






Test Report No.:	LD170707N052-1-R1		
Client			
Name :	SHENZHEN MUST ENERGY TECHNOLOGY CO.,LTD		
Address :	5F, Building 11, Rundongsheng Industrial Park, Longzhu, Xixiang, Baoan District, Shenzhen, Guangdong, China		
Test Item :	ENERGY STORAGE INVERTER		
Identification :	PH10-3648A, PH10-4248A, PH10-4648A, PH10-5048A		
Issued by			
Name :	Bureau Veritas Shenzhen Co., Ltd. Dongguan Branch		  <p>Certificate # 2951.01</p>
Address :	No. 34, Chenwulu Section, Guantai Rd., Houjie Town, Dongguan City, Guangdong 523942, China		
Test specification			
Standard :	IEC 62040-1-1:2002		
Test Result :	The sample satisfies to the clauses examined.		
CPrepared By :			
	 _____ Dora Zhang Engineer / Safety Department		<u>2019-06-18</u> Date
Approved By:			
	 _____ James Huang Technical Manager / Safety Department		<u>2019-06-18</u> Date
<p><small>This report is governed by, and incorporates by reference, CPS Conditions of Service as posted at the date of issuance of this report at http://www.bureauveritas.com/home/about-us/our-business/cps/about-us/terms-conditions and is intended for your exclusive use. Any copying or replication of this report to or for any other person or entity, or use of our name or trademark, is permitted only with our prior written permission. This report sets forth our findings solely with respect to the test samples identified herein. The results set forth in this report are not indicative or representative of the quality or characteristics of the lot from which a test sample was taken or any similar or identical product unless specifically and expressly noted. Our report includes all of the tests requested by you and the results thereof based upon the information that you provided to us. Measurement uncertainty is only provided upon request for accredited tests. You have 60 days from date of issuance of this report to notify us of any material error or omission caused by our negligence or if you require measurement uncertainty; provided, however, that such notice shall be in writing and shall specifically address the issue you wish to raise. A failure to raise such issue within the prescribed time shall constitute your unqualified acceptance of the completeness of this report, the tests conducted and the correctness of the report contents.</small></p>			

TEST REPORT				
IEC 62040-1-1				
Uninterruptible power systems (UPS) –				
Part 1-1: General and safety requirements for UPS used in operator access areas				
Report Number :	LD170707N052-1-R1			
Date of issue :	2019-06-18			
Total number of pages	81			
Testing laboratory	Bureau Veritas Shenzhen Co., Ltd. Dongguan Branch			
Test location :	Bureau Veritas Shenzhen Co., Ltd. Dongguan Branch			
Address :	No. 34, Chenwulu Section, Guantai Rd., Houjie Town, Dongguan City, Guangdong 523942, China			
Applicant's name	SHENZHEN MUST ENERGY TECHNOLOGY CO.,LTD			
Address :	5F, Building 11, Rundongsheng Industrial Park, Longzhu, Xixiang, Baoan District, Shenzhen, Guangdong, China			
Test specification:				
Standard	IEC 62040-1-1:2002			
Non-standard test method :	N/A			
Test Report Form No. :	TEST REPORT IEC 62040-1-1:2002 VER.1			
Test Report Form(s) Originator :	Bureau Veritas Shenzhen Co., Ltd. Dongguan Branch			
Master TRF	Dated 2016-08			
Test item description :	ENERGY STORAGE INVERTER			
Trade Mark :				
Manufacturer	SHENZHEN MUST ENERGY TECHNOLOGY CO.,LTD			
Model/Type reference :	PH10-3648A, PH10-4248A, PH10-4648A, PH10-5048A			
Ratings :	PH10-3648A	PH10-4248A	PH10-4648A	PH10-5048A
Input DC voltage range [V]..... :	580 max			
MPPT DC voltage range [V]..... :	120-550			
Ratings :	PH10-3648A	PH10-4248A	PH10-4648A	PH10-5048A
Input DC current [A]	11 / 11			

Isc PV [A]	15 / 15			
Output AC voltage [V]	230, 50Hz			
Output AC current [A].....	16.4	19.1	21.0	22.8
Output power [VA].....	Max. 3600	Max. 4200	Max. 4600	Max. 5000
Output DC voltage range [V]..... [Battery charge].....	40-60			
Output DC voltage range [V]..... [Battery rated].....	48			
Input DC current [A]	Max.50			
Output AC current [A]..... [Battery discharge].....	Max. 10			
Output AC voltage [V]	230, 50Hz			
Output power [VA].....	Max. 2300			

Copy of marking plate

(1) Below electric ratings and cautions are silk-screen on label and affixed on the side of enclosure

ENERGY STORAGE INVERTER

Model name	PH10-3648A
Max.PV-generator power	4100W
Max.DC voltage	580V
MPPT voltage range	120 ~ 550V
Isc PV	15A/15A
Max.DC current(input A/input B)	11A/11A
Battery rated voltage	48V
Battery voltage range	40-60V
Max.battery charge Current	50A
Max.battery charge power	2500W
Battery type	Lead-acid/Lithium
Rated AC Power	3600W
Max.AC output apparent power	3600VA
Nominal AC Voltage	230V~
Nominal AC Frequency	50Hz
Max.output current	16.4A
Inverter topology	Non-isolated
Power factor range	0.8 lead ~ 0.8 lag
Ingress protection	IP65
Protective class	Class I
Operation temperature range	-25°C~+60°C(-13~+140°F)



ENERGY STORAGE INVERTER

Model name	PH10-4248A
Max.PV-generator power	4800W
Max.DC voltage	580V
MPPT voltage range	120 ~ 550V
Isc PV	15A/15A
Max.DC current(input A/input B)	11A/11A
Battery rated voltage	48V
Battery voltage range	40-60V
Max.battery charge Current	50A
Max.battery charge power	2500W
Battery type	Lead-acid/Lithium
Rated AC Power	4200W
Max.AC output apparent power	4200VA
Nominal AC Voltage	230V~
Nominal AC Frequency	50Hz
Max.output current	19.1A
Inverter topology	Non-isolated
Power factor range	0.8 lead ~ 0.8 lag
Ingress protection	IP65
Protective class	Class I
Operation temperature range	-25°C~+60°C(-13~+140°F)



ENERGY STORAGE INVERTER

Model name	PH10-4648A
Max.PV-generator power	5300W
Max.DC voltage	580V
MPPT voltage range	120 ~ 550V
Isc PV	15A/15A
Max.DC current(input A/input B)	11A/11A
Battery rated voltage	48V
Battery voltage range	40-60V
Max.battery charge Current	50A
Max.battery charge power	2500W
Battery type	Lead-acid/Lithium
Rated AC Power	4600W
Max.AC output apparent power	4600VA
Nominal AC Voltage	230V~
Nominal AC Frequency	50Hz
Max.output current	21A
Inverter topology	Non-isolated
Power factor range	0.8 lead ~ 0.8 lag
Ingress protection	IP65
Protective class	Class I
Operation temperature range	-25°C~+60°C(-13~+140°F)







ENERGY STORAGE INVERTER

Model name	PH10-5048A
Max.PV-generator power	5750W
Max.DC voltage	580V
MPPT voltage range	120 ~ 550V
Isc PV	15A/15A
Max.DC current(input A/input B)	11A/11A
Battery rated voltage	48V
Battery voltage range	40-60V
Max.battery charge Current	50A
Max.battery charge power	2500W
Battery type	Lead-acid/Lithium
Rated AC Power	5000W
Max.AC output apparent power	5000VA
Nominal AC Voltage	230V~
Nominal AC Frequency	50Hz
Max.output current	22.8A
Inverter topology	Non-isolated
Power factor range	0.8 lead ~ 0.8 lag
Ingress protection	IP65
Protective class	Class I
Operation temperature range	-25°C~+60°C(-13~+140°F)



Size: 102 x 73 mm

<div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;"> <p>CAUTION!  </p> <p>Risk of electric shock. Each circuit must be individually disconnected and the service person must wait 5 minutes before servicing.</p> </div> <hr/> <div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;"> <p>CAUTION! </p> <p>Risk of electric shock. Do not remove Cover. No user serviceable parts inside. Refer servicing to qualified service personnel.</p> </div> <hr/> <div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;"> <p>CAUTION! </p> <p>Hot surface. Do not touch.</p> </div> <hr/> <p>When the photovoltaic array is exposed to light, it supplies a DC voltage to the PCE. Please look at the safety instructions within the device and also in the inverter manual.</p>	<div style="border: 1px solid black; padding: 10px; text-align: center;"> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="border: 1px solid black; padding: 2px;">DRM0</td> <td style="border: 1px solid black; padding: 2px; text-align: center;">X</td> <td style="border: 1px solid black; padding: 2px;">DRM1</td> <td style="border: 1px solid black; padding: 2px;"></td> <td style="border: 1px solid black; padding: 2px;">DRM2</td> <td style="border: 1px solid black; padding: 2px;"></td> </tr> <tr> <td style="border: 1px solid black; padding: 2px;">DRM3</td> <td style="border: 1px solid black; padding: 2px;"></td> <td style="border: 1px solid black; padding: 2px;">DRM 4</td> <td style="border: 1px solid black; padding: 2px;"></td> <td style="border: 1px solid black; padding: 2px;">DRM5</td> <td style="border: 1px solid black; padding: 2px; text-align: center;">X</td> </tr> <tr> <td style="border: 1px solid black; padding: 2px;">DRM6</td> <td style="border: 1px solid black; padding: 2px; text-align: center;">X</td> <td style="border: 1px solid black; padding: 2px;">DRM7</td> <td style="border: 1px solid black; padding: 2px; text-align: center;">X</td> <td style="border: 1px solid black; padding: 2px;">DRM8</td> <td style="border: 1px solid black; padding: 2px; text-align: center;">X</td> </tr> </table> </div>	DRM0	X	DRM1		DRM2		DRM3		DRM 4		DRM5	X	DRM6	X	DRM7	X	DRM8	X
DRM0	X	DRM1		DRM2															
DRM3		DRM 4		DRM5	X														
DRM6	X	DRM7	X	DRM8	X														
Size: 80 x 55 mm	Size: 64 x 45 mm																		

Summary of testing:

The PCE comply with this standard.

Model PH10-5048A is selected as type tested sample, otherwise additional test perform on model PH10-3648A

Particulars: test item vs. test requirements	
Equipment mobility	: permanent connection
Operating condition	: continuous
Mains supply tolerance (%)	: N/A
Tested for IT power systems	: No
IT testing, phase-phase voltage (V)	: N/A
Class of equipment	: Class I
Mass of equipment (kg).....	: Approx. 31 kg
Protection against ingress of water	: IP 65
Test case verdicts	
Test case does not apply to the test object :	N/A
Test item does meet the requirement	: P(ass)
Test item does not meet the requirement .. :	F(ail)
Testing	
Date of receipt of test item	: 2017-07-07
Date(s) of performance of test	: 2017-07-07 to 2018-04-09
General remarks	
<p>"This report is not valid as a CB Test Report unless appended by an approved CB Testing Laboratory and appended to a CB Test Certificate issued by an NCB in accordance with IECEE 02".</p> <p>The test result presented in this report relate only to the object(s) tested. This report shall not be reproduced, except in full, without the written approval of the Issuing testing laboratory.</p> <p>"(see Enclosure #)" refers to additional information appended to the report. "(see appended table)" refers to a table appended to the report.</p> <p>Throughout this report a comma is used as the decimal separator.</p> <p>Standard IEC 62040-1-1:2002 is to be used in conjunction with IEC 60950-1:2001, which is referred to in this TRF by "RD".</p>	
Remark 1	This report is to replace the earlier Test Report Ref. No. LD170707N052-1.
Remark 2	The modifications applied on this report are: - To correct the limit for AC filter inductor (CT1) in table 7.7.
Remark 3	For the above "Remark 2" described changes, no test was considered necessary.
Name and address of factory (ies) :	
<p>SHENZHEN MUST ENERGY TECHNOLOGY CO.,LTD</p> <p>5F, Building 11, Rundongsheng Industrial Park, Longzhu, Xixiang, Baoan District, Shenzhen, Guangdong, China</p>	

General product information:

The Solar converter converts DC voltage into AC voltage.

The Solar converter is a single-phase type and only one machine is allowed on each line conductor.

The unit is providing EMC filtering at the output toward mains. The unit does not provide galvanic separation from PV input to a.c. output (transformerless). The output is switched off redundant by the high power switching bridge and a two relays. This assures that the opening of the output circuit will also operate in case of one error.

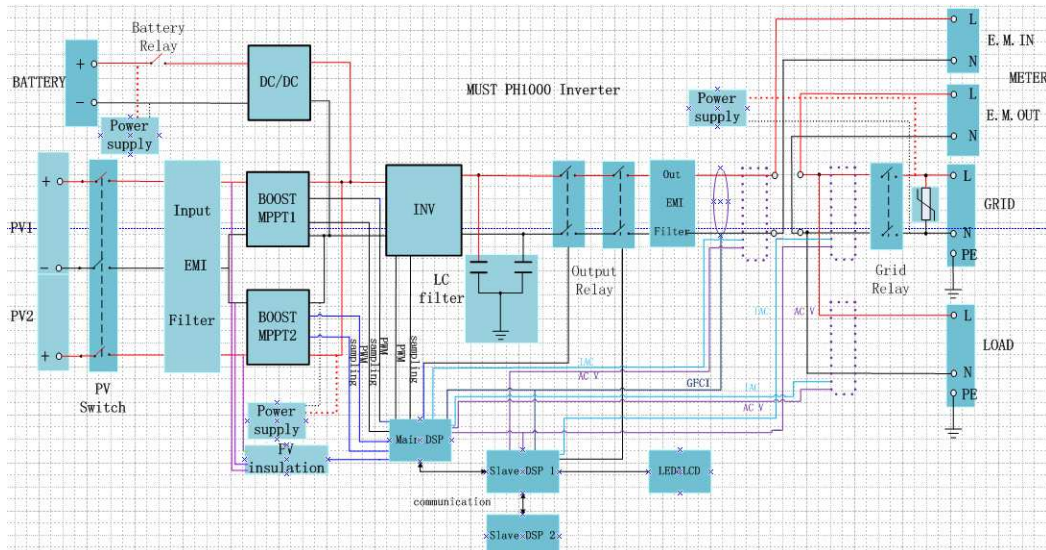


Figure 1-Block diagram

The internal control is redundant built. It consists of Main DSP(U3) and slave DSP(U22).

The Main DSP(U3) can control the relays, measures voltage, and frequency, AC current with injected DC, insulation resistance and residual current, In addition it tests the array insulation resistance and the RCMU circuit before each start up.

The slave DSP(U22) is using for detect residual current, also can open the relays independently and communicate with Main DSP(U3).

The unit provides two relays in series on Line and Neutral conductors. When single-fault applied to one relay, alarm an error code in display panel, another redundant relay provides basic insulation maintained between the PV array and the mains. All the relays are tested before start up. Both controllers Main DSP(U3), Slave DSP(U22) can open the relays.

The product was tested on:

Hardware version: V1.0

Software version: AB1.0

Model difference:

The models PH10-3648A, PH10-4248A, PH10-4648A and PH10-5048A are almost identical in hardware except the amount of BUS capacitors and the output power derated by software.

Temperature: 20±5°C

Relative humidity: 60%

Air pressure: 950 mbar

The test samples were pre-production samples without serial number.

IEC 62040-1-1			
Clause	Requirement – Test	Result – Remark	Verdict
4	GENERAL CONDITIONS FOR TESTS		P
4.3	Components		P
1.5.1/RD	General		P
	Comply with IEC 60950-1 or relevant component standard	(see appended table 4.3)	P
1.5.2/RD	Evaluation and testing of components		P
1.5.4/RD	Transformers	Transformers used are suitable for their intended application and comply with the relevant requirements of the standard and particularly Annex C	P
1.5.5/RD	Interconnecting cables		P
1.5.6/RD	Capacitors in primary circuits	Approved X,Y capacitor used in PCS	P
1.5.7/RD	Double insulation or reinforced insulation bridged by components	Approved optocoupler used	P
1.5.7.1/RD	General		N/A
1.5.7.2/RD	Bridging capacitors		N/A
1.5.7.3/RD	Bridging resistors	A group of resistors used in PCS for voltage sampling	P
1.5.7.4/RD	Accessible parts		N/A
1.5.8/RD	Components in equipment for IT power systems		N/A
4.4	Power interface		P
1.6.1/RD	AC power distribution systems		P
1.6.2/RD	Input current	(see appended table 4.6)	P
4.4 1.6.4/RD	Neutral conductor		P
4.5	Marking and instructions		P
4.5.1	General		P
4.5.2	Power rating	All required markings are affixed on labels located on the enclosure	P
	Input rated voltage/range (V)	See nameplate	P
	Input rated current/range (A)	See nameplate	P

IEC 62040-1-1			
Clause	Requirement – Test	Result – Remark	Verdict
	Input symbol for nature of supply (d.c.)	DC+ and DC-	P
	Input rated frequency/range (Hz)	DC input	N/A
	Output rated voltage/range (V)	See nameplate	P
	Output rated current/range (A)	See nameplate	P
	Number of output phases (1 ϕ - 3 ϕ) with/without neutral	Single phase	P
	Output rated active power (W)	See nameplate	P
	Output rated apparent power (VA)	See nameplate	P
	Output symbol for nature of supply (d.c.)		N/A
	Rated frequency or rated frequency range (Hz):	See nameplate	P
	Max. ambient operating temperature range (°C).....	See nameplate	P
	Manufacturer's name or trademark or identification mark	See nameplate	P
	Type/model or type reference	See nameplate	P
	Symbol for Class II equipment only	Class I equipment	N/A
	Other symbols	See nameplate	P
	Certification marks	See nameplate	P
	Instructions for units with automatic bypass/maintenance bypass, additional input a.c. supply, or external batteries, having text "See installation instructions before connecting to the supply"		N/A
4.5.3	Safety instructions		P
	Guidance for installation for operator and service person	See user manual	P
	Warning label with text "Isolate uninterruptible power supply (UPS) before working on this circuit"		N/A
4.5.4	Main voltage adjustment	No such device	N/A
1.7.4/RD	Supply voltage adjustment	No such device	N/A
	Methods and means of adjustment; reference to installation instructions		N/A
4.5.5 1.7.5/RD	Power outlets	No such outlet	N/A
4.5.6 1.7.6/RD	Fuse identification (marking, special fusing characteristics, cross-reference)		N/A
4.5.7 1.7.7/RD	Wiring terminals		P
1.7.7.1/RD	Protective earthing and bonding terminals	⊕	P

IEC 62040-1-1			
Clause	Requirement – Test	Result – Remark	Verdict
1.7.7.2/RD	Terminal for a.c. mains supply conductors		P
1.7.7.3/RD	Terminals for d.c. mains supply conductors		P
4.5.8	Battery terminals		P
4.5.9 1.7.8/RD	Controls and indicators		P
1.7.8.1/RD	Identification, location and marking		P
1.7.8.2/RD	Colours		P
1.7.8.3/RD	Symbols according to IEC 60417.....		P
1.7.8.4/RD	Markings using figures		N/A
4.5.10 1.7.9/RD	Isolation of multiple power sources		N/A
4.5.11	IT power systems		N/A
1.7.10/RD	IT power distribution systems		N/A
4.5.12	Protection in building installations		N/A
4.5.13 5.1/RD	High leakage current (mA)	The measured touch current is 2,62 mA	P
4.5.14 1.7.11/RD	Thermostats and other regulating devices	No such device	N/A
4.5.15 1.7.12/RD	Language(s)	English	—
4.5.16 1.7.13/RD	Durability of markings		P
4.5.17 1.7.14/RD	Removable parts	No required markings placed on removable parts	P
4.5.18 1.7.15/RD	Replaceable batteries		N/A
	Language(s)		—
4.5.19 1.7.16/RD	Operator access with a tool.....		P
4.5.20	Battery	Sealed lead acid battery, Vented battery, Gel battery and lithium battery of external battery pack (EBP) used.	P
	Clearly legible information	The explanations are provided in the manual.	P
	Battery type	Li-ion or lead-acid Battery can be used.	P
	Nominal voltage of total battery (V)	Li-ion type: 48 Vdc Lead-acid: 48 Vdc	P
	Nominal capacity of total battery (optional)	Detailed information regarding external interfaces provided in the "Installation Manual".	P

IEC 62040-1-1			
Clause	Requirement – Test	Result – Remark	Verdict
	Warning label	The explanations are provided in the manufacturer's EBP of manual.	N/A
	Instructions	See above.	N/A
4.5.21	Installation instructions		N/A

5	FUNDAMENTAL DESIGN REQUIREMENTS		P
5.1	Protection against electric shock and energy hazards		P
2.1.1.2/RD	Battery compartments	No TNV circuits existed in battery compartments	N/A
2.1.1.4/RD	Access to hazardous voltage circuit wiring	No any hazardous voltage circuit wiring can be accessed by operator	P
2.1.1.5/RD	Energy hazards	No energy hazard at operator accessible SELV interface	P
2.1.1.6/RD	Manual controls	No conductive controls or handles or alike provided	P
5.1.1	Operator access		P
	category a)	Operator access to SELV circuits only.	P
	category b)	No operator access to any of the ELV circuits or hazardous voltage.	P
5.1.2 2.1.1.3/RD	Access to ELV wiring	No ELV wiring in operator accessible area	N/A
	Working voltage (V _{peak} or V _{rms}); minimum distance (mm) through insulation		—
5.1.3	Discharge of capacitors in the primary circuit		P
2.1.1.7/RD	Discharge of capacitors in equipment	Off-grid terminal	P
	Time-constant (s); measured voltage (V)	0,24s@0V	—
5.1.4	Backfeed protection		—
	Description of the construction		P
5.1.5	Emergency switching device		P

5.2	Insulation		P
2.2.3.1/RD	Separation by double insulation or reinforced insulation (method 1)	SELV circuits separated according to method 1. For details see appended tables 5.2	P
2.2.3.2/RD	Separation by earthed screen (method 2)		N/A
2.2.3.3/RD	Protection by earthing of the SELV circuit (method 3)		N/A

IEC 62040-1-1			
Clause	Requirement – Test	Result – Remark	Verdict

5.3	Limited current circuits		N/A
2.4.1/RD	General requirements	No such circuit	N/A
2.4.2/RD	Limit values		N/A
	Frequency (Hz)		—
	Measured current (mA)		—
	Measured voltage (V)		—
	Measured capacitance (μF)		—
2.4.3/RD	Connection of limited current circuits to other circuits		N/A

5.4	Provisions for protective earthing		P
2.6/RD	Provisions for earthing and bonding		P
5.4.1 2.6.1/RD	Protective earthing	Reliable connection of relevant conductive parts to the PE terminal via green/yellow insulated wires	P
5.4.1 4.2.3/RD	Steady force test, 30 N		N/A
5.4.1 5.3/RD	Abnormal operating and fault conditions	(see appended table 8.3)	P
5.4.2	Bonding		N/A

5.5	AC and d.c. power isolation		P
2.6.2/RD	Functional earthing		N/A
2.6.3/RD	Protective earthing and protective bonding conductors		P
2.6.3.1/RD	General	See sub clause 2.6.3.3/RD	P
2.6.3.2/RD	Size of protective earthing conductors		P
	Rated current (A), cross-sectional area (mm ²), AWG	Comply with Table 3B	—
2.6.3.3/RD	Size of protective bonding conductors		
	Rated current (A), cross-sectional area (mm ²), AWG	Comply with Table 3B	—
2.6.3.4/RD	Resistance (Ω) of earthing conductors and their terminations, test current (A)	30A, 0,008Ω	P
2.6.3.5/RD	Colour of insulation	Green/yellow	P
2.6.4/RD	Terminals		P
2.6.4.1/RD	General		P

IEC 62040-1-1			
Clause	Requirement – Test	Result – Remark	Verdict
2.6.4.2/RD	Protective earthing and bonding terminals		P
	Rated current (A), type and nominal thread diameter (mm)..... :	Comply with 2.6.3.4/RD	—
2.6.4.3/RD	Separation of the protective earthing conductor from protective bonding conductors		P
2.6.5/RD	Integrity of protective earthing		P
2.6.5.1/RD	Interconnection of equipment		P
2.6.5.2/RD	Components in protective earthing conductors and protective bonding conductors		P
2.6.5.3/RD	Disconnection of protective earth		P
2.6.5.4/RD	Parts that can be removed by an operator		N/A
2.6.5.5/RD	Parts removed during servicing		P
2.6.5.6/RD	Corrosion resistance	All safety earthing connections in compliance with Annex J	P
2.6.5.7/RD	Screws for protective bonding		P
2.6.5.8/RD	Reliance on telecommunication network or cable distribution system		N/A
5.5.1	Disconnect devices	Considered in end system	N/A
5.5.2	Three-phase equipment	Single phase	N/A
	Interrupting neutral and phase conductors		N/A
5.5.3	Switch as a disconnect device	No such device	N/A
1.7.8/RD	Controls and indicators		P
1.7.8.1/RD	Identification, location and marking :		P
1.7.8.2/RD	Colours :		P
1.7.8.3/RD	Symbols according to IEC 60417..... :		P
1.7.8.4/RD	Markings using figures :		P
5.5.4	Multiple power sources		N/A
5.5.5	Ungrounded conductors		P

5.6	Overcurrent and earth fault protection		P
2.7.3/RD	Short-circuit backup protection		P
2.7.4/RD	Number and location of protective devices :		P
2.7.5/RD	Protection by several devices		N/A
2.7.6/RD	Warning to service personnel :		N/A
5.6.1	Basic requirements		P
5.6.2	Battery circuit protection		P
5.6.3	Location of protective device		P

