TEST REPORT

Client Name	EAST Group Co., Ltd.
Name of product	Off-Grid Solar Inverter
Manufacturer	EAST Group Co., Ltd.
Trade mark & model	10kVA，20kVA
Test sort	Commission Test

CCIC Southern Electronic Product Testing (Shenzhen)Co.,Ltd

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CCIC Southern Electronic Product Testing (Shenzhen)Co.,Ltd
TEST REPORT

Name of sample	Off-Grid Solar Inverter		Trade mark	/	
Manufacturer	EAST Group Co., Ltd.		Model/Type	10kVA，20kVA	
Client	EAST Group Co., Ltd.		Sampling method	Sent by client	
Sampler	/		Amount of samples	/	
Sampling place	/		Quantity of samples	2 pcs per model	
Production date	/	Sampling date	/	Sending date	2016-09-20
Test date	2016-09-20 to 2017-04-20		Environment condition	20～25℃ 45～75%RH	

Test item:

All items

Reference documents:

IEC 62040-1:2008 (First Edition) + Am 1:2013

Uninterruptible power systems (UPS) –Part 1: General and safety requirements for UPS

Summary:

Refer to test report.

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)

Test conclusion:

Pass

（Stamp）

Tested by: 2017Y 07M 18D

Inspected by: 2017Y 07M 18D

Approved by: 2017Y 07M 18D

Sample description:

Model 10kVA，20kVA are a serious of Off-Grid Solar Inverter without batteries built in which converts direct current generated from the PV array field and batteries to alternating current, and it is intended to be connected in parallel with the mains to charge batteries to supply common load. It is intended for professional incorporation into PV system, and it is assessed on a component test basis, Communication port: RS485, RS232;Environmental category: Indoor; Pollution degree rating: 2;Ingress protection: IP20;Protection class: Class I

All models are classified a family with the following characteristic:
--Same appearance and structure;
--The control circuits and power circuit have same scheme;
--Difference only in electrical rating ,power inverter board and power component, details see critical component list;
Full testing was performed on model 20kVA,and variations with additional examination and testing subjected to model differences:
--electrical rating test,
-- electric strength test

Test results are represent to other models.

10kVA:
PV input : 350-750Vdc, 1*60A max, DC input: 360Vdc; AC Input: 380Vac, 50Hz, 24A;
AC Output: 380V, 50/60Hz, 15A ,Output Power :9kW.

20kVA:
PV input : 350-750Vdc, 1*60A max, DC input: 360Vdc; AC Input: 380Vac, 50Hz, 48A;
AC Output: 380V, 50/60Hz, 30A ,Output Power :18kW.

IEC 62109-1 : 2010			
Clause	Requirement – Test	Result - Remark	Verdict
4	GENERAL CONDITIONS FOR TESTS		P
4.5	Components		P
	Comply with IEC 62040-1 or relevant component standard	(see appended table 4.5)	P
1.5.2/RD	Evaluation and testing of components	Components which are certified to IEC and/or national standards are used correctly within their ratings. Components not covered by IEC standards are tested under the conditions present in the equipment.	P
1.5.3/RD	Thermal controls		N
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	The Interconnecting power cord set provided and fulfilled with the relevant national standard.	P
1.5.6/RD	Capacitors bridging insulation	X2 and Y2 capacitor according to IEC 60384-14 with 21 days damp heat test.	P
1.5.7/RD	Resistors bridging insulation		N
1.5.7.1/RD	Resistors bridging functional, basic or supplementary insulation		N
1.5.7.2/RD	Resistors bridging double or reinforced insulation between a.c. mains and other circuits		N
1.5.7.3/RD	Resistors bridging double or reinforced insulation between a.c. mains and antenna or coaxial cable		N
1.5.8/RD	Components in equipment for IT power systems	TN power system	N

IEC 62109-1 : 2010			
Clause	Requirement – Test	Result - Remark	Verdict
4.6	Power interface		P
1.6.1/RD	AC power distribution systems	TN power system	P
1.6.2/RD	Input current	(see appended table 4.6)	P
4.6 1.6.4/RD	Neutral conductor	Considering the neutral conductor was live conductor, the neutral conductor was insulated from the body with reinforced insulation throughout the equipment.	P
4.7	Marking and instructions		P
4.7.1	General		P
4.7.2 1.7.1/RD	Power rating	See Label	P
	Input rated voltage/range (V).....:	Ditto	P
	Input rated current/range (A) .....:	Ditto	P
	Input symbol for nature of supply (d.c.) .....:	Ditto	P
	Input rated frequency/range (Hz).....:	Ditto	P
	Number of Input phases and neutral .....:	Ditto	P
	Output rated voltage/range (V) .....:	Ditto	P
	Output rated current/range (A) .....:	Ditto	P
	Output rated power factor, if less than unity, or active power and apparent power or active power and rated current .....:	Ditto	P
	Number of output phases and neutral.....:	Ditto	P
	Output rated active power (W or kW) .....:	Ditto	P
	Output rated apparent power (VA or kVA) ...:	Ditto	P
	Output symbol for nature of supply (d.c.) ....:	No d.c output	N
	Output rated frequency/range (Hz).....:	Ditto	P
	Ambient operating temperature range (°C):	40	P

IEC 62109-1 : 2010			
Clause	Requirement – Test	Result - Remark	Verdict
	Rated short-time withstand current (Icw) or rated conditional short-circuit current (Icc)	10kVA: 3kA; 20kVA: 6kA	P
	Manufacturer's name or trademark or identification mark .....:		P
	Type/model or type reference.....:	See Label	P
	Symbol for Class II equipment only .....:	Class I equipment	N
	Other symbols .....:	Additional symbol or marking not give rise to misunderstanding	P
	Certification marks .....:	CE marking	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" .....:	add the warning marking on back enclosure	P
4.7.3	Safety instructions	The user manual contains information for operation, installation, servicing, transport, storage and technical data.	P
4.7.3.1	General		P
4.7.3.2	Installation .....:		P
	Location in a restricted access location only :		N
	Permanent connector UPS.....:		P
	Pluggable type A or Pluggable type B UPS :		N
4.7.3.3	Operation .....:		P
4.7.3.4	Maintenance.....:		P
4.7.3.5	Distribution related backfeed.....:		P
4.7.4 1.7.4/RD	Main voltage adjustment .....:	No adjustment necessary	N
	Methods and means of adjustment; reference to installation instructions .....:		N

IEC 62109-1 : 2010			
Clause	Requirement – Test	Result - Remark	Verdict
4.7.5 1.7.5/RD	Power outlets.....:		P
4.7.6 1.7.6/RD	Fuse identification (marking, special fusing characteristics, cross-reference) .....:		P
4.7.7 1.7.7/RD	Wiring terminals		P
1.7.7.1/RD	Protective earthing and bonding terminals .:	The symbol of ⏚ was marked on the terminal block for connection of protective earthing conductor.	P
1.7.7.2/RD	Terminals for a.c. mains supply conductors..:	The marking and indication of the AC mains supply neutral conductor on junction box cover are located that indication of function is clearly	P
1.7.7.3/RD	Terminals for d.c. mains supply conductors..:	Only one supply from mains.	P
4.7.8	Battery terminals .....:		P
4.7.9 1.7.8/RD	Controls and indicators		P
1.7.8.1/RD	Identification, location and marking .....:		P
1.7.8.2/RD	Colours .....:	No safety involved controls or indicators.	N
1.7.8.3/RD	Symbols .....:	Functional power switch marked according to IEC 60417, No. 5009 (line half inside circle).	P
1.7.8.4/RD	Markings using figures .....:		N
4.7.10 1.7.9/RD	Isolation of multiple power sources .....:	The markings of the functional power switch are on the switch.	P
4.7.11 1.7.2.4/RD	IT power systems	Equipment was not applied for IT power system	N

IEC 62109-1 : 2010			
Clause	Requirement – Test	Result - Remark	Verdict
4.7.12	Protection in building installation		P
	Rated short-time withstand current (*I*cw) .....:		N
	Rated conditional short circuit current (*I*cc) .:	10kVA: 3kA; 20kVA: 6kA	P
	a) If higher Icp stated ≤ 10 kA		P
	a) If higher Icp stated > 10 kA		N
4.7.13 5.1/RD	High leakage current (mA) .....:	Warning marking used.	P
4.7.14 1.7.10/RD	Thermostats and other regulating devices	Not provided with thermostats and regulating devices.	N
4.7.15 1.7.2.1/RD and 1.7.8.1/RD	Language(s) .....:	Safety instructions and markings were in English language. Other languages will be provided when submitted for national approval.	—
4.7.16 1.7.11/RD	Durability of markings	The label and markings were subjected to the permanence of marking test. The label and marking were rubbed with cloth soaked with water for 15s and then again for 15s with the cloth soaked with petroleum spirit. After this test there was no damage to the label. The marking on the label and silk printing did not fade. There was no curling nor lifting of the label edge.	P
4.7.17 1.7.12/RD	Removable parts	No required markings placed on removable parts.	N
4.7.18 1.7.13/RD	Replaceable batteries	See user manual	P
	Language(s) .....:		—

IEC 62109-1 : 2010			
Clause	Requirement – Test	Result - Remark	Verdict
4.7.19 1.7.2.5/RD	Operator access with a tool .....:	A symbol ⚠ was marked in user manual	P
4.7.20	Battery	Without external battery cabinet provided, details information see user manual.	N
	Clearly legible information .....:		N
	Battery type (lead-acid, NiCd, etc.) and number of blocks or cells .....:		N
	Nominal voltage of total battery (V) .....:		N
	Nominal capacity of total battery (optional) .:		N
	Warning label .....:		N
	Instructions .....:	See user manual	P
2.1.1.5/RD	Protection against energy hazards		P
4.7.21 1.7.2.4/RD	Installation instructions		P

5	FUNDAMENTAL DESIGN REQUIREMENTS		P
5.1	Protection against electric shock and energy hazards		P
5.1.1 2.1.1/RD	Protection for UPS intended to be used in operator access areas		P
2.1.1.1/RD	Access to energized parts		P
	Test by inspection .....:		P
	Test with test finger (Figure 2A) .....:		P
	Test with test pin (Figure 2B) .....:		P
	Test with test probe (Figure 2C) .....:		P
2.1.1.2/RD	Battery compartments		N
2.1.1.3/RD	Access to ELV wiring	No ELV wiring in operator accessible area.	N

IEC 62109-1 : 2010			
Clause	Requirement – Test	Result - Remark	Verdict
	Working voltage (Vpeak or Vrms); minimum distance through insulation (mm)	(see appended table 5.7)	—
2.1.1.4/RD	Access to hazardous voltage circuit wiring	No hazardous voltage circuit wiring operator accessible.	P
2.1.1.5/RD	Energy hazards .....:	No access with test finger to any parts with only basic insulation to ELV or hazardous voltage. The test pin can not touch hazardous voltage through any openings or seams within the appliance.	P
2.1.1.6/RD	Manual controls	No conductive controls or handles or alike provided.	N
2.1.1.7/RD	Discharge of capacitors in equipment		P
	Measured voltage (V); time-constant (s).....:	<10s	—
2.1.1.8/RD	Energy hazards – d.c. mains supply	<10s	P
	a) Capacitor connected to the d.c. mains supply .....:		P
	b) Internal battery connected to the d.c. mains supply .....:		N
2.1.1.9/RD	Audio amplifiers in information technology equipment .....:		N
5.1.2 2.1.1.5 c) /RD	Protection for UPS intended to be used in service access areas		P
	Hazardous energy level .....:	Cannot be maintain at 240VA for 60s	P
5.1.3 2.1.1.5 c) /RD	Protection for UPS intended to be used in restricted access areas		P
	Hazardous energy level .....:	Cannot be maintain at 240VA for 60s	P
5.1.4	Backfeed protection	(see appended table 5.7)	P

IEC 62109-1 : 2010			
Clause	Requirement – Test	Result - Remark	Verdict
	Shock hazard after de-energization of a.c. input for UPS		P
	Measured voltage (V); time-constant (s).....:	<1V,15Sec	—
	Description of the construction .....:	Backfeed protection provided by contactor plus corresponding control circuit. The input is disconnected in line and neutral from the output in backup made and separated with a gap from one input (L/N) pin to the other input (L/N) pin. The detection circuit are connected before the backfeed contactor. However these circuits were isolated by photo couplers to secondary control circuits. No hazardous voltage in backup mode at user accessible wiring connection of terminal block.	P
	Air gap is employed for backfeed protection		P
5.1.5	Emergency switching (disconnect) device		P

5.2	Requirements for auxiliary circuits		P
5.2.1 2.2/RD	Safety extra low voltage circuit - SELV		P
2.2.1/RD	General requirements		P
2.2.2/RD	Voltages under normal conditions (V) .....:	42.4V peak or 60V d.c. not exceeded in SELV circuits under normal operation. (See appended table 5.2.1)	P

IEC 62109-1 : 2010			
Clause	Requirement – Test	Result - Remark	Verdict
2.2.3/RD	Voltages under fault conditions (V) .....:	Single fault not cause excessive voltage in accessible SELV circuits. Limits of 71V peak and 120V d.c. not exceeded within 0.2 sec. And limits 42.4V peak and 60V d.c. not exceeded for longer than 0.2 sec. (See appended table 5.2.1)	P
2.2.4/RD	Connection of SELV circuits to other circuits :		P
5.2.2 2.3/RD	Telephone network voltage circuits - TNV	No TNV circuit.	N
2.3.1/RD	Limits		N
	Type of TNV circuits .....:		—
2.3.2/RD	Separation of TNV circuits from other circuits and from accessible parts		N
2.3.2.1/RD	General requirements		N
2.3.2.2/RD	Protection by basic insulation		N
2.3.2.3/RD	Protection by earthing		N
2.3.2.4/RD	Protection by other constructions .....:		N
2.3.3/RD	Separation from hazardous voltages		N
	Insulation employed .....:		—
2.3.4/RD	Connection of TNV circuits to other circuits		N
	Insulation employed .....:		—
2.3.5/RD	Test for operating voltages generated externally		N
5.2.3 2.4/RD	Limited current circuits		N
2.4.1/RD	General requirements		N
2.4.2/RD	Limit values	(See appended table 5.2.3)	—
	Frequency (Hz).....:		—
	Measured current (mA) .....:		—
	Measured voltage (V) .....:		—

IEC 62109-1 : 2010			
Clause	Requirement – Test	Result - Remark	Verdict
	Measured circuit capacitance (nF or μF) .....:		—
2.4.3/RD	Connection of limited current circuits to other circuits		N
5.2.4 3.5/RD	External signaling circuits		P
3.5.1/RD	General requirements	Interconnection to outlets only for mains powered equipment. Interconnection to SELV interfaces only for secondary circuits with voltages as defined in subclauses 2.2.2/RD and2.2.3/RD.	P
3.5.2/RD	Types of interconnection circuits .....:	See above	P
3.5.3/RD	ELV circuits as interconnection circuits		N
3.5.4/RD	Data ports for additional equipment		N
5.2.5 2.5/RD	Limited power source		N
	a) Inherently limited output		N
	b) Impedance limited output		N
	c) Regulating network limited output under normal operating and single fault condition		N
	d) Overcurrent protective device limited output		N
	Max. output voltage (V), max. output current (A), max. apparent power (VA).....:		—
	Current rating of overcurrent protective device (A) .:		—
	Use of integrated circuit (IC) current limiters		—

5.3	Protective earthing and bonding		P
5.3.1	General		P
2.6/RD	Provisions for earthing and bonding		P
2.6.1/RD	Protective earthing		P

IEC 62109-1 : 2010			
Clause	Requirement – Test	Result - Remark	Verdict
2.6.2/RD	Functional earthing	No functional earthing necessary.	P
2.6.3/RD	Protective earthing conductors and protective bonding conductors		P
2.6.3.1/RD	General		P
2.6.3.2/RD	Size of protective earthing conductors		P
	Rated current (A), cross-sectional area (mm^2), AWG.....:		—
2.6.3.3/RD	Size of protective bonding conductors		P
	Rated current (A), cross-sectional area (mm^2), AWG.....:		—
	Protective current rating (A), cross-sectional area (mm^2), AWG .....:		—
2.6.3.4/RD	Resistance of earthing conductors and their terminations; resistance (Ω), voltage drop (V), test current (A), duration (min).....:	60A , 4 min <0.1Ω	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
2.6.4.2/RD	Protective earthing and bonding terminals	Protective Bonding by screw terminal with washer.	P
	Rated current (A), type, nominal thread diameter (mm).....:		—
2.6.4.3/RD	Separation of the protective earthing conductor from protective bonding conductors	Separated PE and protective bonding conductor used.	N
2.6.5/RD	Integrity of protective earthing		N
2.6.5.1/RD	Interconnection of equipment		N
2.6.5.2/RD	Components in protective earthing conductors and protective bonding conductors		N
2.6.5.3/RD	Disconnection of protective earth		N
2.6.5.4/RD	Parts that can be removed by an operator		N
2.6.5.5/RD	Parts removed during servicing		N

IEC 62109-1 : 2010			
Clause	Requirement – Test	Result - Remark	Verdict
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		N
2.6.5.8/RD	Reliance on telecommunication network or cable distribution system		N
5.3.2 2.6.1/RD	Protective earthing		P
2.10/RD	Clearances, creepage distances and distances through insulation		P
4.2/RD	Mechanical strength		P
5.2/RD	Electric strength		P
5.3.3	Protective bonding		P

5.4	AC and d.c. power isolation		P
5.4.1	General		P
3.4/RD	Disconnection from the mains supply	Disconnect device provided	P
3.4.1/RD	General requirement		P
3.4.2/RD	Disconnect devices	Breaker used as disconnect device	P
3.4.3/RD	Permanently connected equipment		P
3.4.4/RD	Parts which remain energized		P
3.4.5/RD	Switches in flexible cords		N
3.4.6/RD	Number of poles - single-phase and d.c. equipment		N
3.4.7/RD	Number of poles - three-phase equipment		P
3.4.8/RD	Switches as disconnect devices		P
3.4.9/RD	Plugs as disconnect devices		N
3.4.10/RD	Interconnected equipment		P
3.4.11/RD	Multiple power sources		P
5.4.2	Disconnect devices		P

