Prüfbericht-Nr.: *Test Report No.*:	**15093538 002**	**Auftrags-Nr.:** *Order No.*:	154183248	Seite 1 von 23 *Page 1 of 23*
Kunden-Referenz-Nr.: *Client Reference No.*:	505120	**Auftragsdatum:** *Order date*:	20.07.2016	
Auftraggeber: *Client*:	**Huawei Technologies Co., Ltd.** Administration Building, Headquarters of Huawei Technologies Co., Ltd., Bantian, Longgang District, Shenzhen, 518129, P.R.China			
Prüfgegenstand: *Test item*:	SOLAR INVERTER			
Bezeichnung / Typ-Nr.: *Identification / Type No.*:	SUN2000-50KTL, SUN2000-50KTL-C1, SUN2000-42KTL, SUN2000-36KTL, SUN2000-33KTL-JP, SUN2000-40KTL-JP, SUN2000-43KTL-IN-C1, SUN2000-24.7KTL-JP			
Auftrags-Inhalt: *Order content*:	TUV Bauart approval			
Prüfgrundlage: *Test specification*:	EN 62109-1: 2010 IEC 62109-1: 2010, EN 62109-2: 2011, IEC 62109-2: 2011			

Wareneingangsdatum: *Date of receipt*:	27.07.2016
Prüfmuster-Nr.: *Test sample No.*:	SHM20160727001-002
Prüfzeitraum: *Testing period*:	27.07.2016– 27.07.2016
Ort der Prüfung: *Place of testing*:	TÜV Rheinland (Shanghai) Co.,Ltd.
Prüflaboratorium: *Testing laboratory*:	TÜV Rheinland (Shanghai) Co.,Ltd.
Prüfergebnis*: *Test result**:	Pass

geprüft von / *tested by*:

22.09.2016	John Dai / PE	John Dai
Datum *Date*	**Name / Stellung** *Name / Position*	**Unterschrift** *Signature*

kontrolliert von / *reviewed by*:

22.09.2016	Tony Chen / TC	Tony Chen
Datum *Date*	**Name / Stellung** *Name / Position*	**Unterschrift** *Signature*

Sonstiges / *Other*:

1. Added one new additional models of SUN2000-24.7KTL-JP.
2. Max. Output Current of SUN2000 43KTL-IN-C1 change from 60.8A to 60.7A.
3. Add a new approved component for alternative use.
4. CDF 1.0 date Sep. 22, 2016 replaced CDF 1.0 date Apr., 20, 2016.

Zustand des Prüfgegenstandes bei Anlieferung: Prüfmuster vollständig und unbeschädigt
Condition of the test item at delivery: *Test item complete and undamaged*

* Legende:	1 = sehr gut	2 = gut	3 = befriedigend	4 = ausreichend	5 = mangelhaft
	P(ass) = entspricht o.g. Prüfgrundlage(n)		F(ail) = entspricht nicht o.g. Prüfgrundlage(n)	N/A = nicht anwendbar	N/T = nicht getestet
Legend:	*1 = very good*	*2 = good*	*3 = satisfactory*	*4 = sufficient*	*5 = poor*
	P(ass) = passed a.m. test specification(s)		*F(ail) = failed a.m. test specification(s)*	*N/A = not applicable*	*N/T = not tested*

Test Report issued under the responsibility of:

TÜVRheinland®

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TEST REPORT
IEC 62109-1
Safety of power converters for use in photovoltaic power systems – Part1: General requirements

Report Reference No. ..... :	15093538 002
Tested by (name + signature) ..... :	See cover page
Witnessed by (name + signature) .... :	N/A
Supervised by (name + signature) ... :	N/A
Approved by (name + signature) ..... :	See cover page
Date of issue..... :	See cover page
Testing Laboratory ..... :	**TÜV Rheinland (Shanghai) Co., Ltd.**
Address ..... :	B1-13F, No. 177, Lane 777, West Guangzhong Road, Zhabei District, Shanghai 200072, P. R. China
Testing location/ procedure ..... :	CBTL☐ TMP☐ WMT☐ SMT☐ RMT☐ CCATL☒
Testing location/ address ..... :	See cover page.
Applicant's name ..... :	**Huawei Technologies Co., Ltd.**
Address ..... :	Administration Building, Headquarters of Huawei Technologies Co., Ltd., Bantian, Longgang District, Shenzhen, 518129, P.R.C.
Test specification:	
Standard ..... :	IEC 62109-1: 2010, EN 62109-1: 2010
Test procedure ..... :	☐ CB-scheme / ☒ CCA-scheme
Non-standard test method…….. :	N/A
Test Report Form No..... :	IEC 62109-1A
Test Report Form(s) Originator ..... :	VDE Testing and Certification Institute
Master TRF..... :	Dated 2011-03

Test item description ..... :	SOLAR INVERTER
Trade Mark ..... :	HUAWEI
Manufacturer ..... :	Huawei Technologies Co., Ltd.
Model/Type reference ..... :	SUN2000-50KTL, SUN2000-50KTL-C1, SUN2000-42KTL, SUN2000-36KTL, SUN2000-33KTL-JP, SUN2000-40KTL-JP, **SUN2000-43KTL-IN-C1**, **SUN2000-24.7KTL-JP**
Ratings ..... :	See marking label

Testing procedure and testing location:	
☒ **CB Testing Laboratory:**	
Testing location/ address.....:	
☐ **Associated CB Test Laboratory:**	
Testing location/ address.....:	
Tested by (name + signature) .....:	See cover page
Approved by (+ signature).....:	See cover page
☐ Testing procedure: TMP	
Tested by (name + signature) .....:	
Approved by (+ signature).....:	
Testing location/ address.....:	
☐ Testing procedure: WMT	
Tested by (name + signature) .....:	
Witnessed by (+ signature) .....:	
Approved by (+ signature).....:	
Testing location/ address.....:	
☐ Testing procedure: SMT	
Tested by (name + signature) .....:	
Approved by (+ signature).....:	
Supervised by (+ signature) .....:	
Testing location/ address.....:	
☐ Testing procedure: RMT	
Tested by (name + signature) .....:	
Approved by (+ signature).....:	
Supervised by (+ signature) .....:	
Testing location/ address.....:	

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

None.

Summary of testing

Tests performed (name of test and test clause):	**Testing location:**
- See General Product Information on the following pages.	The laboratory described on cover page.

Summary of compliance with National Differences

List of countries addressed: None.

☒ The product fulfils the requirements of

IEC/EN 62109-2: 2011

Copy of marking plate:

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

Test item particular ..... :	
Equipment mobility ..... :	☐ movable ☐ hand-held ☐ transportable ☒ fixed ☐ stationary ☐ for building-in
Connection to the mains..... :	☐ pluggable equipment ☐ direct plug-in ☒ permanent connection ☐ for building-in
Enviromental category..... :	☒ outdoor ☒ indoor conditional ☒ indoor unconditional
Operating condition ..... :	☒ continuous ☐ short-time ☐ intermittent
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 (%) ..... :	According to the specified supply range, see model list on the following pages for details.
Tested for IT power systems ..... :	☐ Yes ☒ No
IT testing, phase-phase voltage (V) ..... :	N/A
Class of equipment ..... :	☒ Class I ☐ Class II ☐ Class III ☐ Not classified
Mass of equipment (kg)..... :	See model list on the following pages.
Pollution degree ..... :	☐ PD1 ☒ PD2 (Inside) ☒ PD3 (Outside)
IP protection class ..... :	IP65
Possible test case verdicts:	
- test case does not apply to the test object ..... :	N/A
- test object was not evaluated for the requirement .... :	N/E
- test object does meet the requirement ..... :	Pass (P)
- test object does not meet the requirement ..... :	Fail (F)
Testing:	
Date of receipt of test items..... :	Aug., 2016
Date(s) of performance of tests..... :	Aug., 2016 – Aug., 2016

General remarks:

"(see Attachment #)" refers to additional information appended to the report.

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

The tests results presented in this report relate only to the object tested.

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

List of test equipment must be kept on file and available for review.

Additional test data and/or information provided in the attachments to this report.

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

Determination of the test results includes consideration of measurement uncertainty from the test equipment and methods.

Manufacturer's Declaration per sub-clause 6.2.5 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 (ies):

Huawei Machine Co., Ltd.

No. 2 City Avenue, Songshan Lake Sci. & Tech. Industry Park, 523808 Dongguan, People's Republic of China.

General product information:

Description of changes:

1. Added one new additional models of SUN2000-24.7KTL-JP.
   The above mentioned additional models are identical to the basic model SUN2000-50KTL (share the same circuit diagram, PCB layout, critical components) which was tested in test report 15093538 001 except the type desiganation and output rating limited by software. Also the output voltage of model SUN2000-24.7KTL-JP add 3~400Vac, 3~420V and 3~440V.

2. Max. Output Current of SUN2000 43KTL-IN-C1 change from 60.8A to 60.7A.

3. Add a new approved component for alternative use.

Change	Description	Comments
1.	Approved internal connecting wires with type of 10267, complies with UL758.	See attachment certificate of approval Ref. UL E187639 for details.
Note(s): For the above described change(s) no additional test is considered to be necessary.		

For the above described change(s) the following was considered to be necessary:

Change	Testing	Comments
	• 4.7 Electrical Ratings Tests	Refer to sub-clause 4.7 of Part 1.
	• 5 Marking and documentation	Refer to sub-clause 5 of Part 1.
	• 7.3.6.3 Protective Bonding Test	Refer to sub-clause 7.3.6.3 of Part 1.
Note(s):		

Model list:

MODELS LIST		SUN2000-50KTL	SUN2000-50KTL-C1	SUN2000-42KTL	SUN2000-36KTL
INPUT	V_{MAX} PV [Vdc]	1100	1100	1100	1100
	I_{SC} PV [A]	30A*4	30A*4	30A*4	30A*4
	MPP Voltage Range V_{MPP}[Vdc]	200-1000	200-1000	200-1000	200-1000
	Max. Input Current Imax [A]	22A*4	22A*4	22A*4	22A*4
	MPP Full Power Voltage Range [Vdc]	600-850	625-850	580-850	480-850
	Start PV Voltage [Vdc]	250	250	250	250
	Stop PV Voltage [Vdc] (PCE Shutdown)	200	200	200	200
	Backfeed Current [A]	0	0	0	0
	Overvoltage Category (OVC)	II	II	II	II
OUTPUT	Rated Output Voltage Ur [Vac]	3~ 480	3~ 500	3~ 480	3~ 380 / 3~ 400 / 3~ 480
	Normal Operating Voltage Range Un [Vac]	(80%-115%)Un ± 1.5V	(80%-115%)Un ± 1.5V	(80%-115%)Un ± 1.5V	(80%-115%)Un ± 1.5V
	Rated Output Frequency F_{NETZ} [Hz]	50	50	50/60	50/60
	Normal Operating Frequency Range Fn [Hz]	45-55	45-55	45-55/55-65	45-55/55-65
	Rated Output Power P_E [W]	46000	47500	42000	36000
	Max. Output Power P_{Emax} [W]	50500	52500	47000	40000
	Max. Output Current Imax [A]	60.8	60.8	56.6	60.7
	Power Factor cosφ [λ]	[-0.8, 0.8]	[-0.8, 0.8]	[-0.8, 0.8]	[-0.8, 0.8]
	Efficiency max. η_{max} [%]	98.8	98.8	98.8	98.6
	Standby Power Consumption [W]	10	10	10	10
	Night Power Consumption [W]	＜1.5	＜1.5	＜1.5	＜1.5
	THD [V / I] (100% full power)	＜ 3%	＜ 3%	＜ 3%	＜ 3%
	Acoustic Noise [dB]	≤50dBA	≤50dBA	≤50dBA	≤50dBA
	Overvoltage Category (OVC)	III	III	III	III
S T	Protective Class	I	I	I	I

	Enclosure Protection (IP)	IP65	IP65	IP65	IP65
	Operating Temperature Range [ºC]	-25 to +60	-25 to +60	-25 to +60	-25 to +60
	Pollution degree (PD)	PD 2	PD 2	PD 2	PD 2
	Altitude [m]	4000	4000	4000	4000
	Array Insulation Resistance Detection [Ω]	100k	100k	100k	100k
	The accuracy of resistance measurement [%]	[-10,0]	[-10,0]	[-10,0]	[-10,0]
	Weight [kg]	55	55	55	55
	Size [mm]	930×550×260	930×550×260	930×550×260	930×550×260
	Software	V200R002	V200R002	V200R002	V200R002

MODELS LIST		SUN2000-33KTL-JP	SUN2000-40KTL-JP	SUN2000-43KTL-IN-C1	**SUN2000-24.7KTL-JP**
INPUT	V_{MAX} PV [Vdc]	1100	1100	1100	**750**
	I_{SC} PV [A]	30A*4	30A*4	30A*4	**30A*4**
	MPP Voltage Range V_{MPP}[Vdc]	200-1000	200-1000	200-1000	**200-750**
	Max. Input Current Imax [A]	22A*4	22A*4	22A*4	**22A*4**
	MPP Full Power Voltage Range [Vdc]	400-850	480-850	500-850	**380-750**
	Start PV Voltage [Vdc]	250	250	250	**250**
	Stop PV Voltage [Vdc] (PCE Shutdown)	200	200	200	**200**
	Backfeed Current [A]	0	0	0	**0**
	Overvoltage Category (OVC)	II	II	II	**II**
OUTPUT	Rated Output Voltage Ur [Vac]	3~ 420 / 3~ 440 / 3~ 480	3~ 440 / 3~ 480	3~ 500	**3~ 400 / 3~ 420 / 3~ 440 / 3~ 480**
	Normal Operating Voltage Range Un [Vac]	(80%-115%)Un ± 1.5V	(80%-115%)Un ± 1.5V	(80%-115%)Un ± 1.5V	**(80%-115%)Un ± 1.5V**
	Rated Output Frequency F_{NETZ} [Hz]	50/60	50/60	50	**50/60**
	Normal Operating Frequency Range Fn [Hz]	45-55/55-65	45-55/55-65	45-55	**45-55/55-65**
	Rated Output Power P_E [W]	33300	40000	43000	**24700**
	Max. Output Power P_{Emax} [W]	33300	40000	52500	**24700**
	Max. Output Current Imax [A]	52.3	60.4	**60.7**	**36.1**
	Power Factor cosφ [λ]	[-0.8, 0.8]	[-0.8, 0.8]	[-0.8, 0.8]	**[-0.8, 0.8]**
	Efficiency max. η_{max} [%]	98.7	98.7	98.8	**98.8**
	Standby Power Consumption [W]	＜1.5	＜1.5	＜1.5	**＜1.5**
	Night Power Consumption [W]	10	10	10	**10**
	THD [V / I] (100% full power)	＜ 3%	＜ 3%	＜ 3%	**＜ 3%**
	Acoustic Noise [dB]	≤50dBA	≤50dBA	≤50dBA	**≤50dBA**

	Overvoltage Category (OVC)	III	III	III	**III**
SYSTEM	Protective Class	I	I	I	**I**
	Enclosure Protection (IP)	IP65	IP65	IP65	**IP65**
	Operating Temperature Range [ºC]	-25 to +60	-25 to +60	-25 to +60	**-25 to +60**
	Pollution degree (PD)	PD 2	PD 2	PD 2	**PD 2**
	Altitude [m]	4000	4000	4000	**4000**
	Array Insulation Resistance Detection [Ω]	100k	100k	100k	**100k**
	The accuracy of resistance measurement [%]	[-10,0]	[-10,0]	[-10,0]	**[-10,0]**
	Weight [kg]	55	55	55	**55**
	Size [mm]	930×550×260	930×550×260	930×550×260	**930×550×260**
	Software	V200R002	V200R002	V200R002	**V200R002**

IEC/EN 62109-1: 2010			
Clause	Requirement – Test	Result - Remark	Verdict
4.7	Electrical Ratings tests	See appended table 4.7	P
4.7.1	Input Ratings	Not exceed 10% of rated input current	P
4.7.2	Output Ratings	Output provides marked output power continuously. The max. output power measured not exceed 10% of rated output power	P
5	Marking and documentation		P
5.1	Marking		P
5.1.1	General		P
5.1.2	Durability of markings	The labels were subjected to the permanence of marking test. The labels were rubbed with the cloth soaked with petroleum spirit for 30 s. After this test there was no damage to the labels. The marking on the labels did not fade. There was no curling or lifting of the label's edges.	P
5.1.3	Identification	See below.	P
	a) the name or trade mark of the manufacturer or supplier	Trade mark is provided on the front control panel.	P
	b) a model number, name or other means to identify the equipment	The model name is provided on the label.	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.	The serial number is provided on the equipment body.	P
5.1.4	Equipment ratings	See below	P
	- input voltage, type of voltage (a.c. or d.c.), frequency, and max. continuous current for each input	See model list.	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	See model list.	P
	- Protective class (I, II, or III)	See model list.	P
	- Overvoltage Category	See model list.	P
	- the environmental information required in section 6	See model list and section 6.	P
5.1.5	Fuse identification	No such devices	N/A

IEC/EN 62109-1: 2010			
Clause	Requirement – Test	Result - Remark	Verdict
5.1.6	Terminals, Connections, and Controls	Relevant symbol, indicator or information are available.	P
5.1.6.1	Protective Conductor Terminals	Symbol 7 of Table C.1 is used.	P
5.1.7	Switches and circuit-breakers	The letter “ON” and “OFF” is clearly marked.	P
5.1.8	Class II Equipment	Class I Equipment.	N/A
5.1.9	Terminal boxes for External Connections	The temperature observed on the terminals were not exceed the limited values specified.	N/A
5.2	Warning markings	See below.	P
5.2.1	Visibility and legibility requirements for warning markings	Warning markings are be visible and legible.	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	No such symbols.	N/A
5.2.2	Content for warning markings		P
5.2.2.1	Ungrounded heatsinks and similar parts	All accessible metal parts were grounded.	N/A
5.2.2.2	Hot Surfaces	Marked with symbol 14 of Table C.1.	P
5.2.2.3	Coolant	Not used.	N/A
	a) a statement that coolant system servicing is to be done only by SERVICE PERSONNEL		N/A
	b) instructions for safe venting, draining or otherwise working on the cooling system		N/A
5.2.2.4	Stored energy	Marked with Symbol 21 of Table C.1 and the time to discharge capacitors to safe voltage and energy levels accompany the symbol.	P
5.2.2.5	Motor guarding	No such devices which can conducted injury to service personal.	N/A
5.2.3	Sonic hazard markings and instructions	No such hazard.	N/A
	a) be marked to warn the OPERATOR of the sonic pressure hazard		N/A

