TEST REPORT
IEC 62109-1
Safety of Power Converter for use in Photovoltaic Power Systems
Part 1: General requirements

Report Number. ..... :	64.290.21.30202.01 part 1 of 2
Date of issue ..... :	2021-07-05
Total number of pages ..... :	72 pages
Name of Testing Laboratory preparing the Report ..... :	TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch
Applicant's name ..... :	Shenzhen SOFARSOLAR Co., Ltd.
Address ..... :	401, Building 4, AnTongDa Industrial Park, District 68, XingDong Community, XinAn Street, BaoAn District, Shenzhen, Guangdong. P.R.China
Test specification:	
Standard ..... :	IEC 62109-1:2010 (First Edition)
Test procedure ..... :	CE_LVD
Non-standard test method ..... :	N/A
Test Report Form No. ..... :	IEC62109_1B
Test Report Form(s) Originator .... :	VDE Testing and Certification Institute
Master TRF ..... :	Dated 2016-04

This report is not valid as a CB Test Report unless signed by an approved CB Testing Laboratory and appended to a CB Test Certificate issued by an NCB in accordance with IECEE 02.

General disclaimer:

The test results presented in this report relate only to the object tested.
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Telephone : +86 20 3832 0668
Telefax : +86 20 3832 0478

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TÜV SÜD Certification and Testing (China) Co., Ltd.
Guangzhou Branch, TÜV SÜD Group
5F, Communication Building, 163 Pingyun Rd,
Huangpu Ave. West, Guangzhou 510656, P. R. China

Test item description ..... :	Solar Grid-tied Inverter
Trade Mark ..... :	SOFAR SOLAR
Manufacturer ..... :	Same as applicant
Model/Type reference ..... :	SOFAR 250KTL-HV, SOFAR 255KTL-HV
Ratings ..... :	See rating label on page 4 and parameter on page 6

Responsible Testing Laboratory (as applicable), testing procedure and testing location(s):

☒	**Testing Laboratory:**	TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch	
Testing location/ address ..... :		TÜV SÜD Testing Center, D1 building, No. 63 Chuangqi Road, Shilou Town, Panyu District, Guangzhou, P.R. China	
Tested by (name, function, signature) ..... :		Richard Wong, Iris Zheng	
Approved by (name, function, signature)... :		Max Fang	

Telephone : +86 20 3832 0668
Telefax : +86 20 3832 0478

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TÜV SÜD Certification and Testing (China) Co., Ltd.
Guangzhou Branch, TÜV SÜD Group
5F, Communication Building, 163 Pingyun Rd,
Huangpu Ave. West, Guangzhou 510656, P. R. China

List of Attachments (including a total number of pages in each attachment):

This test report contains 2 parts listed in below table:

Item #	Description	Pages
Part 1	IEC/EN 62109-1:2010 test report	72
Part 2	IEC/EN 62109-2:2011 test report	17

This test report shall be also used in conjunction with 21 pages of Photo documentation.

Summary of testing:

All tests were carried out according to IEC/EN 62109-1:2010.

Tests performed (name of test and test clause):

Clause	Requirement
4.3	Thermal testing
4.4	Testing in single fault condition
4.5	Humidity preconditioning
4.6	Backfeed voltage tests
4.7	Electrical ratings tests
5.1.2	Durability of markings
7.3	Protection against electric shock
7.4	Protection against energy hazards
7.5	Electrical tests related to shock hazard
8.2	Moving parts
8.5	Wall mounting
9.2.2	Limited power source test
10.2	Sonic pressure and sound level
13.1	Handles and manual controls
13.6.2.1	Stress relief test for enclosure of thermoplastic material
13.7	Mechanical resistance to deflection, impact, or drop

Remark: If no special indicated, all the tests are applied on model SOFAR 255KTL-HV

Testing location:

TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch

Address: TÜV SÜD Testing Center, D1 building, No. 63 Chuangqi Road, Shilou Town, Panyu District, Guangzhou, P.R. China

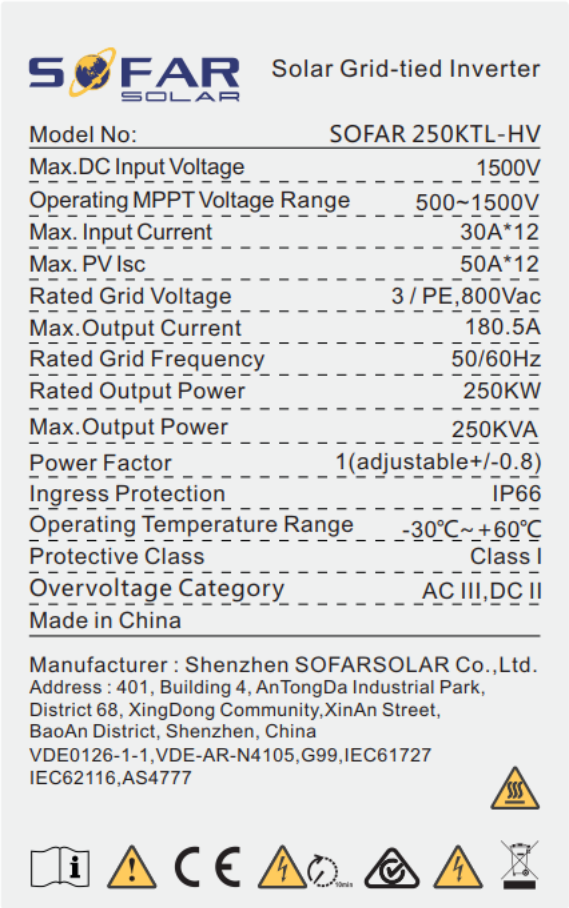
Summary of compliance with National Differences (List of countries addressed):

N/A

Telephone : +86 20 3832 0668
Telefax : +86 20 3832 0478
http://www.tuv-sud.cn

TÜV SÜD Certification and Testing (China) Co., Ltd.
Guangzhou Branch, TÜV SÜD Group
5F, Communication Building, 163 Pingyun Rd,
Huangpu Ave. West, Guangzhou 510656, P. R. China

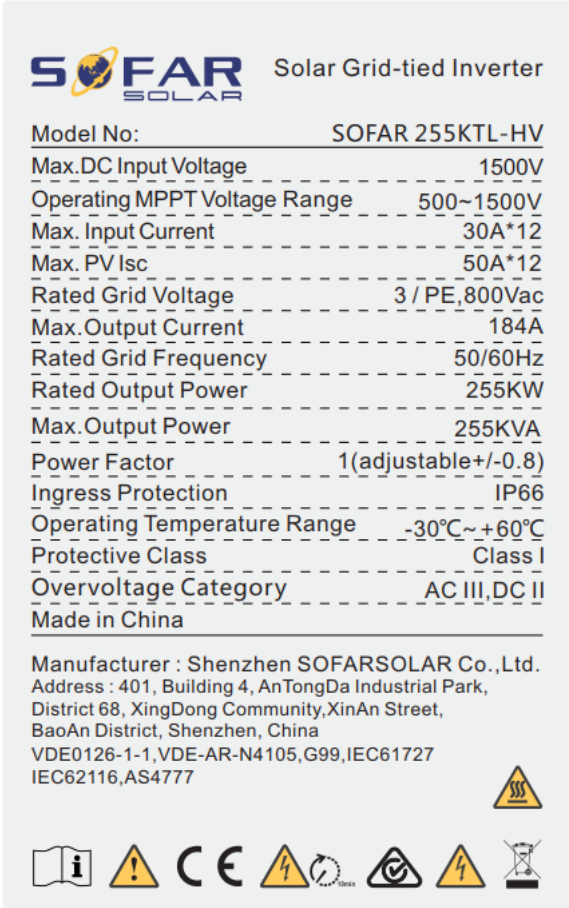
Copy of marking plate:



SOFAR SOLAR Solar Grid-tied Inverter

Model No:	SOFAR 250KTL-HV
Max.DC Input Voltage	1500V
Operating MPPT Voltage Range	500~1500V
Max. Input Current	30A*12
Max. PV Isc	50A*12
Rated Grid Voltage	3 / PE,800Vac
Max.Output Current	180.5A
Rated Grid Frequency	50/60Hz
Rated Output Power	250KW
Max.Output Power	250KVA
Power Factor	1(adjustable+/-0.8)
Ingress Protection	IP66
Operating Temperature Range	-30℃~+60℃
Protective Class	Class I
Overvoltage Category	AC III,DC II
Made in China	

Manufacturer : Shenzhen SOFARSOLAR Co.,Ltd.
Address : 401, Building 4, AnTongDa Industrial Park,
District 68, XingDong Community,XinAn Street,
BaoAn District, Shenzhen, China
VDE0126-1-1,VDE-AR-N4105,G99,IEC61727
IEC62116,AS4777



SOFAR SOLAR Solar Grid-tied Inverter

Model No:	SOFAR 255KTL-HV
Max.DC Input Voltage	1500V
Operating MPPT Voltage Range	500~1500V
Max. Input Current	30A*12
Max. PV Isc	50A*12
Rated Grid Voltage	3 / PE,800Vac
Max.Output Current	184A
Rated Grid Frequency	50/60Hz
Rated Output Power	255KW
Max.Output Power	255KVA
Power Factor	1(adjustable+/-0.8)
Ingress Protection	IP66
Operating Temperature Range	-30℃~+60℃
Protective Class	Class I
Overvoltage Category	AC III,DC II
Made in China	

Manufacturer : Shenzhen SOFARSOLAR Co.,Ltd.
Address : 401, Building 4, AnTongDa Industrial Park,
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VDE0126-1-1,VDE-AR-N4105,G99,IEC61727
IEC62116,AS4777

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.

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Telefax : +86 20 3832 0478

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5F, Communication Building, 163 Pingyun Rd,
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Test item particulars.....:	
Equipment mobility .....:	☐ movable ☐ hand-held ☒ stationary ☒ fixed ☐ transportable ☐ for building-in
Connection to the mains .....:	☐ pluggable equipment ☐ direct plug-in ☒ permanent connection ☐ for building-in
Environmental category .....:	☒ outdoor ☐ indoor unconditional ☐ indoor conditional
Over voltage category Mains .....:	☐ OVC I ☐ OVC II ☒ OVC III ☐ OVC IV
Over voltage category PV.....:	☐ OVC I ☒ OVC II ☐ OVC III ☐ OVC IV
Mains supply tolerance (%).....:	±10%
Tested for power systems.....:	IT
IT testing, phase-phase voltage (V).....:	N/A
Class of equipment.....:	☒ Class I ☐ Class II ☐ Class III ☐ Not classified
Mass of equipment (kg) .....:	99.3 kg (approx.)
Pollution degree.....:	External 3, Internal 2
IP protection class.....:	IP 66
Possible test case verdicts:	
- test case does not apply to the test object.....:	N/A
- test object does meet the requirement.....:	P (Pass)
- test object was not evaluated for the requirement:	N/E
- test object does not meet the requirement.....:	F (Fail)
Testing.....:	
Date of receipt of test item .....:	2021-03-29
Date (s) of performance of tests.....:	2021-04-06 to 2021-06-10

General remarks:

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

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

Manufacturer's Declaration per sub-clause 4.2.5 of IECEE 02:

The application for obtaining a CB Test Certificate includes more than one factory location and a declaration from the Manufacturer stating that the sample(s) submitted for evaluation is (are) representative of the products from each factory has been provided ..... :	☐ **Yes** ☒ **Not applicable**

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

Name and address of factory:

Dongguan SOFAR SOLAR Co., Ltd.

1F – 6F, Building E, No.1 JinQi Road, Bihu Industrial Park, Wulian Villiage, Fenggang Town, Dongguan City, P.R. China.

Telephone : +86 20 3832 0668
Telefax : +86 20 3832 0478

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TÜV SÜD Certification and Testing (China) Co., Ltd.
Guangzhou Branch, TÜV SÜD Group
5F, Communication Building, 163 Pingyun Rd,
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General product information:

(1) The PV grid-tied inverter is non-isolated (transformerless) solar inverter for connection in parallel to public grid;

(2) The unit shall be used at specified ambient range. Temperature: -30 °C ~ +60 °C, auto-derating temperature refer to rating table; Altitude: ≤ 5000 m; Overvoltage category: II(DC side), III(AC side); Relative humidity range: 0 % ~ 100 %.

(3) For altitude 2000m~ 5000m, only clearance is evaluated, other requirements are not evaluated in this report.

(4) The unit provides two relays in series on each phase (L1, L2, L3). The internal control is redundantly built. It contains a main DSP and a slave DSP. Both DSP can open relays independently and communicate with each other.

(5) In order to protect the PCE, user and installer, external AC circuit breakers shall be equipped at the end-use application;

(6) Low voltage electrical installations shall comply with national and local regulation. Only qualified electricians are allowed to install and maintain the inverter;

Model differences:

The two models have the same hardware construction, only through different software setting to control different output power.

Rating:

Model:	SOFAR 250KTL-HV	SOFAR 255KTL-HV
PV input terminal parameters:		
Max. input voltage	1500Vd.c.	
Rated input voltage	1160Vd.c.	
Start-up voltage	550Vd.c.	
MPPT operating voltage range	500~1500Vd.c.	
Full power MPPT voltage range	800~1300Vd.c.	
Number for DC inputs	24	
Max. input MPPT current	30Ad.c.*12	
Max. input short circuit current	50Ad.c.*12	
AC output rating		
AC output power	250kVA@30°C / 235kVA@40°C / 220kVA@50°C	255kVA@30°C / 235kVA@40°C / 220kVA@50°C
Max. Output current	180.5Aa.c.	184Aa.c.
Nominal grid voltage	3 / PE, 800Va.c.	
Nominal frequency	50Hz / 60Hz	
Power factor	0.8 leading ~ 0.8 lagging	
General		
Operating temperature range	-30~+60℃	
Protection class	Class I	
Ingress protection	IP66	
Operating altitude range	≤5000m	

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IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
4	**GENERAL TESTING REQUIREMENTS**		P
4.1	General		P
4.2	General conditions for testing		P
4.2.1	Sequence of tests		P
4.2.2	Reference test conditions		P
4.2.2.1	Environmental conditions		P
4.2.2.2	State of equipment		P
4.2.2.3	Position of equipment	The equipment was installed in accordance with the manufacturer's instructions, in the configuration that results in the worst-case test conditions	P
4.2.2.4	Accessories	Accessories were added that results in the worst-case test conditions	P
4.2.2.5	Covers and removable parts	No	P
4.2.2.6	Mains supply a) Voltage: b) Frequency: c) Polarity: d) Earthing: e) Over-current Protection:	3W+PE, 800Va.c. (80% to 115% tolerance), 50 Hz/60Hz, three phases	P
4.2.2.7	Supply ports other than the mains	PV supply	P
4.2.2.7.1	Photovoltaic supply sources a) Open circuit voltage: b) Short-circuit current:		P
4.2.2.7.2	Battery inputs	No batteries for energy storage	N/A
4.2.2.8	Conditions of loading for output ports		P
4.2.2.9	Earthing terminals		P
4.2.2.10	Controls		P
4.2.2.11	Available short circuit current		P
4.3	Thermal testing	see appended table	P
4.3.1	General		P
4.3.2	Maximum temperatures	See appended table Tests of equipment rated for use in ambient temperatures up to 60 °C	P
4.3.2.1	General		P
4.3.2.2	Touch temperatures	Heatsinking is guard inside	P

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Guangzhou Branch, TÜV SÜD Group
5F, Communication Building, 163 Pingyun Rd,
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IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
		enclosure, symbol 14 marked	
4.3.2.3	Temperature limits for mounting surfaces		P
4.4	Testing in single fault condition	see appended table	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
4.4.3.2	Protection against the spread of fire		P
4.4.3.3	Protection against other hazards		P
4.4.3.4	Protection against parts expulsion hazards		P
4.4.4	Single fault conditions to be applied		P
4.4.4.1	Component fault tests		P
4.4.4.2	Equipment or parts for short-term or intermittent operation	Not for short-term or intermit-tent operation	N/A
4.4.4.3	Motors		P
4.4.4.4	Transformer short circuit tests		P
4.4.4.5	Output short circuit	AC terminal L1-L2: 487Apeak	P
4.4.4.6	Backfeed current test for equipment with more than one source of supply	DC and AC consider as source of supply (PV feedback current 270A, AC feedback current 332A)	P
4.4.4.7	Output overload		P
4.4.4.8	Cooling system failure		P
4.4.4.9	Heating devices	No heating devices used	N/A
4.4.4.10	Safety interlock systems	No safety interlock	N/A
4.4.4.11	Reverse d.c. connections	PV+ and PV– are reversed	P
4.4.4.12	Voltage selector mismatch	No voltage selector	N/A
4.4.4.13	Mis-wiring with incorrect phase sequence or polarity		P
4.4.4.14	Printed wiring board short-circuit test		P
4.5	Humidity preconditioning	95% RH., 40 °C, 48 h	P
4.5.1	General		P
4.5.2	Conditions		P
4.6	Backfeed voltage protection		P
4.6.1	Backfeed tests under normal conditions		P

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IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
4.6.2	Backfeed tests under single-fault conditions		P
4.6.3	Compliance with backfeed tests		P
4.7	Electrical ratings tests	see appended table	P
4.7.1	Input ratings		P
4.7.1.1	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
	Equipment shall bear markings as specified in 5.1 and 5.2	Label are marked on the PCE and graphic symbol is explained in user manual	P
	Graphic symbols may be used and shall be in accordance with Annex C or IEC 60417 as applicable.		P
	Graphic symbols shall be explained in the documentation provided with the PCE.		P
5.1.2	Durability of markings		P
	Markings required by this clause to be located on the PCE shall remain clear and legible under conditions of NORMAL USE and resist the effects of cleaning agents specified by the manufacturer		P
5.1.3	Identification		P
	The equipment shall, as a minimum, be permanently marked with:		P
	a) the name or trade mark of the manufacturer or supplier	Trade mark	P
	b) model number, name or other means to identify the equipment	Model number	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.		P
5.1.4	Equipment ratings		P
	Unless otherwise specified in another part of IEC 62109, the following ratings, as applicable shall be marked on the equipment:	Special requirement as per IEC 62109-2	P
	– input voltage, type of voltage (a.c. or d.c.), frequency, and max. continuous current for each input		P
	– output voltage, type of voltage (a.c. or d.c.), frequency, max. continuous current, and for a.c. outputs, either the power or power factor for		P

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IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
	each output		
	– the ingress protection (IP) rating as in 6.3 below	IP66	P
5.1.5	Fuse identification		N/A
	Marking shall be located adjacent to each fuse or fuseholder, or on the fuseholder, or in another location provided that it is obvious to which fuse the marking applies, giving the fuse current rating and where fuses of different voltage rating value could be fitted, the fuse voltage rating.	No fuse used	N/A
	Where fuses with special fusing characteristics such as time delay or breaking capacity are necessary, the type shall also be indicated		N/A
	For fuses not located in operator access areas and for soldered-in fuses located in operator access areas, it is permitted to provide an unambiguous cross-reference (for example, F1, F2, etc.) to the servicing instructions which shall contain the relevant information.		N/A
5.1.6	Terminals, Connections, and Controls	DC input, grid connection and communication interface	P
	If necessary for safety, an indication shall be given of the purpose of Terminals, connectors, controls, and indicators, and their various positions, including any connections for coolant fluids such as water and drainage. The symbols in Annex C may be used, and where there is insufficient space, symbol 9 of Annex C may be used.	Symbol 9 are marked on the PCE, user manual indicates the installation and safety of connection of connector, control and indicator	P
	Push-buttons and actuators of emergency stop devices, and indicator lamps used only to indicate a warning of danger or the need for urgent action shall be coloured red.	No emergency stop	N/A
	A multiple-voltage unit shall be marked to indicate the particular voltage for which it is set when shipped from the factory. The marking is allowed to be in the form of a paper tag or any other non-permanent material.	The PCE is not intended to connect to multiple-voltage and there is no voltage setting device	N/A
	A unit with d.c. terminals shall be plainly marked indicating the polarity of the connections, with:		P
	– the sign “+“ for positive and “-„ for negative; or		P
	– a pictorial representation illustrating the proper polarity where the correct polarity can be unambiguously determined from the representation	No provided	N/A
5.1.6.1	Protective Conductor Terminals		P
	The means of connection for the protective earthing conductor shall be marked with:		P
	– symbol 7 of Annex C; or		P

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IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
	– the letters “PE“; or		N/A
	– the colour coding green-yellow.		N/A
5.1.7	Switches and circuit-breakers		P
	The on and off-positions of switches and circuits breakers shall be clearly marked. If a push-button switch is used as the power switch, symbols 10 and 16 of Annex C may be used to indicate the on-position, or symbols 11 and 17 to indicate the off-position, with the pair of symbols (10 and 16, or 11 and 17) close together.		P
5.1.8	Class II Equipment	Class I	N/A
	Equipment using Class II protective means throughout shall be marked with symbol 12 of Annex C. Equipment which is only partially protected by DOUBLE INSULATION or REINFORCED INSULATION shall not bear symbol 12 of Table Annex C.		N/A
	Where such equipment has provision for the connection of an earthing conductor for functional reasons (see 7.3.6.4) it shall be marked with symbol 6 of Annex C		N/A
5.1.9	Terminal boxes for External Connections		P
	Where required by note 1 of Table 2 as a result of high temperatures of terminals or parts in the wiring compartment, there shall be a marking, visible beside the terminal before connection, of either:		P
	a) the minimum temperature Rating and size of the cable to be connected to the TERMINALS; or		N/A
	b) a marking to warn the installer to consult the installation instruction. Symbol 9 of Table D-1 is an acceptable marking		P
5.2	Warning markings		P
5.2.1	Visibility and legibility requirements for warning markings		P
	Warning markings shall be legible, and shall have minimum dimensions as follows:	The warning markings are printed out	P
	– Printed symbols shall be at least 2,75 mm high		P
	– Printed text characters shall be at least 1.5 mm high and shall contrast in colour with the background		P
	– Symbols or text that are moulded, stamped or engraved in a material shall have a character height of at least 2,0 mm, and if not contrasting in colour from the background, shall have a depth or raised height of at least 0,5 mm.	The symbols are printed out	P

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IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
	If it is necessary to refer to the instruction manual to preserve the protection afforded by the equipment, the equipment shall be marked with symbol 9 of Annex C	The manual provides necessary information for the warning marking	P
	Symbol 9 of Annex C is not required to be used adjacent to symbols that are explained in the manual		P
5.2.2	Content for warning markings		P
5.2.2.1	Ungrounded heat sinks and similar parts	Grounded heatsink and metal enclosure	N/A
	An ungrounded heat sink or other part that may be mistaken for a grounded part and involves a risk of electric shock in accordance with 7.3 shall be marked with symbol 13 of Annex C, or equivalent. The marking may be on or adjacent to the heat sink and shall be clearly visible when the PCE is disassembled to the extent that a risk of contact with the heat sink exists.		N/A
5.2.2.2	Hot Surfaces		P
	A part of the PCE that exceeds the temperature limits specified in 4.3.2 shall be marked with symbol 14 of Annex C or equivalent.	Symbol 14 marked on PCE	P
5.2.2.3	Coolant	Coolant is not used	N/A
	A unit containing coolant that exceeds 70 °C shall be legibly marked externally where readily visible after installation with symbol 15 of Annex C. The documentation shall provide a warning regarding the risk of burns from hot coolant, and either:		N/A
	a) statement that coolant system servicing is to be done only by SERVICE PERSONNEL, or		N/A
	b) instructions for safe venting, draining, or otherwise working on the cooling system, if these operations can be performed without OPERATOR access to HAZARDS internal to the equipment		N/A
5.2.2.4	Stored energy		P
	Where required by 7.3.9.2 or 7.4.2 the PCE shall be marked with Symbol 21 of Annex C and the time to discharge capacitors to safe voltage and energy levels shall accompany the symbol.	Symbol 21 is marked on PCE	P
5.2.2.5	Motor guarding		P
	Where required by 8.2 a marking shall be provided where it is visible to service personnel before removal of a guard, warning of the hazard and giving instructions for safe servicing (for example disconnection of the source before removing the guard).		P

