

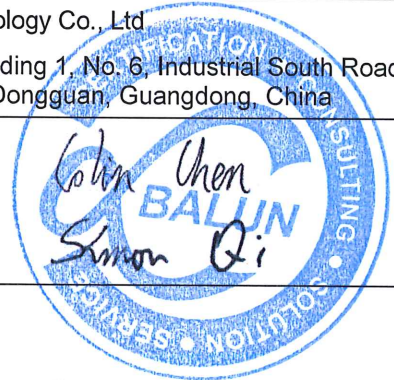


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CNAS L6791

Test Report issued under the responsibility of:



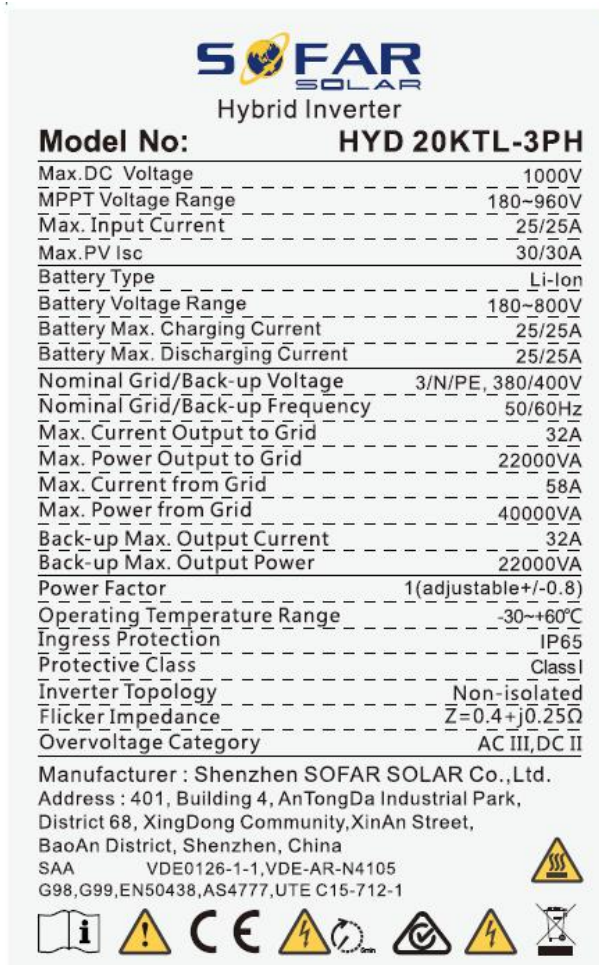
TEST REPORT IEC 62040-1 Uninterruptible power systems (UPS) – Part 1: General and safety requirements for UPS	
Report Number.....:	BL-DG2030075-B02
Date of issue.....:	May 25, 2020
Total number of pages.....:	59
Name of Testing Laboratory preparing the Report.....:	Shenzhen BALUN Technology Co., Ltd
Applicant's name.....:	Shenzhen SOFAR SOLAR Co., Ltd.
Address.....:	401, Building 4, AnTongDa Industrial Park, District 68, XingDong Community, XinAn Street, BaoAn District, Shenzhen, China.
Test specification:	
Standard..... :	IEC 62040-1: 2017
Test procedure.....:	Commissioned test
Non-standard test method.....:	N/A
Test item description.....:	Photovoltaic inverter
Trade Mark.....:	
Manufacturer.....:	Same as the applicant
Model/Type reference.....:	HYD 10KTL-3PH, HYD 15KTL-3PH, HYD 20KTL-3PH
Ratings.....:	See copy of marking label and model list.
Testing Laboratory.....:	Shenzhen BALUN Technology Co., Ltd
Testing location/ address.....:	Room 104, 204, 205, Building 1, No. 6, Industrial South Road, Songshan Lake District, Dongguan, Guangdong, China
Tested by (name, function, signature).....:	Colin Chen /Engineer
Approved by (name, function, signature).....:	Simon Qi /Chief Engineer



List of Attachments (including a total number of pages in each attachment): ATTACHMENT 1 – Photo documentation(8 pages)	
Summary of testing:	
Tests performed (name of test and test clause): All applicable test	Testing location: All tests as described in Test Case and Measurement Sections were performed at the laboratory described on page 1.
Summary of compliance with National Differences List of countries addressed: N/A	
<input checked="" type="checkbox"/> The product fulfils the requirements of IEC EN 62040-1 : 2017 / EN 62040-1 : 2019	

Copy of marking plate

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



Note:

1. The above markings are the minimum requirements required by the safety standard. For the final production samples, the additional markings which do not give rise to misunderstanding may be added.
2. Label is attached on the side surface of enclosure and visible after installation
3. Labels of other models are as the same with HYD 20KTL-3PH's except the parameters of rating.

Test item particulars :
Classification of installation and use : User
Supply Connection : Permanent connection
..... :
Possible test case verdicts:
- test case does not apply to the test object..... : N/A
- test object does meet the requirement..... : P (Pass)
- test object does not meet the requirement..... : F (Fail)
Testing :
Date of receipt of test item : Mar. 23, 2020
Date (s) of performance of tests : Mar. 23, 2020 to Apr. 20, 2020
General remarks:
"(See Enclosure #)" refers to additional information appended to the report. "(See appended table)" refers to a table appended to the report. The tests results presented in this report relate only to the object tested. This report shall not be reproduced except in full without the written approval of the testing laboratory. List of test equipment must be kept on file and available for review. Additional test data and/or information provided in the attachments to this report. Throughout this report a <input type="checkbox"/> comma / <input checked="" type="checkbox"/> point is used as the decimal separator. Determination of the test results includes consideration of measurement uncertainty from the test equipment and methods.
Manufacturer's Declaration per sub-clause 4.2.5 of IEC 62040-1:
The application for obtaining a CB Test Certificate includes more than one factory location and a declaration from the Manufacturer stating that the sample(s) submitted for evaluation is (are) representative of the products from each factory has been provided..... : <input type="checkbox"/> Yes <input checked="" type="checkbox"/> Not applicable
When differences exist; they shall be identified in the General product information section.
Name and address of factory (ies) : Dongguan SOFAR SOLAR Co., Ltd. 1F - 6F, Building E, No. 1 JinQi Road, Bihu Industrial Park, Wulian Village, Fenggang Town, Dongguan City.

General product information:

Brief description:

The PCE under test (EUT) is Hybrid Inverter. During inverter, which convert the variable DC power generated from the photovoltaic (PV) arrays and Batteries to the stable utility AC power which can be fed into the commercial electrical grid. When charging, the grid converts the alternating current into direct current into the battery through the Hybrid Inverter.

The PCE under test is three-phase Hybrid Inverter for solar power generation with the rating of 10kW, 15kW and 20kW.

The external circuit breakers or fuses for PV array, Batteries and Grid connection are required which the statements are provided in the installation manual.

The models of HYD 10KTL-3PH, HYD 15KTL-3PH, and HYD 20KTL-3PH are identical on topological schematic circuit diagram and control solution codes. The difference between each other as following table:

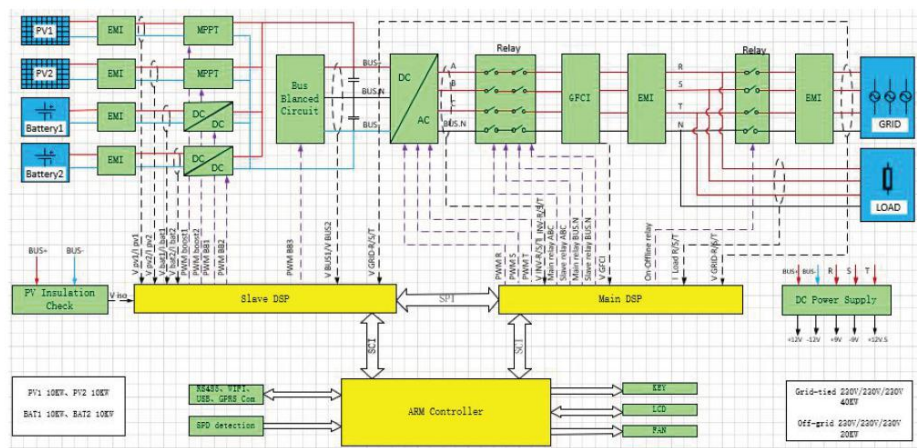
Item \ Model	HYD 20KTL-3PH	HYD 15KTL-3PH	HYD 10KTL-3PH
Recommended Max.PV Power	30000Wp (15000Wp/15000Wp)	22500 Wp (11250Wp /11250Wp)	15000Wp (7500Wp /7500Wp)
Full power MPPT voltage range	450V~850V	350V~850V	220V~850V
Battery Voltage Range for Full Load	400V~800V	300V~800V	200V~800V
Max. charging/discharging power	20000W	15000W	10000W
Nominal AC Power	20000W	15000W	10000W
Max. AC Power Output to Utility Grid	22000VA	16500VA	11000VA
Max. AC Power from Utility Grid	40000VA	30000VA	20000VA
Max. AC Current Output to Utility Grid	32A	24A	16A
Max. AC Current from Utility Grid	58A	44A	29A
Max. output power	22000VA	16500VA	11000VA
Inverter inductance	0.876 mH		1.12 mH

Unless otherwise specified, all the tests were conducted on the basic model of HYD 20KTL-3PH.

The PCE does not provide galvanic separation between the PV array, Batteries and Grid connection circuit (Non-isolation or transformer-less type).

The Grid connection circuit can be switched off by two relays in series for the redundant protection. When single-fault occurs to one relay, the other redundant one will still maintain the basic insulation between PV array, Batteries and Grid connection to the mains. All the relays have functional self-checking before the PCE starting.

Block Diagram:




Throughout the test report following abbreviations may be used:

- input	i/p	- Test repeated, similar result(3 times)	TRSR
- output	o/p	- No indication of dielectric breakdown	NB
- short-circuited	s-c	- Cheesecloth remained intact	NC
- overloaded	o-l	- Tissue paper remained intact	NT
- open-circuited	o-c	- No hazards	NH
- normal conditions	N.C.	- The PCE can recover to operate automatically after removing the abnormal condition	RO
- single fault conditions	SFC	- functional insulation	FI
- between parts of opposite polarity	BOP	- basic insulation	BI
- internal protection operated	IPO	- supplementary insulation	SI
- Component damage (list damaged component)	CD	- double insulation	DI
- No component damaged	NCD	- reinforced insulation	RI
- Power Conversion Equipment Indicate used abbreviations (if any)	PCE	- Equipment Under Test	EUT

IEC 62040-1			
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	No thermal controls.	N/A
1.5.4/RD	Transformers	Transformers used are suitable for their intended application and comply with the relevant requirements of the standard and particularly Annex C	P
1.5.5/RD	Interconnecting cables		P
1.5.6/RD	Capacitors bridging insulation	Approved X,Y capacitor	P
1.5.7/RD	Resistors bridging insulation		P
1.5.7.1/RD	Resistors bridging functional, basic or supplementary insulation	No such component.	N/A
1.5.7.2/RD	Resistors bridging double or reinforced insulation between a.c. mains and other circuits	A group of resistors used in PCS for voltage sampling	P
1.5.7.3/RD	Resistors bridging double or reinforced insulation between a.c. mains and antenna or coaxial cable		N/A
1.5.8/RD	Components in equipment for IT power systems	No such component.	N/A
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	The neutral conductor insulated from earth and from the body throughout the equipment as if it were a line conductor.	P
4.7	Marking and instructions		P
4.7.1	General		P