IEC/EN 62109-1: 2010			
Clause	Requirement – Test	Result - Remark	Verdict
	b) be provided with installation instructions that specify how the installer can ensure that the sound pressure level from equipment		N/A
5.2.4	Equipment with multiple sources of supply		P
5.2.5	Excessive touch current	No touch current exceed 3.5mAac. or 10mAdc. Under any operation conditions	N/A
5.3	Documentation	See below.	P
5.3.1	General	All related informations provided in the user's maunal.	P
	a) explanations of equipment markings, 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		P
	- ENVIRONMENTAL CATEGORY as per 6.1		P
	- WET LOCATIONS classification as per 6.1		P
	- POLLUTION DEGREE classification for the intended external environment as per 6.2		P
	- INGRESS PROTECTION rating as per 6.3		P
	- Ambient temperature and relative humidity ratings		P
	- OVERVOLTAGE CATEGORY assigned to each input and output port as per 7.3.7.1.2		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	Instructions related to safety is in English.	P
5.3.1.2	Format	The printed form is available and is delivered with the PCE.	P
5.3.2	Information related to installation	All below related informations provided in the user's maunal.	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

IEC/EN 62109-1: 2010			
Clause	Requirement – Test	Result - Remark	Verdict
	c) ratings and means of connection of any outputs from the PCE, and any requirements related to wiring and external controls, colour coding of leads, or overcurrent protection needed		P
	d) ventilation requirements		P
	e) requirements for special services, for example cooling liquid		N/A
	f) instructions and information relating to sound pressure level if required by 10.2.1	No sound pressure hazard.	N/A
	g) 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, prevent the accumulation of hazardous gases	No battery used in the PCE.	N/A
	h) tightening torque to be applied to wiring terminals		P
	i) 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	No backfeed current available	N/A
	j) for each input to the PCE, the max value of short-circuit current available from the source, for which the PCE is designed		P
	k) compatibility with RCD and RCM		P
	l) instructions for protective earthing, including the information required by 7.3.6.3.6 applicable		P
5.3.3	Information related to operation	All below related informations provided in the user's maunal.	P
	- instructions for adjustment of controls including the effects of adjustment		P
	- instructions for interconnection to accessories and other equipment, including indication of suitable accessories, detachable parts and any special materials		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		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	All below related informations provided in the service maunal.	P

IEC/EN 62109-1: 2010			
Clause	Requirement – Test	Result - Remark	Verdict
	- Intervals and instructions for any preventive maintenance that is required to maintain safety (for example air filter replacement or periodic re-tightening of terminals)		P
	- instructions for accessing OPERATOR ACCESS AREAS , if any are present, including a warning not to enter other areas of the equipment		P
	- part numbers and instructions for obtaining any required operator replaceable parts	No any operator replaceable part.	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
	- where required by 7.3.9.2, information regarding the location(s) and safe discharge times for capacitor(s).		P
5.3.4.1	Battery maintenance	The PCE is Grid Interactive inverter without battery energy storage function.	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 installation of batteries		N/A
	- CAUTION: Do not dispose of batteries in a fire. The batteries may explode		N/A
	- CAUTION: Do not open or mutilate 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.		N/A
	The following precautions should be observed when working on batteries: 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

IEC/EN 62109-1: 2010			
Clause	Requirement – Test	Result - Remark	Verdict
	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
7.3.6.3	Protective class I - Protective bonding		P
7.3.6.3.1	General	Suitable protective bonding through direct metallic contact provided. And the paint and coating removed in the area of contact.	P
7.3.6.3.2	Requirements for protective bonding	Considered	P
7.3.6.3.3	Rating of protective bonding Protective bonding shall meet following requirements: 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.	See 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.	Max. 1.28V	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.	The alternative of 7.3.6.3.5 is considered.	P
7.3.6.3.3.1	Test current, duration, and acceptance criteria 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 120 s. The impedance of the protective bonding means during and at the end of the test shall not exceed 0,1 Ω	See above.	N/A
	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.	160A, 6 min.	P

<table>
<tr><td colspan="4">IEC/EN 62109-1: 2010</td></tr>
<tr><td>Clause</td><td>Requirement – Test</td><td>Result - Remark</td><td>Verdict</td></tr>
<tr><td></td><td>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.
Table 10 – Test duration for protective bonding test
<table>
<tr><th>Overcurrent protective devide rating
A</th><th>Duration of the test
min</th></tr>
<tr><td>>16 to 30</td><td>2</td></tr>
<tr><td>31 to 60</td><td>4</td></tr>
<tr><td>61 to 100</td><td>6</td></tr>
<tr><td>101 to 200</td><td>8</td></tr>
<tr><td>> 200</td><td>10</td></tr>
</table></td><td></td><td>P</td></tr>
<tr><td>7.3.6.3.4</td><td>Protective bonding impedance (routine test)
The test shall be as in 7.3.6.3.3, except for the following:
·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;
· the test duration may be reduced to no less than 2 s.
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
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).</td><td>Considered.</td><td>P</td></tr>
<tr><td>7.3.6.3.5</td><td>External protective earthing conductor
Table 11 – External protective earthing conductor cross-section
<table>
<tr><th>Cross-sectional area of phase conductors of the PCE, S
mm²</th><th>Minimum cross-sectional area of the corresponding external protective earthing conductor, S_p
mm²</th></tr>
<tr><td>S ≤ 16</td><td>S</td></tr>
<tr><td>16 < S ≤ 35</td><td>16</td></tr>
<tr><td>35 < S</td><td>S/2</td></tr>
<tr><td colspan="2">NOTE The values in this table are valid only if the external protective earthing conductor is made of the same metal as the phase conductors. If this is not so, the cross-sectional area of the external protective earthing conductor is to be determined in a manner which produces a conductance equivalent to that which results from the application of this table.</td></tr>
</table></td><td>Phase conductors : 16-25mm^2
Internal & External protective earthing conductor：16mm^2</td><td>P</td></tr>
<tr><td>7.3.6.3.6</td><td>Means of connection for the external protective earthing conductor</td><td></td><td>P</td></tr>
<tr><td>7.3.6.3.6.1</td><td>General</td><td></td><td>P</td></tr>
<tr><td></td><td>The means of connection for protective conductor corrosion-resistant</td><td>Corrosion-resistant is considered for connection and bonding points.</td><td>P</td></tr>
</table>

IEC/EN 62109-1: 2010			
Clause	Requirement – Test	Result - Remark	Verdict
	The means of connection for the protective earthing conductor shall be permanently marked with: – symbol 7 of Annex C; or – the colour coding green-yellow. Marking shall not be done on easily changeable parts such as screws.	With the symbol 7 of Table C.1. And Green-yellow wire is used.	P
7.3.6.3.7	Touch current in case of failure of the protective earthing conductor		P
	For plug-connected single phase PCE	Three phase PCE.	N/A
	For all other PCE	See appended table 7.5.5. In addition, the caution symbol 15 of Table C.1 provided on PCE and in manual.	P
	Connect two or more PCEs in parallel	Not for parallelly connection use.	N/A

14	Components		P
14.1	General	Components that are certified to IEC and /or national standards are used correctly within their ratings. Components not covered by IEC standards are tested under the conditions present in the equipment. See appended table 14.1.	P
14.2	Motor Overtemperature Protection	DC motor used in cooling fan. For overtemperature protection test or evaluation see appended table 4.4.4.	P
14.3	Overtemperature protection devices	No such devices	N/A
14.4	Fuse holders	No such devices	N/A
14.5	MAINS voltage selecting devices	No such devices.	N/A
14.6	Printed circuit boards	The PCB is UL certified with flammability classification of V-0 minimum.	P
14.7	Circuits or components used as transient overvoltage limiting devices	.	P
14.8	Batteries	Not batteries 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

IEC/EN 62109-1: 2010			
Clause	Requirement – Test	Result - Remark	Verdict
14.8.1.3	Ventilation instructions		N/A
14.8.2	Battery Mounting		N/A
14.8.3	Electrolyte spillage		N/A
14.8.4	Battery Connections		N/A
14.8.5	Battery Maintenance instructions		N/A
14.8.6	Battery accessibility and maintainability		N/A

4.7	TABLE: electrical data (in normal conditions)							P
Type	I/P rated	PV / DC Input			O/P rated	AC Output Testing cond.		
	I [A]	U [V]	I [A]	P [kW]	I [A]	U [V]	I [A]	P [kW]
SUN2000 43KTL-IN-C1	22*4	499.77	87.64	43.80	50.0	288.99	49.53	42.83
	22*4	749.9	59.54	43.55	50.0	288.57	49.74	42.99
	22*4	850.43	56.93	43.67	50.0	288.30	49.68	42.96
SUN2000 24.7KTL-JP	22*4	379.67	67.27	25.53	29.8	277.93	30.018 30.02	277.93 24.93 30.018
	22*4	479.79	53.07	25.45	29.8	277.89	30.03	24.94
	22*4	750.2	34.98	25.26	29.8	277.45	30.04	24.95
Note(s):								

7.3.6.3	TABLE: Protective Bonding Test	P
Location	Resistance measured (mΩ) or voltage drop (V)	Comments
PE terminal to metal enclosure	1.28V	160A, 6min.
Note(s):		

14	TABLE:List of critical components				
Object/part no.	Manufacturer/ trademark	Type/model	Technical data	Standard	Mark(s) of conformity[1)]
Note(s): See attachment 15093538 002 CDF.					

Prüfbericht-Nr.: *Test Report No.*:	**15093538 001**	**Auftrags-Nr.:** *Order No.*:	154152992	Seite 1 von 69 *Page 1 of 69*
Kunden-Referenz-Nr.: *Client Reference No.*:	505120	**Auftragsdatum:** *Order date*:	15.03.2016	
Auftraggeber: *Client*:	**Huawei Technologies Co., Ltd.** Administration Building, Headquarters of Huawei Technologies Co., Ltd., Bantian, Longgang District, Shenzhen, 518129, P.R.China			
Prüfgegenstand: *Test item*:	SOLAR INVERTER			
Bezeichnung / Typ-Nr.: *Identification / Type No.*:	SUN2000-50KTL, SUN2000-50KTL-C1, SUN2000-42KTL, SUN2000-36KTL, SUN2000-33KTL-JP, SUN2000-40KTL-JP, SUN2000-43KTL-IN-C1			
Auftrags-Inhalt: *Order content*:	TUV Bauart approval			
Prüfgrundlage: *Test specification*:	EN 62109-1: 2010 IEC 62109-1: 2010, EN 62109-2: 2011, IEC 62109-2: 2011			

Wareneingangsdatum: *Date of receipt*:	15.03.2016
Prüfmuster-Nr.: *Test sample No.*:	SHM20160315001-003
Prüfzeitraum: *Testing period*:	15.03.2016 – 18.04.2016
Ort der Prüfung: *Place of testing*:	TÜV Rheinland (Shanghai) Co.,Ltd.
Prüflaboratorium: *Testing laboratory*:	TÜV Rheinland (Shanghai) Co.,Ltd.
Prüfergebnis*: *Test result**:	Pass

geprüft von / *tested by*:

29.04.2016	John Dai / PE	John Dai
Datum *Date*	**Name / Stellung** *Name / Position*	**Unterschrift** *Signature*

kontrolliert von / *reviewed by*:

29.04.2016	Tony Chen / Reviewer	Tony Chen
Datum *Date*	**Name / Stellung** *Name / Position*	**Unterschrift** *Signature*

Sonstiges / *Other*:

None.

Zustand des Prüfgegenstandes bei Anlieferung: *Condition of the test item at delivery*:	Prüfmuster vollständig und unbeschädigt *Test item complete and undamaged*

* Legende:	1 = sehr gut	2 = gut	3 = befriedigend	4 = ausreichend	5 = mangelhaft
	P(ass) = entspricht o.g. Prüfgrundlage(n)		F(ail) = entspricht nicht o.g. Prüfgrundlage(n)	N/A = nicht anwendbar	N/T = nicht getestet
Legend:	*1 = very good*	*2 = good*	*3 = satisfactory*	*4 = sufficient*	*5 = poor*
	P(ass) = passed a.m. test specification(s)		*F(ail) = failed a.m. test specification(s)*	*N/A = not applicable*	*N/T = not tested*

Test Report issued under the responsibility of:

TÜVRheinland®

www.tuv.com

TEST REPORT
IEC 62109-1
Safety of power converters for use in photovoltaic power systems – Part1: General requirements

Report Reference No. ..... :	15093538 001.
Tested by (name + signature) ..... :	See cover page
Witnessed by (name + signature) .... :	N/A
Supervised by (name + signature) ... :	N/A
Approved by (name + signature)..... :	See cover page
Date of issue..... :	See cover page
Testing Laboratory ..... :	**TÜV Rheinland (Shanghai) Co., Ltd.**
Address ..... :	B1-13F, No. 177, Lane 777, West Guangzhong Road, Zhabei District, Shanghai 200072, P. R. China
Testing location/ procedure ..... :	CBTL☐ TMP☐ WMT☐ SMT☐ RMT☐ CCATL☒
Testing location/ address ..... :	See cover page.
Applicant's name ..... :	**Huawei Technologies Co., Ltd.**
Address ..... :	Administration Building, Headquarters of Huawei Technologies Co., Ltd., Bantian, Longgang District, Shenzhen, 518129, P.R.China
Test specification:	
Standard ..... :	IEC 62109-1: 2010, EN 62109-1: 2010
Test procedure ..... :	TUV Bauart approval
Non-standard test method…….. :	N/A
Test Report Form No..... :	IEC 62109-1A
Test Report Form(s) Originator ..... :	VDE Testing and Certification Institute
Master TRF..... :	Dated 2011-03

Test item description ..... :	SOLAR INVERTER
Trade Mark ..... :	
Manufacturer ..... :	Huawei Machine Co., Ltd.
Model/Type reference ..... :	SUN2000-50KTL, SUN2000-50KTL-C1, SUN2000-42KTL, SUN2000-36KTL, SUN2000-33KTL-JP, SUN2000-40KTL-JP, SUN2000-43KTL-IN-C1
Ratings ..... :	See marking label and model list

Testing procedure and testing location:	
☒ **CB Testing Laboratory:**	
Testing location/ address.....:	
☐ **Associated CB Test Laboratory:**	
Testing location/ address.....:	
Tested by (name + signature) .....:	See cover page
Approved by (+ signature).....:	See cover page
☐ Testing procedure: TMP	
Tested by (name + signature) .....:	
Approved by (+ signature).....:	
Testing location/ address.....:	
☐ Testing procedure: WMT	
Tested by (name + signature) .....:	
Witnessed by (+ signature) .....:	
Approved by (+ signature).....:	
Testing location/ address.....:	
☐ Testing procedure: SMT	
Tested by (name + signature) .....:	
Approved by (+ signature).....:	
Supervised by (+ signature) .....:	
Testing location/ address.....:	
☐ Testing procedure: RMT	
Tested by (name + signature) .....:	
Approved by (+ signature).....:	
Supervised by (+ signature) .....:	
Testing location/ address.....:	

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

- ATTACHMENT 1 – Test report of IEC 62109-2: 2011 (14 pages)
- ATTACHMENT 2 – Photos (14 pages)
- ATTACHMENT 3 – CDF (10 pages)

Summary of testing

Tests performed (name of test and test clause):	**Testing location:**
4.3 Temperature measurement 4.4 Testing in single fault condition 4.5.2 Humidity preconditioning 4.7 Electric rating test 5.1.2 Durability of marking test 6.3 Ingress protection (IP test) 7.4 Determination of hazardous energy level 7.5.1 Impulse voltage test 7.5.2 Voltage test (electric strength) 7.3.4 Protection against direct contact 7.3.7.4 and 7.3.7.5 Clearance and creepage distance 7.5.4 Touch current measurement 7.3.2.6 Working voltage and DVC 8.5 Wall mounting 13.7.2 Mechanical resistance test 13.7.3 Impact test	The laboratory described on cover page.

Summary of compliance with National Differences

List of countries addressed: None.

☒ The product fulfils the requirements of

IEC/EN 62109-1: 2010 and IEC/EN 62109-2: 2011,

Copy of marking plate:

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

Importer:
Huawei Technologies Hungary Ltd.
Add.: Hungary-Budapest-Kozraktaru. 30-32, Riverpark, 1st floor

Manufacturer:
Huawei Technologies Co., Ltd.
Add.: HQ of Huawei, Bantian, Longgang District, Shenzhen, 518129, P.R.C

CE

Test item particular ..... :	
Equipment mobility ..... :	☐ movable ☐ hand-held ☐ transportable ☒ fixed ☐ stationary ☐ for building-in
Connection to the mains..... :	☐ pluggable equipment ☐ direct plug-in ☒ permanent connection ☐ for building-in
Enviromental category..... :	☒ outdoor ☐ indoor conditional ☐ indoor unconditional
Operating condition ..... :	☒ continuous ☐ short-time ☐ intermittent
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 (%) ..... :	According to the specified supply range, see model list on the following pages for details.
Tested for IT power systems ..... :	☐ Yes ☒ No
IT testing, phase-phase voltage (V) ..... :	N/A
Class of equipment ..... :	☒ Class I ☐ Class II ☐ Class III ☐ Not classified
Mass of equipment (kg)..... :	See model list on the following pages.
Pollution degree ..... :	☐ PD1 ☒ PD2 (Inside) ☒ PD3 (Outside)
IP protection class ..... :	IP65
Possible test case verdicts:	
- test case does not apply to the test object ..... :	N/A
- test object was not evaluated for the requirement .... :	N/E
- test object does meet the requirement ..... :	Pass (P)
- test object does not meet the requirement ..... :	Fail (F)
Testing:	
Date of receipt of test items..... :	Mar., 2016
Date(s) of performance of tests..... :	Mar., 2016 – Apr., 2016

General remarks:

"(see Attachment #)" refers to additional information appended to the report.

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

The tests results presented in this report relate only to the object tested.

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

List of test equipment must be kept on file and available for review.

Additional test data and/or information provided in the attachments to this report.

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

Determination of the test results includes consideration of measurement uncertainty from the test equipment and methods.

Manufacturer's Declaration per sub-clause 6.2.5 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 (ies):

Huawei Machine Co., Ltd.

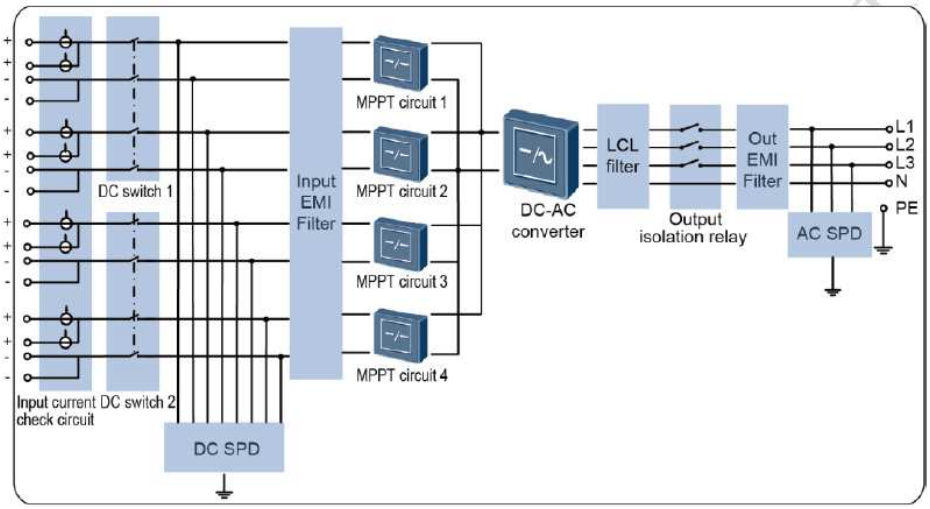
No. 2 City Avenue, Songshan Lake Sci. & Tech.

