Test Report issued under the responsibility of:

LYNS-TCi

TEST REPORT

IEC 62109-1

Safety of Power Converter for use in Photovoltaic Power Systems

Part 1: General requirements

Report Number. ..... :	2502140103001-SF-LD
Total pages ..... :	156
Tested by (name + signature) ..... :	Connor Du / Test Engineer
Approved by (name + signature) ..... :	Kim Lee / Safety Manager
Date of issue ..... :	2025-02-25

HWA-HSING (DONGGUAN) TESTING CO., LTD. LYNS-TCi

Applicant's name ..... :	Midcosta s.r.o.
Address ..... :	Priemyselná 8E, 91701 Trnava Slovakia
Manufacturer ..... :	Same as applicant
Address ..... :	Same as applicant

Testing laboratory name ..... :	HWA-HSING (DONGGUAN) TESTING CO., LTD.
Address ..... :	Room 1201, Unit 2, Building 18, No. 7, Science and Technology Boulevard, Houjie Town, Dongguan City, Guangdong, 523960 P.R.C
Testing Location/ Address..... :	Same as above

Test specification:	
Standard ..... :	☒ IEC 62109-1:2010 (First Edition); EN 62109-1:2010; ☒ IEC 62109-2:2011 (First Edition); EN 62109-2:2011;
Test Report Form No. ..... :	IEC/EN 62109-1/2_V1.0

Issued by: HWA-HSING (DONGGUAN) TESTING CO., LTD.
Address: Room 1201, Unit 2, Building 18, No. 7, Science and Technology Boulevard, Houjie Town, Dongguan City, Guangdong, 523960 People's Republic of China.
Tel: +86 769 85598986 E-Mail: customerservice.dg@hwa-hsing.com Web: www.hwa-hsing.com

Product name ..... :	HYBRID INVERTER
Trade Mark ..... :	MidTeQ
Factory's name ..... :	Wuxi Solinteg Power Co., Ltd.
Factory address ..... :	Building H1-1001, No. 6 Jingxian Road, Xinwu District, 214135Wuxi, Jiangsu Province, China

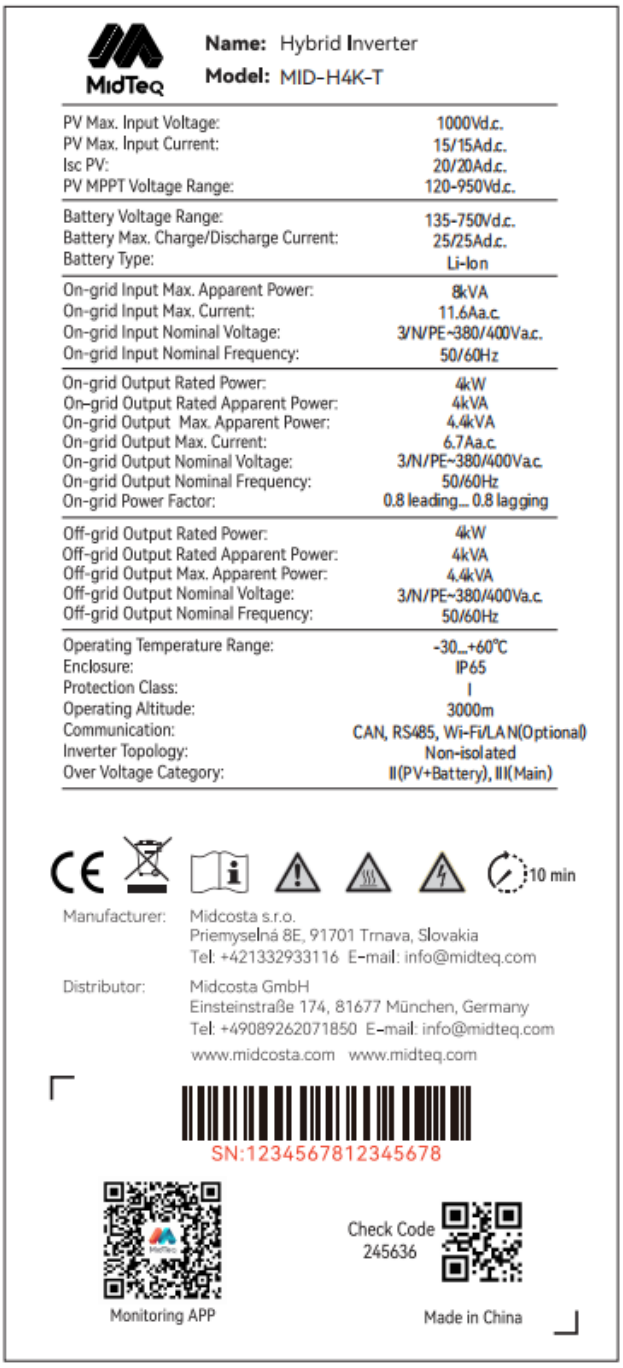
Model/Type reference ..... :	[1)], MID-H4K-T; [2)], MID-H5K-T; [3)], MID-H6K-T; [4)], MID-H8K-T; [5)], MID-H10K-T; [6)], MID-H12K-T; [7)], MID-H10K-T40; [8)], MID-H12K-T40; [9)], MID-H15K-T40; [10)], MID-H20K-T40;
Ratings:	
Max. PV input voltage [Vdc] ..... :	1000
PV MPPT voltage range [Vdc] ..... :	120-950 [1), 2), 3)]; 200-950 [4), 5), 6), 7), 8), 9), 10)]
Max. PV input current [Adc] ..... :	15/15 [1), 2), 3), 4), 5), 6)]; 30/30 [7), 8), 9), 10)]
Max. PV short-circuit current (Adc) :	20/20 [1), 2), 3), 4), 5), 6)]; 40/40 [7), 8), 9), 10)]
Battery voltage range[Vdc] ..... :	135-750
Battery type ..... :	Lithium Battery
-Maximum charging current (A) ..... :	25 [1), 2), 3), 4), 5), 6)]; 40 [7), 8), 9), 10)]
-Maximum discharge current (A) ..... :	25 [1), 2), 3), 4), 5), 6)]; 40 [7), 8), 9), 10)]
Nominal input AC voltage [V] ..... :	380/400 (3W + N + PE)
Nominal output AC voltage [V] ..... :	380/400 (3W + N + PE)
Max. input AC current [A] ..... :	11.6[1)] /14.5[2)] /17.4[3)] / 23.2[4)] / 23.9[5)] / 23.9[6)] / 29.0[7)] / 34.8[8)] / 43.5[9)] / 43.5[10)]
Max. output AC current [A] ..... :	6.7[1)] / 8.3[2)] / 10.0[3)] / 13.3[4)] / 16.5[5)] / 20.0[6)] / 16.5[7)] / 20.0[8)] / 25.0[9)] / 33.5[10)]
Rated AC output power [kW] ..... :	4[1)] / 5[2)] / 6[3)] / 8[4)] / 10[5)] / 12[6)] / 10[7)] / 12[8)] / 15[9)] / 20[10)]
Max. apparent AC output power [kVA] ..... :	4.4[1)] / 5.5[2)] / 6.6[3)] / 8.8[4)] / 11[5)] / 13.2[6)] / 11[7)] / 13.2[8)] / 16.5[9)] / 22[10)]
Nominal input frequency [Hz] ..... :	50/60
Nominal output frequency [Hz] ..... :	50/60
Firmware version / Software version :	V1.00/V1.00

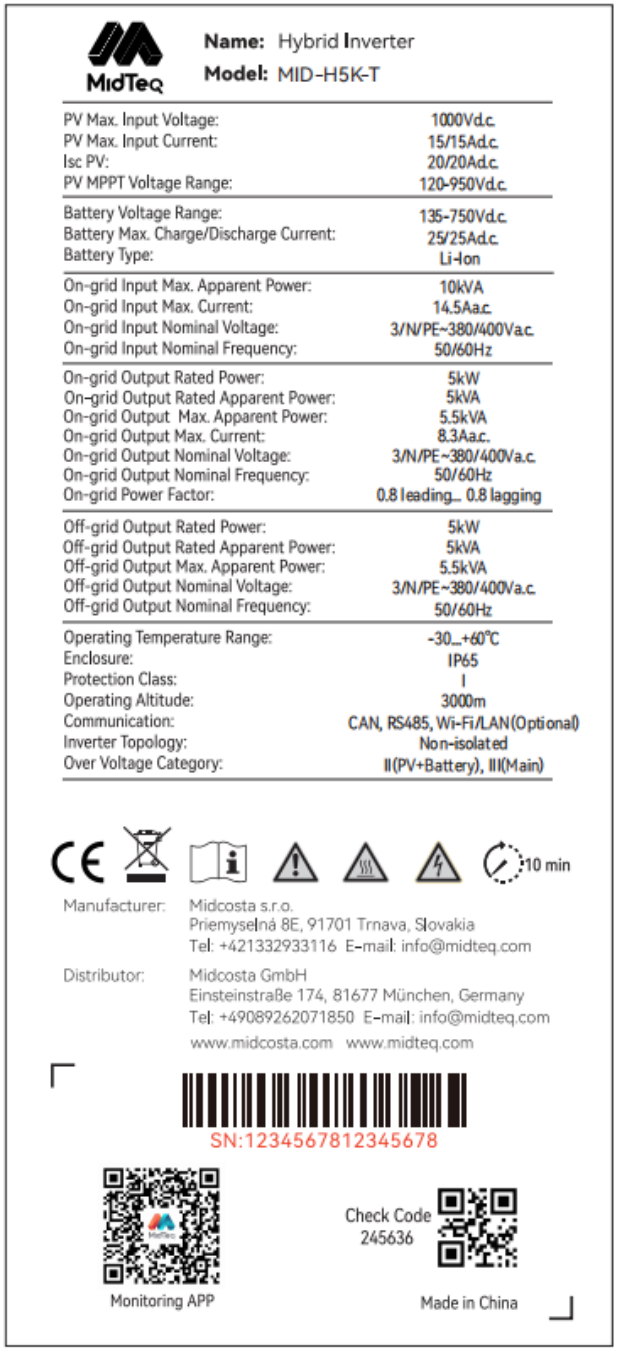
Contents

Revision history of test report

Issued Date	Description	Report No.
2025-02-25	Initial issue.	2502140103001-SF-LD

Copy of marking plate





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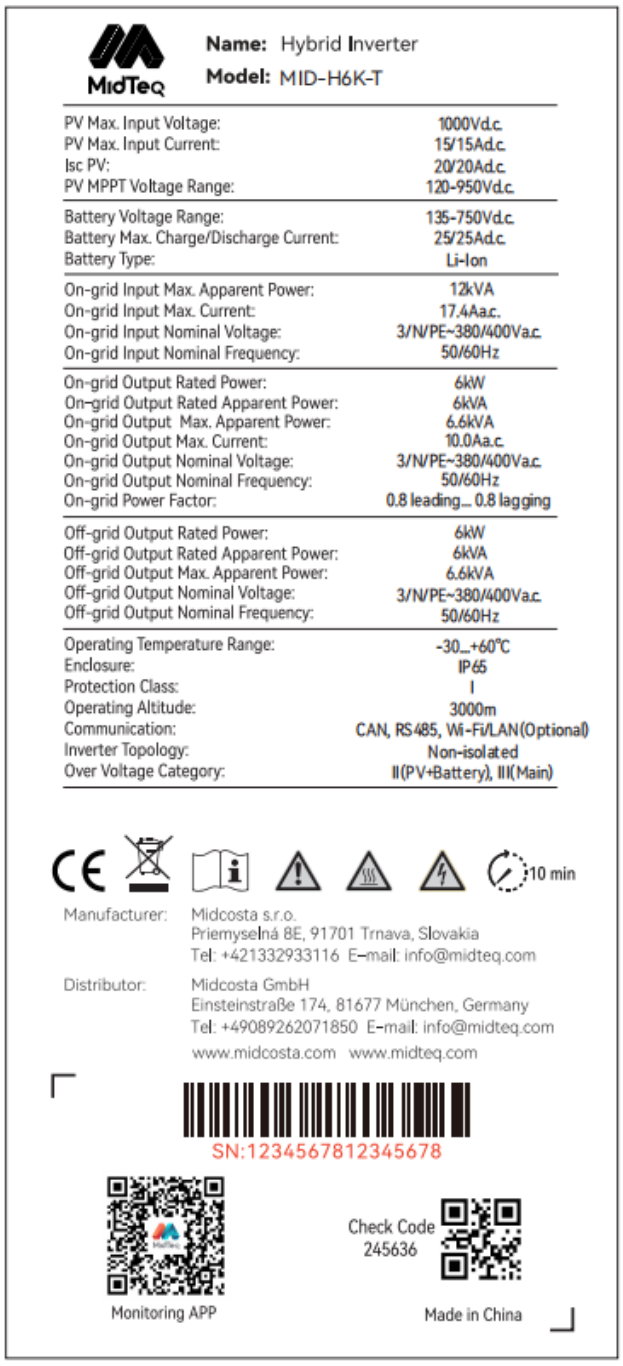

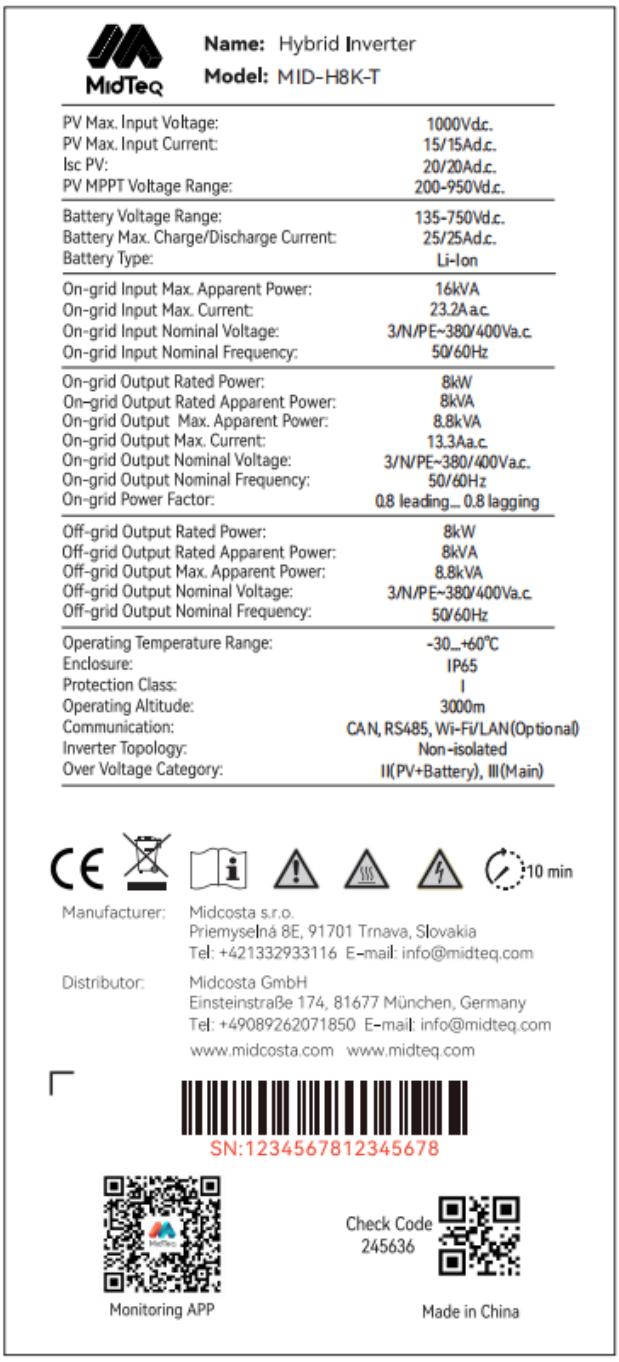

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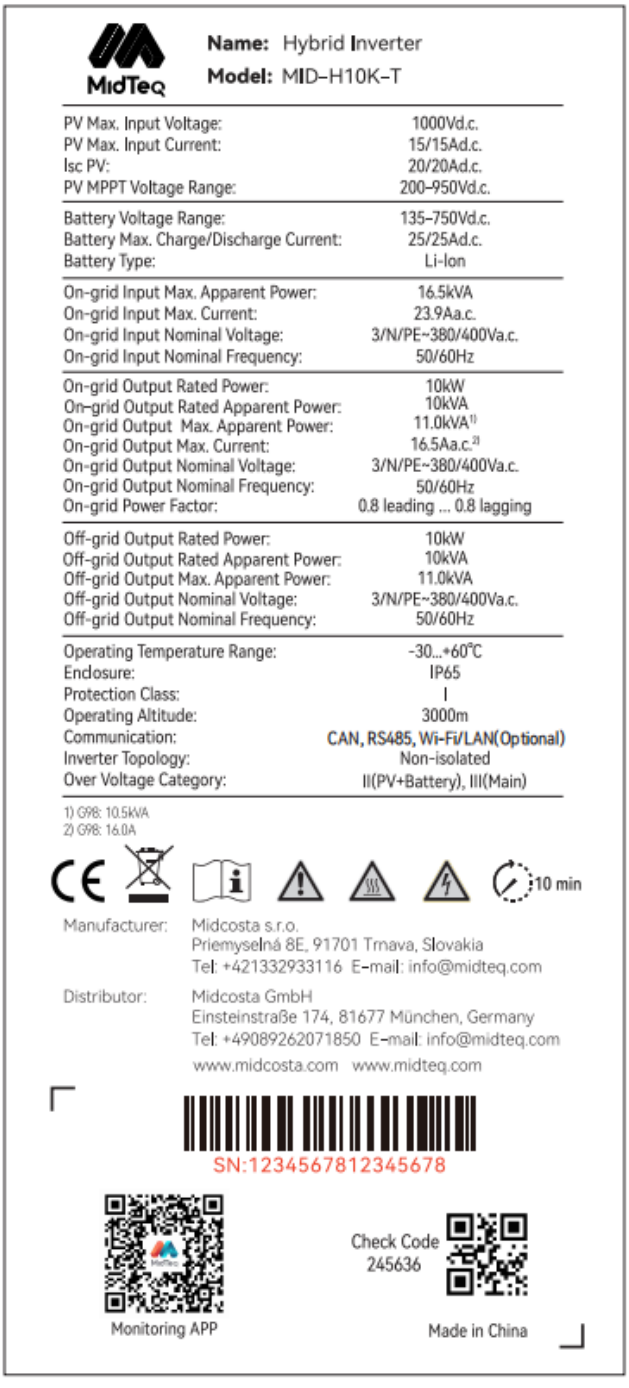

MidTeq

Name: Hybrid Inverter
Model: MID-H10K-T

PV Max. Input Voltage:	1000Vd.c.
PV Max. Input Current:	15/15Ad.c.
Isc PV:	20/20Ad.c.
PV MPPT Voltage Range:	200-950Vd.c.
Battery Voltage Range:	135-750Vd.c.
Battery Max. Charge/Discharge Current:	25/25Ad.c.
Battery Type:	Li-Ion
On-grid Input Max. Apparent Power:	16.5kVA
On-grid Input Max. Current:	23.9Aa.c.
On-grid Input Nominal Voltage:	3/N/PE~380/400Va.c.
On-grid Input Nominal Frequency:	50/60Hz
On-grid Output Rated Power:	10kW
On-grid Output Rated Apparent Power:	10kVA
On-grid Output Max. Apparent Power:	11.0kVA[1)]
On-grid Output Max. Current:	16.5Aa.c.[2)]
On-grid Output Nominal Voltage:	3/N/PE~380/400Va.c.
On-grid Output Nominal Frequency:	50/60Hz
On-grid Power Factor:	0.8 leading ... 0.8 lagging
Off-grid Output Rated Power:	10kW
Off-grid Output Rated Apparent Power:	10kVA
Off-grid Output Max. Apparent Power:	11.0kVA
Off-grid Output Nominal Voltage:	3/N/PE~380/400Va.c.
Off-grid Output Nominal Frequency:	50/60Hz
Operating Temperature Range:	-30...+60℃
Enclosure:	IP65
Protection Class:	I
Operating Altitude:	3000m
Communication:	CAN, RS485, Wi-Fi/LAN(Optional)
Inverter Topology:	Non-isolated
Over Voltage Category:	II(PV+Battery), III(Main)

1) G98: 10.5kVA
2) G98: 16.0A

10 min

Manufacturer: Midcosta s.r.o.
Priemyselná 8E, 91701 Trnava, Slovakia
Tel: +421332933116 E-mail: info@midteq.com

Distributor: Midcosta GmbH
Einsteinstraße 174, 81677 München, Germany
Tel: +49089262071850 E-mail: info@midteq.com
www.midcosta.com www.midteq.com

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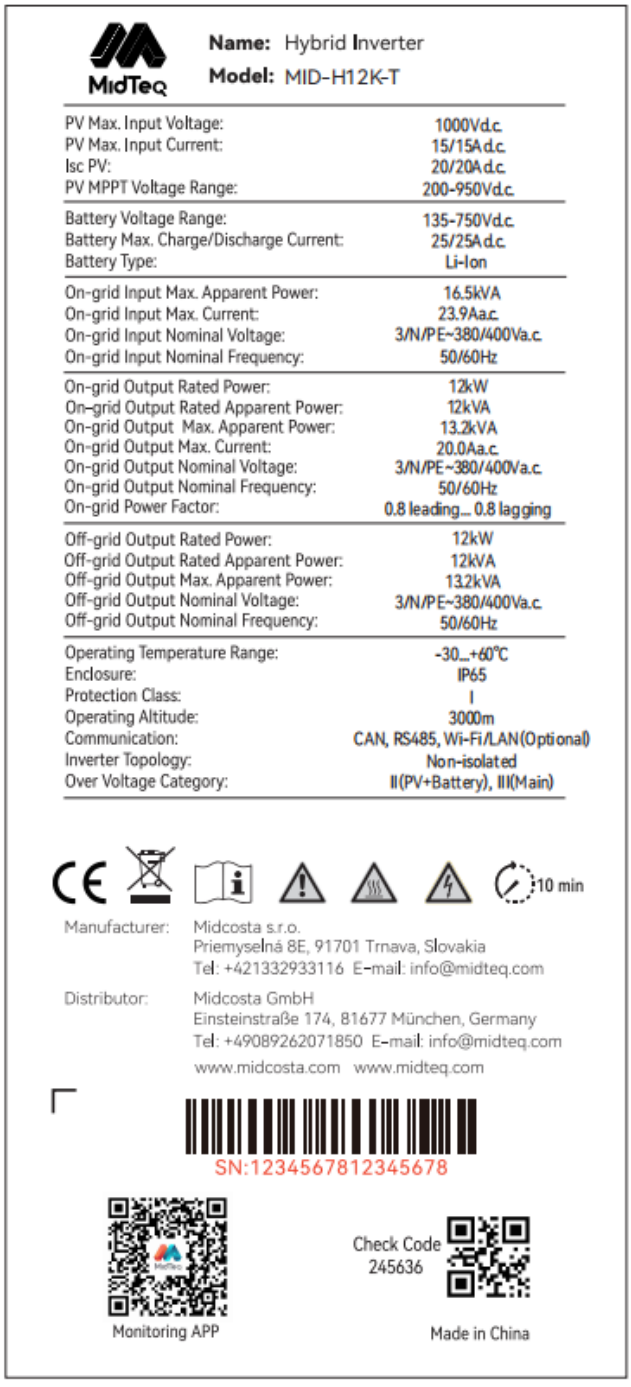

MidTeq

Name: Hybrid Inverter
Model: MID-H12K-T

PV Max. Input Voltage:	1000Vd.c.
PV Max. Input Current:	15/15Ad.c.
Isc PV:	20/20Ad.c.
PV MPPT Voltage Range:	200-950Vd.c.
Battery Voltage Range:	135-750Vd.c.
Battery Max. Charge/Discharge Current:	25/25Ad.c.
Battery Type:	Li-Ion
On-grid Input Max. Apparent Power:	16.5kVA
On-grid Input Max. Current:	23.9Aa.c.
On-grid Input Nominal Voltage:	3/N/PE~380/400Va.c.
On-grid Input Nominal Frequency:	50/60Hz
On-grid Output Rated Power:	12kW
On-grid Output Rated Apparent Power:	12kVA
On-grid Output Max. Apparent Power:	13.2kVA
On-grid Output Max. Current:	20.0Aa.c.
On-grid Output Nominal Voltage:	3/N/PE~380/400Va.c.
On-grid Output Nominal Frequency:	50/60Hz
On-grid Power Factor:	0.8 leading... 0.8 lagging
Off-grid Output Rated Power:	12kW
Off-grid Output Rated Apparent Power:	12kVA
Off-grid Output Max. Apparent Power:	13.2kVA
Off-grid Output Nominal Voltage:	3/N/PE~380/400Va.c.
Off-grid Output Nominal Frequency:	50/60Hz
Operating Temperature Range:	-30...+60℃
Enclosure:	IP65
Protection Class:	I
Operating Altitude:	3000m
Communication:	CAN, RS485, Wi-Fi/LAN(Optional)
Inverter Topology:	Non-isolated
Over Voltage Category:	II(PV+Battery), III(Main)

10 min

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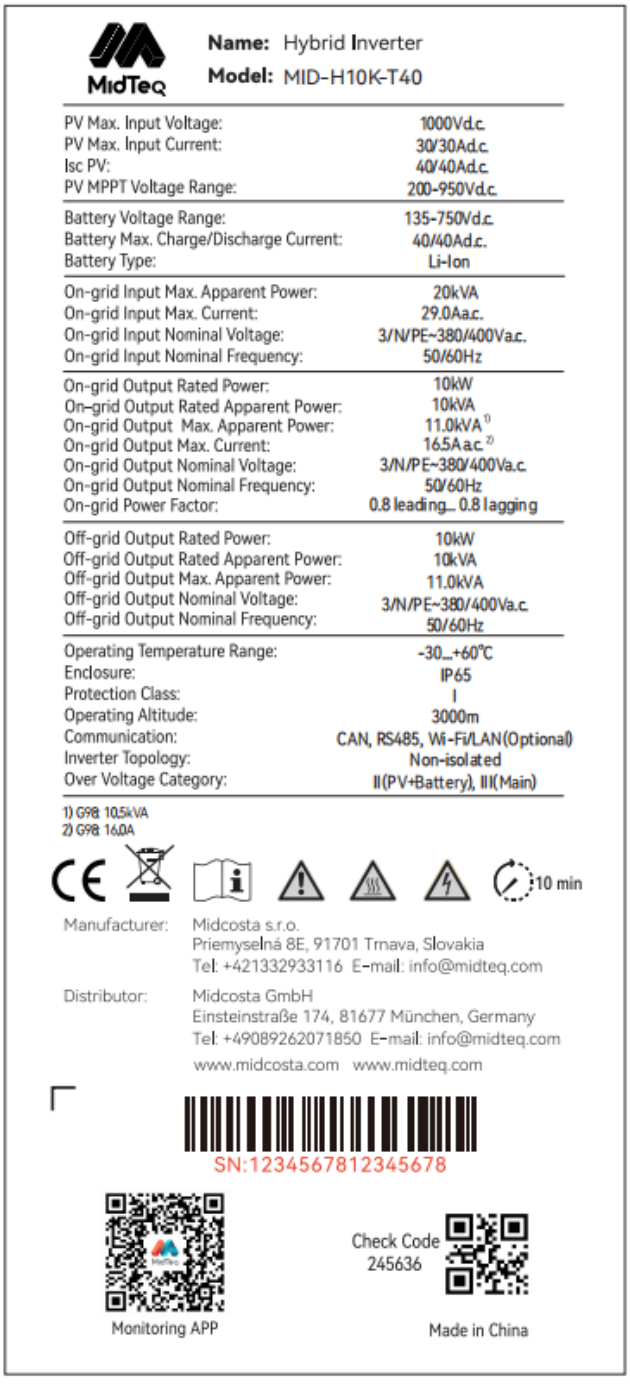

MidTeq

Name: Hybrid Inverter
Model: MID-H10K-T40

PV Max. Input Voltage:	1000Vd.c.
PV Max. Input Current:	30/30Ad.c.
Isc PV:	40/40Ad.c.
PV MPPT Voltage Range:	200-950Vd.c.
Battery Voltage Range:	135-750Vd.c.
Battery Max. Charge/Discharge Current:	40/40Ad.c.
Battery Type:	Li-Ion
On-grid Input Max. Apparent Power:	20kVA
On-grid Input Max. Current:	29.0Aa.c.
On-grid Input Nominal Voltage:	3/N/PE~380/400Va.c.
On-grid Input Nominal Frequency:	50/60Hz
On-grid Output Rated Power:	10kW
On-grid Output Rated Apparent Power:	10kVA
On-grid Output Max. Apparent Power:	11.0kVA 1)
On-grid Output Max. Current:	16.5Aa.c. 2)
On-grid Output Nominal Voltage:	3/N/PE~380/400Va.c.
On-grid Output Nominal Frequency:	50/60Hz
On-grid Power Factor:	0.8 leading... 0.8 lagging
Off-grid Output Rated Power:	10kW
Off-grid Output Rated Apparent Power:	10kVA
Off-grid Output Max. Apparent Power:	11.0kVA
Off-grid Output Nominal Voltage:	3/N/PE~380/400Va.c.
Off-grid Output Nominal Frequency:	50/60Hz
Operating Temperature Range:	-30...+60℃
Enclosure:	IP65
Protection Class:	I
Operating Altitude:	3000m
Communication:	CAN, RS485, Wi-Fi/LAN(Optional)
Inverter Topology:	Non-isolated
Over Voltage Category:	II(PV+Battery), III(Main)

1) G98: 10.5kVA
2) G98: 16.0A

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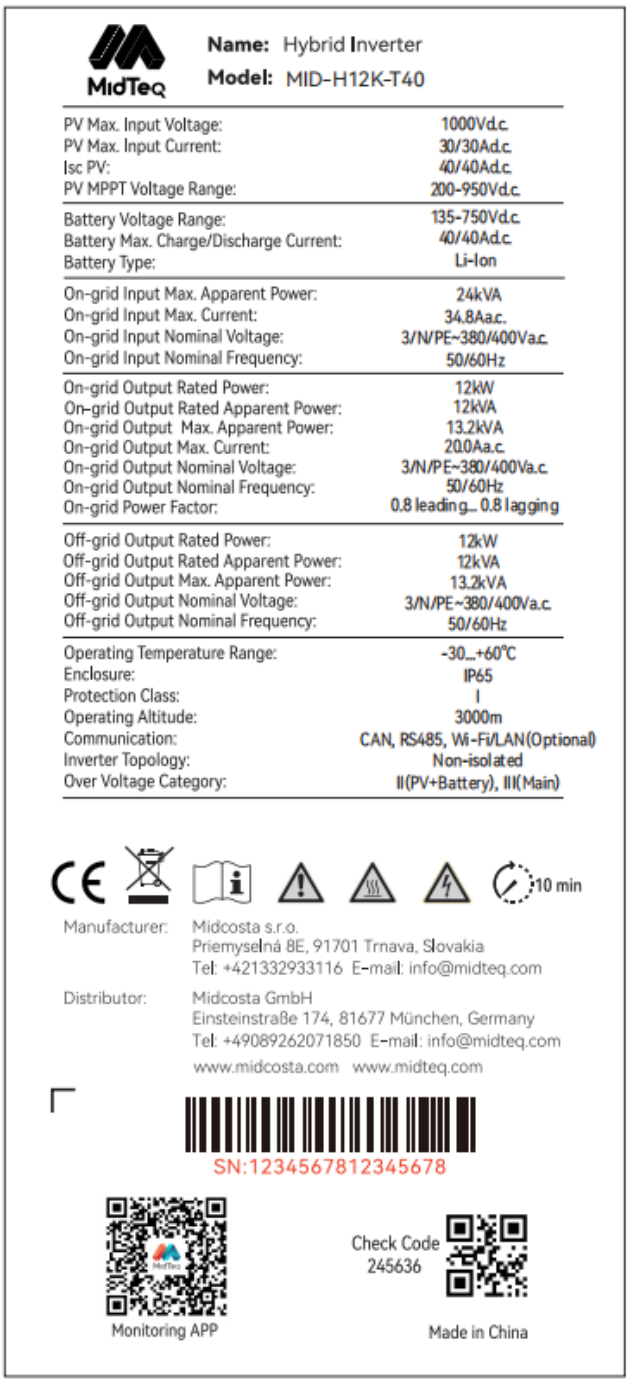

MidTeq

Name: Hybrid Inverter
Model: MID-H12K-T40

PV Max. Input Voltage:	1000Vd.c.
PV Max. Input Current:	30/30Ad.c.
Isc PV:	40/40Ad.c.
PV MPPT Voltage Range:	200-950Vd.c.
Battery Voltage Range:	135-750Vd.c.
Battery Max. Charge/Discharge Current:	40/40Ad.c.
Battery Type:	Li-Ion
On-grid Input Max. Apparent Power:	24kVA
On-grid Input Max. Current:	34.8Aa.c.
On-grid Input Nominal Voltage:	3/N/PE~380/400Va.c.
On-grid Input Nominal Frequency:	50/60Hz
On-grid Output Rated Power:	12kW
On-grid Output Rated Apparent Power:	12kVA
On-grid Output Max. Apparent Power:	13.2kVA
On-grid Output Max. Current:	20.0Aa.c.
On-grid Output Nominal Voltage:	3/N/PE~380/400Va.c.
On-grid Output Nominal Frequency:	50/60Hz
On-grid Power Factor:	0.8 leading... 0.8 lagging
Off-grid Output Rated Power:	12kW
Off-grid Output Rated Apparent Power:	12kVA
Off-grid Output Max. Apparent Power:	13.2kVA
Off-grid Output Nominal Voltage:	3/N/PE~380/400Va.c.
Off-grid Output Nominal Frequency:	50/60Hz
Operating Temperature Range:	-30...+60℃
Enclosure:	IP65
Protection Class:	I
Operating Altitude:	3000m
Communication:	CAN, RS485, Wi-Fi/LAN(Optional)
Inverter Topology:	Non-isolated
Over Voltage Category:	II(PV+Battery), III(Main)

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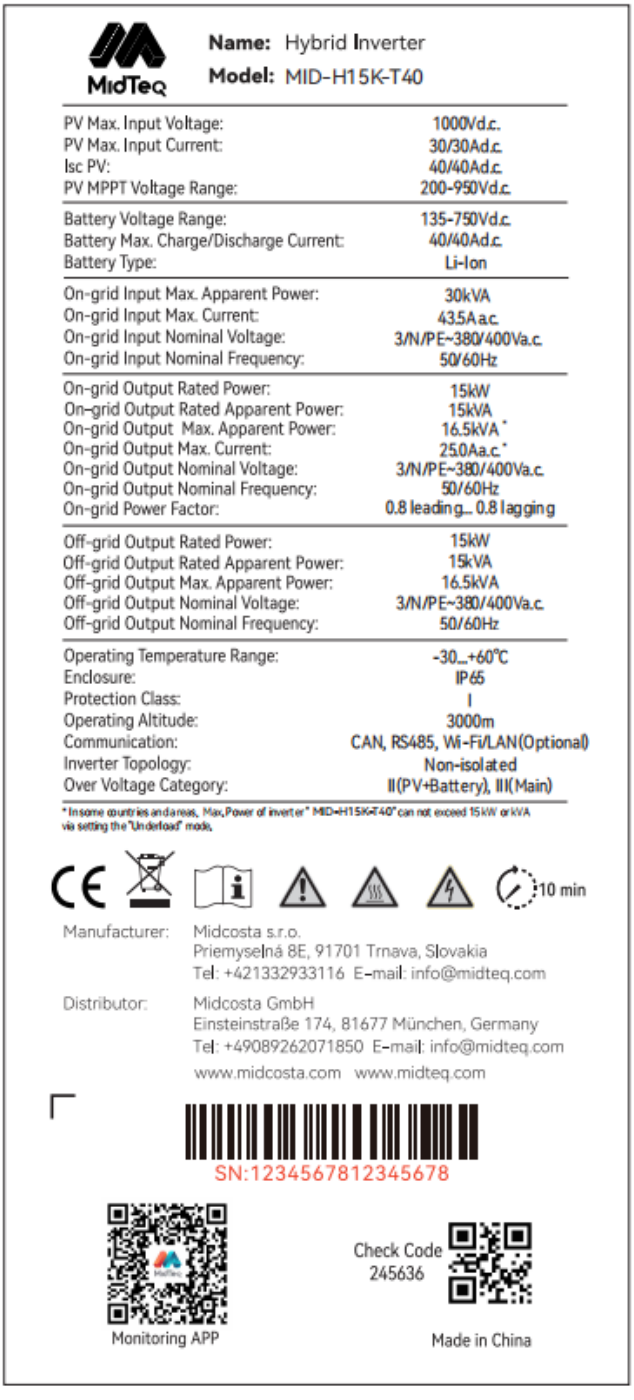

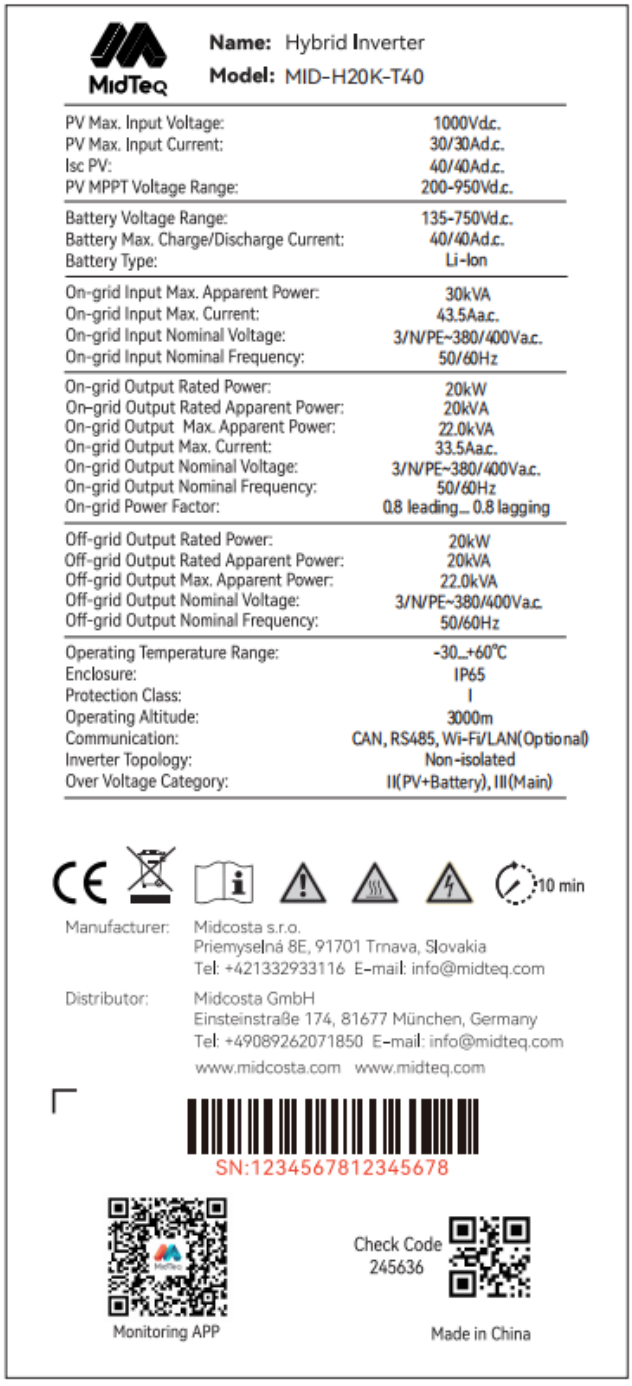

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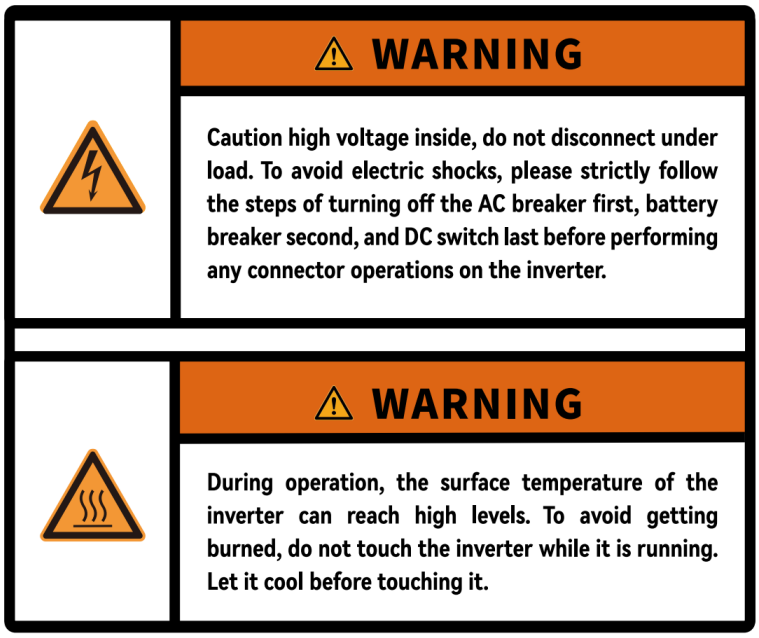


Note:

1. The above markings are the minimum requirements required by the safety standard. For the final production samples, the additional markings which do not give rise to misunderstanding may be added.
2. When the equipment is vended to EUROPE, manufacturers and importers shall indicate on the electrical equipment their name, registered trade name or registered trade mark and the postal address at which they can be contacted or, where that is not possible, on its packaging or in a document accompanying the electrical equipment.
3. Symbols on Marking plate were descriped in user's manual clearly.

