Prüfbericht-Nr.: *Test report no.*:	**CN25ZR1J 001**	**Auftrags-Nr.:** *Order no.*:	326061372	Seite 1 von 109 *Page 1 of 109*
Kunden-Referenz-Nr.: *Client reference no.*:	2028101	**Auftragsdatum:** *Order date:*	2024-10-26	
Auftraggeber: *Client*:	GoodWe Technologies Co., Ltd. No.90 Zijin Rd., New District, Suzhou, 215011, P.R. China			
Prüfgegenstand: *Test item*:	Grid-Tied PV Inverter			
Bezeichnung / Typ-Nr.: *Identification / Type no.*:	GW3K-DNS-G40, GW3.6K-DNS-G40, GW4.2K-DNS-G40, GW5K-DNS-G40, GW6K-DNS-G40, GW3.1K-DNS-L-G40			
Auftrags-Inhalt: *Order content*:	TÜV Rheinland Bauart Mark Approval			
Prüfgrundlage: *Test specification*:	EN 62109-1: 2010, IEC 62109-1: 2010 EN 62109-2: 2011, IEC 62109-2: 2011			
Wareneingangsdatum: *Date of sample receipt*:	2024-11-13			
Prüfmuster-Nr.: *Test sample no:*	A003863335-001 A003863335-002			
Prüfzeitraum: *Testing period*:	2024-11-13 – 2025-02-15			
Ort der Prüfung: *Place of testing*:	No.177, 178, Lane 777 West Guangzhong Road, Jing'an District,Shanghai, China			
Prüflaboratorium: *Testing laboratory:*	TÜV Rheinland (Shanghai) Co., Ltd.			
Prüfergebnis*: *Test result*:*	Pass			

geprüft von: tested by:		**genehmigt von:** *authorized by*:	
Datum: *Date:* 2025-02-21	Matt Ma Derek Yang	**Ausstellungsdatum:** *Issue date:* 2025-02-21	Xingxin Tian
Stellung / Position:	Matt Ma /Trainee Derek Yang /PE	**Stellung** / Position:	Xingxin Tian /Expert

Sonstiges / *Other*:	See the following pages for General product information and comment.
Zustand des Prüfgegenstandes bei Anlieferung: *Condition of the test item at delivery*:	Prüfmuster vollständig und unbeschädigt *Test item complete and undamaged*

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

Anmerkungen
Remarks

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

Test Report issued under the responsibility of:

TÜVRheinland®

TEST REPORT **IEC 62109-1** **Safety of Power Converter for use in Photovoltaic Power Systems** **Part 1: General requirements**	
Report Reference No.....:	**CN25ZR1J 001**
Date of issue.....:	See cover page
Total number of pages .....:	See cover page
Name of Testing Laboratory preparing the Report.....:	**TÜV Rheinland (Shanghai) Co., Ltd.**
Applicant's name.....:	**GoodWe Technologies Co., Ltd.**
Address.....:	No.90 Zijin Rd., New District, Suzhou, 215011, P.R. China
Test specification	
Standard .....:	IEC/EN 62109-1: 2010 (First Edition)
Test procedure .....:	TÜV Rheinland Bauart Mark Approval
Non-standard test method……..:	N/A
Test Report Form No.....:	IEC62109_1B
TRF Originator.....:	VDE Testing and Certification Institute
Master TRF.....:	Dated 2016-04

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

General disclaimer:

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

Test item description..... :	Grid-Tied PV Inverter
Trade Mark..... :	GOODWE
Manufacturer ..... :	Same as the applicant
Model/Type reference..... :	See cover page
Ratings..... :	See copy of marking label and model list

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

List of Attachments (including a total number of pages in each attachment): - ATTACHMENT 1 – Test Report of IEC/EN 62109-2 : 2011 (36 pages) - ATTACHMENT 2 – Photo Documentation (14 pages) - ATTACHMENT 3 – Constructional Data Form (42 pages)	
Summary of testing:	
Tests performed (name of test and test clause): 4.3 Temperature measurement 4.4 Testing in single fault condition 4.5.2 Humidity preconditioning 4.6 Backfeed voltage protection 4.7 Electric rating test 5.1.2 Durability of marking test 6.3 Ingress protection (IP test) 7.3.2.6 Working voltage and DVC 7.3.4.2.3 Access probe tests 7.3.5 Protection in case of direct contact 7.3.6.3.3 Rating of protective bonding 7.3.7.4 and 7.3.7.5 Clearance and creepage distance 7.3.9 Protection against shock hazard due to stored energy 7.5.1 Impulse voltage test 7.5.2 Voltage test (electric strength) 7.5.4 Touch current measurement 8.2 Accessibility Test for moving parts 8.4 Provisions for lifting and carrying 8.5 Wall mounting 10.2 Sonic Pressure and Sound Level 13.1 Handles and manual controls 13.7.2 Mechanical resistance test Remark: - Unless otherwise specified, all the test items were conducted on the basic model of GW6K-DNS-G40 to represent the others. Except the temperature measurement was conducted on the model GW3.6K-DNS-G40 and GW6K-DNS-G40.	**Testing location:** TÜV Rheinland (Shanghai) Co., Ltd. No.177, 178, Lane 777 West Guangzhong Road, Jing'an District, Shanghai, China

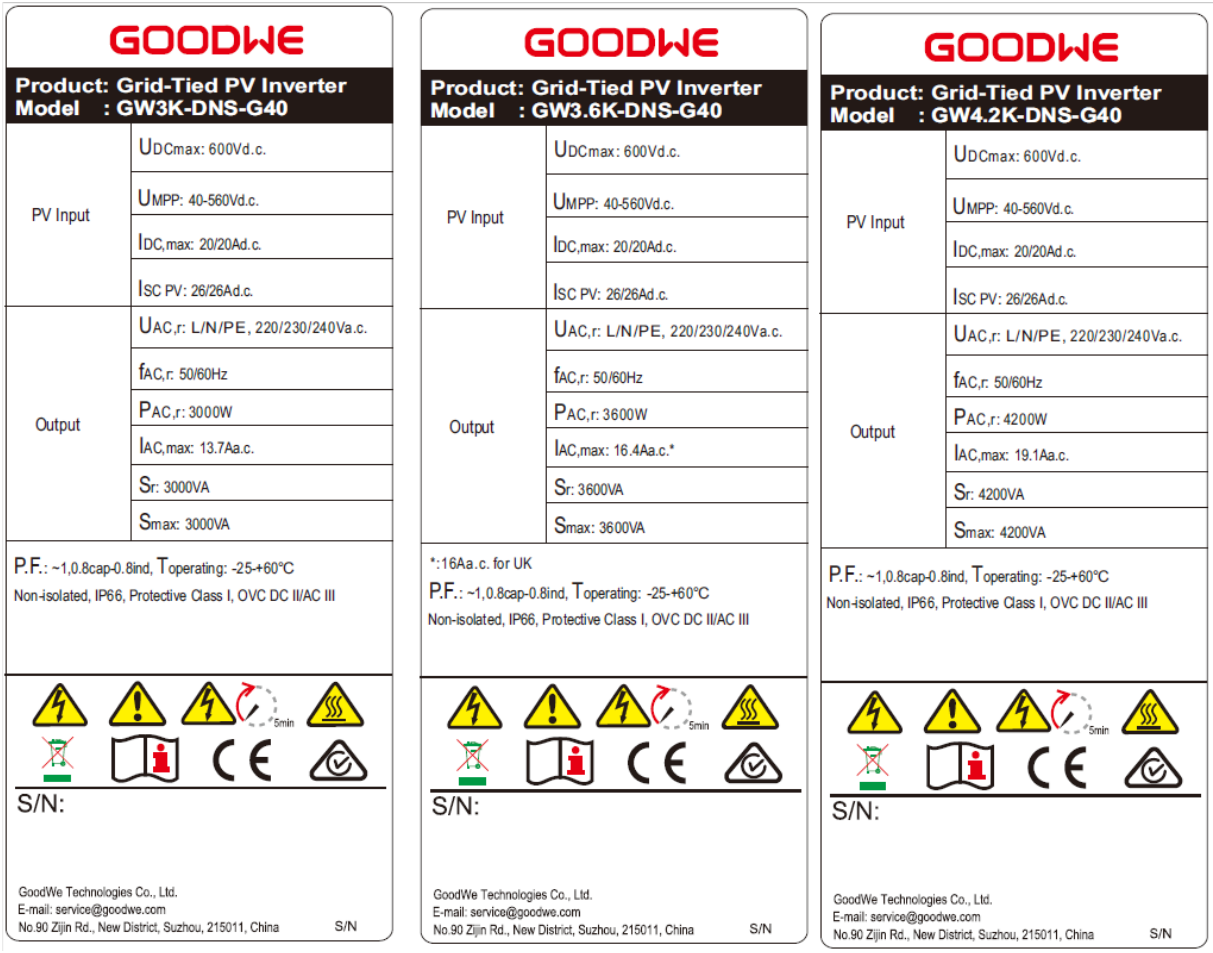
Summary of compliance with National Differences (List of countries addressed):

None.

☒ **The product fulfils the requirements of IEC/EN 62109-1: 2010 and IEC/EN 62109-2: 2011 (insert standard number and edition and delete the text in parenthesis, leave it blank or delete the whole sentence, if not applicable)**

Copy of marking plate:

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



GOODWE

Product: Grid-Tied PV Inverter
Model : GW3K-DNS-G40

PV Input	U_{DCmax}: 600Vd.c.
	U_{MPP}: 40-560Vd.c.
	$I_{DC,max}$: 20/20Ad.c.
	$I_{SC\ PV}$: 26/26Ad.c.
Output	$U_{AC,r}$: L/N/PE, 220/230/240Va.c.
	$f_{AC,r}$: 50/60Hz
	$P_{AC,r}$: 3000W
	$I_{AC,max}$: 13.7Aa.c.
	S_r: 3000VA
	S_{max}: 3000VA

P.F.: ~1,0.8cap-0.8ind, Toperating: -25-+60°C
Non-isolated, IP66, Protective Class I, OVC DC II/AC III

5min

S/N:

GoodWe Technologies Co., Ltd.
E-mail: service@goodwe.com
No.90 Zijin Rd., New District, Suzhou, 215011, China S/N

GOODWE

Product: Grid-Tied PV Inverter
Model : GW3.6K-DNS-G40

PV Input	U_{DCmax}: 600Vd.c.
	U_{MPP}: 40-560Vd.c.
	$I_{DC,max}$: 20/20Ad.c.
	$I_{SC\ PV}$: 26/26Ad.c.
Output	$U_{AC,r}$: L/N/PE, 220/230/240Va.c.
	$f_{AC,r}$: 50/60Hz
	$P_{AC,r}$: 3600W
	$I_{AC,max}$: 16.4Aa.c.*
	S_r: 3600VA
	S_{max}: 3600VA

*:16Aa.c. for UK
P.F.: ~1,0.8cap-0.8ind, Toperating: -25-+60°C
Non-isolated, IP66, Protective Class I, OVC DC II/AC III

5min

S/N:

GoodWe Technologies Co., Ltd.
E-mail: service@goodwe.com
No.90 Zijin Rd., New District, Suzhou, 215011, China S/N

GOODWE

Product: Grid-Tied PV Inverter
Model : GW4.2K-DNS-G40

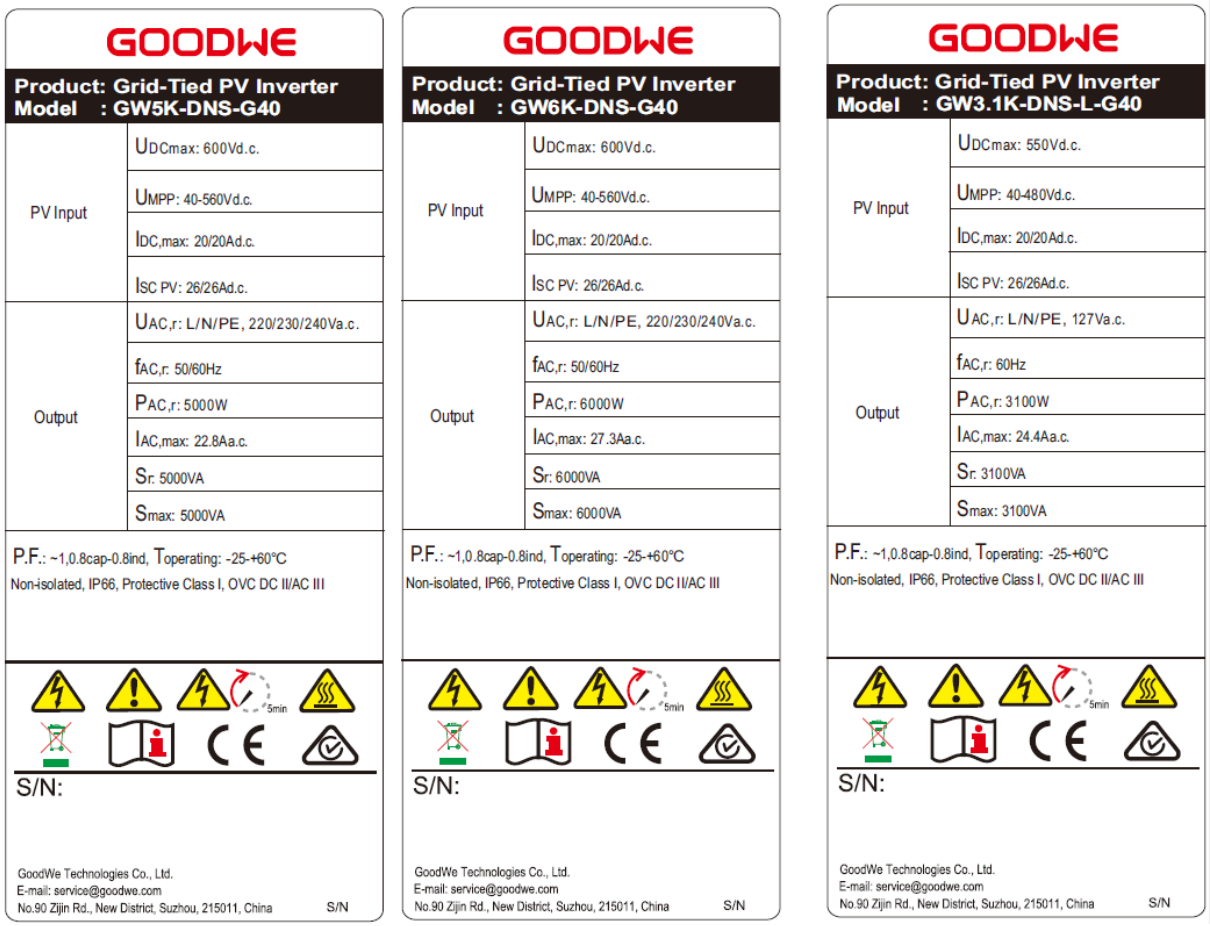
PV Input	U_{DCmax}: 600Vd.c.
	U_{MPP}: 40-560Vd.c.
	$I_{DC,max}$: 20/20Ad.c.
	$I_{SC\ PV}$: 26/26Ad.c.
Output	$U_{AC,r}$: L/N/PE, 220/230/240Va.c.
	$f_{AC,r}$: 50/60Hz
	$P_{AC,r}$: 4200W
	$I_{AC,max}$: 19.1Aa.c.
	S_r: 4200VA
	S_{max}: 4200VA

P.F.: ~1,0.8cap-0.8ind, Toperating: -25-+60°C
Non-isolated, IP66, Protective Class I, OVC DC II/AC III

5min

S/N:

GoodWe Technologies Co., Ltd.
E-mail: service@goodwe.com
No.90 Zijin Rd., New District, Suzhou, 215011, China S/N



Hot Surface marking was marked on top, left and right side of enclosure.

Importer information:

Test item particulars	
Equipment mobility ..... :	☐ movable ☐ hand-held ☐ stationary ☒ fixed ☐ transportable ☐ for building-in
Connection to the mains ..... :	☐ pluggable equipment ☐ direct plug-in ☒ permanent connection ☐ for building-in
Enviromental category..... :	☒ outdoor ☐ indoor unconditional ☐ indoor conditional
Over voltage category Mains ..... :	☐ OVC I ☐ OVC II ☒ OVC III ☐ OVC IV
Over voltage category PV ..... :	☐ OVC I ☒ OVC II ☐ OVC III ☐ OVC IV
Over voltage category Battery ..... :	☐ OVC I ☐ OVC II ☐ OVC III ☐ OVC IV
Mains supply tolerance (%)..... :	According to the specified supply range. see model list on the following pages for details.
Tested for power systems..... :	TN, TT
IT testing, phase-phase voltage (V) ..... :	N/A
Class of equipment..... :	☒ Class I ☐ Class II ☐ Class III ☐ Not classified
Mass of equipment (kg)..... :	See model list on the following pages.
Pollution degree ..... :	☐ PD 1 ☒ PD 2(inside) ☒ PD 3(outside)
IP protection class ..... :	IP66
Testing	
Date of receipt of test item(s) ..... :	See cover page
Dates tests performed ..... :	See cover page
Possible test case verdicts:	
- test case does not apply to the test object ..... :	N/A
- test object does meet the requirement..... :	Pass (P)
- test object was not evaluated for the requirement ..:	N/E
- test object does not meet the requirement..... :	Fail (F)

General remarks:

"(see Attachment #)" refers to additional information appended to the report.

"(see appended table)" refers to a table appended to the report.

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

This report shall not be reproduced except in full without the written approval of the testing laboratory.

List of test equipment must be kept on file and available for review.

Additional test data and/or information provided in the attachments to this report.

Throughout this report a ☐ comma / ☒ point is used as the decimal separator.

Determination of the test results includes consideration of measurement uncertainty from the test equipment and methods.

Manufacturer's Declaration per sub-clause 6.2.5 of IECEE 02:

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

☐ Yes
☒ Not applicable

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

Name and address of factory (ies):

Address 1: GoodWe Technologies Co., Ltd.
No.90 Zijin Rd., New District, Suzhou, 215011, P.R. China

Address 2: GoodWe (GuangDe) Power Supply Technology Co., Ltd.
No.208, Tong Rui East Road, Guangde, Anhui, P.R. China

Address 3: GOODWE VIETNAM TECHNOLOGY COMPANY LIMITED
Factory A1, A2, Lot CN1N, maritime Industrial and Service Park (Deep C2B), Dinh Vu -Cat Hai Economic Zone, Dong Hai 2 Ward, Hai An District, Hai Phong City, Vietnam

General product information:

Brief description:

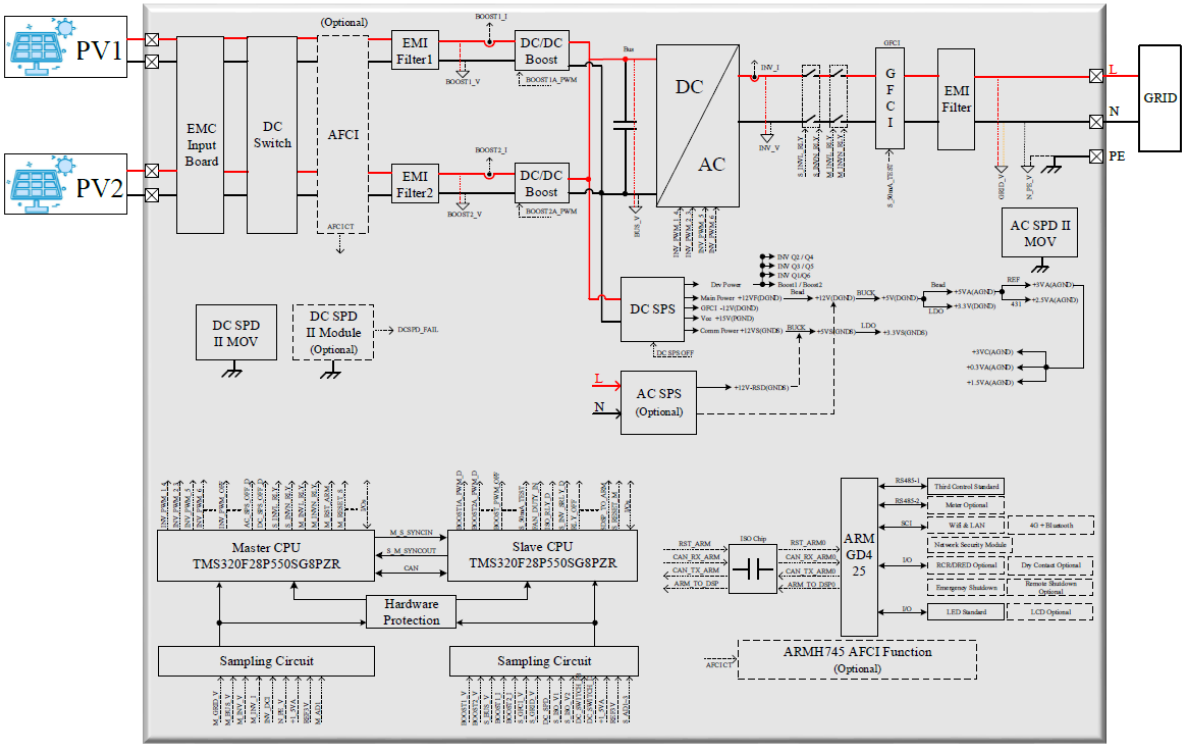
The equipment is a grid-connected PV inverter which converts direct current optimized by photovoltaic DC conditioner to alternating current, and it is intended to be connected in parallel with the public grid.

It is intended for professional incorporation into PV system, and it is assessed on a component test basis.

The external circuit breakers or fuses for Grid connection are required, which is specified in the installation manual. The PCE does not provide galvanic separation between the PV input and AC output circuit (non-isolation or transformer-less type). Each phase of the AC output circuits is equipped with two relays in series that controlled by master and slave CPU, which can be switched off when the inverter shuts down for the redundant protection. When single fault occurs to one relay, the other redundant one will still maintain the basic insulation between PV input circuit and AC output circuit to the mains.

In addition, while the PCE operating all the PV connectors cannot be disconnected and while maintenance the power of PCE should be cut off.

See the block diagram for details.



Block diagram

Description of the differences of the models within a series:

All models are identical in hardware and software except for model name, AC relays, BUS capacitors, electrical ratings and the amount of Fan. See next table for details.

Items	GW3K-DNS-G40	GW3.6K-DNS-G40	GW4.2K-DNS-G40	GW5K-DNS-G40	GW6K-DNS-G40	GW3.1K-DNS-L-G40
	Electric data					
V_{MAX} PV [Vd.c.]	600					550
MPP Voltage Range V_{MPP} [Vd.c.]	40-560					40-480
MPPT Voltage Range for Full Power [Vd.c.]	100-500	120-500	140-500	165-500	195-500	110-420
Rated Output Power [W]	3000	3600	4200	5000	6000	3100
Rated Output Current [Aa.c.]	13.7*1	16.4*1	19.1*1	22.8*1	27.3*1	24.4
Max. Output Apparent Power [VA]	3000	3600	4200	5000	6000	3100
Max. Output Current [Aa.c.]	13.7	16.4	19.1	22.8	27.3	24.4
	Hardware Construction					
Number of inputs	2	2	2	2	2	2
Number of MPPT	2	2	2	2	2	2
Number of strings per MPPT	1	1	1	1	1	1
Number of strings detector	1	1	1	1	1	1
Number of external fans	0	0	0	0	0	0
Number of internal fans	0	0	1	1	1	1
Boost module	650V, 40A Q101, Q102	650V, 40A Q101, Q102	650V, 40A Q101, Q102	650V, 40A Q101, Q102	650V, 40A Q101, Q102	650V, 40A Q101, Q102
Inverter Module	650V, 40A Q201, Q202, Q203, Q204, Q205, Q206	650V, 40A Q201, Q202, Q203, Q204, Q205, Q206	650V, 40A Q201, Q202, Q203, Q204, Q205, Q206	650V, 40A Q201, Q202, Q203, Q204, Q205, Q206	650V, 40A Q201, Q202, Q203, Q204, Q205, Q206	650V, 40A Q201, Q202, Q203, Q204, Q205, Q206
BUS filter capacitor	550V, 390uF	550V, 390uF	550V, 470uF	550V, 470uF	550V, 470uF	550V, 470uF

	C202, C203, C205	C202, C203, C205	C202, C204, C205	C202, C204, C205	C202, C203, C204, C205	C202, C204, C205
AC filter capacitor	350Vac, 4.7uF C312	350Vac, 4.7uF C312	350Vac, 4.7uF C312	350Vac, 4.7uF C312	350Vac, 4.7uF C312	350Vac, 4.7uF C312
AC current detector	50A	50A	65A	65A	65A	65A
AC relay	30A	30A	30A	30A	30A	30A
DC switch	3 poles	3 poles	3 poles	3 poles	3 poles	3 poles

Note: *1: For the rated output current:
Model GW3K-DNS-G40: 13.7A@220V, 13.1A@230V, 12.5A@240V;
Model GW3.6K-DNS-G40: 16.4A@220V, 15.7A@230V, 15.0A@240V;
Model GW4.2K-DNS-G40: 19.1A@220V, 18.3A@230V, 17.5A@240V;
Model GW5K-DNS-G40: 22.8A@220V, 21.8A@230V, 20.9A@240V;
Model GW6K-DNS-G40: 27.3A@220V, 26.1A@230V, 25.0A@240V;

Model list: See next page

MODELS LIST		GW3K-DNS-G40	GW3.6K-DNS-G40	GW4.2K-DNS-G40	GW5K-DNS-G40	GW6K-DNS-G40	GW3.1K-DNS-L-G40
PV INPUT	V_{MAX} PV [Vdc]	600					550
	I_{SC} PV [A]	26/26					
	MPP Voltage Range V_{MPP} [Vdc]	40-560					40-480
	Start PV Voltage [Vdc]	50					
	MPP Full Power Voltage Range [Vdc]	100-500	120-500	140-500	165-500	195-500	110-420
	Nominal PV Voltage V_{NOM} [Vdc]	360					230
	Max. Input Current Imax [A]	20/20					
	Backfeed Current [A]	0					
	Overvoltage Category (OVC)	II					
AC OUTPUT	Rated Output Voltage [Va.c.]	220/230/240, L/N/PE					127, L/N/PE
	Rated Output Frequency [Hz]	50/60					60
	Rated Output Power [W]	3000	3600	4200	5000	6000	3100
	Max. Output Apparent Power [VA]	3000	3600	4200	5000	6000	3100
	Rated Output Current [Aa.c.]	13.7*1	16.4*1	19.1*1	22.8*1	27.3*1	24.4
	Max. Output Current [Aa.c.]	13.7	16.4	19.1	22.8	27.3	24.4
	Power Factor [λ]	1 (Default), [-0.80, +0.80]					
	Overvoltage Category (OVC)	III					
System	Type of inverter	Non-isolated					
	Protective Class	I					
	Enclosure Protection	IP66					
	Operating Temperature Range [ºC]	-25 to 60 (derating at +45°C)					
	Operating Altitude [m]	Max. 4000					
	Pollution degree (PD)	PD 2 (inside), PD 3 (outside)					
	Max. Weight [kg]	Max. 9.2					
	Size (W*H*D) [mm]	358*323*165					
	Firmware	V1.00.00					
	Software [version]	V1.00.00					

Note: *1: For the rated output current:
Model GW3K-DNS-G40: 13.7A@220V, 13.1A@230V, 12.5A@240V;
Model GW3.6K-DNS-G40: 16.4A@220V, 15.7A@230V, 15.0A@240V;
Model GW4.2K-DNS-G40: 19.1A@220V, 18.3A@230V, 17.5A@240V;
Model GW5K-DNS-G40: 22.8A@220V, 21.8A@230V, 20.9A@240V;
Model GW6K-DNS-G40: 27.3A@220V, 26.1A@230V, 25.0A@240V;

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 auto-matically 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

Indicate used abbreviations (if any)

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

4	**GENERAL REQUIREMENTS**		**P**
4.1	General		P
4.2	General conditions for testing	See below.	P
4.2.1	Sequence of tests	The same sample used for all tests.	P
4.2.2	Reference test conditions		P
4.2.2.1	Unless otherwise specified in this standard, for example with regard to environmental category as defined in 6.1, the following ambient environmental conditions shall exist in the test location: a) temperature of 15 °C to 40 °C. b) a relative humidity of not more than 75 % and not less than 5 %. c) an air pressure of 75 kPa to 106 kPa. d) no frost, dew, percolating water, rain, solar radiation, etc.	Ambient environmental conditions compliance.	P
4.2.2.2	State of equipment	Tests were carried out 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		P
	a) Voltage:	See appended table 4.7	P
	b) Frequency:	See appended table 4.7	P
	c) Polarity:	See appended table 4.7	P
	d) Earthing:	Equipment was supplied from either an earthed supply system under tests.	P
	e) Over-current Protection:	Input over current protection that will be present in the installation was provided during testing.	P

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Clause	Requirement – Test	Result – Remark	Verdict
4.2.2.7	Supply ports other than the mains		P
4.2.2.7.1	Photovoltaic supply sources	DC power supply source was used with sufficient capability.	P
4.2.2.7.2	Battery inputs	No battery inputs.	N/A
4.2.2.8	Conditions of loading for output ports	The least favorable loading conditions was considered.	P
	- for continuous operation.	Until steady condition was established.	P
	- for intermittent operation.		N/A
	- for short-time operation.		N/A
4.2.2.9	Earthing terminals	The protective conductor terminal connected to the earth.	P
4.2.2.10	Controls		P
4.2.2.11	Available short circuit current	Considered.	P
4.3	Thermal Testing	See below.	P
4.3.1	General		P
4.3.2	Maximum temperatures Materials and components shall be selected so that under the most serve rated operating conditions, the temperatures do not exceed the temperature limits.	See appended table 4.3.	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		P
	- automatic reset devices or circuits		N/A
	- manual reset devices or circuits		N/A
	- non-resettable devices or circuits	One cycle and until temperatures stabilize.	P
4.4.3	Compliance after application of fault conditions		P
4.4.3.1	Protection against shock hazard		P
4.4.3.2	Protection against the spread of fire		P

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Clause	Requirement – Test	Result – Remark	Verdict
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	See below.	P
4.4.4.1	Component fault tests The following faults are simulated: Short circuit or open circuit of relevant components. Short circuit or open circuit of any components or insulation where failure could adversely affect supplementary insulation or reinforced insulation. In addition, where required by Method 2 of 9.1.1, components that could result in a fire hazard are to be overloaded unless they comply with the requirements of 9.1.3.	See appended table 4.4.	P
4.4.4.2	Equipment or parts for short-term or intermittent operation	Fan and Relay.	P
4.4.4.3	Motors	System Fan.	P
4.4.4.4	Transformer short circuit tests	SPS Transformers.	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	Based on test/circuit topology analysis and manufacturer's declaration, backfeed current form grid to the array is 0A	P
4.4.4.7	Output overload		P
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	See appended table 4.4.	P
4.4.4.14	PWB short-circuit test	The distance on PWB is enough	N/A
4.5	Humidity preconditioning	See below.	P
4.5.1	General		P
4.5.2	Conditions	Humidity: 100%RH Temperature: 60°C Duration: 48hrs	P

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Clause	Requirement – Test	Result – Remark	Verdict
4.6	Voltage Back-feed Protection	Hazardous voltage and energy were 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	Back-feed tests under normal conditions	Relay is available at AC output side to prevent backfeed current from AC to DC side.	P
4.6.2	Back-feed tests under single-fault conditions	Relay is available at AC output side and certified connectors at DC input side to prevent backfeed current from AC to DC side, even if under single-fault conditions.	P
4.6.3	Compliance with back-feed tests	See above.	P
	- 15 s for sources that are connected by fixed wiring		P
	- 1 s for sources that are cord-connected or use connectors that can be opened without the use of a tool		N/A
4.7	Electrical Ratings Tests	See appended table 4.2.2.6.	P
4.7.1	Input Ratings		P
4.7.2	Output Ratings		P

5	**MARKING AND DOCUMENTATION**		**P**
5.1	Marking		P
5.1.1	General		P
	Equipment shall bear markings as specified in 5.1 and 5.2	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

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Clause	Requirement – Test	Result – Remark	Verdict
	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.	
	a) the name or trademark of the manufacturer or supplier	See the nameplate, which is provided on the enclosure.	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 62109, the following ratings, as applicable shall be marked on the equipment:	See below.	P
	– input voltage, type of voltage (a.c. or d.c.), frequency, and max. continuous current for each input	See the nameplate, which is provided on the enclosure.	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 above.	P
5.1.5	Fuse identification		P
	Marking shall be located adjacent to each fuse or fuse holder, or on the fuse holder, 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		N/A
	For fuses not located in operator access areas and for soldered-in fuses located in operator access areas, it is permitted to provide an unambiguous cross-reference (for example, F1, F2, etc.) to the		P

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Clause	Requirement – Test	Result – Remark	Verdict
	servicing instructions which shall contain the relevant information.		
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
	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.		P
	A multiple-voltage unit shall be marked to indicate the particular voltage for which it is set when shipped from the factory. The marking is allowed to be in the form of a paper tag or any other nonpermanent 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 PV input connectors.	P
	– a pictorial representation illustrating the proper polarity where the correct polarity can be unambiguously determined from the representation		P
5.1.6.1	Protective Conductor Terminals		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		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

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Clause	Requirement – Test	Result – Remark	Verdict
5.1.8	Class II Equipment	Class I Equipment.	N/A
	Equipment using Class II protective means throughout shall be marked with symbol 12 of Annex C. Equipment which is only partially protected by DOUBLE INSULATION or REINFORCED INSULATION shall not bear symbol 12 of Table Annex C.		N/A
	Where such equipment has provision for the connection of an earthing conductor for functional reasons (see 7.3.6.4) it shall be marked with symbol 6 of Annex C		N/A
5.1.9	Terminal boxes for External Connections	The temperature observed on the terminals were not exceed the limited values specified.	P
	Where required by note 1 of Table 2 as a result of high temperatures of terminals or parts in the wiring compartment, there shall be a marking, visible beside the terminal before connection, of either:		N/A
	a) the minimum temperature Rating and size of the cable to be connected to the TERMINALS; or		N/A
	b) a marking to warn the installer to consult the installation instruction. Symbol 9 of Table D-1 is an acceptable marking		N/A
5.2	Warning markings		P
5.2.1	Visibility and legibility requirements for warning markings	Warning markings are visible and legible.	P
	Warning markings shall be legible, and shall have minimum dimensions as follows:		P
	– Printed symbols shall be at least 2,75 mm high		P
	– Printed text characters shall be at least 1.5 mm high and shall contrast in color with the background		P
	– Symbols or text that are molded, 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 0,5 mm.	No such symbols.	N/A
	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

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Clause	Requirement – Test	Result – Remark	Verdict
	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 heatsinks and similar parts	All accessible metal parts were grounded.	N/A
	An ungrounded heat sink or other part that may be mistaken for a grounded part and involves a risk of electric shock in accordance with 7.3 shall be marked with symbol 13 of Annex C, or equivalent. The marking may be on or adjacent to the heatsink and shall be clearly visible when the PCE is disassembled to the extent that a risk of contact with the heatsink exists.		N/A
5.2.2.2	Hot Surfaces		P
	A part of the PCE that exceeds the temperature limits specified in 4.3.2 shall be marked with symbol 14 of Annex C or equivalent.	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 the equipment		N/A
5.2.2.4	Stored energy		P
	Where required by 7.3.9.2 or 7.4.2 the PCE shall be marked with Symbol 21 of Annex C and the time to discharge capacitors to safe voltage and energy levels shall accompany the symbol.	Marked with Symbol 21 of 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		P
	Where required by 8.2 a marking shall be provided where it is visible to service personnel before removal of a guard, warning of the hazard and giving instructions for safe servicing (for example disconnection of the source before removing the guard).		P
5.2.3	Sonic hazard markings and instructions	Measured sound pressure not	P

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Clause	Requirement – Test	Result – Remark	Verdict
		exceeds 80 Dba.	
	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.	Considered.	P
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.		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 informations provided in the user's maunal.	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

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Clause	Requirement – Test	Result – Remark	Verdict
	– WET LOCATIONS classification fort he intended external environment as per 6.1		P
	– POLLUTION DEGREE classification for the intended external environment as per 6.2	PD3(outside), PD2(inside).	P
	– INGRESS PROTECTION rating as per 6.3	IP66.	P
	– Ambient temperature and relative humidity ratings	-25°C to +60°C (>45°C derating), humidity 0% to 100 %.	P
	– MAXIMUM altitude rating	4000m.	P
	– OVERVOLTAGE CATEGORY assigned to each input and output port as per 7.3.7.1.2, accompanied by guidance regarding how to ensure that the installation complies with the required overvoltage categories;	OVC III for mains connection. OVC II for PV connection.	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.		P
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 below related informations provided in the user's maunal.	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 coding of leads, disconnection means, or overcurrent protection needed, including instructions that		P

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Clause	Requirement – Test	Result – Remark	Verdict
	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;	No 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;	No battery used in the PCE.	N/A
	i) tightening torque to be applied to wiring terminals;		P
	j) values of back-feed 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;		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;		P
	m) instructions for protective earthing, including the information required by 7.3.6.3.7 if a second protective earthing conductor is to be installed:		P
	n) where required by 7.3.8, the installation instructions shall include the following or equivalent wording:		P
	“This product can cause a d.c. current in the external protective earthing conductor. Where a residual current-operated protective (RCD) or monitoring (RCM) device is used for protection in a case of direct or indirect contact, only an RCD or RCM of Type B is allowed on the supply side of this product. “		P

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Clause	Requirement – Test	Result – Remark	Verdict
	o) for PCE intended to charge batteries, the battery nominal voltage rating, size, and type		N/A
	p) PV array configuration information, such as ratings, whether the array is to be grounded or floating, any external protection devices needed, etc.		P
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 maunal.	P
	– Instructions for adjustment of controls including the effects of adjustment;		P
	– Instructions for interconnection to accessories and other equipment, including indication of suitable accessories, detachable parts and any special materials;		P
	– Warnings regarding the risk of burns from surfaces permitted to exceed the temperature limits of 4.3.2 and required operator actions to reduce the risk; and		P
	– Instructions, that if the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.		P
5.3.4	Information related to maintenance		P
	Maintenance instructions shall include the following:	All related information provided in the service maunal.	
	– Intervals and instructions for any preventive maintenance that is required to maintain safety (for example air filter replacement or periodic re-tightening of terminals);		P
	– Instructions for accessing operator access areas, if any are present, including a warning not to enter other areas of the equipment;		P
	– Part numbers and instructions for obtaining any required operator replaceable parts;	No required operator replaceable parts.	N/A
	– Instructions for safe cleaning (if recommended)		P
	– Where there is more than one source of supply energizing the PCE, information shall be provided in the manual to indicate which disconnect device or devices are required to be oper-		P