IEC 62109-1 : 2010			
Clause	Requirement – Test	Result - Remark	Verdict
5.5	Overcurrent and earth fault protection		P
5.5.1	General		P
2.7.3/RD	Short-circuit backup protection		P
2.7.4/RD	Number and location of protective devices ..:	Overcurrent protection by breakers in the rear of enclosure.	P
2.7.5/RD	Protection by several devices		N
2.7.6/RD	Warning to service personnel .....:	Hazardous voltage may be still present in the equipment after the circuit breaker opened. So that the below wording is required as suitable: Caution – Double Pole/Neutral Fusing.	P
5.5.2	Basic requirements	Equipment relies on circuit breaker	P
5.5.3	Battery circuit protection		P
5.5.3.1	Overcurrent and earth fault protection		P
5.5.3.2	Location of protective device	Overcurrent protection by breakers in the rear of enclosure.	P
5.5.3.3	Rating of protective device		P
5.3.1/RD	Protection against overload and abnormal operation	(see appended table 8.3)	P
5.5.4	Short-time withstand current		N
5.5.4.1	General		N
5.5.4.2	Modes of operation		N
5.5.4.3	Test procedure		N
5.5.4.3.1	General application		N
	Rated UPS output current/(r.m.s) (A) .....:		—
	Prospective test current/(r.m.s) (A) .....:		—
	Typical power factor .....:		—

IEC 62109-1 : 2010			
Clause	Requirement – Test	Result - Remark	Verdict
	Initial asymmetric peak current ration (*I*pk / *I*cw) .....:		—
	Minimum durating of prospective test current (cycles 50/60 Hz) .....:		—
5.5.4.3.2	Exemption from testing	UPS with declared Icc not exceeding 10kA	P

5.6	Protection of personnel – Safety interlocks		N
5.6.1	Operator protection		N
2.8/RD	General principles		N
2.8.1/RD	Protection requirements		N
2.8.2/RD	Inadvertent reactivation		N
2.8.3/RD	Fail-safe operation		N
2.8.4/RD	Protection against extreme hazard		N
2.8.5/RD	Moving parts		N
2.8.6/RD	Overriding		N
2.8.7/RD	Switches, relays and their related circuits		N
2.8.7.1/RD	Separation distances for contact gaps and their related circuits .....:		N
2.8.7.2/RD	Overload test		N
2.8.7.3/RD	Endurance test		N
2.8.7.4/RD	Electric strength test	(see appended table 8.2)	N
2.8.8/RD	Mechanical actuators		N
5.6.2	Service person protection		N
5.6.2.1	Introduction		N
5.6.2.2	Covers		N
5.6.2.3	Location and guarding of parts		N
5.6.2.4	Parts on doors		N
5.6.2.5	Component access		N
2.8.3/RD	Fail-safe operation		N

IEC 62109-1 : 2010			
Clause	Requirement – Test	Result - Remark	Verdict
5.6.2.6	Moving parts		N
5.6.2.7	Capacitor banks		N
5.6.2.8	Internal batteries		N

5.7 2.10/RD	Clearances, creepage distances and distances through insulation		P
2.10.1/RD	General		P
2.10.1.1/RD	Frequency .....:		N
2.10.1.2/RD	Pollution degrees .....:	Pollution degrees 2	P
2.10.1.3/RD	Reduced values for functional insulation		N
2.10.1.4/RD	Intervening unconnected conductive parts		P
2.10.1.5/RD	Insulation with varying dimensions		N
2.10.1.6/RD	Special separation requirements		N
2.10.1.7/RD	Insulation in circuits generating starting pulses		N
2.10.2/RD	Determination of working voltage		P
2.10.2.1/RD	General		P
2.10.2.2/RD	RMS working voltage		P
2.10.2.3/RD	Peak working voltage		P
2.10.3/RD	Clearances		P
2.10.3.1/RD	General		P
2.10.3.2/RD	Mains transient voltages		P

IEC 62109-1 : 2010			
Clause	Requirement – Test	Result - Remark	Verdict
	a) AC mains supply .....:		—
	b) Earthed d.c. mains supplies .....:		—
	c) Unearthed d.c. mains supplies .....:		—
	d) Battery operation .....:		—
2.10.3.3/RD	Clearances in primary circuits	(see appended table 5.7)	P
2.10.3.4/RD	Clearances in secondary circuits	(see appended table 5.7)	P
2.10.3.5/RD	Clearances in circuits having starting pulses		N
2.10.3.6/RD	Transients from a.c. mains supply .....:		—
2.10.3.7/RD	Transients from d.c. mains supply .....:		—
2.10.3.8/RD	Transients from telecommunication networks and cable distribution systems .....:		N
2.10.3.9/RD	Measurement of transient voltage levels		P
	a) Transients from a mains supply		—
	For an a.c. mains supply .....:		—
	For a d.c. mains supply .....:		—
	b) Transients from a telecommunication network :		—
2.10.4/RD	Creepage distances	(see appended table 5.7)	P
2.10.4.1/RD	General		N
2.10.4.2/RD	Material group and comparative tracking index	III b	P
	CTI tests .....:		—
2.10.4.3/RD	Minimum creepage distances		P
2.10.5 /RD	Solid insulation		P
2.10.5.1/RD	General		P

IEC 62109-1 : 2010			
Clause	Requirement – Test	Result - Remark	Verdict
2.10.5.2/RD	Distances through insulation	(see appended table 5.7)	N
2.10.5.3/RD	Insulating compound as solid insulation		N
2.10.5.4/RD	Semiconductor devices		N
2.10.5.5/RD	Cemented joints		N
2.10.5.6/RD	Thin sheet material – General		N
2.10.5.7/RD	Separable thin sheet material		N
	Number of layers (pcs) .....:		—
2.10.5.8/RD	Non-separable thin sheet material		N
2.10.5.9/RD	Thin sheet material – standard test procedure	The thin sheet materials of polyester tape used in inverter transformer.	P
	Electric strength test	(see appended table 8.2)	—
2.10.5.10 /RD	Thin sheet material – alternative test procedure		N
	Electric strength test	(see appended table 8.2)	—
2.10.5.11 /RD	Insulation in wound components		N
2.10.5.12 /RD	Wire in wound components		N
	Working voltage .....:		—
	a) Basic insulation not under stress .....:		N
	b) Basic, supplementary, reinforced insulation :		N
	c) Compliance with Annex U .....:		N
	Two wires in contact inside wound component; angle between 45° and 90° .....:		N

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Clause	Requirement – Test	Result - Remark	Verdict
2.10.5.13 /RD	Wire with solvent-based enamel in wound components		N
	Electric strength test	(see appended table 8.2)	—
	Routine test		N
2.10.5.14 /RD	Additional insulation in wound components		N
	Working voltage .....:		—
	- Basic insulation not under stress .....:		N
	- Supplementary, reinforced insulation .....:		N
2.10.6/RD	Construction of printed boards		N
2.10.6.1/R D	Uncoated printed boards		N
2.10.6.2/R D	Coated printed boards		N
2.10.6.3/R D	Insulation between conductors on the same inner surface of a printed board		N
2.10.6.4/R D	Insulation between conductors on different layers of a printed board		N
	Distance through insulation		N
	Number of insulation layers (pcs) .....:		N
2.10.7/RD	Component external terminations		P
2.10.8/RD	Tests on coated printed boards and coated components		N
2.10.8.1/R D	Sample preparation and preliminary inspection		N
2.10.8.2/R D	Thermal conditioning		N
2.10.8.3/R D	Electric strength test	(see appended table 8.2)	—
2.10.8.4/R D	Abrasion resistance test		N
2.10.9/RD	Thermal cycling		N

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Clause	Requirement – Test	Result - Remark	Verdict
2.10.10/RD	Test for Pollution Degree 1 environment and insulating compound		N
2.10.11/RD	Tests for semiconductor devices and cemented joints		N
2.10.12/RD	Enclosed and sealed parts		N

6	Wiring, connections and supply		P
6.1	General		P
6.1.1	Introduction		P
3.1/RD	General		P
3.1.1/RD	Current rating and overcurrent protection	All internal wires are UL recognized wiring that is PVC insulated, rated VW-1, min. 105°C, 450V. Internal wiring gauge is suitable for current intended to be carried.	P
3.1.2/RD	Protection against mechanical damage	Wires do not touch sharp edges and heatsinks which could damage the insulation and cause hazard.	P
3.1.3/RD	Securing of internal wiring	Internal wires with only basic isolation are routed so that they are not close to any live bare components. The wires are secured by solder pins and quick-connect terminals or solder and glue so that a loosening of the terminal connection is unlikely.	P

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Clause	Requirement – Test	Result - Remark	Verdict
3.1.4/RD	Insulation of conductors	Internal wires with only basic isolation are routed so that they are not close to any live bare components. The wires are secured by solder pins and quick-connect terminals or solder and glue so that a loosening of the terminal connection is unlikely.	P
3.1.5/RD	Beads and ceramic insulators	Not used.	N
3.1.6/RD	Screws for electrical contact pressure	Electrical connections screwed two or more complete threads into metal. No screws of insulating material for electrical connections, or where supplementary or reinforced insulation could be impaired by a metal replacement.	P
3.1.7/RD	Insulating materials in electrical connections	All current carrying and safety earthing connections are metal to metal.	P
3.1.8/RD	Self-tapping and spaced thread screws	All current carrying and safety earthing connections are metal to metal.	P
3.1.9/RD	Termination of conductors	All conductors are reliable secured.	P
	10 N pull test		P
3.1.10/RD	Sleeving on wiring	All sleeving on wiring which used as supplementary insulation were retained in position reliably.	P
6.1.2	Dimensions and rating of busbars and insulated conductors		P

6.2	Connection to power	P

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Clause	Requirement – Test	Result - Remark	Verdict
6.2.1	General provisions for connection to power		P
3.2.2/RD	Multiple supply connections		P
3.2.3/RD	Permanently connected equipment	The terminals used	P
	Number of conductors, diameter of cable and conduits (mm) .....:		—
3.2.4/RD	Appliance inlets		N
3.2.5/RD	Power supply cords		N
3.2.5.1/RD	AC power supply cords		N
	Type .....:		—
	Rated current (A), cross-sectional area (mm²), AWG .....:		—
3.2.5.2/RD	DC power supply cords		N
3.2.6/RD	Cord anchorages and strain relief		N
	Mass of equipment (kg), pull (N) .....:		—
	Longitudinal displacement (mm) .....:		—
3.2.7/RD	Protection against mechanical damage		N
3.2.8/RD	Cord guards		N
	Diameter or minor dimension D (mm); test mass (g) .....:		—
	Radius of curvature of cord (mm).....:		—
6.2.2	Means of connection .....:	Terminals for permanent connection to supply	P
	More than one supply connection .....:		N

6.3	Wiring terminals for external power conductors		P
3.3/RD	Wiring terminals for connection of external conductors		P
3.3.1/RD	Wiring terminals		P
3.3.2/RD	Connection of non-detachable power supply cords		P
3.3.3/RD	Screw terminals		P

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Clause	Requirement – Test	Result - Remark	Verdict
3.3.4/RD	Conductor sizes to be connected		P
	Rated current (A), cord/cable type, cross-sectional area (mm^2)..... :	Rated current (30A);cross-sectional area :4 to 6 mm^2	—
3.3.5/RD	Wiring terminal sizes		P
	Rated current (A), type, nominal thread diameter (mm) ..... :	nominal thread diameter: 4.0mm	—
3.3.6/RD	Wiring terminal design		P
3.3.7/RD	Grouping of wiring terminals		P
3.3.8/RD	Stranded wire		N

7	Physical requirements		P
7.1	Enclosure	Enclosure completely encloses hazardous parts.	P

7.2 4.1/RD	Stability		P
	Angle of 10°	The UPS does not overbalance when: (for all types) - titled to an angle of 10° when a force of 20% of the UPS weight is used from any direction.	P
	Test force (N) ..... :		P

7.3 4.2/RD	Mechanical strength		P
4.2.1/RD	General		P
4.2.2/RD	Steady force test, 10 N		—
4.2.3/RD	Steady force test, 30 N	30 N force applied to housing of battery compartment.	P

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Clause	Requirement – Test	Result - Remark	Verdict
4.2.4/RD	Steady force test, 250 N	250 N applied to outer enclosure. No energy or other hazards.	P
4.2.5/RD	Impact test		P
	Fall test	500 g steel sphere ball fall from 1.3 m height onto top of enclosure. No safety relevantdamages.	P
	Swing test	500 g steel sphere ball as pendulum onto side of enclosure. No safety relevant damages.	P
4.2.6/RD	Drop test; height (mm) .....:		N
4.2.7/RD	Stress relief test	After 7h at 70°C and cooling down to room temperature, no shrinkage, distortion or loosing of front panel was noticeable.	P
4.2.8/RD	Cathode ray tubes	No CRT in the unit.	N
	Picture tube separately certified .....:		—
4.2.9/RD	High pressure lamps	No high pressure lamp.	N
4.2.10/RD	Wall or ceiling mounted equipment; force (N) .:	Not wall or ceiling mounted.	N

7.4	Construction details		P
7.4.1	Introduction		P
4.3.1/RD	Edges and corners	No sharp edge or corner.	N
4.3.2/RD	Handles and manual controls; force (N).....:	No handle or manual control.	N
4.3.3/RD	Adjustable controls	No control.	N
4.3.4/RD	Securing of parts	No connection likely to be exposed to mechanical stress are provided in unit.	P
4.3.5/RD	Connection by plugs and sockets	No plug or socket.	N
4.3.7/RD	Heating elements in earthed equipment	No heating element.	N

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Clause	Requirement – Test	Result - Remark	Verdict
4.3.11/RD	Containers for liquids or gases	No container for liquid or gas.	N
4.4/RD	Protection against hazardous moving parts		N
4.4.1/RD	General		N
4.4.2/RD	Protection in operator access areas .....:		P
4.4.3/RD	Protection in restricted access locations .....:		P
4.4.4/RD	Protection in service access areas		P
4.4.5/RD	Protection against moving fan blades		P
4.4.5.1/RD	General		P
	Not considered to cause pain or injury. a) ...:		N
	Is considered to cause pain, not injury. b) ...:		N
	Considered to cause injury. c) .....:		N
4.4.5.2	Protection for users		N
	Use of symbol or warning .....:		N
4.4.5.3	Protection for service persons		N
	Use of symbol or warning .....:		N
4.5/RD	Thermal requirements		P
4.5.1/RD	General		P
4.5.2/RD	Temperature tests		N
	Normal load condition per Annex L .....:		N
4.5.3/RD	Temperature limits for materials		P
4.5.4/RD	Touch temperature limits		P
4.5.5/RD	Resistance to abnormal heat .....:	(see appended table 7.4)	N
7.4.2	Openings		N
7.4.3	Gas Concentration		N
7.4.4	Equipment movement		N

7.5 4.7/RD	Resistance to fire		P
4.7.1/RD	Reducing the risk of ignition and spread of flame		P

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Clause	Requirement – Test	Result - Remark	Verdict
	Method 1, selection and application of components wiring and materials	Materials with the required flammability classes are used. (see appended table 7.5)	P
	Method 2, application of all of simulated fault condition tests		N
4.7.2/RD	Conditions for a fire enclosure	Electrical parts are not likely to ignite nearby materials. Parts not protected against overheating under fault conditions.	P
4.7.2.1/RD	Parts requiring a fire enclosure		P
4.7.2.2/RD	Parts not requiring a fire enclosure		N
4.7.3/RD	Materials	See below.	P
4.7.3.1/RD	General	PCB rated V-1 or better.	P
4.7.3.2/RD	Materials for fire enclosures	Metal enclosure is used	P
4.7.3.3/RD	Materials for components and other parts outside fire enclosures		N
4.7.3.4/RD	Materials for components and other parts inside fire enclosures	Internal components except small parts are V-1 or better	P
4.7.3.5/RD	Materials for air filter assemblies	No air filter.	N
4.7.3.6/RD	Materials used in high-voltage components	No high voltage component.	N

7.6	Battery location		N
7.6.1	Battery location and installation		N
7.6.2	Accessibility and maintainability		N
7.6.3	Distance		N
7.6.4	Case insulation		N
7.6.5	Wiring		N
7.6.6	Electrolyte spillage		N
7.6.7	Ventilation		N
7.6.8	Charging voltage		N

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Clause	Requirement – Test	Result - Remark	Verdict

7.7	Temperature rise		P
4.5/RD	Thermal requirements		P
4.5.1/RD	General		P
4.5.2/RD	Temperature tests	(see appended table 7.7)	P
	Normal load condition per Annex L .....:		P
4.5.3/RD	Temperature limits for materials		P
4.5.4/RD	Touch temperature limits		P
4.5.5/RD	Resistance to abnormal heat .....:		P

8	Electrical requirements and simulated abnormal conditions		P
8.1	General provisions for earth leakage		P
5.1.1/RD	General	Permanently connected wire and required cross-section of protective earthing conductor is used.	P
5.1.7/RD	Equipment with touch current exceeding 3,5 mA	Warning marking used	P

8.2 5.2/RD	Electric strength		P
5.2.1/RD	General	(see appended table 8.2)	P
5.2.2/RD	Test procedure	(see appended table 8.2)	P

8.3	Abnormal operating and fault conditions		P
8.3.1	General		P
5.3.1/RD	Protection against overload and abnormal operation	(see appended table 8.3)	P
5.3.2/RD	Motors	(see appended Annex B)	P
5.3.3/RD	Transformers	(see appended Annex C)	P
5.3.4/RD	Functional insulation.....:		P
5.3.5/RD	Electromechanical components		N

