

LVD TEST REPORT

Report No.: SET2015-17399

Product: SOLAR OFF-GRID INVERTER

Model No. : GF500,GF1000,GF1500,GF2000

Brand Name: /

Applicant: EAST GROUP CO., LTD.

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

Lab Location: Electronic Testing Building, Shahe Road, Xili, Nanshan District,
Shenzhen, 518055, P. R. China

Tel: 86 755 26627338 **Fax:** 86 755 26627238



This test report consists of **57** pages in total. It may be duplicated completely for legal use with the approval of the applicant. It should not be reproduced except in full, without the written approval of our laboratory. The client should not use it to claim product endorsement by CCIC-SET. The test results in the report only apply to the tested sample. The test report shall be invalid without all the signatures of testing engineers, reviewer and approver. Any objections must be raised to CCIC-SET within 15 days since the date when the report is received. It will not be taken into consideration beyond this limit

Test Report

Product : SOLAR OFF-GRID INVERTER

Model No. : GF500,GF1000,GF1500,GF2000

Brand Name : /

Applicant : EAST GROUP CO., LTD.

Applicant Address : No 6 Northern Industry Road, Songshan Lake SCI&TECH Industry Park,DongGuan,P.R.China

Manufacturer : EAST GROUP CO., LTD.

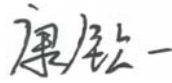
Manufacturer Address : No 6 Northern Industry Road, Songshan Lake SCI&TECH Industry Park,DongGuan,P.R.China

Rating : GF2000:DC Input : PV - voltage range :DC48-90 d.c.V, PV current:80d.c.A max, DC input:48d.c.V; AC Input: 175-280 a.c.V,50/60Hz;AC Output: 230 a.c.V,50/60Hz, AC Current: 9.1 a.c. A ,Max. AC current:20a.c.A,Power :2000W.
GF1500:DC Input : PV - voltage range :DC48-90 d.c.V, PV current:60d.c.A max, DC input:48 d.c.V; AC Input: 175-280 a.c.V,50/60Hz;AC Output: 230a.c.V,50/60Hz, AC Current: 6.8 a.c. A , Max. AC current: 15 a.c.A, Power :1500W.
GF1000:DC Input : PV - voltage range :DC48-90 d.c.V, PV current:60d.c.A max, DC input:48d.c.V; AC Input: 175-280 a.c.V,50/60Hz;AC Output: 230 a.c.V,50/60Hz, AC Current: 4.5 a.c. A , Max. AC current:10 a.c.A ,Power :1000W.
GF500:DC Input : PV - voltage range :DC24-45d.c.V, PV current:60d.c.A max, DC input:24d.c.V; AC Input: 175-280 a.c.V,50/60Hz;AC Output: 230 a.c.V,50/60Hz, AC Current: 2.3 a.c. A , Max. AC current:5 a.c.A ,Power :500W.

Test Standards..... : EN 62109-1:2010 Safety of power converters for use in photovoltaic power systems-Part1:General requirements.
EN 62109-2 :2011 Safety of power converters for use in photovoltaic power systems-Part2:Particular requirements for inverters

Test Result : PASS

Tested by : Kang Qinyi



Signature, Date

Reviewed by : Xie Yuzhang



Signature, Date

Approved by : Wu Lian



Signature, Date

Testing

Date of receipt of test item: 2015-11-02

Date(s) of performance of test.....: 2015-11-02 to 2015-12-02

Factory.....: EAST GROUP CO., LTD.

Address: No 6 Northern Industry Road, Songshan Lake SCI&TECH Industry Park,DongGuan,P.R.China

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)

.....:

General remarks:

This test report shall not be reproduced except in full without the written approval of the testing laboratory.

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

"(see remark #)" refers to a remark appended to the report.

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

Throughout this report, a coma is used as the decimal separator.

Attached with:**General descriptions:**

Model GF500,GF1000,GF1500,GF2000 are a serious of solar off-grid inverter 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 supply common load. It is intended for professional incorporation into PV system, and it is assessed on a component test basis, Communication port: 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 ,transformer and power component;

Full testing was performed on model GF2000,and variations with additional examination and testing subjected to model differences:

--electrical rating test,

--temperature test

Test results are represent to other models.



Ref. No.: SET2015-17399

EN 62109-1 : 2010			
Clause	Requirement – Test	Result - Remark	Verdict
1	GENERAL		P
4	General testing requirements		P
4.1	General		P
4.2	General conditions for testing		P
4.2.1	Sequence of tests		P
4.2.2	Reference test conditions		P
4.2.2.1	Environmental conditions		P
	<p>Unless otherwise specified in this standard, for example with regard to environmental category as defined in 6.1, the following ambient environmental conditions shall exist in the test location:</p> <p>a) temperature of 15 °C to 40 °C;</p> <p>b) a relative humidity of not more than 75 % and not less than 5 %;</p> <p>c) an air pressure of 75 kPa to 106 kPa;</p> <p>d) no frost, dew, percolating water, rain, solar radiation, etc.</p>		P
4.2.2.2	State of equipment		P
4.2.2.3	Position of equipment		P
4.2.2.4	Accessories	No accessories and operator interchangeable parts influence to safety.	P
4.2.2.5	Covers and removable parts	Need to use a tool to remove covers	P
4.2.2.6	Mains supply		P
	a) Voltage:	230Vac	P
	b) Frequency:	50/60Hz	P
	c) Polarity:	Not pluggable equipment type A.	N/A
	d) Earthing:		P
	e) Over-current Protection	80A max for GF2000	P



EN 62109-1 : 2010			
Clause	Requirement – Test	Result - Remark	Verdict
4.2.2.7	Supply ports other than the mains		P
4.2.2.7.1	Photovoltaic supply sources		P
4.2.2.7.2	Battery inputs	24Vdc for GF500 only, 48Vdc for other models .	P
4.2.2.8	Conditions of loading for output ports		P
	- for continuous operation ratings		P
	- for intermittent operation ratings		N/A
	- for short-term operation ratings		N/A
4.2.2.9	Earthing terminals	Protective conductor terminal connected to earth.	P
4.2.2.10	Controls		P
	a) mains selection devices shall be set to the correct value unless otherwise noted in this standard.	No such selection devices.	N/A
	b) combinations of settings shall not be made if they are prohibited by the manufacturer's instructions provided with the equipment.		P
4.2.2.11	Available short circuit current	More than 500A	P
4.3	Thermal Testing		P
4.3.1	General		P
	This subclause specifies requirements intended to prevent hazards due to:		P
	- touchable parts exceeding safe temperatures; and		P
	- components, parts, insulation and plastic materials exceeding temperatures which may degrade safety-related electrical, mechanical, or other properties during normal use over the expected life of the equipment;		P
	- structures and mounting surfaces exceeding temperatures which may degrade the materials over the expected life of the equipment		P
4.3.2	Maximum temperatures	(see appended table 4.3)	P



EN 62109-1 : 2010			
Clause	Requirement – Test	Result - Remark	Verdict
4.3.2.1	General		P
4.3.2.2	Touch temperatures		N/A
4.3.2.3	Temperature limits for mounting surfaces		N/A
4.4	Testing in Three fault condition	(see appended table 4.4)	P
4.4.1	General		P
4.4.2	Test conditions and duration for testing under fault conditions		P
4.4.2.1	General		P
4.4.2.2	Duration of tests		P
4.4.3	Pass/fail criteria for testing under fault conditions		P
4.4.3.1	Protection against shock hazard		P
	Compliance with requirements for protection against electric shock is checked during and after the application of Three faults as follows:	No shock hazards.	P
	a) by making measurements to check that no accessible DVC-A circuits have become shock-hazardous using the steady state limits for DVC-A in Table 6 and the short-term limits of 7.3.2.3, and that such circuits remain separated from live parts at voltages greater than DVC A with at least basic insulation. Compliance is checked by the test of 7.5.2 (without humidity preconditioning) for basic insulation		P
	b) by performing a dielectric strength test as per 7.5.2 (without humidity preconditioning) in the following cases: i) on reinforced or double Insulation, using the test level for basic insulation, and ii) on basic insulation in protective class I equipment, using the test level for basic insulation, unless it can be determined that the fault did not result in any damage to the protective earthing conductor or terminal, or to protective bonding means		P



EN 62109-1 : 2010			
Clause	Requirement – Test	Result - Remark	Verdict
	c) by inspection to ensure a fuse connected between the protective earthing terminal and the protective earthing conductor in the test setup has not opened; the fuse shall be rated 3 A non-time-delay (for equipment rated for use on circuits protected by overcurrent protection rated 30 A or less) or 30 A to 35 A non-time-delay (for equipment rated for use on circuits protected by overcurrent protection rated more than 30 A); the enclosure is not to be contacting earth in any other location during the testing		P
	d) by inspection of the enclosure to ensure that no damage has resulted that allows access to parts that are hazardous live.		P
4.4.3.2	Protection against the spread of fire	No fire hazards	P
4.4.3.3	Protection against other hazards	No other hazards after application of the faults	P
4.4.3.4	Protection against parts expulsion hazards	No such hazards after application of the faults	P
4.4.4	Three fault condition to be applied:		P
4.4.4.1	Component fault tests		P
4.4.4.2	Equipment or parts for short-term or intermittent operation	(see appended table 4.4)	P
4.4.4.3	Motors	(see appended table 4.4)	P
4.4.4.4	Transformer short circuit tests	(see appended table 4.4)	P
4.4.4.5	Output short circuit	(see appended table 4.4)	P
4.4.4.6	Backfeed current test for equipment with more than one source of supply	No backfeed current from another source.	P
4.4.4.7	Output overload		P
4.4.4.8	Cooling system failure	(see appended table 4.4)	P
	a) air-intakes blocked or partially blocked	(see appended table 4.4)	P
	b) cooling fans stopped or disconnected, one at a time		N/A
	c) circulation of water or other coolant shall be stopped or partially restricted		N/A



EN 62109-1 : 2010			
Clause	Requirement – Test	Result - Remark	Verdict
4.4.4.9	Heating devices	Without heating devices.	N/A
	a) timers which limit the heating period shall be overridden to energize the heating circuit continuously		N/A
	b) temperature control devices or circuits shall have Three fault conditions applied such that control over the heater is lost. Over-temperature protection devices meeting the requirements of 14.3 are left operational during the test		N/A
4.4.4.10	Safety interlock systems		N/A
4.4.4.11	Reverse d.c. connections	(see appended table 4.4)	P
4.4.4.12	Voltage selector mismatch	No such device	N/A
4.4.4.13	Mis-wiring with incorrect phase sequence or polarity	(see appended table 4.4)	P
4.4.4.14	PWB short-circuit test	(see appended table 4.4)	P
4.5	Humidity preconditioning		P
4.5.1	General		P
4.5.2	Conditions	Before applying humidity, the equipment is brought to a temperature of $42\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$, normally by keeping it at this temperature for at least 4 h before the humidity preconditioning. Then worst case per manufacturer's manual: 93%; 40°C, 2 days	P
4.6	Voltage Backfeed Protection	Can not touch output terminal without tools , warning label is added.	N/A
4.6.1	Backfeed tests under normal conditions		N/A
4.6.2	Backfeed tests under Three-fault conditions		N/A
4.6.3	Compliance with backfeed tests		N/A
	- 15 s for sources that are permanently connected		N/A




