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

Report number. ..... :	70.409.20.075.07-02 part 1 of 2
Date of issue ..... :	2022-04-25
Total number of pages ..... :	101
Name of testing laboratory preparing the report ..... :	TÜV SÜD Certification & Testing (China) Co., Ltd. Guangzhou Branch
Applicant's name ..... :	AISWEI Technology (Shanghai) Co., Ltd.
Address ..... :	Room 905B, 757 Mengzi Road Huangpu District 200023 Shanghai, PEOPLE'S REPUBLIC OF CHINA
Test specification:	
Standard ..... :	IEC 62109-1 (First Edition), EN 62109-1:2010
Test procedure ..... :	TUV mark
Non-standard test method ..... :	N/A
Test Report Form No. ..... :	IEC62109_1B
Test Report Form(s) Originator .... :	VDE Testing and Certification Institute
Master TRF ..... :	Dated 2016-04

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

General disclaimer:

The test results presented in this report relate only to the object tested.
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Test item description .....:	Grid-Connected PV Inverter
Trade Mark.....:	Solplanet
Manufacturer.....:	AISWEI Technology (Shanghai) Co., Ltd.
Model/Type reference.....:	ASW3K-LT-G2 Pro, ASW4K-LT-G2 Pro, ASW5K-LT-G2 Pro, ASW6K-LT-G2 Pro, ASW8K-LT-G2 Pro, ASW10K-LT-G2 Pro, ASW12K-LT-G2 Pro, ASW13K-LT-G2 Pro, ASW15K-LT-G2 Pro, ASW17K-LT-G2 Pro, ASW20K-LT-G2 Pro, ASW8K-LT-G2, ASW10K-LT-G2, ASW12K-LT-G2, ASW13K-LT-G2, ASW15K-LT-G2, ASW17K-LT-G2, ASW20K-LT-G2
Ratings.....:	See rating labels on page 4 to 10

Responsible Testing Laboratory (as applicable), testing procedure and testing location(s):		
☒ **Name of testing laboratory preparing the report:**	TÜV SÜD Certification & Testing (China) Co., Ltd. Guangzhou Branch	
Location/ address..... :	TÜV SÜD Testing Center, D1 building, No. 63 Chuangqi Road, Shilou Town, Panyu District, Guangzhou 511447, China	
Tested by (name, function, signature) ..... :	*Jun Liu, Shan Huang* *Project handler*	Jun Liu, Shan Huang
Approved by (name, function, signature) .. :	Kai Zhao *Designated reviewer*	Kai Zhao

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

Total test reports contains 2 parts and 1 attachment listed in below table:

Item	Description	Pages
Part 1	IEC 62109-1(ed.1)/ EN 62109-1:2010 test report	101
Part 2	IEC 62109-2(ed.1)/ EN 62109-2:2011 test report	28
Attachment 1	Data form for electrical and electronic component(CDF)	29

Summary of testing:

Family products design, all tests were conducted on representative model ASW20K-LT-G2 Pro except that electrical ratings test was conducted on all models. All tests were conducted at test voltage: 3/N/PE~ 230/400V and test frequency: 50Hz if not specified.

All the tests results are confirmed to the requirements of the standard.

Tests performed (name of test and test clause):

☒ Visual inspection – clauses as available;
☒ Mains supply electrical data in normal condition & electrical ratings tests – clause 4.2.2.6 & 4.7;
☒ Durability and legibility of marking – clause 5.1.2;
☒ Thermal test and single fault test – clause 4.3 & 4.4;
☒ Humidity preconditioning – clause 4.5;
☒ Voltage Back-feed Protection, as combined with 4.4;
☒ Enclosure integrity – clause 6.3;
☒ Non-accessibility – clause 7.3.4.2.3;
☒ Protective bonding – clause 7.3.6.3.3;
☒ Capacitor discharge – clause 7.3.5.3.2 & 7.3.9;
☒ Clearance and creepage distances – clause 7.3.7;
☒ Capacitor discharge – clause 7.3.9 & 7.4;
☒ Energy hazards – clause 7.4;
☒ Electrical tests – clause 7.5;
☐ Stability test – clause 8.3;
☒ Handle loading – clause 8.4;
☒ Support loading – clause 8.5;
☒ Material tests – clause 9.1.3;
☒ Limited power sources – clause 9.2;
☒ Sonic pressure hazards – clause 10;
☒ Actuating parts of controls (Knob pull and limitation of movement) – clause 13.1;
☐ Physical tests on power supply cords – clause 13.3.2.5;
☒ 8 mm stripping test – clause 13.3.3.6;
☒ Mould stress relief test – clause 13.6.2.1;
☒ Deformation tests – clause 13.7;
☐ Battery – clause 14.8;
☒ Annex B operational test as combined with clause 4.4;

Remark: additional test items for modification is specified in General remarks.

Testing location:

1) Original test:

CQC - Trusted(Jiangsu) Testing Technology Co., Ltd.

No.99, Wenlan Road, Xianlin University Zone, Xianlin Street, Qixia District, NanJing, China

2) First revision of modification test:

AISWEI New Energy Technology (Jiangsu) Co., Ltd.

No.198 Xiangyang Road, 215011 Suzhou, PEOPLE'S REPUBLIC OF CHINA

3) Second revision of modification test:

AISWEI Technology (Shanghai) Co., Ltd. Suzhou Branch
No.198 Xiangyang Road, 215011 Suzhou, PEOPLE'S REPUBLIC OF CHINA

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

All tests were carried out according to IEC 62109-1(ed.1), EN 62109-1:2010.

The text of IEC 62109-1:2010 was approved by CENELEC as a European Standard without any

modification. Also, compliance with EN 62109-1:2010, Annex ZA of EN 62109-1:2010 is recorded at the end of this report.

☒ **The product fulfils the requirements of IEC 62109-1(ed.1), EN 62109-1:2010.**

Copy of marking plate:

Solplanet

Model: ASW3K-LT-G2 Pro

Max. input voltage	d.c. 1100V
MPP voltage range	d.c. 150-1000V
Max. input current	d.c. 16A/16A
Isc PV(absolute maximum)	d.c. 25A/25A
Rated grid voltage	3/N/PE~ 380/400/415V
Rated grid frequency	50/60Hz
Rated AC output active power	3000W
Rated AC output apparent power	3000VA
Max. AC output apparent power	3300VA*1
Max. continuous output current	a.c. 4.8A
Adjustable cos(φ)	0.8ind...0.8cap
Operating temperature range	-25...+60°C
Topology	non-isolated
Ingress protection	IP 65
Protective class	I
Overvoltage category	II(PV) III(MAINS)

*1 For European market S_{max}=3000VA

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Solplanet

Model: ASW4K-LT-G2 Pro

Max. input voltage	d.c. 1100V
MPP voltage range	d.c. 150-1000V
Max. input current	d.c. 16A/16A
Isc PV(absolute maximum)	d.c. 25A/25A
Rated grid voltage	3/N/PE~ 380/400/415V
Rated grid frequency	50/60Hz
Rated AC output active power	4000W
Rated AC output apparent power	4000VA
Max. AC output apparent power	4400VA*1
Max. continuous output current	a.c. 6.4A
Adjustable cos(φ)	0.8ind...0.8cap
Operating temperature range	-25...+60°C
Topology	non-isolated
Ingress protection	IP 65
Protective class	I
Overvoltage category	II(PV) III(MAINS)

*1 For European market S_{max}=4000VA

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Solplanet

Model: ASW5K-LT-G2 Pro

Max. input voltage	d.c. 1100V
MPP voltage range	d.c. 150-1000V
Max. input current	d.c. 16A/16A
Isc PV(absolute maximum)	d.c. 25A/25A
Rated grid voltage	3/N/PE~ 380/400/415V
Rated grid frequency	50/60Hz
Rated AC output active power	5000W
Rated AC output apparent power	5000VA
Max. AC output apparent power	5500VA*1
Max. continuous output current	a.c. 8.0A
Adjustable cos(φ)	0.8ind...0.8cap
Operating temperature range	-25...+60°C
Topology	non-isolated
Ingress protection	IP 65
Protective class	I
Overvoltage category	II(PV) III(MAINS)

*1 For European market S_{max}=5000VA

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Solplanet

Model: ASW6K-LT-G2 Pro

Max. input voltage	d.c. 1100V
MPP voltage range	d.c. 150-1000V
Max. input current	d.c. 16A/16A
Isc PV(absolute maximum)	d.c. 25A/25A
Rated grid voltage	3/N/PE~ 380/400/415V
Rated grid frequency	50/60Hz
Rated AC output active power	6000W
Rated AC output apparent power	6000VA
Max. AC output apparent power	6600VA*1
Max. continuous output current	a.c. 9.6A
Adjustable cos(φ)	0.8ind...0.8cap
Operating temperature range	-25...+60°C
Topology	non-isolated
Ingress protection	IP 65
Protective class	I
Overvoltage category	II(PV) III(MAINS)

*1 For European market S_{max}=6000VA

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Solplanet

Model: ASW8K-LT-G2 Pro

Max. input voltage	d.c. 1100V
MPP voltage range	d.c. 150-1000V
Max. input current	d.c. 20A/16A
Isc PV(absolute maximum)	d.c. 30A/25A
Rated grid voltage	3/N/PE~ 380/400/415V
Rated grid frequency	50/60Hz
Rated AC output active power	8000W
Rated AC output apparent power	8000VA
Max. AC output apparent power	8800VA*1
Max. continuous output current	a.c. 12.8A
Adjustable cos(φ)	0.8ind...0.8cap
Operating temperature range	-25...+60°C
Topology	non-isolated
Ingress protection	IP 65
Protective class	I
Overvoltage category	II(PV) III(MAINS)

*1 For European market S_{max}=8000VA

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Solplanet

Model: ASW10K-LT-G2 Pro

Max. input voltage	d.c. 1100V
MPP voltage range	d.c. 150-1000V
Max. input current	d.c. 20A/16A
Isc PV(absolute maximum)	d.c. 30A/25A
Rated grid voltage	3/N/PE~ 380/400/415V
Rated grid frequency	50/60Hz
Rated AC output active power	10000W
Rated AC output apparent power	10000VA
Max. AC output apparent power	11000VA*1
Max. continuous output current	a.c. 16A
Adjustable cos(φ)	0.8ind...0.8cap
Operating temperature range	-25...+60°C
Topology	non-isolated
Ingress protection	IP 65
Protective class	I
Overvoltage category	II(PV) III(MAINS)

*1 For European market S_{max}=10000VA

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Model: ASW12K-LT-G2 Pro

Max. input voltage	d.c. 1100V
MPP voltage range	d.c. 150-1000V
Max. input current	d.c. 32A/20A
Isc PV(absolute maximum)	d.c. 48A/30A
Rated grid voltage	3/N/PE~ 380/400/415V
Rated grid frequency	50/60Hz
Rated AC output active power	12000W
Rated AC output apparent power	12000VA
Max. AC output apparent power	13200VA*1
Max. continuous output current	a.c. 19.1A
Adjustable cos(φ)	0.8ind...0.8cap
Operating temperature range	-25...+60°C
Topology	non-isolated
Ingress protection	IP 65
Protective class	I
Overvoltage category	II(PV) III(MAINS)

*1 For European market S_{max}=12000VA

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Solplanet

Model: ASW15K-LT-G2 Pro

Max. input voltage	d.c. 1100V
MPP voltage range	d.c. 150-1000V
Max. input current	d.c. 32A/20A
Isc PV(absolute maximum)	d.c. 48A/30A
Rated grid voltage	3/N/PE~ 380/400/415V
Rated grid frequency	50/60Hz
Rated AC output active power	15000W
Rated AC output apparent power	15000VA
Max. AC output apparent power	16500VA*1
Max. continuous output current	a.c. 24A
Adjustable cos(φ)	0.8ind...0.8cap
Operating temperature range	-25...+60°C
Topology	non-isolated
Ingress protection	IP 65
Protective class	I
Overvoltage category	II(PV) III(MAINS)

*1 For European market S_{max}=15000VA

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Solplanet

Model: ASW13K-LT-G2 Pro

Max. input voltage	d.c. 1100V
MPP voltage range	d.c. 150-1000V
Max. input current	d.c. 32A/20A
Isc PV(absolute maximum)	d.c. 48A/30A
Rated grid voltage	3/N/PE~ 380/400/415V
Rated grid frequency	50/60Hz
Rated AC output active power	13000W
Rated AC output apparent power	13000VA
Max. AC output apparent power	14300VA*1
Max. continuous output current	a.c. 20.7A
Adjustable cos(φ)	0.8ind...0.8cap
Operating temperature range	-25...+60°C
Topology	non-isolated
Ingress protection	IP 65
Protective class	I
Overvoltage category	II(PV) III(MAINS)

*1 For European market S_{max}=13000VA

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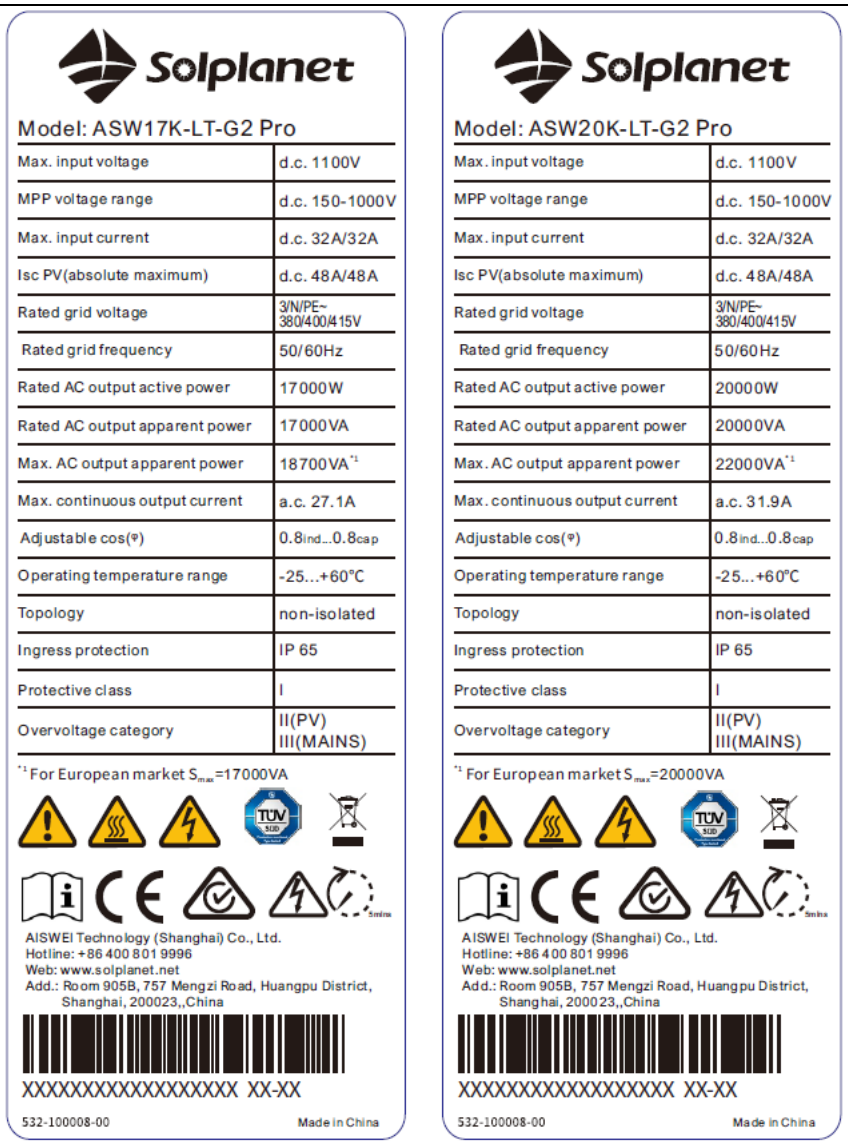

Solplanet

Model: ASW17K-LT-G2 Pro

Max. input voltage	d.c. 1100V
MPP voltage range	d.c. 150-1000V
Max. input current	d.c. 32A/32A
Isc PV(absolute maximum)	d.c. 48A/48A
Rated grid voltage	3/N/PE~ 380/400/415V
Rated grid frequency	50/60Hz
Rated AC output active power	17000W
Rated AC output apparent power	17000VA
Max. AC output apparent power	18700VA*1
Max. continuous output current	a.c. 27.1A
Adjustable cos(φ)	0.8ind...0.8cap
Operating temperature range	-25...+60°C
Topology	non-isolated
Ingress protection	IP 65
Protective class	I
Overvoltage category	II(PV) III(MAINS)

*1 For European market S_{max}=17000VA

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Model: ASW20K-LT-G2 Pro

Max. input voltage	d.c. 1100V
MPP voltage range	d.c. 150-1000V
Max. input current	d.c. 32A/32A
Isc PV(absolute maximum)	d.c. 48A/48A
Rated grid voltage	3/N/PE~ 380/400/415V
Rated grid frequency	50/60Hz
Rated AC output active power	20000W
Rated AC output apparent power	20000VA
Max. AC output apparent power	22000VA*1
Max. continuous output current	a.c. 31.9A
Adjustable cos(φ)	0.8ind...0.8cap
Operating temperature range	-25...+60°C
Topology	non-isolated
Ingress protection	IP 65
Protective class	I
Overvoltage category	II(PV) III(MAINS)

*1 For European market S_{max}=20000VA

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Solplanet

Model: ASW8K-LT-G2

Max. input voltage	d.c. 1100V
MPP voltage range	d.c. 150-1000V
Max. input current	d.c. 26/13A
Isc PV(absolute maximum)	d.c. 40/20A
Rated grid voltage	3/N/PE ~ 380/400/415V
Rated grid frequency	50/60Hz
Max. AC output active power	8kW
Max. AC output apparent power	8kVA
Max. continuous output current	a.c. 12.8A
Adjustable cos(ϕ)	0.8ind...0.8cap
Operating temperature range	-25...+60°C
Topology	non-isolated
Ingress protection	IP65
Protective class	I
Overvoltage category	II(PV) III(MAINS)

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Model: ASW10K-LT-G2

Max. input voltage	d.c. 1100V
MPP voltage range	d.c. 150-1000V
Max. input current	d.c. 26/13A
Isc PV(absolute maximum)	d.c. 40/20A
Rated grid voltage	3/N/PE ~ 380/400/415V
Rated grid frequency	50/60Hz
Max. AC output active power	10kW
Max. AC output apparent power	10kVA
Max. continuous output current	a.c. 16A
Adjustable cos(ϕ)	0.8ind...0.8cap
Operating temperature range	-25...+60°C
Topology	non-isolated
Ingress protection	IP65
Protective class	I
Overvoltage category	II(PV) III(MAINS)

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Solplanet

Model: ASW12K-LT-G2

Max. input voltage	d.c. 1100V
MPP voltage range	d.c. 150-1000V
Max. input current	d.c. 2×26A
Isc PV(absolute maximum)	d.c. 2×40A
Rated grid voltage	3/N/PE ~ 380/400/415V
Rated grid frequency	50/60Hz
Max. AC output active power	12kW
Max. AC output apparent power	12kVA
Max. continuous output current	a.c. 19.1A
Adjustable cos(ϕ)	0.8ind...0.8cap
Operating temperature range	-25...+60°C
Topology	non-isolated
Ingress protection	IP65
Protective class	I
Overvoltage category	II(PV) III(MAINS)

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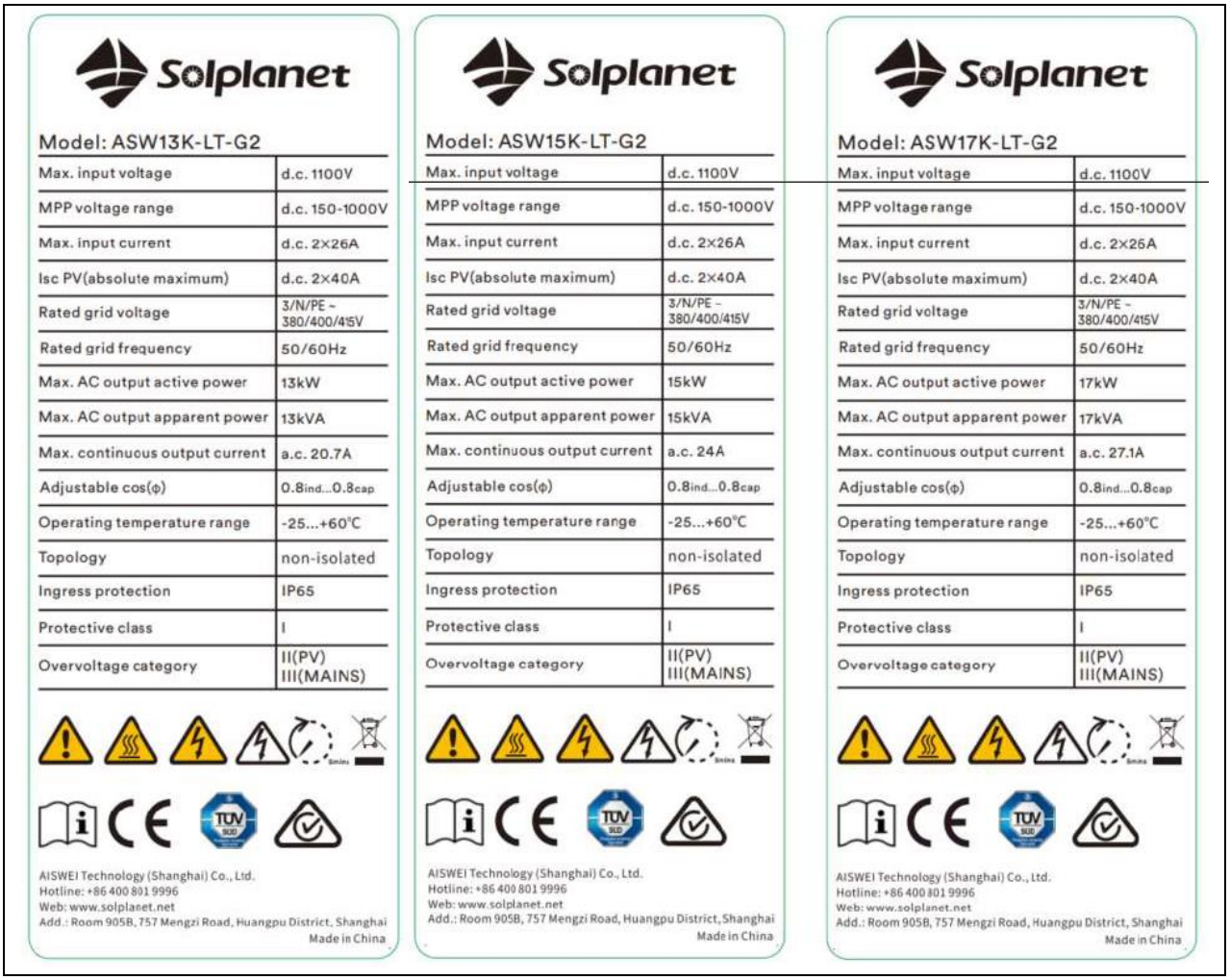

Solplanet

Model: ASW13K-LT-G2

Max. input voltage	d.c. 1100V
MPP voltage range	d.c. 150-1000V
Max. input current	d.c. 2×26A
Isc PV(absolute maximum)	d.c. 2×40A
Rated grid voltage	3/N/PE ~ 380/400/415V
Rated grid frequency	50/60Hz
Max. AC output active power	13kW
Max. AC output apparent power	13kVA
Max. continuous output current	a.c. 20.7A
Adjustable cos(φ)	0.8ind...0.8cap
Operating temperature range	-25...+60°C
Topology	non-isolated
Ingress protection	IP65
Protective class	I
Overvoltage category	II(PV) III(MAINS)

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Solplanet

Model: ASW15K-LT-G2

Max. input voltage	d.c. 1100V
MPP voltage range	d.c. 150-1000V
Max. input current	d.c. 2×26A
Isc PV(absolute maximum)	d.c. 2×40A
Rated grid voltage	3/N/PE ~ 380/400/415V
Rated grid frequency	50/60Hz
Max. AC output active power	15kW
Max. AC output apparent power	15kVA
Max. continuous output current	a.c. 24A
Adjustable cos(φ)	0.8ind...0.8cap
Operating temperature range	-25...+60°C
Topology	non-isolated
Ingress protection	IP65
Protective class	I
Overvoltage category	II(PV) III(MAINS)

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Model: ASW17K-LT-G2

Max. input voltage	d.c. 1100V
MPP voltage range	d.c. 150-1000V
Max. input current	d.c. 2×26A
Isc PV(absolute maximum)	d.c. 2×40A
Rated grid voltage	3/N/PE ~ 380/400/415V
Rated grid frequency	50/60Hz
Max. AC output active power	17kW
Max. AC output apparent power	17kVA
Max. continuous output current	a.c. 27.1A
Adjustable cos(φ)	0.8ind...0.8cap
Operating temperature range	-25...+60°C
Topology	non-isolated
Ingress protection	IP65
Protective class	I
Overvoltage category	II(PV) III(MAINS)

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Name and address of EU-based authorized representative or importer must be affixed to the product when the product place on the EU market. The importer label above is used for EU market.

Marking plate material: pressure-sensitive unprinted label stocks stamped into aluminium surface; Suitable for outdoor use with respect to exposure to Ultraviolet Light, Water Exposure and thermal transfer printed label stock applications, -60°C to 95°C.

An additional PET film provided to cover label.

Remark: The inverter has been tested and evaluated on basis of rated grid voltage 3/N/PE~ 230/400V, 50/60Hz. Rated voltage is fixed with interface protection settings.

Interface protection settings is limited to authorized installer, password and seal provided to protect these from unpermitted interference.

Inverters with multi-output rated voltage ratings are available in difference versions based on output voltages and frequencies, the ratings on which the testing has been based was identified on paper tag and control panel.

Test item particulars ..... :	
Equipment mobility ..... :	☐ movable ☐ hand-held ☐ stationary ☒ fixed ☐ transportable ☐ for building-in
Connection to the mains ..... :	☒ pluggable equipment ☐ direct plug-in ☐ permanent connection ☐ for building-in
Environmental category ..... :	☒ outdoor ☐ indoor unconditional ☐ indoor conditional
Over voltage category Mains ..... :	☐ OVC I ☐ OVC II ☒ OVC III ☐ OVC IV
Over voltage category PV ..... :	☐ OVC I ☒ OVC II ☐ OVC III ☐ OVC IV
Mains supply tolerance (%) ..... :	±10 %
Tested for power systems ..... :	TN-C-S
IT testing, phase-phase voltage (V) ..... :	- - -
Class of equipment ..... :	☒ Class I ☐ Class II ☐ Class III ☐ Not classified
Mass of equipment (kg) ..... :	Approx. 18 kg
Pollution degree ..... :	3(external environment), 2(internal environment)
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 ..... :	P (Pass)
- test object was not evaluated for the requirement ..... :	N/E
- test object does not meet the requirement ..... :	F (Fail)
Testing ..... :	
Date of receipt of test item ..... :	2021-01-19, 2021-12-30, 2022-4-15
Date (s) of performance of tests ..... :	2021-01-19 to 2021-05-19 (original test) 2021-12-30 to 2022-01-10 (evaluation and test based on first modification) 2022-04-22 (evaluation and test based on second modification)

General remarks:

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

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

Reports revision history:
1. First revision from test report 70.409.20.075.07-00 updated and replaced by 70.409.20.075.07-01 due to following reasons:
a. Change model name from (ASW8K-LT-G2, ASW10K-LT-G2, ASW12K-LT-G2, ASW13K-LT-G2, ASW15K-LT-G2, ASW17K-LT-G2, ASW20K-LT-G2) to (ASW8K-LT-G2 Pro, ASW10K-LT-G2 Pro, ASW12K-LT-G2 Pro, ASW13K-LT-G2 Pro, ASW15K-LT-G2 Pro, ASW17K-LT-G2 Pro, ASW20K-LT-G2 Pro).
b. Add new family design models ASW3K-LT-G2 Pro, ASW4K-LT-G2 Pro, ASW5K-LT-G2 Pro, ASW6K-LT-G2 Pro
c. Increase the MPPT current from 13A to 16A, or from 26A to 32A at the condition that the voltage difference between PV input voltage and bus voltage is less than 150V and the electric components boost inductor and boost diode were changed correspondingly.
d. Data form for electrical and electronic component(CDF) was updated.

After review, additional tests listed below are required:
Single fault test was selected and repeated, construction evaluation and voltage test were conducted on representative model ASW20K-LT-G2 Pro. Also electrical ratings test were conducted on new added models. Thermal tests were conducted on representative models ASW6K-LT-G2 Pro, ASW10K-LT-G2 Pro and ASW20K-LT-G2 Pro.

No other critical design and construction changes to the product. So all other tests data are extracted from the former version reports directly.

