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

Report Number..... :	70.409.20.075.07-02 part 2 of 2
Date of issue..... :	2022-04-25
Total number of pages……:	28
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 62109-2 (First Edition), EN 62109-2:2011
Test procedure ..... :	TUV mark
Non-standard test method…….:	N/A
Test Report Form No. ..... :	IEC62109_2B
Test Report Form(s) Originator .... :	LCIE - Laboratoire Central des Industries Electriques
Master TRF ..... :	Dated 2016-08

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:

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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 report 70.409.20.075.07-02 part 1 of 2

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*	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. 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):

☒ Fault-tolerance of residual current monitoring – clause 4.4.4.15.1;
☒ Fault-tolerance of automatic disconnecting means – clause 4.4.4.15.2;
☒ Cooling system failure – Blanketing test – clause 4.4.4.17;
☒ Array insulation resistance detection for inverters for ungrounded and functionally grounded arrays – clause 4.8.2;
☒ Array residual current detection – clause 4.8.3;
☒ Inverter backfeed current onto the array – clause 9.3.4 as combined with clause 4.4 in IEC 62109-1(ed.1)/ EN 62109-1:2010;

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

Testing location:

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

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

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 EN 62109-2:2011.

The text of IEC 62109-2:2011 was approved by CENELEC as a European Standard without any modification. Also compliance with EN 62109-2:2011, Annex ZA of EN 62109-1:2011 is recorded at the end of this report.

☒ **The product fulfils the requirements of IEC 62109-2(ed.1), EN 62109-2:2011**

Copy of marking plate:

Refer to report 70.409.20.075.07-02 part 1 of 2.

Test item particulars..... :	
Equipment mobility .....:	☐ movable ☐ hand-held ☐ stationary ☒ fixed ☐ transportable ☐ for building-in
Connection to the mains.....:	☒ pluggable equipment ☐ direct plug-in ☐ permanent connection ☐ for building-in
Enviromental category .....:	☒ outdoor ☐ indoor unconditional ☐ indoor conditional
Over voltage category Mains .....:	☐ OVC I ☐ OVC II ☒ OVC III ☐ OVC IV
Over voltage category PV.....:	☐ OVC I ☒ OVC II ☐ OVC III ☐ OVC IV
Mains supply tolerance (%).....:	±10 %
Tested for power systems .....:	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 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 manufacture 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, see report part 1 of 2 for test results.

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:

Refer to report 70.409.20.075.07-02 part 1 of 2.

IEC 62109-2			
Clause	Requirement + Test	Result - Remark	Verdict
4	**GENERAL TESTING REQUIREMENTS**		P
4.4.4	Single fault conditions to be applied		P
4.4.4.15	Fault-tolerance of protection for grid-interactive inverters		P
4.4.4.15.1	Fault-tolerance of residual current monitoring according to 4.8.3.5: the residual current monitoring system operates properly	Residual current monitoring is met by provision of RCMU integrated in inverter, the protective system including a self-diagnostic test to check if RCMU is Ok(within the specified accuracy) before the next attempted re-start because it is considered highly unlikely that a fault in the monitoring system would happen on the same day a person coming into contact with normally enclosed hazardous live parts of the PV system. See appended table 4.4.4.15.1	P
	a) . - The inverter ceases to operate		P
	- Indicates a fault in accordance with §13.9		P
	- Disconnect from the mains		P
	- not re-connect after any sequence of removing and reconnecting PV power		P
	- not re-connect after any sequence of removing and reconnecting AC power		P
	- not re-connect after any sequence of removing and reconnecting both PV and AC power		P
	b) . - The inverter continues to operate		N/A
	- the residual current monitoring system operates properly under single fault condition		N/A
	- Indicates a fault in accordance with §13.9		N/A
	c) The inverter continues to operate regardless of loss of residual current monitoring functionality		P
	- not re-connect after any sequence of removing and reconnecting PV power		P
	- not re-connect after any sequence of removing and reconnecting AC power		P
	- not re-connect after any sequence of removing and reconnecting both PV and AC power		P
	- Indicates a fault in accordance with §13.9		P
4.4.4.15.2	Fault-tolerance of automatic disconnecting means		P
4.4.4.15.2	The means provided for automatic		P

