TÜVNORD

TÜV NORD (Hangzhou) Co., Ltd.

Room B409, Building 1, No. 9,
Jiuhuan Road, Shangcheng
District, Hangzhou City, Zhejiang
Province, 310019, P.R. China

Phone: +86 (0) 571 8538 6989
Fax: +86 (0) 571 8538 6986

hzpcert@tuv-nord.com
www.tuv-nord.com/cn

Evaluation Report
No. 492013290.001

Storage Inverter Qualification
according to IEC 62109-1:2010, EN 62109-1:2010, IEC 62109-2:2011, EN 62109-2:2011

Applicant: **Huizhou Foryou Optoelectronics Technology Co., LTD**

Building 6, B Area, No.1 North Shangxia Road, Dongjiang High-Tech Industry Park, Huizhou City, Guangdong Province, China

File No.: PVP05149/24E-01

Designed: by: Barry Yuan Digitally signed by Yuan Yong Date: 2024.08.14 13:35:55 +08'00'

Reviewed: by: Iris Zheng Digitally signed by Iris Zheng Date: 2024.08.15 10:36:57 +08'00'

TÜVNORD

Evaluation Report

File No.: PVP05149/24E-01 Report No.: 492013290.001

Applicant ..... :	**Huizhou Foryou Optoelectronics Technology Co., LTD** Building 6, B Area, No.1 North Shangxia Road, Dongjiang High-Tech Industry Park, Huizhou City, Guangdong Province, China
Manufacturer ..... :	**Huizhou Foryou Optoelectronics Technology Co., LTD** Building 6, B Area, No.1 North Shangxia Road, Dongjiang High-Tech Industry Park, Huizhou City, Guangdong Province, China
Factory..... :	**Huizhou Foryou Optoelectronics Technology Co., LTD** Building 6, B Area, No.1 North Shangxia Road, Dongjiang High-Tech Industry Park, Huizhou City, Guangdong Province, China
Order No. ..... :	QT-PVP05149/24E
Date of Application [YYYY-MM-DD]..... :	2024-06-05
Product(s) ..... :	Hybrid Inverter
Model type(s)..... :	EAG05K3L, EAG06K3L, EAG07K3L, EAG08K3L, EAG10K3L, EAG12K3L
Type of examination ..... :	Commission testing only
Certification program: ..... :	P31-VA-01 Rev. 02
Certification fundamental(s)..... :	IEC 62109-1:2010, EN 62109-1:2010, IEC 62109-2:2011, EN 62109-2:2011
Testing Period [YYYY-MM-DD] start/end..... :	2024-06-30/2024-08-12
Testing Laboratory..... :	**Dongguan BALUN Testing Technology Co., Ltd.** Room 104, 204, 205, Building 1, No. 6, Industrial South Road, Songshan Lake District, Dongguan, Guangdong, China
Annex(es) ..... :	Annex 1: IEC 62109-1:2010, EN 62109-1:2010 Test report no. BL-DG2480010-201 (111 pages) Annex 2: IEC 62109-2:2011, EN 62109-2:2011 Test report no. BL-DG2480010-201 A1(35 pages) Annex 3: Constructional Data Form (11 pages)

Test results listed in this test report refer exclusively to the mentioned test sample.

The submitted test samples as described in the reports hereunder are in compliance with the requirements / are tested according to the requirements:
IEC 62109-1:2010/EN 62109-1:2010 “Safety of power converters for use in photovoltaic power systems – Part 1: General requirements”
IEC 62109-2:2011/EN 62109-2:2011 “Safety of power converters for use in photovoltaic power systems – Part 2: Particular requirements for inverters”

中国认可
国际互认
检测
TESTING
CNAS L14701

TEST REPORT

Application No:	PVP05149/24E-01
Applicant:	Huizhou Foryou Optoelectronics Technology Co., LTD
Address:	Building 6, B Area, No.1 North Shangxia Road, Dongjiang High-Tech Industry Park, Huizhou City, Guangdong Province, China
Equipment Type:	Hybrid Inverter
Mian Testing Model:	EAG12K3L
Series Model:	EAG05K3L, EAG06K3L, EAG07K3L, EAG08K3L, EAG10K3L, EAG12K3L
Brand Name:	ADAYO
Ratings:	See copy of marking label and model list.
Test Standard:	**IEC 62109-1:2010, EN 62109-1:2010**
Sample Arrival Date:	Jun. 30, 2024
Test Date：	Jun. 30, 2024 to Aug. 12, 2024
Date of Issue:	Aug. 13, 2024

ISSUED BY:

Dongguan BALUN Testing Technology Co., Ltd.

Tested by: Leo Sun Leo Sun

Checked by: Tao Zheng Tao Zheng

Approved by: Simon Qi Simon Qi

BALUN Dongguan

Revision History

Version	Issue Date	Revisions Content
Rev. 01	Aug. 13, 2024	Initial Issue

List of Attachments:

Attachments 1 –(Report No.: BL-DG2480010-201 A1) Test report of IEC 62109-2: 2011, EN 62109-2: 2011

Summary of testing:

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

Tests performed (name of test and test clause):

☒ 4.3 Thermal testing

☒ 4.4 Testing in fault condition

☒ 4.5 Humidity preconditioning

☒ 4.7 Electrical ratings tests

☒ 5.1.2 Durability of markings

☒ 6.3 Ingress protection☆

☒ 7.3.2.2 DVC level under normal condition

☒ 7.3.2.3 DVC level under single fault conditions

☒ 7.3.4.2.3 Access probe tests

☒ 7.3.6.3 Protective class I - Protective bonding and earthing

☒ 7.3.7.4,7.3.7.5 Clearance and Creepage distances

☒ 7.3.7.5.2 Working voltage

☒ 7.3.9 Capacitor discharge

☒ 7.4 Protection against energy hazards

☒ 7.5.1 Impulse voltage test

☒ 7.5.4 Touch current measurement

☒ 7.5.2 Voltage test (dielectric strength test)

☒ 8.5 Wall mounting

☒ 10.2 Sonic Pressure and Sound Level

☒ 13.7 Mechanical resistance to deflection, impact or drop

Testing location:

Dongguan BALUN Testing Technology Co., Ltd.

Room 104, 204, 205, Building 1, No. 6, Industrial South Road, Songshan Lake District, Dongguan, Guangdong, China

The tests of clause 6.3 Ingress protection were performed in: Jiangsu Product Quality Testing & Inspection Institute

Report No: (2023)SJSXW-WT0472, issued by Jiangsu Product Quality Testing & Inspection Institute (CNAS L1000) Dated on Aug. 08, 2024, total 9 pages.

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

Copy of marking plate:

ADAYO Hybrid Inverter

EAG05K3L NO.

PV input	
Vmax PV (Vdc) (absolute Max.)	1000V
Isc PV (absolute Max.) (A)	22.5A
MPPT voltage range (Vdc)	200~800V
Max. PV input current / strings (A)	18A
Battery (charge/discharge)	
Battery type	Li-ion/Lead-acid
Battery Norma Voltage (Range) (Vdc)	48V (40-60V)
Max Current(A)	120A
Max Power(kW)	5kW
AC Grid (input and output)	
AC voltage (Vac), Freq. (Hz)	3ΦN/PE 230/400VAC, 50/60Hz
Max. cont. input current (A)	16.6A
Max. cont. output current (A)	8.3A
Max. cont. input Power (kW)	10kW
Max. cont. output Power (kW)	5kW
Max. cont. Apparent Power (kVA)	5.5kVA
Power factor	0.8 leading to 0.8 lagging
AC Load output (stand alone)	
Normal voltage (Vac), Freq. (Hz)	3ΦN/PE 230/400VAC, 50/60Hz
Max. cont. Current(A)	8.3A
Max. cont. Power (kW)	5kW
Power factor	0.8 leading to 0.8 lagging
Others	
Ingress protection (IP)	IP66
Protective class	Class I
Temperature (℃)	-25℃ to +60℃ (Derating 45℃)
Overvoltage category	OVC III (AC Main), OVC II (DC)
Inverter Topology	Non-isolated (PV- AC), High frequency isolated(Battery Side)

Huizhou Foryou Optoelectronics Technology Co.,Ltd.

Add: Foryou Industrial Park Area B, No.1 North Shangxia Road, Dongjiang High-tech Industry Park, Huizhou City, Guangdong Province, China

E-mail : nes@adayoled.com

ADAYO Hybrid Inverter

EAG06K3L NO.

PV input	
Vmax PV (Vdc) (absolute Max.)	1000V
Isc PV (absolute Max.) (A)	22.5A
MPPT voltage range (Vdc)	200~800V
Max. PV input current / strings (A)	18A
Battery (charge/discharge)	
Battery type	Li-ion/Lead-acid
Battery Norma Voltage (Range) (Vdc)	48V (40-60V)
Max Current(A)	125A
Max Power(kW)	6kW
AC Grid (input and output)	
AC voltage (Vac), Freq. (Hz)	3ΦN/PE 230/400VAC, 50/60Hz
Max. cont. input current (A)	20A
Max. cont. output current (A)	10A
Max. cont. input Power (kW)	12kW
Max. cont. output Power (kW)	6kW
Max. cont. Apparent Power (kVA)	6.6kVA
Power factor	0.8 leading to 0.8 lagging
AC Load output (stand alone)	
Normal voltage (Vac), Freq. (Hz)	3ΦN/PE 230/400VAC, 50/60Hz
Max. cont. Current(A)	10A
Max. cont. Power (kW)	6kW
Power factor	0.8 leading to 0.8 lagging
Others	
Ingress protection (IP)	IP66
Protective class	Class I
Temperature (℃)	-25℃ to +60℃ (Derating 45℃)
Overvoltage category	OVC III (AC Main), OVC II (DC)
Inverter Topology	Non-isolated (PV- AC), High frequency isolated(Battery Side)

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ADAYO Hybrid Inverter

EAG07K3L	NO.
PV input	
Vmax PV (Vdc) (absolute Max.)	1000V
Isc PV (absolute Max.) (A)	22.5A
MPPT voltage range (Vdc)	200~800V
Max. PV input current / strings (A)	18A
Battery (charge/discharge)	
Battery type	Li-ion/Lead-acid
Battery Norma Voltage (Range) (Vdc)	48V (40-60V)
Max Current(A)	150A
Max Power(kW)	7kW
AC Grid (input and output)	
AC voltage (Vac), Freq. (Hz)	3ΦN/PE 230/400VAC, 50/60Hz
Max. cont. input current (A)	23.2A
Max. cont. output current (A)	11.6A
Max. cont. input Power (kW)	14kW
Max. cont. output Power (kW)	7kW
Max. cont. Apparent Power (kVA)	7.7kVA
Power factor	0.8 leading to 0.8 lagging
AC Load output (stand alone)	
Normal voltage (Vac), Freq. (Hz)	3ΦN/PE 230/400VAC, 50/60Hz
Max. cont. Current(A)	11.6A
Max. cont. Power (kW)	7kW
Power factor	0.8 leading to 0.8 lagging
Others	
Ingress protection (IP)	IP66
Protective class	Class I
Temperature (℃)	-25℃ to +60℃ (Derating 45℃)
Overvoltage category	OVC III (AC Main), OVC II (DC)
Inverter Topology	Non-isolated (PV- AC), High frequency isolated(Battery Side)

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E-mail : nes@adayoled.com

ADAYO Hybrid Inverter

EAG08K3L	NO.
PV input	
Vmax PV (Vdc) (absolute Max.)	1000V
Isc PV (absolute Max.) (A)	22.5A/22.5A
MPPT voltage range (Vdc)	200~800V
Max. PV input current / strings (A)	18A/18A
Battery (charge/discharge)	
Battery type	Li-ion/Lead-acid
Battery Norma Voltage (Range) (Vdc)	48V (40-60V)
Max Current(A)	190A
Max Power(kW)	8kW
AC Grid (input and output)	
AC voltage (Vac), Freq. (Hz)	3ΦN/PE 230/400VAC, 50/60Hz
Max. cont. input current (A)	26.6A
Max. cont. output current (A)	13.3A
Max. cont. input Power (kW)	16kW
Max. cont. output Power (kW)	8kW
Max. cont. Apparent Power (kVA)	8.8kVA
Power factor	0.8 leading to 0.8 lagging
AC Load output (stand alone)	
Normal voltage (Vac), Freq. (Hz)	3ΦN/PE 230/400VAC, 50/60Hz
Max. cont. Current(A)	13.3A
Max. cont. Power (kW)	8kW
Power factor	0.8 leading to 0.8 lagging
Others	
Ingress protection (IP)	IP66
Protective class	Class I
Temperature (℃)	-25℃ to +60℃ (Derating 45℃)
Overvoltage category	OVC III (AC Main), OVC II (DC)
Inverter Topology	Non-isolated (PV- AC), High frequency isolated(Battery Side)

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E-mail : nes@adayoled.com

ADAYO Hybrid Inverter

EAG10K3L	NO.
PV input	
Vmax PV (Vdc) (absolute Max.)	1000V
Isc PV (absolute Max.) (A)	45A/22.5A
MPPT voltage range (Vdc)	200~800V
Max. PV input current / strings (A)	36A/18A
Battery (charge/discharge)	
Battery type	Li-ion/Lead-acid
Battery Norma Voltage (Range) (Vdc)	48V (40-60V)
Max Current(A)	210A
Max Power(kW)	10kW
AC Grid (input and output)	
AC voltage (Vac), Freq. (Hz)	3ΦN/PE 230/400VAC, 50/60Hz
Max. cont. input current (A)	33.4A
Max. cont. output current (A)	16.7A
Max. cont. input Power (kW)	20kW
Max. cont. output Power (kW)	10kW
Max. cont. Apparent Power (kVA)	11kVA
Power factor	0.8 leading to 0.8 lagging
AC Load output (stand alone)	
Normal voltage (Vac), Freq. (Hz)	3ΦN/PE 230/400VAC, 50/60Hz
Max. cont. Current(A)	16.7A
Max. cont. Power (kW)	10kW
Power factor	0.8 leading to 0.8 lagging
Others	
Ingress protection (IP)	IP66
Protective class	Class I
Temperature (℃)	-25℃ to +60℃ (Derating 45℃)
Overvoltage category	OVC III (AC Main), OVC II (DC)
Inverter Topology	Non-isolated (PV- AC), High frequency isolated(Battery Side)

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E-mail : nes@adayoled.com

ADAYO Hybrid Inverter

EAG12K3L	NO.
PV input	
Vmax PV (Vdc) (absolute Max.)	1000V
Isc PV (absolute Max.) (A)	45A/22.5A
MPPT voltage range (Vdc)	200~800V
Max. PV input current / strings (A)	36A/18A
Battery (charge/discharge)	
Battery type	Li-ion/Lead-acid
Battery Norma Voltage (Range) (Vdc)	48V (40-60V)
Max Current(A)	250A
Max Power(kW)	12kW
AC Grid (input and output)	
AC voltage (Vac), Freq. (Hz)	3ΦN/PE 230/400VAC, 50/60Hz
Max. cont. input current (A)	40A
Max. cont. output current (A)	20A
Max. cont. input Power (kW)	24kW
Max. cont. output Power (kW)	12kW
Max. cont. Apparent Power (kVA)	13.2kVA
Power factor	0.8 leading to 0.8 lagging
AC Load output (stand alone)	
Normal voltage (Vac), Freq. (Hz)	3ΦN/PE 230/400VAC, 50/60Hz
Max. cont. Current(A)	20A
Max. cont. Power (kW)	12kW
Power factor	0.8 leading to 0.8 lagging
Others	
Ingress protection (IP)	IP66
Protective class	Class I
Temperature (℃)	-25℃ to +60℃ (Derating 45℃)
Overvoltage category	OVC III (AC Main), OVC II (DC)
Inverter Topology	Non-isolated (PV- AC), High frequency isolated(Battery Side)

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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) ..... :	N/A
Class of equipment ..... :	☒ Class I ☐ Class II ☐ Class III ☐ Not classified
Mass of Max. equipment (kg) ..... :	38kg for all models
Pollution degree ..... :	PD 3 (internal reduced to PD2)
IP protection class ..... :	IP66
Possible test case verdicts:	
- test case does not apply to the test object .....:	N/A
- test object does meet the requirement .....:	P (Pass)
- test object was not evaluated for the requirement:	N/E
- test object does not meet the requirement .....:	F (Fail)

General remarks:	
"(See Enclosure #)" refers to additional information appended to the report. "(See appended table)" refers to a table appended to the report. **Throughout this report a ☐ comma / ☒ point is used as the decimal separator.**	
Manufacturer's Declaration per sub-clause 4.2.5 of IECEE 02:	
The application for obtaining a CB Test Certificate includes more than one factory location and a declaration from the Manufacturer stating that the sample(s) submitted for evaluation is (are) representative of the products from each factory has been provided..... :	☐ **Yes** ☒ **Not applicable**
When differences exist; they shall be identified in the General product information section.	
Name and address of Manufacturer (ies) ..... :	**Huizhou Foryou Optoelectronics Technology Co., LTD** Building 6, B Area, No.1 North Shangxia Road, Dongjiang High-Tech Industry Park, Huizhou City, Guangdong Province, China
Name and address of factory (ies) ..... :	**Huizhou Foryou Optoelectronics Technology Co., LTD** Building 6, B Area, No.1 North Shangxia Road, Dongjiang High-Tech Industry Park, Huizhou City, Guangdong Province, China

General product information:

Product covered by this report is a Hybrid Inverter for outdoor installation. The connection to the PV input and battery port are through connectors, and connection to grid and AC load and connector.
The unit is bidirectional which apply to PV system with battery to store energy. Energy produced by the PV system is used to optimize self-consumption; excess energy is used to charge the batteries, and then fed into the public grid when the PV energy is adequate, When PV energy output is in sufficient to support connected loads, the system automatically get energy from the batteries if battery capacity is abundant. If the battery capacity is insufficient to meet own consumption requirements, electricity will be drawn from the public grid.
The maximum ambient temperature allowed by the manufacturer's specifications is 60°C.

Differences of the models:

EAG05K3L, EAG06K3L, EAG07K3L, EAG08K3L, EAG10K3L, EAG12K3L use the same software program, main control circuit, drive circuit and power topology of hardware design except the power de-rating by software.
The product has two different views just because the control screen is different.

Front view for all model		

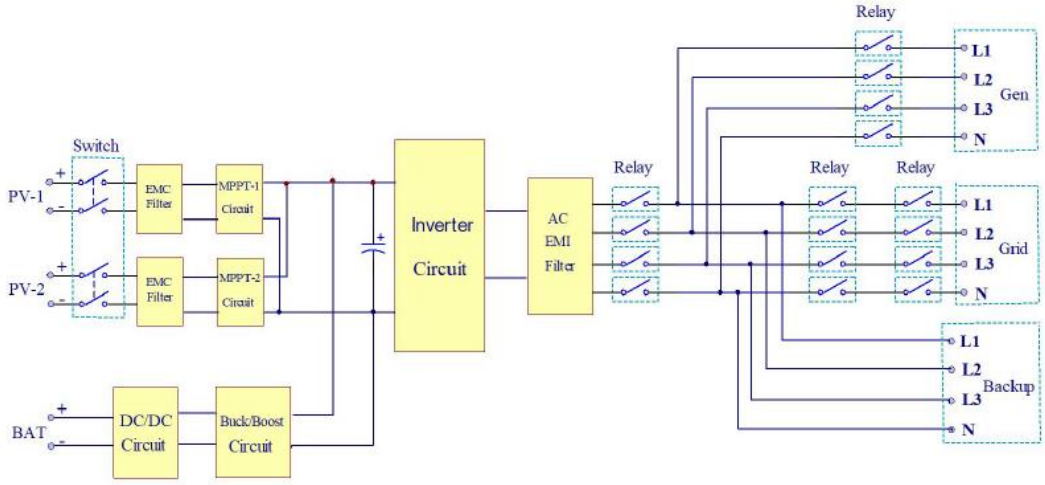
Hardware version: V1.0

Software version:

CPU1: V1.0

CPU2: V1.0

Block diagram of the inverter:



Model list:

Hybrid Inverter			
Model or Type designation	**EAG05K3L**	**EAG06K3L**	**EAG07K3L**
PV input parameters:			
V_{MAX} PV [Vd.c.]	1000		
MPP Voltage Range [Vd.c.]	200-800		
Max. PV Input Current [Ad.c.]	18		
DC Short-circuit current [Ad.c.]	22.5		
Battery parameters:			
Battery type	Li-ion/Lead-acid		
Battery Normal Voltage [Vd.c.]	48		
Max. charge/discharge current [Ad.c.]	120	125	150
AC output (Grid Side) parameters:			
Rated Output Voltage [Va.c.]	230/400 3W+N+PE		
Rated Output Frequency [Hz]	50/60		
Max. Output Power [kW]	5.0	6.0	7.0
Max. Apparent Power [kVA]	5.5	6.6	7.7
Max. Output Current [Aa.c.]	8.3	10.0	11.6
Power Factor cosφ [λ]	0.8(leading)-0.8(lagging)		
AC Load output (stand alone) parameters:			
Rated Output Voltage [Va.c.]	230/400 3W+N+PE		
Rated Output Frequency [Hz]	50/60		
Max. Output Power [kW]	5.0	6.0	7.0
Max. Output Current [Aa.c.]	8.3	10.0	11.6
Others:			
Protective Class	Class I		
Inverter Topology	Non-isolated		
Operation Temperature Range [°C]	-25~60		
Dimension [D*W*H mm]	475*683*256mm		
Weight [kg]	38kg		
Ingress Protection	IP66		
Overvoltage-Category	DC(PV) II, AC(Main) III		

Hybrid Inverter			
Model or Type designation	**EAG08K3L**	**EAG10K3L**	**EAG12K3L**
PV input parameters:			
V_{MAX} PV [Vd.c.]	1000		
MPP Voltage Range [Vd.c.]	200-800		
Max. PV Input Current [Ad.c.]	18/18	36/18	36/18
DC Short-circuit current [Ad.c.]	22.5/22.5	45/22.5	45/22.5
Battery parameters:			
Battery type	Li-ion/Lead-acid		
Battery Normal Voltage [Vd.c.]	48		
Max. charge/discharge current [Ad.c.]	190	210	250
AC output (Grid Side) parameters:			
Rated Output Voltage [Va.c.]	230/400 3W+N+PE		
Rated Output Frequency [Hz]	50/60		
Max. Output Power [kW]	8.0	10.0	12.0
Max. Apparent Power [kVA]	8.8	11.0	13.2
Max. Output Current [Aa.c.]	13.3	16.7	20.0
Power Factor cosφ [λ]	0.8(leading)-0.8(lagging)		
AC Load output (stand alone) parameters:			
Rated Output Voltage [Va.c.]	230/400 3W+N+PE		
Rated Output Frequency [Hz]	50/60		
Max. Output Power [kW]	8.0	10.0	12.0
Max. Output Current [Aa.c.]	13.3	16.7	20.0
Others:			
Protective Class	Class I		
Inverter Topology	Non-isolated		
Operation Temperature Range [°C]	-25~60		
Dimension [D*W*H mm]	475*683*256mm		
Weight [kg]	38kg		
Ingress Protection	IP66		
Overvoltage-Category	DC(PV) II, AC(Main) III		

Throughout the test report following abbreviations may be used:

- input	i/p	- Test repeated, similar result(3 times)	TRSR
- output	o/p	- No indication of dielectric breakdown	NB
- short-circuited	s-c	- Cheesecloth remained intact	NC
- overloaded	o-l	- Tissue paper remained intact	NT
- open-circuited	o-c	- No hazards	NH
- normal conditions	N.C.	- The PCE can recover to operate automaticly after removing the abnormal condition	RO
- single fault conditions	SFC	- functional insulation	FI
- between parts of opposite polarity	BOP	- basic insulation	BI
- internal protection operated	IPO	- supplementary insulation	SI
- Component damage (list damaged component)	CD	- double insulation	DI
- No component damaged	NCD	- reinforced insulation	RI
- Power Conversion Equipment Indicate used abbreviations (if any)	PCE	- Equipment Under Test	EUT

IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
4	**GENERAL TESTING REQUIREMENTS**		P
4.1	General		P
4.2	General conditions for testing		P
4.2.1	Sequence of tests		P
4.2.2	Reference test conditions		P
4.2.2.1	Environmental conditions	Ambient environmental condition compliance.	P
4.2.2.2	State of equipment	Test carried on a complete EUT.	P
4.2.2.3	Position of equipment	The equipment was installed in accordance with the manufacturer's instructions.	P
4.2.2.4	Accessories	Accessories and operator interchangeable parts available from or recommended by the manufacturer according to the installation manual required.	P
4.2.2.5	Covers and removable parts	No covers or parts, which can be removed without using a tool.	N/A
4.2.2.6	Mains supply a) Voltage: b) Frequency: c) Polarity: d) Earthing: e) Over-current Protection:	(see appended table 4.2.2.6)	P
4.2.2.7	Supply ports other than the mains	See below.	P
4.2.2.7.1	Photovoltaic supply sources a) Open circuit voltage: b) Short-circuit current:	(see appended table 4.2.2.7)	P
4.2.2.7.2	Battery inputs		P
4.2.2.8	Conditions of loading for output ports	The least favorable loading conditions was considered.	P
4.2.2.9	Earthing terminals	Connection to the earth	P