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IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
5.2.3	Sonic hazard markings and instructions	No sonic hazard	N/A
	If required by 10.2.1 a PCE shall:		N/A
	a) be marked to warn the operator of the sonic pressure hazard; or		N/A
	b) be provided with installation instructions that specify how the installer can ensure that the sound pressure level from equipment at its point of use after installation, will not reach a value, which could cause a hazard. These instructions shall include the measured sound pressure level, and shall identify readily available and practicable protective materials or measures which may be used.		N/A
5.2.4	Equipment with multiple sources of supply	PV array and AC mains.	P
	A PCE with connections for multiple energy sources shall be marked with symbol 13 of Annex C and the manual shall contain the information required in 5.3.4.	Symbol 13 provided on PCE	P
	The symbol shall be located on the outside of the unit or shall be prominently visible behind any cover giving access to hazardous parts.		P
5.2.5	Excessive touch current		P
	Where required by 7.3.6.3.7 the PCE shall be marked with symbol 15 of Annex C. See also 5.3.2 for information to be provided in the installation manual.	The measured touch current is 7.8mA.	P
5.3	Documentation		P
5.3.1	General		P
	The documentation provided with the PCE shall provide the information needed for the safe operation, installation, and (where applicable) maintenance of the equipment. The documentation shall include the items required in 5.3.2 through 5.3.4, and the following:		P
	a) explanations of equipment makings, including symbols used		P
	b) location and function of terminals and controls		P
	c) all ratings or specifications that are necessary to safely install and operate the PCE, including the following environmental ratings along with an explanation of their meaning and any resulting installation requirements:		P
	– ENVIRONMENTAL CATEGORY as per 6.1	outdoor	P
	– WET LOCATIONS classification fort he intended external environment as per 6.1	Suitable for wet location	P
	– POLLUTION DEGREE classification for the	External: PD3, Internal: PD2	P

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Telefax : +86 20 3832 0478
http://www.tuv-sud.cn

TÜV SÜD Certification and Testing (China) Co., Ltd.
Guangzhou Branch, TÜV SÜD Group
5F, Communication Building, 163 Pingyun Rd,
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Clause	Requirement – Test	Result – Remark	Verdict
	intended external environment as per 6.2		
	– INGRESS PROTECTION rating as per 6.3	IP 66	P
	– Ambient temperature and relative humidity ratings	-30 ºC to +60 ºC (auto-derating temperature refer to rating table)	P
	– MAXIMUM altitude rating	Up to 5000m (> 4000m derating)	P
	– OVERVOLTAGE CATEGORY assigned to each input and output port as per 7.3.7.1.2, accompanied by guidance regarding how to ensure that the installation complies with the required overvoltage categories;	OVC II (PV), OVC III (Mains)	P
	d) a warning that when the photovoltaic array is exposed to light, it supplies a d.c. voltage to the PCE		P
5.3.1.1	Language	English provide	P
	Instructions related to safety shall be in a language that is acceptable in the country where the equipment is to be installed.	For other country language, further evaluation is needed	N/A
5.3.1.2	Format		P
	In general, the documentation must be provided in printed form and is to be delivered with the equipment.	Printed form provided and is to be delivered with equipment	P
	For equipment which requires the use of a computer for both installation and operation, documentation may be provided in electronic format without accompanying printed format.		P
5.3.2	Information related to installation		P
	The documentation shall include installation and where applicable, specific commissioning instructions and, if necessary for safety, warnings against hazards which could arise during installation or commissioning of the equipment. The information provided shall include:		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 externals controls, colour coding		P

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Guangzhou Branch, TÜV SÜD Group
5F, Communication Building, 163 Pingyun Rd,
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	of leads, or overcurrent protection needed;		
	d) explanation of the pin-out of connectors for external connections, unless the connector is used for a standard purpose (e.g. RS 232)		P
	e) ventilation requirements;		P
	f) requirements for special services, for example cooling liquid;	No cooling liquid or other special service	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;		P
	k) for each input to the PCE, the max value of short-circuit current available from the source, for which the PCE is designed; and		P
	l) compatibility with RCD and RCM;		N/A
	m) instructions for protective earthing, including the information required by 7.3.6.3.7 if a second protective earthing conductor is to be installed:		P
	n) where required by 7.3.8, the installation instructions shall include the following or equivalent wording:		N/A
	“This product can cause a d.c. current in the external protective earthing conductor. Where a residual current-operated protective (RCD) or monitoring (RCM) device is used for protection in a case of direct or indirect contact, only an RCD or RCM of Type B is allowed on the supply side of this product.		N/A
	o) for PCE intended to charge batteries, the battery nominal voltage rating, size, and type		N/A
	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 use shall include any operating instructions necessary to ensure safe operation,		P

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TÜV SÜD Certification and Testing (China) Co., Ltd.
Guangzhou Branch, TÜV SÜD Group
5F, Communication Building, 163 Pingyun Rd,
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Clause	Requirement – Test	Result – Remark	Verdict
	including the following, as applicable:		
	– Instructions for adjustment of controls including the effects of adjustment;		P
	– Instructions for interconnection to accessories and other equipment, including indication of suitable accessories, detachable parts and any special materials;		P
	– Warnings regarding the risk of burns from surfaces permitted to exceed the temperature limits of 4.3.2 and required operator actions to reduce the risk; and		P
	– Instructions, that if the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.		P
5.3.4	Information related to maintenance		P
	Maintenance instructions shall include the following:		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);		N/A
	– 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;	No 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.		P
5.3.4.1	Battery maintenance	No energy storage battery inside	N/A
	Where required by 14.8.5, the documentation shall include the applicable items from the following list of instructions regarding maintenance of batteries:		N/A
	– 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		N/A

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Guangzhou Branch, TÜV SÜD Group
5F, Communication Building, 163 Pingyun Rd,
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Clause	Requirement – Test	Result – Remark	Verdict
	installation of batteries		
	– 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
	f) Determine if battery is inadvertently grounded. If inadvertently grounded, remove source from ground. Contact with any part of a grounded battery can result in electrical shock. The likelihood of such shock can be reduced if such grounds are removed during installation and maintenance (applicable to equipment and remote battery supplies not having a grounded supply circuit).		N/A
6	**ENVIRONMENTAL REQUIREMENTS AND CONDITIONS**		P
	The manufacturer shall rate the PCE for the following environmental conditions:		P
	– ENVIRONMENTAL CATEGORY, as in 6.1 below		P
	– Suitability for WET LOCATIONS or not		P
	– POLLUTION DEGREE rating in 6.2 below		P
	– INGRESS PROTECTION (IP) rating, as in 6.3 below	IP66	P
	– Ultraviolet (UV) exposure rating, as in 6.4 below		P
	– Ambient temperature and relative humidity ratings, as in 6.5 below		P
6.1	Environmental categories and minimum environmental conditions		P
6.1.1	Outdoor	Yes	P
6.1.2	Indoor, unconditioned		N/A
6.1.3	Indoor, conditioned		N/A
6.2	Pollution degree	External: PD3, Internal: PD2	P

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Clause	Requirement – Test	Result – Remark	Verdict
6.3	Ingress Protection	IP66 See Report No: WT213101716 of Shenzhen Academy of Metrology and Quality Inspection	P
6.4	UV exposure	Yes	P
6.5	Temperature and humidity		P
7	**PROTECTION AGAINST ELECTRIC SHOCK AND ENERGY HAZARDS**		P
7.1	General		P
7.2	Fault conditions	Normal and single fault condition are considered	P
7.3	Protection against electric shock		P
7.3.1	General	In the PCE the earthed metal enclosure is evaluated by means of basic insulation from DVC C circuit. DVC A circuit and unearthed accessible parts are evaluated by means of double insulation from DVC C. DVC C: PV input and mains output. DVC A: Communication interface	P
7.3.2	Decisive voltage classification		P
7.3.2.1	Use of decisive voltage class (DVC)	Working voltage and protective measures are considered.	P
7.3.2.2	Limits of DVC (according table 6)	Wet location is considered for PCE outside only	P
7.3.2.3	Short-terms limits of accessible voltages under fault conditions		P
7.3.2.4	Requirements for protection (according table 7)	Single fault condition is considered. Accessible earthed conductive parts are separated from DVC-C circuits by basic insulation. Accessible unearthed conductive parts separated from DVC C circuit by double insulation.	P
7.3.2.5	Connection to PELV and SELV circuits	The external signal communication interface is considered as SELV.	P
7.3.2.6	Working voltage and DVC		P

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http://www.tuv-sud.cn

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Guangzhou Branch, TÜV SÜD Group
5F, Communication Building, 163 Pingyun Rd,
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Clause	Requirement – Test	Result – Remark	Verdict
7.3.2.6.1	General	Transients and voltage fluctuations are disregarded. and worst case normal operating condition is considered	P
7.3.2.6.2	AC working voltage (see Figure 2)	800 Vr.m.s phase-phase for Grid side.	P
7.3.2.6.3	DC working voltage (see Figure 3)	Max. 1500 Vd.c. for PV	P
7.3.2.6.4	Pulsating working voltage (see Figure 4)		N/A
7.3.3	protective separation	See description in Cl. 7.3.1	P
	Protective separation shall be achieved by:		P
	▪ double or reinforced insulation, or		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, or		P
	▪ protective impedance comprising limitation of current per 7.3.5.3 and of discharged energy per 7.3.5.4, or		N/A
	▪ limitation of voltage according to 7.3.5.4.		N/A
	The protective separation shall be fully and effectively maintained under all conditions of intended use of the PCE		P
7.3.4	Protection against direct contact		P
7.3.4.1	General		P
	Protection against direct contact is employed to prevent persons from touching live parts that do not meet the requirements of 7.3.5 and shall be provided by one or more of the measure given in 7.3.4.2 (enclosures and barriers) and 7.3.4.3 (insulation).	Enclosure provided	P
	Open type sub-assemblies and devices do not require protective measures against direct contact but the instruction provided with the equipment must indicate that such measures must be provided in the end equipment or in the installation.	End use product	N/A
	Product intended for installation in CLOSED ELECTRICAL OPERATING AREAS, (see 3.9) need not have protective measures against direct contact, except as required by 7.3.4.2.4.	No use under this condition	N/A
7.3.4.2	Protection by means of enclosures and barriers		P
	The following requirements apply where protection against contact with live parts is provided by enclosures or barriers, not by insulation in	Enclosure provided to prevent access to inside hazardous live parts	P

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Telefax : +86 20 3832 0478
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TÜV SÜD Certification and Testing (China) Co., Ltd.
Guangzhou Branch, TÜV SÜD Group
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Clause	Requirement – Test	Result – Remark	Verdict
	accordance with 7.3.4.3.		
7.3.4.2.1	General		P
	Parts of enclosures and barriers that provide protection in accordance with these requirements shall not be removable without the use of a tool (see 7.3.4.2.3).	Secured by screws	P
	Polymeric materials used to meet these requirements shall also meet the requirements of 13.6		P
7.3.4.2.2	Access probe criteria		P
	Protection is considered to be achieved when the separation between the test probes and live parts, when tested as described below, is as follows:		P
	a) decisive voltage classification A, (DVC A) - the probe may touch the live parts	Communication interface is considered as DVC A	P
	b) decisive voltage classification B, (DVC B) - the probe must not touch bare live parts	DVC B circuit is not accessible by probe	P
	c) decisive voltage classification C, (DVC C) – the probe must have adequate clearance to live parts, based on the clearance for Basic insulation using the recurring peak working voltage involved,	DVC C circuit is not accessible by probe	P
7.3.4.2.3	Access probe tests		P
	Compliance with 7.3.4.2.1 is checked by all of the following:		P
	a) Inspection; and		P
	b) Tests with the test finger (Figure D.1) and test pin (Figure D.2) of 0E, the results of which shall comply with the requirements of 7.3.4.2.1 a), b), and c) as applicable. Probe tests are performed on openings in the enclosures after removal of parts that can be detached or opened by an operator without the use of a tool, including fuseholders, and with operator access doors and covers open. It is permitted to leave lamps in place for this test. Connectors that can be separated by an operator without use of a tool, shall also be tested during and after disconnection. Any movable parts are to be put in the most unfavourable position.		P
	The test finger and the test pin are applied as above, without appreciable force, in every possible position, except that floor-standing equipment having a mass exceeding 40 kg is not tilted.		P
	Equipment intended for building-in or rack mounting, or for incorporation in larger equipment, is tested with access to the		N/A

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TÜV SÜD Certification and Testing (China) Co., Ltd.
Guangzhou Branch, TÜV SÜD Group
5F, Communication Building, 163 Pingyun Rd,
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	equipment limited according to the method of mounting detailed in the installation instructions.		
	c) Openings preventing the entry of the jointed test finger (Figure E-1 of 0E) during test b) above, are further tested by means of straight unjointed test finger (Figure E-3 of 0E), applied with a force of 30 N. If the unjointed finger enters, the test with the jointed finger is repeated except that the finger is applied using any necessary force up to 30 N.	air-intakes for cooling fans.	P
	d) In addition to a) – c) above, top surfaces of enclosure shall be tested with the IP3X probe of IEC 60529. The test probe shall not penetrate the top surface of the enclosure when probed from the vertical direction ±5 ° only.	No openings on top surface	P
7.3.4.2.4	Service access areas		P
7.3.4.3	Protection by means of insulation of live parts	The earthed enclosure is with basic insulation from the hazardous live parts inside	P
	Where the requirements of 7.3.4.2 are not met, live parts shall be provided with insulation if:		P
	– their working voltage is greater than the maximum limit of decisive voltage class A, or		P
	– for a DVC A or B circuit, protective separation from adjacent circuit of DVC C is not provided (see note "‡" under Table 7)		P
7.3.5	Protection in case of direct contact	The communication interface is direct contact part and evaluated with reinforce insulation from hazardous live parts	P
7.3.5.1	General		P
	Protection in case of direct contact is required to ensure that contact with live parts does not produce a shock hazard.		P
	The protection against direct contact according to 7.3.4 is not required if the circuit contacted is separated from other circuits according to 7.3.2.3, and:	Considered	P
	– is of decisive voltage class A and complies with 7.3.5.2, or	The communication interface is DVC A and reinforce insulation from the hazardous live parts by means of isolation transformer and opto-coupler	P
	– is provided with protective impedance according to 7.3.5.3, or		N/A
	– is limited in voltage according to 7.3.5.4		N/A

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Guangzhou Branch, TÜV SÜD Group
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	In addition to the measures as given in 7.3.5.2 to 7.3.5.4, it shall be ensured that in the event of error or polarity reversal of connectors no voltages that exceed DVC A can be connected into a circuit with protective separation. This applies for example to plug-in-sub-assemblies or other plug-in devices which can be plugged-in without the use of a tool (key) or which are accessible without the use of a tool.	Considered	P
	Conformity is checked by visual inspection and trial insertion.		P
7.3.5.2	Protection using decisive voltage class A		P
7.3.5.3	Protection by means of protective impedance		N/A
	Circuits and conductive parts do not require protection against direct contact if any connection to circuits of DVC-B or DVC-C is through protective impedance, and the accessible circuit or part is otherwise provided with protective separation from circuits of DVC-B or DVC-C according 7.3.3.		N/A
7.3.5.3.1	Limitation of current through protective impedance		N/A
	The current available through protective impedance to earth and between simultaneously accessible parts, measured at the accessible live parts, shall not exceed a value of 3,5 mA a.c. or 10 mA d.c. under normal and single-fault conditions.		N/A
7.3.5.3.2	Limitation of discharging energy through protective impedance		N/A
	The discharging energy available between simultaneously accessible parts protected by protective impedance shall not exceed the charging voltage and capacitance limits given in Table 9, which applies to both wet and dry locations, under normal and single fault conditions. Refer to figure 8.		N/A
7.3.5.4	Protection by means of limited voltages	No such design	N/A
	That portion of a circuit that has its voltage reduced to DVC-A by a voltage divider that complies with the following requirements, and that is otherwise provided with protective separation from circuits of DVC-B or DVC-C according to 7.3.3, does not require protection against direct contact.		N/A
	The voltage divider shall be designed so that under normal and single fault conditions, including faults in the voltage division circuit, the voltage across the output of the voltage divider does not exceed the limit for DVC-A.		N/A
	This type of protection shall not be used in case of protective class II or unearthed circuits, because it relies on protective earth being connected.		N/A

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Clause	Requirement – Test	Result – Remark	Verdict
7.3.6	Protection against indirect contact		P
7.3.6.1	General		P
	Protection against indirect contact is required to prevent shock- hazardous current being accessible from conductive parts during an insulation failure. This protection shall comply with the requirements for protective class I (basic insulation plus protective earthing), class II (double or reinforced insulation) or class III (limitation of voltages)	Class I also with reinforce insulation design inside PCE	P
	That part of a PCE meets the requirements of 7.3.6.2 and 7.3.6.3 is defined as protective class I	The earthed metal enclosure meet this requirement	P
	That part of a PCE meets the requirements of 7.3.6.4 is defined as protective class II.	The communication interface is reinforce insulated from hazardous live parts inside	P
	That part of PCE which meets the requirements of decisive voltage class A and in which no hazardous voltages are derived, is defined as protective class III. No shock hazard is present in such circuits.		N/A
	Where protection against indirect contact is dependent on means provided during installation, the installation instructions shall provide details of the required means and shall indicate the associated hazards.	The manual requires the PCE be securely earthed	P
7.3.6.2	Insulation between live parts and accessible conductive parts	See Cl. 7.3.7.4 and Cl. 7.3.7.5	P
	Accessible conductive parts of equipment shall be separated from live parts by insulation meeting the requirements of Table 7 or by clearances as specified in 7.3.7.4 and creepages as specified in 7.3.7.5		P
7.3.6.3	Protective class I – Protective bonding and earthing		P
7.3.6.3.1	General		P
	Equipment of protective class I shall be provided with protective earthing, and with protective bonding to ensure electrical contact between accessible conductive parts and the means of connection for the external protective earthing conductor, except bonding is not required for:		P
	a) accessible conductive parts that are protected by one of the measures in 7.3.5.2 to 7.3.5.4, or		N/A
	b) accessible conductive parts are separated from live parts of DVC-B or -C using double or reinforced insulation.		P
7.3.6.3.2	Requirements for protective bonding		P
	Electrical contact with the means of connection of the external protective earthing conductor shall be achieved by one or more of the following means:		P

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	a) through direct metallic contact;		P
	b) through other conductive parts which are not removed when the PCE or sub-units are used as intended ;		N/A
	c) through a dedicated protective bonding conductor;		P
	d) through other metallic components of the PCE		N/A
	Where direct metallic contact is used and one or both of the parts involved is painted or coated, the paint or coating shall be removed in the area of contact, or reliably penetrated, to ensure metal to metal contact.		P
	For moving or removable parts, hinges or sliding contacts designed and maintained to have a low resistance are examples of acceptable means if they comply with the requirements of 7.3.6.3.3.	No such design	N/A
	Metal ducts of flexible or rigid construction and metallic sheaths shall not be used as protective bonding conductors, unless the device or material has been investigated as suitable for protective bonding purposes.	No such design	N/A
7.3.6.3.3	Rating of protective bonding		P
	Protective bonding shall withstand the highest thermal and dynamic stresses that can occur to the PCE item(s) concerned when they are subjected to a fault connecting live parts to accessible conductive parts. The protective bonding shall remain effective for as long as a fault to the accessible conductive parts persists or until an upstream protective device removes power from the part.		P
	Protective bonding shall meet following requirements:		P
	a) For PCE with an overcurrent protective device rating of 16 A or less, the impedance of the protective bonding means shall not exceed 0,1 Ω during or at the end of the test below.		N/A
	b) For PCE with an overcurrent protective device rating of more than 16 A, the voltage drop in the protective bonding test shall not exceed 2,5 V during or at the end of the test below.	2V@500A	P
	As alternative to a) and b) the protective bonding may designed according to the requirements for the external protective earthing conductor in 7.3.6.3.5, in which case no testing is required.		P
	The impedance of protective bonding means shall be checked by passing a test current through the bond for a period of time as specified below. The		P

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	test current is based on the rating of the overcurrent protection for the equipment or part of the equipment under consideration, as follows:		
	a) For pluggable equipment type A, the overcurrent protective device is that provided external to the equipment (for example, in the building wiring, in the mains plug or in an equipment rack);		N/A
	b) For pluggable equipment type B and fixed equipment, the maximum rating of the overcurrent protective device specified in the equipment installation instructions to be provided external to the equipment;	fixed equipment	P
	c) For a circuit or part of the equipment for which an overcurrent protective device is provided as part of the equipment, the rating of the provided overcurrent device.		N/A
	Voltages are measured from the protective earthing terminal to all parts whose protective bonding means are being considered. The impedance of the protective earthing conductor is not included in the measurement. However, if the protective earthing conductor is supplied with the equipment, it is permitted to include the conductor in the test circuit but the measurement of the voltage drop is made only from the main protective earthing terminal to the accessible part required to be earthed.	Measured from the farthest part of earthed metal enclosure to the input earth terminal	P
	On equipment where the protective earth connection to a subassembly or to a separate unit is part of a cable that also supplies power to that subassembly or unit, the resistance of the protective bonding conductor in that cable is not included in the protective bond impedance measurements for the subassembly or separate unit, as shown in Figure 11. However, this option is only permitted if the cab le is protected by a suitably rated protective device that takes into account the size of the conductor. Otherwise the impedance of the protective bonding conductor between the separate units is to be included, by measuring to the protective earthing terminal where the power source enters the first unit in the system, as shown in Figure 12.		P
7.3.6.3.3.1	Test current, duration, and acceptance criteria		P
	The test current, duration of the test and acceptance criteria are as follows:		P
	a) For PCE with an overcurrent protective device rating of 16 A or less, the test current is 200% of the overcurrent protective device rating, but not less than 32 A, applied for 120s. The impedance of the protective bonding means during and at the end of the test shall not		N/A

Telephone : +86 20 3832 0668
Telefax : +86 20 3832 0478
http://www.tuv-sud.cn
TÜV SÜD Certification and Testing (China) Co., Ltd.
Guangzhou Branch, TÜV SÜD Group
5F, Communication Building, 163 Pingyun Rd,
Huangpu Ave. West, Guangzhou 510656, P. R. China

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	exceed 0,1 Ω.		
	b) For PCE with an overcurrent protective device rating of more than 16 A, the test current is 200% of the overcurrent protective device rating and the duration of the test is as shown in Table 10 below. The voltage drop in the protective bonding means, during and at the end of the test, shall not exceed 2,5 V.	2V@500A	P
	c) During and after the test, there shall be no melting, loosening, or other damage that would impair the effectiveness of the protective bonding means.		P
	The test current is derived from an a.c or d.c supply source, the output of which is not earthed.		P
	As an alternative to Table 10, where the time-current characteristic of the overcurrent protective device that limits the fault current in the protective bonding means is known because the device is either provided in the equipment or fully specified in the installation instructions, the test duration may be based on that specific device's time-current characteristic,. The tests are conducted for a duration corresponding to the 200% current value on the time-current characteristic.		P
7.3.6.3.4	Protective bonding impedance (routine test)		N/A
	If the continuity of the protective bonding is achieved at any point by a single means only (for example a single conductor or single fastener), or if the PCE is assembled at the installation location, then the impedance of the protective bonding shall also be tested as a routine test. The test shall be as in 7.3.6.3.3, except for the following:		N/A
	▪ the test current may be reduced to any convenient value greater than 10 A sufficient to allow measurement or calculation of the impedance of the protective bonding means:		N/A
	▪ the test duration may be reduced to no less than 2 s		N/A
	For equipment subject to the type test in 7.3.6.3.3.1a), the impedance during the routine test shall not exceed 0,1Ω.		N/A
	For equipment subject to the type test in 7.3.6.3.3.1b) the impedance during the routine test shall not exceed 2,5 V divided by the test current required by 7.3.6.3.3.1b).		N/A
7.3.6.3.5	External protective earthing conductor		N/A
	A protective earthing conductor shall be connected at all times when power is supplied to PCE of		N/A

