Test Verification of Conformity

Verification Number: 210623184GZU-VOC001

On the basis of the referenced test report(s), sample(s) tested of the below product have been found to comply with the standards harmonized with the directives listed on this verification at the time the tests were carried out. Other standards and Directives may be relevant to the product. This verification is part of the full test report(s) and should be read in conjunction with it <them>.

Once compliance with all product relevant CE mark directives are verified, including any relevant e.g. risk assessment and production control, the manufacturer may indicate compliance by signing a Declaration of Conformity themselves and applying the mark to products identical to the tested sample(s).

Applicant Name & Address:	INVT Solar Technology (Shenzhen) Co., Ltd. 6 th Floor , Block A, INVT Guangming Technology Building, Kejie Fourth Road, Shutianpu Community, Matian Guangming District, 518000 Shenzhen, PEOPLE'S REPUBLIC OF CHAINA
Product Description:	Grid-tied Solar inverter
Models/Type References:	iMars XG100KTR, iMars XG100KTR-F, iMars XG110KTR, iMars XG110KTR-F, iMars XG136KTR-L, iMars XG136KTR-LF, iMars XG136KTR-X, iMars XG136KTR-XF
Ratings & Principle Characteristics:	See Appendix
Brand Name:	invt
Relevant Standards/Directives:	EN IEC 61000-6-3:2021 EN IEC 61000-6-1:2019 EMC Directive 2014/30/EU
Verification Issuing Office Name & Address:	Intertek Testing Services Shenzhen Ltd. Guangzhou Branch Room 02, & 101/E201/E301/E401/E501/E601/E701/E801 of Room 01 1-8/F., No. 7-2. Caipin Road, Science City, GETDD, Guangzhou, Guangdong, China
Date of Tests:	30 July 2021- 25 August 2021
Test Report Number(s):	210623184GZU-001

Additional information in Appendix.

Sky Zhu

Signature

Name: **Sky Zhu**

Position: Team Leader

Date: 02 September 2021

APPENDIX: Test Verification of Conformity

This is an Appendix to Test Verification of Conformity Number: 210623184GZU-VOC001

Ratings & Principle Characteristics:

Model	iMars XG100KTR	iMars XG100KTR-F
Max.PV voltage	1100Vdc	
MPPT voltage range	180V – 1000Vdc	
Max.input current	26A*9	30A*9
PV Isc	40A*9	
Nominal output voltage	3/N/PE, 230/400Vac	
Nominal output Frequency	50/60Hz	
Max.output current	158.8A	
Rated output power	100KW	
Max.apparent power	110KVA	
Power factor range	0.8Leading – 0.8 lagging	
Safety level	Class I	
Ingress Protection	IP 66	
Operation Ambient Temperature	-30°C - +60°C	
Software version	V1.1	
Model	iMars XG110KTR	iMars XG110KTR-F
Max.PV voltage	1100Vdc	
MPPT voltage range	180V – 1000Vdc	
Max.input current	26A*10	30A*10
PV Isc	40A*10	
Nominal output voltage	3/N/PE, 230/400Vac	
Nominal output Frequency	50/60Hz	
Max.output current	174.6A	
Rated output power	110KW	
Max.apparent power	121KVA	
Power factor range	0.8Leading – 0.8 lagging	
Safety level	Class I	
Ingress Protection	IP 66	
Operation Ambient Temperature	-30°C - +60°C	
Software version	V1.1	

APPENDIX: Test Verification of Conformity

This is an Appendix to Test Verification of Conformity Number: 210623184GZU-VOC001

Ratings & Principle Characteristics:

Model	iMars XG136KTR-L	iMars XG136KTR-LF
Max.PV voltage	1100Vdc	
MPPT voltage range	180V – 1000Vdc	
Max.input current	26A*12	30A*12
PV Isc	40A*12	
Nominal output voltage	3/N/PE, 277/480Vac	
Nominal output Frequency	50/60Hz	
Max.output current	174.6A	
Rated output power	136KW	
Max.apparent power	150KVA	
Power factor range	0.8Leading – 0.8 lagging	
Safety level	Class I	
Ingress Protection	IP 66	
Operation Ambient Temperature	-30°C - +60°C	
Software version	V1.1	
Model	iMars XG136KTR-X	iMars XG136KTR-XF
Max.PV voltage	1100Vdc	
MPPT voltage range	180V – 1000Vdc	
Max.input current	26A*12	30A*12
PV Isc	40A*12	
Nominal output voltage	3/N/PE, 311/540Vac	
Nominal output Frequency	50/60Hz	
Max.output current	160.4A	
Rated output power	136KW	
Max.apparent power	150KVA	
Power factor range	0.8Leading – 0.8 lagging	
Safety level	Class I	
Ingress Protection	IP 66	
Operation Ambient Temperature	-30°C - +60°C	
Software version	V1.1	

Sky Zhu

Signature

Name: Sky Zhu
Position: Team Leader
Date: 02 September 2021

Test Verification of Conformity

Verification Number: 210623182GZU -VOC001

On the basis of the referenced test report(s), sample(s) tested of the below product have been found to comply with the standards harmonized with the directives listed on this verification at the time the tests were carried out. Other standards and Directives may be relevant to the product. This verification is part of the full test report(s) and should be read in conjunction with it <them>.

Once compliance with all product relevant CE mark directives are verified, including any relevant e.g. risk assessment and production control, the manufacturer may indicate compliance by signing a Declaration of Conformity themselves and applying the mark to products identical to the tested sample(s).

Applicant Name & Address:	INVT Solar Technology (Shenzhen) Co., Ltd. 6 th Floor , Block A, INVT Guangming Technology Building, Kejie Fourth Road, Shutianpu Community, Matian Guangming District, 518000 Shenzhen, PEOPLE'S REPUBLIC OF CHAINA
Product Description:	Grid-tied Solar inverter
Ratings & Principle Characteristics:	See Appendix: Test Verification of Conformity
Models/Type References:	iMars XG100KTR, iMars XG100KTR-F, iMars XG110KTR, iMars XG110KTR-F, iMars XG136KTR-L, iMars XG136KTR-LF, iMars XG136KTR-X, iMars XG136KTR-XF
Brand Name:	invt
Relevant Standards/Directives:	IEC/EN 62109-1: 2010 Safety of power converters for use in photovoltaic power systems – Part 1: General requirements IEC/EN 62109-2: 2011 Safety of power converters for use in photovoltaic power systems – Part 2: Particular requirements for inverters Low Voltage Directive 2014/35/EU
Verification Issuing Office Name & Address:	Intertek Testing Services Shenzhen Ltd. Guangzhou Branch. Room 02, & 101/E201/E301/E401/E501/E601/E701/E801 of Room 01 1-8/F., No. 7-2. Caipin Road, Science City, GETDD, Guangzhou, Guangdong, China
Date of Tests:	24 Jun 2021 to 26 Jul 2021
Test Report Number(s):	210623182GZU-001, 210623182GZU-002

Additional information in Appendix.

Jason Fu

Signature

Name: Jason Fu
Position: Supervisor
Date: 27 Jul 2021

APPENDIX: Test Verification of Conformity

This is an Appendix to Test Verification of Conformity Number: 210623182GZU -VOC001.

Ratings & Principle Characteristics:	For model: iMars XG136KTR-L DC input: Max. PV Voltage: 1100Vdc; MPPT Voltage Range: 180-1000Vdc; Max.input current: 26A*12; PV Isc: 40A*12 AC output: Max. Apparent Power: 150kVA; Max Output Current: 174.6A; Nominal Output Voltage: 3/N/PE 277Vac/480Vac; Nominal Frequency: 50/60Hz; Power Factor:0.8 Leading – 0.8 Lagging Ambient Temperature: -30℃ - +60℃ IP66, Class I For model: iMars XG136KTR-LF DC input: Max. PV Voltage: 1100Vdc; MPPT Voltage Range: 180-1000Vdc; Max.input current: 30A*12; PV Isc: 40A*12 AC output: Max. Apparent Power: 150kVA; Max Output Current: 174.6A; Nominal Output Voltage: 3/N/PE 277Vac/480Vac; Nominal Frequency: 50/60Hz; Power Factor:0.8 Leading – 0.8 Lagging Ambient Temperature: -30℃ - +60℃ IP66, Class I For model: iMars XG100KTR DC input: Max. PV Voltage: 1100Vdc; MPPT Voltage Range: 180-1000Vdc; Max.input current: 26A*9; PV Isc: 40A*9 AC output: Max. Apparent Power: 110kVA; Max Output Current: 158.8A; Nominal Output Voltage: 3/N/PE 230Vac/400Vac; Nominal Frequency: 50/60Hz; Power Factor:0.8 Leading – 0.8 Lagging Ambient Temperature: -30℃ - +60℃ IP66, Class I

Jason Fu

Signature

Name: Jason Fu
Position: Supervisor
Date: 27 Jul 2021

APPENDIX: Test Verification of Conformity

This is an Appendix to Test Verification of Conformity Number: 210623182GZU -VOC001.

Ratings & Principle Characteristics:	For model: iMars XG100KTR-F DC input: Max. PV Voltage: 1100Vdc; MPPT Voltage Range: 180-1000Vdc; Max.input current: 30A*9; PV Isc: 40A*9 AC output: Max. Apparent Power: 110kVA; Max Output Current: 158.8A; Nominal Output Voltage: 3/N/PE 230Vac/400Vac; Nominal Frequency: 50/60Hz; Power Factor:0.8 Leading – 0.8 Lagging Ambient Temperature: -30℃ - +60℃ IP66, Class I For model: iMars XG110KTR DC input: Max. PV Voltage: 1100Vdc; MPPT Voltage Range: 180-1000Vdc; Max.input current: 26A*10; PV Isc: 40A*10 AC output: Max. Apparent Power: 121kVA; Max Output Current: 174.6A; Nominal Output Voltage: 3/N/PE 230Vac/400Vac; Nominal Frequency: 50/60Hz; Power Factor:0.8 Leading – 0.8 Lagging Ambient Temperature: -30℃ - +60℃ IP66, Class I For model: iMars XG110KTR-F DC input: Max. PV Voltage: 1100Vdc; MPPT Voltage Range: 180-1000Vdc; Max.input current: 30A*10; PV Isc: 40A*10 AC output: Max. Apparent Power: 121kVA; Max Output Current: 174.6A; Nominal Output Voltage: 3/N/PE 230Vac/400Vac; Nominal Frequency: 50/60Hz; Power Factor:0.8 Leading – 0.8 Lagging Ambient Temperature: -30℃ - +60℃ IP66, Class I

Jason Fu

Signature

Name: Jason Fu
Position: Supervisor
Date: 27 Jul 2021

APPENDIX: Test Verification of Conformity

This is an Appendix to Test Verification of Conformity Number: 210623182GZU -VOC001.

Ratings & Principle Characteristics:	For model: iMars XG136KTR-X DC input: Max. PV Voltage: 1100Vdc; MPPT Voltage Range: 180-1000Vdc; Max.input current: 26A*12; PV Isc: 40A*12 AC output: Max. Apparent Power: 150kVA; Max Output Current: 160.4A; Nominal Output Voltage: 3/N/PE 311Vac/540Vac; Nominal Frequency: 50/60Hz; Power Factor:0.8 Leading – 0.8 Lagging Ambient Temperature: -30℃ - +60℃ IP66, Class I For model: iMars XG136KTR-XF DC input: Max. PV Voltage: 1100Vdc; MPPT Voltage Range: 180-1000Vdc; Max.input current: 30A*12; PV Isc: 40A*12 AC output: Max. Apparent Power: 150kVA; Max Output Current: 160.4A; Nominal Output Voltage: 3/N/PE 311Vac/540Vac; Nominal Frequency: 50/60Hz; Power Factor:0.8 Leading – 0.8 Lagging Ambient Temperature: -30℃ - +60℃ IP66, Class I

Jason Fu

Signature

Name: Jason Fu
Position: Supervisor
Date: 27 Jul 2021

Certificate of compliance

Applicant: **INVT Solar Technology (Shenzhen) Co., Ltd.**
6th Floor, Block A, INVT Guangming Technology Building, Kejie Fourth Road, Shutianpu Community, Matian, Guangming District, 518000 Shenzhen
PEOPLE'S REPUBLIC OF CHINA

Product: **Photovoltaic (PV) inverter**

Model:
iMars XG100KTR
iMars XG100KTR-F
iMars XG110KTR
iMars XG110KTR-F
iMars XG136KTR-L
iMars XG136KTR-LF
iMars XG136KTR-X
iMars XG136KTR-XF

Inverter for three-phase parallel connection to the public grid. The network monitoring and disconnection device is an integral part of the above-mentioned model.

Applied rules and standards:

EN 50549-1:2019
Requirements for parallel connection of installations with distribution networks - Part 1: Connection to an LV distribution network - Production of installations up to and including Type B

4.4 Normal operating range
4.5 Immunity to disturbances
4.6 Active response to frequency deviation
4.7 Power response to voltage variations and voltage changes
4.8 EMC and power quality
4.9 Interface protection
4.10 Connection and starting to generate electrical power
4.11 Ceasing and reduction of active power on set point
4.13 Requirements regarding single fault tolerance of interface protection system and interface switch

DIN V VDE V 0126-1-1:2006 (4.1 Functional safety)
Automatic disconnection device between a generator and the public low-voltage grid

Commission Regulation (EU) 2016/631 of 14 April 2016
Establishing a network code on requirements for grid connection of generators (NC RFG).
Type approval for generation units to use in Type A and Type B plants.

At the time of issue of this certificate, the safety concept of an aforementioned representative product corresponds to the valid safety specifications for the specified use in accordance with regulations.

Report number:	**ZEM-ESH-P22010418**	**Certification Program:**	**NSOP-0032-DEU-ZE-V01**
Certificate number:	**U22-0325**	**Date of issue:**	**2022-06-03**

Certification body

Thomas Lammel

DAkkS Deutsche Akkreditierungsstelle D-ZE-12024-01-00

Certification body Bureau Veritas Consumer Products Services Germany GmbH accreditation to DIN EN ISO/IEC 17065

Testing laboratory accredited according to DIN EN ISO/IEC 17025

A partial representation of the certificate requires the written approval of Bureau Veritas Consumer Products Services Germany GmbH

Annex to the EN 50549-1 certificate of compliance No. U22-0325

Appendix

Extract from test report according to EN 50549-1 **No. ZEM-ESH-P22010418**

Type Approval and declaration of compliance with the requirements of EN 50549-1 and Commission Regulation (EU) 2016/631 of 14 April 2016

Manufacturer / applicant	INVT Solar Technology (Shenzhen) Co., Ltd. 6th Floor, Block A, INVT Guangming Technology Building, Kejie Fourth Road, Shutianpu Community, Matian, Guangming District, 518000 Shenzhen PEOPLE'S REPUBLIC OF CHINA
Micro-generator Type	Photovoltaic inverter

	iMars XG100KTR	iMars XG100KTR-F	iMars XG110KTR	iMars XG110KTR-F
MPP DC voltage range [V]	180-1000	180-1000	180-1000	180-1000
Max. input DC voltage [V]	1100	1100	1100	1100
Input DC current [A]	26*9	30*9	26*10	30*10
Output AC voltage [V]	3/N/PE 230/400, 50Hz/60Hz	3/N/PE 230/400, 50Hz/60Hz	3/N/PE 230/400, 50Hz/60Hz	3/N/PE 230/400, 50Hz/60Hz
Output AC current [A]	158,8	158,8	174,6	174,6
Output power [kVA]	110	110	121	121

	iMars XG136KTR-L	iMars XG136KTR-LF	iMars XG136KTR-X	iMars XG136KTR-XF
MPP DC voltage range [V]	180-1000	180-1000	180-1000	180-1000
Max. input DC voltage [V]	1100	1100	1100	1100
Input DC current [A]	26*12	30*12	26*12	30*12
Output AC voltage [V]	3/N/PE 277/480, 50Hz/60Hz	3/N/PE 277/480, 50Hz/60Hz	3/N/PE 311/540, 50Hz/60Hz	3/N/PE 311/540, 50Hz/60Hz
Output AC current [A]	174,6	174,6	160,4	160,4
Output power [kVA]	150	150	150	150

Firmware version	Beginning with V1.1

Description of the structure of the power generation unit:

The power generation unit is equipped with a PV and line-side EMC filter. The power generation unit has no galvanic isolation between DC input and AC output. Output switch-off is performed with single-fault tolerance based on the inverter bridge and two series-connected relays in each line and neutral. This enables a safe disconnection of the power generation unit from the network in case of error.

Note:

The settings of the interface protection are password protected adjustable.

In case the above stated generators are used with an external protection device, the protection settings of the inverters are to be adjusted according to the manufacturer's declaration.

The above stated generators are tested according to the requirements in the EN 50549-1:2019 Commission Regulation (EU) 2016/631 of 14 April 2016. Any modification that affects the stated tests must be named by the manufacturer/supplier of the product to ensure that the product meets all requirements.

Certificate of Conformity

Certificate Number: CN-PV-220112

On the basis of the tests undertaken, the sample<s> of the below product have been found to comply with the requirements of the referenced specification<s>/standard<s> at the time the tests were carried out. It does not imply that Intertek has performed any surveillance or control of the manufacture(s). The manufacturer(s) shall ensure that the manufacturing process assures compliance of the production units with the examined products mentioned in this certificate.

Applicant:	INVT Solar Technology (Shenzhen) Co., Ltd. 6th Floor, Block A, INVT Guangming Technology Building, Kejie Fourth Road, Shutianpu Community, Matian Guangming District, 518000 Shenzhen, PEOPLE'S REPUBLIC OF CHINA
Product:	Grid-tied Solar inverter
Ratings & Principle Characteristics:	See appendix of Certificate of Conformity
Model:	iMars XG100KTR, iMars XG100KTR-F, iMars XG110KTR, iMars XG110KTR-F, iMars XG136KTR-L, iMars XG136KTR-LF, iMars XG136KTR-X, iMars XG136KTR-XF
Brand Name<s>:	invt
Product Complies with:	IEC/EN 62109-1: 2010 Safety of power converters for use in photovoltaic power systems – Part 1: General requirements IEC/EN 62109-2: 2011 Safety of power converters for use in photovoltaic power systems – Part 2: Particular requirements for inverters Low Voltage Directive 2014/35/EU
Certificate Issuing Office Name & Address:	Intertek Testing Services Ltd. Shanghai West Area, 2nd Floor, No. 707, Zhangyang Road China (Shanghai) Pilot Free Trade Zone, Shanghai, P. R. China
Test Report No.<s>:	210623182GZU-001, 210623182GZU-002

Once compliance with all product relevant CE mark directives are verified, including any relevant e.g. risk assessment and production control, the manufacturer may indicate compliance by signing a Declaration of Conformity themselves and applying the mark to products identical to the tested sample(s).
Additional information in Appendix.

Signature

Certification Manager: Grady Ye
Date: 1 June 2022

APPENDIX: Certificate of Conformity

This is an Appendix to Certificate of Conformity Number: CN-PV-220112.

Model	iMars XG100KTR	iMars XG100KTR-F	iMars XG110KTR	iMars XG110KTR-F
Max.PV voltage	1100Vdc			
MPPT voltage range	180V – 1000Vdc			
Max.input current	26A*9	30A*9	26A*10	30A*10
PV Isc	40A*9		40A*10	
Nominal output voltage	3/N/PE, 230/400Vac			
Nominal output Frequency	50/60Hz			
Max.output current	158.8A		174.6A	
Rated output power	100KW		110KW	
Max.apparent power	110KVA		121KVA	
Power factor range	0.8Leading – 0.8 lagging			
Safety level	Class I			
Ingress Protection	IP 66			
Operation Ambient Temperature	-30℃ - +60℃			
Software version	V1.1			

APPENDIX: Certificate of Conformity

This is an Appendix to Certificate of Conformity Number: CN-PV-220112.

Model	iMars XG136KTR-L	iMars XG136KTR-LF	iMars XG136KTR-X	iMars XG136KTR-XF
Max.PV voltage	1100Vdc			
MPPT voltage range	180V – 1000Vdc			
Max.input current	26A*12	30A*12	26A*12	30A*12
PV Isc	40A*12			
Nominal output voltage	3/N/PE, 277/480Vac		3/N/PE, 311/540Vac	
Nominal output Frequency	50/60Hz			
Max.output current	174.6A		160.4A	
Rated output power	136KW			
Max.apparent power	150KVA			
Power factor range	0.8Leading – 0.8 lagging			
Safety level	Class I			
Ingress Protection	IP 66			
Operation Ambient Temperature	-30℃ - +60℃			
Software version	V1.1			

TL-395

Test Report issued under the responsibility of:

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

Report Number. ..... :	210623182GZU-001
Date of issue ..... :	27 Jul 2021
Total number of pages ..... :	80 pages
Name of Testing Laboratory preparing the Report ..... :	Intertek Testing Services Shenzhen Ltd. Guangzhou Branch Room 02, & 101/E201/E301/E401/E501/E601/E701/E801 of Room 01 1-8/F., No. 7-2. Caipin Road, Science City, GETDD, Guangzhou, Guangdong, China
Applicant's name ..... :	INVT Solar Technology (Shenzhen) Co., Ltd.
Address ..... :	6th Floor, Block A, INVT Guangming Technology Building, Kejie Fourth Road, Shutianpu Community, Matian Guangming District, 518000 Shenzhen, PEOPLE'S REPUBLIC OF CHINA
Test specification:	
Standard ..... :	IEC/EN 62109-1:2010 (First Edition)
Test procedure ..... :	Type approval
Non-standard test method ..... :	N/A
Test Report Form No. ..... :	IEC62109_1B
Test Report Form(s) Originator .... :	VDE Testing and Certification Institute
Master TRF ..... :	Dated 2016-04

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

General disclaimer:

The test results presented in this report relate only to the object tested.
This report shall not be reproduced, except in full, without the written approval of the Issuing CB Testing Laboratory. The authenticity of this Test Report and its contents can be verified by contacting the NCB, responsible for this Test Report.

Test item description..... :	Grid-tied Solar inverter
Trade Mark..... :	invt
Manufacturer ..... :	Same as applicant
Model/Type reference..... :	iMars XG100KTR, iMars XG100KTR-F, iMars XG110KTR, iMars XG110KTR-F, iMars XG136KTR-L, iMars XG136KTR-LF, iMars XG136KTR-X, iMars XG136KTR-XF
Ratings..... :	

Model	iMars XG100KTR	iMars XG100KTR-F
Max.PV voltage	1100Vdc	
MPPT voltage range	180V – 1000Vdc	
Max.input current	26A*9	30A*9
PV Isc	40A*9	
Nominal output voltage	3/N/PE, 230/400Vac	
Nominal output Frequency	50/60Hz	
Max.output current	158.8A	
Rated output power	100KW	
Max.apparent power	110KVA	
Power factor range	0.8Leading – 0.8 lagging	
Safety level	Class I	
Ingress Protection	IP 66	
Operation Ambient Temperature	-30℃ - +60℃	
Software version	V1.1	
Model	iMars XG110KTR	iMars XG110KTR-F
Max.PV voltage	1100Vdc	
MPPT voltage range	180V – 1000Vdc	
Max.input current	26A*10	30A*10
PV Isc	40A*10	
Nominal output voltage	3/N/PE, 230/400Vac	
Nominal output Frequency	50/60Hz	
Max.output current	174.6A	
Rated output power	110KW	
Max.apparent power	121KVA	

Power factor range	0.8Leading – 0.8 lagging	
Safety level	Class I	
Ingress Protection	IP 66	
Operation Ambient Temperature	-30℃ - +60℃	
Software version	V1.1	
Model	iMars XG136KTR-L	iMars XG136KTR-LF
Max.PV voltage	1100Vdc	
MPPT voltage range	180V – 1000Vdc	
Max.input current	26A*12	30A*12
PV Isc	40A*12	
Nominal output voltage	3/N/PE, 277/480Vac	
Nominal output Frequency	50/60Hz	
Max.output current	174.6A	
Rated output power	136KW	
Max.apparent power	150KVA	
Power factor range	0.8Leading – 0.8 lagging	
Safety level	Class I	
Ingress Protection	IP 66	
Operation Ambient Temperature	-30℃ - +60℃	
Software version	V1.1	
Model	iMars XG136KTR-X	iMars XG136KTR-XF
Max.PV voltage	1100Vdc	
MPPT voltage range	180V – 1000Vdc	
Max.input current	26A*12	30A*12
PV Isc	40A*12	
Nominal output voltage	3/N/PE, 311/540Vac	
Nominal output Frequency	50/60Hz	
Max.output current	160.4A	
Rated output power	136KW	
Max.apparent power	150KVA	

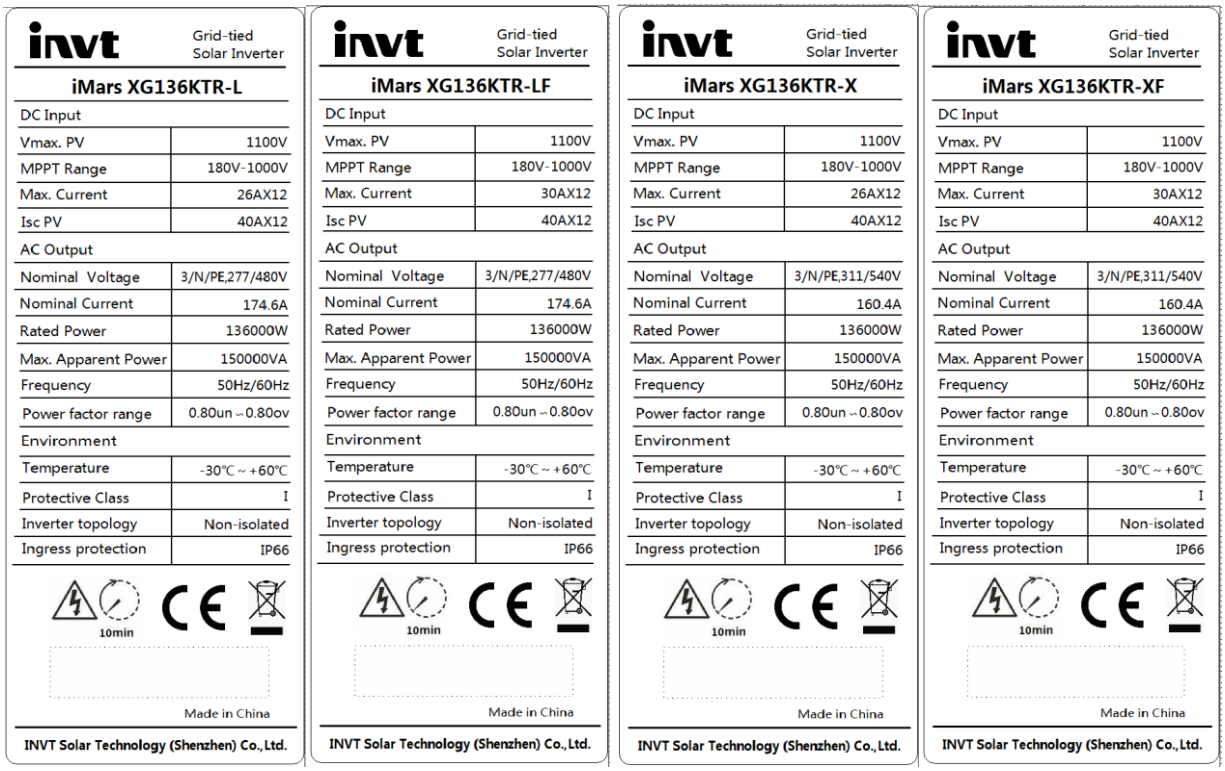
Power factor range	0.8Leading – 0.8 lagging
Safety level	Class I
Ingress Protection	IP 66
Operation Ambient Temperature	-30℃ - +60℃
Software version	V1.1

Responsible Testing Laboratory (as applicable), testing procedure and testing location(s):			
☒	**Testing Laboratory:**	Intertek Testing Services Shenzhen Ltd. Guangzhou Branch	
Testing location/ address .....:		Room 02, & 101/E201/E301/E401/E501/E601/E701/E801 of Room 01 1-8/F., No. 7-2. Caipin Road, Science City, GETDD, Guangzhou, Guangdong, China	
☐	**Associated CB Testing Laboratory:**	N/A	
Testing location/ address .....:		N/A	
Tested by (name, function, signature).....:		Gaison Li Engineer	Gaison Li
Approved by (name, function, signature)...:		Jason Fu Supervisor	Jason Fu
☐	**Testing procedure: CTF Stage 1:**	N/A	
Testing location/ address .....:		N/A	
Tested by (name, function, signature).....:		N/A	
Approved by (name, function, signature)...:		N/A	
☐	**Testing procedure: CTF Stage 2:**	N/A	
Testing location/ address .....:		N/A	
Tested by (name + signature).....:		N/A	
Witnessed by (name, function, signature) .:		N/A	
Approved by (name, function, signature)...:		N/A	
☐	**Testing procedure: CTF Stage 3:**	N/A	
☐	**Testing procedure: CTF Stage 4:**	N/A	
Testing location/ address .....:		N/A	
Tested by (name, function, signature).....:		N/A	
Witnessed by (name, function, signature) .:		N/A	
Approved by (name, function, signature)...:		N/A	
Supervised by (name, function, signature) :		N/A	

List of Attachments (including a total number of pages in each attachment): **N/A**	
Summary of testing:	
Tests performed (name of test and test clause): All applicable tests	**Testing location:** Intertek Testing Services Shenzhen Ltd. Guangzhou Branch Room 02, & 101/E201/E301/E401/E501/E601/E701/E801 of Room 01 1-8/F., No. 7-2. Caipin Road, Science City, GETDD, Guangzhou, Guangdong, China
Summary of compliance with National Differences (List of countries addressed): N/A ☒ **The product fulfils the requirements of** IEC/EN 62109-1:2010 (First Edition)	

Copy of marking plate:

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



invt Grid-tied Solar Inverter

iMars XG136KTR-L

DC Input	
Vmax. PV	1100V
MPPT Range	180V-1000V
Max. Current	26AX12
Isc PV	40AX12
AC Output	
Nominal Voltage	3/N/PE,277/480V
Nominal Current	174.6A
Rated Power	136000W
Max. Apparent Power	150000VA
Frequency	50Hz/60Hz
Power factor range	0.80un～0.80ov
Environment	
Temperature	-30℃～+60℃
Protective Class	I
Inverter topology	Non-isolated
Ingress protection	IP66

10min

Made in China

INVT Solar Technology (Shenzhen) Co.,Ltd.

invt Grid-tied Solar Inverter

iMars XG136KTR-LF

DC Input	
Vmax. PV	1100V
MPPT Range	180V-1000V
Max. Current	30AX12
Isc PV	40AX12
AC Output	
Nominal Voltage	3/N/PE,277/480V
Nominal Current	174.6A
Rated Power	136000W
Max. Apparent Power	150000VA
Frequency	50Hz/60Hz
Power factor range	0.80un～0.80ov
Environment	
Temperature	-30℃～+60℃
Protective Class	I
Inverter topology	Non-isolated
Ingress protection	IP66

10min

Made in China

INVT Solar Technology (Shenzhen) Co.,Ltd.

invt Grid-tied Solar Inverter

iMars XG136KTR-X

DC Input	
Vmax. PV	1100V
MPPT Range	180V-1000V
Max. Current	26AX12
Isc PV	40AX12
AC Output	
Nominal Voltage	3/N/PE,311/540V
Nominal Current	160.4A
Rated Power	136000W
Max. Apparent Power	150000VA
Frequency	50Hz/60Hz
Power factor range	0.80un～0.80ov
Environment	
Temperature	-30℃～+60℃
Protective Class	I
Inverter topology	Non-isolated
Ingress protection	IP66

10min

Made in China

INVT Solar Technology (Shenzhen) Co.,Ltd.

invt Grid-tied Solar Inverter

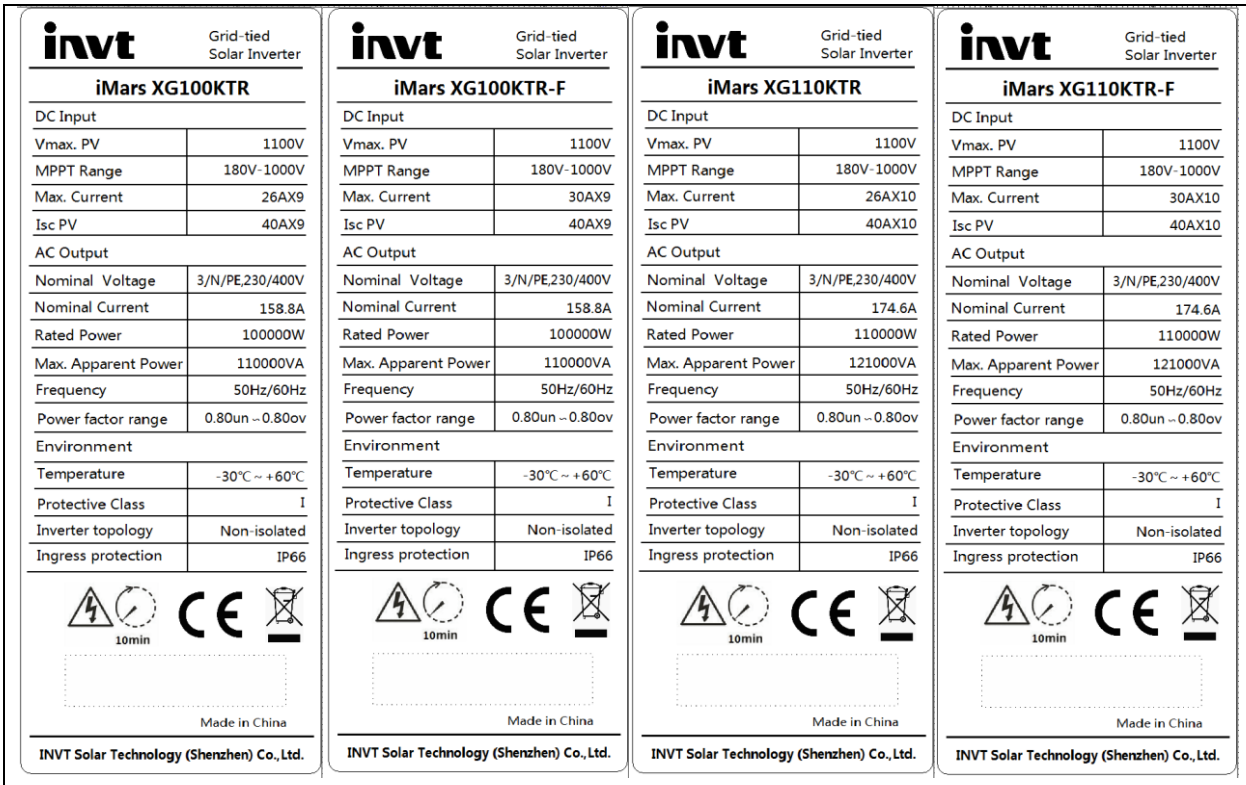
iMars XG136KTR-XF

DC Input	
Vmax. PV	1100V
MPPT Range	180V-1000V
Max. Current	30AX12
Isc PV	40AX12
AC Output	
Nominal Voltage	3/N/PE,311/540V
Nominal Current	160.4A
Rated Power	136000W
Max. Apparent Power	150000VA
Frequency	50Hz/60Hz
Power factor range	0.80un～0.80ov
Environment	
Temperature	-30℃～+60℃
Protective Class	I
Inverter topology	Non-isolated
Ingress protection	IP66

10min

Made in China

INVT Solar Technology (Shenzhen) Co.,Ltd.



invt	Grid-tied Solar Inverter
iMars XG100KTR	
DC Input	
Vmax. PV	1100V
MPPT Range	180V-1000V
Max. Current	26AX9
Isc PV	40AX9
AC Output	
Nominal Voltage	3/N/PE,230/400V
Nominal Current	158.8A
Rated Power	100000W
Max. Apparent Power	110000VA
Frequency	50Hz/60Hz
Power factor range	0.80un～0.80ov
Environment	
Temperature	-30℃～+60℃
Protective Class	I
Inverter topology	Non-isolated
Ingress protection	IP66

10min

Made in China

INVT Solar Technology (Shenzhen) Co.,Ltd.

invt	Grid-tied Solar Inverter
iMars XG100KTR-F	
DC Input	
Vmax. PV	1100V
MPPT Range	180V-1000V
Max. Current	30AX9
Isc PV	40AX9
AC Output	
Nominal Voltage	3/N/PE,230/400V
Nominal Current	158.8A
Rated Power	100000W
Max. Apparent Power	110000VA
Frequency	50Hz/60Hz
Power factor range	0.80un～0.80ov
Environment	
Temperature	-30℃～+60℃
Protective Class	I
Inverter topology	Non-isolated
Ingress protection	IP66

10min

Made in China

INVT Solar Technology (Shenzhen) Co.,Ltd.

invt	Grid-tied Solar Inverter
iMars XG110KTR	
DC Input	
Vmax. PV	1100V
MPPT Range	180V-1000V
Max. Current	26AX10
Isc PV	40AX10
AC Output	
Nominal Voltage	3/N/PE,230/400V
Nominal Current	174.6A
Rated Power	110000W
Max. Apparent Power	121000VA
Frequency	50Hz/60Hz
Power factor range	0.80un～0.80ov
Environment	
Temperature	-30℃～+60℃
Protective Class	I
Inverter topology	Non-isolated
Ingress protection	IP66

10min

Made in China

INVT Solar Technology (Shenzhen) Co.,Ltd.

invt	Grid-tied Solar Inverter
iMars XG110KTR-F	
DC Input	
Vmax. PV	1100V
MPPT Range	180V-1000V
Max. Current	30AX10
Isc PV	40AX10
AC Output	
Nominal Voltage	3/N/PE,230/400V
Nominal Current	174.6A
Rated Power	110000W
Max. Apparent Power	121000VA
Frequency	50Hz/60Hz
Power factor range	0.80un～0.80ov
Environment	
Temperature	-30℃～+60℃
Protective Class	I
Inverter topology	Non-isolated
Ingress protection	IP66

10min

Made in China

INVT Solar Technology (Shenzhen) Co.,Ltd.

