch	65.0	80.0	85
PV input inductor L4	64.1	79.1	150
PV input Y cap C95	59.2	74.1	110
PV input X cap	59.7	74.4	110
PV input boost inductor	62.5	77.4	110
Internal wire to Boost inductor	64.5	79.4	105
BUS cap C92	62.5	77.2	105
Inverter IGBT Q2	87.0	103.2	130
Boost triode Q8	63.9	79.1	130
Output X cap C100	67.7	82.9	110
Output relay K4	80.1	84.8	85
Output varistor RV3	84.5	84.9	85
Output common mode choke L3	106.1	116.9	150
Output filter cap C23	71.7	87.0	110
Output inverter inductor L2	115.3	133.5	150
Output X cap C9	78.2	93.6	110
Output Y cap	71.6	86.9	110
Internal wire output terminal	78.4	90.1	105
Isolated opto-coupler U4	67.8	82.6	110
Output terminal	50.1	65.0	105
PV input cap	62.7	77.3	110
Internal wire to inverter output inductor	83.1	98.8	105
Display	50.4	65.2	95
Front enclosure	53.5	68.2	70
Heatsink	72.3	88.4	--

Side enclosure	52.0	66.8	70
Ambient	44.7	59.6	--

Note:
Condition 3: for PV inverter input with 480Vdc at ambient 45 degree.
Condition 4: for PV inverter input with 480Vdc at ambient 60 degree after derating power.
Tests are conducted on model EA6KTLSI to represent all the models.

4.4	**TABLE: fault condition tests**		P
	ambient temperature (°C) :	25	—

No.	component No.	fault	test voltage (V)	test time	fuse No.	fuse current (A)	result
1.	PV1 voltage monitoring defect R241	o-c	400	3min	--	--	No message. PV inverter disconnected from grid immediately. No damaged, no hazard.
2.	PV1 voltage monitoring defect C235	s-c	400	3min	--	--	No message. PV inverter disconnected from grid immediately. No damaged, no hazard.
3.	Boost1 circuit monitoring defect R244	o-c	400	3min	--	--	No message. PV inverter run normally. (PV inverter restart. Error message: PV Curr Channel Err1) No damaged, no hazard.
4.	Boost1 circuit monitoring defect R245	o-c	400	3min	--	--	No message. PV inverter run normally . (PV inverter restart. Error message: PV Curr Channel Err1) No damaged, no hazard.
5.	PV2 voltage monitoring defect R248	o-c	400	3min	--	--	Error message: PV Above BUS Err PV inverter disconnected from grid immediately. No damaged, no hazard.
6.	PV2 voltage monitoring defect C244	s-c	400	3min	--	--	No message. PV inverter disconnected from grid immediately. No damaged, no hazard.
7.	BUS voltage monitoring defect R252	o-c	400	3min	--	--	Error message: Boost SelfChk Err1 PV inverter disconnected from grid immediately. No damaged, no hazard.

8.	BUS voltage monitoring defect C246	s-c	400	3min	--	--	Error message: BUS Volt Low Err, PV Above BUS Err PV inverter disconnected from grid immediately. No damaged, no hazard.
9.	BUS overvoltage protection defect R259	o-c	400	3min	--	--	Error message: BUS Over VoltHW Err PV inverter disconnected from grid immediately. No damaged, no hazard.
10.	Boost2 circuit monitoring defect R476	s-c	400	3min	--	--	Error message: PV Over Curr HWErr, PV Curr Channel Err2. PV inverter disconnected from grid immediately. No damaged, no hazard.
11.	Boost2 circuit monitoring defect C247	s-c	400	3min	--	--	Error message: PV Curr Channel Err2. PV inverter disconnected from grid immediately. No damaged, no hazard.
12.	ISO monitoring defect R227	o-c	400	3min	--	--	No message. PV inverter runs normally . No damaged, no hazard.
13.	ISO monitoring defect R81	o-c	400	3min	--	--	No message. PV inverter runs normally . (PV inverter restart. Error message: ISO Err) No damaged, no hazard.
14.	ISO monitoring defect C239	s-c	400	3min	--	--	No message. PV inverter runs normally . (PV inverter restart. Error message: ISO Err) No damaged, no hazard.
15.	INV voltage monitoring defect R457	s-c	400	3min	--	--	Error message: Output Relay Err. PV inverter disconnected from grid immediately. No damaged, no hazard.
16.	INV voltage monitoring defect R275	o-c	400	3min	--	--	Error message: Output Relay Err. PV inverter disconnected from grid immediately. No damaged, no hazard.

17.	Grid voltage monitoring(MCU) defect R470	s-c	400	3min	--	--	Error message: DCI High Err, SMCU Grid Volt Err. PV inverter disconnected from grid immediately. No damaged, no hazard.
18.	Grid voltage monitoring(MCU) defect C263	s-c	400	3min	--	--	Error message: SMCU Grid Volt Err. PV inverter disconnected from grid immediately. No damaged, no hazard.
19.	Grid voltage monitoring(DSP) defect R290	o-c	400	3min	--	--	Error message: Grid Volt Loss Err. PV inverter disconnected from grid immediately. No damaged, no hazard.
20.	Grid frequency monitoring defect R293	o-c	400	3min	--	--	Error message: Grid Under Freq Err2. PV inverter disconnected from grid immediately. No damaged, no hazard.
21.	Grid frequency monitoring defect R172	o-c	400	3min	--	--	No message. PV inverter runs normally. (PV inverter restart. Error message: SMCU Grid Freq Err) No damaged, no hazard.
22.	AC current monitoring defect R308	o-c	400	3min	--	--	Error message: Inv Over Curr HWErr, AD Inv Curr Channel Err. PV inverter disconnected from grid immediately. No damaged, no hazard.
23.	DCI monitoring defect R306	o-c	400	3min	--	--	Error message: DCI High Err. PV inverter disconnected from grid immediately. No damaged, no hazard.
24.	Earth monitoring defect R273	o-c	400	3min	--	--	No message. PV inverter runs normally. No damaged, no hazard.
25.	Earth monitoring defect R283	o-c	400	3min	--	--	No message. PV inverter runs normally. No damaged, no hazard.

26.	Leakage current monitoring defect R307	o-c	400	3min	--	--	Error message: Leak Curr Err. PV inverter disconnected from grid immediately. No damaged, no hazard.
27.	Leakage current monitoring defect R312	o-c	400	3min	--	--	Error message: Leak Curr Err. PV inverter disconnected from grid immediately. No damaged, no hazard.
28.	Leakage current monitoring defect C290	s-c	400	3min	--	--	Error message: Leak Curr Err. PV inverter disconnected from grid immediately. No damaged, no hazard.
29.	MCU controller defect CY4	s-c	400	3min	--	--	No message. PV inverter runs normally. (PV inverter is on standby, when it restart.) No damaged, no hazard.
30.	MCU controller defect SPISTEB	o-c	400	3min	--	--	No message. PV inverter runs normally. (PV inverter is on standby, when it restart.) No damaged, no hazard.
31.	MCU controller defect SPISMOB	o-c	400	3min	--	--	No message. PV inverter runs normally. (PV inverter is on standby, when it restart.) No damaged, no hazard.
32.	MCU controller defect SPISMIB	o-c	400	3min	--	--	No message. PV inverter runs normally. (PV inverter is on standby, when it restart.) No damaged, no hazard.
33.	MCU controller defect SPICLKB	o-c	400	3min	--	--	No message. PV inverter runs normally. (PV inverter is on standby, when it restart.) No damaged, no hazard.
34.	Reference power supply defect C150	s-c	400	3min	--	--	Error message: PV Over Volt Err, Ambient Over Temp Err, Grid Over Volt Err2. PV inverter disconnected from grid immediately. No damaged, no hazard.

35.	MCU power supply defect C227	s-c	400	3min	--	--	PV inverter disconnected from grid immediately. Q1, Q2, Q5, Q6 and K1, K2, K4 has be damaged, no hazard.
36.	MCU power supply defect C120	s-c	400	3min	--	--	PV inverter disconnected from grid immediately. Q1, Q2, Q5, Q6 and K1, K2, K4 has be damaged, no hazard.
37.	DSP controller defect CY3	s-c	400	3min	--	--	PV inverter disconnected from grid immediately. Q3, Q4 and K1, K2, K3, K4 has be damaged, no hazard.
38.	Relay defect RELAY1 (1-2pin)	s-c before start up	400	3min	--	--	Error message: Output Relay Err. PV inverter does not start up. No damaged, no hazard.
39.	Relay defect RELAY2 (1-2pin)	s-c before start up	400	3min	--	--	Error message: Output Relay Err. PV inverter does not start up. No damaged, no hazard.
40.	Relay defect RELAY3 (1-2pin)	s-c before start up	400	3min	--	--	Error message: Output Relay Err. PV inverter does not start up. No damaged, no hazard.
41.	Relay defect RELAY4 (1-2pin)	s-c before start up	400	3min	--	--	Error message: Output Relay Err. PV inverter does not start up. No damaged, no hazard.
42.	Earth1 monitoring defect R338	s-c before start up	400	3min	--	--	No message. PV inverter can start up. No damaged, no hazard.
43.	Earth1 monitoring defect R380	o-c before start up	400	3min	--	--	No message. PV inverter can start up. No damaged, no hazard.
44.	Earth1 monitoring defect R53	o-c before start up	400	3min	--	--	No message. PV inverter can start up. No damaged, no hazard.
45.	Earth1 monitoring defect R384	s-c before start up	400	3min	--	--	No message. PV inverter can start up. No damaged, no hazard.
46.	Earth2 monitoring defect R335	s-c before start up	400	3min	--	--	No message. PV inverter can start up. No damaged, no hazard.

