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TESTING
CNAS L12727



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

Report Number : 50409240013128-00 part 1 of 4

Date of issue : 2024-12-17

Total number of pages..... : 106

Name of testing laboratory preparing the report..... : TÜV SÜD New Energy Vehicle Testing (Jiangsu) Co., Ltd.

Applicant's name : Pylon Technologies Co., Ltd.

Address : No.300, Miaoqiao Road, Kangqiao Town, Pudong New Area, 201315 Shanghai, PEOPLE'S REPUBLIC OF CHINA

Test specification:

Standard..... : IEC 62109-1:2010

Test procedure : EESS approval scheme

Non-standard test method : N/A

Test Report Form No. : IEC62109_1B

Test Report Form(s) Originator : VDE Testing and Certification Institute

Master TRF..... : Dated 2016-04

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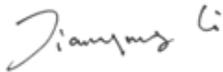
This report is not valid as a CB Test Report unless signed by an approved CB Testing Laboratory and appended to a CB Test Certificate issued by an NCB in accordance with IECEE 02.

General disclaimer:

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

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| | | |
|---|--|--|
| Test item description | Energy Storage System (Force H3X Energy storage system) | |
| Trade Mark..... |  | |
| Manufacturer | Pylon Technologies Co., Ltd. No.300, Miaoqiao Road, Kangqiao Town, Pudong New Area, 201315 Shanghai, PEOPLE'S REPUBLIC OF CHINA | |
| Model/Type reference..... | FH3X-3.6K-HY-1P-5, FH3X-3.6K-HY-1P-10, FH3X-3.6K-HY-1P-15, FH3X-3.6K-HY-1P-20, FH3X-5K-HY-1P-5, FH3X-5K-HY-1P-10, FH3X-5K-HY-1P-15, FH3X-5K-HY-1P-20, FH3X-6K-HY-1P-5, FH3X-6K-HY-1P-10, FH3X-6K-HY-1P-15, FH3X-6K-HY-1P-20, FH3X-8K-HY-1P-5, FH3X-8K-HY-1P-10, FH3X-8K-HY-1P-15, FH3X-8K-HY-1P-20 | |
| Ratings..... | See rating labels on page 4 to 6. | |
| Responsible Testing Laboratory (as applicable), testing procedure and testing location(s): | | |
| <input checked="" type="checkbox"/> | Name of Testing Laboratory preparing the report: | TÜV SÜD New Energy Vehicle Testing (Jiangsu) Co., Ltd. |
| | Location/ address | Building A, No.15 Factory, Jintong International Industrial Park, No.8 Xihu Road, Wujin National Hi-tech Industrial Development Zone, Changzhou City, Jiangsu Province, P.R. China |
| | Tested by (name, function, signature) | Jianyong Li <i>Project handler</i>  |
| | Approved by (name, function, signature) .. | Kai Zhao <i>Designated reviewer</i> |

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

Total test report contains 3 attachments listed in below table:

| Item | Description | Pages |
|--------------|---|-------|
| Attachment 1 | Test report of IP55 according to IEC 60529 (report no. VTL24.11.063CE-1) | 13 |
| Attachment 2 | Test report of salt spray test according to IEC 60068-2-52, vibration test according to IEC 60068-2-6 (report no. VTL24.11.059CE-1) | 22 |
| Attachment 3 | Photo document | 32 |

Summary of testing:

Family design products, all tests were conducted on representative model FH3X-8K-HY-1P-20 except that electrical ratings test was conducted on models FH3X-8K-HY-1P-5, FH3X-8K-HY-1P-10, FH3X-8K-HY-1P-15, FH3X-8K-HY-1P-20, FH3X-3.6K-HY-1P-5, FH3X-3.6K-HY-1P-20. All tests were conducted at test voltage: 1/N/PE~ 230Va.c. and test frequency: 50Hz if not specified.

All the test results are confirmed to the requirements of the standard.

IP55 test was carried out by Jiangsu Vehicle Testing Services Co., Ltd. (CNAS L12681), test reports number: VTL24.11.063CE-1, issued on 2024-11-22.

Salt spray test and vibration test was carried out by Jiangsu Vehicle Testing Services Co., Ltd. (CNAS L12681), test reports number: VTL24.11.059CE-1, issued on 2024-12-04.

Tests performed (name of test and test clause):

Full tests as in below except IP55 test

- Visual inspection – clauses as available;
- Mains supply electrical data in normal condition & electrical ratings tests – clause 4.2.2.6 & 4.7;
- Durability and legibility of marking – clause 5.1.2;
- Thermal test and single fault test – clause 4.3 & 4.4;
- Humidity preconditioning – clause 4.5;
- Voltage Back-feed Protection, as combined with clause 4.4;
- Non-accessibility – clause 7.3.4.2.3;
- Capacitor discharge – clause 7.3.5.3.2 & 7.3.9;
- Clearance and creepage distances – clause 7.3.7;
- Capacitor discharge – clause 7.3.9 & 7.4;
- Energy hazards – clause 7.4;
- Electrical tests – clause 7.5;
- Handle loading – clause 8.4;
- Material tests – clause 9.1.3;
- Sonic pressure hazards – 10;
- Actuating parts of controls (Knob pull and limitation of movement) – clause 13.1;
- Mould stress relief test – clause 13.6.2.1;
- Deformation tests – clause 13.7;
- Annex B operational test as combined with clause 4.4;

Testing location:

TÜV SÜD New Energy Vehicle Testing (Jiangsu) Co., Ltd.

Building A, No.15 Factory, Jintong International Industrial Park, No.8 Xihu Road, Wujin National Hi-tech Industrial Development Zone, Changzhou City, Jiangsu Province, P.R. China

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

All tests were carried out according to IEC 62109-1:2010.

- The product fulfils the requirements of IEC 62109-1:2010.**



Copy of marking plate:

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

Label size(W x H)=70 x 110mm.

Product Name: Force H3X Energy storage system Rated Capacity: 50 Ah

| System Model: | Module No. | Energy | Nominal Voltage | Battery Designation |
|---|------------|-----------|-----------------|----------------------------------|
| <input type="checkbox"/> FH3X-3.6K-HY-1P-5 | 1 | 5.12 kWh | 102.4 V | IFpP16/144/242[(32S)M/0+50/95 |
| <input type="checkbox"/> FH3X-3.6K-HY-1P-10 | 2 | 10.24 kWh | 204.8 V | IFpP16/144/242[(32S)2S]M/0+50/95 |
| <input type="checkbox"/> FH3X-3.6K-HY-1P-15 | 3 | 15.36 kWh | 307.2 V | IFpP16/144/242[(32S)3S]M/0+50/95 |
| <input type="checkbox"/> FH3X-3.6K-HY-1P-20 | 4 | 20.48 kWh | 409.6 V | IFpP16/144/242[(32S)4S]M/0+50/95 |

Controller Model: FH3X-3.6K-HY-1P

| | | |
|---------|--|--|
| PV | Max. input voltage Mppt voltage range Max. input current Isc PV(absolute maximum) | DC 600 V DC 80, ..., 550 V DC 16 A/16 A DC 25 A/25 A |
| Grid | Nominal grid voltage Nominal grid frequency Max. (rated) continuous current to grid Nominal active power to grid Max. (rated) apparent power to grid Max. (rated) continuous current from grid Nominal active power from grid Max. (rated) apparent power from grid Power factor range | 1/N/PE AC 230 V 50/60 Hz AC 15.7 A 3600 W 3600 VA AC 23.5 A 5400 W 5400 VA -0.8, ..., +0.8 |
| Back-up | Nominal output voltage Max. (rated) continuous current Nominal output frequency Max. (rated) apparent power Power factor range | 1/N/PE AC 230 V AC 15.7 A 50/60 Hz 3600 VA -0.8, ..., +0.8 |
| General | Protective class Overvoltage category Inverter topology Operating temperature range Ingress protection | I DC II (PV) /AC III (Grid,Back up) Non-isolated -10, ..., 55 °C IP55 |

Part Number:
Date of Production:
Serial Number:

Pylon Technologies Co., Ltd. | www.pylontech.com.cn MADE IN CHINA
No. 300, Miaoqiao Road, Kangqiao Town, Pudong New Area, Shanghai 201315, China

Product Name: Force H3X Energy storage system Rated Capacity: 50 Ah

| System Model: | Module No. | Energy | Nominal Voltage | Battery Designation |
|---|------------|-----------|-----------------|----------------------------------|
| <input type="checkbox"/> FH3X-5K-HY-1P-5 | 1 | 5.12 kWh | 102.4 V | IFpP16/144/242[(32S)M/0+50/95 |
| <input type="checkbox"/> FH3X-5K-HY-1P-10 | 2 | 10.24 kWh | 204.8 V | IFpP16/144/242[(32S)2S]M/0+50/95 |
| <input type="checkbox"/> FH3X-5K-HY-1P-15 | 3 | 15.36 kWh | 307.2 V | IFpP16/144/242[(32S)3S]M/0+50/95 |
| <input type="checkbox"/> FH3X-5K-HY-1P-20 | 4 | 20.48 kWh | 409.6 V | IFpP16/144/242[(32S)4S]M/0+50/95 |

Controller Model: FH3X-5K-HY-1P

| | | |
|---------|--|--|
| PV | Max. input voltage Mppt voltage range Max. input current Isc PV(absolute maximum) | DC 600 V DC 80, ..., 550 V DC 16 A/16 A DC 25 A/25 A |
| Grid | Nominal grid voltage Nominal grid frequency Max. (rated) continuous current to grid Nominal active power to grid Max. (rated) apparent power to grid Max. (rated) continuous current from grid Nominal active power from grid Max. (rated) apparent power from grid Power factor range | 1/N/PE AC 230 V 50/60 Hz AC 21.7 A 5000 W 5000 VA AC 32.6 A 7500 W 7500 VA -0.8, ..., +0.8 |
| Back-up | Nominal output voltage Max. (rated) continuous current Nominal output frequency Max. (rated) apparent power Power factor range | 1/N/PE AC 230 V AC 21.7 A 50/60 Hz 5000 VA -0.8, ..., +0.8 |
| General | Protective class Overvoltage category Inverter topology Operating temperature range Ingress protection | I DC II (PV) /AC III (Grid,Back up) Non-isolated -10, ..., 55 °C IP55 |

Part Number:
Date of Production:
Serial Number:

Pylon Technologies Co., Ltd. | www.pylontech.com.cn MADE IN CHINA
No. 300, Miaoqiao Road, Kangqiao Town, Pudong New Area, Shanghai 201315, China



| | | | |
|---|------------|-----------------------|--|
| Product Name: Force H3X Energy storage system | | Rated Capacity: 50 Ah | |
| System Model: | Module No. | Energy | Nominal Voltage/Battery Designation |
| <input type="checkbox"/> FH3X-6K-HY-1P-5 | 1 | 5.12 kWh | 102.4 V IFpP16/144/242[(32S)M/0+50/95 |
| <input type="checkbox"/> FH3X-6K-HY-1P-10 | 2 | 10.24 kWh | 204.8 V IFpP16/144/242[(32S)2S]M/0+50/95 |
| <input type="checkbox"/> FH3X-6K-HY-1P-15 | 3 | 15.36 kWh | 307.2 V IFpP16/144/242[(32S)3S]M/0+50/95 |
| <input type="checkbox"/> FH3X-6K-HY-1P-20 | 4 | 20.48 kWh | 409.6 V IFpP16/144/242[(32S)4S]M/0+50/95 |

Controller Model: FH3X-6K-HY-1P

| | | |
|---------|--|--|
| PV | Max. input voltage Mppt voltage range Max. input current Isc PV(absolute maximum) | DC 600 V DC 80, ..., 550 V DC 16 A/16 A DC 25 A/25 A |
| Grid | Nominal grid voltage Nominal grid frequency Max. (rated) continuous current to grid Nominal active power to grid Max. (rated) apparent power to grid Max. (rated) continuous current from grid Nominal active power from grid Max. (rated) apparent power from grid Power factor range | 1/N/PE AC 230 V 50/60 Hz AC 26.1 A 6000 W 6000 VA AC 39.1 A 9000 W 9000 VA -0.8, ..., +0.8 |
| Back-up | Nominal output voltage Max. (rated) continuous current Nominal output frequency Max. (rated) apparent power Power factor range | 1/N/PE AC 230 V AC 26.1 A 50/60 Hz 6000 VA -0.8, ..., +0.8 |
| General | Protective class Overvoltage category Inverter topology Operating temperature range Ingress protection | I DC II (PV) /AC III (Grid,Back up) Non-isolated -10, ..., 55 °C IP55 |

Part Number:
Date of Production:
Serial Number:



Pylon Technologies Co., Ltd. | www.pylontech.com.cn MADE IN CHINA
No. 300, Miaoqiao Road, Kangqiao Town, Pudong New Area, Shanghai 201315, China



| | | | |
|---|------------|-----------------------|--|
| Product Name: Force H3X Energy storage system | | Rated Capacity: 50 Ah | |
| System Model: | Module No. | Energy | Nominal Voltage/Battery Designation |
| <input type="checkbox"/> FH3X-8K-HY-1P-5 | 1 | 5.12 kWh | 102.4 V IFpP16/144/242[(32S)M/0+50/95 |
| <input type="checkbox"/> FH3X-8K-HY-1P-10 | 2 | 10.24 kWh | 204.8 V IFpP16/144/242[(32S)2S]M/0+50/95 |
| <input type="checkbox"/> FH3X-8K-HY-1P-15 | 3 | 15.36 kWh | 307.2 V IFpP16/144/242[(32S)3S]M/0+50/95 |
| <input type="checkbox"/> FH3X-8K-HY-1P-20 | 4 | 20.48 kWh | 409.6 V IFpP16/144/242[(32S)4S]M/0+50/95 |

Controller Model: FH3X-8K-HY-1P

| | | |
|---------|--|--|
| PV | Max. input voltage Mppt voltage range Max. input current Isc PV(absolute maximum) | DC 600 V DC 80, ..., 550 V DC 16 A/16 A/16 A DC 25 A/25 A/25 A |
| Grid | Nominal grid voltage Nominal grid frequency Max. (rated) continuous current to grid Nominal active power to grid Max. (rated) apparent power to grid Max. (rated) continuous current from grid Nominal active power from grid Max. (rated) apparent power from grid Power factor range | 1/N/PE AC 230 V 50/60 Hz AC 34.8 A 8000 W 8000 VA AC 52.2 A 12000 W 12000 VA -0.8, ..., +0.8 |
| Back-up | Nominal output voltage Max. (rated) continuous current Nominal output frequency Max. (rated) apparent power Power factor range | 1/N/PE AC 230 V AC 34.8 A 50/60 Hz 8000 VA -0.8, ..., +0.8 |
| General | Protective class Overvoltage category Inverter topology Operating temperature range Ingress protection | I DC II (PV) /AC III (Grid,Back up) Non-isolated -10, ..., 55 °C IP55 |

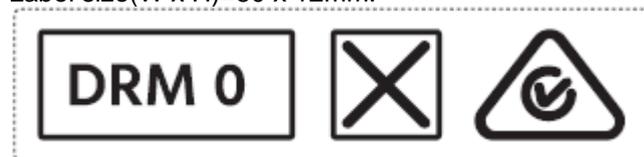
Part Number:
Date of Production:
Serial Number:



Pylon Technologies Co., Ltd. | www.pylontech.com.cn MADE IN CHINA
No. 300, Miaoqiao Road, Kangqiao Town, Pudong New Area, Shanghai 201315, China

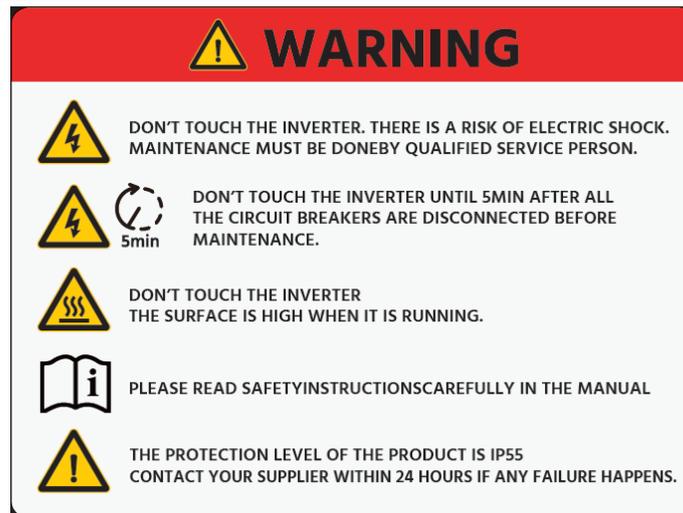
DRM label:

Label size(W x H)=50 x 12mm.



Additional warning labels (see next page):

Label size(W x H)=70 x 85mm.



Product serial number code example: A 8000 P0 3 24 A 00001

A: product type;

8000: product parameter;

P0: ODM customer code;

3: special identifier;

24: year;

A: month;

00001: product serial number;

The code "A 8000 P0 3 24 A 00001" can trace the manufacture information of the Energy Storage System. This is not the actual code and only for example.

Marking plate material: pressure-sensitive unprinted label stocks stamped into aluminium surface; Suitable for outdoor use with respect to exposure to Ultraviolet Light, Water Exposure and thermal transfer printed label stock applications, -40°C to 80°C. An additional PET film provided to cover label.



| | |
|---|--|
| Test item particulars : | |
| Equipment mobility | <input type="checkbox"/> movable <input type="checkbox"/> hand-held <input type="checkbox"/> stationary <input checked="" type="checkbox"/> fixed <input type="checkbox"/> transportable <input type="checkbox"/> for building-in |
| Connection to the mains : | <input checked="" type="checkbox"/> pluggable equipment <input type="checkbox"/> direct plug-in <input type="checkbox"/> permanent connection <input type="checkbox"/> for building-in |
| Environmental category : | <input checked="" type="checkbox"/> outdoor <input type="checkbox"/> indoor unconditional <input type="checkbox"/> indoor conditional |
| Over voltage category Mains | <input type="checkbox"/> OVC I <input type="checkbox"/> OVC II <input checked="" type="checkbox"/> OVC III <input type="checkbox"/> OVC IV |
| Over voltage category PV : | <input type="checkbox"/> OVC I <input checked="" type="checkbox"/> OVC II <input type="checkbox"/> OVC III <input type="checkbox"/> OVC IV |
| Mains supply tolerance (%) : | ±10 % |
| Tested for power systems | TN-C-S |
| IT testing, phase-phase voltage (V) : | - - - |
| Class of equipment : | <input checked="" type="checkbox"/> Class I <input type="checkbox"/> Class II <input type="checkbox"/> Class III <input type="checkbox"/> Not classified |
| Mass of equipment (kg) | See page 12 |
| Pollution degree : | 3(external environment), 2(internal environment) |
| IP protection class | IP 55 |
| : | |
| Possible test case verdicts: | |
| - test case does not apply to the test object | N/A |
| - test object does meet the requirement..... | P (Pass) |
| - test object was not evaluated for the requirement | N/E |
| - test object does not meet the requirement..... | F (Fail) |
| Testing : | |
| Date of receipt of test item | 2024-10-18 |
| Date (s) of performance of tests | 2024-10-18 to 2024-12-04 |



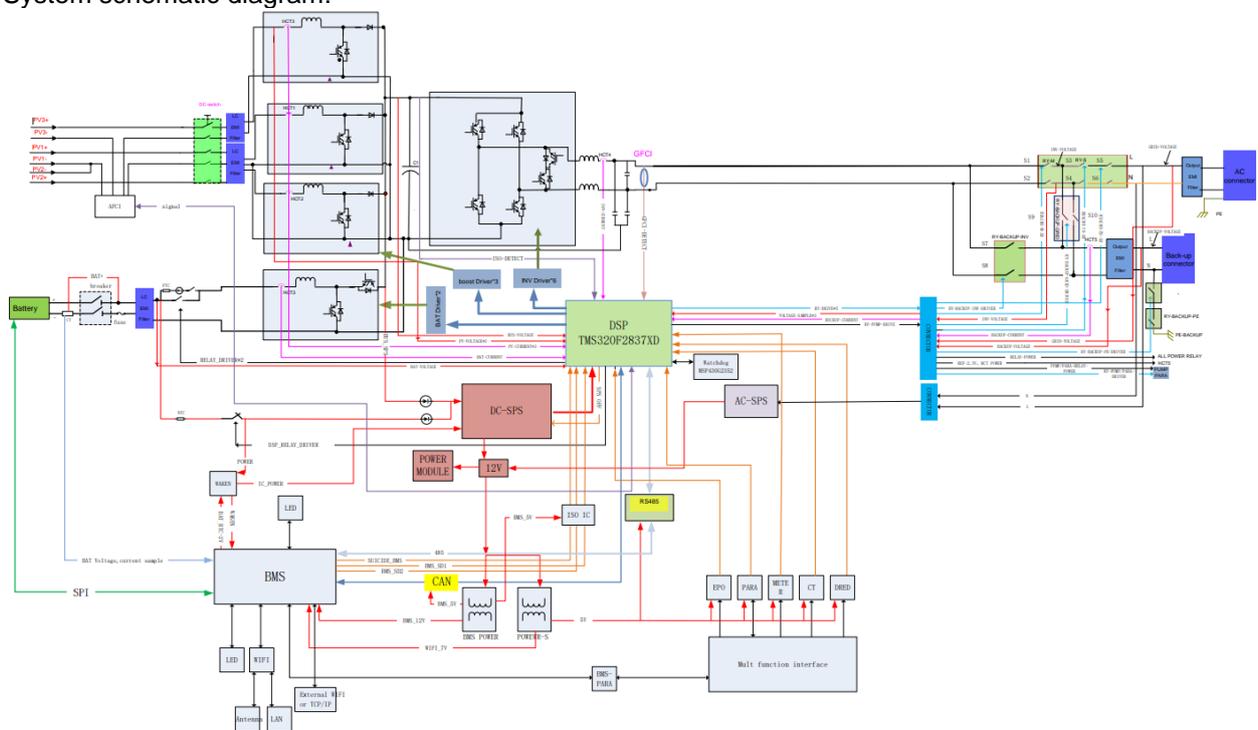
| | |
|---|--|
| General remarks: | |
| "(See Enclosure #)" refers to additional information appended to the report. "(See appended table)" refers to a table appended to the report. | |
| Throughout this report a <input type="checkbox"/> comma / <input checked="" type="checkbox"/> point is used as the decimal separator. | |
| Manufacturer's Declaration per sub-clause 4.2.5 of IEC60086-02: | |
| The application for obtaining a CB Test Certificate includes more than one factory location and a declaration from the Manufacturer stating that the sample(s) submitted for evaluation is (are) representative of the products from each factory has been provided | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> Not applicable |
| When differences exist; they shall be identified in the General product information section. | |
| Name and address of factory (ies) : Jiangsu Pylon Battery Co., Ltd. No. 7 Keyan 3rd Road, Yizheng Economic Development Zone, 211400 Yangzhou, Jiangsu Province, PEOPLE'S REPUBLIC OF CHINA | |

General product information:

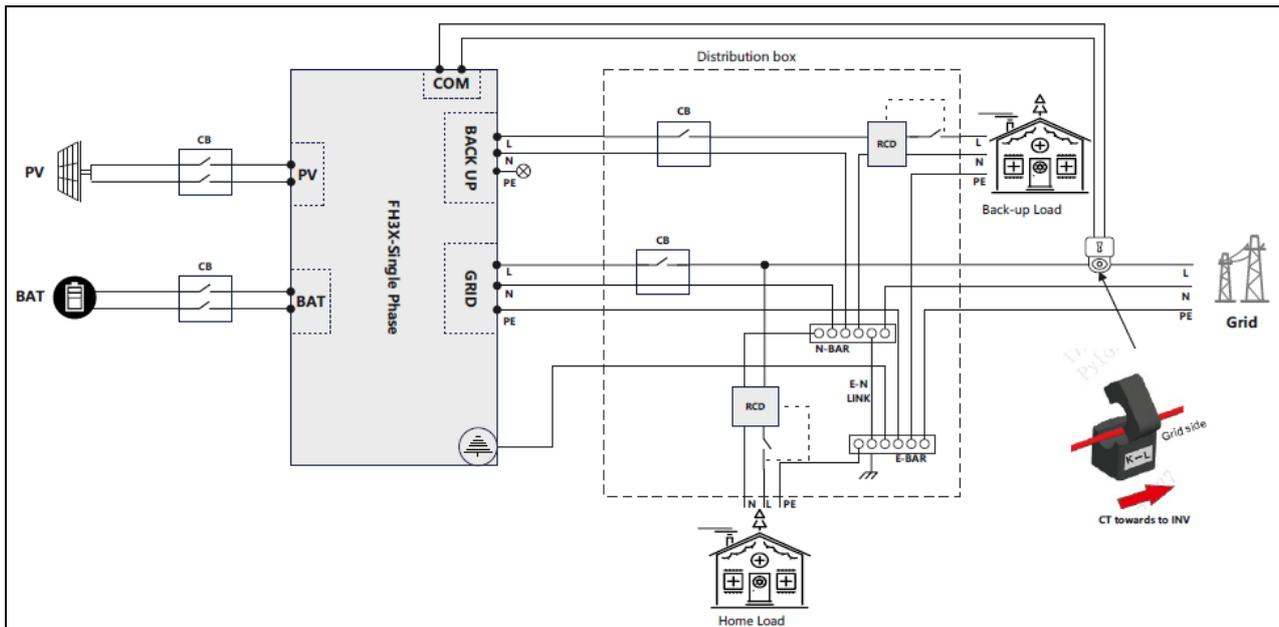
These Storage System are designed for outdoor use, which is an energy storage system with integrated battery and grid-tied inverter. Energy produced from grid-tied inverters shall be used to optimize self-consumption, then charge battery, exceed power from grid-tied system could export to grid. Loads will be supported in priority by grid-tied system, then battery power, exceed consumption power will be drained from grid.

Power distribution system with neutral continuity is maintained throughout the system, it means that only three-pole (for three-line conductors) main switch/circuit breaker upstream or interface protection switches were disconnected because of service/fault condition happened, the internal neutral-to-ground relays shall be opened with function disabled. The means used to bond the grounded conductor to protective earth shall be provided as part of the installation and the required means shall be followed with the installation instructions, including which conductor is to be bonded and the required current carrying capability or cross-section of the bonding means.

System schematic diagram:



Connection diagram (see next page):



Neutral continuity shall be maintained by installation external to the inverter specified in user manual.

Firmware/software version:
BMS: V1.0; Inverter V1.0;

Hardware version:
Power board: LH610-14100-B_V1.0; AC&BACKUP board: LTH610-72000-B_V1.0;
LBSB board: LBSB_LT_30S_V30; MCUR board: MCUR_PXHB_V30; MMCB board: MMCB_SP05_V10

The following documentations are retained on file:

- Photograph;
- Circuit diagrams;
- PCB layout drawing;
- PCB foil pattern assembly drawing;
- Specification sheets for components;
- Instruction manual.
- Manufacturer's work instruction and declaration for 100% routine test as required by IEC 62109-1:2010, IEC 62109-2:2011, AS 62040-1:2019, AS/NZS 4777.2:2020+Inc A1.

Model differences:

FH3X-8K-HY-1P-20: basic model.

Models FH3X-8K-HY-1P-5, FH3X-8K-HY-1P-10, FH3X-8K-HY-1P-15: same hardware with basic model except battery capacity.

Models FH3X-3.6K-HY-1P-20, FH3X-5K-HY-1P-20, FH3X-6K-HY-1P-20: same hardware with basic model except the MPPT quantities; input/output current and power controlled by software are different with basic model.

Models FH3X-3.6K-HY-1P-5, FH3X-3.6K-HY-1P-10, FH3X-3.6K-HY-1P-15, FH3X-5K-HY-1P-5, FH3X-5K-HY-1P-10, FH3X-5K-HY-1P-15, FH3X-6K-HY-1P-5, FH3X-6K-HY-1P-10, FH3X-6K-HY-1P-15: same hardware with basic model except the MPPT quantities, battery capacity; input/output current and power controlled by software are different with basic model.