IEC 62040-1-1			
Clause	Requirement – Test	Result – Remark	Verdict
5.6.4	Rating of protective device		P
5.3.1/RD	Protection against overload and abnormal operation	(see appended table 8.3)	P

5.7	Protection of personnel – Safety interlocks		N/A
5.7.1	Operator protection		N/A
2.8/RD	Safety interlocks		N/A
2.8.1/RD	General principles		N/A
2.8.2/RD	Protection requirements		N/A
2.8.3/RD	Inadvertent reactivation		N/A
2.8.4/RD	Fail-safe operation		N/A
2.8.5/RD	Moving parts		N/A
2.8.6/RD	Overriding		N/A
2.8.7/RD	Switches and relays		N/A
2.8.7.1/RD	Contact gaps (mm) :		N/A
2.8.7.2/RD	Overload test		N/A
2.8.7.3/RD	Endurance test		N/A
2.8.7.4/RD	Electric strength test		N/A
2.8.8/RD	Mechanical actuators		N/A
5.7.2	Service person protection		N/A
5.7.2.1	Covers		N/A
5.7.2.2	Location and guarding of parts		N/A
5.7.2.3	Parts on doors		N/A
5.7.2.4	Component access		N/A
2.8.3/RD	Inadvertent reactivation		N/A
5.7.2.5	Moving parts		N/A
5.7.2.6	Capacitor banks		N/A
5.7.2.7	Internal batteries		N/A

5.8 2.10/RD	Clearances, creepage distances and distances through insulation		P
2.10.1/RD	General	See 2.10.3/RD, 2.10.4/RD and 2.10.5/RD	P
2.10.2/RD	Determination of working voltage	580Vd.c. / 230Va.c. Mains voltage	P
2.10.3/RD	Clearances		P
2.10.3.1/RD	General		P

IEC 62040-1-1			
Clause	Requirement – Test	Result – Remark	Verdict
2.10.3.2/RD	Clearances in primary circuits	(see appended table 5.8)	P
2.10.3.3/RD	Clearances in secondary circuits	(see appended table 5.8)	N/A
2.10.3.4/RD	Measurement of transient voltage levels	Overvoltage category III for a.c. Mains. overvoltage category II for input DC circuit	P
2.10.4/RD	Creepage distances	(see appended table 5.8)	P
	CTI tests..... :	IIIa	—
2.10.5/RD	Solid insulation		P
2.10.5.1/RD	Minimum distance through insulation	(see appended table 5.1.2)	P
2.10.5.2/RD	Thin sheet material		P
	Number of layers (pcs)..... :	2	—
	Electric strength test	(see appended table 5.8)	—
2.10.5.3/RD	Printed boards		P
	Distance through insulation		P
	Electric strength test for thin sheet insulating material	(see appended table 5.8)	—
	Number of layers (pcs)..... :		P
2.10.5.4/RD	Wound components	(see appended Annex U)	P
	Number of layers (pcs)..... :		P
	Two wires in contact inside wound component; angle between 45° and 90°		P
2.10.6/RD	Coated printed boards		N/A
2.10.6.1/RD	General		N/A
2.10.6.2/RD	Sample preparation and preliminary inspection		N/A
2.10.6.3/RD	Thermal cycling		N/A
2.10.6.4/RD	Thermal ageing (°C)..... :		
2.10.6.5/RD	Electric strength test		—
2.10.6.6/RD	Abrasion resistance test		N/A
	Electric strength test		—
2.10.7/RD	Enclosed and sealed parts..... :		N/A
	Temperature $T_1=T_2 + T_{ma} - T_{amb} + 10K$ (°C)..... :		N/A
2.10.8/RD	Spacings filled by insulating compound		N/A
	Electric strength test		—
2.10.9/RD	Component external terminations		P
2.10.10/RD	Insulation with varying dimensions		N/A

IEC 62040-1-1			
Clause	Requirement – Test	Result – Remark	Verdict
5.9	External signalling circuits		N/A
2.3/RD	TNV circuits		N/A
2.3.1/RD	Limits		N/A
	Type of TNV circuits..... :		—
2.3.2/RD	Separation from other circuits and from accessible parts		N/A
	Insulation employed :		—
2.3.3/RD	Separation from hazardous voltages		N/A
	Insulation employed :		—
2.3.4/RD	Connection of TNV circuits to other circuits		N/A
	Insulation employed :		—
2.3.5/RD	Test for operating voltages generated externally		N/A
2.5/RD	Limited power sources		N/A
	Inherently limited output		N/A
	Impedance limited output		N/A
	Overcurrent protective device limited output		N/A
	Regulating network limited output under normal operating and single fault condition		N/A
	Regulating network limited output under normal operating conditions and overcurrent protective device limited output under single fault condition		N/A
	Output voltage (V), output current (A), apparent power (VA) :		—
	Current rating of overcurrent protective device (A) :		—

5.10 2.5/RD	Limited power sources		N/A
	Inherently limited output		N/A
	Impedance limited output		N/A
	Overcurrent protective device limited output		N/A
	Regulating network limited output under normal operating and single fault condition		N/A
	Regulating network limited output under normal operating conditions and overcurrent protective device limited output under single fault condition		N/A
	Output voltage (V), output current (A), apparent power (VA) :		—

IEC 62040-1-1			
Clause	Requirement – Test	Result – Remark	Verdict
	Current rating of overcurrent protective device (A)		—

6	WIRING, CONNECTIONS AND SUPPLY		P
6.1	General		P
3.1/RD			
3.1.1/RD	Current rating and overcurrent protection		P
3.1.2/RD	Protection against mechanical damage		P
3.1.3/RD	Securing of internal wiring		P
3.1.4/RD	Insulation of conductors		P
3.1.5/RD	Beads and ceramic insulators		N/A
3.1.6/RD	Screws for electrical contact pressure		P
3.1.7/RD	Insulating materials in electrical connections		P
3.1.8/RD	Self-tapping and spaced thread screws		N/A
3.1.9/RD	Termination of conductors		P
	10 N pull test		P
3.1.10/RD	Sleeving on wiring		P

6.2	Connection to power		P
3.2.2/RD	Multiple supply connections		P
3.2.3/RD	Permanently connected equipment		P
	Number of conductors, diameter (mm) of cable and conduits	Refer to user manual	—
3.2.4/RD	Appliance inlets		N/A
3.2.5/RD	Power supply cords		N/A
3.2.5.1/RD	AC power supply cords		N/A
	Type		—
	Rated current (A), cross-sectional area (mm ²), AWG		—
3.2.5.2/RD	DC power supply cords		N/A
3.2.7/RD	Protection against mechanical damage		N/A
3.2.8/RD	Cord guards		N/A
	D (mm); test mass (g)		—
	Radius of curvature of cord (mm)		—
6.2.1	Means of connection	Permanent connection	P
	More than one supply connection		N/A

IEC 62040-1-1			
Clause	Requirement – Test	Result – Remark	Verdict
6.3	Wiring terminals for external power conductors		P
3.3.1/RD	Wiring terminals	Permanent connection	P
3.3.2/RD	Connection of non-detachable power supply cords		N/A
3.3.3/RD	Screw terminals		P
3.3.4/RD	Conductor sizes to be connected		P
	Rated current (A), cord/cable type, cross-sectional area (mm ²)	Refer to user manual	—
3.3.5/RD	Wiring terminal sizes		P
	Rated current (A), type and nominal thread diameter (mm)		—
3.3.6/RD	Wiring terminals design		P
3.3.7/RD	Grouping of wiring terminals		P
3.3.8/RD	Stranded wire		P

7	PHYSICAL REQUIREMENTS		P
7.1	Enclosure	Metal enclosure not used to carry current. Metal enclosure completely enclosing hazardous parts	P
7.2	Stability		N/A
4.1/RD	Angle of 10°	Fixed equipment	N/A
	Test: force (N)		N/A

7.3	Mechanical strength		P
4.2.1/RD	General		P
4.2.2/RD	Steady force test, 10 N		P
4.2.3/RD	Steady force test, 30 N		N/A
4.2.4/RD	Steady force test, 250 N		P
4.2.5/RD	Impact test		P
	Fall test		P
	Swing test		P
4.2.6/RD	Drop test		N/A
4.2.7/RD	Stress relief test	For LED cover, 100°C	P
4.2.8/RD	Cathode ray tubes	No such device	N/A
	Picture tube separately certified.....		N/A
4.2.9/RD	High pressure lamps	No such device	N/A

IEC 62040-1-1			
Clause	Requirement – Test	Result – Remark	Verdict
4.2.10/RD	Wall or ceiling mounted equipment; force (N) . :	It is intended to be mounted on concrete wall. Max. 4 times of load (27kg x 4) apply on the mounting brackets	P

7.4	Construction details		P
4.3.1/RD	Edges and corners		P
4.3.2/RD	Handles and manual controls; force (N) :		N/A
4.3.3/RD	Adjustable controls		N/A
4.3.4/RD	Securing of parts		N/A
4.3.5/RD	Connection of plugs and sockets		N/A
4.3.6/RD	Direct plug-in equipment		N/A
	Dimensions (mm) of mains plug for direct plug-in :		N/A
	Torque and pull test of mains plug for direct plug-in; torque (Nm); pull (N)..... :		N/A
4.3.7/RD	Heating elements in earthed equipment		N/A
4.3.8/RD	Batteries (see also 4.5.20)	Approved battery used	N/A
4.3.9/RD	Oil and grease		N/A
4.3.10/RD	Dust, powders, liquids and gases		N/A
4.3.11/RD	Containers for liquids or gases		N/A
4.3.12/RD	Flammable liquids :		N/A
	Quantity of liquid (l) :		N/A
	Flash point (°C) :		N/A
4.3.13/RD	Radiation; type of radiation :		N/A
4.3.13.1/RD	General		N/A
4.3.13.2/RD	Ionizing radiation		N/A
	Measured radiation (pA/kg) :		—
	Measured high-voltage (kV) :		—
	Measured focus voltage (kV) :		—
	CRT markings :		—
4.3.13.3/RD	Effect of ultraviolet (UV) radiation on materials		N/A
	Part, property, retention after test, flammability classification :		N/A
4.3.13.4/RD	Human exposure to ultraviolet (UV) radiation . :		N/A
4.3.13.5/RD	Laser (including LEDs)		N/A
	Laser class :		—

IEC 62040-1-1			
Clause	Requirement – Test	Result – Remark	Verdict
4.3.13.6/RD	Other types		N/A
7.4.1	Openings		P
7.4.2	Gas concentration		P
7.4.3	Equipment movement		N/A

7.5 4.7/RD	Resistance to fire		P
4.7.1/RD	Reducing the risk of ignition and spread of flame		P
	Method 1, selection and application of components wiring and materials	(see appended table 7.5)	P
	Method 2, application of all of simulated fault condition tests		N/A
4.7.2/RD	Conditions for a fire enclosure		P
4.7.2.1/RD	Parts requiring a fire enclosure		P
4.7.2.2/RD	Parts not requiring a fire enclosure		P
4.7.3/RD	Materials		P
4.7.3.1/RD	General		P
4.7.3.2/RD	Materials for fire enclosures	Metallic enclosure	P
4.7.3.3/RD	Materials for components and other parts outside fire enclosures		N/A
4.7.3.4/RD	Materials for components and other parts inside fire enclosures		P
4.7.3.5/RD	Materials for air filter assemblies		N/A
4.7.3.6/RD	Materials used in high-voltage components	No high voltage components provided	N/A

7.6	Battery location		P
7.6.1	Accessibility and maintainability	External battery provide, refer to installation manual	P
7.6.2	Vibration		P
7.6.3	Distance		P
7.6.4	Insulation		N/A
7.6.5	Wiring		P
7.6.6	Electrolyte spillage		P
7.6.7	Ventilation		P
7.6.8	Charging voltages		P

IEC 62040-1-1			
Clause	Requirement – Test	Result – Remark	Verdict
7.7	Temperature rise		P
	Maximum temperatures	(see appended table 7.7)	P
4.5.2/RD	Resistance to abnormal heat		P

8	ELECTRICAL REQUIREMENTS AND SIMULATED ABNORMAL CONDITIONS		P
8.1 5.1.1/RD	General		P
8.1.1	Earth leakage current	The measured touch current is 2,62 mA	P
5.1.2/RD	Equipment under test (EUT)		P
5.1.7/RD	Equipment with touch current exceeding 3.5 mA		N/A
8.1.2	Pluggable equipment type B UPS		N/A
3.2.5/RD	Power supply cords		N/A
3.2.5.1/RD	AC power supply cords		N/A
	Type		—
	Rated current (A), cross-sectional area (mm ²), AWG		—
3.2.5.2/RD	DC power supply cords		N/A

8.2	Electric strength		P
5.2.1/RD	General	(see appended table 5.8)	P
5.2.2/RD	Test procedure	(see appended table 5.8)	P

8.3	Abnormal operating and fault conditions		P
5.3.1/RD	Protection against overload and abnormal operation	(see appended table 8.3)	P
5.3.2/RD	Motors	No motors	N/A
5.3.3/RD	Transformers	(see appended Annex C)	P
5.3.4/RD	Functional insulation		P
5.3.5/RD	Electromechanical components		N/A
5.3.8/RD	Compliance criteria for abnormal operating and fault conditions		P
8.3.1	Simulation of faults		P
8.3.2	Conditions for tests		P

9	CONNECTION TO TELECOMMUNICATION NETWORKS		N/A
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IEC 62040-1-1			
Clause	Requirement – Test	Result – Remark	Verdict
6.1/RD	Protection of telecommunication network service persons, and users of other equipment connected to the network, from hazards in the equipment		N/A
6.1.1/RD	Protection from hazardous voltages		N/A
6.1.2/RD	Separation of the telecommunication network from earth		N/A
6.1.2.1/RD	Requirements		N/A
	Test voltage (V)		—
	Current in the test circuit (mA)		—
6.1.2.2/RD	Exclusions		N/A

6.2/RD	Protection of equipment users from overvoltages on telecommunication networks		N/A
6.2.1/RD	Separation requirements		N/A
6.2.2/RD	Electric strength test procedure		N/A
6.2.2.1/RD	Impulse test		N/A
6.2.2.2/RD	Steady-state test		N/A
6.2.2.3/RD	Compliance criteria		N/A

6.3/RD	Protection of the telecommunication wiring system from overheating		N/A
	Max. output current (A)		—
	Current limiting method		—
1.4.8/RD	Normal operating voltages		N/A
1.4.11/RD	Power from a telecommunication network		N/A
2.1.1/RD	Protection in operator access areas		N/A
2.1.1.1/RD	Access to energized parts		N/A
	Test by inspection		N/A
	Test with test finger		N/A
	Test with test pin		N/A
	Test with test probe		N/A
2.1.1.2/RD	Battery compartments		N/A
2.1.3/RD	Protection in restricted access locations		N/A
2.3/RD	TNV circuits		N/A
2.3.1/RD	Limits		N/A
	Type of TNV circuits		—
2.3.2/RD	Separation from other circuits and from accessible parts		N/A
	Insulation employed		—
2.3.3/RD	Separation from hazardous voltages		N/A

IEC 62040-1-1			
Clause	Requirement – Test	Result – Remark	Verdict
	Insulation employed		—
2.3.4/RD	Connection of TNV circuits to other circuits		N/A
	Insulation employed		—
2.3.5/RD	Test for operating voltages generated externally		N/A
2.6.1/RD	Protective earthing		N/A
2.6.5.8/RD	Reliance on telecommunication network or cable distribution system		N/A
2.9.3/RD	Grade of insulation		N/A
2.10.3.3/RD	Clearances in secondary circuits		N/A
2.10.3.4/RD	Measurement of transient voltage levels		N/A
2.10.4/RD	Creepage distances		N/A
3.5/RD	Interconnection of equipment		N/A
3.5.1/RD	General requirements		N/A
3.5.2/RD	Types of interconnection circuits.....		N/A

M/RD	ANNEX M, CRITERIA FOR TELEPHONE RINGING SIGNALS (see 2.3.1)		N/A
M.1/RD	Introduction		N/A
M.2 /RD	Method A		N/A
M.3/RD	Method B		N/A
M.3.1/RD	Ringing signal		N/A
M.3.1.1/RD	Frequency (Hz)		—
M.3.1.2/RD	Voltage (V)		—
M.3.1.3/RD	Cadence; time (s), voltage (V)		—
M.3.1.4/RD	Single fault current (mA)		—
M.3.2/RD	Tripping device and monitoring voltage		N/A
M.3.2.1/RD	Conditions for use of a tripping device or a monitoring voltage		N/A
M.3.2.2/RD	Tripping device		N/A
M.3.2.3/RD	Monitoring voltage (V)		N/A

A/RD	ANNEX A, TESTS FOR RESISTANCE TO HEAT AND FIRE		N/A
A.1/RD	Flammability test for fire enclosures of movable equipment having a total mass exceeding 18 kg, and of stationary equipment (see 4.7.3.2)		N/A
A.1.1/RD	Samples		—
	Wall thickness (mm)		—
A.1.2/RD	Conditioning of samples; temperature (°C).....		N/A

IEC 62040-1-1			
Clause	Requirement – Test	Result – Remark	Verdict
A.1.3/RD	Mounting of samples		N/A
A.1.4/RD	Test flame (see IEC 60695-11-3)		N/A
	Flame A, B, C or D		—
A.1.6/RD	Compliance criteria		N/A
	Sample 1 burning time (s)		—
	Sample 2 burning time (s)		—
	Sample 3 burning time (s)		—
A.2/RD	Flammability test for fire enclosures of movable equipment having a total mass not exceeding 18 kg, and for material and components located inside fire enclosures (see 4.7.3.2 and 4.7.3.4)		N/A
A.2.1/RD	Samples, material		—
	Wall thickness (mm)		—
A.2.2/RD	Conditioning of samples		N/A
A.2.3/RD	Mounting of samples		N/A
A.2.4/RD	Test flame (see IEC 60695-11-4)		N/A
	Flame A, B or C		—
A.2.5/RD	Test procedure		N/A
A.2.6/RD	Compliance criteria		N/A
	Sample 1 burning time (s)		—
	Sample 2 burning time (s)		—
	Sample 3 burning time (s)		—
A.2.7/RD	Alternative test acc. to IEC 60695-2-2, cl. 4 and 8		N/A
	Sample 1 burning time (s)		—
	Sample 2 burning time (s)		—
	Sample 3 burning time (s)		—
A.3/RD	Hot flaming oil test (see 4.6.2)		N/A
A.3.1/RD	Mounting of samples		N/A
A.3.2/RD	Test procedure		N/A
A.3.3/RD	Compliance criterion		N/A

B/RD	ANNEX B, MOTOR TESTS UNDER ABNORMAL CONDITIONS (see 4.7.2.2 and 5.3.2)		N/A
B.1/RD	General requirements		N/A
	Position		—
	Manufacturer		—

IEC 62040-1-1			
Clause	Requirement – Test	Result – Remark	Verdict
	Type		—
	Rated values		—
B.2/RD	Test conditions		N/A
B.3/RD	Maximum temperatures		N/A
B.4/RD	Running overload test		N/A
B.5/RD	Locked-rotor overload test		N/A
	Test duration (days)		—
	Electric strength test: test voltage (V)		—
B.6/RD	Running overload test for d.c. motors in secondary circuits		N/A
B.7/RD	Locked-rotor overload test for d.c. motors in secondary circuits		N/A
B.7.1/RD	Test procedure		N/A
B.7.2/RD	Alternative test procedure; test time (h)		N/A
B.7.3/RD	Electric strength test		N/A
B.8/RD	Test for motors with capacitors		N/A
B.9/RD	Test for three-phase motors		N/A
B.10/RD	Test for series motors		N/A
	Operating voltage (V)		—

C/RD	ANNEX C, TRANSFORMERS (see 1.5.4 and 5.3.3)		P
	Position	Inside	—
	Manufacturer	HUIZHOU INDUCTANCE ELECTRONIC TECHNOLOGY CO.,LTD.	—
	Type	240-00198-00	—
	Rated values	230Va.c.	—
	Method of protection	Thermal protection	—
C.1/RD	Overload test	(see appended table 7.5 and 8.3)	P
C.2/RD	Insulation	(see appended table 5.8, 8.2 and 9)	P
	Protection from displacement of windings		P

D/RD	ANNEX D, MEASURING INSTRUMENTS FOR TOUCH-CURRENT TESTS (see 5.1.4)		P
D.1/RD	Measuring instrument		P
D.2/RD	Alternative measuring instrument		N/A

IEC 62040-1-1			
Clause	Requirement – Test	Result – Remark	Verdict
E/RD	ANNEX E, TEMPERATURE RISE OF A WINDING (see 1.4.13)		N/A
F/RD	ANNEX F, MEASUREMENT OF CLEARANCES AND CREEPAGE DISTANCES (see 2.10)		P
G/RD	ANNEX G, ALTERNATIVE METHOD FOR DETERMINING MINIMUM CLEARANCES		N/A
G.1/RD	Summary of the procedure for determining minimum clearances		N/A
G.2/RD	Determination of mains transient voltage (V).....:		N/A
G.2.1/RD	AC mains supply		N/A
G.2.2/RD	DC mains supply		N/A
G.3/RD	Determination of telecommunication network transient voltage (V)		N/A
G.4/RD	Determination of required withstand voltage (V):		N/A
G.5/RD	Measurement of transient levels (V)		N/A
G.6/RD	Determination of minimum clearances		N/A
H	ANNEX H, GUIDANCE ON PROTECTION AGAINST INGRESS OF WATER AND FOREIGN OBJECTS (see IEC 60529)		P
J/RD	ANNEX J, TABLE OF ELECTROCHEMICAL POTENTIALS (see 2.6.5.6)		N/A
	Metal used		—
K/RD	ANNEX K, THERMAL CONTROLS (see 1.5.3 and 5.3.7)		N/A
K.1/RD	Making and breaking capacity		N/A
K.2 /RD	Thermostat reliability; operating voltage (V).....:		N/A
K.3/RD	Thermostat endurance test; operating voltage (V)		N/A
K.4/RD	Temperature limiter endurance; operating voltage (V)		N/A
K.5/RD	Thermal cut-out reliability		N/A
K.6/RD	Stability of operation		N/A
L	ANNEX L, BACKFEED PROTECTION TEST		P
L.1	General		N/A

IEC 62040-1-1			
Clause	Requirement – Test	Result – Remark	Verdict
L.2	Test for pluggable equipment type A or pluggable equipment type B UPS		N/A
L.3	Test for permanently connected UPS		P
L.4	Single-fault conditions		P

M	ANNEX M, EXAMPLES OF REFERENCE LOAD CONDITIONS		P
M.1	General		P
M.2	Reference resistive load		P
M.3	Reference inductive-resistive load		N/A
M.4	Reference capacitive-resistive loads		N/A
M.5	Reference non-linear load		N/A
M.5.1	Test method		N/A
M.5.2	Connection of the non-linear reference load		N/A

N	ANNEX N, VENTILATION OF BATTERY COMPARTMENTS		N/A
N.1	General	No inside batteries	N/A
N.2	Hydrogen concentration		N/A
N.3	Blocked conditions		N/A
N.4	Overcharge test		N/A

U/RD	ANNEX U, INSULATED WINDING WIRES FOR USE WITHOUT INTERLEAVED INSULATION (see 2.10.5.4)		N/A
			—

X	ANNEX X, GUIDANCE FOR DISCONNECTION OF BATTERIES DURING SHIPMENT		—
X.1	Applicable products		—
X.2	Battery disconnection		—
X.3	Package labelling/marketing		—
X.4	Damage inspection		—
X.5	The importance of safe handling procedures		—

Y/RD	ANNEX Y, ULTRAVIOLET LIGHT CONDITIONING TEST (see 4.3.13.3)		N/A
Y.1/RD	Test apparatus	Indoor use only	N/A
Y.2/RD	Mounting of test samples		N/A
Y.3/RD	Carbon-arc light-exposure apparatus		N/A

IEC 62040-1-1			
Clause	Requirement – Test	Result – Remark	Verdict
Y.4/RD	Xenon-arc light exposure apparatus		N/A

4.3		TABLE: list of critical components				P
object/part No.	manufacturer/ trademark	type/model	technical data	standard	mark(s) of conformity ¹⁾	
Negative temperature coefficient thermistor	Shenzhen Ampron Technology Corporation	ARP-CWF153G3950 FA150A	25°C/15Kohm	UL 1434	UL E243011	
--Alternative	Shenzhen Kemin sensor Co., Ltd	CWF415KH415 0	25°C/15Kohm	UL 1434	UL E356449	
Insulating trip: K10	Bergquist	k-10#	0,15mm/vtm-0/150°C	UL 746C	UL E59150	
battery input terminal	Shenzhen Connection Electronic Co., Ltd.	DRTB38-NR-02	600V/100A - 40°C-120°C	IEC 62109-1	Tested with appliance	
AC output terminal	Shenzhen Connection Electronic Co., Ltd.	DRTB10-NR2-05	600VAC/60A PA66	IEC 62109-1	Tested with appliance	
PV input terminal	Ningbo Yuanfan Electrical Technology Co., Ltd	YF-H4	30A/1000V,90°C ,IP67,4mm2	IEC62852: 2014	TUV 50344236	
Enclosure (top case)	Foshan Ketu hardware products Co., Ltd.	--	Aluminum T2.0 480*420*13 mm	IEC 62109-1	Tested with appliance	
Enclosure (bottom case)	Foshan Ketu hardware products Co., Ltd.	--	metal, SPCC 1.2 480*420*95 mm	IEC 62109-1	Tested with appliance	
Battery waterproof gland	Guangzhou Yuyuan Electronics Co., Ltd.	--	M8	IEC 62109-1	Tested with appliance	
communication waterproof gland	Guangzhou Yuyuan Electronics Co., Ltd.	--	M25	IEC 62109-1	Tested with appliance	
output waterproof gland	Danwei	--	M20	IEC 62109-1	Tested with appliance	
Seal ring (waterproof tape)	Shenzhen Asia Lanneret Science & Technology Co.,	--	EPDM Rubber 10*4.5	IEC 62109-1	Tested with appliance	