47.	Earth2 monitoring defect R125	o-c before start up	400	3min	--	--	No message. PV inverter can start up. No damaged, no hazard.
48.	Earth2 monitoring defect R336	o-c before start up	400	3min	--	--	No message. PV inverter can start up. No damaged, no hazard.
49.	Earth2 monitoring defect R337	s-c before start up	400	3min	--	--	No message. PV inverter can start up. No damaged, no hazard.
50.	ISO monitoring defect R166	s-c before start up	400	3min	--	--	No message. PV inverter can start up. No damaged, no hazard.
51.	ISO monitoring defect R104	o-c before start up	400	3min	--	--	No message. PV inverter can start up. No damaged, no hazard.
52.	ISO monitoring defect R150	s-c before start up	400	3min	--	--	No message. PV inverter can start up. No damaged, no hazard.
53.	ISO monitoring defect R151	o-c before start up	400	3min	--	--	No message. PV inverter can start up. No damaged, no hazard.
54.	ISO monitoring defect R141	o-c before start up	400	3min	--	--	Error message: ISO Err. PV inverter does not start up. No damaged, no hazard.
55.	Vpv1 sampling defect R83	s-c	400	3min	--	--	Error message: PV Above BUS Err. PV inverter disconnected from grid immediately. No damaged, no hazard.
56.	Vpv1 sampling defect R77	o-c	400	3min	--	--	No message. PV inverter disconnected from grid immediately. No damaged, no hazard.
57.	Vpv2 sampling defect R84	o-c	400	3min	--	--	No message. PV inverter disconnected from grid immediately. No damaged, no hazard.
58.	Vpv2 sampling defect R88	s-c	400	3min	--	--	Error message: PV Above BUS Err. PV inverter disconnected from grid immediately. No damaged, no hazard.

59.	Vbus sampling defect R93	s-c	400	3min	--	--	No message. PV inverter run normally. No damaged, no hazard.
60.	Vbus sampling defect R89	o-c	400	3min	--	--	Error message: BUS Volt Low Err. PV inverter disconnected from grid immediately. No damaged, no hazard.
61.	Vac sampling defect R99	s-c	400	3min	--	--	No message. PV inverter run normally (PV inverter restart. Error message: Inv SelfChk Err) No damaged, no hazard.
62.	Vac sampling defect R103	s-c	400	3min	--	--	Error message: Output Relay Err. PV inverter disconnected from grid immediately. No damaged, no hazard.
63.	Vac sampling defect R97	o-c	400	3min	--	--	No message. PV inverter run normally (PV inverter restart. Error message: Output Relay Err) No damaged, no hazard.
64.	Vac sampling defect R101	o-c	400	3min	--	--	No message. PV inverter run normally (PV inverter restart. Error message: Output Relay Err) No damaged, no hazard.
65.	Vgrid sampling (DSP) defect R119	s-c	400	3min	--	--	Error message: DCI High Err, Grid Over Volt Err1. PV inverter disconnected from grid immediately. No damaged, no hazard.
66.	Vgrid sampling (DSP) defect R123	s-c	400	3min	--	--	Error message: DCI High Err. PV inverter disconnected from grid immediately. No damaged, no hazard.
67.	Vgrid sampling (DSP) defect R116	o-c	400	3min	--	--	Error message: Grid Volt Loss Err, DCI High Err. PV inverter disconnected from grid immediately. No damaged, no hazard.
68.	Vgrid sampling (DSP) defect R120	o-c	400	3min	--	--	Error message: DCI High Err. PV inverter disconnected from grid immediately. No damaged, no hazard.

69.	Vgrid sampling（MCU）defect R126	s-c	400	3min	--	--	No message. PV inverter run normally. No damaged, no hazard.
70.	Vgrid sampling（MCU）defect R337	s-c	400	3min	--	--	No message. PV inverter run normally. No damaged, no hazard.
71.	Vgrid sampling（MCU）defect R124	o-c	400	3min	--	--	No message. PV inverter run normally (PV inverter restart. Error message: SMCU Grid Volt Err) No damaged, no hazard.
72.	Vgrid sampling（MCU）defect R128	o-c	400	3min	--	--	No message. PV inverter run normally. No damaged, no hazard.
73.	C91	s-c	400	3min	--	--	No message. PV inverter disconnected from grid immediately. No damaged, no hazard.
74.	D38	s-c	300	3min	--	--	PV inverter disconnected from grid immediately. Q7，D1 has be damaged, no hazard.
75.	CT1 AGND	o-c	400	3min	--	--	No message. PV inverter run normally (PV inverter restart. Error message: PV Curr Channel Err1) No damaged, no hazard.
76.	CT2 AGND	o-c	400	3min	--	--	No message. PV inverter run normally (PV inverter restart. Error message: PV Curr Channel Err2) No damaged, no hazard.
77.	Q7(D-S)	s-c	300	10min	--	--	PV inverter disconnected from grid immediately. Q7 has be damaged, no hazard.
78.	C84	s-c	400	3min	--	--	PV inverter disconnected from grid immediately. C84 has be damaged, no hazard.
79.	C166	s-c	400	3min	--	--	PV inverter disconnected from grid immediately. Q1, Q2, Q5, Q6 has been damaged, no hazard.

80.	Q1(D-S)	s-c	400	10min	--	--	PV inverter disconnected from grid immediately. Q1, Q5 has been damaged, no hazard.
81.	Q1(D-G)	s-c	400	10min	--	--	PV inverter disconnected from grid immediately. Q1, Q5has be damaged, no hazard.
82.	Q6(D-G)	s-c	400	10min	--	--	PV inverter disconnected from grid immediately. Q2, Q6 has be damaged, no hazard.
83.	C504	s-c	400	3min	--	--	PV inverter disconnected from grid immediately. D501, R503 has be damaged, no hazard.
84.	Q500(D-S)	s-c	400	10min	--	--	PV inverter disconnected from grid immediately. R503, D501 has be damaged, no hazard.
85.	Q500(D-G)	s-c	400	10min	--	--	PV inverter disconnected from grid immediately. R503, D501, Q500 has be damaged, no hazard.
86.	C500	s-c	400	3min	--	--	PV inverter disconnected from grid immediately. R153 has be damaged, no hazard.
87.	C590	s-c	400	3min	--	--	PV inverter disconnected from grid immediately. R157has be damaged, no hazard.
88.	C44	s-c	400	3min	--	--	PV inverter disconnected from grid immediately. No damaged, no hazard.
89.	C63	s-c	400	3min	--	--	PV inverter disconnected from grid immediately. No damaged, no hazard.
90.	R530	o-c	400	3min	--	--	PV inverter disconnected from grid immediately. No damaged, no hazard.
supplementary information: s-c: short-circuited, o-c: open-circuited, o-l: overload.							

7.3.6.3.3	TABLE: protective equipotential bonding			P
Measured between:	Test current (A)	Voltage drop (V)	Resistance (mΩ)	result
--	--	--	--	--
--	--	--	--	--
supplementary information: The cross-sectional area the protective earthing conductor is the same as the phase wire.				

7.3.6.3.7	TABLE: touch current measurement		P
Measured between:	Measured (mA)	Limit (mA)	Comments/conditions
PV+ to Metal Enclosure	0.29	AC 3.5 / DC 10	--
PV- to Metal Enclosure	0.29		--
PV+ to communication terminal	0.29		--
PV- to communication terminal	0.29		--
PV+ to plastic Enclosure	0.29		--
PV- to plastic Enclosure	0.29		--
L to Metal Enclosure	0.29		--
N to Metal Enclosure	0.29		--
L to communication terminal	0.29		--
N to communication terminal	0.29		--
L to plastic Enclosure	0.29		--
N to plastic Enclosure	0.29		--
supplementary information			

7.3.7	TABLE: clearance and creepage distance measurements					P
clearance cl and creepage distance dcr at / of:	Up (V)	U r.m.s. (V)	required cl (mm)*	cl (mm)	required dcr (mm)	dcr (mm)
On control board						
Pri. to Sec. of opto-coupler U33 (R)	600	600	5.5	7.3	6.4	7.3
Pri. Trace to Sec.trace of CON4 (R)	600	600	5.5	9.3	6.4	9.3
Pri. to Sec. of opto-coupler U4 (R)	600	600	5.5	6.9	6.4	6.9
Pri. to Sec. of opto-coupler U28 (R)	600	600	5.5	7.1	6.4	7.1
Terminal of R 70A to pri. Trace (R)	600	600	5.5	9.0	6.4	9.0
On main board						
Pri. Trace to earthing terminal H10(B)	600	600	3.0	7.1	3.2	7.1
Pri. to sec. of cap C5 (B)	600	600	3.0	11.0	3.2	11.0
Terminal of D18 to earthing trace (B)	600	600	3.0	6.0	3.2	6.0
Pri. to sec. of cap C120 (B)	600	600	3.0	5.6	3.2	5.6
Pri. to sec. of cap C73 (B)	600	600	3.0	5.1	3.2	5.1
Pri. to sec. of cap C35 (B)	600	600	3.0	6.4	3.2	6.4
Pri. to sec. of cap C323 (B)	600	600	3.0	7.9	3.2	7.9
Pri. to sec. of cap C137 (B)	600	600	3.0	8.1	3.2	8.1
IGBT to earthed heatsink (B**)	600	600	3.0	4.6	3.0	4.6

Note(s): * F=functional insulation, B=basic insulation, S=supplementary insulation, R=reinforced insulation.