2. Second revision from test report 70.409.20.075.07-01 updated and replaced by 70.409.20.075.07-02 due to following reasons:
a. Change the manufacturer information.
Name: AISWEI Technology (Shanghai) Co., Ltd.
Address: Room 905B, 757 Mengzi Road Huangpu District 200023 Shanghai, PEOPLE'S REPUBLIC OF CHINA

b. Add family design models ASW8K-LT-G2, ASW10K-LT-G2, ASW12K-LT-G2, ASW13K-LT-G2, ASW15K-LT-G2, ASW17K-LT-G2, ASW20K-LT-G2.

c. Add parameter “Rated AC output apparent power” indicated on the label for models with suffix “Pro”.
d. Data form for electrical and electronic component(CDF) was updated.

The MPPT current for new added models G2 series are decreased from 16A to 13A, or from 32A to 26A compared with former models Pro series.

After review, additional electrical rating test are conducted on new added models.

No other critical design and construction changes to the product, all other tests data are extracted from the former version reports directly.

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

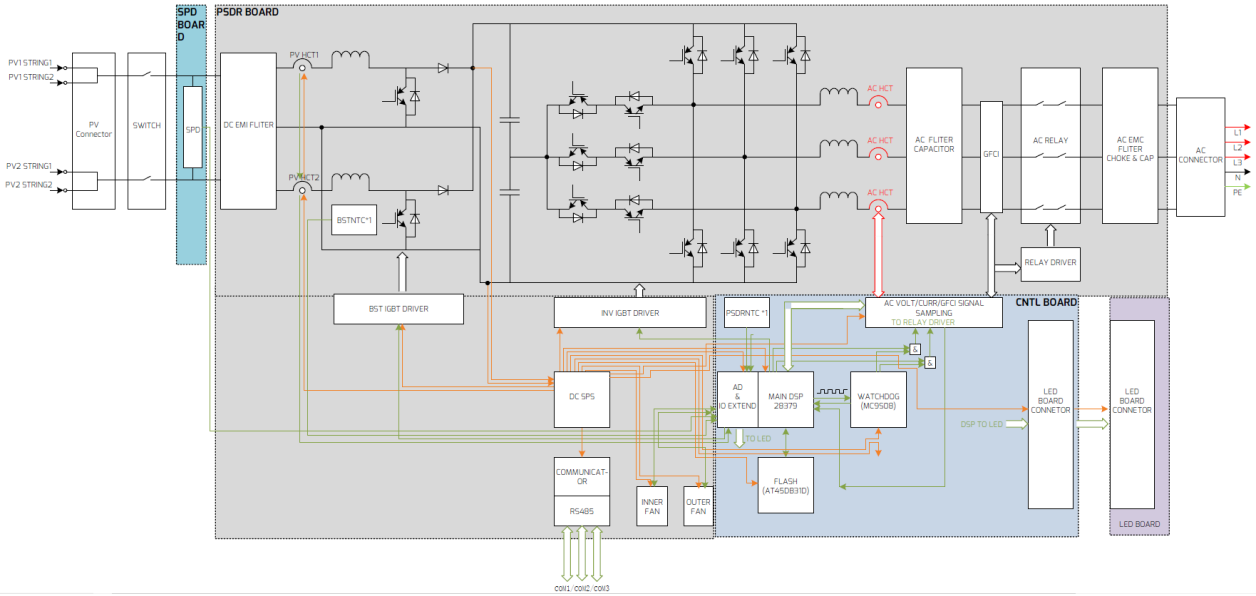
The application for obtaining a CB Test Certificate includes more than one factory location and a declaration from the Manufacturer stating that the sample(s) submitted for evaluation is (are) representative of the products from each factory has been provided.....:	☐ **Yes** ☒ **Not applicable**

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

Name and address of factory (ies) .....:	AISWEI New Energy Technology (Yangzhong) Co., Ltd. No.588 Gangxing Road, Economic Development Zone, 212200 Yangzhong City, Jiangsu Province, PEOPLE'S REPUBLIC OF CHINA

General product information:

These devices are transformer-less grid-connected PV inverters which converts direct current optimized by photovoltaic DC conditioner to alternating current, and it is intended to be connected in parallel with the low-voltage mains to supply common load.
They are intended for professional incorporation into PV system, and they are assessed on a component test basis.



Model differences:

Basic model: ASW20K-LT-G2 Pro
ASW3K-LT-G2 Pro, ASW4K-LT-G2 Pro, ASW5K-LT-G2 Pro, ASW6K-LT-G2 Pro, ASW8K-LT-G2 Pro, ASW10K-LT-G2 Pro, ASW12K-LT-G2 Pro, ASW13K-LT-G2 Pro, ASW15K-LT-G2 Pro, ASW17K-LT-G2 Pro, ASW20K-LT-G2, ASW8K-LT-G2, ASW10K-LT-G2, ASW12K-LT-G2, ASW13K-LT-G2, ASW15K-LT-G2, ASW17K-LT-G2, ASW20K-LT-G2 are family design products.

1 ASW3K-LT-G2 Pro, ASW4K-LT-G2 Pro, ASW5K-LT-G2 Pro, ASW6K-LT-G2 Pro are same in hardware and structure, output power and current are derated and limited by software.
2 ASW8K-LT-G2 Pro, ASW10K-LT-G2 Pro are same in hardware and structure, and output power and current are derated and limited by software.
ASW8K-LT-G2, ASW10K-LT-G2 are same in hardware and structure, and output power and current are derated and limited by software.
3 ASW12K-LT-G2 Pro, ASW13K-LT-G2 Pro, ASW15K-LT-G2 Pro are same in hardware and structure, and output power and current are derated and limited by software.
ASW12K-LT-G2, ASW13K-LT-G2, ASW15K-LT-G2 are same in hardware and structure, and output power and current are derated and limited by software.
4 ASW17K-LT-G2 Pro, ASW20K-LT-G2 Pro are same in hardware and structure, and output power and current are derated and limited by software.
ASW17K-LT-G2, ASW20K-LT-G2 are same in hardware and structure, and output power and current are derated and limited by software.

5 Difference between models on hardware and structure described in point 1 to 4 above are listed as described below:

a) cooling system

ASW3K-LT-G2 Pro, ASW4K-LT-G2 Pro, ASW5K-LT-G2 Pro, ASW6K-LT-G2 Pro have no fan for cooling.
ASW8K-LT-G2 Pro, ASW10K-LT-G2 Pro, ASW8K-LT-G2, ASW10K-LT-G2 have an internal fan for cooling.
ASW12K-LT-G2 Pro, ASW13K-LT-G2 Pro, ASW15K-LT-G2 Pro, ASW17K-LT-G2 Pro, ASW20K-LT-G2 Pro, ASW12K-LT-G2, ASW13K-LT-G2, ASW15K-LT-G2, ASW17K-LT-G2, ASW20K-LT-G2 have an internal fan and an external fan for cooling.

b) components parameters

Models above are designed differently on PV connector number, BUS capacitor number, Boost and inverter inductors value and current sensors measuring range as requirement of output power.

Type	Full load MPPT range	Inverter inductor	INV current measure	Boost inductor	Boost current measure	Relay	Fan
ASW3K-LT-G2 Pro, ASW4K-LT-G2 Pro, ASW5K-LT-G2 Pro, ASW6K-LT-G2 Pro	270V-850V	Type: HX1773-DX3057 Parameter: inductance: 1040uH@f=1kHz;operating temperature: -25 to 130℃ Manufacturer: BO LUO DA XIN ELECTRONIC CO.,LTD	Type: STK-10PL/A Parameter: Ratio: 80mV/A;Measuring current range:±10A Manufacturer: Sinomags Technology Co.,Ltd	Type: HX1773-DX3056 Parameter: inductance: 690uH@f=1kHz;operating temperature: -25 to 130℃ Manufacturer: BO LUO DA XIN ELECTRONIC CO.,LTD	Type: SC840DFT-50I5-075 Parameter: Ratio: 40mV/A;Measuring current range:±50A Manufacturer: Senko Micro Electronics Co., Ltd.	Type: CHFN-V-112HA2F(35A) Parameter: Rated voltage:12V dc Rated current: 35A@277V AC Manufacturer: DONGGUAN CHUROD ELECTRONICS CO LTD	internal fan number: 0 external fan number: 0
ASW8K-LT-G2 Pro, ASW10K-LT-G2 Pro	410V-850V	Type：HX1773-DX2397 Parameter: inductance: 690uH@f=1kHz;operating temperature: -25 to 130℃ Manufacturer: BO LUO DA XIN ELECTRO	Type：STK-20PL Parameter: Ratio: 25mV/A; Measuring current range:±20A Manufacturer: Sinomags Technology Co.,Ltd	Type: HX1773-DX2394 Parameter: inductance: 610uH@f=1kHz;operating temperature: -25 to 130℃ Manufacturer: BO LUO DA XIN ELECTRONIC CO.,LTD	Type: SC840DFT-50I5-075 Parameter: Ratio: 40mV/A;Measuring current range:±50A Manufacturer: Senko Micro Electronics Co., Ltd.	Type: CHFN-V-112HA2F(35A) Parameter: Rated voltage:12V dc Rated current: 35A@277V AC Manufacture	internal fan number: 1 external fan number: 0

		NIC CO.,LTD		Type: HX1773-DX3056 Parameter: inductance: 690uH@f=1kHz;operating temperature: -25 to 130℃ Manufacturer: BO LUO DA XIN ELECTRONIC CO.,LTD		r: DONGGUAN CHUROD ELECTRONICS CO LTD	
ASW8K-LT-G2, ASW10K-LT-G2	410V-850V	Type：HX1773-DX2397 Parameter: inductance: 690uH@f=1kHz;operating temperature: -25 to 130℃ Manufacturer: Bo Luo Da Xin Electronic Co., Ltd	Type: STK-32PL Parameter: Ratio: 25mV/A; Measuring current range:±50A Manufacturer: Sinomags Technology Co.,Ltd	Type1: HX1773-DX2394 Parameter: inductance: 610uH@f=1kHz;operating temperature: -25 to 130℃ Manufacturer: Bo Luo Da Xin Electronic Co., Ltd Type2: HX1773-DX2398 Parameter: inductance: 997uH@f=1kHz;operating temperature: -25 to 130℃ Manufacturer: Bo Luo Da Xin Electronic Co., Ltd	Type: SC840DFT-50I5, -40 to 125℃ Parameter: Ratio: 40mV/A; Measuring current range:±50A Manufacturer: Senko Micro Electronics Co., Ltd.	Type: CHFN-V-112HA2F(35A) Parameter: Rated voltage:12V dc Rated current: 35A@277V AC Manufacturer: Dongguan Churod Electronics Co., Ltd	internal fan number: 1 external fan number: 0
ASW12K-LT-G2 Pro ASW13K-LT-G2 Pro	410V-850V	Type：HX1773-DX2397 Parameter: inductance:	Type: STK-32PL Parameter: Ratio: 25mV/A;M	Type: HX1773-DX2576 Parameter: inductance:	Type: SC840DFT-50I5-075 Parameter: Ratio:	Type: CHFN-V-112HA2F(35A) Parameter:	internal fan number: 1 external

ASW15K-LT-G2 Pro		690uH@f=1kHz;operating temperature: -25 to 130℃ Manufacturer: BO LUO DA XIN ELECTRONIC CO.,LTD	easuring current range:±32A Manufacturer: Sinomags Technology Co.,Ltd	610uH@f=1kHz;operating temperature: -25 to 130℃ Manufacturer: BO LUO DA XIN ELECTRONIC CO.,LTD	40mV/A; Measuring current range:±50A Manufacturer: Senko Micro Electronics Co., Ltd.	Rated voltage:12V dc Rated current: 35A@277V AC Manufacturer: DONGGUAN CHUROD ELECTRONICS CO LTD	fan number : 1
ASW12K-LT-G2 ASW13K-LT-G2 ASW15K-LT-G2	410V-850V	Type：HX1773-DX2395 Parameter: inductance: 507uH@f=1kHz;operating temperature: -25 to 130℃ Manufacturer: Bo Luo Da Xin Electronic Co., Ltd	Type: STK-32PL Parameter: Ratio: 25mV/A;Measuring current range:±50A Manufacturer: Sinomags Technology Co.,Ltd	Type: HX1773-DX2576 Parameter: inductance: 610uH@f=1kHz;operating temperature: -25 to 130℃ Manufacturer: Bo Luo Da Xin Electronic Co., Ltd	Type: SC840DFT-50I5, -40 to 125℃ Parameter: Ratio: 40mV/A; Measuring current range:±50A Manufacturer: Senko Micro Electronics Co., Ltd.	Type: CHFN-V-112HA2F(35A) Parameter: Rated voltage:12V dc Rated current: 35A@277V AC Manufacturer: Dongguan Churod Electronics Co., Ltd	internal fan number : 1 external fan number : 1
ASW17K-LT-G2 Pro ASW20K-LT-G2 Pro	410V-850V	Type：HX1773-DX2395 Parameter: inductance: 507uH@f=1kHz;operating temperature:-25 to 130℃ Manufacturer: BO LUO DA XIN ELECTRONIC CO.,LTD	Type: STK-32PL Parameter: Ratio: 25mV/A;Measuring current range:±32A Manufacturer: Sinomags Technology Co.,Ltd	Type: HX1773-DX2576 Parameter: inductance: 610uH@f=1kHz;operating temperature: -25 to 130℃ Manufacturer: BO LUO DA XIN ELECTRONIC CO.,LTD	Type: SC840DFT-75I5-075 Parameter: Ratio: 26.67mV/A; Measuring current range:±75A Manufacturer: Senko Micro Electronics Co., Ltd.	Type: CHFN-V-112HA2F(35A) Parameter: Rated voltage:12V dc Rated current: 35A@277V AC Manufacturer: DONGGUAN CHUROD ELECTRONICS CO LTD	internal fan number : 1 external fan number : 1
ASW17	410V-	Type：	Type:	Type:	Type:	Type:	internal

K-LT-G2 ASW20K-LT-G2	850V	HX1773-DX2395 Parameter: inductance: 507uH@f=1kHz;operating temperature: -25 to 130℃ Manufacturer: Bo Luo Da Xin Electronic Co., Ltd	STK-32PL Parameter: Ratio: 25mV/A;Measuring current range:±50A Manufacturer: Sinomags Technology Co.,Ltd	HX1773-DX2576 Parameter: inductance: 610uH@f=1kHz;operating temperature: -25 to 130℃ Manufacturer: Bo Luo Da Xin Electronic Co., Ltd	SC840DFT-50I5, -40 to 125℃ Parameter: Ratio: 40mV/A; Measuring current range:±50A Manufacturer: Senko Micro Electronics Co., Ltd.	CHFN-V-112HA2F(35A) Parameter: Rated voltage:12V dc Rated current: 35A@277V AC Manufacturer: Dongguan Churod Electronics Co., Ltd	fan number : 1 external fan number : 1

For parameters please see as in table below (exacted from user manual directly for reference).

Technical Data Sheet		ASW3K-LT-G2 Pro	ASW4K-LT-G2 Pro	ASW5K-LT-G2 Pro	ASW6K-LT-G2 Pro
Input (DC)	Max. PV array power	4500 Wp STC	6000 Wp STC	7500 Wp STC	9000 Wp STC
	Max. input voltage	1100 V			
	MPP voltage range / rated input voltage	150 V to 1000 V / 630 V			
	Max. operating input current	16 A / 16 A			
	Max. short circuit current	25 A / 25 A			
	No. of independent MPPT inputs / strings per MPPT input	2 / PV1:1; PV2:1			
Output (AC)	Rated power	3000 W	4000 W	5000 W	6000 W
	Max. apparent AC power	3300 VA [2]	4400 VA [2]	5500 VA [2]	6600 VA [2]
	AC nominal voltage	220 V / 380 V 230 V / 400 V 240 V / 415 V			
	AC voltage range	160 V to 300 V			
	AC grid frequency / range	50 Hz / 45 Hz to 55 Hz 60 Hz / 55 Hz to 65 Hz			
	Max. output current	4.8A	6.4 A	8.0 A	9.6 A
	Adjustable power factor range	0.8 leading to 0.8 lagging			
	Harmonic distortion (THD) at rated	< 3%			

	output	
General data	Dimensions (W / H / D)	503 / 435 / 183 mm
	Weight	16kg
	Operating temperature range	-25℃…+60℃
	Self-consumption (at night)	< 1W
	Topology	Transformerless
	Cooling concept	Natural Convection
	Degree of protection (according to IEC 60529)	IP65
	Max. operating altitude	3000 m
1) Zero export installations supported with 2-pin RS485 for connection to approved smart meters		
2) For European market, the max. apparent AC power is equal to the rated power		

Technical Data Sheet		ASW8K-LT-G2 Pro	ASW10K-LT-G2 Pro	ASW12K-LT-G2 Pro	ASW15K-LT-G2 Pro	ASW17K-LT-G2 Pro	ASW20K-LT-G2 Pro
Input (DC)	Max. PV array power	12000 Wp STC	15000 Wp STC	18000 Wp STC	22500 Wp STC	25500 Wp STC	30000 Wp STC
	Max. input voltage	1100 V					
	MPP voltage range / rated input voltage	150 V to 1000 V / 630 V					
	Max. operating input current	20A / 16 A	20A / 16 A	32 A / 20 A	32 A / 20 A	32A/32A	32A/32A
	Max. short circuit current	30 A / 25 A	30 A / 25 A	48 A / 30A	48 A / 30A	48A/48A	48A/48A
	No. of independent MPPT inputs / strings per MPPT input	2 / PV1:1; PV2:1	2 / PV1:1; PV2:1	2 / PV1:2; PV2:1	2/PV1:2; PV2:1	2 / PV1:2; PV2:2	2 / PV1:2; PV2:2
Output (AC)	Rated power	8000 W	10000 W	12000 W	15000 W	17000 W	20000 W
	Max. apparent AC power	8800VA [2]	11000VA [2]	13200VA [2]	16500VA [2]	18700VA [2]	22000VA [2]
	AC nominal voltage	220 V / 380 V 230 V / 400 V 240 V / 415 V					

	AC voltage range	160 V to 300 V					
	AC grid frequency / range	50 Hz / 45 Hz to 55 Hz 60 Hz / 55 Hz to 65 Hz					
	Max. output current	12.8 A	16 A	19.1 A	24 A	27.1 A	31.9 A
	Adjustable power factor range	0.8 leading to 0.8 lagging					
	Harmonic distortion (THD) at rated output	< 3 %					
General data	Dimensions (W / H / D)	503 / 435 / 183 mm					
	Weight	16kg	16 kg	17 kg	17 kg	18 kg	18 kg
	Operating temperature range	-25°C – +60°C					
	Self-consumption (at night)	< 1 W					
	Topology	Transformerless					
	Cooling concept	Natural Convection	Natural Convection	Active cooling	Active cooling	Active cooling	Active cooling
	Degree of protection (according to IEC 60529)	IP65					
	Max. operating altitude	3000 m					
1) Zero export installations supported with 2-pin RS485 for connection to approved smart meters							
2) For European market, the max. apparent AC power is equal to the rated power							

Technical Data Sheet		ASW8-LT-G2	ASW10K-LT-G2	ASW12K-LT-G2	ASW15K-LT-G2	ASW17K-LT-G2	ASW20K-LT-G2
Input (DC)	Max. PV array power	12000 Wp STC	15000 Wp STC	18000 Wp STC	22500 Wp STC	25500 Wp STC	30000 Wp STC
	Max. input voltage	1100 V					
	MPP voltage range / rated input voltage	150 V to 1000 V / 630 V					
	Max. operating input	26 A/13 A	26 A/13 A	26A/26 A	26A/26A	26A/26A	26A/26A

	current						
	Max. short circuit current	40 A/20 A	40 A/20 A	40A /40 A	40A /40 A	40A/40A	40A/40A
	No. of independent MPPT inputs / strings per MPPT input	2 / PV1:1; PV2:1	2 / PV1:1; PV2:1	2 / PV1:2; PV2:1	2/PV1:2; PV2:1	2 / PV1:2; PV2:2	2 / PV1:2; PV2:2
Output (AC)	Rated power	8000W	10000W	12000W	15000W	17000W	20000W
	Max. apparent AC power	8000VA	10000VA	12000VA	15000VA	17000VA	20000VA
	AC nominal voltage	220 V / 380 V - 230 V / 400 V - 240 V / 415 V					
	AC voltage range	160 V to 300 V					
	AC grid frequency / range	50 Hz / 45 Hz to 55 Hz 60 Hz / 55 Hz to 65 Hz					
	Max. output current	12.8A	16 A	19.1 A	24 A	27.1 A	31.9 A
	Adjustable power factor range	0.8 leading to 0.8 lagging					
	Harmonic distortion (THD) at rated output	<3 %					
General data	Dimensions (W / H / D)	503 / 435 / 183 mm					
	Weight	16 kg	16 kg	17 kg	17 kg	18 kg	18 kg
	Operating temperature range	-25°C … +60°C					
	Self-consumption (at night)	< 1 W					
	Topology	Transformerless					
	Cooling concept	Natural convection		Active cooling			
	Degree of protection	IP65					

	(according to IEC 60529)	
	Max. operating altitude	3000 m

Hardware version: 270-142003-01
Software and firmware version: Main DSP: V610-03043-00, Slave DSP: V610-60009-00, Safety package: V610-11009-00

The following documentations are retained on file:
- Photograph;
- Circuit diagrams;
- PCB layout drawing;
- PCB foil pattern assembly drawing;
- Specification sheets for components;
- Instruction manual.
- Manufacturer's work instruction and declaration for 100% routing test as required by IEC 62109-1(ed.1)/ EN 62109-1:2010, IEC 62109-2(ed.1)/ EN 62109-2:2011.

License conditions---

1. When installing the equipment, all requirements of the mentioned standards must be fulfilled.

2. In order to protect the installation against electrical and fire hazard, all branch circuits in an installation, switchgear, cables etc., must be short-circuit and over-current protected according to the national/international regulations.

3. When install PV generation system, double/reinforced insulation cable required with mechanical protection. Recommended conductor cross-section area and installation method in user manual.

4. Maximum inverter backfeed current form grid to the array is 0A based on test/circuit topology analysis and manufacturer's declaration.

5. The inverter is intended to be used with appropriate PV-generator, switchgear, SPDs, combiner feeder box, distribution board, electrical protection components and other device to form complete end systems. Compliance with safety regulations depends upon installing and configuring inverter correctly, including using the specified emergency stop device adjacent to solar inverter. The unit must be installed only by professional assemblers who are familiar with requirements for safety and EMC. The assembler is responsible for ensuring that the end product or system complies with all the relevant laws in the country where it is to be used. Refer to instruction manual.

7. Additional equipment connected to the inverter must comply with the respective IEC, EN or ISO standards (e.g. IEC 60950/EN 60950 series for data processing equipment, IEC 61439/EN 61439 series for switchgear).

8. To allow maintenance of PV inverter, means of isolating the PV inverter from the DC side and the AC side shall be provided at the end-use application.

9. For safety reasons, install the emergency stop devices at station adjacent to solar inverter in the end-system. Pressing the stop function on the control panel of the inverter does generate an emergency stop and separate the inverter from dangerous potential.

10. An additional RCD, type B according to IEC/TR 60755(ed.2), which is located between the inverter and the mains, may be provided for fault protection by automatic disconnection of supply in the end-use application with the agreement of local network operator.

11. The following safety parameters are factory set and fixed per IEC 62109-2(ed.1)/ EN 62109-2:2011.

Default interface protection settings

Parameters	Normative requirements		Internal threshold setting	
	Maximum	Trip setting	Maximum	Factory default

	clearance time		clearance time (factory setting)	setting
PV array Insulation resistance measurement before starting operation	-	36.7kΩ	-	200kΩ
Continuous residual current	300ms	300mA	160ms	100mA
Sudden changes in residual current	300ms	30mA	220ms	25mA
	150ms	60mA	80ms	55mA
	40ms	150mA	20ms	110mA

Unauthorised access to factory safety parameters setting and software should be prohibited.
A reset to the factory safety parameters requires retesting and verification in conjunction with the end-use system.

IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict

4	**GENERAL TESTING REQUIREMENTS**		P
4.1	General		P
4.2	General conditions for testing		P
4.2.1	Sequence of tests		P
4.2.2	Reference test conditions		P
4.2.2.1	Environmental conditions		P
4.2.2.2	State of equipment		P
4.2.2.3	Position of equipment	Test equipment was installed in accordance with the manufacturer's instructions, in the configuration that results in the worst-case test conditions	P
4.2.2.4	Accessories		P
4.2.2.5	Covers and removable parts	The cover and removable parts can only be removed by tool, the clause here is not applicable.	N/A
4.2.2.6	Mains supply a) Voltage: b) Frequency: c) Polarity: d) Earthing: e) Over-current Protection:	a) Test voltage is considered within tolerance 90% to 110%. b) AC output 50Hz c) Polarity was connected as specified in user manual. d) the product is supplied by earthed power system. e) Over-current protection device was installed during the test as specified in the user manual.	P
4.2.2.7	Supply ports other than the mains	PV input	P
4.2.2.7.1	Photovoltaic supply sources a) Open circuit voltage: b) Short-circuit current:		P
4.2.2.7.2	Battery inputs	No batteries for energy storage	N/A
4.2.2.8	Conditions of loading for output ports	DC-AC inverter. a.c. output port was loaded with linear loads to obtain the maximum rated output power. Continuous operation ratings, until steady conditions are established.	P
4.2.2.9	Earthing terminals		P
4.2.2.10	Controls		P

IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
4.2.2.11	Available short circuit current		P
4.3	Thermal testing	(see appended table 4.3)	P
4.3.1	General		P
4.3.2	Maximum temperatures		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
4.4.3	Pass/fail criteria for testing under fault conditions		P
4.4.3.1	Protection against shock hazard		P
4.4.3.2	Protection against the spread of fire		P
4.4.3.3	Protection against other hazards		P
4.4.3.4	Protection against parts expulsion hazards		P
4.4.4	Single fault conditions to be applied		P
4.4.4.1	Component fault tests		P
4.4.4.2	Equipment or parts for short-term or intermittent operation	Not for short-term or intermittent operation	N/A
4.4.4.3	Motors	Fan motor is integrated with the product for some models, fan blocked test was evaluated.	P
4.4.4.4	Transformer short circuit tests		P
4.4.4.5	Output short circuit	(1) Line and Neutral (2) Line and PE (3) Line and line Above three combinations of output terminals are tested one a time. The PCE max. output short-circuit current is 109.5 A r.m.s. (17 ms duration)	P
4.4.4.6	Backfeed current test for equipment with more than one source of supply	No backfeed current, see single fault test of table 4.4 from point 4 to 6.	P
4.4.4.7	Output overload		P

IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
4.4.4.8	Cooling system failure		P
4.4.4.9	Heating devices	No such device	N/A
4.4.4.10	Safety interlock systems	No safety interlock	N/A
4.4.4.11	Reverse d.c. connections		P
4.4.4.12	Voltage selector mismatch	No voltage selector	N/A
4.4.4.13	Mis-wiring with incorrect phase sequence or polarity	See single fault test of table 4.4 for point 2 and point 11.	P
4.4.4.14	Printed wiring board short-circuit test		P
4.5	Humidity preconditioning		P
4.5.1	General		P
4.5.2	Conditions		P
4.6	Backfeed voltage protection		P
4.6.1	Backfeed tests under normal conditions		P
4.6.2	Backfeed tests under single-fault conditions		P
4.6.3	Compliance with backfeed tests		P
4.7	Electrical ratings tests	(see appended table 4.7)	P
4.7.1	Input ratings		P
4.7.1.1	Measurement requirements for DC input ports		P
4.7.2	Output ratings		P
5	**MARKING AND DOCUMENTATION**		P
5.1	Marking		P
5.1.1	General	Rack- or panel-mounted equipment, markings on external surface of enclosure, side enclosure with rating label and warning substance, warning symbols, and installation indication or switch position provided at close up of external connection interface. Graphic symbols per Annex C or IEC 60417, refer to section “copy of marking plate”	P
	Equipment shall bear markings as specified in 5.1 and 5.2	Label are marked on the PCE and graphic symbol is explained in user manual	P
	Graphic symbols may be used and shall be in accordance with Annex C or IEC 60417 as applicable.		P
	Graphic symbols shall be explained in the		P