IEC 62109-1			
Clause	Requirement – Test	Result – Remark	Verdict
4.2.2.10	Controls	Any position was set.	P
4.2.2.11	Available short circuit current	Considered.	P
4.3	Thermal testing	(see appended table 4.3)	P
4.3.1	General		P
4.3.2	Maximum temperatures		P
4.3.2.1	General		P
4.3.2.2	Touch temperatures		P
4.3.2.3	Temperature limits for mounting surfaces		P
4.4	Testing in single fault condition	(see appended table 4.4)	P
4.4.1	General		P
4.4.2	Test conditions and duration for testing under fault conditions		P
4.4.2.1	General		P
4.4.2.2	Duration of tests	One cycle and until temperatures stabilize.	P
4.4.3	Pass/fail criteria for testing under fault conditions		P
4.4.3.1	Protection against shock hazard		P
4.4.3.2	Protection against the spread of fire		P
4.4.3.3	Protection against other hazards		P
4.4.3.4	Protection against parts expulsion hazards		P
4.4.4	Single fault conditions to be applied	See below.	P
4.4.4.1	Component fault tests	(see appended table 4.4)	P
4.4.4.2	Equipment or parts for short-term or intermittent operation	Continuous operation equipment.	N/A
4.4.4.3	Motors	No such device.	N/A
4.4.4.4	Transformer short circuit tests	(see appended table 4.4)	P
4.4.4.5	Output short circuit	(see appended table 4.4)	P
4.4.4.6	Backfeed current test for equipment with more than one source of supply		P
4.4.4.7	Output overload	(see appended table 4.4)	P

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Clause	Requirement – Test	Result – Remark	Verdict
4.4.4.8	Cooling system failure	(see appended table 4.4)	P
4.4.4.9	Heating devices	No heating devices used.	N/A
4.4.4.10	Safety interlock systems	No safety interlock device used.	N/A
4.4.4.11	Reverse d.c. connections	(see appended table 4.4)	P
4.4.4.12	Voltage selector mismatch	No voltage selector used.	N/A
4.4.4.13	Mis-wiring with incorrect phase sequence or polarity		P
4.4.4.14	Printed wiring board short-circuit test		N/A
4.5	Humidity preconditioning	(see appended table 7.5)	P
4.5.1	General		P
4.5.2	Conditions	Humidity: 93%RH Temperature: 40°C Duration: 48hrs	P
4.6	Backfeed voltage protection	Hazardous voltage and energy was not present on the terminals, with the DC mains supply source de-energized or disconnected. In addition the symbol 13 of Table C.1 was marked for servicing functions	P
4.6.1	Backfeed tests under normal conditions	Relay or Contactor is available at AC output side to prevent back-feed current from AC to DC side.	P
4.6.2	Backfeed tests under single-fault conditions	Relay or contactor is available at AC output side and with auto disconnected device 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	See above.	P
4.7	Electrical ratings tests	(see appended table 4.7)	P
4.7.1	Input ratings		P
4.7.1.1	Measurement requirements for DC input ports		P

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Clause	Requirement – Test	Result – Remark	Verdict
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	The marking label is on the outer surface of the enclosure.	P
	Graphic symbols may be used and shall be in accordance with Annex C or IEC 60417 as applicable.	All used graphic symbols are in accordance with Annex C.	P
	Graphic symbols shall be explained in the documentation provided with the PCE.	The explanations are provided in the user manual.	P
5.1.2	Durability of markings	The labels were subjected to the permanence of marking test. The labels were rubbed with the cloth soaked with petroleum spirit for 30 s.	P
	Markings required by this clause to be located on the PCE shall remain clear and legible under conditions of NORMAL USE and resist the effects of cleaning agents specified by the manufacturer	After this test there was no damage to the labels. The marking on the labels did not fade. There was no curling or lifting of the label's edges.	P
5.1.3	Identification		P
	The equipment shall, as a minimum, be permanently marked with:	See below.	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 above.	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 above.	P
5.1.4	Equipment ratings		P
	Unless otherwise specified in another part of IEC	See below	P

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Clause	Requirement – Test	Result – Remark	Verdict
	62109, the following ratings, as applicable shall be marked on the equipment:		
	– input voltage, type of voltage (a.c. or d.c.), frequency, and max. continuous current for each input	see above	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 above.	P
	– the ingress protection (IP) rating as in 6.3 below	See clause 6.3	P
5.1.5	Fuse identification		P
	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.		P
	Where fuses with special fusing characteristics such as time delay or breaking capacity are necessary, the type shall also be indicated		P
	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.		P
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.	Relevant symbol, indicator or information are available.	P

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Clause	Requirement – Test	Result – Remark	Verdict
	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 colored red.	No such device.	N/A
	A multiple-voltage unit shall be marked to indicate the particular voltage for which it is set when shipped from the factory. The marking is allowed to be in the form of a paper tag or any other non-permanent material.		N/A
	A unit with d.c. terminals shall be plainly marked indicating the polarity of the connections, with:		P
	– the sign “+“ for positive and “-„ for negative; or	The “+” and “-“ marking provided adjacent to the Battery input connectors.	P
	– a pictorial representation illustrating the proper polarity where the correct polarity can be unambiguously determined from the representation	No pictorial representation illustration used.	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	Symbol 7 of Table C.1 marked adjacent to the PE terminal.	P
	– the letters “PE“; or	See photo	P
	– the color coding green-yellow.		P
5.1.7	Switches and circuit-breakers		P
	The on and off-positions of switches and circuits breakers shall be clearly marked. If a push-button switch is used as the power switch, symbols 10 and 16 of Annex C may be used to indicate the on-position, or symbols 11 and 17 to indicate the off-position, with the pair of symbols (10 and 16, or 11 and 17) close together.	The letter “ON” and “OFF” is clearly marked.	P
5.1.8	Class II Equipment	Class I Equipment.	N/A
	Equipment using Class II protective means	See above.	N/A

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Clause	Requirement – Test	Result – Remark	Verdict
	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.		
	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	See above.	N/A
5.1.9	Terminal boxes for External Connections	No such device used	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:	Not used.	N/A
	a) the minimum temperature Rating and size of the cable to be connected to the TERMINALS; or		N/A
	b) a marking to warn the installer to consult the installation instruction. Symbol 9 of Table D-1 is an acceptable marking		N/A
5.2	Warning markings		P
5.2.1	Visibility and legibility requirements for warning markings		P
	Warning markings shall be legible, and shall have minimum dimensions as follows:		P
	– Printed symbols shall be at least 2,75 mm high		P
	– Printed text characters shall be at least 1.5 mm high and shall contrast in color with the background		P
	– Symbols or text that are moulded, stamped or engraved in a material shall have a character height of at least 2,0 mm, and if not contrasting in color from the background, shall have a depth or raised height of at least	No such symbols.	N/A

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Clause	Requirement – Test	Result – Remark	Verdict
	0,5 mm.		
	If it is necessary to refer to the instruction manual to preserve the protection afforded by the equipment, the equipment shall be marked with symbol 9 of Annex C		P
	Symbol 9 of Annex C is not required to be used adjacent to symbols that are explained in the manual		P
5.2.2	Content for warning markings		P
5.2.2.1	Ungrounded heat sinks and similar parts		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.	Marked with symbol 14 of Table C.1.	P
5.2.2.3	Coolant		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:	Not used.	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		N/A

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Clause	Requirement – Test	Result – Remark	Verdict
	the equipment		
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 Table C.1 and the time to discharge capacitors to safe voltage and energy levels accompany the symbol.	P
5.2.2.5	Motor guarding		N/A
	Where required by 8.2 a marking shall be provided where it is visible to service personnel before removal of a guard, warning of the hazard and giving instructions for safe servicing (for example disconnection of the source before removing the guard).		N/A
5.2.3	Sonic hazard markings and instructions	No such hazard.	N/A
	If required by 10.2.1 a PCE shall:		N/A
	a) be marked to warn the operator of the sonic pressure hazard; or		N/A
	b) be provided with installation instructions that specify how the installer can ensure that the sound pressure level from equipment at its point of use after installation, will not reach a value, which could cause a hazard. These instructions shall include the measured sound pressure level, and shall identify readily available and practicable protective materials or measures which may be used.		N/A
5.2.4	Equipment with multiple sources of supply		P
	A PCE with connections for multiple energy sources shall be marked with symbol 13 of Annex C and the manual shall contain the information required in 5.3.4.	Marked with symbol 13 of Annex C and explain in user manual.	P
	The symbol shall be located on the outside of the unit or shall be prominently visible behind any cover giving access to hazardous parts.	See above.	P

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Clause	Requirement – Test	Result – Remark	Verdict
5.2.5	Excessive touch current		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.	Marked with symbol 15 of Table C.1 and relevant information is provided in user's 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:	All related information provided in the user's manual	P
	a) explanations of equipment makings, including symbols used		P
	b) location and function of terminals and controls		P
	c) all ratings or specifications that are necessary to safely install and operate the PCE, including the following environmental ratings along with an explanation of their meaning and any resulting installation requirements:		P
	– ENVIRONMENTAL CATEGORY as per 6.1		P
	– WET LOCATIONS classification fort he intended external environment as per 6.1		P
	– POLLUTION DEGREE classification for the intended external environment as per 6.2		P
	– INGRESS PROTECTION rating as per 6.3		P
	– Ambient temperature and relative humidity ratings		P

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Clause	Requirement – Test	Result – Remark	Verdict
	– MAXIMUM altitude rating	2000m	P
	– OVERVOLTAGE CATEGORY assigned to each input and output port as per 7.3.7.1.2, accompanied by guidance regarding how to ensure that the installation complies with the required overvoltage categories;		P
	d) a warning that when the photovoltaic array is exposed to light, it supplies a d.c. voltage to the PCE		P
5.3.1.1	Language		P
	Instructions related to safety shall be in a language that is acceptable in the country where the equipment is to be installed.	Instruction related to safety is in English.	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.	The printed form is available and is delivered with the PCE.	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.	See above.	N/A
5.3.2	Information related to installation		P
	The documentation shall include installation and where applicable, specific commissioning instructions and, if necessary for safety, warnings against hazards which could arise during installation or commissioning of the equipment. The information provided shall include:	All related information provided in the user's manual	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, color		P

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Clause	Requirement – Test	Result – Remark	Verdict
	coding of leads, disconnection means, or overcurrent protection needed, including instructions that the 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 externals controls, color coding of leads, or overcurrent protection needed;		P
	d) explanation of the pin-out of connectors for external connections, unless the connector is used for a standard purpose (e.g. RS 232)		P
	e) ventilation requirements;		P
	f) requirements for special services, for example cooling liquid;		N/A
	g) instructions and information relating to sound pressure level if required by 10.2.1;	No hazardous sound level.	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;	The sample is used with an external battery, and the battery is evaluated separately.	P
	i) tightening torque to be applied to wiring terminals;		P
	j) values of backfeed short-circuit currents available from the PCE on input and output conductors under fault conditions, if those currents exceed the max. rated current of the circuit, as per 4.4.4.6;	No backfeed current available.	P
	k) for each input to the PCE, the max value of short-circuit current available from the source, for which the PCE is designed; and		P
	l) compatibility with RCD and RCM;	RCMU built in PCE.	P

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Clause	Requirement – Test	Result – Remark	Verdict
	m) instructions for protective earthing, including the information required by 7.3.6.3.7 if a second protective earthing conductor is to be installed:		P
	n) where required by 7.3.8, the installation instructions shall include the following or equivalent wording:		P
	"This product can cause a d.c. current in the external protective earthing conductor. Where a residual current-operated protective (RCD) or monitoring (RCM) device is used for protection in a case of direct or indirect contact, only an RCD or RCM of Type B is allowed on the supply side of this product."		P
	o) for PCE intended to charge batteries, the battery nominal voltage rating, size, and type		P
	p) PV array configuration information, such as ratings, whether the array is to be grounded or floating, any external protection devices needed, etc.		N/A
5.3.3	Information related to operation		P
	Instructions for use shall include any operating instructions necessary to ensure safe operation, including the following, as applicable:	All related information provided in the user's manual	P
	– Instructions for adjustment of controls including the effects of adjustment;		P
	– Instructions for interconnection to accessories and other equipment, including indication of suitable accessories, detachable parts and any special materials;		P
	– Warnings regarding the risk of burns from surfaces permitted to exceed the temperature limits of 4.3.2 and required operator actions to reduce the risk; and		P
	– Instructions, that if the equipment is used in a manner not specified by the manufacturer,		P

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Clause	Requirement – Test	Result – Remark	Verdict
	the protection provided by the equipment may be impaired.		
5.3.4	Information related to maintenance		P
	Maintenance instructions shall include the following:	All related information provided in the service manual	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		P
	Where required by 14.8.5, the documentation shall include the applicable items from the following list of instructions regarding maintenance of batteries:	External battery module used, and should evaluate in the final product	P
	– 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

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Clause	Requirement – Test	Result – Remark	Verdict
	– CAUTION: Do not dispose of batteries in a fire. The batteries may explode.		N/A
	– CAUTION: Do not open or damage batteries. Released electrolyte is harmful to the skin and eyes. It may be toxic.		N/A
	– CAUTION: A battery can present a risk of electrical shock and high short-circuit current. The following precautions should be observed when working on batteries:		N/A
	a) Remove watches, rings, or other metal objects.		N/A
	b) Use tools with insulated handles.		N/A
	c) Wear rubber gloves and boots.		N/A
	d) Do not lay tools or metal parts on top of batteries		N/A
	e) Disconnect charging source prior to connecting or disconnecting battery terminals		N/A
	f) Determine if battery is inadvertently grounded. If inadvertently grounded, remove source from ground. Contact with any part of a grounded battery can result in electrical shock. The likelihood of such shock can be reduced if such grounds are removed during installation and maintenance (applicable to equipment and remote battery supplies not having a grounded supply circuit).		N/A
6	**ENVIRONMENTAL REQUIREMENTS AND CONDITIONS**		P
	The manufacturer shall rate the PCE for the following environmental conditions:		P
	– ENVIRONMENTAL CATEGORY, as in 6.1 below	See 6.1 below	P
	– Suitability for WET LOCATIONS or not		P
	– POLLUTION DEGREE rating in 6.2 below	See 6.2 below	P

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Clause	Requirement – Test	Result – Remark	Verdict
	– INGRESS PROTECTION (IP) rating, as in 6.3 below	See 6.3 below	P
	– Ultraviolet (UV) exposure rating, as in 6.4 below	See 6.4 below	P
	– Ambient temperature and relative humidity ratings, as in 6.5 below	See 6.5 below	P
6.1	Environmental categories and minimum environmental conditions		P
6.1.1	Outdoor	For outdoor use.	P
6.1.2	Indoor, unconditioned	See above.	N/A
6.1.3	Indoor, conditioned	See above.	N/A
6.2	Pollution degree	PD 3 (internal reduced to PD2)	P
6.3	Ingress Protection	IP66 Report No: (2024) SJSXW-WT0472, issued by Jiangsu Product Quality Testing & Inspection Institute (CNAS L1000) Dated on Aug. 08, 2024, total 9 pages.	P
6.4	UV exposure	UV resistant material is used	P
6.5	Temperature and humidity	Specified by manufacturer.	P
7	**PROTECTION AGAINST ELECTRIC SHOCK AND ENERGY HAZARDS**		P
7.1	General	The proper construction of PCE is available for protection against shock and energy hazards during installation, operation and maintenance under normal and single fault conditions.	P
7.2	Fault conditions	See subclause 4.4.	P
7.3	Protection against electric shock		P
7.3.1	General	Each circuit under evaluation is compliance.	P
7.3.2	Decisive voltage classification		P
7.3.2.1	Use of decisive voltage class (DVC)	See below	P

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Clause	Requirement – Test	Result – Remark	Verdict
7.3.2.2	Limits of DVC (according table 6)	See subclause 7.3.2.1.	P
7.3.2.3	Short-terms limits of accessible voltages under fault conditions		P
7.3.2.4	Requirements for protection (according table 7)	For circuits evaluation information of PCE, refer to brief description of general product information on previous pages.	P
7.3.2.5	Connection to PELV and SELV circuits	DVC-A is classified for display and communication circuits.	P
7.3.2.6	Working voltage and DVC	See subclause 7.3.2.4.	P
7.3.2.6.1	General	See above.	P
7.3.2.6.2	AC working voltage (see Figure 2)		P
7.3.2.6.3	DC working voltage (see Figure 3)		P
7.3.2.6.4	Pulsating working voltage (see Figure 4)		P
7.3.3	protective separation	For protective separation evaluation information of PCE, refer to brief description of general product information on previous pages.	P
	Protective separation shall be achieved by:		P
	▪ double or reinforced insulation, or		P
	▪ protective screening, i.e. by a conductive screen connected to earth by protective bonding in the PCE, or connected to the protective earth conductor itself, whereby the screen is separated from live parts by at least basic insulation, or		P
	▪ protective impedance comprising limitation of current per 7.3.5.3 and of discharged energy per 7.3.5.4, or		N/A
	▪ limitation of voltage according to 7.3.5.4.		N/A
	The protective separation shall be fully and effectively maintained under all conditions of intended use of the PCE		P

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Clause	Requirement – Test	Result – Remark	Verdict
7.3.4	Protection against direct contact	Protection against electric shock by means of earthed metal enclosure. Any access to touch live parts is impossible.	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 measure given in 7.3.4.2 (enclosures and barriers) and 7.3.4.3 (insulation).	See subclause 7.3.2.4.	P
	Open type sub-assemblies and devices do not require protective measures against direct contact but the instruction provided with the equipment must indicate that such measures must be provided in the end equipment or in the installation.		N/A
	Product intended for installation in CLOSED ELECTRICAL OPERATING AREAS, (see 3.9) need not have protective measures against direct contact, except as required by 7.3.4.2.4.		N/A
7.3.4.2	Protection by means of enclosures and barriers	Protection against electric shock by means of earthed metal enclosure.	P
	The following requirements apply where protection against contact with live parts is provided by enclosures or barriers, not by insulation in 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).		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	Considered.	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		P
	Compliance with 7.3.4.2.1 is checked by all of the following:		P
	a) Inspection; and	Live parts are enclosed by the earthed metal enclosure and no openings.	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.	It is not possible to touch the hazardous live parts by the test finger and test pin.	P
	The test finger and the test pin are applied as above, without appreciable force, in every		P

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Clause	Requirement – Test	Result – Remark	Verdict
	possible position, except that floor-standing equipment having a mass exceeding 40 kg is not tilted.		
	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.	Not intended for built-in or rack mounting.	N/A
	c) Openings preventing the entry of the jointed test finger (Figure E-1 of 0E) during test b) above, are further tested by means of straight unjointed test finger (Figure E-3 of 0E), applied with a force of 30 N. If the unjointed finger enters, the test with the jointed finger is repeated except that the finger is applied using any necessary force up to 30 N.	No openings.	N/A
	d) In addition to a) – c) above, top surfaces of enclosure shall be tested with the IP3X probe of IEC 60529. The test probe shall not penetrate the top surface of the enclosure when probed from the vertical direction ±5 ° only.	No openings.	N/A
7.3.4.2.4	Service access areas	It is not allowed to remove the cover during installation and maintenance when PCE is energized.	P
7.3.4.3	Protection by means of insulation of live parts	See subclause 7.3.2, 7.3.3 and 7.3.4.1.	P
	Where the requirements of 7.3.4.2 are not met, live parts shall be provided with insulation if:		N/A
	– their working voltage is greater than the maximum limit of decisive voltage class A, or		N/A
	– for a DVC A or B circuit, protective separation from adjacent circuit of DVC C is not provided (see note “‡“ under Table 7)		N/A

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Clause	Requirement – Test	Result – Remark	Verdict
7.3.5	Protection in case of direct contact		P
7.3.5.1	General	See below.	P
	Protection in case of direct contact is required to ensure that contact with live parts does not produce a shock hazard.		P
	The protection against direct contact according to 7.3.4 is not required if the circuit contacted is separated from other circuits according to 7.3.2.3, and:		P
	– is of decisive voltage class A and complies with 7.3.5.2, or	Only DCV-A classified circuit can be touched directly, see also 7.3.5.2.	P
	– is provided with protective impedance according to 7.3.5.3, or		N/A
	– is limited in voltage according to 7.3.5.4		N/A
	In addition to the measures as given in 7.3.5.2 to 7.3.5.4, it shall be ensured that in the event of error or polarity reversal of connectors no voltages that exceed DVC A can be connected into a circuit with protective separation. This applies for example to plug-in-sub-assemblies or other plug-in devices which can be plugged-in without the use of a tool (key) or which are accessible without the use of a tool.		P
	Conformity is checked by visual inspection and trial insertion.		P
7.3.5.2	Protection using decisive voltage class A	Comm. port is considered as DVC-A which can be accessible and separated from DVC-C by double or reinforced insulation	P
7.3.5.3	Protection by means of protective impedance	This method not considered.	N/A
	Circuits and conductive parts do not require protection against direct contact if any connection to circuits of DVC-B or DVC-C is through protective impedance, and the accessible circuit or part is otherwise provided		N/A

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Clause	Requirement – Test	Result – Remark	Verdict
	with protective separation from circuits of DVC-B or DVC-C according 7.3.3.		
7.3.5.3.1	Limitation of current through protective impedance		N/A
	The current available through protective impedance to earth and between simultaneously accessible parts, measured at the accessible live parts, shall not exceed a value of 3,5 mA a.c. or 10 mA d.c. under normal and single-fault conditions.		N/A
7.3.5.3.2	Limitation of discharging energy through protective impedance		N/A
	The discharging energy available between simultaneously accessible parts protected by protective impedance shall not exceed the charging voltage and capacitance limits given in Table 9, which applies to both wet and dry locations, under normal and single fault conditions. Refer to figure 8.		N/A
7.3.5.4	Protection by means of limited voltages	This method not considered.	N/A
	That portion of a circuit that has its voltage reduced to DVC-A by a voltage divider that complies with the following requirements, and that is otherwise provided with protective separation from circuits of DVC-B or DVC-C according to 7.3.3, does not require protection against direct contact.		N/A
	The voltage divider shall be designed so that under normal and single fault conditions, including faults in the voltage division circuit, the voltage across the output of the voltage divider does not exceed the limit for DVC-A.		N/A
	This type of protection shall not be used in case of protective class II or unearthed circuits, because it relies on protective earth being connected.		N/A

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Clause	Requirement – Test	Result – Remark	Verdict
7.3.6	Protection against indirect contact		P
7.3.6.1	General		P
	Protection against indirect contact is required to prevent shock- hazardous current being accessible from conductive parts during an insulation failure. This protection shall comply with the requirements for protective class I (basic insulation plus protective earthing), class II (double or reinforced insulation) or class III (limitation of voltages)	The PCE is defined as protective class I.	P
	That part of a PCE meets the requirements of 7.3.6.2 and 7.3.6.3 is defined as protective class I	The earthing metal enclosure is complied with Protective class I.	P
	That part of a PCE meets the requirements of 7.3.6.4 is defined as protective class II.	The circuit of communication is complied with Protective class II for accessible communication ports.	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.		P
7.3.6.2	Insulation between live parts and accessible conductive parts	See subclause 7.3.2.3, 7.3.7.4 and 7.3.7.5.	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	The clearances specified in 7.3.7.4 and creepage specified in 7.3.7.5 are complied.	P
7.3.6.3	Protective class I – Protective bonding and earthing		P

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Clause	Requirement – Test	Result – Remark	Verdict
7.3.6.3.1	General		P
	Equipment of protective class I shall be provided with protective earthing, and with protective bonding to ensure electrical contact between accessible conductive parts and the means of connection for the external protective earthing conductor, except bonding is not required for:	Suitable protective bonding provided.	P
	a) accessible conductive parts that are protected by one of the measures in 7.3.5.2 to 7.3.5.4, or	DVC-A classified circuit is considered.	P
	b) accessible conductive parts are separated from live parts of DVC-B or -C using double or reinforced insulation.	Display and communication circuits are separated from live parts used double or reinforced insulation.	P
7.3.6.3.2	Requirements for protective bonding	The cross-section of the protective bonding conductor is the same as that for the external protective earthing conductor.	P
	Electrical contact with the means of connection of the external protective earthing conductor shall be achieved by one or more of the following means:		P
	a) through direct metallic contact;	The connection of external protective earthing conductor is direct metal contact via a terminal with screw.	P
	b) through other conductive parts which are not removed when the PCE or sub-units are used as intended ;		P
	c) through a dedicated protective bonding conductor;	Protective earthing terminal 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 paint or coating shall be removed in the area of contact, or reliably penetrated, to ensure metal		P