Industry Park, Dongguan 523808, P.R. China

General product information:

Breif description:

The PCEs under test models SUN2000-50KTL, SUN2000-50KTL-C1, SUN2000-42KTL, SUN2000-36KTL, SUN2000-33KTL-JP, SUN2000-40KTL-JP and SUN2000-43KTL-IN-C1 are three-phase grid connected inverters for solar power generation. The Grid-connected PV Inverter utilize the advanced power conversion technology IGBT to convert the DC power normally from the photovoltaic array to stable three-phase AC power and then feed the power to the utility grid.



Model Difference:

The models SUN2000-50KTL-C1, SUN2000-42KTL, SUN2000-36KTL, SUN2000-33KTL-JP, SUN2000-40KTL-JP and SUN2000-43KTL-IN-C1 are identical in hardware with SUN2000-50KTL, except for software, electrical ratings and model name.

All models include RS485 and optional PLC communication function. Model SUN2000-36KTL includes optional FE communication function and mornitoring board is different with other models.

Unless otherwise specified, all tests were conducted on basic model of SUN2000-50KTL-C1 to represent the other models.

Throughout the test report following abbreviations may be used:

- cl clearance
- dcr creepage distance
- dti distance through insulation
- BI basic insulation
- DI double insulation
- s-c short-circuit
- o-c open-circuit
- o-l overload
- SI supplementary insulation
- RI reinforced insulation

Model list:

MODELS LIST		SUN2000-50KTL	SUN2000-50KTL-C1	SUN2000-42KTL	SUN2000-36KTL
INPUT	V_{MAX} PV [Vdc]	1100	1100	1100	1100
	I_{SC} PV [A]	30A*4	30A*4	30A*4	30A*4
	MPP Voltage Range V_{MPP}[Vdc]	200-1000	200-1000	200-1000	200-1000
	Max. Input Current Imax [A]	22A*4	22A*4	22A*4	22A*4
	MPP Full Power Voltage Range [Vdc]	600-850	625-850	580-850	480-850
	Start PV Voltage [Vdc]	250	250	250	250
	Stop PV Voltage [Vdc] (PCE Shutdown)	200	200	200	200
	Backfeed Current [A]	0	0	0	0
	Overvoltage Category (OVC)	II	II	II	II
OUTPUT	Rated Output Voltage Ur [Vac]	3~ 480	3~ 500	3~ 480	3~ 380 / 3~ 400 / 3~ 480
	Normal Operating Voltage Range Un [Vac]	(80%-115%)Un ± 1.5V	(80%-115%)Un ± 1.5V	(80%-115%)Un ± 1.5V	(80%-115%)Un ± 1.5V
	Rated Output Frequency F_{NETZ} [Hz]	50	50	50/60	50/60
	Normal Operating Frequency Range Fn [Hz]	45-55	45-55	45-55/55-65	45-55/55-65
	Rated Output Power P_E [W]	46000	47500	42000	36000
	Max. Output Power P_{Emax} [W]	50500	52500	47000	40000
	Max. Output Current Imax [A]	60.8	60.8	56.6	60.7
	Power Factor cosφ [λ]	[-0.8, 0.8]	[-0.8, 0.8]	[-0.8, 0.8]	[-0.8, 0.8]
	Efficiency max. η_{max} [%]	98.8	98.8	98.8	98.6
	Standby Power Consumption [W]	10	10	10	10

	Night Power Consumption [W]	＜1.5	＜1.5	＜1.5	＜1.5
	THD [V / I] (100% full power)	＜ 3%	＜ 3%	＜ 3%	＜ 3%
	Acoustic Noise [dB]	≤50dBA	≤50dBA	≤50dBA	≤50dBA
	Overvoltage Category (OVC)	III	III	III	III
SYSTEM	Protective Class	I	I	I	I
	Enclosure Protection (IP)	IP65	IP65	IP65	IP65
	Operating Temperature Range [ºC]	-25 to +60	-25 to +60	-25 to +60	-25 to +60
	Pollution degree (PD)	PD 2	PD 2	PD 2	PD 2
	Altitude [m]	4000	4000	4000	4000
	Array Insulation Resistance Detection [Ω]	100k	100k	100k	100k
	The accuracy of resistance measurement [%]	[-10,0]	[-10,0]	[-10,0]	[-10,0]
	Weight [kg]	55	55	55	55
	Size [mm]	930×550×260	930×550×260	930×550×260	930×550×260
	Software	V200R002	V200R002	V200R002	V200R002

MODELS LIST		SUN2000-33KTL-JP	SUN2000-40KTL-JP	SUN2000-43KTL-IN-C1	
INPUT	V_{MAX} PV [Vdc]	1100	1100	1100	
	I_{SC} PV [A]	30A*4	30A*4	30A*4	
	MPP Voltage Range V_{MPP}[Vdc]	200-1000	200-1000	200-1000	
	Max. Input Current Imax [A]	22A*4	22A*4	22A*4	
	MPP Full Power Voltage Range [Vdc]	400-850	480-850	500-850	
	Start PV Voltage [Vdc]	250	250	250	
	Stop PV Voltage [Vdc] (PCE Shutdown)	200	200	200	
	Backfeed Current [A]	0	0	0	
	Overvoltage Category (OVC)	II	II	II	
OUTPUT	Rated Output Voltage Ur [Vac]	3~ 420 / 3~ 440 / 3~ 480	3~ 440 / 3~ 480	3~ 500	
	Normal Operating Voltage Range Un [Vac]	(80%-115%)Un ± 1.5V	(80%-115%)Un ± 1.5V	(80%-115%)Un ± 1.5V	
	Rated Output Frequency F_{NETZ} [Hz]	50/60	50/60	50	
	Normal Operating Frequency Range Fn [Hz]	45-55/55-65	45-55/55-65	45-55	
	Rated Output Power P_E [W]	33300	40000	43000	
	Max. Output Power P_{Emax} [W]	33300	40000	52500	
	Max. Output Current Imax [A]	52.3	60.4	60.8	
	Power Factor cosφ [λ]	[-0.8, 0.8]	[-0.8, 0.8]	[-0.8, 0.8]	

	Efficiency max. η_{max} [%]	98.7	98.7	98.8	
	Standby Power Consumption [W]	＜1.5	＜1.5	＜1.5	
	Night Power Consumption [W]	10	10	10	
	THD [V / I] (100% full power)	＜ 3%	＜ 3%	＜ 3%	
	Acoustic Noise [dB]	≤50dBA	≤50dBA	≤50dBA	
	Overvoltage Category (OVC)	III	III	III	
SYSTEM	Protective Class	I	I	I	
	Enclosure Protection (IP)	IP65	IP65	IP65	
	Operating Temperature Range [ºC]	-25 to +60	-25 to +60	-25 to +60	
	Pollution degree (PD)	PD 2	PD 2	PD 2	
	Altitude [m]	4000	4000	4000	
	Array Insulation Resistance Detection [Ω]	100k	100k	100k	
	The accuracy of resistance measurement [%]	[-10,0]	[-10,0]	[-10,0]	
	Weight [kg]	55	55	55	
	Size [mm]	930×550×260	930×550×260	930×550×260	
	Software	V200R002	V200R002	V200R002	

IEC/EN 62109-1: 2010			
Clause	Requirement – Test	Result - Remark	Verdict
4	GENERAL REQUIREMENTS		P
4.1	General General Testing is required by this standard to demonstrate that the EUT is fully in accordance with the applicable requirements of this standard.		P
4.2	General conditions for testing	See below.	P
4.2.1	Sequence of tests	The same sample used for all tests.	P
4.2.2	Reference test conditions		P
4.2.2.1	Environmental conditions a) temp. of 15 °C to 40 °C b) humidity of 5% to 75 % c) air pressure of 75 kPa to 106 kPa. d) no frost, dew, percolating water, rain, solar radiation, etc.	Ambient environmental conditions compliance.	P
4.2.2.2	State of equipment	Tests were carried out on a complete EUT.	P
4.2.2.3	Position of equipment	The equipment was installed in accordance with the manufacturer's instructions.	P
4.2.2.4	Accessories		P
4.2.2.5	Covers and removable parts	No covers or parts, which can be removed without using a TOOL.	N/A
4.2.2.6	Mains supply	See below.	P
	a) Voltage:	A wider range is given in the specifications for the EUT. See the model list on page 10-12.	P
	b) Frequency:	DC Input side: N/A AC Output side: 50Hz.	P
	c) Polarity:	Permanently connected equipment.	N/A
	d) Earthing:	Equipment was supplied from either an earthed supply system under tests.	P
	e) Over-current Protection:	Input over current protection that will be present in the installation was provided during testing.	P
4.2.2.7	Supply ports other than the mains	See below.	P
4.2.2.7.1	Photovoltaic supply sources	DC power supply soure was used with suffcient capability.	P
4.2.2.7.2	Battery inputs	Not used.	N/A

IEC/EN 62109-1: 2010			
Clause	Requirement – Test	Result - Remark	Verdict
4.2.2.8	Conditions of loading for output ports	The least favorable loading conditions was considered.	P
	- for continuous operation.	Until steady condition was established.	P
	- for intermittent operation.		N/A
	- for short-time operation.		N/A
4.2.2.9	Earthing terminals	Connection to the earth	P
4.2.2.10	Controls	Any position was set.	P
4.2.2.11	Available short circuit current	Considered.	P
4.3	Thermal Testing	See below.	P
4.3.1	General		P
4.3.2	Maximum temperatures Materials and components shall be selected so that under the most serve rated operating conditions, the temperatures do not exceed the temperature limits.	See appended table 4.3.	P
4.3.2.1	General		P
4.3.2.2	Touch temperatures		P
4.3.2.3	Temperature limits for mounting surfaces		P
4.4	Testing in single fault condition	See appended table 4.4.	P
4.4.1	General		P
4.4.2	Test conditions and duration for testing under fault conditions		P
4.4.2.1	General		P
4.4.2.2	Duration of tests		P
	- automatic reset devices or circuits		N/A
	- manual reset devices or circuits		N/A
	- non-resettable devices or circuits	One cycle and until temperatures stabilize.	P
4.4.3	Compliance after application of 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	See below.	P

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Clause	Requirement – Test	Result - Remark	Verdict
4.4.4.1	Component fault tests The following faults are simulated: a) Short circuit or open circuit of relevant components. b) Short circuit or open circuit of any components or insulation where failure could adversely affect supplementary insulation or reinforced insulation. c) In addition, where required by Method 2 of 9.1.1, components that could result in a fire hazard are to be overloaded unless they comply with the requirements of 9.1.3.	See appended table 4.4.	P
4.4.4.2	Equipment or parts for short-term or intermittent operation	Continuous operation equipment.	N/A
4.4.4.3	Motors	Fan for heatsink.	P
4.4.4.4	Transformer short circuit tests	See appended table 4.4.	P
4.4.4.5	Output short circuit	See appended table 4.4.	P
4.4.4.6	Backfeed current test for equipment with more than one source of supply		P
4.4.4.7	Output overload	See appended table 4.4.	P
4.4.4.8	Cooling system failure	See appended table 4.4.	P
4.4.4.9	Heating devices	No heating devices used.	N/A
4.4.4.10	Safety interlock systems	No safety interlock device used.	N/A
4.4.4.11	Reverse d .c. connections	See appended table 4.4.	P
4.4.4.12	Voltage selector mismatch	No voltage selector used.	N/A
4.4.4.13	Mis-wiring with incorrect phase sequence or polarity		P
4.4.4.14	PWB short-circuit test	See appended table 4.4.	P
4.5	Humidity preconditioning	See below.	P
4.5.1	General		P
4.5.2	Conditions	Humidity: 93%RH Temperature: 40°C Duration: 48h	P
4.6	Voltage Backfeed Protection	Hazardous voltage and energy was not present on the terminals, with the DC mains supply source de-energized or disconnected. In addition the symbol 13 of Table C.1 was marked for servicing functions	P

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Clause	Requirement – Test	Result - Remark	Verdict
4.6.1	Backfeed tests under normal conditions	Relay is available at AC output side to prevent backfeed current from AC to DC side.	P
4.6.2	Backfeed tests under single-fault conditions	Relay is available at AC output side and certified connectors at DC input side to prevent backfeed current from AC to DC side, even if under single-fault conditions.	P
4.6.3	Compliance with backfeed tests	See above.	P
	- 15 s for sources that are connected by fixed wiring		P
	- 1 s for sources that are cord-connected or use connectors that can be opened without the use of a tool		N/A
4.7	Electrical Ratings Tests	See appended table 4.7.	P
4.7.1	Input Ratings		P
4.7.2	Output Ratings		P

5	Marking and documentation		P
5.1	Marking		P
5.1.1	General		P
5.1.2	Durability of markings	The labels were subjected to the permanence of marking test. The labels were rubbed with the cloth soaked with petroleum spirit for 30 s. After this test there was no damage to the labels. The marking on the labels did not fade. There was no curling or lifting of the label's edges.	P
5.1.3	Identification	See below.	P
	a) the name or trade mark of the manufacturer or supplier	Trade mark is provided on the front enclosure.	P
	b) a model number, name or other means to identify the equipment	The model name is provided on the label.	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.	The serial number is provided on the equipment body.	P
5.1.4	Equipment ratings	See below	P

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Clause	Requirement – Test	Result - Remark	Verdict
	- input voltage, type of voltage (a.c. or d.c.), frequency, and max. continuous current for each input	See model list.	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	See model list.	P
	- Protective class (I, II, or III)	See model list.	P
	- Overvoltage Category	See model list.	P
	- the environmental information required in section 6	See model list and section 6.	P
5.1.5	Fuse identification	No such devices	N/A
5.1.6	Terminals, Connections, and Controls	Relevant symbol, indicator or information are available.	P
5.1.6.1	Protective Conductor Terminals	Symbol 7 of Table C.1 is used.	P
5.1.7	Switches and circuit-breakers	The letter “ON” and “OFF” is clearly marked.	P
5.1.8	Class II Equipment	Class I Equipment.	N/A
5.1.9	Terminal boxes for External Connections	The temperature observed on the terminals were not exceed the limited values specified.	N/A
5.2	Warning markings	See below.	P
5.2.1	Visibility and legibility requirements for warning markings	Warning markings are be visible and legible.	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	No such symbols.	N/A
5.2.2	Content for warning markings		P
5.2.2.1	Ungrounded heatsinks and similar parts	All accessible metal parts were grounded.	N/A
5.2.2.2	Hot Surfaces	Marked with symbol 14 of Table C.1.	P
5.2.2.3	Coolant	Not used.	N/A
	a) a statement that coolant system servicing is to be done only by SERVICE PERSONNEL		N/A

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Clause	Requirement – Test	Result - Remark	Verdict
	b) instructions for safe venting, draining or otherwise working on the cooling system		N/A
5.2.2.4	Stored energy	Marked with Symbol 21 of Table C.1 and the time to discharge capacitors to safe voltage and energy levels accompany the symbol.	P
5.2.2.5	Motor guarding	No such devices which can conducted injury to service personal.	N/A
5.2.3	Sonic hazard markings and instructions	No such hazard.	N/A
	a) be marked to warn the OPERATOR of the sonic pressure hazard		N/A
	b) be provided with installation instructions that specify how the installer can ensure that the sound pressure level from equipment		N/A
5.2.4	Equipment with multiple sources of supply		P
5.2.5	Excessive touch current	No touch current exceed 3.5mAac. or 10mAdc. Under any operation conditions	N/A
5.3	Documentation	See below.	P
5.3.1	General	All related informations provided in the user's maunal.	P
	a) explanations of equipment markings, 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		P
	- ENVIRONMENTAL CATEGORY as per 6.1		P
	- WET LOCATIONS classification as per 6.1		P
	- POLLUTION DEGREE classification for the intended external environment as per 6.2		P
	- INGRESS PROTECTION rating as per 6.3		P
	- Ambient temperature and relative humidity ratings		P
	- OVERVOLTAGE CATEGORY assigned to each input and output port as per 7.3.7.1.2		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	Instructions related to safety is in English.	P

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Clause	Requirement – Test	Result - Remark	Verdict
5.3.1.2	Format	The printed form is available and is delivered with the PCE.	P
5.3.2	Information related to installation	All below related informations provided in the user's maunal.	P
	a) assembly, location, and mounting requirements		P
	b) ratings and means of connection to each source of supply and any requirements related to wiring and external controls, colour coding of leads, disconnection means, or overcurrent protection needed, including instructions that the installation position shall not prevent access to the disconnection means		P
	c) ratings and means of connection of any outputs from the PCE, and any requirements related to wiring and external controls, colour coding of leads, or overcurrent protection needed		P
	d) ventilation requirements		P
	e) requirements for special services, for example cooling liquid		N/A
	f) instructions and information relating to sound pressure level if required by 10.2.1	No sound pressure hazard.	N/A
	g) 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, prevent the accumulation of hazardous gases	No battery used in the PCE.	N/A
	h) tightening torque to be applied to wiring terminals		P
	i) 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	No backfeed current available	N/A
	j) for each input to the PCE, the max value of short-circuit current available from the source, for which the PCE is designed		P
	k) compatibility with RCD and RCM		P
	l) instructions for protective earthing, including the information required by 7.3.6.3.6 applicable		P
5.3.3	Information related to operation	All below related informations provided in the user's maunal.	P
	- instructions for adjustment of controls including the effects of adjustment		P

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Clause	Requirement – Test	Result - Remark	Verdict
	- 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		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	All below related informations provided in the service maunal.	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)		P
	- instructions for accessing OPERATOR ACCESS AREAS , if any are present, including a warning not to enter other areas of the equipment		P
	- part numbers and instructions for obtaining any required operator replaceable parts	No any operator replaceable part.	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
	- where required by 7.3.9.2, information regarding the location(s) and safe discharge times for capacitor(s).		P
5.3.4.1	Battery maintenance	The PCE is Grid-connected inverter without battery energy storage function.	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 installation of batteries		N/A
	- CAUTION: Do not dispose of batteries in a fire. The batteries may explode		N/A