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Telefax : +86 20 3832 0478
http://www.tuv-sud.cn

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Guangzhou Branch, TÜV SÜD Group
5F, Communication Building, 163 Pingyun Rd,
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	protective class I. Unless local wiring regulations state otherwise, the protective earthing conductor cross-sectional area shall be determined from Table 11 or by calculation according to IEC 60364-5-54.		
	If the external protective earthing conductor is routed through a plug and socket or similar means of disconnection, it shall not be possible to disconnect it unless power is simultaneously removed from the part to be protected.		N/A
	The cross-sectional area of every external protective earthing conductor which does not form part of the supply cable or cable enclosure shall, in any case, be not less than:		N/A
	▪ 2,5 mm² if mechanical protection is provided;		N/A
	▪ 4 mm² if mechanical protection is not provided.		N/A
	For cord-connected equipment, provisions shall be made so that the external protective earthing conductor in the cord shall, in the case of failure of the strain-relief mechanism, be the last conductor to be interrupted.		N/A
7.3.6.3.6	Means of connection for the external protective earthing conductor		P
7.3.6.3.6.1	General		P
	The means of connection for the external protective earthing conductor shall be located near the terminals for the respective live conductors. The means of connections shall be corrosion-resistant and shall be suitable for the connection of cables according to 7.3.6.3.5. The means of connection for the protective earthing conductor shall not be used as a part of the mechanical assembly of the equipment or for other connections. A separate means of connection shall be provided for each external protective earthing conductor. Connection and bonding points shall be so designed that their current-carrying capacity is not impaired by mechanical, chemical, or electrochemical influences. Where enclosures and/or conductors of aluminium or aluminium alloys are used, particular attention should be given to the problems of electrolytic corrosion.		P
	The means of connection for the protective earthing conductor shall be permanently marked with:		P
	• symbol 7 of Annex C; or		P
	• the colour coding green-yellow	Green-yellow wire is needed in final installation, which mentioned in user manual	N/A

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Guangzhou Branch, TÜV SÜD Group
5F, Communication Building, 163 Pingyun Rd,
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Clause	Requirement – Test	Result – Remark	Verdict
	Marking shall not be done on easily changeable parts such as screws.		P
7.3.6.3.7	Touch current in case of failure of the protective earthing conductor		P
	The requirements of this sub-clause shall be satisfied to maintain safety in case of damage to or disconnection of the protective earthing conductor.		P
	For pluggable equipment type A, the touch current measured in accordance with 7.5.4 shall not exceed 3,5 mA a.c. or mA d.c.	7.8mA	P
	For all other PCE, one or more of the following measure shall be applied, unless the touch current measured in accordance with 7.5.4 using the test network of IEC 60990 test figure 4 shall not exceed 3,5 mA a.c. or 10 mA d.c.		P
	a) Permanently connected wiring, and:		P
	• a cross-section of the protective earthing conductor of at least 10 mm² Cu or 16 mm² Al; or		P
	• automatic disconnection of the supply in case of discontinuity of the protective earthing conductor; or		N/A
	• provision of an additional terminal for a second protective earthing conductor of the same cross-sectional area as the original protective earthing conductor and installation instruction requiring a second protective earthing conductor to be installed or		N/A
	b) Connection with an industrial connector according to IEC 60309 and a minimum protective earthing conductor cross-section of 2,5 mm² as part of a multi-conductor power cable. Adequate strain relief shall be provided.		N/A
	In addition, the caution symbol 15 of Annex C shall be fixed to the product and the installation manual shall provide details of the protective earthing measures required in the installation as required in 5.3.2.		P
	When it is intended and allowed to connect two or more PCEs in parallel using one common PE conductor, the above touch current requirements apply to the maximum number of the PCEs to be connected in parallel, unless one of the measures in a)		N/A
	or b) above is used. The maximum number of parallel PCEs is used in the testing and has to be stated in the installation manual.		N/A

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Guangzhou Branch, TÜV SÜD Group
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Clause	Requirement – Test	Result – Remark	Verdict
7.3.6.4	Protective Class II – Double or Reinforced Insulation	Communication interface is evaluated with reinforce insulation from live part inside. Comply with clause 7.3.4.3	P
	Equipment or parts of equipment designed for protective class II shall have insulation between live parts and accessible surfaces in accordance with 7.3.4.3. The following requirements also apply:		N/A
	• equipment designed to protective class II shall not have means of connection for the external protective earthing conductor. However this does not apply if the external protective earthing conductor is passed through the equipment to equipment series-connected beyond it. In the latter event, the external protective earthing conductor and its means for connection shall be insulated with basic insulation from the accessible surface of the equipment and from circuits that employ protective separation, extra-low voltage, protective impedance and limited discharging energy, according to 7.3.5. This basic insulation shall correspond to the rated voltage of the series-connected equipment;		N/A
	• metal-encased equipment of protective class II may have provision on its enclosure for the connection of an equipotential bonding conductor;		N/A
	• equipment of protective class II may have provision for the connection of an earthing conductor for functional reasons or for damping of overvoltages; it shall, however, be insulated as though it is a live part;		N/A
	• equipment employing protective class II shall be marked according to 5.1.8.		N/A
7.3.7	Insulation Including Clearance and Creepage Distance		P
7.3.7.1	General		P
	This subclause gives minimum requirements for insulation, based on the principles of IEC 60664.		P
	Manufacturing tolerances shall be taken into account during measurement of creepage, clearance, and insulation distance in the PCE.		P
	Insulation shall be selected after consideration of the following influences:		P
	• pollution degree	External: PD3, Internal: PD2	P
	• overvoltage category	PV (OVC II), Mains (OVC III)	P
	• supply earthing system	IT system considered.	P

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TÜV SÜD Certification and Testing (China) Co., Ltd.
Guangzhou Branch, TÜV SÜD Group
5F, Communication Building, 163 Pingyun Rd,
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Clause	Requirement – Test	Result – Remark	Verdict
	• insulation voltage	PV input: max. 1500 Vd.c., Mains: 3W+PE, 800Va.c.	P
	• location of insulation	See appendix table	P
	• type of insulation	See appendix table	P
	Compliance of insulation, creepage distances, and clearance distances, shall be verified by measurement or visual inspection, and the tests of 7.5.		P
7.3.7.1.3	Supply earthing systems		P
	Three basic types of earthing system are described in IEC 60364-1. They are:		P
	• TN system: has one point directly earthed, the accessible conductive parts of the installation being connected to that point by protective conductors. Three types of TN systems, TN-C, TN-S and TN-C-S, are defined according to the arrangement of the neutral and protective conductor.		N/A
	• TT system: has one point directly earthed, the accessible conductive parts of the installation being connected to earth electrodes electrically independent of the earth electrodes of the power system;		N/A
	• IT system: has all live parts isolated from earth or one point connected to earth through an impedance, the accessible conductive parts of the installation being earthed independently or collectively to the earthing system.		P
7.3.7.1.4	Insulation voltages		P
	Table 12 makes use of the circuit system voltage and overvoltage category to define the impulse withstands voltage and the temporary overvoltage.		P
7.3.7.2	Insulation between a circuit and its surroundings		P
7.3.7.2.1	General	800/1.732=461 Va.c., OVC III (6000 V impulse voltage, 2000Vrms temporary overvoltage) for AC output terminal; 1500 Vd.c., OVC II (6000 V impulse voltage, no temporary overvoltage) for PV input terminal. No isolation between PV and AC mains output.	P
7.3.7.2.2	Circuits connected directly to the mains	System voltage for mains is 800Vrms according to table 12.	P

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TÜV SÜD Certification and Testing (China) Co., Ltd.
Guangzhou Branch, TÜV SÜD Group
5F, Communication Building, 163 Pingyun Rd,
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Clause	Requirement – Test	Result – Remark	Verdict
7.3.7.2.3	Circuits other than mains circuits	System voltage for PV is 1500 Vd.c.	P
7.3.7.2.4	Insulation between circuits		P
7.3.7.3	Functional insulating		P
7.3.7.4	Clearance distances	see appended table. Intend to use in altitudes up to 5000m, the clearance distances have multiplied factor 1.48	P
7.3.7.4.1	Determination		P
7.3.7.4.2	Electric field homogeneity	Inhomogeneous electric field is considered for PCE	N/A
7.3.7.4.3	Clearance to conductive enclosures		P
7.3.7.5	Creepage distances	see appended table	P
7.3.7.5.1	General		P
7.3.7.5.2	Voltage		P
7.3.7.5.3	Materials	Certified PWB used. Materials are considered as Insulating material group I. The inside parts are considered pollution degree 2	P
7.3.7.6	Coating		P
7.3.7.7	PWB spacings for functional insulating	PWB rated V-0 and has a minimum CTI of 600 for Power board, Output Board, Control Board, Fan Board, Cap Board. PWB rated V-0 and has a minimum CTI of 175 for other boards. Detail please refer to critical components table.	P
7.3.7.8	Solid insulating	see appended table. Y capacitor, Optical Isolator and Transformer	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		P

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Guangzhou Branch, TÜV SÜD Group
5F, Communication Building, 163 Pingyun Rd,
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Clause	Requirement – Test	Result – Remark	Verdict
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		P
7.3.7.8.4.1	General		P
7.3.7.8.4.2	Use of coating materials		P
7.3.7.8.5	Wound components		P
7.3.7.8.6	Potting materials	Potting materials used in boost inductor and inverting inductor are not intended to provide solid insulation or to act a coating to protect against pollution.	N/A
7.3.7.9	Insulation requirements above 30 kHz	Isolated transformer for communication circuit.	P
7.3.8	Residual Current-operated protective (RCD) or monitoring (RCM) device compatibility	Internal RCM is used according to IEC 62109-2 test	P
	RCD and RCM are used to provide protection against insulation faults in some domestic and industrial installations, additional to that provided by the installed equipment.		N/A
7.3.9	Capacitor discharge		P
7.3.9.1	Operator access area	Accessible communication interface is DVC A	P
	Equipment shall be so designed that there is no risk of electric shock in operator access areas from charge stored on capacitors after disconnection of the PCE.		P
7.3.9.2	Service access areas		P
	Capacitors located behind panels that are removable for servicing, installation, or disconnection shall present no risk of electric shock or energy hazard from charge stored on capacitors after disconnection of the PCE.	431s to discharge bus capacitor voltage, Warning symbol 21 of Annex C is marked on PCE	P
7.4	Protection against energy hazards		P
7.4.1	Determination of hazardous energy level		P
	A hazardous energy level is considered to exist if	Condition b is considered	P
	a) The voltage is 2 V or more, and power available after 60 s exceeds 240 VA.		N/A
	b) The stored energy in a capacitor is at a voltage. U of 2 V or more, and the stored energy. E, calculated from the following equation, exceeds 20J: $E = 0,5\ CU^2$		P

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Guangzhou Branch, TÜV SÜD Group
5F, Communication Building, 163 Pingyun Rd,
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Clause	Requirement – Test	Result – Remark	Verdict
7.4.2	Operator Access Areas	No energized parts accessible by user	P
	Equipment shall be so designed that there is no risk of energy hazard in operator access areas from accessible circuits.		P
7.4.3	Services Access Areas	Warning symbol 21 of Annex C is marked on PCE	P
7.5	Electrical tests related to shock hazard	see appended table	P
7.5.1	Impulse voltage test (type test)		P
7.5.2	Voltage test (dielectric strength 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		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		N/A
7.5.4	Touch current measurement (type test)		P
	The touch current shall be measured if required by 7.3.6.3.7 and shall not be greater than 3.5 mA a.c. or 10 mA d.c. or special measures of protection as given in 7.3.6.3.7 are required.	Measured touch current is 7.8mA. Additional measure is taken according to 7.3.6.3.7, to keep the safe of person	P
	For type tests on PCE for which wet locations requirements apply according to 6.1, the humidity pre-conditioning of 4.5 shall be performed immediately prior to the touch current test.		P
7.5.5	Equipment with multiple sources of supply		P
8	**PROTECTION AGAINST MECHANICAL HAZARDS**		P
8.1	General		P
	Operation shall not lead to a mechanical HAZARD in NORMAL CONDITION or SINGLE FAULT CONDITION. Edges, projections, corners, openings, guards, handles and the like, that are accessible to the operator shall be smooth and rounded so as not to cause injury during normal use of the equipment.		P
	Conformity is checked as specified in 8.2 to 8.6.		P
8.2	Moving parts		P
	Moving parts shall not be able to crush, cut or pierce parts of the body of an OPERATOR likely to contact them, nor severely pinch the OPERATOR's skin. Hazardous moving parts of equipment, that is moving parts which have the potential to cause	Fans are protected by barriers.	P

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Telefax : +86 20 3832 0478
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TÜV SÜD Certification and Testing (China) Co., Ltd.
Guangzhou Branch, TÜV SÜD Group
5F, Communication Building, 163 Pingyun Rd,
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	injury, shall be so arranged, enclosed or guarded as to provide adequate protection against the risk of personal injury.		
8.2.1	Protection of service persons		P
	Protection shall be provided such that unintentional contact with hazardous moving parts is unlikely during servicing operations. If a guard over a hazardous moving part may need to be removed for servicing, the marking of symbol 15 of Table D-1 shall be applied on or near the guard.	The fans stopped operating during servicing.	P
8.3	Stability		N/A
	Equipment and assemblies of equipment not secured to the building structure before operation shall be physically stable in NORMAL USE.	Wall mounted	N/A
8.4	Provisions for lifting and carrying		P
	If carrying handles or grips are fitted to, or supplied with, the equipment, they shall be capable of withstanding a force of four times the weight of the equipment.		P
	Equipment or parts having a mass of 18 kg or more shall be provided with a means for lifting and carrying or directions shall be given in the manufacturer's documentation.	About 99.3 kg (net weight)	P
8.5	Wall mounting		P
	Mounting brackets on equipment intended to be mounted on a wall or ceiling shall withstand a force of four times the weight of the equipment.	It is intended to be mounted on concrete wall	P
8.6	Expelled parts		N/A
	Equipment shall contain or limit the energy of parts that could cause a HAZARD if expelled in the event of a fault.		N/A
9	**PROTECTION AGAINST FIRE HAZARDS**		P
9.1	Resistance to fire		P
	This subclause specifies requirements intended to reduce the risk of ignition and the spread of flame, both within the equipment and to the outside, by the appropriate use of materials and components and by suitable construction.	Components are witnessed at normal condition, and abnormal tests are verified	P
9.1.1	Reducing the risk of ignition and spread of flame		P
	For equipment or a portion of equipment, there are two alternative methods of providing protection against ignition and spread of flame that could affect materials, wiring, wound components and electronic components such as integrated circuits, transistors, thyristors, diodes, resistors and capacitors.		P

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Guangzhou Branch, TÜV SÜD Group
5F, Communication Building, 163 Pingyun Rd,
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Clause	Requirement – Test	Result – Remark	Verdict
9.1.2	Conditions for a fire enclosure		P
	A FIRE ENCLOSURE is required for equipment or parts of equipment for which Method 2 is not fully applied and complied with.		P
9.1.2.1	Parts requiring a fire enclosure		P
	Except where Method 2 is used, or as permitted in 9.1.2.2, the following are considered to have a risk of ignition and, therefore, require a FIRE ENCLOSURE:		P
	– components in PRIMARY CIRCUITS		P
	– components in SECONDARY CIRCUITS supplied by power sources which exceed the limits for a LIMITED POWER SOURCE as specified in 9.2;		P
	– components in SECONDARY CIRCUITS supplied by a LIMITED POWER SOURCE as specified in 9.2, but not mounted on a material of FLAMMABILITY CLASS V-1;		N/A
	– 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;		P
	– components having unenclosed arcing parts, such as open switch and relay contacts and commutators, in a circuit at HAZARDOUS VOLTAGE or at a HAZARDOUS ENERGY LEVEL; and	Certified relay with fire enclosure	P
	– insulated wiring, except as permitted in 9.1.2.2.	PVC wire	N/A
9.1.2.2	Parts not requiring a fire enclosure	The power source of LED board is less than 15VA	P
9.1.3	Materials requirements for protection against fire hazard		P
9.1.3.1	General		P
	ENCLOSURES, components and other parts shall be so constructed, or shall make use of such materials, that the propagation of fire is limited.		P
9.1.3.2	Materials for fire enclosures		P
	If an enclosure material is not classified as specified below, a test may be performed on the final enclosure or part of the enclosure, in which case the material shall additionally be subjected to periodic SAMPLE testing.		P
9.1.3.3	Materials for components and other parts outside	At least V-1 material used in-	P

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TÜV SÜD Certification and Testing (China) Co., Ltd.
Guangzhou Branch, TÜV SÜD Group
5F, Communication Building, 163 Pingyun Rd,
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Clause	Requirement – Test	Result – Remark	Verdict
	fire enclosures	side fire enclosure, PCB rated V-0	
	Except as otherwise noted below, materials for components and other parts (including MECHANICAL ENCLOSURES, ELECTRICAL ENCLOSURES and DECORATIVE PARTS); located outside FIRE ENCLOSURES, shall be of FLAMMABILITY CLASS HB.		P
9.1.3.4	Materials for air filter assemblies		N/A
9.1.4	Openings in fire enclosures		P
9.1.4.1	General		N/A
	For equipment that is intended to be used or installed in more than one orientation as specified in the product documentation, the following requirements apply in each orientation.		N/A
	These requirements are in addition to those in the following sections:		N/A
	– 7.3.4, Protection against direct contact;		N/A
	– 7.4, Protection against energy hazards;		N/A
	– 13.5, Openings in enclosures		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	No openings	N/A
	The bottom of a FIRE ENCLOSURE or individual barriers, shall provide protection against emission of flaming or molten material under all internal parts, including partially enclosed components or assemblies, for which Method 2 of 9.1.1 has not been fully applied and complied with.		N/A
9.1.4.4	Equipment for use in a CLOSED ELECTRICAL OPERATING AREA	Not intend use at this area	N/A
	The requirements of 9.1.4.3 do not apply to FIXED EQUIPMENT intended only for use in a CLOSED ELECTRICAL OPERATING AREA and to be mounted on a concrete floor or other non-combustible surface. Such equipment shall be marked as follows:		N/A
	WARNING: FIRE HAZARD SUITABLE FOR MOUNTING ON CONCRETE OR OTHER NON-COMBUSTIBLE SURFACE ONLY		N/A
9.1.4.5	Doors or covers in fire enclosures	No door or cover operated by user.	N/A
9.1.4.6	Additional requirements for openings in transportable equipment		N/A
9.2	LIMITED POWER SOURCES		N/A
9.2.1	General	Method 2 is used	N/A

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Clause	Requirement – Test	Result – Remark	Verdict
9.2.2	Limited power source tests		P
9.3	Short-circuit and overcurrent protection		P
9.3.1	General		P
	The PCE shall not present a hazard, under short-circuit or overcurrent conditions at any port, including phase-to-phase, phase-to-earth and phase-to-neutral, and adequate information shall be provided to allow proper selection of external wiring and external protective devices.		P
9.3.2	Protection against short-circuits and overcurrents shall be provided for all input circuits, and for output circuits that do not comply with the requirements for limited power sources in 9.2, except for circuits in which no overcurrent hazard is presented by short-circuits and overloads.		P
9.3.3	Protective devices provided or specified shall have adequate breaking capacity to interrupt the maximum short circuit current specified for the port to which they are connected. If protection that is provided integral to the PCE for an input port is not rated for the short-circuit current of the circuit in which it is used, the installation instructions shall specify that an upstream protective device, rated for the prospective short-circuit current of that port, shall be used to provide backup protection.	External circuit breaker overcurrent protective device is required as per instruction	N/A
10	**PROTECTION AGAINST SONIC PRESSURE HAZARDS**		P
10.1	General		P
	The equipment shall provide protection against the effect of sonic pressure. Conformity tests are carried out if the equipment is likely to cause such HAZARDS.		P
10.2	Sonic pressure and Sound level		P
10.2.1	Hazardous Noise Levels		P
11	**PROTECTION AGAINST LIQUID HAZARDS**	No liquid containment system	N/A
11.1	Liquid Containment, Pressure and Leakage		N/A
	The liquid containment system components shall be compatible with the liquid to be used.		N/A
	There shall be no leakage of liquid onto live parts as a result of:		N/A
	a) Normal operation, including condensation;		N/A
	b) Servicing of the equipment; or		N/A
	c) Inadvertent loosening or detachment of hoses or other cooling system parts over time.		N/A
11.2	Fluid pressure and leakage		N/A
11.2.1	Maximum pressure		N/A

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Telefax : +86 20 3832 0478
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TÜV SÜD Certification and Testing (China) Co., Ltd.
Guangzhou Branch, TÜV SÜD Group
5F, Communication Building, 163 Pingyun Rd,
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Clause	Requirement – Test	Result – Remark	Verdict
11.2.2	Leakage from parts		N/A
11.2.3	Overpressure safety device		N/A
11.3	Oil and grease		N/A
12	**CHEMICAL HAZARDS**		P
12.1	General		P
13	**PHYSICAL REQUIREMENTS**		P
13.1	Handles and manual controls		P
	Handles, knobs, grips, levers and the like shall be reliably fixed so that they will not work loose in normal use, if this might result in a hazard. Sealing compounds and the like, other than self-hardening resins, shall not be used to prevent loosening. If handles, knobs and the like are used to indicate the position of switches or similar components, it shall not be possible to fix them in a wrong position if this might result in hazard.		P
13.1.1	Adjustable controls		P
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	AC terminal	P
13.3.2.1	General		P
	For safe and reliable connection to a MAINS supply, equipment shall be provided with one of the following:		P
	– terminals or leads or a non-detachable power supply cord for permanent connection to the supply; or	permanent connection to the supply	P
	– a non-detachable power supply cord for connection to the supply by means of a plug		N/A
	– an appliance inlet for connection of a detachable power supply cord; or		N/A
	– a mains plug that is part of direct plug-in equipment as in 13.3.8		N/A
13.3.2.2	Permanently connected equipment		P
13.3.2.3	Appliance inlets		P
13.3.2.4	Power supply cord		P
13.3.2.5	Cord anchorages and strain relief		P
	For equipment with a non-detachable power supply cord, a cord anchorage shall be supplied such that:		P
	– the connecting points of the cord conductors are relieved from strain; and		P

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Guangzhou Branch, TÜV SÜD Group
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Clause	Requirement – Test	Result – Remark	Verdict
	– the outer covering of the cord is protected from abrasion.		P
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
13.3.3.4	Wiring terminal design		P
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 mm² and greater		P
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
13.4	Internal wiring and connections		P
13.4.1	General		P
13.4.2	Routing	Internal wire is routed to avoid sharp edge and overheat	P
13.4.3	Colour coding	Metal contact	P
13.4.4	Splices and connections		P
13.4.5	Interconnections between parts of the PCE		P
13.5	Openings in enclosures		P
13.5.1	Top and side openings		P
	Openings in the top and sides of ENCLOSURES shall be so located or constructed that it is unlikely that objects will enter the openings and create hazards by contacting bare conductive parts.		P
13.6	Polymeric Materials		P
13.6.1	General		P
13.6.1.1	Thermal index or capability		P
13.6.2	Polymers serving as enclosures or barriers preventing access to hazards	Polymers serving as barriers preventing access to hazards	P
13.6.2.1	Stress relief test		P
13.6.3	Polymers serving as solid insulation		N/A
13.6.3.1	Resistance to arcing		N/A
13.6.4	UV resistance		P

