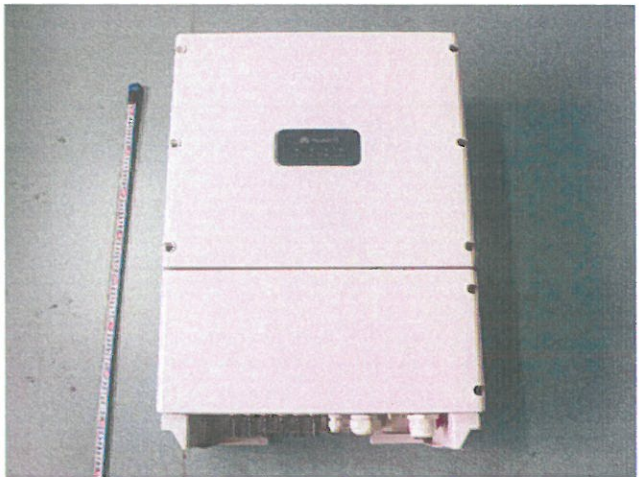




<b>Prüfbericht-Nr.:</b> Test Report No.:	<b>15069214 004</b>	<b>Auftrags-Nr.:</b> Order No.:	<b>154122679</b>	Seite 1 von 14 Page 1 of 14
<b>Kunden-Referenz-Nr.:</b> Client Reference No.:	<b>344854</b>	<b>Auftragsdatum:</b> Order date:	<b>2015.09.16</b>	
<b>Auftraggeber:</b> Client:	<b>Huawei Technologies Co., Ltd.</b>			
<b>Prüfgegenstand:</b> Test item:	<b>SOLAR INVERTER</b>			
<b>Bezeichnung / Typ-Nr.:</b> Identification / Type No.:	<b>SUN2000-33KTL, SUN2000-40KTL, SUN2000-30KTL-A</b>			
<b>Auftrags-Inhalt:</b> Order content:	<b>TUV Certificate</b>			
<b>Prüfgrundlage:</b> Test specification:	<b>EN 62109-1: 2010, EN 62109-2:2011 IEC 62109-1: 2010, IEC 62109-2:2011</b>			
<b>Wareneingangsdatum:</b> Date of receipt:	<b>2015.09.16</b>			
<b>Prüfmuster-Nr.:</b> Test sample No.:	<b>SHM20150916001</b>			
<b>Prüfzeitraum:</b> Testing period:	<b>2015.09.16 – 2015.09.18</b>			
<b>Ort der Prüfung:</b> Place of testing:	<b>TÜV Rheinland (Shanghai) Co., Ltd.</b>			
<b>Prüflaboratorium:</b> Testing laboratory:	<b>TÜV Rheinland (Shanghai) Co., Ltd.</b>			
<b>Prüfergebnis*:</b> Test result*:	<b>Pass</b>			
<b>geprüft von / tested by:</b>		<b>kontrolliert von / reviewed by:</b>		
<b>2015.09.29</b> Datum Date	<b>Tony Chen/ PE</b> Name / Stellung Name / Position		<b>2015.09.29</b> Datum Date	<b>Yue Yin / Reviewer</b> Name / Stellung Name / Position
		<b>Unterschrift</b> Signature		 <b>Unterschrift</b> Signature
<b>Sonstiges / Other:</b> Alternative construction and components.				
<b>Zustand des Prüfgegenstandes bei Anlieferung:</b> Condition of the test item at delivery:		<b>Details im vorherigen Abschnitt</b> Details in the previous section		
<p>* 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</p> <p>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</p>				
<p><b>Dieser Prüfbericht bezieht sich nur auf das o.g. Prüfmuster und darf ohne Genehmigung der Prüfstelle nicht auszugsweise vervielfältigt werden. Dieser Bericht berechtigt nicht zur Verwendung eines Prüfzeichens.</b>  <b>This test report only relates to the a. m. test sample. Without permission of the test center this test report is not permitted to be duplicated in extracts. This test report does not entitle to carry any test mark.</b></p>				

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

Report Reference No. ....: 15069214 004

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: 2010Test 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

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

Test item description .....: SOLAR INVERTER

Trade Mark .....:



Manufacturer .....: Huawei Technologies Co., Ltd.

Model/Type reference .....: SUN2000-33KTL, SUN2000-40KTL, SUN2000-30KTL-A

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):**

- ATTACHMENT 1– Components list
- ATTACHMENT 2– Photo document

**Summary of testing****Tests performed (name of test and test clause):**

- Cl.4.3 was performed on SUN2000-40KTL

**Testing location:**

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





**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 IEC 62109-1:**

**The application for obtaining a CB Test Certificate includes more than one factory location and a declaration from the Manufacturer stating that the sample(s) submitted for evaluation is (are) representative of the products from each factory has been provided:**

☐ 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:

Alternative construction and components for SUN2000-33KTL, SUN2000-40KTL, SUN2000-30KTL-A.

No	Changing	Comments
1	Fixing method of sampling board	All models Refer to Photo document
2	DC current sensor (U7, U20, U23, U11, U12, U13) change from HXS-20 to HLSR 20-P. And add an alternative source.	All models. Refer to Components list.
3	Bus capacitor (C21, C55, C56) change from 1100V, 30uF to 1100V, 2uF. And cancel one source.	All models Refer to Components list.
4	Grid terminal block change from 4 Pins to 3 Pins	For model SUN2000-40KTL, SUN2000-30KTL-A Refer to Photo document.
5	AC filter capacitor (C124, C125, C126, C225, C226, C227) change from 350VAC, 10uF to 380VAC, 8uF	All models Refer to Components list.
6	X- Capacitor (C1, C2, C3, C14, C15, C16) change from 305VAC, 2.2uF to 350VAC, 1.8uF.	All models Refer to Components list.
7	DC connector change from Helios H4 bulkhead to Helios H4-H bulkhead	All models Refer to Components list.
8	Layout of AC filter board is changed	All models Refer to Photo document

**Model list:**

MODELS LIST		SUN2000-30KTL-A	SUN2000-33KTL	SUN2000-40KTL
PV INPUT	V <sub>MAX</sub> PV [Vdc]	1000		
	I <sub>SC</sub> PV [A]	3*32		
	MPP Voltage Range V <sub>MPP</sub> [Vdc]	250-850(Full-load:480-850)	250-850(Full-load:480-850)	250-850(Full-load:580-850)
	Max. Input Current I <sub>MAX</sub> [A]	3*23		
	Start PV Voltage [Vdc]	250		
	Stop PV Voltage [Vdc] (EUT Shutdown)	200		
	Backfeed Current [A]	0		
	Overvoltage Category (OVC)	OVC II		
AC OUTPUT	Rated Output Voltage Ur [Vac]	277/480	220/380-230/400	277/480
	Normal Operating Voltage Range Un [Vac]	408-528	187-242	408-528
	Operating Voltage Adjustable Range Un [Vac]	144-648	66-299.2	144-648
	Rated Output Frequency F <sub>NETZ</sub> [Hz]	50/60		
	Normal Operating Frequency Range Fn [Hz]	49.5-50.2		
	Operating Frequency Adjustable Range Fn [Hz]	42.5-57.5		
	Rated Output Power P <sub>E</sub> [W]	30000	30000	36000
	Max. Output Power P <sub>E<sub>max</sub></sub> [W]	33000	33000	40000
	Max. Apparent power S <sub>E<sub>max</sub></sub> [VA]	33000	33000	40000
	PGU S <sub>E<sub>max</sub></sub> [kVA]	> 30kVA		
	Rated Output Current Ir [A]	36.1A	45.5A	43.3A
	Max. Output Current I <sub>max</sub> [A]	40A	48A	
	Power Factor cosφ [λ]	[-0.80, 0.80]		
	Efficiency max. η <sub>max</sub>	98.8%	98.6%	98.8%
	Standby Power Consumption [W]	< 1		
	Night Power Consumption [W]	< 1		
	THD [V / I] (100% full power)	< 3%		
	Acoustic Noise [dB]	≤29dB		
	Overvoltage Category (OVC)	OVC III		

PV & GRID CONNECTION	Array Insulation Resistance Detection [ $\Omega$ ]	33K ( $> V_{MAX}$ PV/30mA)
	The accuracy of resistance measurement [%/ $\Omega$ ]	$\pm 3K$ ( $< 10\%$ )
	Continuous residual current threshold value [mA]	300 ( $I_{LIMIT}$ : 300)
	Continuous residual current trip time [ms]	300 ( $T_{LIMIT}$ : 300)
	Sudden residual current threshold value [mA]	30 ( $I_{LIMIT}$ : 30) / 60 ( $I_{LIMIT}$ : 60) / 150 ( $I_{LIMIT}$ : 150)
	Sudden residual current trip time [ms]	300 ( $T_{LIMIT}$ : 300) / 150 ( $T_{LIMIT}$ : 150) / 40 ( $T_{LIMIT}$ : 40)
	Voltage threshold value [V]	33KTL: $U_{MIN1}$ : 187 ( $U_{LIMITU1}$ : 187), $U_{MAX1}$ : 242 ( $U_{LIMITO1}$ : 242) $U_{MIN2}$ : 110 ( $U_{LIMITU2}$ : 110), $U_{MAX2}$ : 297 ( $U_{LIMITO2}$ : 297) 40KTL/30KTL-A: $U_{MIN1}$ : 408 ( $U_{LIMITU1}$ : 408), $U_{MAX1}$ : 528 ( $U_{LIMITO1}$ : 528) $U_{MIN2}$ : 240 ( $U_{LIMITU2}$ : 240), $U_{MAX2}$ : 600 ( $U_{LIMITO2}$ : 600)
	The accuracy of voltage measurement [%/V]	Min (2.3Vrms, 1%)
	Voltage trip time [ms]	$U_{MIN1}$ : 2000 ( $T_{LIMIT}$ : 2000), $U_{MAX1}$ : 2000 ( $T_{LIMIT}$ : 2000), $U_{MIN2}$ : 100 ( $T_{LIMIT}$ : 100), $U_{MAX2}$ : 50 ( $T_{LIMIT}$ : 50),
	Frequency threshold value [Hz]	$F_{MIN1}$ : 49.5 ( $F_{LIMITU}$ : 49.5), $F_{MAX1}$ : 50.2 ( $F_{LIMITO}$ : 50.2) $F_{MIN2}$ : 48 ( $F_{LIMITU}$ : 48), $F_{MAX2}$ : 51.5 ( $F_{LIMITO}$ : 51.5)
	The accuracy of frequency measurement [%/Hz]	Min (0.01Hz, 0.1%)
	Frequency trip time [ms]	$F_{MIN1}$ : 600000 ( $T_{LIMIT}$ : 600000), $F_{MAX1}$ : 120000 ( $T_{LIMIT1}$ : 120000) $F_{MIN2}$ : 200 ( $T_{LIMIT}$ : 200), $F_{MAX2}$ : 200 ( $T_{LIMIT}$ : 200)
	ROCOF threshold value [Hz/s]	-
	ROCOF trip time [ms]	-
	Active anti-islanding trip time [s]	2.0 ( $T_{LIMIT}$ : 5)
	DC Injection Current normal value [mA]	Max (5 mA, 0.5%Ir)
	DC Injection Current threshold value [mA]	1000
	DC Injection current trip time [ms]	200 ( $T_{LIMIT}$ : 200)
	Reconnection Voltage [V]	33KTL: $U_{MIN}$ : 187 ( $U_{LIMITU}$ : 187), $U_{MAX}$ : 242 ( $U_{LIMITO}$ : 242) 40KTL/30KTL-A: $U_{MIN}$ : 408 ( $U_{LIMITU}$ : 408), $U_{MAX}$ : 528 ( $U_{LIMITO}$ : 528)
	Reconnection Frequency [Hz]	$F_{MIN}$ : 49.5 ( $F_{LIMITU}$ : 49.5), $F_{MAX}$ : 50.2 ( $F_{LIMITO}$ : 50.2)
	Reconnection Time [s]	180 ( $T_{LIMIT}$ > 60)

CONSTRUCTION	Type of inverter	non-isolated
	Type of NS Protection	Integrated
	Separated by	Transformerless
	MPPT strings	6 strings
	MPPT tracking	3
	Protective Class	I
	Enclosure Protection (IP)	IP65
	Operating Temperature Range [°C]	-25 to 60°C Above 50°C Power derating
	Pollution degree (PD)	PD 3
	Altitude [m]	4000 (G4)
	Size [mm]	550×770×270
	Weight [kg]	50



IEC/EN 62109-1: 2010			
Clause	Requirement – Test	Result - Remark	Verdict
4	GENERAL REQUIREMENTS		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
7	Protection against electric shock and energy hazards		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 / impulse voltage: 6000V.	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. voltage: 400Vrms / 1000Vd.c	P
7.3.7.5.3	Materials	Insulating material group IIIb 175 > CTI 100 assumed.	P
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

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

4.3	TABLE: Thermal testing					P
	test voltage (V) .....	See below				—
	t1 (°C) .....	--				—
	t2 (°C) .....	--				—
Maximum temperature T of part/at:		T (°C)				allowed T <sub>max</sub> (°C)
Supplied Voltage:		580V	850V	850V	580V	--
Ambient Temperature		55.0	55.0	60.0	60.0	
Main Board						
Optocoupler U1		81.6	79.6	73.8	83.3	85
PWB near Q2		87.0	84.0	81.1	88.5	130
Transformer T4 core		83.3	81.5	76.2	84.8	130
Transformer T4 winding		81.6	80.5	74.6	83.1	130
Grid relay K10		85.4	85.0	77.4	86.4	130
Capacitor C153		86.2	80.6	71.1	86.5	105
PV SPD F1057		84.1	79.6	70.8	84.8	85
PV hall sensor U12		81.7	78.3	71.1	82.9	85
Y-capacitor C121		82.9	78.6	70.7	84.0	125
AC output inductor T7 winding		80.8	79.5	72.7	82.0	130
Transformer T2 winding		80.1	78.8	73.7	81.8	130
Transformer T2 core		82.6	81.4	74.2	83.8	130
PV EMI inductor T6 winding		98.9	66.4	73.5	97.9	130
PV EMI inductor T6 core		86.3	85.3	79.0	87.6	130
AC hall sensor U14		77.2	75.3	70.1	78.8	85
Capacitor C226		97.7	87.0	73.3	96.7	105
Leakage Current Detect U19		74.2	73.6	69.5	76.1	85
Y-capacitor C119		81.8	78.0	70.8	83.0	125
Power Board						
BST IGBT U20		72.3	70.3	66.3	74.1	150
INV IGBT U3		80.3	78.0	72.4	81.9	175
Driver transformer T1 winding		83.2	81.2	75.3	84.7	130
Driver transformer T1 core		82.9	81.1	75.0	84.4	130
BUS capacitor C78		83.6	82.4	77.3	84.7	105
Capacitor C112		83.3	82.3	75.8	84.5	105
Capacitor C57		79.2	76.4	69.4	80.5	105

Capacitor C193	86.7	82.4	70.8	87.8	105
DSP board					
DSP U21	86.8	84.0	77.2	88.1	100
DSP U25	93.8	89.9	85.3	95.2	100
AC Filter Board					
T1 core	99.3	97.9	83.1	97.5	130
T1 winding	105.1	105.3	88.3	103.5	130
AC SPD F3	77.3	75.9	70.5	78.6	85
Y-capacitor C3	76.3	74.6	69.4	77.8	110
PLC Board					
Y-capacitor C25	64.6	63.3	61.7	67.0	110
EUT					
Internal AC wire	71.6	71.2	66.8	73.0	105
Internal PV Wire	72.1	70.2	66.2	73.9	105
Internal BST circuit Wire	84.4	80.9	72.5	85.5	105
INV inductor wire	80.6	79.5	73.5	81.8	105
BST inductor wire	83.7	80.5	71.7	84.9	105
BST inductor enclosure	75.5	66.8	59.1	76.8	130
INV inductor enclosure	78.5	79.5	82.5	80.0	130
PV switch	84.1	79.6	69.2	84.6	90
Heatsink	69.5	68.9	67.9	72.1	90
Note(s):					

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)
<b>EUT unit</b>						
PV circuits switch “ + “ to “ - “: FI	4464 (1000Vdc)	1000Vdc	4.7 (3.6x1.29)	12.0	10	12.0
PV circuits to metal chassis: BI	4464 (1000Vdc)	1000Vdc	4.7 (3.6x1.29)	14.0	10	14.0
AC mains output terminal line to line or nature: FI	4000 (300Vrms)	277Vac	3.9 (3.0x1.29)	15.2	3.0 → 3.9*	15.1
AC mains to metal chassis: BI	4464 (1000Vdc)	1000Vdc	4.7 (3.6x1.29)	11.0	10	11.0
<b>On AC filter board</b>						

AC mains line to line or nature cross trace: FI	4000 (300Vrms)	277Vac	3.9 (3.0x1.29)	7.5	3.0 → 1.5**→ 3.9*	7.5
AC mains to earthing cross trace: BI	4464 (1000Vdc)	1000Vdc	4.7 (3.6x1.29)	5.2	10→ 5.0**	5.2

Note(s):

$V_{MAX\ PV} (V) = 1000\ Vd.c$ , AC output voltage = 277Va.c,

PV supply circuits = O.V.C II, AC mains circuits = O.V.C. III,

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

Communication and Display circuit in EUT are considered as DVC-A which could be accessible.


PV side: Surge protector were provided between PV circuits and earth.

Grid side: Surge protector were provided between AC mains and 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.
4. Mark \* indicates the value of creepage distance is increased to related clearance.
5. Mark \*\* indicates the value of creepage distance on PCBs.

- End of test report -



<b>Produkte</b> <i>Products</i>		 <b>TÜVRheinland®</b>
<b>Certificate No.</b> R 50298624   0001-0004 <b>Our Reference</b> 01-CYX-15069214 004 <b>Appendix No.</b> 1.0		
<b>Constructional Data Form (CDF) for Electrical Appliances</b>		Page 1 of 12

License holder	: <b>Huawei Technologies Co., Ltd.</b>
Factory Address	: Administration Building, Headquarters of Huawei Technologies Co., Ltd., Bantian, Longgang District, Shenzhen, 518129, P.R.C.
Type of Appliance	: Solar Inverter
Type Designation	: SUN2000-33KTL, SUN2000-40KTL, SUN2000-30KTL-A
Rating	: See table A
Protection Class	: Class I equipment
Supply connection	: <input type="checkbox"/> fixed power cord <input checked="" type="checkbox"/> permanent connection <input type="checkbox"/> appliance inlet <input type="checkbox"/> direct plug in <input type="checkbox"/> battery operated

Additional information        :

See below

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**Certificate No.** R 50298624 0001-0004 **Our Reference** 01-CYX-15069214 004 **Appendix No.** 1.0

**Constructional Data Form (CDF) for Electrical Appliances**

Page 2 of 12

MODELS LIST		SUN2000-30KTL-A	SUN2000-33KTL	SUN2000-40KTL
PV INPUT	V <sub>MAX</sub> PV [Vdc]	1000		
	I <sub>SC</sub> PV [A]	3*32		
	MPP Voltage Range V <sub>MPP</sub> [Vdc]	250-850(Full-load:480-850)	250-850(Full-load:480-850)	250-850(Full-load:580-850)
	Max. Input Current I <sub>MAX</sub> [A]	3*23		
	Start PV Voltage [Vdc]	250		
	Stop PV Voltage [Vdc] (EUT Shutdown)	200		
	Backfeed Current [A]	0		
	Overvoltage Category (OVC)	OVC II		
AC OUTPUT	Rated Output Voltage Ur [Vac]	277/480	220/380-230/400	277/480
	Normal Operating Voltage Range Un [Vac]	408-528	187-242	408-528
	Operating Voltage Adjustable Range Un [Vac]	144-648	66-299.2	144-648
	Rated Output Frequency F <sub>NETZ</sub> [Hz]	50/60		
	Normal Operating Frequency Range Fn [Hz]	49.5-50.2		
	Operating Frequency Adjustable Range Fn [Hz]	42.5-57.5		
	Rated Output Power P <sub>E</sub> [W]	30000	30000	36000
	Max. Output Power P <sub>E</sub> max [W]	33000	33000	40000
	Max. Apparent power S <sub>E</sub> max [VA]	33000	33000	40000
	PGU S <sub>E</sub> max [kVA]	> 30kVA		
	Rated Output Current Ir [A]	36.1A	45.5A	43.3A
	Max. Output Current Imax [A]	40A	48A	
	Power Factor cosφ [λ]	[-0.80, 0.80]		
	Efficiency max. η <sub>I</sub> max	98.8%	98.6%	98.8%
	Standby Power Consumption [W]	< 1		
	Night Power Consumption [W]	< 1		
	THD [V / I] (100% full power)	< 3%		
	Acoustic Noise [dB]	≤29dB		

**TÜV Rheinland Group**

2015-09-21

Tony Chen



Date

Name

Signature

<b>Produkte</b> <i>Products</i>		<b>TÜVRheinland®</b>
<b>Certificate No.</b> R 50298624   0001-0004 <b>Our Reference</b> 01-CYX-15069214 004 <b>Appendix No.</b> 1.0		
<b>Constructional Data Form (CDF) for Electrical Appliances</b>		Page 3 of 12