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Clause	Requirement + Test	Result - Remark	Verdict
.1	disconnection of a grid-interactive inverter from the mains shall:		
	- disconnect all grounded current-carrying conductors from the mains	Not allowed to be used in grounded current-carrying system.	N/A
	- disconnect all ungrounded current-carrying conductors from the mains	2 pieces VDE approved series relays used for all active conductors except for Neutral conductor. Because neutral conductor in this inverter is connected to earth through distribution system, only for grid voltage measurement and isolated from PV circuit by double and reinforced insulation as well. So the relays on neutral conductor not necessary	P
	- be such that with a single fault applied to the disconnection means or to any other location in the inverter, at least basic insulation or simple separation is maintained between the PV array and the mains when the disconnecting means is intended to be in the open state.	See appended table 4.4.4.15.2 Fault-tolerance of automatic disconnecting	P
4.4.4.15.2 .2	Design of insulation or separation complies with requirements of 7.3.7 of Part 1: report here Part 1 comment and verdict.		P
4.4.4.15.2 .3	For non-isolated inverter, automatic checking of the isolation provided by a disconnect means after single fault.	See appended test table 4.4.4.15.2 Fault-tolerance of automatic disconnecting.	P
	If the check fail: - any still-functional disconnection means shall be left in the open position		P
	- at least basic or simple separation shall be maintained between the PV input and the mains		P
	- the inverter shall not start operation		P
	- the inverter shall indicate a fault in accordance with 13.9		P
4.4.4.16	A stand-alone inverter with a transfer switch to transfer AC loads from the mains or other AC bypass source to the inverter output:	Not stand-alone inverter	N/A
	- shall continue to operate normally		N/A
	- shall not present a risk of fire as the result of an out-of-phase transfer		N/A
	- shall not present a risk of shock as the result of an out-of-phase transfer		N/A
	- And having control preventing switching: components for malfunctioning ……..…:		N/A
4.4.4.17	Cooling system failure – Blanketing test No hazards according to the criteria of sub-	See appended test table Cooling system failure – Blanketing test	P

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Clause	Requirement + Test	Result - Remark	Verdict
	clause 4.4.3 of Part 1 shall result from blanketing the inverter This test is not required for inverters restricted to use only in closed electrical operating areas.		
	Test stop condition: time duration value or stabilized temperature ……:	Stabilize without external surface of the inverter exceed 90˚C	P
4.7	ELECTRICAL RATINGS TESTS		N/A
4.7.4	Stand-alone Inverter AC output voltage and frequency		N/A
4.7.4.1	General		N/A
4.7.4.2	Steady state output voltage at nominal DC input The steady-state AC output voltage shall not be less than 90 % or more than 110 % of the rated nominal voltage with the inverter supplied with its nominal value of DC input voltage.		N/A
4.7.4.3	Steady state output voltage across the DC input range The steady-state AC output voltage shall not be less than 85 % or more than 110 % of the rated nominal voltage with the inverter supplied with any value within the rated range of DC input voltage.		N/A
4.7.4.4	Load step response of the output voltage at nominal DC input The AC output voltage shall not be less than 85 % or more than 110 % of the rated nominal voltage for more than 1,5 s after application or removal of a resistive load.		N/A
4.7.4.5	Steady state output frequency The steady-state AC output frequency shall not vary from the nominal value by more than +4 % or –6 %.		N/A
4.7.5	Stand-alone inverter output voltage waveform		N/A
4.7.5.1	General		N/A
4.7.5.2	The AC output voltage waveform of a sinusoidal output stand-alone inverter shall have a total harmonic distortion (THD) not exceeding of 10 % and no individual harmonic at a level exceeding 6 %.		N/A
4.7.5.3	Non-sinusoidal output waveform requirements		N/A
4.7.5.3.1	General		N/A
4.7.5.3.2	The total harmonic distortion (THD) of the voltage waveform shall not exceed 40 %.		N/A
4.7.5.3.3	The slope of the rising and falling edges of the positive and negative half-cycles of the voltage waveform shall not exceed 10 V/µs measured between the points at which the waveform has a voltage of 10 % and 90 % of		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	the peak voltage for that half-cycle.		
4.7.5.3.4	The absolute value of the peak voltage of the positive and negative half-cycles of the waveform shall not exceed 1,414 times 110 % of the RMS value of the rated nominal AC output voltage.		N/A
4.7.5.4	Information requirements for non-sinusoidal waveforms The instructions provided with a stand-alone inverter not complying with 4.7.5.2 shall include the information in 5.3.2.6.		N/A
4.7.5.5	Output voltage waveform requirements for inverters for dedicated loads. For an inverter that is intended only for use with a known dedicated load, the following requirements may be used as an alternative to the waveform requirements in 4.7.5.2 to 4.7.5.3.		N/A
	The combination of the inverter and dedicated load shall be evaluated to ensure that the output waveform does not cause any hazards in the load equipment and inverter, or cause the load equipment to fail to comply with the applicable product safety standards.		N/A
	The inverter shall be marked with symbols 9 and 15 of Table C.1 of Part 1.		N/A
	The installation instructions provided with the inverter shall include the information in 5.3.2.13.		N/A
4.8	ADDITIONAL TESTS FOR GRID-INTERACTIVE INVERTERS		P
4.8.1	General requirements regarding inverter isolation and array grounding	Inverter isolation: transformer-less solar inverter, without galvanic isolation from the MAINS and PV array. PV Array grounding: Ungrounded with warning substance in manufacturer's manual. Array ground insulation resistance measurement: Before starting operation, per 4.8.2.1 for ungrounded arrays; Action on fault: signal the fault and do not connect to the MAINS; Array residual current detection: monitoring for both continuous excessive residual current per 4.8.3.5.2 and excessive sudden changes per 4.8.3.5.3 by RCMU integrated in inverter; Action on fault: shut down the inverter, disconnect from the MAINS, indicate the fault	P
	- Type of Array grounding supported ……:	Ungrounded array	P