For model information and differences as in table below (extract from user manual directly for reference):

| Model | FH3X-3.6K-HY-1P-5, FH3X-5K-HY-1P- | FH3X-3.6K-HY-1P-10, FH3X-5K-HY-1P- | FH3X-3.6K-HY-1P-15, FH3X-5K-HY- | FH3X-3.6K-HY-1P-20, FH3X-5K-HY- |
|-------|--------------------------------------|---------------------------------------|------------------------------------|------------------------------------|
| | | | | |



| | | | | |
|---|--|--|--|--|
| | 5, FH3X-6K-HY-1P-5, FH3X-8K-HY-1P-5 | 10, FH3X-6K-HY-1P-10, FH3X-8K-HY-1P-10 | 1P-15, FH3X-6K-HY-1P-15, FH3X-8K-HY-1P-15 | 1P-20, FH3X-6K-HY-1P-20, FH3X-8K-HY-1P-20 |
| Battery data | | | | |
| Battery module | FH10050 | | | |
| Number of battery modules | 1 | 2 | 3 | 4 |
| System nominal capacity | 5.12 kWh | 10.24 kWh | 15.36 kWh | 20.48 kWh |
| Nominal Voltage | DC 102.4 V | DC 204.8 V | DC 307.2 V | DC 409.6 V |
| | | | | |
| Model | FH3X-3.6K-HY-1P-5, FH3X-3.6K-HY-1P-10, FH3X-3.6K-HY-1P-15, FH3X-3.6K-HY-1P-20 | FH3X-5K-HY-1P-5, FH3X-5K-HY-1P-10, FH3X-5K-HY-1P-15, FH3X-5K-HY-1P-20 | FH3X-6K-HY-1P-5, FH3X-6K-HY-1P-10, FH3X-6K-HY-1P-15, FH3X-6K-HY-1P-20 | FH3X-8K-HY-1P-5, FH3X-8K-HY-1P-10, FH3X-8K-HY-1P-15, FH3X-8K-HY-1P-20 |
| PV input | | | | |
| Max. input voltage | DC 600 V | | | |
| MPPT voltage range | DC 80, ..., 550 V | | | |
| Max. input current | DC 16/16 A | DC 16/16 A | DC 16/16 A | DC 16/16/16 A |
| Isc PV(absolute maximum) | DC 25/25 A | DC 25/25 A | DC 25/25 A | DC 25/25/25 A |
| AC input/output | | | | |
| Nominal grid voltage | 1/N/PE AC 230 V | | | |
| Nominal grid frequency | 50 Hz | | | |
| Max. (rated) continuous current to grid | AC 15.7 A | AC 21.7 A | AC 26.1 A | AC 34.8 A |
| Nominal active power to grid | 3600 W | 5000 W | 6000 W | 8000 W |
| Max. (rated) apparent power to grid | 3600 VA | 5000 VA | 6000 VA | 8000 VA |
| Max. (rated) continuous current from grid | AC 23.5 A | AC 32.6 A | AC 39.1 A | AC 52.2 A |
| Nominal active power from grid | 5400 W | 7500 W | 9000 W | 12000 W |
| Max. (rated) apparent power from grid | 5400 VA | 7500 VA | 9000 VA | 12000 VA |



| | | | | |
|---------------------------------|-----------------|-----------|-----------|-----------|
| Power factor range | -0.8, ..., +0.8 | | | |
| Back-up output | | | | |
| Nominal output voltage | 1/N/PE AC 230 V | | | |
| Max. (rated) continuous current | AC 15.7 A | AC 21.7 A | AC 26.1 A | AC 34.8 A |
| Nominal output frequency | 50 Hz | | | |
| Max. (rated) apparent power | 3600 VA | 5000 VA | 6000 VA | 8000 VA |
| Power factor range | -0.8, ..., +0.8 | | | |

| | |
|-----------------------|-------------------------------|
| General Data | |
| Protective class | Class I |
| Over voltage category | II (PV) / III (Grid, Back-up) |
| Inverter Topology | Non-isolated |
| Operation Temp | -10, ..., +55°C |
| Ingress Protection | IP55 |
| Relative Humidity (%) | 0, ..., 100 |
| Altitude (m) | 2000 |
| Cooling | Natural |
| Human Interface | WIFI, WLAN, Bluetooth |
| Noise Emission (dB) | < 30 |

| | | | | |
|------------------------|---|---|---|---|
| Model | FH3X-3.6K-HY-1P-5, FH3X-5K-HY-1P-5, FH3X-6K-HY-1P-5, FH3X-8K-HY-1P-5 | FH3X-3.6K-HY-1P-10, FH3X-5K-HY-1P-10, FH3X-6K-HY-1P-10, FH3X-8K-HY-1P-10 | FH3X-3.6K-HY-1P-15, FH3X-5K-HY-1P-15, FH3X-6K-HY-1P-15, FH3X-8K-HY-1P-15 | FH3X-3.6K-HY-1P-20, FH3X-5K-HY-1P-20, FH3X-6K-HY-1P-20, FH3X-8K-HY-1P-20 |
| Dimensions (W*H*D, mm) | 540*665*350 | 540*835*350 | 540*1005*350 | 540*1175*350 |
| Weight (kg) | 77 | 116 | 155 | 194 |

License conditions---

1. When installing the equipment, all requirements of the mentioned standards must be fulfilled.
2. In order to protect the installation against electrical and fire hazard, all branch circuits in an installation, switchgear, cables etc., must be short-circuit and over-current protected according to the national/ international regulations.
3. When install PV generation system, double/reinforced insulation cable required with mechanical protection. Recommended conductor cross-section area and installation method specified in user manual.



4. To allow maintenance of PV inverter part, means of isolating the PV inverter from the PV side and the AC side shall be provided at the end-use application.
5. Continuous inverter backfeed current from grid to the array is 0A based on test/circuit topology analysis and manufacturer's declaration.
6. The inverter is intended to be used with appropriate PV-generator, switchgear, SPDs, combiner feeder box, distribution board, electrical protection components and other device to form complete end systems. Compliance with safety regulations depends upon installing and configuring inverter correctly, including using the specified emergency stop device adjacent to solar inverter. The unit must be installed only by professional assemblers who are familiar with requirements for safety and EMC. The assembler is responsible for ensuring that the end product or system complies with all the relevant laws in the country where it is to be used. Refer to instruction manual.
7. Additional equipment connected to the inverter must comply with the respective IEC, EN or ISO standards (e.g. IEC 60950/EN 60950 series for data processing equipment, IEC 61439/EN 61439 series for switchgear).
8. An additional RCD, type B according to IEC/TR 60755(ed.2), which is located between the inverter and the mains, may be provided for fault protection by automatic disconnection of supply in the end-use application with the agreement of local network operator.
11. Abnormal and component failure tests were conducted with the AC grid and stand-alone output protected by external C-type circuit breaker provided in all live connections to the grid and load. In the case of a short circuit for AC grid output, the inverter provides current of max. 94.0 A for 42.7 ms, C-type circuit breaker rated 63A/AC 230V with additional type B residual-current device shall be used in the end-use application. And the stand-alone output short circuit, the inverter provides current of max. 131.0 A for 24.5 ms, C-type circuit breaker rated 63A/AC 230V with additional type B residual-current device shall be used in the end-use application.
12. Abnormal and component failure tests were conducted with the battery input protected by external C-type circuit breaker rated 63A/1000V.
13. Single fault tests were conducted with external AC breaker rated 63A and complete 2 m length with approved AC wire rated 600V/10mm².
14. For safety reasons, install the emergency stop devices at station adjacent to inverter in the end-system. Pressing the stop function on the control panel of the inverter does generate an emergency stop and separate the inverter from dangerous potential.
15. The following safety parameters are factory set and fixed per IEC 62109-2:2011(EN 62109-2:2011).

Default interface protection settings

| Parameters | Normative requirements | | Internal threshold setting | |
|--|------------------------|--------------|--|-------------------------|
| | Maximum clearance time | Trip setting | Maximum clearance time (factory setting) | Factory default setting |
| PV array Insulation resistance measurement before starting operation | - | 20 kΩ | - | 200 kΩ |
| Continuous residual current | 300ms | 300mA | 160ms | 80mA |
| Sudden changes in residual current | 300ms | 30mA | 100ms | 25mA |
| | 150ms | 60mA | 80ms | 55mA |
| | 40ms | 150mA | 20ms | 110mA |

Unauthorised access to factory safety parameters setting and software should be prohibited.

A reset to the factory safety parameters requires retesting and verification in conjunction with the end-use system.

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| Clause | Requirement – Test | Result – Remark | Verdict |
|-----------|---|---|----------|
| 4 | GENERAL TESTING REQUIREMENTS | | P |
| 4.1 | General | | P |
| 4.2 | General conditions for testing | | P |
| 4.2.1 | Sequence of tests | | P |
| 4.2.2 | Reference test conditions | | P |
| 4.2.2.1 | Environmental conditions | | P |
| 4.2.2.2 | State of equipment | | P |
| 4.2.2.3 | Position of equipment | Test equipment was 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 | The cover and removable parts can only be removed by tool, the clause here is not applicable. | N/A |
| 4.2.2.6 | Mains supply a) Voltage: b) Frequency: c) Polarity: d) Earthing: e) Over-current Protection: | a) Test voltage is considered within tolerance 90% to 110%. b) AC output 50/60 Hz c) Polarity was connected as specified in user manual. d) the product is supplied by earthed power system. e) Over-current protection device was installed during the test as specified in the user manual. | P |
| 4.2.2.7 | Supply ports other than the mains | PV input port | P |
| 4.2.2.7.1 | Photovoltaic supply sources a) Open circuit voltage: b) Short-circuit current: | | P |
| 4.2.2.7.2 | Battery inputs | Battery integrated | P |
| 4.2.2.8 | Conditions of loading for output ports | DC-AC inverter. a.c. output port was loaded with linear loads to obtain the maximum rated output power. Continuous operation ratings, until steady conditions are established | P |
| 4.2.2.9 | Earthing terminals | | P |
| 4.2.2.10 | Controls | | P |

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| Clause | Requirement – Test | Result – Remark | Verdict |
|----------|---|--|---------|
| 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 |
| 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 | Not for short-term or intermittent operation | N/A |
| 4.4.4.3 | Motors | | P |
| 4.4.4.4 | Transformer short circuit tests | | P |
| 4.4.4.5 | Output short circuit | Line and Neutral, Line and PE. Above combinations of output terminals are tested one a time. The PCE AC grid max. output short-circuit current is 94.0A peak impulse (42.7ms duration). Back-up max. output short-circuit current is max. 131.0A peak impulse (24.5 ms duration). | P |
| 4.4.4.6 | Backfeed current test for equipment with more than one source of supply | No continuous backfeed current, see single fault test of table 4.4 | P |
| 4.4.4.7 | Output overload | For AC grid and back-up output, no overload function. | P |

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|-------------|--------------------|-----------------|---------|
| Clause | Requirement – Test | Result – Remark | Verdict |

| | | | |
|----------|--|---|-----|
| | | Internal circuit breaker and battery fuse to provide battery overload protection, and the device hardware and software will also provide protection. | |
| 4.4.4.8 | Cooling system failure | | P |
| 4.4.4.9 | Heating devices | No such device | N/A |
| 4.4.4.10 | Safety interlock systems | No safety interlock | N/A |
| 4.4.4.11 | Reverse d.c. connections | See single fault test of table 4.4. The inverter cannot start up and display fault information | P |
| 4.4.4.12 | Voltage selector mismatch | No voltage selector | 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 | 95% RH, 40°C, 48h | P |
| 4.5.1 | General | | P |
| 4.5.2 | Conditions | | P |
| 4.6 | Backfeed voltage protection | AC/DC connector discharge to DVC A and no energy hazard level within 5 minutes. Symbol   used for warning on marking plate for installer | 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 |
| 5.1.1 | General | Rack- or panel-mounted equipment, markings on external surface of enclosure, side enclosure with rating label and warning substance, warning symbols, and installation indication or switch position provided at close up | P |

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|-------------|---|--|---------|
| Clause | Requirement – Test | Result – Remark | Verdict |
| | | of external connection interface. Graphic symbols per Annex C or IEC 60417, refer to section “copy of marking plate” | |
| | Equipment shall bear markings as specified in 5.1 and 5.2 | Label are marked on the PCE and graphic symbol is explained in user manual | 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 | Tested with isopropyl alcohol for 30s | P |
| 5.1.3 | Identification | | P |
| | The equipment shall, as a minimum, be permanently marked with: | | P |
| | a) the name or trade mark of the manufacturer or supplier | Refer to section “copy of marking plate” | P |
| | b) model number, name or other means to identify the equipment | Refer to section “copy of marking plate” | P |
| | c) a serial number, code or other marking allowing identification of manufacturing location and the manufacturing batch or date within a three month time period. | Marking on equipment | P |
| 5.1.4 | Equipment ratings | Replaced, refer to IEC 62109-2:2011 test report | N/A |
| | Unless otherwise specified in another part of IEC 62109, the following ratings, as applicable shall be marked on the equipment: | | N/A |
| | – input voltage, type of voltage (a.c. or d.c.), frequency, and max. continuous current for each input | | N/A |
| | – 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 | | N/A |
| | – the ingress protection (IP) rating as in 6.3 below | | N/A |
| 5.1.5 | Fuse identification | Not located in operator access areas. No operator replaceable fuse. | P |
| | Marking shall be located adjacent to each fuse or fuseholder, or on the fuseholder, or in another | | N/A |

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|-------------|--|--|---------|
| Clause | Requirement – Test | Result – Remark | Verdict |
| | 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. | | |
| | Where fuses with special fusing characteristics such as time delay or breaking capacity are necessary, the type shall also be indicated | | N/A |
| | For fuses not located in operator access areas and for soldered-in fuses located in operator access areas, it is permitted to provide an unambiguous cross-reference (for example, F1, F2, etc.) to the servicing instructions which shall contain the relevant information. | FUSE marking located adjacent to each fuse. The replacement can only be done by Pylontech. | 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. | The PV input and Battery input are marked with +/- . The AC output and back-up output are connected by approved AC coupler. For installation, pls. refer to installation manual. The symbol from Table C-7 is used for the PE and green-yellow wire used as well | 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. | Indicator lamps used to indicate status of the inverter. | P |
| | A multiple-voltage unit shall be marked to indicate the particular voltage for which it is set when shipped from the factory. The marking is allowed to be in the form of a paper tag or any other non-permanent material. | | N/A |
| | A unit with d.c. terminals shall be plainly marked indicating the polarity of the connections, with: | | P |
| | – the sign “+” for positive and “-”, for negative; or | Polarity marked with +/- | 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 | Symbol 7 of Annex C adjacent to earth terminal | P |
| | The means of connection for the protective earthing conductor shall be marked with: | | P |
| | – symbol 7 of Annex C or | On AC coupler and close to secondary grounding position | P |
| | – the letters “PE” or | | N/A |
| | – the colour coding green-yellow. | | P |

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|-------------|--|---|---------|
| Clause | Requirement – Test | Result – Remark | Verdict |
| 5.1.7 | Switches and circuit-breakers | DC switch is integrated in PCE, On and Off position marking on PCE clearly with “ON” and “OFF”. Output overcurrent protection provided by external type C circuit breaker with rating@63A for model FH3X-8K-HY-1P-20 recommended at end-installation, for other models, refer to user manual. | 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 | N/A |
| | Equipment using Class II protective means throughout shall be marked with symbol 12 of Annex C. Equipment which is only partially protected by DOUBLE INSULATION or REINFORCED INSULATION shall not bear symbol 12 of Table Annex C. | | N/A |
| | Where such equipment has provision for the connection of an earthing conductor for functional reasons (see 7.3.6.4) it shall be marked with symbol 6 of Annex C | | N/A |
| 5.1.9 | Terminal boxes for External Connections | Installation couplers used for external connection | N/A |
| | Where required by note 1 of Table 2 as a result of high temperatures of terminals or parts in the wiring compartment, there shall be a marking, visible beside the terminal before connection, of either: | | N/A |
| | a) the minimum temperature Rating and size of the cable to be connected to the TERMINALS; or | | N/A |
| | b) a marking to warn the installer to consult the installation instruction. Symbol 9 of Table D-1 is an acceptable marking | | N/A |
| 5.2 | Warning markings | | P |
| 5.2.1 | Visibility and legibility requirements for warning markings | | 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 | | P |

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|-------------|--|---|---------|
| Clause | Requirement – Test | Result – Remark | Verdict |
| | high and shall contrast in colour with the background | | |
| | – 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. | | N/A |
| | If it is necessary to refer to the instruction manual to preserve the protection afforded by the equipment, the equipment shall be marked with symbol 9 of Annex C | | P |
| | Symbol 9 of Annex C is not required to be used adjacent to symbols that are explained in the manual | The manual provides necessary information for the warning marking | P |
| 5.2.2 | Content for warning markings | See warning marking and user manual | P |
| 5.2.2.1 | Ungrounded heat sinks and similar parts | With grounded heat sink and similar metal parts | N/A |
| | An ungrounded heat sink or other part that may be mistaken for a grounded part and involves a risk of electric shock in accordance with 7.3 shall be marked with symbol 13 of Annex C, or equivalent. The marking may be on or adjacent to the heat sink and shall be clearly visible when the PCE is disassembled to the extent that a risk of contact with the heat sink exists. | | N/A |
| 5.2.2.2 | Hot Surfaces | | P |
| | A part of the PCE that exceeds the temperature limits specified in 4.3.2 shall be marked with symbol 14 of Annex C or equivalent. | Symbol  marked on PCE | P |
| 5.2.2.3 | Coolant | Air cooling | 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 | Symbol   used for | P |

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|-------------|---|--|---------|
| Clause | Requirement – Test | Result – Remark | Verdict |
| | to discharge capacitors to safe voltage and energy levels shall accompany the symbol. | warning on marking plate for installer as normal discharge. For repairing and internal maintenance, only by service personal who is familiar with product. Do not touch any inner live parts until 5 minutes after disconnection from all external power supplies! | |
| 5.2.2.5 | Motor guarding | Only with low power cooling fan with SELV supply and enclosure as to provide adequate protection against the risk of operator to contact with. | P |
| | Where required by 8.2 a marking shall be provided where it is visible to service personnel before removal of a guard, warning of the hazard and giving instructions for safe servicing (for example disconnection of the source before removing the guard). | Warning marking: Do not touch any inner live parts until 5 minutes after disconnection from all external power supplies! | P |
| 5.2.3 | Sonic hazard markings and instructions | <80dBA@1m, no 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 | PV, battery and mains as sources of supply | P |
| | A PCE with connections for multiple energy sources shall be marked with symbol 13 of Annex C and the manual shall contain the information required in 5.3.4. | Symbol 13 of Annex C used, and with the following substance in manual: Do not touch any inner live parts until 5 minutes after disconnection from all external power supplies! | 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. | Located outside of the unit | P |
| 5.2.5 | Excessive touch current | Measured @0.65mA<3.5mA r.m.s. | P |
| | 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 | | N/A |

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|-------------|---|--|---------|
| Clause | Requirement – Test | Result – Remark | Verdict |
| | manual. | | |
| 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 | Refer to user manual | 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: | As specified in user manual, refer to “Technical Specifications” | P |
| | – ENVIRONMENTAL CATEGORY as per 6.1 | For outdoor use | P |
| | – WET LOCATIONS classification for the intended external environment as per 6.1 | For wet location use | P |
| | – POLLUTION DEGREE classification for the intended external environment as per 6.2 | 3 | P |
| | – INGRESS PROTECTION rating as per 6.3 | IP55 | P |
| | – Ambient temperature and relative humidity ratings | -10°C...+55°C Relative humidity: 0...100% | P |
| | – MAXIMUM altitude rating | 2000m | P |
| | – OVERVOLTAGE CATEGORY assigned to each input and output port as per 7.3.7.1.2, accompanied by guidance regarding how to ensure that the installation complies with the required overvoltage categories; | II (PV) / III (Grid, Back-up) | P |
| | d) a warning that when the photovoltaic array is exposed to light, it supplies a d.c. voltage to the PCE | Refer to user manual | P |
| 5.3.1.1 | Language | English provided | P |
| | Instructions related to safety shall be in a language that is acceptable in the country where the equipment is to be installed. | For other country language, further evaluation is needed | N/A |
| 5.3.1.2 | Format | Printed form provided and is to be delivered with equipment | P |
| | In general, the documentation must be provided in printed form and is to be delivered with the equipment. | | P |

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|-------------|---|---|---------|
| Clause | Requirement – Test | Result – Remark | Verdict |
| | 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 | As specified in user manual, refer to information related to installation | P |
| | The documentation shall include installation and where applicable, specific commissioning instructions and, if necessary for safety, warnings against hazards which could arise during installation or commissioning of the equipment. The information provided shall include: | | 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 external controls, colour coding of leads, or overcurrent protection needed; | | P |
| | d) explanation of the pin-out of connectors for external connections, unless the connector is used for a standard purpose (e.g. RS 232) | | P |
| | e) ventilation requirements; | | P |
| | f) requirements for special services, for example cooling liquid; | | P |
| | g) instructions and information relating to sound pressure level if required by 10.2.1; | <80dBA@1m | 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 |
| | 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; | | P |
| | k) for each input to the PCE, the max value of | | P |

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|-------------|--|---|---------|
| Clause | Requirement – Test | Result – Remark | Verdict |
| | short-circuit current available from the source, for which the PCE is designed; and | | |
| | l) compatibility with RCD and RCM; | | P |
| | m) instructions for protective earthing, including the information required by 7.3.6.3.7 if a second protective earthing conductor is to be installed: | | P |
| | n) where required by 7.3.8, the installation instructions shall include the following or equivalent wording: | Internal RCM is used, refer to user manual if strictly required | 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 | Not intended to charge external batteries | N/A |
| | p) PV array configuration information, such as ratings, whether the array is to be grounded or floating, any external protection devices needed, etc. | | P |
| 5.3.3 | Information related to operation | As specified in user manual, refer to 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 | | P |
| | – Instructions, that if the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired. | | P |
| 5.3.4 | Information related to maintenance | Maintenance made only by professional service personal who is familiar with product, please refer the Product Maintenance instruction as part of user manual. | P |

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|-------------|--|-------------------------------|---------|
| Clause | Requirement – Test | Result – 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 operator replaceable parts | N/A |
| | – Instructions for safe cleaning (if recommended) | | P |
| | – Where there is more than one source of supply energizing the PCE, information shall be provided in the manual to indicate which disconnect device or devices are required to be operated in order to completely isolate the equipment. | | P |
| 5.3.4.1 | Battery maintenance | | P |
| | Where required by 14.8.5, the documentation shall include the applicable items from the following list of instructions regarding maintenance of batteries: | | P |
| | – Servicing of batteries should be performed or supervised by personnel knowledgeable about batteries and the required precautions | | P |
| | – When replacing batteries, replace with the same type and number of batteries or battery packs | | P |
| | – General instructions regarding removal and installation of batteries | | P |
| | – CAUTION: Do not dispose of batteries in a fire. The batteries may explode. | | P |
| | – CAUTION: Do not open or damage batteries. Released electrolyte is harmful to the skin and eyes. It may be toxic. | | P |
| | – 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: | | P |
| | a) Remove watches, rings, or other metal objects. | | P |
| | b) Use tools with insulated handles. | | P |
| | c) Wear rubber gloves and boots. | | P |
| | d) Do not lay tools or metal parts on top of batteries | | P |

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| Clause | Requirement – Test | Result – Remark | Verdict |

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| | e) Disconnect charging source prior to connecting or disconnecting battery terminals | | P |
| | 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). | | P |

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| 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 | Outdoor use | P |
| | – Suitability for WET LOCATIONS or not | Wet locations | P |
| | – POLLUTION DEGREE rating in 6.2 below | PD 3 external, PD 2 internal | P |
| | – INGRESS PROTECTION (IP) rating, as in 6.3 below | IP55 | P |
| | – Ultraviolet (UV) exposure rating, as in 6.4 below | Metal enclosure used except with plastic window, DC switch, cable gland with polymeric material UV resistant | P |
| | – Ambient temperature and relative humidity ratings, as in 6.5 below | -10°C...+55°C Relative humidity: 0...100% | 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 | PD 3 external, PD 2 internal | P |
| 6.3 | Ingress Protection | IP55, see test report (CNAS report number: VTL24.11.063CE-1) | P |
| 6.4 | UV exposure | Metal enclosure used except with plastic window, DC switch and connector for AC, PV and communication wire with polymeric material UV resistant | P |
| 6.5 | Temperature and humidity | -10°C...+55°C Relative humidity: 0...100% | P |

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| 7 | PROTECTION AGAINST ELECTRIC SHOCK AND ENERGY HAZARDS | | P |
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| Clause | Requirement – Test | Result – Remark | Verdict |
| 7.1 | General | See 7.3.7 Table: Clearance and creepage distance measurement | P |
| 7.2 | Fault conditions | See single fault tests | P |
| 7.3 | Protection against electric shock | | P |
| 7.3.1 | General | | P |
| 7.3.2 | Decisive voltage classification | Accessible circuit: DVC A; Power circuit and other circuits: DVC B, DVC C | P |
| 7.3.2.1 | Use of decisive voltage class (DVC) | See 7.3.7 Table: Clearance and creepage distance measurement | P |
| 7.3.2.2 | Limits of DVC (according table 6) | Accessible circuit: below 16VAC r.m.s, 22.6VAC peak and 35VDC under both normal and single fault conditions | P |
| 7.3.2.3 | Short-terms limits of accessible voltages under fault conditions | | P |
| 7.3.2.4 | Requirements for protection (according table 7) | See 7.3.7 Table: Clearance and creepage distance measurement | P |
| 7.3.2.5 | Connection to PELV and SELV circuits | The PELV or SELV classification of the external circuit is not changed and the DVC classification of the external port of the PCE is not changed | P |
| 7.3.2.6 | Working voltage and DVC | | P |
| 7.3.2.6.1 | General | | P |
| 7.3.2.6.2 | AC working voltage (see Figure 2) | 1/N/PE~ 230 V with ±10% tolerance | P |
| 7.3.2.6.3 | DC working voltage (see Figure 3) | DC Vmax: 600V | P |
| 7.3.2.6.4 | Pulsating working voltage (see Figure 4) | | N/A |
| 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 | | N/A |
| | ▪ protective impedance comprising limitation of current per 7.3.5.3 and of discharged energy per 7.3.5.4, or | | P |
| | ▪ limitation of voltage according to 7.3.5.4. | | N/A |

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| Clause | Requirement – Test | Result – Remark | Verdict |
| | 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 | Well earthed metal housing used. See 7.3.7 Table: Clearance and creepage distance measurement | 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). | Enclosure provided | 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 | IP 55 | P |
| | The following requirements apply where protection against contact with live parts is provided by enclosures or barriers, not by insulation in accordance with 7.3.4.3. | Enclosure provided to prevent access to inside live parts | 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). | Secured by screws | P |
| | Polymeric materials used to meet these requirements shall also meet the requirements of 13.6 | LED cover | P |
| 7.3.4.2.2 | Access probe criteria | IP 55 | 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 | Communication interface | P |
| | b) decisive voltage classification B, (DVC B) - the probe must not touch bare live parts | No such circuit | N/A |
| | c) decisive voltage classification C, (DVC C) – the probe must have adequate clearance to live | No access | P |

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| Clause | Requirement – Test | Result – Remark | Verdict |
| | parts, based on the clearance for Basic insulation using the recurring peak working voltage involved, | | |
| 7.3.4.2.3 | Access probe tests | | P |
| | Compliance with 7.3.4.2.1 is checked by all of the following: | | P |
| | a) Inspection; and | Circuit connected to display panel and COM port. Connecting device for DC input and MAINS; Earthed casing with min. basic insulation from power circuit | 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. | IP 55 and without openings on enclosure, for mechanical enclosure test finger cannot access to live parts and approved external connecting device used | P |
| | The test finger and the test pin are applied as above, without appreciable force, in every possible position, except that floor-standing equipment having a mass exceeding 40 kg is not tilted. | | P |
| | Equipment intended for building-in or rack mounting, or for incorporation in larger equipment, is tested with access to the equipment limited according to the method of mounting detailed in the installation instructions. | | N/A |
| | c) Openings preventing the entry of the jointed test finger (Figure E-1 of 0E) during test b) above, are further tested by means of straight unjointed test finger (Figure E-3 of 0E), applied with a force of 30 N. If the unjointed finger enters, the test with the jointed finger is repeated except that the finger is applied using any necessary force up to 30 N. | | 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 $\pm 5^\circ$ only. | IP 55 and without openings on top enclosure | N/A |

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| Clause | Requirement – Test | Result – Remark | Verdict |
| 7.3.4.2.4 | Service access areas | Warning from the manufacture's manual is below: Risk of electric shock, do not remove cover. There are no user serviceable parts inside, refer servicing to qualified and accredited service technicians. Do not touch any inner live parts until 5 minutes after disconnection from all external power supplies! | N/A |
| 7.3.4.3 | Protection by means of insulation of live parts | See 7.3.7 Table: Clearance and creepage distance measurement | 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 | See 7.3.7 Table: Clearance and creepage distance measurement | P |
| 7.3.5.1 | General | | P |
| | Protection in case of direct contact is required to ensure that contact with live parts does not produce a shock hazard. | | P |
| | The protection against direct contact according to 7.3.4 is not required if the circuit contacted is separated from other circuits according to 7.3.2.3, and: | | P |
| | – is of decisive voltage class A and complies with 7.3.5.2, or | | P |
| | – is provided with protective impedance according to 7.3.5.3, or | ISO detection circuit | P |
| | – is limited in voltage according to 7.3.5.4 | | N/A |
| | In addition to the measures as given in 7.3.5.2 to 7.3.5.4, it shall be ensured that in the event of error or polarity reversal of connectors no voltages that exceed DVC A can be connected into a circuit with protective separation. This applies for example to plug-in-sub-assemblies or other plug-in devices which can be plugged-in without the use of a tool (key) or which are accessible without the use of a tool. | | N/A |
| | Conformity is checked by visual inspection and trial | | P |

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| Clause | Requirement – Test | Result – Remark | Verdict |
| | insertion. | | |
| 7.3.5.2 | Protection using decisive voltage class A | Communication interface | P |
| 7.3.5.3 | Protection by means of protective impedance | | P |
| | Circuits and conductive parts do not require protection against direct contact if any connection to circuits of DVC-B or DVC-C is through protective impedance, and the accessible circuit or part is otherwise provided with protective separation from circuits of DVC-B or DVC-C according 7.3.3. | | P |
| 7.3.5.3.1 | Limitation of current through protective impedance | | P |
| | The current available through protective impedance to earth and between simultaneously accessible parts, measured at the accessible live parts, shall not exceed a value of 3,5 mA a.c. or 10 mA d.c. under normal and single-fault conditions. | ISO detection circuit: Max. 0.6mA | P |
| 7.3.5.3.2 | Limitation of discharging energy through protective impedance | | P |
| | The discharging energy available between simultaneously accessible parts protected by protective impedance shall not exceed the charging voltage and capacitance limits given in Table 9, which applies to both wet and dry locations, under normal and single fault conditions. Refer to figure 8. | | P |
| 7.3.5.4 | Protection by means of limited voltages | | N/A |
| | That portion of a circuit that has its voltage reduced to DVC-A by a voltage divider that complies with the following requirements, and that is otherwise provided with protective separation from circuits of DVC-B or DVC-C according to 7.3.3, does not require protection against direct contact. | | N/A |
| | The voltage divider shall be designed so that under normal and single fault conditions, including faults in the voltage division circuit, the voltage across the output of the voltage divider does not exceed the limit for DVC-A. | | N/A |
| | This type of protection shall not be used in case of protective class II or unearthed circuits, because it relies on protective earth being connected. | | N/A |
| 7.3.6 | Protection against indirect contact | See 7.3.7 Table: Clearance and creepage distance measurement | P |
| 7.3.6.1 | General | | P |
| | Protection against indirect contact is required to prevent shock- hazardous current being accessible from conductive parts during an insulation failure. This protection shall comply with the requirements for protective class I (basic insulation plus | Protective class I: basic insulation plus protective earthing; protective class II part (DC/AC connector, display cover): | P |

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| Clause | Requirement – Test | Result – Remark | Verdict |
| | protective earthing), class II (double or reinforced insulation) or class III (limitation of voltages) | reinforced insulation. protective class III part (operator access communication port): DVC A | |
| | 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. | Plastic window, DC Switch, battery breaker and connector for AC/PV and communication wire. | P |
| | That part of PCE which meets the requirements of decisive voltage class A and in which no hazardous voltages are derived, is defined as protective class III. No shock hazard is present in such circuits. | | P |
| | 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. | Second grounding conductor is used. | P |
| 7.3.6.2 | Insulation between live parts and accessible conductive parts | See 7.3.7 Table: Clearance and creepage distance measurement | 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: | PE arrangement: external protective earthing is provided through approved AC installation connector, and an external second protective earthing conductor is bonded to metal case through locking washer, nut, isolating washer and UL approved ring terminal | P |
| | a) accessible conductive parts that are protected by one of the measures in 7.3.5.2 to 7.3.5.4, or | DVC A | P |
| | b) accessible conductive parts are separated from live parts of DVC-B or -C using double or reinforced insulation. | | P |
| 7.3.6.3.2 | Requirements for protective bonding | | P |
| | Electrical contact with the means of connection of the external protective earthing conductor shall be achieved by one or more of the following means: | | P |
| | a) through direct metallic contact; | | P |