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Clause	Requirement – Test	Result – Remark	Verdict
	documentation provided with the PCE.		
5.1.2	Durability of markings		P
	Markings required by this clause to be located on the PCE shall remain clear and legible under conditions of NORMAL USE and resist the effects of cleaning agents specified by the manufacturer	Tested with lsopropyl alcohol for 30s	P
5.1.3	Identification		P
	The equipment shall, as a minimum, be permanently marked with:		P
	a) the name or trade mark of the manufacturer or supplier	Refer to section “copy of marking plate”	P
	b) model number, name or other means to identify the equipment	Refer to section “copy of marking plate”	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.	Marking on equipment	P
5.1.4	Equipment ratings	Replaced, refer to IEC 62109-2(ed.1)/ EN 62109-2:2011 test report	N/A
	Unless otherwise specified in another part of IEC 62109, the following ratings, as applicable shall be marked on the equipment:		N/A
	– input voltage, type of voltage (a.c. or d.c.), frequency, and max. continuous current for each input		N/A
	– output voltage, type of voltage (a.c. or d.c.), frequency, max. continuous current, and for a.c. outputs, either the power or power factor for each output		N/A
	– the ingress protection (IP) rating as in 6.3 below		N/A
5.1.5	Fuse identification	External fuse type gL/gG or comparable automatic circuit breaker rating 60A for ASW20K-LT-G2 Pro recommended at end-installation, for other models, refer to user manual	N/A
	Marking shall be located adjacent to each fuse or fuseholder, or on the fuseholder, or in another location provided that it is obvious to which fuse the marking applies, giving the fuse current rating and where fuses of different voltage rating value could be fitted, the fuse voltage rating.		N/A
	Where fuses with special fusing characteristics such as time delay or breaking capacity are necessary, the type shall also be indicated		N/A

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Clause	Requirement – Test	Result – Remark	Verdict
	For fuses not located in operator access areas and for soldered-in fuses located in operator access areas, it is permitted to provide an unambiguous cross-reference (for example, F1, F2, etc.) to the servicing instructions which shall contain the relevant information.		N/A
5.1.6	Terminals, Connections, and Controls		P
	If necessary for safety, an indication shall be given of the purpose of Terminals, connectors, controls, and indicators, and their various positions, including any connections for coolant fluids such as water and drainage. The symbols in Annex C may be used, and where there is insufficient space, symbol 9 of Annex C may be used.	The input PV1 and input PV2 are marked with +/-. The AC output is connected by approved coupler. For installation, pls. refer to installation manual. The symbol from Table C-7 is used for the PE and green-yellow wire used as well	P
	Push-buttons and actuators of emergency stop devices, and indicator lamps used only to indicate a warning of danger or the need for urgent action shall be coloured red.	Indicator lamps used for dangerous failure	P
	A multiple-voltage unit shall be marked to indicate the particular voltage for which it is set when shipped from the factory. The marking is allowed to be in the form of a paper tag or any other non-permanent material.		P
	A unit with d.c. terminals shall be plainly marked indicating the polarity of the connections, with:		P
	– the sign “+” for positive and “-„ for negative; or	Polarity marked with +/-	P
	– a pictorial representation illustrating the proper polarity where the correct polarity can be unambiguously determined from the representation		N/A
5.1.6.1	Protective Conductor Terminals	Symbol 7 of Annex C adjacent to earth terminal	P
	The means of connection for the protective earthing conductor shall be marked with:		P
	– symbol 7 of Annex C or		P
	– the letters “PE” or		P
	– the colour coding green-yellow.		P
5.1.7	Switches and circuit-breakers	DC switch as isolating mean integrated in the inverter. Output overcurrent protection provided by external type C circuit breaker with rating 60A for ASW20K-LT-G2 Pro recommended at end-installation, for other models, refer to user manual.	P

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Clause	Requirement – Test	Result – Remark	Verdict
	The on and off-positions of switches and circuits breakers shall be clearly marked. If a push-button switch is used as the power switch, symbols 10 and 16 of Annex C may be used to indicate the on-position, or symbols 11 and 17 to indicate the off-position, with the pair of symbols (10 and 16, or 11 and 17) close together.		P
5.1.8	Class II Equipment	Class I	N/A
	Equipment using Class II protective means throughout shall be marked with symbol 12 of Annex C. Equipment which is only partially protected by DOUBLE INSULATION or REINFORCED INSULATION shall not bear symbol 12 of Table Annex C.		N/A
	Where such equipment has provision for the connection of an earthing conductor for functional reasons (see 7.3.6.4) it shall be marked with symbol 6 of Annex C		N/A
5.1.9	Terminal boxes for External Connections	Installation couplers used for external connection	N/A
	Where required by note 1 of Table 2 as a result of high temperatures of terminals or parts in the wiring compartment, there shall be a marking, visible beside the terminal before connection, of either:		N/A
	a) the minimum temperature Rating and size of the cable to be connected to the TERMINALS; or		N/A
	b) a marking to warn the installer to consult the installation instruction. Symbol 9 of Table D-1 is an acceptable marking		N/A
5.2	Warning markings		P
5.2.1	Visibility and legibility requirements for warning markings		P
	Warning markings shall be legible, and shall have minimum dimensions as follows:		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.		P
	If it is necessary to refer to the instruction manual to preserve the protection afforded by the equipment, the equipment shall be marked with symbol 9 of		P

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Clause	Requirement – Test	Result – Remark	Verdict
	Annex C		
	Symbol 9 of Annex C is not required to be used adjacent to symbols that are explained in the manual	The manual provides necessary information for the warning marking	P
5.2.2	Content for warning markings	See warning marking and user manual	P
5.2.2.1	Ungrounded heat sinks and similar parts	With grounded heat sink and similar metal parts	N/A
	An ungrounded heat sink or other part that may be mistaken for a grounded part and involves a risk of electric shock in accordance with 7.3 shall be marked with symbol 13 of Annex C, or equivalent. The marking may be on or adjacent to the heat sink and shall be clearly visible when the PCE is disassembled to the extent that a risk of contact with the heat sink exists.		N/A
5.2.2.2	Hot Surfaces		P
	A part of the PCE that exceeds the temperature limits specified in 4.3.2 shall be marked with symbol 14 of Annex C or equivalent.	Symbol 14 marked on PCE	P
5.2.2.3	Coolant	Air cooling	N/A
	A unit containing coolant that exceeds 70 °C shall be legibly marked externally where readily visible after installation with symbol 15 of Annex C. The documentation shall provide a warning regarding the risk of burns from hot coolant, and either:		N/A
	a) statement that coolant system servicing is to be done only by SERVICE PERSONNEL, or		N/A
	b) instructions for safe venting, draining, or otherwise working on the cooling system, if these operations can be performed without OPERATOR access to HAZARDS internal to the equipment		N/A
5.2.2.4	Stored energy		P
	Where required by 7.3.9.2 or 7.4.2 the PCE shall be marked with Symbol 21 of Annex C and the time to discharge capacitors to safe voltage and energy levels shall accompany the symbol.	Symbol  used for warning on marking plate for installer as normal discharge. For repairing and internal maintenance, only by AISWEI service personal who is familiar with product	P
5.2.2.5	Motor guarding	No hazard motor used, only SELV supplied motor for cooling heatsink used and safely guarded by enclosure	P
	Where required by 8.2 a marking shall be provided where it is visible to service personnel before		P

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Clause	Requirement – Test	Result – Remark	Verdict
	removal of a guard, warning of the hazard and giving instructions for safe servicing (for example disconnection of the source before removing the guard).		
5.2.3	Sonic hazard markings and instructions	<80dBA@1m, no hazard	N/A
	If required by 10.2.1 a PCE shall:		N/A
	a) be marked to warn the operator of the sonic pressure hazard; or		N/A
	b) be provided with installation instructions that specify how the installer can ensure that the sound pressure level from equipment at its point of use after installation, will not reach a value, which could cause a hazard. These instructions shall include the measured sound pressure level, and shall identify readily available and practicable protective materials or measures which may be used.		N/A
5.2.4	Equipment with multiple sources of supply	PV and mains as sources of supply	P
	A PCE with connections for multiple energy sources shall be marked with symbol 13 of Annex C and the manual shall contain the information required in 5.3.4.	Symbol 13 of Annex C used, and with the following substance in manual: Both ac and dc voltage sources are terminated inside this equipment. Each circuit must be individually disconnected before servicing. When the photovoltaic array is exposed to light, it supplies a dc voltage to this equipment	P
	The symbol shall be located on the outside of the unit or shall be prominently visible behind any cover giving access to hazardous parts.	Located outside of the unit	P
5.2.5	Excessive touch current	Measured 4.5mA>3.5mA r.m.s. additional protective earthing terminal provided, symbol 15 of Annex C marked and a second protective earthing conductor is to be installed	P
	Where required by 7.3.6.3.7 the PCE shall be marked with symbol 15 of Annex C. See also 5.3.2 for information to be provided in the installation manual.	Symbol 15 of Annex C marked and a second protective earthing conductor is to be installed, see user manual	P
5.3	Documentation		P
5.3.1	General		P
	The documentation provided with the PCE shall provide the information needed for the safe operation, installation, and (where applicable)		P

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Clause	Requirement – Test	Result – Remark	Verdict
	maintenance of the equipment. The documentation shall include the items required in 5.3.2 through 5.3.4, and the following:		
	a) explanations of equipment makings, including symbols used	Refer to user manual	P
	b) location and function of terminals and controls		P
	c) all ratings or specifications that are necessary to safely install and operate the PCE, including the following environmental ratings along with an explanation of their meaning and any resulting installation requirements:	As specified in user manual, refer to “Technical data”	P
	– ENVIRONMENTAL CATEGORY as per 6.1	For outdoor use	P
	– WET LOCATIONS classification fort he intended external environment as per 6.1	For wet location use	P
	– POLLUTION DEGREE classification for the intended external environment as per 6.2	3	P
	– INGRESS PROTECTION rating as per 6.3	IP65	P
	– Ambient temperature and relative humidity ratings	-25˚C...+60˚C Relative humidity:0…100%	P
	– MAXIMUM altitude rating	3000m	P
	– OVERVOLTAGE CATEGORY assigned to each input and output port as per 7.3.7.1.2, accompanied by guidance regarding how to ensure that the installation complies with the required overvoltage categories;	PV: II Mains: III	P
	d) a warning that when the photovoltaic array is exposed to light, it supplies a d.c. voltage to the PCE	Refer to user manual	P
5.3.1.1	Language	English provide	P
	Instructions related to safety shall be in a language that is acceptable in the country where the equipment is to be installed.	For other country language, further evaluation is needed	N/A
5.3.1.2	Format	Printed form provided and is to be delivered with equipment	P
	In general, the documentation must be provided in printed form and is to be delivered with the equipment.		P
	For equipment which requires the use of a computer for both installation and operation, documentation may be provided in electronic format without accompanying printed format.		N/A
5.3.2	Information related to installation	As specified in user manual, refer to information related to installation	P

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Clause	Requirement – Test	Result – Remark	Verdict
	The documentation shall include installation and where applicable, specific commissioning instructions and, if necessary for safety, warnings against hazards which could arise during installation or commissioning of the equipment. The information provided shall include:		P
	a) assembly, location, and mounting requirements:		P
	b) ratings and means of connection to each source of supply and any requirements related to wiring and external controls, colour coding of leads, disconnection means, or overcurrent protection needed, including instructions that the installation position shall not prevent access to the disconnection means;		P
	c) ratings and means of connection of any outputs from the PCE, and any requirements related to wiring and externals controls, colour coding of leads, or overcurrent protection needed;		P
	d) explanation of the pin-out of connectors for external connections, unless the connector is used for a standard purpose (e.g. RS 232)		P
	e) ventilation requirements;		P
	f) requirements for special services, for example cooling liquid;		P
	g) instructions and information relating to sound pressure level if required by 10.2.1;	<80dBA@1m	N/A
	h) where required by 14.8.1.3, instructions for the adequate ventilation of the room or location in which PCE containing vented or valve-regulated batteries is located, to prevent the accumulation of hazardous gases;	No such battery	N/A
	i) tightening torque to be applied to wiring terminals;		P
	j) values of backfeed short-circuit currents available from the PCE on input and output conductors under fault conditions, if those currents exceed the max. rated current of the circuit, as per 4.4.4.6;		P
	k) for each input to the PCE, the max value of short-circuit current available from the source, for which the PCE is designed; and		P
	l) compatibility with RCD and RCM;		P
	m) instructions for protective earthing, including the information required by 7.3.6.3.7 if a second protective earthing conductor is to be installed:		P

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Clause	Requirement – Test	Result – Remark	Verdict
	n) where required by 7.3.8, the installation instructions shall include the following or equivalent wording:	Internal RCM is used, refer to user manual if strictly required	N/A
	"This product can cause a d.c. current in the external protective earthing conductor. Where a residual current-operated protective (RCD) or monitoring (RCM) device is used for protection in a case of direct or indirect contact, only an RCD or RCM of Type B is allowed on the supply side of this product."		N/A
	o) for PCE intended to charge batteries, the battery nominal voltage rating, size, and type	No charged battery	N/A
	p) PV array configuration information, such as ratings, whether the array is to be grounded or floating, any external protection devices needed, etc.		P
5.3.3	Information related to operation	As specified in user manual, refer to information related to operation	P
	Instructions for use shall include any operating instructions necessary to ensure safe operation, including the following, as applicable:		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; and		P
	– Instructions, that if the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.		P
5.3.4	Information related to maintenance	As specified in user manual, the inverter needs no maintenance or calibration	N/A
	Maintenance instructions shall include the following:		P
	– Intervals and instructions for any preventive maintenance that is required to maintain safety (for example air filter replacement or periodic re-tightening of terminals);		P
	– Instructions for accessing operator access areas, if any are present, including a warning		P

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Clause	Requirement – Test	Result – Remark	Verdict
	not to enter other areas of the equipment;		
	– Part numbers and instructions for obtaining any required operator replaceable parts;		P
	– Instructions for safe cleaning (if recommended)		P
	– Where there is more than one source of supply energizing the PCE, information shall be provided in the manual to indicate which disconnect device or devices are required to be operated in order to completely isolate the equipment.		P
5.3.4.1	Battery maintenance	Without battery	N/A
	Where required by 14.8.5, the documentation shall include the applicable items from the following list of instructions regarding maintenance of batteries:		N/A
	– Servicing of batteries should be performed or supervised by personnel knowledgeable about batteries and the required precautions		N/A
	– When replacing batteries, replace with the same type and number of batteries or battery packs		N/A
	– General instructions regarding removal and installation of batteries		N/A
	– CAUTION: Do not dispose of batteries in a fire. The batteries may explode.		N/A
	– CAUTION: Do not open or damage batteries. Released electrolyte is harmful to the skin and eyes. It may be toxic.		N/A
	– CAUTION: A battery can present a risk of electrical shock and high short-circuit current. The following precautions should be observed when working on batteries:		N/A
	a) Remove watches, rings, or other metal objects.		N/A
	b) Use tools with insulated handles.		N/A
	c) Wear rubber gloves and boots.		N/A
	d) Do not lay tools or metal parts on top of batteries		N/A
	e) Disconnect charging source prior to connecting or disconnecting battery terminals		N/A
	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		N/A

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Clause	Requirement – Test	Result – Remark	Verdict
	maintenance (applicable to equipment and remote battery supplies not having a grounded supply circuit).		
6	**ENVIRONMENTAL REQUIREMENTS AND CONDITIONS**		P
	The manufacturer shall rate the PCE for the following environmental conditions:		P
	– ENVIRONMENTAL CATEGORY, as in 6.1 below	Outdoor use	P
	– Suitability for WET LOCATIONS or not	Wet locations	P
	– POLLUTION DEGREE rating in 6.2 below	PD 3 external, PD 2 internal	P
	– INGRESS PROTECTION (IP) rating, as in 6.3 below	IP65	P
	– Ultraviolet (UV) exposure rating, as in 6.4 below	Metal enclosure used except with plastic window, DC/AC coupler, communication coupler with polymeric material UV resistant.	P
	– Ambient temperature and relative humidity ratings, as in 6.5 below	-25˚C...+60˚C Relative humidity:0…100%	P
6.1	Environmental categories and minimum environmental conditions		P
6.1.1	Outdoor		P
6.1.2	Indoor, unconditioned		N/A
6.1.3	Indoor, conditioned		N/A
6.2	Pollution degree	PD 3 external, PD 2 internal	P
6.3	Ingress Protection	IP65	P
6.4	UV exposure	Metal enclosure used except with plastic window, DC/AC coupler, communication coupler with polymeric material UV resistant.	P
6.5	Temperature and humidity	-25˚C...+60˚C Relative humidity:0…100%	P
7	**PROTECTION AGAINST ELECTRIC SHOCK AND ENERGY HAZARDS**		P
7.1	General	See 7.3.7 Table: Clearance and creepage distance measurement “insulation diagram”	P
7.2	Fault conditions	See single fault tests	P
7.3	Protection against electric shock		P
7.3.1	General		P
7.3.2	Decisive voltage classification	Accessible circuit: DVC A; Power circuit and other	P

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Clause	Requirement – Test	Result – Remark	Verdict
		circuits: DVC B, DVC C	
7.3.2.1	Use of decisive voltage class (DVC)	See 7.3.7 Table: Clearance and creepage distance measurement “insulation diagram”	P
7.3.2.2	Limits of DVC (according table 6)	Accessible circuit : below 16VAC r.m.s, 22.6VAC peak and 35VDC under both normal and single fault conditions	P
7.3.2.3	Short-terms limits of accessible voltages under fault conditions		P
7.3.2.4	Requirements for protection (according table 7)	See 7.3.7 Table: Clearance and creepage distance measurement “insulation diagram”	P
7.3.2.5	Connection to PELV and SELV circuits	The PELV or SELV classification of the external circuit is not changed and the DVC classification of the external port of the PCE is not changed	P
7.3.2.6	Working voltage and DVC		P
7.3.2.6.1	General		P
7.3.2.6.2	AC working voltage (see Figure 2)	AC 400V±10%	P
7.3.2.6.3	DC working voltage (see Figure 3)	DC Vmax: 1100V	P
7.3.2.6.4	Pulsating working voltage (see Figure 4)		N/A
7.3.3	protective separation		P
	Protective separation shall be achieved by:		P
	▪ double or reinforced insulation, or		P
	▪ protective screening, i.e. by a conductive screen connected to earth by protective bonding in the PCE, or connected to the protective earth conductor itself, whereby the screen is separated from live parts by at least basic insulation, or		P
	▪ protective impedance comprising limitation of current per 7.3.5.3 and of discharged energy per 7.3.5.4, or		N/A
	▪ limitation of voltage according to 7.3.5.4.		N/A
	The protective separation shall be fully and effectively maintained under all conditions of intended use of the PCE		P
7.3.4	Protection against direct contact	Well earthed metal housing used. See 7.3.7 Table: Clearance and creepage distance measurement “insulation diagram”	P

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Clause	Requirement – Test	Result – Remark	Verdict
7.3.4.1	General		P
	Protection against direct contact is employed to prevent persons from touching live parts that do not meet the requirements of 7.3.5 and shall be provided by one or more of the measure given in 7.3.4.2 (enclosures and barriers) and 7.3.4.3 (insulation).	Enclosure provided	P
	Open type sub-assemblies and devices do not require protective measures against direct contact but the instruction provided with the equipment must indicate that such measures must be provided in the end equipment or in the installation.		N/A
	Product intended for installation in CLOSED ELECTRICAL OPERATING AREAS, (see 3.9) need not have protective measures against direct contact, except as required by 7.3.4.2.4.		N/A
7.3.4.2	Protection by means of enclosures and barriers	IP65	P
	The following requirements apply where protection against contact with live parts is provided by enclosures or barriers, not by insulation in accordance with 7.3.4.3.	Enclosure provided to prevent access to inside live parts	P
7.3.4.2.1	General		P
	Parts of enclosures and barriers that provide protection in accordance with these requirements shall not be removable without the use of a tool (see 7.3.4.2.3).	Secured by screws	P
	Polymeric materials used to meet these requirements shall also meet the requirements of 13.6	LED cover	P
7.3.4.2.2	Access probe criteria	IP65	P
	Protection is considered to be achieved when the separation between the test probes and live parts, when tested as described below, is as follows:		P
	a) decisive voltage classification A, (DVC A) - the probe may touch the live parts	Communication interface	P
	b) decisive voltage classification B, (DVC B) - the probe must not touch bare live parts	No such circuit	N/A
	c) decisive voltage classification C, (DVC C) – the probe must have adequate clearance to live parts, based on the clearance for Basic insulation using the recurring peak working voltage involved,	No accessible	P
7.3.4.2.3	Access probe tests		P
	Compliance with 7.3.4.2.1 is checked by all of the following:		P

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Clause	Requirement – Test	Result – Remark	Verdict
	a) Inspection; and	Circuit connected to display panel and RS 485 port. Connecting device for DC input and MAINS; Earthed casing with min. basic insulation from power circuit	P
	b) Tests with the test finger (Figure D.1) and test pin (Figure D.2) of 0E, the results of which shall comply with the requirements of 7.3.4.2.1 a), b), and c) as applicable. Probe tests are performed on openings in the enclosures after removal of parts that can be detached or opened by an operator without the use of a tool, including fuseholders, and with operator access doors and covers open. It is permitted to leave lamps in place for this test. Connectors that can be separated by an operator without use of a tool, shall also be tested during and after disconnection. Any movable parts are to be put in the most unfavourable position.	IP65 without openings on enclosure, for mechanical enclosure test finger cannot access to live parts and approved external connecting device used	P
	The test finger and the test pin are applied as above, without appreciable force, in every possible position, except that floor-standing equipment having a mass exceeding 40 kg is not tilted.		P
	Equipment intended for building-in or rack mounting, or for incorporation in larger equipment, is tested with access to the equipment limited according to the method of mounting detailed in the installation instructions.		N/A
	c) Openings preventing the entry of the jointed test finger (Figure E-1 of 0E) during test b) above, are further tested by means of straight unjointed test finger (Figure E-3 of 0E), applied with a force of 30 N. If the unjointed finger enters, the test with the jointed finger is repeated except that the finger is applied using any necessary force up to 30 N.		P
	d) In addition to a) – c) above, top surfaces of enclosure shall be tested with the IP3X probe of IEC 60529. The test probe shall not penetrate the top surface of the enclosure when probed from the vertical direction ±5 ° only.	IP65 without openings on top enclosure	N/A
7.3.4.2.4	Service access areas	The manufacturer's manual with the following substance: No use-serviceable parts inside, before servicing and in the event of internal malfunction, send the inverter to authorized representative or manufacture!	N/A

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Clause	Requirement – Test	Result – Remark	Verdict
		Never operate this product and change any part of inverter by yourself. Only trained and authorized professional personnel who are familiar with the requirements of safety is allowed to perform servicing and maintenance work. Always disconnect the unit from the MAINS and PV supply by the external customer installed disconnecting devices before installation, servicing and maintenance works	
7.3.4.3	Protection by means of insulation of live parts	See 7.3.7 Table: Clearance and creepage distance measurement “insulation diagram”	P
	Where the requirements of 7.3.4.2 are not met, live parts shall be provided with insulation if:		P
	– their working voltage is greater than the maximum limit of decisive voltage class A, or		P
	– for a DVC A or B circuit, protective separation from adjacent circuit of DVC C is not provided (see note “‡” under Table 7)		P
7.3.5	Protection in case of direct contact	See 7.3.7 Table: Clearance and creepage distance measurement “insulation diagram”	P
7.3.5.1	General		P
	Protection in case of direct contact is required to ensure that contact with live parts does not produce a shock hazard.		P
	The protection against direct contact according to 7.3.4 is not required if the circuit contacted is separated from other circuits according to 7.3.2.3, and:		P
	– is of decisive voltage class A and complies with 7.3.5.2, or		P
	– is provided with protective impedance according to 7.3.5.3, or		N/A
	– is limited in voltage according to 7.3.5.4		N/A
	In addition to the measures as given in 7.3.5.2 to 7.3.5.4, it shall be ensured that in the event of error or polarity reversal of connectors no voltages that exceed DVC A can be connected into a circuit with protective separation. This applies for example to		N/A

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Clause	Requirement – Test	Result – Remark	Verdict
	plug-in-sub-assemblies or other plug-in devices which can be plugged-in without the use of a tool (key) or which are accessible without the use of a tool.		
	Conformity is checked by visual inspection and trial insertion.		P
7.3.5.2	Protection using decisive voltage class A	Communication interface	P
7.3.5.3	Protection by means of protective impedance		N/A
	Circuits and conductive parts do not require protection against direct contact if any connection to circuits of DVC-B or DVC-C is through protective impedance, and the accessible circuit or part is otherwise provided with protective separation from circuits of DVC-B or DVC-C according 7.3.3.		N/A
7.3.5.3.1	Limitation of current through protective impedance		N/A
	The current available through protective impedance to earth and between simultaneously accessible parts, measured at the accessible live parts, shall not exceed a value of 3,5 mA a.c. or 10 mA d.c. under normal and single-fault conditions.		N/A
7.3.5.3.2	Limitation of discharging energy through protective impedance		N/A
	The discharging energy available between simultaneously accessible parts protected by protective impedance shall not exceed the charging voltage and capacitance limits given in Table 9, which applies to both wet and dry locations, under normal and single fault conditions. Refer to figure 8.		N/A
7.3.5.4	Protection by means of limited voltages		N/A
	That portion of a circuit that has its voltage reduced to DVC-A by a voltage divider that complies with the following requirements, and that is otherwise provided with protective separation from circuits of DVC-B or DVC-C according to 7.3.3, does not require protection against direct contact.		N/A
	The voltage divider shall be designed so that under normal and single fault conditions, including faults in the voltage division circuit, the voltage across the output of the voltage divider does not exceed the limit for DVC-A.		N/A
	This type of protection shall not be used in case of protective class II or unearthed circuits, because it relies on protective earth being connected.		N/A
7.3.6	Protection against indirect contact	See 7.3.7 Table: Clearance and creepage distance measurement “insulation diagram”	P

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Clause	Requirement – Test	Result – Remark	Verdict
7.3.6.1	General		P
	Protection against indirect contact is required to prevent shock- hazardous current being accessible from conductive parts during an insulation failure. This protection shall comply with the requirements for protective class I (basic insulation plus protective earthing), class II (double or reinforced insulation) or class III (limitation of voltages)	Protective class I: basic insulation plus protective earthing; protective class II part(PV connector, AC connector, display cover): reinforced insulation protective class III part(operator access communication port): DVC A	P
	That part of a PCE meets the requirements of 7.3.6.2 and 7.3.6.3 is defined as protective class I		P
	That part of a PCE meets the requirements of 7.3.6.4 is defined as protective class II.	Plastic window and AC/DC coupler	P
	That part of PCE which meets the requirements of decisive voltage class A and in which no hazardous voltages are derived, is defined as protective class III. No shock hazard is present in such circuits.		P
	Where protection against indirect contact is dependent on means provided during installation, the installation instructions shall provide details of the required means and shall indicate the associated hazards.	It is applicable when the second grounding conductor is used.	P
7.3.6.2	Insulation between live parts and accessible conductive parts	See 7.3.7 Table: Clearance and creepage distance measurement “insulation diagram”	P
	Accessible conductive parts of equipment shall be separated from live parts by insulation meeting the requirements of Table 7 or by clearances as specified in 7.3.7.4 and creepages as specified in 7.3.7.5		P
7.3.6.3	Protective class I – Protective bonding and earthing		P
7.3.6.3.1	General		P
	Equipment of protective class I shall be provided with protective earthing, and with protective bonding to ensure electrical contact between accessible conductive parts and the means of connection for the external protective earthing conductor, except bonding is not required for:	PE arrangement: external protective earthing is provided through approved AC installation connector, and an external second protective earthing conductor is bonded to metal case through locking washer, nut, isolating washer and ring terminal	P
	a) accessible conductive parts that are protected by one of the measures in 7.3.5.2 to 7.3.5.4, or	DVC A	P
	b) accessible conductive parts are separated from live parts of DVC-B or -C using double or reinforced insulation.		P

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Clause	Requirement – Test	Result – Remark	Verdict
7.3.6.3.2	Requirements for protective bonding		P
	Electrical contact with the means of connection of the external protective earthing conductor shall be achieved by one or more of the following means:		P
	a) through direct metallic contact;		P
	b) through other conductive parts which are not removed when the PCE or sub-units are used as intended;	a) applied	N/A
	c) through a dedicated protective bonding conductor;	a) applied	N/A
	d) through other metallic components of the PCE	a) applied	N/A
	Where direct metallic contact is used and one or both of the parts involved is painted or coated, the paint or coating shall be removed in the area of contact, or reliably penetrated, to ensure metal to metal contact.	The paint removed in the area of contact	P
	For moving or removable parts, hinges or sliding contacts designed and maintained to have a low resistance are examples of acceptable means if they comply with the requirements of 7.3.6.3.3.		N/A
	Metal ducts of flexible or rigid construction and metallic sheaths shall not be used as protective bonding conductors, unless the device or material has been investigated as suitable for protective bonding purposes.		N/A
7.3.6.3.3	Rating of protective bonding		P
	Protective bonding shall withstand the highest thermal and dynamic stresses that can occur to the PCE item(s) concerned when they are subjected to a fault connecting live parts to accessible conductive parts. The protective bonding shall remain effective for as long as a fault to the accessible conductive parts persists or until an upstream protective device removes power from the part.		P
	Protective bonding shall meet following requirements:		P
	a) For PCE with an overcurrent protective device rating of 16 A or less, the impedance of the protective bonding means shall not exceed 0,1 Ω during or at the end of the test below.		N/A
	b) For PCE with an overcurrent protective device rating of more than 16 A, the voltage drop in the protective bonding test shall not exceed 2,5 V during or at the end of the test below.		N/A
	As alternative to a) and b) the protective bonding	Protective bonding cross-	P