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Guangzhou Branch, TÜV SÜD Group
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Clause	Requirement – Test	Result – Remark	Verdict
	Polymeric parts of an OUTDOOR ENCLOSURE required for compliance with this standard shall be sufficiently resistance to degradation by ultra-violet (UV) radiation	Certified material is used for outdoor	P
13.7	Mechanical resistance to deflection, impact, or drop		P
13.7.1	General		P
13.7.2	250-N deflection test for metal enclosures		P
13.7.3	7-J impact test for polymeric enclosures		P
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		P
14	**COMPONENTS**		P
14.1	General	see appended table	P
	Where safety is involved, components shall be used in accordance with their specified RATINGS unless a specific exception is made. They shall conform to one of the following:		P
	a) applicable safety requirements of a relevant IEC standard. Conformity with other requirements of the component standard is not required. If neccessary for the application, components shall be subjected to the test of this standard, except that it is not necessary to carry out identical or equivalent tests already performed to check conformity with the component standard;		P
	b) the requirements of this standard and, where necessary for the application, any additional applicable safety requirements of the relevant IEC component standard;		P
	c) if there is no relevant IEC standard, the requirements of this standard;		P
	d) applicable safety requirements of a non-IEC standard which are at least as high as those of the applicable IEC standard, provided that the component has been approved to the non-IEC standard by a recognized testing authority.		P
	Components such as optocouplers, capacitors, transformers, and relays connected across basic, supplemental, reinforced, or double insulation shall comply with the requirements applicable for the grade of insulation being bridged, and if not previously certified to the applicable component		P

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Clause	Requirement – Test	Result – Remark	Verdict
	safety standard shall be subjected to the voltage test of 7.5.2 as routine test.		
14.2	Motor Over temperature Protection		N/A
	Motors which, when stopped or prevented from starting (see 4.4.4.3), would present an electric shock HAZARD, a temperature HAZARD, or a fire HAZARD, shall be protected by an over temperature or thermal protection device meeting the requirements of 14.3.	No hazard when single fault conducted	N/A
14.3	Over temperature protection devices		N/A
14.4	Fuse holders		N/A
14.5	MAINS voltage selecting devices		N/A
14.6	Printed circuit boards		P
	Printed circuit boards shall be made of material with a flammability classification of V-1 of IEC 60707 or better.	V-0	P
	This requirement does not apply to thin-film flexible printed circuit boards that contain only circuits powered from limited power sources meeting the requirements of 9.2.		N/A
	Conformity of the flammability RATING is checked by inspection of data on the materials. Alternatively, conformity is checked by performing the V-1 tests specified in IEC 60707 on three samples of the relevant parts.	V-0	P
14.7	Circuits or components used as transient overvoltage limiting devices		N/A
	If control of transient overvoltage is employed in the equipment, any overvoltage limiting component or circuit shall be tested with the applicable impulse withstand voltage of Table 7-10 using the test method from 7.5.1 except 10 positive and 10 negative impulses are to be applied and may be spaced up to 1 min apart.		N/A
14.8	Batteries		N/A
	Equipment containing batteries shall be designed to reduce the risk of fire, explosion and chemical leaks under normal conditions and after a single fault in the equipment including a fault in circuitry within the equipment battery pack.	No battery used	N/A
14.8.1	Battery Enclosure Ventilation		N/A
14.8.1.1	Ventilation requirements		N/A
14.8.1.2	Ventilation testing		N/A
14.8.1.3	Ventilation instructions		N/A
14.8.2	Battery Mounting		N/A
	Compliance is verified by the application of the		N/A

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	force to the battery's mounting surface. The test force is to be increased gradually so as to reach the required value in 5 to 10 s, and is to be maintained at that value for 1 min. A non-metallic rack or tray shall be tested at the highest normal condition operating temperature.		
14.8.3	Electrolyte spillage		N/A
	Battery trays and cabinets shall have an electrolyte-resistant coating.		N/A
	The ENCLOSURE or compartment housing a VENTED BATTERY shall be constructed so that spillage or leakage of the electrolyte from one battery will be contained within the ENCLOSURE and be prevented from:		N/A
	a) reaching the PCE outer surfaces that can be contacted by the USER		N/A
	b) contaminating adjacent electrical components or materials; and		N/A
	c) bridging required electrical distances		N/A
14.8.4	Battery Connections		N/A
	Reverse battery connection of the terminals shall be prevented if reverse connection could result in a hazard within the meaning of this Standard		N/A
14.8.5	Battery maintenance instructions		N/A
	The information and instructions listed in 5.3.4.1 shall be included in the operator manual for equipment in which battery maintenance is performed by the operator, or in the service manual if battery maintenance is to be performed by service personnel only.		N/A
14.8.6	Battery accessibility and maintainability		N/A
	Battery terminals and connectors shall be accessible for maintenance with the correct TOOLS. Batteries with liquid electrolyte, requiring maintained shall be so located that the battery cell caps are accessible for electrolyte tests and readjusting of electrolyte levels.		N/A
15	Software and firmware performing safety functions		P

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Clause	Requirement – Test	Result – Remark	Verdict

4.7	TABLE: mains supply electrical data in normal condition									P
Model	U (V) DC	I (A) DC	P (kW) DC	U (V) AC			I (A) AC			P (kW) AC
				L1	L2	L3	L1	L2	L3	
SOFAR 250KTL-HV	509.12	178.48	90.85	798.24	798.95	799.91	64.83	64.37	64.18	88.91
	598.89	254.75	152.55	798.62	799.24	800.23	109.02	108.10	107.73	149.50
	698.70	299.81	209.46	798.85	799.52	800.51	149.45	148.23	148.03	205.18
	798.66	293.85	234.66	719.29	719.85	720.79	185.70	184.04	183.90	229.45
	798.52	320.28	255.73	799.00	799.61	800.71	182.25	180.65	180.50	250.15
	798.54	312.08	249.19	878.86	879.66	880.63	161.76	160.43	160.23	244.28
	898.90	260.71	234.33	719.41	719.99	720.87	185.67	184.02	183.88	229.45
	898.79	284.16	255.38	799.08	799.74	800.76	182.23	180.63	180.47	250.14
	898.81	283.84	255.09	878.90	879.67	880.69	165.67	164.28	164.08	250.16
	999.20	234.22	234.01	719.39	719.99	720.88	185.67	184.03	183.88	229.45
	999.09	255.30	255.05	799.07	799.70	800.75	182.23	180.64	180.48	250.14
	999.10	255.07	254.81	878.88	879.66	880.68	165.66	164.28	164.08	250.15
	1159.47	201.85	234.00	719.39	719.99	720.89	186.09	184.44	184.25	229.83
	1159.38	219.57	254.53	799.07	799.75	800.76	182.21	180.62	180.47	250.12
	1159.38	219.43	254.36	878.90	879.67	880.69	165.65	164.27	164.07	250.14
	1299.75	181.07	235.30	719.46	720.01	720.86	187.08	185.41	185.16	230.74
	1299.64	195.66	254.26	799.11	799.76	800.79	182.29	180.69	180.48	250.03
	1299.65	195.38	253.87	878.93	879.75	880.70	165.63	164.25	164.06	250.11
	1400.02	147.88	206.98	798.89	799.54	800.52	148.64	147.34	147.09	203.74
	1497.58	51.23	76.59	798.24	798.91	799.86	55.15	54.56	54.45	75.12
Model	U (V) DC	I (A) DC	P (kW) DC	U (V) AC			I (A) AC			P (kW) AC
				L1	L2	L3	L1	L2	L3	
SOFAR 255KTL-HV	509.11	178.49	90.86	798.26	798.93	799.89	64.83	64.37	64.19	88.92
	598.80	255.20	152.80	798.52	799.17	800.15	109.29	108.33	107.92	149.87
	698.69	300.05	209.62	798.79	799.46	800.44	149.64	148.39	148.18	205.49
	798.70	293.73	234.58	719.19	719.70	720.73	185.69	183.99	183.84	229.48
	798.52	326.44	260.65	798.94	799.54	800.70	185.77	184.07	183.92	255.01
	798.59	312.15	249.26	878.83	879.61	880.60	161.84	160.47	160.27	244.45
	898.95	260.67	234.30	719.40	719.99	720.85	185.69	184.00	183.85	229.52
	898.81	289.68	260.35	799.07	799.72	800.77	185.77	184.09	183.93	255.04
	898.81	289.70	260.36	878.92	879.68	880.68	169.09	167.63	167.44	255.38
	999.23	234.20	233.99	719.41	720.01	720.89	185.69	184.01	183.85	229.52
	999.10	260.26	260.00	799.10	799.77	800.77	185.76	184.09	183.93	255.03
	999.10	260.33	260.06	878.94	879.70	880.71	169.07	167.62	167.42	255.35
	1159.50	201.86	234.02	719.44	720.05	720.90	186.13	184.44	184.25	229.93
	1159.39	223.85	259.50	799.13	799.78	800.80	185.76	184.10	183.94	255.02
	1159.38	223.95	259.60	878.95	879.74	880.71	169.07	167.62	167.42	255.33
	1299.78	181.09	235.33	719.48	720.02	720.89	187.12	185.42	185.18	230.83
	1299.67	200.09	260.01	799.13	799.80	800.82	186.39	184.72	184.52	255.67
	1299.67	199.42	259.12	878.97	879.72	880.73	169.05	167.61	167.42	255.29
	1400.04	148.07	207.25	798.99	799.66	800.59	148.78	147.47	147.22	203.95
	1497.58	51.18	76.53	798.25	798.93	799.90	55.10	54.51	54.40	75.05
Remark: 1. the inverter is designed to be operated with a fixed Cos phi=1 settings inside to apply this test										

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Telefax : +86 20 3832 0478

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TÜV SÜD Certification and Testing (China) Co., Ltd.
Guangzhou Branch, TÜV SÜD Group
5F, Communication Building, 163 Pingyun Rd,
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4.3	Thermal testing (by thermocouples)	P
	(1) Run the device at full load condition at 30°C. Test voltage: PV 850Vd.c., kW, Grid 800Va.c., 50Hz, 255kW, no derating for SOFAR 255KTL-HV	
	(2) Run the device at full load condition at 40°C. Test voltage: PV 850Vd.c., kW, Grid 800Va.c., 50Hz, 255kW, derating to 248KW for SOFAR 255KTL-HV	
	(3) Run the device at full load condition at 50°C. Test voltage: PV 850Vd.c., kW, Grid 720Va.c., 50Hz, 255kW, derating to 203KW for SOFAR 255KTL-HV	
	(4) Run the device at full load condition at 60°C. Test voltage: PV 850Vd.c., kW, Grid 800Va.c., 50Hz, 255kW, derating to 170KW for SOFAR 255KTL-HV	

No.	Temperature (°C) of part at:	Measured temperature (°C) (1)	(2)	(3)	(4)	Limits (°C)
General						
1.	Test ambient temperature	34.6	44.1	53.2	62.0	Ref.
2.	The front of unit	51.3	60.2	67.0	72.3	100
3.	The back of unit	54.6	63.5	70.9	74.9	100
4.	The top of unit	58.0	66.9	72.8	76.5	100
5.	The left side of unit	35.3	44.3	53.3	61.9	70
6.	The right side of unit	47.1	56.3	63.3	69.4	70
7.	The surface of display	49.6	58.6	65.7	71.2	85
8.	Heat sink (outside)	44.6	54.5	61.9	69.2	90
9.	DC switch (inside)	69.1	78.2	81.9	83.0	90
10.	PV input terminal	35.1	44.5	53.6	62.1	90
11.	PV input wire	69.1	78.2	81.5	82.6	105
12.	AC output terminal	67.7	76.8	80.6	81.5	105
13.	AC output wire	73.6	82.8	86.0	85.1	105
EMI Board						
14.	Y Capacitor, C4	66.0	75.0	79.3	81.7	110
15.	Capacitor, EC2	64.0	73.0	77.5	80.4	105
16.	Inductor coil, L5	77.1	86.6	87.1	86.9	Class B 110
17.	Inductor core, L5	75.8	85.2	85.8	86.0	Class B 110
Power Board						
18.	Boost IGBT, IGBT1-A	74.2	84.6	85.7	88.7	150
19.	INV IGBT, IGBT5	91.5	101.7	101.7	101.7	150
20.	Capacitor, C273	74.1	83.4	85.5	87.1	105
21.	Capacitor, C145	70.9	80.3	80.3	84.4	105
22.	Current Sensor, U4	70.0	79.1	80.6	84.0	105
23.	Diode, D28	78.3	87.7	90.1	91.9	150
24.	PCB surface near IGBT6	75.9	85.0	87.3	88.1	130
BoostDriver Board						
25.	Voltage Sensor, TV1	72.9	82.1	83.7	86.8	130
INVDriver Board						
26.	Voltage Sensor, TV1	74.0	83.6	85.7	88.1	130
Cap Board						
27.	Capacitor, EC29	70.4	78.7	82.0	83.1	150
28.	Inductor coil, L1	72.9	82.5	85.5	85.1	Class B 110
29.	Inductor core, L1	74.5	83.4	86.4	85.6	Class B 110
Output Board						
30.	Current Sensor, HCT2	70.5	79.2	82.9	83.8	105

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31.	Current Sensor for residual current, L2	73.3	82.0	85.2	85.4	110
32.	Capacitor, EC3	71.6	80.2	83.8	84.4	105
33.	Capacitor, C4	69.0	77.2	80.7	83.5	105
34.	X Capacitor, C33	72.9	81.3	84.3	85.2	110
35.	Relay, RY6 environment	68.8	77.9	81.5	82.4	85
36.	Inductor coil, L3	93.9	102.7	103.2	101	Class B 110
37.	Inductor core, L3	79.1	88.2	90.4	90.1	Class B 110
38.	Inductor coil, L4	89.4	98.6	99.6	97.9	Class B 110
39.	Inductor core, L4	84.5	93.3	94.8	94.2	Class B 110
40.	PCB surface near L3	80.9	90.3	92.6	91.4	130
Com Board						
41.	Chip, U3	72.4	81.6	85.5	87.2	105
Control Board						
42.	DSP, U30	72.1	81.1	85.3	86.6	105
43.	DSP, U34	74.3	83.4	87.6	88.7	125
44.	Chip, U15	70.0	78.9	82.4	83.8	100
45.	Opto-couple, G01	72.4	81.6	85.7	87.2	100
46.	Capacitor, CTF1	73.3	82.2	85.6	87.3	105
47.	Transformer coil, T6	73.9	82.7	86.3	87.5	130
48.	Transformer core, T6	73.1	81.9	85.4	86.7	130
49.	MOSFET, Q108	82.2	91.1	93.4	95.6	150
50.	Diode, D105	79.5	88.3	91.7	93.1	105
51.	Capacitor, EC13	81.6	88.3	86.8	92.1	105
52.	Fuse, F3	70.5	79.2	83.0	84.3	125
Fan Board						
53.	Transformer coil, T4	79.1	88.1	91.7	93.5	Class B 110
54.	Transformer core, T4	75.8	84.6	88.1	89.6	Class B 110
55.	Inductor coil, L502	73.3	82.4	86.1	87.4	130
56.	Inductor core, L502	70.9	80.1	83.7	84.9	130
57.	Capacitor, EC2	75.3	84.4	88.1	89.4	105
58.	MOSFET, Q502	65.8	75.1	80.2	79.9	150
59.	Diode, D14	71.3	80.2	84.2	85.5	150
SPD Board						
60.	SPD, Mov1	69.3	78.5	81.7	83.4	85

Remark:

1) AC maximum current was limited by software, and the maximum current only achieved under rated voltage;

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Telefax : +86 20 3832 0478

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TÜV SÜD Certification and Testing (China) Co., Ltd.
Guangzhou Branch, TÜV SÜD Group
5F, Communication Building, 163 Pingyun Rd,
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IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict

4.4	TABLE: fault condition tests		P
	Ambient temperature (°C) ……....:	25.4	—
	Relative humidity……:	54.5	—

No.	component	Fault	Input (Vdc)	Output (Vac, kW)	Test duration	Observation
Clause 4.4.4.1 Component fault tests						
DC-EMI Board						
1.	EC2	S-C	1160	800, 255	10min	Fault applied during unit operation, after applied the fault, unit protected and does not connect to grid. Alarm light indicated on cover board. Auxiliary power stopped working. No damaged, no hazards. The unit is recoverable after fault removed.
CAP Board						
2.	R2	S-C	1160	800, 255	10min	Fault applied during unit operation, after applied the fault, unit protected and does not connect to grid. Alarm light indicated on cover board. Software warming “VbusRmsUnbalance”. No damaged, no hazards. The unit is recoverable after fault removed.
3.	R26	S-C	1160	800, 255	10min	Fault applied during unit operation, after applied the fault, unit protected and does not connect to grid. Alarm light indicated on cover board. Software warming “VbusRmsUnbalance”. The unit is recoverable after fault removed.
4.	EC6	S-C	1160	800, 255	10min	Fault applied during unit operation, after applied the fault, the capacitor EC12 in series with EC6 was damaged and not resettable due to overvoltage. Unit protected and does not connect to grid. No hazard.
Control Board						
5.	R1296 (BUS+ voltage sampling circuit)	S-C	1160	800, 255	10min	Fault applied during unit operation, after applied the fault, unit protected and does not connect to grid. Alarm light indicated on cover board. Software warming “VbusRmsUnbalance”. No damaged, no hazards. The unit is recoverable after fault removed.
6.	R1230 (Line voltage sampling circuit)	S-C	1160	800, 255	10min	Operating as normal, no damage, no hazard. Can resettable.
7.	EC11	S-C	1160	800, 255	10min	Fault applied during unit operation, after applied the fault, unit protected and does not connect to grid. Alarm light indicated on cover board. Auxiliary power stopped working. No damaged, no hazards. The unit can be recoverable after fault removed.
8.	R259 (ambient temperature sampling circuit)	S-C	1160	800, 255	10min	Fault applied during unit operation, after applied the fault, unit protected and does not connect to grid. Alarm light indicated on cover board. Software warming

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						"TempFault_Env". No damaged, no hazards. The unit can be recoverable after fault removed.
Fan Power Board						
9.	R34	S-C	1160	800, 255	10min	Fault applied during unit operation. Operating as normal, no damage, no hazard. Can resettable.
10.	Q5 (pin C to pin E)	S-C	1160	800, 255	10min	Fault applied during unit operation, after applied the fault, unit protected and does not connect to grid. Fan assistant power circuit stop working. No damaged, no hazards. The unit can be recoverable after fault removed.
11.	EC507 (24V filter capacitor)	S-C	1160	800, 255	10min	Fault applied during unit operation. Operating as normal, no damage, no hazard. Can resettable.
Power Board						
12.	U3 pin2 to pin4 (PV input current sampling circuit)	S-C	1160	800, 255	10min	Fault applied during unit operation, after applied the fault, unit protected and does not connect to grid. Alarm light indicated on cover board. Software warming "SwPvOCP". No damaged, no hazards. The unit can be recoverable after fault removed.
13.	C32(Bus Capacitor)	S-C	1160	800, 255	10min	Fault applied during unit operation, after applied the fault, unit protected and does not connect to grid. Alarm light indicated on cover board. Software warming "VbusRmsUnbalance". No damaged, no hazards. The unit can be recoverable after fault removed.
14.	C108 (PV input filter capacitor)	S-C	1160	800, 255	10min	Fault applied during unit operation, after applied the fault, unit protected and does not connect to grid. Fan Auxiliary power circuit stop working. No damaged, no hazards. The unit can be recoverable after fault removed.
15.	IGBT1 (pin C to pin E) of Boost IGBT	S-C	1160	800, 255	10min	The fault applied during the unit operation. After applied the fault, the unit shutdown immediately, Boost IGBT1 was damaged and not resettable. No hazard.
16.	R635 (flying capacitor voltage sampling circuit)	S-C	1160	800, 255	10min	Fault applied during unit operation, after applied the fault, unit protected and does not connect to grid. Alarm light indicated on cover board. Software warming "FlyingCapUVP". No damaged, no hazards. The unit can be recoverable after fault removed.
Boost Driver Board						
17.	TV1 pin9 to pin10 on Boost Driver Board of IGBT1	S-C	1160	800, 255	10min	Fault applied during unit operation, after applied the fault, boost driver circuit could not supply voltage, unit protected and does not connect to grid. Alarm light indicated on cover board. No damaged, no hazards. The unit can be recoverable after fault removed.
INV Driver Board						
18.	TV1 pin9 to	S-C	1160	800, 255	10min	Fault applied during unit operation, after

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5F, Communication Building, 163 Pingyun Rd,
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	pin10 on INV Driver Board CN18					applied the fault, invert driver voltage fluctuated, unit protected and does not connect to grid. Alarm light indicated on cover board. No damaged, no hazards. The unit can be recoverable after fault removed.
Output Board						
19.	HCT3 pin2 to pin4 (output current sampling circuit)	S-C	1160	800, 255	10min	Fault applied during unit operation, after applied the fault, unit protected and does not connect to grid. Alarm light indicated on cover board. Software warming "HwACOCP". No damaged, no hazards. The unit can be recoverable after fault removed.
20.	C5 (Invert filter capacitor)	S-C	1160	800, 255	10min	Fault applied during unit operation, after applied the fault, unit protected and does not connect to grid. Alarm light indicated on cover board. Software warming "HwACOCP". No damaged, no hazards. The unit can be recoverable after fault removed.
21.	C22 (virtual Neutral-point capacitor)	S-C	1160	800, 255	10min	Operating as normal, no damage, no hazard. Can resettable.
22.	R88 (Phase-R grid side voltage sampling circuit)	O-C	1160	800, 255	10min	Fault applied during unit operation, after applied the fault, unit protected and does not connect to grid. Alarm light indicated on cover board. Software show deviation of three phase voltage. No damaged, no hazards. The unit can be recoverable after fault removed.
23.	R152(Phase-R invert voltage sampling circuit)	S-C	1160	800, 255	10min	Fault applied during unit operation, after applied the fault, unit protected and does not connect to grid. Alarm light indicated on cover board. Software show deviation of three phase voltage. No damaged, no hazards. The unit can be recoverable after fault removed.
Clause 4.4.4.4 Transformer short circuit tests						
24.	T4 pin1 to pin2 (fan board)	S-C	1160	800, 255	10min	Fault applied during unit operation, after applied the fault, fan power off, fan turned off, unit shut down, no damaged, no hazard. And the unit can be recoverable after fault removed.
25.	T4 pin3 to pin4 (fan board)	S-C	1160	800, 255	10min	Fault applied during unit operation, after applied the fault, fan power off, fan turned off, unit shut down, no damaged, no hazard. And the unit can be recoverable after fault removed.
26.	T4 pin5 to pin6 (fan board)	S-C	1160	800, 255	10min	Fault applied during unit operation, after applied the fault, fan power off, fan turned off, unit shut down, no damaged, no hazard. And the unit can be recoverable after fault removed.
27.	T4 pin7 to pin8 (fan board)	S-C	1160	800, 255	10min	Fault applied during unit operation, after applied the fault, fan power off, fan turned off, unit shut down, no damaged, no hazard.