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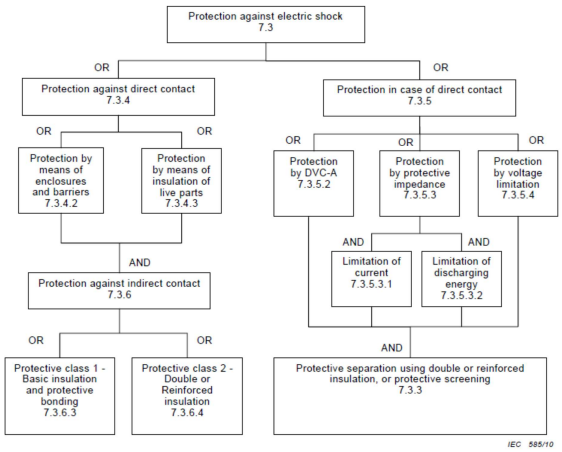
Clause	Requirement – Test	Result - Remark	Verdict
	- CAUTION: Do not open or mutilate batteries. Released electrolyte is harmful to the skin and eyes. It may be toxic		N/A
	- CAUTION: A battery can present a risk of electrical shock and high short-circuit current.		N/A
	The following precautions should be observed when working on batteries: 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	See below.	P
6.1	Environmental categories and minimum environmental conditions	See below.	P
6.1.1	OUTDOOR	For outdoor use.	P
6.1.2	INDOOR, unconditioned	See above.	N/A
6.1.3	INDOOR, conditioned	See above.	N/A
6.2	Pollution degree	PD 3 (outside) PD 2 (inside).	P
6.3	Ingress Protection	IP65.	P
6.4	UV exposure	Anti-UV approved AC/DC connectors are provided.	P
6.5	Temperature and humidity	Specified by manufacturer as: Humidity: 90%RH max. Temperature: 60°C max.	P

7	Protection against electric shock and energy hazards	P

<table>
<tr><td colspan="4">IEC/EN 62109-1: 2010</td></tr>
<tr><td>Clause</td><td>Requirement – Test</td><td>Result - Remark</td><td>Verdict</td></tr>
<tr><td>7.1</td><td>General</td><td>The proper construction of PCE is available for protection against shock and energy hazards during installation, operation and maintenance under normal and single fault conditions.</td><td>P</td></tr>
<tr><td>7.2</td><td>Fault conditions</td><td>Refer to subclause and table 4.4.4.</td><td>P</td></tr>
<tr><td>7.3</td><td>Protection against electric shock</td><td></td><td>P</td></tr>
<tr><td>7.3.1</td><td>General
 
</td><td>Each circuit under evaluation is compliant with Figure 7-1.</td><td>P</td></tr>
<tr><td>7.3.2</td><td>Decisive voltage classification</td><td></td><td>P</td></tr>
<tr><td>7.3.2.1</td><td>Use of decisive voltage class (DVC)</td><td>See below</td><td>P</td></tr>
<tr><td>7.3.2.2</td><td>Limits of DVC
Table 6 – Summary of the limits of the decisive voltage classes
<table>
<tr><td rowspan="2">Decisive voltage Classification (DVC)</td><td colspan="3">Limits of working voltage V</td></tr>
<tr><td>a.c. voltage r.m.s. U_{ACL}</td><td>a.c. voltage peak U_{ACPL}</td><td>d.c. voltage mean U_{DCL}</td></tr>
<tr><td>A*</td><td>≤25
(16)</td><td>≤35,4
(22,6)</td><td>≤60
(35)</td></tr>
<tr><td>B</td><td>50
(33)</td><td>71
(46,7)</td><td>120
(70)</td></tr>
<tr><td>C</td><td>>50
(>33)</td><td>>71
(>46,7)</td><td>>120
(>70)</td></tr>
<tr><td colspan="4">The table values in parentheses are to be used for PCE or portions of PCEs rated for installation in wet locations as addressed in 6.1 for environmental categories and minimum environmental conditions.
*DVC-A circuits are allowed under fault conditions to have voltages up to the DVC-B limits, for maximum 0,2 s.</td></tr>
</table></td><td>See subclause 7.3.2.1.</td><td>P</td></tr>
<tr><td>7.3.2.3</td><td>Requirements for protection</td><td>See subclause 7.3.2.1.</td><td>P</td></tr>
<tr><td>7.3.2.4</td><td>Circuit evaluation</td><td>For circuits evaluation information of PCE, refer to brief description of general product information on previous pages.</td><td>P</td></tr>
</table>

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Clause	Requirement – Test	Result - Remark	Verdict
7.3.2.5	Connection to PELV and SELV circuits		P
7.3.2.6	Working voltage and DVC	See subclause 7.3.2.4.	P
7.3.2.6.1	General	See above.	P
7.3.2.6.2	AC working voltage (see Figure 7-2)		P
7.3.2.6.3	DC working voltage (see Figure 7-3)		P
7.3.2.6.4	Pulsating working voltage (see Figure 7-4)		P
7.3.3	Protective separation Protective separation shall be achieved by: ·double or reinforced insulation, or ·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 ·protective impedance comprising limitation of current per 7.3.5.3.1 and of discharged energy per 7.3.5.3.2, or ·limitation of voltage according to 7.3.5.4.	The double or reinforced insulation was provided between 1) DC input circuits and communication circuits; 2) AC input circuits and display, communication circuits. All accessible metal parts were earthed and separated from live parts by basic insulation.	P
7.3.4	Protection against direct contact	Protection against electic shock by means of earthed metal enclosure without openings. Any access to touch live parts is impossible.	P
7.3.4.1	General	See above.	P
7.3.4.2	Protection by means of enclosures and barriers	Protection against electic shock by means of earthed metal enclosure.	P
7.3.4.2.1	General	See above.	P
7.3.4.2.2	Access probe criteria	Considered.	P
7.3.4.2.3	Access probe tests	See below.	P
	a) Inspection		P
	b) Tests with the test finger (Figure E-1) and test pin (Figure E-2) of 0E		P
	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 a straight unjointed test finger (Figure E-3 of 0E), applied with a force of 30 N	No openings.	N/A
	d) In addition to a) - c) above, top surfaces of enclosures shall be tested with the IP3X probe of IEC 60529	No openings.	N/A

<table>
<tr><td colspan="4">IEC/EN 62109-1: 2010</td></tr>
<tr><td>Clause</td><td>Requirement – Test</td><td>Result - Remark</td><td>Verdict</td></tr>
<tr><td>7.3.4.2.4</td><td>Service access areas</td><td>There is no such kinds of adjustments needed to be opened the enclosure during installation or maintenance.</td><td>N/A</td></tr>
<tr><td>7.3.4.3</td><td>Protection by means of insulation of live parts
Table 8 – Insulation between accessible unearthed parts and DVC-A or -B circuits adjacent to DVC-B or -C circuits
<table>
<tr><th>Considered circuit (closer to accessible parts)</th><th>Adjacent circuit</th><th>Insulation between the considered circuit and the adjacent circuit</th><th>Insulation between the considered circuit and unearthed accessible parts</th></tr>
<tr><td rowspan="2">DVC-A</td><td rowspan="2">DVC-B or DVC-C</td><td>Basic[a]</td><td>Supplemental[a]</td></tr>
<tr><td>Reinforced[a]</td><td>Functional</td></tr>
<tr><td rowspan="2">DVC-B</td><td rowspan="2">DVC-C</td><td>Basic[a]</td><td>Supplemental[a]</td></tr>
<tr><td>Reinforced[a]</td><td>Reinforced</td></tr>
<tr><td colspan="4">[a] Based on the voltage of the circuit having the higher DVC.</td></tr>
</table></td><td>See subclause 7.3.2, 7.3.3 and 7.3.4.1.</td><td>P</td></tr>
<tr><td>7.3.5</td><td>Protection in case of direct contact</td><td></td><td>P</td></tr>
<tr><td>7.3.5.1</td><td>General</td><td>See below.</td><td>P</td></tr>
<tr><td>7.3.5.2</td><td>Protection using decisive voltage class A</td><td>Communication port is considerd as DVC-A which can be accessible and separated from DVC-C by double or reinforced insulaiton.</td><td>P</td></tr>
<tr><td>7.3.5.3</td><td>Protection by means of protective impedance</td><td>This method not considered.</td><td>N/A</td></tr>
<tr><td>7.3.5.3.1</td><td>Limitation of current through protective impedance
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.
Compliance is checked by inspection, by analysis of the relevant circuit diagrams, and by testing, using the circuit of IEC 60990, Figure 4.</td><td></td><td>N/A</td></tr>
<tr><td></td><td>The protective impedances shall be designed and tested to withstand the impulse voltages, temporary overvoltage and working voltage of the circuits to which they are connected. Compliance is checked by the testing of 7.5.1 and 7.5.2.</td><td></td><td>N/A</td></tr>
<tr><td></td><td>Touch current at accessible parts limited to 3,5 mA a.c., 10 mA d.c. from parts to earth and between simultaneously accessible parts</td><td></td><td>N/A</td></tr>
<tr><td>7.3.5.3.2</td><td>Limitation of discharging energy through protective impedance</td><td></td><td>N/A</td></tr>
<tr><td>7.3.5.4</td><td>Protection by means of limited voltages</td><td>This method not considered.</td><td>N/A</td></tr>
<tr><td>7.3.6</td><td>Protection against indirect contact</td><td></td><td>P</td></tr>
</table>

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Clause	Requirement – Test	Result - Remark	Verdict
7.3.6.1	General	The PCE is defined as protective class I.	P
7.3.6.2	Insulation between live parts and accessible conductive parts	See subclaus 7.3.2.3, 7.3.7.4 and 7.3.7.5.	P
7.3.6.3	Protective class I - Protective bonding		P
7.3.6.3.1	General	Suitable protective bonding provided.	P
7.3.6.3.2	Requirements for protective bonding	Considered	P
7.3.6.3.3	Rating of protective bonding Protective bonding shall meet following requirements: 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.	See 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.		N/A
	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.	The alternative of 7.3.6.3.5 is considered.	P
7.3.6.3.3.1	Test current, duration, and acceptance criteria 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 120 s. The impedance of the protective bonding means during and at the end of the test shall not exceed 0,1 Ω	See above.	N/A
	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.		N/A

<table>
<tr><td colspan="4">IEC/EN 62109-1: 2010</td></tr>
<tr><td>Clause</td><td>Requirement – Test</td><td>Result - Remark</td><td>Verdict</td></tr>
<tr><td></td><td>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.
Table 10 – Test duration for protective bonding test
<table>
<tr><th>Overcurrent protective devide rating
A</th><th>Duration of the test
min</th></tr>
<tr><td>>16 to 30</td><td>2</td></tr>
<tr><td>31 to 60</td><td>4</td></tr>
<tr><td>61 to 100</td><td>6</td></tr>
<tr><td>101 to 200</td><td>8</td></tr>
<tr><td>> 200</td><td>10</td></tr>
</table></td><td></td><td>N/A</td></tr>
<tr><td>7.3.6.3.4</td><td>Protective bonding impedance (routine test)
The test shall be as in 7.3.6.3.3, except for the following:
·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;
· the test duration may be reduced to no less than 2 s.
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
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).</td><td>Considered.</td><td>P</td></tr>
<tr><td>7.3.6.3.5</td><td>External protective earthing conductor
Table 11 – External protective earthing conductor cross-section
<table>
<tr><th>Cross-sectional area of phase conductors of the PCE, S
mm^2</th><th>Minimum cross-sectional area of the corresponding external protective earthing conductor, S_p
mm^2</th></tr>
<tr><td>$S \le 16$</td><td>S</td></tr>
<tr><td>$16 < S \le 35$</td><td>16</td></tr>
<tr><td>$35 < S$</td><td>$S/2$</td></tr>
<tr><td colspan="2">NOTE The values in this table are valid only if the external protective earthing conductor is made of the same metal as the phase conductors. If this is not so, the cross-sectional area of the external protective earthing conductor is to be determined in a manner which produces a conductance equivalent to that which results from the application of this table.</td></tr>
</table></td><td>Phase conductors : 16-25mm^2
Internal & External protective earthing conductor：16mm^2</td><td>P</td></tr>
<tr><td>7.3.6.3.6</td><td>Means of connection for the external protective earthing conductor</td><td></td><td>P</td></tr>
<tr><td>7.3.6.3.6.1</td><td>General</td><td></td><td>P</td></tr>
<tr><td></td><td>The means of connection for protective conductor corrosion-resistant</td><td>Corrosion-resistant is considered for connection and bonding points.</td><td>P</td></tr>
</table>

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Clause	Requirement – Test	Result - Remark	Verdict
	The means of connection for the protective earthing conductor shall be permanently marked with: – symbol 7 of Annex C; or – the colour coding green-yellow. Marking shall not be done on easily changeable parts such as screws.	With the symbol 7 of Table C.1. And Green-yellow wire is used.	P
7.3.6.3.7	Touch current in case of failure of the protective earthing conductor		P
	For plug-connected single phase PCE	Three phase PCE.	N/A
	For all other PCE	See appended table 7.5.5. In addition, the caution symbol 15 of Table C.1 provided on PCE and in manual.	P
	Connect two or more PCEs in parallel	Not for parallelly connection use.	N/A
7.3.6.4	Protective Class II – Double or Reinforced Insulation	Class I equipment.	N/A
7.3.7	Insulation Including Clearance and Creepage Distances	See below.	P
7.3.7.1	General		P
7.3.7.1.1	Pollution degree	PD 3 (outside), PD 2 (inside)	P
7.3.7.1.2	Overvoltage category and Impulse withstand voltage rating ..... :		P
	- MAINS circuits	O.V.C III	P
	- PV circuits insulated	O.V.C II	P
	- PV circuits not insulated	No such circuits.	N/A
	- Other circuits	O.V.C II	P
7.3.7.1.3	Supply earthing systems TN system/TT system/IT system	For TN system only.	P
7.3.7.1.4	Insulation voltages	PV supply circuits: 4772V ($V_{MAX\ PV}$: 1100V) AC mains circuits: 4000V (Rated: max. 3N~ 500V)	P
7.3.7.2	Insulation between a circuit and its surroundings		P
7.3.7.2.1	General	Considered.	P

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Clause	Requirement – Test	Result - Remark	Verdict
7.3.7.2.2	Circuits connected directly to the MAINS	Clearances and solid insulation required according to the impulse voltage, temporary overvoltage, or working voltage, whichever gives the most severe requirement.	P
7.3.7.2.3	Circuits other than MAINS circuits	Clearances and solid insulation required according to the impulse voltage and recurring peak voltage.	P
7.3.7.2.4	Insulation between circuits	Clearances and solid insulation according to the higher impulse voltages. Creepages according ot the higher r.m.s. working voltage.	P
7.3.7.3	Functional insulation		P
7.3.7.4	Clearance distances	See appended table 7.3.7.4.	P
7.3.7.4.1	Determination	Altitude: up to 4000m. The max. insulation / implulse voltage: 4772V.	P
7.3.7.4.2	Electric field homogeneity	Not considered.	N/A
7.3.7.4.3	Clearance to conductive enclosures	Refer to subclause 7.3.7.4.1 and 13.7.	P
7.3.7.5	Creepage distances	See appended table 7.3.7.5.	P
7.3.7.5.1	General		P
7.3.7.5.2	Voltage	The max. vlotage: 500Vrms / 1100Vd.c	P
7.3.7.5.3	Materials	Insulating material group IIIb 175 > CTI 100 assumed.	P
7.3.7.6	Coating	Not used.	N/A
7.3.7.7	PWB spacings for functional insulation	Comply with 7.3.7.4 and 7.3.7.5.	N/A
7.3.7.8	Solid insulation		P
7.3.7.8.1	General		P
7.3.7.8.2	Requirements for electrical withstand capability		P
7.3.7.8.2.1	Basic, supplemental, reinforced, and double insulation	Passed the impulse withstand voltage and a.c. or d.c. voltage tests. See appended table 7.5.1, 7.5.2 & 7.5.3. Note: No double or reinforced solid insulation used. No voltage stress on the insulation is greater than 1 kV/mm.	P

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Clause	Requirement – Test	Result - Remark	Verdict
7.3.7.8.2.2	Functional insulation	Not used.	N/A
7.3.7.8.3	Thin sheet or tape material	See below.	P
7.3.7.8.3.1	General		P
7.3.7.8.3.2	Material thickness not less than 0.2 mm	Bobbin used in power transformer.	P
	Basic or supplementary insulation shall consist of at least one layer of material, and shall meet the impulse and a.c. or d.c. voltage test requirements of 7.3.7.8.2.1 for basic or supplementary insulation.	See appended table 7.5.1, 7.5.2 & 7.5.3.	P
	Double insulation shall consist of at least two layers of material. Each layer shall meet the impulse and a.c. or d.c. voltage test requirements of 7.3.7.8.2.1 for basic insulation, and the partial discharge requirements of 7.3.7.8.2.1. The two or more layers together shall meet the impulse and a.c. or d.c. voltage test requirements of 7.3.7.8.2.1 for double insulation.	Not used.	N/A
	Reinforced insulation shall consist of a single layer of material, which will meet the impulse, a.c. or d.c. voltage, and partial discharge test requirements 7.3.7.8.2.1 for reinforced insulation.	Not used.	N/A
7.3.7.8.3.3	Material thickness less than 0.2 mm		P
	Basic or supplementary insulation shall consist of at least one layer of material, and shall meet the impulse and a.c. or d.c. voltage test requirements of 7.3.7.8.2.1 for basic or supplementary insulation.	See appended table 7.5.1, 7.5.2 & 7.5.3.	P
	Double insulation shall consist of at least three layers of material. Each layer shall meet the impulse and a.c. or d.c. voltage test requirements of 7.3.7.8.2.1 for basic insulation any two layers together shall meet the impulse, a.c. or d.c. voltage, and partial discharge test requirements of 7.3.7.8.2.1 for double insulation.	Not used.	N/A
	Reinforced insulation consisting of a single layer of material less than 0,2 mm thick is not permitted.	Not used.	N/A
7.3.7.8.3.4	Compliance	See subclause 7.3.7.8.3.2.	P
7.3.7.8.4	Printed wiring boards (PWBs)		P

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Clause	Requirement – Test	Result - Remark	Verdict
7.3.7.8.4.1	General	Insulation between conductor layers in double-sided single-layer PWBs meet the requirements of 7.3.7.8.1. Basic, supplementary, double and reinforced insulation meet the appropriate requirements of 7.3.7.8.2.1 or 7.3.7.8.2.2. Functional insulation in PWBs meet the requirements of 7.3.7.8.2.3.	P
7.3.7.8.4.2	Use of coating materials	No coating material used.	N/A
	Type 1 protection		N/A
	Type 2 protection		N/A
	Cold test (-25°C) and rapid change of temperature test (-25°C to +125°C)		N/A
7.3.7.8.5	Wound components	No such wound components.	N/A
7.3.7.8.6	Potting materials	No potting materials used.	N/A
7.3.7.9	Insulation requirements above 30 kHz		P
7.3.8	Residual Current -operated protective (RCD) or monitoring (RCM) device compatibility The residual current in the AC input and/or output circuit is measured using a meter or power analyzer or other instrument that can detect only the d.c. component of the residual current. The resulting d.c. residual current component is compared to the limits in IEC 60755 or IEC 62020 as appropriate.		N/A
7.3.9	Capacitor discharge	See appended table 7.3.9.	P
7.3.9.1	Operator access area	The operator is instructed to the installation shall be performed by qualified technician. The pins of connector cannot be touched by test finger due to the design protection.	P
	Time-constant (s); measured voltage (V) ..... :		N/A
7.3.9.2	Service access areas	The warning symbol 21 of Table C.1 and an indication of the discharge time is placed in a clearly visible position on the protective barrier to avoid unconsciousness contact.	P
	Time-constant (s); measured voltage (V) ..... :		N/A
7.4	Protection against energy hazards		P