4.3 TABLE: list of critical components					P
object/part No.	manufacturer/ trademark	type/model	technical data	standard	mark(s) of conformity ¹⁾
	Ltd				
Plastic cover	Sabic Innovative Plastics B V	CFR7630(f1)(gg)	V-0, 125°C	--	UL E45329
Heat sink	Foshan Ketu Hardware Products Co., Ltd.	--	Aluminum 6063 T5 480*420*100	IEC 62109-1	Tested with appliance
Boost inductor	Huizhou Inductance Electronic Technology Co., Ltd.	230-00133-00 230-00134-00	Class B, 1.5mH/φ1.8*1P 1PEW 74Ts	IEC 62109-1	Tested with appliance
-- Alternative	Jepuls Technology(She nzhen) Co., Ltd	230-00133-00 230-00134-00	Class B, 1.5mH/φ1.8*1P 1PEW 74Ts	IEC 62109-1	Tested with appliance
INV inductor	Huizhou Inductance Electronic Technology Co., Ltd.	230-00135-00 230-00136-00	Class B, 1.03mH/φ1.8*2 P 1PEW 50Ts	IEC 62109-1	Tested with appliance
-- Alternative	Shenzhen Yuyuan Power Co., Ltd	230-00135-00 230-00136-00	Class B, 1.03mH/φ1.8*2 P 1PEW 50Ts	IEC 62109-1	Tested with appliance
-- Alternative	Jepuls Technology(She nzhen) Co., Ltd	230-00135-00 230-00136-00	Class B, 1.03mH/φ1.8*2 P 1PEW 50Ts	IEC 62109-1	Tested with appliance
BUCK_BOOST inductor	Huizhou Inductance Electronic Technology Co., Ltd.	230-00137-00	Class B, 1.5mH/φ1.8*1P 1PEW 74Ts	IEC 62109-1	Tested with appliance
-- Alternative	Shenzhen Yuyuan Power Co., Ltd	230-00137-00	Class B, 1.5mH/φ1.8*1P 1PEW 74Ts	IEC 62109-1	Tested with appliance
-- Alternative	Jepuls Technology(She nzhen) Co., Ltd	230-00137-00	Class B, 1.5mH/φ1.8*1P 1PEW 74Ts	IEC 62109-1	Tested with appliance
-- Alternative	JEPULS TECHNOLOGY(SHENZHEN) CO., LTD.	230-00137-00	Class B, 1.5mH/φ1.8*1P 1PEW 74Ts	IEC 62109-1	Tested with appliance
AC output	Huizhou	230-00138-00	2.9mH/Φ1.8*2P/	IEC 62109-1	Tested with

4.3 TABLE: list of critical components					P
object/part No.	manufacturer/ trademark	type/model	technical data	standard	mark(s) of conformity ¹⁾
common-mode inductor (CT1,CT2)	Inductance Electronic Technology Co., Ltd.		15TS, 130°C		appliance
-- Alternative	Shenzhen Yuyuan Power Co., Ltd	230-00138-00	2.9mH/Φ1.8*2P/15TS, 130°C	IEC 62109-1	Tested with appliance
-- Alternative	Powertek Electronic(Shen Zhen)Co., Ltd	230-00138-00	2.9mH/Φ1.8*2P/15TS, 130°C	IEC 62109-1	Tested with appliance
PV input common-mode inductor (L1)	Huizhou Inductance Electronic Technology Co., Ltd.	230-00139-00	Class B, 1.1mH/Φ2.0/9T S	IEC 62109-1	Tested with appliance
-- Alternative	Shenzhen Yuyuan Power Co., Ltd	230-00139-00	Class B, 1.1mH/Φ2.0/9T S	IEC 62109-1	Tested with appliance
-- Alternative	Powertek Electronic(Shen Zhen) Co., Ltd	230-00139-00	Class B, 1.1mH/Φ2.0/9T S	IEC 62109-1	Tested with appliance
battery isolation transformer	Huizhou Inductance Electronic Technology Co., Ltd.	240-00198-00	Class F,7.5mH /φ0.3*48P UEW-F	IEC 62109-1	Tested with appliance
-- Alternative	Shenzhen Ferrocoil Electronics Technology Co., Ltd.	240-00198-00	Class F,7.5mH /φ0.3*48P UEW-F	IEC 62109-1	Tested with appliance
-- Alternative	Jepuls Technology(She nzhzen) Co., Ltd	240-00198-00	Class F,7.5mH /φ0.3*48P UEW-F	IEC 62109-1	Tested with appliance
BUS power supply transformer (TX4)	Huizhou Inductance Electronic Technology Co., Ltd.	240-00199-00	EI28, 26:8:2:10:10:26, Class B	IEC 62109-1	Tested with appliance
-- Alternative	Shenzhen Ferrocoil Electronics Technology Co., Ltd.	240-00199-00	EI28, 26:8:2:10:10:26, Class B	IEC 62109-1	Tested with appliance
-- Alternative	Jepuls	240-00199-00	EI28,	IEC 62109-1	Tested with

4.3		TABLE: list of critical components				P
object/part No.	manufacturer/ trademark	type/model	technical data	standard	mark(s) of conformity ¹⁾	
	Technology(She nzhzen) Co., Ltd		26:8:2:10:10:26, Class B		appliance	
-- Alternative	Shenzhen Yamaxi Electronics Co., Ltd.	240-00199-00	EI28, 26:8:2:10:10:26, Class B	IEC 62109-1	Tested with appliance	
battery power supply transformer (TX1)	Huizhou Inductance Electronic Technology Co., Ltd.	240-00200-01	ER28,45:13:3:5: 45,Class B	IEC 62109-1	Tested with appliance	
-- Alternative	Shenzhen Ferrocoil Electronics Technology Co., Ltd.	240-00200-01	ER28,45:13:3:5: 45,Class B	IEC 62109-1	Tested with appliance	
-- Alternative	Jepuls Technology(She nzhzen) Co., Ltd	240-00200-01	ER28,45:13:3:5: 45,Class B	IEC 62109-1	Tested with appliance	
-- Alternative	Shenzhen Yamaxi Electronics Co., Ltd.	240-00200-01	ER28,45:13:3:5: 45,Class B	IEC 62109-1	Tested with appliance	
drive transformer (TX1 for LV board) (TX1, TX2, TX3 for INV board) (TX1, TX2 for HV board)	Huizhou Inductance Electronic Technology Co., Ltd.	240-00201-00	EFD20,52:25:50 :52:25,Class B	IEC 62109-1	Tested with appliance	
--Alternative	Shenzhen Ferrocoil Electronics Technology Co., Ltd.	240-00201-00	EFD20,52:25:50 :52:25,Class B	IEC 62109-1	Tested with appliance	
communication power supply transformer (TX1)	Huizhou Inductance Electronic Technology Co., Ltd.	240-00238-00	EFD20,9:7:4, Class B	IEC 62109-1	Tested with appliance	
-- Alternative	Shenzhen Ferrocoil Electronics	240-00238-00	EFD20,9:7:4, Class B	IEC 62109-1	Tested with appliance	

4.3 TABLE: list of critical components					P
object/part No.	manufacturer/ trademark	type/model	technical data	standard	mark(s) of conformity ¹⁾
	Technology Co., Ltd.				
GFCI transformer (TX1,TX2)	Huizhou Inductance Electronic Technology Co., Ltd.	240-00203-00	MP2303- 4AS,73:10, Class B	IEC 62109-1	Tested with appliance
-- Alternative	Shenzhen Ferrocoil Electronics Technology Co., Ltd.	240-00203-00	MP2303- 4AS,73:10, Class B	IEC 62109-1	Tested with appliance
-- Alternative	Jepuls Technology(She nzhcn) Co., Ltd	240-00203-00	MP2303- 4AS,73:10,Clas s B	IEC 62109-1	Tested with appliance
LCD	Shenzhen Genyu Optical Co., Ltd.	260-00067-00	VA, Black 6 O'Clock 5.0V - 30°C-80°C	IEC 62109-1	Tested with appliance
-- Alternative	Winstar Display Co., Ltd.	260-00067-00	VA, Black 6 O'Clock 5.0V - 30°C-80°C	IEC 62109-1	Tested with appliance
-- Alternative	Shenzhen Tianruix Electronic Co., Ltd.	260-00067-00	VA, Black 6 O'Clock 5.0V - 30°C-80°C	IEC 62109-1	Tested with appliance
PV input switch	Merz	600V/30A IP66	MDC1A-040- 600-32E-0178D- B25.9	EN 60947-3	DEKRA 936762
-- Alternative	Projoy	600V/32A IP66	PEDS150R- HM32-3	EN 60947-3	TUV R50386431
-- Alternative	BREMAS	750V/32A IP66	DK1001621CA MMVU5	EN 60947-3	TUV B170887707010
internal wiring	Dongguan Jintai Wire & Cable Co., Ltd	1015	600Vac,105°C, AWG10/AWG12 ,VW-1	UL 758	UL E204204
-- Alternative	Yong Hao Electrical Industry Co., Ltd.	1015	600Vac,105°C, AWG10/AWG12 ,VW-1	UL 758	UL E240426
-- Alternative	Dongguan Wenchang Electronic Co.,	1015	600Vac,105°C, AWG10/AWG12 ,VW-1	UL 758	UL E214500

4.3 TABLE: list of critical components					P
object/part No.	manufacturer/ trademark	type/model	technical data	standard	mark(s) of conformity ¹⁾
	Ltd.				
-- Alternative	Dongguan Wenchang Electronic Co., Ltd.	3530	600Vac,150°C, AWG10/AWG12 ,VW-1	UL 758	UL E214500
heat shrinkable sleeve	Shenzhen Woer Heat-Shrinkable Material	RSFR-X	600V, 125°C,	UL 224	UL E203950
-- Alternative	Guangzhou Kaiheng Enterprise Group Co., Ltd	K-2(+)	600V,125°C	UL 224	UL E214175
-- Alternative	TE Connectivity Corporation	VERSAFIT V2	600V, 125°C,	UL 224	UL E35586
PCB	Dongguan XLPCB Electronic Technology Co., Ltd.	XL02	94V-0/130°C	UL 796	UL E346387
-- Alternative	Shenzhen JJXPCB Electronic Co., Ltd.	XL02	94V-0/130°C	UL 796	UL E353925
-- Alternative	Shenzhen Bangde Circuit Co., Ltd	XL02	94V-0/130°C	UL 796	UL E348757
PCB raw material	Kingboard	FR-4	94V-0/130°C, CTI3	UL746 UL94	UL E123995
Varistor (MOV1)	Brightking Electronics Co., Ltd.	HEL-20D681K	max peak current:10KA max continuous voltage:460Vac 40/85/56	IEC/EN 61051	VDE 40027827
-- Alternative	Brightking Electronics Co., Ltd.	681KD20-P10	max peak current:10KA max continuous voltage:460Vac 40/85/56	IEC/EN 61051	VDE 40027827
Optocoupler (U1, U2, U4, U5 for LV board) (U1, U2, U3, U4, U5, U6, U7, U8 for INV board)	Fairchild semiconductor	FOD3120SD	IF: 25mA; I _o : 3A/35V/100°C cl ≥ 7mm, cr ≥ 7mm	EN 60747-5-5	VDE 40018398

4.3 TABLE: list of critical components					P
object/part No.	manufacturer/ trademark	type/model	technical data	standard	mark(s) of conformity ¹⁾
(U1, U2, U3, U4, U5, U6 for HV board)					
-- Alternative	Toshiba Corporation	TLP350	IFLH: 5mA; I _o : 2A/30V/100°C cl ≥ 7mm, cr ≥ 7mm	EN 60747-5-5	VDE 40009302
-- Alternative	Toshiba Corporation	TLP352	IF: 20mA; I _o : 2A/30V/125°C cl ≥ 7mm, cr ≥ 7mm	EN 60747-5-5	VDE 40009302
Battery electrolytic capacitor (EC1, EC2, EC3, EC4, EC5, EC6, EC7, EC17, EC18, EC19, EC20, EC21, EC23)	NCC	EKZN630E 152MLP1S	1500uF/63V/ 105°C	IEC 62109-1	Tested with appliance
-- Alternative	NICHICON	UHW1J152MH D	1500uF/63V/ 105°C	IEC 62109-1	Tested with appliance
-- Alternative	SAMXON	ESF158M1JK35 RR**P	1500uF/63V/ 105°C	IEC 62109-1	Tested with appliance
-- Alternative	SAMXON	ESK1881JL35R R**P	1500uF/63V/105 °C	IEC 62109-1	Tested with appliance
Bus electrolytic capacitor (C42, C43, C44, C45, C46, C61, C62, C63, C64, C65 for INV board) (C7,C8,C15,C16 for HV board)	NCC	EKMS3B1VSN1 02MA45S	1000uF/315V/ 105°C	IEC 62109-1	Tested with appliance
-- Alternative	NICHICON	LGX2F102MEL EZS	1000uF/315V/ 105°C	IEC 62109-1	Tested with appliance
-- Alternative	NICHICON	LGG2F102MEL EZS	1000uF/315V/ 105°C	IEC 62109-1	Tested with appliance

4.3		TABLE: list of critical components				P
object/part No.	manufacturer/ trademark	type/model	technical data	standard	mark(s) of conformity ¹⁾	
			105°C			
-- Alternative	SAMXON	EET108V2FQ45 SZ**P2	1000uF/315V/ 105°C	IEC 62109-1	Tested with appliance	
PV input electrolytic capacitor (C6, C13, C20, C27)	NCC	EKMS3B1VSN3 91MQ35S	390uF/315V/ 105°C	IEC 62109-1	Tested with appliance	
-- Alternative	NICHICON	LGX2F391MEL GZS	390uF/315V/ 105°C	IEC 62109-1	Tested with appliance	
-- Alternative	SAMXON	EET397M2FO3 5SZ**P	390uF/315V/ 105°C	IEC 62109-1	Tested with appliance	
-- Alternative	NICHICON	LGX2V391MEL ENH	390uF/350V/105 °C	IEC 62109-1	Tested with appliance	
Y2 capacitor (C365 for control board) (C2,C18 for LV board) (C1,C2,C12,C16 ,C23,C18,C29,C 30,C120,C140, C127,C144,C48 ,C59 for INV board) (C3, C8 for AC power supply board)	Xiamen Faratronic Co., Ltd.	C43Q1472K40C 000	0.0047uF/300V	IEC 60384-14	ENEC SE/0366-2C	
-- Alternative	Hua Jung Components Co., Ltd.	Y2X1472K0300 AB110*	0.0047uF/300V	IEC 60384-14	ENEC SE/0252-3B	
-- Alternative	Kemet	R413F 1470-- M1	0.0047uF/1000V DC	IEC 60384-14	ENEC V4160	
-- Alternative	Shantou High- new Zone Songtian Enterprise Co., Ltd	CEY211Y5V3E4 72M	0.0047uF/250V AC	IEC 60384-14	VDE 40025748	
Y2 capacitor (C124, C134 for INV board) (C5, C17 for HV	Xiamen Faratronic Co., Ltd.	C43Q1333K6S C000	0.033uF/300V	IEC 60384-14	ENEC SE/0366-2C	

4.3 TABLE: list of critical components					P
object/part No.	manufacturer/ trademark	type/model	technical data	standard	mark(s) of conformity ¹⁾
board)					
--Alternative	Hua Jung Components Co., Ltd.	Y2X1333K0300 AB115*	0.033uF/300V	IEC 60384-14	ENEC SE/0252-3B
Capacitor(C129)	Xiamen Faratronic Co., Ltd.	C6AQ1475KBW 0550	4.7uF/300V	IEC 62109-1	Tested with appliance
--Alternative	Xiamen Faratronic Co., Ltd.	C42P2475KBS	4.7uF/275VAC	IEC 62109-1	Tested with appliance
--Alternative	Kemet	R46 KR 44700--P0	4.7uF/275VAC	IEC 62109-1	Tested with appliance
X2 capacitor (C142, C143,C149)	Xiamen Faratronic Co., Ltd.	C42Q2225KBS C000	2.2uF/305Vac	IEC 60384-14	VDE 40000358
--Alternative	Hua Jung Components Co., Ltd.	MKP-225K0305AB12 74-PV	2.2uF/305Vac	IEC 60384-14	ENEC SE/0252-5B
--Alternative	Hua Jung Components Co., Ltd.	MKP-225K0275AB12 74-PV	2.2uF/275Vac	IEC 60384-14	ENEC SE/0252-4B
X2 capacitor (C117, C135)	Xiamen Faratronic Co., Ltd.	C42Q2105K9S C000	1uF/305Vac	IEC 60384-14	VDE 40000358
--Alternative	Kemet	R46KN4100--N1K	1uF/275Vac	IEC 60384-14	ENEC V4413
--Alternative	Kemet	R46 KN 4100--P0	1uF/275Vac	IEC 60384-14	ENEC V4413
--Alternative	Hua Jung Components Co., Ltd.	MKP-105K0305AB12 2B	1uF/305Vac	IEC 60384-14	ENEC SE/0252-5B
Y2 capacitor(C48, C49, C57, C60)	Xiamen Faratronic Co., Ltd.	C43Q1103K40C 000	0.01uF/300Vac	IEC 60384-14	VDE:SE/0366-2C
--Alternative	Hua Jung Components Co., Ltd.	Y2X1103K0300 AB1104	0.01uF/300Vac	IEC 60384-14	ENEC:SE/0252-3
MOSFET (Q1, Q2, Q3, Q4, Q6, Q7, Q8, Q9)	IR	IRFP4110PbF	120A/100V	IEC 62109-1	Tested with appliance
--Alternative	IR	IRFP4568PB	171A/150V	IEC 62109-1	Tested with appliance

4.3 TABLE: list of critical components					P
object/part No.	manufacturer/ trademark	type/model	technical data	standard	mark(s) of conformity ¹⁾
IGBT (Q1, Q4, Q9, Q10, Q14, Q15, Q21, Q22 for INV board) (Q1, Q2, Q3, Q4, Q5, Q6 for HV board)	Fairchild semiconductor	FGH60N60SMD	60A/650V/150°C	IEC 62109-1	Tested with appliance
--Alternative	Fairchild semiconductor	FGH75T65UPD	75A/650V/150°C	IEC 62109-1	Tested with appliance
--Alternative	Infineon semiconductor	IKW75N60T	75A/600V/150°C	IEC 62109-1	Tested with appliance
--Alternative	Fairchild semiconductor	FGH60T65SHD	60A/650V/150°C	IEC 62109-1	Tested with appliance
--Alternative	ST	STGWA60H65 DFB	60A/650V/150°C	IEC 62109-1	Tested with appliance
Diode (D2, D7, D15, D16)	IXYS	DSEI60-06A	60A/600V/150°C	IEC 62109-1	Tested with appliance
--Alternative	Fairchild semiconductor	FFH60UP60S	60A/600V/150°C	IEC 62109-1	Tested with appliance
--Alternative	APT	APT60DQ60BG	60A/600V/150°C	IEC 62109-1	Tested with appliance
AC current sensor (HCT3 for INV board) (HCT1 for HV board)	LEM	LAH 25-NP	25A/25mA,- 25°C ~ 85°C	IEC 62109-1	Tested with appliance
--Alternative	VACUUMSCHM ELZE	T60404-N4646- X400	25A/25mA,- 25°C ~ 85°C	IEC 62109-1	Tested with appliance
AC current sensor (HCT4 for INV board)	LEM	HXN30-P	30A/4V,-25°C ~ 85°C	IEC 62109-1	Tested with appliance
--Alternative	TAMURA	L18P030D15	30A/4V,-25°C ~ 85°C	IEC 62109-1	Tested with appliance
PV current sensor (HCT1, HCT2)	TAMURA	L18P015D15	15A/4V,-25°C ~ 85°C	IEC 62109-1	Tested with appliance
--Alternative	LEM	HXN15-P	15A/4V,-25°C ~ 85°C	IEC 62109-1	Tested with appliance
AC output relay (RY3, RY4, RY5, RY6, RY8,	Panasonic electric works Co. Ltd	ALFG2PF12	250V AC,31A coil voltage:12Vdc	IEC 61810-1	VDE 40023067

4.3 TABLE: list of critical components					P
object/part No.	manufacturer/ trademark	type/model	technical data	standard	mark(s) of conformity ¹⁾
RY10)					
--Alternative	Xiaomen Hongfa Electroacoustic Co., Ltd.	HF161F-W/12- HT	250V AC,31A,coil voltage:12Vdc	IEC 61810-1	VDE 40031410
--Alternative	Fujitsu	FTR- K3AB012W-PS	250V AC,32A,12Vdc	IEC 61810-1	VDE 40011330
--Alternative	Song chuan Precision CO., Ltd.	832A-1C-F-C	250V AC,30A,coil voltage:12Vdc	IEC 61810-1	VDE 006615
ISO monitor relay (RY1)	Song chuan Precision Co., Ltd.	507-2CH-F-C	240Vac 12A coil voltage:12Vdc	IEC 61810-1	VDE 40006746
DSP (U3)	Texas instruments	TMS320F28069 PZT	90MHZ -40°C- 105°C	IEC 62109-1	Tested with appliance
ARM (U22)	ST	STM32F105VB T6	72MHZ -40°C- 85°C	IEC 62109-1	Tested with appliance
ARM (U57)	ST	STM32F103C8 T6	72MHZ -40°C- 85°C	IEC 62109-1	Tested with appliance
AC Power supply transformer (TX1)	Shenzhen Ferrocoil Electronics Technology Co., Ltd.	240-00217-00	EER28 26:4:42:27	IEC 62109-1	Tested with appliance
--Alternative	Shenzhen Click Technology Co., Ltd.	240-00217-00	EER28 26:4:42:27	IEC 62109-1	Tested with appliance
--Alternative	Shenzhen Yamaxi Electronics Co., Ltd.	240-00217-00	EER28 26:4:42:27	IEC 62109-1	Tested with appliance
--Alternative	Foshan Ouli Electronic Co., Ltd.	240-00217-00	EER28 26:4:42:27	IEC 62109-1	Tested with appliance
1) an asterisk indicates a mark which assures the agreed level of surveillance					

4.6, 1.62/RD	TABLE: electrical data (in normal conditions) (PV –Grid connection)									P
Type	PV			Battery			AC Grid			
	U(V)	I(A)	P(kW)	U(V)	I(A)	P(kW)	U(V)	I(A)	P(kW)	
PH10-3648A	149	22,40	3,33	--	--	--	207,0	15,63	3,21	
	149	22,75	3,39	--	--	--	229,9	13,66	3,11	
	149	22,59	3,36	--	--	--	252,8	12,37	3,10	
	169	21,58	3,65	--	--	--	207,2	16,58	3,42	
	169	22,45	3,79	--	--	--	231,0	15,68	3,60	
	171	22,49	3,84	--	--	--	252,9	14,41	3,63	
	360	10,07	3,61	--	--	--	207,1	16,71	3,45	
	360	10,60	3,80	--	--	--	230,1	15,90	3,65	
	360	10,55	3,78	--	--	--	253,1	14,44	3,64	
	550	6,44	3,53	--	--	--	207,1	16,49	3,39	
	550	6,81	3,73	--	--	--	230,0	15,76	3,60	
	550	6,78	3,72	--	--	--	252,9	14,30	3,59	
	589	0,83	0,49	--	--	--	207,0	2,42	0,46	
	589	0,85	0,50	--	--	--	229,9	2,29	0,47	
	589	0,86	0,51	--	--	--	252,9	2,17	0,48	
PH10-4248A	150	21,92	3,29	--	--	--	207,9	15,35	3,17	
	150	21,88	3,28	--	--	--	230,7	13,45	3,08	
	149	21,51	3,21	--	--	--	253,6	12,28	3,08	
	201	21,47	4,32	--	--	--	206,9	19,11	4,00	
	201	21,59	4,34	--	--	--	231,7	18,02	4,19	
	201	21,38	4,30	--	--	--	252,6	16,51	4,17	
	360	11,52	4,13	--	--	--	207,2	19,06	3,93	
	360	12,43	4,46	--	--	--	229,9	18,66	4,26	
	360	12,48	4,47	--	--	--	252,5	17,06	4,29	
	549	7,45	4,08	--	--	--	207,2	18,88	3,89	
	549	8,01	4,38	--	--	--	229,6	18,60	4,21	
	549	8,09	4,42	--	--	--	252,7	16,93	4,26	
	588	1,20	0,71	--	--	--	206,9	3,39	0,66	
	588	1,20	0,71	--	--	--	229,8	3,28	0,66	
	588	1,20	0,71	--	--	--	253,0	2,70	0,66	
PH10-4648A	149	22,44	3,35	--	--	--	207,8	15,61	3,22	