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5F, Communication Building, 163 Pingyun Rd,
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						And the unit can be recoverable after fault removed.
28.	T4 pin11 to pin14 (fan board)	S-C	1160	800, 255	10min	Fault applied during unit operation, after applied the fault, fan power off, fan turned off, unit shut down, no damaged, no hazard. And the unit can be recoverable after fault removed.
29.	T6 pin1 to pin2 (Control board)	S-C	1160	800, 255	10min	Fault applied during unit operation, after applied the fault, Auxiliary power board offed, software cannot read data. Disconnect from grid, no damaged, no hazard. And the unit can be recoverable after fault removed.
30.	T6 pin13 to pin14 (Control board)	S-C	1160	800, 255	10min	Fault applied during unit operation, after applied the fault, Auxiliary power board offed, software cannot read data. Disconnect from grid, no damaged, no hazard. And the unit can be recoverable after fault removed.
31.	T6 pin17 to pin18 (Control board)	S-C	1160	800, 255	10min	Fault applied during unit operation, after applied the fault, Auxiliary power board offed, software cannot read data. Disconnect from grid, no damaged no hazard. And the unit can be recoverable after fault removed.
32.	T2 pin6 to pin7 (Control board)	S-C	1160	800, 255	10min	Fault applied during unit operation, after applied the fault, Auxiliary power board offed, software cannot read data. Disconnect from grid, no damaged, no hazard. And the unit can be recoverable after fault removed.
Clause 4.4.4.8 Cooling system failure						
33.	Fan (internal)	Disconnected	1160	800, 255	10min	Fault applied during unit operation, after applied the fault, output power derated to 76KW. Software warning “FanFault”. No damaged, no hazard. And the unit can be recoverable after fault removed.
34.	Fan(external)	Block	1160	800, 255	10min	Fault applied during unit operation, after applied the fault, output power derated to 102KW. Software warning “FanFault”. No damaged, no hazard. And the unit can be recoverable after fault removed.
Clause 4.4.4.11 Reverse d.c. connections						
35.	PV1+ and PV1-	Reversed	1160	800, 255	10min	Fault (for tracker 1) applied before test, unit can’t start up, PV1 input voltage was 4V. Reversed back to normal wiring, inverter can be recoverable.
Clause 4.4.4.13 Mis-wiring with incorrect phase sequence or polarity						
36.	L1&L2	Mis-wiring	1160	800, 255	10min	Fault applied before test, unit does not connect to grid. Alarm light indicated on cover board. Software warming “GridUVP”. No damaged no hazards. The unit can be recoverable after fault removed.
37.	L1&L2	S-C	1160	800, 255	10min	Fault applied during unit operation, after applied the fault, unit shut down, no damaged, peak current of AC output is 477A. And the unit can be recoverable after fault removed.
38.	L2	disconnected	1160	800, 255	10min	Fault applied before test, unit can’t start up. Software warming “GridUVP”. And the unit

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Telefax : +86 20 3832 0478
http://www.tuv-sud.cn

TÜV SÜD Certification and Testing (China) Co., Ltd.
Guangzhou Branch, TÜV SÜD Group
5F, Communication Building, 163 Pingyun Rd,
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Clause	Requirement – Test	Result – Remark	Verdict

						can be recoverable after fault removed.
39.	PE conductor	Not connected before energized	1160	800, 255	10min	Fault applied before test. Operating as normal, no damage, no hazard.
supplementary information: S-C: short circuit, O-C: open circuit, O-L: overload, R: reversed						

Telephone : +86 20 3832 0668
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TÜV SÜD Certification and Testing (China) Co., Ltd.
Guangzhou Branch, TÜV SÜD Group
5F, Communication Building, 163 Pingyun Rd,
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Clause	Requirement – Test	Result – Remark	Verdict

7.3.7.4 & 7.3.7.5	Clearance and creepage distance measurements						P
clearance cl and creepage distance dcr at / of:	Up (V)	U r.m.s. (V)	U impulse (V)	required cl (mm)	cl (mm)	required dcr (mm)	dcr (mm)
EMI Board (BI) **(CTI≥175)**							
Y capacitor C12 to earth hole SC2	1500Vd.c.	800Va.c.	6000	8.2	20.1	15.0	20.1
Y capacitor C75 to earth hole	1500Vd.c.	800Va.c.	6000	8.2	20.1	15.0	20.1
CN4 to earth hole SC2	1500Vd.c.	800Va.c.	6000	8.2	15.4	15.0	15.4
Power Board (BI) **(CTI≥600)**							
P34 to to earth hole SC3	1500Vd.c.	800Va.c.	6000	8.2	8.5	7.5	8.5
C219 to SC23	1500Vd.c.	800Va.c.	6000	8.2	15.1	7.5	15.1
J38 to SC11	1500Vd.c.	800Va.c.	6000	8.2	9.3	7.5	9.3
Cap Board (BI) **(CTI≥600)**							
C2 to SC4	1500Vd.c.	800Va.c.	6000	8.2	12.5	7.5	12.5
EC2 to SC8	1500Vd.c.	800Va.c.	6000	8.2	8.5	7.5	8.5
R36 to SC2	1500Vd.c.	800Va.c.	6000	8.2	9.0	7.5	9.0
Output Board (BI) **(CTI≥600)**							
Terminal S-INV to SC10	1500Vd.c.	800Va.c.	6000	8.2	9.3	7.5	9.3
C37 to SC1	1500Vd.c.	800Va.c.	6000	8.2	12.5	7.5	12.5
Hazardous circuit near P47 to earth hole SC2	1500Vd.c.	800Va.c.	6000	8.2	13.1	7.5	13.1
Hazardous circuit near P118 to earth hole SC13	1500Vd.c.	800Va.c.	6000	8.2	11.8	7.5	11.8
Terminal PB5 to SC5	1500Vd.c.	800Va.c.	6000	8.2	12.5	7.5	12.5
Fan Board **(CTI≥600)**							
CY5 to M2(BI)	1500Vd.c.	800Va.c.	6000	8.2	11.6	7.5	11.6
Transformer T4, primary pin near R12 to secondary pin near D14 (RI)	1500Vd.c.	800Va.c.	6000	11.9	34.5	15.0	11.7+12.5+12.3=36.5
R60 to CAE1 (RI)	1500Vd.c.	800Va.c.	6000	11.9	13.6	15.0	13.3+8.4=21.7
EC5 to CAE1 (RI)	1500Vd.c.	800Va.c.	6000	11.9	14.6	15.0	8.1+7.4=15.5
EC509 to CAE2 (RI)	1500Vd.c.	800Va.c.	6000	11.9	19.8	15.0	10.6+10.4=21.0
Opto-couple G01, primary pin to secondary pin (RI) **(CTI≥475)**	1500Vd.c.	800Va.c.	6000	11.9	14.0	15.0	9.2+11.6=20.8
C73 near primary pin of T4 to Transformer T4 secondary pin near D14 (RI)	1500Vd.c.	800Va.c.	6000	11.9	14.3*2=28.6	15.0	14.3*2=28.6
Control Board **(CTI≥600)**							
CN14 to SC6 (BI)	1500Vd.c.	800Va.c.	6000	8.2	11.1	7.5	11.1
C598 to L25 (BI)	1500Vd.c.	800Va.c.	6000	8.2	12.9	7.5	12.9

Telephone : +86 20 3832 0668
Telefax : +86 20 3832 0478

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TÜV SÜD Certification and Testing (China) Co., Ltd.
Guangzhou Branch, TÜV SÜD Group
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Transformer T6, primary pin near C205 to secondary pin near C204 (RI)	1500Vd.c.	800Va.c.	6000	11.9	13.6	15.0	10.9+4.8= 15.7
Opto-couple G03, primary pin to secondary pin (RI) **(CTI≥475)**	1500Vd.c.	800Va.c.	6000	11.9	14.1	15.0	9.8+5.7= 15.5
Opto-couple G01, primary pin to secondary pin (RI) **(CTI≥475)**	1500Vd.c.	800Va.c.	6000	11.9	14.1	15.0	9.8+5.7= 15.5
Transformer T6, pin17 to pin 14 (BI)	1500Vd.c.	800Va.c.	6000	8.2	13.4	7.5	7.8+7.6= 15.4
Chip U82, primary pin near R624 to secondary pin near R618 (RI) **(CTI≥600)**	1500Vd.c.	800Va.c.	6000	11.9	14.8	15.0	13.6+0.9+0 .9=15.4
Remark: BI: Basic insulation, SI: Supplementary insulation, RI: Reinforced insulation * The CTI of opto-couple is ≥475.							

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Clause	Requirement – Test	Result – Remark	Verdict

7.3.7.8.3.2 to 7.3.7.8.3.3	TABLE: distance through insulation measurement			P
distance through insulation di at/of:	U r.m.s. (V)	test voltage (V)	required di (mm)	di (mm)
Model:				
Opto-couple G01, G03(CTI≥475) of Fan Board	1500Vd.c. 800Va.c.	5656Vd.c.	--	Certified
Triple insulation wire of transformer T4 of Fan board (RI)	1500Vd.c. 800Va.c.	5656Vd.c.	--	Certified
Triple insulation wire of transformer T6 of Control board (RI)	1500Vd.c. 800Va.c.	5656Vd.c.	--	Certified

7.5.1 & 7.5.2	impulse voltage test and voltage test				P	
Test voltage applied between:	PV / Bat system voltage /OVC *	Mains / Load voltage/ OVC *	Insulation type (BI, SI, DI, RI)	Impulse test voltage	AC or DC Test voltage	Pass / Fail
PV & AC port to PE	1500Vd.c. OVC II	800Va.c. OVC III	BI	6000V	2828Vd.c.	Pass
PV & AC port to Communication port	1500Vd.c. OVC II	800Va.c. OVC III	RI	8000V	5656Vd.c.	Pass

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Object/part No.	Manufacturer/ Trademark	Type / Model	Technical data	Standard	Mark(s) of Conformity
General					
Metal enclosure	miranly	225Kw unit	965*640*200 mm, aluminum, 2.0mm	IEC 62109-1 IEC 62109-2	Tested with appliance
Heat sinking	Guangdong Winshare thermal Technology CO., Ltd	225Kw Heat sink	575*340*93mm, aluminum	IEC 62109-1 IEC 62109-2	Tested with appliance
LCD cover	SUNG HONG ENTERPRISE CO LTD	LCD cover	silicone, φ54*2.5mm, V-2, f1，-60°C -+250°C	IEC 60695	UL E41613
DC switch	Nader	NDG3V-50H/8/1/02/M/6	1500VDC/26A ,800VDC/50A, -40°C -+90°C	EN60947-3	TUV NO.B 083574 0316
	SANTON International	XBCH+3810/2	1500VDC/20A ,1000Vdc/50A /8POLE，-40°C -+90°C	IEC60947-3	TUV R504363 24
	SANTON International	XBCH+3810/2	1500VDC/20A ,800Vdc/60A/ 8POLE	IEC60947-3	TUV R504363 24
PV Input connector	staubli	PV-ADS4 EVO2/6-UR(32.0747-UR)	1500VDC,47A , male，IP68, -40°C -+90°C	UL 6703	UL E343181
	staubli	PV-ADB4 EVO2/6-UR(32.0746-UR)	CONN, DC POWER INPUT,1500V DC,47A, Female, ROHS, black,IP68, -40°C -+90°C	UL 6703	UL E343181
PV input wire	3Q WIRE & CABLE CO LTD	UL10267,12 AWG	2000V,105°C	UL758,UL1581	UL E341104
AC output terminal	SHANGHAI FOUND AUTOMATION CO.,LTD	FCNH-3P	200A/1000Vac,3P, -55°C -+105°C	IEC62321-5	Test with Appliance
AC output wire	3Q WIRE & CABLE CO LT	UL11627, 2AWG	2000V,105°C	UL758,UL1581	UL E341104
Fan (inside)	AVC	FAN,DBPJ1238B4GP002	24V,1.32A,7000rpm, ROHS,120*120*38, -40°C -+75°C	UL507 /EN60950-1	UL E158191 TUV:B180125730821
Fan (Outside)	MinebeaMitsumi Inc	12038VA24QFUE1	24V,5200rpm, 40000at60°C, 120*120*38,	UL507 /EN60950-1	UL E89936 VDE:150

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5F, Communication Building, 163 Pingyun Rd,
Huangpu Ave. West, Guangzhou 510656, P. R. China

			IPX9, -40°C - +70°C		733
Boost inductor	SHENZHEN JINGQUANHUA ELECTRONICS CO.,LTD	225KW BOOST	550uH/350uH(DC26A),40mΩ,class B	IEC 62109-1 IEC 62109-2	Test with Appliance
- winding	JIANGSU BAOJIELONG MAGNET WIRES CO LTD	MW 36-C 0.6X8mm	200°C	ANSI/UL 1446	UL E326176
	WUXI YOUFAUN ELECTRIC CO LTD	MW 36-C 0.6X8mm	200°C	ANSI/UL 1446	UL E343483
	GUANGDONG JINGDA REA SPECIAL ENAMELED WIRE CO LTD	MW 36-C 0.6X8mm	200°C	ANSI/UL 1446	UL E223994
- Potting	DONGGUAN CITY JIA DI NEW MATERIALS CO LTD	JD-6055297A/B	150°C, V-0	UL 746	UL E485392
	GUANGZHOU HUITIAN NEW MATERIAL CO LTD	JD-6055297A/B	150°C, V-0	UL 746	UL E306078
- Insulation sheet	E I DUPONT DE NEMOURS & CO INC	NOMEX410	220°C, V-0	ANSI/UL 1446	UL E34739
	XINFENG GHILLIE ELECTRICAL MATERIALS CO LTD	Ghillie APA	200°C, V-0	ANSI/UL 1446	UL E322743
- varnish	KYOCERA CHEMICAL CORP	TVB2166*(a)	180°C	ANSI/UL 1446	UL E83702
- insulation tape	3M INNOVATIVE PAPER TECHNOLOGIES	TF/TFT	200°C, V-0	UL 510A	UL E65007
Boost inductor - Alternative	Shenzhen Highlight Electronic Co., Ltd	225KW BOOST	550uH/350uH(DC26A), 40mΩ, class B	IEC 62109-1 IEC 62109-2	Test with Appliance
- winding	Jiateng Electric (Ganzhou) Co. , Ltd	EI/AIW 0.6x8.0mm	180°C	ANSI/UL 1446	UL E318511
	WUXI YOUFAUN ELECTRIC CO LTD	EI/AIW 0.6x8.0mm	180°C	ANSI/UL 1446	UL E343483
- Potting	Shenzhen Jiadi New Material Co., Ltd.	JD-605 1.5W/m.k	150°C, V-0	UL 746	UL E485392
	Guangzhou Huitian New Material Co. , Ltd.	5297 1.5W/m.k	150°C, V-0	UL 746	UL E306078
- Insulation sheet	Xinfeng Jieli Electrical Materials Co. , Ltd.	NMN	180°C, V-0	ANSI/UL 1446	UL E322743

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- varnish	Yueyang Green Technology Co., Ltd.	MW35-C JX-1160H	180°C	ANSI/UL 1446	UL E303754
- insulation tape	Xinfeng Jieli Electrical Materials Co. , Ltd.	polyimide	180°C, V-0	UL 510A	UL E322743
Boost inductor - Alternative	Foshan Catech Co., Ltd.	225KW BOOST	550uH/350uH（DC26A）, 40mΩ, class B	IEC 62109-1 IEC 62109-2	Test with Applianc e
- winding	GUANGZHOU TIANSHUN ELECTRIC EQUIPMENT CO LTD	MW 36-C 0.6X8mm	200°C	ANSI/UL 1446	UL E210986
	TAI-I COPPER (GUANZHOU) CO LTD	MW 36-C 0.6X8mm	200°C	ANSI/UL 1446	UL E234896
- Potting	DONGGUAN CITY JIA DI NEW MATERIALS CO LTD	JD-605 5297A/B	150°C, V-0	UL 746	UL E485392
	SHENZHEN SHENGKANGTAI ORGANIC SILICON MATERIAL CO. LTD	HC-620-3A/B	150°C, V-0	UL 746	UL E341043
- Insulation sheet	CHANGZHOU ISOVOLTA TECHNICAL COMPOSITE CO LTD	NMN 0881	200°C, V-0	ANSI/UL 1446	UL E321326
- varnish	YUEYANG GREEN TECHNOLOGY CO LTD	JX-1160*	180°C	ANSI/UL 1446	UL E303754
- insulation tape	3M INNOVATIVE PAPER TECHNOLOGIES	TF/TFT	200°C, V-0	UL 510A	UL E65007
Boost inductor - Alternative	HUIZHOU BAOHUI ELECTRONICS TECHNOLOGY CO.,LTD	225KW BOOST	550uH/350uH(DC26A), 40mΩ, class B	IEC 62109-1 IEC 62109-2	Test with Applianc e
- winding	Guangdong Jingdaliya special enamelled Wire Co. , Ltd	EI/AIW 0.6x8.0mm	180°C	ANSI/UL 1446	UL E223994
- Potting	GUANGZHOU HUITIAN NEW MATERIAL CO LTD	1.5W/m.k 5297	150°C, V-0	UL 746	UL E306078
- Insulation sheet	Ruian Insulation Material Co. , Ltd.	NMN 0.13/0.08	180°C, V-0	ANSI/UL 1446	UL E230926
- varnish	KYOCERA CHEMICAL CORP	TVB2166*(a)	180°C	ANSI/UL 1446	UL E83702
- insulation tape	Jingjiang Yahua	polyimide	180°C, V-0	UL 510A	UL

Telephone : +86 20 3832 0668
Telefax : +86 20 3832 0478

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TÜV SÜD Certification and Testing (China) Co., Ltd.
Guangzhou Branch, TÜV SÜD Group
5F, Communication Building, 163 Pingyun Rd,
Huangpu Ave. West, Guangzhou 510656, P. R. China

	pressure sensitive Tape Co. , Ltd.				E165111
INV inductor	SHENZHEN JINGQUANHUA ELECTRONICS CO.,LTD	225KW INV	150uH/60uH(DC250A),4mΩ,class B	IEC 62109-1 IEC 62109-2	Test with Appliance
- winding	JIANGSU BAOJIELONG MAGNET WIRES CO LTD	MW 36-C 4.5X10.5mm	200°C	ANSI/UL 1446	UL E326176
	WUXI YOUFAUN ELECTRIC CO LTD	MW 36-C 4.5X10.5mm	200°C	ANSI/UL 1446	UL E343483
	GUANGDONG JINGDA REA SPECIAL ENAMELED WIRE CO LTD	MW 36-C 4.5X10.5mm	200°C	ANSI/UL 1446	UL E223994
- Potting	DONGGUAN CITY JIA DI NEW MATERIALS CO LTD	JD-605 5297A/B	150°C, V-0	UL 746	UL E485392
	GUANGZHOU HUITIAN NEW MATERIAL CO LTD	JD-605 5297A/B	150°C, V-0	UL 746	UL E306078
- Insulation sheet	E I DUPONT DE NEMOURS & CO INC	NOMEX410	220°C, V-0	ANSI/UL 1446	UL E34739
	XINFENG GHILLIE ELECTRICAL MATERIALS CO LTD	Ghillie APA NMN 0881	200°C, V-0	ANSI/UL 1446	UL E322743
- varnish	KYOCERA CHEMICAL CORP	TVB2166*(a)	180°C	ANSI/UL 1446	UL E83702
- insulation tape	3M INNOVATIVE PAPER TECHNOLOGIES	TF/TFT	200°C, V-0	UL 510A	UL E65007
INV inductor - Alternative	Shenzhen Highlight Electronic Co., Ltd	225KW INV	150uH/60uH(DC250A),4mΩ, class B	IEC 62109-1 IEC 62109-2	Test with Appliance
- winding	Jiateng Electric (Ganzhou) Co. , Ltd	EI/AIW 4.5x10.5mm	180°C	ANSI/UL 1446	UL E318511
	WUXI YOUFAUN ELECTRIC CO LTD	EI/AIW 4.5x10.5mm	180°C	ANSI/UL 1446	UL E343483
- Potting	Shenzhen Jiadi New Material Co., Ltd.	JD-605 1.5W/m.k	150°C, V-0	UL 746	UL E485392
	Guangzhou Huitian New Material Co. , Ltd.	5297 1.5W/m.k	150°C, V-0	UL 746	UL E306078
- Insulation sheet	Xinfeng Jieli Electrical Materials Co. , Ltd.	NMN	180°C, V-0	ANSI/UL 1446	UL E322743

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Telefax : +86 20 3832 0478

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Guangzhou Branch, TÜV SÜD Group
5F, Communication Building, 163 Pingyun Rd,
Huangpu Ave. West, Guangzhou 510656, P. R. China

- varnish	Yueyang Green Technology Co., Ltd.	MW35-C JX-1160H	180°C	ANSI/UL 1446	UL E303754
- insulation tape	Xinfeng Jieli Electrical Materials Co. , Ltd.	polyimide	180°C	UL 510A	UL E322743
INV inductor - Alternative	Foshan Catech Co., Ltd.	225KW INV	150uH/60uH（DC250A）, 4mΩ, class B	IEC 62109-1 IEC 62109-2	Test with Applianc e
- winding	GUANGZHOU TIANSHUN ELECTRIC EQUIPMENT CO LTD	MW 36-C 4.5X10.5mm	200°C	ANSI/UL 1446	UL E210986
	TAI-I COPPER (GUANZHOU) CO LTD	MW 36-C 4.5X10.5mm	200°C	ANSI/UL 1446	UL E234896
- Potting	DONGGUAN CITY JIA DI NEW MATERIALS CO LTD	JD-605 5297A/B	150°C, V-0	UL 746	UL E485392
	SHENZHEN SHENGKANGTAI ORGANIC SILICON MATERIAL CO. LTD	HC-620-3A/B	150°C, V-0	UL 746	UL E341043
- Insulation sheet	CHANGZHOU ISOVOLTA TECHNICAL COMPOSITE CO LTD	NMN 0881	200°C, V-0	ANSI/UL 1446	UL E321326
- varnish	YUEYANG GREEN TECHNOLOGY CO LTD	JX-1160*	180°C	ANSI/UL 1446	UL E303754
- insulation tape	3M INNOVATIVE PAPER TECHNOLOGIES	TF/TFT	200°C, V-0	UL 510A	UL E65007
INV inductor - Alternative	HUIZHOU BAOHUI ELECTRONICS TECHNOLOGY CO.,LTD	225KW INV	150uH/60uH（DC250A）, 4mΩ, class B	IEC 62109-1 IEC 62109-2	Test with Applianc e
- winding	Guangdong Jingdaliya special enamelled Wire Co. , Ltd	EI/AIW 4.5x10.5mm	180°C	ANSI/UL 1446	UL E223994
- Potting	GUANGZHOU HUITIAN NEW MATERIAL CO LTD	5297 1.5W/m.k	150°C, V-0	UL 746	UL E306078
- Insulation sheet	Ruian Insulation Material Co. , Ltd.	NMN	180°C, V-0	ANSI/UL 1446	UL E230926
- varnish	KYOCERA CHEMICAL CORP	TVB2166*(a)	180°C	ANSI/UL 1446	UL E83702
- insulation tape	Jingjiang Yahua	polyimide	180°C, V-0	UL 510A	UL

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5F, Communication Building, 163 Pingyun Rd,
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	pressure sensitive Tape Co. , Ltd.				E165111
PCB (for Power Board, Output Board)	SHEN ZHEN SUN & LYNN CIRCUITS CO LTD	Power Board Output Board	PCB thickness 2.5mm, CTI600, V-0, -40°C - +130°C	ZPMV8	UL E234156
	TEAN Electronics (Dayawan) Co., Ltd			ZPMV2	UL E358874
	Glorysky Electronics CO.,LTD			ZPMV2	UL E257384
PCB (for Control Board, Cap Board)	SHEN ZHEN SUN & LYNN CIRCUITS CO LTD	Control Board Cap Board	PCB thickness 2.0mm, CTI600, V-0, -40°C - +130°C	ZPMV8	UL E234156
	TEAN Electronics (Dayawan) Co., Ltd			ZPMV2	UL E358874
	Glorysky Electronics CO.,LTD			ZPMV2	UL E257384
PCB (for Fan Board, BoostDrive Board)	SHEN ZHEN SUN & LYNN CIRCUITS CO LTD	Fan Board BoostDrive Board	PCB thickness 1.6mm, CTI600, V-0, -40°C - +130°C	ZPMV8	UL E234156
	TEAN Electronics (Dayawan) Co., Ltd			ZPMV2	UL E358874
	Glorysky Electronics CO.,LTD			ZPMV2	UL E257384
PCB (for INV Driver Board, EMI Board, Com Board)	SHEN ZHEN SUN & LYNN CIRCUITS CO LTD	INV Driver Board EMI Board Com Board	CTI175, V-0, -40°C - +130°C	ZPMV8	UL E234156
	TEAN Electronics (Dayawan) Co., Ltd			ZPMV2	UL E358874
	Glorysky Electronics CO.,LTD			ZPMV2	UL E257384
EMI Board					
Y1 Capacitor (C1,C4,C6,C8,C10,C12,C14, C16,C19,C21,C23,C25,C27, C29,C31,C33,C35,C37,C39, C41,C43,C45,C47,C49,C55, C58,C60,C62,C64,C66,C68, C70,C73,C75,C77,C79,C81, C83,C85,C87,C89,C91,C93, C95,C97,C99,C101,C103)	XIAMEN FARATRONIC CO.,LTD	C47S1223K90C350	Film Cap, Y1, 22nF, ±10%, 440VAC,1500 Vdc,26.5*22*12mm, -40～110°C	UL 60384	UL E186600
Capacitor (EC1,EC2,EC3,EC4,EC5,EC6,EC7,EC8,EC9,EC10,EC11, EC12)	Sam Young	NXQ 25V15006*11	150uF/25V/Φ6.3*11/7000H, -40～105°C	IEC 62109-1 IEC 62109-2	Test with Appliance
Inductor (L1,L2,L3,L4,L5,L6,L7,L8,L9, L10,L11,L12)	HUIZHOU BAOHUI ELECTRONICS TECHNOLOGY CO.,LTD	115-19-132A/CA01-12247	IND CMC,650uH min@16KHz,3 mΩ MAX, T28*16*13C, class B	IEC 62109-1 IEC 62109-2	Test with Appliance
- winding	DONG GUAN YIDA INDUSTRIAL CO LTD	EIW 1.6mm	180°C	ANSI/UL 1446	UL E344055
	TONGLING JINGDA SPECIAL	EIW 1.6mm	180°C	ANSI/UL 1446	UL E223994