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Clause	Requirement – Test	Result - Remark	Verdict
7.4.1	Determination of HAZARDOUS ENERGY LEVEL	There is no risk of energy hazard in operator access areas, protection of electrical shock by means of earthed metal enclosure.	P
7.4.2	Operator Access Areas	See above.	P
7.4.3	Service Access Areas	The warning symbol 21 of Table C.1 and an indication of the discharge time is placed in a clearly visible position on the protective barrier to avoid unconsciousness contact.	P
7.5	Electrical tests related to shock hazard		P
7.5.1	Impulse voltage test (*type test*) The impulse voltage test is performed with a voltage having a 1,2/50 µs waveform (see Figure 6 of IEC 60060-1) and is intended to simulate overvoltages induced by lightning or due to switching of equipment. See Table 15 for conditions of the impulse voltage test.	During the test no puncture, flashover, or sparkover occurs. See appended table 7.5.1.	P
7.5.2	Voltage Test (dielectric strength test) (type test and routine test)	See below.	P
7.5.2.1	Purpose of test		P
7.5.2.2	Value and type of test voltage The values of the test voltage are determined from column 2 or 3 of Table 17 or Table 18 depending upon whether the circuit under test is mains connected or not mains connected.	See appended table 7.5.2.	P
7.5.2.3	Humidity pre-conditioning		P

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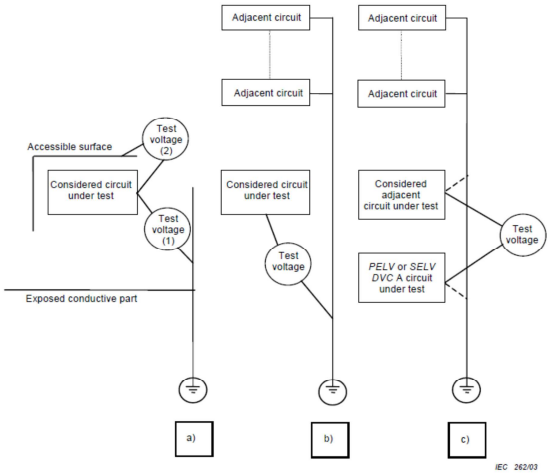
Clause	Requirement – Test	Result - Remark	Verdict
7.5.2.4	Performing the voltage test The test shall be applied as follows, according to Figure 13:  Figure 13 – Voltage test procedures	Refer to appended table 7.5.2.	P
7.5.2.5	Duration of the a.c. or d.c. voltage test The duration of the test shall be at least 60 s for the type test and 1 s for the routine test. The test voltage may be applied with increasing and/or decreasing ramp voltage, and the ramp times are not specified, but regardless of the ramp time, the dwell time at full voltage shall be 60 s and 1 s respectively for type and routine tests.	The full voltage is maintained for 60s.	P
7.5.2.6	Verification of the a .c. or d.c. voltage test	No ELECTRICAL BREAKDOWN occurs during the test.	P
7.5.3	Partial discharge test (type test or sample test)	No double or reinforced solid insulation used. No voltage stress on the insulation is greater than 1 kV/mm.	N/A
7.5.4	Touch current measurement (type test)	See appended table 7.5.5.	P
7.5.5	Equipment with multiple sources of supply		N/A

8	Protection against mechanical HAZARDS		P
8.1	General	Edges, projections, corners, openings, guards, handles and the like, that are accessible to the OPERATOR are smooth and rounded.	P
8.2	Moving parts	Enclosed coolant fan be used.	P
	Openings: Straight unjointed version of the test finger, 30N.	No openings	N/A

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Clause	Requirement – Test	Result - Remark	Verdict
8.2.1	Protection of service persons Compliance is checked by inspection, and where necessary, by ensuring that the IP1X probe of IEC 60529 cannot contact the hazardous moving part with the guard in place.	Enclosed fan be used that it unlikely accessible during servicing operations.	P
8.3	Stability	The PCE is intended to be mounted on a wall.	N/A
	a) Equipment other than HAND - HELD EQUIPMENT; angle of 10°		N/A
	b) Equipment which has both a height of 1 m or more and a mass of 25 kg or more, and all floor-standing equipment; 250 N, or 20 % of the weight of the equipment		N/A
	c) Floor-standing equipment; 800 N		N/A
8.4	Provisions for lifting and carrying 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. Compliance is checked by inspection and by the following test. A single handle or grip is subjected to a force corresponding to four times the weight of the equipment. The force is applied uniformly over a 70 mm width at the centre of the handle or grip, without clamping. The force is steadily increased so that the test value is attained after 10 s and maintained for a period of 1 min.		P
8.5	Wall mounting	Mounting brackets withstand a force of four times the weight of the equipment.	P
8.6	Expelled parts	No such parts.	N/A

9	Protection Against Fire Hazards		P
9.1	Resistance to fire	Suitable and appropriate materials, components and construction are used to reduce the risk of ignition and the spread of flame.	P
9.1.1	Reducing the risk of ignition and spread of flame		P
	Method 1 – Selection and application of components , wiring and materials that reduce the possibility of ignition and spread of flame and, where necessary, by the use of a FIRE ENCLOSURE .	See subclause of 9.1.2 and 9.1.3. In addition, the simulated faults of 4.4.4.1 a) and b) are applied.	P
	Method 2 – Application of all of the simulated fault tests in 4.4.4.1 a), b), and c).	Not applied.	N/A

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Clause	Requirement – Test	Result - Remark	Verdict
9.1.2	Conditions for a fire enclosure A fire enclosure is required for equipment or parts of equipment for which Method 2 is not fully applied and complied with.	A FIRE ENCLOSURE is required for equipment or parts of equipment.	P
9.1.2.1	Parts requiring a fire enclosure	FIRE ENCLOSURE requiered: – Components in PRIMARY CIRCUITS. – Components in SECONDARY CIRCUITS supplied by power sources which exceed the limits for a LIMITED POWER SOURCE as specified in 9.2. – 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. – Components having unenclosed arcing parts. – Insulated wiring, except as permitted in 9.1.2.2.	P
9.1.2.2	Parts not requiring a fire enclosure	See above.	N/A
9.1.3	Materials requirements for protection against fire hazard		P
9.1.3.1	General		P
9.1.3.2	Materials for fire enclosures	Metal enclosure provided.	P
9.1.3.3	Materials for components and other parts outside fire enclosures	All components and parts are enclosed within fire enclosure.	N/A
9.1.3.4	Materials for components and other parts inside fire enclosures	All electronic components are soldered and mounted on V-0 PCB	P
9.1.3.5	Materials for air filter assemblies	No such materials.	N/A
9.1.4	Openings in fire enclosures		N/A
9.1.4.1	General		N/A
9.1.4.2	Side openings treated as bottom openings		N/A
9.1.4.3	Openings in the bottom of a fire enclosure		N/A
9.1.4.4	Equipment for use in a CLOSED ELECTRICAL OPERATING AREA		N/A
9.1.4.5	Doors or covers in fire enclosures	No such parts.	N/A

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Clause	Requirement – Test	Result - Remark	Verdict
9.1.4.6	Additional requirements for openings in transportable equipment	PCE not for transportable equipment.	N/A
9.2	LIMITED POWER SOURCES	Not applied.	N/A
9.2.1	General		N/A
9.2.2	Limited power source tests **Table 22 – Limits for inherently limited power sources** Output voltage[1] U_{oc} (V a.c. / V d.c.) ; Output current[2] I_{sc} (A) ; Apparent power[3] S (VA) ≤20 / ≤20 ; ≤8,0 ; ≤5 · U_{oc} 20 < U_{oc} ≤ 30 / 20 < U_{oc} ≤ 30 ; ≤8,0 ; ≤100 - / 30 < U_{oc} ≤ 60 ; ≤150/U_{oc} ; ≤100 **Table 23 – Limits for power sources not inherently limited** Output voltage[1] U_{oc} (Vac / Vdc) ; Output current[2] I_{sc} (A) ; Apparent power[3] S (VA) ; Current rating of overcurrent protective device[4] (A) ≤20 / ≤20 ; ≤1 000/U_o ; ≤250 ; ≤5 20 < U_{oc} ≤ 30 / 20 < U_{oc} ≤ 30 ; ; ; ≤100/U_{oc} - / 30 < U_{oc} ≤ 60 ; ; ; ≤100/U_{oc}		N/A
9.3	Short-circuit and overcurrent protection	See below.	P
9.3.1	General 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.	No overcurrent hazards was presented by short circuits and overloads tests. (refer to sub-clause 4.4.4)	P
9.3.2	Number and location of overcurrent protective devices	All poles circuit breaker was provided both DC input and AC output termianls.	P
9.3.3	Short-circuit co-ordination (backup protection)	Upstream protective device for backup protection was specified in installation instrucion.	P

10	Protection Against Sonic Pressure Hazards		P
10.1	General	The equipment is not likely to cause such HAZARDS.	P
10.2	Sonic Pressure and Sound level		P
10.2.1	Hazardous Noise Levels	Measured sound level is less then 80dB during the PCE operated with any unfavorable conditions.	P

11	Protection Against Liquid Hazards		N/A
11.1	Liquid Containment , Pressure and Leakage	No liquid contained in this system, and energy storage battery used.	N/A

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Clause	Requirement – Test	Result - Remark	Verdict
11.2	Fluid pressure and leakage		N/A
11.2.1	Maximum pressure		N/A
	a) the rated maximum supply pressure specified for an external source		N/A
	b) the pressure setting of an overpressure safety device provided as part of the assembly		N/A
	c) the maximum pressure that can be developed by an air compressor that is part of the assembly, unless the pressure is limited by an overpressure safety device		N/A
11.2.2	Leakage from parts (two times the maximum pressure in NORMAL USE)		N/A
11.2.3	Overpressure safety device		N/A
	a) be connected as close as possible to the liquid-containing parts of the system that it is intended to protect		N/A
	b) be installed so as to provide easy access for inspection, maintenance and repair		N/A
	c) only be adjustable via the use of a TOOL		N/A
	d) have its discharge opening so located and directed that the released material is not directed towards any person		N/A
	e) have its discharge opening so located and directed that operation of the device will not deposit liquid on parts that may cause a hazard		N/A
	f) have adequate discharge capacity to ensure that, in the event of a failure of the supply pressure control, the pressure does not exceed the rated maximum working pressure of the system		N/A
	g) have no shut-off valve between it and the parts that it is intended to protect		N/A
11.3	Oil and grease		N/A

12	Chemical Hazards		N/A
12.1	General	No chemical Hazards.	N/A

13	Physical Requirements		P
13.1	Handles and manual controls	It can not be possible to fix them in wrong position.	P
	Axial pull is unlikely – 15 N for the operating means of electrical components		N/A
	Axial pull is unlikely – 20 N in other cases		N/A

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Clause	Requirement – Test	Result - Remark	Verdict
	Axial pull is likely – 30 N for the operating means of electrical components		P
	Axial pull is likely – 50 N in other cases		P
13.1.1	Adjustable controls	No such controls.	N/A
13.2	Securing of parts	Screws, nuts, washers, springs or similar parts are secured so as to withstand mechanical stresses occurring	P
13.3	Provisions for external connections		P
13.3.1	General	Appropriate provisons for external connections applied.	P
13.3.2	Connection to an a .c . MAINS supply		P
13.3.2.1	General	Terminals provided for permanent connection to the PV supply.	P
13.3.2.2	Permanently connected equipment	A set of terminals as specified in 13.3.3 for external connection of supply cords.	P
13.3.2.3	Appliance inlets	Permanently connected	N/A
13.3.2.4	Power supply cords	Not provided, but technical requirements provided in manual.	N/A
13.3.2.5	Cord anchorages and strain relief	No power supply cords provided.	N/A
13.3.2.6	Protection against mechanical damage	No sharp points or cutting edge at the bushing.	N/A
13.3.3	Wiring terminals for connection of external conductors	See below.	N/A
13.3.3.1	Wiring terminals	No such parts.	N/A
13.3.3.2	Screw terminals	No such parts.	N/A
13.3.3.3	Wiring terminal sizes	No such parts.	N/A
13.3.3.4	Wiring terminal design	No such parts.	N/A
13.3.3.5	Grouping of wiring terminals	No such parts.	N/A
13.3.3.6	Stranded wire	No such parts.	N/A
13.3.4	Supply wiring space	The space of power supply cords connection met this requirement.	P
13.3.5	Wire bending space for wires 10 mm^2 and greater	Considered.	P
13.3.6	Disconnection from supply sources	The breaker should be provide in the PV and AC branch circuits with specified capacity on mounted.	P

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Clause	Requirement – Test	Result - Remark	Verdict
13.3.7	Connectors , plugs and sockets	The misconnection is unlikely for PV or DC connectors.	P
13.3.8	Direct plug-in equipment	No for direct plug-in use.	N/A
13.4	Internal wiring and connections	See below.	P
13.4.1	General	The insulation, conductors and routing of all wires of the equipment is suitable for the electrical, mechanical, thermal and environmental conditions of use.	P
13.4.2	Routing	Wires are routed away from sharp edges, screw threads, burrs, fins, moving parts, drawers, and similar parts, which could abrade the wire insulation.	P
13.4.3	Colour coding	One or more yellow stripes is not used other than for protective bonding.	P
13.4.4	Splices and connections	All splices and connections are mechanically adequate secure and provided electrical continuity. The likelihood of loose is impossible.	P
13.4.5	Interconnections between parts of the PCE	No such interconnections.	N/A
13.5	Openings in enclosures These requirements are in addition to those in the following sections: – 7.3.4, Protection against direct contact; – 7.4, Protection against energy hazards; – 9.1.4, Openings in fire enclosures.	Not opening in metal enclosure.	N/A
13.5.1	Top and side openings	No openings.	N/A
13.6	Polymeric Materials		P
13.6.1	General	See below.	P
13.6.1.1	Thermal index or capability	Appropriate electrical, mechanical, thermal and flammability degree polymeric materials provided.	P
13.6.2	Polymers serving as enclosures or barriers preventing access to hazards	The polymeric material only used for LCD display.	P
13.6.2.1	Stress relief test	Evaluated	P
13.6.3	Polymers serving as solid insulation	7.3.7.8 considered for insulation sheet and passed.	P
13.6.3.1	Resistance to arcing		N/A

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Clause	Requirement – Test	Result - Remark	Verdict
13.6.4	UV resistance	Approved AC/DC connector is provided. Anti-UV approved insulation plastic is provided and covers the control panel.	P
13.7	Mechanical resistance to deflection , impact , or drop		P
13.7.1	General	See below.	P
13.7.2	250-N deflection test for metal enclosures	A steady force of 250 N applied for 5 s, after test no hazards occurred.	P
13.7.3	7-J impact test for polymeric enclosures	7J force applied to polymeric screen. After the test, all live parts remain inaccessible.	P
13.7.4	Drop test	Not for HAND - HELD , DIRECT PLUG - IN , or TRANSPORTABLE equipment.	N/A
13.8	Thickness requirements for metal enclosures		N/A
13.8.1	General	The metal enclosure complied with 13.7	N/A
13.8.2	Cast metal		N/A
13.8.3	Sheet metal		N/A

14	Components		P
14.1	General	Components that are certified to IEC and /or national standards are used correctly within their ratings. Components not covered by IEC standards are tested under the conditions present in the equipment. See appended table 14.1.	P
14.2	Motor Overtemperature Protection	DC motor used in cooling fan. For overtemperature protection test or evaluation see appended table 4.4.4.	P
14.3	Overtemperature protection devices	No such devices	N/A
14.4	Fuse holders	No such devices	N/A
14.5	MAINS voltage selecting devices	No such devices.	N/A

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Clause	Requirement – Test	Result - Remark	Verdict
14.6	Printed circuit boards	The PCB is UL certified with flammability classification of V-0 minimum.	P
14.7	Circuits or components used as transient overvoltage limiting devices	.	P
14.8	Batteries	Not batteries 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
14.8.3	Electrolyte spillage		N/A
14.8.4	Battery Connections		N/A
14.8.5	Battery Maintenance instructions		N/A
14.8.6	Battery accessibility and maintainability		N/A

15	Software and firmware performing safety functions	See below.	P
	Firmware or software used in or with PCE, that performs one or more safety functions the failure of which could result in a risk of fire, electric shock or other hazard as specified by this standard, shall be evaluated in accordance with Annex B.	Single fault safe compliance. Failures evaluation and risk analysis were performed by means of fault simulation or single fault conditions. (refer to subclause of 4.4.4).	P

A	Annex A, Measurement of clearance and creepage distances (normative)	P

B	Annex B, Programmable Equipment (normative)		N/A
B.1	Software or Firmware That Perform Safety Critical Functions	Refer to subclause 15.	N/A

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Clause	Requirement – Test	Result - Remark	Verdict
B.1.1	All software or firmware that performs a critical safety function/s, such as protection from excessive temperature, over current or improper synchronization of AC source, where failure of which can result in a risk of fire, electric shock or other hazard as specified by this document, shall be evaluated by one of the following means. a) All software or firmware limit or control shall be disabled before the test to evaluate the hardware circuitry during the abnormal test condition of the safety function, and the hardware sensor component that is monitored by the firmware or software is modified or disabled to prevent the software or firmware from reading or responding to the abnormal condition. b) Protection Controls employing software or firmware to perform their function(s), shall be so constructed that they comply with IEC 60730-1 Annex H to address the risks identified in B2.1. Each combination of microprocessor model, manufacturer and firmware/software version used in the production of a PCE shall be evaluated as specified in the remainder of Annex B. Exception: For units with firmware/software that has been found to be compliant with the remainder of Annex B, subsequent firmware/software revisions may be entitled to a limited revaluation for the revised firmware or software. The scope of the re-evaluation shall be defined by the potential impact of the firmware or software revisions and the applicable portions of IEC 60730-1 Annex H shall be reapplied.		N/A
B.2	Evaluation of Controls Employing Software	Refer to subclause 15.	N/A
B.2.1	Risk Analysis		N/A
B.2.1.1	A risk analysis shall be conducted to determine a set of risks and that the software addresses the identified risks. The risk analysis shall be conducted based on the safety requirements for the programmable component.		N/A
B.2.1.3	An analysis shall be conducted to identify the critical, non-critical, and supervisory parts of the software.		N/A
B.2.1.4	An analysis shall be conducted to identify transitions or states that can result in a risk.		N/A

IEC/EN 62109-1: 2010			
Clause	Requirement – Test	Result - Remark	Verdict
B.2.1.5	Risks to be considered include, but are not limited to function associated with the following: a) Temperature control, monitoring and response (ie. Coolant, internal ambient, device) b) Safety interlocks c) Synchronization between multiple AC sources e) Emergency stop of operation (including staged shutdown/sequencing) f) Connection/Disconnection – from an input source and output source g) RCD functions h) Over current protection or control i) The software must detect a hardware or software malfunction and place the device in a safe state as indicated per the “Risks Addressed State” definition.		N/A

