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

Report Number. ..... :	BL-DG20B0833-B01
Date of issue ..... :	Dec. 22, 2020
Total number of pages ..... :	63
Name of Testing Laboratory preparing the Report ..... :	Shenzhen BALUN Technology Co., Ltd
Address of Testing Laboratory preparing the Report ..... :	Room 104, 204, 205, Building 1, No. 6, Industrial South Road, Songshan Lake District, Dongguan, Guangdong, China
Applicant's name ..... :	EVOLVE ENERGY GROUP CO., LIMITED
Address ..... :	RM 702,7/F FU FAI COMM CTR 27 HILLIER ST SHEUNG WAN,HK
Test specification:	
Standard ..... :	IEC 62109-1:2010 (First Edition)
Test procedure ..... :	Commissioned test
Non-standard test method ..... :	N/A
Test item description ..... :	Solar Grid-tied Inverter
Trade Mark ..... :	EVVO
Manufacturer ..... :	EVOLVE ENERGY GROUP CO., LIMITED
Model/Type reference ..... :	E-75KTL, E-80KTL, E-100KTL, E-100KTL-HV, E-110KTL, E-125KTL-HV, E-136KTL-HV
Ratings ..... :	See copy of marking label and model list.
Testing Laboratory ..... :	Shenzhen BALUN Technology Co., Ltd
Testing location/ address 1 ..... :	Room 104, 204, 205, Building 1, No. 6, Industrial South Road, Songshan Lake District, Dongguan, Guangdong, China
Testing location/ address 2 ..... :	Block B, 1/F., Baisha Science & Technology Park, Shahe West Road, Nanshan District, Shenzhen, Guangdong, China
Tested by (name, function, signature) ..... :	Colin Chen /Engineer
Approved by (name, function, signature) ..... :	Simon Qi /Chief Engineer

General disclaimer:

The test results presented in this report relate only to the object tested.

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Note:

The only difference between the EUT (test samples in this report) and testing sample of report BL-DG20C0131-B01, which was issued by Shenzhen BALUN Technology Co., Ltd. on Dec. 11, 2020 as below:

1. The new applicant, manufacturer, trademark and models.

The above differences will not influence the testing. So the test result is referred from report BL-DG20C0131-B01, which was issued by Shenzhen BALUN Technology Co., Ltd. on Dec. 11, 2020.

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

Tests against:

IEC 62109-1(ed. 1)/EN 62109-1:2010, IEC 62109-2(ed. 1)/EN 62109-2:2011

Total test reports contain 1 part and 2 attachments listed in below table:

Item	Description	pages
Part 1	Test report of IEC 62109-1: 2010 (1st Edition)	63
ATTACHMENT 1	Test report of IEC 62109-2: 2011 (1st Edition)	24
ATTACHMENT 2	Photo documentation	13

Summary of testing:

Tests performed (name of test and test clause):

4.2.2.6 Mains supply electrical data in normal condition

4.3 Thermal testing

4.4 Testing in fault condition

4.5 Humidity preconditioning

4.7 Electrical ratings tests

5.1.2 Durability of markings

6.3 Ingress protection

7.3.4.2.3 Access probe tests

7.3.5.3.2 Limitation of discharging energy through protective impedance

7.3.6.3 Protective class I - Protective bonding and earthing

7.3.7.4,7.3.7.5 Clearance and Creepage distances

7.3.9 Protection against shock hazard due to stored energy

7.4 Protection against energy hazards

7.5.1 Impulse voltage test

7.5.2 Voltage test (dielectric strength test)

7.5.4 Touch current measurement

8.4 Provisions for lifting and carrying

8.5 Wall mounting

10.2 Sonic pressure and sound level

13.7 Mechanical resistance to deflection, impact or drop

Remark:

- The max.operating temperature is 60ºC specified by manufacturer, the temperature rise tests were conducted at the max.rated ambient temperature of 45°C or 60ºC (derating) in the chamber.

- Other testing conditions considered in this test report, see General Product Information on the following pages.

Testing location:

All tests except Ingress protection are performed at address 1 listed on page 1.

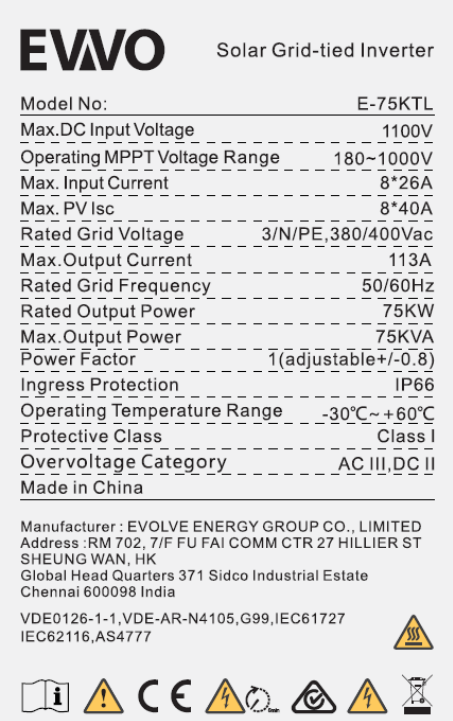
Ingress protection test is performed at address 2 listed on page 1.

Summary of compliance with National Differences (List of countries addressed): None.

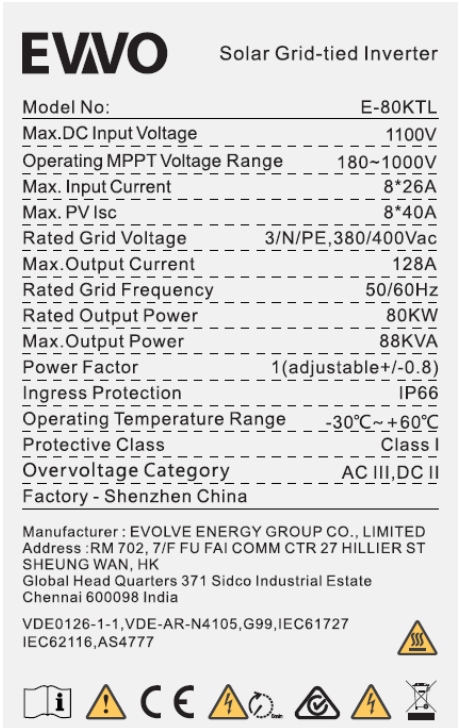
☒ **The product fulfils the requirements of IEC 62109-1: 2010, EN 62109-1: 2010, IEC 62109-2: 2011, EN 62109-2: 2011.**

Copy of marking plate:

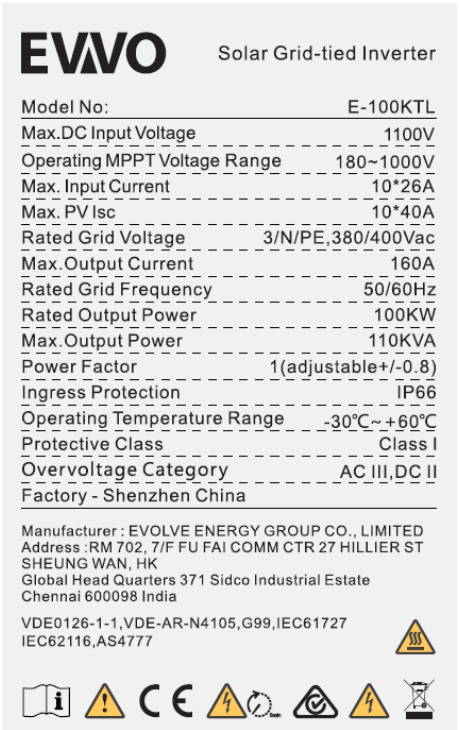
The artwork below may be only a draft.



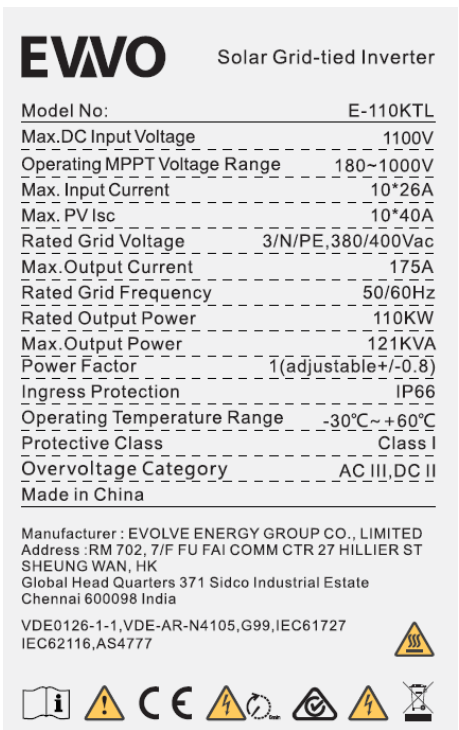
E-75KTL



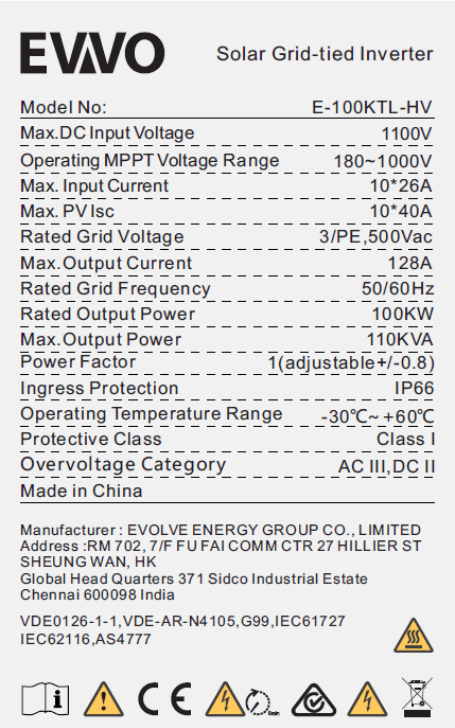
E-80KTL



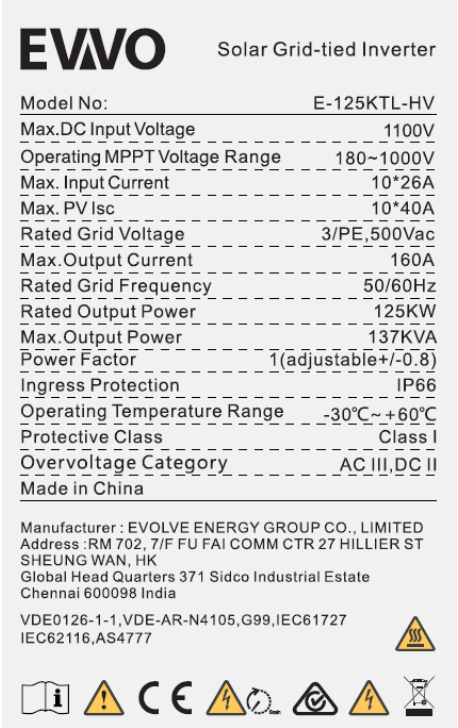
E-100KTL



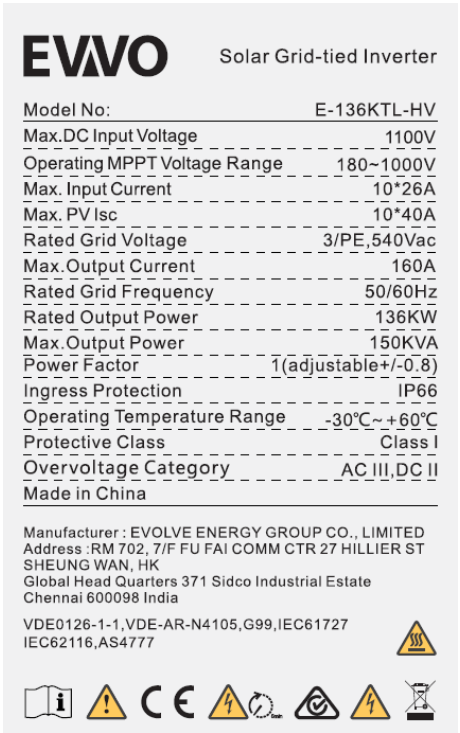
E-110KTL



E-100KTL-HV



E-125KTL-HV



E-136KTL-HV

Note:

1. The above markings are the minimum requirements required by the safety standard. For the final production samples, the additional markings which do not give rise to misunderstanding may be added.
2. Label is attached on the side surface of enclosure and visible after installation.

