

<p>TEST REPORT IEC 62109-1 Safety of Power Converter for use in Photovoltaic Power Systems Part 1: General requirements</p>	
Report Number :	210400878SHA-001
Date of issue :	2021-12-06
Total number of pages	89 Pages
Name of Testing Laboratory preparing the Report	Intertek Testing Services Shanghai Building No.86, 1198 Qinzhou Road (North), Shanghai 200233, China
Applicant's name	Afore New Energy Technology (Shanghai) Co., Ltd
Address :	Build No.7, 333 Wanfang Road, Minhang District, Shanghai. China. 201112
Test specification:	
Standard	IEC/EN 62109-1:2010 (First Edition)
Test procedure	CE-LVD
Non-standard test method	N/A
Test Report Form No.	IEC62109_1B
Test Report Form(s) Originator :	VDE Testing and Certification Institute
Master TRF	Dated 2016-04
<p>Copyright © 2016 IEC System of Conformity Assessment Schemes for Electrotechnical Equipment and Components (IECEE System). All rights reserved.</p> <p>This publication may be reproduced in whole or in part for non-commercial purposes as long as the IECEE is acknowledged as copyright owner and source of the material. IECEE takes no responsibility for and will not assume liability for damages resulting from the reader's interpretation of the reproduced material due to its placement and context.</p>	

Test item description	PV Grid interactive inverter
Trade Mark	Afore
Manufacturer	Same as applicant
Model/Type reference	HNS3000TL, HNS3600TL-1, HNS3600TL, HNS4000TL, HNS5000TL, HNS6000TL, HNS7000TL, HNS8000TL, HNS9000TL, HNS10000TL
Ratings	See below Specifications table

Specifications table					
Model	HNS3000TL	HNS3600TL-1	HNS3600TL	HNS4000TL	HNS5000TL
Input:					
Vmax PV (Vdc)	600	600	600	600	600
Isc PV (absolute Max.) (A)	18 x 2	18	18 x 2	18 x 2	18 x 2
Number MPP trackers	2	1	2	2	2
Number input strings	1/1	1	1/1	1/1	1/1
Max. PV input current(A)	14 x 2	14	14 x 2	14 x 2	14 x 2
MPPT voltage range (Vdc)	70-550	70-550	70-550	70-550	70-550
Vdc range @ full power (Vdc)	110-550	265-550	130-550	145-550	180-550
Output					
Normal Voltage(V)	L/N/PE, 220Vac, 230Vac, 240Vac				
Frequency (Hz)	50 / 60				
Current (normal) (A)	13.1	15.7	15.7	17.4	21.8
Current (Max. continuous) (A)	15	17.5	17.5	20	24
Power rating (W)	3000	3600	3600	4000	5000
Power Rating (VA)	3000	3600	3600	4000	5000
Power factor /rated	1 (-0,8~+0,8 adjustable)	1 (-0,8~+0,8 adjustable)	1 (-0,8~+0,8 adjustable)	1 (-0,8~+0,8 adjustable)	1 (-0,8~+0,8 adjustable)
others					
Protective class	Class I				
Ingress protection (IP)	IP 65				
Temperature (°C)	-25°C to +60°C (up 45°C derating)				
Inverter Isolation	Non-isolated				
Overvoltage category	OVC III (AC Main), OVC II (PV)				
Weight (kg)	10				
Dimensions (WxHxD) (mm)	358x360x142				

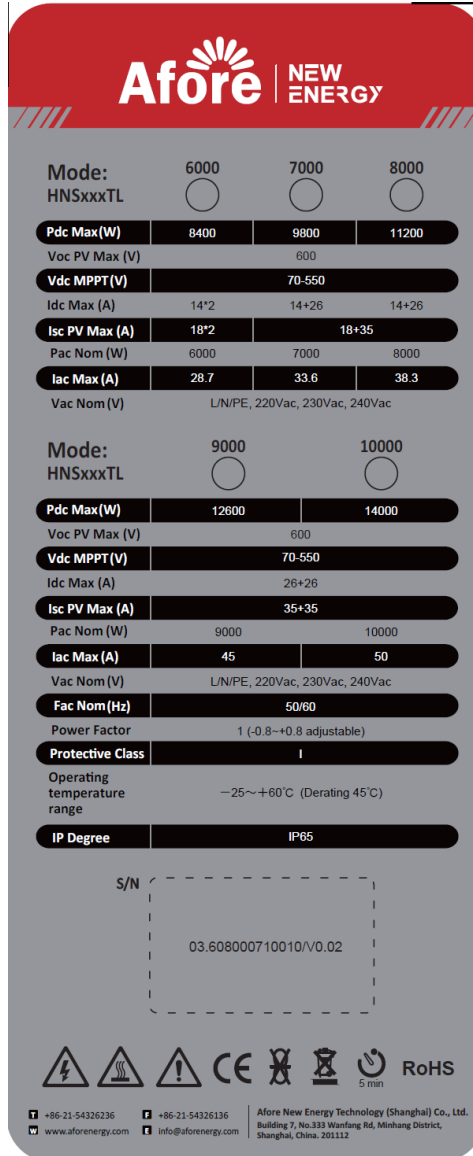
Specifications table					
Model	HNS6000TL	HNS7000TL	HNS8000TL	HNS9000TL	HNS10000TL
Input:					
Vmax PV (Vdc)	600	600	600	600	600
Isc PV (absolute Max.) (A)	18 x 2	18+35	18+35	35 x 2	35 x 2
Number MPP trackers	2	2	2	2	2
Number input strings	1/1	1/2	1/2	2/2	2/2
Max. PV input current(A)	14 x 2	14+26	14+26	26 x 2	26 x 2
MPPT voltage range (Vdc)	70-550	70-550	70-550	70-550	70-550
Vdc range @ full power (Vdc)	220-550	220-550	220-550	220-550	220-550
Output					
Normal Voltage(V)	L/N/PE, 220Vac, 230Vac, 240Vac				
Frequency (Hz)	50 / 60				
Current (normal) (A)	26.1	30.5	34.8	39.2	43.5
Current (Max. continuous) (A)	28.7	33.6	38.3	45	50
Power rating (W)	6000	7000	8000	9000	10000
Power Rating (VA)	6000	7000	8000	9000	10000
Power factor /rated	1 (-0,8~+0,8 adjustable)	1 (-0,8~+0,8 adjustable)	1 (-0,8~+0,8 adjustable)	1 (-0,8~+0,8 adjustable)	1 (-0,8~+0,8 adjustable)
others					
Protective class	Class I				
Ingress protection (IP)	IP 65				
Temperature (°C)	-25°C to +60°C (up 45°C derating)				
Inverter Isolation	Non-isolated				
Overvoltage category	OVC III (AC Main), OVC II (PV)				
Weight (kg)	17			18	
Dimensions (WxHxD) (mm)	510 x 370 x 192			535x370x192	

Responsible Testing Laboratory (as applicable), testing procedure and testing location(s):		
<input checked="" type="checkbox"/> Testing Laboratory:	Intertek Testing Services Shanghai.	
Testing location/ address	Building No.86, 1198 Qinzhou Road (North), Shanghai 200233, China	
<input checked="" type="checkbox"/> Associated Testing Laboratory:		
Testing location/ address		
Tested by (name, function, signature) ...	Chuanhui Xie (Engineer)	<i>Chuanhui Xie</i>
Approved by (name, function, signature)	Sleif Sui (Mandated Reviewer)	<i>Sleif Sui</i>
<hr/>		
<input type="checkbox"/> Testing procedure: CTF Stage 1:		
Testing location/ address		
Tested by (name, function, signature) ...		
Approved by (name, function, signature)		
<hr/>		
<input type="checkbox"/> Testing procedure: CTF Stage 2:		
Testing location/ address		
Tested by (name + signature).....		
Witnessed by (name, function, signature)		
Approved by (name, function, signature)		
<hr/>		
<input type="checkbox"/> Testing procedure: CTF Stage 3:		
<input type="checkbox"/> Testing procedure: CTF Stage 4:		
Testing location/ address		
Tested by (name, function, signature) ...		
Witnessed by (name, function, signature)		
Approved by (name, function, signature)		
Supervised by (name, function, signature)		

<p>List of Attachments (including a total number of pages in each attachment):</p> <p>Appendix 1: Photos of product--total 18 pages (page 72-89)</p>	
<p>Summary of testing: All tests were carried out according to IEC 62109-1:2010.</p>	
<p>Tests performed (name of test and test clause):</p> <ul style="list-style-type: none"> <input checked="" type="checkbox"/> 4.3 Thermal Test <input checked="" type="checkbox"/> 4.4 Testing in single fault condition <input type="checkbox"/> 4.6 Backfeed voltage protection test <input checked="" type="checkbox"/> 4.7 Electrical ratings tests <input checked="" type="checkbox"/> 5 Marking test <input checked="" type="checkbox"/> 6.3 IP test according IEC60529 <input checked="" type="checkbox"/> 7.3.6.3.3 Rating of protective bonding <input checked="" type="checkbox"/> 7.3.7 Insulation including clearance and creepage distances <input checked="" type="checkbox"/> 7.5.1 Impulse voltage test (type test) <input checked="" type="checkbox"/> 7.5.2 Voltage test (dielectric strength test) <input type="checkbox"/> 7.5.4 Touch current measurement <input type="checkbox"/> 8.3 Stability <input type="checkbox"/> 8.4 Provisions for lifting and carrying <input checked="" type="checkbox"/> 8.5 Wall mounting <input type="checkbox"/> 13.3.2.5 Cord anchorages and strain relief <input type="checkbox"/> 13.6.2.1 Stress relief test <input checked="" type="checkbox"/> 13.7 Mechanical resistance to deflection, impact, or drop 	<p>Testing location: Building No.86, 1198 Qinzhou Road (North), Shanghai 200233, China</p>
<p>Summary of compliance with National Differences (List of countries addressed): N/A</p> <p><input checked="" type="checkbox"/> The product fulfils the requirements of IEC/EN 62109-1:2010 (First Edition)</p>	

Copy of marking plate:

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



Series No.


S62A000032132776

Remark:

1. The other model labels are same with above except model number and technical data.
2. Printed symbols shall be at least 2.75 mm high. Printed text characters shall be at least 1.5 mm high, whether upper case or lower case, and shall contrast in colour with the background.
3. The tenth to thirteenth of the serial number (2132): 21=year 32=week.


Warning marking

WARNING




Hot surfaces

To reduce the risk of burns. Do not touch.




Risk of electric shock


Both AC and DC voltage sources are terminated inside this equipment. Each circuit must be individually disconnected before servicing and when the photovoltaic array is exposed to light, it supplies a DC voltage to this equipment.



Risk of electric shock from energy stored in capacitor. Do not remove cover until 5 minutes after disconnecting all sources of supply.




Risk of electric shock, do not remove cover. No user serviceable parts inside. Refer servicing to qualified service personnel.




Check user manual before service

Refer to the operation instruction.



NO warranty for disassembled inverter


Warranty doesn't provide for the inverter disassembled by non-authorized staff.



WARNING:

POWER FED FROM MORE THAN ONE SOURCE


For continued protection against risk of fire, replace only with same type and ratings of fuse.




Electronic Materials


Please scan the QR code below with your mobile phone to obtain relevant electronic information.

MONITORING APP





e USER MANUAL



7140-0056/V0.01

Test item particulars	
Equipment mobility	<input type="checkbox"/> movable <input type="checkbox"/> hand-held <input type="checkbox"/> stationary <input checked="" type="checkbox"/> fixed <input type="checkbox"/> transportable <input type="checkbox"/> for building-in
Connection to the mains	<input type="checkbox"/> pluggable equipment <input type="checkbox"/> direct plug-in <input checked="" type="checkbox"/> permanent connection <input type="checkbox"/> for building-in
Environmental category	<input checked="" type="checkbox"/> outdoor <input type="checkbox"/> indoor unconditional <input type="checkbox"/> indoor conditional
Over voltage category Mains	<input type="checkbox"/> OVC I <input type="checkbox"/> OVC II <input checked="" type="checkbox"/> OVC III <input type="checkbox"/> OVC IV
Over voltage category PV	<input type="checkbox"/> OVC I <input checked="" type="checkbox"/> OVC II <input type="checkbox"/> OVC III <input type="checkbox"/> OVC IV
Mains supply tolerance (%)	-90 / +110 %
Tested for power systems	TN
IT testing, phase-phase voltage (V)	- - -
Class of equipment	<input checked="" type="checkbox"/> Class I <input type="checkbox"/> Class II <input type="checkbox"/> Class III <input type="checkbox"/> Not classified
Mass of equipment (kg)	Max.18 KG
Pollution degree	PD3 (PD2 internal)
IP protection class	IP65
.....	
Possible test case verdicts:	
- test case does not apply to the test object	N/A
- test object does meet the requirement	P (Pass)
- test object was not evaluated for the requirement	N/E
- test object does not meet the requirement	F (Fail)
Testing	
Date of receipt of test item	2021-09-15
Date (s) of performance of tests	2021-09-15 to 2021-11-20

General remarks:	
<p>"(See Enclosure #)" refers to additional information appended to the report. "(See appended table)" refers to a table appended to the report.</p> <p>Throughout this report a <input type="checkbox"/> comma / <input checked="" type="checkbox"/> point is used as the decimal separator. Standard IEC 62109-2:2011 is to be used in conjunction with IEC 62109-1:2010.</p> <p>The test results presented in this report relate only to the item tested. The results indicate that the specimen complies with standard" IEC 62109-1:2010 and IEC 62109-2:2011".</p> <p>Determination of the test conclusion is based on IEC Guide 115 in consideration of measurement uncertainty.</p> <p>This report is for the exclusive use of Intertek's Client and is provided pursuant to the agreement between Intertek and its Client. Intertek's responsibility and liability are limited to the terms and conditions of the agreement. Intertek assumes no liability to any party, other than to the Client in accordance with the agreement, for any loss, expense or damage occasioned by the use of this report. Only the Client is authorized to permit copying or distribution of this report and then only in its entirety. Any use of the Intertek name or one of its marks for the sale or advertisement of the tested material, product or service must first be approved in writing by Intertek. The observations and test results in this report are relevant only to the sample tested. This report by itself does not imply that the material, product, or service is or has ever been under an Intertek certification program.</p>	
Manufacturer's Declaration per sub-clause 4.2.5 of IEC 62109-2:	
<p>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.....:</p>	<p><input type="checkbox"/> Yes <input checked="" type="checkbox"/> Not applicable</p>
When differences exist; they shall be identified in the General product information section.	
<p>Name and address of factory (ies): Same as applicant</p>	

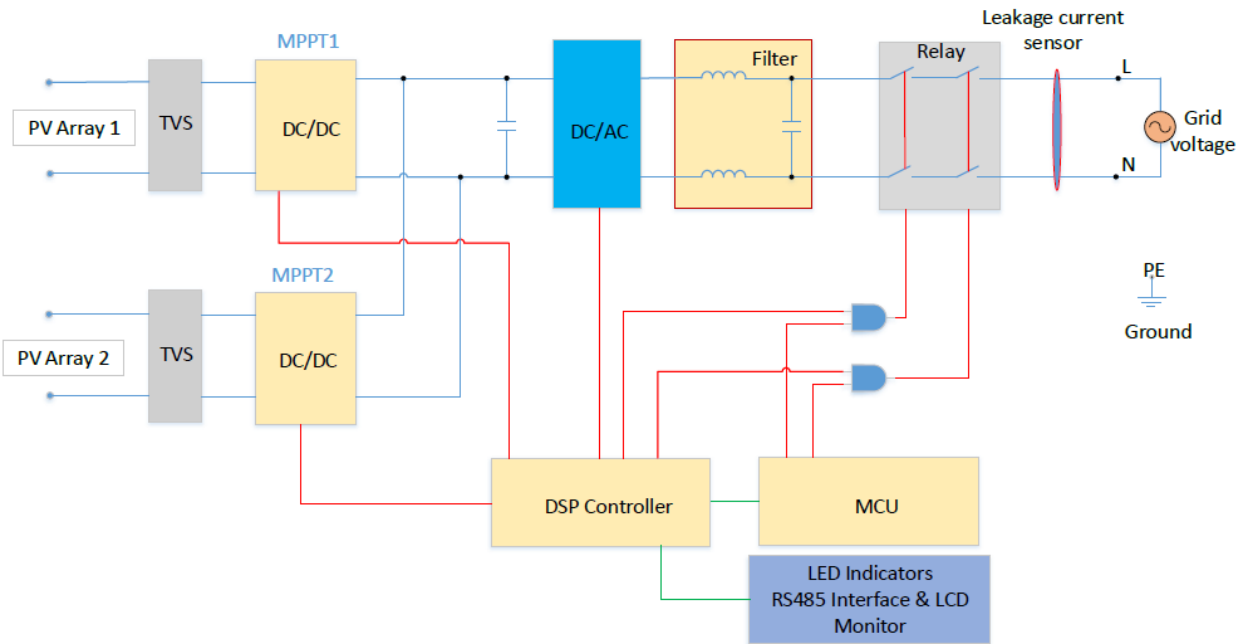
General product information:

The testing unit is a Class I grid-interactive PV inverter for outdoor installation (IP65).