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

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| Clause | Requirement – Test | Result – Remark | Verdict |
| | test current is based on the rating of the overcurrent 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; | | N/A |
| | c) For a circuit or part of the equipment for which an overcurrent protective device is provided as part of the equipment, the rating of the provided overcurrent device. | | N/A |
| | Voltages are measured from the protective earthing terminal to all parts whose protective bonding means are being considered. The impedance of the protective earthing conductor is not included in the measurement. However, if the protective earthing conductor is supplied with the equipment, it is permitted to include the conductor in the test circuit but the measurement of the voltage drop is made only from the main protective earthing terminal to the accessible part required to be earthed. | | N/A |
| | On equipment where the protective earth connection to a subassembly or to a separate unit is part of a cable that also supplies power to that subassembly or unit, the resistance of the protective bonding conductor in that cable is not included in the protective bond impedance measurements for the subassembly or separate unit, as shown in Figure 11. However, this option is only permitted if the cable is protected by a suitably rated protective device that takes into account the size of the conductor. Otherwise the impedance of the protective bonding conductor between the separate units is to be included, by measuring to the protective earthing terminal where the power source enters the first unit in the system, as shown in Figure 12. | | N/A |
| 7.3.6.3.3.1 | Test current, duration, and acceptance criteria | | N/A |
| | The test current, duration of the test and acceptance criteria are as follows: | | N/A |
| | a) For PCE with an overcurrent protective device rating of 16 A or less, the test current is 200% of the overcurrent protective device rating, but not less than 32 A, applied for 120s. The | | N/A |

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| Clause | Requirement – Test | Result – Remark | Verdict |
| | impedance of the protective bonding means during and at the end of the test shall not exceed 0,1 Ω . | | |
| | 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. | | N/A |
| | The test current is derived from an a.c or d.c supply source, the output of which is not earthed. | | N/A |
| | As an alternative to Table 10, where the time-current characteristic of the overcurrent protective device that limits the fault current in the protective bonding means is known because the device is either provided in the equipment or fully specified in the installation instructions, the test duration may be based on that specific device's time-current characteristic. The tests are conducted for a duration corresponding to the 200% current value on the time-current characteristic. | | N/A |
| 7.3.6.3.4 | Protective bonding impedance (routine test) | Manufacturer's work instruction and declaration based on this clause | 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 |
| | <ul style="list-style-type: none"> ▪ 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 |
| | <ul style="list-style-type: none"> ▪ 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 0,1 Ω . | | 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 | | N/A |

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| Clause | Requirement – Test | Result – Remark | Verdict |
| | required by 7.3.6.3.3.1b). | | |
| 7.3.6.3.5 | External protective earthing conductor | Refer to user manual | P |
| | A protective earthing conductor shall be connected at all times when power is supplied to PCE of protective class I. Unless local wiring regulations state otherwise, the protective earthing conductor cross-sectional area shall be determined from Table 11 or by calculation according to IEC 60364-5-54. | | P |
| | If the external protective earthing conductor is routed through a plug and socket or similar means of disconnection, it shall not be possible to disconnect it unless power is simultaneously removed from the part to be protected. | | P |
| | The cross-sectional area of every external protective earthing conductor which does not form part of the supply cable or cable enclosure shall, in any case, be not less than: | | P |
| | <ul style="list-style-type: none"> ▪ 2,5 mm² if mechanical protection is provided; | | N/A |
| | <ul style="list-style-type: none"> ▪ 4 mm² if mechanical protection is not provided. | Min. 10 mm ² of external protective earthing conductor | P |
| | For cord-connected equipment, provisions shall be made so that the external protective earthing conductor in the cord shall, in the case of failure of the strain-relief mechanism, be the last conductor to be interrupted. | | P |
| 7.3.6.3.6 | Means of connection for the external protective earthing conductor | Integrated with the AC coupler, additional PE conductor was fixed by screw near the AC coupler. | P |
| 7.3.6.3.6.1 | General | | P |
| | <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.</p> <p>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.</p> <p>A separate means of connection shall be provided for each external protective earthing conductor.</p> <p>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</p> | Measured max. 0.65mA<3.5mA after IP 55, single fault, and humidity preconditioning, a second protective earthing conductor is bonded to metal case through locking washer, nut, isolating washer and UL approved ring terminal | P |

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| Clause | Requirement – Test | Result – Remark | Verdict |
| | corrosion. | | |
| | The means of connection for the protective earthing conductor shall be permanently marked with: | | P |
| | <ul style="list-style-type: none"> • symbol 7 of Annex C; or | | P |
| | <ul style="list-style-type: none"> • the colour coding green-yellow | | P |
| | Marking shall not be done on easily changeable parts such as screws. | | P |
| 7.3.6.3.7 | Touch current in case of failure of the protective earthing conductor | (see appended table 7.3.6.3.7) Measured max. 0.65mA <3.5mA after IP 55, single fault, and humidity preconditioning and a second protective earthing conductor is to be installed | P |
| | The requirements of this sub-clause shall be satisfied to maintain safety in case of damage to or disconnection of the protective earthing conductor. | | P |
| | For pluggable equipment type A, the touch current measured in accordance with 7.5.4 shall not exceed 3,5 mA a.c. or mA d.c. | Not a pluggable type A equipment | N/A |
| | For all other PCE, one or more of the following measure shall be applied, unless the touch current measured in accordance with 7.5.4 using the test network of IEC 60990 test figure 4 shall not exceed 3,5 mA a.c. or 10 mA d.c. | | P |
| | a) Permanently connected wiring, and: | b) applied | N/A |
| | <ul style="list-style-type: none"> • a cross-section of the protective earthing conductor of at least 10 mm² Cu or 16 mm² Al; or | | N/A |
| | <ul style="list-style-type: none"> • automatic disconnection of the supply in case of discontinuity of the protective earthing conductor; or | | N/A |
| | <ul style="list-style-type: none"> • provision of an additional terminal for a second protective earthing conductor of the same cross-sectional area as the original protective earthing conductor and installation instruction requiring a second protective earthing conductor to be installed or | | N/A |
| | b) Connection with an industrial connector according to IEC 60309 and a minimum protective earthing conductor cross-section of 2,5 mm ² as part of a multi-conductor power cable. Adequate strain relief shall be provided. | Min. 10 mm ² of external protective earthing conductor | P |
| | In addition, the caution symbol 15 of Annex C shall be fixed to the product and the installation | | P |

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| Clause | Requirement – Test | Result – Remark | Verdict |
| | manual shall provide details of the protective earthing measures required in the installation as required in 5.3.2. | | |
| | When it is intended and allowed to connect two or more PCEs in parallel using one common PE conductor, the above touch current requirements apply to the maximum number of the PCEs to be connected in parallel, unless one of the measures in a) | Not allowed | N/A |
| | or b) above is used. The maximum number of parallel PCEs is used in the testing and has to be stated in the installation manual. | | N/A |
| 7.3.6.4 | Protective Class II – Double or Reinforced Insulation | Protective class II part (LED cover): double/reinforced insulation | P |
| | Equipment or parts of equipment designed for protective class II shall have insulation between live parts and accessible surfaces in accordance with 7.3.4.3. The following requirements also apply: | | P |
| | <ul style="list-style-type: none"> equipment designed to protective class II shall not have means of connection for the external protective earthing conductor. However this does not apply if the external protective earthing conductor is passed through the equipment to equipment series-connected beyond it. In the latter event, the external protective earthing conductor and its means for connection shall be insulated with basic insulation from the accessible surface of the equipment and from circuits that employ protective separation, extra-low voltage, protective impedance and limited discharging energy, according to 7.3.5. This basic insulation shall correspond to the rated voltage of the series-connected equipment; | Protective class II part (LED cover): double/reinforced insulation | P |
| | <ul style="list-style-type: none"> metal-encased equipment of protective class II may have provision on its enclosure for the connection of an equipotential bonding conductor; | | N/A |
| | <ul style="list-style-type: none"> 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 |
| | <ul style="list-style-type: none"> equipment employing protective class II shall be marked according to 5.1.8. | Class I equipment | N/A |
| 7.3.7 | Insulation Including Clearance and Creepage Distance | See 7.3.7 Table: Clearance and creepage distance measurement | P |

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|-------------|--|--|---------|
| Clause | Requirement – Test | Result – Remark | Verdict |
| 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 |
| | <ul style="list-style-type: none"> pollution degree | PD 3 external, PD 2 internal | P |
| | <ul style="list-style-type: none"> overvoltage category | II (PV) / III (Grid, Back-up) | P |
| | <ul style="list-style-type: none"> supply earthing system | TN (except corner earthed system) | P |
| | <ul style="list-style-type: none"> insulation voltage | 600V (PV) 1/N/PE~ 230V (Mains) | P |
| | <ul style="list-style-type: none"> location of insulation | See 7.3.7 Table: Clearance and creepage distance measurement | P |
| | <ul style="list-style-type: none"> type of insulation | See 7.3.7 Table: Clearance and creepage distance measurement | P |
| | Compliance of insulation, creepage distances, and clearance distances, shall be verified by measurement or visual inspection, and the tests of 7.5. | | P |
| 7.3.7.1.3 | Supply earthing systems | | P |
| | Three basic types of earthing system are described in IEC 60364-1. They are: | | P |
| | <ul style="list-style-type: none"> 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. | TN system with neutral earthed, except corner earthed system | P |
| | <ul style="list-style-type: none"> 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 |
| | <ul style="list-style-type: none"> 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 | | P |

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|-------------|--|---|---------|
| Clause | Requirement – Test | Result – Remark | Verdict |
| | and overvoltage category to define the impulse withstands voltage and the temporary overvoltage. | | |
| 7.3.7.2 | Insulation between a circuit and its surroundings | | P |
| 7.3.7.2.1 | General | 1/N/PE~ 230V, OVC III (4000 V impulse voltage, 1500 Vr.m.s. temporary overvoltage) for the AC output terminal and 600 V, OVC II (4000 V impulse voltage, no temporary overvoltage) for the PV input terminal No isolation between PV/Battery and AC mains output. Maximum 600 Vd.c. working voltage is assumed between DVC A circuit and DVC C circuit | P |
| 7.3.7.2.2 | Circuits connected directly to the mains | System voltage for mains is 300 Vr.m.s. According to table 12. 4000 V impulse voltage gives the most severe requirement | P |
| 7.3.7.2.3 | Circuits other than mains circuits | System voltage for PV is 600 Vd.c. | P |
| 7.3.7.2.4 | Insulation between circuits | Impulse voltage (4000 V), temporary overvoltage (1500 Vr.m.s) is calculated from table 12 for clearance. Working voltage (600 Vd.c.) across insulation is used for creepage for DC side and (230Vr.m.s) across insulation is used for creepage for AC side. | P |
| 7.3.7.3 | Functional insulating | | P |
| 7.3.7.4 | Clearance distances | | P |
| 7.3.7.4.1 | Determination | | P |
| 7.3.7.4.2 | Electric field homogeneity | Inhomogeneous electric field is considered for PCE | N/A |
| 7.3.7.4.3 | Clearance to conductive enclosures | | P |
| 7.3.7.5 | Creepage distances | (see appended table 7.3.7) | P |
| 7.3.7.5.1 | General | Working voltage (600 Vd.c.) across insulation is used for creepage for DC side and (230Vr.m.s) across insulation is used for creepage for AC side. | P |
| 7.3.7.5.2 | Voltage | | P |
| 7.3.7.5.3 | Materials | Certified PWB used. Other material are considered IIIb | P |

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| Clause | Requirement – Test | Result – Remark | Verdict |
| | | The inside parts are considered pollution degree 2 | |
| 7.3.7.6 | Coating | No coating provided insulation | N/A |
| 7.3.7.7 | PWB spacings for functional insulating | PWB rated V-0 and has a minimum CTI of 175 | P |
| 7.3.7.8 | Solid insulating | (see appended table 7.3.7) | P |
| 7.3.7.8.1 | General | | P |
| 7.3.7.8.2 | Requirements for electrical withstand capability of solid insulation | | P |
| 7.3.7.8.2.1 | Basic, supplemental, reinforced, and double insulation | | 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 | | 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 | | N/A |
| 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 | RCMU integrated in inverter, refer to IEC 62109-2:2011 test report test report. | P |
| | RCD and RCM are used to provide protection against insulation faults in some domestic and industrial installations, additional to that provided by the installed equipment. | If an external RCD or residual current breaker is required strictly, must follow with local regulation | P |
| 7.3.9 | Capacitor discharge | | P |
| 7.3.9.1 | Operator access area | | P |
| | Equipment shall be so designed that there is no risk of electric shock in operator access areas from charge stored on capacitors after disconnection of the PCE. | Accessible communication interface is DVC A | P |
| 7.3.9.2 | Service access areas | 77.0s@60V peak bus after disconnecting DC side. 1.34s@35Va.c. after disconnecting AC side. Inside capacitor discharge to | P |

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| Clause | Requirement – Test | Result – Remark | Verdict |
| | | DVC A and no energy hazard level within 5 minutes. | |
| | 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. | For repairing and maintenance only by professional service personal who is familiar with product.  Symbol  used for warning on marking plate for installation, operation and maintenance. | P |
| 7.4 | Protection against energy hazards | | P |
| 7.4.1 | Determination of hazardous energy level | Condition b is considered | P |
| | A hazardous energy level is considered to exist if | | P |
| | a) The voltage is 2 V or more, and power available after 60 s exceeds 240 VA. | Access to internal power circuit, tool required. No user serviceable parts inside the device per manufacturer's manual. Operator access: communication interface circuit, external connecting device for PV and MAINs waterproof plug. | 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: $E = 0,5 CU^2$ | Calculation see below: Hazardous energy voltage (E=20J): 119.1V (The capacitance of BUS+ to -: 2820uF | 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. | Only access DVC A circuit (communication interface), no risk of energy hazard in operator access area from accessible circuits | P |
| 7.4.3 | Services Access Areas | 77.0s@60V peak bus after disconnecting DC side. 1.34s@35Va.c. after disconnecting AC side.  Symbol  used for warning on marking plate for installation, operation and maintenance. | P |
| 7.5 | Electrical tests related to shock hazard | (see appended table 7.5) | P |
| 7.5.1 | Impulse voltage test (type test) | | P |

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| Clause | Requirement – Test | Result – Remark | Verdict |
| 7.5.2 | Voltage test (dielectric strength test) | | P |
| 7.5.2.1 | Purpose of test | | P |
| 7.5.2.2 | Value and type of test voltage | | P |
| 7.5.2.3 | Humidity pre-conditioning | | P |
| 7.5.2.4 | Performing the voltage test | | P |
| 7.5.2.5 | Duration of the a.c. or d.c. voltage test | | P |
| 7.5.2.6 | Verification of the a.c. or d.c. voltage test | | P |
| 7.5.3 | Partial discharge test | | N/A |
| 7.5.4 | Touch current measurement (type test) | | P |
| | The touch current shall be measured if required by 7.3.6.3.7 and shall not be greater than 3.5 mA a.c. or 10 mA d.c. or special measures of protection as given in 7.3.6.3.7 are required. | Measured max. 0.65mA<3.5mA after IP55, single fault, and humidity preconditioning, a second protective earthing conductor is bonded to metal case through locking washer, nut, isolating washer and UL approved ring terminal | P |
| | For type tests on PCE for which wet locations requirements apply according to 6.1, the humidity pre-conditioning of 4.5 shall be performed immediately prior to the touch current test. | | P |
| 7.5.5 | Equipment with multiple sources of supply | | P |

| | | | |
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| 8 | PROTECTION AGAINST MECHANICAL HAZARDS | | P |
| 8.1 | General | | P |
| | Operation shall not lead to a mechanical HAZARD in NORMAL CONDITION or SINGLE FAULT CONDITION. Edges, projections, corners, openings, guards, handles and the like, that are accessible to the operator shall be smooth and rounded so as not to cause injury during normal use of the equipment. | | P |
| | Conformity is checked as specified in 8.2 to 8.6. | | P |
| 8.2 | Moving parts | | P |
| | Moving parts shall not be able to crush, cut or pierce parts of the body of an OPERATOR likely to contact them, nor severely pinch the OPERATOR's skin. Hazardous moving parts of equipment, that is moving parts which have the potential to cause injury, shall be so arranged, enclosed or guarded as to provide adequate protection against the risk of personal injury. | | P |

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| Clause | Requirement – Test | Result – Remark | Verdict |
| 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. | Disconnect the inverter from all the external power sources before service | P |
| 8.3 | Stability | | N/A |
| | Equipment and assemblies of equipment not secured to the building structure before operation shall be physically stable in NORMAL USE. | Fixed equipment | N/A |
| 8.4 | Provisions for lifting and carrying | | P |
| | If carrying handles or grips are fitted to, or supplied with, the equipment, they shall be capable of withstanding a force of four times the weight of the equipment. | Inverter part weight: 39kg×4; single battery box weight: 38kg×4, for from zero to full load in 5 s to 10 s, then maintained for 1 min, handles/grips not break loose from the equipment and not be any permanent distortion, cracking or other evidence of failure | P |
| | Equipment or parts having a mass of 18 kg or more shall be provided with a means for lifting and carrying or directions shall be given in the manufacturer's documentation. | | P |
| 8.5 | Wall mounting | | N/A |
| | 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. | | N/A |
| 8.6 | Expelled parts | | P |
| | Equipment shall contain or limit the energy of parts that could cause a HAZARD if expelled in the event of a fault. | no such hazard | P |
| 9 | PROTECTION AGAINST FIRE HAZARDS | | P |
| 9.1 | Resistance to fire | | P |
| | This subclause specifies requirements intended to reduce the risk of ignition and the spread of flame, both within the equipment and to the outside, by the appropriate use of materials and components and by suitable construction. | | P |
| 9.1.1 | Reducing the risk of ignition and spread of flame | Method 1 used | P |
| | For equipment or a portion of equipment, there are two alternative methods of providing protection against ignition and spread of flame that could | | P |

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| Clause | Requirement – Test | Result – Remark | Verdict |
| | affect materials, wiring, wound components and electronic components such as integrated circuits, transistors, thyristors, diodes, resistors and capacitors. | | |
| 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; | | N/A |
| | – components in SECONDARY CIRCUITS supplied by a LIMITED POWER SOURCE as specified in 9.2, but not mounted on a material of FLAMMABILITY CLASS V-1; | No such circuits. All components in secondary circuits are mounted on PCB rated V-0. | N/A |
| | – components within a power supply unit or assembly having a limited power output complying with the criteria for a LIMITED POWER SOURCE as specified in 9.2, including overcurrent protective devices, limiting impedances, regulating networks and wiring, up to the point where the LIMITED POWER SOURCE output criteria are met; | SMPS for communication port | 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. | Internal wire meets the clause 9.1.2.2. | P |
| 9.1.2.2 | Parts not requiring a fire enclosure | | N/A |
| 9.1.3 | Materials requirements for protection against fire hazard | | P |
| 9.1.3.1 | General | | P |
| | ENCLOSURES, components and other parts shall be so constructed, or shall make use of such materials, that the propagation of fire is limited. | | P |
| 9.1.3.2 | Materials for fire enclosures | Metal enclosure and materials for components that fill an opening in a fire enclosure, for | P |

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| Clause | Requirement – Test | Result – Remark | Verdict |
| | | DC/AC port and COM port min. class V-0 and no larger than 100 mm in any dimension | |
| | 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 | All internal components are rated V-2 or better or mounded on PCB rated V-0 | P |
| | Except as otherwise noted below, materials for components and other parts (including MECHANICAL ENCLOSURES, ELECTRICAL ENCLOSURES and DECORATIVE PARTS); located outside FIRE ENCLOSURES, shall be of FLAMMABILITY CLASS HB. | | P |
| 9.1.3.4 | Materials for components and other parts inside fire enclosures | All internal components are rated V-2 or better or mounded on PCB rated V-0 | N/A |
| 9.1.3.5 | Materials for air filter assemblies | | N/A |
| 9.1.4 | Openings in fire enclosures | IP 55 and electrical enclosure without openings | N/A |
| 9.1.4.1 | General | | N/A |
| | For equipment that is intended to be used or installed in more than one orientation as specified in the product documentation, the following requirements apply in each orientation. | The equipment is intended to be used one orientation | N/A |
| | These requirements are in addition to those in the following sections: | | N/A |
| | – 7.3.4, Protection against direct contact; | | N/A |
| | – 7.4, Protection against energy hazards; | | N/A |
| | – 13.5, Openings in enclosures | | N/A |
| 9.1.4.2 | Side openings treated as bottom openings | Without side openings in fire enclosure | N/A |
| 9.1.4.3 | Openings in the bottom of a fire enclosure | | N/A |
| | The bottom of a FIRE ENCLOSURE or individual barriers, shall provide protection against emission of flaming or molten material under all internal parts, including partially enclosed components or assemblies, for which Method 2 of 9.1.1 has not been fully applied and complied with. | | N/A |
| 9.1.4.4 | Equipment for use in a CLOSED ELECTRICAL OPERATING AREA | | N/A |
| | The requirements of 9.1.4.3 do not apply to FIXED EQUIPMENT intended only for use in a CLOSED | | N/A |

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| Clause | Requirement – Test | Result – Remark | Verdict |
| | ELECTRICAL OPERATING AREA and to be mounted on a concrete floor or other non-combustible surface. Such equipment shall be marked as follows: | | |
| | 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 | Additional equipment connected to the inverter must provide the fire enclosure. | N/A |
| 9.2.1 | General | | N/A |
| 9.2.2 | Limited power source tests | | N/A |
| 9.3 | Short-circuit and overcurrent protection | Output overcurrent protection provided by external type C circuit breaker with rating@63A for model FH3X-8K-HY-1P-20 recommended at end-installation, for other models, refer to user manual. | 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 |

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| Clause | Requirement – Test | Result – Remark | Verdict |
| | The equipment shall provide protection against the effect of sonic pressure. Conformity tests are carried out if the equipment is likely to cause such HAZARDS. | | P |
| 10.2 | Sonic pressure and Sound level | <80dBA@1m | P |
| 10.2.1 | Hazardous Noise Levels | | P |
| 11 | PROTECTION AGAINST LIQUID HAZARDS | | N/A |
| 11.1 | Liquid Containment, Pressure and Leakage | Without liquid containment system | 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 | Not used | N/A |
| 12 | CHEMICAL HAZARDS | | N/A |
| 12.1 | General | | N/A |
| 13 | PHYSICAL REQUIREMENTS | | P |
| 13.1 | Handles and manual controls | | P |
| | Handles, knobs, grips, levers and the like shall be reliably fixed so that they will not work loose in normal use, if this might result in a hazard. Sealing compounds and the like, other than self-hardening resins, shall not be used to prevent loosening. If handles, knobs and the like are used to indicate the position of switches or similar components, it shall not be possible to fix them in a wrong position if this might result in hazard. | | P |
| 13.1.1 | Adjustable controls | Without adjustable controls | N/A |
| 13.2 | Securing of parts | Two independent fixings will not become loose at the same time and that parts fixed by means of screws provided | P |

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| Clause | Requirement – Test | Result – Remark | Verdict |
| | | with washers is not become loose. | |
| 13.3 | Provisions for external connections | | P |
| 13.3.1 | General | | P |
| 13.3.2 | Connection to an a.c. Mains supply | AC connector used in connection compartment | P |
| 13.3.2.1 | General | | P |
| | For safe and reliable connection to a MAINS supply, equipment shall be provided with one of the following: | | P |
| | – terminals or leads or a non-detachable power supply cord for permanent connection to the supply; or | | N/A |
| | – a non-detachable power supply cord for connection to the supply by means of a plug | | N/A |
| | – an appliance inlet for connection of a detachable power supply cord; or | | P |
| | – a mains plug that is part of direct plug-in equipment as in 13.3.8 | | N/A |
| 13.3.2.2 | Permanently connected equipment | | N/A |
| 13.3.2.3 | Appliance inlets | | P |
| 13.3.2.4 | Power supply cord | | N/A |
| 13.3.2.5 | Cord anchorages and strain relief | Not provided together with power cord for connecting to AC connectors, for installer, should be followed with user manual and test maybe confirmed | N/A |
| | For equipment with a non-detachable power supply cord, a cord anchorage shall be supplied such that: | | N/A |
| | – the connecting points of the cord conductors are relieved from strain; and | | N/A |
| | – the outer covering of the cord is protected from abrasion. | | N/A |
| 13.3.2.6 | Protection against mechanical damage | | P |
| 13.3.3 | Wiring terminals for connection of external conductors | Approved AC and DC connector or coupler used | N/A |
| 13.3.3.1 | Wiring terminals | | N/A |
| 13.3.3.2 | Screw terminals | | N/A |
| 13.3.3.3 | Wiring terminal sizes | | N/A |
| 13.3.3.4 | Wiring terminal design | | N/A |
| 13.3.3.5 | Grouping of wiring terminals | | N/A |

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| Clause | Requirement – Test | Result – Remark | Verdict |
| 13.3.3.6 | Stranded wire | | N/A |
| 13.3.4 | Supply wiring space | | P |
| 13.3.5 | Wire bending space for wires 10 mm ² and greater | | N/A |
| 13.3.6 | Disconnection from supply sources | Disconnect the PCE from the MAINS by Internal automatic disconnecting relays in all live conductor and external AC circuit breaker. Disconnect the PCE from the PV supply by DC switch. Disconnect the PCE form battery supply sources by the DC internal circuit breaker. | P |
| 13.3.7 | Connectors, plugs and sockets | Approved AC and DC connector or coupler used | 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 | Conductor having green-and-yellow insulation is used only for protective bonding connection | P |
| 13.4.4 | Splices and connections | All wire with core cable ends | P |
| 13.4.5 | Interconnections between parts of the PCE | | N/A |
| 13.5 | Openings in enclosures | | N/A |
| 13.5.1 | Top and side openings | IP55 enclosure without openings | N/A |
| | Openings in the top and sides of ENCLOSURES shall be so located or constructed that it is unlikely that objects will enter the openings and create hazards by contacting bare conductive parts. | | N/A |
| 13.6 | Polymeric Materials | | P |
| 13.6.1 | General | UL approved material used. LED cover, connector for AC, PV and communication wire: V-0, suitable for outdoor use with respect to exposure to Ultraviolet Light, Water Exposure and Immersion in accordance with UL 746C | P |
| 13.6.1.1 | Thermal index or capability | Thermal index of Polymeric Materials used higher than the maximum measured operating temperature in heating test | P |
| 13.6.2 | Polymers serving as enclosures or barriers preventing access to hazards | | P |