Note:

1. The above markings are the minimum requirements required by the safety standard. For the final production samples, the additional markings which do not give rise to misunderstanding may be added.
2. Label is attached on the side surface of enclosure and visible after installation.
3. Other labels are identical to above, except the model name and ratings

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 DC ..... :	☐ OVC I ☒ OVC II ☐ OVC III ☐ OVC IV
Mains supply tolerance (%) ..... :	-90 / +110 %
Tested for power systems ..... :	TN systems
IT testing, phase-phase voltage (V) ..... :	- - -
Class of equipment ..... :	☒ Class I ☐ Class II ☐ Class III ☐ Not classified
Mass of equipment (kg) ..... :	Approx. 126Kg
Pollution degree ..... :	Outside PD3; Inside PD2
IP protection class ..... :	IP 66
..... :	
Possible test case verdicts:	
- test case does not apply to the test object .....:	N/A
- test object does meet the requirement .....:	P (Pass)
- test object was not evaluated for the requirement.....:	N/E
- test object does not meet the requirement .....:	F (Fail)
Testing .....:	
Date of receipt of test item.....:	23 Jun 2021
Date (s) of performance of tests .....:	24 Jun 2021 to 26 Jul 2021

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.** **This report shall be used together with report No.210623182GZU-002**	
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) ..... :	Shenzhen INVT Electric Co., Ltd. (Baoan Factory) 4th to 1st floors of Emerson Industrial Park, No. 3, Fengtang Avenue, Tangwei Community, Fuhai Street, Baoan District, Shenzhen, CHINA.

General product information:

The control system is divided into DC and AC control. AC-DSP and CPLD on the AC side mainly monitors the voltage, current, frequency and GFCI on the grid side, and participates in the inverter control.

The DC-DSP monitors the voltage, current, and ISO on the PV input side, and participates in the BOOS booster circuit and maximum power MPPT point tracking.

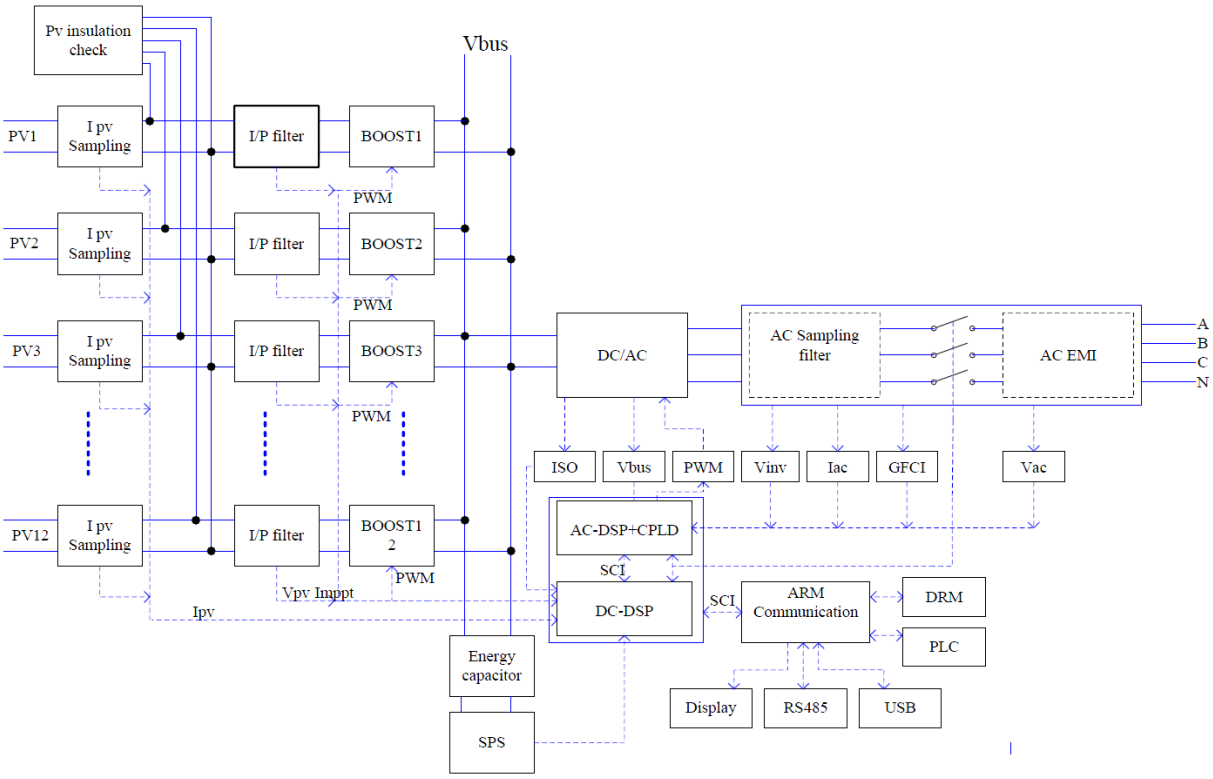
There is an internal communication circuit between the two DSP to coordinate with each other to complete the software function of the whole machine.

The ARM monitoring board does not participate in the control of the whole system. It communicates with the DC-SPS to collect the data of the whole system.

The relays (K3,K4,K5,K6) are designed on redundant structure where K4,K6 are controlled by DC-DSP and K5,K6 are controlled by AC-DSP.

The AC-DSP and DC-DSP are used together to control relay open or close, if the single fault on one controller, the other controller can be capable of opening the relay, so that still providing safety means.

The topology diagram as following:



Model differences:

All models are identical, except the output power derating in software and components as list in CDF.

The detailed difference as following:

Model	iMars XG100KTR, iMars XG100KTR-F	iMars XG110KTR, iMars XG110KTR-F	iMars XG136KTR-L, iMars XG136KTR-LF	iMars XG136KTR-X, iMars XG136KTR-XF
PV input	9 strings MPPT Each MPPT: two string input	10 strings MPPT Each MPPT: two string input	12 strings MPPT Each MPPT: two string input	
AC output voltage	230/400Vac		277/480Vac	311/540Vac

The product was tested on:

The Software version: V1.1

The Hardware version: VA.1

Other than special notes, typical model iMars XG136KTR-L used as representative for testing in this report.

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	Max. 60°C rated ambient temperature tested.	P
4.2.2.2	State of equipment		P
4.2.2.3	Position of equipment	Be fixed in accordance with the manufacturer's instruction	P
4.2.2.4	Accessories		P
4.2.2.5	Covers and removable parts		N/A
4.2.2.6	Mains supply a) Voltage: b) Frequency: c) Polarity: d) Earthing: e) Over-current Protection:	(see appended table 4.2.2.6)	P
4.2.2.7	Supply ports other than the mains		P
4.2.2.7.1	Photovoltaic supply sources a) Open circuit voltage: b) Short-circuit current:	(see appended table 4.2.2.7)	P
4.2.2.7.2	Battery inputs		N/A
4.2.2.8	Conditions of loading for output ports		P
4.2.2.9	Earthing terminals		P
4.2.2.10	Controls		N/A
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

IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
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	(See appended tables)	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		P
4.4.4.4	Transformer short circuit tests		P
4.4.4.5	Output short circuit		P
4.4.4.6	Backfeed current test for equipment with more than one source of supply	Considered	P
4.4.4.7	Output overload		P
4.4.4.8	Cooling system failure	Blanketing test for the heatsink according to IEC 62109-2 Clause 4.4.4.17	P
4.4.4.9	Heating devices	No heating devices	N/A
4.4.4.10	Safety interlock systems	No safety interlock	N/A
4.4.4.11	Reverse d.c. connections	Reverse DC+ and DC-, the PCE cannot start-up. No damaged.	P
4.4.4.12	Voltage selector mismatch	No voltage selector	N/A
4.4.4.13	Mis-wiring with incorrect phase sequence or polarity		P
4.4.4.14	Printed wiring board short-circuit test		P
4.5	Humidity preconditioning	(see appended table 7.5)	P
4.5.1	General		P
4.5.2	Conditions	95% R.H. 40℃. 48H	P
4.6	Backfeed voltage protection		P
4.6.1	Backfeed tests under normal conditions	The max. DC input and output are less than 60V, disconnected DC inputs and main	P
4.6.2	Backfeed tests under single-fault conditions	PV input is separated from Main in accordance with 62109-2s under normal and single-fault conditions with	P

IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
		disconnection method evaluated to IEC 62109-2 Also,  is presented on the marking label means that “After disconnect must wait for 5 mins can touch with PCE terminal”	
4.6.3	Compliance with backfeed tests		P
4.7	Electrical ratings tests	(see appended table 4.2.2.6)	P
4.7.1	Input ratings		P
4.7.1.1	Measurement requirements for DC input ports		P
4.7.2	Output ratings		P
5	**MARKING AND DOCUMENTATION**		P
5.1	Marking		P
5.1.1	General		P
	Equipment shall bear markings as specified in 5.1 and 5.2	Label are marked on PCE and graphic symbol is explained in user manual	P
	Graphic symbols may be used and shall be in accordance with Annex C or IEC 60417 as applicable.		P
	Graphic symbols shall be explained in the documentation provided with the PCE.		P
5.1.2	Durability of markings		P
	Markings required by this clause to be located on the PCE shall remain clear and legible under conditions of NORMAL USE and resist the effects of cleaning agents specified by the manufacturer	After this test, the markings are clearly legible. There was neither loose nor curling on the edge of label.	P
5.1.3	Identification		P
	The equipment shall, as a minimum, be permanently marked with:		P
	a) the name or trade mark of the manufacturer or supplier	Trade mark: invt	P
	b) model number, name or other means to identify the equipment		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.	Within three months	P
5.1.4	Equipment ratings	See below	P

IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
	Unless otherwise specified in another part of IEC 62109, the following ratings, as applicable shall be marked on the equipment:		P
	– input voltage, type of voltage (a.c. or d.c.), frequency, and max. continuous current for each input	Refer to the marking label	P
	– output voltage, type of voltage (a.c. or d.c.), frequency, max. continuous current, and for a.c. outputs, either the power or power factor for each output	Refer to the marking label	P
	– the ingress protection (IP) rating as in 6.3 below	IP 66	P
5.1.5	Fuse identification		N/A
	Marking shall be located adjacent to each fuse or fuseholder, or on the fuseholder, or in another location provided that it is obvious to which fuse the marking applies, giving the fuse current rating and where fuses of different voltage rating value could be fitted, the fuse voltage rating.		N/A
	Where fuses with special fusing characteristics such as time delay or breaking capacity are necessary, the type shall also be indicated		N/A
	For fuses not located in operator access areas and for soldered-in fuses located in operator access areas, it is permitted to provide an unambiguous cross-reference (for example, F1, F2, etc.) to the servicing instructions which shall contain the relevant information.		N/A
5.1.6	Terminals, Connections, and Controls		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 indications were provided adjacent to PV connectors and AC terminal	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.		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.	The PCE is not intended to connect to multiple-voltage and there is no voltage setting device.	N/A
	A unit with d.c. terminals shall be plainly marked indicating the polarity of the connections, with:	The “+” and “-” marking were provided adjacent to the PV input terminals	P
	– the sign “+“ for positive and “-„ for negative; or		P

IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
	– a pictorial representation illustrating the proper polarity where the correct polarity can be unambiguously determined from the representation	Not provided	N/A
5.1.6.1	Protective Conductor Terminals		P
	The means of connection for the protective earthing conductor shall be marked with:		P
	– symbol 7 of Annex C; or		P
	– the letters “PE“; or		N/A
	– the colour coding green-yellow.		P
5.1.7	Switches and circuit-breakers	Approved switch was used for all models.	P
	The on and off-positions of switches and circuits breakers shall be clearly marked. If a push-button switch is used as the power switch, symbols 10 and 16 of Annex C may be used to indicate the on-position, or symbols 11 and 17 to indicate the off-position, with the pair of symbols (10 and 16, or 11 and 17) close together.	“ON” indicated the on-position of DC switch. “OFF” indicated the off-position of DC switch	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	No such parts	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		P

IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
	minimum dimensions as follows:		
	– 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 Annex C	The manual provides necessary information for warning marking	P
	Symbol 9 of Annex C is not required to be used adjacent to symbols that are explained in the manual		P
5.2.2	Content for warning markings		P
5.2.2.1	Ungrounded heat sinks and similar parts	Grounded heatsink	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.	The symbol 14 of Annex C provided on the warning label which located on the surface of enclosure	P
5.2.2.3	Coolant	Coolant is not used	N/A
	A unit containing coolant that exceeds 70 °C shall be legibly marked externally where readily visible after installation with symbol 15 of Annex C. The documentation shall provide a warning regarding the risk of burns from hot coolant, and either:		N/A
	a) statement that coolant system servicing is to be done only by SERVICE PERSONNEL, or		N/A
	b) instructions for safe venting, draining, or otherwise working on the cooling system, if these operations can be performed without OPERATOR access to HAZARDS internal to the equipment		N/A
5.2.2.4	Stored energy		P

IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
	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.		P
5.2.2.5	Motor guarding		N/A
	Where required by 8.2 a marking shall be provided where it is visible to service personnel before removal of a guard, warning of the hazard and giving instructions for safe servicing (for example disconnection of the source before removing the guard).		N/A
5.2.3	Sonic hazard markings and instructions	Hazardous noise is not produced	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		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.	Marked with symbol 13 of Annex C and explained in User manual.	P
	The symbol shall be located on the outside of the unit or shall be prominently visible behind any cover giving access to hazardous parts.		P
5.2.5	Excessive touch current		P
	Where required by 7.3.6.3.7 the PCE shall be marked with symbol 15 of Annex C. See also 5.3.2 for information to be provided in the installation manual.	It is provided a second protective earthing conductor, in addition, the caution symbol 15 of Annex C is fixed to the product and provided details of protective earthing in installation	P
5.3	Documentation		P
5.3.1	General		P
	The documentation provided with the PCE shall provide the information needed for the safe operation, installation, and (where applicable) maintenance of the equipment. The documentation		P

IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
	shall include the items required in 5.3.2 through 5.3.4, and the following:		
	a) explanations of equipment makings, including symbols used		P
	b) location and function of terminals and controls		P
	c) all ratings or specifications that are necessary to safely install and operate the PCE, including the following environmental ratings along with an explanation of their meaning and any resulting installation requirements:		P
	– ENVIRONMENTAL CATEGORY as per 6.1	Outdoor	P
	– WET LOCATIONS classification fort he intended external environment as per 6.1	Suitable for wet location	P
	– POLLUTION DEGREE classification for the intended external environment as per 6.2	Outside: PD3, Inside: PD2	P
	– INGRESS PROTECTION rating as per 6.3	IP 66	P
	– Ambient temperature and relative humidity ratings	Max. +60℃ and 100% R.H.	P
	– MAXIMUM altitude rating	4000m	P
	– OVERVOLTAGE CATEGORY assigned to each input and output port as per 7.3.7.1.2, accompanied by guidance regarding how to ensure that the installation complies with the required overvoltage categories;	OVC II(PV), OVC III(Mains)	P
	d) a warning that when the photovoltaic array is exposed to light, it supplies a d.c. voltage to the PCE		P
5.3.1.1	Language	English provide	P
	Instructions related to safety shall be in a language that is acceptable in the country where the equipment is to be installed.	For other country language further evaluated is needed	N/A
5.3.1.2	Format		P
	In general, the documentation must be provided in printed form and is to be delivered with the equipment.	Printed form provided	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		P
	The documentation shall include installation and where applicable, specific commissioning instructions and, if necessary for safety, warnings against hazards which could arise during		P

IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
	installation or commissioning of the equipment. The information provided shall include:		
	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;		N/A
	g) instructions and information relating to sound pressure level if required by 10.2.1;		N/A
	h) where required by 14.8.1.3, instructions for the adequate ventilation of the room or location in which PCE containing vented or valve-regulated batteries is located, to prevent the accumulation of hazardous gases;		N/A
	i) tightening torque to be applied to wiring terminals;		N/A
	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;	The backfeed current was prevented.	N/A
	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;	Internal RCM is used	N/A
	m) instructions for protective earthing, including the information required by 7.3.6.3.7 if a second protective earthing conductor is to be installed:		P
	n) where required by 7.3.8, the installation instructions shall include the following or equivalent wording:		N/A
	“This product can cause a d.c. current in the external protective earthing conductor. Where a	Internal RCM is used	N/A

IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
	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.“		
	o) for PCE intended to charge batteries, the battery nominal voltage rating, size, and type		N/A
	p) PV array configuration information, such as ratings, whether the array is to be grounded or floating, any external protection devices needed, etc.	PV array should be floating configuration to be connected to PCE, relevant information h ad shown on the installation manual.	P
5.3.3	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		P
	Maintenance instructions shall include the following:		P
	– Intervals and instructions for any preventive maintenance that is required to maintain safety (for example air filter replacement or periodic re-tightening of terminals);		P
	– Instructions for accessing operator access areas, if any are present, including a warning not to enter other areas of the equipment;	No such part	P
	– Part numbers and instructions for obtaining any required operator replaceable parts;		N/A
	– Instructions for safe cleaning (if recommended)		N/A
	– 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		P

IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
	operated in order to completely isolate the equipment.		
5.3.4.1	Battery maintenance	No such parts	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 maintenance (applicable to equipment and remote battery supplies not having a grounded supply circuit).		N/A
6	**ENVIRONMENTAL REQUIREMENTS AND CONDITIONS**		P
	The manufacturer shall rate the PCE for the following environmental conditions:		P
	– ENVIRONMENTAL CATEGORY, as in 6.1 below	Outdoor used	P

IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
	– Suitability for WET LOCATIONS or not	Yes	P
	– POLLUTION DEGREE rating in 6.2 below	Outside PD3, Inside PD2	P
	– INGRESS PROTECTION (IP) rating, as in 6.3 below	IP 66	P
	– Ultraviolet (UV) exposure rating, as in 6.4 below		P
	– Ambient temperature and relative humidity ratings, as in 6.5 below	Max. 60℃， 100%R.H.	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	PD3	P
6.3	Ingress Protection	IP66	P
6.4	UV exposure		P
6.5	Temperature and humidity	-30°C~+60°C, 0%~100% R.H.	P
7	**PROTECTION AGAINST ELECTRIC SHOCK AND ENERGY HAZARDS**		P
7.1	General		P
7.2	Fault conditions	Normal and single fault condition are considered	P
7.3	Protection against electric shock		P
7.3.1	General	In the PCE the earthed metal enclosure is evaluated by means of basic insulation from DVC C circuit DVC A circuit and unearthed accessible parts are evaluated by means of reinforced insulation from DVC C or protective impedance DVC C circuit: The PV input and the Main output DVC A circuit: The signal communication output port.	P
7.3.2	Decisive voltage classification		P
7.3.2.1	Use of decisive voltage class (DVC)	Working voltage and protective measure and considered	P
7.3.2.2	Limits of DVC (according table 6)	Wet location is considered for PCE outside only	P
7.3.2.3	Short-terms limits of accessible voltages under fault conditions		P
7.3.2.4	Requirements for protection (according table 7)	Single fault condition is considered	P

IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
7.3.2.5	Connection to PELV and SELV circuits	The external signal communication ports are considered as SELV	P
7.3.2.6	Working voltage and DVC		P
7.3.2.6.1	General	Transients and voltage fluctuation are disregarded. And worst-case normal operation condition is considered	P
7.3.2.6.2	AC working voltage (see Figure 2)		P
7.3.2.6.3	DC working voltage (see Figure 3)		P
7.3.2.6.4	Pulsating working voltage (see Figure 4)		P
7.3.3	protective separation	In the PCE the earthed metal enclosure is evaluated by means of basic insulation from DVC C circuit DVC A circuit and unearthed accessible parts are evaluated by means of reinforced insulation from DVC C or protective impedance DVC C circuit: The PV input and the Main output DVC A circuit: The signal communication output port	P
	Protective separation shall be achieved by:		P
	▪ double or reinforced insulation, or	The double or reinforced insulation was provided between: 1) PV input circuits and communication circuits; 2) AC output circuits and communication circuits.	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		P
	▪ limitation of voltage according to 7.3.5.4.		N/A
	The protective separation shall be fully and effectively maintained under all conditions of intended use of the PCE		P
7.3.4	Protection against direct contact		P
7.3.4.1	General		P

IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
	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).	Metal enclosure provides basic insulation and PE	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.	Not use under this condition	N/A
7.3.4.2	Protection by means of enclosures and barriers		P
	The following requirements apply where protection against contact with live parts is provided by enclosures or barriers, not by insulation in 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		N/A
7.3.4.2.2	Access probe criteria		P
	Protection is considered to be achieved when the separation between the test probes and live parts, when tested as described below, is as follows:		P
	a) decisive voltage classification A, (DVC A) - the probe may touch the live parts	The signal is considered as DVC A	P
	b) decisive voltage classification B, (DVC B) - the probe must not touch bare live parts	The DVC B circuit is not accessible by probe	P
	c) decisive voltage classification C, (DVC C) – the probe must have adequate clearance to live parts, based on the clearance for Basic insulation using the recurring peak working voltage involved,	The DVC C circuit is not accessible by probe	P
7.3.4.2.3	Access probe tests		P
	Compliance with 7.3.4.2.1 is checked by all of the following:		P
	a) Inspection; and		P
	b) Tests with the test finger (Figure D.1) and test		P

IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
	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.		
	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.	No openings	N/A
	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.		N/A
7.3.4.2.4	Service access areas	Inside PCE are not intentionally touched with energized part when installation and maintenance. Symbol 21 of Annex C are marked on PCE and explained in user manual	P
7.3.4.3	Protection by means of insulation of live parts	The earthed enclosure is with basic insulation form the live parts inside	N/A
	Where the requirements of 7.3.4.2 are not met, live parts shall be provided with insulation if:		N/A
	– their working voltage is greater than the		N/A

IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
	maximum limit of decisive voltage class A, or		
	– for a DVC A or B circuit, protective separation from adjacent circuit of DVC C is not provided (see note "‡" under Table 7)		N/A
7.3.5	Protection in case of direct contact	The single communication ports are direct contact and evaluated with reinforced insulation from live part	P
7.3.5.1	General		P
	Protection in case of direct contact is required to ensure that contact with live parts does not produce a shock hazard.		P
	The protection against direct contact according to 7.3.4 is not required if the circuit contacted is separated from other circuits according to 7.3.2.3, and:	Considered	P
	– is of decisive voltage class A and complies with 7.3.5.2, or	The single communication port is DVC A and reinforced insulation from the live part by means of isolation transformer and optocoupler	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 plug-in-sub-assemblies or other plug-in devices which can be plugged-in without the use of a tool (key) or which are accessible without the use of a tool.	Considered	P
	Conformity is checked by visual inspection and trial insertion.		P
7.3.5.2	Protection using decisive voltage class A	The communication port is DVC A and reinforced insulation from the live part by means of isolation transformer and optocoupler	P
7.3.5.3	Protection by means of protective impedance	Protective impedance not used as protective separation in the PCE	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		N/A

IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
	circuits of DVC-B or DVC-C according 7.3.3.		
7.3.5.3.1	Limitation of current through protective impedance		N/A
	The current available through protective impedance to earth and between simultaneously accessible parts, measured at the accessible live parts, shall not exceed a value of 3,5 mA a.c. or 10 mA d.c. under normal and single-fault conditions.		N/A
7.3.5.3.2	Limitation of discharging energy through protective impedance		N/A
	The discharging energy available between simultaneously accessible parts protected by protective impedance shall not exceed the charging voltage and capacitance limits given in Table 9, which applies to both wet and dry locations, under normal and single fault conditions. Refer to figure 8.		N/A
7.3.5.4	Protection by means of limited voltages	No such design	N/A
	That portion of a circuit that has its voltage reduced to DVC-A by a voltage divider that complies with the following requirements, and that is otherwise provided with protective separation from circuits of DVC-B or DVC-C according to 7.3.3, does not require protection against direct contact.		N/A
	The voltage divider shall be designed so that under normal and single fault conditions, including faults in the voltage division circuit, the voltage across the output of the voltage divider does not exceed the limit for DVC-A.		N/A
	This type of protection shall not be used in case of protective class II or unearthed circuits, because it relies on protective earth being connected.		N/A
7.3.6	Protection against indirect contact		P
7.3.6.1	General		P
	Protection against indirect contact is required to prevent shock- hazardous current being accessible from conductive parts during an insulation failure. This protection shall comply with the requirements for protective class I (basic insulation plus protective earthing), class II (double or reinforced insulation) or class III (limitation of voltages)	The earthing metal enclosure is complied with protective class I and the circuit of communication is complied with protective class II for accessible communication ports	P
	That part of a PCE meets the requirements of 7.3.6.2 and 7.3.6.3 is defined as protective class I	The earthed metal enclosure meets this requirement	P
	That part of a PCE meets the requirements of 7.3.6.4 is defined as protective class II.		P
	That part of PCE which meets the requirements of decisive voltage class A and in which no hazardous voltages are derived, is defined as protective class III. No shock hazard is present in such circuits.		N/A

IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
	Where protection against indirect contact is dependent on means provided during installation, the installation instructions shall provide details of the required means and shall indicate the associated hazards.	The manual requires the PCE must be securely earthed	P
7.3.6.2	Insulation between live parts and accessible conductive parts		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	See Cl. 7.3.7.4 and Cl. 7.3.7.5	P
7.3.6.3	Protective class I – Protective bonding and earthing		P
7.3.6.3.1	General		P
	Equipment of protective class I shall be provided with protective earthing, and with protective bonding to ensure electrical contact between accessible conductive parts and the means of connection for the external protective earthing conductor, except bonding is not required for:		P
	a) accessible conductive parts that are protected by one of the measures in 7.3.5.2 to 7.3.5.4, or		P
	b) accessible conductive parts are separated from live parts of DVC-B or -C using double or reinforced insulation.	Communication circuits are separated from live parts used double or reinforced insulation	P
7.3.6.3.2	Requirements for protective bonding		P
	Electrical contact with the means of connection of the external protective earthing conductor shall be achieved by one or more of the following means:		P
	a) through direct metallic contact;	The connection of external protective earthing conductor is direct metal contact via a terminal with screw.	P
	b) through other conductive parts which are not removed when the PCE or sub-units are used as intended ;		N/A
	c) through a dedicated protective bonding conductor;		P
	d) through other metallic components of the PCE		N/A
	Where direct metallic contact is used and one or both of the parts involved is painted or coated, the paint or coating shall be removed in the area of contact, or reliably penetrated, to ensure metal to metal contact.	The metal enclosure is reliably penetrated earthed	P
	For moving or removable parts, hinges or sliding contacts designed and maintained to have a low resistance are examples of acceptable means if	No such design	N/A

IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
	they comply with the requirements of 7.3.6.3.3.		
	Metal ducts of flexible or rigid construction and metallic sheaths shall not be used as protective bonding conductors, unless the device or material has been investigated as suitable for protective bonding purposes.	No such design	N/A
7.3.6.3.3	Rating of protective bonding	The alternative of 7.3.6.3.5 is considered.	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.		P
	As alternative to a) and b) the protective bonding may designed according to the requirements for the external protective earthing conductor in 7.3.6.3.5, in which case no testing is required.	The alternative of 7.3.6.3.5 is considered.	P
	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		N/A

IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
	part of the equipment, the rating of the provided overcurrent device.		
	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		P
	The test current, duration of the test and acceptance criteria are as follows:		P
	a) For PCE with an overcurrent protective device rating of 16 A or less, the test current is 200% of the overcurrent protective device rating, but not less than 32 A, applied for 120s. The impedance of the protective bonding means during and at the end of the test shall not 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.		P
	c) During and after the test, there shall be no melting, loosening, or other damage that would impair the effectiveness of the protective bonding means.		P
	The test current is derived from an a.c or d.c supply		P

IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
	source, the output of which is not earthed.		
	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)	Manufacture declaration for this	N/A
	If the continuity of the protective bonding is achieved at any point by a single means only (for example a single conductor or single fastener), or if the PCE is assembled at the installation location, then the impedance of the protective bonding shall also be tested as a routine test. The test shall be as in 7.3.6.3.3, except for the following:		N/A
	▪ the test current may be reduced to any convenient value greater than 10 A sufficient to allow measurement or calculation of the impedance of the protective bonding means:		N/A
	▪ the test duration may be reduced to no less than 2 s		N/A
	For equipment subject to the type test in 7.3.6.3.3.1a), the impedance during the routine test shall not exceed 0,1Ω.		N/A
	For equipment subject to the type test in 7.3.6.3.3.1b) the impedance during the routine test shall not exceed 2,5 V divided by the test current required by 7.3.6.3.3.1b).		N/A
7.3.6.3.5	External protective earthing conductor		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.	The protective earthing conductor is fixed permanently and the minimum cross-sectional area is 8mm^2 cable of phase and protective earthing. Only qualified personnel can install the protective earthing.	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.	Permanently connected	N/A
	The cross-sectional area of every external		P

IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
	protective earthing conductor which does not form part of the supply cable or cable enclosure shall, in any case, be not less than:		
	▪ 2,5 mm² if mechanical protection is provided;		N/A
	▪ 4 mm² if mechanical protection is not provided.		P
	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.	Not cord-connected equipment.	N/A
7.3.6.3.6	Means of connection for the external protective earthing conductor	External protective earthing conductors connect to the enclosure body.	P
7.3.6.3.6.1	General		P
	The means of connection for the external protective earthing conductor shall be located near the terminals for the respective live conductors. The means of connections shall be corrosion-resistant and shall be suitable for the connection of cables according to 7.3.6.3.5. The means of connection for the protective earthing conductor shall not be used as a part of the mechanical assembly of the equipment or for other connections. A separate means of connection shall be provided for each external protective earthing conductor. Connection and bonding points shall be so designed that their current-carrying capacity is not impaired by mechanical, chemical, or electrochemical influences. Where enclosures and/or conductors of aluminium or aluminium alloys are used, particular attention should be given to the problems of electrolytic corrosion.	Considered	P
	The means of connection for the protective earthing conductor shall be permanently marked with:		P
	• symbol 7 of Annex C; or		P
	• the colour coding green-yellow		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		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.		N/A

IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
	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.	Accessible parts and earthing terminal: 7.2mAac	P
	a) Permanently connected wiring, and:	Have	P
	• a cross-section of the protective earthing conductor of at least 10 mm² Cu or 16 mm² Al; or		P
	• automatic disconnection of the supply in case of discontinuity of the protective earthing conductor; or		N/A
	• provision of an additional terminal for a second protective earthing conductor of the same cross-sectional area as the original protective earthing conductor and installation instruction requiring a second protective earthing conductor to be installed or		P
	b) Connection with an industrial connector according to IEC 60309 and a minimum protective earthing conductor cross-section of 2,5 mm² as part of a multi-conductor power cable. Adequate strain relief shall be provided.		N/A
	In addition, the caution symbol 15 of Annex C shall be fixed to the product and the installation manual shall provide details of the protective earthing measures required in the installation as required in 5.3.2.		P
	When it is intended and allowed to connect two or more PCEs in parallel using one common PE conductor, the above touch current requirements apply to the maximum number of the PCEs to be connected in parallel, unless one of the measures in a)		N/A
	or b) above is used. The maximum number of parallel PCEs is used in the testing and has to be stated in the installation manual.		N/A
7.3.6.4	Protective Class II – Double or Reinforced Insulation	Class I	N/A
	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:	Signal communication ports are evaluated with reinforced insulation form live parts inside	N/A
	• Equipment designed to protective class II shall not have means of connection for the external protective earthing conductor. However this does not apply if the external protective		N/A

IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
	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;		
	• metal-encased equipment of protective class II may have provision on its enclosure for the connection of an equipotential bonding conductor;		N/A
	• equipment of protective class II may have provision for the connection of an earthing conductor for functional reasons or for damping of overvoltages; it shall, however, be insulated as though it is a live part;		N/A
	• equipment employing protective class II shall be marked according to 5.1.8.		N/A
7.3.7	Insulation Including Clearance and Creepage Distance		P
7.3.7.1	General		P
	This subclause gives minimum requirements for insulation, based on the principles of IEC 60664.	Considered	P
	Manufacturing tolerances shall be taken into account during measurement of creepage, clearance, and insulation distance in the PCE.	Considered	P
	Insulation shall be selected after consideration of the following influences:	Considered	P
	• pollution degree	PD3 outside, PD2 inside	P
	• overvoltage category	The mains circuits: OVC III The PV circuits: OVC II	P
	• supply earthing system	TN	P
	• insulation voltage	PV input: max. 1100Vdc and Main:314Vac	P
	• location of insulation	See table 7.3.7.4 and 7.3.7.5 for detail	P
	• type of insulation	See table 7.3.7.4 and 7.3.7.5 for detail	P
	Compliance of insulation, creepage distances, and clearance distances, shall be verified by measurement or visual inspection, and the tests of 7.5.		P

IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
7.3.7.1.3	Supply earthing systems		P
	Three basic types of earthing system are described in IEC 60364-1. They are:	Inverter is intended to install in TN system	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.		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 the installation being earthed independently or collectively to the earthing system.		N/A
7.3.7.1.4	Insulation voltages	See table 7.3.7.4 and 7.3.7.5 for detail	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		P
7.3.7.2.2	Circuits connected directly to the mains	System voltage for mains is 314Vrms according to table 1	P
7.3.7.2.3	Circuits other than mains circuits		P
7.3.7.2.4	Insulation between circuits		P
7.3.7.3	Functional insulating		P
7.3.7.4	Clearance distances	(see appended table 7.3.7)	P
7.3.7.4.1	Determination	Designed for use in altitudes 4000m and below.	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		P
7.3.7.5.2	Voltage	If Working voltage less than system voltage, system voltage is used for creepage according to IEC60664-1	P

IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
7.3.7.5.3	Materials	Certified PWB used. Other materials are considered IIIb. The inside parts are considered Pollution degree 2	P
7.3.7.6	Coating		N/A
7.3.7.7	PWB spacings for functional insulating	V-0 and short circuit test are considered	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	Impulse test and voltage test are considered for insulation on IGBT as basic insulation	P
7.3.7.8.3.3	Material thickness less than 0,2 mm		N/A
7.3.7.8.3.4	Compliance		N/A
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		N/A
7.3.7.8.5	Wound components	Varnish is not considered as insulation and voltage test performed as routine test.	P
7.3.7.8.6	Potting materials		N/A
7.3.7.9	Insulation requirements above 30 kHz		N/A
7.3.8	Residual Current-operated protective (RCD) or monitoring (RCM) device compatibility	Internal RCM is used. An external built RCD is not necessary	P
	RCD and RCM are used to provide protection against insulation faults in some domestic and industrial installations, additional to that provided by the installed equipment.		N/A
7.3.9	Capacitor discharge		P
7.3.9.1	Operator access area	Accessible signal communication ports are DVC-A circuit.	P
	Equipment shall be so designed that there is no risk of electric shock in operator access areas from		P

IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
	charge stored on capacitors after disconnection of the PCE.		
7.3.9.2	Service access areas	Inside capacitor discharge to DVC A and no energy hazard level within 300s	P
	Capacitors located behind panels that are removable for servicing, installation, or disconnection shall present no risk of electric shock or energy hazard from charge stored on capacitors after disconnection of the PCE.	Warning symbol 21 of annex C is marked on PCE with 5min.	P
7.4	Protection against energy hazards		P
7.4.1	Determination of hazardous energy level	No such high energy level presented in the operator access area.	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.	Considered	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: $E = 0,5\ CU^2$	Considered	P
7.4.2	Operator Access Areas	No energized parts accessible to user	P
	Equipment shall be so designed that there is no risk of energy hazard in operator access areas from accessible circuits.		P
7.4.3	Services Access Areas	The capacitor inside the equipment stored hazardous energy. A symbol 21 of Annex C is provided.	P
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		P
7.5.4	Touch current measurement (type test)		P

IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
	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.	(see appended table 7.3.6.3.7)	P
	For type tests on PCE for which wet locations requirements apply according to 6.1, the humidity pre-conditioning of 4.5 shall be performed immediately prior to the touch current test.		P
7.5.5	Equipment with multiple sources of supply		P
8	**PROTECTION AGAINST MECHANICAL HAZARDS**		P
8.1	General		P
	Operation shall not lead to a mechanical HAZARD in NORMAL CONDITION or SINGLE FAULT CONDITION. Edges, projections, corners, openings, guards, handles and the like, that are accessible to the operator shall be smooth and rounded so as not to cause injury during normal use of the equipment.	No mechanical hazards under the normal or single fault condition.	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.		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.		P
8.3	Stability		N/A
	Equipment and assemblies of equipment not secured to the building structure before operation shall be physically stable in NORMAL USE.	Wall mounted	N/A
8.4	Provisions for lifting and carrying		P
	If carrying handles or grips are fitted to, or supplied with, the equipment, they shall be capable of withstanding a force of four times the weight of the equipment.		P
	Equipment or parts having a mass of 18 kg or more shall be provided with a means for lifting and		P

IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
	carrying or directions shall be given in the manufacturer's documentation.		
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.		P
8.6	Expelled parts		N/A
	Equipment shall contain or limit the energy of parts that could cause a HAZARD if expelled in the event of a fault.		N/A
9	**PROTECTION AGAINST FIRE HAZARDS**		P
9.1	Resistance to fire		P
	This subclause specifies requirements intended to reduce the risk of ignition and the spread of flame, both within the equipment and to the outside, by the appropriate use of materials and components and by suitable construction.	Considered	P
9.1.1	Reducing the risk of ignition and spread of flame		P
	For equipment or a portion of equipment, there are two alternative methods of providing protection against ignition and spread of flame that could affect materials, wiring, wound components and electronic components such as integrated circuits, transistors, thyristors, diodes, resistors and capacitors.	Method 1 used	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
	– components in SECONDARY CIRCUITS supplied by a LIMITED POWER SOURCE as specified in 9.2, but not mounted on a material of FLAMMABILITY CLASS V-1;		N/A
	– components within a power supply unit or assembly having a limited power output		N/A

IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
	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;		
	– 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	Enclosed relay	N/A
	– insulated wiring, except as permitted in 9.1.2.2.	PVC wire	N/A
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		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.	Metal enclosure	P
9.1.3.3	Materials for components and other parts outside fire enclosures		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		P
9.1.3.5	Materials for air filter assemblies		N/A
9.1.4	Openings in fire enclosures	No openings	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.		N/A
	These requirements are in addition to those in the following sections:		N/A
	– 7.3.4, Protection against direct contact;		N/A

IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
	– 7.4, Protection against energy hazards;		N/A
	– 13.5, Openings in enclosures		N/A
9.1.4.2	Side openings treated as bottom openings		N/A
9.1.4.3	Openings in the bottom of a fire enclosure		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		P
9.3.1	General		P
	The PCE shall not present a hazard, under short-circuit or overcurrent conditions at any port, including phase-to-phase, phase-to-earth and phase-to-neutral, and adequate information shall be provided to allow proper selection of external wiring and external protective devices.	The circumstances of short-circuit and overcurrent are protected by the circuits design. When short-circuit or overcurrent of components occurred, the PCE will shutdown and disconnect from the grid immediately.	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.	DC wire are designed for the short circuit rating of the array Short-circuit was occurred at PV input and DC terminal	P
9.3.3	Protective devices provided or specified shall have adequate breaking capacity to interrupt the		P

IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
	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.		
10	**PROTECTION AGAINST SONIC PRESSURE HAZARDS**		N/A
10.1	General		N/A
	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.	No sonic pressure hazards.	N/A
10.2	Sonic pressure and Sound level		N/A
10.2.1	Hazardous Noise Levels		N/A
11	**PROTECTION AGAINST LIQUID HAZARDS**		N/A
11.1	Liquid Containment, Pressure and Leakage		N/A
	The liquid containment system components shall be compatible with the liquid to be used.		N/A
	There shall be no leakage of liquid onto live parts as a result of:		N/A
	a) Normal operation, including condensation;		N/A
	b) Servicing of the equipment; or		N/A
	c) Inadvertent loosening or detachment of hoses or other cooling system parts over time.		N/A
11.2	Fluid pressure and leakage		N/A
11.2.1	Maximum pressure		N/A
11.2.2	Leakage from parts		N/A
11.2.3	Overpressure safety device		N/A
11.3	Oil and grease		N/A
12	**CHEMICAL HAZARDS**		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	DC breaker holder for manual controls.	P

IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
	might result in hazard.		
13.1.1	Adjustable controls	No such setting control	N/A
13.2	Securing of parts		P
13.3	Provisions for external connections		P
13.3.1	General	Certified PV connectors are used. AC terminal provided for grid connection and secured by a cable gland. Installation manual provide information for the disconnection means	P
13.3.2	Connection to an a.c. Mains supply	AC terminal used, and it is detachable with tool	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:	See above	P
	– terminals or leads or a non-detachable power supply cord for permanent connection to the supply; or		P
	– a non-detachable power supply cord for connection to the supply by means of a plug		N/A
	– an appliance inlet for connection of a detachable power supply cord; or		N/A
	– a mains plug that is part of direct plug-in equipment as in 13.3.8		N/A
13.3.2.2	Permanently connected equipment		P
13.3.2.3	Appliance inlets		N/A
13.3.2.4	Power supply cord		N/A
13.3.2.5	Cord anchorages and strain relief	Cable gland used	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		N/A
13.3.3	Wiring terminals for connection of external conductors	AC 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

IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
13.3.3.4	Wiring terminal design		P
13.3.3.5	Grouping of wiring terminals		P
13.3.3.6	Stranded wire		P
13.3.4	Supply wiring space		P
13.3.5	Wire bending space for wires 10 mm² and greater		P
13.3.6	Disconnection from supply sources	The explanations are provided in the installation manual.	P
13.3.7	Connectors plugs and sockets	The misconnection is unlikely for PV connectors.	P
13.3.8	Direct plug-in equipment	Permanently equipment.	N/A
13.4	Internal wiring and connections		P
13.4.1	General	All wires were used suitably and are fixed well to prevent mechanical damage during installation.	P
13.4.2	Routing	Internal wire is routed to avoid sharp edge and overheat	P
13.4.3	Colour coding	Green-yellow wire used as protective bonding only	P
13.4.4	Splices and connections		P
13.4.5	Interconnections between parts of the PCE		P
13.5	Openings in enclosures		N/A
13.5.1	Top and side 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		P
13.6.1.1	Thermal index or capability		P
13.6.2	Polymers serving as enclosures or barriers preventing access to hazards		P
13.6.2.1	Stress relief test		P
13.6.3	Polymers serving as solid insulation		P
13.6.3.1	Resistance to arcing		N/A
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	The LCD panel rated UV resistance according to UL 746C	P

IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
13.7	Mechanical resistance to deflection, impact, or drop		P
13.7.1	General		P
13.7.2	250-N deflection test for metal enclosures		P
13.7.3	7-J impact test for polymeric enclosures		P
13.7.4	Drop test		N/A
13.8	Thickness requirements for metal enclosures		N/A
13.8.1	General	The enclosure complied with13.7.	P
13.8.2	Cast metal		N/A
13.8.3	Sheet metal		P
14	**COMPONENTS**		P
14.1	General	(see appended table 14)	P
	Where safety is involved, components shall be used in accordance with their specified RATINGS unless a specific exception is made. They shall conform to one of the following:		P
	a) applicable safety requirements of a relevant IEC standard. Conformity with other requirements of the component standard is not required. If 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

IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
14.2	Motor Over temperature Protection		N/A
	Motors which, when stopped or prevented from starting (see 4.4.4.3), would present an electric shock HAZARD, a temperature HAZARD, or a fire HAZARD, shall be protected by an over temperature or thermal protection device meeting the requirements of 14.3.		N/A
14.3	Over temperature protection devices		N/A
14.4	Fuse holders		N/A
14.5	MAINS voltage selecting devices		N/A
14.6	Printed circuit boards		P
	Printed circuit boards shall be made of material with a flammability classification of V-1 of IEC 60707 or better.	V-0	P
	This requirement does not apply to thin-film flexible printed circuit boards that contain only circuits powered from limited power sources meeting the requirements of 9.2.		P
	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.		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.		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		N/A

IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
	required value in 5 to 10 s, and is to be maintained at that value for 1 min. A non-metallic rack or tray shall be tested at the highest normal condition operating temperature.		
14.8.3	Electrolyte spillage		N/A
	Battery trays and cabinets shall have an electrolyte-resistant coating.		N/A
	The ENCLOSURE or compartment housing a VENTED BATTERY shall be constructed so that spillage or leakage of the electrolyte from one battery will be contained within the ENCLOSURE and be prevented from:		N/A
	a) reaching the PCE outer surfaces that can be contacted by the USER		N/A
	b) contaminating adjacent electrical components or materials; and		N/A
	c) bridging required electrical distances		N/A
14.8.4	Battery Connections		N/A
	Reverse battery connection of the terminals shall be prevented if reverse connection could result in a hazard within the meaning of this Standard		N/A
14.8.5	Battery maintenance instructions		N/A
	The information and instructions listed in 5.3.4.1 shall be included in the operator manual for equipment in which battery maintenance is performed by the operator, or in the service manual if battery maintenance is to be performed by service personnel only.		N/A
14.8.6	Battery accessibility and maintainability		N/A
	Battery terminals and connectors shall be accessible for maintenance with the correct TOOLS. Batteries with liquid electrolyte, requiring maintained shall be so located that the battery cell caps are accessible for electrolyte tests and readjusting of electrolyte levels.		N/A
15	Software and firmware performing safety functions	Refer to annex B for details	P

IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
Annex A	Measurement of clearances and creepage distances (see 7.3.7.4 and 7.3.7.5)		P
Annex B	Programmable Equipment		P
B.1	Software or firmware that perform safety critical functions		P
B.1.1	Firmware or software that performs a critical safety function/s, the failure of which can result in a risk of fire, electric shock or other hazard as specified by this standard, shall be evaluated by one of the following means.		P
	a) All software or firmware limits or controls shall be disabled before the test to evaluate the hardware circuitry during the abnormal test condition related to the safety function.		P
	b) Protective controls employing software or firmware to perform their function(s), shall be so constructed that they comply with IEC 60730-1 Annex H to address the risks identified in B.2.1.		N/A
B.2	Evaluation of controls employing software		P
Annex C	Symbols to be used in equipment markings		P
Annex D	Test Probes for Determining Access		P
Annex E	RCDs	Integrated RCM used	N/A
Annex F	Altitude correction for clearances		N/A
Annex G	Clearance and creepage distance determination for frequencies greater than 30 kHz	Only clock for IC	P
Annex H	Measuring Instrument for Touch Current Measurements		P
H.1	Measuring instrument		P
H.2	Alternative measuring instrument		N/A
Annex I	Examples of Protection, Insulation, and Overvoltage Category Requirements for PCE		P
Annex J	Ultraviolet light conditioning test		N/A

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

4.2.2.6/4.7	TABLE: mains supply electrical data in normal condition/ Electrical ratings test					P
Type	U (V)	I (A) DC	P (KW) DC	U (V)	I (A) AC	P (KW) AC
iMars XG100KTR	529.98	195.28	103.488	207.60 207.67 207.78	162.64 160.67 160.30	100.419
iMars XG100KTR	528.42	196.56	102.829	230.65 231.07 230.66	147.53 144.52 142.41	100.079
iMars XG100KTR	529.93	192.74	102.126	253.48 253.53 253.63	132.48 129.97 129.77	99.412
iMars XG100KTR	620.00	167.38	103.767	207.60 207.67 207.79	163.88 161.83 161.44	101.156
iMars XG100KTR	616.75	165.56	102.014	230.66 231.07 230.67	147.03 144.08 141.92	99.718
iMars XG100KTR	619.98	164.32	101.866	253.48 253.53 253.62	132.55 130.00 129.75	99.429
iMars XG100KTR	850.01	121.26	103.055	207.60 207.67 207.78	162.37 160.58 160.04	100.285
iMars XG100KTR	843.66	120.90	101.824	230.74 231.12 230.73	144.53 144.52 142.25	99.495
iMars XG100KTR	850.00	121.19	103.000	253.49 253.54 253.64	133.76 131.36 131.01	100.395
iMars XG136KTR-L	561.70	244.38	137.264	249.98 250.03 250.14	178.69 177.17 176.91	133.193
iMars XG136KTR-L	578.70	246.14	139.625	277.70 278.20 277.69	165.28 163.09 161.67	135.903
iMars XG136KTR-L	561.61	250.05	140.421	304.76 304.81 304.90	150.75 148.75 148.66	136.566
iMars XG136KTR-L	729.79	187.39	136.748	249.69 249.74 249.85	179.48 177.91 177.62	133.599
iMars XG136KTR-L	725.66	193.06	139.967	277.72 278.22 277,71	166.21 163.97 162.56	136.607
iMars XG136KTR-L	729.73	191.52	139.749	304.76 304.80 304.90	150.85 148.80 148.63	136.600

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

iMars XG136KTR-L	849.86	162.99	138.500	249.69 249.75 249.86	181.35 180.01 179.53	135.063
iMars XG136KTR-L	849.84	163.45	138.890	277.62 277.67 277.77	164.54 162.86 162.55	136.018
iMars XG136KTR-L	849.84	165.19	140.375	304.77 304.81 304.91	151.54 149.58 149.43	137.265
iMars XG136KTR-X	559.72	250.69	140.251	279.60 279.65 279.75	163.82 162.03 161.83	136.356
iMars XG136KTR-X	559.67	249.94	139.873	311.54 311.58 311.67	147.05 145.00 144.86	136.092
iMars XG136KTR-X	559.62	249.87	139.813	342.48 342.52 342.61	134.04 131.71 131.61	136.043
iMars XG136KTR-X	779.86	179.77	140.191	279.60 279.66 279.76	164.36 162.63 162.35	136.817
iMars XG136KTR-X	799.84	179.31	139.826	311.54 311.58 311.68	147.91 145.80 145.57	136.835
iMars XG136KTR-X	779.80	178.39	139.099	342.48 342.52 342.61	134.33 131.86 131.72	136.234
iMars XG136KTR-X	849.88	163.37	138.827	280.61 280.66 280.75	162.86 161.14 160.89	136.058
iMars XG136KTR-X	849.90	163.57	138.998	311.54 311.58 311.67	147.79 145.53 145.41	136.660
iMars XG136KTR-X	849.86	163.97	139.345	342.49 342.52 342.62	134.74 132.27 132.14	136.656

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

4.3 TABLE: Thermal testing					P
Model :	iMars XG136KTR-L				—
temperature t of part/at:	t (°C)				permitted t (°C)
test Condition :	PV input: 530Vdc, 263.0A AC output: 277.1Vac 163.9A, 277.1Vac 164.9A, 277.1Vac 164.8A	PV input: 850.1Vdc, 164.5A AC output: 277.1Vac 164.7A, 277.2 Vac 165.3A, 277.2Vac 166.1A	PV input: 530.0Vdc, 228.9A AC output: 277.1Vac 142.2A, 277.1Vac 143.0A, 277.2Vac 143.2A	PV input: 850.4Vdc, 145.7A AC output: 277.1Vac 145.5A, 277.1Vac 146.0A, 277.2Vac 146.8A	—
Ambient	45.4	45.0	60.0	60.3	—
PV connector	75.6	70.4	73.9	73.8	105
PV lead wires	75.3	68.5	74.4	71.4	105
Hall SN3	78.4	76.7	78.2	78.2	85
PV SPD F3	76.8	73.4	76.1	73.9	90
DC switch	76.0	70.5	78.0	77.7	90
Output lead wires	78.6	77.2	79.3	77.8	105
C14	77.8	74.6	82.1	79.5	90
Input EMI chock L6	94.3	88.3	93.9	92.7	110
Hall SN6	78.1	74.3	81.4	78.9	85
IGBT Q6	87.8	81.8	81.8	79.6	Reference
C15	84.8	79.6	80.8	80.8	90
IGBT2	93.5	92.3	81.0	76.6	125
C10	85.8	83.0	79.8	77.4	90
Relay K2	78.6	73.0	76.4	75.4	110
PCB under R186	91.4	85.0	90.7	90.3	105
Power board transformer TR1	85.6	81.6	92.4	92.1	110
Boost inductor(winding)	82.5	79.5	94.4	89.7	110
Boost inductor(Lead wire)	81.8	79.0	83.9	79.6	105
INV inductor(winding)	95.9	93.8	91.5	89.9	110
INV inductor(Lead wire)	79.4	75.9	80.2	76.7	105
Electrolytic capacitor C3	79.8	75.7	77.6	74.4	105
Cap board Inductor L1	87.2	84.6	80.9	78.9	110
PCB under R4	94.6	89.8	79.0	77.2	105

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

Hall J2	75.4	72.8	76.7	75.0	90
C32	76.5	71.2	82.5	77.7	90
PCB under R207	89.4	83.7	80.1	79.7	105
Relay K3	79.8	78.6	74.7	72.7	110
Reactor L1	87.2	86.0	88.3	83.8	110
PCB under Q9	80.6	76.0	87.3	86.3	105
Y cap C40	77.6	74.1	77.4	76.7	90
Transformer TR2(winding)	90.1	86.4	88.9	86.4	110
Transformer TR2(Core)	83.9	79.2	79.1	75.4	130
Transformer TR1(winding)	88.5	82.6	88.5	86.8	110
Transformer TR1(Core)	81.2	74.7	81.0	79.3	130
Power board Inductor L1	84.3	80.9	84.8	80.6	110
SPS Transformer TR1(winding)	85.2	81.4	80.9	76.3	110
Optocoupler PC2	77.2	71.7	73.9	72.7	90
Optocoupler PC3	77.3	72.8	68.8	66.9	90
Inside fan	85.1	82.5	77.9	73.7	90
C16	85.3	81.7	80.7	79.0	90
Output EMI chock L2	100.0	95.9	89.6	87.9	110
Output EMI SPD F2	85.1	80.5	76.4	74.0	90
Output EMI C26	87.7	86.7	75.5	73.1	90
AC output terminal	88.7	87.6	73.5	70.2	90
Enclosure, top	51.4	49.7	63.5	61.5	70
Enclosure, front	49.4	43.6	65.1	64.5	70

	TABLE: Heating test, resistance method				N/A
Temperature rise of winding	**R_1 (Ω)**	**R_2 (Ω)**	**ΔT (K)**	**Max. dT (K)**	**Insulation class**
Supplementary information:					

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

No.	component No.	fault	test voltage (V)	test time	fuse No.	fuse current (A)	result
1.	L1-N	s-c	850	3min	--	--	The PCE does not start up and connected to grid. No damaged, no hazard.

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

2.	L1-L2	s-c	850	3min	--	--	The PCE does not start up and connected to grid. No damaged, no hazard.
3.	AC output (R-S)	Incorrect phase sequence	850	3min	--	--	Operating as normal. No damage. No hazard.
4.	AC output (R-T)	Incorrect phase sequence	850	3min	--	--	Operating as normal. No damage. No hazard.
5.	AC output (S-T)	Incorrect phase sequence	850	3min	--	--	Operating as normal. No damage. No hazard.
6.	AC output	Overload	850	3min	--	--	The PCE operated normally No damaged, no hazard.
7.	Fan	o-s	850	10min	--	--	The inverter temperature rises, then shuts down, reconnect to grid after recovers
8.	MPPT1	Reverse	850	3min	--	--	The PCE can't start. Can resettable. No damage. No hazard.
9.	SN2 (PV board)	s-c	850	3min	--	--	The PCE can't start. Can resettable. No damage. No hazard.
10.	C7 (Capacitor board)	s-c	850	3min	--	--	PV inverter does not start up, IGBT damaged. No hazard.
11.	B-C of IGBT2	s-c	850	3min	--	--	Shut down immediately. IGBT damaged, unable to restart. No hazard.
12.	E-C of IGBT2	s-c	850	3min	--	--	Shut down immediately. IGBT damaged, unable to restart. No hazard.
13.	B-E of IGBT2	s-c	850	3min	--	--	Shut down immediately. IGBT damaged, unable to restart. No hazard.
14.	G-C of Q6 (Boost-Inverter board)	s-c	850	3min	--	--	Shut down immediately. Q6 damaged, unable to restart. No hazard.
15.	E-C of Q6 (Boost-Inverter board)	s-c	850	3min	--	--	Shut down immediately. Q6 damaged, unable to restart. No hazard.
16.	G-E of Q6 (Boost-Inverter board)	s-c	850	3min	--	--	Shut down immediately. Q6 damaged, unable to restart. No hazard.

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

17.	G-D of Q2 (AC Sampling board)	s-c	850	3min	--	--	The PCE can't start. Can resettable. No damage. No hazard.
18.	G-S of Q2 (AC Sampling board)	s-c	850	3min	--	--	The PCE can't start. Can resettable. No damage. No hazard.
19.	D-S of Q2 (AC Sampling board)	s-c	850	3min	--	--	The PCE can't start. Can resettable. No damage. No hazard.
20.	TR2 (Pin 1-6)(Power board)	s-c	850	3min	--	--	The PCE can't start. Can resettable. No damage. No hazard.
21.	D-S of Q10 (Power board)	s-c	850	3min	--	--	The PCE can't start. Can resettable. No damage. No hazard.
22.	TR1 (Pin 7-8) (Power board)	s-c	850	3min	--	--	The PCE can't start. Can resettable. No damage. No hazard.
23.	TR1 (Pin 11-12) (Power board)	s-c	850	3min	--	--	The PCE can't start. Can resettable. No damage. No hazard.
24.	D-S of Q11 (Power board)	s-c	850	3min	--	--	The PCE can't start. Can resettable. No damage. No hazard.
25.	RT1 (Pin 2-3) (Drive board)	s-c	850	3min	--	--	The PCE can't start. Can resettable. No damage. No hazard.
26.	PC1 (Pin 4-5) (Drive board)	s-c	850	3min	--	--	The PCE can't start. Can resettable. No damage. No hazard.
27.	U1 (Pin12-13) (AC Sampling board)	s-c	850	3min	--	--	The PCE can't start. Can resettable. No damage. No hazard. Error message:10-02
28.	SN4 (Pin2-4) (AC Sampling board)	s-c	850	3min	--	--	The PCE can't start. Can resettable. No damage. No hazard. Error message:43-01
29.	C16 (AC Sampling board)	s-c	850	3min	--	--	The PCE can't start. Can resettable. No damage. No hazard. Error message:10-01
30.	C15 (AC Sampling board)	s-c	850	3min	--	--	The PCE can't start. Can resettable. No damage. No hazard. Error message:43-01

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

31.	Relay K1 (L1 phase)	s-c before start up	850	3min	--	--	The PEC can't connect to grid. Can resettable. No damage. No hazard. Error message:11-02
32.	Relay K3 (L2 phase)	s-c before start up	850	3min	--	--	The PEC can't connect to grid. Can resettable. No damage. No hazard. Error message:11-02
33.	Relay K5 (L3 phase)	s-c before start up	850	3min	--	--	The PEC can't connect to grid. Can resettable. No damage. No hazard. Error message:11-02
34.	G-D of Q2 (AC Sampling board)	s-c before start up	850	3min	--	--	The PCE can't start. Can resettable. No damage. No hazard. Error message:11-02
35.	G-S of Q2 (AC Sampling board)	s-c before start up	850	3min	--	--	The PCE can't start. Can resettable. No damage. No hazard. Error message:11-02
36.	D-S of Q2 (AC Sampling board)	s-c before start up	850	3min	--	--	The PCE can't start. Can resettable. No damage. No hazard. Error message:11-02
37.	R333 (AC Sampling board)	o-c before start up	850	3min	--	--	Operating as normal. No damage. No hazard.
38.	TR1(ARM board)	s-c before start up	850	3min	--	--	The PCE can't start. Can resettable. No damage. No hazard.
39.	PC3(ARM board)	s-c before start up	850	3min	--	--	The PCE can't start. Can resettable. No damage. No hazard.
40.	SN2 (PV board)	s-c before start up	850	3min	--	--	The PCE can't start. Can resettable. No damage. No hazard. Error message:01-01
41.	TR1 (PIN2-3) (driver board)	s-c before start up	850	3min	--	--	The PCE can't start. Can resettable. No damage. No hazard.

supplementary information:

s-c: short-circuited, o-c: open-circuited, o-l: overload.

During the test:
Fire do not propagate beyond the PCE;
Equipment do not emit molten metal;
Enclosures do not deform to cause non-compliance with the standard.

Pass the dielectric test.

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

7.3.6.3.3	TABLE: protective equipotential bonding;				N/A
Measured between:		Test current (A)	Voltage drop (V)	Resistance (mΩ)	result
Earthing terminal and furthest heatsink side		--	--	--	--
supplementary information The alternative of 7.3.6.3.5 was considered.					

7.3.6.3.7	TABLE: touch current measurement			P
Measured between:		Measured (mA)	Limit (mA)	Comments/conditions
Earthing terminal and metal enclosure		7.2	3.5	N/A
supplementary information The touch current measured has exceed. So provision of an additional terminal for a second protective earthing conductor is necessary and installation instructions stated a second protective earthing conductor shall be installed. In addition, the caution symbol 15 of Annex C is fixed to the product and and the installation manual had provided details of the protective earthing measures required in the installation as required in 5.3.2.				

7.3.7	TABLE: clearance and creepage distance measurements					P
clearance cl and creepage distance dcr at / of:	Up (V)	U r.m.s. (V)	required cl (mm)	cl (mm)	required dcr (mm)	dcr (mm)
PV board circuits to metal enclosure (BI)	1100Vdc	1100V 314	4.5	6.2	5.5	6.2
DC EMI board circuits to metal enclosure (BI)	1100Vdc	1100V 314	4.5	6.1	5.5	6.1
Inverter board circuits to metal enclosure (BI)	1100Vdc	1100V 314	4.5	6.5	5.5	6.5
Capacitor board circuits to metal enclosure (BI)	1100Vdc	1100V 314	4.5	7.2	5.5	7.2
Boost board circuits to metal enclosure (BI)	1100Vdc	1100V 314	4.5	6.3	5.5	6.3
Power board circuits to metal enclosure (BI)	1100Vdc	1100V 314	4.5	6.2	5.5	6.2
Power board circuits to secondary circuits (RI)	1100Vdc	1100V 314	7.8	16.0	11	16.0
Control board circuits to metal enclosure (BI)	1100Vdc	1100V 314	7.8	16.0	11	16.0
AC EMI board circuits to metal enclosure (BI)	1100Vdc	1100V 314	4.5	6.2	5.5	6.2

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

7.3.7	TABLE: clearance and creepage distance measurements	P

Remarks:

1) FI: function insulation BI: Basic insulation SI: Supplementary insulation RI: Reinforced insulation

2) A force of 10 N applied to the internal components and 250 N applied to the enclosure for measure

3) For PV circuit, system voltage is 1100V and overvoltage Category is OVCII, impulse voltage corresponding to PV circuit is 4772V.

4)For AC main circuit, nominal voltage is 311V and overvoltage category is OVC III, impulse voltage is corresponding to main circuit is 4100V.

5)For relay across main output . RMS voltage used for creepage is rationalized to 600V and overvoltage category is OVCII. For other insulation between live parts, which PV circuit and main circuit is not isolated PV system voltage 1100V is considered for the maximum working voltage.

6)The PCE enclosure is rated IP65 and the pollution degree inside enclosure is reduced from PD3 to PD2.

7)The disconnection devices are two relay in series at line. Clearance between contacts of each relay rated min. 1.5mm. each relay with two contact gaps together to withstand the PV impulse voltage according to IEC 62109-2 Clause 4.4.4.15.2.2. Thus the clearance requirement for each contact is half of the requirement.

8) Have been corrected accord to altitude up to 4000m

9)Triple Insulated Wire is used on transformer TR1 as secondary output.

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)
Optocoupler		314Vac 1100Vdc	4240Vdc	--	certified
Insulation sheet		314Vac 1100Vdc	2120Vdc	--	0.26

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
DC input terminal to earthed enclosure		2120Vdc	4772	N/A	No breakdown
AC Output terminal to earthed enclosure		2120Vdc	6460	N/A	No breakdown
AC Output terminal to communication port		4240Vdc	6460	N/A	No breakdown
DC input terminal to communication port		4240Vdc	6460	N/A	No breakdown
Insulation sheet		2120Vdc	4772	N/A	No breakdown
One layer of insulation tape		4240Vdc	6460	N/A	No breakdown
Relay pin 3 to pin 4		2120Vdc	4772	N/A	No breakdown

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

9.2	**TABLE: Limited power sources**	N/A

Circuit output tested:

Note: Measured Uoc (V) with all load circuits disconnected:

Components	Sample No.	Uoc (V)	I_{sc} (A)		VA	
			Meas.	Limit	Meas.	Limit

supplementary information:

Sc=Short circuit, Oc=Open circuit

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

14	TABLE: list of critical components				P
object/part No.	manufacturer/ trademark	type/model	technical data	standard	mark(s) of conformity[1])
The whole unit					
Metal enclosure	Interchangeable	Interchangeable	Galvanized steel plate, outdoor powder dust, 1050x660x330(mm) , Min.thickness 1.0mm	IEC/EN 62109-1 IEC/EN 62109-2	Tested with appliance
PV lead wiring	3Q Wire & Cable Co.,Ltd.	10269	10AWG, 105℃	UL758	E341104
PCB	Various	KB-6160C	V-0,130℃	UL 796	UL E123995
PV input terminal	Dongguan Vaconn Electronic Technology Co.,Ltd.	VP-D4B-PHSM4B	1100Vd.c,35A, 85℃	EN62854	TUV RH R 50492180
(Alternative)	Dongguan Vaconn Electronic Technology Co.,Ltd.	VP-D4B-PHSF4B	1100Vd.c,35A, 85℃	EN62854	TUV RH R 50492180
AC output terminal	SHENZHEN CONNECTION ELECTRONIC CO LTD	DRTB100-R	1000V,300A	UL 1059	UL E304128
DC switch	Zhejiang Benyi Electrical Co., Ltd.	BYSS.1-32/T-6P, BYSS.1-32/T-8P	40A/800V 32A/1000V 25A/1200V	EN 60947-3	TUV R 50425301
(Alternative)	ProJoy Electric Co., Ltd.	PEDS150R-HM55-6, PEDS150R-HM55-8	45A/800V 25A/1000V 15A/1200V	EN 60947-3	TUV R 50494197
Boost inductor	BoLuo DaXin Electronics Co., Ltd.	DG1726-DX2846	Class B	IEC/EN 62109-1 IEC/EN 62109-2	Tested with appliance
Inv inductor	Qingdao Yunlu Juneng	PE2006	Class H	IEC/EN 62109-1	Tested with

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

14	TABLE: list of critical components				P
object/part No.	manufacturer/ trademark	type/model	technical data	standard	mark(s) of conformity[1])
	Electrical Co., Ltd.			IEC/EN 62109-2	appliance
Inside Fan	NMB Technologies Corporation	12038VA-24Q-FU	24V, 1.04A, 5700rpm	UL 507	UL E89936
(Alternative)	CROWN	AGD12038B24M	24Vdc,1.45A, 5200RPM	UL 507	UL E516545
Outside Fan	NMB Technologies Corporation	09238DE-24P-CU01	24V, 1.1A, 10000rpm	IEC/EN 60950-1	VDE 1507300
(Alternative)	CROWN	AGB09238B24V	24V, 1.7A, 8000rpm	UL 507	UL E516545
Comm board					
Communication Optocoupler PC1	Texas Instruments	ISO7841FDWWR	125℃, 5700Vrms, clearance：14.5mm, Creepage distance：14.5mm	EN 60950-1 EN 61010-1 EN 62368-1	TÜV SÜD U8V 077311 0018 rev.01
Communication Optocoupler PC2	Texas Instruments	ISO7842FDWWR	125℃, 5700Vrms, clearance：14.5mm, Creepage distance：14.5mm	EN 60950-1 EN 61010-1 EN 62368-1	TÜV SÜD U8V 077311 0018 rev.01
MCU U12	ST	STM32F107VCT6	100 PIN, 105℃, SMD	IEC/EN 62109-1 IEC/EN 62109-2	Tested with appliance
PV board					
Input Y Cap C1, C2, C3, C4, C5, C6, C7, C8, C9, C10, C11, C12, C13, C14, C15, C16, C17, C18, C19, C20	XIAMEN FARATRONIC CO., LTD.	MKP63Q1102M40C450	0.001uF/300Vac, 110℃	IEC/EN 60384-14	SE/0366-2B
Input Y Cap C21, C22, C23, C24, C25, C26, C27, C28, C29, C30, C31, C32, C33, C34, C35, C36, C37, C38,	XIAMEN FARATRONIC CO., LTD.	MKP63Q1103M40C400	0.01uF/300Vac, 110℃	IEC/EN 60384-14	SE/0366-2B

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

14	TABLE: list of critical components				P
object/part No.	manufacturer/ trademark	type/model	technical data	standard	mark(s) of conformity[1])
C39, C40					
Hall SN1, SN2, SN3, SN4, SN5, SN6, SN7, SN8, SN9, SN10	SINOMAGS TECHNOLOGY CO., LTD.	STK-CTS/P	5V,25A, 105℃	UL 508	E 507664
DC SPD F1, F2, F3, F4, F5, F6, F7, F8, F9, F10, F11, F12, F13, F14	SET	TFMOV10M510	510Vd.c,10KA, 85℃	EN 61643-11	TUV RH R50438698
Power board					
Transformer (TR2)	BoLuo DaXin Electronics Co., Ltd.	KB1726-27362	Class B	IEC 62109-1 IEC 62109-2	Tested with appliance
- BOBBIN	CHANG CHUN PLASTICS CO.,LTD	T375HF	V-0, 150℃	IEC 62109-1 IEC 62109-2	E59481 Tested with appliance
- COPPER WIRE	HUIZHOU GOLDEN OCEAN MAGNET WIRE FACTORY	xUEW-F	155℃	IEC 62109-1 IEC 62109-2	E225143 Tested with appliance
(Alternative)	HOI LUEN ELECTRICAL MFR CO.,LTD	xUEW-F	155℃	IEC 62109-1 IEC 62109-2	E164409 Tested with appliance
- TAPE	JINGJIANG YAHUA PRESSURE SENSITIVE GLUE CO LTD	CT	130℃	IEC 62109-1 IEC 62109-2	E165111 Tested with appliance
-MARGIN TAPE	JINGJIANG YAHUA PRESSURE SENSITIVE GLUE CO LTD	WF	130℃	IEC 62109-1 IEC 62109-2	E165111 Tested with appliance
- EPOXY	DONGGUAN EATTO ELECTRONIC MATERIAL CO LTD	E-500(xx)	V-0, 130℃	IEC 62109-1 IEC 62109-2	E218090 Tested with appliance
Transformer (TR1)	BoLuo DaXin Electronics Co., Ltd.	KB1726-27361	Class B	IEC 62109-1 IEC 62109-2	Tested with appliance

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

14	TABLE: list of critical components				P
object/part No.	manufacturer/ trademark	type/model	technical data	standard	mark(s) of conformity[1])
- BOBBIN	CHANG CHUN PLASTICS CO.,LTD	T375HF	V-0, 150℃	IEC 62109-1 IEC 62109-2	E59481 Tested with appliance
- COPPER WIRE	HUIZHOU GOLDEN OCEAN MAGNET WIRE FACTORY	XUEW-F	155℃	IEC 62109-1 IEC 62109-2	E225143 Tested with appliance
(Alternative)	HOI LUEN ELECTRICAL MFR CO.,LTD	XUEW-F	155℃	IEC 62109-1 IEC 62109-2	E164409 Tested with appliance
- TAPE	JINGJIANG YAHUA PRESSURE SENSITIVE GLUE CO LTD	CT	130℃	IEC 62109-1 IEC 62109-2	E165111 Tested with appliance
-MARGIN TAPE	JINGJIANG YAHUA PRESSURE SENSITIVE GLUE CO LTD	WF	130℃	IEC 62109-1 IEC 62109-2	E165111 Tested with appliance
- EPOXY Dark glue	DONGGUAN EATTO ELECTRONIC MATERIAL CO LTD	E-500(xx)	V-0, 130℃	IEC 62109-1 IEC 62109-2	E218090 Tested with appliance
Optocoupler PC6, PC10, PC11	RENESAS ELECTRONICS CORPORATION	PS2561L1-1	Cl>7mm, voltage:5000V	EN 60747	VDE 40008862
Optocoupler U14, U15, U16, U17, U18, U19	Texas Instruments Deutschland GmbH	UCC23513DWYR	Cr:>8.5mm,Cl:>8.5mm, voltage:5000V	IEC 62109-1 IEC 62109-2	VDE 40040142
MOS Q9, Q10	ST	STFW3N150	2.5A,1500V, 150℃	IEC 62109-1 IEC 62109-2	Tested with appliance
MOS Q11	CREE	C2M1000170D	3.5A,1700V, 150℃	IEC 62109-1 IEC 62109-2	Tested with appliance
Y Cap C34, C35, C36, C37, C40, C41	TDK CORPORATION	CD series	0.0047Uf,440Vac, 105℃	IEC 348-14	VDE 40029780
Film Cap C1,C2,C3,C4,C	XIAMEN FARATRONIC	C3D series	50uF,600Vac, 105℃	IEC 62109-1	Tested with

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

14	TABLE: list of critical components				P
object/part No.	manufacturer/ trademark	type/model	technical data	standard	mark(s) of conformity[1])
5,C6,C7,C8,C9, C10,C11,C12	CO., LTD.			IEC 62109-2	appliance
Input X cap C13,C14,C16,C 17,C62	XIAMEN FARATRONIC CO., LTD.	C3D series	10uF,1100Vdc, 105℃	IEC/EN 61071:2007	TUV R 50266108
Boost IGBT Q1,Q2,Q3,Q4,Q 7,Q8,Q9,Q10,Q 11,Q12	infineon	IKY40N120CH3	1200V,40A, 175℃	IEC 62109-1 IEC 62109-2	Tested with appliance
(Alternative)	ONSEMI	FGH40T120SQ DNL4	1200V,40A, 175℃	IEC 62109-1 IEC 62109-2	Tested with appliance
INV IGBT IGBT1,IGBT2,I GBT3	ONSEMI	NXH450N65L4 Q2F2SG	650V,450A, 150℃	IEC 62109-1 IEC 62109-2	E468801 Tested with appliance
(Alternative)	infineon	F3L400R07W3 S5	650V,400A, 150℃	IEC 62109-1 IEC 62109-2	E83335 Tested with appliance
(Alternative)	Vincotech Hungaria Kft.	30-FT07NIB300S5 03-LH36F58	650V,260A, 175℃	IEC 62109-1 IEC 62109-2	E192116 Tested with appliance
Diode D1,D2,D3,D4,D 7,D8,D9,D10,D1 1,D12	Fairchild	APT60DQ120B G	1200V,60A, 175℃	IEC 62109-1 IEC 62109-2	Tested with appliance
Control board					
DSP U57, U58	Texas Instruments	TMS320F28377	85℃	IEC 62109-1 IEC 62109-2	Tested with appliance
CPLD U42	ALTERA	EPM240T100C 5N	85℃	IEC 62109-1 IEC 62109-2	Tested with appliance
(Alternative)	Gowin Semiconductor Corporation	LQ100X	85℃	IEC 62109-1 IEC 62109-2	Tested with appliance
MCU U15,U16,U17,U 18,U26,U27	Texas Instruments	SN74ACT244	85℃	IEC 62109-1 IEC 62109-2	Tested with appliance
Other parts					
Relays K1,K2,K3,K4,K5 ,K6	Dongguan Churod ElectronicsCo., Ltd.	CHAR-112A200	200A, 830VAC, 85℃	EN 61810-1:2008	TUV R50316974
Input X Cap C2,C4,C6,C8,C	XIAMEN FARATRONIC	C3D series	10μF/1100Vac, 105℃	IEC/EN 61071:2007	TUV R 50266108

