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SUMMARY OF TEST REPORT NO.TR120200715002 DATED 15/07/2020

(Number of pages in test report: 1 to 55)
TEST FORMAT AS PER IEC 62109-2: 2011

1. Customer/Manufacturer Name: : **System Level Solutions (India) Pvt. Ltd.**
   Plot No. 32, Zone D-4, Phase-1, G.I.D.C. Estate, Vithal Udyognagar – 388121, Gujarat, India
2. Product : Utility Interactive Inverter with Integrated GFDI
   (Power Invertors for use in photovoltaic power system (Inverters)),
3. Model : MSI1500; Trademark: System Level Solutions,
4. Test Results : As Mentioned Under

S. No.	TEST REQUIREMENT	CLAUSE	VERDICT
1	General testing requirements	4	P
2	MARKING AND DOCUMENTATION	5	P
3	Environmental requirements and conditions	6	P
4	Protection against electric shock and energy hazards	7	P
5	Protection against mechanical hazards	8	P
6	Protection against fire hazards	9	P
7	Protection against sonic pressure hazards	10	N/A
8	Protection against liquid hazards	11	N/A
9	Protection against Chemical Hazards	12	N/A
10	Physical requirements	13	P
11	Components	14	P

General Information

1. The conformity certificates of critical components are verified to ensure complete testing of apparatus under test and details regarding harmonized IEC standards (where IEC Standards are not available) are also provided in the list of critical components.

Remarks

1. *This report has been generated using digital signatures.*

I, hereby, undertake that the verdict stated in the test reports for all the tests matches with the test results. The sample meets all the relevant requirements of IEC 62109-2: 2011. If any deviation is found, suitable action may be taken.

BHARAT TEST HOUSE (P) LTD.

T. Gautam
Tested By

P. Dinesh Babu
Authorized Signatory

The NABL Accreditation and the BIS recognition claimed is valid only for the scope of accreditation and recognition as on date of this report, as mentioned on NABL and BIS Website respectively.

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TEST REPORT

Test Report No.:	TR120200715002			Page 1 of 55
			Issue Date:	15/07/2020
Customer/Manufacturer Name:	**System Level Solutions (India) Pvt. Ltd.**			
	Plot No. 32, Zone D-4, Phase-1, G.I.D.C. Estate, Vithal Udyognagar – 388121, Gujarat, India			
Item Description:	Utility Interactive Inverter with Integrated GFDI (Power Invertors for use in photovoltaic power system (Inverters))			
Sample Condition:	Fit for testing			
Identification:	**Model:**	MSI1500	Serial No.:	111907A00025
Sample Deposited/Collected by:	Customer			
Reference no.	Nil		Date:	05/11/2019
Job Order No.:	**BTH-R1/EL/191106/1**		Date of receipt:	06/11/2019
Date(s) of performance of tests:	12/11/2019 to 20/03/2020 & 27/04/2020 to 15/07/2020			
Laboratory Name and Address:	**BHARAT TEST HOUSE PVT. LTD.** 1474, HSIIDC Indl. Estate, Rai, Distt. Sonepat-131001 Haryana.			
Test specification(s):	**IEC 62109-2: 2011**			

Scan this QR Code to verify the Report

Result:	The results reported are as per relevant specifications/standards.
Supplementary Information:	- Deviation from the test methods as prescribed in relevant Specification/Work Instructions: Nil - The information supplied by the customer may affect the validity of results reported as per standard requirement.

Remarks:

1. This report has been generated using digital signatures.

This report is related to the sample submitted.