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5F, Communication Building, 163 Pingyun Rd,
Huangpu Ave. West, Guangzhou 510656, P. R. China

	MAGNET WIRE CO LTD				
- Insulation sheet	KINGBOARD LAMINATES (MACAO COMMERCIAL OFFSHORE) LTD	94V-0 FR-4 KB-6150	130°C, V-0	ANSI/UL 1446	UL E123995
- varnish	SUZHOU TAIHU ELECTRIC ADVANCED MATERIAL CO LTD	T-4260(a)	130°C	ANSI/UL 1446	UL E228349
- insulation tape	JINGJIANG YAHUA PRESSURE SENSITIVE GLUE	CT280	130°C, V-0	UL 510A	UL E165111
Inductor (L1,L2,L3,L4,L5,L6,L7,L8,L9, L10,L11,L12) - Alternative	Foshan Catech Co., Ltd	115-19-132A/CA01-12247	IND CMC,650uH min@16KHz,3 mΩ MAX, T28*16*13C, class B	IEC 62109-1 IEC 62109-2	Test with Applianc e
- winding	GUANGDONG JINYAN ELECTROTECHNI CS JOINT STOCK CO., LTD	COPPER xEIW, QZY-x/180	180°C	ANSI/UL 1446	UL E238500
	TONGLING JINGDA SPECIAL MAGNET WIRE CO LTD	COPPER QZY-2/180	180°C	ANSI/UL 1446	UL E223994
- Insulation sheet	SHANGHAI GLOBAL ELECTRONIC MATERIAL LTD	FR-4	130°C, V-0	ANSI/UL 1446	UL E224772
- varnish	ZHUHAI CHANGXIAN NEW MATERIALS TECHNOLOGY CO., LTD	E962	130°C	ANSI/UL 1446	UL E335405
- insulation tape	JINGJIANG YAHUA PRESSURE SENSITIVE GLUE CO LTD	CT (b)(g)	130°C, V-0	UL 510A	UL E165111
Current Sensor (U1,U2,U3,U4,U5,U6,U7,U8, U9,U10,U11,U12)	Sinomags Technology Co., Ltd	STK-25CTS/P1	CURRENT SENSOR, STK-25CTS/P1,5V, ±25A, -40 ~ 105°C, DIP-4P	UL508	UL E507664
Power Board					
Boost IGBT (IGBT1/IGBT12/IGBT13/IGB T4)	Vincotech Electronic Gmbh	B0-SP103BA100 S704-LS69L98T	1500V, IGBT 100A/FWD 30A, Ptot=101 - 116W, -40～ 150°C	UL1557	UL E192116

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5F, Communication Building, 163 Pingyun Rd,
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	Vincotech Electronic Gmbh	B0-SP103BA100S714-LS60L98T	1500V, IGBT 100A/FWD 40A, Ptot=101 - 116W, -40～150°C	UL1557	UL E192116
INV IGBT (IGBT5/IGBT6/IGBT7)	Vincotech	30-PT10NIA400S7-LP59F08Y	1500V, 400A, Ptot=188 - 457W, -40～150°C	UL1557	UL E192116
	ON-Sem	NXH400N100H4Q2F2	1500V ,400A,Ptot=239W, -40～150°C	UL1557	UL E468801
Capacitor (C22,C23,C24,C31,C32,C33,C76,C77,C78,C85,C86,C87,C130,C131,C132,C139,C140,C141,C184,C185,C186,C193,C194,C195,C150,C154,C155,C156,C157,C161,C166,C170,C271,C272,C273,C274,C275,C276)	XIAMEN FARATRONIC CO.,LTD	C3D2K106JB10382	Film Cap,10uF,±5%,800VDC,-40～105°C	UL 810	UL E256238
Capacitor (C8,C9,C29,C118,C119,C123,C30,C46,C47,C128,C135,C136,C62,C63,C83,C137,C138,C145,C84,C100,C101,C112,C116,C117)	XIAMEN FARATRONIC CO.,LTD	C3D2K905KB00382	Film Cap,9uF,±10%,800VDC,105°C, -40~105°C	EN 61071 /UL 810	TUV R50266108/ UL E256238
Current Sensor (U1,U2,U3,U4,U5,U6,U7,U8,U9,U10,U11,U12)	Sinomags Technology Co., Ltd	STK-32PL	Current Sensor, STK-32PL, 5V, 32A， -40~105°C	UL508	UL E507664
	LEM	HLSR 32-P	Current Sensor,HLSR 32-P,5V,32A,-40~105°C	UL508:2010	UL E189713
Relay (RY1,RY2,RY3,RY4)	Xiamen Hongfa Electroacoustic Co., Ltd	HFD3/5	5Vdc/2A/30Vdc, -40~105°C	EN60950/EN41003	UL E133481
Diode (D25,D26,D27,D28,D29,D30,D31,D32,D33,D34,D35,D36)	VISHAY	SS14-E3/61T	1A/40V/DO-214AC, -65~150°C	IEC 61249	Test with Appliance
Capacitor （C16,C38,C54,C70,C92,C108,C124,C146,C162,C178,C200,C216）	XIAMEN FARATRONIC CO.,LTD	C3D4M655KF1B382	F6.5uF,±10%,1500VDC,105°C,42*42*28mm,-40～105°C	UL 810	UL E256238
Wire	3Q WIRE & CABLE CO LTD	UL10269,AWG2	1000V, 105°C	UL758,UL1581	UL E341104
BoostDriver Board					
PWM Controllers (UV1,UV6,UV9)	Texas Instruments	UC2845D8TR	Current Mode PWM Controller/SOIC-8, -40 to 85°C	IEC 62109-1 IEC 62109-2	Test with Appliance
Isolated Gate Driver (UV2,UV3,UV4,UV5,UV7,UV8)	Texas Instruments	UCC23513DWYR	Gate Drive Optocoupler/SO-6, Viso=5KV,cl≥8	UL 1577	UL E181974

Telephone : +86 20 3832 0668
Telefax : +86 20 3832 0478

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TÜV SÜD Certification and Testing (China) Co., Ltd.
Guangzhou Branch, TÜV SÜD Group
5F, Communication Building, 163 Pingyun Rd,
Huangpu Ave. West, Guangzhou 510656, P. R. China

			.5mm, cr≥8.5mm -40 to 130°C		
Transformer (TV1, TV2, TV3)	HUIZHOU BAOHUI ELECTRONICS TECHNOLOGY CO.,LTD	115-19-066C	XFMR,1mH MIN@1KHz, 0.8ohm, max 20:20/40:40, EFD15-10P,SMD,class B	IEC 62109-1 IEC 62109-2	Test with Appliance
-bobbin	SUMITOMO BAKELITE CO LTD	PM-9820 PM-9630	150°C	ANSI/UL 746	UL E41429
- triple insulated wire	SHANGHAI ASIA PACIFIC ELECTRIC CO LTD	UEW-U UEW/NY 0.2φ	155°C	ANSI/UL 1446	UL E214423
	HUIZHOU HUILI INDUSTRIAL CO LTD	PIW-B 0.2φ	130°C	ANSI/UL 1446	UL E322908
-margin tape	JINGJIANG YAHUA PRESSURE SENSITIVE GLUE	WF-2902	130°C	ANSI/UL 510A	UL E165111
-epoxy	DONGGUAN EATTO ELECTRONIC MATERIAL CO LTD	E-500	130°C	UL 746 UL 94	UL E218090
-varnish	SUZHOU TAIHU ELECTRIC ADVANCED MATERIAL CO LTD	T-4260(a)	130°C	ANSI/UL 1446	UL E228349
Transformer (TV1, TV2, TV3) - Alternative	SHENZHEN JINGQUANHUA ELECTRONICS CO.,LTD	BCK-EFD15-4941B	XFMR,1mH MIN@1KHz, 0.8ohm max,20:20/40:40,EFD15-10P,SMD, class B	IEC 62109-1 IEC 62109-2	Test with Appliance
-bobbin	CHANG CHUN PLASTICS CO, LTD	T375J	150°C	ANSI/UL 746	UL E59481
- triple insulated wire	TAI-I COPPER (GUAN-ZHOU) CO LTD	UEW/UEWF 0.2φ	155°C	ANSI/UL 1446	UL E234896
	SHENZHEN KAIZHONG HEDONG NEW MATERIAL CO LTD	TIW-B 0.2φ	130°C	ANSI/UL 1446	UL E357240
-margin tape	JINGJIANG YAHUA PRESSURE SENSITIVE GLUE	WF-2902	130°C	ANSI/UL 510A	UL E165111
-epoxy	DONGGUAN EATTO ELECTRONIC MATERIAL CO LTD	E-500 (XX) 3300HL	130°C	UL 746 UL 94	UL E218090

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-varnish	ELANTAS ELECTRICAL INSULATION ELANTAS PDG INC	5183SW	155°C	ANSI/UL 1446	UL E75225
INVDriver Board					
Transformer (TV1)	HUIZHOU BAOHUI ELECTRONICS TECHNOLOGY CO.,LTD	115-19-066C	XFMR,1mH MIN@1KHz, 0.8ohm max,20:20/40:40,EFD15-10P,SMD,class B	IEC 62109-1 IEC 62109-2	Test with Appliance
-bobbin	SUMITOMO BAKELITE CO LTD	PM-9820 PM-9630	150°C	ANSI/UL 746	UL E41429
- triple insulated wire	SHANGHAI ASIA PACIFIC ELECTRIC CO LTD	UEW-U UEW/NY 0.2φ	155°C	ANSI/UL 1446	UL E214423
	HUIZHOU HUILI INDUSTRIAL CO LTD	PIW-B 0.2φ	130°C	ANSI/UL 1446	UL E322908
-margin tape	JINGJIANG YAHUA PRESSURE SENSITIVE GLUE	WF-2902	130°C	ANSI/UL 510A	UL E165111
-epoxy	DONGGUAN EATTO ELECTRONIC MATERIAL CO LTD	E-500	130°C	UL 746 UL 94	UL E218090
-varnish	SUZHOU TAIHU ELECTRIC ADVANCED MATERIAL CO LTD	T-4260(a)	130°C	ANSI/UL 1446	UL E228349
Transformer (TV1) - Alternative	SHENZHEN JINGQUANHUA ELECTRONICS CO.,LTD	BCK-EFD15-4941B	XFMR,1mH MIN@1KHz, 0.8ohm max,20:20/40:40,EFD15-10P,SMD,class B	IEC 62109-1 IEC 62109-2	Test with Appliance
-bobbin	CHANG CHUN PLASTICS CO, LTD	T375J	150°C	ANSI/UL 746	UL E59481
- triple insulated wire	TAI-I COPPER (GUAN-ZHOU) CO LTD	UEW/UEWF 0.2φ	155°C	ANSI/UL 1446	UL E234896
	SHENZHEN KAIZHONG HEDONG NEW MATERIAL CO LTD	TIW-B 0.2φ	130°C	ANSI/UL 1446	UL E357240
-margin tape	JINGJIANG YAHUA PRESSURE SENSITIVE GLUE	WF-2902	130°C	ANSI/UL 510A	UL E165111

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5F, Communication Building, 163 Pingyun Rd,
Huangpu Ave. West, Guangzhou 510656, P. R. China

-epoxy	DONGGUAN EATTO ELECTRONIC MATERIAL CO LTD	E-500 (XX) 3300HL	130°C	UL 746 UL 94	UL E218090
-varnish	ELANTAS ELECTRICAL INSULATION ELANTAS PDG INC	5183SW	155°C	ANSI/UL 1446	UL E75225
Cap Board					
Bus Capacitor (EC2,EC3,EC5,EC6,EC8,EC9,EC11,EC12,EC14,EC16,EC17,EC18,EC20,EC21,EC23,EC24,EC25,EC26,EC27,EC28,EC29,EC30,EC31,EC32,EC33,EC34,EC35,EC36,EC37,EC38,EC39,EC40)	EPCOS	B43255S0947M002	ECAP,940uF,±20%,410V,5000H,Φ35*60mm,-40～150°C	IEC 62109-1 IEC 62109-2	Test with Appliance
Inductor (L1,L503)	SHENZHEN JINGQUANHUA ELECTRONICS CO.,LTD	TPDG-R16-R1063	IND ,18uH@1KHz, BAR CORE,Z16*40A,class B	IEC 62109-1 IEC 62109-2	Test with Appliance
- winding	WUXI YOUFAUN ELECTRIC CO LTD	1.5mm*6mm	220°C	ANSI/UL 1446	UL E343483
	GUANGDONG JINGDA REA SPECIAL ENAMELED WIRE CO LTD	1.5mm*6mm	220°C	ANSI/UL 1446	UL E223994
- Potting	DONGGUAN EATTO ELECTRONIC MATERIAL CO LTD	E-500	130°C	UL 746	UL E218090
- Insulation sheet	XINFENG GHILLIE ELECTRICAL MATERIALS CO LTD	Ghillie APA	180°C, V-0	ANSI/UL 1446	UL E322743
- varnish	YUEYANG GREEN TECHNOLOGY CO LTD	JX-1160*	180°C	ANSI/UL 1446	UL E303754
- insulation tape	3M COMPANY ELECTRICAL MARKETS DIV (EMD)	PF-301	180°C, V-0	UL 510A	UL E17385
Output Board					
Current Sensor (HCT1,HCT2,HCT3)	Sinomags Technology Co., Ltd	STB-200LA/ZN	5V, 200A, -40～105°C	UL 508	UL E507664
	LEM	LZSR 200-P/SP1	5V, 200A, -40～105°C	UL 508	UL E189713
	VAC	T60404-N4647-X264	12V, 200A, -40～105°C	UL 508	UL E317483
Current Sensor	Sinomags	SFG-2.0P/P1	5V,2A, Closed	UL 508	UL

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(L2)	Technology Co., Ltd		Loop, -40～110°C		E507664
Electrolytic capacitor (EC1,EC3)	NCC	EKY-250ETD221MHB5D	220uF/25V/Φ8x11.5/7000H, -40～105°C	IEC 62109-1 IEC 62109-2	Test with Appliance
Capacitor (C1,C2,C3,C4,C5,C6,C7,C8,C9)	XIAMEN FARATRONIC CO.,LTD	C6AU1705KM1A382	7uF, ±10%, 600VAC, --40°C ~ +105°C	UL 810	UL E256238
Capacitor (C33,C34,C41,C20,C21,C22)	XIAMEN FARATRONIC CO.,LTD	C46U3105MF1C400	X1,1uF, ±20%,660VAC, -40～110°C	UL60384	UL E186600
Relay (RY1,RY2,RY3,RY4,RY5,RY6)	Xiamen Hongfa Electroacoustic Co., Ltd	HF167F-200/12-H3F	1A,200A,12V, contact gap：≥4mm, -40～150°C	IEC61810	TUV R50374273
	Dongguan Churod Electronics Co.,Ltd	CHAR-112A200C	1A,200A,12V, contact gap≥4mm, 40～150°C	IEC61810	Test with Appliance
Inductor(L3)	SHENZHEN JINGQUANHUA ELECTRONICS CO.,LTD	IND CMC, 225KW	712uH, ±25%,0.64mΩ,3L, class B	IEC 62109-1 IEC 62109-2	Test with Appliance
- winding	JIANGSU BAOJIELONG MAGNET WIRES CO LTD	3.0mm*10mm	200°C	ANSI/UL 1446	UL E326176
	WUXI YOUFAUN ELECTRIC CO LTD	3.0mm*10mm	200°C	ANSI/UL 1446	UL E343483
	GUANGDONG JINGDA REA SPECIAL ENAMELED WIRE CO LTD	3.0mm*10mm	200°C	ANSI/UL 1446	UL E223994
- Potting	DONGGUAN EATTO ELECTRONIC MATERIAL CO LTD	3300A-1/3300B-1	130°C, V-0	UL 746	UL E218090
- Insulation sheet	E I DUPONT DE NEMOURS & CO INC	NOMEX410	220°C, V-0	ANSI/UL 1446	UL E34739
- varnish	KYOCERA CHEMICAL CORP	TVB2166*(a)	180°C	ANSI/UL 1446	UL E83702
- insulation tape	3M INNOVATIVE PAPER TECHNOLOGIES	TF/TFT	200°C, V-0	UL 510A	UL E65007
Inductor(L3) - Alternative	Foshan Catech Co., Ltd.	IND CMC, 225KW	712uH, ±25%,0.64mΩ,3L, class B	IEC 62109-1 IEC 62109-2	Test with Appliance
- winding	GUANGZHOU TIANSHUN ELECTRIC EQUIPMENT CO	3.0mm*10mm	200°C	ANSI/UL 1446	UL E210986

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	LTD				
- Potting	DONGGUAN TOPKEY ELECTRONIC CO., LTD	BG610A/B	130°C, V-0	UL 746	UL E356931
- Insulation sheet	XINFENG GHILLIE ELECTRICAL MATERIALS CO LTD	Ghillie APA	200°C, V-0	ANSI/UL 1446	E322743
- varnish	YUEYANG GREEN TECHNOLOGY CO LTD	JX-1160*	180°C	ANSI/UL 1446	UL E303754
- insulation tape	3M INNOVATIVE PAPER TECHNOLOGIES	TF/TFT	200°C, V-0	UL 510A	UL E65007
Inductor(L3) - Alternative	HUIZHOU BAOHUI ELECTRONICS TECHNOLOGY CO.,LTD	IND CMC, 225KW	712uH, ±25%,0.64mΩ ,3L, classB	IEC 62109-1 IEC 62109-2	Test with Applianc e
- winding	SHANGHAI YOUTUO MAGNET WIRE CO LTD	3.0mm*10m m	200°C	ANSI/UL 1446	UL E338133
- Potting	DONGGUAN EATTO ELECTRONIC MATERIAL CO LTD	E-500	130°C, V-0	UL 746	UL E218090
- Insulation sheet	Ruian Insulation Material Co. , Ltd.	NMN	180°C, V-0	ANSI/UL 1446	UL E230926
- varnish	KYOCERA CHEMICAL CORP	TVB2166*(a)	180°C	ANSI/UL 1446	UL E83702
- insulation tape	Jingjiang Yahua pressure sensitive Tape Co. , Ltd.	polyimide	180°C, V-0	UL 510A	UL E165111
Inductor(L3) - Alternative	Shenzhen Highlight Electronic Co., Ltd	IND CMC, 225KW	712uH, ±25%,0.64mΩ ,3L, class B	IEC 62109-1 IEC 62109-2	Test with Applianc e
- winding	GUANGDONG JINGDA REA SPECIAL ENAMELED WIRE CO LTD	MW 36-C 3.0mm*10m m	200°C	ANSI/UL 1446	UL E223994
- Potting	DONGGUAN EATTO ELECTRONIC MATERIAL CO LTD	E-500 (XX) 3300HL	130°C, V-0	UL 746	UL E218090
- Insulation sheet	Xinfeng Jieli Electrical Materials Co. , Ltd.	Ghillie APA	180°C, V-0	ANSI/UL 1446	UL E322743
- varnish	Yueyang Green Technology Co. , Ltd.	JX-1160*	180°C	ANSI/UL 1446	UL E303754

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- insulation tape	Xinfeng Jieli Electrical Materials Co. , Ltd.	Ghillie APA	180°C, V-0	UL 510A	UL E322743
Inductor (L4)	SHENZHEN JINGQUANHUA ELECTRONICS CO.,LTD	IND DMC, 225KW	5.6uH,±20%, 0.4mΩ, 3L, class B	IEC 62109-1 IEC 62109-2	Test with Applianc e
- winding	JIANGSU BAOJIELONG MAGNET WIRES CO LTD	HI-POT 3.0mm*6.0m m	200°C	ANSI/UL 1446	UL E326176
	WUXI YOUFAUN ELECTRIC CO LTD	HI-POT 3.0mm*6.0m m	200°C	ANSI/UL 1446	UL E343483
- Potting	YUEYANG GREEN TECHNOLOGY CO LTD	JX-1150 *	155°C, V-0	UL 746	UL E303754
- Insulation sheet	E I DUPONT DE NEMOURS & CO INC	NOMEX410	220°C, V-0	ANSI/UL 1446	UL E34739
- varnish	KYOCERA CHEMICAL CORP. OR EQUATE	TVB2166*(a)	200°C	ANSI/UL 1446	UL E83702
Inductor (L4) - Alternative	Foshan Catech Co., Ltd.	IND DMC, 225KW	5.6uH,±20%, 0.4mΩ, 3L, class B	IEC 62109-1 IEC 62109-2	Test with Applianc e
- winding	GUANGDONG JINGDA REA SPECIAL ENAMELED WIRE CO LTD	3.0mm*6.0m m	200°C	ANSI/UL 1446	UL E223994
	GUANGZHOU TIANSHUN ELECTRIC EQUIPMENT CO LTD	3.0mm*6.0m m	200°C	ANSI/UL 1446	UL E210986
- Potting	DONGGUAN TOPKEY ELECTRONIC CO, LTD	BG610A/B	130°C, V-0	UL 746	UL E356931
- Insulation sheet	XINFENG GHILLIE ELECTRICAL MATERIALS CO LTD	NMN	200°C, V-0	ANSI/UL 1446	UL E322743
- varnish	YUEYANG GREEN TECHNOLOGY CO LTD	MW35-C	180°C	ANSI/UL 1446	UL E303754
Inductor (L4) - Alternative	HUIZHOU BAOHUI ELECTRONICS TECHNOLOGY CO.,LTD	IND DMC, 225KW	5.6uH,±20%, 0.4mΩ, 3L, class B	IEC 62109-1 IEC 62109-2	Test with Applianc e
- winding	SHANGHAI YOUTUO MAGNET WIRE CO LTD	3.0mm*6.0m m	200°C	ANSI/UL 1446	UL E338133

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- Potting	DONGGUAN EATTO ELECTRONIC MATERIAL CO LTD	E-500 (XX) 3300HL	130°C, V-0	UL 746	UL E218090
- Insulation sheet	Ruian Insulation Material Co. , Ltd.	NMN	180°C, V-0	ANSI/UL 1446	UL E230926
- varnish	KYOCERA CHEMICAL CORP	TVB2166*(a)	180°C	ANSI/UL 1446	UL E83702
Inductor (L4) - Alternative	Shenzhen Highlight Electronic Co., Ltd	IND DMC, 225KW	5.6uH,±20%, 0.4mΩ, 3L, class B	IEC 62109-1 IEC 62109-2	Test with Applianc e
- winding	SHANGHAI YOUTUO MAGNET WIRE CO LTD	3.0mm*6.0m m	200°C	ANSI/UL 1446	UL E338133
- Potting	DONGGUAN EATTO ELECTRONIC MATERIAL CO LTD	E-500 (XX) 3300HL	130°C, V-0	UL 746	UL E218090
- Insulation sheet	Xinfeng Jieli Electrical Materials Co. , Ltd.	NMN	180°C, V-0	ANSI/UL 1446	UL E322743
- varnish	Yueyang Green Technology Co., Ltd.	MW35-C	180°C	ANSI/UL 1446	UL E303754
Gas Tube (GAS1)	SHENZHEN BENCENT ELECTRONIC CO LTD	B8G1500M	1200~1800Vdc，-40~90°C	UL1449	UL E337906
Insulation paper	XINFENG GHILLIE ELECTRICAL MATERIALS CO LTD	Ghillie APA	NMN 0881, -40°C - +200°C	OBJS2	UL E322743
Com Board					
ARM Chip (U3)	NXP	LPC54606J512BD208K	IC,ARM CORTEX-M4,LPC54606J512BD208K, LQFP208, -40～105°C	IEC 62109-1 IEC 62109-2	Test with Applianc e
Control Board					
Chip (U30)	Texas Instruments	TMS320F28075PTP	Digital Signal Controller/HL QFP-176,-40～105°C	IEC 61508	TUV Z10 0840710021
U34	Texas Instruments	F280049PZS	Microcontroller/TMS320F280049CPZS/LQFP100,-40～125°C	IEC 61508	TUV Z10 0840710023
U15	SHENZHEN PANGO MICROSYSTEMS CO.,LTD	PK03024_PGC4KD_LPG144	IC,CPLD,PGC4KD-6ILPG144,3.3V,A,LF,LPG14	IEC 62109-1 IEC 62109-2	Test with Applianc e