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

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Clause	Requirement – Test	Result – Remark	Verdict
	The test current, duration of the test and acceptance criteria are as follows:		N/A
	a) For PCE with an overcurrent protective device rating of 16 A or less, the test current is 200% of the overcurrent protective device rating, but not less than 32 A, applied for 120s. The impedance of the protective bonding means during and at the end of the test shall not exceed 0,1 Ω.		N/A
	b) For PCE with an overcurrent protective device rating of more than 16 A, the test current is 200% of the overcurrent protective device rating and the duration of the test is as shown in Table 10 below. The voltage drop in the protective bonding means, during and at the end of the test, shall not exceed 2,5 V.		N/A
	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.		N/A
	The test current is derived from an a.c or d.c supply source, the output of which is not earthed.		N/A
	As an alternative to Table 10, where the time-current characteristic of the overcurrent protective device that limits the fault current in the protective bonding means is known because the device is either provided in the equipment or fully specified in the installation instructions, the test duration may be based on that specific device's time-current characteristic. The tests are conducted for a duration corresponding to the 200% current value on the time-current characteristic.		N/A
7.3.6.3.4	Protective bonding impedance (routine test)	Manufacturer's work instruction and declaration based on this clause	N/A
	If the continuity of the protective bonding is achieved at any point by a single means only (for example a single conductor or single fastener), or if the PCE is assembled at the installation location, then the impedance of the protective bonding shall also be tested as a routine test. The test shall be as in 7.3.6.3.3, except for the following:		N/A
	▪ the test current may be reduced to any convenient value greater than 10 A sufficient to allow measurement or calculation of the impedance of the protective bonding means:		N/A
	▪ the test duration may be reduced to no less than 2 s		N/A

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Clause	Requirement – Test	Result – Remark	Verdict
	For equipment subject to the type test in 7.3.6.3.3.1a), the impedance during the routine test shall not exceed 0,1Ω.		N/A
	For equipment subject to the type test in 7.3.6.3.3.1b) the impedance during the routine test shall not exceed 2,5 V divided by the test current required by 7.3.6.3.3.1b).		N/A
7.3.6.3.5	External protective earthing conductor		P
	A protective earthing conductor shall be connected at all times when power is supplied to PCE of protective class I. Unless local wiring regulations state otherwise, the protective earthing conductor cross-sectional area shall be determined from Table 11 or by calculation according to IEC 60364-5-54.		P
	If the external protective earthing conductor is routed through a plug and socket or similar means of disconnection, it shall not be possible to disconnect it unless power is simultaneously removed from the part to be protected.		P
	The cross-sectional area of every external protective earthing conductor which does not form part of the supply cable or cable enclosure shall, in any case, be not less than:		P
	▪ 2,5 mm² if mechanical protection is provided;	Conductor cross-section :2.5…6 mm². External protective earthing conductor form part of the supply cable with mechanical protection.	P
	▪ 4 mm² if mechanical protection is not provided.		N/A
	For cord-connected equipment, provisions shall be made so that the external protective earthing conductor in the cord shall, in the case of failure of the strain-relief mechanism, be the last conductor to be interrupted.		P
7.3.6.3.6	Means of connection for the external protective earthing conductor	Integrated in AC coupler	P
7.3.6.3.6.1	General		P
	The means of connection for the external protective earthing conductor shall be located near the terminals for the respective live conductors. The means of connections shall be corrosion-resistant and shall be suitable for the connection of cables according to 7.3.6.3.5. The means of connection for the protective earthing conductor shall not be used as a part of the mechanical assembly of the equipment or for other connections.	Measured max. 4.5mA>3.5mA after IP65, thermal testing, single fault, and humidity preconditioning, a second protective earthing conductor is bonded to metal case through locking washer, nut, isolating washer and approved ring terminal	P

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Clause	Requirement – Test	Result – Remark	Verdict
	A separate means of connection shall be provided for each external protective earthing conductor. Connection and bonding points shall be so designed that their current-carrying capacity is not impaired by mechanical, chemical, or electrochemical influences. Where enclosures and/or conductors of aluminium or aluminium alloys are used, particular attention should be given to the problems of electrolytic corrosion.		
	The means of connection for the protective earthing conductor shall be permanently marked with:		P
	• symbol 7 of Annex C; or		P
	• the colour coding green-yellow		P
	Marking shall not be done on easily changeable parts such as screws.		P
7.3.6.3.7	Touch current in case of failure of the protective earthing conductor	Measured max. 4.5mA>3.5mA after IP65, thermal testing, single fault, and humidity preconditioning	P
	The requirements of this sub-clause shall be satisfied to maintain safety in case of damage to or disconnection of the protective earthing conductor.		P
	For pluggable equipment type A, the touch current measured in accordance with 7.5.4 shall not exceed 3,5 mA a.c. or mA d.c.	Not a pluggable type A equipment	N/A
	For all other PCE, one or more of the following measure shall be applied, unless the touch current measured in accordance with 7.5.4 using the test network of IEC 60990 test figure 4 shall not exceed 3,5 mA a.c. or 10 mA d.c.		P
	a) Permanently connected wiring, and:		P
	• a cross-section of the protective earthing conductor of at least 10 mm² Cu or 16 mm² Al; or		N/A
	• automatic disconnection of the supply in case of discontinuity of the protective earthing conductor; or	automatic disconnection of the supply function used.	P
	• provision of an additional terminal for a second protective earthing conductor of the same cross-sectional area as the original protective earthing conductor and installation instruction requiring a second protective earthing conductor to be installed or	Second protective earthing terminal provided if needed.	P
	b) Connection with an industrial connector according to IEC 60309 and a minimum protective earthing conductor cross-section of	a)applied	N/A

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Clause	Requirement – Test	Result – Remark	Verdict
	2,5 mm² as part of a multi-conductor power cable. Adequate strain relief shall be provided.		
	In addition, the caution symbol 15 of Annex C shall be fixed to the product and the installation manual shall provide details of the protective earthing measures required in the installation as required in 5.3.2.	Symbol 15 used in warning marking	N/A
	When it is intended and allowed to connect two or more PCEs in parallel using one common PE conductor, the above touch current requirements apply to the maximum number of the PCEs to be connected in parallel, unless one of the measures in a)	Not allowed	N/A
	or b) above is used. The maximum number of parallel PCEs is used in the testing and has to be stated in the installation manual.		N/A
7.3.6.4	Protective Class II – Double or Reinforced Insulation	Protective class II part (LED cover): double/reinforced insulation	P
	Equipment or parts of equipment designed for protective class II shall have insulation between live parts and accessible surfaces in accordance with 7.3.4.3. The following requirements also apply:		P
	• equipment designed to protective class II shall not have means of connection for the external protective earthing conductor. However this does not apply if the external protective earthing conductor is passed through the equipment to equipment series-connected beyond it. In the latter event, the external protective earthing conductor and its means for connection shall be insulated with basic insulation from the accessible surface of the equipment and from circuits that employ protective separation, extra-low voltage, protective impedance and limited discharging energy, according to 7.3.5. This basic insulation shall correspond to the rated voltage of the series-connected equipment;	Protective class II part (LED cover): double/reinforced insulation	P
	• metal-encased equipment of protective class II may have provision on its enclosure for the connection of an equipotential bonding conductor;		N/A
	• equipment of protective class II may have provision for the connection of an earthing conductor for functional reasons or for damping of overvoltages; it shall, however, be insulated as though it is a live part;		N/A
	• equipment employing protective class II shall be marked according to 5.1.8.	Class I equipment	N/A

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Clause	Requirement – Test	Result – Remark	Verdict
7.3.7	Insulation Including Clearance and Creepage Distance	See 7.3.7 Table: Clearance and creepage distance measurement “insulation diagram”	P
7.3.7.1	General		P
	This subclause gives minimum requirements for insulation, based on the principles of IEC 60664.		P
	Manufacturing tolerances shall be taken into account during measurement of creepage, clearance, and insulation distance in the PCE.		P
	Insulation shall be selected after consideration of the following influences:		P
	• pollution degree	PD 3 external, PD 2 internal	P
	• overvoltage category	PV: II; Mains: III	P
	• supply earthing system	TN	P
	• insulation voltage	DC 1100V (PV) and AC 400V (Typic of Mains)	P
	• location of insulation	See 7.3.7 Table: Clearance and creepage distance measurement “insulation diagram”	P
	• type of insulation	See 7.3.7 Table: Clearance and creepage distance measurement “insulation diagram”	P
	Compliance of insulation, creepage distances, and clearance distances, shall be verified by measurement or visual inspection, and the tests of 7.5.		P
7.3.7.1.3	Supply earthing systems		P
	Three basic types of earthing system are described in IEC 60364-1. They are:		P
	• TN system: has one point directly earthed, the accessible conductive parts of the installation being connected to that point by protective conductors. Three types of TN systems, TN-C, TN-S and TN-C-S, are defined according to the arrangement of the neutral and protective conductor.	TN system with neutral earthed, except corner earthed system	P
	• TT system: has one point directly earthed, the accessible conductive parts of the installation being connected to earth electrodes electrically independent of the earth electrodes of the power system;		N/A
	• IT system: has all live parts isolated from earth or one point connected to earth through an impedance, the accessible conductive parts of		N/A

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Clause	Requirement – Test	Result – Remark	Verdict
	the installation being earthed independently or collectively to the earthing system.		
7.3.7.1.4	Insulation voltages		P
	Table 12 makes use of the circuit system voltage and overvoltage category to define the impulse withstands voltage and the temporary overvoltage.		P
7.3.7.2	Insulation between a circuit and its surroundings		P
7.3.7.2.1	General	230/400 V, OVC III (4000 V impulse voltage, 1500 Vr.m.s. temporary overvoltage) for the AC output terminal and 1100 V, OVC II (4772 V impulse voltage, no temporary overvoltage) for the PV input terminal No isolation between PV and AC mains output. Maximum 1100 Vd.c. working voltage is assumed between DVC A circuit and DVC C circuit.	P
7.3.7.2.2	Circuits connected directly to the mains	System voltage for mains is 300 Vr.m.s. according to table 12. 4772 V impulse voltage gives the most severe requirement	P
7.3.7.2.3	Circuits other than mains circuits	System voltage for PV is 1100 Vd.c.	P
7.3.7.2.4	Insulation between circuits	Impulse voltage (4772 V), temporary overvoltage (1500 Vr.m.s) is calculated from table 12 for clearance. Working voltage (1100 Vd.c.) across insulation is used for creepage	P
7.3.7.3	Functional insulating		P
7.3.7.4	Clearance distances		P
7.3.7.4.1	Determination		P
7.3.7.4.2	Electric field homogeneity	Inhomogeneous electric field is considered for PCE	N/A
7.3.7.4.3	Clearance to conductive enclosures		P
7.3.7.5	Creepage distances	(see appended table 7.3.7)	P
7.3.7.5.1	General	PV Maximum 1100 Vd.c. system voltage is used for the RMS voltage across insulation	P
7.3.7.5.2	Voltage		P
7.3.7.5.3	Materials	Certified PWB used. Other material is considered IIIb The inside parts are considered pollution degree 2	P

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Clause	Requirement – Test	Result – Remark	Verdict
7.3.7.6	Coating	No coating provided insulation	N/A
7.3.7.7	PWB spacings for functional insulating		P
7.3.7.8	Solid insulating	(see appended table 7.3.7)	P
7.3.7.8.1	General		P
7.3.7.8.2	Requirements for electrical withstand capability of solid insulation		P
7.3.7.8.2.1	Basic, supplemental, reinforced, and double insulation		P
7.3.7.8.2.2	Functional insulation		P
7.3.7.8.3	Thin sheet or tape material		P
7.3.7.8.3.1	General		P
7.3.7.8.3.2	Material thickness not less than 0,2 mm		P
7.3.7.8.3.3	Material thickness less than 0,2 mm		P
7.3.7.8.3.4	Compliance		P
7.3.7.8.4	Printed wiring boards		P
7.3.7.8.4.1	General		P
7.3.7.8.4.2	Use of coating materials	No coating materials	N/A
7.3.7.8.5	Wound components		P
7.3.7.8.6	Potting materials		P
7.3.7.9	Insulation requirements above 30 kHz	No such circuits	N/A
7.3.8	Residual Current-operated protective (RCD) or monitoring (RCM) device compatibility	RCMU integrated for PV side protection, refer to IEC 62109-2(ed.1)/ EN 62109-2:2011 test report	P
	RCD and RCM are used to provide protection against insulation faults in some domestic and industrial installations, additional to that provided by the installed equipment.	If an external RCD or residual current breaker is required strictly, must follow with local regulation	P
7.3.9	Capacitor discharge		P
7.3.9.1	Operator access area		P
	Equipment shall be so designed that there is no risk of electric shock in operator access areas from charge stored on capacitors after disconnection of the PCE.	Accessible communication interface is DVC A	P
7.3.9.2	Service access areas		N/A
	Capacitors located behind panels that are removable for servicing, installation, or disconnection shall present no risk of electric shock or energy hazard from charge stored on capacitors after disconnection of the PCE.	As specified in user manual, the inverter needs no maintenance or service.	N/A

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Clause	Requirement – Test	Result – Remark	Verdict
7.4	Protection against energy hazards		P
7.4.1	Determination of hazardous energy level		P
	A hazardous energy level is considered to exist if		P
	a) The voltage is 2 V or more, and power available after 60 s exceeds 240 VA.	Access to internal power circuit, tool required. No user serviceable parts inside the device per manufacturer's manual. Operator access: communication interface circuit, external connecting device for PV generator and MAINs connection: approved installation coupler used.	P
	b) The stored energy in a capacitor is at a voltage. U of 2 V or more, and the stored energy. E, calculated from the following equation, exceeds 20J: $E = 0,5\ CU^2$		P
7.4.2	Operator Access Areas		P
	Equipment shall be so designed that there is no risk of energy hazard in operator access areas from accessible circuits.	Only access DVC A circuit(communication interface), no risk of energy hazard in operator access area from accessible circuits.	P
7.4.3	Services Access Areas	As specified in user manual, the inverter needs no maintenance or service.	N/A
7.5	Electrical tests related to shock hazard	(see appended table 7.5)	P
7.5.1	Impulse voltage test (type test)		P
7.5.2	Voltage test (dielectric strength test)		P
7.5.2.1	Purpose of test		P
7.5.2.2	Value and type of test voltage		P
7.5.2.3	Humidity pre-conditioning		P
7.5.2.4	Performing the voltage test		P
7.5.2.5	Duration of the a.c. or d.c. voltage test		P
7.5.2.6	Verification of the a.c. or d.c. voltage test		P
7.5.3	Partial discharge test	(see appended table 7.5)	P
7.5.4	Touch current measurement (type test)		P
	The touch current shall be measured if required by 7.3.6.3.7 and shall not be greater than 3.5 mA a.c. or 10 mA d.c. or special measures of protection as given in 7.3.6.3.7 are required.	Measured max. 4.5mA>3.5mA after IP65, thermal testing, single fault, and humidity preconditioning, a second protective earthing	P

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Clause	Requirement – Test	Result – Remark	Verdict
		conductor(cross-section: min. 6mm^2) is bonded to metal case through locking washer, nut, isolating washer and approved ring terminal	
	For type tests on PCE for which wet locations requirements apply according to 6.1, the humidity pre-conditioning of 4.5 shall be performed immediately prior to the touch current test.		P
7.5.5	Equipment with multiple sources of supply		P
8	**PROTECTION AGAINST MECHANICAL HAZARDS**		P
8.1	General		P
	Operation shall not lead to a mechanical HAZARD in NORMAL CONDITION or SINGLE FAULT CONDITION. Edges, projections, corners, openings, guards, handles and the like, that are accessible to the operator shall be smooth and rounded so as not to cause injury during normal use of the equipment.		P
	Conformity is checked as specified in 8.2 to 8.6.		P
8.2	Moving parts		P
	Moving parts shall not be able to crush, cut or pierce parts of the body of an OPERATOR likely to contact them, nor severely pinch the OPERATOR's skin. Hazardous moving parts of equipment, that is moving parts which have the potential to cause injury, shall be so arranged, enclosed or guarded as to provide adequate protection against the risk of personal injury.	no access for operator after installation	P
8.2.1	Protection of service persons		P
	Protection shall be provided such that unintentional contact with hazardous moving parts is unlikely during servicing operations. If a guard over a hazardous moving part may need to be removed for servicing, the marking of symbol 15 of Table D-1 shall be applied on or near the guard.	Access to internal part, disconnect both DC and AC circuit required, fan loss power and stopped.	P
8.3	Stability		N/A
	Equipment and assemblies of equipment not secured to the building structure before operation shall be physically stable in NORMAL USE.	Wall mounting	N/A
8.4	Provisions for lifting and carrying		P
	If carrying handles or grips are fitted to, or supplied with, the equipment, they shall be capable of withstanding a force of four times the weight of the equipment.	Weight: 18.6kg×4 for from zero to full load in 5 s to 10 s, then maintained for 1 min, handles/grips not break loose from the equipment and not	P

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Clause	Requirement – Test	Result – Remark	Verdict
		be any permanent distortion, cracking or other evidence of failure.	
	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.		P
8.5	Wall mounting		P
	Mounting brackets on equipment intended to be mounted on a wall or ceiling shall withstand a force of four times the weight of the equipment.	Weight: 18.6kg×4 for from zero to full load in 5 s to 10 s, then maintained for 1 min, no damage to mounting brackets	P
8.6	Expelled parts		P
	Equipment shall contain or limit the energy of parts that could cause a HAZARD if expelled in the event of a fault.		P
9	**PROTECTION AGAINST FIRE HAZARDS**		P
9.1	Resistance to fire		P
	This subclause specifies requirements intended to reduce the risk of ignition and the spread of flame, both within the equipment and to the outside, by the appropriate use of materials and components and by suitable construction.		P
9.1.1	Reducing the risk of ignition and spread of flame	Method 1 used	P
	For equipment or a portion of equipment, there are two alternative methods of providing protection against ignition and spread of flame that could affect materials, wiring, wound components and electronic components such as integrated circuits, transistors, thyristors, diodes, resistors and capacitors.		P
9.1.2	Conditions for a fire enclosure		P
	A FIRE ENCLOSURE is required for equipment or parts of equipment for which Method 2 is not fully applied and complied with.		P
9.1.2.1	Parts requiring a fire enclosure		P
	Except where Method 2 is used, or as permitted in 9.1.2.2, the following are considered to have a risk of ignition and, therefore, require a FIRE ENCLOSURE:		P
	– components in PRIMARY CIRCUITS		P
	– components in SECONDARY CIRCUITS supplied by power sources which exceed the limits for a LIMITED POWER SOURCE as specified in 9.2;		P

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Clause	Requirement – Test	Result – Remark	Verdict
	– components in SECONDARY CIRCUITS supplied by a LIMITED POWER SOURCE as specified in 9.2, but not mounted on a material of FLAMMABILITY CLASS V-1;	No such circuits. All components in secondary circuits are mounted on PCB rated V-0.	N/A
	– components within a power supply unit or assembly having a limited power output complying with the criteria for a LIMITED POWER SOURCE as specified in 9.2, including overcurrent protective devices, limiting impedances, regulating networks and wiring, up to the point where the LIMITED POWER SOURCE output criteria are met;	SMPS for communication port	P
	– components having unenclosed arcing parts, such as open switch and relay contacts and commutators, in a circuit at HAZARDOUS VOLTAGE or at a HAZARDOUS ENERGY LEVEL; and		P
	– insulated wiring, except as permitted in 9.1.2.2.	Internal wire meet the clause 9.1.2.2.	P
9.1.2.2	Parts not requiring a fire enclosure		N/A
9.1.3	Materials requirements for protection against fire hazard		P
9.1.3.1	General		P
	ENCLOSURES, components and other parts shall be so constructed, or shall make use of such materials, that the propagation of fire is limited.		P
9.1.3.2	Materials for fire enclosures	Metal enclosure and materials for components that fill an opening in a fire enclosure, for DC/AC coupler and COM port min. class V-0 and no larger than 100 mm in any dimension.	P
	If an enclosure material is not classified as specified below, a test may be performed on the final enclosure or part of the enclosure, in which case the material shall additionally be subjected to periodic SAMPLE testing.		N/A
9.1.3.3	Materials for components and other parts outside fire enclosures	All internal components are rated V-2 or better or mounded on PCB rated V-0.	P
	Except as otherwise noted below, materials for components and other parts (including MECHANICAL ENCLOSURES, ELECTRICAL ENCLOSURES and DECORATIVE PARTS); located outside FIRE ENCLOSURES, shall be of FLAMMABILITY CLASS HB.		P
9.1.3.4	Materials for components and other parts inside fire enclosures	All internal components are rated V-2 or better or	P

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Clause	Requirement – Test	Result – Remark	Verdict
		mounded on PCB rated V-0.	
9.1.3.5	Materials for air filter assemblies		N/A
9.1.4	Openings in fire enclosures	The opening of enclosure is filled with terminal covers, and meet the IP65 test.	N/A
9.1.4.1	General		N/A
	For equipment that is intended to be used or installed in more than one orientation as specified in the product documentation, the following requirements apply in each orientation.	The equipment is intended to be used one orientation	N/A
	These requirements are in addition to those in the following sections:		N/A
	– 7.3.4, Protection against direct contact;		N/A
	– 7.4, Protection against energy hazards;		N/A
	– 13.5, Openings in enclosures		N/A
9.1.4.2	Side openings treated as bottom openings	Without side openings in fire enclosure	N/A
9.1.4.3	Openings in the bottom of a fire enclosure		N/A
	The bottom of a FIRE ENCLOSURE or individual barriers, shall provide protection against emission of flaming or molten material under all internal parts, including partially enclosed components or assemblies, for which Method 2 of 9.1.1 has not been fully applied and complied with.		N/A
9.1.4.4	Equipment for use in a CLOSED ELECTRICAL OPERATING AREA		N/A
	The requirements of 9.1.4.3 do not apply to FIXED EQUIPMENT intended only for use in a CLOSED ELECTRICAL OPERATING AREA and to be mounted on a concrete floor or other non-combustible surface. Such equipment shall be marked as follows:		N/A
	WARNING: FIRE HAZARD SUITABLE FOR MOUNTING ON CONCRETE OR OTHER NON-COMBUSTIBLE SURFACE ONLY		N/A
9.1.4.5	Doors or covers in fire enclosures		N/A
9.1.4.6	Additional requirements for openings in transportable equipment		N/A
9.2	LIMITED POWER SOURCES		N/A
9.2.1	General		N/A
9.2.2	Limited power source tests		N/A
9.3	Short-circuit and overcurrent protection	External type C circuit breaker required for end-installation: 400V@60A or equal type gL/gG fuse for ASW20K-LT-	P

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Clause	Requirement – Test	Result – Remark	Verdict
		G2 Pro. for other models, refer to user manual.	
9.3.1	General		P
	The PCE shall not present a hazard, under short-circuit or overcurrent conditions at any port, including phase-to-phase, phase-to-earth and phase-to-neutral, and adequate information shall be provided to allow proper selection of external wiring and external protective devices.		P
9.3.2	Protection against short-circuits and overcurrents shall be provided for all input circuits, and for output circuits that do not comply with the requirements for limited power sources in 9.2, except for circuits in which no overcurrent hazard is presented by short-circuits and overloads.		P
9.3.3	Protective devices provided or specified shall have adequate breaking capacity to interrupt the maximum short circuit current specified for the port to which they are connected. If protection that is provided integral to the PCE for an input port is not rated for the short-circuit current of the circuit in which it is used, the installation instructions shall specify that an upstream protective device, rated for the prospective short-circuit current of that port, shall be used to provide backup protection.		P
10	**PROTECTION AGAINST SONIC PRESSURE HAZARDS**		P
10.1	General		P
	The equipment shall provide protection against the effect of sonic pressure. Conformity tests are carried out if the equipment is likely to cause such HAZARDS.		P
10.2	Sonic pressure and Sound level	<80dBA@1m	P
10.2.1	Hazardous Noise Levels		N/A
11	**PROTECTION AGAINST LIQUID HAZARDS**		N/A
11.1	Liquid Containment, Pressure and Leakage	Without liquid containment system	N/A
	The liquid containment system components shall be compatible with the liquid to be used.		N/A
	There shall be no leakage of liquid onto live parts as a result of:		N/A
	a) Normal operation, including condensation;		N/A
	b) Servicing of the equipment; or		N/A
	c) Inadvertent loosening or detachment of hoses or other cooling system parts over time.		N/A

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Clause	Requirement – Test	Result – Remark	Verdict
11.2	Fluid pressure and leakage		N/A
11.2.1	Maximum pressure		N/A
11.2.2	Leakage from parts		N/A
11.2.3	Overpressure safety device		N/A
11.3	Oil and grease	Not used	N/A
12	**CHEMICAL HAZARDS**		N/A
12.1	General		N/A
13	**PHYSICAL REQUIREMENTS**		P
13.1	Handles and manual controls		P
	Handles, knobs, grips, levers and the like shall be reliably fixed so that they will not work loose in normal use, if this might result in a hazard. Sealing compounds and the like, other than self-hardening resins, shall not be used to prevent loosening. If handles, knobs and the like are used to indicate the position of switches or similar components, it shall not be possible to fix them in a wrong position if this might result in hazard.		P
13.1.1	Adjustable controls	Without adjustable controls	N/A
13.2	Securing of parts	All screws locked with starwasher	P
13.3	Provisions for external connections		P
13.3.1	General		P
13.3.2	Connection to an a.c. Mains supply		P
13.3.2.1	General		P
	For safe and reliable connection to a MAINS supply, equipment shall be provided with one of the following:		P
	– terminals or leads or a non-detachable power supply cord for permanent connection to the supply; or		N/A
	– a non-detachable power supply cord for connection to the supply by means of a plug		N/A
	– an appliance inlet for connection of a detachable power supply cord; or		P
	– a mains plug that is part of direct plug-in equipment as in 13.3.8		N/A
13.3.2.2	Permanently connected equipment	it's a pluggable equipment.	N/A
13.3.2.3	Appliance inlets		P

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Clause	Requirement – Test	Result – Remark	Verdict
13.3.2.4	Power supply cord	Refer to user manual	N/A
13.3.2.5	Cord anchorages and strain relief	Not provided together with power cord for connecting to AC terminals, for installer, should be followed with user manual and test maybe confirmed	N/A
	For equipment with a non-detachable power supply cord, a cord anchorage shall be supplied such that:		N/A
	– the connecting points of the cord conductors are relieved from strain; and		N/A
	– the outer covering of the cord is protected from abrasion.		N/A
13.3.2.6	Protection against mechanical damage		P
13.3.3	Wiring terminals for connection of external conductors		P
13.3.3.1	Wiring terminals		P
13.3.3.2	Screw terminals		P
13.3.3.3	Wiring terminal sizes		P
13.3.3.4	Wiring terminal design		P
13.3.3.5	Grouping of wiring terminals	3/N/PE~	P
13.3.3.6	Stranded wire		P
13.3.4	Supply wiring space		P
13.3.5	Wire bending space for wires 10 mm² and greater	No 10mm2 or greater wire internal the product.	N/A
13.3.6	Disconnection from supply sources	Disconnect the unit from the MAINS by automatic disconnecting relays in all live conductor and PV supply by the DC external switch	P
13.3.7	Connectors, plugs and sockets	Approved PV/AC coupler used	P
13.3.8	Direct plug-in equipment	RS485 port with SELV supply	P
13.4	Internal wiring and connections		P
13.4.1	General		P
13.4.2	Routing		P
13.4.3	Colour coding	Conductor having green-and-yellow insulation is used only for protective bonding connection	P
13.4.4	Splices and connections	All wire with core cable ends	P
13.4.5	Interconnections between parts of the PCE		N/A
13.5	Openings in enclosures		N/A

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Clause	Requirement – Test	Result – Remark	Verdict
13.5.1	Top and side openings	IP65 enclosure without openings	N/A
	Openings in the top and sides of ENCLOSURES shall be so located or constructed that it is unlikely that objects will enter the openings and create hazards by contacting bare conductive parts.		N/A
13.6	Polymeric Materials		P
13.6.1	General	UL approved material used. LED cover, AC/DC coupler, communication port coupler: V-0, suitable for outdoor use with respect to exposure to Ultraviolet Light, Water Exposure and Immersion in accordance with UL 746C	P
13.6.1.1	Thermal index or capability	Thermal index of Polymeric Materials used higher than the maximum measured operating temperature in heating test	P
13.6.2	Polymers serving as enclosures or barriers preventing access to hazards		P
13.6.2.1	Stress relief test	88.3°C@7h	P
13.6.3	Polymers serving as solid insulation		P
13.6.3.1	Resistance to arcing		P
13.6.4	UV resistance		P
	Polymeric parts of an OUTDOOR ENCLOSURE required for compliance with this standard shall be sufficiently resistance to degradation by ultra-violet (UV) radiation		P
13.7	Mechanical resistance to deflection, impact, or drop		P
13.7.1	General		P
13.7.2	250-N deflection test for metal enclosures		P
13.7.3	7-J impact test for polymeric enclosures	LED cover	P
13.7.4	Drop test		N/A
13.8	Thickness requirements for metal enclosures		P
13.8.1	General	Conformity is checked by the test as specified in clause 13.7	P
13.8.2	Cast metal		P
13.8.3	Sheet metal		N/A
14	**COMPONENTS**		P
14.1	General	(see appended table 14)	P