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Clause	Requirement + Test	Result - Remark	Verdict
	- Inverter isolation ……..:	Inverter does not have internal isolated transformer between the mains and PV circuit.	P
4.8.2	Array insulation resistance detection for inverters for ungrounded and functionally grounded arrays	(See attached table)	P
4.8.2.1	Array insulation resistance detection for inverters for ungrounded arrays	Minimum Insulation Resistance before connection to the MAINS: 1100V/30mA=36.7 kΩ For safety and accuracy consideration, factory setting for array insulation resistance detection: 200kohms;	P
	Inverter shall have means to measure DC insulation resistance from PV input (array) to ground before starting operation		P
	Or Inverter shall be provided with instruction in accordance with 5.3.2.11.	The expected insulation resistance of the array to ground shall be calculated based on an array insulation resistance of 40 MΩ per m^2 either known according to 61730, calculate the practice PV system resistance with the surface area of the parallel and series panels and the set value maybe adjusted with agreement of authority agency.	P
	Measured DC insulation resistance: ……:	200kΩ x 0.9=180kΩ	P
	Inverter measurement circuit shall be capable of detecting insulation resistance below the limit value R= Vmax/30mA under normal conditions		P
	Inverter measurement circuit shall be capable of detecting insulation resistance below the limit value R= Vmax/30mA with ground fault in the PV array		P
	Isolated inverters shall indicate a fault if the insulation resistance is less than the limit value		N/A
	Isolated inverter fault indication maintained until insulation resistance has recovered to a value higher than the limit value		N/A
	Non-isolated inverters, or inverters with isolation not complying with the leakage current limits in the minimum inverter isolation requirements in Table 30:		P
	- shall indicate a fault in accordance with 13.9		P
	- shall not connect to the mains		P
4.8.2.2	Array insulation resistance detection for inverters for functionally grounded arrays	Not for functionally grounded arrays	N/A
	a-1) The value of the total resistance, including the intentional resistance for array		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	functional grounding, the expected insulation resistance of the array to ground, and the resistance of any other networks connected to ground (for example measurement networks) must not be lower than R = (VMAX PV/30 mA) ohms.		
	a-2) The installation instructions shall include the information required in 5.3.2.12.		N/A
	b-1) As an alternative to a), or if a resistor value lower than in a) is used, the inverter shall incorporate means to detect, during operation, if the total current through the resistor and any networks (for example measurement networks) in parallel with it, exceeds the residual current values and times in Table 31		N/A
	b-2) Inverter shall either disconnect the resistor or limit the current by other means ……:		N/A
	b-3) If the inverter is a non-isolated inverter, or has isolation not complying with the leakage current limits in the minimum inverter isolation requirements in Table 30, it shall also disconnect from the mains.		N/A
	c) The inverter shall have means to measure the DC insulation resistance from the PV input to ground before starting operation, in accordance with 4.8.2.1.		N/A
4.8.3	Array residual current detection		P
4.8.3.1	General		P
4.8.3.2	30 mA touch current type test for isolated inverters	Not isolated inverters	N/A
4.8.3.3	Fire hazard residual current type test for isolated inverters	Not isolated inverters	N/A
4.8.3.4	Protection by application of RCD's		N/A
	- The requirement for additional protection in 4.8.3.1 can be met by provision of an RCD with a residual current setting of 30 mA, located between the inverter and the mains.	RCMU used for monitoring the residual current, additional RCD may be required in end-use application between inverter and grid for safety consideration if required by local code	N/A
	- The selection of the RCD type to ensure compatibility with the inverter must be made according to rules for RCD selection in Part 1.		N/A
	- The RCD provided integral to the inverter, or		N/A
	- The RDC provided by the installer if details of the rating, type, and location for the RCD are given in the installation instructions per 5.3.2.9.		N/A
4.8.3.5	Protection by residual current monitoring		P