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			4,SMD,-40~100 °C,		
Opto-couple (GO1,GO3)	VISHAY	CNY65AGRST	CNY65AGRST,100-300%,Virom=13.9KV,cl≥14 mm, cr≥14mm, CTI≥475, -55 to 100°C	UL1577	UL E76222
Relay (RY2,RY3,RY4,RY1)	Xiamen Hongfa Electroacoustic Co., Ltd	HFD3/5	5Vdc/2A/30Vdc，-40~105°C	EN60950/EN41003	UL E133481
Capacitor (CTF1,CTF2,CTF3,CTF4)	XIAMEN FARATRONIC CO.,LTD	C372J105K60Y450	1.0uF/630V/W 17*H22.1*T13.6, P=15mm,-40～105°C	IEC 60384-16	Test with Appliance
Transformer (T6)	SHENZHEN JINGQUANHUA ELECTRONICS CO.,LTD	DC AUX POWER	XFMR,POWER,345uH,ER40. , class B	IEC 62109-1 IEC 62109-2	Test with Appliance
- bobbin	SUMITOMO BAKELITE CO LTD	Phenolic PM-9820/PM-9630	150°C	ANSI/UL 746	UL E41429
- triple insulated wire	ShangHai SuRan Electronics Factory	TIW-F	155°C	ANSI/UL 1446	UL E335392
	SHENZHEN JIUDING NEW MATERIAL CO LTD	DTFW-F	155°C	ANSI/UL 1446	UL E357999
- margin tape	JINGJIANG YAHUA PRESSURE SENSITIVE GLUE CO LTD	PF* (d)(g)	180°C	ANSI/UL 510A	UL E165111
- tube	CHANGYUAN ELECTRONICS (SHENZHEN) CO LTD	CB-TT-L	200°C	ANSI/UL 224	UL E180908
- epoxy	DONGGUAN EATTO ELECTRONIC MATERIAL CO., LTD	E-500 (XX) 3300HL	130°C	UL 746 UL 94	UL E218090
- varnish	ELANTAS ELECTRICAL INSULATION ELANTAS PDG INC	5183SW	155°C	ANSI/UL 1446	UL E75225
Transformer (T6)	HUIZHOU BAOHUI ELECTRONICS TECHNOLOGY CO.,LTD	DC AUX POWER	XFMR,POWER,345uH,ER40, class B	IEC 62109-1 IEC 62109-2	Test with Appliance
- bobbin	CHANG CHUN PLASTICS CO LTD	Phenolic T375HF	150°C	ANSI/UL 746	UL E59481
- triple insulated wire	SHANGHAI XIANGXIANG ELECTRON CO	TKE-F	155°C	ANSI/UL 1446	UL E308908

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Telefax : +86 20 3832 0478

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	LTD				
- margin tape	CHANG SHU LIANG YI TAPE INDUSTRY CO LTD	LY-20X	180°C	ANSI/UL 510A	UL E246820
- tube	GREAT HOLDING INDUSTRIAL CO LTD	TFL	200°C	ANSI/UL 224	UL E156256
- epoxy	DONG GUAN SHI PAI HUA CHUANG MATERIAL FTY	H907-HF-N/Z	130°C	UL 746 UL 94	UL E304477
- varnish	HITACHI CHEMICAL CO LTD	WP-2952F-2G(Y)	155°C	ANSI/UL 1446	UL E72979
MOSFET (Q105,Q106,Q107,Q108)	ON Semiconductor	FQB5N90TM	FQB5N90TM/ 900V/5.4A/TO-263,-50～150°C	UL1557	UL E468801
Diode (D104,D105,D197)	MCC	MBRB10200 CT-TP	200V,10A ,D2PAK,-55～150°C	IEC 62109-1 IEC 62109-2	Test with Appliance
Capacitor (EC6,EC7,EC8,EC9,EC10,EC11,EC12,EC13,EC15,EC16)	SamYoung Electronics Co., Ltd	NXH 25V 470uF Φ8*15	470uF/25V/Φ8x15/8000H,-40～105°C	IEC 60384	Test with Appliance
Fuse (F1,F2,F3)	Littelfuse Inc.	1812L110/33	1.1A/33V/1812L Series,-40～125°C	ISO 8820	TUV R50119118
Fan Board					
Transformer (T4)	SHENZHEN JINGQUANHUA ELECTRONICS CO.,LTD	AC, AUX POWER	XFMR,POWER,350uH,PQ50, class B	IEC 62109-1 IEC 62109-2	Test with Appliance
- bobbin	SUMITOMO BAKELITE CO LTD	Phenolic PM-9820/PM-9630	150°C	ANSI/UL 746	UL E41429
- triple insulated wire	SHENZHEN JIUDING NEW MATERIAL CO LTD	DTFW-F	155°C	ANSI/UL 1446	UL E357999
	SHANGHAI XIANGXIANG ELECTRON CO LTD	TKE-F	155°C	ANSI/UL 1446	UL E308908
- margin tape	JINGJIANG YAHUA PRESSURE SENSITIVE GLUE CO LTD	PF* (d)(g) 1K7172	180°C	ANSI/UL 510A	UL E165111
- tube	CHANGYUAN ELECTRONICS (SHENZHEN) CO LTD	CB-TT-L	200°C	ANSI/UL 224	UL E180908
- epoxy	DONGGUAN EATTO ELECTRONIC MATERIAL CO LTD	E-500 (XX) 3300HL	130°C	UL 746 UL 94	UL E218090

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- varnish	ELANTAS ELECTRICAL INSULATION ELANTAS PDG INC	5183SW	155°C	ANSI/UL 1446	UL E75225
Transformer (T4) - Alternative	HUIZHOU BAOHUI ELECTRONICS TECHNOLOGY CO.,LTD	AC AUX POWER	XFMR,POWER,350uH,PQ50, class B	IEC 62109-1 IEC 62109-2	Test with Appliance
- bobbin	CHANG CHUN PLASTICS CO LTD	Phenolic T375HF	150°C	ANSI/UL 746	UL E59481
- triple insulated wire	SHANGHAI XIANGXIANG ELECTRON CO LTD	TIW-F	155°C	ANSI/UL 1446	UL E308908
- margin tape	CHANG SHU LIANG YI TAPE INDUSTRY CO LTD	LY-20X	180°C	ANSI/UL 510A	UL E246820
- tube	GREAT HOLDING INDUSTRIAL CO LTD	TFL	200°C	ANSI/UL 224	UL E156256
- epoxy	DONG GUAN SHI PAI HUA CHUANG MATERIAL FTY	H907-HF-N/Z	130°C	UL 746 UL 94	UL E304477
- varnish	HITACHI CHEMICAL CO LTD	WP-2952F-2G(Y)	155°C	ANSI/UL 1446	UL E72979
Inuctor (L502)	NEW BITE ELECTRONIC TECHNOLOGY CO.,LTD	SPT-08R10353-L/CA01-12162	IND,4.7uH min@1KHz,3 mΩMAX,Φ8*30,with base,class B	IEC 62109-1 IEC 62109-2	Test with Appliance
- winding	TAI-I COPPER (GUANZHOU) CO LTD	MW77C	180°C	ANSI/UL 1446	UL E85640
- Potting	GUDAK CHEMISTRY TECH (DONGGUAN) LTD	G-8500A/B	130°C, V-0	UL 746	UL E216733
- varnish	ELANTAS ELECTRICAL INSULATION ELANTAS PDG INC	5183SW	155°C	ANSI/UL 1446	UL E75225
- insulation tape	KINGBOARD LAMINATES	KB-6150	130°C, V-0	UL 510A	UL E123995
Inductor(L502) - Alternative	Foshan Catech Co., Ltd	SPT-08R10353-L/CA01-12162	IND,4.7uH min@1KHz,3 mΩMAX,Φ8*30,with base,class B	IEC 62109-1 IEC 62109-2	Test with Appliance
- winding	GUANGDONG JINYAN ELECTROTECHNICS JOINT STOCK CO., LTD	xEIW, QZY-x/180	180°C	ANSI/UL 1446	UL E238500
- Potting	GUDAK	G-8500A/B	130°C, V-0	UL 746	UL

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Telefax : +86 20 3832 0478
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	CHEMISTRY TECH (DONGGUAN) LTD				E216733
- varnish	YUEYANG GREEN TECHNOLOGY CO LTD	MW35-C JX-1160H	180°C	ANSI/UL 1446	UL E303754
- insulation tape	JINGJIANG YAHUA PRESSURE SENSITIVE GLUE CO LTD	Polyimide PF* (d)(g)	180°C, V-0	UL 510A	UL E165111
MOSFET (Q1,Q5,Q502)	ST	STW20N95K5	Mos N, STW20N95K5, 950V, 20A, -55～150°C	IEC 62109-1 IEC 62109-2	Test with Appliance
Diode (D14)	MCC	MBRB10200CT-TP	MBRB10200CT-TP, 200V, 10A, -55～150°C	IEC 62109-1 IEC 62109-2	Test with Appliance
Opto-couple (GO1,GO3)	VISHAY	CNY65AGRST	CNY65AGRST,100-300%, Virom=13.9KV, cl≥14mm, cr≥14mm, CTI≥475, -55 to 100°C	UL1577	UL E76222
SPD Board					
MOV: (MOV1,MOV2,MOV3,MOV4, MOV5,MOV6,MOV7,MOV8, MOV9,MOVF1,MOVF2,MOVF3,MOVF4,MOVF5,MOVF6, MOVF7) (in series with Y capacitor of EMI Board)	Xiamen SET Electronics Co., Ltd	TFMOV10M680	680VAC/890VDC /10kA Operations	UL1449	UL E322662
	Sichuan Zhongguang Lightning Protection Technologies Co., Ltd.	ZGGS20-890PVh1a2	680VAC/890VDC /10kA Operations	UL1449	UL E339436
	EPCOS	MT30K680M4	12.5KA(8/20us),680VAC/895VDC，-40～85°C	UL1449	UL E321126

. ……End of test report……..

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TEST REPORT
IEC 62109-2
Safety of Power Converter for use in Photovoltaic Power Systems
Part 2: Particular requirements for inverters

Report Number. ..... :	64.290.21.30202.01 part 2 of 2
Date of issue ..... :	2021-07-05
Total number of pages..... :	17 pages
Name of Testing Laboratory preparing the Report..... :	TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch
Applicant's name..... :	Shenzhen SOFARSOLAR Co., Ltd.
Address ..... :	401, Building 4, AnTongDa Industrial Park, District 68, XingDong Community, XinAn Street, BaoAn District, Shenzhen, Guangdong. P.R.China
Test specification:	
Standard..... :	IEC 62109-2:2011
Test procedure ..... :	CE_LVD
Non-standard test method..... :	N/A
Test Report Form No. ..... :	IEC62109_2B
Test Report Form(s) Originator .... :	LCIE - Laboratoire Central des Industries Electriques
Master TRF..... :	Dated 2016-11

If this Test Report Form is used by non-IECEE members, the IECEE/IEC logo and the reference to the CB Scheme procedure shall be removed.

This report is not valid as a CB Test Report unless signed by an approved CB Testing Laboratory and appended to a CB Test Certificate issued by an NCB in accordance with IECEE 02.

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Guangzhou Branch, TÜV SÜD Group
5F, Communication Building, 163 Pingyun Rd, Huangpu Ave. West, Guangzhou 510656, P. R. China

Test item description ..... :	Solar Grid-tied Inverter
Trade Mark ..... :	SOFAR SOLAR
Manufacturer ..... :	Same as applicant
Model/Type reference ..... :	SOFAR 250KTL-HV, SOFAR 255KTL-HV
Ratings ..... :	See Report No.: 64.290.20.30560.01 part 1 of 2.

Responsible Testing Laboratory (as applicable), testing procedure and testing location(s):

☒	**Testing Laboratory:**	TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch	
Testing location/ address.....:		TÜV SÜD Testing Center, D1 building, No. 63 Chuangqi Road, Shilou Town, Panyu District, Guangzhou, P.R. China	
Tested by (name, function, signature).....:		Richard Wong, Iris Zheng	
Approved by (name, function, signature)...:		Max Fang	

Telephone : +86 20 3832 0668
Telefax : +86 20 3832 0478

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TÜV SÜD Certification and Testing (China) Co., Ltd.
Guangzhou Branch, TÜV SÜD Group
5F, Communication Building, 163 Pingyun Rd, Huangpu
Ave. West, Guangzhou 510656, P. R. China

List of Attachments (including a total number of pages in each attachment):

See Report No.: 64.290.21.30202.01 part 1 of 2.

Summary of testing:

All tests were carried out according to IEC/EN 62109-2:2011.

Tests performed (name of test and test clause):

Clause	Requirement
4.4.4.15.1	Fault-tolerance of residual current monitoring
4.4.4.15.2	Fault-tolerance of automatic disconnecting means
4.4.4.17	Cooling system failure – Blanketing test
4.8.2.1	Array insulation resistance detection for inverters for ungrounded arrays
4.8.3.5.2	Test for detection of excessive continuous residual current
4.8.3.5.3	Test for detection of sudden changes in residual current

Remark: If no special indicated, all the tests are applied on model SOFAR 255KTL-HV

Testing location:

TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch

Address: TÜV SÜD Testing Center, D1 building, No. 63 Chuangqi Road, Shilou Town, Panyu District, Guangzhou, P.R. China

Summary of compliance with National Differences (List of countries addressed):

N/A

Copy of marking plate:

See Report No.: 64.290.21.30202.01 part 1 of 2.

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Guangzhou Branch, TÜV SÜD Group
5F, Communication Building, 163 Pingyun Rd, Huangpu Ave. West, Guangzhou 510656, P. R. China

Test item particulars ..... :	
Equipment mobility ..... :	☐ movable ☐ hand-held ☒ stationary ☒ fixed ☐ transportable ☐ for building-in
Connection to the mains ..... :	☐ pluggable equipment ☐ direct plug-in ☒ permanent connection ☐ for building-in
Enviromental category..... :	☒ outdoor ☐ indoor unconditional ☐ indoor conditional
Over voltage category Mains..... :	☐ OVC I ☐ OVC II ☒ OVC III ☐ OVC IV
Over voltage category PV..... :	☐ OVC I ☒ OVC II ☐ OVC III ☐ OVC IV
Mains supply tolerance (%)..... :	±10%
Tested for power systems..... :	IT
IT testing, phase-phase voltage (V)..... :	N/A
Class of equipment ..... :	☒ Class I ☐ Class II ☐ Class III ☐ Not classified
Mass of equipment (kg) ..... :	99.3 kg (approx.)
Pollution degree ..... :	External 3, Internal 2
IP protection class..... :	IP 66
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 ..... :	2021-03-29
Date (s) of performance of tests..... :	2021-04-30 to 2021-06-19
General remarks:	
"(See Enclosure #)" refers to additional information appended to the report. "(See appended table)" refers to a table appended to the report. **Throughout this report a ☐ comma / ☒ point is used as the decimal separator.**	
Manufacturer's Declaration per sub-clause 4.2.5 of IECEE 02:	
The application for obtaining a CB Test Certificate includes more than one factory location and a declaration from the Manufacturer stating that the sample(s) submitted for evaluation is (are) representative of the products from each factory has been provided ..... :	☐ **Yes** ☒ **Not applicable**
When differences exist; they shall be identified in the General product information section.	
Name and address of factory: Dongguan SOFAR SOLAR Co., Ltd. 1F – 6F, Building E, No.1 JinQi Road, Bihu Industrial Park, Wulian Villiage, Fenggang Town, Dongguan City, P.R. China.	
General product information: See Report No.: 64.290.21.30202.01 part 1 of 2.	

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Telefax : +86 20 3832 0478
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Guangzhou Branch, TÜV SÜD Group
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IEC 62109-2			
Clause	Requirement + Test	Result - Remark	Verdict

4	**GENERAL TESTING REQUIREMENTS**		P
4.4.4	**Single fault conditions to be applied**		P
4.4.4.15	**Fault-tolerance of protection for grid-interactive inverters**		P
4.4.4.15.1	**Fault-tolerance of residual current monitoring according to 4.8.3.5: the residual current monitoring system operates properly**	See appended table 4.4.4.15.1	P
	a) . - The inverter ceases to operate		P
	- Indicates a fault in accordance with §13.9		P
	- Disconnect from the mains		P
	- not re-connect after any sequence of removing and reconnecting PV power		P
	- not re-connect after any sequence of removing and reconnecting AC power		P
	- not re-connect after any sequence of removing and reconnecting both PV and AC power		P
	b) . - The inverter continues to operate		N/A
	- the residual current monitoring system operates properly under single fault condition		N/A
	- Indicates a fault in accordance with §13.9		N/A
	c) . - The inverter continues to operate regardless of loss of residual current monitoring functionality		N/A
	- not re-connect after any sequence of removing and reconnecting PV power		N/A
	- not re-connect after any sequence of removing and reconnecting AC power		N/A
	- not re-connect after any sequence of removing and reconnecting both PV and AC power		N/A
	- Indicates a fault in accordance with §13.9		N/A
4.4.4.15.2	**Fault-tolerance of automatic disconnecting means**		P
4.4.4.15.2.1	**The means provided for automatic disconnection of a grid-interactive inverter from the mains shall:**		P
	- disconnect all grounded current-carrying conductors from the mains		P
	- disconnect all ungrounded current-carrying conductors from the mains		P
	- be such that with a single fault applied to the disconnection means or to any other location in the inverter, at least basic insulation or simple separation is maintained between the PV array and the mains when the disconnecting means is intended to be in the open state.	See appended table 4.4.4.15.2	P
4.4.4.15.2.2	**Design of insulation or separation complies with requirements of 7.3.7 of Part 1: report here Part 1 comment and verdict.**		P
4.4.4.15.2.3	**For non-isolated inverter, automatic checking of the isolation provided by a disconnect means after single fault.**	See appended test table 4.4.4.15.2	P
	If the check fail: - any still-functional disconnection means shall be left in the open position		P
	- at least basic or simple separation shall be maintained between the PV input and the mains		P
	- the inverter shall not start operation		P

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Clause	Requirement + Test	Result - Remark	Verdict
	- the inverter shall indicate a fault in accordance with 13.9		P
4.4.4.16	**A stand-alone inverter with a transfer switch to transfer AC loads from the mains or other AC bypass source to the inverter output:**	Grid interactive inverter	N/A
	- shall continue to operate normally		N/A
	- shall not present a risk of fire as the result of an out-of-phase transfer		N/A
	- shall not present a risk of shock as the result of an out-of-phase transfer		N/A
	- And having control preventing switching: components for malfunctioning ……..…:		N/A
4.4.4.17	**Cooling system failure – Blanketing test** **No hazards according to the criteria of sub-clause 4.4.3 of Part 1 shall result from blanketing the inverter** **This test is not required for inverters restricted to use only in closed electrical operating areas.**	See appended test table 4.4.4.17	P
	Test stop condition: time duration value or stabilized temperature ……..:		P
4.7	**ELECTRICAL RATINGS TESTS**		N/A
4.7.4	**Stand-alone Inverter AC output voltage and frequency**		N/A
4.7.4.1	**General**	Without stand-alone terminal	N/A
4.7.4.2	**Steady state output voltage at nominal DC input** **The steady-state AC output voltage shall not be less than 90 % or more than 110 % of the rated nominal voltage with the inverter supplied with its nominal value of DC input voltage.**		N/A
4.7.4.3	**Steady state output voltage across the DC input range** **The steady-state AC output voltage shall not be less than 85 % or more than 110 % of the rated nominal voltage with the inverter supplied with any value within the rated range of DC input voltage.**		N/A
4.7.4.4	**Load step response of the output voltage at nominal DC input** **The AC output voltage shall not be less than 85 % or more than 110 % of the rated nominal voltage for more than 1,5 s after application or removal of a resistive load.**		N/A
4.7.4.5	**Steady state output frequency** **The steady-state AC output frequency shall not vary from the nominal value by more than +4 % or –6 %.**		N/A
4.7.5	**Stand-alone inverter output voltage waveform**		N/A
4.7.5.1	**General**		N/A
4.7.5.2	**The AC output voltage waveform of a sinusoidal output stand-alone inverter shall have a total harmonic distortion (THD) not exceeding of 10 % and no individual harmonic at a level exceeding 6 %.**		N/A
4.7.5.3	**Non-sinusoidal output waveform requirements**		N/A
4.7.5.3.1	**General**		N/A
4.7.5.3.2	**The total harmonic distortion (THD) of the voltage waveform shall not exceed 40 %.**		N/A
4.7.5.3.3	**The slope of the rising and falling edges of the positive and negative half-cycles of the voltage waveform shall not exceed 10 V/µs measured between the points at**		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	which the waveform has a voltage of 10 % and 90 % of the peak voltage for that half-cycle.		
4.7.5.3.4	**The absolute value of the peak voltage of the positive and negative half-cycles of the waveform shall not exceed 1,414 times 110 % of the RMS value of the rated nominal AC output voltage.**		N/A
4.7.5.4	**Information requirements for non-sinusoidal waveforms** **The instructions provided with a stand-alone inverter not complying with 4.7.5.2 shall include the information in 5.3.2.6.**		N/A
4.7.5.5	**Output voltage waveform requirements for inverters for dedicated loads.** **For an inverter that is intended only for use with a known dedicated load, the following requirements may be used as an alternative to the waveform requirements in 4.7.5.2 to 4.7.5.3.**		N/A
	The combination of the inverter and dedicated load shall be evaluated to ensure that the output waveform does not cause any hazards in the load equipment and inverter, or cause the load equipment to fail to comply with the applicable product safety standards.		N/A
	The inverter shall be marked with symbols 9 and 15 of Table C.1 of Part 1.		N/A
	The installation instructions provided with the inverter shall include the information in 5.3.2.13.		N/A
4.8	**ADDITIONAL TESTS FOR GRID-INTERACTIVE INVERTERS**		P
4.8.1	**General requirements regarding inverter isolation and array grounding**		N/A
	- Type of Array grounding supported ……:		N/A
	- Inverter isolation ……:		N/A
4.8.2	**Array insulation resistance detection for inverters for ungrounded and functionally grounded arrays**		P
4.8.2.1	**Array insulation resistance detection for inverters for ungrounded arrays**	See appended test table 4.8.2.1	P
	Inverter shall have means to measure DC insulation resistance from PV input (array) to ground before starting operation		P
	Or Inverter shall be provided with instruction in accordance with 5.3.2.11.		N/A
	Measured DC insulation resistance: ……:		P
	Inverter measurement circuit shall be capable of detecting insulation resistance below the limit value R= Vmax/30mA under normal conditions		P
	Inverter measurement circuit shall be capable of detecting insulation resistance below the limit value R= Vmax/30mA with ground fault in the PV array		P
	Isolated inverters shall indicate a fault if the insulation resistance is less than the limit value		N/A
	Isolated inverter fault indication maintained until insulation resistance has recovered to a value higher than the limit value		N/A
	Non-isolated inverters, or inverters with isolation not complying with the leakage current limits in the minimum inverter isolation requirements in Table 30:		P
	- shall indicate a fault in accordance with 13.9		P
	- shall not connect to the mains		P
4.8.2.2	**Array insulation resistance detection for inverters for**		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	functionally grounded arrays		
	a-1)The value of the total resistance, including the intentional resistance for array functional grounding, the expected insulation resistance of the array to ground, and the resistance of any other networks connected to ground (for example measurement networks) must not be lower than R = (VMAX PV/30 mA) ohms.		N/A
	a-2) The installation instructions shall include the information required in 5.3.2.12.		N/A
	b-1) As an alternative to a), or if a resistor value lower than in a) is used, the inverter shall incorporate means to detect, during operation, if the total current through the resistor and any networks (for example measurement networks) in parallel with it, exceeds the residual current values and times in Table 31		N/A
	b-2) Inverter shall either disconnect the resistor or limit the current by other means ……:		N/A
	b-3) If the inverter is a non-isolated inverter, or has isolation not complying with the leakage current limits in the minimum inverter isolation requirements in Table 30, it shall also disconnect from the mains.		N/A
	c) The inverter shall have means to measure the DC insulation resistance from the PV input to ground before starting operation, in accordance with 4.8.2.1.		N/A
4.8.3	**Array residual current detection**		P
4.8.3.1	**General**		P
4.8.3.2	**30 mA touch current type test for isolated inverters**	Transformer less type	N/A
4.8.3.3	**Fire hazard residual current type test for isolated inverters**	Transformer less type	N/A
4.8.3.4	**Protection by application of RCD's**		N/A
	- The requirement for additional protection in 4.8.3.1 can be met by provision of an RCD with a residual current setting of 30 mA, located between the inverter and the mains..		N/A
	- The selection of the RCD type to ensure compatibility with the inverter must be made according to rules for RCD selection in Part 1.		N/A
	- The RCD provided integral to the inverter, or		N/A
	- The RDC provided by the installer if details of the rating, type, and location for the RCD are given in the installation instructions per 5.3.2.9.		N/A
4.8.3.5	**Protection by residual current monitoring**		P
4.8.3.5.1	**General**		P
	Where required by Table 30, the inverter shall provide residual current monitoring that functions whenever the inverter is connected to the mains with the automatic disconnection means closed.		P
	The residual current monitoring means shall measure the total (both a.c. and d.c. components) RMS current.		P
	As indicated in Table 30 for different inverter types, array types, and inverter isolation levels, detection may be required for excessive continuous residual current, excessive sudden changes in residual current, or both, according to the following limits:		-
	a) Continuous residual current: The inverter shall disconnect within 0,3 s and indicate a		P