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

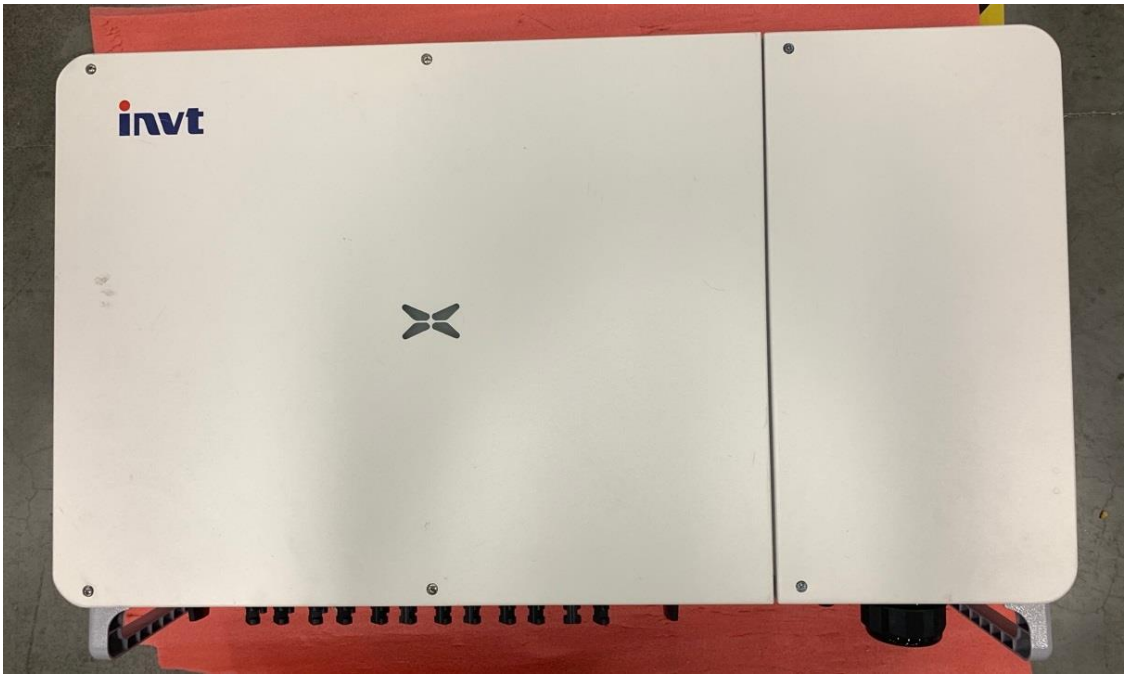
14	TABLE: list of critical components				P
object/part No.	manufacturer/ trademark	type/model	technical data	standard	mark(s) of conformity[1])
14,C16,C18,C20,C22,C24	CO., LTD.				
EMI Hall SN1,SN2,SN3,SN4,SN5,SN6,SN7,SN8,SN9,SN10	SINOMAGS TECHNOLOGY CO., LTD.	STK-PL	5V,32A, 105℃	UL 508	E 507664
(Alternative)	LEM	HLSR 32-P	5V, 32A, 105°C	ANSI/UL 508	UL E189713
Electrolytic capacitors C1, C2, C3, C4, C5, C6, C7, C8, C9, C10, C11, C12, C13, C14, C15, C16, C17, C18	Nantong Jianghai Capacitor Co., Ltd	ECS2YBB471MLA350060E	550Vdc, 470uF, 105℃	IEC 62109-1 IEC 62109-2	Tested with appliance
(Alternative)	RUBYCON	550MXG470MSGPSN	550Vdc, 470uF, 105℃	IEC 62109-1 IEC 62109-2	Tested with appliance
(Alternative)	CapXon	UK471M550P600A	550Vdc, 470uF, 105℃	IEC 62109-1 IEC 62109-2	Tested with appliance
Lnductor L1, L2	BoLuo DaXin Electronics Co., Ltd.	LC36-142	5uH, 1*5mm, 14.5Ts, Class B	IEC 62109-1 IEC 62109-2	Tested with appliance
Driver board transformer TR1	BoLuo DaXin Electronics Co., Ltd.	HX1726	Class B	IEC 62109-1 IEC 62109-2	Tested with appliance
Driver board Optocoupler PC1, PC2	Texas Instruments	UCC23513DWYR	Cr:>8.5mm,Cl:>8.5mm, voltage:5000V	IEC 62109-1 IEC 62109-2	Tested with appliance
DM inductor L1	Qingdao Yunlu Juneng Electrical Co., Ltd.	PE2007	Class E	IEC 62109-1 IEC 62109-2	Tested with appliance
Hall SN4	LEM International SA	CTSR 1-TP/SP18	1000Vac/dc, 150A, 105℃	ANSI/UL61010-1 ANSI/UL61010-2-201	UL E189713
(Alternative)	SINOMAGS TECHNOLOGY CO., LTD.	SFG-P	1000Vac/dc, 150A, 105℃	ANSI/UL61010-1 ANSI/UL61010-2-201	UL E507664

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

14	TABLE: list of critical components				P
object/part No.	manufacturer/ trademark	type/model	technical data	standard	mark(s) of conformity[1])
Hall SN1, SN2, SN3	LEM International SA	LZSR200-PS P1	200A, 5V, 85℃	ANSI/UL 61010-1 ANSI/UL61010-2-201	UL E189713
(Alternative)	SINOMAGS TECHNOLOGY CO., LTD.	STB-LA/ZN	200A, 5V, 105℃	ANSI/UL 61010-1 ANSI/UL61010-2-201	UL E507664
Electrolytic capacitors C27, C28, C29, C31, C32, C33, C35, C36, C37	XIAMEN FARATRONIC CO., LTD.	C6A series	8uF, 380Vac, 105°C	ANSI/UL 810	UL E256238
Common Choke L2	Qingdao Yunlu Juneng Electrical Co., Ltd.	PE2008	Class B	IEC 62109-1 IEC 62109-2	Tested with appliance
Y Cap C7, C8, C9, C11, C12, C13, C14	SHANXI HUAXING ELECTRONIC DEVELOMENT CO	CT7Y1 Series	0.0047uF, 400Vac, Y1, 125°C	IEC/EN 60348-14	VDE 40015542
Y Cap C15, C16, C17, C21, C22, C23	TDK CORPORATION	CD series	0.0022uF, 400Vac, Y1, 85°C	IEC 60384-14	VDE 40029780
Electrolytic capacitors C15, C16, C17, C21, C22, C23	XIAMEN FARATRONIC CO., LTD.	C4B series	2.2uF, 400Vac, 125°C	ANSI/UL 60384-14	UL E186600
SPD F1, F2, F3	Xiamen Set Electronics Co., Ltd.	TMOV34Sxxx	670Vd.c., 20kA, 85°C	EN 61643-11	TÜV J50226017
[1])					

Appendix 1: Photos

Front view



Front view

Side view

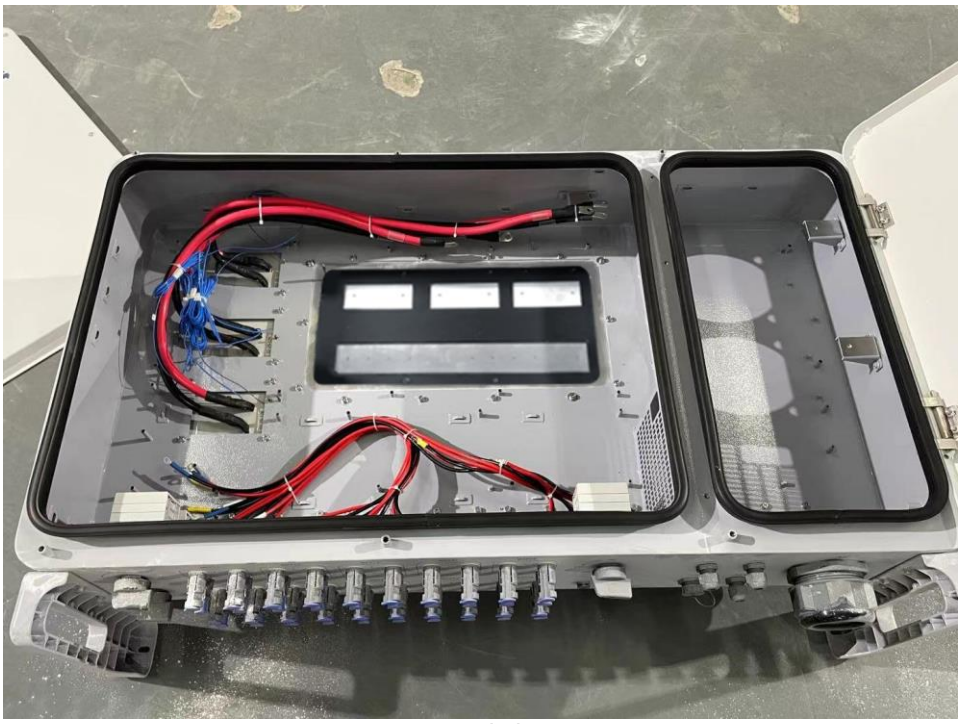
Connection view (for 9 strings)

Connection view (for 10 strings)

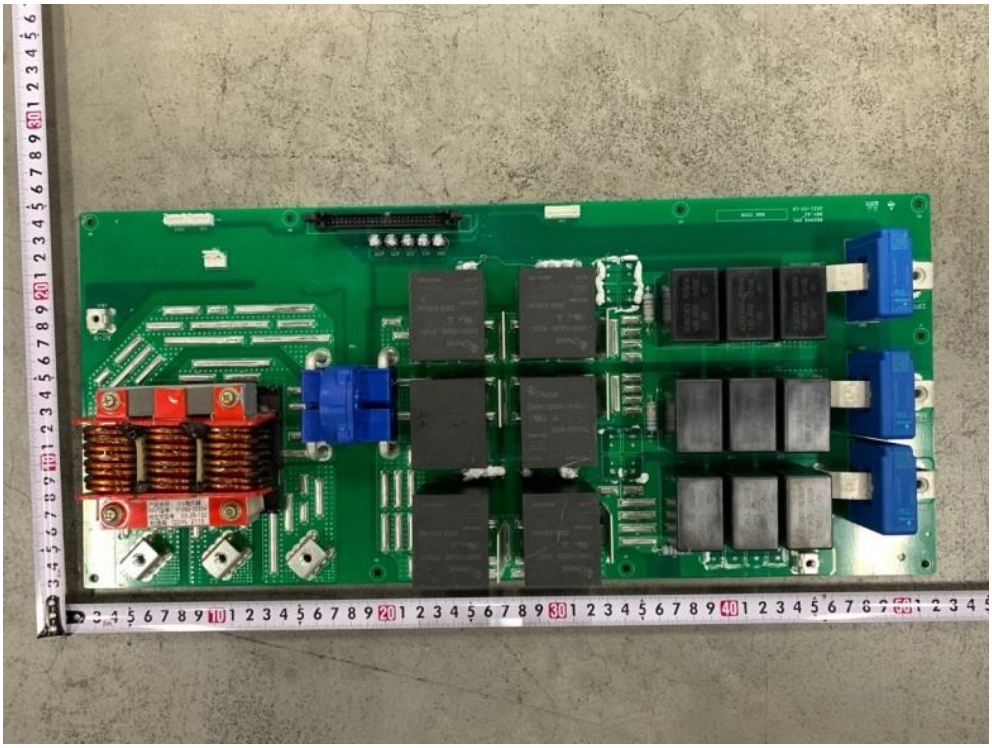
Connection view (for 12 strings)

Internal view

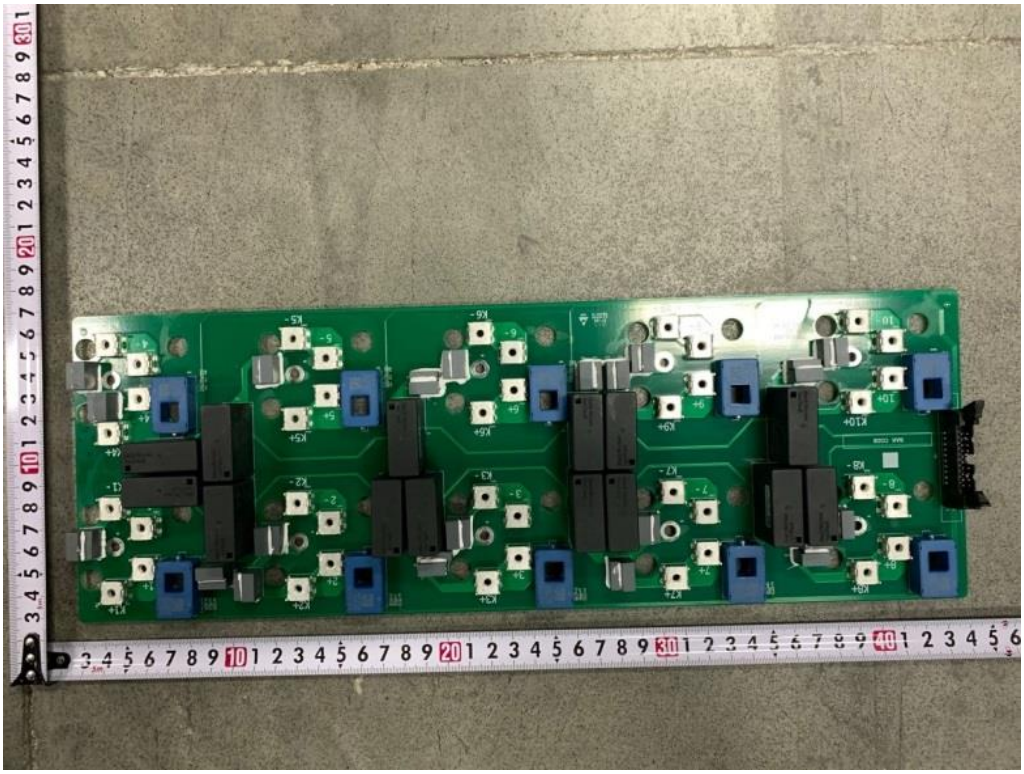
Internal view



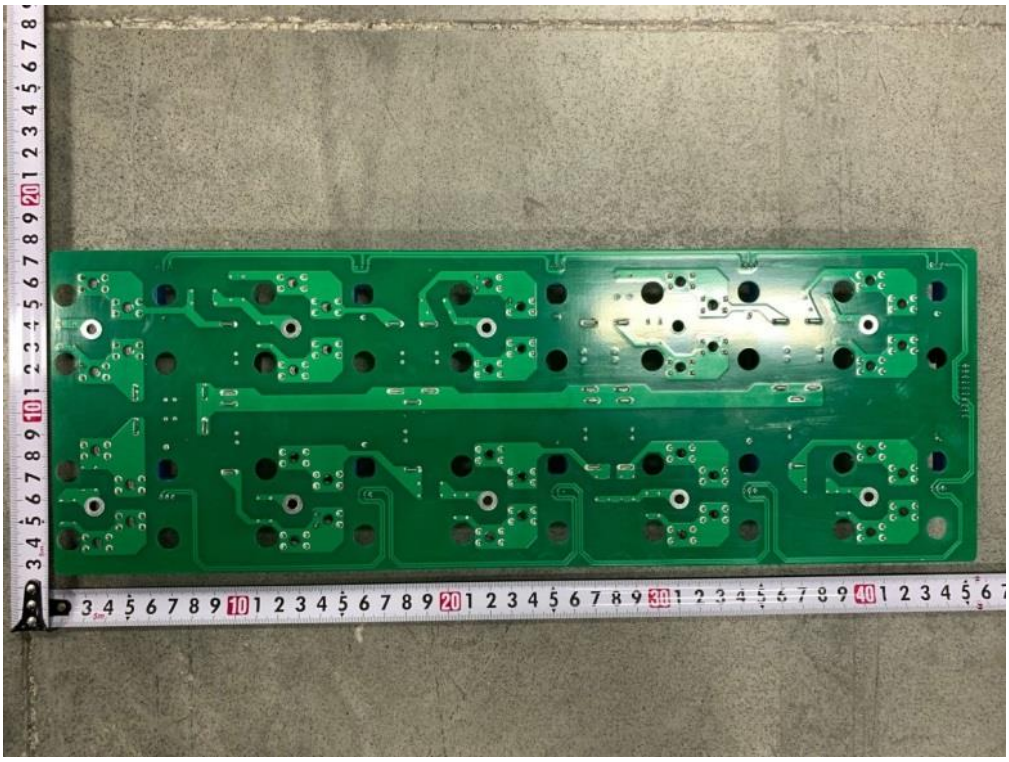
Internal view



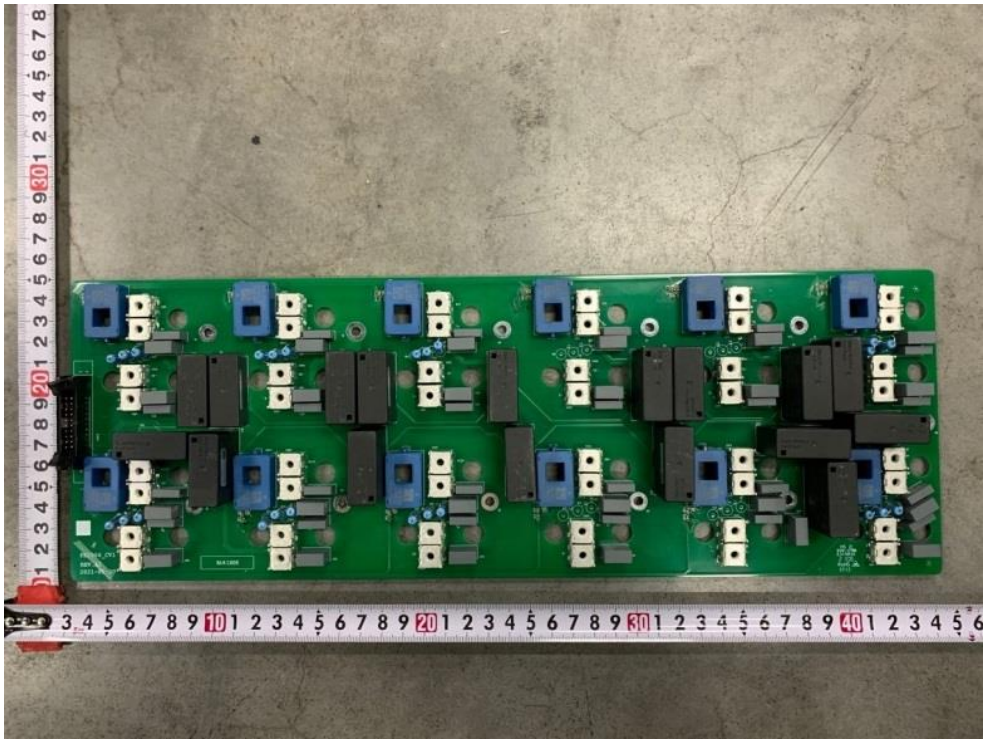
AC Sampling board view



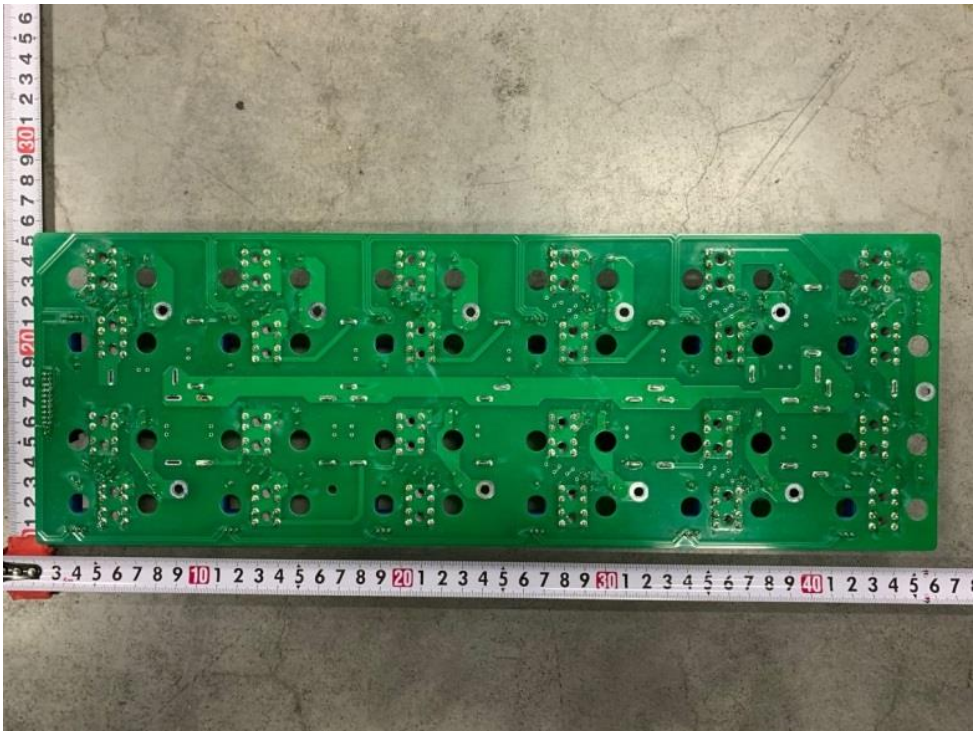
PV input board view (Components side, for 9 and 10 strings)



PV input board view view (Soldered side, for 9 and 10 strings)

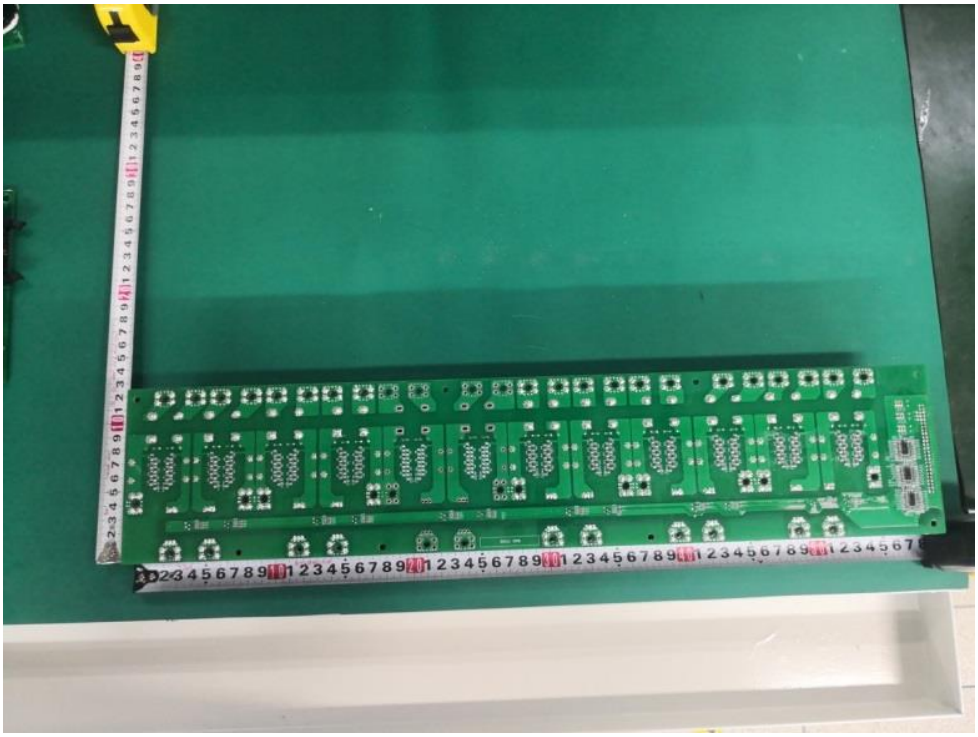


PV input board view (Components side, for 12 strings)

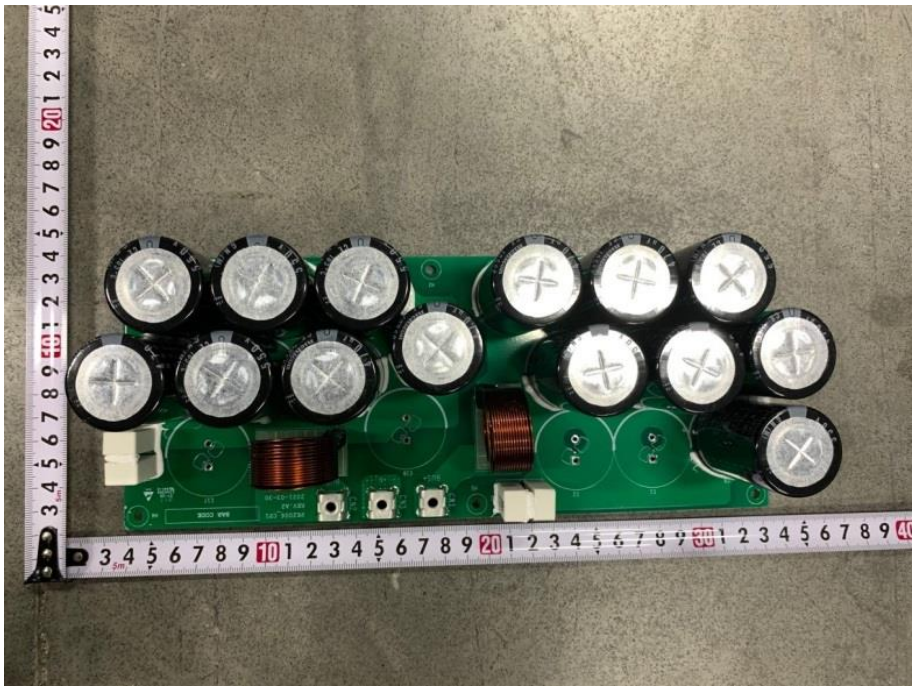


PV input board view (Soldered side, for 12 strings)

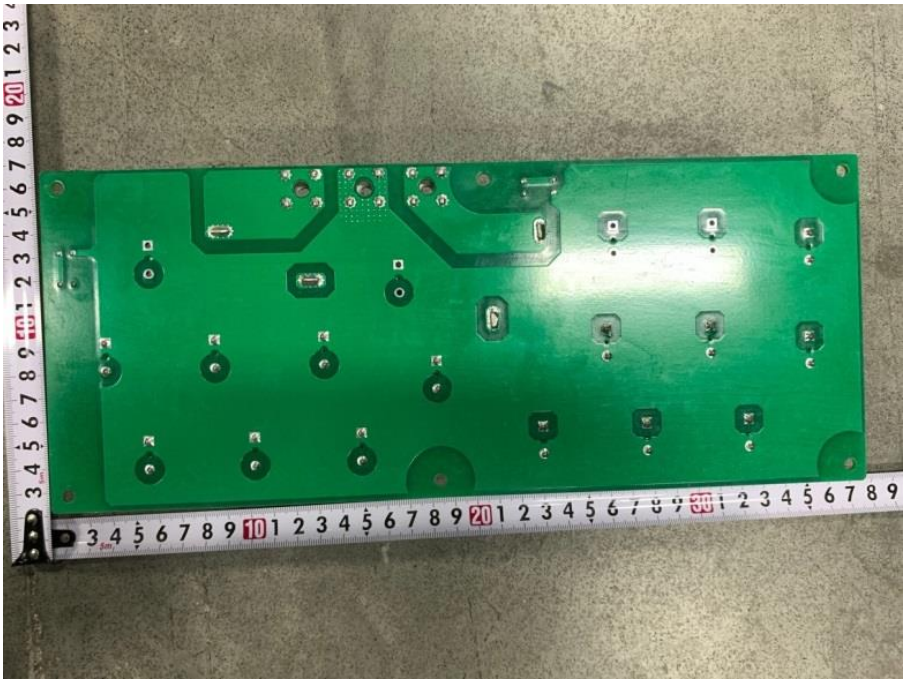
DC EMI board view(Components side)



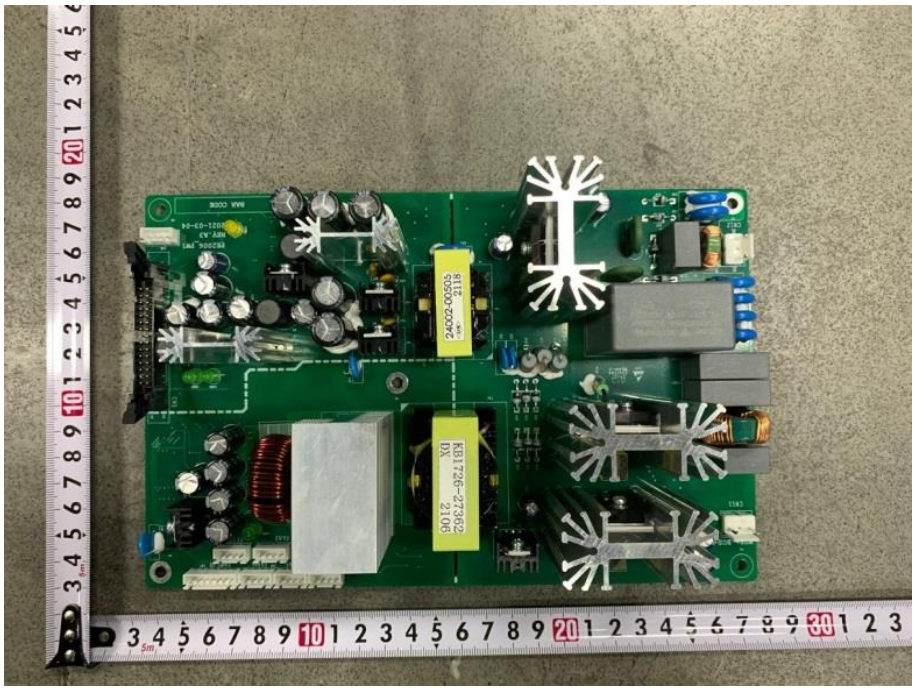
DC EMI board view(Soldered side)



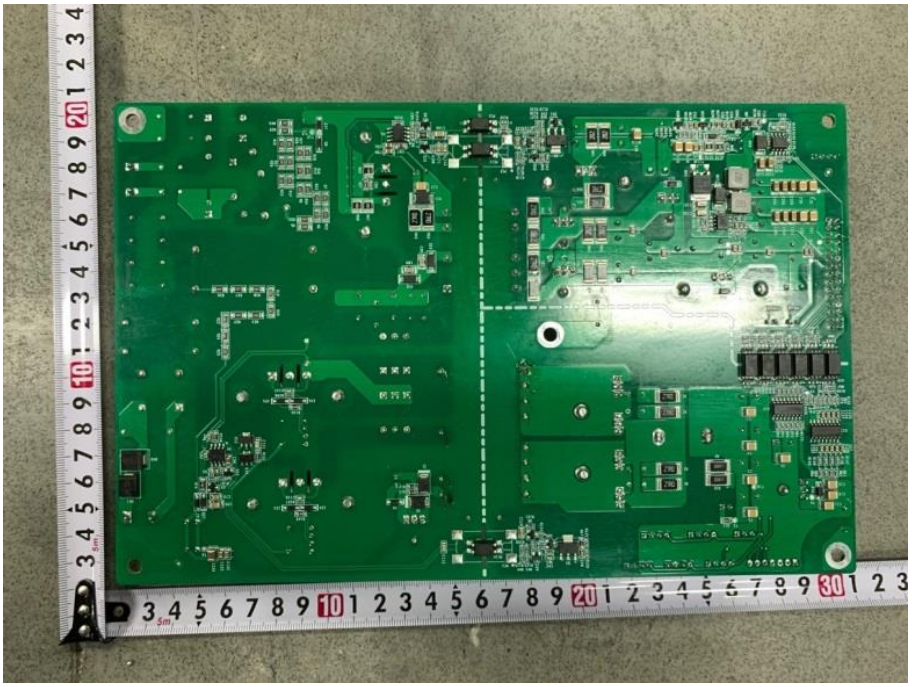
Capacitor board(Components side)



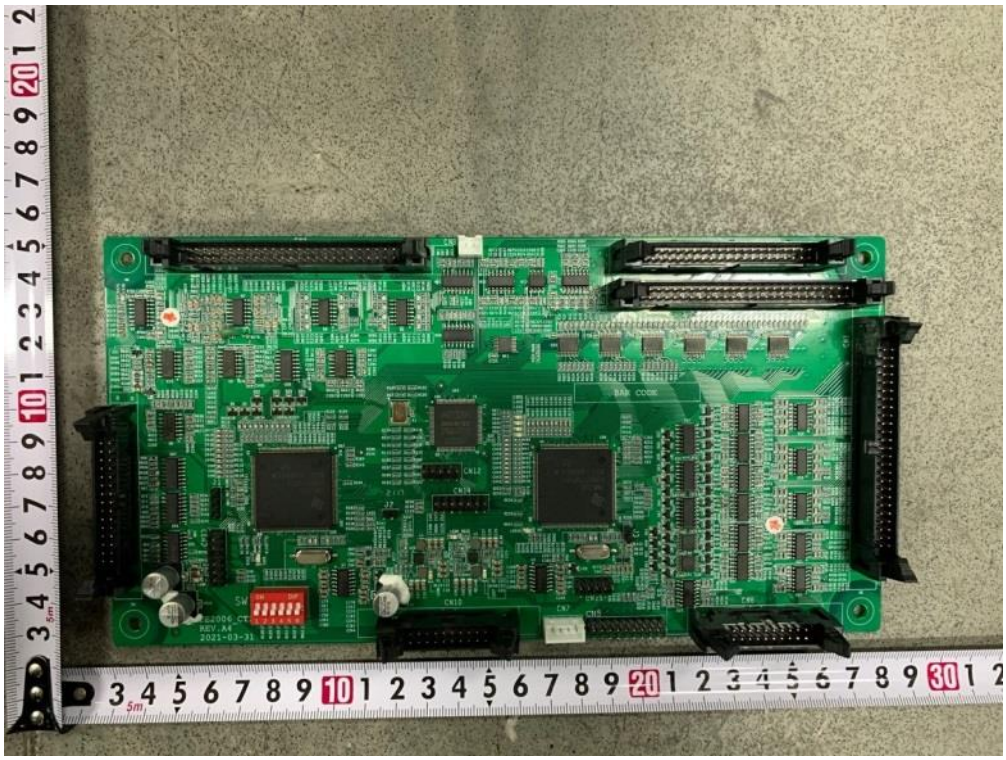
Capacitor board(Soldered side)



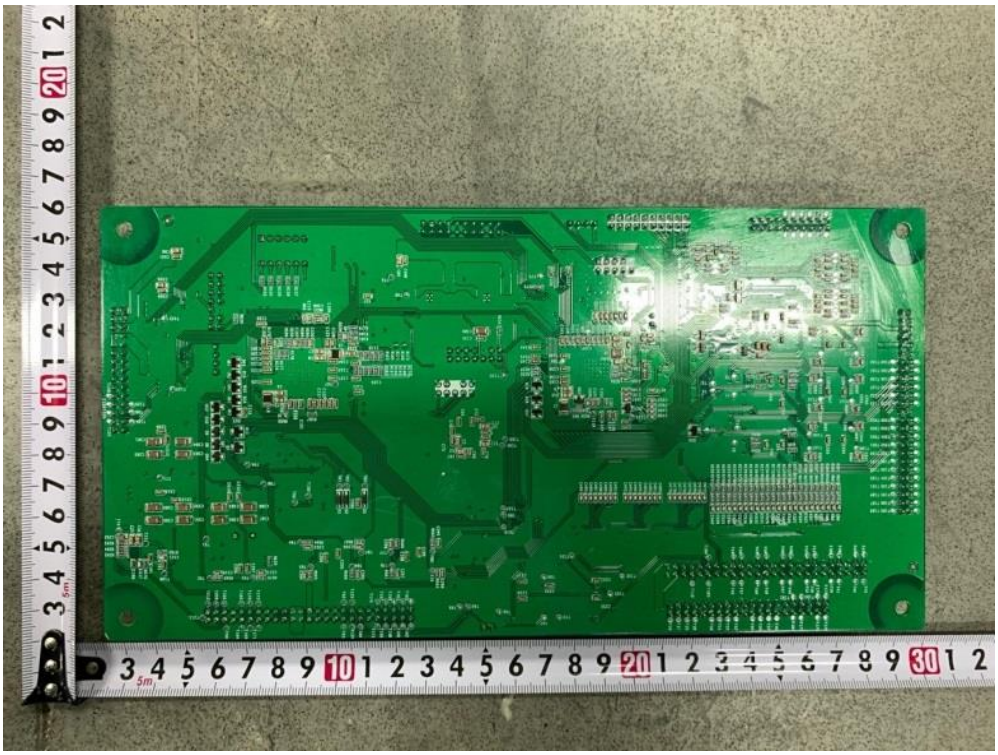
Power board view (Components side)



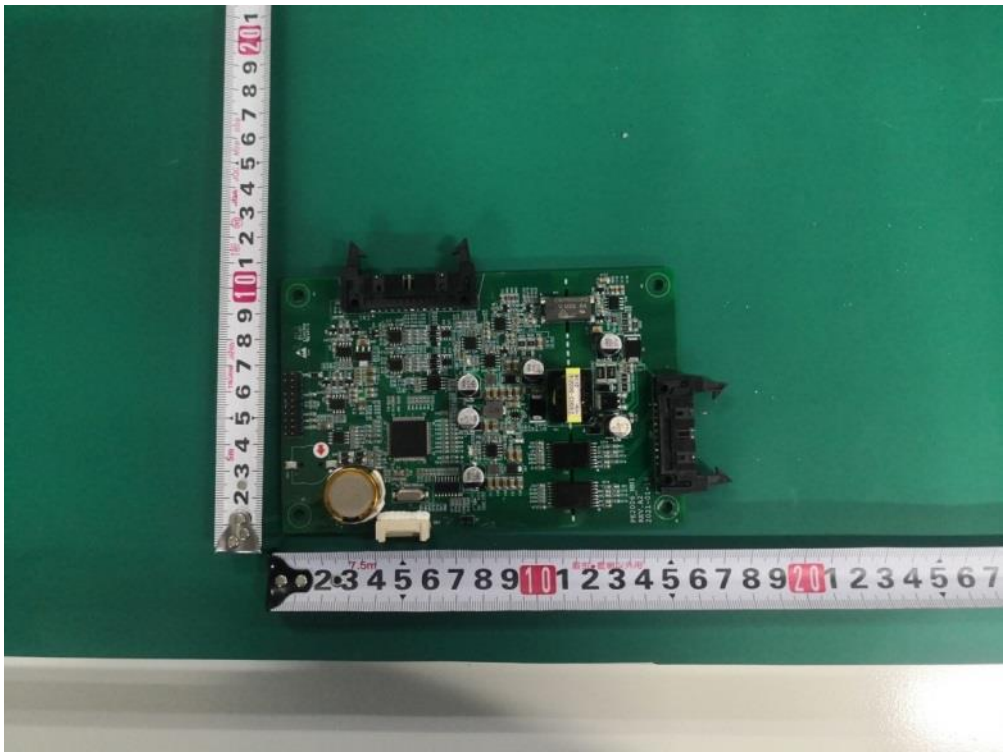
Power board view (Soldered side)



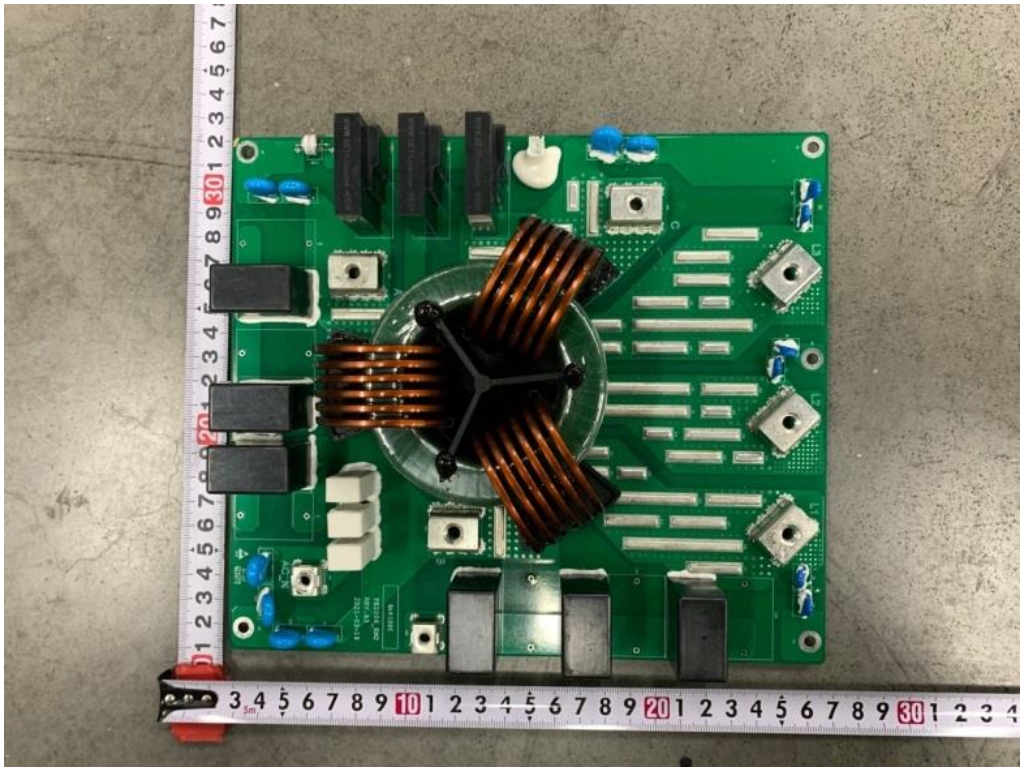
Control board view (Components side)