The unit is providing EMC filtering at the output toward mains.

The unit does not provide galvanic separation from input to output (transformerless).

The output is switched off redundant by the high power switching bridge and two relays. This assures that the opening of the output circuit will also operate in case of one is error.



The product was tested on:

Software version:

- CPU1: DSP V06
- CPU2: CPLD V06
- CPU3(Communication): HMI V06

Model difference:

All models have same circuit diagram, PWB layout and software. Only different enclosure and fan. And different power devices and ratings. HNS3000TL, HNS3600TL-1, HNS3600TL, HNS4000TL, HNS5000TL have same enclosure, heatsink, circuit diagram and PWB layout. And with AC connector.

HNS6000TL, HNS7000TL, HNS8000TL, HNS9000TL, HNS10000TL have same enclosure, heatsink, circuit diagram and PWB layout. And with AC terminal, outlet bushing.

HNS6000TL, HNS7000TL, HNS8000TL have internal fan, HNS9000TL, HNS10000TL with internal and external fan.

IEC 62109-1			
Clause	Requirement + Test	Result - Remark	Verdict
4	GENERAL TESTING REQUIREMENTS		P
4.1	General		P
4.2	General conditions for testing		P
4.2.1	Sequence of tests		P
4.2.2	Reference test conditions		P
4.2.2.1	Environmental conditions		P
4.2.2.2	State of equipment		P
4.2.2.3	Position of equipment		P
4.2.2.4	Accessories		P
4.2.2.5	Covers and removable parts		P
4.2.2.6	Mains supply a) Voltage: b) Frequency: c) Polarity: d) Earthing: e) Over-current Protection:	1 ϕ /N/PE, 230Vac; 50Hz; Earthed Have over-voltage Protection	P
4.2.2.7	Supply ports other than the mains	PV input	P
4.2.2.7.1	Photovoltaic supply sources a) Open circuit voltage: b) Short-circuit current:		P
4.2.2.7.2	Battery inputs	No battery	N/A
4.2.2.8	Conditions of loading for output ports		P
4.2.2.9	Earthing terminals	Protective conductor terminal was connected to earth. No functional earth terminal.	P
4.2.2.10	Controls		P
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	see appended table 4.3	P
4.4	Testing in single fault condition	see appended table 4.4	P
4.4.1	General		P

IEC 62109-1			
Clause	Requirement + Test	Result - Remark	Verdict
4.4.2	Test conditions and duration for testing under fault conditions		P
4.4.2.1	General		P
4.4.2.2	Duration of tests		P
4.4.3	Pass/fail criteria for testing under fault conditions		P
4.4.3.1	Protection against shock hazard		P
4.4.3.2	Protection against the spread of fire		P
4.4.3.3	Protection against other hazards		P
4.4.3.4	Protection against parts expulsion hazards		P
4.4.4	Single fault conditions to be applied		P
4.4.4.1	Component fault tests		P
4.4.4.2	Equipment or parts for short-term or intermittent operation		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	No heating devices used	N/A
4.4.4.10	Safety interlock systems	No safety interlock	N/A
4.4.4.11	Reverse d.c. connections		P
4.4.4.12	Voltage selector mismatch	No voltage selector	N/A
4.4.4.13	Mis-wiring with incorrect phase sequence or polarity		P
4.4.4.14	Printed wiring board short-circuit test		N/A
4.5	Humidity preconditioning		P
4.5.1	General		P
4.5.2	Conditions	93% RH, 40 °C, 48 h	P
4.6	Backfeed voltage protection		P
4.6.1	Backfeed tests under normal conditions		P
4.6.2	Backfeed tests under single-fault conditions		P
4.6.3	Compliance with backfeed tests		P
4.7	Electrical ratings tests	see appended table 4.7	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		P
5.1.1	General	Label is attached	P
	Equipment shall bear markings as specified in 5.1 and 5.2		P
	Graphic symbols may be used and shall be in accordance with Annex C or IEC 60417 as applicable.		P
	Graphic symbols shall be explained in the documentation provided with the PCE.		P
5.1.2	Durability of markings		P
	Markings required by this clause to be located on the PCE shall remain clear and legible under conditions of NORMAL USE and resist the effects of cleaning agents specified by the manufacturer		P
5.1.3	Identification		P
	The equipment shall, as a minimum, be permanently marked with:		P
	a) the name or trade mark of the manufacturer or supplier	see marking plate	P
	b) model number, name or other means to identify the equipment	see marking plate	P
	c) a serial number, code or other marking allowing identification of manufacturing location and the manufacturing batch or date within a three month time period.	see marking plate	P
5.1.4	Equipment ratings		P
	Unless otherwise specified in another part of IEC 62109, the following ratings, as applicable shall be marked on the equipment:		P
	– input voltage, type of voltage (a.c. or d.c.), frequency, and max. continuous current for each input	see marking plate	P
	– output voltage, type of voltage (a.c. or d.c.), frequency, max. continuous current, and for a.c. outputs, either the power or power factor for each output	see marking plate	P
	– the ingress protection (IP) rating as in 6.3 below	see marking plate (IP65)	P

IEC 62109-1			
Clause	Requirement + Test	Result - Remark	Verdict
5.1.5	Fuse identification	No fuse	N/A
	Marking shall be located adjacent to each fuse or fuseholder, or on the fuseholder, or in another location provided that it is obvious to which fuse the marking applies, giving the fuse current rating and where fuses of different voltage rating value could be fitted, the fuse voltage rating.		N/A
	Where fuses with special fusing characteristics such as time delay or breaking capacity are necessary, the type shall also be indicated		N/A
	For fuses not located in operator access areas and for soldered-in fuses located in operator access areas, it is permitted to provide an unambiguous cross-reference (for example, F1, F2, etc.) to the servicing instructions which shall contain the relevant information.		N/A
5.1.6	Terminals, Connections, and Controls		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.	Ground terminals are marked with relevant explanation. PV port with PV special connector AC port with special connector or terminals	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 components	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:	PV port with PV special connector and with + -	P
	– the sign “+” for positive and “-” for negative; or		P
	– a pictorial representation illustrating the proper polarity where the correct polarity can be unambiguously determined from the representation		N/A
5.1.6.1	Protective Conductor Terminals		P
	The means of connection for the protective earthing conductor shall be marked with:		P
	– symbol 7 of Annex C; or		P
	– the letters “PE “; or		N/A
	– the colour coding green-yellow.		P

IEC 62109-1			
Clause	Requirement + Test	Result - Remark	Verdict
5.1.7	Switches and circuit-breakers		P
	The on and off-positions of switches and circuits breakers shall be clearly marked. If a push-button switch is used as the power switch, symbols 10 and 16 of Annex C may be used to indicate the on-position, or symbols 11 and 17 to indicate the off-position, with the pair of symbols (10 and 16, or 11 and 17) close together.	Marked with on and off	P
5.1.8	Class II Equipment	Class I	N/A
	Equipment using Class II protective means throughout shall be marked with symbol 12 of Annex C. Equipment which is only partially protected by DOUBLE INSULATION or REINFORCED INSULATION shall not bear symbol 12 of Table Annex C.		N/A
	Where such equipment has provision for the connection of an earthing conductor for functional reasons (see 7.3.6.4) it shall be marked with symbol 6 of Annex C		N/A
5.1.9	Terminal boxes for External Connections		P
	Where required by note 1 of Table 2 as a result of high temperatures of terminals or parts in the wiring compartment, there shall be a marking, visible beside the terminal before connection, of either:		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		P
5.2	Warning markings		P
5.2.1	Visibility and legibility requirements for warning markings	Warning marking marked on enclosure.	P
	Warning markings shall be legible, and shall have minimum dimensions as follows:		P
	– Printed symbols shall be at least 2,75 mm high		P
	– Printed text characters shall be at least 1.5 mm high and shall contrast in colour with the background		P
	– Symbols or text that are moulded, stamped or engraved in a material shall have a character height of at least 2,0 mm, and if not contrasting in colour from the background, shall have a depth or raised height of at least 0,5 mm.		P
	If it is necessary to refer to the instruction manual to preserve the protection afforded by the equipment, the equipment shall be marked with symbol 9 of Annex C		P

IEC 62109-1			
Clause	Requirement + Test	Result - Remark	Verdict
	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	No ungrounded heat sink	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	No coolant 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		P
	Where required by 8.2 a marking shall be provided where it is visible to service personnel before removal of a guard, warning of the hazard and giving instructions for safe servicing (for example disconnection of the source before removing the guard).		N/A
5.2.3	Sonic hazard markings and instructions		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

IEC 62109-1			
Clause	Requirement + Test	Result - Remark	Verdict
	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.	PV array, AC MAINS	P
	The symbol shall be located on the outside of the unit or shall be prominently visible behind any cover giving access to hazardous parts.		P
5.2.5	Excessive touch current		N/A
	Where required by 7.3.6.3.7 the PCE shall be marked with symbol 15 of Annex C. See also 5.3.2 for information to be provided in the installation manual.		N/A
5.3	Documentation		P
5.3.1	General		P
	The documentation provided with the PCE shall provide the information needed for the safe operation, installation, and (where applicable) maintenance of the equipment. The documentation shall include the items required in 5.3.2 through 5.3.4, and the following:		P
	a) explanations of equipment markings, 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	For outdoor use	P
	– WET LOCATIONS classification for the intended external environment as per 6.1	Wet Locations	P
	– POLLUTION DEGREE classification for the intended external environment as per 6.2	PD3(external), PD2(internal)	P
	– INGRESS PROTECTION rating as per 6.3	IP65	P
	– Ambient temperature and relative humidity ratings	-25°C to 60°C 0-100 % condensing	P
	– MAXIMUM altitude rating		P

IEC 62109-1			
Clause	Requirement + Test	Result - Remark	Verdict
	– OVERVOLTAGE CATEGORY assigned to each input and output port as per 7.3.7.1.2, accompanied by guidance regarding how to ensure that the installation complies with the required overvoltage categories;	PV: II Mains: III	P
	d) a warning that when the photovoltaic array is exposed to light, it supplies a d.c. voltage to the PCE		P
5.3.1.1	Language	English	P
	Instructions related to safety shall be in a language that is acceptable in the country where the equipment is to be installed.		P
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:	As specified in user manual, refer to information related to installation	P
	a) assembly, location, and mounting requirements:		P
	b) ratings and means of connection to each source of supply and any requirements related to wiring and external controls, colour coding of leads, disconnection means, or overcurrent protection needed, including instructions that the installation position shall not prevent access to the disconnection means;		P
	c) ratings and means of connection of any outputs from the PCE, and any requirements related to wiring and external 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;		N/A
	g) instructions and information relating to sound pressure level if required by 10.2.1;		N/A

IEC 62109-1			
Clause	Requirement + Test	Result - Remark	Verdict
	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;		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;	Should be comply with local national code	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:		P
	n) where required by 7.3.8, the installation instructions shall include the following or equivalent wording:		N/A
	“This product can cause a d.c. current in the external protective earthing conductor. Where a residual current-operated protective (RCD) or monitoring (RCM) device is used for protection in a case of direct or indirect contact, only an RCD or RCM of Type B is allowed on the supply side of this product.”	Should be comply with local national code	N/A
	o) for PCE intended to charge batteries, the battery nominal voltage rating, size, and type		N/A
	p) PV array configuration information, such as ratings, whether the array is to be grounded or floating, any external protection devices needed, etc.		N/A
5.3.3	Information related to operation	As specified in user manual, refer to information related to operation	P
	Instructions for use shall include any operating instructions necessary to ensure safe operation, including the following, as applicable:		P
	– Instructions for adjustment of controls including the effects of adjustment;		P
	– Instructions for interconnection to accessories and other equipment, including indication of suitable accessories, detachable parts and any special materials;		P

IEC 62109-1			
Clause	Requirement + Test	Result - Remark	Verdict
	<ul style="list-style-type: none"> 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
	<ul style="list-style-type: none"> 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:	Maintenance made only by authorized service personal	P
	<ul style="list-style-type: none"> 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
	<ul style="list-style-type: none"> Instructions for accessing operator access areas, if any are present, including a warning not to enter other areas of the equipment; 		P
	<ul style="list-style-type: none"> Part numbers and instructions for obtaining any required operator replaceable parts; 		P
	<ul style="list-style-type: none"> Instructions for safe cleaning (if recommended) 		P
	<ul style="list-style-type: none"> 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	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
	<ul style="list-style-type: none"> Servicing of batteries should be performed or supervised by personnel knowledgeable about batteries and the required precautions 		N/A
	<ul style="list-style-type: none"> When replacing batteries, replace with the same type and number of batteries or battery packs 		N/A
	<ul style="list-style-type: none"> General instructions regarding removal and installation of batteries 		N/A
	<ul style="list-style-type: none"> CAUTION: Do not dispose of batteries in a fire. The batteries may explode. 		N/A
	<ul style="list-style-type: none"> CAUTION: Do not open or damage batteries. Released electrolyte is harmful to the skin and eyes. It may be toxic. 		N/A

IEC 62109-1			
Clause	Requirement + Test	Result - Remark	Verdict
	– 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	P
	– Suitability for WET LOCATIONS or not	Yes	P
	– POLLUTION DEGREE rating in 6.2 below	PD3	P
	– INGRESS PROTECTION (IP) rating, as in 6.3 below	IP65	P
	– Ultraviolet (UV) exposure rating, as in 6.4 below	Metal enclosure	P
	– Ambient temperature and relative humidity ratings, as in 6.5 below	-25°C~+60°C, 0-100%, condensing	P
6.1	Environmental categories and minimum environmental conditions		P
6.1.1	Outdoor		P
6.1.2	Indoor, unconditioned		N/A
6.1.3	Indoor, conditioned		N/A
6.2	Pollution degree	PD3	P
6.3	Ingress Protection	IP65	P
6.4	UV exposure	For LCD panel	P
6.5	Temperature and humidity	-25°C~+60°C, 0-100%, condensing	P
7	PROTECTION AGAINST ELECTRIC SHOCK AND ENERGY HAZARDS		P

IEC 62109-1			
Clause	Requirement + Test	Result - Remark	Verdict
7.1	General		P
7.2	Fault conditions		P
7.3	Protection against electric shock		P
7.3.1	General	Earthed metal enclosure protects against direct contact	P
7.3.2	Decisive voltage classification		P
7.3.2.1	Use of decisive voltage class (DVC)		P
7.3.2.2	Limits of DVC (according table 6)	DVC-C output circuit,	P
7.3.2.3	Short-terms limits of accessible voltages under fault conditions	No accessible voltage exceeds DVC A during fault condition.	P
7.3.2.4	Requirements for protection (according table 7)		P
7.3.2.5	Connection to PELV and SELV circuits		P
7.3.2.6	Working voltage and DVC		P
7.3.2.6.1	General		P
7.3.2.6.2	AC working voltage (see Figure 2)		P
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		P
	Protective separation shall be achieved by:		P
	<ul style="list-style-type: none"> ▪ double or reinforced insulation, or 	Reinforced insulation between DC input & AC output to communication circuit	P
	<ul style="list-style-type: none"> ▪ 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 	Live part to enclosure	P
	<ul style="list-style-type: none"> ▪ protective impedance comprising limitation of current per 7.3.5.3 and of discharged energy per 7.3.5.4, or 		N/A
	<ul style="list-style-type: none"> ▪ 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	Well earthed metal enclosure used.	P
7.3.4.1	General		P