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Clause	Requirement + Test	Result - Remark	Verdict
4.8.3.5.1	General		P
	Where required by Table 30, the inverter shall provide residual current monitoring that functions whenever the inverter is connected to the mains with the automatic disconnection means closed.		P
	The residual current monitoring means shall measure the total (both a.c. and d.c. components) RMS current.		P
	As indicated in Table 30 for different inverter types, array types, and inverter isolation levels, detection may be required for excessive continuous residual current, excessive sudden changes in residual current, or both, according to the following limits:		P
	a) Continuous residual current: The inverter shall disconnect within 0,3 s and indicate a fault in accordance with 13.9 if the continuous residual current exceeds:		P
	- maximum 300 mA for inverters with continuous ouput power rating ≤30kV;	100mA@160ms	P
	- maximum 10 mA per kVA of rated continuous output power for inverters with continuous output power rating > 30 kVA.		N/A
	The inverter may attempt to re-connect if the array insulation resistance meets the limit in 4.8.2.		P
	b) Sudden changes in residual current: The inverter shall disconnect from the mains within the time specified in Table 31		P
	The inverter indicates a fault in accordance with 13.9, if a sudden increase in the RMS residual current is detected exceeding the value in the table.		P
	- 30mA@0,3s	25mA@220ms	P
	- 60mA@0,15s	55mA@80ms	P
	- 150mA@0,04s	110mA@20ms	P
	The inverter may attempt to re-connect if the array insulation resistance meets the limit in 4.8.2.		P
4.8.3.5.2	Test for detection of excessive continuous residual current: test repeated 5 times and time to disconnect shall not exceed 0,3 s.	See appended test table 4.8.3.5.2 Test for detection of excessive continuous residual current	P
4.8.3.5.3	Test for detection of sudden changes in residual current repeated 5 times and each of the 5 results shall not exceed the time limit indicated in for each row (30mA, 60mA and150mA) of Table 31.	See appended test table 4.8.3.5.3 Test for detection of sudden changes in residual current	P
4.8.3.6	Systems located in closed electrical operating areas	Outdoor use, not limited to be located in closed electrical operating areas.	N/A
	The protection against shock hazard is not		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	required if the installation information provided with the inverter indicates the restriction for use in a closed electrical operating area, and		
	Installation information indicates what forms of shock hazard protection are and are not provided integral to the inverter, in accordance with 5.3.2.7.		N/A
	The inverter shall be marked as in 5.2.2.6.		N/A
5	**MARKING AND DOCUMENTATION**		P
5.1	Marking		P
5.1.4	Equipment ratings	See marking plate	P
	PV input ratings:		P
	- Vmax PV (absolute maximum) (d.c. V)		P
	- Isc PV (absolute maximum) (d.c. A)		P
	a.c. output ratings:		P
	- Voltage (nominal or range) (a.c. V)		P
	- Current (maximum continuous) (a.c. A)		P
	- Frequency (nominal or range) (Hz)		P
	- Power (maximum continuous) (W or VA)		P
	- Power factor range		P
	a.c input ratings:		N/A
	- Voltage (nominal or range) (a.c. V)		N/A
	- Current (maximum continuous) (a.c. A)		N/A
	- Frequency (nominal or range) (Hz)		N/A
	d.c. output ratings:		N/A
	- Voltage (nominal or range) (d.c. V)		N/A
	- Current (maximum continuous) (d.c. A)		N/A
	Protective class (I or II or III)		P
	Ingress protection (IP) rating per part 1		P
	An inverter that is adjustable for more than one nominal output voltage shall be marked to indicate the particular voltage for which it is set when shipped from the factory.		N/A
5.2	Warning markings		N/A
5.2.2	Content for warning markings		N/A
5.2.2.6	Inverters for closed electrical operating areas		N/A
	Where required by 4.8.3.6, an inverter not provided with full protection against shock hazard on the PV array shall be marked with a warning that the inverter is only for use in a closed electrical operating area, and referring to the installation instructions.		N/A
5.3	Documentation		P
5.3.2	Information related to installation		P
5.3.2.1	Ratings. Subclause 5.3.2 of Part 1 requires the documentation to include ratings information for each input and output. For inverters this information shall be as in Table 33 below. Only those ratings that are applicable based on the type of inverter are required.		P