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Clause	Requirement – Test	Result – Remark	Verdict
	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.		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	See appended table 7.3.6.3.3	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.		P
	b) For PCE with an overcurrent protective device rating of more than 16 A, the voltage drop in the protective bonding test shall not exceed 2,5 V during or at the end of the test below.		P
	As alternative to a) and b) the protective bonding may designed according to the requirements for the external protective earthing conductor in 7.3.6.3.5, in which case no testing is required.	The alternative of 7.3.6.3.5 is considered	P

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Clause	Requirement – Test	Result – Remark	Verdict
	The impedance of protective bonding means shall be checked by passing a test current through the bond for a period of time as specified below. The test current is based on the rating of the overcurrent protection for the equipment or part of the equipment under consideration, as follows:		N/A
	a) For pluggable equipment type A, the overcurrent protective device is that provided external to the equipment (for example, in the building wiring, in the mains plug or in an equipment rack);		N/A
	b) For pluggable equipment type B and fixed equipment, the maximum rating of the overcurrent protective device specified in the equipment installation instructions to be provided external to the equipment;		N/A
	c) For a circuit or part of the equipment for which an overcurrent protective device is provided as part of the equipment, the rating of the provided overcurrent device.		N/A
	Voltages are measured from the protective earthing terminal to all parts whose protective bonding means are being considered. The impedance of the protective earthing conductor is not included in the measurement. However, if the protective earthing conductor is supplied with the equipment, it is permitted to include the conductor in the test circuit but the measurement of the voltage drop is made only from the main protective earthing terminal to the accessible part required to be earthed.		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		N/A

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Clause	Requirement – Test	Result – Remark	Verdict
	measurements for the subassembly or separate unit, as shown in Figure 11. However, this option is only permitted if the cab le is protected by a suitably rated protective device that takes into account the size of the conductor. Otherwise the impedance of the protective bonding conductor between the separate units is to be included, by measuring to the protective earthing terminal where the power source enters the first unit in the system, as shown in Figure 12.		
7.3.6.3.3.1	Test current, duration, and acceptance criteria		P
	The test current, duration of the test and acceptance criteria are as follows:	(see appended table 7.3.6.3.3)	P
	a) For PCE with an overcurrent protective device rating of 16 A or less, the test current is 200% of the overcurrent protective device rating, but not less than 32 A, applied for 120s. The impedance of the protective bonding means during and at the end of the test shall not exceed 0,1 Ω.		N/A
	b) For PCE with an overcurrent protective device rating of more than 16 A, the test current is 200% of the overcurrent protective device rating and the duration of the test is as shown in Table 10 below. The voltage drop in the protective bonding means, during and at the end of the test, shall not exceed 2,5 V.		P
	c) During and after the test, there shall be no melting, loosening, or other damage that would impair the effectiveness of the protective bonding means.		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		N/A

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Clause	Requirement – Test	Result – Remark	Verdict
	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.		
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		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	The external protective earthing conductor cross-sectional is designed as half of phase conductors with same material. Related statement specified in manual	P

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Clause	Requirement – Test	Result – Remark	Verdict
	according to IEC 60364-5-54.		
	If the external protective earthing conductor is routed through a plug and socket or similar means of disconnection, it shall not be possible to disconnect it unless power is simultaneously removed from the part to be protected.	External protective earthing conductor is through a AC connector to mains, it shall not be possible to disconnected it unless power was removed before.	P
	The cross-sectional area of every external protective earthing conductor which does not form part of the supply cable or cable enclosure shall, in any case, be not less than:		P
	▪ 2,5 mm² if mechanical protection is provided;	Related statement specified in user manual.	P
	▪ 4 mm² if mechanical protection is not provided.		N/A
	For cord-connected equipment, provisions shall be made so that the external protective earthing conductor in the cord shall, in the case of failure of the strain-relief mechanism, be the last conductor to be interrupted.		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		P

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Clause	Requirement – Test	Result – Remark	Verdict
	designed that their current-carrying capacity is not impaired by mechanical, chemical, or electrochemical influences. Where enclosures and/or conductors of aluminium or aluminium alloys are used, particular attention should be given to the problems of electrolytic corrosion.		
	The means of connection for the protective earthing conductor shall be permanently marked with:		P
	• symbol 7 of Annex C; or	With the symbol 7 of Table C.1.	P
	• the color coding green-yellow	The color coding of Green – yellow recommended.	P
	Marking shall not be done on easily changeable parts such as screws.		P
7.3.6.3.7	Touch current in case of failure of the protective earthing conductor	DC: 4.3<10mA	P
	The requirements of this sub-clause shall be satisfied to maintain safety in case of damage to or disconnection of the protective earthing conductor.		P
	For pluggable equipment type A, the touch current measured in accordance with 7.5.4 shall not exceed 3,5 mA a.c. or mA d.c.	Not a pluggable type A equipment	N/A
	For all other PCE, one or more of the following measure shall be applied, unless the touch current measured in accordance with 7.5.4 using the test network of IEC 60990 test figure 4 shall not exceed 3,5 mA a.c. or 10 mA d.c.	In addition, the caution symbol 15 of Table C.1 provided on PCE and in manual. (see appended table 7.3.6.3.7)	P
	a) Permanently connected wiring, and:		P
	• a cross-section of the protective earthing conductor of at least 10 mm² Cu or 16 mm² Al; or		N/A
	• automatic disconnection of the supply in case of discontinuity of the protective earthing conductor; or		N/A

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Clause	Requirement – Test	Result – Remark	Verdict
	• provision of an additional terminal for a second protective earthing conductor of the same cross-sectional area as the original protective earthing conductor and installation instruction requiring a second protective earthing conductor to be installed or		P
	b) Connection with an industrial connector according to IEC 60309 and a minimum protective earthing conductor cross-section of 2,5 mm² as part of a multi-conductor power cable. Adequate strain relief shall be provided.		N/A
	In addition, the caution symbol 15 of Annex C shall be fixed to the product and the installation manual shall provide details of the protective earthing measures required in the installation as required in 5.3.2.		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	PCE is designed for protective class I.	N/A
	Equipment or parts of equipment designed for protective class II shall have insulation between live parts and accessible surfaces in accordance with 7.3.4.3. The following requirements also apply:		N/A
	• equipment designed to protective class II shall not have means of connection for the external protective earthing conductor.		N/A

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Clause	Requirement – Test	Result – Remark	Verdict
	However this does not apply if the external protective earthing conductor is passed through the equipment to equipment series-connected beyond it. In the latter event, the external protective earthing conductor and its means for connection shall be insulated with basic insulation from the accessible surface of the equipment and from circuits that employ protective separation, extra-low voltage, protective impedance and limited discharging energy, according to 7.3.5. This basic insulation shall correspond to the rated voltage of the series-connected equipment;		
	• metal-encased equipment of protective class II may have provision on its enclosure for the connection of an equipotential bonding conductor;		N/A
	• equipment of protective class II may have provision for the connection of an earthing conductor for functional reasons or for damping of overvoltages; it shall, however, be insulated as though it is a live part;		N/A
	• equipment employing protective class II shall be marked according to 5.1.8.		N/A
7.3.7	Insulation Including Clearance and Creepage Distance	See below.	P
7.3.7.1	General		P
	This subclause gives minimum requirements for insulation, based on the principles of IEC 60664.		P
	Manufacturing tolerances shall be taken into account during measurement of creepage, clearance, and insulation distance in the PCE.		P
	Insulation shall be selected after consideration of the following influences:		P
	• pollution degree	See sub clause 7.3.7.1.1.	P

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Clause	Requirement – Test	Result – Remark	Verdict
	• overvoltage category	See sub clause 7.3.7.1.2.	P
	• supply earthing system	See sub clause 7.3.7.1.3.	P
	• insulation voltage	See sub clause 7.3.7.1.4.	P
	• location of insulation		P
	• type of insulation		P
	Compliance of insulation, creepage distances, and clearance distances, shall be verified by measurement or visual inspection, and the tests of 7.5.		P
7.3.7.1.3	Supply earthing systems	For TN system.	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.		N/A
7.3.7.1.4	Insulation voltages	Impulse with stand voltage of DC supply circuits: 4464V (V_{MAX} dc: 1000Vd.c.) Impulse with stand voltage of AC mains circuits: 4464V (Rated: 230Va.c.)	P

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Clause	Requirement – Test	Result – Remark	Verdict
	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	Considered.	P
7.3.7.2.2	Circuits connected directly to the mains	Clearances and solid insulation required according to the impulse voltage, temporary overvoltage, or working voltage, whichever gives the most severe requirement.	P
7.3.7.2.3	Circuits other than mains circuits	Clearances and solid insulation required according to the impulse voltage and recurring peak voltage.	P
7.3.7.2.4	Insulation between circuits	Clearances and solid insulation according to the higher impulse voltages. Creepages according of the higher r.m.s. working voltage.	P
7.3.7.3	Functional insulating		P
7.3.7.4	Clearance distances	(see appended table 7.3.7)	P
7.3.7.4.1	Determination	The max. impulse voltage: 4464V.	P
7.3.7.4.2	Electric field homogeneity	Not considered.	N/A
7.3.7.4.3	Clearance to conductive enclosures	Refer to subclause 7.3.7.4.1 and 13.7.	P
7.3.7.5	Creepage distances	(see appended table 7.3.7)	P
7.3.7.5.1	General		P
7.3.7.5.2	Voltage	The max. voltage: 230Vrms / 1000Vd.c	P
7.3.7.5.3	Materials	Insulating material group IIIa CTI ≥ 175 assumed.	P
7.3.7.6	Coating	Not used.	N/A
7.3.7.7	PWB spacings for functional insulating	Comply with 7.3.7.4 and 7.3.7.5.	N/A

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Clause	Requirement – Test	Result – Remark	Verdict
7.3.7.8	Solid insulating	(see appended table 7.3.7)	P
7.3.7.8.1	General		P
7.3.7.8.2	Requirements for electrical withstand capability of solid insulation		P
7.3.7.8.2.1	Basic, supplemental, reinforced, and double insulation		P
7.3.7.8.2.2	Functional insulation	Not used.	N/A
7.3.7.8.3	Thin sheet or tape material	See below.	P
7.3.7.8.3.1	General		P
7.3.7.8.3.2	Material thickness not less than 0,2 mm	Bobbin used in power transformer.	P
7.3.7.8.3.3	Material thickness less than 0,2 mm	More than 3 layers mylar sheets provided between primary and secondary in main transformer.	P
7.3.7.8.3.4	Compliance	See subclause 7.3.7.8.3.2.	P
7.3.7.8.4	Printed wiring boards		P
7.3.7.8.4.1	General	Insulation between conductor layers in double-sided single layer PWBs meet the requirements of 7.3.7.8.1. Basic, supplementary, double and reinforced insulation meet the appropriate requirements of 7.3.7.8.2.1 or 7.3.7.8.2.2. Functional insulation in PWBs meet the requirements of 7.3.7.8.2.3.	P
7.3.7.8.4.2	Use of coating materials	No coating material used.	N/A
7.3.7.8.5	Wound components	No such wound components.	N/A
7.3.7.8.6	Potting materials	No potting materials used.	N/A
7.3.7.9	Insulation requirements above 30 kHz	Considered.	P
7.3.8	Residual Current-operated protective (RCD) or monitoring (RCM) device compatibility	Built-in RCM unit within the PCE.	N/A

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Clause	Requirement – Test	Result – Remark	Verdict
	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.	Under normal and single-fault conditions, the resulting d.c. component of the current in the protective earthing conductor does not exceed the d.c. current withstand requirements in IEC 60755 and IEC 62020 for RCD and RCM of type B.	N/A
7.3.9	Capacitor discharge	Symbol and an indication of the discharge time used in a clearly visible position. 	P
7.3.9.1	Operator access area		N/A
	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.	No such operator area to access without the use of a tool.	N/A
7.3.9.2	Service access areas		P
	Capacitors located behind panels that are removable for servicing, installation, or disconnection shall present no risk of electric shock or energy hazard from charge stored on capacitors after disconnection of the PCE.	The warning symbol 21 of Table C.1 and an indication of the discharge time is placed in a clearly visible position on the protective barrier to avoid unconsciousness contact.	P
7.4	Protection against energy hazards		P
7.4.1	Determination of hazardous energy level	There is no risk of energy hazard in operator access areas, protection of electrical shock by means of earthed metal enclosure.	P
	A hazardous energy level is considered to exist if		N/A
	a) The voltage is 2 V or more, and power available after 60 s exceeds 240 VA.		N/A
	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:		N/A

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Clause	Requirement – Test	Result – Remark	Verdict
	E = 0,5 CU²		
7.4.2	Operator Access Areas		P
	Equipment shall be so designed that there is no risk of energy hazard in operator access areas from accessible circuits.	All hazardous energy parts were enclosed within the earthed metal enclosure.	P
7.4.3	Services Access Areas		P
7.5	Electrical tests related to shock hazard	(see appended table 7.5)	P
7.5.1	Impulse voltage test (type test)	During the test no puncture, flashover, or sparkover occurs.	P
7.5.2	Voltage test (dielectric strength test)	See below.	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)	(see appended table 7.3.6.3.7)	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.	See above.	P
7.5.5	Equipment with multiple sources of supply		N/A
8	**PROTECTION AGAINST MECHANICAL HAZARDS**		P
8.1	General		P
	Operation shall not lead to a mechanical	Edges, projections, corners,	P

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Clause	Requirement – Test	Result – Remark	Verdict
	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.	openings, guards, handles and the like, that are accessible to the OPERATOR are smooth and rounded.	
	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		N/A
	Protection shall be provided such that unintentional contact with hazardous moving parts is unlikely during servicing operations. If a guard over a hazardous moving part may need to be removed for servicing, the marking of symbol 15 of Table D-1 shall be applied on or near the guard.	Barrier and the marking of symbol 15 of Table C.1 is provided for service persons.	N/A
8.3	Stability		N/A
	Equipment and assemblies of equipment not secured to the building structure before operation shall be physically stable in NORMAL USE.		N/A
8.4	Provisions for lifting and carrying		P
	If carrying handles or grips are fitted to, or supplied with, the equipment, they shall be capable of withstanding a force of four times the weight of the equipment.		P
	Equipment or parts having a mass of 18 kg or		P

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Clause	Requirement – Test	Result – Remark	Verdict
	more shall be provided with a means for lifting and carrying or directions shall be given in the manufacturer's documentation.		
8.5	Wall mounting		P
	Mounting brackets on equipment intended to be mounted on a wall or ceiling shall withstand a force of four times the weight of the equipment.		P
8.6	Expelled parts		N/A
	Equipment shall contain or limit the energy of parts that could cause a HAZARD if expelled in the event of a fault.	No such parts.	N/A
9	**PROTECTION AGAINST FIRE HAZARDS**		P
9.1	Resistance to fire		P
	This subclause specifies requirements intended to reduce the risk of ignition and the spread of flame, both within the equipment and to the outside, by the appropriate use of materials and components and by suitable construction.	Suitable and appropriate materials, components and construction are used to reduce the risk of ignition and the spread of flame.	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.	Suitable and appropriate materials, components and construction are used to reduce the risk of ignition and the spread of flame.	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.	A FIRE ENCLOSURE is required for equipment or parts of equipment.	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

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Clause	Requirement – Test	Result – Remark	Verdict
	– 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 LEVEL; and		P
	– insulated wiring, except as permitted in 9.1.2.2.		P
9.1.2.2	Parts not requiring a fire enclosure	See above.	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.	Metal enclosure provided.	P
9.1.3.2	Materials for fire enclosures		P
	If an enclosure material is not classified as	Metal enclosure provided.	P

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Clause	Requirement – Test	Result – Remark	Verdict
	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.		
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.	FLAMMABILITY CLASS HB or better used.	P
9.1.3.4	Materials for components and other parts inside fire enclosures	FLAMMABILITY CLASS V- 0 or better used.	P
9.1.3.5	Materials for air filter assemblies	No such materials.	N/A
9.1.4	Openings in fire enclosures		N/A
9.1.4.1	General	No openings in fire enclosures.	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	See above.	N/A
9.1.4.3	Openings in the bottom of a fire enclosure	See above.	N/A
	The bottom of a FIRE ENCLOSURE or individual barriers, shall provide protection against emission of flaming or molten material under all internal parts, including partially enclosed components or assemblies, for which Method 2 of 9.1.1 has not been fully applied and complied		N/A

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Clause	Requirement – Test	Result – Remark	Verdict
	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	PCE not for transportable equipment.	N/A
9.2	LIMITED POWER SOURCES		N/A
9.2.1	General		N/A
9.2.2	Limited power source tests		N/A
9.3	Short-circuit and overcurrent protection		P
9.3.1	General		P
	The PCE shall not present a hazard, under short-circuit or overcurrent conditions at any port, including phase-to-phase, phase-to-earth and phase-to-neutral, and adequate information shall be provided to allow proper selection of external wiring and external protective devices.	No overcurrent hazards was presented by short circuits and overloads tests. Refer to sub-clause 4.4.4.	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	Upstream protective device for backup protection is specified in	P

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Clause	Requirement – Test	Result – Remark	Verdict
	maximum short circuit current specified for the port to which they are connected. If protection that is provided integral to the PCE for an input port is not rated for the short-circuit current of the circuit in which it is used, the installation instructions shall specify that an upstream protective device, rated for the prospective short-circuit current of that port, shall be used to provide backup protection.	the installation manual.	
10	**PROTECTION AGAINST SONIC PRESSURE HAZARDS**		P
10.1	General		P
	The equipment shall provide protection against the effect of sonic pressure. Conformity tests are carried out if the equipment is likely to cause such HAZARDS.		P
10.2	Sonic pressure and Sound level		P
10.2.1	Hazardous Noise Levels	Sound pressure level is lower than 80dB.	P
11	**PROTECTION AGAINST LIQUID HAZARDS**		N/A
11.1	Liquid Containment, Pressure and Leakage	No liquid contained in this system, and energy storage battery used.	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

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Clause	Requirement – Test	Result – Remark	Verdict
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		N/A
	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.		N/A
13.1.1	Adjustable controls	No such controls.	N/A
13.2	Securing of parts	Screws, nuts, washers, springs or similar parts are secured so as to withstand mechanical stresses occurring	P
13.3	Provisions for external connections		P
13.3.1	General	Appropriate provisions for external connections applied.	P
13.3.2	Connection to an a.c. Mains supply		P
13.3.2.1	General	·	P
	For safe and reliable connection to a MAINS supply, equipment shall be provided with one of the following:		P
	– terminals or leads or a non-detachable power supply cord for permanent connection to the supply; or		N/A
	– a non-detachable power supply cord for connection to the supply by means of a plug		N/A
	– an appliance inlet for connection of a		P

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Clause	Requirement – Test	Result – Remark	Verdict
	detachable power supply cord; or		
	– 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		N/A
13.3.2.3	Appliance inlets		P
13.3.2.4	Power supply cord	Not provided, but technical requirements provided in user manual.	N/A
13.3.2.5	Cord anchorages and strain relief	No power supply cords provided.	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	No power supply cords provided, however plastic inlet bushings provided ready for use.	N/A
13.3.3	Wiring terminals for connection of external conductors		P
13.3.3.1	Wiring terminals		P
13.3.3.2	Screw terminals		P
13.3.3.3	Wiring terminal sizes		P
13.3.3.4	Wiring terminal design		P
13.3.3.5	Grouping of wiring terminals		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	Considered.	P
13.3.6	Disconnection from supply sources	Disconnect devices provided.	P
13.3.7	Connectors, plugs and sockets	The misconnection is unlikely for DC connectors.	P

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Clause	Requirement – Test	Result – Remark	Verdict
13.3.8	Direct plug-in equipment	Not direct plug-in use.	N/A
13.4	Internal wiring and connections		P
13.4.1	General	The insulation, conductors and routing of all wires of the equipment is suitable for the electrical, mechanical, thermal and environmental conditions of use.	P
13.4.2	Routing	Wires are routed away from sharp edges, screw threads, burrs, fins, moving parts, drawers, and similar parts, which could abrade the wire insulation.	P
13.4.3	Color coding	The green/yellow color coding wire only used for protective earthing conductor.	P
13.4.4	Splices and connections	All splices and connections are mechanically adequate secure and provided electrical continuity. The likelihood of loose is impossible.	P
13.4.5	Interconnections between parts of the PCE	The communication cable only used for servicing, no any physical damage or mechanical damage likely.	P
13.5	Openings in enclosures	Not opening in metal enclosure	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	See below.	P
13.6.1.1	Thermal index or capability	Appropriate electrical, mechanical, thermal and flammability degree polymeric	P

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Clause	Requirement – Test	Result – Remark	Verdict
		materials provided.	
13.6.2	Polymers serving as enclosures or barriers preventing access to hazards	Metal enclosure used.	N/A
13.6.2.1	Stress relief test	See above.	N/A
13.6.3	Polymers serving as solid insulation	See above.	P
13.6.3.1	Resistance to arcing		P
13.6.4	UV resistance		P
	Polymeric parts of an OUTDOOR ENCLOSURE required for compliance with this standard shall be sufficiently resistance to degradation by ultra-violet (UV) radiation	UV resistant material is used	P
13.7	Mechanical resistance to deflection, impact, or drop		P
13.7.1	General	See below.	P
13.7.2	250-N deflection test for metal enclosures	A steady force of 250 N applied for 5 s, after test no hazards occurred.	P
13.7.3	7-J impact test for polymeric enclosures	Impact test applied on the display screen cover.	P
13.7.4	Drop test	Not for hand - held, direct plug - in, or transportable equipment.	N/A
13.8	Thickness requirements for metal enclosures		P
13.8.1	General		P
13.8.2	Cast metal		P
13.8.3	Sheet metal		P
14	**COMPONENTS**		P
14.1	General	(see appended table 14) Components that are certified to IEC and /or national standards are used correctly within their ratings. Components not covered by IEC standards are tested under the conditions present in the equipment.	P

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Clause	Requirement – Test	Result – Remark	Verdict
	Where safety is involved, components shall be used in accordance with their specified RATINGS unless a specific exception is made. They shall conform to one of the following:		P
	a) applicable safety requirements of a relevant IEC standard. Conformity with other requirements of the component standard is not required. If necessary for the application, components shall be subjected to the test of this standard, except that it is not necessary to carry out identical or equivalent tests already performed to check conformity with the component standard;		P
	b) the requirements of this standard and, where necessary for the application, any additional applicable safety requirements of the relevant IEC component standard;		P
	c) if there is no relevant IEC standard, the requirements of this standard;		P
	d) applicable safety requirements of a non-IEC standard which are at least as high as those of the applicable IEC standard, provided that the component has been approved to the non-IEC standard by a recognized testing authority.		P
	Components such as optocouplers, capacitors, transformers, and relays connected across basic, supplemental, reinforced, or double insulation shall comply with the requirements applicable for the grade of insulation being bridged, and if not previously certified to the applicable component safety standard shall be subjected to the voltage test of 7.5.2 as routine test.		P
14.2	Motor Over temperature Protection		N/A
	Motors which, when stopped or prevented from starting (see 4.4.4.3), would present an electric		N/A

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Clause	Requirement – Test	Result – Remark	Verdict
	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.		
14.3	Over temperature protection devices	Approved overtemperature protective devices used and for which appropriate rating was selected for use and do not operate in normal use. For overtemperature protection test or evaluation see appended table 4.4.4.	P
14.4	Fuse holders	Fuse holders with fuses are not intended to be replaceable by an OPERATOR.	N/A
14.5	MAINS voltage selecting devices	No such devices.	N/A
14.6	Printed circuit boards		P
	Printed circuit boards shall be made of material with a flammability classification of V-1 of IEC 60707 or better.	PCB materials with a flammability classification of V-1 or better used.	P
	This requirement does not apply to thin-film flexible printed circuit boards that contain only circuits powered from limited power sources meeting the requirements of 9.2.		N/A
	Conformity of the flammability RATING is checked by inspection of data on the materials. Alternatively, conformity is checked by performing the V-1 tests specified in IEC 60707 on three samples of the relevant parts.		P
14.7	Circuits or components used as transient overvoltage limiting devices		N/A
	If control of transient overvoltage is employed in the equipment, any overvoltage limiting component or circuit shall be tested with the applicable impulse withstand voltage of Table 7-10 using the test method from 7.5.1 except 10 positive and 10 negative impulses are to be applied and may be spaced up to 1 min apart.	No such components.	N/A

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Clause	Requirement – Test	Result – Remark	Verdict
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 contacted by the USER		N/A
	b) contaminating adjacent electrical components or materials; and		N/A
	c) bridging required electrical distances		N/A
14.8.4	Battery Connections		N/A
	Reverse battery connection of the terminals shall		N/A

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Clause	Requirement – Test	Result – Remark	Verdict
	be prevented if reverse connection could result in a hazard within the meaning of this Standard		
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 safe compliance. Failures evaluation and risk analysis were performed by means of fault simulation or single fault conditions. (refer to subclause of 4.4.4).	P