C.	Annex C, Symbols to be used in Equipment Marking (normative)	P

D.	Annex D, Test Probes for Determining Access (informative)	P

E.	Annex E, RCDs (informative)		N/A
E.1	Selection of RCD type in AC circuits		N/A

F.	Annex F, Altitude correction for clearances (informative)	N/A

G.	Annex G, Clearance and creepage distance determination for frequencies greater than 30kHz		N/A
G.1	Clearance		N/A
G.2	Creepage distance		N/A

H.	Annex J, Measuring Instrument for Touch Current Measurements		P
H.1	Measuring instrument	Considered.	P
H.2	Alternative measuring instrument	Not used.	N/A

I.	Annex K, Examples of Protection, Insulation, and Overvoltage Category Requirements for PCE		P
I.1	Protection, Insulation and Overvoltage	Consided.	P

4.3	TABLE: Thermal testing		P
	test voltage (V)	See below	—
	t1 (°C)	--	—
	t2 (°C)	--	—

Maximum temperature T of part/at:	T (°C)					allowed T_{max} (°C)
Supplied Voltage:	DC625V AC288V	DC850V AC288V	DC625V AC259V	DC625V AC288V	DC850V AC288V	--
Ambient 1	40.5	41.0	41.0	61.0	60.9	--
Ambient 2	40.7	40.9	40.6	60.8	60.6	--
PCE						
PV connector (outside)	44.2	43.6	44.4	63.8	63.3	85
PV connector (inside)	57.9	54.7	58.5	74.6	73.3	85
DC switch (outside)	43.1	43.1	43.7	63.2	62.9	/
DC switch (inside)	64.4	59.9	64.7	78.2	77.5	/
AC connector	46.2	46.5	47.4	65.6	65.7	/
Enclosure (right part)	53.9	51.0	54.4	70.3	69.5	/
Enclosure (left part)	49.3	47.5	48.9	66.3	66.5	/
Indication light panel	49.0	46.9	48.2	65.7	65.9	/
Heatsink	86.8	61.7	69.7	83.6	83.1	/
Mounting surface	46.0	47.2	48.7	67.7	67.3	/
Input board						
Internal wire (Input board to power board)	86.3	73.9	84.2	93.3	90.3	105
SPD F4	76.5	68.2	75.3	84.6	84.7	85
Capacitor C44	77.3	69.4	76.3	88.3	86.7	105
PCB surface	75.1	66.9	74.2	86.9	84.3	105
PV input wire	64.8	57.8	64.6	78.5	75.8	105
X capacitor	61.2	56.0	61.2	76.3	74.2	95
BOOST inductance coil	84.5	51.1	82.8	103.9	70.5	165
INV inductance coil	103.3	110.7	114.3	104.4	119.2	165
Power board						

PCB surface	93.1	79.1	89.9	99.2	96.6	105
Capacitor C1155	87.4	72.8	83.5	93.2	89.9	105
Transformer T1 coil	85.5	68.9	79.8	92.2	87.0	145
Transformer T1 bobbin	85.4	68.7	79.6	92.0	86.8	150
U4 module (INV B phase)	105.6	91.4	102.5	109.0	108.3	175
Current transducer U3018	85.2	68.2	81.4	92.9	86.7	105
Optocoupler U66	92.2	76.4	85.8	94.5	94.1	95
Y capacitor C174	90.0	78.4	87.0	94.9	94.7	105
Internal wire (INV inductor)	79.8	73.7	79.1	86.8	87.7	105
Internal wire (BOOST inductor)	80.4	63.9	77.2	89.5	81.8	105
Output board						
BUS capacitor C986	68.4	63.1	67.0	80.0	79.1	105
BUS capacitor C991	68.1	61.1	66.4	80.0	77.9	105
Internal wire (input borad to output board)	63.5	57.5	62.6	77.3	75.3	85
Heatsink fan	73.8	62.8	71.2	84.9	80.4	/
Capacitor C1000	70.3	60.1	67.6	81.3	77.7	105
DC aux power transformer coil	72.1	62.7	69.7	83.5	80.3	145
DC aux power transformer bobbin	72.4	63.1	70.0	83.7	80.5	150
AC aux power transformer coil	79.0	69.1	76.0	87.8	85.6	145
AC aux power transformer bobbin	75.5	65.9	73.0	84.9	82.7	150
Capacitor C741	84.5	75.0	84.0	89.3	89.6	105
Capacitor C196	72.4	63.4	70.5	82.7	80.3	105
Inductor T1 bobbin	79.6	71.0	79.2	86.9	86.4	130
Capacitor C192	88.0	78.9	87.4	91.5	93.0	105
Indductor L2 bobbin	91.9	83.1	93.0	93.8	96.3	130
SPD F4	80.6	72.4	79.5	84.5	84.7	85
GFCI U87	71.2	62.4	69.4	81.9	79.4	105
Relay K9	76.7	70.0	76.2	84.7	84.7	85
Relay K7	74.0	67.0	72.9	84.4	83.2	85

AC filter capacitor C733	77.9	71.6	77.5	86.7	87.4	90
Current transducer U85	85.1	78.9	85.8	91.9	93.4	105
AC output wire	86.7	76.5	85.3	90.4	91.7	105
PCB surface	71.1	63.3	70.6	82.6	80.7	105
Sampling board						
PCB surface	74.2	64.8	71.7	85.1	81.9	105
DSP U58	80.5	71.8	78.5	91.6	88.6	127.8
DSP U59	82.2	72.9	79.7	93.3	90.2	112.5
AC connect terminal block						
Protection cover	70.7	64.2	70.0	80.6	81.2	85

Temperature T of winding:	R_1 (Ω)	R_2 (Ω)	T (°C)	allowed T_{max} (°C)	insulation class
--	--	--	--	--	--

Note(s):

With a specified max. ambient temperature of + 60°C, the maximum permitted temperatures are calculated as follows:

Winding components (providing safety isolation):

- Class A (105) → Tmax = 90°C (thermocouple measurement)
- Class B (130) → Tmax = 110°C (thermocouple measurement)
- Class H (180) → Tmax = 150°C (thermocouple measurement)

Others components:

- Winding of 130°C → Tmax = 120°C (thermocouple measurement)
- Internal wiring of 80 /105°C → Tmax = 80 / 105°C
- PCB of 130°C → Tmax = 130°C
- opto-coupler of 100°C → Tmax = 100°C
- Relay coil 130°C → Tmax = 120°C (thermocouple measurement)
- E-Cap. (T = 85°C) → Tmax = 85°C
- E-Cap. (No T marking) → Tmax = 65°C
- Cap. (No T marking) → Tmax = 90°C
- Insulation tube of 125°C → Tmax = 125°C
- Handles or knobs 75°C → Tmax = 75°C
- PCE surface (metal) 70°C → Tmax = 70°C
- PCE surface (Plastic) 95°C → Tmax = 95°C

4.4	TABLE: fault condition tests						
	test voltage (V) ..... :						—
	Ambient temperature (°C) ..... :						
No.	com-ponent No.	fault	test voltage (V)	test time	fuse No.	fuse current (A)	result
1.	PCE input	Reversed	DC 850V /AC 500V	10min	--	--	DC Input: 850Vdc /0A / 0KW AC Output: 0Vac / 0A /0KW FID: Unit can not start,no damage,no hazard. MT: N/A SD: ☒ Yes /☐ No, GD: ☒ Yes /☐ No RO: ☒ Yes /☐ No, NCD: ☒ Yes /☐ No NH: ☒ Pass / ☐ Fail. DST: ☒ Pass / ☐ Fail.
2.	PCE input	s-c	DC 850V /AC 500V	10min	--	--	DC Input: 850Vdc /0A / 0KW AC Output: 0Vac / 0A /0KW FID: Unit disconnected form grid immediately ,no damage,no hazard. MT: N/A SD: ☒ Yes /☐ No, GD: ☒ Yes /☐ No RO: ☒ Yes /☐ No, NCD: ☒ Yes /☐ No NH: ☒ Pass / ☐ Fail. DST: ☒ Pass / ☐ Fail.
3.	PCE output	s-c	DC 850V /AC 500V	10min	--	--	DC Input: 850Vdc /0A / 0KW AC Output: 0Vac / 0A /0KW FID: Unit disconnected form grid immediately ,no damage,no hazard. MT: N/A SD: ☒ Yes /☐ No, GD: ☒ Yes /☐ No RO: ☒ Yes /☐ No, NCD: ☒ Yes /☐ No NH: ☒ Pass / ☐ Fail. DST: ☒ Pass / ☐ Fail.
4.	PCE Cooling system failure	Fan locked	DC 850V /AC 500V	4hour	--	--	DC Input: 850Vdc /64A / 53.5KW AC Output: 500Vac / 60.8A /52.5KW FID: Unit over temperature protected ,run for thermal equilibrium,no damage,no hazard. MT: IGBT=96.3°C, INV Choke=95°C, DC AUX transformer coil=75.7°C SD: ☒ Yes /☐ No, GD: ☒ Yes /☐ No RO: ☒ Yes /☐ No, NCD: ☒ Yes /☐ No NH: ☒ Pass / ☐ Fail. DST: ☒ Pass / ☐ Fail.

5.	PCE Cooling system failure	Heatsink blanketing	DC 850V /AC 500V	4hour	--	--	DC Input: 850Vdc /64A / 53.5KW AC Output: 500Vac / 60.8A /52.5KW FID: Unit over temperature protected ,run for thermal equilibrium,no damage,no hazard. MT: IGBT=98.6°C, INV Choke=106°C, DC AUX transformer coil=81.3°C,Metal enclosure=75°C SD: ☒ Yes /☐ No, GD: ☒ Yes /☐ No RO: ☒ Yes /☐ No, NCD: ☒ Yes /☐ No NH: ☒ Pass / ☐ Fail. DST: ☒ Pass / ☐ Fail.
ISO circuits failure							
6.	C3109	s-c	DC 850V /AC 500V	30min	--	--	DC Input: 850Vdc /64A / 53.5KW AC Output: 500Vac / 60.8A /52.5KW FID: Unit work normally,no hazard. MT: N/A SD: ☐ Yes /☒ No, GD: ☐ Yes /☒ No RO: ☒ Yes /☐ No, NCD: ☒ Yes /☐ No NH: ☒ Pass / ☐ Fail. DST: ☒ Pass / ☐ Fail.
7.	Q3026 QE PIN	s-c	DC 850V /AC 500V	30min	--	--	DC Input: 850Vdc /64A / 53.5KW AC Output: 500Vac / 60.8A /52.5KW FID: Unit work normally,no hazard. MT: N/A SD: ☐ Yes /☒ No, GD: ☐ Yes /☒ No RO: ☒ Yes /☐ No, NCD: ☒ Yes /☐ No NH: ☒ Pass / ☐ Fail. DST: ☒ Pass / ☐ Fail.
8.	D3045	s-c	DC 850V /AC 500V	30min	--	--	DC Input: 850Vdc /64A / 53.5KW AC Output: 500Vac / 60.8A /52.5KW FID: Unit work normally,no hazard. MT: N/A SD: ☐ Yes /☒ No, GD: ☐ Yes /☒ No RO: ☒ Yes /☐ No, NCD: ☒ Yes /☐ No NH: ☒ Pass / ☐ Fail. DST: ☒ Pass / ☐ Fail.
IMI circuits failure							

9.	Q9 DS PIN	s-c	DC 850V /AC 500V	10min	--	--	DC Input: 850Vdc /0A / 0KW AC Output: 500Vac / 0A /0KW FID: Unit shutdown immediately,no damage,no hazard. Error message: 318 (residual current fault) MT: N/A SD: ☒ Yes /☐ No, GD: ☒ Yes /☐ No RO: ☒ Yes /☐ No, NCD: ☒ Yes /☐ No NH: ☒ Pass / ☐ Fail. DST: ☒ Pass / ☐ Fail.
10.	U87 PIN5-PIN7	s-c	DC 850V /AC 500V	10min	--	--	DC Input: 850Vdc /0A / 0KW AC Output: 500Vac / 0A /0KW FID: Unit shutdown immediately,no damage,no hazard. Error message: 318 (residual current fault) MT: N/A SD: ☒ Yes /☐ No, GD: ☒ Yes /☐ No RO: ☒ Yes /☐ No, NCD: ☒ Yes /☐ No NH: ☒ Pass / ☐ Fail. DST: ☒ Pass / ☐ Fail.
11.	C599	s-c	DC 850V /AC 500V	30min	--	--	DC Input: 850Vdc /64A / 53.5KW AC Output: 500Vac / 60.8A /52.5KW FID: Unit normal working ,no damage,no hazard. MT: N/A SD: ☐ Yes /☒ No, GD: ☐ Yes /☒ No RO: ☒ Yes /☐ No, NCD: ☒ Yes /☐ No NH: ☒ Pass / ☐ Fail. DST: ☒ Pass / ☐ Fail.
Relay control circuits failure							
12.	C955	s-c	DC 850V /AC 500V	10min	--	--	DC Input: 850Vdc /0A / 0KW AC Output: 500Vac / 0A /0KW FID: Unit shutdown immediately,no damage,no hazard. MT: N/A SD: ☒ Yes /☐ No, GD: ☒ Yes /☐ No RO: ☒ Yes /☐ No, NCD: ☒ Yes /☐ No NH: ☒ Pass / ☐ Fail. DST: ☒ Pass / ☐ Fail.

13.	C27	s-c	DC 850V /AC 500V	10min	--	--	DC Input: 850Vdc /64A / 53.5KW AC Output: 500Vac / 60.8A /52.5KW FID: Unit shutdown immediately,no damage,no hazard. MT: N/A SD: ☒ Yes /☐ No, GD: ☒ Yes /☐ No RO: ☒ Yes /☐ No, NCD: ☒ Yes /☐ No NH: ☒ Pass / ☐ Fail. DST: ☒ Pass / ☐ Fail.
14.	D91	s-c	DC 850V /AC 500V	30min	--	--	DC Input: 850Vdc /64A / 53.5KW AC Output: 500Vac / 60.8A /52.5KW FID: Unit work normally,no hazard. MT: N/A SD: ☐ Yes /☒ No, GD: ☐ Yes /☒ No RO: ☒ Yes /☐ No, NCD: ☒ Yes /☐ No NH: ☒ Pass / ☐ Fail. DST: ☒ Pass / ☐ Fail.
Others							
15.	U3012 PIN15-PIN19	s-c	DC 850V /AC 500V	10min	--	--	DC Input: 850Vdc /0A / 0KW AC Output: 500Vac / 0A /0KW FID: Unit shutdown immediately,no damage,no hazard. MT: N/A SD: ☒ Yes /☐ No, GD: ☒ Yes /☐ No RO: ☒ Yes /☐ No, NCD: ☒ Yes /☐ No NH: ☒ Pass / ☐ Fail. DST: ☒ Pass / ☐ Fail.
16.	U3012 PIN15-PIN17	s-c	DC 850V /AC 500V	10min	--	--	DC Input: 850Vdc /0A / 0KW AC Output: 500Vac / 0A /0KW FID: Unit shutdown immediately,no damage,no hazard. MT: N/A SD: ☒ Yes /☐ No, GD: ☒ Yes /☐ No RO: ☒ Yes /☐ No, NCD: ☒ Yes /☐ No NH: ☒ Pass / ☐ Fail. DST: ☒ Pass / ☐ Fail.

17.	U3 PIN3-PIN23	s-c	DC 850V /AC 500V	10min	--	--	DC Input: 850Vdc /0A / 0KW AC Output: 500Vac / 0A /0KW FID: Unit shutdown immediately,no damage,no hazard. MT: N/A SD: ☒ Yes /☐ No, GD: ☒ Yes /☐ No RO: ☒ Yes /☐ No, NCD: ☒ Yes /☐ No NH: ☒ Pass / ☐ Fail. DST: ☒ Pass / ☐ Fail.
18.	BUS-CAP C1010	s-c	DC 850V /AC 500V	10min	--	--	DC Input: 850Vdc /0A / 0KW AC Output: 500Vac / 0A /0KW FID: Unit shutdown immediately, C985,C987,C989,C991,C993,C995,C997,C1009,C1011 damaged. DVC-C circuit to DVC-A circuit pass DST test, DVC-C circuit to earth DST test failed and Earth continuously test pass. MT: N/A SD: ☒ Yes /☐ No, GD: ☒ Yes /☐ No RO: ☐ Yes /☒ No, NCD: ☐ Yes /☒ No NH: ☒ Pass / ☐ Fail. DST: ☒ Pass / ☐ Fail.
19.	BUS-CAP C1009	s-c	DC 850V /AC 500V	10min	--	--	DC Input: 850Vdc /0A / 0KW AC Output: 500Vac / 0A /0KW FID: Unit shutdown immediately, C985,C987,C989,C991,C993,C995,C997,C1010,C1011 damaged. MT: N/A SD: ☒ Yes /☐ No, GD: ☒ Yes /☐ No RO: ☐ Yes /☒ No, NCD: ☐ Yes /☒ No NH: ☒ Pass / ☐ Fail. DST: ☒ Pass / ☐ Fail.
20.	BUS-CAP C1011	s-c	DC 850V /AC 500V	10min	--	--	DC Input: 850Vdc /0A / 0KW AC Output: 500Vac / 0A /0KW FID: Unit shutdown immediately, C985,C987,C989,C991,C993,C995,C997,C1009,C1010 damaged. DVC-C circuit to DVC-A circuit pass DST test, DVC-C circuit to earth DST test failed and Earth continuously test pass. MT: N/A SD: ☒ Yes /☐ No, GD: ☒ Yes /☐ No RO: ☐ Yes /☒ No, NCD: ☐ Yes /☒ No NH: ☒ Pass / ☐ Fail. DST: ☒ Pass / ☐ Fail.

21.	D288	o-c	DC 850V /AC 500V	10min	--	--	DC Input: 850Vdc /0A / 0KW AC Output: 500Vac / 0A /0KW FID: Unit shutdown immediately,no damage,no hazard. MT: N/A SD: ☒ Yes /☐ No, GD: ☒ Yes /☐ No RO: ☒ Yes /☐ No, NCD: ☒ Yes /☐ No NH: ☒ Pass / ☐ Fail. DST: ☒ Pass / ☐ Fail.
22.	OSC1 PIN2-PIN3	s-c	DC 850V /AC 500V	10min	--	--	DC Input: 850Vdc /0A / 0KW AC Output: 500Vac / 0A /0KW FID: Unit shutdown immediately,no damage,no hazard. MT: N/A SD: ☒ Yes /☐ No, GD: ☒ Yes /☐ No RO: ☒ Yes /☐ No, NCD: ☒ Yes /☐ No NH: ☒ Pass / ☐ Fail. DST: ☒ Pass / ☐ Fail.
23.	T7 PIN11-PIN12	s-c	DC 850V /AC 500V	10min	--	--	DC Input: 850Vdc /0A / 0KW AC Output: 500Vac / 0A /0KW FID: Unit shutdown immediately,no damage,no hazard. MT: N/A SD: ☒ Yes /☐ No, GD: ☒ Yes /☐ No RO: ☒ Yes /☐ No, NCD: ☒ Yes /☐ No NH: ☒ Pass / ☐ Fail. DST: ☒ Pass / ☐ Fail.
24.	T7 PIN17-PIN20	s-c	DC 850V /AC 500V	30min	--	--	DC Input: 850Vdc /64A / 53.5KW AC Output: 500Vac / 60.8A /52.5KW FID: Unit normal working,no damage,no hazard. MT: N/A SD: ☐ Yes /☒ No, GD: ☐ Yes /☒ No RO: ☒ Yes /☐ No, NCD: ☒ Yes /☐ No NH: ☒ Pass / ☐ Fail. DST: ☒ Pass / ☐ Fail.
25.	T7 PIN1-PIN2	s-c	DC 850V /AC 500V	10min	--	--	DC Input: 850Vdc /64A / 53.5KW AC Output: 500Vac / 60.8A /52.5KW FID: Unit shutdown immediately,no damage,no hazard. MT: N/A SD: ☒ Yes /☐ No, GD: ☒ Yes /☐ No RO: ☒ Yes /☐ No, NCD: ☒ Yes /☐ No NH: ☒ Pass / ☐ Fail. DST: ☒ Pass / ☐ Fail.