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Clause	Requirement + Test	Result - Remark	Verdict
	PV input quantities:	See marking plate	P
	- Vmax PV (absolute maximum) (d.c. V)		P
	- PV input operating voltage range (d.c. V)		P
	- Maximum operating PV input current (d.c. A)		P
	- Isc PV (absolute maximum) (d.c. A)		P
	- Max. inverter backfeed current to the array (a.c. or d.c. A)	Maximum inverter backfeed current form grid to the array is 0A based on test/circuit topology analysis	P
	a.c. output quantities:	See marking plate and user manual	P
	- Voltage (nominal or range) (a.c. V)		P
	- Current (maximum continuous) (a.c. A)		P
	- Current (inrush) (a.c. A, peak and duration)	See table 4.7 of part 1 of 2 report	P
	- Frequency (nominal or range) (Hz)		P
	- Power (maximum continuous) (W or VA)		P
	- Power factor range		P
	- Maximum output fault current (a.c. A, peak and duration or RMS)	See table 4.4 of part 1 of 2 report	P
	- Maximum output overcurrent protection (a.c. A)	See user manual	P
	a.c. input quantities:		N/A
	- Voltage (nominal or range) (a.c. V)		N/A
	- Current (maximum continuous) (a.c. A)		N/A
	- Current (inrush) (a.c. A, peak and duration)		N/A
	- Frequency (nominal or range) (Hz)		N/A
	d.c input (other than PV) quantities:		N/A
	- Voltage (nominal or range) (d.c. V)		N/A
	- Nominal battery voltage (d.c. V)		N/A
	- Current (maximum continuous) (d.c. A)		N/A
	d.c. output quantities:		N/A
	- Voltage (nominal or range) (d.c. V)		N/A
	- Nominal battery voltage (d.c. V)		N/A
	- Current (maximum continuous) (d.c. A)		N/A
	Protective class (I or II or III)	Class I	P
	Ingress protection (IP) rating per part 1	IP66	P
5.3.2.2	Grid-interactive inverter setpoints		N/A
	For a grid-interactive unit with field adjustable trip points, trip times, or reconnect times, the presence of such controls, the means for adjustment, the factory default values, and the limits of the ranges of adjustability shall be provided in the documentation for the PCE or in other format such as on a website. Provided solution: ……		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	The setting of field adjustable setpoints shall be accessible from the PCE		N/A
5.3.2.3	Transformers and isolation	No internal isolation transformer between PV and mains	N/A
	whether an internal isolation transformer is provided, and if so, what level of insulation (functional, basic, reinforced, or double) is provided by that transformer. The instructions shall also indicate what the resulting installation requirements are regarding such things as earthing or not earthing the array, providing external residual current detection devices, etc.		N/A
	An inverter shall be provided with information to the installer regarding:		N/A
	- providing of internal isolation transformer		N/A
	- the level of insulation (functional, basic, reinforced, or double)		N/A
	The instructions shall also indicate what the resulting installation requirements are regarding:		P
	- earthing or not earthing the array	Unearthed array	P
	- providing external residual current detection devices	Pls. follow national regulations	P
	- requiring an external isolation transformer,		N/A
5.3.2.4	Transformers required but not provided	Not required	N/A
	An inverter that requires an external isolation transformer not provided with the unit, shall be provided with instructions that specify, and for the external isolation transformer with which it is intended to be used:		N/A
	- the configuration type		N/A
	- electrical ratings		N/A
	- environmental ratings		N/A
5.3.2.5	PV modules for non-isolated inverters		P
	Non-isolated inverters shall be provided with installation instructions that require PV modules that have an IEC 61730 Class A rating	IEC 61730 Class A rating required	P
	If the maximum AC mains operating voltage is higher than the PV array maximum system voltage then the instructions shall require PV modules that have a maximum system voltage rating based upon the AC mains voltage.		P
5.3.2.6	Non-sinusoidal output waveform information	Not a stand-alone inverter	N/A
	The instruction manual for a stand-alone inverter not complying with 4.7.5.2 shall include a warning that:		N/A
	- the waveform is not sinusoidal,		N/A
	- some loads may experience increased heating,		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	- the user should consult the manufacturers of the intended load equipment before operating that load with the inverter		N/A
	The inverter manufacturer shall provide information regarding:		N/A
	- what types of loads may experience increased heating		N/A
	- recommendations for maximum operating times with such loads		N/A
	The inverter manufacturer shall specify for the waveforms as determined by the testing in 4.7.5.3.2 through 4.7.5.3.4.:		N/A
	- THD		N/A
	- slope		N/A
	- peak voltage		N/A
5.3.2.7	Systems located in closed electrical operating areas	Not located in closed electrical operating areas	N/A
	Where required by 4.8.3.6, an inverter not provided with full protection against shock hazard on the PV array shall be provided with installation instructions:		N/A
	- requiring that the inverter and the array must be installed in closed electrical operating areas		N/A
	- indicating which forms of shock hazard protection are and are not provided integral to the inverter (for example the RCD, isolation transformer complying with the 30 mA touch current limit, or residual current monitoring for sudden changes)		N/A
5.3.2.8	Stand-alone inverter output circuit bonding	Not stand alone inverter	N/A
	Where required by 7.3.10, the documentation for an inverter shall include the following:		N/A
	- if output circuit bonding is required but is not provided integral to the inverter, the required means shall be described in the installation instructions, including which conductor is to be bonded and the required current carrying capability or cross-section of the bonding means;		N/A
	- if the output circuit is intended to be floating, the documentation for the inverter shall indicate that the output is floating.		N/A
5.3.2.9	Protection by application of RCD's		N/A
	Where the requirement for additional protection in 4.8.3.1 is met by requiring an RCD that is not provided integral to the inverter, as allowed by 4.8.3.4, the installation instructions shall state the need for the RCD.	RCMU integrated in inverter used for monitoring the residual current.	N/A
	and shall specify its rating, type, and required circuit location		N/A

IEC 62109-2			
Clause	Requirement + Test	Result - Remark	Verdict
5.3.2.10	Remote indication of faults		P
	The installation instructions shall include an explanation of how to properly make connections to (where applicable), and use, the electrical or electronic fault indication required by 13.9.	Refer to user manual	P
5.3.2.11	External array insulation resistance measurement and response	IRM function integrated in inverter	N/A
	The installation instructions for an inverter for use with ungrounded arrays that does not incorporate all the aspects of the insulation resistance measurement and response requirements in 4.8.2.1, must include:		N/A
	- for isolated inverters: an explanation of what aspects of array insulation resistance measurement and response are not provided, and		N/A
	- an instruction to consult local regulations to determine if any additional functions are required or not;		N/A
	- for non-isolated inverters: an explanation of what external equipment must be provided in the system, and		N/A
	- what the setpoints and response implemented by that equipment must be, and:		N/A
	- how that equipment is to be interfaced with the rest of the system.		N/A
5.3.2.12	Array functional grounding information	Not functional ground array used	N/A
	Where approach a) of 4.8.2.2 is used, the installation instructions for the inverter shall include all of the following:		N/A
	a) the value of the total resistance between the PV circuit and ground integral to the inverter ……		N/A
	b) the minimum array insulation resistance to ground that system designer or installer must meet when selecting the PV panel and system design, based on the minimum value that the design of the PV functional grounding in the inverter was based on ……;		N/A
	c) the minimum value of the total resistance R = VMAX PV/30 mA that the system must meet, with an explanation of how to calculate the total …… ……;		N/A
	d) a warning that there is a risk of shock hazard if the total minimum resistance requirement is not met.		N/A
5.3.2.13	Stand-alone inverters for dedicated loads		N/A

