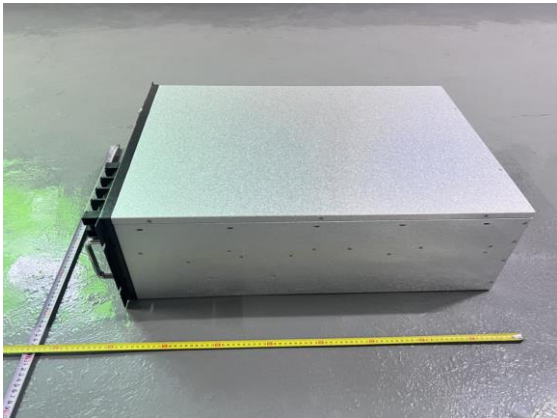


Prüfbericht-Nr.: Test report no.:	CN26FXA8 001	Auftrags-Nr.: Order no.:	27219016	Seite 1 von 98 Page 1 of 98
Kunden-Referenz-Nr.: Client reference no.:	2391566	Auftragsdatum: Order date:	2026.01.29	
Auftraggeber: Client:	Jiangsu Weiheng Intelligent Technology Co., Ltd. Sheng Xiang, Yaxi Community, Luoshe Town, Huishan District, Wuxi City 214000 Jiangsu P.R. China			
Prüfgegenstand: Test item:	Power Conversion System			
Bezeichnung / Typ-Nr.: Identification / Type no.:	TAA-125kW-01, TAA-125kW-11, TAA-105kW-01, TAA-105kW-11			
Auftrags-Inhalt: Order content:	CE-LVD CoC			
Prüfgrundlage: Test specification:	EN 62109-1:2010 EN 62109-2:2011 EN 62477-1:2012+A11:2014+A1:2017+A12:2021			
Wareneingangsdatum: Date of sample receipt:	2025.11.10			
Prüfmuster-Nr.: Test sample no.:	A004199848-001			
Prüfzeitraum: Testing period:	2025.11.10 - 2026.01.30			
Ort der Prüfung: Place of testing:	TÜV Rheinland (Shenzhen) Co., Ltd.			
Prüflaboratorium: Testing laboratory:	TÜV Rheinland (Shenzhen) Co., Ltd.			
Prüfergebnis*: Test result*:	Pass			
erstellt von: created by:	genehmigt von: authorized by:			
Datum: Date: 2026.02.07	 Ann Zhang Project Engineer		 Zhibin Cai Authorizer	
Stellung / Position:	Project Engineer		Authorizer	
Sonstiges / Other:				
Zustand des Prüfgegenstandes bei Anlieferung: Condition of the test item at delivery:	Prüfmuster vollständig und unbeschädigt 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
Dieser Prüfbericht bezieht sich nur auf das o.g. Prüfmuster und darf ohne Genehmigung der Prüfstelle nicht auszugsweise vervielfältigt werden. Dieser Bericht berechtigt nicht zur Verwendung eines Prüfzeichens. <i>This test report only relates to the a. m. test sample. Without permission of the test center this test report is not permitted to be duplicated in extracts. This test report does not entitle to carry any test mark.</i>				

Prüfbericht-Nr.: CN26FXA8 001
Test report no.:

Seite 2 von 98
Page 2 of 98

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. <i>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.</i>
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 <i>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</i>
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. <i>Test clauses with remark of * are subcontracted to qualified subcontractors and described under the respective test clause in the report.</i> <i>Deviations of testing specification(s) or customer requirements are listed in specific test clause in the report.</i>
4	Die Entscheidungsregel für Konformitätserklärungen basierend auf numerischen Messergebnissen 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 bezüglich des Risikos durch diese Entscheidungsregel siehe ILAC G8:2019. <i>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.</i>

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

Report Number..... : CN26FXA8 001

Date of issue : See cover page

Total number of pages : See cover page

**Name of Testing Laboratory
preparing the Report :** TÜV Rheinland (Shenzhen) Co., Ltd.

Applicant's name : Jiangsu Weiheng Intelligent Technology Co., Ltd.

Address : Sheng Xiang, Yaxi Community, Luoshe Town, Huishan District,
Wuxi City 214000 Jiangsu P.R. China

Test specification:

Standard : EN 62109-1:2010

Test procedure : TÜV Rheinland LVD COC 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 2017-08

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General disclaimer:

The test results presented in this report relate only to the object tested.

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Test item description	Power Conversion System	
Trade Mark		
Manufacturer	Same as applicant	
Model/Type reference.....	TAA-125kW-01, TAA-125kW-11, TAA-105kW-01, TAA-105kW-11	
Ratings	BAT Voltage max [V]: 950 Rated Output Voltage [Vac]: 230/400, 3W+N+PE/3W+PE	
Responsible Testing Laboratory (as applicable), testing procedure and testing location(s):		
☒	Testing Laboratory:	TÜV Rheinland (Shenzhen) Co., Ltd.
Testing location/ address		1-5F, Block 5, No. 1100, Huanli Road, Yungu Community, Xihu Street, Guangming District, Shenzhen, Guangdong Province
☐	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 – Test report of IEC 62109-2: 2011 (25 pages) - ATTACHMENT 2 – Test report of IEC/EN 62477-1 (74 pages) - ATTACHMENT 3 – EMF Assessment report (2 pages) - ATTACHMENT 4 – Photo Documentation (19 pages excluding cover page)	
Summary of testing:	
Tests performed (name of test and test clause): The critical tests were performed for this equipment included clauses 4.2.2.6, 4.2.2.7, 4.3, 4.4, 4.5, 4.6, 4.7, 5.1.2, 6.3, 7.3.2.2, 7.3.2.3, 7.3.4.2.3, 7.3.7.4, 7.3.7.5, 7.3.9, 7.5.1, 7.5.2, 7.5.4, 8.2, 8.5, 10.2, 13.7 in scope of this standard, for temperature test the thermocouples method used, regarding fault condition test simulated faults applied.	Testing location: TUV Rheinland (Shenzhen) Co., Ltd. 1-5F, Block 5, No. 1100, Huanli Road, Yungu Community, Xinhua Street, Guangming District, Shenzhen, Guangdong Province
Summary of compliance with National Differences (List of countries addressed): N/A.	

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.


Power Conversion System

Model:	TAA-125kW-01
S/N:	
DC Terminal	
Operating Range	615-950V*
Max. Voltage	950V
Max. Current	203A
AC Terminal	
Nominal Voltage	230V / 400V, 3W+N+PE / 3W+PE
Nominal Operating Frequency	50/60Hz
Rated Power	125kW
Max. Apparent Power	138kVA
Max. Current	200A
Power Factor Range	1(lagging)-1(leading)
General	
Protective Class	I
Operating Temperature Range	-30 - +55°C
Enclosure	IP20
Overvoltage Category	II(DC),III(AC)
Altitude	2000m
*When the system wiring is 3P+N+PE,the DC full load operating voltage is 680-950V.	



Jiangsu Weiheng Intelligent Technology Co., Ltd.

Made in China

Sheng Xiang,Yaxi Community,Luoshe Town, Huishan District, 214000,Wuxi City, Jiangsu Province,P.R. China


Power Conversion System

Model:	TAA-125kW-11
S/N:	
DC Terminal	
Operating Range	615-950V*
Max. Voltage	950V
Max. Current	203A
AC Terminal	
Nominal Voltage	230V / 400V, 3W+N+PE / 3W+PE
Nominal Operating Frequency	50/60Hz
Rated Power	125kW
Max. Apparent Power	138kVA
Max. Current	200A
Power Factor Range	1(lagging)-1(leading)
General	
Protective Class	I
Operating Temperature Range	-30 - +55°C
Enclosure	IP20
Overvoltage Category	II(DC),III(AC)
Altitude	2000m
*When the system wiring is 3P+N+PE,the DC full load operating voltage is 680-950V.	



Jiangsu Weiheng Intelligent Technology Co., Ltd.

Made in China

Sheng Xiang,Yaxi Community,Luoshe Town, Huishan District, 214000,Wuxi City, Jiangsu Province,P.R. China


Power Conversion System

Model:	TAA-105kW-01
S/N:	

DC Terminal	
Operating Range	615-950V*
Max. Voltage	950V
Max. Current	171A

AC Terminal	
Nominal Voltage	230V / 400V, 3W+N+PE / 3W+PE
Nominal Operating Frequency	50/60Hz
Rated Power	105kW
Max. Apparent Power	115.5kVA
Max. Current	167A
Power Factor Range	1(lagging)-1(leading)

General	
Protective Class	I
Operating Temperature Range	-30 - +55 °C
Enclosure	IP20
Overvoltage Category	II(DC), III(AC)
Altitude	2000m

*When the system wiring is 3P+N+PE, the DC full load operating voltage is 680-950V.



Jiangsu Weiheng Intelligent Technology Co., Ltd.

Made in China

Sheng Xiang, Yaxi Community, Luoshe Town, Huishan District, 214000, Wuxi City, Jiangsu Province, P.R. China


Power Conversion System

Model:	TAA-105kW-11
S/N:	

DC Terminal	
Operating Range	615-950V*
Max. Voltage	950V
Max. Current	171A

AC Terminal	
Nominal Voltage	230V / 400V, 3W+N+PE / 3W+PE
Nominal Operating Frequency	50/60Hz
Rated Power	105kW
Max. Apparent Power	115.5kVA
Max. Current	167A
Power Factor Range	1(lagging)-1(leading)

General	
Protective Class	I
Operating Temperature Range	-30 - +55 °C
Enclosure	IP20
Overvoltage Category	II(DC), III(AC)
Altitude	2000m

*When the system wiring is 3P+N+PE, the DC full load operating voltage is 680-950V.



Jiangsu Weiheng Intelligent Technology Co., Ltd.

Made in China

Sheng Xiang, Yaxi Community, Luoshe Town, Huishan District, 214000, Wuxi City, Jiangsu Province, P.R. China

Importer:

Telephone:

Address:

Test item particulars..... :	
Equipment mobility..... :	☐ movable ☐ hand-held ☒ stationary ☒ fixed ☐ transportable ☐ for building-in
Connection to the mains..... :	☐ pluggable equipment ☐ direct plug-in ☒ permanent connection ☐ for building-in
Environmental category..... :	☐ outdoor ☐ indoor unconditional ☒ indoor conditional
Over voltage category Mains :	☐ OVC I ☐ OVC II ☒ OVC III ☐ OVC IV
Over voltage category PV :	☐ OVC I ☒ OVC II ☐ OVC III ☐ OVC IV
Mains supply tolerance (%) :	According to the specified supply range
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 lists.
Pollution degree..... :	☐ PD 1 ☒ PD 2 ☐ PD 3
IP protection class :	IP20
..... :	
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 IEC 60076-2:

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

☐ Yes
☒ Not applicable

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

Name and address of factory (ies)

Jiangsu Weiheng Intelligent Technology Co., Ltd.
 Sheng Xiang, Yaxi Community, Luoshe Town,
 Huishan District, Wuxi City 214000 Jiangsu
 P.R. China

History of amendments and modifications:

N/A

General product information:
Product Description:

The equipment with model TAA-125kW-01, TAA-125kW-11, TAA-105kW-01, TAA-105kW-11 are three-phase Power Conversion System, which will be installed and connected to the grid after installation. The equipment shall be fixed to suitable manner as specified in the installation instruction and must be mounted in a cabinet.

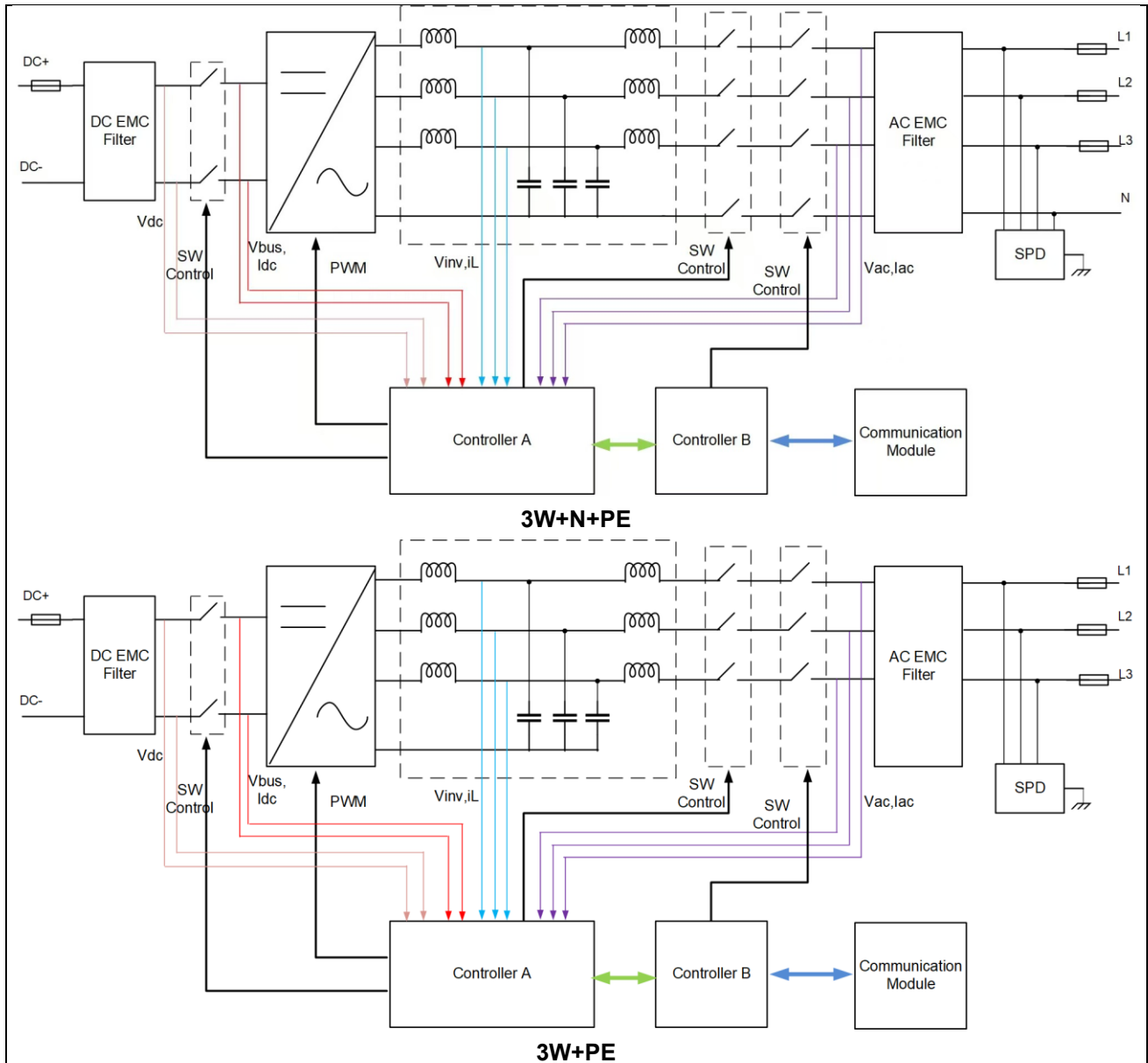
The EUTs contains filters for smoothing the output voltage and for EMC, switching and control circuits. Electronic circuits are mounted on a number of PCBs interconnected by appropriate connectors and wires. Power board including electronics components is mounted on the heat sink to earthing by metal screw and spring washer.

During fault condition defined in this standard, after the DSP receives the abnormal signal from the relevant protective detection circuit, the relays will operate to disconnect the DC active lines from grid automatically. The master DSP and slaver DSP have capacity independently to disconnect from grid, when any grid fault had happened.

The maximum ambient temperature permitted by the manufacturer's specification is 55°C and derate the output power from 45°C.

The structural consistency of the sample has been verified. The data in this report is sourced from Report No.: CN25FXA8 001.

Block Diagram:



Model difference:

The models TAA-125kW-01, TAA-125kW-11, TAA-105kW-01, TAA-105kW-11 are same as the hardware and software, expect the output voltage is different due to be adjusted by software.

The difference between having the suffix '-11' and having the suffix '-01' is the difference in the way the wires come out and the terminals on the DC side. Among them, having the suffix '-01' adopts the front outlet mode, while having the suffix '-11' adopts the rear outlet mode.

1) Definition of circuits inside of the Power Conversion System

I. DC input circuits

Battery input circuits are directly connected to the battery and the voltage can be up to 950Vdc.

Decisive voltage C considered for the Battery voltage side.

II. AC output to the AC mains

AC output will be three phase, 230 Vac.

Decisive voltage C considered for the AC voltage side.

III. Communication

The communication terminals included communication ports RS485, CAN and ModbusTCP/IP which will be connected to the upper computer or network to monitor the status of the inverter by

proprietary software.

Decisive voltage A considered for the communication side.

2) Isolation used in the product

Protective separation applied between decisive voltage A and decisive voltage C with corresponding overvoltage category.

3) Cooling method

Physical cooling by fans and heat sink.

4) Isolation between decisive voltage A and decisive voltage C

Basic insulation and supplementary insulation provided in the product to separate those two parts.

Model List			
MODELS LIST		TAA-105kW-01, TAA-105kW-11	TAA-125kW-01, TAA-125kW-11
Battery Input	Battery Type	lithium-ion battery Lead-acid battery Lithium titanate battery	
	Voltage range [V]	615-950(3W+PE)/650-950(3W+N+PE)	
	Full load voltage range [V]	615-950(3W+PE)/680-950(3W+N+PE)	
	Max continuous charging current [A]	171	203
	Max continuous discharging current [A]	171	203
	Overvoltage Category (OVC)	II	
AC Side (On Grid)	Rated Input/Output Voltage [Vac]	230/400, 3W+N+PE/3W+PE	
	Rated Input/Output Frequency [Hz]	50/60	
	Rated Input/Output Power [kW]	105	125
	Max. Input/Output Apparent power [kVA]	115.5	138.0
	Rated Input/Output Current [A]	152.2	181.2
	Max. Input/Output Current [A]	167	200
	Power Factor cosφ [λ]	0.8Leading - 0.8Lagging	
	Overvoltage Category (OVC)	III	
CONSTRUCTION	Firmware version	V100B000D000	
	Hardware version	A00	
	Type of inverter	Non-isolated	
	Type of NS Protection	Integrated	
	Protective Class	I	
	Enclosure Protection (IP)	IP20	
	Acoustic Noise	≤75dB	
	Operating Temperature Range [°C]	-30°C ~ 55°C (Derating above 45°C)	
	Pollution degree (PD)	2	
	Altitude [m]	4000m	

	Size W*H*D [mm]	For model TAA-105kW-01 and TAA-125kW-01: 520*232*725 For model TAA-105kW-11 and TAA-125kW-11: 520*232*785
	Weight [kg]	For model TAA-105kW-01 and TAA-125kW-01: 69 For model TAA-105kW-11 and TAA-125kW-11: 74.5
Note: having the suffix '-01' adopts the front-maintenance mode, while having the suffix '-11' adopts the rear-maintenance mode.		

EN 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	Considered.	P
4.2.2	Reference test conditions	Considered.	P
4.2.2.1	Environmental conditions	Max. 55°C rated ambient temperature tested.	P
4.2.2.2	State of equipment		P
4.2.2.3	Position of equipment		P
4.2.2.4	Accessories		P
4.2.2.5	Covers and removable parts		P
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	Considered.	P
4.2.2.7.1	Photovoltaic supply sources a) Open circuit voltage: b) Short-circuit current:		N/A
4.2.2.7.2	Battery inputs		P
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	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	Max environment temperature of EUT is 55°C.	P
4.3.2.2	Touch temperatures		P
4.3.2.3	Temperature limits for mounting surfaces		P
4.4	Testing in single fault condition	(See appended table 4.4)	P
4.4.1	General		P
4.4.2	Test conditions and duration for testing under fault conditions		P
4.4.2.1	General		P

EN 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
4.4.2.2	Duration of tests	Considered.	P
4.4.3	Pass/fail criteria for testing under fault conditions	Complied.	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	Complied.	P
4.4.4.1	Component fault tests	Considered.	P
4.4.4.2	Equipment or parts for short-term or intermittent operation		P
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		N/A
4.4.4.7	Output overload		P
4.4.4.8	Cooling system failure	Complied.	P
4.4.4.9	Heating devices	No such device.	N/A
4.4.4.10	Safety interlock systems	No such device.	N/A
4.4.4.11	Reverse d.c. connections		P
4.4.4.12	Voltage selector mismatch	No such device.	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	Relay is available at AC output side to prevent backfeed current from AC to DC side.	P
4.6.2	Backfeed tests under single-fault conditions	Relay is available at AC output side and certified connectors at DC input side to prevent backfeed current from AC to DC side, even if under single-fault conditions	P
4.6.3	Compliance with backfeed tests		P
4.7	Electrical ratings tests	(see appended table 4.2.2.6)	P

EN 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
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		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		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	See copy of marking plate	P
	b) model number, name or other means to identify the equipment	See copy of marking plate	P
	c) a serial number, code or other marking allowing identification of manufacturing location and the manufacturing batch or date within a three month time period.	See copy of marking plate	P
5.1.4	Equipment ratings		P
	Unless otherwise specified in another part of IEC 62109, the following ratings, as applicable shall be marked on the equipment:	See copy of marking plate	P
	– input voltage, type of voltage (a.c. or d.c.), frequency, and max. continuous current for each input	See copy of marking plate	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 copy of marking plate	P
	– the ingress protection (IP) rating as in 6.3 below	See copy of marking plate	P

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Clause	Requirement – Test	Result – Remark	Verdict
5.1.5	Fuse identification	For fuses not located in operator access areas.	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.		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.		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	See only above.	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	 used for PE terminal	P
	– the letters “PE”; or		N/A

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Clause	Requirement – Test	Result – Remark	Verdict
	– the colour coding green-yellow.		P
5.1.7	Switches and circuit-breakers		N/A
	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.		N/A
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	No such terminal boxes.	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 Annex C is an acceptable marking		N/A
5.2	Warning markings		P
5.2.1	Visibility and legibility requirements for warning markings		P
	Warning markings shall be legible, and shall have minimum dimensions as follows:		P
	– Printed symbols shall be at least 2,75 mm high	Considered.	P
	– Printed text characters shall be at least 1.5 mm high and shall contrast in colour with the background	Considered.	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.	Considered.	P
	If it is necessary to refer to the instruction manual to	Considered.	P

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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		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.	No such heatsink.	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 enclosure exceeds the temperature limits, so PCE marked with symbol 14 of Annex C.	P
5.2.2.3	Coolant	No coolant used inside.	N/A
	A unit containing coolant that exceeds 70 °C shall be legibly marked externally where readily visible after installation with symbol 15 of Annex C. The documentation shall provide a warning regarding the risk of burns from hot coolant, and either:		N/A
	a) statement that coolant system servicing is to be done only by SERVICE PERSONNEL, or		N/A
	b) instructions for safe venting, draining, or otherwise working on the cooling system, if these operations can be performed without OPERATOR access to HAZARDS internal to the equipment		N/A
5.2.2.4	Stored energy		P
	Where required by 7.3.9.2 or 7.4.2 the PCE shall be marked with Symbol 21 of Annex C and the time to discharge capacitors to safe voltage and energy levels shall accompany the symbol.	Marked with symbol 21 of Annex C and the time to discharge capacitors to safety voltage and energy levels.	P
5.2.2.5	Motor guarding		P
	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).		P

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Clause	Requirement – Test	Result – Remark	Verdict
5.2.3	Sonic hazard markings and instructions	No sonic 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		N/A
	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.		N/A
	The symbol shall be located on the outside of the unit or shall be prominently visible behind any cover giving access to hazardous parts.		N/A
5.2.5	Excessive touch current	The touch current does not exceed 3.5 mA a.c. or 10 mA d.c.	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.		N/A
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 shall include the items required in 5.3.2 through 5.3.4, and the following:		P
	a) explanations of equipment markings, including symbols used		P
	b) location and function of terminals and controls		P
	c) all ratings or specifications that are necessary to safely install and operate the PCE, 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

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Clause	Requirement – Test	Result – Remark	Verdict
	– WET LOCATIONS classification for the 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	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 III for AC side. OVC II for DC side.	P
	d) a warning that when the photovoltaic array is exposed to light, it supplies a d.c. voltage to the PCE	Provided in the instruction manual.	P
5.3.1.1	Language	English version specification and instruction provided	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		P
	In general, the documentation must be provided in printed form and is to be delivered with the equipment.	Paper version and electronic version will be sent to the customer once sold to end client.	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	Provided in the instruction manual	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		P

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Clause	Requirement – Test	Result – Remark	Verdict
	installation position shall not prevent access to the disconnection means;		
	c) ratings and means of connection of any outputs from the PCE, and any requirements related to wiring and external controls, colour coding of leads, or overcurrent protection needed;		P
	d) 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;	No such special services.	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;		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;		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;	Integrated RCMUs.	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:	Second protective earthing conductor not used.	N/A
	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 residual current-operated protective (RCD) or monitoring (RCM) device is used for protection in a case of direct or indirect contact, only an RCD or RCM of Type B is allowed on the supply side of this product.”		N/A
	o) for PCE intended to charge batteries, the battery nominal voltage rating, size, and type		N/A
	p) PV array configuration information, such as ratings, whether the array is to be grounded or		P

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Clause	Requirement – Test	Result – Remark	Verdict
	floating, any external protection devices needed, etc.		
5.3.3	Information related to operation	All below related information provided in the user's manual.	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	Symbol 14 of Annex C used.	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 information provided in the service manual.	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;		P
	– Instructions for safe cleaning (if recommended)		P
	– Where there is more than one source of supply energizing the PCE, information shall be provided in the manual to indicate which disconnect device or devices are required to be operated in order to completely isolate the equipment.		P
5.3.4.1	Battery maintenance		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

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Clause	Requirement – Test	Result – Remark	Verdict
	– 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		P
	– Suitability for WET LOCATIONS or not		P
	– POLLUTION DEGREE rating in 6.2 below	See clause 6.2 below	P
	– INGRESS PROTECTION (IP) rating, as in 6.3 below	See clause 6.3 below	P
	– Ultraviolet (UV) exposure rating, as in 6.4 below	See clause 6.4 below	P

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Clause	Requirement – Test	Result – Remark	Verdict
	– Ambient temperature and relative humidity ratings, as in 6.5 below	See clause 6.5 below	P
6.1	Environmental categories and minimum environmental conditions		P
6.1.1	Outdoor		N/A
6.1.2	Indoor, unconditioned		N/A
6.1.3	Indoor, conditioned		P
6.2	Pollution degree	PD2	P
6.3	Ingress Protection	IP20	P
6.4	UV exposure		N/A
6.5	Temperature and humidity	-30°C~55°C, 0%~95% humidity	P
7	PROTECTION AGAINST ELECTRIC SHOCK AND ENERGY HAZARDS		P
7.1	General		P
7.2	Fault conditions	Suitable protection provided against electric shock under fault conditions.	P
7.3	Protection against electric shock		P
7.3.1	General	See below.	P
7.3.2	Decisive voltage classification	Considered.	P
7.3.2.1	Use of decisive voltage class (DVC)		P
7.3.2.2	Limits of DVC (according to table 6)	DVC-C for >50Vrms/71Vpeak. DVC-C for >120Vdc. DVC-A for <25Vrms/35.4Vpeak. DVC-A for <60Vdc.	P
7.3.2.3	Short-terms limits of accessible voltages under fault conditions	No parts exceeds DVC-A level.	P
7.3.2.4	Requirements for protection (according to table 7)		P
7.3.2.5	Connection to PELV and SELV circuits	Considered.	P
7.3.2.6	Working voltage and DVC	DVC-A and DVC-C circuits within PCE.	P
7.3.2.6.1	General		P
7.3.2.6.2	AC working voltage (see Figure 2)	Nominal 230/400Va.c.	P
7.3.2.6.3	DC working voltage (see Figure 3)	Battery: Max. 950Vd.c.	P
7.3.2.6.4	Pulsating working voltage (see Figure 4)	Considered.	P
7.3.3	Protective separation		P
	Protective separation shall be achieved by:		P
	▪ double or reinforced insulation, or	Protective separation applied between decisive voltage C	P

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Clause	Requirement – Test	Result – Remark	Verdict
		and accessible unearthed parts with corresponding overvoltage category.	
	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	Protective separation applied between decisive voltage C and accessible earthed metal enclosure with corresponding overvoltage category.	P
	protective impedance comprising limitation of current per 7.3.5.3 and of discharged energy per 7.3.5.4, or		N/A
	limitation of voltage according to 7.3.5.4.		N/A
	The protective separation shall be fully and effectively maintained under all conditions of intended use of the PCE		P
7.3.4	Protection against direct contact		P
7.3.4.1	General		P
	Protection against direct contact is employed to prevent persons from touching live parts that do not meet the requirements of 7.3.5 and shall be provided by one or more of the measures given in 7.3.4.2 (enclosures and barriers) and 7.3.4.3 (insulation).	Earthed metal enclosure used.	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		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.		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).	Enclosure can't be removed without use of tools.	P
	Polymeric materials used to meet these requirements shall also meet the requirements of 13.6		N/A

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Clause	Requirement – Test	Result – Remark	Verdict
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	Considered.	P
	b) decisive voltage classification B, (DVC B) - the probe must not touch bare live parts	Considered.	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,	Considered.	P
7.3.4.2.3	Access probe tests	Mounted in a cabinet and the part where the AC, DC or DVC C is ultimately mounted must not be touched.	P
	Compliance with 7.3.4.2.1 is checked by all of the following:	IP20 appliance.	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.		N/A
	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.		N/A
	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.		P
	c) Openings preventing the entry of the jointed test finger (Figure E-1 of 0E) during test b) above, are further tested by means of straight unjointed test finger (Figure E-3 of 0E), applied with a force of 30 N. If the unjointed finger enters, the		N/A

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Clause	Requirement – Test	Result – Remark	Verdict
	test with the jointed finger is repeated except that the finger is applied using any necessary force up to 30 N.		
	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 $\pm 5^\circ$ only.		N/A
7.3.4.2.4	Service access areas	PCE is not energized since DC input and AC output are disconnected before servicing	P
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:	Considered.	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 2 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.	Mounted in a cabinet and the part where the AC, DC or DVC C is ultimately mounted must not be touched.	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		P
	– 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.		P
	Conformity is checked by visual inspection and trial insertion.		P
7.3.5.2	Protection using decisive voltage class A	For communication terminal	P

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Clause	Requirement – Test	Result – Remark	Verdict
		applied.	
7.3.5.3	Protection by means of protective impedance		P
	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.		P
7.3.5.3.1	Limitation of current through protective impedance		P
	The current available through protective impedance to earth and between simultaneously accessible parts, measured at the accessible live parts, shall not exceed a value of 3,5 mA a.c. or 10 mA d.c. under normal and single-fault conditions.		P
7.3.5.3.2	Limitation of discharging energy through protective impedance		P
	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.		P
7.3.5.4	Protection by means of limited voltages		P
	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.		P
	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.		P
	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.		P
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)		P
	That part of a PCE meets the requirements of	See cl. 7.3.6.2 and 7.3.6.3	P

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Clause	Requirement – Test	Result – Remark	Verdict
	7.3.6.2 and 7.3.6.3 is defined as protective class I		
	That part of a PCE meets the requirements of 7.3.6.4 is defined as protective class II.	See cl. 7.3.6.4	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
	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	Basic insulation used to such parts except those covered by 7.3.6.3.	P
7.3.6.3	Protective class I – Protective bonding and earthing	Earthed metal enclosure used.	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.		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;		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;	Green/Yellow wire used	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		P

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Clause	Requirement – Test	Result – Remark	Verdict
	paint or coating shall be removed in the area of contact, or reliably penetrated, to ensure metal to metal contact.		
	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 parts used	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.		P
7.3.6.3.3	Rating of protective bonding		P
	Protective bonding shall withstand the highest thermal and dynamic stresses that can occur to the PCE item(s) concerned when they are subjected to a fault connecting live parts to accessible conductive parts. The protective bonding shall remain effective for as long as a fault to the accessible conductive parts persists or until an upstream protective device removes power from the part.		P
	Protective bonding shall meet following requirements:		P
	a) For PCE with an overcurrent protective device rating of 16 A or less, the impedance of the protective bonding means shall not exceed 0,1 Ω during or at the end of the test below.		N/A
	b) For PCE with an overcurrent protective device rating of more than 16 A, the voltage drop in the protective bonding test shall not exceed 2.5 V during or at the end of the test below.		N/A
	As alternative to a) and b) the protective bonding 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.		N/A
	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:		P
	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		P

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Clause	Requirement – Test	Result – Remark	Verdict
	overcurrent protective device specified in the equipment installation instructions to be provided external to the equipment;		
	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.	In the end installation, the overcurrent device will be provided.	P
	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.		P
	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 cable 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	Alternative method the clause 7.3.6.3.5 was considered.	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 protective bonding means, during and at the end of the test, shall not exceed 2,5 V.		N/A

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Clause	Requirement – Test	Result – Remark	Verdict
	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)		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	External protective earthing terminal with symbol 7 of Annex C.	P
	A protective earthing conductor shall be connected at all times when power is supplied to PCE of protective class I. Unless local wiring regulations state otherwise, the protective earthing conductor cross-sectional area shall be determined from Table 11 or by calculation according to IEC 60364-5-54.		P
	If the external protective earthing conductor is		N/A

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Clause	Requirement – Test	Result – Remark	Verdict
	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.		
	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;		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.		N/A
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.		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.	Not marked on changeable parts.	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

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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 10 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.	The touch current does not exceed 3.5 mA.	N/A
	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 mm ² 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.		N/A
	When it is intended and allowed to connect two or more PCEs in parallel using one common PE conductor, the above touch current requirements apply to the maximum number of the PCEs to be connected in parallel, unless one of the measures in a)		N/A
	or b) above is used. The maximum number of parallel PCEs is used in the testing and has to be stated in the installation manual.		N/A
7.3.6.4	Protective Class II – Double or Reinforced Insulation	Protective class II part (communication terminal): double insulation.	P
	Equipment or parts of equipment designed for protective class II shall have insulation between live parts and accessible surfaces in accordance with		P

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Clause	Requirement – Test	Result – Remark	Verdict
	7.3.4.3. The following requirements also apply:		
	equipment designed to protective class II shall not have means of connection for the external protective earthing conductor. However this does not apply if the external protective earthing conductor is passed through the equipment to equipment series-connected beyond it. In the latter event, the external protective earthing conductor and its means for connection shall be insulated with basic insulation from the accessible surface of the equipment and from circuits that employ protective separation, extra-low voltage, protective impedance and limited discharging energy, according to 7.3.5. This basic insulation shall correspond to the rated voltage of the series-connected equipment;	Protective class II part (communication terminal): double insulation.	P
	metal-encased equipment of protective class II may have provision on its enclosure for the connection of an equipotential bonding conductor;		N/A
	equipment of protective class II may have provision for the connection of an earthing conductor for functional reasons or for damping of overvoltages; it shall, however, be insulated as though it is a live part;		N/A
	equipment employing protective class II shall be marked according to 5.1.8.	Class I equipment.	N/A
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.		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	Mounted in a cabinet, the entire unit is designed for use in accordance with Pollution degree 2.	P
	overvoltage category	For DC side circuits: Overvoltage Category II For AC side circuits: Overvoltage Category III	P
	supply earthing system	TN system considered.	P
	insulation voltage	Considered	P

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Clause	Requirement – Test	Result – Remark	Verdict
	location of insulation	Considered	P
	type of insulation	Considered	P
	Compliance of insulation, creepage distances, and clearance distances, shall be verified by measurement or visual inspection, and the tests of 7.5.		P
7.3.7.1.3	Supply earthing systems		P
	Three basic types of earthing system are described in IEC 60364-1. They are:		P
	TN system: has one point directly earthed, the accessible conductive parts of the installation being connected to that point by protective conductors. Three types of TN systems, TN-C, TN-S and TN-C-S, are defined according to the arrangement of the neutral and protective conductor.		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.		P
7.3.7.1.4	Insulation voltages	Considered	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	Considered	P
7.3.7.2.3	Circuits other than mains circuits	Considered	P
7.3.7.2.4	Insulation between circuits	Considered	P
7.3.7.3	Functional insulating	Considered	P
7.3.7.4	Clearance distances	(see appended table 7.3.7)	P
7.3.7.4.1	Determination		P
7.3.7.4.2	Electric field homogeneity		P
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

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Clause	Requirement – Test	Result – Remark	Verdict
7.3.7.5.2	Voltage		P
7.3.7.5.3	Materials	Considered	P
7.3.7.6	Coating		N/A
7.3.7.7	PWB spacings for functional insulating		P
7.3.7.8	Solid insulating	(See appended table 7.3.7)	P
7.3.7.8.1	General		P
7.3.7.8.2	Requirements for electrical withstand capability of solid insulation		P
7.3.7.8.2.1	Basic, supplemental, reinforced, and double insulation	Approved plastic material used as basic.	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		N/A
7.3.7.8.3.3	Material thickness less than 0,2 mm		P
7.3.7.8.3.4	Compliance		P
7.3.7.8.4	Printed wiring boards		P
7.3.7.8.4.1	General		P
7.3.7.8.4.2	Use of coating materials		P
7.3.7.8.5	Wound components		N/A
7.3.7.8.6	Potting materials	No such material.	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		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.	RCM used for detection.	P
7.3.9	Capacitor discharge		P
7.3.9.1	Operator access area		P
	Equipment shall be so designed that there is no risk of electric shock in operator access areas from charge stored on capacitors after disconnection of the PCE.		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.	Symbol 21 of Annex C and an indication of the discharge time used in a clearly visible position.	P

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Clause	Requirement – Test	Result – Remark	Verdict
7.4	Protection against energy hazards	Permanent connection and symbol 21 was attached in product.	N/A
7.4.1	Determination of hazardous energy level		P
	A hazardous energy level is considered to exist if		P
	a) The voltage is 2 V or more, and power available after 60 s exceeds 240 VA.		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	No risk of energy hazard in operator access areas from accessible circuits	N/A
	Equipment shall be so designed that there is no risk of energy hazard in operator access areas from accessible circuits.		
7.4.3	Services Access Areas	Symbol 21 of Annex C and an indication of the discharge time used in a clearly visible position.	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		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

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Clause	Requirement – Test	Result – Remark	Verdict
8	PROTECTION AGAINST MECHANICAL HAZARDS		P
8.1	General		P
	Operation shall not lead to a mechanical HAZARD in NORMAL CONDITION or SINGLE FAULT CONDITION. Edges, projections, corners, openings, guards, handles and the like, that are accessible to the operator shall be smooth and rounded so as not to cause injury during normal use of the equipment.		P
	Conformity is checked as specified in 8.2 to 8.6.		P
8.2	Moving parts		N/A
	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.		N/A
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		P
	Equipment and assemblies of equipment not secured to the building structure before operation shall be physically stable in NORMAL USE.		P
8.4	Provisions for lifting and carrying		N/A
	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.		N/A
	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.		N/A
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		N/A