When determine the clearance:

For DC input circuits: Overvoltage Category II applied(impulse withstand voltage 4464V)

For AC output circuits (connected to AC mains): Overvoltage Category III applied (impulse withstand voltage 4000V, temporary overvoltage 2120Vpeak considered.)

Interpolation is used.

Requirement about creepage distances for transformer and for the distance to the metal enclosure come from columns 7 and 8 of Table 14. Requirement about creepage distances for part on PWB come from column 3 of table 14.

PCB with min. CTI 175 used.

** IGBT is isolated to the earthed heatsink via ceramic, the creepage distance limit is uesd equal the associated clearance.

7.3.7.8	TABLE: distance through insulation measurement				P
distance through insulation di at/of:		U r.m.s. (V)	test voltage (V)	required di (mm)	di (mm)
supplementary information: The component was certified.					

7.5	TABLE: electric strength measurements, impulse voltage test and partial discharge test				P
test voltage applied between:		test voltage (V)	impulse withstand voltage (V)	partial discharge extinction voltage (V)	result
PV input terminals to metal enclosure		2120Vdc	4000	--	P
AC output terminals to metal enclosure		2120Vdc	4000	--	P
PV input terminals to communication ports		4240Vdc	6000	--	P
AC output terminals to communication ports		4240Vdc	6000	--	P
PV input terminals to LCD screen		4240Vdc	6000	--	P
AC output terminals to LCD screen		4240Vdc	6000	--	P
Note(s): Based on the system voltage 600V for DC input and 280V L to N for AC mains.					

9.2	TABLE: Limited power sources					N/A
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
supplementary information:						
Sc=Short circuit, Oc=Open circuit						

--End of the report--

Test Report issued under the responsibility of:

TÜVRheinland®

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TEST REPORT
IEC 62109-2
Safety of power converters for use in photovoltaic power systems – Part2: Particular requirements for inverters

Report Reference No.	50255491 001 attachment 1.	
Tested by (name + signature)	See cover page	.....
Witnessed by (name + signature) ...	N/A	.....
Supervised by (name + signature) ..	N/A	.....
Approved by (name + signature)	See cover page	.....
Date of issue.....	See cover page	

Testing Laboratory.....	See cover page
Address	See cover page
Testing location/ procedure	CBTL☐ TMP☐ WMT☒ SMT☐ RMT☐ CCATL☐
Testing location/ address	See cover page

Applicant's name	See cover page
Address	See cover page

Test specification:	
Standard.....	IEC 62109-2: 2011
Test procedure	TÜV Bauart
Non-standard test method……..:	N/A

Test Report Form No.....	IEC 62109-2: 2011
Test Report Form(s) Originator	TÜV Rheinland Group
Master TRF	2011-08

Test item description	See report 50255491 001
Trade Mark	See report 50255491 001.
Manufacturer	See report 50255491 001.
Model/Type reference.....	See report 50255491 001.
Ratings	See report 50255491 001.

Testing procedure and testing location:	
☒ **CB Testing Laboratory:**	
Testing location/ address.....:	
☐ **Associated CB Test Laboratory:**	
Testing location/ address.....:	
Tested by (name + signature).....:	See cover page .....
Approved by (+ signature) .....:	See cover page .....
☐ Testing procedure: TMP	
Tested by (name + signature).....:	
Approved by (+ signature) .....:	
Testing location/ address.....:	
☐ Testing procedure: WMT	
Tested by (name + signature).....:	
Witnessed by (+ signature).....:	
Approved by (+ signature) .....:	
Testing location/ address.....:	
☐ Testing procedure: SMT	
Tested by (name + signature).....:	
Approved by (+ signature) .....:	
Supervised by (+ signature).....:	
Testing location/ address.....:	
☐ Testing procedure: RMT	
Tested by (name + signature).....:	
Approved by (+ signature) .....:	
Supervised by (+ signature).....:	
Testing location/ address.....:	

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

See report 50255491 001.

Summary of testing

Tests performed (name of test and test clause):	**Testing location:**
See report 50255491 001. All the tests are conducted on model EA6KSI represent all the models.	The laboratory described on the cover page.

Summary of compliance with National Differences

List of countries addressed: See report 50255491 001.

Copy of marking plate:

See report 50255491 001.

Equipment mobility	☐ movable	☐ hand-held		
	☐ stationary	☒ fixed (Wall mounted)		
Connection to the mains	☐ pluggable equipment	☐ direct plug-in		
	☒ permanent connection	☐ for building-in		
Enviromental category	☒ outdoor	☐ indoor conditional	☐ indoor unconditional	
Operating condition	☒ continuous	☐ short-time	☐ intermittent	
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 (%)	According to specified supply range			
Tested for IT power systems	☐ Yes	☒ No		
IT testing, phase-phase voltage (V)	N/A			
Class of equipment	☒ Class I	☐ Class II		
	☐ Class III	☐ Not classified		
Mass of equipment (kg)	See report 50255491 001			
Pollution degree	☐ PD 1	☐ PD 2	☒ PD 3	
IP protection class	IP65			

Possible test case verdicts:

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

Testing:

Date of receipt of test items: See report 50255491 001.

Date(s) of performance of tests: See report 50255491 001.

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.

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.

Manufacturer's Declaration per sub-clause 6.2.5 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.

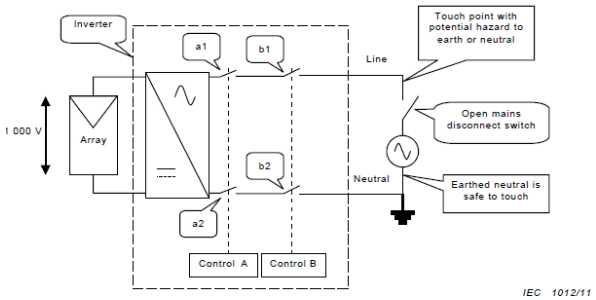
Name and address of factory (ies) : See report 50255491 001.

General product information:

See report 50255491 001.

Throughout the test report following abbreviations may be used:

• cl	clearance	• int	internal distance
• dcr	creepage distance	• o-c	open-circuit
• dti	distance through insulation	• o-l	overload
• PCE	Power Conversion Equipment	• s-c	short-circuit
• BI	basic insulation	• SI	supplementary insulation
• DI	double insulation	• RI	reinforced insulation

IEC 62109-2: 2011			
Clause	Requirement – Test	Result - Remark	Verdict
4	General testing requirements *This clause of Part 1 is applicable with the following exceptions:*		P
4.4	Testing in SINGLE FAULT CONDITIONS		P
4.4.4	SINGLE FAULT CONDITIONS to be applied: *Additional subclauses:*	The PCE could detect and indicate the fault condition and disconnect from or not connect to the grid in case of single fault condition. Refer to the appended table 4.4 of IEC/EN 62109-1 test report 50255491 001.	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		P
4.4.4.15.2	Fault-tolerance of automatic disconnecting means		P
4.4.4.15.2.1	General		P
4.4.4.15.2.2	Design of insulation or separation  **Figure 20 – Example system discussed in Note 2 above**		P
4.4.4.15.2.3	Automatic checking of the disconnect means		P
4.4.4.16	Stand-alone inverters-load transfer test	Grid-interactive inverter.	P
4.4.4.17	Cooling system failure – Blanketing test	See following table 4.4.4.17.	P
4.7	Electrical Ratings Tests *Additional subclauses:*	Refer to the appended table 4.7 of IEC/EN 62109-1 test report 50255491 001.	P
4.7.3	Measurement requirements for AC output ports for stand-alone inverters	Grid-interactive inverter.	N/A
4.7.4	Stand-alone Inverter AC output voltage and frequency		N/A
4.7.4.1	General		N/A
4.7.4.2	Steady state output voltage at nominal DC input		N/A

IEC 62109-2: 2011			
Clause	Requirement – Test	Result - Remark	Verdict
4.7.4.3	Steady state output voltage across the DC input range		N/A
4.7.4.4	Load step response of the output voltage at nominal DC input		N/A
4.7.4.5	Steady state output frequency		N/A
4.7.5	Stand-alone inverter output voltage waveform		N/A
4.7.5.1	General		N/A
4.7.5.2	Sinusoidal output voltage waveform requirements	See following table 4.7.5.2.	N/A
4.7.5.3	Non-sinusoidal output waveform requirements	Sinusoidal output.	N/A
4.7.5.3.1	General		N/A
4.7.5.3.2	Total harmonic distortion		N/A
4.7.5.3.3	Waveform slope		N/A
4.7.5.3.4	Peak voltage		N/A
4.7.5.4	Information requirements for non-sinusoidal waveforms		N/A
4.7.5.5	Output voltage waveform requirements for inverters for dedicated loads	Not for dedicated loads.	N/A
4.8	Additional tests for grid-interactive inverters	See below.	P
4.8.1	General requirements regarding inverter isolation and array grounding		N/A
4.8.2	Array insulation resistance detection for inverters for ungrounded and functionally grounded arrays	Only for ungrounded arrays.	N/A
4.8.2.1	Array insulation resistance detection for inverters for ungrounded arrays	See following table 4.8.2.Complied.	P
4.8.2.2	Array insulation resistance detection for inverters for functionally grounded arrays		N/A
4.8.3	Array residual current detection	Complied.	P
4.8.3.1	General		P
4.8.3.2	30mA touch current type test for isolated inverters	See following table 4.8.3.2.	N/A
4.8.3.3	Fire hazard residual current type test for isolated inverters	See following table 4.8.3.3.	N/A
4.8.3.4	Protection by application of RCD’s		N/A
4.8.3.5	Protection by residual current monitoring		P
4.8.3.5.1	General		P