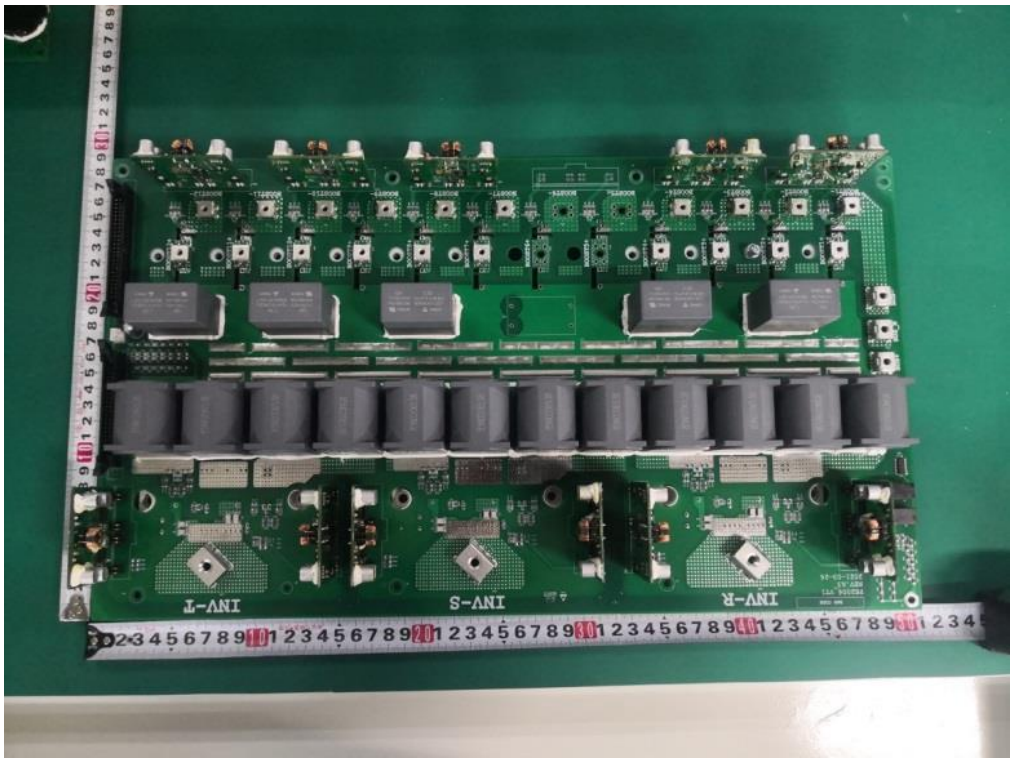
Control board view (Reverse)



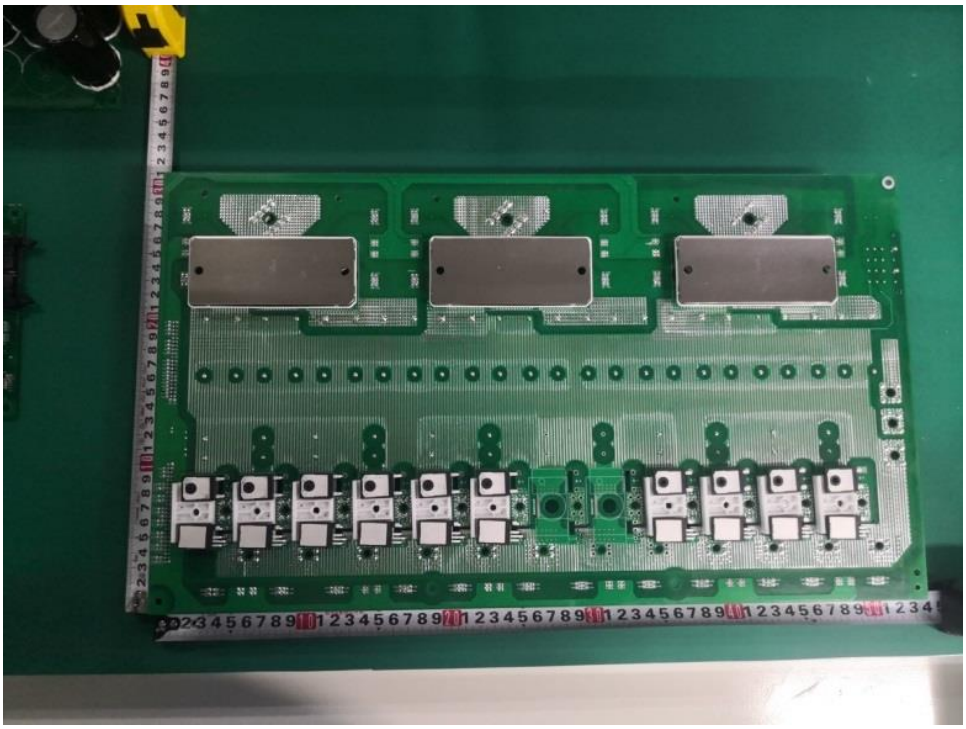
ARM board view



AC EMI board view



Boost-Inverter board (Components side)



Boost-Inverter board (Soldered side)

(End of Report)

TL-395

Test Report issued under the responsibility of:

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

Report Number. .....:	210623182GZU-002
Date of issue .....:	27 Jul 2021
Total number of pages.....	30 pages
Name of Testing Laboratory preparing the Report.....:	Intertek Testing Services Shenzhen Ltd. Guangzhou Branch Room 02, & 101/E201/E301/E401/E501/E601/E701/E801 of Room 01 1-8/F., No. 7-2. Caipin Road, Science City, GETDD, Guangzhou, Guangdong, China
Applicant's name.....:	INVT Solar Technology (Shenzhen) Co., Ltd.
Address .....:	6th Floor , Block A, INVT Guangming Technology Building, Kejie Fourth Road, Shutianpu Community, Matian Guangming District, 518000 Shenzhen, PEOPLE'S REPUBLIC OF CHINA
Test specification:	
Standard.....:	IEC/EN 62109-2:2011
Test procedure .....:	Type approval
Non-standard test method.....:	N/A
Test Report Form No.....:	IEC62109_2B
Test Report Form(s) Originator ....:	LCIE - Laboratoire Central des Industries Electriques
Master TRF.....:	Dated 2016-11

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

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

General disclaimer:

The test results presented in this report relate only to the object tested.
This report shall not be reproduced, except in full, without the written approval of the Issuing CB Testing Laboratory. The authenticity of this Test Report and its contents can be verified by contacting the NCB, responsible for this Test Report.

Test item description	Grid-tied Solar inverter
Trade Mark	invt
Manufacturer.....	Same as applicant
Model/Type reference	iMars XG100KTR, iMars XG100KTR-F, iMars XG110KTR, iMars XG110KTR-F, iMars XG136KTR-L, iMars XG136KTR-LF, iMars XG136KTR-X, iMars XG136KTR-XF

Ratings .....

Model	iMars XG100KTR	iMars XG100KTR-F
Max.PV voltage	1100Vdc	
MPPT voltage range	180V – 1000Vdc	
Max.input current	26A*9	30A*9
PV Isc	40A*9	
Nominal output voltage	3/N/PE, 230/400Vac	
Nominal output Frequency	50/60Hz	
Max.output current	158.8A	
Rated output power	100KW	
Max.apparent power	110KVA	
Power factor range	0.8Leading – 0.8 lagging	
Safety level	Class I	
Ingress Protection	IP 66	
Operation Ambient Temperature	-30℃ - +60℃	
Software version	V1.1	
Model	iMars XG110KTR	iMars XG110KTR-F
Max.PV voltage	1100Vdc	
MPPT voltage range	180V – 1000Vdc	
Max.input current	26A*10	30A*10
PV Isc	40A*10	
Nominal output voltage	3/N/PE, 230/400Vac	
Nominal output Frequency	50/60Hz	
Max.output current	174.6A	
Rated output power	110KW	
Max.apparent power	121KVA	
Power factor range	0.8Leading – 0.8 lagging	

Safety level	Class I	
Ingress Protection	IP 66	
Operation Ambient Temperature	-30℃ - +60℃	
Software version	V1.1	
Model	iMars XG136KTR-L	iMars XG136KTR-LF
Max.PV voltage	1100Vdc	
MPPT voltage range	180V – 1000Vdc	
Max.input current	26A*12	30A*12
PV Isc	40A*12	
Nominal output voltage	3/N/PE, 277/480Vac	
Nominal output Frequency	50/60Hz	
Max.output current	174.6A	
Rated output power	136KW	
Max.apparent power	150KVA	
Power factor range	0.8Leading – 0.8 lagging	
Safety level	Class I	
Ingress Protection	IP 66	
Operation Ambient Temperature	-30℃ - +60℃	
Software version	V1.1	
Model	iMars XG136KTR-X	iMars XG136KTR-XF
Max.PV voltage	1100Vdc	
MPPT voltage range	180V – 1000Vdc	
Max.input current	26A*12	30A*12
PV Isc	40A*12	
Nominal output voltage	3/N/PE, 311/540Vac	
Nominal output Frequency	50/60Hz	
Max.output current	160.4A	
Rated output power	136KW	
Max.apparent power	150KVA	
Power factor range	0.8Leading – 0.8 lagging	
Safety level	Class I	

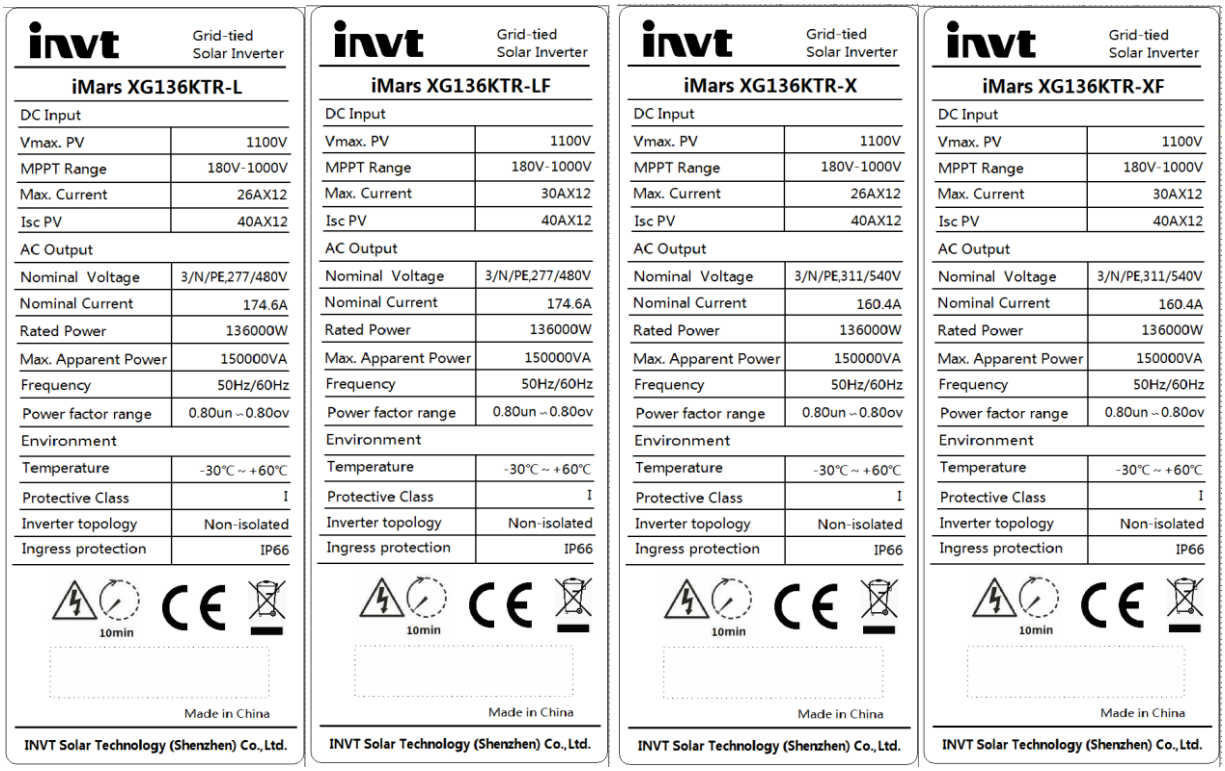
Ingress Protection	IP 66
Operation Ambient Temperature	-30℃ - +60℃
Software version	V1.1

Responsible Testing Laboratory (as applicable), testing procedure and testing location(s):			
☒	**Testing Laboratory:**	Intertek Testing Services Shenzhen Ltd. Guangzhou Branch	
Testing location/ address ..... :		Room 02, & 101/E201/E301/E401/E501/E601/E701/E801 of Room 01 1-8/F., No. 7-2. Caipin Road, Science City, GETDD, Guangzhou, Guangdong, China	
Tested by (name, function, signature) ..... :		Gaison Li Engineer	Gaison Li
Approved by (name, function, signature) .. :		Jason Fu Supervisor	Jason Fu
☐	**Testing procedure: CTF Stage 1:**	N/A	
Testing location/ address ..... :		N/A	
Tested by (name, function, signature) ..... :		N/A	
Approved by (name, function, signature) .. :		N/A	
☐	**Testing procedure: CTF Stage 2:**	N/A	
Testing location/ address ..... :		N/A	
Tested by (name + signature) ..... :		N/A	
Witnessed by (name, function, signature). :		N/A	
Approved by (name, function, signature) .. :		N/A	
☐	**Testing procedure: CTF Stage 3:**	N/A	
☐	**Testing procedure: CTF Stage 4:**	N/A	
Testing location/ address ..... :		N/A	
Tested by (name, function, signature) ..... :		N/A	
Witnessed by (name, function, signature). :		N/A	
Approved by (name, function, signature) .. :		N/A	
Supervised by (name, function, signature) :		N/A	

List of Attachments (including a total number of pages in each attachment): **N/A**	
Summary of testing:	
Tests performed (name of test and test clause): All applicable tests	**Testing location:** Intertek Testing Services Shenzhen Ltd. Guangzhou Branch Room 02, & 101/E201/E301/E401/E501/E601/E701/E801 of Room 01 1-8/F., No. 7-2. Caipin Road, Science City, GETDD, Guangzhou, Guangdong, China
Summary of compliance with National Differences (List of countries addressed): **N/A** ☒ **The product fulfils the requirements of** IEC/EN 62109-2:2011	

Copy of marking plate:

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



invt Grid-tied Solar Inverter

iMars XG136KTR-L

DC Input	
Vmax. PV	1100V
MPPT Range	180V-1000V
Max. Current	26AX12
Isc PV	40AX12
AC Output	
Nominal Voltage	3/N/PE,277/480V
Nominal Current	174.6A
Rated Power	136000W
Max. Apparent Power	150000VA
Frequency	50Hz/60Hz
Power factor range	0.80un～0.80ov
Environment	
Temperature	-30℃～+60℃
Protective Class	I
Inverter topology	Non-isolated
Ingress protection	IP66

10min

Made in China

INVT Solar Technology (Shenzhen) Co.,Ltd.

invt Grid-tied Solar Inverter

iMars XG136KTR-LF

DC Input	
Vmax. PV	1100V
MPPT Range	180V-1000V
Max. Current	30AX12
Isc PV	40AX12
AC Output	
Nominal Voltage	3/N/PE,277/480V
Nominal Current	174.6A
Rated Power	136000W
Max. Apparent Power	150000VA
Frequency	50Hz/60Hz
Power factor range	0.80un～0.80ov
Environment	
Temperature	-30℃～+60℃
Protective Class	I
Inverter topology	Non-isolated
Ingress protection	IP66

10min

Made in China

INVT Solar Technology (Shenzhen) Co.,Ltd.

invt Grid-tied Solar Inverter

iMars XG136KTR-X

DC Input	
Vmax. PV	1100V
MPPT Range	180V-1000V
Max. Current	26AX12
Isc PV	40AX12
AC Output	
Nominal Voltage	3/N/PE,311/540V
Nominal Current	160.4A
Rated Power	136000W
Max. Apparent Power	150000VA
Frequency	50Hz/60Hz
Power factor range	0.80un～0.80ov
Environment	
Temperature	-30℃～+60℃
Protective Class	I
Inverter topology	Non-isolated
Ingress protection	IP66

10min

Made in China

INVT Solar Technology (Shenzhen) Co.,Ltd.

invt Grid-tied Solar Inverter

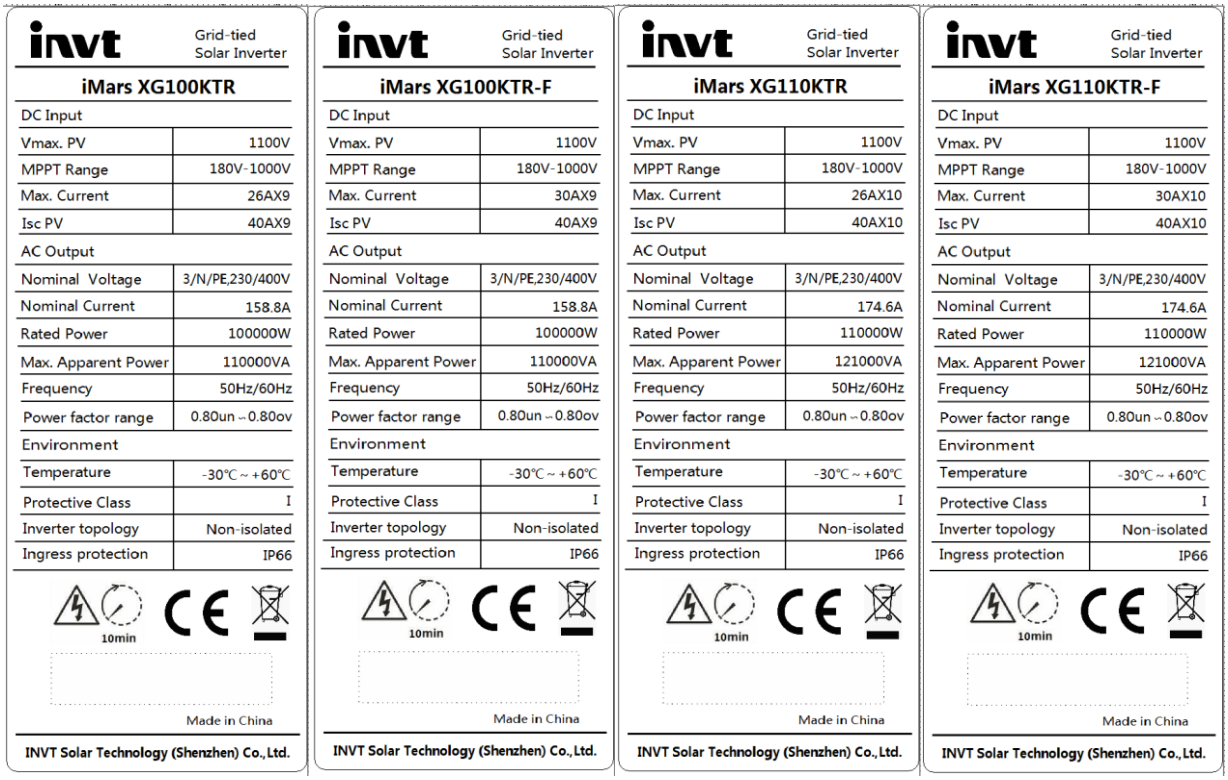
iMars XG136KTR-XF

DC Input	
Vmax. PV	1100V
MPPT Range	180V-1000V
Max. Current	30AX12
Isc PV	40AX12
AC Output	
Nominal Voltage	3/N/PE,311/540V
Nominal Current	160.4A
Rated Power	136000W
Max. Apparent Power	150000VA
Frequency	50Hz/60Hz
Power factor range	0.80un～0.80ov
Environment	
Temperature	-30℃～+60℃
Protective Class	I
Inverter topology	Non-isolated
Ingress protection	IP66

10min

Made in China

INVT Solar Technology (Shenzhen) Co.,Ltd.



invt Grid-tied Solar Inverter

iMars XG100KTR

DC Input	
Vmax. PV	1100V
MPPT Range	180V-1000V
Max. Current	26AX9
Isc PV	40AX9
AC Output	
Nominal Voltage	3/N/PE,230/400V
Nominal Current	158.8A
Rated Power	100000W
Max. Apparent Power	110000VA
Frequency	50Hz/60Hz
Power factor range	0.80un～0.80ov
Environment	
Temperature	-30℃～+60℃
Protective Class	I
Inverter topology	Non-isolated
Ingress protection	IP66

10min

Made in China

INVT Solar Technology (Shenzhen) Co.,Ltd.

invt Grid-tied Solar Inverter

iMars XG100KTR-F

DC Input	
Vmax. PV	1100V
MPPT Range	180V-1000V
Max. Current	30AX9
Isc PV	40AX9
AC Output	
Nominal Voltage	3/N/PE,230/400V
Nominal Current	158.8A
Rated Power	100000W
Max. Apparent Power	110000VA
Frequency	50Hz/60Hz
Power factor range	0.80un～0.80ov
Environment	
Temperature	-30℃～+60℃
Protective Class	I
Inverter topology	Non-isolated
Ingress protection	IP66

10min

Made in China

INVT Solar Technology (Shenzhen) Co.,Ltd.

invt Grid-tied Solar Inverter

iMars XG110KTR

DC Input	
Vmax. PV	1100V
MPPT Range	180V-1000V
Max. Current	26AX10
Isc PV	40AX10
AC Output	
Nominal Voltage	3/N/PE,230/400V
Nominal Current	174.6A
Rated Power	110000W
Max. Apparent Power	121000VA
Frequency	50Hz/60Hz
Power factor range	0.80un～0.80ov
Environment	
Temperature	-30℃～+60℃
Protective Class	I
Inverter topology	Non-isolated
Ingress protection	IP66

10min

Made in China

INVT Solar Technology (Shenzhen) Co.,Ltd.

invt Grid-tied Solar Inverter

iMars XG110KTR-F

DC Input	
Vmax. PV	1100V
MPPT Range	180V-1000V
Max. Current	30AX10
Isc PV	40AX10
AC Output	
Nominal Voltage	3/N/PE,230/400V
Nominal Current	174.6A
Rated Power	110000W
Max. Apparent Power	121000VA
Frequency	50Hz/60Hz
Power factor range	0.80un～0.80ov
Environment	
Temperature	-30℃～+60℃
Protective Class	I
Inverter topology	Non-isolated
Ingress protection	IP66

10min

Made in China

INVT Solar Technology (Shenzhen) Co.,Ltd.

Note:

1. The above markings are the minimum requirements required by the safety standard. For the final production samples, the additional markings which do not give rise to misunderstanding may be added.
2. Label is attached on the side surface of enclosure and visible after installation.
3. Other labels are identical to above, except the model name and ratings

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 (%)..... :	**-90 / +110 %**
Tested for power systems..... :	TN systems
IT testing, phase-phase voltage (V) ..... :	**- - -**
Class of equipment ..... :	☒ **Class I** ☐ **Class II** ☐ **Class III** ☐ **Not classified**
Mass of equipment (kg) ..... :	Approx. 126Kg
Pollution degree ..... :	Outside PD3; Inside PD2
IP protection class..... :	IP 66
..... :	
Possible test case verdicts:	
- test case does not apply to the test object ..... :	N/A
- test object does meet the requirement ..... :	P (Pass)
- test object does not meet the requirement ..... :	F (Fail)
Testing ..... :	
Date of receipt of test item..... :	23 Jun 2021
Date (s) of performance of tests..... :	24 Jun 2021 – 26 Jul 2021

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.** **This report shall be used together with report No.210623182GZU-001**	
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)	**:** Shenzhen INVT Electric Co., Ltd. (Baoan Factory) 4th to 1st floors of Emerson Industrial Park, No. 3, Fengtang Avenue, Tangwei Community, Fuhai Street, Baoan District, Shenzhen, CHINA.

General product information:

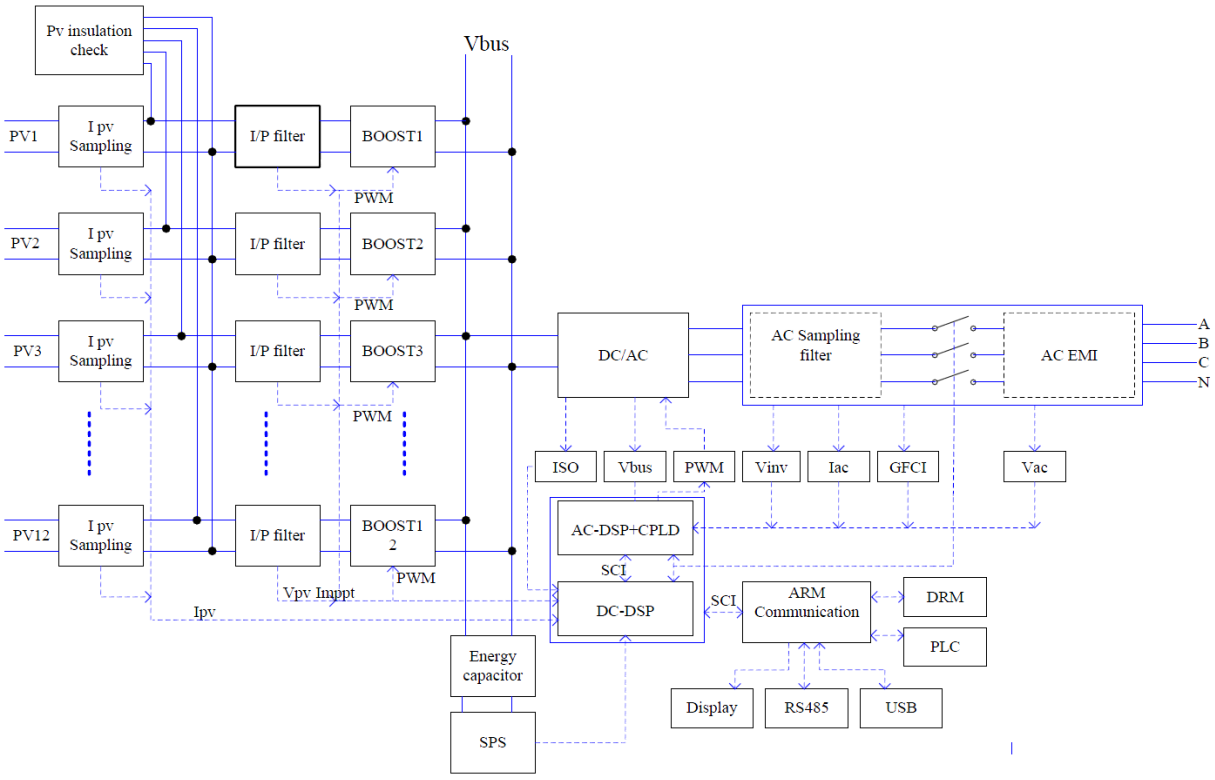
The control system is divided into DC and AC control. AC-DSP and CPLD on the AC side mainly monitors the voltage, current, frequency and GFCI on the grid side, and participates in the inverter control.

The DC-DSP monitors the voltage, current, and ISO on the PV input side, and participates in the BOOS booster circuit and maximum power MPPT point tracking.

There is an internal communication circuit between the two DSP to coordinate with each other to complete the software function of the whole machine.
The ARM monitoring board does not participate in the control of the whole system. It communicates with the DC-SPS to collect the data of the whole system.

The relays (K3,K4,K5,K6) are designed on redundant structure where K4,K6 are controlled by DC-DSP and K5,K6 are controlled by AC-DSP.
The AC-DSP and DC-DSP are used together to control relay open or close, if the single fault on one controller, the other controller can be capable of opening the relay, so that still providing safety means.

The topology diagram as following:



Model differences:

All models are identical, except the output power derating in software and components as list in CDF. The detailed difference as following:

Model	iMars XG100KTR/iMar	iMars XG110KTR/iMars	iMars XG136KTR-L/iMars	iMars XG136KTR-X/iMars

	s XG100KTR-F	XG110KTR-F	XG136KTR-LF	XG136KTR-XF
PV input	9 strings MPPT Each MPPT: two string input	10 strings MPPT Each MPPT: two string input	12 strings MPPT Each MPPT: two string input	
AC output voltage	230/400Vac		277/480Vac	311/540Vac

The product was tested on:

The Software version: V1.1

The Hardware version: VA.1

Other than special notes, typical model iMars XG136KTR-L used as representative for testing in this report.

IEC 62109-2			
Clause	Requirement + Test	Result - Remark	Verdict

4	**GENERAL TESTING REQUIREMENTS**		P
4.4.4	**Single fault conditions to be applied**		P
4.4.4.15	**Fault-tolerance of protection for grid-interactive inverters**		P
4.4.4.15.1	**Fault-tolerance of residual current monitoring according to 4.8.3.5: the residual current monitoring system operates properly**	**See appended table 4.4.4.15.1**	P
	a) ..- The inverter ceases to operate		P
	- Indicates a fault in accordance with §13.9		P
	- Disconnect from the mains		P
	- not re-connect after any sequence of removing and reconnecting PV power		P
	- not re-connect after any sequence of removing and reconnecting AC power		P
	- not re-connect after any sequence of removing and reconnecting both PV and AC power		P
	b) ..- The inverter continues to operate		N/A
	- the residual current monitoring system operates properly under single fault condition		N/A
	- Indicates a fault in accordance with §13.9		N/A
	c) ..- The inverter continues to operate regardless of loss of residual current monitoring functionality		N/A
	- not re-connect after any sequence of removing and reconnecting PV power		N/A
	- not re-connect after any sequence of removing and reconnecting AC power		N/A
	- not re-connect after any sequence of removing and reconnecting both PV and AC power		N/A
	- Indicates a fault in accordance with §13.9		N/A
4.4.4.15.2	**Fault-tolerance of automatic disconnecting means**	Two series relays in each line and can independent operation for each relay.	P
4.4.4.15.2 .1	**The means provided for automatic disconnection of a grid-interactive inverter from the mains shall:**		P
	- disconnect all grounded current-carrying conductors from the mains	Disconnected all line conductors from the mains	P
	- disconnect all ungrounded current-carrying conductors from the mains		P
	- be such that with a single fault applied to the disconnection means or to any other location in the inverter, at least basic insulation or simple separation is maintained between the PV array and the mains when the disconnecting means is intended to be in the open state.	See appended table 4.4.4.15.2 Fault-tolerance of automatic disconnecting There are two relays in serial used as automatic disconnection means. Contact gap is basic insulation .	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**	The automatic disconnection means is automatically	P

IEC 62109-2			
Clause	Requirement + Test	Result - Remark	Verdict
	comment and verdict.	checked before the inverter start operation	
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	The screen shown error information.	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:**	No such transfer switch	N/A
	- shall continue to operate normally		N/A
	- shall not present a risk of fire as the result of an out-of-phase transfer		N/A
	- shall not present a risk of shock as the result of an out-of-phase transfer		N/A
	- And having control preventing switching: components for malfunctioning ……..…:		N/A
4.4.4.17	**Cooling system failure – Blanketing test** **No hazards according to the criteria of sub-clause 4.4.3 of Part 1 shall result from blanketing the inverter** **This test is not required for inverters restricted to use only in closed electrical operating areas.**	**See appended test table Cooling system failure – Blanketing test.**	P
	Test stop condition: time duration value or stabilized temperature ……..:		P
4.7	**ELECTRICAL RATINGS TESTS**		P
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

IEC 62109-2			
Clause	Requirement + Test	Result - Remark	Verdict
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 the peak voltage for that half-cycle.**		N/A
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**	Non-isolation inverter	N/A
	- Type of Array grounding supported ……:		N/A
	- Inverter isolation ……:		N/A
4.8.2	**Array insulation resistance detection for inverters for ungrounded and functionally grounded arrays**	**(See attached table)**	P
4.8.2.1	**Array insulation resistance detection for inverters for ungrounded arrays**		P
	Inverter shall have means to measure DC insulation		P

IEC 62109-2			
Clause	Requirement + Test	Result - Remark	Verdict
	resistance from PV input (array) to ground before starting operation		
	Or Inverter shall be provided with instruction in accordance with 5.3.2.11.	The inverter can measure DC insulation resistance from PV input array to ground before starting operation	N/A
	Measured DC insulation resistance: ……:		P
	Inverter measurement circuit shall be capable of detecting insulation resistance below the limit value R= Vmax/30mA under normal conditions		P
	Inverter measurement circuit shall be capable of detecting insulation resistance below the limit value R= Vmax/30mA with ground fault in the PV array		P
	Isolated inverters shall indicate a fault if the insulation resistance is less than the limit value		N/A
	Isolated inverter fault indication maintained until insulation resistance has recovered to a value higher than the limit value		N/A
	Non-isolated inverters, or inverters with isolation not complying with the leakage current limits in the minimum inverter isolation requirements in Table 30:		P
	- shall indicate a fault in accordance with 13.9		P
	- shall not connect to the mains		P
4.8.2.2	**Array insulation resistance detection for inverters for functionally grounded arrays**		N/A
	a-1)The value of the total resistance, including the intentional resistance for array functional grounding, the expected insulation resistance of the array to ground, and the resistance of any other networks connected to ground (for example measurement networks) must not be lower than R = (VMAX PV/30 mA) ohms.		N/A
	a-2) The installation instructions shall include the information required in 5.3.2.12.		N/A
	b-1) As an alternative to a), or if a resistor value lower than in a) is used, the inverter shall incorporate means to detect, during operation, if the total current through the resistor and any networks (for example measurement networks) in parallel with it, exceeds the residual current values and times in Table 31		N/A
	b-2) Inverter shall either disconnect the resistor or limit the current by other means ……:		N/A
	b-3) If the inverter is a non-isolated inverter, or has isolation not complying with the leakage current limits in the minimum inverter isolation requirements in Table 30, it shall also disconnect from the mains.		N/A
	c) The inverter shall have means to measure the DC insulation resistance from the PV input to ground before starting operation, in accordance with 4.8.2.1.		N/A
4.8.3	**Array residual current detection**		P
4.8.3.1	**General**		P
4.8.3.2	**30 mA touch current type test for isolated inverters**		N/A

IEC 62109-2			
Clause	Requirement + Test	Result - Remark	Verdict
4.8.3.3	**Fire hazard residual current type test for isolated inverters**		N/A
4.8.3.4	**Protection by application of RCD's**	Integrated RCM inside PCE	P
	- 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..		P
	- The selection of the RCD type to ensure compatibility with the inverter must be made according to rules for RCD selection in Part 1.		P
	- The RCD provided integral to the inverter, or		P
	- The RCD provided by the installer if details of the rating, type, and location for the RCD are given in the installation instructions per 5.3.2.9.		N/A
4.8.3.5	**Protection by residual current monitoring**		P
4.8.3.5.1	**General**		P
	Where required by Table 30, the inverter shall provide residual current monitoring that functions whenever the inverter is connected to the mains with the automatic disconnection means closed.		P
	The residual current monitoring means shall measure the total (both a.c. and d.c. components) RMS current.		P
	As indicated in Table 30 for different inverter types, array types, and inverter isolation levels, detection may be required for excessive continuous residual current, excessive sudden changes in residual current, or both, according to the following limits:		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 ≤30kVA;		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
	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**		P

IEC 62109-2			
Clause	Requirement + Test	Result - Remark	Verdict
	(30mA, 60mA and150mA) of Table 31.		
4.8.3.6	**Systems located in closed electrical operating areas**		N/A
	The protection against shock hazard is not required if the installation information provided with the inverter indicates the restriction for use in a closed electrical operating area, and		N/A
	Installation information indicates what forms of shock hazard protection are and are not provided integral to the inverter, in accordance with 5.3.2.7.		N/A
	The inverter shall be marked as in 5.2.2.6.		N/A
5	**MARKING AND DOCUMENTATION**		P
5.1	**Marking**		P
5.1.4	**Equipment ratings**		P
	PV input ratings:	See markings	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 input (other than PV) ratings:		N/A
	- Voltage (nominal or range) (d.c. V)		N/A
	- Current (maximum continuous) (d.c. A)		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**		P
5.2.2	**Content for warning markings**		P
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

IEC 62109-2			
Clause	Requirement + Test	Result - Remark	Verdict
5.3.2.1	**Ratings. Subclause 5.3.2 of Part 1 requires the documentation to include ratings information for each input and output. For inverters this information shall be as in Table 33 below. Only those ratings that are applicable based on the type of inverter are required.**		P
	PV input quantities :		P
	- Vmax PV (absolute maximum) (d.c. V)		P
	- PV input operating voltage range (d.c. V)		P
	- Maximum operating PV input current (d.c. A)		P
	- Isc PV (absolute maximum) (d.c. A)		P
	- Isc PV (absolute maximum) (d.c. A)		P
	- Max. inverter backfeed current to the array (a.c. or d.c. A)		P
	a.c. output quantities:		P
	- Voltage (nominal or range) (a.c. V)		P
	- Current (maximum continuous) (a.c. A)		P
	- Current (inrush) (a.c. A, peak and duration)		P
	- Frequency (nominal or range) (Hz)		P
	- Power (maximum continuous) (W or VA)		P
	- Power factor range		P
	- Maximum output fault current (a.c. A, peak and duration or RMS)		P
	- Maximum output overcurrent protection (a.c. A)		P
	a.c. input quantities:		N/A
	- Voltage (nominal or range) (a.c. V)		N/A
	- Current (maximum continuous) (a.c. A)		N/A
	- Current (inrush) (a.c. A, peak and duration)		N/A
	- Frequency (nominal or range) (Hz)		N/A
	d.c input (other than PV) quantities:		N/A
	- Voltage (nominal or range) (d.c. V)		N/A
	- Nominal battery voltage (d.c. V)		N/A
	- Current (maximum continuous) (d.c. A)		N/A
	d.c. output quantities:		N/A
	- Voltage (nominal or range) (d.c. V)		N/A
	- Nominal battery voltage (d.c. V)		N/A
	- Current (maximum continuous) (d.c. A)		N/A
	Protective class (I or II or III)		P
	Ingress protection (IP) rating per part 1		P
5.3.2.2	**Grid-interactive inverter setpoints**		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: …….	No adjustable setting available. Only the factory default values, however the adjustment shall be performe d by distribution network operator.	N/A
	The setting of field adjustable setpoints shall be accessible from the PCE		N/A
5.3.2.3	**Transformers and isolation**		N/A