PV & GRID CONNECTION	Overvoltage Category (OVC)	OVC III
	Array Insulation Resistance Detection [Ω]	33K ( > V <sub>MAX</sub> PV/30mA)
	The accuracy of resistance measurement [%/Ω]	± 3K (< 10%)
	Continuous residual current threshold value [mA]	300 (I <sub>LIMIT</sub> : 300)
	Continuous residual current trip time [ms]	300 (T <sub>LIMIT</sub> : 300)
	Sudden residual current threshold value [mA]	30 (I <sub>LIMIT</sub> : 30) / 60 (I <sub>LIMIT</sub> : 60) / 150 (I <sub>LIMIT</sub> : 150)
	Sudden residual current trip time [ms]	300 (T <sub>LIMIT</sub> : 300) / 150 (T <sub>LIMIT</sub> : 150) /40 (T <sub>LIMIT</sub> : 40)
	Voltage threshold value [V]	33KTL:U <sub>MIN1</sub> : 187 (U <sub>LIMITU1</sub> : 187), U <sub>MAX1</sub> : 242 (U <sub>LIMITO1</sub> : 242) U <sub>MIN2</sub> : 110 (U <sub>LIMITU2</sub> : 110), U <sub>MAX2</sub> : 297 (U <sub>LIMITO2</sub> : 297) 40KTL/30KTL-A:U <sub>MIN1</sub> : 408 (U <sub>LIMITU1</sub> : 408), U <sub>MAX1</sub> : 528 (U <sub>LIMITO1</sub> : 528) U <sub>MIN2</sub> : 240 (U <sub>LIMITU2</sub> : 240), U <sub>MAX2</sub> : 600 (U <sub>LIMITO2</sub> : 600)
	The accuracy of voltage measurement[%/V]	Min (2.3Vrms, 1%)
	Voltage trip time [ms]	U <sub>MIN1</sub> : 2000(T <sub>LIMIT</sub> : 2000), U <sub>MAX1</sub> : 2000 (T <sub>LIMIT</sub> : 2000), U <sub>MIN2</sub> : 100(T <sub>LIMIT</sub> : 100), U <sub>MAX2</sub> : 50 (T <sub>LIMIT</sub> : 50),
	Frequency threshold value [Hz]	F <sub>MIN1</sub> : 49.5 (F <sub>LIMITU</sub> : 49.5), F <sub>MAX1</sub> : 50.2 (F <sub>LIMITO</sub> : 50.2) F <sub>MIN2</sub> : 48 (F <sub>LIMITU</sub> : 48), F <sub>MAX2</sub> : 51.5 (F <sub>LIMITO</sub> : 51.5)
	The accuracy of frequency measurement [%/Hz]	Min (0.01Hz, 0.1%)
	Frequency trip time [ms]	F <sub>MIN1</sub> : 600000 (T <sub>LIMIT</sub> : 600000), F <sub>MAX1</sub> : 120000 (T <sub>LIMIT1</sub> : 120000) F <sub>MIN2</sub> : 200 (T <sub>LIMIT</sub> : 200), F <sub>MAX2</sub> : 200 (T <sub>LIMIT</sub> : 200)
	ROCOF threshold value [Hz/s]	-
	ROCOF trip time [ms]	-
	Active anti-islanding trip time [s]	2.0 (T <sub>LIMIT</sub> : 5)
	DC Injection Current normal value [mA]	Max (5 mA, 0.5%Ir)
	DC Injection Current threshold value [mA]	1000
	DC Injection current trip time [ms]	200 (T <sub>LIMIT</sub> : 200)
	Reconnection Voltage [V]	33KTL:U <sub>MIN</sub> : 187 (U <sub>LIMITU</sub> : 187), U <sub>MAX</sub> : 242 (U <sub>LIMITO</sub> : 242) 40KTL/30KTL-A:U <sub>MIN</sub> : 408 (U <sub>LIMITU</sub> : 408), U <sub>MAX</sub> : 528 (U <sub>LIMITO</sub> : 528)

**TÜV Rheinland Group**

2015-09-21

Tony Chen

**Date**

**Name**

**Signature**

CONSTRUCTION	Reconnection Frequency [Hz]	$F_{MIN}: 49.5 (F_{LIMITU}: 49.5), F_{MAX}: 50.2 (F_{LIMITO}: 50.2)$
	Reconnection Time [s]	180 ( $T_{LIMIT} > 60$ )
	Type of inverter	non-isolated
	Type of NS Protection	Integrated
	Separated by	Transformerless
	MPPT strings	6 strings
	MPPT tracking	3
	Protective Class	I
	Enclosure Protection (IP)	IP65
	Operating Temperature Range [°C]	-25 to 60°C Above 50°C Power derating
	Pollution degree (PD)	PD 3
	Altitude [m]	4000 (G4)
	Size [mm]	550×770×270
	Weight [kg]	50

PHOTO DOCUMENTATION

15069214 004

for

Solar Inverter

SUN2000-33KTL, SUN2000-40KTL,  
SUN2000-30KTL-A

Huawei Technologies Co.,Ltd.



This documentation consists of 5 pages (excluding this cover page)



<b>Prüfbericht-Nr.:</b> Test Report No.:	<b>15069214 003</b>	<b>Auftrags-Nr.:</b> Order No.:	<b>154109763</b>	Seite 1 von 17 Page 1 of 17
<b>Kunden-Referenz-Nr.:</b> Client Reference No.:	<b>344854</b>	<b>Auftragsdatum:</b> Order date:	<b>2015.07.02</b>	
<b>Auftraggeber:</b> Client:	<b>Huawei Technologies Co., Ltd.</b>			
<b>Prüfgegenstand:</b> Test item:	<b>SOLAR INVERTER</b>			
<b>Bezeichnung / Typ-Nr.:</b> Identification / Type No.:	<b>SUN2000-33KTL, SUN2000-40KTL, SUN2000-30KTL-A</b>			
<b>Auftrags-Inhalt:</b> Order content:	<b>TUV Certificate</b>			
<b>Prüfgrundlage:</b> Test specification:	<b>EN 62109-1: 2010, EN 62109-2:2011 IEC 62109-1: 2010, IEC 62109-2:2011</b>			
<b>Wareneingangsdatum:</b> Date of receipt:	<b>2014.07.07</b>			
<b>Prüfmuster-Nr.:</b> Test sample No.:	<b>SHM20150702001</b>			
<b>Prüfzeitraum:</b> Testing period:	<b>2015.07.03 – 2015.07.06</b>			
<b>Ort der Prüfung:</b> Place of testing:	<b>TÜV Rheinland (Shanghai) Co., Ltd.</b>			
<b>Prüflaboratorium:</b> Testing laboratory:	<b>TÜV Rheinland (Shanghai) Co., Ltd.</b>			
<b>Prüfergebnis*:</b> Test result*:	<b>Pass</b>			
<b>geprüft von / tested by:</b>		<b>kontrolliert von / reviewed by:</b>		
2015.07.09	Tony Chen/ PE		2015.07.09	Yue Yin / Reviewer
<b>Datum</b> Date	<b>Name / Stellung</b> Name / Position	<b>Unterschrift</b> Signature	<b>Datum</b> Date	<b>Name / Stellung</b> Name / Position
				
				<b>Unterschrift</b> Signature
<b>Sonstiges / Other:</b> 1, Added one new additional model of SUN2000-30KTL-A.				
<b>Zustand des Prüfgegenstandes bei Anlieferung:</b> Condition of the test item at delivery:		<b>Details im vorherigen Abschnitt</b> Details in the previous section		
<p>* 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</p> <p>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</p>				
<p><b>Dieser Prüfbericht bezieht sich nur auf das o.g. Prüfmuster und darf ohne Genehmigung der Prüfstelle nicht auszugsweise vervielfältigt werden. Dieser Bericht berechtigt nicht zur Verwendung eines Prüfzeichens.</b>  <i>This test report only relates to the a. m. test sample. Without permission of the test center this test report is not permitted to be duplicated in extracts. This test report does not entitle to carry any test mark.</i></p>				

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

Report Reference No. ....: 15069214 003

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: 2010Test 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

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

Test item description .....: SOLAR INVERTER

Trade Mark .....:



Manufacturer .....: Huawei Technologies Co., Ltd.

Model/Type reference .....: SUN2000-33KTL, SUN2000-40KTL, **SUN2000-30KTL-A**

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):**

- ATTACHMENT 1– Components list (11 pages)

-

**Summary of testing****Tests performed (name of test and test clause):**

- See General Product Information on the following pages.

**Testing location:**

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

**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"






**型号 Model: SUN2000-30KTL-A**  
**名称 Name: 太阳能光伏逆变器**  
**SOLAR INVERTER**

---

**最大输入电压** d.c. Max. Input Voltage: 1000 Vd.c.  
**最大输入电流** d.c. Input Current: 23 A/23 A/23 A  
**MPP电压范围** d.c. MPP Range: 250 ~ 850 Vd.c.  
**输出电压** a.c. Output Nominal Voltage: 480 Va.c.; 3~+⊕  
**输出频率** a.c. Nominal Operating Frequency: 50/60 Hz  
**额定输出功率** a.c. Output Rated Power: 30 kVA  
**最大输出功率** a.c. Output Max. Power: 33 kVA  
**最大输出电流** a.c. Output Max. Current: 40 A  
**功率因数** Power Factor: 0.8(lagging) ~ 0.8(leading)  
**温度范围** Operating Temperature Range: -25 ~ +60 °C  
**防护等级** Enclosure: IP65  
**保护等级** Protection Class: I  
**通讯方式** Communication: PLC

  
www.tuv.com  
ID 2000000000



**华为技术有限公司**  
**HUAWEI TECHNOLOGIES CO.,LTD.**

**中国制造**  
**MADE IN CHINA**



**合格证/QUALIFICATION CARD**

质检员 /QC : 00154815  
 日期/DATE : 2014-09-03

  
SN 210101250310E900001 Y SUN2000-30KTL-PLC



**HUAWEI**  
华为技术有限公司  
HUAWEI TECHNOLOGIES CO., LTD.

中国制造  
MADE IN CHINA





**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 IEC 62109-1A:**

**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 a new additional model of SUN2000-30KTL-A.  
Model of SUN2000-30KTL-A is identical to the basic model SUN2000-40KTL (share the same circuit diagram, PCB layout, critical components) which was tested in test report 15069214 001 except the type designation, output rating limited by software.

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

Change	Testing	Comments
	<ul style="list-style-type: none"> <li>• 4.7 Electrical Ratings Tests</li> </ul>	Refer to sub-clause 4.7 of Part 1.
	<ul style="list-style-type: none"> <li>• 5 Marking and documentation</li> </ul>	Refer to sub-clause 5 of Part 1.

Note(s):

**Model list:**

MODELS LIST		SUN2000-30KTL-A	SUN2000-33KTL	SUN2000-40KTL
PV INPUT	V <sub>MAX</sub> PV [Vdc]	1000		
	I <sub>SC</sub> PV [A]	3*32		
	MPP Voltage Range V <sub>MPP</sub> [Vdc]	250-850(Full-load:480-850)	250-850(Full-load:480-850)	250-850(Full-load:580-850)
	Max. Input Current I <sub>MAX</sub> [A]	3*23		
	Start PV Voltage [Vdc]	250		
	Stop PV Voltage [Vdc] (EUT Shutdown)	200		
	Backfeed Current [A]	0		
	Overvoltage Category (OVC)	OVC II		
AC OUTPUT	Rated Output Voltage Ur [Vac]	277/480	220/380-230/400	277/480
	Normal Operating Voltage Range Un [Vac]	408-528	187-242	408-528
	Operating Voltage Adjustable Range Un [Vac]	144-648	66-299.2	144-648
	Rated Output Frequency F <sub>NETZ</sub> [Hz]	50/60		
	Normal Operating Frequency Range Fn [Hz]	49.5-50.2		
	Operating Frequency Adjustable Range Fn [Hz]	42.5-57.5		
	Rated Output Power P <sub>E</sub> [W]	30000	30000	36000
	Max. Output Power P <sub>E<sub>max</sub></sub> [W]	30000	33000	40000
	Max. Apparent power S <sub>E<sub>max</sub></sub> [VA]	33000	33000	40000
	PGU S <sub>E<sub>max</sub></sub> [kVA]	> 30kVA		
	Rated Output Current Ir [A]	36.1A	45.5A	43.3A
	Max. Output Current I <sub>max</sub> [A]	40A	48A	
	Power Factor cosφ [λ]	[-0.80, 0.80]		
	Efficiency max. η <sub>max</sub>	98.8%	98.6%	98.8%
	Standby Power Consumption [W]	< 1		
	Night Power Consumption [W]	< 1		
	THD [V / I] (100% full power)	< 3%		
	Acoustic Noise [dB]	≤29dB		
	Overvoltage Category (OVC)	OVC III		

PV & GRID CONNECTION	Array Insulation Resistance Detection [ $\Omega$ ]	33K ( $> V_{MAX}$ PV/30mA)
	The accuracy of resistance measurement [%/ $\Omega$ ]	$\pm 3K$ ( $< 10\%$ )
	Continuous residual current threshold value [mA]	300 ( $I_{LIMIT}$ : 300)
	Continuous residual current trip time [ms]	300 ( $T_{LIMIT}$ : 300)
	Sudden residual current threshold value [mA]	30 ( $I_{LIMIT}$ : 30) / 60 ( $I_{LIMIT}$ : 60) / 150 ( $I_{LIMIT}$ : 150)
	Sudden residual current trip time [ms]	300 ( $T_{LIMIT}$ : 300) / 150 ( $T_{LIMIT}$ : 150) / 40 ( $T_{LIMIT}$ : 40)
	Voltage threshold value [V]	33KTL: $U_{MIN1}$ : 187 ( $U_{LIMITU1}$ : 187), $U_{MAX1}$ : 242 ( $U_{LIMITO1}$ : 242) $U_{MIN2}$ : 110 ( $U_{LIMITU2}$ : 110), $U_{MAX2}$ : 297 ( $U_{LIMITO2}$ : 297) 40KTL/30KTL-A: $U_{MIN1}$ : 408 ( $U_{LIMITU1}$ : 408), $U_{MAX1}$ : 528 ( $U_{LIMITO1}$ : 528) $U_{MIN2}$ : 240 ( $U_{LIMITU2}$ : 240), $U_{MAX2}$ : 600 ( $U_{LIMITO2}$ : 600)
	The accuracy of voltage measurement [%/V]	Min (2.3Vrms, 1%)
	Voltage trip time [ms]	$U_{MIN1}$ : 2000 ( $T_{LIMIT}$ : 2000), $U_{MAX1}$ : 2000 ( $T_{LIMIT}$ : 2000), $U_{MIN2}$ : 100 ( $T_{LIMIT}$ : 100), $U_{MAX2}$ : 50 ( $T_{LIMIT}$ : 50),
	Frequency threshold value [Hz]	$F_{MIN1}$ : 49.5 ( $F_{LIMITU}$ : 49.5), $F_{MAX1}$ : 50.2 ( $F_{LIMITO}$ : 50.2) $F_{MIN2}$ : 48 ( $F_{LIMITU}$ : 48), $F_{MAX2}$ : 51.5 ( $F_{LIMITO}$ : 51.5)
	The accuracy of frequency measurement [%/Hz]	Min (0.01Hz, 0.1%)
	Frequency trip time [ms]	$F_{MIN1}$ : 600000 ( $T_{LIMIT}$ : 600000), $F_{MAX1}$ : 120000 ( $T_{LIMIT1}$ : 120000) $F_{MIN2}$ : 200 ( $T_{LIMIT}$ : 200), $F_{MAX2}$ : 200 ( $T_{LIMIT}$ : 200)
	ROCOF threshold value [Hz/s]	-
	ROCOF trip time [ms]	-
	Active anti-islanding trip time [s]	2.0 ( $T_{LIMIT}$ : 5)
	DC Injection Current normal value [mA]	Max (5 mA, 0.5%Ir)
	DC Injection Current threshold value [mA]	1000
	DC Injection current trip time [ms]	200 ( $T_{LIMIT}$ : 200)
	Reconnection Voltage [V]	33KTL: $U_{MIN}$ : 187 ( $U_{LIMITU}$ : 187), $U_{MAX}$ : 242 ( $U_{LIMITO}$ : 242) 40KTL/30KTL-A: $U_{MIN}$ : 408 ( $U_{LIMITU}$ : 408), $U_{MAX}$ : 528 ( $U_{LIMITO}$ : 528)
	Reconnection Frequency [Hz]	$F_{MIN}$ : 49.5 ( $F_{LIMITU}$ : 49.5), $F_{MAX}$ : 50.2 ( $F_{LIMITO}$ : 50.2)
	Reconnection Time [s]	180 ( $T_{LIMIT}$ $> 60$ )

CONSTRUCTION	Type of inverter	non-isolated
	Type of NS Protection	Integrated
	Separated by	Transformerless
	MPPT strings	6 strings
	MPPT tracking	3
	Protective Class	I
	Enclosure Protection (IP)	IP65
	Operating Temperature Range [°C]	-25 to 60 °C Above 50°C Power derating
	Pollution degree (PD)	PD 3
	Altitude [m]	4000 (G4)
	Size [mm]	550×770×270
	Weight [kg]	50

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

4.7	TABLE: electrical data (in normal conditions)							P
Type	I/P rated	PV / DC Input			O/P rated	Grid / AC Output Testing cond.		
	I [A]	U [V]	I [A]	P [kW]	I [A]	U [V]	I [A]	P [kW]
SUN2000-30KTL-A (50Hz)	3X23	484.7	63.58	30.79	40	277.43	35.89	29.86
	3X23	681.1	44.65	30.38	40	277.74	35.64	29.67
	3X23	844.1	36.23	30.59	40	277.86	35.99	29.99
SUN2000-30KTL-A (60Hz)	3X23	485.5	63.35	30.72	40	277.36	35.48	29.51
	3X23	679.3	44.52	30.24	40	277.67	35.60	29.65
	3X23	843.9	36.00	30.58	40	277.81	36.24	29.99
Note(s):								

- End of test report -

**Certificate No.**   R 50298624   0003,0004   
 **Our Reference**    01-CYX-15069214 003   
 **Appendix No.**    1.0

**Constructional Data Form (CDF) for Electrical Appliances**

Page 1 of 11

License holder	:	<b>Huawei Technologies Co., Ltd.</b>
Factory Address	:	Administration Building, Headquarters of Huawei Technologies Co., Ltd., Bantian, Longgang District, Shenzhen, 518129, P.R.C.
Type of Appliance	:	Solar Inverter
Type Designation	:	SUN2000-33KTL, SUN2000-40KTL, SUN2000-30KTL-A
Rating	:	See table A
Protection Class	:	Class I equipment
Supply connection	:	<input type="checkbox"/> fixed power cord <input checked="" type="checkbox"/> permanent connection <input type="checkbox"/> appliance inlet <input type="checkbox"/> direct plug in <input type="checkbox"/> battery operated

Additional information :

See below

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**Certificate No.** R 50298624 0003,0004 **Our Reference** 01-CYX-15069214 003 **Appendix No.** 1.0

**Constructional Data Form (CDF) for Electrical Appliances**

Page 2 of 11

MODELS LIST		SUN2000-30KTL-A	SUN2000-33KTL	SUN2000-40KTL
PV INPUT	V <sub>MAX</sub> PV [Vdc]	1000		
	I <sub>SC</sub> PV [A]	3*32		
	MPP Voltage Range V <sub>MPP</sub> [Vdc]	250-850(Full-load:480-850)	250-850(Full-load:480-850)	250-850(Full-load:580-850)
	Max. Input Current I <sub>MAX</sub> [A]	3*23		
	Start PV Voltage [Vdc]	250		
	Stop PV Voltage [Vdc] (EUT Shutdown)	200		
	Backfeed Current [A]	0		
	Overvoltage Category (OVC)	OVC II		
AC OUTPUT	Rated Output Voltage Ur [Vac]	277/480	220/380-230/400	277/480
	Normal Operating Voltage Range Un [Vac]	408-528	187-242	408-528
	Operating Voltage Adjustable Range Un [Vac]	144-648	66-299.2	144-648
	Rated Output Frequency F <sub>NETZ</sub> [Hz]	50/60		
	Normal Operating Frequency Range Fn [Hz]	49.5-50.2		
	Operating Frequency Adjustable Range Fn [Hz]	42.5-57.5		
	Rated Output Power P <sub>E</sub> [W]	30000	30000	36000
	Max. Output Power P <sub>E</sub> max [W]	30000	33000	40000
	Max. Apparent power S <sub>E</sub> max [VA]	33000	33000	40000
	PGU S <sub>E</sub> max [kVA]	> 30kVA		
	Rated Output Current Ir [A]	36.1A	45.5A	43.3A
	Max. Output Current I <sub>max</sub> [A]	40A	48A	
	Power Factor cosφ [λ]	[-0.80, 0.80]		
	Efficiency max. η <sub>max</sub>	98.8%	98.6%	98.8%
	Standby Power Consumption [W]	< 1		
	Night Power Consumption [W]	< 1		
	THD [V / I] (100% full power)	< 3%		
	Acoustic Noise [dB]	≤29dB		