IEC 62109-1			
Clause	Requirement + Test	Result - Remark	Verdict
	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 measures 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.	No such components	N/A
	Product intended for installation in CLOSED ELECTRICAL OPERATING AREAS, (see 3.9) need not have protective measures against direct contact, except as required by 7.3.4.2.4.		N/A
7.3.4.2	Protection by means of enclosures and barriers		P
	The following requirements apply where protection against contact with live parts is provided by enclosures or barriers, not by insulation in accordance with 7.3.4.3.	IP 65 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).		P
	Polymeric materials used to meet these requirements shall also meet the requirements of 13.6		N/A
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:	IP 65 enclosure	P
	a) decisive voltage classification A, (DVC A) - the probe may touch the live parts		P
	b) decisive voltage classification B, (DVC B) - the probe must not touch bare live parts		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,		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

IEC 62109-1			
Clause	Requirement + Test	Result - Remark	Verdict
	b) Tests with the test finger (Figure D.1) and test pin (Figure D.2) of Annex E, the results of which shall comply with the requirements of 7.3.4.2.1 a), b), and c) as applicable. Probe tests are performed on openings in the enclosures after removal of parts that can be detached or opened by an operator without the use of a tool, including fuseholders, and with operator access doors and covers open. It is permitted to leave lamps in place for this test. Connectors that can be separated by an operator without use of a tool, shall also be tested during and after disconnection. Any movable parts are to be put in the most unfavourable position.		P
	The test finger and the test pin are applied as above, without appreciable force, in every possible position, except that floor-standing equipment having a mass exceeding 40 kg is not tilted.		P
	Equipment intended for building-in or rack mounting, or for incorporation in larger equipment, is tested with access to the equipment limited according to the method of mounting detailed in the installation instructions.		N/A
	c) Openings preventing the entry of the jointed test finger (Figure E-1 of 0E) during test b) above, are further tested by means of straight unjointed test finger (Figure E-3 of 0E), applied with a force of 30 N. If the unjointed finger enters, the test with the jointed finger is repeated except that the finger is applied using any necessary force up to 30 N.	Without openings	N/A
	d) In addition to a) – c) above, top surfaces of enclosure shall be tested with the IP3X probe of IEC 60529. The test probe shall not penetrate the top surface of the enclosure when probed from the vertical direction $\pm 5^\circ$ only.		P
7.3.4.2.4	Service access areas	Not energized at service	N/A
7.3.4.3	Protection by means of insulation of live parts		P
	Where the requirements of 7.3.4.2 are not met, live parts shall be provided with insulation if:	See 7.3.7 Table: Clearance and creepage distance	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 2 under Table 7)		P
7.3.5	Protection in case of direct contact		P
7.3.5.1	General		P

IEC 62109-1			
Clause	Requirement + Test	Result - Remark	Verdict
	Protection in case of direct contact is required to ensure that contact with live parts does not produce a shock hazard.		P
	The protection against direct contact according to 7.3.4 is not required if the circuit contacted is separated from other circuits according to 7.3.2.3, and:		P
	– is of decisive voltage class A and complies with 7.3.5.2, or		P
	– is provided with protective impedance according to 7.3.5.3, or		N/A
	– is limited in voltage according to 7.3.5.4		N/A
	In addition to the measures as given in 7.3.5.2 to 7.3.5.4, it shall be ensured that in the event of error or polarity reversal of connectors no voltages that exceed DVC A can be connected into a circuit with protective separation. This applies for example to plug-in-sub-assemblies or other plug-in devices which can be plugged-in without the use of a tool (key) or which are accessible without the use of a tool.		N/A
	Conformity is checked by visual inspection and trial insertion.		N/A
7.3.5.2	Protection using decisive voltage class A	Communication interface circuit	P
7.3.5.3	Protection by means of protective impedance		N/A
	Circuits and conductive parts do not require protection against direct contact if any connection to circuits of DVC-B or DVC-C is through protective impedance, and the accessible circuit or part is otherwise provided with protective separation from circuits of DVC-B or DVC-C according 7.3.3.		N/A
7.3.5.3.1	Limitation of current through protective impedance		N/A
	The current available through protective impedance to earth and between simultaneously accessible parts, measured at the accessible live parts, shall not exceed a value of 3,5 mA a.c. or 10 mA d.c. under normal and single-fault conditions.		N/A
7.3.5.3.2	Limitation of discharging energy through protective impedance		N/A
	The discharging energy available between simultaneously accessible parts protected by protective impedance shall not exceed the charging voltage and capacitance limits given in Table 9, which applies to both wet and dry locations, under normal and single fault conditions. Refer to figure 8.		N/A
7.3.5.4	Protection by means of limited voltages		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 (basic insulation plus protective earthing) class II part (Communication circuit of SELV): reinforced insulation	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.		P
	That part of PCE which meets the requirements of decisive voltage class A and in which no hazardous voltages are derived, is defined as protective class III. No shock hazard is present in such circuits.		N/A
	Where protection against indirect contact is dependent on means provided during installation, the installation instructions shall provide details of the required means and shall indicate the associated hazards.		N/A
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		P
7.3.6.3	Protective class I – Protective bonding and earthing		P
7.3.6.3.1	General		P

IEC 62109-1			
Clause	Requirement + Test	Result - Remark	Verdict
	Equipment of protective class I shall be provided with protective earthing, and with protective bonding to ensure electrical contact between accessible conductive parts and the means of connection for the external protective earthing conductor, except bonding is not required for:	PE arrangement: external protective earthing is provided through approved AC installation connector, and an external second protective earthing conductor is bonded to metal case	P
	a) accessible conductive parts that are protected by one of the measures in 7.3.5.2 to 7.3.5.4, or		P
	b) accessible conductive parts are separated from live parts of DVC-B or -C using double or reinforced insulation.		P
7.3.6.3.2	Requirements for protective bonding		P
	Electrical contact with the means of connection of the external protective earthing conductor shall be achieved by one or more of the following means:		P
	a) through direct metallic contact;		P
	b) through other conductive parts which are not removed when the PCE or sub-units are used as intended;		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.	No coating	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 part	N/A
	Metal ducts of flexible or rigid construction and metallic sheaths shall not be used as protective bonding conductors, unless the device or material has been investigated as suitable for protective bonding purposes.		N/A
7.3.6.3.3	Rating of protective bonding		P
	Protective bonding shall withstand the highest thermal and dynamic stresses that can occur to the PCE item(s) concerned when they are subjected to a fault connecting live parts to accessible conductive parts. The protective bonding shall remain effective for as long as a fault to the accessible conductive parts persists or until an upstream protective device removes power from the part.		P
	Protective bonding shall meet following requirements:		P

IEC 62109-1			
Clause	Requirement + Test	Result - Remark	Verdict
	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.	Max.0.62V	P
	As alternative to a) and b) the protective bonding may be designed according to the requirements for the external protective earthing conductor in 7.3.6.3.5, in which case no testing is required.	Protective bonding wire size is same as output cable	P
	The impedance of protective bonding means shall be checked by passing a test current through the bond for a period of time as specified below. The test current is based on the rating of the overcurrent protection for the equipment or part of the equipment under consideration, as follows:		P
	a) For pluggable equipment type A, the overcurrent protective device is that provided external to the equipment (for example, in the building wiring, in the mains plug or in an equipment rack);		N/A
	b) For pluggable equipment type B and fixed equipment, the maximum rating of the overcurrent protective device specified in the equipment installation instructions to be provided external to the equipment;		P
	c) For a circuit or part of the equipment for which an overcurrent protective device is provided as part of the equipment, the rating of the provided overcurrent device.		N/A
	Voltages are measured from the protective earthing terminal to all parts whose protective bonding means are being considered. The impedance of the protective earthing conductor is not included in the measurement. However, if the protective earthing conductor is supplied with the equipment, it is permitted to include the conductor in the test circuit but the measurement of the voltage drop is made only from the main protective earthing terminal to the accessible part required to be earthed.		P

IEC 62109-1			
Clause	Requirement + Test	Result - Remark	Verdict
	On equipment where the protective earth connection to a subassembly or to a separate unit is part of a cable that also supplies power to that subassembly or unit, the resistance of the protective bonding conductor in that cable is not included in the protective bond impedance measurements for the subassembly or separate unit, as shown in Figure 11. However, this option is only permitted if the cable is protected by a suitably rated protective device that takes into account the size of the conductor. Otherwise the impedance of the protective bonding conductor between the separate units is to be included, by measuring to the protective earthing terminal where the power source enters the first unit in the system, as shown in Figure 12.		P
7.3.6.3.3.1	Test current, duration, and acceptance criteria		P
	The test current, duration of the test and acceptance criteria are as follows:	see appended table 7.3.6.3.3	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 .		P
	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.		P
	c) During and after the test, there shall be no melting, loosening, or other damage that would impair the effectiveness of the protective bonding means.		P
	The test current is derived from an a.c or d.c supply source, the output of which is not earthed.		P
	As an alternative to Table 10, where the time-current characteristic of the overcurrent protective device that limits the fault current in the protective bonding means is known because the device is either provided in the equipment or fully specified in the installation instructions, the test duration may be based on that specific device's time-current characteristic. The tests are conducted for a duration corresponding to the 200% current value on the time-current characteristic.		N/A
7.3.6.3.4	Protective bonding impedance (routine test)		N/A

IEC 62109-1			
Clause	Requirement + Test	Result - Remark	Verdict
	If the continuity of the protective bonding is achieved at any point by a single means only (for example a single conductor or single fastener), or if the PCE is assembled at the installation location, then the impedance of the protective bonding shall also be tested as a routine test. The test shall be as in 7.3.6.3.3, except for the following:		N/A
	<ul style="list-style-type: none"> ▪ 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
	<ul style="list-style-type: none"> ▪ 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.		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.		P
	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:	Connector on enclosure	P
	<ul style="list-style-type: none"> ▪ 2,5 mm² if mechanical protection is provided; 		P
	<ul style="list-style-type: none"> ▪ 4 mm² if mechanical protection is not provided. 		N/A
	For cord-connected equipment, provisions shall be made so that the external protective earthing conductor in the cord shall, in the case of failure of the strain-relief mechanism, be the last conductor to be interrupted.		N/A
7.3.6.3.6	Means of connection for the external protective earthing conductor		P
7.3.6.3.6.1	General		P

IEC 62109-1			
Clause	Requirement + Test	Result - Remark	Verdict
	<p>The means of connection for the external protective earthing conductor shall be located near the terminals for the respective live conductors. The means of connections shall be corrosion-resistant and shall be suitable for the connection of cables according to 7.3.6.3.5.</p> <p>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.</p> <p>A separate means of connection shall be provided for each external protective earthing conductor.</p> <p>Connection and bonding points shall be so designed that their current-carrying capacity is not impaired by mechanical, chemical, or electrochemical influences.</p> <p>Where enclosures and/or conductors of aluminium or aluminium alloys are used, particular attention should be given to the problems of electrolytic corrosion.</p>		P
	The means of connection for the protective earthing conductor shall be permanently marked with:		P
	<ul style="list-style-type: none"> • symbol 7 of Annex C; or 	Near terminal	P
	<ul style="list-style-type: none"> • the colour coding green-yellow 		P
	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	A second protective earthing conductor used on enclosure	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.		N/A
	For pluggable equipment type A, the touch current measured in accordance with 7.5.4 shall not exceed 3,5 mA a.c. or mA d.c.		N/A
	For all other PCE, one or more of the following measures shall be applied, unless the touch current measured in accordance with 7.5.4 using the test network of IEC 60990 test figure 4 shall not exceed 3,5 mA a.c. or 10 mA d.c.		N/A
	a) Permanently connected wiring, and:		P
	<ul style="list-style-type: none"> • a cross-section of the protective earthing conductor of at least 10 mm² Cu or 16 mm² Al; or 		N/A
	<ul style="list-style-type: none"> • automatic disconnection of the supply in case of discontinuity of the protective earthing conductor; or 		N/A

IEC 62109-1			
Clause	Requirement + Test	Result - Remark	Verdict
	<ul style="list-style-type: none"> provision of an additional terminal for a second protective earthing conductor of the same cross-sectional area as the original protective earthing conductor and installation instruction requiring a second protective earthing conductor to be installed or 	First PE at AC connector and Secondary at external enclosure	P
	b) Connection with an industrial connector according to IEC 60309 and a minimum protective earthing conductor cross-section of 2,5 mm ² as part of a multi-conductor power cable. Adequate strain relief shall be provided.		N/A
	In addition, the caution symbol 15 of Annex C shall be fixed to the product and the installation manual shall provide details of the protective earthing measures required in the installation as required in 5.3.2.		N/A
	When it is intended and allowed to connect two or more PCEs in parallel using one common PE conductor, the above touch current requirements apply to the maximum number of the PCEs to be connected in parallel, unless one of the measures in a)		N/A
	or b) above is used. The maximum number of parallel PCEs is used in the testing and has to be stated in the installation manual.		N/A
7.3.6.4	Protective Class II – Double or Reinforced Insulation	class II part (Communication circuit of SELV): reinforced insulation	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
	<ul style="list-style-type: none"> equipment designed to protective class II shall not have means of connection for the external protective earthing conductor. However this does not apply if the external protective earthing conductor is passed through the equipment to equipment series-connected beyond it. In the latter event, the external protective earthing conductor and its means for connection shall be insulated with basic insulation from the accessible surface of the equipment and from circuits that employ protective separation, extra-low voltage, protective impedance and limited discharging energy, according to 7.3.5. This basic insulation shall correspond to the rated voltage of the series-connected equipment; 		P

IEC 62109-1			
Clause	Requirement + Test	Result - Remark	Verdict
	<ul style="list-style-type: none"> metal-encased equipment of protective class II may have provision on its enclosure for the connection of an equipotential bonding conductor; 		N/A
	<ul style="list-style-type: none"> equipment of protective class II may have provision for the connection of an earthing conductor for functional reasons or for damping of overvoltages; it shall, however, be insulated as though it is a live part; 		N/A
	<ul style="list-style-type: none"> equipment employing protective class II shall be marked according to 5.1.8. 		N/A
7.3.7	Insulation Including Clearance and Creepage Distance	See 7.3.7 Table: 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
	<ul style="list-style-type: none"> pollution degree 	PD3 for outside of enclosure PD2 for internal	P
	<ul style="list-style-type: none"> overvoltage category 	OVC II for PV input circuit, OCV III for mains circuit	P
	<ul style="list-style-type: none"> supply earthing system 		P
	<ul style="list-style-type: none"> insulation voltage 		P
	<ul style="list-style-type: none"> location of insulation 		P
	<ul style="list-style-type: none"> type of insulation 		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	TN system with neutral earthed, except corner earthed system	P
	Three basic types of earthing system are described in IEC 60364-1. They are:		P

IEC 62109-1			
Clause	Requirement + Test	Result - Remark	Verdict
	<ul style="list-style-type: none"> 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
	<ul style="list-style-type: none"> 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
	<ul style="list-style-type: none"> IT system: has all live parts isolated from earth or one point connected to earth through an impedance, the accessible conductive parts of the installation being earthed independently or collectively to the earthing system. 		N/A
7.3.7.1.4	Insulation voltages		P
	Table 12 makes use of the circuit system voltage and overvoltage category to define the impulse withstands voltage and the temporary overvoltage.		P
7.3.7.2	Insulation between a circuit and its surroundings		P
7.3.7.2.1	General		P
7.3.7.2.2	Circuits connected directly to the mains	AC Output circuit connected to mains	P
7.3.7.2.3	Circuits other than mains circuits	PV input	P
7.3.7.2.4	Insulation between circuits		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		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		P
7.3.7.5.2	Voltage		P
7.3.7.5.3	Materials		P
7.3.7.6	Coating		N/A
7.3.7.7	PWB spacings for functional insulating		P
7.3.7.8	Solid insulating	See appended table 7.3.7	P
7.3.7.8.1	General		P

IEC 62109-1			
Clause	Requirement + Test	Result - Remark	Verdict
7.3.7.8.2	Requirements for electrical withstand capability of solid insulation		P
7.3.7.8.2.1	Basic, supplemental, reinforced, and double insulation		P
7.3.7.8.2.2	Functional insulation		P
7.3.7.8.3	Thin sheet or tape material		P
7.3.7.8.3.1	General		P
7.3.7.8.3.2	Material thickness not less than 0,2 mm		P
7.3.7.8.3.3	Material thickness less than 0,2 mm		P
7.3.7.8.3.4	Compliance		P
7.3.7.8.4	Printed wiring boards	UL 94, V-0	P
7.3.7.8.4.1	General		P
7.3.7.8.4.2	Use of coating materials	No coating material	N/A
7.3.7.8.5	Wound components		N/A
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	Should be comply with local national code	N/A
	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		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.	Approved installation coupler use. Accessible communication interface is DVC A (< 30VDC)	P
7.3.9.2	Service access areas		P
	Capacitors located behind panels that are removable for servicing, installation, or disconnection shall present no risk of electric shock or energy hazard from charge stored on capacitors after disconnection of the PCE.	Warning symbol 21 of Annex C is marked on PCE.	P
7.4	Protection against energy hazards		P
7.4.1	Determination of hazardous energy level		P
	A hazardous energy level is considered to exist if		P
	a) The voltage is 2 V or more, and power available after 60 s exceeds 240 VA.	Access to internal power circuit, tool required.	P