EN 62109-1 : 2010			
Clause	Requirement – Test	Result - Remark	Verdict
	- 1 s for sources that are cord-connected or use connectors that can be opened without the use of a tool		N/A
4.7	Electrical Ratings Tests	(see appended table 4.7.1)	P
4.7.1	Input Ratings		P
4.7.1.1	Measurement requirements for DC input ports		P
4.7.1.2	Measurement requirements for DC input ports		P
4.7.2	Output Ratings		P

5	Marking and documentation		P
5.1	Marking		P
5.1.1	General		P
5.1.2	Durability	The markings are rubbed quickly by hand, without undue pressure, for 30 s with a cloth soaked with the specified cleaning agent (or, if not specified, with isopropyl alcohol). The markings shall be clearly legible after the above treatment, and adhesive labels shall not have worked loose or become curled at the edges	P
5.1.3	Identification mark		P
	a) the name or trade mark of the manufacturer or supplier	See copy of marking plate provided in this report	P
	b) a model number, name or other means to identify the equipment	See copy of marking plate provided in this report	P
	c) a serial number, code or other marking allowing identification of manufacturing location and the manufacturing batch or date within a three month time period.	See copy of marking plate provided in this report	P
5.1.4	Power rating	See copy of marking plate provided in this report	P



Ref. No.: SET2015-17399

EN 62109-1 : 2010			
Clause	Requirement – Test	Result - Remark	Verdict
	- input voltage, type of voltage (a.c. or d.c.), frequency, and maximum continuous current for each input	See copy of marking plate provided in this report	P
	- output voltage, type of voltage (a.c. or d.c.), frequency, maximum continuous current, and for a.c. outputs, either the power or power factor for each output	See copy of marking plate provided in this report	P
	- the ingress protection (IP) rating as in 6.3 below	See copy of marking plate provided in this report	P
5.1.5	Fuse identification (marking, special fusing characteristics, cross-reference)		P
5.1.6	Terminals, connections and controls	DC input, battery input, load	P
5.1.6.1	Protective conductor terminals	the colour coding green-yellow and symbol 7 of Annex C	P
5.1.7	Switches and circuit-breakers		P
5.1.8	Class II symbol if applicable	No such devices	N/A
5.1.9	Terminal boxes for External Connections		P
	a) the minimum temperature rating and size of the cable to be connected to the terminals		N/A
	b) a marking to warn the installer to consult the installation instructions. Symbol 9 of Annex C is an acceptable marking.	Add warning 	P

5.2	Warning markings		P
5.2.1	Visibility and legibility requirements for warning markings		P
5.2.2	Content for warning markings		P
5.2.2.1	Ungrounded heatsinks and similar parts	Without grounded heatsinks.	N/A
5.2.2.2	Hot Surfaces		N/A
5.2.2.3	Coolant		N/A
5.2.2.4	Stored energy	Symbol 21 of Annex C used for warning.	P



EN 62109-1 : 2010			
Clause	Requirement – Test	Result - Remark	Verdict
5.2.2.5	Motor guarding		P
5.2.3	Sonic hazard markings and instructions	No sonic hazard.	N/A
5.2.4	Equipment with multiple sources of supply	No multiple sources supply	N/A
5.2.5	Excessive touch current	Measured:2.4mA <limit 3.5mA.	N/A

5.3	Documentation		P
5.3.1	General		P
	a) Explanations of markings and symbols		P
	b) Location and function of terminals and controls		P
	c) Ratings or specifications		P
	d) Warning for supplying voltage		P
5.3.1.1	Language	English version was checked. At least the safety relevant information will be given in other applicable languages to be confirmed during the respective national approval.	P
5.3.1.2	Format		P
5.3.2	Information related to installation		P
	a) assembly, location, and mounting requirements		P
	b) ratings and means of connection to each source of supply and any requirements related to wiring and external controls, colour coding of leads, disconnection means, or overcurrent protection needed, including instructions that the installation position shall not prevent access to the disconnection means		P
	c) ratings and means of connection of any outputs from the PCE, and any requirements related to wiring and external controls, colour coding of leads, or overcurrent protection needed		P



EN 62109-1 : 2010			
Clause	Requirement – Test	Result - Remark	Verdict
	d) explanation of the pin-out of connectors for external connections, unless the connector is used for a standard purpose (e.g. RS 232)		P
	e) ventilation requirements		P
	f) requirements for special services, for example cooling liquid		N/A
	g) instructions and information relating to sound pressure level if required by 10.2.1		N/A
	h) where required by 14.8.1.3, instructions for the adequate ventilation of the room or location in which PCE containing vented or valve-regulated batteries is located, to prevent the accumulation of hazardous gases		N/A
	i) tightening torque to be applied to wiring terminals		P
	j) values of backfeed short-circuit currents available from the PCE on input and output conductors under fault conditions, if those currents exceed the max. rated current of the circuit, as per 4.4.4.6		N/A
	k) for each input to the PCE, the maximum value of short-circuit current available from the source, for which the PCE is designed		P
	l) compatibility with RCD and RCM		P
	m) instructions for protective earthing of the PCE, including the information required by 7.3.6.3.7 if a second protective earthing conductor is to be installed		P
	n) where required by 7.3.8, the installation instructions shall include the following or equivalent wording: "This product can cause current with a d.c. component. Where a residual current-operated protective (RCD) or monitoring (RCM) device is used for protection in case of direct or indirect contact, only an RCD or RCM of Type B is allowed on the supply side of this product."		N/A
	o) for PCE intended to charge batteries, the battery nominal voltage rating, size, and type		P



EN 62109-1 : 2010			
Clause	Requirement – Test	Result - Remark	Verdict
	p) PV array configuration information, such as ratings, whether the array is to be grounded or floating, any external protection devices needed, etc.		P
5.3.3	Information related to operation		P
	– instructions for adjustment of controls including the effects of adjustment;		P
	– instructions for interconnection to accessories and other equipment, including indication of suitable accessories, detachable parts and any special materials		N/A
	– warnings regarding the risk of burns from surfaces permitted to exceed the temperature limits of 4.3.2 and required operator actions to reduce the risk		N/A
	– instructions that if the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.		N/A
5.3.4	Information related to maintenance		P
	– intervals and instructions for any preventive maintenance that is required to maintain safety (for example air filter replacement or periodic re-tightening of terminals);	Limited to trained and authorized professional personnel from manufacturer or its authorized representative	P
	– instructions for accessing operator access areas, if any are present, including a warning not to enter other areas of the equipment;		N/A
	– part numbers and instructions for obtaining any required operator replaceable parts;		N/A
	– instructions for safe cleaning (if recommended);		P
	– where there is more than one source of supply energizing the PCE, information shall be provided in the manual to indicate which disconnect device or devices are required to be operated in order to completely isolate the equipment.		N/A
5.3.4.1	Battery maintenance	Without battery used	N/A



EN 62109-1 : 2010			
Clause	Requirement – Test	Result - Remark	Verdict
	– Servicing of batteries should be performed or supervised by personnel knowledgeable about batteries and the required precautions		N/A
	– When replacing batteries, replace with the same type and number of batteries or battery packs		N/A
	– General instructions regarding removal and installation of batteries.		N/A
	– CAUTION: Do not dispose of batteries in a fire. The batteries may explode.		N/A
	– CAUTION: Do not open or damage batteries. Released electrolyte is harmful to the skin and eyes. It may be toxic		N/A
	– CAUTION: A battery can present a risk of electrical shock and high short-circuit current. The following precautions should be observed when working on batteries:		N/A
	a) Remove watches, rings, or other metal objects.		N/A
	b) Use tools with insulated handles.		N/A
	c) Wear rubber gloves and boots.		N/A
	d) Do not lay tools or metal parts on top of batteries.		N/A
	e) Disconnect charging source prior to connecting or disconnecting battery terminals.		N/A
	e) Disconnect charging source prior to connecting or disconnecting battery terminals.		N/A
	f) Determine if battery is inadvertently grounded. If inadvertently grounded, remove source from ground. Contact with any part of a grounded battery can result in electrical shock. The likelihood of such shock can be reduced if such grounds are removed during installation and maintenance (applicable to equipment and remote battery supplies not having a grounded supply circuit).		N/A
6	Environmental requirements and conditions		P



EN 62109-1 : 2010			
Clause	Requirement – Test	Result - Remark	Verdict
6.1	Environmental categories and minimum environmental conditions		P
6.1.1	OUTDOOR		P
6.1.2	INDOOR, unconditioned		N/A
6.1.3	INDOOR, conditioned		N/A
6.2	Pollution degree	PDII	P
6.3	Ingress Protection	IP20	P
6.4	UV exposure		N/A
6.5	Temperature and humidity	Ambient temperature Operation: -20 °C to +40 °C Operation: ≤95 %, no condensation.	P

7	Protection against electric shock and energy hazards		P
7.1	General		P
7.2	Fault conditions		P
7.3	Protection against electric shock		P
7.3.1	General		P
7.3.2	Decisive voltage classification		P
7.3.2.1	Use of <i>decisive voltage class (DVC)</i>		P
7.3.2.2	Limits of <i>DVC</i>	Accessible circuit: DVC A Power circuit: DVC C, sampling circuit: DVC B	P
7.3.2.3	Short-term limits of accessible voltages under fault conditions		P
7.3.2.4	Requirements for protection		P
7.3.2.5	Connection to PELV and SELV circuits		P
7.3.2.6	Working voltage and DVC		P
7.3.2.6.1	General		P



EN 62109-1 : 2010			
Clause	Requirement – Test	Result - Remark	Verdict
7.3.2.6.2	AC working voltage		P
7.3.2.6.3	DC working voltage		P
7.3.2.6.4	Pulsating working voltage		N/A
7.3.3	Protective separation		P
	• double or reinforced insulation,		P
	• protective screening, i.e. by a conductive screen connected to earth by protective bonding in the PCE, or connected to the protective earth conductor itself, whereby the screen is separated from live parts by at least basic insulation		P
	• protective impedance comprising limitation of current per 7.3.5.3.1 and of discharged energy per 7.3.5.3.2		N/A
	• limitation of voltage according to 7.3.5.4		N/A
7.3.4	Protection against direct contact		P
7.3.4.1	General		P
7.3.4.2	Protection by means of enclosures and barriers		P
7.3.4.2.1	General	User could not open the door without a tool.	P
7.3.4.2.2	Access probe criteria		P
	a) decisive voltage classification A, (DVC A) - the probe may touch the live parts;		P
	b) decisive voltage classification B, (DVC B) - the probe shall have adequate clearance to live parts, based on the clearance for functional insulation;		N/A
	c) decisive voltage classification C, (DVC C) - the probe shall have adequate clearance to live parts, based on the clearance for basic insulation.		P
7.3.4.2.3	Access probe tests		P
	Test by inspection	Compliance	P
	Test with test finger&pin (Figure D.1& D.2)	No hazards.	P
	Test with jointed test finger (Figure D.1)	No hazards.	P