**Constructional Data Form (CDF) for Electrical Appliances**

PV & GRID CONNECTION	Overvoltage Category (OVC)	OVC III
	Array Insulation Resistance Detection [Ω]	33K ( > V <sub>MAX</sub> PV/30mA)
	The accuracy of resistance measurement [%/Ω]	± 3K (< 10%)
	Continuous residual current threshold value [mA]	300 (I <sub>LIMIT</sub> : 300)
	Continuous residual current trip time [ms]	300 (T <sub>LIMIT</sub> : 300)
	Sudden residual current threshold value [mA]	30 (I <sub>LIMIT</sub> : 30) / 60 (I <sub>LIMIT</sub> : 60) / 150 (I <sub>LIMIT</sub> : 150)
	Sudden residual current trip time [ms]	300 (T <sub>LIMIT</sub> : 300) / 150 (T <sub>LIMIT</sub> : 150) / 40 (T <sub>LIMIT</sub> : 40)
	Voltage threshold value [V]	33KTL:U <sub>MIN1</sub> : 187 (U <sub>LIMITU1</sub> : 187), U <sub>MAX1</sub> : 242 (U <sub>LIMITO1</sub> : 242) U <sub>MIN2</sub> : 110 (U <sub>LIMITU2</sub> : 110), U <sub>MAX2</sub> : 297 (U <sub>LIMITO2</sub> : 297) 40KTL/30KTL-A:U <sub>MIN1</sub> : 408 (U <sub>LIMITU1</sub> : 408), U <sub>MAX1</sub> : 528 (U <sub>LIMITO1</sub> : 528) U <sub>MIN2</sub> : 240 (U <sub>LIMITU2</sub> : 240), U <sub>MAX2</sub> : 600 (U <sub>LIMITO2</sub> : 600)
	The accuracy of voltage measurement[%/V]	Min (2.3Vrms, 1%)
	Voltage trip time [ms]	U <sub>MIN1</sub> : 2000(T <sub>LIMIT</sub> : 2000), U <sub>MAX1</sub> : 2000 (T <sub>LIMIT</sub> : 2000), U <sub>MIN2</sub> : 100(T <sub>LIMIT</sub> : 100), U <sub>MAX2</sub> : 50 (T <sub>LIMIT</sub> : 50),
	Frequency threshold value [Hz]	F <sub>MIN1</sub> : 49.5 (F <sub>LIMITU</sub> : 49.5), F <sub>MAX1</sub> : 50.2 (F <sub>LIMITO</sub> : 50.2) F <sub>MIN2</sub> : 48 (F <sub>LIMITU</sub> : 48), F <sub>MAX2</sub> : 51.5 (F <sub>LIMITO</sub> : 51.5)
	The accuracy of frequency measurement [%/Hz]	Min (0.01Hz, 0.1%)
	Frequency trip time [ms]	F <sub>MIN1</sub> : 600000 (T <sub>LIMIT</sub> : 600000), F <sub>MAX1</sub> : 120000 (T <sub>LIMIT1</sub> : 120000) F <sub>MIN2</sub> : 200 (T <sub>LIMIT</sub> : 200), F <sub>MAX2</sub> : 200 (T <sub>LIMIT</sub> : 200)
	ROCOF threshold value [Hz/s]	-
	ROCOF trip time [ms]	-
	Active anti-islanding trip time [s]	2.0 (T <sub>LIMIT</sub> : 5)
	DC Injection Current normal value [mA]	Max (5 mA, 0.5%Ir)
	DC Injection Current threshold value [mA]	1000
	DC Injection current trip time [ms]	200 (T <sub>LIMIT</sub> : 200)
	Reconnection Voltage [V]	33KTL:U <sub>MIN</sub> : 187 (U <sub>LIMITU</sub> : 187), U <sub>MAX</sub> : 242 (U <sub>LIMITO</sub> : 242) 40KTL/30KTL-A:U <sub>MIN</sub> : 408 (U <sub>LIMITU</sub> : 408), U <sub>MAX</sub> : 528 (U <sub>LIMITO</sub> : 528)
	Reconnection Frequency [Hz]	F <sub>MIN</sub> : 49.5 (F <sub>LIMITU</sub> : 49.5), F <sub>MAX</sub> : 50.2 (F <sub>LIMITO</sub> : 50.2)

	Reconnection Time [s]	180 ( $T_{LIMIT} > 60$ )
CONSTRUCTION	Type of inverter	non-isolated
	Type of NS Protection	Integrated
	Separated by	Transformerless
	MPPT strings	6 strings
	MPPT tracking	3
	Protective Class	I
	Enclosure Protection (IP)	IP65
	Operating Temperature Range [°C]	-25 to 60 °C Above 50°C Power derating
	Pollution degree (PD)	PD 3
	Altitude [m]	4000 (G4)
	Size [mm]	550×770×270
	Weight [kg]	50



<b>Prüfbericht-Nr.:</b> <i>Test Report No.:</i>	<b>15069214 001</b>	<b>Auftrags-Nr.:</b> <i>Order No.:</i>	<b>154063242</b>	Seite 1 von 70 Page 1 of 70
<b>Kunden-Referenz-Nr.:</b> <i>Client Reference No.:</i>	<b>505120</b>	<b>Auftragsdatum:</b> <i>Order date:</i>	<b>2014.08.29</b>	
<b>Auftraggeber:</b> <i>Client:</i>	<b>Huawei Technologies Co., Ltd.</b>			
<b>Prüfgegenstand:</b> <i>Test item:</i>	<b>SOLAR INVERTER</b>			
<b>Bezeichnung / Typ-Nr.:</b> <i>Identification / Type No.:</i>	<b>SUN2000-33KTL, SUN2000-40KTL</b>			
<b>Auftrags-Inhalt:</b> <i>Order content:</i>	<b>TUV, CE-LVD</b>			
<b>Prüfgrundlage:</b> <i>Test specification:</i>	<b>IEC/EN 62109-1: 2010 IEC/EN 62109-2: 2011</b>			
<b>Wareneingangsdatum:</b> <i>Date of receipt:</i>	<b>2014.09.01</b>			
<b>Prüfmuster-Nr.:</b> <i>Test sample No.:</i>	<b>SHM20140901001-004</b>			
<b>Prüfzeitraum:</b> <i>Testing period:</i>	<b>2014-09-01 – 2014-09-22</b>			
<b>Ort der Prüfung:</b> <i>Place of testing:</i>	<b>Huawei Technologies Co., Ltd.</b>			
<b>Prüflaboratorium:</b> <i>Testing laboratory:</i>	<b>TÜV Rheinland (Shanghai) Co., Ltd.</b>			
<b>Prüfergebnis*:</b> <i>Test result*:</i>	<b>Siehe Sonstiges / See Other</b>			
<b>geprüft von / tested by:</b>		<b>kontrolliert von / reviewed by:</b>		
11.26.2014	Tony Chen/ PE	11.26.2014 John Dai / Reviewer		
<b>Datum</b> <i>Date</i>	<b>Name / Stellung</b> <i>Name / Position</i>	<b>Unterschrift</b> <i>Signature</i>	<b>Datum</b> <i>Date</i>	<b>Name / Stellung</b> <i>Name / Position</i>
<b>Sonstiges / Other:</b> TUV Rheinland Bauart approval Attachment 1: Test report according to IEC/EN 62109-2:2011. Attachment 2: Photo document.				
<b>Zustand des Prüfgegenstandes bei Anlieferung:</b> <i>Condition of the test item at delivery:</i>		<b>Details im vorherigen Abschnitt</b> <i>Details in the previous section</i>		
<p>* 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</p>				
<p><b>Dieser Prüfbericht bezieht sich nur auf das o.g. Prüfmuster und darf ohne Genehmigung der Prüfstelle nicht auszugsweise vervielfältigt werden. Dieser Bericht berechtigt nicht zur Verwendung eines Prüfzeichens.</b>  <i>This test report only relates to the a. m. test sample. Without permission of the test center this test report is not permitted to be duplicated in extracts. This test report does not entitle to carry any test mark.</i></p>				

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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. ....: 15069214 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.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

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

Test item description .....: SOLAR INVERTER

Trade Mark .....:



Manufacturer .....: Huawei Technologies Co., Ltd.

Model/Type reference .....: SUN2000-33KTL, SUN2000-40KTL

Ratings .....: See marking label and model list

Testing procedure and testing location:	
<input checked="" type="checkbox"/> <b>CB Testing Laboratory:</b>	
Testing location/ address..... :	
<input type="checkbox"/> <b>Associated CB Test Laboratory:</b>	
Testing location/ address..... :	
Tested by (name + signature) .....	See cover page
Approved by (+ signature) .....	See cover page
<input type="checkbox"/> Testing procedure: TMP	
Tested by (name + signature) .....	
Approved by (+ signature) .....	
Testing location/ address..... :	
<input type="checkbox"/> Testing procedure: WMT	
Tested by (name + signature) .....	
Witnessed by (+ signature) .....	
Approved by (+ signature) .....	
Testing location/ address..... :	
<input type="checkbox"/> Testing procedure: SMT	
Tested by (name + signature) .....	
Approved by (+ signature) .....	
Supervised by (+ signature) .....	
Testing location/ address..... :	
<input type="checkbox"/> 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/EN 62109-2: 2011 (13 pages)
- ATTACHMENT 2– Photo document (15 pages)
- ATTACHMENT 3– Components list (11 pages)

**Summary of testing****Tests performed (name of test and test clause):      Testing location:**

Test performed on SUN2000-40KTL as below:      The laboratory described on cover page.

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

Test performed on SUN2000-33KTL as below:

4.7 Electric rating test

**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:**



**型号 Model: SUN2000-33KTL**  
**名称 Name: 太阳能光伏逆变器**  
**SOLAR INVERTER**

---

最大输入电压 d.c. Max. Input Voltage: 1000 Vd.c.  
 最大输入电流 d.c. Input Current: 23 A/23 A/23 A  
 MPP电压范围 d.c. MPP Range: 250 ~ 850 Vd.c.  
 输出电压 a.c. Output Nominal Voltage: 400/380 Va.c.; 3N ~ + ⊕  
 输出频率 a.c. Nominal Operating Frequency: 50/60 Hz  
 额定输出功率 a.c. Output Rated Power: 30 kVA  
 最大输出功率 a.c. Output Max. Power: 33 kVA  
 最大输出电流 a.c. Output Max. Current: 48 A  
 功率因数 Power Factor: 0.8(lagging) ~ 0.8(leading)  
 温度范围 Operating Temperature Range: -25 ~ +60 °C  
 防护等级 Enclosure: IP65  
 保护等级 Protection Class: I  
 通讯方式 Communication: RS485




华为技术有限公司  
 HUAWEI TECHNOLOGIES CO.,LTD.

中国制造  
 MADE IN CHINA



**型号 Model: SUN2000-33KTL**  
**名称 Name: 太阳能光伏逆变器**  
**SOLAR INVERTER**

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最大输入电压 d.c. Max. Input Voltage: 1000 Vd.c.  
 最大输入电流 d.c. Input Current: 23 A/23 A/23 A  
 MPP电压范围 d.c. MPP Range: 250 ~ 850 Vd.c.  
 输出电压 a.c. Output Nominal Voltage: 400/380 Va.c.; 3N ~ + ⊕  
 输出频率 a.c. Nominal Operating Frequency: 50/60 Hz  
 额定输出功率 a.c. Output Rated Power: 30 kVA  
 最大输出功率 a.c. Output Max. Power: 33 kVA  
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 温度范围 Operating Temperature Range: -25 ~ +60 °C  
 防护等级 Enclosure: IP65  
 保护等级 Protection Class: I  
 通讯方式 Communication: PLC




华为技术有限公司  
 HUAWEI TECHNOLOGIES CO.,LTD.

中国制造  
 MADE IN CHINA



型号 Model: SUN2000-40KTL  
名称 Name: 太阳能光伏逆变器  
SOLAR INVERTER

最大输入电压 d.c. Max. Input Voltage: 1000 Vd.c.  
最大输入电流 d.c. Input Current: 23 A/23 A/23 A  
MPP电压范围 d.c. MPP Range: 250 ~ 850 Vd.c.  
输出电压 a.c. Output Nominal Voltage: 480 Va.c.; 3 ~ + ⊕  
输出频率 a.c. Nominal Operating Frequency: 50/60 Hz  
额定输出功率 a.c. Output Rated Power: 36 kVA  
最大输出功率 a.c. Output Max. Power: 40 kVA  
最大输出电流 a.c. Output Max. Current: 48 A  
功率因数 Power Factor: 0.8(lagging) ~ 0.8(leading)  
温度范围 Operating Temperature Range: -25 ~ +60 °C  
防护等级 Enclosure: IP65  
保护等级 Protection Class: I  
通讯方式 Communication: RS485



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中国制造  
MADE IN CHINA



型号 Model: SUN2000-40KTL  
名称 Name: 太阳能光伏逆变器  
SOLAR INVERTER

最大输入电压 d.c. Max. Input Voltage: 1000 Vd.c.  
最大输入电流 d.c. Input Current: 23 A/23 A/23 A  
MPP电压范围 d.c. MPP Range: 250 ~ 850 Vd.c.  
输出电压 a.c. Output Nominal Voltage: 480 Va.c.; 3 ~ + ⊕  
输出频率 a.c. Nominal Operating Frequency: 50/60 Hz  
额定输出功率 a.c. Output Rated Power: 36 kVA  
最大输出功率 a.c. Output Max. Power: 40 kVA  
最大输出电流 a.c. Output Max. Current: 48 A  
功率因数 Power Factor: 0.8(lagging) ~ 0.8(leading)  
温度范围 Operating Temperature Range: -25 ~ +60 °C  
防护等级 Enclosure: IP65  
保护等级 Protection Class: I  
通讯方式 Communication: PLC



华为技术有限公司  
HUAWEI TECHNOLOGIES CO., LTD.

中国制造  
MADE IN CHINA



<b>Test item particular .....</b>			
Equipment mobility .....	<input type="checkbox"/> movable	<input type="checkbox"/> hand-held	<input type="checkbox"/> transportable
	<input checked="" type="checkbox"/> fixed	<input type="checkbox"/> stationary	<input type="checkbox"/> for building-in
Connection to the mains .....	<input type="checkbox"/> pluggable equipment	<input type="checkbox"/> direct plug-in	
	<input checked="" type="checkbox"/> permanent connection	<input type="checkbox"/> for building-in	
Environmental category .....	<input checked="" type="checkbox"/> outdoor	<input checked="" type="checkbox"/> indoor conditional	<input checked="" type="checkbox"/> indoor unconditional
Operating condition .....	<input checked="" type="checkbox"/> continuous	<input type="checkbox"/> short-time	<input type="checkbox"/> intermittent
Over voltage category mains .....	<input type="checkbox"/> OVC I	<input type="checkbox"/> OVC II	<input checked="" type="checkbox"/> OVC III <input type="checkbox"/> OVC IV
Over voltage category PV .....	<input type="checkbox"/> OVC I	<input checked="" type="checkbox"/> OVC II	<input type="checkbox"/> OVC III <input type="checkbox"/> 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 .....	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No	
IT testing, phase-phase voltage (V) .....	N/A		
Class of equipment .....	<input checked="" type="checkbox"/> Class I	<input type="checkbox"/> Class II	
	<input type="checkbox"/> Class III	<input type="checkbox"/> Not classified	
Mass of equipment (kg) .....	See model list on the following pages.		
Pollution degree .....	<input type="checkbox"/> PD1	<input checked="" type="checkbox"/> PD2 (Inside)	<input checked="" type="checkbox"/> 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 .....	Sep, 2014		
Date(s) of performance of tests .....	Sep, 2014 – Sep, 2014		

**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 IEC 62109-2:**

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):

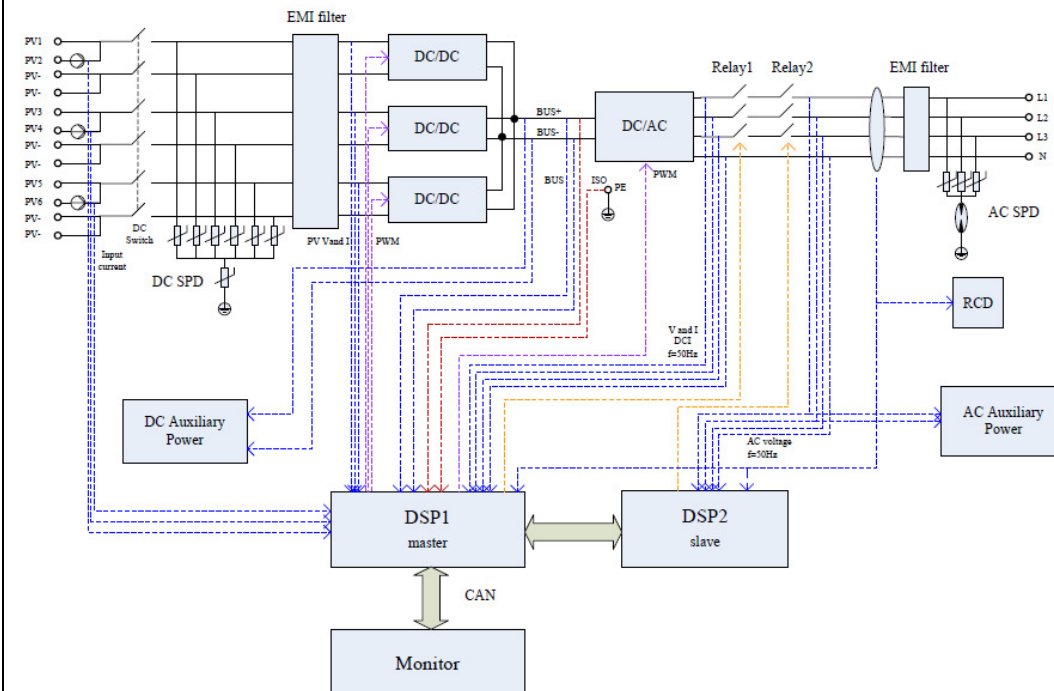
**Huawei Machine Co., Ltd.**

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

General product information:

Breif description:

The Solar inverter SUN2000-33KTL and SUN2000-40KTL convert DC voltage into AC voltage.





The unit is providing EMC filtering at the output toward mains. The unit does not provide galvanic separation from input to output (transformerless). The output is switched off redundant by the high power switching bridge and two relays in series. This assures that the opening of the output circuit will also operate in case of one error.

The internal control is redundant built. It consists of master DSP and slave DSP.

The master DSP can control the relays, measures voltage, and frequency, AC current with injected DC, insulation resistance and residual current, In addition it tests the array insulation resistance and the RCMU circuit before each start up.

The slave DSP is using for sample the grid voltage and current, also can open the relays independently and communicate with master DSP each other.

The grid voltage is measured before the relays and after the relays. The voltage between polarity is calculated. The voltage signals are sent to both DSP. In addition this signal is used for the frequency measurement.

The unit provides two relays in series in each phase. The relays are tested before each start up. Each DSP switch off each relays.

The current is measured by a current sensor. The AC current signal and the injected DC current signal are sent to the master DSP. The master DSP tests and calibrates before each start up all current sensors.

The RCMU is located at the AC output. The RCMU is tested before each start up by the master DSP. While unit working, if a high level residual current occurs, the RCMU will give signal to DSP assuring that unit grid-off from AC mains.

The PV array insulation is measured by the master DSP.

The units have two kinds of communication means, that is RS485 and PLC. In which, the kind of PLC is optional.

Software version: V200R001

Model Difference:

The models SUN2000-33KTL and SUN2000-40KTL are identical in hardware and software, except for electrical ratings.

MODELS LIST		SUN2000-33KTL	SUN2000-40KTL
PV INPUT	$V_{MAX}$ PV [Vdc]	1000	
	$I_{SC}$ PV [A]	3*32	
	MPP Voltage Range $V_{MPP}$ [Vdc]	250-850 (Full-load: 480-850)	250-850 (Full-load: 580-850)
	Max. Input Current $I_{MAX}$ [A]	3*23	
	Start PV Voltage [Vdc]	250	
	Stop PV Voltage [Vdc] (EUT Shutdown)	200	
	Backfeed Current [A]	0	
	Overvoltage Category (OVC)	OVC II	
AC OUTPUT	Rated Output Voltage $U_r$ [Vac]	220/380-230/400	277/480
	Normal Operating Voltage Range $U_n$ [Vac]	187-242	408-528
	Operating Voltage Adjustable Range $U_n$ [Vac]	66-299.2	144-648
	Rated Output Frequency $F_{NETZ}$ [Hz]	50/60	
	Normal Operating Frequency Range $F_n$ [Hz]	49.5-50.2	
	Operating Frequency Adjustable Range $F_n$ [Hz]	42.5-57.5	
	Rated Output Power $P_E$ [W]	30000	36000
	Max. Output Power $P_{E_{max}}$ [W]	33000	40000
	Max. Apparent power $S_{E_{max}}$ [VA]	33000	40000
	PGU $S_{E_{max}}$ [kVA]	> 30kVA	
	Rated Output Current $I_r$ [A]	45.5A	43.3A
	Max. Output Current $I_{max}$ [A]	48A	
	Power Factor $\cos\phi$ [ $\lambda$ ]	[-0.80, 0.80]	
	Efficiency max. $\eta_{max}$	98.6%	98.8%
	Standby Power Consumption [W]	< 1	
	Night Power Consumption [W]	< 1	
	THD [ $V / I$ ] (100% full power)	< 3%	
	Acoustic Noise [dB]	≤29dB	
	Overvoltage Category (OVC)	OVC III	