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Clause	Requirement – Test	Result – Remark	Verdict
	ated in order to completely isolate the equipment.		
5.3.4.1	Battery maintenance		N/A
	Where required by 14.8.5, the documentation shall include the applicable items from the following list of instructions regarding maintenance of batteries:		N/A
	– Servicing of batteries should be performed or supervised by personnel knowledgeable about batteries and the required precautions		N/A
	– When replacing batteries, replace with the same type and number of batteries or battery packs		N/A
	– General instructions regarding removal and installation of batteries		N/A
	– CAUTION: Do not dispose of batteries in a fire. The batteries may explode.		N/A
	– CAUTION: Do not open or damage batteries. Released electrolyte is harmful to the skin and eyes. It may be toxic.		N/A
	– CAUTION: A battery can present a risk of electrical shock and high short-circuit current. The following precautions should be observed when working on batteries:		N/A
	a) Remove watches, rings, or other metal objects.		N/A
	b) Use tools with insulated handles.		N/A
	c) Wear rubber gloves and boots.		N/A
	d) Do not lay tools or metal parts on top of batteries		N/A
	e) Disconnect charging source prior to connecting or disconnecting battery terminals		N/A
	f) Determine if battery is inadvertently grounded. If inadvertently grounded, remove source from ground. Contact with any part of a grounded battery can result in electrical shock. The likelihood of such shock can be reduced if such grounds are removed during installation and maintenance (applicable to equipment and remote battery supplies not having a grounded supply circuit).		N/A
6	**ENVIRONMENTAL REQUIREMENTS AND CONDITIONS**		**P**

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Clause	Requirement – Test	Result – Remark	Verdict
	The manufacturer shall rate the PCE for the following environmental conditions:		P
	– ENVIRONMENTAL CATEGORY, as in 6.1 below	See below.	P
	– Suitability for WET LOCATIONS or not	See below.	P
	– POLLUTION DEGREE rating in 6.2 below	See below.	P
	– INGRESS PROTECTION (IP) rating, as in 6.3 below	See below.	P
	– Ultraviolet (UV) exposure rating, as in 6.4 below	See below.	P
	– Ambient temperature and relative humidity ratings, as in 6.5 below	See below.	P
6.1	Environmental categories and minimum environmental conditions		P
6.1.1	Outdoor	Outdoor use.	P
6.1.2	Indoor, unconditioned		N/A
6.1.3	Indoor, conditioned		N/A
6.2	Pollution degree	PD3 (OUTSIDE), PD2 (INSIDE)	P
6.3	Ingress Protection	IP66.	P
6.4	UV exposure	Recognized anti-UV plastic material used for external DC connector and switch.	P
6.5	Temperature and humidity	-25~+60°C (>45°C derating), humidity 0% to 100 %)	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)		P

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Clause	Requirement – Test	Result – Remark	Verdict
7.3.2.2	Limits of DVC (according to table 6)		P
7.3.2.3	Short-terms limits of accessible voltages under fault conditions		P
7.3.2.4	Requirements for protection (according to table 7)		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		P
7.3.2.6.1	General		P
7.3.2.6.2	AC working voltage (see Figure 2)		P
7.3.2.6.3	DC working voltage (see Figure 3)		P
7.3.2.6.4	Pulsating working voltage (see Figure 4)		P
7.3.3	Protective separation	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	The double or reinforced insulation was provided between 1) DC input circuits and display and communication circuits; 2) AC input circuits and display, communication circuits. All accessible metal parts were earthed and separated from live parts by basic insulation.	P
	▪ protective screening, i.e. by a conductive screen connected to earth by protective bonding in the PCE, or connected to the protective earth conductor itself, whereby the screen is separated from live parts by at least basic insulation, or		P
	▪ protective impedance comprising limitation of current per 7.3.5.3 and of discharged energy per 7.3.5.4, or	Voltage sampling circuits and ISO circuits.	P
	▪ limitation of voltage according to 7.3.5.4.		P
	The protective separation shall be fully and effectively maintained under all conditions of intended use of the PCE		P
7.3.4	Protection against direct contact	Protection against electic	P

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Clause	Requirement – Test	Result – Remark	Verdict
		shock by means of earthed metal enclosure. Any access to touch hazardous live parts is impossible.	
7.3.4.1	General		P
	Protection against direct contact is employed to prevent persons from touching live parts that do not meet the requirements of 7.3.5 and shall be provided by one or more of the measures given in 7.3.4.2 (enclosures and barriers) and 7.3.4.3 (insulation).	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 electic shock by means of earthed metal enclosure.	P
	The following requirements apply where protection against contact with live parts is provided by enclosures or barriers, not by insulation in 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	Metal enclosure.	N/A
7.3.4.2.2	Access probe criteria		P
	Protection is considered to be achieved when the separation between the test probes and live parts, when tested as described below, is as follows:	Considered.	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	Considered.	P

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Clause	Requirement – Test	Result – Remark	Verdict
	parts, based on the clearance for Basic insulation using the recurring peak working voltage involved,		
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 unfavorable position.	It is not possible to touch the hazardous live parts by the test finger.	P
	The test finger and the test pin are applied as above, without appreciable force, in every possible position, except that floor-standing equipment having a mass exceeding 40 kg is not tilted.		P
	Equipment intended for building-in or rack mounting, or for incorporation in larger equipment, is tested with access to the equipment limited according to the method of 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.		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 on top surfaces	N/A
7.3.4.2.4	Service access areas	It is not allowed to remove the cover during installation and	P

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Clause	Requirement – Test	Result – Remark	Verdict
		maintenance when PCE is energized.	
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:		P
	– their working voltage is greater than the maximum limit of decisive voltage class A, or		P
	– for a DVC A or B circuit, protective separation from adjacent circuit of DVC C is not provided (see note "‡" under Table 7)		P
7.3.5	Protection in case of direct contact		P
7.3.5.1	General	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	Voltage sampling circuits and ISO circuits.	P
	– is limited in voltage according to 7.3.5.4	Communication circuits.	P
	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 considerd as DVC-A which can be accessible and separated from DVC-C by double or reinforced insulaiton.	P
7.3.5.3	Protection by means of protective impedance	Voltage sampling circuits and ISO circuits.	P

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Clause	Requirement – Test	Result – Remark	Verdict
	Circuits and conductive parts do not require protection against direct contact if any connection to circuits of DVC-B or DVC-C is through protective impedance, and the accessible circuit or part is otherwise provided with protective separation from circuits of DVC-B or DVC-C according 7.3.3.		P
7.3.5.3.1	Limitation of current through protective impedance		P
	The current available through protective impedance to earth and between simultaneously accessible parts, measured at the accessible live parts, shall not exceed a value of 3,5 mA a.c. or 10 mA d.c. under normal and single-fault conditions.		P
7.3.5.3.2	Limitation of discharging energy through protective impedance		P
	The discharging energy available between simultaneously accessible parts protected by protective impedance shall not exceed the charging voltage and capacitance limits given in Table 9, which applies to both wet and dry locations, under normal and single fault conditions. Refer to figure 8.		P
7.3.5.4	Protection by means of limited voltages		N/A
	That portion of a circuit that has its voltage reduced to DVC-A by a voltage divider that complies with the following requirements, and that is otherwise provided with protective separation from circuits of DVC-B or DVC-C according to 7.3.3, does not require protection against direct contact.		N/A
	The voltage divider shall be designed so that under normal and single fault conditions, including faults in the voltage division circuit, the voltage across the output of the voltage divider does not exceed the limit for DVC-A.		N/A
	This type of protection shall not be used in case of protective class II or unearthed circuits, because it relies on protective earth being connected.		N/A
7.3.6	Protection against indirect contact		P
7.3.6.1	General		P
	Protection against indirect contact is required to prevent shock- hazardous current being accessible from conductive parts during an insulation failure. This protection shall comply with the requirements for protective class I (basic insulation plus protective earthing), class II (double or reinforced insulation) or class III (limitation of voltages)	The PCE is defined as protective class I.	P
	That part of a PCE meets the requirements of	The earthing metal enclosure	P

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Clause	Requirement – Test	Result – Remark	Verdict
	7.3.6.2 and 7.3.6.3 is defined as protective class I	is complied with Protective class I.	
	That part of a PCE meets the requirements of 7.3.6.4 is defined as protective class II.		N/A
	That part of PCE which meets the requirements of decisive voltage class A and in which no hazardous voltages are derived, is defined as protective class III. No shock hazard is present in such circuits.		N/A
	Where protection against indirect contact is dependent on means provided during installation, the installation instructions shall provide details of the required means and shall indicate the associated hazards.		P
7.3.6.2	Insulation between live parts and accessible conductive parts	See subclaus 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
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	P

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Clause	Requirement – Test	Result – Remark	Verdict
		terminal with screw.	
	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		P
	Where direct metallic contact is used and one or both of the parts involved is painted or coated, the paint or coating shall be removed in the area of contact, or reliably penetrated, to ensure metal to metal contact.		P
	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 below.	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.	Suitable protective bonding used.	P
	Protective bonding shall meet following requirements:	See below.	P
	a) For PCE with an overcurrent protective device rating of 16 A or less, the impedance of the protective bonding means shall not exceed 0,1 Ω during or at the end of the test below.		N/A
	b) For PCE with an overcurrent protective device rating of more than 16 A, the voltage drop in the protective bonding test shall not exceed 2,5 V during or at the end of the test below.		P
	As alternative to a) and b) the protective bonding may designed according to the requirements for the external protective earthing conductor in 7.3.6.3.5, in which case no testing is required.		N/A

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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:		P
	a) For pluggable equipment type A, the overcurrent protective device is that provided external to the equipment (for example, in the building wiring, in the mains plug or in an equipment rack);	Fixed equipment.	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;		P
	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.		P
	Voltages are measured from the protective earthing terminal to all parts whose protective bonding means are being considered. The impedance of the protective earthing conductor is not included in the measurement. However, if the protective earthing conductor is supplied with the equipment, it is permitted to include the conductor in the test circuit, but the measurement of the voltage drop is made only from the main protective earthing terminal to the accessible part required to be earthed.		P
	On equipment where the protective earth connection to a subassembly or to a separate unit is part of a cable that also supplies power to that subassembly or unit, the resistance of the protective bonding conductor in that cable is not included in the protective bond impedance measurements for the subassembly or separate unit, as shown in Figure 11. However, this option is only permitted if the 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.		P
7.3.6.3.3.1	Test current, duration, and acceptance criteria		P
	The test current, duration of the test and acceptance criteria are as follows:		P

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Clause	Requirement – Test	Result – Remark	Verdict
	a) For PCE with an overcurrent protective device rating of 16 A or less, the test current is 200% of the overcurrent protective device rating, but not less than 32 A, applied for 120s. The impedance of the protective bonding means during and at the end of the test shall not exceed 0,1 Ω.		N/A
	b) For PCE with an overcurrent protective device rating of more than 16 A, the test current is 200% of the overcurrent protective device rating and the duration of the test is as shown in Table 10 below. The voltage drop in the protective bonding means, during and at the end of the test, shall not exceed 2,5 V.		P
	c) During and after the test, there shall be no melting, loosening, or other damage that would impair the effectiveness of the protective bonding means.		P
	The test current is derived from an a.c or d.c supply source, the output of which is not earthed.		P
	As an alternative to Table 10, where the time-current characteristic of the overcurrent protective device that limits the fault current in the protective bonding means is known because the device is either provided in the equipment or fully specified in the installation instructions, the test duration may be based on that specific device's time-current characteristic, The tests are conducted for a duration corresponding to the 200% current value on the time-current characteristic.		P
7.3.6.3.4	Protective bonding impedance (routine test)	For routine test	P
	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:		P
	▪ 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:		P
	▪ the test duration may be reduced to no less than 2 s		P
	For equipment subject to the type test in		P

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Clause	Requirement – Test	Result – Remark	Verdict
	7.3.6.3.3.1a), the impedance during the routine test shall not exceed 0,1Ω.		
	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).		P
7.3.6.3.5	External protective earthing conductor		P
	A protective earthing conductor shall be connected at all times when power is supplied to PCE of protective class I. Unless local wiring regulations state otherwise, the protective earthing conductor cross-sectional area shall be determined from Table 11 or by calculation according to IEC 60364-5-54.	The cross-sectional area of protective earthing conductor is half of phase conductors.	P
	If the external protective earthing conductor is routed through a plug and socket or similar means of disconnection, it shall not be possible to disconnect it unless power is simultaneously removed from the part to be protected.		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;		P
	▪ 4 mm² if mechanical protection is not provided.		P
	For cord-connected equipment, provisions shall be made so that the external protective earthing conductor in the cord shall, in the case of failure of the strain-relief mechanism, be the last conductor to be interrupted.	Not cord-connected equipment.	N/A
7.3.6.3.6	Means of connection for the external protective earthing conductor		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.	The external protective earthing terminal block consist of other live conducts as AC connector for connecting PCE to the mains. Corrosion-resistant is considered for connection and bonding points. Separated earthing terminal be provided for protective earthing conductor was specified in user manual.	P

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Clause	Requirement – Test	Result – Remark	Verdict
	Connection and bonding points shall be so designed that their current-carrying capacity is not impaired by mechanical, chemical, or electrochemical influences. Where enclosures and/or conductors of aluminum or aluminum 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		P
	The requirements of this sub-clause shall be satisfied to maintain safety in case of damage to or disconnection of the protective earthing conductor.		P
	For pluggable equipment type A, the touch current measured in accordance with 7.5.4 shall not exceed 3,5 mA a.c. or mA d.c.		N/A
	For all other PCE, one or more of the following measure shall be applied, unless the touch current measured in accordance with 7.5.4 using the test network of IEC 60990 test figure 4 shall not exceed 3,5 mA a.c. or 10 mA d.c.	See appended table 7.5.4. In addition, the caution symbol 15 of Table C.1 provided on PCE and in manual.	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		P
	• automatic disconnection of the supply in case of discontinuity of the protective earthing conductor; or		N/A
	• provision of an additional terminal for a second protective earthing conductor of the same cross-sectional area as the original protective earthing conductor and installation instruction requiring a second protective earthing conductor to be installed or		P
	b) Connection with an industrial connector according to IEC 60309 and a minimum protective earthing conductor cross-section of 2,5 mm² as		N/A

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Clause	Requirement – Test	Result – Remark	Verdict
	part of a multi-conductor power cable. Adequate strain relief shall be provided.		
	In addition, the caution symbol 15 of Annex C shall be fixed to the product and the installation manual shall provide details of the protective earthing measures required in the installation as required in 5.3.2.		P
	When it is intended and allowed to connect two or more PCEs in parallel using one common PE conductor, the above touch current requirements apply to the maximum number of the PCEs to be connected in parallel, unless one of the measures in a)	Not for parallel connection.	N/A
	or b) above is used. The maximum number of parallel PCEs is used in the testing and has to be stated in the installation manual.		N/A
7.3.6.4	Protective Class II – Double or Reinforced Insulation	Class I equipment.	N/A
	Equipment or parts of equipment designed for protective class II shall have insulation between live parts and accessible surfaces in accordance with 7.3.4.3. The following requirements also apply:		N/A
	• equipment designed to protective class II shall not have means of connection for the external protective earthing conductor. However, this does not apply if the external protective earthing conductor is passed through the equipment-to-equipment series-connected beyond it. In the latter event, the external protective earthing conductor and its means for connection shall be insulated with basic insulation from the accessible surface of the equipment and from circuits that employ protective separation, extra-low voltage, protective impedance and limited discharging energy, according to 7.3.5. This basic insulation shall correspond to the rated voltage of the series-connected equipment;		N/A
	• 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		N/A

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Clause	Requirement – Test	Result – Remark	Verdict
	be marked according to 5.1.8.		
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		P
	• overvoltage category		P
	• supply earthing system		P
	• insulation voltage		P
	• location of insulation		P
	• type of insulation		P
	Compliance of insulation, creepage distances, and clearance distances, shall be verified by measurement or visual inspection, and the tests of 7.5.		
7.3.7.1.1	Pollution degree	PD 3 (outside), PD 2 (inside).	P
7.3.7.1.2	Overvoltage category and Impulse withstand voltage rating ..... :		P
	- MAINS circuits	O.V.C III	P
	- PV circuits insulated	O.V.C II	P
	- PV circuits not insulated	No such circuits.	N/A
	- Other circuits	O.V.C II	P
7.3.7.1.3	Supply earthing systems	For TN-S, TN-C, TN-C-S, TT 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		P

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Clause	Requirement – Test	Result – Remark	Verdict
	accessible conductive parts of the installation being connected to earth electrodes electrically independent of the earth electrodes of the power system;		
	• IT system: has all live parts isolated from earth or one point connected to earth through an impedance, the accessible conductive parts of the installation being earthed independently or collectively to the earthing system.		N/A
7.3.7.1.4	Insulation voltages		P
	Table 12 makes use of the circuit system voltage and overvoltage category to define the impulse withstand 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 to the higher r.m.s. working voltage.	P
7.3.7.3	Functional insulation		P
7.3.7.4	Clearance distances	See appended table 7.3.7.4.	P
7.3.7.4.1	Determination		P
7.3.7.4.2	Electric field homogeneity		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 7.3.7.5.	P
7.3.7.5.1	General		P
7.3.7.5.2	Voltage		P
7.3.7.5.3	Materials	Insulating material group IIIb 175 > CTI ≥ 100 assumed if not otherwise specified	P
7.3.7.6	Coating	Not used.	N/A

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Clause	Requirement – Test	Result – Remark	Verdict
7.3.7.7	PWB spacings for functional insulation	Comply with 7.3.7.4 and 7.3.7.5.	N/A
7.3.7.8	Solid insulation		P
7.3.7.8.1	General		P
7.3.7.8.2	Requirements for electrical withstand capability		P
7.3.7.8.2.1	Basic, supplemental, reinforced, and double insulation	Passed the impulse withstand voltage and a.c. or d.c. voltage tests. See appended table 7.5.1, 7.5.2 & 7.5.3. Note: No double or reinforced solid insulation used. No voltage stress on the insulation is greater than 1 kV/mm.	P
7.3.7.8.2.2	Functional insulation		P
7.3.7.8.3	Thin sheet or tape material	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		P
	Basic or supplementary insulation shall consist of at least one layer of material, and shall meet the impulse and a.c. or d.c. voltage test requirements of 7.3.7.8.2.1 for basic or supplementary insulation.	See appended table 7.5.1, 7.5.2 & 7.5.3.	P
	Double insulation shall consist of at least two layers of material. Each layer shall meet the impulse and a.c. or d.c. voltage test requirements of 7.3.7.8.2.1 for basic insulation, and the partial discharge requirements of 7.3.7.8.2.1. The two or more layers together shall meet the impulse and a.c. or d.c. voltage test requirements of 7.3.7.8.2.1 for double insulation.	Not used.	N/A
	Reinforced insulation shall consist of a single layer of material, which will meet the impulse, a.c. or d.c. voltage, and partial discharge test requirements 7.3.7.8.2.1 for reinforced insulation.		P
7.3.7.8.3.3	Material thickness less than 0.2 mm		P
	Basic or supplementary insulation shall consist of at least one layer of material, and shall meet the impulse and a.c. or d.c. voltage test requirements of 7.3.7.8.2.1 for basic or supplementary insulation.	See appended table 7.5.1, 7.5.2 & 7.5.3.	P
	Double insulation shall consist of at least three layers of material. Each layer shall meet the impulse and a.c. or d.c. voltage test requirements		P

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Clause	Requirement – Test	Result – Remark	Verdict
	of 7.3.7.8.2.1 for basic insulation any two layers together shall meet the impulse, a.c. or d.c. voltage, and partial discharge test requirements of 7.3.7.8.2.1 for double insulation.		
	Reinforced insulation consisting of a single layer of material less than 0,2 mm thick is not permitted.		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 (PWBs)		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
	Type 1 protection		N/A
	Type 2 protection		N/A
	Cold test (-25°C) and rapid change of temperature test (-25°C to +125°C)		N/A
7.3.7.8.5	Wound components		P
7.3.7.8.6	Potting materials	No potting materials used.	N/A
7.3.7.9	Insulation requirements above 30 kHz		N/A
7.3.8	Residual Current-operated protective (RCD) or monitoring (RCM) device compatibility		P
	RCD and RCM are used to provide protection against insulation faults in some domestic and industrial installations, additional to that provided by the installed equipment.		P
7.3.9	Capacitor discharge		P
7.3.9.1	Operator access area		P
	Equipment shall be so designed that there is no risk of electric shock in operator access areas from charge stored on capacitors after disconnection of the PCE.	The operator is instructed to the installation shall be performed by qualified technician. The pins of connector cannot be touched by test finger due to the design protection.	P
7.3.9.2	Service access areas		P

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Clause	Requirement – Test	Result – Remark	Verdict
	Capacitors located behind panels that are removable for servicing, installation, or disconnection shall present no risk of electric shock or energy hazard from charge stored on capacitors after disconnection of the PCE.	The warning symbol 21 of Table C.1 and an indication of the discharge time is placed in a clearly visible position on the protective barrier to avoid unconsciousness contact.	P
7.4	Protection against energy hazards		P
7.4.1	Determination of hazardous energy level	There is no risk of energy hazard in operator access areas, protection of electrical shock by means of earthed metal enclosure.	P
	A hazardous energy level is considered to exist if		P
	a) The voltage is 2 V or more, and power available after 60 s exceeds 240 VA.		P
	b) The stored energy in a capacitor is at a voltage. U of 2 V or more, and the stored energy. E, calculated from the following equation, exceeds 20J: $E = 0,5\ CU^2$		P
7.4.2	Operator Access Areas		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
	Energy storage devices located behind panels that are removable for servicing, installation or disconnection shall present no risk of electric energy hazard from charge stored after disconnection of the PCE.		P
	Energy storage devices within a PCE shall be discharged to an energy level less than 20 J, as in 7.4.1, within 10 s after the removal	The warning symbol 21 of Table C.1 and an indication of the discharge time is placed in a clearly visible position on the protective barrier to avoid unconsciousness contact.	P
7.5	Electrical tests related to shock hazard		P
7.5.1	Impulse voltage test (*type test*) The impulse voltage test is performed with a voltage having a 1,2/50 µs waveform (see Figure 6 of IEC 60060-1) and is intended to simulate overvoltages induced by lightning or due	See appended table 7.5.1. During the test no puncture, flashover, or sparkover occurs.	P

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	to switching of equipment. See Table 15 for conditions of the impulse voltage test.		
7.5.2	Voltage Test (dielectric strength test) (type test and routine test)	See below.	P
7.5.2.1	Purpose of test		P
7.5.2.2	Value and type of test voltage The values of the test voltage are determined from column 2 or 3 of Table 17 or Table 18 depending upon whether the circuit under test is mains connected or not mains connected.	See appended table 7.5.2.	P
7.5.2.3	Humidity pre-conditioning		P
7.5.2.4	Performing the voltage test The test shall be applied as follows, according to Figure 13	Refer to appended table 7.5.2.	P
7.5.2.5	Duration of the a.c. or d.c. voltage test The duration of the test shall be at least 60 s for the type test and 1 s for the routine test. The test voltage may be applied with increasing and/or decreasing ramp voltage, and the ramp times are not specified, but regardless of the ramp time, the dwell time at full voltage shall be 60 s and 1 s respectively for type and routine tests.	The full voltage is maintained for 60s.	P
7.5.2.6	Verification of the a .c. or d.c. voltage test	No electrical breakdown occurs during the test.	P
7.5.3	Partial discharge test (type test or sample test)	No double or reinforced solid insulation used. No voltage stress on the insulation is greater than 1 kV/mm.	N/A
7.5.4	Touch current measurement (type test)		P
	The touch current shall be measured if required by 7.3.6.3.7 and shall not be greater than 3.5 mA a.c. or 10 mA d.c. or special measures of protection as given in 7.3.6.3.7 are required.	See appended table 7.5.4.	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		P

8	**PROTECTION AGAINST MECHANICAL HAZARDS**		**P**
8.1	General		P
	Operation shall not lead to a mechanical HAZARD in NORMAL CONDITION or SINGLE FAULT	Edges, projections, corners, openings, guards, handles	P

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	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.	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	Enclosed coolant fan be used.	P
	Moving parts shall not be able to crush, cut or pierce parts of the body of an OPERATOR likely to contact them, nor severely pinch the OPERATOR's skin. Hazardous moving parts of equipment, that is moving parts which have the potential to cause injury, shall be so arranged, enclosed or guarded as to provide adequate protection against the risk of personal injury.	No moving part except system fan, which are not accessible by operator	P
8.2.1	Protection of service persons		P
	Protection shall be provided such that unintentional contact with hazardous moving parts is unlikely during servicing operations. If a guard over a hazardous moving part may need to be removed for servicing, the marking of symbol 15 of Table D-1 shall be applied on or near the guard.	Enclosed fan be used that it unlikely accessible during servicing operations.	P
8.3	Stability	The PCE is intended to be mounted on a wall.	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 more shall be provided with a means for lifting and carrying or directions shall be given in the manufacturer's documentation.		P
8.5	Wall mounting		P
	Mounting brackets on equipment intended to be mounted on a wall or ceiling shall withstand a force of four times the weight of the equipment.		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

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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.		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
	– 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;		N/A
	– components in SECONDARY CIRCUITS supplied by a LIMITED POWER SOURCE as specified in 9.2, but not mounted on a material of FLAMMABILITY CLASS V-1;		N/A
	– components within a power supply unit or assembly having a limited power output 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;		N/A
	– components having unenclosed arcing parts, such as open switch and relay contacts and commutators, in a circuit at HAZARDOUS		P

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	VOLTAGE or at a HAZARDOUS ENERGY LEVEL; and		
	– insulated wiring, except as permitted in 9.1.2.2.		P
9.1.2.2	Parts not requiring a fire enclosure		P
9.1.3	Materials requirements for protection against fire hazard		P
9.1.3.1	General		P
	ENCLOSURES, components and other parts shall be so constructed, or shall make use of such materials, that the propagation of fire is limited.		P
9.1.3.2	Materials for fire enclosures		P
	If an enclosure material is not classified as specified below, a test may be performed on the final enclosure or part of the enclosure, in which case the material shall additionally be subjected to periodic SAMPLE testing.		P
9.1.3.3	Materials for components and other parts outside fire enclosures		P
	Except as otherwise noted below, materials for components and other parts (including MECHANICAL ENCLOSURES, ELECTRICAL ENCLOSURES and DECORATIVE PARTS); located outside FIRE ENCLOSURES, shall be of FLAMMABILITY CLASS HB.		P
9.1.3.4	Materials for components and other parts inside fire enclosures	All electronic components are soldered and mounted on V-0 PCB	P
9.1.3.5	Materials for air filter assemblies		P
9.1.4	Openings in fire enclosures	No openings	N/A
9.1.4.1	General		N/A
	For equipment that is intended to be used or installed in more than one orientation as specified in the product documentation, the following requirements apply in each orientation.		N/A
	These requirements are in addition to those in the following sections:		N/A
	– 7.3.4, Protection against direct contact;		N/A
	– 7.4, Protection against energy hazards;		N/A
	– 13.5, Openings in enclosures		N/A
9.1.4.2	Side openings treated as bottom openings		N/A

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Clause	Requirement – Test	Result – Remark	Verdict
9.1.4.3	Openings in the bottom of a fire enclosure		N/A
	The bottom of a FIRE ENCLOSURE or individual barriers, shall provide protection against emission of flaming or molten material under all internal parts, including partially enclosed components or assemblies, for which Method 2 of 9.1.1 has not been fully applied and complied with.		N/A
9.1.4.4	Equipment for use in a CLOSED ELECTRICAL OPERATING AREA		N/A
	The requirements of 9.1.4.3 do not apply to FIXED EQUIPMENT intended only for use in a CLOSED ELECTRICAL OPERATING AREA and to be mounted on a concrete floor or other non-combustible surface. Such equipment shall be marked as follows:		N/A
	WARNING: FIRE HAZARD SUITABLE FOR MOUNTING ON CONCRETE OR OTHER NON-COMBUSTIBLE SURFACE ONLY		N/A
9.1.4.5	Doors or covers in fire enclosures	Cover can only be opened by authorized person with tools.	P
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.		P
9.3.2	Number and location of overcurrent protective devices		P
	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	Short-circuit co-ordination (backup protection)		P

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Clause	Requirement – Test	Result – Remark	Verdict
	Protective devices provided or specified shall have adequate breaking capacity to interrupt the maximum short circuit current specified for the port to which they are connected. If protection that is provided integral to the PCE for an input port is not rated for the short-circuit current of the circuit in which it is used, the installation instructions shall specify that an upstream protective device, rated for the prospective short-circuit current of that port, shall be used to provide backup protection.	Upstream protective device for backup protection is specified in the installation manual.	P
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.	No hazard sonic pressure observed in test.	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 staorage 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
11.3	Oil and grease		N/A

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Clause	Requirement – Test	Result – Remark	Verdict

12	**CHEMICAL HAZARDS**		**N/A**
12.1	General	No chemical Hazards.	N/A

13	**PHYSICAL REQUIREMENTS**		**P**
13.1	Handles and manual controls		P
	Handles, knobs, grips, levers and the like shall be reliably fixed so that they will not work loose in normal use, if this might result in a hazard. Sealing compounds and the like, other than self-hardening resins, shall not be used to prevent loosening. If handles, knobs and the like are used to indicate the position of switches or similar components, it shall not be possible to fix them in a wrong position if this might result in hazard.		P
13.1.1	Adjustable controls	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 provisons for external connections applied.	P
13.3.2	Connection to an a.c. Mains supply		P
13.3.2.1	General	Terminals provided for permanent connection to the PV supply.	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		P
	– a non-detachable power supply cord for connection to the supply by means of a plug		N/A
	– an appliance inlet for connection of a detachable power supply cord; or		N/A
	– a mains plug that is part of direct plug-in equipment as in 13.3.8		N/A
13.3.2.2	Permanently connected equipment	A set of terminals as specified in 13.3.3 for external connection of supply cords.	P

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Clause	Requirement – Test	Result – Remark	Verdict
13.3.2.3	Appliance inlets		N/A
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		P
13.3.3	Wiring terminals for connection of external conductors		P
13.3.3.1	Wiring terminals	Terminals for power supply cords connection by means of screws.	P
13.3.3.2	Screw terminals	Screws and nuts which clamp external supply conductors have a thread conforming to ISO 261 or ISO 262.	P
13.3.3.3	Wiring terminal sizes	The terminals meet the temperature rise test of 4.3 when connected using wire sizes as specified in the documentation or in Table 24.	P
13.3.3.4	Wiring terminal design	Lug terminals applied, and the cable lug clamped by nut.	P
13.3.3.5	Grouping of wiring terminals	Terminals located in proximity to each other.	P
13.3.3.6	Stranded wire	Lug terminals applied.	P
13.3.4	Supply wiring space	Lug terminals applied, and the cable lug is clamped by nut without the risk of damage to the conductors or their insulation.	P
13.3.5	Wire bending space for wires 10 mm² 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 PV or DC connectors.	P
13.3.8	Direct plug-in equipment	Not direct plug-in use.	N/A

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Clause	Requirement – Test	Result – Remark	Verdict
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	No such interconnections.	N/A
13.5	Openings in enclosures		N/A
13.5.1	Top and side openings		N/A
	Openings in the top and sides of ENCLOSURES shall be so located or constructed that it is unlikely that objects will enter the openings and create hazards by contacting bare conductive parts.	No opening	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 materials provided.	P
13.6.2	Polymers serving as enclosures or barriers preventing access to hazards	The polymeric material only used for LCD display.	P
13.6.2.1	Stress relief test		N/A
13.6.3	Polymers serving as solid insulation	7.3.7.8 considered for insulation sheet and passed.	P
13.6.3.1	Resistance to arcing		N/A
13.6.4	UV resistance	Approved AC/DC connector is provided.	P

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		Anti-UV approved insulation plastic is provided and covers the control panel.	
	Polymeric parts of an OUTDOOR ENCLOSURE required for compliance with this standard shall be sufficiently resistance to degradation by ultra-violet (UV) radiation		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		N/A
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	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
	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		P

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Clause	Requirement – Test	Result – Remark	Verdict
	necessary for the application, any additional applicable safety requirements of the relevant IEC component standard;		
	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 Overtemperature Protection		N/A
	Motors which, when stopped or prevented from starting (see 4.4.4.3), would present an electric shock HAZARD, a temperature HAZARD, or a fire HAZARD, shall be protected by an overtemperature or thermal protection device meeting the requirements of 14.3.		N/A
14.3	Overtemperature protection devices	Approved overtemperature protective devices used and for which appropriate rating was selected for use and do not operate in normal use.	P
14.4	Fuse holders	No such devices.	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-0 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.		P
	Conformity of the flammability RATING is checked by inspection of data on the materials. Alternatively, conformity is checked by performing the V-1 tests specified in IEC 60707 on three samples of the relevant parts.		P

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Clause	Requirement – Test	Result – Remark	Verdict
14.7	Circuits or components used as transient overvoltage limiting devices		P
	If control of transient overvoltage is employed in the equipment, any overvoltage limiting component or circuit shall be tested with the applicable impulse withstand voltage of Table 7-10 using the test method from 7.5.1 except 10 positive and 10 negative impulses are to be applied and may be spaced up to 1 min apart.	No such components.	P
14.8	Batteries		N/A
	Equipment containing batteries shall be designed to reduce the risk of fire, explosion and chemical leaks under normal conditions and after a single fault in the equipment including a fault in circuitry within the equipment battery pack.	Not batteries contained.	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 nonmetallic 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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	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**		**P**
	Firmware or software used in or with PCE, that performs one or more safety functions the failure of which could result in a risk of fire, electric shock or other hazard as specified by this standard, shall be evaluated in accordance with Annex B.	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
A	Annex A, Measurement of clearance and creepage distances (normative)		P
B	Annex B, Programmable Equipment (normative)		P
B.1	Software or Firmware That Perform Safety Critical Functions	Refer to subclause 15.	P
B.1.1	All software or firmware that performs a critical safety function/s, such as protection from excessive temperature, over current or improper synchronization of AC source, where failure of which can result in a risk of fire, electric shock or other hazard as specified by this document, shall be evaluated by one of the following means. a) All software or firmware limit or control shall be disabled before the test to evaluate the hardware circuitry during the abnormal test condition of the safety function, and the hardware sensor component that is monitored by the firmware or software is modified or disabled to prevent the software or		P

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	firmware from reading or responding to the abnormal condition. b) Protection Controls employing software or firmware to perform their function(s), shall be so constructed that they comply with IEC 60730-1 Annex H to address the risks identified in B2.1. Each combination of microprocessor model, manufacturer and firmware/software version used in the production of a PCE shall be evaluated as specified in the remainder of Annex B. Exception: For units with firmware/software that has been found to be compliant with the remainder of Annex B, subsequent firmware/software revisions may be entitled to a limited revaluation for the revised firmware or software. The scope of the re-evaluation shall be defined by the potential impact of the firmware or software revisions and the applicable portions of IEC 60730-1 Annex H shall be re-applied.		
B.2	Evaluation of Controls Employing Software	Refer to subclause 15.	N/A
B.2.1	Risk Analysis		N/A
B.2.1.1	A risk analysis shall be conducted to determine a set of risks and that the software addresses the identified risks. The risk analysis shall be conducted based on the safety requirements for the programmable component.		N/A
B.2.1.3	An analysis shall be conducted to identify the critical, non-critical, and supervisory parts of the software.		N/A
B.2.1.4	An analysis shall be conducted to identify transitions or states that can result in a risk.		N/A
B.2.1.5	Risks to be considered include, but are not limited to function associated with the following: a) Temperature control, monitoring and response (ie. Coolant, internal ambient, device) b) Safety interlocks c) Synchronization between multiple AC sources e) Emergency stop of operation (including staged shutdown/sequencing) f) Connection/Disconnection – from an input source and output source g) RCD functions h) Over current protection or control i) The software must detect a hardware or software malfunction and place the device in a safe state as indicated per the “Risks Addressed State” definition.		N/A

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C.	Annex C, Symbols to be used in Equipment Marking (normative)		P
D.	Annex D, Test Probes for Determining Access (informative)		P
E.	Annex E, RCDs (informative)		N/A
E.1	Selection of RCD type in AC circuits		N/A
F.	Annex F, Altitude correction for clearances (informative)		P
G.	Annex G, Clearance and creepage distance determination for frequencies greater than 30kHz		N/A
G.1	Clearance		N/A
G.2	Creepage distance		N/A
H.	Annex H, Measuring Instrument for Touch Current Measurements		P
H.1	Measuring instrument	Considered.	P
H.2	Alternative measuring instrument	Not used.	N/A
I.	Annex I, Examples of Protection, Insulation, and Overvoltage Category Requirements for PCE		P
I.1	Protection, Insulation and Overvoltage	Considered.	P
I.2	Illustrative examples	Considered.	P
J.	Annex J, Instruction of the ultraviolet light conditioning test		P
J.1	General requirement	Considered	P
J.2	Requirement of mounting of the samples		N/A
J.3	Instruction of the Carbon-arc light-exposure apparatus		N/A
J.4	Instruction of the Xenon-arc light-exposure apparatus		N/A

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4.3	TABLE: Thermal testing		P
	test voltage (V) .....:	See below	—
	t1 (°C) .....:	--	—
	t2 (°C) .....:	--	—

Condition	1	2	3	4	--
Maximum temperature T of part/at:	Measured Tmax (°C)	Measured Tmax (°C)	Measured Tmax (°C)	Measured Tmax (°C)	Max. temper-ature limit (°C)
For model GW6K-DNS-G40.					
Ambient	46.06	46.03	45.10	45.09	--
Y Cap. C103	86.82	83.21	83.09	72.37	110
TVR101	86.28	83.25	83.34	73.07	105
GS100	83.58	82.40	82.55	72.36	85
C108	89.25	85.92	85.56	73.49	105
L101Core	94.47	91.73	89.53	73.75	110
L101Coil	93.24	90.80	88.27	72.30	110
L101Base	91.85	88.57	87.98	73.95	110
C110	84.72	81.78	81.88	70.96	105
HCT101	96.41	93.65	93.06	77.38	125
U404	90.72	87.68	89.94	77.07	110
C414	88.52	85.51	87.63	75.29	110
Q401	90.90	88.02	90.96	82.66	130
PCB near Q401	87.55	84.64	87.01	76.49	130
TX400 core	87.43	84.44	85.96	76.44	110
TX400 coil	87.37	84.35	85.81	75.98	110
C413	88.27	84.46	84.72	75.55	110
C201	85.23	82.18	83.22	72.54	110
U101	93.42	90.42	92.04	75.61	130
C204	84.54	81.43	81.69	72.92	105

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

RY100	83.39	83.16	83.20	73.53	85
U600	90.67	86.99	87.21	77.74	125
U502	90.06	86.79	87.02	77.71	125
TX500 core	88.02	84.88	85.26	75.94	110
TX500 coil	87.77	84.67	85.04	75.65	110
U505	92.16	88.62	88.47	78.98	125
U509	89.95	86.76	86.92	78.10	125
HCT301	98.71	93.31	89.55	88.52	125
C301	83.40	80.97	81.03	73.20	110
C310	83.93	80.92	80.15	74.51	105
RY301	82.61	83.38	83.98	76.62	85
RY303	82.59	82.98	83.00	78.56	85
L300 core	97.00	92.15	88.29	85.90	110
L300 coil	87.34	84.26	83.26	76.50	110
L300 base	96.14	90.93	86.84	86.12	110
C327	84.63	81.76	81.01	74.48	110
L301 core	93.83	89.40	87.25	82.76	110
L301 coil	98.36	92.54	87.48	88.42	110
L301 base	91.19	86.94	85.22	81.45	110
C329	81.23	79.02	79.01	71.20	110
TVR301	87.64	84.32	83.59	76.72	105
C507	85.10	82.15	81.97	74.78	110
C330	86.06	82.90	82.18	75.67	110
C331	82.06	79.29	78.67	72.72	110
GS300	82.36	80.36	79.88	73.83	85
Q102	106.67	105.01	107.15	76.95	130
D102	101.22	98.97	99.77	79.10	130

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

Q203	101.25	97.52	95.78	91.34	130
Q202	101.06	96.36	95.06	88.76	130
C208	85.03	82.80	83.81	72.70	105
BOOST inductance Coil	128.32	129.98	126.85	87.25	130
BOOST inductance Core	127.54	129.07	126.41	86.88	130
INV inductance Coil	125.50	120.71	115.65	112.64	130
INV inductance Core	100.76	101.57	101.57	83.33	130
PCB near AC relay	98.12	92.71	87.95	88.46	130
PCB near IGBT	92.60	89.49	87.47	80.83	130
X cap. C3 on EMC board	80.20	78.80	78.97	68.96	105
Y cap. C1 on EMC board	81.72	80.00	79.82	70.50	125
Metal enclosure-top	53.50	52.27	64.40	49.54	70
Metal enclosure-left	66.71	64.63	63.53	60.24	70
Heatsink	99.48*	95.62*	97.77*	81.11*	100*
AC CONNECTOR	55.91	53.92	52.68	53.85	85
AC power cable	91.63	86.65	84.53	80.81	105
DC SWITCH	82.58	79.85	79.84	69.24	85
LCD PLASCTIC PANEL	59.76	58.05	59.84	54.42	85
Inner Fan	79.96	77.37	78.87	69.17	85
Mounting surface	61.75	59.29	61.81	55.96	90
PV CONNECTOR	59.85	58.81	59.75	52.09	85
PV+ power cable	85.50	83.61	82.92	71.11	105
AFCI current sensor	81.13	79.12	79.34	69.99	105
AFCI PCB BASE	82.75	80.22	80.05	72.70	130
DSP PCB BASE	87.97	85.57	85.60	75.57	130
ARM CHIP U4	87.65	85.16	85.24	76.84	105
DSPU15	93.26	90.79	91.11	81.17	130

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

DSPU17	90.68	88.05	88.18	79.30	130
Note(s): Test condition 1 PV to Grid, MPPT=195V, Grid=198V, 6kW; 45°C ambient, 50Hz. Test condition 2 PV to Grid, MPPT=195V, Grid=230V, 6kW; 45°C ambient, 50Hz. Test condition 3 PV to Grid, MPPT=195V, Grid=264V, 6kW; 45°C ambient, 60Hz. Test condition 4 PV to Grid, MPPT=500V, Grid=198V, 6kW; 45°C ambient, 50Hz. Note*: The parts are marked with the hot surface marking of symbol 14 of Annex C.					