General remarks

Possible test case verdicts

Test case does not apply to the test object ...: N/A

Test case is not rated .....: N/R

Test item does meet the requirement .....: P (Pass)

Test item does not meet the requirement ....: F (Fail)

Testing

Date of receipt of test items .....: 2023-07-12

Date(s) of performance of tests .....: 2023-07-12-2023-08-3

General remarks:

The test result presented in this report relate only to the object(s) tested. This report shall not be reproduced in part or in full without the written approval of the issuing testing laboratory.

* Decision Rule for conformance with the prescribed limits:

In this report, a Simple Acceptance (measurement uncertainty associated with the measurement result is not taken into account) is utilized, and the statements of conformity are reported as:

• Pass - the measured value is below the acceptance limit

• Fail - the measured value is above the acceptance limit

unless otherwise normatively specified or contractually agreed with the client.

By client's consent and authorization, this full test report is based on the previous test report (No. 230712JH03-SF-LD-01) which provided by client, due to:

*Other aspects are identical except for the top cover color, model type, logo, nameplate and license holder.

“(see Annex #)" refers to additional information appended to the report.
"(see appended table)" refers to a table appended to the report.

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

Summary testing:

All tests were carried out according to IEC/EN 62109-1:2010& IEC/EN 62109-2:2011, which was approved by CENELEC as European Standard without any modification, detail see **Assessment overview** on page 15.

1, The equipment under test (EUT) has been evaluated at maximum temperature (Tma) 60°C according the manufacture declaration.

2, All test were measured under the worst case and the load conditions during test(see appended Table 4.7 for detail).

3, The whole test was performed basic model MID-H20K-T40. it can be covering the model MID-H4K-T, MID-H5K-T, MID-H6K-T, MID-H8K-T, MID-H10K-T, MID-H12K-T, MID-H10K-T40, MID-H12K-T40 and MID-H15K-T40, since they used almost same hardware platform and software which except the output power derating by software.

4, Input(DC) to output(AC)(DVC-C circuits) is separated by functional insulation(without isolating transformer inside) and provide functional insulation between the circuits itself. Input(DC) and output(AC)(DVC-C circuits) to earth is separated by basic insulation. The user interface(DVC-A circuits) (COM1&2 port) is separated by reinforced insulation to input (DC and output (AC) and provide functional insulation between the circuits itself and between the circuits to earth.

5, The EUT has been evaluated for use in a Pollution Degree II (reduction from pollution degree 3 to 2 because of enclosure IP65) environment and a maximum altitude of 3000m. The unit is specified for outdoor and indoor (unconditioned) use, but the final installation must be located according the manufacture’s recommended environment, and the detail information is provided in the manual.

National Differences:

No other National Differences are addressed to this test report.

General product information

Equipment mobility	☐ movable	☐ hand-held	☐ stationary	
	☒ fixed	☐ transportable	☐ for building-in	
Connection to the mains	☒ pluggable equipment		☐ direct plug-in	
	☐ permanent connection		☐ for building-in	
Environmental category	☒ outdoor	☐ indoor unconditional	☐ indoor conditional	
Over voltage category Mains	☐ OVC I	☐ OVC II	☒ OVC III	☐ OVC IV
Over voltage category PV	☐ OVC I	☒ OVC II	☐ OVC III	☐ OVC IV

Mains supply tolerance (%) ..... According to the specification

Tested for power systems ..... TN systems

IT testing, phase-phase voltage (V) ..... N/A

Operating condition ..... Continuous

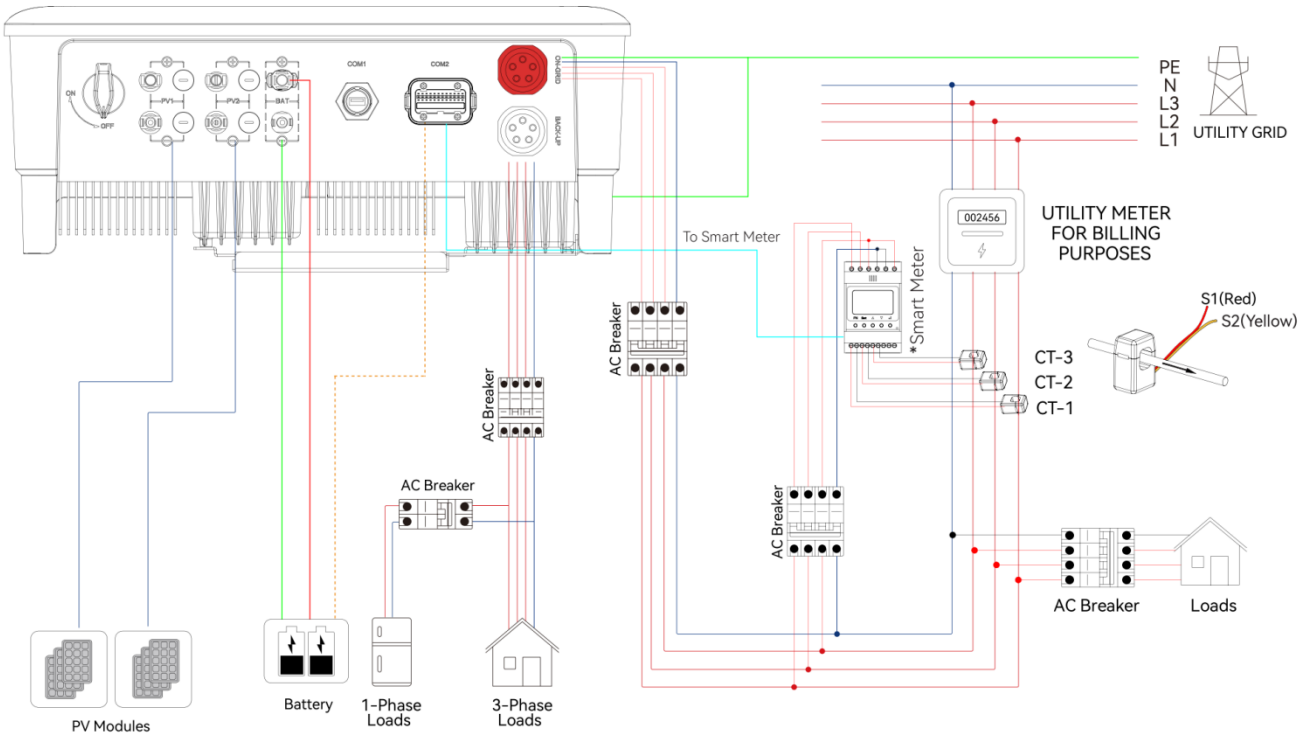
Class of equipment ..... ☒ Class I ☐ Class II ☐ Class III ☐ Not classified

Pollution degree PD2

Protection against ingress of water ..... IP65 according to IEC/EN 60529

Mass of equipment [kg] ..... Approximately 31kg max.

1, The Hybrid inverter is a grid-connected PV inverter with three-phase and the DC input voltage supplied by PV array, batteries. and the Hybrid inverter converts DC voltage generated by Solar into AC voltage, which is intended to be connected in parallel with the public grid and back-up sides via an independent AC breaker.



General product information

2, The unit has 4 kind of connection terminals: PV input terminal, grid terminal, battery terminal and AC load (Back-up) terminal. It is intended to use solar power, utility power and battery power to ensure continuous power supply.

3, The input and output are protected by varistor/varistor with GDT to Earth, the unit is providing EMI filtering at the DC input and AC output toward mains. The unit does not provide galvanic separation from input to output(without isolating transformer inside). The output is switched off redundantly by the high-power switching bridge and two relays in series. When single fault applied to one relay, alarm an error code in display panel, another redundant relay provides basic insulation maintained between the battery and the mains.

4, Differences of the models:

The models MID-H4K-T, MID-H5K-T, MID-H6K-T, MID-H8K-T, MID-H10K-T, MID-H12K-T, MID-H10K-T40, MID-H12K-T40, MID-H15K-T40 and MID-H20K-T40 use the almost same hardware platform and software which except the output power derating by software and the model name's due to the demand for commercial trade purposes. The model difference as show in below table for details:

<table>
<tr><th colspan="2">The module</th><th>MID-H4K-T
MID-H5K-T
MID-H6K-T</th><th>MID-H8K-T
MID-H10K-T
MID-H12K-T</th><th>MID-H10K-T40
MID-H12K-T40</th><th>MID-H15K-T40
MID-H20K-T40</th></tr>
<tr><td>PCB</td><td>--</td><td colspan="4">Common PCB design, only power devices and relays differ</td></tr>
<tr><td>PV common mode inductance</td><td>PV EMC</td><td colspan="2">15A common-mode inductance 3mH</td><td colspan="2">30A common-mode inductance 1mH</td></tr>
<tr><td>BAT common mode inductance</td><td>BAT EMC</td><td colspan="2">25A common-mode inductance 6mH</td><td colspan="2">40A common-mode inductance 2,5mH</td></tr>
<tr><td>INV common mode inductance</td><td>INV EMC</td><td colspan="3">18A common-mode inductance 5mH</td><td>30A common-mode inductance 3,5mH</td></tr>
<tr><td>PV power tube</td><td rowspan="2">PV Boost</td><td colspan="2">40A IGBT</td><td colspan="2">40mR SiCMOS</td></tr>
<tr><td>PV inductance</td><td colspan="2">15A inductance 1220uH</td><td colspan="2">30A inductance 590uH</td></tr>
<tr><td>BAT power tube</td><td rowspan="2">BAT DC-DC</td><td colspan="2">40A IGBT x2</td><td colspan="2">40mR SiCMOS x2</td></tr>
<tr><td>BAT inductance</td><td colspan="2">25A inductance 1220uH</td><td colspan="2">40A inductance 1100uH</td></tr>
<tr><td>INV inductance</td><td>INV L</td><td>6kW inductance 3244 uH</td><td colspan="2">12kW inductance 2218 uH</td><td>20kW inductance 825 uH</td></tr>
<tr><td>Relay</td><td>Relay</td><td colspan="3">33A relay</td><td>43A relay</td></tr>
<tr><td>fan</td><td>-</td><td colspan="2">No fan</td><td colspan="2">With the fan</td></tr>
<tr><td>PV terminal</td><td>-</td><td colspan="2">1+1</td><td colspan="2">2+2</td></tr>
</table>

5, Dimension of EUT (mm): 534*418*210 (W*H*D)

General product information

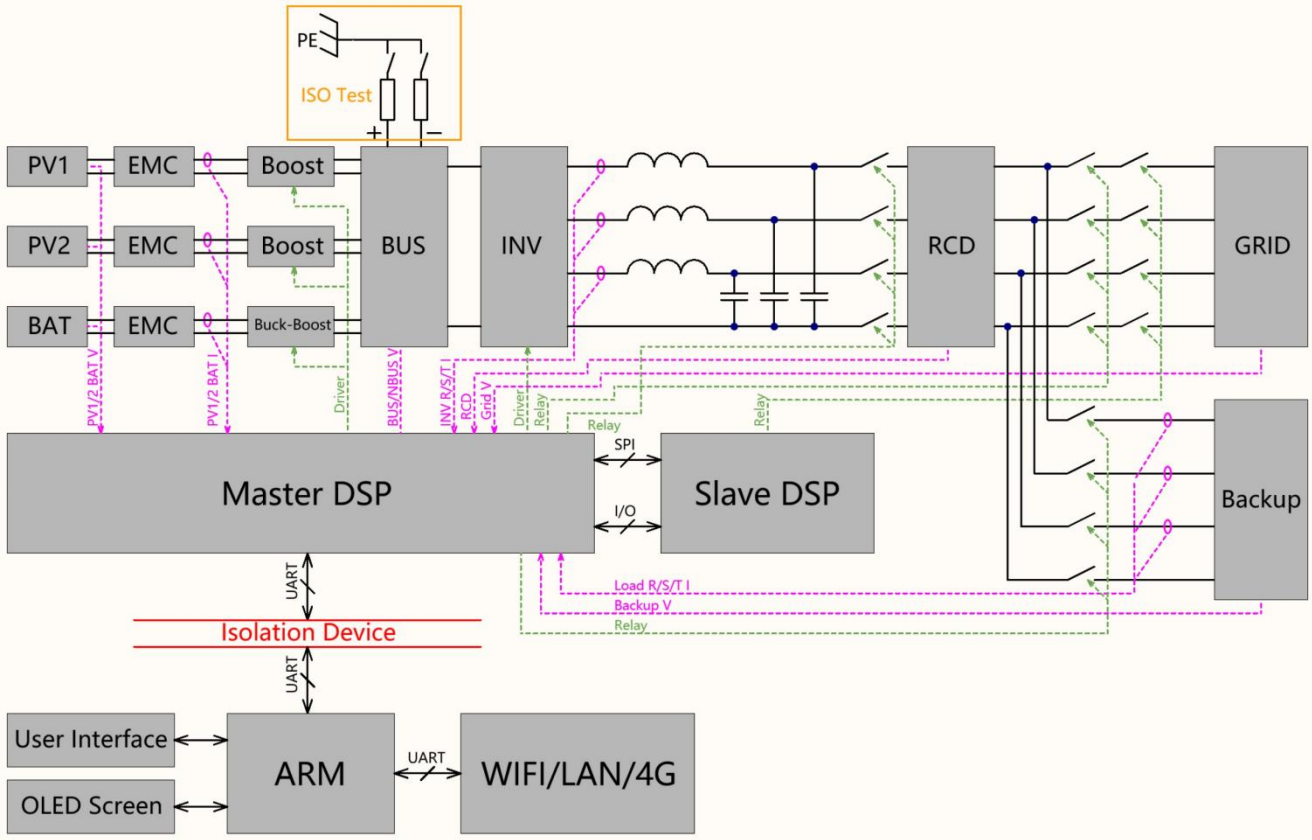
Description of the electrical circuit:

The internal control is redundant built, it consists of Microcontroller Main DSP (U102) and slave DSP(U200).

The Main DSP (U102) control the relays by switching signals; measures the battery voltage, battery current voltage, PV current, Bus voltage, grid voltage, frequency, AC current with injected DC and the array insulation resistance to ground. In addition, it tests the current sensors before each start up.

The slave DSP (U200) is measuring the grid voltage and grid frequency, also can switch off the relays independently, and communicate with Main DSP (U102) each other.

The current is measured by a current sensor. The AC current signal and the injected DC current signal are sent to the Main DSP(U102). The Main DSP(U102) tests and calibrates before each start up all current sensors in each phase. The relays are tested before each start up.



Block diagram

Assessment overview		
Tests performed(name of test and test clause):		
Clause	Requirements	Verdict
IEC/EN 62109-1		
4.2.2.6, 4.2.2.7, 4.7	Mains supply electrical data in normal condition &electrical ratings tests	P
5.1.2	Durability and legibility of marking	P
4.3, 4.4	Thermal test and single fault tests	P
4.5	Humidity preconditioning	P
4.6, 4.4	Backfeed test under normal and single-fault conditions	P
6.3	Ingress protection	P
7.3.2, 7.3.4.2.3	DVC Working Voltage and Access probe tests	P
7.3.5.3, 7.5.4,7.3.6.3.7	Touch current test	P
7.3.6.3.3	Earthing continuity test	P
7.3.5.3.2, 7.3.9	Capacitance discharge test	P
7.3.7, 7.5.2	Electric strength test	P
7.4	Energy hazardous	P
7.5.1	Impulse test	P
7.5.3	Partial Discharge test	N/A
8.3	Stability test	N/A
8.4	Lifting and carrying test	N/A
8.5	Mounting means loading test	P
9.1.3	Material requirements	P
9.2	Limited power source	P
11.2	Fluid pressure and leakage test	N/A
10	Sonic pressure hazards	N/A
13.1	Handle and manual controls pull test	N/A
13.3.2.5	Cord anchorages and strain relief Test	N/A
13.3.3.6	8 mm stripping test	P
13.3.8	Direct plug-in moment test	N/A
13.6.2	Stress relief test	P
13.7	Deformation tests (Steady force test, Steel ball impact test, Drop test)	P
14.8.1.2	Battery ventilation test	N/A
15	Software and firmware performing safety functions	P

Assessment overview		
Tests performed(name of test and test clause):		
Clause	Requirements	Verdict
IEC/EN 62109-2		
4.4.4.15	Fault-tolerance of protection for grid-interactive inverters	P
4.4.4.16	Stand-alone inverters – Load transfer test	P
4.4.4.17	Cooling system failure - Blanketing test	P
4.7.4.2	Steady state output voltage at nominal DC input	P
4.7.4.3	Steady state output voltage across the DC input range	P
4.7.4.4	Load step response of the output voltage at nominal DC input	P
4.7.4.5	Steady state output frequency	P
4.7.5.2	Sinusoidal output voltage waveform requirements	P
4.7.5.3	Non-sinusoidal output waveform requirements	N/A
4.7.5.4	Information requirements for non-sinusoidal waveforms	N/A
4.7.5.5	Output voltage waveform requirements for inverters for dedicated loads	N/A
4.8.1	General requirements regarding inverter isolation and array grounding	P
4.8.2.1	Array insulation resistance detection for inverters for ungrounded arrays	P
4.8.2.2	Array insulation resistance detection for inverters for functionally grounded arrays	N/A
4.8.3.2	30 mA touch current type test for isolated inverters	N/A
4.8.3.3	Fire hazard residual current type test for isolated inverters	N/A
4.8.3.5	Residual Current Test	P

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Clause	**Requirement**	**Remark**	**Verdict**
4	**GENERAL TESTING REQUIREMENTS**		P
4.1	General		P
4.2	General conditions for testing		P
4.2.1	Sequence of tests		P
4.2.2	Reference test conditions		P
4.2.2.1	Environmental conditions		P
4.2.2.2	State of equipment		P
4.2.2.3	Position of equipment	The equipment is installed in accordance with the manufacturer's instructions, in the configuration that results in the worst-case test conditions	P
4.2.2.4	Accessories		P
4.2.2.5	Covers and removable parts		P
4.2.2.6	Mains supply a) Voltage: b) Frequency: c) Polarity: d) Earthing: e) Over-current Protection:	(see appended table 4.2.2.6)	P
4.2.2.7	Supply ports other than the mains	For PV and battery	P
4.2.2.7.1	Photovoltaic supply sources a) Open circuit voltage: b) Short-circuit current:	(see appended table 4.2.2.7)	P
4.2.2.7.2	Battery inputs	(see appended table 4.2.2.7)	P
4.2.2.8	Conditions of loading for output ports		P
4.2.2.9	Earthing terminals		P
4.2.2.10	Controls		P
4.2.2.11	Available short circuit current		P
4.3	Thermal testing	(see appended table 4.3)	P
4.3.1	General		P
4.3.2	Maximum temperatures		P
4.3.2.1	General		P
4.3.2.2	Touch temperatures		P
4.3.2.3	Temperature limits for mounting surfaces		P
4.4	Testing in single fault condition	(see appended table 4.4)	P
4.4.1	General		P
4.4.2	Test conditions and duration for testing under fault conditions		P

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Clause	**Requirement**	**Remark**	**Verdict**
4.4.2.1	General		P
4.4.2.2	Duration of tests		P
4.4.3	Pass/fail criteria for testing under fault conditions		P
4.4.3.1	Protection against shock hazard		P
4.4.3.2	Protection against the spread of fire		P
4.4.3.3	Protection against other hazards		P
4.4.3.4	Protection against parts expulsion hazards		P
4.4.4	Single fault conditions to be applied		P
4.4.4.1	Component fault tests		P
4.4.4.2	Equipment or parts for short-term or intermittent operation		N/A
4.4.4.3	Motors	DC fan considered	P
4.4.4.4	Transformer short circuit tests		P
4.4.4.5	Output short circuit		P
4.4.4.6	Backfeed current test for equipment with more than one source of supply		P
4.4.4.7	Output overload		P
4.4.4.8	Cooling system failure		P
4.4.4.9	Heating devices	No such devises	N/A
4.4.4.10	Safety interlock systems	No such devises	N/A
4.4.4.11	Reverse d.c. connections		P
4.4.4.12	Voltage selector mismatch	No such devises	N/A
4.4.4.13	Mis-wiring with incorrect phase sequence or polarity		P
4.4.4.14	Printed wiring board short-circuit test		P
4.5	Humidity preconditioning		P
4.5.1	General		P
4.5.2	Conditions	RH.100%, 60°C	P
4.6	Backfeed voltage protection		P
4.6.1	Backfeed tests under normal conditions		P
4.6.2	Backfeed tests under single-fault conditions		P
4.6.3	Compliance with backfeed tests		P
4.7	Electrical ratings tests	(see appended table 4.7)	P
4.7.1	Input ratings		P
4.7.1.1	Measurement requirements for DC input ports		P
4.7.2	Output ratings		P
5	Marking and documentation		P
5.1	Marking		P

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Clause	**Requirement**	**Remark**	**Verdict**
5.1.1	General		P
	Equipment shall bear markings as specified in 5.1 and 5.2		P
	Graphic symbols may be used and shall be in accordance with Annex C or IEC 60417 as applicable.		P
	Graphic symbols shall be explained in the documentation provided with the PCE.		P
5.1.2	Durability of markings		P
	Markings required by this clause to be located on the PCE shall remain clear and legible under conditions of NORMAL USE and resist the effects of cleaning agents specified by the manufacturer		P
5.1.3	Identification		P
	The equipment shall, as a minimum, be permanently marked with:	See copy marking plate	P
	a) the name or trade mark of the manufacturer or supplier	See copy marking plate	P
	b) model number, name or other means to identify the equipment	See copy marking plate	P
	c) a serial number, code or other marking allowing identification of manufacturing location and the manufacturing batch or date within a three month time period.		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:		P
	– input voltage, type of voltage (a.c. or d.c.), frequency, and max. continuous current for each input		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		P
	– the ingress protection (IP) rating as in 6.3 below	IP65	P
5.1.5	Fuse identification		P
	Marking shall be located adjacent to each fuse or fuseholder, or on the fuseholder, or in another location provided that it is obvious to which fuse the marking applies, giving the fuse current rating and where fuses of different voltage rating value could be fitted, the fuse voltage rating.		P
	Where fuses with special fusing characteristics such as time delay or breaking capacity are necessary, the type shall also be indicated		P

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Clause	**Requirement**	**Remark**	**Verdict**
	For fuses not located in operator access areas and for soldered-in fuses located in operator access areas, it is permitted to provide an unambiguous cross-reference (for example, F1, F2, etc.) to the servicing instructions which shall contain the relevant information.	The fuse information contains near the fuse holder	P
5.1.6	Terminals, Connections, and Controls		P
	If necessary for safety, an indication shall be given of the purpose of Terminals, connectors, controls, and indicators, and their various positions, including any connections for coolant fluids such as water and drainage. The symbols in Annex C may be used, and where there is insufficient space, symbol 9 of Annex C may be used.		P
	Push-buttons and actuators of emergency stop devices, and indicator lamps used only to indicate a warning of danger or the need for urgent action shall be coloured red.		N/A
	A multiple-voltage unit shall be marked to indicate the particular voltage for which it is set when shipped from the factory. The marking is allowed to be in the form of a paper tag or any other non-permanent material.	The equipment is not intended to connect to multiple-voltage and there is no voltage setting device	N/A
	A unit with d.c. terminals shall be plainly marked indicating the polarity of the connections, with:		P
	– the sign “+“ for positive and “-„ for negative; or	Marked adjacent the DC input terminals	P
	– a pictorial representation illustrating the proper polarity where the correct polarity can be unambiguously determined from the representation		N/A
5.1.6.1	Protective Conductor Terminals		P
	The means of connection for the protective earthing conductor shall be marked with:		P
	– symbol 7 of Annex C; or		P
	– the letters “PE“; or		P
	– the colour coding green-yellow.		P
5.1.7	Switches and circuit-breakers	ON and OFF	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.		P
5.1.8	Class II Equipment	Class I Equipment	N/A
	Equipment using Class II protective means		N/A

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Clause	**Requirement**	**Remark**	**Verdict**
	throughout shall be marked with symbol 12 of Annex C. Equipment which is only partially protected by DOUBLE INSULATION or REINFORCED INSULATION shall not bear symbol 12 of Table Annex C.		
	Where such equipment has provision for the connection of an earthing conductor for functional reasons (see 7.3.6.4) it shall be marked with symbol 6 of Annex C		N/A
5.1.9	Terminal boxes for External Connections		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:		P
	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		P
5.2	Warning markings		P
5.2.1	Visibility and legibility requirements for warning markings		P
	Warning markings shall be legible, and shall have minimum dimensions as follows:		P
	– Printed symbols shall be at least 2,75 mm high		P
	– Printed text characters shall be at least 1.5 mm high and shall contrast in colour with the background		P
	– Symbols or text that are moulded, stamped or engraved in a material shall have a character height of at least 2,0 mm, and if not contrasting in colour from the background, shall have a depth or raised height of at least 0,5 mm.		P
	If it is necessary to refer to the instruction manual to preserve the protection afforded by the equipment, the equipment shall be marked with symbol 9 of Annex C		P
	Symbol 9 of Annex C is not required to be used adjacent to symbols that are explained in the manual		P
5.2.2	Content for warning markings		P
5.2.2.1	Ungrounded heat sinks and similar parts		P
	An ungrounded heat sink or other part that may be mistaken for a grounded part and involves a risk of electric shock in accordance with 7.3 shall be marked with symbol 13 of Annex C, or equivalent. The marking may be on or adjacent to the heat sink		N/A

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Clause	**Requirement**	**Remark**	**Verdict**
	and shall be clearly visible when the PCE is disassembled to the extent that a risk of contact with the heat sink exists.		
5.2.2.2	Hot Surfaces		P
	A part of the PCE that exceeds the temperature limits specified in 4.3.2 shall be marked with symbol 14 of Annex C or equivalent.	The symbol 14 of Annex C provided on the warning Label which located on the surface of enclosure	P
5.2.2.3	Coolant	No such devise	N/A
	A unit containing coolant that exceeds 70 °C shall be legibly marked externally where readily visible after installation with symbol 15 of Annex C. The documentation shall provide a warning regarding the risk of burns from hot coolant, and either:		N/A
	a) statement that coolant system servicing is to be done only by SERVICE PERSONNEL, or		N/A
	b) instructions for safe venting, draining, or otherwise working on the cooling system, if these operations can be performed without OPERATOR access to HAZARDS internal to the equipment		N/A
5.2.2.4	Stored energy		P
	Where required by 7.3.9.2 or 7.4.2 the PCE shall be marked with Symbol 21 of Annex C and the time to discharge capacitors to safe voltage and energy levels shall accompany the symbol.		P
5.2.2.5	Motor guarding		N/A
	Where required by 8.2 a marking shall be provided where it is visible to service personnel before removal of a guard, warning of the hazard and giving instructions for safe servicing (for example disconnection of the source before removing the guard).		N/A
5.2.3	Sonic hazard markings and instructions	No sonic hazard	N/A
	If required by 10.2.1 a PCE shall:		N/A
	a) be marked to warn the operator of the sonic pressure hazard; or		N/A
	b) be provided with installation instructions that specify how the installer can ensure that the sound pressure level from equipment at its point of use after installation, will not reach a value, which could cause a hazard. These instructions shall include the measured sound pressure level, and shall identify readily available and practicable protective materials or measures which may be used.		N/A
5.2.4	Equipment with multiple sources of supply		P

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Clause	**Requirement**	**Remark**	**Verdict**
	A PCE with connections for multiple energy sources shall be marked with symbol 13 of Annex C and the manual shall contain the information required in 5.3.4.		P
	The symbol shall be located on the outside of the unit or shall be prominently visible behind any cover giving access to hazardous parts.		P
5.2.5	Excessive touch current		N/A
	Where required by 7.3.6.3.7 the PCE shall be marked with symbol 15 of Annex C. See also 5.3.2 for information to be provided in the installation manual.		N/A
5.3	Documentation		P
5.3.1	General		P
	The documentation provided with the PCE shall provide the information needed for the safe operation, installation, and (where applicable) maintenance of the equipment. The documentation shall include the items required in 5.3.2 through 5.3.4, and the following:		P
	a) explanations of equipment makings, including symbols used		P
	b) location and function of terminals and controls		P
	c) all ratings or specifications that are necessary to safely install and operate the PCE, including the following environmental ratings along with an explanation of their meaning and any resulting installation requirements:		P
	– ENVIRONMENTAL CATEGORY as per 6.1	Outdoor	P
	– WET LOCATIONS classification fort he intended external environment as per 6.1	Outdoor	P
	– POLLUTION DEGREE classification for the intended external environment as per 6.2	PD2	P
	– INGRESS PROTECTION rating as per 6.3	IP65	P
	– Ambient temperature and relative humidity ratings	-30°C ~ +60°C	P
	– MAXIMUM altitude rating	Up to 3000 m	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;	PV side: OVC II AC side: OVC III	P
	d) a warning that when the photovoltaic array is exposed to light, it supplies a d.c. voltage to the PCE		N/A

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Clause	**Requirement**	**Remark**	**Verdict**
5.3.1.1	Language	English version specification and instruction provided.	P
	Instructions related to safety shall be in a language that is acceptable in the country where the equipment is to be installed.		P
5.3.1.2	Format		P
	In general, the documentation must be provided in printed form and is to be delivered with the equipment.		P
	For equipment which requires the use of a computer for both installation and operation, documentation may be provided in electronic format without accompanying printed format.		P
5.3.2	Information related to installation	Provided in the instruction manual	P
	The documentation shall include installation and where applicable, specific commissioning instructions and, if necessary for safety, warnings against hazards which could arise during installation or commissioning of the equipment. The information provided shall include:		P
	a) assembly, location, and mounting requirements:		P
	b) ratings and means of connection to each source of supply and any requirements related to wiring and external controls, colour coding of leads, disconnection means, or overcurrent protection needed, including instructions that the installation position shall not prevent access to the disconnection means;		P
	c) ratings and means of connection of any outputs from the PCE, and any requirements related to wiring and externals controls, colour coding of leads, or overcurrent protection needed;		P
	d) explanation of the pin-out of connectors for external connections, unless the connector is used for a standard purpose (e.g. RS 232)		P
	e) ventilation requirements;		P
	f) requirements for special services, for example cooling liquid;		N/A
	g) instructions and information relating to sound pressure level if required by 10.2.1;		N/A
	h) where required by 14.8.1.3, instructions for the adequate ventilation of the room or location in which PCE containing vented or valve-regulated batteries is located, to prevent the accumulation of hazardous gases;	No such battery	N/A
	i) tightening torque to be applied to wiring terminals;		P

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Clause	**Requirement**	**Remark**	**Verdict**
	j) values of backfeed short-circuit currents available from the PCE on input and output conductors under fault conditions, if those currents exceed the max. rated current of the circuit, as per 4.4.4.6;		N/A
	k) for each input to the PCE, the max value of short-circuit current available from the source, for which the PCE is designed; and		P
	l) compatibility with RCD and RCM;		N/A
	m) instructions for protective earthing, including the information required by 7.3.6.3.7 if a second protective earthing conductor is to be installed:		P
	n) where required by 7.3.8, the installation instructions shall include the following or equivalent wording:		N/A
	"This product can cause a d.c. current in the external protective earthing conductor. Where a residual current-operated protective (RCD) or monitoring (RCM) device is used for protection in a case of direct or indirect contact, only an RCD or RCM of Type B is allowed on the supply side of this product."		N/A
	o) for PCE intended to charge batteries, the battery nominal voltage rating, size, and type		P
	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:		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		N/A
	– Instructions, that if the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.		P
5.3.4	Information related to maintenance	All below related information provided in the service manual.	P

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Clause	**Requirement**	**Remark**	**Verdict**
	Maintenance instructions shall include the following:		P
	– Intervals and instructions for any preventive maintenance that is required to maintain safety (for example air filter replacement or periodic re-tightening of terminals);		P
	– Instructions for accessing operator access areas, if any are present, including a warning not to enter other areas of the equipment;		P
	– Part numbers and instructions for obtaining any required operator replaceable parts;	No 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 operated in order to completely isolate the equipment.		P
5.3.4.1	Battery maintenance	No batteries contain within PCE	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		N/A

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	or disconnecting battery terminals		
	f) Determine if battery is inadvertently grounded. If inadvertently grounded, remove source from ground. Contact with any part of a grounded battery can result in electrical shock. The likelihood of such shock can be reduced if such grounds are removed during installation and maintenance (applicable to equipment and remote battery supplies not having a grounded supply circuit).		N/A
6	**ENVIRONMENTAL REQUIREMENTS AND CONDITIONS**		P
	The manufacturer shall rate the PCE for the following environmental conditions:		P
	– ENVIRONMENTAL CATEGORY, as in 6.1 below		P
	– Suitability for WET LOCATIONS or not		P
	– POLLUTION DEGREE rating in 6.2 below		P
	– INGRESS PROTECTION (IP) rating, as in 6.3 below		P
	– Ultraviolet (UV) exposure rating, as in 6.4 below		N/A
	– Ambient temperature and relative humidity ratings, as in 6.5 below	-30℃~+60℃	P
6.1	Environmental categories and minimum environmental conditions		P
6.1.1	Outdoor		P
6.1.2	Indoor, unconditioned		N/A
6.1.3	Indoor, conditioned		N/A
6.2	Pollution degree	PD2	P
6.3	Ingress Protection	IP65(checked the approved test report which supplied by manufacturer)	P
6.4	UV exposure	No such UV exposure	N/A
6.5	Temperature and humidity	-30℃~+60℃	P
7	**PROTECTION AGAINST ELECTRIC SHOCK AND ENERGY HAZARDS**		P
7.1	General		P
7.2	Fault conditions	Normal and single fault condition are considered	P
7.3	Protection against electric shock		P
7.3.1	General		P
7.3.2	Decisive voltage classification		P
7.3.2.1	Use of decisive voltage class (DVC)	Working voltage and protective measures are considered.	P
7.3.2.2	Limits of DVC (according table 6)		P

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Clause	**Requirement**	**Remark**	**Verdict**
7.3.2.3	Short-terms limits of accessible voltages under fault conditions		P
7.3.2.4	Requirements for protection (according table 7)		P
7.3.2.5	Connection to PELV and SELV circuits	Only connected to SELV circuits external	P
7.3.2.6	Working voltage and DVC	DVC –C circuits within PCE	P
7.3.2.6.1	General		P
7.3.2.6.2	AC working voltage (see Figure 2)		P
7.3.2.6.3	DC working voltage (see Figure 3)		P
7.3.2.6.4	Pulsating working voltage (see Figure 4)		P
7.3.3	protective separation		P
	Protective separation shall be achieved by:		P
	▪ double or reinforced insulation, or		P
	▪ protective screening, i.e. by a conductive screen connected to earth by protective bonding in the PCE, or connected to the protective earth conductor itself, whereby the screen is separated from live parts by at least basic insulation, or	All accessible metal parts were earthed and separated from live parts by at least basic insulation	P
	▪ protective impedance comprising limitation of current per 7.3.5.3 and of discharged energy per 7.3.5.4, or		N/A
	▪ limitation of voltage according to 7.3.5.4.		N/A
	The protective separation shall be fully and effectively maintained under all conditions of intended use of the PCE		P
7.3.4	Protection against direct contact		P
7.3.4.1	General		P
	Protection against direct contact is employed to prevent persons from touching live parts that do not meet the requirements of 7.3.5 and shall be provided by one or more of the measure given in 7.3.4.2 (enclosures and barriers) and 7.3.4.3 (insulation).		P
	Open type sub-assemblies and devices do not require protective measures against direct contact but the instruction provided with the equipment must indicate that such measures must be provided in the end equipment or in the installation.		N/A
	Product intended for installation in CLOSED ELECTRICAL OPERATING AREAS, (see 3.9) need not have protective measures against direct contact, except as required by 7.3.4.2.4.		N/A
7.3.4.2	Protection by means of enclosures and barriers		P

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Clause	**Requirement**	**Remark**	**Verdict**
	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).	No removable enclosure	P
	Polymeric materials used to meet these requirements shall also meet the requirements of 13.6		N/A
7.3.4.2.2	Access probe criteria		P
	Protection is considered to be achieved when the separation between the test probes and live parts, when tested as described below, is as follows:		P
	a) decisive voltage classification A, (DVC A) - the probe may touch the live parts		P
	b) decisive voltage classification B, (DVC B) - the probe must not touch bare live parts	No DVC-B in the PCE	N/A
	c) decisive voltage classification C, (DVC C) – the probe must have adequate clearance to live parts, based on the clearance for Basic insulation using the recurring peak working voltage involved,		P
7.3.4.2.3	Access probe tests		P
	Compliance with 7.3.4.2.1 is checked by all of the following:		P
	a) Inspection; and		P
	b) Tests with the test finger (Figure D.1) and test pin (Figure D.2) of 0E, the results of which shall comply with the requirements of 7.3.4.2.1 a), b), and c) as applicable. Probe tests are performed on openings in the enclosures after removal of parts that can be detached or opened by an operator without the use of a tool, including fuseholders, and with operator access doors and covers open. It is permitted to leave lamps in place for this test. Connectors that can be separated by an operator without use of a tool, shall also be tested during and after disconnection. Any movable parts are to be put in the most unfavourable position.		P
	The test finger and the test pin are applied as above, without appreciable force, in every possible position, except that floor-standing equipment having a mass exceeding 40 kg is not tilted.		P

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Clause	**Requirement**	**Remark**	**Verdict**
	Equipment intended for building-in or rack mounting, or for incorporation in larger equipment, is tested with access to the equipment limited according to the method of mounting detailed in the installation instructions.		P
	c) Openings preventing the entry of the jointed test finger (Figure E-1 of 0E) during test b) above, are further tested by means of straight unjointed test finger (Figure E-3 of 0E), applied with a force of 30 N. If the unjointed finger enters, the test with the jointed finger is repeated except that the finger is applied using any necessary force up to 30 N.		P
	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.		P
7.3.4.2.4	Service access areas	The PCE is not allowed to remove the covers during installation and maintenance when PCE energized	P
7.3.4.3	Protection by means of insulation of live parts		P
	Where the requirements of 7.3.4.2 are not met, live parts shall be provided with insulation if:		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	The communication interface are direct contact and evaluated with double insulation from live parts	P
7.3.5.1	General		P
	Protection in case of direct contact is required to ensure that contact with live parts does not produce a shock hazard.		P
	The protection against direct contact according to 7.3.4 is not required if the circuit contacted is separated from other circuits according to 7.3.2.3, and:		P
	– is of decisive voltage class A and complies with 7.3.5.2, or	Only DVC-A classified circuits can be touched directly.	P
	– is provided with protective impedance according to 7.3.5.3, or		P
	– is limited in voltage according to 7.3.5.4		N/A
	In addition to the measures as given in 7.3.5.2 to		P

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Clause	**Requirement**	**Remark**	**Verdict**
	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.		
	Conformity is checked by visual inspection and trial insertion.		P
7.3.5.2	Protection using decisive voltage class A		P
7.3.5.3	Protection by means of protective impedance		N/A
	Circuits and conductive parts do not require protection against direct contact if any connection to circuits of DVC-B or DVC-C is through protective impedance, and the accessible circuit or part is otherwise provided with protective separation from circuits of DVC-B or DVC-C according 7.3.3.		N/A
7.3.5.3.1	Limitation of current through protective impedance		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	No such design	N/A
	That portion of a circuit that has its voltage reduced to DVC-A by a voltage divider that complies with the following requirements, and that is otherwise provided with protective separation from circuits of DVC-B or DVC-C according to 7.3.3, does not require protection against direct contact.		N/A
	The voltage divider shall be designed so that under normal and single fault conditions, including faults in the voltage division circuit, the voltage across the output of the voltage divider does not exceed the limit for DVC-A.		N/A
	This type of protection shall not be used in case of protective class II or unearthed circuits, because it relies on protective earth being connected.		N/A
7.3.6	Protection against indirect contact		P