26.	T7 PIN3-PIN4	s-c	DC 850V /AC 500V	10min	--	--	DC Input: 850Vdc /0A / 0KW AC Output: 500Vac / 0A /0KW FID: Unit shutdown immediately,no damage,no hazard. MT: N/A SD: ☒ Yes /☐ No, GD: ☒ Yes /☐ No RO: ☒ Yes /☐ No, NCD: ☒ Yes /☐ No NH: ☒ Pass / ☐ Fail. DST: ☒ Pass / ☐ Fail.
27.	T7 PIN9-PIN10	s-c	DC 850V /AC 500V	10min	--	--	DC Input: 850Vdc /0A / 0KW AC Output: 500Vac / 0A /0KW FID: Unit shutdown immediately,no damage,no hazard. MT: N/A SD: ☒ Yes /☐ No, GD: ☒ Yes /☐ No RO: ☒ Yes /☐ No, NCD: ☒ Yes /☐ No NH: ☒ Pass / ☐ Fail. DST: ☒ Pass / ☐ Fail.
28.	T7 PIN17-PIN16	s-c	DC 850V /AC 500V	10min	--	--	DC Input: 850Vdc /0A / 0KW AC Output: 500Vac / 0A /0KW FID: Unit shutdown immediately,no damage,no hazard. MT: N/A SD: ☒ Yes /☐ No, GD: ☒ Yes /☐ No RO: ☒ Yes /☐ No, NCD: ☒ Yes /☐ No NH: ☒ Pass / ☐ Fail. DST: ☒ Pass / ☐ Fail.
29.	T7 PIN17-PIN18	s-c	DC 850V /AC 500V	10min	--	--	DC Input: 850Vdc /0A / 0KW AC Output: 500Vac / 0A /0KW FID: Unit shutdown immediately,no damage,no hazard. MT: N/A SD: ☒ Yes /☐ No, GD: ☒ Yes /☐ No RO: ☒ Yes /☐ No, NCD: ☒ Yes /☐ No NH: ☒ Pass / ☐ Fail. DST: ☒ Pass / ☐ Fail.
30.	T7 PIN17-PIN19	s-c	DC 850V /AC 500V	10min	--	--	DC Input: 850Vdc /0A / 0KW AC Output: 500Vac / 0A /0KW FID: Unit shutdown immediately,no damage,no hazard. MT: N/A SD: ☒ Yes /☐ No, GD: ☒ Yes /☐ No RO: ☒ Yes /☐ No, NCD: ☒ Yes /☐ No NH: ☒ Pass / ☐ Fail. DST: ☒ Pass / ☐ Fail.

31.	T6 PIN6-PIN8	s-c	DC 850V /AC 500V	30min	--	--	DC Input: 850Vdc /64A / 53.5KW AC Output: 500Vac / 60.8A /52.5KW FID: Unit normal working,no damage,no hazard. MT: N/A SD: ☐ Yes /☒ No, GD: ☐ Yes /☒ No RO: ☒ Yes /☐ No, NCD: ☒ Yes /☐ No NH: ☒ Pass / ☐ Fail. DST: ☒ Pass / ☐ Fail.
32.	T6 PIN2-PIN4	s-c	DC 850V /AC 500V	30min	--	--	DC Input: 850Vdc /64A / 53.5KW AC Output: 500Vac / 60.8A /52.5KW FID: Unit normal working,no damage,no hazard. MT: N/A SD: ☐ Yes /☒ No, GD: ☐ Yes /☒ No RO: ☒ Yes /☐ No, NCD: ☒ Yes /☐ No NH: ☒ Pass / ☐ Fail. DST: ☒ Pass / ☐ Fail.
33.	T6 PIN11-PIN12	s-c	DC 850V /AC 500V	10min	--	--	DC Input: 850Vdc /0A / 0KW AC Output: 500Vac / 0A /0KW FID: Unit shutdown immediately,no damage,no hazard. MT: N/A SD: ☒ Yes /☐ No, GD: ☒ Yes /☐ No RO: ☒ Yes /☐ No, NCD: ☒ Yes /☐ No NH: ☒ Pass / ☐ Fail. DST: ☒ Pass / ☐ Fail.
34.	D205	s-c	DC 850V /AC 500V	30min	--	--	DC Input: 850Vdc /64A / 53.5KW AC Output: 500Vac / 60.8A /52.5KW FID: Unit normal working,no damage,no hazard. MT: N/A SD: ☐ Yes /☒ No, GD: ☐ Yes /☒ No RO: ☒ Yes /☐ No, NCD: ☒ Yes /☐ No NH: ☒ Pass / ☐ Fail. DST: ☒ Pass / ☐ Fail.
35.	D274	s-c	DC 850V /AC 500V	10min	--	--	DC Input: 850Vdc /0A / 0KW AC Output: 500Vac / 0A /0KW FID: Unit shutdown immediately,no damage,no hazard. MT: N/A SD: ☒ Yes /☐ No, GD: ☒ Yes /☐ No RO: ☒ Yes /☐ No, NCD: ☒ Yes /☐ No NH: ☒ Pass / ☐ Fail. DST: ☒ Pass / ☐ Fail.

36.	Q39 D-S	s-c	DC 850V /AC 500V	10min	--	--	DC Input: 850Vdc /0A / 0KW AC Output: 500Vac / 0A /0KW FID: Unit shutdown immediately, Q40 damaged. MT: N/A SD: ☒ Yes /☐ No, GD: ☒ Yes /☐ No RO: ☐ Yes /☒ No, NCD: ☐ Yes /☒ No NH: ☒ Pass / ☐ Fail. DST: ☒ Pass / ☐ Fail.
37.	Q39 D-G	s-c	DC 850V /AC 500V	10min	--	--	DC Input: 850Vdc /0A / 0KW AC Output: 500Vac / 0A /0KW FID: Unit shutdown immediately, R2046, D238 damaged. MT: N/A SD: ☒ Yes /☐ No, GD: ☒ Yes /☐ No RO: ☐ Yes /☒ No, NCD: ☐ Yes /☒ No NH: ☒ Pass / ☐ Fail. DST: ☒ Pass / ☐ Fail.
38.	Q39 G-S	s-c	DC 850V /AC 500V	10min	--	--	DC Input: 850Vdc /0A / 0KW AC Output: 500Vac / 0A /0KW FID: Unit shutdown immediately,no damage,no hazard. MT: N/A SD: ☒ Yes /☐ No, GD: ☒ Yes /☐ No RO: ☒ Yes /☐ No, NCD: ☒ Yes /☐ No NH: ☒ Pass / ☐ Fail. DST: ☒ Pass / ☐ Fail.
39.	Q40 D-S	s-c	DC 850V /AC 500V	10min	--	--	DC Input: 850Vdc /0A / 0KW AC Output: 500Vac / 0A /0KW FID: Unit shutdown immediately, Q39 damaged, no hazard. MT: N/A SD: ☒ Yes /☐ No, GD: ☒ Yes /☐ No RO: ☒ Yes /☐ No, NCD: ☒ Yes /☐ No NH: ☒ Pass / ☐ Fail. DST: ☒ Pass / ☐ Fail.
40.	Q40 D-G	s-c	DC 850V /AC 500V	10min	--	--	DC Input: 850Vdc /0A / 0KW AC Output: 500Vac / 0A /0KW FID: Unit shutdown immediately, R2046,D239 damaged, no hazard. MT: N/A SD: ☒ Yes /☐ No, GD: ☒ Yes /☐ No RO: ☐ Yes /☒ No, NCD: ☐ Yes /☒ No NH: ☒ Pass / ☐ Fail. DST: ☒ Pass / ☐ Fail.

41.	Q40 G-S	s-c	DC 850V /AC 500V	10min	--	--	DC Input: 850Vdc /0A / 0KW AC Output: 500Vac / 0A /0KW FID: Unit shutdown immediately,no damage,no hazard. MT: N/A SD: ☒ Yes /☐ No, GD: ☒ Yes /☐ No RO: ☒ Yes /☐ No, NCD: ☒ Yes /☐ No NH: ☒ Pass / ☐ Fail. DST: ☒ Pass / ☐ Fail.
42.	Q22 D-S	s-c	DC 850V /AC 500V	10min	--	--	DC Input: 850Vdc /0A / 0KW AC Output: 500Vac / 0A /0KW FID: Unit shutdown immediately,can restart, D21 damaged,no hazard. MT: N/A SD: ☒ Yes /☐ No, GD: ☒ Yes /☐ No RO: ☒ Yes /☐ No, NCD: ☐ Yes /☒ No NH: ☒ Pass / ☐ Fail. DST: ☒ Pass / ☐ Fail.
43.	Q22 D-G	s-c	DC 850V /AC 500V	10min	--	--	DC Input: 850Vdc /0A / 0KW AC Output: 500Vac / 0A /0KW FID: Unit shutdown immediately, D21 damaged,no hazard. MT: N/A SD: ☒ Yes /☐ No, GD: ☒ Yes /☐ No RO: ☐ Yes /☒ No, NCD: ☐ Yes /☒ No NH: ☒ Pass / ☐ Fail. DST: ☒ Pass / ☐ Fail.
44.	Q22 G-S	s-c	DC 850V /AC 500V	10min	--	--	DC Input: 850Vdc /0A / 0KW AC Output: 500Vac / 0A /0KW FID: Unit shutdown immediately,no damage,no hazard. MT: N/A SD: ☒ Yes /☐ No, GD: ☒ Yes /☐ No RO: ☒ Yes /☐ No, NCD: ☒ Yes /☐ No NH: ☒ Pass / ☐ Fail. DST: ☒ Pass / ☐ Fail.
45.	U110 Pin1-3	s-c	DC 850V /AC 500V	30min	--	--	DC Input: 850Vdc /64A / 53.5KW AC Output: 500Vac / 60.8A /52.5KW FID: Unit normal working,no damage,no hazard. MT: N/A SD: ☐ Yes /☒ No, GD: ☐ Yes /☒ No RO: ☒ Yes /☐ No, NCD: ☒ Yes /☐ No NH: ☒ Pass / ☐ Fail. DST: ☒ Pass / ☐ Fail.

46.	U110 Pin1-4	s-c	DC 850V /AC 500V	30min	--	--	DC Input: 850Vdc /64A / 53.5KW AC Output: 500Vac / 60.8A /52.5KW FID: Unit normal working,no damage,no hazard. MT: N/A SD: ☐ Yes /☒ No, GD: ☐ Yes /☒ No RO: ☒ Yes /☐ No, NCD: ☒ Yes /☐ No NH: ☒ Pass / ☐ Fail. DST: ☒ Pass / ☐ Fail.
47.	U110 Pin2-3	s-c	DC 850V /AC 500V	30min	--	--	DC Input: 850Vdc /64A / 53.5KW AC Output: 500Vac / 60.8A /52.5KW FID: Unit normal working,no damage,no hazard. MT: N/A SD: ☐ Yes /☒ No, GD: ☐ Yes /☒ No RO: ☒ Yes /☐ No, NCD: ☒ Yes /☐ No NH: ☒ Pass / ☐ Fail. DST: ☒ Pass / ☐ Fail.
48.	U110 Pin2-4	s-c	DC 850V /AC 500V	30min	--	--	DC Input: 850Vdc /64A / 53.5KW AC Output: 500Vac / 60.8A /52.5KW FID: Unit normal working,no damage,no hazard. MT: N/A SD: ☐ Yes /☒ No, GD: ☐ Yes /☒ No RO: ☒ Yes /☐ No, NCD: ☒ Yes /☐ No NH: ☒ Pass / ☐ Fail. DST: ☒ Pass / ☐ Fail.
49.	U111 Pin1-3	s-c	DC 850V /AC 500V	30min	--	--	DC Input: 850Vdc /64A / 53.5KW AC Output: 500Vac / 60.8A /52.5KW FID: Unit normal working,no damage,no hazard. MT: N/A SD: ☐ Yes /☒ No, GD: ☐ Yes /☒ No RO: ☒ Yes /☐ No, NCD: ☒ Yes /☐ No NH: ☒ Pass / ☐ Fail. DST: ☒ Pass / ☐ Fail.
50.	U111 Pin1-4	s-c	DC 850V /AC 500V	30min	--	--	DC Input: 850Vdc /64A / 53.5KW AC Output: 500Vac / 60.8A /52.5KW FID: Unit normal working,no damage,no hazard. MT: N/A SD: ☐ Yes /☒ No, GD: ☐ Yes /☒ No RO: ☒ Yes /☐ No, NCD: ☒ Yes /☐ No NH: ☒ Pass / ☐ Fail. DST: ☒ Pass / ☐ Fail.

51.	U111 Pin2-3	s-c	DC 850V /AC 500V	30min	--	--	DC Input: 850Vdc /64A / 53.5KW AC Output: 500Vac / 60.8A /52.5KW FID: Unit normal working,no damage,no hazard. MT: N/A SD: ☐ Yes /☒ No, GD: ☐ Yes /☒ No RO: ☒ Yes /☐ No, NCD: ☒ Yes /☐ No NH: ☒ Pass / ☐ Fail. DST: ☒ Pass / ☐ Fail.
52.	U111 Pin2-4	s-c	DC 850V /AC 500V	30min	--	--	DC Input: 850Vdc /64A / 53.5KW AC Output: 500Vac / 60.8A /52.5KW FID: Unit normal working,no damage,no hazard. MT: N/A SD: ☐ Yes /☒ No, GD: ☐ Yes /☒ No RO: ☒ Yes /☐ No, NCD: ☒ Yes /☐ No NH: ☒ Pass / ☐ Fail. DST: ☒ Pass / ☐ Fail.
53.	U103 Pin12-13	s-c	DC 850V /AC 500V	30min	--	--	DC Input: 850Vdc /64A / 53.5KW AC Output: 500Vac / 60.8A /52.5KW FID: Unit normal working,no damage,no hazard. MT: N/A SD: ☐ Yes /☒ No, GD: ☐ Yes /☒ No RO: ☒ Yes /☐ No, NCD: ☒ Yes /☐ No NH: ☒ Pass / ☐ Fail. DST: ☒ Pass / ☐ Fail.
54.	D274	s-c	DC 850V /AC 500V	30min	--	--	DC Input: 850Vdc /64A / 53.5KW AC Output: 500Vac / 60.8A /52.5KW FID: Unit normal working,no damage,no hazard. MT: N/A SD: ☐ Yes /☒ No, GD: ☐ Yes /☒ No RO: ☒ Yes /☐ No, NCD: ☒ Yes /☐ No NH: ☒ Pass / ☐ Fail. DST: ☒ Pass / ☐ Fail.
55.	D281	s-c	DC 850V /AC 500V	30min	--	--	DC Input: 850Vdc /64A / 53.5KW AC Output: 500Vac / 60.8A /52.5KW FID: Unit normal working,no damage,no hazard. MT: N/A SD: ☐ Yes /☒ No, GD: ☐ Yes /☒ No RO: ☒ Yes /☐ No, NCD: ☒ Yes /☐ No NH: ☒ Pass / ☐ Fail. DST: ☒ Pass / ☐ Fail.

56.	D280	s-c	DC 850V /AC 500V	30min	--	--	DC Input: 850Vdc /64A / 53.5KW AC Output: 500Vac / 60.8A /52.5KW FID: Unit normal working,no damage,no hazard. MT: N/A SD: ☐ Yes /☒ No, GD: ☐ Yes /☒ No RO: ☒ Yes /☐ No, NCD: ☒ Yes /☐ No NH: ☒ Pass / ☐ Fail. DST: ☒ Pass / ☐ Fail.
57.	D237	s-c	DC 850V /AC 500V	30min	--	--	DC Input: 850Vdc /64A / 53.5KW AC Output: 500Vac / 60.8A /52.5KW FID: Unit normal working,no damage,no hazard. MT: N/A SD: ☐ Yes /☒ No, GD: ☐ Yes /☒ No RO: ☒ Yes /☐ No, NCD: ☒ Yes /☐ No NH: ☒ Pass / ☐ Fail. DST: ☒ Pass / ☐ Fail.
58.	D277/D278	s-c	DC 850V /AC 500V	30min	--	--	DC Input: 850Vdc /64A / 53.5KW AC Output: 500Vac / 60.8A /52.5KW FID: Unit normal working,no damage,no hazard. MT: N/A SD: ☐ Yes /☒ No, GD: ☐ Yes /☒ No RO: ☒ Yes /☐ No, NCD: ☒ Yes /☐ No NH: ☒ Pass / ☐ Fail. DST: ☒ Pass / ☐ Fail.
59.	C302	s-c	DC 850V /AC 500V	30min	--	--	DC Input: 850Vdc /64A / 53.5KW AC Output: 500Vac / 60.8A /52.5KW FID: Unit normal working,no damage,no hazard. MT: N/A SD: ☐ Yes /☒ No, GD: ☐ Yes /☒ No RO: ☒ Yes /☐ No, NCD: ☒ Yes /☐ No NH: ☒ Pass / ☐ Fail. DST: ☒ Pass / ☐ Fail.
60.	T2 Pin3-4	s-c	DC 850V /AC 500V	30min	--	--	DC Input: 850Vdc /64A / 53.5KW AC Output: 500Vac / 60.8A /52.5KW FID: Unit normal working,no damage,no hazard. MT: N/A SD: ☐ Yes /☒ No, GD: ☐ Yes /☒ No RO: ☒ Yes /☐ No, NCD: ☒ Yes /☐ No NH: ☒ Pass / ☐ Fail. DST: ☒ Pass / ☐ Fail.