PV & GRID CONNECTION	Array Insulation Resistance Detection [ $\Omega$ ]	33K ( $> V_{MAX}$ PV/30mA)
	The accuracy of resistance measurement [%/ $\Omega$ ]	$\pm 3K$ ( $< 10\%$ )
	Continuous residual current threshold value [mA]	300 ( $I_{LIMIT}$ : 300)
	Continuous residual current trip time [ms]	300 ( $T_{LIMIT}$ : 300)
	Sudden residual current threshold value [mA]	30 ( $I_{LIMIT}$ : 30) / 60 ( $I_{LIMIT}$ : 60) / 150 ( $I_{LIMIT}$ : 150)
	Sudden residual current trip time [ms]	300 ( $T_{LIMIT}$ : 300) / 150 ( $T_{LIMIT}$ : 150) / 40 ( $T_{LIMIT}$ : 40)
	Voltage threshold value [V]	33KTL: $U_{MIN1}$ : 187 ( $U_{LIMITU1}$ : 187), $U_{MAX1}$ : 242 ( $U_{LIMITO1}$ : 242) $U_{MIN2}$ : 110 ( $U_{LIMITU2}$ : 110), $U_{MAX2}$ : 297 ( $U_{LIMITO2}$ : 297) 40KTL: $U_{MIN1}$ : 408 ( $U_{LIMITU1}$ : 408), $U_{MAX1}$ : 528 ( $U_{LIMITO1}$ : 528) $U_{MIN2}$ : 240 ( $U_{LIMITU2}$ : 240), $U_{MAX2}$ : 600 ( $U_{LIMITO2}$ : 600)
	The accuracy of voltage measurement [%/V]	Min (2.3Vrms, 1%)
	Voltage trip time [ms]	$U_{MIN1}$ : 2000 ( $T_{LIMIT}$ : 2000), $U_{MAX1}$ : 2000 ( $T_{LIMIT}$ : 2000), $U_{MIN2}$ : 100 ( $T_{LIMIT}$ : 100), $U_{MAX2}$ : 50 ( $T_{LIMIT}$ : 50),
	Frequency threshold value [Hz]	$F_{MIN1}$ : 49.5 ( $F_{LIMITU}$ : 49.5), $F_{MAX1}$ : 50.2 ( $F_{LIMITO}$ : 50.2) $F_{MIN2}$ : 48 ( $F_{LIMITU}$ : 48), $F_{MAX2}$ : 51.5 ( $F_{LIMITO}$ : 51.5)
	The accuracy of frequency measurement [%/Hz]	Min (0.01Hz, 0.1%)
	Frequency trip time [ms]	$F_{MIN1}$ : 600000 ( $T_{LIMIT}$ : 600000), $F_{MAX1}$ : 120000 ( $T_{LIMIT1}$ : 120000) $F_{MIN2}$ : 200 ( $T_{LIMIT}$ : 200), $F_{MAX2}$ : 200 ( $T_{LIMIT}$ : 200)
	ROCOF threshold value [Hz/s]	--
	ROCOF trip time [ms]	--
	Active anti-islanding trip time [s]	2.0 ( $T_{LIMIT}$ : 5)
	DC Injection Current normal value [mA]	Max (5 mA, 0.5%Ir)
	DC Injection Current threshold value [mA]	1000
	DC Injection current trip time [ms]	200 ( $T_{LIMIT}$ : 200)
	Reconnection Voltage [V]	33KTL: $U_{MIN}$ : 187 ( $U_{LIMITU}$ : 187), $U_{MAX}$ : 242 ( $U_{LIMITO}$ : 242) 40KTL: $U_{MIN}$ : 408 ( $U_{LIMITU}$ : 408), $U_{MAX}$ : 528 ( $U_{LIMITO}$ : 528)
	Reconnection Frequency [Hz]	$F_{MIN}$ : 49.5 ( $F_{LIMITU}$ : 49.5), $F_{MAX}$ : 50.2 ( $F_{LIMITO}$ : 50.2)
	Reconnection Time [ms]	180 ( $T_{LIMIT}$ $>$ 60)

CONSTRUCTION	Type of inverter	non-isolated
	Type of NS Protection	Integrated
	Separated by	Transformerless
	MPPT strings	6 strings
	MPPT tracking	3
	Protective Class	I
	Enclosure Protection (IP)	IP65
	Operating Temperature Range [°C]	-25 to 60 °C Above 50°C Power derating
	Pollution degree (PD)	PD 3
	Altitude [m]	4000 (G4)
	Size [mm]	550×770×270
	Weight [kg]	50

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 11.	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 source was used with sufficient capability.	P
4.2.2.7.2	Battery inputs	Not used.	N/A

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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	<p>Component fault tests</p> <p>The following faults are simulated:</p> <ul style="list-style-type: none"> <li>a) Short circuit or open circuit of relevant components.</li> <li>b) Short circuit or open circuit of any components or insulation where failure could adversely affect supplementary insulation or reinforced insulation.</li> <li>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.</li> </ul>	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	No motor used.	N/A
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	Contactor 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	Both contactor is available at AC output side and circuit breaker with auto disconnected device 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 5 min. 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



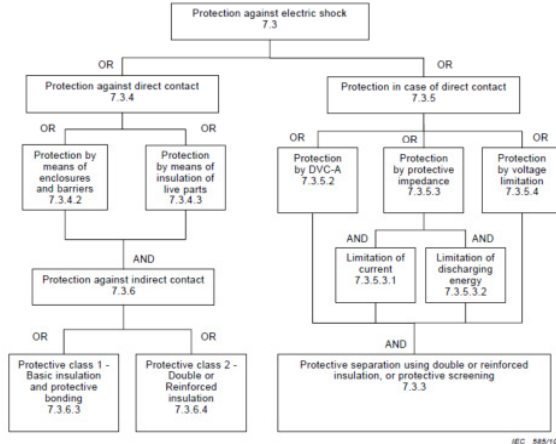
IEC/EN 62109-1: 2010			
Clause	Requirement – Test	Result - Remark	Verdict
	- input voltage, type of voltage (a.c. or d.c.), frequency, and max. continuous current for each input	See model list.	P
	- output voltage, type of voltage (a.c. or d.c.), frequency, max. continuous current, and for a.c. outputs, 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
	b) instructions for safe venting, draining or otherwise working on the cooling system		N/A

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Clause	Requirement – Test	Result - Remark	Verdict
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 EUT		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 EUT		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 EUT.	P
5.3.2	Information related to installation	All below related informations provided in the user's maunal.	P

IEC/EN 62109-1: 2010			
Clause	Requirement – Test	Result - Remark	Verdict
	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 EUT, 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 EUT containing vented or valve-regulated batteries is located, prevent the accumulation of hazardous gases	No battery used in the EUT.	N/A
	h) tightening torque to be applied to wiring terminals		P
	i) values of backfeed short-circuit currents available from the EUT 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 EUT, the max value of short-circuit current available from the source, for which the EUT 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

IEC/EN 62109-1: 2010			
Clause	Requirement – Test	Result - Remark	Verdict
	- 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 EUT, 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 EUT 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

IEC/EN 62109-1: 2010			
Clause	Requirement – Test	Result - Remark	Verdict
	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	The shelter is considered necessary for outdoor use. 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
7.1	General	The proper construction of EUT is available for protection against shock and energy hazards during installation, operation and maintenance under normal and single fault conditions.	P

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Clause	Requirement – Test	Result - Remark	Verdict																						
7.2	Fault conditions	Refer to subclause and table 4.4.4.	P																						
7.3	Protection against electric shock		P																						
7.3.1	General <div data-bbox="394 541 946 982">  </div>	Each circuit under evaluation is compliant with Figure 7-1.	P																						
7.3.2	Decisive voltage classification		P																						
7.3.2.1	Use of decisive voltage class ( DVC)	See below	P																						
7.3.2.2	Limits of DVC <div data-bbox="394 1117 946 1495"> <p><b>Table 6 – Summary of the limits of the decisive voltage classes</b></p> <table border="1"> <thead> <tr> <th rowspan="3">Decisive voltage Classification (DVC)</th><th colspan="3">Limits of working voltage V</th></tr> <tr> <th>a.c. voltage</th><th>a.c. voltage</th><th>d.c. voltage</th></tr> <tr> <th>r.m.s. <math>U_{ACL}</math></th><th>peak <math>U_{ACPL}</math></th><th>mean <math>U_{DCL}</math></th></tr> </thead> <tbody> <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>&gt;50 (&gt;33)</td><td>&gt;71 (&gt;46,7)</td><td>&gt;120 (&gt;70)</td></tr> </tbody> </table> <p>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.</p> <p>*DVC-A circuits are allowed under fault conditions to have voltages up to the DVC-B limits, for maximum 0,2 s.</p> </div>	Decisive voltage Classification (DVC)	Limits of working voltage V			a.c. voltage	a.c. voltage	d.c. voltage	r.m.s. $U_{ACL}$	peak $U_{ACPL}$	mean $U_{DCL}$	A*	≤25 (16)	≤35,4 (22,6)	≤60 (35)	B	50 (33)	71 (46,7)	120 (70)	C	>50 (>33)	>71 (>46,7)	>120 (>70)	See subclause 7.3.2.1.	P
Decisive voltage Classification (DVC)	Limits of working voltage V																								
	a.c. voltage		a.c. voltage	d.c. voltage																					
	r.m.s. $U_{ACL}$	peak $U_{ACPL}$	mean $U_{DCL}$																						
A*	≤25 (16)	≤35,4 (22,6)	≤60 (35)																						
B	50 (33)	71 (46,7)	120 (70)																						
C	>50 (>33)	>71 (>46,7)	>120 (>70)																						
7.3.2.3	Requirements for protection	See subclause 7.3.2.1.	P																						
7.3.2.4	Circuit evaluation	For circuits evaluation information of EUT, refer to brief description of general product information on previous pages.	P																						
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																						

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Clause	Requirement – Test	Result - Remark	Verdict
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 EUT, 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 display 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 electric 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 electric 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
7.3.4.2.4	Service access areas	There is no such kinds of adjustments needed to be opened the enclosure during installation or maintenance.	N/A

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Clause	Requirement – Test	Result - Remark	Verdict																				
7.3.4.3	<p>Protection by means of insulation of live parts</p> <p>Table 8 – Insulation between accessible unearthed parts and DVC-A or -B circuits adjacent to DVC-B or -C circuits</p> <table border="1"> <thead> <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> </thead> <tbody> <tr> <td>DVC-A</td><td>DVC-B or DVC-C</td><td>Basic<sup>a</sup></td><td>Supplemental<sup>a</sup></td></tr> <tr> <td></td><td></td><td>Reinforced<sup>a</sup></td><td>Functional</td></tr> <tr> <td>DVC-B</td><td>DVC-C</td><td>Basic<sup>a</sup></td><td>Supplemental<sup>a</sup></td></tr> <tr> <td></td><td></td><td>Reinforced<sup>a</sup></td><td>Reinforced</td></tr> </tbody> </table> <p><sup>a</sup> Based on the voltage of the circuit having the higher DVC.</p>	Considered circuit (closer to accessible parts)	Adjacent circuit	Insulation between the considered circuit and the adjacent circuit	Insulation between the considered circuit and unearthed accessible parts	DVC-A	DVC-B or DVC-C	Basic <sup>a</sup>	Supplemental <sup>a</sup>			Reinforced <sup>a</sup>	Functional	DVC-B	DVC-C	Basic <sup>a</sup>	Supplemental <sup>a</sup>			Reinforced <sup>a</sup>	Reinforced	See subclause 7.3.2, 7.3.3 and 7.3.4.1.	P
Considered circuit (closer to accessible parts)	Adjacent circuit	Insulation between the considered circuit and the adjacent circuit	Insulation between the considered circuit and unearthed accessible parts																				
DVC-A	DVC-B or DVC-C	Basic <sup>a</sup>	Supplemental <sup>a</sup>																				
		Reinforced <sup>a</sup>	Functional																				
DVC-B	DVC-C	Basic <sup>a</sup>	Supplemental <sup>a</sup>																				
		Reinforced <sup>a</sup>	Reinforced																				
7.3.5	Protection in case of direct contact		P																				
7.3.5.1	General	See below.	P																				
7.3.5.2	Protection using decisive voltage class A	COM port is considered as DVC-A which can be accessible and separated from DVC-C by double or reinforced insulation.	P																				
7.3.5.3	Protection by means of protective impedance	This method not considered.	N/A																				
7.3.5.3.1	<p>Limitation of current through protective impedance</p> <p>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.</p> <p>Compliance is checked by inspection, by analysis of the relevant circuit diagrams, and by testing, using the circuit of IEC 60990, Figure 4.</p>		N/A																				
	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.		N/A																				
	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		N/A																				
7.3.5.3.2	Limitation of discharging energy through protective impedance		N/A																				
7.3.5.4	Protection by means of limited voltages	This method not considered.	N/A																				
7.3.6	Protection against indirect contact		P																				
7.3.6.1	General	The EUT is defined as protective class I.	P																				
7.3.6.2	Insulation between live parts and accessible conductive parts	See subclause 7.3.2.3, 7.3.7.4 and 7.3.7.5.	P																				
7.3.6.3	Protective class I - Protective bonding		P																				



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Clause	Requirement – Test	Result - Remark	Verdict												
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 EUT 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 EUT 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 EUT 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 EUT 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												
	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.  <b>Table 10 – Test duration for protective bonding test</b> <table><tr><th>Overcurrent protective devide rating A</th><th>Duration of the test min</th></tr><tr><td>&gt;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>&gt; 200</td><td>10</td></tr></table>	Overcurrent protective devide rating A	Duration of the test min	>16 to 30	2	31 to 60	4	61 to 100	6	101 to 200	8	> 200	10		N/A
Overcurrent protective devide rating A	Duration of the test min														
>16 to 30	2														
31 to 60	4														
61 to 100	6														
101 to 200	8														
> 200	10														

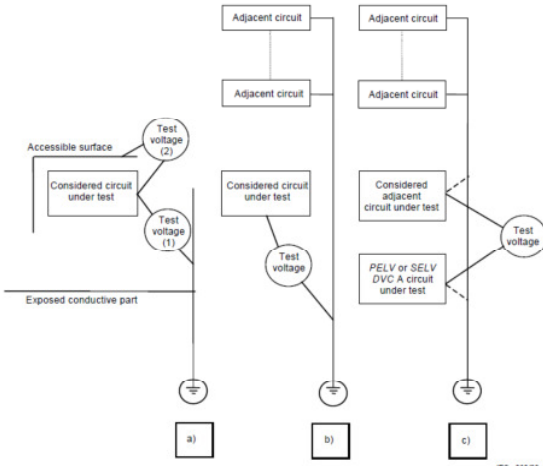
IEC/EN 62109-1: 2010											
Clause	Requirement – Test	Result - Remark	Verdict								
7.3.6.3.4	<p>Protective bonding impedance (routine test)</p> <p>The test shall be as in 7.3.6.3.3, except for the following:</p> <ul style="list-style-type: none"><li>the test current may be reduced to any convenient value greater than 10 A sufficient to allow measurement or calculation of the impedance of the protective bonding means;</li><li>the test duration may be reduced to no less than 2 s.</li></ul> <p>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</p> <p>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).</p>	Considered.	P								
7.3.6.3.5	<p>External protective earthing conductor</p> <p>Table 11 – External protective earthing conductor cross-section</p> <table><tr><th>Cross-sectional area of phase conductors of the PCE, S mm<sup>2</sup></th><th>Minimum cross-sectional area of the corresponding external protective earthing conductor, S<sub>p</sub> mm<sup>2</sup></th></tr><tr><td>S ≤ 16</td><td>S</td></tr><tr><td>16 &lt; S ≤ 35</td><td>16</td></tr><tr><td>35 &lt; S</td><td>S/2</td></tr></table> <p>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.</p>	Cross-sectional area of phase conductors of the PCE, S mm <sup>2</sup>	Minimum cross-sectional area of the corresponding external protective earthing conductor, S <sub>p</sub> mm <sup>2</sup>	S ≤ 16	S	16 < S ≤ 35	16	35 < S	S/2	Protective earthing conductor shall be connected at all times when power is supplied to EUT.	P
Cross-sectional area of phase conductors of the PCE, S mm <sup>2</sup>	Minimum cross-sectional area of the corresponding external protective earthing conductor, S <sub>p</sub> mm <sup>2</sup>										
S ≤ 16	S										
16 < S ≤ 35	16										
35 < S	S/2										
7.3.6.3.6	Means of connection for the external protective earthing conductor		P								
7.3.6.3.6.1	General		P								
	The means of connection for protective conductor corrosion-resistant	Corrosion-resistant is considered for connection and bonding points.	P								
	<p>The means of connection for the protective earthing conductor shall be permanently marked with:</p> <ul style="list-style-type: none"><li>symbol 7 of Annex C; or</li><li>the colour coding green-yellow.</li></ul> <p>Marking shall not be done on easily changeable parts such as screws.</p>	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 EUT	Three phase EUT.	N/A								
	For all other EUT	See appended table 7.5.5. In addition, the caution symbol 15 of Table C.1 provided on EUT and in manual.	P								
	Connect two or more EUTs 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								

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Clause	Requirement – Test	Result - Remark	Verdict
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: 4464V (V <sub>MAX PV</sub> : 1000VDC) AC mains circuits: 4000V (Rated: 230VAC and 277VAC)	P
7.3.7.2	Insulation between a circuit and its surroundings		P
7.3.7.2.1	General	Considered.	P
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 to 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 / impulse voltage: 6000V.	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

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Clause	Requirement – Test	Result - Remark	Verdict
7.3.7.5.1	General		P
7.3.7.5.2	Voltage	The max. voltage: 400Vrms / 1000Vd.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
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

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Clause	Requirement – Test	Result - Remark	Verdict
	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
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.	The RCM is built-in type within the EUT.	N/A
7.3.9	Capacitor discharge	See appended table 7.3.9.	P

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Clause	Requirement – Test	Result - Remark	Verdict
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
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 ( <i>type test</i> ) The impulse voltage test is performed with a voltage having a 1,2/50 $\mu$ s 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	<p>Performing the voltage test</p> <p>The test shall be applied as follows, according to Figure 13:</p>  <p>Figure 13 – Voltage test procedures</p>	Refer to appended table 7.5.2.	P
7.5.2.5	<p>Duration of the a.c. or d.c. voltage test</p> <p>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.</p>	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	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 EUT 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 required: <ul style="list-style-type: none"> <li>– Components in PRIMARY CIRCUITS.</li> <li>– Components in SECONDARY CIRCUITS supplied by power sources which exceed the limits for a LIMITED POWER SOURCE as specified in 9.2.</li> <li>– 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.</li> <li>– Components having unenclosed arcing parts.</li> <li>– Insulated wiring, except as permitted in 9.1.2.2.</li> </ul>	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
9.1.4.6	Additional requirements for openings in transportable equipment	EUT not for transportable equipment.	N/A

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Clause	Requirement – Test	Result - Remark	Verdict																																														
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 <table><tr><th colspan="2">Output voltage<sup>(1)</sup> <i>U<sub>oc</sub></i></th><th>Output current<sup>(2)</sup> <i>I<sub>sc</sub></i></th><th colspan="2">Apparent power<sup>(3)</sup> <i>S</i></th></tr><tr><th>V a.c.</th><th>V d.c.</th><th>A</th><th colspan="2">VA</th></tr><tr><td>≤20</td><td>≤20</td><td>≤8,0</td><td colspan="2">≤5 · <i>U<sub>oc</sub></i></td></tr><tr><td>20 &lt; <i>U<sub>oc</sub></i> ≤ 30</td><td>20 &lt; <i>U<sub>oc</sub></i> ≤ 30</td><td>≤8,0</td><td colspan="2">≤100</td></tr><tr><td>-</td><td>30 &lt; <i>U<sub>oc</sub></i> ≤ 60</td><td>≤150/<i>U<sub>oc</sub></i></td><td colspan="2">≤100</td></tr></table> Table 23 – Limits for power sources not inherently limited <table><tr><th colspan="2">Output voltage<sup>(1)</sup> <i>U<sub>oc</sub></i></th><th>Output current<sup>(2)</sup> <i>I<sub>sc</sub></i></th><th>Apparent power<sup>(3)</sup> <i>S</i></th><th>Current rating of overcurrent protective device<sup>(4)</sup></th></tr><tr><th>Vac</th><th>Vdc</th><th>A</th><th>VA</th><th>A</th></tr><tr><td>≤20</td><td>≤20</td><td rowspan="3">≤1 000/<i>U<sub>0</sub></i></td><td rowspan="3">≤250</td><td>≤5</td></tr><tr><td>20 &lt; <i>U<sub>oc</sub></i> ≤ 30</td><td>20 &lt; <i>U<sub>oc</sub></i> ≤ 30</td><td>≤100/<i>U<sub>oc</sub></i></td></tr><tr><td>-</td><td>30 &lt; <i>U<sub>oc</sub></i> ≤ 60</td><td>≤100/<i>U<sub>oc</sub></i></td></tr></table>	Output voltage <sup>(1)</sup> <i>U<sub>oc</sub></i>		Output current <sup>(2)</sup> <i>I<sub>sc</sub></i>	Apparent power <sup>(3)</sup> <i>S</i>		V a.c.	V d.c.	A	VA		≤20	≤20	≤8,0	≤5 · <i>U<sub>oc</sub></i>		20 < <i>U<sub>oc</sub></i> ≤ 30	20 < <i>U<sub>oc</sub></i> ≤ 30	≤8,0	≤100		-	30 < <i>U<sub>oc</sub></i> ≤ 60	≤150/ <i>U<sub>oc</sub></i>	≤100		Output voltage <sup>(1)</sup> <i>U<sub>oc</sub></i>		Output current <sup>(2)</sup> <i>I<sub>sc</sub></i>	Apparent power <sup>(3)</sup> <i>S</i>	Current rating of overcurrent protective device <sup>(4)</sup>	Vac	Vdc	A	VA	A	≤20	≤20	≤1 000/ <i>U<sub>0</sub></i>	≤250	≤5	20 < <i>U<sub>oc</sub></i> ≤ 30	20 < <i>U<sub>oc</sub></i> ≤ 30	≤100/ <i>U<sub>oc</sub></i>	-	30 < <i>U<sub>oc</sub></i> ≤ 60	≤100/ <i>U<sub>oc</sub></i>		N/A
Output voltage <sup>(1)</sup> <i>U<sub>oc</sub></i>		Output current <sup>(2)</sup> <i>I<sub>sc</sub></i>	Apparent power <sup>(3)</sup> <i>S</i>																																														
V a.c.	V d.c.	A	VA																																														
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Vac	Vdc	A	VA	A																																													
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-	30 < <i>U<sub>oc</sub></i> ≤ 60			≤100/ <i>U<sub>oc</sub></i>																																													
9.3	Short-circuit and overcurrent protection	See below.	P																																														
9.3.1	General The EUT 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 than 50dB during the EUT 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 staorage battery used.	N/A
11.2	Fluid pressure and leakage		N/A
11.2.1	Maximum pressure		N/A

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Clause	Requirement – Test	Result - Remark	Verdict
	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 shall not be possible to fix them in wrong position if this might result in a hazard.	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
	Axial pull is likely – 30 N for the operating means of electrical components		P

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Clause	Requirement – Test	Result - Remark	Verdict
	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 provisions 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 <sup>2</sup> 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
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

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Clause	Requirement – Test	Result - Remark	Verdict
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 EUT	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 display panel.	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
13.6.4	UV resistance	Approved AC/DC connector is provided. Anti-UV approved insulation plastic is provided and covers the control panel.	P

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Clause	Requirement – Test	Result - Remark	Verdict
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
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

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Clause	Requirement – Test	Result - Remark	Verdict
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 EUT, 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
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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	<p>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.</p> <p>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.</p> <p>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 EUT shall be evaluated as specified in the remainder of Annex B.</p> <p>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 reevaluation 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.</p>		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



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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)		P
E.1	Selection of RCD type in AC circuits	Type B universal current sensitive RCD/RCM used.	P
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 EUT		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 <sub>max</sub> (°C)
Supplied Voltage:		520Vd.c.	520Vd.c.	850Vd.c.	850Vd.c.	--
Ambient		55.0	60.0	55.0	60.0	--
EUT						
Enclosure		56.6	61.3	56.5	61.2	70
Cooling panel		72.5	75.8	71.3	74.3	90
PV input terminal		56.4	61.1	56.1	60.8	90
AC output terminal		73.0	74.1	79.6	74.1	105
PV switch (knob)		55.9	60.7	55.6	60.4	90
PV switch		78.8	79.1	69.0	72.4	90
PV input wire		73.4	74.7	66.3	69.9	105
AC output wire		87.5	85.6	84.5	85.2	105
Internal wire (INV)		92.1	90.5	92.5	92.0	105
Internal wire (Boost)		89.6	87.6	78.9	80.6	105
Internal wire (I/O)		85.8	84.5	75.0	77.7	105
Boost inductor L1 core		97.1	94.0	79.1	81.2	130
Boost inductor L2 core		94.6	92.3	80.1	82.2	130
Boost inductor L3 coil		99.3	96.5	78.5	80.8	130
Main board						
Opto-coupler U1		82.8	82.8	78.7	80.8	100
MOS Q2		90.5	89.8	84.9	87.0	Ref.
Transformer T4 coil		84.8	85.0	81.1	83.2	130
Transformer T4 core		85.5	85.6	81.7	83.8	130
Output side relay K10		89.6	88.6	87.4	88.4	90
Capacitor C153		88.6	86.7	76.0	78.7	110
Input side MOV F1057		84.6	83.6	74.9	77.5	Ref.