IEC 62109-1			
Clause	Requirement + Test	Result - Remark	Verdict
	b) The stored energy in a capacitor is at a voltage. U of 2 V or more, and the stored energy. E, calculated from the following equation, exceeds 20J: $E = 0,5 CU^2$		P
7.4.2	Operator Access Areas		P
	Equipment shall be so designed that there is no risk of energy hazard in operator access areas from accessible circuits.	No energy exists in operator access areas	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	RH 93%, 40°C, 48 hours	P
7.5.2.4	Performing the voltage test	Output circuit to input circuit and enclosure	P
7.5.2.5	Duration of the a.c. or d.c. voltage test	60s	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	N/A
7.5.4	Touch current measurement (type test)	See appended table 7.5.4	N/A
	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 7.3.6.3.7	N/A
	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.		N/A
7.5.5	Equipment with multiple sources of supply	Hazards do not present under normal or single fault conditions	P
8	PROTECTION AGAINST MECHANICAL HAZARDS		P
8.1	General		P
	Operation shall not lead to a mechanical HAZARD in NORMAL CONDITION or SINGLE FAULT CONDITION. Edges, projections, corners, openings, guards, handles and the like, that are accessible to the operator shall be smooth and rounded so as not to cause injury during normal use of the equipment.		P

IEC 62109-1			
Clause	Requirement + Test	Result - Remark	Verdict
	Conformity is checked as specified in 8.2 to 8.6.		P
8.2	Moving parts		P
	Moving parts shall not be able to crush, cut or pierce parts of the body of an OPERATOR likely to contact them, nor severely pinch the OPERATOR's skin. Hazardous moving parts of equipment, that is moving parts which have the potential to cause injury, shall be so arranged, enclosed or guarded as to provide adequate protection against the risk of personal injury.		P
8.2.1	Protection of service persons		N/A
	Protection shall be provided such that unintentional contact with hazardous moving parts is unlikely during servicing operations. If a guard over a hazardous moving part may need to be removed for servicing, the marking of symbol 15 of Table D-1 shall be applied on or near the guard.		N/A
8.3	Stability		N/A
	Equipment and assemblies of equipment not secured to the building structure before operation shall be physically stable in NORMAL USE.	Wall mounting	N/A
8.4	Provisions for lifting and carrying	Maximum 18 kg	N/A
	If carrying handles or grips are fitted to, or supplied with, the equipment, they shall be capable of withstanding a force of four times the weight of the equipment.	No such parts	N/A
	Equipment or parts having a mass of 18 kg or more shall be provided with a means for lifting and carrying or directions shall be given in the manufacturer's documentation.		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
	Equipment shall contain or limit the energy of parts that could cause a HAZARD if expelled in the event of a fault.		N/A
9	PROTECTION AGAINST FIRE HAZARDS		P
9.1	Resistance to fire		P
	This subclause specifies requirements intended to reduce the risk of ignition and the spread of flame, both within the equipment and to the outside, by the appropriate use of materials and components and by suitable construction.	Components are witnessed at normal condition and abnormal tests are verified	P

IEC 62109-1			
Clause	Requirement + Test	Result - Remark	Verdict
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	P
9.1.2	Conditions for a fire enclosure		P
	A FIRE ENCLOSURE is required for equipment or parts of equipment for which Method 2 is not fully applied and complied with.		P
9.1.2.1	Parts requiring a fire enclosure		P
	Except where Method 2 is used, or as permitted in 9.1.2.2, the following are considered to have a risk of ignition and, therefore, require a FIRE ENCLOSURE:		P
	– components in PRIMARY CIRCUITS		P
	– components in SECONDARY CIRCUITS supplied by power sources which exceed the limits for a LIMITED POWER SOURCE as specified in 9.2;		N/A
	– components in SECONDARY CIRCUITS supplied by a LIMITED POWER SOURCE as specified in 9.2, but not mounted on a material of FLAMMABILITY CLASS V-1;		N/A
	– components within a power supply unit or assembly having a limited power output complying with the criteria for a LIMITED POWER SOURCE as specified in 9.2, including overcurrent protective devices, limiting impedances, regulating networks and wiring, up to the point where the LIMITED POWER SOURCE output criteria are met;		N/A
	– components having unenclosed arcing parts, such as open switch and relay contacts and commutators, in a circuit at HAZARDOUS VOLTAGE or at a HAZARDOUS ENERGY LEVEL; and		N/A
	– insulated wiring, except as permitted in 9.1.2.2.		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.	Metal enclosure	P
9.1.3.2	Materials for fire enclosures	Metal enclosure	P

IEC 62109-1			
Clause	Requirement + Test	Result - Remark	Verdict
	If an enclosure material is not classified as specified below, a test may be performed on the final enclosure or part of the enclosure, in which case the material shall additionally be subjected to periodic SAMPLE testing.		N/A
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.		P
9.1.3.4	Materials for components and other parts inside fire enclosures	All internal components are rated V-2 or better or mounded on PCB rated V-0.	P
9.1.3.5	Materials for air filter assemblies	No such part	N/A
9.1.4	Openings in fire enclosures	Without openings	N/A
9.1.4.1	General		N/A
	For equipment that is intended to be used or installed in more than one orientation as specified in the product documentation, the following requirements apply in each orientation.		N/A
	These requirements are in addition to those in the following sections:		N/A
	– 7.3.4, Protection against direct contact;		N/A
	– 7.4, Protection against energy hazards;		N/A
	– 13.5, Openings in enclosures		N/A
9.1.4.2	Side openings treated as bottom openings		N/A
9.1.4.3	Openings in the bottom of a fire enclosure		N/A
	The bottom of a FIRE ENCLOSURE or individual barriers, shall provide protection against emission of flaming or molten material under all internal parts, including partially enclosed components or assemblies, for which Method 2 of 9.1.1 has not been fully applied and complied with.		N/A
9.1.4.4	Equipment for use in a CLOSED ELECTRICAL OPERATING AREA		N/A
	The requirements of 9.1.4.3 do not apply to FIXED EQUIPMENT intended only for use in a CLOSED ELECTRICAL OPERATING AREA and to be mounted on a concrete floor or other non-combustible surface. Such equipment shall be marked as follows:		N/A

IEC 62109-1			
Clause	Requirement + Test	Result - Remark	Verdict
	WARNING: FIRE HAZARD SUITABLE FOR MOUNTING ON CONCRETE OR OTHER NON-COMBUSTIBLE SURFACE ONLY		N/A
9.1.4.5	Doors or covers in fire enclosures		N/A
9.1.4.6	Additional requirements for openings in transportable equipment		N/A
9.2	LIMITED POWER SOURCES		N/A
9.2.1	General		N/A
9.2.2	Limited power source tests	See appended table 9.2	N/A
9.3	Short-circuit and overcurrent protection		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 overcurrent shall be provided for all input circuits, and for output circuits that do not comply with the requirements for limited power sources in 9.2, except for circuits in which no overcurrent hazard is presented by short-circuits and overloads.		P
9.3.3	Protective devices provided or specified shall have adequate breaking capacity to interrupt the maximum short circuit current specified for the port to which they are connected. If protection that is provided integral to the PCE for an input port is not rated for the short-circuit current of the circuit in which it is used, the installation instructions shall specify that an upstream protective device, rated for the prospective short-circuit current of that port, shall be used to provide backup protection.		P
10	PROTECTION AGAINST SONIC PRESSURE HAZARDS		N/A
10.1	General		N/A
	The equipment shall provide protection against the effect of sonic pressure. Conformity tests are carried out if the equipment is likely to cause such HAZARDS.	No sonic pressure hazards	N/A
10.2	Sonic pressure and Sound level		N/A
10.2.1	Hazardous Noise Levels		N/A
11	PROTECTION AGAINST LIQUID HAZARDS		N/A
11.1	Liquid Containment, Pressure and Leakage	No liquid containment system	N/A

IEC 62109-1			
Clause	Requirement + Test	Result - Remark	Verdict
	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		P
	Handles, knobs, grips, levers and the like shall be reliably fixed so that they will not work loose in normal use, if this might result in a hazard. Sealing compounds and the like, other than self-hardening resins, shall not be used to prevent loosening. If handles, knobs and the like are used to indicate the position of switches or similar components, it shall not be possible to fix them in a wrong position if this might result in hazard.	DC switch	P
13.1.1	Adjustable controls	Without adjustable controls	N/A
13.2	Securing of parts	All screws locked with starwasher	P
13.3	Provisions for external connections		P
13.3.1	General	Certified PV connectors are used. Installation manuals provide information for the disconnection means.	P
13.3.2	Connection to an a.c. Mains supply	Approved AC connectors and terminals	P
13.3.2.1	General		P
	For safe and reliable connection to a MAINS supply, equipment shall be provided with one of the following:		P
	– terminals or leads or a non-detachable power supply cord for permanent connection to the supply; or	Approved AC connectors and terminals	P

IEC 62109-1			
Clause	Requirement + Test	Result - Remark	Verdict
	– a non-detachable power supply cord for connection to the supply by means of a plug		N/A
	– an appliance inlet for connection of a detachable power supply cord; or		N/A
	– a mains plug that is part of direct plug-in equipment as in 13.3.8		N/A
13.3.2.2	Permanently connected equipment		P
13.3.2.3	Appliance inlets		N/A
13.3.2.4	Power supply cord		N/A
13.3.2.5	Cord anchorages and strain relief		N/A
	For equipment with a non-detachable power supply cord, a cord anchorage shall be supplied such that:		N/A
	– the connecting points of the cord conductors are relieved from strain; and		N/A
	– the outer covering of the cord is protected from abrasion.		N/A
13.3.2.6	Protection against mechanical damage		P
13.3.3	Wiring terminals for connection of external conductors	Approved AC connectors and terminals	N/A
13.3.3.1	Wiring terminals		N/A
13.3.3.2	Screw terminals		N/A
13.3.3.3	Wiring terminal sizes		N/A
13.3.3.4	Wiring terminal design		N/A
13.3.3.5	Grouping of wiring terminals		N/A
13.3.3.6	Stranded wire		N/A
13.3.4	Supply wiring space		N/A
13.3.5	Wire bending space for wires 10 mm ² and greater		N/A
13.3.6	Disconnection from supply sources	Disconnect the unit from the MAINS and PV supply by the external customer installed disconnecting devices.	P
13.3.7	Connectors, plugs and sockets	Approved PV connectors AND AC connectors or terminals used	P
13.3.8	Direct plug-in equipment		N/A
13.4	Internal wiring and connections		P
13.4.1	General		P

IEC 62109-1			
Clause	Requirement + Test	Result - Remark	Verdict
13.4.2	Routing	Internal wire is routed to avoid sharp edge and overheat	P
13.4.3	Colour coding	Conductor having green-and-yellow insulation is used only for protective bonding connection	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	Without openings	N/A
	Openings in the top and sides of ENCLOSURES shall be so located or constructed that it is unlikely that objects will enter the openings and create hazards by contacting bare conductive parts.		N/A
13.6	Polymeric Materials		P
13.6.1	General	Approved PV and AC connectors	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		P
13.6.3	Polymers serving as solid insulation	Approved PV connectors AND AC connectors used	P
13.6.3.1	Resistance to arcing		P
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		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	For LCD panel	P
13.7.4	Drop test		N/A
13.8	Thickness requirements for metal enclosures		P
13.8.1	General	Conformity is checked by the test as specified in clause 13.7	P
13.8.2	Cast metal		N/A

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

IEC 62109-1			
Clause	Requirement + Test	Result - Remark	Verdict
	Printed circuit boards shall be made of material with a flammability classification of V-1 of IEC 60707 or better.	PCB material approved by UL with UL94 V-0 rating	P
	This requirement does not apply to thin-film flexible printed circuit boards that contain only circuits powered from limited power sources meeting the requirements of 9.2.		N/A
	Conformity of the flammability RATING is checked by inspection of data on the materials. Alternatively, conformity is checked by performing the V-1 tests specified in IEC 60707 on three samples of the relevant parts.		N/A
14.7	Circuits or components used as transient overvoltage limiting devices		N/A
	If control of transient overvoltage is employed in the equipment, any overvoltage limiting component or circuit shall be tested with the applicable impulse withstand voltage of Table 7-10 using the test method from 7.5.1 except 10 positive and 10 negative impulses are to be applied and may be spaced up to 1 min apart.		N/A
14.8	Batteries		N/A
	Equipment containing batteries shall be designed to reduce the risk of fire, explosion and chemical leaks under normal conditions and after a single fault in the equipment including a fault in circuitry within the equipment battery pack.		N/A
14.8.1	Battery Enclosure Ventilation		N/A
14.8.1.1	Ventilation requirements		N/A
14.8.1.2	Ventilation testing		N/A
14.8.1.3	Ventilation instructions		N/A
14.8.2	Battery Mounting		N/A
	Compliance is verified by the application of the force to the battery's mounting surface. The test force is to be increased gradually so as to reach the required value in 5 to 10 s, and is to be maintained at that value for 1 min. A non-metallic rack or tray shall be tested at the highest normal condition operating temperature.		N/A
14.8.3	Electrolyte spillage		N/A
	Battery trays and cabinets shall have an electrolyte-resistant coating.		N/A
	The ENCLOSURE or compartment housing a VENTED BATTERY shall be constructed so that spillage or leakage of the electrolyte from one battery will be contained within the ENCLOSURE and be prevented from:		N/A

IEC 62109-1			
Clause	Requirement + Test	Result - Remark	Verdict
	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	All software or firmware limits or controls were disabled during single-fault test, annex B, B.1.1 A) was considered	P

4.3	TABLE: Thermal test, thermocouple measurements					P
Model	HNS5000TL		Ambient temperature (°C)		45°C	
Output power	Rating <input checked="" type="checkbox"/> Derating <input type="checkbox"/>					
Thermocouple locations	180Vdc 207Vac	550Vdc 207Vac	180Vdc 253Vac	550Vdc 253Vac	T-limit (°C)	
T - Ambient	44	46	48	45	reference	
Accessible enclosure	51	52	58	50	100	
Operation panel	46	48	50	47	85	
Heatsink	54	52	63	50	90	
DC switch	59	57	69	53	85	
DC terminal	46	48	53	47	105	
AC terminal	48	53	53	50	105	
DC wire in main part	57	56	66	52	105	
AC wire in main part	63	72	69	64	105	
Inductor for boost circuit	88	84	110	74	130	
Inductor for inverter circuit	82	103	94	84	130	
EMI choke (DC)T1	68	63	84	58	110	
EMI choke (AC)CT2	73	87	80	75	110	
Transformer for SPS AF-SPS-H1	72	81	80	73	105	
Mosfet for SPS drive MOS1	82	101	94	93	150	
PCB	73	69	88	62	130	
Varistor for DC part RV1	62	67	67	61	85	
Varistor for AC part RV2	58	58	66	54	85	
X Capacitor for DC part C46	60	59	70	55	110	
X Capacitor for AC part C15	59	58	68	55	110	
Y Capacitor for DC part C62	60	60	69	57	110	
Y Capacitor for AC part C17	60	65	65	59	110	
Electrical capacitor C183	68	71	76	63	105	
Film capacitor for DC part C44	64	61	77	56	105	
Film capacitor for AC part C9	67	75	73	67	105	
Current sensor for DC part UT2	67	63	79	59	105	
Current sensor for AC part HCT1	75	85	82	75	105	
Relay for ISO detection ALFG1	59	56	70	51	85	
Relay for grid disconnection RL1	67	71	72	65	85	
DSP U15	64	69	71	63	85	
CPLD U11	63	68	69	62	85	

4.3	TABLE: Thermal test, thermocouple measurements					P
MCU U17	62	63	69	58	85	
IGBT module for boost A Q2	75	60	100	56	175	
DIODE module for boost A D54	70	61	87	58	150	
IGBT module for boost B Q3	72	56	95	54	175	
IGBT module for Inverter QA3	78	90	87	81	175	
IGBT module for Inverter QB3	70	85	77	73	175	
IGBT module for Inverter QB1	80	93	90	83	175	
Optocoupler UP2	63	67	71	61	85	
Supplementary information and remarks:						