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|-------------|---|--|---------|
| Clause | Requirement – Test | Result – Remark | Verdict |
| 13.6.2.1 | Stress relief test | 70.0°C, 7h for LED cover | P |
| 13.6.3 | Polymers serving as solid insulation | | P |
| 13.6.3.1 | Resistance to arcing | | P |
| 13.6.4 | UV resistance | Polymeric components that filled the opening of enclosure are UV resistant | P |
| | Polymeric parts of an OUTDOOR ENCLOSURE required for compliance with this standard shall be sufficiently resistance to degradation by ultra-violet (UV) radiation | | P |
| 13.7 | Mechanical resistance to deflection, impact, or drop | | P |
| 13.7.1 | General | | P |
| 13.7.2 | 250-N deflection test for metal enclosures | | P |
| 13.7.3 | 7-J impact test for polymeric enclosures | LED display cover | P |
| 13.7.4 | Drop test | | N/A |
| 13.8 | Thickness requirements for metal enclosures | | P |
| 13.8.1 | General | Conformity is checked by the test as specified in clause 13.7 | P |
| 13.8.2 | Cast metal | Sheet metal used | N/A |
| 13.8.3 | Sheet metal | Min. 1.5mm thickness | P |
| 14 | COMPONENTS | | P |
| 14.1 | General | (see appended table 14) | P |
| | Where safety is involved, components shall be used in accordance with their specified RATINGS unless a specific exception is made. They shall conform to one of the following: | | P |
| | a) applicable safety requirements of a relevant IEC standard. Conformity with other requirements of the component standard is not required. If necessary for the application, components shall be subjected to the test of this standard, except that it is not necessary to carry out identical or equivalent tests already performed to check conformity with the component standard; | | P |
| | b) the requirements of this standard and, where necessary for the application, any additional applicable safety requirements of the relevant IEC component standard; | | P |
| | c) if there is no relevant IEC standard, the requirements of this standard; | | P |
| | d) applicable safety requirements of a non-IEC | | P |

| IEC 62109-1 | | | |
|-------------|--|--|---------|
| Clause | Requirement – Test | Result – Remark | Verdict |
| | 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. | | |
| | Components such as optocouplers, capacitors, transformers, and relays connected across basic, supplemental, reinforced, or double insulation shall comply with the requirements applicable for the grade of insulation being bridged, and if not previously certified to the applicable component safety standard shall be subjected to the voltage test of 7.5.2 as routine test. | | P |
| 14.2 | Motor Over Temperature Protection | | P |
| | Motors which, when stopped or prevented from starting (see 4.4.4.3), would present an electric shock HAZARD, a temperature HAZARD, or a fire HAZARD, shall be protected by an over temperature or thermal protection device meeting the requirements of 14.3. | Fan blocked test was evaluated. | P |
| 14.3 | Over temperature protection devices | Power limited by both temperature of ambient inside enclosure and temperature in IGBT module | P |
| 14.4 | Fuse holders | | P |
| 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. | PCB material approved by UL with UL94 V-0 rating | P |
| | This requirement does not apply to thin-film flexible printed circuit boards that contain only circuits powered from limited power sources meeting the requirements of 9.2. | | N/A |
| | Conformity of the flammability RATING is checked by inspection of data on the materials. Alternatively, conformity is checked by performing the V-1 tests specified in IEC 60707 on three samples of the relevant parts. | | P |
| 14.7 | Circuits or components used as transient overvoltage limiting devices | | N/A |
| | If control of transient overvoltage is employed in the equipment, any overvoltage limiting component or circuit shall be tested with the applicable impulse withstand voltage of Table 7-10 using the test method from 7.5.1 except 10 positive and 10 negative impulses are to be applied and may be spaced up to 1 min apart. | No such device | N/A |
| 14.8 | Batteries | | P |

| IEC 62109-1 | | | |
|-------------|---|---|---------|
| Clause | Requirement – Test | Result – 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. | | P |
| 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 | | P |
| | 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. | | P |
| 14.8.3 | Electrolyte spillage | No electrolyte spillage during charge and discharge | 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 | | P |
| | Reverse battery connection of the terminals shall be prevented if reverse connection could result in a hazard within the meaning of this Standard | | P |
| 14.8.5 | Battery maintenance instructions | | P |
| | 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. | | P |
| 14.8.6 | Battery accessibility and maintainability | | P |
| | Battery terminals and connectors shall be | | P |



| IEC 62109-1 | | | |
|-------------|---|--------------------------------------|---------|
| Clause | Requirement – Test | Result – Remark | Verdict |
| | accessible for maintenance with the correct TOOLS. Batteries with liquid electrolyte, requiring maintained shall be so located that the battery cell caps are accessible for electrolyte tests and readjusting of electrolyte levels. | | |
| 15 | Software and firmware performing safety functions | Refer to single fault condition test | P |

| 4.7 TABLE: mains supply electrical data in normal condition | | | | | | | | | P |
|---|---------------|----------------|--------------|----------|-----------|-----------|-----------|------------|--|
| Model: FH3X-8K-HY-1P-5 | | | | | | | | | |
| U Grid (V) | I Grid (A) | P Grid (kW) | U PV (V) | I PV (A) | P PV (kW) | U BAT (V) | I BAT (A) | P BAT (kW) | Item |
| 207.14 | 11.49 | 2.38 | - | - | - | 105.07 | 24.12 | 2.53 | Battery discharge to Grid, Pn@ max. discharge current |
| 230.12 | 10.35 | 2.38 | - | - | - | 105.23 | 24.07 | 2.53 | |
| 253.12 | 9.41 | 2.38 | - | - | - | 104.95 | 24.13 | 2.53 | |
| U BACK-UP (V) | I BACK-UP (A) | P BACK-UP (kW) | U PV (V) | I PV (A) | P PV (kW) | U BAT (V) | I BAT (A) | P BAT (kW) | Item |
| 227.84 | 10.36 | 2.36 | - | - | - | 103.65 | 24.16 | 2.50 | Battery discharge to backup, Pn @ max. discharge current |
| U Grid (V) | I Grid (A) | P Grid (kW) | U PV (V) | I PV (A) | P PV (kW) | U BAT (V) | I BAT (A) | P BAT (kW) | Item |
| 207.49 | 35.43 | 7.34 | 193.17* 3 | 13.62*3 | 7.77 | - | - | - | PV to Grid, Pn@ Lowest input voltage |
| 230.45 | 34.56 | 7.95 | 193.38* 3 | 14.62*3 | 8.39 | - | - | - | |
| 253.40 | 31.44 | 7.95 | 190.04* 3 | 14.78*3 | 8.37 | - | - | - | |
| 207.46 | 35.45 | 7.35 | 523.54* 3 | 4.97*3 | 7.66 | - | - | - | PV to Grid, Pn@ Highest input voltage |
| 230.44 | 34.49 | 7.94 | 521.88* 3 | 5.40*3 | 8.27 | - | - | - | |
| 253.37 | 31.39 | 7.95 | 520.12* 3 | 5.51*3 | 8.24 | - | - | - | |
| 230.43 | 33.84 | 7.78 | 171.53* 3 | 16.07*3 | 8.24 | - | - | - | PV to Grid @max. PV input current |
| 230.15 | 15.96 | 3.67 | 82.37*3 | 16.03*3 | 3.95 | - | - | - | PV to Grid, @verification min. mppt voltage |
| U Grid (V) | I Grid (A) | P Grid (kW) | U PV (V) | I PV (A) | P PV (kW) | U BAT (V) | I BAT (A) | P BAT (kW) | Item |
| - | - | - | 190.52* 3 | 4.69*3 | 2.68 | 108.86 | 23.30 | 2.54 | PV charge battery, Pn@ Lowest input voltage |
| - | - | - | 521.13* 3 | 1.69*3 | 2.64 | 109.46 | 23.15 | 2.53 | PV charge battery, Pn@ Highest input voltage |
| U Grid (V) | I Grid (A) | P Grid (kW) | U PV (V) | I PV (A) | P PV (kW) | U BAT (V) | I BAT (A) | P BAT (kW) | Item |
| 229.78 | 11.66 | 2.68 | - | - | - | 108.68 | 23.37 | 2.54 | Grid charge battery, Pn@ nominal battery |

| U Grid (V) | I Grid (A) | P Grid (kW) | U Back up (V) | I Back up (A) | P Back up (kW) | U BAT (V) | I BAT (A) | P BAT (kW) | Item |
|------------|------------|-------------|---------------|---------------|----------------|-----------|-----------|------------|--|
| 229.41 | 34.87 | 8.00 | 228.18 | 34.76 | 7.93 | - | - | - | Grid to Back up@ max. backup current |
| U Grid (V) | I Grid (A) | P Grid (kW) | U Back up (V) | I Back up (A) | P Back up (kW) | U BAT (V) | I BAT (A) | P BAT (kW) | Item |
| 229.25 | 46.89 | 10.75 | 227.73 | 35.18 | 8.01 | 107.41 | 23.67 | 2.54 | Grid to battery and backup@ max. Grid power and current |
| U Grid (V) | I Grid (A) | P Grid (kW) | U PV (V) | I PV (A) | P PV (kW) | U BAT (V) | I BAT (A) | P BAT (kW) | Item |
| 230.49 | 34.68 | 7.99 | 199.25* 3 | 10.03*3 | 5.95 | 105.23 | 24.22 | 2.53 | PV and Battery to grid, Pn @ AC max. output current |
| U Grid (V) | I Grid (A) | P Grid (kW) | U PV (V) | I PV (A) | P PV (kW) | U BAT (V) | I BAT (A) | P BAT (kW) | Item |
| 230.50 | 34.67 | 7.99 | 236.46* 3 | 16.06*3 | 10.99 | 109.40 | 23.20 | 2.54 | PV to Grid and charge battery@ max. PV power and current |

Supplementary information:-

| 4.7 TABLE: mains supply electrical data in normal condition | | | | | | | | | P |
|---|---------------|----------------|--------------|----------|-----------|-----------|-----------|------------|--|
| Model: FH3X-8K-HY-1P-10 | | | | | | | | | |
| U Grid (V) | I Grid (A) | P Grid (kW) | U PV (V) | I PV (A) | P PV (kW) | U BAT (V) | I BAT (A) | P BAT (kW) | Item |
| 207.34 | 35.14 | 7.27 | - | - | - | 208.36 | 37.01 | 7.69 | Battery discharge to Grid, Pn@ max. discharge current |
| 230.39 | 33.06 | 7.61 | - | - | - | 208.35 | 38.53 | 8.00 | |
| 253.34 | 30.10 | 7.61 | - | - | - | 208.26 | 38.48 | 7.99 | |
| U BACK-UP (V) | I BACK-UP (A) | P BACK-UP (kW) | U PV (V) | I PV (A) | P PV (kW) | U BAT (V) | I BAT (A) | P BAT (kW) | Item |
| 229.26 | 32.72 | 7.50 | - | - | - | 206.09 | 38.89 | 7.99 | Battery discharge to backup, Pn @ max. discharge current |
| U Grid (V) | I Grid (A) | P Grid (kW) | U PV (V) | I PV (A) | P PV (kW) | U BAT (V) | I BAT (A) | P BAT (kW) | Item |
| 207.49 | 35.43 | 7.34 | 193.17* 3 | 13.62*3 | 7.77 | - | - | - | PV to Grid, Pn@ Lowest input voltage |
| 230.45 | 34.56 | 7.95 | 193.38* 3 | 14.62*3 | 8.39 | - | - | - | |

| | | | | | | | | | |
|---------------|---------------|----------------|------------------|------------------|-------------------|--------------|--------------|---------------|--|
| | | | 3 | | | | | | |
| 253.40 | 31.44 | 7.95 | 190.04* 3 | 14.78*3 | 8.37 | - | - | - | |
| 207.46 | 35.45 | 7.35 | 523.54* 3 | 4.97*3 | 7.66 | - | - | - | PV to Grid, Pn@ Highest input voltage |
| 230.44 | 34.49 | 7.94 | 521.88* 3 | 5.40*3 | 8.27 | - | - | - | |
| 253.37 | 31.39 | 7.95 | 520.12* 3 | 5.51*3 | 8.24 | - | - | - | |
| 230.43 | 33.84 | 7.78 | 171.53* 3 | 16.07*3 | 8.24 | - | - | - | PV to Grid @max. PV input current |
| 230.15 | 15.96 | 3.67 | 82.37*3 | 16.03*3 | 3.95 | - | - | - | PV to Grid, @verification min. mppt voltage |
| U Grid (V) | I Grid (A) | P Grid (kW) | U PV (V) | I PV (A) | P PV (kW) | U BAT (V) | I BAT (A) | P BAT (kW) | Item |
| - | - | - | 188.40* 3 | 14.88*3 | 8.41 | 217.48 | 36.80 | 8.00 | PV charge battery, Pn@ Lowest input voltage |
| - | - | - | 518.34* 3 | 5.43*3 | 8.44 | 217.71 | 36.77 | 8.01 | PV charge battery, Pn@ Highest input voltage |
| U Grid (V) | I Grid (A) | P Grid (kW) | U PV (V) | I PV (A) | P PV (kW) | U BAT (V) | I BAT (A) | P BAT (kW) | Item |
| 229.42 | 34.67 | 7.94 | - | - | - | 217.77 | 34.56 | 7.53 | Grid charge battery, Pn@ nominal battery voltage |
| U Grid (V) | I Grid (A) | P Grid (kW) | U Back up (V) | I Back up (A) | P Back up (kW) | U BAT (V) | I BAT (A) | P BAT (kW) | Item |
| 229.41 | 34.87 | 8.00 | 228.18 | 34.76 | 7.93 | - | - | - | Grid to Back up@ max. backup current |
| U Grid (V) | I Grid (A) | P Grid (kW) | U Back up (V) | I Back up (A) | P Back up (kW) | U BAT (V) | I BAT (A) | P BAT (kW) | Item |
| 229.15 | 52.83 | 12.10 | 227.80 | 25.86 | 5.89 | 216.85 | 27.17 | 5.89 | Grid to battery and backup@ max. Grid power and current |
| U Grid (V) | I Grid (A) | P Grid (kW) | U PV (V) | I PV (A) | P PV (kW) | U BAT (V) | I BAT (A) | P BAT (kW) | Item |
| 230.45 | 34.57 | 7.95 | 199.07* 3 | 7.11*3 | 4.19 | 208.78 | 20.21 | 4.18 | PV and Battery to grid, Pn @ AC max. output current |
| U Grid (V) | I Grid (A) | P Grid (kW) | U PV (V) | I PV (A) | P PV (kW) | U BAT (V) | I BAT (A) | P BAT (kW) | Item |



| | | | | | | | | | |
|--------|-------|------|--------------|---------|-------|--------|-------|------|--|
| 230.34 | 27.86 | 6.41 | 279.21* 3 | 15.96*3 | 13.34 | 215.83 | 29.71 | 6.41 | PV to Grid and charge battery@ max. PV power and current |
|--------|-------|------|--------------|---------|-------|--------|-------|------|--|

Supplementary information:-

| 4.7 TABLE: mains supply electrical data in normal condition | | | | | | | | | P |
|---|---------------|----------------|--------------|----------|-----------|-----------|-----------|------------|--|
| Model: FH3X-8K-HY-1P-15 | | | | | | | | | |
| U Grid (V) | I Grid (A) | P Grid (kW) | U PV (V) | I PV (A) | P PV (kW) | U BAT (V) | I BAT (A) | P BAT (kW) | Item |
| 207.46 | 35.20 | 7.30 | - | - | - | 314.32 | 24.43 | 7.63 | Battery discharge to Grid, Pn@ max. discharge current |
| 230.41 | 33.28 | 7.66 | - | - | - | 314.19 | 25.55 | 7.98 | |
| 253.36 | 30.34 | 7.68 | - | - | - | 314.16 | 25.53 | 7.97 | |
| U BACK-UP (V) | I BACK-UP (A) | P BACK-UP (kW) | U PV (V) | I PV (A) | P PV (kW) | U BAT (V) | I BAT (A) | P BAT (kW) | Item |
| 229.22 | 33.55 | 7.69 | - | - | - | 312.91 | 25.64 | 7.97 | Battery discharge to backup, Pn @ max. discharge current |
| U Grid (V) | I Grid (A) | P Grid (kW) | U PV (V) | I PV (A) | P PV (kW) | U BAT (V) | I BAT (A) | P BAT (kW) | Item |
| 207.49 | 35.43 | 7.34 | 193.17* 3 | 13.62*3 | 7.77 | - | - | - | PV to Grid, Pn@ Lowest input voltage |
| 230.45 | 34.56 | 7.95 | 193.38* 3 | 14.62*3 | 8.39 | - | - | - | |
| 253.40 | 31.44 | 7.95 | 190.04* 3 | 14.78*3 | 8.37 | - | - | - | |
| 207.46 | 35.45 | 7.35 | 523.54* 3 | 4.97*3 | 7.66 | - | - | - | PV to Grid, Pn@ Highest input voltage |
| 230.44 | 34.49 | 7.94 | 521.88* 3 | 5.40*3 | 8.27 | - | - | - | |
| 253.37 | 31.39 | 7.95 | 520.12* 3 | 5.51*3 | 8.24 | - | - | - | |
| 230.43 | 33.84 | 7.78 | 171.53* 3 | 16.07*3 | 8.24 | - | - | - | PV to Grid @max. PV input current |
| 230.15 | 15.96 | 3.67 | 82.37*3 | 16.03*3 | 3.95 | - | - | - | PV to Grid, @verification min. mppt voltage |
| U Grid (V) | I Grid (A) | P Grid (kW) | U PV (V) | I PV (A) | P PV (kW) | U BAT (V) | I BAT (A) | P BAT (kW) | Item |
| - | - | - | 189.24* 3 | 14.58*3 | 8.28 | 325.81 | 24.57 | 8.01 | PV charge battery, Pn@ Lowest input voltage |
| - | - | - | 519.65* 3 | 5.21*3 | 8.13 | 324.38 | 24.66 | 8.00 | PV charge battery, Pn@ |

| U Grid (V) | I Grid (A) | P Grid (kW) | U PV (V) | I PV (A) | P PV (kW) | U BAT (V) | I BAT (A) | P BAT (kW) | Item |
|------------|------------|-------------|---------------|---------------|----------------|-----------|-----------|------------|--|
| 229.41 | 34.71 | 7.96 | - | - | - | 323.49 | 23.63 | 7.64 | Grid charge battery, Pn@ nominal battery voltage |
| U Grid (V) | I Grid (A) | P Grid (kW) | U Back up (V) | I Back up (A) | P Back up (kW) | U BAT (V) | I BAT (A) | P BAT (kW) | Item |
| 229.41 | 34.87 | 8.00 | 228.18 | 34.76 | 7.93 | - | - | - | Grid to Back up@ max. backup current |
| U Grid (V) | I Grid (A) | P Grid (kW) | U Back up (V) | I Back up (A) | P Back up (kW) | U BAT (V) | I BAT (A) | P BAT (kW) | Item |
| 229.14 | 52.56 | 12.04 | 227.78 | 25.87 | 5.89 | 324.73 | 18.16 | 5.90 | Grid to battery and backup@ max. Grid power and current |
| U Grid (V) | I Grid (A) | P Grid (kW) | U PV (V) | I PV (A) | P PV (kW) | U BAT (V) | I BAT (A) | P BAT (kW) | Item |
| 230.43 | 34.51 | 7.94 | 200.13* 3 | 6.99*3 | 4.14 | 316.73 | 13.32 | 4.14 | PV and Battery to grid, Pn @ AC max. output current |
| U Grid (V) | I Grid (A) | P Grid (kW) | U PV (V) | I PV (A) | P PV (kW) | U BAT (V) | I BAT (A) | P BAT (kW) | Item |
| 230.32 | 27.43 | 6.31 | 272.80* 3 | 15.97*3 | 13.04 | 324.52 | 19.47 | 6.32 | PV to Grid and charge battery@ max. PV power and current |

Supplementary information:-

| 4.7 TABLE: mains supply electrical data in normal condition | | | | | | | | | P |
|---|---------------|----------------|----------|----------|-----------|-----------|-----------|------------|---|
| Model: FH3X-8K-HY-1P-20 | | | | | | | | | |
| U Grid (V) | I Grid (A) | P Grid (kW) | U PV (V) | I PV (A) | P PV (kW) | U BAT (V) | I BAT (A) | P BAT (kW) | Item |
| 207.45 | 35.41 | 7.33 | - | - | - | 419.11 | 18.32 | 7.26 | Battery discharge to Grid, Pn@ max. discharge current |
| 230.40 | 33.17 | 7.64 | - | - | - | 420.72 | 19.05 | 7.96 | |
| 253.35 | 30.33 | 7.68 | - | - | - | 418.64 | 19.16 | 7.96 | |
| U BACK-UP (V) | I BACK-UP (A) | P BACK-UP (kW) | U PV (V) | I PV (A) | P PV (kW) | U BAT (V) | I BAT (A) | P BAT (kW) | Item |
| 229.23 | 33.12 | 7.59 | - | - | - | 418.83 | 19.15 | 7.96 | Battery discharge to backup, Pn |

| U Grid (V) | I Grid (A) | P Grid (kW) | U PV (V) | I PV (A) | P PV (kW) | U BAT (V) | I BAT (A) | P BAT (kW) | Item |
|------------|------------|-------------|---------------|---------------|----------------|-----------|-----------|------------|---|
| 207.05 | 35.44 | 7.33 | 191.00* 3 | 13.78*3 | 7.80 | - | - | - | @ max. discharge current |
| 230.42 | 34.53 | 7.95 | 192.42* 3 | 14.73*3 | 8.43 | - | - | - | PV to Grid, Pn@ Lowest input voltage |
| 253.35 | 31.43 | 7.96 | 192.31* 3 | 14.68*3 | 8.40 | - | - | - | |
| 207.43 | 35.45 | 7.34 | 520.10* 3 | 4.97*3 | 7.66 | - | - | - | |
| 230.42 | 34.50 | 7.94 | 522.15* 3 | 5.33*3 | 8.24 | - | - | - | |
| 253.37 | 31.40 | 7.94 | 521.86* 3 | 5.40*3 | 8.21 | - | - | - | |
| 230.42 | 34.36 | 7.90 | 177.05* 3 | 15.87*3 | 8.41 | - | - | - | PV to Grid @max. PV input current |
| 230.07 | 11.90 | 2.73 | 83.17*3 | 11.82*3 | 2.95 | - | - | - | PV to Grid, @verification min. mppt voltage |
| U Grid (V) | I Grid (A) | P Grid (kW) | U PV (V) | I PV (A) | P PV (kW) | U BAT (V) | I BAT (A) | P BAT (kW) | Item |
| - | - | - | 189.21* 3 | 14.58*3 | 8.28 | 432.02 | 18.52 | 8.00 | PV charge battery, Pn@ Lowest input voltage |
| - | - | - | 518.44* 3 | 5.23*3 | 8.13 | 433.22 | 18.43 | 7.98 | PV charge battery, Pn@ Highest input voltage |
| U Grid (V) | I Grid (A) | P Grid (kW) | U PV (V) | I PV (A) | P PV (kW) | U BAT (V) | I BAT (A) | P BAT (kW) | Item |
| 229.39 | 34.77 | 7.97 | - | - | - | 434.88 | 17.70 | 7.70 | Grid charge battery, Pn@ nominal battery voltage |
| U Grid (V) | I Grid (A) | P Grid (kW) | U Back up (V) | I Back up (A) | P Back up (kW) | U BAT (V) | I BAT (A) | P BAT (kW) | Item |
| 229.42 | 35.17 | 8.06 | 228.17 | 35.02 | 7.99 | - | - | - | Grid to Back up@ max. backup current |
| U Grid (V) | I Grid (A) | P Grid (kW) | U Back up (V) | I Back up (A) | P Back up (kW) | U BAT (V) | I BAT (A) | P BAT (kW) | Item |
| 229.13 | 52.63 | 12.06 | 227.76 | 25.99 | 5.92 | 430.11 | 13.78 | 5.92 | Grid to battery and backup@ max. Grid power and current |
| U Grid (V) | I Grid (A) | P Grid (kW) | U PV (V) | I PV (A) | P PV (kW) | U BAT (V) | I BAT (A) | P BAT (kW) | Item |



| 230.42 | 34.53 | 7.95 | 197.97* 3 | 7.38*3 | 4.37 | 422.15 | 9.73 | 4.00 | PV and Battery to grid, Pn @ AC max. output current |
|------------|------------|-------------|--------------|----------|-----------|-----------|-----------|------------|---|
| U Grid (V) | I Grid (A) | P Grid (kW) | U PV (V) | I PV (A) | P PV (kW) | U BAT (V) | I BAT (A) | P BAT (kW) | Item |
| 230.32 | 27.88 | 6.41 | 279.86* 3 | 15.90*3 | 13.34 | 432.21 | 14.84 | 6.41 | PV to Grid and charge battery @ max. PV power and current |

Supplementary information:-

| 4.7 TABLE: mains supply electrical data in normal condition | | | | | | | | | P |
|---|---------------|----------------|--------------|----------|-----------|-----------|-----------|------------|--|
| Model: FH3X-3.6K-HY-1P-5 | | | | | | | | | |
| U Grid (V) | I Grid (A) | P Grid (kW) | U PV (V) | I PV (A) | P PV (kW) | U BAT (V) | I BAT (A) | P BAT (kW) | Item |
| 207.14 | 11.48 | 2.38 | - | - | - | 104.25 | 24.43 | 2.54 | Battery discharge to Grid, Pn @ max. discharge current |
| 230.12 | 10.35 | 2.38 | - | - | - | 104.25 | 24.42 | 2.54 | |
| 253.11 | 9.40 | 2.38 | - | - | - | 104.20 | 24.42 | 2.54 | |
| U BACK-UP (V) | I BACK-UP (A) | P BACK-UP (kW) | U PV (V) | I PV (A) | P PV (kW) | U BAT (V) | I BAT (A) | P BAT (kW) | Item |
| 227.81 | 10.36 | 2.36 | - | - | - | 103.69 | 24.15 | 2.50 | Battery discharge to backup, Pn @ max. discharge current |
| U Grid (V) | I Grid (A) | P Grid (kW) | U PV (V) | I PV (A) | P PV (kW) | U BAT (V) | I BAT (A) | P BAT (kW) | Item |
| 207.13 | 15.77 | 3.26 | 189.44* 2 | 9.01*2 | 3.41 | - | - | - | PV to Grid, Pn @ Lowest input voltage |
| 230.13 | 15.54 | 3.57 | 190.19* 2 | 9.84*2 | 3.73 | - | - | - | |
| 253.12 | 14.13 | 3.57 | 190.79* 2 | 9.82*2 | 3.73 | - | - | - | |
| 207.15 | 15.97 | 3.30 | 519.49* 2 | 3.32*2 | 3.42 | - | - | - | PV to Grid, Pn @ Highest input voltage |
| 230.15 | 15.72 | 3.61 | 518.42* 2 | 3.61*2 | 3.72 | - | - | - | |
| 253.11 | 14.26 | 3.60 | 523.05* 2 | 3.58*2 | 3.71 | - | - | - | |
| 230.14 | 15.66 | 3.60 | 120.44* 2 | 16.03*2 | 3.86 | - | - | - | PV to Grid @max. PV input current |
| 230.05 | 10.59 | 2.43 | 82.62*2 | 16.07*2 | 2.65 | - | - | - | PV to Grid, @verification min. mppt voltage |

| U Grid (V) | I Grid (A) | P Grid (kW) | U PV (V) | I PV (A) | P PV (kW) | U BAT (V) | I BAT (A) | P BAT (kW) | Item |
|------------|------------|-------------|---------------|---------------|----------------|-----------|-----------|------------|--|
| - | - | - | 188.91* 2 | 7.12*2 | 2.66 | 108.76 | 23.09 | 2.51 | PV charge battery, Pn@ Lowest input voltage |
| - | - | - | 528.34* 2 | 2.50*2 | 2.64 | 109.02 | 23.14 | 2.52 | PV charge battery, Pn@ Highest input voltage |
| U Grid (V) | I Grid (A) | P Grid (kW) | U PV (V) | I PV (A) | P PV (kW) | U BAT (V) | I BAT (A) | P BAT (kW) | Item |
| 229.80 | 11.66 | 2.70 | - | - | - | 107.96 | 23.40 | 2.53 | Grid charge battery, Pn@ nominal battery voltage |
| U Grid (V) | I Grid (A) | P Grid (kW) | U Back up (V) | I Back up (A) | P Back up (kW) | U BAT (V) | I BAT (A) | P BAT (kW) | Item |
| 229.68 | 15.98 | 3.66 | 229.10 | 15.80 | 3.62 | - | - | - | Grid to Back up@ max. backup current |
| U Grid (V) | I Grid (A) | P Grid (kW) | U Back up (V) | I Back up (A) | P Back up (kW) | U BAT (V) | I BAT (A) | P BAT (kW) | Item |
| 229.62 | 23.81 | 5.47 | 228.97 | 12.13 | 2.78 | 108.17 | 23.46 | 2.54 | Grid to battery and backup@ max. Grid power and current |
| U Grid (V) | I Grid (A) | P Grid (kW) | U PV (V) | I PV (A) | P PV (kW) | U BAT (V) | I BAT (A) | P BAT (kW) | Item |
| 230.13 | 15.70 | 3.61 | 199.44* 2 | 4.77*2 | 1.89 | 104.74 | 17.96 | 1.88 | PV and Battery to grid, Pn @ AC max. output current |
| U Grid (V) | I Grid (A) | P Grid (kW) | U PV (V) | I PV (A) | P PV (kW) | U BAT (V) | I BAT (A) | P BAT (kW) | Item |
| 230.15 | 12.95 | 2.98 | 177.99* 2 | 16.06*2 | 5.71 | 108.96 | 23.27 | 2.54 | PV to Grid and charge battery@ max. PV power and current |

Supplementary information:-

| 4.7 | TABLE: mains supply electrical data in normal condition | | | | | | | | P |
|----------------------------------|---|-------------|----------|----------|-----------|-----------|-----------|------------|-------------------------------------|
| Model: FH3X-3.6K-HY-1P-20 | | | | | | | | | |
| U Grid (V) | I Grid (A) | P Grid (kW) | U PV (V) | I PV (A) | P PV (kW) | U BAT (V) | I BAT (A) | P BAT (kW) | Item |
| 207.16 | 15.95 | 3.30 | - | - | - | 420.77 | 8.22 | 3.44 | Battery discharge to Grid, Pn@ max. |
| 230.13 | 15.46 | 3.55 | - | - | - | 418.31 | 8.71 | 3.62 | |
| 253.11 | 13.78 | 3.48 | - | - | - | 420.67 | 8.62 | 3.60 | |

| | | | | | | | | | discharge current |
|---------------|---------------|----------------|---------------|---------------|----------------|-----------|-----------|------------|--|
| U BACK-UP (V) | I BACK-UP (A) | P BACK-UP (kW) | U PV (V) | I PV (A) | P PV (kW) | U BAT (V) | I BAT (A) | P BAT (kW) | Item |
| 229.59 | 15.25 | 3.50 | - | - | - | 421.84 | 8.61 | 3.61 | Battery discharge to backup, Pn @ max. discharge current |
| U Grid (V) | I Grid (A) | P Grid (kW) | U PV (V) | I PV (A) | P PV (kW) | U BAT (V) | I BAT (A) | P BAT (kW) | Item |
| 207.13 | 15.77 | 3.26 | 189.44* 2 | 9.01*2 | 3.41 | - | - | - | PV to Grid, Pn@ Lowest input voltage |
| 230.13 | 15.54 | 3.57 | 190.19* 2 | 9.84*2 | 3.73 | - | - | - | |
| 253.12 | 14.13 | 3.57 | 190.79* 2 | 9.82*2 | 3.73 | - | - | - | |
| 207.15 | 15.97 | 3.30 | 519.49* 2 | 3.32*2 | 3.42 | - | - | - | PV to Grid, Pn@ Highest input voltage |
| 230.15 | 15.72 | 3.61 | 518.42* 2 | 3.61*2 | 3.72 | - | - | - | |
| 253.11 | 14.26 | 3.60 | 523.05* 2 | 3.58*2 | 3.71 | - | - | - | |
| 230.14 | 15.66 | 3.60 | 120.44* 2 | 16.03*2 | 3.86 | - | - | - | PV to Grid @max. PV input current |
| 230.05 | 10.59 | 2.43 | 82.62*2 | 16.07*2 | 2.65 | - | - | - | PV to Grid, @verification min. mppt voltage |
| U Grid (V) | I Grid (A) | P Grid (kW) | U PV (V) | I PV (A) | P PV (kW) | U BAT (V) | I BAT (A) | P BAT (kW) | Item |
| - | - | - | 179.05* 2 | 16.08*2 | 5.76 | 431.24 | 12.89 | 5.56 | PV charge battery, Pn@ Lowest input voltage |
| - | - | - | 511.38* 2 | 5.54*2 | 5.66 | 431.91 | 13.00 | 5.61 | PV charge battery, Pn@ Highest input voltage |
| U Grid (V) | I Grid (A) | P Grid (kW) | U PV (V) | I PV (A) | P PV (kW) | U BAT (V) | I BAT (A) | P BAT (kW) | Item |
| 229.69 | 16.01 | 3.67 | - | - | - | 426.14 | 8.46 | 3.60 | Grid charge battery, Pn@ nominal battery voltage |
| U Grid (V) | I Grid (A) | P Grid (kW) | U Back up (V) | I Back up (A) | P Back up (kW) | U BAT (V) | I BAT (A) | P BAT (kW) | Item |
| 229.68 | 15.98 | 3.66 | 229.10 | 15.80 | 3.62 | - | - | - | Grid to Back up@ max. backup current |
| U Grid (V) | I Grid (A) | P Grid (kW) | U Back up (V) | I Back up (A) | P Back up (kW) | U BAT (V) | I BAT (A) | P BAT (kW) | Item |



| | | | | | | | | | |
|------------|------------|-------------|--------------|----------|-----------|-----------|-----------|------------|--|
| 229.57 | 23.59 | 5.41 | 228.97 | 11.56 | 2.65 | 428.25 | 6.38 | 2.73 | Grid to battery and backup@ max. Grid power and current |
| U Grid (V) | I Grid (A) | P Grid (kW) | U PV (V) | I PV (A) | P PV (kW) | U BAT (V) | I BAT (A) | P BAT (kW) | Item |
| 230.14 | 15.71 | 3.61 | 201.28* 2 | 4.71*2 | 1.89 | 421.85 | 4.34 | 1.81 | PV and Battery to grid, Pn @ AC max. output current |
| U Grid (V) | I Grid (A) | P Grid (kW) | U PV (V) | I PV (A) | P PV (kW) | U BAT (V) | I BAT (A) | P BAT (kW) | Item |
| 230.08 | 12.08 | 2.77 | 178.50* 2 | 16.01*2 | 5.71 | 428.72 | 6.49 | 2.78 | PV to Grid and charge battery@ max. PV power and current |