61.	T2 Pin5-8	s-c	DC 850V /AC 500V	30min	--	--	DC Input: 850Vdc /64A / 53.5KW AC Output: 500Vac / 60.8A /52.5KW FID: Unit normal working,no damage,no hazard. MT: N/A SD: ☐ Yes /☒ No, GD: ☐ Yes /☒ No RO: ☒ Yes /☐ No, NCD: ☒ Yes /☐ No NH: ☒ Pass / ☐ Fail. DST: ☒ Pass / ☐ Fail.
62.	Input	Over-voltage	DC 850V /AC 500V	10min	--	--	DC Input: 850Vdc /0A / 0KW AC Output: 500Vac / 0A /0KW FID: PV inverter can not startup. Error message: “103” (High DC Input Volt) . MT: N/A SD: ☒ Yes /☐ No, GD: ☒ Yes /☐ No RO: ☒ Yes /☐ No, NCD: ☒ Yes /☐ No NH: ☒ Pass / ☐ Fail. DST: ☒ Pass / ☐ Fail.
63.	Output	Power over-feed (OCP & OTP function controlled by MCU / software is disable)	DC 850V /AC 500V	10min	--	--	DC Input: 850Vdc /0A / 0KW AC Output: 500Vac / 0A /0KW FID: PV inverter disconnected from grid immediately. Error message: "202" (Abnormal Inv Circurt) MT: N/A SD: ☒ Yes /☐ No, GD: ☒ Yes /☐ No RO: ☒ Yes /☐ No, NCD: ☒ Yes /☐ No NH: ☒ Pass / ☐ Fail. DST: ☒ Pass / ☐ Fail.
64.	Output	Over-voltage (OVP function controlled by MCU / software is disable)	DC 850V /AC 500V	10min	--	--	DC Input: 850Vdc /0A / 0KW AC Output: 500Vac / 0A /0KW FID: Output is overvoltage, PV inverter disconnected from grid immediately Error message: 301 (Abnormal Grid Volt). MT: N/A SD: ☒ Yes /☐ No, GD: ☒ Yes /☐ No RO: ☒ Yes /☐ No, NCD: ☒ Yes /☐ No NH: ☒ Pass / ☐ Fail. DST: ☒ Pass / ☐ Fail.

65.	Output	Phase sequence or polarity incorrect	DC 850V /AC 500V	30min	--	--	DC Input: 850Vdc /64A / 53.5KW AC Output: 500Vac / 60.8A /52.5KW FID: Unit normal working,no damage,no hazard. MT: N/A SD: ☐ Yes /☒ No, GD: ☐ Yes /☒ No RO: ☒ Yes /☐ No, NCD: ☒ Yes /☐ No NH: ☒ Pass / ☐ Fail. DST: ☒ Pass / ☐ Fail.
66.	Output	A-Phase mis-wiring grid connection	DC 850V /AC 500V	10min	--	--	DC Input: 850Vdc /0A / 0KW AC Output: 500Vac / 0A /0KW FID: Unit disconnected from grid immediately,no damage,no hazard. Error message: 301 (Abnormal Grid Volt) MT: N/A SD: ☒ Yes /☐ No, GD: ☒ Yes /☐ No RO: ☒ Yes /☐ No, NCD: ☒ Yes /☐ No NH: ☒ Pass / ☐ Fail. DST: ☒ Pass / ☐ Fail.
67.	Output	B-Phase mis-wiring grid connection	DC 850V /AC 500V	10min	--	--	DC Input: 850Vdc /0A / 0KW AC Output: 500Vac / 0A /0KW FID: PV inverter disconnected from grid immediately,no damage,no hazard. Error message: 301 (Abnormal Grid Volt) MT: N/A SD: ☒ Yes /☐ No, GD: ☒ Yes /☐ No RO: ☒ Yes /☐ No, NCD: ☒ Yes /☐ No NH: ☒ Pass / ☐ Fail. DST: ☒ Pass / ☐ Fail.
68.	Output	C-Phase mis-wiring grid connection	DC 850V /AC 500V	10min	--	--	DC Input: 850Vdc /0A / 0KW AC Output: 500Vac / 0A /0KW FID: PV inverter disconnected from grid immediately,no damage,no hazard. Error message: 301 (Abnormal Grid Volt). MT: N/A SD: ☒ Yes /☐ No, GD: ☒ Yes /☐ No RO: ☒ Yes /☐ No, NCD: ☒ Yes /☐ No NH: ☒ Pass / ☐ Fail. DST: ☒ Pass / ☐ Fail.

69.	PV/DC Voltage detector	Loss	DC 850V /AC 500V	10min	--	--	DC Input: 850Vdc /0A / 0KW AC Output: 500Vac / 0A /0KW FID: PV inverter disconnected from grid after about 3 seconds.,no damage,no hazard. Error message: "400" (System fault). MT: N/A SD: ☒ Yes /☐ No, GD: ☒ Yes /☐ No RO: ☒ Yes /☐ No, NCD: ☒ Yes /☐ No NH: ☒ Pass / ☐ Fail. DST: ☒ Pass / ☐ Fail.
70.	Grid Voltage detector	Loss	DC 850V /AC 500V	10min	--	--	DC Input: 850Vdc /0A / 0KW AC Output: 500Vac / 0A /0KW FID: PV inverter disconnected from grid immediately.,no damage,no hazard. Error message"202"(Invert Circuit Abnormal), or "301"(Grid Under Voltage), or "305"(Under Frequency); MT: N/A SD: ☒ Yes /☐ No, GD: ☒ Yes /☐ No RO: ☒ Yes /☐ No, NCD: ☒ Yes /☐ No NH: ☒ Pass / ☐ Fail. DST: ☒ Pass / ☐ Fail.
71.	Bus Voltage detector	Loss	DC 850V /AC 500V	10min	--	--	DC Input: 850Vdc /0A / 0KW AC Output: 500Vac / 0A /0KW FID: PV inverter disconnected from grid immediately.,no damage,no hazard. Error message "200"(DC Bus Voltage Fault) ; MT: N/A SD: ☒ Yes /☐ No, GD: ☒ Yes /☐ No RO: ☒ Yes /☐ No, NCD: ☒ Yes /☐ No NH: ☒ Pass / ☐ Fail. DST: ☒ Pass / ☐ Fail.
72.	MCU failure	+1.9V power supply disable	DC 850V /AC 500V	10min	--	--	DC Input: 850Vdc /0A / 0KW AC Output: 500Vac / 0A /0KW FID: Unit shutdown immediately,no damage,no hazard. MT: N/A SD: ☒ Yes /☐ No, GD: ☒ Yes /☐ No RO: ☒ Yes /☐ No, NCD: ☒ Yes /☐ No NH: ☒ Pass / ☐ Fail. DST: ☒ Pass / ☐ Fail.

73.	MCU failure	+3.3V power supply disable	DC 850V /AC 500V	10min	--	--	DC Input: 850Vdc /0A / 0KW AC Output: 500Vac / 0A /0KW FID: Unit shutdown immediately,no damage,no hazard. MT: N/A SD: ☒ Yes /☐ No, GD: ☒ Yes /☐ No RO: ☒ Yes /☐ No, NCD: ☒ Yes /☐ No NH: ☒ Pass / ☐ Fail. DST: ☒ Pass / ☐ Fail.
74.	MCU failure	+5V power supply disable	DC 850V /AC 500V	10min	--	--	DC Input: 850Vdc /0A / 0KW AC Output: 500Vac / 0A /0KW FID: Unit shutdown immediately,no damage,no hazard. MT: N/A SD: ☒ Yes /☐ No, GD: ☒ Yes /☐ No RO: ☒ Yes /☐ No, NCD: ☒ Yes /☐ No NH: ☒ Pass / ☐ Fail. DST: ☒ Pass / ☐ Fail.

Legend (Special evaluation for PV Inverter abnormal test)

FID	Fault Indication	MT	Max. Temperature
SD	PCE Shut Down:	DG	Disconnection To Grid
RO	Recovered to Operate after removing the single fault setting	NCD	No comp. or parts damaged
NH	No hazards occurred	DST	Dielectric strength test
s-c	short-circuited	o-c	open-circuited
o-l	Over-load.		

Note(s):

Failures or faults may be short-circuits in the PCE, or to exposed conductive parts, earth faults, or short-circuit in the output circuits, failure in the control circuits, or blocking of a motor fed by power EE.

There shall be no emission of molten metal, burning insulation, or flaming or glowing particles FIDom the fire enclosure, and there shall be no charring, glowing, or flaming of the tissue paper or cheesecloth, or glowing or flaming of surgical cotton.

Faults protected by “UL certified current fuse only” shall be performed and repeated 3 times.

In case of components damaged other than fuse, the evaluation should be repeated 3 times.

Report in result section:

– Measure transformer temperature at all times
– Fuse opened Yes / No?
– Components damaged?
– Emit Flames?
– Emit molten metal?
– Did it pass the electric strength test?

What happened to the SPS? Shutdown / cycle protection / normal operation

4.7	TABLE: electrical data (in normal conditions)							P
Type	I/P rated	PV / DC Input			O/P rated	AC Output Testing cond.		
	I [A]	U [V]	I [A]	P [kW]	I [A]	U [V]	I [A]	P [kW]
SUN2000-50KTL	22*4	600.12	78.63	47.16	54.9	277.22	55.18	46.08
	22*4	720.62	65.33	46.84	54.9	277.22	55.17	46.07
	22*4	851.50	56.08	46.93	54.9	277.23	55.48	46.04
SUN2000-50KTL-C1	22*4	625.18	77.76	48.57	55.3	288.48	54.98	47.48
	22*4	749.52	64.66	48.44	55.3	288.43	54.90	47.51
	22*4	849.60	57.70	48.45	55.3	288.43	54.92	47.53
SUN2000-42KTL	22*4	580.10	74.05	42.95	50.6	277.45	50.54	42.07
	22*4	720.00	61.48	42.64	50.6	277.45	50.42	42.01
	22*4	850.9	58.57	42.66	50.6	277.47	50.34	41.89
SUN2000-36KTL	22*4	480.14	76.97	36.95	54.7	220.37	54.54	36.05
	22*4	619.04	63.84	36.72	54.7	220.39	54.46	36.01
	22*4	850.5	45.08	36.87	54.7	219.87	54.64	35.98
SUN2000-33KTL-JP	22*4	397.8	83.57	33.24	43.7	254.26	42.40	32.38
	22*4	650.0	53.05	33.35	43.7	254.23	43.04	32.83
	22*4	854.9	51.32	33.29	43.7	254.23	42.83	32.66
SUN2000-40KTL-JP	22*4	478.4	84.33	40.34	52.5	254.30	51.56	39.34
	22*4	653.0	64.68	40.32	52.5	254.29	51.91	39.63

	22*4	851.1	64.31	40.26	52.5	254.29	51.61	39.45
SUN2000 43KTL-IN-C1	22*4	501.3	87.25	43.75	50.0	288.26	49.53	42.86
	22*4	747.5	61.51	43.73	50.0	288.31	49.69	43.06
	22*4	849.5	57.74	43.43	50.0	288.30	49.28	42.69
Note(s):								

7.3.4.2.3	TABLE: List of accessible parts		N/A
Item	Description	Determination method (NOTE 3)	Exception
1			
2			
3			

NOTE 1 – Test fingers and pins are to be applied without force unless a force is specified
NOTE 2 – Special consideration should be given to inadequate insulation and high voltage parts
NOTE 3 – The determination methods are:
V = visual; R = rigid test finger; J = jointed test finger; P = test pin; P2.5 = pin 2.5 mm diameter.

7.3.6.3	TABLE: Protective Bonding Test	N/A
Location	Resistance measured (mΩ) or voltage drop (V)	Comments
PE terminal to metal enclosure		
PE terminal to metal enclosure		
Note(s):		

7.3.7.5.2	Table: working voltage measurement				N/A
No.	From	To	Peak voltage (V)	RMS voltage (V)	Comments

Note: Common reference GND established by connecting PE to N – neutral (TN power system) and to secondary GND (or output –).

* The value in bracket is the rated voltage.

7.3.7.4 & 7.3.7.5	TABLE: clearance and creepage distance measurements	P

Clearance cl and creepage distance dcr at/of:	System / Impulse voltage (V)	U r.m.s. (V)	Required cl (mm)	cl (mm)	Required dcr (mm)	dcr (mm)
PCE unit (Vmax PV: OVCII 1100Vdc, OVC III 288Vac, 50Hz)						
PV supply circuits to metal chassis: BI (components)	4772V	1100Vdc	4.0*1.29 =5.2	See below	11.0	See below
- at E-Capacitor	--	--	--	10.0	--	10.0
- at IGBT	--	--	--	>10.0	--	>12.0
PV supply circuits line to line: FI	4772V	1100Vdc	4.0*1.29 =5.2	25	11.0	25
AC mains circuits L1 to L2 to L3 : FI	4772V	1100Vdc	4.0*1.29 =5.2	>50	11.0	>50
PV supply circuits to metal chassis: BI (components)	4772V	1100Vdc	4.0*1.29 =5.2	10.0	11.0	>12.0
AC mains circuits to metal chassis: BI (components)	4772V	1100Vdc	4.0*1.29 =5.2	10.0	11.0	>12.0
On ENE2FLTC Board (Output board)						
AC mains circuits L1 to L2 to L3 : FI	4772V	1100Vdc	4.0*1.29 =5.2	5.7	5.5	5.7
PV supply circuits to COM circuits: RI	4772V	1100Vdc	6.5*1.29 =8.4	See below	11.0	See below
- at Transformer T7 (ER224DG)	--	--	--	18.8	--	18.8
- at PCB trace	--	--	--	12.2	--	12.2
AC mains circuits to COM circuits: RI	4772V	1100Vdc	6.5*1.29 =8.4	See below	11.0	See below
- at Optocoupler U100, U103, U104	--	--	--	11.2	--	11.2
- at Transformer T6	--	--	--	17.0	--	17.0
- at PCB trace	--	--	--	11.1	--	11.1
PV supply circuits earth : BI	4772V	1100Vdc	4.0*1.29 =5.2	5.7	5.5	5.7
AC mains circuits to earth : BI	4772V	1100Vdc	4.0*1.29 =5.2	5.7	5.5	5.7
COM circuits to earth : BI	4772V	1100Vdc	4.0*1.29 =5.2	5.6	5.5	5.6
On ENE2PDBA Board (Input board)						
PV supply terminal " + " to " -: FI	4772V	1100Vdc	4.0*1.29 =5.2	6.0	5.5	6.0
PV supply circuits to earth: BI	4772V	1100Vdc	4.0*1.29 =5.2	5.7	5.5	5.7
On ENE2PWRB Board (INV board)						

PV supply circuits/ AC mains circuits to earth: BI	4772V	1100Vdc	4.0*1.29 =5.2	5.7	5.5	5.7
On ENE2CTLA Board (Sampling board)						
PV supply circuits/ AC mains circuits to earth: BI	4772V	1100Vdc	4.0*1.29 =5.2	5.7	5.5	5.7
Independence components						
DC switch 1	4772V	1100Vdc	4.0*1.29 =5.2	>20	11.0	>20
DC switch 2	4772V	1100Vdc	4.0*1.29 =5.2	>20	11.0	>20

Circuits Definition:	
Communication Circuits: DVC-A	Power Supply Circuits: DVC-C
Display Circuits: DVC-A	PV Circuits: DVC-C
DSP Circuits: DVC-C	AC 288/500V mains / Grid Circuits: DVC-C
Protection Separation	
Accessible Parts Earthed to PV Circuits: BI	Accessible Parts Earthed to AC 288/500V mains /Grid Circuits: BI
Communication Circuits to PV Circuits: RI	Communication Circuits to AC 288/500V mains/Grid Circuits: RI
Communication Circuits to DSP Circuits: RI	

Legend			
BI	Basic insulation	SI	Supplementary insulation
DI	Double insulation	RI	Reinforced insulation
FI	Functional insulation	O.V.C	Overvoltage category
PD	Pollution degree	MG	Insulating material group
PPI	Protection by Protective Impedance	DVC	Decision Voltage Classification
s-c	Shorted Circuits	o-c	Opened Circuits

Note(s):

$V_{MAX\ PV}$ (V) = 1100 Vd.c, AC output voltage = 500 Va.c

PV supply circuits = O.V.C II, AC mains circuits = O.V.C. III, DC Power Supply Voltage = O.V.C II.

PD = PD2 (IP65), MG = IIIa/b, Altitude = 4000m (1.29 factor)

Communication Circuits in PCE is considered as DVC-A with reinforced insulation from DVC-C circuits.

Communication circuits in PCE are considered as DVC-A which could be accessible.

PV side: SPD were provided between PV circuits and earth.

Grid side: SPD were provided between AC mains circuits and mains to earth as well.

1. Annex I of SPD or varistor for reducing impulse voltage was considered in this test report.

2. Interpolation is permitted in general, except for impulse withstand voltage decision.
3. Functional insulation was shorted circuit tests and consideration. see sub-clause 5.3.4 c).

Circuit breakers are required both to PV input (30A for each string) and Grid output side (61A) in final installation.

7.3.7.8	TABLE: Distance Through Insulation Measurements				P
Distance through insulation di at/of:		U r.m.s. (V)	Test voltage (V)	Required di (mm)	di (mm)
Bobbin of Isolated Transformer T7		1000	--	0.2	>0.4
Bobbin of Isolated Transformer T6		1000	--	0.2	>0.4
Legend					
BI	Basic insulation	SI	Supplementary insulation		
DI	Double insulation	RI	Reinforced insulation		
FI	Functional insulation	O.V.C	Overvoltage category		
Supplementary information: "* " means approved components.					

7.3.9	TABLE: discharge test			Ambient: 25º C
Condition	τ calculated (s)	τ measured → DVC A (s)	t limit → DVC A (s)	Comments
PV supply input terminal "+" to "-"	--	Max. value > 5 min.	1 / 10	Switch "ON" position
Line to Line	--	Max. value < 1s	1 / 10	Switch "ON" / ~~"OFF"~~ position
Line to Neutral	--	Max. value < 1s	1 / 10	Switch "ON" / ~~"OFF"~~ position
Overall capacity :				
Discharge resistor :				

7.5.1, 7.5.2 & 7.5.3	TABLE: electric strength measurements, impulse voltage test and partial discharge test				P
test voltage applied between:		test voltage (V)	impulse withstand voltage (kV) 1.2/50 µs	partial discharge extinction voltage (V)	result
DC input terminal to earthed enclosure		2120Vdc	6.0	--	Pass
AC output terminal to earthed enclosure		2120Vdc	6.0	--	Pass

DC input terminal to communication port	4240Vdc	6.0	--	Pass
AC output terminal to communication port	4240Vdc	6.0	--	Pass

Legend			
BI	Basic insulation	SI	Supplementary insulation
DI	Double insulation	RI	Reinforced insulation
FI	Functional insulation	O.V.C	Overvoltage category

Note(s):

7.5.5	TABLE: Touch Current Measurement			P
Condition	Measurement (mA)		Limit (mA)	Comments
At metal enclosure	3.0		3.5	PE disconnected

Legend			
BI	Basic insulation	SI	Supplementary insulation
DI	Double insulation	RI	Reinforced insulation
FI	Functional insulation	O.V.C	Overvoltage category

Note(s):

13.7	TABLE: Mechanical Resistance		P
Impacts per surface	Surface tested	Impact energy (Nm)	Comments
7J for polymeric screen	250N for metal enclosure	--	--

Supplementary information:

14	TABLE:List of critical components				P
Object/part no.	Manufacturer/ trademark	Type/model	Technical data	Standard	Mark(s) of conformity[1)]

Note(s): See attachment 15092104 001 CDF.

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

- End of test report -