Input circuit sensor U12	87.9	86.5	77.1	79.8	110
Capacitor C121	88.0	86.2	76.1	78.7	125
Output side inductor T7 coil	97.8	93.9	95.9	95.0	130
PV side EMI inductor T6 core	101.1	98.3	79.0	81.3	130
PV side EMI inductor T6 coil	108.2	106.8	80.4	82.8	130
Capacitor C60	58.6	63.3	58.7	63.0	110
Transformer T2 core	84.0	83.7	80.9	82.6	130
Transformer T2 coil	84.6	84.4	81.3	83.2	130
Output circuit sensor U14	89.1	87.1	86.3	87.3	Ref.
Filter capacitor C226	82.0	81.8	78.7	81.1	Ref.
Capacitor C119	87.5	86.0	76.9	79.3	125
Leakage current protector U19	79.2	79.6	76.8	78.9	Ref.
Power board					
Boost drive Transformer T1 coil	86.7	86.0	82.7	84.6	130
Boost drive Transformer T1 core	85.0	84.4	81.1	83.1	130
Bus capacitor C78	86.6	86.3	86.8	87.6	105
Bus capacitor C112	86.4	85.4	84.3	85.5	105
IGBT module	92.6	90.8	92.7	93.1	150
Bus capacitor C57	86.3	85.5	78.8	81.1	105
Storage capacitor C193	90.4	89.1	77.9	80.3	Ref.
AC Filter board					
MOV F3	81.5	81.3	78.9	80.6	Ref.
Filter inductor T1 coil	109.4	101.5	103.3	101.5	130
Filter inductor T1 core	105.2	99.7	101.0	99.6	130
Capacitor C3	81.9	82.6	78.7	81.2	110
DSP board					
DSP U25	98.6	98.7	93.1	95.5	Ref.
DSP U21	90.2	90.2	86.7	88.8	Ref.
PLC board					
Capacitor C25	64.6	67.5	62.7	66.4	110

Communication transformer T2	63.8	66.9	62.3	66.0	Ref.
PLC chip	66.8	69.7	64.8	68.5	Ref.
Temperature T of winding:	R <sub>1</sub> (Ω)	R <sub>2</sub> (Ω)	T (°C)	allowed T <sub>max</sub> (°C)	insulation class
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4.4	TABLE: fault condition tests						P
	test voltage (V) .....					DC 850	—
	Ambient temperature (°C) .....					25	
No.	component No.	fault	test voltage (V)	test time	fuse No.	fuse current (A)	result
1.	Output	s-c	850	10min	--	--	DC Input: 850Vdc / 0A / 0W AC Output: 0Vac / 0A / 0kW FID: Unit disconnected from grid immediately, can restart, no damage, no hazard MT: N/A SD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, GD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No RO: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NCD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No NH: <input checked="" type="checkbox"/> Pass / <input type="checkbox"/> Fail. DST: <input checked="" type="checkbox"/> Pass / <input type="checkbox"/> Fail.
2.	Input	s-c	850	10min	--	--	DC Input: 850Vdc / 0A / 0W AC Output: 0Vac / 0A / 0kW FID: Unit disconnected from grid immediately, can restart, no damage, no hazard MT: N/A SD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, GD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No RO: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NCD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No NH: <input checked="" type="checkbox"/> Pass / <input type="checkbox"/> Fail. DST: <input checked="" type="checkbox"/> Pass / <input type="checkbox"/> Fail.
3.	Internal fan	Lock	850	2h	--	--	DC Input: 850Vdc / 42.5A / 36kW AC Output: 277Vac / 42.5A / 35.4kW FID: Unit over temperature protected, run for thermal equilibrium, no damage, no hazard MT: N/A SD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, GD: <input type="checkbox"/> Yes / <input checked="" type="checkbox"/> No RO: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NCD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No NH: <input checked="" type="checkbox"/> Pass / <input type="checkbox"/> Fail. DST: <input checked="" type="checkbox"/> Pass / <input type="checkbox"/> Fail.

4.	Heatsink	Blanketing	850	2h	--	--	DC Input: 850Vdc /42.5A /36kW AC Output:277Vac / 42.5A / 35.4kW FID: Unit over temperature protected ,run for thermal equilibrium, no damage, no hazard MT: N/A SD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, GD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No RO: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NCD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No NH: <input checked="" type="checkbox"/> Pass / <input type="checkbox"/> Fail. DST: <input checked="" type="checkbox"/> Pass / <input type="checkbox"/> Fail.
ENE2FLTA (Main Board)							
5.	T4 Pin1-2	S-C	850	10 min	--	--	DC Input: 850Vdc / 0A / 0W AC Output: 0Vac / 0A / 0kW FID: Unit shutdown at once, can restart, no hazard MT: N/A SD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, GD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No RO: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NCD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No NH: <input checked="" type="checkbox"/> Pass / <input type="checkbox"/> Fail. DST: <input checked="" type="checkbox"/> Pass / <input type="checkbox"/> Fail.
6.	T4 Pin3-4	S-C	850	10 min	--	--	DC Input: 850Vdc / 0A / 0W AC Output: 0Vac / 0A / 0kW FID: Unit shutdown at once, can restart, no hazard MT: N/A SD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, GD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No RO: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NCD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No NH: <input checked="" type="checkbox"/> Pass / <input type="checkbox"/> Fail. DST: <input checked="" type="checkbox"/> Pass / <input type="checkbox"/> Fail.
7.	T4 Pin9-10	S-C	850	10 min	--	--	DC Input: 850Vdc /42.5A /36kW AC Output:277Vac / 42.5A / 35.4kW FID: Unit wok normally, no hazard MT: N/A SD: <input type="checkbox"/> Yes / <input checked="" type="checkbox"/> No, GD: <input type="checkbox"/> Yes / <input checked="" type="checkbox"/> No RO: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NCD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No NH: <input checked="" type="checkbox"/> Pass / <input type="checkbox"/> Fail. DST: <input checked="" type="checkbox"/> Pass / <input type="checkbox"/> Fail.

8.	T4 Pin11-12	S-C	850	10 min	--	--	DC Input: 850Vdc /42.5A /36kW AC Output:277Vac / 42.5A / 35.4kW FID: Unit wok normally, no hazard MT: N/A SD: <input type="checkbox"/> Yes / <input checked="" type="checkbox"/> No, GD: <input type="checkbox"/> Yes / <input checked="" type="checkbox"/> No RO: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NCD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No NH: <input checked="" type="checkbox"/> Pass / <input type="checkbox"/> Fail. DST: <input checked="" type="checkbox"/> Pass / <input type="checkbox"/> Fail.
9.	T4 Pin16-17	S-C	850	10 min	--	--	DC Input: 850Vdc /42.5A /36kW AC Output:277Vac / 42.5A / 35.4kW FID: Unit wok normally, no hazard MT: N/A SD: <input type="checkbox"/> Yes / <input checked="" type="checkbox"/> No, GD: <input type="checkbox"/> Yes / <input checked="" type="checkbox"/> No RO: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NCD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No NH: <input checked="" type="checkbox"/> Pass / <input type="checkbox"/> Fail. DST: <input checked="" type="checkbox"/> Pass / <input type="checkbox"/> Fail.
10.	T4 Pin18-17	S-C	850	10 min	--	--	DC Input: 850Vdc /42.5A /36kW AC Output:277Vac / 42.5A / 35.4kW FID: Unit wok normally, no hazard MT: N/A SD: <input type="checkbox"/> Yes / <input checked="" type="checkbox"/> No, GD: <input type="checkbox"/> Yes / <input checked="" type="checkbox"/> No RO: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NCD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No NH: <input checked="" type="checkbox"/> Pass / <input type="checkbox"/> Fail. DST: <input checked="" type="checkbox"/> Pass / <input type="checkbox"/> Fail.
11.	T4 Pin19-17	S-C	850	10 min	--	--	DC Input: 850Vdc /42.5A /36kW AC Output:277Vac / 42.5A / 35.4kW FID: Unit wok normally, no hazard MT: N/A SD: <input type="checkbox"/> Yes / <input checked="" type="checkbox"/> No, GD: <input type="checkbox"/> Yes / <input checked="" type="checkbox"/> No RO: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NCD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No NH: <input checked="" type="checkbox"/> Pass / <input type="checkbox"/> Fail. DST: <input checked="" type="checkbox"/> Pass / <input type="checkbox"/> Fail.
12.	T4 Pin20-17	S-C	850	10 min	--	--	DC Input: 850Vdc /42.5A /36kW AC Output:277Vac / 42.5A / 35.4kW FID: Unit wok normally, no hazard MT: N/A SD: <input type="checkbox"/> Yes / <input checked="" type="checkbox"/> No, GD: <input type="checkbox"/> Yes / <input checked="" type="checkbox"/> No RO: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NCD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No NH: <input checked="" type="checkbox"/> Pass / <input type="checkbox"/> Fail. DST: <input checked="" type="checkbox"/> Pass / <input type="checkbox"/> Fail.

13.	Q1 D-S	S-C	Q1 D-S	10 min	--	--	DC Input: 850Vdc / 0A / 0W AC Output: 0Vac / 0A / 0kW FID: Unit shutdown at once, cannot restart, no hazard, CD: R10, R46, R183 MT: N/A SD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, GD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No RO: <input type="checkbox"/> Yes / <input checked="" type="checkbox"/> No, NCD: <input type="checkbox"/> Yes / <input checked="" type="checkbox"/> No NH: <input checked="" type="checkbox"/> Pass / <input type="checkbox"/> Fail. DST: <input checked="" type="checkbox"/> Pass / <input type="checkbox"/> Fail.
14.	Q1 D-G	S-C	850	10 min	--	--	DC Input: 850Vdc / 0A / 0W AC Output: 0Vac / 0A / 0kW FID: Unit shutdown at once, cannot restart, no hazard, CD: R10, D47 MT: N/A SD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, GD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No RO: <input type="checkbox"/> Yes / <input checked="" type="checkbox"/> No, NCD: <input type="checkbox"/> Yes / <input checked="" type="checkbox"/> No NH: <input checked="" type="checkbox"/> Pass / <input type="checkbox"/> Fail. DST: <input checked="" type="checkbox"/> Pass / <input type="checkbox"/> Fail.
15.	Q1 G-S	S-C	850	10 min	--	--	DC Input: 850Vdc / 0A / 0W AC Output: 0Vac / 0A / 0kW FID: Unit shutdown at once, cannot restart, no hazard, CD: R10, D47 MT: N/A SD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, GD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No RO: <input type="checkbox"/> Yes / <input checked="" type="checkbox"/> No, NCD: <input type="checkbox"/> Yes / <input checked="" type="checkbox"/> No NH: <input checked="" type="checkbox"/> Pass / <input type="checkbox"/> Fail. DST: <input checked="" type="checkbox"/> Pass / <input type="checkbox"/> Fail.
16.	Q2 D-S	S-C	850	10 min	--	--	DC Input: 850Vdc / 0A / 0W AC Output: 0Vac / 0A / 0kW FID: Unit shutdown at once, cannot restart, no hazard, CD: R10, R190 MT: N/A SD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, GD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No RO: <input type="checkbox"/> Yes / <input checked="" type="checkbox"/> No, NCD: <input type="checkbox"/> Yes / <input checked="" type="checkbox"/> No NH: <input checked="" type="checkbox"/> Pass / <input type="checkbox"/> Fail. DST: <input checked="" type="checkbox"/> Pass / <input type="checkbox"/> Fail.
17.	Q2 D-G	S-C	850	10 min	--	--	DC Input: 850Vdc / 0A / 0W AC Output: 0Vac / 0A / 0kW FID: Unit shutdown at once, cannot restart, no hazard, CD: R190, D49 MT: N/A SD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, GD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No RO: <input type="checkbox"/> Yes / <input checked="" type="checkbox"/> No, NCD: <input type="checkbox"/> Yes / <input checked="" type="checkbox"/> No NH: <input checked="" type="checkbox"/> Pass / <input type="checkbox"/> Fail. DST: <input checked="" type="checkbox"/> Pass / <input type="checkbox"/> Fail.

18.	Q2 G-S	S-C	DC 450	10 min	--	--	DC Input: 850Vdc / 0A / 0W AC Output: 0Vac / 0A / 0kW FID: Unit shutdown at once, cannot restart, no hazard, CD: R190,D49 MT: N/A SD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, GD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No RO: <input type="checkbox"/> Yes / <input checked="" type="checkbox"/> No, NCD: <input type="checkbox"/> Yes / <input checked="" type="checkbox"/> No NH: <input checked="" type="checkbox"/> Pass / <input type="checkbox"/> Fail. DST: <input checked="" type="checkbox"/> Pass / <input type="checkbox"/> Fail.
19.	T2 Pin2-4	S-C	850	10 min	--	--	DC Input: 850Vdc / 42.5A / 36kW AC Output: 277Vac / 42.5A / 35.4kW FID: Unit wok normally, no hazard MT: N/A SD: <input type="checkbox"/> Yes / <input checked="" type="checkbox"/> No, GD: <input type="checkbox"/> Yes / <input checked="" type="checkbox"/> No RO: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NCD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No NH: <input checked="" type="checkbox"/> Pass / <input type="checkbox"/> Fail. DST: <input checked="" type="checkbox"/> Pass / <input type="checkbox"/> Fail.
20.	T2 Pin6-8	S-C	850	10 min	--	--	DC Input: 850Vdc / 0A / 0W AC Output: 0Vac / 0A / 0kW FID: Unit shutdown at once, cannot restart, no hazard, CD: R187,D97 MT: N/A SD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, GD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No RO: <input type="checkbox"/> Yes / <input checked="" type="checkbox"/> No, NCD: <input type="checkbox"/> Yes / <input checked="" type="checkbox"/> No NH: <input checked="" type="checkbox"/> Pass / <input type="checkbox"/> Fail. DST: <input checked="" type="checkbox"/> Pass / <input type="checkbox"/> Fail.
21.	T2 Pin11-12	S-C	850	10 min	--	--	DC Input: 850Vdc / 42.5A / 36kW AC Output: 277Vac / 42.5A / 35.4kW FID: Unit wok normally, no hazard MT: N/A SD: <input type="checkbox"/> Yes / <input checked="" type="checkbox"/> No, GD: <input type="checkbox"/> Yes / <input checked="" type="checkbox"/> No RO: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NCD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No NH: <input checked="" type="checkbox"/> Pass / <input type="checkbox"/> Fail. DST: <input checked="" type="checkbox"/> Pass / <input type="checkbox"/> Fail.
22.	Q3 D-S	S-C	850	10 min	--	--	DC Input: 850Vdc / 0A / 0W AC Output: 0Vac / 0A / 0kW FID: Unit shut down, can restart, no damage, no hazard MT: N/A SD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, GD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No RO: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NCD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No NH: <input checked="" type="checkbox"/> Pass / <input type="checkbox"/> Fail. DST: <input checked="" type="checkbox"/> Pass / <input type="checkbox"/> Fail.



23.	Q3 D-G	S-C	850	10 min	--	--	DC Input: 850Vdc / 0A / 0W AC Output: 0Vac / 0A / 0kW FID: Unit shutdown at once, cannot restart, no hazard, CD: R303,D59 MT: N/A SD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, GD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No RO: <input type="checkbox"/> Yes / <input checked="" type="checkbox"/> No, NCD: <input type="checkbox"/> Yes / <input checked="" type="checkbox"/> No NH: <input checked="" type="checkbox"/> Pass / <input type="checkbox"/> Fail. DST: <input checked="" type="checkbox"/> Pass / <input type="checkbox"/> Fail.
24.	Q3 G-S	S-C	850	10 min	--	--	DC Input: 850Vdc / 0A / 0W AC Output: 0Vac / 0A / 0kW FID: Unit shutdown at once, cannot restart, no hazard, CD: R303,D59 MT: N/A SD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, GD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No RO: <input type="checkbox"/> Yes / <input checked="" type="checkbox"/> No, NCD: <input type="checkbox"/> Yes / <input checked="" type="checkbox"/> No NH: <input checked="" type="checkbox"/> Pass / <input type="checkbox"/> Fail. DST: <input checked="" type="checkbox"/> Pass / <input type="checkbox"/> Fail.
25.	U26 Pin1-3	S-C	850	10 min	--	--	DC Input: 850Vdc / 42.5A / 36kW AC Output: 277Vac / 42.5A / 35.4kW FID: Unit wok normally, no hazard MT: N/A SD: <input type="checkbox"/> Yes / <input checked="" type="checkbox"/> No, GD: <input type="checkbox"/> Yes / <input checked="" type="checkbox"/> No RO: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NCD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No NH: <input checked="" type="checkbox"/> Pass / <input type="checkbox"/> Fail. DST: <input checked="" type="checkbox"/> Pass / <input type="checkbox"/> Fail.
26.	U26 Pin1-4	S-C	850	10 min	--	--	DC Input: 850Vdc / 42.5A / 36kW AC Output: 277Vac / 42.5A / 35.4kW FID: Unit wok normally, no hazard MT: N/A SD: <input type="checkbox"/> Yes / <input checked="" type="checkbox"/> No, GD: <input type="checkbox"/> Yes / <input checked="" type="checkbox"/> No RO: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NCD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No NH: <input checked="" type="checkbox"/> Pass / <input type="checkbox"/> Fail. DST: <input checked="" type="checkbox"/> Pass / <input type="checkbox"/> Fail.
27.	U26 Pin2-3	S-C	850	10 min	--	--	DC Input: 850Vdc / 42.5A / 36kW AC Output: 277Vac / 42.5A / 35.4kW FID: Unit wok normally, no hazard MT: N/A SD: <input type="checkbox"/> Yes / <input checked="" type="checkbox"/> No, GD: <input type="checkbox"/> Yes / <input checked="" type="checkbox"/> No RO: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NCD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No NH: <input checked="" type="checkbox"/> Pass / <input type="checkbox"/> Fail. DST: <input checked="" type="checkbox"/> Pass / <input type="checkbox"/> Fail.