4.3	TABLE: Thermal testing				P
	test voltage (V) .....:	See below			—
	t1 (°C) .....:	--			—
	t2 (°C) .....:	--			—
Condition	5	6	7	8	--
Maximum temperature T of part/at:	Measured T_{max} (°C)	Measured T_{max} (°C)	Measured T_{max} (°C)	Measured T_{max} (°C)	Max. temper-ature limit (°C)
For model GW6K-DNS-G40.					
Ambient	45.21	59.50	60.52	59.28	--
Y Cap. C103	73.03	88.48	85.18	86.96	110
TVR101	73.88	88.86	85.81	87.01	105
GS100	73.18	83.99	83.17	83.54	85
C108	74.58	90.42	86.34	88.78	105
L101Core	74.79	93.25	86.79	91.93	110
L101Coil	73.18	92.09	85.34	90.98	110
L101Base	75.65	92.07	86.79	90.26	110
C110	72.06	87.20	84.10	85.92	105
HCT101	79.43	96.08	90.53	94.08	125
U404	79.69	93.43	90.81	91.15	110
C414	77.65	91.39	88.87	89.19	110
Q401	84.94	94.52	96.54	93.46	130
PCB near Q401	78.73	91.12	90.23	89.18	130

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

TX400 core	77.93	90.95	89.64	89.08	110
TX400 coil	77.41	90.84	89.15	88.78	110
C413	76.29	90.32	88.01	88.01	110
C201	74.14	88.38	85.69	85.99	110
U101	79.79	95.17	89.09	92.65	130
C204	73.42	87.65	85.35	85.23	105
RY100	73.99	79.45	83.25	79.48	85
U600	78.36	92.91	90.19	90.41	125
U502	78.32	92.72	90.08	90.22	125
TX500 core	76.56	90.91	88.39	88.42	110
TX500 coil	76.34	90.66	88.13	88.16	110
U505	79.56	93.95	91.11	90.81	125
U509	78.35	92.69	90.18	89.01	125
HCT301	82.92	98.52	95.07	91.66	125
C301	73.00	87.70	85.14	84.71	110
C310	73.22	87.60	85.43	84.62	105
RY301	76.32	79.90	83.03	80.13	85
RY303	77.74	79.59	82.53	79.35	85
L300 core	81.27	96.99	93.05	90.64	110
L300 coil	76.24	90.37	87.90	86.90	110
L300 base	80.54	96.24	92.63	89.53	110
C327	73.91	88.17	85.83	84.89	110
L301 core	79.49	94.73	91.49	89.73	110
L301 coil	83.74	97.49	95.82	90.96	110
L301 base	77.11	92.66	89.41	88.04	110
C329	71.48	85.84	83.67	83.49	110
TVR301	75.78	90.30	87.79	86.90	105

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Clause	Requirement – Test	Result – Remark	Verdict

C507	74.24	88.52	86.30	85.69	110
C330	75.10	89.13	87.22	85.97	110
C331	71.91	86.06	84.13	83.23	110
GS300	73.29	83.13	83.68	83.46	85
Q102	87.51	105.40	91.64	101.91	130
D102	85.14	100.99	93.05	97.12	130
Q203	88.42	101.76	100.10	94.07	130
Q202	87.85	101.08	99.74	95.86	130
C208	74.61	88.81	86.09	86.61	105
BOOST inductance Coil	83.18	117.81	94.18	122.97	130
BOOST inductance Core	83.42	117.41	94.46	123.14	130
INV inductance Coil	98.01	119.26	109.87	111.09	130
INV inductance Core	81.89	101.32	91.89	100.71	130
PCB near AC relay	81.42	97.82	93.48	90.27	130
PCB near IGBT	78.92	93.20	90.72	89.87	130
X cap. C3 on EMC board	69.67	84.72	82.04	83.79	105
Y cap. C1 on EMC board	71.05	86.16	83.41	84.44	125
Metal enclosure-top	59.79	66.13	72.96*	70.38*	100*
Metal enclosure-left	59.67	73.45*	73.15*	71.87*	100*
Heatsink	85.59*	99.66*	94.48*	95.37*	100*
AC CONNECTOR	52.07	65.85	67.18	64.62	85
AC power cable	77.41	92.42	89.66	87.80	105
DC SWITCH	69.96	83.33	82.44	80.20	85
LCD PLASCTIC PANEL	56.64	69.23	70.58	69.39	85
Inner Fan	70.90	80.21	82.90	78.94	85
Mounting surface	57.06	71.63	70.91	68.11	90
PV CONNECTOR	53.94	68.84	68.59	72.82	85

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Clause	Requirement – Test	Result – Remark	Verdict

PV+ power cable	72.00	88.09	84.12	86.81	105
AFCI current sensor	70.78	85.42	83.07	83.92	105
AFCI PCB BASE	72.52	86.88	84.61	84.34	130
DSP PCB BASE	76.28	91.22	88.00	88.91	130
ARM CHIP U4	77.07	91.86	89.41	89.51	105
DSPU15	81.94	96.61	93.55	94.27	130
DSPU17	79.62	94.13	91.47	91.53	130
Note(s): Test condition 5 PV to Grid, MPPT=500V, Grid=264V, 6kW, 45°C ambient, 60Hz. Test condition 6 PV to Grid, MPPT=195V, Grid=198V, $P_{degrated}$, 60°C ambient, 50Hz. Test condition 7 PV to Grid, MPPT=500V, Grid=264V, $P_{degrated}$, 60°C ambient, 60Hz. Test condition 8 PV to Grid, MPPT=195V, Grid=264V, $P_{overload}$, 60°C ambient, 50Hz. Note*: The parts are marked with the hot surface marking of symbol 14 of Annex C.					

4.3	TABLE: Thermal testing				P
	test voltage (V) .....:		See below		—
	t1 (°C) .....:		--		—
	t2 (°C) .....:		--		—
Condition	9	--	--	--	--
Maximum temperature T of part/at:	Measured T_{max} (°C)	Measured T_{max} (°C)	Measured T_{max} (°C)	Measured T_{max} (°C)	Max. temper-ature limit (°C)
For model GW6K-DNS-G40.					
Ambient	59.63	--	--	--	--
Y Cap. C103	89.00	--	--	--	110
TVR101	87.74	--	--	--	105
GS100	83.46	--	--	--	85
C108	92.40	--	--	--	105
L101Core	99.14	--	--	--	110
L101Coil	98.12	--	--	--	110
L101Base	96.35	--	--	--	110

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Clause	Requirement – Test	Result – Remark	Verdict

C110	93.61	--	--	--	105
HCT101	103.98	--	--	--	125
U404	107.70	--	--	--	110
C414	105.44	--	--	--	110
Q401	114.88	--	--	--	130
PCB near Q401	110.26	--	--	--	130
TX400 core	109.27	--	--	--	110
TX400 coil	109.91	--	--	--	110
C413	85.43	--	--	--	110
C201	102.07	--	--	--	110
U101	107.19	--	--	--	130
C204	97.56	--	--	--	105
RY100	83.12	--	--	--	85
U600	92.10	--	--	--	125
U502	91.67	--	--	--	125
TX500 core	87.12	--	--	--	110
TX500 coil	86.57	--	--	--	110
U505	99.77	--	--	--	125
U509	104.11	--	--	--	125
HCT301	113.65	--	--	--	125
C301	100.65	--	--	--	110
C310	88.73	--	--	--	105
RY301	83.03	--	--	--	85
RY303	83.17	--	--	--	85
L300 core	108.21	--	--	--	110
L300 coil	99.88	--	--	--	110
L300 base	107.06	--	--	--	110

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Clause	Requirement – Test	Result – Remark	Verdict

C327	95.82	--	--	--	110
L301 core	106.39	--	--	--	110
L301 coil	104.22	--	--	--	110
L301 base	96.26	--	--	--	110
C329	96.18	--	--	--	110
TVR301	89.64	--	--	--	105
C507	83.56	--	--	--	110
C330	84.59	--	--	--	110
C331	84.05	--	--	--	110
GS300	83.06	--	--	--	85
Q102	112.19	--	--	--	130
D102	107.26	--	--	--	130
Q203	109.44	--	--	--	130
Q202	103.34	--	--	--	130
C208	98.21	--	--	--	105
BOOST inductance Coil	110.64	--	--	--	130
BOOST inductance Core	110.30	--	--	--	130
INV inductance Coil	112.98	--	--	--	130
INV inductance Core	98.53	--	--	--	130
PCB near AC relay	109.88	--	--	--	130
PCB near IGBT	94.69	--	--	--	130
X cap. C3 on EMC board	78.46	--	--	--	105
Y cap. C1 on EMC board	80.21	--	--	--	125
Metal enclosure-top	74.32*	--	--	--	100*
Metal enclosure-left	71.39*	--	--	--	100*
Heatsink	99.87*	--	--	--	100*
AC CONNECTOR	63.61	--	--	--	85

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Clause	Requirement – Test	Result – Remark	Verdict

AC power cable	92.21	--	--	--	105
DC SWITCH	81.97	--	--	--	85
LCD PLASCTIC PANEL	65.44	--	--	--	85
Inner Fan	83.31	--	--	--	85
Mounting surface	68.78	--	--	--	90
PV CONNECTOR	67.06	--	--	--	85
PV+ power cable	90.56	--	--	--	105
AFCI current sensor	84.80	--	--	--	105
AFCI PCB BASE	82.03	--	--	--	130
DSP PCB BASE	92.40	--	--	--	130
ARM CHIP U4	90.23	--	--	--	105
DSPU15	99.68	--	--	--	130
DSPU17	97.03	--	--	--	130
Note(s): Test condition 9 PV to Grid, MPPT=500V, Grid=198V, 6kW, 60°C ambient, 50Hz, fan locked Note*: The parts are marked with the hot surface marking of symbol 14 of Annex C.					

4.3	TABLE: Thermal testing				P
	test voltage (V) .....:	See below			—
	t1 (°C) .....:	--			—
	t2 (°C) .....:	--			—
Condition	11	12	13	14	--
Maximum temperature T of part/at:	Measured T_{max} (°C)	Measured T_{max} (°C)	Measured T_{max} (°C)	Measured T_{max} (°C)	Max. temper-ature limit (°C)
For model GW3.6K-DNS-G40					
Ambient	45.45	44.64	60.69	59.74	--
Y Cap. C103	80.31	59.27	87.15	74.75	110
TVR101	78.39	59.02	85.63	74.58	105
GS100	76.43	58.46	83.40	74.02	85

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Clause	Requirement – Test	Result – Remark	Verdict

C108	84.78	60.25	90.48	76.20	105
L101Core	94.58	63.10	98.00	79.29	110
L101Coil	94.09	62.01	97.34	77.94	110
L101Base	89.37	62.27	94.22	79.36	110
C110	85.33	61.86	90.86	78.37	105
HCT101	97.68	68.37	101.55	85.88	125
U404	98.99	75.87	103.95	92.76	110
C414	96.75	73.75	101.73	90.52	110
Q401	105.71	90.34	110.89	107.00	130
PCB near Q401	101.35	82.84	106.39	99.53	130
TX400 core	99.82	79.18	105.05	96.20	110
TX400 coil	100.39	79.33	105.67	96.65	110
C413	73.48	60.16	82.69	76.06	110
C201	92.01	65.35	97.10	85.33	110
U101	99.22	67.63	103.87	89.47	130
C204	84.45	64.09	89.05	81.77	105
RY100	76.31	59.53	82.06	74.06	85
U600	80.43	65.33	89.13	81.21	125
U502	79.84	65.27	88.55	81.13	125
TX500 core	74.26	62.73	83.94	78.43	110
TX500 coil	73.77	62.45	83.39	78.16	110
U505	85.38	68.68	92.59	85.77	125
U509	89.77	69.58	95.89	87.76	125
HCT301	92.63	74.93	98.82	92.10	125
C301	82.25	66.98	90.76	84.65	110
C310	72.08	60.66	80.96	76.79	105
RY301	78.47	76.05	82.93	79.74	85

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Clause	Requirement – Test	Result – Remark	Verdict

RY303	77.56	73.15	82.88	79.05	85
L300 core	87.13	71.98	93.55	87.60	110
L300 coil	80.83	65.89	88.49	83.13	110
L300 base	86.08	70.54	92.82	86.74	110
C327	77.83	64.09	85.92	80.64	110
L301 core	85.18	69.97	91.78	86.10	110
L301 coil	83.03	66.15	89.71	84.24	110
L301 base	77.57	65.72	85.55	81.01	110
C329	78.50	64.64	87.10	82.09	110
TVR301	72.81	61.34	81.92	77.23	105
C507	68.97	58.76	79.23	74.85	110
C330	69.11	58.49	79.29	74.90	110
C331	69.17	58.34	79.00	74.57	110
GS300	70.26	58.97	80.07	75.40	85
Q102	108.59	64.56	110.86	89.14	130
D102	99.21	65.94	103.07	87.81	130
Q203	92.51	72.51	98.94	91.35	130
Q202	87.68	69.94	94.48	87.31	130
C208	85.90	63.97	92.20	83.05	105
BOOST inductance Coil	103.03	64.34	105.38	79.65	130
BOOST inductance Core	102.27	64.20	105.01	79.38	130
INV inductance Coil	97.99	71.90	101.02	87.09	130
INV inductance Core	88.59	62.95	93.71	79.36	130
PCB near AC relay	88.05	71.74	94.49	88.21	130
PCB near IGBT	80.36	65.85	88.70	82.54	130
X cap. C3 on EMC board	69.95	54.31	77.59	68.79	105
Y cap. C1 on EMC board	71.76	55.01	79.41	70.11	125

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Clause	Requirement – Test	Result – Remark	Verdict

Metal enclosure-top	58.33	50.68	72.96*	69.64	100*
Metal enclosure-left	55.60	49.98	69.80	67.76	70
Heatsink	90.09*	64.61	95.57*	83.58*	100*
AC CONNECTOR	49.41	47.11	62.34	63.12	85
AC power cable	74.28	62.36	83.09	78.44	105
DC SWITCH	74.31	56.70	81.93	71.16	85
LCD PLASCTIC PANEL	53.30	48.83	64.80	64.83	85
Inner Fan	76.61	59.52	83.34	76.57	85
Mounting surface	58.18	50.69	68.33	66.90	90
PV CONNECTOR	56.40	47.43	68.61	63.11	85
PV+ power cable	83.23	59.17	89.24	75.08	105
AFCI current sensor	75.38	56.96	83.00	72.74	105
AFCI PCB BASE	68.60	57.78	78.37	73.90	130
DSP PCB BASE	82.23	64.99	89.73	80.63	130
ARM CHIP U4	78.04	64.84	87.15	80.87	105
DSPU15	88.48	72.05	96.22	87.86	130
DSPU17	83.69	70.33	92.14	86.22	130

Note(s): For model GW3.6K-DNS-G40 without inner fan.

Test condition 11 PV to Grid, MPPT=120V, Grid=196V, 3.6kW, 45°C ambient, 50Hz

Test condition 12 PV to Grid, MPPT=500V, Grid=264V, 3.6kW, 45°C ambient, 60Hz

Test condition 13 PV to Grid, MPPT=120V, Grid=264V, Pderated, 60°C ambient, 60Hz

Test condition 14 PV to Grid, MPPT=500V, Grid=264V, Pderated, 60°C ambient, 60Hz

Note*: The parts are marked with the hot surface marking of symbol 14 of Annex C.

4.4	TABLE: fault condition tests							
	test voltage (V) ..... :						See below	P
	Ambient temperature (°C) ..... :						25°C	
No.	component No.	fault	test voltage (V)	test time	fuse No.	fuse current (A)	result	

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Clause	Requirement – Test	Result – Remark	Verdict

1.	PCE input PV	Reversed	DC 500	10min	--	--	Before fault: DC Input: 500Vdc / 12.5A / 6.25kW AC Output: 230Vac / 26.1A / 6kW After fault: DC Input: 0Vdc / 0A / 0W AC Output: 230Vac / 0A / 0kW FID: Can not open the PCE MT: N/A SD: ☒ Yes /☐ No, GD: ☒ Yes /☐ No RO: ☒ Yes /☐ No, NCD: ☒ Yes /☐ No NH: ☒ Pass / ☐ Fail. DST: ☒ Pass / ☐ Fail.
2.	PCE input PV	s-c	DC 500	10min	--	--	Before fault: DC Input: 500Vdc / 12.5A / 6.25kW AC Output: 230Vac / 26.1A / 6kW After fault: DC Input: 0Vdc / 0A / 0W AC Output: 230Vac / 0A / 0kW FID: Can not open the PCE MT: N/A SD: ☒ Yes /☐ No, GD: ☒ Yes /☐ No RO: ☒ Yes /☐ No, NCD: ☒ Yes /☐ No NH: ☒ Pass / ☐ Fail. DST: ☒ Pass / ☐ Fail.

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3.	PCE output	L & N mis-wiring grid connection	DC360	10min.	--	--	Before fault: DC Input: 360Vdc / 17.36A / 6.25kW AC Output: 230Vac / 26.1A / 6kW After fault: DC Input: 360Vdc / 0A / 0W AC Output: 230Vac / 0A / 0kW FID: Red light on, PCE shut down. MT: N/A SD: ☒ Yes /☐ No, GD: ☒ Yes /☐ No RO: ☒ Yes /☐ No, NCD: ☒ Yes /☐ No NH: ☒ Pass / ☐ Fail. DST: ☒ Pass / ☐ Fail.
4.	PCE output	Phase sequence or polarity incorrect	DC360	10min.	--	--	Before fault: DC Input: 360Vdc / 17.36A / 6.25kW AC Output: 230Vac / 26.1A / 6kW After fault: DC Input: 360Vdc / 17.36A / 6.25kW AC Output: 230Vac / 26.1A / 6kW FID: normal working MT: N/A SD: ☐ Yes /☒ No, GD: ☐ Yes /☒ No RO: ☒ Yes /☐ No, NCD: ☒ Yes /☐ No NH: ☒ Pass / ☐ Fail. DST: ☒ Pass / ☐ Fail.

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5.	PCE output	A-Phase mis-wiring grid connection (open phase)	DC360	10min.	--	--	Before fault: DC Input: 360Vdc / 17.36A / 6.25kW AC Output: 230Vac / 26.1A / 6kW After fault: DC Input: 360Vdc / 0A / 0kW AC Output: 230Vac / 0A / 0kW FID: Red light on, PCE shut down. MT: N/A SD: ☒ Yes /☐ No, GD: ☒ Yes /☐ No RO: ☒ Yes /☐ No, NCD: ☒ Yes /☐ No NH: ☒ Pass / ☐ Fail. DST: ☒ Pass / ☐ Fail.
6.	PCE input PV	Over-voltage	DC 600	10min	--	--	Before fault: DC Input: 600Vdc / 0A / 0kW AC Output: 230Vac / 0A / 0kW After fault: DC Input: 600Vdc / 0A / 0kW AC Output: 230Vac / 0A / 0kW FID: Red light on, PCE shut down. Indicate" PV over voltage" fault. MT: N/A SD: ☒ Yes /☐ No, GD: ☒ Yes /☐ No RO: ☒ Yes /☐ No, NCD: ☒ Yes /☐ No NH: ☒ Pass / ☐ Fail. DST: ☒ Pass / ☐ Fail.

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7.	PCE input (only for multi-string)	Different input MPP1: low input MPP2: high input	MPPT1: 500V MPPT2: 210V	10min.	--	--	Before fault: DC Input1: 360Vdc / 8.68A / 3.12kW DC Input2: 360Vdc / 8.68A / 3.12kW AC Output: 230Vac / 26.1A / 6kW After fault: DC Input1: 210Vdc / 10A / 2.1kW DC Input2: 500Vdc / 6.3A / 3.15kW AC Output: 230Vac / 23.8A / 5.47kW FID: normal working MT: N/A SD: ☐ Yes /☒ No, GD: ☐ Yes /☒ No RO: ☒ Yes /☐ No, NCD: ☒ Yes /☐ No NH: ☒ Pass / ☐ Fail. DST: ☒ Pass / ☐ Fail.
8.	PCE input (only for multi-string)	Same input (MPP1 & MPP2 from same power source)	DC360	10min.	--	--	Before fault: DC Input: 360Vdc / 17.36A / 6.25kW AC Output: 230Vac / 26.1A / 6kW After fault: DC Input: 360Vdc / 17.36A / 6.25kW AC Output: 230Vac / 26.1A / 6kW FID: normal working MT: N/A SD: ☐ Yes /☒ No, GD: ☐ Yes /☒ No RO: ☒ Yes /☐ No, NCD: ☒ Yes /☐ No NH: ☒ Pass / ☐ Fail. DST: ☒ Pass / ☐ Fail.

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9.	PCE output	Power over-feed (OCP &function controlled by DSP / software is disable)	DC360	10min.	--	--	Before fault: DC Input: 360Vdc / 17.36A / 6.25kW AC Output: 230Vac / 26.1A / 6kW After fault: DC Input: 360Vdc / 17.36A / 6.25kW AC Output: 230Vac / 26.1A / 6kW FID: normal working MT: N/A SD: ☐ Yes /☒ No, GD: ☐ Yes /☒No RO: ☒ Yes /☐ No, NCD: ☒ Yes /☐ No NH: ☒ Pass / ☐ Fail. DST: ☒ Pass / ☐ Fail.
10.	PCE output	Over-voltage (OVP function controlled by DSP / software is disable)	DC360	10min.	--	--	Before fault: DC Input: 360Vdc / 17.36A / 6.25kW AC Output: 230Vac / 26.1A / 6kW After fault: DC Input: 360Vdc / 0A / 0kW AC Output: 264Vac / 0A / 0kW FID: Red light on, PCE shut down. MT: N/A SD: ☒ Yes /☐ No, GD: ☒ Yes /☐ No RO: ☒ Yes /☐ No, NCD: ☒ Yes /☐ No NH: ☒ Pass / ☐ Fail. DST: ☒ Pass / ☐ Fail.
11.	PCE output	s-c	DC360	10min	--	--	Before fault: DC Input: 360Vdc / 17.36A / 6.25kW AC Output: 230Vac / 26.1A / 6kW After fault: DC Input: 360Vdc / 0A / 0kW AC Output: 0Vac / 0A / 0kW FID: Red light on, PCE shut down. MT: N/A SD: ☒ Yes /☐ No, GD: ☒ Yes /☐ No RO: ☒ Yes /☐ No, NCD: ☒ Yes /☐ No NH: ☒ Pass / ☐ Fail. DST: ☒ Pass / ☐ Fail.

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12.	PCE Cooling system failure	Fan locked	DC360	10min.	--	--	Before fault: DC Input: 360Vdc / 17.36A / 6.25kW AC Output: 230Vac / 26.1A / 6kW After fault: DC Input: 360Vdc / 17.36A / 6.25kW AC Output: 230Vac / 26.1A / 6kW FID: normal working MT: N/A SD: ☐ Yes /☒ No, GD: ☐ Yes /☒ No RO: ☒ Yes /☐ No, NCD: ☒ Yes /☐ No NH: ☒ Pass / ☐ Fail. DST: ☒ Pass / ☐ Fail.
13.	PCE backfeed current	MPPT 1 connected MPPT 2 shorted at input port Measure backfeed current on mppt 2 input port	DC360	10min.	--	--	Before fault: DC Input1: 360Vdc / 8.68A / 3.12kW DC Input2: 360Vdc / 8.68A / 3.12kW AC Output: 230Vac / 26.1A / 6kW After fault: DC Input1: 360Vdc / 8.68A / 3.12kW DC Input2: 0Vdc / 0A / 0kW AC Output: 230Vac / 13.18A / 3.03kW FID: MPPT2 Overcurrent MT: N/A SD: ☐ Yes /☒ No, GD: ☐Yes /☒ No RO: ☒ Yes /☐ No, NCD: ☒ Yes /☐ No NH: ☒ Pass / ☐ Fail. DST: ☒ Pass / ☐ Fail.

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14.	PCE backfeed voltage	MPPT 1 connected MPPT 2 disconnected (open-circuit) Measure backfeed voltage on mppt 2 input port	DC360	10min.	--	--	Before fault: DC Input1: 360Vdc / 8.68A / 3.12kW DC Input2: 0Vdc / 0A / 0kW AC Output: 230Vac / 13.18A / 3.03kW After fault: DC Input1: 360Vdc / 8.68A / 3.12kW DC Input2: 0Vdc / 0A / 0kW AC Output: 230Vac / 13.18A / 3.03kW FID: normal working MT: N/A SD: ☐ Yes /☒ No, GD: ☐Yes /☒ No RO: ☒ Yes /☐ No, NCD: ☒ Yes /☐ No NH: ☒ Pass / ☐ Fail. DST: ☒ Pass / ☐ Fail.
MCU or DPS processer failure							
15.	DSP failure (U15)	+3.3V power supply disable (s-c)	DC360	10min.	--	--	Before fault: DC Input: 360Vdc / 17.36A / 6.25kW AC Output: 230Vac / 26.1A / 6kW After fault: DC Input: 360Vdc / 0A / 0kW AC Output: 230Vac / 0A / 0kW FID: Red light on, stop MT: N/A SD: ☒ Yes /☐ No, GD: ☒ Yes /☐ No RO: ☒ Yes /☐ No, NCD: ☒ Yes /☐ No NH: ☒ Pass / ☐ Fail. DST: ☒ Pass / ☐ Fail.

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16.	DSP failure (U15)	Reset (s-c)	DC360	10min.	--	--	Before fault: DC Input: 360Vdc / 17.36A / 6.25kW AC Output: 230Vac / 26.1A / 6kW After fault: DC Input: 360Vdc / 0A / 0kW AC Output: 230Vac / 0A / 0kW FID: Red light on, stop MT: N/A SD: ☒ Yes /☐ No, GD: ☒ Yes /☐ No RO: ☒ Yes /☐ No, NCD: ☒ Yes /☐ No NH: ☒ Pass / ☐ Fail. DST: ☒ Pass / ☐ Fail.
17.	Slave DSP failure (U17)	+3.3V power supply disable (s-c)	DC360	10min.	--	--	Before fault: DC Input: 360Vdc / 17.36A / 6.25kW AC Output: 230Vac / 26.1A / 6kW After fault: DC Input: 360Vdc / 0A / 0kW AC Output: 230Vac / 0A / 0kW FID: Red light on, stop MT: N/A SD: ☒ Yes /☐ No, GD: ☒ Yes /☐ No RO: ☒ Yes /☐ No, NCD: ☒ Yes /☐ No NH: ☒ Pass / ☐ Fail. DST: ☒ Pass / ☐ Fail.

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18.	Slave DSP failure (U17)	Reset (s-c)	DC360	10min.	--	--	Before fault: DC Input: 360Vdc / 17.36A / 6.25kW AC Output: 230Vac / 26.1A / 6kW After fault: DC Input: 360Vdc / 0A / 0kW AC Output: 230Vac / 0A / 0kW FID: Red light on, stop MT: N/A SD: ☒ Yes /☐ No, GD: ☒ Yes /☐ No RO: ☒ Yes /☐ No, NCD: ☒ Yes /☐ No NH: ☒ Pass / ☐ Fail. DST: ☒ Pass / ☐ Fail.
19.	ARM failure (U303)	+3.3V power supply disable (s-c)	DC360	10min	--	--	Before fault: DC Input: 360Vdc / 17.36A / 6.25kW AC Output: 230Vac / 26.1A / 6kW After fault: DC Input: 360Vdc / 0A / 0kW AC Output: 230Vac / 0A / 0kW FID: Black screen, stop MT: N/A SD: ☒ Yes /☐ No, GD: ☒ Yes /☐ No RO: ☒ Yes /☐ No, NCD: ☒ Yes /☐ No NH: ☒ Pass / ☐ Fail. DST: ☒ Pass / ☐ Fail

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20.	ARM failure (U303)	Reset (s-c)	DC360	10min	--	--	Before fault: DC Input: 360Vdc / 17.36A / 6.25kW AC Output: 230Vac / 26.1A / 6kW After fault: DC Input: 360Vdc / 0A / 0kW AC Output: 230Vac / 0A / 0kW FID: Red light on, stop MT: N/A SD: ☒ Yes /☐ No, GD: ☒ Yes /☐ No RO: ☒ Yes /☐ No, NCD: ☒ Yes /☐ No NH: ☒ Pass / ☐ Fail. DST: ☒ Pass / ☐ Fail
Loss of control & Function check fault							
21.	Boost IGBT PMW driver (Q101)	No driver power (o-c)	DC360	10min.	--	--	Before fault: DC Input: 360Vdc / 17.36A / 6.25kW AC Output: 230Vac / 26.1A / 6kW After fault: DC Input: 360Vdc / 17.36A / 6.25kW AC Output: 230Vac / 26.1A / 6kW FID: normal working MT: N/A SD: ☐ Yes /☒ No, GD: ☐ Yes /☒ No RO: ☒ Yes /☐ No, NCD: ☒ Yes /☐ No NH: ☒ Pass / ☐ Fail. DST: ☒ Pass / ☐ Fail.

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22.	Boost IGBT PMW driver (Q102)	No driver signal (o-c)	DC360	10min.	--	--	Before fault: DC Input: 360Vdc / 17.36A / 6.25kW AC Output: 230Vac / 26.1A / 6kW After fault: DC Input: 360Vdc / 17.36A / 6.25kW AC Output: 230Vac / 26.1A / 6kW FID: normal working MT: N/A SD: ☒ Yes /☐ No, GD: ☒ Yes /☐ No RO: ☒ Yes /☐ No, NCD: ☒ Yes /☐ No NH: ☒ Pass / ☐ Fail. DST: ☒ Pass / ☐ Fail.
23.	INV IGBT PMW driver (Q201)	No driver power (s-c)	DC360	10min.	--	--	Before fault: DC Input: 360Vdc / 17.36A / 6.25kW AC Output: 230Vac / 26.1A / 6kW After fault: DC Input: 360Vdc / 0A / 0kW AC Output: 230Vac / 0A / 0kW FID: Red light on, stop, can't work MT: N/A SD: ☒ Yes /☐ No, GD: ☒ Yes /☐ No RO: ☒ Yes /☐ No, NCD: ☒ Yes /☐ No NH: ☒ Pass / ☐ Fail. DST: ☒ Pass / ☐ Fail.

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24.	INV IGBT PMW driver (Q202)	No driver signal (s-c)	DC360	10min.	--	--	Before fault: DC Input: 360Vdc / 17.36A / 6.25kW AC Output: 230Vac / 26.1A / 6kW After fault: DC Input: 360Vdc / 0A / 0kW AC Output: 230Vac / 0A / 0kW FID: Red light on, stop, can't work MT: N/A SD: ☒ Yes /☐ No, GD: ☒ Yes /☐ No RO: ☒ Yes /☐ No, NCD: ☒ Yes /☐ No NH: ☒ Pass / ☐ Fail. DST: ☒ Pass / ☐ Fail.
25.	PV/DC Voltage detector (PCBA1 C12)	Loss / failure (s-c)	DC360	10min.	--	--	Before fault: DC Input1: 360Vdc / 8.68A / 3.12kW DC Input2: 360Vdc / 8.68A / 3.12kW AC Output: 230Vac / 26.1A / 6kW After fault: DC Input1: 360Vdc / 8.68A / 3.12kW DC Input2: 0Vdc / 0A / 0kW AC Output: 230Vac / 13.18A / 3.03kW FID: normal working MT: N/A SD: ☐ Yes /☒ No, GD: ☐Yes /☒ No RO: ☒ Yes /☐ No, NCD: ☒ Yes /☐ No NH: ☒ Pass / ☐ Fail. DST: ☒ Pass / ☐ Fail.

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26.	PV current detector (HCT102)	Loss / failure (s-c)	DC360	10min.	--	--	Before fault: DC Input1: 360Vdc / 8.68A / 3.12kW DC Input2: 360Vdc / 8.68A / 3.12kW AC Output: 230Vac / 26.1A / 6kW After fault: DC Input1: 360Vdc / 8.68A / 3.12kW DC Input2: 0Vdc / 0A / 0kW AC Output: 230Vac / 13.18A / 3.03kW FID: normal working MT: N/A SD: ☐ Yes /☒ No, GD: ☐Yes /☒ No RO: ☒ Yes /☐ No, NCD: ☒ Yes /☐ No NH: ☒ Pass / ☐ Fail. DST: ☒ Pass / ☐ Fail.
27.	BUS Voltage detector (PCBA1 C36)	Loss / failure (s-c)	DC360	10min.	--	--	Before fault: DC Input: 360Vdc / 17.36A / 6.25kW AC Output: 230Vac / 26.1A / 6kW After fault: DC Input: 360Vdc / 0A / 0kW AC Output: 230Vac / 0A / 0kW FID: Red light on, stop, can't work MT: N/A SD: ☒ Yes /☐ No, GD: ☒ Yes /☐ No RO: ☒ Yes /☐ No, NCD: ☒ Yes /☐ No NH: ☒ Pass / ☐ Fail. DST: ☒ Pass / ☐ Fail.

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28.	Inverter current detector (HCT301)	Loss / failure (s-c)	DC360	10min.	--	--	Before fault: DC Input: 360Vdc / 17.36A / 6.25kW AC Output: 230Vac / 26.1A / 6kW After fault: DC Input: 360Vdc / 0A / 0kW AC Output: 230Vac / 0A / 0kW FID: Red light on, stop, can't work MT: N/A SD: ☒ Yes /☐ No, GD: ☒ Yes /☐ No RO: ☒ Yes /☐ No, NCD: ☒ Yes /☐ No NH: ☒ Pass / ☐ Fail. DST: ☒ Pass / ☐ Fail.
29.	Inverter Voltage detector (PCBA1 C50)	Loss / failure (s-c)	DC360	10min.	--	--	Before fault: DC Input: 360Vdc / 17.36A / 6.25kW AC Output: 230Vac / 26.1A / 6kW After fault: DC Input: 360Vdc / 0A / 0kW AC Output: 230Vac / 0A / 0kW FID: Red light on, stop, can't work MT: N/A SD: ☒ Yes /☐ No, GD: ☒ Yes /☐ No RO: ☒ Yes /☐ No, NCD: ☒ Yes /☐ No NH: ☒ Pass / ☐ Fail. DST: ☒ Pass / ☐ Fail.