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Clause	Requirement – Test	Result – Remark	Verdict
	that could cause a HAZARD if expelled in the event of a fault.		
9	PROTECTION AGAINST FIRE HAZARDS		P
9.1	Resistance to fire		P
	This subclause specifies requirements intended to reduce the risk of ignition and the spread of flame, both within the equipment and to the outside, by the appropriate use of materials and components and by suitable construction.		P
9.1.1	Reducing the risk of ignition and spread of flame		P
	For equipment or a portion of equipment, there are two alternative methods of providing protection against ignition and spread of flame that could affect materials, wiring, wound components and electronic components such as integrated circuits, transistors, thyristors, diodes, resistors and capacitors.		P
9.1.2	Conditions for a fire enclosure		P
	A FIRE ENCLOSURE is required for equipment or parts of equipment for which Method 2 is not fully applied and complied with.		P
9.1.2.1	Parts requiring a fire enclosure		P
	Except where Method 2 is used, or as permitted in 9.1.2.2, the following are considered to have a risk of ignition and, therefore, require a FIRE ENCLOSURE:		P
	– components in PRIMARY CIRCUITS		P
	– components in SECONDARY CIRCUITS supplied by power sources which exceed the limits for a LIMITED POWER SOURCE as specified in 9.2;		P
	– 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;		P
	– components within a power supply unit or assembly having a limited power output complying with the criteria for a LIMITED POWER SOURCE as specified in 9.2, including overcurrent protective devices, limiting impedances, regulating networks and wiring, up to the point where the LIMITED POWER SOURCE output criteria are met;		P
	– components having unenclosed arcing parts, such as open switch and relay contacts and commutators, in a circuit at HAZARDOUS VOLTAGE or at a HAZARDOUS ENERGY		P

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Clause	Requirement – Test	Result – Remark	Verdict
	LEVEL; and		
	– insulated wiring, except as permitted in 9.1.2.2.		P
9.1.2.2	Parts not requiring a fire enclosure		N/A
9.1.3	Materials requirements for protection against fire hazard		P
9.1.3.1	General		P
	ENCLOSURES, components and other parts shall be so constructed, or shall make use of such materials, that the propagation of fire is limited.		P
9.1.3.2	Materials for fire enclosures	Metal enclosure used.	P
	If an enclosure material is not classified as specified below, a test may be performed on the final enclosure or part of the enclosure, in which case the material shall additionally be subjected to periodic SAMPLE testing.		N/A
9.1.3.3	Materials for components and other parts outside fire enclosures		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	Internal components except small parts are V-2, HF-2 or better.	P
9.1.3.5	Materials for air filter assemblies	No such materials used	N/A
9.1.4	Openings in fire enclosures	Mounted in a cabinet	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
	– 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		N/A

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Clause	Requirement – Test	Result – Remark	Verdict
	parts, including partially enclosed components or assemblies, for which Method 2 of 9.1.1 has not been fully applied and complied with.		
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	(See appended table 9.2)	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.		P
9.3.2	Protection against short-circuits and overcurrents shall be provided for all input circuits, and for output circuits that do not comply with the requirements for limited power sources in 9.2, except for circuits in which no overcurrent hazard is presented by short-circuits and overloads.		P
9.3.3	Protective devices provided or specified shall have adequate breaking capacity to interrupt the maximum short circuit current specified for the port to which they are connected. If protection that is provided integral to the PCE for an input port is not rated for the short-circuit current of the circuit in which it is used, the installation instructions shall specify that an upstream protective device, rated for the prospective short-circuit current of that port, shall be used to provide backup protection.		P
10	PROTECTION AGAINST SONIC PRESSURE HAZARDS		N/A
10.1	General		N/A

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Clause	Requirement – Test	Result – Remark	Verdict
	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.	Sound pressure less than 80dBA, no hazards	N/A
10.2	Sonic pressure and Sound level	See above.	N/A
10.2.1	Hazardous Noise Levels		N/A
11	PROTECTION AGAINST LIQUID HAZARDS	No liquid used.	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 might result in hazard.		P
13.1.1	Adjustable controls		N/A
13.2	Securing of parts		P
13.3	Provisions for external connections		P
13.3.1	General		P
13.3.2	Connection to an a.c. Mains supply		P
13.3.2.1	General		P

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Clause	Requirement – Test	Result – Remark	Verdict
	For safe and reliable connection to a MAINS supply, equipment shall be provided with one of the following:		P
	– terminals or leads or a non-detachable power supply cord for permanent connection to the supply; or		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	No such device.	N/A
13.3.2.5	Cord anchorages and strain relief		N/A
	For equipment with a non-detachable power supply cord, a cord anchorage shall be supplied such that:		N/A
	– the connecting points of the cord conductors are relieved from strain; and		N/A
	– the outer covering of the cord is protected from abrasion.		N/A
13.3.2.6	Protection against mechanical damage		P
13.3.3	Wiring terminals for connection of external conductors	Sizes specified in instruction manual	P
13.3.3.1	Wiring terminals		P
13.3.3.2	Screw terminals		P
13.3.3.3	Wiring terminal sizes		P
13.3.3.4	Wiring terminal design		P
13.3.3.5	Grouping of wiring terminals		P
13.3.3.6	Stranded wire		P
13.3.4	Supply wiring space		P
13.3.5	Wire bending space for wires 10 mm ² and greater		N/A
13.3.6	Disconnection from supply sources	Disconnect the PCE from DC supply sources by the internal automatic disconnecting DC Contactor.	P
13.3.7	Connectors, plugs and sockets		P
13.3.8	Direct plug-in equipment		N/A
13.4	Internal wiring and connections		P

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Clause	Requirement – Test	Result – Remark	Verdict
13.4.1	General	Internal wiring is PVC insulated, rated VW-1. Internal wiring gauge is suitable for current intended to be carried.	P
13.4.2	Routing		P
13.4.3	Colour coding		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		N/A
13.6.2.1	Stress relief test		N/A
13.6.3	Polymers serving as solid insulation		P
13.6.3.1	Resistance to arcing		N/A
13.6.4	UV resistance		N/A
	Polymeric parts of an OUTDOOR ENCLOSURE required for compliance with this standard shall be sufficiently resistance to degradation by ultra-violet (UV) radiation		N/A
13.7	Mechanical resistance to deflection, impact, or drop		P
13.7.1	General	Metal and approved plastic used enclosure used.	P
13.7.2	250-N deflection test for metal enclosures	Applied for external of metal enclosure	P
13.7.3	7-J impact test for polymeric enclosures	Complied.	N/A
13.7.4	Drop test		N/A
13.8	Thickness requirements for metal enclosures		P
13.8.1	General		P
13.8.2	Cast metal		N/A
13.8.3	Sheet metal	2.0mm	P

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Clause	Requirement – Test	Result – Remark	Verdict

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
14.2	Motor Over temperature Protection		P
	Motors which, when stopped or prevented from starting (see 4.4.4.3), would present an electric shock HAZARD, a temperature HAZARD, or a fire HAZARD, shall be protected by an over temperature or thermal protection device meeting the requirements of 14.3.		P
14.3	Over temperature protection devices		P
14.4	Fuse holders		N/A
14.5	MAINS voltage selecting devices	No such device.	N/A
14.6	Printed circuit boards		P
	Printed circuit boards shall be made of material with		P

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Clause	Requirement – Test	Result – Remark	Verdict
	a flammability classification of V-1 of IEC 60707 or better.		
	This requirement does not apply to thin-film flexible printed circuit boards that contain only circuits powered from limited power sources meeting the requirements of 9.2.		N/A
	Conformity of the flammability RATING is checked by inspection of data on the materials. Alternatively, conformity is checked by performing the V-1 tests specified in IEC 60707 on three samples of the relevant parts.	V-0 min. PCB used	P
14.7	Circuits or components used as transient overvoltage limiting devices		P
	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.	Certified components used	P
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 required value in 5 to 10 s, and is to be maintained at that value for 1 min. A non-metallic rack or tray shall be tested at the highest normal condition operating temperature.		N/A
14.8.3	Electrolyte spillage		N/A
	Battery trays and cabinets shall have an electrolyte-resistant coating.		N/A
	The ENCLOSURE or compartment housing a VENTED BATTERY shall be constructed so that spillage or leakage of the electrolyte from one battery will be contained within the ENCLOSURE and be prevented from:		N/A
	a) reaching the PCE outer surfaces that can be		N/A

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Clause	Requirement – Test	Result – Remark	Verdict
	contacted by the USER		
	b) contaminating adjacent electrical components or materials; and		N/A
	c) bridging required electrical distances		N/A
14.8.4	Battery Connections		N/A
	Reverse battery connection of the terminals shall be prevented if reverse connection could result in a hazard within the meaning of this Standard		N/A
14.8.5	Battery maintenance instructions		N/A
	The information and instructions listed in 5.3.4.1 shall be included in the operator manual for equipment in which battery maintenance is performed by the operator, or in the service manual if battery maintenance is to be performed by service personnel only.		N/A
14.8.6	Battery accessibility and maintainability		N/A
	Battery terminals and connectors shall be accessible for maintenance with the correct TOOLS. Batteries with liquid electrolyte, requiring maintained shall be so located that the battery cell caps are accessible for electrolyte tests and readjusting of electrolyte levels.		N/A
15	Software and firmware performing safety functions	Single fault tests simulated for equipment. No critical hazard listed in this standard occur.	P

A	Annex A, Measurement of clearance and creepage distances (normative)		P
B	Annex B, Programmable Equipment (normative)		N/A
B.1	Software or Firmware That Perform Safety Critical Functions	Refer to subclause 15.	N/A

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Clause	Requirement – Test	Result – Remark	Verdict
B.1.1	All software or firmware that performs a critical safety function/s, such as protection from excessive temperature, over current or improper synchronization of AC source, where failure of which can result in a risk of fire, electric shock or other hazard as specified by this document, shall be evaluated by one of the following means. a) All software or firmware limit or control shall be disabled before the test to evaluate the hardware circuitry during the abnormal test condition of the safety function, and the hardware sensor component that is monitored by the firmware or software is modified or disabled to prevent the software or firmware from reading or responding to the abnormal condition. b) Protection Controls employing software or firmware to perform their function(s), shall be so constructed that they comply with IEC 60730-1 Annex H to address the risks identified in B2.1. Each combination of microprocessor model, manufacturer and firmware/software version used in the production of a PCE shall be evaluated as specified in the remainder of Annex B. Exception: For units with firmware/software that has been found to be compliant with the remainder of Annex B, subsequent firmware/software revisions may be entitled to a limited reevaluation for the revised firmware or software. The scope of the re-evaluation shall be defined by the potential impact of the firmware or software revisions and the applicable portions of IEC 60730-1 Annex H shall be reapplied.		N/A
B.2	Evaluation of Controls Employing Software	Refer to subclause 15.	N/A
B.2.1	Risk Analysis		N/A
B.2.1.1	A risk analysis shall be conducted to determine a set of risks and that the software addresses the identified risks. The risk analysis shall be conducted based on the safety requirements for the programmable component.		N/A
B.2.1.3	An analysis shall be conducted to identify the critical, non-critical, and supervisory parts of the software.		N/A
B.2.1.4	An analysis shall be conducted to identify transitions or states that can result in a risk.		N/A

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Clause	Requirement – Test	Result – Remark	Verdict
B.2.1.5	Risks to be considered include, but are not limited to function associated with the following: a) Temperature control, monitoring and response (ie. Coolant, internal ambient, device) b) Safety interlocks c) Synchronization between multiple AC sources e) Emergency stop of operation (including staged shutdown/sequencing) f) Connection/Disconnection – from an input source and output source g) RCD functions h) Over current protection or control i) The software must detect a hardware or software malfunction and place the device in a safe state as indicated per the “Risks Addressed State” definition.		N/A
C.	Annex C, Symbols to be used in Equipment Marking (normative)		P
D.	Annex D, Test Probes for Determining Access (informative)		P
E.	Annex E, RCDs (informative)		N/A
E.1	Selection of RCD type in AC circuits		N/A
F.	Annex F, Altitude correction for clearances (informative)		P
G.	Annex G, Clearance and creepage distance determination for frequencies greater than 30kHz		N/A
G.1	Clearance		N/A
G.2	Creepage distance		N/A
H.	Annex J, Measuring Instrument for Touch Current Measurements		P
H.1	Measuring instrument	Considered.	P
H.2	Alternative measuring instrument	Not used.	N/A
I.	Annex K, Examples of Protection, Insulation, and Overvoltage Category Requirements for PCE		P

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Clause	Requirement – Test	Result – Remark	Verdict
I.1	Protection, Insulation and Overvoltage	Considered.	P
I.2	Illustrative examples	Considered.	P
J.	Annex J, Instruction of the ultraviolet light conditioning test		N/A
J.1	General requirement		N/A
J.2	Requirement of mounting of the samples		N/A
J.3	Instruction of the Carbon-arc light-exposure apparatus		N/A
J.4	Instruction of the Xenon-arc light-exposure apparatus		N/A

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Clause	Requirement – Test	Result – Remark	Verdict

4.2.2.6/ 4.2.2.7		TABLE: electrical data					P
TAA-105kW-01 / TAA-105kW-11 (3W+PE)							
1)Bat-Grid							
Input (Bat)			Output (Grid)				
U (V)	I (A)	P (W)	U (V)	I (A)	P (W)	PF	
Tested at 50Hz							
614.64	177.80	109280	398.83	152.15	105100	0.999	
			398.72	152.11			
			398.91	152.26			
949.88	117.47	111580	398.83	153.59	106090	0.999	
			398.11	152.88			
			398.81	152.91			
Tested at 60Hz							
614.65	179.25	110170	398.84	153.36	105930	0.999	
			398.11	153.32			
			398.70	153.26			
949.89	117.71	111810	398.84	153.87	106280	0.999	
			398.82	153.74			
			398.53	153.92			
2)Grid-Bat							
Input (Grid)			Output (Bat)				
U (V)	I (A)	P (W)	U (V)	I (A)	P (W)	PF	
Tested at 50Hz							
397.93	153.19	105530	615.55	164.30	101130	0.999	
397.93	153.68	105860	950.47	105.43	100210	0.999	
Tested at 60Hz							
397.91	152.69	105170	615.54	163.66	100740	0.999	
397.91	154.06	106110	950.48	105.65	100420	0.999	
TAA-105kW-01 / TAA-105kW-11 (3W+N+PE)							
1)Bat-Grid							
Input (Bat)			Output (Grid)				
U (V)	I (A)	P (W)	U (V)	I (A)	P (W)	PF	
Tested at 50Hz							
649.84	114.48	74263	230.53	114.89	70855	0.892	

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Clause	Requirement – Test			Result – Remark		Verdict
			230.52	114.95		
			230.52	113.83		
679.72	161.69	109900	230.67	152.52	105490	0.999
			230.60	152.99		
			230.59	152.91		
949.91	117.08	111220	230.67	152.85	105760	0.999
			230.60	152.83		
			230.59	152.99		
Tested at 60Hz						
649.85	114.47	74299	230.20	111.26	70957	0.923
			230.24	112.49		
			230.21	112.13		
679.72	162.33	110340	230.28	153.31	105880	0.999
			230.19	153.13		
			230.38	153.71		
949.91	117.41	111530	230.28	153.50	106030	0.999
			230.18	153.13		
			230.31	152.81		
2)Grid-Bat						
Input (Grid)			Output (Bat)			
U (V)	I (A)	P (W)	U (V)	I (A)	P (W)	PF
Tested at 50Hz						
229.75	153.31	105610	680.55	145.35	100960	0.999
229.75	153.46	105710	950.50	105.29	100080	0.999
Tested at 60Hz						
229.74	152.88	105300	680.54	147.89	100640	0.999
229.73	153.22	105530	950.51	105.10	99900	0.999
TAA-125kW-01 / TAA-125kW-11 (3W+PE)						
1)Bat-Grid						
Input (Bat)			Output (Grid)			
U (V)	I (A)	P (W)	U (V)	I (A)	P (W)	PF
Tested at 50Hz						
614.67	211.92	130260	398.82	181.39	125290	0.999
			398.77	181.72		
			398.98	181.66		

EN 62109-1						
Clause	Requirement – Test			Result – Remark		Verdict
949.90	139.41	132430	398.82	182.25	125880	0.999
			398.24	182.13		
			398.52	182.23		
Tested at 60Hz						
614.66	211.83	130200	398.83	181.26	125190	0.999
			398.22	181.23		
			398.91	181.62		
949.90	139.98	132970	398.83	182.91	126330	170904
			398.35	182.24		
			398.92	182.93		
2)Grid-Bat						
Input (Grid)			Output (Bat)			
U (V)	I (A)	P (W)	U (V)	I (A)	P (W)	PF
Tested at 50Hz						
397.95	182.50	125720	615.52	195.68	120440	0.999
397.85	182.81	125930	950.47	125.42	119210	0.999
Tested at 60Hz						
397.97	181.98	125330	615.53	195.07	120070	0.999
397.97	183.27	126220	950.47	125.70	119470	0.999
TAA-125kW-01 / TAA-125kW-11 (3W+N+PE)						
1)Bat-Grid						
Input (Bat)			Output (Grid)			
U (V)	I (A)	P (W)	U (V)	I (A)	P (W)	PF
Tested at 50Hz						
649.82	143.25	92918	230.20	143.45	88727	0.895
			230.12	143.11		
			230.24	142.06		
679.72	192.54	130870	230.27	181.95	125650	0.999
			230.20	181.98		
			230.30	182.70		
949.90	139.35	132370	230.26	182.33	125930	0.999
			230.18	182.22		
			230.22	182.26		
Tested at 60Hz						
649.82	142.44	92450	230.20	138.59	88356	0.923
			230.21	139.82		

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Clause	Requirement – Test			Result – Remark		Verdict
			230.24	133.51		
679.72	193.15	131290	230.27	182.47	126020	0.999
			230.17	181.99		
			230.28	181.84		
949.90	139.73	132730	230.27	182.71	126200	0.999
			230.18	182.32		
			230.29	181.65		
2)Grid-Bat						
Input (Grid)			Output (Bat)			
U (V)	I (A)	P (W)	U (V)	I (A)	P (W)	PF
Tested at 50Hz						
229.75	182.39	125640	680.50	176.52	12120	0.999
229.75	182.67	125830	950.47	125.30	119100	0.999
Tested at 60Hz						
229.75	182.02	125360	680.50	176.13	119860	0.999
229.75	182.38	125610	950.47	125.14	118940	0.999

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Clause	Requirement – Test			Result – Remark		Verdict
4.3	TABLE: heating temperature rise measurements					P
	test voltage (V)			See below		—
	t1 (°C)			See below		—
	t2 (°C)			See below		—
Thermocouple Locations		Max. temperature measured (°C)				Max. temperature limit, (°C)
		1	2	3	4	
Whole Unit						
1. Ambient	48.08	48.46	55.07	48.49	--	
2. Enclosure	48.40	48.94	55.26	48.87	70	
3. Heat sink sheet	69.95	74.53	71.99	77.49	100*	
4. Mounting surface	48.37	49.04	55.27	48.86	70	
5. BAT- Terminal	48.76	48.83	55.48	49.14	125	
6. AC Terminal	49.44	49.96	55.90	49.96	120	
7. Lower Fan	48.27	48.76	55.22	48.69	70	
8. Upper Fan	56.48	58.14	61.61	58.30	70	
9. BAT Enter Bronze	63.02	55.50	64.75	62.77	140	
10. AC Enter Bronze	58.68	59.68	62.11	60.07	140	
11. Handle	48.11	48.62	55.06	48.57	55	
12. DC Relay	77.34	72.15	76.90	78.91	85	
DC EMI Board						
13. Y Cap (C1)	71.22	64.36	71.24	72.24	125	
14. C3	69.42	63.62	70.08	70.42	105	
15. Fuse (F1)	84.25	73.00	80.05	85.89	90	
16. Filter Inductance L1 Core	63.00	63.20	66.25	65.22	110	
17. Filter Inductance L1 Winding	93.28	75.17	85.82	93.38	110	
Detection Board						
18. Optocoupler (U10)	66.90	68.80	71.09	69.43	125	
19. Y Cap (C322)	62.48	63.96	66.30	65.21	125	
20. CT T1	66.08	68.12	70.33	68.72	75	
21. Optocoupler (U63)	64.25	65.88	68.49	66.67	110	
22. C139	58.42	60.75	63.17	60.63	105	
Control Board						
23. U2 (main Chip)	73.82	76.21	78.48	75.93	125	
24. U3 (Slave Chip)	67.61	69.96	72.34	69.80	85	

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Clause	Requirement – Test		Result – Remark		Verdict
Auxiliary Power Board					
25. T1 Skeleton	79.04	86.92	83.60	80.87	110
26. T1 Winding	77.78	82.80	82.52	79.84	110
27. T4 Skeleton	64.36	66.59	69.23	66.31	110
28. T4 Winding	68.78	70.77	73.59	70.83	110
29. Y Cap (C26)	72.73	76.44	77.44	74.88	125
30. C102	65.07	70.93	70.03	66.88	105
31. C54	73.29	75.65	78.12	75.27	85
32. Primary Sink	64.63	67.28	69.10	66.84	100*
33. Secondary Sink	71.13	76.21	75.67	72.97	100*
34. D12	72.39	75.53	77.20	74.66	150
35. C115	63.52	65.83	68.40	65.65	105
36. T2 Skeleton	69.58	74.63	74.19	71.56	110
37. T2 Winding	70.25	75.59	74.71	72.06	110
38. Q3	68.90	74.23	73.58	70.77	150
39. Optocoupler (U8)	68.73	71.62	73.51	71.00	110
40. D49	71.47	73.96	76.02	73.59	150
DC Bus Board					
41. Bus Capacitance C31	56.07	61.69	60.55	58.35	105
42. Bus Capacitance C19	61.40	67.15	64.52	64.24	105
43. Y Cap (C2)	50.90	52.60	57.12	51.79	125
44. C180	69.56	72.66	71.27	72.02	105
45. U18	68.26	71.36	71.86	71.31	85
46. INV IGBT	71.11	76.62	73.13	81.14	175
Communication Board					
47. U1	56.31	57.08	61.93	56.44	85
48. U2	52.75	53.46	58.61	52.93	85
49. U3	52.32	53.04	58.13	52.47	85
Inductance Board					
50. L7 Winding	89.71	94.29	83.23	94.52	110
51. L7 Core	68.10	72.28	69.09	70.92	110
52. C81	59.28	65.16	63.14	61.26	105
53. R156	55.82	57.99	60.91	57.45	85
54. RLY24	57.73	60.12	61.97	59.25	85
55. RLY21	74.06	77.84	76.16	75.63	85

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Clause	Requirement – Test			Result – Remark		Verdict
56. L9 (N-wire inductance)	50.56	51.60	57.04	51.60	110	
57. T1	58.00	61.25	62.26	59.73	105	
58. L5 winding	77.10	82.57	75.50	81.31	110	
59. L5 core	73.99	80.31	73.99	77.40	110	
Thermocouple Locations	Max. temperature measured (°C)				Max. temperature limit, (°C)	
	5	6	7	8		
Whole Unit						
1. Ambient	48.49	55.26	46.80	46.73	--	
2. Enclosure	48.87	57.65	47.23	47.25	70	
3. Heat sink sheet	77.49	77.48	68.72	66.23	100*	
4. Mounting surface	48.86	57.64	47.10	47.21	70	
5. BAT- Terminal	49.14	57.81	47.56	46.84	125	
6. AC Terminal	49.96	57.51	48.26	46.97	120	
7. Lower Fan	48.69	57.76	47.10	47.14	70	
8. Upper Fan	58.30	62.97	55.49	56.49	70	
9. BAT Enter Bronze	62.77	64.61	61.96	47.56	140	
10. AC Enter Bronze	60.07	62.82	57.73	53.59	140	
11. Handle	48.57	57.31	46.70	46.70	55	
12. DC Relay	78.91	78.31	76.51	70.04	85	
DC EMI Board						
13. Y Cap (C1)	72.24	71.84	70.46	62.17	125	
14. C3	70.42	70.72	68.61	61.66	105	
15. Fuse (F1)	85.89	80.81	83.83	71.29	90	
16. Filter Inductance L1 Core	65.22	67.75	62.00	68.13	110	
17. Filter Inductance L1 Winding	93.38	85.31	93.02	71.72	110	
Detection Board						
18. Optocoupler (U10)	69.43	72.90	65.89	66.74	125	
19. Y Cap (C322)	65.21	68.20	61.57	62.38	125	
20. CT T1	68.72	72.30	65.09	66.42	75	
21. Optocoupler (U63)	66.67	70.37	63.34	64.09	110	
22. C139	60.63	64.72	57.29	58.88	105	
Control Board						
23. U2 (main Chip)	75.93	79.99	72.75	74.22	125	
24. U3 (Slave Chip)	69.80	73.89	66.60	67.77	85	

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

Auxiliary Power Board					
25. T1 Skeleton	80.87	84.98	78.22	75.45	110
26. T1 Winding	79.84	84.04	76.98	82.77	110
27. T4 Skeleton	66.31	70.60	63.45	64.88	110
28. T4 Winding	70.83	75.06	67.91	69.71	110
29. Y Cap (C26)	74.88	78.87	71.89	75.77	125
30. C102	66.88	71.36	64.07	69.67	105
31. C54	75.27	79.52	72.20	66.74	85
32. Primary Sink	66.84	70.62	63.65	66.80	100*
33. Secondary Sink	72.97	77.18	69.77	62.31	100*
34. D12	74.66	78.94	71.48	74.72	150
35. C115	65.65	70.07	62.46	64.01	105
36. T2 Skeleton	71.56	75.87	68.17	71.46	110
37. T2 Winding	72.06	76.05	68.89	73.19	110
38. Q3	70.77	74.92	67.65	71.70	150
39. Optocoupler (U8)	71.00	75.08	67.82	70.89	110
40. D49	73.59	77.64	70.42	72.99	150
DC Bus Board					
41. Bus Capacitance C31	58.35	61.96	54.99	59.32	105
42. Bus Capacitance C19	64.24	66.17	60.44	65.20	105
43. Y Cap (C2)	51.79	57.92	49.84	50.77	125
44. C180	72.02	73.05	68.47	62.06	105
45. U18	71.31	74.25	67.39	69.77	85
46. INV IGBT	81.14	79.94	70.33	64.38	175
Communication Board					
47. U1	56.44	64.91	54.15	55.26	85
48. U2	52.93	61.38	50.87	51.58	85
49. U3	52.47	61.11	50.38	48.05	85
Inductance Board					
50. L7 Winding	94.52	84.83	88.86	85.97	110
51. L7 Core	70.92	70.68	67.19	70.64	110
52. C81	61.26	64.53	58.14	63.39	105
53. R156	57.45	62.25	54.62	56.21	85
54. RLY24	59.25	62.95	56.33	58.63	85
55. RLY21	75.63	77.20	72.16	75.59	85

EN 62109-1						
Clause	Requirement – Test			Result – Remark		Verdict
56. L9 (N-wire inductance)	51.60	58.55	49.39	50.08	110	
57. T1	59.73	63.32	56.99	57.43	105	
58. L5 winding	81.31	77.58	76.14	80.65	110	
59. L5 core	77.40	75.93	72.82	78.45	110	
Thermocouple Locations	Max. temperature measured (°C)				Max. temperature limit, (°C)	
	9	10	11	12		
Whole Unit						
1. Ambient	54.70	55.26	47.05	55.00	--	
2. Enclosure	54.98	57.65	47.50	55.34	70	
3. Heat sink sheet	67.33	77.48	74.37	70.53	100*	
4. Mounting surface	54.81	57.64	47.40	55.23	70	
5. BAT- Terminal	54.79	57.81	47.70	55.15	125	
6. AC Terminal	54.75	57.51	48.55	55.15	120	
7. Lower Fan	54.93	57.76	47.37	55.31	70	
8. Upper Fan	61.25	62.97	56.63	62.40	70	
9. BAT Enter Bronze	55.41	64.61	60.44	55.72	140	
10. AC Enter Bronze	58.97	62.82	57.93	59.50	140	
11. Handle	54.69	57.31	46.94	55.03	55	
12. DC Relay	76.42	78.31	76.39	76.89	85	
DC EMI Board						
13. Y Cap (C1)	70.84	71.84	69.55	70.80	125	
14. C3	69.70	70.72	68.10	69.81	105	
15. Fuse (F1)	79.98	80.81	82.52	80.02	90	
16. Filter Inductance L1 Core	68.25	67.75	63.07	70.72	110	
17. Filter Inductance L1 Winding	83.67	85.31	89.41	82.42	110	
Detection Board						
18. Optocoupler (U10)	70.46	72.90	67.56	72.09	125	
19. Y Cap (C322)	66.06	68.20	63.20	67.75	125	
20. CT T1	70.11	72.30	66.81	71.78	75	
21. Optocoupler (U63)	68.08	70.37	64.86	69.50	110	
22. C139	62.58	64.72	58.88	64.07	105	
Control Board						
23. U2 (main Chip)	77.83	79.99	74.28	79.33	125	
24. U3 (Slave Chip)	71.44	73.89	68.11	72.91	85	

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

Auxiliary Power Board

25. T1 Skeleton	76.88	84.98	79.49	78.02	110
26. T1 Winding	83.60	84.04	78.39	84.88	110
27. T4 Skeleton	68.90	70.60	64.72	70.05	110
28. T4 Winding	73.49	75.06	69.32	74.01	110
29. Y Cap (C26)	78.01	78.87	73.42	79.28	125
30. C102	70.01	71.36	65.56	71.21	105
31. C54	70.19	79.52	73.57	71.26	85
32. Primary Sink	69.66	70.62	65.27	70.87	100*
33. Secondary Sink	66.36	77.18	71.26	67.09	100*
34. D12	77.76	78.94	73.11	79.05	150
35. C115	68.26	70.07	63.89	69.47	105
36. T2 Skeleton	72.94	75.87	69.76	73.93	110
37. T2 Winding	73.69	76.05	70.51	74.87	110
38. Q3	72.54	74.92	69.16	73.78	150
39. Optocoupler (U8)	73.93	75.08	69.43	75.46	110
40. D49	76.02	77.64	71.96	77.52	150

DC Bus Board

41. Bus Capacitance C31	59.79	61.96	56.79	61.00	105
42. Bus Capacitance C19	63.96	66.17	62.52	65.41	105
43. Y Cap (C2)	56.73	57.92	50.40	57.23	125
44. C180	64.69	73.05	69.86	65.93	105
45. U18	71.60	74.25	69.71	73.75	85
46. INV IGBT	66.00	79.94	64.89	69.05	175

Communication Board

47. U1	61.38	64.91	54.42	61.81	85
48. U2	58.11	61.38	51.13	58.53	85
49. U3	55.64	61.11	50.61	55.98	85

Inductance Board

50. L7 Winding	78.48	84.83	89.49	79.89	110
51. L7 Core	68.78	70.68	68.24	70.02	110
52. C81	62.91	64.53	59.12	63.85	105
53. R156	60.68	62.25	55.48	61.44	85
54. RLY24	61.57	62.95	57.19	62.68	85
55. RLY21	75.70	77.20	73.11	76.83	85

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

56. L9 (N-wire inductance)	56.79	58.55	50.13	57.65	110
57. T1	60.70	63.32	57.72	61.48	105
58. L5 winding	74.89	77.58	77.82	76.65	110
59. L5 core	73.84	75.93	74.49	75.29	110

Note:

*Marked with the hot surface marking of symbol 14 of Annex C.

Test on model TAA-125kW-01

Condition 1: The ambient temperature 45°C, DC input 615V, AC output 230V, the PCS output power with 100% still the parts temperature steady

Condition 2: The ambient temperature 45°C, DC input 950V, AC output 230V, the PCS output power with 100% still the parts temperature steady

Condition 3: The ambient temperature 55°C, DC input 615V, AC output 230V, the PCS output power with 100% still the parts temperature steady

Condition 4: The ambient temperature 55°C, DC input 950V, AC output 230V(L-N), the PCS output power with 100% still the parts temperature steady

Condition 5: The ambient temperature 45°C, AC input 230V, DC output 615V, the PCS output power with 100% still the parts temperature steady

Condition 6: The ambient temperature 55°C, AC input 230V, DC output 615V, the PCS output power with 100% still the parts temperature steady

Test on model TAA-125kW-11

Condition 7: The ambient temperature 45°C, DC input 615V, AC output 230V, the PCS output power with 100% still the parts temperature steady

Condition 8: The ambient temperature 45°C, DC input 950V, AC output 230V, the PCS output power with 100% still the parts temperature steady

Condition 9: The ambient temperature 55°C, DC input 615V, AC output 230V, the PCS output power with 100% still the parts temperature steady

Condition 10: The ambient temperature 55°C, DC input 950V, AC output 230V(L-N), the PCS output power with 100% still the parts temperature steady

Condition 11: The ambient temperature 45°C, AC input 230V, DC output 615V, the PCS output power with 100% still the parts temperature steady

Condition 12: The ambient temperature 55°C, AC input 230V, DC output 615V, the PCS output power with 100% still the parts temperature steady

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

4.4		TABLE: fault condition tests						P
		test voltage (V) :				950		--
		Ambient temperature (°C) :				25		--
No.	com- ponent No.	fault	test voltage (V)	test time	fuse No.	fuse current (A)	result	
Abnormal operation condition								
1.	PCE BAT + and -	S-C	PV 950Vdc Grid 230Vac	5min	--	--	Error message: Battery Voltage undervoltage DC fuse damaged DC contactor damaged PCS out of service No damaged No hazard.	
2.	PCE GRID L and N	S-C	PV 950Vdc Grid 230Vac	5min	--	--	Error message: Battery Voltage undervoltage Modulation operation bus overvoltage Positive and negative bus imbalance fault Grid C phase overvoltage (CA line voltage) Battery voltage overvoltage PCS out of service No damaged No hazard.	
3.	PCE GRID L and PE	S-C	PV 950Vdc Grid 230Vac	5min	--	--	Error message: Battery Voltage undervoltage Modulation operation bus overvoltage Positive and negative bus imbalance fault Grid C phase overvoltage (CA line voltage) Battery voltage overvoltage PCS out of service No damaged No hazard.	
4.	PCE Cooling system failure	Fan locked	PV 950Vdc Grid 230Vac	5min	--	--	Error message: 24V power supply fault PCS out of service No damaged No hazard.	

EN 62109-1							
Clause	Requirement – Test					Result – Remark	Verdict
5.	PCE Cooling system failure	opening blocked	PV 950Vdc Grid 230Vac	5min	--	--	Error message: 24V power supply fault PCS out of service No damaged No hazard.
6.	Cooling failure	Quilt	PV 950Vdc Grid 230Vac	5min	--	--	Error message: PCS working normal and the output power derating No damaged No hazard.
7.	PCE Output	Phase sequence before start up	PV 950Vdc Grid 230Vac	5min	--	--	Error message: Grid A phase undervoltage (AB line voltage) PCS out of service No damaged No hazard.
8.	PCE Output	Phase mis-wiring grid connection	PV 950Vdc Grid 230Vac	5min	--	--	Error message: Grid A phase overvoltage (AB line voltage) PCS out of service No damaged No hazard.
EPCS125-AMM0							
9.	C321	S-C	PV 950Vdc Grid 230Vac	5min	--	--	Error message: 24V power supply fault PCS out of service No damaged No hazard.
10.	C93	S-C	PV 950Vdc Grid 230Vac	5min	--	--	Error message: 24V power supply fault PCS out of service No damaged No hazard.
11.	C24	S-C	PV 950Vdc Grid 230Vac	5min	--	--	Error message: PCS working normal and the output power derating No damaged No hazard

EN 62109-1							
Clause	Requirement – Test					Result – Remark	Verdict
12.	C30	S-C	PV 950Vdc Grid 230Vac	5min	--	--	Error message: PCS working normal and the output power derating ETH communication Exception No damaged No hazard
13.	C244	S-C	PV 950Vdc Grid 230Vac	5min	--	--	Error message: PCS working normal and the output power derating PCS out of service No damaged No hazard
14.	INV_SY NC_T_IS O R591	O-C	PV 950Vdc Grid 230Vac	5min	--	--	Error message: PCS working normal and the output power derating PCS out of service No damaged No hazard
15.	U14 PIN1 to PIN4	S-C	PV 950Vdc Grid 230Vac	5min	--	--	Error message: PCS working normal and the output power derating LED indicator light off ETH communication Exception PCS out of service No damaged No hazard
16.	C29	S-C	PV 950Vdc Grid 230Vac	5min	--	--	Error message: 24V power supply fault PCS out of service No damaged No hazard.
17.	V+_FAN C158	S-C	PV 950Vdc Grid 230Vac	5min	--	--	Error message: 24V power supply fault PCS out of service No damaged No hazard.

EN 62109-1							
Clause	Requirement – Test					Result – Remark	Verdict
18.	C206	S-C	PV 950Vdc Grid 230Vac	5min	--	--	Error message: Positive and negative bus imbalance fault Modulation operation bus undervoltage PCS out of service No damaged No hazard.
19.	DCBUS+ R32	S-C	PV 950Vdc Grid 230Vac	5min	--	--	Error message: Positive and negative bus imbalance fault Modulation operation bus undervoltage PCS out of service No damaged No hazard.
20.	I_BAT R483	S-C	PV 950Vdc Grid 230Vac	5min	--	--	Error message: DC overcurrent Modulation operation bus undervoltage PCS out of service No damaged No hazard.
21.	IL_A C190	S-C	PV 950Vdc Grid 230Vac	5min	--	--	Error message: Grid A phase software overcurrent PCS out of service No damaged No hazard.
22.	R465	S-C	PV 950Vdc Grid 230Vac	5min	--	--	Error message: Grid A phase software overcurrent PCS out of service No damaged No hazard.
23.	15V C38	S-C	PV 950Vdc Grid 230Vac	5min	--	--	Error message: 24V power supply fault PCS out of service No damaged No hazard.
24.	ILA_OCP R446	S-C	PV 950Vdc Grid 230Vac	5min	--	--	Error message: DC pre-charge overcurrent PCS out of service No damaged No hazard.