IEC 62040-1			
Clause	Requirement + Test	Result - Remark	Verdict
4.7.2 1.7.1/RD	Power rating	All required markings are affixed on labels or marked on enclosure	P
	Input rated voltage/range (V).....:		P
	Input rated current/range (A).....:		P
	Input symbol for nature of supply (d.c.)		P
	Input rated frequency/range (Hz).....:	50Hz	P
	Number of Input phases and neutral.....:		P
	Output rated voltage/range (V)		P
	Output rated current/range (A)		P
	Output rated power factor, if less than unity, or active power and apparent power or active power and rated current		P
	Number of output phases and neutral.....:		P
	Output rated active power (W or kW)		P
	Output rated apparent power (VA or kVA)		P
	Output symbol for nature of supply (d.c.)		P
	Output rated frequency/range (Hz).....:		P
	Ambient operating temperature range (°C).....:		P
	Rated short-time withstand current (I_{cw}) or rated conditional short-circuit current (I_{cc})		P
	Manufacturer's name or trademark or identification mark		P
	Type/model or type reference.....:	See marking plates	P
	Symbol for Class II equipment only	Class I equipment	N/A
	Other symbols	Series No.	P
	Certification marks	CE	P
	Instructions for units with automatic bypass/maintenance bypass, additional input a.c. supply, or external batteries, having text "See installation instructions before connecting to the supply"		N/A
4.7.3	Safety instructions	The user manual contains information for operation, installation, servicing, transport storage and technical data.	P
4.7.3.1	General		P

IEC 62040-1			
Clause	Requirement + Test	Result - Remark	Verdict
4.7.3.2	Installation..... :	The battery terminals are considered as hazardous live parts, it should be evaluated in the end product.	P
	Location in a restricted access location only :		N/A
	Permanent connector UPS..... :	Only a qualified professional person can install	P
	Pluggable type A or Pluggable type B UPS :		N/A
4.7.3.3	Operation..... :	Only a qualified professional person can operate	P
4.7.3.4	Maintenance..... :	For all repair and maintenance always return the unit to an authorized Service Center.	P
4.7.3.5	Distribution related backfeed..... :	Considered	P
4.7.4 1.7.4/RD	Main voltage adjustment :	No such device.	N/A
	Methods and means of adjustment; reference to installation instructions :		N/A
4.7.5 1.7.5/RD	Power outlets..... :	No such device.	N/A
4.7.6 1.7.6/RD	Fuse identification (marking, special fusing characteristics, cross-reference) :		N/A
4.7.7 1.7.7/RD	Wiring terminals	See below.	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..... :		P
1.7.7.3/RD	Terminals for d.c. mains supply conductors..... :		P
4.7.8	Battery terminals :	The symbols of polarity of battery terminals are according to IEC60417, Nos. 5005 and 5006 (+ and -).	P
4.7.9 1.7.8/RD	Controls and indicators	The relevant messages are showed on panel.	P
1.7.8.1/RD	Identification, location and marking :		P
1.7.8.2/RD	Colours :		N/A
1.7.8.3/RD	Symbols :	No symbols used.	N/A
1.7.8.4/RD	Markings using figures :	No indicators for different positions.	N/A

IEC 62040-1			
Clause	Requirement + Test	Result - Remark	Verdict
4.7.10 1.7.9/RD	Isolation of multiple power sources	Considered	P
4.7.11 1.7.2.4/RD	IT power systems	Equipment is not intended connected IT power systems.	N/A
4.7.12	Protection in building installation	Suitable information provided in the "Installation Manual"	P
	Rated short-time withstand current (<i>I_{cw}</i>)		P
	Rated conditional short circuit current (<i>I_{cc}</i>)		N/A
	a) If higher <i>I_{cp}</i> stated ≤ 10 kA		N/A
	a) If higher <i>I_{cp}</i> stated > 10 kA		N/A
4.7.13 5.1/RD	High leakage current (mA)		P
4.7.14 1.7.10/RD	Thermostats and other regulating devices	The NTC device was not adjustable.	N/A
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 removable parts.	P
4.7.18 1.7.13/RD	Replaceable batteries	No replaceable batteries.	N/A
	Language(s)	English	—
4.7.19 1.7.2.5/RD	Operator access with a tool.....		P
4.7.20	Battery	Lithium battery of external battery pack used.	P

IEC 62040-1			
Clause	Requirement + Test	Result - Remark	Verdict
	Clearly legible information	The explanations are provided in the manual.	P
	Battery type (lead-acid, NiCd, etc.) and number of blocks or cells	Li-ion battery can be used.	P
	Nominal voltage of total battery (V)		P
	Nominal capacity of total battery (optional)		P
	Warning label		P
	Instructions		P
2.1.1.5/RD	Protection against energy hazards	No any energy hazards in operator access area.	N/A
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	No access with test finger and test pin to any hazardous parts.	P
2.1.1.1/RD	Access to energized parts	See above.	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)		N/A
2.1.1.2/RD	Battery compartments	No battery compartment.	N/A
2.1.1.3/RD	Access to ELV wiring	No ELV wiring in operator accessible area.	N/A
	Working voltage (V_{peak} or V_{rms}); minimum distance through insulation (mm)	(see appended table 5.7)	—
2.1.1.4/RD	Access to hazardous voltage circuit wiring	No any hazardous voltage circuit wiring can be accessed by operator	P
2.1.1.5/RD	Energy hazards	No energy hazard at operator accessible SELV interface	P
2.1.1.6/RD	Manual controls	No conductive controls or handles or alike provided	P
2.1.1.7/RD	Discharge of capacitors in equipment		P
	Measured voltage (V); time-constant (s).....	(see appended table 5.1.1)	—
2.1.1.8/RD	Energy hazards – d.c. mains supply	Connected to a.c. mains.	N/A

IEC 62040-1			
Clause	Requirement + Test	Result - Remark	Verdict
	a) Capacitor connected to the d.c. mains supply ...:		N/A
	b) Internal battery connected to the d.c. mains supply		N/A
2.1.1.9/RD	Audio amplifiers in information technology equipment	Not such equipment.	N/A
5.1.2 2.1.1.5 c) /RD	Protection for UPS intended to be used in service access areas		N/A
	Hazardous energy level		N/A
5.1.3 2.1.1.5 c) /RD	Protection for UPS intended to be used in restricted access areas		N/A
	Hazardous energy level		N/A
5.1.4	Backfeed protection	(see appended table 5.7)	N/A
	Shock hazard after de-energization of a.c. input for UPS		N/A
	Measured voltage (V); time-constant (s).....:		—
	Description of the construction		N/A
	Air gap is employed for backfeed protection		N/A
5.1.5	Emergency switching (disconnect) device		N/A

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)	(See appended table 5.2.1)	P
2.2.3/RD	Voltages under fault conditions (V)	(See appended table 5.2.1)	P
2.2.4/RD	Connection of SELV circuits to other circuits ...:	SELV	P
5.2.2 2.3/RD	Telephone network voltage circuits - TNV	No such circuit	N/A
2.3.1/RD	Limits		N/A
	Type of TNV circuits.....:		—
2.3.2/RD	Separation of TNV circuits from other circuits and from accessible parts		N/A
2.3.2.1/RD	General requirements		N/A
2.3.2.2/RD	Protection by basic insulation		N/A
2.3.2.3/RD	Protection by earthing		N/A
2.3.2.4/RD	Protection by other constructions		N/A

IEC 62040-1			
Clause	Requirement + Test	Result - Remark	Verdict
2.3.3/RD	Separation from hazardous voltages		N/A
	Insulation employed..... :		—
2.3.4/RD	Connection of TNV circuits to other circuits		N/A
	Insulation employed..... :		—
2.3.5/RD	Test for operating voltages generated externally		N/A
5.2.3 2.4/RD	Limited current circuits		N/A
2.4.1/RD	General requirements		N/A
2.4.2/RD	Limit values	(See appended table 5.2.3)	—
	Frequency (Hz)..... :		—
	Measured current (mA)..... :		—
	Measured voltage (V)..... :		—
	Measured circuit capacitance (nF or μ F)..... :		—
2.4.3/RD	Connection of limited current circuits to other circuits		N/A
5.2.4 3.5/RD	External signaling circuits		N/A
3.5.1/RD	General requirements		N/A
3.5.2/RD	Types of interconnection circuits		N/A
3.5.3/RD	ELV circuits as interconnection circuits		N/A
3.5.4/RD	Data ports for additional equipment		N/A
5.2.5 2.5/RD	Limited power source		N/A
	a) Inherently limited output		N/A
	b) Impedance limited output		N/A
	c) Regulating network limited output under normal operating and single fault condition		N/A
	d) Overcurrent protective device limited output		N/A
	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 62040-1			
Clause	Requirement + Test	Result - Remark	Verdict
2.6.2/RD	Functional earthing		N/A
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)..... :	(See appended table 5.3.1)	P
2.6.3.5/RD	Colour of insulation..... :		P
2.6.4/RD	Terminals		P
2.6.4.1/RD	General		P
2.6.4.2/RD	Protective earthing and bonding terminals		P
	Rated current (A), type, nominal thread diameter (mm)..... :		—
2.6.4.3/RD	Separation of the protective earthing conductor from protective bonding conductors		P
2.6.5/RD	Integrity of protective earthing		P
2.6.5.1/RD	Interconnection of equipment		P
2.6.5.2/RD	Components in protective earthing conductors and protective bonding conductors		P
2.6.5.3/RD	Disconnection of protective earth		P
2.6.5.4/RD	Parts that can be removed by an operator		P
2.6.5.5/RD	Parts removed during servicing		P
2.6.5.6/RD	Corrosion resistance		P
2.6.5.7/RD	Screws for protective bonding		P
2.6.5.8/RD	Reliance on telecommunication network or cable distribution system		N/A
5.3.2 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

IEC 62040-1			
Clause	Requirement + Test	Result - Remark	Verdict
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		P
3.4.1/RD	General requirement		P
3.4.2/RD	Disconnect devices		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	None	N/A
3.4.6/RD	Number of poles - single-phase and d.c. equipment		N/A
3.4.7/RD	Number of poles - three-phase equipment		N/A
3.4.8/RD	Switches as disconnect devices		N/A
3.4.9/RD	Plugs as disconnect devices		N/A
3.4.10/RD	Interconnected equipment		N/A
3.4.11/RD	Multiple power sources		P
5.4.2	Disconnect devices	External circuit breaker required	P
5.5	Overcurrent and earth fault protection		P
5.5.1	General		P
2.7.3/RD	Short-circuit backup protection	Building installation is considered as providing shortcircuit backup protection.	P
2.7.4/RD	Number and location of protective devices :		P
2.7.5/RD	Protection by several devices		N/A
2.7.6/RD	Warning to service personnel :	No service work necessary.	N/A
5.5.2	Basic requirements		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		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		P
5.5.4.1	General		P
5.5.4.2	Modes of operation		N/A
5.5.4.3	Test procedure		N/A

IEC 62040-1			
Clause	Requirement + Test	Result - Remark	Verdict
5.5.4.3.1	General application		N/A
	Rated UPS output current/(r.m.s) (A)		—
	Prospective test current/(r.m.s) (A)		—
	Typical power factor		—
	Initial asymmetric peak current ration (I_{pk} / I_{cw}) . :		—
	Minimum duration of prospective test current (cycles 50/60 Hz)		
5.5.4.3.2	Exemption from testing		P

5.6	Protection of personnel – Safety interlocks		N/A
5.6.1	Operator protection		N/A
2.8/RD	General principles	No safety interlocks used	N/A
2.8.1/RD	Protection requirements		N/A
2.8.2/RD	Inadvertent reactivation		N/A
2.8.3/RD	Fail-safe operation		N/A
2.8.4/RD	Protection against extreme hazard		N/A
2.8.5/RD	Moving parts		N/A
2.8.6/RD	Overriding		N/A
2.8.7/RD	Switches, relays and their related circuits		N/A
2.8.7.1/RD	Separation distances for contact gaps and their related circuits		N/A
2.8.7.2/RD	Overload test		N/A
2.8.7.3/RD	Endurance test		N/A
2.8.7.4/RD	Electric strength test	(see appended table 8.2)	N/A
2.8.8/RD	Mechanical actuators		N/A
5.6.2	Service person protection		N/A
5.6.2.1	Introduction		N/A
5.6.2.2	Covers		N/A
5.6.2.3	Location and guarding of parts		N/A
5.6.2.4	Parts on doors		N/A
5.6.2.5	Component access		N/A
2.8.3/RD	Fail-safe operation		N/A
5.6.2.6	Moving parts		N/A
5.6.2.7	Capacitor banks		N/A
5.6.2.8	Internal batteries		N/A