4.2.2.6/4.7	TABLE: electrical data (in normal conditions)											
Type	PV input			AC load			Battery			Grid output		
	U [V]	I [A]	P[kW]	U [V]	I [A]	P[kW]	U [V]	I [A]	P[kW]	U [V]	I [A]	P[kW]
A condition: PV supplies Grid-connected (Full load) and AC load												
EAG05K3L	347.8	7.6*2	5.3	207.0	0	0	0	0	0	207.0	8.2*3	5.0
	350.1	7.5*2	5.2	230.1	0	0	0	0	0	230.1	7.4*3	5.0
	348.0	7.6*2	5.3	252.7	0	0	0	0	0	252.7	8.1*3	5.0
	786.3	3.4*2	5.3	206.9	0	0	0	0	0	206.9	8.2*3	5.0
	785.5	3.4*2	5.3	230.0	0	0	0	0	0	230.0	7.4*3	5.0
	786.7	3.4*2	5.3	252.7	0	0	0	0	0	252.7	6.8*3	5.0
EAG06K3L	347.0	9.2*2	6.3	207.0	0	0	0	0	0	207.0	9.9*3	6.0
	348.0	9.1*2	6.3	230.1	0	0	0	0	0	230.1	9.0*3	6.0
	348.9	9.1*2	6.3	252.7	0	0	0	0	0	252.7	8.2*3	6.0
	785.4	4.0*2	6.3	206.9	0	0	0	0	0	206.9	9.9*3	6.0
	787.2	4.0*2	6.3	230.0	0	0	0	0	0	230.0	8.9*3	6.0
	786.2	4.0*2	6.3	252.7	0	0	0	0	0	252.7	8.2*3	6.0
EAG07K3L	348.7	10.6*2	7.4	207.0	0	0	0	0	0	207.0	11.5*3	7.0
	350.7	10.5*2	7.3	230.1	0	0	0	0	0	230.1	10.3*3	6.9
	348.1	10.7*2	7.4	252.7	0	0	0	0	0	252.7	9.5*3	7.0
	785.2	4.7*2	7.4	206.9	0	0	0	0	0	206.9	11.5*3	7.0
	787.4	4.7*2	7.4	230.0	0	0	0	0	0	230.0	10.4*3	7.0
	785.7	4.7*2	7.4	252.7	0	0	0	0	0	252.7	9.5*3	7.0
EAG08K3L	348.1	12.2*2	8.4	207.0	0	0	0	0	0	207.0	8.1*3	8.0
	348.6	12.1*2	8.4	230.1	0	0	0	0	0	230.1	7.2*3	8.0
	350.1	12.1*2	8.4	252.7	0	0	0	0	0	252.7	6.6*3	8.0
	785.5	5.4*2	8.4	206.9	0	0	0	0	0	206.9	8.1*3	8.0
	786.6	5.4*2	8.4	230.0	0	0	0	0	0	230.0	7.2*3	8.0
	787.5	5.4*2	8.4	252.7	0	0	0	0	0	252.7	6.6*3	8.0
EAG10K3L	348.3	15.1*2	10.5	207.0	0	0	0	0	0	207.0	16.5*3	10.0
	349.4	15.1*2	10.5	230.1	0	0	0	0	0	230.1	14.9*3	10.0
	348.4	15.2*2	10.5	252.7	0	0	0	0	0	252.7	13.7*3	10.0
	786.3	6.7*2	10.5	206.9	0	0	0	0	0	206.9	16.5*3	10.2
	787.6	6.7*2	10.5	230.0	0	0	0	0	0	230.0	14.9*3	10.0
	786.1	6.7*2	10.5	252.7	0	0	0	0	0	252.7	13.6*3	10.0
EAG12K3L	348.7	18.1*2	12.6	207.0	0	0	0	0	0	207.0	19.7*3	12.0
	350.0	18.0*2	12.6	230.1	0	0	0	0	0	230.1	18.0*3	12.1
	348.1	18.3*2	12.7	252.7	0	0	0	0	0	252.7	16.4*3	12.1
	786.8	8.0*2	12.6	206.9	0	0	0	0	0	206.9	19.8*3	12.0
	788.5	8.0*2	12.6	230.0	0	0	0	0	0	230.0	17.9*3	12.0
	784.8	8.1*2	12.6	252.7	0	0	0	0	0	252.7	16.3*3	12.0

4.2.2.6/4.7	TABLE: electrical data (in normal conditions)

Type	PV input			AC load			Battery			Grid output		
	U [V]	I [A]	P[kW]	U [V]	I [A]	P[kW]	U [V]	I [A]	P[kW]	U [V]	I [A]	P[kW]
B condition: Battery supplies Grid-connected and AC load (Full load)												
EAG05K3L	0	0	0	206.9	7.7*3	4.8	44.2	119.5	5.3	206.9	0.6*3	0.4
	0	0	0	230.1	6.9*3	4.8	43.9	120.8	5.3	230.1	0.6*3	0.4
	0	0	0	252.8	6.3*3	4.8	44.2	119.7	5.3	252.8	0.5*3	0.4
	0	0	0	206.9	8.0*3	5.0	55.8	98.2	5.5	206.9	0.6*3	0.4
	0	0	0	230.0	7.2*3	5.0	55.5	98.4	5.5	230.0	0.6*3	0.4
	0	0	0	252.7	6.6*3	5.0	55.9	100.4	5.5	252.7	0.5*3	0.4
EAG06K3L	0	0	0	206.9	8.5*3	5.3	48.1	124.5	6.0	206.9	0.6*3	0.4
	0	0	0	230.1	7.7*3	5.3	48.0	124.8	6.0	230.1	0.6*3	0.4
	0	0	0	252.8	7.0*3	5.3	48.0	124.6	6.0	252.8	0.5*3	0.4
	0	0	0	206.9	9.7*3	6.0	55.9	117.9	6.6	206.9	0.6*3	0.4
	0	0	0	230.1	8.7*3	6.0	55.1	119.4	6.6	230.1	0.6*3	0.4
	0	0	0	252.6	7.9*3	6.0	55.6	118.8	6.6	252.6	0.5*3	0.4
EAG07K3L	0	0	0	206.9	9.9*3	6.2	46.6	149.9	7.0	206.9	0.7*3	0.5
	0	0	0	230.1	8.9*3	6.2	46.6	149.9	7.0	230.1	0.7*3	0.5
	0	0	0	252.8	8.1*3	6.2	46.7	149.8	7.0	252.8	0.6*3	0.5
	0	0	0	206.9	11.3*3	7.0	55.8	137.6	7.7	206.9	0.8*3	0.5
	0	0	0	230.1	10.1*3	7.0	55.9	140.0	7.7	230.1	0.8*3	0.5
	0	0	0	252.6	9.2*3	7.0	55.5	139.1	7.7	252.6	0.7*3	0.5
EAG08K3L	0	0	0	206.9	12.2*3	7.6	43.8	190.9	8.4	206.9	0.9*3	0.5
	0	0	0	230.1	11.0*3	7.6	43.9	189.9	8.3	230.1	0.8*3	0.5
	0	0	0	252.8	10.0*3	7.6	44.0	190.0	8.4	252.8	0.7*3	0.6
	0	0	0	206.9	12.9*3	8.0	55.7	157.2	8.8	206.9	0.9*3	0.6
	0	0	0	230.1	11.6*3	8.0	55.8	159.6	8.8	230.1	0.8*3	0.6
	0	0	0	252.6	10.5*3	8.0	56.3	158.2	8.8	252.6	0.7*3	0.6
EAG10K3L	0	0	0	207.0	14.3*3	8.9	47.4	210.0	10.0	206.9	0.9*3	0.6
	0	0	0	230.0	12.9*3	8.9	47.8	209.5	10.0	230.0	0.8*3	0.6
	0	0	0	252.8	11.7*3	8.9	47.6	209.8	10.0	252.8	0.8*3	0.6
	0	0	0	206.9	16.1*3	10.0	55.7	197.8	11.0	206.9	1.1*3	0.7
	0	0	0	230.1	14.5*3	10.0	55.8	201.0	11.1	230.1	1.0*3	0.7
	0	0	0	252.6	13.2*3	10.0	55.5	198.9	11.1	252.6	0.6*3	0.7
EAG12K3L	0	0	0	206.9	17.2*3	10.7	47.9	249.8	12.0	206.9	0.6*3	0.7
	0	0	0	230.0	15.4*3	10.7	47.9	249.5	12.0	230.0	0.5*3	0.7
	0	0	0	252.8	14.1*3	10.7	48.0	249.8	12.0	252.8	0.6*3	0.7
	0	0	0	206.9	19.5*3	12.1	55.7	236.1	13.2	206.9	0.6*3	0.8
	0	0	0	230.1	17.4*3	12.0	56.0	240.9	13.3	230.1	0.5*3	0.8
	0	0	0	252.6	15.9*3	12.1	55.5	239.1	13.3	252.6	0.6*3	0.8

4.2.2.6/4.7	TABLE: electrical data (in normal conditions)											
Type	PV input			AC load			Battery			Grid output		
	U [V]	I [A]	P[kW]	U [V]	I [A]	P[kW]	U [V]	I [A]	P[kW]	U [V]	I [A]	P[kW]
C condition: PV supplies Battery charge												
EAG05K3L	348.7	7.6*2	5.3	0	0	0	44.1	114.5	5.1	206.9	0.3*3	0.2
	350.3	7.5*2	5.3	0	0	0	43.8	114.9	5.0	252.7	0.3*3	0.2
	350.3	7.5*2	5.3	0	0	0	56.1	89.8	5.0	206.7	0.3*3	0.2
	350.3	7.5*2	5.3	0	0	0	56.1	89.5	5.0	252.6	0.3*3	0.2
	796.2	3.3*2	5.3	0	0	0	44.1	114.6	5.1	206.9	0.3*3	0.2
	796.2	3.3*2	5.3	0	0	0	43.8	113.6	5.0	252.7	0.3*3	0.2
	796.2	3.3*2	5.3	0	0	0	55.9	89.2	5.0	206.8	0.3*3	0.2
	796.2	3.3*2	5.3	0	0	0	56.1	89.3	5.0	252.6	0.3*3	0.2
EAG06K3L	349.7	9.0*2	6.3	0	0	0	47.7	124.7	6.0	206.9	0.3*3	0.2
	350.2	9.0*2	6.3	0	0	0	47.9	124.9	6.0	252.8	0.3*3	0.2
	349.7	9.0*2	6.3	0	0	0	56.0	106.3	6.0	206.7	0.4*3	0.2
	350.2	9.0*2	6.3	0	0	0	56.0	106.1	6.0	252.6	0.3*3	0.2
	788.0	4.0*2	6.3	0	0	0	47.9	124.6	6.0	206.9	0.4*3	0.2
	788.0	4.0*2	6.3	0	0	0	48.0	124.9	6.0	252.7	0.3*3	0.2
	789.2	4.0*2	6.3	0	0	0	55.9	106.0	5.9	206.8	0.4*3	0.2
	789.2	4.0*2	6.3	0	0	0	56.0	105.7	5.9	252.6	0.3*3	0.2
EAG07K3L	350.1	10.5*2	7.4	0	0	0	44.2	149.2	6.6	206.9	1.1*3	0.6
	349.0	10.6*2	7.4	0	0	0	44.0	149.5	6.6	252.8	0.9*3	0.6
	350.1	10.5*2	7.4	0	0	0	55.9	125.2	7.0	206.7	0.4*3	0.2
	349.5	10.6*2	7.4	0	0	0	55.8	125.2	7.0	252.6	0.4*3	0.2
	783.2	4.7*2	7.4	0	0	0	44.2	149.7	6.6	206.9	1.1*3	0.6
	783.2	4.7*2	7.4	0	0	0	43.8	149.8	6.6	252.7	0.9*3	0.6
	783.2	4.7*2	7.4	0	0	0	55.7	125.1	7.0	206.8	0.4*3	0.2
	783.2	4.7*2	7.4	0	0	0	56.0	125.2	7.0	252.6	0.4*3	0.2
EAG08K3L	349.8	12.1*2	8.4	0	0	0	44.2	178.4	7.9	206.9	0.4*3	0.2
	349.1	12.1*2	8.4	0	0	0	44.1	179.5	7.9	252.7	0.4*3	0.2
	349.5	12.1*2	8.4	0	0	0	55.9	143.8	8.1	206.7	0.5*3	0.2
	349.1	12.1*2	8.4	0	0	0	55.8	143.9	8.1	252.6	0.4*3	0.2
	787.1	5.4*2	8.4	0	0	0	44.2	179.5	7.9	206.9	0.4*3	0.2
	786.1	5.4*2	8.4	0	0	0	43.7	179.3	7.8	252.7	0.4*3	0.2
	786.1	5.4*2	8.4	0	0	0	55.7	143.5	8.0	206.8	0.4*3	0.2
	786.1	5.4*2	8.4	0	0	0	56.0	142.4	8.0	252.6	0.4*3	0.2

4.2.2.6/4.7	TABLE: electrical data (in normal conditions)

Type	PV input			AC load			Battery			Grid output		
	U [V]	I [A]	P[kW]	U [V]	I [A]	P[kW]	U [V]	I [A]	P[kW]	U [V]	I [A]	P[kW]
EAG10K3L	349.8	15.1*2	10.5	0	0	0	44.1	208.0	9.2	206.9	1.8*3	1.1
	349.5	15.1*2	10.5	0	0	0	44.3	208.4	9.2	252.6	1.6*3	1.1
	349.2	15.1*2	10.5	0	0	0	56.1	178.9	10.1	206.7	0.6*3	0.3
	349.2	15.1*2	10.5	0	0	0	55.8	179.0	10.0	252.6	0.5*3	0.3
	785.0	6.7*2	10.5	0	0	0	44.2	209.9	9.3	206.9	1.9*3	1.1
	785.0	6.7*2	10.5	0	0	0	43.7	209.5	9.2	252.7	1.6*3	1.1
	782.7	6.7*2	10.4	0	0	0	55.8	178.3	10.0	206.8	0.6*3	0.3
	784.3	6.7*2	10.5	0	0	0	56.1	178.2	10.0	252.6	0.5*3	0.3
EAG12K3L	349.7	18.1*2	12.6	0	0	0	48.0	249.5	12.0	206.9	0.7*3	0.4
	349.7	18.1*2	12.6	0	0	0	48.0	249.6	12.0	252.6	0.6*3	0.4
	349.7	18.1*2	12.6	0	0	0	56.2	214.0	12.1	206.7	0.7*3	0.4
	349.6	18.1*2	12.6	0	0	0	55.8	214.8	12.0	252.6	0.6*3	0.4
	784.3	8.1*2	12.6	0	0	0	48.0	249.6	12.0	206.9	0.7*3	1.8
	783.7	8.1*2	12.6	0	0	0	48.0	249.5	12.0	252.7	0.6*3	1.8
	783.7	8.1*2	12.6	0	0	0	55.8	214.0	11.9	206.8	0.7*3	0.4
	783.7	8.1*2	12.6	0	0	0	56.1	213.8	12.0	252.6	0.6*3	0.4
D condition: Grid-connected supplies Battery charge												
EAG05K3L	0	0	0	0	0	0	44.2	108.0	4.7	207.0	8.4*3	5.0
	0	0	0	0	0	0	44.5	108.3	4.8	229.4	7.6*3	5.0
	0	0	0	0	0	0	44.6	108.1	4.8	253.0	6.9*3	5.0
	0	0	0	0	0	0	56.1	85.0	4.8	206.5	8.5*3	5.0
	0	0	0	0	0	0	56.1	85.0	4.8	229.4	7.5*3	4.9
	0	0	0	0	0	0	56.0	85.0	4.7	252.4	6.9*3	5.0
EAG06K3L	0	0	0	0	0	0	45.5	125.0	5.7	206.5	10.3*3	6.1
	0	0	0	0	0	0	45.7	125.3	5.7	229.4	9.2*3	6.0
	0	0	0	0	0	0	45.7	125.3	5.7	252.4	8.4*3	6.0
	0	0	0	0	0	0	56.3	101.8	5.7	206.5	10.0*3	5.9
	0	0	0	0	0	0	56.3	101.8	5.7	229.4	9.2*3	6.0
	0	0	0	0	0	0	56.3	101.7	5.7	252.4	8.4*3	6.0
EAG07K3L	0	0	0	0	0	0	44.3	149.2	6.6	206.5	11.9*3	7.0
	0	0	0	0	0	0	44.3	149.2	6.6	229.5	10.7*3	7.0
	0	0	0	0	0	0	44.3	149.1	6.6	252.4	9.7*3	7.0
	0	0	0	0	0	0	56.3	117.8	6.6	206.5	11.8*3	7.0
	0	0	0	0	0	0	56.3	117.7	6.6	229.5	10.6*3	6.9
	0	0	0	0	0	0	56.3	117.8	6.6	252.4	9.7*3	7.0

4.2.2.6/4.7	TABLE: electrical data (in normal conditions)

Type	PV input			AC load			Battery			Grid output		
	U [V]	I [A]	P[kW]	U [V]	I [A]	P[kW]	U [V]	I [A]	P[kW]	U [V]	I [A]	P[kW]
EAG08K3L	0	0	0	0	0	0	44.2	172.6	7.6	206.5	13.7*3	8.1
	0	0	0	0	0	0	44.2	172.6	7.6	229.5	12.2*3	8.0
	0	0	0	0	0	0	44.3	172.6	7.6	252.4	11.2*3	8.0
	0	0	0	0	0	0	56.0	136.0	7.6	206.5	13.6*3	8.0
	0	0	0	0	0	0	56.1	136.0	7.6	229.4	12.2*3	8.0
	0	0	0	0	0	0	56.2	136.0	7.6	252.4	11.1*3	8.0
EAG10K3L	0	0	0	0	0	0	44.3	216.3	9.5	207.6	16.7*3	9.9
	0	0	0	0	0	0	43.9	218.7	9.6	229.4	15.2*3	10.0
	0	0	0	0	0	0	44.6	212.2	9.5	252.3	13.8*3	10.0
	0	0	0	0	0	0	56.7	169.5	9.6	207.6	16.9*3	10.0
	0	0	0	0	0	0	56.7	168.0	9.5	229.4	15.2*3	10.0
	0	0	0	0	0	0	56.8	167.9	9.5	252.4	13.8*3	10.0
EAG12K3L	0	0	0	0	0	0	44.2	258.2	11.4	206.5	20.2*3	12.0
	0	0	0	0	0	0	44.1	259.3	11.4	229.4	18.3*3	11.9
	0	0	0	0	0	0	44.1	259.4	11.4	252.4	16.6*3	12.0
	0	0	0	0	0	0	56.7	201.5	11.4	206.5	20.2*3	12.0
	0	0	0	0	0	0	56.8	201.5	11.4	229.4	18.2*3	12.0
	0	0	0	0	0	0	56.8	201.5	11.4	252.4	16.6*3	12.0

4.3	TABLE: heating temperature rise measurements		P
	test voltage (V)	See below	—
	Ambient temperature t1 (°C)	See below	—
	Ambient temperature t2 (°C)	See below	—

temperature rise dT of part/at:	T (°C)				allowed T_{max} (°C)
Model: EAG12K3L (No screen)					
Supplied Voltage:	PV 350V Grid 203V	PV 350V Grid 253V	PV800V Grid 203V	PV 800V Grid 253V	--
Enclosure –Bottom	68.6	65.0	66.1	64.3	100.0
Enclosure –Front	67.9	64.4	65.5	63.7	100.0
Enclosure –Rear	69.3	65.7	66.8	64.9	100.0
Enclosure –Left	68.3	64.7	65.8	64.0	100.0
Enclosure –Right	68.7	65.2	66.3	64.4	100.0
Battery Terminal	55.8	53.0	53.9	52.4	105.0
Inner Fans	51.5	52.6	51.6	51.9	70.0
AC IGBT Q1-1	91.8	81.7	87.2	80.8	175.0
AC Connector	51.0	48.4	49.2	47.9	120.0
AC Main Inductor	89.7	79.8	85.2	78.9	130.0
Enclosure –Top	67.3	63.8	64.9	63.1	100.0
DC Main Inductor	76.2	72.2	73.5	71.5	130.0
T-Ambient	45.9	45.9	45.9	45.9	--
Bat Transformer TX1	50.5	48.5	49.0	49.0	130.0
Operation Panel	46.7	47.5	48.0	46.7	125.0
DC switch	54.9	52.1	53.0	51.5	85.0
DC Internal wire	55.3	52.4	53.4	51.9	105.0
BAT-IGBT QL-H1	56.2	54.0	54.5	54.5	175.0
DC-X capacitor C7	56.3	53.4	54.4	52.8	105.0
DC-Y capacitor C1006	55.6	52.7	53.6	52.1	110.0
Dc inductance L1	61.7	59.2	53.7	54.9	130.0
DC PCB	79.3	75.2	76.5	74.4	130.0

Bus Capacitor EC7	62.5	59.3	60.3	58.6	105.0
APS-BAT Power MOS Q4	86.4	73.8	79.6	73.7	150.0
AC HCT B5	76.9	72.9	74.2	72.1	105.0
Boost Inductor L2	89.1	85.5	77.5	79.3	130.0
PV Connector	46.9	48.5	46.9	46.7	85.0
APS-DC Transformer winding TX2	89.9	85.2	86.7	84.3	130.0
Optocoupler on main board KF1	55.0	52.1	53.1	51.6	100.0
CPU for display U1	56.4	53.5	54.5	52.9	105.0
BOOST IGBT PV1-Q1	92.8	89.1	80.7	82.6	175.0
Relay KF10	76.0	72.0	73.3	71.3	85.0
GFCI B6	60.0	56.9	57.9	56.3	85.0
Bus Capacitor EC9	73.9	70.9	64.3	65.8	105.0
AC Y capacitor C1006	81.2	77.0	78.4	76.2	110.0
Main CPU K1B	78.2	74.1	75.4	73.3	105.0
Slave CPU K2B	77.1	73.1	74.4	72.4	105.0
APS-DC Power MOS Q1	90.0	80.1	85.5	79.2	150.0

4.3	TABLE: heating temperature rise measurements		P
	test voltage (V)	See below	—
	Ambient temperature t1 (°C)	See below	—
	Ambient temperature t2 (°C)	See below	—

temperature rise dT of part/at:	T (°C)				allowed T_{max} (°C)
Model: EAG12K3L (No screen)					
Supplied Voltage:	PV 350V Grid 203V	PV 350V Grid 253V	PV800V Grid 203V	PV 800V Grid 253V	--
Enclosure –Bottom	78.3	78.7	63.6	73.1	100.0
Enclosure –Front	78.7	77.9	63.0	72.4	100.0
Enclosure –Rear	78.6	79.5	64.2	73.8	100.0
Enclosure –Left	77.7	78.3	63.3	72.7	100.0
Enclosure –Right	78.2	78.8	63.7	73.2	100.0
Battery Terminal	63.2	67.7	65.4	62.9	105.0
Inner Fans	66.9	66.9	66.7	66.2	70.0
AC IGBT Q1-1	103.1	103.1	99.0	89.0	175.0
AC Connector	69.0	69.0	62.1	64.1	120.0
AC Main Inductor	97.0	97.0	93.1	83.7	130.0
Enclosure –Top	77.2	77.2	62.4	71.7	100.0
DC Main Inductor	81.6	81.6	73.0	75.8	130.0
T-Ambient	60.4	60.4	60.4	60.4	--
Bat Transformer TX1	73.2	73.2	71.7	68.1	130.0
Operation Panel	62.3	62.3	77.2	62.3	125.0
DC switch	66.6	66.6	64.3	61.8	85.0
DC Internal wire	67.0	67.0	65.3	62.2	105.0
BAT-IGBT QL-H1	61.7	61.7	66.3	61.7	175.0
DC-X capacitor C7	68.4	68.4	63.4	63.5	105.0
DC-Y capacitor C1006	67.4	67.4	63.8	62.6	110.0
Dc inductance L1	90.9	90.9	80.9	79.4	130.0
DC PCB	89.5	89.5	84.6	83.1	130.0

Bus Capacitor EC7	66.9	66.9	63.3	62.1	105.0
APS-BAT Power MOS Q4	71.7	71.7	70.3	66.8	150.0
AC HCT B5	82.4	82.4	77.9	76.5	105.0
Boost Inductor L2	90.6	90.6	80.7	79.2	130.0
PV Connector	65.7	65.7	63.0	61.0	85.0
APS-DC Transformer winding TX2	96.3	96.3	91.1	89.4	130.0
Optocoupler on main board KF1	66.7	66.7	63.1	61.9	100.0
CPU for display U1	68.4	68.4	64.7	66.7	105.0
BOOST IGBT PV1-Q1	106.0	106.0	94.4	92.6	175.0
Relay KF10	77.3	77.3	73.1	71.7	85.0
GFCI B6	72.8	72.8	68.8	67.6	85.0
Bus Capacitor EC9	78.5	78.5	69.8	68.6	105.0
AC Y capacitor C1006	87.0	87.0	82.3	80.7	110.0
Main CPU K1B	83.7	83.7	79.2	81.6	105.0
Slave CPU K2B	82.7	82.7	78.2	80.6	105.0
APS-DC Power MOS Q1	97.3	97.3	93.4	84.0	150.0