EN 62109-1 : 2010			
Clause	Requirement – Test	Result - Remark	Verdict
	Test with IP3X test probe	No TNV circuit	N/A
7.3.4.2.4	Service access areas	The manufacturer's manual with the following substance: Always disconnect the unit from the Batteries and PV supply by the external customer installed disconnecting devices before installation, servicing and maintenance works	P
7.3.4.3	Protection by means of insulation of live parts		P
7.3.5	Protection in case of direct contact		P
7.3.5.1	General		P
7.3.5.2	Protection using decisive voltage class A		P
7.3.5.3	Protection by means of protective impedance		N/A
7.3.5.3.1	Limitation of current through protective impedance		N/A
7.3.5.3.2	Limitation of discharging energy through protective impedance		N/A
7.3.5.4	Protection by means of limited voltages		N/A
7.3.6	Protection against indirect contact		P
7.3.6.1	General		P
7.3.6.2	Insulation between live parts and accessible conductive parts		P
7.3.6.3	Protective class I - Protective bonding		P
7.3.6.3.1	General		P
	a) accessible conductive parts that are protected by one of the measures in 7.3.5.2 to 7.3.5.4		P
	b) accessible conductive parts that are separated from live parts of DVC-B or -C using double or reinforced insulation.		P
7.3.6.3.2	Rating of protective bonding		P
	a) through direct metallic contact;		N/A



EN 62109-1 : 2010			
Clause	Requirement – Test	Result - Remark	Verdict
	b) through other conductive parts which are not removed when the PCE or sub-units are used as intended		N/A
	c) through dedicated protective bonding conductors;		P
	d) through other metallic components of the PCE.		N/A
7.3.6.3.3	Rating of protective bonding		P
7.3.6.3.3.1	Test current, duration, and acceptance criteria	Testcurrent:40A, duration:2min; limit:0.1Ω	P
7.3.6.3.4	Protective bonding impedance (routine test)	45mΩ	P
7.3.6.3.5	External protective earthing conductor		P
7.3.6.3.6	Means of connection for the external protective earthing conductor		P
7.3.6.3.6.1	General	Symbol 7 of annex C and the colour coding green-yellow	P
7.3.6.3.7	Touch current in case of failure of the protective earthing conductor	<2.4mA	P
7.3.6.4	Protective class II - Double or reinforced insulation		N/A
7.3.7	Insulation Including Clearance and Creepage Distances		P
7.3.7.1	General		P
7.3.7.1.1	Pollution degrees	II	P
7.3.7.1.2	Overvoltage category and Impulse withstand voltage rating category:	OVCIIfor AC, and OVC II for DC	P
7.3.7.1.3	Supply earthing systems	TN system	P
7.3.7.1.4	Insulation voltages	AC: 2500V DC:2500V	P
7.3.7.2	Insulation between a circuit and its surroundings		P
7.3.7.2.1	General		P
7.3.7.2.2	Circuits connected directly to the MAINS		P
7.3.7.2.3	Circuits other than MAINS circuits		P
7.3.7.2.4	Insulation between circuits		P



EN 62109-1 : 2010			
Clause	Requirement – Test	Result - Remark	Verdict
7.3.7.3	Functional insulation		P
7.3.7.4	Clearance distances	(see append table 7.3.7)	P
7.3.7.4.1	Determination		P
7.3.7.4.2	Electric field homogeneity		N/A
7.3.7.4.3	Clearance to conductive enclosures		P
7.3.7.5	Creepage distances	(see append table 7.3.7)	P
7.3.7.5.1	General		P
7.3.7.5.2	Voltage		P
7.3.7.5.3	Materials	Insulating material group IIIb: 175 CTI \geq 100, compliance checked for material certificate and specifications.	P
7.3.7.6	Coating		N/A
7.3.7.7	PWB spacings for functional insulation	UL approved PCB used	P
7.3.7.8	Solid insulation		P
7.3.7.8.1	General		P
7.3.7.8.2	Requirements for electrical withstand capability of solid insulation		P
7.3.7.8.2.1	Basic, supplemental, reinforced, and double insulation		P
7.3.7.8.2.2	Functional insulation		P
7.3.7.8.3	Thin sheet or tape material		P
7.3.7.8.3.1	General		P
7.3.7.8.3.2	Material thickness not less than 0,2 mm	Sleeving use for insulation not less than 0.3mm	P
7.3.7.8.3.3	Material thickness less than 0,2 mm		N/A
7.3.7.8.3.4	Compliance		P
7.3.7.8.4	Printed wiring boards (PWBs)		P
7.3.7.8.4.1	General		P
7.3.7.8.4.2	Use of coating materials		N/A
7.3.7.8.5	Wound components		P



EN 62109-1 : 2010			
Clause	Requirement – Test	Result - Remark	Verdict
7.3.7.8.6	Potting materials		N/A
7.3.7.9	Insulation requirements above 30 kHz		N/A
7.3.8	Residual Current Detection (RCD) or Monitoring (RCM) device compatibility		P
7.3.9	Protection against shock hazard due to stored energy	Add warning label	P
7.3.9.1	Operator access area		P
7.3.9.2	Service access areas	The warning symbol of Annex D was placed on the outer enclosure.	P
7.4	Protection against energy hazards		P
7.4.1	Determination of hazardous energy level		P
7.4.2	Operator access areas		P
7.4.3	Service access areas		P
7.5	Electrical tests related to shock hazard		P
7.5.1	Impulse voltage test (type test)	See append table 7.5.1	P
7.5.2	Voltage test (dielectric strength test) (type test and routine test)		P
7.5.2.1	Purpose of test		P
7.5.2.2	Value and type of test voltage		P
7.5.2.3	Humidity pre-conditioning	40°C, 93%RH 48 h	P
7.5.2.4	Performing the voltage test		P
7.5.2.5	Duration of the a.c. or d.c. voltage test		P
7.5.2.6	Verification of the a.c. or d.c. voltage test		P
7.5.3	Partial discharge test (type test or sample test)		P
7.5.4	Touch current measurement (type test)		P
	Measured touch current (mA)	2.4mA	P
	Max. allowed touch current (mA)	3.5 mA, comply with related requirement	—
7.5.5	Equipment with multiple sources of supply		N/A



EN 62109-1 : 2010			
Clause	Requirement – Test	Result - Remark	Verdict
8	Protection against mechanical HAZARDS		P
8.1	General		P
8.2	Moving parts		N/A
8.2.1	Protection of service persons		N/A
8.3	Stability		N/A
8.4	Provisions for lifting and carrying		P
8.5	Wall mounting		N/A
8.6	Expelled parts		N/A

9	Protection against fire hazards		P
9.1	Resistance to fire		P
9.1.1	Reducing the risk of ignition and spread of flame	Use of materials with the required flammability classes.	P
	Method 1, selection and application of components wiring and materials	(see appended table 4.7)	P
	Method 2, application of all of simulated fault condition tests		N/A
9.1.2	Conditions for a fire enclosure	See below	P
9.1.2.1	Parts requiring a fire enclosure		P
	– components in mains circuits;		P
	– components in secondary circuits supplied by power sources which exceed the limits for a limited power source as specified in 9.2;		P
	– components in secondary circuits supplied by a limited power source as specified in 9.2, but not mounted on material of flammability class V-1;		N/A



EN 62109-1 : 2010			
Clause	Requirement – Test	Result - Remark	Verdict
	– components within a power supply unit or assembly having a limited power output complying with the criteria for a limited power source as specified in 9.2, including overcurrent protective devices, limiting impedances, regulating networks and wiring, up to the point where the limited power source output criteria are met;		N/A
	– components having unenclosed arcing parts, such as open switch and relay contacts and commutators, in a circuit at hazardous voltage or at a hazardous energy level;		P
	– insulated wiring, except as permitted in 9.1.2.2.		P
9.1.2.2	Parts not requiring a fire enclosure		P
	– wiring and cables insulated with PVC, TFE, PTFE, FEP, neoprene or polyimide;		P
	– plugs and connectors forming part of a power supply cord or interconnecting cable;		N/A
	– components, including connectors, meeting the requirements of 9.1.3.2, which fill an opening in a fire enclosure;		P
	– connectors in secondary circuits supplied by power sources which are limited to a maximum of 15 VA under normal operating conditions and after a Three fault in the equipment;		N/A
	– connectors in secondary circuits supplied by a limited power source as specified in 9.2,		N/A
	– other components in secondary circuits:		N/A
9.1.3	Materials requirements for protection against fire hazard		P
9.1.3.1	General	PCB is with flammability category V-0	P
9.1.3.2	Materials for fire enclosures	Metal enclosure used.	P
9.1.3.3	Materials for components and other parts inside fire enclosures	Plastic parts outside metal enclosure rated at HF-1	P



Ref. No.: SET2015-17399

EN 62109-1 : 2010			
Clause	Requirement – Test	Result - Remark	Verdict
9.1.3.4	Materials for air filter assemblies	Internal components except small parts are V-2 or better.	P
9.1.4	Openings in fire enclosures		N/A
9.1.4.1	General		N/A
9.1.4.2	Side openings treated as bottom openings		N/A
9.1.4.3	Openings in the bottom of a fire enclosure		N/A
	Construction of the bottom, dimensions (mm)		N/A
9.1.4.4	Equipment for use in a closed electrical operating area		N/A
9.1.4.5	Doors or covers in fire enclosures		N/A
9.1.4.6	Additional requirements for openings in transportable equipment	Not transportable equipment.	N/A
	dimensions (mm)		N/A
9.2	Limited power sources		N/A
	a) Inherently limited output		N/A
	b) Impedance limited output		N/A
	c) Overcurrent protective device limited output		N/A
	d) Regulating network limits the output		N/A
	Max. output voltage (V), max. output current (A), max. apparent power (VA).....		—
	Current rating of overcurrent protective device (A) :		—
9.3	Short-circuit and overcurrent protection		P
9.3.1	General		P
9.3.2	Number and location of overcurrent protective devices		P
9.3.3	Short-circuit co-ordination (backup protection)		P

10	Protection Against Sonic Pressure Hazards		P
10.1	General	<60dB	P
10.2	Sonic Pressure and Sound level		P
10.2.1	Hazardous noise levels	No such hazards.	P



EN 62109-1 : 2010			
Clause	Requirement – Test	Result - Remark	Verdict
11	Protection Against Liquid Hazards		N/A
11.1	Liquid Containment, Pressure and Leakage		N/A
	a) Normal operation, including condensation;		N/A
	b) Servicing of the equipment;		N/A
	c) Inadvertent loosening or detachment of hoses or other cooling system parts over time.		N/A
11.2	Fluid pressure and leakage		N/A
11.2.1	Maximum pressure		N/A
	a) the rated maximum supply pressure specified for an external source;		N/A
	b) the pressure setting of an overpressure safety device provided as part of the assembly		N/A
	c) the maximum pressure that can be developed by an air compressor that is part of the assembly, unless the pressure is limited by an overpressure safety device.		N/A
11.2.2	Leakage from parts		N/A
11.2.3	Overpressure safety device		N/A
	a) be connected as close as possible to the liquid-containing parts of the system that it is intended to protect;		N/A
	b) be installed so as to provide easy access for inspection, maintenance and repair;		N/A
	c) only be adjustable via the use of a tool;		N/A
	d) have its discharge opening so located and directed that the released material is not directed towards any person;		N/A
	e) have its discharge opening so located and directed that operation of the device will not deposit liquid on parts that may cause a hazard;		N/A
	f) have adequate discharge capacity to ensure that, in the event of a failure of the supply pressure control, the pressure does not exceed the rated maximum working pressure of the system;		N/A
	g) have no shut-off valve between it and the parts that it is intended to protect.		N/A
11.3	Oil and grease		N/A