IEC 62040-1			
Clause	Requirement + Test	Result - Remark	Verdict
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	30-60kHz generated internally.	P
2.10.1.2/RD	Pollution degrees	PD2	P
2.10.1.3/RD	Reduced values for functional insulation	Considered	P
2.10.1.4/RD	Intervening unconnected conductive parts	Considered	N/A
2.10.1.5/RD	Insulation with varying dimensions	Insulation kept homogenous.	P
2.10.1.6/RD	Special separation requirements		P
2.10.1.7/RD	Insulation in circuits generating starting pulses	No such circuit.	N/A
2.10.2/RD	Determination of working voltage	(See appended table 5.7)	P
2.10.2.1/RD	General		P
2.10.2.2/RD	RMS working voltage	(see appended table 5.7)	P
2.10.2.3/RD	Peak working voltage	(see appended table 5.7)	P
2.10.3/RD	Clearances	See below and advantage of annex G is not considered.	P
2.10.3.1/RD	General	Considered.	P
2.10.3.2/RD	Mains transient voltages		P
	a) AC mains supply	240V a.c. and overvoltage Category II.	P
	b) Earthed d.c. mains supplies		N/A
	c) Unearthed d.c. mains supplies		N/A
	d) Battery operation		P
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)	N/A
2.10.3.5/RD	Clearances in circuits having starting pulses		N/A
2.10.3.6/RD	Transients from a.c. mains supply	Normal transient voltage considered (overvoltage category II for primary circuit).	N/A

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Clause	Requirement + Test	Result - Remark	Verdict
2.10.3.7/R D	Transients from d.c. mains supply		N/A
2.10.3.8/R D	Transients from telecommunication networks and cable distribution systems		N/A
2.10.3.9/R D	Measurement of transient voltage levels		N/A
	a) Transients from a mains supply		N/A
	For an a.c. mains supply		N/A
	For a d.c. mains supply		N/A
	b) Transients from a telecommunication network :		N/A
2.10.4/RD	Creepage distances	(see appended table 5.7)	P
2.10.4.1/R D	General	CTI rating for all materials of minimum 100.	P
2.10.4.2/R D	Material group and comparative tracking index		P
	CTI tests	Material group IIIb is assumed to be used.	N/A
2.10.4.3/R D	Minimum creepage distances	(see appended table 5.7)	P
2.10.5 /RD	Solid insulation		P
2.10.5.1/R D	General	See below.	P
2.10.5.2/R D	Distances through insulation	(see appended table 5.7)	P
2.10.5.3/R D	Insulating compound as solid insulation		P
2.10.5.4/R D	Semiconductor devices		P
2.10.5.5/R D	Cemented joints	No such construction.	N/A
2.10.5.6/R D	Thin sheet material – General		P
2.10.5.7/R D	Separable thin sheet material		P
	Number of layers (pcs)	2 layers	—
2.10.5.8/R D	Non-separable thin sheet material	Not such material.	N/A
2.10.5.9/R D	Thin sheet material – standard test procedure		N/A
	Electric strength test	(see appended table 8.2)	—
2.10.5.10 /RD	Thin sheet material – alternative test procedure		P

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Clause	Requirement + Test	Result - Remark	Verdict
	Electric strength test	(see appended table 8.2)	—
2.10.5.11 /RD	Insulation in wound components	Approved triple insulated wire used as winding of T1.	P
2.10.5.12 /RD	Wire in wound components		P
	Working voltage		—
	a) Basic insulation not under stress		P
	b) Basic, supplementary, reinforced insulation :		P
	c) Compliance with Annex U		P
	Two wires in contact inside wound component; angle between 45° and 90°	Physical separation provided by insulation tape and tube.	P
2.10.5.13 /RD	Wire with solvent-based enamel in wound components		P
	Electric strength test	(see appended table 8.2)	—
	Routine test		N/A
2.10.5.14 /RD	Additional insulation in wound components	No such construction.	N/A
	Working voltage		—
	- Basic insulation not under stress		N/A
	- Supplementary, reinforced insulation		N/A
2.10.6/RD	Construction of printed boards	See below.	P
2.10.6.1/RD	Uncoated printed boards		P
2.10.6.2/RD	Coated printed boards	No coated printed boards.	N/A
2.10.6.3/RD	Insulation between conductors on the same inner surface of a printed board		P
2.10.6.4/RD	Insulation between conductors on different layers of a printed board		P
	Distance through insulation		P
	Number of insulation layers (pcs)		P
2.10.7/RD	Component external terminations		N/A
2.10.8/RD	Tests on coated printed boards and coated components	No such boards and components	N/A
2.10.8.1/RD	Sample preparation and preliminary inspection		N/A
2.10.8.2/RD	Thermal conditioning		N/A
2.10.8.3/RD	Electric strength test	(see appended table 8.2)	—

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Clause	Requirement + Test	Result - Remark	Verdict
2.10.8.4/RD	Abrasion resistance test		N/A
2.10.9/RD	Thermal cycling		N/A
2.10.10/RD	Test for Pollution Degree 1 environment and insulating compound		N/A
2.10.11/RD	Tests for semiconductor devices and cemented joints		N/A
2.10.12/RD	Enclosed and sealed parts	No hermetically sealed component.	N/A

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 which is PVC insulated, min.rated VW-1, minimum 85°C. 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 which could damage the insulation and cause hazard.	P
3.1.3/RD	Securing of internal wiring	The wires are secured by hook in and soldering or soldering and additional fixed by glue so that a loosening of the terminal connection is unlikely.	P
3.1.4/RD	Insulation of conductors	The insulation of the individual conductors is suitable for the application and the working voltage. For the insulation material see 3.1.1.	P
3.1.5/RD	Beads and ceramic insulators		P
3.1.6/RD	Screws for electrical contact pressure		P
3.1.7/RD	Insulating materials in electrical connections		P
3.1.8/RD	Self-tapping and spaced thread screws	Not used.	N/A
3.1.9/RD	Termination of conductors	All conductors are reliable secured.	P
	10 N pull test	Force of 10 N applied to the termination points of the conductors.	P

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Clause	Requirement + Test	Result - Remark	Verdict
3.1.10/RD	Sleeving on wiring	No sleeving used to provide supplementary insulation.	P
6.1.2	Dimensions and rating of busbars and insulated conductors		P

6.2	Connection to power		P
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		P
	Number of conductors, diameter of cable and conduits (mm)		—
3.2.4/RD	Appliance inlets		N/A
3.2.5/RD	Power supply cords	Not provided.	N/A
3.2.5.1/RD	AC power supply cords		N/A
	Type		—
	Rated current (A), cross-sectional area (mm ²), AWG		—
3.2.5.2/RD	DC power supply cords		N/A
3.2.6/RD	Cord anchorages and strain relief		N/A
	Mass of equipment (kg), pull (N)		—
	Longitudinal displacement (mm)		—
3.2.7/RD	Protection against mechanical damage		P
3.2.8/RD	Cord guards		P
	Diameter or minor dimension D (mm); test mass (g)		—
	Radius of curvature of cord (mm).....		—
6.2.2	Means of connection	Permanent connection	P
	More than one supply connection		P

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
3.3.4/RD	Conductor sizes to be connected		P
	Rated current (A), cord/cable type, cross-sectional area (mm ²).....		—

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Clause	Requirement + Test	Result - Remark	Verdict
3.3.5/RD	Wiring terminal sizes		P
	Rated current (A), type, nominal thread diameter (mm)		—
3.3.6/RD	Wiring terminal design		P
3.3.7/RD	Grouping of wiring terminals		P
3.3.8/RD	Stranded wire		P

7	Physical requirements		P
7.1	Enclosure		P

7.2 4.1/RD	Stability		N/A
	Angle of 10°	Fixed	N/A
	Test force (N)		N/A

7.3 4.2/RD	Mechanical strength		P
4.2.1/RD	General		P
4.2.2/RD	Steady force test, 10 N	10 N applied to all internal components.	—
4.2.3/RD	Steady force test, 30 N	No internal enclosure.	N/A
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		P
	Swing test		N/A
4.2.6/RD	Drop test; height (mm)	Fixed	N/A
4.2.7/RD	Stress relief test	Metal enclosure	—
4.2.8/RD	Cathode ray tubes	No CRT in the unit.	N/A
	Picture tube separately certified		—
4.2.9/RD	High pressure lamps	No high pressure lamp provided.	N/A
4.2.10/RD	Wall or ceiling mounted equipment; force (N) ..:	1100N, 1 min.	P

7.4	Construction details		P
7.4.1	Introduction		P
4.3.1/RD	Edges and corners	Edges and corners of the enclosure are rounded.	P

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Clause	Requirement + Test	Result - Remark	Verdict
4.3.2/RD	Handles and manual controls; force (N)..... :	No handles or controls provided.	N/A
4.3.3/RD	Adjustable controls	No such controls provided.	N/A
4.3.4/RD	Securing of parts	Mechanical fixings in such a way designed that they will withstand mechanical stress occurring in normal use.	N/A
4.3.5/RD	Connection by plugs and sockets	Mismatch of connectors either not possible or does not result in any hazard.	N/A
4.3.7/RD	Heating elements in earthed equipment	No heating elements provided.	N/A
4.3.11/RD	Containers for liquids or gases	No container for liquid or gas.	N/A
4.4/RD	Protection against hazardous moving parts	<i>No moving parts</i>	N/A
4.4.1/RD	General		N/A
4.4.2/RD	Protection in operator access areas		N/A
4.4.3/RD	Protection in restricted access locations		N/A
4.4.4/RD	Protection in service access areas		N/A
4.4.5/RD	Protection against moving fan blades		N/A
4.4.5.1/RD	General		N/A
	Not considered to cause pain or injury. a)		N/A
	Is considered to cause pain, not injury. b)		N/A
	Considered to cause injury. c)		N/A
4.4.5.2	Protection for users		N/A
	Use of symbol or warning		N/A
4.4.5.3	Protection for service persons		N/A
	Use of symbol or warning		N/A
4.5/RD	Thermal requirements		P
4.5.1/RD	General	Equipment loaded with rated output current.	P
4.5.2/RD	Temperature tests	(see appended table 7.4)	P
	Normal load condition per Annex L	(see appended table 7.4)	P
4.5.3/RD	Temperature limits for materials	(see appended table 7.4)	P
4.5.4/RD	Touch temperature limits	(see appended table 7.4)	P
4.5.5/RD	Resistance to abnormal heat	(see appended table 7.4)	P
7.4.2	Openings		N/A
7.4.3	Gas Concentration		N/A
7.4.4	Equipment movement		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
7.5 4.7/RD	Resistance to fire		P
4.7.1/RD	Reducing the risk of ignition and spread of flame	No excessive temperatures. No easily burning materials employed. Fire enclosure provided.	P
	Method 1, selection and application of components wiring and materials	(see appended table 7.5)	P
	Method 2, application of all of simulated fault condition tests	(see appended table 7.5)	N/A
4.7.2/RD	Conditions for a fire enclosure	Fire enclosure provided.	P
4.7.2.1/RD	Parts requiring a fire enclosure	With having the powered by not LPS circuit. The fire enclosure is required.	P
4.7.2.2/RD	Parts not requiring a fire enclosure		N/A
4.7.3/RD	Materials	Metal enclosure	P
4.7.3.1/RD	General		P
4.7.3.2/RD	Materials for fire enclosures	Min.V-0 fire enclosure used.	P
4.7.3.3/RD	Materials for components and other parts outside fire enclosures		N/A
4.7.3.4/RD	Materials for components and other parts inside fire enclosures	PCB rated V-0. Internal components except small parts are V-2 or better	P
4.7.3.5/RD	Materials for air filter assemblies	No air filters provided.	N/A
4.7.3.6/RD	Materials used in high-voltage components	No high voltage components provided.	N/A

7.6	Battery location		N/A
7.6.1	Battery location and installation	Certified lithium battery of external battery pack (EBP).will be used in final installation not included in UPS. The explanations are provided in the manufacturer's EBP of manual.	N/A
7.6.2	Accessibility and maintainability		N/A
7.6.3	Distance		N/A
7.6.4	Case insulation		N/A
7.6.5	Wiring		N/A
7.6.6	Electrolyte spillage		N/A
7.6.7	Ventilation		N/A
7.6.8	Charging voltage		N/A