EN 62109-1							
Clause	Requirement – Test					Result – Remark	Verdict
25.	ILA_OCP R446	O-C	PV 950Vdc Grid 230Vac	5min	--	--	Error message: DC pre-charge overcurrent PCS out of service No damaged No hazard.
26.	VINV_A R538	S-C	PV 950Vdc Grid 230Vac	5min	--	--	Error message: PCS working normal and the output power derating No damaged No hazard
27.	VINV_A R538	O-C	PV 950Vdc Grid 230Vac	5min	--	--	Error message: AC Main Relay Open Circuit Fault PCS out of service No damaged No hazard
28.	C257	S-C	PV 950Vdc Grid 230Vac	5min	--	--	Error message: PCS working normal and the output power derating No damaged No hazard
29.	VG_A R24	S-C	PV 950Vdc Grid 230Vac	5min	--	--	Error message: PCS working normal and the output power derating No damaged No hazard
30.	VG_A R24	O-C	PV 950Vdc Grid 230Vac	5min	--	--	Error message: Grid A phase undervoltage (AB line voltage) PCS out of service No damaged No hazard
31.	C250	S-C	PV 950Vdc Grid 230Vac	5min	--	--	Error message: PCS working normal and the output power derating No damaged No hazard
32.	V_BAT R31	S-C	PV 950Vdc Grid 230Vac	5min	--	--	Error message: PCS working normal and the output power derating No damaged No hazard

EN 62109-1							
Clause	Requirement – Test					Result – Remark	Verdict
33.	V_BAT R31	O-C	PV 950Vdc Grid 230Vac	5min	--	--	Error message: Battery voltage undervoltage PCS out of service No damaged No hazard
34.	C269	S-C	PV 950Vdc Grid 230Vac	5min	--	--	Error message: Battery voltage undervoltage PCS out of service No damaged No hazard
35.	T_L_MA X C217	S-C	PV 950Vdc Grid 230Vac	5min	--	--	Error message: Environment over temperature or inductor over temperature point Modulation operation bus overvoltage PCS out of service No damaged No hazard
36.	T_L_MA X R514	S-C	PV 950Vdc Grid 230Vac	5min	--	--	Error message: System resonance fault PCS out of service No damaged No hazard
37.	IG_A R40	O-C,	PV 950Vdc Grid 230Vac	5min	--	--	Error message: Grid A phase software overcurrent PCS out of service No damaged No hazard
38.	IG_A R40	S-C	PV 950Vdc Grid 230Vac	5min	--	--	Error message: Modulation operation bus overvoltage Battery voltage overvoltage PCS out of service No damaged No hazard
39.	C183	S-C	PV 950Vdc Grid 230Vac	5min	--	--	Error message: System resonance fault PCS out of service No damaged No hazard

EN 62109-1							
Clause	Requirement – Test					Result – Remark	Verdict
40.	VGA_DC R638	O-C	PV 950Vdc Grid 230Vac	5min	--	--	Error message: Positive and negative bus imbalance fault PCS out of service No damaged No hazard
41.	VGA_DC R638	S-C	PV 950Vdc Grid 230Vac	5min	--	--	Error message: System resonance fault PCS out of service No damaged No hazard
42.	C303	S-C	PV 950Vdc Grid 230Vac	5min	--	--	Error message: System resonance fault PCS out of service No damaged No hazard
43.	EX_VIN_ R R691	O-C	PV 950Vdc Grid 230Vac	5min	--	--	Error message: PCS working normal and the output power derating No damaged No hazard
44.	EX_VIN_ R R691	S-C	PV 950Vdc Grid 230Vac	5min	--	--	Error message: PCS working normal and the output power derating No damaged No hazard
45.	EX_VG_ A R633	O-C	PV 950Vdc Grid 230Vac	5min	--	--	Error message: PCS working normal and the output power derating No damaged No hazard
46.	EX_VG_ A R633	S-C	PV 950Vdc Grid 230Vac	5min	--	--	Error message: PCS working normal and the output power derating No damaged No hazard
47.	C265	S-C	PV 950Vdc Grid 230Vac	5min	--	--	Error message: PCS working normal and the output power derating No damaged No hazard

EN 62109-1							
Clause	Requirement – Test					Result – Remark	Verdict
48.	EX_CT_A C315	S-C	PV 950Vdc Grid 230Vac	5min	--	--	Error message: PCS working normal and the output power derating No damaged No hazard
49.	C279	S-C	PV 950Vdc Grid 230Vac	5min	--	--	Error message: PCS working normal and the output power derating No damaged No hazard
50.	I_BALANCE R860	O-C	PV 950Vdc Grid 230Vac	5min	--	--	Error message: PCS working normal and the output power derating No damaged No hazard
51.	I_BALANCE R860	S-C	PV 950Vdc Grid 230Vac	5min	--	--	Error message: PCS working normal and the output power derating No damaged No hazard
52.	C344	S-C	PV 950Vdc Grid 230Vac	5min	--	--	Error message: PCS working normal and the output power derating No damaged No hazard
53.	C362	S-C	PV 950Vdc Grid 230Vac	5min	--	--	Error message: Balance module software overcurrent PCS out of service No damaged No hazard
54.	T_BALANCE R824	O-C	PV 950Vdc Grid 230Vac	5min	--	--	Error message: PCS working normal and the output power derating No damaged No hazard
55.	T_BALANCE R824	S-C	PV 950Vdc Grid 230Vac	5min	--	--	Error message: PCS working normal and the output power derating No damaged No hazard

EN 62109-1							
Clause	Requirement – Test					Result – Remark	Verdict
56.	C286	S-C	PV 950Vdc Grid 230Vac	5min	--	--	Error message: 24V power supply fault PCS out of service No damaged No hazard
57.	C27	S-C	PV 950Vdc Grid 230Vac	5min	--	--	Error message: PCS working normal and the output power derating No damaged No hazard
58.	C288	S-C	PV 950Vdc Grid 230Vac	5min	--	--	Error message: 24V power supply fault PCS out of service No damaged No hazard
59.	C290	S-C	PV 950Vdc Grid 230Vac	5min	--	--	Error message: 24V power supply fault PCS out of service No damaged No hazard
60.	C274	S-C	PV 950Vdc Grid 230Vac	5min	--	--	Error message: 24V power supply fault PCS out of service No damaged No hazard
61.	V_ISO R868	S-C	PV 950Vdc Grid 230Vac	5min	--	--	Error message: PCS working normal and the output power derating No damaged No hazard
62.	V_ISO R868	O-C	PV 950Vdc Grid 230Vac	5min	--	--	Error message: PCS working normal and the output power derating No damaged No hazard
63.	C370	S-C	PV 950Vdc Grid 230Vac	5min	--	--	Error message: PCS working normal and the output power derating No damaged No hazard

EN 62109-1							
Clause	Requirement – Test					Result – Remark	Verdict
64.	C370	S-C	PV 950Vdc Grid 230Vac	5min	--	--	Error message: PCS working normal and the output power derating No damaged No hazard
65.	C367	S-C	PV 950Vdc Grid 230Vac	5min	--	--	Error message: PCS working normal and the output power derating No damaged No hazard
EPCS125-AMM1							
66.	BUS C28	S-C	PV 950Vdc Grid 230Vac	5min	--	--	Error message: IGBT hardware overcurrent PCS out of service IGBT failure No hazard
67.	DCBUS+ R131	O-C	PV 950Vdc Grid 230Vac	5min	--	--	Error message: Positive and negative bus imbalance fault Modulation operation bus undervoltage PCS out of service No damaged No hazard
68.	DCBUS+ R131	S-C	PV 950Vdc Grid 230Vac	5min	--	--	Error message: Modulation operation bus overvoltage PCS out of service No damaged No hazard
69.	C205	S-C	PV 950Vdc Grid 230Vac	5min	--	--	Error message: IGBT hardware overcurrent PCS out of service IGBT failure No hazard
70.	C160	S-C	PV 950Vdc Grid 230Vac	5min	--	--	Error message: IGBT hardware overcurrent PCS out of service IGBT failure No hazard

EN 62109-1							
Clause	Requirement – Test					Result – Remark	Verdict
71.	C87	S-C	PV 950Vdc Grid 230Vac	5min	--	--	Error message: IGBT hardware overcurrent PCS out of service IGBT failure No hazard
72.	R189	S-C	PV 950Vdc Grid 230Vac	5min	--	--	Error message: IGBT module over temperature PCS out of service No damaged No hazard
73.	C187	S-C	PV 950Vdc Grid 230Vac	5min	--	--	Error message: IGBT hardware overcurrent PCS out of service IGBT failure No hazard
74.	Q2 PIN1 to PIN2	S-C	PV 950Vdc Grid 230Vac	5min	--	--	Error message: 24V power supply fault PCS out of service Q2 failure No hazard
75.	Q2 PIN1 to PIN3	S-C	PV 950Vdc Grid 230Vac	5min	--	--	Error message: 24V power supply fault PCS out of service Q2 failure No hazard
76.	Q2 PIN3 to PIN2	S-C	PV 950Vdc Grid 230Vac	5min	--	--	Error message: 24V power supply fault PCS out of service Q2 failure No hazard Q2 damaged
EPCS125-AMM2							
77.	C89	S-C	PV 950Vdc Grid 230Vac	5min	--	--	Error message: DC overcurrent PCS out of service The fuse is damaged No hazard

EN 62109-1							
Clause	Requirement – Test					Result – Remark	Verdict
78.	C38	S-C	PV 950Vdc Grid 230Vac	5min	--	--	Error message: DC overcurrent PCS out of service The fuse is damaged No hazard
79.	Vin_R R69	O-C	PV 950Vdc Grid 230Vac	5min	--	--	Error message: Grid A phase undervoltage (AB line voltage) Modulation operation bus overvoltage Positive and negative bus imbalance fault PCS out of service No damaged No hazard
80.	Vin_R R69	S-C	PV 950Vdc Grid 230Vac	5min	--	--	Error message: Grid A phase overvoltage (AB line voltage) PCS out of service No damaged No hazard
81.	N_Vin_R R75	O-C	PV 950Vdc Grid 230Vac	5min	--	--	Error message: Modulation operation bus overvoltage PCS out of service No damaged No hazard
82.	N_Vin_R R75	S-C	PV 950Vdc Grid 230Vac	5min	--	--	Error message: PCS working normal and the output power derating No damaged No hazard
83.	VG_DC_ R R159	O-C	PV 950Vdc Grid 230Vac	5min	--	--	Error message: PCS working normal and the output power derating No damaged No hazard
84.	VG_DC_ R R159	S-C	PV 950Vdc Grid 230Vac	5min	--	--	Error message: PCS working normal and the output power derating No damaged No hazard

EN 62109-1							
Clause	Requirement – Test					Result – Remark	Verdict
85.	VINV_R R134	O-C	PV 950Vdc Grid 230Vac	5min	--	--	Error message: DC main relay open circuit fault Modulation operation bus overvoltage PCS out of service No damaged No hazard
86.	VINV_R R134	S-C	PV 950Vdc Grid 230Vac	5min	--	--	Error message: DC main relay open circuit fault Modulation operation bus overvoltage PCS out of service No damaged No hazard
87.	A phase RLY3	S-C before starting	PV 950Vdc Grid 230Vac	5min	--	--	Error message: AC main relay sticking fault The PCS will not start No damaged
88.	A phase RLY22	S-C before starting	PV 950Vdc Grid 230Vac	5min	--	--	Error message: AC main relay sticking fault The PCS will not start No damaged No hazard
89.	B phase RLY5	S-C before starting	PV 950Vdc Grid 230Vac	5min	--	--	Error message: AC main relay sticking fault The PCS will not start No damaged No hazard
90.	B phase RLY20	S-C before starting	PV 950Vdc Grid 230Vac	5min	--	--	Error message: AC main relay sticking fault The PCS will not start No damaged No hazard
91.	C phase RLY21	S-C before starting	PV 950Vdc Grid 230Vac	5min	--	--	Error message: AC main relay sticking fault The PCS will not start No damaged No hazard
92.	C phase RLY18	S-C before starting	PV 950Vdc Grid 230Vac	5min	--	--	Error message: AC main relay sticking fault The PCS will not start No damaged No hazard

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Clause	Requirement – Test					Result – Remark	Verdict
93.	N phase RLY23	S-C before starting	PV 950Vdc Grid 230Vac	5min	--	--	Error message: AC main relay sticking fault The PCS will not start No damaged No hazard
94.	N phase RLY19	S-C before starting	PV 950Vdc Grid 230Vac	5min	--	--	Error message: AC main relay sticking fault The PCS will not start No damaged No hazard
EPCS125-AMM3							
95.	R17	S-C	PV 950Vdc Grid 230Vac	5min	--	--	Error message: Battery voltage overvoltage Modulation operation bus overvoltage PCS out of service No damaged No hazard
96.	R17	O-C	PV 950Vdc Grid 230Vac	5min	--	--	Error message: Battery voltage overvoltage Modulation operation bus overvoltage PCS out of service No damaged No hazard
97.	R48	S-C	PV 950Vdc Grid 230Vac	5min	--	--	Error message: PCS working normal and the output power derating No damaged No hazard
98.	R48	O-C	PV 950Vdc Grid 230Vac	5min	--	--	Error message: PCS working normal and the output power derating No damaged No hazard
EPCS125-AMM4							
99.	C103	S-C	PV 950Vdc Grid 230Vac	5min	--	--	Error message: IGBT hardware overcurrent PCS out of service IGBT failure No hazard

EN 62109-1							
Clause	Requirement – Test					Result – Remark	Verdict
100	R148	S-C	PV 950Vdc Grid 230Vac	5min	--	--	Error message: PCS working normal and the output power derating No damaged No hazard
101	C72	S-C	PV 950Vdc Grid 230Vac	5min	--	--	Error message: 24V power supply fault PCS out of service No damaged No hazard
102	C68	S-C	PV 950Vdc Grid 230Vac	5min	--	--	Error message: PCS working normal and the output power derating No damaged No hazard
103	C66	S-C	PV 950Vdc Grid 230Vac	5min	--	--	Error message: 24V power supply fault PCS out of service No damaged No hazard
104	Q5 PIN1 to 2	S-C	PV 950Vdc Grid 230Vac	5min	--	--	Error message: 24V power supply fault PCS out of service Q5 failure No hazard
105	Q5 PIN1 to 3	S-C	PV 950Vdc Grid 230Vac	5min	--	--	Error message: 24V power supply fault PCS out of service Q5 failure No hazard
106	Q5 PIN3 to 2	S-C	PV 950Vdc Grid 230Vac	5min	--	--	Error message: 24V power supply fault PCS out of service Q5 failure No hazard
107	C117	S-C	PV 950Vdc Grid 230Vac	5min	--	--	Error message: 24V power supply fault PCS out of service No damaged No hazard

EN 62109-1							
Clause	Requirement – Test					Result – Remark	Verdict
108	C115	S-C	PV 950Vdc Grid 230Vac	5min	--	--	Error message: 24V power supply fault PCS out of service No damaged No hazard
109	C118	S-C	PV 950Vdc Grid 230Vac	5min	--	--	Error message: 24V power supply fault PCS out of service No damaged No hazard
EPCS100-AMU2B							
110	F2	S-C	PV 950Vdc Grid 230Vac	5min	--	--	Error message: PCS working normal and the output power derating No damaged No hazard
111	C334	S-C	PV 950Vdc Grid 230Vac	5min	--	--	Error message: PCS working normal and the output power derating ETH communication Exception No damaged No hazard
112	Y2	S-C	PV 950Vdc Grid 230Vac	5min	--	--	Error message: PCS working normal and the output power derating ETH communication Exception No damaged No hazard
113	C324	S-C	PV 950Vdc Grid 230Vac	5min	--	--	Error message: PCS working normal and the output power derating ETH communication Exception No damaged No hazard
114	C328	S-C	PV 950Vdc Grid 230Vac	5min	--	--	Error message: PCS working normal and the output power derating ETH communication Exception No damaged No hazard

EN 62109-1							
Clause	Requirement – Test					Result – Remark	Verdict
115	Y3	S-C	PV 950Vdc Grid 230Vac	5min	--	--	Error message: PCS working normal and the output power derating ETH communication Exception No damaged No hazard
EBTS240U1							
116	C1	S-C	PV 950Vdc Grid 230Vac	5min	--	--	Error message: 24V power supply fault The external indicator blinks red No damaged No hazard
117	Y2	S-C	PV 950Vdc Grid 230Vac	5min	--	--	Error message: 24V power supply fault No damaged No hazard
118	C31	S-C	PV 950Vdc Grid 230Vac	5min	--	--	Error message: 24V power supply fault No damaged No hazard
119	Y1	S-C	PV 950Vdc Grid 230Vac	5min	--	--	Error message: 24V power supply fault No damaged No hazard
Note(s): S-C: short-circuited, O-C: open-circuited, O-L: overload.							

7.3.6.3.3	TABLE: protective equipotential bonding				N/A
Measured between:		Test current (A)	Voltage drop (V)	Resistance (mΩ)	result
--		--	--	--	--
supplementary information:					

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

7.3.6.3.7	TABLE: touch current measurement			P
Measured between:	Measured (mA)	Limit (mA)	Comments/conditions	
Metal enclosure to PE terminal	AC 2.710/ DC 2.720	AC 3.5/ DC 10	--	
Communication terminal to PE terminal	AC 0.186/ DC 0.202	AC 3.5/ DC 10	--	
Supplementary information:				

7.3.7	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)	
Auxiliary Power Board							
T1 pri. to sec. (BI)	950Vdc	230Vac	4.4	32.3	4.8	32.3	
C26 pri. to sec. (BI)	950Vdc	230Vac	4.4	8.9	4.8	8.9	
C54 to C50 (BI)	950Vdc	230Vac	4.4	7.4	4.8	7.4	
J18 pin10 to pin11 (SI)	950Vdc	230Vac	4.4	6.4	4.8	6.4	
T4 pri. to sec. (SI)	950Vdc	230Vac	4.4	12.9	4.8	12.9	
T4 pin9 to pin11 (SI)	950Vdc	230Vac	4.4	6.3	4.8	6.3	
C115 to C114 (SI)	950Vdc	230Vac	4.4	5.0	4.8	5.0	
C71, C68 (BI)	950Vdc	230Vac	4.4	8.1	4.8	8.1	
C139, C140 (BI)	950Vdc	230Vac	4.4	8.1	4.8	8.1	
RLY1 to PE (BI)	950Vdc	230Vac	4.4	6.4	4.8	6.4	
D57 to PE (BI)	950Vdc	230Vac	4.4	7.5	4.8	7.5	
J19 to PE (BI)	950Vdc	230Vac	4.4	7.6	4.8	7.6	
R103 to PE (BI)	950Vdc	230Vac	4.4	7.0	4.8	7.0	
U6 (BI)	950Vdc	230Vac	4.4	6.5	4.8	9.8	
C139 to R202 (RI)	950Vdc	230Vac	7.6	8.1	9.6	10.2	
Detection Board							
J4 pin7 to pin9 (SI)	950Vdc	230Vac	4.4	5.4	4.8	5.4	
J7 to J27 (SI)	950Vdc	230Vac	4.4	7.6	4.8	7.6	
R767 to R697 (SI)	950Vdc	230Vac	4.4	10.2	4.8	10.2	
T2 (SI)	950Vdc	230Vac	4.4	6.6	4.8	6.6	
R1002 to D47 (BI)	950Vdc	230Vac	4.4	10.0	4.8	10.0	

EN 62109-1						
Clause	Requirement – Test			Result – Remark		Verdict
C322 (BI)	950Vdc	230Vac	4.4	8.5	4.8	8.5
C87 to C158 (BI)	950Vdc	230Vac	4.4	8.9	4.8	8.9
U23, U25, U24, U17, U63, U14 U27, U19, U15, U18, U20, U21, U16 (SI)	950Vdc	230Vac	4.4	6.5	4.8	9.8
U62 (SI)	950Vdc	230Vac	4.4	7.6	4.8	9.8
U9, U10,U11 (SI)	950Vdc	230Vac	4.4	7.4	4.8	10.1
C138 to PE (BI)	950Vdc	230Vac	4.4	7.6	4.8	7.6
C306 to PE (BI)	950Vdc	230Vac	4.4	6.5	4.8	6.5
C139 to PE (BI)	950Vdc	230Vac	4.4	7.8	4.8	7.8
C322 to PE (BI)	950Vdc	230Vac	4.4	7.7	4.8	7.7
C869 to PE (BI)	950Vdc	230Vac	4.4	7.1	4.8	7.1
J19 to PE (BI)	950Vdc	230Vac	4.4	12.1	4.8	12.1
DC Filter Board						
BAT-_FIL (BI)	950Vdc	230Vac	4.4	7.6	4.8	7.6
BUS- to PE (BI)	950Vdc	230Vac	4.4	13.4	4.8	13.4
C4 to PE (BI)	950Vdc	230Vac	4.4	8.4	4.8	8.4
C2 to PE (BI)	950Vdc	230Vac	4.4	8.4	4.8	8.4
Whole Board						
L to L (BI)	950Vdc	230Vac	4.4	39.2	9.5	39.2
L to N (FI)	950Vdc	230Vac	4.4	39.2	9.5	39.2
Bus Capacitor Board						
C2 to PE (BI)	950Vdc	230Vac	4.4	7.6	4.8	7.6
J31 to PE (BI)	950Vdc	230Vac	4.4	9.9	4.8	9.9
C1 to PE (BI)	950Vdc	230Vac	4.4	7.6	4.8	7.6
R131 to PE (BI)	950Vdc	230Vac	4.4	13.5	4.8	13.5
J25 to PE (BI)	950Vdc	230Vac	4.4	8.4	4.8	8.4
J1 to PE (BI)	950Vdc	230Vac	4.4	9.2	4.8	9.2
C77 to PE (BI)	950Vdc	230Vac	4.4	9.9	4.8	9.9
C24 to PE (BI)	950Vdc	230Vac	4.4	5.1	4.8	5.1
C22 to PE (BI)	950Vdc	230Vac	4.4	5.1	4.8	5.1
Inductance Board						
L3 to H17 (BI)	950Vdc	230Vac	4.4	7.0	4.8	7.0
L1 to H2 (BI)	950Vdc	230Vac	4.4	7.0	4.8	7.0
L2 to H10 (BI)	950Vdc	230Vac	4.4	8.4	4.8	8.4
L6 to H15 (BI)	950Vdc	230Vac	4.4	7.4	4.8	7.4

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Clause	Requirement – Test			Result – Remark		Verdict
L6 to H5 (BI)	950Vdc	230Vac	4.4	8.3	4.8	8.3
RLY11 to H8 (BI)	950Vdc	230Vac	4.4	11.1	4.8	11.1
R2 to H9 (BI)	950Vdc	230Vac	4.4	5.0	4.8	5.0
R130 to H21 (BI)	950Vdc	230Vac	4.4	4.9	4.8	4.9
C68 to H14 (BI)	950Vdc	230Vac	4.4	9.8	4.8	9.8
C88 to H12(BI)	950Vdc	230Vac	4.4	5.8	4.8	5.8
J41 to H13 (BI)	950Vdc	230Vac	4.4	9.5	4.8	9.5
L9 to H1 (BI)	950Vdc	230Vac	4.4	6.5	4.8	6.5
R150 to H6 (BI)	950Vdc	230Vac	4.4	5.2	4.8	5.2
R4 to H4 (BI)	950Vdc	230Vac	4.4	5.0	4.8	5.0
C91 to H11 (BI)	950Vdc	230Vac	4.4	5.0	4.8	5.0
R60 to H19 (BI)	950Vdc	230Vac	4.4	7.4	4.8	7.4
RLY20 to H16 (BI)	950Vdc	230Vac	4.4	10.5	4.8	10.5
J31 to H18 (BI)	950Vdc	230Vac	4.4	6.9	4.8	6.9
Note(s): * FI=functional insulation, BI=basic insulation, SI=supplementary insulation, RI=reinforced insulation. When determine the clearance: For DC input circuits: Overvoltage Category II applied (impulse withstand voltage 4310V) For AC output circuits (connected to AC mains): Overvoltage Category III applied (impulse withstand voltage 4000V, temporary overvoltage 2120Vpeak considered.) Interpolation is used. Due to the max. altitude is 4000m, limit of clearance by the correction factor 1.29 considered. Requirement about creepage distances for transformer and for the distance to the metal enclosure come from columns 7 and 8 of Table 14. Requirement about creepage distances for part on PWB come from column 3 of table 14. PCB with min. CTI 175 used.						

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

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	
BAT supply circuits to enclosure: BI	2120dc	7385	--	P	
AC mains to enclosure: BI	2120dc	7385	--	P	
BAT supply circuits to LCD Panel: RI	4240dc	9847	--	P	
AC mains to LCD Panel: RI	4240dc	9847	--	P	
BAT supply circuits to COM port: RI	4240dc	9847	--	P	
AC mains to COM port: RI	4240dc	9847	--	P	
Note(s): Test is carried out at sea level, the test voltage is considered with the altitude factor.					

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

14	TABLE: Critical components information					P
object/part No.	manufacturer/ trademark	type/model	technical data	Standard	mark(s) of conformity1)	
General						
Metal Enclosure	Shenzhen Enjoy Technology Co.,Ltd.	21011194	material:Aluminum-zinc coated plate Aluminium size:90×520×232mm thickness:1.2mm	EN 62109-1 EN 62109-2 EN 62477-1	Tested with Appliance	
Heat sink	Shenzhen Huajin Precision Hardware Co., Ltd.	63169052	material:Aluminium alloy 1060 Aluminium size:496×145×110mm thickness:1.2mm	EN 62109-1 EN 62109-2 EN 62477-1	Tested with Appliance	
DC+ Input terminal	Phoenix Contact Asia-Pacific(Nanjing) Co.,Ltd.	BPC-B/S 35-70 OG	IP65 1500V DC 250A, -40℃-125℃	PPP51090A:2018	TUV SUD No.Z207702 60023 Rev.03	
alternative	Weidmuller Interface (Shanghai) Co., Ltd.	NWBC-P-10OR-70	IP67、1500VDC、 250A、-40℃-+125℃	PPP 51090B:2023	TUV SUD No.Z207601 50052Rev.00	
DC- Input terminal	Phoenix Contact Asia-Pacific(Nanjing) Co.,Ltd.	BPC-B/S 35-70 BK	IP65 1500V DC 250A, -40℃-125℃	PPP51090A:2018	TUV SUD No.Z207702 60023 Rev.03	
alternative	Dongguan dekl Electronics Co.,Ltd.	DW150-03-01-C	AC600V 300A -40℃-120℃	EN60947-7-1:2009 EN 60947-1:2007/A2:2014	TUV SUD No.N8A1175 900002 Rev.00	
alternative	Weidmuller Interface (Shanghai) Co., Ltd.	NWBC-P-10BK-70	IP67、1500VDC、 250A、-40℃-+125℃	PPP 51090B:2023	TUV SUD No.Z207601 50052Rev.00	
Output terminal	Dongguan dekl Electronics Co.,Ltd.	DW150-04-01-C	600VAC 300A 40℃to+120℃	EN60947-7-1:2009 EN 60947-1:2007/A2:2014	TUV SUD No.N8A1175 900002 Rev.00	
Communication terminal	DONGGUAN TERMINAL ELECTRONIC TECHNOLOGY CO LTD	CHH 1.5-10-3.81-03V	IP20 -40℃to+105℃	UL 1059	UL E346560	
DC Contactor	TDK ELECTRONICS (MALAYSIA) SDN BHD	B88269X6410C011A2	1000Vdc 250A -40℃to+85℃	IEC 6180-1-2015 IEC6180-1:2015/AMD2019 IEC60664-1:2020	TUV SUD No.N8A0685 630005 Rev.00	

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

14	TABLE: Critical components information					P
object/part No.	manufacturer/ trademark	type/model	technical data	Standard	mark(s) of conformity ¹⁾	
Output current transducer(H LA,HLB,HLC)	Nanjing Zhongxu Electronic Technology Co., Ltd;	HDC-500BS-ZJ	500A -40°C to +85°C	EN 62109-1 EN 62109-2 EN 62477-1	Tested with Appliance	
M0,sampling board						
Isolated opto-coupler (U14,U15,U16,U17,U18,U19,U20,U21,U22,U23,U24,U25,U26,U27,U63)	LITE-ON Technology Corp.	LTV-816S-TA1(C)	5mA, 5000Va.c. -55°C to +110°C cl, cr: ≥ 7mm	EN IEC 60747-5-5 (VDE 0884-5):2021-10; EN IEC 60747-5-5:2020	VDE 40015248	
alternative	Renesas Electronics Corporation	PS2561L-1-V-F3-A/L	5mA, 5000Va.c. -55°C to +100°C cl, cr: ≥ 7mm	IEC 60747-5-5	VDE 40008862	
alternative	Everlight Electronics Co., Ltd.	EL816S1(C)(TA)	5mA, 5000Va.c. -55°C to +110°C cl, cr: ≥ 7mm	IEC 60747-5-5	VDE 132249	
Isolated opto-coupler (U9,U10,U11)	analog devices, inc.	ADUM1402BRWZ-RL	5000V -40°C to +105°C cl, cr: ≥ 7mm	EN IEC 60747-17 (VDE 0884-17):2021-10; EN IEC 60747-17:2020+AC:2021	VDE 133860	
alternative	Suzhou Novosense Microelectronics Co	NSi8242W1-DSWR	5000V -55°C to +125°C cl, cr: ≥ 7mm	EN IEC 60747-17 (VDE 0884-17):2021-10; EN IEC 60747-17:2020+AC:2021	VDE 40052820	
alternative	Skyworks Solutions, Inc.	Si8642BB-B-IS	5000V -40°C to +125°C cl, cr: ≥ 7mm	EN IEC 60747-17 (VDE 0884-17):2021-10; EN IEC 60747-17:2020+AC:2021	VDE 40018443	
alternative	Texas Instruments Deutschland GmbH	ISO7242CDWR	4000V -40°C to +125°C cl, cr: ≥ 7mm	EN IEC 60747-17 (VDE 0884-17):2021-10; EN IEC 60747-17:2020+AC:2021	VDE 40047657	
alternative	Shanghai Chipanalog Microelectronics Co., Ltd.	CA-IS3742HW	5000V -40°C to +125°C cl, cr: ≥ 7mm	IEC 60747-17 (VDE 0884-17):2021-10; EN IEC 60747-	VDE 40052786	

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

14	TABLE: Critical components information					P
object/part No.	manufacturer/ trademark	type/model	technical data	Standard	mark(s) of conformity1)	
				17:2020+AC:2021		
Optocoupler (U32)	LITE-ON Technology Corp.	LTV-816S-TA1(C)	5mA, 5000Va.c. -55℃ to 110℃ cl, cr: ≥ 7mm	EN IEC 60747-5-5 (VDE 0884-5):2021-10; EN IEC 60747-5-5:2020	VDE 40015248	
alternative	Renesas Electronics Corporation	PS2561L-1-V-F3-A/L	5mA, 5000Va.c. -55℃ to 100℃ cl, cr: ≥ 7mm	IEC 60747-5-5	VDE 40008862	
alternative	Everlight Electronics Co., Ltd.	EL816S1(C)(TA)	5mA, 5000Va.c.; -55℃ to 110℃ cl, cr: ≥ 7mm	IEC 60747-5-5	VDE 132249	
PCB	GUANZHOU KUANGSHUN PHOTSENSITIVE MATERIAL CO. LTD.	EPCS125-AMM0	130℃, V-0 CTI >175	UL 94	UL E189612	
alternative	SHENGYI TECHNOLOGY CO. LTD.	EPCS125-AMM0	130℃, V-0 CTI >175	UL 94	UL E109769	
alternative	SHEN ZHEN SUN&LYNN CIRCUITS CO. LTD.	EPCS125-AMM0	130℃, V-0 CTI >175	UL 94	UL E234156	
M1, convert power board						
BUS CAP (C19,C20,C21,C22,C23,C24,C25,C26,C27,C28,C29,C30,C31,C32,C33,C34,C35,C36,C38,C45,C161,C168,C169,C170)	Nantong Jianghai Capacitor Co.,LTD	ECS2HBW821ML M350070	820μF,500V -25℃to+105℃	UL 810	UL E355297	
alternative	SHEN ZHEN JIANG HAO ELECTRONICS CO.,LTD	CD289B	820μF,500V -25℃to+105℃	EN 62109-1 EN 62109-2 EN 62477-1	Tested with Appliance	
BUS absorb cap(C74,C75,C76,C77,C78,C79)	XIAMEN FARATRONIC CO LTD	C302J105K06C000	630Vd.c.,1uF -40℃to85℃	EN 62109-1 EN 62109-2 EN 62477-1	Tested with Appliance	
alternative	Dongguan Hongyuan	HMPT630W10K0O425	630Vd.c.,1uF -40℃to85℃	EN 62109-1 EN 62109-2	Tested with Appliance	

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

14	TABLE: Critical components information					P
object/part No.	manufacturer/ trademark	type/model	technical data	Standard	mark(s) of conformity ¹⁾	
	Electronics Co., Ltd			EN 62477-1		
Input Bostr cap (C179,C180, C181,C182,C183,C184)	XIAMEN FARATRONIC CO LTD	C3D1U406KF0A3 82	40µF,600V DC -40°C~105°C	EN61071:2007 EN61881-1:2011	TUV RH R50266108	
Y-CAP (C1,C2)	Shanxi Huaxing Electronics Group Co., Ltd;	CT7-2F4-400VAC-472M	4700pf,400VAC, -25°C to +105°C Y1	EN 60384-14:2013/A1:2016 IEC 60384-14:2013 IEC 60384-14:2013/AMD1:2016	VDE 40015542	
PCB	GUANZHOU KUANGSHUN PHOTSENSITI VTY MATERIAL CO. LTD.	EPCS125-AMM1	130°C, V-0 CTI >175	UL 94	UL E189612	
alternative	SHENGYI TECHNOLOGY CO. LTD.	EPCS125-AMM1	130°C, V-0 CTI >175	UL 94	UL E109769	
alternative	SHEN ZHEN SUN&LYNN CIRCUITS CO. LTE.	EPCS125-AMM1	130°C, V-0 CTI >175	UL 94	UL E234156	
Isolated opto-coupler (U1,U3)	ON Semiconductor (Fairchild Semiconductor Pte Ltd.)	FOD3150A	2A,5000Va.c. -55°C to +100°C cl, cr: ≥ 7mm	EN/IEC 60747-5-5	VDE 40018398	
alternative	oshiba Electronic Devices & Storage Corporation	TLP350(LF1,TP1)	5A,5000Va.c. -40°C to +125°C cl, cr: ≥7mm	EN IEC 60747-5-5 (VDE 0884-5):2021-10; EN IEC 60747-5-5:202	VDE 40011913	
alternative	Suzhou Novosense Microelectronic s Co	NSI6801TC-DDBR	5A,5000Va.c. -40°C to +125°C cl, cr: ≥7mm	EN IEC 60747-17 (VDE 0884-17):2021-10; EN IEC 60747-17:2020+AC:2021	VDE 40057024	
IGBT (U11,U12,U13,U14,U15,U16)	nfineon Technologies AG	F3L200R07W2S5 F_B11	650V 200A -40°C to +175°C	UL1557	UL E83335	

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

14	TABLE: Critical components information					P
object/part No.	manufacturer/ trademark	type/model	technical data	Standard	mark(s) of conformity ¹⁾	
alternative	MACMIC SCIENCE & TECHNOLOGY CO LTD	MMG200CE065P D6T5	650V 200A -40°C to +175°C	UL 1557	UL E332185	
alternative	WeEn Semiconductor s Co Ltd.	WMG150N07B2P	650V 200A -40°C to +175°C	EN 62109-1 EN 62109-2 EN 62477-1	Tested with Appliance	
alternative	WeEn Semiconductor s Co Ltd.	WMHG150N07B2P	650V 200A -40°C to +175°C	EN 62109-1 EN 62109-2 EN 62477-1	Tested with Appliance	
M2 AC/DC power board						
AC fuse (F3,F4,F5)	NANRONG ELECTRIC INDUSTRIAL (HK) LIMITED	HBD250-LMT	DC150V/AC240V-250A- AC100KA/DC50KA -40°C to +120°C	UL248	UL E496054	
fuse- (F1)	Littelfuse Inc.	0324030.MXP	250VAC-30A -55°C to +125°C	EN 60127-7:2016 EN 60127-1:2006+A1+A2	TUV RH J 50440217	
alternative	SHENZHEN VICTORS INDUSTRIAL CO LTD	VF324-30A250V	250VAC-30A -40°C to +125°C	UL248	UL E343461	
alternative	NANRONG ELECTRIC INDUSTRIAL (HK) LIMITED	HDP600 30A250V A	250VAC-30A -40°C to +120°C	UL248	UL E343461	
DC input internal wire	Shenzhen Enjoy Technology Co.,Ltd.	EPCS125-AM-F1-03T	240A 140°C 20*3mm	EN 62109-1 EN 62109-2 EN 62477-1	Tested with Appliance	
AC output internal wire	Shenzhen Enjoy Technology Co.,Ltd.	EPCS125-AM-F1-03	240A 140°C 20*3mm	EN 62109-1 EN 62109-2 EN 62477-1	Tested with Appliance	
Internal wire to input Boost inductor	Shenzhen Enjoy Technology Co.,Ltd.	EPCS125-AM-F-TZ-01	260A 140°C Diameter:Φ10mm High:128mm	EN 62109-1 EN 62109-2 EN 62477-1	Tested with Appliance	
Internal wire to output inductor	Shenzhen Enjoy Technology Co.,Ltd.	EPCS125-AM-F-TZ-01	260A 140°C Diameter:Φ10mm High:128mm	EN 62109-1 EN 62109-2 EN 62477-1	Tested with Appliance	
Input Varistor (R147,R149, R155,R156)	THINKING ELECTRONIC INDUSTRIAL CO., LTD.	TVR20102KSY	625VAC/825VDC 5000A -40°C to +85°C	IEC61051-1:2007-04/IEC61051-2:1991	VDE 005944	

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

14	TABLE: Critical components information					P
object/part No.	manufacturer/ trademark	type/model	technical data	Standard	mark(s) of conformity ¹⁾	
				IEC 61051-2:1991		
alternative	Guangdong Fenghua Advanced Technology Holding Co Ltd. Xianhua New Sensitive Components Branch	FNR-20K102	625VAC/825VDC 6500A 40°C to+105°C	IEC61051	VDE 40008242	
alternative	Shanxi Huaxing Electronics Group Co., Ltd;	MYG20G20K102	625VAC/825VDC 6500A -40°C to+105°C	IEC 61051-2:1991 IEC 61051-2:1991 IEC 61051-1:2007 DIN EN 61051-1:2009 IEC 61051-2(ed.1);am1:2009-05	VDE 40018747	
Y-Cap (C85,C86,C87,C88.C64 C66 C68 C70)	Shanxi Huaxing Electronics Group Co., Ltd;	CT7-2F4-400VAC-472M	4700pf,400VAC, -25°C to+105°C Y1	EN 60384-14:2013/A1:2016 IEC 60384-14:2013 IEC 60384-14:2013/AMD1:2016	VDE 40015542	
X-cap (C38,C40,C42,C46,C51,C52)	XIAMEN FARATRONIC CO LTD	C42Q2155M91C380	1.5µF,305Vac/275V/ac Operation Temperature: -25°C to+110°C X2	DIN EN 60384-14 (VDE 0565-1-1):2014-04; EN 60384-14:2013-08 IEC 60384-14:2013 IEC 60384-14:2013/AMD1:2016 DIN EN 60384-14/A1 (VDE 0565-1-1/A1):2017-04; EN 60384-14:2013/A1:2016	VDE 40000358	
Boost inductor (L4 L5 L6)	HUIZHOU MP NEWENRGY T	MP80H2-1930-L	Class B 130°C	EN 62109-1 EN 62109-2 EN 62477-1	Tested with Appliance	