Ref. No.: SET2015-17399

EN 62109-1 : 2010			
Clause	Requirement – Test	Result - Remark	Verdict
12	Chemical Hazards		N/A
12.1	General		N/A
13	Physical Requirements		P
13.1	Handles and manual controls		P
13.1.1	Adjustable controls	No such controls.	N/A
13.2	Securing of parts		P
13.3	Provisions for external connections		P
13.3.1	General		P
13.3.2	Connection to an a.c. MAINS supply		P
13.3.2.1	General		P
13.3.2.2	Permanently connected equipment		P
13.3.2.3	Appliance inlets		N/A
13.3.2.4	Power supply cords	No provide	N/A
	Type		N/A
	Rated current (A), cross-sectional area (mm ²), AWG		N/A
13.3.2.5	Cord anchorages and strain relief	Use wire connector to fix	N/A
	Mass of equipment (kg), pull (N)		—
	Longitudinal displacement (mm)		—
13.3.2.6	Protection against mechanical damage		P
13.3.3	Wiring terminals for connection of external conductors		P
13.3.3.1	Wiring terminals		P
13.3.3.2	Screw terminals		P
13.3.3.3	Wiring terminal sizes		P
	Rated current (A), type, nominal thread diameter (mm)		—
13.3.3.4	Wiring terminal design		P



EN 62109-1 : 2010			
Clause	Requirement – Test	Result - Remark	Verdict
13.3.3.5	Grouping of wiring terminals		P
13.3.3.6	Stranded wire		P
13.3.4	Supply wiring space		P
13.3.5	Wire bending space for wires 10 mm ² and greater		N/A
13.3.6	Disconnection from supply sources		P
13.3.7	Connectors, plugs and sockets		P
13.3.8	Direct plug-in equipment		N/A
	Torque		N/A
	Compliance with the relevant mains plug standard		N/A
13.4	Internal wiring and connections		P
13.4.1	General		P
13.4.2	Routing		P
13.4.3	Colour coding	Yellow/green only used for protective bonding.	P
13.4.4	Splices and connections		P
13.4.5	Interconnections between parts of the PCE		P
13.5	Openings in enclosures		N/A
13.5.1	Top and side opening		N/A
	Dimensions (mm)	Ingress degree IP20	—
13.6	Polymeric Materials	No such materials.	N/A
13.6.1	General		N/A
13.6.1.1	Thermal index or capability		N/A
13.6.2	Polymers serving as enclosures or barriers preventing access to hazards		P
13.6.2.1	Stress relief test	Bobbin material 70°C 7H	P
13.6.3	Polymers serving as solid insulation		P
13.6.3.1	Resistance to arcing		P
13.6.4	UV resistance		N/A
13.7	Mechanical resistance to deflection, impact, or drop		P



EN 62109-1 : 2010			
Clause	Requirement – Test	Result - Remark	Verdict
13.7.1	General		P
13.7.2	Thickness requirements for metal enclosures		P
13.7.3	7 J impact test for polymeric enclosures		N/A
13.7.4	Drop test		N/A
13.8	Thickness requirements for metal enclosures		P
13.8.1	General		P
13.8.2	Cast metal		N/A
13.8.3	Sheet metal	Min 2.0mm	P

14	Components		P
14.1	General		P
14.2	Motor Overtemperature Protection		P
14.3	Overtemperature protection devices		P
14.4	Fuse holders		P
14.5	MAINS voltage selecting devices	No such devices.	N/A
14.6	Printed circuit boards	PCB rated v-0	P
14.7	Circuits or components used as transient overvoltage limiting devices		P
14.8	Batteries		P
14.8.1	Battery enclosure ventilation		N/A
14.8.1.1	Ventilation requirements		N/A
14.8.1.2	Ventilation testing		N/A
14.8.1.3	Ventilation instructions		N/A
14.8.2	Battery mounting		N/A
14.8.3	Electrolyte spillage		N/A
14.8.4	Battery connections		N/A
14.8.5	Battery maintenance instructions		N/A
14.8.6	Battery accessibility and maintainability		N/A



EN 62109-1 : 2010			
Clause	Requirement – Test	Result - Remark	Verdict
15	Software and firmware performing safety functions		N/A
A	ANNEX A, MEASUREMENT OF CLEARANCES AND CREEPAGE DISTANCES		P
B	ANNEX B, PROGRAMMABLE SOFTWARE		N/A
B.1	Software or firmware that performs safety critical functions		N/A
B.1.1	Firmware or Software that performs a critical safety function/s		N/A
B.2.	Evaluation of controls employing software		N/A
B.2.1	Risk analysis		N/A
B.2.1.1	Risk analysis determine a set of risks and that the software addresses the identified risks		N/A
B.2.1.2	Risk analysis identify the critical, non-critical, and supervisory parts of the software		N/A
B.2.1.3	Risk analysis identify transitions or states that can result in a risk		N/A
B.2.1.4	Risks to be considered		N/A
	a) Temperature control, monitoring and response (i.e. coolant, internal ambient, device)		N/A
	b) Safety interlocks		N/A
	c) Synchronization between multiple AC sources		N/A
	d) Emergency stop of operation (including staged shutdown / sequencing)		N/A
	e) Connection / disconnection – from an input source and output source		N/A
	f) RCD functions		N/A
	g) Over current protection or control		N/A
C	ANNEX C, SYMBOLS TO BE USED IN EQUIPMENT MARKINGS		P
D	ANNEX D, TEST PROBES FOR DETERMINING ACCESS		P



Ref. No.: SET2015-17399

EN 62109-1 : 2010			
Clause	Requirement – Test	Result - Remark	Verdict
E	ANNEX E, RCDs		N/A
E.1	Selection of RCD type in AC circuits		N/A
F	ANNEX F, RCDs		N/A
F.1	Correction factor for clearances at altitudes above 2 000 m		N/A
F.2	Test voltages for verifying clearances at different altitude		N/A
G	ANNEX G, CLEARANCE AND CREEPAGE DISTANCE DETERMINATION FOR FREQUENCIES GREATER THAN 30 KHZ		N/A
G.1	Clearances		N/A
G.2	Creepage		N/A
H	ANNEX H, MEASURING INSTRUMENT FOR TOUCH CURRENT MEASUREMENTS		P
H.1	Measuring instrument		P
H.2	Alternative measuring instrument		N/A
I	ANNEX I, EXAMPLES OF PROTECTION, INSULATION, AND OVERVOLTAGE CATEGORY REQUIREMENTS FOR PCE		P
I.1	Numerical		P
I.2	Illustrative		P
J	ANNEX J, ULTRABIOLET LIGHT CONDITIONING TEST		N/A
J.1	General		N/A
J.2	Mounting		N/A
J.3	Carbon-arc light-exposure apparatus		N/A
J.4	Xenon-arc light-exposure apparatus		N/A



EN 62109-1 : 2010					
Clause	Requirement – Test		Result - Remark		Verdict
4.3.a	TABLE: Thermal requirements(model: GF2000)				P
Supply voltage (V)	DC 90V		DC 45V		—
Ambient T _{min} (°C)	25.1		24.7		—
Ambient T _{max} (°C)	25.6		25.3		—
Maximum measured temperature T of part/at:	T (°C)		T (°C)		Allowed T _{max} (°C)
	Measure	Correct to ambient temperture 40℃	Measure	Correct to ambient temperature 40℃	
Iron of Isolating transformer	81.6	96.5	82.1	97.4	--
Winding of Isolating transformer (top spot)	72.8	87.7	74.4	89.7	130
Winding of Isolating transformer (bottom spot)	91.8	106.7	94.2	109.5	130
Bobbin of Isolating transformer	72.5	87.4	74.8	90.1	130
PV input wire	44.6	59.5	46.7	62	85
Batteries input wire	47.3	62.2	49.1	64.4	85
AC output terminal	26.2	41.1	26.7	42	105
AC input terminal	26.2	41.1	26.5	41.8	105
Winding of output line filter L1	39.0	53.9	40.8	56.1	110
Winding of line conductor(top)	44.8	59.7	49.7	65	110
Output wire of isolating transformer	52.7	67.6	56.5	71.8	85
Relay cabinet	54.5	69.4	55.7	71	85
DC filtering Capacitor	38.3	53.2	40.3	55.6	85
Heatsink of IGBT 1	46.6	61.5	51.0	66.3	110
Fan cabinet	46.1	61	50.1	65.4	85
Winding of SMPS transformer	36.2	51.1	37.5	52.8	110
Heatsink of IGBT 2	41.6	56.5	45.0	60.3	105
Panel	35.3	50.2	36.2	51.5	60
Back cabinet	40.1	55	41.7	57	70
Top cabinet	39.8	54.7	40.1	55.4	70



EN 62109-1 : 2010					
Clause	Requirement – Test			Result - Remark	Verdict
4.3.b	TABLE: Thermal requirements(model: GF1500)				P
Supply voltage (V)	DC 45V		DC 90V		—
Ambient T_{min} (°C)	24.5		24.1		—
Ambient T_{max} (°C)	24.7		24.3		—
Maximum measured temperature T of part/at:	T (°C)		T (°C)		Allowed T_{max} (°C)
	Measure	Correct to ambient temperature 40°C	Measure	Correct to ambient temperature 40°C	
Iron of Isolating transformer	80.3	96.0	81.2	97.3	130
Winding of Isolating transformer (top spot)	89.6	105.3	90.2	106.3	130
Winding of Isolating transformer (bottom spot)	84.2	99.9	85.6	101.7	130
Invertering Mosfet	47.5	63.2	48.3	64.4	90
MPPT Mosfet	40.9	56.6	42.9	59.0	90
Invertering Mosfet 1	47.7	63.4	48.9	65.0	90
Invertering Mosfet2	48.1	63.8	48.0	64.1	90
PV Mosfet	45.3	61.0	44.7	60.8	90

4.3.c	TABLE: Thermal requirements(model: GF1000)				P
Supply voltage (V)	DC 45V		DC 90V		—
Ambient T_{min} (°C)	24.1		24.2		—
Ambient T_{max} (°C)	24.6		24.5		—
Maximum measured temperature T of part/at:	T (°C)		T (°C)		Allowed T_{max} (°C)
	Measure	Correct to ambient temperature 40°C	Measure	Correct to ambient temperature 40°C	
Iron of Isolating transformer	78.3	94.7	78.9	95.0	130
Winding of Isolating transformer (top spot)	82.4	98.8	83.7	99.8	130
Winding of Isolating transformer (bottom spot)	81.1	97.5	80.2	96.3	130
Invertering Mosfet	45.2	61.6	45.7	61.8	90
MPPT Mosfet	46.3	62.7	46.6	62.1	90
Invertering Mosfet 1	45.6	62.0	44.3	60.4	90



EN 62109-1 : 2010					
Clause	Requirement – Test			Result - Remark	Verdict
Invertering Mosfet2	47.3	63.7	45.8	61.9	90
Heatsink of 7805	43.9	60.3	42.4	58.5	90
PV protective diode	40.2	56.6	39.5	55.6	90

4.3.d	TABLE: Thermal requirements(model: GF500)				P
Supply voltage (V)	DC 22V		DC 45V		—
Ambient T_{min} (°C)	24.1		24.3		—
Ambient T_{max} (°C)	24.6		24.5		—
Maximum measured temperature T of part/at:	T (°C)		T (°C)		Allowed T_{max} (°C)
	Measure	Correct to ambient temperature 40°C	Measure	Correct to ambient temperature 40°C	
Iron of Isolating transformer	77.6	94.0	77.7	93.6	130
Winding of Isolating transformer (top spot)	80.5	96.9	80.9	96.8	130
Winding of Isolating transformer (bottom spot)	79.1	95.5	78.3	94.2	130

4.4	TABLE: Fault condition tests					P
	Ambient temperature (°C)				24,8°C	—
	Power source for EUT: Manufacturer, model/type, output rating				--	—
Component No.	Fault	Supply voltage (V)	Test time	Fuse #	Fuse current (A)	Observation
Output	Shorted-circuit	I/P: 60Vdc O/P: 230Vac	1S	----	----	EUT shut down immediately. No display due to system shun down. No component damaged, once the short-circuit resume, EUT is worked normally. No hazards.
Output	overload	I/P: 60Vdc O/P: 230Vac	1S	----	----	EUT shut down immediately. LED of batteries is light. No hazards.
Ventilation hole	Blocked	I/P: 60Vdc O/P: 230Vac	30 min	----	----	EUT limit output when temperature of thermal detector rised to 85°C. The output power limited to 0
Fan	Blocked	I/P: 60Vdc O/P: 230Vac	30 min	----	----	Test result as above. No hazards.