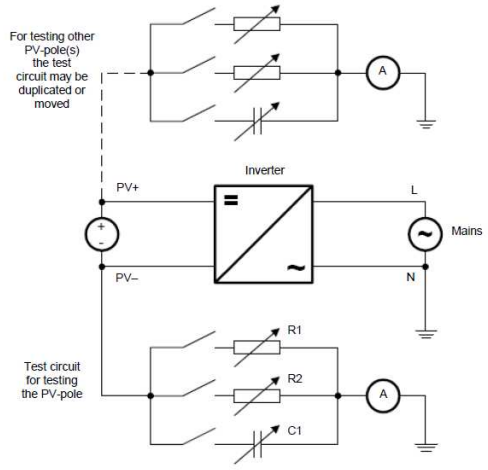
<table>
<tr><td colspan="4">IEC 62109-2: 2011</td></tr>
<tr><td>Clause</td><td>Requirement – Test</td><td>Result - Remark</td><td>Verdict</td></tr>
<tr><td></td><td>Table 31 – Response time limits for sudden changes in residual current
<table>
<tr><th>Residual current sudden change</th><th>Max time to inverter disconnection from the mains</th></tr>
<tr><td>30 mA</td><td>0,3 s</td></tr>
<tr><td>60 mA</td><td>0,15 s</td></tr>
<tr><td>150 mA</td><td>0,04 s</td></tr>
</table>
NOTE These values of residual current and time are based on the RCD standard IEC61008-1.


Figure 21 – Example test circuit for residual current detection testing</td><td>See following table 4.8.3.5.</td><td>P</td></tr>
<tr><td>4.8.3.5.2</td><td>Test for detection of excessive continuous residual current</td><td>See appended table.</td><td>P</td></tr>
<tr><td>4.8.3.5.3</td><td>Test for detection of sudden changes in residual current</td><td>See appended table.</td><td>P</td></tr>
<tr><td>4.8.3.6</td><td>Systems located in closed electrical operating areas</td><td></td><td>N/A</td></tr>
<tr><td>5</td><td>Marking and documentation
This clause of Part 1 is applicable with the following exceptions:</td><td>See report 50255491 001.</td><td>P</td></tr>
<tr><td>5.1</td><td>Marking</td><td></td><td>P</td></tr>
<tr><td>5.1.4</td><td>Equipment ratings
Replacement:</td><td>See report 50255491 001.</td><td>P</td></tr>
<tr><td>5.2</td><td>Warning markings</td><td>See report 50255491 001.</td><td>P</td></tr>
</table>

IEC 62109-2: 2011			
Clause	Requirement – Test	Result - Remark	Verdict
5.2.2	Content for warning markings		P
5.2.2.6	Inverters for closed electrical operating areas		N/A
5.3	Documentation		P
5.3.2	Information related to installation Additional subclauses:		P
5.3.2.1	Ratings		P
5.3.2.2	Grid-interactive inverter setpoints		P
5.3.2.3	Transformers and isolation		P
5.3.2.4	Transformers required but not provided	See above.	N/A
5.3.2.5	PV modules for non-isolated inverters		P
5.3.2.6	Non-sinusoidal output waveform information		N/A
5.3.2.7	Systems located in closed electrical operating areas		N/A
5.3.2.8	Stand- alone inverter output circuit bonding		N/A
5.3.2.9	Protection by application of RCD's	Not used.	N/A
5.3.2.10	Remote indication of faults		P
5.3.2.11	External array insulation resistance measurement and response		P
5.3.2.12	Array functional grounding information		N/A
5.3.2.13	Stand-alone inverters for dedicated loads		N/A
5.3.2.14	Identification of firmware version(s)		P
6	Environmental requirements and conditions *This clause of Part 1 is applicable.*		P
7	Protection against electric shock and energy hazards *This clause of Part 1 is applicable except for the following additions:*	See report 50255491 001.	P
7.3	Protection against electric shock *Additional subclauses:*		P
7.3.10	Additional requirements for stand-alone inverters		N/A
	Stand-alone inverter output circuit bonding		N/A
	Stand-alone inverter isolation and protection of DVC-A circuits		N/A
7.3.11	Functionally grounded arrays		N/A
8	Protection against mechanical hazards *This clause of Part 1 is applicable.*	See report 50255491 001	P

IEC 62109-2: 2011			
Clause	Requirement – Test	Result - Remark	Verdict
9	Protection against fire hazards *This clause of Part 1 is applicable with the following exceptions:*		P
9.3	Short-circuit and overcurrent protection *Additional subclause:*		P
9.3.4	Inverter backfeed current onto the array		P
10	Protection against sonic pressure hazards *This clause of Part 1 is applicable*	See report 50255491 001	P
11	Protection against liquid hazards *This clause of Part 1 is applicable*	See report 50255491 001	P
12	Protection against chemical hazards *This clause of Part 1 is applicable*	See report 50255491 001	P
13	Physical requirements *This clause of Part 1 is applicable with the following exception:* *Additional subclause:*	See report 50255491 001	P
13.9	Fault indication		P
	a) a visible or audible indication, integral to the inverter, and detectable from outside the inverter, and	LCD panel is available for fault indication.	P
	b) an electrical or electronic indication that can be remotely accessed and used.	RS485/232 port as communication connection.	P
14	Components *This clause of Part 1 is applicable*	See report 50255491 001	P

4.4.4.17	Cooling system fainlure – Blanketing test		P
	Test voltage(V)	See below	--
	t1(°C)	See below	--
	t2(°C)	See below	--
Maximum temperature T of part/at:		Measured T (°C)	allowed T_{max} (°C)
Test Voltage		370Vdc	--
Display		69.6	90
Enclosure		77.9	90
Ambient		22.7	--
Note(s):			

4.7.5.2	Stand-alone inverter output voltage waveform	N/A

Harmonics at continuous operation

P/Pn[%]	5%	50%	100%	Limites Limit
Ordinal number	Measurement [Harmonic/Fundamental]			
	[%]	[%]	[%]	[%]
2				6.0
3				6.0
4				6.0
5				6.0
6				6.0
7				6.0
8				6.0
9				6.0
10				6.0
11				6.0
12				6.0
13				6.0
14				6.0
15				6.0
16				6.0
17				6.0
18				6.0
19				6.0

20				6.0
21				6.0
22				6.0
23				6.0
24				6.0
25				6.0
26				6.0
27				6.0
28				6.0
29				6.0
30				6.0
31				6.0
32				6.0
33				6.0
34				6.0
35				6.0
36				6.0
37				6.0
38				6.0
39				6.0
40				6.0
THD				10.0
Note: The PCE is grid-interactive inverter and without stand-alone functions.				

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

Conditions	Measurement [I.F. / N.O.]				Identification
	PV / DC Supply Voltage [Vdc]				
	120	300	480	600	
PV1+ to PE: 18 [kΩ]	I.F.	I.F.	I.F.	I.F.	I.F.: Isolation Fault N.O.: Normal Operation
PV1- to PE: 18 [kΩ]	I.F.	I.F.	I.F.	I.F.	
PV1+ to PE: 20 [kΩ]	N.O.	N.O.	N.O.	N.O.	
PV1- to PE: 20 [kΩ]	N.O.	N.O.	N.O.	N.O.	

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: Array Insulation Resistance Threshold Value should be larger than R = $V_{MAX\,PV}$ / 30mA Tested on EA6KSI to represent all the models.

4.8.3.2, 4.8.3.3	TABLE: Touch current and fire hazard residual current measurement	N/A

Condition	PV power supply " + " → earthing [mA]	PV power supply " - " → earthing [mA]	Limit [mA]	Comments
Touch current			30	Pass
Touch current			30	Pass
Touch current			30	Pass

Condition	PV power supply " + " → earthing [mA]	PV power supply " - " → earthing [mA]	Limit [mA]	Comments
fire hazard residual current			10mA / kW	Pass
fire hazard residual current			10mA / kW	Pass
fire hazard residual current			10mA / kW	Pass

Note:

Using measurement circuit of IEC 60990 figure 4 for testing touch current.

Using ammeter for testing fire hazard residual current.

4.8.3.5	TABLE: Protection by residual current monitoring	P
Test conditions:	Output power (kVA) : 6.0 Input voltage (V_{DC}): 370 Frequency (Hz): 50 Output AC Voltage (V_{AC}): 230	
4.8.3.5.2	Test for detection of excessive continuous residual current	P

Fault Current (mA)		Disconnection time (ms)	
Measured Fault Current	Limit 300mA for output power ≤ 30 kVA 10mA per kVA for output power > 30 kVA	Measured Disconnection time	Limit
+ PV to N:			
281.89	300	112.4	300
278.40	300	107.4	300
281.64	300	199.8	300
278.27	300	270.2	300
278.10	300	230.2	300
- PV to N:			
276.42	300	108.6	300
287.13	300	104.2	300
275.16	300	104.8	300
275.68	300	161.2	300
280.57	300	200.8	300

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 0,3s.
The test is repeated for each PV input terminal. It is not required to test all PV input terminals if analysis of the design indicates that one or more terminals can be expected to have the same result, for example where multiple PV string inputs are in parallel.