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Clause	Requirement – Test	Result - Remark	Verdict
5.3.9/RD	Compliance criteria for abnormal operating and fault conditions		P
5.3.9.1/RD	During the tests		P
5.3.9.2/RD	After the tests		P
8.3.2	Simulation of faults		P
8.3.3	Conditions for tests		P

9 6/RD	Connection to telecommunication networks		N
6.1/RD	Protection of telecommunication network service persons, and users of other equipment connected to the network, from hazards in the equipment		N
6.1.1/RD	Protection from hazardous voltages		N
6.1.2/RD	Separation of the telecommunication network from earth		N
6.1.2.1/RD	Requirements		N
	Supply voltage (V) .....:		—
	Current in the test circuit (mA) .....:		—
6.1.2.2/RD	Exclusions .....:		N
6.2/RD	Protection of equipment users from overvoltages on telecommunication networks		N
6.2.1/RD	Separation requirements		N
6.2.2/RD	Electric strength test procedure		N
6.2.2.1/RD	Impulse test	(see appended table 9)	N
6.2.2.2/RD	Steady-state test	(see appended table 9)	N
6.2.2.3/RD	Compliance criteria		N
6.3/RD	Protection of the telecommunication wiring system from overheating		N
	Max. output current (A) .....:		—
3.5/RD	Interconnection of equipment		N
3.5.1/RD	General requirements		N
3.5.2/RD	Types of interconnection circuits .....:		N

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Clause	Requirement – Test	Result - Remark	Verdict
3.5.3/RD	ELV circuits as interconnection circuits		N
3.5.4/RD	Data ports for additional equipment		N
2.1.3/RD	Protection in restricted access locations		N
2.3.1/RD	Limits		N
	Type of TNV circuits .....:		—
2.3.2/RD	Separation from other circuits and from accessible parts		N
2.3.2.1/RD	General requirements		N
2.3.2.2/RD	Protection by basic insulation		N
2.3.2.3/RD	Protection by earthing		N
2.3.2.4/RD	Protection by other constructions .....:		N
2.3.3/RD	Separation from hazardous voltages		N
	Insulation employed .....:		—
2.3.4/RD	Connection of TNV circuits to other circuits		N
	Insulation employed .....:		—
2.3.5/RD	Test for operating voltages generated externally		N
2.6.5.8/RD	Reliance on telecommunication network or cable distribution system		N
2.10.3.3/RD	Clearances in primary circuits	(see appended table 5.7)	N
2.10.3.4/RD	Clearances in secondary circuits	(see appended table 5.7)	N
2.10.4/RD	Creepage distances		N
2.10.4.1/RD	General		N
2.10.4.2/RD	Material group and comparative tracking index		N
	CTI tests.....:		—
2.10.4.3/RD	Minimum creepage distances		N
M/RD	Annex M, CRITERIA FOR TELEPHONE RINGING SIGNALS (see 2.3.1/RD)		N
M.1/RD	Introduction		N

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Clause	Requirement – Test	Result - Remark	Verdict
M.2 /RD	Method A		N
M.3/RD	Method B		N
M.3.1/RD	Ringing signal		N
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
M.3.2.1/RD	Conditions for use of a tripping device or a monitoring voltage		—
M.3.2.2/RD	Tripping device		N
M.3.2.3/RD	Monitoring voltage (V) .....:		N

A/RD	Annex A, Tests for resistance to heat and fire		P
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/RD)		N
A.1.1/RD	Samples .....:		—
	Wall thickness (mm) .....:		—
A.1.2/RD	Conditioning of samples; temperature (°C) .:		N
A.1.3/RD	Mounting of samples .....:		N
A.1.4/RD	Test flame (see IEC 60695-11-3)		N
	Flame A, B, C or D .....:		—
A.1.5/RD	Test procedure		N
A.1.6/RD	Compliance criteria		N
	Sample 1 burning time (s) .....:		—
	Sample 2 burning time (s) .....:		—

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Clause	Requirement – Test	Result - Remark	Verdict
	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/RD and 4.7.3.4/RD) Metal material as fire enclosure		P
A.2.1/RD	Samples, material.....:		—
	Wall thickness (mm) .....:		—
A.2.2/RD	Conditioning of samples; temperature (°C) .:		N
A.2.3/RD	Mounting of samples .....:		N
A.2.4/RD	Test flame (see IEC 60695-11-4)		N
	Flame A, B or C .....:		—
A.2.5/RD	Test procedure		N
A.2.6/RD	Compliance criteria		N
	Sample 1 burning time (s) .....:		—
	Sample 2 burning time (s) .....:		—
	Sample 3 burning time (s) .....:		—
A.2.7/RD	Alternative test acc. to IEC 60695-11-5, cl. 5 and 9		N
	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/RD)		N
A.3.1/RD	Mounting of samples		N
A.3.2/RD	Test procedure		N
A.3.3/RD	Compliance criterion		N

B/RD	Annex B, Motor tests under abnormal conditions (see 4.7.2.2/RD and 5.3.2/RD)		P
B.1/RD	General requirements	Approved DC fan used.	P
	Position .....:	AC fans	—
	Manufacturer .....:	AEAOA	—
	Type .....:	SA1238A2HBT	—

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Clause	Requirement – Test	Result - Remark	Verdict
	Rated values .....:	220V-240V 0.09A	—
B.2/RD	Test conditions		N
B.3/RD	Maximum temperatures		N
B.4/RD	Running overload test		N
B.5/RD	Locked-rotor overload test		N
	Test duration (days) .....:		—
	Electric strength test: test voltage (V) .....:		—
B.6/RD	Running overload test for d.c. motors in secondary circuits		N
B.6.1/RD	General		N
B.6.2/RD	Test procedure		N
B.6.3/RD	Alternative test procedure		N
B.6.4/RD	Electric strength test; test voltage (V) .....:		N
B.7/RD	Locked-rotor overload test for d.c. motors in secondary circuits		P
B.7.1/RD	General		P
B.7.2/RD	Test procedure		N
B.7.3/RD	Alternative test procedure		N
B.7.4/RD	Electric strength test; test voltage (V) .....:		N
B.8/RD	Test for motors with capacitors		N
B.9/RD	Test for three-phase motors		N
B.10/RD	Test for series motors		N
	Operating voltage (V) .....:		—

C/RD	Annex C, Transformers (see 1.5.4/RD and 5.3.3/RD)		P
	Position .....:		—
	Manufacturer .....:		—
	Type .....:		—
	Rated values .....:		—
	Method of protection.....:		—

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Clause	Requirement – Test	Result - Remark	Verdict
C.1/RD	Overload test		P
C.2/RD	Insulation		P
	Protection from displacement of windings ....:		P

D/RD	Annex D, Measuring instruments for touch current tests (see 5.1.4/RD)		P
D.1/RD	Measuring instrument	Fig. D.1 used.	P
D.2/RD	Alternative measuring instrument		N

E/RD	Annex E, Temperature rise of a winding (see Annex E/RD)	N

F/RD	Annex F, Measurements of clearances and creepage distance (see 2.10/RD and Annex G/RD)	P

G/RD	Annex G, Alternative method for determining minimum clearances		N
G.1/RD	Clearances		N
G.1.1/RD	General		N
G.1.2/RD	Summary of the procedure for determining minimum clearances		N
G.2/RD	Determination of mains transient voltage (V)		N
G.2.1/RD	AC mains supply .....:		N
G.2.2/RD	Earthed d.c. mains supplies .....:		N
G.2.3/RD	Unearthed d.c. mains supplies .....:		N
G.2.4/RD	Battery operation .....:		N
G.3/RD	Determination of telecommunication network transient voltage (V) .....:		N
G.4/RD	Determination of required withstand voltage (V)		N
G.4.1/RD	Mains transients and internal repetitive peaks :		N
G.4.2/RD	Transients from telecommunication networks .:		N
G.4.3/RD	Combination of transients		N
G.4.4/RD	Transients from cable distribution systems		N
G.5/RD	Measurement of transient voltages (V)		N

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Clause	Requirement – Test	Result - Remark	Verdict
	a) Transients from a mains supply		N
	For an a.c. mains supply		N
	For a d.c. mains supply		N
	b) Transients from a telecommunication network		N
G.6/RD	Determination of minimum clearances .....:		N

H	Annex H, Guidance on protection against ingress of water and foreign objects (see IEC 60529)	N

I	Annex I, Backfeed protection test		P
I.1	General		P
I.2	Test for pluggable UPS		N
I.3	Test for permanently connected UPS		P
I.4	Load-induced change of reference potential		P
I.5	Solid-state backfeed protection (see clause 7.1-7.5 of IEC 62040-2 and clause 7.1-7.2 of IEC 62040-3)		N

J/RD	Annex J, Table of electrochemical potentials (see 2.6.5.6/RD)		N
	Metal(s) used .....:		—

K/RD	Annex K, Thermal controls (see 1.5.3/RD and 5.3.8/RD)		N
K.1/RD	Making and breaking capacity		N
K.2 /RD	Thermostat reliability; operating voltage (V) :		N
K.3/RD	Thermostat endurance test; operating voltage (V) .....:		N
K.4/RD	Temperature limiter endurance; operating voltage (V) .....:		N
K.5/RD	Thermal cut-out reliability		N
K.6/RD	Stability of operation		N

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Clause	Requirement – Test	Result - Remark	Verdict
L	Annex L, Reference loads		P
L.1	General		P
L.2	Reference resistive load	Measured output voltage from online and battery back-up mode is complied with the tolerance specified by manufacturer.	P
L.3	Reference inductive-resistive load		—
L.4	Reference capacitive-resistive loads	Measured output voltage from online and battery back-up mode is complied with the tolerance specified by manufacturer.	P
L.5	Reference non-linear load		N
L.5.1	General		N
L.5.2	Test method		N
L.5.3	Connection of the non-linear reference load		—

M	Annex M, Ventilation of battery compartments		N
M.1	General		N
M.2	Normal conditions		N
M.3	Blocked conditions		N
M.4	Overcharge conditions		N

N	Annex N, Minimum and maximum cross-sections of copper conductors suitable for connection (see 6.3)		N

U/RD	Annex U, Insulated winding wires for use without interleaved insulation (see 2.10.5.4/RD)		N
			—

V/RD	Annex V, AC POWER DISTRIBUTION SYSTEMS (see 1.6.1/RD)		P

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Clause	Requirement – Test	Result - Remark	Verdict
V.1/RD	Introduction		N
V.2/RD	TN power distribution systems		P
V.3/RD	TT power distribution systems		N
V.4/RD	IT power distribution systems		N

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Clause	Requirement – Test	Result - Remark	Verdict
4.6, 1.6.2/RD	TABLE: Electrical Data (in normal conditions)		P

fuse #	I rated (A)	U (V)	P (kW)	I (A)	I fuse (A)	condition/status
10kVA						
--	--	232.28/232.38/232.39	10.043	19.72/19.05/19.16	--	Supply by mains, charging of empty batteries and rated output load
--		280.17/280.22/280.24	10.076	19.87/19.88/19.85	--	Ditto
--	--	179.00/179.09/179.13	9.899	20.68/20.67/20.57	--	Ditto
--	--	371.52	9.797	26.37	--	Supply by battery and rated output load.
--	--	699.59	16.160	26.842	--	Supply by PV module, charging of empty batteries and rated output load
--	--	400.12	16.025	39.851	--	Supply by PV module, charging of empty batteries and rated output load
20kVA						
--	--	220.21/220.12/219.60	19.547	37.562/37.470/36.902	--	Supply by mains, charging of empty batteries and rated output load
--		263.5/263.42/262.91	19.012	38.122/38.653/38.486	--	Ditto
--	--	177.82/177.81/177.41	19.043	43.012/43.101/43.013	--	Ditto
--	--	368.54	20.102	54.396	--	Supply by battery and rated output load.
--	--	700	22.890	32.7	--	Supply by PV module, charging of empty batteries and rated output load
--	--	398	18.825	47.3	--	Supply by PV module, charging of empty batteries and rated output load

Supplementary information: means A/B/C three phase

IEC 62109-1 : 2010			
Clause	Requirement – Test	Result - Remark	Verdict
5.2.1 2.2/RD	**TABLE: Evaluation Of Voltage Limiting Components In SELV Circuits**		N

Component (measured between)	**max. voltage (V) (normal operation)**		**Voltage Limiting Components**
	V peak	**V d.c.**	

Fault test performed on voltage limiting components	**Voltage measured (V) in SELV circuits (V peak or V d.c.)**

Supplementary information: No voltage on secondary side exceeding SELV limits during normal/abnormal operation. No test necessary.

5.2.5 2.5/RD	**TABLE: Limited Power Sources**	N

Circuit output tested:

Note: Measured Uoc (V) with all load circuits disconnected:

Components	**Sample No.**	**Uoc (V)**	**Isc (A)**		**VA**	
			Meas.	**Limit**	**Meas.**	**Limit**

Supplementary information:
Sc=Short circuit, Oc=Open circuit

IEC 62109-1 : 2010			
Clause	Requirement – Test	Result - Remark	Verdict
5.7 2.10.3/RD	**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)
AC circuit to Secondary Circuit near to Opto-coupler U0 Pre –Sec side on PCB of SMPS Power board (RI)	700	420	5.6	6.0	5.6	6.0
DC circuit to GND of Top enclosure (BI)	700	700	10.0	>10.0	10.0	>10.0
AC circuit to Secondary Circuit near to X'FMR Pre –Sec side on PCB of SMPS Power board (RI)	700	420	5.6	12.0	5.6	12.0
AC circuit to Secondary Circuit near to CT Pre –Sec side on PCB of SMPS Power board (RI)	700	420	5.6	9.0	5.6	9.0
AC circuit to Secondary Circuit near to RST terminal Pre –Sec side on PCB of Rectify Power board (RI)	700	420	5.6	10.0	5.6	10.0
AC circuit to Secondary Circuit near to X'FMR T1 Pre –Sec side on PCB of Rectify Power board (RI)	700	420	5.6	8.0	5.6	8.0
AC circuit to Secondary Circuit on PCB of INV Power board (RI)	700	420	5.6	8.0	5.6	8.0
AC circuit to Secondary Circuit near to X'FMR T1 Pre –Sec side on PCB of STS Power board (RI)	700	420	5.6	10.0	5.6	10.0

IEC 62109-1 : 2010						
Clause	Requirement – Test			Result - Remark		Verdict
AC circuit to Secondary Circuit near to X'FMR T1 Pre –Sec side on PCB of IGBT Power board (RI)	**700**	**420**	**5.6**	**10.0**	**5.6**	**10.0**
AC circuit to GND on PCB of Filter board (BI)	**700**	**420**	**2.8**	**7.3**	**2.8**	**7.3**
AC circuit to Secondary Circuit near to X'FMR T1 Pre –Sec side on PCB of IGBT DRIVING board (RI)	**700**	**420**	**5.6**	**9.0**	**5.6**	**9.0**
AC circuit to Secondary Circuit near to Opto-coupler U4,U5 Pre –Sec side on PCB of IGBT DRIVING board (RI)	**700**	**420**	**5.6**	**9.0**	**5.6**	**9.0**
AC circuit to to GND on PCB of IGBT DRIVING board (BI)	**700**	**420**	**2.8**	**5.0**	**2.8**	**5.0**
DC circuit to Secondary Circuit near to Opto-coupler U1-3 Pre –Sec side on PCB of IGBT DRIVING board (RI)	**700**	**700**	**5.6**	**6.8**	**5.6**	**6.8**
DC circuit to Secondary Circuit near to Y CAP Y1 Pre –Sec side on PCB of IGBT DRIVING board (RI)	**700**	**700**	**5.6**	**8.5**	**5.6**	**8.5**
DC circuit to Secondary Circuit near to RS485 Opto-coupler U15,U16 Pre –Sec side on PCB of IGBT DRIVING board (RI)	**700**	**700**	**5.6**	**7.5**	**5.6**	**7.5**
DC circuit to Secondary Circuit near to X'FMR T1 Pre –Sec side on PCB of IGBT DRIVING board (RI)	**700**	**700**	**5.6**	**20.0**	**5.6**	**20.0**
Supplementary information:						

IEC 62109-1 : 2010				
Clause	Requirement – Test	Result - Remark		Verdict
5.7 2.10.5.2/ RD	**TABLE: Distance Through Insulation Measurements**			P
Distance through insulation di at/of:	**U r.m.s. (V)**	**Test voltage (V)**	**Required di (mm)**	**di (mm)**
Opto-coupler for RS485	**450**	**300**	**0.4**	**approved comp.**
Supplementary information:				

7.7 4.5/RD	TABLE: Heating Test								P
Supply voltage (V) ..... :	304V (AC mode)		456V (AC mode)		700Vdc (PV mode)		350Vdc (PV mode)		—
Ambient Tmin (°C) ..... :	26.7	Shift to 40.0	26.7	Shift to 40.0	23.1	Shift to 40.0	28.4	Shift to 40.0	—
Ambient Tmax (°C) ..... :	32.7		32.7		33.0		33.9		—
Maximum measured temperature T of part/at:	T (°C)								Allowed Tmax (°C)
DSP of main control board	61.4	68.7	59.1	70.7	61.3	68.3	61.8	67.9	130
Transformer T1 winding of main control board	52.1	59.4	50.0	61.6	52.2	59.2	52.7	58.8	100
Transformer T2 winding of power board	92.1	99.4	91.4	103	91.2	98.2	91.7	97.8	100
Transformer T2 core of power board	81.8	89.1	80.2	91.8	80.0	87.0	81.0	87.0	100
Transformer T1 winding of power board	61.3	68.6	58.7	70.3	61.7	68.7	62.8	68.9	100
Transformer T1 core of power board	56.6	63.9	53.9	65.5	56.9	63.9	58.4	64.5	100
Fuse F1 of power board	51.2	58.5	49.8	61.4	43.5	50.5	43.9	50.0	90
Rectifier D2 on power board	72.1	79.4	48.2	59.8	58.6	65.6	58.7	64.8	130

