



中国认可
国际互认
检测
TESTING
CNAS L14701

TEST REPORT


Application number: PVP01079/22B-01

Applicant: Shenzhen Hopewind Technology Co., Ltd.

Address: A1 Area of Building 6, Jinhaoyuan, No.1 of Yanshan Avenue, Yanchuan Community, Songgang Sub-district, Baoan District, Shenzhen, Guangdong Province, China

Equipment Type: PV Grid-interactive Inverter

Model Name: hopeSun 100KTL, hopeSun 110KTL, hopeSun 125KTL-M, hopeSun 136KTL-M

Brand Name:  Hopewind

Ratings: See copy of marking label and model list.

Test Standard: IEC 62109-1:2010; EN 62109-1:2010

Test Date: Jan. 02, 2022 to Feb. 19, 2022

Date of Issue: May. 10, 2022

ISSUED BY:

Dongguan BALUN Testing Technology Co., Ltd.

Tested by: Ben Liu

Ben Liu

Checked by: Xingzhen Man

Xingzhen Man

Approved by: Simon Qi

Simon Qi



Revision History

Version	Issue Date	Revisions Content
<u>Rev. 01</u>	<u>May. 10, 2022</u>	<u>Initial Issue</u>

List of Attachments:

Attachments 1 –Test report of IEC 62109-2: 2011 (34 pages)

Summary of testing:

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

Tests performed (name of test and test clause):

- ☒ 4.3 Thermal testing
- ☒ 4.4 Testing in fault condition
- ☒ 4.5 Humidity preconditioning
- ☒ 4.7 Electrical ratings tests
- ☒ 5.1.2 Durability of markings
- ☒ 6.3 Ingress protection☆
- ☒ 7.3.2.2 DVC level under normal condition
- ☒ 7.3.2.3 DVC level under single fault conditions
- ☒ 7.3.4.2.3 Access probe tests
- ☒ 7.3.6.3 Protective class I - Protective bonding and earthing
- ☒ 7.3.7.4,7.3.7.5 Clearance and Creepage distances
- ☒ 7.3.7.5.2 Working voltage
- ☒ 7.3.9 Capacitor discharge
- ☒ 7.4 Protection against energy hazards
- ☒ 7.5.1 Impulse voltage test
- ☒ 7.5.2 Voltage test (dielectric strength test)
- ☒ 7.5.4 Touch current measurement
- ☒ 8.5 Wall mounting
- ☒ 10.2 Sonic Pressure and Sound Level
- ☒ 13.7 Mechanical resistance to deflection, impact or drop

Testing location 1:

Dongguan BALUN Testing Technology Co., Ltd.
Room 104, 204, 205, Building 1, No. 6, Industrial South Road, Songshan Lake District, Dongguan, Guangdong, China

Testing location 2:

The tests of clause 6.3 Ingress protection were performed in:

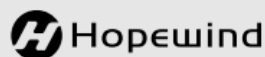
Shenzhen Chengxin Technology Service Co., Ltd
No. 13 North of Aiqun Road, Shiyan Street, Baoan District, Shenzhen, Guangdong, China

Report No: CTS20210235-S-2022-03-22-M1, issued by Shenzhen Chengxin Technology service Co., Ltd. (CNAS L12944) Dated on Mar. 22, 2022, total 17 pages.

All tests except Ingress protection are performed at testing location 1

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

Copy of marking plate:

光伏并网逆变器
PV Grid-interactive Inverter

型号 Model: hopeSun 100KTL

产品序列号 Serial No.: 贴序列号标签

制造日期 Manufacture Date: 制造日期标签

最大输入电压 Max. Input Voltage: 1100Vd.c.

MPP电压范围 MPP Voltage Range: 200-1000Vd.c.

最大输入电流 Max. Input Current: 65A/65A/65A/65A

最大短路电流 Isc PV: 100A/100A/100A/100A

直流侧 DC

输出电压 Nominal Output Voltage: 400Va.c./230Va.c.; 3P+N+PE

输出频率 Nominal Output Frequency: 50Hz/60Hz

额定输出功率 Rated Output Power: 100kW

最大输出功率 Max. Output Power: 110kW

最大输出电流 Max. Output Current: 158.8A

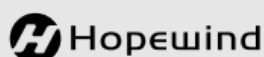
功率因数 Power Factor: 0.9 (lagging) -0.9 (leading)

交流侧 AC

工作环境温度 Operating Ambient Temperature: -40 to +60°C

防护等级 Ingress Protection: IP65

保护等级 Protection Class: I

深圳市禾望科技有限公司
Shenzhen Hopewind Technology Co., Ltd中国制造
MADE IN CHINA光伏并网逆变器
PV Grid-interactive Inverter

型号 Model: hopeSun 110KTL

产品序列号 Serial No.: 贴序列号标签

制造日期 Manufacture Date: 制造日期标签

最大输入电压 Max. Input Voltage: 1100Vd.c.

MPP电压范围 MPP Voltage Range: 200-1000Vd.c.

最大输入电流 Max. Input Current: 65A/65A/65A/65A

最大短路电流 Isc PV: 100A/100A/100A/100A

直流侧 DC

输出电压 Nominal Output Voltage: 400Va.c./230Va.c.; 3P+N+PE

输出频率 Nominal Output Frequency: 50Hz/60Hz

额定输出功率 Rated Output Power: 110kW

最大输出功率 Max. Output Power: 121kW

最大输出电流 Max. Output Current: 174.6A

功率因数 Power Factor: 0.9 (lagging) -0.9 (leading)

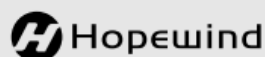
交流侧 AC

工作环境温度 Operating Ambient Temperature: -40 to +60°C

防护等级 Ingress Protection: IP65

保护等级 Protection Class: I

深圳市禾望科技有限公司
Shenzhen Hopewind Technology Co., Ltd中国制造
MADE IN CHINA

光伏并网逆变器
PV Grid-interactive Inverter

型号 Model: hopeSun 125KTL-M

产品序列号 Serial No.: 贴序列号标签

制造日期 Manufacture Date: 制造日期标签

最大输入电压 Max.Input Voltage: 1100Vd.c.

MPP电压范围 MPP Voltage Range: 200-1000Vd.c.

最大输入电流 Max. Input Current: 65A/65A/65A/65A

最大短路电流 Isc PV: 100A/100A/100A/100A

直流侧 DC

输出电压 Nominal Output Voltage: 500Va.c.;3P+N+PE

输出频率 Nominal Output Frequency: 50Hz/60Hz

额定输出功率 Rated Output Power: 125kW

最大输出功率 Max.Output Power: 137.5kW

最大输出电流 Max. Output Current: 158.8A

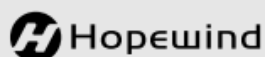
功率因数 Power Factor: 0.9 (lagging) -0.9 (leading)

交流侧 AC

工作环境温度 Operating Ambient Temperature: -40 to +60°C

防护等级 Ingress Protection: IP65

保护等级 ProtectionClass: I

深圳市禾望科技有限公司
Shenzhen Hopewind Technology Co.,Ltd中国制造
MADE IN CHINA光伏并网逆变器
PV Grid-interactive Inverter

型号 Model: hopeSun 136KTL-M

产品序列号 Serial No.: 贴序列号标签

制造日期 Manufacture Date: 制造日期标签

最大输入电压 Max.Input Voltage: 1100Vd.c.

MPP电压范围 MPP Voltage Range: 250-1000Vdc

最大输入电流 Max. Input Current: 65A/65A/65A/65A

最大短路电流 Isc PV: 100A/100A/100A/100A

直流侧 DC

输出电压 Nominal Output Voltage: 520Va.c.;3P+PE

输出频率 Nominal Output Frequency: 50Hz/60Hz

额定输出功率 Rated Output Power: 136KW

最大输出功率 Max.Output Power: 150KW

最大输出电流 Max. Output Current: 174.6A

功率因数 Power Factor: 0.8(lagging) -0.8(leading)

交流侧 AC

工作环境温度 Operating Ambient Temperature: -40 to +60°C

防护等级 Ingress Protection: IP65

保护等级 ProtectionClass: I

深圳市禾望科技有限公司
Shenzhen Hopewind Technology Co.,Ltd中国制造
MADE IN CHINA

Test item particulars..... :	
Equipment mobility	Permanent connection
Operating condition..... :	Continuous
Environmental category	Outdoor use
Over voltage category Mains	OVC III
Over voltage category PV	OVC II
Class of equipment..... :	Class I
Pollution degree	PD3 (internal reduced to PD2)
IP protection class	IP65
Mass of equipment (kg)	See model list.
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)

General remarks:

"(See Enclosure #)" refers to additional information appended to the report.

"(See appended table)" refers to a table appended to the report.

Throughout this report a ☐ comma / ☒ point is used as the decimal separator.

Manufacturer's Declaration per sub-clause 4.2.5 of IEC 60335-1:

The application for obtaining a CB Test Certificate includes more than one factory location and a declaration from the Manufacturer stating that the sample(s) submitted for evaluation is (are) representative of the products from each factory has been provided

☐ Yes

☒ Not applicable

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

Name and address of manufacturer (ies) : Shenzhen Hopewind Technology Co., Ltd
A1 Area of Building 6, Jinhaoyuan, No.1 of Yanshan Avenue, Yanchuan Community, Songgang Sub-district, Baoan District, Shenzhen, Guangdong Province, China

Name and address of factory (ies) : Suzhou Hopewind Electric Co., LTD
555 Songjia Road, wusongjiang science and Technology Industrial Park, wuzhong Economic Development Zone, Suzhou. Jiangsu Province, China

General product information:

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

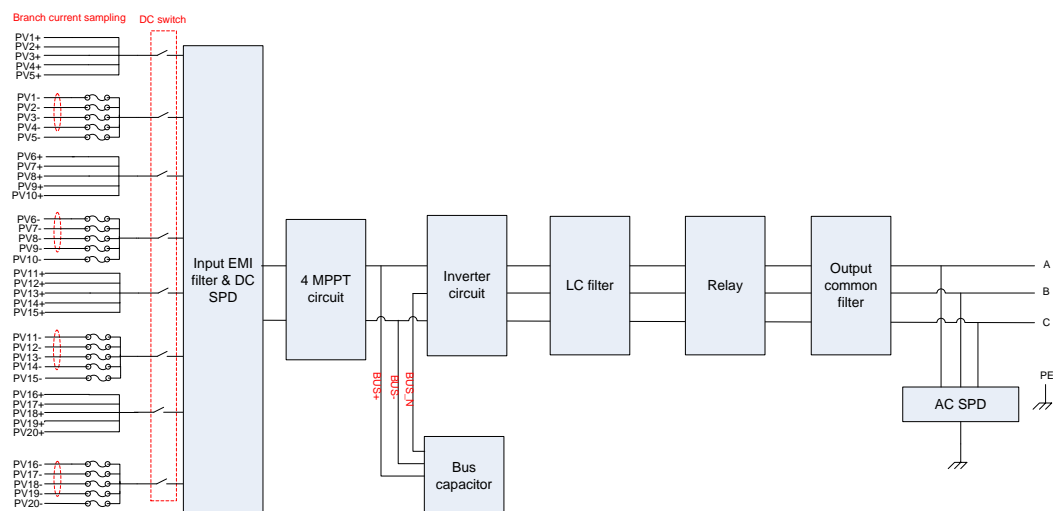
Models hopeSun 100KTL, hopeSun 110KTL, hopeSun 125KTL-M and hopeSun 136KTL-M have same PCB layout, communication port, electric circuits, electronic control circuits, and have similar software protection designed. The difference is that the output voltage is different and software limits the output power and the use of certain components. Refer the Model list for detail.

The maximum ambient temperature permitted by the manufacturer's specification is 60°C, all tests performed at hopeSun 136KTL-M unless otherwise stated

No.	Difference	Model			
		hopeSun 100KTL	hopeSun 110KTL,	hopeSun 125KTL-M	hopeSun 136KTL-M
1	Gird Voltage	400Va.c.	400Va.c.	500Va.c.	520Va.c.
2	Neutral wire	3P+N+PE	3P+N+PE	3P+N+PE	3P+PE

Hardware version: hopeSunC4_PCB_A
 hopeSunF7_PCB_A
 hopeSunHVB2_PCB_B
 hopeSunME_PCB_A
 hopeSunP7_PCB_A
 hopeSunWP_PCB_A
 hopeSunWQ_PCB_A

Software version: bootloader: V102.003.000
 FPGA: 108.000.000
 Inverter side: 106.005.000
 Boost side: 569.004.000

Block diagram of the utility interactive inverter:

Model list:

Model or Type designation	hopeSun 100KTL	hopeSun 110KTL	hopeSun 125KTL-M	hopeSun 136KTL-M
PV Input Parameters				
V _{max} PV [V d.c.]	1100			
MPPT Voltage Range [V d.c.]	200-1000	200-1000	200-1000	250-1000
Max. PV Input Current [A d.c.]	65/65/65/65			
DC Short-circuit Current [A d.c.]	100/100/100/100			
AC Output Parameters				
Rated Output Voltage [V a.c.]	400/230; 3P+N+PE	400/230; 3P+N+PE	500; 3P+N+PE	520; 3P+PE
Rated Output Frequency [Hz]	50/60			
Rated Output Power [kW]	100	110	125	136
Max. Apparent Output Power [kVA]	110	121	137.5	150
Max. Output Current [A a.c.]	158.8	174.6	158.8	174.6
Power Factor cosφ [λ]	0.9 (lagging)-0.9 (leading)			
Others				
Protective Class	Class I			
Inverter Topology	Non-isolated			
Operation Temperature Range	-40~60°C			
Ingress Protection	IP65			
Size [W*H*D mm]	800mm*680mm*315mm			
Weight [kg]	90			
Overvoltage Category	DC II, AC III			

Throughout the test report following abbreviations may be used:

- input	i/p	- Test repeated, similar result(3 times)	TRSR
- output	o/p	- No indication of dielectric breakdown	NB
- short-circuited	s-c	- Cheesecloth remained intact	NC
- overloaded	o-l	- Tissue paper remained intact	NT
- open-circuited	o-c	- No hazards	NH
- normal conditions	N.C.	- The PCE can recover to operate automatically after removing the abnormal condition	RO

- single fault conditions	SFC	- functional insulation	FI
- between parts of opposite polarity	BOP	- basic insulation	BI
- internal protection operated	IPO	- supplementary insulation	SI
- Component damage (list damaged component)	CD	- double insulation	DI
- No component damaged	NCD	- reinforced insulation	RI
- Power Conversion Equipment Indicate used abbreviations (if any)	PCE	- Equipment Under Test	EUT

IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
4	GENERAL TESTING REQUIREMENTS		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	Ambient environmental condition compliance.	P
4.2.2.2	State of equipment	Test carried on a complete EUT.	P
4.2.2.3	Position of equipment	The equipment was installed in accordance with the manufacturer's instructions.	P
4.2.2.4	Accessories	Accessories and operator interchangeable parts available from or recommended by the manufacturer according to the installation manual required.	P
4.2.2.5	Covers and removable parts	No covers or parts, which can be removed without using a tool.	N/A
4.2.2.6	Mains supply a) Voltage: b) Frequency: c) Polarity: d) Earthing: e) Over-current Protection:	(see appended table 4.2.2.6)	P
4.2.2.7	Supply ports other than the mains	See below.	P
4.2.2.7.1	Photovoltaic supply sources a) Open circuit voltage: b) Short-circuit current:	(see appended table 4.2.2.7)	P
4.2.2.7.2	Battery inputs	No battery	N/A
4.2.2.8	Conditions of loading for output ports	The least favorable loading conditions was considered.	P
4.2.2.9	Earthing terminals	Connection to the earth	P
4.2.2.10	Controls	Any position was set.	P

IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
4.2.2.11	Available short circuit current	Considered.	P
4.3	Thermal testing	(see appended table 4.3)	P
4.3.1	General		P
4.3.2	Maximum temperatures		P
4.3.2.1	General		P
4.3.2.2	Touch temperatures		P
4.3.2.3	Temperature limits for mounting surfaces		P
4.4	Testing in single fault condition	(see appended table 4.4)	P
4.4.1	General		P
4.4.2	Test conditions and duration for testing under fault conditions		P
4.4.2.1	General		P
4.4.2.2	Duration of tests	One cycle and until temperatures stabilize.	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	See below.	P
4.4.4.1	Component fault tests	(see appended table 4.4)	P
4.4.4.2	Equipment or parts for short-term or intermittent operation	Continuous operation equipment.	N/A
4.4.4.3	Motors	No such device.	N/A
4.4.4.4	Transformer short circuit tests	(see appended table 4.4)	P
4.4.4.5	Output short circuit	(see appended table 4.4)	P
4.4.4.6	Backfeed current test for equipment with more than one source of supply	DC mains supply source only	P
4.4.4.7	Output overload	(see appended table 4.4)	P

IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
4.4.4.8	Cooling system failure	(see appended table 4.4)	P
4.4.4.9	Heating devices	No heating devices used.	N/A
4.4.4.10	Safety interlock systems	No safety interlock device used.	N/A
4.4.4.11	Reverse d.c. connections	(see appended table 4.4)	P
4.4.4.12	Voltage selector mismatch	No voltage selector used.	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	(see appended table 7.5)	P
4.5.1	General		P
4.5.2	Conditions	Humidity: 93%RH Temperature: 50°C Duration: 48hrs	P
4.6	Backfeed voltage protection	Hazardous voltage and energy was not present on the terminals, with the DC mains supply source de-energized or disconnected. In addition the symbol 13 of Table C.1 was marked for servicing functions	P
4.6.1	Backfeed tests under normal conditions	Relay or Contactor is available at AC output side to prevent back-feed current from AC to DC side.	P
4.6.2	Backfeed tests under single-fault conditions	Relay or contactor is available at AC output side and with auto disconnected device at DC input side to prevent backfeed current from AC to DC side, even if under single-fault conditions.	P
4.6.3	Compliance with backfeed tests	See above.	P
4.7	Electrical ratings tests	(see appended table 4.7)	P
4.7.1	Input ratings		P
4.7.1.1	Measurement requirements for DC input ports		P
4.7.2	Output ratings		P

IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
5	MARKING AND DOCUMENTATION		P
5.1	Marking		P
5.1.1	General		P
	Equipment shall bear markings as specified in 5.1 and 5.2	The marking label is on the outer surface of the enclosure.	P
	Graphic symbols may be used and shall be in accordance with Annex C or IEC 60417 as applicable.	All used graphic symbols are in accordance with Annex C.	P
	Graphic symbols shall be explained in the documentation provided with the PCE.	The explanations are provided in the user manual.	P
5.1.2	Durability of markings	The labels were subjected to the permanence of marking test. The labels were rubbed with the cloth soaked with petroleum spirit for 30 s.	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	After this test there was no damage to the labels. The marking on the labels did not fade. There was no curling or lifting of the label's edges.	P
5.1.3	Identification		P
	The equipment shall, as a minimum, be permanently marked with:	See below.	P
	a) the name or trade mark of the manufacturer or supplier	See copy of marking plate.	P
	b) model number, name or other means to identify the equipment	See above.	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 above.	P
5.1.4	Equipment ratings		P
	Unless otherwise specified in another part of IEC 62109, the following ratings, as applicable shall be marked on the equipment:	See below	P

IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
	– input voltage, type of voltage (a.c. or d.c.), frequency, and max. continuous current for each input	see above	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 above.	P
	– the ingress protection (IP) rating as in 6.3 below	See clause 6.3	P
5.1.5	Fuse identification	The fuse is secure on the PCB. It cannot access by operator.	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.	Relevant symbol, indicator or information are available.	P
	Push-buttons and actuators of emergency stop	No such device.	N/A

IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
	devices, and indicator lamps used only to indicate a warning of danger or the need for urgent action shall be coloured red.		
	A multiple-voltage unit shall be marked to indicate the particular voltage for which it is set when shipped from the factory. The marking is allowed to be in the form of a paper tag or any other non-permanent material.		N/A
	A unit with d.c. terminals shall be plainly marked indicating the polarity of the connections, with:		P
	– the sign “+” for positive and “-”, for negative; or		N/A
	– a pictorial representation illustrating the proper polarity where the correct polarity can be unambiguously determined from the representation	No pictorial representation illustration used.	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	Symbol 7 of Table C.1 marked adjacent to the PE terminal.	P
	– the letters “PE”; or	See above.	N/A
	– the colour coding green-yellow.		P
5.1.7	Switches and circuit-breakers		P
	The on and off-positions of switches and circuits breakers shall be clearly marked. If a push-button switch is used as the power switch, symbols 10 and 16 of Annex C may be used to indicate the on-position, or symbols 11 and 17 to indicate the off-position, with the pair of symbols (10 and 16, or 11 and 17) close together.	The letter “ON” and “OFF” is clearly marked.	P
5.1.8	Class II Equipment	Class I Equipment.	N/A
	Equipment using Class II protective means throughout shall be marked with symbol 12 of Annex C. Equipment which is only partially	See above.	N/A

IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
	protected by DOUBLE INSULATION or REINFORCED INSULATION shall not bear symbol 12 of Table Annex C.		
	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	See above.	N/A
5.1.9	Terminal boxes for External Connections	No such device used	N/A
	Where required by note 1 of Table 2 as a result of high temperatures of terminals or parts in the wiring compartment, there shall be a marking, visible beside the terminal before connection, of either:	Not used.	N/A
	a) the minimum temperature Rating and size of the cable to be connected to the TERMINALS; or		N/A
	b) a marking to warn the installer to consult the installation instruction. Symbol 9 of Table D-1 is an acceptable marking		N/A
5.2	Warning markings		P
5.2.1	Visibility and legibility requirements for warning markings		P
	Warning markings shall be legible, and shall have minimum dimensions as follows:		P
	– Printed symbols shall be at least 2,75 mm high		P
	– Printed text characters shall be at least 1.5 mm high and shall contrast in colour with the background		P
	– Symbols or text that are moulded, stamped or engraved in a material shall have a character height of at least 2,0 mm, and if not contrasting in colour from the background, shall have a depth or raised height of at least 0,5 mm.	No such symbols.	N/A
	If it is necessary to refer to the instruction		P

IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
	manual to preserve the protection afforded by the equipment, the equipment shall be marked with symbol 9 of Annex C		
	Symbol 9 of Annex C is not required to be used adjacent to symbols that are explained in the manual		P
5.2.2	Content for warning markings		P
5.2.2.1	Ungrounded heat sinks and similar parts		N/A
	An ungrounded heat sink or other part that may be mistaken for a grounded part and involves a risk of electric shock in accordance with 7.3 shall be marked with symbol 13 of Annex C, or equivalent. The marking may be on or adjacent to the heat sink and shall be clearly visible when the PCE is disassembled to the extent that a risk of contact with the heat sink exists.	No such heatsink.	N/A
5.2.2.2	Hot Surfaces		P
	A part of the PCE that exceeds the temperature limits specified in 4.3.2 shall be marked with symbol 14 of Annex C or equivalent.	Marked with symbol 14 of Table C.1.	P
5.2.2.3	Coolant		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:	No coolant used.	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	Marked with Symbol 21 of Table	P

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Clause	Requirement – Test	Result – Remark	Verdict
	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.	C.1 and the time to discharge capacitors to safe voltage and energy levels accompany the symbol.	
5.2.2.5	Motor guarding		N/A
	Where required by 8.2 a marking shall be provided where it is visible to service personnel before removal of a guard, warning of the hazard and giving instructions for safe servicing (for example disconnection of the source before removing the guard).		N/A
5.2.3	Sonic hazard markings and instructions	No such hazard.	N/A
	If required by 10.2.1 a PCE shall:		N/A
	a) be marked to warn the operator of the sonic pressure hazard; or		N/A
	b) be provided with installation instructions that specify how the installer can ensure that the sound pressure level from equipment at its point of use after installation, will not reach a value, which could cause a hazard. These instructions shall include the measured sound pressure level, and shall identify readily available and practicable protective materials or measures which may be used.		N/A
5.2.4	Equipment with multiple sources of supply		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.	Marked with symbol 13 of Annex C and explain in user manual.	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.	See above.	P
5.2.5	Excessive touch current		P
	Where required by 7.3.6.3.7 the PCE shall be marked with symbol 15 of Annex C. See also 5.3.2 for information to be provided in the	Marked with symbol 15 of Table C.1 and relevant information is provided in user's manual.	P

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Clause	Requirement – Test	Result – Remark	Verdict
	installation manual.		
5.3	Documentation		P
5.3.1	General		P
	The documentation provided with the PCE shall provide the information needed for the safe operation, installation, and (where applicable) maintenance of the equipment. The documentation shall include the items required in 5.3.2 through 5.3.4, and the following:	All related information provided in the user's manual	P
	a) explanations of equipment makings, including symbols used		P
	b) location and function of terminals and controls		P
	c) all ratings or specifications that are necessary to safely install and operate the PCE, including the following environmental ratings along with an explanation of their meaning and any resulting installation requirements:		P
	– ENVIRONMENTAL CATEGORY as per 6.1	Outdoor	P
	– WET LOCATIONS classification for the intended external environment as per 6.1	Suitable for wet location	P
	– POLLUTION DEGREE classification for the intended external environment as per 6.2	PD 3 outside. PD 2 inside	P
	– INGRESS PROTECTION rating as per 6.3	IP65	P
	– Ambient temperature and relative humidity ratings	Specified by manufacturer.	P
	– MAXIMUM altitude rating	4000m	P
	– OVERVOLTAGE CATEGORY assigned to each input and output port as per 7.3.7.1.2, accompanied by guidance regarding how to ensure that the	OVC III for AC connection. OVC II for DC connection.	P

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Clause	Requirement – Test	Result – Remark	Verdict
	installation complies with the required overvoltage categories;		
	d) a warning that when the photovoltaic array is exposed to light, it supplies a d.c. voltage to the PCE	Provided in the instruction manual.	P
5.3.1.1	Language	English version provide	P
	Instructions related to safety shall be in a language that is acceptable in the country where the equipment is to be installed.	Instruction related to safety is in English.	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.	The printed form is available and is delivered with the PCE.	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.	See above.	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:	All related information provided in the user's manual	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		P

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Clause	Requirement – Test	Result – Remark	Verdict
	outputs from the PCE, and any requirements related to wiring and externals controls, colour coding of leads, or overcurrent protection needed;		
	d) explanation of the pin-out of connectors for external connections, unless the connector is used for a standard purpose (e.g. RS 232)		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;	No hazardous sound level.	N/A
	h) where required by 14.8.1.3, instructions for the adequate ventilation of the room or location in which PCE containing vented or valve-regulated batteries is located, to prevent the accumulation of hazardous gases;	No battery located in the PCE.	N/A
	i) tightening torque to be applied to wiring terminals;		P
	j) values of backfeed short-circuit currents available from the PCE on input and output conductors under fault conditions, if those currents exceed the max. rated current of the circuit, as per 4.4.4.6;	No backfeed current available.	P
	k) for each input to the PCE, the max value of short-circuit current available from the source, for which the PCE is designed; and		P
	l) compatibility with RCD and RCM;	RCMU built in PCE.	P
	m) instructions for protective earthing, including the information required by 7.3.6.3.7 if a second protective earthing conductor is to be installed:		P

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Clause	Requirement – Test	Result – Remark	Verdict
	n) where required by 7.3.8, the installation instructions shall include the following or equivalent wording:		P
	“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.”		P
	o) for PCE intended to charge batteries, the battery nominal voltage rating, size, and type	PCE is not intended to charge battery.	P
	p) PV array configuration information, such as ratings, whether the array is to be grounded or floating, any external protection devices needed, etc.		N/A
5.3.3	Information related to operation		P
	Instructions for use shall include any operating instructions necessary to ensure safe operation, including the following, as applicable:	All related information provided in the user's manual	P
	– Instructions for adjustment of controls including the effects of adjustment;		P
	– Instructions for interconnection to accessories and other equipment, including indication of suitable accessories, detachable parts and any special materials;		P
	– Warnings regarding the risk of burns from surfaces permitted to exceed the temperature limits of 4.3.2 and required operator actions to reduce the risk; and		P
	– Instructions, that if the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.		P

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Clause	Requirement – Test	Result – Remark	Verdict
5.3.4	Information related to maintenance		P
	Maintenance instructions shall include the following:	All related information provided in the service manual	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		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:	No battery located in the PCE.	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 		N/A

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Clause	Requirement – Test	Result – Remark	Verdict
	fire. The batteries may explode.		
	– CAUTION: Do not open or damage batteries. Released electrolyte is harmful to the skin and eyes. It may be toxic.		N/A
	– CAUTION: A battery can present a risk of electrical shock and high short-circuit current. The following precautions should be observed when working on batteries:		N/A
	a) Remove watches, rings, or other metal objects.		N/A
	b) Use tools with insulated handles.		N/A
	c) Wear rubber gloves and boots.		N/A
	d) Do not lay tools or metal parts on top of batteries		N/A
	e) Disconnect charging source prior to connecting or disconnecting battery terminals		N/A
	f) Determine if battery is inadvertently grounded. If inadvertently grounded, remove source from ground. Contact with any part of a grounded battery can result in electrical shock. The likelihood of such shock can be reduced if such grounds are removed during installation and maintenance (applicable to equipment and remote battery supplies not having a grounded supply circuit).		N/A
6	ENVIRONMENTAL REQUIREMENTS AND CONDITIONS		P
	The manufacturer shall rate the PCE for the following environmental conditions:		P
	– ENVIRONMENTAL CATEGORY, as in 6.1 below	Outdoor use	P
	– Suitability for WET LOCATIONS or not	Not	P
	– POLLUTION DEGREE rating in 6.2 below	See 6.2 below	P
	– INGRESS PROTECTION (IP) rating, as in	IP65	P

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Clause	Requirement – Test	Result – Remark	Verdict
	6.3 below		
	– Ultraviolet (UV) exposure rating, as in 6.4 below	See 6.4 below	P
	– Ambient temperature and relative humidity ratings, as in 6.5 below	See 6.5 below	P
6.1	Environmental categories and minimum environmental conditions		P
6.1.1	Outdoor	For outdoor use.	P
6.1.2	Indoor, unconditioned	See above.	N/A
6.1.3	Indoor, conditioned	See above.	N/A
6.2	Pollution degree	PD 3 outside. PD 2 inside	P
6.3	Ingress Protection	Outdoor use IP65 Report No: CTS20210235-S-2022-03-22-M1, issued by Shenzhen Chengxin Technology service Co., Ltd. (CNAS L12944) Dated on Mar. 22, 2022, total 17 pages.	P
6.4	UV exposure	The shelter is considered necessary for outdoor use. Anti-UV approved AC and DC connectors provided.	P
6.5	Temperature and humidity	Specified by manufacturer.	P
7	PROTECTION AGAINST ELECTRIC SHOCK AND ENERGY HAZARDS		P
7.1	General	The proper construction of PCE is available for protection against shock and energy hazards during installation, operation and maintenance under normal and single fault conditions.	P
7.2	Fault conditions	See subclause 4.4.	P
7.3	Protection against electric shock		P
7.3.1	General	Each circuit under evaluation is compliance.	P
7.3.2	Decisive voltage classification		P
7.3.2.1	Use of decisive voltage class (DVC)	Working voltage and protective	P

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Clause	Requirement – Test	Result – Remark	Verdict
		measure and considered	
7.3.2.2	Limits of DVC (according table 6)	See subclause 7.3.2.1.	P
7.3.2.3	Short-terms limits of accessible voltages under fault conditions	No parts were exceed DVC-A level	P
7.3.2.4	Requirements for protection (according table 7)	For circuits evaluation information of PCE, refer to brief description of general product information on previous pages.	P
7.3.2.5	Connection to PELV and SELV circuits	DVC-A is classified for display and communication circuits.	P
7.3.2.6	Working voltage and DVC	See subclause 7.3.2.4.	P
7.3.2.6.1	General	See above.	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)	DVC-A and DVC-C circuits within PCE.	P
7.3.3	protective separation	For protective separation evaluation information of PCE, refer to brief description of general product information on previous pages.	P
	Protective separation shall be achieved by:		P
	<ul style="list-style-type: none"> double or reinforced insulation, or 		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 		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		P

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Clause	Requirement – Test	Result – Remark	Verdict
	intended use of the PCE		
7.3.4	Protection against direct contact	Protection against electric shock by means of earthed metal enclosure. Any access to touch live parts is impossible.	P
7.3.4.1	General		P
	Protection against direct contact is employed to prevent persons from touching live parts that do not meet the requirements of 7.3.5 and shall be provided by one or more of the measure given in 7.3.4.2 (enclosures and barriers) and 7.3.4.3 (insulation).	See subclause 7.3.2.4.	P
	Open type sub-assemblies and devices do not require protective measures against direct contact but the instruction provided with the equipment must indicate that such measures must be provided in the end equipment or in the installation.		N/A
	Product intended for installation in CLOSED ELECTRICAL OPERATING AREAS, (see 3.9) need not have protective measures against direct contact, except as required by 7.3.4.2.4.		N/A
7.3.4.2	Protection by means of enclosures and barriers	Protection against electric shock by means of earthed metal enclosure.	P
	The following requirements apply where protection against contact with live parts is provided by enclosures or barriers, not by insulation in accordance with 7.3.4.3.		P
7.3.4.2.1	General		P
	Parts of enclosures and barriers that provide protection in accordance with these requirements shall not be removable without the use of a tool (see 7.3.4.2.3).		P
	Polymeric materials used to meet these requirements shall also meet the requirements of 13.6		N/A

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Clause	Requirement – Test	Result – Remark	Verdict
7.3.4.2.2	Access probe criteria	Considered.	P
	Protection is considered to be achieved when the separation between the test probes and live parts, when tested as described below, is as follows:		P
	a) decisive voltage classification A, (DVC A) - the probe may touch the live parts	Considered.	P
	b) decisive voltage classification B, (DVC B) - the probe must not touch bare live parts	Considered.	P
	c) decisive voltage classification C, (DVC C) – the probe must have adequate clearance to live parts, based on the clearance for Basic insulation using the recurring peak working voltage involved,	Considered.	P
7.3.4.2.3	Access probe tests		P
	Compliance with 7.3.4.2.1 is checked by all of the following:		P
	a) Inspection; and	Live parts are enclosed by the earthed metal enclosure and no openings.	P
	b) Tests with the test finger (Figure D.1) and test pin (Figure D.2) of 0E, the results of which shall comply with the requirements of 7.3.4.2.1 a), b), and c) as applicable. Probe tests are performed on openings in the enclosures after removal of parts that can be detached or opened by an operator without the use of a tool, including fuseholders, and with operator access doors and covers open. It is permitted to leave lamps in place for this test. Connectors that can be separated by an operator without use of a tool, shall also be tested during and after disconnection. Any movable parts are to be put in the most unfavourable position.	It is not possible to touch the hazardous live parts by the test finger and test pin.	P
	The test finger and the test pin are applied as above, without appreciable force, in		P

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Clause	Requirement – Test	Result – Remark	Verdict
	every possible position, except that floor-standing equipment having a mass exceeding 40 kg is not tilted.		
	Equipment intended for building-in or rack mounting, or for incorporation in larger equipment, is tested with access to the equipment limited according to the method of mounting detailed in the installation instructions.	Not intended for built-in or rack mounting.	N/A
	c) Openings preventing the entry of the jointed test finger (Figure E-1 of 0E) during test b) above, are further tested by means of straight unjointed test finger (Figure E-3 of 0E), applied with a force of 30 N. If the unjointed finger enters, the test with the jointed finger is repeated except that the finger is applied using any necessary force up to 30 N.	No openings.	N/A
	d) In addition to a) – c) above, top surfaces of enclosure shall be tested with the IP3X probe of IEC 60529. The test probe shall not penetrate the top surface of the enclosure when probed from the vertical direction $\pm 5^\circ$ only.	No openings.	N/A
7.3.4.2.4	Service access areas	It is not allowed to remove the cover during installation and maintenance when PCE is energized.	P
7.3.4.3	Protection by means of insulation of live parts	See subclause 7.3.2, 7.3.3 and 7.3.4.1.	P
	Where the requirements of 7.3.4.2 are not met, live parts shall be provided with insulation if:		P
	– their working voltage is greater than the maximum limit of decisive voltage class A, or		P
	– for a DVC A or B circuit, protective separation from adjacent circuit of DVC C		P

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Clause	Requirement – Test	Result – Remark	Verdict
	is not provided (see note “†” under Table 7)		
7.3.5	Protection in case of direct contact	The single communication port is direct contact and evaluated with reinforced insulation from live part	P
7.3.5.1	General	See below.	P
	Protection in case of direct contact is required to ensure that contact with live parts does not produce a shock hazard.	Considered	P
	The protection against direct contact according to 7.3.4 is not required if the circuit contacted is separated from other circuits according to 7.3.2.3, and:	Considered	P
	– is of decisive voltage class A and complies with 7.3.5.2, or	Only DCV-A classified circuit can be touched directly, see also 7.3.5.2.	P
	– is provided with protective impedance according to 7.3.5.3, or		N/A
	– is limited in voltage according to 7.3.5.4		N/A
	In addition to the measures as given in 7.3.5.2 to 7.3.5.4, it shall be ensured that in the event of error or polarity reversal of connectors no voltages that exceed DVC A can be connected into a circuit with protective separation. This applies for example to plug-in-sub-assemblies or other plug-in devices which can be plugged-in without the use of a tool (key) or which are accessible without the use of a tool.		P
	Conformity is checked by visual inspection and trial insertion.		P
7.3.5.2	Protection using decisive voltage class A	Comm. port is considered as DVC-A which can be accessible and separated from DVC-C by double or reinforced insulation	P
7.3.5.3	Protection by means of protective impedance	This method not considered.	N/A
	Circuits and conductive parts do not require		N/A

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	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.		
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	This method not considered.	N/A
	That portion of a circuit that has its voltage reduced to DVC-A by a voltage divider that complies with the following requirements, and that is otherwise provided with protective separation from circuits of DVC-B or DVC-C according to 7.3.3, does not require protection against direct contact.		N/A
	The voltage divider shall be designed so that under normal and single fault conditions, including faults in the voltage division circuit, the voltage across the output of the voltage divider does not exceed the limit for DVC-A.		N/A
	This type of protection shall not be used in case of protective class II or unearthed circuits,		N/A

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Clause	Requirement – Test	Result – Remark	Verdict
	because it relies on protective earth being connected.		
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)	The PCE is defined as protective class I.	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 earthing metal enclosure is complied with Protective class I.	P
	That part of a PCE meets the requirements of 7.3.6.4 is defined as protective class II.	The circuit of communication is complied with Protective class II for accessible communication ports.	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.		P
7.3.6.2	Insulation between live parts and accessible conductive parts	See subclause 7.3.2.3, 7.3.7.4 and 7.3.7.5.	P
	Accessible conductive parts of equipment shall be separated from live parts by insulation meeting the requirements of Table 7 or by clearances as specified in 7.3.7.4 and creepages as specified in 7.3.7.5	The clearances specified in 7.3.7.4 and creepage specified in 7.3.7.5 are complied.	P
7.3.6.3	Protective class I – Protective bonding and		P