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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	Equipment loaded with rated output current.	P
4.5.2/RD	Temperature tests	(see appended table 7.4)	P
	Normal load condition per Annex L	(see appended table 7.4)	P
4.5.3/RD	Temperature limits for materials	(see appended table 7.4)	P
4.5.4/RD	Touch temperature limits	(see appended table 7.4)	P
4.5.5/RD	Resistance to abnormal heat	(see appended table 7.4)	P
8	Electrical requirements and simulated abnormal conditions		P
8.1	General provisions for earth leakage		P
5.1.1/RD	General	Live part and metal enclosure: 2.0mA	P
5.1.7/RD	Equipment with touch current exceeding 3,5 mA		N/A
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)	N/A
5.3.3/RD	Transformers	(see appended Annex C)	P
5.3.4/RD	Functional insulation.....:	By short-circuited, results see appended table 8.3.	P
5.3.5/RD	Electromechanical components		P
5.3.9/RD	Compliance criteria for abnormal operating and fault conditions		P
5.3.9.1/RD	During the tests	No fire or molten metal occurred and no deformation of enclosure during the tests.	P
5.3.9.2/RD	After the tests	No reduction of clearance and creepage distance. Electric strength test is made on basic, supplementary and reinforced insulation after test.	P

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Clause	Requirement + Test	Result - Remark	Verdict
8.3.2	Simulation of faults		P
8.3.3	Conditions for tests		P
9 6/RD	Connection to telecommunication networks		N/A
6.1/RD	Protection of telecommunication network service persons, and users of other equipment connected to the network, from hazards in the equipment		N/A
6.1.1/RD	Protection from hazardous voltages		N/A
6.1.2/RD	Separation of the telecommunication network from earth		N/A
6.1.2.1/RD	Requirements		N/A
	Supply voltage (V)		—
	Current in the test circuit (mA)		—
6.1.2.2/RD	Exclusions		N/A
6.2/RD	Protection of equipment users from overvoltages on telecommunication networks		
6.2.1/RD	Separation requirements		N/A
6.2.2/RD	Electric strength test procedure		N/A
6.2.2.1/RD	Impulse test	(see appended table 9)	N/A
6.2.2.2/RD	Steady-state test	(see appended table 9)	N/A
6.2.2.3/RD	Compliance criteria		N/A
6.3/RD	Protection of the telecommunication wiring system from overheating		N/A
	Max. output current (A)		—
3.5/RD	Interconnection of equipment		N/A
3.5.1/RD	General requirements		N/A
3.5.2/RD	Types of interconnection circuits		N/A
3.5.3/RD	ELV circuits as interconnection circuits		N/A
3.5.4/RD	Data ports for additional equipment		N/A
2.1.3/RD	Protection in restricted access locations		N/A
2.3.1/RD	Limits		N/A
	Type of TNV circuits.....		—
2.3.2/RD	Separation from other circuits and from accessible parts		N/A
2.3.2.1/RD	General requirements		N/A
2.3.2.2/RD	Protection by basic insulation		N/A
2.3.2.3/RD	Protection by earthing		N/A
2.3.2.4/RD	Protection by other constructions		N/A
2.3.3/RD	Separation from hazardous voltages		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Insulation employed..... :		—
2.3.4/RD	Connection of TNV circuits to other circuits		N/A
	Insulation employed..... :		—
2.3.5/RD	Test for operating voltages generated externally		N/A
2.6.5.8/RD	Reliance on telecommunication network or cable distribution system		N/A
2.10.3.3/RD	Clearances in primary circuits	(see appended table 5.7)	N/A
2.10.3.4/RD	Clearances in secondary circuits	(see appended table 5.7)	N/A
2.10.4/RD	Creepage distances		N/A
2.10.4.1/RD	General		N/A
2.10.4.2/RD	Material group and comparative tracking index		N/A
	CTI tests..... :		—
2.10.4.3/RD	Minimum creepage distances		N/A
M/RD	Annex M, CRITERIA FOR TELEPHONE RINGING SIGNALS (see 2.3.1/RD)		N/A
M.1/RD	Introduction		N/A
M.2 /RD	Method A		N/A
M.3/RD	Method B		N/A
M.3.1/RD	Ringling signal		N/A
M.3.1.1/RD	Frequency (Hz)		—
M.3.1.2/RD	Voltage (V)		—
M.3.1.3/RD	Cadence; time (s), voltage (V)		—
M.3.1.4/RD	Single fault current (mA)		—
M.3.2/RD	Tripping device and monitoring voltage		N/A
M.3.2.1/RD	Conditions for use of a tripping device or a monitoring voltage		—
M.3.2.2/RD	Tripping device		N/A
M.3.2.3/RD	Monitoring voltage (V)		N/A
A/RD	Annex A, Tests for resistance to heat and fire		N/A
A.1/RD	Flammability test for fire enclosures of movable equipment having a total mass exceeding 18 kg, and of stationary equipment (see 4.7.3.2/RD)		N/A
A.1.1/RD	Samples..... :		—
	Wall thickness (mm)..... :		—

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Clause	Requirement + Test	Result - Remark	Verdict
A.1.2/RD	Conditioning of samples; temperature (°C)		N/A
A.1.3/RD	Mounting of samples		N/A
A.1.4/RD	Test flame (see IEC 60695-11-3)		N/A
	Flame A, B, C or D		—
A.1.5/RD	Test procedure		N/A
A.1.6/RD	Compliance criteria		N/A
	Sample 1 burning time (s).....		—
	Sample 2 burning time (s).....		—
	Sample 3 burning time (s).....		—
A.2/RD	Flammability test for fire enclosures of movable equipment having a total mass not exceeding 18 kg, and for material and components located inside fire enclosures (see 4.7.3.2/RD and 4.7.3.4/RD)		N/A
A.2.1/RD	Samples, material.....		—
	Wall thickness (mm).....		—
A.2.2/RD	Conditioning of samples; temperature (°C)		N/A
A.2.3/RD	Mounting of samples		N/A
A.2.4/RD	Test flame (see IEC 60695-11-4)		N/A
	Flame A, B or C		—
A.2.5/RD	Test procedure		N/A
A.2.6/RD	Compliance criteria		N/A
	Sample 1 burning time (s).....		—
	Sample 2 burning time (s).....		—
	Sample 3 burning time (s).....		—
A.2.7/RD	Alternative test acc. to IEC 60695-11-5, cl. 5 and 9		N/A
	Sample 1 burning time (s).....		—
	Sample 2 burning time (s).....		—
	Sample 3 burning time (s).....		—
A.3/RD	Hot flaming oil test (see 4.6.2/RD)		N/A
A.3.1/RD	Mounting of samples		N/A
A.3.2/RD	Test procedure		N/A
A.3.3/RD	Compliance criterion		N/A
B/RD	Annex B, Motor tests under abnormal conditions (see 4.7.2.2/RD and 5.3.2/RD)		N/A
B.1/RD	General requirements		N/A
	Position		—
	Manufacturer		—

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

C/RD	Annex C, Transformers (see 1.5.4/RD and 5.3.3/RD)		P
	Position		—
	Manufacturer		—
	Type		—
	Rated values		—
	Method of protection.....	By protection circuit	—
C.1/RD	Overload test		P
C.2/RD	Insulation	See below	P
	Protection from displacement of windings.....	By bobbin, tube and insulation tape	P

D/RD	Annex D, Measuring instruments for touch current tests (see 5.1.4/RD)		P
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Clause	Requirement + Test	Result - Remark	Verdict
D.1/RD	Measuring instrument		P
D.2/RD	Alternative measuring instrument		N/A
E/RD	Annex E, Temperature rise of a winding (see Annex E/RD)		P
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/A
G.1/RD	Clearances		N/A
G.1.1/RD	General		N/A
G.1.2/RD	Summary of the procedure for determining minimum clearances		N/A
G.2/RD	Determination of mains transient voltage (V)		N/A
G.2.1/RD	AC mains supply		N/A
G.2.2/RD	Earthed d.c. mains supplies		N/A
G.2.3/RD	Unearthed d.c. mains supplies		N/A
G.2.4/RD	Battery operation		N/A
G.3/RD	Determination of telecommunication network transient voltage (V)		N/A
G.4/RD	Determination of required withstand voltage (V)		N/A
G.4.1/RD	Mains transients and internal repetitive peaks ..		N/A
G.4.2/RD	Transients from telecommunication networks ..		N/A
G.4.3/RD	Combination of transients		N/A
G.4.4/RD	Transients from cable distribution systems		N/A
G.5/RD	Measurement of transient voltages (V)		N/A
	a) Transients from a mains supply		N/A
	For an a.c. mains supply		N/A
	For a d.c. mains supply		N/A
	b) Transients from a telecommunication network		N/A
G.6/RD	Determination of minimum clearances		N/A
H	Annex H, Guidance on protection against ingress of water and foreign objects (see IEC 60529)		N/A
I	Annex I, Backfeed protection test		P
I.1	General		P
I.2	Test for pluggable UPS		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
I.3	Test for permanently connected UPS		P
I.4	Load-induced change of reference potential		N/A
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/A
J/RD	Annex J, Table of electrochemical potentials (see 2.6.5.6/RD)		N/A
	Metal(s) used		—
K/RD	Annex K, Thermal controls (see 1.5.3/RD and 5.3.8/RD)		N/A
K.1/RD	Making and breaking capacity		N/A
K.2 /RD	Thermostat reliability; operating voltage (V)		N/A
K.3/RD	Thermostat endurance test; operating voltage (V)		N/A
K.4/RD	Temperature limiter endurance; operating voltage (V)		N/A
K.5/RD	Thermal cut-out reliability		N/A
K.6/RD	Stability of operation		N/A
L	Annex L, Reference loads		P
L.1	General		P
L.2	Reference resistive load		P
L.3	Reference inductive-resistive load		—
L.4	Reference capacitive-resistive loads		N/A
L.5	Reference non-linear load		N/A
L.5.1	General		N/A
L.5.2	Test method		N/A
L.5.3	Connection of the non-linear reference load		—
M	Annex M, Ventilation of battery compartments		N/A
M.1	General	External battery provide	N/A
M.2	Normal conditions		N/A
M.3	Blocked conditions		N/A
M.4	Overcharge conditions		N/A
N	Annex N, Minimum and maximum cross-sections of copper conductors suitable for connection (see 6.3)		P

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Clause	Requirement + Test	Result - Remark	Verdict
U/RD	Annex U, Insulated winding wires for use without interleaved insulation (see 2.10.5.4/RD)		P
			—
V/RD	Annex V, AC POWER DISTRIBUTION SYSTEMS (see 1.6.1/RD)		P
V.1/RD	Introduction		P
V.2/RD	TN power distribution systems		P
V.3/RD	TT power distribution systems		N/A
V.4/RD	IT power distribution systems		N/A

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Clause	Requirement + Test	Result - Remark	Verdict

4.6, 1.6.2/RD	TABLE: Electrical Data (in normal conditions)						P
Type	U (V) DC	I (A) DC	P (kW) DC	U (V) grid	I (A) AC	P (kW) AC	
Model :HYD 10KTL-3PH							
Inverter (PV input)	220.3	48.992	10.795	230.7	14.85	10.27	
	600.9	17.682	10.626	230.7	14.95	10.34	
	849.1	12.772	10.845	229.5	15.33	10.54	
Inverter (Battery input)	203.3	53.393	10.854	230.5	14.79	10.22	
	804.3	13.030	10.483	230.6	14.72	10.16	
Off-grid (PV input)	217.1	47.724	10.360	230.8	14.50	10.04	
	597.0	17.360	10.364	230.8	14.50	10.04	
	852.0	12.112	10.319	231.1	14.52	10.07	
Off-grid (Battery input)	200.3	54.110	10.837	230.2	15.08	10.37	
	804.9	13.764	11.076	231.1	15.48	10.74	
Charger	198.0	48.382	9.584	230.3	14.65	10.11	
	799.9	12.224	9.782	230.4	14.63	10.10	
Model :HYD 15KTL-3PH							
Inverter (PV input)	353.8	44.983	15.914	231.1	22.08	15.30	
	598.0	26.285	15.719	230.1	22.17	15.29	
	850.2	18.518	15.743	230.0	22.17	15.29	
Inverter (Battery input)	301.1	52.251	15.736	230.8	21.79	15.08	
	796.0	19.507	15.531	230.8	21.79	15.06	
Off-grid (PV input)	350.8	44.382	15.568	230.7	21.69	15.01	
	595.7	25.942	15.453	230.8	21.81	15.10	
	848.2	15.260	15.487	231.1	21.72	15.06	
Off-grid (Battery input)	299.3	54.420	16.287	230.3	22.82	15.74	
	802.4	20.505	16.452	231.0	23.01	15.94	
Charger	299.3	48.572	14.540	229.9	22.02	15.18	
	803.4	18.156	14.590	229.1	21.96	15.05	
Model :HYD 20KTL-3PH							