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Clause	**Requirement**	**Remark**	**Verdict**
7.3.6.1	General		P
	Protection against indirect contact is required to prevent shock- hazardous current being accessible from conductive parts during an insulation failure. This protection shall comply with the requirements for protective class I (basic insulation plus protective earthing), class II (double or reinforced insulation) or class III (limitation of voltages)		P
	That part of a PCE meets the requirements of 7.3.6.2 and 7.3.6.3 is defined as protective class I		P
	That part of a PCE meets the requirements of 7.3.6.4 is defined as protective class II.	Class I equipment	N/A
	That part of PCE which meets the requirements of decisive voltage class A and in which no hazardous voltages are derived, is defined as protective class III. No shock hazard is present in such circuits.		N/A
	Where protection against indirect contact is dependent on means provided during installation, the installation instructions shall provide details of the required means and shall indicate the associated hazards.		P
7.3.6.2	Insulation between live parts and accessible conductive parts		P
	Accessible conductive parts of equipment shall be separated from live parts by insulation meeting the requirements of Table 7 or by clearances as specified in 7.3.7.4 and creepages as specified in 7.3.7.5		P
7.3.6.3	Protective class I – Protective bonding and earthing		P
7.3.6.3.1	General		P
	Equipment of protective class I shall be provided with protective earthing, and with protective bonding to ensure electrical contact between accessible conductive parts and the means of connection for the external protective earthing conductor, except bonding is not required for:		P
	a) accessible conductive parts that are protected by one of the measures in 7.3.5.2 to 7.3.5.4, or		P
	b) accessible conductive parts are separated from live parts of DVC-B or -C using double or reinforced insulation.		P
7.3.6.3.2	Requirements for protective bonding		P
	Electrical contact with the means of connection of the external protective earthing conductor shall be achieved by one or more of the following means:		P
	a) through direct metallic contact;	The connection of external protective earthing conductor is direct metal contact via a	P

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Clause	**Requirement**	**Remark**	**Verdict**
		terminal with screw.	
	b) through other conductive parts which are not removed when the PCE or sub-units are used as intended;		N/A
	c) through a dedicated protective bonding conductor;		P
	d) through other metallic components of the PCE		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.		N/A
7.3.6.3.3	Rating of protective bonding		P
	Protective bonding shall withstand the highest thermal and dynamic stresses that can occur to the PCE item(s) concerned when they are subjected to a fault connecting live parts to accessible conductive parts. The protective bonding shall remain effective for as long as a fault to the accessible conductive parts persists or until an upstream protective device removes power from the part.		P
	Protective bonding shall meet following requirements:		P
	a) For PCE with an overcurrent protective device rating of 16 A or less, the impedance of the protective bonding means shall not exceed 0,1 Ω during or at the end of the test below.	For PCE with an overcurrent protective device rating of 16 A or less	P
	b) For PCE with an overcurrent protective device rating of more than 16 A, the voltage drop in the protective bonding test shall not exceed 2,5 V during or at the end of the test below.		N/A
	As alternative to a) and b) the protective bonding may designed according to the requirements for the external protective earthing conductor in 7.3.6.3.5, in which case no testing is required.		N/A
	The impedance of protective bonding means shall be checked by passing a test current through the bond for a period of time as specified below. The test current is based on the rating of the overcurrent		P

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Clause	**Requirement**	**Remark**	**Verdict**
	protection for the equipment or part of the equipment under consideration, as follows:		
	a) For pluggable equipment type A, the overcurrent protective device is that provided external to the equipment (for example, in the building wiring, in the mains plug or in an equipment rack);		N/A
	b) For pluggable equipment type B and fixed equipment, the maximum rating of the overcurrent protective device specified in the equipment installation instructions to be provided external to the equipment;		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:	(see appended table 7.3.6.3.3)	P
	a) For PCE with an overcurrent protective device rating of 16 A or less, the test current is 200% of the overcurrent protective device rating, but not less than 32 A, applied for 120s. The impedance of the protective bonding means during and at the end of the test shall not exceed 0,1 Ω.		P

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Clause	**Requirement**	**Remark**	**Verdict**
	b) For PCE with an overcurrent protective device rating of more than 16 A, the test current is 200% of the overcurrent protective device rating and the duration of the test is as shown in Table 10 below. The voltage drop in the protective bonding means, during and at the end of the test, shall not exceed 2,5 V.		N/A
	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)	Be carried out by the manufacturer	N/A
	If the continuity of the protective bonding is achieved at any point by a single means only (for example a single conductor or single fastener), or if the PCE is assembled at the installation location, then the impedance of the protective bonding shall also be tested as a routine test. The test shall be as in 7.3.6.3.3, except for the following:		N/A
	▪ the test current may be reduced to any convenient value greater than 10 A sufficient to allow measurement or calculation of the impedance of the protective bonding means:		N/A
	▪ the test duration may be reduced to no less than 2 s		N/A
	For equipment subject to the type test in 7.3.6.3.3.1a), the impedance during the routine test shall not exceed 0,1Ω.		N/A
	For equipment subject to the type test in 7.3.6.3.3.1b) the impedance during the routine test shall not exceed 2,5 V divided by the test current required by 7.3.6.3.3.1b).		N/A
7.3.6.3.5	External protective earthing conductor		P
	A protective earthing conductor shall be connected at all times when power is supplied to PCE of protective class I. Unless local wiring regulations		P

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Clause	**Requirement**	**Remark**	**Verdict**
	state otherwise, the protective earthing conductor cross-sectional area shall be determined from Table 11 or by calculation according to IEC 60364-5-54.		
	If the external protective earthing conductor is routed through a plug and socket or similar means of disconnection, it shall not be possible to disconnect it unless power is simultaneously removed from the part to be protected.		N/A
	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:		N/A
	▪ 2,5 mm² if mechanical protection is provided;		N/A
	▪ 4 mm² if mechanical protection is not provided.		N/A
	For cord-connected equipment, provisions shall be made so that the external protective earthing conductor in the cord shall, in the case of failure of the strain-relief mechanism, be the last conductor to be interrupted.		N/A
7.3.6.3.6	Means of connection for the external protective earthing conductor		P
7.3.6.3.6.1	General		P
	The means of connection for the external protective earthing conductor shall be located near the terminals for the respective live conductors. The means of connections shall be corrosion-resistant and shall be suitable for the connection of cables according to 7.3.6.3.5. The means of connection for the protective earthing conductor shall not be used as a part of the mechanical assembly of the equipment or for other connections. A separate means of connection shall be provided for each external protective earthing conductor. Connection and bonding points shall be so designed that their current-carrying capacity is not impaired by mechanical, chemical, or electrochemical influences. Where enclosures and/or conductors of aluminium or aluminium alloys are used, particular attention should be given to the problems of electrolytic corrosion.		P
	The means of connection for the protective earthing conductor shall be permanently marked with:		P
	• symbol 7 of Annex C; or		P
	• the colour coding green-yellow		P
	Marking shall not be done on easily changeable parts such as screws.		P
7.3.6.3.7	Touch current in case of failure of the protective		P

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Clause	**Requirement**	**Remark**	**Verdict**
	earthing conductor		
	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.		P
	a) Permanently connected wiring, and:		P
	• a cross-section of the protective earthing conductor of at least 10 mm² Cu or 16 mm² Al; or		N/A
	• automatic disconnection of the supply in case of discontinuity of the protective earthing conductor; or		N/A
	• provision of an additional terminal for a second protective earthing conductor of the same cross-sectional area as the original protective earthing conductor and installation instruction requiring a second protective earthing conductor to be installed or		P
	b) Connection with an industrial connector according to IEC 60309 and a minimum protective earthing conductor cross-section of 2,5 mm² as part of a multi-conductor power cable. Adequate strain relief shall be provided.		N/A
	In addition, the caution symbol 15 of Annex C shall be fixed to the product and the installation manual shall provide details of the protective earthing measures required in the installation as required in 5.3.2.		P
	When it is intended and allowed to connect two or more PCEs in parallel using one common PE conductor, the above touch current requirements apply to the maximum number of the PCEs to be connected in parallel, unless one of the measures in a)		N/A
	or b) above is used. The maximum number of parallel PCEs is used in the testing and has to be stated in the installation manual.		N/A
7.3.6.4	Protective Class II – Double or Reinforced Insulation	No such construction	N/A
	Equipment or parts of equipment designed for protective class II shall have insulation between live		N/A

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Clause	**Requirement**	**Remark**	**Verdict**
	parts and accessible surfaces in accordance with 7.3.4.3. The following requirements also apply:		
	• equipment designed to protective class II shall not have means of connection for the external protective earthing conductor. However this does not apply if the external protective earthing conductor is passed through the equipment to equipment series-connected beyond it. In the latter event, the external protective earthing conductor and its means for connection shall be insulated with basic insulation from the accessible surface of the equipment and from circuits that employ protective separation, extra-low voltage, protective impedance and limited discharging energy, according to 7.3.5. This basic insulation shall correspond to the rated voltage of the series-connected equipment;		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 be marked according to 5.1.8.		N/A
7.3.7	Insulation Including Clearance and Creepage Distance		P
7.3.7.1	General		P
	This subclause gives minimum requirements for insulation, based on the principles of IEC 60664.		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	PD2	P
	• overvoltage category	The mains circuits: OVC III The PV array circuits: OVC II	P
	• supply earthing system	TN	P
	• insulation voltage		P
	• location of insulation		P
	• type of insulation		P
	Compliance of insulation, creepage distances, and clearance distances, shall be verified by		P

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Clause	**Requirement**	**Remark**	**Verdict**
	measurement or visual inspection, and the tests of 7.5.		
7.3.7.1.3	Supply earthing systems		P
	Three basic types of earthing system are described in IEC 60364-1. They are:		P
	• TN system: has one point directly earthed, the accessible conductive parts of the installation being connected to that point by protective conductors. Three types of TN systems, TN-C, TN-S and TN-C-S, are defined according to the arrangement of the neutral and protective conductor.		P
	• TT system: has one point directly earthed, the accessible conductive parts of the installation being connected to earth electrodes electrically independent of the earth electrodes of the power system;		N/A
	• IT system: has all live parts isolated from earth or one point connected to earth through an impedance, the accessible conductive parts of the installation being earthed independently or collectively to the earthing system.		N/A
7.3.7.1.4	Insulation voltages		P
	Table 12 makes use of the circuit system voltage and overvoltage category to define the impulse withstands voltage and the temporary overvoltage.		P
7.3.7.2	Insulation between a circuit and its surroundings		P
7.3.7.2.1	General		P
7.3.7.2.2	Circuits connected directly to the mains		P
7.3.7.2.3	Circuits other than mains circuits		P
7.3.7.2.4	Insulation between circuits		P
7.3.7.3	Functional insulating		P
7.3.7.4	Clearance distances	(see appended table 7.3.7)	P
7.3.7.4.1	Determination		P
7.3.7.4.2	Electric field homogeneity		P
7.3.7.4.3	Clearance to conductive enclosures		N/A
7.3.7.5	Creepage distances	(see appended table 7.3.7)	P
7.3.7.5.1	General		P
7.3.7.5.2	Voltage		P
7.3.7.5.3	Materials	Certified PWB used. Other material are considered IIIb The inside parts are considered pollution degree 2	P
7.3.7.6	Coating	No coating provided insulation	N/A

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Clause	**Requirement**	**Remark**	**Verdict**
7.3.7.7	PWB spacings for functional insulating	PWB rated V-0 and has a minimum CTI of 175, short-circuit test are considered	P
7.3.7.8	Solid insulating		P
7.3.7.8.1	General		P
7.3.7.8.2	Requirements for electrical withstand capability of solid insulation		P
7.3.7.8.2.1	Basic, supplemental, reinforced, and double insulation		P
7.3.7.8.2.2	Functional insulation		P
7.3.7.8.3	Thin sheet or tape material		P
7.3.7.8.3.1	General		P
7.3.7.8.3.2	Material thickness not less than 0,2 mm	0.34 mm	P
7.3.7.8.3.3	Material thickness less than 0,2 mm		P
7.3.7.8.3.4	Compliance		P
7.3.7.8.4	Printed wiring boards		P
7.3.7.8.4.1	General		P
7.3.7.8.4.2	Use of coating materials		P
7.3.7.8.5	Wound components		P
7.3.7.8.6	Potting materials		P
7.3.7.9	Insulation requirements above 30 kHz		N/A
7.3.8	Residual Current-operated protective (RCD) or monitoring (RCM) device compatibility		N/A
	RCD and RCM are used to provide protection against insulation faults in some domestic and industrial installations, additional to that provided by the installed equipment.		N/A
7.3.9	Capacitor discharge		P
7.3.9.1	Operator access area		P
	Equipment shall be so designed that there is no risk of electric shock in operator access areas from charge stored on capacitors after disconnection of the PCE.		P
7.3.9.2	Service access areas		P
	Capacitors located behind panels that are removable for servicing, installation, or disconnection shall present no risk of electric shock or energy hazard from charge stored on capacitors after disconnection of the PCE.	Warning symbol provided	P
7.4	Protection against energy hazards		P
7.4.1	Determination of hazardous energy level		P

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Clause	**Requirement**	**Remark**	**Verdict**
	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.		P
7.4.3	Services Access Areas		P
7.5	Electrical tests related to shock hazard	(see appended table 7.5)	P
7.5.1[#]	Impulse voltage test (type test)		P
7.5.2	Voltage test (dielectric strength test)		P
7.5.2.1	Purpose of test		P
7.5.2.2	Value and type of test voltage		P
7.5.2.3	Humidity pre-conditioning		P
7.5.2.4	Performing the voltage test		P
7.5.2.5	Duration of the a.c. or d.c. voltage test		P
7.5.2.6	Verification of the a.c. or d.c. voltage test		P
7.5.3	Partial discharge test	The voltage stress on the insulation is not greater than 1kV per mm. The thickness of plastic enclosure is more than 2 mm.	N/A
7.5.4	Touch current measurement (type test)	(see appended table 7.3.6.3.7)	P
	The touch current shall be measured if required by 7.3.6.3.7 and shall not be greater than 3.5 mA a.c. or 10 mA d.c. or special measures of protection as given in 7.3.6.3.7 are required.		P
	For type tests on PCE for which wet locations requirements apply according to 6.1, the humidity pre-conditioning of 4.5 shall be performed immediately prior to the touch current test.		P
7.5.5	Equipment with multiple sources of supply		P
8	**PROTECTION AGAINST MECHANICAL HAZARDS**		P
8.1	General		P
	Operation shall not lead to a mechanical HAZARD		P

[#] This test has been subcontracted, Testing Lab.: Wuxi Institute of Inspection, Testing and Certification National Center of Inspection on Solar Photovoltaic Products Quality

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Clause	**Requirement**	**Remark**	**Verdict**
	in NORMAL CONDITION or SINGLE FAULT CONDITION. Edges, projections, corners, openings, guards, handles and the like, that are accessible to the operator shall be smooth and rounded so as not to cause injury during normal use of the equipment.		
	Conformity is checked as specified in 8.2 to 8.6.		P
8.2	Moving parts		N/A
	Moving parts shall not be able to crush, cut or pierce parts of the body of an OPERATOR likely to contact them, nor severely pinch the OPERATOR's skin. Hazardous moving parts of equipment, that is moving parts which have the potential to cause injury, shall be so arranged, enclosed or guarded as to provide adequate protection against the risk of personal injury.		N/A
8.2.1	Protection of service persons		P
	Protection shall be provided such that unintentional contact with hazardous moving parts is unlikely during servicing operations. If a guard over a hazardous moving part may need to be removed for servicing, the marking of symbol 15 of Table D-1 shall be applied on or near the guard.		P
8.3	Stability	Fixed installation	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	No such devise	N/A
	If carrying handles or grips are fitted to, or supplied with, the equipment, they shall be capable of withstanding a force of four times the weight of the equipment.		N/A
	Equipment or parts having a mass of 18 kg or more shall be provided with a means for lifting and carrying or directions shall be given in the manufacturer's documentation.		N/A
8.5	Wall mounting		P
	Mounting brackets on equipment intended to be mounted on a wall or ceiling shall withstand a force of four times the weight of the equipment.	4 times the weight, applied for 1min, after the test, there is no damage to the bracket and the mounting surface	P
8.6	Expelled parts		N/A
	Equipment shall contain or limit the energy of parts that could cause a HAZARD if expelled in the event of a fault.		N/A
9	**PROTECTION AGAINST FIRE HAZARDS**		P
9.1	Resistance to fire		P

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Clause	**Requirement**	**Remark**	**Verdict**
	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.	Components are witnessed at normal condition and abnormal tests are verified	P
9.1.1	Reducing the risk of ignition and spread of flame		P
	For equipment or a portion of equipment, there are two alternative methods of providing protection against ignition and spread of flame that could affect materials, wiring, wound components and electronic components such as integrated circuits, transistors, thyristors, diodes, resistors and capacitors.	Method 1 used	P
9.1.2	Conditions for a fire enclosure		P
	A FIRE ENCLOSURE is required for equipment or parts of equipment for which Method 2 is not fully applied and complied with.		P
9.1.2.1	Parts requiring a fire enclosure		P
	Except where Method 2 is used, or as permitted in 9.1.2.2, the following are considered to have a risk of ignition and, therefore, require a FIRE ENCLOSURE:		P
	– components in PRIMARY CIRCUITS		P
	– components in SECONDARY CIRCUITS supplied by power sources which exceed the limits for a LIMITED POWER SOURCE as specified in 9.2;		P
	– components in SECONDARY CIRCUITS supplied by a LIMITED POWER SOURCE as specified in 9.2, but not mounted on a material of FLAMMABILITY CLASS V-1;		P
	– components within a power supply unit or assembly having a limited power output complying with the criteria for a LIMITED POWER SOURCE as specified in 9.2, including overcurrent protective devices, limiting impedances, regulating networks and wiring, up to the point where the LIMITED POWER SOURCE output criteria are met;		P
	– components having unenclosed arcing parts, such as open switch and relay contacts and commutators, in a circuit at HAZARDOUS VOLTAGE or at a HAZARDOUS ENERGY LEVEL; and		P
	– insulated wiring, except as permitted in 9.1.2.2.		P
9.1.2.2	Parts not requiring a fire enclosure		N/A
9.1.3	Materials requirements for protection against fire hazard		P

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Clause	**Requirement**	**Remark**	**Verdict**
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	The shell material of this product belongs to metal material, so it can be considered to meet the requirements without testing	P
	If an enclosure material is not classified as specified below, a test may be performed on the final enclosure or part of the enclosure, in which case the material shall additionally be subjected to periodic SAMPLE testing.		N/A
9.1.3.3	Materials for components and other parts outside fire enclosures		P
	Except as otherwise noted below, materials for components and other parts (including MECHANICAL ENCLOSURES, ELECTRICAL ENCLOSURES and DECORATIVE PARTS); located outside FIRE ENCLOSURES, shall be of FLAMMABILITY CLASS HB.		P
9.1.3.4	Materials for components and other parts inside fire enclosures		P
9.1.3.5	Materials for air filter assemblies		N/A
9.1.4	Openings in fire enclosures		P
9.1.4.1	General		P
	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.		P
	These requirements are in addition to those in the following sections:		P
	– 7.3.4, Protection against direct contact;		P
	– 7.4, Protection against energy hazards;		P
	– 13.5, Openings in enclosures		P
9.1.4.2	Side openings treated as bottom openings	No opening	P
9.1.4.3	Openings in the bottom of a fire enclosure	No opening	P
	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.		P
9.1.4.4	Equipment for use in a CLOSED ELECTRICAL OPERATING AREA		N/A

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Clause	**Requirement**	**Remark**	**Verdict**
	The requirements of 9.1.4.3 do not apply to FIXED EQUIPMENT intended only for use in a CLOSED ELECTRICAL OPERATING AREA and to be mounted on a concrete floor or other non-combustible surface. Such equipment shall be marked as follows:		N/A
	WARNING: FIRE HAZARD SUITABLE FOR MOUNTING ON CONCRETE OR OTHER NON-COMBUSTIBLE SURFACE ONLY		N/A
9.1.4.5	Doors or covers in fire enclosures		N/A
9.1.4.6	Additional requirements for openings in transportable equipment		N/A
9.2	LIMITED POWER SOURCES		P
9.2.1	General		P
9.2.2	Limited power source tests	Communication ports considered	P
9.3	Short-circuit and overcurrent protection		P
9.3.1	General		P
	The PCE shall not present a hazard, under short-circuit or overcurrent conditions at any port, including phase-to-phase, phase-to-earth and phase-to-neutral, and adequate information shall be provided to allow proper selection of external wiring and external protective devices.		P
9.3.2	Protection against short-circuits and overcurrents shall be provided for all input circuits, and for output circuits that do not comply with the requirements for limited power sources in 9.2, except for circuits in which no overcurrent hazard is presented by short-circuits and overloads.		P
9.3.3	Protective devices provided or specified shall have adequate breaking capacity to interrupt the maximum short circuit current specified for the port to which they are connected. If protection that is provided integral to the PCE for an input port is not rated for the short-circuit current of the circuit in which it is used, the installation instructions shall specify that an upstream protective device, rated for the prospective short-circuit current of that port, shall be used to provide backup protection.		P
10	**PROTECTION AGAINST SONIC PRESSURE HAZARDS**		P
10.1	General		P
	The equipment shall provide protection against the effect of sonic pressure. Conformity tests are carried out if the equipment is likely to cause such HAZARDS.		P
10.2	Sonic pressure and Sound level	See user manual	P

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Clause	**Requirement**	**Remark**	**Verdict**
10.2.1	Hazardous Noise Levels		N/A
11	**PROTECTION AGAINST LIQUID HAZARDS**		N/A
11.1	Liquid Containment, Pressure and Leakage		N/A
	The liquid containment system components shall be compatible with the liquid to be used.		N/A
	There shall be no leakage of liquid onto live parts as a result of:		N/A
	a) Normal operation, including condensation;		N/A
	b) Servicing of the equipment; or		N/A
	c) Inadvertent loosening or detachment of hoses or other cooling system parts over time.		N/A
11.2	Fluid pressure and leakage		N/A
11.2.1	Maximum pressure		N/A
11.2.2	Leakage from parts		N/A
11.2.3	Overpressure safety device		N/A
11.3	Oil and grease		N/A
12	**CHEMICAL HAZARDS**		N/A
12.1	General		N/A
13	**PHYSICAL REQUIREMENTS**		P
13.1	Handles and manual controls		N/A
	Handles, knobs, grips, levers and the like shall be reliably fixed so that they will not work loose in normal use, if this might result in a hazard. Sealing compounds and the like, other than self-hardening resins, shall not be used to prevent loosening. If handles, knobs and the like are used to indicate the position of switches or similar components, it shall not be possible to fix them in a wrong position if this might result in hazard.		N/A
13.1.1	Adjustable controls		N/A
13.2	Securing of parts		P
13.3	Provisions for external connections		P
13.3.1	General		P
13.3.2	Connection to an a.c. Mains supply		P
13.3.2.1	General		P
	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

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Clause	**Requirement**	**Remark**	**Verdict**
	– a non-detachable power supply cord for connection to the supply by means of a plug		N/A
	– an appliance inlet for connection of a detachable power supply cord; or		N/A
	– a mains plug that is part of direct plug-in equipment as in 13.3.8		N/A
13.3.2.2	Permanently connected equipment		P
13.3.2.3	Appliance inlets		N/A
13.3.2.4	Power supply cord		N/A
13.3.2.5	Cord anchorages and strain relief		P
	For equipment with a non-detachable power supply cord, a cord anchorage shall be supplied such that:		P
	– the connecting points of the cord conductors are relieved from strain; and		P
	– the outer covering of the cord is protected from abrasion.		P
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		P
13.3.3.2	Screw terminals		P
13.3.3.3	Wiring terminal sizes		P
13.3.3.4	Wiring terminal design		P
13.3.3.5	Grouping of wiring terminals		P
13.3.3.6	Stranded wire		P
13.3.4	Supply wiring space		P
13.3.5	Wire bending space for wires 10 mm^2 and greater		P
13.3.6	Disconnection from supply sources		P
13.3.7	Connectors, plugs and sockets		P
13.3.8	Direct plug-in equipment		N/A
13.4	Internal wiring and connections		P
13.4.1	General		P
13.4.2	Routing		P
13.4.3	Colour coding		P
13.4.4	Splices and connections		P
13.4.5	Interconnections between parts of the PCE		P
13.5	Openings in enclosures		N/A
13.5.1	Top and side openings	No openings	N/A

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Clause	**Requirement**	**Remark**	**Verdict**
	Openings in the top and sides of ENCLOSURES shall be so located or constructed that it is unlikely that objects will enter the openings and create hazards by contacting bare conductive parts.		N/A
13.6	Polymeric Materials	Approved by UL	P
13.6.1	General		P
13.6.1.1	Thermal index or capability		P
13.6.2	Polymers serving as enclosures or barriers preventing access to hazards		N/A
13.6.2.1	Stress relief test		N/A
13.6.3	Polymers serving as solid insulation		P
13.6.3.1	Resistance to arcing		P
13.6.4	UV resistance		N/A
	Polymeric parts of an OUTDOOR ENCLOSURE required for compliance with this standard shall be sufficiently resistance to degradation by ultra-violet (UV) radiation	Metallic	N/A
13.7	Mechanical resistance to deflection, impact, or drop		P
13.7.1	General		P
13.7.2	250-N deflection test for metal enclosures		P
13.7.3	7-J impact test for polymeric enclosures	LCD panel was considered	P
13.7.4	Drop test		N/A
13.8	Thickness requirements for metal enclosures		P
13.8.1	General		P
13.8.2	Cast metal		P
13.8.3	Sheet metal		N/A
14	**COMPONENTS**		P
14.1	General	(see appended table 14)	P
	Where safety is involved, components shall be used in accordance with their specified RATINGS unless a specific exception is made. They shall conform to one of the following:		P
	a) applicable safety requirements of a relevant IEC standard. Conformity with other requirements of the component standard is not required. If necessary for the application, components shall be subjected to the test of this standard, except that it is not necessary to carry out identical or equivalent tests already performed to check conformity with the component standard;		P
	b) the requirements of this standard and, where necessary for the application, any additional applicable safety requirements of the relevant		P

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Clause	**Requirement**	**Remark**	**Verdict**
	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 Over temperature Protection		N/A
	Motors which, when stopped or prevented from starting (see 4.4.4.3), would present an electric shock HAZARD, a temperature HAZARD, or a fire HAZARD, shall be protected by an over temperature or thermal protection device meeting the requirements of 14.3.		N/A
14.3	Over temperature protection devices		N/A
14.4	Fuse holders		N/A
14.5	MAINS voltage selecting devices		N/A
14.6	Printed circuit boards		P
	Printed circuit boards shall be made of material with a flammability classification of V-1 of IEC 60707 or better.	V-0, approved by UL	P
	This requirement does not apply to thin-film flexible printed circuit boards that contain only circuits powered from limited power sources meeting the requirements of 9.2.		N/A
	Conformity of the flammability RATING is checked by inspection of data on the materials. Alternatively, conformity is checked by performing the V-1 tests specified in IEC 60707 on three samples of the relevant parts.		N/A
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.		P
14.8	Batteries		N/A

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Clause	**Requirement**	**Remark**	**Verdict**
	Equipment containing batteries shall be designed to reduce the risk of fire, explosion and chemical leaks under normal conditions and after a single fault in the equipment including a fault in circuitry within the equipment battery pack.		N/A
14.8.1	Battery Enclosure Ventilation		N/A
14.8.1.1	Ventilation requirements		N/A
14.8.1.2	Ventilation testing		N/A
14.8.1.3	Ventilation instructions		N/A
14.8.2	Battery Mounting		N/A
	Compliance is verified by the application of the force to the battery's mounting surface. The test force is to be increased gradually so as to reach the required value in 5 to 10 s, and is to be maintained at that value for 1 min. A non-metallic rack or tray shall be tested at the highest normal condition operating temperature.		N/A
14.8.3	Electrolyte spillage		N/A
	Battery trays and cabinets shall have an electrolyte-resistant coating.		N/A
	The ENCLOSURE or compartment housing a VENTED BATTERY shall be constructed so that spillage or leakage of the electrolyte from one battery will be contained within the ENCLOSURE and be prevented from:		N/A
	a) reaching the PCE outer surfaces that can be contacted by the USER		N/A
	b) contaminating adjacent electrical components or materials; and		N/A
	c) bridging required electrical distances		N/A
14.8.4	Battery Connections		N/A
	Reverse battery connection of the terminals shall be prevented if reverse connection could result in a hazard within the meaning of this Standard		N/A
14.8.5	Battery maintenance instructions		N/A
	The information and instructions listed in 5.3.4.1 shall be included in the operator manual for equipment in which battery maintenance is performed by the operator, or in the service manual if battery maintenance is to be performed by service personnel only.		N/A
14.8.6	Battery accessibility and maintainability		N/A
	Battery terminals and connectors shall be accessible for maintenance with the correct TOOLS. Batteries with liquid electrolyte, requiring maintained shall be so located that the battery cell		N/A

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

4.2.2.6, 4.2.2.7, 4.7 TABLE: Electrical Rating Test-**for model: MID-H4K-T**						P
Input type	Input voltage (Vdc)	Input current (A)	Input power (W)	Output voltage (Vac)	Output current (A)	Output power (W)
				L1/L2/L3		
Battery discharge + Off the grid	170.17	25.18	4280.00	226.53	5.91	1338.79
	--	--	--	226.57	5.94	1345.83
	--	--	--	226.54	5.96	1350.18
	750.05	5.56	4168.00	226.13	5.97	1349.99
	--	--	--	226.25	5.94	1343.93
	--	--	--	226.24	6.01	1359.70
Battery discharge + grid	170.20	24.94	4240.00	230.14	5.82	1339.41
	--	--	--	230.14	5.84	1344.02
	--	--	--	230.19	5.89	1355.82
	750.08	5.73	4290.00	230.05	5.86	1348.09
	--	--	--	230.00	5.84	1343.20
	--	--	--	230.11	5.90	1357.65
PV + grid	123.06	29.94	3680.00	230.04	5.10	1173.20
	--	--	--	230.02	5.17	1189.20
	--	--	--	230.06	5.12	1177.91
	135.55	30.16	4088.00	230.01	5.80	1334.06
	--	--	--	230.19	5.74	1321.29
	--	--	--	230.15	5.83	1341.77
	856.41	5.38	4607.00	230.06	6.16	1416.09
	--	--	--	230.12	6.10	1402.68
	--	--	--	230.17	6.12	1407.61
	950.43	0.68	630.00	229.99	0.72	165.59
	--	--	--	229.97	0.95	218.47
	--	--	--	229.99	0.59	135.69
Input type	Input voltage (Vdc)	Input current (A)	Input power (W)	Output voltage (Vdc)	Output current (A)	Output power (W)
PV + Battery charge	144.73	30.87	4467.00	164.14	25.11	4020.93
	146.68	29.81	4371.00	750.30	5.40	4060.00
	852.96	5.22	4454.00	160.39	25.03	4016.54
	853.41	4.91	4193.75	750.24	5.36	4024.00
Input type	Input voltage (Vac)	Input current (A)	Input power (W)	Output voltage (Vdc)	Output current (A)	Output power (W)
	L1/L2/L3					
AC (input) + Battery charge	206.99	6.81	1409.60	160.91	25.04	4030.00
	207.05	6.89	1426.57	--	--	--

4.2.2.6, 4.2.2.7, 4.7 TABLE: Electrical Rating Test-**for model: MID-H4K-T**						P
	207.06	6.93	1434.93	--	--	--
	230.18	6.25	1438.63	160.94	25.06	4033.00
	230.10	6.17	1419.72	--	--	--
	230.14	6.27	1442.98	--	--	--
	253.00	5.67	1434.51	160.93	25.07	4035.00
	252.99	5.69	1439.51	--	--	--
	253.10	5.72	1447.73	--	--	--
	207.02	6.70	1387.03	750.36	5.29	3967.00
	207.07	6.69	1385.30	--	--	--
	207.09	6.69	1385.43	--	--	--
	230.13	6.10	1403.79	750.38	5.36	4023.00
	229.89	6.11	1404.63	--	--	--
	230.03	6.16	1416.98	--	--	--
	253.16	5.58	1414.63	750.38	5.34	4007.00
	253.13	5.57	1409.93	--	--	--
	253.18	5.60	1417.70	--	--	--
Supplementary information:						

4.2.2.6, 4.2.2.7, 4.7 TABLE: Electrical Rating Test-**for model: MID-H5K-T**						P
Input type	Input voltage (Vdc)	Input current (A)	Input power (W)	Output voltage (Vac)	Output current (A)	Output power (W)
				L1/L2/L3		
Battery discharge + Off the grid	210.09	24.97	5240.00	226.44	7.37	1668.86
	--	--	--	226.57	7.42	1681.15
	--	--	--	226.56	7.43	1683.34
	750.06	6.93	5199.00	226.11	7.42	1677.74
	--	--	--	226.21	7.39	1671.69
	--	--	--	226.29	7.49	1694.91
Battery discharge + grid	210.09	25.20	5258.90	230.14	5.82	1339.41
	--	--	--	230.14	5.84	1344.02
	--	--	--	230.19	5.89	1355.82
	750.09	6.98	5230.00	230.05	5.86	1348.09
	--	--	--	230.00	5.84	1343.20
	--	--	--	230.11	5.90	1357.65
PV + grid	123.06	29.94	3680.00	230.04	5.10	1173.21
	--	--	--	230.02	5.17	1189.20
	--	--	--	230.06	5.12	1177.91

4.2.2.6, 4.2.2.7, 4.7 TABLE: Electrical Rating Test-**for model: MID-H5K-T**						P
	165.95	30.43	4989.00	230.00	7.05	1621.50
	--	--	--	230.06	6.99	1608.12
	--	--	--	230.01	7.08	1628.33
	856.47	6.68	5725.00	229.99	8.22	1890.52
	--	--	--	230.13	8.12	1868.66
	--	--	--	230.19	8.17	1880.65
	950.43	0.70	640.00	229.97	0.69	158.68
	--	--	--	230.00	0.97	223.10
	--	--	--	230.08	0.66	151.86
Input type	Input voltage (Vdc)	Input current (A)	Input power (W)	Output voltage (Vdc)	Output current (A)	Output power (W)
PV + Battery charge	179.48	30.92	5549.00	200.21	25.18	5041.69
	179.47	30.20	5419.00	750.54	6.78	5087.00
	860.67	6.17	5312.00	200.28	25.07	5021.92
	854.44	6.06	5174.77	750.39	6.67	5004.00
Input type	Input voltage (Vac)	Input current (A)	Input power (W)	Output voltage (Vdc)	Output current (A)	Output power (W)
	L1/L2/L3					
AC (input) + Battery charge	207.22	8.27	1713.71	200.93	25.03	5029.00
	207.19	8.31	1721.75	--	--	--
	207.17	8.36	1731.94	--	--	--
	230.14	7.83	1801.99	200.93	24.99	5021.00
	229.99	7.79	1791.62	--	--	--
	230.01	7.84	1803.28	--	--	--
	253.10	7.15	1809.67	200.92	25.18	5058.00
	253.05	7.15	1809.32	--	--	--
	253.07	7.24	1832.23	--	--	--
	207.05	8.35	1731.61	750.37	6.66	4997.00
	207.13	8.36	1732.35	--	--	--
	207.10	8.34	1582.25	--	--	--
	230.01	7.64	1757.28	750.40	6.69	5020.00
	229.92	7.72	1774.98	--	--	--
	230.15	7.72	1776.76	--	--	--
	253.00	6.96	1760.88	750.42	6.67	5006.00
	253.09	7.02	1776.69	--	--	--
	253.11	7.04	1781.89	--	--	--
Supplementary information:						

4.2.2.6, 4.2.2.7, 4.7 TABLE: Electrical Rating Test-**for model: MID-H6K-T**						P
Input type	Input voltage (Vdc)	Input current (A)	Input power (W)	Output voltage (Vac)	Output current (A)	Output power (W)
				L1/L2/L3		
Battery discharge + Off the grid	250.01	25.41	6350.00	226.56	8.85	2005.065
	--	--	--	226.53	8.85	2004.782
	--	--	--	226.51	8.94	2025.017
	750.06	8.40	6296.00	226.22	8.91	2016.534
	--	--	--	226.28	8.90	2012.978
	--	--	--	226.32	8.94	2022.622
Battery discharge + grid	250.05	25.06	6254.20	207.02	9.64	1996.46
	--	--	--	206.98	9.74	2015.76
	--	--	--	207.06	9.63	1993.16
	250.04	25.17	6264.80	253.01	7.92	2002.86
	--	--	--	253.04	8.05	2037.70
	--	--	--	253.04	7.89	1996.23
PV + grid	123.06	29.94	3680.00	230.04	5.10	1173.19
	--	--	--	230.02	5.17	1189.19
	--	--	--	230.06	5.12	1177.88
	199.88	30.34	6063.00	230.03	8.65	1989.74
	--	--	--	230.06	8.62	1982.21
	--	--	--	229.96	8.65	1988.23
	856.54	7.92	6782.00	230.05	9.78	2250.60
	--	--	--	230.06	9.73	2239.15
	--	--	--	230.18	9.66	2223.56
	950.43	0.72	670.00	229.98	0.67	154.09
	--	--	--	230.03	0.93	213.93
	--	--	--	229.98	0.62	142.59
Input type	Input voltage (Vdc)	Input current (A)	Input power (W)	Output voltage (Vdc)	Output current (A)	Output power (W)
PV + Battery charge	214.52	30.56	6554.00	240.24	25.36	6092.94
	211.96	30.32	6425.00	750.70	7.96	5974.00
	848.87	7.44	6315.00	240.61	25.02	6019.99
	862.64	7.19	6206.19	750.23	8.02	6020.00
Input type	Input voltage (Vac)	Input current (A)	Input power (W)	Output voltage (Vdc)	Output current (A)	Output power (W)
	L1/L2/L3					
AC (input) + Battery charge	207.16	10.08	2088.54	240.91	24.35	5866.16
	207.01	10.05	2079.85	--	--	--

4.2.2.6, 4.2.2.7, 4.7 TABLE: Electrical Rating Test-**for model: MID-H6K-T**						P
	207.03	10.15	2101.51	--	--	--
	230.12	9.33	2146.30	240.90	24.92	6002.26
	230.11	9.26	2131.29	--	--	--
	229.97	9.42	2165.16	--	--	--
	253.02	8.57	2167.39	240.89	25.09	6044.17
	253.11	8.55	2165.13	--	--	--
	253.11	8.58	2170.44	--	--	--
	206.95	10.11	2091.63	750.49	8.00	6006.92
	207.12	10.08	2087.39	--	--	--
	207.16	10.10	2091.66	--	--	--
	230.02	9.11	2095.50	750.45	8.02	6019.36
	230.11	9.03	2078.16	--	--	--
	230.18	9.13	2102.00	--	--	--
	253.05	8.24	2085.88	750.43	7.99	5997.44
	252.91	8.25	2086.01	--	--	--
	253.12	8.32	2105.93	--	--	--
Supplementary information:						

4.2.2.6, 4.2.2.7, 4.7 TABLE: Electrical Rating Test-**for model: MID-H8K-T**						P
Input type	Input voltage (Vdc)	Input current (A)	Input power (W)	Output voltage (Vac)	Output current (A)	Output power (W)
				L1/L2/L3		
Battery discharge + Off the grid	340.34	25.04	8522.11	226.55	11.80	2673.33
	--	--	--	226.60	11.87	2689.75
	--	--	--	226.51	11.93	2702.20
	750.07	11.31	8481.04	226.13	11.96	2703.38
	--	--	--	226.25	11.89	2691.04
	--	--	--	226.29	11.98	2710.73
Battery discharge + grid	330.12	25.24	8333.57	230.21	11.60	2669.71
	--	--	--	230.13	11.67	2685.20
	--	--	--	230.08	11.57	2662.95
	750.07	11.37	8528.30	230.09	11.67	2685.15
	--	--	--	230.13	11.62	2674.06
	--	--	--	230.18	11.68	2688.51
PV + grid	201.05	30.65	6160.00	230.01	8.38	1927.45
	--	--	--	230.00	8.54	1964.21
	--	--	--	230.09	8.55	1967.23

4.2.2.6, 4.2.2.7, 4.7 TABLE: Electrical Rating Test-**for model: MID-H8K-T**						P
	270.66	30.46	8244.00	230.05	11.70	2690.61
	--	--	--	230.04	11.69	2690.03
	--	--	--	230.10	11.68	2688.21
	856.91	10.51	9004.00	253.07	11.85	2998.36
	--	--	--	253.12	11.73	2968.88
	--	--	--	253.26	11.75	2974.79
	950.44	0.68	630.00	230.00	0.66	151.80
	--	--	--	230.03	0.93	213.93
	--	--	--	230.04	0.68	156.43
Input type	Input voltage (Vdc)	Input current (A)	Input power (W)	Output voltage (Vdc)	Output current (A)	Output power (W)
PV + Battery charge	281.52	30.96	8714.00	320.64	25.19	8075.98
	284.19	30.10	8554.00	750.32	10.91	8066.00
	859.63	9.78	8403.00	320.76	25.13	8061.98
	862.62	9.57	8252.58	750.01	10.67	8005.00
Input type	Input voltage (Vac)	Input current (A)	Input power (W)	Output voltage (Vdc)	Output current (A)	Output power (W)
	L1/L2/L3					
AC (input) + Battery charge	206.99	13.27	2746.16	320.94	23.98	7697.10
	207.02	13.21	2735.32	--	--	--
	207.09	13.35	2765.07	--	--	--
	230.24	12.56	2890.65	320.94	25.03	8033.45
	230.03	12.49	2874.02	--	--	--
	230.12	12.66	2912.45	--	--	--
	250.57	11.32	2835.72	320.91	24.96	8010.56
	250.69	11.25	2821.22	--	--	--
	253.48	11.42	2894.27	--	--	--
	206.98	13.25	2743.15	750.53	10.67	8006.65
	206.97	13.29	2751.31	--	--	--
	207.08	13.33	2759.55	--	--	--
	230.08	12.02	2764.68	750.69	10.67	8009.86
	230.31	12.05	2775.21	--	--	--
	230.16	12.05	2773.88	--	--	--
	253.08	10.94	2767.45	750.57	10.71	8037.10
	253.09	10.96	2773.05	--	--	--
	253.08	11.06	2800.02	--	--	--
Supplementary information:						