28.	U26 Pin2-4	S-C	850	10 min	--	--	DC Input: 850Vdc /42.5A /36kW AC Output:277Vac / 42.5A / 35.4kW FID: Unit wok normally, no hazard MT: N/A SD: <input type="checkbox"/> Yes / <input checked="" type="checkbox"/> No, GD: <input type="checkbox"/> Yes / <input checked="" type="checkbox"/> No RO: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NCD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No NH: <input checked="" type="checkbox"/> Pass / <input type="checkbox"/> Fail. DST: <input checked="" type="checkbox"/> Pass / <input type="checkbox"/> Fail.
29.	U30 Pin1-3	S-C	850	30 min	--	--	DC Input: 850Vdc /42.5A /36kW AC Output:277Vac / 42.5A / 35.4kW FID: Unit wok normally, no hazard MT: N/A SD: <input type="checkbox"/> Yes / <input checked="" type="checkbox"/> No, GD: <input type="checkbox"/> Yes / <input checked="" type="checkbox"/> No RO: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NCD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No NH: <input checked="" type="checkbox"/> Pass / <input type="checkbox"/> Fail. DST: <input checked="" type="checkbox"/> Pass / <input type="checkbox"/> Fail.
30.	U30 Pin1-4	S-C	850	10 min	--	--	DC Input: 850Vdc /42.5A /36kW AC Output:277Vac / 42.5A / 35.4kW FID: Unit wok normally, no hazard MT: N/A SD: <input type="checkbox"/> Yes / <input checked="" type="checkbox"/> No, GD: <input type="checkbox"/> Yes / <input checked="" type="checkbox"/> No RO: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NCD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No NH: <input checked="" type="checkbox"/> Pass / <input type="checkbox"/> Fail. DST: <input checked="" type="checkbox"/> Pass / <input type="checkbox"/> Fail.
31.	U30 Pin2-3	S-C	850	10 min	--	--	DC Input: 850Vdc /42.5A /36kW AC Output:277Vac / 42.5A / 35.4kW FID: Unit wok normally, no hazard MT: N/A SD: <input type="checkbox"/> Yes / <input checked="" type="checkbox"/> No, GD: <input type="checkbox"/> Yes / <input checked="" type="checkbox"/> No RO: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NCD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No NH: <input checked="" type="checkbox"/> Pass / <input type="checkbox"/> Fail. DST: <input checked="" type="checkbox"/> Pass / <input type="checkbox"/> Fail.
32.	U30 Pin2-4	S-C	850	10 min	--	--	DC Input: 850Vdc /42.5A /36kW AC Output:277Vac / 42.5A / 35.4kW FID: Unit wok normally, no hazard MT: N/A SD: <input type="checkbox"/> Yes / <input checked="" type="checkbox"/> No, GD: <input type="checkbox"/> Yes / <input checked="" type="checkbox"/> No RO: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NCD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No NH: <input checked="" type="checkbox"/> Pass / <input type="checkbox"/> Fail. DST: <input checked="" type="checkbox"/> Pass / <input type="checkbox"/> Fail.

33.	U1 Pin2-8	S-C	850	10 min	--	--	DC Input: 850Vdc /42.5A /36kW AC Output:277Vac / 42.5A / 35.4kW FID: Unit wok normally, no hazard MT: N/A SD: <input type="checkbox"/> Yes / <input checked="" type="checkbox"/> No, GD: <input type="checkbox"/> Yes / <input checked="" type="checkbox"/> No RO: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NCD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No NH: <input checked="" type="checkbox"/> Pass / <input type="checkbox"/> Fail. DST: <input checked="" type="checkbox"/> Pass / <input type="checkbox"/> Fail.
34.	U2 Pin2-8	S-C	850	10 min	--	--	DC Input: 850Vdc /42.5A /36kW AC Output:277Vac / 42.5A / 35.4kW FID: Unit wok normally, no hazard MT: N/A SD: <input type="checkbox"/> Yes / <input checked="" type="checkbox"/> No, GD: <input type="checkbox"/> Yes / <input checked="" type="checkbox"/> No RO: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NCD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No NH: <input checked="" type="checkbox"/> Pass / <input type="checkbox"/> Fail. DST: <input checked="" type="checkbox"/> Pass / <input type="checkbox"/> Fail.
35.	D36	S-C	850	30 min	--	--	DC Input: 850Vdc /42.5A /36kW AC Output:277Vac / 42.5A / 35.4kW FID: Unit wok normally, no hazard MT: N/A SD: <input type="checkbox"/> Yes / <input checked="" type="checkbox"/> No, GD: <input type="checkbox"/> Yes / <input checked="" type="checkbox"/> No RO: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NCD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No NH: <input checked="" type="checkbox"/> Pass / <input type="checkbox"/> Fail. DST: <input checked="" type="checkbox"/> Pass / <input type="checkbox"/> Fail.
36.	D37	S-C	850	10 min	--	--	DC Input: 850Vdc /42.5A /36kW AC Output:277Vac / 42.5A / 35.4kW FID: Unit wok normally, no hazard MT: N/A SD: <input type="checkbox"/> Yes / <input checked="" type="checkbox"/> No, GD: <input type="checkbox"/> Yes / <input checked="" type="checkbox"/> No RO: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NCD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No NH: <input checked="" type="checkbox"/> Pass / <input type="checkbox"/> Fail. DST: <input checked="" type="checkbox"/> Pass / <input type="checkbox"/> Fail.
37.	D38	S-C	850	10 min	--	--	DC Input: 850Vdc /42.5A /36kW AC Output:277Vac / 42.5A / 35.4kW FID: Unit wok normally, no hazard MT: N/A SD: <input type="checkbox"/> Yes / <input checked="" type="checkbox"/> No, GD: <input type="checkbox"/> Yes / <input checked="" type="checkbox"/> No RO: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NCD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No NH: <input checked="" type="checkbox"/> Pass / <input type="checkbox"/> Fail. DST: <input checked="" type="checkbox"/> Pass / <input type="checkbox"/> Fail.

38.	D78	S-C	850	10 min	--	--	DC Input: 850Vdc /42.5A /36kW AC Output:277Vac / 42.5A / 35.4kW FID: Unit wok normally, no hazard MT: N/A SD: <input type="checkbox"/> Yes / <input checked="" type="checkbox"/> No, GD: <input type="checkbox"/> Yes / <input checked="" type="checkbox"/> No RO: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NCD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No NH: <input checked="" type="checkbox"/> Pass / <input type="checkbox"/> Fail. DST: <input checked="" type="checkbox"/> Pass / <input type="checkbox"/> Fail.
39.	D48	S-C	850	10 min	--	--	DC Input: 850Vdc /42.5A /36kW AC Output:277Vac / 42.5A / 35.4kW FID: Unit wok normally, no hazard MT: N/A SD: <input type="checkbox"/> Yes / <input checked="" type="checkbox"/> No, GD: <input type="checkbox"/> Yes / <input checked="" type="checkbox"/> No RO: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NCD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No NH: <input checked="" type="checkbox"/> Pass / <input type="checkbox"/> Fail. DST: <input checked="" type="checkbox"/> Pass / <input type="checkbox"/> Fail.
ENE2PWRA (Power Board)							
40.	U20	S-C	850	10 min	--	--	DC Input: 850Vdc / 0A / 0W AC Output: 0Vac / 0A / 0kW FID: Unit shutdown at once, can restart, no hazard MT: N/A SD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, GD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No RO: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NCD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No NH: <input checked="" type="checkbox"/> Pass / <input type="checkbox"/> Fail. DST: <input checked="" type="checkbox"/> Pass / <input type="checkbox"/> Fail.
41.	C34	S-C	850	10 min	--	--	DC Input: 850Vdc / 0A / 0W AC Output: 0Vac / 0A / 0kW FID: Unit shutdown after 30 seconds, no damage, no hazard, CD:C28,C69,C70,C26,C23 MT: N/A SD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, GD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No RO: <input type="checkbox"/> Yes / <input checked="" type="checkbox"/> No, NCD: <input type="checkbox"/> Yes / <input checked="" type="checkbox"/> No NH: <input checked="" type="checkbox"/> Pass / <input type="checkbox"/> Fail. DST: <input checked="" type="checkbox"/> Pass / <input type="checkbox"/> Fail.
ENE2COMB(PLC board)							

42.	T1 Pin1-2	S-C	850	10 min	--	--	DC Input: 850Vdc /42.5A /36kW AC Output:277Vac / 42.5A / 35.4kW FID: Unit wok normally, no hazard MT: N/A SD: <input type="checkbox"/> Yes / <input checked="" type="checkbox"/> No, GD: <input type="checkbox"/> Yes / <input checked="" type="checkbox"/> No RO: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NCD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No NH: <input checked="" type="checkbox"/> Pass / <input type="checkbox"/> Fail. DST: <input checked="" type="checkbox"/> Pass / <input type="checkbox"/> Fail.
43.	T1 Pin3-4	S-C	850	10 min	--	--	DC Input: 850Vdc /42.5A /36kW AC Output:277Vac / 42.5A / 35.4kW FID: Unit wok normally, no hazard MT: N/A SD: <input type="checkbox"/> Yes / <input checked="" type="checkbox"/> No, GD: <input type="checkbox"/> Yes / <input checked="" type="checkbox"/> No RO: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NCD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No NH: <input checked="" type="checkbox"/> Pass / <input type="checkbox"/> Fail. DST: <input checked="" type="checkbox"/> Pass / <input type="checkbox"/> Fail.
44.	T1 Pin5-8	S-C	850	10 min	--	--	DC Input: 850Vdc /42.5A /36kW AC Output:277Vac / 42.5A / 35.4kW FID: Unit wok normally, no hazard MT: N/A SD: <input type="checkbox"/> Yes / <input checked="" type="checkbox"/> No, GD: <input type="checkbox"/> Yes / <input checked="" type="checkbox"/> No RO: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NCD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No NH: <input checked="" type="checkbox"/> Pass / <input type="checkbox"/> Fail. DST: <input checked="" type="checkbox"/> Pass / <input type="checkbox"/> Fail.
Unit							
45.	Input	Reversed	850	10 min	--	--	DC Input: 850Vdc /42.5A /36kW AC Output:277Vac / 42.5A / 35.4kW FID: Error message: "120-125"(String transposition) Unit wok normally, no harzard MT: N/A SD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, GD: <input type="checkbox"/> Yes / <input checked="" type="checkbox"/> No RO: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NCD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No NH: <input checked="" type="checkbox"/> Pass / <input type="checkbox"/> Fail. DST: <input checked="" type="checkbox"/> Pass / <input type="checkbox"/> Fail.
46.	Input	Over-voltage	1000	10 min	--	--	DC Input: 1000Vdc /0A /0kW AC Output:0Vac / 0A / 0kW FID: Error message: "103" (High DC Input Volt) PV inverter can not startup. MT: N/A SD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, GD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No RO: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NCD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No NH: <input checked="" type="checkbox"/> Pass / <input type="checkbox"/> Fail. DST: <input checked="" type="checkbox"/> Pass / <input type="checkbox"/> Fail.

47.	Output	Power over-feed (OCP & OTP function controlled by MCU / software is disable)	850	10 min	--	--	DC Input: 850Vdc /42.5A /36kW AC Output:277Vac / 42.5A / 35.4kW FID: Error message: "202" (Abnormal Inv Circurt) PV inverter disconnected from grid immediately. MT: N/A SD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, GD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No RO: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NCD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No NH: <input checked="" type="checkbox"/> Pass / <input type="checkbox"/> Fail. DST: <input checked="" type="checkbox"/> Pass / <input type="checkbox"/> Fail.
48.	Output	Over-voltage (OVP function controlled by MCU / software is disable)	850	10 min	--	--	DC Input: 850Vdc /42.5A /36kW AC Output:277Vac / 42.5A / 35.4kW FID: PV inverter wok normally, no harzard. MT: N/A SD: <input type="checkbox"/> Yes / <input checked="" type="checkbox"/> No, GD: <input type="checkbox"/> Yes / <input checked="" type="checkbox"/> No RO: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NCD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No NH: <input checked="" type="checkbox"/> Pass / <input type="checkbox"/> Fail. DST: <input checked="" type="checkbox"/> Pass / <input type="checkbox"/> Fail.
49.	Output	Phase sequence or polarity incorrect	850	10 min	--	--	DC Input: 850Vdc /42.5A /36kW AC Output:277Vac / 42.5A / 35.4kW FID: Unit wok normally, no hazard MT: N/A SD: <input type="checkbox"/> Yes / <input checked="" type="checkbox"/> No, GD: <input type="checkbox"/> Yes / <input checked="" type="checkbox"/> No RO: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NCD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No NH: <input checked="" type="checkbox"/> Pass / <input type="checkbox"/> Fail. DST: <input checked="" type="checkbox"/> Pass / <input type="checkbox"/> Fail.
50.	Output	A-Phase mis-wiring grid connection	850	10 min	--	--	DC Input: 850Vdc /42.5A /36kW AC Output:277Vac / 42.5A / 35.4kW FID: Error message: 301 (Abnormal Grid Volt ) the output is overvoltage, PV inverter disconnected from grid immediately. MT: N/A SD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, GD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No RO: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NCD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No NH: <input checked="" type="checkbox"/> Pass / <input type="checkbox"/> Fail. DST: <input checked="" type="checkbox"/> Pass / <input type="checkbox"/> Fail.

51.	Output	B-Phase mis-wiring grid connection	850	10 min	--	--	DC Input: 850Vdc /42.5A /36kW AC Output:277Vac / 42.5A / 35.4kW FID: Error message: 301 (Abnormal Grid Volt ) the output is overvoltage, PV inverter disconnected from grid immediately. MT: N/A SD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, GD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No RO: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NCD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No NH: <input checked="" type="checkbox"/> Pass / <input type="checkbox"/> Fail. DST: <input checked="" type="checkbox"/> Pass / <input type="checkbox"/> Fail.
52.	Output	C-Phase mis-wiring grid connection	850	10 min	--	--	DC Input: 850Vdc /42.5A /36kW AC Output:277Vac / 42.5A / 35.4kW FID: Error message: 301 (Abnormal Grid Volt ) the output is overvoltage, PV inverter disconnected from grid immediately. MT: N/A SD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, GD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No RO: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NCD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No NH: <input checked="" type="checkbox"/> Pass / <input type="checkbox"/> Fail. DST: <input checked="" type="checkbox"/> Pass / <input type="checkbox"/> Fail.
53.	PV/DC Voltage detector	Loss	850	10 min	--	--	DC Input: 850Vdc /42.5A /36kW AC Output:277Vac / 42.5A / 35.4kW FID: Error message: "112" (Input/Output Power Unbalanced ), PV inverter disconnected from grid after about 3 seconds. MT: N/A SD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, GD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No RO: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NCD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No NH: <input checked="" type="checkbox"/> Pass / <input type="checkbox"/> Fail. DST: <input checked="" type="checkbox"/> Pass / <input type="checkbox"/> Fail.
54.	Grid Voltage detector	Loss	850	10 min	--	--	DC Input: 850Vdc /42.5A /36kW AC Output:277Vac / 42.5A / 35.4kW FID: Error message"202"(Invert Circuit Abnormal), or "301"(Grid Under Voltage), or "305"(Under Frequency); PV inverter disconnected from grid immediately. MT: N/A SD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, GD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No RO: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NCD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No NH: <input checked="" type="checkbox"/> Pass / <input type="checkbox"/> Fail. DST: <input checked="" type="checkbox"/> Pass / <input type="checkbox"/> Fail.

55.	Bus Voltage detector	Loss	850	10 min	--	--	DC Input: 850Vdc /42.5A /36kW AC Output:277Vac / 42.5A / 35.4kW FID: Error message "201"(DC Bus Voltage Fault) ; PV inverter disconnected from grid immediately. MT: N/A SD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, GD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No RO: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NCD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No NH: <input checked="" type="checkbox"/> Pass / <input type="checkbox"/> Fail. DST: <input checked="" type="checkbox"/> Pass / <input type="checkbox"/> Fail.
56.	MCU failure	+1.8V power supply disable	850	10 min	--	--	DC Input: 850Vdc /0A /0kW AC Output:0Vac / 0A / 0kW FID: No warning, PV inverter can not startup. MT: N/A SD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, GD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No RO: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NCD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No NH: <input checked="" type="checkbox"/> Pass / <input type="checkbox"/> Fail. DST: <input checked="" type="checkbox"/> Pass / <input type="checkbox"/> Fail.
57.	MCU failure	+3.3V power supply disable	850	10 min	--	--	DC Input: 850Vdc /0A /0kW AC Output:0Vac / 0A / 0kW FID: No warning, PV inverter can not startup. MT: N/A SD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, GD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No RO: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NCD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No NH: <input checked="" type="checkbox"/> Pass / <input type="checkbox"/> Fail. DST: <input checked="" type="checkbox"/> Pass / <input type="checkbox"/> Fail.
58.	MCU failure	+5V power supply disable	850	10 min	--	--	DC Input: 850Vdc /0A /0kW AC Output:0Vac / 0A / 0kW FID: No warning, PV inverter can not startup. MT: N/A SD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, GD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No RO: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NCD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No NH: <input checked="" type="checkbox"/> Pass / <input type="checkbox"/> Fail. DST: <input checked="" type="checkbox"/> Pass / <input type="checkbox"/> 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-I	Over-load.		
<p>Note(s):</p> <p>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.</p> <p>There shall be no emission of molten metal, burning insulation, or flaming or glowing particles from 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.</p> <p>Faults protected by "UL certified current fuse only" shall be performed and repeated 3 times.</p> <p>In case of components damaged other than fuse, the evaluation should be repeated 3 times.</p> <p>Report in result section:</p> <ul style="list-style-type: none"> <li>– Measure transformer temperature at all times</li> <li>– Fuse opened Yes / No?</li> <li>– Components damaged?</li> <li>– Emit Flames?</li> <li>– Emit molten metal?</li> <li>– Did it pass the electric strength test?</li> </ul> <p>What happened to the SPS? Shutdown / cycle protection / normal operation</p>			

4.7	TABLE: electrical data (in normal conditions)							P
Type designation	I/P rated	PV / DC Input			O/P rated	Grid / AC Output Testing cond.		
	I [A]	U [V]	I [A]	P [kW]	I [A]	U [V]	I [A]	P [kW]
SUN2000-33KTL	3X23	481.6	62.82	30.2	48	230.77	42.62	29.45
	3X23	622.0	48.49	30.10	48	230.49	42.59	29.51
	3X23	849.7	35.54	30.20	48	230.77	42.59	29.41
SUN2000-40KTL	3X23	520.2	68.94	35.86	48	277.69	42.12	35.13
	3X23	681.1	52.93	36.04	48	277.71	42.49	35.43
	3X23	848.9	42.48	36.03	48	277.70	42.51	35.44
4.7 a)	TABLE: electrical data (in 110% load, for reference)							--
Type designation	I/P rated	PV / DC Input			O/P rated	Grid / AC Output Testing cond.		
	I [A]	U [V]	I [A]	P [kW]	I [A]	U [V]	I [A]	P [kW]
SUN2000-33KTL	3X23	482.9	69.16	33.40	48	230.72	47.03	32.43
	3X23	621.1	53.85	33.44	48	230.74	47.40	32.68
	3X23	848.8	39.56	33.56	48	230.64	47.28	32.60
SUN2000-40KTL	3X23	581.0	68.64	39.89	48	277.85	46.70	38.92
	3X23	681.3	58.41	39.78	48	278.08	47.09	39.33
	3X23	849.1	47.07	39.94	48	277.85	46.98	39.13
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)	
EUT unit							
PV circuits switch “ + “ to “ - “: FI	4464 (1000Vdc)	1000Vdc	4.7 (3.6x1.29)	12.0	10	12.0	
PV circuits to metal chassis: BI	4464 (1000Vdc)	1000Vdc	4.7 (3.6x1.29)	14.0	10	14.0	
AC mains output terminal line to line or nature: FI	4000 (300Vrms)	277Vac	3.9 (3.0x1.29)	15.1	3.0 → 3.9*	15.1	

AC mains to metal chassis: BI	4464 (1000Vdc)	1000Vdc	4.7 (3.6x1.29)	10.9	10	10.9
<b>On Main Board</b>						
PV circuits “ + “ to “ - “cross trace: FI	4464 (1000Vdc)	1000Vdc	4.7 (3.6x1.29)	5.1	10→ 5.0**	5.1
AC mains line to line or nature cross trace: FI	4000 (300Vrms)	277Vac	3.9 (3.0x1.29)	4.0	3.0 → 1.5**→ 3.9*	4.0
PV circuits to earthing cross trace: BI	4464 (1000Vdc)	1000Vdc	4.7 (3.6x1.29)	5.1	10→ 5.0**	5.1
AC mains to earthing cross trace: BI	4464 (1000Vdc)	1000Vdc	4.7 (3.6x1.29)	5.1	10→ 5.0**	5.1
PV circuits to DSP circuit: BI	4464 (1000Vdc)	1000Vdc	4.7 (3.6x1.29)	See below	10→ 5.0**	See below
-cross series sampling resistor	--	--	--	7.0	--	7.0
-cross T4 (pri. to sec. of DSP circuit )	--	--	--	22.0	--	22.0
-cross trace	--	--	--	10.1	--	10.1
AC mains to DSP circuit: BI	4464 (1000Vdc)	1000Vdc	4.7 (3.6x1.29)	See below	10→ 5.0**	See below
-cross series sampling resistor	--	--	--	5.6	--	5.6
-cross trace	--	--	--	10.1	--	10.1
DSP circuit to communication and display circuit (SELV): (SI)	4464 (1000Vdc)	1000Vdc	4.7 (3.6x1.29)	See below	10→ 5.0**	See below
-cross optocoupler (U1, U2)	--	--	--	9.6	--	9.6
-cross T4 (sec. of DSP circuit to sec. of SELV )	--	--	--	21.0	--	21.0
-cross trace	--	--	--	10.9	--	10.9
PV circuits to communication and display circuit (SELV): RI	4464 (1000Vdc)	1000Vdc	7.9 (6.1x1.29)	See below	20→ 10.0**	See below
-cross T4 (pri to sec. of SELV )	--	--	--	22.0	--	22.0
-cross trace	--	--	--	10.1	--	10.1
AC mains to communication and display circuit (SELV): RI	4464 (1000Vdc)	1000Vdc	7.9 (6.1x1.29)	See below	20→ 10.0**	See below
-cross T2 (pri to sec)	--	--	--	13.0	--	13.0
-cross trace	--	--	--	12.9	--	12.9
<b>On PLC board</b>						
AC mains line to line or nature cross trace: FI	4000 (300Vrms)	277Vac	3.9 (3.0x1.29)	9.5	3.0 → 1.5**→ 3.9*	9.5

AC mains to earthing cross trace: BI	4464 (1000Vdc)	1000Vdc	4.7 (3.6x1.29)	9.7	10→ 5.0**	9.7
AC mains to communication and display circuit (SELV): RI	4464 (1000Vdc)	1000Vdc	7.9 (6.1x1.29)	See below	20→ 10.0**	See below
-cross communication transformer (T1,T2,T3)	--	--	--	10.1	--	10.1
-cross trace	--	--	--	10.7	--	10.7
On AC filter board						
AC mains line to line or nature cross trace: FI	4000 (300Vrms)	277Vac	3.9 (3.0x1.29)	7.4	3.0 → 1.5**→ 3.9*	7.4
AC mains to earthing cross trace: BI	4464 (1000Vdc)	1000Vdc	4.7 (3.6x1.29)	5.1	10→ 5.0**	5.1
On Power board						
PV circuits “ + “ to “ - “cross trace: FI	4464 (1000Vdc)	1000Vdc	4.7 (3.6x1.29)	5.1	10→ 5.0**	5.1
PV circuits to earthing: BI	4464 (1000Vdc)	1000Vdc	4.7 (3.6x1.29)	See below	10→ 5.0**	See below
-cross trace	--	--	--	5.1	--	5.1
-cross IGBT	--	--	--	11.1	--	11.1
Independence components						
Transformer T4, transformer T2, optocoupler (U1, U2), Communication transformer (T1,T2,T3), sampling resistor						
Circuits Definition:						
Communication and Display Circuits (SELV): DVC-A			AC mains / Grid Circuits: DVC-C			
DSP Circuits (ELV): DVC-C			PV Circuits/ DC Circuits: DVC-C			
Protection Separation						
Accessible Parts Unearthed to Communication and Display Circuits: FI			PV Circuits to DSP Circuits: BI			
Communication Circuits to Display Circuits: FI			AC mains to DSP Circuits: BI			
Accessible Parts Earthed to PV Circuits: BI			DSP Circuits to Communication and Display Circuits: SI			
Accessible Parts Earthed to AC mains: BI			Communication and Display Circuits to PV Circuits: RI			
			Communication and Display Circuits to AC mains: 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):**
 $V_{MAX\ PV} (V) = 1000\ Vd.c.$ , AC output voltage = 277Va.c,

PV supply circuits = O.V.C II, AC mains circuits = O.V.C. III,

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

Communication and Display circuit in EUT are considered as DVC-A which could be accessible.