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Clause	Requirement + Test			Result - Remark		Verdict
Inverter (PV input)	452.4	46.658	21.105	230.4	29.49	20.37
	603.5	34.791	20.995	230.3	29.52	20.39
	852.4	24.679	21.036	230.4	29.53	20.39
Inverter (Battery input)	399.0	52.762	21.051	230.3	29.24	20.19
	801.9	26.111	20.938	230.3	29.36	20.26
Off-grid (PV input)	449.6	46.259	20.798	230.5	29.04	20.08
	596.3	34.732	20.711	230.5	29.09	20.12
	849.8	24.443	20.771	230.6	29.32	20.29
Off-grid (Battery input)	403.1	54.383	21.924	230.6	30.18	20.88
	803.5	26.862	21.583	230.7	30.19	20.89
Charger	402.5	47.599	19.156	230.5	28.86	19.95
	804.5	24.237	19.505	228.8	29.42	20.15
Supplementary information:						

5.1.1 2.1.1.5/RD	TABLE: Max. V, A, VA Test					N/A
Voltage (rated) (V)	Current (rated) (A)	Voltage (max.) (V)	Current (max.) (A)	VA (max.) (VA)		
Supplementary information:						

5.1.1 2.1.1.5/RD	TABLE: Stored Energy				N/A
Capacitance C (µF)	Voltage U (V)		Energy E (J)		
--	--	--	--	--	
Supplementary information:					

5.1.1 2.1.1.7/ RD	TABLE: discharge of capacitors in the primary circuit				P
Condition	t calculated (s)	t measured (s)	t u@ 0V (s)	Comments	
AC output	--	--	0.13	--	
Supplementary information:					

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Clause	Requirement + Test	Result - Remark	Verdict	
5.2.1 2.2/RD	TABLE: Evaluation Of Voltage Limiting Components In SELV Circuits		N/A	
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:				

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

5.7 2.10.2/RD	Table: Working Voltage Measurement			P
Location	RMS voltage (V)	Peak voltage (V)	Comments	
AC output/input	230Vac	326V	--	
PV circuit	1000Vdc	--	--	
Battery circuit	800Vdc	--	--	
supplementary information:				

IEC 62040-1			
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)	
Power board							
PV+ to PE: BI	4000	1000Vdc 230Vac	3.6	5.28	5.0	5.28	
Live part to PE (C63): BI	4000	1000Vdc 230Vac	3.6	6.30	5.0	6.30	
Live part to PE (R136): BI	4000	1000Vdc 230Vac	3.6	7.02	5.0	7.02	
Output board							
Live part to PE (X capacitance): BI	4000	1000Vdc 230Vac	3.6	5.33	5.0	5.33	
Live part to PE (CY13): BI	4000	1000Vdc 230Vac	3.6	5.99	5.0	5.99	
Live part to PE (CY17): BI	4000	1000Vdc 230Vac	3.6	6.56	5.0	6.56	
Communication board							
Live part to SELV (T1 pin12 - pin 15): RI	4000	1000Vdc 230Vac	5.5	11.65	10.0	11.65	
Primary to Secondary (C185): RI	4000	1000Vdc 230Vac	5.5	7.97	10.0	11.70	
Live part to Secondary : BI	4000	1000Vdc 230Vac	5.5	7.40	10.0	7.40	
EUT							
Live part to PE (C63): BI	4000	1000Vdc 230Vac	3.6	7.81	10.0	7.81	
Live part to Enclosure: BI	4000	1000Vdc 230Vac	3.6	11.06	10.0	17.59	
Live part to Cover: BI	4000	1000Vdc 230Vac	3.6	15.5	10.0	36.9	
Supplementary information:							

IEC 62040-1				
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)
Bobbin in transformer (BI)	DC 1000V or AC 230/400V	2120	0.2	1.0
Optical coupler ¹⁾ (RI)	DC 1000V or AC 230/400V	4240	0.4	0.6
Supplementary information:				

IEC 62040-1					
Clause	Requirement + Test	Result - Remark			Verdict
7.4 4.5/RD	TABLE: Heating Test				P
	test voltage (V)	See below			—
	t1 (°C).....	See below			—
	t2 (°C)	See below			—
Thermocouple Locations		Max. temperature measured (°C)			Limit, (°C)
Conditions:		Inverter model(PV input)			--
Supplied Voltage [Vd.c.]	450	450	850	850	--
Ambient [°C]	45	60	45	60	--
PV1 input wire	67.3	82.3	63.6	74.9	105
BAT2 input wire	59.0	74.2	57.5	69.7	105
PV input connector	61.4	76.5	59.9	71.3	85
Display buttons	50.4	65.8	50.5	64.3	85
PV terminal	47.4	63.2	46.2	61.1	85
EUT front	54.3	69.8	54.9	68.0	70
EUT side	50.4	66.0	49.8	63.1	70
MOS tube Q7	65.9	82.2	61.8	74.2	130
Fan	71.5	72.9	71.8	72.3	--
Inverter coil R	97.4	102.4	102.4	103.3	110
Inverter coil S	100.4	105.4	105.4	104.8	110
Inverter coil T	91.3	96.3	96.3	98.8	110
PV1 inductor coil	54.7	95.3	59.7	71.0	110
PV2 inductor coil	55.8	99.2	60.8	72.2	110
Battery2 inductor coil	46.9	67.2	51.9	62.7	110
Battery1 inductor coil	45.8	64.4	50.8	61.3	110
Power board					
MOV3	59.7	74.9	58.3	70.4	--
Capacitance C67	72.4	88.0	64.8	76.6	105
Capacitance C35	70.4	86.2	68.3	78.9	105
Inductor L4	72.6	87.5	65.5	77.0	110
Y capacitance C38	64.9	80.2	62.0	73.8	100
MOV6	62.7	77.9	60.2	72.1	100
BUS capacitance	66.8	82.0	68.0	76.8	105

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Clause	Requirement + Test			Result - Remark	Verdict
Capacitance C93	72.1	87.8	72.9	81.7	105
MOS tube Q3	50.7	66.9	48.1	63.0	130
MOS tube Q4	50.3	66.4	48.1	62.9	130
MOS tube Q8	53.1	68.9	50.4	64.5	130
MOS tube Q9	49.2	65.2	47.1	61.9	130
MOS tube Q5	56.7	72.9	51.6	66.1	130
MOS tube Q6	53.1	69.1	49.5	64.0	130
MOS tube Q11	55.8	71.9	50.0	64.5	130
MOS tube Q10	52.3	68.3	48.6	63.3	130
Diode D7	74.9	90.3	63.5	76.8	130
Diode D8	68.5	84.0	58.1	72.3	130
MOS tube Q17	73.8	91.2	51.5	65.7	130
MOS tube Q18	83.3	101.3	54.3	68.1	130
Diode D10	78.1	94.1	70.1	81.8	130
Diode D9	76.4	92.0	65.4	78.3	130
MOS tube Q19	86.0	104.3	61.4	73.6	130
MOS tube Q20	80.4	99.4	56.3	69.7	130
INV IGBT	88.1	103.5	90.5	93.9	130
Output board					
Capacitance C20	63.9	79.3	75.9	64.8	105
Capacitance ECB1	71.0	86.3	82.1	74.2	105
Capacitance CY10	60.8	76.1	72.8	61.5	110
Capacitance C60	61.6	77.0	73.5	62.1	105
Common mode inductor L1	71.6	86.9	82.5	75.6	110
Differential mode inductor L3	93.9	106.4	103.6	101.3	110
Common mode inductor L2	67.5	82.4	77.6	68.2	110
Capacitance C30	69.0	84.1	79.4	69.9	105
Capacitance C82	63.2	78.5	75.0	63.8	105
Lightning protector SPD2	61.5	76.8	73.2	61.9	100
Heat sink	47.9	61.1	59.8	45.5	70
Switch	46.9	62.6	60.7	46.2	70
Outout wire	62.2	77.4	73.6	62.3	105
Output terminal	52.3	68.1	65.5	51.7	85
Transformer T3	68.7	83.7	80.1	71.4	110

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Clause	Requirement + Test			Result - Remark		Verdict
Transformer T1	73.3	87.8	85.4	76.3	110	
Thermocouple Locations						
Max. temperature measured (°C)					Limit, (°C)	
Conditions:	Inverter model (Battery input)		Charger model		--	
Supplied Voltage [Vd.c.]	600	600	230Vac	230 Vac	--	
Ambient [°C]	45	60	45	60	--	
PV1 input wire	62.7	61.2	62.4	77.9	105	
BAT2 input wire	62.5	78.3	60.5	76.1	105	
PV input connector	58.5	78.2	58.6	74.0	85	
Display buttons	49.4	73.8	48.7	63.8	85	
PV terminal	47.8	64.5	47.2	62.4	85	
EUT front	53.3	62.8	52.3	67.5	70	
EUT side	50.5	68.6	50.3	65.8	70	
MOS tube Q7	59.5	66.0	60.8	76.9	130	
Fan	69.4	75.6	69.0	72.0	--	
Inverter coil R	95.7	72.3	97.1	103.3	110	
Inverter coil S	97.5	106.3	97.6	104.8	110	
Inverter coil T	89.4	107.8	88.4	105.2	110	
PV1 inductor coil	51.2	107.4	50.9	66.0	110	
PV2 inductor coil	50.8	66.6	50.7	65.9	110	
Battery2 inductor coil	62.6	66.2	59.5	75.5	110	
Battery1 inductor coil	61.4	78.7	58.7	74.7	110	
Power board						
MOV3	64.2	79.9	62.9	78.5	--	
Capacitance C67	64.7	81.1	64.4	80.2	105	
Capacitance C35	64.3	80.2	64.6	80.0	105	
Inductor L4	64.6	80.5	64.0	79.3	110	
Y capacitance C38	63.8	79.5	63.1	78.5	100	
MOV6	61.8	77.4	61.6	76.8	100	
BUS capacitance	63.5	78.8	63.2	78.0	105	
Capacitance C93	66.4	82.5	67.4	83.1	105	
MOS tube Q3	81.7	98.8	85.0	105.0	130	
MOS tube Q4	73.2	90.0	92.9	114.0	130	

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Clause	Requirement + Test		Result - Remark		Verdict
MOS tube Q8	85.3	105.0	80.4	107.5	130
MOS tube Q9	77.2	95.9	60.0	77.4	130
MOS tube Q5	77.4	94.0	82.3	101.9	130
MOS tube Q6	74.5	91.1	92.9	113.6	130
MOS tube Q11	79.5	98.0	57.4	74.6	130
MOS tube Q10	78.9	97.5	60.6	78.6	130
Diode D7	58.5	74.6	58.6	75.2	130
Diode D8	83.2	75.2	58.3	75.3	130
MOS tube Q17	57.6	73.8	55.2	72.0	130
MOS tube Q18	56.3	72.3	55.5	72.0	130
Diode D10	61.0	77.1	62.9	79.3	130
Diode D9	58.9	75.0	59.4	76.0	130
MOS tube Q19	58.8	74.7	59.4	75.6	130
MOS tube Q20	56.3	72.3	56.3	72.6	130
INV IGBT	77.4	93.9	77.1	94.1	130
Output board					
Capacitance C20	61.7	77.3	61.3	76.4	105
Capacitance ECB1	65.6	81.1	68.2	82.9	105
Capacitance CY10	58.9	74.2	58.5	73.7	110
Capacitance C60	59.5	74.9	59.2	74.5	105
Common mode inductor L1	66.5	82.3	67.6	83.3	110
Differential mode inductor L3	80.6	96.8	86.3	101.8	110
Common mode inductor L2	64.0	79.6	63.3	78.9	110
Capacitance C30	65.1	80.9	65.2	80.4	105
Capacitance C82	60.7	76.3	60.8	75.8	105
Lightning protector SPD2	59.2	74.7	59.2	74.1	100
Heat sink	58.5	74.5	47.4	63.0	70
Switch	47.0	62.2	46.6	61.7	70
Outout wire	60.0	75.5	59.5	74.7	105
Output terminal	51.1	66.6	50.3	65.6	85
Transformer T3	66.7	82.0	66.4	81.1	110
Transformer T1	72.0	86.6	71.5	85.5	110
Supplementary information:					
	TABLE: Heating test, resistance method				--