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Clause	Requirement – Test	Result – Remark	Verdict
	earthing		
7.3.6.3.1	General		P
	Equipment of protective class I shall be provided with protective earthing, and with protective bonding to ensure electrical contact between accessible conductive parts and the means of connection for the external protective earthing conductor, except bonding is not required for:	Suitable protective bonding provided.	P
	a) accessible conductive parts that are protected by one of the measures in 7.3.5.2 to 7.3.5.4, or	DVC-A classified circuit is considered.	P
	b) accessible conductive parts are separated from live parts of DVC-B or -C using double or reinforced insulation.	Display and communication circuits are separated from live parts used double or reinforced insulation.	P
7.3.6.3.2	Requirements for protective bonding	The cross-section of the protective bonding conductor is the same as that for the external protective earthing conductor.	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;	The connection of external protective earthing conductor is direct metal contact via a terminal with screw.	P
	b) through other conductive parts which are not removed when the PCE or sub-units are used as intended ;		P
	c) through a dedicated protective bonding conductor;	Protective earthing terminal used.	P
	d) through other metallic components of the PCE		N/A
	Where direct metallic contact is used and one or both of the parts involved is painted or coated, the paint or coating shall be removed in the		P

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Clause	Requirement – Test	Result – Remark	Verdict
	area of contact, or reliably penetrated, to ensure metal to metal contact.		
	For moving or removable parts, hinges or sliding contacts designed and maintained to have a low resistance are examples of acceptable means if they comply with the requirements of 7.3.6.3.3.		N/A
	Metal ducts of flexible or rigid construction and metallic sheaths shall not be used as protective bonding conductors, unless the device or material has been investigated as suitable for protective bonding purposes.		P
7.3.6.3.3	Rating of protective bonding	See appended table 7.3.6.3.5	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.		N/A
	Protective bonding shall meet following requirements:		N/A
	a) For PCE with an overcurrent protective device rating of 16 A or less, the impedance of the protective bonding means shall not exceed 0,1 Ω during or at the end of the test below.		N/A
	b) For PCE with an overcurrent protective device rating of more than 16 A, the voltage drop in the protective bonding test shall not exceed 2,5 V during or at the end of the test below.		N/A
	As alternative to a) and b) the protective bonding may designed according to the requirements for the external protective earthing conductor in 7.3.6.3.5, in which case no testing	The alternative of 7.3.6.3.5 is considered	P

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Clause	Requirement – Test	Result – Remark	Verdict
	is required.		
	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;		N/A
	c) For a circuit or part of the equipment for which an overcurrent protective device is provided as part of the equipment, the rating of the provided overcurrent device.		N/A
	Voltages are measured from the protective earthing terminal to all parts whose protective bonding means are being considered. The impedance of the protective earthing conductor is not included in the measurement. However, if the protective earthing conductor is supplied with the equipment, it is permitted to include the conductor in the test circuit but the measurement of the voltage drop is made only from the main protective earthing terminal to the accessible part required to be earthed.		N/A
	On equipment where the protective earth connection to a subassembly or to a separate unit is part of a cable that also supplies power to that subassembly or unit, the resistance of the protective bonding conductor in that cable is not included in the protective bond impedance		N/A

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Clause	Requirement – Test	Result – Remark	Verdict
	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.		
7.3.6.3.3.1	Test current, duration, and acceptance criteria	The alternative of sub clause 7.3.6.3.5 was considered.	N/A
	The test current, duration of the test and acceptance criteria are as follows:		N/A
	a) For PCE with an overcurrent protective device rating of 16 A or less, the test current is 200% of the overcurrent protective device rating, but not less than 32 A, applied for 120s. The impedance of the protective bonding means during and at the end of the test shall not exceed 0,1 Ω .		N/A
	b) For PCE with an overcurrent protective device rating of more than 16 A, the test current is 200% of the overcurrent protective device rating and the duration of the test is as shown in Table 10 below. The voltage drop in the protective bonding means, during and at the end of the test, shall not exceed 2,5 V.		N/A
	c) During and after the test, there shall be no melting, loosening, or other damage that would impair the effectiveness of the protective bonding means.		N/A
	The test current is derived from an a.c or d.c supply source, the output of which is not earthed.		N/A
	As an alternative to Table 10, where the time-		N/A

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Clause	Requirement – Test	Result – Remark	Verdict
	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.		
7.3.6.3.4	Protective bonding impedance (routine test)	For routine test	N/A
	If the continuity of the protective bonding is achieved at any point by a single means only (for example a single conductor or single fastener), or if the PCE is assembled at the installation location, then the impedance of the protective bonding shall also be tested as a routine test. The test shall be as in 7.3.6.3.3, except for the following:	The alternative of sub clause 7.3.6.3.5 was considered.	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 0,1 Ω .		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	The external protective earthing conductor cross-sectional is designed as half of phase	P

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Clause	Requirement – Test	Result – Remark	Verdict
	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.	conductors with same material. Related statement specified in manual.	
	If the external protective earthing conductor is routed through a plug and socket or similar means of disconnection, it shall not be possible to disconnect it unless power is simultaneously removed from the part to be protected.	Permanently connected	N/A
	The cross-sectional area of every external protective earthing conductor which does not form part of the supply cable or cable enclosure shall, in any case, be not less than:		P
	<ul style="list-style-type: none"> 2,5 mm² if mechanical protection is provided; 		N/A
	<ul style="list-style-type: none"> 4 mm² if mechanical protection is not provided. 	Related statement specified in user manual.	P
	For cord-connected equipment, provisions shall be made so that the external protective earthing conductor in the cord shall, in the case of failure of the strain-relief mechanism, be the last conductor to be interrupted.	Not cord-connected equipment.	N/A
7.3.6.3.6	Means of connection for the external protective earthing conductor		P
7.3.6.3.6.1	General		P
	<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</p>	The external protective earthing terminal block consist of other live conducts as AC connector for connecting PCE to the mains.	P

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Clause	Requirement – Test	Result – Remark	Verdict
	conductor. Connection and bonding points shall be so designed that their current-carrying capacity is not impaired by mechanical, chemical, or electrochemical influences. Where enclosures and/or conductors of aluminium or aluminium alloys are used, particular attention should be given to the problems of electrolytic corrosion.		
	The means of connection for the protective earthing conductor shall be permanently marked with:		P
	<ul style="list-style-type: none"> symbol 7 of Annex C; or 	With the symbol 7 of Table C.1.	P
	<ul style="list-style-type: none"> the colour coding green-yellow 	The color coding of Green – yellow recommended.	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		P
	The requirements of this sub-clause shall be satisfied to maintain safety in case of damage to or disconnection of the protective earthing conductor.		P
	For pluggable equipment type A, the touch current measured in accordance with 7.5.4 shall not exceed 3,5 mA a.c. or mA d.c.	Not a pluggable type A equipment	N/A
	For all other PCE, one or more of the following measure shall be applied, unless the touch current measured in accordance with 7.5.4 using the test network of IEC 60990 test figure 4 shall not exceed 3,5 mA a.c. or 10 mA d.c.	In addition, the caution symbol 15 of Table C.1 provided on PCE and in manual. (see appended table 7.3.6.3.7)	P
	a) Permanently connected wiring, and:	Not exceed 3.5mA a.c.	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 		N/A

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Clause	Requirement – Test	Result – Remark	Verdict
	earthing conductor; or		
	<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 		N/A
	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.	Not exceed 3.5mA a.c.	N/A
	In addition, the caution symbol 15 of Annex C shall be fixed to the product and the installation manual shall provide details of the protective earthing measures required in the installation as required in 5.3.2.		N/A
	When it is intended and allowed to connect two or more 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	PCE is designed for protective class I.	N/A
	Equipment or parts of equipment designed for protective class II shall have insulation between live parts and accessible surfaces in accordance with 7.3.4.3. The following requirements also apply:		N/A
	<ul style="list-style-type: none"> equipment designed to protective class II shall not have means of connection for the external protective earthing conductor. 		N/A

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Clause	Requirement – Test	Result – Remark	Verdict
	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;		
	<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 below.	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 	See sub clause 7.3.7.1.1.	P

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Clause	Requirement – Test	Result – Remark	Verdict
	<ul style="list-style-type: none"> • overvoltage category 	See sub clause 7.3.7.1.2.	P
	<ul style="list-style-type: none"> • supply earthing system 	See sub clause 7.3.7.1.3.	P
	<ul style="list-style-type: none"> • insulation voltage 	See sub clause 7.3.7.1.4.	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	For TN system.	P
	Three basic types of earthing system are described in IEC 60364-1. They are:		P
	<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	See table 7.3.7.4 and 7.3.7.5 for detail	P
	Table 12 makes use of the circuit system voltage and overvoltage category to define the impulse withstands voltage and the temporary overvoltage.		P

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Clause	Requirement – Test	Result – Remark	Verdict
7.3.7.2	Insulation between a circuit and its surroundings		P
7.3.7.2.1	General	Considered.	P
7.3.7.2.2	Circuits connected directly to the mains	System voltage for mains is 520Vrms according to table 12	P
7.3.7.2.3	Circuits other than mains circuits	System voltage for PV is 1100Vdc.	P
7.3.7.2.4	Insulation between circuits	4000V impulse voltage is calculated from table 12 for clearance. 1100Vdc working voltage across insulation is used for creepage	P
7.3.7.3	Functional insulating		P
7.3.7.4	Clearance distances	(see appended table 7.3.7)	P
7.3.7.4.1	Determination	The max. insulation / impulse voltage: 6000V.	P
7.3.7.4.2	Electric field homogeneity	Not considered.	N/A
7.3.7.4.3	Clearance to conductive enclosures	Refer to subclause 7.3.7.4.1 and 13.7.	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	The max. voltage: 520Vrms / 1100Vd.c	P
7.3.7.5.3	Materials	Insulating material group IIIb 175 > CTI ≥ 100 assumed.	P
7.3.7.6	Coating	Not used.	N/A
7.3.7.7	PWB spacings for functional insulating	Comply with 7.3.7.4 and 7.3.7.5.	P
7.3.7.8	Solid insulating	(see appended table 7.3.7)	P
7.3.7.8.1	General		P
7.3.7.8.2	Requirements for electrical withstand capability of solid insulation		P
7.3.7.8.2.1	Basic, supplemental, reinforced, and double insulation	1100V peak. Impulse voltage test and voltage test are considered	P

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Clause	Requirement – Test	Result – Remark	Verdict
		for solid insulation	
7.3.7.8.2.2	Functional insulation	Not used.	N/A
7.3.7.8.3	Thin sheet or tape material	See below.	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		N/A
7.3.7.8.3.4	Compliance	See subclause 7.3.7.8.3.2.	P
7.3.7.8.4	Printed wiring boards		P
7.3.7.8.4.1	General	Insulation between conductor layers in double-sided single layer PWBs meet the requirements of 7.3.7.8.1. Basic, supplementary, double and reinforced insulation meet the appropriate requirements of 7.3.7.8.2.1 or 7.3.7.8.2.2. Functional insulation in PWBs meet the requirements of 7.3.7.8.2.3.	P
7.3.7.8.4.2	Use of coating materials	No coating material used.	N/A
7.3.7.8.5	Wound components	No such wound components.	N/A
7.3.7.8.6	Potting materials	No potting materials used.	N/A
7.3.7.9	Insulation requirements above 30 kHz	Considered.	P
7.3.8	Residual Current-operated protective (RCD) or monitoring (RCM) device compatibility	Built-in RCM unit within the PCE.	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.	Under normal and single-fault conditions, the resulting d.c. component of the current in the protective earthing conductor does not exceed the d.c. current withstand requirements in IEC 60755 and IEC 62020 for RCD and RCM of type B.	N/A
7.3.9	Capacitor discharge	The warning symbol 21 of Table C.1 and an indication of the discharge time is placed in a	P

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Clause	Requirement – Test	Result – Remark	Verdict
		clearly visible position on the protective barrier to avoid unconsciousness contact.	
7.3.9.1	Operator access area		N/A
	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.	No such operator area to access without the use of a tool.	N/A
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.	The warning symbol 21 of Table C.1 and an indication of the discharge time is placed in a clearly visible position on the protective barrier to avoid unconsciousness contact.	P
7.4	Protection against energy hazards		P
7.4.1	Determination of hazardous energy level	There is no risk of energy hazard in operator access areas, protection of electrical shock by means of earthed metal enclosure.	P
	A hazardous energy level is considered to exist if		N/A
	a) The voltage is 2 V or more, and power available after 60 s exceeds 240 VA.		N/A
	b) The stored energy in a capacitor is at a voltage. U of 2 V or more, and the stored energy. E, calculated from the following equation, exceeds 20J: $E = 0,5 CU^2$		N/A
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.	All hazardous energy parts were enclosed within the earthed metal enclosure.	P
7.4.3	Services Access Areas		P

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Clause	Requirement – Test	Result – Remark	Verdict
7.5	Electrical tests related to shock hazard	(see appended table 7.5)	P
7.5.1	Impulse voltage test (type test)	During the test no puncture, flashover, or sparkover occurs.	P
7.5.2	Voltage test (dielectric strength test)	See below.	P
7.5.2.1	Purpose of test		P
7.5.2.2	Value and type of test voltage		P
7.5.2.3	Humidity pre-conditioning		P
7.5.2.4	Performing the voltage test		P
7.5.2.5	Duration of the a.c. or d.c. voltage test		P
7.5.2.6	Verification of the a.c. or d.c. voltage test		P
7.5.3	Partial discharge test	(see appended table 7.5)	P
7.5.4	Touch current measurement (type test)	AC: 2.84<3.5mA	P
	The touch current shall be measured if required by 7.3.6.3.7 and shall not be greater than 3.5 mA a.c. or 10 mA d.c. or special measures of protection as given in 7.3.6.3.7 are required.	(see appended table 7.3.6.3.7)	P
	For type tests on PCE for which wet locations requirements apply according to 6.1, the humidity pre-conditioning of 4.5 shall be performed immediately prior to the touch current test.	See above.	P
7.5.5	Equipment with multiple sources of supply		N/A
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.	Edges, projections, corners, openings, guards, handles and the like, that are accessible to the OPERATOR are smooth and rounded.	P
	Conformity is checked as specified in 8.2 to 8.6.		P

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Clause	Requirement – Test	Result – Remark	Verdict
8.2	Moving parts		N/A
	Moving parts shall not be able to crush, cut or pierce parts of the body of an OPERATOR likely to contact them, nor severely pinch the OPERATOR's skin. Hazardous moving parts of equipment, that is moving parts which have the potential to cause injury, shall be so arranged, enclosed or guarded as to provide adequate protection against the risk of personal injury.		N/A
8.2.1	Protection of service persons		P
	Protection shall be provided such that unintentional contact with hazardous moving parts is unlikely during servicing operations. If a guard over a hazardous moving part may need to be removed for servicing, the marking of symbol 15 of Table D-1 shall be applied on or near the guard.	Barrier and the marking of symbol 15 of Table C.1 is provided for service persons.	P
8.3	Stability		N/A
	Equipment and assemblies of equipment not secured to the building structure before operation shall be physically stable in NORMAL USE.	The equipment shall be firmly fixed mounted on the concrete ground as mentioned in user manual.	N/A
8.4	Provisions for lifting and carrying		N/A
	If carrying handles or grips are fitted to, or supplied with, the equipment, they shall be capable of withstanding a force of four times the weight of the equipment.		N/A
	Equipment or parts having a mass of 18 kg or more shall be provided with a means for lifting and carrying or directions shall be given in the manufacturer's documentation.		N/A
8.5	Wall mounting		P
	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

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Clause	Requirement – Test	Result – Remark	Verdict
	Equipment shall contain or limit the energy of parts that could cause a HAZARD if expelled in the event of a fault.	No such parts.	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.	Suitable and appropriate materials, components and construction are used to reduce the risk of ignition and the spread of flame.	P
9.1.1	Reducing the risk of ignition and spread of flame		P
	For equipment or a portion of equipment, there are two alternative methods of providing protection against ignition and spread of flame that could affect materials, wiring, wound components and electronic components such as integrated circuits, transistors, thyristors, diodes, resistors and capacitors.	Suitable and appropriate materials, components and construction are used to reduce the risk of ignition and the spread of flame.	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.	A FIRE ENCLOSURE is required for equipment or parts of equipment.	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		N/A

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Clause	Requirement – Test	Result – Remark	Verdict
	material of FLAMMABILITY CLASS V-1;		
	– 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.		P
9.1.2.2	Parts not requiring a fire enclosure	See above.	N/A
9.1.3	Materials requirements for protection against fire hazard		N/A
9.1.3.1	General		N/A
	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 provided.	N/A
9.1.3.2	Materials for fire enclosures		P
	If an enclosure material is not classified as specified below, a test may be performed on the final enclosure or part of the enclosure, in which case the material shall additionally be subjected to periodic SAMPLE testing.	Metal enclosure provided.	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	Internal wire: VW-1 PWB: V-0	P

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Clause	Requirement – Test	Result – Remark	Verdict
	ENCLOSURES and DECORATIVE PARTS); located outside FIRE ENCLOSURES, shall be of FLAMMABILITY CLASS HB.		
9.1.3.4	Materials for components and other parts inside fire enclosures	Internal components are V-2, HF- 2 or better.	N/A
9.1.3.5	Materials for air filter assemblies	No such materials.	N/A
9.1.4	Openings in fire enclosures		P
9.1.4.1	General	No openings in fire enclosures.	P
	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.		P
	These requirements are in addition to those in the following sections:		P
	– 7.3.4, Protection against direct contact;		P
	– 7.4, Protection against energy hazards;		P
	– 13.5, Openings in enclosures		P
9.1.4.2	Side openings treated as bottom openings	See above.	N/A
9.1.4.3	Openings in the bottom of a fire enclosure	See above.	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

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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		P
9.1.4.6	Additional requirements for openings in transportable equipment	PCE not for transportable equipment.	N/A
9.2	LIMITED POWER SOURCES		N/A
9.2.1	General		N/A
9.2.2	Limited power source tests		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.	No overcurrent hazards was presented by short circuits and overloads tests. Refer to sub-clause 4.4.4.	P
9.3.2	Protection against short-circuits and overcurrents shall be provided for all input circuits, and for output circuits that do not comply with the requirements for limited power sources in 9.2, except for circuits in which no overcurrent hazard is presented by short-circuits and overloads.		P
9.3.3	Protective devices provided or specified shall have adequate breaking capacity to interrupt the maximum short circuit current specified for the port to which they are connected. If protection that is provided integral to the PCE for an input port is not rated for the short-circuit current of the circuit in which it is used, the installation instructions shall specify that an upstream protective device, rated for the prospective short-circuit current of that port, shall be used to provide backup protection.	Upstream protective device for backup protection is specified in the installation manual.	P
10	PROTECTION AGAINST SONIC PRESSURE HAZARDS		P