4.2.2.6, 4.2.2.7, 4.7 TABLE: Electrical Rating Test-**for model: MID-H10K-T**						P
Input type	Input voltage (Vdc)	Input current (A)	Input power (W)	Output voltage (Vac)	Output current (A)	Output power (W)
				L1/L2/L3		
Battery discharge + Off the grid	420.18	25.00	10504.50	226.54	14.73	3336.99
	--	--	--	226.57	14.81	3355.56
	--	--	--	226.50	14.87	3368.00
	750.09	14.04	10527.51	226.03	14.86	3357.68
	--	--	--	226.33	14.85	3361.39
	--	--	--	226.34	14.92	3376.77
Battery discharge + grid	419.21	25.03	10493.71	230.22	14.67	3377.30
	--	--	--	230.24	14.74	3394.26
	--	--	--	230.10	14.64	3369.11
	750.07	14.10	10575.99	230.07	14.61	3361.26
	--	--	--	230.19	14.59	3358.53
	--	--	--	230.06	14.64	3368.14
PV + grid	201.05	30.65	6162.18	230.01	8.38	1927.45
	--	--	--	230.00	8.54	1964.21
	--	--	--	230.09	8.55	1967.23
	340.25	29.81	10141.96	230.06	14.53	3342.74
	--	--	--	230.12	14.57	3352.82
	--	--	--	230.17	14.52	3342.08
	856.77	13.25	11354.77	230.26	16.24	3740.38
	--	--	--	230.12	16.14	3713.00
	--	--	--	230.18	16.08	3700.52
	950.42	0.65	617.77	230.00	0.68	156.40
	--	--	--	230.01	0.96	220.81
	--	--	--	230.06	0.64	147.24
Input type	Input voltage (Vdc)	Input current (A)	Input power (W)	Output voltage (Vdc)	Output current (A)	Output power (W)
PV + Battery charge	348.26	30.43	10598.00	399.97	25.06	10024.40
	346.44	30.15	10445.00	750.36	13.40	10055.00
	859.67	12.21	10494.00	400.26	25.11	10050.60
	872.82	11.89	10379.30	750.31	13.35	10016.00
Input type	Input voltage (Vac)	Input current (A)	Input power (W)	Output voltage (Vdc)	Output current (A)	Output power (W)
	L1/L2/L3					
AC (input) + Battery charge	207.16	16.58	3435.30	400.97	23.91	9585.99
	207.19	16.49	3415.75	--	--	--

4.2.2.6, 4.2.2.7, 4.7 TABLE: Electrical Rating Test-**for model: MID-H10K-T**						P
	207.06	16.63	3443.36	--	--	--
	230.13	15.52	3571.39	400.95	25.00	10024.15
	230.03	15.55	3577.58	--	--	--
	230.16	15.78	3631.91	--	--	--
	253.12	14.24	3605.12	400.92	25.06	10046.25
	253.07	14.28	3614.30	--	--	--
	253.26	14.29	3619.61	--	--	--
	207.11	16.49	3415.24	750.03	13.35	10015.90
	207.10	16.49	3414.73	--	--	--
	207.04	16.61	3438.04	--	--	--
	230.12	14.99	3448.52	750.04	13.37	10027.28
	230.08	15.05	3462.95	--	--	--
	230.21	15.10	3476.88	--	--	--
	253.16	13.59	3439.43	750.02	13.32	9991.77
	253.10	13.69	3464.88	--	--	--
	253.20	13.73	3475.13	--	--	--
Supplementary information:						

4.2.2.6, 4.2.2.7, 4.7 TABLE: Electrical Rating Test-**for model: MID-H10K-T40**						P
Input type	Input voltage (Vdc)	Input current (A)	Input power (W)	Output voltage (Vac)	Output current (A)	Output power (W)
				L1/L2/L3		
Battery discharge + Off the grid	265.02	40.27	10672.36	226.13	14.95	3380.70
	--	--	--	226.13	14.95	3380.63
	--	--	--	226.22	15.08	3411.44
	750.08	14.03	10522.12	226.09	14.81	3347.74
	--	--	--	226.27	14.85	3360.58
	--	--	--	226.26	14.93	3378.74
Battery discharge + grid	265.02	40.29	10677.66	230.04	14.58	3353.98
	--	--	--	230.11	14.71	3384.89
	--	--	--	230.17	14.72	3388.09
	750.09	14.11	10583.77	230.12	14.52	3341.37
	--	--	--	230.10	14.60	3359.50
	--	--	--	230.21	14.60	3361.10
PV + grid	200.24	58.44	11702.63	230.05	16.21	3728.21
	--	--	--	230.12	16.13	3712.02
	--	--	--	230.10	16.02	3686.96

4.2.2.6, 4.2.2.7, 4.7 TABLE: Electrical Rating Test-**for model: MID-H10K-T40**						P
	634.04	18.11	11482.46	230.12	16.00	3681.95
	--	--	--	230.14	15.97	3675.35
	--	--	--	230.11	16.15	3716.21
	852.21	13.51	11513.36	230.09	15.93	3665.25
	--	--	--	230.14	16.04	3691.40
	--	--	--	230.21	16.26	3743.13
	950.42	0.70	665.29	229.96	229.96	163.27
	--	--	--	230.01	0.99	227.70
	--	--	--	230.08	0.62	142.65
Input type	Input voltage (Vdc)	Input current (A)	Input power (W)	Output voltage (Vdc)	Output current (A)	Output power (W)
PV + Battery charge	174.05	61.24	10658.00	250.22	40.68	10178.90
	174.66	60.08	10512.00	750.28	13.45	10082.52
	849.52	12.31	10458.00	250.14	40.01	10007.50
	859.26	13.26	10392.70	750.47	13.36	10029.00
Input type	Input voltage (Vac)	Input current (A)	Input power (W)	Output voltage (Vdc)	Output current (A)	Output power (W)
	L1/L2/L3					
AC (input) + Battery charge	207.17	16.60	3438.61	250.16	39.20	9805.52
	207.10	16.51	3419.25	--	--	--
	207.12	16.60	3438.54	--	--	--
	230.08	15.39	3540.23	250.15	40.10	10031.02
	230.05	15.44	3552.22	--	--	--
	230.03	15.50	3565.45	--	--	--
	253.16	14.01	3546.56	250.16	39.83	9964.62
	253.17	13.91	3520.54	--	--	--
	253.18	14.06	3558.98	--	--	--
	207.09	16.56	3430.03	750.01	13.34	10008.13
	207.21	16.48	3414.74	--	--	--
	207.05	16.57	3429.94	--	--	--
	230.03	15.03	3456.68	750.02	13.36	10018.77
	230.20	15.11	3478.35	--	--	--
	230.20	15.18	3495.07	--	--	--
	253.16	13.68	3462.43	750.04	13.40	10050.54
	252.97	13.64	3450.20	--	--	--
	253.10	13.85	3505.45	--	--	--
Supplementary information:						

4.2.2.6, 4.2.2.7, 4.7 TABLE: Electrical Rating Test-**for model: MID-H12K-T**						P
Input type	Input voltage (Vdc)	Input current (A)	Input power (W)	Output voltage (Vac)	Output current (A)	Output power (W)
				L1/L2/L3		
Battery discharge + Off the grid	500.02	24.98	12490.50	226.54	17.76	4023.37
	--	--	--	226.56	17.68	4005.63
	--	--	--	226.57	17.89	4053.28
	750.09	16.68	12511.50	226.17	17.82	4030.37
	--	--	--	226.31	17.78	4023.86
	--	--	--	226.29	17.83	4034.79
Battery discharge + grid	499.25	25.43	12697.92	230.65	17.41	4015.95
	--	--	--	230.59	17.46	4027.14
	--	--	--	230.72	17.37	4007.65
	750.10	16.64	12481.66	230.05	17.46	4016.59
	--	--	--	230.10	17.51	4029.07
	--	--	--	230.11	17.53	4033.76
PV + grid	201.05	30.65	6162.18	230.01	8.38	1927.45
	--	--	--	230.00	8.54	1964.21
	--	--	--	230.09	8.55	1967.23
	398.08	30.42	12109.59	230.05	17.17	3949.87
	--	--	--	230.01	17.24	3965.32
	--	--	--	230.04	17.26	3970.40
	856.54	16.50	14134.62	230.29	19.37	4461.16
	--	--	--	230.16	19.31	4444.43
	--	--	--	230.34	19.26	4436.06
	950.43	0.68	646.29	229.89	0.67	154.03
	--	--	--	230.04	0.98	225.44
	--	--	--	230.04	0.64	147.23
Input type	Input voltage (Vdc)	Input current (A)	Input power (W)	PV+ Battery charge	Output current (A)	Output power (W)
PV + Battery charge	414.48	30.63	12696.00	480.61	25.19	12105.20
	416.02	30.00	12478.00	750.38	16.06	12047.00
	850.49	14.77	12566.77	480.19	24.91	11962.93
	869.42	14.36	12481.30	750.34	15.97	11982.00
Input type	Input voltage (Vac)	Input current (A)	Input power (W)	Output voltage (Vdc)	Output current (A)	Output power (W)
	L1/L2/L3					
AC (input) + Battery charge	207.20	20.26	4196.92	480.21	24.62	11824.21
	207.18	20.11	4165.77	--	--	--

4.2.2.6, 4.2.2.7, 4.7 TABLE: Electrical Rating Test-**for model: MID-H12K-T**						P
	207.10	20.37	4217.86	--	--	--
	230.13	18.26	4201.73	480.20	25.06	12035.73
	230.02	18.15	4174.61	--	--	--
	230.17	18.32	4215.85	--	--	--
	253.13	16.51	4178.45	480.21	25.02	12013.89
	253.12	16.47	4167.94	--	--	--
	253.13	16.70	4226.81	--	--	--
	207.08	19.98	4138.27	750.04	16.07	12053.89
	207.10	19.94	4129.18	--	--	--
	207.10	20.14	4171.24	--	--	--
	230.17	18.08	4160.50	750.03	16.02	12013.23
	230.16	17.91	4121.99	--	--	--
	230.06	18.05	4151.40	--	--	--
	253.11	16.31	4127.48	750.00	16.01	12010.50
	253.12	16.34	4136.99	--	--	--
	253.17	16.41	4153.98	--	--	--
Supplementary information:						

4.2.2.6, 4.2.2.7, 4.7 TABLE: Electrical Rating Test-**for model: MID-H12K-T40**						P
Input type	Input voltage (Vdc)	Input current (A)	Input power (W)	Output voltage (Vac)	Output current (A)	Output power (W)
				L1/L2/L3		
Battery discharge + Off the grid	310.46	40.32	12517.75	226.08	17.68	3997.01
	--	--	--	226.28	17.83	4034.54
	--	--	--	226.33	17.88	4046.82
	750.09	16.72	12541.50	226.09	17.82	4028.91
	--	--	--	226.28	17.82	4032.31
	--	--	--	226.27	17.86	4041.20
Battery discharge + grid	310.44	40.35	12526.25	230.16	17.44	4014.03
	--	--	--	230.21	17.58	4047.11
	--	--	--	230.31	17.57	4046.56
	750.10	16.85	12639.19	230.05	17.45	4014.32
	--	--	--	230.18	17.57	4044.21
	--	--	--	230.17	17.57	4044.05
PV + grid	198.99	61.29	12196.10	229.98	17.22	3960.17
	--	--	--	230.06	17.34	3989.29
	--	--	--	230.17	17.26	3972.68

4.2.2.6, 4.2.2.7, 4.7 TABLE: Electrical Rating Test-**for model: MID-H12K-T40**						P
	628.79	21.69	13638.46	230.01	19.41	4464.42
	--	--	--	230.16	19.32	4446.65
	--	--	--	230.18	19.45	4477.06
	847.95	16.25	13779.19	230.04	19.03	4377.62
	--	--	--	230.04	19.19	4414.45
	--	--	--	230.07	19.41	4465.60
	950.43	0.64	608.28	229.89	0.70	160.92
	--	--	--	230.01	0.96	220.81
	--	--	--	230.00	0.63	144.90
Input type	Input voltage (Vdc)	Input current (A)	Input power (W)	PV+ Battery charge	Output current (A)	Output power (W)
PV + Battery charge	209.61	60.63	12707.00	300.44	40.10	12048.60
	213.56	59.67	12742.00	750.14	15.97	11976.00
	845.09	14.76	12475.00	300.65	39.92	12001.80
	855.80	14.37	12299.00	750.48	15.90	11930.00
Input type	Input voltage (Vac)	Input current (A)	Input power (W)	Output voltage (Vdc)	Output current (A)	Output power (W)
	L1/L2/L3					
AC (input) + Battery charge	207.10	20.18	4178.68	300.82	40.06	12049.95
	207.07	20.08	4156.89	--	--	--
	207.16	20.25	4194.37	--	--	--
	230.06	18.18	4182.51	300.84	40.33	12134.08
	229.98	18.23	4191.35	--	--	--
	230.12	18.32	4214.72	--	--	--
	253.26	16.63	4212.03	300.84	40.17	12085.34
	253.13	16.55	4189.22	--	--	--
	253.25	16.61	4207.53	--	--	--
	207.00	19.95	4130.54	750.04	16.05	12034.39
	207.12	19.99	4140.10	--	--	--
	207.12	20.02	4147.27	--	--	--
	230.07	18.02	4145.65	750.05	16.02	12018.05
	230.10	17.94	4127.06	--	--	--
	230.13	18.08	4159.65	--	--	--
	253.07	16.36	4138.99	750.06	16.13	12097.72
	253.10	16.39	4148.02	--	--	--
	253.10	16.55	4189.85	--	--	--
Supplementary information:						

4.2.2.6, 4.2.2.7, 4.7 TABLE: Electrical Rating Test-**for model: MID-H15K-T40**						P
Input type	Input voltage (Vdc)	Input current (A)	Input power (W)	Output voltage (Vac)	Output current (A)	Output power (W)
				L1/L2/L3		
Battery discharge + Off the grid	390.29	40.34	15744.30	226.10	22.20	5019.38
	--	--	--	226.35	22.29	5045.27
	--	--	--	226.33	22.30	5047.23
	750.10	20.71	15534.57	226.10	22.22	5024.03
	--	--	--	226.30	22.28	5041.99
	--	--	--	226.31	22.30	5046.62
Battery discharge + grid	390.28	40.41	15771.21	230.16	21.86	5031.30
	--	--	--	230.05	21.76	5005.95
	--	--	--	230.16	21.96	5054.20
	750.11	20.82	15617.29	230.10	21.87	5032.22
	--	--	--	230.13	21.99	5060.65
	--	--	--	230.13	21.91	5042.21
PV + grid	198.99	61.29	12196.10	229.98	17.22	3960.17
	--	--	--	230.06	17.34	3989.29
	--	--	--	230.17	17.26	3972.68
	252.60	60.75	15345.45	230.10	21.56	4960.87
	--	--	--	229.97	21.72	4995.04
	--	--	--	230.04	21.62	4973.46
	846.22	20.30	17178.27	230.13	24.02	5527.72
	--	--	--	230.09	24.04	5531.44
	--	--	--	230.12	24.38	5610.23
	950.43	0.63	598.77	229.95	0.68	156.36
	--	--	--	229.99	0.99	227.69
	--	--	--	230.06	0.65	149.54
Input type	Input voltage (Vdc)	Input current (A)	Input power (W)	PV+ Battery charge	Output current (A)	Output power (W)
PV + Battery charge	259.78	60.58	15736.00	375.32	40.12	15057.80
	260.55	60.36	15725.00	750.32	19.98	14992.00
	858.73	18.13	15571.00	375.10	40.15	15059.20
	855.81	18.27	15635.40	750.56	20.00	15010.00
Input type	Input voltage (Vac)	Input current (A)	Input power (W)	Output voltage (Vdc)	Output current (A)	Output power (W)
	L1/L2/L3					
AC (input) + Battery charge	207.11	24.95	5167.60	375.03	39.35	14757.06
	207.07	24.88	5150.74	--	--	--

4.2.2.6, 4.2.2.7, 4.7 TABLE: Electrical Rating Test-**for model: MID-H15K-T40**						P
	207.01	25.08	5190.96	--	--	--
	230.08	22.69	5220.58	375.03	40.18	15067.58
	230.19	22.77	5241.49	--	--	--
	230.06	22.89	5266.72	--	--	--
	253.09	20.90	5290.53	375.03	40.08	15032.70
	253.18	20.80	5265.17	--	--	--
	253.16	20.94	5299.93	--	--	--
	207.12	25.02	5181.24	750.09	20.10	15073.06
	207.05	25.08	5192.22	--	--	--
	207.09	25.23	5224.49	--	--	--
	230.12	22.62	5205.59	750.11	20.01	15012.70
	230.15	22.58	5196.72	--	--	--
	230.14	22.60	5201.00	--	--	--
	253.03	20.37	5154.16	750.06	20.01	15009.45
	253.12	20.36	5152.24	--	--	--
	253.16	20.56	5205.90	--	--	--
Supplementary information:						

4.2.2.6, 4.2.2.7, 4.7 TABLE: Electrical Rating Test-**for model: MID-H20K-T40**						P
Input type	Input voltage (Vdc)	Input current (A)	Input power (W)	Output voltage (Vac)	Output current (A)	Output power (W)
				L1/L2/L3		
Battery discharge + Off the grid	515.05	40.30	20756.52	226.13	29.64	6702.61
	--	--	--	226.27	29.62	6702.09
	--	--	--	226.27	29.95	6776.79
	750.12	27.55	20665.81	226.21	29.58	6691.20
	--	--	--	226.21	29.68	6713.85
	--	--	--	226.29	29.93	6772.92
Battery discharge + grid	515.05	40.37	20792.57	230.09	29.56	6801.52
	--	--	--	230.16	29.54	6798.87
	--	--	--	230.11	29.59	6809.04
	750.18	27.61	20712.47	230.09	29.56	6801.52
	--	--	--	230.16	29.54	6798.87
	--	--	--	230.11	29.59	6809.04
PV + grid	198.99	61.29	12196.10	229.98	17.22	3960.17
	--	--	--	230.06	17.34	3989.29
	--	--	--	230.17	17.26	3972.68

4.2.2.6, 4.2.2.7, 4.7 TABLE: Electrical Rating Test-**for model: MID-H20K-T40**						P
	337.63	60.54	20440.12	229.94	28.75	6610.78
	--	--	--	229.98	28.81	6625.78
	--	--	--	230.01	28.73	6608.30
	859.03	27.04	23228.17	230.14	32.17	7403.67
	--	--	--	230.13	32.16	7401.01
	--	--	--	230.28	32.42	7465.55
	950.41	0.64	608.26	229.90	0.66	151.74
	--	--	--	230.00	0.94	216.20
	--	--	--	230.07	0.62	142.64
Input type	Input voltage (Vdc)	Input current (A)	Input power (W)	Output voltage (Vdc)	Output current (A)	Output power (W)
PV + Battery charge	341.59	60.75	20750.00	500.58	40.21	20129.20
	342.39	60.64	20761.00	749.93	26.98	20229.00
	862.61	24.00	20698.00	500.30	40.09	19916.00
	865.73	24.13	20887.50	750.27	26.73	20052.00
Input type	Input voltage (Vac)	Input current (A)	Input power (W)	Output voltage (Vdc)	Output current (A)	Output power (W)
	L1/L2/L3					
AC (input) + Battery charge	207.14	33.21	6879.19	500.71	38.83	19442.57
	207.15	33.01	6838.29	--	--	--
	207.10	33.31	6898.67	--	--	--
	230.08	31.15	7167.10	500.72	40.10	20079.37
	230.04	30.98	7127.62	--	--	--
	230.00	31.35	7211.03	--	--	--
	253.05	28.35	7173.07	500.72	40.17	20115.93
	253.25	28.36	7183.18	--	--	--
	253.16	28.42	7193.57	--	--	--
	207.14	33.57	6953.82	750.09	26.68	20011.65
	207.17	33.38	6915.89	--	--	--
	207.20	33.58	6957.09	--	--	--
	230.12	30.23	6955.67	750.12	26.60	19956.19
	230.00	30.03	6906.96	--	--	--
	230.03	30.15	6935.63	--	--	--
	253.34	27.38	6935.07	750.21	26.62	19971.34
	253.06	27.16	6873.08	--	--	--
	253.34	27.44	6951.31	--	--	--
Supplementary information:						

4.3 TABLE: heating temperature rise measurements-**for model: MID-H20K-T40**				P
	test voltage (V)	**No.1#**	**No.2#**	—
	t1 (°C).....	**60**	**60**	—
	t2 (°C)	**60**	**60**	—
Thermocouple Locations		Max. temperature measured (°C)		Max. temperature limit, (°C)
Machine internal temperature		69.9	77.7	100
C406		73.1	78.7	110
C415		72.3	76.9	105
C410		71.4	78.6	105
L401		76.8	79.2	130
HCT406		77.2	83.9	105
RY400		82.8	81.5	85
RY401		79.5	80.7	85
RY404		74.9	83.7	85
RY407		77.4	76.8	85
RY406		78.4	76.5	85
RY403		80.1	82.0	85
RY405		72.5	84.7	85
RY408		76.3	83.3	85
HCT400		76.3	89.2	105
C301		71.9	78.4	105
Winding of transformer (TX5)		74.0	80.4	130
Iron core of transformer (TX5)		75.0	81.9	130
PCB near Q207		73.8	87.3	130
PCB near Q109		71.8	80.2	130
PCB near Q104		67.0	72.1	130
C233		73.4	82.7	105
C231		72.3	81.6	105
C229		72.2	81.5	105
F1		73.1	83.0	90
L101		70.0	76.8	130
L102		78.9	97.1	130
C116		69.4	76.6	105
Winding of Transformer (TX200)		93.3	102.2	130

Iron core of transformer (TX200)	87.7	98.1	130
TVR105	69.8	76.5	105
RY100	70.8	74.8	85
RY103	69.2	84.1	85
RY102	71.2	81.9	85
RY105	69.4	83.6	85
TVR102	68.6	86.2	105
L100	68.5	97.7	130
C106	67.4	80.8	105
PCB near R209	69.5	83.7	85
RY201	72.6	82.8	85
PCB near D201	78.3	85.6	130
PCB near U102	68.5	73.5	130
Winding of Boost	69.1	76.9	130
Iron core of Boost	77.1	88.4	130
Winding of INV	77.4	104.5	130
Iron core of INV	71.3	83.8	130
Output lead wire(AC)	67.6	83.1	105
AC output terminal	63.7	68.5	85
Input lead wire(DC)	67.8	75.0	105
DC input terminal	62.9	65.1	85
DC switch	62.6	64.5	85
Inside of plastic shell	62.9	65.1	80
Exterior of plastic case	62.5	64.5	80
Mounting surface	65.9	71.9	90
Metallic enclosure (mounting surface)	63.2	66.4	90
Metallic enclosure (top)	66.0	72.2	100*
Metallic enclosure (side)	65.4	71.8	100*
Metallic enclosure (rear)	64.2	69.0	100*
Supplementary information: # Test conditions: No.1: Battery discharge + Off the grid; Input 515.00Vdc/20756.52W, Output 226.27Vac/50Hz/20181.49W. No.2: AC (input) + Battery charge; Input 207.15Vac/50Hz/20616.15W, Output 500.71Vdc/19442.57W *Symbol 14 of annex C used.			

4.3 TABLE: heating temperature rise measurements- **for model: MID-H20K-T40**				P
	test voltage (V)	**No.3#**	**No.4#**	—
	t1 (°C).....	**60**	**60**	—
	t2 (°C)	**60**	**60**	—
Thermocouple Locations		Max. temperature measured (°C)		Max. temperature limit, (°C)
Machine internal temperature		78.0	76.5	100
C406		79.3	79.9	110
C415		77.8	77.8	105
C410		78.6	79.3	105
L401		79.8	80.6	130
HCT406		83.7	84.7	105
RY400		80.7	81.9	85
RY401		79.0	80.2	85
RY404		83.5	81.2	85
RY407		76.4	80.9	85
RY406		76.5	81.0	85
RY403		81.5	79.1	85
RY405		83.9	81.7	85
RY408		84.2	83.1	85
HCT400		88.4	89.1	105
C301		78.6	79.0	105
Winding of transformer (TX5)		82.2	81.0	130
Iron core of transformer (TX5)		83.7	82.3	130
PCB near Q207		85.5	86.7	130
PCB near Q109		85.6	81.6	130
PCB near Q104		74.0	72.5	130
C233		83.7	82.2	105
C231		82.4	80.5	105
C229		81.9	79.5	105
F1		85.8	83.9	90
L101		78.2	77.0	130
L102		101.4	98.1	130
C116		78.0	76.8	105
Winding of Transformer (TX200)		105.9	103.7	130

Iron core of transformer (TX200)	100.5	98.7	130
TVR105	77.9	76.7	105
RY100	78.3	75.0	85
RY103	83.8	81.6	85
RY102	80.7	77.9	85
RY105	84.3	82.2	85
TVR102	85.4	87.9	105
L100	94.8	102.8	130
C106	80.4	82.7	105
PCB near R209	83.1	85.3	85
RY201	82.6	84.4	85
PCB near D201	87.8	86.0	130
PCB near U102	75.0	73.6	130
Winding of Boost	78.4	77.4	130
Iron core of Boost	91.7	88.9	130
Winding of INV	101.2	104.6	130
Iron core of INV	82.2	83.4	130
Output lead wire(AC)	81.7	84.4	105
AC output terminal	68.5	68.5	85
Input lead wire(DC)	76.7	75.2	105
DC input terminal	65.9	65.4	85
DC switch	65.2	64.7	85
Inside of plastic shell	65.5	65.0	80
Exterior of plastic case	64.8	64.4	80
Mounting surface	71.5	71.6	90
Metallic enclosure (mounting surface)	66.4	66.3	90
Metallic enclosure (top)	72.2	72.0	100*
Metallic enclosure (side)	71.6	71.8	100*
Metallic enclosure (rear)	68.9	68.9	100*

Supplementary information:

Test conditions:

No.3: AC (input)+ Battery charge; Input 253.25Vac/50Hz/21549.82W, Output 500.72Vdc/20115.93W.
No.4: Battery discharge + grid; Input 515.05Vdc/20792.57W, Output 230.11Vac/50Hz/20409.43W.

*Symbol 14 of annex C used.

4.3 TABLE: heating temperature rise measurements- **for model: MID-H20K-T40**				P
	test voltage (V)	**No.5#**	**No.6#**	—
	t1 (°C).....	**60**	**60**	—
	t2 (°C)	**60**	**60**	—
Thermocouple Locations		Max. temperature measured (°C)		Max. temperature limit, (°C)
Machine internal temperature		74.2	76.2	100
C406		66.7	78.7	110
C415		66.6	76.6	105
C410		66.3	77.5	105
L401		66.4	79.2	130
HCT406		69.9	82.8	105
RY400		81.5	79.9	85
RY401		79.7	78.6	85
RY404		82.9	82.4	85
RY407		78.0	75.6	85
RY406		77.5	75.5	85
RY403		79.8	79.8	85
RY405		81.3	82.5	85
RY408		84.2	84.1	85
HCT400		71.0	87.1	105
C301		68.9	77.3	105
Winding of transformer (TX5)		79.9	77.3	130
Iron core of transformer (TX5)		81.5	78.9	130
PCB near Q207		67.6	84.5	130
PCB near Q109		79.4	68.9	130
PCB near Q104		98.1	89.6	130
C233		76.5	80.1	105
C231		77.0	80.3	105
C229		79.0	82.4	105
F1		85.4	74.3	90
L101		92.8	84.2	130
L102		101.9	76.1	130
C116		82.7	77.4	105
Winding of Transformer (TX200)		104.6	104.5	130

Iron core of transformer (TX200)	99.5	97.6	130
TVR105	83.4	77.7	105
RY100	69.4	80.4	85
RY103	67.8	83.4	85
RY102	68.6	84.5	85
RY105	68.2	83.8	85
TVR102	67.3	84.9	105
L100	67.0	95.9	130
C106	66.6	80.2	105
PCB near R209	68.4	82.4	85
RY201	71.7	82.0	85
PCB near D201	89.6	86.0	130
PCB near U102	87.8	82.7	130
Winding of Boost	96.3	97.6	130
Iron core of Boost	93.6	83.0	130
Winding of INV	65.8	96.6	130
Iron core of INV	67.4	81.4	130
Output lead wire(AC)	67.1	81.2	105
AC output terminal	63.4	67.4	85
Input lead wire(DC)	75.0	70.7	105
DC input terminal	65.7	64.5	85
DC switch	65.3	64.1	85
Inside of plastic shell	64.9	64.7	80
Exterior of plastic case	64.3	64.1	80
Mounting surface	63.8	70.6	90
Metallic enclosure (mounting surface)	64.1	66.0	90
Metallic enclosure (top)	69.6	67.9	100*
Metallic enclosure (side)	63.3	70.6	100*
Metallic enclosure (rear)	62.9	67.9	100*
Supplementary information: # Test conditions: No.5: PV+ Battery charge; Input 342.39Vdc/20761.00W, Output 498.1Vdc/20229.00W. No.6: PV+ grid; Input 337.63Vdc/20440.12W, Output 230.01Vac/50Hz/19844.86W. *Symbol 14 of annex C used.			

4.3 TABLE: heating temperature rise measurements- **for model: MID-H20K-T40**				P
	test voltage (V)	**No.7#**	**No.8#**	—
	t1 (°C).....	**60**	**60**	—
	t2 (°C)	**60**	**60**	—
Thermocouple Locations		Max. temperature measured (°C)		Max. temperature limit, (°C)
Machine internal temperature		68.6	75.9	100
C406		72.8	81.2	110
C415		72.1	78.7	105
C410		71.5	80.2	105
L401		76.7	82.1	130
HCT406		77.5	85.8	105
RY400		81.0	82.6	85
RY401		77.5	81.5	85
RY404		83.3	84.3	85
RY407		75.7	76.9	85
RY406		76.5	76.9	85
RY403		78.1	81.9	85
RY405		80.8	84.1	85
RY408		84.7	83.7	85
HCT400		76.6	90.5	105
C301		71.8	79.0	105
Winding of transformer (TX5)		73.0	78.0	130
Iron core of transformer (TX5)		74.0	79.3	130
PCB near Q207		74.7	87.5	130
PCB near Q109		69.9	75.4	130
PCB near Q104		65.9	69.9	130
C233		72.3	81.0	105
C231		71.2	80.2	105
C229		71.2	79.8	105
F1		70.2	77.5	90
L101		68.9	74.4	130
L102		75.0	87.3	130
C116		68.6	73.7	105
Winding of Transformer (TX200)		93.3	102.1	130

Iron core of transformer (TX200)	87.3	96.7	130
TVR105	68.4	73.8	105
RY100	70.6	76.1	85
RY103	69.3	82.5	85
RY102	71.2	79.7	85
RY105	69.4	83.1	85
TVR102	68.4	89.2	105
L100	68.3	105.2	130
C106	67.2	84.1	105
PCB near R209	69.3	86.3	85
RY201	72.3	85.0	85
PCB near D201	78.2	84.3	130
PCB near U102	67.7	71.7	130
Winding of Boost	67.8	74.2	130
Iron core of Boost	75.0	83.3	130
Winding of INV	78.4	106.6	130
Iron core of INV	71.4	84.1	130
Output lead wire(AC)	67.3	83.5	105
AC output terminal	63.6	68.3	85
Input lead wire(DC)	66.5	72.0	105
DC input terminal	62.5	64.3	85
DC switch	62.2	63.9	85
Inside of plastic shell	62.7	64.5	80
Exterior of plastic case	62.4	64.0	80
Mounting surface	66.1	71.8	90
Metallic enclosure (mounting surface)	63.0	66.3	90
Metallic enclosure (top)	66.0	71.7	100*
Metallic enclosure (side)	65.6	72.0	100*
Metallic enclosure (rear)	64.2	69.1	100*
Supplementary information: # Test conditions: No.7: Battery discharge +Off the grid; Input 750.12Vdc/20665.81W, Output 226.29Vac/50Hz/20177.97W. No.8: Battery discharge + grid; Input 750.18Vdc/20712.47W, Output 230.16Vac/50Hz/20409.43W. *Symbol 14 of annex C used.			

4.3 TABLE: heating temperature rise measurements- **for model: MID-H20K-T40**				P
	test voltage (V)	**No.9#**	**No.10#**	—
	t1 (°C).....	**60**	**60**	—
	t2 (°C)	**60**	**60**	—
Thermocouple Locations		Max. temperature measured (°C)		Max. temperature limit, (°C)
Machine internal temperature		73.5	75.2	100
C406		68.0	80.0	110
C415		67.4	77.6	105
C410		67.0	79.3	105
L401		67.6	80.9	130
HCT406		70.5	84.8	105
RY400		82.2	79.5	85
RY401		78.7	78.2	85
RY404		82.6	82.2	85
RY407		77.1	75.4	85
RY406		76.6	75.0	85
RY403		84.2	79.9	85
RY405		83.7	83.3	85
RY408		81.2	84.9	85
HCT400		71.3	89.6	105
C301		69.6	77.8	105
Winding of transformer (TX5)		80.7	75.6	130
Iron core of transformer (TX5)		82.4	76.9	130
PCB near Q207		67.1	86.5	130
PCB near Q109		81.1	66.5	130
PCB near Q104		89.0	78.9	130
C233		76.1	79.2	105
C231		75.8	79.3	105
C229		76.6	80.1	105
F1		87.8	72.1	90
L101		87.7	78.4	130
L102		107.9	74.6	130
C116		82.9	73.8	105
Winding of Transformer (TX200)		103.3	101.4	130

Iron core of transformer (TX200)	98.5	94.5	130
TVR105	84.0	74.7	105
RY100	69.4	77.3	85
RY103	68.0	83.2	85
RY102	68.6	82.4	85
RY105	68.2	82.5	85
TVR102	67.5	87.6	105
L100	67.6	102.4	130
C106	67.1	82.5	105
PCB near R209	68.8	84.5	85
RY201	72.0	83.5	85
PCB near D201	88.8	82.9	130
PCB near U102	82.6	76.0	130
Winding of Boost	82.4	76.5	130
Iron core of Boost	93.2	79.3	130
Winding of INV	67.2	105.8	130
Iron core of INV	67.1	84.2	130
Output lead wire(AC)	67.5	84.1	105
AC output terminal	63.5	67.9	85
Input lead wire(DC)	76.2	69.3	105
DC input terminal	65.5	63.7	85
DC switch	65.1	63.3	85
Inside of plastic shell	65.0	64.4	80
Exterior of plastic case	64.4	63.8	80
Mounting surface	63.7	71.3	90
Metallic enclosure (mounting surface)	63.9	66.2	90
Metallic enclosure (top)	67.2	71.9	100*
Metallic enclosure (side)	63.3	71.8	100*
Metallic enclosure (rear)	63.0	68.7	100*
Supplementary information: # Test conditions: No.9: PV + Battery charge; Input 865.73Vdc/20887.50W, Output 750.27Vdc/20052.00W. No.10: PV + grid; Input 859.03Vdc/23228.17W, Output 230.14Vac/50Hz/22270.23W. *Symbol 14 of annex C used.			

4.3 TABLE: heating temperature rise measurements- **for model: MID-H20K-T40**				P
	test voltage (V)	**No.11#**	**No.12#**	—
	t1 (°C).....	**45**	**45**	—
	t2 (°C)	**45**	**45**	—
Thermocouple Locations		Max. temperature measured (°C)		Max. temperature limit, (°C)
Machine internal temperature		67.9	67.8	100
C406		79.1	72.3	110
C415		77.4	69.6	105
C410		75.5	72.4	105
L401		96.0	73.8	130
HCT406		87.7	78.9	105
RY400		83.9	77.7	85
RY401		80.3	77.9	85
RY404		82.2	80.5	85
RY407		78.8	73.2	85
RY406		81.2	72.5	85
RY403		80.8	80.5	85
RY405		83.0	83.2	85
RY408		84.2	82.7	85
HCT400		81.8	86.1	105
C301		71.6	71.3	105
Winding of transformer (TX5)		69.8	68.9	130
Iron core of transformer (TX5)		70.8	70.0	130
PCB near Q207		78.4	82.5	130
PCB near Q109		72.4	67.4	130
PCB near Q104		61.2	59.5	130
C233		75.2	75.3	105
C231		74.4	74.4	105
C229		72.5	73.1	105
F1		79.5	74.4	90
L101		67.1	65.4	130
L102		99.7	89.8	130
C116		68.0	65.8	105
Winding of Transformer (TX200)		87.6	92.7	130

Iron core of transformer (TX200)	85.0	88.0	130
TVR105	66.8	65.0	105
RY100	69.9	74.2	85
RY103	66.7	82.7	85
RY102	70.9	80.4	85
RY105	66.5	80.6	85
TVR102	64.4	83.3	105
L100	64.4	105.3	130
C106	62.3	79.2	105
PCB near R209	65.7	80.3	85
RY201	67.5	79.0	85
PCB near D201	74.8	74.9	130
PCB near U102	62.4	61.5	130
Winding of Boost	67.2	65.6	130
Iron core of Boost	81.0	78.2	130
Winding of INV	105.5	118.5	130
Iron core of INV	76.7	82.0	130
Output lead wire(AC)	62.7	82.2	105
AC output terminal	54.9	57.1	85
Input lead wire(DC)	63.9	62.4	105
DC input terminal	51.9	51.7	85
DC switch	51.1	50.8	85
Inside of plastic shell	51.1	51.6	80
Exterior of plastic case	50.2	50.9	80
Mounting surface	60.0	61.8	90
Metallic enclosure (mounting surface)	52.0	54.2	90
Metallic enclosure (top)	59.6	60.6	100*
Metallic enclosure (side)	61.0	63.5	100*
Metallic enclosure (rear)	57.0	58.7	100*
Supplementary information: # Test conditions: No.11: Battery discharge + Off the grid; Input 514.60Vdc/20789.84W, Output 228.00Vac/50Hz/19959.70W. No.12: AC(input)+ Battery charge; Input 208.00Vac/50Hz/20165.00W, Output 594.00Vdc/19661.40W. *Symbol 14 of annex C used.			

4.3 TABLE: heating temperature rise measurements- **for model: MID-H20K-T40**				P
	test voltage (V)	**No.13#**	**No.14#**	—
	t1 (°C).....	**45**	**45**	—
	t2 (°C)	**45**	**45**	—
Thermocouple Locations		Max. temperature measured (°C)		Max. temperature limit, (°C)
Machine internal temperature		67.2	69.9	100
C406		74.9	74.3	110
C415		71.0	70.8	105
C410		73.9	72.8	105
L401		76.8	75.7	130
HCT406		81.0	79.9	105
RY400		75.2	79.8	85
RY401		75.2	79.5	85
RY404		76.0	82.7	85
RY407		79.8	73.0	85
RY406		82.6	73.4	85
RY403		83.4	81.9	85
RY405		83.8	82.9	85
RY408		84.8	83.6	85
HCT400		87.3	88.1	105
C301		71.8	72.1	105
Winding of transformer (TX5)		67.4	71.9	130
Iron core of transformer (TX5)		68.5	73.0	130
PCB near Q207		82.9	80.3	130
PCB near Q109		65.9	74.8	130
PCB near Q104		58.4	62.1	130
C233		73.8	77.7	105
C231		73.2	76.9	105
C229		71.8	75.0	105
F1		70.5	80.9	90
L101		63.6	69.1	130
L102		83.7	101.4	130
C116		63.4	69.9	105
Winding of Transformer (TX200)		92.6	94.8	130

Iron core of transformer (TX200)	87.4	91.4	130
TVR105	63.0	68.5	105
RY100	83.5	77.8	85
RY103	84.6	80.7	85
RY102	82.7	81.8	85
RY105	84.3	79.4	85
TVR102	87.5	84.0	105
L100	119.5	113.8	130
C106	84.0	82.2	105
PCB near R209	83.7	83.5	85
RY201	81.6	81.7	85
PCB near D201	74.2	78.1	130
PCB near U102	60.4	63.5	130
Winding of Boost	64.4	68.3	130
Iron core of Boost	75.6	84.1	130
Winding of INV	118.6	109.3	130
Iron core of INV	81.9	78.3	130
Output lead wire(AC)	84.6	83.9	105
AC output terminal	56.9	57.0	85
Input lead wire(DC)	61.1	64.7	105
DC input terminal	50.6	52.3	85
DC switch	49.9	51.4	85
Inside of plastic shell	50.9	52.0	80
Exterior of plastic case	50.3	51.2	80
Mounting surface	61.5	60.7	90
Metallic enclosure (mounting surface)	54.1	54.5	90
Metallic enclosure (top)	60.4	60.9	100*
Metallic enclosure (side)	63.3	62.0	100*
Metallic enclosure (rear)	58.6	57.8	100*
Supplementary information: # Test conditions: No.13: AC(input) + Battery charge; Input 253.50Vac/50Hz/19989.00W, Output 751.00Vdc/19150.50W. No.14: Battery discharge + grid; Input 515.20Vdc/20762.56W, Output 228.20Vac/50Hz/20048.00W. *Symbol 14 of annex C used.			