4.3	TABLE: heating temperature rise measurements		P
	test voltage (V)	See below	—
	Ambient temperature t1 (°C)	See below	—
	Ambient temperature t2 (°C)	See below	—

temperature rise dT of part/at:	T (°C)				allowed T_{max} (°C)
Model: EAG12K3L (No screen)					
Supplied Voltage:	Bat 48V Grid 203V	Bat 48V Grid 253V	Bat 56V Grid 203V	Bat 56V Grid 253V	--
Enclosure –Bottom	72.2	69.8	77.7	68.8	100.0
Enclosure –Front	71.5	69.1	76.9	68.1	100.0
Enclosure –Rear	72.9	70.5	78.4	69.5	100.0
Enclosure –Left	71.8	69.5	77.3	68.5	100.0
Enclosure –Right	72.3	70.0	77.8	68.9	100.0
Battery Terminal	58.8	56.9	80.3	56.0	105.0
Inner Fans	51.4	51.8	50.6	51.5	70.0
AC IGBT Q1-1	96.6	86.0	91.8	82.1	175.0
AC Connector	53.7	51.9	51.0	51.2	120.0
AC Main Inductor	94.4	84.0	89.7	80.2	130.0
Enclosure –Top	70.8	68.5	67.3	67.5	100.0
DC Main Inductor	80.2	77.6	76.2	76.5	130.0
T-Ambient	45.9	45.9	45.9	45.9	--
Bat Transformer TX1	89.1	86.4	75.7	83.8	130.0
Operation Panel	49.2	47.6	46.7	46.9	125.0
DC switch	57.8	55.9	54.9	55.1	85.0
DC Internal wire	58.2	56.3	55.3	55.5	105.0
BAT-IGBT QL-H1	92.8	90.0	78.9	87.2	175.0
DC-X capacitor C7	59.3	57.3	56.3	56.6	105.0
DC-Y capacitor C1006	58.5	56.6	55.6	55.8	110.0
Dc inductance L1	70.9	68.8	68.1	65.9	130.0
DC PCB	83.5	80.7	79.3	79.7	130.0

Bus Capacitor EC7	65.8	63.6	62.5	62.8	105.0
APS-BAT Power MOS Q4	90.9	88.2	77.3	85.4	150.0
AC HCT B5	80.9	78.2	76.9	77.2	105.0
Boost Inductor L2	50.5	49.0	48.5	47.0	130.0
PV Connector	47.0	48.6	46.9	48.6	85.0
APS-DC Transformer winding TX2	94.6	91.5	89.9	90.2	130.0
Optocoupler on main board KF1	57.9	56.0	56.4	55.2	100.0
CPU for display U1	59.4	57.4	54.0	56.7	105.0
BOOST IGBT PV1-Q1	56.2	54.5	76.0	52.3	175.0
Relay KF10	80.0	77.4	60.0	76.3	85.0
GFCI B6	63.2	61.1	81.2	60.3	85.0
Bus Capacitor EC9	82.1	79.6	78.2	76.4	105.0
AC Y capacitor C1006	85.5	82.7	77.1	81.6	110.0
Main CPU K1B	82.3	79.6	90.0	78.5	105.0
Slave CPU K2B	81.2	78.5	77.5	77.5	105.0
APS-DC Power MOS Q1	94.7	84.3	89.0	80.5	150.0

4.3	TABLE: heating temperature rise measurements		P
	test voltage (V)	See below	—
	Ambient temperature t1 (°C)	See below	—
	Ambient temperature t2 (°C)	See below	—

temperature rise dT of part/at:	T (°C)				allowed T_{max} (°C)
Model: EAG12K3L (No screen)					
Supplied Voltage:	Bat 48V Grid 203V	Bat 48V Grid 253V	Bat 56V Grid 203V	Bat 56V Grid 253V	--
Enclosure –Bottom	82.0	79.0	79.2	78.4	100.0
Enclosure –Front	81.2	78.2	78.4	77.6	100.0
Enclosure –Rear	82.8	79.8	80.0	79.2	100.0
Enclosure –Left	81.6	78.6	78.8	78.0	100.0
Enclosure –Right	82.1	79.2	79.4	78.5	100.0
Battery Terminal	70.6	68.1	68.3	67.5	105.0
Inner Fans	66.7	66.8	66.3	66.0	70.0
AC IGBT Q1-1	106.3	99.9	102.0	98.9	175.0
AC Connector	71.9	69.3	69.5	68.8	120.0
AC Main Inductor	100	94.0	96.0	93.0	130.0
Enclosure –Top	80.4	77.5	77.7	76.9	100.0
DC Main Inductor	85.0	81.9	82.2	81.3	130.0
T-Ambient	60.4	60.4	60.4	60.4	--
Bat Transformer TX1	95.4	93.5	84.9	83.0	130.0
Operation Panel	64.9	62.6	62.8	62.1	125.0
DC switch	69.4	66.9	67.1	66.4	85.0
DC Internal wire	69.8	67.3	67.5	66.8	105.0
BAT-IGBT QL-H1	111.6	109.4	99.3	97.1	175.0
DC-X capacitor C7	71.2	68.6	68.9	68.1	105.0
DC-Y capacitor C1006	70.2	67.7	67.9	67.2	110.0
Dc inductance L1	75.2	72.9	71.4	71.4	130.0

DC PCB	93.2	89.8	90.1	89.2	130.0
Bus Capacitor EC7	69.7	67.2	67.4	66.7	105.0
APS-BAT Power MOS Q4	95.7	93.8	85.2	83.3	150.0
AC HCT B5	85.8	82.7	83.0	82.1	105.0
Boost Inductor L2	76.2	73.9	72.4	72.4	130.0
PV Connector	68.4	65.9	66.1	65.5	85.0
APS-DC Transformer winding TX2	100.3	96.7	97.0	96.0	130.0
Optocoupler on main board KF1	69.5	67.0	67.2	66.5	100.0
CPU for display U1	71.3	68.7	68.9	68.2	105.0
BOOST IGBT PV1-Q1	74.7	72.5	71.0	71.0	175.0
Relay KF10	80.5	77.6	77.8	77.0	85.0
GFCI B6	75.8	73.1	73.3	72.5	85.0
Bus Capacitor EC9	82.6	80.1	78.5	78.5	105.0
AC Y capacitor C1006	90.6	87.3	87.6	86.7	110.0
Main CPU K1B	87.2	84.1	84.3	83.5	105.0
Slave CPU K2B	86.1	83.0	83.3	82.4	105.0
APS-DC Power MOS Q1	100.3	94.3	96.3	93.3	150.0

4.3	TABLE: heating temperature rise measurements		P
	test voltage (V)	See below	—
	Ambient temperature t1 (°C)	See below	—
	Ambient temperature t2 (°C)	See below	—

temperature rise dT of part/at:	T (°C)				allowed T_{max} (°C)
Model: EAG12K3L (screen)					
Supplied Voltage:	PV 350V Grid 203V	PV 350V Grid 253V	PV800V Grid 203V	PV 800V Grid 253V	--
Enclosure –Bottom	69.8	66.2	67.3	65.5	100.0
Enclosure –Front	69.3	65.8	66.9	65.1	100.0
Enclosure –Rear	70.6	67	68.1	66.2	100.0
Enclosure –Left	69.1	65.5	66.6	64.8	100.0
Enclosure –Right	69.8	66.3	67.4	65.5	100.0
Battery Terminal	57.1	54.3	55.2	53.7	105.0
Inner Fans	52.8	52.6	52.4	52.8	70.0
AC IGBT Q1-1	93.2	83.1	88.6	82.2	175.0
AC Connector	52.1	49.5	50.3	49.0	120.0
AC Main Inductor	90.4	80.5	85.9	79.6	130.0
Enclosure –Top	68.1	64.6	65.7	63.9	100.0
DC Main Inductor	76.8	72.8	74.1	72.1	130.0
T-Ambient	45.3	45.3	45.3	45.3	--
Bat Transformer TX1	51.8	49.8	50.3	50.3	130.0
Operation Panel	47.9	48.7	49.2	47.9	125.0
DC switch	56.1	53.3	54.2	52.7	85.0
DC Internal wire	56.2	53.3	54.3	52.8	105.0
BAT-IGBT QL-H1	56.9	54.7	55.2	55.2	175.0
DC-X capacitor C7	57.5	54.6	55.6	54.0	105.0
DC-Y capacitor C1006	57.1	54.2	55.1	53.6	110.0
Dc inductance L1	63.0	60.5	55.0	56.2	130.0

DC PCB	79.8	75.7	77.0	74.9	130.0
Bus Capacitor EC7	63.4	60.2	61.2	59.5	105.0
APS-BAT Power MOS Q4	87.5	74.9	80.7	74.8	150.0
AC HCT B5	78.3	74.3	75.6	73.5	105.0
Boost Inductor L2	89.8	86.2	78.2	80.0	130.0
PV Connector	47.7	49.3	47.7	47.5	85.0
APS-DC Transformer winding TX2	90.8	86.1	87.6	85.2	130.0
Optocoupler on main board KF1	56.0	53.1	54.1	52.6	100.0
CPU for display U1	57.5	54.6	55.6	54.0	105.0
BOOST IGBT PV1-Q1	93.6	89.9	81.5	83.4	175.0
Relay KF10	77.2	73.2	74.5	72.5	85.0
GFCI B6	61.2	58.1	59.1	57.5	85.0
Bus Capacitor EC9	74.7	71.7	65.1	66.6	105.0
AC Y capacitor C1006	81.9	77.7	79.1	76.9	110.0
Main CPU K1B	79.6	75.5	76.8	74.7	105.0
Slave CPU K2B	78.7	74.7	76.0	74.0	105.0
APS-DC Power MOS Q1	91.0	81.1	86.5	80.2	150.0

4.3	TABLE: heating temperature rise measurements		P
	test voltage (V)	See below	—
	Ambient temperature t1 (°C)	See below	—
	Ambient temperature t2 (°C)	See below	—

temperature rise dT of part/at:	T (°C)				allowed T_{max} (°C)
Model: EAG12K3L (screen)					
Supplied Voltage:	PV 350V Grid 203V	PV 350V Grid 253V	PV800V Grid 203V	PV 800V Grid 253V	--
Enclosure –Bottom	79.5	79.9	64.8	74.3	100.0
Enclosure –Front	80.1	79.3	64.4	73.8	100.0
Enclosure –Rear	79.9	80.8	65.5	75.1	100.0
Enclosure –Left	78.5	79.1	64.1	73.5	100.0
Enclosure –Right	79.3	79.9	64.8	74.3	100.0
Battery Terminal	64.5	69.0	66.7	64.2	105.0
Inner Fans	64.2	64.1	64.4	64.0	70.0
AC IGBT Q1-1	104.5	104.5	100.4	90.4	175.0
AC Connector	70.1	70.1	63.2	65.2	120.0
AC Main Inductor	97.7	97.7	93.8	84.4	130.0
Enclosure –Top	78.0	78.0	63.2	72.5	100.0
DC Main Inductor	82.2	82.2	73.6	76.4	130.0
T-Ambient	60.8	60.8	60.8	60.8	--
Bat Transformer TX1	74.5	74.5	73.0	69.4	130.0
Operation Panel	63.5	63.5	78.4	63.5	125.0
DC switch	67.8	67.8	65.5	63.0	85.0
DC Internal wire	67.9	67.9	66.2	63.1	105.0
BAT-IGBT QL-H1	62.4	62.4	67.0	62.4	175.0
DC-X capacitor C7	69.6	69.6	64.6	64.7	105.0
DC-Y capacitor C1006	68.9	68.9	65.3	64.1	110.0
Dc inductance L1	92.2	92.2	82.2	80.7	130.0
DC PCB	90.0	90.0	85.1	83.6	130.0

Bus Capacitor EC7	67.8	67.8	64.2	63.0	105.0
APS-BAT Power MOS Q4	72.8	72.8	71.4	67.9	150.0
AC HCT B5	83.8	83.8	79.3	77.9	105.0
Boost Inductor L2	91.3	91.3	81.4	79.9	130.0
PV Connector	66.5	66.5	63.8	61.8	85.0
APS-DC Transformer winding TX2	97.2	97.2	92.0	90.3	130.0
Optocoupler on main board KF1	67.7	67.7	64.1	62.9	100.0
CPU for display U1	69.5	69.5	65.8	67.8	105.0
BOOST IGBT PV1-Q1	106.8	106.8	95.2	93.4	175.0
Relay KF10	78.5	78.5	74.3	72.9	85.0
GFCI B6	74.0	74.0	70.0	68.8	85.0
Bus Capacitor EC9	79.3	79.3	70.6	69.4	105.0
AC Y capacitor C1006	87.7	87.7	83.0	81.4	110.0
Main CPU K1B	85.1	85.1	80.6	83.0	105.0
Slave CPU K2B	84.3	84.3	79.8	82.2	105.0
APS-DC Power MOS Q1	98.3	98.3	94.4	85.0	150.0

4.3	TABLE: heating temperature rise measurements		P
	test voltage (V)	See below	—
	Ambient temperature t1 (°C)	See below	—
	Ambient temperature t2 (°C)	See below	—

temperature rise dT of part/at:	T (°C)				allowed T_{max} (°C)
Model: EAG12K3L (screen)					
Supplied Voltage:	Bat 48V Grid 203V	Bat 48V Grid 253V	Bat 56V Grid 203V	Bat 56V Grid 253V	--
Enclosure –Bottom	73.4	71.0	78.9	70.0	100.0
Enclosure –Front	72.9	70.5	78.3	69.5	100.0
Enclosure –Rear	74.2	71.8	79.7	70.8	100.0
Enclosure –Left	72.6	70.3	78.1	69.3	100.0
Enclosure –Right	73.4	71.1	78.9	70.0	100.0
Battery Terminal	60.1	58.2	81.6	57.3	105.0
Inner Fans	52.1	52.2	52	52.1	70.0
AC IGBT Q1-1	98.0	87.4	93.2	83.5	175.0
AC Connector	54.8	53.0	52.1	52.3	120.0
AC Main Inductor	95.1	84.7	90.4	80.9	130.0
Enclosure –Top	71.6	69.3	68.1	68.3	100.0
DC Main Inductor	80.8	78.2	76.8	77.1	130.0
T-Ambient	45.3	45.3	45.3	45.3	--
Bat Transformer TX1	90.4	87.7	77.0	85.1	130.0
Operation Panel	50.4	48.8	47.9	48.1	125.0
DC switch	59.0	57.1	56.1	56.3	85.0
DC Internal wire	59.1	57.2	56.2	56.4	105.0
BAT-IGBT QL-H1	93.5	90.7	79.6	87.9	175.0
DC-X capacitor C7	60.5	58.5	57.5	57.8	105.0
DC-Y capacitor C1006	60.0	58.1	57.1	57.3	110.0
Dc inductance L1	72.2	70.1	69.4	67.2	130.0
DC PCB	84.0	81.2	79.8	80.2	130.0

Bus Capacitor EC7	66.7	64.5	63.4	63.7	105.0
APS-BAT Power MOS Q4	92.0	89.3	78.4	86.5	150.0
AC HCT B5	82.3	79.6	78.3	78.6	105.0
Boost Inductor L2	51.2	49.7	49.2	47.7	130.0
PV Connector	47.8	49.4	47.7	49.4	85.0
APS-DC Transformer winding TX2	95.5	92.4	90.8	91.1	130.0
Optocoupler on main board KF1	58.9	57.0	57.4	56.2	100.0
CPU for display U1	60.5	58.5	55.1	57.8	105.0
BOOST IGBT PV1-Q1	57.0	55.3	76.8	53.1	175.0
Relay KF10	81.2	78.6	61.2	77.5	85.0
GFCI B6	64.4	62.3	82.4	61.5	85.0
Bus Capacitor EC9	82.9	80.4	79.0	77.2	105.0
AC Y capacitor C1006	86.2	83.4	77.8	82.3	110.0
Main CPU K1B	83.7	81.0	91.4	79.9	105.0
Slave CPU K2B	82.8	80.1	79.1	79.1	105.0
APS-DC Power MOS Q1	95.7	85.3	90.0	81.5	150.0

4.3	TABLE: heating temperature rise measurements		P
	test voltage (V)	See below	—
	Ambient temperature t1 (°C)	See below	—
	Ambient temperature t2 (°C)	See below	—

temperature rise dT of part/at:	T (°C)				allowed T_{max} (°C)
Model: EAG12K3L (screen)					
Supplied Voltage:	Bat 48V Grid 203V	Bat 48V Grid 253V	Bat 56V Grid 203V	Bat 56V Grid 253V	--
Enclosure –Bottom	83.2	80.2	80.4	79.6	100.0
Enclosure –Front	82.6	79.6	79.8	79.0	100.0
Enclosure –Rear	84.1	81.1	81.3	80.5	100.0
Enclosure –Left	82.4	79.4	79.6	78.8	100.0
Enclosure –Right	83.2	80.3	80.5	79.6	100.0
Battery Terminal	71.9	69.4	69.6	68.8	105.0
Inner Fans	66.8	68.1	67.2	67.5	70.0
AC IGBT Q1-1	107.7	101.3	103.4	100.3	175.0
AC Connector	73.0	70.4	70.6	69.9	120.0
AC Main Inductor	100.7	94.7	96.7	93.7	130.0
Enclosure –Top	81.2	78.3	78.5	77.7	100.0
DC Main Inductor	85.6	82.5	82.8	81.9	130.0
T-Ambient	60.8	60.8	60.8	60.8	--
Bat Transformer TX1	96.7	94.8	86.2	84.3	130.0
Operation Panel	66.1	63.8	64.0	63.3	125.0
DC switch	70.6	68.1	68.3	67.6	85.0
DC Internal wire	70.7	68.2	68.4	67.7	105.0
BAT-IGBT QL-H1	112.3	110.1	100	97.8	175.0
DC-X capacitor C7	72.4	69.8	70.1	69.3	105.0
DC-Y capacitor C1006	71.7	69.2	69.4	68.7	110.0
Dc inductance L1	76.5	74.2	72.7	72.7	130.0
DC PCB	93.7	90.3	90.6	89.7	130.0

Bus Capacitor EC7	70.6	68.1	68.3	67.6	105.0
APS-BAT Power MOS Q4	96.8	94.9	86.3	84.4	150.0
AC HCT B5	87.2	84.1	84.4	83.5	105.0
Boost Inductor L2	76.9	74.6	73.1	73.1	130.0
PV Connector	69.2	66.7	66.9	66.3	85.0
APS-DC Transformer winding TX2	101.2	97.6	97.9	96.9	130.0
Optocoupler on main board KF1	70.5	68.0	68.2	67.5	100.0
CPU for display U1	72.4	69.8	70.0	69.3	105.0
BOOST IGBT PV1-Q1	75.5	73.3	71.8	71.8	175.0
Relay KF10	81.7	78.8	79.0	78.2	85.0
GFCI B6	77.0	74.3	74.5	73.7	85.0
Bus Capacitor EC9	83.4	80.9	79.3	79.3	105.0
AC Y capacitor C1006	91.3	88.0	88.3	87.4	110.0
Main CPU K1B	88.6	85.5	85.7	84.9	105.0
Slave CPU K2B	87.7	84.6	84.9	84.0	105.0
APS-DC Power MOS Q1	101.3	95.3	97.3	94.3	150.0

4.4	TABLE: fault condition tests						P
	test voltage (V) .....:					See below	—
	Ambient temperature (°C) .....:					25°C (Unless otherwise stated)	
No.	component No.	fault	test voltage (V)	test time	fuse No.	fuse current (A)	result
Model: 12KS48P3							
	PV1+ to PV1-	Short circuit	230V 500V	10min	--	--	Unit shut down, no damage, no hazard, no fire
2	PV1+ to PV1-	Polarity revers	230V 500V	10min	--	--	The power supply voltage is 1V, and the inverter is not turned on, no damage, no hazard, no fire
3	PV input	Overload 120%	230V 500V	2h	--	--	Unit normal operation, no damage, no hazard, no fire.
4	AC output	Short circuit	230V 500V	10min	--	--	Unit shut down no damage, no hazard, no fire.
5	AC output	L&N reverse	230V 500V	10min	--	--	The machine doesn't start properly, no damage, no hazard, no fire.
6	Bus Capacitor EC2	Short circuit	230V 500V	10min	--	--	Unit shut down, the screen goes black, no damage, no hazard, no fire
7	KF9	Short circuit before start up	230V 500V	10min	--	--	Unit can’t start up, error message:” Relay fault”, no damage, no hazard, no fire.
8	KF9	open circuit before start up	230V 500V	10min	--	--	Unit can’t start up, error message:” Relay fault”, no damage, no hazard, no fire.
9	KF10	Short circuit before start up	230V 500V	10min	--	--	Unit can’t start up, error message:” Relay fault”, no damage, no hazard, no fire.
10	KF10	open circuit before start up	230V 500V	10min	--	--	Unit can’t start up, error message:” Relay fault”, no damage, no hazard, no fire.
11	KF14	open circuit	230V	10min	--	--	Unit can’t start up, error message:”

		before start up	500V				Relay fault",no damage, no hazard, no fire.
12	KF15	Short circuit before start up	230V 500V	10min	--	--	Unit can't start up, error message:" Relay fault",no damage, no hazard, no fire.
13	KF15	open circuit before start up	230V 500V	10min	--	--	Unit can't start up, error message:" Relay fault",no damage, no hazard, no fire.
14	transformer T1 Pin 10 to Pin 11	Short circuit	230V 500V	10min	--	--	Unit can't start up, error message:" Relay fault",no damage, no hazard, no fire.
15	transformer T1 Pin 14 to Pin 16	Short circuit	230V 500V	10min	--	--	The unit cannot be started until it is powered on, no damage, no hazard, no fire
16	GFCI monitoring TX1000 Pin2 to Pin3	Short circuit	230V 500V	10min	--	--	The unit cannot be started until it is powered on, no display, no damage, no hazard, no fire
17	IGBT Q1-1 Pin G to C	Short circuit	230V 500V	10min	--	--	Grid trip, error message:" Gournd I Failure ",no damage, no hazard, no fire.
18	IGBT Q1-1 Pin G to E	Short circuit	230V 500V	10min	--	--	Unit shut down, screen goes black, IGBT damaged, no hazard, no fire.
19	IGBT Q2-1 Pin G to C	Short circuit	230V 500V	10min	--	--	Unit shut down, no damage, no hazard, no fire
20	IGBT Q2-1 Pin G to E	Short circuit	230V 500V	10min	--	--	Unit shut down, screen goes black, IGBT damaged, no hazard, no fire.
21	IGBT Q3-1 Pin G to C	Short circuit	230V 500V	10min	--	--	Unit shut down, screen goes black, IGBT damaged, no hazard, no fire.
22	IGBT Q3-1 Pin G to E	Short circuit	230V 500V	10min	--	--	Unit shut down, no damage, no hazard, no fire
23	IGBT QH-H-1 Pin G to C	Short circuit	230V 500V	10min	--	--	Unit shut down, screen goes black, IGBT damaged, no hazard, no fire.

24	IGBT QH-H-1 Pin G to E	Short circuit	230V 500V	10min	--	--	Unit shut down, screen goes black, IGBT damaged, no hazard, no fire.
25	IGBT Q-BL-UP Pin G to C	Short circuit	230V 500V	10min	--	--	Unit shut down, no damage, no hazard, no fire
26	IGBT Q-BL-UP Pin G to E	Short circuit	230V 500V	10min	--	--	Unit shut down, screen goes black, IGBT damaged, no hazard, no fire.
27	IGBT QH-BUCK-1 Pin G to C	Short circuit	230V 500V	10min	--	--	Unit shut down, screen goes black, IGBT damaged, no hazard, no fire.
28	IGBT QH-BUCK-1 Pin G to E	Short circuit	230V 500V	10min	--	--	Unit shut down, no damage, no hazard, no fire
29	IGBT QH-BOOST-1 Pin G to C	Short circuit	230V 500V	10min	--	--	Unit shut down, screen goes black, IGBT damaged, no hazard, no fire.
30	IGBT QH-BOOST-1 Pin G to E	Short circuit	230V 500V	10min	--	--	Unit shut down, screen goes black, IGBT damaged, no hazard, no fire.
31	MOSFET PV1-Q1 Pin G to C	Short circuit	230V 500V	10min	--	--	Unit shut down, no damage, no hazard, no fire
32	MOSFET PV1-Q1 Pin G to E	Short circuit	230V 500V	10min	--	--	Unit shut down, screen goes black, IGBT damaged, no hazard, no fire.
33	MOSFET PV2-Q1 Pin G to C	Short circuit	230V 500V	10min	--	--	Unit shut down, screen goes black, IGBT damaged, no hazard, no fire.
34	MOSFET PV2-Q1 Pin G to E	Short circuit	230V 500V	10min	--	--	Unit shut down, no damage, no hazard, no fire
35	MOSFET QL-H1 Pin G to C	Short circuit	230V 500V	10min	--	--	Unit shut down, screen goes black, IGBT damaged, no hazard, no fire.