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Clause	Requirement – Test	Result – Remark	Verdict
10.1	General		P
	The equipment shall provide protection against the effect of sonic pressure. Conformity tests are carried out if the equipment is likely to cause such HAZARDS.		P
10.2	Sonic pressure and Sound level		P
10.2.1	Hazardous Noise Levels	Sound pressure level is lower than 80dB.	P
11	PROTECTION AGAINST LIQUID HAZARDS		N/A
11.1	Liquid Containment, Pressure and Leakage	The battery is not used in this system and does not contain liquid	N/A
	The liquid containment system components shall be compatible with the liquid to be used.		N/A
	There shall be no leakage of liquid onto live parts as a result of:		N/A
	a) Normal operation, including condensation;		N/A
	b) Servicing of the equipment; or		N/A
	c) Inadvertent loosening or detachment of hoses or other cooling system parts over time.		N/A
11.2	Fluid pressure and leakage		N/A
11.2.1	Maximum pressure		N/A
11.2.2	Leakage from parts		N/A
11.2.3	Overpressure safety device		N/A
11.3	Oil and grease		N/A
12	CHEMICAL HAZARDS		N/A
12.1	General		N/A
13	PHYSICAL REQUIREMENTS		P
13.1	Handles and manual controls		N/A
	Handles, knobs, grips, levers and the like shall be reliably fixed so that they will not work loose in normal use, if this might result in a hazard.		N/A

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Clause	Requirement – Test	Result – Remark	Verdict
	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.		
13.1.1	Adjustable controls	No such controls.	N/A
13.2	Securing of parts	Screws, nuts, washers, springs or similar parts are secured so as to withstand mechanical stresses occurring	P
13.3	Provisions for external connections		P
13.3.1	General	Appropriate provisions for external connections applied.	P
13.3.2	Connection to an a.c. Mains supply		P
13.3.2.1	General		P
	For safe and reliable connection to a MAINS supply, equipment shall be provided with one of the following:		P
	– terminals or leads or a non-detachable power supply cord for permanent connection to the supply; or		N/A
	– 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		P
	– a mains plug that is part of direct plug-in equipment as in 13.3.8		N/A
13.3.2.2	Permanently connected equipment		N/A
13.3.2.3	Appliance inlets		P
13.3.2.4	Power supply cord	Not provided, but technical requirements provided in user manual.	N/A
13.3.2.5	Cord anchorages and strain relief	No power supply cords provided.	N/A

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Clause	Requirement – Test	Result – Remark	Verdict
	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	No power supply cords provided, however plastic inlet bushings provided ready for use.	N/A
13.3.3	Wiring terminals for connection of external conductors		P
13.3.3.1	Wiring terminals		P
13.3.3.2	Screw terminals	Screws and nuts which clamp external supply conductors have a thread conforming to ISO 261 or ISO 262.	P
13.3.3.3	Wiring terminal sizes	The terminals meet the temperature rise test of 4.3 when connected using wire sizes as specified in the documentation or in Table 24.	P
13.3.3.4	Wiring terminal design	Lug terminals applied, and the cable lug clamped by nut.	P
13.3.3.5	Grouping of wiring terminals	Terminals located in proximity to each other.	P
13.3.3.6	Stranded wire	Lug terminals applied.	P
13.3.4	Supply wiring space	Lug terminals applied, and the cable lug is clamped by nut without the risk of damage to the conductors or their insulation.	P
13.3.5	Wire bending space for wires 10 mm ² and greater	Considered.	P
13.3.6	Disconnection from supply sources	Disconnect devices provided.	P
13.3.7	Connectors, plugs and sockets	The misconnection is unlikely for DC connectors.	P
13.3.8	Direct plug-in equipment	Not direct plug-in use.	N/A

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Clause	Requirement – Test	Result – Remark	Verdict
13.4	Internal wiring and connections		P
13.4.1	General	The insulation, conductors and routing of all wires of the equipment is suitable for the electrical, mechanical, thermal and environmental conditions of use.	P
13.4.2	Routing	Wires are routed away from sharp edges, screw threads, burrs, fins, moving parts, drawers, and similar parts, which could abrade the wire insulation.	P
13.4.3	Colour coding	The green/yellow color coding wire only used for protective earthing conductor.	P
13.4.4	Splices and connections	All splices and connections are mechanically adequate secure and provided electrical continuity. The likelihood of loose is impossible.	P
13.4.5	Interconnections between parts of the PCE	The communication cable only used for servicing, no any physical damage or mechanical damage likely.	P
13.5	Openings in enclosures	Not opening in metal enclosure	N/A
13.5.1	Top and side openings		N/A
	Openings in the top and sides of ENCLOSURES shall be so located or constructed that it is unlikely that objects will enter the openings and create hazards by contacting bare conductive parts.		N/A
13.6	Polymeric Materials		P
13.6.1	General	See below.	P
13.6.1.1	Thermal index or capability	Appropriate electrical, mechanical, thermal and flammability degree polymeric materials provided.	P
13.6.2	Polymers serving as enclosures or barriers	Metal enclosure used.	N/A

IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
	preventing access to hazards		
13.6.2.1	Stress relief test	See above.	N/A
13.6.3	Polymers serving as solid insulation	See above.	N/A
13.6.3.1	Resistance to arcing		N/A
13.6.4	UV resistance	Metal enclosure provided.	N/A
	Polymeric parts of an OUTDOOR ENCLOSURE required for compliance with this standard shall be sufficiently resistance to degradation by ultra-violet (UV) radiation		N/A
13.7	Mechanical resistance to deflection, impact, or drop		P
13.7.1	General	See below.	P
13.7.2	250-N deflection test for metal enclosures	A steady force of 250 N applied for 5 s, after test no hazards occurred.	P
13.7.3	7-J impact test for polymeric enclosures	Impact test applied on the display screen cover.	P
13.7.4	Drop test	Not for hand - held, direct plug - in, or transportable equipment.	N/A
13.8	Thickness requirements for metal enclosures		P
13.8.1	General		P
13.8.2	Cast metal		N/A
13.8.3	Sheet metal		N/A
14	COMPONENTS		P
14.1	General	(see appended table 14) Components that are certified to IEC and /or national standards are used correctly within their ratings. Components not covered by IEC standards are tested under the conditions present in the equipment.	P
	Where safety is involved, components shall be used in accordance with their specified RATINGS unless a specific exception is made.		P

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

IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
14.3	Over temperature protection devices	Approved overtemperature protective devices used and for which appropriate rating was selected for use and do not operate in normal use. For overtemperature protection test or evaluation see appended table 4.4.4.	P
14.4	Fuse holders	Fuse holders with fuses are not intended to be replaceable by an OPERATOR.	N/A
14.5	MAINS voltage selecting devices	No such devices.	N/A
14.6	Printed circuit boards		P
	Printed circuit boards shall be made of material with a flammability classification of V-1 of IEC 60707 or better.		P
	This requirement does not apply to thin-film flexible printed circuit boards that contain only circuits powered from limited power sources meeting the requirements of 9.2.		N/A
	Conformity of the flammability RATING is checked by inspection of data on the materials. Alternatively, conformity is checked by performing the V-1 tests specified in IEC 60707 on three samples of the relevant parts.		P
14.7	Circuits or components used as transient overvoltage limiting devices		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.	No such components.	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	No such device containing in PCE	N/A

IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
	and after a single fault in the equipment including a fault in circuitry within the equipment battery pack.		
14.8.1	Battery Enclosure Ventilation		N/A
14.8.1.1	Ventilation requirements		N/A
14.8.1.2	Ventilation testing		N/A
14.8.1.3	Ventilation instructions		N/A
14.8.2	Battery Mounting		N/A
	Compliance is verified by the application of the force to the battery's mounting surface. The test force is to be increased gradually so as to reach the required value in 5 to 10 s, and is to be maintained at that value for 1 min. A non-metallic rack or tray shall be tested at the highest normal condition operating temperature.		N/A
14.8.3	Electrolyte spillage		N/A
	Battery trays and cabinets shall have an electrolyte-resistant coating.		N/A
	The ENCLOSURE or compartment housing a VENTED BATTERY shall be constructed so that spillage or leakage of the electrolyte from one battery will be contained within the ENCLOSURE and be prevented from:		N/A
	a) reaching the PCE outer surfaces that can be contacted by the USER		N/A
	b) contaminating adjacent electrical components 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

IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
	The information and instructions listed in 5.3.4.1 shall be included in the operator manual for equipment in which battery maintenance is performed by the operator, or in the service manual if battery maintenance is to be performed by service personnel only.		N/A
14.8.6	Battery accessibility and maintainability		N/A
	Battery terminals and connectors shall be accessible for maintenance with the correct TOOLS. Batteries with liquid electrolyte, requiring maintained shall be so located that the battery cell caps are accessible for electrolyte tests and readjusting of electrolyte levels.		N/A
15	Software and firmware performing safety functions	Single fault safe compliance. Failures evaluation and risk analysis were performed by means of fault simulation or single fault conditions. (refer to subclause of 4.4.4).	P

4.2.2.6/4.7	TABLE: electrical data (in normal conditions)					P
Model	PV input			AC Grid output		
	U (V) DC	I (A) DC	P (kW) DC	U (V) AC	I (A) AC	P (kW) AC
hopeSun100K TL	599.02	174.40	104.47	208.15	159.89 160.02 160.13	99.91
	599.02	174.33	104.42	231.12	144.47 144.51 144.68	100.22
	599.03	175.35	105.03	254.08	132.11 132.18 132.28	100.75
	750.12	139.25	104.45	208.16	160.96 161.09 161.23	100.59
	750.12	139.80	104.87	231.11	145.76 145.85 146.02	101.13
	750.12	139.69	104.78	254.09	132.32 132.35 132.53	100.91
	850.20	121.02	102.89	208.14	160.05 160.19 160.35	100.02
	850.20	121.55	103.33	231.10	144.70 144.81 144.99	100.40
	850.20	120.84	102.73	254.08	131.87 131.96 132.13	100.59
hopeSun110K TL	598.96	190.64	114.19	208.23	174.83 174.97 175.06	109.28
	598.96	190.97	114.38	231.19	158.32 158.36 158.51	109.85
	598.97	191.41	114.65	254.16	144.42 144.48 144.57	110.16
	750.08	153.00	114.76	208.24	176.97 177.09 177.23	110.62

	750.08	153.39	115.05	231.20	159.84 159.93 160.07	110.93
	750.08	153.72	115.30	254.15	145.32 145.35 145.54	110.85
	850.17	133.48	113.47	208.21	176.19 176.32 176.46	110.12
	850.17	134.58	114.41	231.17	159.26 159.35 159.55	110.52
	850.17	133.20	113.24	254.12	145.56 145.63 145.81	111.04
hopeSun125K TL-M	600.80	213.35	128.17	260.44	159.93 159.87 160.02	124.96
	600.77	213.48	128.25	289.26	144.33 144.33 144.41	125.26
	600.57	214.01	128.52	318.04	131.54 131.53 131.63	125.52
	750.41	169.54	127.22	260.47	159.54 159.51 159.66	124.68
	750.40	169.21	126.97	289.26	144.14 144.14 144.24	125.10
	750.40	169.23	126.99	318.08	131.34 131.33 131.41	125.34
	849.73	150.79	128.13	260.42	161.36 161.31 161.53	126.09
	849.96	148.71	126.39	289.20	144.85 144.81 144.99	125.69
	849.94	151.56	128.81	318.01	132.16 132.11 132.26	126.09

hopeSun136K TL-M	598.96	235.24	140.85	470.51	167.81 167.95 168.25	136.00
	598.94	234.11	140.17	522.42	150.96 151.10 151.39	135.76
	598.97	234.37	140.32	571.93	138.16 138.32 138.53	135.83
	749.18	187.42	140.36	470.50	167.70 167.86 168.12	135.95
	749.17	187.55	140.46	522.49	151.59 151.76 151.98	136.36
	749.17	188.15	140.90	571.94	139.21 139.39 139.59	136.92
	849.25	165.23	140.26	470.52	167.84 167.96 168.20	135.85
	849.26	164.83	139.92	522.53	151.40 151.52 151.78	135.89
	849.28	164.72	139.83	571.91	138.47 138.61 138.83	136.18
Supplementary information: Test with 50Hz						

4.3	TABLE: heating temperature rise measurements				P
	test voltage (V)	See below			—
	Ambient temperature t1 (°C)	See below			—
	Ambient temperature t2 (°C)	See below			—
temperature rise dT of part/at:		T (°C)			allowed T _{max} (°C)
Supplied Voltage(V):	AC340V DC465V 60°C	AC400V DC465V 60°C	AC440V DC465V 60°C	--	--
Model: hopeSun100KTL					
DC input terminal	66.34	68.04	65.69	--	85
DC wire	83.22	83.39	83.72	--	125
DC switch	66.30	66.43	66.22	--	85
DC FUSE FUI8	95.54	95.73	96.11	--	105
DC FUSE FU18	86.87	87.04	87.39	--	105
AC output terminal	81.22	81.38	81.71	--	85
AC output wire	72.66	72.80	73.09	--	125
Enclosure back (outside)	64.75	64.88	65.14	--	70
Display (LED)	65.82	65.95	66.21	--	95
mounting port	63.50	63.64	63.89	--	70
Bus cap C12(BUS board)	71.56	71.70	71.99	--	105
Bus cap C10(BUS board)	74.55	74.70	75.00	--	105
Bobbin of SPS Transformer T3(Auxiliary source board)	93.54	93.73	94.10	--	110
Wire of SPS Transformer T3(Auxiliary source board)	89.75	89.93	90.29	--	110
Bobbin of Insulation Transformer T2(Auxiliary source board)	88.10	88.28	88.63	--	110
Wire of Insulation Transformer T2(Auxiliary source board)	77.28	77.43	77.74	--	110
PCB near IGBT Q26(Power board)	76.70	76.85	77.16	--	130
Cap C2(Lightning protection board)	96.48	96.67	97.06	--	110
Cap (DC) C3(Lightning protection board)	94.51	94.70	95.08	--	110

Cap (DC) C9(Lightning protection board)	83.36	83.53	83.86	--	110
Cap (DC) C8(Lightning protection board)	85.30	85.47	85.81	--	110
Varistor RV2(Lightning protection board)	81.56	81.72	82.05	--	105
X cap (AC) C411	80.35	80.51	80.83	--	110
Cap (AC) C427	95.27	95.46	95.84	--	110
Cap (AC) C423	81.83	81.99	82.32	--	105
Drive optocoupler U48	81.19	81.35	81.68	--	100
Insulate optocoupler U53	78.66	78.82	79.13	--	100
Relay (AC) K7	79.01	79.17	79.48	--	90
Relay (AC) K8	80.80	80.96	81.28	--	90
Relay (AC) K9	80.91	81.07	81.40	--	90
Relay (AC) K10	83.29	83.46	83.79	--	90
Relay (AC) K11	82.28	82.45	82.77	--	90
Relay (AC) K12	82.02	82.18	83.35	--	90
AC Current sensor SH1	80.70	80.86	81.18	--	105
DC Current sensor SH2	80.80	80.96	81.28	--	105
DC Current sensor SH3	83.58	83.75	84.08	--	105
Master CPU U8	90.20	90.38	90.74	--	150
Slave CPU U3	91.43	91.61	91.98	--	150
temperature rise dT of part/at:	T (°C)				allowed T _{max} (°C)
Supplied Voltage(V):	AC340V DC465V 60°C	AC400V DC465V 60°C	AC440V DC465V 60°C	--	--
Model: hopeSun110KTL					
DC input terminal	67.64	68.38	68.04	--	85
DC wire	82.89	83.80	83.39	--	125
DC switch	65.09	66.77	66.43	--	85
DC FUSE FUI8	95.16	96.21	95.73	--	105
DC FUSE FU18	86.52	87.47	87.04	--	105

AC output terminal	80.90	81.79	81.39	--	85
AC output wire	73.87	73.17	72.80	--	125
Enclosure back (outside)	64.49	65.20	64.88	--	70
Display (LED)	65.56	66.27	65.95	--	95
mounting port	66.13	63.94	63.64	--	70
Bus cap C12(BUS board)	71.27	72.05	71.70	--	105
Bus cap C10(BUs board)	74.25	75.07	74.70	--	105
Bobbin of SPS Transformer T3(Auxiliary source board)	93.17	94.19	93.73	--	110
Wire of SPS Transformer T3(Auxiliary source board)	89.39	90.37	89.93	--	110
Bobbin of Insulation Transformer T2(Auxiliary source board)	87.75	88.72	88.28	--	110
Wire of Insulation Transformer T2(Auxiliary source board)	76.97	77.82	77.43	--	110
PCB near IGBT Q26(Power board)	76.39	77.23	76.85	--	130
Cap C2(Lightning protection board)	96.10	97.16	96.68	--	110
Cap (DC) C3(Lightning protection board)	94.13	95.17	94.69	--	110
Cap (DC) C9(Lightning protection board)	83.03	83.94	83.53	--	110
Cap (DC) C8(Lightning protection board)	84.96	85.89	85.47	--	110
Varistor RV2(Lightning protection board)	81.24	82.13	81.73	--	105
X cap (AC) C411	80.03	80.91	80.51	--	110
Cap (AC) C427	94.89	95.93	95.46	--	110
Cap (AC) C423	81.50	82.40	81.99	--	105
Drive optocoupler U48	80.87	81.76	81.36	--	100
Insolate optocoupler U53	78.35	79.21	78.82	--	100
Relay (AC) K7	78.70	79.57	79.17	--	90
Relay (AC) K8	80.48	81.37	80.96	--	90
Relay (AC) K9	80.59	81.48	81.07	--	90
Relay (AC) K10	82.96	82.19	83.46	--	90
Relay (AC) K11	81.96	82.01	82.45	--	90
Relay (AC) K12	83.36	83.44	83.86	--	90

AC Current sensor SH1	80.38	80.45	80.86	--	105
DC Current sensor SH2	80.48	81.36	81.80	--	105
DC Current sensor SH3	83.25	84.17	83.75	--	105
Master CPU U8	89.84	90.83	90.38	--	150
Slave CPU U3	91.07	92.07	91.62	--	150
temperature rise dT of part/at:	T (°C)				allowed T _{max} (°C)
Supplied Voltage(V):	AC425V DC529V 60°C	AC500V DC529V 60°C	AC550V DC529V 60°C	--	--
Model: hopeSun125KTL-M					
DC input terminal	68.86	66.73	65.47	--	85
DC wire	81.86	81.77	82.63	--	125
DC switch	67.23	68.57	66.77	--	85
DC FUSE FUI8	96.88	98.82	99.79	--	105
DC FUSE FU18	88.09	89.85	90.73	--	105
AC output terminal	82.36	84.01	84.83	--	85
AC output wire	73.67	74.64	73.26	--	125
Enclosure back (outside)	65.66	66.97	67.63	--	70
Display (LED)	66.74	65.46	66.10	--	95
mounting port	66.15	65.68	66.33	--	70
Bus cap C12(BUS board)	72.56	74.01	74.74	--	105
Bus cap C10(BUs board)	75.60	77.11	77.87	--	105
Bobbin of SPS Transformer T3(Auxiliary source board)	94.85	96.75	97.70	--	110
Wire of SPS Transformer T3(Auxiliary source board)	91.01	92.83	93.74	--	110
Bobbin of Insulation Transformer T2(Auxiliary source board)	89.34	91.13	92.02	--	110
Wire of Insulation Transformer T2(Auxiliary source board)	78.36	79.93	80.71	--	110
PCB near IGBT Q26(Power board)	77.78	79.34	80.11	--	130
Cap C2(Lightning protection board)	97.83	99.79	100.76	--	110
Cap (DC) C3(Lightning protection board)	95.84	97.76	98.72	--	110