IEC 62109-1 : 2010									
Clause	Requirement – Test				Result - Remark				Verdict
Cap C19 on power board	63.2	70.5	60.5	72.1	51.7	58.7	51.9	58.0	85
Transistor Q4 on power board	90.5	97.8	85.8	97.4	80.7	87.7	81.1	87.1	130
Heatsink of Diode D38 on power board	91.9	99.2	90.1	101.7	90.4	97.4	90.7	96.7	130
Heatsink of Diode D41 on power board	76.7	84	74.6	86.2	76.0	83.0	76.8	82.9	130
Winding of A phase inductor	65.8	73.1	60.5	72.1	32.5	39.5	33.3	39.4	165
Winding of B phase inductor	78.4	85.7	73.9	85.5	33.0	40.0	33.7	39.8	165
Core of inductor	77.5	84.8	70.7	82.3	33.9	40.9	34.5	40.6	165
Winding of A phase isolated transformer	119.3	126.6	117.1	128.7	105.9	112.9	106.5	112.5	165
Winding of B phase isolated transformer	127.6	134.9	125.5	137.1	101.0	108.0	101.5	107.5	165
Core of isolated transformer	108.4	115.7	108.2	119.8	98.4	105.4	98.5	104.6	165
Filter capacitor	33.7	41.0	31.5	43.1	34.6	41.6	35.1	41.2	85
X capacitor on filter board	41.7	49.0	38.5	50.1	40.5	47.5	41.2	47.3	85
Enclosure of relay	42.9	50.2	40.5	52.1	42.2	49.2	42.7	48.8	85
Bus cap C73 on Inverter board	40.9	48.2	38.8	50.4	43.2	50.2	43.9	50.0	85
A phase current detector on inverter board	44.2	51.5	41.3	52.9	45.7	52.7	47.0	53.1	85
A phase inverter IGBT top	52.0	59.3	49.1	60.7	53.4	60.4	53.8	59.9	130
A phase inverter IGBT bottom	49.4	56.7	46.5	58.1	50.6	57.6	51.1	57.2	130
heatsink of IGBT	49.1	56.4	46.3	57.9	50.4	57.4	50.9	57.0	130
DC fuse body	59.7	67.0	55.1	66.7	60.3	67.3	61.7	67.7	90
Cap C57 on rectifier board	61.4	61.4	49.5	61.1	43.9	50.9	45.3	51.4	85
Driving transformer T6 winding on rectifier board	63.4	63.4	55.2	66.8	49.8	56.8	50.7	56.8	100
A phase current detector on rectifier board	70.4	70.4	61.8	73.4	50.7	57.7	51.7	57.7	85
DC current detector	55.2	55.2	43.8	55.4	49.1	56.1	49.8	55.9	85
Rectifier SCR	67.8	67.8	57.8	69.4	51.8	58.8	52.3	58.4	130
Inverter SCR	52.3	59.6	49.6	61.2	52.8	59.8	53.5	59.6	130
By pass SCR	50.3	57.6	47.6	59.2	50.9	57.9	51.4	57.5	130
AC input breaker	52.1	59.4	48.2	59.8	35.1	42.1	35.8	41.9	85
output breaker	41.6	48.9	38.8	50.4	39.1	46.1	40.1	46.2	85

IEC 62109-1 : 2010									
Clause	Requirement – Test				Result - Remark				Verdict
PV breaker	**36.9**	**44.2**	**34.3**	**45.9**	**41.1**	**48.1**	**42.2**	**48.2**	**85**
top enclosure	**38.8**	**46.1**	**35.5**	**47.1**	**40.3**	**47.3**	**40.6**	**46.7**	**70**
left enclosure	**38.1**	**45.4**	**35.6**	**47.2**	**39.3**	**46.3**	**39.8**	**45.9**	**70**
right enclosure	**36.4**	**43.7**	**33.5**	**45.1**	**35.8**	**42.8**	**36.3**	**42.4**	**70**
Winding of transformer T1 on PV module	**31.5**	**38.8**	**28.8**	**40.4**	**29.5**	**36.5**	**39.1**	**45.2**	**100**
Cap C49 of PV module	**31.6**	**38.9**	**29.8**	**41.4**	**47.5**	**54.5**	**53.6**	**59.7**	**85**
Inductor L1 of PV module	**31.7**	**39.0**	**30.2**	**41.8**	**62.9**	**69.9**	**98.0**	**104.1**	**165**
IGBT 1 of PV module (Q12)	**31.7**	**39.0**	**29.7**	**41.3**	**89.0**	**96.0**	**100.1**	**106.1**	**130**
IGBT 2 of PV module (Q9)	**31.7**	**39.0**	**29.6**	**41.2**	**64.6**	**71.6**	**101.5**	**107.6**	**130**
heatsink of IGBT 1 of PV module(Q12)	**31.7**	**39.0**	**29.6**	**41.2**	**58.5**	**65.5**	**75.1**	**81.2**	**130**
heatsink of IGBT 2 of PV module(Q9)	**31.8**	**39.1**	**29.8**	**41.4**	**58.7**	**65.7**	**75.6**	**81.6**	**130**
Cap C47	**32.0**	**39.3**	**30.5**	**42.1**	**39.4**	**46.4**	**50.9**	**57.0**	**85**
Enclosure of Relay RLY1	**33.0**	**40.3**	**31.1**	**42.7**	**54.1**	**61.1**	**88.2**	**94.3**	**130**
Enclosure of Relay RLY2	**32.0**	**39.3**	**29.8**	**41.4**	**44.5**	**51.5**	**68.6**	**74.7**	**130**
panel	**34.4**	**41.7**	**32.3**	**43.9**	**35.6**	**42.6**	**36.0**	**42.0**	**80**
Cabinet of PV module	**32.6**	**39.9**	**29.8**	**41.4**	**36.0**	**43.0**	**36.6**	**42.7**	**70**
ambient	**32.7**	**40.0**	**28.4**	**40**	**33.0**	**40.0**	**33.9**	**40.0**	**--**

Supplementary information: regarding the condition of batteries input , please refer to other test condition as the batteries input is directly enter to bus capacitor just thought contactor

1. Tma is 40°C;

2. Test on model 20kVA

Temperature T of winding:	**t_1 (°C)**	**R_1 (Ω)**	**t_2 (°C)**	**R_2 (Ω)**	**T (°C)**	**Allowed T_{max} (°C)**	**Insulation class**

Supplementary information:

IEC 62109-1 : 2010			
Clause	Requirement – Test	Result - Remark	Verdict
7.4 4.5.5/RD	**TABLE: Ball Pressure Test of Thermoplastics**		**N**
Allowed impression diameter (mm) .....:			**—**
Part	**Test temperature (°C)**	**Impression diameter (mm)**	
Supplementary information:			

5.7 **2.10.5**	**TABLE: Dielectric Strength**		**P**
Test voltage applied between:	**Test potential applied (V)**	**Breakdown / flashover (Yes/No)**	
DC input to Ground	**2120V d.c.**	**No**	
DC input to ungrouded assesposible part	**4240V d.c.**	**No**	
AC output to ground	**2120V d.c.**	**No**	
AC output to ungrouded assesposible part	**4240V d.c.**	**No**	
Supplementary information: the test is conducted under 10K and 20K separately.			

7.5 **4.7/RD**	**TABLE: Resistance to fire**				**N**
Part	**Manufacturer of material**	**Type of material**	**Thickness (mm)**	**Flammability class**	**Evidence**
Supplementary information:					

IEC 62109-1 : 2010			
Clause	Requirement – Test	Result - Remark	Verdict
8.3 5.3/RD	**TABLE: Fault condition tests**		**P**
	Ambient temperature (°C) .....:	**24.8**	**—**
	Power source for EUT: Manufacturer, model/type, output rating .....:	**--**	**—**

Com-ponent No.	Fault	Supply voltage (V)	Test time	Fuse #	Fuse current (A)	Observation
Output	**Shorted-circuit**	**I/P: 360Vdc O/P: 380Vac**	**1S**	**----**	**----**	**EUT shut down immediately. No display due to system shun down. warning signal light is on and message" over-current problem" displayed on the panel. No component damaged, once the short-circuit resume, EUT is worked normally. No hazards.**
Output	**overload**	**I/P: 360Vdc O/P: 380Vac**	**1S**	**----**	**----**	**EUT shut down immediately. 200% overload ; warning signal light is flashed and message" output overload problem" displayed on the panel. No component damaged, once the problem resume, EUT is worked normally. No hazards.**
Ventilation hole	**Blocked**	**I/P: 360Vdc O/P: 380Vac**	**30 min**	**----**	**----**	**EUT limit output when temperature of thermal detector rised to 85℃. warning signal light is on and message" high temperature problem" displayed on the panel. No component damaged, once the problem resume, EUT is worked normally， No hazards.**
Fan	**Blocked**	**I/P: 360Vdc O/P: 380Vac**	**30 min**	**----**	**----**	**Warning signal light is flashed and message" Fan problem" displayed on the panel. No component damaged,No hazards.**
batteries	**Reverse**	**I/P: 360Vdc O/P: 380Vac**	**1S**	**----**	**----**	**EUT shut down immediately. Contactor is opened, aux power supply is not worked， Soft start component is overheat, No hazards**

IEC 62109-1 : 2010						
Clause	Requirement – Test			Result - Remark		Verdict
Input	**Reverse**	**I/P: 360Vdc O/P: 380Vac**	**5 min**	**----**	**----**	**Unit can n't start. warning signal light is fiashed and message" phase error" displayed on the panel. once the problem resume, EUT is worked normally，No hazards**
Manual by pass AC switch	**Mis-match**	**I/P: 360Vdc O/P: 380Vac**	**5 min**	**----**	**----**	**EUT under PV mode, Manual by pass AC switch can not power on due to mechanical lock, only operated by professional person.**
Manual by pass maintance switch	**Mis-match**	**I/P: 360Vdc O/P: 380Vac**	**5 min**	**----**	**----**	**EUT under PV mode, Manual by pass maintance switch can not power on due to mechanical lock, only operated by professional person**
Display board						
power supply+5 /485 C223	**Shorted-circuit**	**I/P: 360Vdc O/P: 380Vac**	**2min**	**----**	**----**	**Diode D30 is smoking , the second winding of transformer T1 is short-circuit, no 5V power supply for RS485 No hazards.**
power supply+5 /monitor C267	**Shorted-circuit**	**I/P: 360Vdc O/P: 380Vac**	**2min**	**----**	**----**	**Diode 36 damaged,The Primary winding of transformer T1 is short-circuit, no 5V power supply for minitor,No hazards.**
power supply+12 /com C261	**Shorted-circuit**	**I/P: 360Vdc O/P: 380Vac**	**2min**	**----**	**----**	**Diode D34 damaged, indicating light for LED1、LED2、LED3、D15、D16、D17 are power off ,monitor circuit does not work, no hazards.**
Q10 D and C	**Shorted-circuit**	**I/P: 360Vdc O/P: 380Vac**	**2min**	**F1**	**2A**	**F1 fuse opened. All light are power off.monitor circuit does not work, no hazards.**
Power board						
C19	**Shorted-circuit**	**I/P: 360Vdc O/P: 380Vac**	**2min**	**----**	**----**	**EUT shut down immediately, C20 damaged, aux power supply does not work. No hazards .**
Q1 C and E	**Shorted-circuit**	**I/P: 360Vdc O/P: 380Vac**	**2min**	**----**	**----**	**EUT shut down immediately, D25 light is off, aux power supply does not work. No hazards .**

IEC 62109-1 : 2010						
Clause	Requirement – Test			Result - Remark		Verdict
Q3 C and E	**Shorted-circuit**	**I/P: 360Vdc O/P: 380Vac**	**2min**	**----**	**----**	**EUT shut down immediately, D25 light is off, aux power supply does not work. No hazards .**
C43 -15V	**Shorted-circuit**	**I/P: 360Vdc O/P: 380Vac**	**2min**	**----**	**----**	**EUT shut down immediately, Diode D36 damaged, aux power supply -15V does not output. No hazards .**
D36	**Shorted-circuit**	**I/P: 360Vdc O/P: 380Vac**	**2min**	**----**	**----**	**EUT shut down immediately, aux power supply -15V does not output. No hazards.**
EA89Ⅱ IGBT driving board						
C4	**Shorted-circuit**	**/P: 360Vdc O/P: 380Vac**	**2min**	**----**	**----**	**EUT shut down immediately, with "IGBI over current" on the panel, warning light is on, No hazards .**
Sampling board						
INV Voltage sample Resistor R159	**Shorted-circuit**	**I/P: 350Vdc O/P: 230Vac**	**2min**	**----**	**----**	**Wrong voltage display on the panel, still work normally.**
INV Voltage sample Resistor R159	**Open-circuit**	**I/P: 350Vdc O/P: 230Vac**	**2min**	**----**	**----**	**EUT shut down immediately, SCR circuit shu down,No hazards .**
Current sample signal C4	**Shorted-circuit**	**I/P: 350Vdc O/P: 230Vac**	**2min**	**----**	**----**	**Wrong current display on the panel, still work normally.**
Current sample signal C4	**Open-circuit**	**I/P: 350Vdc O/P: 230Vac**	**2min**	**----**	**----**	**Wrong current display on the panel, still work normally.**
BYP Voltage sample Resistor R164	**Shorted-circuit**	**I/P: 350Vdc O/P: 230Vac**	**2min**	**----**	**----**	**EUT cannot start, with "wrong voltage problem" on the panel, No hazards .**
BYP Voltage sample Resistor R164	**Open-circuit**	**I/P: 350Vdc O/P: 230Vac**	**2min**	**----**	**----**	**EUT cannot start, with "wrong voltage problem" on the panel, No hazards .**

IEC 62109-1 : 2010						
Clause	Requirement – Test			Result - Remark		Verdict
OUT Voltage sample Resistor R167	**Shorted-circuit**	**I/P: 350Vdc O/P: 230Vac**	**2min**	**----**	**----**	**EUT does work normally.**
OUT Voltage sample Resistor R167	**Open-circuit**	**I/P: 350Vdc O/P: 230Vac**	**2min**	**----**	**----**	**EUT shut down immediately, with "Mosffet problem" on the panel, No hazards .**
PV voltage resistor	**Shorted-circuit**	**I/P: 350Vdc O/P: 230Vac**	**2min**	**----**	**----**	**Wrong PV voltage display on the panel, still work normally.**
PV voltage resistor	**Open-circuit**	**I/P: 350Vdc O/P: 230Vac**	**2min**	**----**	**----**	**EUT shut down immediately, with "PV wrong voltage problem" on the panel, No hazards**
PV current	**Shorted-circuit**	**I/P: 350Vdc O/P: 230Vac**	**2min**	**----**	**----**	**Wrong PV current display on the panel, still work normally.**
PV current	**Open-circuit**	**I/P: 350Vdc O/P: 230Vac**	**2min**	**----**	**----**	**EUT MPPT modem shut down immediately, with "PV wrong current problem" on the panel, No hazards**
Main circuit						
Contactor signal	**misfunction**		**2min**	**----**	**----**	**EUT MPPT modem shut down immediately, relay is opened with warning light flashing,No hazards**
IGBT D and S	**Shorted-circuit**	**I/P: 350Vdc O/P: 230Vac**	**2min**	**----**	**----**	**EUT shut down immediately, with "IGBI over current" on the panel, warning light is on, No hazards .**
SCR3 C and E	**Shorted-circuit**	**I/P: 350Vdc O/P: 230Vac**	**2min**	**----**	**----**	**EUT shut down immediately, with "rectify circuit problem " on the panel, warning light is on, No hazards .**
PWM1 Q1 C and E	**Shorted-circuit**	**I/P: 350Vdc O/P: 230Vac**	**2min**	**----**	**----**	**EUT shut down immediately, with "rectify circuit problem " on the panel, warning light is on, No hazards**
PWM1 Q1 C and G	**Shorted-circuit**	**I/P: 350Vdc O/P: 230Vac**	**2min**	**----**	**----**	**EUT shut down immediately, with "rectify circuit problem " on the panel, warning light is on, No hazards y**
Supplementary information: Test on model 20kVA.						