36	MOSFET QL-H1 Pin G to E	Short circuit	230V 500V	10min	--	--	Unit shut down, screen goes black, IGBT damaged, no hazard, no fire.
37	RCMU B6 pin1-pin2	Open circuit before start up	230V 500V	10min	--	--	Unit can't start up, no damage, no hazard, no fire
38	RCMU B6 pin1-pin2	Short circuit before start up	230V 500V	10min	--	--	Unit can't start up, error message:" isolation failure", no damage, no hazard, no fire.
39	DC Voltage detect R560	Open circuit	230V 500V	10min	--	--	Unit can't start up, error message:" isolation failure", no damage, no hazard, no fire
40	DC Voltage detect R560	Short circuit	230V 500V	10min	--	--	Unit stops the connection to the grid immediately, no damage, no hazard, no fire
41	DC current B1	Open circuit	230V 500V	10min	--	--	Unit stops the connection to the grid immediately, no damage, no hazard, no fire
42	DC current B1	Short circuit	230V 500V	10min	--	--	Unit shut down, no damage, no hazard, no fire
43	Bus voltage resistance monitoring, R240	Open circuit	230V 500V	10min	--	--	Unit shut down, no damage, no hazard, no fire
44	Bus voltage resistance monitoring, R240	Short circuit	230V 500V	10min	--	--	Unit shut down, error message:" DC BUS HIGH", damage, no hazard, no fire., no damage, no hazard, no fire.
45	Grid voltage resistance monitoring R183	Open circuit	230V 500V	10min	--	--	Unit shut down, error message:" DC BUS LOW", damage, no hazard, no fire., no damage, no hazard, no fire.
46	Grid voltage resistance monitoring R183	Short circuit	230V 500V	10min	--	--	Unit shut down, display "VAC Failure" no damage, no hazard, no fire
47	Frequency resistance	Open circuit	230V 500V	10min	--	--	Unit shut down, display "VAC Failure" no damage, no hazard, no fire

	monitoring R453						
48	Frequency resistance monitoring R453	Short circuit	230V 500V	10min	--	--	Unit shut down, display " VAC Failure" no damage, no hazard, no fire
49	Main CPU1, loss control	C34 Pin 1-Pin2 Open circuit	230V 500V	10min	--	--	Unit shut down, display "VAC Failure" no damage, no hazard, no fire
50	Slave CPU1, loss control	C34 Pin 1-Pin2 Open circuit	230V 500V	10min	--	--	Unit shut down, display " CPU Failure" no damage, no hazard, no fire

Legend

FID	Fault Indication	MT	Max. Temperature
SD	PCE Shut Down:	DG	Disconnection To Grid
RO	Recovered to Operate after removing the single fault setting	NCD	No Comp. or parts Damaged
NH	No Hazards occurred	PEST	Pass the Electric Strength Test.
BI	Basic insulation	SI	Supplementary insulation
DI	Double insulation	RI	Reinforced insulation
FI	Functional insulation	O.V.C	Overvoltage category
s-c	short-circuited	o-c	open-circuited
o-l	Over-load.	DST	Dielectric strength test

Note(s):

The electric strength test performed after fault condition test and see appended table 7.5.2 for detailed test conditions.

7.3.6.3.3	TABLE: protective equipotential bonding;	P

Measured between:	Test current (A)	Voltage drop (V)	Resistance (mΩ)	result
PE to enclosure top	85	1.2	--	P
PE to enclosure bottom	85	1.3	--	P
supplementary information: The alternative of 7.3.6.3.5 was considered.				

7.3.6.3.7	TABLE: touch current measurement	P

Measured between:	Measured (mA)	Limit (mA)	Comments/conditions
PE to metal enclosure	DC 0.48	AC 3.5 / DC 10	PE disconnected
Communication port to metal enclosure	DC 4.30	AC 3.5 / DC 10	PE disconnected
supplementary information			

7.3.7.4 & 7.3.7.5	TABLE: clearance and creepage distance measurements					P
Clearance cl and creepage distance dcr at/of:	System / Impulse voltage (V)	U r.m.s. (V)	Required cl (mm)	cl (mm)	Required dcr (mm)	dcr (mm)
PV1+ to PE (BI)	4464	1000 Vd.c.	3.6	7.8	5.0	7.8
Battery+ to PE(BI)	2500	60 Vd.c.	1.5	4.4	1.5	4.4
AC output L and N (FI)	2500	230 Va.c.	1.5	5.9	1.6	5.9
AC output L1 and L2 (FI)	2500	230 Va.c.	1.5	5.2	1.6	5.2
communication port across isolation transformer on PCB (RI)	6464	1000 Vd.c.	6.1	13	10	13
AC output L1 to metal enclosure (BI)	4000	230 Va.c.	3.0	7.8	3.2	7.8
AC output L2 to metal enclosure (BI)	4000	230 Va.c.	3.0	7.8	3.2	7.8
AC output L3 to metal enclosure (BI)	4000	230 Va.c.	3.0	7.8	3.2	7.8
OptoCouplerat communication port (BI)	4464	1000 Vd.c.	3.6	8.9	5.0	8.9

Note(s): FI=functional insulation, BI=basic insulation, SI=supplementary insulation, RI=reinforced insulation, DI=Double insulation

When determine the clearance:

For DC input circuits: Overvoltage Category II applied (impulse withstand voltage V)

For AC output circuits (connected to AC mains): Overvoltage Category III applied (impulse withstand voltage V, temporary overvoltage Vpeak considered.)

Interpolation is used.

For the inner layer of the PCB, pollution I was considered.

Requirement about creepage distances for the distance to the metal enclosure come from columns 7 and 8 of Table 14. Requirement about creepage distances for other parts come from column 3 of table 14.

PCB with min. CTI 175 used.

7.3.7	TABLE: distance through insulation measurement				P
distance through insulation di at/of:		U r.m.s. (V)	test voltage (Vdc)	required di (mm)	di (mm)
Insulation sheet between live parts and accessible metal enclosure (BI)		230	2120	0.2	>0.2
Optocoupler between live parts and accessible communication port (RI)		230	4240	0.4	>0.4
Note(s): 1) Certificated components.					

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
Input to metal chassis (BI)		2120Vdc	4464V	--	No breakdown
Output to metal chassis (BI)		2120Vdc	4464V	--	No breakdown
Input to Comm. part (DI)		4240 Vdc	6464V	--	No breakdown
Output to Comm. part (DI)		4240 Vdc	6464V	--	No breakdown
Legend					
BI	Basic insulation	SI	Supplementary insulation		
DI	Double insulation	RI	Reinforced insulation		
FI	Functional insulation	O.V.C	Overvoltage category		
Note(s):					

14	TABLE: list of critical components				P
Object	**Manufacturer**	**Type / model**	**Technical Data**	**Standard(s)**	**Remark**
Enclosure	Jinan Anfu Electric Technology Co., Ltd	AEP-10KS48P3-I.2-1A	650*468*250mm 5052 aluminum 2.0mm Min,thickness	IEC/EN 62109	Tested with appliance
Cover of top	Jinan Anfu Electric Technology Co., Ltd	AEP-10KS48P3-I.1-1A	475*486.5*20 mm 5052 aluminum 2.0mm Min,thickness	IEC/EN 62109	Tested with appliance
Cover of bottom	Jinan Anfu Electric Technology Co., Ltd	AEP-10KS48P3-I.1-2A	475*170*20mm 5052 aluminum 2.0mm Min,thickness	IEC/EN 62109	Tested with appliance
Heat sink	Weifang Keyang Technology Co., Ltd	AEP-10KS48P3-I.2-3	425mm*287mm*71.75mm 6063 aluminum	IEC/EN 62109	Tested with appliance
Cover for LED	Cover for LED Covestro Deutschland AG	PC 6165X	3mm, V-0, 125 ℃	UL 746C	UL E41613
PV connector	Wuxi Betteri Electronic Technology Co., LTD.	BC03B	1000 Vdc, 30A, -40~+85 ℃, Class II, IP67	IEC 62852(ed.1); EN 62852:2015	TUV B 18 03 85127 008
-Alt	JIANGXI JINKO PV MATERIAL Co., Ltd.	PV-JK02M1	1500 Vdc, 45A, -40~+85 ℃ Class II, IP68	IEC 62852:2014; EN 62852:2015	TUV R 50318165
-Alt	JIANGXI JINKO PV MATERIAL Co., Ltd.	PV-JK03M2/2B	1500 Vdc,45A, -40~+85℃ Class II, IP68	IEC 62852:2014; EN 62852:2015	TUV R 50318165
DC Switch	Zhejiang Benyi Electrical Co., Ltd	BYSS.1-50h	1200V/50A -40~+85℃,	EN60947-3:2009+A1+A2	TUV R 50425301

-Alt	Beijing People's Electric Plant Co., Ltd	GHX5-32P	1100V/30A,-40~+85℃,IP20	AS 60947.3:2018 ; AS/NZS IEC 60947.1:2015	TUV AZ 69025800
AC internal wire	3Q WIRE & CABLE CO LTD	10269	1000V,105ºC, 10AWG	UL758	UL E341104
DC cable	3Q WIRE & CABLE CO LTD	10269	1000V,105ºC, 12AWG	UL758	UL E341104
Ground wire	3Q WIRE & CABLE CO LTD	10269	1000V,105ºC, 10AWG	UL758	UL E341104
heat shrinkable	SHENZHEN WOER HEAT-SHRINKABLE MATERIAL CO LTD	RSFR-H	125℃, 600V, VW-1	UL 224	UL E203950
PCB	HUIZHOU KINGSUM ELECTRONICS CO LTD	KSE-M	V-0, 130℃,0.17mm	UL796	UL E345887
GFCI	ZiBo JinGuang Electronics Co.,Ltd	AEP-10KS48P-Ⅰ.2-6	Class B, 130 ℃,	IEC/EN 62109	Tested with appliance
Transformer	ZiBo JinGuang Electronics Co.,Ltd	AEP-10KS48P-Ⅰ.2-6	Class B, 130 ℃,	IEC/EN 62109	Tested with appliance
Bobbin of Transformer	SHINKONG SYNTHETIC FIBERS CORP	E202G30	V-0, 0.38mm	UL94	UL E107536
Adhesive tape	JINGJIANG HENGHE RUBBER INDUSTRY CO LTD	PVCH	130℃	UL510A	UL E219145
wire of Transformer	Shandong SAITE Electronics CO LTD	UEW	155℃	UL 1446	UL E194410
Three layers insulated wire of Transformer	Weihai Yanwei Electronic Technology Co.,LTD	TIW-F	155℃	UL 60950-1	UL E499041

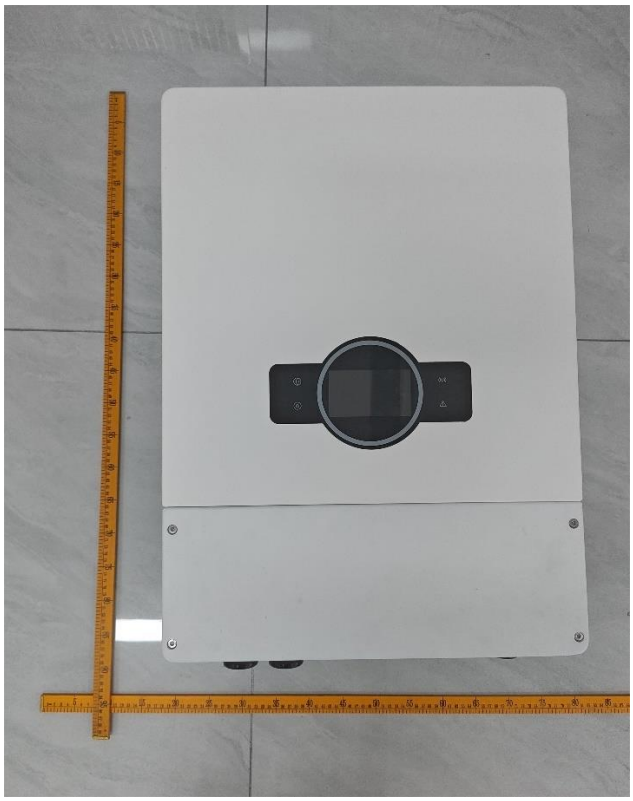
Core of Transformer	ZiBo JinGuang Electronics Co.,Ltd	EE16	PC44	IEC/EN 62109	Tested with appliance
Relay (KF5, KF6, KF7, KF8, KF9, KF10, KF11, KF12, KF13, KF14, KF15, KF16)	ZETTLER RELAY (XIAMEN) CO.,LTD	AZSR143	43 A, 277 Vac, -40~85 ℃ Contact gap: 1.8 mm	EN 61810-1:2015	TUV B 088793 0015 Rev. 00
Optocoupler (KF1, KF2, KF3, KF4, KF5, KF6, KF7, KF8, KF9, KF10, KF11, KF12, KF13, KF14, KF15, KF16, KF17, KF18, KF19, KF20, KF21, KF22, KF23, KF24, KF25, KF26, KF27, KF28, KF29, KF30, KF31, KF32, U18, U20)	FAIRCHILD SEMICONDUCTOR CORP	FOD8342T	3A,6-pin, 5000Vrms -40~100 ℃	UL 1577	UL E90700
APS-DC Power MOS	Fairchild Semiconductor Corporation	FQD16N25C	VCE=250V;Ic=16 A -55℃,～+150℃,	IEC/EN 62109	Tested with appliance
APS-BAT Power MOS	Fairchild Semiconductor Corporation	FQD16N25C	VCE=250V;Ic=16 A -55℃,～+150℃,	IEC/EN 62109	Tested with appliance
X capacitor (C7, C9, C14, C35, C36, C38)	HUA JUNG COMPONENTS CO LTD	MKP-225K030 5AB1272US	2.2μF/305V -40℃～110℃	UL 60384-14 CSA E60384-14:14 CSA E60384-1:14	UL E149075

-Alt	Ningguo YuHua Electrical Products Co., Ltd	YHR	305VAC/4.7μF±5%，-40℃～105℃	EN 61071:2017 IEC 61071:2017	TUV R 50559252
Y capacitor (C1006, C1007, C1008, C1009,)	SICHUAN ZHONGXING ELECTRONIC CO LTD	MKP61H-X2	350VAC/8.2μ±10%; -40℃～110℃	UL60384-14 CSA-E60384-14	UL E217215
AC HCT	Sinomags Technology Co., Ltd	STK-50PL	600V, 50A -40℃~105℃	IEC/EN 62109	Tested with appliance
Battery Terminal	JIANGXI HUNTEC ELECTRICAL TECHNOLOGY CO., LTD	RTC200-2P	660V，200A，-20℃～105℃	EN 60947-7-1:2009	I/ISETC.0017 20191112
AC Connector	SHENZHEN TENGDAXING TECHNOLOGY CO.,LTD	RJ10.16-09	300V，65A，-40℃～120℃	UL 486A	UL E528840
Fans	MINEBEAMITSUMI INC.	08025VE-12L-GMD-01	12V/0.17A -10℃～70℃	UL 507	UL E89936
Temperature sensor	Dongguan City Star Electronic Technology Co., Ltd	MF53-103F-3 950-230L	-10℃～+100℃ Viso 2200V	IEC/EN 62109	Tested with appliance
Bus Capacitor	QINGDAO SAMYOUNG ELECTRONICS CO.,LTD	TLS550VS470 (M)	550V/470μF±20%,-25℃～+105℃	IEC/EN 62109	Tested with appliance
-Alt	Hunan Aihua Group CO., LTD	ELM2JM471R 60KT	550V/470μF±20%,-25℃～+105℃	IEC/EN 62109	Tested with appliance

MOV1, MOV2, MOV3, MOV4	Xiamen SET Electronic CO., LTD.	SFV20D821K	820VDC, -40℃,～+85℃	EN 61051-1:2008 IEC 61051-1:2007 IEC 61051-2:1991 IEC 61051-2-2:1991	TUV J 50239739
IGBT for DC (QL-H1, QL-H2, QL-H3, QL-H4, QL-H5, QL-H6, QL-H7, QL-H8, QL-H9, QL-H10, QL-H11, QL-H12)	WUXI NCE Power Co.,Ltd	NCEP026N10T	VCE=100V;Ic=230A -55℃,～+175℃,	IEC/EN 62109	Tested with appliance
-Alt	Hunteck Semiconductor CO.,LTD	HGK027N10A	VCE=100V;Ic=248A -55℃,～+175℃,	IEC/EN 62109	Tested with appliance
-Alt	Infineon Technologies AG	IRFP4468PbF	VCE=100V;Ic=290A -55℃,～+175℃,	IEC/EN 62109	Tested with appliance
IGBT for AC (Q1-1,Q1-2,Q1-3,Q1-4,Q2-1,Q2-2,Q2-3,Q2-4,Q3-1,Q3-2,Q3-3,Q3-4,PV2-Q1,PV2-Q2,PV1-Q1,PV1-Q2)	Trinno Technology Co.,Ltd	TGAN40N120F2D	VCE=1200V; Ic=40A -55℃,～+150℃	IEC/EN 62109	Tested with appliance
-Alt	WUXI NCE Power Co.,Ltd	NCE40TD120VT	VCE=1200V; Ic=40A -40℃,～+175℃	IEC/EN 62109	Tested with appliance

-Alt	STARPOWER SEMICONDUCTOR Co.,Ltd	DG50Q12T2	VCE=1200V; Ic=50A -40℃,～+175℃	IEC/EN 62109	Tested with appliance
Inductance	HUIZHOU BAOHUI ELECTRONICS TECHNOLOGY CO.,LTD	T42*26*18C(R 12K	Class B, 130 ℃	IEC/EN 62109	Tested with appliance
WINDING TAPE of Inductance	JINGJIANG YAHUA PRESSURE SENSITIVE GLUE	CT	CT-,0.05mm, 130 ℃	UL510	UL E165111
EPOXY of Inductance	DONGGUAN EATTO ELECTRICAL MATERIAL Co.,Ltd	3300 A/B	90 ℃	UL746C	UL E218090
CPU for display	Geehy SEMICONDUCTOR Technology CO.,LTD	APM32F103RCT	Flash：256KB SRAM：64KB -40℃～105℃	IEC/EN 62109	Tested with appliance
CPU	Texas Instruments Co.,Ltd	TMS320F28335	150MHz, 256kb Flash, 34kb Ram, -40℃,～+105℃	IEC/EN 62109	Tested with appliance

---------- End of CDF ----------

Pictures of the unit
 Front enclosure view for all models (No screen)
 Front enclosure view for all models (screen)

Pictures of the unit

Back enclosure view for all models

Left enclosure view for all models (No screen)

Pictures of the unit

Left enclosure view for all models(screen)

Right enclosure view for all models (No screen)

Pictures of the unit

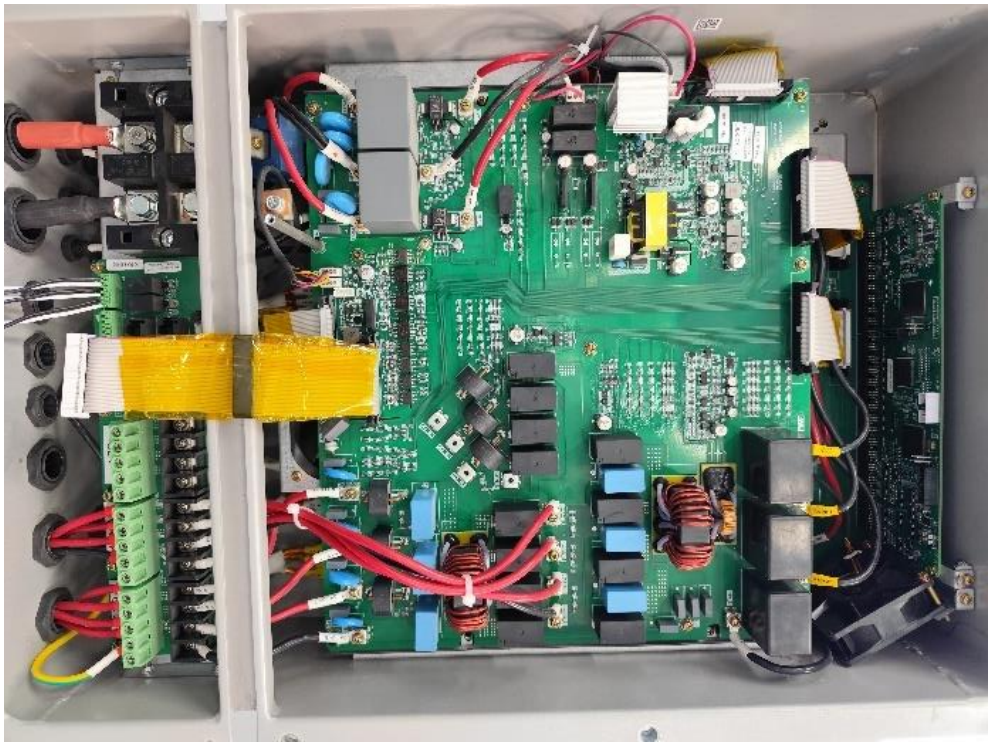
Right enclosure view for all models (screen)

Top enclosure view for all models (No screen)

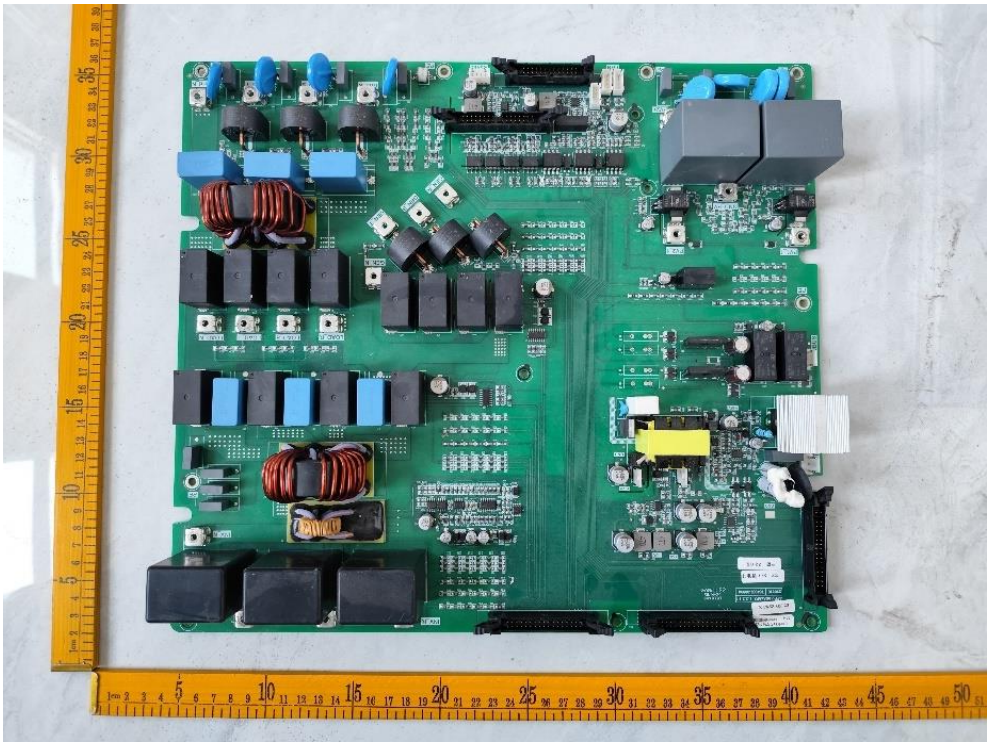
Pictures of the unit

Top enclosure view for all models(screen)

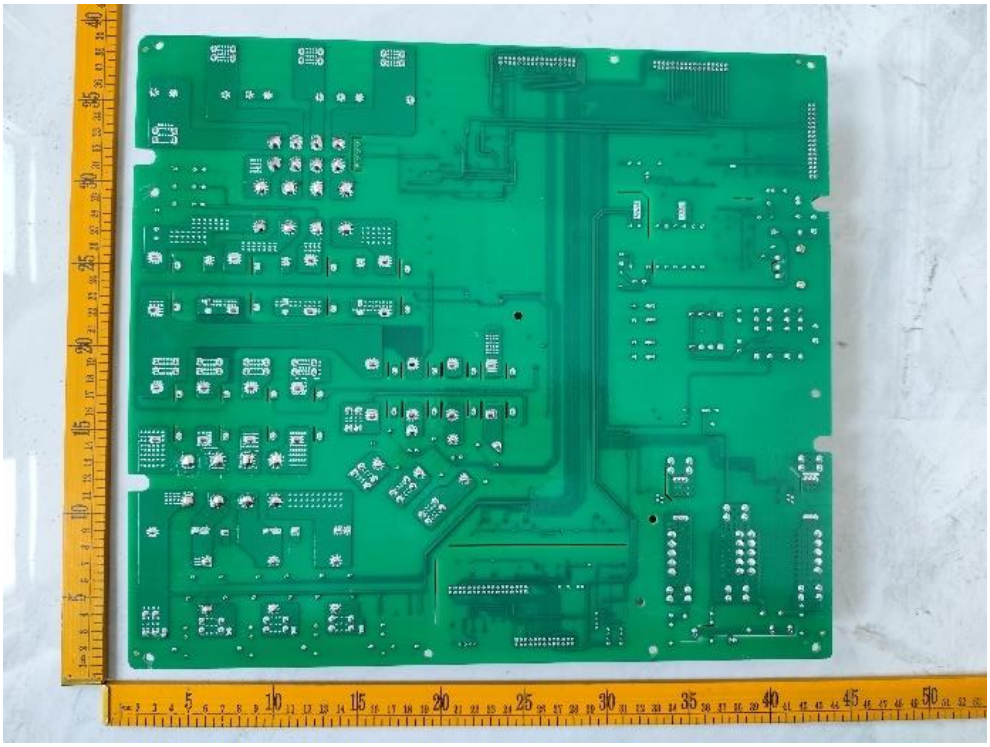
Bottom enclosure view for all models (No screen)