4.3 TABLE: heating temperature rise measurements- **for model: MID-H20K-T40**				P
	test voltage (V)	**No.15#**	**No.16#**	—
	t1 (°C).....	**45**	**45**	—
	t2 (°C)	**45**	**45**	—
Thermocouple Locations		Max. temperature measured (°C)		Max. temperature limit, (°C)
Machine internal temperature		67.1	71.5	100
C406		54.7	72.7	110
C415		54.7	69.6	105
C410		53.6	71.8	105
L401		54.6	74.3	130
HCT406		57.9	78.2	105
RY400		77.1	78.1	85
RY401		75.5	78.6	85
RY404		78.2	80.9	85
RY407		73.0	73.4	85
RY406		72.8	72.9	85
RY403		75.4	80.2	85
RY405		76.5	82.1	85
RY408		79.7	83.0	85
HCT400		59.9	85.0	105
C301		57.1	71.1	105
Winding of transformer (TX5)		71.3	68.5	130
Iron core of transformer (TX5)		72.9	69.9	130
PCB near Q207		55.3	82.4	130
PCB near Q109		73.1	58.8	130
PCB near Q104		103.2	95.9	130
C233		69.5	75.1	105
C231		70.7	76.3	105
C229		73.4	79.3	105
F1		80.6	66.8	90
L101		96.1	86.7	130
L102		107.2	69.0	130
C116		80.3	72.0	105
Winding of Transformer (TX200)		99.1	98.1	130

Iron core of transformer (TX200)	95.8	92.5	130
TVR105	84.6	74.0	105
RY100	58.7	77.5	85
RY103	57.0	83.9	85
RY102	57.8	83.6	85
RY105	57.2	83.0	85
TVR102	56.3	84.9	105
L100	56.2	111.3	130
C106	56.1	81.1	105
PCB near R209	57.6	81.4	85
RY201	61.1	80.3	85
PCB near D201	85.5	80.4	130
PCB near U102	86.7	81.8	130
Winding of Boost	97.9	102.7	130
Iron core of Boost	93.6	78.3	130
Winding of INV	52.7	109.4	130
Iron core of INV	55.6	79.7	130
Output lead wire(AC)	56.3	82.5	105
AC output terminal	49.8	56.4	85
Input lead wire(DC)	67.1	61.0	105
DC input terminal	54.1	51.8	85
DC switch	53.4	51.1	85
Inside of plastic shell	51.7	51.1	80
Exterior of plastic case	51.0	50.4	80
Mounting surface	50.1	61.2	90
Metallic enclosure (mounting surface)	51.1	54.0	90
Metallic enclosure (top)	58.7	65.8	100*
Metallic enclosure (side)	49.8	62.3	100*
Metallic enclosure (rear)	49.1	57.6	100*
Supplementary information: # Test conditions: No.15: PV + Battery charge; Input 350.00Vdc/21490.00W, Output 498.60Vdc/19794.42W. No.16: PV + grid; Input 368.6Vdc/206416.00W, Output 230.00Vac/50Hz/19754.00W. *Symbol 14 of annex C used.			

4.3 TABLE: heating temperature rise measurements- **for model: MID-H20K-T40**				P
	test voltage (V)	**No.17#**	**No.18#**	—
	t1 (°C).....	**45**	**45**	—
	t2 (°C)	**45**	**45**	—
Thermocouple Locations		Max. temperature measured (°C)		Max. temperature limit, (°C)
Machine internal temperature		67.0	67.1	100
C406		83.8	74.7	110
C415		80.8	71.0	105
C410		80.8	73.9	105
L401		103.9	76.7	130
HCT406		96.0	80.9	105
RY400		81.4	84.6	85
RY401		80.0	78.7	85
RY404		82.5	82.2	85
RY407		73.0	74.0	85
RY406		70.6	73.8	85
RY403		77.3	80.6	85
RY405		81.0	84.1	85
RY408		83.9	84.0	85
HCT400		86.2	87.9	105
C301		74.3	71.9	105
Winding of transformer (TX5)		66.4	67.5	130
Iron core of transformer (TX5)		67.4	68.6	130
PCB near Q207		83.6	82.8	130
PCB near Q109		66.0	66.0	130
PCB near Q104		58.5	58.4	130
C233		73.1	73.6	105
C231		72.9	72.9	105
C229		71.9	71.4	105
F1		69.9	70.6	90
L101		63.1	63.6	130
L102		83.0	83.6	130
C116		63.1	63.3	105
Winding of Transformer (TX200)		87.7	93.4	130

Iron core of transformer (TX200)	82.9	87.6	130
TVR105	62.5	63.1	105
RY100	70.9	73.2	85
RY103	68.5	84.3	85
RY102	72.4	80.7	85
RY105	68.2	82.6	85
TVR102	66.5	87.7	105
L100	66.5	119.2	130
C106	64.0	84.0	105
PCB near R209	67.1	83.8	85
RY201	68.9	81.6	85
PCB near D201	72.5	74.3	130
PCB near U102	60.3	60.6	130
Winding of Boost	64.7	64.6	130
Iron core of Boost	74.1	75.9	130
Winding of INV	120.4	118.4	130
Iron core of INV	80.7	81.6	130
Output lead wire(AC)	64.4	83.9	105
AC output terminal	56.0	57.1	85
Input lead wire(DC)	59.8	61.3	105
DC input terminal	51.1	51.1	85
DC switch	50.4	50.4	85
Inside of plastic shell	50.5	50.9	80
Exterior of plastic case	49.7	50.3	80
Mounting surface	62.2	61.6	90
Metallic enclosure (mounting surface)	52.0	54.2	90
Metallic enclosure (top)	60.2	60.1	100*
Metallic enclosure (side)	63.9	63.3	100*
Metallic enclosure (rear)	58.9	58.5	100*
Supplementary information: # Test conditions: No.7: Battery discharge +Off the grid; Input 750.12Vdc/20665.81W, Output 226.29Vac/50Hz/20177.97W. No.8: Battery discharge + grid; Input 750.18Vdc/20712.47W, Output 230.16Vac/50Hz/20409.43W. *Symbol 14 of annex C used.			

4.3 TABLE: heating temperature rise measurements- **for model: MID-H20K-T40**				P
	test voltage (V)	**No.19#**	**No.20#**	—
	t1 (°C).....	**45**	**45**	—
	t2 (°C)	**45**	**45**	—
Thermocouple Locations		Max. temperature measured (°C)		Max. temperature limit, (°C)
Machine internal temperature		59.4	64.6	100
C406		52.7	71.2	110
C415		52.5	67.7	105
C410		51.6	70.4	105
L401		52.6	73.2	130
HCT406		55.3	76.7	105
RY400		74.3	79.2	85
RY401		72.0	78.3	85
RY404		75.7	81.8	85
RY407		70.4	74.8	85
RY406		70.0	74.1	85
RY403		72.6	80.3	85
RY405		74.0	83.8	85
RY408		77.3	83.1	85
HCT400		56.7	82.9	105
C301		54.5	68.1	105
Winding of transformer (TX5)		66.2	63.3	130
Iron core of transformer (TX5)		67.6	64.2	130
PCB near Q207		51.6	79.4	130
PCB near Q109		65.8	52.4	130
PCB near Q104		75.1	66.2	130
C233		61.6	68.5	105
C231		61.3	69.0	105
C229		61.8	69.2	105
F1		73.7	59.1	90
L101		74.7	66.6	130
L102		96.4	61.9	130
C116		69.3	60.7	105
Winding of Transformer (TX200)		88.7	90.5	130

Iron core of transformer (TX200)	84.8	83.8	130
TVR105	70.3	62.2	105
RY100	55.2	74.9	85
RY103	53.8	83.4	85
RY102	54.3	79.8	85
RY105	53.7	83.3	85
TVR102	52.7	82.9	105
L100	53.0	112.0	130
C106	52.5	79.9	105
PCB near R209	54.3	79.4	85
RY201	58.0	78.0	85
PCB near D201	74.5	71.5	130
PCB near U102	68.9	64.1	130
Winding of Boost	63.9	62.7	130
Iron core of Boost	81.0	67.1	130
Winding of INV	50.9	108.1	130
Iron core of INV	52.3	77.8	130
Output lead wire(AC)	52.6	80.9	105
AC output terminal	48.5	55.3	85
Input lead wire(DC)	61.6	56.3	105
DC input terminal	50.8	49.5	85
DC switch	50.4	48.9	85
Inside of plastic shell	50.1	49.8	80
Exterior of plastic case	49.5	49.4	80
Mounting surface	48.5	59.7	90
Metallic enclosure (mounting surface)	49.0	53.0	90
Metallic enclosure (top)	52.3	58.9	100*
Metallic enclosure (side)	48.2	61.1	100*
Metallic enclosure (rear)	47.9	56.7	100*
Supplementary information: # Test conditions: No.19: PV + Battery charge; Input 850.10Vdc/20912.46W，Output497.6Vdc/19953.76W No.20: PV + grid; Input 860.00Vdc/20640.00W, Output 230.34Vac/50Hz/19490.00W. *Symbol 14 of annex C used.			

4.3 TABLE: Heating test, resistance method					N/A
	Test voltage (V) ..... :	--			—
	Ambient, t_1 (°C) ..... :	--			—
	Ambient, t_2 (°C) ..... :	--			—
Temperature rise of winding	**R_1 (Ω)**	**R_2 (Ω)**	**ΔT (K)**	**Max. dT (K)**	**Insulation class**
--	--	--	--	--	--
--	--	--	--	--	--
--	--	--	--	--	--
Supplementary information:					

4.4 TABLE: fault condition tests							P
	ambient temperature (°C) ..... :		25.0				—
No.	component No.	fault	test voltage (V)	test time	fuse No.	fuse current (A)	result
Mains power board							
1	Relay fault RY400	short before start-up	Input: 340Vdc Output: 230Vac	10min	--	--	The inverter is not connected to the grid. Error message “Relay Check Fail”, No damage, No hazard
2	Relay fault RY401	short before start-up	Input: 340Vdc Output: 230Vac	10min	--	--	The inverter is not connected to the grid. Error message “Relay Check Fail”, No damage, No hazard
3	Relay fault RY404	short before start-up	Input: 340Vdc Output: 230Vac	10min	--	--	The inverter is not connected to the grid. Error message “Relay Check Fail”, No damage, No hazard
4	Relay fault RY407	short before start-up	Input: 340Vdc Output: 230Vac	10min	--	--	The inverter is not connected to the grid. Error message “Relay Check Fail”, No damage, No hazard
5	Relay fault RY406	short before start-up	Input: 340Vdc Output: 230Vac	10min	--	--	The inverter is not connected to the grid. Error message “Relay Check Fail”, No damage, No hazard
6	Relay fault RY403	short before start-up	Input: 340Vdc Output: 230Vac	10min	--	--	The inverter is not connected to the grid. Error message “Relay Check Fail”, No damage, No hazard

7	Relay fault RY405	short before start-up	Input: 340Vdc Output: 230Vac	10min	--	--	The inverter is not connected to the grid. Error message “Relay Check Fail”, No damage, No hazard
8	Relay fault RY408	short before start-up	Input: 340Vdc Output: 230Vac	10min	--	--	The inverter is not connected to the grid. Error message “Relay Check Fail”, No damage, No hazard
9	Phase R Voltage monitoring R400	Short	Input: 340Vdc Output: 230Vac	10min	--	--	The inverter is not connected to the grid. Error message “Inverter OV”, No damage, No hazard.
10	Phase R Voltage monitoring R402	Open	Input: 340Vdc Output: 230Vac	10min	--	--	The inverter is not connected to the grid. The fault information is displayed. “Inverter OV”, No damage, No hazard.
11	Phase R Voltage monitoring R436	Short	Input: 340Vdc Output: 230Vac	10min	--	--	The inverter is not connected to the grid. The fault information is displayed. “Backup OV”, No damage, No hazard.
12	Phase R Voltage monitoring R438	Open	Input: 340Vdc Output: 230Vac	10min	--	--	The inverter is not connected to the grid. The fault information is displayed. “Backup OV”, No damage, No hazard.
13	Phase S Voltage monitoring R410	Short	Input: 340Vdc Output: 230Vac	10min	--	--	The inverter is not connected to the grid. The fault information is displayed. “Inverter OV”, No damage, No hazard.
14	Phase S Voltage monitoring R417	Open	Input: 340Vdc Output: 230Vac	10min	--	--	The inverter is not connected to the grid. The fault information is displayed. “Inverter OV”, No damage, No hazard.
15	Phase S Voltage monitoring R491	Short	Input: 340Vdc Output: 230Vac	10min	--	--	The inverter is not connected to the grid. The fault information is displayed. “Backup OV”, No damage, No hazard.
16	Phase S Voltage monitoring R494	Open	Input: 340Vdc Output: 230Vac	10min	--	--	The inverter is not connected to the grid. The fault information is displayed. “Backup OV”, No damage, No hazard.

17	Phase T Voltage monitoring R425	Short	Input: 340Vdc Output: 230Vac	10min	--	--	The inverter is not connected to the grid. The fault information is displayed. “Inverter OV”, No damage, No hazard.
18	Phase T Voltage monitoring R447	Open	Input: 340Vdc Output: 230Vac	10min	--	--	The inverter is not connected to the grid. The fault information is displayed. “Inverter OV”, No damage, No hazard.
19	Phase T Voltage monitoring R523	Short	Input: 340Vdc Output: 230Vac	10min	--	--	The inverter is not connected to the grid. The fault information is displayed. “Backup OV”, No damage, No hazard.
20	Phase T Voltage monitoring R525	Open	Input: 340Vdc Output: 230Vac	10min	--	--	The inverter is not connected to the grid. The fault information is displayed. “Backup OV”, No damage, No hazard.
21	BUS Voltage monitoring R200	Short	Input: 340Vdc Output: 230Vac	10min	--	--	The inverter is not connected to the grid. The fault information is displayed. “Bus voltage fault”, No damage, No hazard.
22	BUS Voltage monitoring R203	Open	Input: 340Vdc Output: 230Vac	10min	--	--	The inverter is not connected to the grid. The fault information is displayed. “Bus voltage fault”, No damage, No hazard.
23	BUS Voltage monitoring R262	Short	Input: 340Vdc Output: 230Vac	10min	--	--	The inverter is not connected to the grid. The fault information is displayed. “Bus voltage fault”, No damage, No hazard.
24	BUS Voltage monitoring R265	Open	Input: 340Vdc Output: 230Vac	10min	--	--	The inverter is not connected to the grid. The fault information is displayed. “Bus voltage fault”, No damage, No hazard.
25	PV ISO defected R157	short before start-up	Input: 340Vdc Output: 230Vac	10min	--	--	The inverter is not connected to the grid. The fault information is displayed. “ISO Over limitation”, No damage, No hazard.

26	PV ISO defected R171	short before start-up	Input: 340Vdc Output: 230Vac	10min	--	--	The inverter is not connected to the grid. The fault information is displayed. “ISO Over limitation”, No damage, No hazard.
27	PV ISO defected R151	short before start-up	Input: 340Vdc Output: 230Vac	10min	--	--	The inverter is not connected to the grid. The fault information is displayed. “ISO Over limitation”, No damage, No hazard.
28	PV ISO defected R191	short before start-up	Input: 340Vdc Output: 230Vac	10min	--	--	The inverter is not connected to the grid. The fault information is displayed. “ISO Over limitation”, No damage, No hazard.
29	PV ISO defected C155	short before start-up	Input: 340Vdc Output: 230Vac	10min	--	--	The inverter is not connected to the grid. The fault information is displayed. “ISO Over limitation”, No damage, No hazard.
30	PV ISO defected U104 pin4 to pin11	short before start-up	Input: 340Vdc Output: 230Vac	10min	--	--	The inverter is not connected to the grid. The fault information is displayed. “ISO Over limitation”, No damage, No hazard.
31	Q201 pin1-2	Short	Input: 340Vdc Output: 230Vac	10min	--	--	After the inverter is connected to the grid, Q201 and Q203 burst, the grid circuit breaker jumps, The fault information is displayed “Mains Lost”, No damage, No hazard.
32	Q201 pin3-2	Short	Input: 340Vdc Output: 230Vac	10min	--	--	After the inverter is connected to the grid, Q209 is short circuit, no obvious explosion, the grid circuit breaker jumps, the inverter can’t work, No hazard.
33	Q209 pin1-2	Short	Input: 340Vdc Output: 230Vac	10min	--	--	After the inverter is connected to the grid. Q209 bursts, and the grid circuit breaker trips, the fault information is displayed: Mains Lost

34	Q209 pin3-2	Short	Input: 340Vdc Output: 230Vac	10min	--	--	After the inverter is connected to the gridQ201 burst, the grid circuit breaker jumps, the inverter cannot work, No hazard.
35	C201	Short	Input: 340Vdc Output: 230Vac	10min	--	--	The inverter is not connected to the grid, The fault information is displayed: BUS Unbalance, No damage, No hazard.
36	GFCI monitoring R756	Short	Input: 340Vdc Output: 230Vac	10min	--	--	The inverter is not connected to the grid, The fault information is displayed: BUS Unbalance, No damage, No hazard.
37	GFCI monitoring R759	Short	Input: 340Vdc Output: 230Vac	10min	--	--	The inverter is not connected to the grid, The fault information is displayed: BUS Unbalance, No damage, No hazard.
38	GFCI monitoring C752	Short	Input: 340Vdc Output: 230Vac	10min	--	--	The inverter is not connected to the grid, The fault information is displayed: BUS Unbalance, No damage, No hazard.
39	GFCI monitoring C753	Open	Input: 340Vdc Output: 230Vac	10min	--	--	The inverter is not connected to the grid, The fault information is displayed: BUS Unbalance, No damage, No hazard.
Input board							
40	PV voltage monitoring R105	Short	Input: 340Vdc Output: 230Vac	10min	--	--	The inverter is not connected to the grid. No damage, No hazard.
41	PV voltage monitoring R106	Open	Input: 340Vdc Output: 230Vac	10min	--	--	The inverter is not connected to the grid. No damage, No hazard.
42	PV voltage monitoring R134	Short	Input: 340Vdc Output: 230Vac	10min	--	--	The inverter is not connected to the grid. No damage, No hazard.

43	PV voltage monitoring R136	Open	Input: 340Vdc Output: 230Vac	10min	--	--	The inverter is not connected to the grid. No damage, No hazard.
44	BAT voltage monitoring R145	Short	Input: 340Vdc Output: 230Vac	10min	--	--	The inverter is not connected to the grid. No damage, No hazard.
45	BAT voltage monitoring R148	Open	Input: 340Vdc Output: 230Vac	10min	--	--	The inverter is not connected to the grid. No damage, No hazard.
46	BAT voltage monitoring R156	Short	Input: 340Vdc Output: 230Vac	10min	--	--	The inverter is not connected to the grid. No damage, No hazard.
47	BAT voltage monitoring R157	Open	Input: 340Vdc Output: 230Vac	10min	--	--	The inverter is not connected to the grid. No damage, No hazard.
48	PV input terminals	Revers	Input: 340Vdc Output: 230Vac	10min	--	--	The inverter is not connected to the grid. No damage, No hazard.
Control board							
49	Communication between U102 and U200 R208	Open	Input: 340Vdc Output: 230Vac	10min	--	--	The inverter is not connected to the grid. The fault information is displayed: SCI Fault, No damage, No hazard.
50	Communication between U102 and U200 R210	Open	Input: 340Vdc Output: 230Vac	10min	--	--	The inverter is not connected to the grid. The fault information is displayed: SCI Fault, No damage, No hazard.
51	U102 pin88 to GND (+3.3VD to GND)	Short	Input: 340Vdc Output: 230Vac	10min	--	--	The inverter is not connected to the grid. The fault information is displayed: SCI Fault, No damage, No hazard.
supplementary information The errors in the control circuit simulate that the safety is even ensured during a single fault. Assessment criterion: The NS protection must send a shutdown command to the coupling switch. If the error is detected, the device is switched off within 10 s after error detection. If the auxiliary voltage fails with the central NS protection or if the control fails with the integrated NS protection, the switch-off command must be given immediately.							

7.3.6.3.7 TABLE: touch current measurement			P
Measured between:	Measured (mA)	Limit (mA)	Comments/conditions
Earthing terminal to metal enclosure	2.85	3.5	PV to Grid connection, Max. current recorded after clause 4.3 thermal testing and 4.5, single fault condition test, humidity preconditioning and IP65 test
supplementary information:			

7.3.7 TABLE: clearance and creepage distance measurements						P
clearance cl and creepage distance dcr at / of:	System voltage (V)	OVC	required cl (mm)	cl (mm)	required dcr (mm)	dcr (mm)
The maximum altitude of this product is 3000m. After the height correction of electrical gap in Appendix G, it is known that the doubling factor of electrical gap is 1.14						
Between the feet of the fuse(F1) (F)	DC: <750	II (DC) III (AC)	3.0*1.14	36.80	7.0	36.80
PV to metal enclosure (B)	DC: <1000	II (DC) III (AC)	3.58*1.14	10.35	10	10.35
Between the feet of the varistor (TVR101) (F)	DC: <1000	II (DC) III (AC)	3.0*1.14	8.98	7.0	8.98
Between the feet of the PV1 terminal (F)	DC: <1000	II (DC) III (AC)	3.58*1.14	11.07	10	11.07
Between the feet of the PV2 terminal (F)	DC: <1000	II (DC) III (AC)	3.58*1.14	10.93	10	10.93
AC mains part to metal enclosure (B)	AC: <500	II (DC) III (AC)	3.58*1.14	10.35	5.0	10.35
The shortest distance between the charged part and the heat sink (B)	DC: <750	II (DC) III (AC)	3.0*1.14	7.25	7.0	7.25
Primary to secondary of Transformer (TX200) on PCB (R)	DC: <1000	II (DC) III (AC)	6.08*1.14	21.25	10	21.25
Primary to secondary of relay (RY405) on PCB (R)	AC: <500	III (AC)	3.58*1.14	17.25	10	17.25
Note(s): * F=functional insulation, B=basic insulation, S=supplementary insulation, R=reinforced insulation. When determine the clearance: For DC input circuits: Overvoltage Category II. For AC output circuits (stand-alone): Overvoltage Category II applied (impulse withstand voltage 2500V) For AC output circuits (on-grid): Overvoltage Category III PCB with min. CTI 175 used.						

7.3.9 TABLE: Protection against shock hazard due to stored energy				P
Test Location	Voltage (after 10s)	DVC A voltage (V)	Discharge time to DVC A (s)	Remark
Service access areas:				
C200	680V	60	55.6	The symbol 21 of Annex C with 10 min was provided on the label
C214	650V	60	55.6	The symbol 21 of Annex C with 10 min was provided on the label
C229	660V	60	55.6	The symbol 21 of Annex C with 10 min was provided on the label
C233	630V	60	55.6	The symbol 21 of Annex C with 10 min was provided on the label
Supplementary information:				

7.5 TABLE: electric strength measurements, impulse voltage test and partial discharge test				P
test voltage applied between:	test voltage (V)	impulse withstand voltage (V)	partial discharge extinction voltage (V)	result
PV input to Protective Earth	2120Vdc	4464	--	Pass
AC output to Protective Earth	2120Vdc	4464	--	Pass
AC input to Protective Earth	2120Vdc	4464	--	Pass
Battery input to Protective Earth	2120Vdc	4464	--	Pass
PV input to Communication port	4240Vdc	6464	--	Pass
AC output to Communication port	4240Vdc	6464	--	Pass
Battery input to Communication port	4240Vdc	6464	--	Pass
AC input to Communication port	4240Vdc	6464	--	Pass
Note: Supplementary information: 1. Test voltage according to Table 17 and 18. 2. 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 voltage test.				

8.5	Mounting Means Loading Test	P

Test Force	1216 N for the bracket	
Test duration:	1 min	
Requirement	Result	Remarks
Does the mounting means or equipment remain secure?	Security	Pass
Is the mounting means or the enclosure damaged?	No damage	Pass

If no wall construction is specified, a 10 mm

2 mm thick plaster board (drywall) on nominal 50 mm 100 mm

10 mm studs at 400 mm

10 mm center is to be used as the support.

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Clause	**Requirement**	**Remark**	**Verdict**
4	**GENERAL TESTING REQUIREMENTS**		-
4.4.4	**Single fault conditions to be applied**		-
4.4.4.15	**Fault-tolerance of protection for grid-interactive inverters**		-
4.4.4.15.1	**Fault-tolerance of residual current monitoring according to 4.8.3.5: the residual current monitoring system operates properly**	**See appended table 4.4.4.15.1**	**P**
	a)..- The inverter ceases to operate		P
	- Indicates a fault in accordance with §13.9		P
	- Disconnect from the mains		P
	- not re-connect after any sequence of removing and reconnecting PV power		P
	- not re-connect after any sequence of removing and reconnecting AC power		P
	- not re-connect after any sequence of removing and reconnecting both PV and AC power		P
	b)..- The inverter continues to operate		P
	- the residual current monitoring system operates properly under single fault condition		P
	- Indicates a fault in accordance with §13.9		P
	c)..- The inverter continues to operate regardless of loss of residual current monitoring functionality		N/A
	- not re-connect after any sequence of removing and reconnecting PV power		N/A
	- not re-connect after any sequence of removing and reconnecting AC power		N/A
	- not re-connect after any sequence of removing and reconnecting both PV and AC power		N/A
	- Indicates a fault in accordance with §13.9		N/A
4.4.4.15.2	**Fault-tolerance of automatic disconnecting means**	**One series relay in each line and may independent operation for each relay**	**P**
4.4.4.15.2.1	**The means provided for automatic disconnection of a grid-interactive inverter from the mains shall:**		**P**
	- disconnect all grounded current-carrying conductors from the mains	Disconnected all line conductors from the mains	P
	- disconnect all ungrounded current-carrying conductors from the mains	Disconnected all line conductors from the mains	P
	- be such that with a single fault applied to the disconnection means or to any other location in the inverter, at least basic insulation or simple separation is maintained between the PV array and the mains when the disconnecting means is intended to be in the open state.	See appended table 4.4.4.15.2 Fault-tolerance of automatic disconnecting	P
4.4.4.15.2.2	**Design of insulation or separation complies with requirements of 7.3.7 of Part 1: report here Part 1 comment and verdict.**		**P**
4.4.4.15.2.3	**For non-isolated inverter, automatic checking of the isolation provided by a disconnect means after single fault.**	**See appended test table 4.4.4.15.2 Fault-tolerance of automatic disconnecting.**	**P**

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Clause	**Requirement**	**Remark**	**Verdict**
	If the check fail: - any still-functional disconnection means shall be left in the open position		P
	- at least basic or simple separation shall be maintained between the PV input and the mains		P
	- the inverter shall not start operation		P
	- the inverter shall indicate a fault in accordance with 13.9		P
4.4.4.16	**A stand-alone inverter with a transfer switch to transfer AC loads from the mains or other AC bypass source to the inverter output:**	**See appended test table**	**P**
	- shall continue to operate normally		P
	- shall not present a risk of fire as the result of an out-of-phase transfer		P
	- shall not present a risk of shock as the result of an out-of-phase transfer		P
	- And having control preventing switching: components for malfunctioning ……..…:		P
4.4.4.17	**Cooling system failure – Blanketing test** **No hazards according to the criteria of sub-clause 4.4.3 of Part 1 shall result from blanketing the inverter** **This test is not required for inverters restricted to use only in closed electrical operating areas.**	**See appended test table Cooling system failure – Blanketing test.**	**P**
	Test stop condition: time duration value or stabilized temperature ……..:		-
4.7	**ELECTRICAL RATINGS TESTS**		**P**
4.7.4	**Stand-alone Inverter AC output voltage and frequency**		**P**
4.7.4.1	**General**		**P**
4.7.4.2	**Steady state output voltage at nominal DC input** **The steady-state AC output voltage shall not be less than 90 % or more than 110 % of the rated nominal voltage with the inverter supplied with its nominal value of DC input voltage.**	**See appended test table 4.7.4 Steady state Inverter AC output voltage and frequency**	**P**
4.7.4.3	**Steady state output voltage across the DC input range** **The steady-state AC output voltage shall not be less than 85 % or more than 110 % of the rated nominal voltage with the inverter supplied with any value within the rated range of DC input voltage.**	**See appended test table 4.7.4 Steady state Inverter AC output voltage and frequency**	**P**
4.7.4.4	**Load step response of the output voltage at nominal DC input** **The AC output voltage shall not be less than 85 % or more than 110 % of the rated nominal voltage for more than 1,5 s after application or removal of a resistive load.**	**See appended test table 4.7.4 Steady state Inverter AC output voltage and frequency**	**P**
4.7.4.5	**Steady state output frequency** **The steady-state AC output frequency shall not vary from the nominal value by more than +4 % or –6 %.**	**See appended test table 4.7.4 Steady state Inverter AC output voltage and frequency**	**P**
4.7.5	**Stand-alone inverter output voltage waveform**		**P**
4.7.5.1	**General**		**P**
4.7.5.2	**The AC output voltage waveform of a sinusoidal output stand-alone inverter shall have a total**	**See appended test table**	**P**

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Clause	**Requirement**	**Remark**	**Verdict**
	harmonic distortion (THD) not exceeding of 10 % and no individual harmonic at a level exceeding 6 %.		
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.	See attached document: 4.7.5.5 Evaluation of inverter for dedicated load	N/A
	The inverter shall be marked with symbols 9 and 15 of Table C.1 of Part 1.		N/A
	The installation instructions provided with the inverter shall include the information in 5.3.2.13.		N/A
4.8	**ADDITIONAL TESTS FOR GRID-INTERACTIVE INVERTERS**		**P**
4.8.1	**General requirements regarding inverter isolation and array grounding**		**P**
	- Type of Array grounding supported ……:	Ungrounded	P
	- Inverter isolation ……:	Transformer-less type	P
4.8.2	**Array insulation resistance detection for inverters for ungrounded and functionally grounded arrays**	**(See attached table)**	**P**
4.8.2.1	**Array insulation resistance detection for inverters for ungrounded arrays**		**P**
	Inverter shall have means to measure DC insulation 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: ……:		-
	Inverter measurement circuit shall be capable of detecting insulation resistance below the limit value R= Vmax/30mA under normal conditions	(See attached table)	P

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

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Clause	**Requirement**	**Remark**	**Verdict**
	according to rules for RCD selection in Part 1.		
	- The RCD provided integral to the inverter, or		N/A
	- The RDC provided by the installer if details of the rating, type, and location for the RCD are given in the installation instructions per 5.3.2.9.		N/A
4.8.3.5	**Protection by residual current monitoring**		**P**
4.8.3.5.1	**General**		-
	Where required by Table 30, the inverter shall provide residual current monitoring that functions whenever the inverter is connected to the mains with the automatic disconnection means closed.		P
	The residual current monitoring means shall measure the total (both a.c. and d.c. components) RMS current.		P
	As indicated in Table 30 for different inverter types, array types, and inverter isolation levels, detection may be required for excessive continuous residual current, excessive sudden changes in residual current, or both, according to the following limits:		-
	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:		-
	- maximum 300 mA for inverters with continuous ouput 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
	b) Sudden changes in residual current: The inverter shall disconnect from the mains within the time specified in Table 31		P
	The inverter indicates a fault in accordance with 13.9, if a sudden increase in the RMS residual current is detected exceeding the value in the table.		P
	The inverter may attempt to re-connect if the array insulation resistance meets the limit in 4.8.2.		P
4.8.3.5.2	**Test for detection of excessive continuous residual current: test repeated 5 times and time to disconnect shall not exceed 0,3 s.**	**See appended test table 4.8.3.5.2 Test for detection of excessive continuous residual current**	**P**
4.8.3.5.3	**Test for detection of sudden changes in residual current repeated 5 times and each of the 5 results shall not exceed the time limit indicated in for each row (30mA, 60mA and150mA) of Table 31.**		**P**
4.8.3.6	**Systems located in closed electrical operating areas**		-
	The protection against shock hazard is not required if the installation information provided with the inverter indicates the restriction for use in a closed electrical operating area, and		N/A
	Installation information indicates what forms of shock hazard protection are and are not provided integral to the inverter, in accordance with 5.3.2.7.		N/A
	The inverter shall be marked as in 5.2.2.6.		N/A

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Clause	**Requirement**	**Remark**	**Verdict**
5	**Marking and documentation**		**P**
5.1	**Marking**		**P**
5.1.4	**Equipment ratings**		**P**
	PV input ratings:	See copy of marking plate	P
	- Vmax PV (absolute maximum) (d.c. V)		P
	- Isc PV (absolute maximum) (d.c. A)		P
	a.c. output ratings:	See copy of marking plate	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:	See copy of marking plate	P
	- Voltage (nominal or range) (a.c. V)		P
	- Current (maximum continuous) (a.c. A)		P
	- Frequency (nominal or range) (Hz)		P
	d.c. output ratings:	See copy of marking plate	P
	- Voltage (nominal or range) (d.c. V)		P
	- Current (maximum continuous) (d.c. A)		P
	Protective class (I or II or III)	Class I	P
	Ingress protection (IP) rating per part 1	IP65	P
	An inverter that is adjustable for more than one nominal output voltage shall be marked to indicate the particular voltage for which it is set when shipped from the factory.		N/A
5.2	**Warning markings**		**P**
5.2.2	**Content for warning markings**		**P**
5.2.2.6	**Inverters for closed electrical operating areas**		**N/A**
	Where required by 4.8.3.6, an inverter not provided with full protection against shock hazard on the PV array shall be marked with a warning that the inverter is only for use in a closed electrical operating area, and referring to the installation instructions.		N/A
5.3	**Documentation**		**P**
5.3.2	**Information related to installation**		**P**
5.3.2.1	**Ratings. Subclause 5.3.2 of Part 1 requires the documentation to include ratings information for each input and output. For inverters this information shall be as in Table 33 below. Only those ratings that are applicable based on the type of inverter are required.**		**P**
	PV input quantities :		P
	- Vmax PV (absolute maximum) (d.c. V)		P
	- PV input operating voltage range (d.c. V)		P
	- Maximum operating PV input current (d.c. A)		P
	- Isc PV (absolute maximum) (d.c. A)		P
	- Isc PV (absolute maximum) (d.c. A)		P
	- Max. inverter backfeed current to the array (a.c. or d.c. A)		P
	a.c. output quantities:		P
	- Voltage (nominal or range) (a.c. V)		P
	- Current (maximum continuous) (a.c. A)		P
	- Current (inrush) (a.c. A, peak and duration)		P
	- Frequency (nominal or range) (Hz)		P
	- Power (maximum continuous) (W or VA)		P

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Clause	**Requirement**	**Remark**	**Verdict**
	- Power factor range		P
	- Maximum output fault current (a.c. A, peak and duration or RMS)		P
	- Maximum output overcurrent protection (a.c. A)		P
	a.c. input quantities:		P
	- Voltage (nominal or range) (a.c. V)		P
	- Current (maximum continuous) (a.c. A)		P
	- Current (inrush) (a.c. A, peak and duration)		P
	- Frequency (nominal or range) (Hz)		P
	d.c input (other than PV) quantities:		P
	- Voltage (nominal or range) (d.c. V)		P
	- Nominal battery voltage (d.c. V)		P
	- Current (maximum continuous) (d.c. A)		P
	d.c. output quantities:		P
	- Voltage (nominal or range) (d.c. V)		P
	- Nominal battery voltage (d.c. V)		P
	- Current (maximum continuous) (d.c. A)		P
	Protective class (I or II or III)		P
	Ingress protection (IP) rating per part 1		P
5.3.2.2	**Grid-interactive inverter setpoints**		**N/A**
	For a grid-interactive unit with field adjustable trip points, trip times, or reconnect times, the presence of such controls, the means for adjustment, the factory default values, and the limits of the ranges of adjustability shall be provided in the documentation for the PCE or in other format such as on a website. Provided solution: ……		N/A
	The setting of field adjustable setpoints shall be accessible from the PCE		N/A
5.3.2.3	**Transformers and isolation**		**N/A**
	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:		-
	- 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:		-
	- 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:		-
	- the configuration type		N/A

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Clause	**Requirement**	**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:		-
	- 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:		-
	- 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.:		-
	- THD		N/A
	- slope		N/A
	- peak voltage		N/A
5.3.2.7	**Systems located in closed electrical operating areas**		**N/A**
	Where required by 4.8.3.6, an inverter not provided with full protection against shock hazard on the PV array shall be provided with installation instructions:		-
	- requiring that the inverter and the array must be installed in closed electrical operating areas		N/A
	- indicating which forms of shock hazard protection are and are not provided integral to the inverter (for example the RCD, isolation transformer complying with the 30 mA touch current limit, or residual current monitoring for sudden changes)		N/A
5.3.2.8	**Stand-alone inverter output circuit bonding**		**P**
	Where required by 7.3.10, the documentation for an inverter shall include the following:		-
	- if output circuit bonding is required but is not provided integral to the inverter, the required means shall be described in the installation instructions, including which conductor is to be bonded and the required current carrying capability or cross-section of the bonding means;		N/A
	- if the output circuit is intended to be floating, the documentation for the inverter shall indicate that the output is floating.		P
5.3.2.9	**Protection by application of RCD's**		**N/A**

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Clause	**Requirement**	**Remark**	**Verdict**
	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:		-
	- 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:		-
	a) the value of the total resistance between the PV circuit and ground integral to the inverter ……		N/A
	b) the minimum array insulation resistance to ground that system designer or installer must meet when selecting the PV panel and system design, based on the minimum value that the design of the PV functional grounding in the inverter was based on ……;		N/A
	c) the minimum value of the total resistance R = VMAX PV/30 mA that the system must meet, with an explanation of how to calculate the total …… ;		N/A
	d) a warning that there is a risk of shock hazard if the total minimum resistance requirement is not met.		N/A
5.3.2.13	**Stand-alone inverters for dedicated loads**		**N/A**
	Where the approach of 4.7.5.5 is used, the installation instructions for the inverter shall include a warning that the inverter is only to be used with the dedicated load for which it was evaluated, and		N/A

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Clause	**Requirement**	**Remark**	**Verdict**
	shall specify the dedicated load.		N/A
5.3.2.14	**Identification of firmware version(s)**		**P**
	An inverter utilizing firmware for any protective functions shall provide means to identify the firmware version.		P
	This can be a marking, but the information can also be provided by a display panel, communications port or any other type of user interface……..		P
7	**PROTECTION AGAINST ELECTRIC SHOCK AND ENERGY HAZARDS**		-
7.3	**Protection against electric shock**		-
7.3.10	**Additional requirements for stand-alone inverters**		-
	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		P
	If not provided integral to the inverter, the required means shall be described in the installation instructions as per 5.3.2.8.		P
	The means used to bond the grounded conductor to protective earth shall comply with the requirements for protective bonding in Part 1,		P
	If the bond can only ever carry fault currents in stand-alone mode, the maximum current for the bond is determined by the inverter maximum output fault current.		P
	Output circuit bonding arrangements shall ensure that in any mode of operation, the system only has the grounded circuit conductor bonded to earth in one place at a time..		P
	Switching arrangements may be used, in which case the switching device used is to be subjected to the bond impedance test along with the rest of the bonding path		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.		P
	Outputs that are intentionally floating with no circuit conductor bonded to ground, must not have any voltages with respect to ground that are a shock hazard in accordance with Clause 7 of Parts 1 and 2.		P
	The documentation for the inverter shall indicate that the output is floating as per 5.3.2.8.		P
7.3.11	**Functionally grounded arrays**		**N/A**
	All PV conductors in a functionally grounded array shall be treated as being live parts with respect to protection against electric shock.		N/A
9	**PROTECTION AGAINST FIRE HAZARDS**		**P**
9.3	**Short-circuit and overcurrent protection**		**P**
9.3.4	**Inverter backfeed current onto the array**		**P**
	The backfeed current testing and documentation requirements in Part 1 apply, including but not limited to the following.		P

IEC 62109-2			
Clause	**Requirement**	**Remark**	**Verdict**
	Inverter backfeed current onto the PV array maximum value……..		P
	This inverter backfeed current value shall be provided in the installation instructions regardless of the value of the current, in accordance with Table 33.		P
13	**PHYSICAL REQUIREMENTS**		**P**
13.9	**Fault indication**		**P**
	Where this Part 2 requires the inverter to indicate a fault, both of the following shall be provided:		**P**
	a) a visible or audible indication, integral to the inverter, and detectable from outside the inverter, and		P
	b) an electrical or electronic indication that can be remotely accessed and used.		P
	The installation instructions shall include information regarding how to properly make connections (where applicable) and use the electrical or electronic means in b) above, in accordance with 5.3.2.10.		P

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

4.4.4.15.1	Fault-tolerance of residual current monitoring					
Component No.	**Fault**	**Supply voltage (V)**	**Test time**	**Fuse #**	**Fuse current (A)**	**Observation**
PV ISO defected R157	short before start-up	Input: 340Vdc Output: 230Vac	10min	--	--	The inverter is not connected to the grid. The fault information is displayed. “ISO Over limitation”, No damage, No hazard.
PV ISO defected R171	short before start-up	Input: 340Vdc Output: 230Vac	10min	--	--	The inverter is not connected to the grid. The fault information is displayed. “ISO Over limitation”, No damage, No hazard.
PV ISO defected R151	short before start-up	Input: 340Vdc Output: 230Vac	10min	--	--	The inverter is not connected to the grid. The fault information is displayed. “ISO Over limitation”, No damage, No hazard.
PV ISO defected R191	short before start-up	Input: 340Vdc Output: 230Vac	10min	--	--	The inverter is not connected to the grid. The fault information is displayed. “ISO Over limitation”, No damage, No hazard.
PV ISO defected C155	short before start-up	Input: 340Vdc Output: 230Vac	10min	--	--	The inverter is not connected to the grid. The fault information is displayed. “ISO Over limitation”, No damage, No hazard.
PV ISO defected U104 pin4 to pin11	short before start-up	Input: 340Vdc Output: 230Vac	10min	--	--	The inverter is not connected to the grid. The fault information is displayed. “ISO Over limitation”, No damage, No hazard.
PV voltage monitoring R105	Short	Input: 340Vdc Output: 230Vac	10min	--	--	The inverter is not connected to the grid. No damage, No hazard.
PV voltage monitoring R106	Open	Input: 340Vdc Output: 230Vac	10min	--	--	The inverter is not connected to the grid. No damage, No hazard.
PV voltage monitoring R134	Short	Input: 340Vdc Output: 230Vac	10min	--	--	The inverter is not connected to the grid. No damage, No hazard.