	149	22,01	3,28	--	--	--	230,8	13,83	3,17
	149	21,55	3,22	--	--	--	252,6	12,45	3,11
	220	21,09	4,64	--	--	--	207,3	21,21	4,38
	220	22,17	4,87	--	--	--	230,3	20,18	4,62
	220	22,10	4,86	--	--	--	253,1	18,39	4,62
	360	12,82	4,59	--	--	--	207,3	21,20	4,38
	359	13,57	4,86	--	--	--	230,0	20,29	4,65
	359	13,55	4,86	--	--	--	254,0	18,42	4,66
	550	8,15	4,46	--	--	--	207,3	20,78	4,28
	550	8,63	4,72	--	--	--	230,2	19,86	4,54
	550	8,56	4,69	--	--	--	253,1	18,01	4,53
	589	1,07	0,63	--	--	--	207,0	3,00	0,60
	589	1,08	0,64	--	--	--	230,0	2,76	0,61
	588	1,09	0,64	--	--	--	251,9	2,59	0,61
PH10-5048A	151	22,35	3,37	--	--	--	207,9	15,56	3,21
	151	21,82	3,30	--	--	--	230,6	13,71	3,14
	151	20,91	3,16	--	--	--	253,1	11,92	2,99
	239	21,04	5,04	--	--	--	207,4	22,98	4,75
	239	21,62	5,17	--	--	--	230,3	21,53	4,94
	239	21,62	5,18	--	--	--	253,1	19,66	4,96
	360	14,03	5,03	--	--	--	207,1	23,22	4,79
	359	14,61	5,24	--	--	--	230,1	21,85	5,01
	360	14,60	5,24	--	--	--	253,1	19,94	5,03
	550	9,09	4,98	--	--	--	207,5	23,13	4,76
	550	9,55	5,23	--	--	--	230,3	21,98	5,02
	550	9,48	5,19	--	--	--	253,2	19,91	5,00
	589	1,08	0,64	--	--	--	207,0	3,13	0,61
	589	1,09	0,64	--	--	--	229,8	2,90	0,61
	589	1,10	0,65	--	--	--	252,8	2,73	0,62
Supplementary information:									

Type	PV						Battery			AC Grid		
	U(V)	I(A)	P(kW)	U(V)	I(A)	P(kW)	U(V)	I(A)	P(kW)			
PH10-3648A	150	18,05	2,71	48,29	51,04	2,46	--	--	--			
	170	15,70	2,66	48,28	50,45	2,43	--	--	--			
	360	7,35	2,64	48,31	50,87	2,45	--	--	--			
	550	4,88	2,68	48,33	51,23	2,47	--	--	--			
	589	4,53	2,67	48,26	50,50	2,43	--	--	--			
PH10-4248A	150	17,90	2,68	48,33	50,43	2,43	--	--	--			
	220	11,97	2,64	48,32	49,98	2,41	--	--	--			
	360	7,45	2,68	48,31	51,11	2,47	--	--	--			
	550	4,95	2,72	48,34	51,39	2,48	--	--	--			
	589	4,60	2,71	48,33	51,69	2,49	--	--	--			
PH10-4648A	150	17,45	2,62	48,25	49,06	2,36	--	--	--			
	220	12,02	2,65	48,28	50,82	2,45	--	--	--			
	360	7,31	2,62	48,33	51,24	2,47	--	--	--			
	550	4,85	2,67	48,30	50,64	2,44	--	--	--			
	589	4,66	2,75	48,33	52,00	2,51	--	--	--			
PH10-5048A	151	17,78	2,69	48,28	51,06	2,46	--	--	--			
	239	10,78	2,58	48,27	51,96	2,50	--	--	--			
	360	7,55	2,71	48,29	51,49	2,48	--	--	--			
	550	4,92	2,71	48,29	51,75	2,50	--	--	--			
	590	4,54	2,68	48,26	51,08	2,46	--	--	--			

Supplementary information:

4.6, 1.62/RD		TABLE: electrical data (in normal conditions) (Battery discharging –Grid connection)								P
Type	PV			Battery			AC Grid			
	U(V)	I(A)	P(kW)	U(V)	I(A)	P(kW)	U(V)	I(A)	P(kW)	
PH10-3648A	--	--	--	46,22	52,73	2,44	207,6	10,60	2,21	
	--	--	--	46,23	52,30	2,42	230,9	9,49	2,19	
	--	--	--	46,32	53,67	2,49	253,3	9,12	2,24	
	--	--	--	48,41	52,93	2,57	207,3	11,30	2,33	
	--	--	--	48,49	52,94	2,57	230,8	10,19	2,34	
	--	--	--	48,37	53,24	2,58	252,9	9,33	2,34	
	--	--	--	57,97	39,54	2,30	207,4	11,01	2,30	
	--	--	--	58,21	38,83	2,27	230,3	9,89	2,29	
	--	--	--	57,98	44,38	2,58	253,3	9,08	2,30	
PH10-4248A	--	--	--	46,45	52,70	2,45	207,2	10,74	2,23	
	--	--	--	46,12	52,34	2,42	230,0	9,55	2,20	
	--	--	--	46,17	52,46	2,43	252,9	8,71	2,20	
	--	--	--	47,72	52,47	2,51	207,5	11,02	2,29	
	--	--	--	47,73	52,27	2,50	229,3	9,93	2,29	
	--	--	--	47,71	52,55	2,51	252,7	9,05	2,29	
	--	--	--	57,90	41,24	2,39	207,4	11,00	2,29	
	--	--	--	57,84	41,18	2,39	230,4	9,93	2,30	
	--	--	--	57,82	39,79	2,31	253,1	9,05	2,29	
PH10-4648A	--	--	--	46,22	52,61	2,44	207,7	10,57	2,20	
	--	--	--	46,49	52,10	2,43	229,5	9,56	2,20	
	--	--	--	46,53	52,47	2,45	253,2	8,81	2,23	
	--	--	--	48,42	53,02	2,57	207,4	11,30	2,33	
	--	--	--	48,49	52,94	2,57	230,8	10,19	2,34	
	--	--	--	48,35	53,26	2,58	253,0	9,35	2,35	
	--	--	--	57,61	40,64	2,34	207,5	11,03	2,30	
	--	--	--	57,86	42,67	2,47	230,2	9,92	2,29	
	--	--	--	58,00	42,24	2,46	253,0	9,04	2,29	
PH10-5048A	--	--	--	46,35	52,07	2,42	206,5	10,59	2,19	
	--	--	--	46,01	52,29	2,41	230,7	9,56	2,20	
	--	--	--	46,23	52,33	2,42	253,1	8,72	2,21	
	--	--	--	47,95	53,37	2,57	207,0	12,39	2,31	
	--	--	--	48,13	52,67	2,54	230,6	11,05	2,29	

	--	--	--	48,06	52,61	2,53	253,6	10,67	2,29
	--	--	--	57,57	39,90	2,30	207,6	11,04	2,31
	--	--	--	58,26	39,05	2,28	230,4	9,98	2,31
	--	--	--	57,69	39,94	2,31	252,9	9,14	2,31

Supplementary information:

4.6, 1.62/ RD	TABLE: electrical data (in normal conditions) (Grid – battery charging)	P
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Type	PV			Battery			AC Grid		
	U(V)	I(A)	P(kW)	U(V)	I(A)	P(kW)	U(V)	I(A)	P(kW)
PH10-3648A	--	--	--	48,34	50,99	2,46	207,3	13,25	2,74
	--	--	--	48,30	50,53	2,44	229,3	11,80	2,69
	--	--	--	48,30	50,16	2,42	253,0	10,44	2,63
PH10-4248A	--	--	--	48,31	50,10	2,42	207,3	13,00	2,68
	--	--	--	48,31	50,37	2,43	229,4	11,73	2,68
	--	--	--	48,32	50,79	2,45	252,4	10,83	2,72
PH10-4648A	--	--	--	48,34	51,15	2,47	207,3	13,26	2,74
	--	--	--	48,30	50,74	2,45	229,4	11,84	2,71
	--	--	--	48,27	50,12	2,42	253,0	10,45	2,63
PH10-5048A	--	--	--	48,33	51,90	2,50	207,1	15,13	2,82
	--	--	--	48,32	51,87	2,50	230,2	13,45	2,79
	--	--	--	48,33	51,54	2,49	253,2	12,41	2,81

Supplementary information:

5.1.2	TABLE: distance through insulation measurements	P
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distance through insulation di at/of:	Up (V)	test voltage (V)	required di (mm)	di (mm)
Plastic cover	580Vd.c. 230Va.c.	4242Vd.c.	0,4	1,5

5.8 and 9	TABLE: clearance and creepage distance measurements						P
clearance cl and creepage distance dcr at / of:	Up (V)	U r.m.s. (V)	required cl (mm)	cl (mm)	required dcr (mm)	dcr (mm)	
PV+ and PE (C3)(BI)	580Vd.c.	230Va.c.	3,0	5,0	3,0	5,0	
PV- and PE (C17)(BI)	580Vd.c.	230Va.c.	3,0	5,0	3,0	5,0	
PV+ and PV- (BI)	580Vd.c.	230Va.c.	3,0	3,5	3,0	3,5	
Boost inductor and PE (BI)	580Vd.c.	230Va.c.	3,0	4,2	3,0	4,2	
INVT inductor and PE (BI)	580Vd.c.	230Va.c.	3,0	4,1	3,0	4,1	
IGBT(Q1) and PE (BI)	580Vd.c.	230Va.c.	3,0	4,0	3,0	4,0	
Diode (D2) and PE (BI)	580Vd.c.	230Va.c.	3,0	4,0	3,0	4,0	
Line and PE (BI)	580Vd.c.	230Va.c.	3,0	6,2	3,0	6,2	
Neutral and PE (BI)	580Vd.c.	230Va.c.	3,0	6,0	3,0	6,0	
Line and Neutral (BI)	580Vd.c.	230Va.c.	3,0	5,0	3,0	5,0	
Contact gap of Relay (RY3,RY4,RY5,RY6) (BI)	580Vd.c.	230Va.c.	1,5	>1,5	1,5	>1,5	
Transformer (TX1) primary winding and secondary winding (RI)	580Vd.c.	230Va.c.	5,5	6,2	6,0	6,2	
Transformer (TX1) core and secondary winding (RI)	580Vd.c.	230Va.c.	5,5	6,5	6,0	6,5	
Optocoupler (U61,U62,U63,U48,U49,U31,U42,U44,U27,U41,U43,U65,U53,U51,U50) (RI)	580Vd.c.	230Va.c.	5,5	6,6	6,0	6,6	
Optocoupler (U56,U54) (RI)	580Vd.c.	230Va.c.	5,5	6,2	6,0	6,2	
*Battery isolated transformer(RI)	580Vd.c.	230Va.c.	5,5 (PD1)	>10	5,5 (PD1)	>10	
Note: Battery isolated transformer potted with epoxy							

5.8, 6, 8.2 and 9	TABLE: electric strength tests, impulse tests and voltage surge tests		P
test voltage applied between:	test voltage (V) a.c. / d.c.	breakdown Yes / No	
PV input to earthed enclosure	2121 Vd.c.	No	
PV input to communication port	4242 Vd.c.	No	
Battery input terminal to PV input	4242 Vd.c.	No	
Battery input terminal to AC output	4242 Vd.c.	No	
AC output to earthed enclosure	2121 Vd.c.	No	
AC output to communication port	4242 Vd.c.	No	
supplementary information			

7.5 & 8.3		TABLE: fault condition tests						P
	ambient temperature (°C)	21,2						--
	model/type of power supply	Chroma / Chroma						--
	manufacturer of power supply	61512 / 62150H-1000S						--
	rated markings of power supply	DC: 0-1000V, 15kW AC: 0-300V, 15kW						--
Component No.	Fault	Test condition		Test time	Fuse No.	Fault condition		Result
		AC	DC			AC	DC	
Charge and discharge board (LV side)								
EC6	S-C	230V 10A	Bat: 56V 44,6A	5 min	--	230V <0,1A	Bat: 56V <0,1A	Hybrid inverter disconnected from grid immediately. the battery was protection, no damage, no hazards.
Q4 D-S	S-C	230V 10A	Bat: 56V 44,6A	5 min	--	230V <0,1A	Bat: 56V <0,1A	Hybrid inverter disconnected from grid immediately, the battery was protection, Q4, Q9, Q7 damage, no hazards.
Q4 G-S	S-C	230V 10A	Bat: 56V 44,6A	5 min	--	230V <0,1A	Bat: 56V <0,1A	Hybrid inverter disconnected from grid immediately, the battery was protection, Q2, Q9, Q7 damage, no hazards.
Q4 D-G	S-C	230V 10A	Bat: 56V 44,6A	5 min	--	230V <0,1A	Bat: 56V <0,1A	Hybrid inverter disconnected from grid immediately, the battery was protection, Q4, Q9, Q7 damage, no hazards.
R1	O-C	230V 10A	Bat: 56V 44,6A	5 min	--	230V 10A	Bat: 56V 44,6A	Normal work ,no error, no damage. no hazards.
R94	O-C	230V 10A	Bat: 56V 44,6A	5 min	--	230V <0,1A	Bat: 56V <0,1A	Hybrid inverter give an error, Error message: "Error 3(No BAT Fault)", no damage, no hazards.
U2 PIN 2-3	S-C	230V 10A	Bat: 56V 44,6A	5 min	--	230V <0,1A	Bat: 56V <0,1A	Hybrid inverter disconnected from grid immediately, U2 damage, no hazards.
C44	S-C	230V 10A	Bat: 56V 44,6A	5 min	--	230V <0,1A	Bat: 56V <0,1A	Hybrid inverter disconnected from grid immediately. Frequent restarts, Q3, Q1 damage, no hazards.
C55	S-C	230V 10A	Bat: 56V 44,6A	5 min	--	230V <0,1A	Bat: 56V <0,1A	Hybrid inverter disconnected from grid immediately. Frequent restarts, no damage, no hazards.
C56	S-C	230V 10A	Bat: 56V 44,6A	5 min	--	230V <0,1A	Bat: 56V <0,1A	Hybrid inverter disconnected from grid immediately. Frequent restarts, D12 damage, no hazards.

C57	S-C	230V 10A	Bat: 56V 44,6A	5 min	--	230V <0,1A	Bat: 56V <0,1A	Hybrid inverter disconnected from grid immediately. Frequent restarts, D13 damage, no hazards.
C60	S-C	230V 10A	Bat: 56V 44,6A	5 min	--	230V <0,1A	Bat: 56V <0,1A	Hybrid inverter disconnected from grid immediately. Frequent restarts, D14 damage, no hazards.
C58	S-C	230V 10A	Bat: 56V 44,6A	5 min	--	230V <0,1A	Bat: 56V <0,1A	Hybrid inverter disconnected from grid immediately. EUT shutdown, no damage, no hazards.
C61	S-C	230V 10A	Bat: 56V 44,6A	5 min	--	230V <0,1A	Bat: 56V <0,1A	Hybrid inverter disconnected from grid immediately, EUT shutdown, no damage, no hazards.
EC8	S-C	230V 10A	Bat: 56V 44,6A	5 min	--	230V <0,1A	Bat: 56V <0,1A	Hybrid inverter disconnected from grid immediately, EUT Frequent restarts, no damage, no hazards.
Power board 1								
C12	S-C	230V 10A	Bat: 56V 44,6A	5 min	--	230V <0,1A	Bat: 56V <0,1A	Hybrid inverter disconnected from grid immediately, the battery was protection, D1 and D2 open circuit, no hazards.
C10	S-C	230V 10A	Bat: 56V 44,6A	5 min	--	230V <0,1A	Bat: 56V <0,1A	Hybrid inverter disconnected from grid immediately and shut down, no damage, no hazards.
U1(R21)	S-C	230V 10A	Bat: 56V 44,6A	5 min	--	230V <0,1A	Bat: 56V <0,1A	Hybrid inverter disconnected from grid immediately and shut down, no damage, no hazards.
U1 PIN 7-6	S-C	230V 10A	Bat: 56V 44,6A	5 min	--	230V <0,1A	Bat: 56V <0,1A	Hybrid inverter disconnected from grid immediately and shut down. D1, D2, Q2, R19, R20, R22 damage, no hazards.
Q2 D-S	S-C	230V 10A	Bat: 56V 44,6A	5 min	--	230V <0,1A	Bat: 56V <0,1A	Hybrid inverter disconnected from grid immediately and shut down. D1, D2, R19, R20, R22 damage, no hazard.
Q2 G-S	S-C	230V 10A	Bat: 56V 44,6A	5 min	--	230V <0,1A	Bat: 56V <0,1A	Hybrid inverter disconnected from grid immediately, the battery was protection, Q4, Q9, Q7 damage, no hazards.
Q2 D-G	S-C	230V 10A	Bat: 56V 44,6A	5 min	--	230V <0,1A	Bat: 56V <0,1A	Hybrid inverter disconnected from grid immediately and shut down. D1, D2, Q2, U2, R19, R20, R22 damage, no hazards.

TX1 PIN 3-5	S-C	230V 10A	Bat: 56V 44,6A	5 min	--	230V <0,1A	Bat: 56V <0,1A	Hybrid inverter disconnected from grid immediately and shut down. Q2 damage, no hazards.
U2 PIN1-2	S-C	230V 10A	Bat: 56V 44,6A	5 min	--	230V 10A	Bat: 56V 44,6A	Normal work ,no error, no damage.no hazards.
U2 PIN3-4	S-C	230V 10A	Bat: 56V 44,6A	5 min	--	230V <0,1A	Bat: 56V <0,1A	Hybrid inverter disconnected from grid immediately, and shut down, no damage ,no hazards.
Power board 2								
U9 PIN 7-8	S-C	230V 22A	360V 14,5A	5 min	--	230V <0,1A	360V <0,1A	Hybrid inverter disconnected from grid immediately and shut down. U9 damage, no hazards.
U9 PIN 7-5(EC31)	S-C	230V 22A	360V 14,5A	5 min	--	230V <0,1A	360V <0,1A	Hybrid inverter disconnected from grid immediately and shut down. No damage, no hazards.
Q39 D-S	S-C	230V 22A	360V 14,5A	5 min	--	230V <0,1A	360V <0,1A	Hybrid inverter disconnected from grid immediately and shut down. R1, R305, R306 damage, no hazards.
Q39 G-S	S-C	230V 22A	360V 14,5A	5 min	--	230V <0,1A	360V <0,1A	Hybrid inverter disconnected from grid immediately and shut down. No damage, no hazards.
Q39 D-G	S-C	230V 22A	360V 14,5A	5 min	--	230V <0,1A	360V <0,1A	Hybrid inverter disconnected from grid immediately and shut down. U9, Q39 damage, no hazards.
TX4 PIN 1-4	S-C	230V 22A	360V 14,5A	5 min	--	230V <0,1A	360V <0,1A	Hybrid inverter disconnected from grid immediately and shut down. Q39 damage, no hazards.
TX4 PIN 2-4	S-C	230V 22A	360V 14,5A	5 min	--	230V <0,1A	360V <0,1A	Hybrid inverter disconnected from grid immediately and shut down. Q39 damage, no hazards.
TX4 PIN 3-4	S-C	230V 22A	360V 14,5A	5 min	--	230V <0,1A	360V <0,1A	Hybrid inverter disconnected from grid immediately and shut down. Q39 damage, no hazard.
TX4 PIN 5-4	S-C	230V 22A	360V 14,5A	5 min	--	230V <0,1A	360V <0,1A	Hybrid inverter disconnected from grid immediately and shut down. Q39 damage, no hazards.
EC33	S-C	230V 22A	360V 14,5A	5 min	--	230V <0,1A	360V <0,1A	Hybrid inverter disconnected from grid immediately and shut down. U10 damage, no hazards.
Power board 3								

REC1 PIN3-4	S-C	230V 22A	360V 14,5A	5 min	--	230V <0,1A	360V <0,1A	Grid breaker operated, hybrid inverter disconnected from grid immediately. REC1, F1 damage, no hazards.
C5	S-C	230V 22A	360V 14,5A	5 min	--	230V 22A	360V 14,5A	Hybrid inverter power derate suddenly, then normal work. REC1, F1 damage, no hazards.
R1	O-C	230V 22A	360V 14,5A	5 min	--	230V 22A	360V 14,5A	Normal work, no damage, no hazards.
Q1 D-S	S-C	230V 22A	360V 14,5A	5 min	--	230V 22A	360V 14,5A	Hybrid inverter power derate transient, and then normal work, REC1, F1 damage no hazards.
Q1 G-S	S-C	230V 22A	360V 14,5A	5 min	--	230V 22A	360V 14,5A	Normal work, no damage no hazards.
Q1 D-G	S-C	230V 22A	360V 14,5A	5 min	--	230V 22A	360V 14,5A	Normal work, REC1, F1, U2, Q1 damage, no hazards.
U2 PIN 7-8	S-C	230V 22A	360V 14,5A	5 min	--	230V 22A	360V 14,5A	Normal work, U2 damage, no hazards.
U2 PIN 7-5(C7)	S-C	230V 22A	360V 14,5A	5 min	--	230V 22A	360V 14,5A	Normal work, No damage, no hazards.
TX1 PIN 8-11	S-C	230V 22A	360V 14,5A	5 min	--	230V <0,1A	360V <0,1A	Hybrid inverter power derate suddenly, then normal work. REC1, F1, Q1 damage, no hazards.
Control board								
DSP1 Vcc	O-C	230V 22A	360V 14,5A	5 min	--	230V <0,1A	360V <0,1A	Hybrid inverter disconnected from grid immediately. No damage, no hazards.
DSP2 Vcc	O-C	230V 22A	360V 14,5A	5 min	--	230V <0,1A	360V <0,1A	Hybrid inverter disconnected from grid immediately. No damage, no hazards.
Communication between DSP1 and DSP2	O-C	230V 22A	360V 14,5A	5 min	--	230V <0,1A	360V <0,1A	Hybrid inverter disconnected from grid immediately. No damage, no hazards.
crystal oscillator	S-C	230V 22A	360V 14,5A	5 min	--	230V <0,1A	360V <0,1A	Hybrid inverter disconnected from grid immediately. No damage, no hazards.
Drive output of DSP1	O-C	230V 22A	360V 14,5A	5 min	--	230V <0,1A	360V <0,1A	Hybrid inverter disconnected from grid immediately. No damage, no hazards.
Drive output of DSP2	O-C	230V 22A	360V 14,5A	5 min	--	230V <0,1A	360V <0,1A	Hybrid inverter disconnected from grid immediately. No damage, no hazards.
Boost/INVT board								
C6	S-C	230V 22A	360V 14,5A	5 min	--	230V <0,1A	360V <0,1A	Hybrid inverter shutdown, no damage, no hazards.
HCT1	O-C	230V 22A	360V 14,5A	5 min	--	230V 16,5A	360V 11A	Hybrid inverter power derate to 3800W. No damage, no hazards.

Q1 G-C	S-C	230V 22A	360V 14,5A	5 min	--	230V <0,1A	360V <0,1A	Hybrid inverter disconnected from grid immediately. R10, R14, U1 damage, no hazards.
Q1 G-E	S-C	230V 22A	360V 14,5A	5 min	--	230V 16,5A	360V 11A	Hybrid inverter power derate to 3800W. No damage, no hazards.
Q1 E-C	S-C	230V 22A	360V 14,5A	5 min	--	230V <0,1A	360V <0,1A	Hybrid inverter shutdown, Q1 damage, no Hazard.
R54	O-C	230V 22A	360V 14,5A	5 min	--	230V 16,5A	360V 11A	Hybrid inverter power derate to 3800W. No damage, no hazards.
R49	O-C	230V 22A	360V 14,5A	5 min	--	230V 22A	360V 14,5A	Normal work, no damage, no hazards.
Q5 D-S	S-C	230V 22A	360V 14,5A	5 min	--	230V 22A	360V 14,5A	Normal work, no damage, no hazards.
U1 Pin 2-3	S-C	230V 22A	360V 14,5A	5 min	--	230V 16,5A	360V 11A	Hybrid inverter power derate to 3800W. No damage, no hazards.
U1 Pin 8-5	S-C	230V 22A	360V 14,5A	5 min	--	230V <0,1A	360V <0,1A	Hybrid inverter disconnected from grid immediately and shutdown. No damage, no hazards.
C42	S-C	230V 22A	360V 14,5A	5 min	--	230V <0,1A	360V <0,1A	Hybrid inverter disconnected from grid immediately. C61, C62, C63, C64, C65 damage, no hazards.
R97	O-C	230V 22A	360V 14,5A	5 min	--	230V 22A	360V 14,5A	Normal work, no damage, no hazards.
Q16 G-D	S-C	230V 22A	360V 14,5A	5 min	--	230V 22A	360V 14,5A	Normal work, no damage, no hazards.
Q16 G-S	S-C	230V 22A	360V 14,5A	5 min	--	230V 22A	360V 14,5A	Normal work, no damage, no hazards.
Q16 S-D	S-C	230V 22A	360V 14,5A	5 min	--	230V 22A	360V 14,5A	Normal work, no damage, no hazards.
Q9 G-E	S-C	230V 22A	360V 14,5A	5 min	--	230V <0,1A	360V <0,1A	Hybrid inverter disconnected from grid immediately. Q9, Q10, Q14, Q15, Q21, Q22 damage, no hazards.
Q9 B-C	S-C	230V 22A	360V 14,5A	5 min	--	230V <0,1A	360V <0,1A	Hybrid inverter disconnected from grid immediately. Q9, Q10, Q14, Q15, Q21, Q22, R95, R100, U8 damage, no hazards.
Q9 C-E	S-C	230V 22A	360V 14,5A	5 min	--	230V <0,1A	360V <0,1A	Hybrid inverter disconnected from grid immediately. Q10, Q14, Q15, Q21, Q22, R95, R100, U6 damage, no hazards.
R150	O-C	230V 22A	360V 14,5A	5 min	--	230V <0,1A	360V <0,1A	Hybrid inverter disconnected from grid immediately. Q1, Q4, Q9, Q10, Q14, Q15, Q21, Q22 damage, no hazards.