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

14	TABLE: Critical components information					P
object/part No.	manufacturer/ trademark	type/model	technical data	Standard	mark(s) of conformity ¹⁾	
	ECHNOLOGY CO.LTD					
-Wire	FUZHOU DARTONG M&ECO,LTD.	AIW/ 2.0*8mm	180℃	UL1446	UL E142051	
-alternative	TAI-I COPPER (GUANZHOU) COLTD.	AIW/ 2.0*8mm	180℃	UL1446	UL E234896	
-Tape	POCO Holding Co.,LED	AF778040*2P	130℃	EN 62109-1 EN 62109-2 EN 62477-1	Tested with Appliance	
alternative	ACYC(HUIZHOU)MAGNETIC COMPNENT CO;LTD	AF778040*2P	130℃	EN 62109-1 EN 62109-2 EN 62477-1	Tested with Appliance	
alternative	ACYC(HUIZHOU)MAGNETIC COMPNENT CO;LTD	AF778040*2P	130℃	EN 62109-1 EN 62109-2 EN 62477-1	Tested with Appliance	
-BASE	KINGBOARD LAMINATES HOLDINGS LTD	FR4 130℃	130℃	UL 94 UL746	UL E123995	
-TUBE	DONGGUAN LING FREE HARDWARE PLASTICSPRODUCT CO LTD	LFGS-4	200℃	UL224	UL E352366	
-MARGIN TAPE	JINGJIANG YAHUA PRESSURE	WF	130℃	UL510A	UL E165111	
Input filter inductor (L1 L2 LL3)	HUIZHOU MP NEWENRGY TECHNOLOGY CO.LTD	MP85H2-1929-L	Class B 130℃	EN 62109-1 EN 62109-2 EN 62477-1	Tested with Appliance	
-Wire	FUZHOU DARTONG M&ECO,LTD.	AIW/ 2.0*8mm	180℃	UL1446	UL E142051	
alternative	TAI-I COPPER (GUANZHOU) COLTD	AIW/ 2.0*8mm	180℃	UL1446	UL E234896	
-Tape	POCO Holding Co.,LED	ACX77840 064005HL	130℃	EN 62109-1 EN 62109-2 EN 62477-1	Tested with Appliance	
alternative	ACYC(HUIZHOU)MAGNETIC COMPNENT CO;LTD	ACX77840 064005HL	130℃	EN 62109-1 EN 62109-2 EN 62477-1	Tested with Appliance	
alternative	ACYC(HUIZHOU)MAGNETIC COMPNENT CO;LTD	ACX77840 064005HL	130℃	EN 62109-1 EN 62109-2 EN 62477-1	Tested with Appliance	

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

14	TABLE: Critical components information					P
object/part No.	manufacturer/ trademark	type/model	technical data	Standard	mark(s) of conformity ¹⁾	
	O;LTD					
-MARGIN TAPE	JINGJIANG YAHUA PRESSURE SENSITIVE GLUE CO LTD	WF	130°C	UL510A	UL E165111	
-BASE	KINGBOARD LAMINATES HOLDINGS LTD	FR4	130°C	UL 94	UL E123995	
-TUBE	DONGGUAN LING FREE HARDWARE PLASTICSPRODUCT CO LTD	LFGS-4	200°C	UL224	UL E352366	
Input filter cap (C77,C78,C79,C80,C81,C82)	XIAMEN FARATRONIC CO LTD	C6A	20µF,300V AC -40°Cto+105°C	EN 61071:2007 EN61881-1:2011 UL 810	TUV RH R50266136 UL E256238	
alternative	Dongguang Hongfarad Electronic Co.,Ltd	HAPK206K3A0PJ EN	20µF,300V AC -40°Cto+105°C	UL 60384-14	UL E537882	
alternative	Guangdong Futian Electric Co., Ltd	CB206J300V453A 1	20µF,300V AC -40°Cto+105°C	UL 810	UL E475461	
alternative	SHENG YE ELECTRIC CO., LTD	F0200J0300F25C 38A0	20µF,300V AC -40°Cto+105°C	UL 810	UL E185116	
Bleeding resistor (G1)	SHENZHEN BENCENT ELECTRONIC CO LTD	B8G2500L	2500V DC, -40°Cto+125°C	UL 1449	UL E337906	
Input Resonance inductor(L7,L8)	HUIZHOU MP NEWENRGY TECHNOLOGY CO.LTD	MP133H1-1951-L	Class B 130°C	EN 62109-1 EN 62109-2 EN 62477-1	Tested with Appliance	
-Wire	FUZHOU DARTONG M&ECO.,LTD	AIW/ 4.0*8.0mm	200°C	UL1446	UL E142051	
alternative	TAI-I COPPER (GUANZHOU) CO.,LTD	AIW/ 4.0*8.0mm	200°C	UL1446	UL E234896	
-Tape	ACYC(HUIZHOU)MAGNETIC COMPONENT CO;LTD	1K107B 133*60*27	180°C/	EN 62109-1 EN 62109-2 EN 62477-1	Tested with Appliance	
-BASE	CELANESE INTERNATIONAL	FR-530	130°C	UL94	UL E41938	

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

14	TABLE: Critical components information					P
object/part No.	manufacturer/ trademark	type/model	technical data	Standard	mark(s) of conformity1)	
	AL CORP					
-EPOXY	YUEYANG GREEN TECHNOLOGY CO LTD	GRG-1000Y1	180℃	UL1446	UL E328930	
Output relay(RLY3,R LY5,RLY18,R LY19,RLY20, RLY21,RLY2 2,RLY23)	Dong Guan Churod Electronics Co.,Ltd	CHAR-124A200C	Air gap≥4.0mm,1000V 200A -40℃to+85℃	EN61810-1:2008 EN61810-1:2015	TUV RH R50316974	
alternative	Xiamen Hongfa Elctroacoustic Co.,Ltd.	HF167F-270	Air gap≥ 4.0mm 1000V 270A -40℃to+85℃	EN 61810-1:2015	TUV RH R50374273	
RCD detective inductor (T1)	Sinomags Technologies Co.,Ltd.	SFG-3.0P/PF	5V Vc-17.5mA Ic-1000V -40℃to+105℃	EN 62109-1 EN 62109-2 EN 62477-1	Tested with Appliance	
Output voltage detective resistor (R68,R69,R7 1,R74,R75,R 77,R80,R81, R83,R86,R87 ,R89,R92,R9 3,R95,R98,R 99,R101,R12 5,R126,R127, R128,R129,R 130,R131,R1 32,R133,R13 4,R135,R136, R137,R138,R 139,R140,R1 41,R142,R15 7,R158,R159, R160,R161,R 162,R163,R1 64,R165,R16 6,R167,R168, R169,R170,R 171,R172,R1 73,R174)	SICHUAN YONG XING ELECTRONIC S CO.,LTD	RJ14	1/4W, 1MΩ±1% -55℃to+125℃	EN 62109-1 EN 62109-2 EN 62477-1	Tested with Appliance	

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

14	TABLE: Critical components information					P
object/part No.	manufacturer/ trademark	type/model	technical data	Standard	mark(s) of conformity ¹⁾	
Ac soft start relay (RLY11,RLY13,RLY14,RLY15,RLY16,RLY17)	Wangrong Electronics (Shenzhen) Co., Ltd	RB-224DF6-S	24VDC-2C-250VAC -40°C to +105°C cl, cr: ≥7.6mm	EN 61810-1:2008	TUV RH R50249912	
alternative	Xiamen Hongfa Electroacoustic Co., Ltd.	HF115FK/24-2Z4T	24VDC-2C-250VAC -40°C to +105°C cl, cr: ≥7.6mm	DIN EN 61810-1 (VDE 0435-201):2015-10; EN 61810-1:2015 DIN EN 61810-1/A1 (VDE 0435-201/A1):2020-08; EN 61810-1:2015/A1:202	VDE 116934	
PCB	GUANZHOU KUANGSHUN PHOTSENSITIVE MATERIAL CO. LTD.	EPCS125-AMM2	130°C, V-0 CTI >175	UL 94	UL E189612	
alternative	SHENGYI TECHNOLOGY CO. LTD.	EPCS125-AMM2	130°C, V-0 CTI >175	UL 94	UL E109769	
alternative	SHEN ZHEN SUN&LYNN CIRCUITS CO. LTE.	EPCS125-AMM2	130°C, V-0 CTI >175	UL 94	UL E234156	
Relay (KA2)	Xiamen Hongfa Electroacoustic Co., Ltd.	HF140FF	Air gap ≥1.5mm, 250VAC,12A -40°C to +85°C	EN 61810-1:2004	TUV RH R50149131	
M3,Dc filter board						
Output Y cap (C1 ,C2 ,C4 , C5)	Shanxi Huaxing Electronics Group Co., Ltd;	CT7-2F4-400VAC-472M	400VAC, 472M -25°C to +85°C Y1	EN 60384-14:2013/A1:2016 IEC 60384-14:2013 IEC 60384-14:2013/AMD1:2016	VDE 40015542	
Output X cap (C3,C6)	XIAMEN FARATRONIC CO. LTD.	C46U3105MF1C400	760Vac/1500Vdc-1uF -40°C to +110°C X1	UL 60384-14:2014 EN60384-14:2013	SE/0366-3B	
Dc fuse	NANRONG ELECTRIC INDUSTRIAL	HEV-J-Q-250	AC/DC1000V-250A-AC50KA/DC10KA	IEC 60269-4:2009+A1+A2 IEC 60269-	TUV RH J50470852	

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

14	TABLE: Critical components information					P
object/part No.	manufacturer/ trademark	type/model	technical data	Standard	mark(s) of conformity1)	
	(HK) LIMITED		-40℃to+85℃	1:2006+A1+A2 EN 60269-4:2009+A1+A2 EN 60269-1:2007+A1+A2		
ISO resistor-1 (R31 R32 R33 R34 R35 R36 R37 R41 R42 R43 R44 R45 R46 R47)	YAGEO COMPONENT S (SUZHOU) CO LTD	RC1206FR-07100KL	1/4W-100kΩ±1% -55℃to+125℃	EN 62109-1 EN 62109-2 EN 62477-1	Tested with Appliance	
alternative	Guangdong Fenghua Advanced Technology Holding Co Ltd.	RS-06K1003FT	1/4W-100kΩ±1% -55℃to+125℃	EN 62109-1 EN 62109-2 EN 62477-1	Tested with Appliance	
ISO resistor-2 (R48 R49 R50 R51 R52 R53 R54 R55 R56 R57 R58 R59 R60 R61)	YAGEO COMPONENT S (SUZHOU) CO LTD	AC1206FR-07475K	1/4W-475kohm±1% -55℃to+155℃	EN 62109-1 EN 62109-2 EN 62477-1	Tested with Appliance	
alternative	Walsin Technology Corporation	WR12X4753FTLJ	1/4W-475kohm±1% -55℃to+155℃	EN 62109-1 EN 62109-2 EN 62477-1	Tested with Appliance	
PCB	GUANZHOU KUANGSHUN PHOTSENSITI VTY MATERIAL CO. LTD.	EPCS125-AMM3	130℃, V-0 CTI >175	UL 94	UL E189612	
alternative	SHENGYI TECHNOLOGY CO. LTD.	EPCS125-AMM3	130℃, V-0 CTI >175	UL 94	UL E109769	
alternative	SHEN ZHEN SUN&LYNN CIRCUITS CO. LTE.	EPCS125-AMM3	130℃, V-0 CTI >175	UL 94	UL E234156	
M4 auxiliary power board						
Y-Cap (C26,C68,C71,C135,C136,C138,C139,C140)	Shanxi Huaxing Electronics Group Co., Ltd;	CT7-2F4-400VAC-472M	4700pf,400VAC, -25℃to+105℃ Y1	EN 60384-14:2013/A1:2016 IEC 60384-14:2013 IEC 60384-14:2013/AMD1:2016	VDE 40015542	

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

14	TABLE: Critical components information					P
object/part No.	manufacturer/ trademark	type/model	technical data	Standard	mark(s) of conformity ¹⁾	
Isolated transformer (T1)	Shenzhen Tengyuesheng Electronic Technology Co., Ltd.	ER42/20	ClassB 130°C	EN 62109-1 EN 62109-2 EN 62477-1	Tested with Appliance	
-Wire	NINGBO JINTIAN NEW MATERIAL CO .LTD.	UEW-F	155°C	UL 1446	UL E227047	
-Tape	SHEN ZHEN XINHUAHUI ELECTRONIC MATERIALS CO. LTD.	CT-280B	155°C	UL 510A	UL E328315	
-Bobbin	CHANG CHUN Plastics CO.,LTD.	T375HF	155°C	UL 94	UL E59481	
-Glue	DONGGUAN EATTO ELECTRONIC MATERIAL	E500	130°C	UL 510A	UL E328315	
-Tube	SHENZHEN FUSHUNCHANG ELECTRONIC CO. LTD.	FSC-L	200°C	UL 224	UL E521597	
Transformer (T4)	Shenzhen Tengyuesheng Electronic Technology Co., Ltd	EEL25	Class B, 130°C	EN 62109-1 EN 62109-2 EN 62477-1	Tested with Appliance	
-Wire	NINGBO JINTIAN NEW MATERIAL CO .LTD.	UEW-F/MW79-C	155°C	UL 1446	UL E227047	
-Tape	JINGJIANG YAHUA PRESSURE SENSITIVE GLUE CO.,LTD	PF-301	180°C	UL 510A	UL E165111	
-Bobbin	CHANG CHUN PLASTICS CO.,LTD	T375HF	150°C	UL 94	UL E59481	
-TRIPLE WIRE	Guangzhou Wanbao Electronic Material Co. Ltd	DTM-F	155°C	UL 2353	UL E323485	

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

14	TABLE: Critical components information					P
object/part No.	manufacturer/ trademark	type/model	technical data	Standard	mark(s) of conformity ¹⁾	
-Glue	Guangzhou Pochely New Material Technology Co Ltd	E-500	130°C	UL 746A	UL E204979	
-Tube	SHENZHEN FUSHUNCHA NG ELECTRONIC CO LTD	FSC-L	200°C	UL 224	UL E521597	
Fuse (F1,F2,F8,F9)	Shenzhen ShenShan Special Cooperation Zone VICFUSE CO.,LTD.	VF505-P003L-1000VDC	1000VAC/DC-3A -55°C to +125°C	EN 60127-7:2016 EN 60127-1:2006+A1+A2	1111286937	
Isolated opto-coupler (U6,U8)	LITE-ON Technology Corp.	LTV-816S-TA1(C)	5mA, 5000Va.c. -55°C to +110°C cl, cr: ≥ 7mm	EN IEC 60747-5-5 (VDE 0884-5):2021-10; EN IEC 60747-5-5:2020	VDE 40015248	
Alternative	Renesas Electronics Corporation	PS2561L-1-V-F3-A/L	5mA, 5000Va.c. -55°C to +100°C cl, cr: ≥ 7mm	IEC 60747-5-5	VDE 40008862	
alternative	Everlight Electronics Co., Ltd.	EL816S1(C)(TA)	5mA, 5000Va.c. -55°C to +110°C cl, cr: ≥ 7mm	IEC 60747-5-5	VDE 132249	
PCB	GUANZHOU KUANGSHUN PHOTSENSITIVE MATERIAL CO. LTD.	EPCS125-AMM4	130°C, V-0 CTI >175	UL 94	UL E189612	
alternative	SHENGYI TECHNOLOGY CO. LTD.	EPCS125-AMM4	130°C, V-0 CTI >175	UL 94	UL E109769	
alternative	SHEN ZHEN SUN&LYNN CIRCUITS CO. LTE.	EPCS125-AMM4	130°C, V-0 CTI >175	UL 94	UL E234156	
1) an asterisk indicates a mark which assures the agreed level of surveillance 2) License available upon request.						

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

Functional Components

Components which are required for performance purposes and not directly addressed by a component standard or product standard: Ripple capacitors, Mosfets, etc.

Object/part No.	Type/ model (optional)	Technical data
DSP	AVP32F335QP176S	-40°C to 125°C, -0.3V to 4.6V
FPGA	GW1N-UV4PG256MC6/I5	-40°C to 85°C, -0.5V to 3.75 V

--End of test report--

TEST REPORT EN 62109-2 Safety of Power Converter for use in Photovoltaic Power Systems Part 2: Particular requirements for inverters	
Report Number.:	CN26FXA8 001 attachment 1
Date of issue	See report CN26FXA8 001
Total number of pages	25 pages
Name of Testing Laboratory preparing the Report.....:	See cover page
Applicant's name	See cover page
Address	See cover page
Test specification:	
Standard	EN 62109-2:2011
Test procedure.....:	TÜV Rheinland LVD COC approval
Non-standard test method.....:	N/A
Test Report Form No.....:	IEC 62109_2B
Test Report Form(s) Originator.....:	LCIE - Laboratoire Central des Industries Electriques
Master TRF	Dated 2016-11
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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 :	See report CN26FXA8 001	
Trade Mark :	See report CN26FXA8 001	
Manufacturer	See report CN26FXA8 001	
Model/Type reference :	See report CN26FXA8 001	
Ratings :	See report CN26FXA8 001	
Responsible Testing Laboratory (as applicable), testing procedure and testing location(s):		
☒ Testing Laboratory:	See report CN26FXA8 001	
Testing location/ address	See report CN26FXA8 001	
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):

See report CN26FXA8 001.

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

See report CN26FXA8 001.

Testing location:

See report CN26FXA8 001.

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

See report CN26FXA8 001.

Copy of marking plate:

See report CN26FXA8 001.

Test item particulars.....:	
Equipment mobility	☐ movable ☐ hand-held ☒ stationary ☒ fixed ☐ transportable ☐ for building-in
Connection to the mains.....:	☐ pluggable equipment ☐ direct plug-in ☒ permanent connection ☐ for building-in
Environmental category	☐ outdoor ☐ indoor unconditional ☒ indoor conditional
Over voltage category Mains	☐ OVC I ☐ OVC II ☒ OVC III ☐ OVC IV
Over voltage category PV	☐ OVC I ☒ OVC II ☐ OVC III ☐ OVC IV
Mains supply tolerance (%)	According to specified supply range
Tested for power systems	☐ Yes ☒ No
IT testing, phase-phase voltage (V)	N/A
Class of equipment	☒ Class I ☐ Class II ☐ Class III ☐ Not classified
Mass of equipment (kg)	See report CN26FXA8 001.
Pollution degree	☐ PD 1 ☒ PD 2 ☐ PD 3
IP protection class.....	IP20
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	See report CN26FXA8 001.
Date (s) of performance of tests	See report CN26FXA8 001.
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 IEC 60335-1:	
The application for obtaining a CB Test Certificate includes more than one factory location and a declaration from the Manufacturer stating that the sample(s) submitted for evaluation is (are) representative of the products from each factory has been provided:	☐ Yes ☒ Not applicable
When differences exist; they shall be identified in the General product information section.	

Name and address of factory (ies): See report CN26FXA8 001.

General product information:

See report CN26FXA8 001.

Throughout the test report following abbreviations may be used:

- | | | | | | |
|---|-----|-----------------------------|---|-----|--------------------------|
| • | cl | clearance | • | int | internal distance |
| • | dcr | creepage distance | • | o-c | open-circuit |
| • | dti | distance through insulation | • | o-l | overload |
| • | PCE | Power Conversion Equipment | • | s-c | short-circuit |
| • | BI | basic insulation | • | SI | supplementary insulation |
| • | DI | double insulation | • | RI | reinforced insulation |

EN 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		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		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	P
4.4.4.15.2.2	Design of insulation or separation complies with requirements of 7.3.7 of Part 1: report here Part 1 comment and verdict.		P
4.4.4.15.2.3	For non-isolated inverter, automatic checking of the isolation provided by a disconnect means after single fault.	See appended test table 4.4.4.15.2 Fault-tolerance of automatic	P

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Clause	Requirement + Test	Result - Remark	Verdict
		disconnecting.	
	If the check fail: - any still-functional disconnection means shall be left in the open position		P
	- at least basic or simple separation shall be maintained between the PV input and the mains		P
	- the inverter shall not start operation		P
	- the inverter shall indicate a fault in accordance with 13.9		P
4.4.4.16	A stand-alone inverter with a transfer switch to transfer AC loads from the mains or other AC bypass source to the inverter output:		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 following table 4.4.4.17.	P
	Test stop condition: time duration value or stabilized temperature		P
4.7	ELECTRICAL RATINGS TESTS		N/A
4.7.4	Stand-alone Inverter AC output voltage and frequency		N/A
4.7.4.1	General		N/A
4.7.4.2	Steady state output voltage at nominal DC input The steady-state AC output voltage shall not be less than 90 % or more than 110 % of the rated nominal voltage with the inverter supplied with its nominal value of DC input voltage.		N/A
4.7.4.3	Steady state output voltage across the DC input range The steady-state AC output voltage shall not be less than 85 % or more than 110 % of the rated nominal voltage with the inverter supplied with any value within the rated range of DC input voltage.		N/A
4.7.4.4	Load step response of the output voltage at nominal DC input The AC output voltage shall not be less than 85 % or more than 110 % of the rated nominal voltage for more than 1,5 s after application or removal of a resistive load.		N/A
4.7.4.5	Steady state output frequency The steady-state AC output frequency shall not vary from the nominal value by more than +4 % or –6 %.		N/A
4.7.5	Stand-alone inverter output voltage waveform		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
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/ μ s 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		N/A
4.8.1	General requirements regarding inverter isolation and array grounding	Assessed against final installation.	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		N/A
4.8.2.1	Array insulation resistance detection for inverters for ungrounded arrays		N/A
	Inverter shall have means to measure DC insulation resistance from PV input (array) to ground before starting operation		N/A
	Or Inverter shall be provided with instruction in		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	accordance with 5.3.2.11.		
	Measured DC insulation resistance::		N/A
	Inverter measurement circuit shall be capable of detecting insulation resistance below the limit value $R = V_{max}/30mA$ under normal conditions		N/A
	Inverter measurement circuit shall be capable of detecting insulation resistance below the limit value $R = V_{max}/30mA$ with ground fault in the PV array		N/A
	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:		N/A
	- shall indicate a fault in accordance with 13.9		N/A
	- shall not connect to the mains		N/A
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 $R = (V_{MAX PV}/30 mA)$ 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		N/A
4.8.3.1	General		N/A
4.8.3.2	30 mA touch current type test for isolated inverters		N/A
4.8.3.3	Fire hazard residual current type test for isolated inverters		N/A
4.8.3.4	Protection by application of RCD's		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	- 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..		N/A
	- The selection of the RCD type to ensure compatibility with the inverter must be made according to rules for RCD selection in Part 1.		N/A
	- The RCD provided integral to the inverter, or		N/A
	- The RDC provided by the installer if details of the rating, type, and location for the RCD are given in the installation instructions per 5.3.2.9.		N/A
4.8.3.5	Protection by residual current monitoring		N/A
4.8.3.5.1	General		N/A
	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.		N/A
	The residual current monitoring means shall measure the total (both a.c. and d.c. components) RMS current.		N/A
	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:		N/A
	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:		N/A
	- maximum 300 mA for inverters with continuous output power rating ≤ 30 kV;		N/A
	- 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.		N/A
	b) Sudden changes in residual current: The inverter shall disconnect from the mains within the time specified in Table 31		N/A
	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.		N/A
	The inverter may attempt to re-connect if the array insulation resistance meets the limit in 4.8.2.		N/A
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.		N/A
4.8.3.5.3	Test for detection of sudden changes in residual current repeated 5 times and each of the 5 results shall not exceed the time limit indicated in for each row (30mA, 60mA and 150mA) of Table 31.		N/A
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		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	with the inverter indicates the restriction for use in a closed electrical operating area, and		
	Installation information indicates what forms of shock hazard protection are and are not provided integral to the inverter, in accordance with 5.3.2.7.		N/A
	The inverter shall be marked as in 5.2.2.6.		N/A
5	MARKING AND DOCUMENTATION		P
5.1	Marking		P
5.1.4	Equipment ratings		P
	PV input ratings:		N/A
	- V _{max} PV (absolute maximum) (d.c. V)		N/A
	- I _{sc} PV (absolute maximum) (d.c. A)		N/A
	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:		P
	- Voltage (nominal or range) (a.c. V)		P
	- Current (maximum continuous) (a.c. A)		P
	- Frequency (nominal or range) (Hz)		P
	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
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 :		N/A
	- V _{max} PV (absolute maximum) (d.c. V)		N/A
	- PV input operating voltage range (d.c. V)		N/A
	- Maximum operating PV input current (d.c. A)		N/A
	- I _{sc} PV (absolute maximum) (d.c. A)		N/A
	- I _{sc} PV (absolute maximum) (d.c. A)		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	- Max. inverter backfeed current to the array (a.c. or d.c. A)		N/A
	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:		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
	d.c input (other than PV) quantities:		P
	- Voltage (nominal or range) (d.c. V)		P
	- Nominal battery voltage (d.c. V)		P
	- Current (maximum continuous) (d.c. A)		P
	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		P
	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:		P
	The setting of field adjustable setpoints shall be accessible from the PCE		P
5.3.2.3	Transformers and isolation		N/A
	whether an internal isolation transformer is provided, and if so, what level of insulation (functional, basic, reinforced, or double) is provided by that transformer. The instructions shall also indicate what the resulting installation requirements are regarding such things as earthing or not earthing the array, providing external residual current detection devices, etc.		N/A
	An inverter shall be provided with information to the installer regarding:		N/A
	- providing of internal isolation transformer		N/A
	- the level of insulation (functional, basic, reinforced, or double)		N/A
	The instructions shall also indicate what the resulting installation requirements are regarding:		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	- 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		N/A
	Non-isolated inverters shall be provided with installation instructions that require PV modules that have an IEC 61730 Class A rating		N/A
	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
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

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Clause	Requirement + Test	Result - Remark	Verdict
	- if output circuit bonding is required but is not provided integral to the inverter, the required means shall be described in the installation instructions, including which conductor is to be bonded and the required current carrying capability or cross-section of the bonding means;		N/A
	- if the output circuit is intended to be floating, the documentation for the inverter shall indicate that the output is floating.		N/A
5.3.2.9	Protection by application of RCD's		N/A
	Where the requirement for additional protection in 4.8.3.1 is met by requiring an RCD that is not provided integral to the inverter, as allowed by 4.8.3.4, the installation instructions shall state the need for the RCD,.		N/A
	and shall specify its rating, type, and required circuit location		N/A
5.3.2.10	Remote indication of faults		N/A
	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.		N/A
5.3.2.11	External array insulation resistance measurement and response		P
	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:		P
	- 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		P
	- what the setpoints and response implemented by that equipment must be, and:		P
	- how that equipment is to be interfaced with the rest of the system.		P
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

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Clause	Requirement + Test	Result - Remark	Verdict
	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 $R = V_{MAX} PV/30 \text{ mA}$ 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 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.....		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		P
	One circuit conductor bonded to earth to create a grounded conductor and an earthed system.		P
	The means used to bond the grounded conductor to protective earth provided within the inverter or 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.	Described in the installation instructions.	P
	The means used to bond the grounded conductor to protective earth shall comply with the requirements for protective bonding in Part 1,		P
	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.		P
	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.		P

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Clause	Requirement + Test	Result - Remark	Verdict
	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		P
	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		N/A
	The backfeed current testing and documentation requirements in Part 1 apply, including but not limited to the following.		N/A
	Inverter backfeed current onto the PV array maximum value.....		N/A
	This inverter backfeed current value shall be provided in the installation instructions regardless of the value of the current, in accordance with Table 33.		N/A
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

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Clause	Requirement + Test	Result - Remark	Verdict

4.4.4	TABLE: Single fault condition to be applied					P
	Ambient temperature (°C)	:	--			—
	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
--	--	--	--	--	--	--
--	--	--	--	--	--	--
--	--	--	--	--	--	--
Check that the residual current monitoring operates properly						
Supplementary information: See report CN26FXA8 001.						

4.4.4	TABLE: Single fault condition to be applied					P
	Ambient temperature (°C)	:	--			—
	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
--	--	--	--	--	--	--
--	--	--	--	--	--	--
--	--	--	--	--	--	--
Check that the relays fulfil the basic insulation or simple separation based on the PV circuit working voltage.						
Each active phase can be switched. (L and N)						
Supplementary information: See report CN26FXA8 001.						

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Clause	Requirement + Test	Result - Remark	Verdict
4.4.4.17	Cooling system failure – Blanketing test		P
	Test voltage (Vdc).....:	950	—
	Test current (Idc)	203	—
	Test voltage (Vac).....:	230	—
	Test current (Iac)	181.2	—
	t _{amb1} (°C)	See below	—
	t _{amb2} (°C)	See below	—
maximum temperature T of part/at::		T (°C)	T_{max} (°C)
Enclosure		62.32	90
LED surface		61.14	90
Mounting surface		60.41	90
Ambient		44.04	--
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	
--	--	Without load	--	
--	--	Resistive load application	--	
--	--	Resistive load removal	--	
Supplementary information: See report CN26FXA8 001				

4.7.5.2	TABLE: Stand-alone inverter output voltage waveform									N/A
Order number	Measurement									Limit
	5%Load			50%Load			100%Load			[%]
	L1[%]	L2[%]	L3[%]	L1[%]	L2[%]	L3[%]	L1[%]	L2[%]	L3[%]	
2	--	--	--	--	--	--	--	--	--	6%
3	--	--	--	--	--	--	--	--	--	6%
4	--	--	--	--	--	--	--	--	--	6%
5	--	--	--	--	--	--	--	--	--	6%

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Clause	Requirement + Test						Result - Remark			Verdict
6	--	--	--	--	--	--	--	--	--	6%
7	--	--	--	--	--	--	--	--	--	6%
8	--	--	--	--	--	--	--	--	--	6%
9	--	--	--	--	--	--	--	--	--	6%
10	--	--	--	--	--	--	--	--	--	6%
11	--	--	--	--	--	--	--	--	--	6%
12	--	--	--	--	--	--	--	--	--	6%
13	--	--	--	--	--	--	--	--	--	6%
14	--	--	--	--	--	--	--	--	--	6%
15	--	--	--	--	--	--	--	--	--	6%
16	--	--	--	--	--	--	--	--	--	6%
17	--	--	--	--	--	--	--	--	--	6%
18	--	--	--	--	--	--	--	--	--	6%
19	--	--	--	--	--	--	--	--	--	6%
20	--	--	--	--	--	--	--	--	--	6%
21	--	--	--	--	--	--	--	--	--	6%
22	--	--	--	--	--	--	--	--	--	6%
23	--	--	--	--	--	--	--	--	--	6%
24	--	--	--	--	--	--	--	--	--	6%
25	--	--	--	--	--	--	--	--	--	6%
26	--	--	--	--	--	--	--	--	--	6%
27	--	--	--	--	--	--	--	--	--	6%
28	--	--	--	--	--	--	--	--	--	6%
29	--	--	--	--	--	--	--	--	--	6%
30	--	--	--	--	--	--	--	--	--	6%
31	--	--	--	--	--	--	--	--	--	6%
32	--	--	--	--	--	--	--	--	--	6%
33	--	--	--	--	--	--	--	--	--	6%
34	--	--	--	--	--	--	--	--	--	6%
35	--	--	--	--	--	--	--	--	--	6%
36	--	--	--	--	--	--	--	--	--	6%
37	--	--	--	--	--	--	--	--	--	6%
38	--	--	--	--	--	--	--	--	--	6%
39	--	--	--	--	--	--	--	--	--	6%
40	--	--	--	--	--	--	--	--	--	6%

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Clause	Requirement + Test						Result - Remark			Verdict
THD	--	--	--	--	--	--	--	--	--	10%

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Clause	Requirement + Test	Result - Remark	Verdict

4.8.2	TABLE: Array insulation resistance detection for inverters for ungrounded and functionally grounded arrays			N/A
4.8.2.1	Array insulation resistance detection for inverters for ungrounded arrays			N/A
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
PV+				
--	--	--	--	--
--	--	--	--	--
--	--	--	--	--
--	--	--	--	--
PV-				
--	--	--	--	--
--	--	--	--	--
--	--	--	--	--
--	--	--	--	--
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. I.F.: Isolation Fault, N.O.: Normal Operation *Array Insulation Resistance Threshold Value $R = -- [k\Omega]$ (Should be larger than $R = V_{MAX\ PV} / 30mA$.)				
Supplementary information:				

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Clause	Requirement + Test	Result - Remark	Verdict

4.8.3.2	TABLE: 30mA touch current type test for isolated inverters		N/A
Condition		Current (mA)	Limit (30mA)
DC+ to PE		--	30mA
DC- to PE		--	30mA
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		--	10mA/kW
DC- to PE		--	10mA/kW
Supplementary information:			

4.8.3.5	TABLE: Protection by residual current monitoring		N/A
Test conditions:		Output power (kVA) : Input voltage (V _{DC}): Frequency (Hz): Output AC Voltage (V _{AC}):	
4.8.3.5.2	Test for detection of excessive continuous residual current		N/A
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:			
--	--	--	300
--	--	--	300
--	--	--	300
--	--	--	300
--	--	--	300
- PV to N:			
--	--	--	300
--	--	--	300
--	--	--	300
--	--	--	300
--	--	--	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.

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Clause	Requirement + Test	Result - Remark	Verdict
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		N/A
+PV to N			
Limit (mA)	U _N	Limit (ms)	
	Disconnection time (ms)		
30	--	300	
30	--	300	
30	--	300	
30	--	300	
30	--	300	
60	--	150	
60	--	150	
60	--	150	
60	--	150	
60	--	150	
150	--	40	
150	--	40	
150	--	40	
150	--	40	
150	--	40	
-PV to N			
Limit (mA)	U _N	Limit (ms)	
	Disconnection time (ms)		
30	--	300	
30	--	300	
30	--	300	
30	--	300	
30	--	300	
60	--	150	
60	--	150	
60	--	150	
60	--	150	
60	--	150	
150	--	40	
150	--	40	
150	--	40	
150	--	40	
150	--	40	

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Clause	Requirement + Test	Result - Remark	Verdict
Note: The capacitive current is risen until disconnection. Test condition: $I_c + 30/60/150\text{mA} \leq I_{c\text{max}}$. R_1 is set that 30/60/150mA Flow and switch S is closed.			
Supplementary information:			

-End-

TEST REPORT
EN 62477-1
Safety requirements for power electronic converter systems
and equipment
Part 1: General

Report Reference No. : CN26FXA8 001 attachment 2
Date of issue : See cover page
Total number of pages : See cover page

Name of Testing Laboratory
preparing the Report..... : See report CN26FXA8 001

Applicant's name : See report CN26FXA8 001
Address : See report CN26FXA8 001

TRF template used : IEC EE OD-2020-F1:2020, Ed.1.3
Standard : EN 62477-1:2012+A11:2014+A1:2017+A12:2021
Test procedure : See cover page
Non-standard test method..... : N/A

Test Report Form No. : IEC62477_1D
Test Report Form(s) Originator : VDE Prüf- und Zertifizierungsinstitut GmbH
Master TRF : Dated 2023-09-08

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

General disclaimer:

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Test item description	See report CN26FXA8 001	
Trade Mark	See report CN26FXA8 001	
Manufacturer	See report CN26FXA8 001	
Model/Type reference	See report CN26FXA8 001	
Ratings	See report CN26FXA8 001	
Responsible Testing Laboratory (as applicable), testing procedure and testing location(s):		
☒ Testing Laboratory:	See report CN26FXA8 001	
Testing location/ address.....	See report CN26FXA8 001	
Tested by (name, function, signature)	Ann Zhang	See cover page
Approved by (name, function, signature)...	Zhibin Cai	See cover page
☐ 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):

See report CN26FXA8 001

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

Following tests performed during evaluation.

<u>Clause(s)</u>	<u>Test(s)</u>
4	Electrical data in normal condition
5.2.2.1	Clearance and creepage distances
5.2.2.2	Non-accessibility test
5.2.2.4.2.3	Steady force test, 250 N
5.2.3.2	Impulse voltage test
5.2.3.4	a.c or d.c voltage test
5.2.3.7	Touch current measurement
5.2.3.8	Capacitor discharge test
5.2.3.10	Temperature rise test
5.2.4.4	Output short-circuit test
5.2.4.5	Output Overload test (type test)
5.2.4.6	Breakdown of components test
5.2.4.9.2	Inoperative blower motor
5.2.4.9.3	Clogged filter
5.2.6.3.1	Dry heat test
5.2.6.3.2	Damp heat test

Testing location:

See report CN26FXA8 001

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

N/A

Statement concerning the uncertainty of the measurement systems used for the tests

(may be required by the product standard or client)

☐ **Internal procedure used for type testing through which traceability of the measuring uncertainty has been established:**

Procedure number, issue date and title:

Calculations leading to the reported values are on file with the NCB and testing laboratory that conducted the testing.

☒ **Statement not required by the standard used for type testing**

(Note: When IEC or ISO standard requires a statement concerning the uncertainty of the measurement systems used for tests, this should be reported above. The informative text in parenthesis should be delete in both cases after selecting the applicable option)

Copy of marking plate:

See report CN26FXA8 001.

Test item particulars :	
Classification of installation and use : N/A	
Supply Connection : N/A	
..... :	
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 : 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 IEC60335-1:	
The application for obtaining a CB Test Certificate includes more than one factory location and a declaration from the Manufacturer stating that the sample(s) submitted for evaluation is (are) representative of the products from each factory has been provided :	☐ Yes ☒ Not applicable
When differences exist; they shall be identified in the General product information section.	
Name and address of factory (ies) : See report CN26FXA8 001	

General product information:

See report CN26FXA8 001.