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Clause	Requirement + Test			Result - Remark		Verdict
	Test voltage (V)..... :			--		—
	Ambient, t ₁ (°C)..... :			--		—
	Ambient, t ₂ (°C)..... :			--		—
Temperature rise of winding	R ₁ (Ω)	R ₂ (Ω)	ΔT (K)	Max. dT (K)	Insulation class	
--	--	--	--	--	--	
Supplementary information:						

7.4 4.5.5/RD	TABLE: Ball Pressure Test of Thermoplastics			P
Allowed impression diameter (mm)		≤2 mm		—
Part	Test temperature (°C)		Impression diameter (mm)	
Bobbin (3300A-1/3300B-1)	125		0.97	
AC input/output terminal	125		1.05	
Battery input/output terminal	125		1.03	
PV input terminal	125		1.10	
Supplementary information:				

5.7 2.10.5	TABLE: Dielectric Strength			P
Test voltage applied between:		Test potential applied (V)	Breakdown / flashover (Yes/No)	
Input to metal chassis (BI)		2120	No	
Output to metal chassis (BI)		2120	No	
Input to Comm. part (DI)		4240	No	
Output to Comm. part (DI)		4240	No	
Supplementary information:				

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

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Clause	Requirement + Test	Result - Remark	Verdict

8 5.1/RD	TABLE: touch current measurement		P
Measured between:	Measured (mA)	Limit (mA)	Comments/conditions
At metal enclosure	AC 2.3	AC 3.5 / DC 10	PE disconnected
Supplementary information:			

8.3 5.3/RD	TABLE: Fault condition tests					P
	Ambient temperature (°C)		25°C, if not stated otherwise		—	
	Power source for EUT: Manufacturer, model/type, output rating		DC Source: WANKE,WDGC-1000KW, 1000kW. AC Source: WANKE, WLPA-33-1000KVA, 1000KVA.		—	
Component No.	Fault	Supply voltage (V)	Test time	Fuse #	Fuse current (A)	Observation
Relay defect RL1 pin4-pin3	Short before start up	PV: 600Vdc Battery side: 600Vdc AC output: 230Vac	10min	--	--	Indicate Relay fault,error code"ID41"(RelayFail).Do not connect to AC mainsn.No damage,no hazards.
Relay defect RL2 pin4-pin3	Short before start up	PV: 600Vdc Battery side: 600Vdc AC output: 230Vac	10min	--	--	Indicate Relay fault,error code"ID41"(RelayFail).Do not connect to AC mainsn.No damage,no hazards.
Relay defect RL3 pin4-pin3	Short before start up	PV: 600Vdc Battery side: 600Vdc AC output: 230Vac	10min	--	--	Indicate Relay fault,error code"ID41"(RelayFail).Do not connect to AC mainsn.No damage,no hazards.
Relay defect RL4 pin4-pin3	Short before start up	PV: 600Vdc Battery side: 600Vdc AC output: 230Vac	10min	--	--	Indicate Relay fault,error code"ID41"(RelayFail).Do not connect to AC mainsn.No damage,no hazards.
Relay defect RL5 pin4-pin3	Short before start up	PV: 600Vdc Battery side: 600Vdc AC output: 230Vac	10min	--	--	Indicate Relay fault,error code"ID41"(RelayFail).Do not connect to AC mainsn.No damage,no hazards.

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Clause	Requirement + Test				Result - Remark		Verdict
Relay defect RL6 pin4- pin3	Short before start up	PV: 600Vdc Battery side: 600Vdc AC output: 230Vac	10min	--	--	Indicate Relay fault,error code"ID41"(RelayFail).Do not connect to AC mains.No damage,no hazards.	
Grid voltage monitoring R137	Open	PV: 600Vdc Battery side: 600Vdc AC output: 230Vac	10min	--	--	Output a.c. relays operated, disconnected with grid. error code"ID02"(GridUVP).Do not connect to AC mains.No damage,no hazards.	
Grid voltage monitoring R 140	Short	PV: 600Vdc Battery side: 600Vdc AC output: 230Vac	10min	--	--	Output a.c. relays operated, disconnected with grid. error code"ID01"(GridOVP).Do not connect to AC mains.No damage,no hazards.	
Grid voltage monitoring R157	Open	PV: 600Vdc Battery side: 600Vdc AC output: 230Vac	10min	--	--	Output a.c. relays operated, disconnected with grid. error code"ID02"(GridUVP).Do not connect to AC mains.No damage,no hazards.	
Grid voltage monitoring R 159	Short	PV: 600Vdc Battery side: 600Vdc AC output: 230Vac	10min	--	--	Output a.c. relays operated, disconnected with grid. error code"ID01"(GridOVP).Do not connect to AC mains.No damage,no hazards.	
Grid voltage monitoring R152	Open	PV: 600Vdc Battery side: 600Vdc AC output: 230Vac	10min	--	--	Output a.c. relays operated, disconnected with grid. error code"ID02"(GridUVP).Do not connect to AC mains.No damage,no hazards.	
Grid voltage monitoring R 155	Short	PV: 600Vdc Battery side: 600Vdc AC output: 230Vac	10min	--	--	Output a.c. relays operated, disconnected with grid. error code"ID01"(GridOVP).Do not connect to AC mains.No damage,no hazards.	
Grid voltage monitoring R147	Open	PV: 600Vdc Battery side: 600Vdc AC output: 230Vac	10min	--	--	Output a.c. relays operated, disconnected with grid. error code"ID02"(GridUVP).Do not connect to AC mains.No damage,no hazards.	
Grid voltage monitoring R 149	Short	PV: 600Vdc Battery side: 600Vdc AC output: 230Vac	10min	--	--	Output a.c. relays operated, disconnected with grid. error code"ID01"(GridOVP).Do not connect to AC mains.No damage,no hazards.	
RCMU detect defect R 8	Open	PV: 600Vdc Battery side: 600Vdc AC output: 230Vac	10min	--	--	Indicate GFCI fault,error code"ID21" (GFCIDeviceFault(DC)) "ID22" (GFCIDeviceFault(AC)). Do not connect to AC mains.No damage,no hazards.	

IEC 62040-1						
Clause	Requirement + Test				Result - Remark	Verdict
RCMU detect defect C171	Short	PV: 600Vdc Battery side: 600Vdc AC output: 230Vac	10min	--	--	Indicate GFCI fault,error code"ID21" (GFCIDeviceFault(DC)) "ID22" (GFCIDeviceFault(AC)). Do not connect to AC mainsn.No damage,no hazards.
RCMU detect defect R 246	Short	PV: 600Vdc Battery side: 600Vdc AC output: 230Vac	10min	--	--	Indicate GFCI fault,error code"ID21" (GFCIDeviceFault(DC)) "ID22" (GFCIDeviceFault(AC)).Do not connect to AC mainsn.No damage,no hazards.
RCMU detect defect R 244	Open	PV: 600Vdc Battery side: 600Vdc AC output: 230Vac	10min	--	--	Indicate GFCI fault,error code"ID29" (ConsistentFault_GFCI , The GFCI sampling value between the master DSP and slave DSP is not consistent).Do not connect to AC mainsn. No damage,no hazards.
RCMU detect defect R 249	Open	PV: 600Vdc Battery side: 600Vdc AC output: 230Vac	10min	--	--	Indicate GFCI fault,error code"ID29" (ConsistentFault_GFCI , The GFCI sampling value between the master DSP and slave DSP is not consistent). Do not connect to AC mainsn. No damage,no hazards.
RCMU detect defect C551	Short	PV: 600Vdc Battery side: 600Vdc AC output: 230Vac	10min	--	--	Indicate GFCI fault,error code"ID29" (ConsistentFault_GFCI , The GFCI sampling value between the master DSP and slave DSP is not consistent). Do not connect to AC mainsn. No damage,no hazards.
RCMU detect defect R 920	Open	PV: 600Vdc Battery side: 600Vdc AC output: 230Vac	10min	--	--	Indicate GFCI fault,error code"ID29"(ConsistentFault_GF CI , The GFCI sampling value between the master DSP and slave DSP is not consistent).Do not connect to AC mainsn. No damage,no hazards.
Current sensor defect C10	Short	PV: 600Vdc Battery side: 600Vdc AC output: 230Vac	10min	--	--	Indicate DCI fault,error code"ID18"(HwADFaultDCI).Do not connect to AC mainsn. No damage,no hazards.

IEC 62040-1						
Clause	Requirement + Test				Result - Remark	Verdict
Current sensor defect C 51	Short	PV: 600Vdc Battery side: 600Vdc AC output: 230Vac	10min	--	--	Indicate DCI fault,error code"ID18"(HwADFaultDCI).Do not connect to AC mainsn.No damage,no hazards.
Current sensor defect C102	Short	PV: 600Vdc Battery side: 600Vdc AC output: 230Vac	10min	--	--	Indicate DCI fault,error code"ID18"(HwADFaultDCI).Do not connect to AC mainsn.No damage,no hazards.
Current sensor defect R 57	Open	PV: 600Vdc Battery side: 600Vdc AC output: 230Vac	10min	--	--	Indicate Grid current fault,error code"ID17"(HwADFaultGrid).Do not connect to AC mainsn.No damage,no hazards.
Current sensor defect R 166	Open	PV: 600Vdc Battery side: 600Vdc AC output: 230Vac	10min	--	--	Indicate DCI fault,error code"ID18"(HwADFaultDCI).Do not connect to AC mainsn.No damage,no hazards.
Grid voltage monitoring R109	Open	PV: 600Vdc Battery side: 600Vdc AC output: 230Vac	10min	--	--	No fault. no damage.Offline – DCV is wrong.
Grid voltage monitoring R109	Short	PV: 600Vdc Battery side: 600Vdc AC output: 230Vac	10min	--	--	No fault.no damage. Offline – DCV is wrong.
Grid voltage monitoring R203	Short	PV: 600Vdc Battery side: 600Vdc AC output: 230Vac	10min	--	--	Indicate Grid voltage fault,error code"ID19"(HwADFaultVGrid(DC)) "ID20" (HwADFaultVGrid(AC)). Do not connect to AC mainsn.No damage,no hazards.
Grid voltage monitoring R240	Short	PV: 600Vdc Battery side: 600Vdc AC output: 230Vac	10min	--	--	Indicate Grid voltage fault,error code"ID19"(HwADFaultVGrid(DC)) "ID20"(HwADFaultVGrid (AC)).Do not connect to AC mainsn.No damage,no hazards.
Grid voltage monitoring C541	Short	PV: 600Vdc Battery side: 600Vdc AC output: 230Vac	10min	--	--	Indicate Grid voltage fault,error code"ID20" (HwADFaultVGrid(AC)). Do not connect to AC mainsn.No damage,no hazards.
Grid voltage monitoring C539	Short	PV: 600Vdc Battery side: 600Vdc AC output: 230Vac	10min	--	--	Indicate Grid voltage fault,error code"ID20" (HwADFaultVGrid(AC)). Do not connect to AC mainsn.No damage,no hazards.