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Clause	Requirement – Test	Result – Remark	Verdict
	Where safety is involved, components shall be used in accordance with their specified RATINGS unless a specific exception is made. They shall conform to one of the following:		P
	a) applicable safety requirements of a relevant IEC standard. Conformity with other requirements of the component standard is not required. If necessary for the application, components shall be subjected to the test of this standard, except that it is not necessary to carry out identical or equivalent tests already performed to check conformity with the component standard;		P
	b) the requirements of this standard and, where necessary for the application, any additional applicable safety requirements of the relevant IEC component standard;		P
	c) if there is no relevant IEC standard, the requirements of this standard;		P
	d) applicable safety requirements of a non-IEC standard which are at least as high as those of the applicable IEC standard, provided that the component has been approved to the non-IEC standard by a recognized testing authority.		P
	Components such as optocouplers, capacitors, transformers, and relays connected across basic, supplemental, reinforced, or double insulation shall comply with the requirements applicable for the grade of insulation being bridged, and if not previously certified to the applicable component safety standard shall be subjected to the voltage test of 7.5.2 as routine test.		P
14.2	Motor Over Temperature Protection		P
	Motors which, when stopped or prevented from starting (see 4.4.4.3), would present an electric shock HAZARD, a temperature HAZARD, or a fire HAZARD, shall be protected by an over temperature or thermal protection device meeting the requirements of 14.3.	Fan blocked test was evaluated.	P
14.3	Over temperature protection devices	Power limited by both temperature of ambient inside enclosure and temperature in IGBT module	P
14.4	Fuse holders	No internal fuse and fuse holder	N/A
14.5	MAINS voltage selecting devices		N/A
14.6	Printed circuit boards		P
	Printed circuit boards shall be made of material with a flammability classification of V-1 of IEC 60707 or	PCB material approved by UL with UL94 V-0 rating	P

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Clause	Requirement – Test	Result – Remark	Verdict
	better.		
	This requirement does not apply to thin-film flexible printed circuit boards that contain only circuits powered from limited power sources meeting the requirements of 9.2.		N/A
	Conformity of the flammability RATING is checked by inspection of data on the materials. Alternatively, conformity is checked by performing the V-1 tests specified in IEC 60707 on three samples of the relevant parts.		P
14.7	Circuits or components used as transient overvoltage limiting devices		N/A
	If control of transient overvoltage is employed in the equipment, any overvoltage limiting component or circuit shall be tested with the applicable impulse withstand voltage of Table 7-10 using the test method from 7.5.1 except 10 positive and 10 negative impulses are to be applied and may be spaced up to 1 min apart.	No such device	N/A
14.8	Batteries		N/A
	Equipment containing batteries shall be designed to reduce the risk of fire, explosion and chemical leaks under normal conditions and after a single fault in the equipment including a fault in circuitry within the equipment battery pack.	No battery	N/A
14.8.1	Battery Enclosure Ventilation		N/A
14.8.1.1	Ventilation requirements		N/A
14.8.1.2	Ventilation testing		N/A
14.8.1.3	Ventilation instructions		N/A
14.8.2	Battery Mounting		N/A
	Compliance is verified by the application of the force to the battery's mounting surface. The test force is to be increased gradually so as to reach the required value in 5 to 10 s, and is to be maintained at that value for 1 min. A non-metallic rack or tray shall be tested at the highest normal condition operating temperature.		N/A
14.8.3	Electrolyte spillage		N/A
	Battery trays and cabinets shall have an electrolyte-resistant coating.		N/A
	The ENCLOSURE or compartment housing a VENTED BATTERY shall be constructed so that spillage or leakage of the electrolyte from one battery will be contained within the ENCLOSURE and be prevented from:		N/A
	a) reaching the PCE outer surfaces that can be		N/A

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Clause	Requirement – Test	Result – Remark	Verdict
	contacted by the USER		
	b) contaminating adjacent electrical components or materials; and		N/A
	c) bridging required electrical distances		N/A
14.8.4	Battery Connections		N/A
	Reverse battery connection of the terminals shall be prevented if reverse connection could result in a hazard within the meaning of this Standard		N/A
14.8.5	Battery maintenance instructions		N/A
	The information and instructions listed in 5.3.4.1 shall be included in the operator manual for equipment in which battery maintenance is performed by the operator, or in the service manual if battery maintenance is to be performed by service personnel only.		N/A
14.8.6	Battery accessibility and maintainability		N/A
	Battery terminals and connectors shall be accessible for maintenance with the correct TOOLS. Batteries with liquid electrolyte, requiring maintained shall be so located that the battery cell caps are accessible for electrolyte tests and readjusting of electrolyte levels.		N/A
15	Software and firmware performing safety functions	Refer to single fault condition test	N/A

	EN 62109-1:2010		P
Annex ZA	Normative references to international publications with their corresponding European publications	Considered	P

Original tests:

4.7	**TABLE: mains supply electrical data in normal condition**					P
Type	U (V) DC	I (A) DC	P (W) DC	U (V) grid	I (A) AC	P (W) AC
Model: ASW20K-LT-G2						
Min. MPP voltage	453.1*2	22.1*2	19958	201.1*3	32.0*3	19331
Min. MPP voltage	450.1*2	23.3*2	20588	230.9*3	28.8*3	19974
Max. MPP voltage	859.1*2	11.4*2	19996	201.1*3	32.0*3	19326
Max. MPP voltage	848.2*2	12.0*2	20449	230.9*3	28.7*3	19896
Max. Inrush current @ grid connected and disconnected	9.35A peak@100 µs					
Model: ASW17K-LT-G2						
Min. MPP voltage	458.4*2	17.9*2	16855	200.9*3	27.2*3	16376
Min. MPP voltage	449.8*2	19.8*2	17454	230.8*3	24.5*3	16970
Max. MPP voltage	899.1*2	9.3*2	16987	200.9*3	27.2*3	16439
Max. MPP voltage	850.6*2	10.6*2	17455	230.8*3	24.5*3	17007
Max. Inrush current @ grid connected and disconnected	9.35A peak@100 µs					
Model: ASW15K-LT-G2						
Min. MPP voltage	502.0*2	13.4*2	13272	200.7*3	21.5*3	12932
Min. MPP voltage	458.1*2	16.9*2	15273	230.7*3	21.5*3	14835
Max. MPP voltage	900.6*2	16.7*2	14835	200.8*3	23.9*3	14363
Max. MPP voltage	866.4*2	17.6*2	15219	230.7*3	21.5*3	14828
Max. Inrush current @ grid connected and disconnected	7.95Apeak@110us					
Model: ASW13K-LT-G2						
Min. MPP voltage	458.1*2	10.7/17.7	12750	200.6*3	20.6*3	12387
Min. MPP voltage	450.2*2	11.2/18.3	13175	230.6*3	18.6*3	12832
Max. MPP voltage	850.1*2	9.1*2	12803	200.6*3	20.6*3	12400
Max. MPP voltage	852.4*2	7.7*2	13174	230.6*3	18.6*3	12819
Max. Inrush current @ grid connected and disconnected	7.95Apeak@110us					
Model: ASW12K-LT-G2						
Min. MPP voltage	480.9*2	12.2*2	11676	200.6*3	18.9*3	11369
Min. MPP voltage	447.8*2	13.7*2	12128	230.5*3	17.1*3	11810
Max. MPP voltage	900.9*2	6.5*2	11774	200.6*3	19.0*3	11417
Max. MPP voltage	851.8*2	7.11*2	12119	230.5*3	17.1*3	11825

Max. Inrush current @ grid connected and disconnected	7.95Apeak@110us					
Model: ASW10K-LT-G2						
Min. MPP voltage	476.9*2	10.3*2	9766	200.5*3	15.8*3	9518
Min. MPP voltage	448.0*2	11.4*2	10084	230.4*3	14.2*3	9832
Max. MPP voltage	895.8*2	5.4*2	9845	200.5*3	15.9*3	9555
Max. MPP voltage	852.8*2	5.9*2	10074	230.4*3	14.2*3	9833
Max. Inrush current @ grid connected and disconnected	7.95Apeak@110us					
Model: ASW8K-LT-G2						
Min. MPP voltage	475.0*2	8.3*2	7803	200.4*3	12.7*3	7610
Min. MPP voltage	447.2*2	9.2*2	8068	230.3*3	11.4*3	7870
Max. MPP voltage	895.8*2	4.4*2	7870	200.4*3	12.7*3	7641
Max. MPP voltage	852.6*2	4.7*2	8054	230.3*3	11.4*3	7862
Max. Inrush current @ grid connected and disconnected	7.95Apeak@110us					
Remark: Function checked at extreme low temperature -25°C as well.						

4.3	**TABLE: heating temperature rise measurements**		P
	test voltage (V)	See Note 1	See Note 2	-
	t1 (°C)	36.8	44.8	-
	t2 (°C)	37.0	45.0	-
Max. temperature T of part/at:	T (°C)		permitted T (°C)
Boost choke 1-1	100.2	79.1	130(Class F)
Mounting surface	82.0	69.4	90
Boost choke 2-1	100.8	77.2	130(Class F)
Front cover	58.8	62.8	100
INV choke U-1	78.3	107.2	130(Class F)
DC switch	68.7	69.6	85
INV choke V-1	86.1	120.7	130(Class F)
Slave DSP	72.4	76.5	85
INV choke W-1	81.1	113.7	130(Class F)
AC output connector	71.1	76.2	85
Isolation opto-couplers	72.4	75.2	85
GFCI L	79.5	85.5	110(Class B)
AC com-choke	83.6	88.9	110(Class B)
AC output capacitor C505	76.0	80.6	125
Heatsink	93.5	85.6	100
DC SPS MOS Q356	80.9	87.2	130
Boost 2 diode D151	104.7	90.0	130
Master DSP	75.7	79.3	105
INV-W T4 Q211	105.9	104.6	130
INV-W T1 Q202	104.2	108.2	130
INV-V T4 Q210	104.7	113.3	130
INV-V T1 Q201	95.4	107.4	130

INV-U T4 Q209	107.1	119.5	130
INV-U T1 Q200	95.0	112.4	130
Boost 2 IGBT Q151	115.0	86.8	130
Boost 1 IGBT Q150	116.9	88.4	130
INV-W T3 Q208	92.0	93.1	130
INV-W T2 Q207	86.6	92.4	130
Internal fan	70.6	73.4	80
Internal wire	75.1	80.4	105
AC Y capacitor	74.6	79.5	110
DC connector	65.6	68.1	85
DC SPS transformer TX350	73.2	76.7	110(Class B)
Ambient	36.8	44.8	Ref.
BUS Cap. air	72.4	75.5	105
DC capacitor C104	77.3	76.2	85
DC com-choke	84.6	76.3	110(Class B)
DC capacitor C103	72.8	73.3	85
Driver transformer TX301	74.3	76.2	110(Class B)
Driver transformer TX302	75.7	78.5	110(Class B)
DC SPS capacitor C371	74.0	77.0	105
DC SPS diode D359	88.1	91.4	130
DC SPS D358	73.5	76.7	130
INV HCT402	75.2	84.2	105
LC capacitor C410	68.0	74.9	85
AC relay K501 surface	84.4	83.4	105
External fan	49.1	55.7	70
Supplementary information: Note 1: Run the device at min. MPP input and full load output conditions until steady condition established(no derating below 37°C). Note 2: Run the device at max. MPP input and full load output conditions until steady condition established(no derating below 45°C).			

4.3	**TABLE: heating temperature rise measurements**			P
	test voltage (V)	See Note 1	See Note 2	-
	t1 (°C)	62.2	62.1	-
	t2 (°C)	60.0	60.0	-
Max. temperature T of part/at:		T (°C)		permitted T (°C)
Boost choke 1-1		96.9	69.7	130(Class F)
Mounting surface		81.6	69.2	90
Boost choke 2-1		97.5	70.2	130(Class F)
Front cover		67.4	69.5	100
INV choke U-1		83.7	117.7	130(Class F)
DC switch		65.4	69.7	85
INV choke V-1		88.7	125.0	130(Class F)
Slave DSP		80.5	76.4	85
INV choke W-1		85.0	115.4	130(Class F)
AC output connector		78.1	75.7	85
Isolation opto-couplers		80.1	76.3	85
GFCI L		82.7	83.7	110(Class B)
AC com-choke		84.3	87.7	110(Class B)
AC output capacitor C505		81.0	79.5	125
Heatsink		91.1	90.9	100
DC SPS MOS Q356		88.7	85.5	130

Boost 2 diode D151	102.0	88.1	130
Master DSP	83.3	80.4	105
INV-W T4 Q211	103.3	101.7	130
INV-W T1 Q202	101.6	105.1	130
INV-V T4 Q210	102.2	110.0	130
INV-V T1 Q201	94.7	104.6	130
INV-U T4 Q209	104.4	116.6	130
INV-U T1 Q200	94.6	104.4	130
Boost 2 IGBT Q151	112.1	84.1	130
Boost 1 IGBT Q150	114.1	85.7	130
INV-W T3 Q208	90.3	91.1	130
INV-W T2 Q207	87.2	90.9	130
Internal fan	78.8	74.9	80
Internal wire	79.3	79.8	105
AC Y capacitor	79.8	77.8	110
DC connector	76.2	71.8	85
DC SPS transformer TX350	81.0	77.7	110(Class B)
Ambient	62.2	62.1	Ref.
BUS Cap. air	79.7	75.9	105
DC capacitor C104	79.8	74.8	85
DC com-choke	82.2	75.2	110(Class B)
DC capacitor C103	78.9	74.4	85
Driver transformer TX301	80.5	76.7	110(Class B)
Driver transformer TX302	81.1	78.0	110(Class B)
DC SPS capacitor C371	81.6	77.9	105
DC SPS diode D359	95.7	92.4	130
DC SPS D358	81.0	77.3	130
INV HCT402	80.4	84.7	105
LC capacitor C410	77.8	77.0	85
AC relay K501 surface	84.5	84.9	105
External fan	66.8	67.5	70
Supplementary information: Note 1: Run the device at min. MPP input and full load output conditions until steady condition established (derating at 60°C). Note 2: Run the device at max. MPP input and full load output conditions until steady condition established (derating at 60°C).			

4.4.4.8	**TABLE: Cooling system failure**			P
	test voltage (V)	See Note 1	See Note 2	-
	t1 (°C)	37.4	39.5	-
	t2 (°C)	-	-	-
Max. temperature T of part/at:		T (°C)		permitted T (°C)
Boost choke 1-1		91.8	95.1	-
Mounting surface		82.6	77.8	90
Boost choke 2-1		93.4	96.1	-
Front cover		63.8	55.4	100
INV choke U-1		82.1	77.4	-
DC switch		65.5	66.3	-
INV choke V-1		85.4	84.2	-
Slave DSP		74.2	63.8	-
INV choke W-1		82.9	77.6	-
AC output connector		72.6	67.9	-

Isolation opto-couplers	75.1	69.5	-
GFCI L	78.4	78.1	-
AC com-choke	80.7	82.2	-
AC output capacitor C505	77.0	73.9	-
Heatsink	91.2	94.3	100
DC SPS MOS Q356	81.0	74.5	-
Boost 2 diode D151	100.8	106.2	-
Master DSP	78.7	71.8	-
INV-W T4 Q211	103.7	103.4	-
INV-W T1 Q202	100.7	99.1	-
INV-V T4 Q210	101.0	96.4	-
INV-V T1 Q201	93.9	91.6	-
INV-U T4 Q209	103.4	99.4	-
INV-U T1 Q200	93.8	90.0	-
Boost 2 IGBT Q151	114.9	116.7	-
Boost 1 IGBT Q150	115.6	113.1	-
INV-W T3 Q208	92.8	90.7	-
INV-W T2 Q207	86.6	83.1	-
Internal fan	73.4	67.5	-
Internal wire	73.7	72.4	-
AC Y capacitor	75.1	67.2	-
DC connector	68.8	62.5	-
DC SPS transformer TX350	75.6	69.5	-
Ambient	37.4	39.5	-
BUS Cap. air	75.0	69.6	-
DC capacitor C104	78.4	76.0	-
DC com-choke	82.2	85.6	-
DC capacitor C103	75.3	70.9	-
Driver transformer TX301	76.6	72.0	-
Driver transformer TX302	77.2	72.9	-
DC SPS capacitor C371	76.3	70.6	-
DC SPS diode D359	90.5	84.6	-
DC SPS D358	75.8	70.0	-
INV HCT402	76.4	69.7	-
LC capacitor C410	73.0	65.5	-
AC relay K501	83.8	88.1	-
External fan	59.9	45.1	-
Supplementary information: Note 1: Run the device at min. MPP input and full load output conditions until steady condition established (blanketing test). Note 2: Run the device at min. MPP input and full load output conditions until steady condition established (one temperature sensor fault). Note 3: No over temperature observed in components, no other hazard observed.			

4.4.4.8	**TABLE: Cooling system failure**			P
	test voltage (V)	See Note 1	See Note 2	—
	t1 (°C)	36.2	43.3	—
	t2 (°C)	-	-	—
Max. temperature T of part/at:		T (°C)		permitted T (°C)
Boost choke 1-1		86.1	65.0	-
Mounting surface		69.6	63.6	90
Boost choke 2-1		80.3	66.5	-
Front cover		54.0	60.4	100

INV choke U-1	67.0	98.8	-
DC switch	62.0	66.9	-
INV choke V-1	72.4	109.6	-
Slave DSP	65.2	71.5	-
INV choke W-1	72.2	109.0	-
AC output connector	63.3	70.2	-
Isolation opto-couplers	67.5	73.0	-
GFCI L	67.6	75.4	-
AC com-choke	71.0	77.8	-
AC output capacitor C505	69.1	75.5	-
Heatsink	91.4	93.7	100
DC SPS MOS Q356	71.1	78.6	-
Boost 2 diode D151	88.8	86.0	-
Master DSP	70.4	76.6	-
INV-W T4 Q211	101.0	100.5	-
INV-W T1 Q202	99.3	103.1	-
INV-V T4 Q210	99.3	106.5	-
INV-V T1 Q201	97.1	107.3	-
INV-U T4 Q209	101.0	112.5	-
INV-U T1 Q200	95.4	106.5	-
Boost 2 IGBT Q151	94.0	81.2	-
Boost 1 IGBT Q150	108.1	82.9	-
INV-W T3 Q208	90.8	90.8	-
INV-W T2 Q207	87.3	91.5	-
Internal fan	65.6	71.3	-
Internal wire	63.8	70.8	-
AC Y capacitor	65.9	72.9	-
DC connector	60.8	66.2	-
DC SPS transformer TX350	66.8	72.9	-
Ambient	36.2	43.3	-
BUS Cap. air	66.9	72.1	-
DC capacitor C104	67.6	70.7	-
DC com-choke	70.3	71.3	-
DC capacitor C103	65.8	70.1	-
Driver transformer TX301	68.6	73.9	-
Driver transformer TX302	69.9	75.7	-
DC SPS capacitor C371	67.6	73.4	-
DC SPS diode D359	75.8	81.9	-
DC SPS D358	68.9	74.4	-
INV HCT402	65.6	76.1	-
LC capacitor C410	62.9	71.4	-
AC relay K501	71.3	79.2	-
External fan	61.3	67.8	-
Supplementary information: Note 1: Run the device at min. MPP input and full load output conditions until steady condition established (one external fan disconnected). Note 2: Run the device at max. MPP input and full load output conditions until steady condition established (one internal fan disconnected). Note 3: No over temperature observed in components, no other hazard observed.			

4.4	**TABLE: fault condition tests**		P
	ambient temperature (°C) ..... :	25°C	—

No.	component No.	fault	test voltage (V)	test time	fuse No.	fuse current (A)	result
Input and output fault							
1	AC output	Overload	Refer to above table	Steady condition	-	-	Inverter output at 20.4kW, work normally. During the test the components are within limits, temperature of components refer to heating test, no hazard.
2	DC+ to DC-	Reverse	MAINS:400 PV: 800	10min	-	-	Inverter can not start up. No output power feed into grid. No components damage, no hazard.
3	Output L to L	Short	MAINS:400 PV: 800	10min	-	-	Inverter stop operation immediately after short-circuit. No output power feed into grid. No components damage, no hazard. 107.2A peak, total duration 17ms.
4	Output L to N	Short	MAINS:400 PV: 800	10min	-	-	Inverter stop operation immediately after short-circuit. No output power feed into grid. No components damage, no hazard. 107.2A peak, total duration 22ms.
5	Output L to G	Short	MAINS:400 PV: 800	10min	-	-	Inverter stop operation immediately after short-circuit. No output power feed into grid. Warning NO.165: Ground connect warning No components damage, no hazard.
6	DC+ to DC -	Short	MAINS:400 PV: 800	10min	-	-	Inverter stop operation immediately after short-circuit. No backfeed current observed to PV side. No output power feed into grid. No components damage, no hazard.
7	DC source disconnected	Disconnected without additional fault	MAINS:400 PV: 0	10min	-	-	Inverter stop operation immediately due to DC under voltage. No backfeed voltage observed onto PV side. No output power feed into grid. No components damage, no hazard.
8	DC source disconnected	IGBT shorted	MAINS:400 PV: 0	10min	-	-	Inverter stop operation immediately due to DC under voltage. No backfeed voltage observed onto PV side. No output power feed into grid. No components damage, no hazard.
9	Mains outage	Disconnected	MAINS:0 PV: 800	10min	-	-	Inverter shut down for immediately due to islanding detection.No backfeed voltage observed onto Mains side.No output no power feed into grid.Error message: Utility Loss. No components damage, no hazard.
10	Mains outage	IGBT shorted	MAINS:0 PV: 800	10min	-	-	Inverter damaged and shut down immediately.No backfeed voltage observed onto Mains side. No output power feed into grid, no hazard.

11	L1/L2/L3	Reversed	MAINS:400 PV: 800	10min	-	-	The inverter operated normally.
Components single fault condition and Functional insulation on PWB short circuit test							
12	Y1 capacitor, C200	Short	MAINS:400 PV: 800	10min	-	-	PV inverter shut down immediately. Red fault LED light. No components damage, no hazard.
13	Bus-capacitor, C209	Short	MAINS:400 PV: 800	10min	-	-	PV inverter stop operation immediately after short-circuit. No output power feed into grid. C149 damaged, no hazard.
14	TX350, pin 13– pin 14	Short	MAINS:400 PV: 800	10min	-	-	PV inverter shut down. LED Off. No components damage, no hazard.
15	TX350, pin 11 – pin 12	Short	MAINS:400 PV: 800	10min	-	-	PV inverter shut down. LED Off. No components damage, no hazard.
16	TX350-EI28, pin 1 – pin 3	Short	MAINS:400 PV: 800	10min	-	-	PV inverter shut down. LED Off. No components damage, no hazard.
17	TX300-EI28, pin 9 – pin 10	Short	MAINS:400 PV: 800	10min	-	-	PV inverter shut down. LED Off. No components damage, no hazard.
18	Boost IGBT Q150, C-E	Short	MAINS:400 PV: 800	10min	-	-	PV inverter PV1 stop working, PV2 works normally. No fault information. No components damage, no hazard.
19	Boost IGBT Q150, G-E	Short	MAINS:400 PV: 800	10min	-	-	PV inverter PV1 stop working, PV2 works normally. No fault information. No components damage, no hazard.
20	Boost Diode D151	Short	MAINS:400 PV: 800	10min	-	-	Normal operation. No other components damage, no hazard.
21	Boost IGBT Q151, C-E	Short	MAINS:400 PV: 800	10min	-	-	PV inverter PV2 stop working, PV1 works normally. No fault information. No components damage, no hazard.
22	Boost IGBT Q151, G-E	Short	MAINS:400 PV: 800	10min	-	-	PV inverter PV2 stop working, PV1 works normally. No fault information. No components damage, no hazard.
23	Boost Diode D150	Short	MAINS:400 PV: 800	10min	-	-	Normal operation. No other components damage, no hazard.
24	INV IGBT Q200, C-E	Short	MAINS:400 PV: 800	10min	-	-	PV inverter shut down immediately. Red fault LED light, The fault information" 6409 interference of device". No components damage, no hazard.
25	INV IGBT Q210, C-E	Short	MAINS:400 PV: 800	10min	-	-	PV inverter shut down immediately. Red fault LED light, The fault information "6409 interference of device". No components damage, no hazard.
26	INV IGBT Q208. C-E	Short	MAINS:400 PV: 800	10min	-	-	PV inverter shut down immediately. Red fault LED light, The fault information "6409 interference of device". No components damage, no hazard.
Relay control circuit							

27	Relay K501	Short before start-up	MAINS:400 PV: 800	10min	-	-	PV inverter could not start. Red fault LED light, The fault information" Relay check Fail". No components damage, no hazard.
28	Relay K503	Short before start-up	MAINS:400 PV: 800	10min	-	-	PV inverter could not start. Red fault LED light, The fault information" Relay check Fail". No components damage, no hazard.
29	Relay K505	Short before start-up	MAINS:400 PV: 800	10min	-	-	PV inverter could not start. Red fault LED light, The fault information" Relay check Fail". No components damage, no hazard.
30	Relay K507	Short before start-up	MAINS:400 PV: 800	10min	-	-	PV inverter could not start. Red fault LED light, The fault information" Relay check Fail". No components damage, no hazard.
31	Relay K509	Short before start-up	MAINS:400 PV: 800	10min	-	-	PV inverter could not start. Red fault LED light, The fault information" Relay check Fail". No components damage, no hazard.
32	Relay K511	Short before start-up	MAINS:400 PV: 800	10min	-	-	PV inverter could not start. Red fault LED light, The fault information" Relay check Fail". No components damage, no hazard.
33	Relay driver R541	Open before start-up	MAINS:400 PV: 800	10min	-	-	PV inverter could not start. Red fault LED light, The fault information" Relay check Fail". No components damage, no hazard.
34	Relay driver R544	Open before start-up	MAINS:400 PV: 800	10min	-	-	PV inverter could not start. Red fault LED light, The fault information" Relay check Fail". No components damage, no hazard.
35	Relay driver Q504	Short before start-up	MAINS:400 PV: 800	10min	-	-	PV inverter could not start. Red fault LED light, The fault information" Relay check Fail". No components damage, no hazard.
36	Relay driver Q505	Short before start-up	MAINS:400 PV: 800	10min	-	-	PV inverter could not start. Red fault LED light, The fault information" Relay check Fail". No components damage, no hazard.
ISO detect circuit							

37	PV array insulation resistance monitoring, Q552, C to E	Short before start-up	MAINS:400 PV: 800	10min	-	-	PV inverter could not start. Red fault LED light, The fault information" Isolation Fault". No components damage, no hazard.
38	PV array insulation resistance monitoring, R583	Open before start-up	MAINS:400 PV: 800	10min	-	-	PV inverter could not start. Red fault LED light, The fault information" Isolation Fault". No components damage, no hazard.
39	PV array insulation resistance monitoring, R550	Open before start-up	MAINS:400 PV: 800	10min	-	-	PV inverter could not start. Red fault LED light, The fault information" Isolation Fault". No components damage, no hazard.
40	PV array insulation resistance monitoring, R557	Short before start-up	MAINS:400 PV: 800	10min	-	-	PV inverter works normally. No other components damage, no hazard.
41	PV array insulation resistance monitoring, R559	Short before start-up	MAINS:400 PV: 800	10min	-	-	PV inverter could not start. Red fault LED light, The fault information" Isolation Fault". No components damage, no hazard.
42	PV array insulation resistance monitoring, R570	Open before start-up	MAINS:400 PV: 800	10min	-	-	PV inverter could not start. Red fault LED light, The fault information" Isolation Fault". No components damage, no hazard.
43	PV array insulation resistance monitoring, RY550 (Pin5-8)	Short before start-up	MAINS:400 PV: 800	10min	-	-	PV inverter could not start. Red fault LED light, The fault information" Isolation Fault". No components damage, no hazard.
44	PV array insulation resistance monitoring, RY551 (Pin3-4)	Short before start-up	MAINS:400 PV: 800	10min	-	-	PV inverter could not start. Red fault LED light, The fault information" Isolation Fault". No components damage, no hazard.
45	PV array insulation resistance monitoring, C554	Short before start-up	MAINS:400 PV: 800	10min	-	-	PV inverter works normally. No other components damage, no hazard.
RCD detect circuit							
46	RCMU detect, Q402	Short before start-up	MAINS:400 PV: 800	10min	-	-	PV inverter could not start to work. Red fault LED light. The Warning information "Ground connect warning". No components damage, no hazard.