Additional 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 Battery :

☐ OVC I ☒ OVC II ☐ OVC III ☐ OVC IV

Mains supply tolerance (%) :

N/A

Tested for power systems :

TN

IT testing, phase-phase voltage (V) :

N/A

Class of equipment :

☒ Class I ☐ Class II ☐ Class III
☐ Not classified

Mass of equipment (kg) :

See model list

Pollution degree :

PD 2

IP protection class :

IP20

For more information:

See model list

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Clause	Requirement + Test	Result - Remark	Verdict
4	PROTECTION AGAINST HAZARDS		P
4.1	General		P
4.2	Fault and abnormal conditions	See Table 4.2 to 4.3	P
	Components in 4.2 also include insulation systems, ports, etc (IEC 62477-1:2012/AMD1:2016)		N/A
4.3	Short-circuit and overcurrent protection	See Table 4.2 to 4.3	P
4.3.1	General		P
4.3.2	Specification of prospective short-circuit current		P
4.3.2.1	General		P
	The interrupting capability of the overcurrent protective device shall be equal or greater than the prospective short circuit current of the mains supply.		P
	For pluggable equipment type A, either the PECS shall be designed so that the building installation provides short circuit backup protection, or additional short circuit backup protection shall be provided as part of the equipment.	Not pluggable equipment type A	N/A
	For permanently connected equipment or pluggable equipment type B, it is permitted for short circuit backup protection to be in the building installation.		P
4.3.2.2	Specification of the rated conditional short-circuit current (I_{cc}) on input ports (IEC 62477-1:2012/AMD1:2016)	PECS manufacturer selects the short time withstand current (I_{cw}).	N/A
	In case the PECS manufacturer selects the conditional short-circuit current (I_{cc}) rating according to 4.3.1, the following specified: (IEC 62477-1:2012/AMD1:2016)		N/A
	- conditional short-circuit current (I_{cc}), (IEC 62477-1:2012/AMD1:2016)		N/A
	- characteristics of the short-circuit protective device, and (IEC 62477-1:2012/AMD1:2016)		N/A
	- minimum required prospective short-circuit current ($I_{cp, mr}$) (IEC 62477-1:2012/AMD1:2016)		N/A
	If it is shown by analysis that the result of one test is representative of the worst case, less severe combinations need not be tested. (IEC 62477-1:2012/AMD1:2016)		N/A
4.3.2.3	Output short circuit current ability	Considered. Overcurrent protection method provided in manual.	P
	The output short circuit current ratings apply to a.c. and d.c. power output ports and to other ports for	Output short current 327A. Duration 1ms for model	P

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Clause	Requirement + Test	Result - Remark	Verdict
	which overcurrent protection is necessary. For all output ports, short circuit evaluation to determine the minimum and maximum output short circuit current shall be performed according to 5.2.4.4 and the output short circuit current available from the PECS shall be specified as in 5.2.4.4 and 6.2. Internal electronic output short circuit protection is considered acceptable as an output short circuit protection device of the PECS, when compliance is shown by test in 5.2.4.4.	EPCS105-AM-(F). Output short current 600A. Duration 1ms for model EPCS125-AM-(F).	
4.3.2.4	Combined input and output ports	The DC port and AC port combine input and output.	P
	For ports which are both input and output ports the applicable requirements of both 4.3.2.1 and 4.3.2.3 apply.		P
4.3.3	Short-circuit coordination (backup protection)		P
	Protective devices provided or specified shall have adequate breaking capability to interrupt the maximum prospective short circuit current specified for the port to which they are connected. If internal protection of the PECS is not rated for the prospective short circuit current, the installation instructions shall specify an upstream protective device, rated for this prospective short circuit current of that port, which shall be used to provide backup protection. Analysis shall ensure the protection coordination between the external and internal protective device.	Provide by installation instructions.	P
	Compliance shall be checked by inspection and by the tests of 5.2.4.4 and 5.2.4.5.		P
4.3.4	Protection by several devices		N/A
	Where protective devices that require manual replacement or resetting are used in more than one pole of a supply to a given load, those devices shall be located together. It is permitted to combine two or more protective devices in one component. Compliance shall be checked by inspection.		N/A
4.3.5	Input ports short time withstand current, I_{cw} (IEC 62477-1:2012/AMD1:2016)	I_{cw} = 6kA@100ms is claimed by the manufacturer.	P
	In case the PECS manufacturer selects the short time withstand current (I_{cw}) rating according to 4.3.1, the following specified: (IEC 62477-1:2012/AMD1:2016)		P
	- rated short time withstand current (I_{cw}), (IEC 62477-1:2012/AMD1:2016)		P
	- associated duration, and (IEC 62477-		P

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Clause	Requirement + Test	Result - Remark	Verdict
	1:2012/AMD1:2016)		
	- rated peak withstand current (I_{pk}). (IEC 62477-1:2012/AMD1:2016)		P
	If it is shown by analysis that the result of one test is representative of the worst case, less severe combinations need not be tested. (IEC 62477-1:2012/AMD1:2016)		P
4.4	Protection against electric shock		P
4.4.1	General		P
4.4.2	Decisive voltage classification		P
4.4.2.1	General	Considered	P
4.4.2.2	Determination of decisive voltage class		P
4.4.2.2.1	General		P
	For protection against the ventricular fibrillation body reaction, DVC can be selected from Table 2.		P
4.4.2.2.2	Selection tables for contact area and skin humidity condition		P
	In order to protect against ventricular fibrillation, the appropriate conditions from Table 3 and Table 4 shall be selected.		P
4.4.2.2.3	Limits of the working voltage for the DVC	30V RMS, 42.4Vpeak or 60V DC	P
4.4.2.3	Requirements for protection against electric shock		P
4.4.3	Provision for basic protection		P
4.4.3.1	General	Considered	P
4.4.3.2	Protection by means of insulation of live parts	Considered	P
	Live parts shall be completely surrounded with insulation if their working voltage is greater than DVC As or if they do not have protective separation from adjacent circuits of DVC C.	Basic insulation is provided between enclosure and internal hazardous live parts.	P
	Basic insulation may be provided by solid insulation or air clearance.		P
	The insulation shall be rated according to the impulse voltage, temporary overvoltage or working voltage (see 4.4.7.2.1), whichever gives the most severe requirement. It shall not be possible to remove the insulation without the use of a tool or key.		P
4.4.3.3	Protection by means of enclosures or barriers	Considered	P
	Live parts with voltage higher than DVC As shall be:	IP20, Mounted in a cabinet.	P

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Clause	Requirement + Test	Result - Remark	Verdict
	- arranged in enclosures or located behind enclosures or barriers, which meet at least the requirements of the Protective Type IPXXB according to Clause 7 of IEC 60529:1989; - located at the top surfaces of enclosures or barriers which are accessible when the equipment is energized shall meet at least the requirements of the protective type IP3X with regard to vertical access only.		
	For moveable equipment with no defined top and bottom this requirement of protective Type IP3X applies to all sides.		N/A
	If the PECS is installed in a restricted access area, IPXXB instead of IP3X applies.		N/A
	Product committees using this document as reference document might consider less requirement for equipment having openings in the top of an enclosure with a height exceeding 1,8 m.		N/A
	Compliance is shown by test of 5.2.2.2.		P
	It shall only be possible to open enclosures or remove barriers: • with the use of a tool or key; or • after de-energization of these live parts.	Mounted in a cabinet and the part where the AC, DC or DVC C is ultimately mounted must not be touched.	P
	Where the enclosure is required to be opened and the PECS energized during installation or maintenance: a) accessible live parts of voltage higher than DVC As shall be protected by at least IPXXA; b) live parts of voltage higher than DVC As that are likely to be touched when making adjustments shall be protected by at least IPXXB; c) it shall be ensured that persons are aware that live parts with voltage higher than DVC As are accessible.		P
4.4.3.4	Protection by means of limitation of touch current and charge		P
	The limitation of touch current and discharge energy shall not exceed: - a value of 3,5 mA a.c. or 10 mA d.c. for the limitation of touch current; and - a value of 50 µC for the limitation of discharge energy.	Not exceed limitation of touch current.	P
4.4.3.5	Protection by means of limited voltages		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	The voltage between simultaneously accessible parts shall not be greater than DVC As as determined in 4.4.2.2.		N/A
4.4.4	Provision for fault protection		P
4.4.4.1	General		P
	Fault protection shall be provided by one or more of the following measures: • Protective equipotential bonding in 4.4.4.2 in combinations with the PE conductor in 4.4.4.3; • Automatic disconnection of supply in 4.4.4.4; • Supplementary insulation in 4.4.4.5; • Simple separation between circuits in 4.4.4.6; • Electrically protective screening in 4.4.4.7. Fault protection shall be independent and additional to those for basic protection.		P
4.4.4.2	Protective equipotential bonding		P
4.4.4.2.1	General		P
	Protective equipotential bonding shall be provided between accessible conductive parts of the equipment and the means of connection for the PC conductor, except: a) accessible conductive parts that are protected by one of the measures in 4.4.6.4; or b) when accessible conductive parts are separated from <i>live parts</i> using <i>double</i> or <i>reinforced insulation</i>.		P
	Electrical contact to the means of connection of the PE conductor shall be achieved by one or more of the following means: • through direct metallic contact; • through other accessible conductive parts or other metallic components which are not removed when the PECS is used as intended; • through a dedicated protective equipotential bonding conductor.		P
4.4.4.2.2	Rating of protective equipotential bonding		P
	Protective equipotential bonding shall either be: a) sized in accordance with the requirements for the PE conductor in 4.4.4.3 and the means of connection for the PE conductor in 4.4.4.3.2 to ensure no voltage drop exceeding the values from 4.4.2.2.3 during a fault; or b) sized		P

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Clause	Requirement + Test	Result - Remark	Verdict
	• to withstand the highest stresses that can occur to the PECS item(s) concerned when they are subjected to a fault connecting to accessible conductive parts; and • to 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; and • to ensure no voltage drop exceeding the values from 4.4.2.2.3 during normal operation and during a fault. Compliance shall be checked with the type tests in 5.2.3.11		
4.4.4.3	PE conductor		P
4.4.4.3.1	General		P
	A PE conductor shall be connected at all times when power is supplied to the PECS, unless the PECS complies with the requirements of protective class II (see 4.4.6.3) or protective class III. Unless local wiring regulations state otherwise, the PE conductor cross-sectional area shall be determined from Table 7 or by calculation according to 543.1 of IEC 60364-5-54:2011.		P
	If the PE 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.		N/A
	The cross-sectional area of every PE conductor that 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; or • 4 mm² if mechanical protection is not provided.	Larger than 4 mm ²	P
	Provisions within cord-connected equipment shall be made so that the PE conductor in the cord shall, in the case of failure of the strain-relief mechanism, be the last conductor to be interrupted. For special system topologies, the PECS designer shall verify the PE conductor cross-section required.		N/A
4.4.4.3.2	Means of connection for the PE conductor		P
	PECS shall have a means of connection for the PE conductor, located near the terminals for the respective live conductors. The means of connection shall be corrosion-resistant and shall be suitable for the connection of conductors according to Table 7		P

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Clause	Requirement + Test	Result - Remark	Verdict
	and of cables in accordance with the wiring rules applicable at the installation. The means of connection for the PE conductor shall not be used as a part of the mechanical assembly of the equipment or for other connections. Connection and bonding points shall be designed so 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. Compliance shall be checked by inspection.		
4.4.4.3.3	Touch current in case of failure of PE conductor	Touch current less than limit specified in 4.4.3.4	N/A
	For all other PECS, one or more of the following measures shall be applied, unless the touch current can be shown to be less than the limits specified in 4.4.3.4: a) Use of a fixed connection and - a cross-section of the PE conductor of at least 10 mm² Cu or 16 mm² Al; or - automatic disconnection of the supply in case of discontinuity of the PE conductor; or - provision of an additional terminal for a second PE conductor of the same cross-sectional area as the original PE conductor; or b) Use of a pluggable type B connection with a minimum PE conductor cross-section of 2,5 mm² as part of a multi-conductor power cable. Adequate strain relief shall be provided.		N/A
	Compliance is checked by inspection and by test of 5.2.3.7.		N/A
4.4.4.4	Automatic disconnection of supply		P
	For automatic disconnection of supply: - a protective equipotential bonding system shall be provided; and - a protective device operated by the fault current shall disconnect one or more of the line conductors supplying the equipment, system or installation, in case of a failure of basic insulation. The protective device shall interrupt the fault current within a time as specified in Figure 1, Figure 2		P

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Clause	Requirement + Test	Result - Remark	Verdict
	or Figure 3 in 4.4.2.2.3.		
4.4.4.5	Supplementary insulation	Considered	P
4.4.4.6	Simple separation between circuits		P
	If any component is connected between the separated circuits, that component shall withstand the electric stresses specified for the insulation which it bridges. If any component is connected between a circuit and a circuit connected to earth, its impedance shall limit the current flow through the component to the steady-state touch current values indicated in 4.4.3.4.		P
4.4.4.7	Electrically protective screening		P
	Electrically protective screening interposed between hazardous live parts of a PECS, shall consist of a conductive screen connected to the protective equipotential bonding of the PECS whereby the screen is separated from live parts by at least simple separation. The protective screen and the connection to the protective equipotential bonding system of the PECS and that interconnection shall comply with the requirements of 4.4.4.2.		P
4.4.5	Enhanced protection		P
4.4.5.1	General		P
	Enhanced protection shall provide both basic and fault protection and can be achieved by means of: • Reinforced insulation in 4.4.5.2; • Protective separation between circuits in 4.4.5.3; • Protection by means of in 4.4.5.4.	Double insulation used.	P
4.4.5.2	Reinforced insulation		N/A
	Reinforced insulation shall be so designed as to be able to withstand electric, thermal, mechanical and environmental stresses with the same reliability of protection as provided by double insulation. (basic insulation and supplementary insulation, see 4.4.3.2 and 4.4.4.5)		N/A
4.4.5.3	Protective separation between circuits	Double insulation.	P
	Protective separation between a circuit and other circuits shall be achieved by one of the following means: • double insulation (basic insulation and supplementary insulation in 4.4.3.2 and 4.4.4.5); • reinforced insulation in 4.4.5.2;	Between the DVC-A circuit and DVC-C circuit	P

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Clause	Requirement + Test	Result - Remark	Verdict
	• electrically protective screening in 4.4.4.7; • a combination of these provisions.		
	If conductors of the separated circuit are contained together with conductors of other circuits in a multi-conductor cable or in another grouping of conductors, they shall be insulated, individually or collectively, for the highest voltage present, so that double insulation is achieved. If any component is connected between the separated circuits, that component shall comply with the requirements for protective impedance devices (see 4.4.5.4)		N/A
4.4.5.4	Protection by means of protective impedance	Considered.	P
	Protective impedance shall be arranged so that under both normal and single fault conditions the current and discharge energy available shall be limited according to 4.4.3.4.		P
	The protective impedances shall be designed and tested to withstand the impulse voltages and temporary overvoltages for the circuits to which they are connected. See 5.2.3.2 and 5.2.3.4 for tests.		P
	Compliance with the requirement for the limitation of touch current is checked by test of 5.2.3.6.		P
	Compliance with the requirement for the discharge energy shall be checked by performing calculations and/or measurements to determine the voltage and capacitance. NOTE A protective impedance designed according to this subclause is not considered to be a galvanic connection.		P
4.4.6	Protective measures		P
4.4.6.1	General		P
4.4.6.2	Protective measures for protective class I equipment		P
	Protective class I equipment shall meet the requirements for: • basic protection in 4.4.3; and • fault protection in 4.4.4.2 and 4.4.4.3 with respect to equipotential bonding and PE conductor.		P
4.4.6.3	Protective measures for protective class II equipment	Class I	N/A
	Protective class II equipment shall meet the requirements for enhanced protection according to 4.4.5 and the enclosure shall meet the requirement		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	for basic protection in 4.4.3 with respect to accessibility to hazardous live parts. Protective class II equipment shall not have means of connection for the PE conductor. This does not apply if a PE conductor is passed through the equipment to equipment series-connected beyond it. In the latter case the PE conductor and its means for connection shall be separated from: · accessible surface of the equipment; and · circuits which employ protective separation with at least simple separation according to the requirement in 4.4.4.6. The simple separation shall be designed according to the rated voltage of the series-connected equipment. Equipment of protective class II may have provision for the connection of an earthing conductor for functional reasons or for the damping of overvoltages. In this case, the functional earthing conductor shall be separated from: · accessible surface of the equipment; and · circuits which employ protective separation according to 4.4.5.3 with at least protective separation according to the requirement in 4.4.5.3. Equipment of protective class II shall be marked according to 6.3.7.3.3. Compliance is checked by inspection.		
4.4.6.4	Protective measures for protective class III equipment		N/A
4.4.6.4.1	General	Class I	N/A
	Protective measures shall be achieved by protective separation by one of the following means: • basic insulation and supplementary insulation (double insulation) according to 4.4.3.2 and 4.4.4.5; • reinforced insulation according to 4.4.5.2; • electrically protective screening and simple separation according to 4.4.4.7; or • a combination of these provisions; used in combination with one of the following means: • protective impedance according to 4.4.5.4 comprising limitation of discharge energy and of current; or		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	• limitation of voltage according to 4.4.3.5.		
	The protective separation shall be fully and effectively maintained under all conditions of intended use of the PECS.		N/A
4.4.6.4.2	Connection to PELV and SELV circuits		P
	If a port is intended for connection of an external PELV or SELV circuit with a higher voltage than DVC As: • measures to limit the voltage to that of DVC As shall be taken (see Annex A); or • basic protection shall be provided. For connectors containing pins with very small contact area ($< 1 \text{ mm}^2$), the next higher voltage level for DVC As, of Table 5, is permitted. Example: if DVC A1 is DVC As, then DVC A2 is permitted at pins of signal connectors. The connection of external PELV or SELV circuits to an internal circuit is permitted with the following consideration: • without measures: only if the DVC of the PELV and SELV voltage are lower than or equal to the DVC selected from Table 5 for the internal circuit under consideration; and • with measures: if the DVC of the PELV and SELV voltage are higher than the DVC selected from Table 5 for the internal circuit under consideration. The possibility of an addition of the voltages of the circuits under consideration to a higher level under fault conditions shall be considered. For marking, see 6.3.7.1. Consideration needs to be given to factors such as whether the circuits involved are earthed or not, what the voltages involved are, whether or not direct contact with live parts is possible, single faults in either equipment or the interconnections, etc.	The communication port is SELV.	P
4.4.7	Insulation		P
4.4.7.1	General		P
4.4.7.1.1	Influencing factors		P
	This subclause gives minimum requirements for insulation, based on the principles of IEC 60664.		P
	Insulation shall be selected after consideration of the following influences: - pollution degree; - overvoltage category; - supply system earthing;		P

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Clause	Requirement + Test	Result - Remark	Verdict
	- impulse withstand voltage, temporary over-voltage and working voltage; - location of insulation; - type of insulation.		
	Verification of insulation shall be made according to 5.2.2.1, 5.2.3.2, 5.2.3.4 and 5.2.3.5.		P
4.4.7.1.2	Pollution degree		P
	Insulation, especially when provided by clearances and creepage distances, is affected by pollution which occurs during the expected lifetime of the PECS. The micro-environmental conditions for insulation shall be applied according to Table 8.	PD 2	P
	The pollution degree shall be determined according to the environmental condition for which the product is specified. See Table 18 for selection of pollution degree according to environmental classification of the installation.		P
	The insulation may be determined according to pollution degree 2 if one of the following applies: a) instructions are provided with the PECS indicating that it shall be installed in a pollution degree 2 environment; or b) the specific installation application of the PECS is known to be a pollution degree 2 environment; or c) the PECS enclosure or coatings applied within the PECS according to 4.4.7.8.4.2 or 4.4.7.8.6 provide adequate protection against what is expected in pollution degree 3 and 4 (conductive pollution and condensation).		P
	The PECS manufacturer shall state in the documentation the pollution degree for which the PECS has been designed.		P
	If operation in a pollution degree 4 environment is required, protection against conductive pollution shall be provided by means of a suitable enclosure.		N/A
4.4.7.1.3	Overvoltage category (OVC)		P
	The measures for reduction of the impulse voltage shall ensure that the temporary overvoltages that could occur are sufficiently limited so that their peak value does not exceed the relevant rated impulse voltage of Table 9 and shall meet the requirement of 4.4.7.2.2, 4.4.7.2.3 and 4.4.7.3 as applicable.		P
	Four categories are considered. • Equipment of overvoltage category IV (OVC IV) is for use at the origin of the installation.	AC mains circuits = OVC III, Battery circuit = OVC II considered	P

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Clause	Requirement + Test	Result - Remark	Verdict
	• Equipment of overvoltage category III (OVC III) is equipment in fixed installations and for cases where the reliability and the availability of the equipment are subject to special requirements. • Equipment of overvoltage category II (OVC II) is energy-consuming equipment to be supplied from the fixed installation. • Equipment of overvoltage category I (OVC I) is equipment for connection to circuits in which measures are taken to limit transient overvoltages to an appropriately low level.		
4.4.7.1.4	Supply earthing systems		P
	The following three basic types of system earthing are described in IEC 60364-1. • 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 system, TN-C, TN-S and TN-C-S, are defined according to the arrangement of the neutral and protective conductors. • 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. • 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 system earthing.	TN system, reference manual	P
4.4.7.1.5	Determination of impulse withstand voltage and temporary overvoltage		P
	Table 9 uses the system voltage (see 4.4.7.1.6) and overvoltage category of the circuit under consideration to determine the impulse withstand voltage. The system voltage is also used to determine the temporary overvoltage. A PECS having more than one input or output shall be evaluated according to the input or output which gives the most severe requirements.		P
4.4.7.1.6	Determination of the system voltage		P
4.4.7.1.6.1	For mains supply		P
4.4.7.1.6.2	For non-main supply		P
	For PSCS supplied by non-mains a.c. or d.c., the system voltage is the r.m.s. value of the supply voltage between phases.		P

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Clause	Requirement + Test	Result - Remark	Verdict
4.4.7.1.7	Components bridging insulation		P
	Components bridging insulation shall comply with the requirements of the level of insulation (e.g. basic, reinforced, double) they are bridging.		P
4.4.7.2	Insulation to the surroundings		P
4.4.7.2.1	General		P
4.4.7.2.2	Circuits connected to mains supply		P
	Insulation between the surroundings and circuits which are connected directly to the mains supply shall be designed according to the impulse withstand voltage, temporary overvoltage, or working voltage, whichever gives the most severe requirement.		P
4.4.7.2.3	Circuits connected to Non-mains supply		P
	Insulation between the surroundings and circuits supplied from a non-mains supply shall be designed according to: • the impulse withstand voltage determined from Table 9 using the system voltage; • the working voltage; • the temporary overvoltage if known to exist due to the nature of the supply; whichever gives the more severe requirement.		P
	Temporary overvoltage on a non-mains supply shall be determined as follows: • Without detailed knowledge of the temporary overvoltage, it shall be according to Table 9. • If the temporary overvoltage is known this value shall be used.		P
	By the determination of temporary overvoltages on non-mains supply, following situations should be considered: • loss of the neutral in a non-mains low-voltage system; • accidental earthing of a non-mains low voltage IT system; and • short circuit in the non-mains low voltage installation.		P
4.4.7.2.4	Insulation between circuits		P
	Insulation between two circuits shall be designed according to the circuit having the more severe requirement. For the design of simple and protective separation	Basic insulation between the DVC-C circuit and PE. Reinforced or double insulation between the DVC-C	P

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Clause	Requirement + Test	Result - Remark	Verdict
	between circuits the insulation shall be designed according to: • the circuit having the more severe requirement; or • the working voltage between the circuits; whichever gives the most severe requirement.	circuit and communication port.	
4.4.7.3	Functional insulation		P
	If the failure of functional insulation does not produce a hazard (electrical, thermal, fire), no specific requirements apply for the dimensioning of functional insulation. In other cases the following requirements apply. Testing is not required, except where the circuit analysis required by 4.2 shows that failure of the insulation could result in a hazard. For parts or circuits that are significantly affected by external transients, functional insulation shall be designed according to the impulse withstand voltage of overvoltage category II, except that overvoltage category III shall be used when the PECS is connected at the origin of the installation. Where measures are provided that reduce transient overvoltages within the circuit from category III to values of category II, or values of category II to values of category I, functional insulation may be designed for the reduced values. Where the circuit characteristics can be shown by testing (see 5.2.3.2) to reduce impulse voltages, functional insulation may be designed for the highest impulse voltage occurring in the circuit during the tests. For parts or circuits that are not significantly affected by external transients, functional insulation shall be designed according to the working voltage across the insulation.		P
4.4.7.4	Clearance distance		P
4.4.7.4.1	Determination	See Table 4.4.7.4	P
	Clearances for functional, basic and supplementary insulation shall be dimensioned according to Table 10 (see Annex D for examples of the evaluation of clearance distances). Interpolation is permitted, when clearance is determined from temporary overvoltage or working voltage. Clearances for reinforced insulation shall be dimensioned to withstand an impulse voltage one step higher than the impulse withstand voltage, or 1,6 times the peak temporary overvoltage or peak working voltage, required for basic insulation.		P

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Clause	Requirement + Test	Result - Remark	Verdict
	Clearance distances for use in altitudes between 2 000 m and 20 000 m shall be calculated using a correction factor according to Table A.2 of IEC 60664-1:2007, which is reproduced as Table E.1. A correction factor selected from Table F.2 is also used for determination of clearance distances for approximately homogenous fields when frequencies are greater than 30 kHz, as given in Annex F.		
	Compliance shall be checked by visual inspection (see 5.2.2.1) or by performing the impulse voltage test of 5.2.3.2 and the a.c. or d.c. voltage test of 5.2.3.4.		P
4.4.7.4.2	Electric field homogeneity		N/A
	The dimensions in Table 10 correspond to the requirements of an inhomogeneous electric field distribution across the clearance, which are the conditions normally experienced in practice. If a homogeneous electric field distribution is known to exist, the clearance distance for basic or supplementary insulation may be reduced to not less than that required by Table F.2 (Case B) of IEC 60664-1:2007. In this case, however, the impulse voltage test of 5.2.3.2 shall be performed across the considered clearance. If the withstand against steady state voltages, recurring peak or temporary overvoltages according to Table 10 is decisive for the dimensioning of clearance and if these clearances are smaller than the values of Table 10 then an a.c. or d.c. voltage test according to 5.2.3.4 is required. Clearance distances for reinforced insulation shall not be reduced for homogeneous fields.		N/A
4.4.7.4.3	Clearance to conductive enclosures		P
	The clearance between any non-insulated live part and the walls of a metal enclosure shall be in accordance with 4.4.7.4.1 during and following the deflection tests of 5.2.2.4.2.		P
	Compliance is checked by inspection and by test of 5.2.2.4.2.		P
	If the design clearance distance is at least 12,7 mm and the clearance distance required by 4.4.7.4.1 does not exceed 8 mm, the deflection tests may be omitted.		P
4.4.7.5	Creepage distance		P
4.4.7.5.1	Insulating material groups		P
	Creepage distance requirements for PWBs		P

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Clause	Requirement + Test	Result - Remark	Verdict
	exposed to pollution degree 3 environmental conditions shall be determined based on Table 11 pollution degree 3 under "Other insulators".		
	For inorganic insulating materials, for example glass or ceramic, which do not track, the creepage distance may equal the associated clearance distance, as determined from Table 10.		P
4.4.7.5.2	Determination	See Table 4.4.7.5	P
	Creepage distances for functional, basic and supplementary insulation shall be dimensioned according to Table 11. Interpolation is permitted. Creepage distances for reinforced insulation shall be twice the distances required for basic insulation.		P
	When the creepage distance requirement determined from Table 11 is less than the clearance distance required by 4.4.7.4.1 or the clearance distance determined by impulse testing (see 5.2.3.2), then the creepage distance shall be increased to the clearance distance.		P
	Compliance of creepage distances shall be checked by measurement or inspection (see 5.2.2.1) (see Annex D for examples of the evaluation of creepage distances).		P
4.4.7.6	Coating		N/A
	A coating may be used to provide insulation, to protect a surface against pollution, and to allow a reduction in creepage and clearance distances (see 4.4.7.8.4.2 and 4.4.7.8.6)		N/A
4.4.7.7	PWB spacings for functional insulation		P
	Spacings for functional insulation shall comply with the requirement of 4.4.7.4 and 4.4.7.5.		P

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Clause	Requirement + Test	Result - Remark	Verdict
	Decreased spacings on PWB are permitted when all the following are satisfied: • the PWB has flammability rating of V-0 (see IEC 60695-11-10); • the PWB base material has a minimum CTI of 100; • the equipment complies with the PWB short circuit test (see 5.2.4.7). Decreased spacings for components assembled on PWB are permitted when used in: • pollution degree 1 or 2 environment; and • not more than overvoltage category I. In this case the manufacture specification may be used. Compliance is checked by inspection and by test of 5.2.4.7 if applicable.		P
4.4.7.8	Solid insulation		P
4.4.7.8.1	General		P
	Materials selected for solid insulation shall be able to withstand the stresses occurring. These include mechanical, electrical, thermal, climatic and chemical stresses which are to be expected in normal use. Insulation materials shall also be resistant to ageing during the expected lifetime of the PECS. Tests shall be performed on components and sub-assemblies using solid insulation, in order to ensure that the insulation performance has not been compromised by the design or manufacturing process.		P
4.4.7.8.2	Material requirements		P
	The insulating material shall have a CTI of 100 or greater. The insulating material shall be suitable for the maximum temperature it attains as determined by the temperature rise test of 5.2.3.10. Consideration shall be given as to whether or not the insulating material additionally provides mechanical strength and whether or not the part can be subject to impact during use.		P
	The insulating material in contact with live parts higher than DVC As shall comply with: • the glow-wire test described in 5.2.5.3 at a test temperature of 850 °C; or • the glow-wire test described in 5.2.5.3, at a lower test temperature, but not less than 550 °C, depending on the classification of the use of the PECS,		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	according to Table A.1 of IEC 60695-2-11:2011; or • the alternative hot wire ignition test of 5.2.5.4.		
	Thermoplastic insulating materials used in contact with live parts higher than DVC As or used as part of the enclosure shall comply with the ball pressure test as abnormal heat test according to IEC 60695-10-2.		N/A
	Where an insulating material is used in a PECS that incorporates switching contacts, and is within 12,7 mm of the contacts, it shall comply with the high current arcing ignition test of 5.2.5.2.		N/A
	In case the manufacturer of the insulating material provides data to demonstrate compliance with the above requirements no further testing is required. No further evaluation is required when generic materials are used according to Table 12.		N/A
	Compliance is checked by inspection and by test of 5.2.3.10 and 5.2.5.3 or 5.2.5.2.		N/A
4.4.7.8.3	Thin sheet or tape material		P
4.4.7.8.3.1	General		P
	4.4.7.8.3 applies to the use of thin sheet or tape materials in assemblies such as wound components and bus-bars. Insulation consisting of thin (less than 0,75 mm) sheet or tape materials is permitted, provided that it is protected from damage and is not subject to mechanical stress under normal use. Where more than one layer of insulation is used, there is no requirement for all layers to be of the same material. NOTE 1 One layer of insulation tape wound with more than 50 % overlap is considered to constitute two layers. NOTE 2 Basic, supplementary and double insulation can be applied as a pre-assembled system of thin materials.		P
4.4.7.8.3.2	Material thickness $\geq 0,2$ mm		N/A
	Basic or supplementary insulation shall consist of at least one layer of material, which will meet the requirements of 4.4.7.8.1 and 4.4.7.10.1.		N/A
	Double insulation shall consist of at least two layers of material, each of which will meet the requirements of 4.4.7.8.1, 4.4.7.10.1, and the partial discharge requirements of 4.4.7.10.2, and both layers together will meet the impulse and a.c. or d.c.		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	voltage requirements of 4.4.7.10.2.		
	Reinforced insulation shall consist of a single layer of material, which will meet the requirements of 4.4.7.8.1 and 4.4.7.10.2.		N/A
	NOTE The requirements of this subclause indicate that double insulation can be at least 0,4 mm thick, while reinforced insulation is permitted to be 0,2 mm thick.		N/A
4.4.7.8.3.3	Material thickness less than 0,2 mm		P
	Basic or supplementary insulation shall consist of at least two layers of material, which will meet the requirements of 4.4.7.8.1 and 4.4.7.10.1.		P
	Double insulation shall consist of at least three layers of material. Each layer shall meet the requirements of 4.4.7.8.1 and 4.4.7.10.1, and any two layers together shall meet the requirements of 4.4.7.10.2.		P
	Reinforced insulation consisting of a single layer of material is not permitted.		P
4.4.7.8.3.4	Compliance		P
	Compliance shall be checked by the tests described in 5.2.3.1 to 5.2.3.5. When a component or sub-assembly makes use of thin sheet insulating materials, it is permitted to perform the tests on the component rather than on the material.		P
4.4.7.8.4	Printed wiring boards (PWBs)		P
4.4.7.8.4.1	General		P
	Insulation between conductor layers in double-sided single-layer PWBs, multi-layer PWBs and metal core PWBs, shall meet the requirements of 4.4.7.8.1. Basic, supplementary, double and reinforced insulation shall meet the appropriate requirements of 4.4.7.10.1 or 4.4.7.10.2. Functional insulation in PWBs shall meet the requirements of 4.4.7.7. For the inner layers of multi-layer PWBs, the insulation between adjacent tracks on the same layer shall be treated as either: • a creepage distance for pollution degree 1 and a clearance as in air (see Example D.14); or • solid insulation, in which case it shall meet the requirements of 4.4.7.8.1 and 4.4.7.10.		P
4.4.7.8.4.2	Use of coating materials		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	A coating material used to provide functional, basic, supplementary and reinforced insulation shall meet the requirement as specified below.		N/A
	Type 1 protection (as defined in IEC 60664-3) improves the microenvironment of the parts under protection. The clearance and creepage distance of Table 10 and Table 11 for pollution degree 1 apply under the protection. Between two conductive parts, it is a requirement that one or both conductive parts, together with all the spacing between them, are covered by the protection.		N/A
	Type 2 protection is considered to be similar to solid insulation. Under the protection, the requirements for solid insulation specified in 4.4.7.8 are applicable, including the coating material itself, and spacings shall not be less than those specified in Table 1 of IEC 60664-3:2003. The requirements for clearance and creepage in Table 10 and Table 11 do not apply. Between two conductive parts, it is a requirement that both conductive parts, together with the spacing between them, are covered by the protection so that no air gap exists between the protective material, the conductive parts and the printed boards.		N/A
	The coating material used to provide Type 1 and Type 2 protection shall be designed to withstand the stresses anticipated to occur during the expected lifetime of the PECS. A type test on representative PWBs shall be conducted according to Clause 5 of IEC 60664-3:2003. For the cold test (5.7.1 of IEC 60664-3:2003), a temperature of -25 °C shall be used, and for the rapid change of temperature test (5.7.3 of IEC 60664-3:2003): -25 °C to +125 °C. No routine test is required.		N/A
4.4.7.8.5	Wound components		N/A
	Varnish or enamel insulation of wires shall not be used for basic, supplementary, double or reinforced insulation. Wound components shall meet the requirements of 4.4.7.8.1 and 4.4.7.10. The component itself shall pass the requirements given in 4.4.7.8.1 and 4.4.7.10.2. If the component has reinforced or double insulation, the a.c. or d.c. voltage test of 5.2.3.4 shall be performed as a routine test.		N/A
4.4.7.8.6	Potting materials		N/A
	A potting material may be used to provide solid insulation or to act as a coating to protect against		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	pollution.		
	If used as solid insulation, it shall comply with the requirements of 4.4.7.8.1 and 4.4.7.10.		N/A
	If used to protect against pollution, the requirements for Type 1 protection in 4.4.7.8.4.2 apply.		N/A
4.4.7.9	Connection of parts of solid insulation (Cemented joints)		N/A
	The creepage and clearance path in the presence of a cemented joint between two insulating parts, are determined as follows. • Type 1 or type 2 protection as described in 4.4.7.8.4.2 apply. • A cemented joint that is not evaluated as providing protection of type 1 or type 2, is neither considered solid insulation nor to reduce pollution degree. The clearance and creepage distances of Table 10 and Table 11 apply for the pollution degree of the environment around the joint. See 5.2.5.7 for test.		N/A
4.4.7.10	Requirements for electrical withstand capability		P
4.4.7.10.1	Basic or supplementary insulation	See Table 4.4.7.10	P
	Test with impulse withstand voltage according to 5.2.3.1		P
	Test with a.c. or d.c. voltage according to 5.2.3.4		P
4.4.7.10.2	Double and reinforced insulation	See Table 4.4.7.10	P
	Double or reinforced insulation shall be tested as follows: • Test with impulse withstand voltage according to 5.2.3.2; and • Test with a.c. or d.c. voltage according to 5.2.3.4.		P
	For solid insulation, the partial discharge test according to 5.2.3.5 shall be performed in addition to the above tests, if the recurring peak working voltage across the insulation is greater than 750 V and the voltage stress on the insulation is greater than 1 kV/mm. The partial discharge test shall be performed as a type test on all components, sub-assemblies and PWB. In addition, a sample test shall be performed if the insulation consists of a single layer of material.		N/A
	Double insulation shall be designed so that failure of the basic insulation or of the supplementary insulation will not result in reduction of the insulation capability of the remaining part of the insulation.		P

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Clause	Requirement + Test	Result - Remark	Verdict
4.4.7.11	Insulation requirements above 30 kHz		N/A
4.4.8	Compatibility with residual current-operated protective devices		P
	To ensure the intended work of an RCD provided by the installation PECS shall satisfy one of the following conditions. a) A Pluggable Type A single-phase PECS, shall be designed so that, under normal and fault conditions any resulting d.c. component of the current in the PE conductor does not exceed the d.c. current withstand requirements in IEC 60755 for RCD of type A. b) For PECS that are Pluggable Type B or intended for permanent connection, d.c. current in the PE conductor is not limited if the information and marking requirements of 6.3.7.4 are complied with.		P
	Compliance with RCD provided by the installation shall be checked by simulation or calculation of current in the PE conductor under normal and single fault conditions according to the guideline provided in Annex H.		P
4.4.9	Capacitor discharge		P
	For protection against shock hazard, capacitors within a PECS shall be discharged to a voltage less than DVC As, or to a residual charge less than 50 μC, after the removal of power from the PECS: • For pluggable PECS type A and B the discharge time shall not exceed 1 s or the hazardous live parts shall be protected against direct contact by at least IPXXB (see 4.4.3.3). • For permanently connected PECS the discharge time shall not exceed 5 s. For pluggable PECS type A and B and permanently connected PECS, which do not meet the above requirements, access shall only be possible by means of a tool or key and the information and marking requirements of 6.5.2 apply. Compliance is checked by test of 5.2.3.8.	Considered	P
4.5	Protection against electrical energy hazards		P
4.5.1	Operator Access Areas		P
4.5.1.1	General		P
	Equipment shall be so designed that there is no risk of electrical energy hazard in operator access areas from accessible circuits by fulfilling requirement of 4.2.		P

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Clause	Requirement + Test	Result - Remark	Verdict
	A risk of injury due to an electrical energy hazard exists if it is likely that two or more bare parts (one of which may be earthed) between which a hazardous energy level exists, will be bridged by a metallic object. The likelihood of bridging the parts under consideration is determined by means of the test finger of Figure 1 of IEC 60529:1989, in a straight position. If it is possible to bridge the parts with this test finger, a hazardous energy level shall not exist. Barriers, guards, and similar means preventing unintentional contact may be provided as an alternative to limiting the energy.		
	Compliance is checked by inspection or test of 5.2.2.2.		P
4.5.1.2	Determination of hazardous energy level		P
	A hazardous electrical energy level is considered to exist if: • the voltage is 2 V or more; and • power available exceeds 240 VA after 60 s; or • the energy exceeds 20 J. Compliance shall be checked with the test in 5.2.3.9 or by calculation.		P
4.5.2	Service Access Areas		P
	Capacitors within a PECS shall be discharged to an energy level less than 20 J, as in 4.5.1.2, within 5 s after the removal of power from the PECS. If this requirement is not achievable for functional or other reasons, the information and marking requirements of 6.5.2 apply.	The warning symbol was explained and the time required for the capacitors to discharge after the removal of power from the PECS was stated in the installation and maintenance manuals.	P
	If the capacitor discharge time cannot be accurately calculated, the discharge time shall be measured.		P
4.6	Protection against fire and thermal hazards		P
4.6.1	Circuits representing a fire hazard		P
	The following types of circuits are considered a fire hazard: - circuits directly connected to the mains - circuits that are not directly connected to the mains but exceed the limits for limited power sources in 4.6.5 - components having unenclosed arcing parts		P
4.6.2	Components representing a fire hazard		P

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Clause	Requirement + Test	Result - Remark	Verdict
4.6.2.1	General		P
	Compliance with 4.6.2 and 4.6.3 shall be confirmed by inspection of component and material data sheets and, where necessary, by test.		P
4.6.2.2	Components within a circuit representing a fire hazard		P
	Inside fire enclosures, materials for components and other parts and all materials in contact with such parts shall comply with flammability class V-2 as classified in IEC 60695-11-10 or flammability class HF-2 as classified in ISO 9772 or better.		P
	The above requirement does not apply to any of the following: • electrical components which do not present a fire hazard under abnormal operating conditions when tested according to 5.2.4.6; • materials and components within an enclosure of 0,06 m³ or less, consisting totally of metal and having no ventilation openings, or within a sealed unit containing an inert gas; • electronic components, such as integrated circuit packages, opto-coupler packages, capacitors and other small parts that are mounted on material of flammability class V-1 or better; • wiring, cables and connectors insulated with PVC, TFE, PTFE, FEP, neoprene or polyimide; • the following parts, provided that they are separated from electrical parts (other than insulated wires and cables) which under fault conditions are likely to produce a temperature that could cause ignition, by at least 13 mm of air or by a solid barrier of material of flammability class V-1 or better: – other small parts which would contribute negligible fuel to a fire, including, labels, mounting feet, key caps, knobs and the like; – tubing for air or any fluid systems, containers for powders or liquids and foamed plastic parts, provided that they are of flammability class HB.		P
4.6.2.3	Components within a circuit not representing a fire hazard		P
	For components within a circuit not representing a fire hazard 4.6.2 does not apply.		P
4.6.3	Fire enclosures		P
4.6.3.1	General		P
	Fire enclosures are used to reduce the risk of fire to	Metal enclosure	P