Supplementary information: Tested on EA6KSI to represent all the models.

4.8.3.5.3	TABLE: Test for detection of sudden changes in residual current	P

+PV to N		
Limit (mA)	U_N Disconnection time (ms)	Limit (ms)
30	171.5	300
30	278.5	300
30	175.5	300
30	155.0	300
30	164.5	300
60	25.5	150
60	36.5	150
60	24.0	150

60	25.0	150
60	33.5	150
150	22.0	40
150	10.0	40
150	10.0	40
150	11.0	40
150	24.0	40
-PV to N		
Limit (mA)	U_N Disconnection time (ms)	Limit (ms)
30	152.5	300
30	163.0	300
30	167.0	300
30	168.0	300
30	171.0	300
60	35.5	150
60	36.5	150
60	19.0	150
60	41.5	150
60	26.0	150
150	22.5	40
150	5.5	40
150	31.5	40
150	8.0	40
150	14.0	40
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: Tested on EA6KSI to represent all the models.		

- End of test report -

Product: Grid-tied PV Inverter

Type: EA2KSI, EA2.5KSI, EA3KSI, EA3KSI-D, EA3.68KSI, EA4KSI, EA4.6KSI, EA5KSI, EA6KSI

Figure 1. Front view for model: EA2KSI, EA2.5KSI, EA3KSI

Figure 2. Rear view for model: EA2KSI, EA2.5KSI, EA3KSI

Product: Grid-tied PV Inverter

Type: EA2KSI, EA2.5KSI, EA3KSI, EA3KSI-D, EA3.68KSI, EA4KSI, EA4.6KSI, EA5KSI, EA6KSI

Figure 3. Terminal panel view for model: EA2KSI, EA2.5KSI, EA3KSI

Figure 4. Internal view-1 for model: EA2KSI, EA2.5KSI, EA3KSI

Product: Grid-tied PV Inverter

Type: EA2KSI, EA2.5KSI, EA3KSI, EA3KSI-D, EA3.68KSI, EA4KSI, EA4.6KSI, EA5KSI, EA6KSI

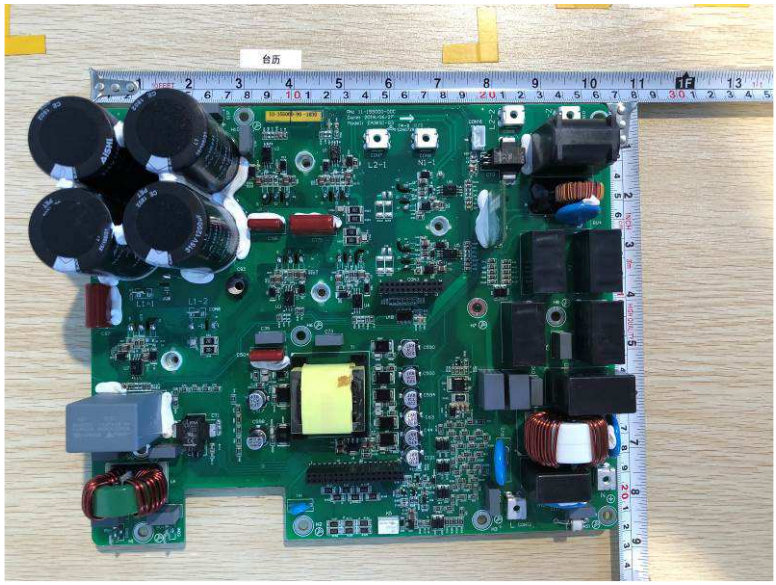


Figure 5. Component side view of Main board for model: EA2KSI, EA2.5KSI, EA3KSI

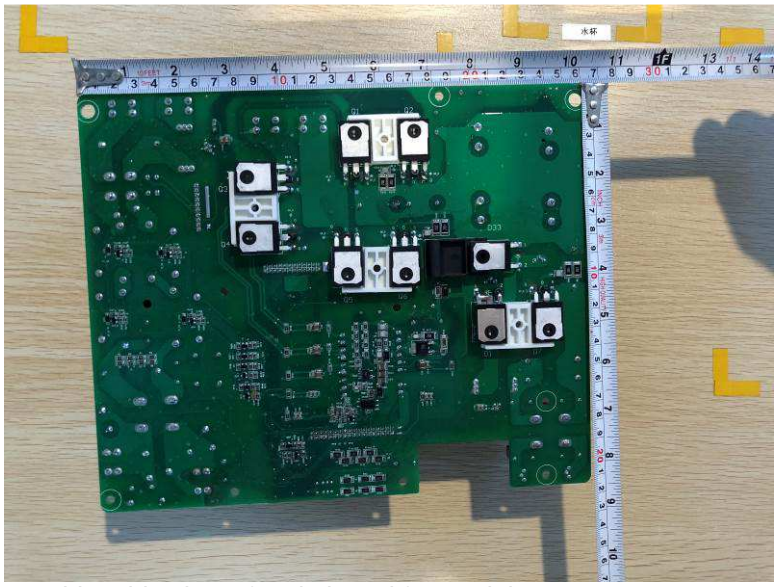


Figure 6. Solder side view of Main board for model: EA2KSI, EA2.5KSI, EA3KSI

Product: Grid-tied PV Inverter

Type: EA2KSI, EA2.5KSI, EA3KSI, EA3KSI-D, EA3.68KSI, EA4KSI, EA4.6KSI, EA5KSI, EA6KSI

Figure 7. Front view for model: EA3KSI-D, EA3.68KSI, EA4KSI, EA4.6KSI, EA5KSI, EA6KSI

Figure 8. Rear view for model: EA3KSI-D, EA3.68KSI, EA4KSI, EA4.6KSI, EA5KSI, EA6KSI

Product: Grid-tied PV Inverter

Type: EA2KSI, EA2.5KSI, EA3KSI, EA3KSI-D, EA3.68KSI, EA4KSI, EA4.6KSI, EA5KSI, EA6KSI

Figure 9. Terminal panel view for model: EA3KSI-D, EA3.68KSI, EA4KSI, EA4.6KSI, EA5KSI, EA6KSI

Figure 10. Internal view-1 for model: EA3KSI-D, EA3.68KSI, EA4KSI, EA4.6KSI, EA5KSI

Product: Grid-tied PV Inverter

Type: EA2KSI, EA2.5KSI, EA3KSI, EA3KSI-D, EA3.68KSI, EA4KSI, EA4.6KSI, EA5KSI, EA6KSI

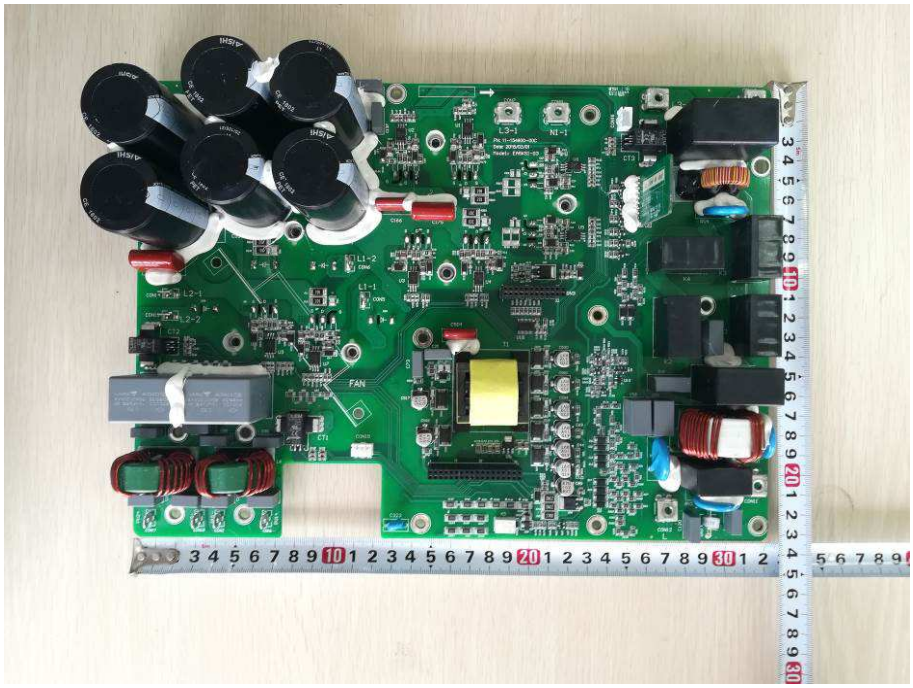


Figure 11. Component side view of Main board for model: EA3KSI-D, EA3.68KSI, EA4KSI, EA4.6KSI, EA5KSI, EA6KSI