Tested by:	**Approved by:**	**Issued by:**
	BHARAT TEST HOUSE (P) LTD.	
T. Gautam	**P. Dinesh Babu**	**P. Dinesh Babu**
Testing Engineer	**TM**	**TM**
Date: 15/07/2020	**Date: 15/07/2020**	**Date: 15/07/2020**

BHARAT TEST HOUSE PVT. LTD. | 1474, HSIIDC Industrial Estate, Rai, Distt-Sonepat, Haryana-131001
Tel: 0130-2367673, 2974474 | email: bthrai@bharattesthouse.com

TEST REPORT
IEC 62109-2: 2011
Safety of Power Converter for use in Photovoltaic Power Systems
Part 2: Particular requirements for inverters

Report Reference No	:	TR120200715002
Date of issue	:	15/07/2020
Total number of pages		55
Testing Laboratory	:	**BHARAT TEST HOUSE PVT. LTD.**
Address	:	1474, HSIIDC Indl. Estate, Rai, Distt. Sonepat-131001 Haryana.
Customer/Manufacturer Name	:	**System Level Solutions (India) Pvt. Ltd.**
Address	:	Plot No. 32, Zone D-4, Phase-1, G.I.D.C. Estate, Vithal Udyognagar – 388121, Gujarat, India
Test specification:		
Standard	:	**IEC 62109-2: 2011**
Test procedure	:	Compliance Report
Non-standard test method	:	N/A
Test item description	:	**Utility interactive inverter with integrated GFDI (Power Invertors for use in photovoltaic power system (Inverters))**
Trade Mark	:	**System Level Solutions** ,
Manufacturer	:	**System Level Solutions (India) Pvt. Ltd.**
Model/Type reference	:	MSI1500
Ratings	:	As Indicated in marking label (refer page no. 4)

Tested by:	**Approved by / Authorized Signatory:**
T. Gautam	**P. Dinesh Babu**
Testing Engg.	**T.M.**
Date: 15/07/2020	**Date: 15/07/2020**

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List of Attachments (including a total number of pages in each attachment): 2		
Attachment No.	**Attachment Description**	**No. of pages in Attachment**
Attachment – 1	List of Components	2
Attachment – 2	Photo Documents	2

Summary of testing:

Tests performed (name of test and test clause):	**Testing location:**
All Applicable tests	**BHARAT TEST HOUSE PVT. LTD.** 1474, HSIIDC Indl. Estate, Rai, Distt. Sonepat-131001 Haryana.

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Copy of marking plate:

MSI1500

PV Input Ratings		**AC Output Ratings**	
Maximum Input voltage	60Vdc	Peak Power	1400W
Operating voltage range	22-55Vdc	Maximum continuous output power	1200-1400W
MPPT voltage range (Full Power)	32-45Vdc	Maximum continuous output current	6.09Aac
Maximum Input current	10Adc X 4	Nominal grid voltage	230Vac
Ambient temperature range	-25°C to 60°C	Operating grid voltage range	212-264Vac
Maximum Input short circuit current	15Adc X 4	Nominal operating frequency	50Hz
Protection Class	Class I	Operating frequency range	48-52Hz
Ingress Protection Rating	IP67	Power factor	±0.8 adjustable

Tested for : IEC 60068-2-1:2007, IEC 60068-2-2:2007, IEC 60068-2-14:2009, IEC 60068-2-30:2005, IEC 61683:1999,IEC 62116:2008, IEC 61000-6-1:2016, IEC 61000-6-2:2016, IEC 61000-6-3:2011, IEC 61000-6-4:2018

CAUTION: Don not remove cover. No user serviceable parts inside. Refer servicing to qualified service personnel. Both AC & DC voltage sources are terminated inside this equipment. Each circuit must be individually disconnected before servicing. When the photo-voltaic array is exposed to light, it supplies a DC voltage to this equipment.

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Test item particulars ..... :	
Equipment mobility ..... :	[ ] movable [ ] hand-held [] stationary [**√**] fixed [ ] transportable [] for building-in
Connection to the mains ..... :	[**√**] pluggable equipment [ ] direct plug-in [] permanent connection [ ] for building-in
Environmental category..... :	[**√**] outdoor [] indoor unconditional[ ]indoor conditional
Over voltage category Mains ..... :	[ ] OVC I [ ] OVC II [**√**] OVC III [ ] OVC IV
Over voltage category PV ..... :	[ ] OVC I [**√**] OVC II [ ] OVC III [ ] OVC IV
Mains supply tolerance (%)..... :	-90%, +110%
Tested for power system ..... :	Yes (TN System)
IT testing, phase-phase voltage (V)..... :	N/A
Class of equipment ..... :	[**√**] Class I[ ] Class II [ ] Class III [ ] Not classified
Mass of equipment (kg) ..... :	7.5
Pollution degree ..... :	PD3
IP protection class ..... :	IP67
Possible test case verdicts:	
- test case does not apply to the test object ..... :	N/A (Not Applicable)
- 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 ..... :	06/11/2019
Date (s) of performance of tests..... :	12/11/2019 to 20/03/2020 & 27/04/2020 to 15/07/2020
General remarks: The test results presented in this report relate only to the object tested. This report shall not be reproduced, except in full, without the written approval of the Issuing testing laboratory.	
Manufacturer's Declaration per Standard: N/A	