IEC 62109-1 : 2010			
Clause	Requirement – Test	Result - Remark	Verdict

4.5	TABLE: Critical components information				P
Object / part No	**Manufacturer/ trademark**	**Type / model**	**Technical data**	**Standard**	**Mark(s) of Conformity**
Optical-couplers	**LITE-ON TECHNOLOGY CORP**	**LTV-816S-TA1**	**CTR200~400-tp6/6uS-5000Vac-GW4**	**UL1577**	**E113898**
Optical-couplers	**LITE-ON TECHNOLOGY CORP**	**LTV-356T**	**50mA,6V,50% ～600%,80V,170mW,-55℃～110**	**UL1577**	**E113898**
Optical-couplers	**AVAGO TECHNOLOGIES PTE LTD**	**HCPL-316J-500E**	**Double protection optical isolators having an isolation voltage of 3750 Vac**	**UL1577**	**E55361**
Metalized Film Capacitor	**Xiamen Faratronic Co. Ltd.**	**C43Q1224MB0C400**	**Y2,300VAC,0.22uF±20%**	**UL60384-14**	**E186600**
CAP safety	**Xiamen Faratronic Co. Ltd.**	**C42P2225KBSC400**	**X1,275VAC,2.2uF,±10%**	**UL60384-14**	**E186600**
CAP safety	**Xiamen Faratronic Co. Ltd.**	**C43Q1223M61C000**	**MKP,Y2X1,300V,22n,20%**	**UL60384-14**	**E186600**
CAP safety	**Shenzhen Surong Capacitors Co. Ltd.**	**MP2474K3E4G0-A**	**X2 280V 474K(±10%)**	**UL60384-14**	**E314875**
Isolated Transformer（for AUX.POWER）	**SHENZHEN FERROCOIL ELECTRONICS TECHNOLOGY CO.,LTD**	**E3HPPT2**	**22:22:22,300uH**	**Applicable parts of EN62040**	**Tested with appliance**
--Bobbin	**CHANG CHUN PLASTICS CO.,LTD OR EQU**	**PHENOLIC T375J**	**94v-0**	**UL94**	**E59481**
--Ferrite Core Eel-16	**HENGDIAN GROUP DMEGC MAGNETICS**	**DMR40**	**--**	**--**	**--**

IEC 62109-1 : 2010					
Clause	Requirement – Test		Result - Remark		Verdict
	CO.,LTD				
	LINGTONG	LP4	--	--	--
--Wire	PACIFIC ELECTRIC WIRE & CABLE CO.,LTD	POLYURETHANE ENAMELED TYPE NO.: UEW/U	THERMAL RATING: 130℃	UL1446	E201757
--Mylar Tape	SHENGDAFENG ELECTRONICS CO.,LTD	ADHESIVE POLYESTER TYPE NO.: PZ	TAPE 0.025mm THERMAL RATING: 130℃	UL510	E317896
--Varnish	HANG CHEUNG PETROCHEMICAL LTD	TYPE: 8562/C	THERMAL RATING: 155℃	UL1446	E200154
--Tube	FLUO TECH INDUCTRIES CO LTD	TEFLON TUBE THERMAL RATING 200℃	MAX. OPER TEMP: 200℃	UL224	E175982
--Margin Tape	JINGJIANG PRESSURE SENSITIVE GLUE FTY	NONWOVEN CLOTH TYPE NO.:WF	THERMAL RATING 130℃	UL510	E165111
Isolated Transformer（for IGBT-DR）	JEPULS TECHNOLOGY (SHENZHEN) CO.,LTD	BCK1301-064	EA66 Ⅱ -IGBT_DRV TX	Applicable parts of EN62040	Tested with appliance
--Bobbin	CHANG CHUAN PLASTICS CO.,LTD.	Phenolic T375J	94v-0	UL94	E59481(S)
--Ferrite Core	LIANFENG	EPC13 NH2B	--	--	--
	DONGYAN	EPC13 HE4	--	--	--
	DONGYAN	EPC13 KP4	--	--	--

IEC 62109-1 : 2010					
Clause	Requirement – Test			Result - Remark	Verdict
--Wire	SHEN ZHEN CITY CHENG WEI INDUSTRY CO.,LTD	POLYURETHANE ENAMELED TYPE NO.: 2UEW	THERMAL RATING: 130℃	UL1446	E227475
	SHEN ZHEN FENG CHING METAL CORP			UL1446	E172395
--Mylar Tape	JINGJIANG PRESSURE SENSITIVE GLUE FTY	Polyester Tape Type:CT-280	RATING THERMAL:130℃	UL510	E165111
--Varnish	HANG CHEUNG CO.	Type NO.:8562E		UL1446	E180908
--Tube	SHENZHEN CHANGYUAN ELECTRONIC MATERIAL CO.,LTD	Teflon TFL 200℃		UL224	E180908
--Margin Tape	JINGJIANG PRESSURE SENSITIVE GLUE FTY	Nonwoven Cloth Type: WF	RATING THERMAL:130℃	UL510	E165111
Isolated Transformer（for AUX.POWER）	SHENZHEN FERROCOIL ELECTRONICS TECHNOLOGY CO.,LTD	ER42 Transformer	EA200T1-23:23:6:3:5:5:8-700uH	Applicable parts of EN62040	Tested with appliance
--Bobbin	CHANG CHUN PLASTICS CO.,LTD	PHENLIC T375J	94v-0	UL 94	E59481(S)
--Ferrite Core ER42	HENGDIAN GROUP DMEGC MAGNETICS CO.,LTD	DMR40	ER42	--	--
	TONGDA	TD4		--	--

IEC 62109-1 : 2010					
Clause	Requirement – Test		Result - Remark		Verdict
--Wire	PACIFIC ELECTRIC WIRE & CABLE CO.,LTD	POLYURETHANE ENAMELED WIRE TYPE: UEW-U	THERMAL RATING 130℃	UL1446	E201757(S)
--Mylar Tape	JEPULS PRESSURE SENDITIVE GLUE FTY	TYPE NO.:PZ	THERMAL RATING 130℃ ADHESIVE POLYESTER TAPE 0.025mm	UL510	E165111(N)
--Varnish	HANG CHEUNG PETROCHEMICAL LTD	TYPE: 8562/C		UL1446	E200154
--Tube	FLUO TECH INDUSTRIES CO.,LTD	TEFLON TUBE		UL224	E175982(S)
--Margin Tape	JEPULS PRESSURE SENDITIVE GLUE FTY	NONWOVEN CLOTH NO.:WF		UL510	E165111(N)
--EPOXY	SHAW HUOW	9001A/B		UL94	E105888(S)
Isolated output Transformer （for 20kVA）	Guang Hua Industrial Co., Ltd.	EA89II-20K-3/3-1, 187-220,20kVA ,AL C.B1.0620300	Input 187VAC CLASS H output 220VAC	Applicable parts of EN62040	Tested with appliance
--wire	DONGGUAN XINLONG VARNISHED WIRE CO LTD	Primary coil-Aluminum enamelled wire- Φ 2.6mm; Secondary	Material Designation:xUEWF(AL) ; ANSI/Conductor Type : Al ; Temp Class：180	UL1446	E171082

IEC 62109-1 : 2010					
Clause	Requirement – Test		Result - Remark		Verdict
		coil-Aluminum enamelled wire -Φ2.4mm			
	YICHUN DEYUANXINMAO ALUMINIUM INDUSTRY CO LTD		Material Designation:xUEWH(AL), QAL-x/180; ANSI/Conductor Type：Al;	UL1446	E347038
--insulating paper	GUANGZHOU BETTER NEW MATERIALS CO., LTD	System Component ：NMN, NHN, YMY, BETTER 116	System Temp Class:180(H); thickness ：0.13mm;0.25mm	UL510	UL:E316816
	ZHUZHOU TIMES ELECTRIC INSULATION CO., LTD	Laminate Designation:TJ6630 DMD	System Temp Class:180(H); thickness ：0.13mm;0.25mm	UL510	UL:E355960
--Core	Shanghai Baosteel Group	B50A470 Thickness 0.5mm	300-340-115	--	--
--Varnish	ZHUZHOU TIMES ELECTRIC INSULATION CO LTD	TJ11	Twisted Pair：180	UL1446	UL:E235491
--Temperature switch	THERMIK GERAETEBAU GMBH	C06.155.05-XXXX	160±5℃ 250V/2.5A	IEC60730	VDE:4002228
	GUANGZHOU DE WAN ELECTRICAL EQUIPMENT CO LTD	T11-U	160 ± 5 ℃ 250V/2.5A	IEC60730	VDE:4000120
--Tube	DONGGUAN YONGCHAO INSULATION MATERIAL CO	YC-15-25-40-70	200℃ 4KV	UL224	UL:E325767

IEC 62109-1 : 2010					
Clause	Requirement – Test		Result - Remark		Verdict
	LTD				
Isolated Output Transformer （for 10kVA）	Guang Hua Industrial Co., Ltd.	EA89II-20K,187 : 220,20kVA,ALC.B1.EA89800	Input 187VAC CLASS H output 220VAC	Applicable parts of EN62040	Tested with appliance
--wire	DONGGUAN XINLONG VARNISHED WIRE CO LTD	Primary coil-Aluminum enamelled wire -Φ1.9mm; Secondary coil-Aluminum enamelled wire -Φ1.8mm	Material Designation:xUEWF(AL) ; ANSI/Conductor Type : Al ; Temp Class：180	UL1446	UL : E171082
	YICHUN DEYUANXINMAO ALUMINIUM INDUSTRY CO LTD		Material Designation:xUEWH(AL), QAL-x/180; ANSI/Conductor Type：Al;	UL1446	UL : E347038
--insulating paper	GUANGZHOU BETTER NEW MATERIALS CO., LTD	System Component : NMN, NHN, YMY, BETTER 116	System Temp Class:180(H); thickness : 0.13mm;0.25mm	UL510	UL:E316816
	ZHUZHOU TIMES ELECTRIC INSULATION CO., LTD	Laminate Designation:TJ6630 DMD	System Temp Class:180(H); thickness : 0.13mm;0.25mm	UL510	UL:E355960
--Core	Shanghai Baosteel Group	B50A470 Thickness 0.5mm	300-335-80	--	--
--Varnish	ZHUZHOU TIMES ELECTRIC INSULATION CO LTD	TJ11	Twisted Pair：180	UL1446	UL:E235491

IEC 62109-1 : 2010			
Clause	Requirement – Test	Result - Remark	Verdict

Reactor(for 20kVA)	**Guang Hua Industrial Co., Ltd.**	**EA89-20K,3mH, +/-10%,40A; C.L0.EA89200**	**CLASS H**	**Applicable parts of EN62040**	**Tested with appliance**
--wire	**SHANGHAI YOUTUO MAGNET WIRE CO LTD**	**coil-Aluminum enamelled wire -3*7mm;**	**Material Designation: xEI / AIW @，Q（ZY / XY）@ -x ; ANSI/Conductor Type：Al; Temp Class : 180(#)**	**UL1446**	**UL:E338133**
--insulating paper	**GUANGZHOU BETTER NEW MATERIALS CO., LTD**	**System Component : NMN, NHN, YMY, BETTER 116**	**System Temp Class:180(H); thickness : 0.13mm;0.25mm**	**UL510**	**UL:E316816**
	ZHUZHOU TIMES ELECTRIC INSULATION CO., LTD	**Laminate Designation:TJ6630 DMD**	**System Temp Class:180(H); thickness : 0.13mm;0.25mm**	**UL510**	**UL:E355960**
--Core	**Shanghai Baosteel Group**	**B50A470 Thickness 0.5mm**	**230-198-65**	**--**	**--**
--Varnish	**ZHUZHOU TIMES ELECTRIC INSULATION CO LTD**	**TJ11**	**Twisted Pair: 180**	**UL1446**	**UL:E235491**
--Temperature switch	**THERMIK GERAETEBAU GMBH**	**C06.155.05-XXXX**	**160±5℃ 250V/2.5A**	**EN60730**	**VDE:4002228**
	GUANGZHOU DE WAN ELECTRICAL EQUIPMENT CO	**T11-U**	**160 ± 5 ℃ 250V/2.5A**		**VDE:4000120**

IEC 62109-1 : 2010					
Clause	Requirement – Test		Result - Remark		Verdict
	LTD				
--Tube	DONGGUAN YONGCHAO INSULATION MATERIAL CO LTD	YC-15-25-40-70	200℃ 4KV	UL224	UL:E325767
Reactor(for 20kVA)	Guang Hua Industrial Co., Ltd.	EA89-10K,6mH, +/-10%,20A; C.L0.EA89010	CLASS H	Applicable parts of EN62040	Tested with appliance
--wire	SHANGHAI YOUTUO MAGNET WIRE CO LTD	coil-Aluminum enamelled wire -2*5mm;	Material Designation: xEI / AIW @，Q（ZY / XY）@ -x ; ANSI/Conductor Type：Al; Temp Class : 180(#)	UL1446	UL:E338133
--insulating paper	GUANGZHOU BETTER NEW MATERIALS CO., LTD	System Component : NMN, NHN, YMY, BETTER 116	System Temp Class:180(H); thickness : 0.13mm;0.25mm	UL510	UL:E316816
	ZHUZHOU TIMES ELECTRIC INSULATION CO., LTD	Laminate Designation:TJ6630 DMD	System Temp Class:180(H); thickness : 0.13mm;0.25mm	UL510	UL:E355960
--Core	Shanghai Baosteel Group	B50A470 Thickness 0.5mm	230-170-45	--	--
--Varnish	ZHUZHOU TIMES ELECTRIC INSULATION CO LTD	TJ11	Twisted Pair：180	UL1446	UL:E235491

IEC 62109-1 : 2010					
Clause	Requirement – Test		Result - Remark		Verdict
--Temperature switch	THERMIK GERAETEBAU GMBH	C06.155.05-XXXX	160±5℃ 250V/2.5A	IEC60730	VDE:4002228
	GUANGZHOU DE WAN ELECTRICAL EQUIPMENT CO LTD	T11-U	160 ± 5 ℃ 250V/2.5A	IEC60730	VDE:4000120
--Tube	DONGGUAN YONGCHAO INSULATION MATERIAL CO LTD	YC-15-25-40-70	200℃ 4KV	UL510	UL:E325767
--Temperature switch	THERMIK GERAETEBAU GMBH	C06.155.05-XXXX	160±5℃ 250V/2.5A	IEC60730	VDE:4002228
	GUANGZHOU DE WAN ELECTRICAL EQUIPMENT CO LTD	T11-U	160 ± 5 ℃ 250V/2.5A	IEC60730	VDE:4000120
--Tube	DONGGUAN YONGCHAO INSULATION MATERIAL CO LTD	YC-15-25-40-70	200℃ 4KV	UL224	UL:E325767
Contactor (for 10kVA)	SHANGHAI LIANGXIN ELECTRICAL CO., LTD	NDC1(Z)-1210	12A/3P,Ith=25A, DC24V	IEC 60947-4 IEC60947-5	TUV: B150783574102
Contactor (for 20kVA)	SHANGHAI LIANGXIN ELECTRICAL CO., LTD	NDC1(Z)-1810	18A/3P,Ith=32A, DC24V	IEC 60947-4 IEC60947-5	TUV: AN50205110
Breaker(Cold start)	PEOPLE ELECTRICAL	DZ47-63	1P ,type C,16A Ics=Icn:6000A	IEC 60898-1	CQC: 2002010307

IEC 62109-1 : 2010					
Clause	Requirement – Test		Result - Remark		Verdict
	APPLIANCES GROUP CO., LTD				**012494**
Breaker(Cold start)	**SHANGHAI LIANGXIN ELECTRICAL CO., LTD**	**NDM1A-63**	**1P ,type C,16A Ics=Icn:6000A**	**IEC 60898-1**	**TUV: R50150384**
Breaker (for 10kVA:Bypass, Output)	**ZHEJIANG CHNT ELECTRICS CO., LTD**	**DZ47-60**	**3P , type C ,32A Ics=Icn:6000A**	**IEC 60898-1**	**CQC: 2002010307 005876**
Breaker (for 10kVA:Bypass, Output)	**SHANGHAI LIANGXIN ELECTRICAL CO., LTD**	**NDM1A-63**	**3P , type C ,32A Ics=Icn:6000A**	**IEC 60898-1**	**TUV: R50150384**
Breaker (for 20kVA :Bypass ,Output)	**ZHEJIANG CHNT ELECTRICS CO., LTD**	**DZ47-60**	**3P , type C ,50A Ics=Icn:4000A**	**IEC 60898-1**	**CQC: 2002010307 005876**
Breaker (for 20kVA :Bypass ,Output)	**SHANGHAI LIANGXIN ELECTRICAL CO., LTD**	**NDM1A-63**	**3P , type C ,50A Ics=Icn:4500A**	**IEC 60898-1**	**TUV: R50150384**
Breaker (for 10kVA: Input)	**ZHEJIANG CHNT ELECTRICS CO., LTD**	**DZ158-125**	**3P , type C ,80A Ics=Icn:6000A**	**IEC6094 7-2**	**CQC: 2002010307 005877**
Breaker (for 10kVA: Input)	**SHANGHAI LIANGXIN ELECTRICAL CO., LTD**	**NDM1A-125**	**3P , type C ,80A Ics=Icn:7500A**	**IEC6094 7-2**	**TUV: R50349722**
Breaker (for 20kVA: Input)	**ZHEJIANG CHNT ELECTRICS CO., LTD**	**DZ158-125**	**3P , type C ,100A Ics=Icn:6000A**	**IEC6094 7-2**	**CQC: 2002010307 005877**
Breaker (for 20kVA: Input)	**SHANGHAI LIANGXIN ELECTRICAL CO.,**	**NDM1A-125**	**3P , type C ,100A Ics=Icn:7500A**	**IEC6094 7-2**	**TUV: R50349722**

IEC 62109-1 : 2010					
Clause	Requirement – Test		Result - Remark		Verdict
	LTD				
Breaker （PV input）	SHANGHAI LIANGXIN ELECTRICAL CO., LTD	NDB2Z-63	2P type C ,63A Ics=Icn:6000A	NDT500324	TUV: AN50226324
Fuse (for 10kVA)	Mingrong Electrical Proterction Co.,ltd	Φ 16.5*49.5 mm	RGS4,690V,35A,	IEC 60269-4	CQC CB Certif. No.:CN30196
Fuse (for 20kVA)	Mingrong Electrical Proterction Co.,ltd	Φ16.5*63mm	RGS4,63A,690V,	IEC 60269-4	CQC CB Certif. No.:CN30196
Relay of PV module	SHORI Electric Co., Ltd	S16-12-1AP	12VDC,1A,14VDC,80A	Applicable parts of EN62040	Tested with appliance
AC FAN	AEAOA	AC AXIAL FAN	SA1238A2HBT 220V-240V 0.09A	EN60335-2-80 EN60335-1	TUV: R50250076
DC fan	PELKO Motors	R1238Y24BPCB1-7	DC24V,0.85A	EN60335-2-80 EN60335-1	TUV B050955369
IGBT	STARPOWER	GD50HFK60C1S	Vce=600V Ic=50A Vcesat=1.95V Tvjmax 175℃	--	--
SCR	SEMIKRON	SKKT 57/16 E G6	1600V/57A	UL1557	UL E63532
hall effect	Nanjing Chieful	CS100B	100A	Q/3201C	--