U4 PIN 2-3	S-C	230V 22A	360V 14,5A	5 min	--	230V 11A	360V 14,5A	Hybrid inverter power derate to 2500W. No damage, no hazards.
U6 PIN 2-3	S-C	230V 22A	360V 14,5A	5 min	--	230V 11A	360V 14,5A	Hybrid inverter power derate to 2500W. No damage, no hazards.
C104	S-C	230V 22A	360V 14,5A	5 min	--	230V <0,1A	360V <0,1A	Hybrid inverter disconnected from grid immediately and shutdown. No damage, no hazards.
RY3	Short before start	230V <0,1A	360V <0,1A	5 min	--	230V <0,1A	360V <0,1A	Error message: "Error 18" (Relay Fault). Hybrid inverter can not connect with grid. No damage, no hazards.
RY4	Short before start	230V <0,1A	360V <0,1A	5 min	--	230V <0,1A	360V <0,1A	Error message: "Error 18" (Relay Fault). Hybrid inverter can not connect with grid. No damage, no hazards.
RY5	Short before start	230V <0,1A	360V <0,1A	5 min	--	230V <0,1A	360V <0,1A	Error message: "Error 18" (Relay Fault). Hybrid inverter can not connect with grid. No damage, no hazards.
RY6	Short before start	230V <0,1A	360V <0,1A	5 min	--	230V <0,1A	360V <0,1A	Error message: "Error 18" (Relay Fault). Hybrid inverter can not connect with grid. No damage, no hazards.
Q29 G-D	S-C	230V 22A	360V 14,5A	5 min	--	230V <0,1A	360V <0,1A	Hybrid inverter disconnected from grid immediately, reconnection give an error : "Error 18"(Relay Fault). No damage, no hazards.
Q29 G-S	S-C	230V 22A	360V 14,5A	5 min	--	230V <0,1A	360V <0,1A	Hybrid inverter disconnected from grid immediately, reconnection give an error : "Error 18"(Relay Fault). No damage, no hazards.
R215	O-C	230V 22A	360V 14,5A	5 min	--	230V <0,1A	360V <0,1A	Hybrid inverter disconnected from grid immediately, reconnection give an error : "Error 18"(Relay Fault). No damage, no hazards.
R218	S-C	230V 22A	360V 14,5A	5 min	--	230V <0,1A	360V <0,1A	Hybrid inverter disconnected from grid immediately, reconnection give an error : "Error 18"(Relay Fault). No damage, no hazards.
R234	O-C	230V 22A	360V 14,5A	5 min	--	230V 22A	360V 14,5A	Normal work, no damage, no hazards.
RY8 PIN 3-4	S-C	230V 22A	360V 14,5A	5 min	--	230V 22A	360V 14,5A	Normal work, no damage, no hazards.
R240	O-C	230V 22A	360V 14,5A	5 min	--	230V <0,1A	360V <0,1A	Hybrid inverter disconnected from grid immediately, and can't reconnect to grid. No damage, no hazards.
R253	O-C	230V 22A	360V 14,5A	5 min	--	230V 22A	360V 14,5A	Normal work, no damage, no hazards.

R269	O-C	230V 22A	360V 14,5A	5 min	--	230V 22A	360V 14,5A	Normal work, no damage, no hazards.
R187	O-C	230V 22A	360V 14,5A	5 min	--	230V 22A	360V 14,5A	Normal work, no damage, no hazards.
R202	O-C	230V 22A	360V 14,5A	5 min	--	230V 22A	360V 14,5A	Normal work, no damage, no hazards.
GFCI	O-C	230V 22A	360V 14,5A	5 min	--	230V <0,1A	360V <0,1A	Hybrid inverter disconnected from grid immediately and error message: "Error 27(GFCI High)". No damage, no hazards.
GFCI	S-C	230V 22A	360V 14,5A	5 min	--	230V <0,1A	360V <0,1A	Hybrid inverter disconnected from grid immediately and error message: "Error 27(GFCI High)". No damage, no hazards.
Charge and discharge board (HV side)								
Q2 B-E	S-C	230V 10A	Bat: 56V 44,6A	5 min	--	230V 6,5A	Bat: 56V 30A	Hybrid inverter output power away fluctuate, no damage, no hazards.
Q2 B-C	S-C	230V 10A	Bat: 56V 44,6A	5 min	--	230V <0,1A	Bat: 56V <0,1A	Hybrid inverter disconnected from grid immediately, the battery was protection. Q2, Q6 damage, no hazards.
Q2 C-E	S-C	230V 10A	Bat: 56V 44,6A	5 min	--	230V <0,1A	Bat: 56V <0,1A	Hybrid inverter disconnected from grid immediately, the battery was protection. Q2, Q6 damage, no hazards.
R4	O-C	230V 10A	Bat: 56V 44,6A	5 min	--	230V <0,1A	Bat: 56V <0,1A	Hybrid inverter disconnected from grid immediately. No damage, no hazards.
HCT1	S-C	230V 10A	Bat: 56V 44,6A	5 min	--	230V <0,1A	Bat: 56V <0,1A	Hybrid inverter disconnected from grid immediately, the battery was protection. Q4 damage, no hazards.
C7	S-C	230V 10A	Bat: 56V 44,6A	5 min	--	230V 8,7A	Bat: 56V 39A	Hybrid inverter output power away fluctuate, no damage, no hazard.
U3 PIN2-3	S-C	230V 10A	Bat: 56V 44,6A	5 min	--	230V <0,1A	Bat: 56V <0,1A	Hybrid inverter disconnected from grid immediately, and can't connect to Grid, no damage, no hazard.
Q4 B-E	S-C	230V 10A	Bat: 56V 44,6A	5 min	--	230V <0,1A	Bat: 56V <0,1A	Hybrid inverter disconnected from grid immediately and can't connect to Grid. No damage, no hazards.
Q4 B-C	S-C	230V 10A	Bat: 56V 44,6A	5 min	--	230V <0,1A	Bat: 56V <0,1A	Hybrid inverter disconnected from grid immediately, the battery was protection. Q2, Q6, R30, D8, U3 damage, no hazards.
Q4 C-E	S-C	230V 10A	Bat: 56V 44,6A	5 min	--	230V <0,1A	Bat: 56V <0,1A	Hybrid inverter disconnected from grid immediately, the battery was protection. Q2, Q6 damage, no hazards.

C52	S-C	230V 10A	Bat: 56V 44,6A	5 min	--	230V <0,1A	Bat: 56V <0,1A	Hybrid inverter disconnected from grid immediately and shutdown. D12 damage, no hazards.
C54	S-C	230V 10A	Bat: 56V 44,6A	5 min	--	230V <0,1A	Bat: 56V <0,1A	Hybrid inverter disconnected from grid immediately and shutdown. D16 damage, no hazards.
C56	S-C	230V 10A	Bat: 56V 44,6A	5 min	--	230V <0,1A	Bat: 56V <0,1A	Hybrid inverter disconnected from grid immediately and shutdown. D18 damage, no hazards.
C58	S-C	230V 10A	Bat: 56V 44,6A	5 min	--	230V <0,1A	Bat: 56V <0,1A	Hybrid inverter disconnected from grid immediately and shutdown. D20 damage, no hazards.
Whole EUT								
PV+ and PV-	S-C	230V 22A	360V 14,5A	5 min	--	230V <0,1A	360V <0,1A	Hybrid inverter disconnect form grid, no damage, no hazards.
Off grid port	Overload	Load: 230V 11,7A	Bat: 56V 53,5A	7 h	--	Load: 0V 0A	Bat: 56V 0,5A	The off grid port can draw 120% rated power, then the EUT protected. Error message: "Error 4"(Backup Overload Fault), no damage, no hazards.

supplementary information

S-C: short circuit; O-C: open circuit

The errors in the control circuit simulate that the safety is even under one error ensured.

The tests had been performed on the PH10-5048A are valid for the PH10-3648A, PH10-4248A and PH10-4648A since it is same as in hardware and just power derated by software.

7.7#1 TABLE: heating temperature rise measurements (Grid interactive mode from PV)							P
		A*	B	C*	D	—	
	test voltage (V)	Input: 235V Output: 220V	Input: 235V Output: 253V	Input: 550V Output: 220V	Input: 550V Output: 253V		
	t1 (°C)	44,2	44,5	44,2	44,0	—	
	t2 (°C)	45,0	45,6	45,3	45,7	—	
Item	Thermocouple Locations	Max. temperature measured (°C)				Max. temperature limit, (°C)	
		A	B	C	D		
1	Ambient temperature	45,1	46,2	45,4	45,9	--	
2	Enclosure front	52,6	51,3	51,3	51,2	100*	
3	Enclosure side	61,0	57,6	59,2	59,2	100*	
4	Rear heatsink	67,0	63,2	61,2	59,8	100*	
5	Mounting surface	62,6	59,2	57,5	56,8	90	
6	PV connector	50,5	48,6	48,7	48,8	85	
7	BATT connector	48,6	48,0	47,7	50,1	85	
8	AC connector	54,4	52,9	53,6	54,6	85	
9	Ambient of DC switch	65,9	62,8	58,4	57,7	Ref.	
10	MOSFET (Q7)	61,9	58,4	56,7	55,8	150	
11	Optocoupler (U5)	58,6	55,4	54,4	53,8	100	
12	Relay (K2)	64,5	61,6	57,5	56,3	85	
13	Winding of transformer (TX1)(main board)	61,4	58,3	56,7	56,2	110	
14	Winding of isolated transformer	63,8	59,8	58,4	57,3	110	
15	MOSFET (Q6)	63,4	59,3	58,0	56,9	150	
16	Optocoupler (U5)	65,0	61,2	60,1	59,2	100	
17	BUS capacitor (C8)	64,1	60,6	59,6	58,6	105	
18	Winding of boost inductor	98,2	55,2	66,7	64,5	110	
19	PV filter inductor (L1)	86,7	81,8	65,0	64,6	110	

20	PV filter capacitor (C10)	78,0	74,2	64,8	63,9	100
21	Hall (HCT2)	79,0	76,8	69,4	68,6	85
22	IGBT (Q4)	103,6	100,9	64,5	62,8	150
23	Winding of transformer (TX4)(main board)	80,1	78,1	80,6	79,9	110
24	BUS capacitor (C63)	74,1	71,4	66,2	64,6	105
25	IGBT (Q15)	87,3	79,5	80,9	76,3	150
26	AC current sensor (HCT3)	71,5	69,4	67,8	66,6	110
27	AC filter capacitor (C129)	79,9	74,1	78,5	78,6	100
28	AC filter inductor (CT1)	107,2	95,5	106,3	106,0	130
29	Relay (RY3)	81,6	78,8	80,7	82,0	85
30	Relay (RY4)	79,8	75,7	79,4	82,3	85
31	Relay (RY8)	78,4	79,8	79,1	81,1	85
32	Hall (L3)	75,1	69,9	69,9	68,6	85
33	Y-capacitor (C123)	67,0	62,1	64,5	63,4	100
34	Varistor (MOV1)	70,9	65,2	68,3	66,8	85
35	DSP (U3)	85,2	82,5	83,8	84,7	130(as PCB)
36	DSP (U22)	75,3	71,4	73,4	75,5	130(as PCB)
37	Optocoupler (U51)	65,9	62,6	63,7	66,2	100
38	Winding of transformer (TX1)(control board)	72,8	70,7	71,3	71,4	110

Supplementary information:

For condition A and C, when the grid voltage is to low (eg. 207 Va.c.), the output power of inverter will be less than rated power. Because the output a.c. current is limited by software.

So the tests performed under the condition, which the inverter can draw rated power with 220V a.c. voltage.

7.7#2		TABLE: heating temperature rise measurements (Grid interactive mode and charging battery from PV)				P
		E*	F	G*	H	—
	test voltage (V)	Input: 235V Output: 220V	Input: 235V Output: 253V	Input: 550V Output: 220V	Input: 550V Output: 253V	
	t1 (°C)	44,2	42,3	43,5	43,9	—
	t2 (°C)	45,8	46,0	45,2	45,1	—
Item	Thermocouple Locations	Max. temperature measured (°C)				Max. temperature limit, (°C)
		E	F	G	H	
1	Ambient temperature	46,1	46,5	45,4	45,3	--
2	Enclosure front	52,2	53,2	52,9	51,5	100*
3	Enclosure side	56,3	58,1	57,0	55,2	100*
4	Rear heatsink	68,5	70,2	68,6	63,7	100*
5	Mounting surface	64,6	66,6	64,7	60,2	90
6	PV connector	52,6	52,9	53,0	51,3	85
7	BATT connector	53,3	53,5	55,1	52,6	85
8	AC connector	52,6	54,3	53,2	52,1	85
9	Ambient of DC switch	68,2	69,6	66,5	62,8	Ref.
10	MOSFET (Q7)	76,6	77,8	81,5	72,2	150
11	Optocoupler (U5)	91,5	92,1	91,9	88,7	100
12	Relay (K2)	78,4	78,8	77,6	72,6	85
13	Winding of transformer (TX1)(main board)	84,9	86,4	85,7	81,8	110
14	Winding of isolated transformer	79,5	80,5	84,6	75,1	110
15	MOSFET (Q6)	86,5	87,6	94,0	81,6	150
16	Optocoupler (U5)	84,5	85,6	89,3	80,3	100
17	BUS capacitor (C8)	79,9	81,0	88,4	78,1	105
18	Winding of boost inductor	96,5	99,6	70,7	65,9	110
19	PV filter inductor (L1)	85,8	88,1	69,0	65,7	110

20	PV filter capacitor (C10)	77,9	80,4	69,2	65,8	100
21	Hall (HCT2)	72,8	76,7	69,0	66,7	85
22	IGBT (Q4)	101,3	106,0	68,0	63,8	150
23	Winding of transformer (TX4)(main board)	87,5	89,6	91,6	87,2	110
24	BUS capacitor (C63)	70,8	72,6	68,0	63,6	105
25	IGBT (Q15)	74,1	74,6	72,7	68,0	150
26	AC current sensor (HCT3)	62,4	64,2	62,9	60,7	110
27	AC filter capacitor (C129)	64,6	66,4	68,7	67,7	100
28	AC filter inductor (CT1)	76,5	78,9	84,5	83,7	130
29	Relay (RY3)	65,3	76,2	74,4	74,1	85
30	Relay (RY4)	66,1	72,6	71,8	71,4	85
31	Relay (RY8)	70,0	74,5	72,4	73,0	85
32	Hall (L3)	67,6	68,9	68,1	65,4	85
33	Y-capacitor (C123)	60,3	61,1	60,7	58,7	100
34	Varistor (MOV1)	62,4	63,3	63,0	61,0	85
35	DSP (U3)	82,0	83,7	81,6	79,8	130(as PCB)
36	DSP (U22)	69,9	72,1	70,9	69,1	130(as PCB)
37	Optocoupler (U51)	62,6	65,5	63,6	61,3	100
38	Winding of transformer (TX1)(control board)	73,4	75,4	73,3	69,7	110

Supplementary information:

For condition E and G, when the grid voltage is to low (eg. 207 Va.c.), the output power of inverter will be less than rated power. Because the output a.c. current is limited by software.

So the tests performed under the condition, which the inverter can draw rated power with 220V a.c. voltage.

7.7#3 TABLE: heating temperature rise measurements (Battery discharge and grid interactive mode)							P
		I*	J	K*	--	—	
	test voltage (V)	Input: batter y Output: t:220V	Input: batter y Output: t:253V	Input: batter y Output: t:220V	--		
	t1 (°C)	45,2	45,3	58,2	--	—	
	t2 (°C)	48,5	48,4	60,2	--	—	
Item	Thermocouple Locations	Max. temperature measured (°C)				Max. temperatur e limit, (°C)	
		I	J	K	--		
1	Ambient temperature	49,7	49,7	60,5	--	--	
2	Enclosure front	52,6	52,8	65,1	--	100*	
3	Enclosure side	54,5	54,6	67,0	--	100*	
4	Rear heatsink	59,6	60,1	73,4	--	100*	
5	Mounting surface	58,3	58,8	71,9	--	90	
6	PV connector	52,0	52,4	64,8	--	85	
7	BATT connector	54,5	54,8	66,2	--	85	
8	AC connector	53,0	53,1	64,5	--	85	
9	Ambient of DC switch	60,3	60,6	72,5	--	Ref.	
10	MOSFET (Q7)	69,5	70,7	85,5	--	150	
11	Optocoupler (U5)	85,6	86,8	95,0	--	100	
12	Relay (K2)	69,1	69,5	83,2	--	85	
13	Winding of transformer (TX1)(main board)	78,1	78,5	89,4	--	110	
14	Winding of isolated transformer	69,5	70,6	83,8	--	110	
15	MOSFET (Q6)	73,5	74,2	87,1	--	150	
16	Optocoupler (U5)	73,9	74,5	87,0	--	100	
17	BUS capacitor (C8)	70,7	71,5	84,4	--	105	
18	Winding of boost inductor	79,3	80,8	72,3	--	110	

19	PV filter inductor (L1)	59,1	59,2	72,0	--	110
20	PV filter capacitor (C10)	60,3	60,4	73,3	--	100
21	Hall (HCT2)	62,1	61,8	75,3	--	85
22	IGBT (Q4)	59,7	59,6	74,0	--	150
23	Winding of transformer (TX4)(main board)	80,0	80,3	91,8	--	110
24	BUS capacitor (C63)	60,5	60,6	73,5	--	105
25	IGBT (Q15)	63,4	62,9	77,2	--	150
26	AC current sensor (HCT3)	58,8	58,8	70,3	--	110
27	AC filter capacitor (C129)	59,8	60,2	72,1	--	100
28	AC filter inductor (CT1)	66,5	67,4	79,7	--	130
29	Relay (RY3)	70,2	70,9	74,8	--	85
30	Relay (RY4)	66,4	66,4	77,5	--	85
31	Relay (RY8)	74,6	74,2	81,4	--	85
32	Hall (L3)	61,7	61,8	75,0	--	85
33	Y-capacitor (C123)	57,3	57,2	68,0	--	100
34	Varistor (MOV1)	59,2	58,9	71,8	--	85
35	DSP (U3)	78,8	78,9	89,8	--	130(as PCB)
36	DSP (U22)	67,8	67,9	79,2	--	130(as PCB)
37	Optocoupler (U51)	61,1	61,1	72,4	--	100
38	Winding of transformer (TX1)(control board)	68,4	68,5	80,8	--	110

Supplementary information:

For condition I and K, when the grid voltage is too low (eg. 207 V.a.c.), the output power of inverter will be less than rated power. Because the output a.c. current is limited by software.

So the tests performed under the condition, which the inverter can draw rated power with 220V a.c. voltage.

7.7#4 TABLE: heating temperature rise measurements				P
		L*	M*	—
	test voltage (V)	Input:235V Output:220V	Input:235V Output:220V	
	t1 (°C)	58,9	57,8	—
	t2 (°C)	60,2	59,6	—
Item	Thermocouple Locations	Max. temperature measured (°C)		Max. temperature limit, (°C)
		L	M	
1	Ambient temperature	60,4	60,1	--
2	Enclosure front	65,5	64,3	100*
3	Enclosure side	72,6	66,7	100*
4	Rear heatsink	76,5	74,4	100*
5	Mounting surface	72,6	71,3	90
6	PV connector	63,8	64,3	85
7	BATT connector	61,6	64,5	85
8	AC connector	67,2	64,5	85
9	Ambient of DC switch	75,3	73,9	Ref.
10	MOSFET (Q7)	71,5	81,1	150
11	Optocoupler (U5)	68,9	96,9	100
12	Relay (K2)	74,2	83,8	85
13	Winding of transformer (TX1)(main board)	70,6	88,8	110
14	Winding of isolated transformer	72,6	80,1	110
15	MOSFET (Q6)	72,7	89,3	150
16	Optocoupler (U5)	74,4	87,1	100
17	BUS capacitor (C8)	73,2	80,4	105
18	Winding of boost inductor	97,7	86,2	110
19	PV filter inductor (L1)	94,7	86,8	110
20	PV filter capacitor (C10)	84,9	79,7	100
21	Hall (HCT2)	83,1	78,6	85

22	IGBT (Q4)	115,6	108,0	150
23	Winding of transformer (TX4)(main board)	89,1	90,5	110
24	BUS capacitor (C63)	80,2	73,2	105
25	IGBT (Q15)	97,5	81,1	150
26	AC current sensor (HCT3)	78,9	69,3	110
27	AC filter capacitor (C129)	79,5	71,9	100
28	AC filter inductor (CT1)	111,6	80,5	130
29	Relay (RY3)	84,0	76,0	85
30	Relay (RY4)	84,4	77,9	85
31	Relay (RY8)	84,1	81,7	85
32	Hall (L3)	84,6	75,3	85
33	Y-capacitor (C123)	76,7	76,4	100
34	Varistor (MOV1)	82,3	72,2	85
35	DSP (U3)	94,4	90,0	130(as PCB)
36	DSP (U22)	84,0	78,9	130(as PCB)
37	Optocoupler (U51)	76,5	72,0	100
38	Winding of transformer (TX1)(control board)	83,0	80,0	110

Supplementary information:

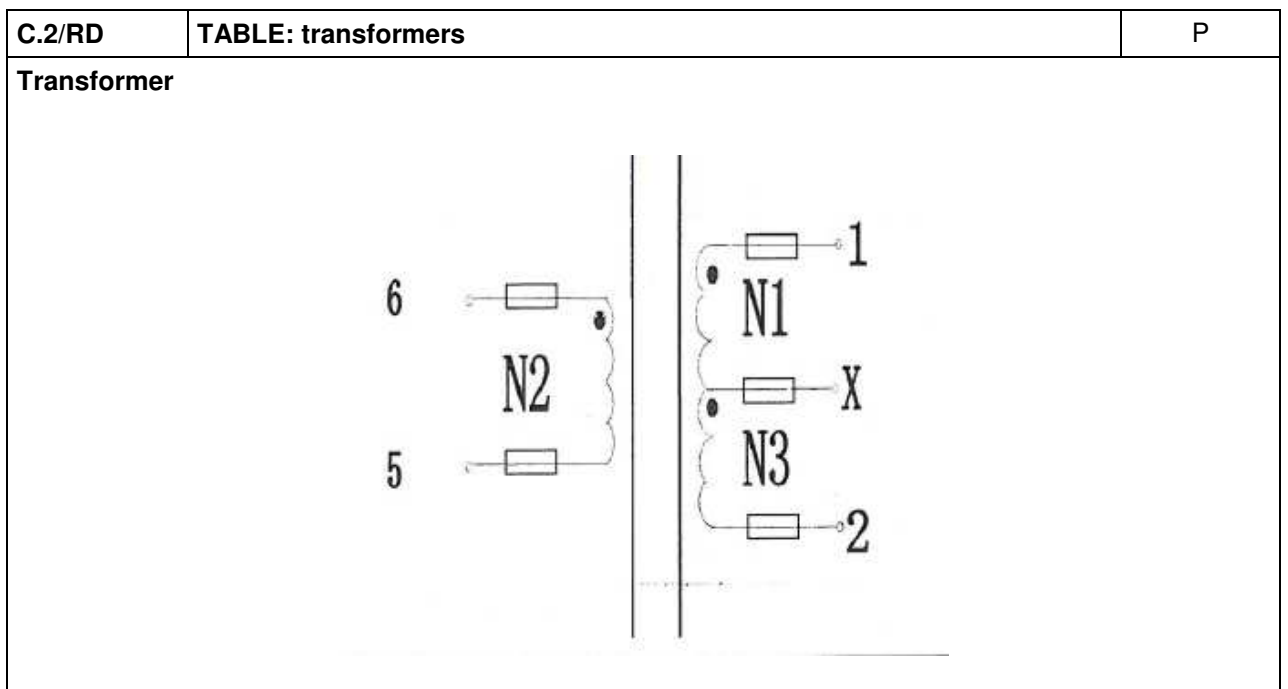
For condition L and M, when the grid voltage is too low (eg. 207 V a.c.), the output power of inverter will be less than rated power. Because the output a.c. current is limited by software.