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General product information:

Said to be:

"Item	:	**Utility interactive inverter with integrated GFDI** **(Power Invertors for use in photovoltaic power system (Inverters))**
Trademark	:	**System Level Solutions** ,
Model	:	MSI1500
Rating	:	**PV Input Ratings** Maximum input voltage**:** 60Vdc Operating voltage range: 22-55Vdc MPPT voltage range (Full Power): 32-45Vdc Maximum input current: 10Adc X4 Maximum input short circuit current: 15Adc X4 **AC Output Ratings** Peak Power : 1400W Maximum continuous output power: 1200-1400W Maximum continuous output current: 6.09Aac Nominal grid voltage: 230Vac Operating grid voltage range: 212-264V Nominal operating frequency: 50Hz Operating frequency range: 48-52Hz Power factor:±0.8 adjustable
Dimension	:	322mm x278mm x61mm

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Clause	Requirement + Test	Result – Remark	Verdict
4	**General testing requirements**	See below	P
4.1 /RD	General	EUT is fully in accordance with the applicable requirements of this standard	P
4.2/RD	General conditions for testing	See below	P
4.2.1/RD	Sequence of tests	Considered	P
4.2.2/RD	Reference test conditions	See below	P
4.2.2.1/RD	Environmental conditions	Temperature: 27 ± 3°C Relative humidity: 65 ± 5 %RH Air Pressure: 75kPa to 106kPa No frost, dew, percolating water, rain, solar radiation.	P
4.2.2..2/RD	State of equipment		P
4.2.2.3/RD	Position of equipment	Equipment is installed in accordance with the manufacturer's instructions	P
4.2.2.4/RD	Accessories	No external accessories	N/A
4.2.2.5/RD	Covers and removable parts	No such parts or covers that can be removed without using the tool	N/A
4.2.2.6/RD	Mains supply a) Voltage: b) Frequency: c) Polarity: d) Earthing: e) Over-current Protection:	a) Grid voltage: 230Vac	P
		b) Frequency: 48-52Hz	P
		c) Pluggable Equipment Type B	N/A
		d) The tests are conducted with EUT earthed	P
		e) Fuses areused in the EUT to provide protection against single fault conditions	P
4.2.2.7/RD	Supply ports other than the mains	PV input	P
4.2.2.7.1/RD	Photovoltaic supply sources a) Open circuit voltage: b) Short-circuit current:	Complied	P
4.2.2.7.2/RD	Battery inputs		N/A
4.2.2.8/RD	Conditions of loading for output ports	Least favorable loading conditions was considered	P
4.2.2.9 /RD	Earthing terminals	Connected to Earth	P
4.2.2.10/RD	Controls	No such control by operator	N/A
4.2.2.11/RD	Available short circuit current	Considered	P
4.3/RD	Thermal testing	See below	P
4.3.1/RD	General	See table 4.3/RD	P
4.3.2/RD	Maximum temperatures	See below	P
4.3.2.1/RD	General		P
4.3.2.2/RD	Touch temperatures	See table 4.3/RD	P
4.3.2.3/RD	Temperatures limits for mounting surfaces		P
4.4/RD	Testing in single fault condition	See below	P
4.4.1/RD	General	Considered	P

