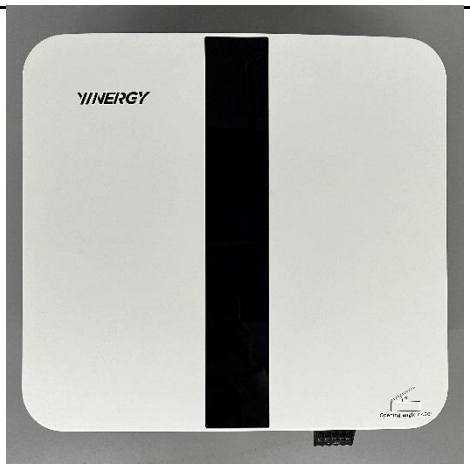
Prüfbericht-Nr.: *Test report no.*:	**CN23W946 002**	**Auftrags-Nr.:** *Order no.*:	244570107	Seite 1 von 44 *Page 1 of 44*
Kunden-Referenz-Nr.: *Client reference no.*:	2492816	**Auftragsdatum:** *Order date:*	2023-12-06	
Auftraggeber: *Client*:	Yi Energy Technology (Zhejiang) Co., Ltd. Room 109, Building 1, No. 55, Yifeng Road, Qiantang District, Hangzhou, Zhejiang P.R. China			
Prüfgegenstand: *Test item*:	Hybrid Inverter			
Bezeichnung / Typ-Nr.: *Identification / Type no.*:	HI-3P5K-H-Y1, HI-3P6K-H-Y1, HI-3P8K-H-Y1, HI-3P10K-H-Y1, HI-3P12K-H-Y1			
Auftrags-Inhalt: *Order content*:	TÜV Rheinland Bauart mark approval			
Prüfgrundlage: *Test specification*:	EN 62109-1: 2010, EN 62109-2: 2011 IEC 62109-1: 2010, IEC 62109-2: 2011			

Wareneingangsdatum: *Date of sample receipt*:	2024-01-06
Prüfmuster-Nr.: *Test sample no:*	A003663543-001
Prüfzeitraum: *Testing period*:	2024-01-06 to 2024-02-20
Ort der Prüfung: *Place of testing*:	Yi Energy Technology (Zhejiang) Co., Ltd.
Prüflaboratorium: *Testing laboratory:*	TÜV Rheinland (Shanghai) Co.,Ltd.
Prüfergebnis*: *Test result**:	Pass



geprüft von:
tested by: Mike Yu

Datum:
Date: 2024-02-29

genehmigt von:
authorized by:
David Zhou

Ausstellungsdatum:
Issue date: 2024-02-29

Stellung / Position: Sachverständige(r)/Expert

Stellung / Position: Sachverständige(r)/Expert

Sonstiges / *Other*: - Based on report CN23W946 001, appearance of enclosure, internal circuit layout, dimensions and manufacturer logo are updated. See following pages for details.

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

* Legende:	P(ass) = entspricht o.g. Prüfgrundlage(n)	F(ail) = entspricht nicht o.g. Prüfgrundlage(n)	N/A = nicht anwendbar	N/T = nicht getestet
* *Legend:*	*P(ass) = passed a.m. test specification(s)*	*F(ail) = failed a.m. test specification(s)*	*N/A = not applicable*	*N/T = not tested*

Anmerkungen
Remarks

1	Alle eingesetzten Prüfmittel waren zum angegebenen Prüfzeitraum gemäß eines festgelegten Kalibrierungsprogramms unseres Prüfhauses kalibriert. Sie entsprechen den in den Prüfprogrammen hinterlegten Anforderungen. Die Rückverfolgbarkeit der eingesetzten Prüfmittel ist durch die Einhaltung der Regelungen unseres Managementsystems gegeben. Detaillierte Informationen bezüglich Prüfkonditionen, Prüfequipment und Messunsicherheiten sind im Prüflabor vorhanden und können auf Wunsch bereitgestellt werden. *The equipment used during the specified testing period was calibrated according to our test laboratory calibration program. The equipment fulfils the requirements included in the relevant standards. The traceability of the test equipment used is ensured by compliance with the regulations of our management system. Detailed information regarding test conditions, equipment and measurement uncertainty is available in the test laboratory and could be provided on request.*
2	Wie vertraglich vereinbart, wurde dieses Dokument nur digital unterzeichnet. Der TÜV Rheinland hat nicht überprüft, welche rechtlichen oder sonstigen diesbezüglichen Anforderungen für dieses Dokument gelten. Diese Überprüfung liegt in der Verantwortung des Benutzers dieses Dokuments. Auf Verlangen des Kunden kann der TÜV Rheinland die Gültigkeit der digitalen Signatur durch ein gesondertes Dokument bestätigen. Diese Anfrage ist an unseren Vertrieb zu richten. Eine Umweltgebühr für einen solchen zusätzlichen Service wird erhoben. Informationen zur Verifizierung der Authentizität unserer Dokumente erhalten Sie auf folgender Webseite: go.tuv.com/digital-signature *As contractually agreed, this document has been signed digitally only. TUV Rheinland has not verified and unable to verify which legal or other pertaining requirements are applicable for this document. Such verification is within the responsibility of the user of this document. Upon request by its client, TUV Rheinland can confirm the validity of the digital signature by a separate document. Such request shall be addressed to our Sales department. An environmental fee for such additional service will be charged. For information on verifying the authenticity of our documents, please visit the following website: go.tuv.com/digital-signature*
3	Prüfklausel mit der Note * wurden an qualifizierte Unterauftragnehmer vergeben und sind unter der jeweiligen Prüfklausel des Berichts beschrieben. Abweichungen von Prüfspezifikation(en) oder Kundenanforderungen sind in der jeweiligen Prüfklausel im Bericht aufgeführt. *Test clauses with remark of * are subcontracted to qualified subcontractors and descripted under the respective test clause in the report.* *Deviations of testing specification(s) or customer requirements are listed in specific test clause in the report.*
4	Die Entscheidungsregel für Konformitätserklärungen basierend auf numerischen Messergebnisen in diesem Prüfbericht basiert auf der "Null-Grenzwert-Regel" und der "Einfachen Akzeptanz" gemäß ILAC G8:2019 und IEC Guide 115:2021, es sei denn, in der auf Seite 1 dieses Berichts genannten angewandten Norm ist etwas anderes festgelegt oder vom Kunden gewünscht. Dies bedeutet, dass die Messunsicherheit nicht berücksichtigt wird und daher auch nicht im Prüfbericht angegeben wird. Zu weiteren Informationen bezueglich des Risikos durch diese Entscheidungsregel siehe ILAC G8:2019. *The decision rule for statements of conformity, based on numerical measurement results, in this test report is based on the "Zero Guard Band Rule" and "Simple Acceptance" in accordance with ILAC G8:2019 and IEC Guide 115:2021, unless otherwise specified in the applied standard mentioned on Page 1 of this report or requested by the customer. This means that measurement uncertainty is not taken in account and hence also not declared in the test report. For additional information to the resulting risk based of this decision rule please refer to ILAC G8:2019.*