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30.	Grid/voltage detector (PCBA1 C55)	Loss / failure (s-c)	DC360	10min.	--	--	Before fault: DC Input: 360Vdc / 17.36A / 6.25kW AC Output: 230Vac / 26.1A / 6kW After fault: DC Input: 360Vdc / 0A / 0kW AC Output: 230Vac / 0A / 0kW FID: Red light on, stop, can't work MT: N/A SD: ☒ Yes /☐ No, GD: ☒ Yes /☐ No RO: ☒ Yes /☐ No, NCD: ☒ Yes /☐ No NH: ☒ Pass / ☐ Fail. DST: ☒ Pass / ☐ Fail.
31.	PV insulation resistance monitoring function check (PCBA1 C13)	Loss / failure (s-c)	DC360	10min.	--	--	Before fault: DC Input: 360Vdc / 0A / 0kW AC Output: 230Vac / 0A / 0kW After fault: DC Input: 360Vdc / 0A / 0kW AC Output: 230Vac / 0A / 0kW FID: Red light on, stop, can't work MT: N/A SD: ☒ Yes /☐ No, GD: ☒ Yes /☐ No RO: ☒ Yes /☐ No, NCD: ☒ Yes /☐ No NH: ☒ Pass / ☐ Fail. DST: ☒ Pass / ☐ Fail.

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32.	RCD/RCM function check (PCBA1 C83)	Loss / failure (s-c)	DC360	10min.	--	--	Before fault: DC Input: 360Vdc / 17.36A / 6.25kW AC Output: 230Vac / 26.1A / 6kW After fault: DC Input: 360Vdc / 0A / 0kW AC Output: 230Vac / 0A / 0kW FID: Red light on, GFCI Fault MT: N/A SD: ☒ Yes /☐ No, GD: ☒ Yes /☐ No RO: ☒ Yes /☐ No, NCD: ☒ Yes /☐ No NH: ☒ Pass / ☐ Fail. DST: ☒ Pass / ☐ Fail.
33.	Grid Relay / Contactor function check (RY300)	Loss / failure (s-c)	DC360	10min.	--	--	Before fault: DC Input: 360Vdc / 17.36A / 6.25kW AC Output: 230Vac / 26.1A / 6kW After fault: DC Input: 360Vdc / 0A / 0kW AC Output: 230Vac / 0A / 0kW FID: PCE shutdown. Indicate “Relay Check Failure” MT: N/A SD: ☒ Yes /☐ No, GD: ☒ Yes /☐ No RO: ☒ Yes /☐ No, NCD: ☒ Yes /☐ No NH: ☒ Pass / ☐ Fail. DST: ☒ Pass / ☐ Fail.

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34.	INV Relay / Contactor function check (RY300)	Loss / failure (s-c)	DC360	10min.	--	--	Before fault: DC Input: 360Vdc / 17.36A / 6.25kW AC Output: 230Vac / 26.1A / 6kW After fault: DC Input: 360Vdc / 0A / 0kW AC Output: 230Vac / 0A / 0kW FID: PCE shutdown. Indicate “Relay Check Failure” MT: N/A SD: ☒ Yes /☐ No, GD: ☒ Yes /☐ No RO: ☒ Yes /☐ No, NCD: ☒ Yes /☐ No NH: ☒ Pass / ☐ Fail. DST: ☒ Pass / ☐ Fail.
35.	Boost IGBT temperatur e detector (BST-NTC)	Loss / failure (s-c)	DC360	10min.	--	--	Before fault: DC Input: 360Vdc / 17.36A / 6.25kW AC Output: 230Vac / 26.1A / 6kW After fault: DC Input: 360Vdc / 17.36A / 6.25kW AC Output: 230Vac / 26.1A / 6kW FID: normal working MT: N/A SD: ☐ Yes /☒ No, GD: ☐ Yes /☒ No RO: ☒ Yes /☐ No, NCD: ☒ Yes /☐ No NH: ☒ Pass / ☐ Fail. DST: ☒ Pass / ☐ Fail.

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36.	INV IGBT temperature detector (INV-NTC)	Loss / failure (s-c)	DC360	10min.	--	--	Before fault: DC Input: 360Vdc / 17.36A / 6.25kW AC Output: 230Vac / 26.1A / 6kW After fault: DC Input: 360Vdc / 5A / 1.8kW AC Output: 230Vac / 7.5A / 1.73kW FID: normal working MT: N/A SD: ☐ Yes /☒ No, GD: ☐ Yes /☒ No RO: ☒ Yes /☐ No, NCD: ☒ Yes /☐ No NH: ☒ Pass / ☐ Fail. DST: ☒ Pass / ☐ Fail.
37.	Heatsink temperature detector (BST-NTC)	Loss / failure (s-c)	DC360	10min.	--	--	Before fault: DC Input: 360Vdc / 17.36A / 6.25kW AC Output: 230Vac / 26.1A / 6kW After fault: DC Input: 360Vdc / 17.36A / 6.25kW AC Output: 230Vac / 26.1A / 6kW FID: normal working MT: N/A SD: ☐ Yes /☒ No, GD: ☐ Yes /☒ No RO: ☒ Yes /☐ No, NCD: ☒ Yes /☐ No NH: ☒ Pass / ☐ Fail. DST: ☒ Pass / ☐ Fail.

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38.	Current sampling	o-c	DC360	10min	-	-	Before fault: DC Input: 360Vdc / 17.36A / 6.25kW AC Output: 230Vac / 26.1A / 6kW After fault: DC Input: 360Vdc / 0A / 0kW AC Output: 230Vac / 0A / 0kW FID: Red light on, stop, can't work MT: N/A SD: ☒ Yes /☐ No, GD: ☒ Yes /☐ No RO: ☒ Yes /☐ No, NCD: ☒ Yes /☐ No NH: ☒ Pass / ☐ Fail. DST: ☒ Pass / ☐ Fail.
Components single fault condition and Functional insulation on PWB short circuit test							
39.	INV IGBT (Q201)	Loss / failure (CE s-c)	DC360	10min.	--	--	Before fault: DC Input: 360Vdc / 17.36A / 6.25kW AC Output: 230Vac / 26.1A / 6kW After fault: DC Input: 360Vdc / 0A / 0kW AC Output: 230Vac / 0A / 0kW FID: PCE Shutdown. MT: N/A SD: ☒ Yes /☐ No, GD: ☒ Yes /☐ No RO: ☒ Yes /☐ No, NCD: ☐Yes /☒ No NH: ☒ Pass / ☐ Fail. DST: ☒ Pass / ☐ Fail.

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Clause	Requirement – Test	Result – Remark	Verdict

40.	Boost IGBT (Q101)	Loss / failure (CE s-c)	DC360	10min.	--	--	Before fault: DC Input1: 360Vdc / 9.17A / 3.3Kw DC Input2: 360Vdc / 9.17A / 3.3Kw AC Output: 230Vac / 27.6A / 6.3kW After fault: DC Input1: 1Vdc / 9.17A / 0kW DC Input2: 360Vdc / 9.17A / 3.3Kw AC Output: 230Vac / 13.77A / 3.17kW FID: normal working MT: N/A SD: ☒ Yes /☐ No, GD: ☒ Yes /☐ No RO: ☒ Yes /☐ No, NCD: ☐Yes /☒ No NH: ☒ Pass / ☐ Fail. DST: ☒ Pass / ☐ Fail.
41.	DC input Bus capacitor (C202)	Loss / failure (s-c)	DC360	10min.	--	--	Before fault: DC Input: 360Vdc / 18.3A / 6.59kW AC Output: 230Vac / 27.5A / 6.3kW After fault: DC Input: 1Vdc / 19A / 0kW AC Output: 230Vac / 0A / 0kW FID: Black screen, stop MT: N/A SD: ☒ Yes /☐ No, GD: ☒ Yes /☐ No RO: ☒ Yes /☐ No, NCD: ☐Yes /☒ No NH: ☒ Pass / ☐ Fail. DST: ☒ Pass / ☐ Fail.

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Clause	Requirement – Test	Result – Remark	Verdict

42.	DC input filter capacitor (C111)	Loss / failure (s-c)	DC360	10min.	--	--	Before fault: DC Input: 360Vdc / 17.36A / 6.25kW AC Output: 230Vac / 26.1A / 6kW After fault: DC Input: 360Vdc / 0A / 0kW AC Output: 230Vac / 0A / 0kW FID: PCE Shutdown. MT: N/A SD: ☒ Yes /☐ No, GD: ☒ Yes /☐ No RO: ☒ Yes /☐ No, NCD: ☒ Yes /☐ No NH: ☒ Pass / ☐ Fail. DST: ☒ Pass / ☐ Fail.
43.	LC filter capacitor (C312)	Loss / failure (s-c)	DC360	10min.	--	--	Before fault: DC Input: 360Vdc / 17.36A / 6.25kW AC Output: 230Vac / 26.1A / 6kW After fault: DC Input: 360Vdc / 0A / 0kW AC Output: 230Vac / 0A / 0kW FID: PCE Shutdown MT: N/A SD: ☒ Yes /☐ No, GD: ☒ Yes /☐ No RO: ☒ Yes /☐ No, NCD: ☒ Yes /☐ No NH: ☒ Pass / ☐ Fail. DST: ☒ Pass / ☐ Fail.

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Clause	Requirement – Test	Result – Remark	Verdict

44.	Power supply transformer (TX400 on Power board) for the first wound winding	Loss / failure (s-c)	DC360	10min.	--	--	Before fault: DC Input: 360Vdc / 17.36A / 6.25kW AC Output: 230Vac / 26.1A / 6kW After fault: DC Input: 360Vdc / 0A / 0kW AC Output: 230Vac / 0A / 0kW FID: Stop, black screen, not working MT: N/A SD: ☒ Yes /☐ No, GD: ☒ Yes /☐ No RO: ☒ Yes /☐ No, NCD: ☒ Yes /☐ No NH: ☒ Pass / ☐ Fail. DST: ☒ Pass / ☐ Fail.
45.	Power supply transformer (TX400 on Power board) for the second wound winding	Loss / failure (s-c)	DC360	10min.	--	--	Before fault: DC Input: 360Vdc / 17.36A / 6.25kW AC Output: 230Vac / 26.1A / 6kW After fault: DC Input: 360Vdc / 0A / 0kW AC Output: 230Vac / 0A / 0kW FID: Stop, black screen, not working MT: N/A SD: ☒ Yes /☐ No, GD: ☒ Yes /☐ No RO: ☒ Yes /☐ No, NCD: ☒ Yes /☐ No NH: ☒ Pass / ☐ Fail. DST: ☒ Pass / ☐ Fail.

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Clause	Requirement – Test	Result – Remark	Verdict

46.	Power supply transformer (TX500 on Power board) for the first wound winding	Loss / failure (s-c)	DC360	10min.	--	--	Before fault: DC Input: 360Vdc / 17.36A / 6.25kW AC Output: 230Vac / 26.1A / 6kW After fault: DC Input: 360Vdc / 0A / 0kW AC Output: 230Vac / 0A / 0kW FID: Stop, black screen, not working MT: N/A SD: ☒ Yes /☐ No, GD: ☒ Yes /☐ No RO: ☒ Yes /☐ No, NCD: ☒ Yes /☐ No NH: ☒ Pass / ☐ Fail. DST: ☒ Pass / ☐ Fail.
47.	Power supply transformer (TX500 on Power board) for the second wound winding	Loss / failure (s-c)	DC360	10min.	--	--	Before fault: DC Input: 360Vdc / 17.36A / 6.25kW AC Output: 230Vac / 26.1A / 6kW After fault: DC Input: 360Vdc / 0A / 0kW AC Output: 230Vac / 0A / 0kW FID: Stop, black screen, not working MT: N/A SD: ☒ Yes /☐ No, GD: ☒ Yes /☐ No RO: ☒ Yes /☐ No, NCD: ☒ Yes /☐ No NH: ☒ Pass / ☐ Fail. DST: ☒ Pass / ☐ Fail.

Legend (Special evaluation for PV Inverter abnormal test)

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	DST	Dielectric strength test
s-c	short-circuited	o-c	open-circuited
o-l	Over-load.		

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Clause	Requirement – Test	Result – Remark	Verdict

Note(s):

Failures or faults may be short-circuits in the PCE, or to exposed conductive parts, earth faults, or short-circuit in the output circuits, failure in the control circuits, or blocking of a motor fed by power EE.

There shall be no emission of molten metal, burning insulation, or flaming or glowing particles FIDom the fire enclosure, and there shall be no charring, glowing, or flaming of the tissue paper or cheesecloth, or glowing or flaming of surgical cotton.

Faults protected by “UL certified current fuse only” shall be performed and repeated 3 times.

In case of components damaged other than fuse, the evaluation should be repeated 3 times.

4.7	TABLE: electrical data (in normal conditions) (50Hz)							P
Type	I/P rated	PV / DC Input			O/P rated	AC Output Testing cond.		
	I [A]	U [V]	I [A]	P [W]	I [A]	U [V]	I [A]	P [W]
GW6K-DNS-G40 @45°C	20*2	360	15.62	5601.98	27.3	198	27.38	5438.67
	20*2	360	17.33	6228.18	27.3	263	22.83	6036.29
	20*2	195	32.45	6340.68	27.3	230	26.13	6026.17
	20*2	360	17.35	6233.45	27.3	230	26.13	6027.87
	20*2	500	12.41	6199.03	27.3	230	26.07	6008.84
Note(s): N/A								
4.7	TABLE: electrical data (in normal conditions) (60Hz)							P
Type	I/P rated	PV / DC Input			O/P rated	AC Output Testing cond.		
	I [A]	U [V]	I [A]	P [W]	I [A]	U [V]	I [A]	P [W]
GW6K-DNS-G40 @45°C	20*2	360	15.66	5631.47	27.3	198	27.40	5442.30
	20*2	360	17.27	6217.30	27.3	263	22.79	6026.89
	20*2	195	31.87	6221.09	27.3	230	25.65	5914.08
	20*2	360	17.34	6234.36	27.3	230	26.15	6031.34
	20*2	500	12.39	6194.07	27.3	230	26.06	6005.10
Note(s): N/A								
4.7	TABLE: electrical data (in normal conditions) (50Hz)							P
Type	I/P rated	PV / DC Input			O/P rated	AC Output Testing cond.		
	I [A]	U [V]	I [A]	P [W]	I [A]	U [V]	I [A]	P [W]

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Clause	Requirement – Test	Result – Remark	Verdict

GW5K-DNS-G40 @45°C	20*2	360	12.93	4632.08	22.8	198	22.50	4467.19
	20*2	360	14.24	5120.38	22.8	263	18.75	4952.11
	20*2	165	31.63	5233.80	22.8	230	21.49	4950.98
	20*2	360	14.29	5137.98	22.8	230	21.52	4959.96
	20*2	500	10.26	5115.11	22.8	230	21.50	4949.30
Note(s): N/A								
4.7	TABLE: electrical data (in normal conditions) (60Hz)							P
Type	I/P rated	PV / DC Input			O/P rated	AC Output Testing cond.		
	I [A]	U [V]	I [A]	P [W]	I [A]	U [V]	I [A]	P [W]
GW5K-DNS-G40 @45°C	20*2	360	12.86	4624.70	22.8	198	22.48	4461.78
	20*2	360	14.21	5113.10	22.8	263	18.71	4942.35
	20*2	165	31.69	5230.96	22.8	230	21.45	4941.70
	20*2	360	14.25	5125.44	22.8	230	21.46	4944.79
	20*2	500	10.22	5109.12	22.8	230	21.48	4944.65
Note(s): N/A								
4.7	TABLE: electrical data (in normal conditions) (50Hz)							P
Type	I/P rated	PV / DC Input			O/P rated	AC Output Testing cond.		
	I [A]	U [V]	I [A]	P [W]	I [A]	U [V]	I [A]	P [W]
GW4.2K-DNS-G40 @45°C	20*2	360	10.97	3932.13	19.1	198	19.11	3790.16
	20*2	360	12.09	4343.11	19.1	263	15.93	4202.98
	20*2	140	31.92	4461.83	19.1	230	18.22	4194.35
	20*2	360	12.11	4348.35	19.1	230	18.27	4207.27
	20*2	500	8.68	4324.18	19.1	230	18.26	4198.86
Note(s): --								
4.7	TABLE: electrical data (in normal conditions) (60Hz)							P
Type	I/P rated	PV / DC Input			O/P rated	AC Output Testing cond.		
	I [A]	U [V]	I [A]	P [W]	I [A]	U [V]	I [A]	P [W]

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Clause	Requirement – Test	Result – Remark	Verdict

GW4.2K-DNS-G40 @45°C	20*2	360	10.77	3874.49	19.1	198	18.94	3758.33
	20*2	360	11.90	4288.93	19.1	263	15.78	4166.11
	20*2	140	31.44	4415.74	19.1	230	18.10	4167.28
	20*2	360	11.96	4300.78	19.1	230	18.12	4174.22
	20*2	500	8.57	4284.86	19.1	230	18.14	4170.44
Note(s): N/A								

4.7	TABLE: electrical data (in normal conditions) (50Hz)							P
Type	I/P rated	PV / DC Input			O/P rated	AC Output Testing cond.		
	I [A]	U [V]	I [A]	P [W]	I [A]	U [V]	I [A]	P [W]
GW3.6K-DNS-G40 @45°C	20*2	360	9.39	3368.88	16.4	198	16.45	3261.15
	20*2	360	10.31	3708.77	16.4	263	13.63	3598.19
	20*2	120	32.00	3842.30	16.4	230	15.65	3601.33
	20*2	360	10.34	3711.95	16.4	230	15.63	3598.24
	20*2	500	7.43	3708.64	16.4	230	15.65	3597.52
Note(s): N/A								
4.7	TABLE: electrical data (in normal conditions) (60Hz)							P
Type	I/P rated	PV / DC Input			O/P rated	AC Output Testing cond.		
	I [A]	U [V]	I [A]	P [W]	I [A]	U [V]	I [A]	P [W]
GW3.6K-DNS-G40 @45°C	20*2	360	9.36	3369.71	16.4	198	16.45	3261.21
	20*2	360	10.30	3708.15	16.4	263	13.63	3597.34
	20*2	120	32.01	3842.05	16.4	230	15.64	3598.50
	20*2	360	10.32	3711.51	16.4	230	15.63	3597.97
	20*2	500	7.42	3706.16	16.4	230	15.65	3595.13
Note(s): N/A								
4.7	TABLE: electrical data (in normal conditions) (50Hz)							P
Type	I/P rated	PV / DC Input			O/P rated	AC Output Testing cond.		
	I [A]	U [V]	I [A]	P [W]	I [A]	U [V]	I [A]	P [W]

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GW3K-DNS-G40 @45°C	20*2	360	7.80	2799.71	13.7	198	13.73	2720.04
	20*2	360	8.58	3089.84	13.7	263	11.38	3000.27
	20*2	100	32.14	3224.85	13.7	230	13.04	3000.67
	20*2	360	8.59	3090.04	13.7	230	13.05	3000.99
	20*2	500	6.17	3082.50	13.7	230	13.08	3001.56
Note(s): N/A								
4.7	TABLE: electrical data (in normal conditions) (60Hz)							P
Type	I/P rated	PV / DC Input			O/P rated	AC Output Testing cond.		
	I [A]	U [V]	I [A]	P [W]	I [A]	U [V]	I [A]	P [W]
GW3K-DNS-G40 @45°C	20*2	360	7.78	2799.05	13.7	198	13.73	2719.26
	20*2	360	8.59	3088.82	13.7	263	11.37	2999.20
	20*2	100	32.23	3224.40	13.7	230	13.04	2999.42
	20*2	360	8.58	3089.69	13.7	230	13.04	3000.25
	20*2	500	6.17	3081.63	13.7	230	13.08	3000.99
Note(s): N/A								
4.7	TABLE: electrical data (in normal conditions) (60Hz)							P
Type	I/P rated	PV / DC Input			O/P rated	AC Output Testing cond.		
	I [A]	U [V]	I [A]	P [W]	I [A]	U [V]	I [A]	P [W]
GW3.1K-DNS-L-G40 @45°C	20*2	230	13.02	2968.53	24.4	114	24.46	2806.09
	20*2	230	14.30	3265.74	24.4	139	22.22	3102.44
	20*2	110	30.46	3355.29	24.4	127	24.22	3093.09
	20*2	230	14.26	3257.16	24.4	127	24.20	3091.16
	20*2	420	7.78	3264.28	24.4	127	24.28	3099.35
Note(s): N/A								

7.3.6.3.3	**TABLE: protective equipotential bonding**			P
Measured between:	Test current (A)	Voltage drop (V)	Resistance (mΩ)	Result

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PE terminal to metal enclosure	32	0.38	12	P
Supplementary information: N/A				

7.3.7.4 & 7.3.7.5	**TABLE: clearance and creepage distance measurements**					P
Clearance cl and creepage distance dcr at/of:	Impulse voltage (V)	U r.m.s. (V)	Required cl (mm)	cl (mm)	Required dcr (mm)	dcr (mm)
PCE unit (Vmax PV: OVCII 600Vdc, AC: OVC II 240Vac, 50/60Hz, altitude Max. 4000m)						
PV supply circuits to PE: BI	**4000**	**240Vac**	**3.0*1.29=3.9**	**See below**	**6**	**See below**
-IGBT/Diode body to metal screw through Plastic block	4000	240Vac	3.0*1.29=3.9	5.7	6	11
-IGBT/Diode body to heatsink through Ceramic chip	4000	240Vac	3.0*1.29=3.9	5.3	3.9	5.3
-Bus Cap. C202 Pin to bottom heatsink	4000	240Vac	3.0*1.29=3.9	7.5	6	7.5
-JP207 to bottom heatsink	4000	240Vac	3.0*1.29=3.9	8.0	6	8.0
-PV+ CN101 pin to bottom heatsink	4000	240Vac	3.0*1.29=3.9	8.1	6	8.1
-PV connector to metal enclosure	4000	240Vac	3.0*1.29=3.9	28	6	28
-AC connector to metal enclosure	4000	240Vac	3.0*1.29=3.9	18	6	18
-DC switch to metal enclosure	4000	240Vac	3.0*1.29=3.9	24	6	24
-Bus Cap. to top metal enclosure	4000	240Vac	3.0*1.29=3.9	24	6	24
-Boost Inductor core to metal enclosure	4000	240Vac	3.0*1.29=3.9	4.0*1	6	6.5*1
-Boost Inductor coil to metal enclosure	4000	240Vac	3.0*1.29=3.9	5.0*1	6	6.5*1
-INV Inductor core to metal enclosure	4000	240Vac	3.0*1.29=3.9	4.0*1	6	6.5*1
-INV Inductor coil to metal enclosure	4000	240Vac	3.0*1.29=3.9	4.0*1	6	6.5*1
PV supply circuits to Communication port: RI	**6000**	**600Vdc**	**5.5*1.29=7.1**	**See below**	**6.0→7.1**	**See below**
-PV supply circuits to Arm Board: RI	4000	240Vac	5.5*1.29=7.1	8.0*1	6.0→7.1	12

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Note: *1: the Power board and Arm board insulated by mylar. The INV Inductor and Boost Inductor covered by insulation tape.						
PV Input Board (model: 190-70306)						
PV supply circuits to PE: BI	**4000**	**600Vdc**	**3.0*1.29=3.9**	**See below**	**3.0→3.9**	**See below**
-at C2/C8	4000	600Vdc	3.0*1.29=3.9	5.7	3.0→3.9	5.7
-at C6/C10	4000	600Vdc	3.0*1.29=3.9	4.1	3.0→3.9	4.1
-at C1/C7	4000	600Vdc	3.0*1.29=3.9	6.1	3.0→3.9	6.1
-at C5/C9	4000	600Vdc	3.0*1.29=3.9	4.6	3.0→3.9	4.6
PV supply circuit: FI	**2500**	**600Vdc**	**1.5*1.29=2.0**	**See below**	**3.0**	**See below**
-Between CN2 to CN1	2500	600Vdc	1.5*1.29=2.0	4.5	3.0	4.5
Power Board (model: 190-10348)						
PV supply circuits to PE: BI	**4000**	**600Vdc**	**3.0*1.29=3.9**	**See below**	**3.0→3.9**	**See below**
-at R195	4000	600Vdc	3.0*1.29=3.9	4.4	3.0→3.9	4.4
-at C335	4000	600Vdc	3.0*1.29=3.9	4.3	3.0→3.9	4.3
-at C441	4000	600Vdc	3.0*1.29=3.9	5.3	3.0→3.9	5.3
-at C223	4000	600Vdc	3.0*1.29=3.9	4.0	3.0→3.9	4.0
-at C202	4000	600Vdc	3.0*1.29=3.9	5.3	3.0→3.9	5.3
-at Y Cap. C201	4000	600Vdc	3.0*1.29=3.9	4.1	3.0→3.9	4.1
ISO -at R164 to R185 (with four resistors)	4000	600Vdc	3.0*1.29=3.9	6.8	3.0→3.9	6.8
PV supply circuit: FI	**2500**	**600Vdc**	**1.5*1.29=2.0**	**See below**	**3.0**	**See below**
-Between CN101 to CN103	2500	600Vdc	1.5*1.29=2.0	4.1	3.0	4.1
-Between CN102 to CN103	2500	600Vdc	1.5*1.29=2.0	4.1	3.0	4.1
-Between TX400 pin6 to pin8	2500	600Vdc	1.5*1.29=2.0	3.3	3.0	3.8
-Between Bus+ to Bus-	2500	600Vdc	1.5*1.29=2.0	4.1	3.0	4.1
PV supply circuits to Communication port: RI	**6000**	**600Vdc**	**5.5*1.29=7.1**	**See below**	**6.0→7.1**	**See below**
-Between TX400 primary pin19 to secondary pin15	6000	600Vdc	5.5*1.29=7.1	7.5	6.0→7.1	7.5

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-Between TX400 primary pin8 to secondary pin15	6000	600Vdc	5.5*1.29=7.1	17.1	6.0→7.1	17.1
-Between TX400 Primary coil to Secondary pin (Through bobbin and tape)	6000	600Vdc	5.5*1.29=7.1	11.5	6.0→7.1	11.5
-Between TX400 primary core to secondary pin	6000	600Vdc	5.5*1.29=7.1	10.5	6.0→7.1	10.5
-Between D406 to D412	6000	600Vdc	5.5*1.29=7.1	8.7	6.0→7.1	8.7
-Between C109 primary pin to Com. Circuit	6000	600Vdc	5.5*1.29=7.1	7.2	6.0→7.1	7.2
-Between C438 to R460	6000	600Vdc	5.5*1.29=7.1	7.8	6.0→7.1	7.8
-Between L404 to C458	6000	600Vdc	5.5*1.29=7.1	7.2	6.0→7.1	7.2
PV supply circuits to Control: BI	**4000**	**240Vac**	**3.0*1.29=3.9**	**See below**	**3.0→3.9**	**See below**
-at TX400 primary pin8 to control pin11	4000	240Vac	3.0*1.29=3.9	4.3	3.0→3.9	4.3
-at TX400 primary coil to control coil	4000	240Vac	3.0*1.29=3.9	4.0	3.0→3.9	4.0
-at TX400 primary coil to control pin	4000	240Vac	3.0*1.29=3.9	4.0	3.0→3.9	4.0
-at TX400 primary core to control coil	4000	240Vac	3.0*1.29=3.9	4.5	3.0→3.9	4.5
-at TX400 primary core to control pin13	4000	240Vac	3.0*1.29=3.9	10.5	3.0→3.9	10.5
-at JP401 to D409	4000	240Vac	3.0*1.29=3.9	5.2	3.0→3.9	5.2
-at R469 to D144	4000	240Vac	3.0*1.29=3.9	5.2	3.0→3.9	5.2
-at Optical U404	4000	240Vac	3.0*1.29=3.9	6.7	3.0→3.9	6.7
-at Y cap. C414	4000	240Vac	3.0*1.29=3.9	8.2	3.0→3.9	8.2
-at Optical U102	4000	240Vac	3.0*1.29=3.9	8.2	3.0→3.9	8.2
-at Optical U101	4000	240Vac	3.0*1.29=3.9	8.2	3.0→3.9	8.2
-Between C139 to C130	4000	240Vac	3.0*1.29=3.9	5.8	3.0→3.9	5.8
-Between R257 to control trace	4000	240Vac	3.0*1.29=3.9	4.0	3.0→3.9	4.0
-at HCT101	4000	240Vac	3.0*1.29=3.9	4.1	3.0→3.9	4.1
-at HCT102	4000	240Vac	3.0*1.29=3.9	4.2	3.0→3.9	4.2
BOOST1+ Voltage sampling -at R100 to R116 (with five resis-tors)	4000	240Vac	3.0*1.29=3.9	7.5	3.0→3.9	7.5

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Clause	Requirement – Test	Result – Remark	Verdict

BOOST1- Voltage sampling -at R102 to R118 (with five resistors)	4000	240Vac	3.0*1.29=3.9	7.5	3.0→3.9	7.5
BOOST2+ Voltage sampling -at R101 to R117 (with five resistors)	4000	240Vac	3.0*1.29=3.9	7.5	3.0→3.9	7.5
BOOST2- Voltage sampling -at R103 to R119 (with five resistors)	4000	240Vac	3.0*1.29=3.9	7.5	3.0→3.9	7.5
PV1+ ISO -at R161 to R188 (with five resistors)	4000	240Vac	3.0*1.29=3.9	7.5	3.0→3.9	7.5
PV2+ ISO -at R160 to R187 (with five resistors)	4000	240Vac	3.0*1.29=3.9	7.5	3.0→3.9	7.5
PV- ISO -at R162 to R189 (with five resistors)	4000	240Vac	3.0*1.29=3.9	7.5	3.0→3.9	7.5
Control to Com.: BI	**4000**	**240Vac**	**3.0*1.29=3.9**	**See below**	**3.0→3.9**	**See below**
-at TX400 control pin13 to Com. pin14	4000	240Vac	3.0*1.29=3.9	15.3	3.0→3.9	15.3
-at TX400 control pin12 to Com. pin15	4000	240Vac	3.0*1.29=3.9	15.3	3.0→3.9	15.3
-at TX400 control coil to Com. Pin 14	4000	240Vac	3.0*1.29=3.9	12.5	3.0→3.9	12.5
-at TX400 control coil to Com. Pin 15	4000	240Vac	3.0*1.29=3.9	15.8	3.0→3.9	15.8
-Between C436 to C442	4000	240Vac	3.0*1.29=3.9	7.3	3.0→3.9	7.3
-Between C425 to C152	4000	240Vac	3.0*1.29=3.9	4.9	3.0→3.9	4.9
-at U502	4000	240Vac	3.0*1.29=3.9	8.2	3.0→3.9	8.2
-at U600	4000	240Vac	3.0*1.29=3.9	8.2	3.0→3.9	8.2
-Between CN607 to C510	4000	240Vac	3.0*1.29=3.9	4.4	3.0→3.9	4.4
-Between D106 to EC400	4000	240Vac	3.0*1.29=3.9	4.4	3.0→3.9	4.4
AC mains circuits to PE: BI	**4000**	**240Vac**	**3.0*1.29=3.9**	**See below**	**3.0→3.9**	**See below**
-at CN300	4000	240Vac	3.0*1.29=3.9	4.0	3.0→3.9	4.0
-at C327	4000	240Vac	3.0*1.29=3.9	4.0	3.0→3.9	4.0

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

-at GS300	4000	240Vac	3.0*1.29=3.9	4.0	3.0→3.9	4.0
AC GRID N to PE-at R353 to R379 (with five resistors)	4000	240Vac	3.0*1.29=3.9	7.5	3.0→3.9	7.5
AC mains circuit: FI	**2500**	**600Vdc**	**1.5*1.29=2.0**	**See below**	**3.0**	**See below**
-Between CN310 to CN309	2500	600Vdc	1.5*1.29=2.0	3.4	3.0	3.4
-at L301	2500	600Vdc	1.5*1.29=2.0	3.4	3.0	3.4
-Between CN303 to CN304	2500	600Vdc	1.5*1.29=2.0	4.5	3.0	4.5
AC mains circuits to Communi-cation port: RI	**6000**	**600Vdc**	**5.5*1.29=7.1**	**See below**	**6.0→7.1**	**See below**
-TX500 primary pin7 to secondary pin3	6000	600Vdc	5.5*1.29=7.1	13.2	6.0→7.1	13.1
-TX500 primary pin7 to secondary pin1	6000	600Vdc	5.5*1.29=7.1	13.8	6.0→7.1	13.8
-TX500 primary coil to secondary pin1	6000	600Vdc	5.5*1.29=7.1	9.1	6.0→7.1	9.1
-TX500 primary core to secondary pin3	6000	600Vdc	5.5*1.29=7.1	7.9	6.0→7.1	7.9
-at U500	6000	600Vdc	5.5*1.29=7.1	7.4	6.0→7.1	7.4
AC mains circuits to Control: BI	**4000**	**600Vdc**	**3.0*1.29=3.9**	**See below**	**3.0→3.9**	**See below**
TX500 primary pin7 to control pin9	4000	600Vdc	3.0*1.29=3.9	4.1	3.0→3.9	4.1
TX500 primary coil to control pin9	4000	600Vdc	3.0*1.29=3.9	5.2	3.0→3.9	5.2
TX500 primary core to control pin9	4000	600Vdc	3.0*1.29=3.9	4.5	3.0→3.9	4.5
-Between 520 to U503	4000	600Vdc	3.0*1.29=3.9	4.6	3.0→3.9	4.6
-at C516	4000	600Vdc	3.0*1.29=3.9	6.0	3.0→3.9	6.0
-at T500 to C324 bonding pad*1	4000	600Vdc	3.0*1.29=3.9	4.4	3.0→3.9	4.4
-at GFCI L300 primary pin to con-trol pin	4000	600Vdc	3.0*1.29=3.9	4.1	3.0→3.9	4.1
-at AC Relay RY301/302/303/304 Control pin to coil	4000	600Vdc	3.0*1.29=3.9	4.1	3.0→3.9	4.1
-at HCT301	4000	600Vdc	3.0*1.29=3.9	4.1	3.0→3.9	4.1
-Between CN301 to C307	4000	600Vdc	3.0*1.29=3.9	4.0	3.0→3.9	4.0
-at U506/504/509/508/507/505	4000	600Vdc	3.0*1.29=3.9	6.4	3.0→3.9	6.4

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

INV L Voltage sampling -at R308 to R324 (with five resis-tors)	4000	600Vdc	3.0*1.29=3.9	7.5	3.0→3.9	7.5
INV N Voltage sampling -at R309 to R325 (with five resis-tors)	4000	600Vdc	3.0*1.29=3.9	7.5	3.0→3.9	7.5
GRID L Voltage sampling -at R350 to R376 (with five resis-tors)	4000	600Vdc	3.0*1.29=3.9	7.5	3.0→3.9	7.5
GRID N Voltage sampling -at R351 to R377 (with five resis-tors)	4000	600Vdc	3.0*1.29=3.9	7.5	3.0→3.9	7.5
Control to Com.: BI	**4000**	**240Vac**	**3.0*1.29=3.9**	**See below**	**3.0→3.9**	**See below**
-at TX500 control pin 9 to com pin1	4000	600Vdc	3.0*1.29=3.9	14.5	3.0→3.9	14.5
Note: *1: The components C324 is deleted from BOM and remain the bonding pad. Contact gap of Grid relays (RY301, RY302, RY303, RY304) is 1.8mm min.						

Independence components						
--	--	--	--	--	--	--

Circuits Definition:	
Communication Circuits: DVC-A	PV Circuits: DVC-C
AC mains / Grid Circuits: DVC-C	
Protection Separation	
Accessible Parts Earthed to PV supply Circuits: BI	Accessible Parts Earthed to AC mains /Grid Circuits: BI
Communication Circuits to AC mains /Grid Circuits: RI	Communication Circuits to PV supply Circuits: RI
AC mains to PV supply circuits: Not isolated	Control to PV/AC supply Circuits: BI

Legend			
BI	Basic insulation	SI	Supplementary insulation
DI	Double insulation	RI	Reinforced insulation
FI	Functional insulation	O.V.C	Overvoltage category

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

PD	Pollution degree	MG	Insulating material group
PPI	Protection by Protective Impedance	DVC	Decision Voltage Classification
s-c	Shorted Circuits	o-c	Opened Circuits

Note:

PV V_{MAX} = 600 Vd.c, AC system voltage = 240 Va.c

PV Supply Voltage = O.V.C II, AC mains circuits = O.V.C. III.

PD = PD2, MG = IIIa for PCB and components across insulation, e.g. optocoupler, X/Y capacitor, Altitude = 4000m (1.29 factor)

Communication Circuits in PCE is considered as DVC-A with reinforced insulation from DVC-C circuits.

Communication circuits in PCE are considered as DVC-A which could be accessible.

1. Interpolation is permitted in general, except for impulse withstand voltage decision.
2. Functional insulation was shorted circuit tests and consideration. see sub-clause 5.3.4 c).

7.5.1, 7.5.2 and 7.5.3	**TABLE: electric strength measurements, impulse voltage test and partial discharge test**			P
test voltage applied between:	test voltage [V]	impulse withstand voltage [V] 1.2/50 µs	partial discharge extinction voltage [V]	result
PV input terminal to earthed enclosure (BI)	2120Vdc	4900	--	Pass
AC output terminal to earthed enclosure (BI)	2120Vdc	4900	--	Pass
PV input terminal to communication port (DI/RI)	4240Vdc	7400	--	Pass
AC output terminal to communication port (DI/RI)	4240Vdc	7400	--	Pass
Legend				
BI	Basic insulation	SI	Supplementary insulation	
DI	Double insulation	RI	Reinforced insulation	
FI	Functional insulation	O.V.C	Overvoltage category	
Note(s): N/A				

7.5.4	**TABLE: Touch Current Measurement**	P

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

Location	Single / Three phase	Measured current (mA)		Comments/conditions
		a.c.	d.c.	
At metal enclosure to PE	Three	0.5	--	after clause 7.5.2.3, Humidity preconditioning
Note(s): N/A				

14	**TABLE: list of critical components**				P
object/part No.	Manufacturer/trademark	Type/model	Technical data	standard	Mark (s) of conformity
Note: See Attachment 3 – Critical components Documentation (CDF) for details.					