4.3	TABLE: Thermal test, thermocouple measurements					P
Model	HNS5000TL		Ambient temperature (°C)		60°C	
Output power	Rating <input type="checkbox"/> Derating <input checked="" type="checkbox"/>					
Thermocouple locations	180Vdc 207Vac	550Vdc 207Vac	180Vdc 253Vac	550Vdc 253Vac	T-limit (°C)	
T - Ambient	59	58	60	58	reference	
Accessible enclosure	69	64	70	62	100	
Operation panel	62	61	63	59	85	
Heatsink	72	64	75	62	90	
DC switch	79	68	82	65	85	
DC terminal	64	60	65	59	105	
AC terminal	66	65	66	62	105	
DC wire in main part	76	68	79	64	105	
AC wire in main part	85	84	82	76	105	
Inductor for boost circuit	113	93	120	83	130	
Inductor for inverter circuit	101	112	103	93	130	
EMI choke (DC) T1	92	74	98	70	110	
EMI choke (AC) CT2	98	99	93	87	110	
Transformer for SPS AF-SPS-H1	93	93	93	85	105	
Mosfet for SPS drive MOS1	101	112	107	105	150	
PCB	97	81	102	74	130	
Varistor for DC part RV1	81	79	80	73	85	
Varistor for AC part RV2	78	70	80	66	85	
X Capacitor for DC part C46	81	70	84	66	110	
X Capacitor for AC part C15	78	70	81	66	110	
Y Capacitor for DC part C62	80	72	82	68	110	
Y Capacitor for AC part C17	78	77	78	71	110	
Electrical capacitor C183	90	83	90	75	105	
Film capacitor for DC part C44	86	73	90	68	105	
Film capacitor for AC part C9	87	87	86	79	105	
Current sensor for DC part UT2	89	75	92	70	105	
Current sensor for AC part HCT1	98	98	95	88	105	
Relay for ISO detection ALFG1	77	65	81	65	85	
Relay for grid disconnection RL1	83	80	82	75	85	
DSP U15	84	82	84	75	85	
CPLD U11	82	80	82	75	85	

4.3	TABLE: Thermal test, thermocouple measurements					P
MCU U17	81	75	82	71	85	
IGBT module for boost A Q2	101	72	110	68	175	
DIODE module for boost A D54	93	73	100	70	150	
IGBT module for boost B Q3	96	69	103	65	175	
IGBT module for Inverter QA3	103	103	96	94	175	
IGBT module for Inverter QB3	92	98	89	86	175	
IGBT module for Inverter QB1	106	106	100	96	175	
Optocoupler UP2	83	79	84	73	85	
Supplementary information and remarks:						

4.3	TABLE: Thermal test, thermocouple measurements					P
Model	HNS8000TL		Ambient temperature (°C)		45°C	
Output power	Rating <input checked="" type="checkbox"/> Derating <input type="checkbox"/>					
Thermocouple locations	220Vdc 207Vac	550Vdc 207Vac	220Vdc 253Vac	550Vdc 253Vac	T-limit (°C)	
T - Ambient	45	46	46	46	reference	
Accessible enclosure	75	65	78	61	100	
Operation panel	54	54	55	50	85	
Heatsink	61	63	61	59	90	
DC switch	73	65	73	61	85	
DC terminal	65	63	65	57	85	
AC terminal	74	74	72	63	105	
DC wire in main part	71	69	70	58	105	
AC wire in main part	69	69	66	63	105	
Inductor for boost circuit	96	78	98	71	130	
Inductor for inverter circuit	120	122	106	103	130	
EMI choke (DC) T1	101	79	102	77	110	
EMI choke (AC) CT2	87	91	83	98	110	
Transformer for SPS AF-SPS-H1	79	79	78	92	105	
Mosfet for SPS drive MOS1	80	81	80	95	150	
PCB	79	78	78	91	130	
Varistor for DC part RV1	78	76	77	64	85	
Varistor for AC part RV2	76	74	75	68	85	
X Capacitor for DC part C46	81	73	80	67	110	
X Capacitor for AC part C15	79	80	76	75	110	
Y Capacitor for DC part C62	80	77	79	67	110	
Y Capacitor for AC part C17	79	78	77	78	110	
Electrical capacitor C183	85	83	81	75	105	
Film capacitor for DC part C44	84	73	84	69	105	
Film capacitor for AC part C9	81	84	79	89	105	
Current sensor for DC part UT2	84	73	84	69	105	
Current sensor for AC part HCT1	85	85	82	96	105	
Relay for ISO detection ALFG1	63	58	63	55	85	
Relay for grid disconnection RL1	74	78	72	81	85	
DSP U15	79	81	78	76	85	
CPLD U11	80	80	78	76	85	

4.3	TABLE: Thermal test, thermocouple measurements					P
MCU U17	79	78	77	66	85	
IGBT module for boost A Q2	99	70	107	65	175	
DIODE module for boost A D54	90	72	93	68	150	
IGBT module for boost B Q3	87	64	94	60	175	
IGBT module for Inverter QA3	101	101	96	96	175	
IGBT module for Inverter QB3	84	90	82	82	175	
IGBT module for Inverter QB1	100	101	97	91	175	
Optocoupler UP2	80	80	79	71	85	
Supplementary information and remarks:						

4.3	TABLE: Thermal test, thermocouple measurements					P
Model	HNS8000TL		Ambient temperature (°C)		60°C	
Output power	Rating <input type="checkbox"/> Derating <input checked="" type="checkbox"/>					
Thermocouple locations	220Vdc 207Vac	550Vdc 207Vac	220Vdc 253Vac	550Vdc 253Vac	T-limit (°C)	
T - Ambient	60	61	60	60	reference	
Accessible enclosure	81	78	82	74	100	
Operation panel	68	67	67	65	85	
Heatsink	74	76	73	72	90	
DC switch	82	79	81	75	85	
DC terminal	77	76	75	72	105	
AC terminal	84	85	81	79	105	
DC wire in main part	81	82	80	76	105	
AC wire in main part	79	81	76	75	105	
Inductor for boost circuit	95	88	97	80	130	
Inductor for inverter circuit	115	122	105	111	130	
EMI choke (DC) T1	102	91	101	85	110	
EMI choke (AC) CT2	94	96	89	87	110	
Transformer for SPS AF-SPS-H1	88	88	86	82	105	
Mosfet for SPS drive MOS1	89	94	88	87	150	
PCB	88	89	86	83	130	
Varistor for DC part RV1	83	84	84	81	85	
Varistor for AC part RV2	82	82	83	79	85	
X Capacitor for DC part C46	88	85	87	79	110	
X Capacitor for AC part C15	87	89	84	81	110	
Y Capacitor for DC part C62	89	89	87	82	110	
Y Capacitor for AC part C17	88	88	85	82	110	
Electrical capacitor C183	92	93	89	85	105	
Film capacitor for DC part C44	91	85	89	79	105	
Film capacitor for AC part C9	89	90	87	83	105	
Current sensor for DC part UT2	91	85	90	80	105	
Current sensor for AC part HCT1	93	95	89	87	105	
Relay for ISO detection ALFG1	69	67	68	67	85	
Relay for grid disconnection RL1	81	78	78	82	85	
DSP U15	78	81	82	81	85	
CPLD U11	82	82	83	81	85	

4.3	TABLE: Thermal test, thermocouple measurements					P
MCU U17	81	83	83	83	85	
IGBT module for boost A Q2	104	82	107	77	175	
DIODE module for boost A D54	97	85	98	80	150	
IGBT module for boost B Q3	94	77	98	73	175	
IGBT module for Inverter QA3	108	108	102	104	175	
IGBT module for Inverter QB3	93	104	90	92	175	
IGBT module for Inverter QB1	108	109	103	105	175	
Optocoupler UP2	83	82	83	83	85	
Supplementary information and remarks:						

4.3	TABLE: Thermal test, thermocouple measurements				P
Model	HNS10000TL		Ambient temperature (°C)	45°C	
Output power	Rating <input checked="" type="checkbox"/> Derating <input type="checkbox"/>				
Thermocouple locations	220Vdc 207Vac	550Vdc 207Vac	220Vdc 253Vac	550Vdc 253Vac	T-limit (°C)
T - Ambient	46	45	45	46	reference
Accessible enclosure	62	62	59	58	100
Operation panel	54	55	52	51	85
Heatsink	58	53	57	53	90
DC switch	62	60	60	57	85
DC terminal	56	52	57	53	105
AC terminal	67	66	63	61	105
DC wire in main part	68	64	67	60	105
AC wire in main part	83	82	74	72	105
Inductor for boost circuit	84	78	80	68	130
Inductor for inverter circuit	102	105	87	85	130
EMI choke (DC) T1	83	72	92	67	110
EMI choke (AC) CT2	86	85	77	74	110
Transformer for SPS AF-SPS-H1	72	71	68	65	105
Mosfet for SPS drive MOS1	72	71	69	66	150
PCB	73	72	69	66	130
Varistor for DC part RV1	69	67	66	62	85
Varistor for AC part RV2	69	67	65	62	85
X Capacitor for DC part C46	67	64	66	60	110
X Capacitor for AC part C15	71	70	66	64	110
Y Capacitor for DC part C62	70	68	67	63	110
Y Capacitor for AC part C17	69	67	65	62	110
Electrical capacitor C183	78	76	71	68	105
Film capacitor for DC part C44	71	66	71	61	105
Film capacitor for AC part C9	73	72	68	65	105
Current sensor for DC part UT2	70	65	69	61	105
Current sensor for AC part HCT1	81	81	74	72	105
Relay for ISO detection ALFG1	56	58	61	60	85
Relay for grid disconnection RL1	77	81	76	77	85
DSP U15	77	76	72	70	85
CPLD U11	72	71	68	65	85

4.3	TABLE: Thermal test, thermocouple measurements					P
MCU U17	71	70	67	64	85	
IGBT module for boost A Q2	70	62	70	61	175	
DIODE module for boost A D54	77	67	75	66	150	
IGBT module for boost B Q3	71	59	73	60	175	
IGBT module for Inverter QA3	91	92	84	82	175	
IGBT module for Inverter QB3	76	78	71	68	175	
IGBT module for Inverter QB1	103	104	94	92	175	
Optocoupler UP2	74	73	69	67	85	
Supplementary information and remarks:						

4.3	TABLE: Thermal test, thermocouple measurements				P
Model	HNS10000TL		Ambient temperature (°C)	60°C	
Output power	Rating <input type="checkbox"/> Derating <input checked="" type="checkbox"/>				
Thermocouple locations	220Vdc 207Vac	550Vdc 207Vac	220Vdc 253Vac	550Vdc 253Vac	T-limit (°C)
T - Ambient	61	60	60	60	reference
Accessible enclosure	74	70	71	66	100
Operation panel	65	61	64	61	85
Heatsink	71	61	70	62	90
DC switch	75	67	72	64	85
DC terminal	70	62	73	62	105
AC terminal	79	73	75	68	105
DC wire in main part	81	71	80	67	105
AC wire in main part	95	89	86	79	105
Inductor for boost circuit	98	84	96	74	130
Inductor for inverter circuit	116	112	102	93	130
EMI choke (DC) T1	97	79	105	74	110
EMI choke (AC) CT2	98	92	89	81	110
Transformer for SPS AF-SPS-H1	85	78	81	72	105
Mosfet for SPS drive MOS1	84	78	82	73	150
PCB	85	79	82	73	130
Varistor for DC part RV1	82	74	78	69	85
Varistor for AC part RV2	81	74	77	70	85
X Capacitor for DC part C46	79	71	78	67	110
X Capacitor for AC part C15	84	77	78	71	110
Y Capacitor for DC part C62	82	75	80	70	110
Y Capacitor for AC part C17	80	74	76	69	110
Electrical capacitor C183	90	83	84	75	105
Film capacitor for DC part C44	83	73	84	68	105
Film capacitor for AC part C9	85	78	80	72	105
Current sensor for DC part UT2	82	72	82	68	105
Current sensor for AC part HCT1	94	88	87	79	105
Relay for ISO detection ALFG1	71	68	68	69	85
Relay for grid disconnection RL1	79	82	83	82	85
DSP U15	84	83	84	77	85
CPLD U11	84	78	80	72	85

4.3	TABLE: Thermal test, thermocouple measurements					P
MCU U17	83	77	79	72	85	
IGBT module for boost A Q2	83	70	83	68	175	
DIODE module for boost A D54	90	74	88	73	150	
IGBT module for boost B Q3	84	66	86	67	175	
IGBT module for Inverter QA3	104	99	97	90	175	
IGBT module for Inverter QB3	89	85	83	76	175	
IGBT module for Inverter QB1	119	112	108	100	175	
Optocoupler UP2	84	80	81	74	85	
Supplementary information and remarks:						

4.4.4		TABLE: Single fault tolerance				P
No.	Component name	Component No.	Fault point	Duration	Result	
1.	ISO Relay	ALFG1	Short circuit before start up inverter	3min	Unit can't operate, error message: Isolation Fault. No danger, no hazard, no fire	
2.	Monitoring Relay - L	RL2	Pin1 to Pin2 short circuit before start up inverter	3min	Unit can't operate, error message: Relay Fault. No danger, no hazard, no fire	
3.	Monitoring Relay - L	RL2	Pin1 to Pin2 open circuit before start up inverter	3min	Unit can't operate, error message: Relay Fault. No danger, no hazard, no fire	
4.	Monitoring Relay - L	RL2	Pin3 to Pin4 short circuit before start up inverter	3min	Unit can't operate, error message: Relay Fault. No danger, no hazard, no fire	
5.	Monitoring Relay - L	RL2	Pin3 to Pin4 open circuit before start up inverter	3min	Unit can't operate, error message: Relay Fault. No danger, no hazard, no fire	
6.	Monitoring Relay - N	RL1	Pin1 to Pin2 short circuit before start up inverter	3min	Unit can't operate, error message: Relay Fault. No danger, no hazard, no fire	
7.	Monitoring Relay - N	RL1	Pin1 to Pin2 open circuit before start up inverter	3min	Unit can't operate, error message: Relay Fault. No danger, no hazard, no fire	
8.	Monitoring Relay - N	RL1	Pin3 to Pin4 short circuit before start up inverter	3min	Unit can't operate, error message: Relay Fault. No danger, no hazard, no fire	
9.	Monitoring Relay - N	RL1	Pin3 to Pin4 open circuit before start up inverter	3min	Unit can't operate, error message: Relay Fault. No danger, no hazard, no fire	
10.	AC voltage measure	R113	Pin1-Pin2 Short circuit	3min	Unit shut down, Error message: Grid Volt Fault. No danger, no hazard, no fire	
11.	AC voltage measure	C34	Pin1-Pin2 Short circuit	3min	Unit shut down, Error message: Grid Volt Fault. No danger, no hazard, no fire	
12.	AC current measure	C208	Pin1-Pin2 Short circuit	3min	Unit can't operate, error message: Inv Over Current. No danger, no hazard, no fire	
13.	AC frequency measure	C20	Pin1-Pin2 Short circuit	3min	Unit shut down, error message: Grid Freq Fault. No danger, no hazard, no fire	
14.	DC current measure	C249	Pin1-Pin2 Short circuit	3min	Unit shut down,error message: PV1 Over Current. No danger, no hazard, no fire	
15.	Bus cap	C45	Pin1-Pin2 Short circuit before start up	3min	Unit can't start-up, No danger, no hazard, no fire	
16.	COM-of CPU1-CPU2	U15	Pin 58 Open circuit	3min	Unit shut down. error message: Communication lose. No danger, no hazard, no fire	
17.	CPU1 Failure -Power	C105	Pin 1-Pin2 Short circuit	3min	Unit shut down. No danger, no hazard, no fire	
18.	CPU1 Failure -Reset	C141	Pin 1-Pin2 Short circuit	3min	Unit can't operate, No danger, no hazard, no fire	