IEC 62109-1 : 2010					
Clause	Requirement – Test		Result - Remark		Verdict
sensor	Science & Technology CO.,LTD		4V	HGL02-2007	
Capacitor	HUNAN AIHUA GROUP CO.,LTD	ELH2WM471 R50TC	450VDC/470UF	--	--
PCB	BAOYUEJIA ELECTRONICS CO LTD	Various	130℃ V-0	UL94	UL: E230225
PCB	HUIZHOU TRUSTWIN ELECTRONICS DEVELOPMENT CO LTD	Various	130℃ V-0	UL94	UL: E340729
PCB	KEMBLE ELECTRONICS LTD	Various	130℃ V-0	UL94	UL : E64353
hall effect sensor of PV module	Nanjing Chieful Science & Technology CO.,LTD	sensor CSM050SY	50A ,4V	Q/320115 QHKJ01 -2013	--
Hyperfast Diode of PV module	FAIRCHILD	RHRG30120	1200V,30A,TO-247	--	--
Diodes Module of PV module	IXYS	DSEP60-06A	600V/60A,1.39V/ 35nS,TO-247AD	--	--
IGBT of PV module	FAIRCHILD	SGL50N60RUFDTU	600V/80A,TO-264	--	--
Transformer of PV module	BO LUO DA XIN ELECTRONICS CO.,LTD	EI33	64:12:5:12:8:7,100W，1.0mH	Applicable parts of EN62040	Tested with appliance
--BOBBIN	CHANG CHUN PLASTICS CO.,LTD	PHENOLIC T375HF EI-33 (PIN6+6)	150℃	UL94	UL：E59481

IEC 62109-1 : 2010					
Clause	Requirement – Test		Result - Remark		Verdict
--CORE	RUYUAN DONGYANGGUANG MAGNETIC MATERIAL CO.,LTD	FERRITE HE4 (GAP)	--	--	--
--COPPER WIRE	HUIZHOU GOLDEN OCEAN MAGNET WIRE FACTORY	UEW-X# MW75	130℃	UL1446	UL : E225143
	HOI LUEN ELECTRICALMFR CO.,LTD	XUEW MW75	130℃	UL1446	UL : E164409
--TAPE	JINGJIANG YA HUA PRESSURE SENSITIVE GLUE	MYLAR TAPE	130℃	UL510	UL: E165111
--MARGIN TAPE	JINGJIANG YA HUA PRESSURE SENSITIVE GLUE CO.,LTD	NONWOVEN CLOTH TAPE(WF-2902)	130℃	UL510	UL: E165111
--BUSHING	SHEN ZHENWOER HEAT SHRINKABLE MATERIAL CO.,LTD	TEFLON/WF	200℃	UL226	UL : E203950
--VARNISH	WU JIANG TAIHU INSULATING MATERIAL CO LTD	T-4260(a)	130℃	UL1446	UL : E228349
Inductor of PV module	YUYUAN ELECTRICAL CO.,LTD	DSP-INV.LT250-34	265uH ± 10% 50TS Φ 2.0mm*2P	--	--
--CORE	DMEGC or MICROMETALS	IRON CORE	T250-34	--	--
--WIRE	P.E.W.C.CO.LTD	PEW H	180℃	UL1446	UL :

IEC 62109-1 : 2010					
Clause	Requirement – Test		Result - Remark		Verdict
					E201757
--VARNISH	P D GEORGE/VIKING OR EQUIVALENCE	F8033-2 V1630 FS	F8033-2 V1630 FS	UL1446	UL：E73071
--BASE	PANYU TIANYU OR EQUIVALENCE	PBT 301-G20	UL94V-0	UL94	UL ： E152735
--EPOXY	DONGGUAN EATTO ELECTRONIC MATERIAL CO LTD	3300A/B-1	UL94V-0	UL94	UL ： E218090
Capacitor of PV module	HUNAN AIHUA GROUP CO.,LTD	LH	500V 820uF M(+/-20%) Φ 35*80 P(K)=10mm -25℃～+105℃	CRS-2014-LH / 01	--
Heatsink	Shenzhen HuashengYuan Electrical Co.,Ltd		Metal Size: 270mmx80mmx62 0mm	--	--
Heatsink of PV module	EAST GROUP CO,.LTD		Metal Size: 112mmx57mmx78mm	--	--
PV Enclosure	EAST GROUP CO,.LTD		Metal Size: 450mmx840mmx1 100mm	--	--
Supplementary information:					

Photo document

Photo 1 Front view

Photo 2 Side view

Photo document

Photo 3 Side view

Photo 4 Back view

Photo document

Photo 5 Inside instruction(right side)

Photo 6 Inside instruction(left side)