PV voltage monitoring R136	Open	Input: 340Vdc Output: 230Vac	10min	--	--	The inverter is not connected to the grid. No damage, No hazard.
Check that the residual current monitoring operates properly						Yes
Supplementary information:						

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

4.4.4.15.2	**Fault-tolerance of automatic disconnecting means**					
Component No.	Fault	Supply voltage (V)	Test time	Fuse #	Fuse current (A)	Observation
Relay fault RY400	short before start-up	Input: 340Vdc Output: 230Vac	10min	--	--	The inverter is not connected to the grid. Error message “Relay Check Fail”, No damage, No hazard
Relay fault RY401	short before start-up	Input: 340Vdc Output: 230Vac	10min	--	--	The inverter is not connected to the grid. Error message “Relay Check Fail”, No damage, No hazard
Relay fault RY404	short before start-up	Input: 340Vdc Output: 230Vac	10min	--	--	The inverter is not connected to the grid. Error message “Relay Check Fail”, No damage, No hazard
Relay fault RY407	short before start-up	Input: 340Vdc Output: 230Vac	10min	--	--	The inverter is not connected to the grid. Error message “Relay Check Fail”, No damage, No hazard
Relay fault RY406	short before start-up	Input: 340Vdc Output: 230Vac	10min	--	--	The inverter is not connected to the grid. Error message “Relay Check Fail”, No damage, No hazard
Relay fault RY403	short before start-up	Input: 340Vdc Output: 230Vac	10min	--	--	The inverter is not connected to the grid. Error message “Relay Check Fail”, No damage, No hazard
Relay fault RY405	short before start-up	Input: 340Vdc Output: 230Vac	10min	--	--	The inverter is not connected to the grid. Error message “Relay Check Fail”, No damage, No hazard

Relay fault RY408	short before start-up	Input: 340Vdc Output: 230Vac	10min	--	--	The inverter is not connected to the grid. Error message “Relay Check Fail”, No damage, No hazard
Check that the relays fulfil the basic insulation or simple separation based on the PV circuit working voltage.						Yes
Each active phase can be switched. (L and N)						Yes
Supplementary information:						

4.4.4.17	**Cooling system fainlure – Blanketing test-for model MID-H20K-T40**						**P**
	Test voltage (Vdc) ..... :	850	--	--	--	--	—
	Test current (Idc)	26.95	--	--	--	--	—
	Test voltage (Vac) ..... :	230.23	--	--	--	--	—
	Test current (Iac)	32.24	--	--	--	--	—
	t_{amb1} (°C) ..... :	45	--	--	--	--	—
	t_{amb2} (°C) ..... :	45	--	--	--	--	—
maximum temperature T of part/at::		**T (°C)**					**T_{max} (°C)**
1.	Heatsink	85.2	--	--	--	--	90
2.	Metallic enclosure (mounting surface)	78.3	--	--	--	--	90
3.	Metallic enclosure (mounting surface)	81.8	--	--	--	--	90
4.	Metallic enclosure (side)	81.0	--	--	--	--	90
5.	Metallic enclosure (rear)	78.2	--	--	--	--	90
Supplementary information:							

4.7.4	**TABLE: Steady state Inverter AC output voltage and frequency** - for model MID-H20K-T40		**P**
	Minimum DC input (V) Maximum DC input (V) Nominal DC input (V) Nominal output AC voltage (V) :		135Vdc 750Vdc 640Vdc 230Vac
AC output U (V)	**Frequency (Hz)**	**Condition/status**	**Comments**
226.45	50.0	Without load	Nominal DC input
226.55	50.0	Resistive load application	
226.55	50.0	Resistive load removal	
228.89	--	No load to full power	
229.92	--	Full power to no load	
226.78	50.0	Without load	Minimum DC input
226.87	50.0	Resistive load application	

4.7.4	**TABLE: Steady state Inverter AC output voltage and frequency** - for model MID-H20K-T40		**P**
	Minimum DC input (V) Maximum DC input (V) Nominal DC input (V) Nominal output AC voltage (V) :		135Vdc 750Vdc 640Vdc 230Vac
AC output U (V)	**Frequency (Hz)**	**Condition/status**	**Comments**
226.84	50.0	Resistive load removal	
226.80	50.0	Without load	Maximum DC input (V)
226.77	50.0	Resistive load application	
226.86	50.0	Resistive load removal	

Supplementary information:

Below testing with data were included in this table:

4.7.4.2 Steady state output voltage at nominal DC input

4.7.4.3 Steady state output voltage across the DC input range

4.7.4.4 Load step response of the output voltage at nominal DC input

4.7.4.5 Steady state output frequency

4.7.5.2	**TABLE: Sinusoidal output voltage waveform requirements**									**P**
Harmonic. Nr.(U)	P/Prated: % of rated output power									Limits (% of Fundamental)
	5%			50%			100%			
	L1 [%]	L2 [%]	L3 [%]	L1 [%]	L2 [%]	L3 [%]	L1 [%]	L2 [%]	L3 [%]	
Model: MID-H4K-T										
2.	0.034	0.018	0.023	0.019	0.030	0.039	0.044	0.020	0.029	6
3.	0.039	0.044	0.063	0.099	0.067	0.100	0.106	0.104	0.058	6
4.	0.028	0.028	0.036	0.018	0.027	0.040	0.038	0.018	0.028	6
5.	0.096	0.069	0.080	0.156	0.150	0.148	0.155	0.154	0.148	6
6.	0.025	0.013	0.027	0.010	0.020	0.019	0.024	0.015	0.026	6
7.	0.052	0.052	0.064	0.079	0.056	0.071	0.085	0.074	0.045	6
8.	0.073	0.065	0.073	0.067	0.072	0.081	0.077	0.073	0.081	6
9.	0.023	0.014	0.020	0.023	0.035	0.033	0.033	0.022	0.040	6
10.	0.058	0.056	0.060	0.067	0.071	0.092	0.087	0.072	0.076	6
11.	0.037	0.053	0.047	0.036	0.051	0.033	0.039	0.034	0.047	6
12.	0.025	0.009	0.018	0.010	0.019	0.019	0.020	0.010	0.015	6
13.	0.027	0.025	0.029	0.060	0.051	0.053	0.058	0.056	0.046	6
14.	0.017	0.017	0.017	0.022	0.020	0.035	0.034	0.022	0.018	6

15.	0.013	0.011	0.020	0.023	0.023	0.031	0.029	0.020	0.023	6
16.	0.022	0.015	0.021	0.019	0.018	0.019	0.020	0.019	0.019	6
17.	0.021	0.022	0.026	0.044	0.044	0.044	0.047	0.041	0.043	6
18.	0.012	0.009	0.010	0.009	0.008	0.011	0.013	0.010	0.009	6
19.	0.017	0.024	0.023	0.050	0.050	0.042	0.047	0.053	0.046	6
20.	0.014	0.014	0.012	0.019	0.012	0.018	0.019	0.017	0.016	6
21.	0.015	0.011	0.018	0.008	0.011	0.015	0.014	0.011	0.013	6
22.	0.013	0.019	0.018	0.012	0.010	0.012	0.014	0.013	0.010	6
23.	0.023	0.025	0.022	0.030	0.029	0.022	0.025	0.028	0.027	6
24.	0.011	0.010	0.015	0.013	0.012	0.015	0.016	0.010	0.014	6
25.	0.021	0.012	0.016	0.035	0.031	0.034	0.036	0.032	0.028	6
26.	0.017	0.015	0.018	0.016	0.025	0.022	0.023	0.017	0.024	6
27.	0.009	0.008	0.010	0.011	0.022	0.013	0.012	0.013	0.016	6
28.	0.021	0.019	0.023	0.025	0.022	0.023	0.026	0.028	0.024	6
29.	0.017	0.017	0.015	0.035	0.030	0.033	0.039	0.031	0.033	6
30.	0.013	0.008	0.010	0.010	0.009	0.010	0.012	0.010	0.012	6
31.	0.012	0.014	0.015	0.037	0.039	0.040	0.040	0.036	0.038	6
32.	0.013	0.015	0.011	0.018	0.013	0.019	0.020	0.018	0.016	6
33.	0.010	0.009	0.009	0.015	0.014	0.017	0.016	0.013	0.012	6
34.	0.010	0.011	0.012	0.010	0.012	0.012	0.015	0.014	0.018	6
35.	0.016	0.017	0.021	0.032	0.027	0.030	0.033	0.034	0.036	6
36.	0.010	0.009	0.010	0.007	0.013	0.012	0.012	0.012	0.013	6
37.	0.020	0.018	0.019	0.032	0.030	0.032	0.030	0.033	0.033	6
38.	0.014	0.012	0.012	0.011	0.013	0.012	0.014	0.011	0.015	6
39.	0.008	0.010	0.009	0.009	0.009	0.009	0.008	0.011	0.014	6
40.	0.013	0.013	0.017	0.010	0.011	0.011	0.014	0.011	0.012	6
Total THD	0.156	0.142	0.159	0.246	0.231	0.256	0.260	0.243	0.226	10
Supplementary information:										

4.7.5.2	**TABLE: Sinusoidal output voltage waveform requirements**								**P**
Harmonic. Nr.(U)	P/Prated: % of rated output power								Limits (% of Fundamental)
	5%			50%			100%		
	L1 [%]	L2 [%]	L3 [%]	L1 [%]	L2 [%]	L3 [%]	L1 [%]	L2 [%]	L3 [%]	
Model: MID-H5K-T									
2.	0.017	0.032	0.043	0.019	0.029	0.037	0.019	0.030	0.037	6

3.	0.100	0.068	0.101	0.099	0.073	0.103	0.099	0.066	0.102	6
4.	0.015	0.028	0.040	0.016	0.028	0.040	0.018	0.028	0.044	6
5.	0.154	0.153	0.149	0.155	0.153	0.147	0.155	0.150	0.148	6
6.	0.010	0.019	0.021	0.012	0.020	0.022	0.009	0.020	0.023	6
7.	0.079	0.058	0.075	0.079	0.058	0.072	0.077	0.060	0.074	6
8.	0.068	0.071	0.079	0.071	0.077	0.080	0.068	0.071	0.082	6
9.	0.023	0.036	0.032	0.022	0.036	0.033	0.022	0.039	0.035	6
10.	0.069	0.074	0.088	0.069	0.077	0.095	0.066	0.074	0.090	6
11.	0.037	0.053	0.035	0.036	0.052	0.034	0.037	0.051	0.034	6
12.	0.012	0.018	0.020	0.011	0.019	0.023	0.010	0.016	0.020	6
13.	0.059	0.051	0.053	0.057	0.051	0.054	0.059	0.051	0.053	6
14.	0.023	0.020	0.039	0.022	0.022	0.035	0.023	0.020	0.035	6
15.	0.022	0.022	0.030	0.023	0.022	0.030	0.022	0.021	0.029	6
16.	0.020	0.018	0.020	0.023	0.019	0.020	0.019	0.021	0.019	6
17.	0.044	0.047	0.048	0.042	0.045	0.047	0.044	0.046	0.046	6
18.	0.010	0.010	0.013	0.011	0.011	0.012	0.011	0.012	0.013	6
19.	0.052	0.051	0.043	0.050	0.047	0.040	0.049	0.048	0.041	6
20.	0.018	0.015	0.019	0.018	0.013	0.017	0.017	0.012	0.018	6
21.	0.008	0.012	0.016	0.008	0.013	0.016	0.009	0.013	0.017	6
22.	0.013	0.012	0.011	0.014	0.011	0.012	0.013	0.013	0.012	6
23.	0.030	0.029	0.024	0.028	0.030	0.022	0.029	0.031	0.022	6
24.	0.010	0.010	0.015	0.011	0.013	0.014	0.010	0.010	0.016	6
25.	0.036	0.032	0.034	0.035	0.031	0.033	0.035	0.028	0.032	6
26.	0.018	0.024	0.024	0.017	0.023	0.022	0.016	0.024	0.023	6
27.	0.014	0.014	0.014	0.014	0.016	0.015	0.016	0.018	0.013	6
28.	0.022	0.023	0.000	0.024	0.022	0.017	0.026	0.024	0.021	6
29.	0.034	0.029	0.034	0.035	0.032	0.035	0.035	0.031	0.034	6
30.	0.009	0.013	0.014	0.012	0.011	0.012	0.009	0.012	0.012	6
31.	0.035	0.039	0.040	0.039	0.040	0.041	0.038	0.039	0.043	6
32.	0.018	0.014	0.020	0.018	0.015	0.021	0.017	0.016	0.018	6
33.	0.014	0.011	0.016	0.013	0.012	0.015	0.015	0.014	0.019	6
34.	0.010	0.011	0.014	0.011	0.012	0.015	0.009	0.012	0.012	6
35.	0.034	0.026	0.030	0.036	0.028	0.032	0.033	0.028	0.030	6
36.	0.010	0.012	0.013	0.007	0.013	0.012	0.008	0.012	0.011	6
37.	0.031	0.030	0.031	0.031	0.029	0.032	0.031	0.030	0.032	6

38.	0.010	0.013	0.012	0.010	0.014	0.012	0.010	0.014	0.011	6
39.	0.011	0.009	0.011	0.010	0.011	0.010	0.009	0.011	0.009	6
40.	0.009	0.012	0.011	0.010	0.012	0.011	0.009	0.012	0.013	6
Total THD	0.245	0.230	0.255	0.247	0.233	0.254	0.245	0.230	0.256	10
Supplementary information:										

4.7.5.2	**TABLE: Sinusoidal output voltage waveform requirements**								**P**
Harmonic. Nr.(U)	P/Prated: % of rated output power								Limits (% of Fundamental)
	5%			50%			100%		
	L1 [%]	L2 [%]	L3 [%]	L1 [%]	L2 [%]	L3 [%]	L1 [%]	L2 [%]	L3 [%]	
Model: MID-H6K-T										
2.	0.017	0.029	0.038	0.017	0.030	0.037	0.016	0.028	0.039	6
3.	0.099	0.068	0.100	0.100	0.067	0.101	0.102	0.067	0.101	6
4.	0.020	0.028	0.041	0.016	0.028	0.040	0.016	0.025	0.043	6
5.	0.158	0.153	0.149	0.153	0.150	0.148	0.153	0.148	0.148	6
6.	0.011	0.019	0.021	0.009	0.020	0.020	0.013	0.018	0.021	6
7.	0.083	0.061	0.073	0.078	0.056	0.071	0.078	0.061	0.074	6
8.	0.069	0.073	0.080	0.068	0.073	0.080	0.067	0.072	0.079	6
9.	0.023	0.042	0.034	0.022	0.036	0.033	0.027	0.034	0.031	6
10.	0.069	0.075	0.096	0.067	0.079	0.093	0.068	0.075	0.091	6
11.	0.037	0.051	0.034	0.037	0.051	0.036	0.034	0.051	0.034	6
12.	0.013	0.019	0.022	0.012	0.017	0.019	0.011	0.017	0.020	6
13.	0.060	0.051	0.054	0.058	0.051	0.054	0.057	0.050	0.054	6
14.	0.023	0.021	0.038	0.028	0.021	0.038	0.021	0.023	0.035	6
15.	0.023	0.022	0.030	0.022	0.022	0.029	0.022	0.022	0.030	6
16.	0.020	0.020	0.022	0.021	0.019	0.021	0.020	0.022	0.021	6
17.	0.046	0.047	0.044	0.046	0.046	0.047	0.046	0.043	0.046	6
18.	0.011	0.010	0.012	0.010	0.011	0.012	0.010	0.010	0.013	6
19.	0.051	0.050	0.042	0.050	0.049	0.042	0.050	0.048	0.041	6
20.	0.020	0.015	0.021	0.016	0.012	0.017	0.019	0.015	0.020	6
21.	0.011	0.012	0.019	0.008	0.012	0.015	0.009	0.011	0.018	6
22.	0.014	0.010	0.010	0.012	0.011	0.011	0.012	0.009	0.012	6
23.	0.029	0.030	0.022	0.029	0.030	0.022	0.031	0.029	0.022	6
24.	0.010	0.011	0.014	0.009	0.011	0.014	0.010	0.011	0.014	6
25.	0.035	0.029	0.034	0.034	0.033	0.035	0.034	0.031	0.036	6

26.	0.018	0.023	0.021	0.019	0.023	0.021	0.019	0.024	0.024	6
27.	0.012	0.015	0.014	0.014	0.017	0.012	0.013	0.017	0.014	6
28.	0.024	0.023	0.019	0.024	0.022	0.020	0.026	0.024	0.023	6
29.	0.036	0.031	0.035	0.035	0.030	0.034	0.035	0.029	0.034	6
30.	0.011	0.012	0.013	0.010	0.011	0.013	0.012	0.010	0.013	6
31.	0.034	0.037	0.039	0.035	0.038	0.040	0.037	0.037	0.040	6
32.	0.023	0.016	0.021	0.018	0.014	0.018	0.017	0.014	0.018	6
33.	0.013	0.010	0.016	0.016	0.010	0.018	0.013	0.010	0.015	6
34.	0.016	0.015	0.017	0.012	0.014	0.013	0.011	0.011	0.013	6
35.	0.034	0.029	0.030	0.032	0.029	0.029	0.034	0.027	0.030	6
36.	0.009	0.013	0.012	0.007	0.013	0.013	0.010	0.012	0.015	6
37.	0.030	0.030	0.031	0.030	0.030	0.033	0.030	0.030	0.032	6
38.	0.009	0.014	0.013	0.009	0.012	0.011	0.010	0.013	0.010	6
39.	0.011	0.012	0.010	0.009	0.011	0.009	0.009	0.010	0.009	6
40.	0.010	0.012	0.011	0.009	0.011	0.011	0.009	0.010	0.011	6
Total THD	0.245	0.231	0.256	0.245	0.231	0.254	0.244	0.230	0.255	10
Supplementary information:										

4.7.5.2	**TABLE: Sinusoidal output voltage waveform requirements**								**P**
Harmonic. Nr.(U)	P/Prated: % of rated output power								Limits (% of Fundamental)
	5%			50%			100%		
	L1 [%]	L2 [%]	L3 [%]	L1 [%]	L2 [%]	L3 [%]	L1 [%]	L2 [%]	L3 [%]	
Model: MID-H8K-T									
2.	0.020	0.030	0.043	0.017	0.027	0.042	0.017	0.030	0.039	6
3.	0.099	0.066	0.101	0.100	0.067	0.099	0.101	0.069	0.101	6
4.	0.018	0.030	0.042	0.017	0.027	0.044	0.016	0.027	0.041	6
5.	0.156	0.152	0.152	0.154	0.150	0.148	0.155	0.150	0.150	6
6.	0.012	0.021	0.023	0.011	0.019	0.021	0.011	0.019	0.023	6
7.	0.084	0.061	0.077	0.079	0.057	0.071	0.081	0.059	0.073	6
8.	0.068	0.072	0.083	0.069	0.070	0.080	0.071	0.073	0.082	6
9.	0.026	0.038	0.032	0.023	0.037	0.034	0.024	0.038	0.032	6
10.	0.068	0.072	0.087	0.070	0.073	0.086	0.068	0.080	0.089	6
11.	0.038	0.051	0.037	0.035	0.050	0.037	0.036	0.051	0.034	6
12.	0.010	0.018	0.021	0.012	0.018	0.021	0.011	0.021	0.020	6
13.	0.058	0.051	0.055	0.057	0.050	0.053	0.058	0.050	0.053	6

14.	0.021	0.021	0.041	0.024	0.022	0.034	0.024	0.024	0.036	6
15.	0.023	0.022	0.030	0.021	0.024	0.029	0.021	0.021	0.030	6
16.	0.019	0.020	0.021	0.020	0.019	0.020	0.021	0.020	0.020	6
17.	0.045	0.046	0.048	0.043	0.045	0.047	0.044	0.045	0.045	6
18.	0.009	0.011	0.013	0.010	0.009	0.012	0.010	0.011	0.012	6
19.	0.052	0.049	0.045	0.049	0.048	0.041	0.052	0.049	0.041	6
20.	0.020	0.013	0.018	0.017	0.013	0.018	0.017	0.013	0.018	6
21.	0.010	0.013	0.017	0.008	0.013	0.016	0.008	0.012	0.015	6
22.	0.016	0.010	0.010	0.012	0.010	0.011	0.013	0.009	0.013	6
23.	0.029	0.030	0.024	0.029	0.032	0.024	0.029	0.031	0.024	6
24.	0.011	0.012	0.016	0.011	0.010	0.012	0.009	0.011	0.014	6
25.	0.032	0.029	0.036	0.038	0.031	0.037	0.036	0.030	0.034	6
26.	0.019	0.025	0.020	0.018	0.022	0.021	0.021	0.022	0.020	6
27.	0.013	0.014	0.013	0.014	0.019	0.014	0.016	0.013	0.014	6
28.	0.025	0.023	0.021	0.025	0.022	0.024	0.023	0.023	0.025	6
29.	0.035	0.031	0.033	0.035	0.029	0.035	0.035	0.031	0.035	6
30.	0.009	0.013	0.011	0.013	0.012	0.013	0.010	0.011	0.013	6
31.	0.035	0.038	0.038	0.034	0.038	0.039	0.037	0.038	0.040	6
32.	0.022	0.015	0.021	0.020	0.015	0.020	0.022	0.014	0.021	6
33.	0.013	0.015	0.019	0.014	0.010	0.014	0.014	0.012	0.016	6
34.	0.011	0.012	0.014	0.011	0.013	0.017	0.008	0.014	0.013	6
35.	0.037	0.030	0.032	0.034	0.028	0.030	0.033	0.028	0.030	6
36.	0.009	0.015	0.014	0.008	0.012	0.012	0.010	0.012	0.011	6
37.	0.031	0.029	0.031	0.032	0.031	0.034	0.030	0.031	0.033	6
38.	0.010	0.014	0.011	0.010	0.014	0.011	0.010	0.014	0.011	6
39.	0.009	0.011	0.009	0.011	0.011	0.010	0.011	0.010	0.010	6
40.	0.011	0.011	0.012	0.009	0.010	0.010	0.008	0.010	0.011	6
Total THD	0.247	0.231	0.259	0.245	0.230	0.254	0.244	0.232	0.255	10
Supplementary information:										

4.7.5.2	TABLE: Sinusoidal output voltage waveform requirements								P
Harmonic. Nr.(U)	P/Prated: % of rated output power								Limits (% of Fundamental)
	5%			50%			100%		
	L1 [%]	L2 [%]	L3 [%]	L1 [%]	L2 [%]	L3 [%]	L1 [%]	L2 [%]	L3 [%]	
Model: MID-H10K-T									

2.	0.018	0.029	0.043	0.018	0.029	0.043	0.043	0.021	0.029	6
3.	0.099	0.067	0.102	0.099	0.067	0.102	0.103	0.105	0.057	6
4.	0.017	0.028	0.042	0.017	0.028	0.042	0.038	0.017	0.041	6
5.	0.155	0.150	0.152	0.155	0.150	0.152	0.153	0.152	0.150	6
6.	0.014	0.025	0.024	0.014	0.025	0.024	0.024	0.014	0.023	6
7.	0.078	0.058	0.073	0.078	0.058	0.073	0.084	0.074	0.073	6
8.	0.068	0.075	0.083	0.068	0.075	0.083	0.078	0.072	0.082	6
9.	0.025	0.036	0.035	0.025	0.036	0.035	0.032	0.024	0.032	6
10.	0.067	0.074	0.092	0.067	0.074	0.092	0.084	0.069	0.089	6
11.	0.035	0.051	0.033	0.035	0.051	0.033	0.039	0.033	0.034	6
12.	0.011	0.017	0.022	0.011	0.017	0.022	0.018	0.008	0.020	6
13.	0.057	0.050	0.052	0.057	0.050	0.052	0.057	0.055	0.053	6
14.	0.023	0.022	0.041	0.023	0.022	0.041	0.032	0.022	0.036	6
15.	0.022	0.021	0.029	0.022	0.021	0.029	0.028	0.021	0.030	6
16.	0.019	0.019	0.020	0.019	0.019	0.020	0.018	0.02	0.020	6
17.	0.044	0.045	0.047	0.044	0.045	0.047	0.047	0.042	0.045	6
18.	0.010	0.011	0.012	0.010	0.011	0.012	0.011	0.008	0.012	6
19.	0.052	0.050	0.041	0.052	0.050	0.041	0.045	0.048	0.041	6
20.	0.017	0.012	0.018	0.017	0.012	0.018	0.014	0.015	0.018	6
21.	0.008	0.013	0.017	0.008	0.013	0.017	0.011	0.011	0.015	6
22.	0.015	0.009	0.010	0.015	0.009	0.010	0.012	0.013	0.013	6
23.	0.029	0.029	0.023	0.029	0.029	0.023	0.024	0.027	0.024	6
24.	0.013	0.011	0.014	0.013	0.011	0.014	0.016	0.008	0.014	6
25.	0.038	0.029	0.035	0.038	0.029	0.035	0.034	0.031	0.034	6
26.	0.018	0.023	0.020	0.018	0.023	0.020	0.022	0.015	0.020	6
27.	0.013	0.013	0.010	0.013	0.013	0.010	0.012	0.012	0.014	6
28.	0.024	0.024	0.022	0.024	0.024	0.022	0.026	0.025	0.025	6
29.	0.038	0.029	0.034	0.038	0.029	0.034	0.037	0.031	0.035	6
30.	0.009	0.011	0.012	0.009	0.011	0.012	0.01	0.008	0.013	6
31.	0.036	0.038	0.038	0.036	0.038	0.038	0.038	0.033	0.040	6
32.	0.017	0.016	0.018	0.017	0.016	0.018	0.019	0.019	0.021	6
33.	0.014	0.013	0.016	0.014	0.013	0.016	0.014	0.013	0.016	6
34.	0.009	0.012	0.012	0.009	0.012	0.012	0.013	0.013	0.013	6
35.	0.034	0.030	0.030	0.034	0.030	0.030	0.032	0.036	0.030	6
36.	0.007	0.012	0.014	0.007	0.012	0.014	0.012	0.01	0.011	6

37.	0.030	0.030	0.032	0.030	0.030	0.032	0.03	0.032	0.033	6
38.	0.010	0.014	0.013	0.010	0.014	0.013	0.013	0.01	0.014	6
39.	0.010	0.010	0.008	0.010	0.010	0.008	0.007	0.007	0.011	6
40.	0.008	0.011	0.015	0.008	0.011	0.015	0.013	0.013	0.011	6
Total THD	0.245	0.233	0.259	0.245	0.233	0.259	0.259	0.243	0.226	10
Supplementary information:										

4.7.5.2	**TABLE: Sinusoidal output voltage waveform requirements**								**P**
Harmonic. Nr.(U)	P/Prated: % of rated output power								Limits (% of Fundamental)
	5%			50%			100%		
	L1 [%]	L2 [%]	L3 [%]	L1 [%]	L2 [%]	L3 [%]	L1 [%]	L2 [%]	L3 [%]	
Model: MID-H10K-T40									
2.	0.021	0.028	0.040	0.018	0.029	0.038	0.021	0.028	0.039	6
3.	0.101	0.067	0.101	0.100	0.067	0.102	0.099	0.067	0.100	6
4.	0.016	0.026	0.041	0.019	0.027	0.042	0.015	0.028	0.041	6
5.	0.155	0.150	0.149	0.156	0.150	0.148	0.156	0.152	0.148	6
6.	0.011	0.020	0.020	0.012	0.022	0.023	0.011	0.020	0.021	6
7.	0.079	0.060	0.073	0.082	0.059	0.077	0.081	0.060	0.075	6
8.	0.067	0.073	0.078	0.068	0.071	0.081	0.066	0.071	0.080	6
9.	0.023	0.036	0.034	0.024	0.038	0.036	0.023	0.037	0.031	6
10.	0.066	0.077	0.088	0.067	0.071	0.093	0.065	0.077	0.092	6
11.	0.036	0.052	0.035	0.036	0.051	0.036	0.036	0.052	0.035	6
12.	0.014	0.019	0.023	0.010	0.019	0.024	0.009	0.018	0.021	6
13.	0.059	0.052	0.053	0.058	0.052	0.054	0.057	0.050	0.054	6
14.	0.022	0.025	0.035	0.024	0.020	0.034	0.021	0.018	0.037	6
15.	0.022	0.022	0.030	0.023	0.022	0.029	0.024	0.021	0.030	6
16.	0.021	0.020	0.021	0.019	0.020	0.023	0.021	0.020	0.023	6
17.	0.043	0.045	0.046	0.044	0.046	0.045	0.043	0.048	0.045	6
18.	0.009	0.011	0.012	0.010	0.013	0.013	0.012	0.011	0.013	6
19.	0.051	0.049	0.040	0.049	0.048	0.040	0.049	0.049	0.041	6
20.	0.017	0.014	0.019	0.017	0.014	0.019	0.017	0.012	0.017	6
21.	0.009	0.011	0.017	0.009	0.013	0.016	0.008	0.013	0.017	6
22.	0.014	0.010	0.010	0.013	0.011	0.012	0.013	0.011	0.011	6
23.	0.029	0.031	0.022	0.029	0.030	0.023	0.030	0.030	0.021	6
24.	0.014	0.009	0.014	0.010	0.011	0.015	0.012	0.012	0.016	6

25.	0.035	0.029	0.038	0.035	0.032	0.035	0.034	0.031	0.034	6
26.	0.018	0.023	0.020	0.019	0.023	0.022	0.019	0.026	0.022	6
27.	0.014	0.018	0.012	0.011	0.016	0.013	0.015	0.015	0.012	6
28.	0.024	0.022	0.023	0.024	0.022	0.023	0.026	0.023	0.025	6
29.	0.035	0.029	0.033	0.035	0.030	0.033	0.034	0.030	0.035	6
30.	0.010	0.012	0.014	0.013	0.013	0.013	0.010	0.012	0.011	6
31.	0.035	0.039	0.039	0.035	0.037	0.039	0.036	0.040	0.039	6
32.	0.018	0.018	0.020	0.020	0.016	0.021	0.018	0.014	0.019	6
33.	0.012	0.010	0.015	0.014	0.013	0.015	0.014	0.012	0.020	6
34.	0.010	0.012	0.012	0.010	0.014	0.014	0.012	0.015	0.013	6
35.	0.032	0.028	0.030	0.033	0.026	0.029	0.035	0.028	0.030	6
36.	0.008	0.012	0.012	0.009	0.012	0.012	0.008	0.012	0.013	6
37.	0.030	0.031	0.033	0.033	0.029	0.032	0.030	0.030	0.031	6
38.	0.011	0.012	0.011	0.010	0.013	0.011	0.011	0.012	0.012	6
39.	0.010	0.010	0.009	0.011	0.012	0.012	0.010	0.009	0.009	6
40.	0.010	0.010	0.010	0.008	0.010	0.011	0.009	0.014	0.013	6
Total THD	0.247	0.232	0.253	0.246	0.230	0.258	0.244	0.231	0.254	10
Supplementary information:										

4.7.5.2	**TABLE: Sinusoidal output voltage waveform requirements**								**P**
Harmonic. Nr.(U)	P/Prated: % of rated output power								Limits (% of Fundamental)
	5%			50%			100%		
	L1 [%]	L2 [%]	L3 [%]	L1 [%]	L2 [%]	L3 [%]	L1 [%]	L2 [%]	L3 [%]	
Model: MID-H12K-T									
2.	0.016	0.029	0.041	0.017	0.026	0.04	0.007	0.018	0.023	6
3.	0.102	0.067	0.104	0.098	0.066	0.101	0.092	0.059	0.094	6
4.	0.019	0.026	0.041	0.017	0.029	0.042	0.011	0.019	0.034	6
5.	0.156	0.151	0.151	0.156	0.156	0.149	0.145	0.141	0.139	6
6.	0.014	0.020	0.022	0.013	0.021	0.022	0.004	0.012	0.014	6
7.	0.078	0.057	0.076	0.078	0.056	0.072	0.069	0.047	0.063	6
8.	0.071	0.072	0.081	0.068	0.073	0.084	0.061	0.065	0.072	6
9.	0.024	0.039	0.034	0.023	0.036	0.032	0.015	0.027	0.024	6
10.	0.070	0.071	0.092	0.067	0.071	0.092	0.060	0.062	0.074	6
11.	0.036	0.052	0.035	0.035	0.053	0.033	0.029	0.043	0.028	6
12.	0.011	0.020	0.021	0.011	0.018	0.022	0.005	0.010	0.013	6

13.	0.057	0.051	0.055	0.056	0.05	0.053	0.050	0.043	0.047	6
14.	0.023	0.024	0.038	0.025	0.02	0.037	0.015	0.010	0.022	6
15.	0.024	0.022	0.030	0.022	0.021	0.03	0.016	0.015	0.023	6
16.	0.019	0.020	0.022	0.02	0.021	0.02	0.013	0.013	0.014	6
17.	0.047	0.045	0.045	0.044	0.048	0.047	0.036	0.038	0.038	6
18.	0.011	0.010	0.012	0.009	0.013	0.012	0.003	0.004	0.006	6
19.	0.050	0.049	0.043	0.051	0.05	0.04	0.042	0.041	0.034	6
20.	0.017	0.013	0.019	0.017	0.014	0.019	0.010	0.006	0.011	6
21.	0.009	0.012	0.016	0.009	0.015	0.016	0.003	0.005	0.010	6
22.	0.013	0.010	0.011	0.012	0.008	0.011	0.007	0.004	0.005	6
23.	0.030	0.034	0.023	0.029	0.03	0.026	0.022	0.023	0.017	6
24.	0.011	0.011	0.017	0.012	0.01	0.014	0.004	0.005	0.008	6
25.	0.035	0.030	0.034	0.038	0.033	0.035	0.027	0.022	0.027	6
26.	0.019	0.025	0.023	0.019	0.023	0.02	0.010	0.015	0.013	6
27.	0.015	0.016	0.012	0.013	0.014	0.013	0.005	0.006	0.005	6
28.	0.024	0.021	0.022	0.023	0.022	0.025	0.016	0.014	0.015	6
29.	0.036	0.031	0.035	0.035	0.032	0.035	0.028	0.022	0.027	6
30.	0.011	0.014	0.012	0.012	0.013	0.014	0.004	0.005	0.005	6
31.	0.037	0.039	0.040	0.036	0.04	0.039	0.029	0.031	0.032	6
32.	0.018	0.014	0.019	0.019	0.015	0.021	0.011	0.008	0.012	6
33.	0.017	0.012	0.018	0.013	0.012	0.016	0.007	0.004	0.009	6
34.	0.014	0.013	0.016	0.01	0.012	0.012	0.004	0.006	0.006	6
35.	0.035	0.028	0.030	0.035	0.028	0.031	0.026	0.021	0.023	6
36.	0.009	0.012	0.012	0.008	0.013	0.012	0.003	0.006	0.006	6
37.	0.032	0.031	0.032	0.032	0.033	0.032	0.024	0.024	0.025	6
38.	0.012	0.014	0.013	0.009	0.014	0.013	0.004	0.007	0.005	6
39.	0.009	0.010	0.010	0.009	0.012	0.011	0.004	0.005	0.004	6
40.	0.010	0.011	0.012	0.008	0.011	0.011	0.003	0.005	0.005	6
Total THD	0.247	0.231	0.256	0.244	0.229	0.259	0.236	0.222	0.245	10
Supplementary information:										

4.7.5.2	**TABLE: Sinusoidal output voltage waveform requirements**								**P**
Harmonic. Nr.(U)	P/Prated: % of rated output power								Limits (% of Fundamental)
	5%			50%			100%		
	L1 [%]	L2 [%]	L3 [%]	L1 [%]	L2 [%]	L3 [%]	L1 [%]	L2 [%]	L3 [%]

Model: MID-H12K-T40										
2.	0.006	0.017	0.022	0.007	0.017	0.022	0.017	0.031	0.039	6
3.	0.092	0.059	0.093	0.092	0.059	0.093	0.099	0.066	0.099	6
4.	0.010	0.019	0.033	0.010	0.019	0.033	0.018	0.028	0.040	6
5.	0.147	0.142	0.139	0.147	0.142	0.139	0.154	0.151	0.148	6
6.	0.004	0.012	0.014	0.004	0.012	0.014	0.011	0.022	0.022	6
7.	0.071	0.049	0.064	0.071	0.049	0.064	0.081	0.060	0.075	6
8.	0.060	0.065	0.071	0.060	0.065	0.072	0.067	0.070	0.080	6
9.	0.015	0.027	0.024	0.014	0.027	0.024	0.026	0.037	0.033	6
10.	0.059	0.061	0.073	0.059	0.061	0.073	0.069	0.071	0.095	6
11.	0.029	0.044	0.028	0.029	0.044	0.028	0.036	0.053	0.034	6
12.	0.005	0.010	0.013	0.005	0.011	0.013	0.011	0.018	0.020	6
13.	0.051	0.044	0.047	0.051	0.044	0.047	0.058	0.052	0.056	6
14.	0.015	0.011	0.021	0.015	0.011	0.021	0.023	0.020	0.031	6
15.	0.016	0.015	0.023	0.016	0.015	0.023	0.023	0.021	0.029	6
16.	0.013	0.013	0.015	0.013	0.013	0.015	0.020	0.019	0.022	6
17.	0.036	0.037	0.038	0.036	0.037	0.038	0.045	0.044	0.046	6
18.	0.004	0.005	0.006	0.004	0.005	0.006	0.010	0.011	0.013	6
19.	0.042	0.041	0.034	0.042	0.041	0.034	0.050	0.051	0.040	6
20.	0.011	0.007	0.012	0.011	0.007	0.012	0.018	0.014	0.018	6
21.	0.003	0.006	0.010	0.003	0.005	0.010	0.009	0.012	0.016	6
22.	0.007	0.004	0.005	0.007	0.004	0.004	0.012	0.010	0.009	6
23.	0.022	0.023	0.016	0.022	0.023	0.016	0.028	0.030	0.023	6
24.	0.004	0.005	0.008	0.004	0.004	0.008	0.012	0.010	0.014	6
25.	0.027	0.022	0.027	0.027	0.022	0.027	0.035	0.029	0.033	6
26.	0.010	0.016	0.013	0.010	0.015	0.013	0.018	0.023	0.021	6
27.	0.005	0.006	0.005	0.005	0.007	0.005	0.013	0.017	0.013	6
28.	0.016	0.015	0.017	0.016	0.015	0.013	0.022	0.022	0.023	6
29.	0.028	0.023	0.026	0.028	0.023	0.026	0.035	0.028	0.035	6
30.	0.004	0.005	0.006	0.004	0.005	0.005	0.013	0.010	0.012	6
31.	0.028	0.031	0.032	0.028	0.031	0.032	0.034	0.038	0.043	6
32.	0.011	0.007	0.011	0.011	0.007	0.011	0.018	0.019	0.020	6
33.	0.006	0.004	0.008	0.006	0.004	0.008	0.011	0.010	0.016	6
34.	0.003	0.006	0.006	0.003	0.006	0.006	0.009	0.011	0.014	6
35.	0.026	0.021	0.023	0.026	0.021	0.023	0.032	0.027	0.031	6

36.	0.003	0.006	0.006	0.003	0.006	0.006	0.008	0.015	0.012	6
37.	0.024	0.024	0.025	0.024	0.023	0.025	0.029	0.031	0.031	6
38.	0.004	0.006	0.005	0.004	0.007	0.005	0.009	0.013	0.011	6
39.	0.004	0.005	0.004	0.004	0.005	0.004	0.009	0.010	0.009	6
40.	0.003	0.005	0.004	0.003	0.004	0.004	0.008	0.010	0.012	6
Total THD	0.237	0.223	0.245	0.237	0.222	0.245	0.245	0.228	0.254	10
Supplementary information:										