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Clause	Requirement + Test	Result - Remark	Verdict
	the environment, independent of the location where they are installed. A fire enclosure shall be provided for all PECS unless: • the product committee specifies that a fire enclosure is not required; or • there is an agreement between the user and the manufacturer; or • the PECS is intended to be used only in areas without combustible materials and is marked according to 6.3.5.		
4.6.3.2	Flammability of enclosure materials		P
	Materials used for fire enclosures of PECS shall meet the flammability test requirements of 5.2.5.5, except for those portions of the enclosure that enclose only circuits not representing a fire hazard.	Metals enclosure	P
	Materials are considered to comply without test if, in the minimum thickness used, the material is of flammability class 5VA or better, according to IEC 60695-11-20.		N/A
	Metals, ceramic materials, and glass which is heat-resistant tempered, wired or laminated, are considered to comply without test.		P
	Materials for components that fill an opening in a fire enclosure shall: • be of at least V-1 class material and no larger than 100 mm in any dimension; or • be of at least V-2 class material and either – not larger than 25 mm in any dimension; or – not larger than 100 mm in any dimension and located at least 100mm from any part that is a source of fire hazard; or • be of at least V-2 class material and there is a barrier or device(s) that forms a barrier made of a V-0 class material between the part and a source of fire hazard; or • comply with a relevant IEC component standard that includes flammability requirements for components that are intended to form part of, or fill openings in, a fire enclosure.	No such part	N/A
	Polymeric materials that serve as the outer enclosure and have surface area greater than 1 m ² or a single dimension larger than 2 m, shall have a maximum flame spread index of 100 as determined by ASTM E162 or ANSI/ASTM E84.		N/A
	The manufacturer may provide data from the fire enclosure material supplier to demonstrate		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	compliance with the above requirements. In this case, no further testing is required.		
	Compliance shall be checked by visual inspection and, where necessary, by test.		P
4.6.3.3	Openings in fire enclosures		N/A
4.6.3.3.1	General	No such part	N/A
4.6.3.3.2	Openings in the top and the side of fire enclosures		N/A
	Openings in the top surfaces of fire enclosures shall be designed to prevent an external object falling vertically or at up to 5° from vertically from entering the enclosure in an area that could lead to a fire hazard. This requirement applies to all sides of moveable equipment with no defined top and bottom, unless top and bottom surfaces can be suitably demonstrated in the installation instructions. Compliance shall be checked by test of 5.2.2.2.		N/A
	Openings in the top surfaces of fire enclosures not located vertically above or within 5° from vertical of a circuit representing a fire hazard as defined in 4.6.1 are not subject to the test of 5.2.2.2 and can be of any construction if the construction prevents access to parts greater than DVC As with the IP3X probe as detailed in 4.4.3.3. Where a portion of the side of a fire enclosure falls within the area traced out by the 5° angle in Figure 6, the limitations in 4.6.3.3.3 regarding openings in bottoms of fire enclosures also apply to this portion of the side. Compliance shall be checked by visual inspection.		N/A
4.6.3.3.3	Openings in the bottom of fire enclosures		N/A
	Compliance is checked by inspection or with the hot flaming oil test in 5.2.5.6, in case the fire enclosure is designed differently than as described in this subclause.		N/A
4.6.3.3.4	Doors of covers in fire enclosures		N/A
	If part of a fire enclosure consists of a door or a cover leading to an operator access area, it shall comply with one of the following requirements: • the door or cover shall be provided with a safety interlock; or • a door or cover, intended to be routinely opened by the user, shall comply with both of the following conditions: – it shall not be removable from other parts of		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	the fire enclosure by the user; and – it shall be provided with a means to keep it closed during normal operation. A door or cover intended only for occasional use by an installer, such as for the installation of accessories, is permitted to be removable provided that the equipment instructions include directions for correct removal and reinstallation of the door or cover. Compliance is checked by inspection.		
4.6.4	Temperature limits		P
4.6.4.1	Internal parts	See table 4.6.4	P
	Equipment and its component parts shall not attain temperatures in excess of those in Table 14 when tested in accordance with the ratings of the equipment. Compliance is checked by test of 5.2.3.10.		P
4.6.4.2	Accessible parts		P
	When surface temperatures of the PECS, close to mounting surfaces, exceed the limit of Table 15, a warning according to 6.3.5 shall be provided.		P
4.6.5	Limited power sources		N/A
	Where a limited power source is required, the source shall comply with Table 16 or Table 17 as applicable.		N/A
	A limited power source shall comply with one of the following requirements: a) the output is inherently limited in compliance with Table 16; or b) a linear or non-linear impedance limits the output in compliance with Table 16. If a positive temperature coefficient device (e.g. PTC) is used, it shall pass the applicable tests specified in IEC 60730-1; or c) a regulating network limits the output in compliance with Table 16, both with and without a single fault in the regulating network; or d) an overcurrent protective device is used and the output is limited in compliance with Table 17.		N/A
	Compliance to determine the maximum available power is checked by test of 5.2.3.9.		N/A
4.7	Protection against mechanical hazards		P
4.7.1	General		P
	Failure of any component within the PECS shall not release sufficient energy to lead to a hazard, for		P

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Clause	Requirement + Test	Result - Remark	Verdict
	example, expulsion of material into an area occupied by personnel.		
4.7.2	Specific requirements for liquid cooled PSCS		N/A
4.7.2.1	General		N/A
4.7.2.2	Coolant		N/A
	Coolant temperature in operation shall not exceed the limit specified in Table 14.		N/A
	Compliance is checked by inspection and test of 5.2.3.10.		N/A
4.7.2.3	Design requirements		N/A
4.7.2.3.1	General		N/A
	The liquid containment system components shall be compatible with the liquid to be used. Equipment using liquids shall be so constructed that it is unlikely that either a dangerous concentration of these materials or a hazard in the meaning of this standard will be created by condensation, vaporization, leakage, spillage or corrosion during normal operation, storage, filling or emptying. Compliance is checked by inspection. The flexible hoses should be made of material free of conductive contaminants such as carbon.		N/A
4.7.2.3.2	Corrosion requirements		N/A
	All cooling system components shall be suitable for use with the specified coolant. They shall be corrosion resistant and shall not corrode as a result of prolonged exposure to the coolant and/or air. Compliance is checked by inspection.		N/A
4.7.2.3.3	Tubing, joints and seals		N/A
	Cooling <i>system</i> tubing, joints and seals shall be designed to prevent leakage during excursions of pressure over the life of the equipment. The entire cooling <i>system</i> including tubing shall satisfy the requirements of the hydrostatic pressure test of 5.2.7.		N/A
4.7.2.3.4	Provision for condensation		N/A
	Where internal condensation occurs during normal operation or maintenance, measures shall be taken to prevent degradation of insulation. In those areas where such condensation is expected, clearance and creepage distances of Table 10 and Table 11 shall be evaluated at least for a pollution degree 3 environment (see Table 8), and provision shall be made to prevent accumulation of water (for example by providing a drain).		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Compliance is checked by inspection.		
4.7.2.3.5	Leakage of coolant		N/A
	During a leakage measures has to ensure that coolant will not result in wetting of live parts or electrical insulation.		N/A
4.7.2.3.6	Loss of coolant		N/A
	Loss of coolant form the cooling system shall not result in thermal hazards, explosion, or shock hazard. The requirements of the Loss of coolant test of 5.4.3.9.4 shall be satisfied.		N/A
4.7.2.3.7	Conductivity of coolant		N/A
	When the coolant is intentionally in contact with live parts (for example non-earthed heatsinks), the conductivity of the coolant shall be continuously monitored and controlled, in order to avoid hazardous current flow through the coolant.		N/A
4.7.2.3.8	Insulation requirements for coolant hoses		N/A
	When the coolant is intentionally in contact with live parts (for example non-earthed heatsinks), the coolant hoses form a part of the insulation system. Depending on the location of the hoses, the requirements of 4.4.7 for functional or simple or protective separation shall be applied where relevant.		N/A
4.8	Equipment with multiple sources of supply		P
	Equipment with more than one supply; design shall be: - separate means of connection are provided for different circuits; and - supply plug connections, if any, are not interchangeable if a hazard could be created by incorrect plugging; and - hazards, within the meaning of this standard, shall not be present under normal or single fault conditions due to the presence of multiple sources of supply. Actions such as disconnection or de-energizing of a supply are considered a normal condition. Compliance is checked by the evaluation of 4.2		P
	Examples of the types of hazards that should be considered are: a) Backfeed prevention – preventing voltage or energy available within the PECS or one of its sources from being fed back to any of the input terminals for another source,		P

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Clause	Requirement + Test	Result - Remark	Verdict
	either directly or by a leakage path. b) Protection against unintentional islanding. c) Touch current levels may be higher with multiple sources connected simultaneously. d) Hazard resulting from damage to one or more connected sources due to energy from another source, for example the mains. e) Damage to wiring due to currents higher than the wiring is designed for flowing from another source.		
4.9	Protection against environmental stresses		P
	The manufacturer has to specify the following conditions for operation, storage and transportation according to IEC 60721: - Coolant temperature (min/max); - Ambient temperature (min/max); - Humidity (min/max) - Pollution degree; - Vibration; - U.V. resistance; - Over voltage category (OVC); - Altitude for thermal consideration, if rated for operation above 1000 m; - Altitude for insulation coordination considerations, if rated for operation above 2000 m.		P
	The manufacturer shall state the environmental service condition for the PECS according to Table 18.		P
4.10	Protection against Sonic Pressure Hazards		P
4.10.1	General		P
4.10.2	Sonic pressure and sound level		P
	If the measured sound pressure exceeds 70 dBA (except that sounds from alarms are not included) the documentation shall provide information regarding the sound level of the equipment.	Less than 70 dB A	N/A
4.11	Wiring and connections		P
4.11.1	General	Considered	P
	The wiring and connections between parts of the equipment and within each part shall be protected from mechanical damage during installation. The insulation, conductors and routing of all wires of the equipment shall be suitable for the electrical, mechanical, thermal and environmental conditions of		P

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Clause	Requirement + Test	Result - Remark	Verdict
	use. Conductors which are able to contact each other shall be provided with insulation rated for the DVC requirements of the relevant circuits. The compliance with 4.11.2 to 4.11.8 shall be checked by inspection (see 5.2.1) of the overall construction and datasheets if applicable.		
4.11.2	Routing		P
	A hole through which insulated wires pass in a sheet metal wall within the enclosure of the equipment shall be provided with a smooth, well-rounded bushing or grommet or shall have smooth, well-rounded surfaces upon which the wires bear to reduce the risk of abrasion of the insulation.		P
	Wires shall be routed away from sharp edges, screw threads, burrs, fins, moving parts, drawers, and similar parts, which abrade the wire insulation. The minimum bend radius specified by the wire manufacturer shall not be violated.		P
	Clamps and guides, either metallic or non-metallic, used for routing stationary internal wiring shall be provided with smooth, well-rounded edges. The clamping action and bearing surface shall be such that abrasion or deformation of the insulation does not occur. If a metal clamp is used for conductors having thermoplastic insulation less than 0,8 mm thick, non-conduction mechanical protection shall be provided.		P
4.11.3	Colour coding		P
	Insulated conductors, other than those which are integral of ribbon cable or multi-cord signal cable, identified by the colour green with or without one or more yellow stripes shall only be used for protective bonding.		P
4.11.4	Splices and connections		P
	All splices and connections shall be mechanically secured and shall provide electrical continuity. Electrical connections shall be soldered, welded, crimped, or otherwise securely connected. A soldered joint, other than a component on a PWB, shall additionally be mechanically secured. <i>NOTE Stranded wire should not be consolidated with solder where secured in a terminal that relies on pressure for contact or equivalent</i> When stranded internal wiring is connected to a wire-binding screw, the construction shall be such that loose strands of wire do not contact: • other uninsulated live parts not always of the		P

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Clause	Requirement + Test	Result - Remark	Verdict
	same potential as the wire; • de-energized metal parts. When screw terminal connections are used, the resulting connections may require routine maintenance (tightening). Appropriate reference shall be made in the maintenance manual (see 6.5.1).		
4.11.5	Accessible connections		P
	In addition to measures given in 4.4.6.4 it shall be ensured that neither insertion error nor polarity reversal of connectors can lead to a voltage on an accessible connection higher than the maximum of DVC As. 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 or key or which are accessible without the use of a tool or key. This does not apply to equipment intended to be installed in restricted access areas. If relevant, non-interchangeability and protection against polarity reversal of connectors, plugs and socket outlets shall be confirmed by inspection and trial insertion.	No voltage higher than DVC As occur dependent final installation.	P
4.11.6	Interconnections between parts of the PSCS		P
	In addition to complying with the requirements given in 4.11.1 to 4.11.5, the means provided for the interconnection between parts of the PECS shall comply with the following requirements or those of 4.11.7. Cable assemblies and flexible cords provided for interconnection between sections of equipment or between units of a system shall be suitable for the service or use involved. Cables shall be protected from physical damage as they leave the enclosure and shall be provided with mechanical strain relief. Misalignment of male and female connectors, insertion of a multipin male connector in a female connector other than the one intended to receive it, and other manipulations of parts which are accessible to the operator shall not result in mechanical damage or a risk of thermal hazards, electric shock, or injury to persons. When external interconnecting cables terminate in a plug which mates with a receptacle on the external surface of an enclosure, no risk of electric shock shall exist at accessible contacts of either the plug or receptacle when disconnected. <i>NOTE An interlock circuit in the cable to de-energize the accessible contacts whenever an end of the cable is disconnected meets the intent of these</i>		P

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Clause	Requirement + Test	Result - Remark	Verdict
	<i>requirements.</i>		
4.11.7	Supply connections		P
	The connection points provided shall be of appropriate construction to preclude the possibility of loose strands reducing the spacing between conductors when careful attention is paid to installation.		P
4.11.8	Terminals		P
4.11.8.1	Construction requirements		P
	All parts of terminals which maintain contact and carry current shall be of metal having adequate mechanical strength. Terminal connections shall be such that the conductors can be connected by means of screws, springs or other equivalent means so as to ensure that the necessary contact pressure is maintained. Terminals shall be so constructed that the conductors can be clamped between suitable surfaces without any significant damage either to conductors or terminals. Terminals shall not allow the conductors to be displaced or be displaced themselves in a manner detrimental to the operation of equipment and the insulation shall not be reduced below the rated values. The requirements of this subclause are met by using terminals complying with IEC 60947-7-1 or IEC 60947-7-2, as appropriate.		P
4.11.8.2	Connecting capacity		P
	Terminals shall be provided which accommodate the conductors specified in the installation and maintenance manuals (see 6.3.6.4) and cables in accordance with the wiring rules applicable at the installation. The terminals shall meet the temperature rise test of 5.2.3.10.		P
	Information regarding the permitted wire sizes shall be given in the installation manual.		P
4.11.8.3	Connection		P
	Terminals for connection to external conductors shall be readily accessible during installation. Sets of terminals for connection to the same input or output shall be grouped together and shall be located in proximity to each other and to the main protective earthing terminal, if any. If the installation instructions provide detail on the proper earthing of the system, the protective earthing terminal need not be placed in proximity to the terminals.		P

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Clause	Requirement + Test	Result - Remark	Verdict
	Clamping screws and nuts shall not serve to fix any other component although they may hold the terminals in place or prevent them from turning.		
4.11.8.4	Wire bending space for wires 10 mm ² and greater		N/A
	The distance between a terminal for connection to the main supply, or between major parts of the PECS (for example a transformer), and an obstruction toward which the wire is directed upon leaving the terminal shall be at least that specified in Table 19.		N/A
4.12	Enclosures		P
4.12.1	General		P
4.12.2	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 could 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 could result in a hazard.		P
4.12.3	Cast metal	Sheet metal	N/A
	Die-cast metal, except at threaded holes for conduit, where a minimum of 6,4 mm thickness is required, shall be: • not less than 2,0 mm thick for an area larger than 155 cm² or having any dimension larger than 150 mm; • not less than 1,2 mm thick for an area of 155 cm² or less and having no dimension larger than 150 mm. The area under evaluation may be bounded by reinforcing ribs subdividing a larger area. Malleable iron or permanent-mould cast aluminium, brass, bronze, or zinc, except at threaded holes for conduit, where a minimum of 6,4 mm thickness is required, shall be: • at least 2,4 mm thick for an area greater than 155 cm² or having any dimension more than 150 mm; • at least 1,5 mm thick for an area of 155 cm² or less having no dimension more than 150 mm. A sand-cast metal enclosure shall be a minimum of 3,0 mm thick except at locations for threaded holes for conduit, where a minimum of 6,4 mm is required.		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
4.12.4	Sheet metal		P
4.12.5	Stability		P
	Under conditions of normal use, units and equipment shall not become physically unstable to the degree that they could become a hazard to an operator or to a service person. If units are designed to be fixed together on site and not used individually, the stability of each individual unit is exempt from the requirements of 4.12.5. The requirements of 4.12.5 are not applicable if the installation instructions for a unit specify that the equipment is to be secured to the building structure before operation. Under conditions of operator use, a stabilizing means, if needed, shall be automatic in operation when drawers, doors, etc., are opened. During operations performed by a service person, the stabilizing means, if needed, shall either be automatic in operation, or a marking shall be provided to instruct the service person to deploy the stabilizing means. Compliance is checked by test of 5.2.2.5.		P
5	TEST REQUIREMENTS		P
5.1	General		P
5.1.1	Test objectives and classification		P
5.1.2	Selection of test samples		P
5.1.3	Sequence of tests		P
5.1.4	Earthing conditions		P
5.1.5	General conditions for tests		P
5.1.5.1	Application of tests		P
	Unless otherwise stated, upon conclusion of the tests, the equipment need not be operational.		P
5.1.5.2	Test samples		P
5.1.5.3	Operating parameters for tests		P
5.1.6	Compliance		P
5.1.7	Test overview		P
5.2	Test specifications		P
5.2.1	Visual inspections (type test, sample test and routine test)		P

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Clause	Requirement + Test	Result - Remark	Verdict
	Before type testing, a check shall be made that the PECS delivered for the test is as expected with respect to supply voltage, input and output ranges, etc.		P
5.2.2	Mechanical tests		P
5.2.2.1	Clearances and creepage distance (type test)	See table 5.2.2.1 for details	P
	It shall be verified by measurement or visual inspection that the clearance and creepage distances comply with 4.4.7.4 and 4.4.7.5.		P
	Where this verification is impossible to perform, an impulse voltage test (see 5.2.3.2) shall be performed between the considered circuits.		P
5.2.2.2	Non-accessibility test (type test)		P
	This test is intended to show that live parts, protected by means of enclosures and barriers in compliance with 4.4.3.3, are not accessible.		P
	This test shall be performed as a type test of the enclosure of a PSCS as specified in IEC 60529 for the enclosure classification for protection against access to hazardous parts.		P
	Except as noted below: •The test probe for IP3X shall not penetrate the top surface of the enclosure when probed from the vertical direction $\pm 5^\circ$ only.		N/A
5.2.2.3	Ingress protection test (IP rating) (type test)	IP20	P
	The claimed IP rating of the enclosure shall be verified. This test shall be performed as a type test of the enclosure of a PSCS as specified in IEC 60529 for the enclosure classification.		P
5.2.2.4	Enclosure integrity test (type test)		P
5.2.2.4.1	General		P
	The integrity tests apply to PSCS, and also where PSCS are intended for operation without a further enclosure in restricted access areas. After completion of the integrity test, the PSCS shall pass the tests of 5.2.3.2 and 5.2.3.4 and shall be inspected to confirm that:		P
	- no degradation of any safety-relevant component of the PSCS has occurred.		P
	- live parts have not become accessible (see 4.4.3.3).		P
	- enclosures show no cracks or openings which		P

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Clause	Requirement + Test	Result - Remark	Verdict
	could cause a hazard.		
	- clearances are not less than their minimum permitted values and other insulation is undamaged.		P
	- barriers have not been damaged or loosened.		P
	- no moving parts which could cause a hazard are exposed.		P
	The integrity tests shall be performed at the worst case point on representative accessible face(s) of the enclosure.		P
	The PSCS is not required to be operational after testing and the enclosure may be deformed to such an extent that its original IP rating is not maintained.		P
5.2.2.4.2	Deflection test (type test)		P
5.2.2.4.2.1	General		P
	If requested by 4.12.1 the test in 5.2.2.4.2.2 and 5.2.2.4.2.3 applies, for metallic enclosure, as applicable.		P
5.2.2.4.2.2	Steady force test, 30 N		N/A
5.2.2.4.2.3	Steady force test, 250 N		P
5.2.2.4.3	Impact test (type test)		N/A
5.2.2.4.4	Drop		N/A
	Transportable equipment ≤ 18 kg Drop three times from 1000 mm on a horizontal surface at locations where they provide the most adverse results.		N/A
5.2.2.4.5	Stress relief		N/A
5.2.2.5	Stability test		P
5.2.2.6	Wall or ceiling mounted equipment		N/A
5.2.2.7	Handles and manual controls securement		N/A
5.2.3	Electrical tests		P
5.2.3.1	General		P
	The electrical tests described in 5.2.3.2 to 5.2.3.5 are applicable to basic, supplementary and reinforced insulation. Before performing these tests, preconditioning according to 5.2.6.3.1 and 5.2.6.3.2 is required.		P
	When performing electrical and preconditioning tests, the preferred procedure is to test the entire equipment; however it is acceptable to test the		P

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Clause	Requirement + Test	Result - Remark	Verdict
	components or sub-assemblies providing the basic and reinforced insulation. When components or sub-assemblies are tested, test conditions shall simulate the least favourable conditions occurring inside the equipment at the place of installation.		
5.2.3.2	Impulse voltage test (type test and sample test)	See Table 4.4.7.10	P
5.2.3.3	Alternative to Impulse voltage test (type test and sample test)		N/A
	An a.c. or d.c. voltage test according to 5.2.3.4 may be used as an alternative method to the impulse voltage test of 5.2.3.2.		N/A
	For an a.c. voltage test the peak value of the a.c. test voltage shall be equal to the impulse test of Table 25 and applied for three cycles of the a.c. test voltage.		N/A
	For a d.c. voltage test the average value of the d.c. test voltage shall be equal to the impulse test voltage of Table 25 and applied three times for 10 ms in each polarity.		N/A
	See IEC60664-1 clause 6.1.2.2.2 for further information.		N/A
5.2.3.4	A.C. or d.c. voltage test (type test and routine test)		P
5.2.3.4.1	Purpose of test	See Table 4.4.7.10	P
	The test is used to verify that the clearances and solid insulation of components and of assembled PSCS has adequate dielectric strength to resist temporary overvoltage conditions.		P
5.2.3.4.2	Value and type of test voltage		P
	The values of the test voltage for circuits connected to mains supply are determined from column 2 or 3 of Table 26. The voltage test shall be performed with a sinusoidal voltage at 50 Hz or 60 Hz. If the circuit contains capacitors the test may be performed with a d.c. voltage of a value equal to the peak value of the specified a.c. voltage.		P
5.2.3.4.3	Performing the voltage test		P
	a) Test (1) between accessible conductive part (connected to earth) and each circuit sequentially (except DVC As circuits). Test voltage according to Table 26, or Table 27, column 2, corresponding to voltage of considered circuit under test. Test (2) between accessible surface (non-conductive or conductive but not connected		P

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	to earth9 and each circuit sequentially (except DVC As circuits). Test voltage according to Table 26 or Table 27, column 3 (for type test) or column 2 (for routine test), corresponding to voltage of considered circuit under test.		
	b) Test between each considered circuit sequentially and the other adjacent circuits connected together. Test voltage according to Table 26 or Table 27, column 2, corresponding to voltage of considered circuit under test.		P
	c) Test between DVC As circuit and each adjacent circuit sequentially. Test voltage according to Table 26 or Table 27, column 3 (for type test) or column 2 (for routine test), corresponding to the circuit with the higher voltage. Either the adjacent circuit or the DVC As circuit may be earthed for this test. It is necessary to test functional insulation between PELV and SELV circuits, but it is not necessary to test functional insulation between adjacent PELV or adjacent SELV circuits.		P
5.2.3.4.4	Duration of the a.c. or d.c. voltage test		P
	The duration of the test shall be at least 60 s for the type test and 1 s for the routine test. The test voltage may be applied with increasing and/or decreasing ramp voltage but the full voltage shall be maintained for 60 s and 1 s respectively for type and routine tests.		P
5.2.3.4.5	Verification of the a.c. or d.c. voltage test		P
	The test is successfully passed if no electrical breakdown occurs during the test.		P
5.2.3.5	Partial discharge test (type test, sample test)		N/A
	The partial discharge test shall confirm that the solid insulation (see 4.4.7.8) used in components and subassemblies for protective separation of electrical circuits remains partial-discharge-free within the specified voltage range (see Table 28).		N/A
	This test shall be performed as a type test and a sample test. It may be omitted for insulating materials which are not degraded by partial discharge, for example ceramics. The partial discharge inception and extinction voltage are influenced by climatic factors (e.g. temperature and moisture), equipment self-heating, and		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	manufacturing tolerance. These influencing variables can be significant under certain conditions and shall therefore be taken into account during type testing.		
5.2.3.6	Protective impedance (type test and routine test)		P
	A type test shall be performed to verify that the current through a protective impedance under normal operating or single-fault conditions does not exceed the values given in 4.4.3.4. The test shall be performed using the circuit of IEC 60990:1999, Figure 4. NOTE IEC 60990 states that the use of a single network for the measurement of a.c. combined with d.c. has not been investigated, but no suggestion is made for measurement in such cases. The value of the protective impedance shall be verified as a routine test.		P
	Touch current measurement (type test)		P
	The touch current shall be measured to determine if the measures of protection need not be taken (see 4.4.4.3.3). The PECS shall be set up in an insulated state without any connection to the earth and shall be operated at rated voltage. Under these conditions, the touch current shall be measured between the means of connection for the PE conductor and the PE conductor itself with the test circuit of Figure 4 of IEC 60990:1999.		P
	• For a PSCS to be connected to an earthed neutral system, the neutral of the mains of the test site shall be directly connected to the protective earthing conductor.		P
	• For a PSCS to be connected to an earthed neutral system, the neutral shall be connected through a resistance of 1 kΩ to the protective earthing conductor which shall be connected to each input phase in turn. The highest value will be taken as the definitive result.		N/A
	• For a PSCS to be connected to a corner earthed system, the protective earthing conductor shall be connected to each input phase in turn. The highest value will be taken as the definitive result.		N/A
	• For a PSCS with a particular earthing system, this system shall operate as intended during the test.		N/A
	• If a PSCS is intended to be connected to more than one system network, each of these different system networks (or the worst-case, if that can be determined) shall be used to make the touch		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	current measurement.		
5.2.3.8	Capacitor discharge (type test)		P
	The capacitor discharge time as required by 4.4.3.4 may be verified by a type test and/or by calculation taking into account the relevant tolerances.		P
5.2.3.9	Limited power source test (type test)		N/A
	When required by 4.6.5 a limited power circuit shall be tested as below, with the equipment operating under normal operating conditions. In case the limited power source requirement depends on overcurrent protective device(s), the device(s) shall be short-circuited. With the equipment operating under normal operating conditions, a variable resistive load is connected to the parts under consideration and adjusted to obtain a level required limited VA power. Further adjustment is made, if necessary, to maintain the limited VA power for a period specified by 4.6.5. A variable resistive load is connected to the circuit under consideration and adjusted to obtain the limit of apparent power as indicated in Table 16 or Table 17, as applicable. Further adjustment is made, if necessary, to maintain the limit of apparent power for the time period indicated in Table 16 or Table 17, as applicable. The test is passed, if after the test period the available apparent power does not exceed the limits indicated in Table 16 or Table 17, as applicable. In case the limited power source requirement depends on overcurrent protective device(s), the current rating of at least one of the protective device(s) in the current path shall not exceed the limit in Table 17.		N/A
5.2.3.10	Temperature rise test (type test)	See Table of 4.6.4	P
	If possible the PECS must operate in the worst conditions of the rated power and the output current.		P
	Equipment, in which the heating or cooling quantity depends on the temperature, the temperature measurement must be carried out under the most unfavourable conditions of ambient temperature within the range specified by the manufacturer.		P
	The PECS shall be tested with at least 1,2 m of wire attached to each field wiring terminal. The wire shall be of the smallest size intended to be connected to the PECS as specified by the manufacturer for installation. When there is only provision		P

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Clause	Requirement + Test	Result - Remark	Verdict
	for the connection of bus-bars to the PECS, they shall be of the minimum size intended to be connected to the PECS as specified by the manufacturer, and they shall be at least 1,2 m in length.		
	The test shall be maintained until thermal stabilization has been reached. That is, when three successive readings, taken at intervals of 10 % of the previously elapsed duration of the test and not less than 10 min. intervals, indicate no change in temperature, defined as $\pm 1\text{ }^{\circ}\text{C}$ between any of the three successive readings, with respect to the ambient temperature.		P
	The temperature of an electrical insulation (other than that of windings) is measured on the surface of the insulation at a point close to the heat source, if a failure of this insulation could cause a hazard. If temperatures of windings are measured by the thermocouple method, the thermocouple shall be located on the surface of the winding assuming the hottest part due to surrounding heat emitting components. See also notes in Table 14.		P
	The maximum temperature attained shall be corrected to the rated ambient temperature of the PSCS by adding the difference between the ambient temperature during the test and the maximum rated ambient temperature.		N/A
	No corrected temperature shall exceed the rated temperature of the material or component measured.		N/A
	During the test, thermal cut-out, overload detection functions and devices shall not operate.		N/A
5.2.3.11	Protective bonding tests (type tests and routine test)		P
5.2.3.11.1	General		P
	Each conductive accessible part under consideration shall be tested separately, to determine if the protective equipotential bonding path for that part is adequate to withstand the test current that the bonding path may be subjected to under fault conditions. The circuit under consideration shall be selected from amongst those circuits adjacent to the accessible part under consideration and separated from it by only basic or functional insulation. All of these selected circuits have to be analysed regarding prospective short circuit current and the associated protective element(s): - If the circuit under consideration exceeds		P

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	the 5 s disconnection time requirement of IEC 60364-4-41, the protective equipotential bonding impedance test of 5.2.3.11.2 and the protective equipotential bonding short circuit test of 5.2.3.11.3 have to be performed. - If the circuit under consideration meets the 5 s disconnection time requirement of IEC 60364-4-41, the protective equipotential bonding short circuit test of 5.2.3.11.3 has to be performed. - If the circuit under consideration meets the disconnection time requirement of IEC 60364-4-41:2005, Table 41.1, as applicable, depending on the earthing system of the installation, no type test is required.		
	For pluggable equipment type A only the protective equipotential bonding impedance test of 5.2.3.11.2 have to be performed.		N/A
5.2.3.11.2	Protective bonding impedance test (type test)		P
5.2.3.11.2.1	Test Conditions	See clause 5.2.3.11.1	P
	Where required by 4.4.4.2.2 and 5.2.3.11.2.1, the impedance of protective equipotential bonding means shall be checked by passing a test current through the bond for a period of time. The test current is based on the rating of the overcurrent protection for the equipment or part of the equipment under consideration, as follows: • 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); • for pluggable equipment type B and permanently connected equipment, the maximum rating of the overcurrent protective device specified in the equipment installation instructions to be provided external to the equipment; • the rating of the provided overcurrent device for a circuit or part of the equipment for which an overcurrent protective device is provided as part of the equipment.		P
5.2.3.11.2.2	Test current, duration, and acceptance criteria:		P
	a) For PECS with an overcurrent protective device rating of 16 A or less, this test may be omitted, if an impedance not exceeding 0,1 Ω can be demonstrated.		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	b) As an alternative to Table 29, where the time-current characteristic of the overcurrent protective device that limits the fault current in the protective equipotential 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.		P
	c) For PECS with an overcurrent protective device rating of more than 460 A, calculations or simulations according to IEC 60949 shall be used to show the ability of the prospective short circuit current to fulfil the requirements. The protective equipotential bonding continuity routine test of 5.2.3.11.4 shall be performed to show that the impedance of the protective equipotential bonding means during and at the end of the test shall not exceed the expected value.		N/A
	Acceptance criteria: The test current is 200 % of the overcurrent protective device rating and the duration of the test is as shown in Table 29. The voltage drop in the protective equipotential bonding means, during and at the end of the test, shall not exceed DVC As, as determined from Table 2 and Table 5 with respect to the accessible surface of the enclosure.		P
	After the tests, visual inspection shall show no damage to the <i>protective equipotential bonding</i> means.		P
5.2.3.11.3	Protective bonding short circuit withstand test (type test)		P
	As required by 5.2.3.11.2.1, the short circuit test in 5.2.4.3 shall be performed to ensure that protective bonding has the ability to withstand the prospective short circuit current that it may be subjected to under fault conditions.		P
	The testing shall include an individual test of the protective bonding path for each conductive accessible part unless analysis shows that the short circuit withstand capability of the path is adequate, or that the results of one combination are representative of the anticipated results of another combination.		P
5.2.3.11.4	Protective bonding continuity test (routine test)		N/A
5.2.4	Abnormal operation and simulated faults tests		P

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Clause	Requirement + Test	Result - Remark	Verdict
5.2.4.1	General	See table 4.2 and 4.3	P
5.2.4.2	Pass criteria		P
	As a result of the abnormal operation tests, the PSCS shall comply with the following: • there shall be no emission of flame, burning particles or molten metal; • the surgical cotton indicator shall not have ignited; • the earth connection and protective bonding of the PSCS shall not have opened; • doors and cover shall remain in place; • during and after the test, accessible DVC As, SELV and PELV circuits and accessible conductive parts shall not exhibit voltages greater than the time dependent voltages of Figure 1, Figure 2 or Figure 3, as appropriate and shall be separated from live parts at voltages greater than DVC As with at least basic insulation. Compliance shall be checked by the a.c./d.c. insulation test of 5.2.3.4 for basic insulation; • during and after the test, live parts at voltages greater than DVC As shall not become accessible. • components, e.g. busbar supports, used for the mounting of live parts not break away from their initial position, (IEC 62477-1:2012/AMD1:2016) • no conductor shall get pulled out of its terminal connector. (IEC 62477-1:2012/AMD1:2016)		P
	The PSCS is not required to be operational after testing and it is possible that the enclosure can become deformed. Overcurrent protection integral to the PECS, or required to be used with the PECS, is allowed to open.		P
5.2.4.3	Protective bonding short circuit withstand test (type test)		N/A
5.2.4.3.1	General		N/A
	When required by 5.2.3.11.2.1, a protective bonding path shall be subjected to the following short-circuit withstand test.		N/A
5.2.4.3.2	Test conditions		N/A
	The equipment under test shall be supplied with power and the output port shall be operating as intended in 5.2.4.1 prior to closing the switching		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	means that applied will be more severe.		
	The protective bonding short circuit test shall be performed with the PSCS working with light load, unless analysis shows that higher short circuit currents are available under higher loading conditions.		N/A
	A new sample may be used for each short-circuit test.		N/A
5.2.4.3.3	Protective equipotential bonding short-circuit test method		N/A
5.2.4.3.4	Pass criteria		N/A
5.2.4.4	Output Short-circuit test (type test)		P
5.2.4.4.1	Load conditions		P
	The short circuit test shall be performed with the PSCS at full load or light load whichever creates the more severe condition.		P
5.2.4.4.2	Short-circuit test method		P
	In addition to determining compliance with the criteria of 5.2.4.2, this test is used to determine the output short circuit current rating of the port under consideration, in accordance with 4.3.2.3. An oscilloscope or other suitable instrument shall be used to measure the peak current during the test, and to measure or calculate the r.m.s. value of the current.		P
	The value(s) to be recorded and to be provided with the PECS instructions, in accordance with 6.2, are the peak current, and the highest of the r.m.s. current values measured or calculated over a time period as follows: a) for a.c. signals, three cycles of the nominal a.c. frequency for the port under consideration, in which case the value is to be stated as the 3-cycle r.m.s. value; b) for all signals, the duration of the short circuit from the time the short circuit is applied, until the time the short circuit current is interrupted by a protective device or other mechanism, in which case the value stated is to include the r.m.s. value and the time period in seconds; c) for short circuit tests that result in a continuous non-zero value, the steady-state r.m.s. value, in which case the value is to be stated as a continuous r.m.s. value. For PECS with internal short circuit protection according to 4.3.2.3, which protects the output port within some few μs, the requirements in a), b) and		P

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	c) are not applicable.		
5.2.4.5	Output Overload test (type test)	Considered	P
5.2.4.6	Breakdown of components test (type test)		P
5.2.4.6.1	Load conditions	See table 4.2 and 4.3	P
	The breakdown of a component, identified as a result of the circuit analysis of 4.2, shall be tested with the PSCS at full load or light load whichever creates the more severe condition.		P
5.2.4.6.2	Application of short-circuit or open-circuit		P
	The short circuit shall be applied with cable of a cross-section appropriate for the current that normally flows through the component, but no less than 2.5 mm ² . The length of the loop shall be as short as practical to perform the test. Short circuits and open circuits are applied using an appropriate switching device.		P
	Each identified component shall be subjected to only one breakdown of components test unless both open- and short-circuit failure modes are likely in that component.		P
5.2.4.6.3	Test sequence		P
	For the Breakdown of components test, identified components shall be short-circuited or open-circuited, whichever creates the worst hazard, one at a time.		P
5.2.4.7	PWB short-circuit test (type test)		N/A
	On PWBs, functional insulation provided by spacings which are less than those specified in Table 10 and Table 11 (see 4.4.7.7) shall be type tested as described below.		N/A
	The decreased spacings shall be short-circuited one at a time, on representative samples, and the short-circuit shall be maintained until no further damage occurs.		P
5.2.4.8	Loss of phase (type test)	See table 4.2 and 4.3	P
	A multi-phase PSCS shall be operated with each line (including neutral, if used) disconnected in turn at the input. The test shall be performed by disconnecting one line with the power conversion equipment operating at its maximum normal load and shall be repeated by initially energizing the device with on lead disconnected.		P
	The test shall continue until terminated by a protective mechanism, a component failure occurs, or the		P