Supplementary information:-

| 4.3 TABLE: heating temperature rise measurements | | | | | | | P |
|--|------------------|------------|------------|------------|------------|------------------|---|
| Model: | FH3X-8K-HY-1P-20 | | | | | | |
| test voltage (V) | See Note 1 | See Note 2 | See Note 3 | See Note 4 | See Note 5 | — | |
| t1 (°C) | 45.0 | 55.0 | 45.0 | 45.0 | 45.0 | — | |
| t2 (°C) | 47.2 | 55.3 | 45.0 | 45.5 | 45.0 | — | |
| Max. temperature T of part/at: | T (°C) | | | | | permitted T (°C) | |
| Inverter box | | | | | | | |
| BOOST1 IGBT Q901 | 91.6 | 84.6 | 75.8 | 90.0 | 71.9 | 130 | |
| BOOST1 Diode D901 | 85.6 | 81.2 | 76.1 | 87.0 | 71.2 | 130 | |
| BOOST2 IGBT Q902 | 91.3 | 84.5 | 76.6 | 89.7 | 72.5 | 130 | |
| BOOST2 Diode D903 | 85.2 | 81.4 | 77.2 | 87.2 | 72.5 | 130 | |
| BOOST3 IGBT Q103 | 90.2 | 83.2 | 73.8 | 88.5 | 71.0 | 130 | |
| BOOST3 Diode D105 | 83.1 | 80.3 | 74.2 | 85.3 | 70.6 | 130 | |
| INV IGBT Q1001 | 92.1 | 86.4 | 89.4 | 97.6 | 74.1 | 130 | |
| INV IGBT Q1002 | 93.9 | 87.6 | 91.9 | 99.4 | 74.2 | 130 | |
| INV IGBT Q1003 | 91.0 | 85.9 | 88.4 | 96.3 | 73.7 | 130 | |
| INV IGBT Q1004 | 92.1 | 86.4 | 88.5 | 97.1 | 73.6 | 130 | |
| INV IGBT Q1005 | 86.8 | 83.7 | 85.8 | 93.6 | 75.0 | 130 | |
| INV IGBT Q1006 | 88.4 | 84.8 | 88.8 | 97.2 | 75.2 | 130 | |
| BAT IGBT BOOST Q701 | 70.7 | 73.7 | 52.4 | 51.8 | 50.2 | 130 | |
| BAT IGBT BOOST Q705 | 69.5 | 73.0 | 66.1 | 75.1 | 69.8 | 130 | |
| BAT IGBT BUCK Q702 | 70.8 | 73.8 | 66.8 | 76.6 | 70.2 | 130 | |
| BAT IGBT BUCK Q706 | 71.9 | 74.4 | 67.8 | 77.3 | 70.6 | 130 | |
| DC Current Sensor U901 | 87.4 | 81.2 | 72.5 | 87.0 | 72.7 | 125 | |
| DC Current Sensor U2 | 88.3 | 81.4 | 71.3 | 88.0 | 71.2 | 125 | |
| DC Current Sensor U902 | 88.0 | 81.0 | 71.7 | 87.3 | 71.8 | 125 | |
| Common mode choke CT901 core | 80.1 | 74.8 | 65.9 | 82.6 | 66.9 | 110 (class B) | |
| Common mode choke CT901 PV+ coil | 81.8 | 75.5 | 66.1 | 82.6 | 66.7 | 110 (class B) | |
| Common mode choke | 81.3 | 75.0 | 66.1 | 81.4 | 66.7 | 110 | |



| | | | | | | |
|-----------------------------------|------|------|------|-------|-------|------------------|
| CT901 PV- coil | | | | | | (class B) |
| PV2 X Cap. C922 | 72.3 | 71.6 | 64.2 | 75.7 | 66.5 | 105 |
| PV2 Y Cap. C918 | 70.3 | 71.0 | 63.4 | 74.2 | 66.0 | 105 |
| PV2 DC Cap. C923 | 72.0 | 71.6 | 64.4 | 75.5 | 66.6 | 105 |
| DC Varistor TVS901 | 69.1 | 70.1 | 62.9 | 72.8 | 65.6 | 125 |
| Gas tube GD901 | 69.0 | 70.4 | 62.4 | 73.3 | 64.9 | 85 |
| PV trace | 74.8 | 72.4 | 64.4 | 76.9 | 66.2 | 130 |
| DC contactor | 64.3 | 66.8 | 60.5 | 76.8 | 73.1 | 85 |
| BAT pre-charge relay RY702 | 66.5 | 68.6 | 62.0 | 70.9 | 65.8 | 85 |
| BAT HCT HCT701 | 68.7 | 70.2 | 63.8 | 73.0 | 68.4 | 105 |
| BAT common mode choke CT701 core | 74.0 | 72.4 | 64.2 | 77.2 | 65.9 | 110 (class B) |
| BAT common mode choke CT701 coil | 78.4 | 74.4 | 65.1 | 80.2 | 66.2 | 110 (class B) |
| BAT Y cap. C702 | 68.7 | 69.9 | 63.7 | 72.3 | 66.5 | 105 |
| BAT X cap. C703 | 68.6 | 69.9 | 63.4 | 72.6 | 67.5 | 105 |
| BAT DC cap. C705 | 67.9 | 69.3 | 63.0 | 72.5 | 67.9 | 105 |
| DC SPS EC1202 core | 78.4 | 78.7 | 74.9 | 83.9 | 78.8 | 110 (class B) |
| DC SPS EC1202 coil | 78.5 | 78.8 | 75.1 | 84.4 | 78.6 | 110 (class B) |
| DC SPS MOS U1202 | 80.9 | 81.1 | 77.6 | 86.9 | 80.6 | 130 |
| DC SPS diode D1209 | 99.8 | 99.6 | 96.6 | 111.0 | 104.7 | 130 |
| DC SPS IC U1201 | 79.2 | 79.3 | 75.5 | 83.5 | 77.6 | 130 |
| AC rectifier bridge D801 | 76.1 | 76.1 | 73.3 | 79.3 | 74.3 | 130 |
| AC SPS L1901 core | 73.2 | 73.0 | 68.6 | 75.8 | 70.6 | 110 (class B) |
| AC SPS L1901 coil | 73.6 | 73.8 | 69.7 | 76.9 | 71.8 | 110 (class B) |
| AC SPS MOS U802 | 76.6 | 76.4 | 73.3 | 80.1 | 74.8 | 130 |
| AC SPS diode D1903 | 74.4 | 74.3 | 70.7 | 78.1 | 72.2 | 130 |
| AC SPS IC U1901 | 48.3 | 56.3 | 46.0 | 46.5 | 46.0 | 130 |
| Master CPU U201 | 73.4 | 74.9 | 69.0 | 77.4 | 72.3 | 125 |
| Slave CPU U401 body | 71.5 | 72.5 | 66.9 | 75.3 | 69.7 | 85 |
| Crystal oscillator Y401 | 70.3 | 71.6 | 65.7 | 74.2 | 69.0 | 85 |
| Internal Fan | 67.5 | 69.4 | 62.9 | 71.1 | 65.4 | 80 |
| BUS Cap. C1007 | 70.9 | 71.0 | 64.9 | 74.3 | 67.5 | 105 |
| BUS Cap. C1011 | 72.6 | 72.3 | 66.5 | 76.0 | 69.1 | 105 |
| AC HCT HCT501 | 74.9 | 73.3 | 72.5 | 77.3 | 73.1 | 105 |
| GFCI CT1301 | 74.2 | 73.0 | 71.8 | 76.6 | 73.4 | 110 |
| POWER-S IC U2004 | 76.2 | 76.9 | 72.6 | 80.0 | 74.5 | 125 |
| POWER-S transformer L2001 core | 71.8 | 72.7 | 67.8 | 75.1 | 70.2 | 110 (class B) |
| POWER-S transformer L2001 coil | 72.3 | 73.1 | 68.5 | 75.9 | 70.5 | 110 (class B) |
| POWER-BMS IC U1 | 73.8 | 75.0 | 69.6 | 77.6 | 72.3 | 125 |
| POWER-BMS transformer TX1401 coil | 71.6 | 72.5 | 67.3 | 75.3 | 70.1 | 120 |
| Isolated IC U1608 | 70.4 | 71.7 | 66.7 | 74.0 | 69.1 | 125 |
| AC grid relay RY1306 | 74.2 | 75.5 | 73.4 | 80.3 | 76.0 | 85 |
| INV relay RY1301 | 73.5 | 73.0 | 69.0 | 76.7 | 70.4 | 85 |
| AC common mode choke CT1302 coil | 93.4 | 81.4 | 89.9 | 95.6 | 84.7 | 110 (class B) |
| AC common mode choke CT1302 core | 84.4 | 77.3 | 81.0 | 85.9 | 83.5 | 110 (class B) |



| | | | | | | |
|--|------|------|------|------|------|---------------|
| AC Y Cap. C1311 | 74.2 | 72.4 | 70.7 | 76.5 | 73.2 | 105 |
| AC filter Cap. C1316 | 70.8 | 70.7 | 67.3 | 73.2 | 70.2 | 110 |
| AC varistor MOV1301 | 71.6 | 71.2 | 68.2 | 74.3 | 70.5 | 125 |
| Backup relay RY801 | 69.6 | 70.4 | 65.3 | 72.8 | 68.5 | 85 |
| Backup current sensor HCT701 | 70.3 | 71.2 | 66.2 | 73.2 | 69.3 | 105 |
| Backup common mode choke CT801 coil | 67.9 | 69.5 | 64.0 | 70.8 | 67.3 | 110 (class B) |
| Backup common mode choke CT801 core | 67.5 | 69.2 | 63.7 | 70.4 | 66.8 | 110 (class B) |
| Backup Y Cap. C803 | 69.1 | 70.0 | 65.5 | 71.7 | 68.4 | 110 |
| Backup Y Cap. C802 | 67.3 | 69.1 | 63.7 | 70.1 | 66.7 | 110 |
| PV BOOST1/2 inductor coil (top) | 85.6 | 83.0 | 60.6 | 95.0 | 61.9 | 110 (class B) |
| PV BOOST1/2 inductor core (top) | 85.3 | 82.7 | 60.4 | 94.4 | 62.1 | 110 (class B) |
| PV BOOST1/2 inductor coil (bottom) | 82.7 | 81.0 | 60.2 | 91.5 | 61.8 | 110 (class B) |
| PV BOOST1/2 inductor core (bottom) | 83.4 | 81.7 | 60.3 | 92.6 | 61.9 | 110 (class B) |
| PV BOOST3 inductor coil | 79.5 | 79.7 | 59.6 | 88.6 | 62.7 | 110 (class B) |
| PV BOOST3 inductor core | 82.8 | 82.0 | 60.2 | 92.8 | 62.6 | 110 (class B) |
| INV L inductor coil | 95.8 | 85.8 | 99.9 | 96.2 | 95.6 | 110 (class B) |
| INV L inductor core | 91.0 | 83.5 | 94.6 | 91.0 | 93.4 | 110 (class B) |
| INV N inductor coil | 92.4 | 84.0 | 96.3 | 92.8 | 92.5 | 110 (class B) |
| INV N inductor core | 89.9 | 83.0 | 93.6 | 90.4 | 91.9 | 110 (class B) |
| BAT inductor coil | 68.8 | 72.3 | 58.2 | 77.5 | 65.1 | 110 (class B) |
| BAT inductor core | 68.7 | 72.2 | 58.4 | 77.3 | 65.5 | 110 (class B) |
| Heatsink | 72.8 | 74.6 | 72.3 | 77.2 | 71.1 | 100 |
| LED cover | 50.3 | 57.1 | 50.4 | 52.7 | 51.1 | 85 |
| PV connector | 56.6 | 63.6 | 54.1 | 60.7 | 54.4 | 85 |
| Gride connector | 57.6 | 61.6 | 57.6 | 58.5 | 58.0 | 85 |
| Backup connector | 51.2 | 58.7 | 51.5 | 53.0 | 52.2 | 85 |
| PV switch | 68.6 | 69.9 | 63.7 | 72.2 | 66.8 | 85 |
| BAT circuit breaker | 67.1 | 69.1 | 62.6 | 71.9 | 68.8 | 85 |
| BAT ISO relay K3002 | 71.9 | 72.4 | 67.4 | 75.4 | 69.5 | 85 |
| Fuse for control | 63.5 | 66.5 | 59.8 | 68.2 | 67.2 | 105 |
| Grid power wire | 72.7 | 71.5 | 69.6 | 75.4 | 70.5 | 105 |
| Backup power wire | 67.2 | 69.1 | 63.8 | 70.0 | 66.5 | 105 |
| BAT power wire | 68.3 | 69.7 | 63.5 | 73.1 | 68.2 | 105 |
| Metal enclosure | 60.4 | 65.6 | 58.6 | 63.4 | 59.7 | 100 |
| Battery Module | | | | | | |
| NTC1 | - | - | - | 48.7 | 52.6 | 105 |
| NTC2 | - | - | - | 48.8 | 52.6 | 105 |
| BAT + plastic | - | - | - | 49.9 | 51.6 | 125 |
| BAT - plastic | - | - | - | 49.2 | 51.2 | 125 |
| Battery pack electrode welding bracket | - | - | - | 46.6 | 47.6 | 125 |



| | | | | | | |
|-------------------------|------|------|------|------|------|------|
| Bracket cover | - | - | - | 48.7 | 51.2 | 100 |
| BMU PCB trace | - | - | - | 49.7 | 51.2 | 130 |
| Isolated IC TF6 | - | - | - | 48.1 | 50.0 | 125 |
| PCB near resistor F26 | - | - | - | 49.0 | 50.7 | 130 |
| Fuse for battery module | - | - | - | 49.7 | 52.3 | 125 |
| BAT connector | - | - | - | 54.3 | 55.4 | 125 |
| Output power cord | - | - | - | 50.1 | 52.6 | 105 |
| Ambient | 47.2 | 55.3 | 45.0 | 45.5 | 45.0 | Ref. |

Supplementary information:

- 1) Normal condition / PV to Grid: DC 190V from PV input, AC 230V/8kW for Grid output. / 47.2°C (without power derating)
- 2) Normal condition / PV to Grid: DC 190V from PV input, AC 230V/8kW for Grid output. / 55.3°C (power derating to thermal steady)
- 3) Normal condition / PV to Grid: DC 520V from PV input, AC 230V/8kW for Grid output. / 45.0°C (without power derating)
- 4) Normal condition / PV to charge battery and Grid: DC 280V from PV input, 20A/8kW for battery in charge AC 230V/4.8kW for Grid output. / 45.5°C (without power derating)
- 5) Normal condition / Battery to Grid: DC 409.6V/20A/8kW for Battery in discharge, AC 230V/8kW for Grid output. / 45.0°C (without power derating)

| 4.3 TABLE: heating temperature rise measurements | | | | | | P |
|--|------------------|------------|------------|------------|-------------|------------------|
| Model: | FH3X-8K-HY-1P-20 | | | | | |
| test voltage (V) | See Note 6 | See Note 7 | See Note 8 | See Note 9 | See Note 10 | — |
| t1 (°C) | 55.0 | 55.0 | 45.0 | 45.0 | 55.0 | — |
| t2 (°C) | 55.1 | 55.1 | 45.0 | 47.0 | 55.1 | — |
| Max. temperature T of part/at: | T (°C) | | | | | permitted T (°C) |
| Inverter box | | | | | | |
| BOOST1 IGBT Q901 | 85.2 | 79.2 | 82.3 | 73.1 | 81.6 | 130 |
| BOOST1 Diode D901 | 83.4 | 78.4 | 79.0 | 72.6 | 80.5 | 130 |
| BOOST2 IGBT Q902 | 84.8 | 79.8 | 82.4 | 74.4 | 82.7 | 130 |
| BOOST2 Diode D903 | 83.5 | 79.9 | 80.4 | 75.0 | 83.1 | 130 |
| BOOST3 IGBT Q103 | 84.3 | 78.4 | 81.0 | 71.8 | 80.2 | 130 |
| BOOST3 Diode D105 | 82.2 | 78.0 | 77.4 | 71.6 | 79.6 | 130 |
| INV IGBT Q1001 | 90.0 | 82.5 | 95.0 | 87.1 | 95.0 | 130 |
| INV IGBT Q1002 | 91.2 | 83.0 | 97.1 | 88.7 | 96.9 | 130 |
| INV IGBT Q1003 | 89.5 | 82.4 | 93.8 | 84.1 | 92.1 | 130 |
| INV IGBT Q1004 | 89.8 | 82.0 | 93.8 | 83.9 | 92.0 | 130 |
| INV IGBT Q1005 | 87.4 | 83.7 | 91.0 | 101.8 | 110.1 | 130 |
| INV IGBT Q1006 | 89.7 | 83.8 | 95.2 | 114.2 | 122.5 | 130 |
| BAT IGBT BOOST Q701 | 56.3 | 56.7 | 51.1 | 52.8 | 62.6 | 130 |
| BAT IGBT BOOST Q705 | 77.2 | 78.4 | 75.5 | 71.2 | 79.6 | 130 |
| BAT IGBT BUCK Q702 | 78.1 | 78.6 | 75.5 | 82.3 | 90.4 | 130 |
| BAT IGBT BUCK Q706 | 78.4 | 78.9 | 75.4 | 80.5 | 88.6 | 130 |
| DC Current Sensor U901 | 83.8 | 78.9 | 78.4 | 73.2 | 79.8 | 125 |
| DC Current Sensor U2 | 83.4 | 77.4 | 77.6 | 71.2 | 77.8 | 125 |
| DC Current Sensor U902 | 83.6 | 77.9 | 77.8 | 72.0 | 78.7 | 125 |
| Common mode choke CT901 core | 78.3 | 72.7 | 72.1 | 67.2 | 73.8 | 110 (class B) |
| Common mode choke CT901 PV+ coil | 78.3 | 72.6 | 72.2 | 66.9 | 73.5 | 110 (class B) |
| Common mode choke CT901 PV- coil | 77.7 | 72.6 | 72.2 | 67.1 | 73.6 | 110 (class B) |
| PV2 X Cap. C922 | 75.2 | 72.5 | 69.8 | 66.7 | 73.3 | 105 |
| PV2 Y Cap. C918 | 75.0 | 72.2 | 69.1 | 66.2 | 72.9 | 105 |
| PV2 DC Cap. C923 | 75.4 | 72.5 | 69.8 | 66.8 | 73.4 | 105 |



| | | | | | | |
|-----------------------------------|-------|-------|-------|-------|-------|---------------|
| DC Varistor TVS901 | 73.7 | 71.7 | 68.4 | 65.8 | 72.3 | 125 |
| Gas tube GD901 | 74.3 | 71.3 | 68.2 | 65.0 | 71.7 | 85 |
| PV trace | 75.6 | 72.2 | 70.2 | 66.4 | 73.0 | 130 |
| DC contactor | 79.2 | 78.8 | 74.3 | 72.3 | 78.5 | 85 |
| BAT pre-charge relay RY702 | 73.2 | 71.9 | 67.7 | 65.8 | 72.3 | 85 |
| BAT HCT HCT701 | 74.8 | 74.3 | 70.0 | 68.4 | 74.7 | 105 |
| BAT common mode choke CT701 core | 75.8 | 71.9 | 69.8 | 66.1 | 72.7 | 110 (class B) |
| BAT common mode choke CT701 coil | 77.3 | 72.3 | 71.3 | 66.4 | 73.0 | 110 (class B) |
| BAT Y cap. C702 | 73.7 | 72.5 | 69.0 | 67.0 | 73.4 | 105 |
| BAT X cap. C703 | 74.1 | 73.3 | 69.3 | 67.4 | 73.7 | 105 |
| BAT DC cap. C705 | 74.6 | 73.8 | 69.3 | 67.1 | 73.4 | 105 |
| DC SPS EC1202 core | 84.2 | 84.3 | 81.5 | 80.2 | 86.6 | 110 (class B) |
| DC SPS EC1202 coil | 84.2 | 84.6 | 82.0 | 80.7 | 87.1 | 110 (class B) |
| DC SPS MOS U1202 | 86.4 | 86.6 | 83.9 | 83.0 | 89.8 | 130 |
| DC SPS diode D1209 | 109.7 | 109.7 | 105.9 | 109.0 | 114.6 | 130 |
| DC SPS IC U1201 | 83.0 | 83.1 | 80.7 | 78.7 | 85.4 | 130 |
| AC rectifier bridge D801 | 78.7 | 79.9 | 76.9 | 77.0 | 83.6 | 130 |
| AC SPS L1901 core | 76.0 | 76.3 | 73.9 | 72.0 | 78.5 | 110 (class B) |
| AC SPS L1901 coil | 76.9 | 77.3 | 74.9 | 73.4 | 80.0 | 110 (class B) |
| AC SPS MOS U802 | 79.4 | 80.4 | 77.1 | 77.1 | 83.7 | 130 |
| AC SPS diode D1903 | 77.5 | 78.1 | 76.2 | 75.0 | 81.6 | 130 |
| AC SPS IC U1901 | 56.2 | 56.1 | 46.1 | 48.6 | 57.1 | 130 |
| Master CPU U201 | 78.6 | 78.2 | 74.4 | 72.2 | 78.6 | 125 |
| Slave CPU U401 body | 76.0 | 75.6 | 72.5 | 70.0 | 76.4 | 85 |
| Crystal oscillator Y401 | 75.2 | 74.9 | 71.2 | 68.9 | 75.2 | 85 |
| Internal Fan | 72.6 | 71.7 | 67.9 | 65.7 | 72.1 | 80 |
| BUS Cap. C1007 | 74.5 | 73.3 | 70.7 | 68.0 | 74.3 | 105 |
| BUS Cap. C1011 | 75.2 | 74.8 | 72.4 | 69.3 | 75.4 | 105 |
| AC HCT HCT501 | 75.2 | 78.2 | 77.9 | 75.5 | 81.9 | 105 |
| GFCI CT1301 | 74.9 | 78.0 | 77.4 | 74.9 | 81.3 | 110 |
| POWER-S IC U2004 | 80.3 | 80.1 | 78.1 | 76.7 | 83.1 | 125 |
| POWER-S transformer L2001 core | 76.0 | 75.9 | 73.3 | 71.1 | 77.4 | 110 (class B) |
| POWER-S transformer L2001 coil | 76.3 | 76.3 | 73.9 | 71.9 | 78.0 | 110 (class B) |
| POWER-BMS IC U1 | 78.4 | 78.3 | 75.0 | 72.8 | 79.2 | 125 |
| POWER-BMS transformer TX1401 coil | 76.1 | 76.0 | 72.9 | 70.5 | 76.8 | 120 |
| Isolated IC U1608 | 74.9 | 75.0 | 71.9 | 69.7 | 76.0 | 125 |
| AC grid relay RY1306 | 78.3 | 80.2 | 70.9 | 80.2 | 81.6 | 85 |
| INV relay RY1301 | 76.4 | 76.7 | 72.2 | 72.8 | 80.3 | 85 |
| AC common mode choke CT1302 coil | 82.3 | 87.6 | 73.3 | 106.8 | 105.7 | 110 (class B) |
| AC common mode choke CT1302 core | 78.0 | 84.3 | 71.4 | 95.2 | 104.9 | 110 (class B) |
| AC Y Cap. C1311 | 74.5 | 77.2 | 71.4 | 78.1 | 83.7 | 105 |
| AC filter Cap. C1316 | 73.2 | 74.7 | 71.1 | 72.8 | 78.5 | 110 |
| AC varistor MOV1301 | 73.7 | 75.3 | 70.6 | 73.8 | 79.6 | 125 |
| Backup relay RY801 | 73.9 | 73.9 | 81.2 | 71.5 | 77.4 | 85 |



| | | | | | | |
|--|------|------|-------|-------|-------|---------------|
| Backup current sensor HCT701 | 74.4 | 74.6 | 83.4 | 72.0 | 77.9 | 105 |
| Backup common mode choke CT801 coil | 72.8 | 72.7 | 106.6 | 71.1 | 77.0 | 110 (class B) |
| Backup common mode choke CT801 core | 72.4 | 72.4 | 93.3 | 69.4 | 75.4 | 110 (class B) |
| Backup Y Cap. C803 | 72.9 | 73.6 | 84.0 | 71.1 | 76.8 | 110 |
| Backup Y Cap. C802 | 72.1 | 72.3 | 77.8 | 68.1 | 74.1 | 110 |
| PV BOOST1/2 inductor coil (top) | 91.5 | 69.8 | 75.5 | 60.1 | 66.9 | 110 (class B) |
| PV BOOST1/2 inductor core (top) | 91.0 | 70.0 | 75.6 | 60.3 | 68.2 | 110 (class B) |
| PV BOOST1/2 inductor coil (bottom) | 89.1 | 69.7 | 73.7 | 60.1 | 68.2 | 110 (class B) |
| PV BOOST1/2 inductor core (bottom) | 90.0 | 69.8 | 74.4 | 60.2 | 68.2 | 110 (class B) |
| PV BOOST3 inductor coil | 88.0 | 70.7 | 73.2 | 60.5 | 68.4 | 110 (class B) |
| PV BOOST3 inductor core | 90.7 | 70.5 | 75.3 | 60.6 | 68.5 | 110 (class B) |
| INV L inductor coil | 85.5 | 96.8 | 106.5 | 101.9 | 105.2 | 110 (class B) |
| INV L inductor core | 83.0 | 94.6 | 101.3 | 96.5 | 103.8 | 110 (class B) |
| INV N inductor coil | 83.9 | 94.4 | 103.3 | 98.2 | 105.5 | 110 (class B) |
| INV N inductor core | 83.0 | 93.8 | 99.9 | 95.5 | 102.7 | 110 (class B) |
| BAT inductor coil | 80.9 | 73.3 | 68.4 | 62.8 | 70.3 | 110 (class B) |
| BAT inductor core | 80.8 | 73.4 | 68.3 | 62.6 | 70.1 | 110 (class B) |
| Heatsink | 77.1 | 78.8 | 75.5 | 77.3 | 84.9 | 100 |
| LED cover | 58.7 | 58.6 | 52.0 | 50.8 | 59.6 | 85 |
| PV connector | 65.7 | 63.1 | 57.6 | 54.0 | 64.6 | 85 |
| Gride connector | 61.9 | 64.6 | 53.6 | 62.6 | 69.3 | 85 |
| Backup connector | 60.2 | 60.4 | 70.2 | 53.3 | 61.5 | 85 |
| PV switch | 73.4 | 72.8 | 69.1 | 67.0 | 73.1 | 85 |
| BAT circuit breaker | 74.3 | 74.2 | 68.8 | 67.1 | 73.0 | 85 |
| BAT ISO relay K3002 | 75.7 | 75.5 | 73.0 | 70.7 | 77.2 | 85 |
| Fuse for control | 71.5 | 72.6 | 66.0 | 65.5 | 71.2 | 105 |
| Grid power wire | 73.7 | 75.8 | 70.1 | 76.3 | 82.0 | 105 |
| Backup power wire | 72.0 | 72.2 | 91.4 | 68.3 | 74.4 | 105 |
| BAT power wire | 74.3 | 74.2 | 70.3 | 68.3 | 74.4 | 105 |
| Metal enclosure | 67.3 | 67.2 | 61.3 | 59.9 | 67.4 | 100 |
| Battery Module | | | | | | |
| NTC1 | 55.5 | 56.7 | 45.1 | 48.9 | 55.5 | 105 |
| NTC2 | 55.6 | 56.8 | 45.2 | 49.0 | 55.6 | 105 |
| BAT + plastic | 61.3 | 59.3 | 47.6 | 51.2 | 59.1 | 125 |
| BAT - plastic | 59.9 | 58.4 | 47.1 | 51.1 | 58.3 | 125 |
| Battery pack electrode welding bracket | 59.5 | 56.2 | 44.9 | 48.6 | 57.7 | 125 |
| Bracket cover | 58.1 | 57.2 | 46.1 | 49.7 | 56.8 | 100 |
| BMU PCB trace | 63.5 | 58.0 | 47.3 | 61.6 | 66.8 | 130 |
| Isolated IC TF6 | 58.5 | 56.7 | 46.1 | 50.7 | 57.3 | 125 |
| PCB near resistor F26 | 62.9 | 57.6 | 46.8 | 63.5 | 68.1 | 130 |



| | | | | | | |
|-------------------------|------|------|------|------|------|------|
| Fuse for battery module | 61.0 | 59.6 | 47.6 | 51.2 | 58.8 | 125 |
| BAT connector | 66.3 | 63.5 | 52.3 | 55.6 | 63.2 | 125 |
| Output power cord | 60.8 | 59.9 | 47.7 | 51.5 | 58.9 | 105 |
| Ambient | 55.1 | 55.1 | 45.0 | 47.0 | 55.1 | Ref. |

Supplementary information:

6) Normal condition / PV to charge battery and Grid: DC 280V from PV input, 20A/8kW for battery in charge AC 230V/4.8kW for Grid output. / 55.0°C (power derating to thermal steady)

7) Battery to Grid: DC 409.6V/20A/8kW for Battery in discharge, AC 230V/8kW for Grid output. / 55.1°C (power derating to thermal steady)

8) PV and Battery to Backup: DC 190V from PV input and DC 409.6V/10A from Battery input, AC 230V/8kW for Backup output. / 45.0°C (without power derating)

9) Normal condition / Grid to charge Battery and backup: AC 230V/12kW from AC Grid input, DC 409.6/6kW for Battery in charge and AC 230V/6kW for Backup output. / 47.0°C (without power derating)

10) Normal condition / Grid to charge Battery and backup: AC 230V/12kW from AC Grid input, DC 409.6/6kW for Battery in charge and AC 230V/6kW for Backup output. / 55.1°C (power derating to thermal steady)

| | | |
|----------------|--|----------|
| 4.4.4.8 | TABLE: heating temperature rise measurements for cooling system failure | P |
|----------------|--|----------|

Model: FH3X-8K-HY-1P-20

| | | | |
|--|------------|------------|------------------|
| test voltage (V) | See Note 1 | See Note 2 | — |
| t1 (°C) | 55.0 | 55.0 | — |
| t2 (°C) | 60.4 | 55.2 | — |
| Max. temperature T of part/at: | T (°C) | | permitted T (°C) |
| Heatsink | 77.8 | 78.8 | 90 |
| LED cover | 67.6 | 55.9 | 90 |
| PV connector | 71.5 | 60.0 | 90 |
| GRID connector | 71.4 | 67.0 | 90 |
| Backup connector | 70.7 | 59.9 | 90 |
| PV switch | 74.4 | 66.4 | 90 |
| BAT circuit breaker | 74.0 | 66.9 | 90 |
| Grid power wire | 75.3 | 84.2 | 90 |
| Backup power wire | 75.8 | 71.0 | 90 |
| BAT power wire | 75.3 | 70.4 | 90 |
| Metal enclosure | 73.7 | 67.7 | 90 |
| Battery pack electrode welding bracket | 66.4 | 55.8 | 90 |
| Bracket cover | 64.2 | 56.2 | 90 |
| Ambient | 60.4 | 55.2 | Ref. |