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Telefax : +86 20 3832 0478
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Clause	Requirement + Test	Result - Remark	Verdict
	fault in accordance with 13.9 if the continuous residual current exceeds:		
	- maximum 300 mA for inverters with continuous ouput power rating ≤30kV;		N/A
	- maximum 10 mA per kVA of rated continuous output power for inverters with continuous output power rating > 30 kVA.		P
	The inverter may attempt to re-connect if the array insulation resistance meets the limit in 4.8.2.		N/A
	b) Sudden changes in residual current: The inverter shall disconnect from the mains within the time specified in Table 31		P
	The inverter indicates a fault in accordance with 13.9, if a sudden increase in the RMS residual current is detected exceeding the value in the table.		P
	The inverter may attempt to re-connect if the array insulation resistance meets the limit in 4.8.2.		N/A
4.8.3.5.2	**Test for detection of excessive continuous residual current: test repeated 5 times and time to disconnect shall not exceed 0,3 s.**	See appended test table 4.8.3.5.2	P
4.8.3.5.3	**Test for detection of sudden changes in residual current repeated 5 times and each of the 5 results shall not exceed the time limit indicated in for each row (30mA, 60mA and150mA) of Table 31.**	See appended test table 4.8.3.5.3	P
4.8.3.6	**Systems located in closed electrical operating areas**		N/A
	The protection against shock hazard is not required if the installation information provided with the inverter indicates the restriction for use in a closed electrical operating area, and		N/A
	Installation information indicates what forms of shock hazard protection are and are not provided integral to the inverter, in accordance with 5.3.2.7.		N/A
	The inverter shall be marked as in 5.2.2.6.		N/A
5	**MARKING AND DOCUMENTATION**		P
5.1	**Marking**		P
5.1.4	**Equipment ratings**		P
	PV input ratings:		P
	- Vmax PV (absolute maximum) (d.c. V)		P
	- Isc PV (absolute maximum) (d.c. A)		P
	a.c. output ratings:		P
	- Voltage (nominal or range) (a.c. V)		P
	- Current (maximum continuous) (a.c. A)		P
	- Frequency (nominal or range) (Hz)		P
	- Power (maximum continuous) (W or VA)		P
	- Power factor range		P
	a.c input ratings:		N/A
	- Voltage (nominal or range) (a.c. V)		N/A
	- Current (maximum continuous) (a.c. A)		N/A
	- Frequency (nominal or range) (Hz)		N/A
	d.c. output ratings:		N/A
	- Voltage (nominal or range) (d.c. V)		N/A
	- Current (maximum continuous) (d.c. A)		N/A
	Protective class (I or II or III)		P
	Ingress protection (IP) rating per part 1		P

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TÜV SÜD Certification and Testing (China) Co., Ltd.
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Clause	Requirement + Test	Result - Remark	Verdict
	An inverter that is adjustable for more than one nominal output voltage shall be marked to indicate the particular voltage for which it is set when shipped from the factory.		N/A
5.2	**Warning markings**		N/A
5.2.2	**Content for warning markings**		N/A
5.2.2.6	**Inverters for closed electrical operating areas**		N/A
	Where required by 4.8.3.6, an inverter not provided with full protection against shock hazard on the PV array shall be marked with a warning that the inverter is only for use in a closed electrical operating area, and referring to the installation instructions.		N/A
5.3	**Documentation**		P
5.3.2	**Information related to installation**		P
5.3.2.1	**Ratings. Subclause 5.3.2 of Part 1 requires the documentation to include ratings information for each input and output. For inverters this information shall be as in Table 33 below. Only those ratings that are applicable based on the type of inverter are required.**		P
	PV input quantities :		P
	- Vmax PV (absolute maximum) (d.c. V)		P
	- PV input operating voltage range (d.c. V)		P
	- Maximum operating PV input current (d.c. A)		P
	- Isc PV (absolute maximum) (d.c. A)		P
	- Isc PV (absolute maximum) (d.c. A)		P
	- Max. inverter backfeed current to the array (a.c. or d.c. A)		P
	a.c. output quantities:		P
	- Voltage (nominal or range) (a.c. V)		P
	- Current (maximum continuous) (a.c. A)		P
	- Current (inrush) (a.c. A, peak and duration)		P
	- Frequency (nominal or range) (Hz)		P
	- Power (maximum continuous) (W or VA)		P
	- Power factor range		P
	- Maximum output fault current (a.c. A, peak and duration or RMS)		P
	- Maximum output overcurrent protection (a.c. A)		P
	a.c. input quantities:		N/A
	- Voltage (nominal or range) (a.c. V)		N/A
	- Current (maximum continuous) (a.c. A)		N/A
	- Current (inrush) (a.c. A, peak and duration)		N/A
	- Frequency (nominal or range) (Hz)		N/A
	d.c input (other than PV) quantities:		N/A
	- Voltage (nominal or range) (d.c. V)		N/A
	- Nominal battery voltage (d.c. V)		N/A
	- Current (maximum continuous) (d.c. A)		N/A
	d.c. output quantities:		N/A
	- Voltage (nominal or range) (d.c. V)		N/A
	- Nominal battery voltage (d.c. V)		N/A
	- Current (maximum continuous) (d.c. A)		N/A
	Protective class (I or II or III)		P
	Ingress protection (IP) rating per part 1		P
5.3.2.2	**Grid-interactive inverter setpoints**	Non-adjustable to operator, settled by manufacture before shipment	N/A

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	For a grid-interactive unit with field adjustable trip points, trip times, or reconnect times, the presence of such controls, the means for adjustment, the factory default values, and the limits of the ranges of adjustability shall be provided in the documentation for the PCE or in other format such as on a website. Provided solution: ……		N/A
	The setting of field adjustable setpoints shall be accessible from the PCE		P
5.3.2.3	**Transformers and isolation**		N/A
	whether an internal isolation transformer is provided, and if so, what level of insulation (functional, basic, reinforced, or double) is provided by that transformer. The instructions shall also indicate what the resulting installation requirements are regarding such things as earthing or not earthing the array, providing external residual current detection devices, etc.	Non-isolation, the PV array shall not be earthed	N/A
	An inverter shall be provided with information to the installer regarding:		N/A
	- providing of internal isolation transformer		N/A
	- the level of insulation (functional, basic, reinforced, or double)		N/A
	The instructions shall also indicate what the resulting installation requirements are regarding:		P
	- earthing or not earthing the array	Not earthed	P
	- providing external residual current detection devices		N/A
	- requiring an external isolation transformer,		N/A
5.3.2.4	**Transformers required but not provided**		N/A
	An inverter that requires an external isolation transformer not provided with the unit, shall be provided with instructions that specify, and for the external isolation transformer with which it is intended to be used:		N/A
	- the configuration type		N/A
	- electrical ratings		N/A
	- environmental ratings		N/A
5.3.2.5	**PV modules for non-isolated inverters**		P
	Non-isolated inverters shall be provided with installation instructions that require PV modules that have an IEC 61730 Class A rating		P
	If the maximum AC mains operating voltage is higher than the PV array maximum system voltage then the instructions shall require PV modules that have a maximum system voltage rating based upon the AC mains voltage.		N/A
5.3.2.6	**Non-sinusoidal output waveform information**		N/A
	The instruction manual for a stand-alone inverter not complying with 4.7.5.2 shall include a warning that:		N/A
	- the waveform is not sinusoidal,		N/A
	- some loads may experience increased heating,		N/A
	- the user should consult the manufacturers of the intended load equipment before operating that load with the inverter		N/A
	The inverter manufacturer shall provide information regarding:		N/A
	- what types of loads may experience increased heating		N/A
	- recommendations for maximum operating times with such loads		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	The inverter manufacturer shall specify for the waveforms as determined by the testing in 4.7.5.3.2 through 4.7.5.3.4.:		N/A
	- THD		N/A
	- slope		N/A
	- peak voltage		N/A
5.3.2.7	**Systems located in closed electrical operating areas**		N/A
	Where required by 4.8.3.6, an inverter not provided with full protection against shock hazard on the PV array shall be provided with installation instructions:		N/A
	- requiring that the inverter and the array must be installed in closed electrical operating areas		N/A
	- indicating which forms of shock hazard protection are and are not provided integral to the inverter (for example the RCD, isolation transformer complying with the 30 mA touch current limit, or residual current monitoring for sudden changes)		N/A
5.3.2.8	**Stand-alone inverter output circuit bonding**		N/A
	Where required by 7.3.10, the documentation for an inverter shall include the following:		N/A
	- if output circuit bonding is required but is not provided integral to the inverter, the required means shall be described in the installation instructions, including which conductor is to be bonded and the required current carrying capability or cross-section of the bonding means;		N/A
	- if the output circuit is intended to be floating, the documentation for the inverter shall indicate that the output is floating.		N/A
5.3.2.9	**Protection by application of RCD's**		N/A
	Where the requirement for additional protection in 4.8.3.1 is met by requiring an RCD that is not provided integral to the inverter, as allowed by 4.8.3.4, the installation instructions shall state the need for the RCD,.		N/A
	and shall specify its rating, type, and required circuit location		N/A
5.3.2.10	**Remote indication of faults**		P
	The installation instructions shall include an explanation of how to properly make connections to (where applicable), and use, the electrical or electronic fault indication required by 13.9.		P
5.3.2.11	**External array insulation resistance measurement and response**		N/A
	The installation instructions for an inverter for use with ungrounded arrays that does not incorporate all the aspects of the insulation resistance measurement and response requirements in 4.8.2.1, must include:		N/A
	- for isolated inverters: an explanation of what aspects of array insulation resistance measurement and response are not provided, and		N/A
	- an instruction to consult local regulations to determine if any additional functions are required or not;		N/A
	- for non-isolated inverters: an explanation of what external equipment must be provided in the system, and		N/A
	- what the setpoints and response implemented by that equipment must be, and:		N/A

Telephone : +86 20 3832 0668
Telefax : +86 20 3832 0478

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TÜV SÜD Certification and Testing (China) Co., Ltd.
Guangzhou Branch, TÜV SÜD Group
5F, Communication Building, 163 Pingyun Rd, Huangpu Ave. West, Guangzhou 510656, P. R. China

IEC 62109-2			
Clause	Requirement + Test	Result - Remark	Verdict
	- how that equipment is to be interfaced with the rest of the system.		N/A
5.3.2.12	**Array functional grounding information**		N/A
	Where approach a) of 4.8.2.2 is used, the installation instructions for the inverter shall include all of the following:		N/A
	a) the value of the total resistance between the PV circuit and ground integral to the inverter ……		N/A
	b) the minimum array insulation resistance to ground that system designer or installer must meet when selecting the PV panel and system design, based on the minimum value that the design of the PV functional grounding in the inverter was based on ……;		N/A
	c) the minimum value of the total resistance R = VMAX PV/30 mA that the system must meet, with an explanation of how to calculate the total ……;		N/A
	d) a warning that there is a risk of shock hazard if the total minimum resistance requirement is not met.		N/A
5.3.2.13	**Stand-alone inverters for dedicated loads**		N/A
	Where the approach of 4.7.5.5 is used, the installation instructions for the inverter shall include a warning that the inverter is only to be used with the dedicated load for which it was evaluated, and		N/A
	shall specify the dedicated load.		N/A
5.3.2.14	**Identification of firmware version(s)**		P
	An inverter utilizing firmware for any protective functions shall provide means to identify the firmware version.		P
	This can be a marking, but the information can also be provided by a display panel, communications port or any other type of user interface		P
7	**PROTECTION AGAINST ELECTRIC SHOCK AND ENERGY HAZARDS**		P
7.3	**Protection against electric shock**		P
7.3.10	**Additional requirements for stand-alone inverters**		N/A
	One circuit conductor bonded to earth to create a grounded conductor and an earthed system.		N/A
	The means used to bond the grounded conductor to protective earth provided within the inverter or		N/A
	as part of the installation		N/A
	If not provided integral to the inverter, the required means shall be described in the installation instructions as per 5.3.2.8.		N/A
	The means used to bond the grounded conductor to protective earth shall comply with the requirements for protective bonding in Part 1,		N/A
	If the bond can only ever carry fault currents in stand-alone mode, the maximum current for the bond is determined by the inverter maximum output fault current.		N/A
	Output circuit bonding arrangements shall ensure that in any mode of operation, the system only has the grounded circuit conductor bonded to earth in one place at a time..		N/A
	Switching arrangements may be used, in which case the switching device used is to be subjected to the bond impedance test along with the rest of the bonding path		N/A

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Guangzhou Branch, TÜV SÜD Group
5F, Communication Building, 163 Pingyun Rd, Huangpu Ave. West, Guangzhou 510656, P. R. China

IEC 62109-2			
Clause	Requirement + Test	Result - Remark	Verdict
	Inverters intended to have a circuit conductor bonded to earth shall not impose any normal current on the bond except for leakage current.		N/A
	Outputs that are intentionally floating with no circuit conductor bonded to ground, must not have any voltages with respect to ground that are a shock hazard in accordance with Clause 7 of Parts 1 and 2.		N/A
	The documentation for the inverter shall indicate that the output is floating as per 5.3.2.8.		N/A
7.3.11	**Functionally grounded arrays**		N/A
	All PV conductors in a functionally grounded array shall be treated as being live parts with respect to protection against electric shock.		N/A
9	**PROTECTION AGAINST FIRE HAZARDS**		P
9.3	**Short-circuit and overcurrent protection**		P
9.3.4	**Inverter backfeed current onto the array**		P
	The backfeed current testing and documentation requirements in Part 1 apply, including but not limited to the following.		P
	Inverter backfeed current onto the PV array maximum value……..		P
	This inverter backfeed current value shall be provided in the installation instructions regardless of the value of the current, in accordance with Table 33.		P
13	**PHYSICAL REQUIREMENTS**		P
13.9	**Fault indication**		P
	Where this Part 2 requires the inverter to indicate a fault, both of the following shall be provided:		P
	a) a visible or audible indication, integral to the inverter, and detectable from outside the inverter, and		P
	b) an electrical or electronic indication that can be remotely accessed and used.		P
	The installation instructions shall include information regarding how to properly make connections (where applicable) and use the electrical or electronic means in b) above, in accordance with 5.3.2.10.		P

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4.4.4.15.1	Fault-tolerance of residual current monitoring	P
Ambient temperature (°C)	24.6	—
Relative humidity (%)……:	59.3	—

No.	component	Fault	Input (Vdc)	Output (Vac)	Test duration	Fuse current(A)	Observation
1.	U24 Pin8 to Pin13 (Control board)	S-C	1160	800, 255	10min	--	Fault applied during unit operation, after applied the fault, unit protected and does not connect to grid. Alarm light indicated on cover board. Software warming “GFCIFualt”. No damaged, no hazards. The unit can be recoverable after fault removed.
2.	CN11 Pin16 to Pin30 (Control board)	S-C	1160	800, 255	10min	--	Fault applied during unit operation, after applied the fault, unit protected and does not connect to grid. Alarm light indicated on cover board. Software warming “GFCIFualt”. No damaged, no hazards. The unit can be recoverable after fault removed.
3.	R53 (Output board)	S-C	1160	800, 255	10min	--	Fault applied during unit operation. Operating as normal, no damage, no hazard. Can resettable.
4.	L2 pin1 to pin4(Output board)	S-C	1160	800, 255	10min	--	Fault applied during unit operation, after applied the fault, unit protected and does not connect to grid. Alarm light indicated on cover board. Software warming “GFCIFualt”. No damaged, no hazards. The unit can be recoverable after fault removed.
Supplementary information: S-C: short circuit, O-C: open circuit							

4.4.4.15.2	Fault-tolerance of automatic disconnecting means	P
Ambient temperature (°C) .....:	24.6	
Power source for EUT: Manufacturer, model/type, output rating :	--	

No.	Component	Fault	Supply voltage (V)	Test time	Fuse #	Fuse current (A)	Observation
1.	RY1 (pin3 to pin4)	S-C	1160	10min	--	--	Fault applied before test, unit can’t connect to grid. Software warming “RelayFail”. And the unit can be recoverable after fault removed.
2.	RY2	S-C	1160	10min	--	--	Same as above.
3.	RY3	S-C	1160	10min	--	--	Same as above.
4.	RY4	S-C	1160	10min	--	--	Same as above.
5.	RY5	S-C	1160	10min	--	--	Same as above.
6.	RY6	S-C	1160	10min	--	--	Same as above.
Check that the relays fulfil the basic insulation or simple separation based on the PV circuit working voltage.							Yes L distance:4mm*2=8mm
Each active phase can be switched. (L and N)							Yes
Supplementary information: S-C: short circuit, O-C: open circuit							

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4.4.4.17	Cooling system failure – Blanketing test		P
Input	Test voltage (Vdc)	918Vd.c.	—
	Test current (Idc)	278A	—
Output	Test voltage (Vac)	800Va.c.	—
	Test current (Iac)	183A	—
--	t_{amb1} (°C)	34.8	—
--	t_{amb2} (°C)	35.0	—
Input	Test duration……,	4h	
maximum temperature T of part/at::		T (°C)	T_{max} (°C)
External left side surface		31.4	90
External top surface		68.0	90
External back surface		72.7	90
Mounting surface		52.8	90
Supplementary information:			

4.8.2.1	Array insulation resistance detection for inverters for ungrounded arrays				P
DC Voltage below minimum operating voltage (V)	DC Voltage for inverter begin operation (V)	Resistance between ground and PV input terminal (Ω)	Required Insulation resistance R = ($V_{MAX\ PV}$ / 30mA) (Ω)	Result	
PV+ (12 trackers in parallel)					
550Vdc	500Vdc	45kΩ	1500V/30mA=50kΩ	1. Software warming "PEConnectFault"; Alarm light indicated on cover board; 2. Unit cannot start up and connect to grid.	
PV- (12 trackers in parallel)					
550Vdc	500Vdc	45kΩ	1500V/30mA=50kΩ	Same as above	
Note: For isolated inverters, shall indicate a fault in accordance with 13.9 (operation is allowed); the fault indication shall be maintained until the array insulation resistance has recovered to a value higher than the limit above For non-isolated inverters, or inverters with isolation not complying with the leakage current limits in the minimum inverter isolation requirements in Table 30, shall indicate a fault in accordance with 13.9, and shall not connect to the mains; the inverter may continue to make the measurement, may stop indicating a fault and may connect to the mains if the array insulation resistance has recovered to a value higher than the limit above. It is not required to test all PV input terminals if analysis of the design indicates that one or more terminals can be expected to have the same result, for example where multiple PV string inputs are in parallel.					

4.8.3.5.2	Test for detection of excessive continuous residual current								P
Test conditions:	See below								
Tracker No.	PV (+ or -)	Input (Vdc)	Output (Vac, kW)	Baseline trigger current (mA)	Measured trigger time (ms), shall < 300 ms (repeat 5 times)				
PV1 (12 trackers in parallel)	+	1160	800, 255	2265	264.5	255.3	258.8	260.1	253.2
PV1 (12 trackers in parallel)	-	1160	800, 255	2265	257.2	264.8	266.2	259.4	263.5
Note: – maximum 300mA for inverters with continuous output power rating ≤30 kVA; – maximum 10mA per kVA of rated continuous output power for inverters with continuous output power									

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rating > 30 kVA. This test shall be repeated 5 times, and for all 5 tests the time to disconnect shall not exceed 0,3s. The test is repeated for each PV input terminal. It is not required to test all PV input terminals if analysis of the design indicates that one or more terminals can be expected to have the same result, for example where multiple PV string inputs are in parallel.
Supplementary information: All above tests indicate a fault in accordance with clause 13.9. Trip settings by designer.

4.8.3.5.3	**Test for correct triggering with sudden instance residual current**								P
Tracker No.	PV (+ or -)	Input (Vdc)	Output (Vac, kW)	Baseline trigger current (mA)	Measured trigger time (ms), shall < 300 ms for (30 mA); (repeat 5 times)				
30 mA sudden changes in residual current									
PV1 (12 trackers in parallel)	+	1160	800, 255	2220	218.2	216.4	209.5	215.5	220.5
PV1 (12 trackers in parallel)	-	1160	800, 255	2220	212.5	213.8	217.7	209.4	216.7
Tracker No.	PV (+ or -)	Input (Vdc)	Output (Vac, kW)	Baseline trigger current (mA)	Measured trigger time (ms), shall <150 ms for (60 mA); (repeat 5 times)				
60 mA sudden changes in residual current									
PV1 (12 trackers in parallel)	+	1160	800, 255	2175	61.3	56.7	62.4	60.3	63.4
PV1 (12 trackers in parallel)	-	1160	800, 255	2175	58.8	61.7	61.2	55.4	62.9
Tracker No.	PV (+ or -)	Input (Vdc)	Output (Vac, kW)	Baseline trigger current (mA)	Measured trigger time (ms), shall <40 ms for (150 mA); (repeat 5 times)				
150 mA sudden changes in residual current									
PV1 (12 trackers in parallel)	+	1160	800, 255	2040	37.5	37.4	35.4	36.1	33.8
PV1 (12 trackers in parallel)	-	1160	800, 255	2040	35.9	36.3	36.6	37.4	35.1
Note: The capacitive current is risen until disconnection. Test condition: I_c + 30/60/150mA <= I_{cmax}. R_1 is set that 30/60/150mA Flow and switch S is closed.									
Supplementary information: All above tests indicate a fault in accordance with clause 13.9. Trip settings by designer.									

……End of test report……..……

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Telefax : +86 20 3832 0478

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TÜV SÜD Certification and Testing (China) Co., Ltd.
Guangzhou Branch, TÜV SÜD Group
5F, Communication Building, 163 Pingyun Rd, Huangpu Ave. West, Guangzhou 510656, P. R. China