Cap (DC) C9(Lightning protection board)	84.53	86.22	87.07	--	110
Cap (DC) C8(Lightning protection board)	86.50	88.23	89.10	--	110
Varistor RV2(Lightning protection board)	82.70	84.35	85.18	--	105
X cap (AC) C411	81.48	83.11	83.92	--	110
Cap (AC) C427	96.61	98.54	99.51	--	110
Cap (AC) C423	82.98	84.64	85.47	--	105
Drive optocoupler U48	82.33	83.98	84.80	--	100
Insulate optocoupler U53	79.76	81.36	82.15	--	100
Relay (AC) K7	80.12	81.72	82.52	--	90
Relay (AC) K8	81.93	83.57	84.39	--	90
Relay (AC) K9	82.04	82.01	81.15	--	90
Relay (AC) K10	81.92	81.89	81.04	--	90
Relay (AC) K11	81.73	81.69	80.85	--	90
Relay (AC) K12	81.51	83.13	80.63	--	90
AC Current sensor SH1	81.83	81.80	80.94	--	105
DC Current sensor SH2	81.93	81.90	81.05	--	105
DC Current sensor SH3	84.75	86.45	87.29	--	105
Master CPU U8	91.46	93.29	94.20	--	150
Slave CPU U3	92.71	94.56	95.49	--	150
temperature rise dT of part/at:	T (°C)				allowed T _{max} (°C)
Supplied Voltage(V):	AC520V DC580V 40°C	AC520V DC704V 40°C	AC520V DC880V 40°C	--	--
Model: hopeSun136KTL-M					
DC input terminal(outside)	48.15	48.88	47.91	--	85
DC wire(internal)	71.41	72.52	74.46	--	125
DC switch(outside)	48.11	48.34	45.50	--	85
DC FUSE FU18	80.05	80.07	83.45	--	105
DC FUSE FU18	72.78	73.89	75.87	--	105

AC output terminal (outside)	68.05	69.09	70.94	--	85
AC output wire (internal)	41.99	42.63	43.77	--	125
Enclosure back (outside)	54.25	55.08	56.55	--	70
Display (LED)	46.66	47.38	46.43	--	95
mounting port	47.40	47.14	47.39	--	70
Bus cap C12(BUS board)	62.26	59.97	62.51	--	105
Bus cap C10(BUs board)	62.47	71.68	65.11	--	105
Bobbin of SPS Transformer T3(Auxiliary source board)	76.31	75.38	81.70	--	110
Wire of SPS Transformer T3(Auxiliary source board)	70.50	71.58	78.40	--	110
Bobbin of Insulation Transformer T2(Auxiliary source board)	74.93	74.94	76.95	--	110
Wire of Insulation Transformer T2(Auxiliary source board)	64.75	65.74	67.50	--	110
PCB near IGBT Q26(Power board)	64.26	65.24	66.99	--	130
CapC2(Lightning protection board)	80.84	82.07	84.27	--	110
Cap (DC)C3(Lightning protection board)	79.18	79.20	82.54	--	110
Cap (DC)C9(Lightning protection board)	69.86	70.92	72.81	--	110
Cap (DC)C8(Lightning protection board)	71.47	72.56	74.50	--	110
Varistor RV2(Lightning protection board)	68.34	69.38	71.24	--	105
X cap (AC) C411	67.33	68.35	70.18	--	110
Cap (AC) C427	79.83	81.05	83.22	--	110
Cap (AC) C423	68.56	68.58	71.47	--	105
Drive Op U48	68.03	69.06	70.92	--	100
Insolate Op U53	65.91	66.91	68.71	--	100
Relay (AC) k7	66.21	67.22	69.02	--	90
Relay (AC) k8	67.70	68.74	70.58	--	90
Relay (Ac) k9	67.80	68.83	70.68	--	90
Relay (Ac) k10	71.95	73.04	75.00	--	90
Relay (AC) k11	70.35	70.37	73.34	--	90
Relay (AC) k12	70.13	71.20	73.11	--	90

AC Current sensor SH1	71.18	72.27	74.20	--	105
DC Current sensor SH2	72.71	73.82	75.80	--	105
DC Current sensor SH3	70.03	71.10	73.01	--	105
Master CPU U8	75.58	76.73	78.79	--	150
Slave CPU U3	76.61	76.63	79.86	--	150
temperature rise dT of part/at:	T (°C)				allowed T _{max} (°C)
Supplied Voltage(V):	AC442V DC580V 60°C	AC442V DC704V 60°C	AC442V DC880V 60°C	--	--
Model: hopeSun136KTL-M					
DC input terminal(outside)	68.16	66.79	65.92	--	85
DC wire(internal)	82.98	83.84	82.75	--	125
DC switch(outside)	65.58	62.87	64.34	--	85
DC FUSE FUI8	95.87	93.96	92.74	--	105
DC FUSE FU18	87.17	85.43	84.32	--	105
AC output terminal (outside)	81.51	79.88	78.84	--	85
AC output wire (internal)	75.44	73.94	72.98	--	125
Enclosure back (outside)	64.98	63.68	62.85	--	70
Display (LED)	66.05	64.73	66.34	--	95
mounting port	63.72	62.45	64.55	--	70
Bus cap C12(BUS board)	71.82	70.38	69.46	--	105
Bus cap C10(BUs board)	74.81	73.32	72.36	--	105
Bobbin of SPS Transformer T3(Auxiliary source board)	93.87	91.99	90.79	--	110
Wire of SPS Transformer T3(Auxiliary source board)	90.07	88.27	87.12	--	110
Bobbin of Insulation Transformer T2(Auxiliary source board)	88.41	86.65	85.52	--	110
Wire of Insulation Transformer T2(Auxiliary source board)	77.55	76.00	75.01	--	110
PCB near IGBT Q26(Power board)	76.97	75.43	74.45	--	130
CapC2(Lightning protection board)	96.82	94.89	93.65	--	110
Cap (DC)C3(Lightning protection board)	94.84	92.94	91.73	--	110

Cap (DC)C9(Lightning protection board)	83.66	81.99	80.92	--	110
Cap (DC)C8(Lightning protection board)	85.60	83.89	82.79	--	110
Varistor RV2(Lightning protection board)	81.86	80.22	79.18	--	105
X cap (AC) C411	80.64	79.02	78.00	--	110
Cap (AC) C427	95.61	93.70	92.48	--	110
Cap (AC) C423	82.12	80.48	79.43	--	105
Drive Op U48	81.48	79.85	78.81	--	100
Insulate Op U53	78.94	77.36	76.35	--	100
Relay (AC) K7	79.30	77.72	76.71	--	90
Relay (AC) k8	81.09	79.47	78.44	--	90
Relay (Ac) k9	81.20	79.58	78.55	--	90
Relay (Ac) k10	83.58	82.76	83.35	--	90
Relay (AC) k11	81.73	82.58	81.50	--	90
Relay (AC) k12	81.48	82.32	81.25	--	90
AC Current sensor SH1	83.55	83.55	82.46	--	105
DC Current sensor SH2	82.73	82.78	82.55	--	105
DC Current sensor SH3	83.88	82.20	81.13	--	105
Master CPU U8	90.53	88.72	87.56	--	150
Slave CPU U3	91.76	89.92	88.76	--	150
temperature rise dT of part/at:	T (°C)				allowed T _{max} (°C)
Supplied Voltage(V):	AC520V DC580V 60°C	AC520V DC704V 60°C	AC520V DC880V 60°C	--	--
Model: hopeSun136KTL-M					
DC input terminal(outside)	66.05	66.18	64.87	--	125
DC wire(internal)	82.92	83.09	81.42	--	85
DC switch(outside)	64.47	64.61	65.57	--	85
DC FUSE FU18	92.92	93.11	91.24	--	105
DC FUSE FU18	84.49	84.66	82.96	--	105

AC output terminal (outside)	79.00	79.16	77.57	--	85
AC output wire (internal)	73.11	73.26	70.83	--	125
Enclosure back (outside)	62.97	63.10	61.84	--	70
Display (LED)	64.01	64.14	62.86	--	95
mounting port	64.57	64.70	63.40	--	70
Bus cap C12(BUS board)	69.60	69.74	68.35	--	105
Bus cap C10(BUs board)	72.51	72.65	71.20	--	105
Bobbin of SPS Transformer T3(Auxiliary source board)	90.98	91.16	89.33	--	110
Wire of SPS Transformer T3(Auxiliary source board)	87.30	87.47	85.72	--	110
Bobbin of Insulation Transformer T2(Auxiliary source board)	85.69	85.86	84.14	--	110
Wire of Insulation Transformer T2(Auxiliary source board)	75.16	75.31	73.81	--	110
PCB near IGBT Q26(Power board)	74.60	74.75	73.25	--	130
CapC2(Lightning protection board)	93.84	94.03	92.15	--	110
Cap (DC)C3(Lightning protection board)	91.92	92.10	90.26	--	110
Cap (DC)C9(Lightning protection board)	81.08	81.24	79.62	--	110
Cap (DC)C8(Lightning protection board)	82.96	83.13	81.46	--	110
Varistor RV2(Lightning protection board)	79.33	79.49	77.90	--	105
X cap (AC) C411	78.15	78.31	76.74	--	110
Cap (AC) C427	92.67	92.85	91.00	--	110
Cap (AC) C423	79.59	79.75	78.15	--	105
Drive Op U48	78.97	79.13	77.54	--	100
Insolate Op U53	76.51	76.66	75.13	--	100
Relay (AC) K7	76.86	77.01	75.47	--	90
Relay (AC) k8	78.59	78.75	77.17	--	90
Relay (Ac) k9	78.70	78.86	77.28	--	90
Relay (Ac) k10	83.51	83.68	82.01	--	90
Relay (AC) k11	81.67	81.83	80.19	--	90
Relay (AC) k12	81.41	81.57	79.94	--	90

AC Current sensor SH1	82.63	82.79	81.14	--	105
DC Current sensor SH2	82.71	82.03	82.88	--	105
DC Current sensor SH3	81.30	81.46	79.83	--	105
Master CPU U8	87.74	87.91	86.15	--	150
Slave CPU U3	88.93	89.11	87.33	--	150
temperature rise dT of part/at:	T (°C)				allowed T _{max} (°C)
Supplied Voltage(V):	AC572V DC580V 60°C	AC572V DC704V 60°C	AC572V DC880V 60°C	--	--
Model: hopeSun136KTL-M					
DC input terminal(outside)	65.00	66.70	65.46	--	85
DC wire(internal)	81.59	81.83	82.16	--	125
DC switch(outside)	65.70	65.90	64.79	--	85
DC FUSE FUI8	91.43	91.70	92.07	--	105
DC FUSE FU18	83.13	83.38	83.71	--	105
AC output terminal (outside)	77.73	77.96	78.27	--	85
AC output wire (internal)	71.94	72.15	72.45	--	125
Enclosure back (outside)	61.96	62.15	62.40	--	70
Display (LED)	62.99	65.60	63.43	--	95
mounting port	63.53	63.17	62.86	--	70
Bus cap C12(BUS board)	68.48	68.69	68.96	--	105
Bus cap C10(BUs board)	71.34	71.56	71.84	--	105
Bobbin of SPS Transformer T3(Auxiliary source board)	89.51	89.78	90.14	--	110
Wire of SPS Transformer T3(Auxiliary source board)	85.89	86.15	86.50	--	110
Bobbin of Insulation Transformer T2(Auxiliary source board)	84.31	84.57	84.90	--	110
Wire of Insulation Transformer T2(Auxiliary source board)	73.95	74.18	74.47	--	110
PCB near IGBT Q26(Power board)	73.40	73.62	73.91	--	130
CapC2(Lightning protection board)	92.33	92.61	92.98	--	110
Cap (DC)C3(Lightning protection board)	90.44	90.71	91.07	--	110

Cap (DC)C9(Lightning protection board)	79.78	80.02	80.34	--	110
Cap (DC)C8(Lightning protection board)	81.63	81.87	82.20	--	110
Varistor RV2(Lightning protection board)	78.06	78.29	78.61	--	105
X cap (AC) C411	76.90	77.13	77.44	--	110
Cap (AC) C427	91.18	91.45	91.82	--	110
Cap (AC) C423	78.31	78.54	78.86	--	105
Drive Op U48	77.70	77.93	78.24	--	100
Insulate Op U53	75.28	75.50	75.81	--	100
Relay (AC) K7	75.62	75.85	76.16	--	90
Relay (AC) k8	77.33	77.56	77.87	--	90
Relay (Ac) k9	77.44	77.67	77.98	--	90
Relay (Ac) k10	82.17	82.42	82.75	--	90
Relay (AC) k11	80.35	80.59	80.92	--	90
Relay (AC) k12	80.10	80.34	80.66	--	90
AC Current sensor SH1	81.30	81.54	81.87	--	105
DC Current sensor SH2	83.05	83.29	83.63	--	105
DC Current sensor SH3	79.99	80.23	80.55	--	105
Master CPU U8	86.33	86.59	86.93	--	150
Slave CPU U3	87.50	87.77	88.12	--	150

	Winding temperature rise measurements					--
	Ambient temperature t1 (°C) :		--		—	
	Ambient temperature t2 (°C) :		--		—	
temperature rise dT of winding:		R ₁ (Ω)	R ₂ (Ω)	T (°C)	allowed T _{max} (°C)	insulation class
--		--	--	--	--	--
Note(s):						

4.4	TABLE: fault condition tests						P
	test voltage (V)				See below		—
	Ambient temperature (°C)				25°C, if not stated otherwise		
No.	component No.	fault	test voltage (V)	test time	fuse No.	fuse current (A)	result
1.	DC input	s-c	750	10min	--	--	The unit indicates a fault and shut down. DC fuses open. No hazard.
2.	DC input	Reversed	750	10min	--	--	The unit indicates a fault and unable to connect with grid. Can resettable. No damage. No hazard.
3.	AC output	Overload 120%	750	10min	--	--	Overload step by step, the unit can loaded 110% and reach equilibrium state, when load further more, the The unit indicates a fault and shut down. Can resettable. No damage. No hazard.
4.	AC output	s-c	750	10min	--	--	The unit indicates a fault and shut down. Can resettable. No damage. No hazard.
5.	AC output	Phase mis-wiring grid connection (before start up)	750	10min	--	--	The unit indicates a fault and unable to connect with grid. Can resettable. No damage. No hazard.
6.	Relay (AC) k7	s-c (before start up)	750	10min	--	--	The unit indicates a fault and unable to connect with grid. Can resettable. No damage. No hazard.
7.	Relay (AC) k8	s-c (before start up)	750	10min	--	--	The unit indicates a fault and unable to connect with grid. Can resettable. No damage. No hazard.
8.	Relay (AC) k9	s-c (before start up)	750	10min	--	--	The unit indicates a fault and unable to connect with grid. Can resettable. No damage. No hazard.
9.	Relay (AC) k10	s-c (before start up)	750	10min	--	--	The unit indicates a fault and unable to connect with grid. Can resettable. No damage. No hazard.
10.	Relay (AC) k11	s-c (before start up)	750	10min	--	--	The unit indicates a fault and unable to connect with grid. Can resettable. No damage. No hazard.

11.	Relay (AC) k12	s-c (before start up)	750	10min	--	--	The unit indicates a fault and unable to connect with grid. Can resettable. No damage. No hazard.
12.	Cooling system failure	Fan locked	750	10min	--	--	The unit keep running with rated power at the beginning. After 40 minutes, the unit shut down. Can resettable. No damage. No hazard.
13.	SPS transformer T2 Pin 6 to Pin 7	s-c	750	10min	--	--	The unit indicate a fault and shut down. Can resettable. No damage. No hazard
14.	SPS transformer T2 Pin 9 to Pin 10	s-c	750	10min	--	--	The unit indicate a fault and shut down. Can resettable. No damage. No hazard
15.	SPS transformer T1 Pin 6 to Pin 7	s-c	750	10min	--	--	The unit indicate a fault and shut down. Can resettable. No damage. No hazard
16.	SPS transformer T1 Pin 9 to Pin 10	s-c	750	10min	--	--	The unit indicate a fault and shut down. Can resettable. No damage. No hazard
17.	Drive Optocoupler U2 (IGBT)	o-c	750	10min	--	--	The unit indicates a fault and shut down. Can resettable. No damage. No hazard
18.	Drive Optocoupler U2 (IGBT)	s-c	750	10min	--	--	The unit indicates a fault and shut down. Can resettable. No damage. No hazard
19.	Q6 (MOSFET) Pin 1 to Pin 2	s-c	750	10min	--	--	The unit indicates a fault and shut down. Can resettable. No hazard. Q5, Q6, Q13 damaged
20.	Q6 (MOSFET)	s-c	750	10min	--	--	The unit indicate a fault and shut down. Can resettable. No hazard. D2, D21,

	Pin 2 to Pin 3						D25 damaged
21.	Q6 (MOSFET) Pin 1 to Pin 3	s-c	750	10min	--	--	The unit indicates a fault and shut down. Can resettable. No damage. No hazard
22.	Insulate Optocoupler U5	o-c	750	10min	--	--	The unit indicates a fault and shut down. Can resettable. No damage. No hazard
23.	Insulate Optocoupler U5	s-c	750	10min	--	--	The unit indicates a fault and shut down. Can resettable. No damage. No hazard
24.	ISO detection circuit R506	s-c	750	10min	--	--	The unit normal operation, No damage. No hazard
25.	ISO detection circuit R506	o-c	750	10min	--	--	The unit indicates a fault and shut down. Can resettable. No damage. No hazard
26.	AC voltage sampling circuit R763	s-c	750	10min	--	--	The unit normal operation, No damage. No hazard
27.	AC voltage sampling circuit R763	o-c	750	10min	--	--	The unit indicates a fault and shut down. Can resettable. No damage. No hazard
28.	AC voltage sampling circuit R777	s-c	750	10min	--	--	The unit normal operation, No damage. No hazard
29.	AC voltage sampling circuit R777	o-c	750	10min	--	--	The unit indicates a fault and shut down. Can resettable. No damage. No hazard
30.	AV current sampling circuit R443	s-c	750	10min	--	--	The unit normal operation, No damage. No hazard

31.	AV current sampling circuit R443	o-c	750	10min	--	--	The unit indicates a fault and shut down. Can resettable. No damage. No hazard
32.	DC voltage sampling circuit R511	s-c	750	10min	--	--	The unit normal operation, No damage. No hazard
33.	DC voltage sampling circuit R511	o-c	750	10min	--	--	The unit indicates a fault and shut down. Can resettable. No damage. No hazard
34.	DC voltage sampling circuit R515	s-c	750	10min	--	--	The unit normal operation, No damage. No hazard
35.	DC voltage sampling circui R515	o-c	750	10min	--	--	The unit indicates a fault and shut down. Can resettable. No damage. No hazard
36.	Bus voltage sampling circuit R519	s-c	750	10min	--	--	The unit normal operation, No damage. No hazard
37.	Bus voltage sampling circuit R519	o-c	750	10min	--	--	The unit indicates a fault and shut down. Can resettable. No damage. No hazard
Legend							
FID	Fault Indication				MT		Max. Temperature
SD	PCE Shut Down:				DG		Disconnection To Grid
RO	Recovered to Operate after removing the single fault setting				NCD		No Comp. or parts Damaged
NH	No Hazards occurred				PEST		Pass the Electric Strength Test.
BI	Basic insulation				SI		Supplementary insulation
DI	Double insulation				RI		Reinforced insulation
FI	Functional insulation				O.V.C		Overvoltage category
s-c.	short-circuited				o-c		open-circuited
o-l	Over-load.						
Note(s):							

The electric strength test performed after fault condition test and see appended table 7.5.2 for detailed test conditions.