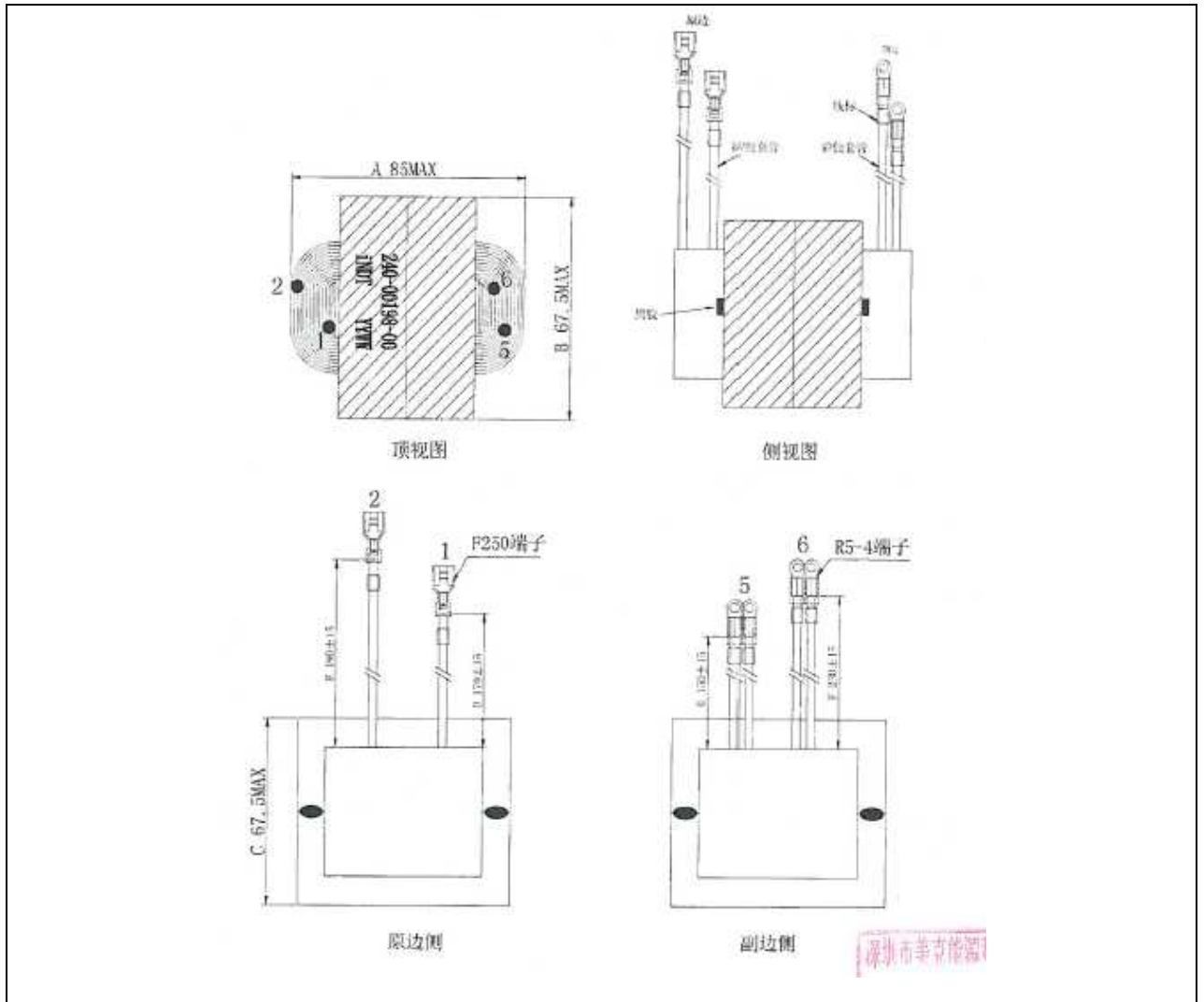
So the tests performed under the condition, which the inverter can draw rated power with 220V a.c. voltage.

Condition L, Grid interactive mode from PV

Condition M, Grid interactive mode and charging battery from PV

C.2/RD		TABLE: transformers					P
Transformer part name: 240-00198-00							
Manufacturer: Huizhou Inductance Electronic Technology Co., Ltd.							
Type: Basic insulation							
Location	Working voltage peak / V	Working voltage rms / V	Required clearance / mm	Measured clearance / mm	Required creepage / mm	Measured creepage dist./ mm	
Primary winding to secondary winding (BI)	340V	230Va.c.	2,0	3,5	2,4	3,5	
Core and Secondary winding (BI)	340V	230Va.c.	2,0	6,0	2,4	6,0	
Supplementary information:							

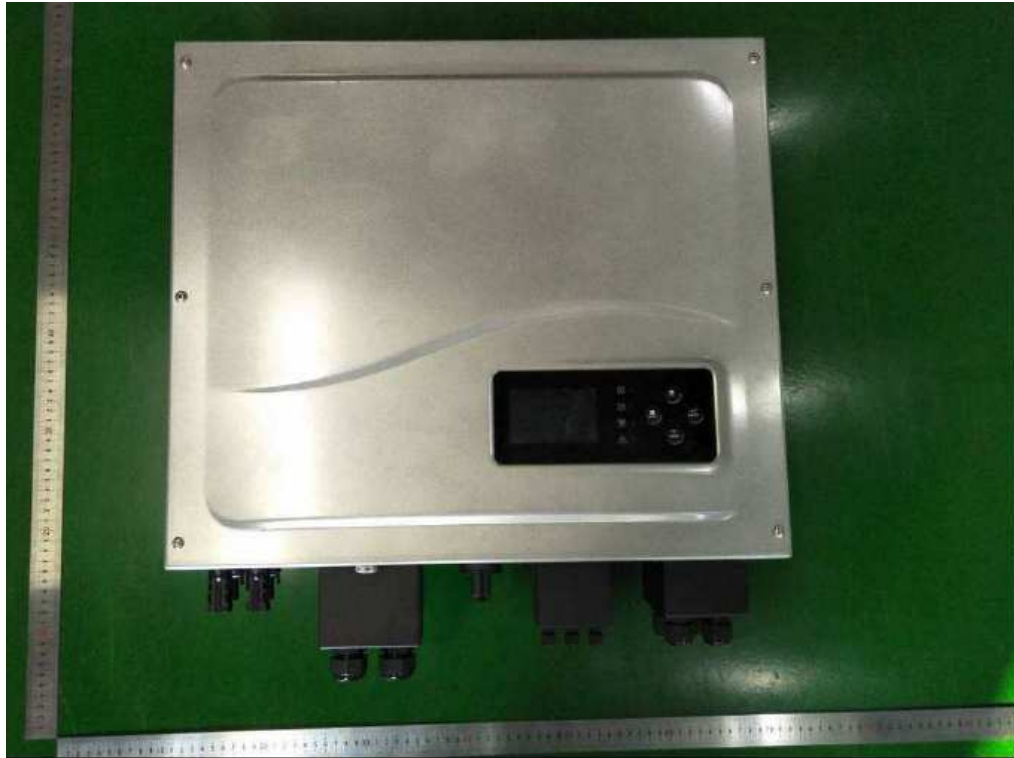




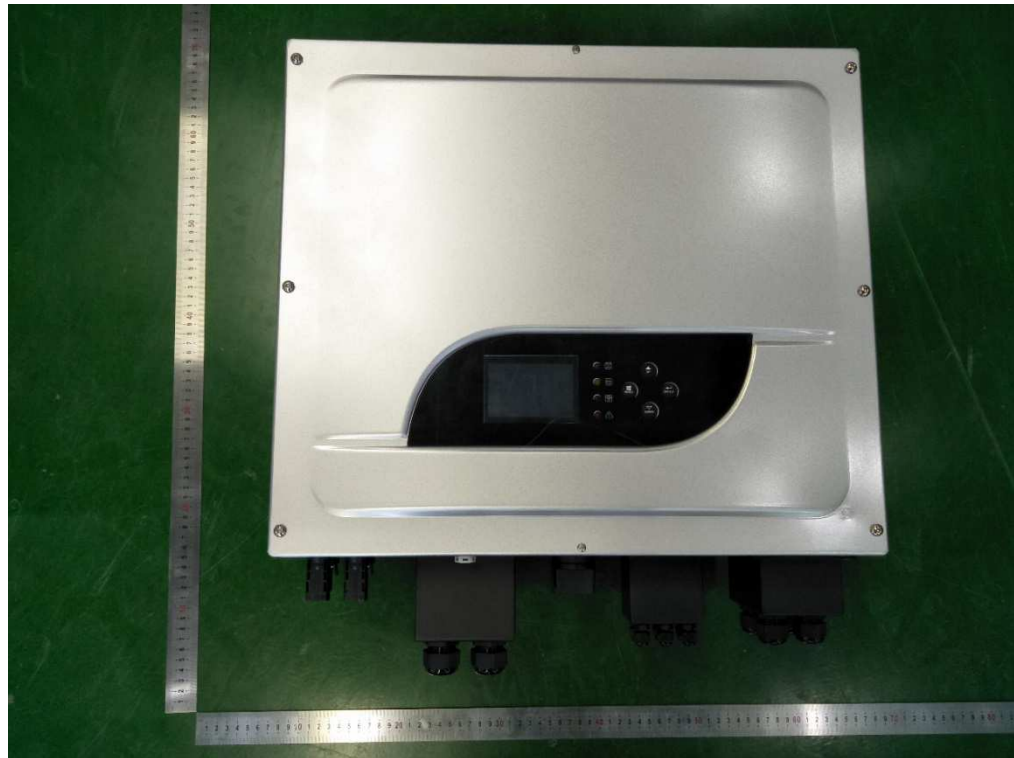
Annex 1

Pictures of the unit

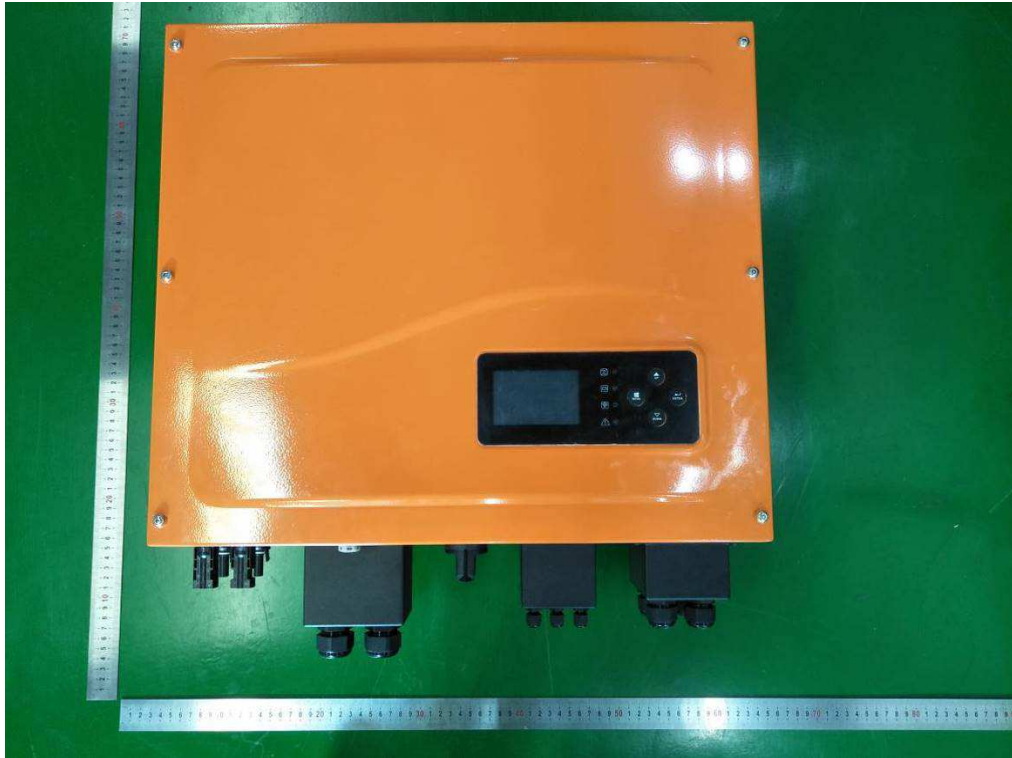
Front view (silvery top case)-1



Front view (silvery top case)-2



Front view (orange top case)



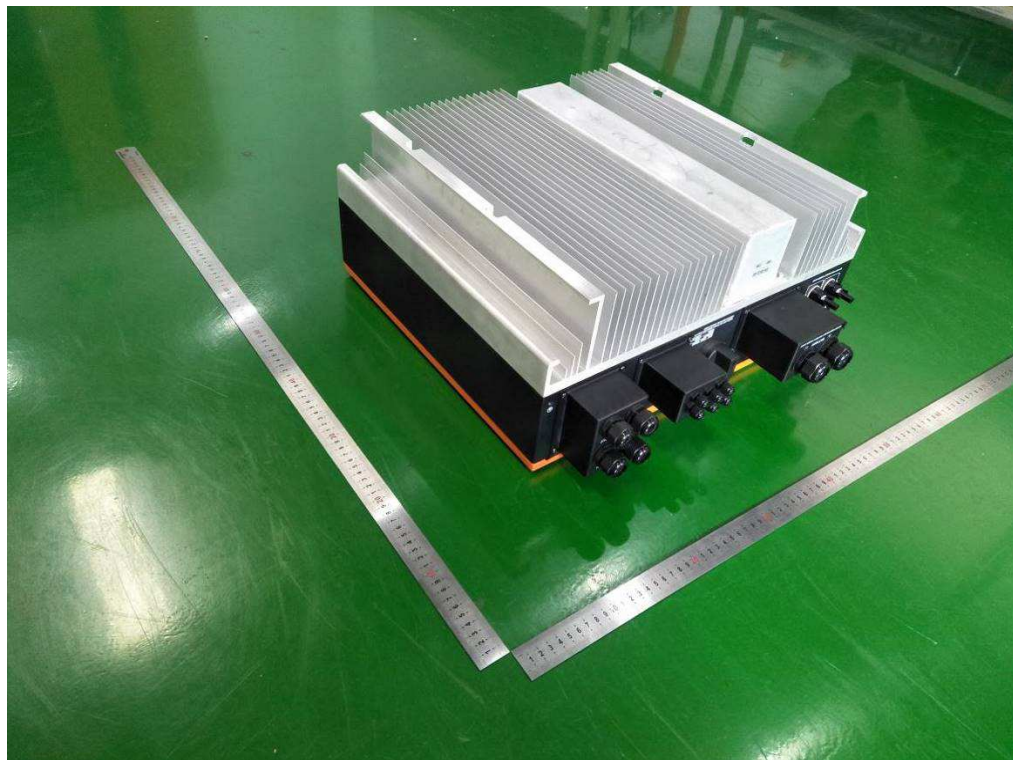
Side view



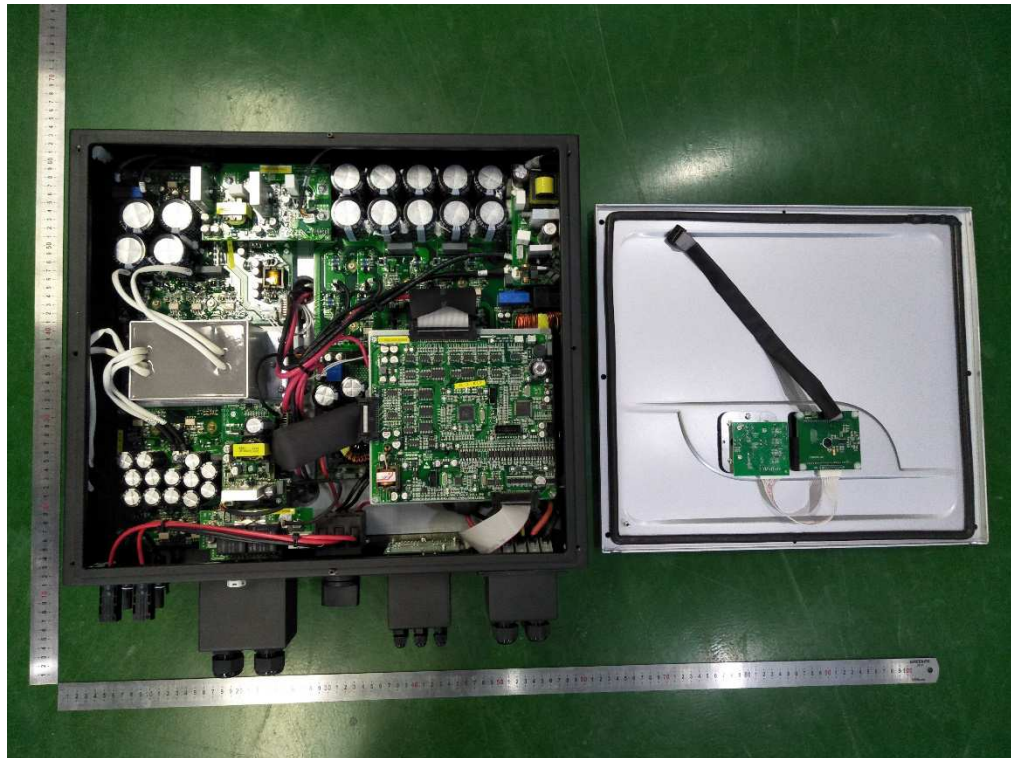
Bottom view



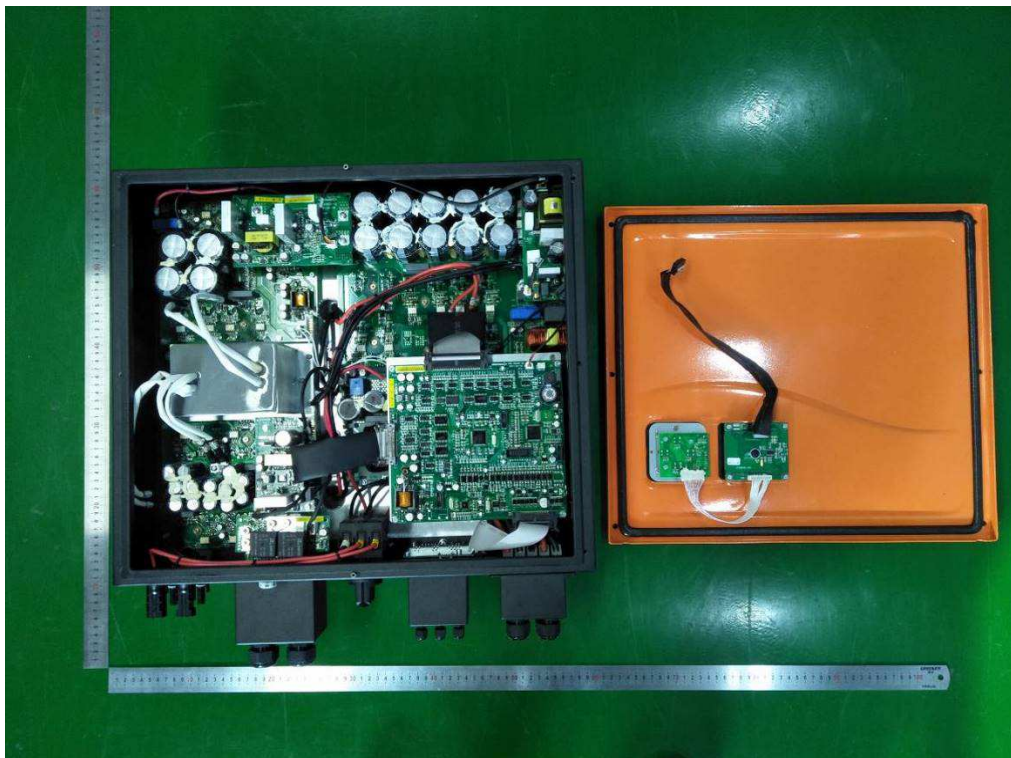
Rear view



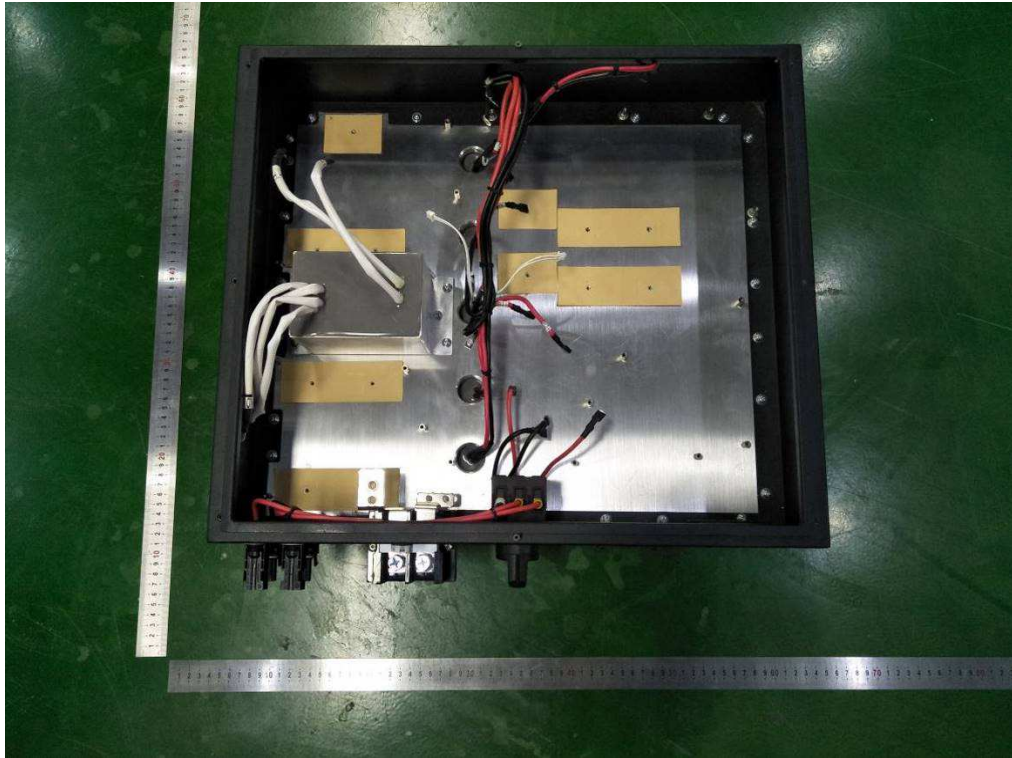
Internal view – 1



Internal view – 2



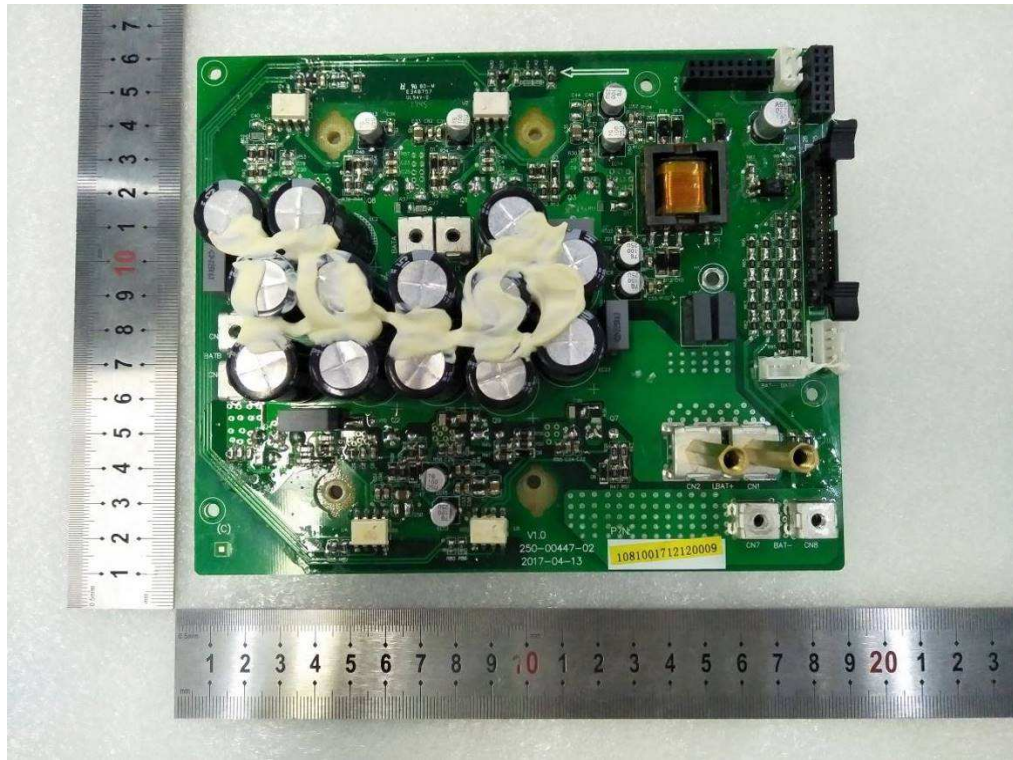
Internal view – 3



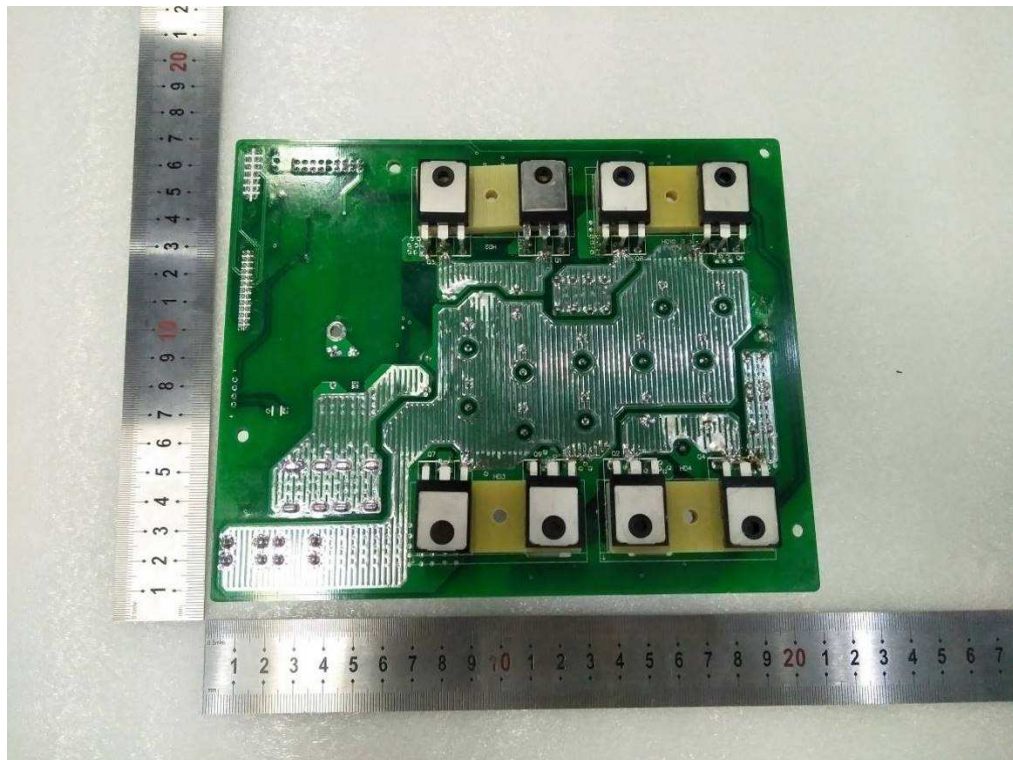
Earthing terminal view



Charge and discharge LV board component side view



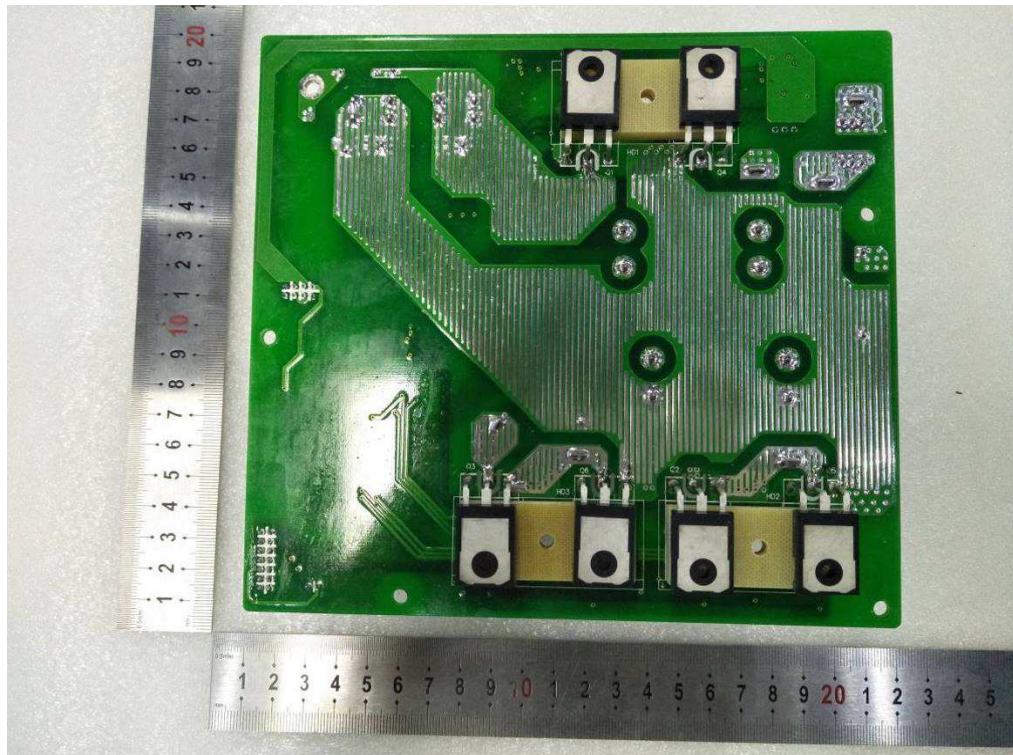
Charge and discharge LV board solder side view