Ref. No.: SET2015-17399

EN 62109-1 : 2010						
Clause	Requirement – Test				Result - Remark	
Secondary of transformer	Shorted-circuit	I/P: 60Vdc O/P: 230Vac	1S	----	----	EUT shut down immediately. No display due to system shun down. No component damaged, once the short-circuit resume, EUT is worked normally. No hazards
Input	Reverse	I/P: 60Vdc O/P: 230Vac	5 min	----	----	The EUT can't start. LCD display "PV reverse". No hazards.
Switch	Mis-match	I/P: 60Vdc O/P: 230Vac	5 min	----	----	No effect , No hazards.
R1	Shorted-circuit	I/P: 60Vdc O/P: 230Vac	10 min	----	----	The power display "0" no effect. No hazards.
R40	Shorted-circuit	I/P: 60Vdc O/P: 230Vac	1S	----	----	EUT change to AC input mode. No hazards.
R40	Opened-circuit	I/P: 60Vdc O/P: 230Vac	1S	----	----	EUT change to AC input mode. No hazards.
R2	Opened-circuit	I/P: 60Vdc O/P: 230Vac	1s	----	----	EUT is worked normally. No hazards.
C15	Shorted-circuit	I/P: 60Vdc O/P: 230Vac	1s	----	----	EUT shut down immediately, No display due to system shun down. No component damaged, once the short-circuit resume, EUT is worked normally. No hazards.
C15	Shorted-circuit	I/P: 60Vdc O/P: 230Vac	1s	----	----	EUT shut down immediately, No display due to system shun down. No component damaged, once the short-circuit resume, EUT is worked normally. No hazards.
C19	Shorted-circuit	I/P: 60Vdc O/P: 230Vac	1s	Fuse2	80A	EUT shut down immediately. Fuse2 opened, hi-pot test is pass, No hazards.
Q8 D and S	Shorted-circuit	I/P: 60Vdc O/P: 230Vac	1s	----	----	EUT shut down immediately. Mosfet Q12&Q13 is damaged, hi-pot test is passed, No hazards.
Q22 G and S	Shorted-circuit	I/P: 60Vdc O/P: 230Vac	1s	----	----	EUT shut down immediately LED indicated fault. No hazards.



Ref. No.: SET2015-17399

EN 62109-1 : 2010								
Clause		Requirement – Test			Result - Remark			Verdict
4.7	TABLE: Electrical rating tests (off grid)							P
output Level	input Voltage (V)	input current (A)	input power (kW)	output voltage (V)	Uthd (%)	output current (A)	output power (kW)	Frequency (Hz)
GF2000								
0%	48.41	2.565	0.124	228.62	4.4%	/	/	50.009
5%	48.04	4.703	0.225	227.98	4.1%	1.069	0.103	50.025
50%	45.99	26.87	1.224	227.36	2.2%	4.613	1.043	50.025
100%	42.87	58.25	2.438	228.07	3.7%	8.793	2.005	50.025
0%	89.97	1.347	0.121	230.58	4.3%	/	/	50.023
5%	90.06	2.330	0.210	228.05	4.5%	0.583	0.103	50.028
50%	89.96	13.349	1.201	227.88	2.5%	4.457	1.015	50.023
100%	74.84	31.482	2.356	226.45	2.6%	8.703	1.970	50.025
0%	51.17	2.304	0.118	229.91	4.4%	/	/	50.023
5%	51.16	4.164	0.213	228.16	4.2%	0.455	0.103	50.024
50%	51.18	24.512	1.254	226.68	2.3%	4.583	1.038	50.026
100%	51.05	47.451	2.422	227.25	3.0%	8.767	1.992	50.025
*0%-10 0%	/	/	/	/	/	229.5	/	/
*100%- 0%	/	/	/	/	/	230.2	/	/
Note: * After 1.5S, measure output voltage by oscilloscopes.								
GF1500								
0%	Nominal DC voltage	1.989	0.094	229.29	4.1%	/	/	50.027
5%	Nominal DC voltage	3.826	0.176	230.06	3.8%	0.347	0.080	50.025
50%	Nominal DC voltage	22.802	0.941	230.22	1.3%	3.536	0.814	50.025
100%	Nominal Nominal DC voltage	44.909	1.738	229.2	1.8%	6.659	1.526	50.024
0%	PV min voltage	1.801	0.085	229.19	4%	/	/	50.024
5%	PV min voltage	3.647	0.166	230.29	4%	0.348	0.080	50.027



Ref. No.: SET2015-17399

EN 62109-1 : 2010								
Clause	Requirement – Test				Result - Remark			Verdict
50%	PV min voltage	22.625	0.931	230.18	1.2%	3.538	0.814	50.025
100%	PV min voltage	44.785	1.733	229.59	1.6%	6.665	1.530	50.024
0%	PV max voltage	1.874	0.089	229.85	4.6%	/	/	50.025
5%	PV max voltage	3.673	0.169	229.11	4%	0.346	0.079	50.022
50%	PV max voltage	22.458	0.930	229.6	1.4%	3.524	0.809	50.025
100%	PV max voltage	44.750	1.745	230.06	1.6%	6.669	1.534	50.026
GF1000								
0%	Nominal DC voltage	1.05	0.047	228.35	4%	/	/	50.022
5%	Nominal DC voltage	2.3	0.102	225.58	3.1%	0.233	0.052	50.021
50%	Nominal DC voltage	14.995	0.611	226.59	1.1%	2.352	0.533	50.024
100%	Nominal DC voltage	31.257	1.212	226.33	1.7%	4.725	1.069	50.024
0%	PV min voltage	1.098	0.049	226.88	5.1%	/	/	50.024
5%	PV min voltage	2.330	0.105	226.28	3%	0.233	0.053	50.021
50%	PV min voltage	14.754	0.612	226.33	1.1%	2.349	0.532	50.024
100%	PV min voltage	30.432	1.204	226.71	1.7%	4.689	1.063	50.024
0%	PV max voltage	1.098	0.049	226.88	5%	/	/	50.024
5%	PV max voltage	7.360	0.394	226.54	3.7%	0.234	0.053	50.021
50%	PV max voltage	6.312	0.298	225.45	1.2%	2.339	0.527	50.023
100%	PV max voltage	7.167	0.246	225.54	1.6%	4.658	1.051	50.025
GF500								
0%	Nominal DC voltage	0.915	0.047	229.01	4.1%	/	/	50.025
5%	Nominal DC voltage	2.054	0.047	230	4%	0.1	0.025	50.028



Ref. No.: SET2015-17399

EN 62109-1 : 2010								
Clause	Requirement – Test				Result - Remark			Verdict
50%	Nominal DC voltage	14.541	0.302	228.94	1.5%	1.16	0.262	50.022
100%	Nominal DC voltage	33.246	0.64	228.17	2.4%	2.368	0.54	50.025
0%	PV min voltage	0.93	0.020	229.32	6.3%	/	/	50.025
5%	PV min voltage	2.081	0.046	229.89	4%	0.1	0.025	50.028
50%	PV min voltage	14.767	0.302	229.05	1.6%	1.147	0.263	50.025
100%	PV min voltage	33.831	0.646	229.28	2.5%	2.379	0.545	50.025
0%	PV max voltage	0.689	0.012	228.4	6.3%	/	/	50.022
5%	PV max voltage	1.634	0.032	229.62	4%	0.1	0.025	50.028
50%	PV max voltage	13.755	0.273	228.94	1.6%	1.147	0.263	50.025
100%	PV max voltage	31.926	0.603	229.09	2.5%	2.377	0.544	50.022

7.3.7.4&7.3.7.5	Clearance distances and creepage					P
Clearance (cl) and creepage distance (cr) at/of/between:	U r.m.s. (V)	System Voltage (V)	Required cl (mm)	cl (mm)	Required dcr (mm)	dcr (mm)
Main board :DC circuit to GND (BI)	90	90	1.5	2.0	1.5	2.0
DC circuit to GND (BI)	90	90	1.5	2.0	1.5	2.0
Main board :AC circuit to DVC B (BI)	<250	<250	1.5	3.0	1.5	3.0
AC circuit to GND (BI)	<250	<250	1.5	3.0	2.5	3.0
RS232 board: DVC B to RS232 circuit (BI)	<50	<250	1.5	2.0	1.5	2.0
Pri-sec of transformer (RI)	<250	<250	4.8	6.0	5.0	6.0
Supplementary information:						
1. Basic insulation was used between input and DVC B circuit.						
2. Supplementary insulation was used between RS 232 port communicated with PC and control board.						



Ref. No.: SET2015-17399

EN 62109-1 : 2010				
Clause	Requirement – Test		Result - Remark	
7.5.1 7.5.2 7.5.3	TABLE: Impulse voltage test AC or DC voltage test Partial Discharge Test			P
test voltage applied between:		test voltage (V)	impulse withstand voltage (V)	partial discharge extinction voltage (V)
DC input to Ground		225V d.c.	--	--
DC input to ungrounded assessable part		450V d.c.	--	--
AC output to ground		2120V d.c.	--	--
AC output to ungrounded assessable part		4240V d.c.	--	--
Pri to sec of mains transformer		2120V d.c.	--	--
				No breakdown

14	TABLE: List of critical components				
Object/part No.	Manufacturer/ trademark	Type/model	Technical data	Standard (Edition / year)	Mark(s) of conformity ¹⁾
Fuse (for GF500、 GF1000、GF1500)	LITTLE FUSE INC	Series 299	30A	UL248	UL
	SHENZHEN Deer Electronic Co., Ltd.	5*20*12mm	30A	IEC 60127	VDE
	YUJIE	5*20*12mm	30A	IEC 60127	VDE
Fuse (for GF2000)	LITTLE FUSE INC	Series 299	40A	UL248	UL
	YUJIE	5*20*12mm	40A	IEC 60127	VDE
PCB	Various	Various	130°C V-0	UL94	UL
Temperature switch (for all)	DONGGUAN KAIN ELECTRONIC CO., LTD	KI66 50°C Normally Open	AC250V 5A 50°C	IEC 60730-1	VDE