7.3.6.3.3	TABLE: protective equipotential bonding				N/A
Measured between:	Test current (A)	Voltage drop (V)	Resistance (mΩ)	result	
--	--	--	--	--	
Supplementary information:					
The alternative of sub clause 7.3.6.3.5 was considered					

7.3.6.3.7	TABLE: touch current measurement			P
Measured between:		Measured (mA)	Limit (mA)	Comments/conditions
At metal enclosure		AC 2.84	AC 3.5 / DC 10	PE disconnected
supplementary information				

7.3.7.4 & 7.3.7.5		TABLE: clearance and creepage distance measurements					P
Clearance cl and creepage distance dcr at/of:	System / Impulse voltage (V)	U r.m.s. (V)	Required cl (mm)	cl (mm)	Required dcr (mm)	dcr (mm)	
AC filter board:							
Output L1-L2 (FI)	4771	1100Vdc 520Vac	5.5	7.2	5.5	7.2	
Output L2-L3 (FI)	4771	1100Vdc 520Vac	5.5	7.2	5.5	7.2	
Mains to PE (BI)	4771	1100Vdc 520Vac	5.5	14.1	5.5	14.1	
Lightning protection board:							
Mains to SELV (RI)	6000	1100Vdc 520Vac	7.1	12.0	11.04	12.0	
Mains to PE (BI)	4771	1100Vdc 520Vac	5.5	5.52	5.5	5.52	
PV1+ to PV1- (FI)	4771	1100Vdc 520Vac	5.5	5.6	5.5	5.6	
PV1+ to PE (BI)	4771	1100Vdc 520Vac	5.5	7.1	5.5	7.1	
Bus board:							
Mains to PE (BI)	4771	1100Vdc 520Vac	5.5	7.1	5.5	7.1	
Output board:							
Mains to SELV(Com) (DI)	6000	1100Vdc 520Vac	7.1	9.7	7.1	9.7	
Transformer to Mains (BI)	4771	1100Vdc 520Vac	5.5	6.2	5.5	6.2	
Mains to SELV(LED) (DI)	6000	1100Vdc 520Vac	7.1	9.3	7.1	9.3	
Small IGBT board:							
IGBT to PE (BI)	4771	1100Vdc 520Vac	5.5	5.9	5.5	5.9	
Mains to PE (BI)	4771	1100Vdc 520Vac	5.5	5.7	5.5	5.7	
Big IGBT board:							
IGBT to PE (BI)	4771	1100Vdc 520Vac	5.5	5.6	5.5	5.6	
Mains to PE (BI)	4771	1100Vdc 520Vac	5.5	8.6	5.5	8.6	

Others:						
L to PE(BI)	4771	1100Vdc 520Vac	5.5	18.3	5.5	18.3
SPS transformer T2 primary to Secondary (DI)	6000	1100Vdc 520Vac	7.1	19.4	7.1	>7.1
Insulation transformer T3 primary to Secondary (DI)	6000	1100Vdc 520Vac	7.1	11.8	7.1	>11.8
Insulation transformer T3 primary to core (BI)	4771	1100Vdc 520Vac	5.5	6.1	5.5	>6.1
X cap to PE (BI)	4771	1100Vdc 520Vac	5.5	13.5	5.5	>13.5
Y cap to PE (BI)	4771	1100Vdc 520Vac	5.5	11.4	5.5	>11.4
BUS cap to enclosure (BI)	4771	1100Vdc 520Vac	5.5	6.4	5.5	>6.4
<p>Note(s): FI=functional insulation, BI=basic insulation, S=supplementary insulation, R=reinforced insulation.</p> <p>When determine the clearance:</p> <p>For DC input circuits: Overvoltage Category II applied (impulse withstand voltage 4771V)</p> <p>For AC output circuits (connected to AC mains): Overvoltage Category III applied (impulse withstand voltage 6000V, temporary overvoltage 2120Vpeak considered.)</p> <p>Interpolation is used.</p> <p>For the inner layer of the PCB, pollution I was considered.</p> <p>Requirement about creepage distances for the distance to the metal enclosure come from columns 7 and 8 of Table 14. Requirement about creepage distances for other parts come from column 3 of table 14.</p> <p>PCB with min. CTI 175 used.</p>						

7.3.7	TABLE: distance through insulation measurement				P
distance through insulation di at/of:	U r.m.s. (V)	test voltage (V)	required di (mm)	di (mm)	
Triple insulation wire of transformer core (BI)	1100Vdc	4000	--	certified	
Communication isolated optocoupler (RI)	2120Vdc	6000	--	certified	
Note(s): 1) Certificated components.					

7.5	TABLE: electric strength measurements, impulse voltage test and partial discharge test				P
test voltage applied between:		test voltage (V)	impulse withstand voltage (V)	partial discharge extinction voltage (V)	result
PV input to Ground (BI)		2545Vdc	6000	N/A	No breakdown
AC output to Ground (BI)		2545Vdc	6000	N/A	No breakdown
PV input to communication port (RI)		5090Vdc	8000	N/A	No breakdown
AC outputt to communication port (RI)		5090Vdc	8000	N/A	No breakdown
Legend					
BI	Basic insulation		SI	Supplementary insulation	
DI	Double insulation		RI	Reinforced insulation	
FI	Functional insulation		O.V.C	Overvoltage category	
Note(s):					

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
--	--	--	--	--	--	--

14	TABLE: list of critical components					P
Object	Manufacturer	Type / model	Technical Data	Standard(s)	Remark	
Model: hopeSun 100KTL/hopeSun 110KTL/hopeSun 125KTL/ hopeSun 136KTL						
PV connector 13110104 13110103	Wuxi Betteri Electronic Technology Co.,Ltd	BC03B/ BC03B	600V/30A, -40°C to 85°C	IEC 60950-1:2005	TUV B 131285127003	
DC Switch 13090084	Zhejiang Ben Yi electrical Co.,Ltd	BYSS.2-50	1000V-40A- 800V(50A) -40°C to 85°C	UL 508	UL E482690	
Fan outside 13120078	NMB	08038RA- 12Q-GL-01	12Vdc-13.8W-1.15A 70°C	UL 507	UL E89936	
Fan inside 13120080 13120061	NMB	09225VA- 12P-AL-00& 09225VA12P AL00-900	12Vdc-6.24W-0.68A 70°C	UL 507	UL E89936	
Boost inductor 24020247 24020248	Hopewind	HWL0299&H WL0313	180uH-55A-64KHz CLASS F	IEC 62109-1	Tested with apparatus	
Inverter inductor 24020249 24020250 24020251	Hopewind	HWL0314 & HWL0315 & HWL0316	80uH-18KHz CLASS F	IEC 62109-1	Tested with apparatus	
hopeSunHVB2 board						
DC Fuse FU1 - FU10 13010018	Xi'an sinofuse electric Co.,Ltd	RS308-PV- 3E20A	Ue=1000V, In=20A 105°C	EN 60269-6:2011	TUV R50402583	
Alternate	Hollyland	HC10gPV	Ue=1000V, In=200A 105°C	EN 60269-6:2011	TUV R50263929	
Alternate	Bussmann	PV-20A10F	Ue=1000V, In=200A 105°C	UL 248-1	UL E335324	

14	TABLE: list of critical components					P
Object	Manufacturer	Type / model	Technical Data	Standard(s)	Remark	
DC Hall SH1 - SH8 29030102	Sinomags Technology Co., Ltd	STK- 25CTS/P2	50mV/A-±25A-2.5%- 5V 105°C	UL 2367	UL E507664	
hopeSunF3 board						
X-cap C1,C2,C3,C4 22030058	Xiamen Faratronic Co.,Ltd	C3D3L106K F02C00	1200V-10uF-±10% 110°C	UL 810	UL E256238	
Alternate	WUXI CRE NEW ENERGY TECHNOLOG Y CO LTD	DPS1061200 K413101	1200V-10uF-±10% 110°C	UL 810	UL E496566	
Y-cap C13 - C20 22030063	Xiamen Faratronic Co.,Ltd	C43Q1333K 61C000	300Vac-33nF-±10% -40 to 105°C	UL 60384-14	UL E186600	
Alternate	Sichuan Zhongxing Electronic Co., Ltd E186600	MK63333KF 26XB000	300Vac-33nF-±10% -40 to 105°C	UL 60384-14	UL E217215	
Y-cap C5 - C12 22050002	TDK CORPORATI ON	CD16- E2GA472MY *S	250VAC-4700pF- ±20% -25°C to 105°C	UL 60384-14	UL E37861	
Alternate	Fenghua Advanced Technology Co.Ltd	CT7- Y12Y5U0E4 72MSE	250VAC-4700pF- ±20% -25°C -125°C	UL 60384-14	UL E219015	
Varistor RV1,RV2,RV 4,RV5 21030017	THINKING ELECTRONIC INDUSTRIAL CO LTD	TVA25821K GKGEUX1	510Vac-670Vdc- 738Vdc-10kA -40 to 105°C	UL 1449	UL E314979	
Alternate	LONG KE ELECTRONIC S (HUIYANG) CO LTD	25D821KA	510Vac-670Vdc- 738Vdc-10k -40°C to 105°C	UL 1449	UL E326953	

14	TABLE: list of critical components					P
Object	Manufacturer	Type / model	Technical Data	Standard(s)	Remark	
Alternate	Guangdong Fenghua Advanced Technology Holding Co., Ltd	FNR25K821 BASN1NN	510Vac-670Vdc-738Vdc-10kA -40°C to 85°C	UL 1449	UL E325462	
Surge protector RV3,RV6,RV7, RV8 13070037	Xiamen Set Electronics Co. , Ltd	TFMOV25S8 21	820V-10kA-25kA -40°C to 80°C	UL 1449	UL E322662	
Alternate	PTG	PE 510-25M2-10	820V-10kA-25kA -40°C to 85°C	UL 1449	UL E501870	
hopeSunWE board						
Metal film Cap C191 - C200 22030122	Xiamen Faratronic Co., Ltd	C3D1U506K FAA382	600V-50uF-±10% 110°C	UL 810	UL E256238	
Alternate	WUXI CRE NEW ENERGY TECHNOLOGY CO LTD	DMJ-PS	600V-50uF-±10% 110°C	UL 810	UL E496566	
Inverter MOS Q6 - Q47 26060054 26060081	Infineon	IKZ75N65ES 5	650V-75A 175°C	IEC 62109-1	Tested with apparatus	
Alternate	Fuji Electric Co.,Ltd.	FGZ75XS65 C	650V-75A 175°C	IEC 62109-1	Tested with apparatus	
Diode D28 - D45 26010106	ON semiconductor	FFH60UP60 S	600V-60A 125°C	IEC 62109-1	Tested with apparatus	
Alternate	MacMic	MM60FU060 B	600V-60A 125°C	IEC 62109-1	Tested with apparatus	
hopeSunD3 board						

14	TABLE: list of critical components					P
Object	Manufacturer	Type / model	Technical Data	Standard(s)	Remark	
Transformer T1,T2 24020206	Hopewind	HWT0077	190uH-1.2W-200KHz Class B	IEC 62109-1	Tested with apparatus	
Bobbin of insulation Transformer	SUMITOMO BAKELITE CO LTD	PM- 9820,PM- 9825	UL94 V-0, 150°C	UL 94	UL E41429	
Insulation tape of transformer	JINGJIANG PRESSURE SENSITIVE GLUE FTY	PZ	130°C	UL 510A	UL E165111	
Wire of transformer	FURUKAWA ELECTRONIC CO LTD	TEX-E	130°C	UL 2353	UL E206440	
Alternate	SHANGHAI XIANGXIANG ELECTRON CO LTD	TKW-B	130°C	UL 2353	UL E308908	
Alternate	SHANGHAI LUCKY TRADE CO LTD	TIW-B	130°C	UL 2353	UL E305883	
Optocoupler U2,U3,U4,U5 27020032	Fairchild	FOD3120SD	3750Vrms-2.5A- 0.3/0.3us, 100°C	IEC 62109-1	Tested with apparatus	
hopeSunWJ board						
Metal film Cap C1,C2,C3,C4 22030135	Xiamen Faratronic Co.,Ltd	C3D3L206K F0AC00	1200Vdc-20uF 110°C	UL 810	UL E256238	
Alternate	WUXI CRE NEW ENERGY TECHNOLOG Y CO LTD	DMJ-PS	1200Vdc-20uF 110°C	UL 810	UL E496566	
Transformer T1,T2 24020163	Hopewind	HWT0051	680uH-100kHz Class B	IEC 62109-1	Tested with apparatus	

14	TABLE: list of critical components					P
Object	Manufacturer	Type / model	Technical Data	Standard(s)	Remark	
Bobbin of insulation Transformer	CHANG CHUN PLASTICS CO LTD	T375HF	V-0,150°C	UL94	UL E59481	
Insulation tape of transformer	JINGJIANG PRESSURE SENSITIVE GLUE FTY	PZ/CT	130°C	UL94	UL E165111	
Wire of transformer	SHANGHAI XIANGXIANG ELECTRON CO LTD	TKW-B	130°C	UL 2353,	UL E308908	
Alternate	COSMOLINK	TIW-M(B)	130°C	UL 2353,	UL E213764	
Alternate	FURUKAWA ELECTRONIC CO LTD	TEX-E	130°C	UL 2353,	UL E206440	
Optocoupler U13,U14,U15,U16 27020032	Fairchild	FOD3120SD	3750Vrms-2.5A-0.3/0.3us , 100°C	UL 1577	UL E90700	
Hall SH1,SH2,SH3,SH4 29030030	Sinomags Technology Co., Ltd	STK-80PL	80Arms-10mV/A-±200A-1% -40 to 105°C	UL 508	UL E507664	
Alternate	LEM SWITZERLAND S A	HLSR 80-P/SP10	80Arms-10mV/A-±200A-1% -40 to 105°C	UL 508	UL E189713	
BOOST MOS Q1 - Q8, Q11 - Q14 26050019	CREE	C2M0080120D	1200V-31.6A-80mΩ-TO-247-3-150°C	IEC 62109-1	Tested with apparatus	
Diode D1 - D4, D19 - D26 26010105	ROHM	SCS240KE2	1200V-32A-TO-247-3 175°C	IEC 62109-1	Tested with apparatus	

14	TABLE: list of critical components					P
Object	Manufacturer	Type / model	Technical Data	Standard(s)	Remark	
Alternate	CREE	C4D20120D	1200V-32A-TO-247-3 150°C	IEC 62109-1	Covered within apparatus	
hopeSunM9 board						
Grid Relay K7 - K12 13030069	DONGGUAN CHUROD ELECTRONIC S CO LTD	CHAR- 112A200	830Vac-200A -40 to 85°C	UL 60947-1	UL E341422	
Hall for output SH4 29030101	Sinomags Technology Co., Ltd	SFG-3.0P/P1	0.4V/A-±5A-0.5%- 5V-10KHz -40 to 105°C	EN 61326- 1:2013	TUV R AE 50428896 0001	
Alternate	LEM SWITZERLAN D S A	CTSR 3- TP/SP19	0.4V/A-±5A-0.5%-5V -40 to 105°C	UL 508	UL E189713	
Surge protector RV9,RV10,R V11,RV12 13070062	AnhuiJinli Electric Tech Co.,Ltd	GTSP- MDV670/20	670Vdc-10kA-25kA 110°C	EN 61643- 31:2019	TUVR R50440587	
Alternate	PTG	PV 670- 25M2-M	670Vdc-10kA-25kA -40°C to 85°C	UL 1449.	UL E501870	
X-Cap C424—C429 22030152	Sichuan Zhongxing Electronic Co., Ltd	MK61105KQ 3BHB000	350Vac-1uF-±10% 110°C	UL 60384-14	UL E217215	
Alternate	XIAMEN FARATRONIC CO LTD	C4BR2105K BWC450	350Vac-1uF-±10% 110°C	UL 60384-14	UL E186600	
Metal film Cap C407 - C418 22030123	Xiamen Faratronic Co.,Ltd	C6AR2805K F20550	350Vac-8uF-±10% 110°C	UL 60384-14	UL E256238	

14	TABLE: list of critical components					P
Object	Manufacturer	Type / model	Technical Data	Standard(s)	Remark	
Alternate	WUXI CRE NEW ENERGY TECHNOLOG Y CO LTD	APS8050480 J210101	350Vac-8uF-±10% 110°C	UL 60384-14	UL E496566	
X-Cap C430 22030052	WUXI CRE NEW ENERGY TECHNOLOG Y CO LTD	DPS5060600 K412102	1200V-5uF-±10% 110°C	UL 60384-14	UL E496566	
Alternate	Xiamen Faratronic Co.,Ltd	C3D3L505K F00C00	1200V-5uF 110°C	UL 60384-14	UL E256238	
Y-Cap C451,C422 22030063	Xiamen Faratronic Co.,Ltd	C43Q1333K 61C000	300Vac-33nF-±10% -40 to 05°C	UL 60384-14	UL E186600	
Alternate	Sichuan Zhongxing Electronic Co., Ltd	MKP Series	300Vac-33nF-±10% -40 to 110°C	UL 60384-14	UL E217215	
Y-Cap C369 22050002	TDK CORPORATI ON	CD16- E2GA472MY *S	250VAC-4700pF- ±20% -25°C to 125°C	UL 60384-14	UL E37861	
Alternate	Fenghua Advanced Technology Co.Ltd	CT7- Y12Y5U0E4 72MSE	250VAC-4700pF- ±20% -25°C to125°C	UL 60384-14	UL E219015	
Relay K5,K6 13030017	Xiamen Hongfa Electroacousti c Co., Ltd.	HF115F/012- 2ZS4AF	2C/O-250Vac-8A; - 40°C to 85°C	IEC 61810- 1:2015/AMD 1:2019	VDE 116934	
Optocoupler U49,U50, U51 27020039	Suzhou Novosense Microelectroni cs Co.,Ltd	NSI8131W1	5000Vrms- 150Mbps; -40 to 125°C	UL 1577	UL E500602	
Alternate	SILICON LABORATORI ES INC	SI8631ED-B- IS	5000Vrms- 150Mbps -40 to 125°C	UL 1577	UL E257455	

14	TABLE: list of critical components					P
Object	Manufacturer	Type / model	Technical Data	Standard(s)	Remark	
Alternate	TEXAS INSTRUMENT S TUCSON CORP	ISO7731QD WRQ1	5000Vrms- 150Mbps; -40 to 125°C	UL 1577	UL E181974	
Varistor RV5,RV6, RV7,RV8 21030003	THINKING ELECTRONIC INDUSTRIAL CO LTD	TVR14820KI Y	65Vdc-82Vdc-4500A -40 to 105°C	UL 1449	UL E314979	
Alternate	Guangdong Fenghua Advanced Technology Holding Co., Ltd.	FNR14K820 BFSN1BN	65Vdc-82Vdc-4500A -40 to 85°C	UL 1449	VDE40008242	
Alternate	TDK	S14K82	65Vdc-82Vdc-4500A -40 to 85°C	IEC 60950- 1:2013	VDE40027582	
HopeSunP4 board						
Transformer T3 24020201	Hopewind	HWT0073	505uH-50W-50KHz Class B	IEC 62109-1	Tested within apparatus	
Bobbin of insulation Transformer	SUMITOMO BAKELITE CO LTD	PM- 9820,PM- 9823	V-0,150°C	UL94	UL E41429	
Alternate	CHANG CHUN PLASTICS CO LTD	T375HF	V-0,150°C	UL94	UL E59481	
Insulation tape of transformer	JINGJIANG YAHUA PRESSURE SENSITIVE GLUE CO LTD	CT/PZ	130°C	UL 510A	UL E165111	
Alternate	JINGJIANG JINGYI	JY25-A(b)	130°C	UL 510A	UL E246950	
Wire of transformer	FURUKAWA ELECTRONIC CO LTD	TEX-E	130°C	IEC 62109-1	UL E206440	