IEC 62109-2			
Clause	Requirement + Test	Result - Remark	Verdict
	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:		N/A
	- earthing or not earthing the array		N/A
	- providing external residual current detection devices		N/A
	- requiring an external isolation transformer,		N/A
5.3.2.4	**Transformers required but not provided**		N/A
	An inverter that requires an external isolation transformer not provided with the unit, shall be provided with instructions that specify, and for the external isolation transformer with which it is intended to be used:		N/A
	- the configuration type		N/A
	- electrical ratings		N/A
	- environmental ratings		N/A
5.3.2.5	**PV modules for non-isolated inverters**		P
	Non-isolated inverters shall be provided with installation instructions that require PV modules that have an IEC 61730 Class A rating		P
	If the maximum AC mains operating voltage is higher than the PV array maximum system voltage then the instructions shall require PV modules that have a maximum system voltage rating based upon the AC mains voltage.		N/A
5.3.2.6	**Non-sinusoidal output waveform information**		N/A
	The instruction manual for a stand-alone inverter not complying with 4.7.5.2 shall include a warning that:		N/A
	- the waveform is not sinusoidal,		N/A
	- some loads may experience increased heating,		N/A
	- the user should consult the manufacturers of the intended load equipment before operating that load with the inverter		N/A
	The inverter manufacturer shall provide information regarding:		N/A
	- what types of loads may experience increased heating		N/A
	- recommendations for maximum operating times with such loads		N/A
	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

IEC 62109-2			
Clause	Requirement + Test	Result - Remark	Verdict
5.3.2.7	**Systems located in closed electrical operating areas**		N/A
	Where required by 4.8.3.6, an inverter not provided with full protection against shock hazard on the PV array shall be provided with installation instructions:		N/A
	- requiring that the inverter and the array must be installed in closed electrical operating areas		N/A
	- indicating which forms of shock hazard protection are and are not provided integral to the inverter (for example the RCD, isolation transformer complying with the 30 mA touch current limit, or residual current monitoring for sudden changes)		N/A
5.3.2.8	**Stand-alone inverter output circuit bonding**		N/A
	Where required by 7.3.10, the documentation for an inverter shall include the following:		N/A
	- if output circuit bonding is required but is not provided integral to the inverter, the required means shall be described in the installation instructions, including which conductor is to be bonded and the required current carrying capability or cross-section of the bonding means;		N/A
	- if the output circuit is intended to be floating, the documentation for the inverter shall indicate that the output is floating.		N/A
5.3.2.9	**Protection by application of RCD's**	Integrated RCM used inside	N/A
	Where the requirement for additional protection in 4.8.3.1 is met by requiring an RCD that is not provided integral to the inverter, as allowed by 4.8.3.4, the installation instructions shall state the need for the RCD,.		N/A
	and shall specify its rating, type, and required circuit location		N/A
5.3.2.10	**Remote indication of faults**		P
	The installation instructions shall include an explanation of how to properly make connections to (where applicable), and use, the electrical or electronic fault indication required by 13.9.	The instructions are specified insection "Warning List "of th e product manual.	P
5.3.2.11	**External array insulation resistance measurement and response**	Integrated resistance measurement inside	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

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

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

IEC 62109-2			
Clause	Requirement + Test	Result - Remark	Verdict

4.4.4	TABLE: Single fault condition to be applied						P
	Ambient temperature (°C) ..... :				25		—
	Power source for EUT: Manufacturer, model/type, output rating ..... :				--		—
4.4.4.15.1	Fault-tolerance of residual current monitoring						
Component No.	Fault	Supply voltage (V)	Test time	Fuse #	Fuse current (A)	Observation	
U1 (Pin12-13) (AC Sampling board)	s-c	850	3min	--	--	The PCE can't start. Can resettable. No damage. No hazard. Error message:10-02	
SN4 (Pin2-4) (AC Sampling board)	s-c	850	3min	--	--	The PCE can't start. Can resettable. No damage. No hazard. Error message:43-01	
C16 (AC Sampling board)	s-c	850	3min			The PCE can't start. Can resettable. No damage. No hazard. Error message:10-01	
C15 (AC Sampling board)	s-c	850	3min			The PCE can't start. Can resettable. No damage. No hazard. Error message:43-01	
Check that the residual current monitoring operates properly							
Supplementary information:							

4.4.4	TABLE: Single fault condition to be applied						P
	Ambient temperature (°C)				25		—
	Power source for EUT: Manufacturer, model/type, output rating				--		—
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 K1 (L1 phase)	s-c before start up	850	3min	--	--	The PEC can't connect to grid. Can resettable. No damage. No hazard. Error message:11-02	
Relay K3 (L2 phase)	s-c before start up	850	3min	--	--	The PEC can't connect to grid. Can resettable. No damage. No hazard. Error message:11-02	

IEC 62109-2						
Clause	Requirement + Test				Result - Remark	Verdict
Relay K5 (L3 phase)	s-c before start up	850	3min	--	--	The PEC can't connect to grid. Can resettable. No damage. No hazard. Error message:11-02
G-D of Q2 (AC Sampling board)	s-c before start up	850	3min	--	--	The PCE can't start. Can resettable. No damage. No hazard. Error message:11-02
G-S of Q2 (AC Sampling board)	s-c before start up	850	3min	--	--	The PCE can't start. Can resettable. No damage. No hazard. Error message:11-02
D-S of Q2 (AC Sampling board)	s-c before start up	850	3min	--	--	The PCE can't start. Can resettable. No damage. No hazard. Error message:11-02
R333 (AC Sampling board)	o-c before start up	850	3min	--	--	Operating as normal. No damage. No hazard.
TR1 (ARM board)	s-c before start up	850	3min	--	--	The PCE can't start. Can resettable. No damage. No hazard.
PC3 (ARM board)	s-c before start up	850	3min	--	--	The PCE can't start. Can resettable. No damage. No hazard.
SN2 (PV board)	s-c before start up	850	3min	--	--	The PCE can't start. Can resettable. No damage. No hazard. Error message:01-01
TR1 (PIN2-3) (driver board)	s-c before start up	850	3min	--	--	The PCE can't start. Can resettable. No damage. No hazard.
Check that the relays fulfil the basic insulation or simple separation based on the PV circuit working voltage.						There are two relays in serial used as automatic disconnection means.
Each active phase can be switched. (L and N)						
Supplementary information:						

4.4.4.17	Cooling system fainlure – Blanketing test				P
	Test voltage (Vdc)..... :	530.5			—
	Test current (Idc)	269.7			—
	Test voltage (Vac)..... :	227.0	227.0	227.0	—
	Test current (Iac)	168.0	165.9	165.4	—
	t_{amb1} (°C) ..... :	27.34			—
	t_{amb2} (°C) ..... :	29.41			—
maximum temperature T of part/at::		T (°C)			T_{max} (°C)
Ambient temp.		45.00			--

IEC 62109-2			
Clause	Requirement + Test	Result - Remark	Verdict

Enclosure (Top)	50.99	90
Enclosure (Side)	50.27	90
Enclosure (front)	57.66	90
Enclosure (Bottom)	56.31	90
Mounting surface	57.65	90
Supplementary information:		

4.7.4	TABLE: Steady state Inverter AC output voltage and frequency		N/A
	Nominal DC input (V) Nominal output AC voltage (V) :		
AC output U (V)	Frequency (Hz)	Condition/status	Comments
Supplementary information:			

IEC 62109-2			
Clause	Requirement + Test	Result - Remark	Verdict

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 (Ω)	Required Insulation resistance R = ($V_{MAX\ PV}$ / 30mA) (Ω)	Result
DC+				
180V	250V	45.0kohm	36.67kohm	The PV inverter cannot start-up. Error message: “07-01”
180V	250V	45.0kohm	36.67kohm	The PV inverter cannot start-up. Error message: “07-01”
DC-				
180V	250V	45.0kohm	36.67kohm	The PV inverter cannot start-up. Error message: “07-01”
180V	250V	45.0kohm	36.67kohm	The PV inverter cannot start-up. Error message: “07-01”

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:

4.8.3.2	TABLE: 30mA touch current type test for isolated inverters	N/A

Condition	Current (mA)	Limit (30mA)
DC+ to PE		
DC- to PE		

IEC 62109-2			
Clause	Requirement + Test	Result - Remark	Verdict

Supplementary information:

The touch current measurement circuit of IEC 60990, Figure 4 is connected from each terminal of the array to ground, one at a time.

4.8.3.3	TABLE: Fire hazard residual current type test for isolated inverters	N/A

Condition	Current (mA)	Limit (300mA or 10mA per kVA)
DC+ to PE		
DC- to PE		

Supplementary information:

IEC 62109-2			
Clause	Requirement + Test	Result - Remark	Verdict

4.8.3.5	TABLE: Protection by residual current monitoring	P
Test conditions:	Output power (kVA) : 136 Input voltage (V_{DC}): 850 Frequency (Hz):50 Output AC Voltage (V_{AC}):230	
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
+ PV to N:			
289	1360	195	300
293	1360	201	300
287	1360	198	300
291	1360	197	300
285	1360	203	300
- PV to N:			
287	1360	195	300
286	1360	201	300
290	1360	198	300
281	1360	197	300
283	1360	203	300

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

Supplementary information:

4.8.3.5.3	TABLE: Test for detection of sudden changes in residual current	P

+PV to N		
Limit (mA)	U_N Disconnection time (ms)	Limit (ms)
30	129.0	300
30	142.0	300
30	141.0	300
30	150.0	300
30	140.0	300

IEC 62109-2			
Clause	Requirement + Test	Result - Remark	Verdict

60	99.2	150
60	94.8	150
60	102.8	150
60	92.8	150
60	94.4	150
150	24.4	40
150	16.4	40
150	24.8	40
150	38.4	40
150	30.4	40
-PV to N		
Limit (mA)	U_N Disconnection time (ms)	Limit (ms)
30	134.4	300
30	133.6	300
30	149.6	300
30	140.4	300
30	132.8	300
60	113.2	150
60	107.6	150
60	113.6	150
60	100.8	150
60	102.4	150
150	31.6	40
150	29.6	40
150	32.0	40
150	19.2	40
150	27.6	40

Note:
The capacitive current is raised until disconnection.
Test condition: I_c + 30/60/150mA <= I_{cmax}. R_1 is set that 30/60/150mA Flow and switch S is closed.

Supplementary information:

(End of report)

INVT Solar Technology (Shenzhen) Co., Ltd.

TEST REPORT

SCOPE OF WORK
EMC TESTING– See page 2

REPORT NUMBER
210623184GZU-001

ISSUE DATE **[REVISED DATE]**

02-September-2021 [----------]

PAGES
48

DOCUMENT CONTROL NUMBER
EN IEC 61000-6-1, 6-3-a

Block E, No.7-2 Guang Dong
Software Science Park, Caipin Road,
Guangzhou Science City, GETDD
Guangzhou, China

Telephone: 86-20-8213 9688
Facsimile: 86-20-3205 7538
www.intertek.com

TEST REPORT

Applicant Name & Address	:	INVT Solar Technology (Shenzhen) Co., Ltd. 6 th Floor , Block A, INVT Guangming Technology Building, Kejie Fourth Road, Shutianpu Community, Matian Guangming District, 518000 Shenzhen, PEOPLE'S REPUBLIC OF CHAINA
Manufacturing Site	:	Same as applicant
Intertek Report No:		210623184GZU-001

Test standards

EN IEC 61000-6-3:2021
EN IEC 61000-6-1:2019

Sample Description

Product	:	Grid-tied Solar inverter
Model No.	:	iMars XG100KTR, iMars XG100KTR-F, iMars XG110KTR, iMars XG110KTR-F, iMars XG136KTR-L, iMars XG136KTR-LF, iMars XG136KTR-X, iMars XG136KTR-XF
Electrical Rating	:	See page 6 to 7
Serial No.		Not Labeled
Date Received	:	23 June 2021
Date Test Conducted	:	30 July 2021- 25 August 2021

Prepared and Checked By

Guitar Huang

Project Engineer

Approved By:

Sky Zhu

Team Leader

TEST REPORT

CONTENT

TEST REPORT

1. TEST RESULTS SUMMARY

Test Item	Standard	Result
Continuous conducted disturbance voltage	EN IEC 61000-6-3:2021 Reference: EN 55016-2-1:2014	Pass
Discontinuous conducted disturbance voltage	EN IEC 61000-6-3:2021 Reference: EN 55014-1:2017+A11:2020	N/A
Emission at Telecommunications / network Ports	EN IEC 61000-6-3:2021 Reference: EN 55032 :2015+A11 :2020	Pass
Radiated emission (30 MHz–1000 MHz)	EN IEC 61000-6-3:2021 Reference: EN 55016-2-3:2017	Pass
Radiated emission (1 GHz–6 GHz)	EN IEC 61000-6-3:2021 Reference: EN 55016-2-3:2017	N/A
Harmonic of current	EN IEC 61000-6-3:2021 Reference: EN IEC 61000-3-2 :2019	N/A
Flicker	EN IEC 61000-6-3:2021 Reference: EN 61000-3-3:2013+A1:2019	N/A
ESD immunity	EN IEC 61000-6-1:2019 Reference: EN 61000-4-2:2009	Pass
Radiated EM field immunity	EN IEC 61000-6-1:2019 Reference: EN 61000-4-3:2006 +A1:2008 + A2:2010	Pass
EFT immunity	EN IEC 61000-6-1:2019 Reference: EN 61000-4-4:2012	Pass
Surge immunity	EN IEC 61000-6-1:2019 Reference: EN 61000-4-5:2014	Pass
Inject current immunity	EN IEC 61000-6-1:2019 Reference: EN 61000-4-6:2014	Pass
Power frequency magnetic field immunity	EN IEC 61000-6-1:2019 Reference: EN 61000-4-8:2010	Pass
Voltage dips and interruption immunity	EN IEC 61000-6-1:2019 Reference: EN 61000-4-11:2004	N/A

Remark:
1. The symbol “N/A” in above table means Not Applicable.
2. When determining the test results, measurement uncertainty of tests has been considered.

TEST REPORT

2. EMC RESULTS CONCLUSION

RE: EMC Testing Pursuant to EMC Directive 2014/30/EU performed on the Grid-tied Solar inverter, Models: iMars XG100KTR, iMars XG100KTR-F, iMars XG110KTR, iMars XG110KTR-F, iMars XG136KTR-L, iMars XG136KTR-LF, iMars XG136KTR-X, iMars XG136KTR-XF

General product information:
The control system is divided into DC and AC control. AC-DSP and CPLD on the AC side mainly monitors the voltage, current, frequency and GFCI on the grid side, and participates in the inverter control.
The DC-DSP monitors the voltage, current, and ISO on the PV input side, and participates in the BOOS booster circuit and maximum power MPPT point tracking.
There is an internal communication circuit between the two DSP to coordinate with each other to complete the software function of the whole machine.
The ARM monitoring board does not participate in the control of the whole system. It communicates with the DC-SPS to collect the data of the whole system.
The relays (K3,K4,K5,K6) are designed on redundant structure where K4,K6 are controlled by DC-DSP and K5,K6 are controlled by AC-DSP.
The AC-DSP and DC-DSP are used together to control relay open or close, if the single fault on one controller, the other controller can be capable of opening the relay, so that still providing safety means.

Model differences:
All models are identical, except the output power derating in software and components as list in CDF.
The detailed difference as following:

Model	iMars XG100KTR, iMars XG100KTR-F	iMars XG110KTR, iMars XG110KTR-F	iMars XG136KTR-L, iMars XG136KTR-LF	iMars XG136KTR-X, iMars XG136KTR-XF
PV input	9 strings MPPT Each MPPT: two string input	10 strings MPPT Each MPPT: two string input	12 strings MPPT Each MPPT: two string input	
AC output voltage	230/400Vac		277/480Vac	311/540Vac

The product was tested on:
The Software version: V1.1
The Hardware version: VA.1

Other than special notes, typical model **iMars XG136KTR-L** used as representative for testing in this report.

The production units are required to conform to the initial sample as received when the units are placed on the market.

TEST REPORT

Electrical Rating:

Model	iMars XG100KTR	iMars XG100KTR-F
Max.PV voltage	1100Vdc	
MPPT voltage range	180V – 1000Vdc	
Max.input current	26A*9	30A*9
PV Isc	40A*9	
Nominal output voltage	3/N/PE, 230/400Vac	
Nominal output Frequency	50/60Hz	
Max.output current	158.8A	
Rated output power	100KW	
Max.apparent power	110KVA	
Power factor range	0.8Leading – 0.8 lagging	
Safety level	Class I	
Ingress Protection	IP 66	
Operation Ambient Temperature	-30℃ - +60℃	
Software version	V1.1	
Model	iMars XG110KTR	iMars XG110KTR-F
Max.PV voltage	1100Vdc	
MPPT voltage range	180V – 1000Vdc	
Max.input current	26A*10	30A*10
PV Isc	40A*10	
Nominal output voltage	3/N/PE, 230/400Vac	
Nominal output Frequency	50/60Hz	
Max.output current	174.6A	
Rated output power	110KW	
Max.apparent power	121KVA	
Power factor range	0.8Leading – 0.8 lagging	
Safety level	Class I	
Ingress Protection	IP 66	
Operation Ambient Temperature	-30℃ - +60℃	
Software version	V1.1	

TEST REPORT

Model	iMars XG136KTR-L	iMars XG136KTR-LF
Max.PV voltage	1100Vdc	
MPPT voltage range	180V – 1000Vdc	
Max.input current	26A*12	30A*12
PV Isc	40A*12	
Nominal output voltage	3/N/PE, 277/480Vac	
Nominal output Frequency	50/60Hz	
Max.output current	174.6A	
Rated output power	136KW	
Max.apparent power	150KVA	
Power factor range	0.8Leading – 0.8 lagging	
Safety level	Class I	
Ingress Protection	IP 66	
Operation Ambient Temperature	-30℃ - +60℃	
Software version	V1.1	
Model	iMars XG136KTR-X	iMars XG136KTR-XF
Max.PV voltage	1100Vdc	
MPPT voltage range	180V – 1000Vdc	
Max.input current	26A*12	30A*12
PV Isc	40A*12	
Nominal output voltage	3/N/PE, 311/540Vac	
Nominal output Frequency	50/60Hz	
Max.output current	160.4A	
Rated output power	136KW	
Max.apparent power	150KVA	
Power factor range	0.8Leading – 0.8 lagging	
Safety level	Class I	
Ingress Protection	IP 66	
Operation Ambient Temperature	-30℃ - +60℃	
Software version	V1.1	

TEST REPORT

3. LABORATORY MEASUREMENTS

Configuration Information

Support Equipment:	DC power source
Rated Voltage and frequency under test:	See page 6 to 7
Condition of Environment:	Temperature: 22~28°C Relative Humidity:35~60% Atmosphere Pressure:86~106kPa

Notes:

1. The EMI measurements had been made in the operating mode produced the largest emission in the frequency band being investigated consistent with normal applications. An attempt had been made to maximize the emission by varying the configuration of the EUT.

2. The EMS measurements had been made in the frequency bands being investigated, with the EUT in the most susceptible operating mode consistent with normal applications. The configuration of the test sample had been varied to achieve maximum susceptibility.

3. Test Location:
All tests were performed at:
INVT Solar Technology (Shenzhen) Co., Ltd.
6 th Floor , Block A, INVT Guangming Technology Building, Kejie Fourth Road, Shutianpu Community, Matian Guangming District, 518000 Shenzhen, PEOPLE'S REPUBLIC OF CHAINA

Except the Harmonic of current, Flicker, Radiated EM field immunity and Power frequency magnetic field immunity tests were subcontracted at:
Shenzhen EMTEK Co.,Ltd.
Bldg. 69, Majialong Industry Zone, Nanshan District, Shenzhen,Guangdong,China.

4.Measurement Uncertainty

No.	Item	Measurement Uncertainty
1	Conduction Emission (150 kHz-30 MHz)	3.5dB
2	Radiated Emission (30 MHz-1 GHz)	3.6 dB

The measurement uncertainty describes the overall uncertainty of the given measured value during the operation of the EUT.
Measurement uncertainty is calculated in accordance with CISPR16-4-2:2011
The measurement uncertainty is given with a confidence of 95%, k=2.

TEST REPORT

4. EQUIPMENT USED DURING TEST

Equipment from IVT				
Test item	Equipment	Model	No.	Due Date
CS	signal generator	CIT-10	IT-RD-617	2022-07-07
	signal generator	75A250AM1	IT-RD-142	2022-04-05
	EM Clamp	EMCL-20	IT-RD-618	2022-07-07
	attenuator	75W 6dB	IT-RD-619	2021-08-27
	CDN	CDN-M5-32A	IT-RD-642	2022-01-12
EFT	EFT system	EFT 500T	IT-RD-704	2021-11-05
	EFT Clamp	CCC 1000	IT-RD-705	2021-11-05
Surge	Surge signal generator	CWS 800G+SPN 3832T	IT-RD-787	2022-04-05
	Signal line surge generator	SG-728G+SCN-C5	IT-RD-552	2021-09-23
ESD	ESD system	EDS 30V	IT-RD-754	2022-04-08
CE/RE	EMI Receiver	ESPI3	IT-RD-139	2021-12-22
	AMN	NNLK 8121	IT-RD-247	2021-09-23
	Antenna	VULB9168	IT-RD-257	2022-03-11
	shield room	543	IT-RD-455	2024-11-18
	shield room	753	IT-RD-245	2024-11-18
	3m anechoic chamber	966	IT-RD-717	2024-09-21

TEST REPORT

R/S (EMTEK)						
Equ.No.	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
EE-066-2	Power Amplifier	MILMEGA	AS0102-55	1018770	2022/5/19	1 Year
EE-066-4	50ohm Diode Power Sensor	BOONTON	51011EMC	34236	2021/5/19	1 Year
EE-066-6	RF Power Meter. Dual Channel	BOONTON	4232A	10539	2021/5/19	1 Year
EE-067	Log.-Per. Antenna	SCHWARZBECK	VULP 9118E	811	N/A	N/A
EE-218	Signal Generator	Agilent	N5181A	MY50145187	2021/5/19	1 Year
EE-219	50ohm Diode Power Sensor	BOONTON	51011EMC	36164	2021/5/19	1 Year
EE-220	Broad-Band Horn Antenna	SCHWARZBECK	STLP 9149	9149-227	N/A	N/A
EE-221	Field Strength Meter	DARE	RSS1006A	10I00037SNO22	2021/5/19	1 Year
EE-222	Multi-function interface system	DARE	CTR1009B	12I00250SNO72	N/A	N/A
EE-223	Automatic switch group	DARE	RSW1004A	N/A	N/A	N/A
EE-224	Power Amplifier	MILMEGA	AS1860-50	1059346	2021/5/19	1 Year
EE-225	Power Amplifier	MILMEGA	80RF1000-175	1059345	2021/5/19	1 Year
EE-225-1	Directional Coupler	MILMEGA	DC6180AM1	0340463	2021/5/19	1 Year
EE-115	Audio Analyzer	R&S	UPV	101473	2021/5/19	1 Year
EE-615	Audio Test System	AUDIO PRECISION	ATS-1	41100	2021/5/19	1 Year

Power frequency magnetic field (EMTEK)						
Equ.No.	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
EE-006	Magnetic Field Tester	HAEFELY	MAG100	250040.1	2021/5/28	1Year

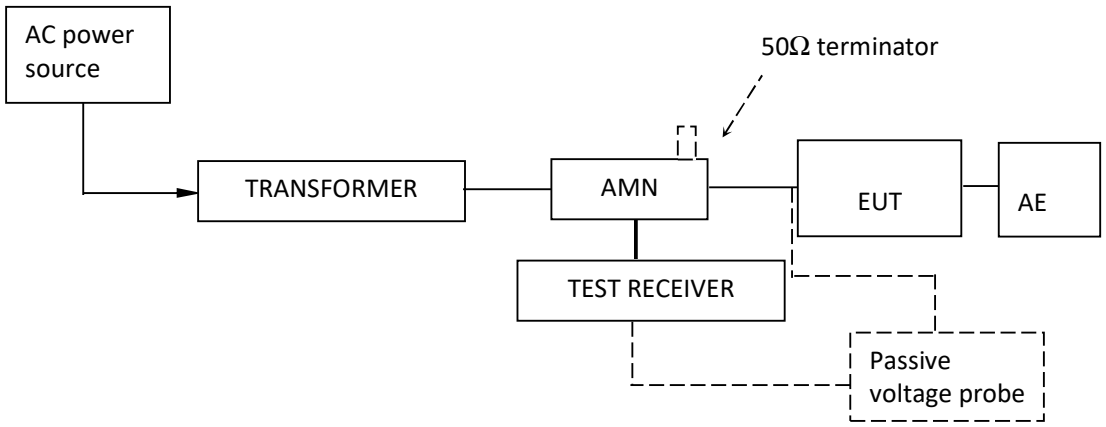
TEST REPORT

5. EMI TEST

5.1 EN 61000-6-3 Continuous Conducted Disturbance Voltage Test

Test Result: Pass

5.1.1 Block Diagram of Test Setup



5.1.2 Test Setup and Procedure

The EUT was set to achieve the maximum emission level. The mains terminal disturbance voltage was measured with the EUT in a shielded room. The EUT was connected to AC power source through an Artificial Mains Network which provides a 50Ω linear impedance artificial hand is used if appropriate (for handheld apparatus). The load/control terminal disturbance voltage was measured with passive voltage probe if appropriate.

The table-top EUT was placed on a 0.8m high non-metallic table above earthed ground plane (Ground Reference Plane).And for floor standing EUT, was placed on a 0.1m high non-metallic supported on GRP. The EUT keeps a distance of at least 0.4m from a vertical metallic surface. The Artificial Mains Network is situated at a distance of 0.8m from the EUT.

During the test, mains lead of EUT excess 0.8m was folded back and forth parallel to the lead so as to form a horizontal bundle with a length between 0.3m and 0.4m.

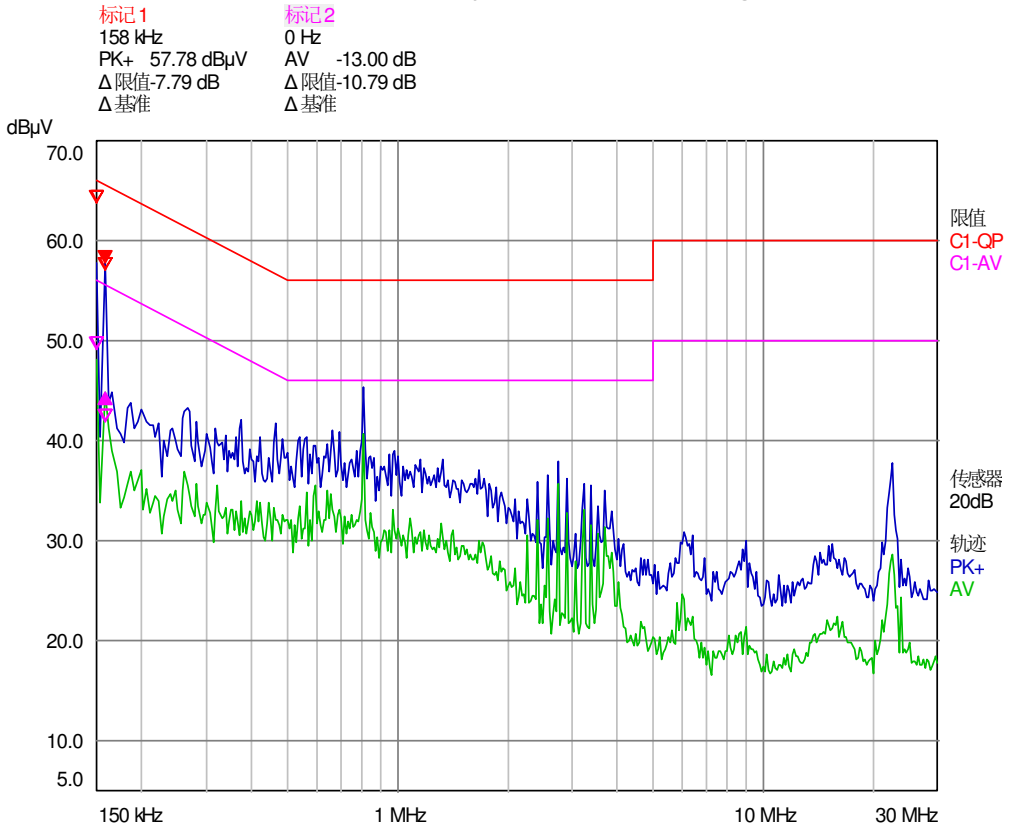
The bandwidth of test receiver was set at 9 kHz. The frequency range from 150 kHz to 30 MHz was checked.

TEST REPORT

5.1.3 Test Data and curve

At mains terminal:

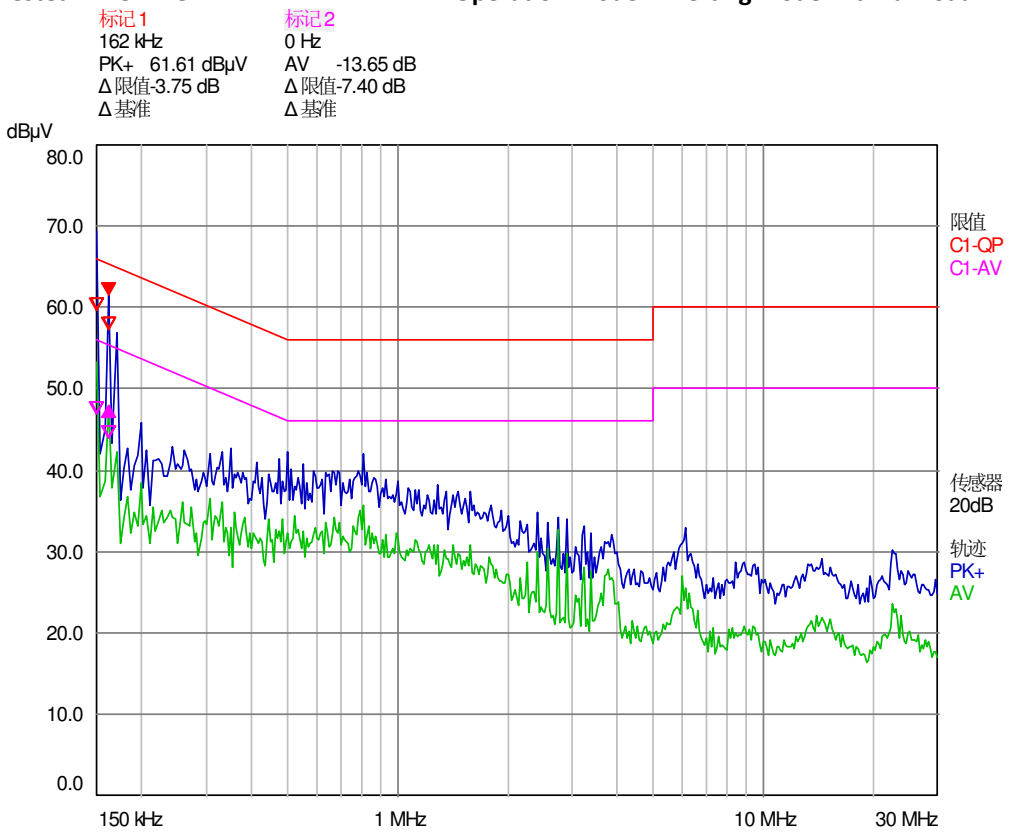
Tested Wire: Live 1 **Operation Mode: Inverting mode with full load**



Track	Frequency (MHz)	Level (dBµV)	Limit (dBµV)	Margin (dB)
1 QP	0.15	63.72	66.00	-2.28
2 AV	0.15	49.17	56.00	-6.83
1 QP	0.158	57.06	65.57	-8.51
2 AV	0.158	41.88	55.57	-13.69

TEST REPORT

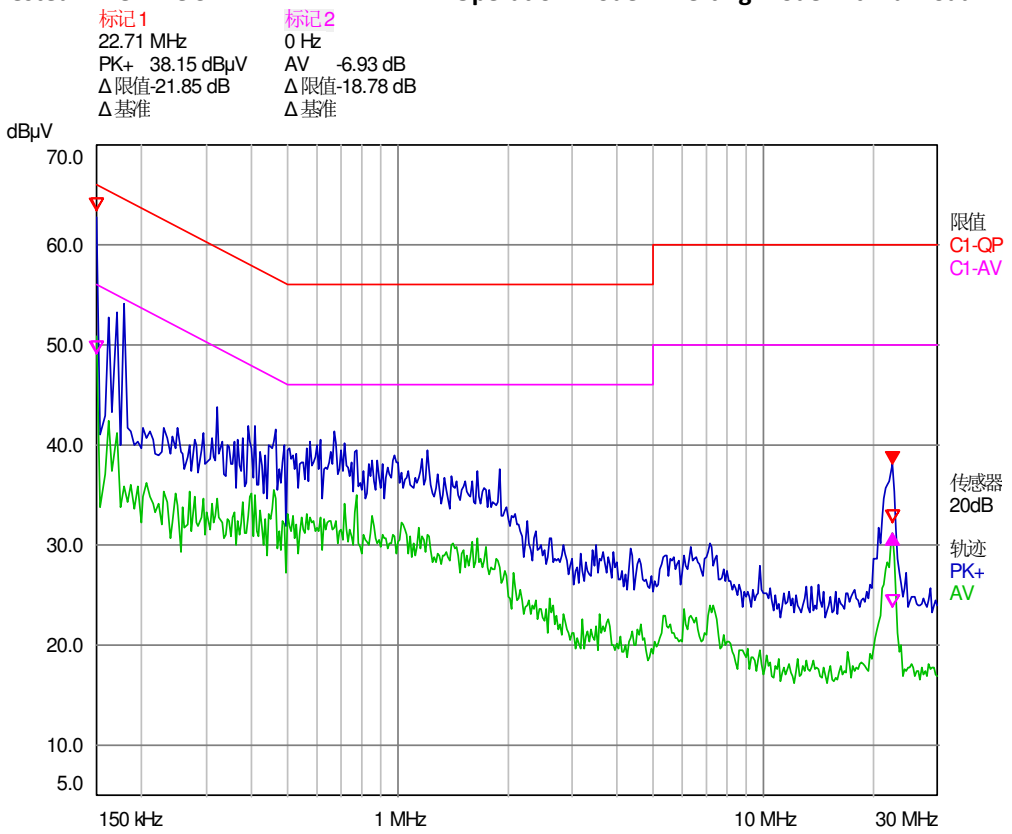
Tested Wire: Live 2 **Operation Mode: Inverting mode with full load**



Track	Frequency (MHz)	Level (dBµV)	Limit (dBµV)	Margin (dB)
1 QP	0.15	59.70	66.00	-6.30
2 AV	0.15	46.87	56.00	-9.13
1 QP	0.162	57.30	65.36	-8.06
2 AV	0.162	43.99	55.36	-11.37

TEST REPORT

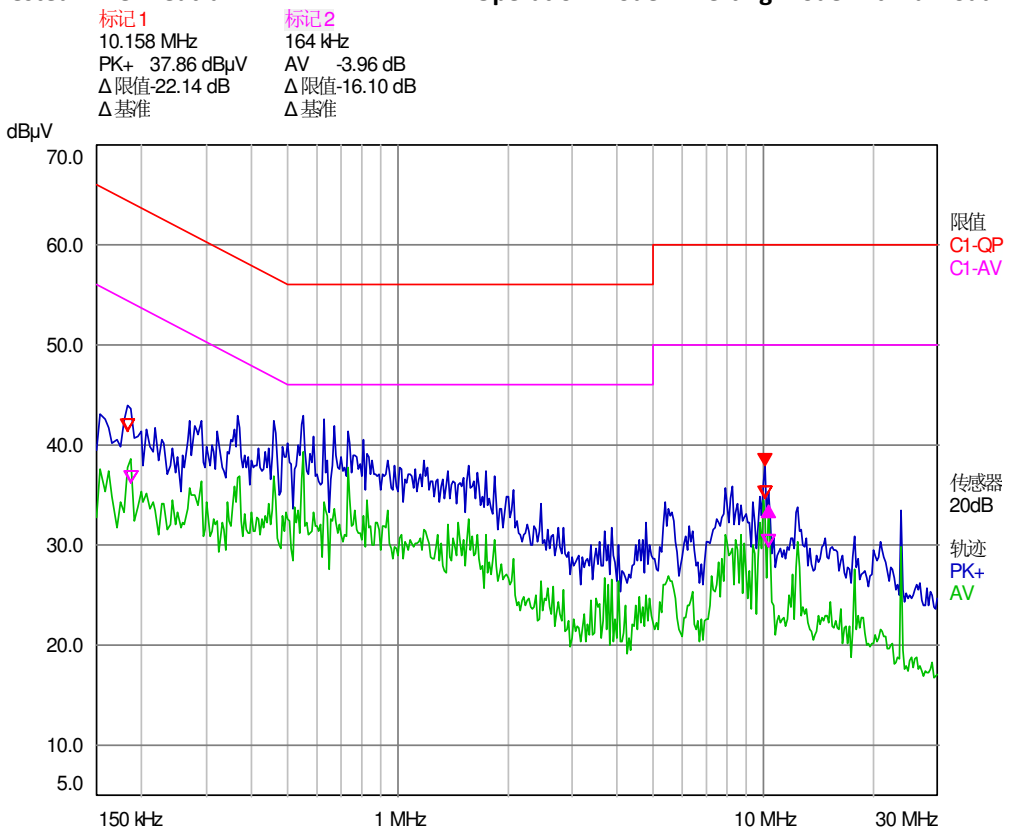
Tested Wire: Live 3 **Operation Mode: Inverting mode with full load**



Track	Frequency (MHz)	Level (dBµV)	Limit (dBµV)	Margin (dB)
1 QP	0.15	63.50	66.00	-2.50
2 AV	0.15	49.07	56.00	-6.93
1 QP	22.71	32.16	60.00	-27.84
2 AV	22.71	23.79	50.00	-26.21

TEST REPORT

Tested Wire: Neutral **Operation Mode: Inverting mode with full load**



Track	Frequency (MHz)	Level (dBµV)	Limit (dBµV)	Margin (dB)
1 QP	0.182	41.33	64.39	-23.06
2 AV	0.186	36.19	54.21	-18.02
1 QP	10.158	34.59	60.00	-25.41
2 AV	10.322	29.85	50.00	-20.15

TEST REPORT

5.2 EN 61000-6-3 Discontinuous Conducted Disturbance Voltage

Test Result: Not applicable

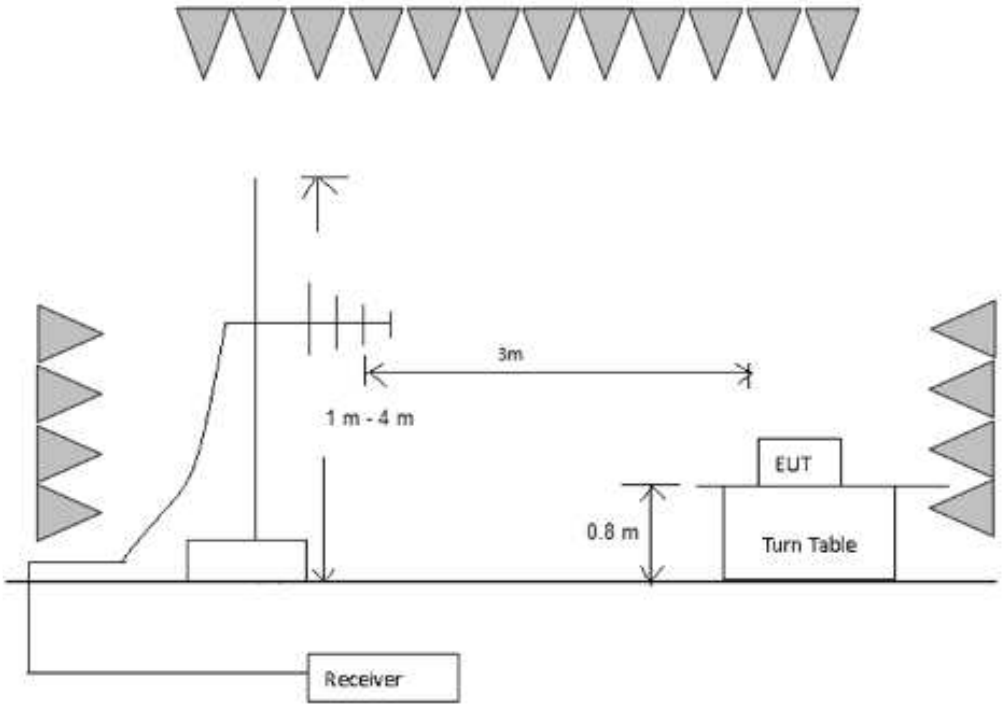
5.3 EN 61000-6-3 Emission at Telecommunications/network Ports

Test Result: Not applicable.
Remark: The test only apply to balanced telecommunication ports intended for connection to unscreened balanced pairs

5.4 EN 61000-6-3 Radiated Emission below 1 GHz

Test Result: Pass

5.4.1 Block Diagram of Test Setup



5.4.2 Test Setup and Procedure

The measurement was applied in a semi-anechoic chamber. The EUT and simulators were placed on a 0.8m high wooden turntable above the horizontal metal ground plane. The turn table rotated 360 degrees to determine the position of the maximum emission level. The EUT was set 3 meters away from the receiving antenna which was mounted on an antenna mask. The antenna moved up and down between from 1meter to 4 meters to find out the maximum emission level.