IEC 62109-2			
Clause	Requirement + Test	Result - Remark	Verdict
	Where the approach of 4.7.5.5 is used, the installation instructions for the inverter shall include a warning that the inverter is only to be used with the dedicated load for which it was evaluated, and		N/A
	shall specify the dedicated load.		N/A
5.3.2.14	Identification of firmware version(s)		P
	An inverter utilizing firmware for any protective functions shall provide means to identify the firmware version.	V1.0	P
	This can be a marking, but the information can also be provided by a display panel, communications port or any other type of user interface…….	The firmware version can be identified by Apps	P
7	**PROTECTION AGAINST ELECTRIC SHOCK AND ENERGY HAZARDS**		N/A
7.3	Protection against electric shock		N/A
7.3.10	Additional requirements for stand-alone inverters		N/A
	One circuit conductor bonded to earth to create a grounded conductor and an earthed system.		N/A
	The means used to bond the grounded conductor to protective earth provided within the inverter or		N/A
	as part of the installation		N/A
	If not provided integral to the inverter, the required means shall be described in the installation instructions as per 5.3.2.8.		N/A
	The means used to bond the grounded conductor to protective earth shall comply with the requirements for protective bonding in Part 1,		N/A
	If the bond can only ever carry fault currents in stand-alone mode, the maximum current for the bond is determined by the inverter maximum output fault current.		N/A
	Output circuit bonding arrangements shall ensure that in any mode of operation, the system only has the grounded circuit conductor bonded to earth in one place at a time.		N/A
	Switching arrangements may be used, in which case the switching device used is to be subjected to the bond impedance test along with the rest of the bonding path		N/A
	Inverters intended to have a circuit conductor bonded to earth shall not impose any normal current on the bond except for leakage current.		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Outputs that are intentionally floating with no circuit conductor bonded to ground, must not have any voltages with respect to ground that are a shock hazard in accordance with Clause 7 of Parts 1 and 2.		N/A
	The documentation for the inverter shall indicate that the output is floating as per 5.3.2.8.		N/A
7.3.11	Functionally grounded arrays		N/A
	All PV conductors in a functionally grounded array shall be treated as being live parts with respect to protection against electric shock.		N/A
9	**PROTECTION AGAINST FIRE HAZARDS**		P
9.3	Short-circuit and overcurrent protection		P
9.3.4	Inverter backfeed current onto the array		P
	The backfeed current testing and documentation requirements in Part 1 apply, including but not limited to the following.		P
	Inverter backfeed current onto the PV array maximum value……..	Maximum inverter backfeed current form grid to the array is 0A based on test/circuit topology analysis	P
	This inverter backfeed current value shall be provided in the installation instructions regardless of the value of the current, in accordance with Table 33.	Refer to user manual	P
13	**PHYSICAL REQUIREMENTS**		P
13.9	Fault indication		P
	Where this Part 2 requires the inverter to indicate a fault, both of the following shall be provided:		P
	a) a visible or audible indication, integral to the inverter, and detectable from outside the inverter, and	Visible indication	P
	b) an electrical or electronic indication that can be remotely accessed and used.	RS485 port as communication method for remote accessed and used	P
	The installation instructions shall include information regarding how to properly make connections (where applicable) and use the electrical or electronic means in b) above, in accordance with 5.3.2.10.		P

	EN 62109-2:2011		P
Annex ZA	Normative references to international publications with their corresponding European publications	Considered	P

Original test:

4.4.4	TABLE: Single fault condition to be applied					P
	Ambient temperature (°C) ..... :		N/A (at the prevailing ambient temperature)			—
4.4.4.15.1	Fault-tolerance of residual current monitoring					
Component No.	Fault	Supply voltage (V)	Test time	Fuse #	Fuse current (A)	Observation
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.
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.
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.
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.
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.
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.
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.
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.
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.

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.
Check that the residual current monitoring operates properly						Inverter ceases to operate, indicates a fault in accordance with 13.9, disconnects from the mains, and does not re-connect after any sequence of removing and reconnecting PV power, AC power, or both
Supplementary information: Also see report 70.409.20.075.07-02 part 1 of 2.						