14	TABLE: list of critical components					P
Object	Manufacturer	Type / model	Technical Data	Standard(s)	Remark	
Alternate	SHANGHAI XIANGXIANG ELECTRON CO LTD	TKW-B	130°C	UL 2353	UL E308908	
Alternate	Great loflon	TRW(B)	130°C	UL 2353	UL E211989	
Transformer T2 24020025	Hopewind	EEL16	300uH-EEL16 Class B	IEC 62109-1	Tested within apparatus	
Bobbin of insulation Transformer	CHANG CHUN PLASTICS CO LTD	T375J	V-0,150°C	UL94	UL E59481	
Insulation tape of transformer	JINGJIANG YAHUA PRESSURE SENSITIVE GLUE FTY	PZ	130°C	UL94	UL E165111	
Wire of transformer	DONGGUAN XINLONG VARNISHED WIRE CO LTD	xUEW	130°C	UL94	Tested within apparatus	
Alternate	TAI-I ELECTRIC WIRE & CABLE CO LTD	UEWB	130°C	UL94	UL E85640	
Alternate	SHENZHEN CHENGWEI INDUSTRY CO LTD	(x)UEW-E- (&)-(*)	130°C	UL94	UL E227475	
Alternate	WUXI JUFENG COMPOUND LINE CO LTD	xUEWB*\$, QA-x/130*	130°C	UL 1446,	UL E206882	
Optocoupler U2 27020020	VISHAY SEMICONDU CTOR GMBH	TCLT1009	CTR2~4-ton/6uS; - 40 to 100°C	UL 1577	UL E76222	

14	TABLE: list of critical components					P
Object	Manufacturer	Type / model	Technical Data	Standard(s)	Remark	
Y-Cap C52,C38 22030010	Sichuan Zhongxing Electronic Co., Ltd	MK63472KF 240B000	300Vac-4.7nF- -40 to 110°C	UL 60384-14	UL E217215	
Alternate	Xiamen Faratronic Co.,Ltd	C43Q1472K 40A405	300Vac-4.7nF-±10% -40 to 110°C	UL 60384-14	UL E186600	
hopeSunC3 board						
E-Cap C1 - C14 22010062	Nantong Jianghai Capacitor Co.,Ltd	ECS2YKC47 1MLA350060	550V-470uF- ±20%,105°C	IEC 62109-1	Tested within apparatus	
Alternate	capXon	UK471M550 P600A	550V-470uF 105°C	IEC 62109-1	Tested within apparatus	
hopeSunU3 board						
DSP Chip U2 25010011	Lattice	LCMXO2- 2000HC- 4TG144I	FPGA-LCMXO2-2K LUT-111 I/O-I4- TQFP144, 150°C	IEC 62109-1	Tested within apparatus	
DSP Chip U8 25030016	ST	STM32F407 ZGT7	MCU- STM32F407ZGT6- 168MHz- 1024Kbytes-3.3V, 150°C	IEC 62109-1	Tested within apparatus	
DSP Chip U3 25030014	TI	TMS320F28 062PZPS	F28062-90MHz-64K- 3.3V,150°C	IEC 62109-1	Tested within apparatus	
HPS1K0X3						
Gas tube G1	THINKING ELECTRONIC INDUSTRIAL CO LTD	GB83R090H B	90V-15kA, -40 to 85°C	UL 497B	UL E245070	
Alternate	EPCOS AG A TDK GROUP CO	T83-A90X	90V-15kA, -40 to 85°C	UL 497B	UL E163070	
Varistor RV1,RV2	THINKING ELECTRONIC INDUSTRIAL CO LTD	TVR14820KI Y	65Vdc-82Vdc-4500A -40 to 105°C	UL 1449	UL E314979	

14	TABLE: list of critical components					P
Object	Manufacturer	Type / model	Technical Data	Standard(s)	Remark	
Alternate	TDK	S14K82	65Vdc-82Vdc-4500A -40 to 85°C	IEC 60950-1:2013	VDE40027582	
Alternate	Guangdong Fenghua Advanced Technology Holding Co., Ltd.	FNR14K820 BFSN1BN	65Vdc-82Vdc-4500A -40 to 85°C	IEC 61051-1:2007	VDE40008242	