- End of Test Report -

Test Report issued under the responsibility of:

TÜVRheinland®

TEST REPORT
IEC 62109-2
Safety of power converters for use in photovoltaic power systems – Part2: Particular requirements for inverters

Report Reference No.....:	**CN25ZR1J 001 attachment 1**
Date of issue.....:	See cover page.
Total number of pages.....:	36
Name of Testing Laboratory preparing the Report.....:	**TÜV Rheinland (Shanghai) Co., Ltd.**
Applicant's name .....:	**GoodWe Technologies Co., Ltd.**
Address .....:	No.90 Zijin Rd., New District, Suzhou, 215011, P.R. China
Test specification:	
Standard.....:	IEC/EN 62109-2: 2011 (First Edition)
Test procedure .....:	TÜV Rheinland Bauart Mark Approval
Non-standard test method.....:	N/A
Test Report Form No.....:	IEC62109_2B
Test Report Form(s) Originator .....:	LCIE - Laboratoire Central des Industries Electriques
Master TRF .....:	Dated 2016-11

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

General disclaimer:

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

Test item description .....:	Grid-Tied PV Inverter
Trade Mark .....:	See test report of CN25ZR1J 001
Manufacturer.....:	See test report of CN25ZR1J 001
Model/Type reference .....:	See test report of CN25ZR1J 001
Ratings .....:	See test report of CN25ZR1J 001

Responsible Testing Laboratory (as applicable), testing procedure and testing location(s):

☐	**CB Testing Laboratory:**		
Testing location/ address ..... :			
Tested by (name, function, signature) ..... :			
Approved by (name, function, signature) .. :			
☐	**Testing procedure: CTF Stage 1:**		
Testing location/ address ..... :			
Tested by (name, function, signature) ..... :			
Approved by (name, function, signature) .. :			
☐	**Testing procedure: CTF Stage 2:**		
Testing location/ address ..... :			
Tested by (name + signature) ..... :			
Witnessed by (name, function, signature). :			
Approved by (name, function, signature) .. :			
☐	**Testing procedure: CTF Stage 3:**		
☐	**Testing procedure: CTF Stage 4:**		
Testing location/ address ..... :			
Tested by (name, function, signature) ..... :			
Witnessed by (name, function, signature). :			
Approved by (name, function, signature) .. :			
Supervised by (name, function, signature) :			

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

See test report of CN25ZR1J 001

Summary of testing:

Tests performed (name of test and test clause):

Clause	Test items
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
4.8.2.1	Array insulation resistance detection for inverters for ungrounded and functionally grounded arrays
4.8.3.5.2	Test for detection of excessive continuous residual current
4.8.3.5.3	Test for detection of sudden changes in residual current

Remark:

- All of the above tests were performed on model GW6K-DNS-G40.
- Other testing conditions considered in this test report, see General product information of the report CN25ZR1J 001 for details.

Testing location:

TÜV Rheinland Shanghai Co. Ltd.
No.177, 178, Lane 777 West Guangzhong Road, Jing'an District, Shanghai, China.

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

None

☒ **The product fulfils the requirements of IEC/EN 62109-1: 2010 and IEC/EN 62109-2: 2011 (insert standard number and edition and delete the text in parenthesis, leave it blank or delete the whole sentence, if not applicable)**

Copy of marking plate:

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

See test report CN25ZR1J 001.

Test item particulars:	
Equipment mobility ..... :	☐ movable ☐ hand-held ☐ stationary ☒ fixed (Wall mounted) ☐ transportable ☐ for building-in
Connection to the mains..... :	☐ pluggable equipment ☐ direct plug-in ☒ permanent connection ☐ for building-in
Enviromental category..... :	☒ outdoor ☐ indoor conditional ☐ indoor unconditional
Operating condition ..... :	☒ continuous ☐ short-time ☐ intermittent
Over voltage category mains..... :	☐ OVC I ☐ OVC II ☒ OVC III ☐ OVC IV
Over voltage category PV ..... :	☐ OVC I ☒ OVC II ☐ OVC III ☐ OVC IV
Over voltage category Battery ..... :	☐ OVC I ☐ OVC II ☐ OVC III ☐ OVC IV
Mains supply tolerance (%) ..... :	According to specified supply range
Tested for power systems ..... :	TN, TT
IT testing, phase-phase voltage (V) ..... :	N/A
Class of equipment ..... :	☒ Class I ☐ Class II ☐ Class III ☐ Not classified
Mass of equipment (kg)..... :	See model list.
Pollution degree ..... :	☐ PD 1 ☒ PD 2(inside) ☒ PD 3 (outside)
IP protection class ..... :	IP66
Possible test case verdicts:	
- test case does not apply to the test object..... :	N/A
- test object does meet the requirement..... :	Pass (P)
- test object does not meet the requirement..... :	Fail (F)
Testing:	
Date of receipt of test items ..... :	See cover page
Date(s) of performance of tests ..... :	See cover page

General remarks:

"(see Attachment #)" refers to additional information appended to the report.

"(see appended table)" refers to a table appended to the report.

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

This report shall not be reproduced except in full without the written approval of the testing laboratory.

List of test equipment must be kept on file and available for review.

Additional test data and/or information provided in the attachments to this report.

Throughout this report a ☐ comma / ☒ point is used as the decimal separator.

Determination of the test results includes consideration of measurement uncertainty from the test equipment and methods.

Manufacturer's Declaration per sub-clause 6.2.5 of IECEE 02:

The application for obtaining a CB Test Certificate includes more than one factory location and a declaration from the Manufacturer stating that the sample(s) submitted for evaluation is (are) representative of the products from each factory has been provided..... : ☐ Yes ☒ Not applicable

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

Name and address of factory (ies) ..... : See test report CN25ZR1J 001.

General product information:

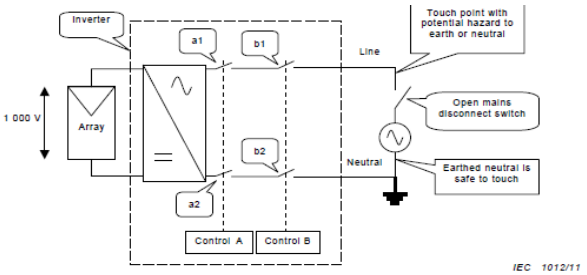
See test report CN25ZR1J 001.

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 automatically 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

Indicate used abbreviations (if any)

IEC 62109-2			
Clause	Requirement – Test	Result - Remark	Verdict
4	General testing requirements *This clause of Part 1 is applicable except as follows:*		P
4.4	Testing in single fault conditions		P
4.4.4	Single fault conditions to be applied: *Additional subclauses:*	The PCE can detect and indicate the fault condition and disconnect from or not connect to the grid in case of single fault condition. Refer to the appended table 4.4 of IEC 62109-1 test report CN25ZR1J 001.	P
4.4.4.15	Fault-tolerance of protection for grid-interactive inverters		P
4.4.4.15.1	Fault-tolerance of residual current monitoring according to 4.8.3.5: the residual current monitoring system operates properly		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

IEC 62109-2			
Clause	Requirement – Test	Result - Remark	Verdict
4.4.4.15.2	Fault-tolerance of automatic disconnecting means		P
4.4.4.15.2.1	The means provided for automatic disconnection of a grid-interactive inverter from the mains shall:		P
	- disconnect all grounded current-carrying conductors from the mains		P
	- disconnect all ungrounded current-carrying conductors from the mains	2 approved relays used in all ungrounded AC conductors.	P
	- be such that with a single fault applied to the disconnection means or to any other location in the inverter, at least basic insulation or simple separation is maintained between the PV array and the mains when the disconnecting means is intended to be in the open state.	See above.	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.  **Figure 20 – Example system discussed in Note 2 above**	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 fails: - 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
	- and the inverter shall indicate a fault in accordance with 13.9		P
4.4.4.16	A stand-alone inverter with a transfer switch to transfer AC loads from the mains or other AC bypass source to the inverter output:	Not stand-alone inverter	N/A
	- shall continue to operate normally		N/A

IEC 62109-2			
Clause	Requirement – Test	Result - Remark	Verdict
	- shall not present a risk of fire as the result of an out-of-phase transfer		N/A
	- shall not present a risk of shock as the result of an out-of-phase transfer		N/A
	- And having control preventing switching: components for malfunctioning……:		N/A
4.4.4.17	Cooling system failure – Blanketing test	See appended test table Cooling system failure – Blanketing test.	P
	Test stop condition: time duration value or stabilized temperature……:		P
4.7	Electrical Ratings Tests *Additional subclauses:*	Refer to the clause 4.3 of report CN25ZR1J 001	P
4.7.3	Measurement requirements for AC output ports for stand-alone inverters	All models can operate in the stand-alone mode	P
4.7.4	Stand-alone Inverter AC output voltage and frequency		N/A
4.7.4.1	General		N/A
4.7.4.2	Steady state output voltage at nominal DC input The steady-state AC output voltage shall not be less than 90 % or more than 110 % of the rated nominal voltage with the inverter supplied with its nominal value of DC input voltage.		N/A
4.7.4.3	Steady state output voltage across the DC input range The steady-state AC output voltage shall not be less than 85 % or more than 110 % of the rated nominal voltage with the inverter supplied with any value within the rated range of DC input voltage.		N/A
4.7.4.4	Load step response of the output voltage at nominal DC input The AC output voltage shall not be less than 85 % or more than 110 % of the rated nominal voltage for more than 1,5 s after application or removal of a resistive load.		N/A
4.7.4.5	Steady state output frequency The steady-state AC output frequency shall not vary from the nominal value by more than +4 % or –6 %.		N/A
4.7.5	Stand-alone inverter output voltage waveform		N/A
4.7.5.1	General	Not stand-alone inverter	N/A

IEC 62109-2			
Clause	Requirement – Test	Result - Remark	Verdict
4.7.5.2	The AC output voltage waveform of a sinusoidal output stand-alone inverter shall have a total harmonic distortion (THD) not exceeding of 10 % and no individual harmonic at a level exceeding 6 %.		N/A
4.7.5.3	Non-sinusoidal output waveform requirements		N/A
4.7.5.3.1	General		N/A
4.7.5.3.2	The total harmonic distortion (THD) of the voltage waveform shall not exceed 40 %.		N/A
4.7.5.3.3	The slope of the rising and falling edges of the positive and negative half-cycles of the voltage waveform shall not exceed 10 V/µs measured between the points at which the waveform has a voltage of 10 % and 90 % of the peak voltage for that half-cycle.		N/A
4.7.5.3.4	The absolute value of the peak voltage of the positive and negative half-cycles of the waveform shall not exceed 1,414 times 110 % of the RMS value of the rated nominal AC output voltage.		N/A
4.7.5.4	Information requirements for non-sinusoidal waveforms The instructions provided with a stand-alone inverter not complying with 4.7.5.2 shall include the information in 5.3.2.6.		N/A
4.7.5.5	Output voltage waveform requirements for inverters for dedicated loads. For an inverter that is intended only for use with a known dedicated load, the following requirements may be used as an alternative to the waveform requirements in 4.7.5.2 to 4.7.5.3.		N/A
	The combination of the inverter and dedicated load shall be evaluated to ensure that the output waveform does not cause any hazards in the load equipment and inverter or cause the load equipment to fail to comply with the applicable product safety standards.		N/A
	The inverter shall be marked with symbols 9 and 15 of Table C.1 of Part 1.		N/A
	The installation instructions provided with the inverter shall include the information in 5.3.2.13.		N/A
4.8	Additional tests for grid-interactive inverters		P
4.8.1	General requirements regarding inverter isolation and array grounding	Non-isolated inverters for ungrounded arrays.	P
	- Type of Array grounding supported ……:	The PCE is intended to be used with the ungrounded arrays.	P

IEC 62109-2			
Clause	Requirement – Test	Result - Remark	Verdict
	- Inverter isolation ……:	The PCE is non-isolated inverter.	P
4.8.2	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	Inverter indicated the insulation fault and didn't connect to the grid when a resistor linked between PV+/- to ground.	P
	Inverter shall have means to measure DC insulation resistance from PV input (array) to ground before starting operation		P
	Or Inverter shall be provided with instruction in accordance with 5.3.2.11.		N/A
	Measured DC insulation resistance: ……:	(See appended table 4.8.2)	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.	The PCE is non-isolated inverter.	N/A
	Isolated inverter fault indication maintained until insulation resistance has recovered to a value higher than the limit value.	See above.	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:	(See appended table 4.8.2)	P
	- shall indicate a fault in accordance with 13.9		N/A
	- shall not connect to the mains		N/A
4.8.2.2	Array insulation resistance detection for inverters for functionally grounded arrays	Not for functionally grounded arrays	N/A
	a-1) The value of the total resistance, including the intentional resistance for array functional grounding, the expected insulation resistance of the array to ground, and the resistance of any other networks connected to ground (for example measurement networks) must not be lower than R = (VMAX PV/30 mA) ohms.		N/A
	a-2) The installation instructions shall include the information required in 5.3.2.12.		N/A

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

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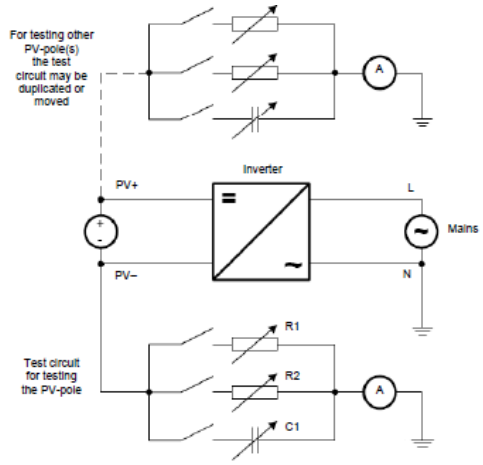
Clause	Requirement – Test	Result - Remark	Verdict
	Where required by Table 30, the inverter shall provide residual current monitoring that functions whenever the inverter is connected to the mains with the automatic disconnection means closed.		P
	The residual current monitoring means shall measure the total (both a.c. and d.c. components) RMS current.  For the continuous residual current test, R1 establishes a baseline current just below the trip point, and R2 is switched in to cause the current to exceed the trip point. Capacitor C1 is not used. For the sudden change residual current test, C1 establishes a baseline current and R1 or R2 is switched in to cause the desired value of sudden change. The other resistor is not used. IEC 1013/11 **Figure 21 – Example test circuit for residual current detection testing**		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 output power rating ≤30kV;		P
	- maximum 10 mA per kVA of rated continuous output power for inverters with continuous output power rating > 30 kVA.		N/A
	The inverter may attempt to re-connect if the array insulation resistance meets the limit in 4.8.2.		P

<table>
<tr><td colspan="4">IEC 62109-2</td></tr>
<tr><td>Clause</td><td>Requirement – Test</td><td>Result - Remark</td><td>Verdict</td></tr>
<tr><td></td><td>b) Sudden changes in residual current: The inverter shall disconnect from the mains within the time specified in Table 31
Table 31 – Response time limits for sudden changes in residual current
<table>
<tr><td>Residual current sudden change</td><td>Max. time to inverter disconnection from the mains</td></tr>
<tr><td>30 mA</td><td>0,3 s</td></tr>
<tr><td>60 mA</td><td>0,15 s</td></tr>
<tr><td>150 mA</td><td>0,04 s</td></tr>
<tr><td colspan="2">NOTE These values of residual current and time are based on the RCD standard IEC 61008-1.</td></tr>
</table></td><td></td><td>P</td></tr>
<tr><td></td><td>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.</td><td></td><td>P</td></tr>
<tr><td></td><td>The inverter may attempt to re-connect if the array insulation resistance meets the limit in 4.8.2.</td><td></td><td>P</td></tr>
<tr><td>4.8.3.5.2</td><td>Test for detection of excessive continuous residual current: test repeated 5 times and time to disconnect shall not exceed 0,3 s.</td><td>See appended table 4.8.3.5.2</td><td>P</td></tr>
<tr><td>4.8.3.5.3</td><td>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.</td><td>See appended table 4.8.3.5.3</td><td>P</td></tr>
<tr><td>4.8.3.6</td><td>Systems located in closed electrical operating areas</td><td>Not specified to be located in closed electrical operating area.</td><td>N/A</td></tr>
<tr><td></td><td>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</td><td></td><td>N/A</td></tr>
<tr><td></td><td>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.</td><td></td><td>N/A</td></tr>
<tr><td></td><td>The inverter shall be marked as in 5.2.2.6.</td><td></td><td>N/A</td></tr>
</table>

5	Marking and documentation *This clause of Part 1 is applicable with the following exceptions:*		P

IEC 62109-2			
Clause	Requirement – Test	Result - Remark	Verdict
5.1	Marking		P
5.1.4	Equipment ratings *Replacement:*	(See copy of marking plate in part 1 test report CN25ZR1J 001.)	P
	PV input ratings:		P
	- Vmax PV (absolute maximum) (d.c. V)		P
	- Isc PV (absolute maximum) (d.c. A)		P
	a.c. output ratings:		P
	- Voltage (nominal or range) (a.c. V)		P
	- Current (maximum continuous) (a.c. A)		P
	- Frequency (nominal or range) (Hz)		P
	- Power (maximum continuous) (W or VA)		P
	- Power factor range		P
	a.c input ratings:		N/A
	- Voltage (nominal or range) (a.c. V)		N/A
	- Current (maximum continuous) (a.c. A)		N/A
	- Frequency (nominal or range) (Hz)		N/A
	d.c. output ratings:		N/A
	- Voltage (nominal or range) (d.c. V)		N/A
	- Current (maximum continuous) (d.c. A)		N/A
	Protective class (I or II or III)	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 *Additional subclauses:*		P

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Clause	Requirement – Test	Result - Remark	Verdict
5.3.2.1	Ratings. Subclause 5.3.2 of Part 1 requires the documentation to include ratings information for each input and output. For inverters this information shall be as in Table 33 below. Only those ratings that are applicable based on the type of inverter are required.	Ratings are listed in label and user manual	P
	PV input quantities :	See report CN25ZR1J 001	P
	- Vmax PV (absolute maximum) (d.c. V)	See report CN25ZR1J 001	P
	- PV input operating voltage range (d.c. V)	See report CN25ZR1J 001	P
	- Maximum operating PV input current (d.c. A)	See report CN25ZR1J 001	P
	- Isc PV (absolute maximum) (d.c. A)	See report CN25ZR1J 001	P
	- Isc PV (absolute maximum) (d.c. A)	See report CN25ZR1J 001	P
	- Max. inverter backfeed current to the array (a.c. or d.c. A)	See report CN25ZR1J 001	P
	a.c. output quantities:	See report CN25ZR1J 001	P
	- Voltage (nominal or range) (a.c. V)	See report CN25ZR1J 001	P
	- Current (maximum continuous) (a.c. A)	See report CN25ZR1J 001	P
	- Current (inrush) (a.c. A, peak and duration)	See report CN25ZR1J 001	P
	- Frequency (nominal or range) (Hz)	See report CN25ZR1J 001	P
	- Power (maximum continuous) (W or VA)	See report CN25ZR1J 001	P
	- Power factor range	See report CN25ZR1J 001	P
	- Maximum output fault current (a.c. A, peak and duration or RMS)	See report CN25ZR1J 001	P
	- Maximum output overcurrent protection (a.c. A)	See report CN25ZR1J 001	P
	a.c. input quantities:		N/A
	- Voltage (nominal or range) (a.c. V)		N/A
	- Current (maximum continuous) (a.c. A)		N/A
	- Current (inrush) (a.c. A, peak and duration)		N/A
	- Frequency (nominal or range) (Hz)		N/A
	d.c input (other than PV) quantities:		N/A
	- Voltage (nominal or range) (d.c. V)		N/A
	- Nominal battery voltage (d.c. V)		N/A
	- Current (maximum continuous) (d.c. A)		N/A
	d.c. output quantities:		N/A
	- Voltage (nominal or range) (d.c. V)		N/A

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Clause	Requirement – Test	Result - Remark	Verdict
	- Nominal battery voltage (d.c. V)		N/A
	- Current (maximum continuous) (d.c. A)		N/A
	Protective class (I or II or III)	Class I	P
	Ingress protection (IP) rating per part 1	IP66	P
5.3.2.2	Grid-interactive inverter setpoints		N/A
	For a grid-interactive unit with field adjustable trip points, trip times, or reconnect times, the presence of such controls, the means for adjustment, the factory default values, and the limits of the ranges of adjustability shall be provided in the documentation for the PCE or in other format such as on a website. Provided solution: ……..	No adjustable setting available. Only the factory default values, however the adjustment shall be performed by distribution network operator.	N/A
	The setting of field adjustable setpoints shall be accessible rom the PCE		N/A
5.3.2.3	Transformers and isolation		N/A
	whether an internal isolation transformer is provided, and if so, what level of insulation (functional, basic, reinforced, or double) is provided by that transformer. The instructions shall also indicate what the resulting installation requirements are regarding such things as earthing or not earthing the array, providing external residual current detection devices, etc.		N/A
	An inverter shall be provided with information to the installer regarding:		N/A
	- providing of internal isolation transformer		N/A
	- the level of insulation (functional, basic, reinforced, or double)		N/A
	The instructions shall also indicate what the resulting installation requirements are regarding:		N/A
	- earthing or not earthing the array		N/A
	- providing external residual current detection devices		N/A
	- requiring an external isolation transformer		N/A
5.3.2.4	Transformers required but not provided		N/A
	An inverter that requires an external isolation transformer not provided with the unit, shall be provided with instructions that specify, and for the external isolation transformer with which it is intended to be used:		N/A
	- the configuration type		N/A

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Clause	Requirement – Test	Result - Remark	Verdict
	- electrical ratings		N/A
	- environmental ratings		N/A
5.3.2.5	PV modules for non-isolated inverters		P
	Non-isolated inverters shall be provided with installation instructions that require PV modules that have an IEC 61730 Class A rating		P
	If the maximum AC mains operating voltage is higher than the PV array maximum system voltage then the instructions shall require PV modules that have a maximum system voltage rating based upon the AC mains voltage.		N/A
5.3.2.6	Non-sinusoidal output waveform information		N/A
	The instruction manual for a stand-alone inverter not complying with 4.7.5.2 shall include a warning that:	Grid-interactive inverter.	N/A
	- the waveform is not sinusoidal,		N/A
	- some loads may experience increased heating,		N/A
	- the user should consult the manufacturers of the intended load equipment before operating that load with the inverter		N/A
	The inverter manufacturer shall provide information regarding:		N/A
	- what types of loads may experience increased heating		N/A
	- recommendations for maximum operating times with such loads		N/A
	The inverter manufacturer shall specify for the waveforms as determined by the testing in 4.7.5.3.2 through 4.7.5.3.4.:		N/A
	- THD		N/A
	- slope		N/A
	- peak voltage		N/A
5.3.2.7	Systems located in closed electrical operating areas	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

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Clause	Requirement – Test	Result - Remark	Verdict
	- 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 30mA touch current limit, or residual current monitoring for sudden changes)		N/A
5.3.2.8	Stand- alone inverter output circuit bonding	All models can operate in the stand-alone mode	N/A
	Where required by 7.3.10, the documentation for an inverter shall include the following:		N/A
	- if output circuit bonding is required but is not provided integral to the inverter, the required means shall be described in the installation instructions, including which conductor is to be bonded and the required current carrying capability or cross-section of the bonding means;	The requirements of output circuit bonding are described in the installation instruction.	N/A
	- if the output circuit is intended to be floating, the documentation for the inverter shall indicate that the output is floating.		N/A
5.3.2.9	Protection by application of RCD's		N/A
	Where the requirement for additional protection in 4.8.3.1 is met by requiring an RCD that is not provided integral to the inverter, as allowed by 4.8.3.4, the installation instructions shall state the need for the RCD,.		N/A
	and shall specify its rating, type, and required circuit location		N/A
5.3.2.10	Remote indication of faults		P
	The installation instructions shall include an explanation of how to properly make connections to (where applicable), and use, the electrical or electronic fault indication required by 13.9.		P
5.3.2.11	External array insulation resistance measurement and response		N/A
	The installation instructions for an inverter for use with ungrounded arrays that does not incorporate all the aspects of the insulation resistance measurement and response requirements in 4.8.2.1, must include:		N/A

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Clause	Requirement – Test	Result - Remark	Verdict
	- for isolated inverters: an explanation of what aspects of array insulation resistance measurement and response are not provided, and		N/A
	- an instruction to consult local regulations to determine if any additional functions are required or not;		N/A
	- for non-isolated inverters: an explanation of what external equipment must be provided in the system, and		N/A
	- what the setpoints and response implemented by that equipment must be, and:		N/A
	- how that equipment is to be interfaced with the rest of the system.		N/A
5.3.2.12	Array functional grounding information		N/A
	Where approach a) of 4.8.2.2 is used, the installation instructions for the inverter shall include all of the following:		N/A
	a) the value of the total resistance between the PV circuit and ground integral to the inverter		N/A
	b) the minimum array insulation resistance to ground that system designer or installer must meet when selecting the PV panel and system design, based on the minimum value that the design of the PV functional grounding in the inverter was based on		N/A
	c) the minimum value of the total resistance R = VMAX PV/30 mA that the system must meet, with an explanation of how to calculate the total		N/A
	d) a warning that there is a risk of shock hazard if the total minimum resistance requirement is not met.		N/A
5.3.2.13	Stand-alone inverters for dedicated loads	No such dedicated loads	N/A
	Where the approach of 4.7.5.5 is used, the installation instructions for the inverter shall include a warning that the inverter is only to be used with the dedicated load for which it was evaluated, and		N/A
	shall specify the dedicated load.		N/A
5.3.2.14	Identification of firmware version(s)		P

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Clause	Requirement – Test	Result - Remark	Verdict
	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
6	Environmental requirements and conditions *This clause of Part 1 is applicable.*		P
7	Protection against electric shock and energy hazards *This clause of Part 1 is applicable except for the following additions:*		P
7.3	Protection against electric shock *Additional subclauses:*		N/A
7.3.10	Additional requirements for stand-alone inverters		N/A
	One circuit conductor bonded to earth to create a grounded conductor and an earthed system.		N/A
	The means used to bond the grounded conductor to protective earth provided within the inverter or		N/A
	as part of the installation		N/A
	If not provided integral to the inverter, the required means shall be described in the installation instructions as per 5.3.2.8.		N/A
	The means used to bond the grounded conductor to protective earth shall comply with the requirements for protective bonding in Part 1,		N/A
	If the bond can only ever carry fault currents in stand-alone mode, the maximum current for the bond is determined by the inverter maximum output fault current.	No such use.	N/A
	Output circuit bonding arrangements shall ensure that in any mode of operation, the system only has the grounded circuit conductor bonded to earth in one place at a time..		N/A
	Switching arrangements may be used, in which case the switching device used is to be subjected to the bond impedance test along with the rest of the bonding path		N/A
	Inverters intended to have a circuit conductor bonded to earth shall not impose any normal current on the bond except for leakage current.		N/A

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Clause	Requirement – Test	Result - Remark	Verdict
	Outputs that are intentionally floating with no circuit conductor bonded to ground, must not have any voltages with respect to ground that are a shock hazard in accordance with Clause 7 of Parts 1 and 2.		N/A
	The documentation for the inverter shall indicate that the output is floating as per 5.3.2.8.		N/A
7.3.11	Functionally grounded arrays		N/A
	All PV conductors in a functionally grounded array shall be treated as being live parts with respect to protection against electric shock.		N/A
8	Protection against mechanical hazards *This clause of Part 1 is applicable.*		P
9	Protection against fire hazards *This clause of Part 1 is applicable with the following exceptions:*		P
9.3	Short-circuit and overcurrent protection *Additional subclause:*		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
10	Protection against sonic pressure hazards *This clause of Part 1 is applicable*		P
11	Protection against liquid hazards *This clause of Part 1 is applicable*		P
12	Protection against chemical hazards *This clause of Part 1 is applicable*		P

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Clause	Requirement – Test	Result - Remark	Verdict
13	Physical requirements *This clause of Part 1 is applicable with the following exception:* *Additional subclause:*		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	Display panel is available for fault indication.	P
	b) an electrical or electronic indication that can be remotely accessed and used.	Error message could be accessed through communication port.	P
	The installation instructions shall include information regarding how to properly make connections (where applicable) and use the electrical or electronic means in b) above, in accordance with 5.3.2.10.		P
14	Components *This clause of Part 1 is applicable*		P

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Clause	Requirement – Test	Result - Remark	Verdict

4.4.4	TABLE: Single fault condition to be applied					P
	Ambient temperature (°C) ..... :				25	—
	Power source for EUT: Manufacturer, model/type, output rating :				See below	—
4.4.4.15.1	Fault-tolerance of residual current monitoring					
Component No.	Fault	Supply voltage (V)	Test time	Fuse #	Fuse current (A)	Observation
Check that the residual current monitoring operates properly						Checked
Supplementary information: Refer to IEC 62109-1 table 4.4						

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

4.4.4	TABLE: Single fault condition to be applied		P
	Ambient temperature (°C) .....:	25	—
	Power source for EUT: Manufacturer, model/type, output rating .....:	See below	—

4.4.4.15.2	Fault-tolerance of automatic disconnecting means					
Component No.	Fault	Supply voltage (V)	Test time	Fuse #	Fuse current (A)	Observation

Check that the relays fulfil the basic insulation or simple separation based on the PV circuit working voltage.	Checked
Each active phase can be switched. (L and N)	Checked
Supplementary information: Refer to 62109-1 table 4.4	

4.4.4.16	Stand-alone inverters – Load transfer test			N/A
Phase	Displaced angle	Operate normally?	Result	Remark
L-N	N/A	N/A	N/A	N/A
A	N/A	N/A	N/A	N/A
B	N/A	N/A	N/A	N/A
C	N/A	N/A	N/A	N/A

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Clause	Requirement – Test	Result - Remark	Verdict

4.4.4.17	Cooling system failure – Blanketing test		P
	test voltage (Vdc) ..... :	--	—
	test current (Idc) ..... :	--	
	test voltage (Vac) ..... :	--	
	test current (Iac) ..... :	--	
	t1 (°C) ..... :	--	—
	t2 (°C) ..... :	--	—

maximum temperature T of part/at:	T (°C)				Tmax (°C)
Ambient	60.27	--	--	--	--
Y Cap. C103	90.99	--	--	--	110
TVR101	91.58	--	--	--	105
GS100	83.06	--	--	--	85
C108	92.62	--	--	--	105
L101Core	93.64	--	--	--	110
L101Coil	92.08	--	--	--	110
L101Base	93.96	--	--	--	110
C110	90.04	--	--	--	105
HCT101	97.97	--	--	--	125
U404	98.09	--	--	--	110
C414	95.85	--	--	--	110
Q401	98.38	--	--	--	130
PCB near Q401	95.11	--	--	--	130
TX400 core	94.45	--	--	--	110
TX400 coil	94.38	--	--	--	110
C413	93.87	--	--	--	110
C201	91.83	--	--	--	110
U101	98.80	--	--	--	130
C204	90.48	--	--	--	105

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Clause	Requirement – Test		Result - Remark		Verdict
RY100	83.72	--	--	--	85
U600	96.19	--	--	--	125
U502	95.89	--	--	--	125
TX500 core	93.99	--	--	--	110
TX500 coil	93.71	--	--	--	110
U505	96.78	--	--	--	125
U509	95.76	--	--	--	125
HCT301	97.18	--	--	--	125
C301	90.74	--	--	--	110
C310	89.39	--	--	--	105
RY301	82.97	--	--	--	85
RY303	83.67	--	--	--	85
L300 core	95.63	--	--	--	110
L300 coil	92.37	--	--	--	110
L300 base	94.91	--	--	--	110
C327	90.40	--	--	--	110
L301 core	94.79	--	--	--	110
L301 coil	95.34	--	--	--	110
L301 base	92.76	--	--	--	110
C329	88.68	--	--	--	110
TVR301	92.00	--	--	--	105
C507	91.05	--	--	--	110
C330	91.27	--	--	--	110
C331	88.56	--	--	--	110
GS300	84.33	--	--	--	85
Q102	109.09	--	--	--	130
D102	104.64	--	--	--	130

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Clause	Requirement – Test		Result - Remark		Verdict
Q203	104.71	--	--	--	130
Q202	103.65	--	--	--	130
C208	92.35	--	--	--	105
BOOST inductance Coil	117.83	--	--	--	130
BOOST inductance Core	117.42	--	--	--	130
INV inductance Coil	117.70	--	--	--	130
INV inductance Core	106.56	--	--	--	130
PCB near AC relay	95.50	--	--	--	130
PCB near IGBT	95.99	--	--	--	130
X cap. C3 on EMC board	87.30	--	--	--	105
Y cap. C1 on EMC board	88.81	--	--	--	125
Metal enclosure-top	74.63*	--	--	--	100*
Metal enclosure-left	76.55*	--	--	--	100*
Heatsink	105.81*	--	--	--	For Ref.
AC CONNECTOR	66.34	--	--	--	85
AC power cable	92.63	--	--	--	105
DC SWITCH	83.54	--	--	--	85
LCD PLASCTIC PANEL	73.23	--	--	--	90
Inner Fan	83.55	--	--	--	85
Mounting surface	82.16	--	--	--	90
PV CONNECTOR	70.31	--	--	--	85
PV+ power cable	90.21	--	--	--	105
AFCI current sensor	88.24	--	--	--	105
AFCI PCB BASE	89.42	--	--	--	130
DSP PCB BASE	93.71	--	--	--	130
ARM CHIP U4	94.62	--	--	--	105
DSPU15	99.27	--	--	--	130

IEC 62109-2						
Clause	Requirement – Test			Result - Remark		Verdict
DSPU17		96.77	--	--	--	130
Note(s): Test condition 10 PV to Grid, MPPT=500V, Grid=198V, 6kW, 60°C ambient, 50Hz, Blanked. Note*: The parts are marked with the hot surface marking of symbol 14 of Annex C.						

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

4.7.4.4	TABLE: Steady state Inverter AC output voltage and frequency		N/A
	Nominal output AC voltage [V]:	N/A	
	Nominal output frequency [Hz]:	N/A	

Condition	Output Voltage (V)	Output Frequency (Hz)	Maximum time, s before cessation of current
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
Note(s):			

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

4.7.5 Stand-alone inverter output voltage waveform				N/A
Power Condition	5%P			Limit (%)
	Phase A:	Phase B:	Phase C:	
	Harmonic measured (%)	Harmonic measured (%)	Harmonic measured (%)	
N/A	N/A	N/A	N/A	N/A
Power Condition	50% P			Limit (%)
	Phase A:	Phase B:	Phase C:	
	Harmonic measured (%)	Harmonic measured (%)	Harmonic measured (%)	
N/A	N/A	N/A	N/A	N/A
Power Condition	100% P			Limit (%)
	Phase A:	Phase B:	Phase C:	
	Harmonic measured (%)	Harmonic measured (%)	Harmonic measured (%)	
N/A	N/A	N/A	N/A	N/A

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

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

DC Voltage below minimum operating voltage (V)	DC Voltage for inverter begin operation (V)	Resistance between ground and PV input terminal (kΩ)	Required Insulation resistance R = ($V_{MAX\ PV}$ / 30mA) (kΩ)	Result
PV+				
50	360	72	20	Isolation Fault
50	360	80	20	Normal Operation
50	360	88	20	Normal Operation
PV-				
50	360	72	20	Isolation Fault
50	360	80	20	Normal Operation
50	360	88	20	Normal Operation

Note: the actual array insulation resistance threshold value R=80kΩ.

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.

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

4.8.3.2	TABLE: 30mA touch current type test for isolated inverters			N/A
Condition	PV supply " + " → terminal A [mA]	PV supply " - " → terminal A [mA]	Limit [mA]	Comments
DC+ to PE	N/A	N/A	30	N/A
DC- to PE	N/A	N/A	30	N/A
Supplementary information: The touch current measurement circuit of IEC 60990, Figure 4 is connected from each terminal of the array to ground, one at a time.				

4.8.3.3	TABLE: Fire hazard residual current type test for isolated inverters			N/A
Condition	PV supply " + " → earthing [mA]	PV supply " - " → earthing [mA]	Limit [mA]	Comments
fire hazard residual current	N/A	N/A	300	Inverter ≤ 30KVA
fire hazard residual current	N/A	N/A	10mA per KVA	Inverter > 30KVA
Supplementary information: Using ammeter for testing fire hazard residual current.				

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

4.8.3.5	TABLE: Protection by residual current monitoring	P
Test conditions:	Output power (kVA) : 6 Input voltage (V_{DC}): 500 Frequency (Hz): 50 Output AC Voltage (VAC): 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:			
230	**300**	112	**300**
200	**300**	102	**300**
210	**300**	110	**300**
210	**300**	114	**300**
210	**300**	111	**300**
PV- to N:			
250	**300**	117	**300**
240	**300**	108	**300**
240	**300**	108	**300**
251	**300**	121	**300**
250	**300**	116	**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: N/A

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

4.8.3.5.3	TABLE: Residual current monitoring test		P
Conditions	Trigger disconnection maximum time		
	Measurement [ms]		Limit [ms]
	U_N		
Sudden residual current ≥ 30mA			
PV+ to Neutral	204		300
	202		300
	202		300
	204		300
	208		300
PV- to Neutral	206		300
	200		300
	200		300
	200		300
	192		300
Sudden residual current ≥ 60mA			
PV+ to Neutral	71		150
	71		150
	75		150
	64		150
	72		150
PV- to Neutral	76		150
	68		150
	68		150
	78		150
	76		150
Sudden residual current ≥ 150mA			
PV+ to Neutral	36		40
	38		40
	28		40
	38		40
	36		40
PV- to Neutral	39		40

IEC 62109-2			
Clause	Requirement – Test	Result - Remark	Verdict
		28	40
		27	40
		22	40
		28	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: N/A			

- End of test report -

P H O T O D O C U M E N T A T I O N

CN25ZR1J 001 attachment 2

GW3K-DNS-G40, GW3.6K-DNS-G40,
GW4.2K-DNS-G40, GW5K-DNS-G40,
GW6K-DNS-G40, GW3.1K-DNS-L-G40

GoodWe Technologies Co., Ltd.

This documentation consists of 14 pages (excluding this cover page).