Ref. No.: SET2015-17399

EN 62109-1 : 2010					
Clause	Requirement – Test		Result - Remark		Verdict
	DONGGUAN KAIN ELECTRONIC CO., LTD	KI66 85℃ Normally Closed	AC250V 5A 85℃	IEC 60730-1	VDE
INPUT Connector board (for all)	LIU-FENG	FT16HWP-3.5— 6P	76A,750V,16mm ²	IEC60998	CE
Connecting device (for all)	HEAVY POWER CO., LTD	PA16	68A 300V	EN60998-1 EN60998-2	VDE
Input wire (for all)	GOLDEN SONNY	60227 IEC 02(RV)	6mm ² 、10mm ² 、 12mm ²	IEC 60227	TUV
Capacitor (for GF500)	HUNAN AIHUA GROUP CO., LTD	LH series	35V 4700Uf 105℃	--	--
capacitor (for GF1000、 GF1500、 GF2000)	HUNAN AIHUA GROUP CO., LTD	LH series	63V 4700Uf 105℃	--	--
MOS (for GF500)	INTERNATION AL RECTIFIRE	IRLB4132RbF	BV=30V, Rds(on)=3.5mΩ	--	--
MOS (for GF1000)	WISDOM SEMI CONDUCTOR (shenzhen)	WFP75N75	BV≥75V, I(dss)< 10uA, Vgs(th) 2-4V	--	--
MOS (for GF1500)	INTERNATION AL RECTIFIRE	IRFB4410ZRbF, IRFS4410ZRbF, IRFSL4410ZRbF	BV=100V, Rds(on)=7.2mΩ	--	--
MOS (for GF2000)	INTERNATION AL RECTIFIRE	IRFB4410PbF	BV=100V, Rds(on)=3.7mΩ	--	--
Transformer (for GF500)	Yangzhou Jinying Electric Appliance Co., Ltd.	GF500W-24VDC -230V	24VDC 230V	EN 62109-1:2010	Test with equipment
Transformer (for GF1000)	Yangzhou Jinying Electric Appliance Co., Ltd.	GF1500H-48VD C-230V	48VDC 230V	EN 62109-1:2010	Test with equipment



Ref. No.: SET2015-17399

EN 62109-1 : 2010					
Clause	Requirement – Test		Result - Remark		Verdict
Transformer (for GF1500)	Yangzhou Jinying Electric Appliance Co., Ltd.	GF2000H-48VD C-230V	48VDC 230V	EN 62109-1:2010	Test with equipment
Transformer (for GF2000)	Yangzhou Jinying Electric Appliance Co., Ltd.	GF3000H-48VD C-230V	48VDC 230V	EN 62109-1:2010	Test with equipment
Bobbin	PINGHU MEISHEN ELECTRIC APPARATUS CO.,LTD	PA66/G30	V-0,130°C	UL746	UL
Coil	XU ZHOU SHENGBAO INDUSTRY CO.,LTD	QZ-2, QL(ZY/XY)-2	130°C,200°C	UL1446	UL
Insulation paper	CHANGZHOU JINHAO SPECIAL INSULATION MATERIAL FACTORY	Various	200°C	UL510	UL
Wire	NANJING KAIYAN ELECTRONIC CO.,LTD	227 IEC 08(RV90)	130°C	IEC 60227	TUV
FUSE (for GF500)	SHENZHEN Deer Electronic Co., Ltd.	60F series	250V 5A	IEC 60127	VDE
FUSE (for GF1000)	SHENZHEN Deer Electronic Co., Ltd.	60F series	250V 10A	IEC 60127	VDE
FUSE (for GF1500)	SHENZHEN Deer Electronic Co., Ltd.	60F series	250V 15A	IEC 60127	VDE



Ref. No.: SET2015-17399

EN 62109-1 : 2010					
Clause	Requirement – Test			Result - Remark	Verdict
FUSE (for GF2000)	SHENZHEN Deer Electronic Co., Ltd.	60F series	250V 20A	IEC 60127	VDE
Relay (for all)	Song Chuan Precision Co., Ltd.	793-P-1C	DC24V	EN 61810-5 EN 61810-1 EN 60255-23	TUV
Fan	Nice Full Electronics Co., Ltd.	D90SH-24	DC24V 0.5A	EN60950-1	TUV
OUTPUT Connector board (for all)	Changhe Electronics Co., Ltd. Heavy Power Co., Ltd	PA10H-12P, PA9	24A 450V 2.5 mm ²	DIN EN 60998-1 DIN EN 60998-2-1	VDE
Inductor (for GF500、GF1000)	Shenzhen Yuyuan Power Co., Ltd	CHOKE 1030	1.6mH 9A	EN 62109-1:2010	Test with equipment
Coil	Various	2UEW+NY	130℃	UL1446	UL
Base	Various	Base-001-1	PHENOLIC T375J	UL510	UL
Spacer	Various	KB6150	FR-1 130℃ T3.0mm	UL510	UL
Inductor (for GF1500、GF2000)	Shenzhen Yuyuan Power Co., Ltd	CHOKE (S)	2.5mH	EN 62109-1:2010	Test with equipment
Coil	Various	Various	180℃	UL1446	UL
Case	Various	PBT4130F	UL 94V-0	UL94	UL
Base	Various	FR-4	T1.6	UL510	UL
X-capacitor (for GF500、GF1000)	DONGGUAN COCEN ELECTRONICS CO., LTD	MPP	0.47uF 275VAC	IEC60384-14	VDE



Ref. No.: SET2015-17399

EN 62109-1 : 2010					
Clause	Requirement – Test			Result - Remark	Verdict
X-capacitor (for GF1500、GF2000)	DONGGUAN COCEN ELECTRONICS CO., LTD	MPP	2.2uF 275VAC	IEC60384-14	VDE
Y-capacitor	Guangdong Fenghua Advanced Technology Co., Ltd.	CT7-Y2	4n7 450V	IEC60384-14	VDE

14.8	TABLE: Batteries								N/A		
The tests of 4.3.8 are applicable only when appropriate battery data is not available										N/A	
Is it possible to install the battery in a reverse polarity position?										N/A	
	Non-rechargeable batteries			Rechargeable batteries							
	Discharging		Un-intentional charging	Charging		Discharging		Reversed charging			
	Meas. current	Manuf. Specs.		Meas. current	Manuf. Specs.	Meas. current	Manuf. Specs.	Meas. current	Manuf. Specs.		
Max. current during normal condition	--	--	--	--	--	--	--	--	--		
Max. current during fault condition	--	--	--	--	--	--	--	--	--		
Test results:										Verdict	
- Chemical leaks										N/A	
- Explosion of the battery										N/A	



Ref. No.: SET2015-17399

EN 62109-1 : 2010			
Clause	Requirement – Test	Result - Remark	Verdict
- Emission of flame or expulsion of molten metal			N/A
- Electric strength tests of equipment after completion of tests			N/A



EN 62109-2 : 2011			
Clause	Requirement – Test	Result - Remark	Verdict
4	General testing requirements		P
4.4	Testing in single fault condition	See the IEC 62109-1 report	P
4.4.4	Single fault conditions to be applied		P
4.4.4.15	Fault-tolerance of protection for grid-interactive inverters		N/A
4.4.4.15.1	Fault-tolerance of residual current monitoring		N/A
4.4.4.15.2	Fault-tolerance of automatic disconnecting means		N/A
4.4.4.15.2.1	General (EN 62109-2)		N/A
4.4.4.15.2.2	Design of insulation or separation (EN 62109-2)		N/A
4.4.4.15.2.3	Automatic checking of the disconnect means (EN 62109-2)		N/A
4.4.4.16	Stand-alone inverters – Load transfer test		P
4.4.4.17	Cooling system failure – Blanketing test	EUT use only in closed electrical operating areas	N/A
4.7	Electrical ratings tests	(see appended table 4.7)	P
4.7.3	Measurement requirements for AC output ports for stand-alone inverters	(see appended table 4.7)	P
4.7.4	Stand-alone Inverter AC output voltage and frequency	(see appended table 4.7)	P
4.7.5	Stand-alone inverter output voltage waveform	(see appended table 4.7)	P
4.8	Additional tests for grid-interactive inverters		N/A
4.8.1	General requirements regarding inverter isolation and array grounding		N/A
4.8.2	Array insulation resistance detection for inverters for ungrounded and functionally grounded arrays		N/A
4.8.3	Array residual current detection		N/A
5	Marking and documentation		P
6	Environmental requirements and conditions		P
7	Protection against electric shock and energy hazards		P
7.3	Protection against electric shock		P



EN 62109-2 : 2011			
Clause	Requirement – Test	Result - Remark	Verdict
7.3.10	Additional requirements for stand-alone inverters	The means used to bond the grounded conductorto protective earth was provided as part of the installation.T he required means described in the installation instructions	P
7.3.11	Functionally grounded arrays		P
8	Protection against mechanical hazards		P
9	Protection against fire hazards		P
9.3	Short-circuit and overcurrent protection		P
9.3.4	Inverter backfeed current onto the array		P
10	Protection against sonic pressure hazards		P
11	Protection against liquid hazards		N/A
12	Protection against chemical hazards		P
13	Physical requirements		P
13.9	Fault indication	Fault information is display on LCD panel and LED.	P
14	Components		P



Ref. No.: SET2015-17399

EN 62109-2 : 2011				
Clause	Requirement – Test		Result - Remark	Verdict
Table 4.8.3:Array residual current detection				Verdict
fault current that occurs suddenly				N/A
PV polarity	Trip current(mA)	Cut-off time(ms)	limits(s)	-----
-----	-----	-----	-----	-----

4.8.3.5.2	Test for detection of excessive continuous residual current			N/A
Fault Current (mA)		Disconnection time (ms)		
Measured Fault Current	Limit 300mA	Measured Disconnection time	Limit	
----	----	----	----	