Supplementary information:

1) Blanketing condition: Grid to charge Battery and backup: AC 230V/12kW from AC Grid input, DC 409.6/6kW for Battery in charge and AC 230V/6kW for Backup output. / 55.1°C (power derating to thermal steady)

2) Fan blocking condition: Grid to charge Battery and backup: AC 230V/12kW from AC Grid input, DC 409.6/6kW for Battery in charge and AC 230V/6kW for Backup output. / 55.1°C (power derating to thermal steady)

3) The duration of the test is less than 7 h for the temperatures stabilize and no external surface of the inverter is at a temperature exceeding 90 °C, no hazard observed. No over temperature observed in components, no hazard observed.

| | | |
|------------|-------------------------------------|----------|
| 4.4 | TABLE: fault condition tests | P |
|------------|-------------------------------------|----------|

| | | |
|-------------------------------|--------|---|
| ambient temperature (°C)..... | 25.0°C | — |
|-------------------------------|--------|---|

| No. | component No. | fault | test voltage (V) | test time | fuse No. | fuse current (A) | Result |
|-----|---------------|-------|------------------|-----------|----------|------------------|--------|
|-----|---------------|-------|------------------|-----------|----------|------------------|--------|

Model: FH3X-8K-HY-1P-20

Input and output fault

| | | | | | | | |
|---|------------------------|--|---|------------------|---|---|---|
| 1 | AC output for Grid | Overload | MAINS: 230 PV: 550 Battery: 409.6 | Steady condition | - | - | FID: The inverter AC grid output power was limited within 8kW. SD: <input type="checkbox"/> Yes / <input checked="" type="checkbox"/> No, RO: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NCD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NH: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, DST: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No |
| 2 | AC output for backup | Overload | MAINS: 230 PV: 550 Battery: 409.6 | Steady condition | - | - | FID: The inverter backup output power was limited within 8kW. SD: <input type="checkbox"/> Yes / <input checked="" type="checkbox"/> No, RO: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NCD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NH: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, DST: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No |
| 3 | PV+ to PV- | Reverse before inverter start up | MAINS: 230 PV: 550 Battery: 409.6 | 10min | - | - | FID: The inverter cannot start. SD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, RO: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NCD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NH: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, DST: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No |
| 4 | PV+ to PV- | Short-circuit | MAINS: 230 PV: 550 Battery: 409.6 | 10min | - | - | FID: The Inverter off-grid immediately. No backfeed current observed on PV side, No output no power feed into grid. SD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, RO: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NCD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NH: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, DST: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No |
| 5 | PV1+ to PV1- | Short-circuit, with D901 Short-circuit | MAINS: 230 PV: 550 Battery: 409.6 | 10min | - | - | FID: The inverter shut down immediately. No backfeed current observed on PV side, No output no power feed into grid. SD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, RO: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NCD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NH: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, DST: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No |
| 6 | Output L to N for Grid | Short-circuit | MAINS: 230 PV: 550 Battery: 409.6 | 10min | - | - | FID: The inverter shut down immediately. Error code: 9 Utility grid disconnected. Max. peak current: 94.0A, Total duration: 42.7ms. External breaker protected. No backfeed current into grid. SD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, RO: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NCD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NH: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, DST: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No |
| 7 | Output L to G for Grid | Short-circuit | MAINS: 230 PV: 550 | 10min | - | - | FID: The inverter shut down immediately. Error code: 9 |

| | | | | | | | |
|----|-----------------------------|---|--|-------|---|---|---|
| | | | Battery: 409.6 | | | | Utility grid disconnected. Max. peak current: 67.0A, Total duration: 62.5ms. External breaker protected. No backfeed current into grid. SD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, RO: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NCD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NH: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, DST: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No |
| 8 | Output L to N for Backup | Short-circuit | MAINS: 230 PV: 550 Battery: 409.6 | 10min | - | - | FID: The inverter shut down immediately. Max. peak current: 131.0A, Total duration: 24.5ms. External breaker protected. No backfeed current into Backup. SD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, RO: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NCD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NH: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, DST: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No |
| 9 | Output L to G for Backup | Short-circuit | MAINS: 230 PV: 550 Battery: 409.6 | 10min | - | - | FID: The inverter shut down immediately. Max. peak current: 103.0A, Total duration: 14.2ms. External breaker protected. No backfeed current into Backup. SD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, RO: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NCD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NH: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, DST: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No |
| 10 | Battery+ to Battery- | Reverse before inverter start up | MAINS: 230 PV: 550 Battery: 409.6 | 10min | - | - | FID: The inverter shut down immediately. Error code: 24, Battery Null Error. SD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, RO: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NCD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NH: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, DST: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No |
| 11 | Battery+ to Battery- | Short-circuit | MAINS: 230 PV: 550 Battery: 409.6 | 10min | - | - | FID: The inverter shut down immediately. Error code: 24, Battery Null Error. BMS fuse opened, and external breaker protected. SD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, RO: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NCD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NH: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, DST: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No |
| 12 | PV source disconnected | Disconnected without additional | MAINS: 230 PV: 600 Battery: | 10min | - | - | FID: The Inverter work normally in battery mode. No backfeed voltage |

| | | | | | | | |
|------------------------------|----------------------------|--|---|-------|---|---|---|
| | | fault | 409.6 | | | | observed on PV side. SD: <input type="checkbox"/> Yes / <input checked="" type="checkbox"/> No, RO: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NCD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NH: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, DST: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No |
| 13 | PV source disconnected | Disconnected with discharge resistance R107 opened | MAINS: 230 PV: 600 Battery: 409.6 | 10min | - | - | FID: The inverter shut down. No backfeed voltage observed on PV side. SD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, RO: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NCD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NH: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, DST: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No |
| 14 | Grid outage | Disconnected without additional fault | MAINS: 230 PV: 550 Battery: 409.6 | 10min | - | - | FID: The inverter works normally on backup mode. No backfeed voltage observed on AC side. SD: <input type="checkbox"/> Yes / <input checked="" type="checkbox"/> No, RO: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NCD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NH: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, DST: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No |
| 15 | Grid outage | Disconnected with discharge resistance R808 opened | MAINS: 230 PV: 550 Battery: 409.6 | 10min | - | - | FID: The inverter shut down immediately. Error code: 9 Utility grid disconnected. No backfeed voltage observed on AC side. SD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, RO: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NCD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NH: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, DST: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No |
| Component fault tests | | | | | | | |
| 16 | PV Input Y capacitor C903 | Short-circuit | MAINS: 230 PV: 550 Battery: 409.6 | 10min | - | - | FID: The Inverter shut down immediately. Error code: 6, Surface insulation resistance error. SD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, RO: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NCD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NH: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, DST: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No |
| 17 | BUS capacitor C1003 | Short-circuit | MAINS: 230 PV: 550 Battery: 409.6 | 10min | - | - | FID: The inverter shut down immediately after short-circuit. BUS capacitor C1003 broken. SD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, RO: <input type="checkbox"/> Yes / <input checked="" type="checkbox"/> No, NCD: <input type="checkbox"/> Yes / <input checked="" type="checkbox"/> No, NH: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, DST: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No |
| 18 | Boost IGBT Q901 pin C to E | Short-circuit | MAINS: 230 PV: 550 Battery: 409.6 | 10min | - | - | FID: The inverter shut down immediately after short-circuit. Boost IGBT Q901 broken. SD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, |

| | | | | | | | |
|----|--------------------------------|---------------|---|-------|---|---|---|
| | | | | | | | RO: <input type="checkbox"/> Yes / <input checked="" type="checkbox"/> No, NCD: <input type="checkbox"/> Yes / <input checked="" type="checkbox"/> No, NH: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, DST: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No |
| 19 | Boost IGBT Q901 pin C to G | Short-circuit | MAINS: 230 PV: 550 Battery: 409.6 | 10min | - | - | FID: The inverter shut down immediately after short-circuit. Boost IGBT Q901 broken. SD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, RO: <input type="checkbox"/> Yes / <input checked="" type="checkbox"/> No, NCD: <input type="checkbox"/> Yes / <input checked="" type="checkbox"/> No, NH: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, DST: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No |
| 20 | Boost diode D901 | Short-circuit | MAINS: 230 PV: 550 Battery: 409.6 | 10min | - | - | FID: The inverter shut down immediately after short-circuit. Boost diode D901 broken. SD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, RO: <input type="checkbox"/> Yes / <input checked="" type="checkbox"/> No, NCD: <input type="checkbox"/> Yes / <input checked="" type="checkbox"/> No, NH: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, DST: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No |
| 21 | Boost IGBT Q902 pin C to E | Short-circuit | MAINS: 230 PV: 550 Battery: 409.6 | 10min | - | - | FID: The inverter shut down immediately after short-circuit. Boost IGBT Q902 broken. SD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, RO: <input type="checkbox"/> Yes / <input checked="" type="checkbox"/> No, NCD: <input type="checkbox"/> Yes / <input checked="" type="checkbox"/> No, NH: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, DST: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No |
| 22 | Boost IGBT Q902 pin C to G | Short-circuit | MAINS: 230 PV: 550 Battery: 409.6 | 10min | - | - | FID: The inverter shut down immediately after short-circuit. Boost IGBT Q902 broken. SD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, RO: <input type="checkbox"/> Yes / <input checked="" type="checkbox"/> No, NCD: <input type="checkbox"/> Yes / <input checked="" type="checkbox"/> No, NH: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, DST: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No |
| 23 | Boost IGBT Q103 pin C to E | Short-circuit | MAINS: 230 PV: 550 Battery: 409.6 | 10min | - | - | FID: The inverter shut down immediately after short-circuit. Boost IGBT Q103 broken. SD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, RO: <input type="checkbox"/> Yes / <input checked="" type="checkbox"/> No, NCD: <input type="checkbox"/> Yes / <input checked="" type="checkbox"/> No, NH: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, DST: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No |
| 24 | BAT Boost IGBT Q701 pin C to E | Short-circuit | MAINS: 230 PV: 550 Battery: 409.6 | 10min | - | - | FID: The inverter shut down immediately after short-circuit. BAT Boost IGBT Q701 broken. SD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, RO: <input type="checkbox"/> Yes / <input checked="" type="checkbox"/> No, NCD: <input type="checkbox"/> Yes / <input checked="" type="checkbox"/> No, NH: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, DST: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No |

| | | | | | | | |
|----|--|---------------|---|-------|---|---|---|
| 25 | BAT Boost IGBT Q701 pin C to G | Short-circuit | MAINS: 230 PV: 550 Battery: 409.6 | 10min | - | - | FID: The inverter shut down immediately after short-circuit. BAT Boost IGBT Q701 broken. SD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, RO: <input type="checkbox"/> Yes / <input checked="" type="checkbox"/> No, NCD: <input type="checkbox"/> Yes / <input checked="" type="checkbox"/> No, NH: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, DST: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No |
| 26 | INV IGBT Q1003 pin C to E | Short-circuit | MAINS: 230 PV: 550 Battery: 409.6 | 10min | - | - | FID: The inverter shut down immediately after short-circuit. INV IGBT Q1003 broken. SD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, RO: <input type="checkbox"/> Yes / <input checked="" type="checkbox"/> No, NCD: <input type="checkbox"/> Yes / <input checked="" type="checkbox"/> No, NH: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, DST: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No |
| 27 | INV IGBT Q1003 pin C to G | Short-circuit | MAINS: 230 PV: 550 Battery: 409.6 | 10min | - | - | FID: The inverter shut down immediately after short-circuit. INV IGBT Q1003 broken. SD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, RO: <input type="checkbox"/> Yes / <input checked="" type="checkbox"/> No, NCD: <input type="checkbox"/> Yes / <input checked="" type="checkbox"/> No, NH: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, DST: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No |
| 28 | INV IGBT Q1004 pin C to E | Short-circuit | MAINS: 230 PV: 550 Battery: 409.6 | 10min | - | - | FID: The inverter shut down immediately after short-circuit. INV IGBT Q1004 broken. SD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, RO: <input type="checkbox"/> Yes / <input checked="" type="checkbox"/> No, NCD: <input type="checkbox"/> Yes / <input checked="" type="checkbox"/> No, NH: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, DST: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No |
| 29 | INV IGBT Q1004 pin C to G | Short-circuit | MAINS: 230 PV: 550 Battery: 409.6 | 10min | - | - | FID: The inverter shut down immediately after short-circuit. INV IGBT Q1004 broken. SD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, RO: <input type="checkbox"/> Yes / <input checked="" type="checkbox"/> No, NCD: <input type="checkbox"/> Yes / <input checked="" type="checkbox"/> No, NH: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, DST: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No |
| 30 | AC SPS Transformer L1901 pin 7 to pin 9 | Short-circuit | MAINS: 230 PV: 550 Battery: 409.6 | 10min | - | - | FID: The inverter shut down immediately. LED indicator was On and Off alternatively. SD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, RO: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NCD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NH: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, DST: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No |
| 31 | DC SPS Transformer EC1202 pin 7 to pin 8 | Short-circuit | MAINS: 230 PV: 550 Battery: 409.6 | 10min | - | - | FID: The inverter shut down immediately. LED indicator was On and Off alternatively. |

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| | | | | | | | SD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, RO: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NCD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NH: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, DST: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No |
| 32 | DC SPS Transformer EC1202 pin 9 to pin 10 | Short-circuit | MAINS: 230 PV: 550 Battery: 409.6 | 10min | - | - | FID: The inverter shut down immediately. LED indicator was On and Off alternatively. SD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, RO: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NCD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NH: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, DST: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No |
| 33 | DC SPS Transformer EC1202 pin 11 to pin 12 | Short-circuit | MAINS: 230 PV: 550 Battery: 409.6 | 10min | - | - | FID: The inverter shut down immediately. LED indicator was On and Off alternatively. SD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, RO: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NCD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NH: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, DST: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No |
| 34 | DC SPS Transformer EC1202 pin 13 to pin 14 | Short-circuit | MAINS: 230 PV: 550 Battery: 409.6 | 10min | - | - | FID: The inverter shut down immediately. LED indicator was On and Off alternatively. SD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, RO: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NCD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NH: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, DST: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No |
| 35 | Power_S Transformer L2001 pin 1 to pin 2 | Short-circuit | MAINS: 230 PV: 550 Battery: 409.6 | 10min | - | - | FID: The inverter shut down immediately. LED indicator was On and Off alternatively. SD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, RO: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NCD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NH: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, DST: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No |
| 36 | Power_S Transformer L2001 pin 7 to pin 8 | Short-circuit | MAINS: 230 PV: 550 Battery: 409.6 | 10min | - | - | FID: The inverter shut down immediately. LED indicator was On and Off alternatively. SD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, RO: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NCD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NH: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, DST: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No |
| 37 | Power_S Transformer L2001 pin 7 to pin 8 | Over-load | MAINS: 230 PV: 550 Battery: 409.6 | 10min | - | - | FID: pin 7 to pin 8 (after C2005) loaded with 0.92 A, when current increase to 1.1 A, the PCE shut down. L2001 coil: 95.8°C L2001 core: 95.7°C Ambient: 45°C SD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, |

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| | | | | | | | RO: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NCD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NH: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, DST: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No |
| 38 | BMS power Transformer TX1401 pin 6, 7 to pin 9, 10 | Short-circuit | MAINS: 230 PV: 550 Battery: 409.6 | 10min | - | - | FID: The inverter shut down immediately. Error code: 21, BMS communication Error. SD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, RO: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NCD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NH: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, DST: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No |
| 39 | BMS power Transformer TX1401 pin 6, 7 to pin 9, 10 | Over-load | MAINS: 230 PV: 550 Battery: 409.6 | 10min | - | - | FID: pin 6, 7 to pin 9, 10 (after C32) loaded with 0.4 A, when current increase to 0.47 A. The inverter shut down immediately, Error code: 21, BMS communication Error. TX1401 coil: 95.9°C TX1401 core: 95.6°C Ambient: 45°C SD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, RO: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NCD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NH: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, DST: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No |
| Relay control circuit | | | | | | | |
| 40 | Grid output relay RY1302 contactors | Short-circuit, before inverter start-up | MAINS: 230 PV: 550 Battery: 409.6 | 10min | - | - | FID: The inverter cannot start. Error code: 4 Rly-Check Fault Grid Relay Fault. SD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, RO: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NCD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NH: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, DST: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No |
| 41 | Grid output relay RY1304 contactors | Open-circuit, before inverter start-up | MAINS: 230 PV: 550 Battery: 409.6 | 10min | - | - | FID: The inverter cannot start. Error code: 4 Rly-Check Fault Grid Relay Fault. SD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, RO: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NCD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NH: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, DST: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No |
| 42 | Grid output relay RY1305 contactors | Short-circuit, before inverter start-up | MAINS: 230 PV: 550 Battery: 409.6 | 10min | - | - | FID: The inverter cannot start. Error code: 4 Rly-Check Fault Grid Relay Fault. SD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, RO: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NCD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NH: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, DST: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No |
| 43 | Grid output relay RY1306 | Short-circuit, before | MAINS: 230 PV: 550 | 10min | - | - | FID: The inverter cannot start. Error code: 4 Rly- |

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| | contactors | inverter start-up | Battery: 409.6 | | | | Check Fault Grid Relay Fault. SD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, RO: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NCD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NH: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, DST: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No |
| 44 | Grid output relay RY1301 contactors | Short-circuit, before inverter start-up | MAINS: 230 PV: 550 Battery: 409.6 | 10min | - | - | FID: The inverter cannot start. Error code: 4 Rly-Check Fault Grid Relay Fault. SD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, RO: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NCD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NH: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, DST: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No |
| 45 | Grid output relay RY1303 contactors | Short-circuit, before inverter start-up | MAINS: 230 PV: 550 Battery: 409.6 | 10min | - | - | FID: The inverter cannot start. Error code: 4 Rly-Check Fault Grid Relay Fault. SD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, RO: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NCD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NH: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, DST: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No |
| 46 | Grid output relay driver, Q1307 pin C to E | Short-circuit, before inverter start-up | MAINS: 230 PV: 550 Battery: 409.6 | 10min | - | - | FID: The inverter cannot start. Error code: 4 Rly-Check Fault Grid Relay Fault. SD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, RO: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NCD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NH: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, DST: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No |
| 47 | Grid output relay driver, R1367 | Open-circuit, before inverter start-up | MAINS: 230 PV: 550 Battery: 409.6 | 10min | - | - | FID: The inverter cannot start. Error code: 4 Rly-Check Fault Grid Relay Fault. SD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, RO: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NCD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NH: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, DST: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No |
| 48 | Grid output relay driver, R202 | Open-circuit, before inverter start-up | MAINS: 230 PV: 550 Battery: 409.6 | 10min | - | - | FID: The inverter cannot start. Error code: 4 Rly-Check Fault Grid Relay Fault. SD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, RO: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NCD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NH: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, DST: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No |
| 49 | Grid output relay driver, Q201 pin C to E | Short-circuit before inverter start-up | MAINS: 230 PV: 550 Battery: 409.6 | 10min | - | - | FID: The inverter cannot start. Error code: 4 Rly-Check Fault Grid Relay Fault. SD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, RO: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, |



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| | | | | | | | NCD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NH: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, DST: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No |
| 50 | Grid output relay driver, Q1304 pin C to E | Short-circuit, before inverter start-up | MAINS: 230 PV: 550 Battery: 409.6 | 10min | - | - | FID: The inverter cannot start. Error code: 4 Rly-Check Fault Grid Relay Fault. SD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, RO: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NCD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NH: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, DST: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No |
| 51 | Grid output relay driver, R1349 | Open-circuit, before inverter start-up | MAINS: 230 PV: 550 Battery: 409.6 | 10min | - | - | FID: The inverter cannot start. Error code: 4 Rly-Check Fault Grid Relay Fault. SD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, RO: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NCD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NH: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, DST: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No |
| ISO detect circuit | | | | | | | |
| 52 | PV array insulation resistance monitoring, K1401 contactors | Short-circuit before inverter start-up | MAINS: 230 PV: 550 Battery: 409.6 | 10min | - | - | FID: The inverter cannot start, Error code: 4, ISO Fault. SD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, RO: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NCD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NH: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, DST: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No |
| 53 | PV array insulation resistance monitoring, R1412 | Open-circuit before inverter start-up | MAINS: 230 PV: 550 Battery: 409.6 | 10min | - | - | FID: The inverter cannot start, Error code: 4, ISO Fault. SD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, RO: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NCD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NH: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, DST: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No |
| 54 | PV array insulation resistance monitoring, R1406 | Open-circuit Before inverter start-up | MAINS: 230 PV: 550 Battery: 409.6 | 10min | - | - | FID: The inverter cannot start, Error code: 4, ISO Fault. SD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, RO: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NCD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NH: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, DST: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No |
| 55 | PV array insulation resistance monitoring, Q1401 Pin C-E | Short-circuit before inverter start-up | MAINS: 230 PV: 550 Battery: 409.6 | 10min | - | - | FID: The inverter cannot start, Error code: 4, ISO Fault. SD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, RO: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NCD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NH: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, DST: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No |
| 56 | PV array insulation resistance monitoring, | Open-circuit Before inverter start-up | MAINS: 230 PV: 550 Battery: 409.6 | 10min | - | - | FID: The inverter cannot start, Error code: 4, ISO Fault. SD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, |

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| | R1416 | | | | | | RO: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NCD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NH: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, DST: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No |
| 57 | PV array insulation resistance monitoring, R211 | Short-circuit before inverter start-up | MAINS: 230 PV: 550 Battery: 409.6 | 10min | - | - | FID: The inverter cannot start, Error code: 4, ISO Fault. SD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, RO: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NCD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NH: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, DST: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No |
| RCMU detect circuit | | | | | | | |
| 58 | RCMU monitoring circuit R1329 | Open-circuit Before inverter start-up | MAINS: 230 PV: 550 Battery: 409.6 | 10min | - | - | FID: The inverter cannot start. Error code: 3, Residual current device fault. SD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, RO: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NCD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NH: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, DST: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No |
| 59 | RCMU monitoring circuit R1334 | Open-circuit Before inverter start-up | MAINS: 230 PV: 550 Battery: 409.6 | 10min | - | - | FID: The inverter cannot start. Error code: 3, Residual current device fault. SD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, RO: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NCD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NH: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, DST: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No |
| 60 | RCMU monitoring circuit Q1301 B to C | Short-circuit before inverter start-up | MAINS: 230 PV: 550 Battery: 409.6 | 10min | - | - | FID: The inverter cannot start. Error code: 3, Residual current device fault. SD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, RO: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NCD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NH: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, DST: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No |
| 61 | RCMU monitoring circuit R1337 | Open-circuit Before inverter start-up | MAINS: 230 PV: 550 Battery: 409.6 | 10min | - | - | FID: The inverter cannot start. Error code: 3, Residual current device fault. SD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, RO: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NCD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NH: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, DST: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No |
| Loss of control & Function check fault | | | | | | | |
| 62 | Grid voltage monitoring R1301 | Open-circuit | MAINS: 230 PV: 550 Battery: 409.6 | 10min | - | - | FID: The inverter shut down immediately. Error code: 9, Utility grid disconnected. SD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, RO: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NCD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NH: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, |

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| | | | | | | | DST: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No |
| 63 | Grid voltage monitoring R603 | Open-circuit | MAINS: 230 PV: 550 Battery: 409.6 | 10min | - | - | FID: The inverter shut down immediately. Error code: 9, Utility grid disconnected. SD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, RO: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NCD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NH: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, DST: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No |
| 64 | Grid voltage monitoring U161-A Pin 2-3 | Short-circuit | MAINS: 230 PV: 550 Battery: 409.6 | 10min | - | - | FID: The inverter shut down immediately. Error code: 9, Utility grid disconnected. SD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, RO: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NCD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NH: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, DST: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No |
| 65 | Grid current monitoring R514 | Open-circuit | MAINS: 230 PV: 550 Battery: 409.6 | 10min | - | - | FID: The inverter shut down immediately. Error code: 11, INV over current. SD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, RO: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NCD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NH: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, DST: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No |
| 66 | Grid current monitoring U502-A Pin 2-3 | Short-circuit | MAINS: 230 PV: 550 Battery: 409.6 | 10min | - | - | FID: The inverter shut down immediately. Error code: 11, INV over current. SD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, RO: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NCD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NH: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, DST: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No |
| 67 | Grid current monitoring R618 | Open-circuit | MAINS: 230 PV: 550 Battery: 409.6 | 10min | - | - | FID: The inverter shut down immediately. Error code: 11, INV over current. SD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, RO: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NCD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NH: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, DST: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No |
| 68 | PV input voltage monitoring R905 | Open-circuit | MAINS: 230 PV: 550 Battery: 409.6 | 10min | - | - | FID: The inverter shut down immediately. Error code: 5, PV voltage too high. SD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, RO: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NCD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NH: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, DST: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No |
| 69 | PV input voltage monitoring U501-D pin 12 to 13 | Short-circuit | MAINS: 230 PV: 550 Battery: 409.6 | 10min | - | - | FID: The inverter shut down immediately. Error code: 5, PV voltage too high. SD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, RO: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, |

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| | | | | | | | NCD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NH: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, DST: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No |
| 70 | PV input current monitoring R506 | Open-circuit | MAINS: 230 PV: 550 Battery: 409.6 | 10min | - | - | FID: The inverter shut down immediately. Error code: 5, PV voltage too high. SD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, RO: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NCD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NH: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, DST: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No |
| 71 | Battery current monitoring C503 | Short-circuit | MAINS: 230 PV: 550 Battery: 409.6 | 10min | - | - | FID: The inverter shut down immediately. Error code: 29, Battery over current. SD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, RO: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NCD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NH: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, DST: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No |
| 72 | Battery current monitoring R503 | Open-circuit | MAINS: 230 PV: 550 Battery: 409.6 | 10min | - | - | FID: The inverter shut down immediately. Error code: 29, Battery over current. SD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, RO: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NCD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NH: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, DST: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No |
| 73 | Battery voltage monitoring R705 | Open-circuit | MAINS: 230 PV: 550 Battery: 409.6 | 10min | - | - | FID: The inverter shut down immediately. SD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, RO: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NCD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NH: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, DST: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No |
| 74 | Temperature monitoring R629 | Open-circuit | MAINS: 230 PV: 550 Battery: 409.6 | 10min | - | - | FID: The inverter shut down immediately. SD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, RO: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NCD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NH: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, DST: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No |
| CPU circuit | | | | | | | |
| 75 | Master DSP U201 | +3.3V power decrease continuously | MAINS: 230 PV: 550 Battery: 409.6 | 10min | - | - | FID: The inverter shut down immediately. DSP protection worked for low voltage. SD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, RO: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NCD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NH: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, DST: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No |
| 76 | Master DSP U201 | +3.3V power rise continuously | MAINS: 230 PV: 550 Battery: 409.6 | 10min | - | - | FID: The inverter shut down immediately. DSP protection worked for high voltage and broken at last. |

| | | | | | | | |
|--------------------|---|-----------------------------------|---|-------|---|---|--|
| | | | | | | | SD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, RO: <input type="checkbox"/> Yes / <input checked="" type="checkbox"/> No, NCD: <input type="checkbox"/> Yes / <input checked="" type="checkbox"/> No, NH: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, DST: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No |
| 77 | Master DSP U201 | Oscillator disabled | MAINS: 230 PV: 550 Battery: 409.6 | 10min | - | - | FID: The inverter shut down immediately. SD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, RO: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NCD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NH: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, DST: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No |
| 78 | Slave DSP U401 | +3.3V power decrease continuously | MAINS: 230 PV: 550 Battery: 409.6 | 10min | - | - | FID: The inverter shut down immediately. DSP protection worked for low voltage. SD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, RO: <input type="checkbox"/> Yes / <input checked="" type="checkbox"/> No, NCD: <input type="checkbox"/> Yes / <input checked="" type="checkbox"/> No, NH: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, DST: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No |
| 79 | Slave DSP U401 | +3.3V power rise continuously | MAINS: 230 PV: 550 Battery: 409.6 | 10min | - | - | FID: The inverter shut down immediately. DSP protection worked for high voltage and broken at last. SD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, RO: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NCD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NH: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, DST: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No |
| 80 | Communication between CPUs | Open-circuit | MAINS: 230 PV: 550 Battery: 409.6 | 10min | - | - | FID: The inverter shut down immediately. Error code: 14, Internal communication fault. SD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, RO: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NCD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NH: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, DST: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No |
| BMS circuit | | | | | | | |
| 81 | BMU power IC U42 +3.3V | Short-circuit | MAINS: 230 PV: 550 Battery: 409.6 | 10min | - | - | FID: The inverter shut down immediately. SD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, RO: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NCD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NH: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, DST: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No |
| 82 | BAT temperature monitoring R639 | Short-circuit | MAINS: 230 PV: 550 Battery: 409.6 | 10min | - | - | FID: The battery over temperature protection. SD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, RO: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NCD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NH: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, DST: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No |
| 83 | BMS IC U1 on main control MMCB_SP05_V10 board | +3.3V power decrease continuously | MAINS: 230 PV: 550 Battery: 409.6 | 10min | - | - | FID: The inverter shut down immediately. Error code: F2, BMS comm fail. SD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, |

| | | | | | | | |
|---------------------|---|---------------|--|-------|--|---|---|
| | | | | | | | RO: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NCD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NH: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, DST: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No |
| 84 | BMS IC U1 +3.3V on main control MMCB_SP05_V10 board | Short-circuit | MAINS: 230 PV: 550 Battery: 409.6 | 10min | - | - | FID: The inverter shut down immediately. Fault information: BMS comm fail. SD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, RO: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NCD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NH: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, DST: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No |
| AFCI detect circuit | | | | | | | |
| 85 | AFCI CT L2802 pin 3 to 4 | Short-circuit | MAINS: 230 PV: 550 Battery: 409.6 | 10min | - | - | FID: The inverter shut down immediately. Error code: 27, APCI Selt-Test fault. SD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, RO: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NCD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NH: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, DST: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No |
| 86 | AFCI CT L2802 pin 3 to 4 | Open-circuit | MAINS: 230 PV: 550 Battery: 409.6 | 10min | - | - | FID: The inverter shut down immediately. Error code: 27, APCI Selt-Test fault. SD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, RO: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NCD: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, NH: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No, DST: <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No |
| FID | Fault Indication | | | DST | Dielectric strength test | | |
| SD | PCE Shut Down | | | RO | Recovered to Operate after removing the single fault | | |
| NCD | No comp. or parts damaged | | | NH | No hazards occurred | | |
| MT | Max. Temperature | | | OC | Open Circuit | | |
| SC | Short Circuit | | | OL | Over-Load | | |

Supplementary information:

Note 1: All single fault tests were carried out by a 30A non-time delay fuse connected between the protective earthing terminal and the protective earthing conductor in the test setup which had not opened during the tests. All single fault tests were conducted with the AC output protected by external circuit breaker provided in all live connections to the AC supply.