PV side: Surge protector were provided between PV circuits and earth.

Grid side: Surge protector were provided between AC mains and 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.
4. Mark \* indicates the value of creepage distance is increased to related clearance.
5. Mark \*\* indicates the value of creepage distance on PCBs.

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)
Photo coupler (U1, U2) (certified)*		1000	- *	0.4	>1.0
Communication transformer (T1,T2,T3)		1000	- *	0.4	>1.0
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: 25° C)				P
Condition	$\tau$ calculated (s)	$\tau$ measured → DVC A (s)	t limit → DVC A (s)	Comments	
PV supply input terminal “+” to “-”	--	Max. value < 60 s.	10	Switch “ON” position	
Line to Line	--	Max. value < 60s	10	Switch “ON” position	
Line to Neutral	--	Max. value < 60 s.	10	Switch “ON” 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 (V) 1.2/50 μs	partial discharge extinction voltage (V)	result
AC/DCcircuit to enclousre		2000/2650V dc	10020	--	Pass
AC/DC circuit to DSP circuit		2000/2650V dc	10020	--	Pass
DSP circuit to Communication and Display Circuits		2000/2650V dc	10020	--	Pass
AC/DC circuit to Communication and Display Circuits		5300/4000V dc	---	--	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				N/A
Condition	L→ terminal A (mA)	N → terminal A (mA)	Limit (mA)	Comments	
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 display screen	250N for metal enclosure	--	--
Supplementary information:				

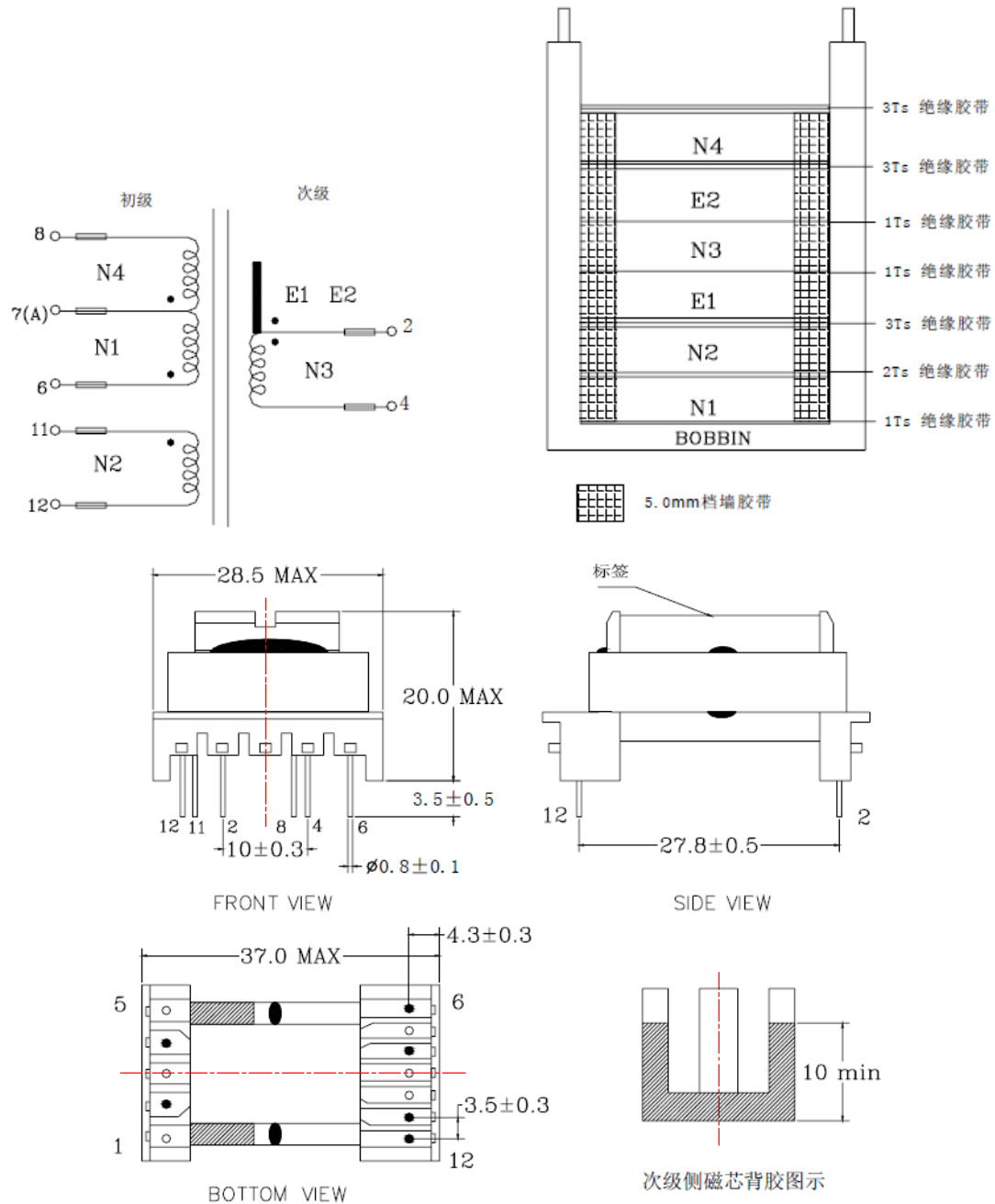
14	TABLE:List of critical components (See ATTACHMENT 3)					P
Object/part no.	Manufacturer/ trademark	Type/model	Technical data	Standard	Mark(s) of conformity <sup>1</sup> .	
--	--	--	--	--	--	
Note(s):An asterisk indicates a mark that assures the agreed level of surveillance.						

14.1 a)	Separating Transformer (T2) on ENE2FLTA (Main Board)		P
Construction details:			
Manufacturer: see table 14			
Type: see table 14			
Connected circuits over-voltage category		OVC III	
Pollution degree		PD2	
System voltage		1000V d.c	
Insulation impulse voltage		4464 (1000Vdc)	4464 (1000Vdc)
Required clearance distance for basic insulation (from table 7.7)		4.7mm for BI/SI (3.6x1.29)	7.9 mm for RI (6.1 x1.29)
Effective voltage rms		1000V d.c	
Required creepage distance for basic insulation (from table 7.8)		5.0mm for BI/SI	10.0mm for RI
Measured min. clearances			
Location		inside (mm)	outside (mm)
Pri. Coil / Pin– Core (BI)		8.0	8.0

Sec. Coil / Pin – Core (SI)	8.0	8.0
Pri. Coil / Pin to Sec. Coil / Pin (RI)	16.0	16.0
Measured min. creepage distance		
Location	inside (mm)	outside (mm)
Pri. Coil / Pin– Core (BI)	8.0	8.0
Sec. Coil / Pin – Core (SI)	8.0	8.0
Pri. Coil / Pin to Sec. Coil / Pin (RI)	16.0	16.0



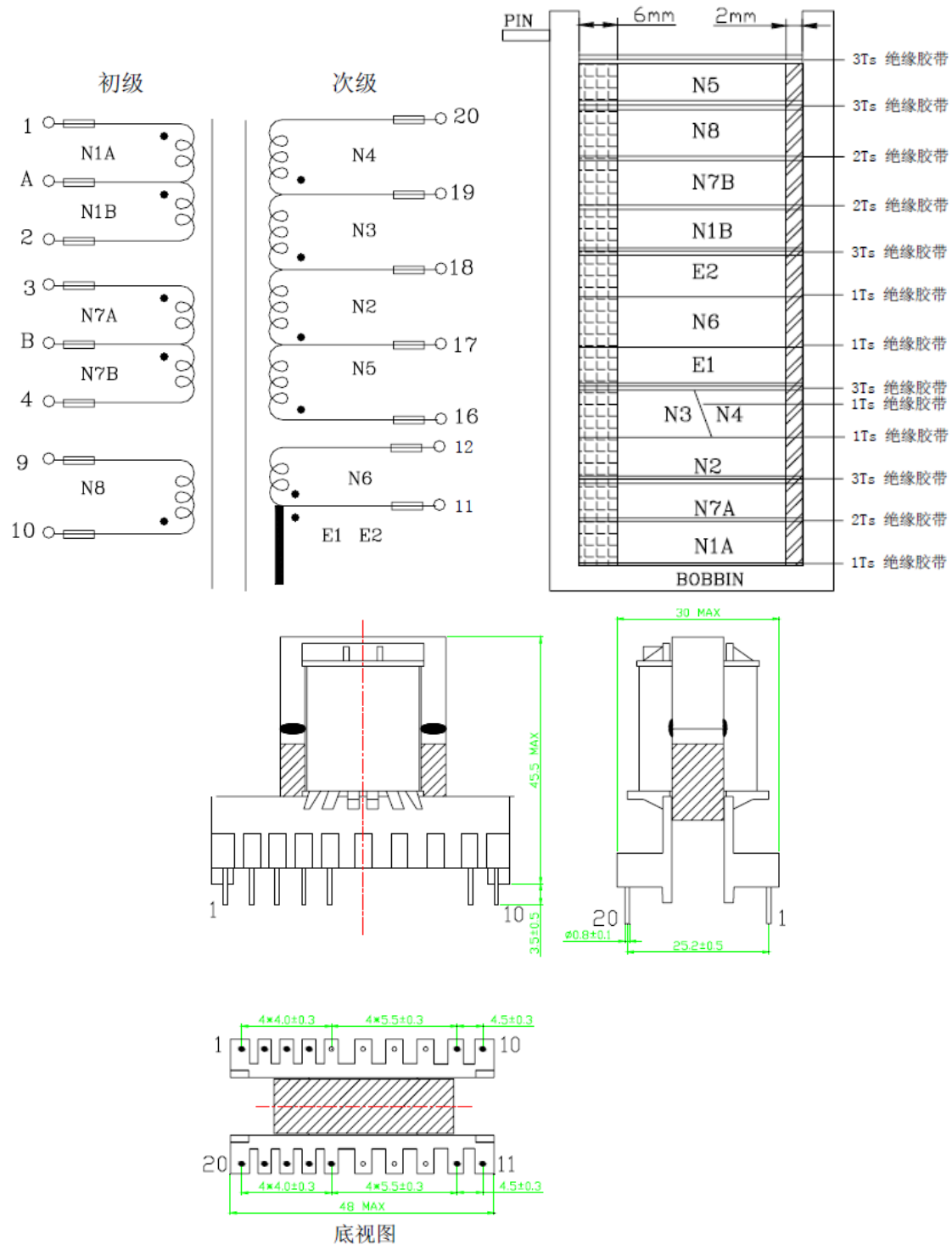
Construction:



Electric strength test	
With DC4000V after humidity treatment	
Result	Pass

14.1 b)	Separating Transformer (T4) on ENE2FLTA (Main Board)		P
Construction details:			
Manufacturer: see table 14			
Type: see table 14			
Connected circuits over-voltage category		OVC III	
Pollution degree		PD2	
System voltage		1000V d.c	
Insulation impulse voltage		4464 (1000Vdc)	4464 (1000Vdc)
Required clearance distance for basic insulation (from table 7.7)		4.7mm for BI/SI (3.6x1.29)	7.9 mm for RI (6.1 x1.29)
Effective voltage rms		1000V d.c	
Required creepage distance for basic insulation (from table 7.8)		5.0mm for BI/SI	10.0mm for RI
Measured min. clearances			
Location	inside (mm)		outside (mm)
Pri. Coil / Pin– Core (BI)	6.0		6.0
Sec. Coil / Pin – Core (SI)	6.0		6.0
Sec. Coil / Pin (communication and display circuit) – Sec. Coil / Pin (DSP circuit) (SI)	6.0		6.0
Pri. Coil / Pin to Sec. Coil / Pin (RI)	12.0		12.0
Measured min. creepage distance			
Location	inside (mm)		outside (mm)
Pri. Coil / Pin– Core (BI)	6.0		6.0
Sec. Coil / Pin – Core (SI)	6.0		6.0
Sec. Coil / Pin (communication and display circuit) – Sec. Coil / Pin (DSP circuit) (SI)	6.0		6.0
Pri. Coil / Pin to Sec. Coil / Pin (RI)	12.0		12.0

Construction:

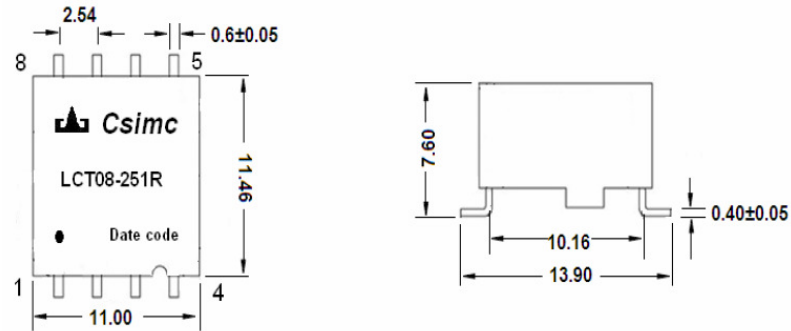


Electric strength test	
With DC 4000V after humidity treatment	
Result	Pass

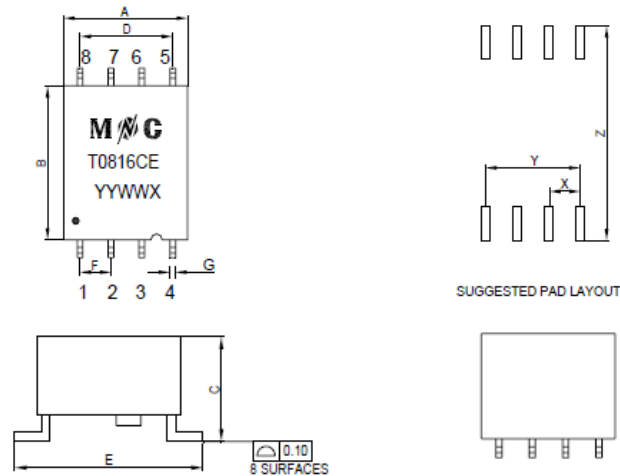
14.1 c)	Separating Transformer (T1, T2, T3) on ENE2COMB (PLC board)		P
Construction details:			
Manufacturer: see table 14			
Type: see table 14			
Connected circuits over-voltage category		OVC III	
Pollution degree		PD2	
System voltage		1000V d.c	
Insulation impulse voltage		4464 (1000Vdc)	
Required clearance distance for basic insulation (from table 7.7)		7.9 mm for RI (6.1 x1.29)	
Effective voltage rms		1000V d.c	
Required creepage distance for basic insulation (from table 7.8)		10.0mm for RI	
Measured min. clearances			
Location		inside (mm)	outside (mm)
Pri. Pin to Sec. Pin (RI)		--	10.1
Measured min. creepage distance			
Location		inside (mm)	outside (mm)
Pri. Pin to Sec. Pin (RI)		--	10.1

Construction:

### LCT08-251R



### T0816CE



DIM	MILLIMETERS			INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
A	10.75	11.00	11.25	0.423	0.433	0.443
B	11.21	11.46	11.71	0.441	0.451	0.461
C	/	/	8.00	/	/	0.315
D	/	7.62	/	/	0.300	/
E	13.75	13.90	14.05	0.541	0.547	0.553
F	2.39	2.54	2.69	0.094	0.100	0.106
G	0.50	0.60	0.70	0.020	0.024	0.028
X	/	2.54	/	/	0.100	/
Y	/	7.62	/	/	0.300	/
Z	/	14.60	/	/	0.575	/

Electric strength test	
With DC 4000V after humidity treatment	
Result	Pass

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 -



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<b>TEST REPORT</b> <b>IEC 62109-2</b> <b>Safety of power converters for use in photovoltaic power systems –</b> <b>Part2: Particular requirements for inverters</b>	
Report Reference No. ....	15069214 001 attachment 1.
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 .....	B1-13/F, No.177, Lane 777, West Guangzhong Road, Zhabei District, Shanghai 200072, P. R. China
Testing location/ procedure .....	CBTL <input type="checkbox"/> TMP <input type="checkbox"/> WMT <input type="checkbox"/> SMT <input type="checkbox"/> RMT <input type="checkbox"/> CCATL <input checked="" type="checkbox"/>
Testing location/ address .....	See cover page
Applicant's name .....	See cover page
Address .....	See cover page
Test specification:	
Standard .....	IEC/EN 62109-2: 2011
Test procedure .....	TÜV Bauart
Non-standard test method.....:	N/A
Test Report Form No.....	IEC 62109-2: 2011
Test Report Form(s) Originator .....	TÜV Rheinland Group
Master TRF .....	2011-08
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Test item description .....	See report 15069214 001.
Trade Mark .....	See report 15069214 001.
Manufacturer .....	See report 15069214 001.
Model/Type reference.....	See report 15069214 001.
Ratings .....	See report 15069214 001.

<b>Testing procedure and testing location:</b>	
<input checked="" type="checkbox"/> <b>CB Testing Laboratory:</b> Testing location/ address..... : <input type="checkbox"/> <b>Associated CB Test Laboratory:</b> Testing location/ address..... : Tested by (name + signature) ..... : See cover page  Approved by (+ signature)..... : See cover page	
<input type="checkbox"/> Testing procedure: TMP Tested by (name + signature) ..... : Approved by (+ signature)..... : Testing location/ address..... :	
<input type="checkbox"/> Testing procedure: WMT Tested by (name + signature) ..... : Witnessed by (+ signature) ..... : Approved by (+ signature)..... : Testing location/ address..... :	
<input type="checkbox"/> Testing procedure: SMT Tested by (name + signature) ..... : Approved by (+ signature)..... : Supervised by (+ signature) ..... : Testing location/ address..... :	
<input type="checkbox"/> 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):**

See report 15069214 001.

**Summary of testing****Tests performed (name of test and test clause):**

See report 15069214 001.

**Testing location:**

The laboratory described on cover page.

**Summary of compliance with National Differences**

List of countries addressed: None.

☒ The product fulfils the requirements of EN 62109-2: 2011.

**Copy of marking plate:**

See report 15069214 001.

Equipment mobility .....	<input type="checkbox"/> movable	<input type="checkbox"/> hand-held
	<input type="checkbox"/> stationary	<input checked="" type="checkbox"/> fixed (Wall mounted)
Connection to the mains.....	<input type="checkbox"/> pluggable equipment	<input type="checkbox"/> direct plug-in
	<input checked="" type="checkbox"/> permanent connection	<input type="checkbox"/> for building-in
Environmental category.....	<input checked="" type="checkbox"/> outdoor	<input checked="" type="checkbox"/> indoor conditional
		<input checked="" type="checkbox"/> indoor unconditional
Operating condition .....	<input checked="" type="checkbox"/> continuous	<input type="checkbox"/> short-time
		<input type="checkbox"/> intermittent
Over voltage category mains.....	<input type="checkbox"/> OVC I	<input type="checkbox"/> OVC II
	<input checked="" type="checkbox"/> OVC III	<input type="checkbox"/> OVC IV
Over voltage category PV.....	<input type="checkbox"/> OVC I	<input checked="" type="checkbox"/> OVC II
	<input type="checkbox"/> OVC III	<input type="checkbox"/> OVC IV
Mains supply tolerance (%) .....	According to specified supply range	
Tested for IT power systems .....	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No
IT testing, phase-phase voltage (V) .....	N/A	
Class of equipment .....	<input checked="" type="checkbox"/> Class I	<input type="checkbox"/> Class II
	<input type="checkbox"/> Class III	<input type="checkbox"/> Not classified
Mass of equipment (kg).....	See model list	
Pollution degree .....	<input type="checkbox"/> PD 1	<input checked="" type="checkbox"/> PD 2 (inside)
		<input checked="" type="checkbox"/> PD 3 (outside)
IP protection class .....	IP65	

**Possible test case verdicts:**

- test case does not apply to the test object.....: N/A
- test object does meet the requirement .....
- test object does not meet the requirement .....