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) .....:	N/A
Class of equipment .....:	☒ Class I ☐ Class II ☐ Class III ☐ Not classified
Mass of equipment (kg) .....:	See model list.
Pollution degree.....:	PD3(Inside PD2)
IP protection class.....:	IP66
.....:	
Possible test case verdicts:	
- test case does not apply to the test object..... :	N/A
- test object does meet the requirement ..... :	P (Pass)
- test object was not evaluated for the requirement:	N/E
- test object does not meet the requirement..... :	F (Fail)
Testing ..... :	
Date of receipt of test item ..... :	Aug. 14, 2020
Date (s) of performance of tests..... :	Aug. 14, 2020 to Sep. 02, 2020

General remarks:	
"(See Enclosure #)" refers to additional information appended to the report. "(See appended table)" refers to a table appended to the report. The tests 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.** Determination of the test results includes consideration of measurement uncertainty from the test equipment and methods.	
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) ..... :	Dongguan SOFAR SOLAR Co., Ltd. 1F - 6F, Building E, No. 1 JinQi Road, Bihu Industrial Park, Wulian Village, Fenggang Town, Dongguan City.

General product information:

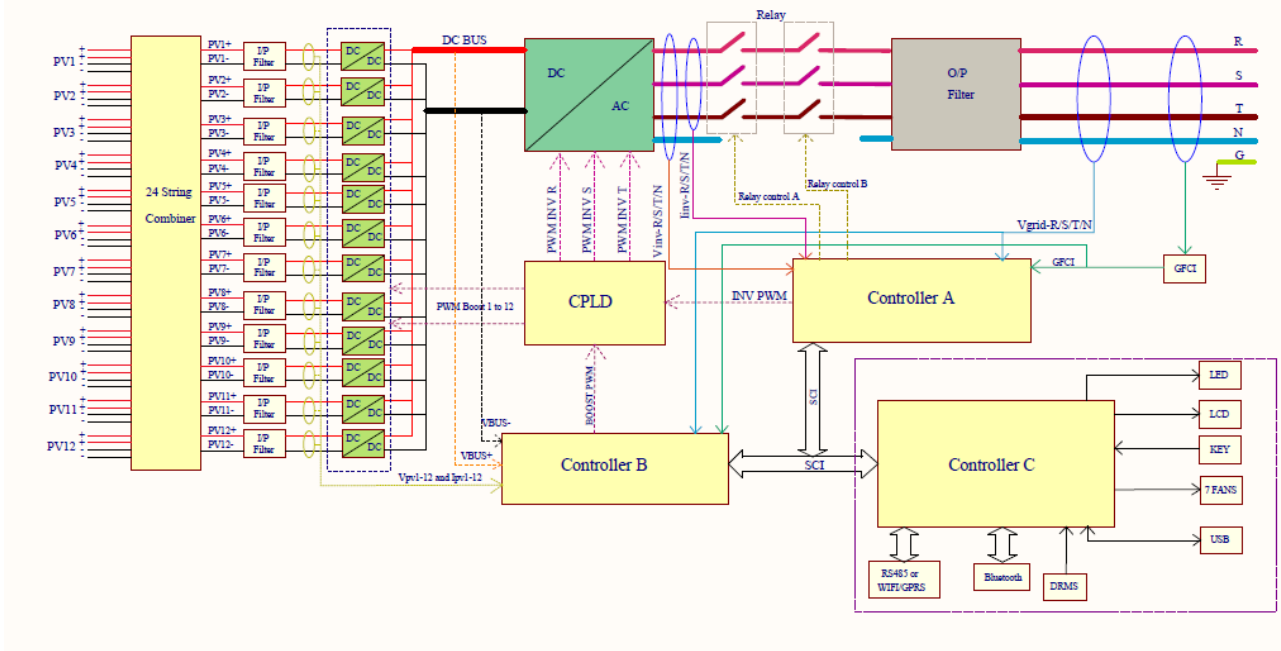
Brief description:
The PCE under test (EUT) is Solar Grid-tied Inverter which utilizes the advanced power electronics conversion components such as MOSFET, IGBT, IPM to convert the variable DC power generated from the photovoltaic (PV) arrays to the stable utility AC power which can be fed into the commercial electrical grid.

The models of E-75KTL, E-80KTL, E-100KTL, E-100KTL-HV, E-110KTL, E-125KTL-HV and E-136KTL-HV are identical on topological schematic circuit diagram and control solution codes except for the type designation, the input/output rating. So there are some differences on the related power electronics components such as the inverter module, reactors and bus capacitors. See the model differences list below for details.

Parts / Model	E-75KTL	E-80KTL	E-100KTL	E-110KTL	E-100KTL-HV	E-125KTL-HV	E-136KTL-HV
Number of boost inductors	8	8	10	10	10	10	12
Number of Boost module	4	4	5	5	5	5	6
Note(s):							

Unless otherwise specified, all the tests were conducted on the model E-136KTL-HV.

Block Diagram:



Model list:

Model or Type designation		E-75KTL	E-80KTL	E-100KTL	E-110KTL
PV input	VMAX PV [Vd.c.]	1100			
	MPP Voltage Range [Vd.c.]	180-1000			
	Full power MPPT voltage range [Vd.c.]	500-850			
	Max. PV Input Current [Ad.c.]	8*26		10*26	
	Max.DC Short-circuit current [Ad.c.]	8*40		10*40	
	Overvoltage Category (OVC)	II			
AC input	Rated Output Voltage [Va.c.]	3/N/PE, 380V/400Vac			
	Rated Output Frequency [Hz]	50/60			
	Rated Output Power [kW]	75	80	100	110
	Max. Output Power [kVA]	75	88	110	121
	Max. Output Current [Aa.c.]	113	128	160	175
	Power Factor cosφ [λ]	1 default (adjustable +/-0.8)			
	Overvoltage Category (OVC)	III			
System	Type of inverter	Non-isolated			
	Separated by	None / Transformer-less			
	Protective Class	Class I			
	Enclosure Protection (IP)	IP66			
	Operating Temperature Range [ºC]	-30 to 60			
	Pollution degree (PD)	PD 2 (inside) PD 3 (outside)			
	Weight [kg]	88	88	90	90
	Size (W x H x D) [mm]	995.5mm x 663.5mm x 368mm			

Model or Type designation		E-100KTL-HV	E-125KTL-HV	E-136KTL-HV
PV input	VMAX PV [Vd.c.]	1100		
	MPP Voltage Range [Vd.c.]	180-1000		
	Full power MPPT voltage range [Vd.c.]	550V-850V		
	Max. PV Input Current [Ad.c.]	10*26		12*26
	Max.DC Short-circuit current [Ad.c.]	10*40		12*40
	Overvoltage Category (OVC)	II		
AC inpu	Rated Output Voltage [Va.c.]	3/PE, 500Vac		3/PE, 540Vac
	Rated Output Frequency [Hz]	50/60		

	Rated Output Power [kW]	100	125	136
	Max. Output Power [kVA]	110	137	150
	Max. Output Current [Aa.c.]	128	160	160
	Power Factor cosφ [λ]	1 default (adjustable +/-0.8)		
	Overvoltage Category (OVC)	III		
System	Type of inverter	Non-isolated		
	Separated by	None / Transformer-less		
	Protective Class	Class I		
	Enclosure Protection (IP)	IP66		
	Operating Temperature Range [ºC]	-30 to 60		
	Pollution degree (PD)	PD 2 (inside) PD 3 (outside)		
	Weight [kg]	90	90	92
	Size (W x H x D) [mm]	995.5mm x 663.5mm x 368mm		

Throughout the test report following abbreviations may be used:

- input	i/p	- Test repeated, similar result(3 times)	TRSR
- output	o/p	- No indication of dielectric breakdown	NB
- short-circuited	s-c	- Cheesecloth remained intact	NC
- overloaded	o-l	- Tissue paper remained intact	NT
- open-circuited	o-c	- No hazards	NH
- normal conditions	N.C.	- The PCE can recover to operate automaticly after removing the abnormal condition	RO
- single fault conditions	SFC	- functional insulation	FI
- between parts of opposite polarity	BOP	- basic insulation	BI
- internal protection operated	IPO	- supplementary insulation	SI
- Component damage (list damaged component)	CD	- double insulation	DI
- No component damaged	NCD	- reinforced insulation	RI
- Power Conversion Equipment Indicate used abbreviations (if any)	PCE	- Equipment Under Test	EUT

IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
4	**GENERAL TESTING REQUIREMENTS**		
4.1	General		P
4.2	General conditions for testing		P
4.2.1	Sequence of tests		P
4.2.2	Reference test conditions		P
4.2.2.1	Environmental conditions	Max. 60°C rated ambient temperature tested.	P
4.2.2.2	State of equipment		P
4.2.2.3	Position of equipment	Be fixed in accordance with the manufacturer's instruction	P
4.2.2.4	Accessories		N/A
4.2.2.5	Covers and removable parts		N/A
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		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 inputs	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		N/A
4.2.2.11	Available short circuit current		P
4.3	Thermal testing	(see appended table 4.3)	P
4.3.1	General		P
4.3.2	Maximum temperatures		P
4.3.2.1	General		P
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

IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
4.4.2.1	General		P
4.4.2.2	Duration of tests		P
4.4.3	Pass/fail criteria for testing under fault conditions		P
4.4.3.1	Protection against shock hazard		P
4.4.3.2	Protection against the spread of fire		P
4.4.3.3	Protection against other hazards		P
4.4.3.4	Protection against parts expulsion hazards		P
4.4.4	Single fault conditions to be applied		P
4.4.4.1	Component fault tests		P
4.4.4.2	Equipment or parts for short-term or intermittent operation		P
4.4.4.3	Motors	No motors	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		N/A
4.4.4.10	Safety interlock systems		N/A
4.4.4.11	Reverse d.c. connections		P
4.4.4.12	Voltage selector mismatch	No voltage selector	N/A
4.4.4.13	Mis-wiring with incorrect phase sequence or polarity		P
4.4.4.14	Printed wiring board short-circuit test	No insulation distance less than the required spacing.	N/A
4.5	Humidity preconditioning	(see appended table 7.5)	P
4.5.1	General		P
4.5.2	Conditions	95% R.H. 40℃. 48H	P
4.6	Backfeed voltage protection		P
4.6.1	Backfeed tests under normal conditions	0A	P
4.6.2	Backfeed tests under single-fault conditions	PV input is separated from grid with basic insulation under normal and single-fault conditions with disconnection method evaluated to EN 62109-2	P
4.6.3	Compliance with backfeed tests		P
4.7	Electrical ratings tests	(see appended table 4.2.2.6)	P

IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
4.7.1	Input ratings		P
4.7.1.1	Measurement requirements for DC input ports		P
4.7.2	Output ratings		P
5	**MARKING AND DOCUMENTATION**		P
5.1	Marking		--
5.1.1	General		P
	Equipment shall bear markings as specified in 5.1 and 5.2	Label are marked on PCE and graphic symbol is explained in user manual	P
	Graphic symbols may be used and shall be in accordance with Annex C or IEC 60417 as applicable.		P
	Graphic symbols shall be explained in the documentation provided with the PCE.		P
5.1.2	Durability of markings		P
	Markings required by this clause to be located on the PCE shall remain clear and legible under conditions of NORMAL USE and resist the effects of cleaning agents specified by the manufacturer		P
5.1.3	Identification		P
	The equipment shall, as a minimum, be permanently marked with:		P
	a) the name or trade mark of the manufacturer or supplier		P
	b) model number, name or other means to identify the equipment		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.	Within three months	P
5.1.4	Equipment ratings	See below	P
	Unless otherwise specified in another part of IEC 62109, the following ratings, as applicable shall be marked on the equipment:	Special requirement as IEC/EN 62109-2	P
	– input voltage, type of voltage (a.c. or d.c.), frequency, and max. continuous current for each input	Refer to the marking label on page 4	P
	– output voltage, type of voltage (a.c. or d.c.), frequency, max. continuous current, and for a.c. outputs, either the power or power factor for each output	Refer to the marking label on page 4	P
	– the ingress protection (IP) rating as in 6.3 below	IP66	P

IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
5.1.5	Fuse identification	The fuse is secure on the PCB. It cannot access by operator.	P
	Marking shall be located adjacent to each fuse or fuseholder, or on the fuseholder, or in another location provided that it is obvious to which fuse the marking applies, giving the fuse current rating and where fuses of different voltage rating value could be fitted, the fuse voltage rating.		P
	Where fuses with special fusing characteristics such as time delay or breaking capacity are necessary, the type shall also be indicated		N/A
	For fuses not located in operator access areas and for soldered-in fuses located in operator access areas, it is permitted to provide an unambiguous cross-reference (for example, F1, F2, etc.) to the servicing instructions which shall contain the relevant information.		P
5.1.6	Terminals, Connections, and Controls		P
	If necessary for safety, an indication shall be given of the purpose of Terminals, connectors, controls, and indicators, and their various positions, including any connections for coolant fluids such as water and drainage. The symbols in Annex C may be used, and where there is insufficient space, symbol 9 of Annex C may be used.	“+” and “-” marked close to PV input connect. “+” and “-” marked close to Battery side. “L” “N” and “GND” marked close to AC output terminal block.	P
	Push-buttons and actuators of emergency stop devices, and indicator lamps used only to indicate a warning of danger or the need for urgent action shall be coloured red.	No such 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.	The PCE is not intended to connect to multiple-voltage and there is no voltage setting device.	N/A
	A unit with d.c. terminals shall be plainly marked indicating the polarity of the connections, with:	See below	P
	– 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	Not provided	N/A
5.1.6.1	Protective Conductor Terminals		P
	The means of connection for the protective earthing conductor shall be marked with:	The protective earthing terminal is connected via AC connector.	P
	– symbol 7 of Annex C; or		P

IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
	– the letters “PE“; or		N/A
	– the colour coding green-yellow.		N/A
5.1.7	Switches and circuit-breakers		N/A
	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.		N/A
5.1.8	Class II Equipment	Class I	N/A
	Equipment using Class II protective means throughout shall be marked with symbol 12 of Annex C. Equipment which is only partially protected by DOUBLE INSULATION or REINFORCED INSULATION shall not bear symbol 12 of Table Annex C.		N/A
	Where such equipment has provision for the connection of an earthing conductor for functional reasons (see 7.3.6.4) it shall be marked with symbol 6 of Annex C		N/A
5.1.9	Terminal boxes for External Connections	No such terminal box	N/A
	Where required by note 1 of Table 2 as a result of high temperatures of terminals or parts in the wiring compartment, there shall be a marking, visible beside the terminal before connection, of either:		N/A
	a) the minimum temperature Rating and size of the cable to be connected to the TERMINALS; or		N/A
	b) a marking to warn the installer to consult the installation instruction. Symbol 9 of Table D-1 is an acceptable marking		N/A
5.2	Warning markings		P
5.2.1	Visibility and legibility requirements for warning markings		P
	Warning markings shall be legible, and shall have minimum dimensions as follows:		P
	– Printed symbols shall be at least 2,75 mm high		P
	– Printed text characters shall be at least 1.5 mm high and shall contrast in colour with the background		P
	– Symbols or text that are moulded, stamped or engraved in a material shall have a character height of at least 2,0 mm, and if not contrasting in colour from the background, shall have a		P

IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
	depth or raised height of at least 0,5 mm.		
	If it is necessary to refer to the instruction manual to preserve the protection afforded by the equipment, the equipment shall be marked with symbol 9 of Annex C	The manual provides necessary information for warning marking	P
	Symbol 9 of Annex C is not required to be used adjacent to symbols that are explained in the manual		P
5.2.2	Content for warning markings		P
5.2.2.1	Ungrounded heat sinks and similar parts	Grounded heatsink and metal enclosure	N/A
	An ungrounded heat sink or other part that may be mistaken for a grounded part and involves a risk of electric shock in accordance with 7.3 shall be marked with symbol 13 of Annex C, or equivalent. The marking may be on or adjacent to the heat sink and shall be clearly visible when the PCE is disassembled to the extent that a risk of contact with the heat sink exists.		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.		P
5.2.2.3	Coolant	Coolant is not used	N/A
	A unit containing coolant that exceeds 70 °C shall be legibly marked externally where readily visible after installation with symbol 15 of Annex C. The documentation shall provide a warning regarding the risk of burns from hot coolant, and either:		N/A
	a) statement that coolant system servicing is to be done only by SERVICE PERSONNEL, or		N/A
	b) instructions for safe venting, draining, or otherwise working on the cooling system, if these operations can be performed without OPERATOR access to HAZARDS internal to the equipment		N/A
5.2.2.4	Stored energy		P
	Where required by 7.3.9.2 or 7.4.2 the PCE shall be marked with Symbol 21 of Annex C and the time to discharge capacitors to safe voltage and energy levels shall accompany the symbol.		P
5.2.2.5	Motor guarding		N/A
	Where required by 8.2 a marking shall be provided where it is visible to service personnel before removal of a guard, warning of the hazard and giving instructions for safe servicing (for example disconnection of the source before removing the	No motor inside enclosure	N/A

IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
	guard).		
5.2.3	Sonic hazard markings and instructions	Hazardous noise level not produced	N/A
	If required by 10.2.1 a PCE shall:		N/A
	a) be marked to warn the operator of the sonic pressure hazard; or		N/A
	b) be provided with installation instructions that specify how the installer can ensure that the sound pressure level from equipment at its point of use after installation, will not reach a value, which could cause a hazard. These instructions shall include the measured sound pressure level, and shall identify readily available and practicable protective materials or measures which may be used.		N/A
5.2.4	Equipment with multiple sources of supply		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.		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.	The touch current does not exceed limited	N/A
5.3	Documentation		P
5.3.1	General		P
	The documentation provided with the PCE shall provide the information needed for the safe operation, installation, and (where applicable) maintenance of the equipment. The documentation shall include the items required in 5.3.2 through 5.3.4, and the following:		P
	a) explanations of equipment makings, including symbols used		P
	b) location and function of terminals and controls		P
	c) all ratings or specifications that are necessary to safely install and operate the PCE, including the following environmental ratings along with an explanation of their meaning and any resulting installation requirements:		P
	– ENVIRONMENTAL CATEGORY as per 6.1	Outdoor	P

IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
	– WET LOCATIONS classification fort he intended external environment as per 6.1	Suitable for wet location	P
	– POLLUTION DEGREE classification for the intended external environment as per 6.2	PD 3 outside. PD 2 inside	P
	– INGRESS PROTECTION rating as per 6.3	IP66	P
	– Ambient temperature and relative humidity ratings	Max. +60℃ and 100% R.H.	P
	– MAXIMUM altitude rating	4000m	P
	– OVERVOLTAGE CATEGORY assigned to each input and output port as per 7.3.7.1.2, accompanied by guidance regarding how to ensure that the installation complies with the required overvoltage categories;	OVC II(PV), OVC III(Mains)	P
	d) a warning that when the photovoltaic array is exposed to light, it supplies a d.c. voltage to the PCE		P
5.3.1.1	Language	English provide	P
	Instructions related to safety shall be in a language that is acceptable in the country where the equipment is to be installed.	For other country language further evaluated is needed	N/A
5.3.1.2	Format		P
	In general, the documentation must be provided in printed form and is to be delivered with the equipment.	Printed form provided	P
	For equipment which requires the use of a computer for both installation and operation, documentation may be provided in electronic format without accompanying printed format.		N/A
5.3.2	Information related to installation		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

IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
	c) ratings and means of connection of any outputs from the PCE, and any requirements related to wiring and externals controls, colour coding of leads, or overcurrent protection needed;		P
	d) explanation of the pin-out of connectors for external connections, unless the connector is used for a standard purpose (e.g. RS 232)		P
	e) ventilation requirements;		P
	f) requirements for special services, for example cooling liquid;	No 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;	No such battery	N/A
	i) tightening torque to be applied to wiring terminals;		N/A
	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;	Not exceeds the max. rated current.	N/A
	k) for each input to the PCE, the max value of short-circuit current available from the source, for which the PCE is designed; and		P
	l) compatibility with RCD and RCM;	Internal RCM is used	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:	Touch current is not exceeded limit	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.“	Internal RCM is used	N/A
	o) for PCE intended to charge batteries, the battery nominal voltage rating, size, and type	Grid interactive	N/A
	p) PV array configuration information, such as ratings, whether the array is to be grounded or floating, any external protection devices		N/A

IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
	needed, etc.		
5.3.3	Information related to operation		P
	Instructions for use shall include any operating instructions necessary to ensure safe operation, including the following, as applicable:		P
	– Instructions for adjustment of controls including the effects of adjustment;		P
	– Instructions for interconnection to accessories and other equipment, including indication of suitable accessories, detachable parts and any special materials;		P
	– Warnings regarding the risk of burns from surfaces permitted to exceed the temperature limits of 4.3.2 and required operator actions to reduce the risk; and		P
	– Instructions, that if the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.		P
5.3.4	Information related to maintenance		P
	Maintenance instructions shall include the following:		P
	– Intervals and instructions for any preventive maintenance that is required to maintain safety (for example air filter replacement or periodic re-tightening of terminals);		P
	– Instructions for accessing operator access areas, if any are present, including a warning not to enter other areas of the equipment;		N/A
	– Part numbers and instructions for obtaining any required operator replaceable parts;	No such part	N/A
	– 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	No battery inside	N/A
	Where required by 14.8.5, the documentation shall include the applicable items from the following list of instructions regarding maintenance of batteries:		N/A
	– Servicing of batteries should be performed or supervised by personnel knowledgeable about batteries and the required precautions		N/A

IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
	– When replacing batteries, replace with the same type and number of batteries or battery packs		N/A
	– General instructions regarding removal and installation of batteries		N/A
	– CAUTION: Do not dispose of batteries in a fire. The batteries may explode.		N/A
	– CAUTION: Do not open or damage batteries. Released electrolyte is harmful to the skin and eyes. It may be toxic.		N/A
	– CAUTION: A battery can present a risk of electrical shock and high short-circuit current. The following precautions should be observed when working on batteries:		N/A
	a) Remove watches, rings, or other metal objects.		N/A
	b) Use tools with insulated handles.		N/A
	c) Wear rubber gloves and boots.		N/A
	d) Do not lay tools or metal parts on top of batteries		N/A
	e) Disconnect charging source prior to connecting or disconnecting battery terminals		N/A
	f) Determine if battery is inadvertently grounded. If inadvertently grounded, remove source from ground. Contact with any part of a grounded battery can result in electrical shock. The likelihood of such shock can be reduced if such grounds are removed during installation and maintenance (applicable to equipment and remote battery supplies not having a grounded supply circuit).		N/A
6	**ENVIRONMENTAL REQUIREMENTS AND CONDITIONS**		P
	The manufacturer shall rate the PCE for the following environmental conditions:		P
	– ENVIRONMENTAL CATEGORY, as in 6.1 below	Outdoor use	P
	– Suitability for WET LOCATIONS or not	Yes	P
	– POLLUTION DEGREE rating in 6.2 below	PD 3 outside. PD 2 inside	P
	– INGRESS PROTECTION (IP) rating, as in 6.3 below	IP 66	P
	– Ultraviolet (UV) exposure rating, as in 6.4 below	Yes	P
	– Ambient temperature and relative humidity ratings, as in 6.5 below	Max. 60℃， 100%R.H.	P
6.1	Environmental categories and minimum environmental conditions		P

IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
6.1.1	Outdoor		P
6.1.2	Indoor, unconditioned		N/A
6.1.3	Indoor, conditioned		N/A
6.2	Pollution degree	PD 3 outside. PD 2 inside	P
6.3	Ingress Protection	IP66	P
6.4	UV exposure	PV terminals are certified.	P
6.5	Temperature and humidity	Max. 60℃， 100%R.H.	P
7	**PROTECTION AGAINST ELECTRIC SHOCK AND ENERGY HAZARDS**		P
7.1	General		P
7.2	Fault conditions	Normal and single fault condition are considered	P
7.3	Protection against electric shock		P
7.3.1	General	In the PCE the earthed metal enclosure is evaluated by means of basic insulation from DVC C circuit DVC A circuit and unearthed accessible parts are evaluated by means of reinforced insulation from DVC C or protective impedance DVC C circuit: The PV input and the Main output DVC A circuit: The signal communication output port.	P
7.3.2	Decisive voltage classification		P
7.3.2.1	Use of decisive voltage class (DVC)	Working voltage and protective measure and considered	P
7.3.2.2	Limits of DVC (according table 6)	Wet location is considered for PCE outside only	P
7.3.2.3	Short-terms limits of accessible voltages under fault conditions		P
7.3.2.4	Requirements for protection (according table 7)	Single fault condition is considered	P
7.3.2.5	Connection to PELV and SELV circuits	The external signal communication port is considered as SELV	P
7.3.2.6	Working voltage and DVC		P
7.3.2.6.1	General	Transients and voltage fluctuation are disregarded. And worst case normal operation condition is considered	P
7.3.2.6.2	AC working voltage (see Figure 2)		P

IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
7.3.2.6.3	DC working voltage (see Figure 3)		P
7.3.2.6.4	Pulsating working voltage (see Figure 4)		P
7.3.3	protective separation	In the PCE the earthed metal enclosure is evaluated by means of basic insulation from DVC C circuit DVC A circuit and unearthed accessible parts are evaluated by means of reinforced insulation from DVC C or protective impedance DVC C circuit: The PV input and the Main output DVC A circuit: The signal communication output port	P
	Protective separation shall be achieved by:		P
	▪ double or reinforced insulation, or		P
	▪ protective screening, i.e. by a conductive screen connected to earth by protective bonding in the PCE, or connected to the protective earth conductor itself, whereby the screen is separated from live parts by at least basic insulation, or		P
	▪ protective impedance comprising limitation of current per 7.3.5.3 and of discharged energy per 7.3.5.4, or		P
	▪ limitation of voltage according to 7.3.5.4.		N/A
	The protective separation shall be fully and effectively maintained under all conditions of intended use of the PCE		P
7.3.4	Protection against direct contact		P
7.3.4.1	General		P
	Protection against direct contact is employed to prevent persons from touching live parts that do not meet the requirements of 7.3.5 and shall be provided by one or more of the measure given in 7.3.4.2 (enclosures and barriers) and 7.3.4.3 (insulation).	Enclosure provided	P
	Open type sub-assemblies and devices do not require protective measures against direct contact but the instruction provided with the equipment must indicate that such measures must be provided in the end equipment or in the installation.	End use product	N/A
	Product intended for installation in CLOSED ELECTRICAL OPERATING AREAS, (see 3.9) need not have protective measures against direct contact, except as required by 7.3.4.2.4.	Not use under this condition	N/A

IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
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.	Enclosure provided to prevent access to inside live parts	P
7.3.4.2.1	General		P
	Parts of enclosures and barriers that provide protection in accordance with these requirements shall not be removable without the use of a tool (see 7.3.4.2.3).	Secured by screws	P
	Polymeric materials used to meet these requirements shall also meet the requirements of 13.6	The plastic board as part of enclosure is evaluated as clause 13.6	P
7.3.4.2.2	Access probe criteria		P
	Protection is considered to be achieved when the separation between the test probes and live parts, when tested as described below, is as follows:		P
	a) decisive voltage classification A, (DVC A) - the probe may touch the live parts	The signal is considered as DVC A	P
	b) decisive voltage classification B, (DVC B) - the probe must not touch bare live parts	The DVC B circuit is not accessible by probe	P
	c) decisive voltage classification C, (DVC C) – the probe must have adequate clearance to live parts, based on the clearance for Basic insulation using the recurring peak working voltage involved,	The DVC C circuit is not accessible by probe	P
7.3.4.2.3	Access probe tests		P
	Compliance with 7.3.4.2.1 is checked by all of the following:		P
	a) Inspection; and		P
	b) Tests with the test finger (Figure D.1) and test pin (Figure D.2) of 0E, the results of which shall comply with the requirements of 7.3.4.2.1 a), b), and c) as applicable. Probe tests are performed on openings in the enclosures after removal of parts that can be detached or opened by an operator without the use of a tool, including fuseholders, and with operator access doors and covers open. It is permitted to leave lamps in place for this test. Connectors that can be separated by an operator without use of a tool, shall also be tested during and after disconnection. Any movable parts are to be put in the most 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		P

IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
	equipment having a mass exceeding 40 kg is not tilted.		
	Equipment intended for building-in or rack mounting, or for incorporation in larger equipment, is tested with access to the equipment limited according to the method of mounting detailed in the installation instructions.		N/A
	c) Openings preventing the entry of the jointed test finger (Figure E-1 of 0E) during test b) above, are further tested by means of straight unjointed test finger (Figure E-3 of 0E), applied with a force of 30 N. If the unjointed finger enters, the test with the jointed finger is repeated except that the finger is applied using any necessary force up to 30 N.		N/A
	d) In addition to a) – c) above, top surfaces of enclosure shall be tested with the IP3X probe of IEC 60529. The test probe shall not penetrate the top surface of the enclosure when probed from the vertical direction ±5 ° only.		N/A
7.3.4.2.4	Service access areas	Inside PCE are not intentionally touched with energized part when installation and maintenance. Symbol 21 of Annex C are marked on PCE and explained in user manual	P
7.3.4.3	Protection by means of insulation of live parts	The earthed enclosure is with basic insulation form the live parts inside	P
	Where the requirements of 7.3.4.2 are not met, live parts shall be provided with insulation if:		P
	– their working voltage is greater than the maximum limit of decisive voltage class A, or		P
	– for a DVC A or B circuit, protective separation from adjacent circuit of DVC C is not provided (see note “‡“ under Table 7)		P
7.3.5	Protection in case of direct contact	The single communication port is direct contact and evaluated with reinforced insulation from live part	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,	Considered	P

IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
	and:		
	– is of decisive voltage class A and complies with 7.3.5.2, or	The single communication port is DVC A and reinforced insulation from the live part by means of isolation transformer and optocoupler	P
	– is provided with protective impedance according to 7.3.5.3, or		N/A
	– is limited in voltage according to 7.3.5.4		N/A
	In addition to the measures as given in 7.3.5.2 to 7.3.5.4, it shall be ensured that in the event of error or polarity reversal of connectors no voltages that exceed DVC A can be connected into a circuit with protective separation. This applies for example to plug-in-sub-assemblies or other plug-in devices which can be plugged-in without the use of a tool (key) or which are accessible without the use of a tool.	Considered	P
	Conformity is checked by visual inspection and trial insertion.		P
7.3.5.2	Protection using decisive voltage class A	The single communication port is DVC A and reinforced insulation from the live part by means of isolation transformer and optocoupler	P
7.3.5.3	Protection by means of protective impedance	Protective impedance not used as protective separation in the PCE	N/A
	Circuits and conductive parts do not require protection against direct contact if any connection to circuits of DVC-B or DVC-C is through protective impedance, and the accessible circuit or part is otherwise provided with protective separation from circuits of DVC-B or DVC-C according 7.3.3.		N/A
7.3.5.3.1	Limitation of current through protective impedance		N/A
	The current available through protective impedance to earth and between simultaneously accessible parts, measured at the accessible live parts, shall not exceed a value of 3,5 mA a.c. or 10 mA d.c. under normal and single-fault conditions.		N/A
7.3.5.3.2	Limitation of discharging energy through protective impedance		N/A
	The discharging energy available between simultaneously accessible parts protected by protective impedance shall not exceed the charging voltage and capacitance limits given in Table 9, which applies to both wet and dry locations, under normal and single fault conditions. Refer to figure 8.		N/A
7.3.5.4	Protection by means of limited voltages	No such design	N/A

IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
	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)	Class I also with reinforced insulation design inside PCE	P
	That part of a PCE meets the requirements of 7.3.6.2 and 7.3.6.3 is defined as protective class I	The earthed metal enclosure meets this requirement	P
	That part of a PCE meets the requirements of 7.3.6.4 is defined as protective class II.	The signal communication port is reinforced insulation from live parts inside	N/A
	That part of PCE which meets the requirements of decisive voltage class A and in which no hazardous voltages are derived, is defined as protective class III. No shock hazard is present in such circuits.		N/A
	Where protection against indirect contact is dependent on means provided during installation, the installation instructions shall provide details of the required means and shall indicate the associated hazards.	The manual requires the PCE must be securely earthed	P
7.3.6.2	Insulation between live parts and accessible conductive parts		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	See Cl. 7.3.7.4 and Cl. 7.3.7.5	P
7.3.6.3	Protective class I – Protective bonding and earthing		P
7.3.6.3.1	General		P
	Equipment of protective class I shall be provided		P

IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
	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:		
	a) accessible conductive parts that are protected by one of the measures in 7.3.5.2 to 7.3.5.4, or		N/A
	b) accessible conductive parts are separated from live parts of DVC-B or -C using double or reinforced insulation.		N/A
7.3.6.3.2	Requirements for protective bonding		P
	Electrical contact with the means of connection of the external protective earthing conductor shall be achieved by one or more of the following means:	The earthing wire is reliable secured to internal metal enclosure	P
	a) through direct metallic contact;		P
	b) through other conductive parts which are not removed when the PCE or sub-units are used as intended;		N/A
	c) through a dedicated protective bonding conductor;		P
	d) through other metallic components of the PCE		N/A
	Where direct metallic contact is used and one or both of the parts involved is painted or coated, the paint or coating shall be removed in the area of contact, or reliably penetrated, to ensure metal to metal contact.	The metal enclosure is reliably penetrated and earthed	P
	For moving or removable parts, hinges or sliding contacts designed and maintained to have a low resistance are examples of acceptable means if they comply with the requirements of 7.3.6.3.3.	No such design	N/A
	Metal ducts of flexible or rigid construction and metallic sheaths shall not be used as protective bonding conductors, unless the device or material has been investigated as suitable for protective bonding purposes.	No such design	N/A
7.3.6.3.3	Rating of protective bonding		P
	Protective bonding shall withstand the highest thermal and dynamic stresses that can occur to the PCE item(s) concerned when they are subjected to a fault connecting live parts to accessible conductive parts. The protective bonding shall remain effective for as long as a fault to the accessible conductive parts persists or until an upstream protective device removes power from the part.		P
	Protective bonding shall meet following		P

IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
	requirements:		
	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.		P
	As alternative to a) and b) the protective bonding may designed according to the requirements for the external protective earthing conductor in 7.3.6.3.5, in which case no testing is required.	Test done	N/A
	The impedance of protective bonding means shall be checked by passing a test current through the bond for a period of time as specified below. The test current is based on the rating of the overcurrent protection for the equipment or part of the equipment under consideration, as follows:		P
	a) For pluggable equipment type A, the overcurrent protective device is that provided external to the equipment (for example, in the building wiring, in the mains plug or in an equipment rack);		N/A
	b) For pluggable equipment type B and fixed equipment, the maximum rating of the overcurrent protective device specified in the equipment installation instructions to be provided external to the equipment;		P
	c) For a circuit or part of the equipment for which an overcurrent protective device is provided as part of the equipment, the rating of the provided overcurrent device.	Internal RCM remove power if earth fault happens	P
	Voltages are measured from the protective earthing terminal to all parts whose protective bonding means are being considered. The impedance of the protective earthing conductor is not included in the measurement. However, if the protective earthing conductor is supplied with the equipment, it is permitted to include the conductor in the test circuit but the measurement of the voltage drop is made only from the main protective earthing terminal to the accessible part required to be earthed.	Measured form the farthest part of earthed metal enclosure to the input earth terminal	P
	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		P

IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
	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.		
7.3.6.3.3.1	Test current, duration, and acceptance criteria	Refer clause 7.3.6.3.5	P
	The test current, duration of the test and acceptance criteria are as follows:		P
	a) For PCE with an overcurrent protective device rating of 16 A or less, the test current is 200% of the overcurrent protective device rating, but not less than 32 A, applied for 120s. The impedance of the protective bonding means during and at the end of the test shall not exceed 0,1 Ω.		-
	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.		-
	c) During and after the test, there shall be no melting, loosening, or other damage that would impair the effectiveness of the protective bonding means.		-
	The test current is derived from an a.c or d.c supply source, the output of which is not earthed.		-
	As an alternative to Table 10, where the time-current characteristic of the overcurrent protective device that limits the fault current in the protective bonding means is known because the device is either provided in the equipment or fully specified in the installation instructions, the test duration may be based on that specific device's time-current characteristic,. The tests are conducted for a duration corresponding to the 200% current value on the time-current characteristic.		N/A
7.3.6.3.4	Protective bonding impedance (routine test)	Manufacture declaration for this and with FI	N/A
	If the continuity of the protective bonding is achieved at any point by a single means only (for example a single conductor or single fastener), or if the PCE is assembled at the installation location, then the impedance of the protective bonding shall also be tested as a routine test.		N/A

IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
	The test shall be as in 7.3.6.3.3, except for the following:		
	▪ the test current may be reduced to any convenient value greater than 10 A sufficient to allow measurement or calculation of the impedance of the protective bonding means:		N/A
	▪ the test duration may be reduced to no less than 2 s		N/A
	For equipment subject to the type test in 7.3.6.3.3.1a), the impedance during the routine test shall not exceed 0,1Ω.		N/A
	For equipment subject to the type test in 7.3.6.3.3.1b) the impedance during the routine test shall not exceed 2,5 V divided by the test current required by 7.3.6.3.3.1b).		N/A
7.3.6.3.5	External protective earthing conductor		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.	>4mm^2	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.	Permanently connected	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;		N/A
	▪ 4 mm² if mechanical protection is not provided.	The installation manual requires min 4mm^2 wire	P
	For cord-connected equipment, provisions shall be made so that the external protective earthing conductor in the cord shall, in the case of failure of the strain-relief mechanism, be the last conductor to be interrupted.	Not cord-connected equipment.	N/A
7.3.6.3.6	Means of connection for the external protective earthing conductor		P
7.3.6.3.6.1	General		P
	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		P

IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
	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.		
	The means of connection for the protective earthing conductor shall be permanently marked with:		P
	• symbol 7 of Annex C; or		P
	• the colour coding green-yellow		N/A
	Marking shall not be done on easily changeable parts such as screws.		P
7.3.6.3.7	Touch current in case of failure of the protective earthing conductor		P
	The requirements of this sub-clause shall be satisfied to maintain safety in case of damage to or disconnection of the protective earthing conductor.		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.		P
	For all other PCE, one or more of the following measure shall be applied, unless the touch current measured in accordance with 7.5.4 using the test network of IEC 60990 test figure 4 shall not exceed 3,5 mA a.c. or 10 mA d.c.	2.93 mA a.c. max.	P
	a) Permanently connected wiring, and:	Not exceed 3.5mA a.c.	N/A
	• a cross-section of the protective earthing conductor of at least 10 mm² Cu or 16 mm² Al; or		N/A
	• automatic disconnection of the supply in case of discontinuity of the protective earthing conductor; or		N/A
	• 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		N/A

IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
	installed or		
	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.	Not exceed 3.5mA a.c.	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 PCE in parallel using one common PE conductor, the above touch current requirements apply to the maximum number of the PCE to be connected in parallel, unless one of the measures in a)		N/A
	or b) above is used. The maximum number of parallel PCE 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	Signal communication port are evaluated with reinforced insulation form live parts inside	P
	Equipment or parts of equipment designed for protective class II shall have insulation between live parts and accessible surfaces in accordance with 7.3.4.3. The following requirements also apply:		P
	• equipment designed to protective class II shall not have means of connection for the external protective earthing conductor. However this does not apply if the external protective earthing conductor is passed through the equipment to equipment series-connected beyond it. In the latter event, the external protective earthing conductor and its means for connection shall be insulated with basic insulation from the accessible surface of the equipment and from circuits that employ protective separation, extra-low voltage, protective impedance and limited discharging energy, according to 7.3.5. This basic insulation shall correspond to the rated voltage of the series-connected equipment;		N/A
	• metal-encased equipment of protective class II may have provision on its enclosure for the connection of an equipotential bonding conductor;		N/A
	• equipment of protective class II may have provision for the connection of an earthing		N/A

IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
	conductor for functional reasons or for damping of overvoltages; it shall, however, be insulated as though it is a live part;		
	• 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	PD 3 outside. PD 2 inside	P
	• overvoltage category	PV (OVC II), Main (OVC III)	P
	• supply earthing system	TN	P
	• insulation voltage	PV input: max. 1100Vdc and Main:312 Vac	P
	• location of insulation	See table 7.3.7.4 and 7.3.7.5 for detail	P
	• type of insulation	See table 7.3.7.4 and 7.3.7.5 for detail	P
	Compliance of insulation, creepage distances, and clearance distances, shall be verified by measurement or visual inspection, and the tests of 7.5.		P
7.3.7.1.3	Supply earthing systems		P
	Three basic types of earthing system are described in IEC 60364-1. They are:	Inverter is intended to install in TN system	P
	• TN system: has one point directly earthed, the accessible conductive parts of the installation being connected to that point by protective conductors. Three types of TN systems, TN-C, TN-S and TN-C-S, are defined according to the arrangement of the neutral and protective conductor.		P
	• TT system: has one point directly earthed, the accessible conductive parts of the installation being connected to earth electrodes electrically independent of the earth electrodes of the power system;		N/A
	• IT system: has all live parts isolated from earth or one point connected to earth through an impedance, the accessible conductive parts of		N/A

IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
	the installation being earthed independently or collectively to the earthing system.		
7.3.7.1.4	Insulation voltages	See table 7.3.7.4 and 7.3.7.5 for detail	P
	Table 12 makes use of the circuit system voltage and overvoltage category to define the impulse 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	600V, OVC III (6000V impulse voltage, 1500Vrms temporary overvoltage) for the AC output terminal. 1100V, OVC II (6000V impulse voltage, no temporary overvoltage) for PV input terminal. No isolation between PV and AC main output. Maximum 1100Vdc working voltage is assumed at DVC A circuit and DVC C circuit	P
7.3.7.2.2	Circuits connected directly to the mains	System voltage for mains is 600Vrms according to table 12	P
7.3.7.2.3	Circuits other than mains circuits	System voltage for PV is 1000Vdc.	P
7.3.7.2.4	Insulation between circuits	6000V impulse voltage is calculated from table 12 for clearance. 1100Vdc working voltage across insulation is used for creepage	P
7.3.7.3	Functional insulating		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	Inhomogeneous electric field is considered for PCE	N/A
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	PV maximum 1100V system voltage is used for the RMS voltage across insulation	P
7.3.7.5.2	Voltage	If Working voltage less than system voltage, system voltage is used for creepage according to IEC60664-1	P
7.3.7.5.3	Materials	Certified PWB used. Other materials are considered IIIb. The inside part are considered Pollution degree 2	P

IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
7.3.7.6	Coating		N/A
7.3.7.7	PWB spacings for functional insulating	V-0 and short circuit test are considered	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	1100V peak. Impulse voltage test and voltage test are considered for solid insulation.	P
7.3.7.8.2.2	Functional insulation		P
7.3.7.8.3	Thin sheet or tape material		P
7.3.7.8.3.1	General		P
7.3.7.8.3.2	Material thickness not less than 0,2 mm	Impulse test and voltage test are considered for insulation on IGBT as basic insulation	P
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		P
7.3.7.8.4.1	General	Four layers PWB	P
7.3.7.8.4.2	Use of coating materials		N/A
7.3.7.8.5	Wound components	Varnish is not considered as insulation and voltage test performed as routine test.	P
7.3.7.8.6	Potting materials		N/A
7.3.7.9	Insulation requirements above 30 kHz		N/A
7.3.8	Residual Current-operated protective (RCD) or monitoring (RCM) device compatibility	Internal RCM is used. An external built RCD is not necessary	P
	RCD and RCM are used to provide protection against insulation faults in some domestic and industrial installations, additional to that provided by the installed equipment.		N/A
7.3.9	Capacitor discharge		P
7.3.9.1	Operator access area	Accessible signal communication port is DVA circuit.	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	Inside capacitor discharge to DVC A and no energy hazard level within 300s	P

IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
	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.	Warning symbol 21 of annex C is marked on PCE with 5min.	P
7.4	Protection against energy hazards		P
7.4.1	Determination of hazardous energy level	No such high energy level presented in the operator access area.	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.		N/A
	b) The stored energy in a capacitor is at a voltage. U of 2 V or more, and the stored energy. E, calculated from the following equation, exceeds 20J: $E = 0,5\ CU^2$	Communication port : 5.83 V, 1.32mA. No cap.	P
7.4.2	Operator Access Areas	No energized parts accessible by user	P
	Equipment shall be so designed that there is no risk of energy hazard in operator access areas from accessible circuits.		P
7.4.3	Services Access Areas		P
7.5	Electrical tests related to shock hazard	(see appended table 7.5)	P
7.5.1	Impulse voltage test (type test)		P
7.5.2	Voltage test (dielectric strength test)		P
7.5.2.1	Purpose of test		P
7.5.2.2	Value and type of test voltage		P
7.5.2.3	Humidity pre-conditioning		P
7.5.2.4	Performing the voltage test		P
7.5.2.5	Duration of the a.c. or d.c. voltage test		P
7.5.2.6	Verification of the a.c. or d.c. voltage test		P
7.5.3	Partial discharge test	(see appended table 7.5)	P
7.5.4	Touch current measurement (type test)		P
	The touch current shall be measured if required by 7.3.6.3.7 and shall not be greater than 3.5 mA a.c. or 10 mA d.c. or special measures of protection as given in 7.3.6.3.7 are required.	(see appended table 7.3.6.3.7)	P
	For type tests on PCE for which wet locations requirements apply according to 6.1, the humidity pre-conditioning of 4.5 shall be performed immediately prior to the touch current test.		P

IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
7.5.5	Equipment with multiple sources of supply		P
8	**PROTECTION AGAINST MECHANICAL HAZARDS**		P
8.1	General		--
	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		N/A
	Moving parts shall not be able to crush, cut or pierce parts of the body of an OPERATOR likely to contact them, nor severely pinch the OPERATOR's skin. Hazardous moving parts of equipment, that is moving parts which have the potential to cause injury, shall be so arranged, enclosed or guarded as to provide adequate protection against the risk of personal injury.	No moving parts	N/A
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.	Wall mounted	N/A
8.4	Provisions for lifting and carrying		P
	If carrying handles or grips are fitted to, or supplied with, the equipment, they shall be capable of withstanding a force of four times the weight of the equipment.		P
	Equipment or parts having a mass of 18 kg or more shall be provided with a means for lifting and carrying or directions shall be given in the manufacturer's documentation.		P
8.5	Wall mounting		P
	Mounting brackets on equipment intended to be mounted on a wall or ceiling shall withstand a force of four times the weight of the equipment.		P
8.6	Expelled parts		N/A

IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
	Equipment shall contain or limit the energy of parts that could cause a HAZARD if expelled in the event of a fault.		N/A
9	**PROTECTION AGAINST FIRE HAZARDS**		P
9.1	Resistance to fire		P
	This subclause specifies requirements intended to reduce the risk of ignition and the spread of flame, both within the equipment and to the outside, by the appropriate use of materials and components and by suitable construction.	Components are witnessed at normal condition and abnormal test are verified	P
9.1.1	Reducing the risk of ignition and spread of flame		P
	For equipment or a portion of equipment, there are two alternative methods of providing protection against ignition and spread of flame that could affect materials, wiring, wound components and electronic components such as integrated circuits, transistors, thyristors, diodes, resistors and capacitors.	Method 1 used	P
9.1.2	Conditions for a fire enclosure		P
	A FIRE ENCLOSURE is required for equipment or parts of equipment for which Method 2 is not fully applied and complied with.		P
9.1.2.1	Parts requiring a fire enclosure		P
	Except where Method 2 is used, or as permitted in 9.1.2.2, the following are considered to have a risk of ignition and, therefore, require a FIRE ENCLOSURE:		P
	– components in PRIMARY CIRCUITS		P
	– components in SECONDARY CIRCUITS supplied by power sources which exceed the limits for a LIMITED POWER SOURCE as specified in 9.2;		P
	– components in SECONDARY CIRCUITS supplied by a LIMITED POWER SOURCE as specified in 9.2, but not mounted on a material of FLAMMABILITY CLASS V-1;	PWB rated V-0	N/A
	– components within a power supply unit or assembly having a limited power output complying with the criteria for a LIMITED POWER SOURCE as specified in 9.2, including overcurrent protective devices, limiting impedances, regulating networks and wiring, up to the point where the LIMITED POWER SOURCE output criteria are met;		P
	– components having unenclosed arcing parts, such as open switch and relay contacts and commutators, in a circuit at HAZARDOUS	Certified relay	N/A

IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
	VOLTAGE or at a HAZARDOUS ENERGY LEVEL; and		
	– insulated wiring, except as permitted in 9.1.2.2.	PVC wire	N/A
9.1.2.2	Parts not requiring a fire enclosure	Fire enclosure used	N/A
9.1.3	Materials requirements for protection against fire hazard		P
9.1.3.1	General		P
	ENCLOSURES, components and other parts shall be so constructed, or shall make use of such materials, that the propagation of fire is limited.		P
9.1.3.2	Materials for fire enclosures	Metal fire enclosure	P
	If an enclosure material is not classified as specified below, a test may be performed on the final enclosure or part of the enclosure, in which case the material shall additionally be subjected to periodic SAMPLE testing.		P
9.1.3.3	Materials for components and other parts outside fire enclosures		P
	Except as otherwise noted below, materials for components and other parts (including MECHANICAL ENCLOSURES, ELECTRICAL ENCLOSURES and DECORATIVE PARTS); located outside FIRE ENCLOSURES, shall be of FLAMMABILITY CLASS HB.	Internal wire:VW-1 PWB: V-0	P
9.1.3.4	Materials for components and other parts inside fire enclosures		N/A
9.1.3.5	Materials for air filter assemblies		N/A
9.1.4	Openings in fire enclosures	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
	The bottom of a FIRE ENCLOSURE or individual barriers, shall provide protection against emission of flaming or molten material under all internal		N/A

IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
	parts, including partially enclosed components or assemblies, for which Method 2 of 9.1.1 has not been fully applied and complied with.		
9.1.4.4	Equipment for use in a CLOSED ELECTRICAL OPERATING AREA		N/A
	The requirements of 9.1.4.3 do not apply to FIXED EQUIPMENT intended only for use in a CLOSED ELECTRICAL OPERATING AREA and to be mounted on a concrete floor or other non-combustible surface. Such equipment shall be marked as follows:		N/A
	WARNING: FIRE HAZARD SUITABLE FOR MOUNTING ON CONCRETE OR OTHER NON-COMBUSTIBLE SURFACE ONLY		N/A
9.1.4.5	Doors or covers in fire enclosures	No door or cover operated by user	N/A
9.1.4.6	Additional requirements for openings in transportable equipment		N/A
9.2	LIMITED POWER SOURCES		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		P
9.3.1	General		P
	The PCE shall not present a hazard, under short-circuit or overcurrent conditions at any port, including phase-to-phase, phase-to-earth and phase-to-neutral, and adequate information shall be provided to allow proper selection of external wiring and external protective devices.		P
9.3.2	Protection against short-circuits and overcurrents shall be provided for all input circuits, and for output circuits that do not comply with the requirements for limited power sources in 9.2, except for circuits in which no overcurrent hazard is presented by short-circuits and overloads.	AC main fuse protect the AC wire and DC wire are designed for the short circuit rating of the array	P
9.3.3	Protective devices provided or specified shall have adequate breaking capacity to interrupt the maximum short circuit current specified for the port to which they are connected. If protection that is provided integral to the PCE for an input port is not rated for the short-circuit current of the circuit in which it is used, the installation instructions shall specify that an upstream protective device, rated for the prospective short-circuit current of that port, shall be used to provide backup protection.	AC fuse integral to PCE	P
10	**PROTECTION AGAINST SONIC PRESSURE HAZARDS**		P

IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
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.	No hazardous noise when operating.	P
10.2	Sonic pressure and Sound level		P
10.2.1	Hazardous Noise Levels	<60 dB	P
11	**PROTECTION AGAINST LIQUID HAZARDS**		N/A
11.1	Liquid Containment, Pressure and Leakage	No liquid containment system	N/A
	The liquid containment system components shall be compatible with the liquid to be used.		N/A
	There shall be no leakage of liquid onto live parts as a result of:		N/A
	a) Normal operation, including condensation;		N/A
	b) Servicing of the equipment; or		N/A
	c) Inadvertent loosening or detachment of hoses or other cooling system parts over time.		N/A
11.2	Fluid pressure and leakage		N/A
11.2.1	Maximum pressure		N/A
11.2.2	Leakage from parts		N/A
11.2.3	Overpressure safety device		N/A
11.3	Oil and grease		N/A
12	**CHEMICAL HAZARDS**		N/A
12.1	General		N/A
13	**PHYSICAL REQUIREMENTS**		P
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.		N/A
13.1.1	Adjustable controls	No such setting control	N/A
13.2	Securing of parts		P
13.3	Provisions for external connections		P

IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
13.3.1	General		--
13.3.2	Connection to an a.c. Mains supply	An industrial AC connector used and it is detachable with tool	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:	Certified PV connectors are used. AC terminal provided for grid connection and secured by a cable gland. Installation manual provide information for the disconnection means	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 main plug that is part of direct plug-in equipment as in 13.3.8		N/A
13.3.2.2	Permanently connected equipment		P
13.3.2.3	Appliance inlets		N/A
13.3.2.4	Power supply cord		N/A
13.3.2.5	Cord anchorages and strain relief	Cable gland used	P
	For equipment with a non-detachable power supply cord, a cord anchorage shall be supplied such that:		P
	– the connecting points of the cord conductors are relieved from strain; and		P
	– the outer covering of the cord is protected from abrasion.		P
13.3.2.6	Protection against mechanical damage		P
13.3.3	Wiring terminals for connection of external conductors		P
13.3.3.1	Wiring terminals		P
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		N/A
13.3.5	Wire bending space for wires 10 mm² and greater		N/A

IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
13.3.6	Disconnection from supply sources	Installation manual instruct the disconnect device when connection AC main	P
13.3.7	Connectors, plugs and sockets		P
13.3.8	Direct plug-in equipment		N/A
13.4	Internal wiring and connections		P
13.4.1	General		P
13.4.2	Routing	Internal wire is routed to avoid sharp edge and overheat	P
13.4.3	Colour coding	Green-yellow wire used as protective bonding only	P
13.4.4	Splices and connections		P
13.4.5	Interconnections between parts of the PCE		P
13.5	Openings in enclosures		N/A
13.5.1	Top and side openings	No openings in enclosure	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		P
13.6.2.1	Stress relief test		N/A
13.6.3	Polymers serving as solid insulation		P
13.6.3.1	Resistance to arcing		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	The enclosure of the unit is made of metal with painting and the plastic window frame rated UV resistance according to UL 746C	P
13.7	Mechanical resistance to deflection, impact, or drop		P
13.7.1	General		P
13.7.2	250-N deflection test for metal enclosures		P
13.7.3	7-J impact test for polymeric enclosures		P
13.7.4	Drop test		N/A
13.8	Thickness requirements for metal enclosures		P
13.8.1	General		P

IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
13.8.2	Cast metal		N/A
13.8.3	Sheet metal		P
14	**COMPONENTS**		P
14.1	General	(see appended table 14)	P
	Where safety is involved, components shall be used in accordance with their specified RATINGS unless a specific exception is made. They shall conform to one of the following:		P
	a) applicable safety requirements of a relevant IEC standard. Conformity with other requirements of the component standard is not required. If necessary for the application, components shall be subjected to the test of this standard, except that it is not necessary to carry out identical or equivalent tests already performed to check conformity with the component standard;		P
	b) the requirements of this standard and, where necessary for the application, any additional applicable safety requirements of the relevant IEC component standard;		P
	c) if there is no relevant IEC standard, the requirements of this standard;		P
	d) applicable safety requirements of a non-IEC standard which are at least as high as those of the applicable IEC standard, provided that the component has been approved to the non-IEC standard by a recognized testing authority.		P
	Components such as optocouplers, capacitors, transformers, and relays connected across basic, supplemental, reinforced, or double insulation shall comply with the requirements applicable for the grade of insulation being bridged, and if not previously certified to the applicable component safety standard shall be subjected to the voltage test of 7.5.2 as routine test.		P
14.2	Motor Over Temperature Protection		N/A
	Motors which, when stopped or prevented from starting (see 4.4.4.3), would present an electric shock HAZARD, a temperature HAZARD, or a fire HAZARD, shall be protected by an over temperature or thermal protection device meeting the requirements of 14.3.	No motor	N/A
14.3	Over temperature protection devices		N/A
14.4	Fuse holders		N/A

IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
14.5	MAINS voltage selecting devices		N/A
14.6	Printed circuit boards		P
	Printed circuit boards shall be made of material with a flammability classification of V-1 of IEC 60707 or better.	V-0	P
	This requirement does not apply to thin-film flexible printed circuit boards that contain only circuits powered from limited power sources meeting the requirements of 9.2.		P
	Conformity of the flammability RATING is checked by inspection of data on the materials. Alternatively, conformity is checked by performing the V-1 tests specified in IEC 60707 on three samples of the relevant parts.		P
14.7	Circuits or components used as transient overvoltage limiting devices		N/A
	If control of transient overvoltage is employed in the equipment, any overvoltage limiting component or circuit shall be tested with the applicable impulse withstand voltage of Table 7-10 using the test method from 7.5.1 except 10 positive and 10 negative impulses are to be applied and may be spaced up to 1 min apart.		N/A
14.8	Batteries		N/A
	Equipment containing batteries shall be designed to reduce the risk of fire, explosion and chemical leaks under normal conditions and after a single fault in the equipment including a fault in circuitry within the equipment battery pack.		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		N/A

IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
	spillage or leakage of the electrolyte from one battery will be contained within the ENCLOSURE and be prevented from:		
	a) reaching the PCE outer surfaces that can be contacted by the USER		N/A
	b) contaminating adjacent electrical components or materials; and		N/A
	c) bridging required electrical distances		N/A
14.8.4	Battery Connections		N/A
	Reverse battery connection of the terminals shall be prevented if reverse connection could result in a hazard within the meaning of this Standard		N/A
14.8.5	Battery maintenance instructions		N/A
	The information and instructions listed in 5.3.4.1 shall be included in the operator manual for equipment in which battery maintenance is performed by the operator, or in the service manual if battery maintenance is to be performed by service personnel only.		N/A
14.8.6	Battery accessibility and maintainability		N/A
	Battery terminals and connectors shall be accessible for maintenance with the correct TOOLS. Batteries with liquid electrolyte, requiring maintained shall be so located that the battery cell caps are accessible for electrolyte tests and readjusting of electrolyte levels.		N/A
15	Software and firmware performing safety functions		P

IEC 62109-1

4.2.2.6/4.7	TABLE: electrical data in normal condition							P
Model	U (V) DC	I (A) DC	P (W) DC	U (V) grid		I (A) AC	F(Hz)AC	P (W) AC
E-75KTL	499.30	154.35	76916	L1	230.76	108.88	50.00	75086
				L2	230.56	108.59		
				L3	230.62	108.32		
	681.47	112.02	76333	L1	230.72	108.94	50.00	75114
				L2	230.58	108.63		
				L3	230.60	108.36		
	849.86	90.51	76919	L1	230.70	108.89	50.00	75052
				L2	230.63	108.54		
				L3	230.63	108.26		
E-80KTL	496.86	166.37	82664	L1	230.46	116.94	50.00	80440
				L2	230.49	116.67		
				L3	230.42	115.95		
	669.56	122.81	82228	L1	230.44	116.24	50.00	80139
				L2	230.49	116.48		
				L3	230.41	115.98		
	849.65	97.08	82480	L1	230.82	117.40	50.00	80689
				L2	230.70	117.60		
				L3	230.03	117.13		
E-100KTL	510.45	199.98	102100	L1	230.80	147.09	50.00	99290
				L2	230.70	145.02		
				L3	229.85	141.63		
	680.29	150.32	102300	L1	230.67	145.51	50.00	99870
				L2	230.56	145.64		
				L3	229.75	145.24		
	848.25	120.72	102400	L1	231.73	144.82	50.00	99980
				L2	231.56	144.98		
				L3	230.71	144.53		
E-110KTL	528.44	213.43	112800	L1	231.87	161.39	50.00	109700
				L2	231.69	158.14		
				L3	230.97	157.14		
	676.16	165.49	111900	L1	232.049	158.10	50.00	109300
				L2	231.78	158.28		
				L3	231.109	157.71		
	849.53	132.07	112200	L1	231.65	158.60	50.00	109400

IEC 62109-1

				L2	231.51	158.52		
				L3	230.68	158.26		
E-100KTL-HV	549.00	186.69	102500	L1	499.83	115.07	50.00	99910
				L2	499.43	115.81		
				L3	500.31	115.72		
	680.99	150.05	102200	L1	500.10	115.31	50.00	100100
				L2	499.46	115.86		
				L3	500.40	115.99		
	848.56	120.09	101900	L1	499.97	115.41	50.00	100200
				L2	499.39	115.98		
				L3	500.32	116.19		
E-125KTL-HV	543.53	237.52	129100	L1	500.37	144.67	50.00	125600
				L2	499.63	145.68		
				L3	500.73	145.41		
	675.07	189.76	128100	L1	500.35	144.26	50.00	125400
				L2	499.61	145.61		
				L3	500.67	145.14		
	850.56	149.08	126800	L1	500.48	143.40	50.00	124500
				L2	499.58	144.09		
				L3	500.71	144.34		
E-136KTL-HV	546.45	255.43	139577	L1	538.42	145.00	50.00	135588
				L2	539.29	145.50		
				L3	539.29	145.47		
	675.09	205.12	138476	L1	538.39	144.69	50.00	135291
				L2	539.50	145.08		
				L3	539.47	145.21		
	850.20	163.46	138976	L1	538.45	145.95	50.00	136630
				L2	539.48	146.65		
				L3	539.26	146.68		
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)
Test by model : E-136KTL-HV					
Test voltage	Input: 850Vdc	Input: 550Vdc	Input: 850Vdc	Input: 550Vdc	--
Capacitance C70	73.8	76.9	78.5	84.9	105
Capacitance C33	72	74.6	77.5	84.6	105
IGBT driver board CN3	71.7	75.4	77.3	83.8	130
Current sensor surface U6	71.1	75.2	76.9	84.3	100
PCB near IGBT (IGBT3)	71.4	75.2	77.0	84.0	130
PV terminal	59.6	63.7	68.8	73.1	95
PV wire	72.6	75.9	77.7	86.1	95
AC wire	78.8	80.6	81.1	87.4	105
AC terminal	73.3	75.3	78.1	84.3	105
Electrolytic capacitor EC6	75.1	76.7	79.2	85.6	105
Fan	72	73.6	77.6	84.1	-
Relay RY3	74.1	76	79.2	85.4	-
Filter capacitor C26	73.2	74.1	78.4	84.8	105
Current sensor	80	81.8	81.9	88.4	100
Inductance 1	91	91.9	87.8	94.3	110
Inductance 1	79.1	80.7	81.4	87.8	110
Lightning protection	79.6	81.3	81.8	88.0	-
Relay	77.6	79.5	80.6	86.9	-
Current sensor	77.4	78.7	80.6	86.8	100
Transformer coil	81	82.5	85.9	92.3	110
Transformer core	78.5	80.3	83.5	89.7	110
PCB near Q1	77.5	78.6	82.1	88.7	130
LCD board PCB	72.2	73.2	77.6	84.0	130
Coil	73.8	75.4	78.8	85.4	110
Core	74.6	75.7	79.8	86.3	110
Optocoupler	74.3	75.8	79.4	85.9	100
PCB near chip	71.3	73.7	76.6	83.0	130
PV switch	52.6	58.3	63.7	66.1	95
Display	61.9	63.1	70.9	74.9	95