4.4.4		TABLE: Single fault tolerance				P
No.	Component name	Component No.	Fault point	Duration	Result	
19.	EEPROM	U20	Pin 5 Open circuit	3min	EEPROM read and write function is abnormal. No danger, no hazard, no fire.	
20.	EEPROM	U20	Pin 6 Open circuit	3min	EEPROM read and write function is abnormal. No danger, no hazard, no fire.	
21.	Drive optocoupler	U10	Pin1-Pin2 Short circuit before start up	3min	Unit can't start-up, No danger, no hazard, no fire	
22.	power tube Boost	Q2	Pin2-Pin3 Short circuit before start up	3min	Unit can't start-up, No danger, no hazard, no fire	
23.	Diode	D54	Short circuit	3min	Unit normal operation, No danger, no hazard, no fire	
24.	power tube IGBT	QA1	Pin1-Pin3 Short circuit	3min	Unit shut down, error message: Self Lock. No danger, no hazard, no fire	
25.	power tube IGBT	QA1	Pin2-Pin3 Short circuit	3min	Unit shut down, error message: Inv Over Current. No danger, no hazard, no fire	
26.	power tube IGBT	QA2	Pin2-Pin3 Short circuit	3min	Unit shut down, error message: Inv Over Current. No danger, no hazard, no fire	
27.	GFCI check	--	Short circuit	3min	Unit shut down, error message: GFCI Fault. No danger, no hazard, no fire	
4.4.4.4 Transformer short circuit tests						
28.	Transformer short circuit tests +20V	AF-SPS-H1	Pin12-Pin13 Short circuit before start up	10min	Unit can't start up, No danger, no hazard, no fire	
29.	Transformer short circuit tests +8V	AF-SPS-H1	Pin15-Pin16 Short circuit before start up	10min	Unit can't start up, No danger, no hazard, no fire	
30.	Transformer short circuit tests +12V	AF-SPS-H1	Pin15-Pin18 Short circuit before start up	10min	Unit can't start up, No danger, no hazard, no fire	
31.	Transformer short circuit tests +5V	AF-SPS-H1	Pin19-Pin20 Short circuit before start up	10min	Unit can't start up, No danger, no hazard, no fire	
32.	Transformer short circuit tests +5.1V	AF-SPS-H1	Pin22-Pin24 Short circuit before start up	10min	Unit can't start up, No danger, no hazard, no fire	
33.	Transformer short circuit tests -5V	AF-SPS-H1	Pin25-Pin26 Short circuit before start up	10min	Unit can't start up, No danger, no hazard, no fire	
34.	Transformer short circuit tests +15V	AF-SPS-H1	Pin28-Pin29 Short circuit before start up	10min	Unit can't start up, No danger, no hazard, no fire	

4.4.4		TABLE: Single fault tolerance				P
No.	Component name	Component No.	Fault point	Duration	Result	
35.	power tube MOS-SPS	Q2	G-D Short circuit	3min	SPS no output, no danger, no hazard, no fire	
4.4.4.5 Output short circuit						
36.	Output L to N	--	short circuit	3min	Unit shut down, error message: Inv Over Current. No danger, no hazard, no fire	
37.	Output L to PE	--	short circuit	3min	Unit shut down, error message: Grid Volt Fault. No danger, no hazard, no fire	
38.	Output N to PE	--	short circuit	3min	Unit shut down, error message: Grid Volt Fault. No danger, no hazard, no fire	
4.4.4.7 Output overload						
39.	Overload	--	Output overload (110%)	30 min	Unit normal operation, No danger, no hazard, no fire	
4.4.4.8 cooling system failure test						
40.	Cooling system failure – Blanketing test	--	Put the unit to box	2Hour	1 hour power run at 80%	
4.4.4.11 Reverse d.c. connections						
41.	PV+ to PV-	--	Reverse polarity	3min	Unit cannot start up, no danger, no hazard, no fire	
4.4.4.13 Mis-wiring with incorrect phase sequence or polarity						
42.	Output L - N	--	Reverse polarity before start up	3min	Unit normal operation. No danger, no hazard, no fire	
<p>Remarks:</p> <p>Abbreviations APS: auxiliary power supply EM: error message EUT: equipment under test, SC short circuit, OP: open circuit, O/L: Overloaded EUT shut down: EUT not connect to Grid, cease to export power to Grid, the relay is opened. EUT standby: EUT connect to Grid, cease to export power to Grid, the relay is closed.</p> <p>During the test: Fire cannot propagate beyond the EUT. Equipment shall not emitt molten metal. Enclosures shall not deform to cause non-compliance with the standard. Dielectric test is made on RI and BI between Pri. circuit and protective earthing terminal after the test. No Backfeed voltage on the test.</p>						

4.7 Electrical ratings tests								P
HNS5000TL		Input			Output rated			
Condition	Rated	U (V)	I (A)	P (W)	U (V)	I (A)	P (W)	S(VA)
I DC Max.	28	185.1	27.89	5162.4	230.86	21.73	5003	5017
I AC Max	24	353.9	14.59	5163.4	207.70	23.99	4988	4983
P AC Max.	5000	363.8	14.16	5151.4	230.62	21.65	4979	4993
HNS8000TL		Input			Output rated			
Condition	Rated	U (V)	I (A)	P (W)	U (V)	I (A)	P (W)	S(VA)
I DC Max.	14+26	180.5	39.89	7200.7	230.12	32.23	7418	7422
I AC Max	38.3	359.8	22.47	8084.7	209.23	38.27	7986	8007
P AC Max.	8000	360.2	22.37	8057.7	230.08	34.85	7998	8019
HNS10000TL		Input			Output rated			
Condition	Rated	U (V)	I (A)	P (W)	U (V)	I (A)	P (W)	S(VA)
I DC Max.	26*2	200.1	25.91	5185	230.54	22.22	5029	5122
I AC Max	50	359.6	28.88	10385	200.14	49.96	9999	10073
P AC Max.	10000	360.4	28.67	10331	229.79	43.61	10016	10021

7.3.6.3.3 TABLE: protective equipotential bonding;				P
Measured between:	Test current (A)	Voltage drop (V)	Resistance (mΩ)	result
AC earthing terminal to enclosure (HNS5000TL)	56.4 A	Max.0.28V	--	Pass
AC earthing terminal to enclosure (HNS8000TL)	84.8 A	Max.0.42V	--	Pass
AC earthing terminal to enclosure (HNS10000TL)	100.0A	Max.0.62V	--	Pass
supplementary information				

7.3.6.3.7 TABLE: touch current measurement				N/A
Measured between:	Measured (mA)	Limit (mA)	Comments/conditions	
Between earthing terminal of inverter and external protective earthing conductor	-	3.5mA a.c		
supplementary information: 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 instructions requiring a second protective earthing conductor to be installed.				

7.3.7	TABLE: clearance and creepage distance measurements						P
Model	HNS5000TL						
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)	
PV circuits and accessible metal enclosure (BI)-PCB	600V	230Vac	3.87	5.8	3.87	14.9	
Mains AC circuits and accessible metal enclosure (BI)-PCB	600V	230Vac	3.87	>20	3.87	>30	
PV circuits and SELV circuit (RI)- PCB	600V	230Vac	7.09	8	7.09	8	
Mains AC circuits and SELV circuit (RI)- PCB	600V	230Vac	7.09	>20	7.09	>20	
Main board PV circuit:							
BI between PV circuit (PV1+) to Earth through PCB (through C62)	600	230	3.87	7.48	3.87	7.48	
BI between PV circuit (PV1-) to Earth through PCB (through C60)	600	230	3.87	7.48	3.87	7.48	
FI between PV circuit PV1+ to PV1-through PCB	600	230	3.87	6.09	3.87	6.09	
FI between PV circuit BUS+ to BUS-through PCB	600	230	3.87	4.00	3.87	4.00	
BI between PV circuit (BUS+) to Earth through PCB (through C92)	600	230	3.87	5.82	3.87	5.82	
Main board AC circuit:							
BI between AC circuit (Grid L) to Earth through PCB (through C16)	600	230	3.87	6.00	3.87	6.00	
BI between AC circuit (Grid N) to Earth through PCB (through C62)	600	230	3.87	6.70	3.87	6.70	
FI between AC circuit grid L to N through PCB	600	230	3.87	4.60	3.87	4.60	
Communication circuit:							
RI between communication circuit and Control circuit through PCB under optocoupler (UF1/UF2)	600	230	7.09	7.12	7.09	12.00	
BI between communication circuit to Earth through PCB (through C201)	600	230	3.87	6.12	3.87	6.12	
PCE Unit:							
BI between DC input conductor to Metal enclosure	600	230	3.87	14.00	6.3	24.48	
BI between AC output conductor to Metal enclosure	600	230	3.87	>5	6.3	>20	
BI between IGBT pins to heat sink across insulation material (ceramic)	600	230	3.87	7.32	6.3	15.22	
Remark: overvoltage: AC main: OVCIII, PV: OVCII							

7.3.7	TABLE: clearance and creepage distance measurements						P
Model	HNS10000TL						
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)	
PV circuits and accessible metal enclosure (BI)-PCB	600	230	3.87	5.8	3.87	14.9	
Mains AC circuits and accessible metal enclosure (BI)-PCB	600	230	3.87	26	3.87	>30	
PV circuits and SELV circuit (RI)- PCB	600	230	7.09	8	7.09	8	
Mains AC circuits and SELV circuit (RI)- PCB	600	230	7.09	>20	7.09	>20	
Main board PV circuit:							
BI between PV circuit (PV1+) to Earth through PCB (through C62)	600	230	3.87	7.48	3.87	7.48	
BI between PV circuit (PV1-) to Earth through PCB (through C60)	600	230	3.87	7.48	3.87	7.48	
FI between PV circuit PV1+ to PV1-through PCB	600	230	3.87	6.09	3.87	6.09	
FI between PV circuit BUS+ to BUS-through PCB	600	230	3.87	4.00	3.87	4.00	
BI between PV circuit (BUS+) to Earth through PCB (through C92)	600	230	3.87	5.82	3.87	5.82	
Main board AC circuit:							
BI between AC circuit (Grid L) to Earth through PCB (through C16)	600	230	3.87	6.00	3.87	6.00	
BI between AC circuit (Grid N) to Earth through PCB (through C62)	600	230	3.87	6.70	3.87	6.70	
FI between AC circuit grid L to N through PCB	600	230	3.87	4.60	3.87	4.60	
Communication circuit:							
RI between communication circuit and Control circuit through PCB under optocoupler (UF1/UF2)	600	230	7.09	7.12	7.09	12.00	
BI between communication circuit to Earth through PCB (through C201)	600	230	3.87	6.12	3.87	6.12	
PCE Unit:							
BI between DC input conductor to Metal enclosure	600	230	3.87	14.00	6.3	24.48	
BI between AC output conductor to Metal enclosure	600	230	3.87	28.18	6.3	>40	
BI between IGBT pins to heat sink across insulation material (ceramic)	600	230	3.87	7.32	6.3	15.22	
Remark: overvoltage: AC main: OVCIII, PV: OVCII							

7.5 TABLE: electric strength measurements, impulse voltage test and partial discharge test				P
test voltage applied between:	test voltage (V)	impulse withstand voltage (V)	partial discharge extinction voltage (V)	result
Mains AC circuits and accessible metal enclosure (BI)	1500V AC/2120V DC	4000V	-	Pass
PV circuits and accessible metal enclosure (BI)	1500V AC/2120V DC	4000V	-	Pass
Mains AC circuits and SELV circuit (RI)	3000V AC/4240V DC	6000V	-	Pass
PV circuits and SELV circuit (RI)	3000V AC/4240V DC	6000V	-	Pass
Remark: OVC II for PV input circuit, OCV III for mains circuit				

7.5.4 TABLE: Touch current measurement			N/A
Leakage current between	I (mA)	Max. allowed I (mA)	
Metal enclosure → ground	-	-	
Communication port → ground	-	-	

9.2	TABLE: Limited power sources					N/A
Circuit output tested:						
Note: Measured Uoc (V) with all load circuits disconnected:						
Components	Sample No.	Uoc (V)	I _{sc} (A)		VA	
			Meas.	Limit	Meas.	Limit
supplementary information:						
Sc=Short circuit, Oc=Open circuit						

14	TABLE: list of critical components					P
object/part No.	manufacturer/ trademark	type/model	technical data	standard	mark(s) of conformity ¹⁾	
Cover of enclosure (HNS5000TL)	Guangzhou Weizheng Sheet Metal Fabrication Co., Ltd.	6533-0210	360*320*86 mm Made of aluminium, 2 mm thickness.	IEC/EN 62109-1:2010	Tested with appliance	
Heat sink for the bottom of enclosure (HNS5000TL)	Aerospace Huashengyuan Electrical (SuZhou) Co., Ltd.	6557-0099	360*320*54.5 mm Made of aluminium	IEC/EN 62109-1:2010	Tested with appliance	
AC connector (HNS5000TL)	SUZHOU EXCEEDCONN TECHNOLOGY CO., LTD.	EN030-1126-0001	250V/25A, RSV 4000V, V-0, IP68, -40~+105°C	IEC/EN 61535:2019	TUV B 077046018 Rev.01	
Relay (ALFG1) (HNS5000TL)	XIAMEN HONGFA ELECTROACOUSTIC CO., LTD	HF32F/005-HS	5Vdc, 5A, Viso 2500V, -40~85 °C	IEC/EN 61810-1:2015	VDE 40012204	
Relay (RL1, RL2, RL3, RL4) (HNS5000TL)	XIAMEN HONGFA ELECTROACOUSTIC CO., LTD	HF161F-W/12-HT (477)	277Vac, 33A, Viso 2500V, -40~85 °C, Contact gap: 1.8 mm	IEC/EN 61810-1:2015	VDE 40031410	
Cover of enclosure (HNS10000TL)	Ningbo Win'o Manufacturing Co., Ltd.	6533-0192	460*370*195mm Made of aluminium, 2 mm thickness.	IEC/EN 62109-1:2010	Tested with appliance	
Enclosure (HNS10000TL)	Jiaxing Zhulian Electric Appliance Co. LTD	6527-0210	460*370*176 mm ADC12, Mini 2mm thickness	IEC/EN 62109-1:2010	Tested with appliance	
AC terminal (HNS10000TL)	SHENZHEN CONNECTION ELECTRONIC CO., LTD.	DSTB8	4P, copper, 600V/50A, RSV 3000V, V-0, -40~+105°C UL E304128	IEC/EN 62109-1:2010	Tested with appliance	
Material for enclosure of AC output (HNS10000TL)	Covestro	Makrolo	2807 + (z)(f2) outdoor use, V-2 UL E41613	IEC/EN 62109-1:2010	Tested with appliance	
Gasket enclosure of AC output (HNS10000TL)	WUJIANG FLYUP	3FH60B09	NBR+F13, NEMA 4X, 6, -40~75°C. UL MH60110	IEC/EN 62109-1:2010	Tested with appliance	
Relay (ALFG1) (HNS10000TL)	XIAMEN HONGFA ELECTROACOUSTIC CO., LTD	HF140FF/012-2HSWTF	12Vdc, 10A, 250Vac Viso 5000V, -40~85 °C Contact gap: 2.0 mm	IEC/EN 61810-1:2004	TUV R 50149131	
Relay (RL1, RL2, RL3, RL4) (HNS10000TL)	Zettler Electronics, GmbH	AZSR143-1AE-12D103	50A, 480Vac, -40~85 °C, Viso 4500V Contact gap: 2.0 mm	IEC/EN 61810-1:2015	TUV B088793001 5	
(Alternative) (HNS10000TL)	SONGCHUAN	HF161F-40W/12HTF (967)	43A, 277Vac, -40~85 °C, Viso 2500V Contact gap: 1.8 mm	IEC/EN 61810-1:2015	TUV R 50475730	
External fan (HNS10000TL)	MINEBEAMITSUMI INC	NDB1530_0802 5DE12NCUD	12V, 5250RPM, -20~70°C, IP68. UL E89936	IEC/EN 62109-1:2010	Tested with appliance	