Note 2: Pass the dielectric strength test of basic insulation test voltage for accessible DVC-A, reinforced or double Insulation and basic insulation in protective class I equipment.

Note 3: The equipment was placed on white tissue-paper covering a softwood surface and covering the equipment with cheesecloth during the fault testing, no emission of molten metal, burning insulation, or flaming or glowing particles from the fire enclosure, and there was no charring, glowing, or flaming of the cheesecloth.

Note 4: No other hazard (e.g. chemical, expulsion) observed after each test.

| | | | | |
|-------------------|---|------------|---------------------|----------|
| 7.3.6.3.7 | TABLE: touch current measurement | | | P |
| Measured between: | Measured (mA) | Limit (mA) | Comments/conditions | |

| | | | |
|---|------|-----|--|
| means of connection for the internal protective earthing conductor itself | 0.65 | 3.5 | after clause 4.4 fault condition tests and 4.5 Humidity pre-conditioning, clause 6.3 IP 55 test. |
|---|------|-----|--|

Supplementary information

Note 1: A second protective earthing conductor is to be installed.

| 7.3.7 | TABLE: clearance and creepage distance measurements | | | | | | P |
|---|---|------------------|------------------|---|--|---|---|
| clearance cl and creepage distance dcr at / of: | Up (V) | U r.m.s. (V) | required cl (mm) | cl (mm) | required dcr (mm) | dcr (mm) | |
| Inverter box | | | | | | | |
| Across contacts of DC isolating switch (RI) | <DC600 | <DC600 | 5.5 | See below | Other insulator: 12 (PV) | See below | |
| -On DC switch | <DC600 | <DC600 | See above | Approved by third party (8000V impulse) | See above | Approved by third party (8000V impulse) | |
| Across power circuit different polarity (FI) | <DC600 <AC326 | <DC600 <AC230 | 1.5 | See below | 3.1 (PV), 1.5 (Mains) (via other insulator: 6.0 (PV), 2.5 (Mains)) | See below | |
| - PV1+ / PV1- , PV2+ / PV2- via PCB trace | <DC600 | <DC600 | 1.5 | 3.6 | 3.1 | 3.6 | |
| - PV3+ / PV3- via PCB trace | <DC600 | <DC600 | 1.5 | 9.3 | 3.1 | 9.3 | |
| - BUS+ / BUS- via PCB trace | <DC600 | <DC600 | 1.5 | 3.1 | 3.1 | 3.1 | |
| - BAT+ / BAT- via PCB trace | <DC600 | <DC600 | 1.5 | 6.0 | 3.1 | 6.0 | |
| - Across Grid L to N via PCB trace | <AC326 | <AC230 | 1.5 | 4.8 | 1.5 | 4.8 | |
| - Across Backup L to N via PCB trace | <AC326 | <AC230 | 1.5 | 6.6 | 1.5 | 6.6 | |
| -Battery+ / Battery- via PCB trace | <DC600 | <DC600 | 1.5 | 3.7 | 3.1 | 3.7 | |
| - PV1+ / PV1- , PV2+ / PV2- via other insulator (common inductor) | <DC600 | <DC600 | 1.5 | 12.0 | 6.0 | 12.0 | |
| - PV3+ / PV3- via other insulator (common inductor) | <DC600 | <DC600 | 1.5 | 7.8 | 6.0 | 9.5 | |
| -Grid L to N via other insulator (common inductor) | <AC326 | <AC230 | 1.5 | 9.4 | 2.5 | 9.4 | |
| - Backup L to N via other insulator (common inductor) | <AC326 | <AC230 | 1.5 | 8.4 | 2.5 | 8.4 | |
| -Battery+/Battery- via other insulator (common inductor) | <DC600 | <DC600 | 1.5 | 10.3 | 6.0 | 10.3 | |
| Across power circuit, drive, SIO/SOPs circuit, control circuit to earth(BI) | <DC600 <AC326 | <DC600 <AC230 | 3.0 | See below | 3.1 (Via PCB) (via other insulator: 6.0 (PV), 3.0(Mains)) | See below | |
| - power circuit on PV side via PCB trace to earth | <DC600 <AC326 | <DC600 <AC230 | 3.0 | 4.6 | 3.1 | 4.6 | |



| | | | | | | |
|--|------------------|------------------|-----|-----------|---|-----------|
| - power circuit on Battery side via PCB trace to earth | <DC600 | <DC600 | 3.0 | 5.7 | 3.1 | 5.7 |
| - power circuit on Mains side via PCB trace to earth | <AC326 | <AC230 | 3.0 | 4.2 | 3.1 | 4.2 |
| - power circuit on Backup side via PCB trace to earth | <AC326 | <AC230 | 3.0 | 4.8 | 3.1 | 4.8 |
| - IGBT to earthed metal enclosure (Via ceramic substrate) | <DC600 <AC326 | <DC600 <AC230 | 3.0 | 5.0 | 3.1 | 5.0 |
| - Bus cap. to earth | <DC600 <AC326 | <DC600 <AC230 | 3.0 | 3.1 | 3.1 | 3.1 |
| - on voltage sampling resistor (R1401+R1402+R1403+R1404+R1405+R1406) | <DC600 <AC325 | <DC600 <AC230 | 3.0 | 1.8x6 | 3.1 | 1.8x6 |
| Across contacts of relays(BI/SI) | <DC600 <AC325 | <DC600 <AC230 | 3.0 | See below | 3.1 (Via PCB) | See below |
| - on AC grid L conductor series relays (each two relays of RY1305, RY1302, RY1301) | <DC600 <AC326 | <DC600 <AC230 | 3.0 | 1.8x2 | 3.1 | 8.5 |
| - on AC grid N conductor series relays (each two relays of RY1303, RY1304, RY1306) | <DC600 <AC326 | <DC600 <AC230 | 3.0 | 1.8x2 | 3.1 | 8.5 |
| Across power circuit to Mains circuit before AC relay (RI) | <DC600 <AC325 | <DC600 <AC230 | 5.5 | See below | 6.0 (Via PCB) (via other insulator: 12) | See below |
| - Via PCB tracks shortest way | <DC600 <AC325 | <DC600 <AC230 | 5.5 | 6.0 | 6.0 | 6.0 |
| - on AC transformer L1901 | <DC600 <AC325 | <DC600 <AC230 | 5.5 | 6.3 | 6.0 | 6.3 |
| - on Y1 capacitor (C819) | <DC600 <AC325 | <DC600 <AC230 | 5.5 | 6.3 | 6.0 | 6.3 |
| - on optocoupler (U803, U1902) | <DC600 <AC325 | <DC600 <AC230 | 5.5 | 6.3 | 6.0 | 6.3 |
| Across power circuit to communication port (RI) | <DC600 <AC325 | <DC600 <AC230 | 5.5 | See below | 6.0 (Via PCB) (via other insulator: 12.0) | See below |
| - Via PCB tracks shortest way | <DC600 <AC325 | <DC600 <AC230 | 5.5 | 6.3 | 6.0 | 6.3 |
| - on isolating power-s transformer L2001 | <DC600 <AC325 | <DC600 <AC230 | 5.5 | 6.1 | 6.0 | 6.1 |
| - on isolating BMS power transformer TX1401 | <DC600 <AC325 | <DC600 <AC230 | 5.5 | 6.1 | 6.0 | 6.2 |
| - on optocoupler (U1704, U1705, U1604, U1607, U3003) | <DC600 <AC325 | <DC600 <AC230 | 5.5 | 6.3 | 6.3 | 6.3 |
| - on optocoupler (U2505, U1601, U1608, U2905, U8) | <DC600 <AC325 | <DC600 <AC230 | 5.5 | 7.4 | 6.3 | 7.4 |
| - on optocoupler (U6) | <DC600 <AC325 | <DC600 <AC230 | 5.5 | 7.4 | 6.3 | 7.4 |
| Between internal live parts to LED cover (RI) | <DC600 <AC325 | <DC600 <AC230 | 5.5 | See below | Other insulator: | See below |

| | | | | | | |
|--|------------------|------------------|-----|-----------|---------------------------|-----------|
| | | | | | 12.0 | |
| - on live parts to external plastic surface | <DC600 <AC325 | <DC600 <AC230 | 5.5 | 20.0 | 12.0 | >20.0 |
| For main control MNCB_SP05_V10 board | | | | | | |
| Across battery and BMS circuit to earth (BI) | <DC600 | <DC600 | 3.0 | See below | 3.0 (Via PCB) | See below |
| - Via PCB tracks shortest way to earth | <DC600 | <DC600 | 3.0 | 5.0 | 3.0 | 5.0 |
| Across power circuit to COM port (RI) | | | | | | |
| - Via PCB tracks shortest way on MNCB board | <DC600 <AC325 | <DC600 <AC230 | 5.5 | See below | 6.0 (Via PCB) | See below |
| - on Photocoupler U369, U367 on MNCB board | <DC600 <AC325 | <DC600 <AC230 | 5.5 | 14.5 | 6.0 | 14.5 |
| - on IC for isolation U35 on MNCB board | <DC600 <AC325 | <DC600 <AC230 | 5.5 | 15.0 | 6.0 | 15.0 |
| Battery box | | | | | | |
| - Battery terminal to earth(BI) | <DC600 <AC325 | <DC600 <AC230 | 3.0 | 7.5 | 6.0 (via other insulator) | >7.5 |
| - Via PCB tracks shortest way on LBSB board (RI) | <DC600 <AC325 | <DC600 <AC230 | 5.5 | 11.8 | 6.0 | 11.8 |
| - Via TF6 on LBSB board (RI) | <DC600 <AC325 | <DC600 <AC230 | 5.5 | 11.9 | 6.0 | 11.9 |
| Supplementary information: | | | | | | |
| 1) Maximum operation altitude: 2000 m as specified in instruction manual. | | | | | | |
| 2) Allowable limits for cl. and cr. are taken consideration into requirements as specified in IEC 62109-1:2010, IEC 62109-2:2011, which is worst case. | | | | | | |
| 3) DC link over-voltage shut-down limit: <600V. | | | | | | |
| 4) For isolating transformer L2001, triple insulation wire was used on primary circuit, details see CDF. | | | | | | |
| 5) For isolating transformer TX1401, triple insulation wire was used on secondary circuit, details see CDF. | | | | | | |
| 6) For isolating transformer L1901, FIW wire was used on secondary circuit, details see CDF. | | | | | | |

| 7.3.7 | TABLE: distance through insulation measurement | | | | P |
|--|--|----------------------|------------------|---------------|---|
| distance through insulation di at/of: | U r.m.s. (V) | test voltage (V) | required di (mm) | di (mm) | |
| Optocoupler/isolating IC (U803, U1902, U1705, U1604, U1607, U3003, U2505, U1601, U1608, U2905, U8, U6, U369, U367, U35) (RI) | <DC600 <AC230 | AC 3000/ DC 4240V | 0.4 | 0.4 | |
| LED cover (RI) | <DC600 <AC230 | AC 3000/ DC 4240V | 0.4 | 2.0 | |
| Insulation sheet between primary winding and secondary winding of transformer L2001 (DI, three layers insulation sheet+ Insulation tube on triple insulated primary winding) | <DC600 <AC230 | AC 3000/ DC 4240V | - | 0.1x3+0.1=0.4 | |



| | | | | |
|---|------------------|----------------------|---|---------------|
| Insulation sheet between primary winding and secondary winding of transformer TX1401 (DI, two layers insulation sheet+ Insulation tube on triple insulated secondary winding) | <DC600 <AC230 | AC 3000/ DC 4240V | - | 0.1x2+0.1=0.3 |
| Insulation sheet between primary winding and secondary winding of transformer L1901 (DI, two layers insulation sheet+ Insulation tube on FIW secondary winding) | <DC600 <AC230 | AC 3000/ DC 4240V | - | 0.1x2+0.1=0.3 |
| Insulation tape under inverter and boost inductor (BI) | <DC600 <AC230 | AC 1500/ DC 2120 | - | 0.2 |
| Insulation sheet between IGBT body and heatsink (BI) | <DC600 <AC230 | AC 1500/ DC 2120 | - | 1.0 |
| Insulation tube on communication wire (BI) | <DC600 <AC230 | AC 1500/ DC 2120 | - | 0.4 |
| 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 |
| Across contacts of DC isolating switch (RI) | AC 3000/ DC 4240, note 1, note 2 | 8000 (for components), Note 1, note 6 | N/A, note 3 | P |
| Across DC+ to DC-, AC L to L, Bat+ to Bat- (FI) | N/A, note 4 | N/A, note 4 | N/A, note 3 | N/A, note 4 |
| Across power circuit, drive, SIO/SOPs circuit, control circuit to earth (BI) | AC 1500/ DC 2120, Note 2, note 5 | 4000 Note 5, note 6 | N/A, note 3 | P |
| Across contacts of relays (BI): | AC 1500/ DC 2120, Note 2, note 5 | 4000 Note 5, note 6 | N/A, note 3 | P |
| Across power circuit, drive, SIO/SOPs circuit, control circuit to communication port (RI) | AC 1500/ DC 2120, Note 2, note 5 | 6000 Note 5, note 6 | N/A, note 3 | P |
| Across internal live parts to LED cover (RI) | AC 3000/ DC 4240, note 2 | 6000 Note 1, note 6 | N/A, note 3 | P |
| Supplementary information: Note 1: Impulse withstand voltage is 6000V, and dielectric strength test voltage is AC 3000V/DC 4240V, the test voltage in above table shows the actual voltage applied for described insulation barriers. Note 2: Voltage test (dielectric strength test) was performed after: 1) Humidity pre-conditioning as specified in clause 4.5 of IEC 62109-1:2010; The device is classed IP55 for outdoor use. The Voltage test was performed immediately after the humidity pre-conditioning. 2) Thermal testing as specified in clause 4.3 of IEC 62109-1:2010; 3) Testing in single fault condition as specified in clause 4.4 of IEC 62109-1:2010; 4) IP55 test as specified in clause 6.3 of IEC 62109-1:2010; 5) Mechanical resistance to deflection, impact, or drop as specified in clause 13.7 of IEC 62109-1:2010. Note 3: Protection separation shall withstand the partial discharge test according to 7.5.3, only if the recurring peak working voltage across the insulation is greater than 700V and the voltage stress on the insulation is greater than 1 kV/mm, so rated discharge voltage is equal to sum of the recurring peak voltages in each of the circuits separated by the insulation. | | | | |

Note 4: Functional insulation shall comply with the requirements of clause 7.3.7.3. For parts or circuits in overvoltage category II, III, or IV, functional insulation is designed according to the applicable impulse voltage as determined by clause 7.3.7.1.4. Testing is not required.

Note 5: Impulse withstand voltage is 4000V, and dielectric strength test voltage is AC 1500V/DC 2120V, the test voltage in above table shows the actual voltage applied for described insulation barriers.

Note 6: To make sure that this voltage does not stress on basic or supplementary insulation barriers and non-applied insulating area are accidentally tested, this test is applied on individual parts only.

Note 7: Impulse testing voltage applied only for solid insulation like nomic paper, isolated transformer, optocoupler and multilayer PWBs etc.

| 8&13.7& 13.3.3.6 | TABLE: Protection against mechanical hazards, Mechanical strength | | P |
|---|--|--------------------|---|
| Part under test | Test (impact, drop, force, handle, rough handling, mobile) | Remarks | |
| Handle loading | Inverter part weight: 38kg×4; single battery box weight: 39kg×4 for 70s | No damage | |
| Metal enclosure | Deflection test: 5s@250N | No damage | |
| Cover for display | 7J@-25°C | No hazard observed | |
| Supplementary information: Equipment weight: Inverter part weight: 38kg; single battery box weight: 39kg. Dielectric strength – Pass, see Table Safety related electrical (dielectric) tests. | | | |

| 14 | TABLE: list of critical components | | | | | P |
|---------------------------------------|--|-----------------|---|--|--|---|
| object/part No. | manufacturer/ trademark | type/model | technical data | standard | mark(s) of conformity ¹⁾ | |
| Enclosure (for Inverter and BMS) | Ugreat Intelligent Science Technology Co., Ltd | Interchangeable | Size: 540*409.7*218.4 mm; thickness: 2.0mm; material: aluminium, sheet metal | EN 62109-1 IEC62109-2 AS 62040-1 | Test with appliance | |
| Cover | Ugreat Intelligent Science Technology Co., Ltd | Interchangeable | Size: 501*399.7*16m m; thickness: 2mm; material: aluminium, sheet metal, | EN 62109-1 IEC62109-2 AS 62040-1 | Test with appliance | |
| Heatsink (the rear side of enclosure) | Tianjin Ruixinchang light Alloy Co., Ltd | AL6063 | Size: 320*299*107mm ; material: aluminium, sheet metal, | EN 62109-1 IEC62109-2 AS 62040-1 | Test with appliance | |
| Battery module Enclosure | Kunshan Kersen Science & Technology Co., Ltd. | Interchangeable | Size: 540*350*194m m; thickness: 2mm/1.5mm; material: AL6063 T5 + DX51D+ZM, sheet metal | EN 62109-1 IEC62109-2 AS 62040-1 | Test with appliance | |
| LED Cover | Covestro | 9415 + (z) (f1) | 5VA, 115°C, | UL 94, UL 746 | UL E41613 | |

| 14 TABLE: list of critical components | | | | | P |
|--|---|--------------------------|---|---|--|
| object/part No. | manufacturer/ trademark | type/model | technical data | standard | mark(s) of conformity ¹⁾ |
| | Deutschland AG [PC Resins] | | 3.0mm, UV Exposure & Water Immersion f1, GWFI: 960°C | | |
| Decorative plastic enclosure (white) | Covestro Deutschland AG [PC Resins] | FR6020 HF + (z) (f1) | V-0 or 5VA, 125°C, 3.0mm, UV Exposure & Water Immersion f1 | UL 94, UL 746 | UL E41613 |
| Decorative plastic enclosure (black) | Covestro Deutschland AG [PC Resins] | 2407 + (z) (f1) | HB or V-2, 115°C, 3.0mm, UV Exposure & Water Immersion f1 | UL 94, UL 746 | UL E41613 |
| Coating for metal enclosure | Akzonobel | JL321CC | 1.2-1.8 g/cm ³ ; 60-80; Cable Gland | EN 62109-1 IEC62109-2 AS 62040-1 | Test with appliance |
| DC switch | Zhejiang Benyi Electrical Co., Ltd. | BYSS.1-32/T- 6P(AS) | 1000Vdc, 32A, 4xle, Icw: 1500A, Icm: 2kA -40°C to +85°C, IP66 | EN 60947-3, IEC 60947-1, IEC 60947-3, AS 60947.3 | TUV R 50425301 EESS-241036-0 |
| Grid output connector (Female terminal) | Dongguan Vaconn Electronics Technology Co Ltd | VPACO3EP-3P- 012 | 300Vac, 35A, -40°C to 85°C, IP67 | IEC 61984, EN 61984, UL 2238 | TUV R 50422360 UL E509801 |
| Grid output connector (Male terminal) | Dongguan Vaconn Electronics Technology Co Ltd | VPACO6EP- 3S(SC)-017 | 300Vac, 60A, -40°C to 85°C, IP67 | IEC 61984, EN 61984, UL 2238 | TUV R 50422360 UL E509801 |
| Backup output connector (Female terminal) | Dongguan Vaconn Electronics Technology Co Ltd | VPAC03EP-3P | 300Vac, 60A, -40°C to 85°C, IP67 | IEC 61984, EN 61984, UL 2238 | TUV R 50422360 UL E509801 |
| Backup output connector (Male terminal) | Dongguan Vaconn Electronics Technology Co Ltd | VPACO6EP- 3SD(SC)-001 | 300Vac, 60A, -40°C to 85°C, IP67 | IEC 61984, EN 61984, UL 2238 | TUV R 50422360 UL E509801 |
| Battery breaker | Zhejiang Benyi Electrical Co., Ltd. | BB1-63 | Ue: 900V, In: 63A, 3P, Icu: 6kA, -40°C to 80°C | IEC 60947-2 AS/NZS IEC 60947.2 AS/NZS IEC 60947.1 | TUV RH R 50563583 TUV-026660-EA |
| PV connector (+) | Dongguan Vaconn Electronics Co. Ltd | VP-D4B-PTSM4 | 1100V, 35A, -40°C to 85°C IP68 | IEC 62852 EN 62852 | TUV R 50396796 |
| -Alt. | Amphenol | H4SMM8DM | 1500V, 65A, | IEC 62852 | TUV B 107201 |

| 14 TABLE: list of critical components | | | | | P |
|---------------------------------------|--|-----------------------|---|-----------------------|--|
| object/part No. | manufacturer/ trademark | type/model | technical data | standard | mark(s) of conformity ¹⁾ |
| | | | -40°C to 85°C IP68 | EN 62852 | 0002 Rev.02 |
| PV connector (-) | Dongguan Vaconn Electronics Co. Ltd | VP-D4B-PHSF4 | 1100V, 35A, -40°C to 85°C IP68 | IEC 62852 EN 62852 | TUV R 50396796 |
| -Alt. | Amphenol | H4SFM8DM | 1500V, 65A, -40°C to 85°C IP68 | IEC 62852 EN 62852 | TUV B 107201 0002 Rev.02 |
| PV connector female | Dongguan Vaconn Electronics Co. Ltd | VP-D4B-CTSF4 | 1100V, 35A, -40°C to 85°C IP68 | IEC 62852 EN 62852 | TUV RH R 50396796 |
| -Alt. | Amphenol | H4SFC8DM | 1500V, 65A, -40°C to 85°C IP68 | IEC 62852 EN 62852 | TUV B 107201 0002 Rev.02 |
| PV cable male | Dongguan Vaconn Electronics Co. Ltd | VP-D4B-CTSM4 | 1100V, 35A, -40°C to 85°C IP68 | IEC 62852 EN 62852 | TUV RH R 50396796 |
| -Alt. | Amphenol | H4SMC8DM | 1500V, 65A, -40°C to 85°C IP68 | IEC 62852 EN 62852 | TUV B 107201 0002 Rev.02 |
| Push-button switch | Bruder Electric Jiangyin Co., Ltd | BLA1..., BLA3 | Ui: 660V, Uimp:4Kv, lth: 10A; IP 55 | EN 60947-5-1 | CE by CQC CE22030600776 6 |
| -Alt. | Jiangyin Changjiang Electric Appliance Co., Ltd | LA38-22/10CP- PN R | Ui: 250V, lth: 5A, IP 65 | EN 60947-5-1 | AN 50547704 0001 |
| DC connecting wires | 3Q wire&cable Co., Ltd. | 10271 | 1000V, 12AWG, 105°C | UL 758 | UL E341104 |
| -Alt. | 3Q wire&cable Co., Ltd. | 10269 | 1000V, 12AWG, 105°C | UL 758 | UL E341104 |
| -Alt. | 3Q wire&cable Co., Ltd. | 10269 | 1000V, 10AWG, 105°C | UL 758 | UL E341104 |
| -Alt. | KUNSHAN NEW ZHICHENG ELECTRONICS TECHNOLOGIE S CO LTD | 10269 | 1000V, 12AWG, 105°C | UL 758 | UL E237831 |
| -Alt. | KUNSHAN NEW ZHICHENG | 10269 | 1000V, 10AWG, | UL 758 | UL E237831 |



| 14 TABLE: list of critical components | | | | | P |
|---------------------------------------|--|------------|---------------------------|----------|--|
| object/part No. | manufacturer/ trademark | type/model | technical data | standard | mark(s) of conformity ¹⁾ |
| | ELECTRONICS TECHNOLOGIE S CO LTD | | 105°C | | |
| Grid output wires | Danyang Winpower Wire & Cable MFG Co., Ltd. | 10269 | 1000V, 8AWG 105°C | UL 758 | UL E330446 |
| -Alt. | 3Q wire&cable Co., Ltd. | 10269 | 1000V, 8AWG 105°C | UL 758 | UL E341104 |
| -Alt. | 3Q wire&cable Co., Ltd. | 10271 | 1000V, 8AWG 105°C | UL 758 | UL E341104 |
| -Alt. | KUNSHAN NEW ZHICHENG ELECTRONICS TECHNOLOGIE S CO LTD | 10269 | 1000V, 8AWG, 105°C | UL 758 | UL E237831 |
| -Alt. | KUNSHAN NEW ZHICHENG ELECTRONICS TECHNOLOGIE S CO LTD | 3932 | 2000V, 8AWG 125°C | UL 758 | UL E237831 |
| -Alt. | 3Q WIRE & CABLE CO LTD | 3239 | 3000V, 8AWG 150°C | UL 758 | UL E341104 |
| -Alt. | 3Q wire&cable Co., Ltd. | 3644 | 1000V, 8AWG 150°C | UL 758 | UL E341104 |
| Backup output wires | 3Q wire&cable Co., Ltd. | 10269 | 1000V, 10AWG 105°C | UL 758 | UL E341104 |
| -Alt. | Danyang Winpower Wire & Cable MFG Co., Ltd. | 10269 | 1000V, 10AWG 105°C | UL 758 | UL E330446 |
| -Alt. | KUNSHAN NEW ZHICHENG ELECTRONICS TECHNOLOGIE S CO LTD | 10269 | 1000V, 10AWG, 105°C | UL 758 | UL E237831 |
| -Alt. | KUNSHAN NEW ZHICHENG ELECTRONICS TECHNOLOGIE S CO LTD | 3932 | 2000V, 10AWG 125°C | UL 758 | UL E237831 |
| -Alt. | 3Q WIRE & | 3239 | 3000V, | UL 758 | UL E341104 |

| 14 TABLE: list of critical components | | | | | P |
|--|---|---|--|---------------------|--|
| object/part No. | manufacturer/ trademark | type/model | technical data | standard | mark(s) of conformity ¹⁾ |
| | CABLE CO LTD | | 10AWG 150°C | | |
| -Alt. | 3Q wire&cable Co., Ltd. | 3644 | 1000V, 10AWG 150°C | UL 758 | UL E341104 |
| Gasket | ASIA LANNERET SCIENCE & TECHNOLOGY CO LTD | EPDM-2015 | Silicone, - 40 °C to + 70 °C | UL157 and UL 50E | UL MH60816 |
| Fuse for control | ADVANCED SURGETECH MATERIALS LTD | A226010-80A | Contact ratings: 1000Vd.c., 80A | UL 248-13 | UL E470032 |
| DC contactor | ZHEJIANG DONGYA ELECTRONIC CO LTD | DH100D128BM A4 | Contact ratings: 1000Vd.c., 100A Coil ratings: 24V, 2A, -40°C to 85°C | UL 60947-4-1 | UL E145623 |
| - Alt. | ZHEJIANG BSB ELECTRICAL APPLIANCES CO LTD | BSBC7-100H- 12 | Contact ratings: 1000Vd.c., 100A, Coil ratings: 12V, 2A | UL 60947-4-1 | UL E499520 |
| Battery connector and connector between controller and module | Amphenol Technology (Zhuhai) Co. Ltd. | C10-792381- 1000, C10- 792380-1000 | 1000VDC, 125°C, 100A, max. for 4AWG, -40°C to 80°C | EN 61984 | TUV RH AN 50591051 0001 |
| -Alt. | Shenzhen Connector Technology Co., Ltd. | SZCNT01-E- 2+12-PY SZCNT01-E- 2+12-SY | 1000Vd.c., 100A MAX FOR 4AWG, -55°C to 125°C | IEC 61984 | TUV N8A 079745 0016 Rev. 00 |
| Batteries | Pylon | FH3X-3.6K-HY- 1P-5, FH3X- 3.6K-HY-1P-10, FH3X-3.6K-HY- 1P-15, FH3X- 3.6K-HY-1P-20, FH3X-5K-HY- 1P-5, FH3X-5K- HY-1P-10, FH3X-5K-HY- 1P-15, FH3X- 5K-HY-1P-20, FH3X-6K-HY- 1P-5, FH3X-6K- HY-1P-10, FH3X-6K-HY- 1P-15, FH3X- | 50Ah, FH3X-3.6K-HY- 1P-5: 102.4Vd.c.; FH3X-3.6K-HY- 1P-10: 204.8Vd.c.; FH3X-3.6K-HY- 1P-15: 307.2Vd.c.; FH3X-3.6K-HY- 1P-20: 409.6Vd.c.; FH3X-5K-HY- 1P-5: | IEC 62619 | TUV No. B 090762 0088 Rev.00 |



| 14 TABLE: list of critical components | | | | | P |
|--|---|--|--|--|--|
| object/part No. | manufacturer/ trademark | type/model | technical data | standard | mark(s) of conformity ¹⁾ |
| | | 6K-HY-1P-20, FH3X-8K-HY- 1P-5, FH3X-8K- HY-1P-10, FH3X-8K-HY- 1P-15, FH3X- 8K-HY-1P-20 | 102.4Vd.c.; FH3X-5K-HY- 1P-10: 204.8Vd.c.; FH3X-5K-HY- 1P-15: 307.2Vd.c.; FH3X-5K-HY- 1P-20: 409.6Vd.c.; FH3X-6K-HY- 1P-5: 102.4Vd.c.; FH3X-6K-HY- 1P-10: 204.8Vd.c.; FH3X-6K-HY- 1P-15: 307.2Vd.c.; FH3X-6K-HY- 1P-20: 409.6Vd.c.; FH3X-8K-HY- 1P-5: 102.4Vd.c.; FH3X-8K-HY- 1P-10: 204.8Vd.c.; FH3X-8K-HY- 1P-15: 307.2Vd.c.; FH3X-8K-HY- 1P-20: 409.6Vd.c. | | |
| Fuse for battery module | ADVANCED SURGETECH MATERIALS LTD | A202001-200 | 150VDC, 200A | IEC 60269-1 IEC 60269-7 UL248-13 | TUV RH R 50592564 UL E470032 |
| -Alt. | Bussmann | AMH-200 | 150VDC, 200A | IEC 60269-1 IEC 60269-7 UL248-13 | TUV RH R 50596649 UL E91958 |
| Ceramic gasket (Between IGBT and metal enclosure) | Suzhou Grady Electronic Technology),., Ltd | ceramic chip | 58*37*1mm | EN 62109-1 IEC62109-2 AS 62040-1 | Test with appliance |
| Internal Fan | NMB | 06025SA-12S- AT-02 | 12Vdc, 0.6A; 80°C, 1.01m ³ /min | UL 507 | UL E89936 |
| PCB material | JIANGSU COMBO ELECTRONIC | CB-M(ASP 1) | 130°C, V-0 | UL 796 | UL E307203 |