Clause	Requirement + Test	Result – Remark	Verdict
4.4.2/RD	Test conditions and duration for testing under fault conditions	See below	P
4.4.2.1/RD	General	Considered	P
4.4.2.2/RD	Duration of tests	See table 4.4.4	P
4.4.3/RD	Pass/fail criteria for testing under fault conditions	See below	P
4.4.3.1/RD	Protection against shock hazard	No unfavorable condition occurs during and after single fault condition that could impair safety	P
4.4.3.2/RD	Protection against the spread of fire	No molten metal, burning insulation or similar hazard occurred	P
4.4.3.3/RD	Protection against other hazards	No other hazard occurred	P
4.4.3.4/RD	Protection against parts expulsion hazards	No such hazard occurred	P
4.4.4	**Single fault conditions to be applied**	See below	P
4.4.4.1/RD	Component fault tests	See table 4.4.4	P
4.4.4.2 /RD	Equipment or parts for short-term or intermittent operation		P
4.4.4.3 /RD	Motors	See table 4.4.4	P
4.4.4.4**/RD**	Transformer short circuit tests	See table 4.4.4	P
4.4.4.5/RD	Output short circuit	See table 4.4.4	P
4.4.4.6/RD	Backfeed current test for equipment with more than one source of supply		P
4.4.4.7/RD	Output overload	The output is overloaded to the maximum output power before the point at which voltage collapse	P
4.4.4.8/RD	Cooling system failure	See table 4.4.4.17	P
4.4.4.9/RD	Heating devices	No such parts	N/A
4.4.4.10/RD	Safety interlock systems	No such parts	N/A
4.4.4.11/RD	Reverse d.c. connections	No hazards occurred	P
4.4.4.12/RD	Voltage selector mismatch	No such parts	N/A
4.4.4.13/RD	Mis-wiring with incorrect phase sequence or polarity	No hazards occurred	P
4.4.4.14/RD	Printed wiring board short-circuit test		N/A
4.4.4.15	**Fault-tolerance of protection for grid-interactive inverters**	See below	P
4.4.4.15.1	Fault-tolerance of residual current monitoring according to 4.8.3.5: the residual current monitoring system operates properly	See table 4.4.4	P
	a) ..- The inverter ceases to operate	Complied	P
	- Indicates a fault in accordance with 13.9		P
	- Disconnect from the mains		P
	- not re-connect after any sequence of removing and reconnecting PV power		P
	- not re-connect after any sequence of removing and reconnecting AC power		P
	- not re-connect after any sequence of removing and reconnecting both PV and AC power		P
	b) ..- The inverter continues to operate		N/A

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Clause	Requirement + Test	Result – Remark	Verdict
	- the residual current monitoring system operates properly under single fault condition		N/A
	- Indicates a fault in accordance with 13.9		N/A
	c) - The inverter continues to operate regardless of loss of residual current monitoring functionality		N/A
	- not re-connect after any sequence of removing and reconnecting PV power		N/A
	- not re-connect after any sequence of removing and reconnecting AC power		N/A
	- not re-connect after any sequence of removing and reconnecting both PV and AC power		N/A
	- Indicates a fault in accordance with 13.9		N/A
4.4.4.15.2	**Fault-tolerance of automatic disconnecting means**	See below	P
4.4.4.15.2.1	The means provided for automatic disconnection of a grid-interactive inverter from the mains shall:	Relay provided	P
	- disconnect all grounded current-carrying conductors from the mains	Disconnected line conductor from the mains	P
	- disconnect all ungrounded current-carrying conductors from the mains		P
	- be such that with a single fault applied to the disconnection means or to any other location in the inverter, at least basic insulation or simple separation is maintained between the PV array and the mains when the disconnecting means is intended to be in the open state.	Satisfactory See table 4.4.4	P
4.4.4.15.2.2	Design of insulation or separation complies with requirements of 7.3.7 of Part 1: report here Part 1 comment and verdict.	Vmax of PV array (60V), overvoltage category (II), pollution degree (III), impulse withstand voltage of 2500V. See table 7.3.7/RD.	P
4.4.4.15.2.3	For non-isolated inverter, automatic checking of the isolation provided by a disconnect means after single fault.		N/A
	If the check fail: - any still-functional disconnection means shall be left in the open position		N/A
	- at least basic or simple separation shall be maintained between the PV input and the mains		N/A
	- the inverter shall not start operation		N/A
	- the inverter shall indicate a fault in accordance with 13.9		N/A
4.4.4.16	A stand-alone inverter with a transfer switch to transfer AC loads from the mains or other AC bypass source to the inverter output:	Not a stand-alone inverter	N/A
	- shall continue to operate normally		N/A
	- shall not present a risk of fire as the result of an out-of-phase transfer		N/A
	- shall not present a risk of shock as the result of an out-of-phase transfer		N/A