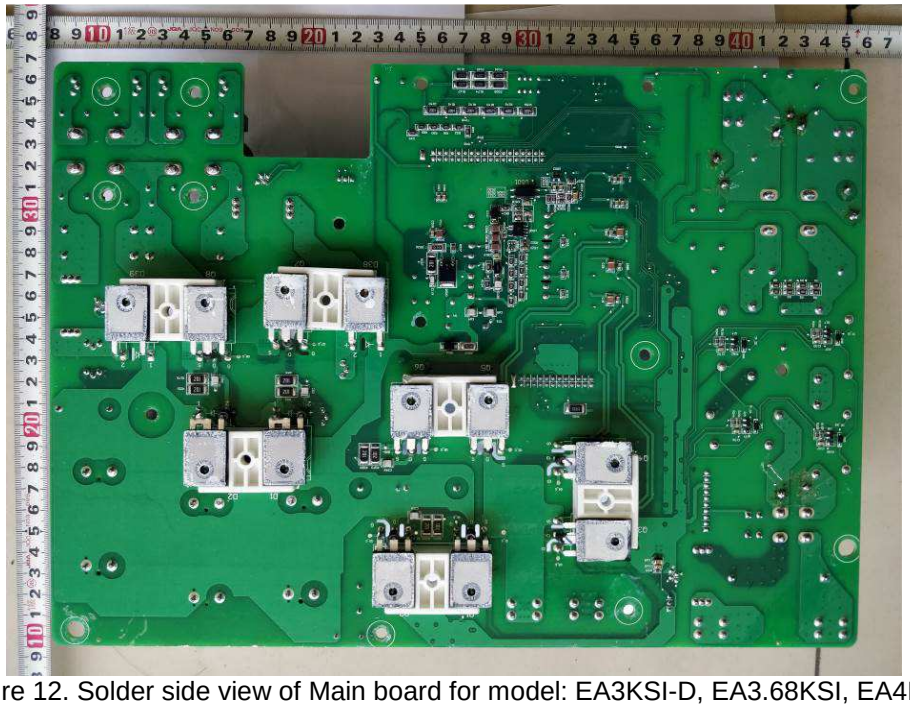


Figure 12. Solder side view of Main board for model: EA3KSI-D, EA3.68KSI, EA4KSI, EA4.6KSI, EA5KSI, EA6KSI

Product: Grid-tied PV Inverter

Type: EA2KSI, EA2.5KSI, EA3KSI, EA3KSI-D, EA3.68KSI, EA4KSI, EA4.6KSI, EA5KSI, EA6KSI

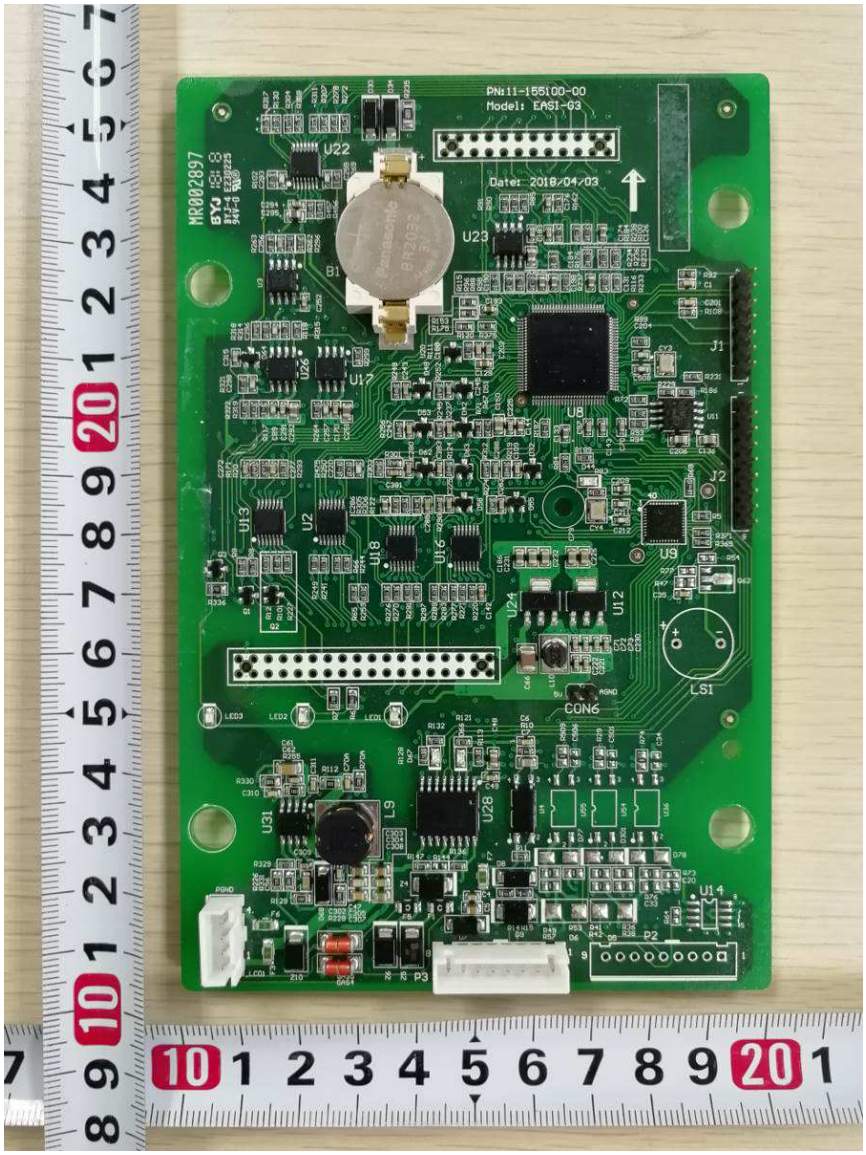


Figura 13. Component side view of Control board

Product: Grid-tied PV Inverter

Type: EA2KSI, EA2.5KSI, EA3KSI, EA3KSI-D, EA3.68KSI, EA4KSI, EA4.6KSI, EA5KSI, EA6KSI

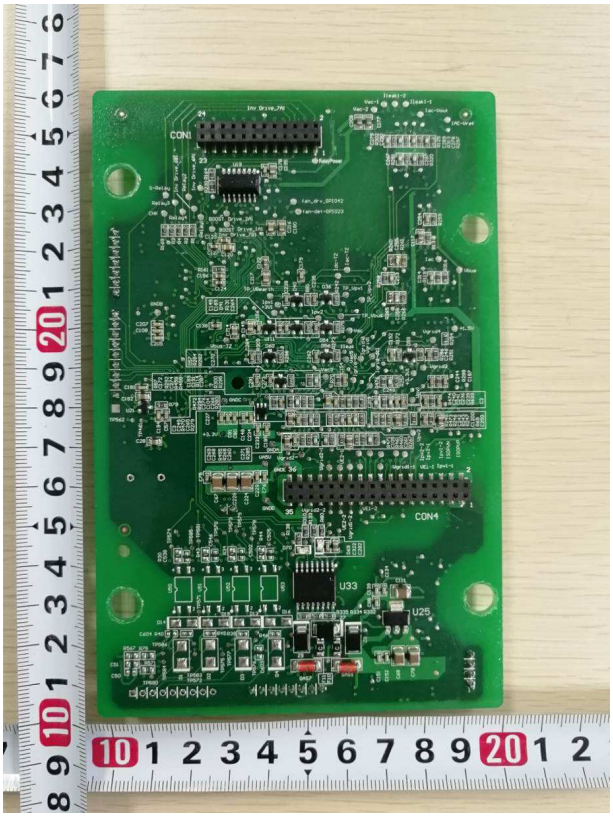


Figure 14. Solder side view of Control board

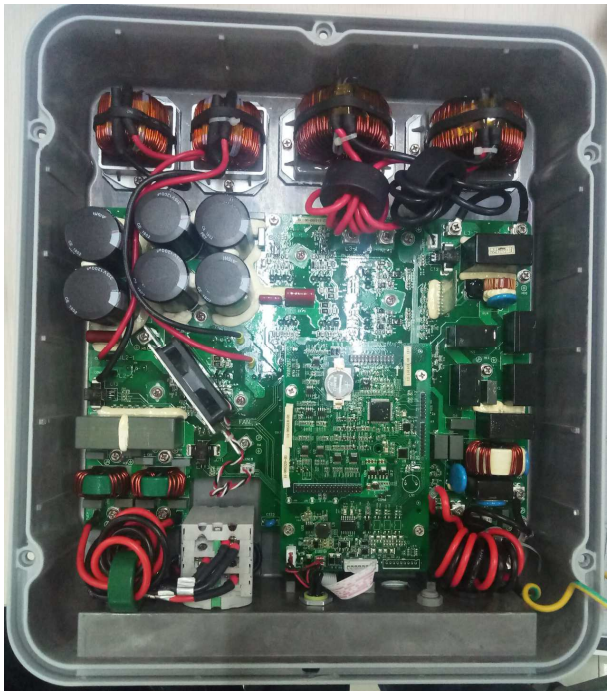


Figure 15. Internal view-2 for model: EA6KSI

Constructional Data Form (CDF) for Electrical Appliances

License holder	:	**EAST Group Co., Ltd.** No.6 Northern Industry Road, Songshan Lake Sci.& Tech. industrial zone, Dongguan City, Guangdong province, China
Factory	:	**EAST Group Co., Ltd.** No.6 Northern Industry Road, Songshan Lake Sci.& Tech. industrial zone, Dongguan City, Guangdong province, China
Type of Appliance	:	Grid-tied PV Inverter
Type Designation	:	see Table A
Rating	:	see Table A
Protection Class	:	Class I
Supply connection	:	☐ fixed power cord ☒ permanent connection ☐ appliance inlet ☐ direct plug in ☐ battery operated

Please tick above box ☒ when applicable

Additional information :

Ambient temp -25 ~ 60°C

IP65

MODEL LIST 1		EA2KSI	EA2.5KSI	EA3KSI	EA3KSI-D
INPUT(PV)	V_{MAX} PV [Vdc]	600			
	I_{SC} PV [A]	12			2x12
	MPP Voltage Range V_{MPP}[Vdc]	90-550			
	Max. PV Input Current [A]	11			11x2
	MPP Full Power Voltage Range [Vdc]	200-480	250-480	300-480	150-480
	Input PV Operating Voltage Range [Vdc]	90-600			
	Start PV Voltage [Vdc]	120			
	Backfeed Current [A]	0			
	Overvoltage Category (OVC)	OVC II			
GRID CONNE	Rated Output Voltage Ur [Vac]	230			
	Normal Operating Voltage Range Un [Vac]	180-280			