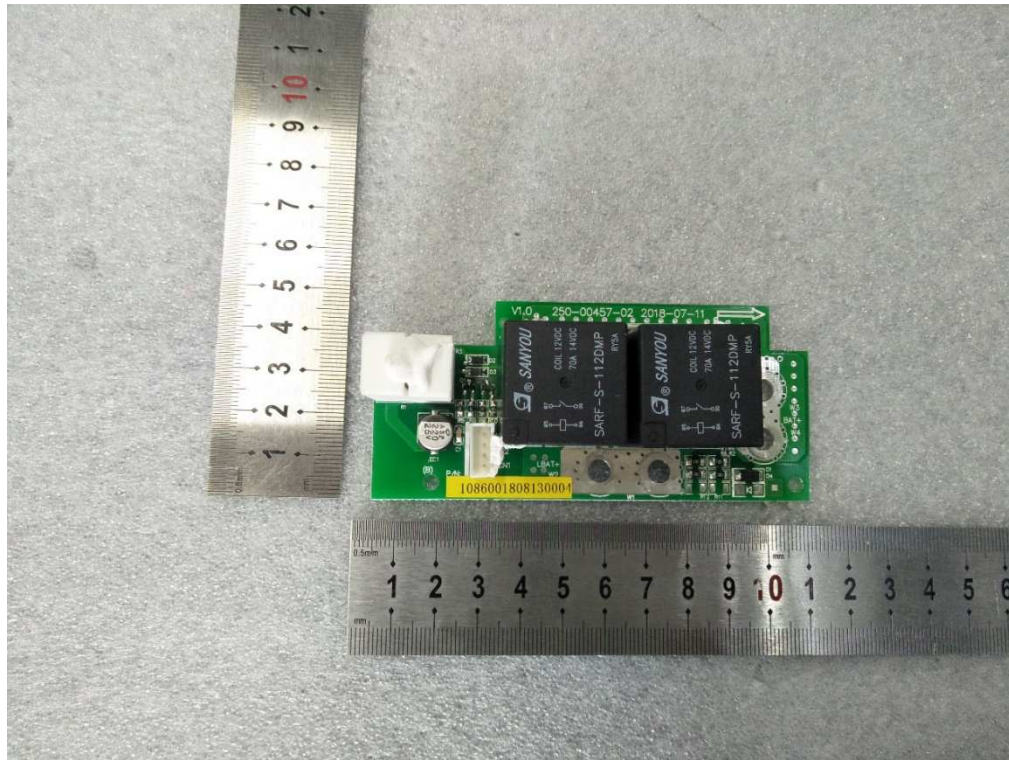
Charge and discharge HV board component side view



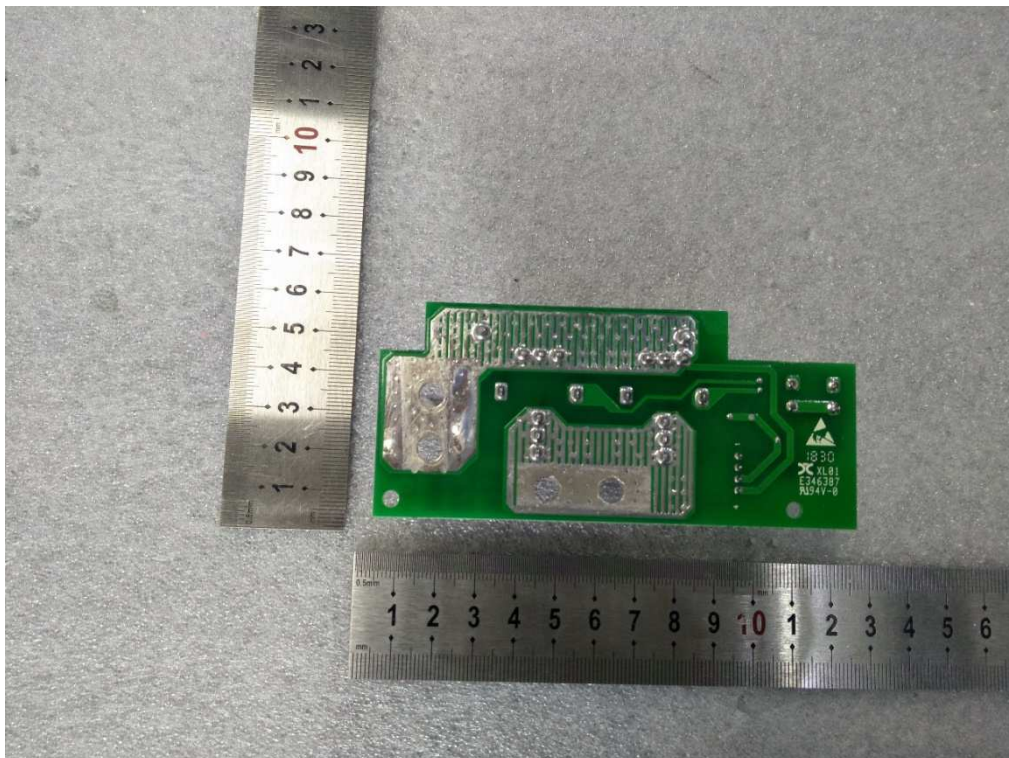
Charge and discharge HV board solder side view



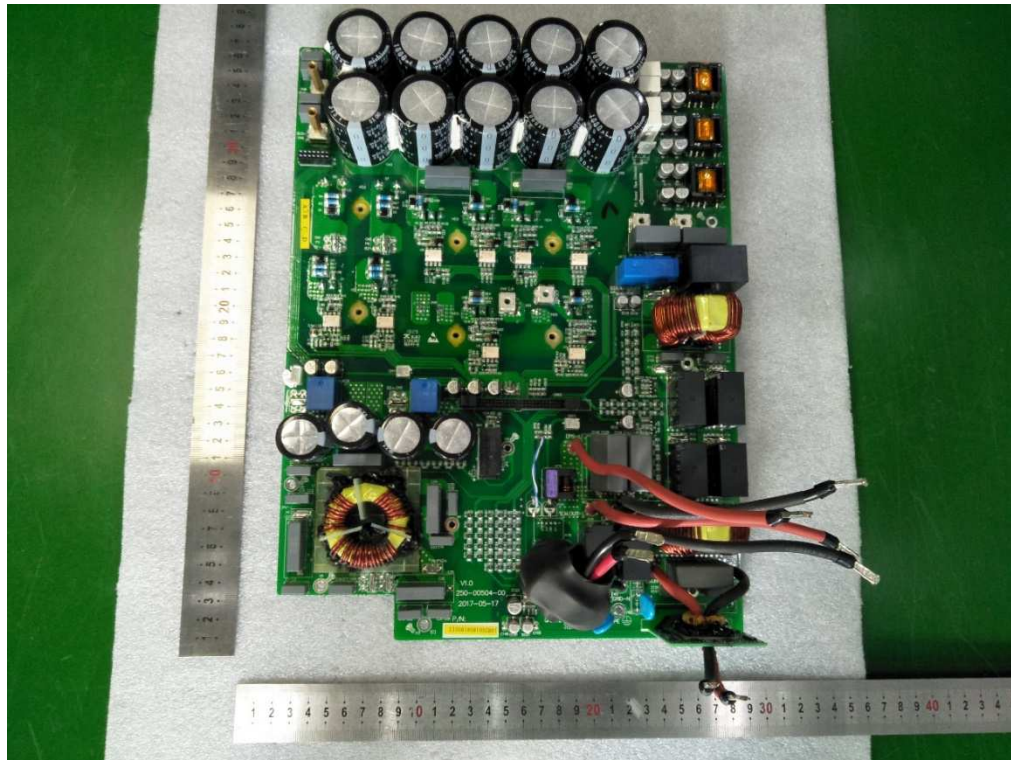
Reverse protection board component side view



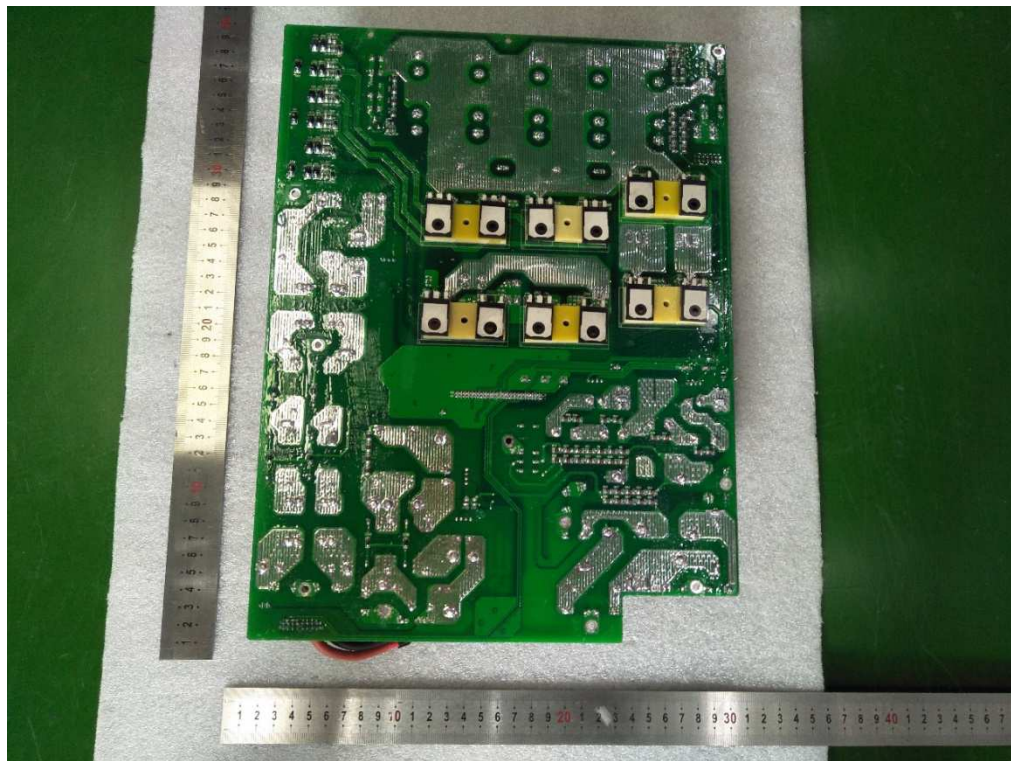
Reverse protection board solder side view