Figure 1. Overall view

Figure 2. Bottom view

Figure 3. Back view

Figure 4. Right view

Figure 5. Top view

Figure 6. Left view

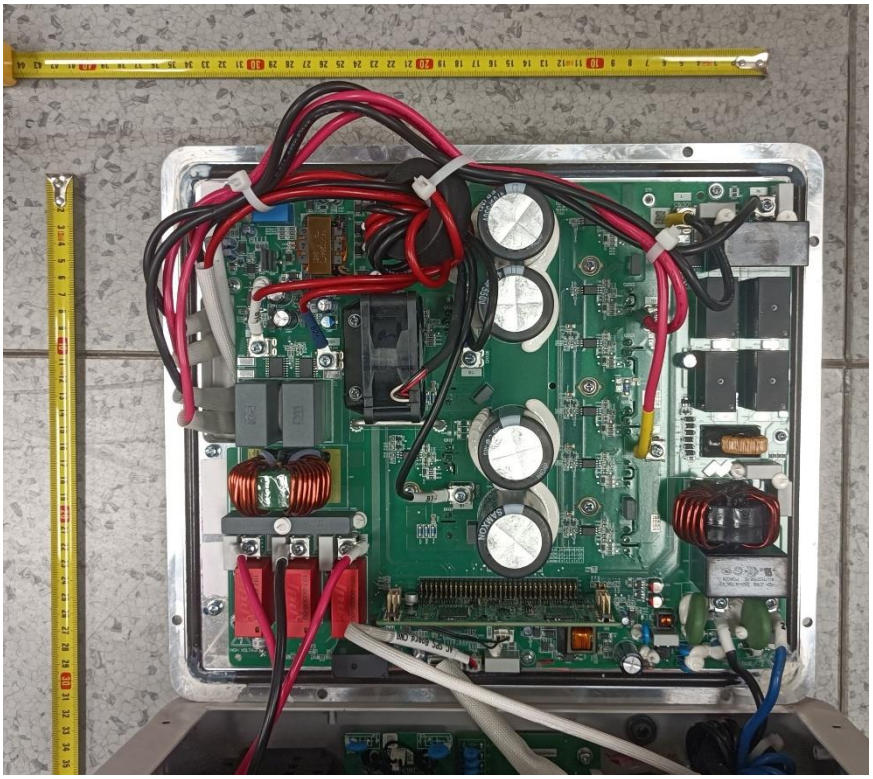

Figure 7. Internal view

Figure 8. Top cover view

Figure 9. External earthed terminal view

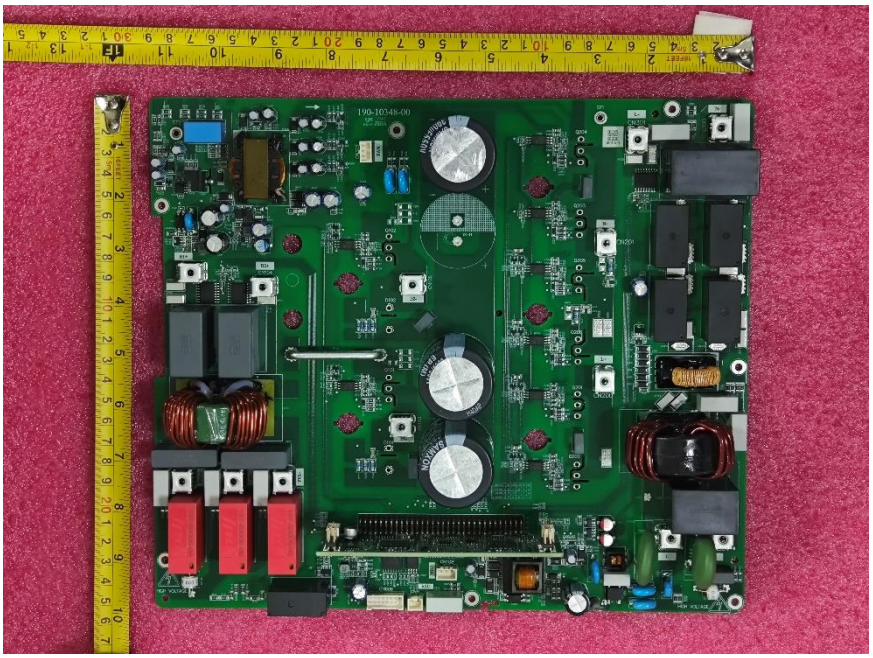

Figure 10. Top side view of power board for models GW3K-DNS-G40, GW3.6K-DNS-G40

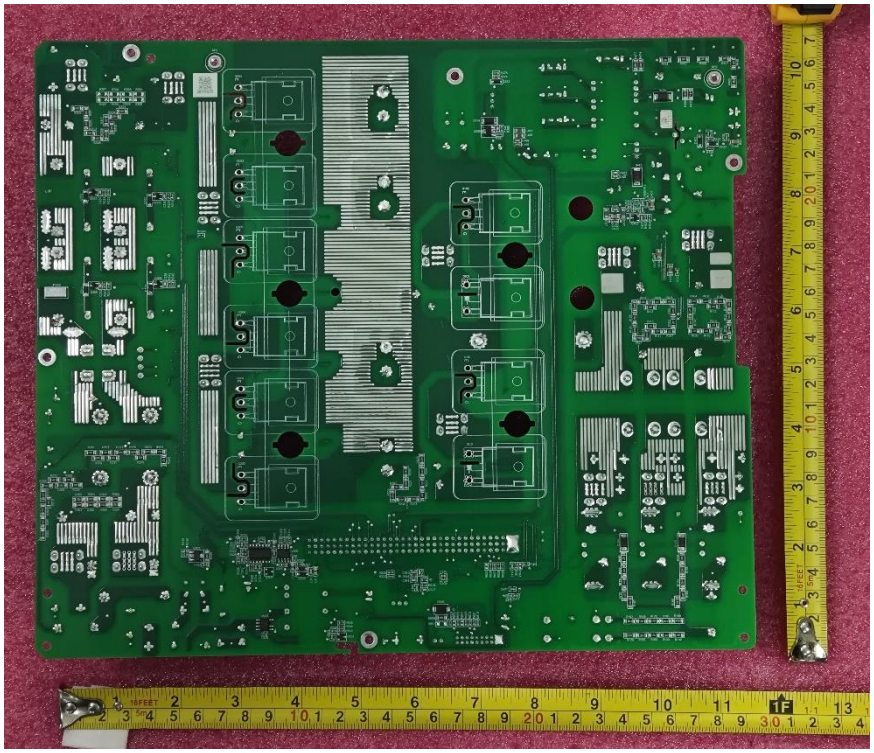

Figure 11. Bottom side view of power board for models GW3K-DNS-G40, GW3.6K-DNS-G40

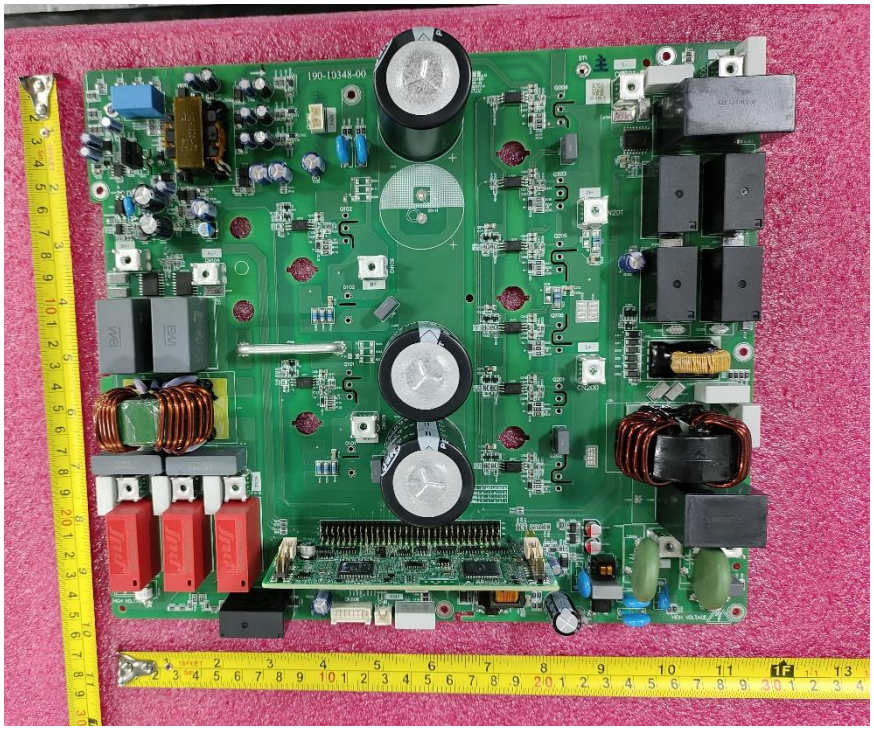

Figure 12. Top side view of power board for models GW4.2K-DNS-G40, GW5K-DNS-G40, GW3.1K-DNS-L-G40

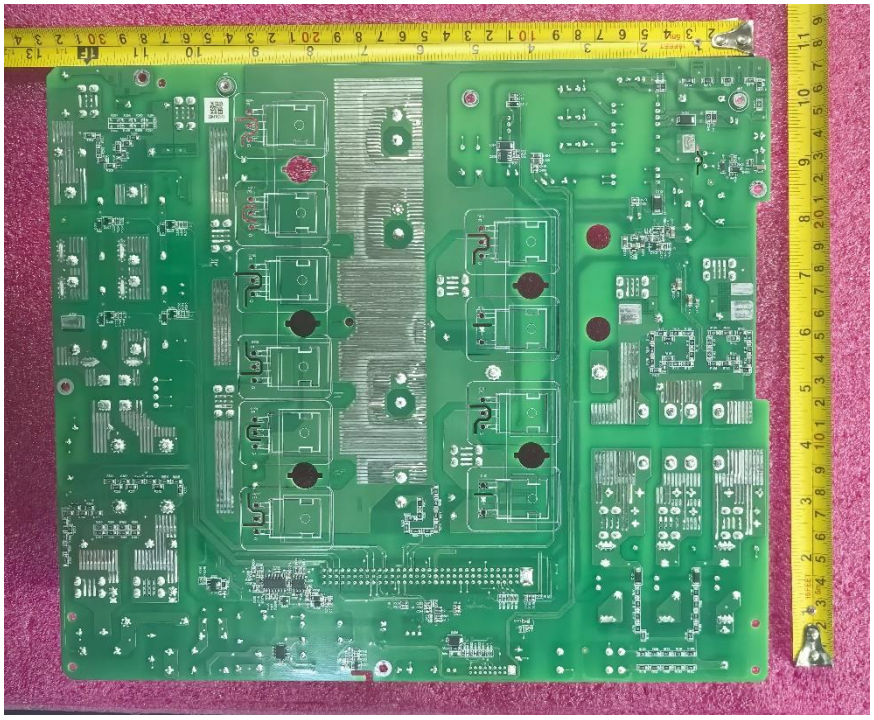

Figure 13. Bottom side view of power board for models GW4.2K-DNS-G40, GW5K-DNS-G40, GW3.1K-DNS-L-G40

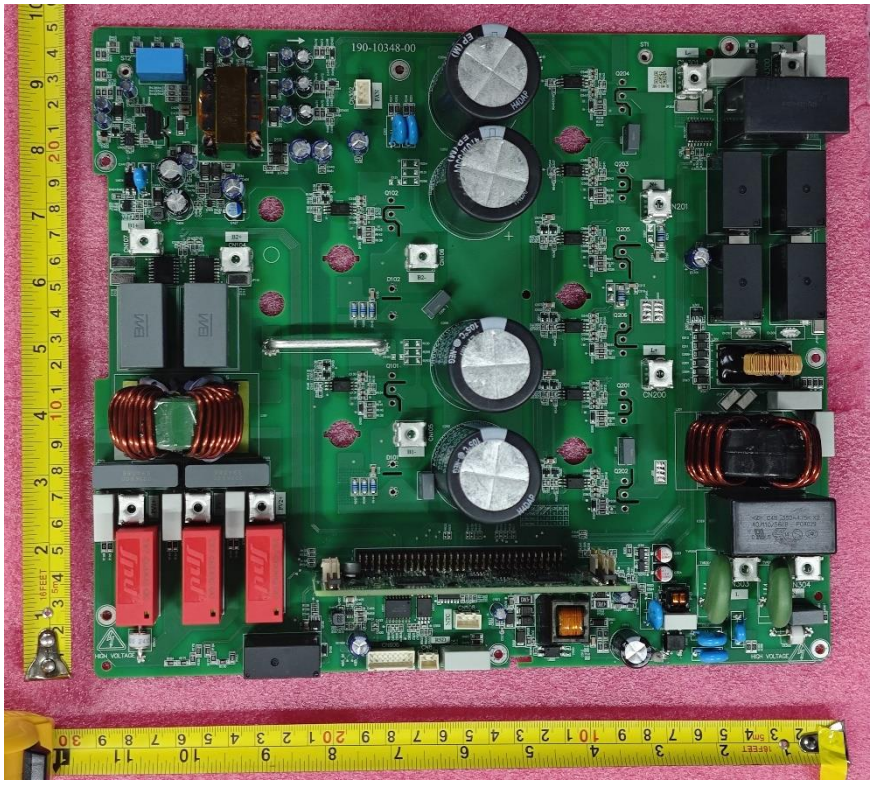

Figure 14. Top side view of power board for models GW6K-DNS-G40

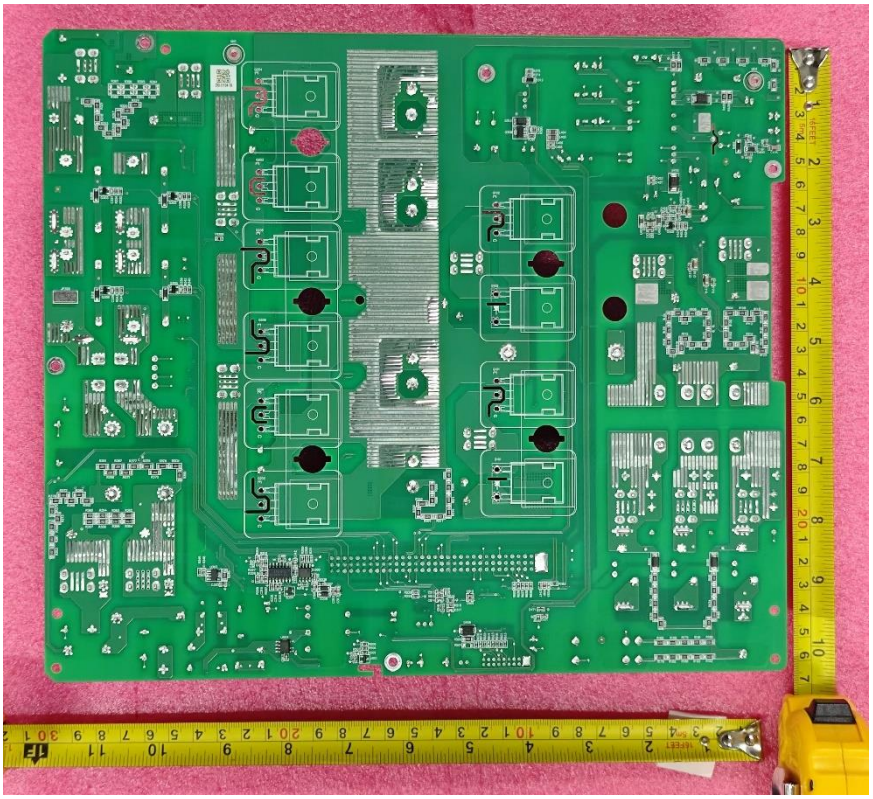

Figure 15. Bottom side view of power board for models GW6K-DNS-G40

Figure 16. Top side view of control board

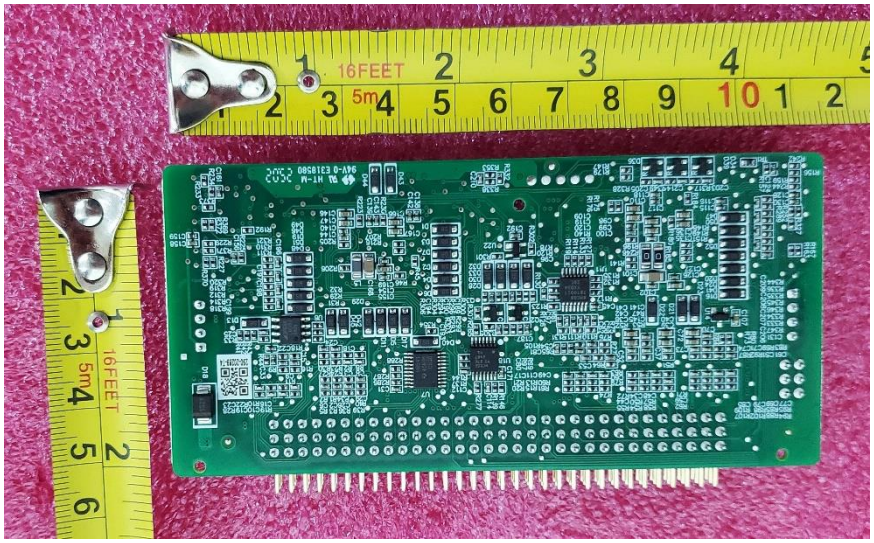

Figure 17. Bottom side view of control board

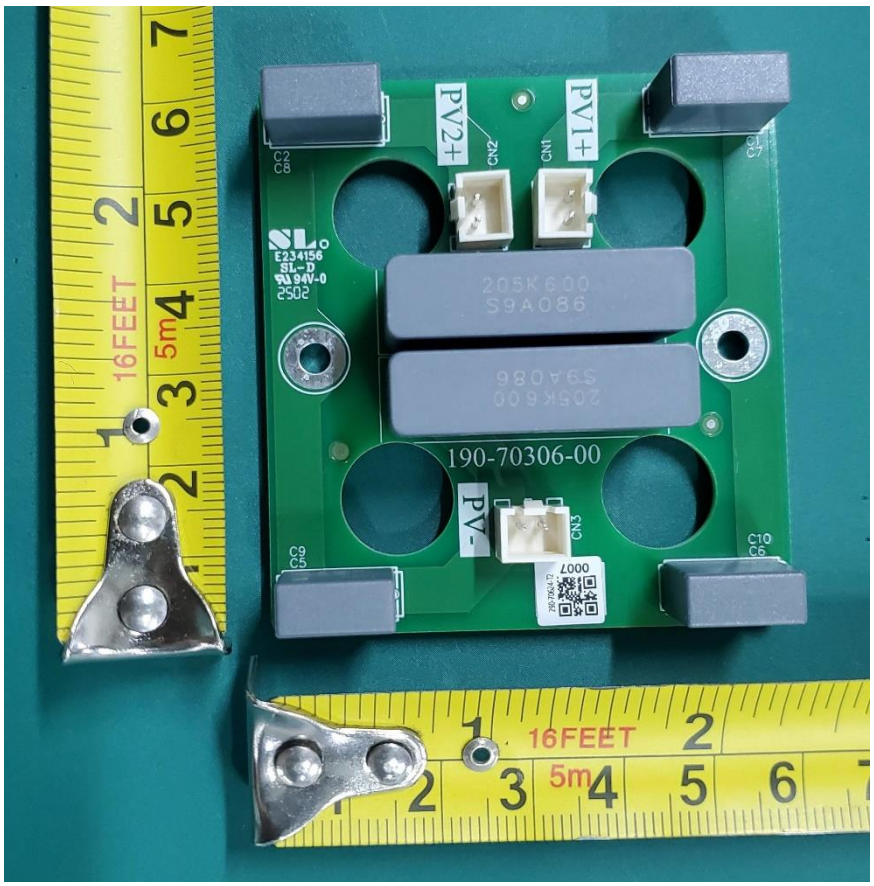

Figure 18. Top side view of PV EMC board

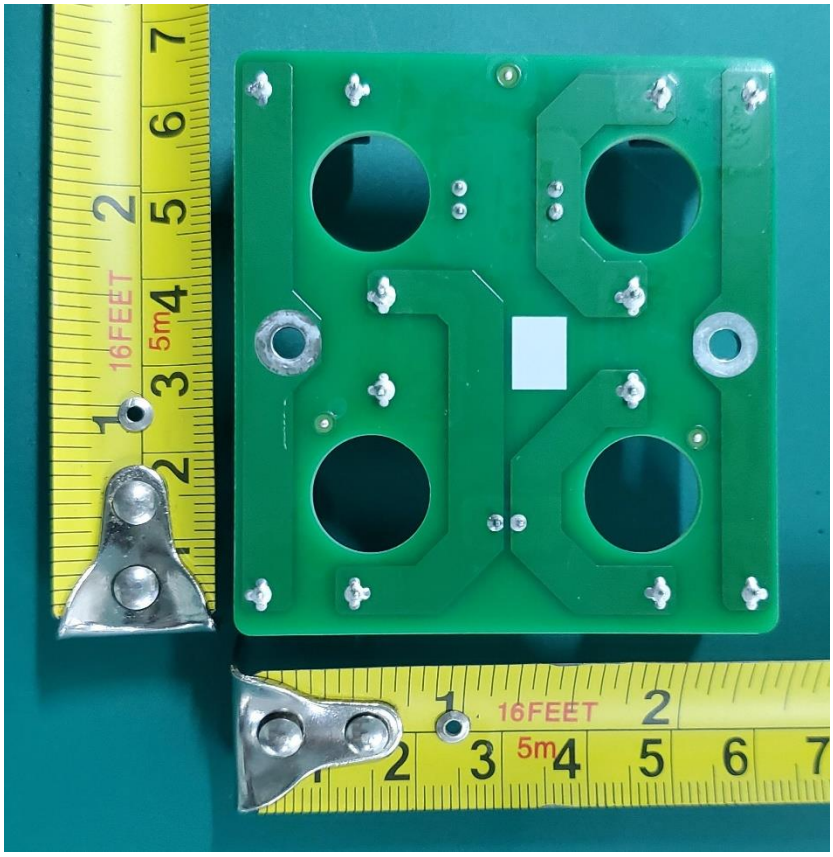

Figure 19. Bottom side view of PV EMC board

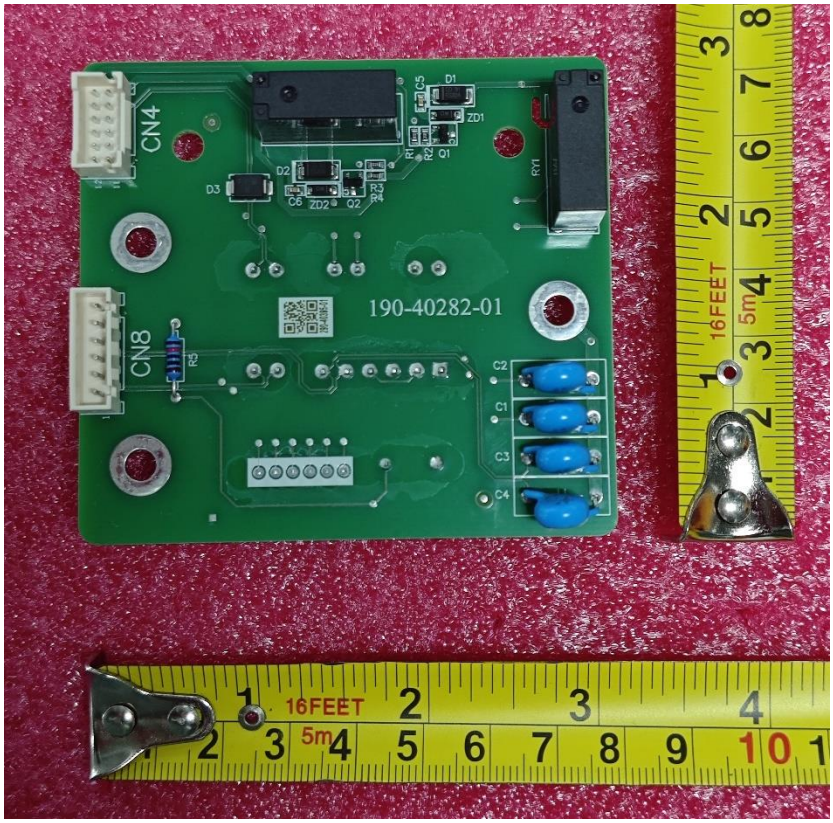

Figure 20. Top side view of communication board

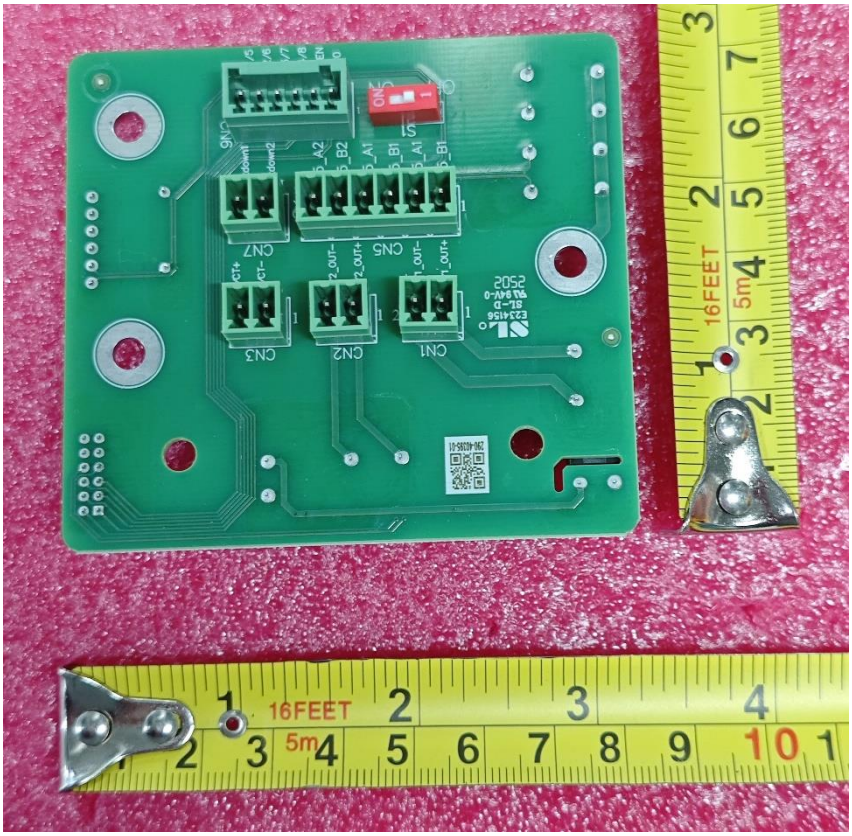

Figure 21. Bottom side view of communication board

Figure 22. Top side view of LCD board

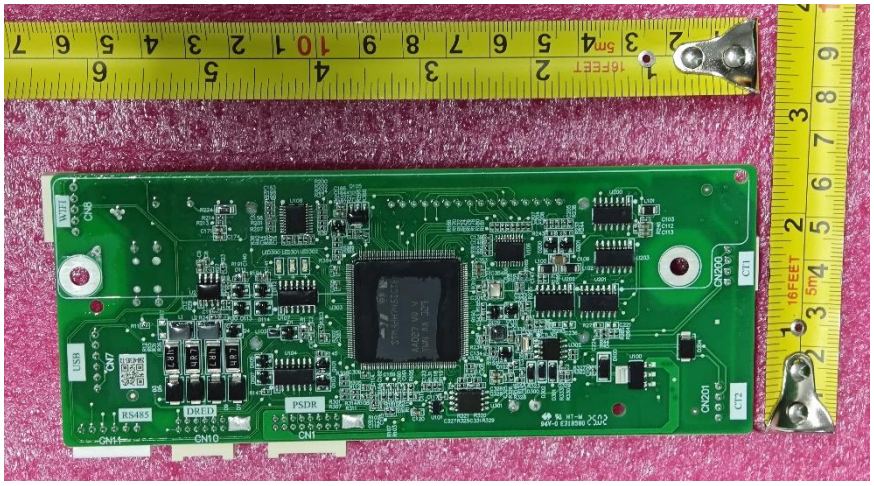

Figure 23. Bottom side view of LCD board

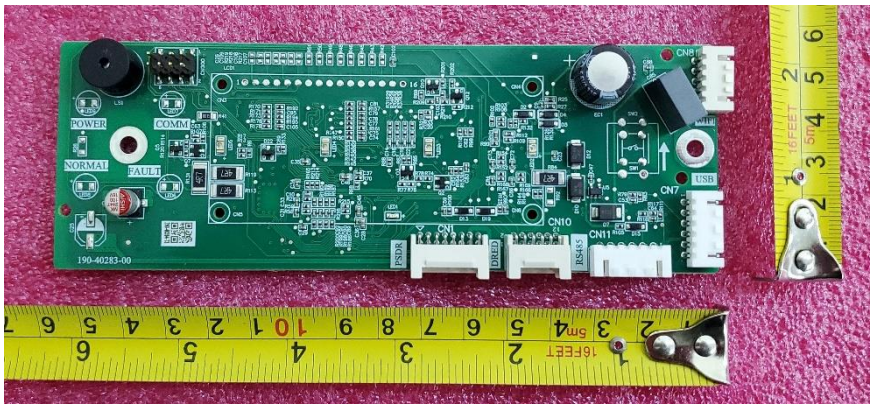

Figure 24. Top side view of LED board (optional)

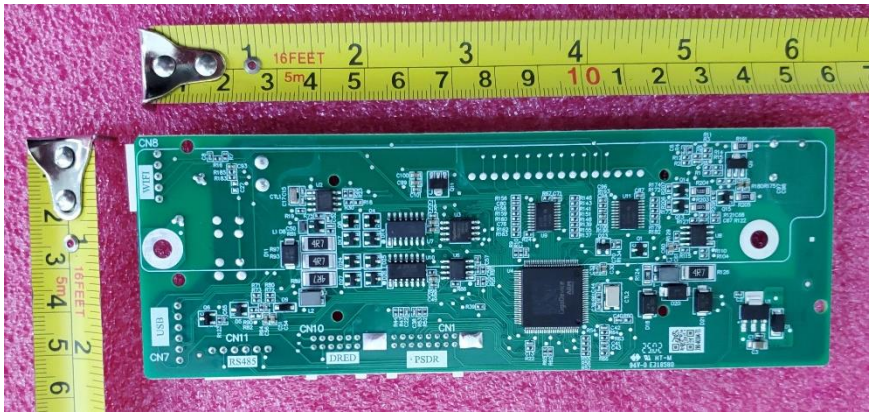

Figure 25. Bottom side view of LED board (optional)

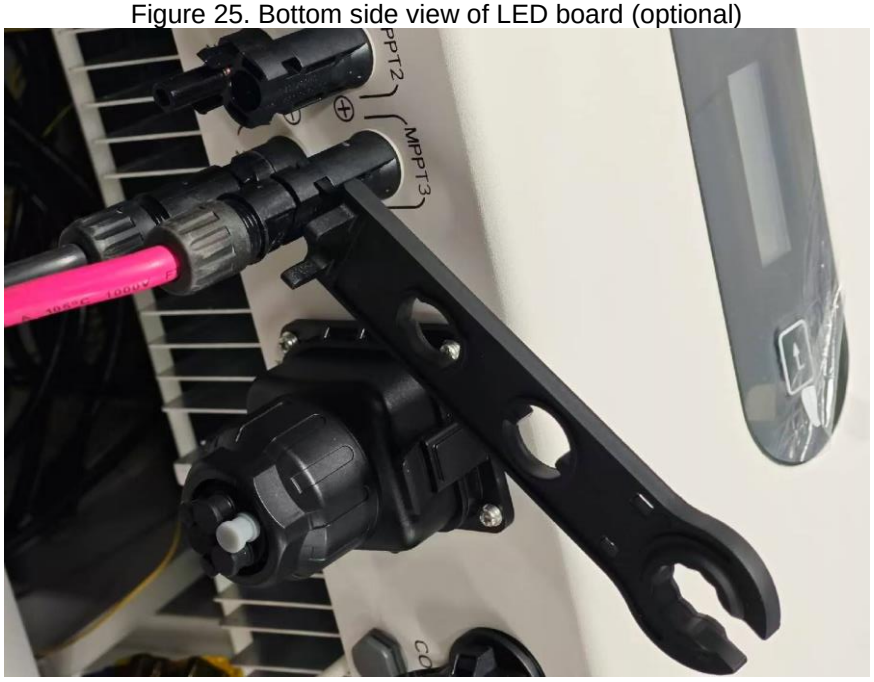

Figure 26. PV connector with tools

Figure 27. AC connector with tools

Constructional Data Form (CDF) for Electrical Appliances

License holder	:	GoodWe Technologies Co., Ltd.
License holderAddress	:	No.90 Zijin Rd., New District, Suzhou, 215011, China
Factory 1	:	Same as License holder
Factory Address	:	Same as License holder
Factory 2	:	GoodWe (GuangDe) Power Supply Technology Co., Ltd.
Factory Address	:	No. 208, Tong Rui East Road, Guangde, Anhui, P. R. China
Factory 3	:	GOODWE VIETNAM TECHNOLOGY COMPANY LIMITED
Factory Address	:	Factory A1, A2, Lot CN1N, Maritime Industrial and Service Park (Deep C2B), Dinh Vu – Cat Hai Economic Zone, Dong Hai 2 Ward, Hai An District, Hai Phong City Vietnam
Type of Appliance	:	Grid-Tied PV Inverter
Type Designation	:	GW3K-DNS-G40, GW3.6K-DNS-G40, GW4.2K-DNS-G40, GW5K-DNS-G40, GW6K-DNS-G40, GW3.1K-DNS-L-G40
Rating	:	See model list
Protection Class	:	Class I
Supply connection	:	☐ fixed power cord ☒ permanent connection ☐ appliance inlet ☐ direct plug in ☐ Special Connector

Constructional Data Form (CDF) for Electrical Appliances

MODELS LIST		GW3K-DNS-G40	GW3.6K-DNS-G40	GW4.2K-DNS-G40
INPUT	V_{MAX} PV [Vdc]	600		
	MPP Voltage Range V_{MPP}[Vdc]	40-560		
	MPP Voltage Range for Full power [Vdc]	100-500	120-500	140-500
	Nominal PV Voltage V_{nom}[Vdc]	360		
	Start PV Voltage [Vdc]	50		
	I_{SC} PV [A]	26		
	Max. Input Current Imax [A]	20		
	Backfeed Current [A]	0		
	Overvoltage Category (OVC)	II		
OUTPUT	Rated Output Voltage Ur [Vac]	220/230/240, L/N/PE		
	Rated Output Frequency F_{NETZ} [Hz]	50 / 60		
	Normal Operating Frequency Range Fn [Hz]	45~55 / 55~65		
	Rated Output Power P_E [kW]	3	3.6	4.2
	Max. Output Power P_{Emax} [kVA]	3	3.6	4.2
	Max. Output Current Imax [A]	13.7	16.4	19.1
	Power Factor cosφ [λ]	1 (Default), [-0.80, +0.80]		
	Overvoltage Category (OVC)	III		
SYSTEM	Protective Class	I		
	Enclosure Protection (IP)	IP66		
	Operating Temperature Range [°C]	-25 to 60 (derating at 45)		
	Pollution degree (PD)	PD 2 (inside), PD 3 (outside)		
	Altitude [m]	Max. 4000		
	Weight [kg]	Max. 9.2		
	Size [mm]	358 x 323 x 165		
	Type of Inverter	Non-isolated		
	Firmware version	V1.00.00		

Constructional Data Form (CDF) for Electrical Appliances

MODELS LIST		GW5K-DNS-G40	GW6K-DNS-G40	GW3.1K-DNS-L-G40
INPUT	V_{MAX} PV [Vdc]	600		550
	MPP Voltage Range V_{MPP}[Vdc]	40-560		40-480
	MPP Voltage Range for Full power [Vdc]	165-500	195-500	110-420
	Nominal PV Voltage V_{nom}[Vdc]	360		230
	Start PV Voltage [Vdc]	50		
	I_{SC} PV [A]	26		
	Max. Input Current Imax [A]	20		
	Backfeed Current [A]	0		
	Overvoltage Category (OVC)	II		
OUTPUT	Rated Output Voltage Ur [Vac]	220/230/240, L/N/PE		127, L/N/PE
	Rated Output Frequency F_{NETZ} [Hz]	50 / 60		60
	Normal Operating Frequency Range Fn [Hz]	45~55 / 55~65		59.5~60.2
	Rated Output Power P_E [kW]	5	6	3.1
	Max. Output Power P_{Emax} [kVA]	5	6	3.1
	Max. Output Current Imax [A]	22.8	27.3	24.4
	Power Factor cosφ [λ]	1 (Default), [-0.80, +0.80]		
	Overvoltage Category (OVC)	III		
SYSTEM	Protective Class	I		
	Enclosure Protection (IP)	IP66		
	Operating Temperature Range [°C]	-25 to 60 (derating at 45)		
	Pollution degree (PD)	PD 2 (inside), PD 3 (outside)		
	Altitude [m]	Max. 4000		
	Weight [kg]	Max. 9.2		
	Size [mm]	358 x 323 x 165		
	Type of Inverter	Non-isolated		
	Firmware version	V1.00.00		

Critical Components
Material: e.g. external enclosure, PCB, closed-end connector, sleeves, cord anchorage etc
Components with winding: e.g. motor, transformer, magnetic coil etc.
Other components: e.g. switch, thermostat, heater, plug, internal wire, capacitor, relay, varistor etc.