4.4.4	TABLE: Single fault condition to be applied					P
	Ambient temperature (°C) ..... :			N/A (at the prevailing ambient temperature)		—
4.4.4.15.2	Fault-tolerance of automatic disconnecting means					
Component No.	Fault	Supply voltage (V)	Test time	Fuse #	Fuse current (A)	Observation
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.
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.
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.
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.
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.
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.
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.

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.
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.
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.
Check that the relays fulfil the basic insulation or simple separation based on the PV circuit working voltage.						The remaining relays gaps in series provided basic clearance: ≥2 x 2.26 mm
Each active phase can be switched. (L1/L2/L3)						Yes
Supplementary information: Also see report 70.409.20.075.07-02 part 1 of 2.						

4.4.4.17	TABLE: cooling system failure - blanketing test		P
	test voltage (V) .....:	See supplementary information	—
	t1 (°C) .....:	37.4	—
	t2 (°C) .....:	37.0	—

Max. temperature T of part/at:	T (°C)	permitted T (°C)
Boost choke 1-1	91.8	-
Mounting surface	82.6	90
Boost choke 2-1	93.4	-
Front cover	63.8	100
INV choke U-1	82.1	-
DC switch	65.5	-
INV choke V-1	85.4	-
Slave DSP	74.2	-
INV choke W-1	82.9	-
AC output connector	72.6	-
Isolation opto-couplers	75.1	-
GFCI L	78.4	-
AC com-choke	80.7	-
AC output capacitor C505	77.0	-
Heatsink	91.2	100
DC SPS MOS Q356	81.0	-
Boost 2 diode D151	100.8	-
Master DSP	78.7	-
INV-W T4 Q211	103.7	-
INV-W T1 Q202	100.7	-
INV-V T4 Q210	101.0	-
INV-V T1 Q201	93.9	-
INV-U T4 Q209	103.4	-
INV-U T1 Q200	93.8	-
Boost 2 IGBT Q151	114.9	-
Boost 1 IGBT Q150	115.6	-
INV-W T3 Q208	92.8	-
INV-W T2 Q207	86.6	-
Internal fan	73.4	-

Internal wire	73.7	-
AC Y capacitor	75.1	-
DC connector	68.8	-
DC SPS transformer TX350	75.6	-
Ambient	37.4	-
BUS Cap. air	75.0	-
DC capacitor C104	78.4	-
DC com-choke	82.2	-
DC capacitor C103	75.3	-
Driver transformer TX301	76.6	-
Driver transformer TX302	77.2	-
DC SPS capacitor C371	76.3	-
DC SPS diode D359	90.5	-
DC SPS D358	75.8	-
INV HCT402	76.4	-
LC capacitor C410	73.0	-
AC relay K501	83.8	-
External fan	59.9	-
Supplementary information: Note 1: Run the device at min. MPP input and full load output conditions until steady condition established(no derating to steady condition) with the entire inverter including any external heatsink provided shall be covered in surgical cotton with an uncompressed thickness of minimum 2 cm, covering all heatsink fins and air channels until steady condition established. Note 2: Operating ambient range: -25°C …+60°C, the test was conducted on of actual ambient 37.4°C. Note 3: No over temperature observed in components, no other hazard observed.		

4.8.2	TABLE: Array insulation resistance detection for inverters for ungrounded and functionally grounded arrays			P
4.8.2.1	Array insulation resistance detection for inverters for ungrounded arrays			P
DC Voltage below minimum operating voltage (V)	DC Voltage for inverter begin operation (V)	Resistance between ground and PV input terminal (kΩ)	Required Insulation resistance R = (VMAX PV / 30mA) (kΩ)	Result
ISO setting=200kΩ DC+(MPP tracker 1)				
100	150	180	33.3	Insulation fault
100	150	180	33.3	Insulation fault
100	150	180	33.3	Insulation fault
100	150	180	33.3	Insulation fault
100	150	180	33.3	Insulation fault
100	150	220	33.3	Normal Operation
100	150	220	33.3	Normal Operation
100	150	220	33.3	Normal Operation
100	150	220	33.3	Normal Operation
100	150	220	33.3	Normal Operation
DC+(MPP tracker 2)				

100	150	180	33.3	Insulation fault
100	150	180	33.3	Insulation fault
100	150	180	33.3	Insulation fault
100	150	180	33.3	Insulation fault
100	150	180	33.3	Insulation fault
100	150	220	33.3	Normal Operation
100	150	220	33.3	Normal Operation
100	150	220	33.3	Normal Operation
100	150	220	33.3	Normal Operation
100	150	220	33.3	Normal Operation
DC- (MPP tracker 1 and MPP tracker 2)				
100	150	180	33.3	Insulation fault
100	150	180	33.3	Insulation fault
100	150	180	33.3	Insulation fault
100	150	180	33.3	Insulation fault
100	150	180	33.3	Insulation fault
100	150	220	33.3	Normal Operation
100	150	220	33.3	Normal Operation
100	150	220	33.3	Normal Operation
100	150	220	33.3	Normal Operation
100	150	220	33.3	Normal Operation

Note:

For isolated inverters, shall indicate a fault in accordance with 13.9 (operation is allowed); the fault indication shall be maintained until the array insulation resistance has recovered to a value higher than the limit above

For non-isolated inverters, or inverters with isolation not complying with the leakage current limits in the minimum inverter isolation requirements in Table 30, shall indicate a fault in accordance with 13.9, and shall not connect to the mains; the inverter may continue to make the measurement, may stop indicating a fault and may connect to the mains if the array insulation resistance has recovered to a value higher than the limit above.