| 14 TABLE: list of critical components | | | | | P |
|---|---|-------------------------|--|---|--|
| object/part No. | manufacturer/ trademark | type/model | technical data | standard | mark(s) of conformity ¹⁾ |
| | TECHNOLOGY CO LTD | | | | |
| -Alt. | CAMELOT (QING YUAN) HYTEC TECHNOLOGIE S INVESTMENT CO LTD | JL-1 | 130°C, V-0 | UL 796 | UL E350325 |
| -Alt. | SuZhou Wutong Electronics Co., Ltd | GS-4 | 130°C, V-0 | UL 796 | UL E236256 |
| -Alt. | Interchangeable | Interchangeable | V-0 or better, min. 130°C | UL 796 | UL |
| PCB coating for all PCB | Lackwerke Peters GmbH&Co., KG | SL 1301 ECO- FLZ/239 | V-0, Coating Min. Thk (mic) 20 | UL 94 | UL E80315 |
| -Alt. | Lackwerke Peters GmbH&Co., KG | SL 1307 FLZ/4 | V-0, Coating Min. Thk (mic) 25 | UL 94 | UL E80315 |
| For Power board: LH610-14100-B_V1.0 | | | | | |
| Pre-charge resistance (R707) | TDK Electronics GmbH & Co OG | B59451C1130B 070 | 620V, 56Ω, 12A | IEC 60738-1 IEC 60738-1-3 UL 1434 | VDE 40040539 UL E69802 |
| Pre-charge contactor (RY702) | XIAMEN HONGFA ELECTROACO USTIC CO LTD | HF140FF- V/012-2HWTF | Contact ratings: 500Vdc, Coil ratings: 12V, 0.117A Topr: ≤20ms | EN 61810-1 UL 508 | TUV RH R 50149131 UL E134517 |
| IGBT for charge (Q706, Q702) | Infineon Technologies Co., Ltd | IKW50N65ES5 | 650V, 50A, -40°C to 175°C | EN 62109-1 IEC62109-2 AS 62040-1 | Test with appliance |
| IGBT for discharge (Q701, Q705) | Infineon Technologies Co., Ltd | IKW50N65ES5 | 650V, 50A, -40°C to 175°C | EN 62109-1 IEC62109-2 AS 62040-1 | Test with appliance |
| DC Gas tube (GD901) | TDK Electronics GmbH & Co OG | EM600XHC | 600V, 10KA, -40 to 125°C | UL 1449 | UL E319264 |
| DC Varistor (TVS901, TVS902, TVS903, TVS904, TVS905) | Xiamen Set Electronics Co., Ltd. | SFV20D821KT | 510Vac, 670Vdc, 10KA, 125°C | UL 1449, IEC 61051-2-2 EN IEC 61051-2 EN IEC 61051-1 | UL E322662 TUV RH J 50239739 |
| AC Current Sensor (HCT501) | LEM | CASR 50-NP | 50A, -40 to 105°C | UL 508 | UL E189713 |
| -Alt. | TAMURA | LA16P050S05 | 50A, -40 to 105°C | UL 61010-1 | UL E243511 |
| AC Transformer L1901) | GLORIA | TS-EE19KE | 3mH±10%; Class B | EN 62109-1 IEC62109-2 AS 62040-1 | Test with appliance |
| -Core | SUZHOU | EE19 GP40 | 130°C | EN 62109-1 | Test with |

| 14 TABLE: list of critical components | | | | | P |
|---------------------------------------|---|-------------------------------|---|--|--|
| object/part No. | manufacturer/ trademark | type/model | technical data | standard | mark(s) of conformity ¹⁾ |
| | GUANDA MAGNET CO LTD | | | IEC62109-2 AS 62040-1 | appliance |
| -Alt. | BDK | EE19 BP40 | 130°C | EN 62109-1 IEC62109-2 AS 62040-1 | Test with appliance |
| -Alt. | Dongci | EE19 DM40 | 130°C | EN 62109-1 IEC62109-2 AS 62040-1 | Test with appliance |
| -Bobbin | CHANG CHUN PLASTICS CO LTD | T375HF | Phenolic, V-0, 150°C, min. 0.71 thickness, GWFI: 960°C | IEC 60695-11- 10 UL 94 | UL E59481 |
| - Magnet Wire | NINGBO JINTIAN NEW MATERIAL CO LTD | QA-1 | 155°C | UL 1446 | UL E227047 |
| -Alt. | DONG GUAN YIDA INDUSTRIAL CO LTD | QA-1 | 155°C | UL 1446 | UL E344055 |
| - Reinforced Insulated Wire | HUIZHOU CITY DENGGAODA ELECTROTECH CO LTD | FIW-F | 155°C | UL 2353 | UL E501004 |
| -Tape | JINGYI CO LTD | JY25-A | 130°C | UL 510 | UL 246950 |
| -Varnish | WUJIANG TAIHU INSULATING MATERIALS CO LTD | T4260(a) | 130°C | UL 1446 | UL E228349 |
| BAT BOOST Inductor | GLORIA | LE-T63*3A | 420uH±10%, Class B | EN 62109-1 IEC62109-2 AS 62040-1 | Test with appliance |
| PV BOOST Inductor (L1) | GLORIA | LE-T63*3A | 715uH±10%, Class B | EN 62109-1 IEC62109-2 AS 62040-1 | Test with appliance |
| -Core | POCO | NPH250060-18, NPC250060-18 | 130°C | EN 62109-1 IEC62109-2 AS 62040-1 | Test with appliance |
| -Magnet wire | NINGBO JINTIAN NEW MATERIAL CO LTD | QZY-2 | 180°C | UL 1446 | UL E227047 |
| -Lead wire | 3Q WIRE & CABLE CO LTD | UL 10269 | 1000V, 105°C | UL 758 | UL E341104 |
| -Alt. | DANYANG WINPOWER WIRE & CABLE MFG CO LTD | UL10269 | 105°C | UL 758 | UL E330446 |
| -Alt. | WUXI XINHONGYE WIRE&CABLE CO LTD | UL10269 | 105°C | UL 758 | UL E248566 |



| 14 TABLE: list of critical components | | | | | P |
|---------------------------------------|--|----------------------|-----------------------|--|--|
| object/part No. | manufacturer/ trademark | type/model | technical data | standard | mark(s) of conformity ¹⁾ |
| -Tube | SHENZHEN WOER HEAT- SHRINKABLE MATERIAL CO LTD | RSFR-H | 125°C | UL 224 | UL E203950 |
| -Alt. | SHENZHEN WOLIDA TRADING CO LTD | RSFR-H | 125°C | UL 224 | UL E329530 |
| -Alt. | DONGGUAN LING FREE HARDWARE PLASTICS PRODUCT CO LTD | LFST-002 | 125°C | UL 224 | UL E352366 |
| -Alt. | DONGGUAN SALIPT CO LTD | SALIPT S-901- 600 | 125°C | UL 224 | UL E209436 |
| -Tape | JINGJIANG JINGYI ADHESIVE PRODUCT CO LTD | J16 | 180°C | UL 510 | UL E246950 |
| -Silicone Rubber | Dongguan City Jia Di New Materials Co Ltd | JD-605 | V-0, 125°C | UL 94 UL 746 | UL E485392 |
| Inverter Inductor (L and N) | GLORIA | LE-T63*3B | 420uH±10%, Class B | EN 62109-1 IEC62109-2 AS 62040-1 | Test with appliance |
| -Core | POCO | NPV250060-18 | 130°C | EN 62109-1 IEC62109-2 AS 62040-1 | Test with appliance |
| -Magnet wire | NINGBO JINTIAN NEW MATERIAL CO LTD | QZY-2.5 | 180°C | UL 1446 | UL E227047 |
| -Lead wire | 3Q Wire & Cable Co Ltd (Or Other) | UL10269 | 105°C | UL 758 | UL E341104 |
| -Alt. | DANYANG WINPOWER WIRE & CABLE MFG CO LTD | UL10269 | 105°C | UL 758 | UL E330446 |
| -Alt. | WUXI XINHONGYE WIRE&CABLE CO LTD | UL10269 | 105°C | UL 758 | UL E248566 |
| -Tube | SHENZHEN WOER HEAT- SHRINKABLE MATERIAL CO LTD | RSFR-H | 125°C | UL 224 | UL E203950 |
| -Alt. | SHENZHEN WOLIDA | RSFR-H | 125°C | UL 224 | UL E329530 |



| 14 TABLE: list of critical components | | | | | P |
|---------------------------------------|---|------------------|--|--|--|
| object/part No. | manufacturer/ trademark | type/model | technical data | standard | mark(s) of conformity ¹⁾ |
| | TRADING CO LTD | | | | |
| -Alt. | DONGGUAN LING FREE HARDWARE PLASTICS PRODUCT CO LTD | LFST-002 | 125°C | UL 224 | UL E352366 |
| -Alt. | DONGGUAN SALIPT CO LTD | SALIPT S-901-600 | 125°C | UL 224 | UL E209436 |
| -Tape | JINGJIANG JINGYI ADHESIVE PRODUCT CO LTD | J16 | 180°C | UL 510 | UL E246950 |
| -Silicone Rubber | Dongguan City Jia Di New Materials Co Ltd | JD-605 | V-0, 125°C | UL 94 UL 746 | UL E485392 |
| GFCI (CT1301) | WUXI JINGLEI ELECTRONIC CO | H560-20003-01 | Class B | EN 62109-1 IEC62109-2 AS 62040-1 | Test with appliance |
| -Core | VAC | W539(1pcs) | 130°C | EN 62109-1 IEC62109-2 AS 62040-1 | Test with appliance |
| -Magnet wire | JIANGSU DARTONG M&E CO LTD | UEW | 200°C | UL 1446 | UL E237377 |
| - Triple Insulated Wire | COSMOLINK CO LTD | TIW-M | 130°C | UL 2353 | UL E213764 |
| -Case | SUMITOMO BAKELITE CO LTD | PM-9820 | Phenolic, V-0, 150°C, min. 0.71 thickness, GWFI: 960°C | UL 746B | UL E41429 |
| -Epoxy | Eatto Electronic Material Co Ltd | 3300A-1/3300B-1 | 130°C | UL 746B | UL E218090 |
| -Tube | GREAT HOLDING INDUSTRIAL CO LTD | TFL | 200°C | UL 224 | UL E203950 |
| X Capacitor (C825) | Fara | MKP65 | X1 type, 440Vac, 22nF, -40°C to +110°C | UL 60384-14 | UL E186600 |
| Current Transducer (HCT701) | LEM | HLSR 50-P | 50A, -40 to 105°C | UL 508: 2010 | UL E189713 |
| DC Current Sensor (U2, U902, U901) | LEM | GO 20-SME | 20A, -40 to 125°C | UL 61010-1 | UL E486776 |
| -Alt. | TAMURA | LA16P020S05 | 20A, -40 to 105°C | UL 61010-1 | UL E243511 |
| Y Capacitor (C1001, C1008, | Fara | MKP63 series | Y2 type, | UL 60384-14 | UL E186600 |



| 14 TABLE: list of critical components | | | | | P |
|--|--------------------------------|------------------------------------|--|--|--|
| object/part No. | manufacturer/ trademark | type/model | technical data | standard | mark(s) of conformity ¹⁾ |
| C1501, C30) | | | 300Vac, 1500Vdc, 10nF, -40°C to +105°C | | |
| Y Capacitor (C702, C712, C905, C916, C921, C138, C139, C904, C915, C918, C134, C135, C904, C915, C918) | Fara | MKP63 series | Y2 type, 300Vac, 1500Vdc, 22nF, -40°C to +105°C | UL 60384-14 | UL E186600 |
| Y Capacitor (C903, C914, C917, C22, C23, C701, C711, C704, C713) | Fara | MKP63 series | Y2 type, 300Vac, 4.7nF, -40°C to +110°C | UL 60384-14 | UL E186600 |
| Y Capacitor (C819, C826, C827) | Fara | MKP67 | Y1 type, 440Vac, 1nF, -40°C to +110°C | UL 60384-14 | UL E186600 |
| BUS Capacitor (C1004, C1005, C1006, C1007, C1011, C1012) | JiangHai | ECS2YBB471M T4P23570E- CD297 | 105°C, 550 V, 470 µF | EN 62109-1 IEC62109-2 AS 62040-1 | Test with appliance |
| Boost IGBT (Q901, Q902, Q103) | Infineon | IKW40N65H5 | 650V, 40A, -40°C to 175°C | EN 62109-1 IEC62109-2 AS 62040-1 | Test with appliance |
| -Alt. | ROHM | RGW80TS65D | 650V, 40A, -55°C to 175°C | EN 62109-1 IEC62109-2 AS 62040-1 | Test with appliance |
| -Alt. | FAIRCHILD | FGA40N65SMD | 650V, 40A, -55°C to 175°C | EN 62109-1 IEC62109-2 AS 62040-1 | Test with appliance |
| Boost Diode (D901, D903, D105) | VISHAY | VS-EPX3007L- N3 | 650V, 30A, -55°C to 175°C | EN 62109-1 IEC62109-2 AS 62040-1 | Test with appliance |
| -Alt. | IXYS | DSEI30-06A | 600V, 37A, - 40°C to 150°C | EN 62109-1 IEC62109-2 AS 62040-1 | Test with appliance |
| INV IGBT (Q1001, Q1002, Q1003, Q1004, Q1005, Q1006) | ROHM | RGTVX6TS65D | 650V, 80A, -55°C to 175°C | EN 62109-1 IEC62109-2 AS 62040-1 | Test with appliance |
| -Alt. | Infineon | IKW75N65ES5 IKW75N65EH5 | 650V, 75A, - 55°C to 175°C | EN 62109-1 IEC62109-2 AS 62040-1 | Test with appliance |
| DC X Capacitor (C906, C922, C133, C703) | XIAMEN FARATRONIC CO LTD | C3D | X2 type, 900Vdc, 1uF, -40°C to 105°C, | UL 60384-14 | UL E256238 |
| DC X Capacitor (C1201) | Xiamen Faratronic Co., | MMKP82 | X2 type, | UL 60384-16 | UL E256238 |



| 14 TABLE: list of critical components | | | | | P |
|--|---|----------------------|--|---|--|
| object/part No. | manufacturer/ trademark | type/model | technical data | standard | mark(s) of conformity ¹⁾ |
| | Ltd | | 1KVdc, 0.022uF, -55°C to 110°C | | |
| ISO Relay (K1401) | Xiamen Hongfa Electroacoustic Co., Ltd. | HFD3-V/12-SR | 10mA/1000VDC , Coil Vdc 30V, Class B, -40 to 85°C | IEC 61810-1, EN 61810-1, UL 508 | VDE 40018867 UL E133481 |
| Photo coupler (U3003, U1604, U1607, U1704, U1902, U803) | Vishay | SFH615A- 3X009T | Isolation of 5300 Vrms, VIOTM 8000V peak, External clearance Input – Output: ≥8.0mm, -55 to 115°C | IEC 60747-5-5 EN IEC 60747- 5-5 UL1577 | VDE 40033345 UL E52744 |
| Photo coupler (U1705) | TOSHIBA | TLP240A(TP1,F (O | Isolation of 5000 Vrms, VIOTM 8000V peak, External clearance Input – Output: ≥7mm, -40 to 85°C | UL 508 | UL E499232 |
| CAN Photo coupler (U2505, U8) | Texas Instruments | ISO1050DWR | Isolation of 4243 Vrms, clearance Input – Output: ≥8mm -55 to +125°C | EN IEC 60747- 17 UL 1577 | VDE 40047657 UL E181974 |
| Isolated Photo coupler (U6) | TOSHIBA | TLP7820(B- TP4,E) | Isolation of 5000 Vrms, VIOTM 8000V peak, External clearance Input – Output: ≥8mm -40 to +105°C | UL 1577 | UL E67349 |
| Isolated IC (U1608, U1601) | Texas Instruments | ISO6742DWR | Isolation of 5000 Vrms, VIOTM 7071V peak, External clearance Input – Output: ≥8.0mm, -40 to 125°C | EN IEC 60747- 17, UL 1577 | VDE 40040142 UL E181974 |
| Isolated IC (U2905) | Novosense | NSi8130W1 | Isolation of 5000 Vrms, VIOTM 7000V peak, External clearance Input – Output: ≥8.0mm, | EN IEC 60747- 17, UL 1577 | VDE 40050121 UL E500602 |



| 14 TABLE: list of critical components | | | | | P |
|---------------------------------------|---|---------------|--|--|--|
| object/part No. | manufacturer/ trademark | type/model | technical data | standard | mark(s) of conformity ¹⁾ |
| | | | -40 to 125°C | | |
| Isolated Transformer (L2001) | WUXI JINGLEI ELECTRONIC CO., Ltd | H560-00026-01 | 29uH±10%, Class B | EN 62109-1 IEC62109-2 AS 62040-1 | Test with appliance |
| -Core | SPINEL | EEL19 PC95 | 130°C | EN 62109-1 IEC62109-2 AS 62040-1 | Test with appliance |
| -Bobbin | SUMITOMO BAKELITE CO LTD. | PM-9820 | Phenolic, V-0, 150°C, min. 0.71 thickness, GWFI: 960°C | UL 746B | UL E41429 |
| -Magnet wire | JIANGSU DARTONG M&E CO., LTD. | 2UEW-F | 155°C | UL 1446 | UL 237377 |
| - Triple Insulated Wire | HUIZHOU HULI INDUSTRIAL CO., LTD. | TIW-B | 130°C | UL 2353 | UL 322908 |
| -Insulation Tape | JINGJIANG YAHUA PRESSURE SENSITIVE GLUE CO., LTD. | CT | 130°C | UL 510 | UL E165111 |
| -Barrier Tape | JINGJIANG YAHUA PRESSURE SENSITIVE GLUE CO., LTD. | WF-2901 | 130°C | UL 510 | UL E165111 |
| -Tube | GREAT HOLDING INDUSTRIAL CO., LTD. | TFT | 200°C | UL 224 | UL E156256 |
| -Varnish | WUJIANG TAIHU INSULATING MATERIALS CO., LTD | T-4260(a) | 155°C | UL 1446 | UL E228349 |
| Isolated Transformer (TX1401) | JiangSu Sunlord FuJun New Energy Co., Ltd. | H560-00053-00 | 8.5uH±10%; Class B | EN 62109-1 IEC62109-2 AS 62040-1 | Test with appliance |
| -Core | BDK | EP13 BP96 | 130°C | EN 62109-1 IEC62109-2 AS 62040-1 | Test with appliance |
| -Alt. | LianFeng | EP13 KF9 | 130°C | EN 62109-1 IEC62109-2 AS 62040-1 | Test with appliance |
| -Alt. | TIANTONG | EP13 TP4W | 130°C | EN 62109-1 IEC62109-2 AS 62040-1 | Test with appliance |
| -Bobbin | SUMITOMO | PM-9820 | Phenolic, V-0, 150°C, min. | UL 94 | UL E41429 |



| 14 TABLE: list of critical components | | | | | P |
|--|---|-----------------------|---|---|--|
| object/part No. | manufacturer/ trademark | type/model | technical data | standard | mark(s) of conformity ¹⁾ |
| | | | 0.71 thickness, GWFI: 960°C | | |
| -Alt. | SUMITOMO | PM-9630 | Phenolic, V-0, 150°C, min. 0.71 thickness, GWFI: 960°C | UL 94 | UL E41429 |
| -Magnet wire | SAINT | 2UEW-H | 180°C | UL 1446 | UL E194410 |
| -Alt. | JINTIAN | 2UEW-H | 180°C | UL 1446 | UL E227047 |
| - Triple Insulated Wire | YUSHENG | TIW-F | 155°C | UL 2353 | UL E332529 |
| -Alt. | KAIZHONGHED ONG | TIW-F | 155°C | UL 2353 | UL E357240 |
| -Insulation Tape | YAHUA | PF-301 | 180°C | UL 510 | UL E165111 |
| -Alt | JINGYANG | JY-201 | 200°C | UL 510 | UL E309872 |
| -Varnish | WUJIANG TAIHU INSULATING MATERIALS CO LTD | T-4260(a) | 130°C | UL 1446 | UL E228349 |
| -Epoxy | DONGGUAN EATTO ELECTRONIC MATERIAL CO LTD | E-500 (XX) | 130°C, V-0 | UL 94, UL746B | UL E218090 |
| Potting material | Dong guan Jia Di new materials co., Ltd. | JD-505A/B | V-0, 200°C | UL94, UL746 | UL E485392 |
| -Alt. | Dong guan Jia Di new materials co., Ltd. | JD-605A/B | V-0, 200°C | UL94, UL746 | UL E485392 |
| Master CPU (U201) | TI | TMS320F28379 DPTPT | 3.3Vdc, 32-Bit CPU, 200MHz, - 40°C to 125°C | EN 62109-1 IEC62109-2 AS 62040-1 | Test with appliance |
| Slave CPU (U401) | TI | MSP430G2353 | 3,3Vdc, 16 bits CPU, 16MHz, - 40°C to 85°C | EN 62109-1 IEC62109-2 AS 62040-1 | Test with appliance |
| For AC&BACKUP board: LTH610-72000-B V1.0 | | | | | |
| AC Gas tube (GD501) | Xiamen Set Electronics Co., Ltd. | SE152M-L | 380Vac, 10KA, 85°C | UL 1449 | UL E322662 |
| AC Varistor (MOV1301, MOV1302) | Xiamen Set Electronics Co., Ltd. | SFV20D821KT | 510Vac, 670Vdc, 10KA, 125°C | UL 1449, IEC 61051-2-2 EN IEC 61051-2 EN IEC 61051-1 | UL E322662 TUV RH J 50239739 |
| Current Transducer (HCT701) | LEM | HLSR 50-P | 50A, -40 to 105°C | UL 508: 2010 | UL E189713 |
| X capacitor (C802) | Fara | C4B | X2 type, 350Vac, 4.7uF, | UL 60384-14 | UL E186600 |



| 14 TABLE: list of critical components | | | | | P |
|---|----------------------------|--------------------------------|---|---------------------------------------|--|
| object/part No. | manufacturer/ trademark | type/model | technical data | standard | mark(s) of conformity ¹⁾ |
| | | | -40°C to 110°C | | |
| Y capacitor (C1315) | Fara | MKP63 series | Y2 type, 300Vac, 1500Vdc, 22nF, -40°C to +105°C | UL 60384-14 | UL E186600 |
| Signal relay (RY401, RY2101) | Hongfa | HF32FV-G/5- HSTF | 250Vac, 10A -40°C to +85°C | UL 60335-1 | UL E134517 |
| Y Capacitor (C1317, C806) | Fara | MKP63 series | Y2 type, 300Vac, 1500Vdc, 10nF, -40°C to +105°C | UL 60384-14 | UL E186600 |
| Y Capacitor (C1311, C803) | Fara | MKP63 series | Y2 type, 300Vac, 1500Vdc, 22nF, -40°C to +105°C | UL 60384-14 | UL E186600 |
| Y Capacitor (C801, C1310) | Fara | MKP63 series | Y2 type, 300Vac, 47pF, -40°C to +110°C | UL 60384-14 | UL E186600 |
| AC X Capacitor (C1316) | Fara | C4B | X2 type, 350Vac, 3.3uF, -40°C to 110°C, | UL 60384-14 | UL E186600 |
| AC Grid Output Relay (RY1302, RY1304, RY1305, RY1306) | Hongfa | HF165F/12- HT(A21) | 60A/400VAC, Coil Vdc 12V, Class F, -40°C to +85°C, contact gap 1.8mm | IEC 61810-1, EN 61810-1, UL 508 | TUV RH R 50463438 UL E134517 |
| Backup relay (RY801, RY101, RY802, RY805) | Hongfa | HF165F/12- HT(A21) | 60A/400VAC, Coil Vdc 12V, Class F, -40°C to +85°C, contact gap 1.8mm | IEC 61810-1, EN 61810-1, UL 508 | TUV RH R 50463438 UL E134517 |
| INV relay (RY1301, RY1303) | Hongfa | HF161F- 40W/12- HTF(967) | 40A/277VAC, Coil Vdc 12V, Class F, -40°C to +85°C, contact gap > 1.8mm | UL 508 | UL E134517 |
| N/PE relay (RY803, RY806) | Hongfa | HF161F- 40W/12- HTF(967) | 40A/277VAC, Coil Vdc 12V, Class F, -40°C to +85°C, contact gap > 1.8mm | UL 508 | UL E134517 |
| For AFCI_ACSPS board: LH610-80500-B | | | | | |
| Sense Transformers | Pulse Electronics | PE-67200NL | -40°C to +130°C | IEC 62368-1, EN IEC 62368-1 | VDE 001441 |



| 14 TABLE: list of critical components | | | | | P |
|--|---|-------------------------|---|--|--|
| object/part No. | manufacturer/ trademark | type/model | technical data | standard | mark(s) of conformity ¹⁾ |
| (L2802, L2806) | | | | | |
| -Alt. | Pulse Electronics | LCT03-T18F | -40°C to +130°C | EN 62109-1 IEC62109-2 AS 62040-1 | Test with appliance |
| -Core | DongCi | DNL1000 | 130°C | EN 62109-1 IEC62109-2 AS 62040-1 | Test with appliance |
| - Magnet Wire | DONG GUAN YIDA INDUSTRIAL CO LTD | xEIW/200, QZY- x/200 | 200°C | UL 1446 | UL E344055 |
| - Alt. | NINGBO JINTIAN NEW MATERIAL CO LTD | xEIW/200, QZY- x/200 | 200°C | UL 1446 | UL E227047 |
| -Triple Insulated Wire | SHANGHAI SURAN ELECTRONICS FACTORY | TIW-F | 155°C | UL 2353 | UL E335392 |
| - Alt. | E&B TECHNOLOGY CO LTD | E&B-XXXB-1 | 155°C | UL 2353 | UL E315265 |
| - PCB | KINGBOARD LAMINATES HOLDINGS LTD | FR-4 | 130°C | UL 94 | UL E123995 |
| - Varnish | SUZHOU TAIHU | T-4260(a) | 155°C | UL 1446 | UL E228349 |
| - Epoxy | DONGGUAN EATTO ELECTRONIC MATERIAL CO LTD | 3300A-1/3300B- 1 | 130°C | UL 94, UL746B | UL E218090 |
| - Tube | Lingfei | PTFE | 200°C | UL 224 | UL E352366 |
| IC (U3002) | TI | TMS320F28001 3x | 3.3Vdc, 32-Bit CPU, 120MHz, -40°C to +125°C | EN 62109-1 IEC62109-2 AS 62040-1 | Test with appliance |
| -Alt. | Suzhou Grady Electronic Technology Co., Ltd | ceramic chip | 34*19.4*1mm | EN 62109-1 IEC62109-2 AS 62040-1 | Test with appliance |
| For main control MMCB_SP05_V10 board | | | | | |
| IC for MCU (U1) | ST | STM32H725 | Supply voltage: 2.97V-3.63V, -40°C to 125°C | EN 62109-1 IEC62109-2 AS 62040-1 | Test with appliance |
| IC for step-down DC-DC converter (U20) | Texas Instruments | TPS54232 | Supply voltage:3.5V- 28V, T _J :-40°C -150°C | EN 62109-1 IEC62109-2 AS 62040-1 | Test with appliance |
| -Alt. | Silicon Content Technology Co., Ltd. | SCT9320STD | Supply voltage:3.8V- 32V, T _J :-40°C -150°C | EN 62109-1 IEC62109-2 AS 62040-1 | Test with appliance |
| - Alt. | Texas | TPS54233 | Supply | EN 62109-1 | Test with |



| 14 TABLE: list of critical components | | | | | P |
|--|---|------------------------|---|--|--|
| object/part No. | manufacturer/ trademark | type/model | technical data | standard | mark(s) of conformity ¹⁾ |
| | Instruments | | voltage:3.5V-28V, T _j :-40-150°C | IEC62109-2 AS 62040-1 | appliance |
| IC for isolation (U35) | Texas Instruments | ISO7841DWR | Isolation of 5700 Vrms, VIOTM 8000V peak, External clearance Input – Output: ≥8.0mm, -55 to 125°C | EN IEC 60747- 17 UL 1577 | VDE 40040142 UL E181974 |
| - Alt. | NOVOSENSE | NSI8241W1- DSWR | Isolation of 5000 Vrms, VIOTM 8000V peak, External clearance Input – Output: ≥8.0mm, -40 to 125°C | EN IEC 60747- 17 UL 1577 | VDE 40052820 UL E500602 |
| Cell (BT1) | FDK CORPORATIO N | CR17335EG | 3Vdc, 1600mAh | UL 1642 | UL MH13421 |
| Photocoupler (U367, U369) | VISHAY SEMICONDC TOR GMBH | CNY65AGRST | Isolation of 8200 Vrms, VIOTM 10000V peak, External clearance Input – Output: ≥14.7mm, -55°C to +110°C | EN IEC 60747- 5-5 UL1577 | VDE 40027351 UL E76222 |
| -Alt. | VISHAY SEMICONDC TOR GMBH | CNY651AGRST | Isolation of 8200 Vrms, VIOTM 10000V peak, External clearance Input – Output: ≥14.7mm, -55°C to +110°C | EN IEC 60747- 5-5 UL1577 | VDE 40027351 UL E76222 |
| NTC (R6) | Nanjing Shiheng Electronics Co. Ltd. | CMF0603 103F3550 | R ₂₅ =10kΩ±1%, B _{25/50} =3950K±1 %, T _{opr} :-40°C to 105°C | EN 62109-1 IEC62109-2 AS 62040-1 | Test with appliance |
| For current MCUR_PXHB_V30 board | | | | | |
| IC for current and voltage sensing (U1, U2) | TI | ADS131B04 | Supply voltage:2.7V~3. 6V, Topr:-40°C to 125°C | EN 62109-1 IEC62109-2 AS 62040-1 | Test with appliance |
| Shunt resistor (J1) | Shenzhen Yezhan Electronics Co., | FHR-M-0.1F- 8518-t3 | RES, 0.1mΩ, 36W, 5%, DIP | EN 62109-1 IEC62109-2 AS 62040-1 | Test with appliance |



| 14 TABLE: list of critical components | | | | | P |
|---------------------------------------|---|-------------------|-----------------------------|--|--|
| object/part No. | manufacturer/ trademark | type/model | technical data | standard | mark(s) of conformity ¹⁾ |
| | Ltd. | | | | |
| - Alt. | Nanjing SART Science & Technology Development Co., Ltd. | SRHS85MQF0L 10 | RES, 0.1Mr, 36W, 1%, DIP | EN 62109-1 IEC62109-2 AS 62040-1 | Test with appliance |

¹⁾ an asterisk indicates a mark which assures the agreed level of surveillance

--- End of test report---