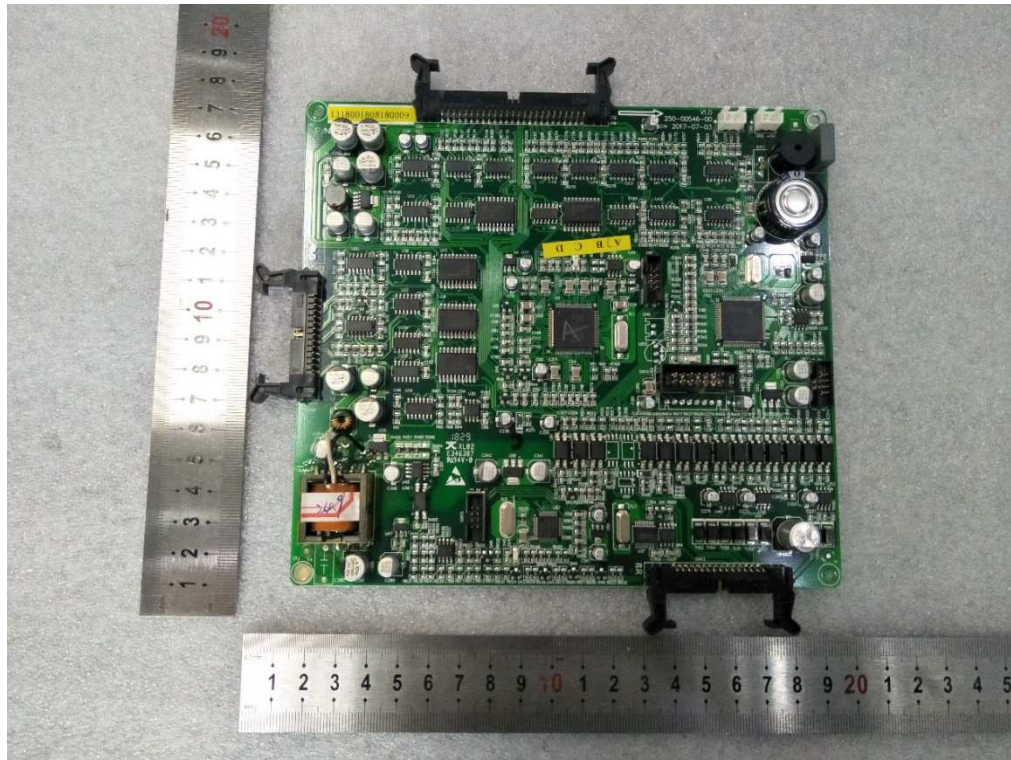
INVT board component side view



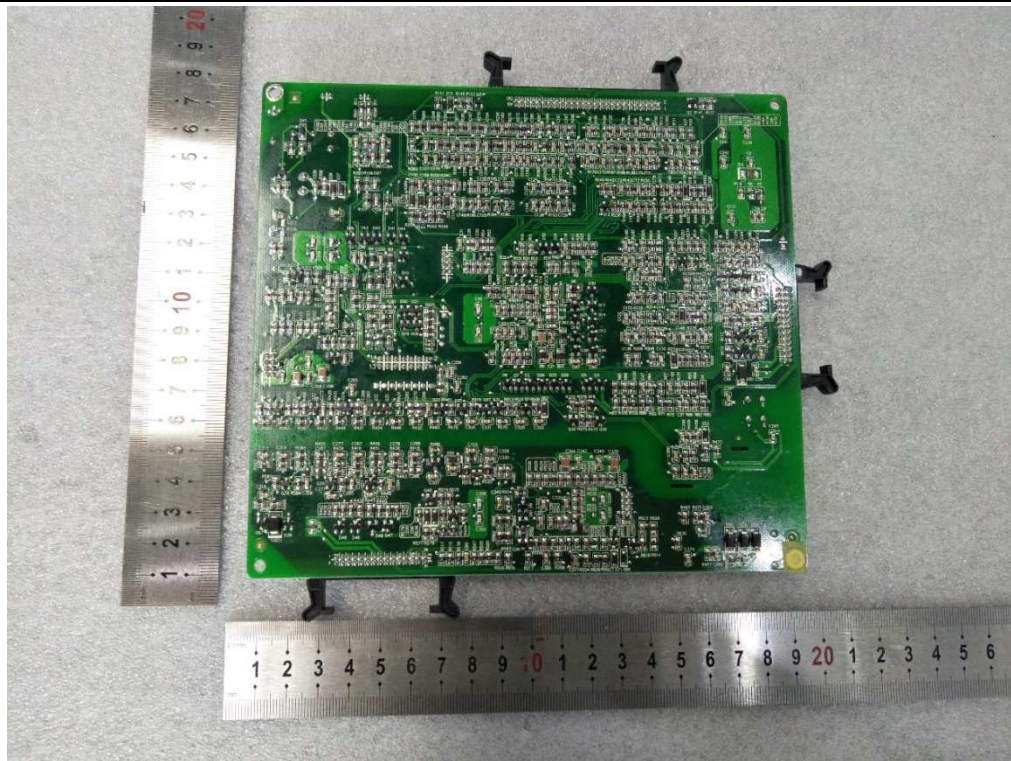
INVT board solder side view



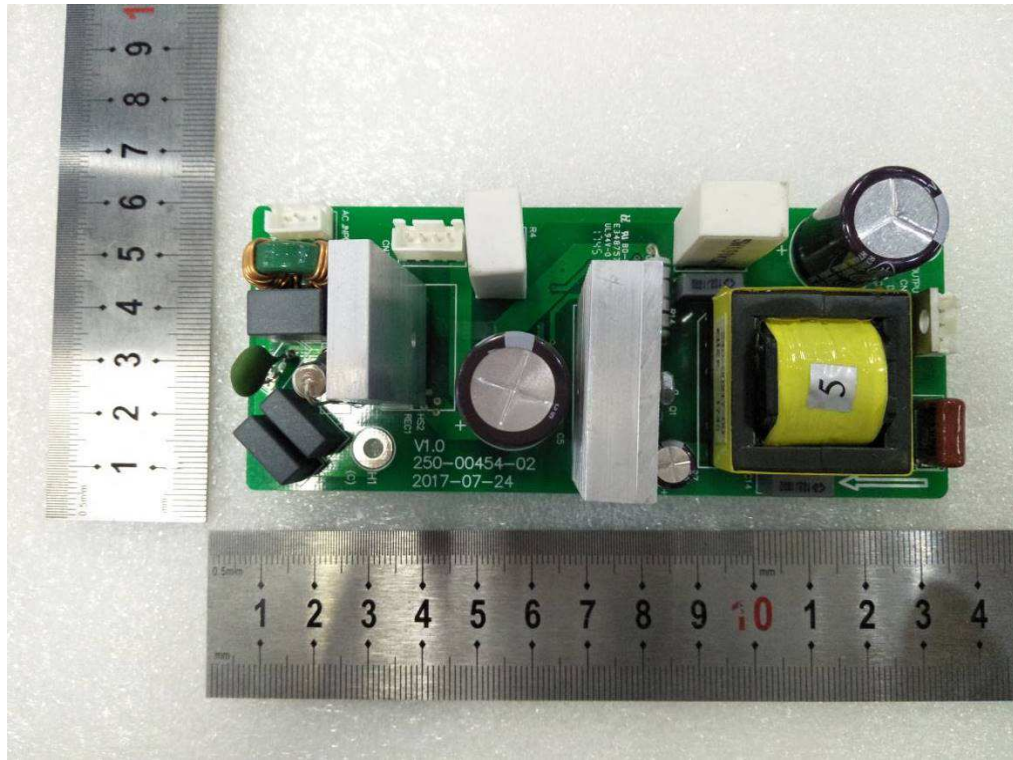
Control board component side view



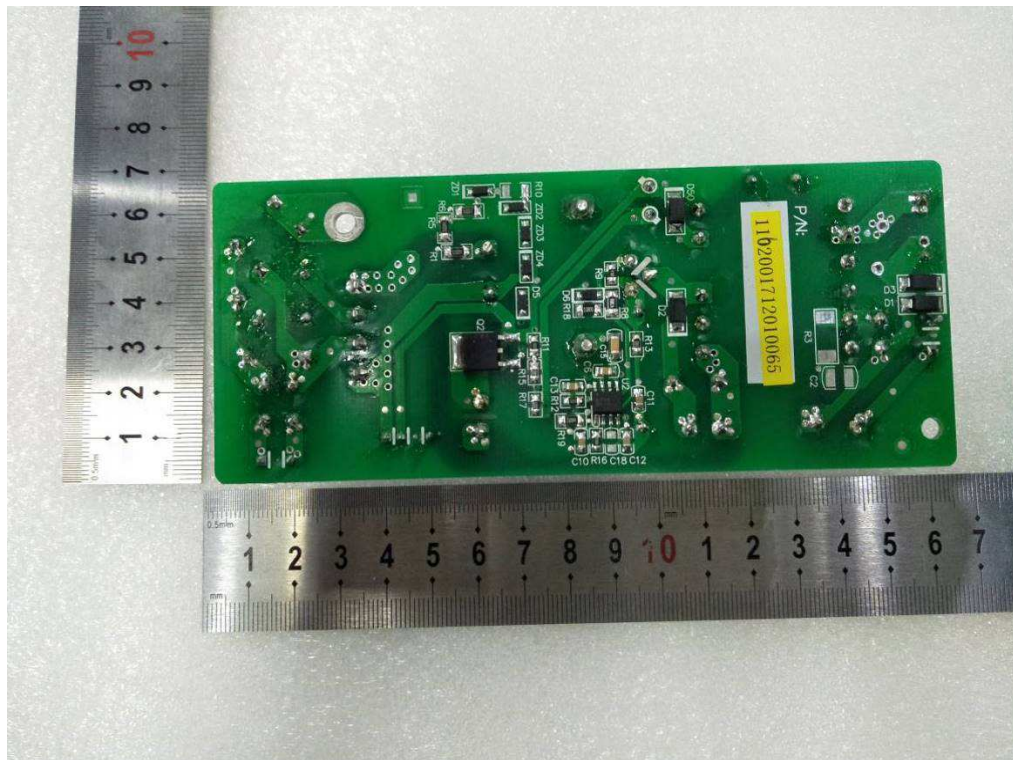
Control board solder side view



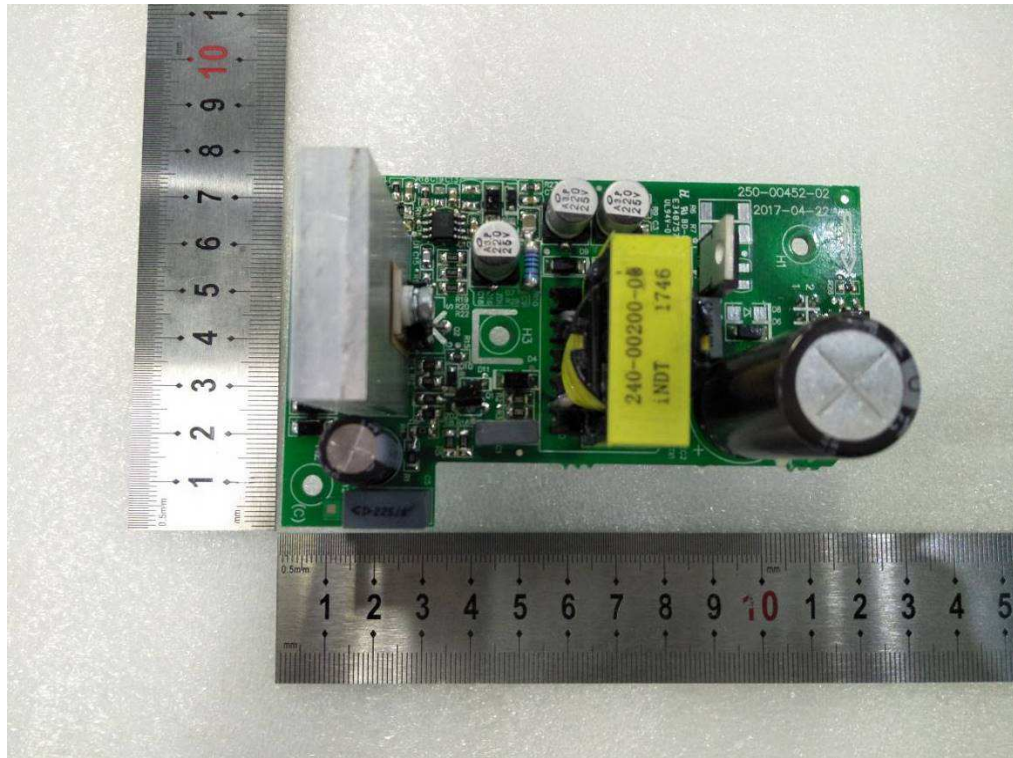
AC SPS component side view



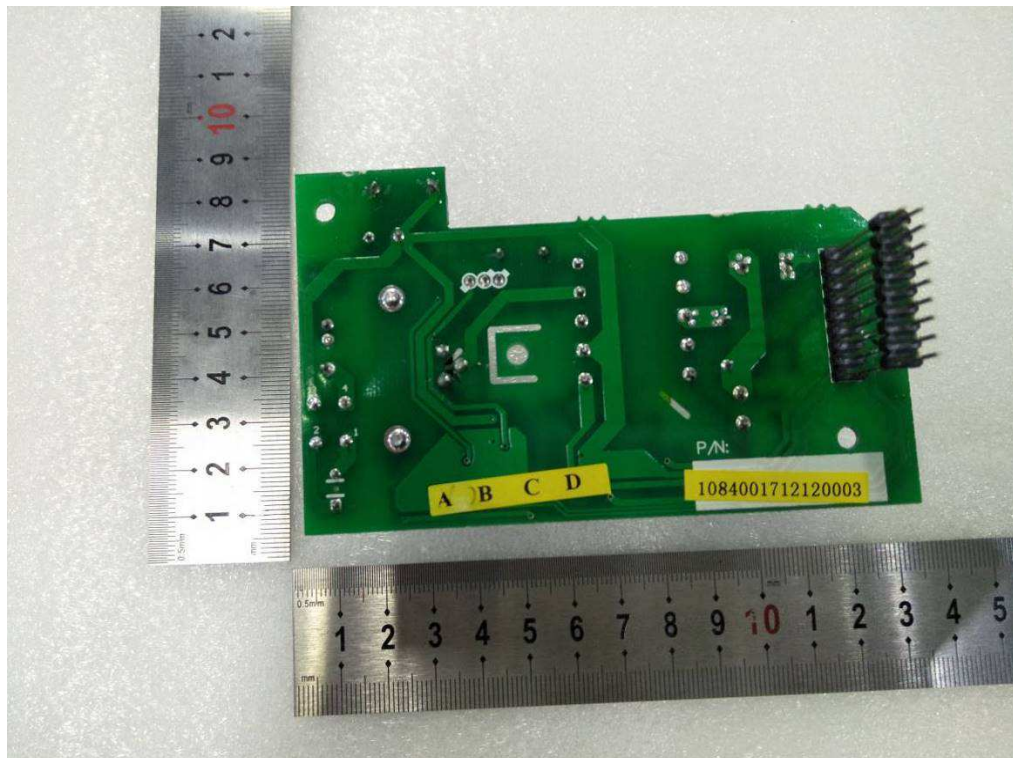
AC SPS board solder side view



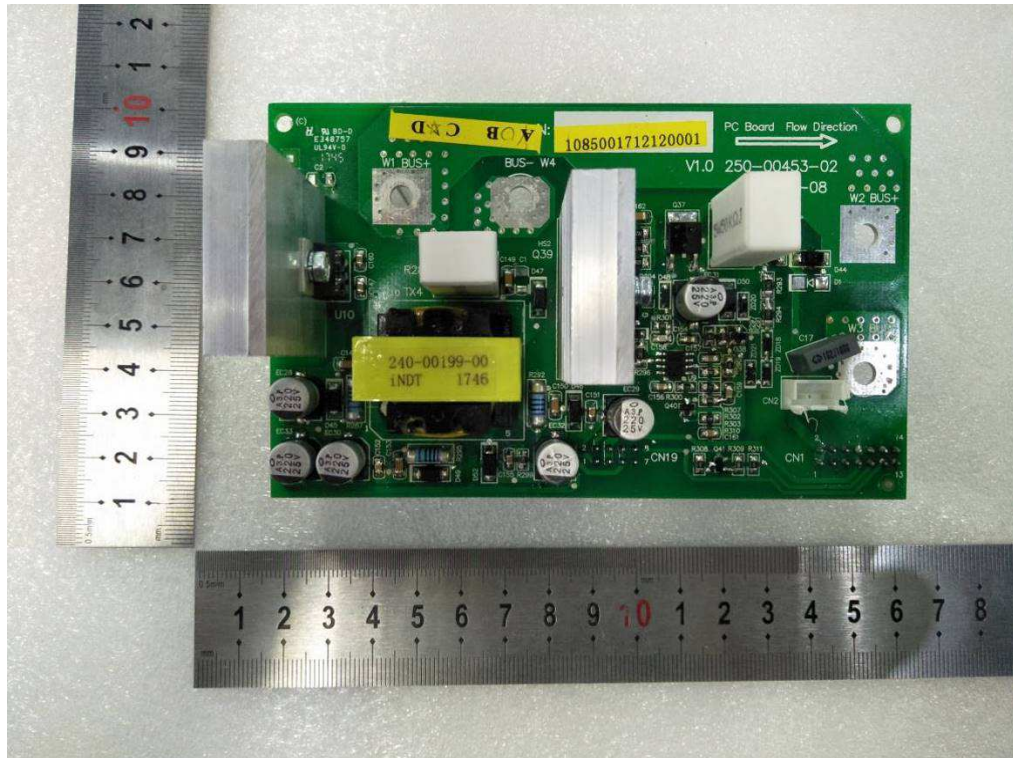
BAT SPS board component side view



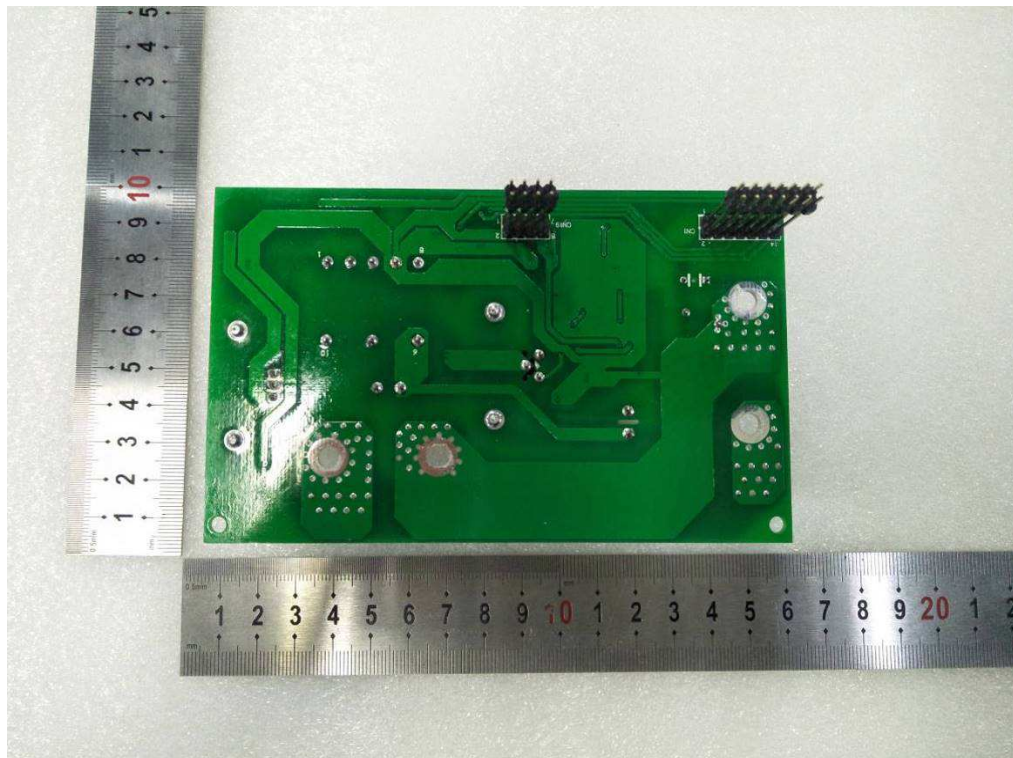
BAT SPS board solder side view



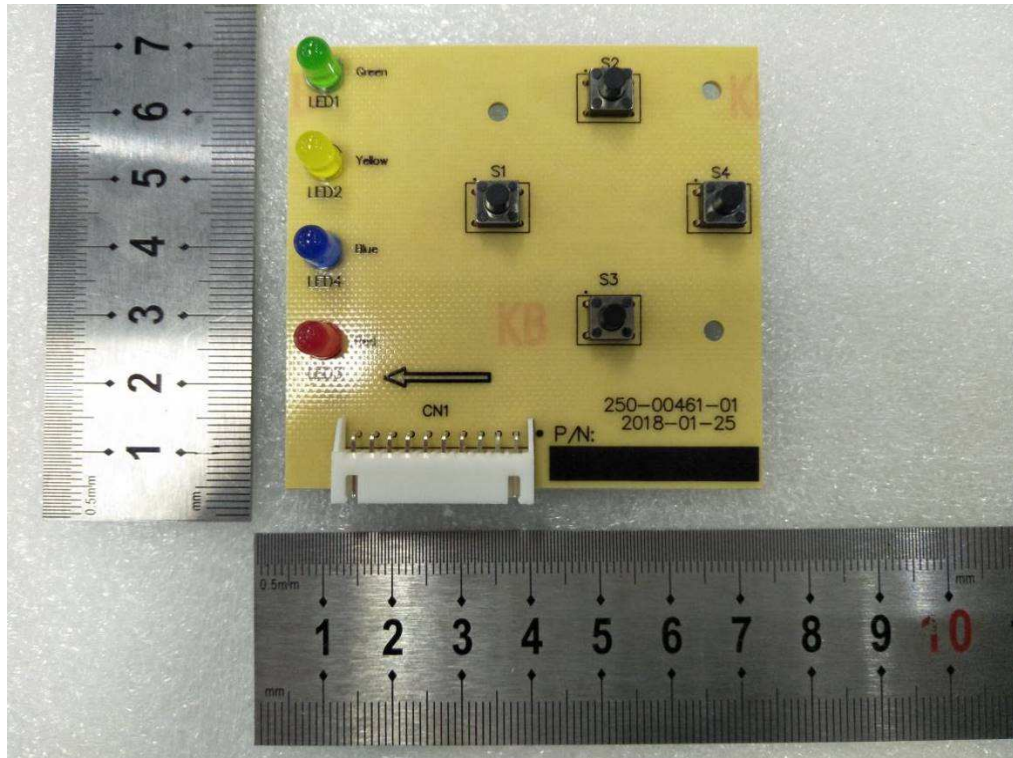
BUS SPS board component side view



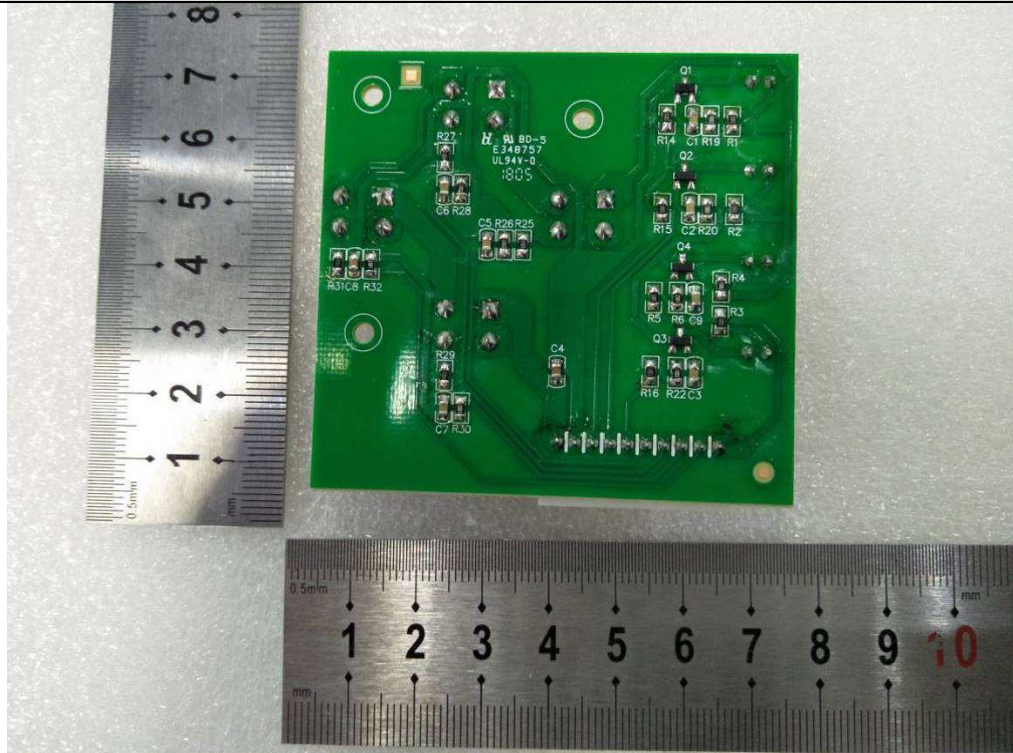
BUS SPS board solder side view



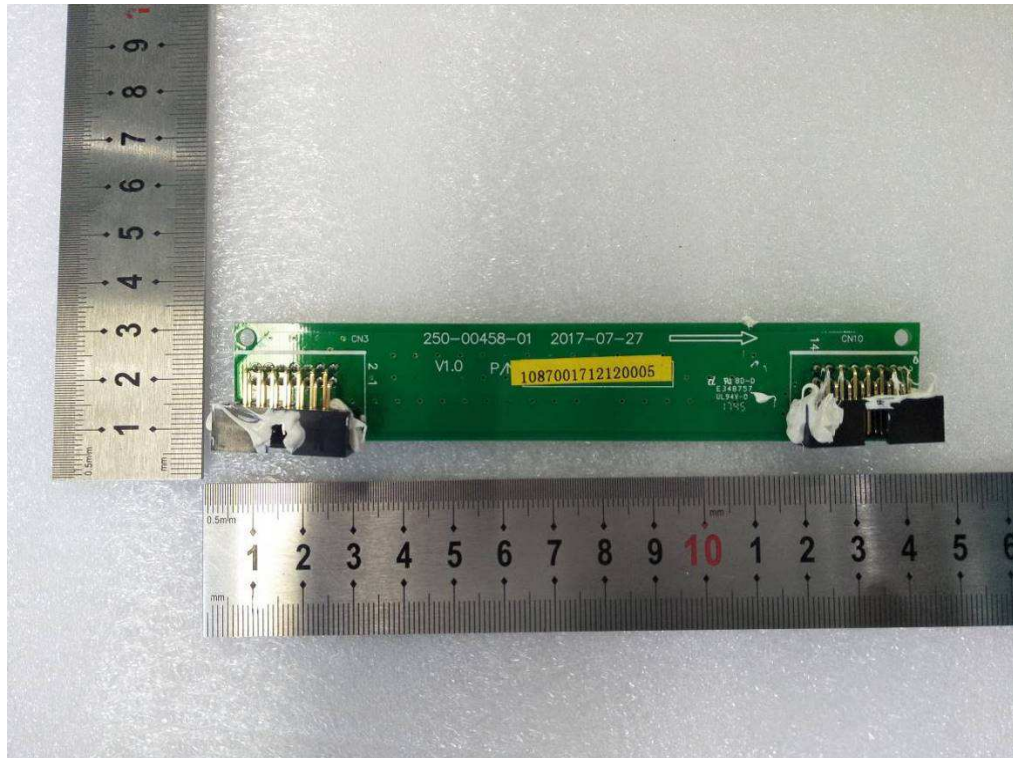
Keyboard board component side view



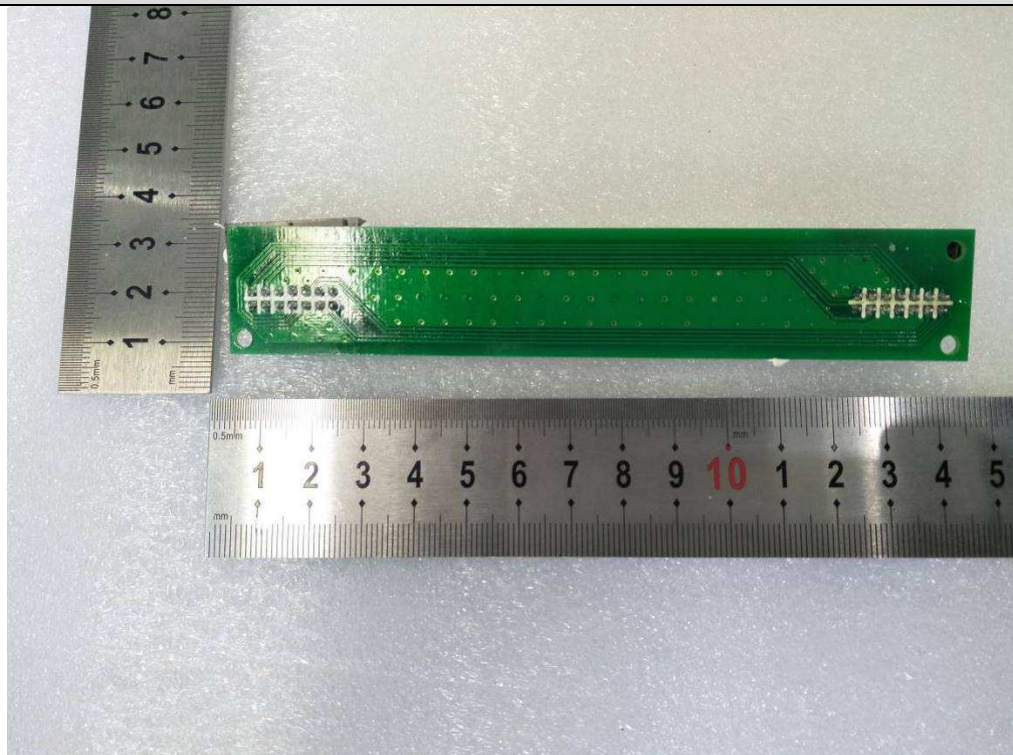
Keyboard board solder side view



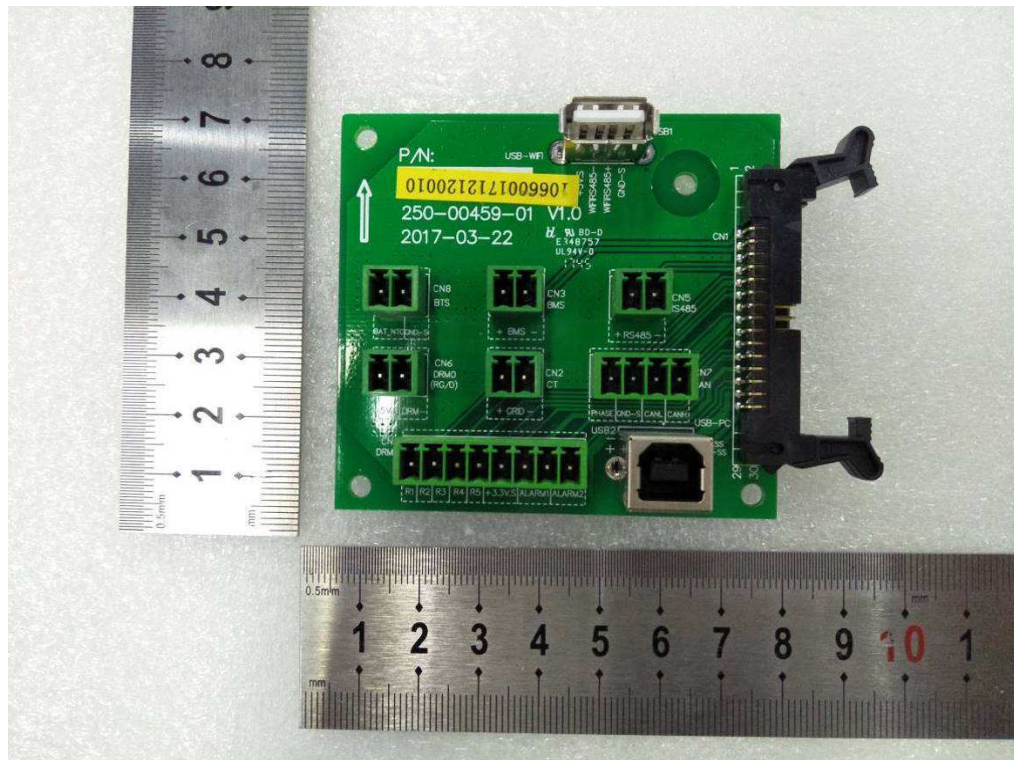
Interactive board component side view



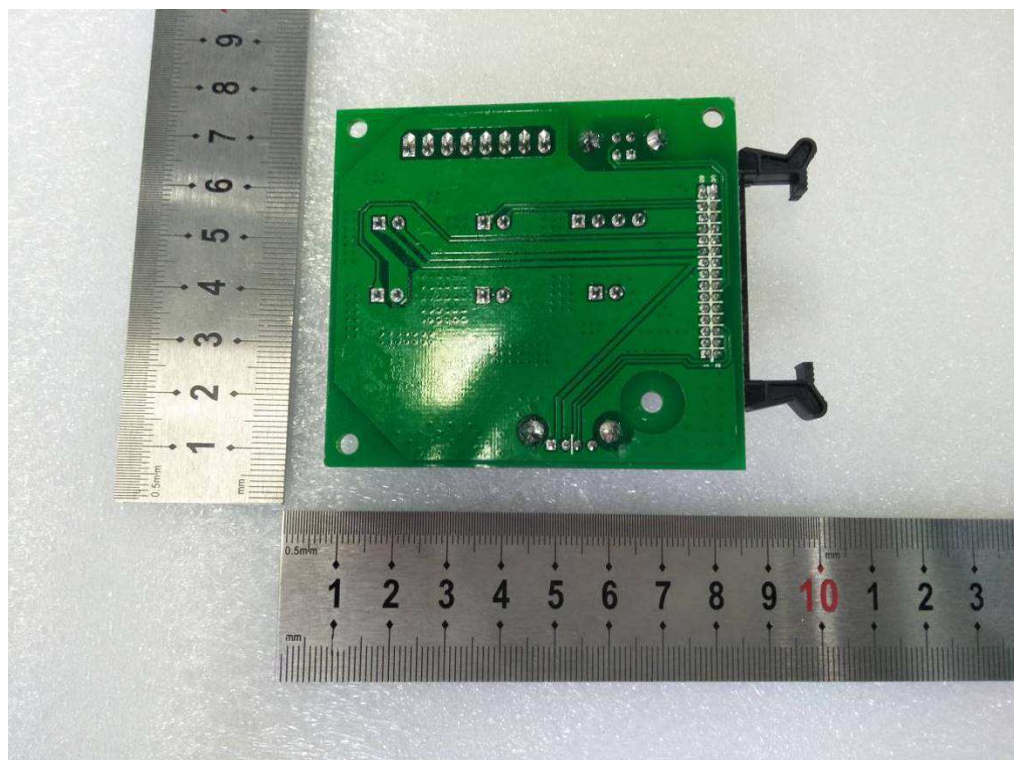
Interactive board solder side view



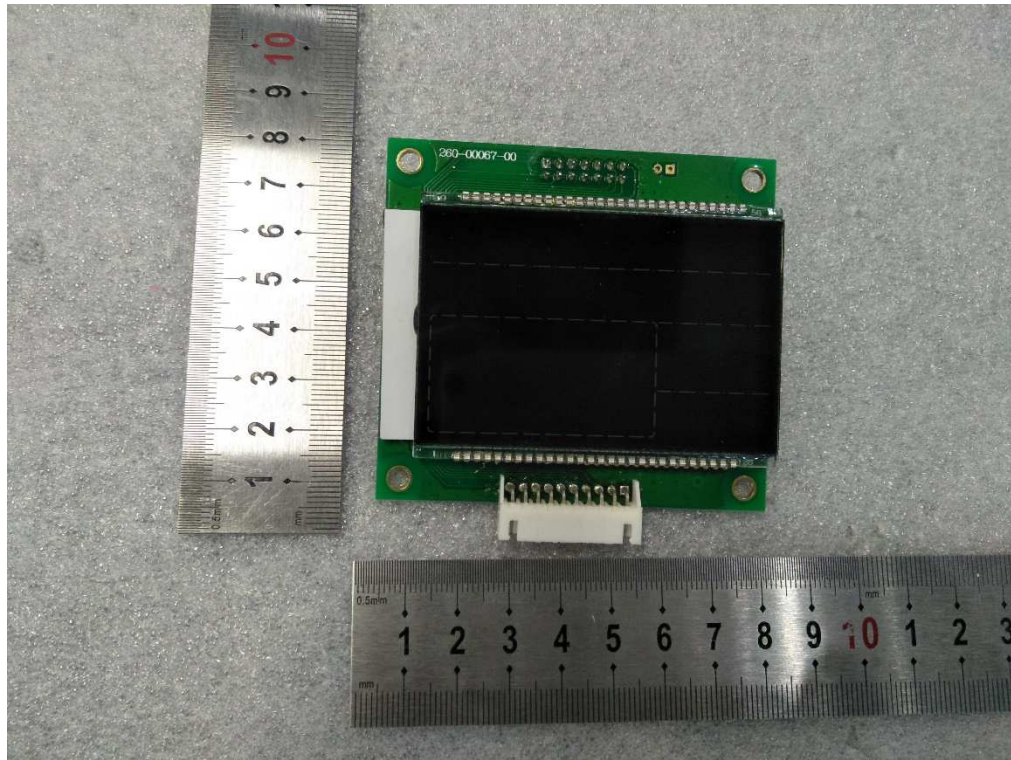
Com. board component side view



Com. board solder side view



Display board component side view



Display board solder side view