47	RCMU detect, R423	Open before start-up	MAINS:400 PV: 800	10min	-	-	PV inverter could not start to work. Red fault LED light. The Warning information “Ground connect warning”. No components damage, no hazard.
48	RCMU detect, R425	Open before start-up	MAINS:400 PV: 800	10min	-	-	PV inverter could not start to work. Red fault LED light. The Warning information “Ground connect warning”. No components damage, no hazard.
49	RCMU detect, R441	Open before start-up	MAINS:400 PV: 800	10min	-	-	PV inverter could not start to work. Red fault LED light. The Warning information “Ground connect warning”. No components damage, no hazard.
50	RCMU detect, C433	Short before start-up	MAINS:400 PV: 800	10min	-	-	PV inverter could not start to work. Red fault LED light. The Warning information “Ground connect warning”. No components damage, no hazard.
CPU circuit							
51	Main CPU, U516	Short +3.3V power supply pin to GND	MAINS:400 PV: 800	10min	-	-	PV inverter shut down immediately. DSP protect by itself for low voltage No components damage, no hazard. Inverter can be restarted and operated normally when the fault was removed.
52	Main CPU, U516	Short +1.2V power supply pin to GND	MAINS:400 PV: 800	10min	-	-	PV inverter shut down immediately. DSP protect by itself for low voltage No components damage, no hazard. Inverter can be restarted and operated normally when the fault was removed.
53	Main CPU, U516	Oscillator short	MAINS:400 PV: 800	10min	-	-	PV inverter shut down immediately. LED Off. No components damage, no hazard. Inverter can be restarted and operated normally when the fault was removed.
54	Communication between DSPs, R667	Open	MAINS:400 PV: 800	10min	-	-	PV inverter shut down immediately. LED indicator On/Off flash alternatively. No components damage, no hazard.
55	Slave CPU, U523	Short +3.3V power supply pin to GND	MAINS:400 PV: 800	10min	-	-	PV inverter shut down immediately. DSP protect by itself for low voltage.No components damage, no hazard. Inverter can be restarted and operated normally when the fault was removed.

Supplementary information:
Note 1: All single fault tests were carried out by a 30A non-time delay fuse connected between the protective earthing terminal and the protective earthing conductor in the test setup which had not opened during the tests. All single fault tests were conducted with the AC output protected by external circuit breaker provided in all live connections to the AC supply.
Note 2: Pass the dielectric strength test of basic insulation test voltage for accessible DVC-A, reinforced or double Insulation and basic insulation in protective class I equipment.

Note 3: The equipment was placed on white tissue-paper covering a softwood surface and covering the equipment with cheesecloth during the fault testing, no emission of molten metal, burning insulation, or flaming or glowing particles from the fire enclosure, and there was no charring, glowing, or flaming of the cheesecloth.

Note 4: No other hazard(e.g. chemical, expulsion) observed after each test, SC=Short circuit, OC=Open circuit, OV=Over voltage, OL=Over load.

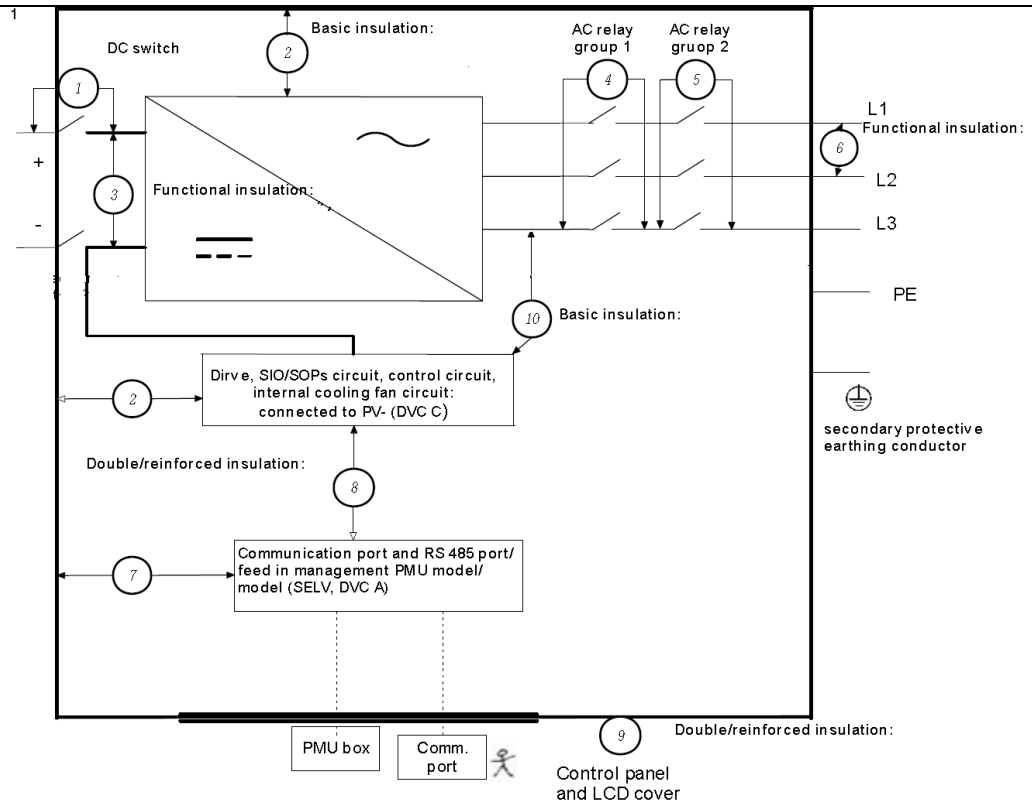
7.3.6.3.7	**TABLE: touch current measurement**	P (Note 1)

Measured between:	Measured (mA)	Limit (mA)	Comments/conditions
means of connection for the external protective earthing conductor and the external protective earthing conductor itself	4.5	3.5	after clause 4.3, thermal testing and 4.5, single fault condition test
means of connection for the external protective earthing conductor and the external protective earthing conductor itself	4.5	3.5	after clause 7.5.2.3, Humidity pre-conditioning
means of connection for the external protective earthing conductor and the external protective earthing conductor itself	4.5	3.5	after clause 6.3, IP65 test

Supplementary information

Note 1: Symbol 15 of Annex C marked and a second protective earthing conductor is to be installed.

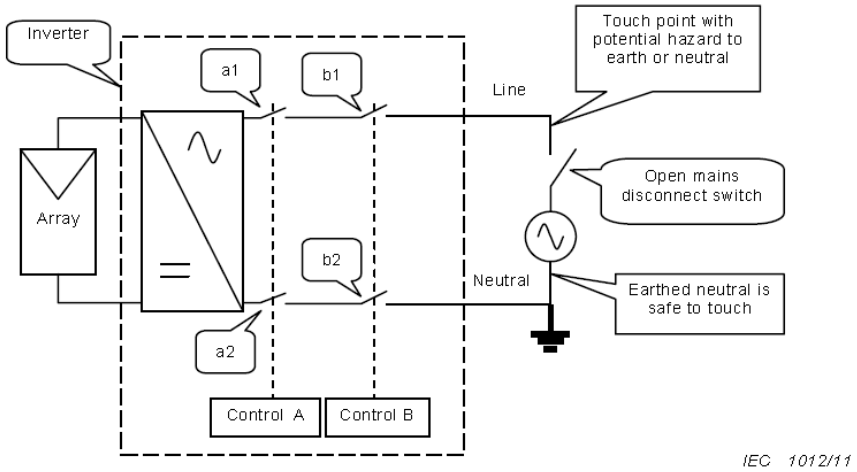
7.3.7	**TABLE: clearance and creepage distance measurements**	P
Insulation diagram		



Transformer-less inverter insulation diagram

Isolation components and areas:

Area	Comments
Insulation area 2&6: Across DC+ to DC-, AC L1 to L2, L2 to L3, (FI)	In this insulation, it should be separated from each other terminals only by functional insulation required. And in this case, the overvoltage category that applies to functional insulation within each circuit is one category lower than the overvoltage category that applies from the circuit to earth. The inverter is not provided with internal isolation transformer and is not constructed of galvanic isolation from the MAINS to the PV generator circuit. Insulation voltage for insulation barrier is taken to be 440/253V a.c./OVC II(MAINS) and 1100V d.c./OVC I(PV), which is the worst case. Clearance distance is determined based on impulse voltage rating of the combined PV & Mains circuit of which is the worst case, whereas the overvoltage category of PV circuit is I and Mains circuit is II. So the impulse voltage is determined 3079V. Creepage distance is determined based on working voltage occurred by design in a circuit or across insulation at rated supply conditions and worst case operating conditions, which is worst case: Vmax PV=1100V. Insulation area exists on PCB 270-13600-00.
Insulation area 3&7: Across power circuit, drive, SIO/SOPs circuit, control circuit to earth(BI);	The inverter is not provided with internal isolation transformer and is not constructed of galvanic isolation from the MAINS to the PV generator circuit. Insulation voltage for insulation barrier is taken to be 440/253V a.c./OVC III(MAINS) and 1100V d.c./OVC II(PV), which is the worst case. Power circuit is classed as DVC C circuit, so accessible earthed conductive parts shall be separated from DVC C circuit by at least basic insulation and

	accessible un-earthed conductive parts shall be separated from DVC C circuit by reinforced or double insulation or by protective separation. All accessible insulation material shall be at least reinforced or double insulation from DVC C circuit. In this insulation, the case of inverter is reliably connected to earth, so it should be separated from power circuit only by basic insulation required. Clearance distance is determined based on impulse voltage rating of the combined PV&Mains circuit of which is the worst case, whereas the overvoltage category of PV circuit is II and Mains circuit is III. So the impulse voltage is determined 4772V. Creepage distance is determined based on working voltage occurred by design in a circuit or across insulation at rated supply conditions and worst case operating conditions, which is worst case: Vmax PV=1100V, Vmax Mains=440/253V. This insulation barrier 3&7 provides basic insulation. Insulation area exists on PCB 270-13600-00.
Insulation area 4&5: Across contacts of relays(BI)	The inverter is not provided with internal isolation transformer and is not constructed of galvanic isolation from the MAINS to the PV generator circuit. Insulation voltage for insulation barrier is taken to be 1100V d.c./OVC II(PV). In this insulation, it is required the design to provide basic insulation after application of a single fault, in order to protect against shock hazard from the PV voltage for someone working on the mains circuits. In this topology, achieving the required fault tolerant automatic disconnection means is to use 2 relays in series on both L and N conductors. The required single-fault tolerance can then be arranged by having 2 separate relay control circuits (Control A and B, see below figure) each controlling one group of relays. In any single fault scenario involving one control circuit or one relay, there will still be at least one group of relays in the conductor that can properly open to isolate both mains circuit conductors from the inverter and therefore from the array, so it is required the total clearance in one group of relays should be meet at least basic insulation.  Clearance distance is determined based on impulse voltage rating of the combined PV circuit, whereas the overvoltage category of PV circuit is II. So the impulse voltage is determined min. 4772V. Creepage distance is determined based on working voltage occurred by design in a circuit or across insulation at rated supply conditions and worst case operating conditions, which is worst case: Vmax PV=1100V, Vmax

	Mains=440/253V. This insulation barrier 4&5 provides basic insulation. 2 pieces VDE approved series relays used for L1/L2/L3 conductors. Isolation barrier across contacts of automatic disconnecting means, the required total clearance is 4.0*1.14=4,6 mm, creepage is 5.6 mm divided between the air gaps in the two remaining relays, complies with basic insulation corresponding to PV system impulse voltage. Distance between contacts at least 2.3 mm, cr. at least 2.8 mm for one relay contact, pls. see specification of relay and data form for electrical and electronic component. Insulation area exists on AC output part of PCB 270-13600-00.
Insulation area 8: Between Drive, SIO/SOPs circuit, control circuit to communication port (RI)	The inverter is not provided with internal isolation transformer and is not constructed of galvanic isolation from the MAINS to the PV generator circuit. Insulation voltage for insulation barrier is taken to be 440/253V a.c./OVC III(MAINS) and 1100V d.c./OVC II(PV), which is the worst case. Communication circuit is classed as DVC A circuit(PELV) and operator is accessible, so it shall be separated from Drive, SIO/SOPs circuit, control circuit(DVC C) by at least double/reinforced insulation. Clearance distance is determined based on impulse voltage rating of the combined PV&Mains circuit of which is the worst case, whereas the overvoltage category of PV circuit is II and Mains circuit is III. So the impulse voltage is determined min. 4772V for individual basic and supplementary insulation, and 6772V for reinforced insulation. Creepage distance is determined based on working voltage occurred by design in a circuit or across insulation at rated supply conditions and worst case operating conditions, which is worst case: V assumed<1100V. This insulation barrier 8 provides reinforced insulation. Insulation area exists on communication part of PCB 270-13600-00.
Insulation area 9: Between internal live parts to LED cover(RI)	The inverter is not provided with internal isolation transformer and is not constructed of galvanic isolation from the MAINS to the PV generator circuit. Insulation voltage for insulation barrier is taken to be 440/253V a.c./OVC III(MAINS) and 1100V d.c./OVC II(PV), which is the worst case. LED cover is operator accessible, so it shall be separated from DVC C circuit by at least double/reinforced insulation. Clearance distance is determined based on impulse voltage rating of the combined PV&Mains circuit of which is the worst case, whereas the overvoltage category of PV circuit is II and Mains circuit is III. So the impulse voltage is determined min. 6772V. Creepage distance is determined based on working voltage occurred by design in a circuit or across insulation at rated supply conditions and worst case operating conditions, which is worst case: V assumed<1100V. This insulation barrier 9 provides reinforced insulation. Insulation area exists on LED cover.

clearance cl and creepage distance dcr at / of:	Upeak (V)	U r.m.s. (V)	required cl (mm)	cl (mm)	required dcr (mm)	dcr (mm)
Across power circuit different polarity (FI)	<DC1100 <AC623	<DC1100 <AC440	2.4	See below	5.6 (PV) 2.4 (Mains)	See below
- PV+ / PV-, BUS+ / BUS- via PCB trace	<DC1100	<DC1100	2.4	5.7	5.6	5.7
- U/V/W/N via PCB trace	<AC623	<AC440	2.4	2.7	2.4	2.7

- PV+ / PV-, U/V/W/N via other insulator	<DC1100 <AC623	<DC1100 <AC440	2.4	≥2.4	11.0	≥11.0
Across power circuit, drive, SIO/SOPs circuit, control circuit, display circuit to earth(BI)	<DC1100 <AC623	<DC1100 <AC440	4.6	See below	5.6 (PV) 4.6 (Mains)	See below
- power circuit on PV side via PCB trace to earth	<DC1100	<DC1100	4.6	5.7	5.6	5.7
- power circuit on BUS side via PCB trace to earth	<DC1100	<DC1100	4.6	5.7	5.6	5.7
- power circuit on Mains side via PCB trace to earth	<AC623	<AC440	4.6	5.0	4.6	5.0
- drive, SIO/SOPs circuit via PCB trace to earth	<DC1100 <AC623	<DC1100 <AC440	4.6	5.7	5.6	5.7
- control circuit, display circuit via PCB trace to earth	<DC1100 <AC623	<DC1100 <AC440	4.6	5.7	5.6	5.7
- power circuit on Mains and PV side via other insulator to earth	<DC1100 <AC623	<DC1100 <AC440	4.6	≥4.6	11.0	≥11.0
Across contacts of relays(BI)	<DC1100 <AC623	<DC1100 <AC440	4.6	See below	5.6	See below
- on in series relays K501, K503, K505, K507, K509, K511	<DC1100 <AC623	<DC1100 <AC440	4.6	≥4.6	5.6	≥5.6
Across power circuit, drive, SIO/SOPs circuit, control circuit to communication port (PELV, DVC A)(RI)	<DC1100 <AC623	<DC1100 <AC440	7.4	See below	11.1 (PV) 7.4 (Mains)	See below
- via PCB tracks shortest way	<DC1100 <AC623	<DC1100 <AC440	7.4	11.5	11.1	11.5
- on isolating transformer TX350	<DC1100 <AC623	<DC1100 <AC440	7.4	12.0	11.1	12.0
-on isolating IC of U652	<DC1100 <AC623	<DC1100 <AC440	7.4	8.0	7.4(PD1)	8.0
Between internal live parts to LED cover(RI)	<DC1100 <AC623	<DC1100 <AC440	7.4	See below	Other insulator: 20.0	See below
- on live parts to external plastic surface	<DC1100 <AC623	<DC1100 <AC440	7.4	>20.0	20.0	>20.0
Supplementary information: Note 1: Maximum operation altitude: 3000 m as specified in instruction manual, altitude correction factor for clearances is 1.14. Note 2: Allowable limits for cl. and cr. are taken consideration into requirements as specified in IEC 62109-1(ed.1), EN 62109-1:2010, IEC 62109-2(ed.1), EN 62109-2:2011, which is worst case.						

Note 3: U652 potted by epoxy, and pass the type 1 test according to IEC 60664-3:2016.

7.3.7	**TABLE: distance through insulation measurement**				P
distance through insulation di at/of:		U r.m.s. (V)	test voltage (V)	required di (mm)	di (mm)
Isolated IC U652 (RI)		<DC 1100 <AC 440/253	AC 3000/ DC 4240V	0.2	>0.2
LED cover (RI)		<DC 1100 <AC 440/253	Ditto	0.2	2.2
Insulation sheet between primary winding and secondary winding of transformer TX350(DI, two layers insulation sheet+ Insulation tube on triple insulated primary winding)		<DC 1100 <AC 440/253	Ditto	-	0.1x2+0.1 =0.3
Epoxy resin used to fill inverter and boost inductor (BI)		<DC 1100 <AC 440/253	AC 1500/ DC 2120	-	>0.4
Insulation pad under inverter and boost inductor (BI)		<DC 1100 <AC 440/253	Ditto	-	0.5
Insulation sheet between diode body and heatsink (BI)		<DC 1100 <AC 440/253	Ditto	-	0.15
Insulation tube on communication cable (BI)		<DC 1100 <AC 440/253	Ditto	-	0.44
Insulation tube on DC Fan power cable (BI)		<DC 1100 <AC 440/253	Ditto	-	0.44
Internal power cable (BI)		<DC 1100 <AC 440/253	Ditto	-	
Supplementary information:					

7.5	**TABLE: electric strength measurements, impulse voltage test and partial discharge test**				P
test voltage applied between:		test voltage (V)	impulse withstand voltage (V)	partial discharge extinction voltage (V)	result
Insulation area 2&6: Across DC+ to DC-, AC L1 to L2, L2 to L3, (FI), note 1		N/A, note 5	N/A, note 5	N/A, note 5	N/A, note 5
Insulation area 3&7: Across power circuit, drive, SIO/SOPs circuit, control circuit to earth(BI), note 1		AC 1500/ DC 2120, Note 6, note 3	4772(for cl. verification)/ 6000(for components), Note 6, note 3	N/A, note 4	P
Insulation area 4+5: Across contacts of relays(BI+SI), note 1		AC 1500/ DC 2120, Note 6, note 3	4772(for cl. verification)/ 6000(for components), Note 6, note 3	N/A, note 4	P

Insulation area 8: Between Drive, SIO/SOPs circuit, control circuit to communication port (RI), note 1	AC 3000/ DC 4240, Note 2, note 3	6772(for cl. verification)/ 8000(for components), Note 2, note 3	Upd:1100V, note 4	P
Insulation area 9: Across internal live parts to control panel to LED cover(RI), note 1	AC 3000/ DC 4240, Note 2, note 3	6772(for cl. verification)/ 8000(for components), Note 2, note 3	N/A, note 4	P

Supplementary information:

Note 1: See also insulation diagram incorporated in table clearance and creepage distance measurements.

Note 2: Impulse withstand voltage is 6772(for cl. verification)/ 8000(for components), and dielectric strength test voltage is AC 3000V/DC 4240V, the test voltage in above table shows the actual voltage applied for described insulation barriers.

Note 3: Voltage test (dielectric strength test) was performed after:

1) Humidity pre-conditioning as specified in clause 4.5 of IEC 62109-1(ed.1)/EN 62109-1(2010);
The device is classed IP65 for outdoor use. The Voltage test was performed immediately after the humidity pre-conditioning.
2) Thermal testing as specified in clause 4.3 of IEC 62109-1(ed.1)/EN 62109-1(2010);
3) Testing in single fault condition as specified in clause 4.4 of IEC 62109-1(ed.1)/EN 62109-1(2010);
4) IP65 test as specified in clause 6.3 of IEC 62109-1(ed.1)/EN 62109-1(2010);
5) Mechanical resistance to deflection, impact, or drop as specified in clause 13.7 of IEC 62109-1(ed.1)/EN 62109-1(2010).

Note 4: Protection seperation shall withstand the partial discharge test according to 7.5.3, only if the recurring peak working voltage across the insulation is greater than 700 V and the voltage stress on the insulation is greater than 1 kV/mm, so rated discharge voltage is equal to sum of the recurring peak voltages in each of the circuits separated by the insulation.

Note 5: Functional insulation shall comply with the requirements of clause 7.3.7.3. For parts or circuits in overvoltage category II, III, or IV, functional insulation is designed according to the applicable impulse voltage as determined by 7.3.7.1.4.Testing is not required. See cl. and cr. distance for functional insualtion.

Note 6: Impulse withstand voltage is 4772(for cl. verification)/ 6772(for components), and dielectric strength test voltage is AC 1500V/DC 2120V, the test voltage in above table shows the actual voltage applied for described insulation barriers.

Note 7: To make sure that this voltage in not stress on basic or supplementary insulation barriers and non-applied insulating area are accidentally tested, this test is applied on individual parts only.

14	**TABLE: list of critical components(See data form for electrical and electronic component)**				P
object/part No.	manufacturer/ trademark	type/model	technical data	standard	mark(s) of conformity[1])

[1]) an asterisk indicates a mark which assures the agreed level of surveillance

Additional tests based on first modification:

4.7	**TABLE: mains supply electrical data in normal condition**					P
Type	U (V) DC	I (A) DC	P (W) DC	U (V) grid	I (A) AC	P (W) AC
Model: ASW20K-LT-G2 Pro						
Min. MPP voltage	420.3*2	23.8*2	19958	201.1*3	32.0*3	19331
Min. MPP voltage	412.1*2	25.6*2	20588	230.9*3	28.8*3	19974
Max. MPP voltage	859.1*2	11.4*2	19996	201.1*3	32.0*3	19326
Max. MPP voltage	848.2*2	12.0*2	20449	230.9*3	28.7*3	19896
Max PV current	471.3*2	32.0*1/11.0	20053	208.2*3	31.7*3	19834
Model: ASW17K-LT-G2 Pro						
Min. MPP voltage	417.8*2	21.6*2	17415	200.9*3	27.2*3	16376
Min. MPP voltage	400.8*2	21.7*2	17454	230.8*3	24.5*3	16970
Max. MPP voltage	888.1*2	9.6*2	16987	200.9*3	27.2*3	16439
Max. MPP voltage	850.6*2	10.6*2	17455	230.8*3	24.5*3	17007
Max PV current	471.3*2	32.0/4.1	17112	208.2*3	27.1*3	16952
Model: ASW15K-LT-G2 Pro						
Min. MPP voltage	426.8*2	16.2*2	14772	200.8*3	23.9*3	14432
Min. MPP voltage	400.1*2	19.1*2	15373	230.7*3	21.5*3	14935
Max. MPP voltage	886.6*2	8.3*2	14935	200.8*3	24.1*3	14523
Max. MPP voltage	848.5*2	8.9*2	15339	230.7*3	21.6*3	14952
Max PV current	470.1*2	31.6/1.0	15398	230.7*3	21.6*3	14975
Model: ASW13K-LT-G2 Pro						
Min. MPP voltage	427.1*2	13.7*2	12950	200.6*3	20.7*3	12487
Min. MPP voltage	399.9*2	16.5*2	13275	230.6*3	18.6*3	12915
Max. MPP voltage	888.1*2	6.9*2	12100	200.7*3	20.7*3	12498
Max. MPP voltage	850.4*2	7.7*2	13174	230.6*3	18.7*3	12975
Max PV current	420.9*1	31.9*1	13284	200.6*3	20.6*3	12345
Model: ASW12K-LT-G2 Pro						
Min. MPP voltage	427.3*2	12.5*2	11676	200.6*3	19.2*3	11528
Min. MPP voltage	399.8*2	15.2*2	12228	230.5*3	17.1*3	11810
Max. MPP voltage	897.9*2	6.5*2	11874	200.6*3	19.2*3	11562
Max. MPP voltage	849.8*2	7.1*2	12089	230.5*3	17.2*3	11965
Max PV current	384.4*1	32.0*1	12263	230.5*3	17.2*3	11980
Model: ASW10K-LT-G2 Pro						
Min. MPP voltage	430.9*2	11.4*2	9886	200.5*3	16.0*3	9651
Min. MPP voltage	398.8*2	12.7*2	10124	230.4*3	14.4*3	9969

Max. MPP voltage	904.2*2	5.5*2	9885	200.5*3	16.1*3	9689
Max. MPP voltage	854.8*2	5.9*2	10124	230.4*3	14.4*3	10005
Max PV current(16A)	641.3*1	15.9*1	10198	230.4*3	14.5*3	10010
Model: ASW8K-LT-G2 Pro						
Min. MPP voltage	435.0*2	9.1*2	7953	200.4*3	12.8*3	7710
Min. MPP voltage	400.4*2	10.2*2	8168	230.3*3	11.5*3	7979
Max. MPP voltage	903.2*2	4.4*2	7850	200.4*3	12.8*3	7747
Max. MPP voltage	852.6*2	4.7*2	8097	230.3*3	11.5*3	8015
Max PV current	516.3*1	15.9*1	8197	230.3*3	11.5*3	7997
Model: ASW6K-LT-G2 Pro						
Min. MPP voltage	286.5*2	10.4*2	5983	200.3*3	9.5*3	5721
Min. MPP voltage	268.8*2	11.5*2	6160	230.3*3	8.6*3	5914
Max. MPP voltage	901.1*2	3.3*2	6028	200.3*3	9.6*3	5757
Max. MPP voltage	854.6*2	3.6*2	6180	230.3*3	8.6*3	5954
Max PV current(16A)	388.9*1	15.9*1	6176	230.3*3	8.7*3	5993
Model: ASW5K-LT-G2 Pro						
Min. MPP voltage	287.8*2	8.7*2	4989	200.2*3	7.9*3	4778
Min. MPP voltage	267.4*2	9.7*2	5160	230.3*3	7.2*3	4956
Max. MPP voltage	915.4*2	2.8*2	5076	200.4*3	8.0*3	4808
Max. MPP voltage	854.1*2	3.1*2	5210	230.2*3	7.2*3	4989
Max PV current(16A)	325.6*1	15.9*1	5175	230.3*3	7.2*3	4993
Model: ASW4K-LT-G2 Pro						
Min. MPP voltage	289.7*2	6.9*2	3998	200.2*3	6.4*3	3814
Min. MPP voltage	268.6*2	7.8*2	4180	230.1*3	5.8*3	3997
Max. MPP voltage	914.2*2	2.2*2	4088	200.1*3	6.4*3	3841
Max. MPP voltage	852.5*2	2.5*2	4216	230.1*3	5.8*3	4010
Max PV current(16A)	265.3*1	16.0*1	4205	230.1*3	5.8*3	3989
Model: ASW3K-LT-G2 Pro						
Min. MPP voltage	292.3*2	5.1*2	3006	200.1*3	4.8*3	2851
Min. MPP voltage	269.2*2	5.8*2	3124	230.1*3	4.3*3	2980
Max. MPP voltage	925.9*2	1.7*2	3102	200.1*3	4.8*3	2886
Max. MPP voltage	850.6*2	1.9*2	3250	230.1*3	4.4*3	3065
Max PV current(16A)	199.3*1	16.0*1	3187	230.1*3	4.4*3	2999
Max. Inrush current @ grid connected and disconnected for all above models: 7.95Apeak@110us						
Remark: Function checked at extreme low temperature -25°C as well.						