Encolsure	62.1	63.8	67.0	68.1	70
Ambient	45	45	60.0	60.0	-
Test by model E-110KTL					
Test voltage	Input: 850Vdc	Input: 500Vdc	Input: 850Vdc	Input: 500Vdc	--
Power board					
Capacitance C19	65.6	62.2	81.1	77.8	105
Capacitance C20	64.7	71.2	80.1	87.5	105
Capacitance C49	68.2	68.1	83.4	84.4	105
IGBT9 BOOST	63.5	72.5	78.7	89.5	110
IGBT8 INV	54.3	90.1	70.0	108.8	110
PV9 BOOST inductance	107.8	100.8	107.8	105.7	110
Capacitance C16	62.0	63.4	77.0	79.3	105
Capacitance C102	60.1	61.5	74.9	77.2	105
Capacitance C60	72.9	68.3	87.7	84.4	105
U1	66.2	63.0	81.5	78.6	130
PV1 BOOST inductor	65.5	71.2	80.2	87.0	110
Output board					
Capacitance C1	69.7	65.1	84.9	80.6	105
Capacitance C54	63.8	60.9	78.9	76.6	105
SPD4 SPD	61.8	59.6	76.8	75.2	-
Capacitance C3	74.0	67.0	88.4	82.4	105
Relay RY5	63.2	61.1	78.5	76.7	-
Capacitance C40	64.7	61.6	80.2	77.4	105
Capacitance C45	61.4	59.2	76.2	74.7	105
Capacitance C58	62.0	60.1	77.0	75.8	105
Inductance L5	68.1	63.4	82.9	79.1	110
EUT					
PV1 input power line	63.4	65.5	78.2	81.4	85
PV10 input power line	57.4	57.9	72.2	73.5	85
PV1 input connector	59.9	59.8	74.2	75.4	95
MOV3 (lightning protection board)	58.3	58.5	73.1	73.9	-
Display buttons	50.4	49.6	65.8	65.1	95
PV terminal	46.2	47.5	61.7	63.3	95
Front of the case	54.9	53.0	70.6	68.6	70
Side of the case	49.7	49.8	64.3	65.5	70

EC1 (capacitor board)	68.0	65.3	81.6	80.4	105
Common mode inductor coil L2	75.5	66.6	90.2	82.5	110
Differential mode inductor coil L3	101.2	81.4	105.7	95.4	110
DC switch	46.2	46.8	61.4	62.5	95
Output power line	62.3	60.1	77.3	75.7	85
Output terminal	51.6	51.9	67.3	67.8	95
Transformer T4 (control board)	71.3	66.4	84.5	81.7	110
Transformer T6 (control board)	76.3	71.2	89.8	86.0	110
Inverter inductance T	50.3	52.9	65.8	68.8	110
Ambient	45.0	45.0	60.0	60.0	-

	TABLE: Heating test, resistance method		
	Test voltage (V)..... :		—
	Ambient, t_1 (°C) ..... :		—
	Ambient, t_2 (°C) ..... :		—

Temperature rise of winding	**R_1 (Ω)**	**R_2 (Ω)**	**ΔT (K)**	**Max. dT (K)**	**Insulation class**

Supplementary information: Virtual ground used for the test.

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

No.	component No.	fault	test voltage (V)	test time	fuse No.	fuse current (A)	result
1	BUS C65	S/C	Input: 850Vdc Output: 540Vac(L-L)	30min	--	--	FID:Inverter shut down.IGBT6,IGBT7,IGBT8 damaged
2	BUS C69	S/C	Input: 850Vdc Output: 540Vac(L-L)	30min	--	--	FID:Inverter shut down.IGBT6,IGBT7,IGBT8 damaged
3	IGBT 8 Q3 pin D-G	S/C	Input: 850Vdc Output: 540Vac(L-L)	30min	--	--	FID:Inverter shut down.IGBT6,IGBT7,IGBT8 damaged
4	IGBT 8 Q3 pin D-E	S/C	Input: 850Vdc Output: 540Vac(L-L)	30min	--	--	FID:Inverter shut down.IGBT6,IGBT7,IGBT8 damaged

5	IGBT 8 Q3 pin G-E	S/C	Input: 850Vdc Output: 540Vac(L-L)	30min	--	--	FID:Inverter shut down.IGBT6,IGBT7,IGBT8 damaged
6	BOOST 8 G-S	S/C	Input: 850Vdc Output: 540Vac(L-L)	30min	--	--	FID:PV8 Boost cannot work,LCD cannot display PV8 current
7	T4 pin 9-12	S/C	Input: 850Vdc Output: 540Vac(L-L)	30min	--	--	FID:Inverter shut down. System without auxiliary power supply
8	T4 pin 4-5	S/C	Input: 850Vdc Output: 540Vac(L-L)	30min	--	--	FID:Inverter shut down. System without auxiliary power supply
9	R778	S/C	Input: 850Vdc Output: 540Vac(L-L)	30min	--	--	FID:Inverter shut down. LCD display “IsoFault” fault.
10	U22 pin 3-4	S/C	Input: 850Vdc Output: 540Vac(L-L)	30min	--	--	FID:Inverter shut down. System without auxiliary power supply
11	Q58 pin 1-2	S/C	Input: 850Vdc Output: 540Vac(L-L)	30min	--	--	FID:Inverter shut down. System without auxiliary power supply
12	Q58 pin 2-3	S/C	Input: 850Vdc Output: 540Vac(L-L)	30min	--	--	FID:Inverter shut down. System without auxiliary power supply
13	Q58 pin 1-3	S/C	Input: 850Vdc Output: 540Vac(L-L)	30min	--	--	FID:Inverter shut down. System without auxiliary power supply
14	U5 Vcc - Vout	S/C	Input: 850Vdc Output: 540Vac(L-L)	30min	--	--	FID:Inverter shut down. LCD display “Branch current offset Error” fault
15	Q3 Pin S-D	S/C	Input: 850Vdc Output: 540Vac(L-L)	30min	--	--	FID:Inverter work normally.

16	Q3 Pin G-D	S/C	Input: 850Vdc Output: 540Vac(L-L)	30min	--	--	FID:Inverter work normally.
17	Q3 Pin S-G	S/C	Input: 850Vdc Output: 540Vac(L-L)	30min	--	--	FID:Inverter work normally.
18	Q6 pin B-C	S/C	Input: 850Vdc Output: 540Vac(L-L)	30min	--	--	FID:Inverter cannot start. LCD display “RelayFail” fault.
19	Q6 pin E-C	S/C	Input: 850Vdc Output: 540Vac(L-L)	30min	--	--	FID:Inverter cannot start. LCD display “RelayFail” fault.
20	EC4	S/C	Input: 850Vdc Output: 540Vac(L-L)	30min	--	--	FID:Inverter shut down.IGBT6,IGBT7,IGBT8 damaged
21	AC output	S/C	Input: 850Vdc Output: 540Vac(L-L)	30min	--	--	FID:Inverter shut down,LCD display “HwAcOCP”fault.
22	AC output	Reverse	Input: 850Vdc Output: 540Vac(L-L)	30min	--	--	FID:Inverter work normally.
23	DC input	S/C	Input: 850Vdc Output: 540Vac(L-L)	30min	--	--	FID:Inverter shut down, Inverter cannot start.
24	DC input	Reverse	Input: 850Vdc Output: 540Vac(L-L)	30min	--	--	FID:Inverter cannot start.
25	Fan	Lock	Input: 850Vdc Output: 540Vac(L-L)	30min	--	--	FID:Inverter work normally.LCD display “FAN alarm” fault.
26	Temperature sampling	Failure	Input: 850Vdc Output: 540Vac(L-L)	30min	--	--	FID:Inverter shut down.LCD display “TempFault”.

supplementary information
During the test:
Fire do not propagate beyond the EUT;
Equipment do not emitt molten metal;
Enclosures do not deform to cause non-compliance with the standard.
Pass the dielectric test.

7.3.6.3.3	TABLE: protective equipotential bonding			P
Measured between:	Test current (A)	Voltage drop (V)	Resistance (mΩ)	result
supplementary information: Refer clause 7.3.6.3.5				

7.3.6.3.7	TABLE: touch current measurement		P
Measured between:	Measured (mA)	Limit (mA)	Comments/conditions
Earthing terminal and external protective earthing conductor	2.93	3.5	Normal operation
supplementary information: N/A			

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)
Between PV+ and PV- on PV board (BI)	1100 Vdc	312 Vac	5.5	5.68	5.6	5.68
Between PV+ and Ground on PV board (BI)	1100 Vdc	312 Vac	5.5	5.63	5.6	5.63
Between PV- and Ground on PV board (BI)	1100 Vdc	312 Vac	5.5	5.65	5.6	5.65
Between AC L and AC N on AC board (BI)	1100 Vdc	312 Vac	5.5	5.62	5.6	5.62
Between AC and Ground on AC board (BI)	1100 Vdc	312 Vac	5.5	5.83	5.6	5.83
Between live part and enclosure (BI)	1100 Vdc	312 Vac	5.5	5.83	11.0	14.33
Between primary and secondary of optocoupler on communication board U20 (RI)	250Vac	250Vac	5.5	6.4	5.5	6.59
Between primary and secondary of optocoupler on communication board U13 (RI)	250Vac	250Vac	5.5	6.77	5.5	8.03
Note(s): *, BI=basic insulation, RI=reinforced insulation. When determine the clearance: For DC input circuits: Overvoltage Category II applied(impulse withstand voltage 6000V) For AC output circuits (connected to AC mains): Overvoltage Category III applied (impulse withstand voltage 6000V considered.). For the inner layer of the PCB, pollution II was considered. Requirement about creepage distances for the distance to the metal enclosure come from columns 7 of Table 11. The voltage across optocoupler on communication board does not exceed 250Vac PCB with min. CTI 175 used. Consider the maximum working altitude of the machine is 2000m.						

IEC 62109-1

7.3.7	TABLE: distance through insulation measurement				P
distance through insulation di at/of:		U r.m.s. (V)	test voltage (V)	required di (mm)	di (mm)
Triple insulation wire of transformer core		1100 Vdc	6000Vpk	--	certified
Communication isolated optocoupler		1100 Vdc	6000Vpk	--	certified

7.5	TABLE: electric strength measurements, impulse voltage test and partial discharge test				P
test voltage applied between:		test voltage (Vdc)	impulse withstand voltage (V)	partial discharge extinction voltage (V)	result
PV input and Ground (BI)		2545Vdc	6000V	N/A	No breakdown
PV input and communication output port(RI)		5049Vdc	8000V	N/A	No breakdown
AC mains output and Ground (BI)		2545Vdc	6000V	N/A	No breakdown
AC mains and communication output port(RI)		5049Vdc	8000V	N/A	No breakdown

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)	Isc (A)		VA		
			Meas.	Limit	Meas.	Limit	
supplementary information:							
Sc=Short circuit, Oc=Open circuit							