Photo document



Photo 1 Front view



Photo 2 Bottom view



Ref. No.: SET2015-17399

Photo document



Photo 3 Side view



Photo 4 Input/output terminal

Photo document

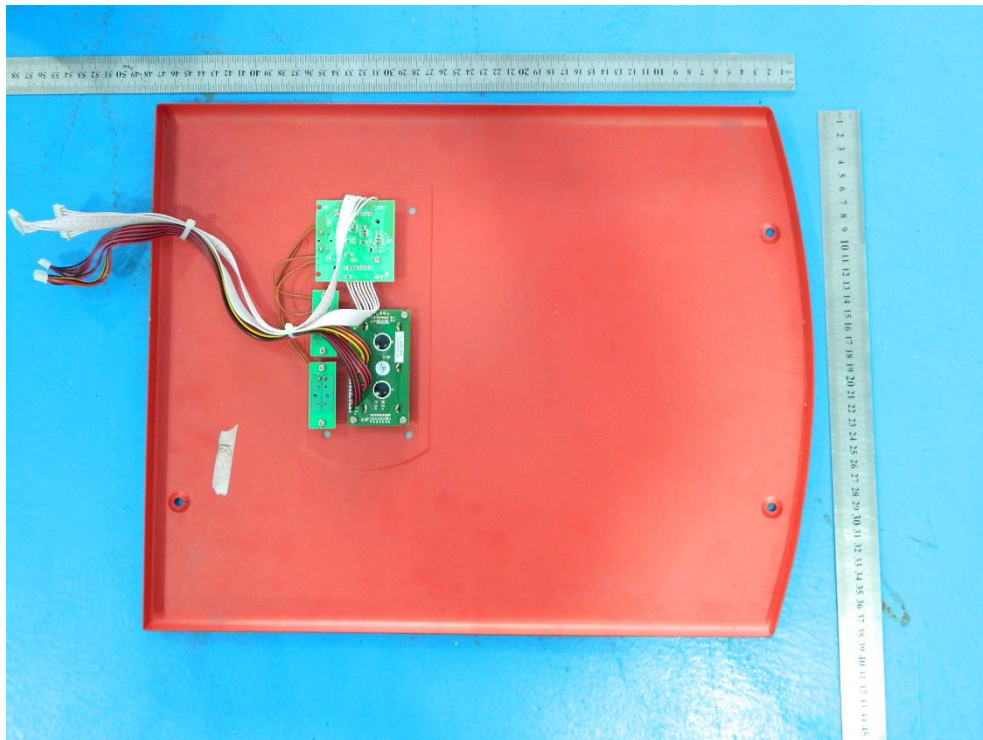


Photo 5 Inside panel view



Photo 6 Inside instruction



Photo document

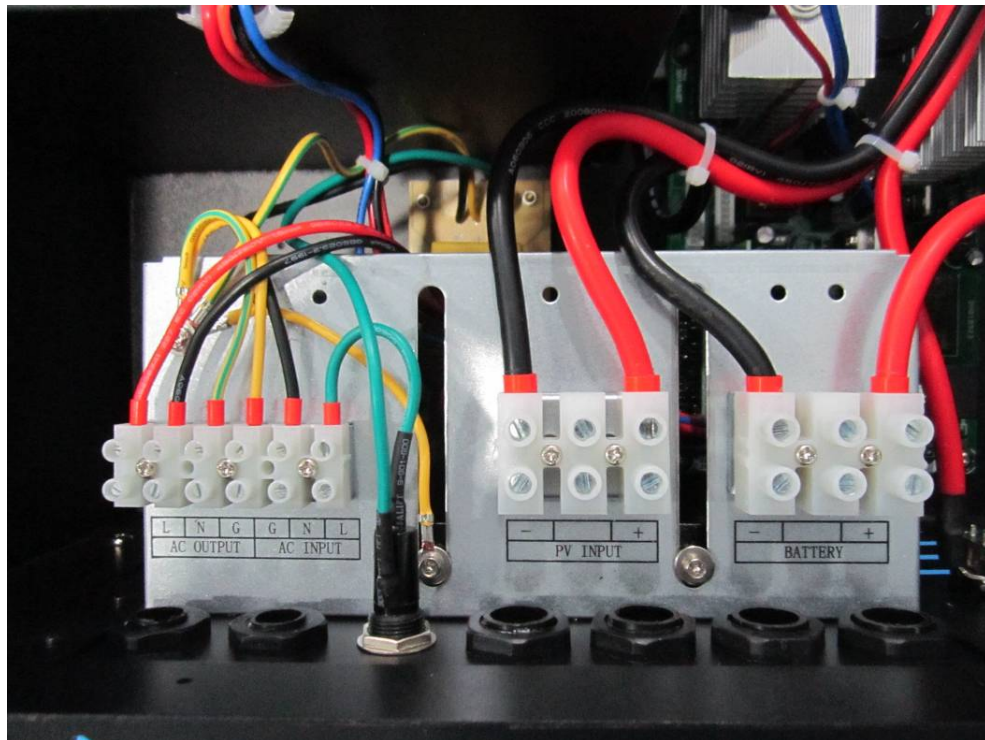


Photo 7 Inside connective terminal

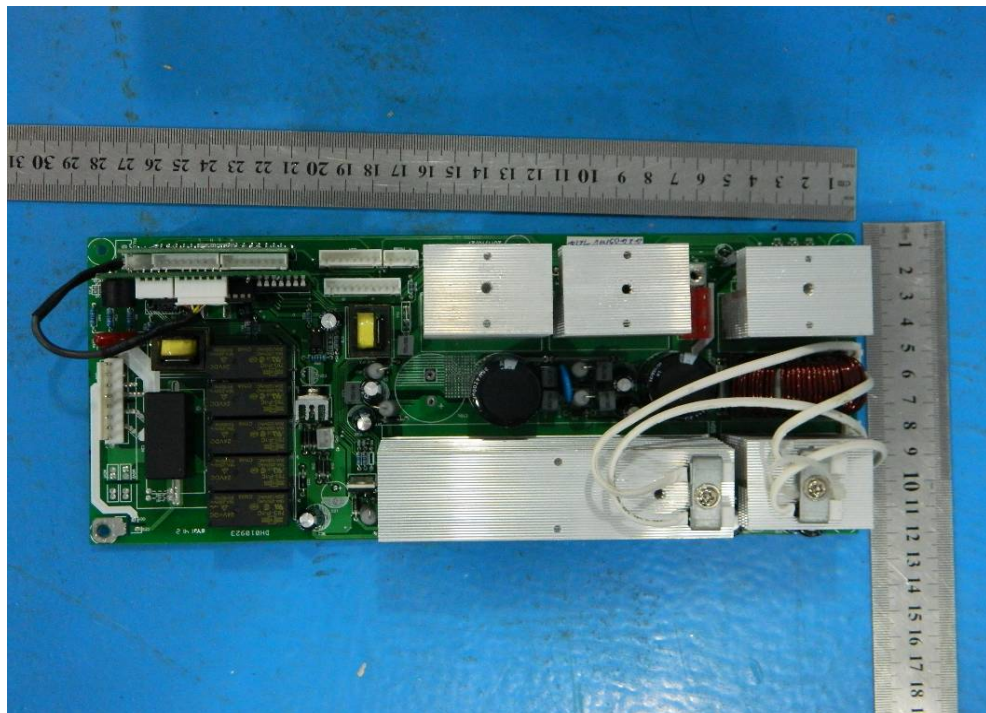


Photo 8 Power Board

Photo document

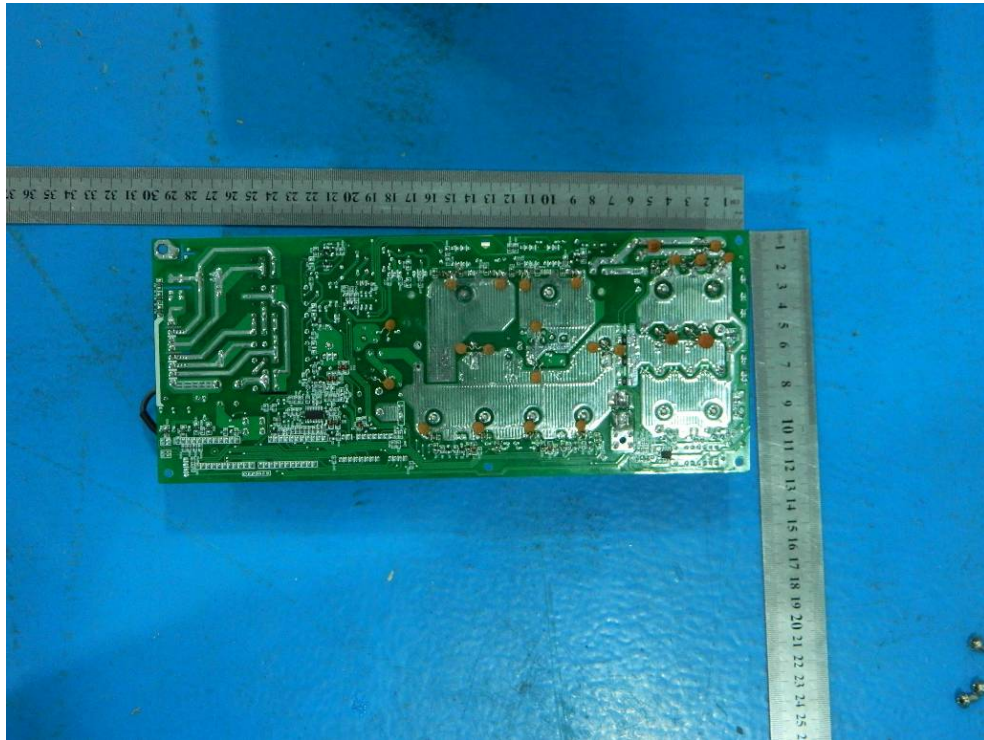


Photo 9 Power board



Photo 10 RS232 board

Photo document



Photo 11 RS232 board

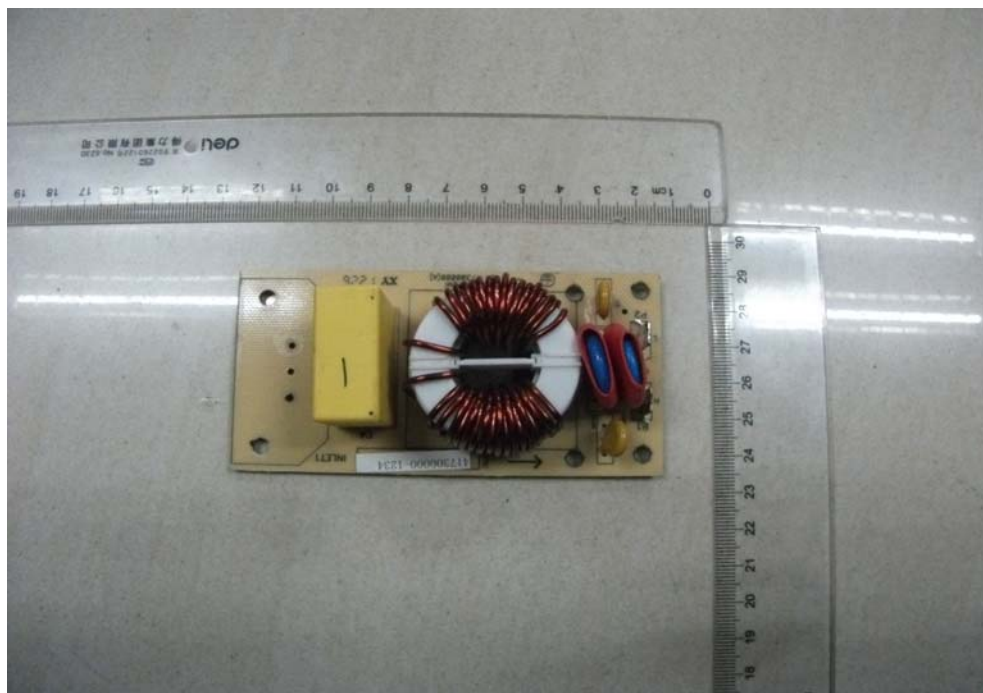


Photo 12 EMC board

Photo document