**Testing:**

Date of receipt of test items .....: See report 15069214 001

Date(s) of performance of tests .....: See report 15069214 001

**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 IEC 60335-1:**

**The application for obtaining a CB Test Certificate includes more than one factory location and a declaration from the Manufacturer stating that the sample(s) submitted for evaluation is (are) representative of the products from each factory has been provided :**

☐ Yes  
☒ Not applicable

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

**Name and address of factory (ies) :** See report 15069214 001

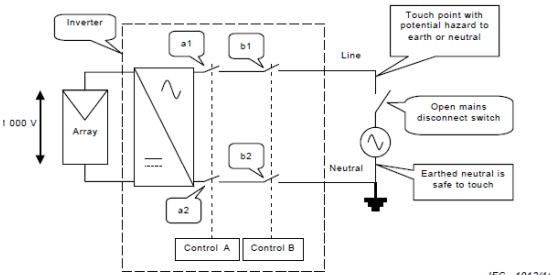
**General product information:**

See report 15069214 001.

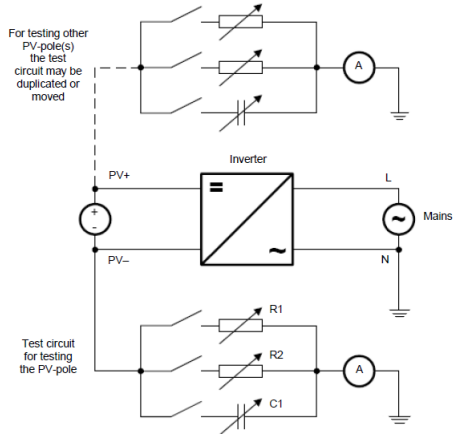
Throughout the test report following abbreviations may be used:

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

Indicate used abbreviations (if any)

IEC 62109-2: 2011			
Clause	Requirement – Test	Result - Remark	Verdict
4	General testing requirements <i>This clause of Part 1 is applicable with the following exceptions:</i>		P
4.4	Testing in SINGLE FAULT CONDITIONS		P
4.4.4	SINGLE FAULT CONDITIONS to be applied: <i>Additional subclauses:</i>	The EUT could detect and indicate the fault condition and disconnect from or not connect to the grid in case of single fault condition. Refer to the appended table 4.4 of IEC/EN 62109-1 test report 15069214 001.	P
4.4.4.15	Fault-tolerance of protection for GRID-INTERACTIVE INVERTERS		P
4.4.4.15.1	Fault-tolerance of residual current monitoring		P
4.4.4.15.2	Fault-tolerance of automatic disconnecting means		P
4.4.4.15.2.1	General		P
4.4.4.15.2.2	Design of insulation or separation   Figure 20 – Example system discussed in Note 2 above		P
4.4.4.15.2.3	Automatic checking of the disconnect means		P
4.4.4.16	Stand-alone inverters-load transfer test	Grid-connected PV Inverter.	N/A
4.4.4.17	Cooling system failure – Blanketing test		P
4.7	Electrical Ratings Tests <i>Additional subclauses:</i>	Refer to the appended table 4.7 of IEC/EN 62109-1 test report 15069214 001.	P
4.7.3	Measurement requirements for AC output ports for stand-alone inverters	Grid-connected PV Inverter.	N/A
4.7.4	Stand-alone Inverter AC output voltage and frequency	Grid-connected PV Inverter.	N/A
4.7.4.1	General		N/A
4.7.4.2	Steady state output voltage at nominal DC input		N/A

IEC 62109-2: 2011			
Clause	Requirement – Test	Result - Remark	Verdict
4.7.4.3	Steady state output voltage across the DC input range		N/A
4.7.4.4	Load step response of the output voltage at nominal DC input		N/A
4.7.4.5	Steady state output frequency		N/A
4.7.5	Stand-alone inverter output voltage waveform		N/A
4.7.5.1	General		N/A
4.7.5.2	Sinusoidal output voltage waveform requirements		N/A
4.7.5.3	Non-sinusoidal output waveform requirements		N/A
4.7.5.3.1	General		N/A
4.7.5.3.2	Total harmonic distortion		N/A
4.7.5.3.3	Waveform slope		N/A
4.7.5.3.4	Peak voltage		N/A
4.7.5.4	Information requirements for non-sinusoidal waveforms		N/A
4.7.5.5	Output voltage waveform requirements for inverters for dedicated loads		N/A
4.8	Additional tests for grid-interactive inverters	See below.	P
4.8.1	General requirements regarding inverter isolation and array grounding	Non-isolated inverters for ungrounded arrays.	P
4.8.2	Array insulation resistance detection for inverters for ungrounded and functionally grounded arrays	See below.	P
4.8.2.1	Array insulation resistance detection for inverters for ungrounded arrays	Inverter indicated the insulation fault and didn't connect to the grid when a resistor (the value of 500 kΩ) linked between PV+/- to earth.	P
4.8.2.2	Array insulation resistance detection for inverters for functionally grounded arrays	See above.	N/A
4.8.3	Array residual current detection		P
4.8.3.1	General		P
4.8.3.2	30mA touch current type test for isolated inverters		N/A
4.8.3.3	Fire hazard residual current type test for isolated inverters		N/A
4.8.3.4	Protection by application of RCD's		N/A
4.8.3.5	Protection by residual current monitoring	See below.	P

IEC 62109-2: 2011											
Clause	Requirement – Test	Result - Remark	Verdict								
4.8.3.5.1	General	Type-B RCM used for monitoring leakage current both from DC input side and AC output side.	P								
	<div>Table 31 – Response time limits for sudden changes in residual current</div> <table><tr><th>Residual current sudden change</th><th>Max. time to inverter disconnection from the mains</th></tr><tr><td>30 mA</td><td>0,3 s</td></tr><tr><td>60 mA</td><td>0,15 s</td></tr><tr><td>150 mA</td><td>0,04 s</td></tr></table> <div>NOTE These values of residual current and time are based on the RCD standard IEC61008-1.</div>	Residual current sudden change	Max. time to inverter disconnection from the mains	30 mA	0,3 s	60 mA	0,15 s	150 mA	0,04 s	See appended table.	P
Residual current sudden change	Max. time to inverter disconnection from the mains										
30 mA	0,3 s										
60 mA	0,15 s										
150 mA	0,04 s										
	<div><p>For testing other PV-pole(s) the test circuit may be duplicated or moved</p><p>For the continuous residual current test, R1 establishes a baseline current just below the trip point, and R2 is switched in to cause the current to exceed the trip point. Capacitor C1 is not used.</p><p>For the sudden change residual current test, C1 establishes a baseline current and R1 or R2 is switched in to cause the desired value of sudden change. The other resistor is not used.</p><p>IEC 1013/11</p><p>Figure 21 – Example test circuit for residual current detection testing</p></div>	See appended table.	P								
4.8.3.5.2	Test for detection of excessive continuous residual current	See appended table.	P								
4.8.3.5.3	Test for detection of sudden changes in residual current	See appended table.	P								
4.8.3.6	Systems located in closed electrical operating areas	Not specified to be located in closed electrical operating area.	N/A								

IEC 62109-2: 2011			
Clause	Requirement – Test	Result - Remark	Verdict
5	Marking and documentation <i>This clause of Part 1 is applicable with the following exceptions:</i>	See report 15069214 001.	P
5.1	Marking		P
5.1.4	Equipment ratings <i>Replacement:</i>		P
5.2	Warning markings		P
5.2.2	Content for warning markings		P
5.2.2.6	Inverters for closed electrical operating areas		P
5.3	Documentation		P
5.3.2	Information related to installation <i>Additional subclauses:</i>		P
5.3.2.1	Ratings		P
5.3.2.2	Grid-interactive inverter setpoints	No adjustable setting available. Only the factory default values, however the adjustment shall be performed by distribution network operator.	N/A
5.3.2.3	Transformers and isolation	Transformerless EUT.	N/A
5.3.2.4	Transformers required but not provided	Transformerless EUT	N/A
5.3.2.5	PV modules for non-isolated inverters		P
5.3.2.6	Non-sinusoidal output waveform information	Grid-connection inverter.	N/A
5.3.2.7	Systems located in closed electrical operating areas	Not specified to be located in closed electrical operating area.	N/A
5.3.2.8	Stand- alone inverter output circuit bonding	Grid-connection inverter.	N/A
5.3.2.9	Protection by application of RCD's	Integrated RCM provided in inverter.	N/A
5.3.2.10	Remote indication of faults	The instructions are specified in section of "Connecting Communications Cables" in the user's manual.	P
5.3.2.11	External array insulation resistance measurement and response	Subclause 4.8.2.1 compliance.	N/A
5.3.2.12	Array functional grounding information	No such requirements.	N/A
5.3.2.13	Stand-alone inverters for dedicated loads	Grid-connection inverter.	N/A

IEC 62109-2: 2011			
Clause	Requirement – Test	Result - Remark	Verdict
5.3.2.14	Identification of firmware version(s)	The firmware version is displayed on display panel and disclosed by communication interface.	P
6	Environmental requirements and conditions <i>This clause of Part 1 is applicable.</i>		P
7	Protection against electric shock and energy hazards <i>This clause of Part 1 is applicable except for the following additions:</i>	See report 15069214 001.	P
7.3	Protection against electric shock <i>Additional subclauses:</i>		P
7.3.10	Additional requirements for stand-alone inverters	Grid-connection inverter	N/A
	Stand-alone inverter output circuit bonding		N/A
	Stand-alone inverter isolation and protection of DVC-A circuits		N/A
7.3.11	Functionally grounded arrays		N/A
8	Protection against mechanical hazards <i>This clause of Part 1 is applicable.</i>	See report 15069214 001.	P
9	Protection against fire hazards <i>This clause of Part 1 is applicable with the following exceptions:</i>	See report 15069214 001.	P
9.3	Short-circuit and overcurrent protection <i>Additional subclause:</i>		P
9.3.4	Inverter backfeed current onto the array		P
10	Protection against sonic pressure hazards <i>This clause of Part 1 is applicable</i>	See report 15069214 001.	P
11	Protection against liquid hazards <i>This clause of Part 1 is applicable</i>	See report 15069214 001.	P
12	Protection against chemical hazards <i>This clause of Part 1 is applicable</i>	See report 15069214 001.	P



IEC 62109-2: 2011			
Clause	Requirement – Test	Result - Remark	Verdict
13	Physical requirements <i>This clause of Part 1 is applicable with the following exception:</i> <i>Additional subclause:</i>	See report 15069214 001.	P
13.9	Fault indication		P
	a) a visible or audible indication, integral to the inverter, and detectable from outside the inverter, and	Display panel is available for fault indication.	P
	b) an electrical or electronic indication that can be remotely accessed and used.	The error message also can be remotely accessed and used	P
14	Components <i>This clause of Part 1 is applicable</i>	See report 15069214 001.	P

4.8.2.1	TABLE: Insulation resistance measurement				P
Conditions	Measurement [I.F. / N.O.]				Identification
	PV / DC Supply Voltage [Vdc]				
	480	500	800	1000	
PV1+ to PE: <u>90</u> [kΩ]	I.F.	I.F.	I.F.	I.F.	I.F.: Isolation Fault  N.O.: Normal Operation
PV1- to PE: <u>90</u> [kΩ]	I.F.	I.F.	I.F.	I.F.	
PV1+ to PE: <u>100</u> [kΩ]	N.O.	N.O.	N.O.	N.O.	
PV1- to PE: <u>100</u> [kΩ]	N.O.	N.O.	N.O.	N.O.	
PV1+ to PE: <u>110</u> [kΩ]	N.O.	N.O.	N.O.	N.O.	
PV1- to PE: <u>110</u> [kΩ]	N.O.	N.O.	N.O.	N.O.	
Note:					
Array Insulation Resistance Threshold Value R = <u>100</u> [kΩ] (Should be larger than $R = V_{MAX\ PV} / 30mA$ .)					

4.8.3.2, 4.8.3.3	TABLE: Touch current and fire hazard residual current measurement				N/A
Condition	PV power supply “ + “ → terminal A [mA]	PV power supply “ - “ →terminal A [mA]	Limit [mA]	Comments	
Condition	PV power supply “ + “ → earthing [mA]	PV power supply “ - “ → earthing [mA]	Limit [mA]	Comments	

Note:  
Using measurement circuit of IEC 60990 figure 4 for testing touch current.  
Using ammeter for testing fire hazard residual current.

4.8.3.5.1	TABLE: Residual current monitoring test		P
Conditions	Steadily Residual current threshold value		
	Measurement [mA]	Limit [mA]	
PV+ to Neutral	270	300	
	270	300	
	270	300	
	250	300	
	250	300	
PV- to Neutral	258	300	
	258	300	
	258	300	
	258	300	
	258	300	
Note: 100% output power and Vmpp max input voltage			

4.8.3.5.1	TABLE: Residual current monitoring test		P
Conditions	Trigger disconnection maximum time		
	Measurement [ms]	Limit [ms]	
	Residual current sudden change30mA		
PV+ to Neutral	205.0	300	
PV- to Neutral	199.4	300	
Conditions	Trigger disconnection maximum time		
	Measurement [ms]	Limit [ms]	
	Residual current sudden change60mA		
PV+ to Neutral	133.6	150	
PV- to Neutral	146.4	150	
Conditions	Trigger disconnection maximum time		
	Measurement [ms]	Limit [ms]	
	Residual current sudden change150mA		
PV+ to Neutral	26.2	40	
PV- to Neutral	26.0	40	
Note: 100% output power and Vmppmax input voltage			

- End of test report -

PHOTO DOCUMENTATION

15069214 001

for

Solar Inverter

SUN2000-33KTL, SUN2000-40KTL

Huawei Technologies Co., Ltd.



This documentation consists of 15 pages (excluding this cover page)

**Report Number:** 15069214 001

**Model:** SUN2000-33KTL, SUN2000-40KTL







**Report Number:** 15069214 001

**Model:** SUN2000-33KTL, SUN2000-40KTL



**Certificate No.** R 50298624 0001-0002 **Our Reference** 01-CYX-15069214 001 **Appendix No.** 1.0

**Constructional Data Form (CDF) for Electrical Appliances**

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License holder : **Huawei Technologies Co., Ltd.**  
Factory Address : Administration Building, Headquarters of Huawei Technologies Co., Ltd., Bantian, Longgang District, Shenzhen, 518129, P.R.C.  
Type of Appliance : Solar Inverter  
Type Designation : SUN2000-33KTL, SUN2000-40KTL  
Rating : See model list  
Protection Class : Class I equipment  
Supply connection : ☐ fixed power cord  
☒ permanent connection  
☐ appliance inlet  
☐ direct plug in  
☐ battery operated

Additional information :

See model list as below.



Constructional Data Form (CDF) for Electrical Appliances

MODELS LIST		SUN2000-33KTL	SUN2000-40KTL
PV INPUT	V <sub>MAX</sub> PV [Vdc]	1000	
	I <sub>SC</sub> PV [A]	3*32	
	MPP Voltage Range V <sub>MPP</sub> [Vdc]	250-850(Full-load:480-850)	250-850(Full-load:580-850)
	Max. Input Current I <sub>MAX</sub> [A]	3*23	
	Start PV Voltage [Vdc]	250	
	Stop PV Voltage [Vdc] (EUT Shutdown)	200	
	Backfeed Current [A]	0	
	Overvoltage Category (OVC)	OVC II	
AC OUTPUT	Rated Output Voltage U <sub>r</sub> [Vac]	220/380-230/400	277/480
	Normal Operating Voltage Range U <sub>n</sub> [Vac]	187-242	408-528
	Operating Voltage Adjustable Range U <sub>n</sub> [Vac]	66-299.2	144-648
	Rated Output Frequency F <sub>NETZ</sub> [Hz]	50/60	
	Normal Operating Frequency Range F <sub>n</sub> [Hz]	49.5-50.2	
	Operating Frequency Adjustable Range F <sub>n</sub> [Hz]	42.5-57.5	
	Rated Output Power P <sub>E</sub> [W]	30000	36000
	Max. Output Power P <sub>Emax</sub> [W]	33000	40000
	Max. Apparent power S <sub>Emax</sub> [VA]	33000	40000
	PGU S <sub>Emax</sub> [kVA]	> 30kVA	
	Rated Output Current I <sub>r</sub> [A]	45.5A	43.3A
	Max. Output Current I <sub>max</sub> [A]	48A	
	Power Factor cosφ [λ]	[-0.80, 0.80]	
	Efficiency max. η <sub>max</sub>	98.6%	98.8%
	Standby Power Consumption [W]	< 1	
	Night Power Consumption [W]	< 1	
	THD [V / I] (100% full power)	< 3%	
	Acoustic Noise [dB]	≤29dB	
	Overvoltage Category (OVC)	OVC III	

Constructional Data Form (CDF) for Electrical Appliances

PV & GRID CONNECTION	Array Insulation Resistance Detection [Ω]	33K (> V <sub>MAX</sub> PV/30mA)
	The accuracy of resistance measurement [%/Ω]	± 3K (< 10%)
	Continuous residual current threshold value [mA]	300 (I <sub>LIMIT</sub> : 300)
	Continuous residual current trip time [ms]	300 (T <sub>LIMIT</sub> : 300)
	Sudden residual current threshold value [mA]	30 (I <sub>LIMIT</sub> : 30) / 60 (I <sub>LIMIT</sub> : 60) / 150 (I <sub>LIMIT</sub> : 150)
	Sudden residual current trip time [ms]	300 (T <sub>LIMIT</sub> : 300) / 150 (T <sub>LIMIT</sub> : 150) / 40 (T <sub>LIMIT</sub> : 40)
	Voltage threshold value [V]	33KTL:U <sub>MIN1</sub> : 187 (U <sub>LIMITU1</sub> : 187), U <sub>MAX1</sub> : 242 (U <sub>LIMITO1</sub> : 242) U <sub>MIN2</sub> : 110 (U <sub>LIMITU2</sub> : 110), U <sub>MAX2</sub> : 297 (U <sub>LIMITO2</sub> : 297) 40KTL:U <sub>MIN1</sub> : 408 (U <sub>LIMITU1</sub> : 408), U <sub>MAX1</sub> : 528 (U <sub>LIMITO1</sub> : 528) U <sub>MIN2</sub> : 240 (U <sub>LIMITU2</sub> : 240), U <sub>MAX2</sub> : 600 (U <sub>LIMITO2</sub> : 600)
	The accuracy of voltage measurement [%/V]	Min (2.3Vrms, 1%)
	Voltage trip time [ms]	U <sub>MIN1</sub> : 2000 (T <sub>LIMIT</sub> : 2000), U <sub>MAX1</sub> : 2000 (T <sub>LIMIT</sub> : 2000), U <sub>MIN2</sub> : 100 (T <sub>LIMIT</sub> : 100), U <sub>MAX2</sub> : 50 (T <sub>LIMIT</sub> : 50),
	Frequency threshold value [Hz]	F <sub>MIN1</sub> : 49.5 (F <sub>LIMITU</sub> : 49.5), F <sub>MAX1</sub> : 50.2 (F <sub>LIMITO</sub> : 50.2) F <sub>MIN2</sub> : 48 (F <sub>LIMITU</sub> : 48), F <sub>MAX2</sub> : 51.5 (F <sub>LIMITO</sub> : 51.5)
	The accuracy of frequency measurement [%/Hz]	Min (0.01Hz, 0.1%)
	Frequency trip time [ms]	F <sub>MIN1</sub> : 600000 (T <sub>LIMIT</sub> : 600000), F <sub>MAX1</sub> : 120000 (T <sub>LIMIT1</sub> : 120000) F <sub>MIN2</sub> : 200 (T <sub>LIMIT</sub> : 200), F <sub>MAX2</sub> : 200 (T <sub>LIMIT</sub> : 200)
	ROCOF threshold value [Hz/s]	-
	ROCOF trip time [ms]	-
	Active anti-islanding trip time [s]	2.0 (T <sub>LIMIT</sub> : 5)
	DC Injection Current normal value [mA]	Max (5 mA, 0.5%Ir)
	DC Injection Current threshold value [mA]	1000
	DC Injection current trip time [ms]	200 (T <sub>LIMIT</sub> : 200)
	Reconnection Voltage [V]	33KTL:U <sub>MIN</sub> : 187 (U <sub>LIMITU</sub> : 187), U <sub>MAX</sub> : 242 (U <sub>LIMITO</sub> : 242) 40KTL:U <sub>MIN</sub> : 408 (U <sub>LIMITU</sub> : 408), U <sub>MAX</sub> : 528 (U <sub>LIMITO</sub> : 528)
	Reconnection Frequency [Hz]	F <sub>MIN</sub> : 49.5 (F <sub>LIMITU</sub> : 49.5), F <sub>MAX</sub> : 50.2 (F <sub>LIMITO</sub> : 50.2)
	Reconnection Time [ms]	180 (T <sub>LIMIT</sub> > 60)

**Certificate No.** R 50298624 0001-0002 **Our Reference** 01-CYX-15069214 001 **Appendix No.** 1.0

**Constructional Data Form (CDF) for Electrical Appliances**

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CONSTRUCTION	Type of inverter	non-isolated
	Type of NS Protection	Integrated
	Separated by	Transformerless
	MPPT strings	6 strings
	MPPT tracking	3
	Protective Class	I
	Enclosure Protection (IP)	IP65
	Operating Temperature Range [°C]	-25 to 60 °C Above 50°C Power derating
	Pollution degree (PD)	PD 3
	Altitude [m]	4000 (G4)
	Size [mm]	550×770×270
	Weight [kg]	50