Pictures of the unit
 Bottom enclosure view for all models(screen)
 Internal view all models

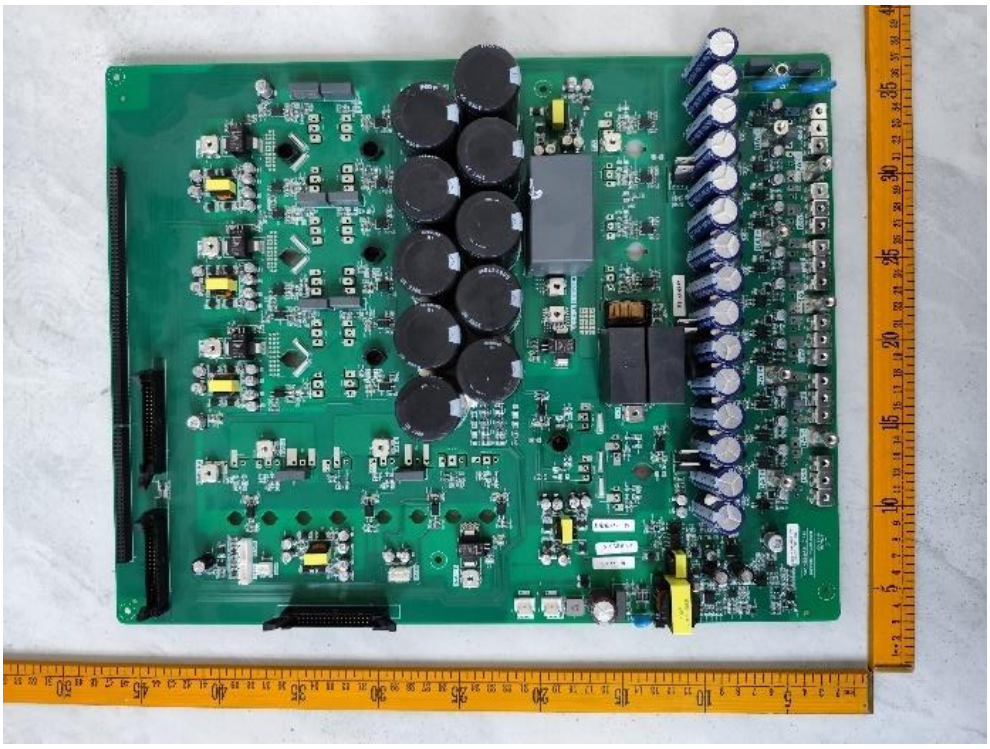
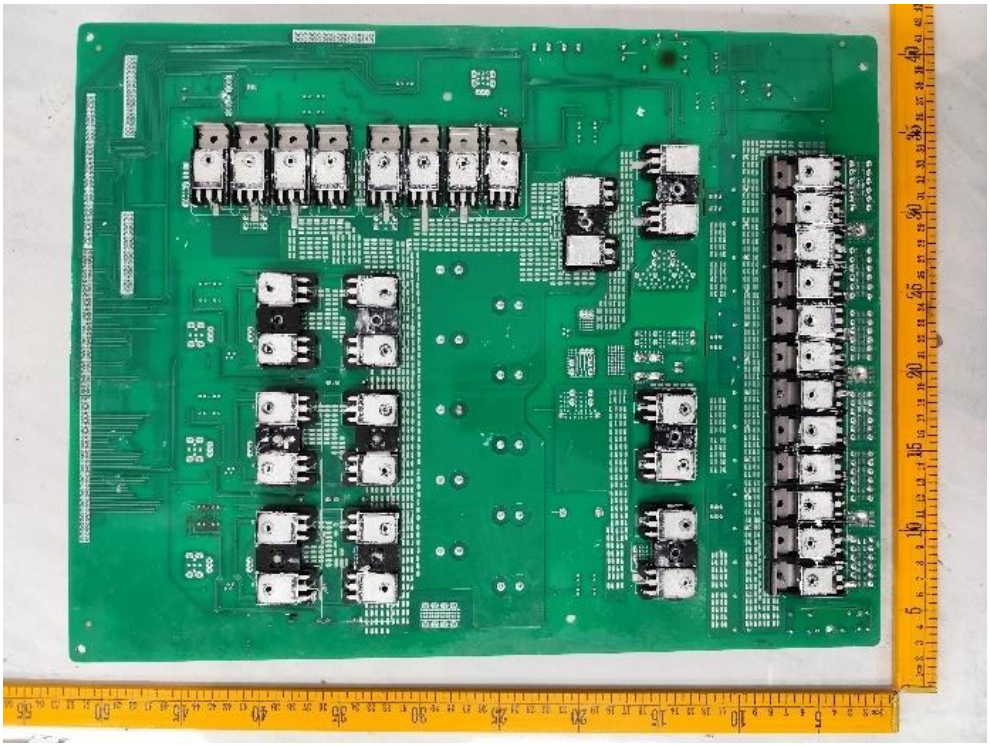
Pictures of the unit

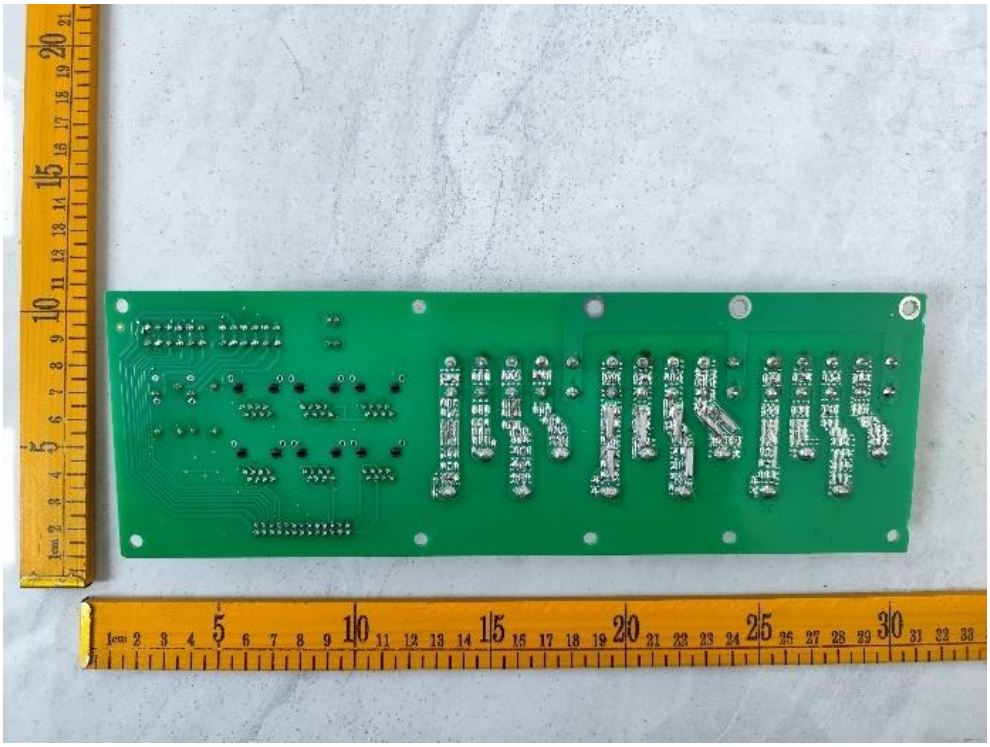


EMC board I



EMC board II

Pictures of the unit
 Main board I
 Main board II

Pictures of the unit
 Output board I
 Output board II

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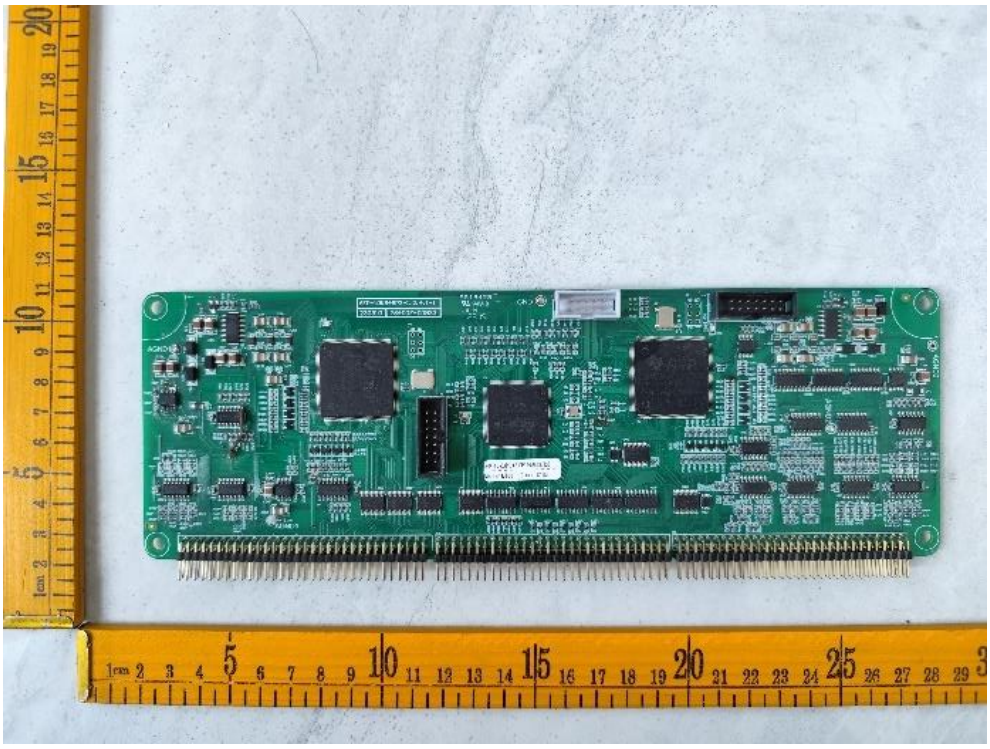
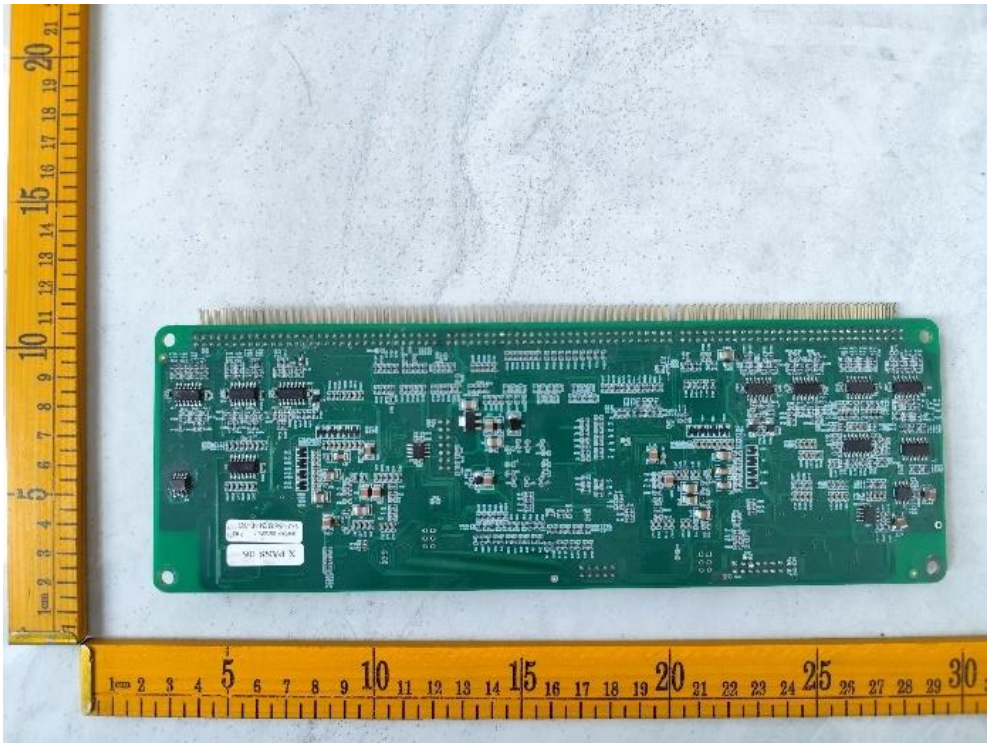
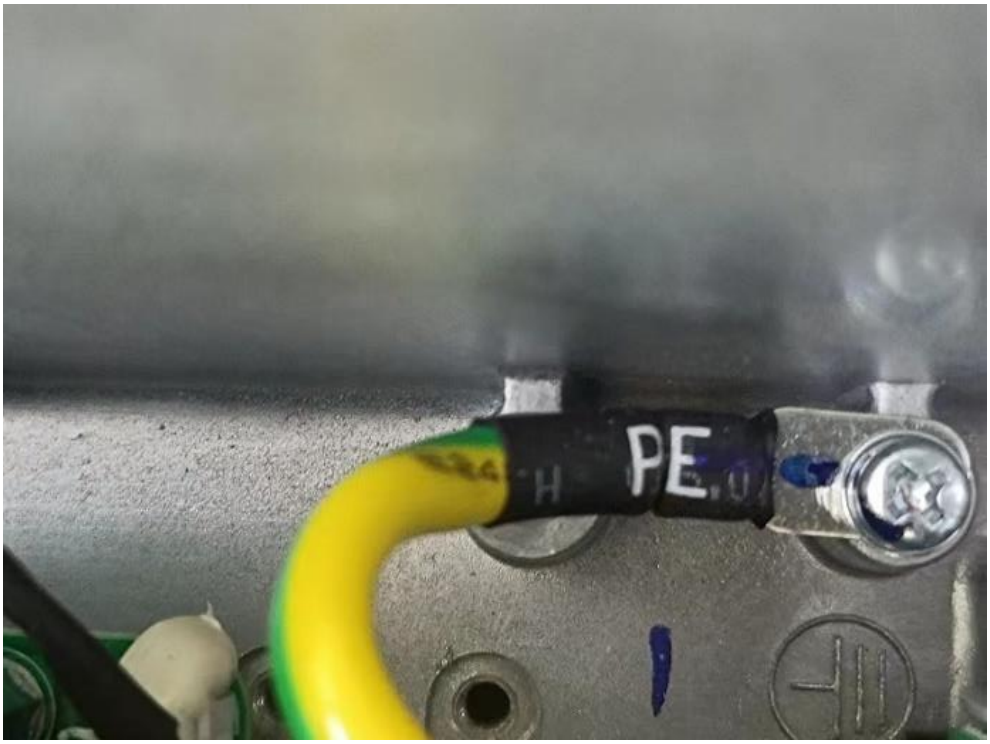

Control board I

Control board II

Pictures of the unit



PE view

Test Equipment list				
No	**Test Equipment**	**Equipment model**	**Equipment No.**	**Calibration due date**
1	Simulation of ac power supply	WPLA-330200KVA	BZ-DGD-L204	2024/11/01
2	Solar IV simulator	WKDY-30KVA	BZ-DGD-L068	2024/09/06
3	Programmable AC Load	ACLT-3820H	BZ-DGD-L063	2024/09/06
4	Power analyser	PA6000	BZ-DGD-L059	2024/09/19
5	Temperature recorder	LR8400-21	BZ-DGD-L038	2024/09/07
6	Hi-Pot & IR tester	19032	BZ-DGD-L066	2025/01/22
7	Digital Caliper	200mm	BZ-DGB-L044	2025/01/22
8	Pull and push	2P-1000	BZ-DGD-L080	2025/02/01
9	Steel ball	50mm	BZ-DGD-L081-5	2025/02/03
10	Thermostat	16m³	BZ-DGD-L015	2025/05/10
11	Surge generator	HCWG 70	BZ-DGE-L036	2025/01/08
12	Noise meter	TES-1357	BZ-DGD-L029	2025/02/20
13	Oscilloscope	MS04054B	BZ-DGD-L064	2025/01/22
14	Touch current test network	/	BZ-DGD-L091	2024/09/12
15	Ground Resistance Tester	LK2678	BZ-DGD-L095	2024/10/19
16	Stop watch	PS-1003A	BZ-DGD-L217	2025/01/25
17	Jointed test finger	/	BZ-DGD-L081-2	2025/02/03
18	Test pin	/	BZ-DGD-L081-8	2025/02/03

Statement

1. The laboratory guarantees the scientificity, accuracy and impartiality of the test, and is responsible for all the information in the report, except the information provided by the customer. The customer is responsible for the impact of the information provided on the validity of the results.

2. The report without China inspection body and laboratory Mandatory Approval (CMA) mark has no effect of proving to the society.

3. For the report with CNAS mark, the items marked with "☆" are not within the accredited scope.

4. This report is invalid if it is altered, without the signature of the testing and approval personnel, or without the “inspection and testing dedicated stamp” or test report stamp.

5. The test data and results are only valid for the tested samples provided by the customer.

6. This report shall not be partially reproduced without the written permission of the laboratory.

7. Any objection shall be raised to the laboratory within 30 days after receiving the report.

--- End of report---

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TESTING
CNAS L14701

TEST REPORT

Application No:	PVP05149/24E-01
Applicant:	Huizhou Foryou Optoelectronics Technology Co., LTD
Address:	Building 6, B Area, No.1 North Shangxia Road, Dongjiang High-Tech Industry Park, Huizhou City, Guangdong Province, China
Equipment Type:	Hybrid Inverter
Mian Testing Model:	EAG12K3L
Series Model:	EAG05K3L, EAG06K3L, EAG07K3L, EAG08K3L, EAG10K3L, EAG12K3L
Brand Name:	ADAYO
Ratings:	See copy of marking label and model list.
Test Standard:	**IEC 62109-2:2011; EN 62109-2:2011**
Sample Arrival Date:	Jun. 30, 2024
Test Date：	Jun. 30, 2024 to Aug. 12, 2024
Date of Issue:	Aug. 13, 2024

ISSUED BY:

Dongguan BALUN Testing Technology Co., Ltd.

Tested by: Leo Sun Leo Sun

Checked by: Tao Zheng Tao Zheng

Approved by: Simon Qi Simon Qi

Revision History

Version	Issue Date	Revisions Content
Rev. 01	Aug. 13, 2024	Initial Issue

List of Attachments:

None.

Summary of testing:

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

Tests performed (name of test and test clause):	**Testing location:**
☒4.4.4.15.1 Fault-tolerance of residual current monitoring ☒4.4.4.15.2 Fault-tolerance of automatic disconnecting means ☒4.4.4.17 Cooling system failure – Blanketing test ☒4.7.4 Stand-alone Inverter AC output voltage and frequency ☒4.7.5 Stand-alone inverter output voltage waveform ☒4.8.2 Array insulation resistance detection for inverters for ungrounded and functionally grounded arrays ☒4.8.3 Array residual current detection ☒4.8.3.5 Protection by residual current monitoring Remark: - Other testing conditions considered in this test report, see General product information of the report BL-DG2480010-201 for details.	The laboratory described on report BL-DG2480010-201.

☒ **The product fulfils the requirements of IEC 62109-1: 2010, EN 62109-1: 2010, IEC 62109-2: 2011, EN 62109-2: 201**

Copy of marking plate:

See report BL-DG2480010-201.

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 ..... :	/
IT testing, phase-phase voltage (V) ..... :	N/A
Class of equipment ..... :	☒ Class I ☐ Class II ☐ Class III ☐ Not classified
Mass of Max. equipment (kg) ..... :	38kg for all models
Pollution degree ..... :	PD 3 (internal reduced to PD2)
IP protection class ..... :	IP66
Possible test case verdicts:	
- test case does not apply to the test object .....:	N/A
- test object does meet the requirement .....:	P (Pass)
- test object was not evaluated for the requirement:	N/E
- test object does not meet the requirement .....:	F (Fail)

General remarks:	
"(See Enclosure #)" refers to additional information appended to the report. "(See appended table)" refers to a table appended to the report. **Throughout this report a ☐ comma / ☒ point is used as the decimal separator.**	
Manufacturer's Declaration per sub-clause 4.2.5 of IECEE 02:	
The application for obtaining a CB Test Certificate includes more than one factory location and a declaration from the Manufacturer stating that the sample(s) submitted for evaluation is (are) representative of the products from each factory has been provided..... :	☐ **Yes** ☒ **Not applicable**
When differences exist; they shall be identified in the General product information section.	
Name and address of Manufacturer (ies) ..... :	See report BL-DG2480010-201
Name and address of factory (ies) ..... :	See report BL-DG2480010-201
General product information: See report BL-DG2480010-201.	