IEC 62040-1							
Clause	Requirement + Test				Result - Remark		Verdict
Grid voltage monitoring C540	Short	PV: 600Vdc Battery side: 600Vdc AC output: 230Vac	10min	--	--	Indicate Grid voltage fault,error code"ID20" (HwADFaultVGrid(AC)). Do not connect to AC mainsn. No damage,no hazards.	
Grid voltage monitoring R904	Open	PV: 600Vdc Battery side: 600Vdc AC output: 230Vac	10min	--	--	Indicate Grid voltage fault,error code"ID19" (HwADFaultVGrid(DC)). Do not connect to AC mainsn. No damage,no hazards.	
Grid voltage monitoring R905	Open	PV: 600Vdc Battery side: 600Vdc AC output: 230Vac	10min	--	--	Indicate Grid voltage fault,error code"ID19" (HwADFaultVGrid(DC)). Do not connect to AC mainsn. No damage,no hazards.	
Grid voltage monitoring R906	Open	PV: 600Vdc Battery side: 600Vdc AC output: 230Vac	10min	--	--	Indicate Grid voltage fault,error code"ID19" (HwADFaultVGrid(DC)). Do not connect to AC mainsn. No damage,no hazards.	
ISO detect defect R 132	Short before start-up	PV: 600Vdc Battery side: 600Vdc AC output: 230Vac	10min	--	--	Indicate ISO fault,error code"ID42"(PvIsoFault). Do not connect to AC mainsn. No damage,no hazards.	
ISO detect defect R 77	Short before start-up	PV: 600Vdc Battery side: 600Vdc AC output: 230Vac	10min	--	--	Indicate ISO fault,error code"ID42"(PvIsoFault). Do not connect to AC mainsn. No damage,no hazards.	
ISO detect defect R 125	Short before start-up	PV: 600Vdc Battery side: 600Vdc AC output: 230Vac	10min	--	--	Indicate ISO fault,error code"ID42" (PvIsoFault). Do not connect to AC mainsn. No damage,no hazards.	
ISO detect defect R 136	Short before start-up	PV: 600Vdc Battery side: 600Vdc AC output: 230Vac	10min	--	--	Indicate ISO fault,error code"ID42"(PvIsoFault).Do not connect to AC mainsn.Q14 damage,no hazards.	
ISO detect defect C705	Short before start-up	PV: 600Vdc Battery side: 600Vdc AC output: 230Vac	10min	--	--	Indicate ISO fault,error code"ID42"(PvIsoFault). Do not connect to AC mainsn. No damage,no hazards.	
ISO detect defect C630	Short before start-up	PV: 600Vdc Battery side: 600Vdc AC output: 230Vac	10min	--	--	Indicate ISO fault,error code"ID42"(PvIsoFault).Do not connect to AC mainsn.No damage,no hazards.	

IEC 62040-1						
Clause	Requirement + Test				Result - Remark	Verdict
DSP communication defect R481	Short	PV: 600Vdc Battery side: 600Vdc AC output: 230Vac	10min	--	--	Indicate SCI fault,error code"ID154" (SciCommLose(AC)). Do not connect to AC mainsn. Q26 damage,no hazards.
DSP communication defect R484	Short	PV: 600Vdc Battery side: 600Vdc AC output: 230Vac	10min	--	--	Indicate SCI fault,error code"ID153" (SciCommLose(DC)). Do not connect to AC mainsn. Q25 damage,no hazards.
Supplementary information:						

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

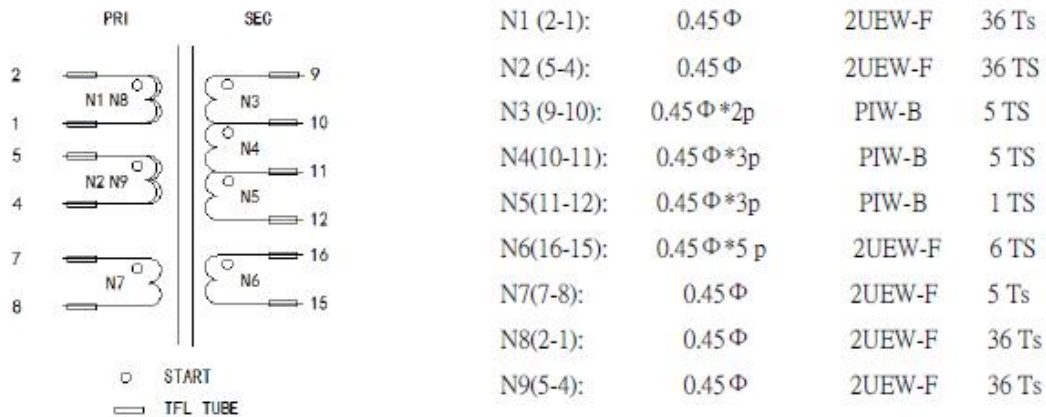
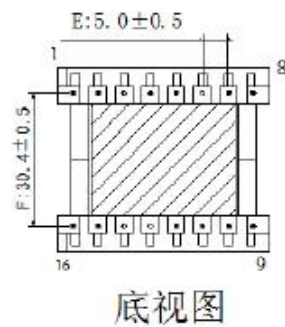
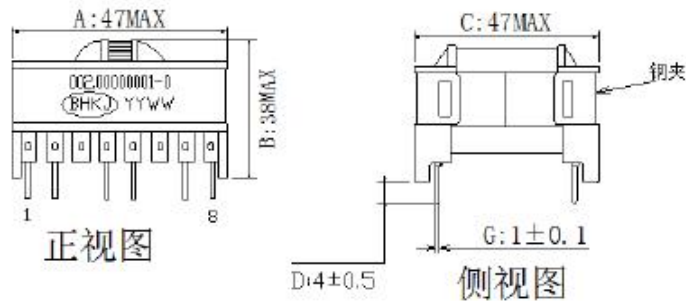
C.2/RD		TABLE: transformers						P
Loc.	Tested insulation	Working voltage peak / V (2.10.2)	Working voltage rms / V (2.10.2)	Required electric strength (5.2)	Required clearance / mm (2.10.3)	Required creepage distance / mm (2.10.4)	Required distance thr. insul. (2.10.5)	
Loc.	Tested insulation			Test voltage / V	Measured clearance / mm	Measured creepage dist. / mm	Measured distance thr. insul. / mm; number of layers	

Supplementary information: See table 4.5 and 5.7 for details

C.2/RD		TABLE: transformers						P
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IEC 62040-1			
Clause	Requirement + Test	Result - Remark	Verdict

Transformer



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

M	Ventilation of battery compartments	N/A
	<p>The required dimension for the ventilation openings will be calculated with the following formula:</p> $A \geq Q/360 \text{ [m}^2\text{]}$ <p>with $Q = 0.054 * n * I * C$</p> <p>where:</p> <p>Q : airflow in m³/h n : number of battery cells I : constant factor (0,2A/100Ah for valve regulated lead acid batteries) C : is the battery nominal capacity in Ah at the 10h discharge rate</p> <p>With the specific data for the UPS the following dimension for the ventilation openings is required:</p> <p>n : ? C : ?</p> $A \geq (0.054 * n * 0.2 A/100 Ah * C)/360$ $A \geq ? \text{ m}^2$	
	Verdict	
	The size of ventilation openings in battery cabinet exceeds the required airflow by far (as well as the UPS).	

IEC 62040-1					
Clause	Requirement + Test			Result - Remark	Verdict
4.5	TABLE: list of critical components				P
object/part No.	manufacturer/ trademark	type/model	technical data	standard	mark(s) of conformity ¹⁾
PV connector	Amphenol Industrial operations	PV-ADBP4- S2/6-UR; PV-ADSP4- S2/6-UR	1000Vdc, 39A, Max. 108°C, IP68	EN 50521	TUV R60028286 R60087448
alternative	Phoenix Contact GmbH & Co.kg	PV-FT-CF-C; PV-FT-CM-C	1000Vdc, 40A, Max.85°C, IP65	DIN EN 50521	TUV R60029159
alternative	Stäubli Electrical Connectors Ltd.	MC4 Series	1000Vdc, 39A, Max. 90°C, IP68	EN 50521	TUV R60028286 R60087448
alternative	Amphenol Technology Co., Ltd	H4-RH Bulkhead	1000Vdc, 39A, Max. 90°C, IP68	EN 50521	TUV 17011847012
DC switch	SANTON	XBE+3410-2-D	16A 1000V/50A 500V/4POLE	EN 60947	TUV R50423069;
Varistor (MOV1, MOV2, MOV3, MOV4)	LITTELFUSE	V1000LA160BP	1000VAC/360J/ Φ20mm	UL 1449	UL E320116
alternative	TDK Co., Ltd.,(Chilisin Electronics Gorp)	B72220S0511K 101	510VAC/511K/P =10.0mm	IEC 60068/ IEC 61051	VDE 40027582
Y1 capacitor Input&power board:(C1, C3, C4, C7, C17, C18, C19, C20, C21, C23, C24, C29, C37, C38, C39, C40, C43, C44, C62) control board : (C184, C185, C192, C193, C194, C195, C196, C197, C218, C340, C732, C733, C747)	Samwha capacitor Co.,Ltd	SDE2G472M15 BW1	Y1/4.7nF/400VA C/P10.0/ Y5V/ Max.125°C	EN 60384-14 IEC 60384-14	VDE 40015805
Y2 capacitor: Output board: (CY1, CY2, CY3, CY4, CY5, CY6, CY7, CY8, CY9, CY10, CY11, CY12,	XiaMen FARATRONIC Co.,Ltd	C43Q1103K40C 450	Y2/10nF/300VA C/13*12*6.0	UL 60384-14	UL E186600

IEC 62040-1					
Clause	Requirement + Test			Result - Remark	Verdict
4.5	TABLE: list of critical components				P
object/part No.	manufacturer/ trademark	type/model	technical data	standard	mark(s) of conformity ¹⁾
CY13, CY14, CY15, CY16, CY17, CY18, CY19, CY20, CY21)					
BUS-Capacitor Input&power board: (EC1, EC2, EC3, EC4, EC5, EC6, EC7, EC8, EC9, EC10, EC11, EC12	Sam Young Electronics Co., Ltd.	TLS550VS470(M)(Φ35x60L)	470uF/550V/Φ3 5*60/3000H	IEC/EN 62109-1 IEC/EN 62109-2 IEC/EN 62477	Tested within appliance
alternative	Nichicon Co., Ltd.	LGN2L471MEL ANH	470uF/550V/Φ3 5*60/3000H	IEC/EN 62109-1 IEC/EN 62109-2 IEC/EN 62477	Tested within appliance
BUS-Capacitor Input&power board: (C91, C92, C93, C94)	Panasonic Corporation	EZPE55117MT A	110uF,10%,550 Vdc,70C,Lead Spacing = 52.5mm*20.3m m	IEC/EN 62109-1 IEC/EN 62109-2 IEC/EN 62477	Tested within appliance
alternative	HUA JUNG COMPONENTS CO.,LTD	EPB- 117J0600DB15 2B-FF	110uF,10%,550 Vdc,70C,Lead Spacing = 52.5mm*20.3m m	IEC/EN 62109-1 IEC/EN 62109-2 IEC/EN 62477	Tested within appliance
Capacitor Input&power board: (C15,C16,C35, C36, C95, C96, C97, C98)	XiaMen FARATRONIC Co.,Ltd	C3D1M156KF1 2382	15uF/1100VDC/ W42*H44*T24,P =37.5,4lead	EN61071:2007 IEC 61071:2007 EN61881- 1:2011 IEC 61881- 1:2011	TUV R50266108
Capacitor output board: (C17, C18, C30, C31, C40, C41)	TDK Co., Ltd.,	B32754S8405J 500	4.0uF/350VAC/ ±10%/22*36.5*3 1.5/2P,P=27.5	IEC/EN 62109-1 IEC/EN 62109-2 IEC/EN 62477	Tested within appliance
Capacitor output board: (C20, C21, C22, C60, C61, C62, C82, C83, C84)	TDK Co., Ltd.,	B32924A4335M 000	3.3uF/350VAC/ ±20%/X2/22*36. 5*31.5/2P,P=27. 5	EN60384-14, IEC60384-14 UL60384-14,	ENEC-01393 UL E97863
IGBT Module Input&power	Vincotech Technologies	10- PG07N3A050S	50A/1200V flow3xNPC 1	UL 1557	UL E192116