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	temperature stabilizes.		
	This particular requirement may be simulated for PSCS with rated input current greater than 500 A.		N/A
5.2.4.9	Cooling failure tests (type test)		P
5.2.4.9.1	General and pass criteria		P
	For PSCS having a combination of cooling mechanisms, all relevant tests shall be performed. It is not necessary to perform the tests simultaneously. The test shall continue, - until the temperature stabilizes, in which case the temperature limits of 4.6.4.2 apply; or - until terminated by a protective mechanism or a component failure occurs, in which case the temperature limits of 4.6.4.2 may be exceeded by not more than 5°C. If this is not possible a warning statement shall be provided in the user documentation.		P
	NOTE The temperature increase of 5 °C with regard to the steady state limits reflect the spread of the burn threshold given in IEC Guide 117.		P
5.2.4.9.2	Inoperative blower motor		P
	A PSCS having forced ventilation shall be operated at rated load with fan or blower motor or motors made inoperative, singly or in combination from a single fault, by physically preventing their rotation.		P
5.2.4.9.3	Clogged filter		P
	Enclosed PSCS having filtered ventilation openings shall be operated with the openings blocked to represent clogged filters. The test shall be performed initially with the ventilation openings blocked 50 %. The test shall be repeated under full blocked condition.		P
5.2.4.9.4	Loss of coolant		N/A
	A liquid cooled PSCS shall be operated at rated load. Loss of coolant shall be simulated by draining the coolant, blocking the flow or disabling the system coolant pump.		N/A
	If the PSCS is shut down due to the operation of a thermal device located inside the coolant, then the test shall be repeated with the coolant drained out of the system.		N/A
	NOTE: It is presumed that the thermal device will be inoperative if not surrounded by coolant liquid.		N/A

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5.2.4.10	Short time withstand current (I_{cw}) test (type test) (IEC 62477-1:2012/AMD1:2016)		N/A
5.2.4.10.1	General (IEC 62477-1:2012/AMD1:2016)		N/A
	As required in 4.3.5, the short time withstand current test performed as a type test to verify the safety of the PECS. (IEC 62477-1:2012/AMD1:2016)		N/A
	Short-circuits are applied in the PECS at locations based on the evaluation in 4.2 so that terminals and other parts in the fault current path are being exposed to the short-circuit current. (IEC 62477-1:2012/AMD1:2016)		N/A
5.2.4.10.2	Short time withstand current test method (IEC 62477-1:2012/AMD1:2016)		N/A
	The input mains supply port terminals provided with a cable with a cross-section as specified for the installation. (IEC 62477-1:2012/AMD1:2016)		N/A
	If a switching device is used to initiate the short-circuit or switch the power to the PECS, it not limit the test current. (IEC 62477-1:2012/AMD1:2016)		N/A
	The complete length of the cable (forth and back) approximately 2 m, unless this length is insufficient, in which case the length as short as practical to perform the test. (IEC 62477-1:2012/AMD1:2016)		N/A
	The testing include individual tests for each input mains supply port. (IEC 62477-1:2012/AMD1:2016)		N/A
	The worst case combination of terminals (including neutral and earth) subjected to a short-circuit test. (IEC 62477-1:2012/AMD1:2016)		N/A
	The PECS can be tested unenergized and not operating as intended prior to the short-circuit withstand test, if it can be shown that the test result is not affected. (IEC 62477-1:2012/AMD1:2016)		N/A
	A new sample used for each short-circuit test. (IEC 62477-1:2012/AMD1:2016)		N/A
	Table 37 lists the a.c. current test method as a minimum requirement for PECS. (IEC 62477-1:2012/AMD1:2016)		N/A
5.2.4.10.3	Compliance criteria (IEC 62477-1:2012/AMD1:2016)		N/A
	As a result of the short time withstand current (I_{cw}) test, the PECS comply with the compliance criteria of 5.2.4.2. (IEC 62477-1:2012/AMD1:2016)		N/A
5.2.5	Material tests		P
5.2.5.1	General		P

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	When requested by 4.4.7.8.2, the manufacturer shall test the flammability properties of the materials used for insulating purposes, as defined in 5.2.5.2, 5.2.5.3 and 5.2.5.4. When requested by 4.6.3.2 the manufacturer shall test the flammability properties of the materials used for fire enclosure, as defined in 5.2.5.5.	Approved material used	N/A
5.2.5.2	High current arcing ignition test (type test)		N/A
5.2.5.3	Glow-wire test (type test)		N/A
	The glow-wire test shall be made under the conditions specified in 4.4.7.8.2 according to IEC 60695-2-10 and IEC 60695-2-13.		N/A
5.2.5.4	Hot wire ignition test (type test – alternative to Glow-wire test)		N/A
5.2.5.5	Flammability test (type test)		N/A
5.2.5.6	Flaming oil test (type test)		N/A
5.2.5.7	Test of cemented joints (type test)		N/A
	When required by 4.4.7.9 representative samples of cemented joints providing protection of type 1 or type 2 as defined in IEC 60664-3:2003 shall be tested as a type test as follows. The samples shall be subjected to the conditioning procedure specified in 5.7 of IEC 60664-3:2003, using the following parameters: for the cold test (5.7.1), a temperature of -25 °C shall be used, and for the rapid change of temperature test (5.7.3): – 25 °C to +125 °C. After the conditioning the samples shall pass the following tests in the prescribed order: a) The mechanical strength of the joint shall be evaluated by loading the joint using the forces anticipated to be present under normal conditions. There shall be no separation of the parts. b) The insulation resistance between the conductive parts separated by the joint shall be measured according to 5.8.3 of IEC 60664-3:2003. c) Cemented joints shall be treated as to be thin sheet material and shall be tested according 4.4.7.8.3. d) The sectioning of the joint shall not show any cracks, voids or separation.		N/A
5.2.6	Environmental tests (type test)		P

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Clause	Requirement + Test	Result - Remark	Verdict
5.2.6.1	General		P
	Compliance is shown by conducting test of 5.2.6.3, 5.2.6.4, 5.2.6.5 and 5.2.6.6 according to Table 30 as applicable for the environmental conditions specified by the manufacture.		P
5.2.6.2	Acceptance criteria		P
	The following acceptance criteria shall be satisfied: - no degradation of any safety-relevant component of the PSCS; - no potentially hazardous behaviour of the PSCS during the test; - no sign of component overheating; - no live part shall become accessible; - no cracks in the enclosure and no damaged or loose insulators; - pass routine a.c. or d.c. voltage test 5.2.3.4; - pass protective bonding test 5.2.3.11.2; - no potentially hazardous behaviour when the PSCS is operated following the test.		P
5.2.6.3	Climatic tests		P
5.2.6.3.1	Dry heat test (steady state)		P
	To prove the ability of components and equipment to be operated, transported or stored at high temperatures the dry heat (steady state) test shall be performed according to the conditions specified in Table 31.		P
5.2.6.3.2	Damp heat test (steady state)		P
	To prove the resistance to humidity, the PSCS shall be subjected to a Damp heat test (steady state) according to Table 32.		P
5.2.6.4	Vibration test (type test)		P
	To verify the mechanical vibration strength the PECS in combination with its installation shall be evaluated by: a) tests defined in this section according to the conditions specified in Table 33; - or b) calculation or simulation based on tests, as defined in this section, on a representative model of PECS. For PSCS with a mass more than 100 kg, this test may be performed on sub-assemblies.		P

EN 62477-1			
Clause	Requirement + Test	Result - Remark	Verdict
	NOTE For large equipment, the possibility of using a shock test as an alternative to a vibration test is under consideration.		
5.2.6.5	Salt mist (type test)		N/A
	To verify the resistance against salt mist, the PECS in combination with its installation shall be evaluated by tests defined in this section according to the conditions specified in Table 34. For PSCS with a mass more than 100 kg, this test may be performed on sub-assemblies.		N/A
5.2.6.6	Dust and sand (type test)		N/A
	To verify the mechanical strength against dust and sand the PECS in combination with its installation shall be evaluated by tests defined in this section under the conditions specified in Table 35. For PSCS with a mass more than 100 kg, this test may be performed on sub-assemblies.		N/A
5.2.7	Hydrostatic pressure (type test and routine test)		N/A
	For type tests, the pressure inside the cooling system of a liquid cooled PSCS (see 4.7.2.3.3) shall be increased at a gradual rate until a pressure relief mechanism (if provided) operates, or until a pressure of twice the operating value or 1,5 times the maximum pressure rating of the system is achieved, whichever is the greater. <i>NOTE: for the purpose of this test the coolant pump may be disabled.</i> For routine tests, the pressure shall be increased to the maximum pressure rating of the system. The pressure shall be maintained for at least one minute. There shall be no thermal, shock, or other hazard resulting from the test. There shall be no significant leakage of coolant or loss of pressure during the test, other than from a pressure relief mechanism during a type test. After the hydrostatic pressure type test the PSCS shall pass the a.c. or d.c. voltage test 5.2.3.4.		N/A
6	INFORMATION AND MARKING REQUIREMENTS		P
6.1	General		P
6.2	Information for selection (IEC 62477-1:2012/AMD1:2016)		P
	- the name or trademark of the manufacturer, supplier or importer;		P
	- catalogue number or equivalent;		P

EN 62477-1			
Clause	Requirement + Test	Result - Remark	Verdict
	- electrical ratings for each power port: - maximum nominal input voltage; - maximum nominal output voltage; - maximum nominal output current or nominal output power rating; - maximum nominal input current rms for dimensioning overload protective elements and wiring; - number of phases (e.g. 3 a.c.); - nominal frequency range (e.g. 50 Hz to 60 Hz); - protective class (I, II, III);		P
	- the type of electrical supply system (e.g. TN, IT) to which the PECS may be connected;		P
	- short-circuit current rating(s) in terms of: - conditional short-circuit current (I_{cc}) and minimum required prospective short-circuit current $I_{cp,mr}$ and the characteristics of the short-circuit protective device according to clause 4.3.2.2, or - rated short time withstand current (I_{cw}), duration and the rated peak withstand current (I_{pk}) according to 4.3.5.		P
	- output short-circuit current in accordance with 4.3.2.3;		P
	- supply requirements of the load (if applicable);		P
	- liquid coolant type and design pressure for liquid cooled PECS;		N/A
	- IP rating for enclosure;	IP 20	P
	- operating and storage environment;	In user manual	P
	- reference(s) to relevant standard(s) for manufacture, test, or use;		P
	- reference to instructions for installation, use and maintenance.		P
6.3	Information for installation and commissioning		P
6.3.1	General		P
6.3.2	Mechanical considerations		P
	The following drawings shall be prepared by the manufacturer: - Dimensional drawing, including mass information - Mounting drawing		P

EN 62477-1			
Clause	Requirement + Test	Result - Remark	Verdict
6.3.3	Environment		P
	In accordance with 4.9 the following environmental conditions shall be specified, for operation, transportation and storage:		P
	Climatic (temperature, humidity, altitude, pollution, ultra-violet light, etc.)		P
	Mechanical (vibration, shock, drop, topple, etc.)		P
	Electrical (overvoltage category)		P
6.3.4	Handling and mounting		P
	In order to prevent injury or damage, the installation documents shall include warnings of any hazards which can be experienced during installation. Where necessary, instructions shall be provided for: - packing and unpacking; - moving; - lifting; - strength and rigidity of mounting surface; - fastening; - provision of adequate access for operation, adjustment and maintenance.		P
6.3.5	Enclosure temperature		P
	When surface temperatures of the PECS, close to mounting surfaces, exceed the limit of 4.6.4.2, the installation manual shall contain a warning to consider the combustibility of the mounting surface.		P
	Where required by 4.6.3.1, the following marking shall appear on the PECS and in the installation instructions: "suitable for mounting on concrete or other non-combustible surfaces only".		N/A
6.3.6	Connections		P
6.3.6.1	General		P
	Information shall be provided to enable the installer to make safe electrical connection to the PSCS. This shall include information for protection against hazards (for example, electric shock or availability of energy) that may be encountered during installation, operation or maintenance.		P
6.3.6.2	Interconnection and wiring diagrams		P
	The installation and maintenance manuals shall include details of all necessary connections, together with a suggested interconnection diagram.		P

EN 62477-1			
Clause	Requirement + Test	Result - Remark	Verdict
6.3.6.3	Conductor (cable) selection		P
	The Installation manual shall define the voltage and current levels for all connections to the PSCS, together with cable insulation requirements. These shall be worst-case values, taking into account overcurrent and overload conditions and the possible effects of non-sinusoidal currents.		P
6.3.6.4	Terminal capacity and identification		P
	The installation and maintenance manuals shall indicate the range of acceptable conductor sizes and types (solid or stranded) for all terminals, and also the maximum number of conductors which can simultaneously be connected.		P
	For field wiring terminals, the manuals shall specify the requirements for tightening torque values and also the insulation temperature rating requirements for the conductor or cable.		P
	The identification of all field wiring terminals shall be marked on the PSCS, either directly or by label attached close to the terminals.		P
	The installation and maintenance manuals identify all external terminals relating to circuits protected by one of the methods of 4.4.6.4.		P
6.3.7	Protection requirements		P
6.3.7.1	Accessible parts circuits		P
	The installation, users and maintenance manuals shall identify any accessible parts at voltages greater than DVC As, and shall describe the insulation and separation provisions required for protection.		P
	The manuals shall also indicate the precautions to be taken to ensure that the safety of DVC As connections maintained during installation.		P
	Where a hazard is present after the removal of a cover, a warning label shall be placed on the equipment. The label shall be visible before the cover is removed.		P
	The manual of a PSCS state the maximum voltage allowed to be connected to each port.		P
	The manuals provide instructions for the use of PELF circuits within a zone of equipotential bonding.		N/A
6.3.7.2	Type of electrical supply system		P
	The installation manual or the PECS specify requirements for safe earthing including the permitted		P

EN 62477-1			
Clause	Requirement + Test	Result - Remark	Verdict
	earthing system of the installation (see 4.4.7.1.4)		
	The unacceptable earthing systems shall be indicated as: - not permitted; or - with modification of values and/or safety levels which shall be quantified through type test.		P
6.3.7.3	Protective class		P
6.3.7.3.1	General		P
	The installation manual of the PECS shall declare the protective class specified for the PECS and the product shall be marked according to the requirement of 6.3.7.3.2, 6.3.7.3.3, and 6.3.7.3.4.		P
6.3.7.3.2	Protective class I equipment		P
	Terminals for connection of the PE conductor shall be clearly and indelibly marked with one or more of the following:		P
	The symbol IEC 60417-5019 (2011-01)		P
	With the letters PE		P
	The colour coding green or green-yellow		P
6.3.7.3.3	Protective class II equipment		N/A
	Equipment of protective class II shall be marked with symbol IEC 60417-5172 (2011-01) (see Annex C). Where such equipment has provision for the connection of an earthing conductor for functional reasons (see 4.4.6.3) it shall be marked with symbol IEC 60417-5018 (2011-01) (see Annex C).		N/A
6.3.7.3.4	Protective class III equipment		N/A
	No marking is required on the product.		N/A
6.3.7.4	Touch current marking		N/A
	Where the touch current in the PE conductor exceeds the limits given in 4.4.4.3.3., this shall be stated in the installation and maintenance manuals. In addition, a warning symbol ISO 7010- W001 (2011-06) (see Annex C) shall be placed on the product, and a notice shall be provided in the installation manual to instruct the user that the minimum size of the PE conductor shall comply with the local safety regulations for high PE conductor current equipment.		N/A
6.3.7.5	Compatibility with RCD marking	Recommended in the installation manual	N/A
	The installation and maintenance manuals shall		N/A

EN 62477-1			
Clause	Requirement + Test	Result - Remark	Verdict
	indicate compatibility with RCDs (see 4.4.8). When 4.4.8 b) applies, a caution notice and the symbol ISO 7010-W001 (2011-06) (see Annex C) shall be provided in the user manual, and the symbol shall be placed on the product. The caution notice shall be the following or equivalent: "This product can cause a d.c. current in the PE conductor. Where a residual current-operated protective device (RCD) is used for protection against electrical shock, only an RCD of Type B is allowed on the supply side of this product." (See 6.4.3 for general requirements for labels, signs and signals.)		
6.3.7.6	Cable and connection		P
	Any particular cable and connection requirements shall be identified in the installation and maintenance manuals.		P
6.3.7.7	External protection devices	Recommended in the installation manual	N/A
	Where external devices are necessary to protect against hazards, the installation manual shall specify the required characteristics (see also 5.2.4 and 4.3.2.1)		N/A
6.3.8	Commissioning		P
	If commissioning tests are necessary to ensure the electrical and thermal safety of a PSCS, information to support these tests shall be provided for each part of the PSCS. This information can depend on the specific installation, and close cooperation between manufacturer, installer, and user can be required. Commissioning information shall include references to hazards that might be encountered during commissioning, for example those mentioned in 6.4. and 6.5.		P
6.4	Information for use		P
6.4.1	General		P
	The user's manual shall include all information regarding the safe operation of the PSCS. In particular, it shall identify any hazardous materials and risks of electrical shock, overheating, misuse of the PSCS.		P
	The manual should also indicate any hazards which can result from reasonably foreseeable misuse of the PSCS.		P
6.4.2	Adjustment		P
	The user's manual shall give details of all safety-relevant adjustments intended for the user. The		P

EN 62477-1			
Clause	Requirement + Test	Result - Remark	Verdict
	identification or function of each control or indicating device and fuse shall be marked adjacent to the item. Where it is not possible to do this on the product, the information shall be provided pictorially in the manual.		
	Maintenance adjustments may also be described in this manual but shall be made clear that they should only be made by qualified personnel.		P
	Clear warnings shall be provided where excessive adjustment could lead to a hazardous state of the PSCS.		N/A
	Any special equipment necessary for making adjustments shall be specified and described.		P
6.4.3	Labels, signs and signals		
6.4.3.1	General		P
	Labelling shall be in accordance with good ergonomic principles so that notices, controls, indications, test facilities, fuses, etc., are sensibly placed and logically grouped to facilitate correct and unambiguous identification. All safety related equipment labels shall be located so as to be visible after installation or readily visible by opening a door or removing a cover. Where a symbol is used, the information provided with the PSCS shall contain an explanation of the symbol and its meaning.		P
	Labels shall: • wherever possible, use international symbols as given by ISO 3864-1, ISO 7000 or IEC 60417; • if no international symbol is available, be worded in an appropriate language or in a language associated with a particular technical field; • be concise and unambiguous; • be conspicuous, legible and durable; • state the hazards involved and give ways in which risks can be reduced.		P
	When instructing the person(s) concerned as to • what to avoid: the wording should include "no", "do not", or "prohibited"; • what to do: the wording should include "shall", or "must"; • the nature of the hazard: the wording should include "caution", "warning", or "danger", as appropriate; • the nature of safe conditions: the wording should		P

EN 62477-1			
Clause	Requirement + Test	Result - Remark	Verdict
	include the noun appropriate to the safety device.		
	Safety signs shall comply with ISO 3864-1.		P
	The signal words indicated hereinafter shall be used and the following hierarchy respected: • DANGER to call attention to a high risk, for example: "High voltage". • WARNING to call attention to a medium risk, for example: "This surface can be hot." • CAUTION to call attention to a low risk, for example: "Some of the tests specified in this standard involve the use of processes imposing risks on persons concerned." Danger, warning and caution markings on the PECS shall be prefixed with the word "DANGER", "WARNING", or "CAUTION" as appropriate in letters not less than 3,2 mm high. The remaining letters of such markings shall be not less than 1,6 mm high.		P
6.4.3.2	Isolators		N/A
	Where an isolating device is not intended to interrupt load current, a warning shall state: DO NOT OPEN UNDER LOAD.		N/A
	The following requirements apply to any supply isolating device which does not disconnect all sources of power to the PSCS.		N/A
	If the isolating device is mounted in an equipment enclosure with the operating handle externally operable, a warning label shall be provided adjacent to the operating handle stating that it does not disconnect all power to the PSCS.		N/A
	Where a control circuit disconnecter can be confused with power circuit disconnectors due to size or location, a warning label shall be provided adjacent to the operating handle of the control disconnecter stating that it does not disconnect all power to the PSCS.		N/A
6.4.3.3	Visual and audible signals		P
	Visual signals such as flashing lights, and audible signals such as sirens, may be used to warn of an impending hazardous event such as the driven equipment start-up and shall be identified. It is essential that these signals: - are unambiguous; - can be clearly perceived and differentiated from all other signals used;		P

EN 62477-1			
Clause	Requirement + Test	Result - Remark	Verdict
	- can be clearly recognized by the user; - are emitted before the occurrence of the hazardous event. It is recommended that higher frequency flashing lights be used for information. Note: IEC 60073 provides guidance on recommended flashing rates and on/off ratios.		
6.4.3.4	Hot surfaces		P
	Where required by 4.6.4.2 the warning symbol W017 of ISO 7010 shall be marked on or adjacent to parts exceeding the touch temperature limits of Table 15.		P
6.4.3.5	Equipment marking		P
	The Identification of each control or indicating device and fuse shall be marked adjacent to the item. Replaceable fuses shall be marked with their rating and time characteristics. Where it is not possible to do this on the product, the information shall be provided pictorially in the manual. Appropriate identification shall be marked on or adjacent to each movable connector. Test points shall be individually marked with the circuit diagram reference. The polarity of any polarized devices shall be marked adjacent to the device. The diagram reference and if possible the function shall be marked adjacent to each pre-set control in a position where it is clearly visible while the adjustment is being made.		P
6.5	Information for maintenance		P
6.5.1	General		P
	The PECS shall be marked with the date code, or serial number from which the date of manufacture can be determined.		P
	Safety information shall be provided in the installation and maintenance manuals including appropriate, the following:		P
	• Preventive maintenance procedures and schedules		P
	• Safety precautions during maintenance		P
	• Location of live parts that can be accessible during maintenance (for example, when covers are removed)		P
	• Adjustment procedures		P
	• Subassembly and component repair and		P

EN 62477-1			
Clause	Requirement + Test	Result - Remark	Verdict
	replacement procedures		
	• Any other relevant information		P
6.5.2	Capacitor discharge		P
	When the requirements 4.4.9 are not met, the warning symbol W012 of ISO 7010 and an indication of the discharge time (for example, 45 s, 5 min) shall be placed in a clearly visible position on the enclosure, the capacitor protective barrier, or at a point close to the capacitor(s) concerned (depending on the construction). The symbol shall be explained and the time required for the capacitors to discharge after the removal or the power from the PSCS shall be stated in the installation and maintenance manuals.		P
6.5.3	Auto restart/bypass connection		P
	If a PSCS can be configured to provide automatic restart or bypass connection, the installation, user and maintenance manuals shall contain appropriate warning statements.		P
	A PSCS which is set to provide automatic restart or bypass connection, after the removal of power, shall be clearly identified at the installation.		P
6.5.4	Other hazards		P
	The manufacturer shall identify any components and materials of a PSCS which require special procedures to prevent hazards.		P
6.5.5	Equipment with multiple sources of supply		P
	In accordance with 4.8, where there is more than one source of supply energizing the PSCS, information shall be provided to indicate which disconnect device or devices are required to be operated in order to completely isolate the equipment.		P

EN 62477-1			
Clause	Requirement + Test	Result - Remark	Verdict

4	TABLE: mains supply electrical data in normal condition	P
See report CN26FXA8 001.		

4.4	TABLE: fault condition tests	P
See report CN26FXA8 001.		

4.6	TABLE: heating temperature rise measurements	P
See report CN26FXA8 001.		

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)	
See report CN26FXA8 001.							

4.4.7.8.3.2 to 4.4.7.9	TABLE: distance through insulation measurement				N/A
distance through insulation di at/of:		U r.m.s. (V)	test voltage (V)	required di (mm)	di (mm)
--		--	--	--	--
Supplementary information: The component was certified.					

4.4.7.10	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	
See report CN26FXA8 001.					

EN 62477-1					
Clause	Requirement + Test			Result - Remark	Verdict
14	TABLE: Critical components information				P
object/part No.	manufacturer/ trademark	type/model	technical data	standard	mark(s) of conformity ¹⁾
See report CN26FXA8 001.					

EN 62477-1/A11			
Clause	Requirement + Test	Result - Remark	Verdict
	FOREWORD		P
	This document (EN 62477-1:2012/A11:2014) has been prepared by CLC/TC 22X "Power electronics". The aim behind this Amendment is to link EN 62477-1:2012 to the Low Voltage Directive 2006/95/EC, further to a CLC/TC 22X request, approved by the Technical Board by the decision D146/C017. In addition, a recent Technical Board decision (D147/C061), confirmed that EN 62477-1:2012 partially supersedes EN 50178:1997. This standard covers the Principle Elements of the Safety Objectives for Electrical Equipment Designed for Use within Certain Voltage Limits (LVD - 2006/95/EC).		P

EN 62477-1/A12			
Clause	Requirement + Test	Result - Remark	Verdict
ZZ	ANNEX ZZ (INFORMATIVE) RELATIONSHIP BETWEEN THIS EUROPEAN STANDARD AND THE SAFETY OBJECTIVES OF DIRECTIVE 2014/35/EU [2014 OJ L96] AIMED TO BE COVERED		P
	This European standard has been prepared under a Commission's standardisation request relating to harmonised standards in the field of the Low Voltage Directive, M/511, to provide one voluntary means of conforming to safety objectives of Directive 2014/35/EU of the European Parliament and of the Council of 26 February 2014 on the harmonisation of the laws of the Member States relating to the making available on the market of electrical equipment designed for use within certain voltage limits [2014 OJ L96]. Once this standard is cited in the Official Journal of the European Union under that Directive, compliance with the normative clauses of this standard given in Table ZZ.1 confers, within the limits of the scope of this standard, a presumption of conformity with the corresponding safety objectives of that Directive, and associated EFTA regulations.		P

-End-

Test report no.: CN26FXA8 001 Attachment 3

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Prüfbericht-Nr.:

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Clause <i>Absatz</i>	Requirements – Tests <i>Anforderungen - Prüfungen</i>	Measuring results – Remarks <i>Messergebnisse – Bemerkungen</i>	Result <i>Ergebnis</i>
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Attachment 3
EN IEC 62311

**Assessment of electronic and electrical equipment related to human exposure
restrictions for electromagnetic fields (0 Hz – 300 GHz)**

5	Performance of assessments	Eveluation refer to Page 2	P
5.1	Assessment methods		P
	- Simplified assessment (possible for particular cases)		N/A
	- Measurement		N/A
	- Calculation		N/A
5.2	Frequency range under assessment for unintentional radiation		P
5.3	General procedure for the assessment of equipment		P
6	Uncertainty		P
6.1	General		N/A
6.2	Consideration of uncertainty for compliance		N/A
7	Considerations on sources with multiple frequencies and non-uniformity of fields		N/A
7.1	Sources with multiple frequencies		N/A
7.2	Exposure to non-uniform fields		N/A
8	Evaluation of compliance to limits		P

Test report no.: CN26FXA8 001 Attachment 3
Prüfbericht-Nr.:

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Seite 2 von 2

Clause Absatz	Requirements – Tests Anforderungen - Prüfungen	Measuring results – Remarks Messergebnisse – Bemerkungen	Result Ergebnis
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General Information

Auftraggeber:
Client: See cover page

Prüfgegenstand:
Test item: See cover page

Bezeichnung / Typ-Nr.:
Identification / Type no.: See cover page

Prüfgrundlage:
Test specification: EN IEC 62311: 2020

Eveluation of Human Exposure to Electromagnetic Fields 0Hz-300GHz

The equipment is a Power Conversion System with low power consumption, it does incorporate only non-intentional radiators, but does not contain radio transmitters; the typical usage, installation and physical characteristics make the equipment inherently compliant with all applicable EMF exposure levels according to Clause 5.3, EN IEC 62311: 2020.

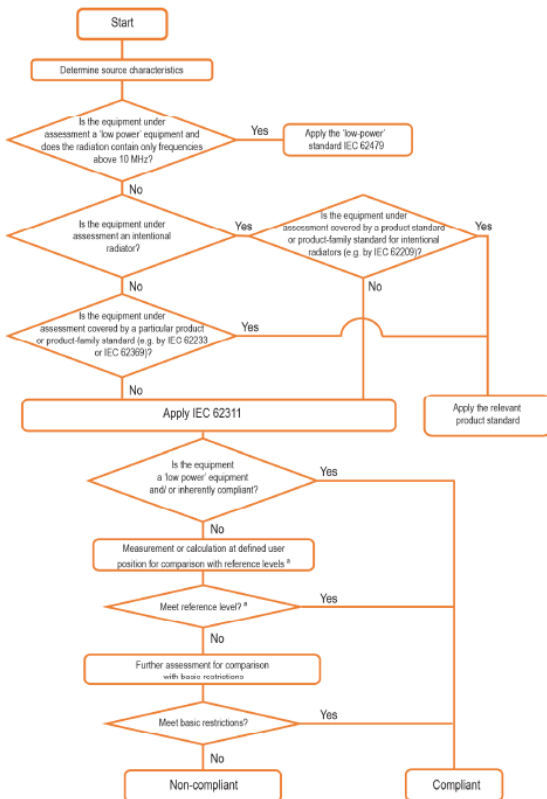


PHOTO DOCUMENTATION

CN26FXA8 001 ATTACHMENT 4

for

Power Conversion System

TAA-125kW-01, TAA-125kW-11, TAA-105kW-01,
TAA-105kW-11

Jiangsu Weiheng Intelligent Technology Co., Ltd.



This documentation consists of 19 pages (excluding this cover page)

Model: see cover page



Figure 1. Front view
(for model TAA-105KW-01,TAA-125KW-01)

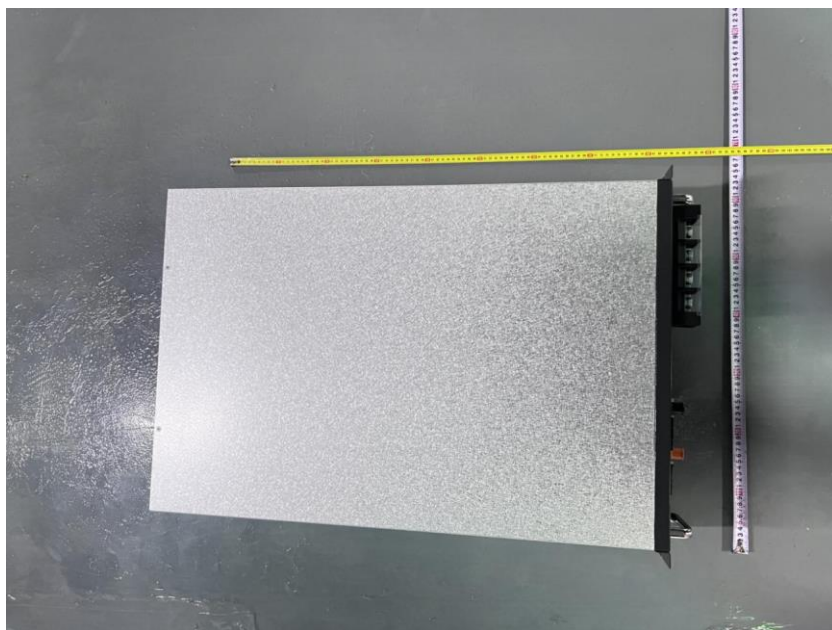


Figure 2. Top view
(for model TAA-105KW-01,TAA-125KW-01)

Model: see cover page

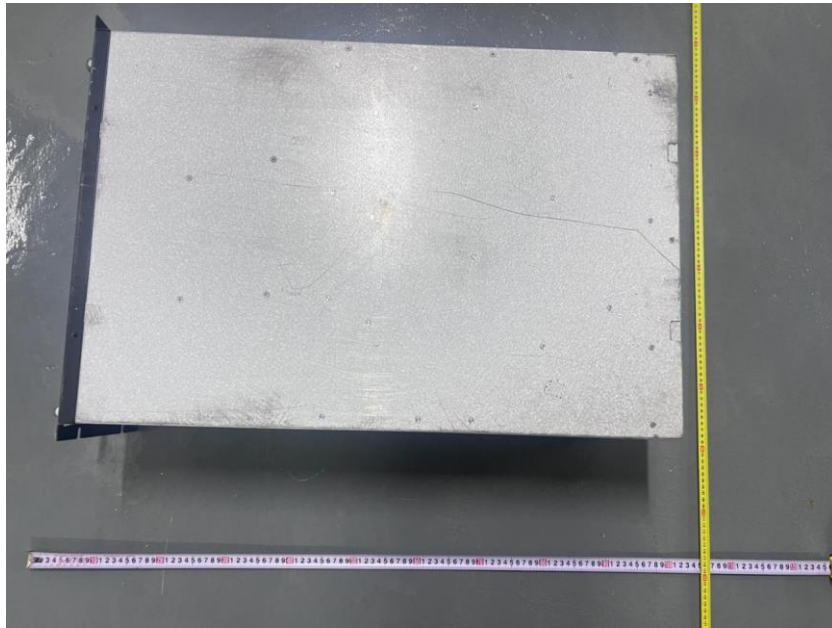


Figure 3. Bottom view
(for model TAA-105KW-01, TAA-125KW-01)

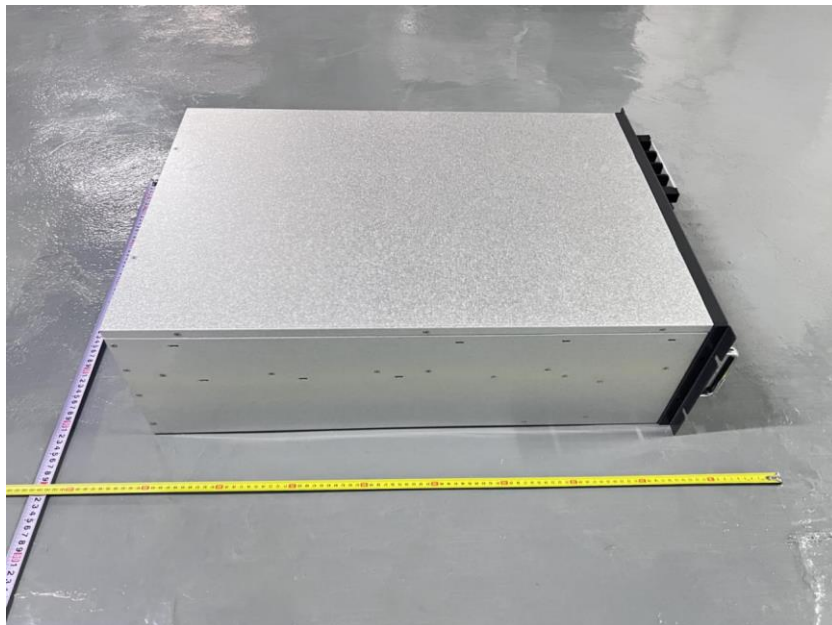


Figure 4. Right view
(for model TAA-105KW-01, TAA-125KW-01)

Model: see cover page

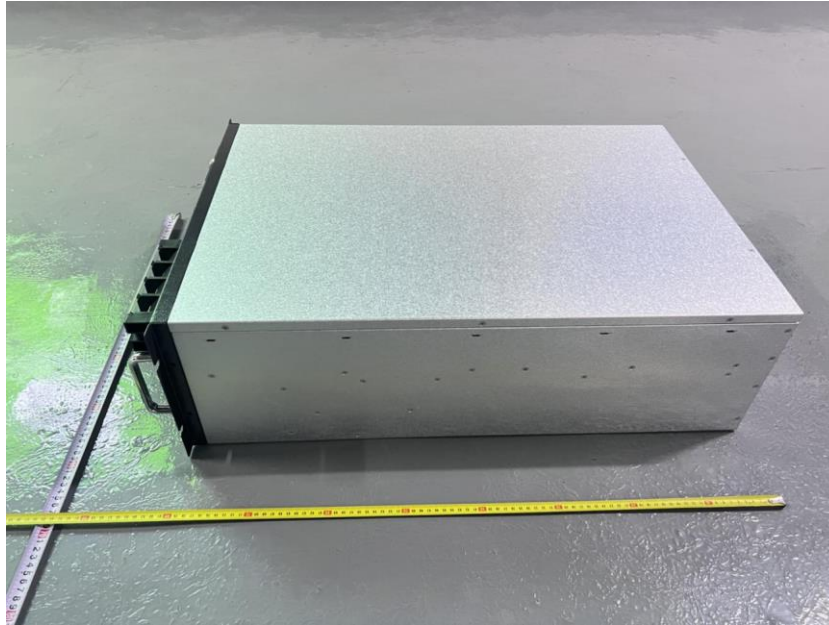


Figure 5. Left view
(for model TAA-105KW-01,TAA-125KW-01)

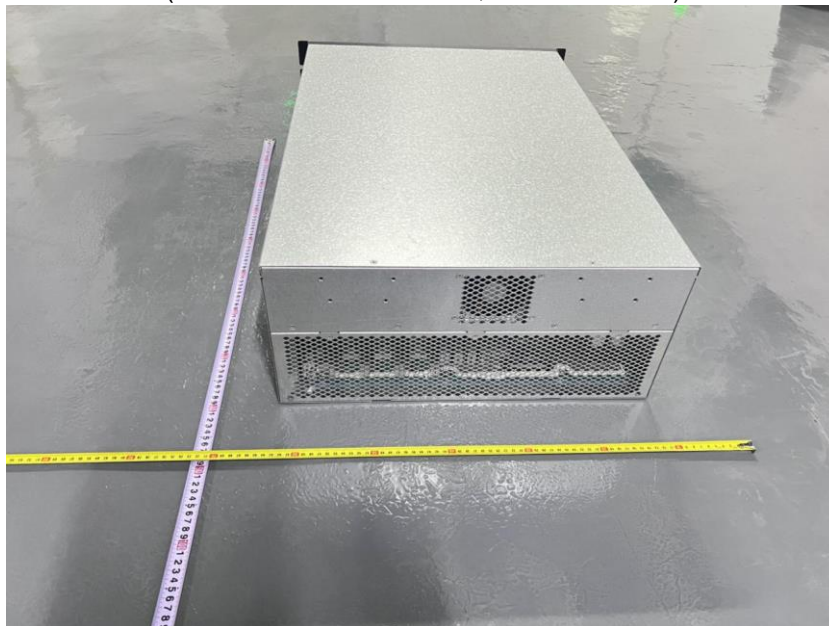


Figure 6. Back view
(for model TAA-105KW-01,TAA-125KW-01)

Model: see cover page



Figure 7. Front view
(for model TAA-105KW-11,TAA-125KW-11)

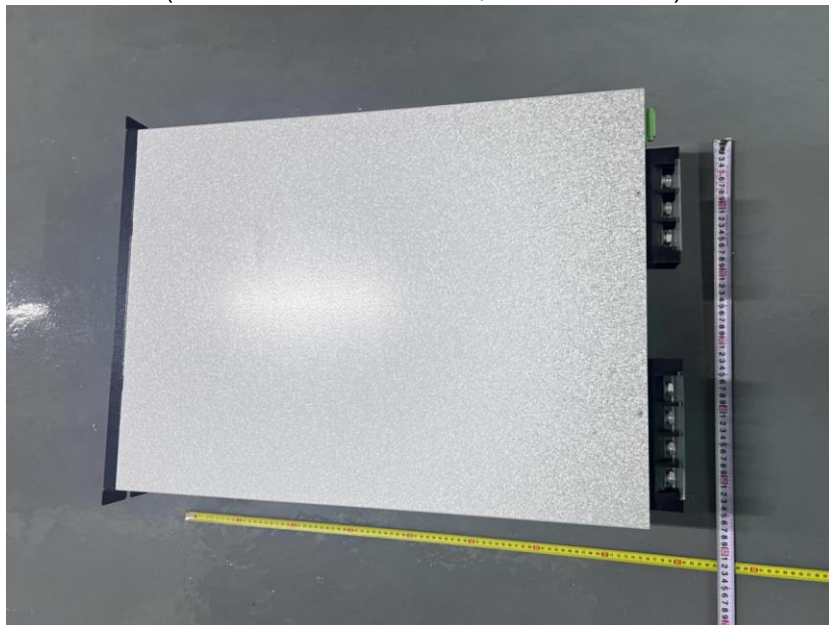


Figure 8. Top view
(for model TAA-105KW-11,TAA-125KW-11)