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

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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	See report BL-DG2480010-201	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		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	2 approved relays used in	P

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Clause	Requirement – Test	Result – Remark	Verdict
	conductors from the mains	all ungrounded AC Conductors (line)	
	- 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.		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.	PV array parameters (working voltage, impulse withstand voltage, and temporary over-voltage) are considered	P
4.4.4.15.2.3	For non-isolated inverter, automatic checking of the isolation provided by a disconnect means after single fault.		P
	If the check fail: - any still-functional disconnection means shall be left in the open position		P
	- at least basic or simple separation shall be maintained between the PV input and the mains		P
	- the inverter shall not start operation		P
	- the inverter shall indicate a fault in accordance with 13.9		P
4.4.4.16	A stand-alone inverter with a transfer switch to transfer AC loads from the mains or other AC bypass source to the inverter output:		P
	- shall continue to operate normally		P
	- shall not present a risk of fire as the result of an out-of-phase transfer		P
	- shall not present a risk of shock as the result of an out-of-phase transfer		P
	- And having control preventing switching: components for malfunctioning ……..…:		P
4.4.4.17	Cooling system failure – Blanketing test No hazards according to the criteria of sub-clause 4.4.3 of Part 1 shall result from blanketing the inverter This test is not required for inverters restricted to use only in closed electrical operating areas.	See appended test table Cooling system failure – Blanketing test.	P
	Test stop condition: time duration value or stabilized	Temperatures stabilize and	P

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Clause	Requirement – Test	Result – Remark	Verdict
	temperature ……..:	no external surface of the inverter is at a temperature exceeding 100 °C.	
4.7	ELECTRICAL RATINGS TESTS		P
4.7.4	Stand-alone Inverter AC output voltage and frequency		P
4.7.4.1	General		P
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.	See appended test table 4.7.4 Steady state Inverter AC output voltage and frequency	P
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.	See appended test table 4.7.4 Steady state Inverter AC output voltage and frequency	P
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.	See appended test table 4.7.4 Steady state Inverter AC output voltage and frequency	P
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 %.	See appended test table 4.7.4 Steady state Inverter AC output voltage and frequency	P
4.7.5	Stand-alone inverter output voltage waveform		P
4.7.5.1	General	See appended table 4.7.5	P
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 %.		P
4.7.5.3	Non-sinusoidal output waveform requirements	Sinusoidal output	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		N/A

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Clause	Requirement – Test	Result – Remark	Verdict
	waveform shall not exceed 10 V/µs measured between the points at which the waveform has a voltage of 10 % and 90 % of the peak voltage for that half-cycle.		
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.	Sinusoidal output	N/A
4.7.5.5	Output voltage waveform requirements for inverters for dedicated loads. For an inverter that is intended only for use with a known dedicated load, the following requirements may be used as an alternative to the waveform requirements in 4.7.5.2 to 4.7.5.3.		N/A
	The combination of the inverter and dedicated load shall be evaluated to ensure that the output waveform does not cause any hazards in the load equipment and inverter, or cause the load equipment to fail to comply with the applicable product safety standards.		N/A
	The inverter shall be marked with symbols 9 and 15 of Table C.1 of Part 1.		N/A
	The installation instructions provided with the inverter shall include the information in 5.3.2.13.		N/A
4.8	ADDITIONAL TESTS FOR GRID-INTERACTIVE INVERTERS		P
4.8.1	General requirements regarding inverter isolation and array grounding		P
	- Type of Array grounding supported …….:	Ungrounded	P
	- Inverter isolation ……..:	Non-isolated	P
4.8.2	Array insulation resistance detection for inverters for ungrounded and functionally grounded arrays	Only for ungrounded arrays.	P
4.8.2.1	Array insulation resistance detection for inverters for ungrounded arrays	See below.	P
	Inverter shall have means to measure DC insulation resistance from PV input (array) to ground before starting operation		P
	Or Inverter shall be provided with instruction in		P

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Clause	Requirement – Test	Result – Remark	Verdict
	accordance with 5.3.2.11.		
	Measured DC insulation resistance: ……:		P
	Inverter measurement circuit shall be capable of detecting insulation resistance below the limit value R= Vmax/30mA under normal conditions		P
	Inverter measurement circuit shall be capable of detecting insulation resistance below the limit value R= Vmax/30mA with ground fault in the PV array		P
	Isolated inverters shall indicate a fault if the insulation resistance is less than the limit value	Non-isolated inverter	N/A
	Isolated inverter fault indication maintained until insulation resistance has recovered to a value higher than the limit value	Non-isolated inverter	N/A
	Non-isolated inverters, or inverters with isolation not complying with the leakage current limits in the minimum inverter isolation requirements in Table 30:		P
	- shall indicate a fault in accordance with 13.9		P
	- shall not connect to the mains		P
4.8.2.2	Array insulation resistance detection for inverters for functionally grounded arrays	Inverters connected to ungrounded 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

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Clause	Requirement – Test	Result – Remark	Verdict
	c) The inverter shall have means to measure the DC insulation resistance from the PV input to ground before starting operation, in accordance with 4.8.2.1.		N/A
4.8.3	Array residual current detection		P
4.8.3.1	General		P
4.8.3.2	30 mA touch current type test for isolated inverters	Non-isolated inverter.	N/A
4.8.3.3	Fire hazard residual current type test for isolated inverters	Non-isolated inverter.	N/A
4.8.3.4	Protection by application of RCD's		P
	- The requirement for additional protection in 4.8.3.1 can be met by provision of an RCD with a residual current setting of 30 mA, located between the inverter and the mains.		P
	- The selection of the RCD type to ensure compatibility with the inverter must be made according to rules for RCD selection in Part 1.		P
	- The RCD provided integral to the inverter, or		P
	- The 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	RCMU used for monitoring the residual current.	P
4.8.3.5.1	General		P
	Where required by Table 30, the inverter shall provide residual current monitoring that functions whenever the inverter is connected to the mains with the automatic disconnection means closed.		P
	The residual current monitoring means shall measure the total (both a.c. and d.c. components) RMS current.		P
	As indicated in Table 30 for different inverter types, array types, and inverter isolation levels, detection may be required for excessive continuous residual current, excessive sudden changes in residual current, or both, according to the following limits:		P
	a) Continuous residual current: The inverter shall disconnect within 0.3 s and indicate a fault in accordance with 13.9 if the continuous residual current exceeds:		P
	- maximum 300 mA for inverters with continuous		P

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Clause	Requirement – Test	Result – Remark	Verdict
	ouput power rating ≤30kV;		
	- 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		P
	The inverter indicates a fault in accordance with 13.9, if a sudden increase in the RMS residual current is detected exceeding the value in the table.		P
	The inverter may attempt to re-connect if the array insulation resistance meets the limit in 4.8.2.		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.	See appended test table 4.8.3.5.2 Test for detection of excessive continuous residual current	P
4.8.3.5.3	Test for detection of sudden changes in residual current repeated 5 times and each of the 5 results shall not exceed the time limit indicated in for each row (30mA, 60mA and150mA) of Table 31.		P
4.8.3.6	Systems located in closed electrical operating areas	Not specified to be located in closed electrical operating area.	N/A
	The protection against shock hazard is not required if the installation information provided with the inverter indicates the restriction for use in a closed electrical operating area, and		N/A
	Installation information indicates what forms of shock hazard protection are and are not provided integral to the inverter, in accordance with 5.3.2.7.		N/A
	The inverter shall be marked as in 5.2.2.6.		N/A
5	Marking and documentation		P
5.1	Marking		P
5.1.4	Equipment ratings		P
	PV input ratings:		P
	- Vmax PV (absolute maximum) (d.c. V)	1000	P
	- Isc PV (absolute maximum) (d.c. A)	EAG05K3L:22.5	P

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Clause	Requirement – Test	Result – Remark	Verdict
		EAG06K3L:22.5 EAG07K3L:22.5 EAG08K3L:22.5/22.5 EAG10K3L:45/22.5 EAG12K3L:45/22.5	
	a.c. output ratings:		P
	- Voltage (nominal or range) (a.c. V)	230/400 3W+N+PE	P
	- Current (maximum continuous) (a.c. A)	EAG05K3L:8.3 EAG06K3L:10.0 EAG07K3L:11.6 EAG08K3L:13.3 EAG10K3L:16.7 EAG12K3L:20.0	P
	- Frequency (nominal or range) (Hz)	50/60	P
	- Power (maximum continuous) (W or VA)	EAG05K3L:5000W EAG06K3L:6000W EAG07K3L:7000W EAG08K3L:8000W EAG10K3L:10000W EAG12K3L:12000W	P
	- Power factor range	0.8 leading to 0.8 lagging	P
	a.c input ratings:		P
	- Voltage (nominal or range) (a.c. V)	230/400 3W+N+PE	P
	- Current (maximum continuous) (a.c. A)	EAG05K3L:16.6 EAG06K3L:20.0 EAG07K3L:23.2 EAG08K3L:26.6 EAG10K3L:33.4 EAG12K3L:40.0	P
	- Frequency (nominal or range) (Hz)	50/60	P
	d.c. output ratings:		P
	- Voltage (nominal or range) (d.c. V)	48V	P
	- Current (maximum continuous) (d.c. A)	EAG05K3L:120 EAG06K3L:125 EAG07K3L:150 EAG08K3L:190 EAG10K3L:210 EAG12K3L:250	P

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Clause	Requirement – Test	Result – Remark	Verdict
	Protective class (I or II or III)	Class I	P
	Ingress protection (IP) rating per part 1	IP66	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 :	All related information provided in the user's manual.	P
	- Vmax PV (absolute maximum) (d.c. V)	1000	P
	- PV input operating voltage range (d.c. V)	200-800	P
	- Maximum operating PV input current (d.c. A)	EAG05K3L:18 EAG06K3L:18 EAG07K3L:18 EAG08K3L:18/18 EAG10K3L:36/18 EAG12K3L:36/18	P
	- Isc PV (absolute maximum) (d.c. A)	EAG05K3L:22.5 EAG06K3L:22.5 EAG07K3L:22.5 EAG08K3L:22.5/22.5 EAG10K3L:45/22.5 EAG12K3L:45/22.5	P

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Clause	Requirement – Test	Result – Remark	Verdict
	- Max. inverter backfeed current to the array (a.c. or d.c. A)	0	P
	a.c. output quantities:		P
	- Voltage (nominal or range) (a.c. V)	230/400 3W+N+PE	P
	- Current (maximum continuous) (a.c. A)	EAG05K3L:8.3 EAG06K3L:10.0 EAG07K3L:11.6 EAG08K3L:13.3 EAG10K3L:16.7 EAG12K3L:20.0	P
	- Current (inrush) (a.c. A, peak and duration)	<10A/5ms	P
	- Frequency (nominal or range) (Hz)	50/60	P
	- Power (maximum continuous) (W or VA)	EAG05K3L:5000W EAG06K3L:6000W EAG07K3L:7000W EAG08K3L:8000W EAG10K3L:10000W EAG12K3L:12000W	P
	- Power factor range	0.8 leading to 0.8 lagging	P
	- Maximum output fault current (a.c. A, peak and duration or RMS)	<40A	P
	- Maximum output overcurrent protection (a.c. A)	40A	P
	a.c. input quantities:		P
	- Voltage (nominal or range) (a.c. V)	230/400 3W+N+PE	P
	- Current (maximum continuous) (a.c. A)	EAG05K3L:16.6 EAG06K3L:20.0 EAG07K3L:23.2 EAG08K3L:26.6 EAG10K3L:33.4 EAG12K3L:40.0	P
	- Current (inrush) (a.c. A, peak and duration)	<10A/5ms	P
	- Frequency (nominal or range) (Hz)	50/60	P
	d.c input (other than PV) quantities:		P
	- Voltage (nominal or range) (d.c. V)	48(44-60)	P
	- Nominal battery voltage (d.c. V)	48	P
	- Current (maximum continuous) (d.c. A)	EAG05K3L:120 EAG06K3L:125	P

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Clause	Requirement – Test	Result – Remark	Verdict
		EAG07K3L:150 EAG08K3L:190 EAG10K3L:210 EAG12K3L:250	
	d.c. output quantities:		P
	- Voltage (nominal or range) (d.c. V)	48(44-60)	P
	- Nominal battery voltage (d.c. V)	48	P
	- Current (maximum continuous) (d.c. A)	EAG05K3L:120 EAG06K3L:125 EAG07K3L:150 EAG08K3L:190 EAG10K3L:210 EAG12K3L:250	P
	Protective class (I or II or III)	Class I	P
	Ingress protection (IP) rating per part 1	IP66	P
5.3.2.2	Grid-interactive inverter setpoints		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

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Clause	Requirement – Test	Result – Remark	Verdict
	The instructions shall also indicate what the resulting installation requirements are regarding:		N/A
	- earthing or not earthing the array		N/A
	- providing external residual current detection devices		N/A
	- requiring an external isolation transformer,		N/A
5.3.2.4	Transformers required but not provided	See above.	N/A
	An inverter that requires an external isolation transformer not provided with the unit, shall be provided with instructions that specify, and for the external isolation transformer with which it is intended to be used:		N/A
	- the configuration type		N/A
	- electrical ratings		N/A
	- environmental ratings		N/A
5.3.2.5	PV modules for non-isolated inverters		P
	Non-isolated inverters shall be provided with installation instructions that require PV modules that have an IEC 61730 Class A rating		P
	If the maximum AC mains operating voltage is higher than the PV array maximum system voltage then the instructions shall require PV modules that have a maximum system voltage rating based upon the AC mains voltage.		P
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

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Clause	Requirement – Test	Result – Remark	Verdict
	- THD		N/A
	- slope		N/A
	- peak voltage		N/A
5.3.2.7	Systems located in closed electrical operating areas	Not specified to be located in closed electrical operating area.	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	Non-isolated inverter	P
	Where required by 7.3.10, the documentation for an inverter shall include the following:		P
	- 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;		P
	- 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	Not used.	N/A
	Where the requirement for additional protection in 4.8.3.1 is met by requiring an RCD that is not provided integral to the inverter, as allowed by 4.8.3.4, the installation instructions shall state the need for the RCD,.		N/A
	and shall specify its rating, type, and required circuit location		N/A
5.3.2.10	Remote indication of faults		P
	The installation instructions shall include an		P

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Clause	Requirement – Test	Result – Remark	Verdict
	explanation of how to properly make connections to (where applicable), and use, the electrical or electronic fault indication required by 13.9.		
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		P
	- an instruction to consult local regulations to determine if any additional functions are required or not;		P
	- 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
	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 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

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Clause	Requirement – Test	Result – Remark	Verdict
	Where the approach of 4.7.5.5 is used, the installation instructions for the inverter shall include a warning that the inverter is only to be used with the dedicated load for which it was evaluated, and		N/A
	shall specify the dedicated load.		N/A
5.3.2.14	Identification of firmware version(s)		P
	An inverter utilizing firmware for any protective functions shall provide means to identify the firmware version.		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		P
	as part of the installation		P
	If not provided integral to the inverter, the required means shall be described in the installation instructions as per 5.3.2.8.		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
	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

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Clause	Requirement – Test	Result – Remark	Verdict
	Inverters intended to have a circuit conductor bonded to earth shall not impose any normal current on the bond except for leakage current.		P
	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.		P
	The documentation for the inverter shall indicate that the output is floating as per 5.3.2.8.		P
7.3.11	Functionally grounded arrays		N/A
	All PV conductors in a functionally grounded array shall be treated as being live parts with respect to protection against electric shock.		N/A
9	PROTECTION AGAINST FIRE HAZARDS		P
9.3	Short-circuit and overcurrent protection		P
9.3.4	Inverter backfeed current onto the array		P
	The backfeed current testing and documentation requirements in Part 1 apply, including but not limited to the following.		P
	Inverter backfeed current onto the PV array maximum value……		P
	This inverter backfeed current value shall be provided in the installation instructions regardless of the value of the current, in accordance with Table 33.		P
13	PHYSICAL REQUIREMENTS		P
13.9	Fault indication		P
	Where this Part 2 requires the inverter to indicate a fault, both of the following shall be provided:		P
	a) a visible or audible indication, integral to the inverter, and detectable from outside the inverter, and	LED or LCD panel is available for fault indication.	P
	b) an electrical or electronic indication that can be remotely accessed and used.**Error! Hyperlink reference not valid.**		P
	The installation instructions shall include information regarding how to properly make connections (where applicable) and use the electrical or electronic		P

IEC 62109-2			
Clause	Requirement – Test	Result – Remark	Verdict
	means in b) above, in accordance with 5.3.2.10.		

4.4.4	**TABLE: Single fault condition to be applied**					**P**
	Ambient temperature (°C)					**45**
	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**
RCMU B6 pin1-pin2	Open circuit before start up	230V 500V	5min	--	--	Unit can't start up, no damage, no hazard, no fire
RCMU B6 pin1-pin2	Short circuit before start up	230V 500V	5min	--	--	Unit can't start up, error message:" isolation failure", no damage, no hazard, no fire.
Check that the residual current monitoring operates properly						RCMU operates properly
Supplementary information:						

4.4.4	**TABLE: Single fault condition to be applied**		P
	Ambient temperature (°C)		45
	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
KF9	Short circuit before start up	230V 500V	10min	--	--	Unit can't start up, error message:" Relay fault", no damage, no hazard, no fire.
KF9	open circuit before start up	230V 500V	10min	--	--	Unit can't start up, error message:" Relay fault", no damage, no hazard, no fire.
KF10	Short circuit before start up	230V 500V	10min	--	--	Unit can't start up, error message:" Relay fault", no damage, no hazard, no fire.
KF10	open circuit before start up	230V 500V	10min	--	--	Unit can't start up, error message:" Relay fault", no damage, no hazard, no fire.
KF14	open circuit before start up	230V 500V	10min	--	--	Unit can't start up, error message:" Relay fault",no damage, no hazard, no fire.
KF15	Short circuit before start up	230V 500V	10min	--	--	Unit can't start up, error message:" Relay fault",no damage, no hazard, no fire.
KF15	open circuit before start up	230V 500V	10min	--	--	Unit can't start up, error message:" Relay fault",no damage, no hazard, no fire.
Check that the relays fulfil the basic insulation or simple separation based on the PV circuit working voltage.						Relays fulfil the basic insulation or simple separation.
Each active phase can be switched. (L and N)						All pole disconnection.

Legend			
FID	Fault Indication	MT	Max. Temperature
SD	PCE Shut Down:	DG	Disconnection To Grid
RO	Recovered to Operate after removing the single fault setting	NCD	No Comp. or parts Damaged

NH	No Hazards occurred	PEST	Pass the Electric Strength Test.
s-c	short-circuited	o-c	open-circuited
o-l	over-load.		
Supplementary information: The electric strength test performed after fault condition test and see appended table 7.5.2 of Part1 for detailed test conditions.			

4.4.4.17	**Cooling system fainlure – Blanketing test**		P
	Model	EAG12K3L (No screen)	
	Test voltage (Vdc) .....:	650V	—
	Test current (Adc)	9.6/9.6	—
	Test voltage (Vac).....:	230	—
	Test current (Aac)	17.5/17.5/17.5	—
	t_{amb1} (°C) .....:	60°C	—
	t_{amb2} (°C) .....:	See below.	—
maximum temperature T of part/at:		T (°C)	T_{max} (°C)
Enclosure Front (outside)		74.3	90*
Enclosure rear (outside)		73.4	90*
Enclosure left (outside)		74.4	90*
Enclosure right (outside)		73.4	90*
Enclosure bottom (outside)		73.7	90*
Enclosure top (outside)		72.4	90*
Supplementary information: *The inverter shall be operated at full power. The duration of the test shall be a minimum of 7 h except that the test may be stopped when temperatures stabilize if no external surface of the inverter is at a temperature exceeding 90 °C.			

4.4.4.17	**Cooling system fainlure – Blanketing test**		P
	Model	EAG12K3L(screen)	
	Test voltage (Vdc) .....:	650V	—
	Test current (Adc)	9.6/9.6	—
	Test voltage (Vac).....:	230	—
	Test current (Aac)	17.5/17.5/17.5	—
	t_{amb1} (°C) .....:	60°C	—
	t_{amb2} (°C) .....:	See below.	—
maximum temperature T of part/at:		T (°C)	T_{max} (°C)
Enclosure Front (outside)		74.6	90*
Enclosure rear (outside)		73.8	90*
Enclosure left (outside)		75.0	90*
Enclosure right (outside)		73.6	90*
Enclosure bottom (outside)		74.2	90*
Enclosure top (outside)		72.5	90*

Supplementary information:

*The inverter shall be operated at full power. The duration of the test shall be a minimum of 7 h except that the test may be stopped when temperatures stabilize if no external surface of the inverter is at a temperature exceeding 90 °C.

4.7.4	TABLE: Steady state Inverter AC output voltage and frequency		P
	Nominal DC input (V) Nominal output AC voltage (V)		--
AC output U (V)	Frequency (Hz)	Condition/status	Comments
230.1	50.0	Without load	--
230.1	50.0	Without load	--
230.1	50.0	Without load	--
230.0	50.0	Resistive load application	--
230.1	50.0	Resistive load application	--
230.1	50.0	Resistive load application	--
230.1	50.0	Resistive load removal	--
230.1	50.0	Resistive load removal	--
230.1	50.0	Resistive load removal	--
Supplementary information: Non-isolated inverter.			

4.7.5	TABLE: Output Harmonic Distortion				P
Harmonics	Measurements [%]			Limits [%]	Verdict
	5%	50%	100%		
THD (to the 40th)	0.91	0.88	0.95	10	P
2nd	0.180	0.171	0.209	6	P
3rd	0.801	0.786	0.826	6	P
4th	0.031	0.025	0.074	6	P
5th	0.196	0.159	0.277	6	P
6th	0.126	0.123	0.117	6	P
7th	0.033	0.022	0.113	6	P
8th	0.038	0.048	0.037	6	P
9th	0.045	0.052	0.039	6	P
10th	0.043	0.036	0.041	6	P
11th	0.031	0.038	0.065	6	P

12th	0.034	0.019	0.055	6	P
13th	0.047	0.068	0.027	6	P
14th	0.029	0.029	0.012	6	P
15th	0.084	0.060	0.090	6	P
16th	0.027	0.025	0.009	6	P
17th	0.041	0.066	0.037	6	P
18th	0.026	0.043	0.045	6	P
19th	0.100	0.098	0.061	6	P
20th	0.050	0.058	0.017	6	P
21th	0.050	0.026	0.033	6	P
22th	0.030	0.050	0.033	6	P
23th	0.160	0.148	0.125	6	P
24th	0.065	0.055	0.017	6	P
25th	0.098	0.072	0.085	6	P
26th	0.061	0.037	0.019	6	P
27th	0.075	0.064	0.072	6	P
28th	0.022	0.015	0.039	6	P
29th	0.037	0.025	0.033	6	P
30th	0.017	0.013	0.022	6	P
31th	0.025	0.018	0.063	6	P
32th	0.012	0.021	0.046	6	P
33th	0.023	0.024	0.029	6	P
34th	0.017	0.014	0.025	6	P
35th	0.018	0.016	0.064	6	P
36th	0.007	0.007	0.012	6	P
37th	0.011	0.009	0.019	6	P
38th	0.004	0.005	0.009	6	P
39th	0.008	0.011	0.010	6	P
40th	0.006	0.005	0.008	6	P
Note(s): Non-isolated inverter. All values take the maximum value of the three phases					

4.8.2	**TABLE: Array insulation resistance detection for inverters for ungrounded and functionally grounded arrays**	P
4.8.2.1	**Array insulation resistance detection for inverters for ungrounded arrays**	P

DC Voltage below minimum operating voltage(V)	DC Voltage for inverter begin operation(V)	Resistance between ground and PV input terminal (kΩ)	Required Insulation resistance $R = (V_{MAX\ PV} / 30mA)$ (kΩ)	Result
DC+				
180	200	30.0	33.3	I.F.: Isolation Failure
180	600	33.5	33.3	N.O.: Normal Operation
180	800	35.0	33.3	N.O.: Normal Operation
DC-				
180	200	30.0	33.3	I.F.: Isolation Failure
180	600	33.5	33.3	N.O.: Normal Operation
180	800	35.0	33.3	N.O.: Normal Operation

Note:

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

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

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

Supplementary information:

1) Array Insulation Resistance Threshold Value R =33.3 [kΩ] (should be larger than R=VMAX PV / 30mA)Ω.

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

Condition	Current (mA)	Limit (30mA)
--	--	--
--	--	--

Supplementary information: Non-isolated inverter.

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)
--	--	--
--	--	--
Supplementary information: Non-isolated inverter.		

4.8.3.5	TABLE: Protection by residual current monitoring	P
Test conditions:	**Output power (kVA): 12** **Input voltage (V_{DC}): 650** **Frequency (Hz):50** **Output AC Voltage (V_{AC}): 230**	

4.8.3.5.2	Test for detection of excessive continuous residual current	P

Fault Current (mA)		Disconnection time (ms)	
Measured Fault Current	Limit 300mA for output power ≤ 30 kVA 10mA per kVA for output power > 30 kVA	Measured Disconnection time	Limit
+ PV to N:			
287	300	26.2	300
295	300	29.8	300
292	300	35.0	300
289	300	25.2	300
295	300	24.8	300
- PV to N:			
296	300	27.8	300
289	300	23.0	300
294	300	29.8	300
289	300	32.6	300
295	300	38.6	300

Note:

– maximum 300mA for inverters with continuous output power rating ≤30 kVA;

– maximum 10mA per kVA of rated continuous output power for inverters with continuous output power rating > 30 kVA.

This test shall be repeated 5 times, and for all 5 tests the time to disconnect shall not exceed 0,3s.

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

Supplementary information: 100% output power and max input voltage

4.8.3.5.3	TABLE: Test for detection of sudden changes in residual current	P
+PV to N		
Limit (mA)	U_N Disconnection time (ms)	Limit (ms)
30	30.6	300
30	32.4	300
30	20.2	300
30	33.8	300
30	19.4	300
60	19.2	150
60	20.2	150
60	27.8	150
60	20.2	150
60	31.2	150
150	28.8	40
150	25.0	40
150	37.8	40
150	25.0	40
150	31.2	40
-PV to N		
Limit (mA)	U_N Disconnection time (ms)	Limit (ms)
30	30.4	300
30	24.4	300
30	37.4	300
30	31.2	300
30	32.2	300
60	32.8	150
60	23.6	150
60	24.8	150
60	19.8	150
60	33.4	150
150	31.6	40
150	25.2	40
150	20.6	40
150	29.8	40
150	30.0	40

Note: The capacitive current is raised until disconnection. Test condition: I_c + 30/60/150mA <= I_{cmax}. R_1 is set that 30/60/150mA Flow and switch S is closed.
Supplementary information: 100% output power and max input voltage

Test Equipment list				
No	**Test Equipment**	**Equipment model**	**Equipment No.**	**Calibration due date**
1	Simulation of ac power supply	WPLA-330200KVA	BZ-DGD-L204	2024/11/01
2	Solar IV simulator	WKDY-30KVA	BZ-DGD-L068	2024/09/06
3	Programmable AC Load	ACLT-3820H	BZ-DGD-L063	2024/09/06
4	Power analyser	PA6000	BZ-DGD-L059	2024/09/19
5	Temperature recorder	LR8400-21	BZ-DGD-L038	2024/09/07
6	Hi-Pot & IR tester	19032	BZ-DGD-L066	2025/01/22
7	Digital Caliper	200mm	BZ-DGB-L044	2025/01/22
8	Pull and push	2P-1000	BZ-DGD-L080	2025/02/01
9	Steel ball	50mm	BZ-DGD-L081-5	2025/02/03
10	Thermostat	16m³	BZ-DGD-L015	2025/05/10
11	Surge generator	HCWG 70	BZ-DGE-L036	2025/01/08
12	Noise meter	TES-1357	BZ-DGD-L029	2025/02/20
13	Oscilloscope	MS04054B	BZ-DGD-L064	2025/01/22
14	Touch current test network	/	BZ-DGD-L091	2024/09/12
15	Ground Resistance Tester	LK2678	BZ-DGD-L095	2024/10/19
16	Stop watch	PS-1003A	BZ-DGD-L217	2025/01/25
17	Jointed test finger	/	BZ-DGD-L081-2	2025/02/03
18	Test pin	/	BZ-DGD-L081-8	2025/02/03

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