Photo document

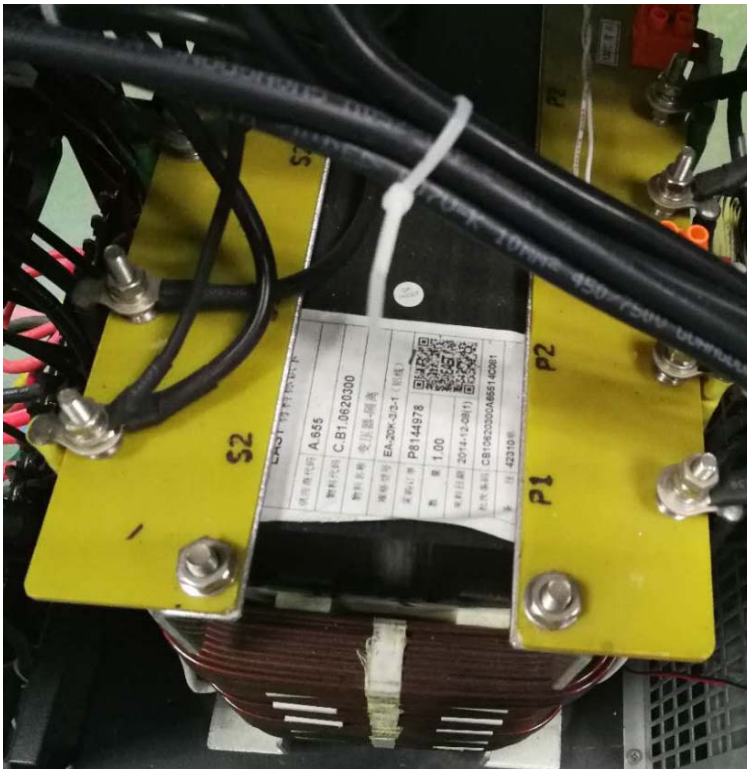

Photo 7 Main isolated transformer

Photo 8 reactor

Photo document

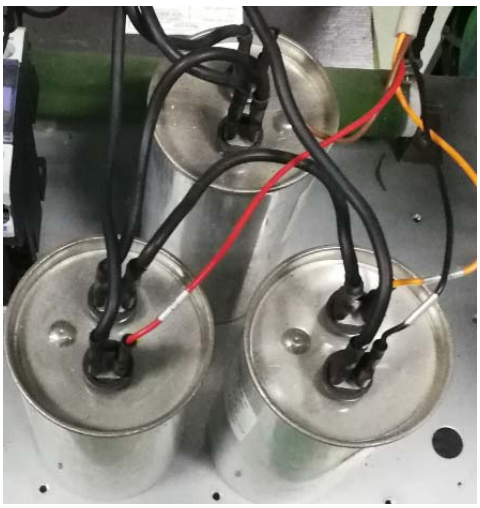

Photo 9 Bus capacitor

Photo 10 I/O board front view

Photo document

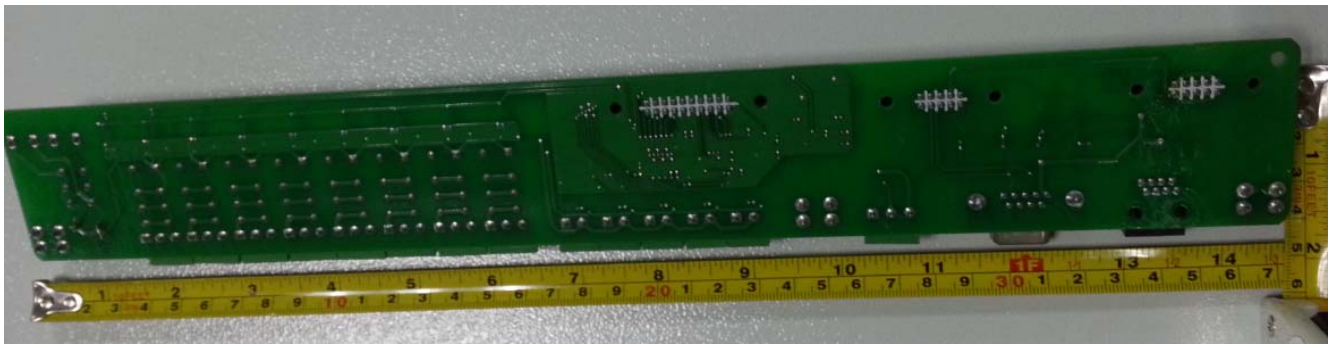

Photo 11 I/O board back view

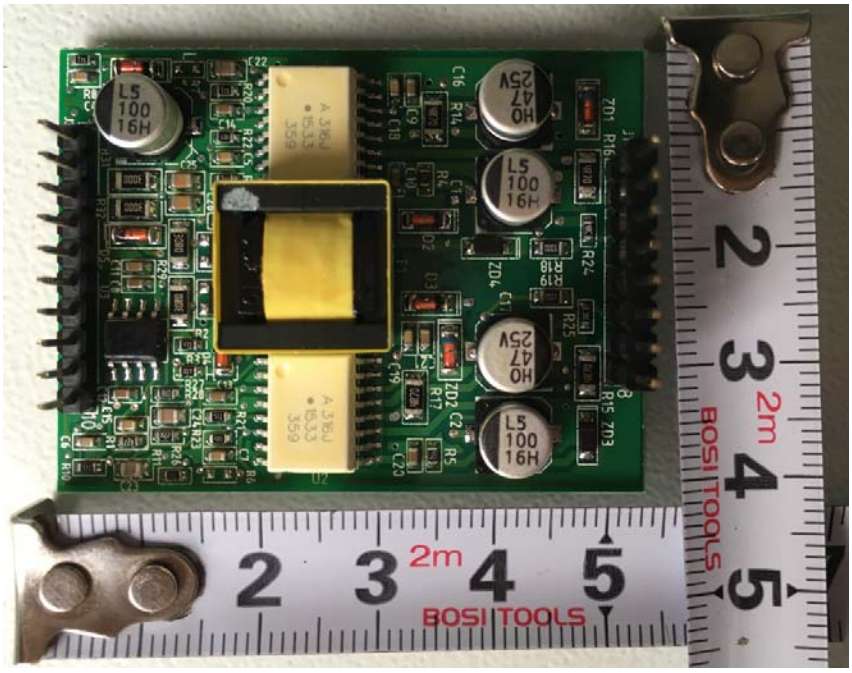

Photo 12 IGBT driving board front view

Photo document

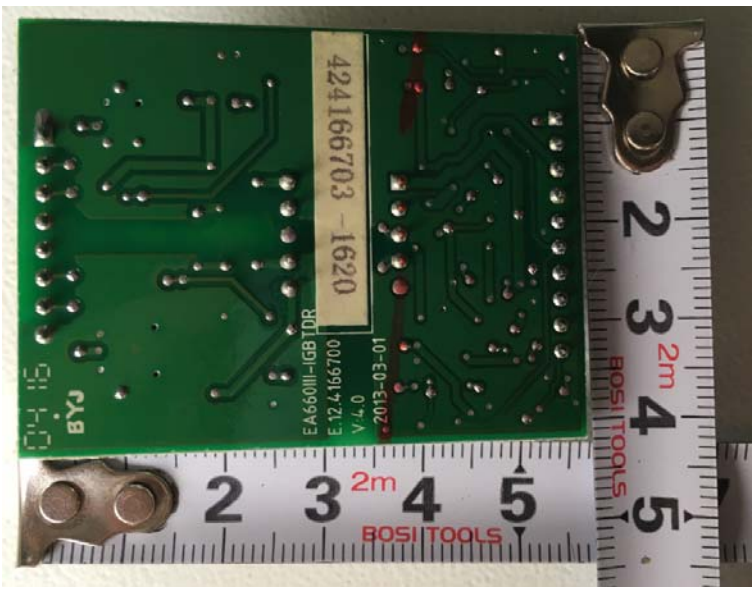

Photo 13 IGBT driving board back view

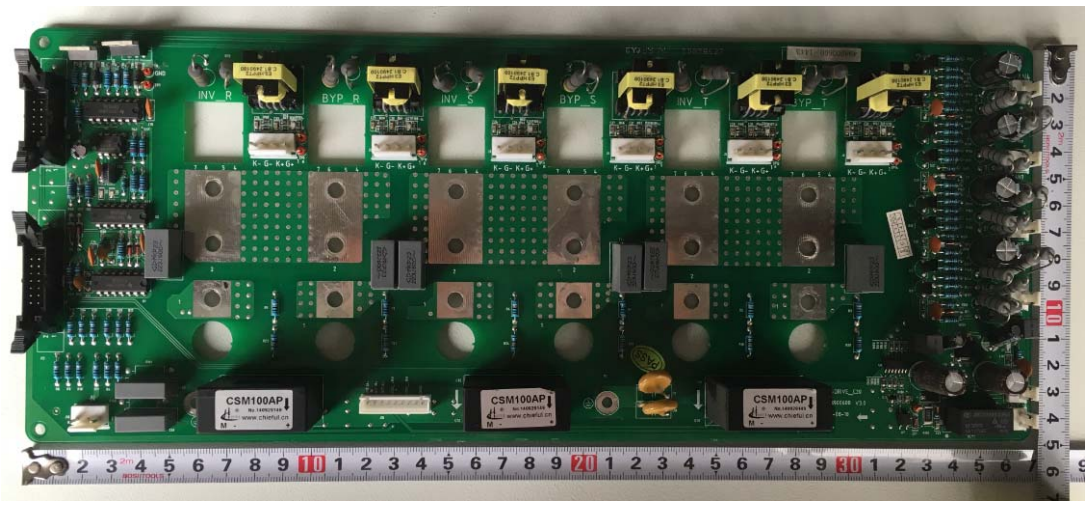

Photo 14 STS driving board front view

Photo document

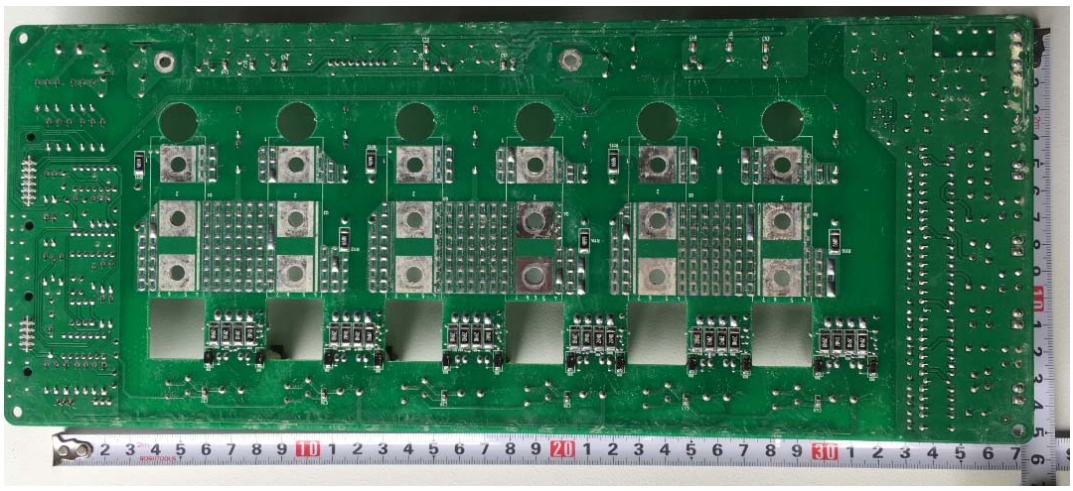

Photo 15 STS driving board back view

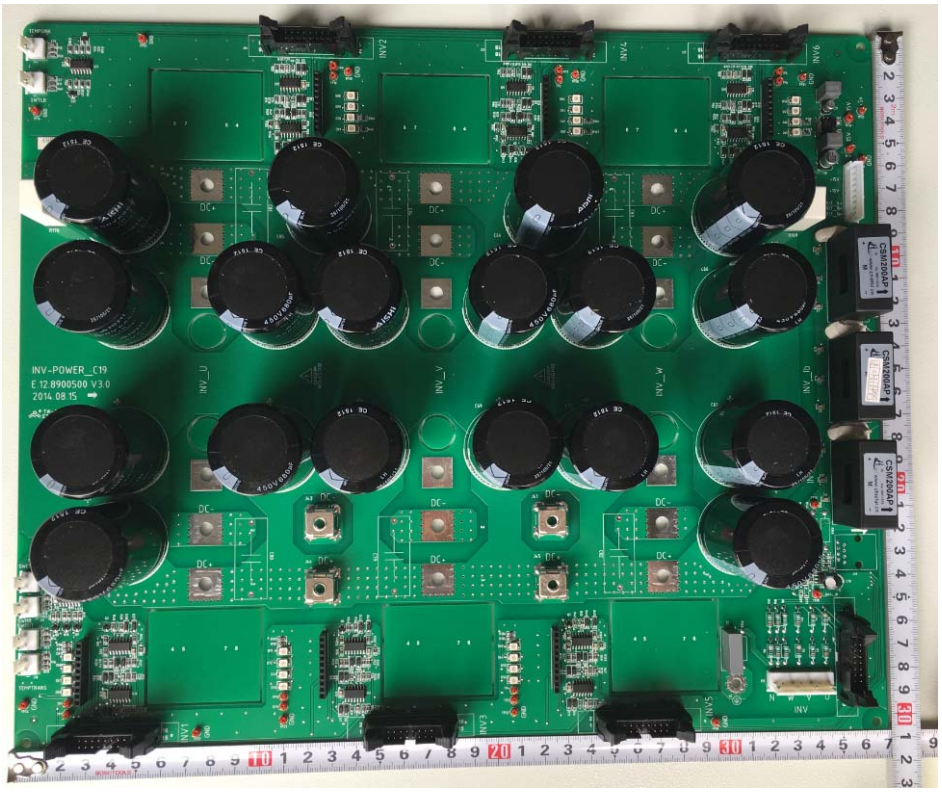

Photo 16 INV power board front view

Photo document

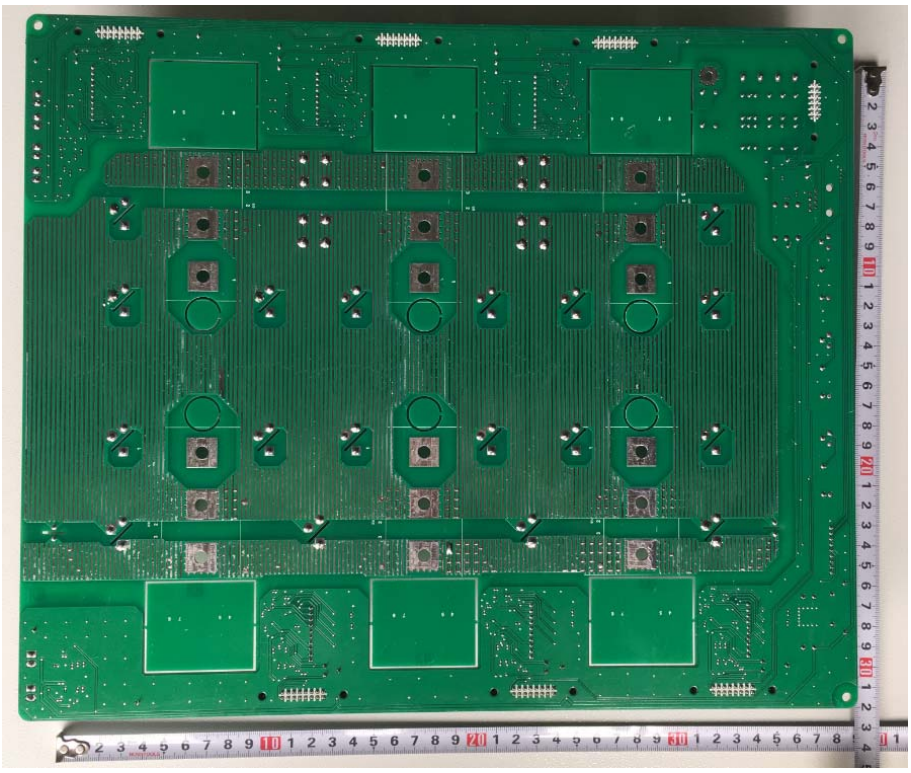

Photo 17 INV power board back view

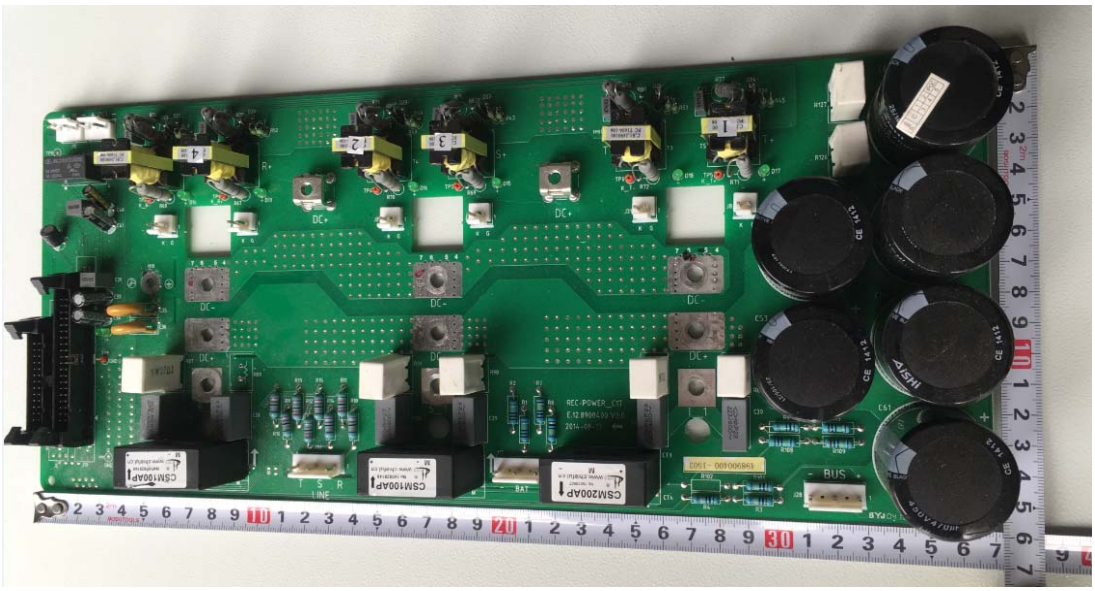

Photo 18 Rectify driving board front view

Photo document

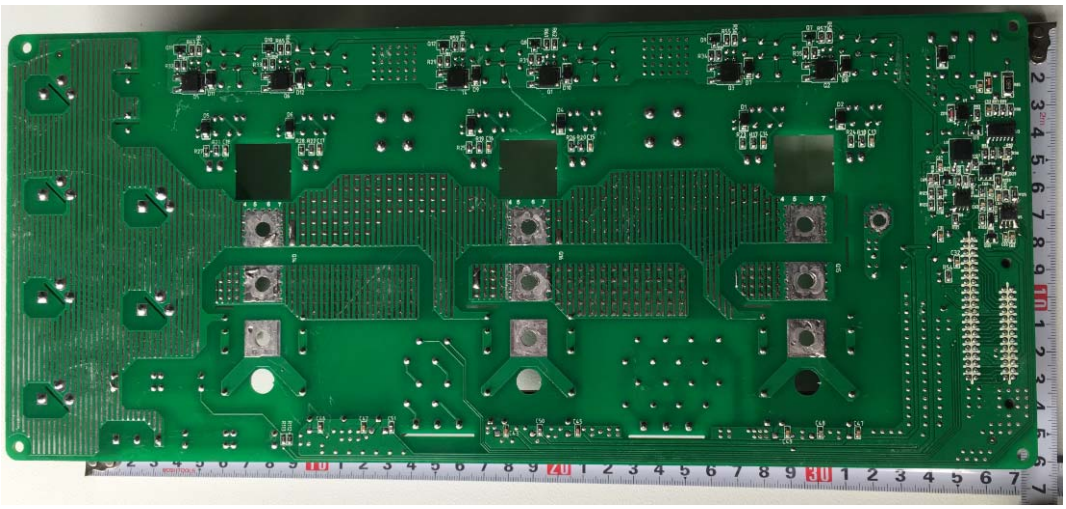

Photo 19 Rectify driving board back view

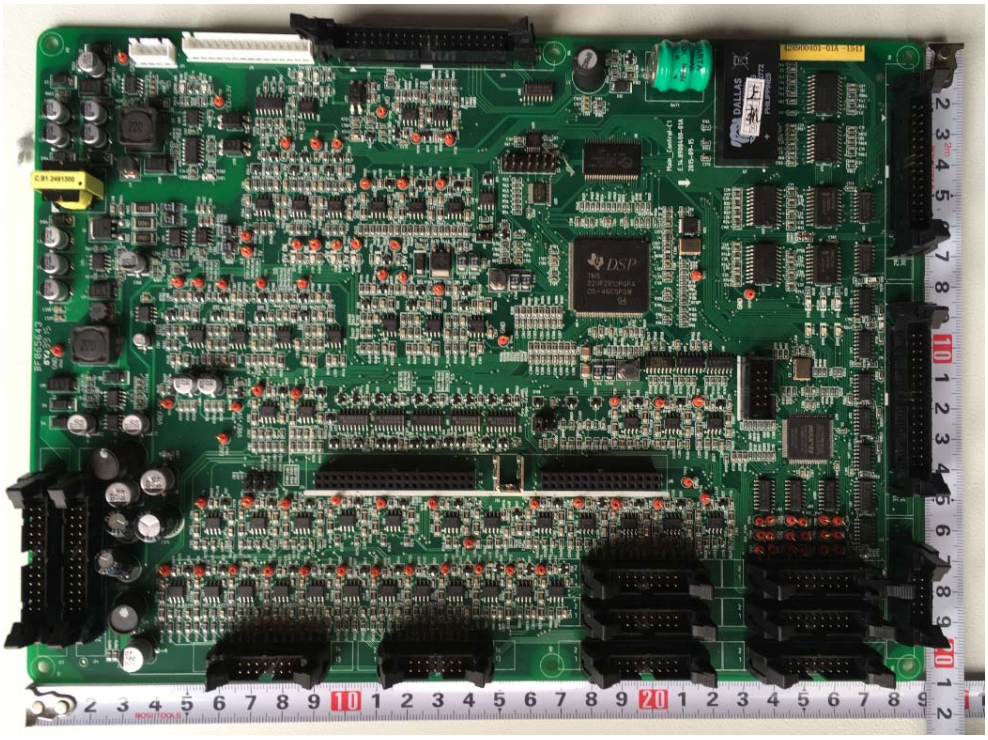

Photo 20 Main control front view

Photo document

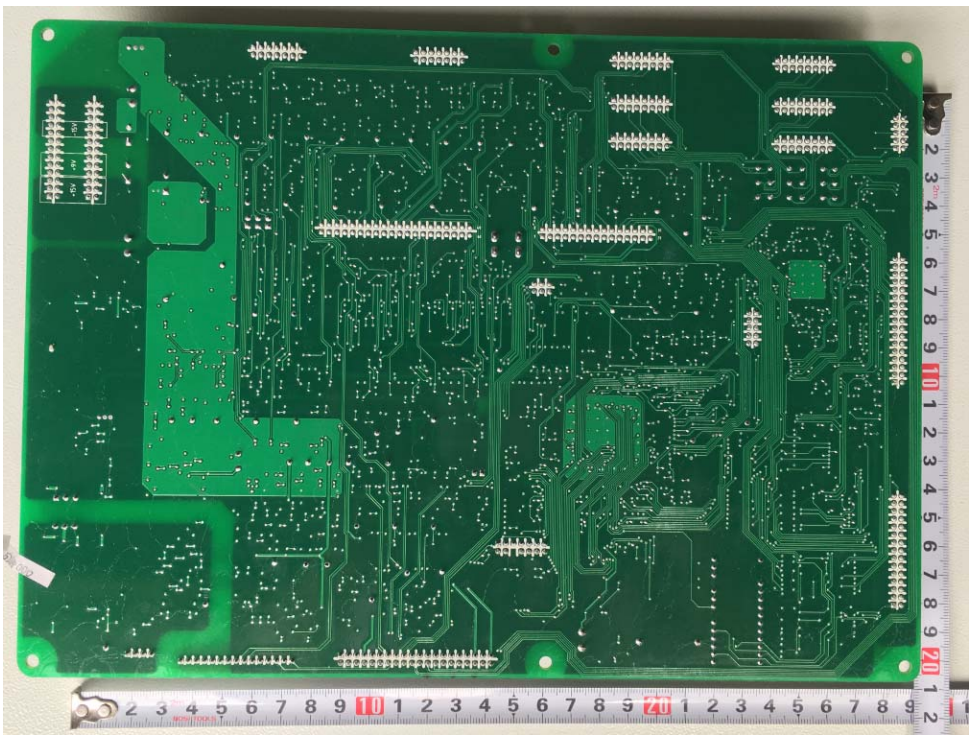

Photo 21 Main control back view

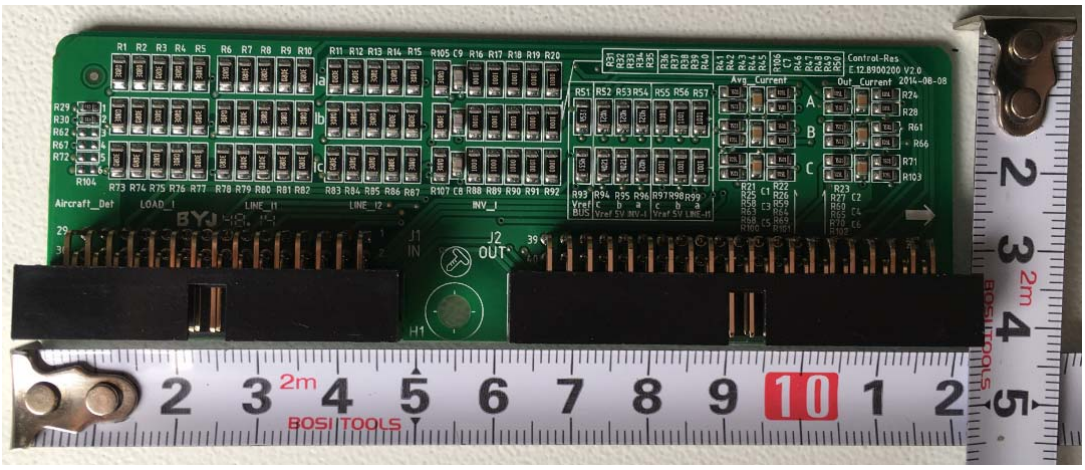

Photo 22 Current sampling board front view

Photo document

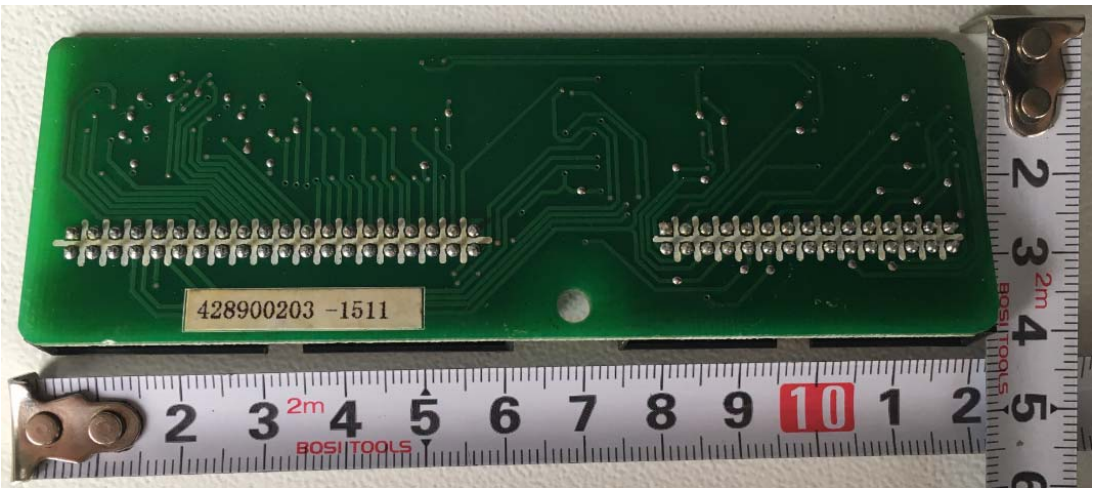

Photo 23 Current sampling board back view

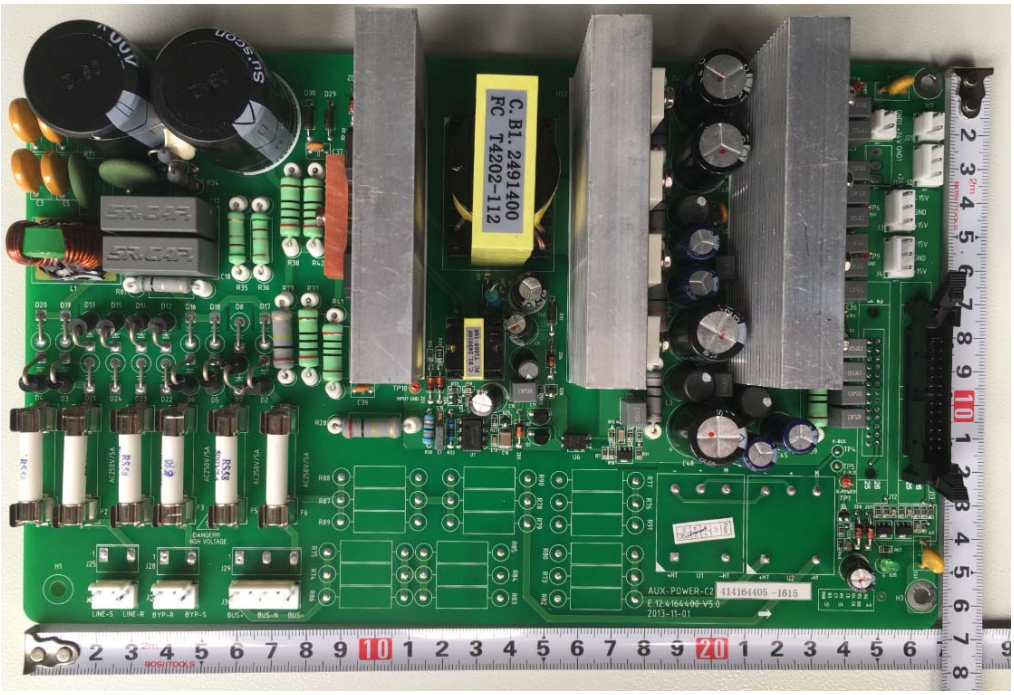

Photo 24 SMPS power front view

Photo document

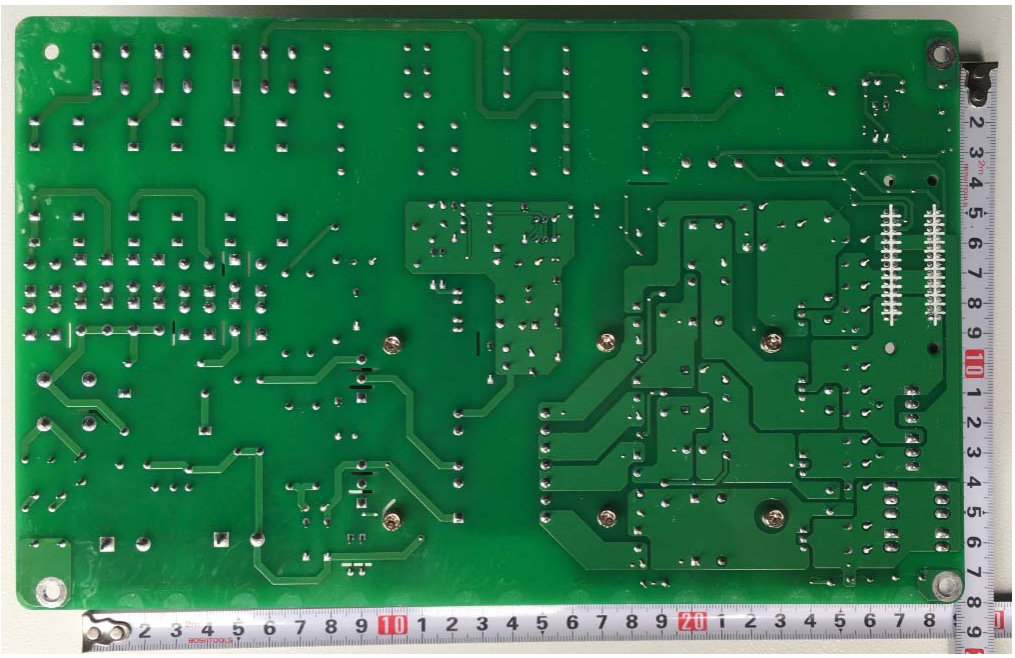

Photo 25 SMPS power back view

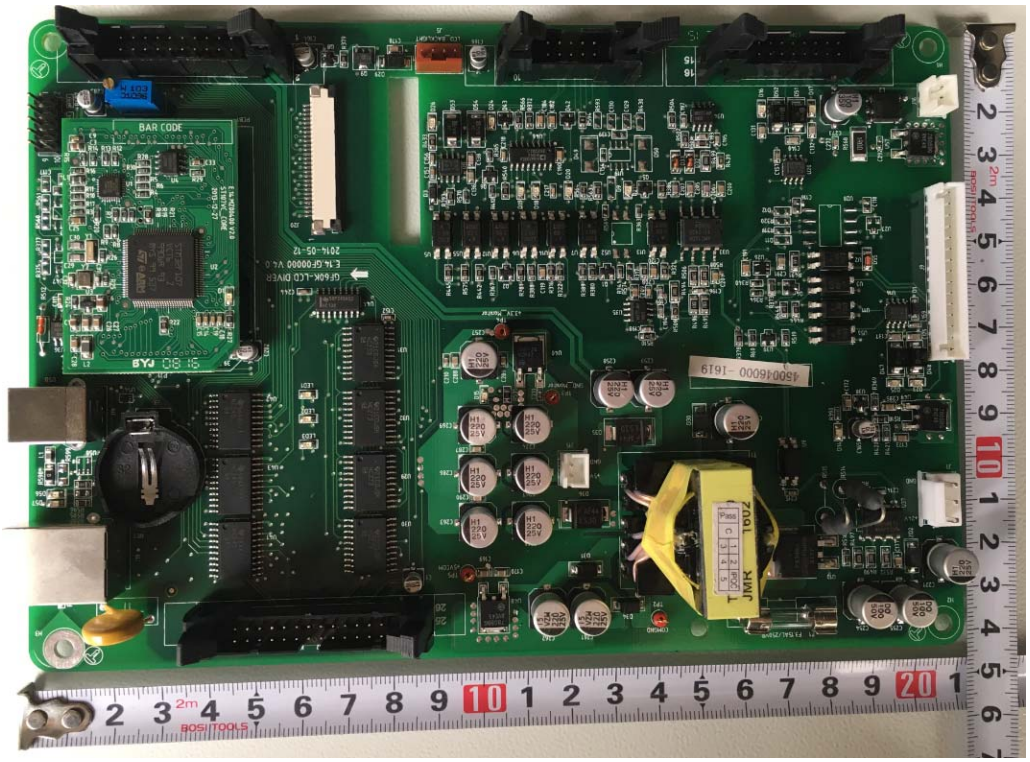

Photo 26 Monitor board front view

Photo document

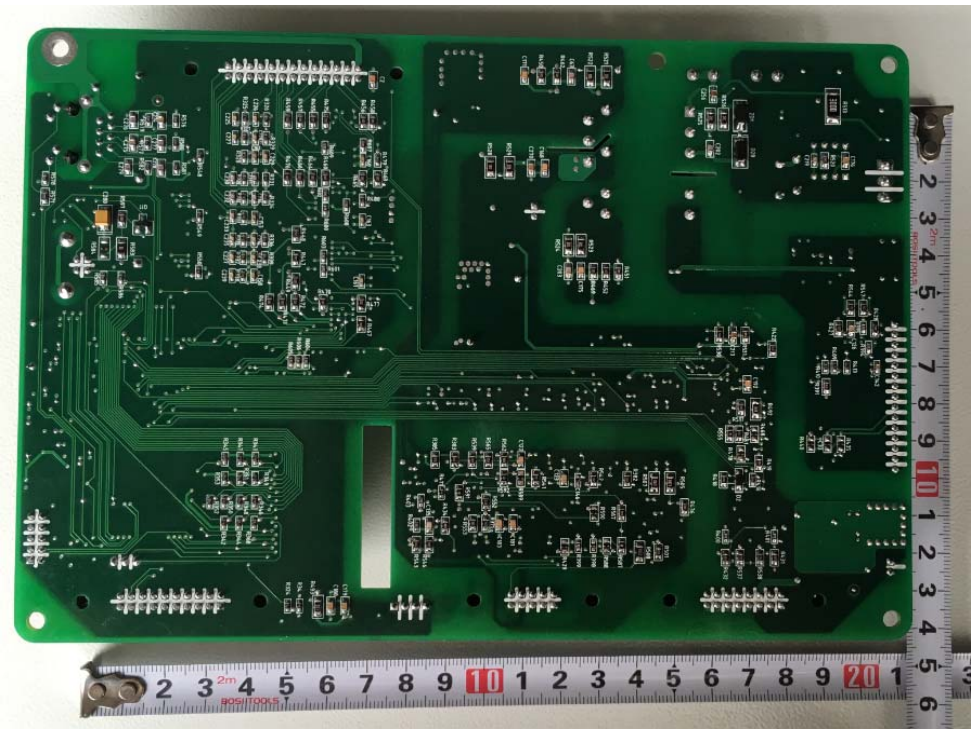

Photo 27 Monitor board back view

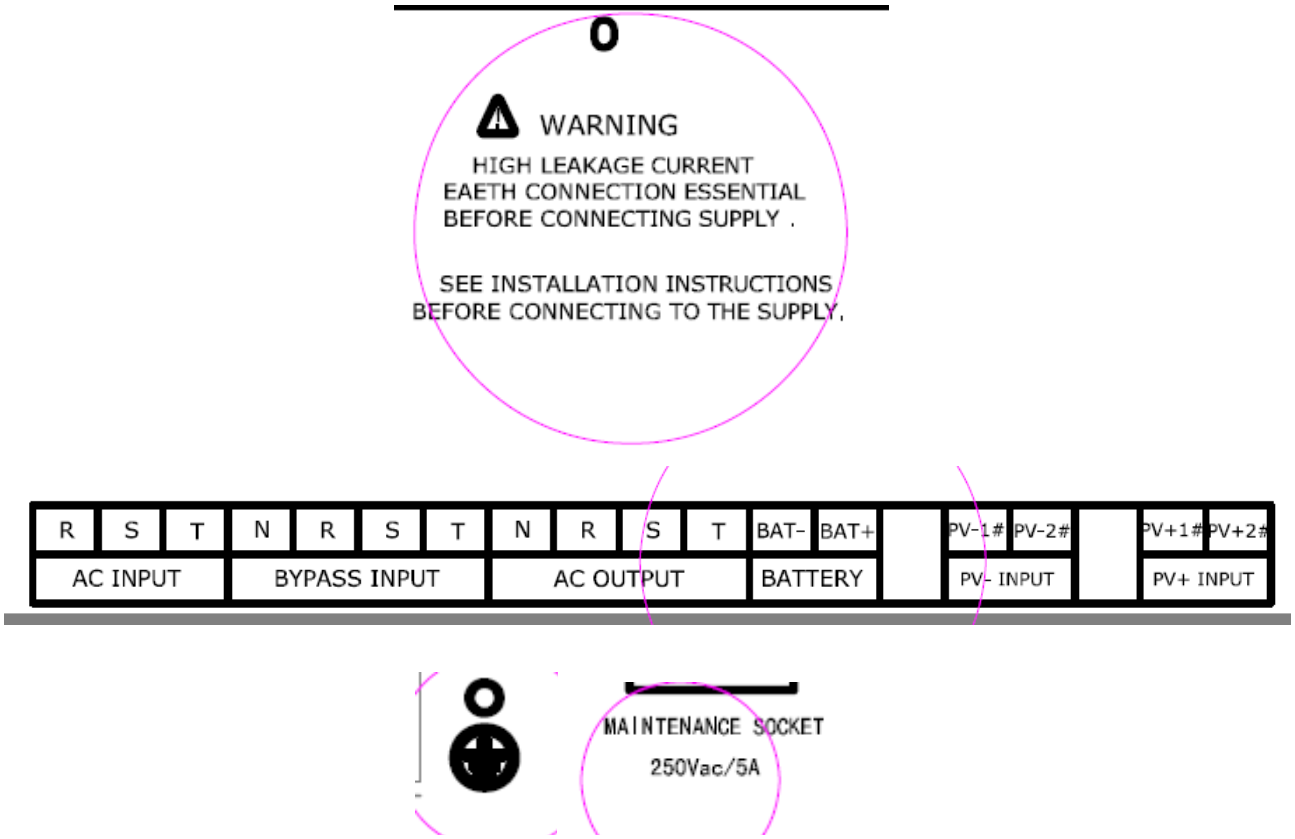

Photo 27 Warning marking on back cabinet

Photo document

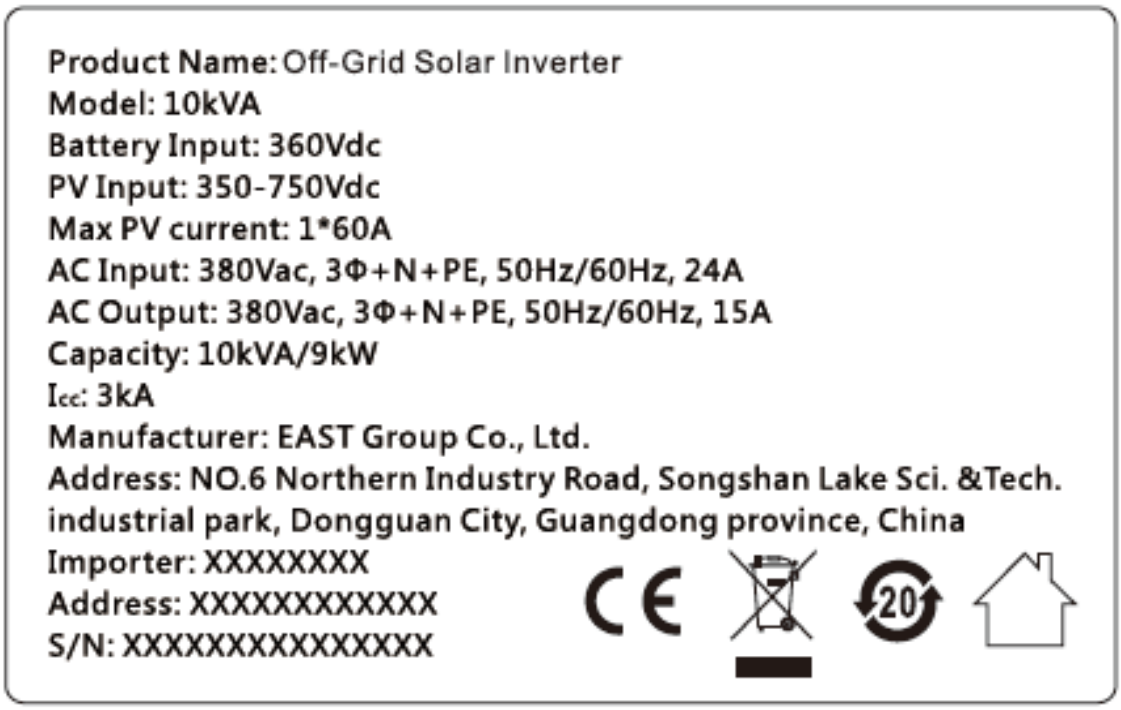