Model: see cover page

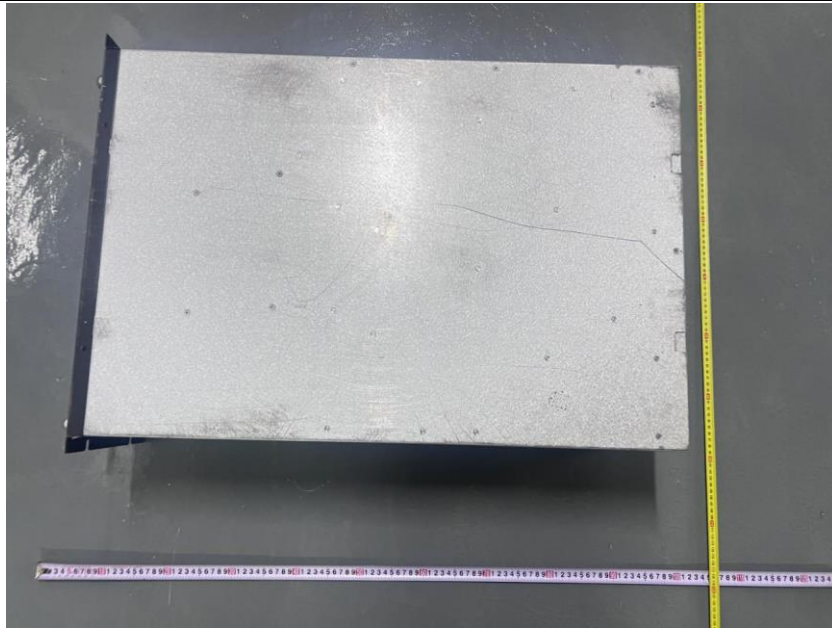


Figure 9. Bottom view
(for model TAA-105KW-11,TAA-125KW-11)

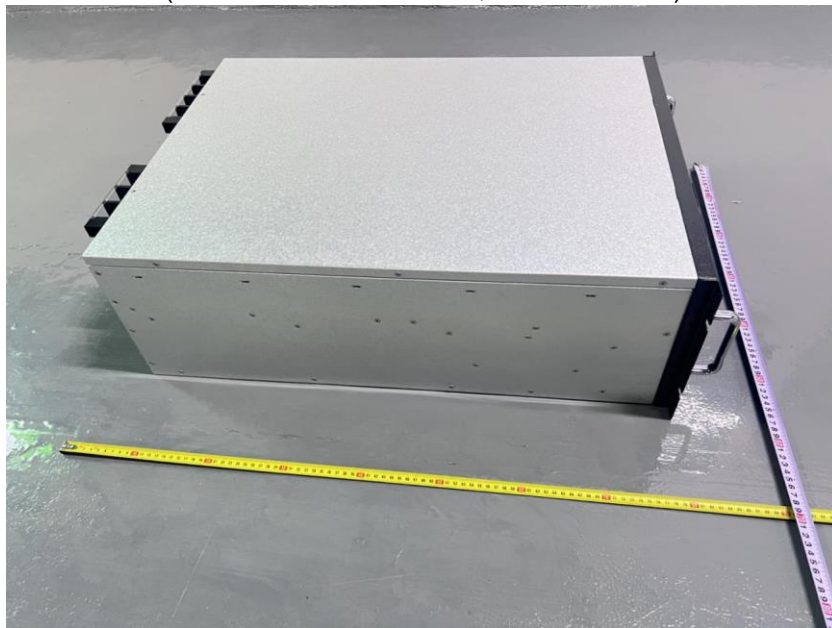


Figure 10. Right view
(for model TAA-105KW-11,TAA-125KW-11)

Model: see cover page



Figure 11. Left view
(for model TAA-105KW-11,TAA-125KW-11)

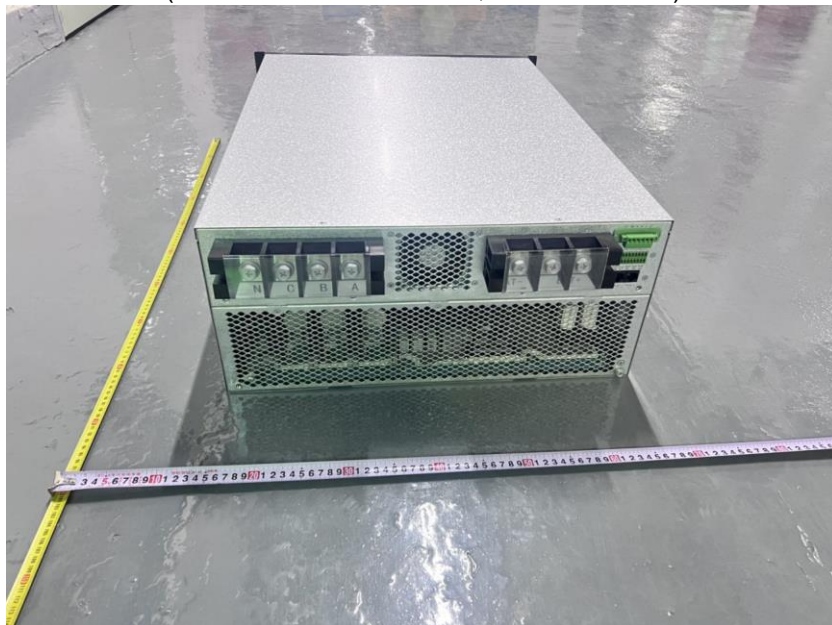


Figure 12. Back view
(for model TAA-105KW-11,TAA-125KW-11)

Model: see cover page

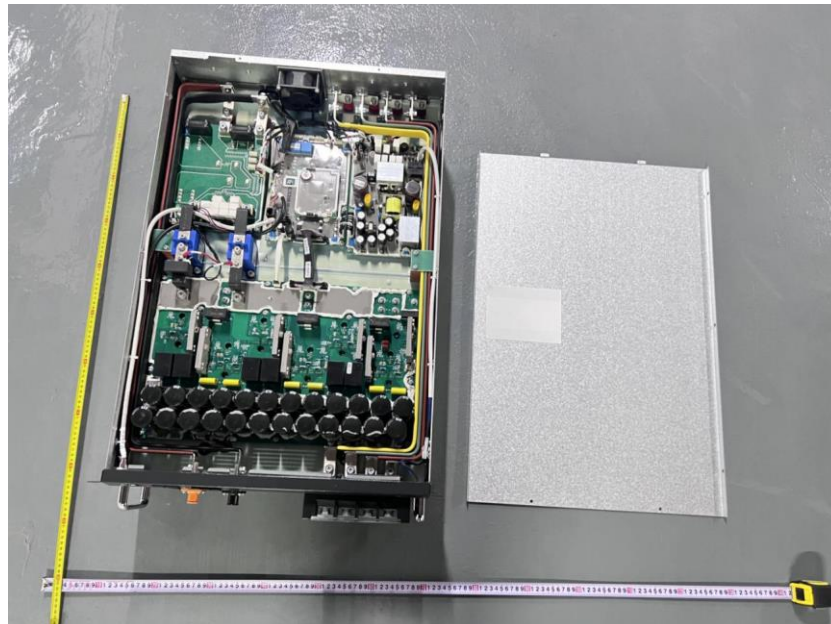


Figure 13. Opening view 1
(for model TAA-105KW-01,TAA-125KW-01)

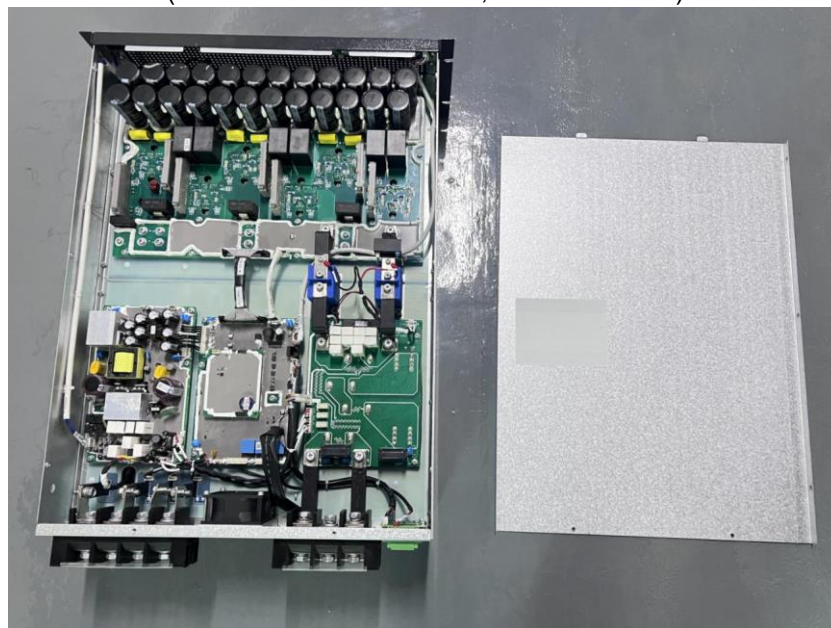


Figure 14. Opening view 2
(for model TAA-105KW-11,TAA-125KW-11)

Model: see cover page

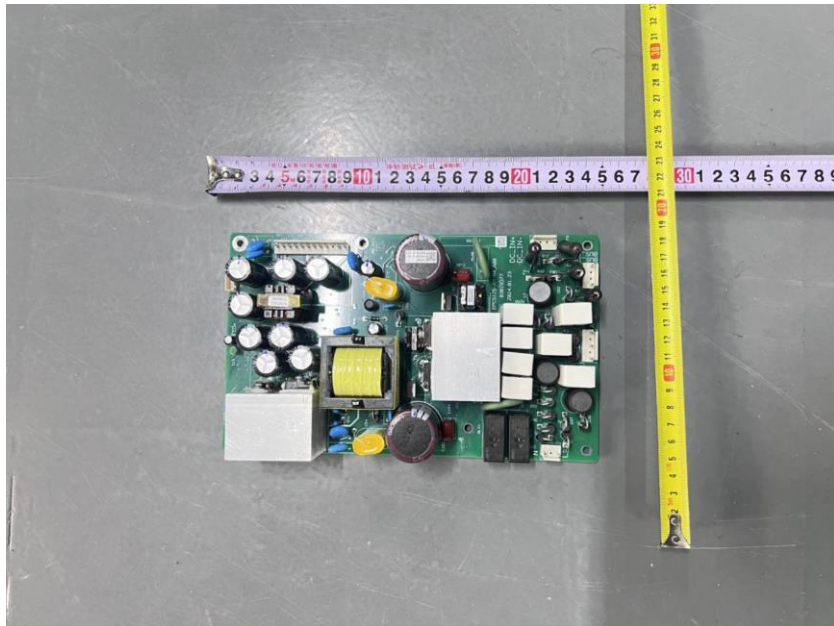


Figure 15. M4, auxiliary power board – front (Only DC supply)

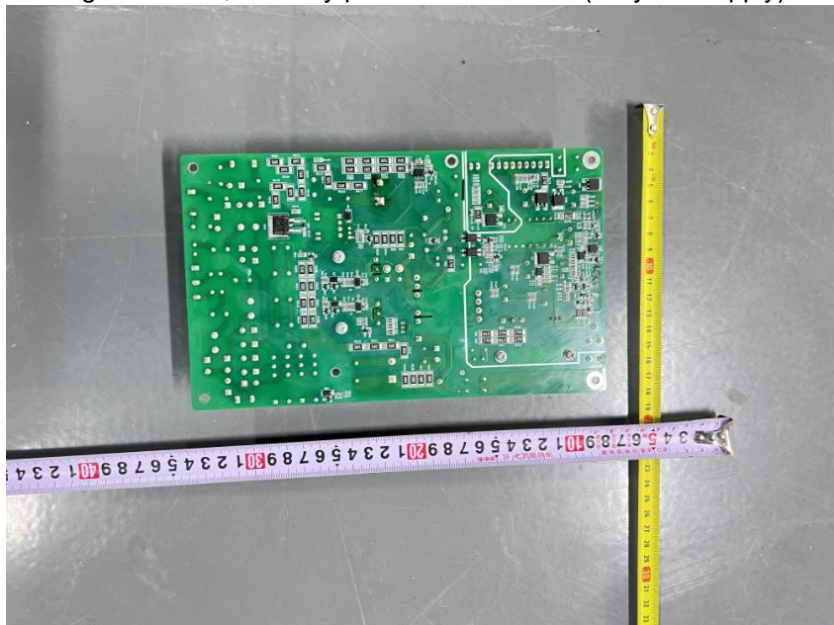


Figure 16. M4, auxiliary power board – back (Only DC supply)

Model: see cover page

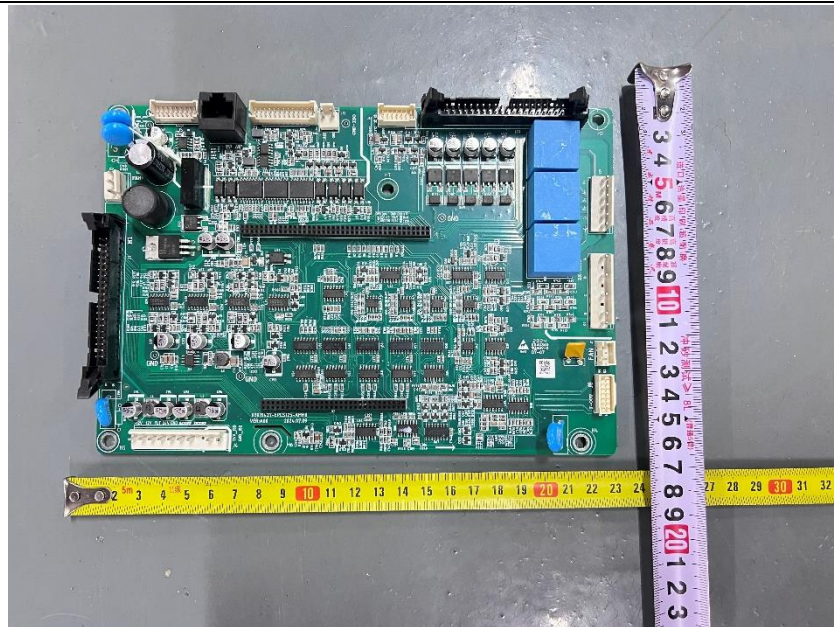


Figure 17. M0, sampling board - front

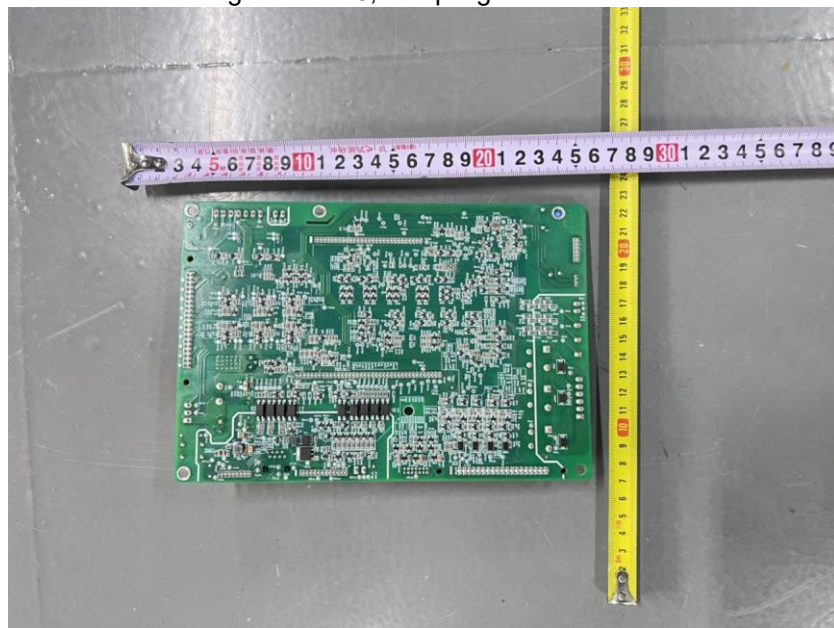


Figure 18. M0, sampling board - back

Model: see cover page

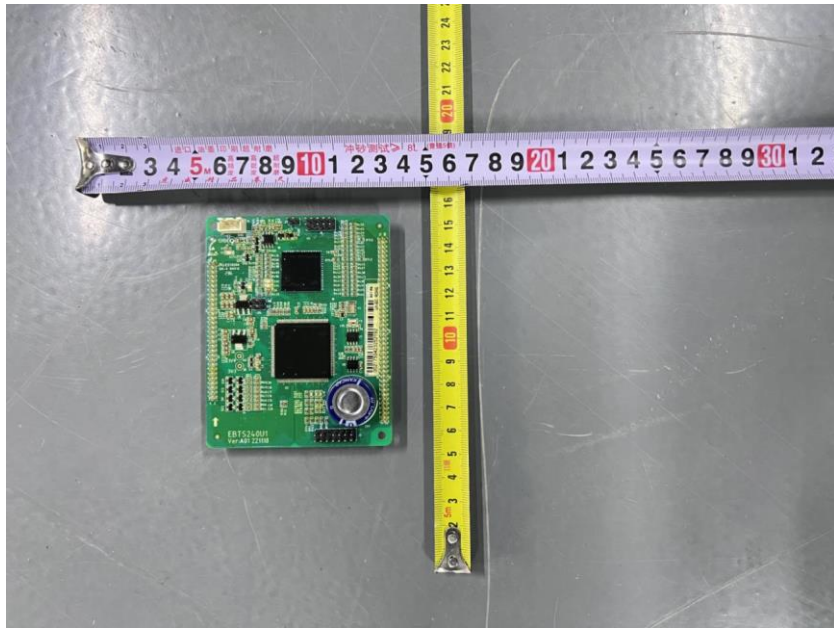


Figure 19. U1, Chip board - front

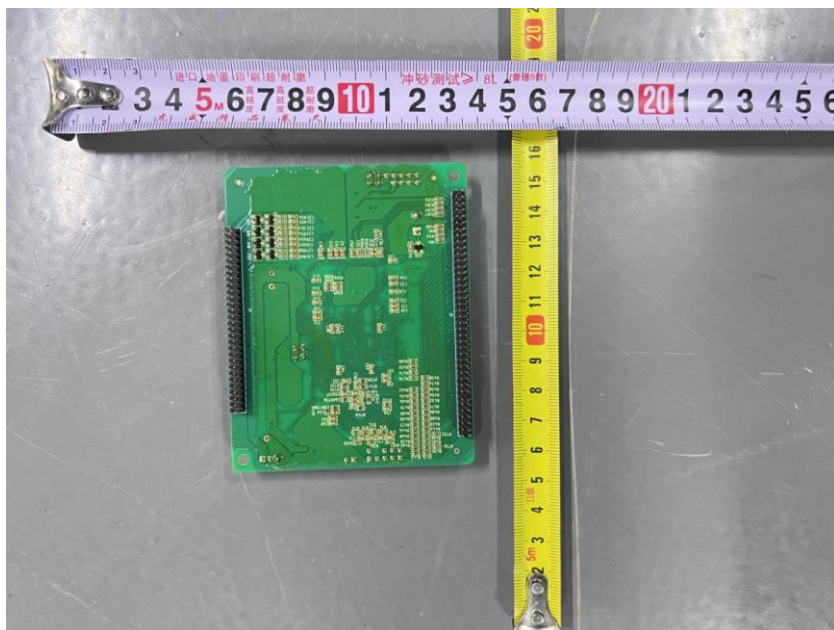


Figure 20. U1, Chip board - back

Model: see cover page

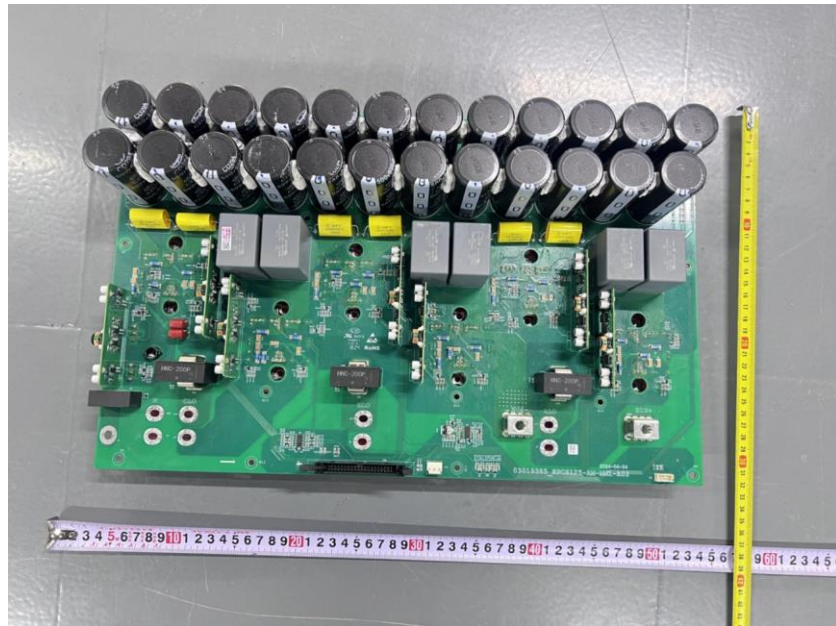


Figure 21. M1, convert power board – front

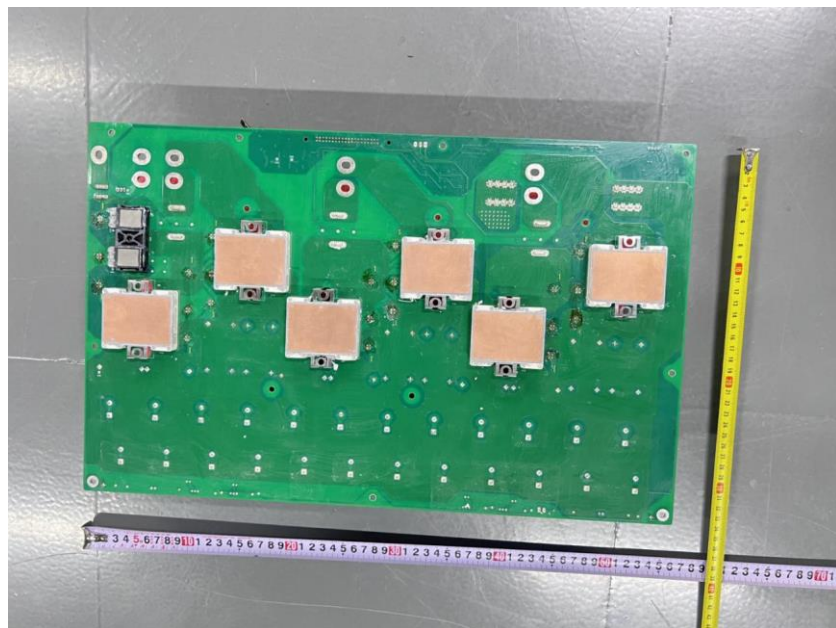


Figure 22. M1, convert power board - back

Model: see cover page



Figure 23. M2, AC/DC power board– front

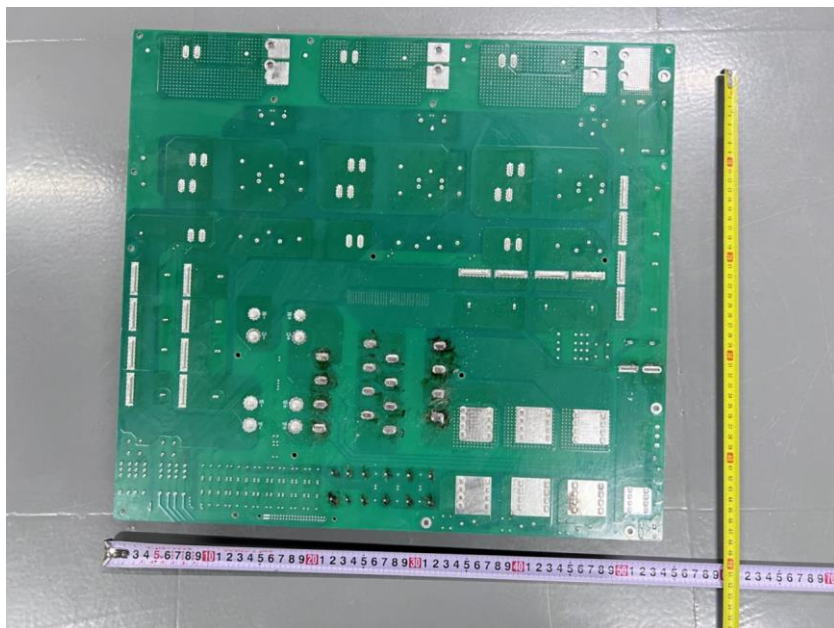


Figure 24. M2, AC/DC power board – back

Model: see cover page

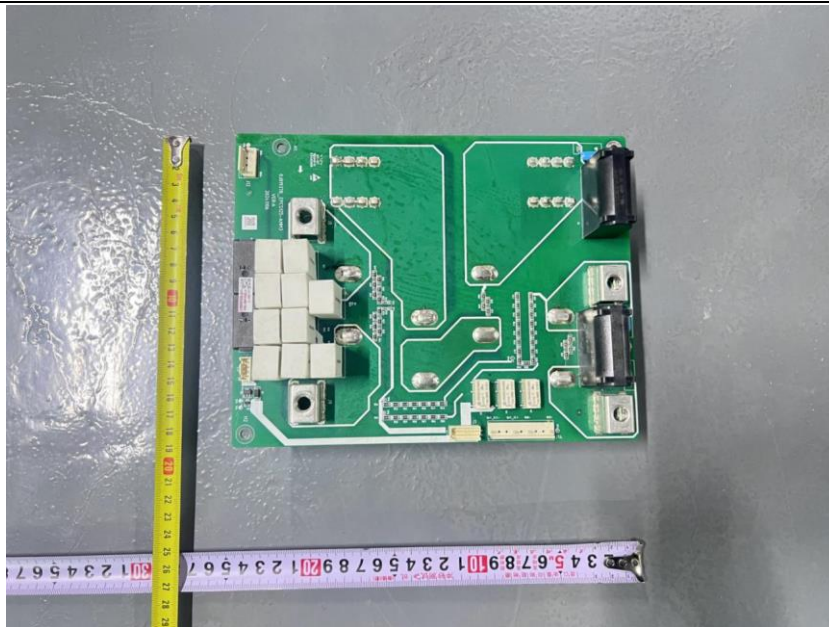


Figure 25.M3,Dc filter board– front

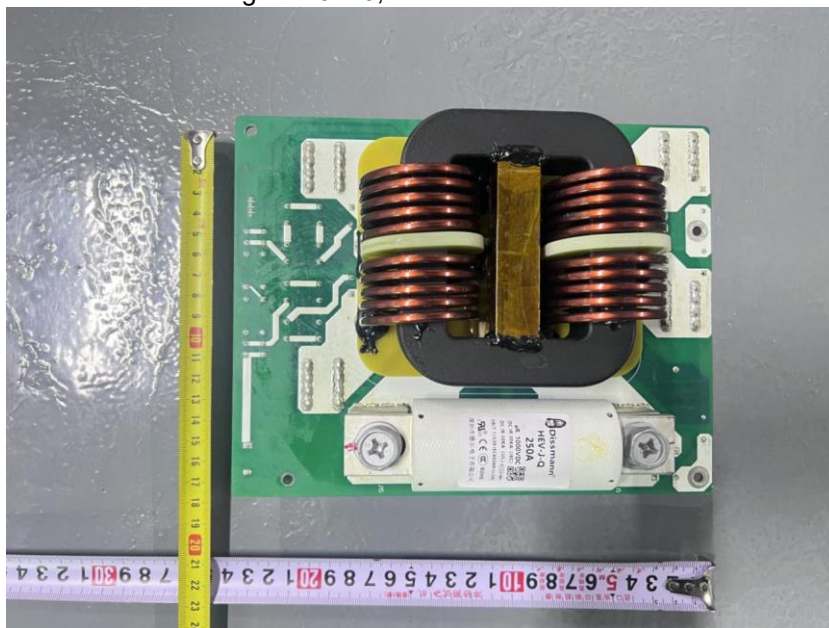


Figure 26.M3,Dc filter board– back

Model: see cover page

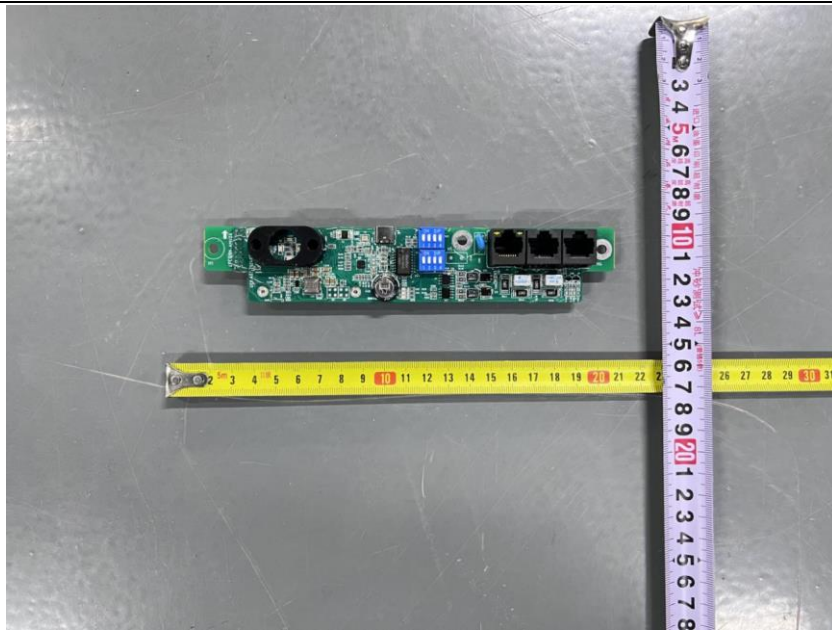


Figure 75. A2, LED + Communication board - front

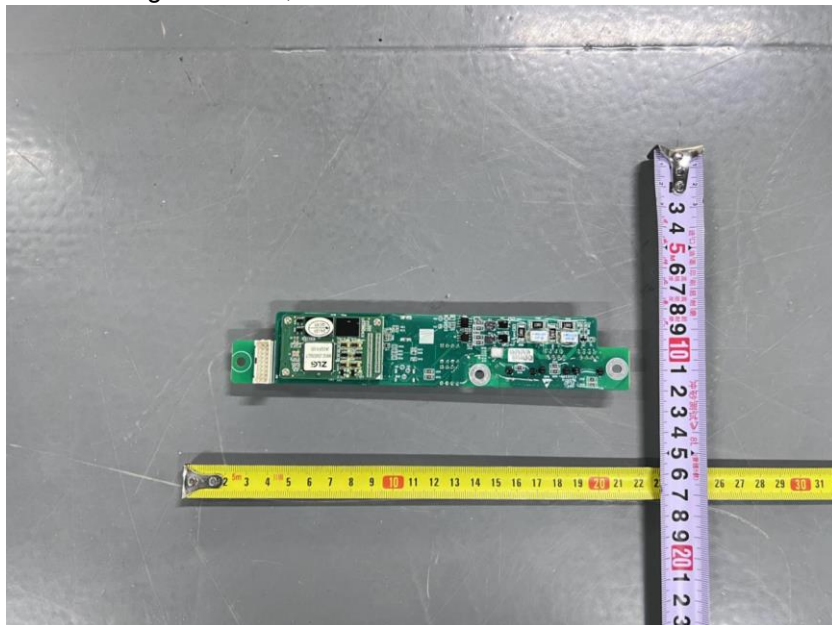


Figure 28. LED + Communication board - back

Model: see cover page

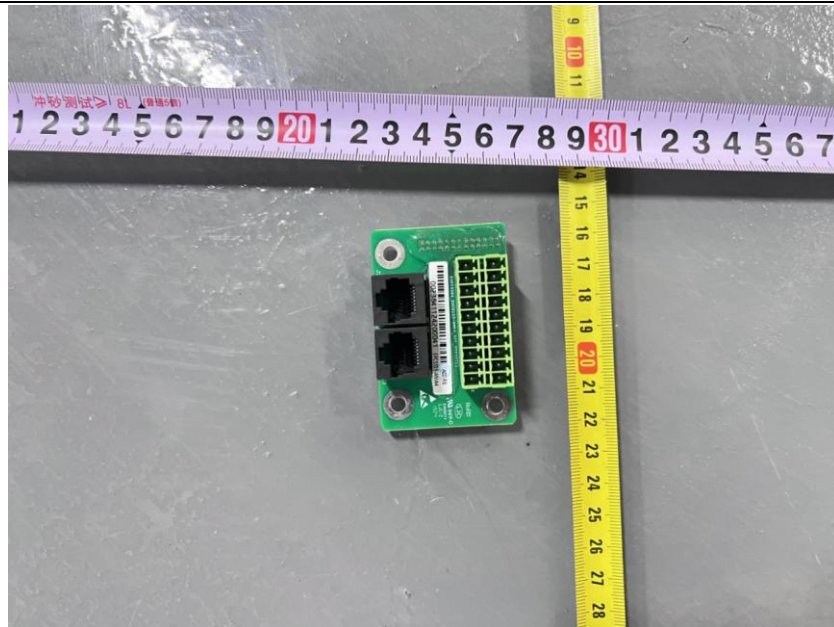


Figure 29.A4,Signal port board - front

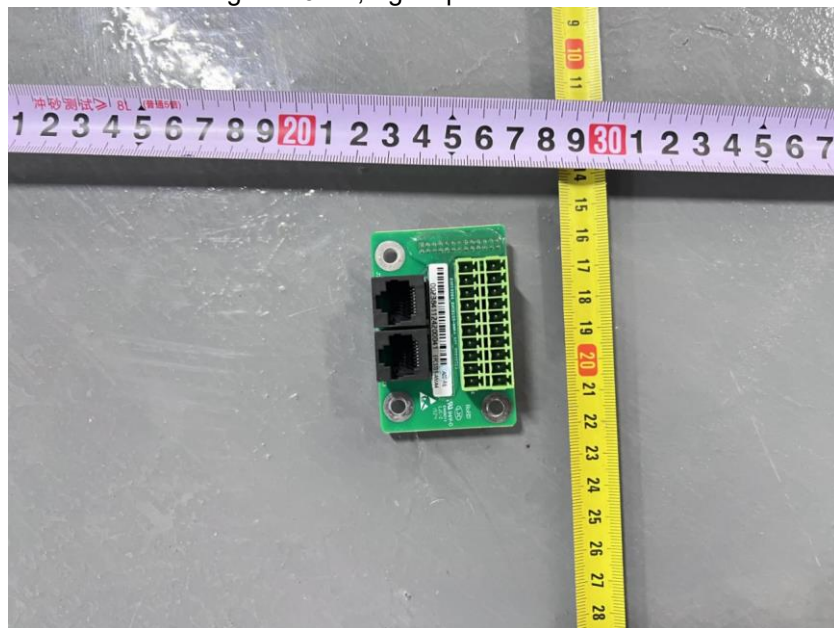


Figure 30.A4,Signal port board - back

Model: see cover page



Figure 7. Dc terminal +
(for model , TAA-105KW-11,TAA-125KW-11)



Figure 8. Dc terminal -
(for model , TAA-105KW-11,TAA-125KW-11)

Model: see cover page



Figure 33. Dc terminal - front
(for model , TAA-105KW-01,TAA-125KW-01)

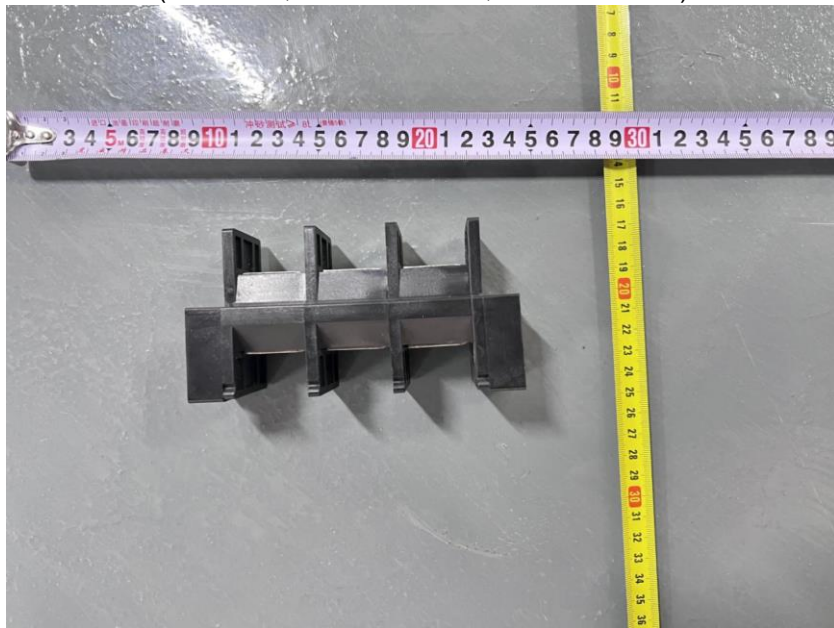


Figure 34. Dc terminal - back
(for model , TAA-105KW-01,TAA-125KW-01)

Model: see cover page



Figure 35. Ac terminal - front

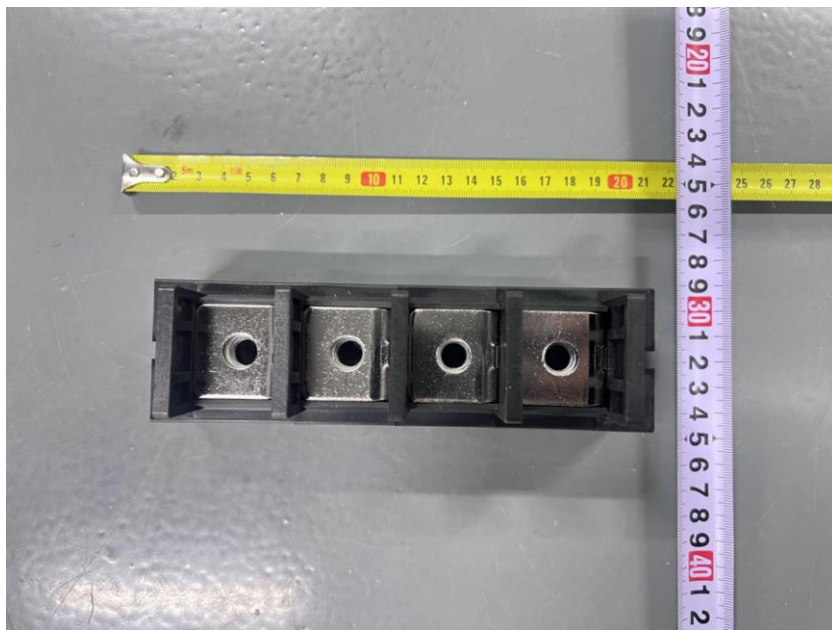


Figure 36. Ac terminal - back

Model: see cover page



Figure 37. Machine grounding

-End-