Test Report issued under the responsibility of:

TÜVRheinland®

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

Report Number..... :	**CN23W946 002**
Date of issue..... :	**See cover page**
Total number of pages..... :	**See cover page**
Name of Testing Laboratory preparing the Report ..... :	**See cover page**
Applicant's name..... :	**Yi Energy Technology (Zhejiang) Co., Ltd.**
Address..... :	Room 109, Building 1, No. 55, Yifeng Road, Qiantang District, Hangzhou, Zhejiang P.R. China
Test specification:	
Standard..... :	EN 62109-1: 2010
Test procedure..... :	TÜV Bauart 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

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 .....:	Hybrid Inverter
Trade Mark.....:	YINERGY
Manufacturer.....:	Same as the applicant
Model/Type reference.....:	See cover page
Ratings.....:	See marking label and model list

Responsible Testing Laboratory (as applicable), testing procedure and testing location(s): N/A			
☐	**CB Testing Laboratory:**		
Testing location/ address..... :			
☐	**Associated CB Testing Laboratory:**		
Testing location/ address..... :			
Tested by (name, function, signature).... :			
Approved by (name, function, signature):			
☐	**Testing procedure: CTF Stage 1:**		
Testing location/ address..... :			
Tested by (name, function, signature).... :			
Approved by (name, function, signature):			
☐	**Testing procedure: CTF Stage 2:**		
Testing location/ address..... :			
Tested by (name + signature)..... :			
Witnessed by (name, function, signature):			
Approved by (name, function, signature):			
☐	**Testing procedure: CTF Stage 3:**		
☐	**Testing procedure: CTF Stage 4:**		
Testing location/ address..... :			
Tested by (name, function, signature).... :			
Witnessed by (name, function, signature):			
Approved by (name, function, signature):			
Supervised by (name, function, signature):			

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

- ATTACHMENT 1 – Photos (9 pages)

Summary of testing:

Tests performed (name of test and test clause):	**Testing location:**
6.3 Ingress protection (IP test) 7.5.1 Impulse voltage test 7.5.2 Voltage test (electric strength) 7.3.6.3.3 Resistance of protective bonding 7.3.7.4 and 7.3.7.5 Clearance and creepage distance 13.7.3 Impact test Unless otherwise specified, all the tests conducted on the basic model of HI-3P12K-H-Y1 to represent the others.	Yi Energy Technology (Zhejiang) Co., Ltd.

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

N/A

☒ **The product fulfils the requirements of IEC/EN 62109-1: 2010 and IEC/EN 62109-2: 2011**

Test Report No.	Date dd.mm.yyyy	Remark(s)
CN23W946 001	08.09.2023	Original report of IEC 62109-1 and IEC 62109-2
CN23W946 002	29.02.2024	Appearance of enclosure, internal circuit layout, dimensions and manufacturer logo are updated

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.

YIINERGY Product:Hybrid Inverter
Model :HI-3P5K-H-Y1

PV Input	Max.Input Voltage:1000 Vd.c.
	MPPT Range:200-950 Vd.c.
	Max.Input Current:14/28 Ad.c.
	Max.Short-circuit Current:17/34 Ad.c.
Battery	Voltage Range:170-600 Vd.c.
	Maximum Current:20 Ad.c.
	Type:Li-ion
On-gird	Output Nominal Voltage:400/380 V, 3L/N/PE
	Nominal Operating Frequency:50/60 Hz
	Output Rated Power:5 kW
	Max.Output Apparent Power:5 kVA
	Max.Output Current:8.3 A
	Max.Input Apparent Power:10 kVA
	Max.Input Current:15.2 A
Back-up	Output Nominal Voltage:400/380 V, 3L/N/PE
	Nominal Operating Frequency:50/60 Hz
	Output Rated Power:5 kW
	Max.Output Apparent Power:10 kVA(10s)
Generator	Input Nominal Voltage: 400/380 V, 3L/N/PE
	Nominal Operating Frequency: 50/60 Hz
	Max. Input Power: 5 kW
Others	Power Factor: ~1,0.8(lagging)-0.8(leading)
	OperatingTemperature:-25~+60 ℃
	Inverter Topology:Transformerless
	Enclosure:IP66
	Protection Class:I
	OVC AC III/DC II

S/N

Made in China

Yi Energy Technology (Zhejiang) Co., Ltd.
www.yienergy.com
1-109, No. 55, Yifeng Road, Xiasha, Qiantang District, Hangzhou, Zhejiang

YIINERGY Product:Hybrid Inverter
Model :HI-3P6K-H-Y1

PV Input	Max.Input Voltage:1000 Vd.c.
	MPPT Range:200-950 Vd.c.
	Max.Input Current:14/28 Ad.c.
	Max.Short-circuit Current:17/34 Ad.c.
Battery	Voltage Range:170-600 Vd.c.
	Maximum Current:20 Ad.c.
	Type:Li-ion
On-gird	Output Nominal Voltage:400/380 V, 3L/N/PE
	Nominal Operating Frequency:50/60 Hz
	Output Rated Power:6 kW
	Max.Output Apparent Power:6 kVA
	Max.Output Current:10 A
	Max.Input Apparent Power:12 kVA
	Max.Input Current:18.2 A
Back-up	Output Nominal Voltage:400/380 V, 3L/N/PE
	Nominal Operating Frequency:50/60 Hz
	Output Rated Power:6 kW
	Max.Output Apparent Power:12 kVA(10s)
Generator	Input Nominal Voltage: 400/380 V, 3L/N/PE
	Nominal Operating Frequency: 50/60 Hz
	Max. Input Power: 6 kW
Others	Power Factor: ~1,0.8(lagging)-0.8(leading)
	OperatingTemperature:-25~+60 ℃
	Inverter Topology:Transformerless
	Enclosure:IP66
	Protection Class:I
	OVC AC III/DC II

S/N

Made in China

Yi Energy Technology (Zhejiang) Co., Ltd.
www.yienergy.com
1-109, No. 55, Yifeng Road, Xiasha, Qiantang District, Hangzhou, Zhejiang

YINENERGY

Product:Hybrid Inverter
Model :HI-3P8K-H-Y1

PV Input	Max.Input Voltage:1000 Vd.c.
	MPPT Range:200-950 Vd.c.
	Max.Input Current:14/28 Ad.c.
	Max.Short-circuit Current:17/34 Ad.c.
Battery	Voltage Range:170-600 Vd.c.
	Maximum Current:30 Ad.c.
	Type:Li-ion
On-gird	Output Nominal Voltage:400/380 V, 3L/N/PE
	Nominal Operating Frequency:50/60 Hz
	Output Rated Power:8 kW
	Max.Output Apparent Power:8 kVA
	Max.Output Current:13.3 A
	Max.Input Apparent Power:16 kVA
	Max.Input Current:24.2 A
Back-up	Output Nominal Voltage:400/380 V, 3L/N/PE
	Nominal Operating Frequency:50/60 Hz
	Output Rated Power:8 kW
	Max.Output Apparent Power:16 kVA(10s)
Generator	Input Nominal Voltage: 400/380 V, 3L/N/PE
	Nominal Operating Frequency: 50/60 Hz
	Max. Input Power: 8 kW
Others	Power Factor: ~1,0.8(lagging)-0.8(leading)
	OperatingTemperature:-25~+60 ℃
	Inverter Topology:Transformerless
	Enclosure:IP66
	Protection Class:I
	OVC AC III/DC II