4.3	TABLE: heating temperature rise measurements (ASW6K-LT-G2 Pro)					P
	test voltage (V)	See note1	See note2	See note3	See note4	-
	t1 (°C)	37.0	59.0	40.4	59.9	-
	t2 (°C)	37.2	59.5	40.1	59.8	-
Max. temperature T of part/at:		T (°C)				permitted T (°C)
Boost Diode D150		74.9	68.5	75.3	67.4	130
INV IGBT Q202		75.1	68.8	75.9	67.3	130
INV IGBT Q210		71.8	68.1	73.3	67.1	130
INV IGBT Q206		68.3	67.5	70.1	66.9	130
INV IGBT Q211		73.5	68.5	74.8	67.5	130
INV IGBT Q208		70.8	68.0	72.6	67.3	130
Boost IGBT Q150		75.6	69.0	75.9	67.6	130
Boost Diode D151		74.9	68.5	75.7	67.4	130
INV IGBT Q207		69.3	67.9	71.0	67.2	130
DC Switch Handle		45.3	62.2	47.8	62.6	85
DC Switch		49.3	62.9	51.7	62.9	75
AC COM-CHOKE		57.6	67.6	58.7	67.8	110
AC X Cap C505		51.6	65.4	53.8	65.8	105
INV IGBT Q203		64.8	66.9	67.2	66.3	130
INV IGBT Q200		69.8	67.8	71.8	66.4	130
INV IGBT Q201		73.4	68.4	74.8	66.8	130
INV IGBT Q204		66.0	67.0	68.1	66.3	130
INV IGBT Q209		71.8	68.1	73.3	66.5	130
AC Relay K501		67.0	67.2	68.9	66.7	85
PCB Coil		73.9	84.9	75.9	84.8	130
BOOST Inductor PV1 (Core)		77.6	73.1	87.4	72.7	110
BOOST Inductor PV1 (Wire)		76.9	72.7	86.3	72.3	110
AC Wire		77.5	72.9	87.5	72.9	105
BOOST Inductor PV2		75.7	72.1	85.2	72.2	110
PV HCT U151		51.1	63.6	52.4	64.0	125
INV Inductor W (Core)		52.4	64.0	53.4	64.4	110
INV Inductor W (Wire)		51.6	63.9	52.7	64.4	110
INV Inductor V		53.0	64.2	53.9	64.7	110
Mounting Surface		51.7	64.0	53.0	64.4	90
INV Inductor U		52.4	64.1	53.5	64.6	110
Touch Surface		41.1	60.7	44.3	61.1	90
Driver Transformer TX301		53.6	65.4	56.0	65.4	110
AC X Cap C410		55.3	67.8	57.2	67.9	105
BUS Cap C204		62.3	68.2	64.9	67.8	105
DC SPS Transformer TX350		69.8	80.9	72.4	77.4	105
INV HCT402		58.1	69.9	59.5	70.0	105
DC SPS MOSFET Q356		67.5	77.7	70.3	77.8	130
PV wire		50.0	62.9	52.6	63.0	105
Driver Transformer TX302		55.6	67.5	58.2	67.4	110
Slave DSP		60.5	71.6	62.9	71.7	105
PV Connector		48.2	62.9	50.8	63.0	90
PV Y Cap C107		62.2	73.3	64.8	73.6	110
Driver U254		61.6	71.2	64.0	73.6	105
PV Side Film capacitor C103		54.0	64.4	55.8	64.3	105
Main DSP		66.8	78.7	69.3	78.8	105
PV Common choke CT100		60.0	65.8	60.6	65.4	110

Bus Film capacitor C206	58.0	66.1	59.3	65.8	110
Communication U652	53.6	65.9	40.9	60.6	105
GFCI Conductor CT400	62.2	73.1	63.9	73.5	110
Heatsink	62.3	69.5	64.2	68.8	100
AC Y Cap C511	51.6	65.0	53.7	65.2	105
AC Connector	45.7	62.4	48.2	62.7	90
Ambient	37.0	59.0	40.4	59.9	Ref.
Supplementary information: Note1. Started at Lowest full load MPP voltage DC 270V with output AC voltage 209V and rated output power 6kW until steady condition established. (No derating at 37.0°C). Note2. Started at lowest full load MPP voltage DC 270V with output AC voltage 209V and rated output power 6kW until steady condition established. The product stabilized until the output power derating to 1947W. (derating operation at 59.0°C). Note3. Started at Lowest full load MPP voltage DC 270V with output AC voltage 253V and rated output power 6kW until steady condition established. (No derating at 40.4°C). Note4. Started at lowest full load MPP voltage DC 270V with output AC voltage 253V and rated output power 6kW until steady condition established. The product stabilized until the output power derating to 2107W. (derating operation at 59.9°C).					

4.3	**TABLE: heating temperature rise measurements (ASW6K-LT-G2 Pro)**					P
	test voltage (V)	See note1	See note2	See note3	See note4	-
	t1 (°C)	47.5	58.6	48.1	59.9	-
	t2 (°C)	47.2	58.6	48.0	59.8	-
Max. temperature T of part/at:		T (°C)				permitted T (°C)
Boost Diode D150		73.0	68.0	72.3	66.0	130
INV IGBT Q202		80.5	70.9	78.3	67.5	130
INV IGBT Q210		77.9	70.0	76.3	67.2	130
INV IGBT Q206		74.5	68.7	72.5	66.3	130
INV IGBT Q211		76.9	69.6	75.3	66.8	130
INV IGBT Q208		73.0	68.0	71.7	65.9	130
Boost IGBT Q150		69.9	66.6	69.6	65.2	130
Boost Diode D151		74.4	68.4	73.3	66.3	130
INV IGBT Q207		74.3	68.6	72.3	66.3	130
DC Switch Handle		55.8	62.4	55.4	63.1	85
DC Switch		55.1	61.4	55.7	62.4	75
AC COM-CHOKE		65.8	67.4	64.9	67.9	110
AC X Cap C505		60.0	64.8	60.1	65.8	105
INV IGBT Q203		73.6	68.5	71.4	66.2	130
INV IGBT Q200		78.3	70.4	76.6	67.2	130
INV IGBT Q201		81.4	71.3	79.2	67.7	130
INV IGBT Q204		74.3	68.6	72.0	66.1	130
INV IGBT Q209		80.1	70.9	78.0	67.4	130
AC Relay K501		74.9	68.9	72.4	66.3	85
PCB Coil		81.0	84.6	80.9	84.9	130
BOOST Inductor PV1 (Core)		58.7	62.1	59.6	62.4	110
BOOST Inductor PV1 (Wire)		58.6	62.1	59.6	62.3	110
AC Wire		58.6	62.0	62.0	62.3	105
BOOST Inductor PV2		58.5	62.0	61.7	62.3	110
PV HCT U151		65.8	69.2	62.5	67.6	125
INV Inductor W (Core)		67.9	70.7	64.1	68.7	110
INV Inductor W (Wire)		66.8	70.2	63.2	68.4	110
INV Inductor V		68.9	71.6	64.8	69.3	110

Mounting Surface	66.5	70.1	63.1	68.4	90
INV Inductor U	67.4	70.6	63.8	68.8	110
Touch Surface	51.0	59.4	51.6	61.0	90
Driver Transformer TX301	60.7	65.2	60.8	65.5	110
AC X Cap C410	64.2	68.3	63.4	68.4	105
BUS Cap C204	68.1	68.1	67.2	67.5	105
DC SPS Transformer TX350	77.6	81.4	77.2	81.4	105
INV HCT402	68.0	70.9	66.4	70.9	105
DC SPS MOSFET Q356	75.7	79.4	75.2	78.9	130
PV wire	54.9	61.5	55.6	62.6	105
Driver Transformer TX302	64.3	68.4	64.1	68.1	110
Slave DSP	67.8	71.4	67.4	71.6	105
PV Connector	56.0	61.9	56.2	62.7	90
PV Y Cap C107	70.0	73.9	69.7	73.9	110
Driver U254	69.2	71.5	68.9	73.5	105
PV Side Film capacitor C103	57.8	63.1	58.2	63.7	105
Main DSP	74.6	78.5	74.2	78.8	105
PV Common choke CT100	60.4	64.6	60.6	64.9	110
Bus Film capacitor C206	60.7	64.8	60.7	65.0	110
Communication U652	61.1	65.4	48.7	60.6	105
GFCI Conductor CT400	70.0	73.2	69.4	73.5	110
Heatsink	70.6	70.4	69.1	69.2	100
AC Y Cap C511	60.1	64.8	59.8	65.5	105
AC Connector	55.6	61.8	55.6	62.8	90
Ambient	47.5	58.6	48.1	59.9	Ref.

Supplementary information:
Note1. Started at highest full load MPP voltage DC 850V with output AC voltage 209V and rated output power 6kW until steady condition established. (No derating at 47.5°C).
Note2. Started at highest full load MPP voltage DC 850V with output AC voltage 209V and rated output power 6kW until steady condition established. The product stabilized until the output power derating to 2108W. (derating operation at 58.6°C).
Note3. Started at highest full load MPP voltage DC 850V with output AC voltage 253V and rated output power 6kW until steady condition established. (No derating at 48.1°C).
Note4. Started at highest full load MPP voltage DC 850V with output AC voltage 253V and rated output power 6kW until steady condition established. The product stabilized until the output power derating to 2105W. (derating operation at 59.9°C).

4.3	**TABLE: heating temperature rise measurements (ASW6K-LT-G2 Pro)**					P
	test voltage (V)	See note1	See note2	-	-	-
	t1 (°C)	47.2	59.9	-	-	-
	t2 (°C)	47.1	58.6	-	-	-
Max. temperature T of part/at:		T (°C)				permitted T (°C)
Boost Diode D150		81.3	68.0	-	-	130
INV IGBT Q202		78.5	68.1	-	-	130
INV IGBT Q210		76.2	67.7	-	-	130
INV IGBT Q206		72.7	66.9	-	-	130
INV IGBT Q211		76.6	67.7	-	-	130
INV IGBT Q208		73.4	67.0	-	-	130
Boost IGBT Q150		76.2	67.7	-	-	130
Boost Diode D151		75.2	67.2	-	-	130
INV IGBT Q207		73.0	67.1	-	-	130

DC Switch Handle	53.9	62.4	-	-	85
DC Switch	57.3	62.8	-	-	75
AC COM-CHOKE	64.6	67.5	-	-	110
AC X Cap C505	59.3	65.3	-	-	105
INV IGBT Q203	70.5	66.5	-	-	130
INV IGBT Q200	75.2	67.5	-	-	130
INV IGBT Q201	78.0	68.1	-	-	130
INV IGBT Q204	71.3	66.5	-	-	130
INV IGBT Q209	76.7	67.7	-	-	130
AC Relay K501	72.0	66.7	-	-	85
PCB Coil	80.9	84.7	-	-	130
BOOST Inductor PV1 (Core)	82.4	74.4	-	-	110
BOOST Inductor PV1 (Wire)	81.7	73.8	-	-	110
AC Wire	62.6	65.0	-	-	105
BOOST Inductor PV2	61.9	64.6	-	-	110
PV HCT U151	58.8	63.4	-	-	125
INV Inductor W (Core)	60.0	63.7	-	-	110
INV Inductor W (Wire)	59.1	63.7	-	-	110
INV Inductor V	60.3	63.9	-	-	110
Mounting Surface	59.3	63.7	-	-	90
INV Inductor U	59.9	63.9	-	-	110
Touch Surface	50.7	60.9	-	-	90
Driver Transformer TX301	61.2	65.1	-	-	110
AC X Cap C410	62.0	67.3	-	-	105
BUS Cap C204	69.1	67.5	-	-	105
DC SPS Transformer TX350	76.6	80.5	-	-	105
INV HCT402	64.7	69.6	-	-	105
DC SPS MOSFET Q356	74.0	77.2	-	-	130
PV wire	55.2	62.9	-	-	105
Driver Transformer TX302	63.4	67.2	-	-	110
Slave DSP	67.3	71.3	-	-	105
PV Connector	56.1	63.0	-	-	90
PV Y Cap C107	68.8	72.9	-	-	110
Driver U254	68.7	73.2	-	-	105
PV Side Film capacitor C103	60.1	64.1	-	-	105
Main DSP	73.9	78.5	-	-	105
PV Common choke CT100	64.9	65.2	-	-	110
Bus Film capacitor C206	62.6	65.2	-	-	110
Communication U652	47.7	60.6	-	-	105
GFCI Conductor CT400	69.1	73.1	-	-	110
Heatsink	68.6	69.0	-	-	100
AC Y Cap C511	59.3	64.9	-	-	105
AC Connector	54.5	62.5	-	-	90
Ambient	47.2	59.9	-	-	Ref.
Supplementary information: Note1. Started at only one MPP voltage DC 380V, max current 16A with output AC voltage 209V and rated output power 6kW until steady condition established. (No derating at 47.2°C). Note2. Started at only one MPP voltage DC 380V, max current 16A with output AC voltage 209V and rated output power 6kW until steady condition established. The product stabilized until the output power derating to 2111W. (derating operation at 59.9°C).					

4.3	**TABLE: heating temperature rise measurements (ASW10K-LT-G2 Pro)**				P
	test voltage (V)	See note1	See note2	See note3	See note4	-

	t1 (°C)	39.5	59.7	40.3	60.1	-
	t2 (°C)	39.3	59.6	40.1	60.0	-
Max. temperature T of part/at:		T (°C)				permitted T (°C)
AC Relay K501		67.7	71.8	65.4	72.1	85
Boost Diode D150		80.7	76.6	77.6	76.6	130
Boost Diode D151		89.7	81.3	86.0	80.5	130
INV IGBT Q211		95.5	84.3	91.0	83.2	130
INV IGBT Q202		94.2	84.1	89.7	83.1	130
INV IGBT Q210		94.9	84.6	89.9	83.4	130
INV IGBT Q201		94.7	84.6	89.3	83.3	130
INV IGBT Q209		93.4	84.3	88.1	83.1	130
INV IGBT Q200		90.9	83.3	85.8	82.2	130
INV IGBT Q203		82.6	79.8	79.2	79.4	130
INV IGBT Q204		83.7	80.0	80.2	79.6	130
INV IGBT Q205		86.1	81.2	82.6	80.7	130
INV IGBT Q206		87.2	81.3	83.6	80.8	130
INV IGBT Q207		88.4	81.6	85.1	81.1	130
INV IGBT Q208		89.4	81.7	86.4	81.3	130
Boost IGBT Q151		98.0	85.5	96.2	85.1	130
Boost IGBT Q150		91.5	81.3	89.2	82.2	130
INV HCT402		69.0	72.7	66.8	73.0	105
Heatsink		72.6	75.6	70.8	75.8	100
Touch Surface		51.4	64.2	51.0	64.7	90
BOOST Inductor PV1 (Wire)		88.9	84.6	95.9	93.5	110
INV Inductor U (Wire)		70.5	72.3	67.0	73.4	110
BOOST Inductor PV2 (Wire)		91.2	85.7	98.7	95.2	110
BOOST Inductor PV1 (Core)		92.3	85.8	101.1	97.9	110
BOOST Inductor PV2 (Core)		91.3	85.3	100.0	97.1	110
AC Connector		62.5	69.3	60.9	69.9	90
Communication U652		68.5	72.9	67.0	73.4	105
Mounting Surface		50.5	63.6	50.0	64.2	90
Main DSP		73.4	78.1	71.8	78.7	105
DC Switch		64.0	69.9	62.6	70.3	75
DC Switch Handle		48.0	62.9	47.9	63.6	85
AC COM-CHOKE		71.2	73.0	68.3	73.2	110
INV Inductor U (Core)		70.1	72.3	66.7	73.4	110
INV Inductor W (Wire)		72.0	73.7	68.8	74.8	110
INV Inductor W (Core)		72.5	73.8	69.3	74.8	110
INV Inductor V (Wire)		73.6	74.0	70.0	75.1	110
INV Inductor V (Core)		74.6	74.3	70.7	75.4	110
Slave DSP		66.9	72.0	65.4	72.5	105
BUS Cap C204		69.1	71.7	66.8	72.0	105
PV Common choke CT100		68.2	71.5	66.6	72.0	110
PV Side Film capacitor C111		67.0	71.5	65.7	72.1	105
PV Wire		67.2	71.3	65.9	71.9	105
ISO RELAY		67.9	72.1	66.4	72.7	85
DC SPS MOSFET Q356		71.0	75.4	69.7	76.3	130
AC X Cap C505		67.9	72.2	66.1	72.6	105
AC Y Cap C511		66.8	71.5	64.9	71.8	105
DC SPS Transformer TX350 (Core)		69.4	74.1	67.9	74.7	110

Driver Transformer TX301	69.2	73.0	67.6	73.6	110
AC X Cap C410	64.8	70.2	63.0	70.5	105
PV Y Cap C107	67.4	71.6	66.0	72.3	105
Internal Fan	69.8	74.3	68.2	74.9	85
DC SPS Transformer TX350 (Wire)	69.3	73.8	67.8	74.4	110
Driver U254	71.4	74.3	69.7	74.8	105
PV Connector	62.2	69.3	61.1	69.9	90
GFCI Conductor CT400	66.9	71.5	64.9	71.9	110
PV HCT U151	70.0	73.1	68.5	73.7	110
AC Wire	66.8	71.0	64.6	71.4	105
Ambient	39.5	59.7	40.3	60.1	Ref.
Supplementary information: Note1. Started at Lowest full load MPP voltage DC 400V with output AC voltage 208V and rated output power 10kW until steady condition established. (No derating at 39.5°C). Note2. Started at lowest full load MPP voltage DC 400V with output AC voltage 208V and rated output power 10kW until steady condition established. The product stabilized until the output power derating to 4579W. (derating operation at 59.7°C). Note3. Started at Lowest full load MPP voltage DC 430V with output AC voltage 253V and rated output power 10kW until steady condition established. (No derating at 40.3°C). Note4. Started at lowest full load MPP voltage DC 430V with output AC voltage 253V and rated output power 10kW until steady condition established. The product stabilized until the output power derating to 4095W. (derating operation at 60.1°C).					

4.3	**TABLE: heating temperature rise measurements (ASW10K-LT-G2 Pro)**				P
	test voltage (V)	See note1	See note2	See note3	See note4	-
	t1 (°C)	37.6	59.5	36.8	60.3	-
	t2 (°C)	37.4	59.5	36.6	60.0	-
Max. temperature T of part/at:		T (°C)				permitted T (°C)
AC Relay K501		66.0	72.3	60.0	72.0	85
Boost Diode D150		73.7	75.3	67.0	75.0	130
Boost Diode D151		82.8	77.7	74.6	77.5	130
INV IGBT Q211		93.6	82.3	83.4	82.2	130
INV IGBT Q202		94.4	83.0	84.0	82.9	130
INV IGBT Q210		97.2	84.1	86.3	84.1	130
INV IGBT Q201		98.5	84.8	87.5	84.9	130
INV IGBT Q209		97.7	84.7	86.9	84.8	130
INV IGBT Q200		95.3	83.9	85.0	84.0	130
INV IGBT Q203		85.5	79.7	75.5	79.3	130
INV IGBT Q204		86.3	79.8	75.9	79.3	130
INV IGBT Q205		88.2	80.6	77.9	80.2	130
INV IGBT Q206		88.4	80.4	77.8	79.8	130
INV IGBT Q207		87.1	79.7	76.9	79.2	130
INV IGBT Q208		85.5	78.7	75.5	78.2	130
Boost IGBT Q151		82.0	76.7	74.1	76.3	130
Boost IGBT Q150		74.2	74.8	67.2	74.4	130
INV HCT402		67.6	73.8	61.3	73.4	105
Heatsink		72.9	75.1	65.8	74.8	100
Touch Surface		49.5	64.9	46.8	64.9	90
BOOST Inductor PV1 (Wire)		61.9	69.4	58.3	69.2	110
INV Inductor U (Wire)		85.2	88.9	71.1	86.3	110
BOOST Inductor PV2 (Wire)		62.5	69.6	58.8	69.5	110

BOOST Inductor PV1 (Core)	63.3	70.8	59.3	70.8	110
BOOST Inductor PV2 (Core)	63.0	70.7	59.1	70.7	110
AC Connector	61.1	70.4	56.1	70.1	90
Communication U652	66.0	73.0	60.5	72.7	105
Mounting Surface	49.8	66.1	46.0	65.7	90
Main DSP	71.1	78.6	65.6	78.3	105
DC Switch	60.8	70.0	56.2	69.8	75
DC Switch Handle	45.8	63.5	44.0	63.6	85
AC COM-CHOKE	69.7	73.4	62.8	72.9	110
INV Inductor U (Core)	84.3	88.4	70.5	85.9	110
INV Inductor W (Wire)	88.6	90.7	74.0	88.1	110
INV Inductor W (Core)	90.2	91.7	74.9	88.9	110
INV Inductor V (Wire)	91.1	92.6	75.5	89.7	110
INV Inductor V (Core)	93.1	94.0	76.8	90.8	110
Slave DSP	64.8	72.5	59.4	72.2	105
BUS Cap C204	67.0	71.6	60.9	71.3	105
PV Common choke CT100	63.8	71.3	58.7	71.1	110
PV Side Film capacitor C111	63.9	71.6	58.7	71.3	105
PV Wire	62.9	71.0	58.0	70.8	105
ISO RELAY	65.2	72.3	59.7	72.0	85
DC SPS MOSFET Q356	69.3	76.8	63.7	76.4	130
AC X Cap C505	66.0	72.6	60.3	72.3	105
AC Y Cap C511	65.3	72.3	59.4	72.0	105
DC SPS Transformer TX350 (Core)	67.4	74.9	62.1	74.6	110
Driver Transformer TX301	67.2	73.6	61.6	73.3	110
AC X Cap C410	63.4	71.6	57.9	71.2	105
PV Y Cap C107	64.4	72.0	59.2	71.8	105
Internal Fan	67.4	74.6	61.9	74.2	85
DC SPS Transformer TX350 (Wire)	67.1	74.4	61.6	74.0	110
Driver U254	68.8	74.2	62.6	73.9	105
PV Connector	59.9	69.5	55.4	69.4	90
GFCI Conductor CT400	65.1	72.3	59.4	71.9	110
PV HCT U151	65.6	72.6	60.3	72.3	110
AC Wire	65.4	71.9	59.5	71.7	105
Ambient	37.6	59.5	36.8	60.3	Ref.

Supplementary information:
Note1. Started at highest full load MPP voltage DC 850V with output AC voltage 208V and rated output power 10kW until steady condition established. (No derating at 37.6°C).
Note2. Started at highest full load MPP voltage DC 850V with output AC voltage 208V and rated output power 10kW until steady condition established. The product stabilized until the output power derating to 3519W. (derating operation at 59.5°C).
Note3. Started at highest full load MPP voltage DC 850V with output AC voltage 253V and rated output power 10kW until steady condition established. (No derating at 36.8°C).
Note4. Started at highest full load MPP voltage DC 850V with output AC voltage 253V and rated output power 10kW until steady condition established. The product stabilized until the output power derating to 4314W. (derating operation at 60.3°C).

4.3	**TABLE: heating temperature rise measurements (ASW20K-LT-G2 Pro)**				P
	test voltage (V)	See note1	See note2	See note3	See note4	-
	t1 (°C)	34.5	61.7	37.5	59.2	-
	t2 (°C)	34.5	61.5	37.4	59.1	-

Max. temperature T of part/at:	T (°C)				permitted T (°C)
INV IGBT Q209 U4	91.5	83.5	87.2	85.6	130
INV IGBT Q200 U1	89.7	82.1	84.6	84.3	130
INV IGBT Q204 V2	75.9	75.8	70.6	77.7	130
INV IGBT Q202 W1	93.0	85.0	89.6	87.0	130
AC Connector	61.1	72.0	59.9	71.2	90
INV IGBT Q203 U2	73.7	76.2	70.9	77.7	130
BUS Cap C204	70.9	75.4	68.7	75.1	105
Boost IGBT Q150	94.5	89.4	95.8	87.5	130
INV IGBT Q206 U3	80.1	79.0	77.2	81.0	130
Boost Diode D151	97.1	85.9	93.9	88.2	130
INV HCT402	70.1	76.4	68.4	75.5	105
INV IGBT Q210 V4	93.3	84.5	87.6	86.0	130
Boost Diode D150	90.2	84.9	90.4	89.0	130
INV IGBT Q208 W3	88.6	83.0	86.6	85.9	130
Boost IGBT Q151	96.9	90.0	98.0	89.4	130
INV IGBT Q211 W4	98.1	87.3	95.1	89.3	130
INV IGBT Q205 W2	75.3	78.0	74.6	79.8	130
INV IGBT Q201 V1	86.9	82.6	85.4	85.0	130
INV IGBT Q207 V3	83.9	80.8	80.9	82.9	130
INV Inductor U wire	79.1	79.9	74.9	80.4	130
INV Inductor V wire	80.1	80.0	75.6	81.1	130
INV Inductor W core	81.6	80.5	76.6	81.3	130
Boost Inductor 1 wire	96.7	89.3	110.4	100.1	130
Boost Inductor 2 wire	94.4	87.5	106.9	98.8	130
PV Y Cap C112	67.8	74.5	67.3	74.3	105
GFCI Conductor CT400	65.5	74.0	63.5	73.1	110
Main DSP	71.5	80.3	70.9	79.8	105
External fan	43.7	63.5	45.6	64.3	70
PV HCT U151	75.1	77.4	73.4	77.5	125
Internal fan	67.7	76.9	67.4	76.7	80
PV Common choke CT100	77.3	76.1	74.6	76.2	110
Slave DSP	49.7	66.2	52.0	67.8	105
DC SPS MOSFET Q356	69.5	78.4	69.5	78.6	130
Heatsink Left	77.0	80.7	76.4	80.7	100
Boost Inductor 1 core	99.5	90.1	113.2	101.3	130
INV Inductor V core	84.3	81.6	79.0	82.9	130
Boost Inductor 2 core	98.6	89.1	112.0	101.8	130
INV Inductor W wire	78.8	79.5	74.4	80.2	130
INV Inductor U core	81.2	80.5	76.6	81.1	130
Driver Transformer TX301	68.7	75.2	67.4	75.2	110
PV Side Film capacitor C104	66.5	74.0	66.5	73.8	105
DC Switch	63.3	72.5	62.8	71.9	75
ISO Relay	65.6	74.6	65.4	74.3	85
Driver U254	70.8	76.2	68.6	76.2	105
AC X Cap C410	63.3	73.4	62.5	72.5	105
PCB Coil	85.9	80.3	78.9	79.3	130
PV Connector	56.7	70.3	57.9	69.8	90
AC wire	71.3	75.5	68.7	75.0	105
AC Common choke CT100	84.3	79.3	77.7	78.7	110
Touch Surface	46.7	67.1	48.8	65.5	75

Communication U652	66.1	74.6	65.5	74.4	105
Mounting Surface	64.9	75.0	65.2	74.4	90
DC Switch Handle	39.9	62.6	42.4	62.5	85
AC Y Cap C511	70.6	75.0	67.0	74.5	105
Heatsink Right	67.2	76.1	66.7	76.0	100
AC Relay K501	75.1	75.8	68.7	75.3	85
AC X cap C505	67.0	74.5	65.7	74.1	105
PV wire	58.8	70.5	59.0	70.3	105
DC SPS Transformer TX350	66.4	75.3	65.8	75.0	110
Ambient	34.5	61.7	37.5	59.2	Ref.
Supplementary information: Note1. Started at Lowest full load MPP voltage DC 400V with output AC voltage 207V and rated output power 20kW until steady condition established. (No derating at 34.5°C). Note2. Started at lowest full load MPP voltage DC 400V with output AC voltage 207V and rated output power 20kW until steady condition established. The product stabilized until the output power derating to 9954W. (derating operation at 61.7°C). Note3. Started at Lowest full load MPP voltage DC 430V with output AC voltage 253V and rated output power 20kW until steady condition established. (No derating at 37.5°C). Note4. Started at lowest full load MPP voltage DC 430V with output AC voltage 253V and rated output power 20kW until steady condition established. The product stabilized until the output power derating to 11.5kW. (derating operation at 59.2°C).					