Object/part No.	Manufacturer/ trademark	Type/ model	Technical data	Standard	Mark(s) of conformity
PV connector	JINKO	PV-JK01M-M/RB PV-JK01M-F/RB	45A, 1100VDC, IP68, 85°C	EN 62852:2015/A1:2020, IEC 62852:2014, IEC 62852:2014/AMD 1:2020 UL6703	TUV B 112370 0012 TUV R 50519334 UL E346240
-Alternate	JINKO	PV-JK00M1-M/2A PV-JK00M1-F/2A	45A, 1100VDC, IP68, 85°C	EN 62852:2015/A1:2020, IEC 62852:2014, IEC 62852:2014/AMD 1:2020 UL6703	TUV B 112370 0010 TUV R 50519334 UL E346240
-Alternate	JINKO	PV-JK01M1-M/RB14 PV-JK01M-F/RB	45A, 1100VDC, IP68, 85°C	EN 62852:2015/A1:2020, IEC 62852:2014, IEC 62852:2014/AMD 1:2020 UL6703	TUV B 112370 0012 TUV R 50519334 UL E346240
-Alternate	JINKO	PV-JK00M1-M/2B12 PV-JK00M1-F/2A	45A, 1100VDC, IP68, 85°C	EN 62852:2015/A1:2020, IEC 62852:2014, IEC 62852:2014/AMD 1:2020 UL6703	TUV B 112370 0010 TUV R 50519334 UL E346240
-Alternate	STAUBLI	PV-ADS4-EVO-2A/6 PV-ADB4-EVO-2A/6	42A, 1500VDC, IP68, 85°C	IEC 62852:2014 UL6703	TUV R 60127171 E343181
-Alternate	STAUBLI	PV-ADBP4-S2-UR/6 PV-ADSP4-S2-UR/6	45A, 1250VDC, IP68, 85°C	IEC 62852:2014 UL6703	TUV R 60127181 E343181
-Alternate	STAUBLI	PV-KBT4-Evo EVO 2(A)/6I PV-KST4-Evo EVO 2(A)/6I	53A, 1500VDC, IP68, 85°C	IEC 62852:2014 UL6703	TUV R 60127169 E343181

AC connector	EXCEEDCONN	EN040-2203-101	400V, 40A, 105°C, IP68	EN61984:2009	TUV B 077046 0072
-Alternate	EXCEEDCONN	EN040-1103-101	400V, 40A, 105°C, IP68	EN61984:2009	TUV B 077046 0072
-Alternate	HANDA	HDC-42i3m2	600V, 42A, 85°C, IP68	EN61984:2009	TUV B 113788 0001
-Alternate	HANDA	HDC-42i3f1	600V, 42A, 85°C, IP68	EN61984:2009	TUV B 113788 0001
DC switch	GEIREN (Not for Australian market)	GHX5-32P	600V, 50A, 85°C, IP66	IEC 60947-3 EN 60947-3	TUV R 50592803
-Alternate	GEIREN (Not for Australian market)	GHX5-32P	1100V, 50A, 85°C, IP66	IEC 60947-3 EN 60947-3	TUV R 50592803
-Alternate	NADER (Not for Australian market)	NDG3V-50	1100V, 50A, 85°C, IP66	EN IEC 60947-1:2021, EN IEC 60947-3:2021	TUV B 083574 0316
-Alternate	NADER (Not for Australian market)	NDG3V-50	600V, 40A, 85°C, IP66	EN IEC 60947-1:2021, EN IEC 60947-3:2021	TUV B 083574 0316
-Alternate	NADER (For Australian market)	NDG3V-50/series	600V, 55A, 85°C, IP66	EN IEC 60947-1:2021, EN IEC 60947-3:2021	TUV B 083574 0316
USB Cover	SABIC INNOVATIVE PLASTICS US L L C	357(f1)(w)(IC)	V-0, Min. thickness 2mm	UL94	UL E121562
-Alternate	SABIC JAPAN L L C	357(f1)(w)(IC)	V-0, Min. thickness 1.8mm	UL94	UL E207780
RS485 cover	Celanese (Suzhou) Engineering Plastics Co Ltd	A3 RV0 (f1), A 63 R V0 (f1)	V-0, Min thick 1.2mm	UL94	UL E331274
-Alt.	GINAR TECHNOLOGY CO LTD	A0520FN(+)(f1)	V-0, Min thick 1.2mm	UL94	UL E154352
-Alt.	CELANESE INTERNATIONAL CORP	101L(r9)(f1)	V-0, Min thick 1.2mm	UL94	UL E41938
-Alt.	SABIC JAPAN L L C	925U(f1)(GG), 945U(f1)(GG), 955U(f1)(GG), 945URW(f1)	V-0, Min thick 1.2mm	UL94	UL E207780
LCD cover	TORAY INDUSTRIES INC FILM DIV	Lumirror	V-2, Min thick 0.2mm	UL94	UL E86511
Plastic windows	Covestro Deutschland AG	6557+(z)(f1)	V-0, Min thick 1.8mm	UL94	UL E41613

-Alternate	Covestro Deutschland AG	6557+(z)(f1)	V-0, Min thick 1.5mm	UL94	UL E41613
Mylar film	CHENGDU KANGLONGXIN PLASTICS CO LTD	KLX PP BK-10	V-0, 158*31mm, Min. Thickness=0.25mm, -40~+150°C	ANSI/UL 94 UL 746A UL 746B	UL E315185
PV Cable	WUXI XINHONGYE WIRE & CABLE CO LTD	104T12A-03-022 104T12A-01-022	UL1015, AWG12, 600V, 105°C	UL758	UL E248566
-Alternate	3Q WIRE & CABLE CO LTD	3Q-M-9036	UL1015, AWG12, 600 V, 105°C	UL758	UL E341104
-Alternate	WUXI XINHONGYE WIRE & CABLE CO LTD	104T10A-01-024	UL1015, AWG10, 600 V, 105°C	UL758	UL E248566
-Alternate	3Q WIRE & CABLE CO LTD	3Q-F-1489	UL1015, AWG10, 600V, 105°C	UL758	UL E341104
AC Cable	WUXI XINHONGYE WIRE & CABLE CO LTD	104T10A-0506-024	UL1015, AWG10, 600V, 105°C	UL758	UL E248566
-Alternate	WUXI XINHONGYE WIRE & CABLE CO LTD	104T10A-07-024	UL1015, AWG10, 600 V, 105°C	UL758	UL E248566
-Alternate	3Q WIRE & CABLE CO LTD	SK-1015-811	UL1015, AWG10, 600 V, 105°C	UL758	UL E341104
-Alternate	WUXI XINHONGYE WIRE & CABLE CO LTD	114T10A-01-002	UL1032, AWG10, 1000V, 90°C	UL758	UL E248566
-Alternate	3Q WIRE & CABLE CO LTD	3Q-F-1217	UL1032, AWG10, 1000V, 90°C	UL758	UL E341104
-Alternate	3Q WIRE & CABLE CO LTD	3Q-F-1489	UL1015, AWG10, 600V, 105°C	UL758	UL E341104
Heat-shrink tubing-01	SHENZHEN WOER HEAT-SHRINKABLE MATERIAL CO LTD	RSFR-H	⌀6, 125°C, Min. thick 0.28mm, VW-1	UL 224	UL E203950
Heat-shrink tubing-02	SHENZHEN WOER HEAT-SHRINKABLE MATERIAL CO LTD	RSFR-H	⌀9, 125°C, Min. thick 0.3, VW-1	UL 224	UL E203950
FAN	FLY UPWARDS	DF0401512B2LN	DC FAN 12Vdc, 40*40*15mm, 9.83CFM, 0.15A,	EN 62368-1:2014/A11:2017	TUV B 112498 0026

			-30~+85°C		
-Alternate	Ningbo Shengjiu Thermal Technology Co., LTD.	SA120415BMCFR004	DC FAN 12Vdc 40*40*15mm, 9.25CFM, 0.15A, -30~+85°C	EN 62368-1:2014+A11	TUV R 50438525
-Alternate	Fly Upwards Electron Co Ltd	DF0602512B2HN	DC FAN 12V 60*60*25mm, 33.13CFM, 0.26A, -30~+85°C	UL 507 EN 62368-1:2014/A11:2017	UL E255988 TUV B 112498 0026
-Alternate	NMB Technologies Corporation	06025SA-12R-BT-D1	DC FAN 12V 60*60*25mm,0.85m^3/min,0.23A,-10~+80°C	EN IEC 62368-1:2020+A11:2020 IEC 62368-1:2018	VDE 40007459
-Alternate	DONGGUAN PROTECHNIC ELECTRIC CO LTD	MGT6012ZB-O25D	DC FAN 12V 60*60*25mm,0.88m^3, min,0.2A,-10~+80°C	UL 507 EN IEC 62368-1:2020/A11:2020	UL E187236 TUV B 031023 0146
Heatsink	GOODWE	320-00380	AL6063-T5 344*295*65mm	EN IEC 62109-1 EN IEC 62109-2	Test with appliance
Metal enclosure	GOODWE	300-03388, 300-03437	Min thick.1.5mm, Aluminium	EN IEC 62109-1 EN IEC 62109-2	Test with appliance
Ceramic chip	GOODWE	332-00328	Min thick.1mm, 96%AL2O3	EN IEC 62109-1 EN IEC 62109-2	Test with appliance
-Alternate	GOODWE	332-00390	Min thick.1mm, ALN	EN IEC 62109-1 EN IEC 62109-2	Test with appliance
Plastic block (for IGBT)	SABIC JAPAN L L C	OFC08	V-0, 130°C, Min thick.1mm	UL 94	UL E207780
Main PCB	KUNSHAN HUATAO ELECTRONICS CO LTD	HT-M	FR-4, V-0, 130°C, CTI 175~249	UL 796	UL E318580
-Alternate	SHEN ZHEN SUN & LYNN CIRCUITS CO LTD	SL-M	FR-4, V-0, 130°C, CTI 175~249	UL 796	UL E234156
-Alternate	GuangDong Kingshine Electronic Technology Co Ltd	MS-H1	FR-4, V-0, 130°C, CTI 175~249	UL 796	UL E358874
Control PCB	KUNSHAN HUATAO ELECTRONICS CO LTD	HT-M	FR-4, V-0, 130°C, CTI 175~249	UL 796	UL E318580
-Alternate	SHEN ZHEN SUN & LYNN	SL-M	FR-4, V-0, 130°C, CTI 175~249	UL 796	UL E234156

	CIRCUITS CO LTD				
-Alternate	GuangDong Kingshine Electronic Technology Co Ltd	MS-H1	FR-4, V-0, 130°C, CTI 175~249	UL 796	UL E358874
745 ARM PCB	KUNSHAN HUATAO ELECTRONICS CO LTD	HT-M	FR-4, V-0, 130°C, CTI 175~249	UL 796	UL E318580
-Alternate	SHEN ZHEN SUN & LYNN CIRCUITS CO LTD	SL-M	FR-4, V-0, 130°C, CTI 175~249	UL 796	UL E234156
-Alternate	GuangDong Kingshine Electronic Technology Co Ltd	MS-H1	FR-4, V-0, 130°C, CTI 175~249	UL 796	UL E358874
425 ARM PCB	KUNSHAN HUATAO ELECTRONICS CO LTD	HT-M	FR-4, V-0, 130°C, CTI 175~249	UL 796	UL E318580
-Alternate	SHEN ZHEN SUN & LYNN CIRCUITS CO LTD	SL-M	FR-4, V-0, 130°C, CTI 175~249	UL 796	UL E234156
-Alternate	GuangDong Kingshine Electronic Technology Co Ltd	MS-H1	FR-4, V-0, 130°C, CTI 175~249	UL 796	UL E358874
COMM PCB	KUNSHAN HUATAO ELECTRONICS CO LTD	HT-M	FR-4, V-0, 130°C, CTI 175~249	UL 796	UL E318580
-Alternate	SHEN ZHEN SUN & LYNN CIRCUITS CO LTD	SL-M	FR-4, V-0, 130°C, CTI 175~249	UL 796	UL E234156
-Alternate	GuangDong Kingshine Electronic Technology Co Ltd	MS-H1	FR-4, V-0, 130°C, CTI 175~249	UL 796	UL E358874
EMC PCB	KUNSHAN HUATAO ELECTRONICS CO LTD	HT-M	FR-4, V-0, 130°C, CTI 175~249	UL 796	UL E318580
-Alternate	SHEN ZHEN SUN & LYNN	SL-M	FR-4, V-0, 130°C, CTI 175~249	UL 796	UL E234156

	CIRCUITS CO LTD				
-Alternate	GuangDong Kingshine Electronic Technology Co Ltd	MS-H1	FR-4, V-0, 130°C, CTI 175~249	UL 796	UL E358874
NTC	GUIZHOU KAILI ECONOMIC ZONE ZHONGHAO ELECTRONICS CO., LTD.	WEI-153 series	1500V, -30~+120°C	UL1434	UL E519045
-Alternate	KEMIT	MF58100K	3000V, -40~+125°C	UL1434	UL E356449
Boost/INV Choke for model GW6K-DNS-G40	GOODWE	141-10784	250uH@36KHz 780uH@18KHz, -40 ~ +155°C	EN IEC 62109-1 EN IEC 62109-2	Test with appliance
Core	POCO	NPC-75/NPC-60	FeSi	EN IEC 62109-1 EN IEC 62109-2	Test with Unit
-Alternate	POCO	NPV-60	FeSi	EN IEC 62109-1 EN IEC 62109-2	Test with Unit
-Alternate	GUANYOUDA	Ferrites	DMR90	EN IEC 62109-1 EN IEC 62109-2	Test with Unit
Magnet wire	SHANGHAI YOUTUO MAGNET WIRE CO., LTD	Q(ZY/XY) LB-1/200	1.0*6.0mm, 200°C	ANSI/UL 1446	UL E338133
-Alternate	WUXI YOUFAUN ELECTRIC CO.,LTD	Q(ZY/XY) LB-1/200	1.0*9.0mm	ANSI/UL 1446	UL E343483
-Alternate	WUXI TOLY ELECTRIC WORKS CO LTD	Q(ZY/XY) LB-1/200	1.0*9.0mm	ANSI/UL 1446	UL E239135
Varnish	SUZHOU TAIHU ELECTRIC ADVANCED MATERIAL CO LTD	T-4260 (MW 80-C)	155°C	ANSI/UL 1446	UL E228349
Wire	WUXI XINHONGYE CABLE TECHNOLOGY CO., LTD	AWG10/ AWG12	105°C, 1000V, UL10269	UL758	UL E248566

-Alternate	ZHEJIANG3QWIRE & CABLE CO,LTD	AWG10/ AWG12	105°C, 1000V, UL10269	UL758	UL E341104
Tape	CHANG SHU LIANG YI TAPE INDUSTRY CO LTD	LY-20X	180°C	CAN/UL 510A	UL E246820
Epoxy board	ANHUI YISOLA COMPOSITE MATERIAL CO LTD	FR-4	130°C	UL 94 UL746B	UL E510612
Insulation paper	UIL CO LTD	AMA/NMN	180°C	UL 1446	UL E365641
Tube	SHENZHEN WOER HEAT-SHRINKABLE MATERIAL CO LTD	RSFR-H	125°C	UL 224	UL E203950
Sleeving	SHENZHEN WOER HEAT-SHRINKABLE MATERIAL CO LTD	SRS-70	200°C	UL 1441	UL E532653
Casting glue	GUANZHOU HUITIAN NEW MATERIAL CO LTD	5297	150°C	ANSI/UL 94 IEC 60695-11-10 UL 746A UL 746B	UL E306078
Sn	SUZHOU COSTAR ELECTRONIC MATERIAL CO..LTD	Sn99.3/cu0.7	Sn99.3/cu0.7	EN IEC 62109-1 EN IEC 62109-2	Test with Unit
Terminal	ZHEJIANG KEAISI TERMINAL CO., LTD (OR EQUIVALENT)	RNBL5.5-4-135° RNBL5.5-4-90°	RNBL5.5-4-135° RNBL5.5-4-90°	EN IEC 62109-1 EN IEC 62109-2	Test with Unit
-Alternate	KUNSHAN XIMENKAN ELECTRONIC & ELECTRIC CO, LTD (OR EQUIVALENT)	RNBL5.5-4-135° RNBL5.5-4-90°	RNBL5.5-4-135° RNBL5.5-4-90°	EN IEC 62109-1 EN IEC 62109-2	Test with Unit

Boost/INV Choke for models GW5K-DNS-G40, GW4.2K-DNS-G40, GW3.1K-DNS-L-G40	GOODWE	141-10785	250uH@36KHz 780uH@18KHz, -40 ~ +155°C	EN IEC 62109-1 EN IEC 62109-2	Test with appliance
Core	POCO	NPC-75/NPC-60	FeSi	EN IEC 62109-1 EN IEC 62109-2	Test with Unit
-Alternate	POCO	NPV-60	FeSi	EN IEC 62109-1 EN IEC 62109-2	Test with Unit
-Alternate	GUANYOUDA	ferrite 67*30*15mm	DMR90	EN IEC 62109-1 EN IEC 62109-2	Test with Unit
Magnet wire	SHANGHAI YOUTUO MAGNET WIRE CO LTD	Q(ZY/XY) LB-1/200	1.0*6.0mm, 200°C	ANSI/UL 1446	UL E338133
-Alternate	WUXI YOUFAUN ELECTRIC CO LTD	Q(ZY/XY) LB-1/200	1.0*9.0mm, 200°C	ANSI/UL 1446	UL E343483
-Alternate	WUXI TOLY ELECTRIC WORKS CO LTD	Q(ZY/XY) LB-1/200	1.0*9.0mm, 200°C	ANSI/UL 1446	UL E239135
Varnish	SUZHOU TAIHU ELECTRIC ADVANCED MATERIAL CO LTD	T-4260 (MW 80-C)	Polyester Resin/155°C	ANSI/UL 1446	UL E228349
Wire	WUXI XINHONGYE CABLE TECHNOLOGY CO., LTD	AWG10/ AWG12	105°C, 1000V, UL10269	UL 758	UL E248566
-Alternate	ZHEJIANG3QWIRE & CABLE CO LTD	AWG10/ AWG12	105°C, 1000V, UL10269	UL 758	UL E341104
Tape	CHANG SHU LIANG YI TAPE INDUSTRY CO LTD	LY-20X	180°C	CAN/UL 510A	UL E246820
Epoxy board	ANHUI YISOLA COMPOSITE	FR-4	130°C	UL 94 UL746B	UL E510612

	MATERIAL CO LTD				
Insulation paper	UIL CO LTD	AMA/NMN	180°C	UL 1446	UL E365641
Tube	SHENZHEN WOER HEAT-SHRINKABLE MATERIAL CO LTD	RSFR-H	125°C	UL 224	UL E203950
Sleeving	SHENZHEN WOER HEAT-SHRINKABLE MATERIAL CO LTD	SRS-70	200°C	UL 1441	UL E532653
Casting glue	GUANZHOU HUITIAN NEW MATERIAL CO LTD	5297	150°C	ANSI/UL 94 IEC 60695-11-10 UL 746A UL 746B	UL E306078
Sn	SUZHOU COSTAR ELECTRONIC MATERIAL CO..LTD	Sn99.3/cu0.7	Sn99.3/cu0.7	EN IEC 62109-1 EN IEC 62109-2	Test with Unit
Terminal	ZHEJIANG KEAISI TERMINAL CO., LTD (OR EQUIVALENT)	RNBL5.5-4-135° RNBL5.5-4-90°	RNBL5.5-4-135° RNBL5.5-4-90°	EN IEC 62109-1 EN IEC 62109-2	Test with Unit
-Alternate	KUNSHAN XIMENKAN ELECTRONIC & ELECTRIC CO LTD (OR EQUIVALENT)	RNBL5.5-4-135° RNBL5.5-4-90°	RNBL5.5-4-135° RNBL5.5-4-90°	EN IEC 62109-1 EN IEC 62109-2	Test with Unit
Boost/INV Choke for models GW3K-DNS-G40, GW3.6K-DNS-G40	GOODWE	141-10786	250uH@36KHz 1080uH@18KHz, -40 ~ +155°C	EN IEC 62109-1 EN IEC 62109-2	Test with appliance
Core	POCO	NPC-75/NPC-60	FeSi	EN IEC 62109-1 EN IEC 62109-2	Test with Unit
-Alternate	POCO	NPV-60	FeSi	EN IEC 62109-1	Test with Unit

				EN IEC 62109-2	
-Alternate	GUANYOUDA	Ferrites 67*30*15mm	DMR90	EN IEC 62109-1 EN IEC 62109-2	Test with Unit
Magnet wire	SHANGHAI YOUTUO MAGNET WIRE CO., LTD	Q(ZY/XY) LB-1/200	1.0*6.0mm, 200°C	ANSI/UL 1446	UL E338133
-Alternate	WUXI YOUFAUN ELECTRIC CO LTD	Q(ZY/XY) LB-1/200	1.0*9.0mm, 200°C	ANSI/UL 1446	UL E343483
-Alternate	WUXI TOLY ELECTRIC WORKS CO LTD	Q(ZY/XY) LB-1/200	1.0*9.0mm, 200°C	ANSI/UL 1446	UL E239135
Varnish	SUZHOU TAIHU ELECTRIC ADVANCED MATERIAL CO LTD	T-4260 (MW 80-C)	155°C	ANSI/UL 1446	UL E228349
Wire	WUXI XINHONGYE CABLE TECHNOLOGY CO., LTD	AWG10/ AWG12	105°C, 1000V, UL10269	UL 758	UL E248566
-Alternate	3Q WIRE & CABLE CO LTD	AWG10/ AWG12	105°C, 1000V, UL10269	UL 758	UL E341104
Tape	CHANG SHU LIANG YI TAPE INDUSTRY CO LTD	LY-20X	180°C	CAN/UL 510A	UL E246820
Epoxy board	ANHUI YISOLA COMPOSITE MATERIAL CO LTD	FR-4	130°C	UL 94 UL746B	UL E510612
Insulation paper	UIL CO LTD	AMA/NMN	180°C	UL 1446	UL E365641
Tube	SHENZHEN WOER HEAT-SHRINKABLE MATERIAL CO LTD	RSFR-H	125°C	UL 224	UL E203950
Sleeving	SHENZHEN WOER HEAT-	SRS-70	200°C	UL 1441	UL E532653

	SHRINKABLE MATERIAL CO LTD				
Casting glue	GUANZHOU HUITIAN NEW MATERIAL CO LTD	5297	150°C	ANSI/UL 94 IEC 60695-11-10 UL 746A UL 746B	UL E306078
Sn	SUZHOU COSTAR ELECTRONIC MATERIAL CO..LTD	Sn99.3/cu0.7	Sn99.3/cu0.7	EN IEC 62109-1 EN IEC 62109-2	Test with Unit
Terminal	ZHEJIANG KEAISI TERMINAL CO., LTD (OR EQUIVALENT)	RNBL5.5-4-135° RNBL5.5-4-90°	RNBL5.5-4-135° RNBL5.5-4-90°	EN IEC 62109-1 EN IEC 62109-2	Test with Unit
-Alternate	KUNSHAN XIMENKAN ELECTRONIC & ELECTRIC CO, LTD (OR EQUIVALENT)	RNBL5.5-4-135° RNBL5.5-4-90°	RNBL5.5-4-135° RNBL5.5-4-90°	EN IEC 62109-1 EN IEC 62109-2	Test with Unit
Power board 190-10348					
PV filter capacitor (C108, C109, C110, C111)	YUWA	YHKC series	2μF, 600Vdc, -40°C ~+105°C	EN IEC 62109-1 EN IEC 62109-2	Test with appliance
-Alternate	FARA	C3D series	2μF, 600Vdc, -40°C ~+105°C	EN IEC 62109-1 EN IEC 62109-2	Test with appliance
-Alternate	NISTRONICS	MDC series	2μF, 600Vdc, -40°C ~+105°C	EN IEC 62109-1 EN IEC 62109-2	Test with appliance
-Alternate	YUWA	YHKC series	10μF, 600Vdc, -40°C ~+105°C	EN IEC 62109-1 EN IEC 62109-2	Test with appliance
-Alternate	FARA	C3D series	10μF, 600Vdc, -40°C ~+105°C	EN IEC 62109-1 EN IEC 62109-2	Test with appliance
-Alternate	NISTRONICS	MDC series	10μF, 600Vdc, -40°C ~+105°C	EN IEC 62109-1 EN IEC 62109-2	Test with appliance
-Alternate	BM	B12 series	10μF, 600Vdc, -40°C ~+105°C	EN IEC 62109-1 EN IEC 62109-2	Test with appliance

AC filter capacitor (C312)	YUWA	YHR AC filter (High humidity type)	4.7μF, 350Vac, -40°C ~+105°C	EN IEC 62109-1 EN IEC 62109-2	Test with appliance
-Alternate	NISTRONICS	MAC series	4.7μF, 350Vac, -40°C ~+105°C	EN IEC 62109-1 EN IEC 62109-2	Test with appliance
-Alternate	BM	B32 series	4.7μF, 350Vac, -40°C ~+105°C	EN IEC 62109-1 EN IEC 62109-2	Test with appliance
-Alternate	FARA	C6A series	4.7μF, 350Vac, -40°C ~+105°C	EN IEC 62109-1 EN IEC 62109-2	Test with appliance
-Alternate	NISTRONICS	MAC series	3.3μF, 350Vac, -40°C ~+105°C	EN IEC 62109-1 EN IEC 62109-2	Test with appliance
-Alternate	FARA	C6A series	3.3μF, 350Vac, -40°C ~+105°C	EN IEC 62109-1 EN IEC 62109-2	Test with appliance
X capacitor (C329, C504)	Nistronics (Jiangxi) Co., Ltd.	MPR Series	0.068uF, 305Vac, -40°C ~+105°C, X2	EN 60384-14:2013-08 EN 60384-14:2013/A1:2016 IEC 60384-14:2013 IEC 60384-14:2013/AMD1:2016	VDE 40032056
-Alternate	NANTONG JIANGHAI CAPACITOR CO.,LTD.	CBB312 Series	0.068uF, 305Vac, -40°C ~+105°C, X2	EN 60384-14:2013-08 EN 60384-14:2013/A1:2016 IEC 60384-14:2013 IEC 60384-14:2013/AMD1:2016	VDE 40044989
-Alternate	FARA	C4B Series	6.8μF, 350Vac, -40°C ~+110°C, X2	EN IEC 60384-14:2023	SE-ENEC-2400831
-Alternate	Aihua Infinity Capacitors (Suzhou) Co., Ltd	FXT Series	6.8μF, 350Vac, -40°C ~+110°C, X2	EN IEC 60384-14:2023 IEC 60384-14:2023	VDE 40058450
-Alternate	NISTRONICS	MPR Series	6.8μF, 350Vac, -40°C ~+110°C, X2	IEC 60384-14	VDE 40052379

-Alternate	FARA	C4B Series	4.7μF, 350Vac, -40°C ~ +110°C, X2	EN IEC 60384-14:2023	SE-ENEC-2400831
-Alternate	Aihua Infinity Capacitors (Suzhou) Co., Ltd	FXT Series	4.7μF, 350Vac, -40°C ~ +110°C, X2	EN 60384-14:2013-08 EN 60384-14:2013/A1:2016 IEC 60384-14:2013 IEC 60384-14:2013/AMD1:2016	VDE 40052137
-Alternate	Nistronics (Jiangxi) Co., Ltd.	MPR Series	4.7μF, 350Vac, -40°C ~ +110°C, X2	EN 60384-14:2013-08 EN 60384-14:2013/A1:2016 IEC 60384-14:2013 IEC 60384-14:2013/AMD1:2016	VDE 40052379
-Alternate	YUWA	MKPB Series	4.7μF, 350Vac, -40°C ~ +110°C, X2	EN 60384-14:2013; EN 60384-14:2013/A1:2016	ENEC-03262-A1
-Alternate	FARA	C4B Series	3.3μF, 350VAC, -40°C~+110°C, X2	EN IEC 60384-14:2023	SE-ENEC-2400831
-Alternate	Nistronics (Jiangxi) Co., Ltd.	MPR Series	3.3μF, 350VAC, -40°C~+110°C, X2	EN 60384-14:2013-08 EN 60384-14:2013/A1:2016 IEC 60384-14:2013 IEC 60384-14:2013/AMD1:2016	VDE 40052379
-Alternate	Aihua Infinity Capacitors (Suzhou) Co., Ltd	FXT Series	3.3μF, 350VAC, -40°C~ +110°C, X2	EN 60384-14:2013-08 EN 60384-14:2013/A1:2016 IEC 60384-14:2013 IEC 60384-	VDE 40052137

				14:2013/AMD1:2016	
-Alternate	Guangdong Fengming Electronic Tech. Co., Ltd	B43 Series	3.3μF, 350VAC, -40°C~ +110°C, X2	EN 60384-14:2013+A1	TUV HN 69262648
Y capacitor (C103, C104, C105, C200, C201, C301, C302, C326, C327, C330, C331, C332, C333, C413, C414, C504, C507, C508)	Walsin Technology Corp.	AH series	4.7nF, 400Vac, -25°C~+125°C, Y1	EN IEC 60384-14:2023 IEC 60384-14:2023	VDE 40001804
-Alternate	Shantou High-New Technology Dev. Zone Songtian Enterprise Co., Ltd.	CD series	4.7nF, 400Vac, -25°C~+125°C, Y1	EN 60384-14:2013-08 EN 60384-14:2013/A1:2016 IEC 60384-14:2013 IEC 60384-14:2013/AMD1:2016	VDE 40025754
-Alternate	Walsin Technology Corp.	Y5P(AH) series	1nF, 400Vac, -25°C~+125°C, Y1	EN IEC 60384-14:2023 IEC 60384-14:2023	VDE 40001804
-Alternate	Shantou High-New Technology Dev. Zone Songtian Enterprise Co., Ltd.	CD series	1nF, 400Vac, -25°C~+125°C, Y1	EN 60384-14:2013-08 EN 60384-14:2013/A1:2016 IEC 60384-14:2013 IEC 60384-14:2013/AMD1:2016	VDE 40025754
-Alternate	Walsin Technology Corp.	Y5P(AH) series	0.47nF, 400Vac, -25°C~+125°C, Y1	EN IEC 60384-14:2023 IEC 60384-14:2023	VDE 40001804
-Alternate	Shantou High-New Technology Dev. Zone Songtian Enterprise Co.,	CD series	0.47nF, 400Vac, -25°C~+125°C, Y1	EN 60384-14:2013-08 EN 60384-14:2013/A1:2016 IEC 60384-	VDE 40025754

	Ltd.			14:2013 IEC 60384-14:2013/AMD1:2016	
-Alternate	FARA	MKP63 Series	0.010μF, 300Vac, -40°C~ +110°C, Y2	EN IEC 60384-14:2023	SE-ENEC-2400708
-Alternate	JIANGHAI	CBB322 Series	0.010μF, 300Vac, -40°C~ +110°C, Y2	IEC 60384-14	ENEC-03710-A1
-Alternate	Guangdong Fengming Electronic Tech. Co., Ltd	MKP Series	0.010μF, 300Vac, -40°C~ +110°C, Y2	EN 60384-14:2013+A1	HN 69262649
-Alternate	FARA	MKP63 Series	47nF, 300Vac, -40°C~ +110°C, Y2	EN IEC 60384-14:2023	SE-ENEC-2400708
-Alternate	Guangdong Fengming Electronic Tech. Co., Ltd	MKP Series	47nF, 300Vac, -40°C~ +110°C, Y2	EN 60384-14:2013+A1	HN 69262649
-Alternate	Nistronics (Jiangxi) Co., Ltd.	MPY Series	47nF, 300Vac, -40°C~ +110°C, Y2	EN 60384-14:2013-08 IEC 60384-14:2013 IEC 60384-14:2013/AMD1:2016 EN 60384-14:2013/A1:2016	VDE 40039835
-Alternate	FARA	MKP63 Series	0.033μF, 300Vac, -40°C~ +110°C, Y2	EN IEC 60384-14:2023	SE-ENEC-2400708
-Alternate	Guangdong Fengming Electronic Tech. Co., Ltd	MKP Series	0.033μF, 300Vac, -40°C~ +110°C, Y2	EN 60384-14:2013+A1	HN 69262649
-Alternate	JIANGHAI	CBB322 Series	0.033μF, 300Vac, -40°C~ +110°C, Y2	EN 60384-14:2013; EN 60384-14:2013/A1:2016	ENEC-03710-A1
-Alternate	Aihua Infinity Capacitors (Suzhou) Co., Ltd	FY2 Series	0.033μF, 300Vac, -40°C~ +110°C, Y2	EN 60384-14:2013-08 EN 60384-14:2013/A1:2016 IEC 60384-14:2013 IEC 60384-14:2013/AMD1:2016	VDE 40052687
-Alternate	Walsin Technology Corp.	AH SERIES	220pF, 400VAC, -25°C~+125°C, Y1	EN IEC 60384-14:2023	VDE 40001804

				IEC 60384-14:2023	
-Alternate	Shantou High-New Technology Dev. Zone Songtian Enterprise Co., Ltd.	CD SERIES	220pF, 400VAC, -25°C~+125°C, Y1	EN 60384-14:2013-08 EN 60384-14:2013/A1:2016 IEC 60384-14:2013 IEC 60384-14:2013/AMD1:2016	VDE 40025754
Absorption capacitor (C206, C207, C208, C209, C400)	FARA	C3D Series	2μF, 1100V, -40°C~+105°C	EN IEC 62109-1 EN IEC 62109-2	Test with appliance
-Alternate	NISTRONICS	MDCC Series	2μF, 1100V, -40°C~+105°C	EN IEC 62109-1 EN IEC 62109-2	Test with appliance
-Alternate	JIANGHAI	CBB138 Series	2μF, 1100V, -40°C~+105°C	EN IEC 62109-1 EN IEC 62109-2	Test with appliance
-Alternate	AISHI	FDG Series	2μF, 1100V, -40°C~+105°C	EN IEC 62109-1 EN IEC 62109-2	Test with appliance
-Alternate	FARA	C32(MKP21 Series)	0.33μF, 1250Vdc, -55°C~+105°C	EN IEC 62109-1 EN IEC 62109-2	Test with appliance
-Alternate	AISHI	FGC Series	0.33μF, 1250Vdc, -55°C~+105°C	EN IEC 62109-1 EN IEC 62109-2	Test with appliance
-Alternate	YUWA	MKPC Series	0.33μF, 1250Vdc, -55°C~+105°C	EN IEC 62109-1 EN IEC 62109-2	Test with appliance
-Alternate	JIANGHAI	CBB166 Series	0.33μF, 1250Vdc, -55°C~+105°C	EN IEC 62109-1 EN IEC 62109-2	Test with appliance
-Alternate	NISTRONICS	MPC Series	0.33μF, 1250Vdc, -55°C~+105°C	EN IEC 62109-1 EN IEC 62109-2	Test with appliance
-Alternate	FARA	MKP25 Series	0.39μF, 630VAC, -40°C ~ +105°C	EN IEC 62109-1 EN IEC 62109-2	Test with appliance
-Alternate	JIANGHAI	CBB23 Series	0.39μF, 630VAC, -40°C ~ +105°C	EN IEC 62109-1 EN IEC 62109-2	Test with appliance
-Alternate	AISHI	FGA Series	0.39μF, 630VAC, -40°C ~ +105°C	EN IEC 62109-1 EN IEC 62109-2	Test with appliance

-Alternate	BM	B72 Series	0.39μF, 630VAC, -40°C ~ +105°C	EN IEC 62109-1 EN IEC 62109-2	Test with appliance
-Alternate	NISTRONICS	MPC Series	0.01μF, 630V, -55°C~+105°C	EN IEC 62109-1 EN IEC 62109-2	Test with appliance
-Alternate	NISTRONICS	MPC Series	0.022μF, 630V, -55°C~+105°C	EN IEC 62109-1 EN IEC 62109-2	Test with appliance
-Alternate	NISTRONICS	MPC Series	0.033μF, 630V, -55°C~+105°C	EN IEC 62109-1 EN IEC 62109-2	Test with appliance
-Alternate	FARA	C32(MKP21 Series)	0.01μF, 630V, -55°C~+105°C	EN IEC 62109-1 EN IEC 62109-2	Test with appliance
-Alternate	FARA	C32(MKP21 Series)	0.022μF, 630V, -55°C~+105°C	EN IEC 62109-1 EN IEC 62109-2	Test with appliance
-Alternate	FARA	C32(MKP21 Series)	0.033μF, 630V, -55°C~+105°C	EN IEC 62109-1 EN IEC 62109-2	Test with appliance
-Alternate	FARA	C6A Series	0.022μF, 1250V, -55°C~+105°C	EN IEC 62109-1 EN IEC 62109-2	Test with appliance
-Alternate	AISHI	FGC Series	0.022μF, 1250V, -55°C~+105°C	EN IEC 62109-1 EN IEC 62109-2	Test with appliance
-Alternate	NISTRONICS	MPC Series	0.022μF, 1250V, -55°C~+105°C	EN IEC 62109-1 EN IEC 62109-2	Test with appliance
-Alternate	JIANGHAI	CBB162 Series	0.022μF, 1250V, -55°C~+105°C	EN IEC 62109-1 EN IEC 62109-2	Test with appliance
Bus capacitor (C202, C203, C204, C205)	HEC	LY	390μF, 550V, -40°C ~ +105°C	EN IEC 62109-1 EN IEC 62109-2	Test with appliance
-Alternate	HEC	LY	470μF, 550V, -40°C ~ +105°C	EN IEC 62109-1 EN IEC 62109-2	Test with appliance
-Alternate	SAMXON	DP	390μF, 550V, -40°C ~ +105°C	EN IEC 62109-1 EN IEC 62109-2	Test with appliance
-Alternate	SAMXON	DP	470μF, 550V, -40°C ~ +105°C	EN IEC 62109-1 EN IEC 62109-2	Test with appliance
-Alternate	AISHI	LT	390μF, 550V, -40°C ~ +105°C	EN IEC 62109-1 EN IEC 62109-2	Test with appliance
-Alternate	AISHI	LT	470μF, 550V, -40°C ~ +105°C	EN IEC 62109-1 EN IEC 62109-2	Test with appliance

-Alternate	JIANGHAI	CD297	390μF, 550V, -40°C ~ +105°C	EN IEC 62109-1 EN IEC 62109-2	Test with appliance
-Alternate	JIANGHAI	CD297	470μF, 550V, -40°C ~ +105°C	EN IEC 62109-1 EN IEC 62109-2	Test with appliance
Insulation transformer (TX400)	SHENZHEN TRANSFORMER ELECTRONICS CO., LTD.	140-00264	HFTX 16:4:4:4:5:7:7:7:7:16 FER EE28 CLASS B -40°C~+155°C	EN IEC 62109-1 EN IEC 62109-2	Test with appliance
Core	HENGDIAN EAST MAGNETIC MATERIAL CO LTD	EE28	DMR44/EE28	EN IEC 62109-1 EN IEC 62109-2	Test with Unit
-Alternate	TDG HOLDING CO., LTD	EE28	TP4A/EE28	EN IEC 62109-1 EN IEC 62109-2	Test with Unit
-Alternate	NANTONG GUANYOUDA MAGNET CO LTD	EE28	GP44/EE28	EN IEC 62109-1 EN IEC 62109-2	Test with Unit
Bobbin	SUMITOMO BAKELITE CO LTD	PM-9823	150°C	ANSI/UL94	UL E41429
-Alternate	CHANG CHUN PLASTICS CO, LTD	T375HF/T200HF	150°C	ANSI/UL94	UL E59481
Tube	CHANGYUAN ELECTRONICS GROUP CO LTD	CB-TT-L	200°C	UL 224	UL E180908
-Alternate	DONGGUAN LING FREE HARDWARE PLASTICS PRODUCT CO LTD	LING FREE PTFE TUBE (150V)	200°C	UL 224	UL E352366
Magnet wire	SHENZHEN DAYANG INDUSTRY CO LTD	xUEW-NY@/155, xQAN/155 MW 80-C	155°C	ANSI/UL 1446	UL E176101
-Alternate	TA YA ELECTRIC WIRE & CABLE CO	LZ-UESB-F-1	155°C	ANSI/UL 1446	UL E84201

	LTD				
-Alternate	TAI-I COPPER(GUANZHOU) CO LTD	UEWF TYPE:MW79-C	155°C	ANSI/UL 1446	UL E234896
Triple insulation wire	Guangzhou Wanbao Electronic Material Co Ltd	DTM-F	155°C	UL2353 EN IEC 62368-1:2020+A11:2020 IEC 62368-1:2018	UL E323485 VDE 40044801
-Alternate	SHENZHEN KAIZHONGHEDONG NEW MATERIALS CO LTD	TIW-F	155°C	UL2353 EN IEC 62368-1:2020+A11:2020 IEC 62368-1:2018	UL E357240 VDE 40038861
-Alternate	HUIZHOU JINMAXIANCAI CO LTD	TIW-F	155°C	UL2353 EN IEC 62368-1:2020+A11:2020 IEC 62368-1:2018	UL E488352 VDE 40058841
Tape	JINGJIANG YAHUA PRESSURE SENSITIVE GLUE	PF* (d)(g)	180°C	CAN/UL 510A	UL E165111
-Alternate	XINFENG GHILLIE ELECTRICAL MATERIALS CO LTD	JL- N408	180°C	CAN/UL 510A	UL E326305
-Alternate	JINGJIANG JINGYI ADHESIVE PRODUCT CO LTD	J16	180°C	CAN/UL 510A	UL E246950
Margin tape	JINGJIANG YAHUA PRESSURE SENSITIVE GLUE	WF* (c)(h)	130°C	CAN/UL 510A	UL E165111
-Alternate	JINGJIANG JINGYI	WF310(a)	130°C	CAN/UL 510A	UL E246950