14	TABLE: list of critical components				P
Component	Manufacturer/ trademark	Type/model	Technical data	Standard	Mark(s) of conformity
DC connector	Stäubli Electrical Connectors Ltd.	MC4 Series	1000Vdc, 39A, Max. 90°C, IP68	EN 50521 UL6703	TUV R60028286 R60087448 E343181
	Amphenol Industrial operations	Helios H4 Series	1000Vdc, 39A, Max. 90°C, IP68	EN 50521 UL6703	TUV R 50157783 UL E339277
Input lead wire	All	All accepted	Min. 2AWG, 2000V, 105°C, VW-1	UL 11627	UL
Output lead wire	All	All accepted	Min. 10AWG, 2000V, 105°C, VW-1	UL 11627	UL
DC Switch	Santon Switchgear Ltd	XBHP+3810/ 2	1200/20A, 800V/40A, Max.85°C	EN 60947-3	71-107727
	Shanghai Liangxin Electrical Co.,Ltd	NDG3V-32C/20/8/1/02/M/1100	1100VDC/20A/8POLE	TUV IEC60947-3	TUV NO.B083574 0250
AC output	Shanghai Huntec Electrical Technology Co.,Ltd	RBH200A-4P	200A/600Vac,4P	IEC/EN 62109-1 IEC/EN 62109-2	Tested with appliance
	Shanghai Found Automation Co.,Ltd	FCNH-4P	200A/600Vac,4P	IEC/EN 62109-1 IEC/EN 62109-2	Tested with appliance
All PCB	All	All accepted	Min.130°C, min. V-0, CTI≥175	UL 796	UL
Gas Discharge Tube (GAS1)	Shenzhen Bencent Electronics ltd	B8G1500M	1200~1800Vdc，-40~90℃	UL1449	UL E337906
Output on-grid Relay(RY3, RY4, RY5, RY6, RY7, RY8)	Xiamen Hongfa Electroacoustic Co.,Ltd	HF167F-200	HF167F-200,1A,200A,12V, 30000cycles	TUV EN61810-12005	UL E133481
	Churod Electronics Co., Ltd.	CHAR-112A200C	200A,12V,30000cycles	UL EN61810-12015	UL E341422
Output Current sensor(HCT3,HCT4,HCT5)	Sinomages Technology Co.,Ltd	STB-200LA/ZN	CURRENT SENSOR,STB-200LA/ZN, 5V, 200A ,-40～105℃, DIP-9P	UL508	UL E507664

14	TABLE: list of critical components				P
Component	Manufacturer/ trademark	Type/model	Technical data	Standard	Mark(s) of conformity
	LEM Electronics (China)Co., Ltd	LZSR 200-P/SP1	CURRENT SENSOR, LZSR 200-P/SP1, 5V, 200A ,-40～105℃, DIP-9P	UL508	UL E189713
	VACUUMSCHMELZE	DB-4647-P280	CURRENT SENSOR, DB-4647-P280, 5V, 200A ,-40～105℃	UL508	UL E317483
Y1-Cap (C7, C8, C9, C10, C4, C5, C6)	Samwha	SDE2G472M15BW1	Y1/4.7nF/400VAC/Y5U/P10.0	UL:EN60384-14:2005 VDE:EN60384-14:2013	E97754 40015804
SPD (SPD1,SPD2, SPD3, SPD4)	Zhongguang Hi-tech	ZGGS20-670PVh1b1	510VAC/670VDC/10kA	UL1449	E339436
	Shenzhen Haipengxin Electronics Co.,Ltd	PV20K-670	510VAC/670VDC/10kA	UL1449	E321856
	TDK(ZHUHAI FTZ) CO.,LTD	MT30K510M4	510VAC/670VDC/10kA	UL1449	E321126
Boost IGBT Module	ON-Semi	NXH100B120H3Q0SG/ NXH100B120H3Q0PG	1200V, 50A	---	---
	Vincotech Electronic Gmbh	V23990-P629-L57-PM/V23990-P629-L57Y-PM	1200V, 50A	UL1557	E192116
INV IGBT Module	ON-Semi	NXH450N65L4Q2F2SG/ NXH450N65L4Q2F2PG	650V ,450A	---	---
	Vincotech Electronic Gmbh	30-FT07NIB300S503-LH36F58/ 30-PT07NIB300S503-LH36F58Y	650V ,450A	UL1557	E192116
BUS Electrolytic Capacitor	SamYoung	TLS550VS470(M)(Φ35x60L)	470uF/550V/Φ35*60/3000H	IEC/EN 62109-1 IEC/EN 62109-2	Tested with appliance
	nichicon	LGN2L471MELANH	470uF/550V/Φ35*60/3000H	IEC/EN 62109-1 IEC/EN 62109-2	Tested with appliance
	TDK(ZHUHAI FTZ) CO.,LTD	B43544S7477M002	470uF/550V/Φ35*60/3000H	IEC/EN 62109-1 IEC/EN 62109-2	Tested with appliance

14	TABLE: list of critical components				P
Component	Manufacturer/ trademark	Type/model	Technical data	Standard	Mark(s) of conformity
	Nantong Jianghai Capacitor Co., Ltd	ECSW2BB431MLB350060E	430uF/525V/Φ35*60/5000H	IEC/EN 62109-1 IEC/EN 62109-2	Tested with appliance
Optical Coupler(U9, U15, U19, U20, U21, U22)	LITE-ON TECHNOLOGY CORPORATION	LTV816S2TPB-V	Isolation voltage:5000Vrms 110°C	DIN EN 60747-5-5	VDE 40015248
	TOSHIBA Corporation	TLP785F(D4GRT7.F(C	Isolation voltage:5000Vrms 85°C	UL1577	UL E67349
Driver Transformer	Huizhou baohui electro-tech ltd	115-19-066B	Class B,130°C	IEC/EN 62109-1 IEC/EN 62109-2	Tested with appliance
	Shenzhen Jingquanhua Electronics Co.,Ltd	BCK-EFD15-4941B	Class B,130℃	IEC/EN 62109-1 IEC/EN 62109-2	Tested with appliance
X2 CAP	Xiamen Faratronic Electroacoustic Co.,Ltd	C4BG2335KB1C350	Film Cap,X2,3.3uF,±10%,400VAC,110°C	UL-CUL 60384-14	UL E186600
		C4BR2475MBWC350	Film X2/4.7uF/M/350VAC/P27.5	UL-CUL 60384-14	UL E186600
ISO Relay	Xiamen Hongfa Electroacoustic Co.,Ltd	HFD3/5	5Vdc/2A/30Vdc	UL508 VDE:EN41003	CUL:E133481 VDE:40018867
Input Current sensor	LEM Electronics (China)Co.,Ltd	HLSR 20-P	Current Sensor,HLSR 20-P,5V,20A,-40~105°C,RoHS	UL508:2010	UL E189713
		HLSR 32-P	Current Sensor,HLSR 32-P,5V,32A,-40~105°C,RoHS	UL508	UL E189713
	Sinomages Technology Co.,Ltd	STK-20PL	Current Sensor, STK-20PL,5V，20A，-40~105°C,RoHS	UL508	UL E507664
		STK-32PL	Current Sensor, STK-32PL,5V，32A，-40~105°C,RoHS	UL508	UL E507664

14	TABLE: list of critical components				P
Component	Manufacturer/ trademark	Type/model	Technical data	Standard	Mark(s) of conformity
Boost inductor	HeFei Yunlu Juneng Electric Co.,Ltd	100KW BOOST1	650uH/70*40*56mm	IEC/EN 62109-1 IEC/EN 62109-2	Tested with appliance
	Shenzhen Jingquanhua Electronics Co.,Ltd		650uH/70*40*56mm	IEC/EN 62109-1 IEC/EN 62109-2	Tested with appliance
	ECRIEE-TAMURA ELECTRIC CO.,LTD		650uH/70*40*56mm	IEC/EN 62109-1 IEC/EN 62109-2	Tested with appliance
	Huizhou baohui electro-tech ltd		650uH/70*40*56mm	IEC/EN 62109-1 IEC/EN 62109-2	Tested with appliance
	CHINA AMORPHOUS TECHNOLOGY CO.,LTD		650uH/70*40*56mm	IEC/EN 62109-1 IEC/EN 62109-2	Tested with appliance
INV inductor	HeFei Yunlu Juneng Electric Co.,Ltd	100KW INV1	105uH/65x50x21 mm	IEC/EN 62109-1 IEC/EN 62109-2	Tested with appliance
	Shenzhen Jingquanhua Electronics Co.,Ltd		105uH/65x50x21 mm	IEC/EN 62109-1 IEC/EN 62109-2	Tested with appliance
	ECRIEE-TAMURA ELECTRIC CO.,LTD		105uH/65x50x21 mm	IEC/EN 62109-1 IEC/EN 62109-2	Tested with appliance
	Huizhou baohui electro-tech ltd		105uH/65x50x21 mm	IEC/EN 62109-1 IEC/EN 62109-2	Tested with appliance
	CHINA AMORPHOUS TECHNOLOGY CO.,LTD		105uH/65x50x21 mm	IEC/EN 62109-1 IEC/EN 62109-2	Tested with appliance
Output Common-mode inductor (L2)	Shenzhen SPT electro-tech ltd	SPT-85H10443-L	712uH,±25%,0.64 mΩ,3L	IEC/EN 62109-1 IEC/EN 62109-2	Tested with appliance
	CHINA AMORPHOUS TECHNOLOGY CO.,LTD	CA01-12161	712uH,±25%,0.64 mΩ,3L	IEC/EN 62109-1 IEC/EN 62109-2	Tested with appliance
	Shenzhen Jingquanhua Electronics Co.,Ltd	TPDG-T85-1075	712uH,±25%,0.64 mΩ,3L	IEC/EN 62109-1 IEC/EN 62109-2	Tested with appliance
Output Differential-mode inductor (L3)	Shenzhen SPT electro-tech ltd	SPT-80F10444-L	5.6uH,±20%,0.4mΩ,3L	IEC/EN 62109-1 IEC/EN 62109-2	Tested with appliance
	CHINA AMORPHOUS TECHNOLOGY CO.,LTD	CA02-10736	5.6uH,±20%,0.4mΩ,3L	IEC/EN 62109-1 IEC/EN 62109-2	Tested with appliance

14	**TABLE: list of critical components**				**P**
Component	Manufacturer/ trademark	Type/model	Technical data	Standard	Mark(s) of conformity
	Shenzhen Jingquanhua Electronics Co.,Ltd	TPDG-QT-1128	5.6uH,±20%,0.4mΩ,3L	IEC/EN 62109-1 IEC/EN 62109-2	Tested with appliance
Aux Power Transformer	Huizhou baohui electro-tech ltd	115-19-085D	0.46mH,ETD39-12P	IEC/EN 62109-1 IEC/EN 62109-2	Tested with appliance
	Shenzhen Jingquanhua Electronics Co.,Ltd	BCK-ETD39-4942B	0.46mH,ETD39-12P	IEC/EN 62109-1 IEC/EN 62109-2	Tested with appliance
Interior DC Fans	MinebeaMitsumi Inc	12038VA24QFUE1	24V,5200rpm,40000at60℃, 120*120*38	cULus File NO.UL507 VDE File NO EN60950-1	UL:E89936 VDE:150733
	DELTA ELECTRONICS ,INC.	DBPJ1238B4GP002	24V,1.32A,7000rpm, ROHS,120*120*38	cULus File NO.UL507 TUV:EN60950-1	UL:E132003 TUV:R50156481
External DC Fans	MinebeaMitsumi Inc	09238DE24PCUE1	24V,1.5A,10000rpm, 92*92*38mm,IP68	cULus File NO.UL507 VDE File NO EN60950-1	UL:E89936 VDE:150733
	DELTA ELECTRONICS ,INC.	THD0924HEGDA	24VDC,10700rpm, 92*92*38,IP68	cULus File NO.UL507 TUV:EN60950-1	UL:E132003 TUV:R50156481

List of test equipment used:

No	Test Equipment	Equipment model	Equipment No.	Calibration due date
1	Simulation of ac power supply	WLPA-33-1000KVA	BZ-DGD-L001	--
2	Solar IV simulator	WDGC-1000KW	BZ-DGD-L002	--
3	Programmable ac load	ACLT-38160H	BZ-DGD-L003	--
4	Power analyser	PW6001-16	BZ-DGD-L025	2021/03/25
5	Oscilloscope	MSO4054B	BZ-DGD-L028	2021/03/24
6	Heating Recorder	LR8400-21	BZ-DGD-L032	2021/08/27
7	Hi-Pot & IR tester	Chroma 19032	BZ-DGD-L066	2021/04/25
8	Noise meter	TES-1357	BZ-DGD-L029	2021/03/09
9	Digital Caliper	LS160	BZ-DGD-L048	2021/03/09
10	Testing Finger B	AUTO-B	BZ-DGD-L011	2020/11/01
11	DC Electronic Load	IT8511+	BZ-DGD -L027	2020/10/31
12	Pull and push	2P-1000	BZ-DGB-L080	2021/08/27
13	Electronic Scale	TCS-300	BZ-DGB-L020	2021/03/09
14	Thermostat	16m³	BZ-DGD-L015	2021/03/09
15	Surge generator	HCWG 70	BZ-DGE-L036	2021/05/05
16	Strong flush test device	JL—112	BZ-KKX-L008	2020/10/27
17	Sand and dust test chamber	SC-500	BZ-KKX-L010	2021/06/29
18	Grounding resistance tester	LK2678	BZ-DGD-L095	2020/08/28
19	Contact current test network	/	BZ-DGD-L091	2020/09/02

- End of Test Report -