TÜV Rheinland Group

Jan. 15, 2019

Date **Name** **Signature**

	Rated Output Frequency F_{NETZ} [Hz]	50/60			
	Normal Operating Frequency Range Fn [Hz]	45-55 / 55-65			
	Rated Output Power P_E [W]	2000	2500	3000	3000
	Max. Output Current Imax [A]	8.7	10.9	13	13
	Power Factor cosφ [λ]	0.8 cap-0.8ind adjustable (defaut: 1)			
	Efficiency max. η_{max}[%]	97.8			
	Night Power Consumption [W]	< 0.5			
	THD [V / I] (100% full power)	< 3%			
	Acoustic Noise [dB]	< 40			
	Overvoltage Category (OVC)	OVC III			
SYSTEM	Type of inverter	Non-transformer			
	Firmware [DSP/MCU]	MDSP: V009, MCU: V009			
	Separated by	Transformerless			
	MPPT strings	1			2
	MPPT tracking	1			2
	Protective Class	1			
	Enclosure Protection (IP)	IP65			
	Operating Temperature Range [ºC]	-25-60 (derating after 45ºC)			
	Pollution degree (PD)	PD3 for outside, PD2 for inside			
	Altitude [m]	4000 (> 2000 derating power)			
	Weight [kg]	< 9			< 11.5
	Size (WxDxH) [mm]	308x116.5x353			370x126.5x420
Note:					

MODEL LIST 2		EA3.68KSI	EA4KSI	EA4.6KSI	EA5KSI	EA6KSI
INPUT(PV)	V_{MAX} PV [Vdc]	600				
	I_{SC} PV [A]	2x12				
	MPP Voltage Range V_{MPP}[Vdc]	90-550				
	Max. PV Input Current [A]	11x2				
	MPP Full Power Voltage Range	200-480		230-480	250-480	300-480

	[Vdc]					
	Input PV Operating Voltage Range [Vdc]	90-600				
	Start PV Voltage [Vdc]	120				
	Backfeed Current [A]	0				
	Overvoltage Category (OVC)	OVC II				
GRID CONNECTION	Rated Output Voltage Ur [Vac]	230				
	Normal Operating Voltage Range Un [Vac]	180-280				
	Rated Output Frequency F_{NETZ} [Hz]	50/60				
	Normal Operating Frequency Range Fn [Hz]	45-55 / 55-65				
	Rated Output Power P_E [W]	3680	4000	4600	4900	6000
	Max. Output Current Imax [A]	16	17.4	20	21.3	26.1
	Power Factor cosφ [λ]	0.8 cap-0.8ind adjustable (defaut: 1)				
	Efficiency max. η_{max}[%]	97.8				
	Night Power Consumption [W]	< 0.5				
	THD [V / I] (100% full power)	< 3%				
	Acoustic Noise [dB]	< 40				
	Overvoltage Category (OVC)	OVC III				
SYSTEM	Type of inverter	Non-transformer				
	Firmware [DSP/MCU]	MDSP: V009, MCU: V009				
	Separated by	Transformerless				
	MPPT strings	2				
	MPPT tracking	2				
	Protective Class	1				
	Enclosure Protection (IP)	IP65				
	Operating Temperature Range [ºC]	-25-60 (derating after 45ºC)				
	Pollution degree (PD)	PD3 for outside, PD2 for inside				
	Altitude [m]	4000 (> 2000 derating power)				

	Weight [kg]	< 11.5
	Size (WxDxH) [mm]	370x126.5x420
Note:		

Jan. 15, 2019

Date	Name	Signature

Critical Components					
Material: e.g. external enclosure, PCB, closed-end connector, sleeves, cord anchorage etc Components with winding: e.g. motor, transformer, magnetic coil etc. Other components: e.g. switch, thermostat, heater, plug, internal wire, capacitor, relay, varistor etc.					
object/part No.	manufacturer/ trademark	type/model	technical data	standard	mark(s) of conformity[1])
EA2KSI, EA2.5KSI, EA3KSI					
Aluminum alloy Die casting Enclosure	ShenZhen Kangsheng Hardware Co., Ltd	/	material：ADC12 aluminium alloy size: (W/D/H) [mm] 308× 116.5× 353	IEC/EN 62109-1	Test with the appliance
X capacitor C100	Xiamen Faratronic Co., Ltd.	C42Q2475K BWC400 MKP62	X2, 305V, 4.7uf, -40°C～+110°C	EN 60384-14, UL 60384-14	VDE 40000358 UL E186600
Y capacitor C5, C10	Xiamen Faratronic Co., Ltd.	C43Q1103 M40Q400 MKP63	Y2, 300V, 10nF, -40°C～+110°C	EN 60384-14, UL 60384-14	SEMKO 0366-2C UL E186600
Current Sensor CT3	LEM	HLSR20-P	-50A～50A, -40°C～+105°C	UL 61010-1	UL E189713
AC output internal wire	ZHONGLI SCIENCE & TECHNOLOGY GROUP CO LTD	UL1015,600 V, 11AWG(RED, BLACK)	600V, -20°C～ +105°C	UL 758	UL E156525
DC Switch	ProJoy Electric Co., Ltd.	PEDS150R-HM16-2	13A, DC800V, 2P, DC-PV2, -40°C～+85°C	AS 60947.3, AS/NZS IEC 60947.1	SAA SAA-190350-EA
Printed ircuit Board	BAOYUEJIA ELECTRONICS (ZHONG SHAN) CO., LTD.	Version:11-155000-00	262mm×216mm × 2mm, 130°C FR-4 V-0, CTI: IIIA 400 > CTI ⩾ 175	UL 796	UL E230225
	HUIZHOU TRUSTWIN				UL E340729

	ELECTRONICS DEVELOPMENT CO.,LTD.				
	Dongguan kemble Electronic Co.,Ltd.				UL: E64353
EA3KSI-D, EA3.68KSI, EA4KSI, EA4.6KSI, EA5KSI, EA6KSI					
Aluminum alloy Die casting Enclosure	ShenZhen Kangsheng Hardware Co., Ltd	/	material：ADC12 aluminium alloy size: (W/D/H) [mm] 370 × 126.5 × 420	IEC/EN 62109-1	Test with the appliance
IGBT Q8	INFINEON	IKW40N65H5(K40EH5)	650V, 40A, -40°C～+130°C	IEC/EN 62109-1	Test with the appliance
Power Diode D2	Advanced Power Electronics Corp	APT60DQ60BG	600V, 60A, -40°C～+130°C	IEC/EN 62109-1	Test with the appliance
Power Diode D39	IXYS	DLA60I1200HA	1200V, 60A, -40°C～+130°C	IEC/EN 62109-1	Test with the appliance
Bus Cap C84,C94	Hunan Aihua Group	ELT2FM122R60KT	315V, 1200uF±20%（M）, -25°C～+105°C	IEC/EN 62109-1	Test with the appliance
EMC Inductor L6	Shenzhen City Spitz Electronics Co., Ltd.	LST600-15-0.5A	15A, 0.5Mh, -40°C～+130°C	IEC/EN 62109-1	Test with the appliance
Y capacitor C157, C173	Xiamen Faratronic Co., Ltd.	C43Q1103M40Q400 MKP63	Y2, 300V, 10nF, -40°C～+110°C	EN 60384-14, UL 60384-14	SEMKO 0366-2C UL E186600
Y capacitor C165,C167	Xiamen Faratronic Co., Ltd.	C43Q1472M40C400 MKP63	Y2, 300V, 4.7nF, -40°C～+110°C	EN 60384-14, UL 60384-14	SEMKO 0366-2C UL E186600
X capacitor C100	Xiamen Faratronic Co., Ltd.	C42Q2685KFWC400 MKP62	X2, 305V, 6.8uf, -40°C～+110°C	EN 60384-14, UL 60384-14	VDE 40000358 UL E186600

Y capacitor C5,C10	Xiamen Faratronic Co., Ltd.	C43Q1333 M6SQ400 MKP63	Y2, 300V, 33nF, -40°C～+110°C	EN 60384-14, UL 60384-14	SEMKO 0366-2C UL E186600
AC output internal wire	ZHONGLI SCIENCE & TECHNOLOGY GROUP CO LTD	UL1015,600 V,10AWG,(RED,BLAC K)	600V, 10AWG, -20°C～+105°C	UL 758	UL E156525
Current Sensor CT2	LEM	HLSR10-P	-25A～25A, -40°C～+105°C	UL 61010-1	UL E189713
Current Sensor CT3	LEM	HLSR32-P	-80A～80A, -40°C～+105°C	UL 61010-1	UL E189713
DC Switch	ProJoy Electric Co., Ltd.	PEDS150R-HM32-3	13A, DC1000V, 3P, DC-PV2, -40°C～+85°C	AS 60947.3, AS/NZS IEC 60947.1	SAA SAA-190350-EA
Printed Circuit Board	BAOYUEJIA ELECTRONICS (ZHONG SHAN) CO., LTD.	Version:11-154900-00	322mm×231.5mm×2mm, 130°C FR-4 V-0 , CTI:IIIA 400 > CTI ⩾ 175	UL 796	UL: E230225
	HUIZHOU TRUSTWIN ELECTRONICS DEVELOPMENT CO.,LTD.				UL:E340729
	Dongguan kemble Electronic Co.,Ltd.				UL: E64353
For all					
IGBT Q1,Q2, Q5,Q6，Q7	INFINEON	IKW40N65 H5(K40EH5)	650V, 40A, -40°C～+130°C	IEC/EN 62109-1	Test with the appliance
IGBT Q3,Q4	INFINEON	IKW40N120 H3(K40H12 03)	1200V, 40A, -40°C～+130°C	IEC/EN 62109-1	Test with the appliance
		IKW40N120 CS6(K40M CS6)			