	ADHESIVE PRODUCT CO LTD				
Epoxy	DONGGUAN EATTO ELECTRONIC MATERIAL CO LTD	E-500 (XX)	130°C	UL94	UL E218090
-Alternate	DONG GUAN SHI PAI HUA CHUANG MATERIAL FTY	H907-H##	130°C	UL94	UL E304477
Varnish	YUEYANG GREEN TECHNOLOGY CO LTD	JX-1150(a)	155°C	ANSI/UL 1446	UL E303754
Insulation transformer (TX400) -Alternate	HAINING LIANFENG DONGJIN ELECTRONICS CO., LTD	140-00264	HFTX 16:4:4:4:5:7:7:7:7:16 FER EE28 CLASS B -40°C~+155°C	EN IEC 62109-1 EN IEC 62109-2	Test with appliance
Core	BOCHENG	EE28	BP40/EE28	EN IEC 62109-1 EN IEC 62109-2	Test with Unit
-Alternate	SUNSHINE	EE28	SSP-4/EE28	EN IEC 62109-1 EN IEC 62109-2	Test with Unit
-Alternate	GUANDA	EE28	GP4/EE28	EN IEC 62109-1 EN IEC 62109-2	Test with Unit
-Alternate	LFG	EE28	NH2B/EE28	EN IEC 62109-1 EN IEC 62109-2	Test with Unit
Magnet wire	TAI-I COPPER(GUANG ZHOU) CO LTD	UEWF	Φ0.2mm/Φ0.45mm/155°C	ANSI/UL 1446	UL E234896
-Alternate	WUXI JUFENG COMPOUND LINE CO LTD	MW79-C xUEW155*, QA-x/155F*	155°C	ANSI/UL 1446	UL E206882
Triple insulation wire	SHENZHEN KAIZHONG HEDONG NEW MATERIALS CO LTD	TIW-B	130°C	ANSI/UL 2353 IEC 62368-1:2018 EN IEC 62368-	UL E357240 VDE 40038861

				1:2020+A11:2020	
-Alternate	KBI COSMOLINK CO., LTD	TIW-M	130°C	ANSI/UL 2353 EN 60950-1:2006+A11+A1+A12+A2:2013 EN IEC 62368-1:2020+A11:2020 IEC 62368-1:2018	UL E213764 VDE 138053
Bobbin	CHANG CHUN PLASTICS CO LTD	T375HF	150°C	ANSI/UL 94	UL E59481
-Alternate	SUMITOMO BAKELITE CO LTD	PM-9630	150°C	ANSI/UL94	UL E41429
-Alternate	SUMITOMO BAKELITE CO LTD	PM-9820	150°C	ANSI/UL94	UL E41429
Tape	JINGJIANG YAHUA PRESSURE SENSITIVE GLUE CO LTD	PF* (d)(g)	180°C	CAN/UL 510A	UL E165111
Margin tape	JINGJIANG YAHUA PRESSURE SENSITIVE GLUE CO LTD	WF* (c)(h)	130°C	CAN/UL 510A	UL E165111
Tube	GREAT HOLDING INDUSTRIAL CO LTD	TFL	200°C	UL 224	UL E156256
Epoxy	DONG GUAN SHI PAI HUA CHUANG MATERIAL FTY	H907-H##	130°C	UL94	UL E304477
Varnish	SUZHOU TAIHU ELECTRIC ADVANCED MATERIAL CO LTD	T-4260(a)	130°C	ANSI/UL 1446	UL E228349

Insulation transformer (TX400) -Alternate	HUIZHOU BAOHUI ELECTRONICS TECHNOLOGY CO.,LTD	140-00264	HFTX 16:4:4:4:5:7:7:7:7:16 FER EE28 CLASS B -40°C~+155°C	EN IEC 62109-1 EN IEC 62109-2	Test with appliance
Core	NANTONG GUANYOUDA MAGNET CO LTD	EE2821T	GP4/ EE2821T	EN IEC 62109-1 EN IEC 62109-2	Test with Unit
-Alternate	HENGDIAN GROUP DMEGC MAGNETICS CO LTD	EE28E	DMR40/ EE28E	EN IEC 62109-1 EN IEC 62109-2	Test with Unit
Magnet wire	TAI-I COPPER(GUANGZHOU) CO LTD	UEWF	Φ0.2mm/Φ0.45mm/155°C	ANSI/UL 1446	UL E234896
-Alternate	PACIFIC ELECTRIC WIRE & CABLE (SHENZHEN) CO LTD	UEFN/U@	Φ0.2mm/Φ0.45mm/155°C	ANSI/UL 1446	UL E201757
Triple insulation wire	SHENZHEN KAIZHONG HEDONG NEW MATERIALS CO LTD	TIW-F	155°C	EN IEC 61558-1 EN IEC 62368	UL E357240 VDE 40038861
-Alternate	HUIZHOU JINMAXIANCAI CO LTD	TIW-F*	155°C	ANSI/UL 2353 IEC 62368-1:2018 EN IEC 62368-1:2020+A11:2020	UL E516017 VDE 40058841
Bobbin	SUMITOMO BAKELITE CO LTD	PM-9630	150°C	ANSI/UL94	UL E41429
-Alternate	SUMITOMO BAKELITE CO LTD	PM-9820	150°C	ANSI/UL94	UL E41429
Tape	JINGJIANG YAHUA PRESSURE SENSITIVE GLUE CO LTD	PF* (d)(g)	180°C	CAN/UL 510A	UL E165111

Margin tape	JINGJIANG YAHUA PRESSURE SENSITIVE GLUE	WF* (c)(h)	130°C	CAN/UL 510A	UL E165111
Varnish	SUZHOU TAIHU ELECTRIC ADVANCED MATERIAL CO LTD	T-4260(a)	130°C	UL 1446	UL E228349
Tube	SHENZHEN WOER HEAT-SHRINKABLE MATERIAL CO LTD	WF (PTFE)	200°C	UL 224	UL E203950
Epoxy	DONGGUAN EATTO ELECTRONIC MATERIAL CO LTD	E-500 (XX)	130°C	UL94	UL E218090
-Alternate	HUIZHOU QIFU NEW MATERIALS TECHNOLOGY CO LTD	300A/300B	130°C	UL94	UL E354501
Insulation transformer (TX500)	HUIZHOU BAOHUI ELECTRONICS TECHNOLOGY CO.,LTD	140-00149	HF TX 72:11:72:11 EE16 DMR 40/TP4/NH2B -40~+130°C	EN IEC 62109-1 EN IEC 62109-2	Test with appliance
Core	NANTONG GUANYOUDA MAGNET CO LTD	EE16	GP4	EN IEC 62109-1 EN IEC 62109-2	Test with Unit
Magnet wire	PACIFIC ELECTRIC WIRE & CABLE (SHENZHEN) CO LTD	UEWN/U	0.16φ/155°C	ANSI/UL 1446	UL E201757
Triple insulation wire	HUIZHOU DONGJU FIUOTE CHPLASTIC CO LTD	TIW-BXXX	0.35φ/0.3φ/130°C	ANSI/UL 2353 IEC 62368-1:2018 EN IEC 62368-1:2020+A11:2020	UL E488352 VDE 40047395

-Alternate	SHENZHEN KAIZHONG HEDONG NEW MATERIALS CO LTD	TIW-B*	0.35φ/0.3φ/130°C	ANSI/UL 2353 EN IEC 62368-1:2020+A11:2020 IEC 62368-1:2018	UL E357240 VDE 40038861
Tape	JINGJIANG YAHUA PRESSURE SENSITIVE GLUE CO LTD	PF* (d)(g)	180°C	CAN/UL 510A	UL E165111
Bobbin	SUMITOMO BAKELITE CO LTD	PM-9630	150°C	ANSI/UL94	UL E41429
-Alternate	SUMITOMO BAKELITE CO LTD	PM-9820	150°C	ANSI/UL94	UL E41429
-Alternate	CHANG CHUN PLASTICS CO.,LTD	T735J	150°C	ANSI/UL 94	UL E59481
Varnish	SUZHOU TAIHU ELECTRIC ADVANCED MATERIAL CO LTD	T-4260(a)	155°C	ANSI/UL 1446	UL E228349
Tube	SHENZHEN WOER HEAT-SHRINKABLE MATERIAL CO LTD	WF (PTFE)	200°C	UL 224	UL E203950
Margin tape	JINGJIANG YAHUA PRESSURE SENSITIVE GLUE	WF* (c)(h)	130°C	CAN/UL 510A	UL E165111
Insulation transformer (TX500) -Alternate	HAINING LIANFENG DONGJIN ELECTRONICS CO., LTD	140-00149	HF TX 72:11:72:11 EE16 DMR 40/TP4/NH2B -40~+130°C	EN IEC 62109-1 EN IEC 62109-2	Test with appliance
Core	DMEGC	EE16	DMR40	EN IEC 62109-1 EN IEC 62109-2	Test with Unit
-Alternate	TDG	EE16	TP4	EN IEC 62109-1	Test with Unit

				EN IEC 62109-2	
-Alternate	LFG	EE16	NH2B	EN IEC 62109-1 EN IEC 62109-2	Test with Unit
-Alternate	SHANDONG SAINT ELECTRIC CO LTD	*UEW/155,QA-*/155,*UEW/155 Litz,QA-*/155 Litz,MW79-C	155°C	ANSI/UL 1446	UL E194410
Magnet wire	WUXI JUFENG COMPOUND LINE CO LTD	xUEW155*, QA-x/155F	155°C	ANSI/UL 1446	UL E206882
Triple insulation wire	SHENZHEN KAIZHONG HEDONG NEW MATERIAL CO LTD	TIW-B	0.35φ /0.3φ/130°C	ANSI/UL 1446 EN IEC 62368-1:2020+A11:2020 IEC 62368-1:2018	UL E357240 VDE 40038861
-Alternate	KBI COSMOLINK CO.,LTD	TIW-M	130°C	ANSI/UL 2353 EN 60950-1:2006+A11+A1+A12+A2:2013 EN IEC 62368-1:2020+A11:2020 IEC 62368-1:2018	UL E213764 VDE 138053
Bobbin	CHANG CHUN PLASTICS CO LTD	T375HF	150°C	ANSI/UL 94	UL E59481
Tape	JINGJIANG YAHUA PRESSURE SENSITIVE GLUE	PF* (d)(g)	180°C	CAN/UL 510A	UL E165111
Tube	GREAT HOLDING INDUSTRIAL CO LTD	TFL	200°C	UL 224	UL E156256
Varnish	SUZHOU TAIHU ELECTRIC ADVANCED MATERIAL CO LTD	T-4260(a)	155°C	UL 1446	UL E228349

Epoxy	DONG GUAN SHI PAI HUA CHUANG MATERIAL FTY	H907-H##	130°C	UL94	UL E304477
Margin tape	JINGJIANG YAHUA PRESSURE SENSITIVE GLUE CO LTD	WF* (c)(h)	130°C	CAN/UL 510A	UL E165111
ISO Relay (RY100)	HF	HF/HF46F/12-HS1T	12VDC 250VAC/5A 30VDC/5A/-40~+85°C	EN 61810-1:2015 EN 61810-1:2015/A1:2020	VDE 40025215
HCT (HCT101, HCT102, HCT301)	NOVOSENSE	NSM2013	5V, 50A, -40°C ~+125°C	IEC 62368-1:2014	TUV SUD CBS 112807 0002
-Alternate	Chengdu CrossChip Microsystems Co., LTD	CC6924	5V, 50A, -40°C ~+125°C	EN IEC 62368-1:2020+A11	TUV R 50590288
-Alternate	NOVOSENSE	NSM2013	5V, 65A, -40°C ~+125°C	IEC 62368-1:2014	TUV SUD CBS 112807 0002
-Alternate	CROSSCHIP	CC6924	5V, 65A, -40°C ~+125°C	EN IEC 62368-1:2020+A11	TUV R 50590288
-Alternate	NOVOSENSE	NSM2019	5V, 50A, -40°C ~+125°C	IEC 62368-1:2014	TUV SUD CBS 112807 0002
BOOST IGBT (Q101, Q102)	SILAN	SGTP40V65SDB 1P7	40A, 650V, -40~+175°C	EN IEC 62109-1 EN IEC 62109-2	Test with appliance
-Alternate	INFINEON	IKW40N65H5	40A, 650V, -40~+175°C	EN IEC 62109-1 EN IEC 62109-2	Test with appliance
BOOST DIODE (D101, D102)	YANGJIE	MUR3060PL	30A, 600V, -55~+175°C	EN IEC 62109-1 EN IEC 62109-2	Test with appliance
-Alternate	WEEN	BYC30W-600PT2	30A, 600V, -55~+175°C	EN IEC 62109-1 EN IEC 62109-2	Test with appliance
-Alternate	MACMIC	MM30FU060B	30A, 600V, -55~+175°C	EN IEC 62109-1 EN IEC 62109-2	Test with appliance

INV IGBT (Q201, Q202, Q203, Q204, Q205, Q206)	MACMIC	MM40G3U65B	40A, 650V, -40~+175°C	EN IEC 62109-1 EN IEC 62109-2	Test with appliance
-Alternate	MACMIC	MM60G3U65B	60A, 650V, -40~+175°C	EN IEC 62109-1 EN IEC 62109-2	Test with appliance
-Alternate	NCEPOWER	NCE40YD65BT	40A, 650V, -40~+175°C	EN IEC 62109-1 EN IEC 62109-2	Test with appliance
-Alternate	SILAN	SGTP40V65SDB 1P7	40A, 650V, -40~+175°C	EN IEC 62109-1 EN IEC 62109-2	Test with appliance
-Alternate	NCEPOWER	NCE40ED65VT	40A, 650V, -40~+175°C	EN IEC 62109-1 EN IEC 62109-2	Test with appliance
-Alternate	ON	FGA40N65SMD	40A, 650V, -40~+175°C	EN IEC 62109-1 EN IEC 62109-2	Test with appliance
-Alternate	SILAN	SGTP50V65SDB 1P7	50A, 650V, -40~+175°C	EN IEC 62109-1 EN IEC 62109-2	Test with appliance
-Alternate	NCEPOWER	NCE50ED65VT	50A, 650V, -40~+175°C	EN IEC 62109-1 EN IEC 62109-2	Test with appliance
-Alternate	ON	FGA60N65SMD	60A, 650V, -40~+175°C	EN IEC 62109-1 EN IEC 62109-2	Test with appliance
-Alternate	ST	STGWA40H65DF B	40A, 650V, -40~+175°C	EN IEC 62109-1 EN IEC 62109-2	Test with appliance
-Alternate	ST	STGWA60H65DF B	60A, 650V, -40~+175°C	EN IEC 62109-1 EN IEC 62109-2	Test with appliance
MOSFET	ORIENTAL	OSG90R1K2KF	5A, 900V, N-Channel, -55~+150°C	EN IEC 62109-1 EN IEC 62109-2	Test with appliance
-Alternate	ST	STB6NK90ZT4	5.8A, 900V, N-Channel, -55~+150°C	EN IEC 62109-1 EN IEC 62109-2	Test with appliance
Insulate Optocoupler (U404, U500)	Shanghai Chipanalog Microelectronics Co., Ltd.	CA-IS3211VCJ	Isolation rating 5700Vrms, Clearance >8mm, Creepage >8mm, -40~+125°C	EN IEC 60747-17:2020+AC:2021	VDE 40057278
-Alternate	Suzhou Novosense Microelectronics Co., Ltd.	NSI68013EC-DSWFR	Isolation rating 5700Vrms, Clearance >8mm, Creepage >8mm,	EN IEC 62368-1:2020+A11	TUV R 50574061

			-40~+125°C		
-Alternate	Suzhou Novosense Microelectronics Co., Ltd.	NSI6801C-DSWFR	Isolation rating 5700Vrms, Clearance >8mm, Creepage >8mm, -40~+125°C	EN IEC 60747-17:2020+AC:2021	VDE 40052820
-Alternate	Shenzhen Orient Components Co. Ltd.	ORPC-817SA1-H-TA1-C-G-(GK)-(GDW)	Isolation rating 5000Vrms, Clearance >7.6mm, Creepage >7.6mm, -55~+110°C	EN IEC 60747-5-5:2020 IEC 60747-5-5:2020	VDE 40029733
-Alternate	Xiamen Hualian Semiconductor Technology Co. LTD	HPL6W147C	Isolation rating 7500Vrms, Clearance >15mm, Creepage >15mm, -55~+110°C	EN IEC 60747-5-5:2020	VDE 40004708
Varistor (TVR8, TVR10, TVR12, TVR301, TVR303)	MAIDA DEVELOPMENT CO	25D821K	510VAC/675VDC 20kA, -40~+125°C	UL 1449 IEC 61051-1:2007 IEC 61051-2:1991 IEC 61051-2-2:1991 IEC 61051-2:1991/AMD1:2009	UL E321173 VDE 40023049
-Alternate	Xiamen Set Electronics Co., Ltd.	SFV25D821KT	510VAC/670VDC 20kA, -40~+125°C	IEC 61051-2-2:1991 IEC 61051-2:1991+A1 EN IEC 61051-1:2018	TUV J 50500874
-Alternate	GUIZHOU KAILI ECONOMIC ZONE ZHONGHAO ELECTRONICS CO.,LTD	WLR-G20D821KJB1SPDB20-H	510VAC/670VDC, -40~+125°C	IEC 61051-2:1991 IEC 61051-2-2:1991 IEC 61051-1:2007 IEC 61051-2:1991/AMD1:2009	VDE 40050367

-Alternate	BestBright Electronics Co. Ltd	821KD20-P10	510VAC/670VDC, -40~+125°C	IEC 61051-2:1991 IEC 61051-2-2:1991 IEC 61051-1:2007 IEC 61051-2:1991/AMD1:2009	VDE 40027827
-Alternate	Shantou High-New Technology Dev. Zone Songtian Enterprise Co., Ltd.	STE20D821K1HN0FQBDRJ	510VAC/670VDC, -40~+125°C	IEC 61051-1:2007 IEC 61051-2:1991 IEC 61051-2-2:1991 IEC 61051-2:1991/AMD1:2009	VDE 40023049
SPD (TVR8, TVR10, TVR12)	Anhui Jinli Electric Tech.Co.,Ltd	GTSP-MDV670/20/A	510VAC/670VDC, 10kA, -40~+85°C	EN/IEC 61643-31	TUV R 50440587
-Alternate	PTG	PV 670-20M2-10	510VAC/670VDC, 10kA, -40~+85°C	EN 61643-11:2012/A11:2018, IEC 61643-11:2011	TUV B 088817 0016
-Alternate	Xiamen Set Electronics Co., Ltd.	TFMOV10M510	510VAC/670VDC, 10kA, -40~+85°C	EN 50539-11:2013+A1	TUV R 50438698
-Alternate	Shenzhen Haipengxin Electronics Co., Ltd	PV20K-670	510VAC/670VDC, 10kA, -40~+85°C	IEC 61643-11:2011 EN 61643-11:2012+A11	TUV R 50585247
Surge arresters (GS100, GS300)	BRIGHTKING	2RP600L-8	600V, 20KA, -40~+85°C	EN 61643-311:2013	VDE 40043014
-Alternate	SHENZHEN BENCENT ELECTRONIC CO LTD	B8G600H	600V, 20KA, -40~+85°C	EN 61643-311:2013	TUV B 104564 0001
Relay (RY301, RY302,	Xiamen Hongfa Electroacoustic Co., Ltd.	HF161F-W/12-HT(477)	12VDC, 33A, 1H contact gap 1.8mm, -40~+85°C	EN 61810-1:2015 EN 61810-1:2015/A1:2020	VDE 40031410

RY303, RY304)				IEC 61810-1:2015 IEC 61810-1:2015/AMD1:2019	
-Alternate	Dongguan Churod Electronics Co., Ltd.	CHFN-V-112HA2F(31A)	12VDC, 31A, 1H Contact gap: 2.25mm, -40~+85°C	EN 61810-1	TUV R 50220099
-Alternate	ZHEJIANG FANHAR ELECTRONICS CO., LTD	FH20T-BG-1AT DC12V(50A)	12VDC, 50A, Contact gap:2.0mm, -40~+85°C	IEC 61810-1:2015+A1 EN 61810-1:2015+A1	TUV R 50581364
ISO Relay (RY100)	OMRON	G2RG-2A4	12VDC, 8A, -40~+85°C	EN 61810-1:2015 EN 61810-1:2015/A1:2020 IEC 61810-1:2015 IEC 61810-1:2015/AMD1:2019	VDE 40015012
-Alternate	Xiamen Hongfa Electroacoustic Co., Ltd.	140FF/012-2HSWT	12VDC, 8A, -40~+85°C	EN 61810-1	TUV R 50149131
-Alternate	Churod Electronics Co., Ltd.	CHI05-S-212HA2	12VDC, 10A, -40~+85°C	IEC 61810-1:2015+A1 EN 61810-1:2015+A1	TUV R 50512829
-Alternate	Xiamen Hongfa Electroacoustic Co., Ltd.	HF/HF46F/12-HS1T	12VDC, 250VAC, 5A 30VDC, 5A, -40~+85°C	EN 61810-1:2015 EN 61810-1:2015/A1:2020 IEC 61810-1:2015 IEC 61810-1:2015/AMD1:2019	VDE 40025215
-Alternate	Dongguan Churod Electronics Co., Ltd.	CHM-S-112DA3	12VDC, 277VAC, 5A, -40~+85°C	EN 61810-1	TUV R 50196152
Digital isolator (U600)	Texas Instruments Deutschland GmbH	ISO7742DWR	Isolation rating 5000Vrms,	EN IEC 60747-17:2020+AC:2021	VDE 40040142

			Clearance >8mm, Creepage >8mm, –55°C ~+125°C		
-Alternate	Suzhou Novosense Microelectronics Co.,Ltd	NSI8242W1-DSWR	Isolation rating 5000Vrms, Clearance >8mm, Creepage >8mm, -40°C~+125°C	EN IEC 60747-17:2020+AC:2021	VDE 40052820
-Alternate	Shanghai Chipanalog Microelectronics Co., Ltd.	CA-IS3742HW	Isolation rating 5000Vrms, Clearance >8mm, Creepage >8mm, –40°C ~+125°C	EN IEC 60747-17:2020+AC:2021	VDE 40057278
Digital isolator U504, U506, U509, U508, U505, U507, U101, U102	Shanghai Chipanalog Microelectronics Co., Ltd.	CA-IS3211VCJ	Isolation rating 5700Vrms, Clearance >8mm, Creepage >8mm, -40℃~+125°C	EN IEC 60747-17:2020+AC:2021	VDE 40057278
-Alternate	Suzhou Novosense Microelectronics Co., Ltd.	NSI68013EC-DSWFR	Isolation rating 5700Vrms, Clearance >8mm, Creepage >8mm, -40~+125°C	EN IEC 62368-1:2020+A11	TUV R 50574061
Digital isolator U502	Suzhou Novosense Microelectronics Co.,Ltd	NSI1400DDSWVR	Isolation rating 5000Vrms, Clearance >8mm, Creepage >8mm, -40~+125°C	EN IEC 62368-1:2020+A11	TUV R 50574061
-Alternate	Shanghai Chipanalog Microelectronics Co., Ltd.	CA-IS1300G25G	Isolation rating 5000Vrms, Clearance >8mm, Creepage >8mm, -40~+125°C	EN IEC 60747-17:2020+AC:2021	VDE 40057278
L300 (GFCI)	GOODWE	141-11000	GFCI CHOKE 73:10:1:1 FER SI MP2303-4AS	EN IEC 62109-1 EN IEC 62109-2	Test with appliance
Core	CATECH	CAC0-01-0011-H	(19*15*5)	EN IEC 62109-1 EN IEC 62109-2	Test with appliance
Wire	Tongling Jingda Special Magnet Wire Co Ltd	QZY-*/180	180°C	UL 1446	UL E223994

Triple insulated wire	HUIZHOU JINMAXIANCAI CO LTD	TIW-B*	130°C	ANSI/UL 2353 IEC 62368-1:2018 EN IEC 62368-1:2020+A11:2020	UL E516017 VDE 40058841
-Insulating plate	KINGBOARD LAMINATES HOLDINGS LTD	FR-4	V-0, 130°C	UL 94 UL 746B	UL E123995
Tube	SHEN ZHEN WOER HEAT SHRINKABLE MATERIAL CO., LTD	TFL	200°C	UL 224	UL E203950
L300 (GFCI) -Alternate	GOODWE	141-11000	GFCI CHOKE 73:10:1:1 FER SI MP2303-4AS	EN IEC 62109-1 EN IEC 62109-2	Test with appliance
Core	VAC	W539	--	EN IEC 62109-1 EN IEC 62109-2	Test with appliance
Wire	TAI-I COPPER(GUANZHOU) CO LTD	UEW/UEWF	130/155°C	ANSI/UL 1446	UL E234896
Triple insulated wire	HUIZHOU HUILI INDUSTRIAL CO LTD	PIW-B	130°C	ANSI/UL 2353 EN IEC 62368-1:2020+A11:2020 IEC 62368-1:2018	UL E322908 VDE 40029142
-Alternate	SHENZHEN KAIZHONG HEDONG NEW MATERIALS CO LTD	TIW-B/TIW-F	130/155°C	ANSI/UL 2353 IEC 62368-1:2018 EN IEC 62368-1:2020+A11:2020	UL E357240 VDE 40038861
Varnish	SUZHOU TAIHU ELECTRIC ADVANCED MATERIAL CO LTD	T-4260 (a)	130°C	ANSI/UL 1446	UL E228349
Bobbin	SUMITOMO BAKELITE CO LTD	PM-9630	150°C	ANSI/UL94	UL E41429

-Alternate	SUMITOMO BAKELITE CO LTD	PM-9820	150°C	ANSI/UL94	UL E41429
-Alternate	CHANG CHUN PLASTICS CO., LTD	T735J	150°C	ANSI/UL 94	UL E59481
Tube	SHEN ZHEN WOER HEAT SHRINKABLE MATERIAL CO., LTD	WF	200°C	UL 224	UL E203950
EPOXY	DONGGUAN EATTO ELECTRONIC MATERIAL CO LTD	3300A/B	V-0, 130°C	UL 94	UL E218090
L300 (GFCI) -Alternate	GOODWE	141-11020	GFCI CHOKE 73:10:1:1 FER SI MP2303-4AS	EN IEC 62109-1 EN IEC 62109-2	Test with appliance
Core	HITACHI METALS LTD.	MP2303-4AS	-	EN IEC 62109-1 EN IEC 62109-2	Test with appliance
Wire	TAI-I COPPER(GUANZHOU) CO LTD	UEW/UEWF	130/155°C	ANSI/UL 1446	UL E234896
Triple insulated wire	HUIZHOU HUILI INDUSTRIAL CO LTD	PIW-B	130°C	ANSI/UL 2353 EN IEC 62368-1:2020+A11:2020 IEC 62368-1:2018	UL E322908 VDE 40029142
-Alternate	SHENZHEN KAIZHONG HEDONG NEW MATERIALS CO LTD	TIW-B/TIW-F	130/155°C	ANSI/UL 2353 IEC 62368-1:2018 EN IEC 62368-1:2020+A11:2020	UL E357240 VDE 40038861
Varnish	SUZHOU TAIHU ELECTRIC ADVANCED MATERIAL CO LTD	T-4260 (a)	130°C	ANSI/UL 1446	UL E228349

Base	KINGBOARD LAMINATES HOLDINGS LTD	FR-4	V-0, 130°C	UL 94 UL 746B	UL E123995
EPOXY	DONGGUAN EATTO ELECTRONIC MATERIAL CO LTD	3300A/B	V-0, 130°C	UL 94	UL E218090
Tube	SHEN ZHEN WOER HEAT SHRINKABLE MATERIAL CO., LTD	WF	200°C	UL 224	UL E203950
L301	EAGLERISE ELECTRIC&ELECTRONIC(CHINA) Co.,Ltd	141-11043	1P COM-CHOKE 6mH MIN@1kHz Φ2.6*1P Nanocrystalline NC-00023-L-b-02/W424 CLASS B EMI 8Ts	EN IEC 62109-1 EN IEC 62109-2	Test with appliance
Core	POURLEROI	40*25*15 Nano-crystaline	40*25*15 Nano-crystaline	EN IEC 62109-1 EN IEC 62109-2	Test with appliance
Magnet wire	Tongling Jingda Special Magnet Wire Co Ltd	QZY-2/180	180°C	UL 1446	UL E223994
-Alternate	TAI-I ELECTRIC WIRE&CABLE CO LTD	EIW	180°C	UL 1446	UL E85640
Varnish	ZHEJIANG RONGTAI TECHNICAL INDUSTRY CO LTD	R-1140	180°C	UL 1446	UL E227128
-Alternate	QINGYUAN BETTER NEW MATERIAL CO.LTD	BETTER 116 (n)	180°C	UL 1446	UL E230067
Glue	DONGGUAN SHI PAI HUA CHUANG INSULATION MATERIAL FTY	808A/B-H	130°C	UL 94 UL 746B	UL E304477
-Alternate	DONGGUAN EATTO	E-500	130°C	UL 94	UL E218090

	ELECTRONIC MATERIAL CO LTD			UL 746B	
Base	KINGBOARD LAMINATES HOLDINGS LTD	KB-616(X)	130°C	UL 796	UL E123995
L301 -Alternate	CHINA AMORPHOUS TECHNOLOGY CO., LTD	141-11043	1P COM-CHOKE 6mH MIN@1kHz Φ2.6*1P Nanocrystalline NC-00023-L-b-02/W424 CLASS B EMI 8Ts	EN IEC 62109-1 EN IEC 62109-2	Test with appliance
Core	CATECH CD.,LTD	NC-0023-L-b-02/W424	Nano-crystalline	EN IEC 62109-1 EN IEC 62109-2	Test with appliance
Wire	Tongling Jingda Special Magnet Wire Co Ltd	QZY-2/180	200°C	UL 1446	UL E223994
-Alternate	GUANGDONG JINYAN ELECTROTECHNICS JOINT STOCK CO.,LTD	QZY-x/180	180°C	UL 1446	UL E238500
PCB	KINGBOARD LAMINATES HOLDINGS LTD	KB-616(X)	FR-4, 2.0mm, 130°C	UL 796	UL E123995
-Alternate	SHANGHAI GLOBAL ELECTRONIC MATERIAL LTD	FR-4	FR-4, 2.0mm, 130°C	UL 94	UL E224772
Varnish	ZHUHAI CHANGXIAN NEW MATERIALS TECHNOLOGY CO LTD	E962	130°C	UL 1446	UL E335405
Adhesive	DONGGUAN TOPKEY ELECTRONIC CO LTD	BG610A/B	V-0, 130°C	UL 94 UL 746B	UL E356931
L101	HUIZHOU INDUCTANCE ELECTRONICS TECHNOLOGY CO.,LTD	141-11010	CHOKE 0.65mH MIN@1kHz Φ2.3*1P T42*26*18C R12K 8Ts	EN IEC 62109-1 EN IEC 62109-2	Test with appliance

Core	SU ZHOU TIAN MING MAGNETICSCO., LID	M12K	T42*26*18C	EN IEC 62109-1 EN IEC 62109-2	Test with appliance
Magnet wire	XINGNING JINYAN ELECTRICAL CO LTD	QZY-x/180	180°C	UL 1446	UL E238500
-Alternate	Tongling Jingda Special Magnet Wire Co Ltd	QZY-2/180	180°C	UL 1446	UL E223994
Electric insulating oil (Varnish)	ZHUHAI CHANGXIAN NEW MATERLALS TECHNOLOGY CO LTD	E962	MW 28-C, 155°C	UL 1446	UL E335405
-Alternate	SUZHOU TAIHU ELECTRIC ADVANCED MATERIAL CO LTD	T-4260(a)	MW 28-C, 155°C	UL 1446	UL E228349
-Tape	JINGJIANG YAHUA PRESSUER SENSITIVE GLUE CO LTD	CT*, WF*	130°C	UL 510A	UL E165111
-Alternate	CHANG SHU LIANG YI TAPE INDUSTRY CO LTD	LY-XX	130°C	UL 510A	UL E246820
-Insulating plate	KINGBOARD LAMINATES HOLDINGS LTD	FR-4/KB-6150	V-0, 130°C	UL 94 UL 746B	UL E123995
Vinyl (Epoxy)	DONGGUAN SHIPAI HUACHUANG MATERIAL FACTORY	808A/B	130°C	UL 94 UL 746B	UL E304477
-Alternate	DONGGUAN EATTO ELECTRONIC MATERIAL CO LTD	3300AB	90°C	UL 94 UL 746A	UL E218090

Tube	SHEN ZHEN WOER HEAT SHRINKABLE MATERIAL CO.,LTD	WF	600V, 200°C, VW-1	UL 224	UL E203950
-Alternate	CHANGYUAN ELECTRONICS GROUP CO LTD	CB-TT-L	150V, 200°C, VW-1	UL 224	UL E180908
-Alternate	HUIZHOU DONGJU FLUO TECH PLASTIC CO LTD	TFS	600V, 200°C, VW-1	UL 224	UL E478618
L101 -Alternate	HAINING LIANFENG DONGJIN ELECTRONICS CO., LTD	141-11010	CHOKE 0.65mH MIN@1kHz Φ2.3*1P T42*26*18C R12K 8Ts	EN IEC 62109-1 EN IEC 62109-2	Test with appliance
Core	TIANMING	M12K	T42*26*18C	EN IEC 62109-1 EN IEC 62109-2	Test with appliance
Magnet wire	XIANDENG HI-TECH ELECTRIC CO LTD	*EIW/180 or QZY-*/180 *	MW 76-C, 180°C	UL 1446	UL E488183
-Alternate	WUXI JUFENG COMPOUND LINE CO LTD	xEIW, QZY-x/180	MW30-C, 180°C	UL 1446	UL E206882
Malar	DUPONT HONGJI FILMS FOSHAN CO LTD	ELD	105°C	UL 94	UL E241830
Tube	GREAT HOLDING INDUSTRIAL CO LTD	TFL	200°C	UL 224	UL E156256
PCB	KINGBOARD LAMINATES HOLDINGS LTD	KB-6150	FR-4.0, 130°C	UL 796	UL E123995
Varnish	SUZHOU TAIHU ELECTRIC ADVANCED MATERIAL CO LTD	T-4260(a)	MW 80-C, 155°C	UL 1446	UL E228349
Epoxy	DONG GUAN SHI PAI HUA CHUANG MATERIAL FTY	H907-HF-Z	130°C	UL 94	UL E304477

L101 -Alternate	JTK TECHNOLOGY(SUZHOU) CO., LTD	141-11010	CHOKE 0.65mH MIN@1kHz Φ2.3*1P T42*26*18C R12K 8Ts	EN IEC 62109-1 EN IEC 62109-2	Test with appliance
Core	TIANMING	R12K	T42*26*18C	EN IEC 62109-1 EN IEC 62109-2	Test with appliance
Mylar film	HEFEI LUCKY SCIENCE & TECHNOLOGY	FG, PG, FE52, FF1, FP	VTM-2, 105°C	UL 94	UL E342454
Wire	XIANDENG HI-TECH ELECTRIC CO LTD	xEIW/180	MW30-C, 180°C	UL 1446	UL E488183
Base	HANGZHOU LIANSHEN INSULATION CO LTD	FR-4 (LS1130)	V-0, 130°C	UL 796	UL E315523
Epoxy	DONGGUAN EATTO ELECTRONIC MATERIAL CO LTD	3300A/B	V-0, 130°C	UL 94	UL E218090
Varnish	SUZHOU TAIHU ELECTRIC ADVANCED MATERIAL CO LTD	T-4260	MW 80-C,155°C	UL 1446	UL E228349
Tube	GREAT HOLDING INDUSTRIAL CO. LTD	TFL, TFS	VW-1, 200°C	UL 224	UL E156256
Control board 190-20147					
Master/ Slave DSP (U15, U17)	TI	TMS320F28P550 SJ9PZR	±2000V, -40°C~+150°C	EN IEC 62109-1 EN IEC 62109-2	Test with appliance
-Alternate	TI	TMS320F28P550 SG8PZR	±2000V, -40°C~+150°C	EN IEC 62109-1 EN IEC 62109-2	Test with appliance
-Alternate	TI	TMS320F280049	60MHz, 3.3V, 105°C	EN IEC 62109-1 EN IEC 62109-2	Test with appliance
-Alternate	TI	TMS320F280039	60MHz, 3.3V, 105°C	EN IEC 62109-1 EN IEC 62109-2	Test with appliance

ARM745 board 190-40281					
ARM Chip (U303)	ST	STM32H745IGT6	125°C	EN IEC 62109-1 EN IEC 62109-2	Test with appliance
-Alternate	ST	STM32H745II	3.3V, -40~+85°C	EN IEC 62109-1 EN IEC 62109-2	Test with appliance
-Alternate	ST	ST/STM32H753II T6	LQFP 176 SMD 3.3V	EN IEC 62109-1 EN IEC 62109-2	Test with appliance
ARM425 board 190-40283					
ARM Chip (U4)	GigaDevice	GD32F425VGT6	3.3V, -40~+85°C	EN IEC 62109-1 EN IEC 62109-2	Test with appliance
-Alternate	GigaDevice	GD32F405VGT6	3.3V, -40~+85°C	EN IEC 62109-1 EN IEC 62109-2	Test with appliance
PV Input board 190-70306					
Y cap C1, C2, C5, C6	FARA	MKP63 Series	0.010μF, 300Vac, -40°C~+110°C, Y2	EN IEC 60384-14:2023	SE-ENEC-2400708
-Alternate	Guangdong Fengming Electronic Tech. Co., Ltd	MKP Series	0.010μF, 300Vac, -40°C~+110°C, Y2	EN 60384-14:2013+A1	HN 69262649
Filter Cap. C3, C4	YUWA	YHKC series	2μF, 600Vdc, -40°C~+105°C	EN IEC 62109-1 EN IEC 62109-2	Test with appliance
-Alternate	FARA	C3D series	2μF, 600Vdc, -40°C~+105°C	EN IEC 62109-1 EN IEC 62109-2	Test with appliance
-Alternate	NISTRONICS	MDC series	2μF, 600Vdc, -40°C~+105°C	EN IEC 62109-1 EN IEC 62109-2	Test with appliance
Remark: N/A					