TEST REPORT

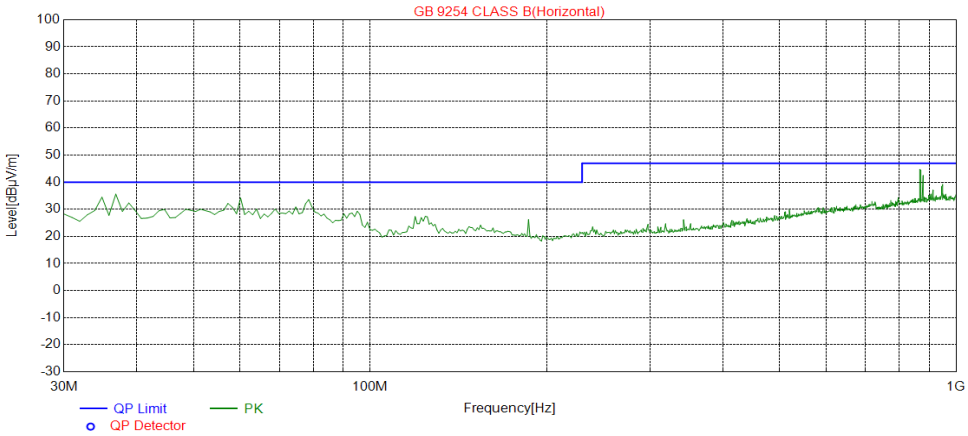
Broadband antenna was used as receiving antenna. Both horizontal and vertical polarization of the antenna was set on measurement. In order to find the maximum emission, all of the interface cables were manipulated according to EN55032 requirement during radiated test.
The bandwidth setting on R&S Test Receiver was 120 kHz.
The frequency range from 30MHz to 1000MHz was checked

TEST REPORT

5.4.3 Test Data and Curve

Operation Mode: Inverting mode with full load

Horizontal



All emission levels are more than 10 dB below the limit.

TEST REPORT

Vertical

Final Data List					
NO.	Freq. [MHz]	QP Value [dBµV/m]	QP Limit [dBµV/m]	QP Margin [dB]	Polarity
1	75.0018	17.06	40.00	22.94	Vertical
2	80.4101	15.73	40.00	24.27	Vertical

TEST REPORT

5.5 EN 61000-6-3 Radiated Emission above 1 GHz

Test Result: Not Applicable
Remark:
The highest internal source of the EUT is not more than 108 MHz, so the measurement above 1000 MHz is not applicable.

6. Harmonics of current

Test Result: Not applciable.
The test is applicable to equipment connected to public low-voltage systems with input current 16 A and ≤75 A per phase

7. Flicker

Test Result: Not applicable
The test is appliable to low-voltage supply systems – Equipment with rated current ≤75 A and subject to conditional connection.

TEST REPORT

8. EMS TEST

Performance Criteria:

Criterion A:	The apparatus shall continue to operate as intended during the test. No degradation of performance or loss of function is allowed below a performance level (or permission loss of performance) specified by the manufacturer, when the apparatus is used as intended. If the minimum performance level or the permissible performance loss is not specified by the manufacturer, then either of these may be derived from the product description and documentation and from what the user may reasonably expect from the apparatus if used as intended.
Criterion B:	The apparatus shall continue to operate as intended after the test. No degradation of performance or loss of function is allowed below a performance level (or permission loss of performance) specified by the manufacturer, when the apparatus is used as intended. During the test, degradation of performance is allowed, however, no change of actual operating state or stored data is allowed. If the minimum performance level or the permissible performance loss is not specified by the manufacturer, then either of these may be derived from the product description, and documentation, and from what the user may reasonably expect from the apparatus if used as intended.
Criterion C:	Temporary loss of function is allowed, provided the function is self-recoverable or can be restored by the operation of the controls, or by any operation specified in the instruction for use.

Operation mode of EMS test:

Test Item	Operation mode
ESD immunity	Inverting mode with light load
Radiated EM field immunity	
EFT immunity	
Surge immunity	
Inject current immunity	
Power frequency magnetic field immunity	
Voltage dips and interruption immunity	

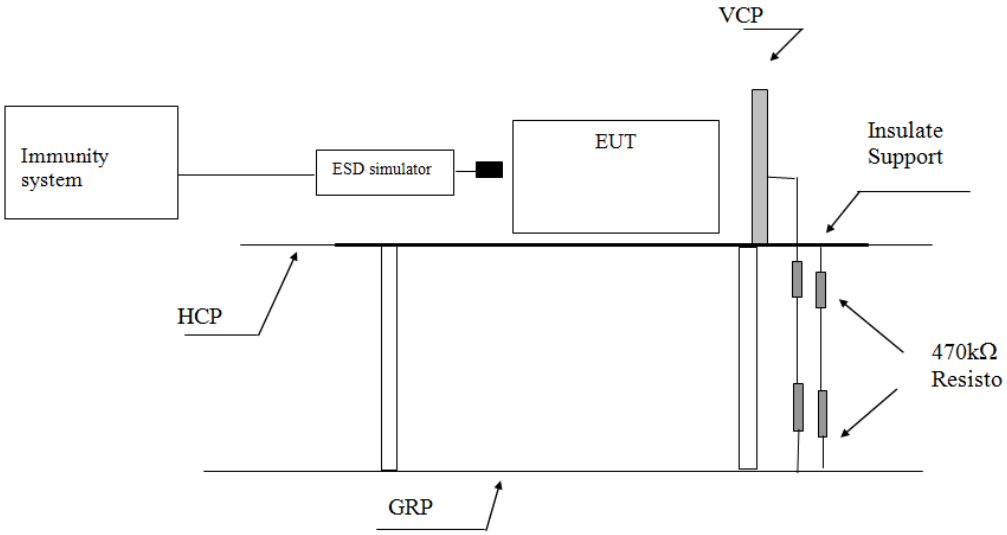
8.1 EN 61000-4-2(Pursuant to EN 61000-6-1) Electrostatic Discharge Immunity

Performance criterion: B

Test Result: Pass

TEST REPORT

8.1.1 Block Diagram of Test Setup



Note: HCP means Horizontal Coupling Plane,

VCP means Vertical Coupling Plane

GRP means Ground Reference Plane

8.1.2 Test Setup and Procedure

The EUT was put on a 0.8m high wooden table 0.1m high for floor standing equipment standing on the ground reference plane (GRP) 3m by 2m in size, made by iron 1.0 mm thick.

A horizontal coupling plane(HCP) 1.6m by 0.8m in size was placed on the table, and the EUT with its cables were isolated from the HCP by an insulating support thick than 0.5mm. The VCP 0.5m by 0.5m in size & HCP were constructed from the same material type & thickness as that of the GRP, and connected to the GRP via a 470kΩ resistor at each end.

The distance between EUT and any of the other metallic surface excepted the GRP, HCP & VCP was greater than 1m.

The EUT was arranged and connected according to its functional requirements.

Direct static electricity discharges were applied only to those points and surface which were accessible to personnel during normal usage.

TEST REPORT

On each preselected points 10 times of each polarity single discharge were applied. The time interval between successive single discharges was at least 1s.

The ESD generator was held perpendicular to the surface to which the discharge was applied. The discharge return cable of the generator was kept at a distance of 0.2m whilst the discharge was being applied. During the contact discharges, the tip of the discharge electrode was touched the EUT before the discharge switch was operated. During the air discharges, the round discharge tip of the discharge electrode was approached as fast as possible to touch the EUT.

Indirect discharge was conducted to objects placed near the EUT, simulated by applying the discharges of the ESD generator to a coupling plane, in the contact discharge mode.

After each discharge, the ESD generator was removed from the EUT, the generator was then retriggered for a new single discharge. For ungrounded product, a grounded carbon fibre brush with bleeder resistors (2×470 kΩ) in the grounding cable was used after each discharge to remove remnant electrostatic voltage.

For air discharge, a minimum of 10 single air discharges were applied to the selected test point for each such area.

8.1.3 Test Result

Direct Application of ESD

Direct Contact Discharge

Applied Voltage (kV)	No. of Discharge for each point	Result	Discharged Points
4	20	Pass	Accessible metal parts of the EUT Conductive substrate with coating which is not declared to be insulating

Direct Air Discharge

Applied Voltage (kV)	No. of Discharge for each point	Result	Discharged Points
2, 4, 8	20	Pass	All accessible points where contact discharge cannot be applied such as Displays, Indicators light, Keyboard, Button, Switch, Knob, Air gap, Slots, Hole and so on

TEST REPORT

Indirect Application of ESD

Horizontal Coupling Plane under the EUT

Applied Voltage (kV)	No. of Discharge for each point	Result	Discharged Point
4	20	Pass	At the front edge of each HCP opposite the centre point of each unit of the EUT

Vertical Coupling Plane beside the EUT

Applied Voltage (kV)	No. of Discharge for each point	Result	Discharged Point
4	20	Pass	The centre of the vertical edge of the coupling plane

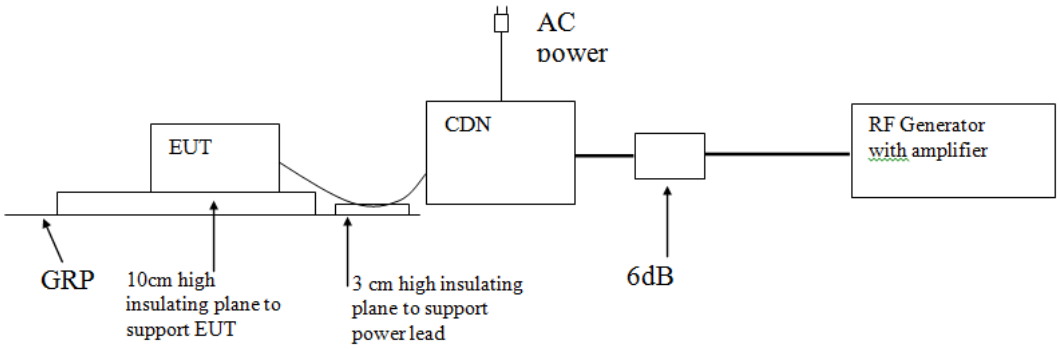
8.2 EN 61000-4-6(Pursuant to EN 61000-6-1) Injected Current (0.15 MHz to 80 MHz)

Tested Port: ☒ AC power ☒DC power ☐Functional earth ☐Signal/Control

Performance criterion: A

Test Result: Pass

8.2.1 Block Diagram of Test Setup



8.2.2 Test Setup and Procedure

The EUT was placed on an insulating support of 0.1m height above a ground reference Plane, arranged and connected to satisfy its functional requirement.
All relevant cables were provided with the appropriate coupling and decoupling devices at a distance between 0.1m and 0.3m from the projected geometry of the EUT on an insulating support of 0.03m height above the ground reference plane.
Test voltage was verified before each testing though power meter combined in the RF generator with AMP.

TEST REPORT

Dwell time was set to 3s and step was set as 1% to keep sufficient response time for EUT.
The frequency from 0.15MHz to 80MHz was checked.
The frequency range is scanned as specified. However, when specified in Annex A of EN 61000-6-1, an additional comprehensive functional test shall be carried out at a limited number of frequencies. The selected frequencies for conducted test are: 0,2; 1; 7,1; 13,56; 21; 27,12 and 40,68 MHz (±1 %).

8.2.3 Test Result

Port	Frequency (MHz)	Level	Result
A.C. Power Lines	0.15 to 80	3V (r.m.s.)	Pass
D.C. Power Lines	0.15 to 80	3V (r.m.s.)	Pass
Signal Lines	0.15 to 80	3V (r.m.s.)	N/A
Control Lines	0.15 to 80	3V (r.m.s.)	N/A
Functional Earth	0.15 to 80	3V (r.m.s.)	N/A

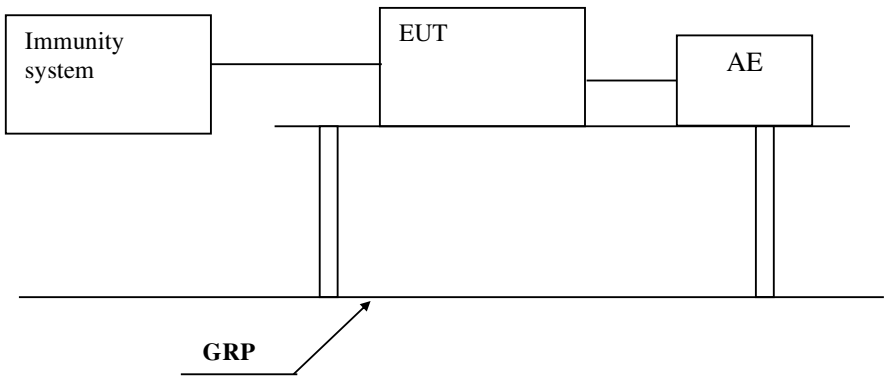
8.3 EN 61000-4-4(Pursuant to EN 61000-6-1) Electrical Fast Transient/Burst

Tested Port: ☒ AC power ☒DC power ☐Functional earth ☐ Signal/Control

Performance criterion: B

Test Result: Pass

8.3.1 Block Diagram of Test Setup



8.3.2 Test Setup and Procedure

The EUT was placed on a 0.1m high wooden table, standing on the ground reference plane 3m by 2m in size, made by steel 1mm thick.

The distance between the EUT and any other of the metallic surface except the GRP was greater than 0.5m.

TEST REPORT

The mains lead excess than 0.5m was folded to avoid a flat coil and situated at a distance of 0.1m above the ground reference plane to insure the distance between the coupling device and the EUT was 0.5m.

The EUT was arranged and connected to satisfy its functional requirement and supplied by the coupling-decoupling network. Repetition Frequency was 5 kHz.

8.3.3 Test Result

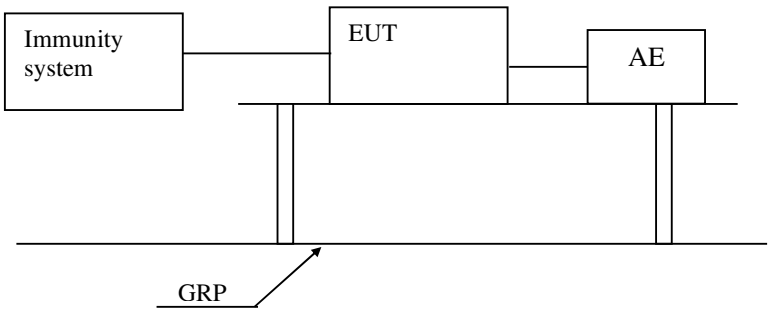
Level	Polarity	A.C. Power supply line and functional earth terminal	D.C. Power Lines, Signal Line & Control Line
0.5 kV	+	N/A	Pass
0.5 kV	-	N/A	Pass
1 kV	+	Pass	N/A
1 kV	-	Pass	N/A

8.4 EN 61000-4-5(Pursuant to EN 61000-6-1) Surge Immunity

Tested Port: ☒ AC power ☐ DC power

Performance criterion: B
Test Result: Pass

8.4.1 Block Diagram of Test Setup



8.4.2 Test Setup and Procedure

The surge was applied to the EUT power supply terminals via the capacitive coupling network.

Decoupling networks were required in order to avoid possible adverse effects on equipment not under test that might be powered by the same lines and to provide sufficient decoupling impedance to the surge wave so that the specified wave might be developed on the lines under test.

The EUT was arranged and connected according to its functional requirements.

TEST REPORT

The EUT was placed on a 0.1m high wooden support above the GRP), supplied by the coupling-decoupling network, and arranged and connected to satisfy its functional requirement. The power cord between the EUT and the coupling/decoupling network was less than 2 meters.

8.4.3 Test Result

Tested Port	Level	Result
AC power	Line to line±0.5kV, ±1kV	Pass
AC power	Line to earth ±0.5kV, ±1kV,±2kV	Pass
DC power	Line to earth ±0.5kV	N/A

8.5 EN 61000-4-11(Pursuant to EN 61000-6-1) Voltage Dips and Interruptions

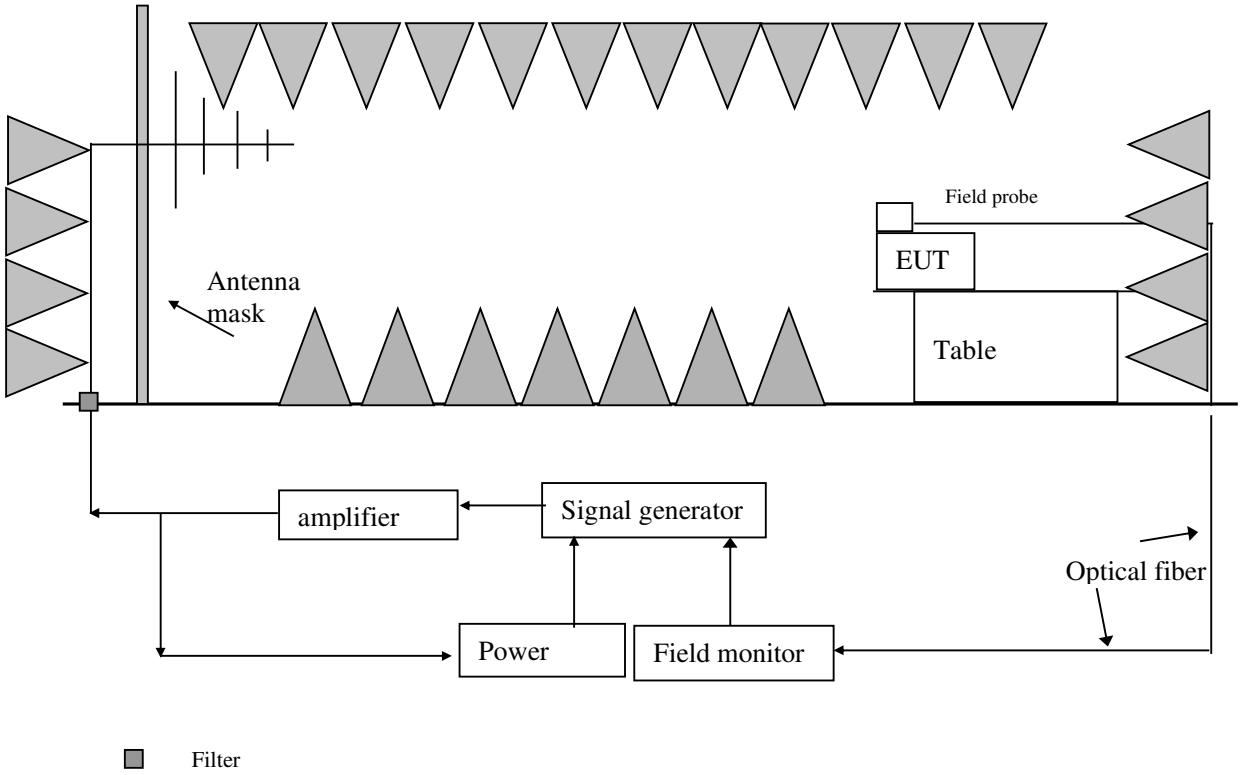
Tested Port: AC power
Test Result: Not Applicable
Remark: the test only applicable to the AC input port.

TEST REPORT

8.6 EN 61000-4-3(Pursuant to EN 61000-6-1) Radiated Electromagnetic Field Immunity

Performance criterion: A
Test Result: Pass

8.6.1 Block Diagram of Test Setup



TEST REPORT

8.6.2 Test Setup and Procedure

The test was conducted in a fully anechoic chamber to maintain a uniform field of sufficient dimensions with respect to the EUT, and also in order to comply with various national and international laws prohibiting interference to radio communications.

The equipment was placed in the test facility on a non-conducting table 0.8m high (for floor standing EUT, is placed on a non-conducting support 0.1m height).

The EUT was placed on the uniform calibrated plane which is 3V/m EM field.

For all ports connected to EUT, manufacturer specified cable type and length was used, for those cables no specification, unshielded cable applied. Wire was left exposed to the electromagnetic field for a distance of 1 m from the EUT.

The EUT was arranged and connected according to its functional requirements

Before testing, the intensity of the established field strength had been checked by placing the field sensor at a calibration grid point, and with the field generating antenna and cables in the same positions as used for the calibration, the forward power needed to give the calibrated field strength was measured. Spot checks was made at a number of calibration grid points over the frequency range 80 to 1000 MHz and 1.4 to 6.0 GHz, both polarizations was checked. After calibration, the EUT was initially placed with one face coincident with the calibration plane.

The frequency range was swept from 80 to 1000MHz and 1.4 to 6.0 GH, with the signal 80% amplitude modulated with a 1 kHz sinewave, pausing to adjust the r.f. signal level.
The dwell time at each frequency was 3s so as that the EUT to be exercised and be able to respond.

The step size was 1% of the fundamental with linear interpolation between calibrated points.
Test was performed with the generating antenna facing each of the four sides of the EUT.

8.6.3 Test Result

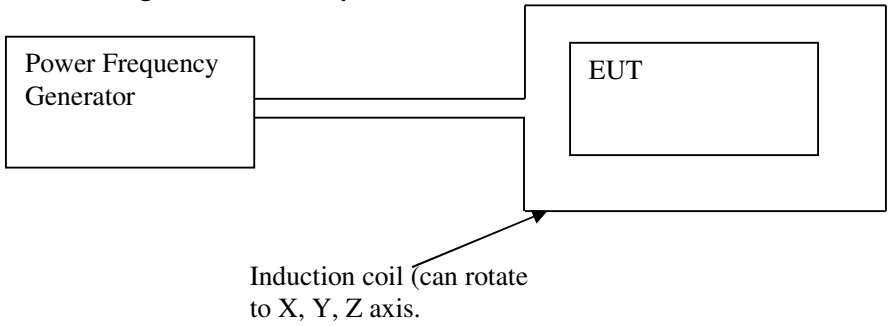
Frequency (MHz)	Exposed Side	Field Strength (V/m)	Result
80 to 1000,1400 to 6000	Front	3 V/m (r.m.s.)	Pass
80 to 1000,1400 to 6000	Left	3 V/m (r.m.s.)	Pass
80 to 1000,1400 to 6000	Rear	3 V/m (r.m.s.)	Pass
80 to 1000,1400 to 6000	Right	3 V/m (r.m.s.)	Pass

TEST REPORT

8.7 EN 61000-4-8(Pursuant to EN 61000-6-1) Power Frequency Magnetic Field Immunity

Tested Port: Enclosure
Performance criterion: A

8.7.1 Block Diagram of Test Setup



8.7.2 Test Setup and Procedure

Put EUT into center of induction coil (with suitable dimensions) in the testing.

For tabletop equipment:
The EUT was placed on a big enough wooden desk with height of 0.8m and operating as intended.
The equipment shall be subjected to the test magnetic field by using the induction coil of standards (1m*1m).
The induction coil shall be rotated by 90^0 in order to expose the EUT to the test field with different orientations.

For Floor-standing equipment:
The EUT was placed on big enough wooden desk with height of 0.1m and operating as intended.

The equipment shall be subjected to the test magnetic field by using induction coils of suitable dimensions; the test shall be repeated by moving and shifting the induction coils, in order to test the whole volume of the EUT for each orthogonal direction. The test shall be repeated with the coil shifted to different position along the side of the EUT, in steps corresponding to 50% of the shortest side of the coil.

The induction coil shall then be rotated by 90^0 in order to expose the EUT to the test field with different orientations and the same procedure followed.

8.7.3 Test Result

TEST REPORT

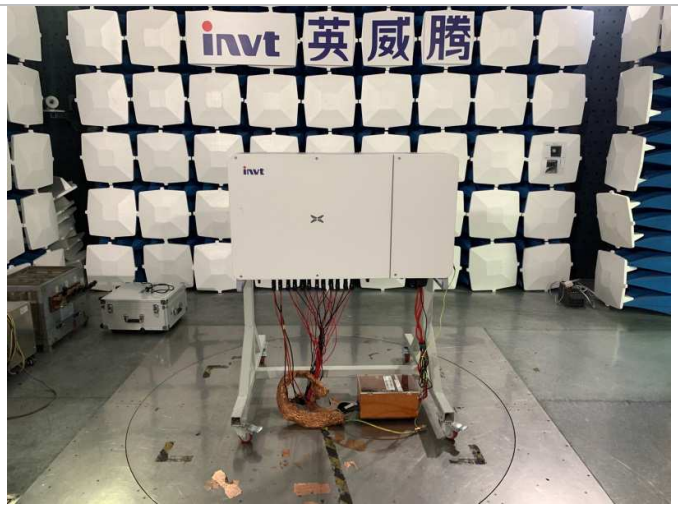
Mains frequency: ☒ 50 Hz ☒60 Hz

Orientations of induction coil	Magnetic Field Strength (A/m)	Result
X	3 A/m	Pass
Y	3 A/m	Pass
Z	3 A/m	Pass

TEST REPORT

9. APPENDIX I - PHOTOS OF TEST SETUP

Conducted disturbance voltage at mains ports

Radiated emission (30 MHz–1000 MHz)


TEST REPORT

ESD Immunity


Inject current immunity

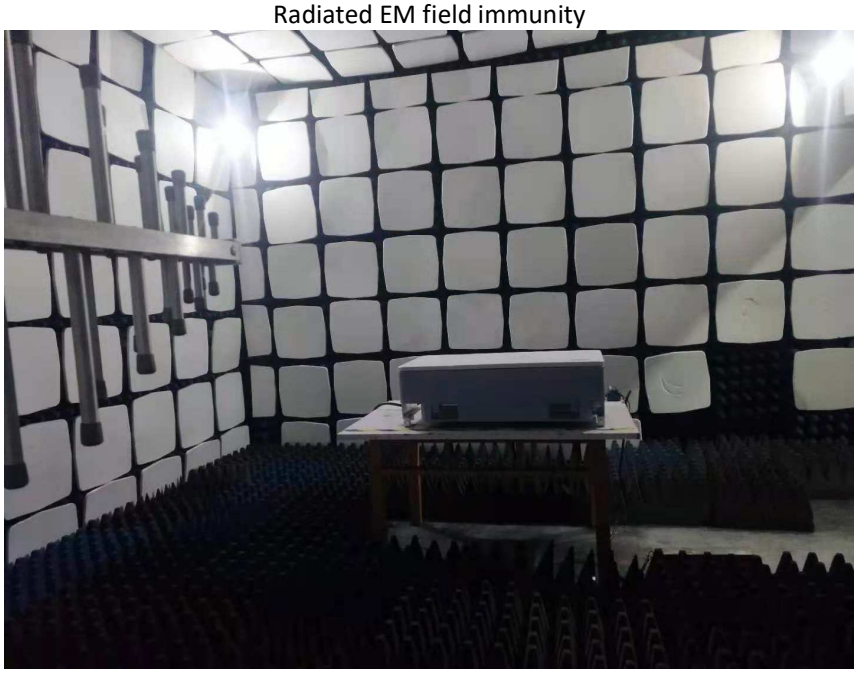

TEST REPORT

Surge Immunity


EFT Immunity


TEST REPORT

Radiated EM field immunity



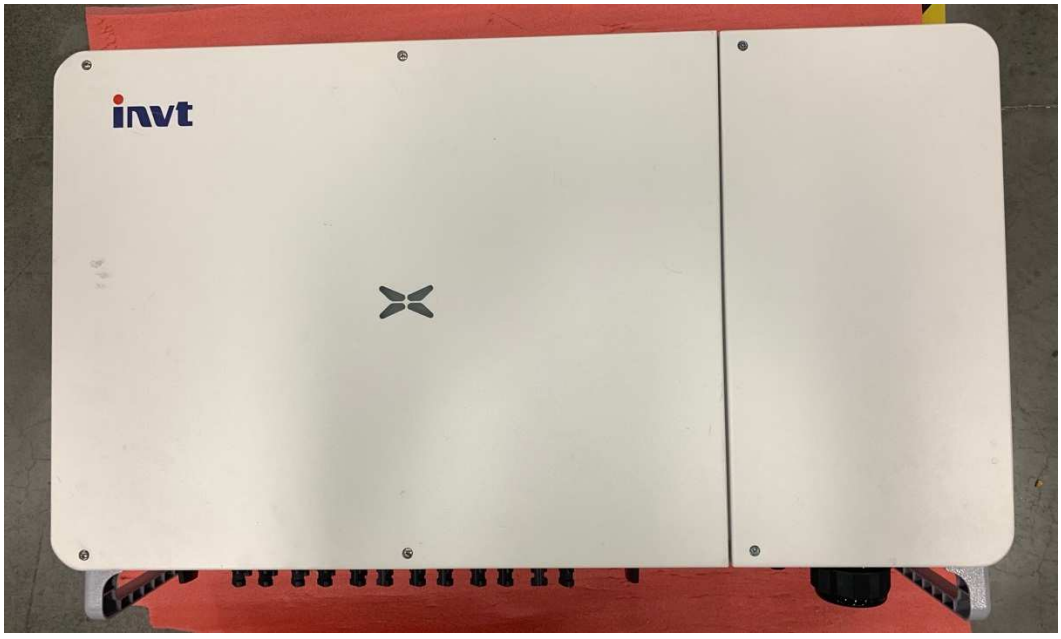
Power frequency magnetic field immunity

TEST REPORT

10. APPENDIX II – PHOTOS OF EUT

Appendix 1: Photos

Front view



Front view

TEST REPORT

Side view

Connection view (for 9 strings)

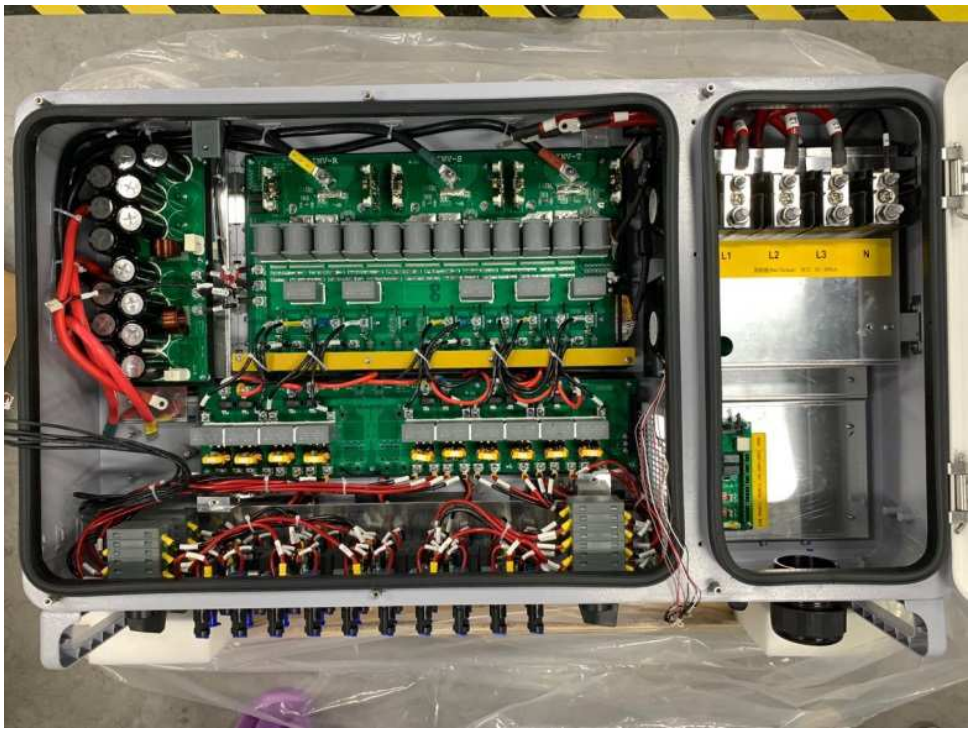
TEST REPORT

Connection view (for 10 strings)

Connection view (for 12 strings)