Power Diode D1	Advanced Power Electronics Corp	APT60DQ60BG	600V, 60A, -40°C～+130°C	IEC/EN 62109-1	Test with the appliance
Power Diode D38	IXYS	DLA60I1200HA	1200V, 60A, -40°C～+130°C	IEC/EN 62109-1	Test with the appliance
Bus Cap C82,C83,C92,C93	Hunan Aihua Group	ELT2FM122R60KT	315V, 1200uF±20%（M）, -25°C～+105°C	IEC/EN 62109-1	Test with the appliance
RV1,RV2,RV3,RV4	Shantou High-New Zone Songtian Enterprise Co., LTD	STE-20D681K	680V, 6500A, -40°C～+85°C	IEC/EN 61051-1 IEC 61051-2 IEC 61051-2-2	VDE 40023049
EMC Inductor L4	Shenzhen City Spitz Electronics Co., Ltd.	LST600-15-0.5A	15A, 0.5mH, -40°C～+130°C	IEC/EN 62109-1	Test with the appliance
Y capacitor C153,C155	Xiamen Faratronic Co., Ltd.	C43Q1103M40Q400MKP63	Y2, 300V, 10nF, -40°C～+110°C	EN 60384-14, UL 60384-14	SEMKO 0366-2C UL E186600
Y capacitor C90,C95	Xiamen Faratronic Co., Ltd.	C43Q1472M40C400MKP63	Y2, 300V, 4.7nF, -40°C～+110°C	EN 60384-14, UL 60384-14	SEMKO 0366-2C UL E186600
EMC Inductor L3	Shenzhen City Spitz Electronics Co., Ltd.	LDT350-30-3.8A	30A, 3.8mH, -40°C～+130°C	IEC/EN 62109-1	Test with the appliance
X capacitor C23	Xiamen Faratronic Co., Ltd.	C42Q2335KBWC400MKP62	X2, 305V, 3.3uF, -40°C～+110°C	EN 60384-14, UL 60384-14	VDE 40000358 UL E186600
X capacitor C9	Xiamen Faratronic Co., Ltd.	C42Q2225M9WC400MKP62	X2, 305V, 2.2uF, -40°C～+110°C	EN 60384-14, UL 60384-14	VDE 40000358 UL E186600
Y capacitor C58, C59	Xiamen Faratronic Co., Ltd.	C43Q1563M6SQ400MKP63	Y2, 300V, 56nF, -40°C～+110°C	EN 60384-14, UL 60384-14	SEMKO 0366-2C UL E186600
Y capacitor C117, C120	Xiamen Faratronic Co., Ltd.	C43Q1472M40C400MKP63	Y2, 300V, 4.7nF, -40°C～+110°C	EN 60384-14, UL 60384-14	SEMKO 0366-2C UL E186600

PV input terminal	Amphenol Technology (Shenzhen) Co., Ltd.	H4CMM4D-M	IP 65，1000V, 35A, -40°C～+85°C	IEC/EN 62852 UL 6703	TUV R50388083 UL E339277
		H4CFM4D-M			
		H4CFC4D-M			
		H4CMC4D-M			
	Multi-Contact	PV-ADBP4/6	IP 65, 1000V, 30A, -40°C～+85°C	IEC/EN 62852	TUV R60127190
		PV-ADSP4/6			
		PV-KST4/6II-UR			
		PV-KBT4/6II-UR			
AC Output terminal	Suzhou Exceedconn Technology Co.,Ltd.	EN030-1126-0001 EN030-2026-0001	IP 65, 250V , 25A -40°C～+105°C	UL 2238	UL E464733 TUV B151177046018
PV input internal wire	ZHONGLI SCIENCE & TECHNOLOGY GROUP CO LTD	UL1015,600V,11AWG(RED,BLACK)	600V, -20°C～+105°C	UL 758	UL E156525
Relay K1, K2, K3, K4	Panasonic	ALFG2PF12	250VAC, 31A, -40°C～+85°C	UL 60947-1 UL 60947-4-1 IEC/EN 61810-1	UL E43028 VDE 40023067
Current Sensor CT1	LEM	HLSR10-P	-25A～25A, -40°C～+105°C	UL 61010-1	UL E189713
INV Inductor	Shenzhen City Spitz Electronics Co., Ltd.	LDT600-15-0.69A	0.69mH, 30A -40°C～+150°C	IEC/EN 62109-1	Test with the appliance
	Shenzhen Click Technology Co., Ltd.				

SPS Isolated transformer T1	Shenzhen Click Technology Co., Ltd.	ER2834-120V-5V	1.27mH±10%, 1.62ohm -40°C～+130°C	IEC/EN 62109-1	Test with the appliance
Wire	Pacific Electric Wire & Cable Co., Ltd	MW75-C(UEWB)	Thermal rating 130°C	UL 1446	UL E201757
Tape	JINGJIANG YAHUA PRESSURE SENSITIVE GLUE CO.,LTD	polyester tape CT/PZ	polyester tape 0.025mm CT/PZ 130°C	UL 510A	UL E165111
Isolated opto-coupler U4, U36, U50, U51, U52, U53, U54, U55	FAIRCHILD	FODM1009 R2	70V, 50mA -40°C～+110°C	EN 60747-5-5	VDE 40044370
ISO resistor R33，R104, R105, R106, R107, R109, R165, R166, R167, R174, R324, R325	Viking	/	400V, 620Kohm, ±0.5%, 1/3W,2010 -55°C～+155°C	IEC/EN 62109-1	Test with the appliance
Fuse F3, F6, F7	Bussman	CC12H4A	63V, 4A -55°C～+125°C	UL 248-1	UL E19180
ISO resistor R137, R140, R141, R142, R143, R148, R149, R150, R151, R152, R156, R176	Viking	/	300V, 2Mohm,± 0.5%, 1/4W, 2010 -55°C～+155°C	IEC/EN 62109-1	Test with the appliance
Bleeding resistor R55, R59, R456, R457, R460, R461	YAGEO	/	400V, 200Kohm, ±1%, 1/4W, 1206 -55°C～+155°C	IEC/EN 62109-1	Test with the appliance
Insulation sheet under the inverter transistor	SHENZHEN WANDAN HARDW ARE PLASTIC CO.,LTD	/	30×22×2.0mm（L/W/H），3500V/mm，Tmax=+1000°C	IEC/EN 62109-1	Test with the appliance
THERMISTOR NTC	Shenzhen Kemin Sensor Co., Ltd	CWF4 15KJ4150	15K, 2.5mA	IEC/EN 62109-1	Test with the appliance

			-55°C～+125°C		
Gas Discharge Tube GAS1	BRIGHTKING ELECTRONICS CO., LTD	2RP600L-8	600VDC, 20KA, -40°C～+85°C	UL 1449	UL E327997
CPU U8	TI	TMS320F28066PZT	-40°C～+105°C	IEC/EN 62109-1	Test with the appliance
CPU U9	TI	MSP430F2252TRHA-VQFN	-40°C～+105°C	IEC/EN 62109-1	Test with the appliance
		MSP430F2254TRHA-VQFN			
Printed Circuit Board	BAOYUEJIA ELECTRONICS (ZHONG SHAN) CO.,LTD.	Version：11-155100-00	157.5mm ×97mm ×1.6mm, 130°C FR-4 V-0, CTI:IIIA 400 > CTI ⩾ 175	UL 796	UL E230225
	HUIZHOU TRUSTWIN ELECTRONICS DEVELOPMENT CO.,LTD.				UL E340729
	Dongguan kemble Electronic Co.,Ltd.				UL E64353
Printed Circuit Board	BAOYUEJIA ELECTRONICS (ZHONG SHAN) CO., LTD.	Version：11-155200-00	44mm×27mm×1.6mm, 130°C FR-4 V-0, CTI:IIIA 400 > CTI ⩾ 175	UL 796	UL E230225
	HUIZHOU TRUSTWIN ELECTRONICS DEVELOPMENT CO.,LTD.				UL E340729
	Dongguan kemble Electronic Co.,Ltd.				UL E64353
1) an asterisk indicates a mark which assures the agreed level of surveillance					

Functional Components

Components which are required for performance purposes and not directly addressed by a component standard or product standard: Ripple capacitors, Mosfets, etc.

Object/part No.	Type/ model (optional)	Technical data
EA2KSI Main board	/	Hardware: V00 Firmware: V009
EA2.5KSI Main board	/	Hardware: V00 Firmware: V009
EA3KSI Main board	/	Hardware: V00 Firmware: V009
EA3KSI-D Main board	/	Hardware: V00 Firmware: V009
EA3.68KSI Main board	/	Hardware: V00 Firmware: V009
EA4KSI Main board	/	Hardware: V00 Firmware: V009
EA4.6KSI Main board	/	Hardware: V00 Firmware: V009
EA5KSI Main board	/	Hardware: V00 Firmware: V009
EA6KSI Main board	/	Hardware: V00 Firmware: V009