IEC 62040-1					
Clause	Requirement + Test			Result - Remark	Verdict
4.5	TABLE: list of critical components				P
object/part No.	manufacturer/ trademark	type/model	technical data	standard	mark(s) of conformity ¹⁾
board: (Q21)		5-M896F96T			
IGBT Input&power board: (Q3, Q4, Q5, Q6, Q7, Q8, Q9, Q10, Q11, Q12, Q17, Q18, Q19, Q20)	Fairchild Semiconductor Corporation	FGH40T120SM D-F155	40A/1200V/TO- 247G03	IEC/EN 62109-1 IEC/EN 62109-2 IEC/EN 62477	Tested within appliance
MOSFET control board: (Q2,Q3)	IXYS CORPORATIO N	IXFP4N85X	NMOS/3.5A/850 V/2.5Ω/TO-220	IEC/EN 62109-1 IEC/EN 62109-2 IEC/EN 62477	Tested within appliance
Diode Input&power board: (D7,D8, D9, D10)	ON Semicconductor	FFSH20120AD N—F155	20A/1200V/TO- 247	IEC/EN 62109-1 IEC/EN 62109-2 IEC/EN 62477	Tested within appliance
Relay Input&power board: (RL1,RL2)	Xiamen Hong fa Electroacoustics Co., Ltd.	HF161F-W/12- HT(477)	33A/277VAC/12 VDC	IEC 61810- 1:2015 DIN EN 61810-1 (VDE 0435- 201):2015-10; EN 61810- 1:2015	VDE 40031410
Relay output board: (RL1, RL2, RL3, RL4, RL5, RL6, RL7, RL8)	ZETTLER RELAY(XIA MEN)CO., LTD	AZSR143-1AE- 12D	43A/277VAC/12 VDC/1A	EN61810- 1:2015	TUV B0887930015
Relay output board: (RL11, RL13, RL15, RL17)	ZETTLER RELAY(XIA MEN)CO., LTD	AZSR165-1A- 12DL	80A/690VAC/12 VDC/1H	EN61810- 1:2015	TUV B170988793008
Relay output board: (RL9,RL10)	Xiamen Hong fa Electroacoustics Co., Ltd.	HF115F/012- 2ZS4	12Vdc/8A/250V ac	IEC 61810- 1:2015 DIN EN 61810-1 (VDE 0435- 201):2015-10; EN 61810- 1:2015	VDE 116934

IEC 62040-1					
Clause	Requirement + Test			Result - Remark	Verdict
4.5	TABLE: list of critical components				P
object/part No.	manufacturer/ trademark	type/model	technical data	standard	mark(s) of conformity ¹⁾
Input EMI inductor Input&power board: (L1, L2, L3, L4)	HUIZHOU BAOHUI ELECTRONICS TECHNOLOGY CO., LTD	115-18-001A	1.1mH/2.2*2P	IEC/EN 62109-1 IEC/EN 62109-2 IEC/EN 62477	Tested within appliance
Inductor Input&power board: (L5)	SHENZHEN SPT ELECTRONICS TECHNOLOGY CO., LTD	SPT-40H10292-L	3mH NPH157060	IEC/EN 62109-1 IEC/EN 62109-2 IEC/EN 62477	Tested within appliance
Boost Inductor Input&power board:	HUIZHOU BAOHUI ELECTRONICS TECHNOLOGY CO., LTD	NPF250060-18*3	914uh NPF250060	IEC/EN 62109-1 IEC/EN 62109-2 IEC/EN 62477	Tested within appliance
alternative	SHENZHEN Spitzer ELECTRONICS CO., LTD	NPF250060-18*3	1100uh NPF250060	IEC/EN 62109-1 IEC/EN 62109-2 IEC/EN 62477	Tested within appliance
Inv Inductor Input&power board:	HUIZHOU BAOHUI ELECTRONICS TECHNOLOGY CO., LTD	NPF250060-18*3	876uh NPF250060	IEC/EN 62109-1 IEC/EN 62109-2 IEC/EN 62477	Tested within appliance
alternative	SHENZHEN Spitzer ELECTRONICS CO., LTD	NPF250060-18*3	1030uh NPF250060	IEC/EN 62109-1 IEC/EN 62109-2 IEC/EN 62477	Tested within appliance
output EMI inductor output board: (L2)	SHENZHEN SPT ELECTRONICS TECHNOLOGY CO., LTD	SPT-64H10332-L	1mH Min/60A/T64x40 x20mm	IEC/EN 62109-1 IEC/EN 62109-2 IEC/EN 62477	Tested within appliance
-coil	WUXI JUFENG COMPOUND LINE CO LTD	MW 75-C	130°C	UL 1446	UL E206882
alternative	SHENZHEN SPT ELECTRONICS TECHNOLOGY CO., LTD	SPT-64H10332-L	1mH Min/60A/T64x40 x20mm	IEC/EN 62109-1 IEC/EN 62109-2 IEC/EN 62477	Tested within appliance
-coil	TAI-I COPPER (GUANZHOU)	MW 75-C	130°C	UL 1446	UL E234896

IEC 62040-1					
Clause	Requirement + Test			Result - Remark	Verdict
4.5	TABLE: list of critical components				P
object/part No.	manufacturer/ trademark	type/model	technical data	standard	mark(s) of conformity ¹⁾
	CO LTD				
output EMI inductor output board: (L1)	SHENZHEN SPT ELECTRONICS TECHNOLOGY CO., LTD	SPT-50H10331-L	1.8mH Min/30A/T50x40 x20mm	IEC/EN 62109-1 IEC/EN 62109-2 IEC/EN 62477	Tested within appliance
-coil	WUXI JUFENG COMPOUND LINE CO LTD	MW 75-C	130°C	UL 1446	UL E206882
alternative	SHENZHEN SPT ELECTRONICS TECHNOLOGY CO., LTD	SPT-50H10331-L	1.8mH Min/30A/T50x40 x20mm	IEC/EN 62109-1 IEC/EN 62109-2 IEC/EN 62477	Tested within appliance
-coil	TAI-I COPPER (GUANZHOU) CO LTD	MW 75-C	130°C	UL 1446	UL E234896
Transformer control board : (T3)	HUIZHOU BAOHUI ELECTRONICS TECHNOLOGY CO., LTD	115-19-067A	EE13V(16/21:21)) DIP	IEC/EN 62109-1 IEC/EN 62109-2 IEC/EN 62477	Tested within appliance
-coil	SHANGHAI ASIA PACIFIC ELECTRIC CO LTD	MW 75-C	130°C	UL 1446	UL E214423
-alternative	PACIFIC ELECTRIC WIRE & CABLE (SHENZHEN) CO LTD	MW 75-C	130°C	UL 1446	UL E201757
-alternative	SUZHOU TAIHU ELECTRIC ADVANCED MATERIAL CO LTD	MW 28-C	130°C	UL 1446	UL E228349
Transformer control board : (T1)	HUIZHOU BAOHUI ELECTRONICS TECHNOLOGY CO., LTD	ETD39(TRANSFORMER)	0.46mH/ETD39/ R40 DIP	IEC/EN 62109-1 IEC/EN 62109-2 IEC/EN 62477	Tested within appliance
-coil	SHANGHAI ASIA PACIFIC ELECTRIC CO	MW 75-C	130°C	UL 1446	UL E214423

IEC 62040-1					
Clause	Requirement + Test			Result - Remark	Verdict
4.5	TABLE: list of critical components				P
object/part No.	manufacturer/ trademark	type/model	technical data	standard	mark(s) of conformity ¹⁾
	LTD				
-alternative	PACIFIC ELECTRIC WIRE & CABLE (SHENZHEN) CO LTD	MW 75-C	130°C	UL 1446	UL E201757
-alternative	SUZHOU TAIHU ELECTRIC ADVANCED MATERIAL CO LTD	MW 28-C	130°C	UL 1446	UL E228349
IC control board : (U1,U2,U3)	TEXAS INSTRUMENTS	AMC1200BDW VR	AMC1200BDW V/SOIC-8	UL1577	UL E181974
IC control board : (U39)	TEXAS INSTRUMENTS	TMS320F28004 9PZS	Microcontroller/ LQFP100	IEC/EN 62109-1 IEC/EN 62109-2 IEC/EN 62477	Tested within appliance
IC control board : (U37)	TEXAS INSTRUMENTS	TMS320F28075 PTP	Digital Signal Controller/HLQF P-176	IEC/EN 62109-1 IEC/EN 62109-2 IEC/EN 62477	Tested within appliance
IC control board : (U13)	SHENZHEN PANGO MICROSYSTE MS CO., LTD	PK03004_PGC 2KG_LPG144	CPLD IO 112/4 3.3V /LPG144	IEC/EN 62109-1 IEC/EN 62109-2 IEC/EN 62477	Tested within appliance
Optocoupler control board : (U23)	TEXAS INSTRUMENTS	ISO7721	Digital Isolators/SOP-8	UL 1577	UL E181974
All PCB	SHANTOU LUCKY STAR PCB CO LTD	WS888	130°C, V-0	UL 796	UL E301869
alternative	SHENZHEN GLORYSKY ELECTRONICS CO LTD	GS-M	130°C, V-0	UL 796	UL E257384
Internal wiring (DC-in)	All accepted	ALL AWG#12 AWG#10	1000V 105°C	UL 2885	UL E341104
Internal wiring (AC-out)	All accepted	AWG#6	1000V 105°C	UL 2885	UL E341104
Surface cover	All accepted	AL 5052 thickness=2.0m m	564.8mm*465m m*145mm	IEC/EN 62109-1 IEC/EN 62109-2	Tested within appliance

IEC 62040-1					
Clause	Requirement + Test			Result - Remark	Verdict
4.5	TABLE: list of critical components				P
object/part No.	manufacturer/ trademark	type/model	technical data	standard	mark(s) of conformity ¹⁾
				IEC/EN 62477	
Heat-sink (the rear side of enclosure)	All accepted	AL 6063 T5	415mm*212mm*73.3mm	IEC/EN 62109-1 IEC/EN 62109-2 IEC/EN 62477	Tested within appliance
Metal Enclosure	All accepted	AL 5052 thickness=2.0mm	Min. thickness:2.0	/	/
SPD output board: (SPD1,SPD2,S PD3,SPD4)	SICHUAN ZHONGGUANG HI-TECH CO., LTD	ZGGS20-670PVh1b1	ZGGS20-670PVh1b1 /510VAC/670VDC /10kA (8/20s)	IEC/EN 62109-1 IEC/EN 62109-2 IEC/EN 62477	Tested within appliance
1) an asterisk indicates a mark which assures the agreed level of surveillance					

List of test equipment used:

No.	Equipment name	Manufacture	Serial No.	Calibration Data	Usage
1	Simulation of ac power supply	WLPA-33-1000KVA	BZ-DGD-L001	--	√
2	Solar IV simulator	WDGC-1000KW	BZ-DGD-L002	--	√
3	Programmable ac load	ACLT-38160H	BZ-DGD-L003	--	√
4	Power analyser	PW6001-16	BZ-DGD-L025	2021\3\04	√
5	Oscilloscope	MSO4054B	BZ-DGD-L028	2021\3\04	√
6	Heating Recorder	LR8400-21	BZ-DGD-L032	2020\8\28	√
7	Hi-Pot & IR tester	Chroma 19032	BZ-DGD-L066	2021\3\04	√
8	Noise meter	TES-1357	BZ-DGD-L029	2021\3\06	√
9	Digital Caliper	LS160	BZ-DGD-L048	2020\07\02	√
10	Testing Finger B	AUTO-B	BZ-DGD-L011	2020\11\1	√
11	DC Electronic Load	IT8511+	BZ-DGD -L027	2020\10\31	√
12	Pull and push	2P-1000	BZ-DGB-L080	2020\8\28	√
13	Electronic Scale	TCS-300	BZ-DGB-L020	2020\07\02	√
14	Thermostat	16m ³	BZ-DGD-L015	2020\07\02	√
15	Surge generator	HCWG 70	BZ-DGE-L036	2020\5\6	√

- End of Test Report -