4.7.5.2	**TABLE: Sinusoidal output voltage waveform requirements**								**P**
Harmonic. Nr.(U)	P/Prated: % of rated output power								Limits (% of Fundamental)
	5%			50%			100%		
	L1 [%]	L2 [%]	L3 [%]	L1 [%]	L2 [%]	L3 [%]	L1 [%]	L2 [%]	L3 [%]	
Model: MID-H15K-T40									
2.	0.018	0.030	0.042	0.020	0.029	0.040	0.018	0.029	0.042	6
3.	0.098	0.067	0.101	0.100	0.068	0.100	0.099	0.067	0.101	6
4.	0.018	0.027	0.042	0.019	0.030	0.041	0.017	0.026	0.041	6
5.	0.155	0.151	0.148	0.156	0.154	0.149	0.153	0.151	0.150	6
6.	0.010	0.023	0.021	0.012	0.022	0.023	0.010	0.020	0.021	6
7.	0.080	0.057	0.075	0.080	0.060	0.075	0.080	0.062	0.076	6
8.	0.067	0.071	0.080	0.068	0.074	0.081	0.067	0.071	0.082	6
9.	0.022	0.036	0.031	0.026	0.039	0.033	0.025	0.039	0.032	6
10.	0.068	0.074	0.085	0.066	0.072	0.092	0.068	0.073	0.089	6
11.	0.036	0.050	0.034	0.036	0.051	0.038	0.035	0.051	0.035	6
12.	0.010	0.019	0.020	0.011	0.019	0.021	0.010	0.018	0.021	6
13.	0.057	0.049	0.053	0.057	0.052	0.054	0.058	0.051	0.056	6
14.	0.022	0.020	0.033	0.024	0.022	0.037	0.022	0.018	0.043	6
15.	0.022	0.021	0.028	0.022	0.022	0.030	0.022	0.021	0.029	6
16.	0.019	0.019	0.020	0.020	0.019	0.022	0.019	0.017	0.020	6
17.	0.043	0.045	0.044	0.044	0.046	0.044	0.043	0.046	0.047	6
18.	0.009	0.009	0.012	0.010	0.010	0.012	0.010	0.010	0.015	6
19.	0.052	0.049	0.041	0.051	0.048	0.041	0.051	0.051	0.041	6
20.	0.018	0.013	0.019	0.017	0.013	0.018	0.020	0.014	0.018	6
21.	0.008	0.011	0.015	0.009	0.011	0.017	0.008	0.012	0.016	6
22.	0.012	0.010	0.009	0.016	0.010	0.011	0.012	0.009	0.012	6
23.	0.028	0.028	0.022	0.028	0.030	0.022	0.029	0.029	0.022	6

24.	0.010	0.011	0.014	0.010	0.013	0.014	0.011	0.010	0.014	6
25.	0.035	0.027	0.035	0.034	0.030	0.036	0.034	0.029	0.034	6
26.	0.018	0.023	0.023	0.018	0.023	0.020	0.017	0.023	0.021	6
27.	0.013	0.017	0.013	0.014	0.019	0.016	0.013	0.015	0.013	6
28.	0.024	0.022	0.026	0.025	0.021	0.024	0.024	0.023	0.021	6
29.	0.038	0.029	0.034	0.036	0.029	0.035	0.036	0.030	0.034	6
30.	0.009	0.011	0.011	0.010	0.012	0.013	0.010	0.011	0.011	6
31.	0.037	0.043	0.041	0.034	0.038	0.039	0.035	0.037	0.040	6
32.	0.020	0.014	0.019	0.020	0.015	0.024	0.018	0.015	0.020	6
33.	0.014	0.014	0.020	0.013	0.012	0.017	0.013	0.011	0.018	6
34.	0.011	0.013	0.014	0.013	0.018	0.016	0.009	0.013	0.014	6
35.	0.033	0.028	0.029	0.035	0.028	0.033	0.033	0.027	0.031	6
36.	0.007	0.012	0.013	0.008	0.013	0.014	0.010	0.012	0.013	6
37.	0.030	0.030	0.033	0.030	0.030	0.033	0.034	0.030	0.033	6
38.	0.009	0.013	0.012	0.011	0.015	0.012	0.010	0.014	0.014	6
39.	0.009	0.010	0.010	0.011	0.011	0.011	0.010	0.011	0.009	6
40.	0.009	0.011	0.011	0.009	0.011	0.012	0.010	0.010	0.012	6
Total THD	0.245	0.231	0.255	0.244	0.232	0.255	0.242	0.230	0.255	10
Supplementary information:										

4.7.5.2	**TABLE: Sinusoidal output voltage waveform requirements**								**P**
Harmonic. Nr.(U)	P/Prated: % of rated output power								Limits (% of Fundamental)
	5%			50%			100%		
	L1 [%]	L2 [%]	L3 [%]	L1 [%]	L2 [%]	L3 [%]	L1 [%]	L2 [%]	L3 [%]	
Model: MID-H20K-T40										
2.	0.062	0.050	0.042	0.017	0.030	0.037	0.548	0.535	0.572	6
3.	0.651	0.634	0.648	0.102	0.066	0.102	2.592	2.495	2.595	6
4.	0.016	0.016	0.021	0.019	0.026	0.041	0.461	0.483	0.459	6
5.	0.133	0.122	0.139	0.158	0.154	0.149	0.809	0.820	0.827	6
6.	0.009	0.012	0.015	0.012	0.022	0.023	0.185	0.158	0.159	6
7.	0.059	0.058	0.081	0.081	0.058	0.074	0.632	0.621	0.663	6
8.	0.009	0.011	0.009	0.069	0.072	0.082	0.174	0.182	0.175	6
9.	0.163	0.121	0.147	0.024	0.037	0.032	0.483	0.487	0.527	6
10.	0.010	0.009	0.015	0.074	0.075	0.091	0.119	0.112	0.141	6
11.	0.156	0.154	0.154	0.035	0.051	0.034	0.362	0.357	0.335	6

12.	0.011	0.008	0.013	0.011	0.019	0.021	0.092	0.094	0.106	6
13.	0.131	0.125	0.131	0.058	0.050	0.053	0.213	0.197	0.198	6
14.	0.016	0.011	0.010	0.023	0.022	0.042	0.096	0.112	0.095	6
15.	0.055	0.084	0.075	0.023	0.023	0.030	0.242	0.235	0.221	6
16.	0.012	0.009	0.010	0.019	0.019	0.020	0.163	0.156	0.153	6
17.	0.020	0.038	0.049	0.045	0.045	0.044	0.154	0.145	0.117	6
18.	0.015	0.014	0.017	0.011	0.010	0.015	0.085	0.074	0.083	6
19.	0.082	0.085	0.091	0.051	0.048	0.041	0.126	0.134	0.139	6
20.	0.022	0.017	0.026	0.018	0.014	0.019	0.067	0.063	0.062	6
21.	0.132	0.124	0.132	0.010	0.012	0.015	0.140	0.135	0.137	6
22.	0.032	0.025	0.028	0.013	0.009	0.010	0.091	0.085	0.085	6
23.	0.200	0.184	0.173	0.029	0.030	0.023	0.094	0.097	0.094	6
24.	0.044	0.033	0.041	0.011	0.010	0.015	0.061	0.046	0.052	6
25.	0.141	0.169	0.114	0.038	0.031	0.037	0.072	0.064	0.060	6
26.	0.029	0.029	0.029	0.017	0.025	0.022	0.057	0.064	0.067	6
27.	0.073	0.081	0.065	0.014	0.019	0.014	0.059	0.067	0.065	6
28.	0.015	0.018	0.017	0.024	0.022	0.027	0.089	0.099	0.085	6
29.	0.050	0.050	0.041	0.035	0.030	0.034	0.072	0.063	0.073	6
30.	0.011	0.009	0.013	0.011	0.011	0.012	0.064	0.056	0.058	6
31.	0.044	0.048	0.014	0.036	0.038	0.040	0.084	0.055	0.056	6
32.	0.009	0.009	0.009	0.020	0.015	0.019	0.052	0.053	0.063	6
33.	0.029	0.031	0.014	0.013	0.011	0.015	0.068	0.089	0.089	6
34.	0.007	0.008	0.008	0.011	0.014	0.015	0.066	0.068	0.072	6
35.	0.012	0.020	0.016	0.034	0.027	0.030	0.053	0.057	0.059	6
36.	0.022	0.022	0.025	0.009	0.013	0.013	0.039	0.047	0.052	6
37.	0.023	0.030	0.030	0.031	0.032	0.034	0.071	0.038	0.069	6
38.	0.020	0.023	0.021	0.009	0.016	0.012	0.041	0.052	0.050	6
39.	0.051	0.065	0.057	0.010	0.011	0.013	0.081	0.061	0.087	6
40.	0.005	0.005	0.007	0.010	0.011	0.012	0.057	0.054	0.062	6
Total THD	0.764	0.740	0.760	0.247	0.231	0.257	2.821	2.737	2.796	10
Supplementary information:										

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

DC Voltage below minimum operating voltage (V)	DC Voltage for inverter begin operation (V)	Resistance between ground and PV input terminal (Ω)	Required Insulation resistance R = ($V_{MAX\ PV}$ / 30mA) (Ω)	Result
DC+				
135	135	94000	33300	ISO overLimitation
135	400	93000	33300	
135	600	94000	33300	
135	800	94000	33300	
135	1000	94000	33300	
DC-(MPP tracker 1)				
135	135	170000	33300	ISO overLimitation
135	400	87000	33300	
135	600	85000	33300	
135	800	84000	33300	
135	1000	84000	33300	

Note:

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

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

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

Supplementary information:

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

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

Supplementary information:

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

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

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

Supplementary information:

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

4.8.3.5.2	Test for detection of excessive continuous residual current	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:			
300	128	276	300
300	132	278	300
300	133	272	300
300	135	282	300
300	136	280	300
- PV to N:			
300	133	268	300
300	134	274	300
300	136	280	300
300	135	264	300
300	135	276	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:

Model: MID-H20K-T40, Testing is under nominal voltage.

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

+PV to N		
Limit (mA)	U_N Disconnection time (ms)	Limit (ms)
30	262	300
30	260	300
30	276	300
30	270	300
30	262	300
60	118	150
60	117	150
60	125	150
60	127	150
60	123	150

150	32	40
150	33	40
150	35	40
150	35	40
150	35	40
-PV to N		
Limit (mA)	**U_N**	**Limit (ms)**
	Disconnection time (ms)	
30	274	300
30	268	300
30	274	300
30	274	300
30	278	300
60	118	150
60	129	150
60	125	150
60	128	150
60	130	150
150	33	40
150	33	40
150	36	40
150	28	40
150	32	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:

Model: MID-H20K-T40, Testing is under nominal voltage.

14 TABLE: list of critical components					P
object/part No.	manufacturer/ trademark	type/model	technical data	standard	mark(s) of conformity[1])
Metallic enclosure (Cover casing)	Maanshanshi Huayu Casting Co., Ltd.	Cast metal	Min. 2.5mm thickness.	IEC/EN 62109-1 IEC/EN 62109-2	Tested in this report
Or	Wuxi Linsheng Technologoy Co.,LTD	Cast metal	Min. 2.5mm thickness.	IEC/EN 62109-1 IEC/EN 62109-2	Tested in this report
Metallic enclosure (Bottom Casing)	Maanshanshi Huayu Casting Co., Ltd.	Cast metal	Min. 4mm thickness.	IEC/EN 62109-1 IEC/EN 62109-2	Tested in this report
Wall Bracket	Suzhou HouYuan technology Co., Ltd.	Cast metal	Dimensions (WxHxD): 294*215*32mm, made of SPCC, 2.0mm thickness.	IEC/EN 62109-1 IEC/EN 62109-2	Tested in this report
Plastic window for display	JINGMEN GORUN TECHNOLOGY CO LTD	HF11	V-0, min.80°C, Min. thickness: 0.25, V-0	UL746B	UL
Insulation sheet (ceramics)	SUZHOU WIN JOY ELECTRONIC TECHNOLOGY CO LTD	96% Al2O3, ≥1600˚C, ≥1500Vac	Thermal Conductivity(w/m.k)≥25	IEC/EN 62109-1 IEC/EN 62109-2	Tested in this report
Or	SUZHOU WIN JOY ELECTRONIC TECHNOLOGY CO LTD	Al2O3, ≥1600˚C, ≥1500Vac, Thermal Conductivity(w/m.k)≥200	Thermal Conductivity(w/m.k)≥200	IEC/EN 62109-1 IEC/EN 62109-2	Tested in this report
PV connector	Dongguan Vaconn Electronic Technology Co.,Ltd.	VP-D4B-CHSM4, VP-D4B-CHSF4	1100Vdc, 35A, 85°C, IP68	EN 62852 IEC 62852	TUV
Or	Stäubli Electrical Connectors AG	PV-ADBP4-S2/6-UR, PV-ADSP4-S2/6-UR	1100Vdc, 39A, 90°C, IP68	IEC 62852 UL 6703	TUV UL
Battery connector	Dongguan Vaconn Electronic Technology Co.,Ltd	VP-D4B-PHDM6B, VP-D4B-PHDF6B	1500V , 45A, +85°C, IP68	IEC 62852	TUV
AC connector	Shanghai Vaconn Electronic Technology Co. Ltd	VPAC07EW-5S	600V, 65A, 85°C	EN 61984	TUV

14 TABLE: list of critical components					P
object/part No.	manufacturer/ trademark	type/model	technical data	standard	mark(s) of conformity[1])
DC Switch (Optional, None for NZL/AUS market)	ProJoy Electric Co., Ltd.	PEDS150H-HM40-3	1100Vdc, 40A, 85°C, IP66	EN 60947-3	TUV
Or	ProJoy Electric Co., Ltd.	PEDS150H-HM40-4	1100Vdc, 40A, 85°C, IP66	EN 60947-3	TUV
Lead wire	3Q WIRE&CABLE CO.，LTD.	10269	8-12 AWG, 1000Vac, 105°C	UL758	UL
Or	WUXI XINHONGYE WIRE&CABLE CO.，LTD.	10269	8-12 AWG, 1000Vac, 105°C	UL758	UL
Or	Interchangeable	Interchangeable	8-12 AWG, 1000Vac, 105°C	UL758	UL
Inductor potting epoxy	DONGGUAN CITY JIA DI NEW MATERIALS CO LTD	JD-505, JD-605	V-0, 150°C	UL94	UL
Thermal conductivity material	DONGGUAN CITY JIA DI NEW MATERIALS CO LTD	JD-100	150°C	--	--
Communication termina 24pin	JANG SU HANDA POWER TECHNOLOGY CO.LTD	SHWS-24pin	IP67, PA66	--	--
Communication termina wifi 3.0 USB	Suzhou Luyi Electronic Technology CO.,LTD.	DNBSWS-0004	Pulling force ⩾ 70N Holding force ⩾ 100N	--	--
Nylon Cable Gland	Beishi Electric Technology Co., LTD	M1207B	M12*1.5, IP67 100°C	UL514B	UL
Electronic capacitor (C200, C201, C202, C213, C214, C216, C228, C229, C230, C231, C232, C233)	Nichicon	LGX2H471MELC58	470μF, 500V, 105°C	IEC/EN 62109-1 IEC/EN 62109-2	Tested in this report
Electronic capacitor (C403, C424, C431)	KEMET	C4AF9BU4470A12K	4.7μF, 310V,-105°C	IEC/EN 62109-1 IEC/EN 62109-2	Tested in this report

14 TABLE: list of critical components					P
object/part No.	manufacturer/ trademark	type/model	technical data	standard	mark(s) of conformity[1])
Or	FARA	C6AQ1475KB W0550	4.7μF, 310V,-105°C	IEC/EN 62109-1 IEC/EN 62109-2	Tested in this report
Or	NISTRONICS	MACC 0350K475WP1 B0055	4.7μF, 310V,-105°C	IEC/EN 62109-1 IEC/EN 62109-2	Tested in this report
Electronic capacitor (C115, C116, C127)	KEMET ELECTRONICS ITALIA SRL	C4AEOBW5200A3LJ	20uF, 1100V, min.85°C	IEC/EN 62109-1 IEC/EN 62109-2	Tested in this report
Or	Panasonic	EZPE1B206MTA	20uF, 1100V, min.85°C	IEC/EN 62109-1 IEC/EN 62109-2	Tested in this report
X-capacitor (C405, C406, C407, C106, C107, C108)	KEMET ELECTRONICS ITALIA SRL	R.46	X2, 3.3uF, 310Vac 110°C	IEC 60384-14, EN 60384-14	
Or	XIAMEN FARATRONIC CO LTD	MKP62	X2, 3.3uF, 310Vac 110°C	IEC 60384-14, EN 60384-14	VDE
Y-capacitor (C232)	ARCOTRONICS	R.41	Y2, 300Vac, 1nF, 110°C	IEC 60384-14, EN 60384-14	
Or	XIAMEN FARATRONIC CO LTD	MKP63	Y2, 300Vac, 1nF, 110°C	IEC 60384-14, EN 60384-14	
Or	TDK CORPORATION	CS45	Y2, 300Vac, 1nF, 110°C	IEC 60384-14, EN 60384-14	VDE
Y-capacitor (C105, C106, C113, C114, C103, C104)	ARCOTRONICS	R.41	Y2, 300Vac, 4.7nF,110°C	IEC 60384-14, EN 60384-14	
Or	XIAMEN FARATRONIC CO LTD	MKP63	Y2, 300Vac, 4.7nF 110°C	IEC 60384-14, EN 60384-14	
Or	TDK CORPORATION	CS45	Y2, 300Vac, 4.7nF 110°C	IEC 60384-14, EN 60384-14	VDE
Y-capacitor (C411, C412, C100, C101)	ARCOTRONICS	R.41	Y2, 300Vac, 33nF, 110°C	IEC 60384-14, EN 60384-14	
Or	XIAMEN FARATRONIC CO LTD	MKP63	Y2, 300Vac, 33nF, 110°C	IEC 60384-14, EN 60384-14	
Or	TDK CORPORATION	CS45	Y2, 300Vac, 33nF, 110°C	IEC 60384-14, EN 60384-14	VDE
Boost inductor (MID-H4K-T,	Magsonder Innovation	K91-00031-A0	1387uH ±10%, Class B	IEC/EN 62109-1 IEC/EN 62109-2	Tested in this report

14 TABLE: list of critical components					P
object/part No.	manufacturer/ trademark	type/model	technical data	standard	mark(s) of conformity[1])
MID-H5K-T, MID-H6K-T, MID-H8K-T, MID-H10K-T, MID-H12K-T)	(Jiangsu) Co., Ltd				
Or	JTK TECHNOLOGY(SUZHOU) CO.,LTD	K91-00031-00	Φ1.6*2P 85Ts 1387uH ±10%	IEC/EN 62109-1 IEC/EN 62109-2	Tested in this report
Boost inductor (MID-H10K-T40, MID-H12K-T40, MID-H15K-T40, MID-H20K-T40)	JTK TECHNOLOGY (SUZHOU) CO.,LTD	K91-00044-00	606uH±10%, Class B	IEC/EN 62109-1 IEC/EN 62109-2	Tested in this report
Or	Magsonder Innovation (Jiangsu) Co., Ltd	K91-00044-A0	606uH±10%, Class B	IEC/EN 62109-1 IEC/EN 62109-2	Tested in this report
BAT inductor (MID-H4K-T, MID-H5K-T, MID-H6K-T, MID-H8K-T, MID-H10K-T, MID-H12K-T)	JTK TECHNOLOGY (SUZHOU) CO.,LTD	K91-00024-00	1200uH±10%, Class B	IEC/EN 62109-1 IEC/EN 62109-2	Tested in this report
Or	Magsonder Innovation (Jiangsu) Co., Ltd	K91-00024-A0	1200uH±10%, Class B	IEC/EN 62109-1 IEC/EN 62109-2	Tested in this report
Or	RunchengHaizhi Electronic Technology (Suzhou) Co., Ltd	K91-00024-B0	1200uH±10%, Class B	IEC/EN 62109-1 IEC/EN 62109-2	Tested in this report
BAT inductor (MID-H10K-T40, MID-H12K-T40, MID-H15K-T40, MID-H20K-T40)	JTK TECHNOLOGY (SUZHOU) CO.,LTD	K91-00043-00	1100uH±10%, Class B	IEC/EN 62109-1 IEC/EN 62109-2	Tested in this report
Or	Magsonder Innovation (Jiangsu) Co., Ltd	K91-00043-A0	1100uH±10%, Class B	IEC/EN 62109-1 IEC/EN 62109-2	Tested in this report
INV inductor (MID-H4K-T, MID-H5K-T, MID-H6K-T)	Magsonder Innovation (Jiangsu) Co., Ltd	K91-00022-00	Φ1.8*1P 130Ts 3244uH ±10%, Class B	IEC/EN 62109-1 IEC/EN 62109-2	Tested in this report
INV inductor (MID-H8K-T, MID-H10K-T,	Magsonder Innovation (Jiangsu) Co.,	K91-00019-00	2218uH ±10%, Class B	IEC/EN 62109-1 IEC/EN 62109-2	Tested in this report

14 TABLE: list of critical components					P
object/part No.	manufacturer/ trademark	type/model	technical data	standard	mark(s) of conformity[1])
MID-H12K-T, MID-H10K-T40, MID-H12K-T40)	Ltd				
Or	RunchengHaizhi Electronic Technology (Suzhou) Co., Ltd	K91-00019-00	2218uH ±10%, Class B	IEC/EN 62109-1 IEC/EN 62109-2	Tested in this report
INV inductor (MID-H15K-T40, MID-H20K-T40)	JTK TECHNOLOGY (SUZHOU) CO.,LTD	K91-00045-00	1300uH±10％, Class B	IEC/EN 62109-1 IEC/EN 62109-2	Tested in this report
Or	Magsonder Innovation (Jiangsu) Co., Ltd	K91-00045-A0	1300uH±10％, Class B	IEC/EN 62109-1 IEC/EN 62109-2	Tested in this report
Transformer (TX200)	JTK TECHNOLOGY (SUZHOU) CO.,LTD	K90-00014-00	Class B	IEC/EN 62109-1 IEC/EN 62109-2	Tested in this report
-Bobbin	CHANG CHUN PLASTICS CO LTD	T375HF	V-0, 150°C	UL94	UL
-Wingding	SHANDONG SAINT ELECTRIC CO LTD	UEW N/155, QA N-*/155, *UEW N/155 Litz, QA N-*/155 Litz, MW80-C	155°C	UL1446	UL
-TAPE	JINGJIANG YAHUA PRESSURE SENSITIVE GLUE CO LTD	PF-301	180°C	UL224	UL
-TUBE	CHANGYUAN ELECTRONICS GROUP CO LTD	CB-DWT, CBDWT(XY)	600V, 125°C	UL224	UL
-VARNISH	SUZHOU TAIHU ELECTRIC ADVANCED MATERIAL	T-4260(a)	130°C	UL1446	UL
Transformer (TX500)	JTK TECHNOLOGY (SUZHOU) CO.,LTD	K90-00015-00	Class B	IEC/EN 62109-1 IEC/EN 62109-2	Tested in this report
-Bobbin	CHANG CHUN PLASTICS CO	T375HF	V-0, 150°C	UL94	UL

14 TABLE: list of critical components					P
object/part No.	manufacturer/ trademark	type/model	technical data	standard	mark(s) of conformity[1])
	LTD				
Or	SUMITOMO BAKELITE CO LTD	PM-9820	V-0, 150°C	UL94	UL
-Wingding	WUHU OULY ELECTRONICS CO., LTD	TIW-B	V-0, 150°C	UL1446	UL
-TAPE	JINGJIANG YAHUA PRESSURE SENSITIVE GLUE CO LTD	PF	180°C	UL224	UL
- TUBE	CHANGYUAN ELECTRONICS GROUP CO LTD	CB-TT-L	200°C	UL224	UL
-VARNISH	SUZHOU TAIHU ELECTRIC ADVANCED MATERIAL	T-4260(a)	130°C	UL1446	UL
Current transducer HCT401, HCT402, HCT403	VACUUMSCHMELZE GmbH & Co. KG	T60404-N4646-X661	I_{PN}: 25,0A $V_{ref\ internal}$: 2.5; K_N:1:200 T_{amb}: 85°C	UL508	UL
Or	LEM	CASR 25-NP	I_{PN}:25,0A; $V_{ref\ internal}$: 2.5 Theoretical sensitivity; 25mV/A; Sensitivity error: ±0.7%; T_{amb}:105°C	UL508	UL
Current transducer (MID-H4K-T, MID-H5K-T, MID-H6K-T, MID-H8K-T, MID-H10K-T, MID-H12K-T) (HCT103)	VACUUMSCHMELZE GmbH & Co. KG	T60404-N4646-X661	I_{PN}: 25,0A $V_{ref\ internal}$: 2.5; K_N:1:200 T_{amb}: 85°C	UL508	UL
Or	LEM	CASR 25-NP	I_{PN}:25,0A; $V_{ref\ internal}$: 2.5 Theoretical sensitivity; 25mV/A; Sensitivity error: ±0.7%;	UL508	UL

14 TABLE: list of critical components					P
object/part No.	manufacturer/ trademark	type/model	technical data	standard	mark(s) of conformity[1])
			T_{amb}:105°C		
Current transducer (MID-H10K-T40, MID-H12K-T40, MID-H15K-T40, MID-H20K-T40) (HCT103)	VACUUMSCHMELZE GmbH & Co. KG	T60404-N4646-X664, T60404-N4646-X664	I_{PN}: 50,0A Vref internal：2.5±0.005V; K_N:1:200 T_{amb}: 85°C	UL508	UL
Or	LEM	CASR 50-NP	I_{PN}:50,0A; Vref internal：2.5 Theoretical sensitivity; 12.5mV/A; Sensitivity error: ±0.7%; T_{amb}:105°C	UL508	UL
Current transducer (MID-H4K-T, MID-H5K-T, MID-H6K-T, MID-H8K-T, MID-H10K-T, MID-H12K-T) (HCT100, HCT101)	SINOMAGS	STK-10PL	Vcc: 5.0V; Icc: 5mA; Theoretical gain:80mV/A; Error of gain: ±0.5%; Tamb:105°C	EN 61010-1 EN 61010-2-030	TUV
Current transducer (MID-H10K-T40, MID-H12K-T40, MID-H15K-T40, MID-H20K-T40) (HCT100, HCT101)	SINOMAGS TECHNOLOGY CO., LTD	STK-20PL	Vcc: 5.0V; Icc: 5mA; Theoretical gain:23mV/A; Error of gain: ±0.5%; Tamb:105°C	EN 61010-1 EN 61010-2-030	TUV
Current transducer (MID-H4K-T, MID-H5K-T, MID-H6K-T, MID-H8K-T, MID-H10K-T, MID-H12K-T) (HCT404, HCT405, HCT406)	SINOMAGS TECHNOLOGY CO., LTD	STK-20PL	Vcc: 5.0V; Icc: 5mA; Theoretical gain:23mV/A; Error of gain: ±0.5%; Tamb:105°C	EN 61010-1 EN 61010-2-030	TUV
Current transducer (MID-H10K-T40, MID-H12K-T40, MID-H15K-T40, MID-H20K-T40)	SINOMAGS TECHNOLOGY CO., LTD	STK-32PL	Vcc: 5.0V; Icc: 5mA; Theoretical gain:14.4mV/A; Error of gain: ±0.5%;	EN 61010-1 EN 61010-2-030	TUV

14 TABLE: list of critical components					P
object/part No.	manufacturer/ trademark	type/model	technical data	standard	mark(s) of conformity[1])
(HCT404, HCT405, HCT406)			Tamb:105°C		
RCMU Device (HCT400)	SINOMAGS TECHNOLOGY CO., LTD	SFG-1.0P/P2F	Theoretical sensitivity: 1.2V/A; Sensitivity error: 0.5%; 105°C	UL508	UL
Varistor (TVR100, TVR104, TVR102, TVR105, TVR101, TVR103, TVR100, TVR101, TVR102, TVR103)	BESTBRIGHT ELECTRONICS CO LTD	821KD20J	670Vdc, 1W, 105°C	IEC 61051-1 IEC 61051-2	VDE
Gas tube B20-71001-XX GT100	BESTBRIGHT ELECTRONICS CO LTD	2RP600L-8	Impulse sparkover voltage ≤1300V/μs, Nominal AC discharge current 10A, 85°C	DIN EN 61643-311	VDE
AC Relay (RY400, RY401, RY403, RY404, RY405, RY406, RY407, RY408, RY100, RY101, RY102, RY103, RY104, RY105, RY106, RY107	Xiamen Hongfa Electroacoustic Co., Ltd	HF161F-W/12-HT	33A, 277Vac, 85°C	IEC 61810-1 EN 61810-1	VDE
Or	ZETTLER RELAY (XIAMEN) CO LTD	AZSR131-1AE-12D	35A,277Vac, 85°C	IEC 61810-1 EN 61810-1	TUV
AC Relay (MID-H10K-T40, MID-H12K-T40, MID-H15K-T40, MID-H20K-T40) (RY400, RY401, RY403, RY404, RY405, RY406, RY407, RY408, RY100, RY101, RY102, RY103, RY104, RY105,	Xiamen Hongfa Electroacoustic Co., Ltd	HF161F-40W	40A, 277Vac, 85°C	IEC 61810-1 EN 61810-1	TUV

14 TABLE: list of critical components					P
object/part No.	manufacturer/ trademark	type/model	technical data	standard	mark(s) of conformity[1])
RY106, RY107)					
Or	ZETTLER RELAY (XIAMEN) CO LTD	AZSR143-1AE-12D	43A,277Vac, 85°C	IEC 61810-1 EN 61810-1	TUV
BAT Relay (RY100)	Xiamen Hongfa Electroacoustic Co., Ltd	F161F-40W/12-HTF(967)	40A, 277Vac, 85°C	IEC 61810-1 EN 61810-1	TUV
Or	ZETTLER RELAY (XIAMEN) CO LTD	AZSR143-1AE-12D	43A,277Vac, 85°C	IEC 61810-1 EN 61810-1	UL
ISO Relay (RY101, RY102)	Xiamen Hongfa Electroacoustic Co., Ltd	HF140FF-012-2HSWT	10A/250VAC/12 VDC/2Z	IEC 61810-1 EN 61810-1	VDE
Or	American Zettler Inc	AZ733W-2A-12DE	10A/250VAC/12 VDC/2Z	IEC 61810-1 EN 61810-1	TUV
IGBT (MID-H4K-T, MID-H5K-T, MID-H6K-T, MID-H8K-T, MID-H10K-T, MID-H12K-T) (Q100, Q104, Q105, Q106, Q108, Q109)	ON	NGTB40N120FL3WG	40A 1200V	IEC/EN 62109-1 IEC/EN 62109-2	Tested in this report
Or	ON	FGH40T120SMD-F155	40A 1200V	IEC/EN 62109-1 IEC/EN 62109-2	Tested in this report
Or	ST	STGWA40H120DF2	40A 1200V	IEC/EN 62109-1 IEC/EN 62109-2	Tested in this report
Or	NCE Power	NCE40TD120VTP	40A 1200V	IEC/EN 62109-1 IEC/EN 62109-2	Tested in this report
Or	NCE Power	NCE40TD120VTP	40A 1200V	IEC/EN 62109-1 IEC/EN 62109-2	Tested in this report
Or	Silan	SGTP40V120FDB2P7	40A 1200V	IEC/EN 62109-1 IEC/EN 62109-2	Tested in this report
SICMOSFET (MID-H10K-T40, MID-H12K-T40, MID-H15K-T40, MID-H20K-T40) (Q100, Q104, Q105, Q106, Q108, Q109)	CREE	C3M0040120K	40mR 1200V	IEC/EN 62109-1 IEC/EN 62109-2	Tested in this report
Or	Genesic	G3R40MT12K	40mR 1200V	IEC/EN 62109-1	Tested in this report

14 TABLE: list of critical components					P
object/part No.	manufacturer/ trademark	type/model	technical data	standard	mark(s) of conformity[1])
				IEC/EN 62109-2	
Or	Basic	B1M032120HK	32mR 1200V	IEC/EN 62109-1 IEC/EN 62109-2	Tested in this report
Or	ST	SCT040W120G3AG	40mR 1200V	IEC/EN 62109-1 IEC/EN 62109-2	Tested in this report
Or	ON	NTH4L040N120M3S	40mR 1200V	IEC/EN 62109-1 IEC/EN 62109-2	Tested in this report
Or	Infineon	IMZA120R040M1H	40mR 1200V	IEC/EN 62109-1 IEC/EN 62109-2	Tested in this report
Or	CETC	WM2A040120L	40mR 1200V	IEC/EN 62109-1 IEC/EN 62109-2	Tested in this report
IGBT (MID-H4K-T, MID-H5K-T, MID-H6K-T, MID-H8K-T, MID-H10K-T, MID-H12K-T, (MID-H10K-T40, MID-H12K-T40, MID-H15K-T40, MID-H20K-T40) (Q200, Q201, Q202, Q209, Q210, Q211)	Infineon	IKQ75N120CH3	75A 1200V	IEC/EN 62109-1 IEC/EN 62109-2	Tested in this report
Or	Infineon	IKQ75N120CS6	75A 1200V	IEC/EN 62109-1 IEC/EN 62109-2	Tested in this report
Or	Infineon	IKQ50N120CH3	50A 1200V	IEC/EN 62109-1 IEC/EN 62109-2	Tested in this report
Or	ON	FGY75T120SQDN	75A 1200V	IEC/EN 62109-1 IEC/EN 62109-2	Tested in this report
Or	ON	FGY60T120SQDN	60A 1200V	IEC/EN 62109-1 IEC/EN 62109-2	Tested in this report
Or	ST	STGYA75H120DF2	75A 1200V	IEC/EN 62109-1 IEC/EN 62109-2	Tested in this report
Or	NCE Power	NCE75TD120VTP	75A 1200V	IEC/EN 62109-1 IEC/EN 62109-2	Tested in this report
Or	Silan	SGTP75V120FDB2PW	75A 1200V	IEC/EN 62109-1 IEC/EN 62109-2	Tested in this report
IGBT (MID-H4K-T, MID-H5K-T, MID-H6K-T, MID-H8K-T,	Infineon	IKW75N65ES5	75A 650V	IEC/EN 62109-1 IEC/EN 62109-2	Tested in this report

14 TABLE: list of critical components					P
object/part No.	manufacturer/ trademark	type/model	technical data	standard	mark(s) of conformity[1])
MID-H10K-T, MID-H12K-T,) (MID-H10K-T40, MID-H12K-T40, MID-H15K-T40, MID-H20K-T40) (Q203, Q204, Q205, Q206, Q207, Q208)					
Or	Infineon	IKW50N65ES5	50A 650V	IEC/EN 62109-1 IEC/EN 62109-2	Tested in this report
Or	ON	FGH75T65SQDT	75A 650V	IEC/EN 62109-1 IEC/EN 62109-2	Tested in this report
Or	ON	FGHL75T65MQDT	75A 650V	IEC/EN 62109-1 IEC/EN 62109-2	Tested in this report
Or	ST	STGWA80H65DFB	80A 650V	IEC/EN 62109-1 IEC/EN 62109-2	Tested in this report
Or	ST	STGWA60H65DFB	60A 650V	IEC/EN 62109-1 IEC/EN 62109-2	Tested in this report
Or	NCE Power	NCE80TD65BT	80A 650V	IEC/EN 62109-1 IEC/EN 62109-2	Tested in this report
Or	ROHM	RGTVX6TS65	80A 650V	IEC/EN 62109-1 IEC/EN 62109-2	Tested in this report
Or	Silan	SGTP75V65SDS1P7	75A 650V	IEC/EN 62109-1 IEC/EN 62109-2	Tested in this report
Diode (MID-H4K-T, MID-H5K-T, MID-H6K-T, MID-H8K-T, MID-H10K-T, MID-H12K-T) (D102, D104)	Infineon	IDW15G120C5B	15A 1200V	IEC/EN 62109-1 IEC/EN 62109-2	Tested in this report
Or	Infineon	IDW20G120C5B	20A 1200V	IEC/EN 62109-1 IEC/EN 62109-2	Tested in this report
Or	ON	FFSH15120ADN-F155	15A 1200V	IEC/EN 62109-1 IEC/EN 62109-2	Tested in this report
Or	ON	FFSH20120ADN-F155	20A 1200V	IEC/EN 62109-1 IEC/EN 62109-2	Tested in this report
Or	ST	STPSC20H12C	20A 1200V	IEC/EN 62109-1 IEC/EN 62109-2	Tested in this report
Or	CREE	C4D15120D	15A 1200V	IEC/EN 62109-1 IEC/EN 62109-2	Tested in this report

14 TABLE: list of critical components					P
object/part No.	manufacturer/ trademark	type/model	technical data	standard	mark(s) of conformity[1])
Or	CREE	C4D20120D	20A 1200V	IEC/EN 62109-1 IEC/EN 62109-2	Tested in this report
Or	Basic	B2D20120HC1	20A 1200V	IEC/EN 62109-1 IEC/EN 62109-2	Tested in this report
Diode (MID-H10K-T40, MID-H12K-T40, MID-H15K-T40, MID-H20K-T40) (D102, D104)	Infineon	IDW30G120C5B	30A 1200V	IEC/EN 62109-1 IEC/EN 62109-2	Tested in this report
Or	ON	FFSH30120ADN-F155	30A 1200V	IEC/EN 62109-1 IEC/EN 62109-2	Tested in this report
Or	ST	STPSC30H12C	30A 1200V	IEC/EN 62109-1 IEC/EN 62109-2	Tested in this report
Or	CREE	C4D30120D	30A 1200V	IEC/EN 62109-1 IEC/EN 62109-2	Tested in this report
Or	Basic	B2D30120HC1	30A 1200V	IEC/EN 62109-1 IEC/EN 62109-2	Tested in this report
Optocoupler	VISHAY Semiconductor GmbH	SFH615A	Clearance:≥7.0 mm, Transient overvoltage (peak voltage): 10000Vpeak 100 °C	DIN EN 60747-5-5 (VDE 0884-5); EN 60747-5-5	VDE
Non-optical isolators (U500)	Texas Instruments Deutschland GmbH	ISO7731DWR	Outer creepage distance: ≥8.0mm, Transient overvoltage (peak voltage): 6000Vpeak	IEC/EN 62368-1, Clause: 5.4.3; 5.4.4.4; 5.4.9	VDE
Or	Suzhou Novosense Microelectronics Co.,Ltd	NSi8131W1	Outer creepage distance: ≥8.0mm, Transient overvoltage (peak voltage): 7000Vpeak	DIN VDE V 0884-11	VDE
Or	Suzhou Novosense Microelectronics Co.,Ltd	NSi8231W1	Outer creepage distance: ≥8.0mm, Transient overvoltage (peak voltage): 8000Vpeak	DIN VDE V 0884-11	VDE

14 TABLE: list of critical components					P
object/part No.	manufacturer/ trademark	type/model	technical data	standard	mark(s) of conformity[1])
PCB	NIPPON (BOLUO) ELECTRONIC S CO LTD	NCL7, NCL8	V-0, 130°C	UL796	UL
Or	KUNSHAN HUAXIN CIRCUIT BOARD CO LTD	HXF-H	V-0, 130°C	UL796	UL
[1]) an asterisk indicates a mark which assures the agreed level of surveillance					