Photo 28 Rating Plate

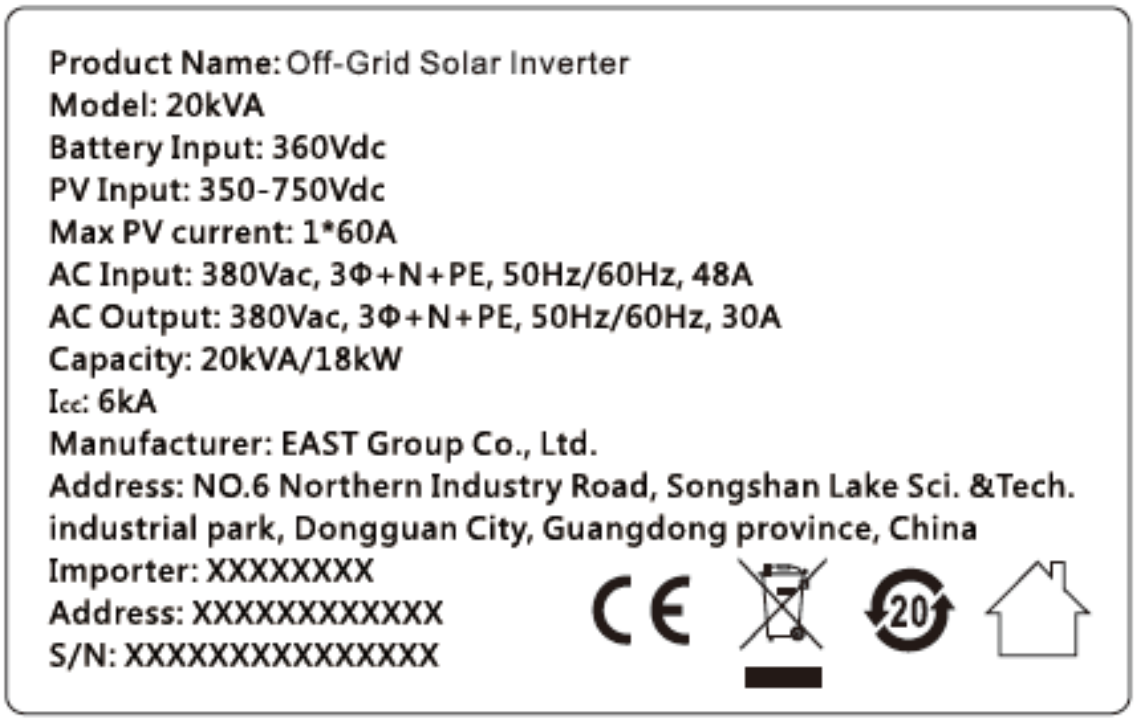

Photo 29 Rating Plate

TESTING INSTRUMENTS

NO.	NAME	TYPE	SERIAL NO.	CAL.	EXPIRED
1	Oscilloscope (high voltage port x2)	TDS3032C	C011961	TEKTRONIX	2018/03/10
2	Digital Power Meter	WT3000	91K303618	YOKOGWA	2017/07/26
3	PV simulator	TC.P.32.1000.400.P.V	0943CC155	Regatron	--
		TC.P.32.1000.400.P.V	1603CC614	Regatron	--
4	programmable AC source	GS630	MC31711167	Shenzhen shangyin	--
5	programmable DC source	PDC0800V270X	NP100008	Greatwall	--
6	Dielectric Strength Tester	7700	9590153	ASSOCIATED research Inc	2017/10/26
7	Grounding Continuity Tester	7316	1370133	Extech	2017/10/19
8	Power Quality Analyzer	435	15320036	FLUKE	2018/05/17
9	Surge Generator	TSS500M10	V0733102805	EM TEST	2018/06/10
10	leakage current network	SET-LDLW	0350	SET	2018/04/27
11	Data Acquisition Unit	34972A/34901A	A1106712	Agilent	2018/01/17
12	Vernier Caliper	0~150mm	210903	shanghai measuring & cutting tool	2017/12/02
13	Test finger	ZX-1	--	GTIHEA	2017/11/22
14	Test pin	KXT-308	KXT20080829001	TESTING	2017/08/26
15	thrust meter	NK-300	261558	JAPAN ALGOL	2018/03/11
16	Temperature and humidity chamber	SEWTH-Z-160LHS	A141202118	ESPEC	2017/10/16

STATEMENT

1. **The test report is invalid without stamp of laboratory.**
2. **The test report is invalid without signature of person(s) testing and authorizing.**
3. **The test report is invalid if erased and corrected.**
4. **Test results of the report is valid to the test samples if sampling by client.**
5. **“☆” item cannot be Accredited by CNAS.**
6. **The test report shall not be reproduced except in full, without written approval of the laboratory.**
7. **If there is any objection to report, the client should inform issuing laboratory within 15 days from the date of receving test report.**

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