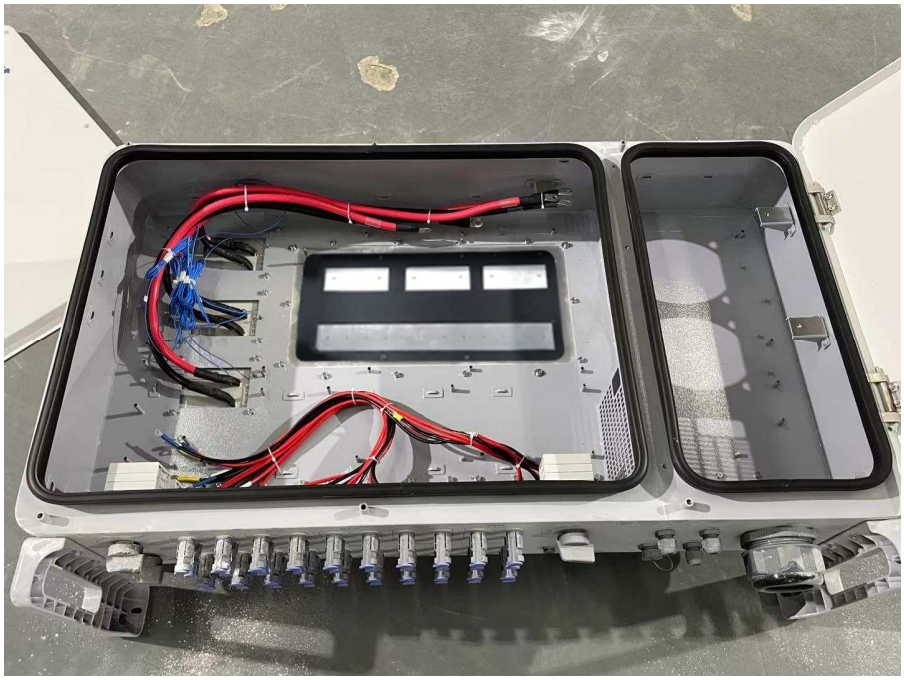
TEST REPORT

Internal view

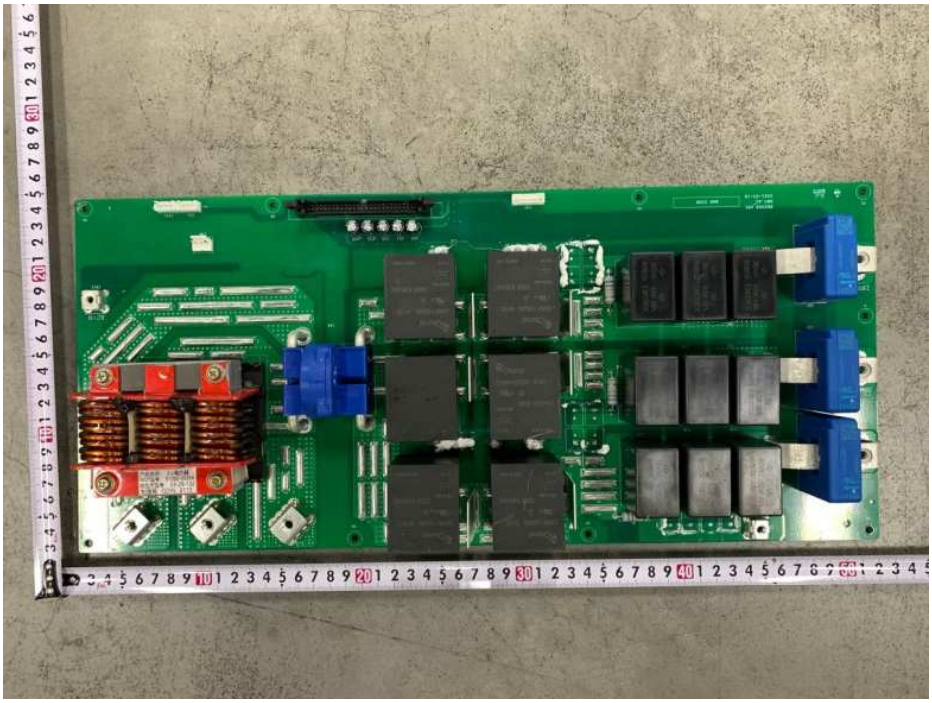


Internal view

TEST REPORT

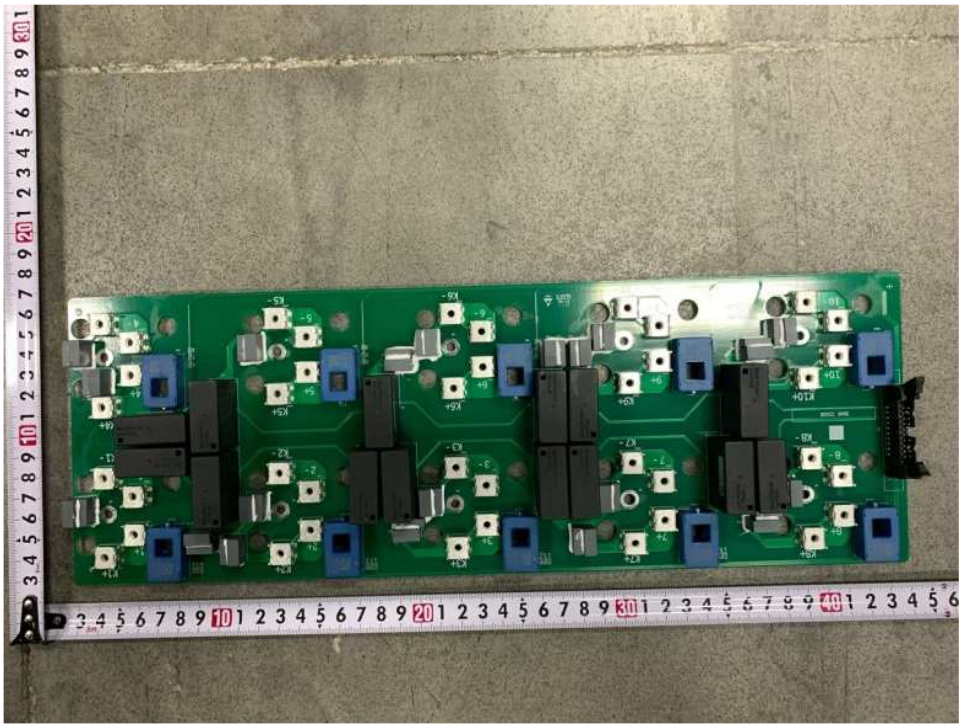


Internal view

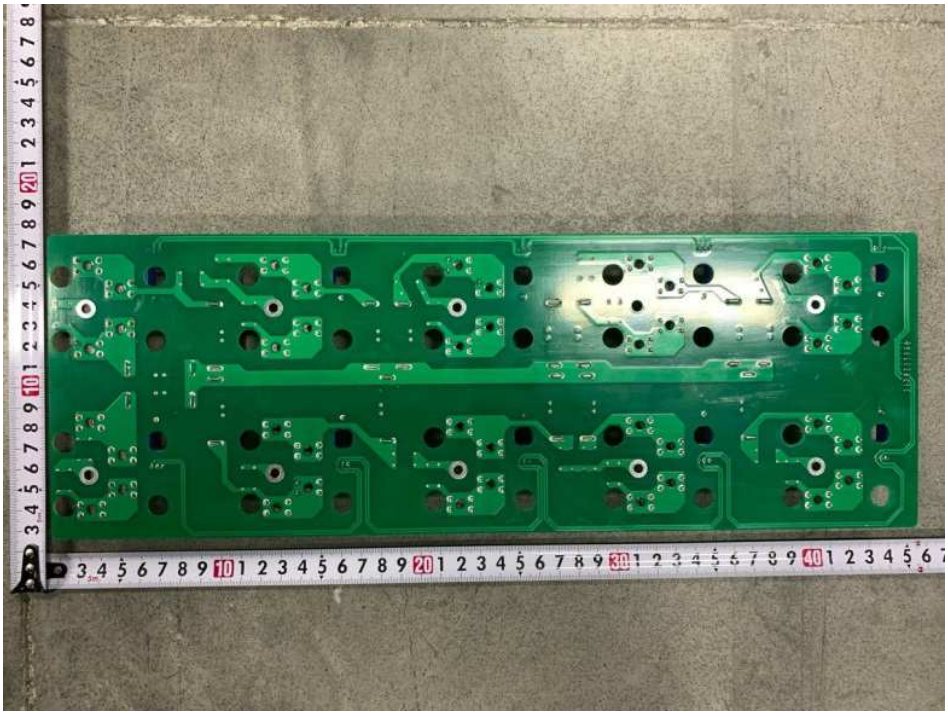


AC Sampling board view

TEST REPORT

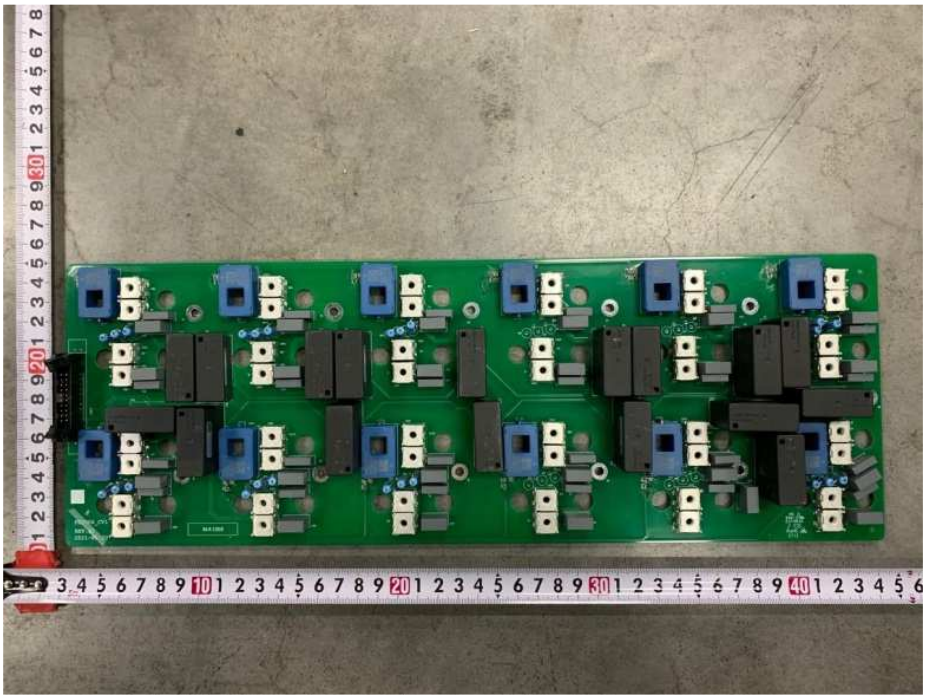


PV input board view (Components side, for 9 and 10 strings)

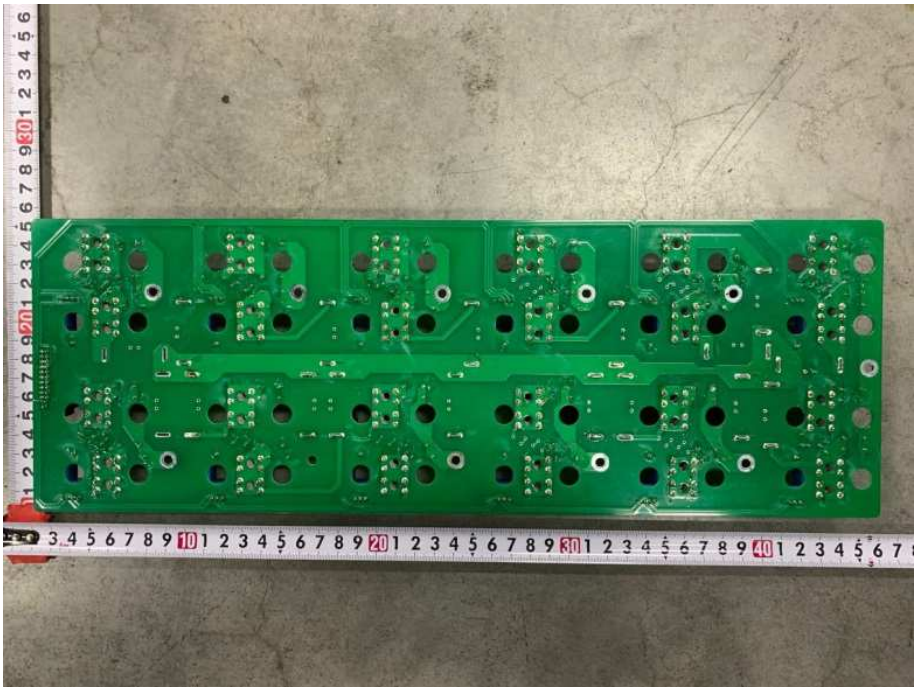


PV input board view view (Soldered side, for 9 and 10 strings)

TEST REPORT



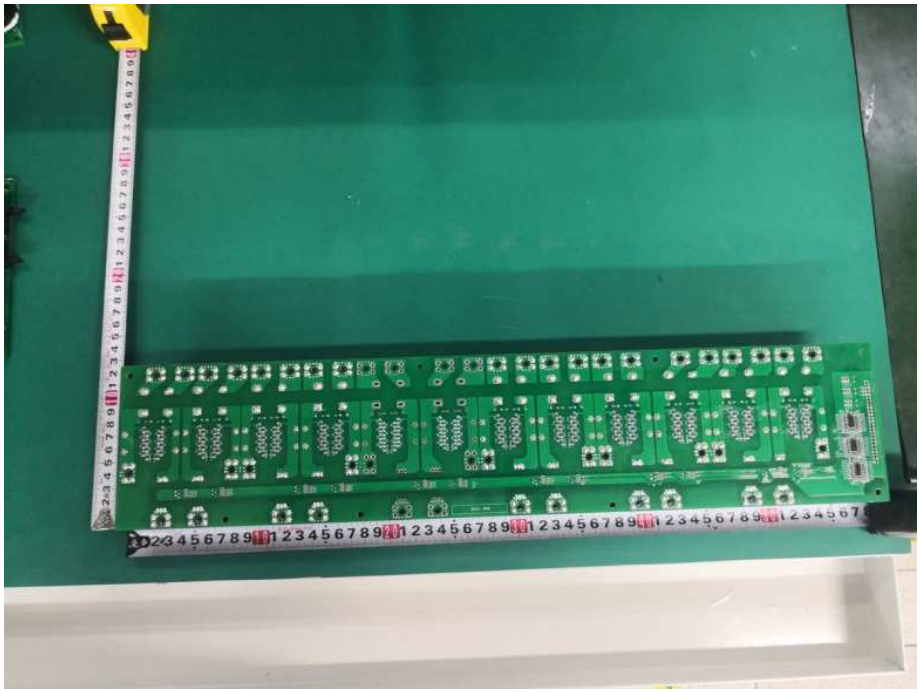
PV input board view (Components side, for 12 strings)



PV input board view (Soldered side, for 12 strings)

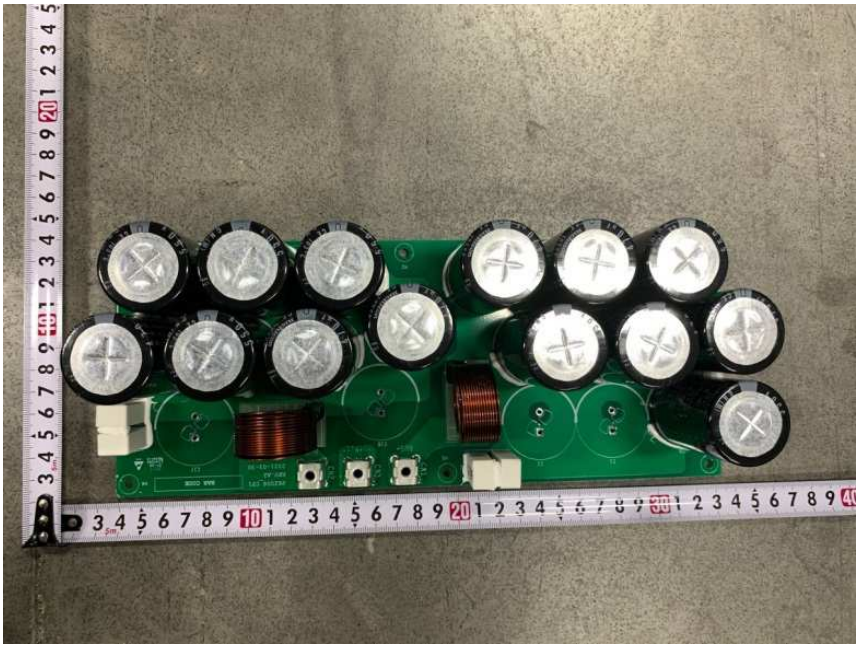
TEST REPORT

DC EMI board view(Components side)

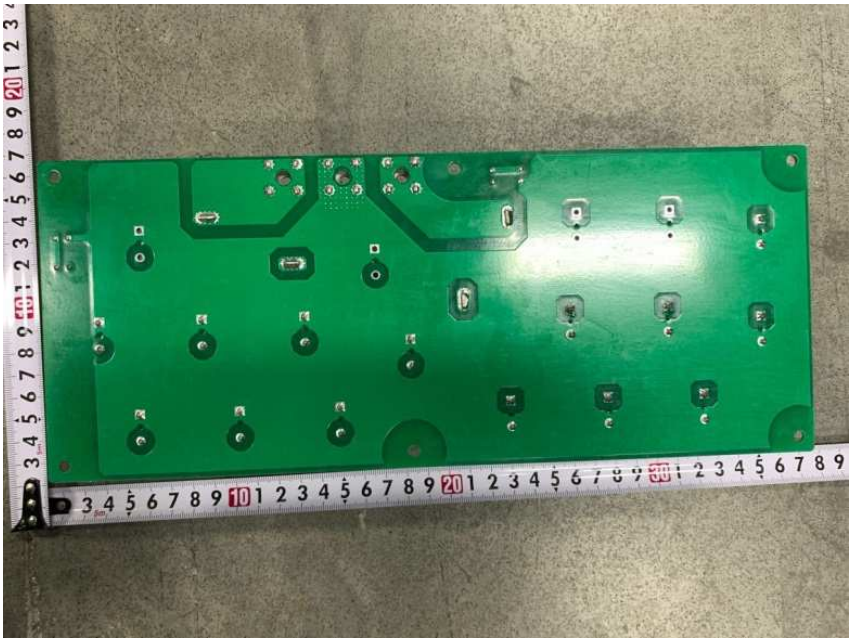


DC EMI board view(Soldered side)

TEST REPORT

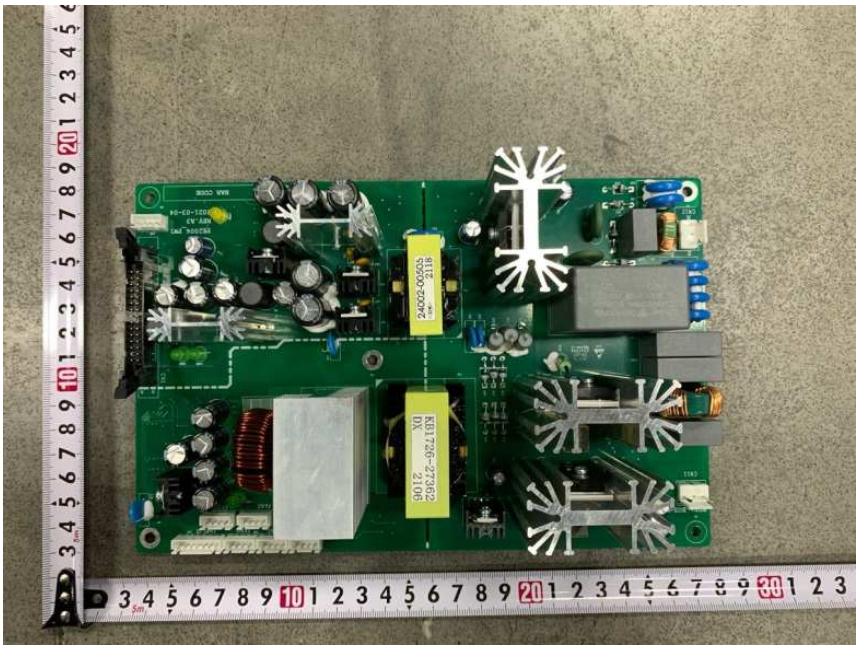


Capacitor board(Components side)

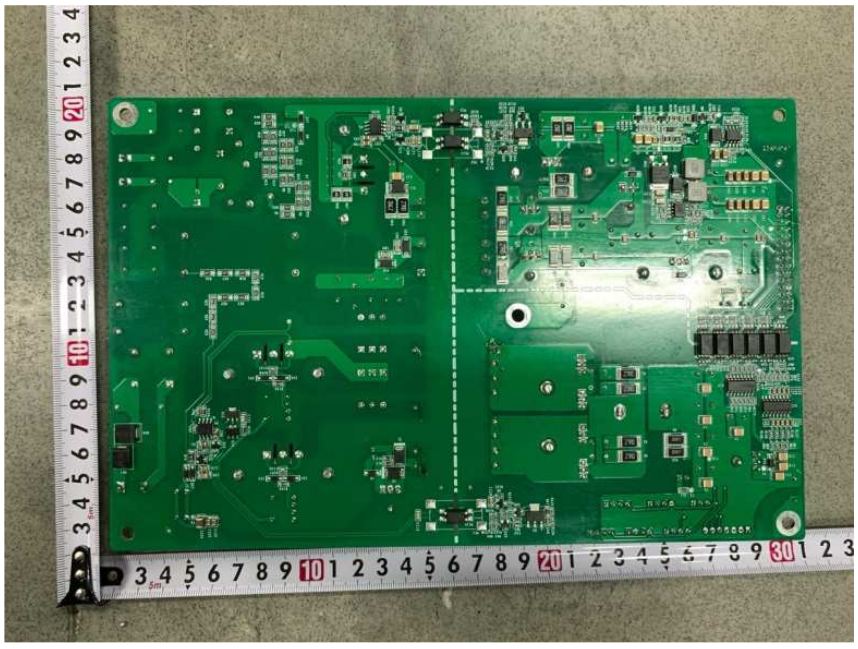


Capacitor board(Soldered side)

TEST REPORT

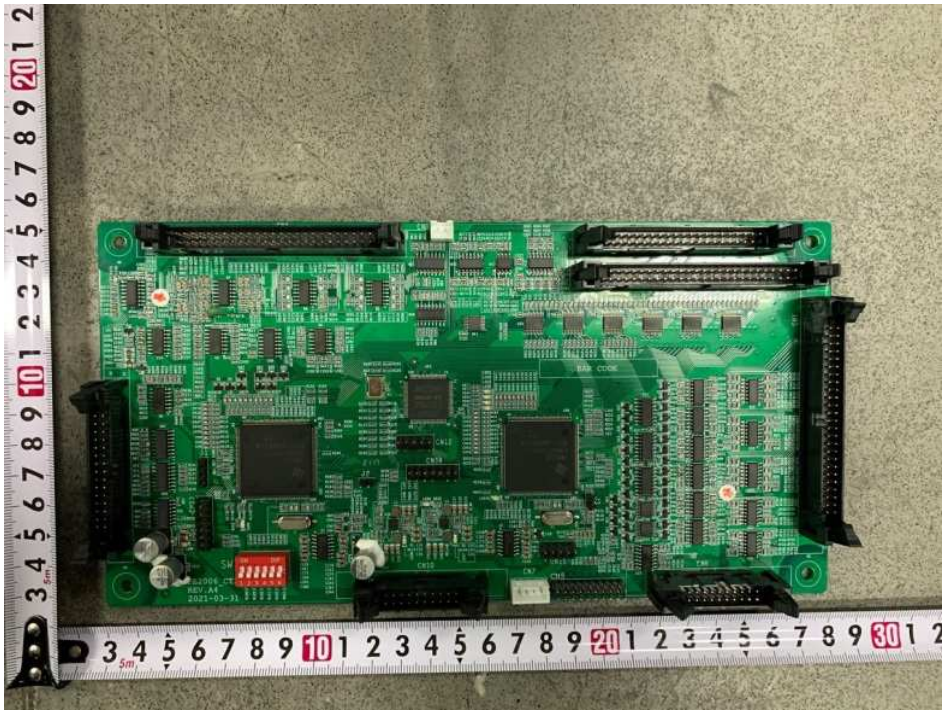


Power board view (Components side)

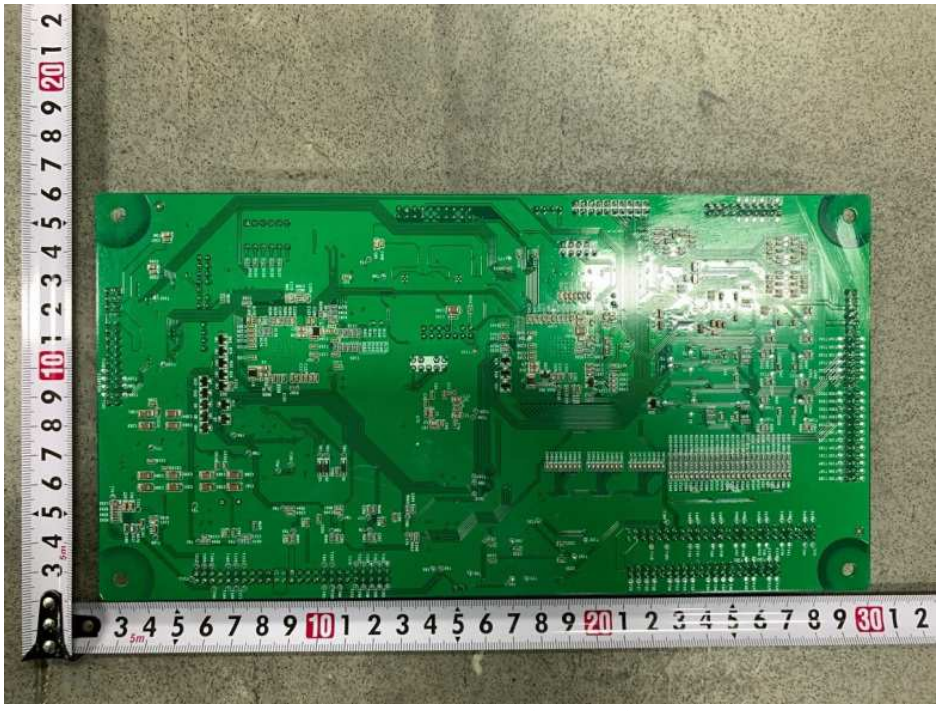


Power board view (Soldered side)

TEST REPORT

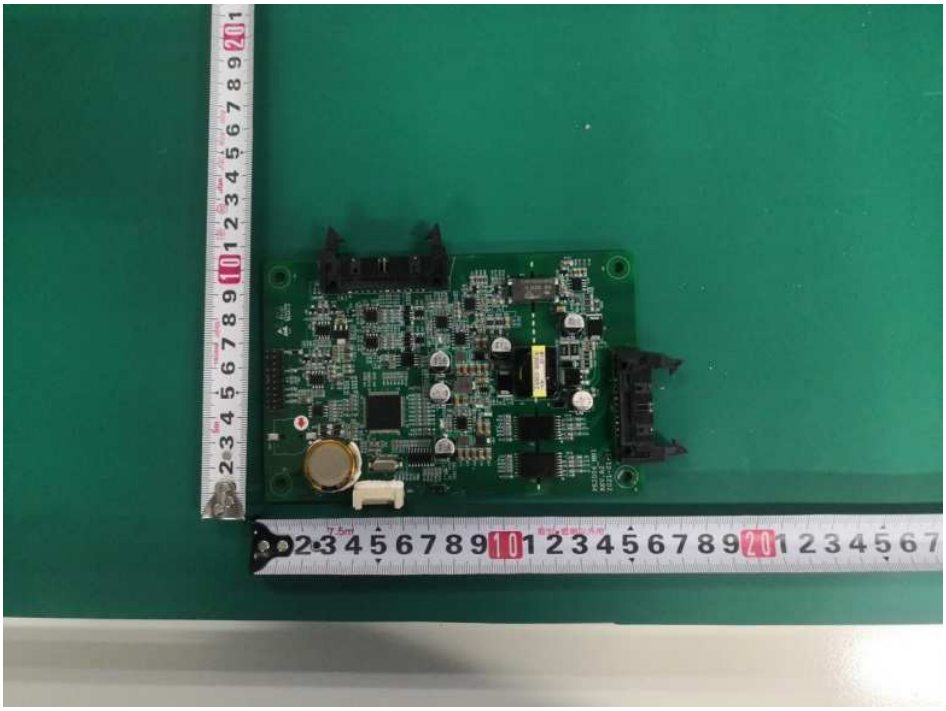


Control board view (Components side)

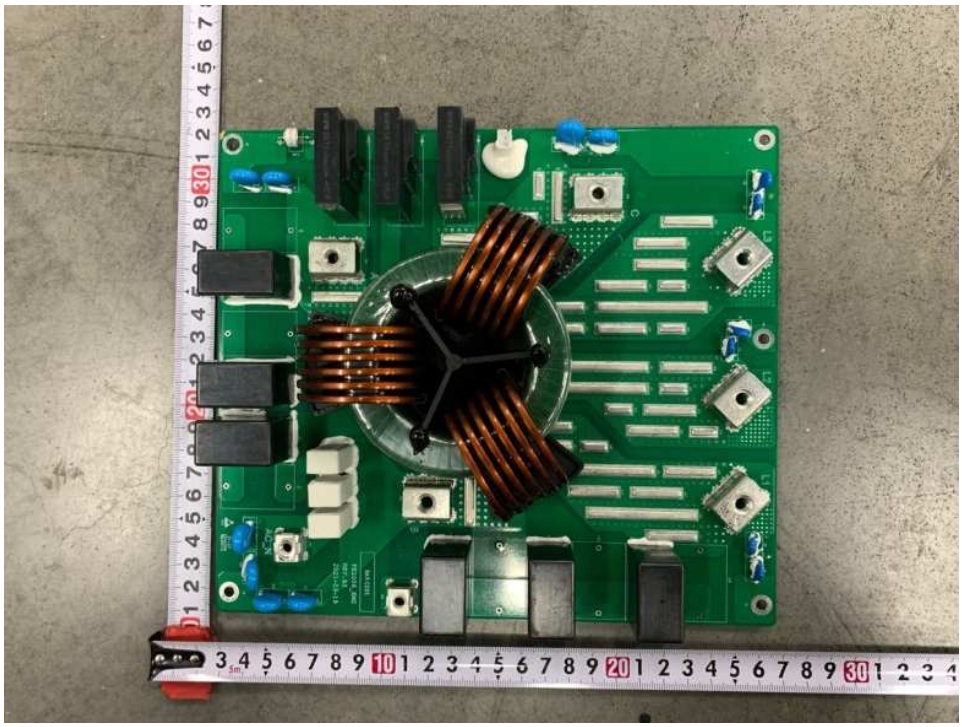


Control board view (Reverse)

TEST REPORT



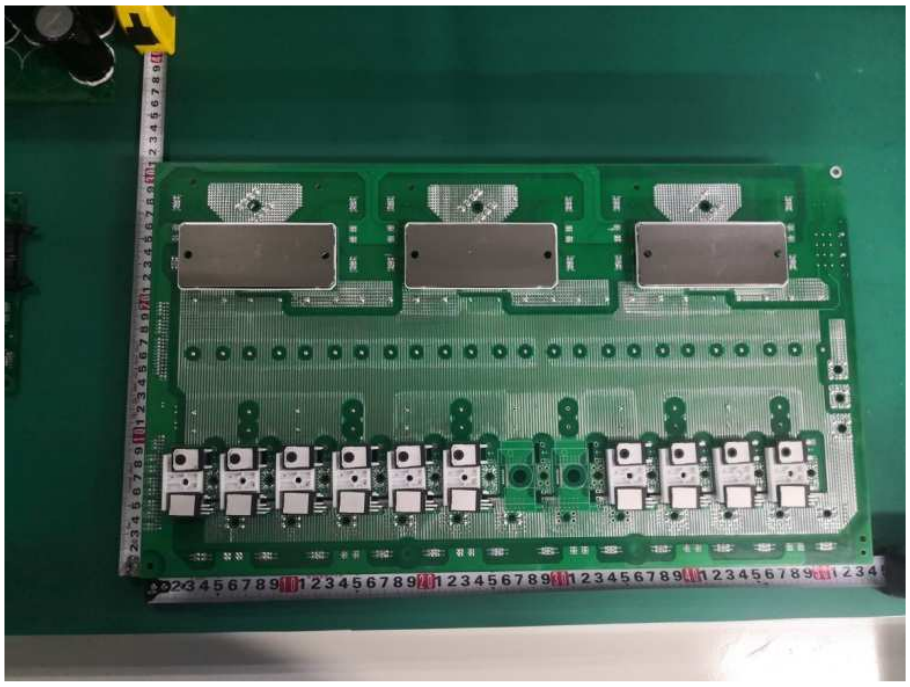
ARM board view



AC EMI board view

TEST REPORT

Boost-Inverter board (Components side)



Boost-Inverter board (Soldered side)

**********End of Report**********

Certificate of Conformity

Certificate Number: CN-PV-230052

On the basis of the tests undertaken, the sample<s> of the below product have been found to comply with the requirements of the referenced specification<s>/standard<s> at the time the tests were carried out. It does not imply that Intertek has performed any surveillance or control of the manufacture(s). The manufacturer(s) shall ensure that the manufacturing process assures compliance of the production units with the examined products mentioned in this certificate.

Applicant:	INVT Solar Technology (Shenzhen) Co., Ltd. 6th Floor, Block A, INVT Guangming Technology Building, Kejie Fourth Road, Shutianpu Community, Matian Guangming District, 518000 Shenzhen, PEOPLE'S REPUBLIC OF CHINA.
Product:	Grid-tied Solar inverter
Ratings & Principle Characteristics:	See appendix of Certificate of Conformity
Model:	iMars XG100KTR, iMars XG100KTR-F, iMars XG110KTR, iMars XG110KTR-F, iMars XG136KTR-L, iMars XG136KTR-LF, iMars XG136KTR-X, iMars XG136KTR-XF
Brand Name<s>:	invt
Product Complies with:	IEC 61727:2004 Photovoltaic (PV) systems – Characteristics of the utility interface IEC 62116:2014 Test procedure of islanding prevention measures for utility-interconnected photovoltaic inverters
Certificate Issuing Office Name & Address:	Intertek Testing Services Ltd. Shanghai West Area, 2nd Floor, No. 707, Zhangyang Road China (Shanghai) Pilot Free Trade Zone, Shanghai, P. R. China Accredited by ACCREDIA in accordance with ISO/IEC 17065:2012
Test Report No.<s>:	220602098GZU-002, 220602098GZU-003

Additional information in Appendix.

Signature

Certification Manager: Grady Ye
Date: 16 February 2023

PRD N° 306B

APPENDIX: Certificate of Conformity

This is an Appendix to Certificate of Conformity Number: CN-PV-230052.

Model	iMars XG100KTR	iMars XG100KTR-F	iMars XG110KTR	iMars XG110KTR-F
Max.PV voltage	1100Vdc			
MPPT voltage range	180V – 1000Vdc			
Max.input current	26A*9	30A*9	26A*10	30A*10
PV Isc	40A*9		40A*10	
Nominal output voltage	3/N/PE, 230/400Vac			
Nominal output Frequency	50Hz/60Hz			
Max.output current	158.8A		174.6A	
Rated output power	100KW		110KW	
Max.apparent power	110KVA		121KVA	
Power factor range	0.8Leading – 0.8 lagging			
Safety level	Class I			
Ingress Protection	IP 66			
Operation Ambient Temperature	-30℃ - +60℃			
Software version	V1.1			

APPENDIX: Certificate of Conformity

This is an Appendix to Certificate of Conformity Number: CN-PV-230052.

Model	iMars XG136KTR-L	iMars XG136KTR-LF	iMars XG136KTR-X	iMars XG136KTR-XF
Max. PV voltage	1100Vdc			
MPPT voltage range	180V – 1000Vdc			
Max. input current	26A*12	30A*12	26A*12	30A*12
PV Isc	40A*12			
Nominal output voltage	3/N/PE, 277/480Vac		3/N/PE, 311/540Vac	
Nominal output Frequency	50Hz/60Hz			
Max. output current	174.6A		160.4A	
Rated output power	136KW			
Max. apparent power	150KVA			
Power factor range	0.8Leading – 0.8 lagging			
Safety level	Class I			
Ingress Protection	IP 66			
Operation Ambient Temperature	-30℃ - +60℃			
Software version	V1.1			

Certificate of compliance

Applicant: **INVT Solar Technology (Shenzhen) Co., Ltd.**
6th Floor, Block A, INVT Guangming Technology Building, Kejie Fourth Road, Shutianpu Community, Matian, Guangming District, 518000 Shenzhen
PEOPLE'S REPUBLIC OF CHINA

Product: **Photovoltaic (PV) inverter**

Model:
iMars XG100KTR
iMars XG100KTR-F
iMars XG110KTR
iMars XG110KTR-F
iMars XG136KTR-L
iMars XG136KTR-LF
iMars XG136KTR-X
iMars XG136KTR-XF

Inverter for three-phase parallel connection to the public grid. The network monitoring and disconnection device is an integral part of the above-mentioned model.

Applied rules and standards:

EN 50549-1:2019
Requirements for parallel connection of installations with distribution networks - Part 1: Connection to an LV distribution network - Production of installations up to and including Type B

4.4 Normal operating range
4.5 Immunity to disturbances
4.6 Active response to frequency deviation
4.7 Power response to voltage variations and voltage changes
4.8 EMC and power quality
4.9 Interface protection
4.10 Connection and starting to generate electrical power
4.11 Ceasing and reduction of active power on set point
4.13 Requirements regarding single fault tolerance of interface protection system and interface switch

DIN V VDE V 0126-1-1:2006 (4.1 Functional safety)
Automatic disconnection device between a generator and the public low-voltage grid

Commission Regulation (EU) 2016/631 of 14 April 2016
Establishing a network code on requirements for grid connection of generators (NC RFG).
Type approval for generation units to use in Type A and Type B plants.

At the time of issue of this certificate, the safety concept of an aforementioned representative product corresponds to the valid safety specifications for the specified use in accordance with regulations.

Report number:	**ZEM-ESH-P22010418**	**Certification Program:**	**NSOP-0032-DEU-ZE-V01**
Certificate number:	**U22-0325**	**Date of issue:**	**2022-06-03**

Certification body

Thomas Lammel

DAkkS Deutsche Akkreditierungsstelle D-ZE-12024-01-00

Certification body Bureau Veritas Consumer Products Services Germany GmbH accreditation to DIN EN ISO/IEC 17065

Testing laboratory accredited according to DIN EN ISO/IEC 17025

A partial representation of the certificate requires the written approval of Bureau Veritas Consumer Products Services Germany GmbH

Annex to the EN 50549-1 certificate of compliance No. U22-0325

Appendix

Extract from test report according to EN 50549-1 **No. ZEM-ESH-P22010418**

Type Approval and declaration of compliance with the requirements of EN 50549-1 and Commission Regulation (EU) 2016/631 of 14 April 2016

Manufacturer / applicant	INVT Solar Technology (Shenzhen) Co., Ltd. 6th Floor, Block A, INVT Guangming Technology Building, Kejie Fourth Road, Shutianpu Community, Matian, Guangming District, 518000 Shenzhen PEOPLE'S REPUBLIC OF CHINA
Micro-generator Type	Photovoltaic inverter

	iMars XG100KTR	iMars XG100KTR-F	iMars XG110KTR	iMars XG110KTR-F
MPP DC voltage range [V]	180-1000	180-1000	180-1000	180-1000
Max. input DC voltage [V]	1100	1100	1100	1100
Input DC current [A]	26*9	30*9	26*10	30*10
Output AC voltage [V]	3/N/PE 230/400, 50Hz/60Hz	3/N/PE 230/400, 50Hz/60Hz	3/N/PE 230/400, 50Hz/60Hz	3/N/PE 230/400, 50Hz/60Hz
Output AC current [A]	158,8	158,8	174,6	174,6
Output power [kVA]	110	110	121	121

	iMars XG136KTR-L	iMars XG136KTR-LF	iMars XG136KTR-X	iMars XG136KTR-XF
MPP DC voltage range [V]	180-1000	180-1000	180-1000	180-1000
Max. input DC voltage [V]	1100	1100	1100	1100
Input DC current [A]	26*12	30*12	26*12	30*12
Output AC voltage [V]	3/N/PE 277/480, 50Hz/60Hz	3/N/PE 277/480, 50Hz/60Hz	3/N/PE 311/540, 50Hz/60Hz	3/N/PE 311/540, 50Hz/60Hz
Output AC current [A]	174,6	174,6	160,4	160,4
Output power [kVA]	150	150	150	150

Firmware version	Beginning with V1.1

Description of the structure of the power generation unit:

The power generation unit is equipped with a PV and line-side EMC filter. The power generation unit has no galvanic isolation between DC input and AC output. Output switch-off is performed with single-fault tolerance based on the inverter bridge and two series-connected relays in each line and neutral. This enables a safe disconnection of the power generation unit from the network in case of error.

Note:

The settings of the interface protection are password protected adjustable.

In case the above stated generators are used with an external protection device, the protection settings of the inverters are to be adjusted according to the manufacturer's declaration.

The above stated generators are tested according to the requirements in the EN 50549-1:2019 Commission Regulation (EU) 2016/631 of 14 April 2016. Any modification that affects the stated tests must be named by the manufacturer/supplier of the product to ensure that the product meets all requirements.