S/N

Made in China

Yi Energy Technology (Zhejiang) Co., Ltd.
www.yienergy.com
1-109, No. 55, Yifeng Road, Xiasha, Qiantang District, Hangzhou, Zhejiang

YINENERGY

Product:Hybrid Inverter
Model :HI-3P10K-H-Y1

PV Input	Max.Input Voltage:1000 Vd.c.
	MPPT Range:200-950 Vd.c.
	Max.Input Current:14/28 Ad.c.
	Max.Short-circuit Current:17/34 Ad.c.
Battery	Voltage Range:170-600 Vd.c.
	Maximum Current:30 Ad.c.
	Type:Li-ion
On-gird	Output Nominal Voltage:400/380 V, 3L/N/PE
	Nominal Operating Frequency:50/60 Hz
	Output Rated Power:10 kW
	Max.Output Apparent Power:10 kVA
	Max.Output Current:16.7 A
	Max.Input Apparent Power:16 kVA
	Max.Input Current:24.2 A
Back-up	Output Nominal Voltage:400/380 V, 3L/N/PE
	Nominal Operating Frequency:50/60 Hz
	Output Rated Power:10 kW
	Max.Output Apparent Power:16 kVA(10s)
Generator	Input Nominal Voltage: 400/380 V, 3L/N/PE
	Nominal Operating Frequency: 50/60 Hz
	Max. Input Power: 10 kW
Others	Power Factor: ~1,0.8(lagging)-0.8(leading)
	Operating Temperature:-25~+60 ℃
	Inverter Topology:Transformerless
	Enclosure:IP66
	Protection Class:I
	OVC AC III/DC II

S/N

Made in China

Yi Energy Technology (Zhejiang) Co., Ltd.
www.yienergy.com
1-109, No. 55, Yifeng Road, Xiasha, Qiantang District, Hangzhou, Zhejiang

YINERGY

Product:Hybrid Inverter
Model :HI-3P12K-H-Y1

PV Input	Max.Input Voltage:1000 Vd.c.
	MPPT Range:200-950 Vd.c.
	Max.Input Current:14/28 Ad.c.
	Max.Short-circuit Current:17/34 Ad.c.
Battery	Voltage Range:170-600 Vd.c.
	Maximum Current:30 Ad.c.
	Type:Li-ion
On-gird	Output Nominal Voltage:400/380 V, 3L/N/PE
	Nominal Operating Frequency:50/60 Hz
	Output Rated Power:12 kW
	Max.Output Apparent Power:12 kVA
	Max.Output Current:17.4 A
	Max.Input Apparent Power:16 kVA
	Max.Input Current:24.2 A
Back-up	Output Nominal Voltage:400/380 V, 3L/N/PE
	Nominal Operating Frequency:50/60 Hz
	Output Rated Power:12 kW
	Max.Output Apparent Power:16 kVA(10s)
Generator	Input Nominal Voltage: 400/380 V, 3L/N/PE
	Nominal Operating Frequency: 50/60 Hz
	Max. Input Power: 12 kW
Others	Power Factor: ~1,0.8(lagging)-0.8(leading)
	Operating Temperature:-25~+60 ℃
	Inverter Topology:Transformerless
	Enclosure:IP66
	Protection Class:I
	OVC AC III/DC II

S/N

Made in China

Yi Energy Technology (Zhejiang) Co., Ltd.
www.yienergy.com
1-109, No. 55, Yifeng Road, Xiasha, Qiantang District,
Hangzhou, Zhejiang

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 unconditional ☐ indoor conditional ☐ indoor
Over voltage category Mains.....:	☐ OVC I ☐ OVC II ☒ OVC III ☐ OVC IV
Over voltage category PV .....:	☐ OVC I ☒ OVC II ☐ OVC III ☐ OVC IV
Over voltage category Battery.....:	☐ OVC I ☒ OVC II ☐ OVC III ☐ OVC IV
Mains supply tolerance (%).....:	-90 / +110 %
Tested for power systems.....:	TN
IT testing, phase-phase voltage (V).....:	- - -
Class of equipment.....:	☒ Class I ☐ Class II ☐ Class III ☐ Not classified
Mass of equipment (kg) .....:	See model list on the following pages
Pollution degree.....:	☐ PD1 ☒ PD2 (Inside) ☒ PD3 (Outside)
IP protection class.....:	IP66
.....:	
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 .....:	See cover page
Date (s) of performance of tests.....:	See cover page

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.

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) ..... : Yi Energy Technology (Zhejiang) Co., Ltd
No.161,Yuancheng Road,Qiantang District,Hangzhou,Zhejiang P.R. China

General product information:

Description of change(s):

1. Change the appearance of enclosure.
2. Change the layout in PV input MOV, slot in PCB near CY27 and CY24, refer to photo document for details.
3. Dimensions updated to 528×485×195.
4. Update manufacturer Logo.

For the change described above, the following tests were necessary:

1. Construction Check
2. Marking and documentation
3. Impulse voltage test
4. Voltage test (electric strength)
5. Resistance of protective bonding
6. Clearance and creepage distance measurements

For the above-described change(s) the following tests were necessary:

Change	Testing	Comments
1	Clause 6.3 Ingress protection (IP test)	Pass
2	Clause 7.5.1, 7.5.2 & 7.5.3 electric strength measurements, impulse voltage test and partial discharge test	Pass
3	Clause 7.3.6.3.3 Resistance of protective bonding	Pass
4	Clause 7.3.7.4 and 7.3.7.5 Clearance and creepage distance	Pass
5	Clause 13.7.3 Impact test	Pass

Throughout the test report following abbreviations may be used:

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

Model list:

MODELS LIST	HI-3P5K-H-Y1	HI-3P6K-H-Y1	HI-3P8K-H-Y1	HI-3P10K-H-Y1	HI-3P12K-H-Y1
PV Input Data					
Max. PV Input Power(W)	7500	9000	12000	15000	15000
Max. PV Input Voltage(V)	1000				
Nominal PV Input Voltage(V)	650				
MPPT Voltage Range	200-950				
Full power MPPT Operating Range [V]	400-850	450-850	400-850	400-850	400-850
Number of MPPTs	2	2	2	2	2
Number of PV String per MPPT	1/1	1/1	1/1	1/2	1/2
Max. PV Input Current (A)	14/14	14/14	14/14	14/28	14/28
Max. Short Circuit current[A]	17/17	17/17	17/17	17/34	17/34
Battery					
Battery Type	Li-ion				
Voltage Range (V)	170-600				
Nominal Battery Voltage (V)	500				
Max. Charge Current (A)	20	20	30	30	30
Max. Discharge Current (A)	20	20	30	30	30
Rated Power (W)	5000	6000	8000	10000	10000
AC Input and Output (On-grid)					
Max. Output Apparent Power (VA)	5000	6000	8000	10000	12000
Max. Output Apparent Power (VA)	5500	6600	8800	11000	12000
Max. Input Apparent Power (VA)	12000	12000	16000	16000	16000
Nominal AC Voltage (V)	380/400, 3L/N/PE				

Nominal Grid Frequency (Hz)	50/60				
Max. Output Current (A)	8.3	10	13.3	16.7	17.4
Max. Input Current (A)	18.2	18.2	24.2	24.2	24.2
Power Factor	~1(0.8 leading ... 0.8 lagging)				
Total Harmonic Distortion (@nominal output)	<3%				
AC Output (Off-grid)					
Max. Output Apparent Power (VA)	5000	6000	8000	10000	12000
Peak Output Apparent Power (VA)	10000, 10s	12000, 10s	16000, 10s	16000, 10s	16000, 10s
Nominal AC Voltage (V)	380/400, 3L/N/PE				
Nominal AC Frequency (Hz)	50/60				
Max. Output Current (A)	8.3	10	13.3	16.7	17.4
Total Harmonic Distortion (@linear load)	<3%				
Protection					
PV String Input Reverse Polarity Protection	Integrated				
Anti-islanding Protection	Integrated				
Residual Current Monitoring Unit	Integrated				
AC Over Current Protection	Integrated				
AC Short Current Protection	Integrated				
AC OV and UV Protection	Integrated				
Surge Protection	DC Type II / AC Type III				
Diesel Generator					
Max. Input Power	5000	6000	8000	10000	12000
Nominal Input Voltage (V)	380/400, 3L/N/PE				
Nominal Input Frequency (Hz)	50/60				
General					
Dimension (W×H×D) [mm]	528×485×195				
Weight (kg)	28kg				
Mounting	Wall-Mounted				

Protective class	Class I
Protection Degree	PD2 (internal), PD3 (external)
Operation Temperature (℃)	-25 to + 60 (>45, derating)
Relative Humidity	0-95%, no condensing
Altitude (m)	≤4000
Cooling	Natural convection
Protection Degree	IP66
Noise (dBA)	<40
User Interface	LED & App
Communication Interface	RS485, Wi-Fi/Ethernet/4G (optional)
Communication with Meter	RS485
Communication with BMS	RS485, CAN
Digital Input/output	DRM, 1 × DI, 2 × DO
Isolation Method	Transformer less

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

4	**GENERAL TESTING REQUIREMENTS**		P
4.1	General		P
4.2	General conditions for testing	See below.	P
4.2.1	Sequence of tests	The same sample used for all tests.	P
4.2.2	Reference test conditions		P
4.2.2.1	Environmental conditions	Ambient environmental conditions compliance.	P
4.2.2.2	State of equipment	Tests carried out on a complete EUT.	P
4.2.2.3	Position of equipment	The equipment installed in accordance with the manufacturer's instructions.	P
4.2.2.4	Accessories		P
4.2.2.5	Covers and removable parts	No covers or parts can be removed without using a TOOL.	N/A
4.2.2.6	Mains supply a) Voltage: b) Frequency: c) Polarity: d) Earthing: e) Over-current Protection:	(see appended table 4.7)	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 4.7)	P
4.2.2.7.2	Battery inputs		P
4.2.2.8	Conditions of loading for output ports	The least favorable loading conditions was considered.	P
4.2.2.9	Earthing terminals	Connection to the earth	P
4.2.2.10	Controls		P
4.2.2.11	Available short circuit current	Considered.	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

IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
4.4.1	General		P
4.4.2	Test conditions and duration for testing under fault conditions		P
4.4.2.1	General		P
4.4.2.2	Duration of tests	One cycle and until temperatures stabilize.	P
4.4.3	Pass/fail criteria for testing under fault conditions		P
4.4.3.1	Protection against shock hazard		P
4.4.3.2	Protection against the spread of fire		P
4.4.3.3	Protection against other hazards		P
4.4.3.4	Protection against parts expulsion hazards		P
4.4.4	Single fault conditions to be applied		P
4.4.4.1	Component fault tests		P
4.4.4.2	Equipment or parts for short-term or intermittent operation	Continuous operation equipment.	N/A
4.4.4.3	Motors		N/A
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		N/A
4.4.4.7	Output overload		P
4.4.4.8	Cooling system failure		P
4.4.4.9	Heating devices	No heating devices used.	N/A
4.4.4.10	Safety interlock systems	No safety interlock device used.	N/A
4.4.4.11	Reverse d.c. connections		P
4.4.4.12	Voltage selector mismatch	No voltage selector used.	N/A
4.4.4.13	Mis-wiring with incorrect phase sequence or polarity		P
4.4.4.14	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		P
4.6	Backfeed voltage protection		P
4.6.1	Backfeed tests under normal conditions	No hazardous voltage and energy present on unconnected terminal in normal conditons.	P
4.6.2	Backfeed tests under single-fault conditions	No hazardous voltage and	P

IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
		energy present on unconnected terminal in single fault conditons.	
4.6.3	Compliance with backfeed tests		P
4.7	Electrical ratings tests	(see appended table 4.7)	P
4.7.1	Input ratings		P
4.7.1.1	Measurement requirements for DC input ports		P
4.7.2	Output ratings		P

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

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		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	The labels subjected to the permanence of marking test. The labels rubbed with the cloth soaked with petroleum spirit for 30 s. After this test there was no damage to the labels. The marking on the labels did not fade. There was no curling or lifting of the label's edges.	P
5.1.3	Identification	See below.	P
	The equipment shall, as a minimum, be permanently marked with:		
	a) the name or trade mark of the manufacturer or supplier	Trade mark is provided on the front enclosure.	P
	b) model number, name or other means to identify the equipment	The model name is provided on the label.	P
	c) a serial number, code or other marking allowing identification of manufacturing location and the manufacturing batch or date within a three month time period.	The serial number is provided on the equipment body.	P
5.1.4	Equipment ratings	See below	P
	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	See model list.	P
	– output voltage, type of voltage (a.c. or d.c.), frequency, max. continuous current, and for a.c. outputs, either the power or power factor for each output	See model list.	P
	– the ingress protection (IP) rating as in 6.3 below	See model list.	P
5.1.5	Fuse identification	No such devices	N/A

IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
	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	Relevant symbol, indicator or information are available.	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.		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.		N/A
	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.		N/A
	A unit with d.c. terminals shall be plainly marked indicating the polarity of the connections, with:		P
	– the sign “+“ for positive and “-„ for negative; or		P
	– a pictorial representation illustrating the proper polarity where the correct polarity can be unambiguously determined from the representation		P
5.1.6.1	Protective Conductor Terminals	Symbol 7 of Table C.1 is used.	P
	The means of connection for the protective earthing conductor shall be marked with:		P
	– symbol 7 of Annex C; or		P
	– the letters “PE“; or		P
	– the colour coding green-yellow.		P
5.1.7	Switches and circuit-breakers	The letter “ON” and “OFF” is	P

IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
		clearly marked.	
	The on and off-positions of switches and circuits breakers shall be clearly marked. If a push-button switch is used as the power switch, symbols 10 and 16 of Annex C may be used to indicate the on-position, or symbols 11 and 17 to indicate the off-position, with the pair of symbols (10 and 16, or 11 and 17) close together.		P
5.1.8	Class II Equipment	Class I Equipment.	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	The temperature observed on the terminals were not exceed the limited values specified.	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	Warning markings are be visible and legible.	P
	Warning markings shall be legible, and shall have minimum dimensions as follows:		P
	– Printed symbols shall be at least 2,75 mm high		P
	– Printed text characters shall be at least 1.5 mm high and shall contrast in colour with the background		P
	– Symbols or text that are moulded, stamped or engraved in a material shall have a character height of at least 2,0 mm, and if not contrasting in colour from the background, shall have a depth or raised height of at least 0,5 mm.	No such symbols.	N/A
	If it is necessary to refer to the instruction manual to		P

IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
	preserve the protection afforded by the equipment, the equipment shall be marked with symbol 9 of Annex C		
	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	All accessible metal parts were grounded.	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	Marked with symbol 14 of Table C.1.	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.		
5.2.2.3	Coolant	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	Marked with Symbol 21 of Table C.1 and the time to discharge capacitors to safe voltage and energy levels accompany the symbol.	P
	Where required by 7.3.9.2 or 7.4.2 the PCE shall be marked with Symbol 21 of Annex C and the time to discharge capacitors to safe voltage and energy levels shall accompany the symbol.		P
5.2.2.5	Motor guarding	No such devices which can conducted injury to service personal.	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		N/A

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

	giving instructions for safe servicing (for example disconnection of the source before removing the guard).		
5.2.3	Sonic hazard markings and instructions	No such hazard.	N/A
	If required by 10.2.1 a PCE shall:		N/A
	a) be marked to warn the operator of the sonic pressure hazard; or		N/A
	b) be provided with installation instructions that specify how the installer can ensure that the sound pressure level from equipment at its point of use after installation, will not reach a value, which could cause a hazard. These instructions shall include the measured sound pressure level, and shall identify readily available and practicable protective materials or measures which may be used.		N/A
5.2.4	Equipment with multiple sources of supply		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.		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	No touch current exceed 3.5mAac. or 10mAdc. Under any operation conditions	N/A
	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.		P
5.3	Documentation		P
5.3.1	General	See below.	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 shall include the items required in 5.3.2 through 5.3.4, and the following:		P
	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		P

IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
	– WET LOCATIONS classification fort he intended external environment as per 6.1		P
	– POLLUTION DEGREE classification for the intended external environment as per 6.2		P
	– INGRESS PROTECTION rating as per 6.3		P
	– Ambient temperature and relative humidity ratings		P
	– MAXIMUM altitude rating		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;		P
	d) a warning that when the photovoltaic array is exposed to light, it supplies a d.c. voltage to the PCE		P
5.3.1.1	Language	Instructions related to safety is in English.	P
	Instructions related to safety shall be in a language that is acceptable in the country where the equipment is to be installed.		P
5.3.1.2	Format	The printed form is available and is delivered with the PCE.	P
	In general, the documentation must be provided in printed form and is to be delivered with the equipment.		P
	For equipment which requires the use of a computer for both installation and operation, documentation may be provided in electronic format without accompanying printed format.		P
5.3.2	Information related to installation	All below related informations provided in the user's maunal.	P
	The documentation shall include installation and where applicable, specific commissioning instructions and, if necessary for safety, warnings against hazards which could arise during installation or commissioning of the equipment. The information provided shall include:		P
	a) assembly, location, and mounting requirements:		P
	b) ratings and means of connection to each source of supply and any requirements related to wiring and external controls, colour coding of leads, disconnection means, or overcurrent protection needed, including instructions that the installation position shall not prevent access to the disconnection means;		P

IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
	c) ratings and means of connection of any outputs from the PCE, and any requirements related to wiring and 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;	No sound pressure hazard.	N/A
	h) where required by 14.8.1.3, instructions for the adequate ventilation of the room or location in which PCE containing vented or valve-regulated batteries is located, to prevent the accumulation of hazardous gases;	No battery used in the PCE.	N/A
	i) tightening torque to be applied to wiring terminals;		P
	j) values of backfeed short-circuit currents available from the PCE on input and output conductors under fault conditions, if those currents exceed the max. rated current of the circuit, as per 4.4.4.6;	No backfeed current available, this value indicated in model list.	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;	RCMU integrated into the inverter.	P
	m) instructions for protective earthing, including the information required by 7.3.6.3.7 if a second protective earthing conductor is to be installed:		P
	n) where required by 7.3.8, the installation instructions shall include the following or equivalent wording:		P
	"This product can cause a d.c. current in the external protective earthing conductor. Where a residual current-operated protective (RCD) or monitoring (RCM) device is used for protection in a case of direct or indirect contact, only an RCD or RCM of Type B is allowed on the supply side of this product."		P
	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.		P

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

5.3.3	Information related to operation	All below related informations provided in the user's maunal.	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	All below related informations provided in the service maunal.	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;		P
	– Part numbers and instructions for obtaining any required operator replaceable parts;	No any operator replaceable part.	N/A
	– Instructions for safe cleaning (if recommended)		P
	– Where there is more than one source of supply energizing the PCE, information shall be provided in the manual to indicate which disconnect device or devices are required to be operated in order to completely isolate the equipment.		P
5.3.4.1	Battery maintenance	The PCE is Grid-connected inverter without battery energy storage function.	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		N/A

IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
	batteries and the required precautions		
	– 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	See below.	P
	– Suitability for WET LOCATIONS or not	See below.	P
	– POLLUTION DEGREE rating in 6.2 below	See below.	P
	– INGRESS PROTECTION (IP) rating, as in 6.3 below	See below.	P
	– Ultraviolet (UV) exposure rating, as in 6.4 below	See below.	P
	– Ambient temperature and relative humidity ratings, as in 6.5 below	See below.	P
6.1	Environmental categories and minimum environmental conditions		P