Annex 1 – Pictures of the unit

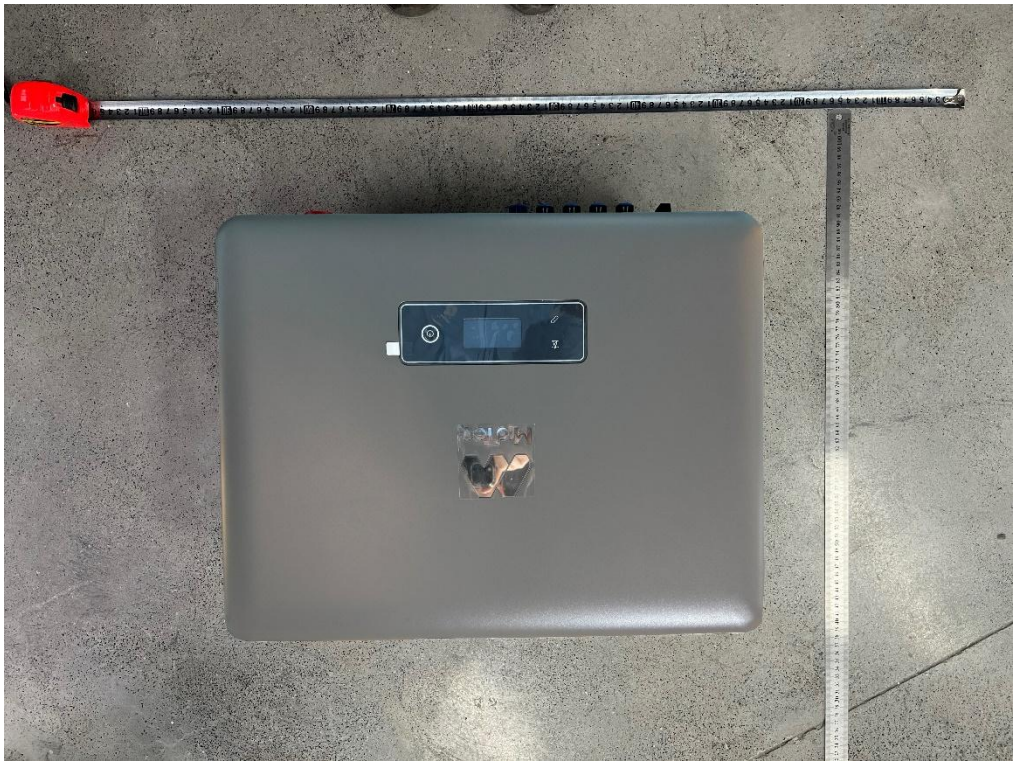
General view - 1

General view - 2

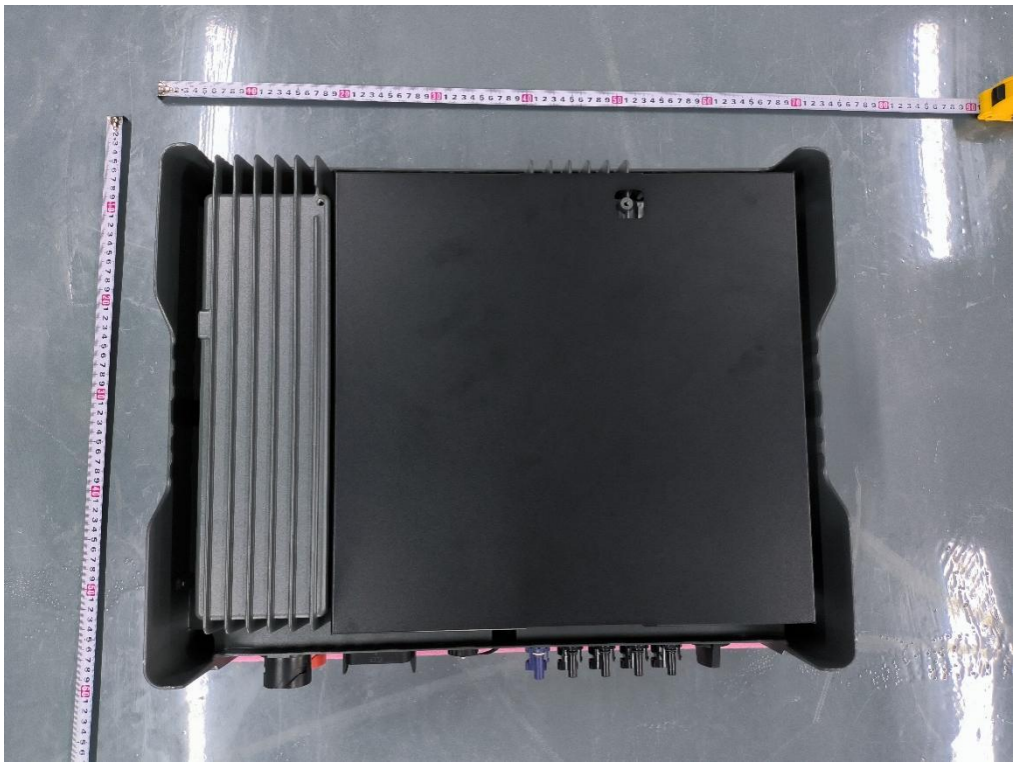
General view - 3

General view - 4

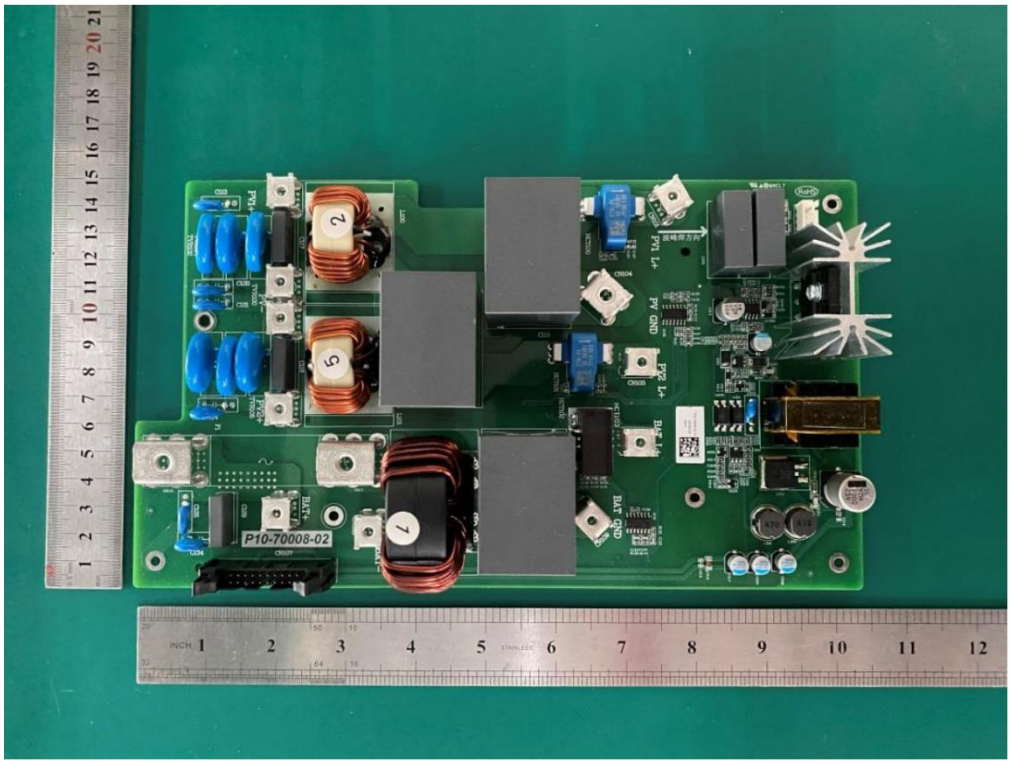
General view - 5



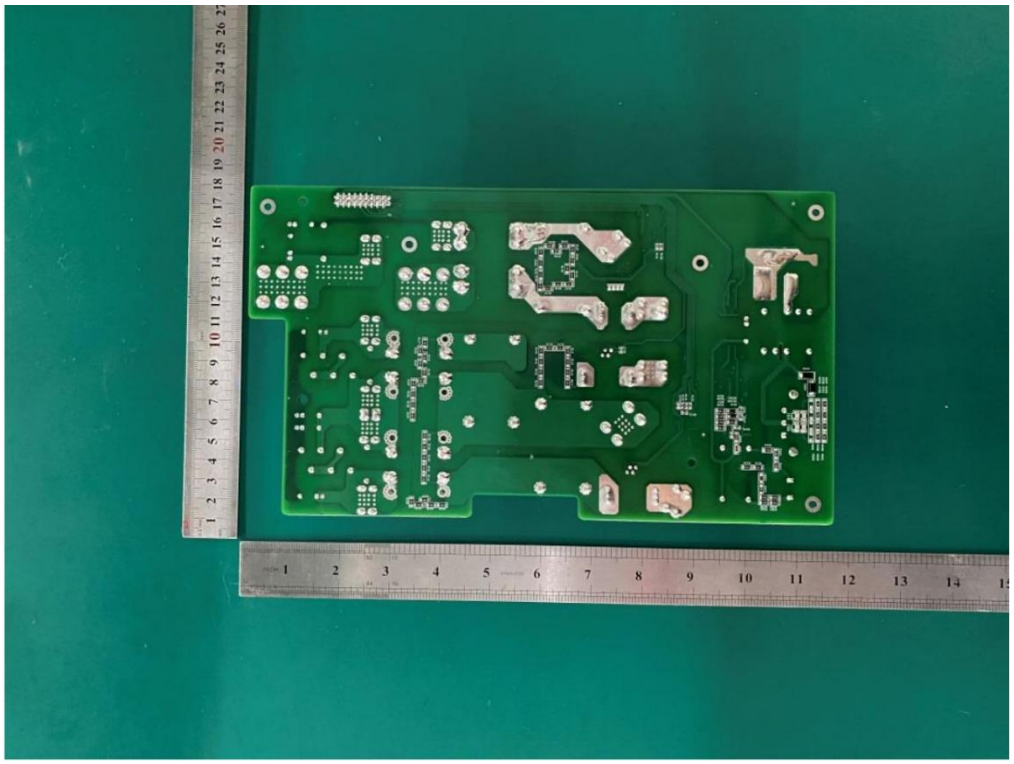
General view - 6



Input circuit board view - 1

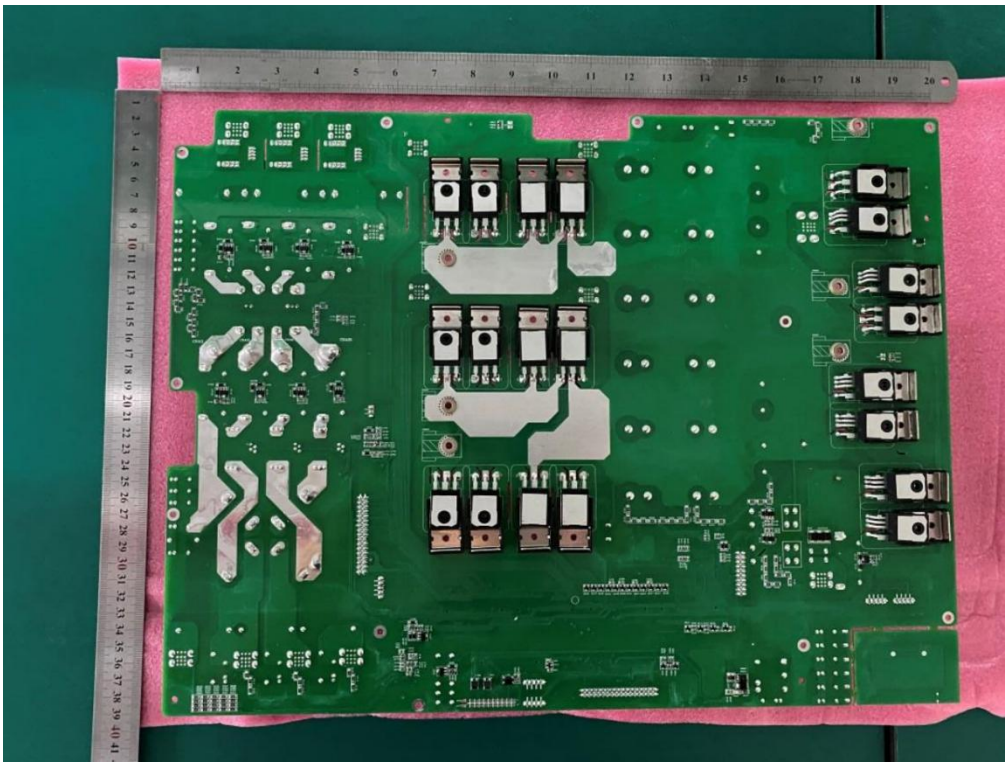


Input circuit board view - 2

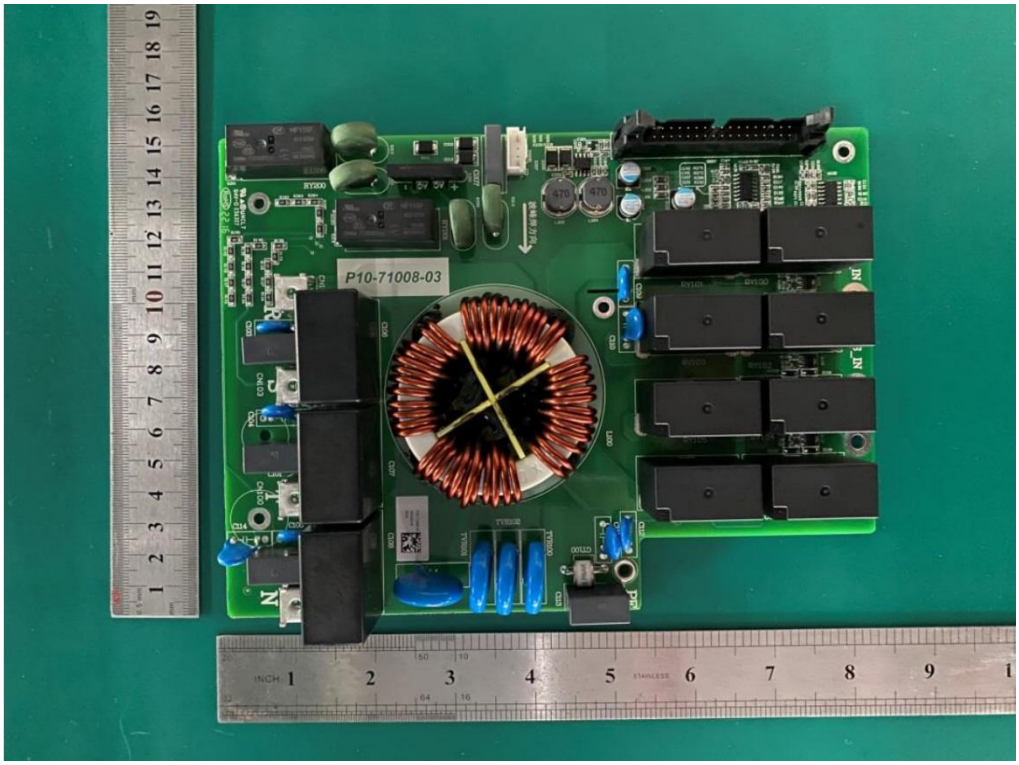


Main circuit board view - 1

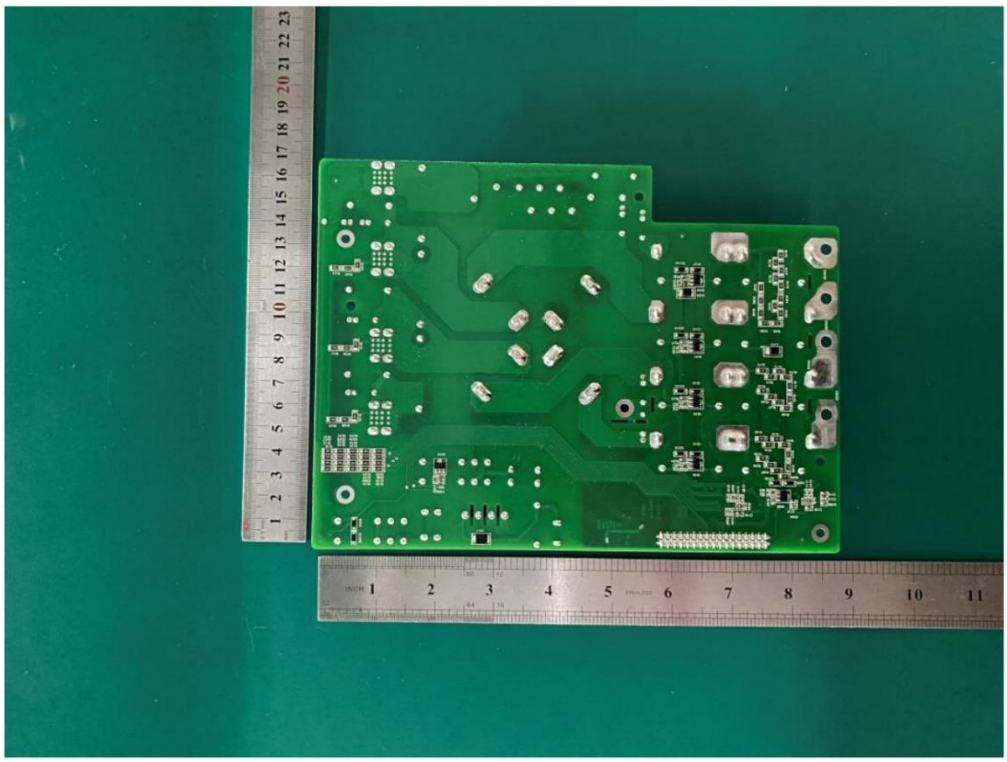
Main circuit board view - 2



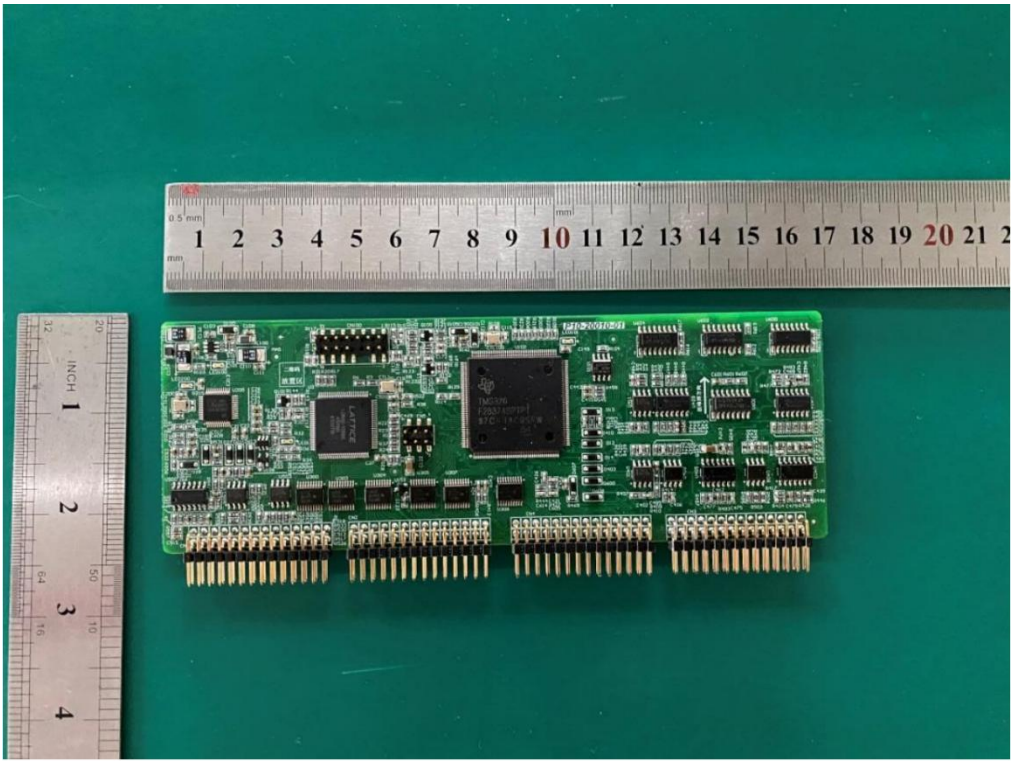
Output circuit board view - 1



Output circuit board view - 2

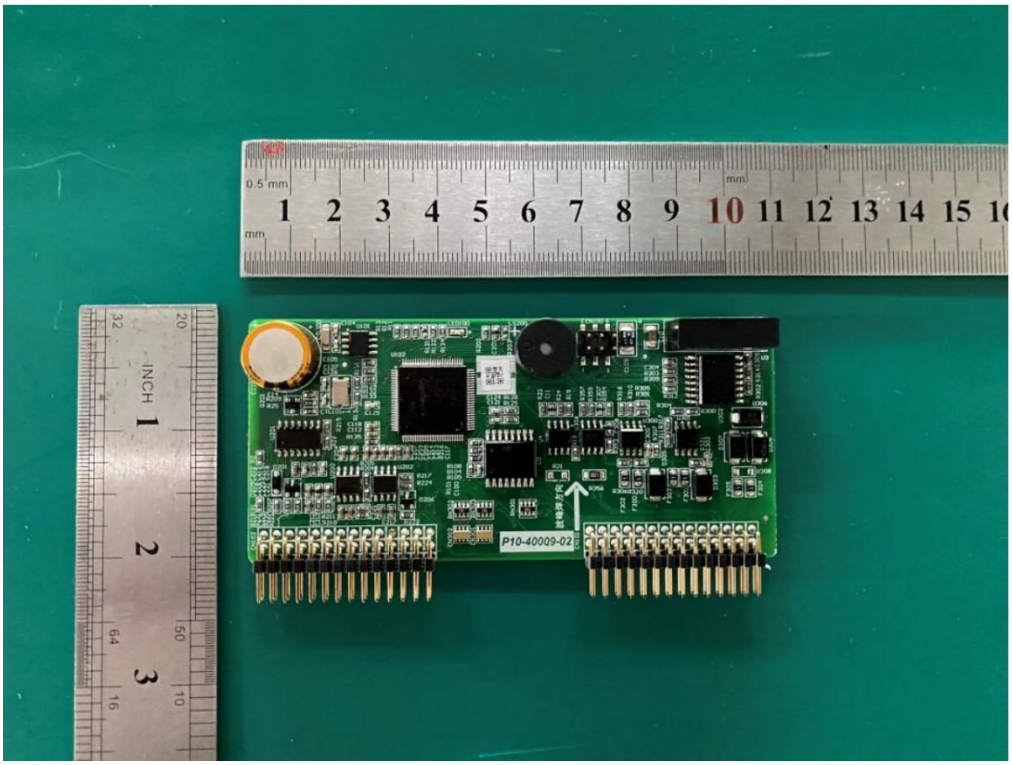


Control circuit board view - 1

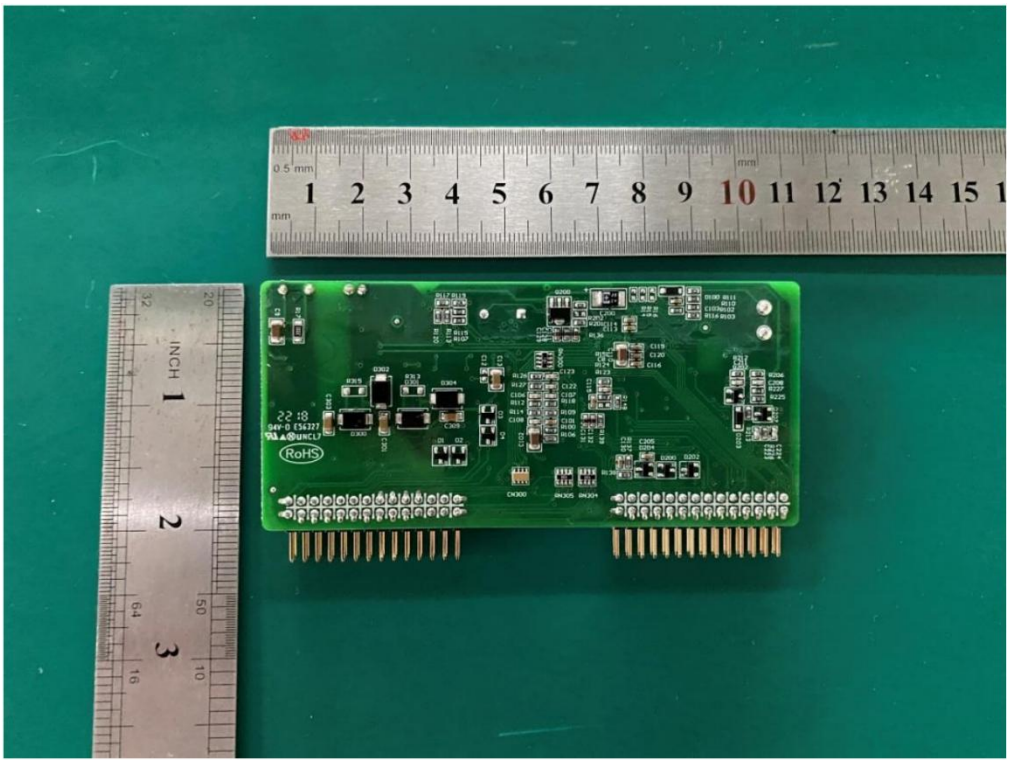


Control circuit board view - 2

Arm circuit board view - 1

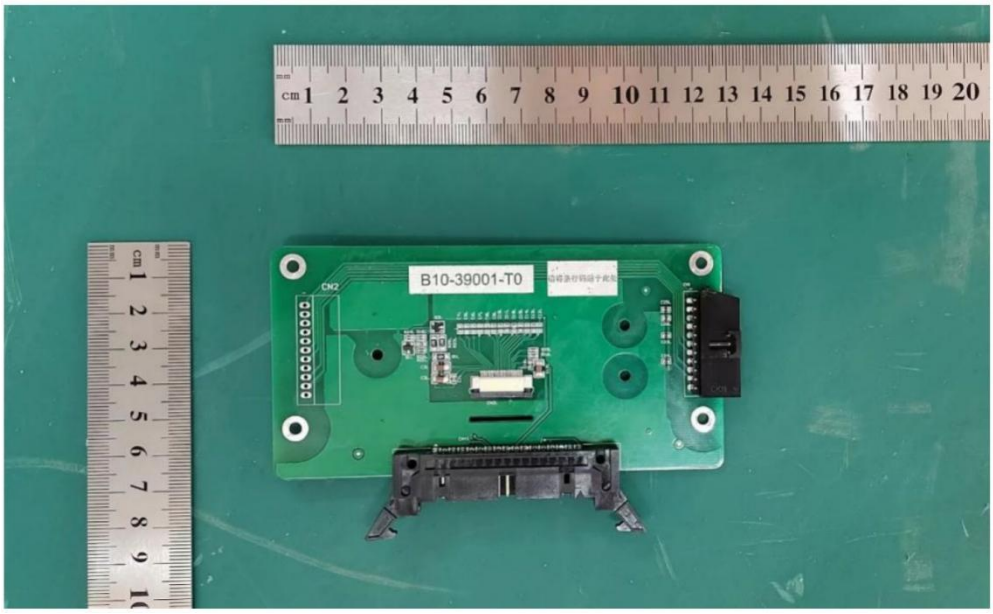


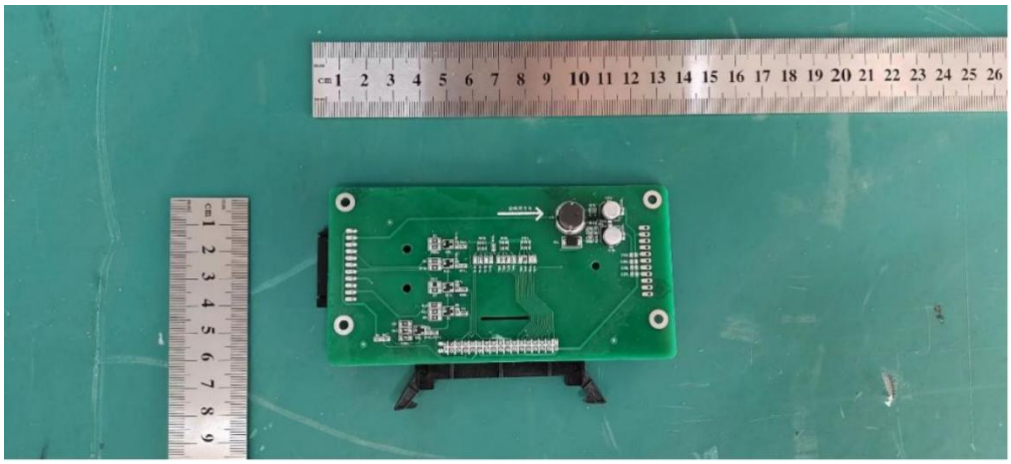
Arm circuit board view - 2



Display circuit board view

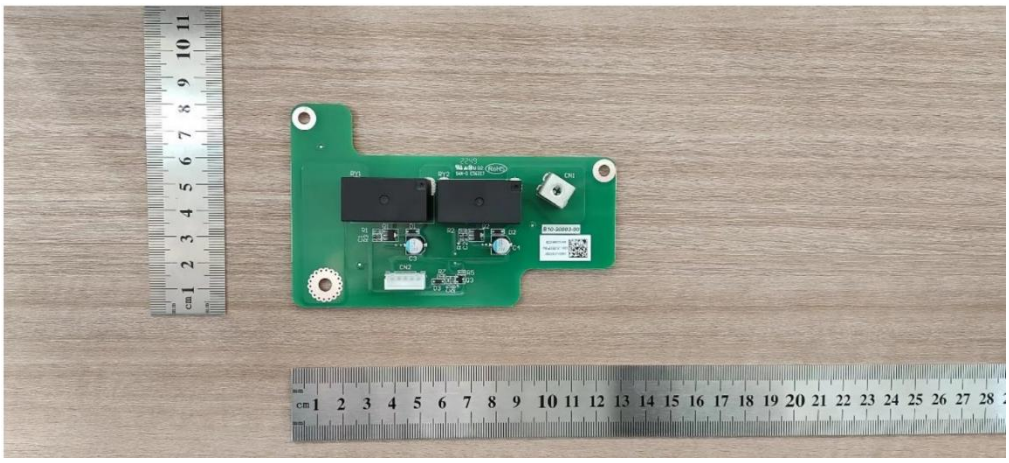
(alternative)

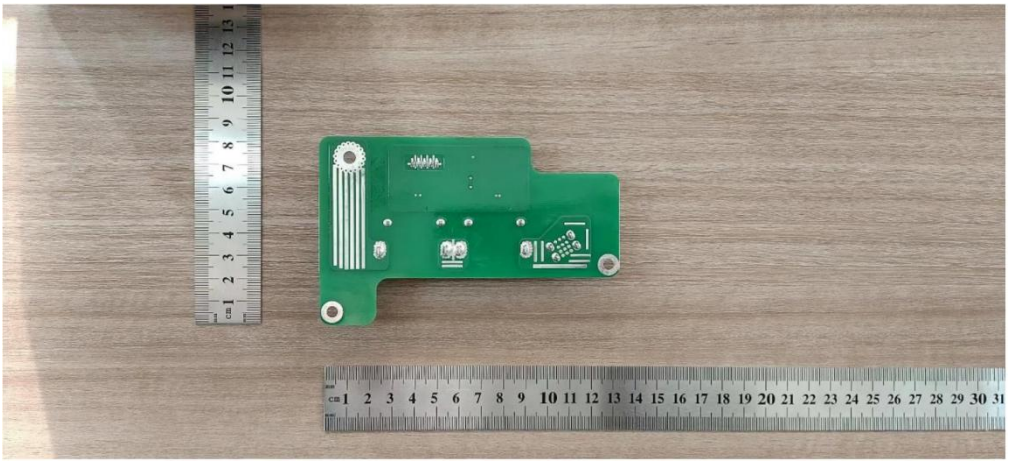




N-PE PCB board view

(alternative)





Annex 2 – Technical documents (Relay specification)

HF161F-W SOLAR RELAY

c UL us
File No.:E134517

VDE
File No.:40031410

CQC
File No.:CQC10002050943
CQC18002203499

Features

- 31A switching capacity
- Applicable to inverter used for photovoltaic power generation systems
- Ideal for UPS
- 1.5mm contact gap (compliant to European Photovoltaic Standard VDE0126)
  1.8mm contact gap (compliant to IEC 62109-2-2011)
- The clearance distance between contact and coil is bigger than 6.4mm, the creepage distance is bigger than 8mm. (special code 477:7.5mm)
- Low coil holding voltage contributes to saving energy of equipment.
- UL insulation system: Class F

RoHS compliant

CONTACT DATA

Contact gap	1.5mm	1.8mm	2.0mm	2.3mm
Contact arrangement	1A			
Contact resistance 1)	⩽100mΩ (1A 6VDC)			
Contact material	$AgSnO_2$			
Contact rating	Resistive: 26A 250VAC Inductive: 31A 250VAC (cosø=0.8) 0.1s:10s	Resistive: 26A 250VAC Inductive: 33A 250VAC (cosø=0.8) 0.1s:10s	Resistive: 26A 250VAC Inductive: 31A 250VAC (cosø=0.8) 0.1s:10s	Resistive: 26A 250VAC
Max. switching voltage	277VAC			
Max. switching current	31A	33A	31A	26A
Max. switching power	7750VA	8250VA	7750VA	7202VA
Mechanical endurance	1 x 10^6OPS	1 x 10^5OPS	1 x 10^5OPS	1 x 10^5OPS
Electrical endurance	HT type: 3 x 10^4OPS (26A 250VAC Resistive 75°C 1.5s on 1.5s off)	HT type: 3 x 10^4OPS (26A 250VAC Resistive 75°C 1.5s on 1.5s off)	HT type: 3 x 10^4OPS (26A 250VAC Resistive 75°C 1.5s on 1.5s off)	HT type: 3 x 10^4OPS (26A 250VAC Resistive Room temp. 1.5s on 1.5s off)

Notes: 1)The data shown above are initial values.

COIL

Coil power	Approx. 1.4W
Holding voltage	35% to 120%UN (at 23°C) 45% to 80%UN (at 85°C)

Notes: 1)The coil holding voltage is the voltage of coil after being applied rated voltage for 100ms
2)The relay col does not allow applied more than maximum of holding voltage values for a long time (Eg: 120% Un at 23°C; 80% Un at 85°C) , prevent overheating burned.

COIL DATA at 23°C

Nominal Voltage VDC	Pick-up Voltage VDC max.1)	Drop-out Voltage VDC min.1)	Max. Voltage VDC *2)	Coil Resistance Ω
9	6.3	0.9	10.8	58 x (1±10%)
12	8.4	1.2	14.4	103 x (1±10%)
18	12.6	1.8	21.6	230 x (1±10%)
24	16.8	2.4	28.8	410 x (1±10%)

Notes: 1)The data shown above are initial values.
2)*Maximum voltage refers to the maximum voltage which relay coil could endure in a short period of time.

CHARACTERISTICS

Insulation resistance		1000MΩ (at 500VDC)
Dielectric strength	Between coil & contacts	4500VAC 1min
	Between open contacts	2500VAC 1min
Surge voltage (between coil & contacts)		10kV (1.2/50μs)
Operate time (at rated. volt.)		20ms max.
Release time (at rated. volt.)		10ms max.
Temperature rise (at rated. volt.)		95K max. (Contact load current 31A, rated voltage excitation, at 60°C)
		70K max. (Contact load current 31A, 80% of rated voltage excitation, at 85°C)
Shock resistance	Functional	196m/s²
	Destructive	980m/s²
Vibration resistance		10Hz to 55Hz 1.5mm DA
Ambient temperature		-40°C to 85°C (Apply holding voltage to coil, which is 45% to 80% that of rated voltage)
Humidity		5% to 85% RH
Termination		PCB
Unit weight		Approx. 21g
Construction		Flux proofed

Notes: The data shown above are initial values.

SAFETY APPROVAL RATINGS

UL/CUL	$AgSnO_2$	26A 277VAC at 75°C 22A 277VAC at 85°C
VDE	$AgSnO_2$	26A 277VAC at 75°C 22A 277VAC at 85°C 31A 250VAC cosø =0.8 0.1s:10s 33A 250VAC cosø =0.8 0.1s:10s (477)

Notes: 1) All values unspecified are at room temperature.
2) Only typical loads are listed above. Other load specifications can be available upon request.

AZSR143

50 AMP MINIATURE POWER RELAY

FEATURES

- 50 Amp switching capability
- Contact gap: 1.8mm standard / 2.0mm available
- Dielectric strength 4.5 kV_{RMS}
- 10kV Surge
- UL class F insulation
- UL / CUR E365652
- TÜV B0887930015
- CQC 19002227975

CONTACTS

Arrangement	SPST-N.O. (1 Form A)
Ratings (max.) switched power switched current continuous current switched voltage	(resistive load) 13850 VA 50 A 50 A 277 VAC
Rated Loads **UL/CUR/TÜV/CQC**	43 A at 277 VAC, resistive, 85°C, 30k cycles 33 A at 277 VAC, resistive, 105°C, 30k cycles 50 A at 277 VAC, resistive, 85°C, 6k cycles 20 A at 277 VAC on, carry 50A, 20A 277VAC off, resistive, 85°C, 50k cycles
Contact material	$AgSnO_2$ (silver tin oxide)
Contact gap standard version option (103) version	 1.8 mm 2.0 mm
Contact resistance initial typical	(load contact) ≤ 100 mΩ < 3 mΩ

COIL

Nominal coil DC voltages	5, 9, 12, 18, 24, 48
Dropout voltage	> 5% of nominal coil voltage
Holding voltage	> 35% of nominal coil voltage
Coil power nominal holding power at pickup voltage	(at 23 °C) 1.6 W 196 mW 900 mW
Temperature Rise	70 K (126°F) at nom. coil voltage, 85°C
Max. temperature	Class F insulation - 155°C (311°F)

GENERAL DATA

Life Expectancy mechanical electrical	(minimum operations) 1 x 10^5 see UL/CUR/TÜV/CQC ratings
Operate Time	20 ms (max.) at nominal coil voltage
Release Time	10 ms (max.) at nominal coil voltage, without coil suppression
Dielectric Strength coil to load contacts open load contacts	(at sea level for 1 min.) 4500 V_{RMS} 2500 V_{RMS}
Surge Voltage	10kV @1.2/50µs (coil to contacts)
Insulation Resistance	1000 MΩ (min.) at 23°C, 500 VDC, 50% RH
Temperature Range operating	(at nominal coil voltage) -40°C (-40°F) to 85°C (185°F)
Vibration resistance	0.062" (1.5 mm) DA at 10–55 Hz
Shock	20 g
Enclosure protection category material group flammability	P.B.T. polyester RT II, flux proof IIIa UL94 V-0
Terminals	Tinned copper alloy, P. C.
Soldering max. temperature max. time	 270 °C 5 s
Dimensions length width height	 35.0 mm (1.38") 16.0 mm (0.63") 27.9 mm (1.10")
Weight	25 grams (approx.)
Compliance	UL 508, IEC 61810-1, RoHS, REACH
Packing unit in pcs	50 per plastic tray / 500 per carton box

Annex 3 – Test equipment list

Equipment	Internal No.	Manufacturer	Type	Serial No.	Calibration Due Date
Grid source	HC-ENG-030	KEWELL TECHNOLOGY CO., LTD.	KAC-45-345-33	6018888220300485	Monitored by Power Analyzer
	HC-ENG-040	KEWELL TECHNOLOGY CO., LTD.	KAC-45-345-33	6018888220903255	
DC Simulation Power Supply	HC-ENG-043	KEWELL TECHNOLOGY CO., LTD.	S7000-21K-2000-0040	6018888221003326	
	HC-ENG-044	KEWELL TECHNOLOGY CO., LTD.	S7000-21K-2000-0040	6018888221001316	
	HC-ENG-049	KEWELL TECHNOLOGY CO., LTD.	S7000-21K-2000-0040	6018888221201709	
Power Analyzer	HC-ENG-003	DEWESoft	SIRIUSi-HS-4xHV-4xLV	DB20123915 DB20124350	2023/9/5
Temperature Recorder	HS-SAF-081	Agilent Technologies, Inc.	34970A	MY44065751	2024/3/11
Temp&Hum.Tester chamber	HC-ENG-025	Grea Testing	GR-HWS500	GR2022021001	2024/3/11
Current transducer	HC-ENG-037-001	LEM	DS CT 400	1222140771	2023/9/5
Current transducer	HC-ENG-037-002	LEM	DS CT 400	1222140772	2023/9/5
Current transducer	HC-ENG-037-003	LEM	DS CT 400	1222140773	2023/9/5
Current transducer	HC-ENG-037-004	LEM	DS CT 400	1222140774	2023/9/5
Humidity&Temperature recorder	HS-SAF-116	Elitech Technology, Inc.	GSP-8A	CMA22B000589	2024/1/15
Residual current -resistance box	HC-ENG-031	EMAX	IMAXF8	202208003	Monitored by Power Analyzer
Residual current -capacitance box	HC-ENG-033	EMAX	IMAXQ05	202208005	
Tape measure	HS-SAF-071	Deli Group Co., Ltd.	8208	--	2024/3/26
Electrical scales	HS-SAF-087	SENSUN	TCS-150-A	T3163071	2024/3/11
Digital phosphor Oscilloscope	HS-SAF-009	Tektronix	TDS3032B	TDS3032B B030570	2024/3/11
Digital Oscilloscopes probe	HS-SAF-117	Tronovo	G3100	--	2024/3/26
Leakage current tester	HS-SAF-	CEPREI	410S	1508AG12	2024/3/26

Equipment	Internal No.	Manufacturer	Type	Serial No.	Calibration Due Date
	054	LABORATORY			
Leakage Current Tester	HS-SAF-012	Simpson	228	KEM040605	2024/3/26
Multifunction Safety Analyzer	HS-SAF-005	QINGDAO IDI ELECTRONICS CO., LTD.	MN4234	MD00176	2024/3/11
Digital Caliper	HS-SAF-073	Shanghai Meinaite Co., Ltd.	MNT-150	K22051103847	2024/3/11
Push-pull tester	HS-SAF-031	SUNDOO	SN-500	2815B11546	2024/3/11
Ground continuity tester	HS-SAF-105	BLUE BRIGHT	LK2678	G78-0621-001	2024/3/11
Electronic loading	HS-SAF-058	Applent Instruments Ltd	AT8612	861201510127	2024/3/11
Drop test board	HS-SAF-045	ANGUI TESTING	AGCL426	--	2024/3/26

<<End of Test Report>>