--- End of CDF---

Pictures of the unit



Figure 1. Overview I



Figure 2. Overview II

Pictures of the unit



Figure 3. Overview III



Figure 4. Overview IV

Pictures of the unit



Figure 5. Overview V



Figure 6. Overview VI

Pictures of the unit



Figure 7. Inside view I

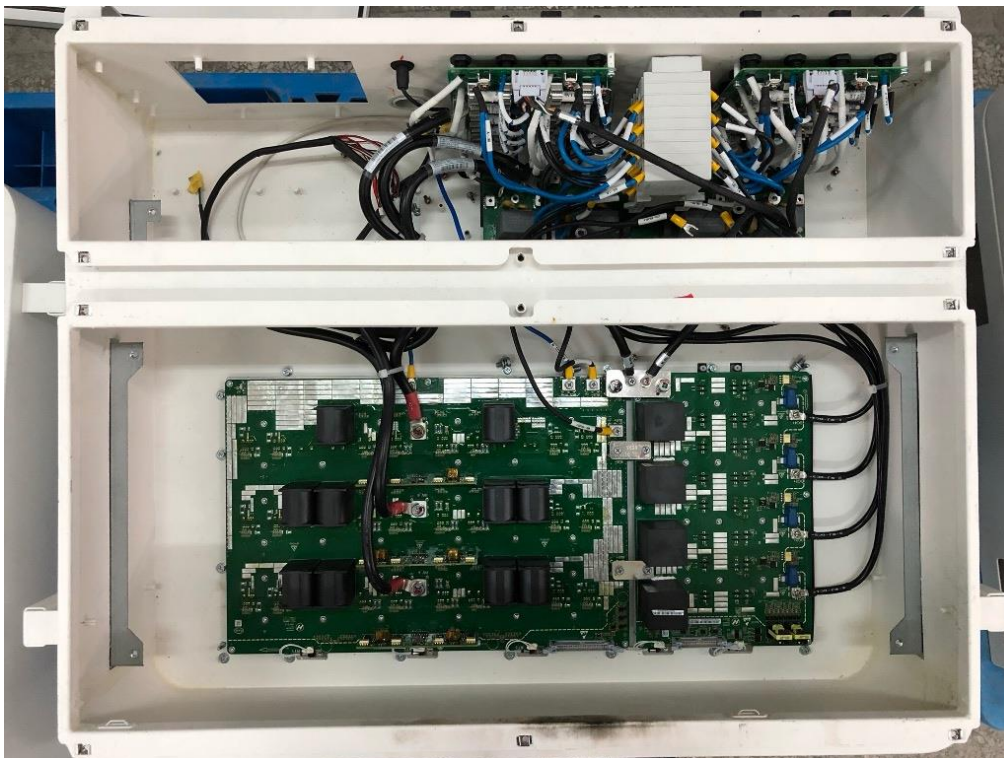


Figure 8. Inside view II

Pictures of the unit

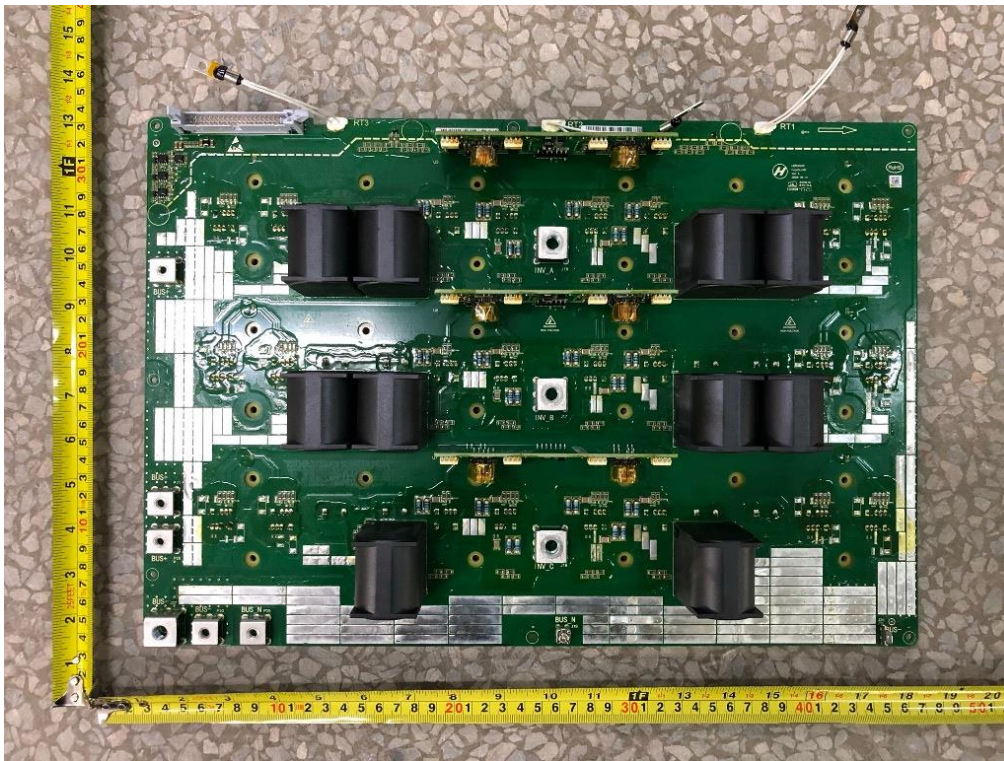


Figure 9. Front of hopeSunWE board

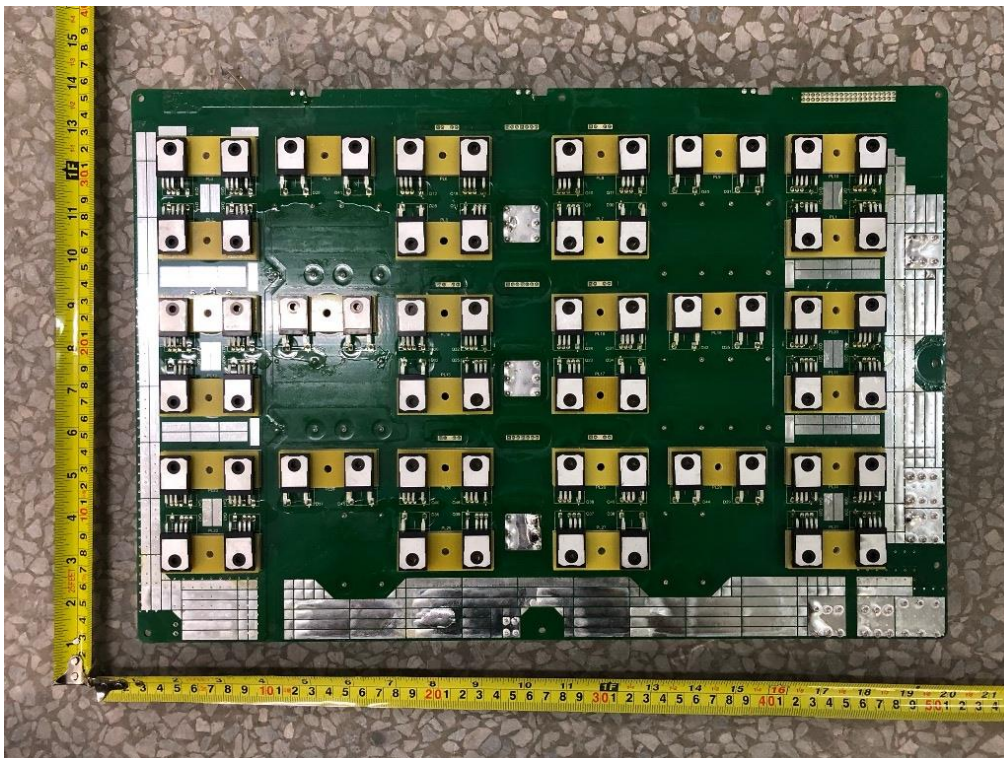


Figure 10. Back of hopeSunWE board

Pictures of the unit



Figure 11. Front of hopeSunC3 board



Figure 12. Back of hopeSunC3 board

Pictures of the unit

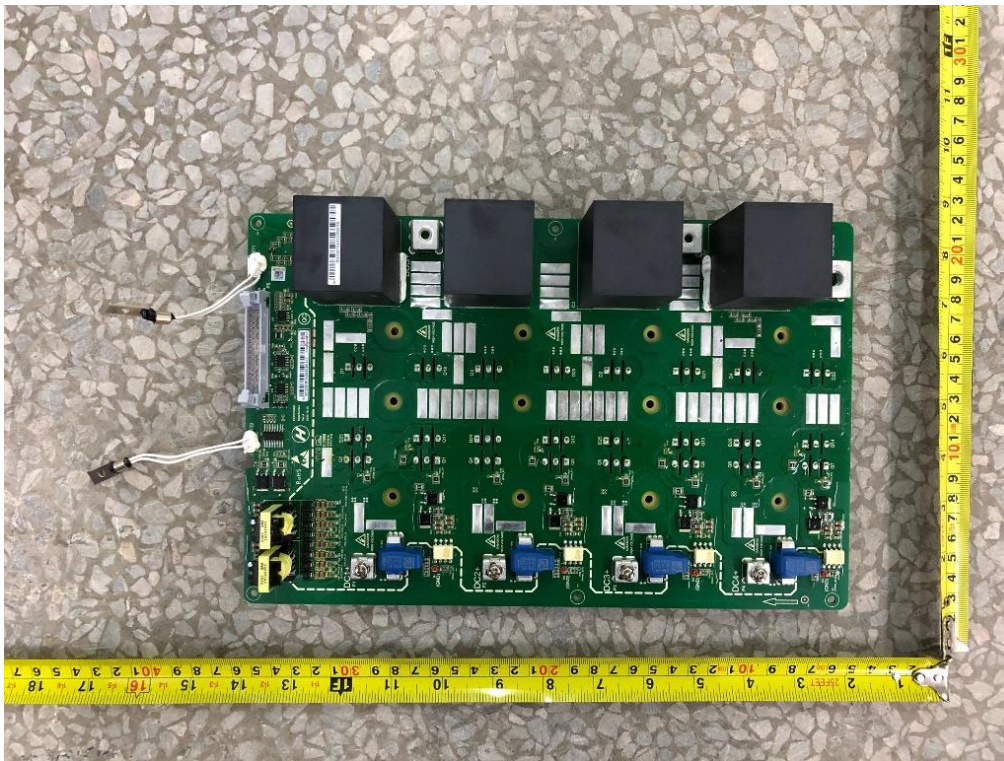


Figure 13. Front of hopeSunWJ board

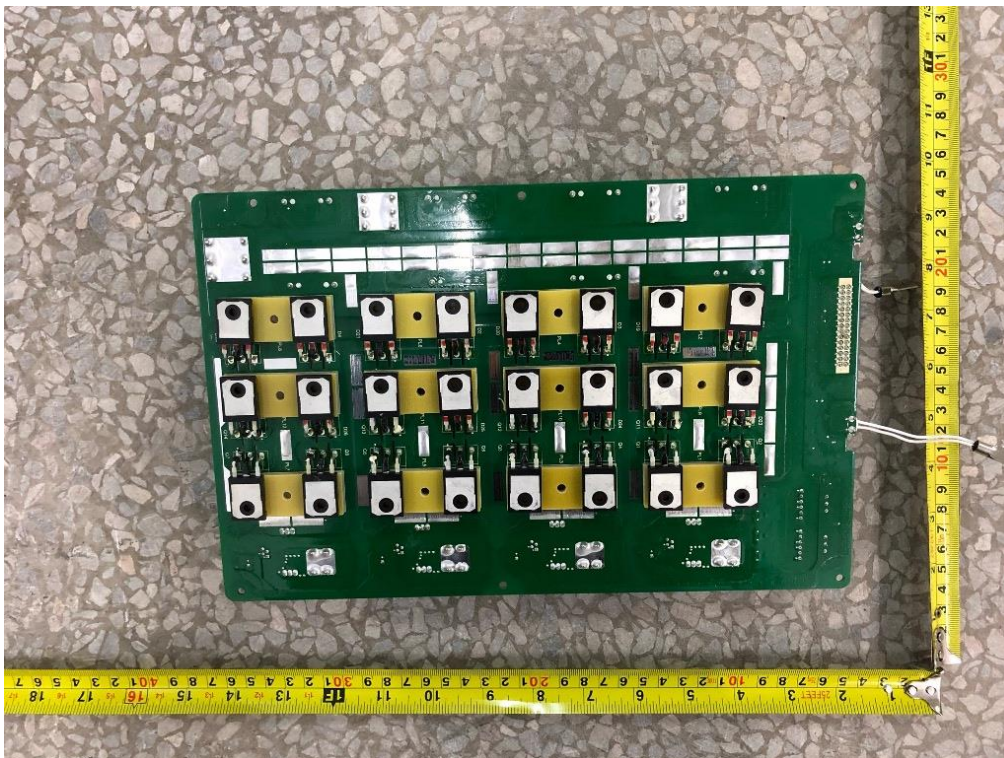


Figure 14. Back of hopeSunWJ board

Pictures of the unit

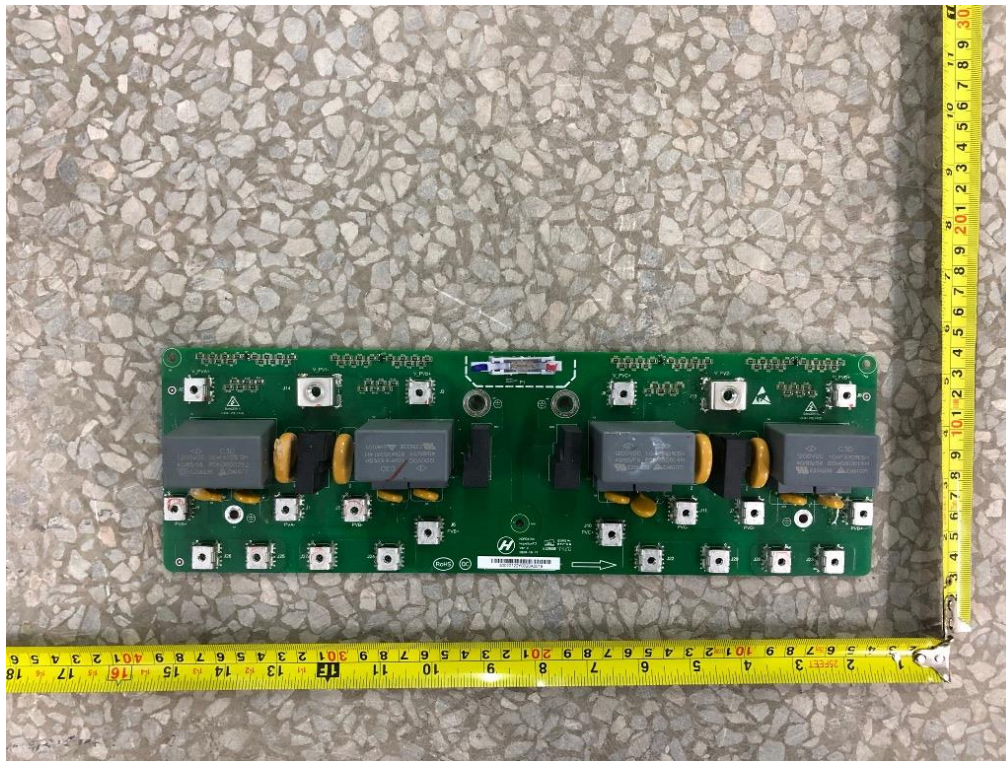


Figure 15. Front of hopeSunF3 board

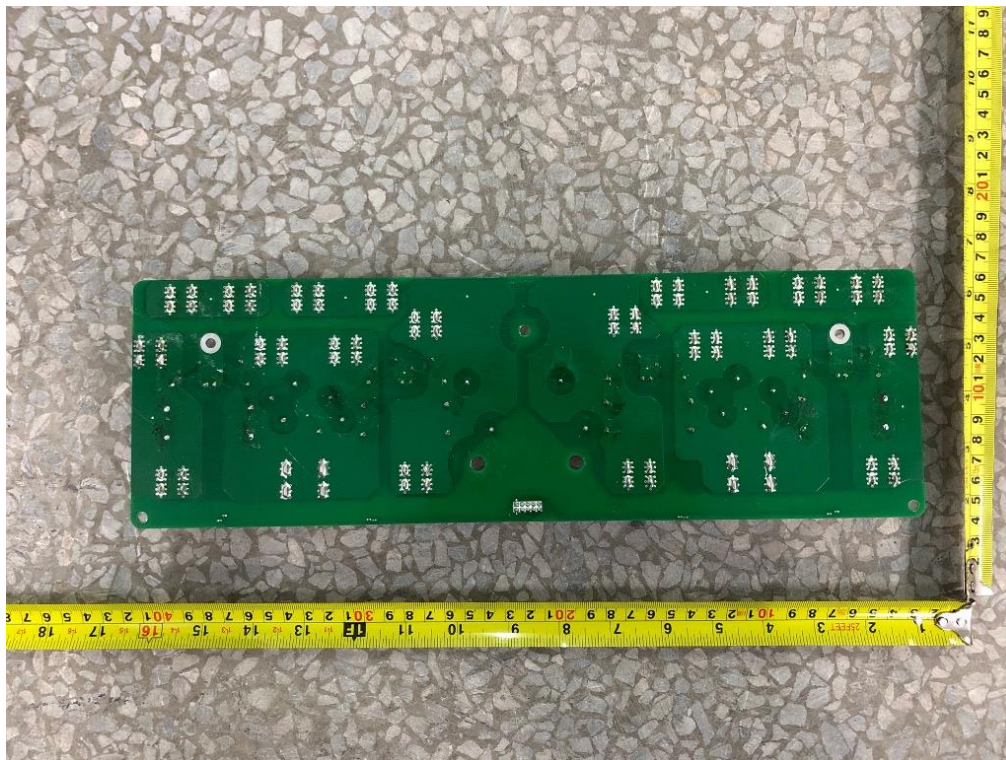


Figure 16. Back of hopeSunF3 board

Pictures of the unit

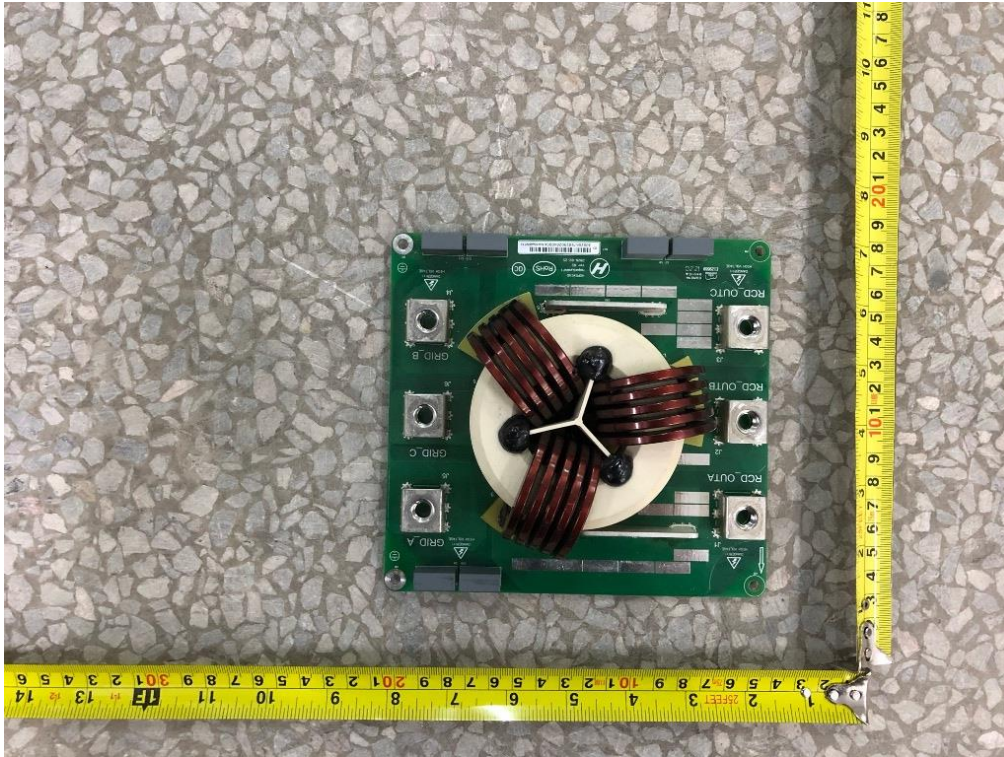


Figure 17. Front of hopeSunHVF1 board



Figure 18. Back of hopeSunHVF1 board

Pictures of the unit

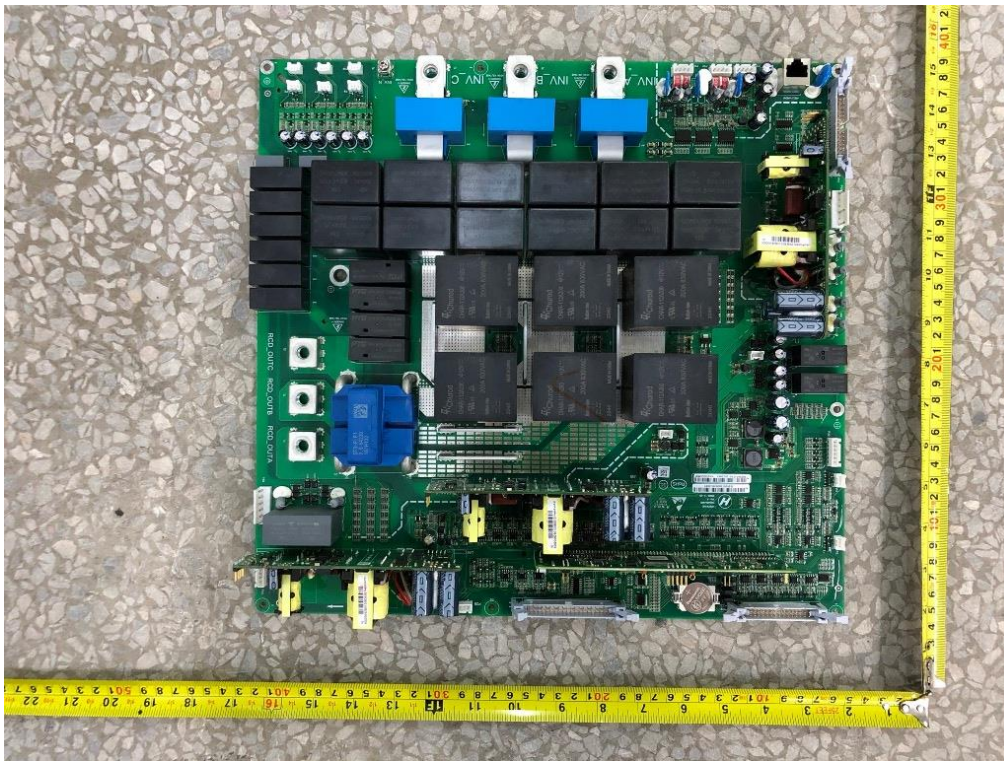


Figure 19. Front of hopeSunM9 board

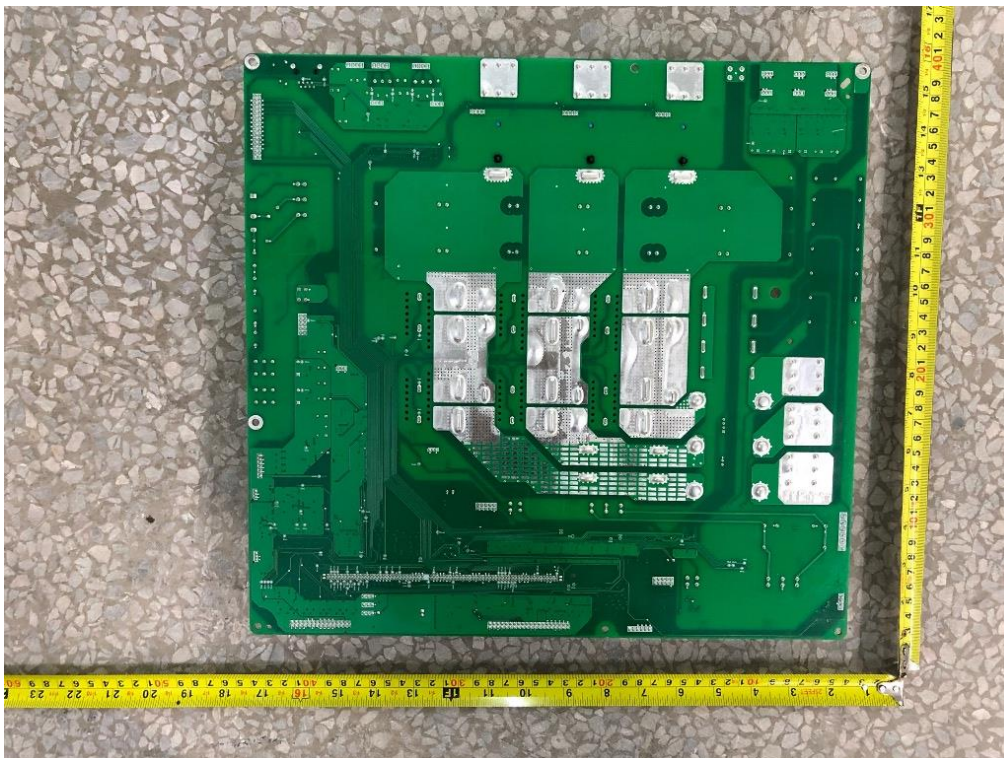


Figure 20. Back of hopeSunM9 board

Pictures of the unit

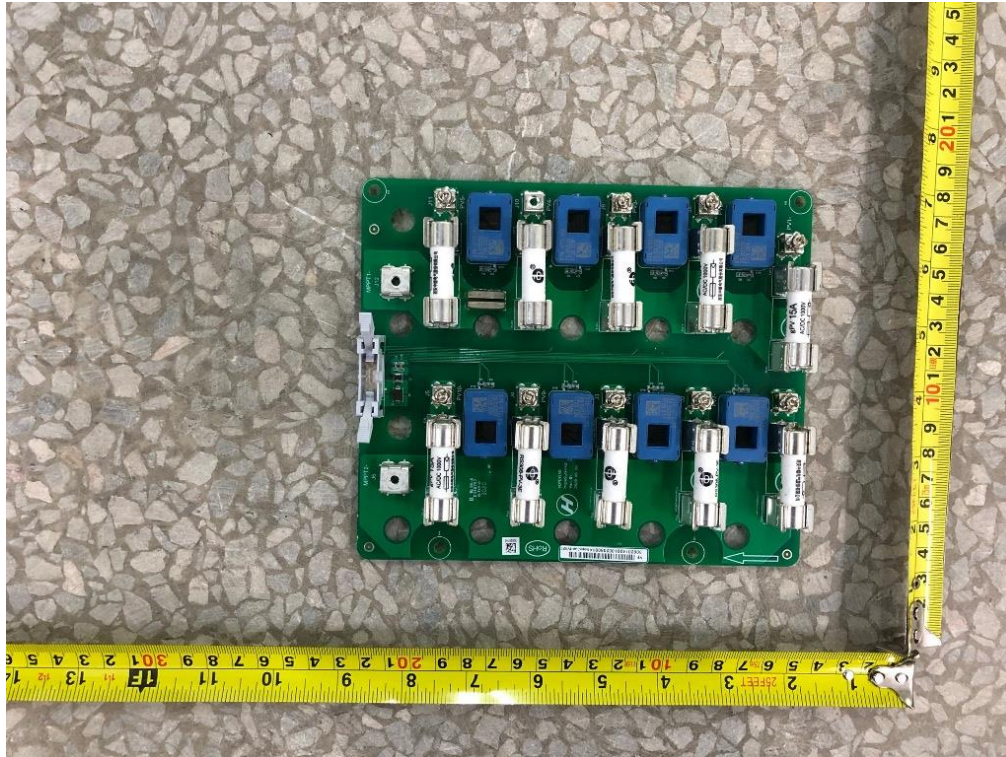


Figure 21. Front of hopeSunHVV2 board

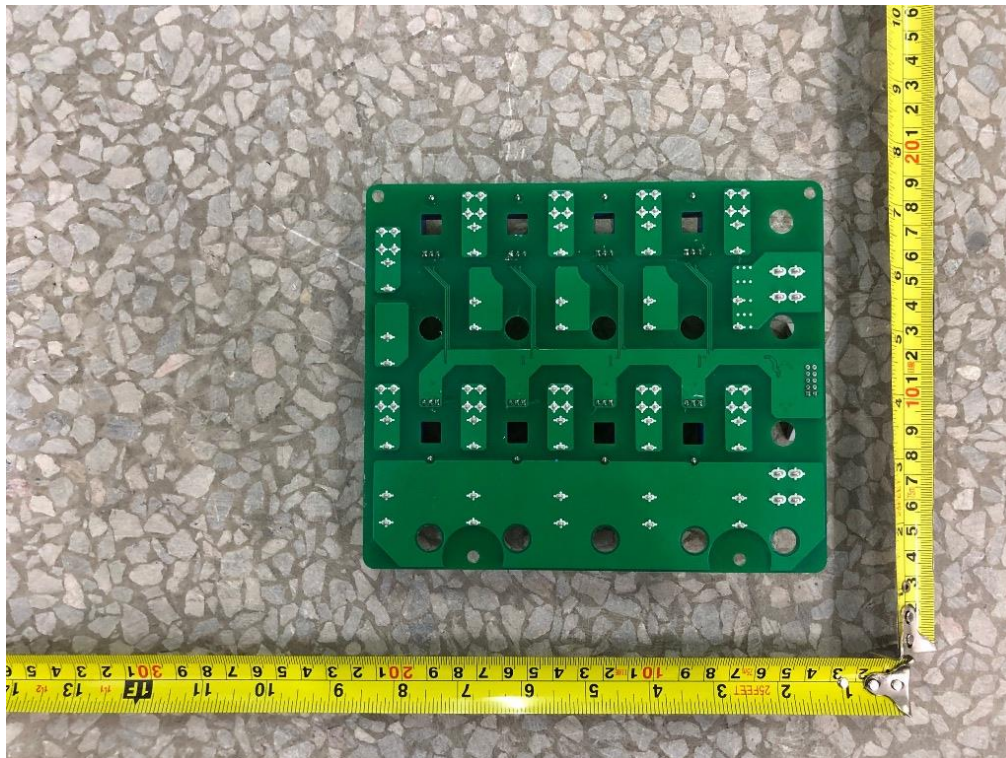


Figure 22. Back of hopeSunHVV2 board

Pictures of the unit



Figure 23. Front of HPS1K0X3 board

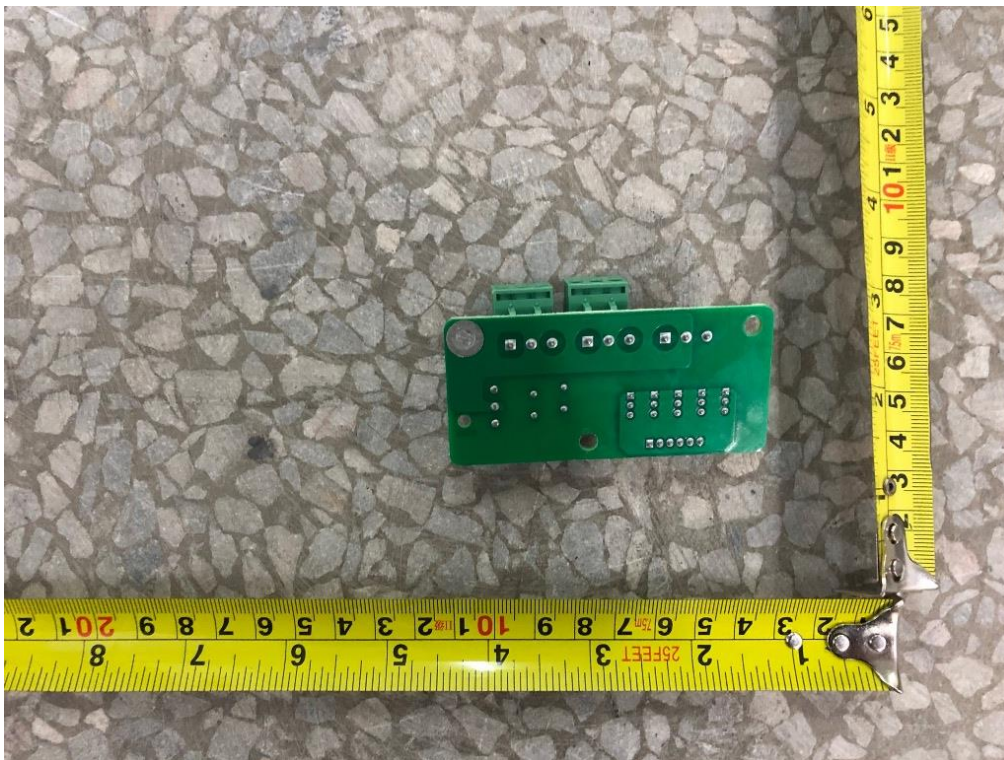


Figure 24. Back of HPS1K0X3 board

Test Equipment list				
No	Test Equipment	Equipment model	Equipment No.	Calibration due date
1	Simulation of ac power supply	WPLA-330200KVA	BZ-DGD-L204	2022/06/28
2	Solar IV simulator	WLPA-150KW	BZ-DGD-L013	2022/11/02
3	Power analyser	PA6000H	BZ-DGD-L059	2022/10/21
4	Temperature recorder	LR8400-21	BZ-DGD-L038	2022/11/02
5	Hi-Pot & IR tester	Chroma 19032	BZ-DGD-L066	2023/02/28
6	Digital Caliper	200mm	BZ-DGB-L044	2022/06/20
7	Pull and push	2P-1000	BZ-DGD-L080	2022/08/26
8	Steel ball	50mm	BZ-DGD-L085	2022/08/26
9	Thermostat	16m ³	BZ-DGD-L015	2022/08/08
10	Surge generator	HCWG 70	BZ-DGE-L036	2022/08/08
11	Noise meter	TES-1357	BZ-DGD-L029	2023/02/23
12	Oscilloscope	MS04054B	BZ-DGD-L064	2023/02/28
13	Touch current test network	/	BZ-DGD-L091	2022/08/26

Statement

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