It is not required to test all PV input terminals if analysis of the design indicates that one or more terminals can be expected to have the same result, for example where multiple PV string inputs are in parallel.

Supplementary information:

Additional test with first one pole ground fault, following an insulation resistance below limit simulated, then allow the inverter to start, the inverter shall not connect to the mains. Also tested with blind spot of PV+ and PV- with low insulation resistance together.

4.8.3.5	TABLE: Protection by residual current monitoring	P
Test conditions:	Output power (kVA): 20 Input voltage (VDC): 650 Frequency (Hz): 50 Output AC Voltage (VAC): 400	
4.8.3.5.2	Test for detection of excessive continuous residual current	P

Fault Current (mA)		Disconnection time (ms)	
Measured Fault Current	Limit 300mA for output power ≤ 30 kVA 10mA per kVA for output power > 30 kVA	Measured Disconnection time	Limit
Default: 100mA@160ms PV1+ to N: (MPP tracker 1)			
106,6	300	191.0	300
106.9	300	189.0	300
106.8	300	190.0	300
105.4	300	192.0	300
105.2	300	193.0	300
PV2+ to N: (MPP tracker 2)			
103.4	300	174.0	300
104.5	300	185.0	300
104.0	300	186.0	300
103.2	300	190.0	300
104.6	300	188.0	300
PV- to N:			
103.4	300	174.0	300
104.0	300	186.0	300
105.2	300	192.0	300
105.2	300	191.0	300
106.6	300	191.0	300

Note:
1. – maximum 300mA for inverters with continuous output power rating ≤30 kVA;
– maximum 10mA per kVA of rated continuous output power for inverters with continuous output power rating > 30 kVA.
2. This test shall be repeated 5 times, and for all 5 tests the time to disconnect shall not exceed 0,3s.
3. The test is repeated for each PV input terminal. It is not required to test all PV input terminals if analysis of the design indicates that one or more terminals can be expected to have the same result, for example where multiple PV string inputs are in parallel.
4. The inverter in designed to used common PV- for both MPP tracker 1 and tracker 2.

4.8.3.5.3	TABLE: Test for detection of sudden changes in residual current	P
PV1+ to N: (MPP tracker 1)		
Limit (mA)	UN Disconnection time (ms)	Limit (ms)
Setting: 25mA@220ms		
30	242.0	300
30	234.0	300
30	234.0	300
30	224.0	300
30	238.0	300
Setting: 55mA@80ms		
60	100.0	150
60	100.0	150
60	86.0	150
60	86.0	150

60	76.0	150
Setting: 110mA@20ms		
150	28.0	40
150	28.0	40
150	28.0	40
150	32.0	40
150	36.0	40
PV2+ to N: (MPP tracker 2)		
Limit (mA)	UN Disconnection time (ms)	Limit (ms)
Setting: 25mA@220ms		
30	242.0	300
30	224.0	300
30	238.0	300
30	238.0	300
30	222.0	300
Setting: 55mA@80ms		
60	86.0	150
60	78.0	150
60	78.0	150
60	86.0	150
60	86.0	150
Setting: 110mA@20ms		
150	38.0	40
150	38.0	40
150	22.0	40
150	34.0	40
150	28.0	40
PV- to N:		
Limit (mA)	UN Disconnection time (ms)	Limit (ms)
Setting: 25mA@220ms		
30	238.0	300
30	226.0	300
30	226.0	300
30	232.0	300
30	232.0	300
Setting: 55mA@80ms		
60	98.0	150
60	94.0	150
60	94.0	150
60	88.0	150
60	88.0	150
Setting: 110mA@20ms		
150	26.0	40
150	28.0	40
150	28.0	40
150	28.0	40
150	28.0	40

Note:
1.The capacitive current is risen until disconnection.
2.Test condition: Ic + 30/60/150mA <= Icmax. R1 is set that 30/60/150mA Flow and switch S is closed.
3. The inverter in designed to used common PV- for both MPP tracker 1 and tracker 2.

Additional tests based on first modification:

4.4.4.8	**TABLE: heating temperature rise measurements for cooling system failure**					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)
Heatsink		69.8	76.5	84.8	-	90
Touch Surface		61.2	66.0	69.3	-	90
AC Connector		64.4	71.1	75.2	-	90
Mounting Surface		64.3	70.0	77.2	-	90
DC Switch Handle		61.2	64.6	69.6	-	85
PV Connector		61.0	70.6	73.9	-	90

Supplementary information:
Note 1: Test with model ASW6K-LT-G2 Pro. 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: Test with model ASW10K-LT-G2 Pro. 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: Test with model ASW20K-LT-G2 Pro. 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: 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.

--- End of test report---