4.3	**TABLE: heating temperature rise measurements (ASW20K-LT-G2 Pro)**				P
	test voltage (V)	See note1	See note2	See note3	See note4	-
	t1 (°C)	38.2	60.9	47.8	58.9	-
	t2 (°C)	38.0	60.8	47.6	58.8	-
Max. temperature T of part/at:		T (°C)				permitted T (°C)
INV IGBT Q209 U4		107.8	90.1	102.7	91.1	130
INV IGBT Q200 U1		103.6	88.4	98.4	88.7	130
INV IGBT Q204 V2		87.3	81.1	84.3	80.7	130
INV IGBT Q202 W1		103.0	88.0	99.2	88.6	130
AC Connector		67.5	72.7	68.8	71.6	90
INV IGBT Q203 U2		88.8	81.4	84.4	80.6	130
BUS Cap C204		75.0	75.0	74.4	74.3	105
Boost IGBT Q150		87.6	80.2	86.8	80.0	130
INV IGBT Q206 U3		93.5	83.3	88.2	82.5	130
Boost Diode D151		93.5	83.4	92.1	83.7	130
INV HCT402		79.6	78.0	77.3	76.8	105
INV IGBT Q210 V4		104.2	88.5	101.2	89.8	130
Boost Diode D150		87.4	82.3	88.6	82.4	130
INV IGBT Q208 W3		94.8	83.2	88.4	82.1	130
Boost IGBT Q151		88.5	81.3	88.9	82.1	130
INV IGBT Q211 W4		106.3	88.9	101.9	89.6	130
INV IGBT Q205 W2		93.3	83.3	87.8	82.5	130
INV IGBT Q201 V1		103.3	88.3	98.9	88.9	130
INV IGBT Q207 V3		94.4	83.4	88.5	82.4	130
INV Inductor U wire		112.3	100.7	99.1	96.8	130
INV Inductor V wire		118.5	105.2	103.1	100.7	130
INV Inductor W core		119.8	105.3	104.3	101.0	130
Boost Inductor 1 wire		62.3	68.9	66.9	68.9	130
Boost Inductor 2 wire		61.7	68.6	66.4	68.9	130
PV Y Cap C112		69.7	73.4	71.2	72.8	105

GFCI Conductor CT400	71.3	74.3	72.0	73.3	110
Main DSP	77.5	80.4	78.2	79.5	105
External fan	49.3	64.3	56.1	64.3	70
PV HCT U151	74.3	75.8	75.1	75.4	125
Internal fan	72.2	76.5	73.8	75.8	80
PV Common choke CT100	70.9	73.1	72.3	72.8	110
Slave DSP	59.3	69.9	62.9	69.3	105
DC SPS MOSFET Q356	75.6	79.5	76.8	78.8	130
Heatsink Left	72.9	76.6	74.6	74.5	100
Boost Inductor 1 core	63.7	69.4	68.1	69.5	130
INV Inductor V core	125.4	108.9	108.0	104.2	130
Boost Inductor 2 core	62.4	68.7	67.1	69.1	130
INV Inductor W wire	115.0	102.7	101.0	98.7	130
INV Inductor U core	115.4	101.9	101.2	98.0	130
Driver Transformer TX301	73.2	75.3	73.7	74.7	110
PV Side Film capacitor C104	68.5	72.5	69.9	71.9	105
DC Switch	65.1	71.0	67.4	70.4	75
ISO Relay	70.5	74.3	71.5	73.3	85
Driver U254	76.8	77.0	76.1	76.1	105
AC X Cap C410	70.2	73.8	70.9	72.8	105
PCB Coil	93.5	81.1	88.1	80.6	130
PV Connector	61.3	69.9	64.5	68.9	90
AC wire	78.6	76.4	77.0	75.6	105
AC Common choke CT100	91.2	80.0	86.2	79.6	110
Touch Surface	52.3	66.6	57.9	65.0	75
Communication U652	70.3	74.3	71.7	73.5	105
Mounting Surface	71.9	75.2	72.6	74.2	90
DC Switch Handle	44.0	62.0	51.8	61.4	85
AC Y Cap C511	76.0	75.8	75.2	74.9	105
Heatsink Right	72.4	76.3	73.6	75.7	100
AC Relay K501	77.9	76.3	76.8	75.5	85
AC X cap C505	73.6	75.0	73.6	74.3	105
PV wire	61.2	69.5	64.6	68.8	105
DC SPS Transformer TX350	71.3	75.3	72.5	74.5	110
Ambient	38.2	60.9	47.8	58.9	Ref.

Supplementary information:
Note1. Started at highest full load MPP voltage DC 850V with output AC voltage 207V and rated output power 20kW until steady condition established. (No derating at 38.2°C).
Note2. Started at highest full load MPP voltage DC 850V with output AC voltage 207V and rated output power 20kW until steady condition established. The product stabilized until the output power derating to 9638W. (derating operation at 60.9°C).
Note3. Started at highest full load MPP voltage DC 850V with output AC voltage 253V and rated output power 20kW until steady condition established. (No derating at 47.8°C).
Note4. Started at highest full load MPP voltage DC 850V with output AC voltage 253V and rated output power 20kW until steady condition established. The product stabilized until the output power derating to 12.4kW. (derating operation at 58.9°C).

4.3	**TABLE: heating temperature rise measurements (ASW20K-LT-G2 Pro)**					P
	test voltage (V)	See note1	See note2	-	-	-
	t1 (°C)	37.3	59.3	-	-	-
	t2 (°C)	37.2	59.3	-	-	-
Max. temperature T of part/at:		T (°C)				permitted T (°C)

INV IGBT Q209 U4	91.8	87.8	-	-	130
INV IGBT Q200 U1	90.5	86.9	-	-	130
INV IGBT Q204 V2	75.8	80.4	-	-	130
INV IGBT Q202 W1	93.0	88.3	-	-	130
AC Connector	62.9	71.3	-	-	90
INV IGBT Q203 U2	74.0	79.1	-	-	130
BUS Cap C204	70.3	74.8	-	-	105
Boost IGBT Q150	94.7	85.9	-	-	130
INV IGBT Q206 U3	79.6	82.2	-	-	130
Boost Diode D151	92.1	88.3	-	-	130
INV HCT402	71.4	75.7	-	-	105
INV IGBT Q210 V4	93.5	88.6	-	-	130
Boost Diode D150	97.0	85.6	-	-	130
INV IGBT Q208 W3	86.2	85.5	-	-	130
Boost IGBT Q151	89.6	88.2	-	-	130
INV IGBT Q211 W4	97.7	90.1	-	-	130
INV IGBT Q205 W2	88.3	85.9	-	-	130
INV IGBT Q201 V1	87.3	85.9	-	-	130
INV IGBT Q207 V3	82.7	83.7	-	-	130
INV Inductor U wire	80.2	81.1	-	-	130
INV Inductor V wire	81.3	81.8	-	-	130
INV Inductor W core	82.9	82.4	-	-	130
Boost Inductor 1 wire	72.8	80.1	-	-	130
Boost Inductor 2 wire	98.2	77.0	-	-	130
PV Y Cap C112	69.1	73.7	-	-	105
GFCI Conductor CT400	67.1	73.7	-	-	110
Main DSP	72.8	79.4	-	-	105
External fan	46.2	64.2	-	-	70
PV HCT U151	77.3	76.8	-	-	125
Internal fan	68.9	76.0	-	-	80
PV Common choke CT100	77.1	75.4	-	-	110
Slave DSP	52.0	67.4	-	-	105
DC SPS MOSFET Q356	70.5	77.4	-	-	130
Heatsink Left	77.0	78.8	-	-	100
Boost Inductor 1 core	74.1	81.1	-	-	130
INV Inductor V core	85.4	83.8	-	-	130
Boost Inductor 2 core	102.8	77.9	-	-	130
INV Inductor W wire	80.1	81.1	-	-	130
INV Inductor U core	82.4	81.9	-	-	130
Driver Transformer TX301	69.8	75.1	-	-	110
PV Side Film capacitor C104	66.4	72.7	-	-	105
DC Switch	63.9	71.2	-	-	75
ISO Relay	66.6	73.6	-	-	85
Driver U254	71.8	76.7	-	-	105
AC X Cap C410	64.9	72.4	-	-	105
PCB Coil	87.4	81.9	-	-	130
PV Connector	58.1	69.2	-	-	90
AC wire	72.9	75.7	-	-	105
AC Common choke CT100	85.7	80.7	-	-	110
Touch Surface	48.9	64.9	-	-	75
Communication U652	67.3	74.0	-	-	105
Mounting Surface	66.3	73.3	-	-	90

DC Switch Handle	42.5	61.9	-	-	85
AC Y Cap C511	72.3	75.9	-	-	105
Heatsink Right	68.3	75.3	-	-	100
AC Relay K501	76.6	78.3	-	-	85
AC X cap C505	68.5	74.2	-	-	105
PV wire	59.0	69.5	-	-	105
DC SPS Transformer TX350	67.5	74.4	-	-	110
Ambient	37.3	59.3	-	-	Ref.
Supplementary information: Note1. Started at DC 470V, max current 32A for one MPP with output AC voltage 207V and rated output power 20kW until steady condition established. (No derating at 37.3°C). Note2. Started at DC 470V, max current 32A for one MPP with output AC voltage 207V and rated output power 20kW until steady condition established. The product stabilized until the output power derating to 11.6kW. (derating operation at 59.3°C).					

4.4.4.8	**TABLE: heating temperature rise measurements for cooling system failure and temperature sensor fault (ASW6K-LT-G2 Pro)**				P
	test voltage (V)	See note1	See note2	-	-	-
	t1 (°C)	60.0	59.8	-	-	-
	t2 (°C)	59.8	59.7	-	-	-
Max. temperature T of part/at:		T (°C)				permitted T (°C)
Boost Diode D150		77.1	70.3	-	-	-
INV IGBT Q202		77.2	70.6	-	-	-
INV IGBT Q210		75.8	69.9	-	-	-
INV IGBT Q206		74.6	69.2	-	-	-
INV IGBT Q211		76.8	70.2	-	-	-
INV IGBT Q208		76.1	69.6	-	-	-
Boost IGBT Q150		77.7	70.4	-	-	-
Boost Diode D151		77.1	70.2	-	-	-
INV IGBT Q207		75.0	69.4	-	-	-
DC Switch Handle		61.2	62.3	-	-	85
DC Switch		61.8	62.6	-	-	-
AC COM-CHOKE		63.9	67.4	-	-	-
AC X Cap C505		60.2	64.8	-	-	-
INV IGBT Q203		72.0	68.3	-	-	-
INV IGBT Q200		73.9	69.4	-	-	-
INV IGBT Q201		75.8	70.1	-	-	-
INV IGBT Q204		72.8	68.5	-	-	-
INV IGBT Q209		74.9	69.7	-	-	-
AC Relay K501		73.5	68.8	-	-	-
PCB Coil		82.2	85.1	-	-	-
BOOST Inductor PV1 (Core)		83.8	78.8	-	-	-
BOOST Inductor PV1 (Wire)		83.2	78.2	-	-	-
AC Wire		85.0	78.8	-	-	-
BOOST Inductor PV2		83.9	77.5	-	-	-
PV HCT U151		60.2	63.1	-	-	-
INV Inductor W (Core)		60.9	63.4	-	-	-
INV Inductor W (Wire)		62.8	63.5	-	-	-
INV Inductor V		63.5	63.8	-	-	-
Mounting Surface		64.3	63.7	-	-	90
INV Inductor U		64.5	63.8	-	-	-
Touch Surface		61.2	60.8	-	-	90

Driver Transformer TX301	61.7	65.9	-	-	-
AC X Cap C410	65.2	67.1	-	-	-
BUS Cap C204	69.1	69.5	-	-	-
DC SPS Transformer TX350	78.8	81.2	-	-	-
INV HCT402	68.0	69.2	-	-	-
DC SPS MOSFET Q356	76.7	78.2	-	-	-
PV wire	64.5	62.7	-	-	-
Driver Transformer TX302	64.0	67.7	-	-	-
Slave DSP	69.9	71.9	-	-	-
PV Connector	61.0	62.9	-	-	90
PV Y Cap C107	71.2	73.5	-	-	-
Driver U254	70.6	71.0	-	-	-
PV Side Film capacitor C103	60.7	64.8	-	-	-
Main DSP	76.1	79.0	-	-	-
PV Common choke CT100	63.5	66.8	-	-	-
Bus Film capacitor C206	64.2	67.1	-	-	-
Communication U652	62.8	63.6	-	-	-
GFCI Conductor CT400	70.8	73.2	-	-	-
Heatsink	69.8	70.3	-	-	90
AC Y Cap C511	60.5	64.7	-	-	-
AC Connector	64.4	62.0	-	-	90
Ambient	60.0	59.8	-	-	Ref.

Supplementary information:
Note 1: Started at Lowest full load MPP voltage DC 270V with output AC voltage 209V and rated output power 6kW until steady condition established. The product stabilized until the output power derating to 2200W. (Blanketing test , derating operation at 60.0°C).
Note 2: Started at Lowest full load MPP voltage DC 270V with output AC voltage 209V and rated output power 6kW until steady condition established. The product stabilized until the output power derating to 2107W. (one temperature sensor fault, derating operation at 59.8°C).
Note 3: The duration of the test is less than 7 h for the temperatures stabilize and no external surface of the inverter is at a temperature exceeding 90 °C.
Note 4: No over temperature observed, no other hazard observed.

4.4.4.8	**TABLE: heating temperature rise measurements for cooling system failure and temperature sensor fault (ASW10K-LT-G2 Pro)**				P
	test voltage (V)	See note1	See note2	See note3	-	-
	t1 (°C)	60.2	61.2	60.0	-	-
	t2 (°C)	60.1	61.0	59.8	-	-
Max. temperature T of part/at:		T (°C)				permitted T (°C)
AC Relay K501		77.0	73.0	71.9	-	-
Boost Diode D150		75.3	76.6	75.6	-	-
Boost Diode D151		75.2	79.7	79.0	-	-
INV IGBT Q211		76.4	82.1	81.4	-	-
INV IGBT Q202		76.8	81.9	81.3	-	-
INV IGBT Q210		77.7	82.0	81.7	-	-
INV IGBT Q201		78.9	81.7	81.7	-	-
INV IGBT Q209		78.5	81.4	81.5	-	-
INV IGBT Q200		78.5	80.7	80.8	-	-
INV IGBT Q203		74.4	79.0	78.0	-	-
INV IGBT Q204		74.7	79.3	78.2	-	-
INV IGBT Q205		74.5	80.3	79.1	-	-
INV IGBT Q206		74.7	80.4	79.1	-	-

INV IGBT Q207	74.3	80.9	79.4	-	-
INV IGBT Q208	74.5	81.1	79.5	-	-
Boost IGBT Q151	78.1	82.9	83.1	-	-
Boost IGBT Q150	76.8	80.8	80.9	-	-
INV HCT402	78.2	74.1	72.8	-	-
Heatsink	59.5	76.5	74.6	-	90
Touch Surface	61.9	66.0	64.7	-	90
BOOST Inductor PV1 (Wire)	78.7	82.1	93.7	-	-
INV Inductor U (Wire)	70.9	77.0	73.3	-	-
BOOST Inductor PV2 (Wire)	80.5	82.6	95.3	-	-
BOOST Inductor PV1 (Core)	80.1	81.6	96.8	-	-
BOOST Inductor PV2 (Core)	79.6	81.3	96.1	-	-
AC Connector	64.8	71.1	69.8	-	90
Communication U652	73.0	74.0	73.1	-	-
Mounting Surface	61.9	70.0	64.2	-	90
Main DSP	81.3	79.4	78.4	-	-
DC Switch	66.2	71.1	70.4	-	-
DC Switch Handle	64.0	64.6	63.7	-	85
AC COM-CHOKE	74.0	73.7	72.9	-	-
INV Inductor U (Core)	70.8	77.2	73.3	-	-
INV Inductor W (Wire)	71.2	75.4	74.7	-	-
INV Inductor W (Core)	71.4	75.5	74.7	-	-
INV Inductor V (Wire)	71.5	77.4	75.0	-	-
INV Inductor V (Core)	72.0	77.7	75.3	-	-
Slave DSP	73.8	73.4	72.3	-	-
BUS Cap C204	74.0	72.3	71.9	-	-
PV Common choke CT100	69.8	72.4	71.9	-	-
PV Side Film capacitor C111	70.1	72.6	72.1	-	-
PV Wire	67.6	72.3	71.8	-	-
ISO RELAY	72.5	73.4	72.4	-	-
DC SPS MOSFET Q356	80.0	76.6	76.1	-	-
AC X Cap C505	69.0	73.4	72.5	-	-
AC Y Cap C511	68.8	73.0	71.6	-	-
DC SPS Transformer TX350 (Core)	76.1	75.3	74.6	-	-
Driver Transformer TX301	70.8	73.8	73.3	-	-
AC X Cap C410	72.9	72.2	70.6	-	-
PV Y Cap C107	68.9	72.7	72.1	-	-
Internal Fan	66.7	75.5	74.6	-	-
DC SPS Transformer TX350 (Wire)	76.5	75.0	74.2	-	-
Driver U254	75.9	75.1	74.2	-	-
PV Connector	65.6	70.6	69.7	-	90
GFCI Conductor CT400	77.8	73.0	71.7	-	-
PV HCT U151	72.9	73.9	73.6	-	-
AC Wire	68.0	72.4	71.2	-	-
Ambient	60.2	61.2	60.0	-	Ref.

Supplementary information:
Note 1: Started at Lowest full load MPP voltage DC 400V with output AC voltage 208V and rated output power 10kW until steady condition established. The product stabilized until the output power derating to 4060W. (cooling fan blocked test , derating operation at 60.2°C).
Note 2: Started at Lowest full load MPP voltage DC 400V with output AC voltage 208V and rated output power 10kW until steady condition established. The product stabilized until the output power derating to

1911W. (Blanketing test, derating operation at 61.2°C).
Note 3: Started at Lowest full load MPP voltage DC 400V with output AC voltage 208V and rated output power 10kW until steady condition established. The product stabilized until the output power derating to 7650W. (one temperature sensor fault, derating operation at 60.0°C).
Note 4: The duration of the test is less than 7 h for the temperatures stabilize and no external surface of the inverter is at a temperature exceeding 90 °C.
Note 5: No over temperature observed, no other hazard observed.

4.4.4.8	**TABLE: heating temperature rise measurements for cooling system failure, temperature sensor fault and overload test (ASW20K-LT-G2 Pro)**				P
	test voltage (V)	See note1	See note2	See note3	See note4	-
	t1 (°C)	60.4	58.0	60.2	26.7	-
	t2 (°C)	60.2	58.0	60.1	26.5	-
Max. temperature T of part/at:	T (°C)				permitted T (°C)
INV IGBT Q209 U4	86.1	93.6	84.9	86.6	-
INV IGBT Q200 U1	85.6	91.8	84.7	85.2	-
INV IGBT Q204 V2	79.8	90.3	79.5	70.0	-
INV IGBT Q202 W1	87.4	93.2	86.8	90.2	-
AC Connector	71.5	70.8	75.2	55.8	90
INV IGBT Q203 U2	78.7	88.4	78.8	68.2	-
BUS Cap C204	75.1	73.9	78.6	67.5	-
Boost IGBT Q150	86.5	89.6	86.9	94.6	-
INV IGBT Q206 U3	81.7	90.8	81.6	75.8	-
Boost Diode D151	88.3	91.1	88.0	96.7	-
INV HCT402	75.4	72.9	79.0	65.1	-
INV IGBT Q210 V4	87.1	93.3	86.3	89.6	-
Boost Diode D150	85.0	87.8	85.8	89.3	-
INV IGBT Q208 W3	85.7	91.0	85.5	87.2	-
Boost IGBT Q151	89.4	92.6	89.0	98.8	-
INV IGBT Q211 W4	89.1	92.9	88.5	96.3	-
INV IGBT Q205 W2	84.5	90.7	77.6	87.1	-
INV IGBT Q201 V1	84.8	93.5	83.9	82.5	-
INV IGBT Q207 V3	83.5	90.2	83.5	80.8	-
INV Inductor U wire	79.9	72.7	81.9	73.9	-
INV Inductor V wire	80.6	74.6	83.2	74.9	-
INV Inductor W core	80.9	75.7	84.1	76.3	-
Boost Inductor 1 wire	86.6	86.4	91.2	111.9	-
Boost Inductor 2 wire	85.2	86.8	89.8	109.1	-
PV Y Cap C112	74.2	73.8	77.8	64.9	-
GFCI Conductor CT400	73.6	72.4	77.3	60.9	-
Main DSP	79.6	78.9	83.4	67.0	-
External fan	65.0	69.1	66.5	36.8	-
PV HCT U151	77.2	76.1	80.7	73.7	-
Internal fan	76.5	76.8	79.1	63.6	-
PV Common choke CT100	76.2	74.0	79.4	77.6	-
Slave DSP	67.7	62.8	71.6	43.7	-
DC SPS MOSFET Q356	77.7	77.3	81.5	65.4	-
Heatsink Left	79.6	82.6	84.8	75.1	90
Boost Inductor 1 core	87.5	87.0	91.8	115.6	-
INV Inductor V core	82.2	75.5	84.4	79.2	-
Boost Inductor 2 core	86.8	88.3	91.1	114.9	-
INV Inductor W wire	79.8	75.1	83.2	73.3	-

INV Inductor U core	80.6	73.3	82.5	76.1	-
Driver Transformer TX301	75.4	76.1	78.5	65.1	-
PV Side Film capacitor C104	73.3	72.7	77.2	63.6	-
DC Switch	71.8	71.3	76.0	59.9	-
ISO Relay	73.9	73.7	77.6	61.3	-
Driver U254	76.8	78.5	79.6	66.8	-
AC X Cap C410	72.5	71.3	76.4	58.5	-
PCB Coil	80.3	75.7	82.9	81.1	-
PV Connector	69.7	70.5	73.9	51.9	90
AC wire	75.3	74.0	78.4	66.9	-
AC Common choke CT100	79.4	76.0	82.1	79.7	-
Touch Surface	65.6	64.4	69.3	40.4	90
Communication U652	74.3	74.5	77.9	62.1	-
Mounting Surface	73.5	72.6	77.2	59.9	90
DC Switch Handle	62.9	63.2	69.6	32.9	85
AC Y Cap C511	75.4	74.0	78.6	66.5	90
Heatsink Right	75.6	75.4	79.3	63.1	90
AC Relay K501	77.5	75.4	80.4	72.0	-
AC X cap C505	74.2	73.7	77.6	62.6	-
PV wire	70.3	70.2	73.4	54.8	-
DC SPS Transformer TX350	74.7	74.6	78.5	62.1	-
Ambient	60.4	58.0	60.2	26.7	Ref.

Supplementary information:
Note 1: Started at Lowest full load MPP voltage DC 430V with output AC voltage 207V and rated output power 20kW until steady condition established. The product stabilized until the output power derating to 10.6kW. (one temperature sensor fault, derating operation at 60.4°C).
Note 2: Started at Lowest full load MPP voltage DC 430V with output AC voltage 207V and rated output power 20kW until steady condition established. The product stabilized until the output power derating to 9111W. (cooling fan blocked test, derating operation at 58.0°C).
Note 3: Started at Lowest full load MPP voltage DC 430V with output AC voltage 207V and rated output power 20kW until steady condition established. The product stabilized until the output power derating to 6296W. (Blanketing test, derating operation at 60.2°C).
Note 4: Started at MPP voltage DC 430V with output AC voltage 207V and output power 21.8kW until steady condition established. (No derating at 26.7°C).
Note 5: The duration of the test is less than 7 h for the temperatures stabilize and no external surface of the inverter is at a temperature exceeding 90 °C.
Note 6: No over temperature observed, no other hazard observed.

4.4	**TABLE: fault condition tests**		P
	ambient temperature (°C) .....:	25°C	—

No.	component No.	fault	test voltage (V)	test time	fuse No.	fuse current (A)	result
Input and output fault							
1	AC output	Overload	Refer to above table	Steady condition	-	-	Inverter output at 21.8kW, work normally. During the test the components are within limits, temperature of components refer to heating test, no hazard.
2	DC+ to DC-	Reverse	MAINS:400 PV: 800	10min	-	-	Inverter can not start up. No output power feed into grid. No components damage,

							no hazard.
3	DC+ to DC -	Short	MAINS:400 PV: 800	10min	-	-	Inverter stop operation immediately after short-circuit. No backfeed current observed to PV side. No output power feed into grid. No components damage, no hazard.
4	DC source disconnected	Disconnected without additional fault	MAINS:400 PV: 0	10min	-	-	Inverter stop operation immediately due to DC under voltage. No backfeed voltage observed onto PV side. No output power feed into grid. No components damage, no hazard.
5	DC source disconnected	IGBT shorted	MAINS:400 PV: 0	10min	-	-	Inverter stop operation immediately due to DC under voltage. No backfeed voltage observed onto PV side. No output power feed into grid. No components damage, no hazard.

Supplementary information:
Note 1: All single fault tests were carried out by a 30A non-time delay fuse connected between the protective earthing terminal and the protective earthing conductor in the test setup which had not opened during the tests. All single fault tests were conducted with the AC output protected by external circuit breaker provided in all live connections to the AC supply.
Note 2: Pass the dielectric strength test of basic insulation test voltage for accessible DVC-A, reinforced or double Insulation and basic insulation in protective class I equipment.

Note 3: The equipment was placed on white tissue-paper covering a softwood surface and covering the equipment with cheesecloth during the fault testing, no emission of molten metal, burning insulation, or flaming or glowing particles from the fire enclosure, and there was no charring, glowing, or flaming of the cheesecloth.

Note 4: No other hazard(e.g. chemical, expulsion) observed after each test.

7.5	**TABLE: electric strength measurements, impulse voltage test and partial discharge test**			P
test voltage applied between:	test voltage (V)	impulse withstand voltage (V)	partial discharge extinction voltage (V)	result
Across RS485/wifi circuit to power circuits (RI)	AC 3000/DC 4240	-	-	P
Across power circuit to earthed parts (BI)	AC 1500/DC 2120	-	-	P

Supplementary information:

Note 1: The test voltage in above table shows the actual voltage applied for described insulation barriers.

To make sure that this voltage in not stress on basic or supplementary insulation barriers and non-applied insulating area are accidentally tested, this test is applied on individual parts only.

Note 2: Voltage test (dielectric strength test) was performed after:

1)Thermal testing as specified in IEC 62109-1:2010, 4.3;

2)Single fault test as specified in IEC 62109-1:2010, 4.4;

Additional tests based on second modification:

4.7	TABLE: mains supply electrical data in normal condition					P
Type	U (V) DC	I (A) DC	P (W) DC	U (V) grid	I (A) AC	P (W) AC
Model: ASW20K-LT-G2						
Min. MPP voltage	453.1*2	22.1*2	19958	201.1*3	32.0*3	19331
Min. MPP voltage	450.1*2	23.3*2	20588	230.9*3	28.8*3	19974
Max. MPP voltage	859.1*2	11.4*2	19996	201.1*3	32.0*3	19326
Max. MPP voltage	848.2*2	12.0*2	20449	230.9*3	28.7*3	19896
Max. Inrush current @ grid connected and disconnected	9.35A peak@100 µs					
Model: ASW17K-LT-G2						
Min. MPP voltage	458.4*2	17.9*2	16855	200.9*3	27.2*3	16376
Min. MPP voltage	449.8*2	19.8*2	17454	230.8*3	24.5*3	16970
Max. MPP voltage	899.1*2	9.3*2	16987	200.9*3	27.2*3	16439
Max. MPP voltage	850.6*2	10.6*2	17455	230.8*3	24.5*3	17007
Max. Inrush current @ grid connected and disconnected	9.35A peak@100 µs					
Model: ASW15K-LT-G2						
Min. MPP voltage	502.0*2	13.4*2	13272	200.7*3	21.5*3	12932
Min. MPP voltage	458.1*2	16.9*2	15273	230.7*3	21.5*3	14835
Max. MPP voltage	900.6*2	16.7*2	14835	200.8*3	23.9*3	14363
Max. MPP voltage	866.4*2	17.6*2	15219	230.7*3	21.5*3	14828
Max. Inrush current @ grid connected and disconnected	7.95Apeak@110us					
Model: ASW13K-LT-G2						
Min. MPP voltage	458.1*2	10.7/17.7	12750	200.6*3	20.6*3	12387
Min. MPP voltage	450.2*2	11.2/18.3	13175	230.6*3	18.6*3	12832
Max. MPP voltage	850.1*2	9.1*2	12803	200.6*3	20.6*3	12400
Max. MPP voltage	852.4*2	7.7*2	13174	230.6*3	18.6*3	12819
Max. Inrush current @ grid connected and disconnected	7.95Apeak@110us					
Model: ASW12K-LT-G2						
Min. MPP voltage	480.9*2	12.2*2	11676	200.6*3	18.9*3	11369
Min. MPP voltage	447.8*2	13.7*2	12128	230.5*3	17.1*3	11810
Max. MPP voltage	900.9*2	6.5*2	11774	200.6*3	19.0*3	11417
Max. MPP voltage	851.8*2	7.11*2	12119	230.5*3	17.1*3	11825

Max. Inrush current @ grid connected and disconnected	7.95Apeak@110us					
Model: ASW10K-LT-G2						
Min. MPP voltage	476.9*2	10.3*2	9766	200.5*3	15.8*3	9518
Min. MPP voltage	448.0*2	11.4*2	10084	230.4*3	14.2*3	9832
Max. MPP voltage	895.8*2	5.4*2	9845	200.5*3	15.9*3	9555
Max. MPP voltage	852.8*2	5.9*2	10074	230.4*3	14.2*3	9833
Max. Inrush current @ grid connected and disconnected	7.95Apeak@110us					
Model: ASW8K-LT-G2						
Min. MPP voltage	475.0*2	8.3*2	7803	200.4*3	12.7*3	7610
Min. MPP voltage	447.2*2	9.2*2	8068	230.3*3	11.4*3	7870
Max. MPP voltage	895.8*2	4.4*2	7870	200.4*3	12.7*3	7641
Max. MPP voltage	852.6*2	4.7*2	8054	230.3*3	11.4*3	7862
Max. Inrush current @ grid connected and disconnected	7.95Apeak@110us					
Remark: Function checked at extreme low temperature -25°C as well.						

--- End of test report---