Photo 13 EMC board

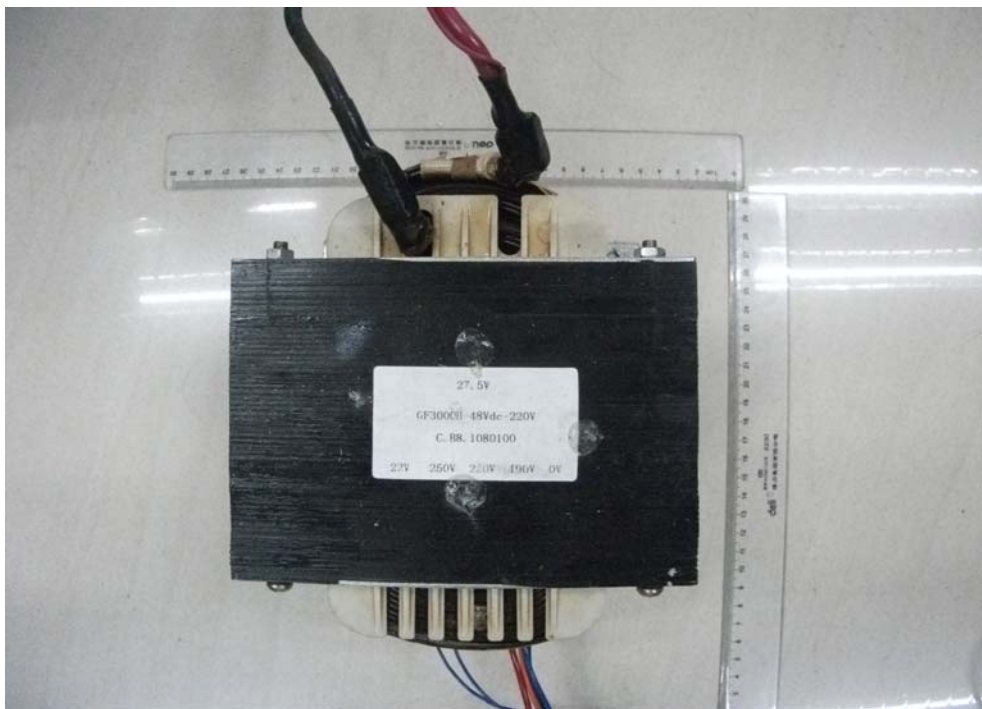


Photo 14 Transformer for GF2000



Ref. No.: SET2015-17399

Photo document



Photo 15 Transformer for GF1500

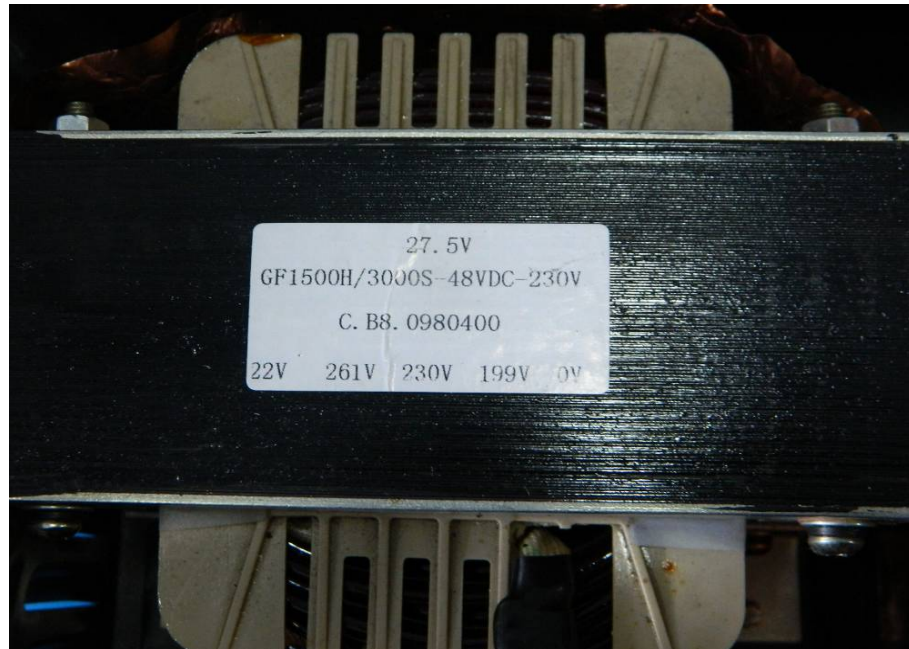


Photo 16 Transformer for GF1000



Photo document

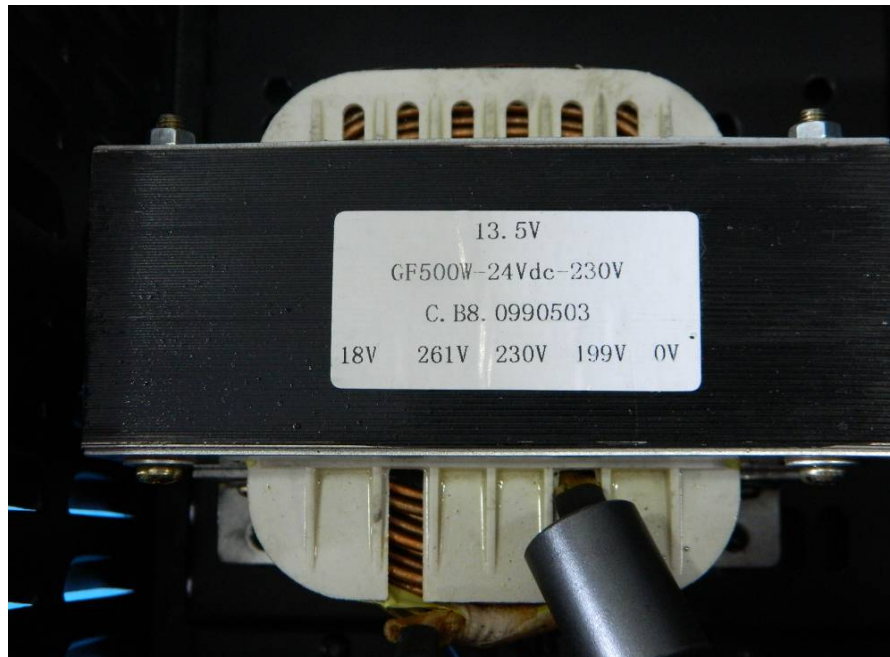


Photo 17 Transformer for GF500

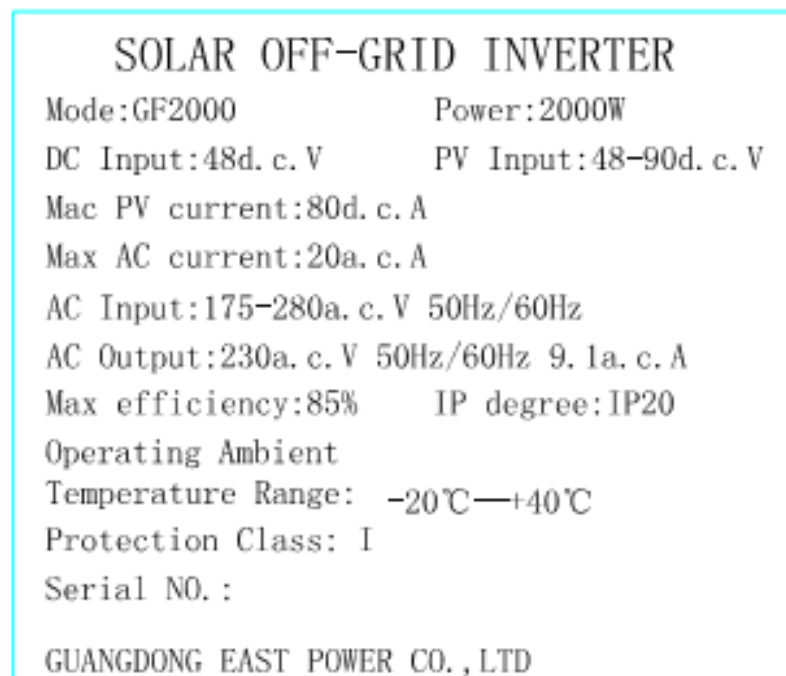


Photo 18 Rating plate



Photo document

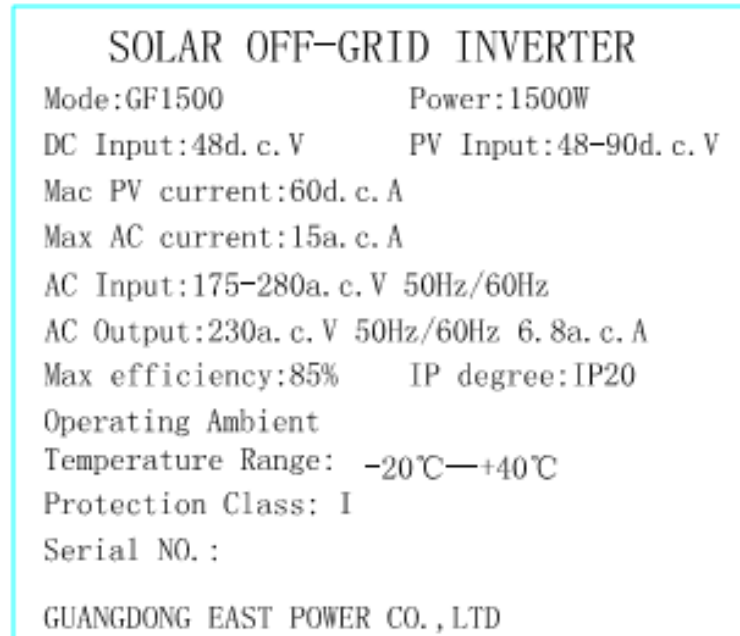


Photo 19 Rating plate

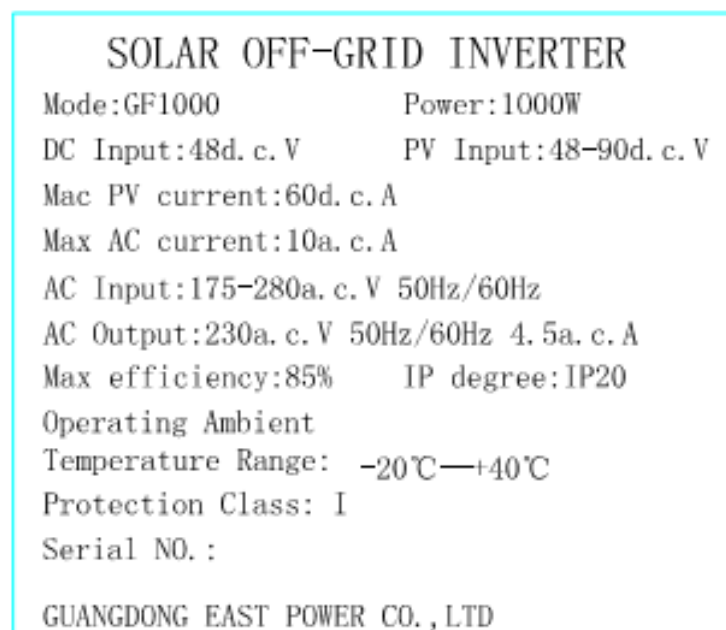


Photo 20 Rating plate



Ref. No.: SET2015-17399

Photo document

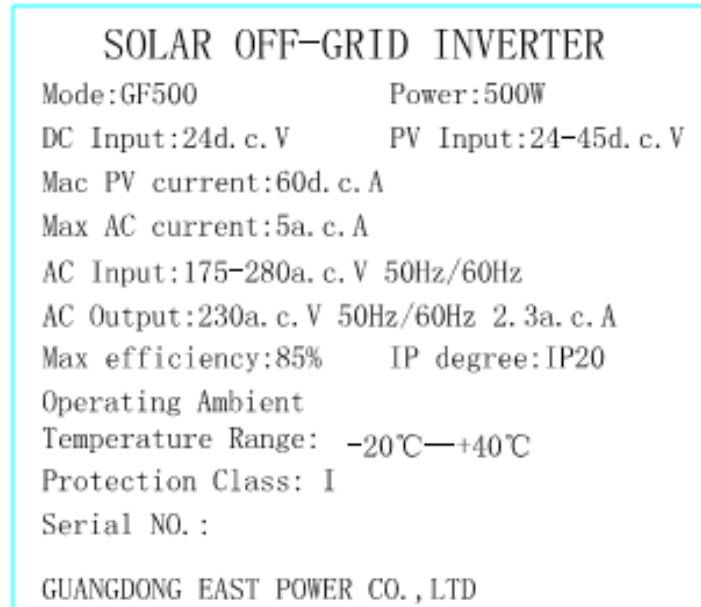


Photo 21 Rating plate