14	TABLE: list of critical components					P
object/part No.	manufacturer/ trademark	type/model	technical data	standard	mark(s) of conformity ¹⁾	
External fan connector (HNS10000TL)	Shanghai Fuerkang Precision Electronic Technology Co., LTD	JST 04R-JWPF-VSLE-S/JST 04T-JWPF-VSLE-S	10A max, 105°C	IEC/EN 62109-1:2010	Tested with appliance	
External fan wire (HNS10000TL)	SHANGHAI JINGFENG WIRE & CABLE CO LTD	2547	500V, 80°C, 22AWG. UL E320487	IEC/EN 62109-1:2010	Tested with appliance	
Cover for LED	Covestro Deutschland AG [PC Resins]	Makrolon:2805+(z)(f1)	PC, UL94V-2, UV resistance f1, -40~115°C UL E41613	IEC/EN 62109-1:2010	Tested with appliance	
Adhesive-type label	3M	4646	Al surface Outdoor use, -35~110°C UL 969, UL E17478	IEC/EN 62109-1:2010	Tested with appliance	
Heat shrink tube	Changyuan Electronics Group Co., Ltd	CB-600	600V, 105°C, VW-1. cURus E180908	IEC/EN 62109-1:2010	Tested with appliance	
Gasket sealing	RAMPF Polymer Solution GmbH & Co KG	RAKU@PUR 32-3250-8	-40°C~100°C cURus MH30032	IEC/EN 62109-1:2010	Tested with appliance	
Water proof seals	Ningbo Yusheng Electric Co., Ltd.	M20x1.5	PA6, UL 94V-2, -40~110°C.	IEC/EN 62109-1:2010	Tested with appliance	
Waterproof seals material	DOMO ENGINEERING PLASTICS EUROPE SPA	6G30 V0EF(d)(f2)	Outdoor use, PA6, UL 94, V-0. E170540	IEC/EN 62109-1:2010	Tested with appliance	
Muti-functional Vents	Shanghai PuWei	PPCM1215107 EW	IP65, UV resistance	IEC/EN 62109-1:2010	Tested with appliance	
Com connector	SuZhou LuYi Electronic Technology Co., Ltd.	HJA042101	10A/250V, IP68, -40 ~85°C	EN61984:2009	TUV No. B107880 0001Rev.00	
Material for com connector	E I DUPONT DE NEMOURS & CO INC	FR50	V-0, UV resistance, f1 E41938	IEC/EN 62109-1:2010	Tested with appliance	
PV connector	Dongguan Vaconn Electronic Technology co., Ltd.	VP-D4B-PHSM4, VP-D4B-PHSF4	1100V/30A, IP68, -40~85°C	IEC 62852:2014 EN 62852:2015	TUV R 50396796	
Gasket enclosure of AC output	WUJIANG FLYUP	3FH60B09	NBR+F13, NEMA 4X, 6, -40~75°C. UL MH60110	IEC/EN 62109-1:2010	Tested with appliance	
Gland or outlet bushing for external fan wire	JiaXing ShengYang Electric Co., Ltd	JAR-K-M16	M16*1.5, PA66, -40-100°C. UL E506986	IEC/EN 62109-1:2010	Tested with appliance	
Grounding terminal	Suzhou Haiyou Wei Precision Hardware Co., Ltd	M4*10 Three combination screws	M40*10, SUS304	IEC/EN 62109-1:2010	Tested with appliance	
DC cable	3Q CABLE	1015	750Vdc, 105°C, 12AWG, UL758 UL E341104	IEC/EN 62109-1:2010	Tested with appliance	
DC cable	3Q CABLE	10269	1250Vdc, 105°C, 12AWG, UL758 UL E341104	IEC/EN 62109-1:2010	Tested with appliance	

14	TABLE: list of critical components					P
object/part No.	manufacturer/ trademark	type/model	technical data	standard	mark(s) of conformity ¹⁾	
AC cable	3Q CABLE	10269	1000Vac, 105°C, 10AWG, UL758 UL E341104	IEC/EN 62109- 1:2010	Tested with appliance	
AC cable	3Q CABLE	10269	1000Vac, 105°C, 12AWG, UL758 UL E341104	IEC/EN 62109- 1:2010	Tested with appliance	
PCB	Kunshan dayang printed circuit board Co.,Ltd	Type: DY-M	V-0, 130°C, UL E360224	IEC/EN 62109- 1:2010	Tested with appliance	
Optocoupler (U9, U18, U28, U29, U30, U36, U37, U38)	FAIRCHILD SEMICONDUCTOR CORP	FOD3120SD	1CH, 2.5A, 8-SMD, 5000Vrms -40~100 °C	IEC/EN 60747- 5-5:2011; A1:2015	VDE 40018398	
Transformer	Shanghai damask s atin electric technolo gy Co.,Ltd.	AF-SPS-HER- V0.5	Class A, 130°C	IEC/EN 62109- 1:2010	Tested with appliance	
-Bobbin	CHANGCHUN PLASTICS CO., LTD.	T375HF	150°C, V-0 E59481	IEC/EN 62109- 1:2010	Tested with appliance	
-Magnet Wire	DONGGUAN YIDA INDUSTRIAL CO., LTD	xUEW/155	MW79-C, 155°C E344055	IEC/EN 62109- 1:2010	Tested with appliance	
-Core of SPS transformer	HAINING WANDA JIAYUAN ELECTRONICS CO., LTD	ETD3435 WD4A	WD4A	IEC/EN 62109- 1:2010	Tested with appliance	
-Tape	JINGJIANG JINGYI ADHESIVE PRODUCT CO., LTD.	JY25-A	T0.025, 130°C E246950	IEC/EN 62109- 1:2010	Tested with appliance	
-Margin tape	JINGJIANG JINGYI ADHESIVE PRODUCT CO., LTD. (UL 246950)	WF310	130°C E246950	IEC/EN 62109- 1:2010	Tested with appliance	
Power inductor	SHANGHAI JINGWAY ELECTRONICS CO., LTD	PD100221010A 0	Class H, 3000VAC, 180°C	IEC/EN 62109- 1:2010	Tested with appliance	
-Insulation sheet for inductor	CHANGSHU LIANGYI TAPE INDUSTRY CO., LTD	LY-20X	180°C E246820	IEC/EN 62109- 1:2010	Tested with appliance	
-Magnet Wire	DONGGUAN YIDA INDUSTRILA CO., LTD	PEW-H	Polyester-imide, 180°C UL: E344055	IEC/EN 62109- 1:2010	Tested with appliance	
MOV (RV1, RV2, RV7)	Brightking	681KN14	420Vac, 560Vdc, 680V1mA, -40~+85°C	IEC61051-2: 1991	VDE 40027827	
X capacitor (C46, C148)	Xiamen Faratronic Co., Ltd.	C4BQ2225K9W C400	2.2uf, 305VAC	EN 60384-14: 2013+A1	ENEC14, SEMKO SE/0366-6B	

14	TABLE: list of critical components					P
object/part No.	manufacturer/ trademark	type/model	technical data	standard	mark(s) of conformity ¹⁾	
Y capacitor (C14, C15, C60, C62, C201, C269, C270, C271, C272, C282, C283, C284)	Xiamen Faratronic Co., Ltd.	C43Q1102M40 C000	Y2, 300 Vac, 1000pF,	EN 60384-14 : 2013+A1	ENEC14, SEMKO SE/0366-2D	
Y Capacitor (C92, C149, C156, C166, C276, C277, C278, C279, C286)	Xiamen Faratronic Co., Ltd.	C43Q1472M40 C000	Y2, 300 Vac, 4.7nF,	EN 60384-14 : 2013	ENEC14, SEMKO 0366-2D	
DC bus capacitor	CAPXON ELECTRONIC (SHEN ZHEN) CO., LTD	315VXH1000M	315V, 1000uF, - 40~105°C	IEC/EN 62109- 1:2010	Tested with appliance	
(Alternative)	NCC	EKM3B1VSN 102MA45S	315V, 1000uF, - 25~105°C	IEC/EN 62109- 1:2010	Tested with appliance	
(Alternative)	NCC	ELXS3B1VSN1 02MA45S	315V, 1000uF, - 25~105°C	IEC/EN 62109- 1:2010	Tested with appliance	
DC Choke (L4)	Guangzhou EMC technology Co., Ltd	EMC-L0016	150°C, 1.74mH.	IEC/EN 62109- 1:2010	Tested with appliance	
AC Choke (CT1, CT2)	Shanghai damask satin electric technology Co., Ltd	CL0160090020 2	150°C, 0.5mH.	IEC/EN 62109- 1:2010	Tested with appliance	
Current sensor for DC part (UT1, UT2)	Ningbo Sinomags Technology Co., LTD	STK-20PL	l _{pn} : 20A, -40°C~105°C. E507664	IEC/EN 62109- 1:2010	Tested with appliance	
Current sensor for AC part (HCT1)	VAC	4646-X764	l _{pn} : 50A, -40°C~85°C. E317483	IEC/EN 62109- 1:2010	Tested with appliance	
(Alternative)	LEM	CASR50-NP	l _{pn} : 50A, -40°C~85°C. E189713	IEC/EN 62109- 1:2010	Tested with appliance	
DSP (U15)	ST	STM32F405RG T6	-40°C~ 85°C LQFP-64	IEC/EN 62109- 1:2010	Tested with appliance	
Slave CPU (U11)	ST	STM32F030R8	MCU -40°C~85°C LQFP-64	IEC/EN 62109- 1:2010	Tested with appliance	
Communicatio n CPU (U17)	ST	STM32F070CB	MCU -40°C~85°C LQFP-48	IEC/EN 62109- 1:2010	Tested with appliance	
IGBT (Q2, Q3)	ST	STGWA40H65 DFB	40A/650V	IEC/EN 62109- 1:2010	Tested with appliance	
IGBT (QA1, QA3, QB1-4)	ON Semiconductor	FGHL75T65MQ D	75A/650V	IEC/EN 62109- 1:2010	Tested with appliance	
(Alternative)	infinon	IKW75N65ES5	75A/650V	IEC/EN 62109- 1:2010	Tested with appliance	
Zero-sequence Current sensor	Jingpeng	JP-H-12172 JP2605	50mm, 200°C	IEC/EN 62109- 1:2010	Tested with appliance	
Insulation sheet for IGBT	SHENZHEN CITY JIA RIFENG TAI ELECTRONIC TECHNOLOGY CO., LTD	JRF-TC025	1600°C, 35*22*1mm	IEC/EN 62109- 1:2010	Tested with appliance	

Appendix1 Photos:

Overview-HNS5000TL



Overview-HNS5000TL



Appendix1 Photos:

Overview-HNS5000TL



Overview-HNS5000TL



Appendix1 Photos:

Overview-HNS5000TL

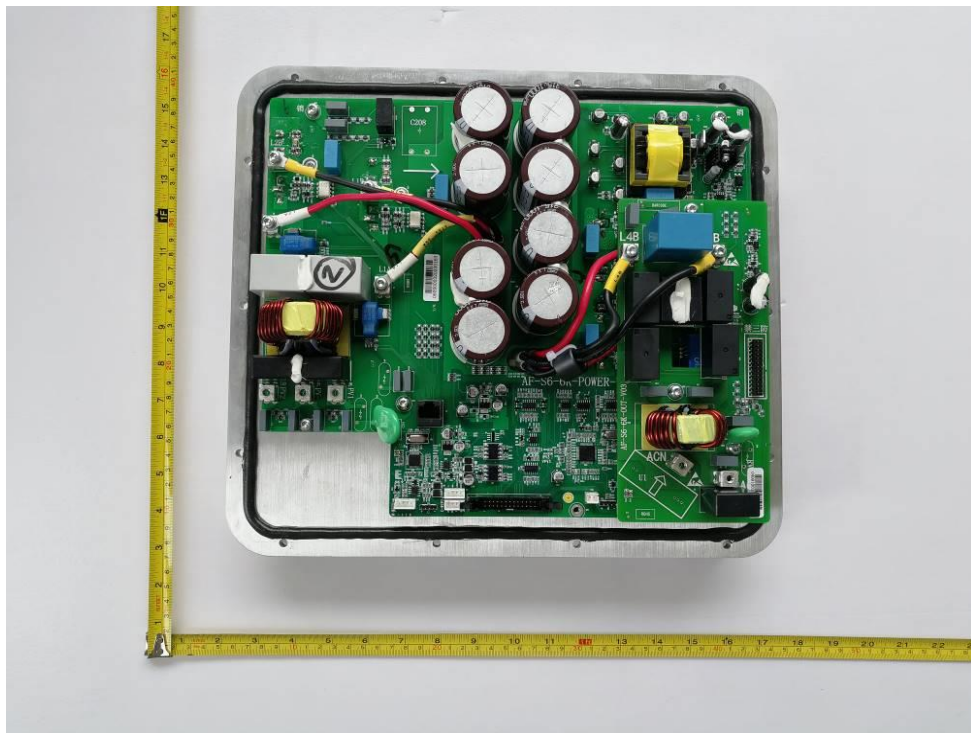


Internal View- HNS5000TL

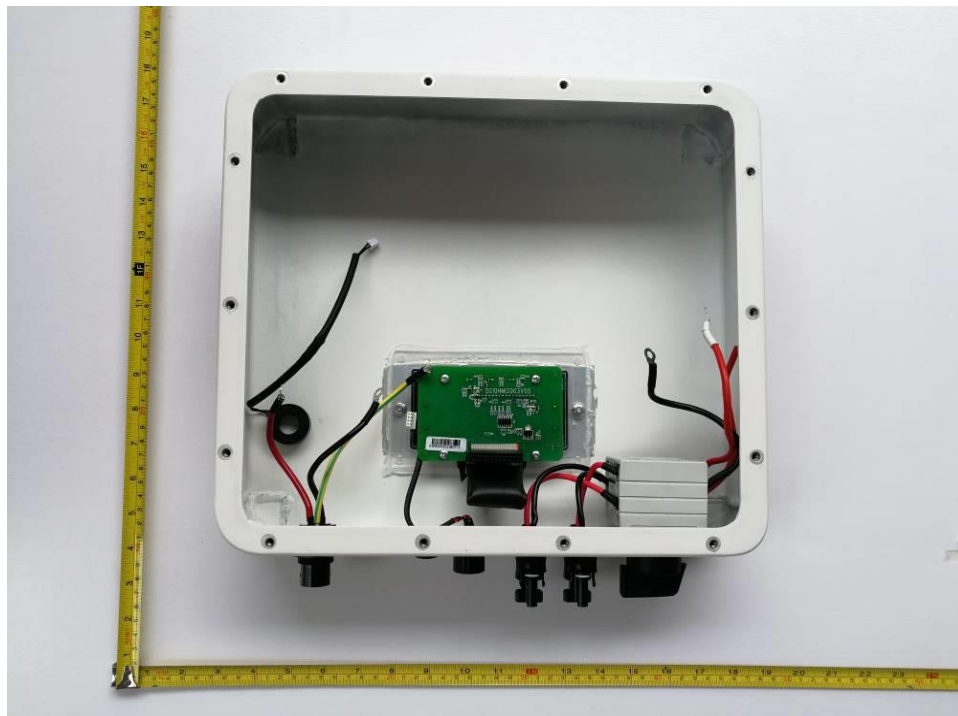


Appendix1 Photos:

Internal View-HNS5000TL

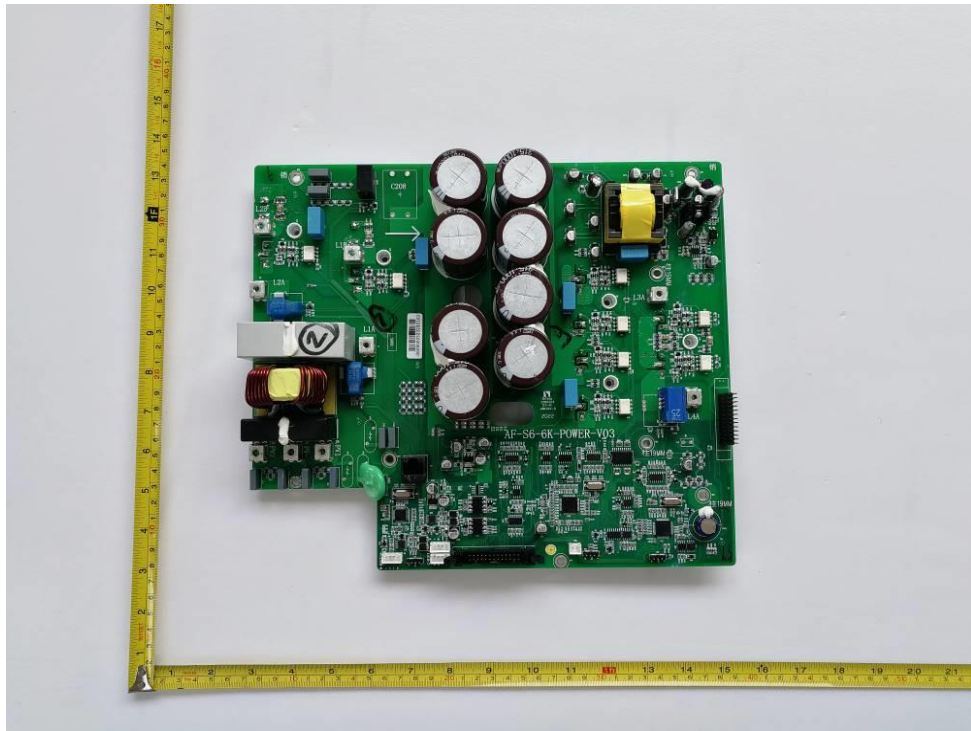


Internal View-HNS5000TL

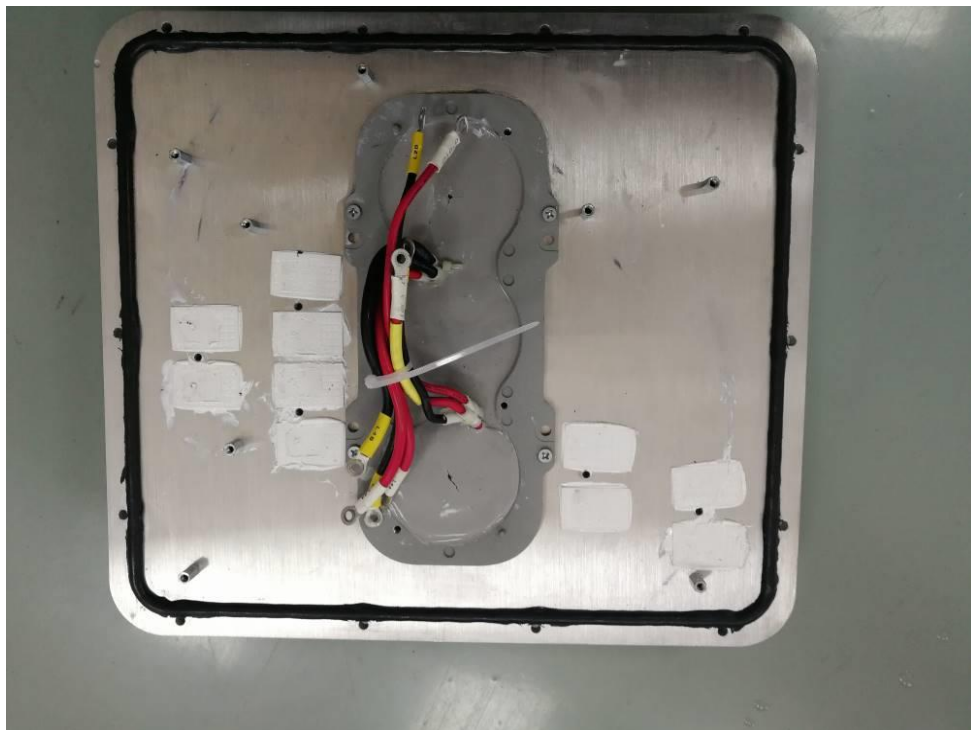


Appendix1 Photos:

Internal View-HNS5000TL



Internal View-HNS5000TL



Appendix1 Photos:

Overview-HNS8000TL



Overview-HNS8000TL



Appendix1 Photos:

Overview-HNS8000TL



Overview-HNS8000TL



Appendix1 Photos:

Overview-HNS8000TL- Secondary grounding



Internal View-grounding

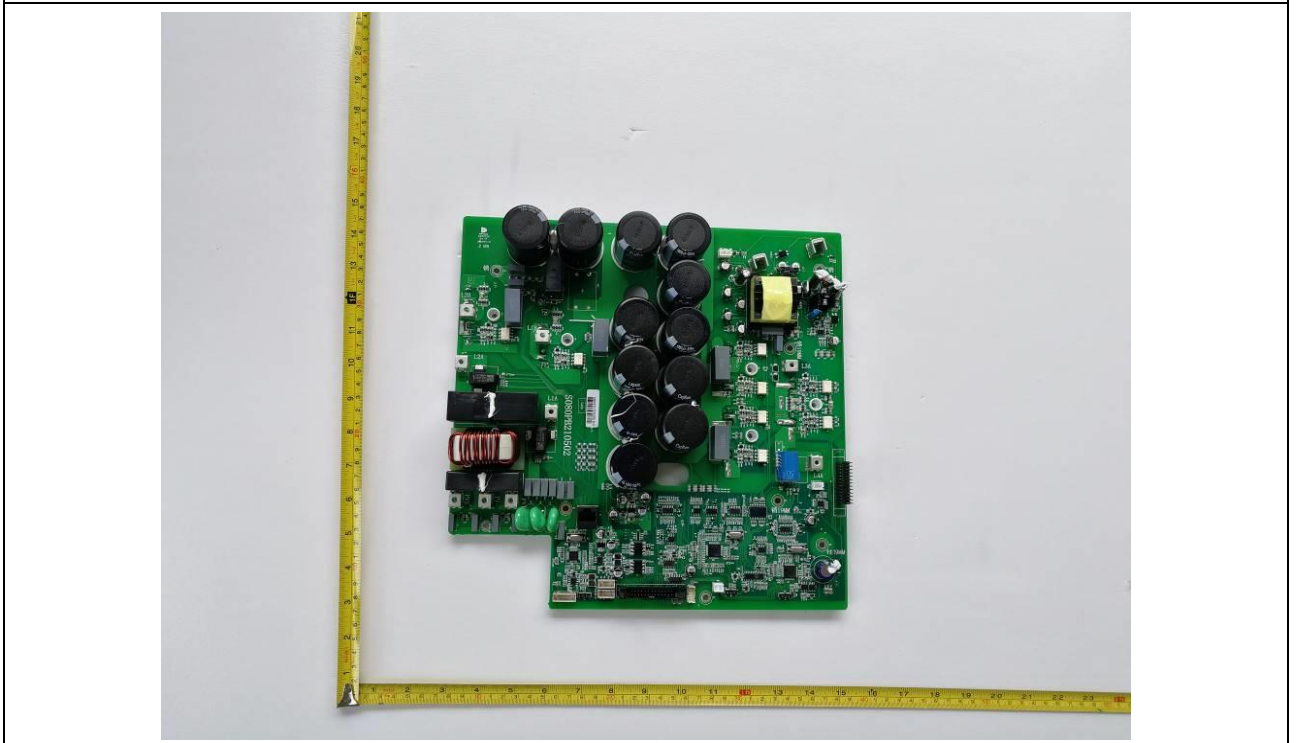


Appendix1 Photos:

Internal View-HNS8000TL

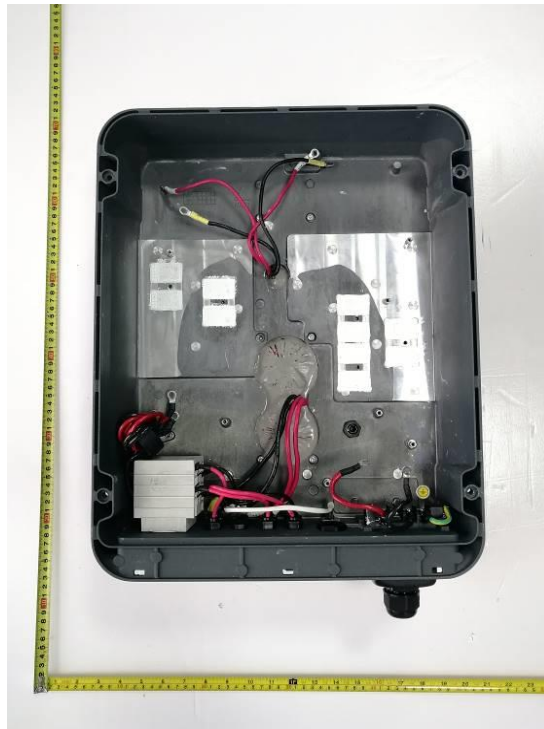


Internal View-HNS8000TL



Appendix1 Photos:

Internal View-HNS8000TL



Overview-HNS10000TL



Overview-HNS10000TL



Overview-HNS10000TL



Appendix1 Photos:

Overview-HNS10000TL



Overview-HNS5000TL



Appendix1 Photos:

Overview-HNS10000TL- Secondary grounding



Internal View-grounding

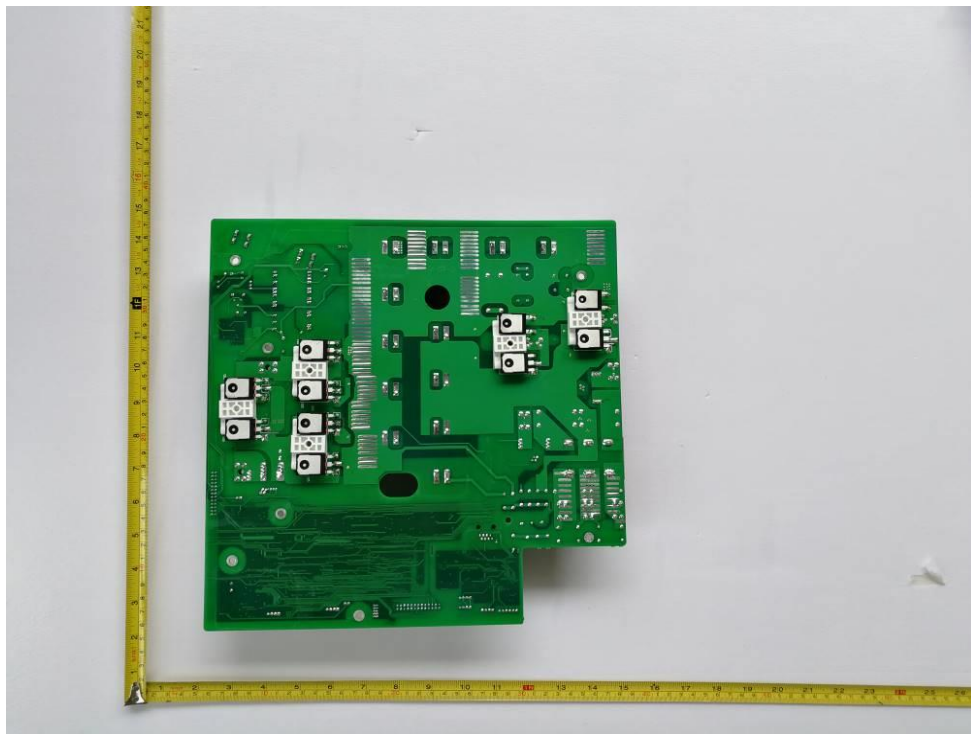


Appendix1 Photos:

Internal View-HNS1000TL

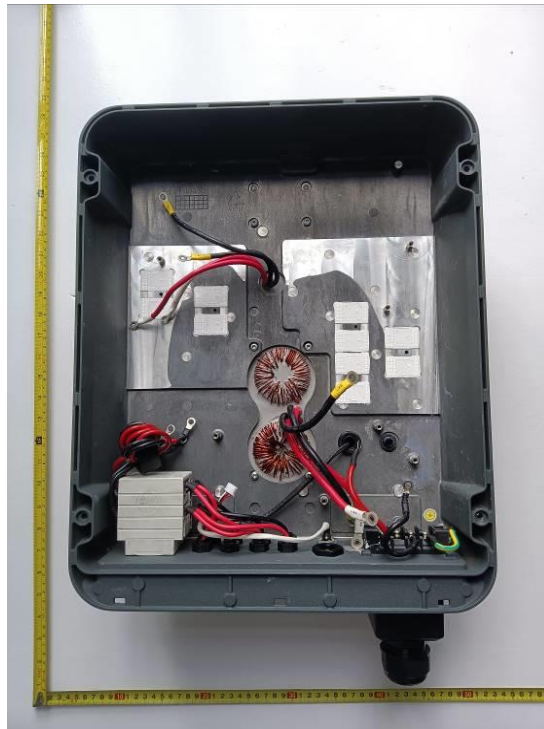


Internal View-HNS1000TL

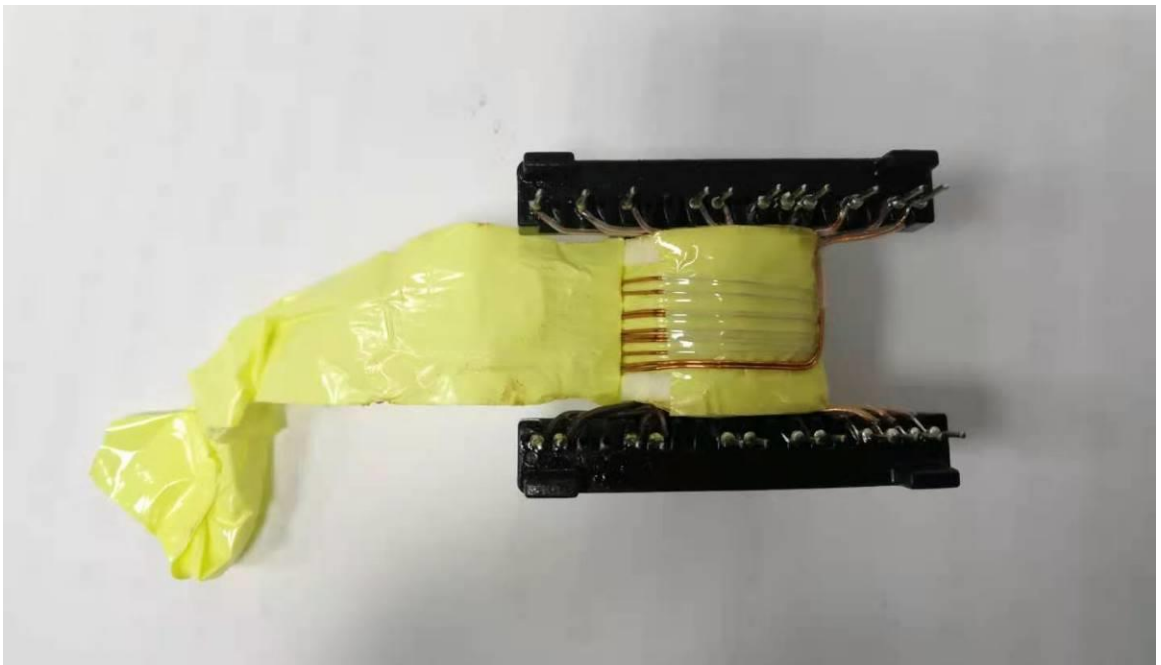


Appendix1 Photos:

Internal View-HNS1000TL

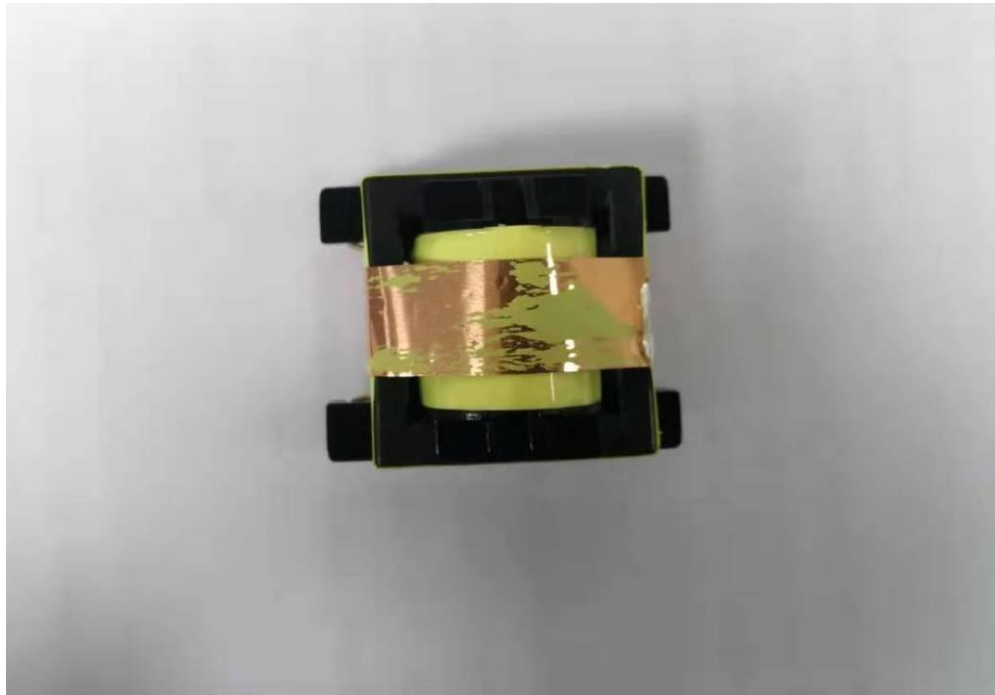


transformer



Appendix1 Photos:

transformer



transformer



Appendix1 Photos:

Inductor



Inductor



Appendix1 Photos:



End of Test Report