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

6.1.1	Outdoor		P
6.1.2	Indoor, unconditioned	See above.	P
6.1.3	Indoor, conditioned	See above.	P
6.2	Pollution degree	PD 3 (outside) PD 2 (inside).	P
6.3	Ingress Protection	IP66.	P
6.4	UV exposure	Anti-UV approved AC/DC connectors are provided.	P
6.5	Temperature and humidity	Specified by manufacturer as: Humidity: 100%RH max. Temperature: 60°C max.	P
7	**PROTECTION AGAINST ELECTRIC SHOCK AND ENERGY HAZARDS**		P
7.1	General	The proper construction of PCE is available for protection against shock and energy hazards during installation, operation and maintenance under normal and single fault conditions.	P
7.2	Fault conditions	Refer to subclause and table 4.4.4.	P
7.3	Protection against electric shock		P
7.3.1	General	Each circuit under evaluation is compliant with Figure 7-1.	P
7.3.2	Decisive voltage classification		P
7.3.2.1	Use of decisive voltage class (DVC)		P
7.3.2.2	Limits of DVC (according table 6)		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)	For circuits evaluation information of PCE, refer to brief description of general product information on previous pages.	P
7.3.2.5	Connection to PELV and SELV circuits		P
7.3.2.6	Working voltage and DVC		P
7.3.2.6.1	General		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		P
	Protective separation shall be achieved by:		

IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
	▪ double or reinforced insulation, or	The double or reinforced insulation was provided between 1) DC input circuits and display and communication circuits; 2) AC input circuits and display, communication circuits. All accessible metal parts were earthed and separated from live parts by basic insulation.	P
	▪ 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	Protection against electic shock by means of earthed metal enclosure without openings. Any access to touch live parts is impossible.	P
7.3.4.1	General	See above.	P
	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).		P
	Open type sub-assemblies and devices do not require protective measures against direct contact but the instruction provided with the equipment must indicate that such measures must be provided in the end equipment or in the installation.		N/A
	Product intended for installation in CLOSED ELECTRICAL OPERATING AREAS, (see 3.9) need not have protective measures against direct contact, except as required by 7.3.4.2.4.		N/A
7.3.4.2	Protection by means of enclosures and barriers	Protection against electic shock by means of earthed metal enclosure.	P
	The following requirements apply where protection against contact with live parts is provided by enclosures or barriers, not by insulation in		P

IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
	accordance with 7.3.4.3.		
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).		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		P
	b) decisive voltage classification B, (DVC B) - the probe must not touch bare live parts		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,		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 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.		P
	The test finger and the test pin are applied as above, without appreciable force, in every possible position, except that floor-standing equipment having a mass exceeding 40 kg is not tilted.		P
	Equipment intended for building-in or rack mounting, or for incorporation in larger equipment, is tested with access to the equipment limited according to the method of		P

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

	mounting detailed in the installation instructions.		
	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.	No openings.	N/A
7.3.4.2.4	Service access areas	There is no such kinds of adjustments needed to be opened the enclosure during installation or maintenance.	N/A
7.3.4.3	Protection by means of insulation of live parts		P
	Where the requirements of 7.3.4.2 are not met, live parts shall be provided with insulation if:		P
	– their working voltage is greater than the maximum limit of decisive voltage class A, or		P
	– for a DVC A or B circuit, protective separation from adjacent circuit of DVC C is not provided (see note "‡" under Table 7)		P
7.3.5	Protection in case of direct contact		P
7.3.5.1	General		P
	Protection in case of direct contact is required to ensure that contact with live parts does not produce a shock hazard.		P
	The protection against direct contact according to 7.3.4 is not required if the circuit contacted is separated from other circuits according to 7.3.2.3, and:		P
	– is of decisive voltage class A and complies with 7.3.5.2, or		P
	– is provided with protective impedance according to 7.3.5.3, or	This method not considered.	N/A
	– is limited in voltage according to 7.3.5.4	This method not considered.	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		P

IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
	(key) or which are accessible without the use of a tool.		
	Conformity is checked by visual inspection and trial insertion.		P
7.3.5.2	Protection using decisive voltage class A	Communication port is considerd as DVC-A which can be accessible and separated from DVC-C by double or reinforced insulaiton.	P
7.3.5.3	Protection by means of protective impedance	This method not considered.	N/A
	Circuits and conductive parts do not require protection against direct contact if any connection to circuits of DVC-B or DVC-C is through protective impedance, and the accessible circuit or part is otherwise provided with protective separation from circuits of DVC-B or DVC-C according 7.3.3.		N/A
7.3.5.3.1	Limitation of current through protective impedance		N/A
	The current available through protective impedance to earth and between simultaneously accessible parts, measured at the accessible live parts, shall not exceed a value of 3,5 mA a.c. or 10 mA d.c. under normal and single-fault conditions.		N/A
7.3.5.3.2	Limitation of discharging energy through protective impedance		N/A
	The discharging energy available between simultaneously accessible parts protected by protective impedance shall not exceed the charging voltage and capacitance limits given in Table 9, which applies to both wet and dry locations, under normal and single fault conditions. Refer to figure 8.		N/A
7.3.5.4	Protection by means of limited voltages	This method not considered.	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

IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
	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 PCE is defined as protective class I.	P
	That part of a PCE meets the requirements of 7.3.6.2 and 7.3.6.3 is defined as protective class I		P
	That part of a PCE meets the requirements of 7.3.6.4 is defined as protective class II.		N/A
	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
	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.		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		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:	Suitable protective bonding provided.	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.		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;		N/A
	b) through other conductive parts which are not removed when the PCE or sub-units are used as intended ;		N/A

IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
	c) through a dedicated protective bonding conductor;	Single-core outdoor copper cable	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.	Single-core outdoor copper cable used.	N/A
	For moving or removable parts, hinges or sliding contacts designed and maintained to have a low resistance are examples of acceptable means if they comply with the requirements of 7.3.6.3.3.	No such part.	N/A
	Metal ducts of flexible or rigid construction and metallic sheaths shall not be used as protective bonding conductors, unless the device or material has been investigated as suitable for protective bonding purposes.	No such products used.	N/A
7.3.6.3.3	Rating of protective bonding		P
	Protective bonding shall withstand the highest thermal and dynamic stresses that can occur to the PCE item(s) concerned when they are subjected to a fault connecting live parts to accessible conductive parts. The protective bonding shall remain effective for as long as a fault to the accessible conductive parts persists or until an upstream protective device removes power from the part.	Alternative method used, external protective earthing conductor complied with the requirements of clause 7.3.6.3.5.	N/A
	Protective bonding shall meet following requirements:		N/A
	a) For PCE with an overcurrent protective device rating of 16 A or less, the impedance of the protective bonding means shall not exceed 0,1 Ω during or at the end of the test below.		N/A
	b) For PCE with an overcurrent protective device rating of more than 16 A, the voltage drop in the protective bonding test shall not exceed 2,5 V during or at the end of the test below.		N/A
	As alternative to a) and b) the protective bonding 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.	Protective earthing conductor complied with the requirements of clause 7.3.6.3.5.	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		N/A

IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
	building wiring, in the mains plug or in an equipment rack);		
	b) For pluggable equipment type B and fixed equipment, the maximum rating of the overcurrent protective device specified in the equipment installation instructions to be provided external to the equipment;		N/A
	c) For a circuit or part of the equipment for which an overcurrent protective device is provided as part of the equipment, the rating of the provided overcurrent device.		N/A
	Voltages are measured from the protective earthing terminal to all parts whose protective bonding means are being considered. The impedance of the protective earthing conductor is not included in the measurement. However, if the protective earthing conductor is supplied with the equipment, it is permitted to include the conductor in the test circuit but the measurement of the voltage drop is made only from the main protective earthing terminal to the accessible part required to be earthed.		N/A
	On equipment where the protective earth connection to a subassembly or to a separate unit is part of a cable that also supplies power to that subassembly or unit, the resistance of the protective bonding conductor in that cable is not included in the protective bond impedance measurements for the subassembly or separate unit, as shown in Figure 11. However, this option is only permitted if the cab le is protected by a suitably rated protective device that takes into account the size of the conductor. Otherwise the impedance of the protective bonding conductor between the separate units is to be included, by measuring to the protective earthing terminal where the power source enters the first unit in the system, as shown in Figure 12.		N/A
7.3.6.3.3.1	Test current, duration, and acceptance criteria	See above	N/A
	The test current, duration of the test and acceptance criteria are as follows:		N/A
	a) For PCE with an overcurrent protective device rating of 16 A or less, the test current is 200% of the overcurrent protective device rating, but not less than 32 A, applied for 120s. The impedance of the protective bonding means during and at the end of the test shall not exceed 0,1 Ω.		N/A
	b) For PCE with an overcurrent protective device rating of more than 16 A, the test current is 200% of the overcurrent protective device rating and the duration of the test is as shown in Table 10 below. The voltage drop in the		N/A

IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
	protective bonding means, during and at the end of the test, shall not exceed 2,5 V.		
	c) During and after the test, there shall be no melting, loosening, or other damage that would impair the effectiveness of the protective bonding means.		N/A
	The test current is derived from an a.c or d.c supply source, the output of which is not earthed.		N/A
	As an alternative to Table 10, where the time-current characteristic of the overcurrent protective device that limits the fault current in the protective bonding means is known because the device is either provided in the equipment or fully specified in the installation instructions, the test duration may be based on that specific device's time-current characteristic,. The tests are conducted for a duration corresponding to the 200% current value on the time-current characteristic.		N/A
7.3.6.3.4	Protective bonding impedance (routine test)	For routine test	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 cross-sectional area of protective earthing conductor is same as phase conductors, for these models the cross-sectional area is from 6mm^2 to 16mm^2.	P
	If the external protective earthing conductor is routed through a plug and socket or similar means		P

IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
	of disconnection, it shall not be possible to disconnect it unless power is simultaneously removed from the part to be protected.		
	The cross-sectional area of every external protective earthing conductor which does not form part of the supply cable or cable enclosure shall, in any case, be not less than:		P
	▪ 2,5 mm² if mechanical protection is provided;		P
	▪ 4 mm² if mechanical protection is not provided.	4mm², external enclosure grounding.	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.		P
7.3.6.3.6	Means of connection for the external protective earthing conductor		P
7.3.6.3.6.1	General		P
	The means of connection for 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.	Corrosion-resistant is considered for connection and bonding points.	
	The means of connection for the protective earthing conductor shall be permanently marked with:	With the symbol 7 of Table C.1. And Green-yellow wire is used.	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		P

IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
	disconnection of the protective earthing conductor.		
	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
	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.	See appended table 7.5.5. In addition, the caution symbol 15 of Table C.1 provided on PCE and in manual.	P
	a) Permanently connected wiring, and:		N/A
	• a cross-section of the protective earthing conductor of at least 10 mm² Cu or 16 mm² Al; or		N/A
	• automatic disconnection of the supply in case of discontinuity of the protective earthing conductor; or		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		N/A
	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.	An additional terminal for a second protective earthing conductor provided on inverter as well.	P
	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)	Not for parallelly connection use.	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.	Not for parallelly connection use.	N/A
7.3.6.4	Protective Class II – Double or Reinforced Insulation	Class I equipment.	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:		N/A
	• equipment designed to protective class II shall		N/A

IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
	not have means of connection for the external protective earthing conductor. However this does not apply if the external protective earthing conductor is passed through the equipment to equipment series-connected beyond it. In the latter event, the external protective earthing conductor and its means for connection shall be insulated with basic insulation from the accessible surface of the equipment and from circuits that employ protective separation, extra-low voltage, protective impedance and limited discharging energy, according to 7.3.5. This basic insulation shall correspond to the rated voltage of the series-connected equipment;		
	• 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	See below.	P
7.3.7.1	General		P
	This subclause gives minimum requirements for insulation, based on the principles of IEC 60664.		P
	Manufacturing tolerances shall be taken into account during measurement of creepage, clearance, and insulation distance in the PCE.		P
	Insulation shall be selected after consideration of the following influences:		P
	• pollution degree	PD 3 (outside), PD 2 (inside)	P
	• overvoltage category	O.V.C III for main circuit O.V.C II for PV circuit	P
	• supply earthing system		P
	• insulation voltage		P
	• location of insulation		P
	• type of insulation		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		
	Three basic types of earthing system are described in IEC 60364-1. They are:	TN & TT	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;		P
	• 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		P
	Table 12 makes use of the circuit system voltage and overvoltage category to define the impulse withstands voltage and the temporary overvoltage.	PV supply circuits: 4464V ($V_{MAX\ PV}$: 1000V) AC mains circuits: 4000V (Rated: 400V, 3L/N/PE)	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		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	Altitude: up to 4000m. The max. insulation / implulse voltage: 4464V.	
7.3.7.4.2	Electric field homogeneity	Not considered.	N/A
7.3.7.4.3	Clearance to conductive enclosures	Refer to subclause 7.3.7.4.1 and 13.7.	P
7.3.7.5	Creepage distances	(see appended table 7.3.7)	P
7.3.7.5.1	General		P
7.3.7.5.2	Voltage	The max. vlotage: 400Vrms / 1000Vd.c	P
7.3.7.5.3	Materials	Insulating material group IIIb 175 > CTI 100 assumed.	P

IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
7.3.7.6	Coating	Not used.	N/A
7.3.7.7	PWB spacings for functional insulating	Comply with 7.3.7.4 and 7.3.7.5.	N/A
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	Passed the impulse withstand voltage and a.c. or d.c. voltage tests. See appended table 7.5.1, 7.5.2 & 7.5.3. Note: No double or reinforced solid insulation used. No voltage stress on the insulation is greater than 1 kV/mm.	P
7.3.7.8.2.2	Functional insulation		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	Bobbin used in power transformer.	P
7.3.7.8.3.3	Material thickness less than 0,2 mm		N/A
7.3.7.8.3.4	Compliance	See subclause 7.3.7.8.3.2.	P
7.3.7.8.4	Printed wiring boards		P
7.3.7.8.4.1	General	Insulation between conductor layers in double-sided single-layer PWBs meet the requirements of 7.3.7.8.1. Basic, supplementary, double and reinforced insulation meet the appropriate requirements of 7.3.7.8.2.1 or 7.3.7.8.2.2. Functional insulation in PWBs meet the requirements of 7.3.7.8.2.3.	P
7.3.7.8.4.2	Use of coating materials	No coating material used.	N/A
7.3.7.8.5	Wound components		P
7.3.7.8.6	Potting materials	No potting materials used.	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	RCMU is integrated into the inverter	P
	RCD and RCM are used to provide protection against insulation faults in some domestic and industrial installations, additional to that provided by	External type A RCD needed.	P

IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
	the installed equipment.		
7.3.9	Capacitor discharge		P
7.3.9.1	Operator access area		P
	Equipment shall be so designed that there is no risk of electric shock in operator access areas from charge stored on capacitors after disconnection of the PCE.	The operator is instructed to the installation shall be performed by qualified technician. The pins of connector cannot be touched by test finger due to the design protection.	P
7.3.9.2	Service access areas		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.	The warning symbol 21 of Table C.1 and an indication of the discharge time is placed in a clearly visible position on the protective barrier to avoid unconsciousness contact.	P
7.4	Protection against energy hazards		P
7.4.1	Determination of hazardous energy level	There is no risk of energy hazard in operator access areas, protection of electrical shock by means of earthed metal enclosure.	P
	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.		P
	b) The stored energy in a capacitor is at a voltage. U of 2 V or more, and the stored energy. E, calculated from the following equation, exceeds 20J: $E = 0,5\ CU^2$		P
7.4.2	Operator Access Areas	See above.	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 warning symbol 21 of Table C.1 and an indication of the discharge time is placed in a clearly visible position on the protective barrier to avoid unconsciousness contact.	P
7.5	Electrical tests related to shock hazard	(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

IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
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	The full voltage is maintained for 60s.	P
7.5.2.6	Verification of the a.c. or d.c. voltage test	No ELECTRICAL BREAKDOWN occurs during the test.	P
7.5.3	Partial discharge test	No double or reinforced solid insulation used. No voltage stress on the insulation is greater than 1 kV/mm.	N/A
7.5.4	Touch current measurement (type test)		P
	The touch current shall be measured if required by 7.3.6.3.7 and shall not be greater than 3.5 mA a.c. or 10 mA d.c. or special measures of protection as given in 7.3.6.3.7 are required.	(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.	Edges, projections, corners, openings, guards, handles and the like, that are accessible to the OPERATOR are smooth and rounded.	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.	Enclosed coolant fan be used	P
8.2.1	Protection of service persons	No openings	N/A
	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.	Enclosed fan be used that it unlikely accessible during servicing operations.	P

IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
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.	The PCE is intended to be mounted on a wall.	N/A
8.4	Provisions for lifting and carrying		P
	If carrying handles or grips are fitted to, or supplied with, the equipment, they shall be capable of withstanding a force of four times the weight of the equipment.	Weight: 26kgX 4 for from zero to full load in 5 s to 10 s, then maintained for 1 min, handles/grips not break loose from the equipment and not be any permanent distortion, cracking or other evidence of failure.	P
	Equipment or parts having a mass of 18 kg or more shall be provided with a means for lifting and carrying or directions shall be given in the manufacturer's documentation.		P
8.5	Wall mounting		P
	Mounting brackets on equipment intended to be mounted on a wall or ceiling shall withstand a force of four times the weight of the equipment.	Weight: 26kgX 4 for from zero to full load in 5 s to 10 s, then maintained for 1 min, no damage to mounting brackets	P
8.6	Expelled parts		N/A
	Equipment shall contain or limit the energy of parts that could cause a HAZARD if expelled in the event of a fault.	No such parts.	N/A

7.3.6.3.3	TABLE: Resistance of protective bonding			P
Location (from to)	Resistance measured [mΩ]	Voltage drop [V]	Comments	
PE terminal to case cover	4.5	0.158	Test with 35A	
Note: The test voltage shall not exceed 24V. Supplementary information: tested with 35A				

7.3.7.4 & 7.3.7.5	TABLE: clearance and creepage distance measurements						P
Clearance cl and creepage distance dcr at/of:	System / Impulse voltage (V)	U r.m.s. (V)	Required cl (mm)	cl (mm)	Required dcr (mm)	dcr (mm)	
PCE unit (Vmax PV: OVCII 1000Vdc, BAT: OVCII 600Vdc, OVC III 400Vac, 50Hz, altitude 4000m)							
On Unit							
PV supply circuits PV1+ to PV-: FI	2847	1000Vdc	1.7*1.29 =2.2	15	10.0	15	
AC mains circuits L1 to N : FI (connector)	2847	1000Vdc	1.7*1.29 =2.2	7.5	10.0	11.5	
-at BAT circuits line to line	2847	1000Vdc	1.7 *1.29 =2.2	15	10.0	15	
HV circuit to gourd metal enclosure	4464	1000Vdc	3.6 *1.29 = 4.7	See below	10.0	See below	
-at CM1 to metal	--	--	--	8	--	10.9	
-at C110 to metal	--	--	--	15	--	15	
-at Control board to metal cover	--	--	--	7.2	--	11	
-at PV supply circuits to metal chassis	--	--	--	15	--	15	
-at GT1 to metal	--	--	--	6	--	15	
-at U6 to metal	--	--	--	6	--	15	
-at CN1 to metal	--	--	--	15	--	15	
-at CY17 to metal	--	--	--	10	--	15	
-at AC mains circuits/ to metal (connector)	--	--	--	15	--	15	
-at PV power inductor	--	--	--	5	--	15	
-at AC power inductor	--	--	--	5	--	15	
-at Battery power inductor	--	--	--	5	--	15	

7.5.1, 7.5.2 & 7.5.3	TABLE: electric strength measurements, impulse voltage test and partial discharge test			P
test voltage applied between:	Electric strength	Impulse withstand	Partial discharge	Result

	Test voltage [Vrms]	Leakage current [mA]	voltage [kV] 1.2--50 us	extinction voltage [V]	
PV circuit to PE	DC 2120	--	4000	--	☒ Pass -- ☐ Fail
AC circuit to PE	DC 2120	--	4000	--	☒ Pass -- ☐ Fail
Battery circuit to PE	DC 2120	--	4000	--	☒ Pass -- ☐ Fail
PV circuit to Communication circuit	DC 4240	--	6000	--	☒ Pass -- ☐ Fail
AC circuit to Communication circuit	DC 4240	--	6000	--	☒ Pass -- ☐ Fail
Battery circuit to Communication circuit	DC 4240	--	6000	--	☒ Pass -- ☐ Fail

Legend			
BI	Basic insulation	SI	Supplementary insulation
DI	Double insulation	RI	Reinforced insulation

Note(s):

- End of Test Report -