Clause	Requirement + Test	Result – Remark	Verdict
	- for an inverter employing a bypass switch having a control preventing switching, the test is to be conducted under the condition of a component malfunction		N/A
4.4.4.17	Cooling system failure – Blanketing test No hazards according to the criteria of sub-clause 4.4.3 of Part 1 shall result from blanketing the inverter This test is not required for inverters restricted to use only in closed electrical operating areas.		P
	Test stop condition: time duration value or stabilized temperature….:	See table 4.4.4.17	P
4.5/RD	Humidity preconditioning	See below	P
4.5.1/RD	General	Considered	P
4.5.2/RD	Conditions	40˚C, 92%RH for 48hrs	P
4.6/RD	Backfeed voltage protection	Satisfactory	P
4.6.1/RD	Backfeed tests under normal conditions	Maximum backfeed voltage observed onmains terminal after 15s: 09.12Vac	P
4.6.2/RD	Backfeed tests under single-fault conditions	Maximum backfeed voltage observed onmains terminal after 15s: 09.31Vac	P
4.6.3/RD	Compliance with backfeed tests	No hazardous voltage or energy present on terminals under test	P
4.7	**Electrical ratings tests**	See below	P
4.7.1/RD	Input ratings	See table 4.2.2.6/4.7 RD	P
4.7.1.1/RD	Measurement requirements for DC input ports		P
4.7.2/ RD	Output ratings	See table 4.2.2.6/4.7 RD	P
4.7.3	Measurement requirements for AC output ports for standalone inverters	Not a stand-alone inverter	N/A
4.7.4	**Stand-alone Inverter AC output voltage and frequency**		N/A
4.7.4.1	General	Not a stand-alone inverter	N/A
4.7.4.2	Steady state output voltage at nominal DC input The steady-state AC output voltage shall not be less than 90 % or more than 110 % of the rated nominal voltage with the inverter supplied with its nominal value of DC input voltage.		N/A
4.7.4.3	Steady state output voltage across the DC input range The steady-state AC output voltage shall not be less than 85 % or more than 110 % of the rated nominal voltage with the inverter supplied with any value within the rated range of DC input voltage.		N/A
4.7.4.4	Load step response of the output voltage at nominal DC input The AC output voltage shall not be less than 85 % or more than 110 % of the rated nominal voltage for more than 1,5 s after application or removal of a resistive load.		N/A
4.7.4.5	Steady state output frequency The steady-state AC output frequency shall not vary from the nominal value by more than +4 % or –6 %.		N/A
4.7.5	**Stand-alone inverter output voltage waveform**		N/A
4.7.5.1	General	Not a stand-alone inverter	N/A

Clause	Requirement + Test	Result – Remark	Verdict
4.7.5.2	The AC output voltage waveform of a sinusoidal output stand-alone inverter shall have a total harmonic distortion (THD) not exceeding of 10 % and no individual harmonic at a level exceeding 6 %.		N/A
4.7.5.3	Non-sinusoidal output waveform requirements		N/A
4.7.5.3.1	General		N/A
4.7.5.3.2	The total harmonic distortion (THD) of the voltage waveform shall not exceed 40 %.		N/A
4.7.5.3.3	The slope of the rising and falling edges of the positive and negative half-cycles of the voltage waveform shall not exceed 10 V/µs measured between the points at which the waveform has a voltage of 10 % and 90 % of the peak voltage for that half-cycle.		N/A
4.7.5.3.4	The absolute value of the peak voltage of the positive and negative half-cycles of the waveform shall not exceed 1,414 times 110 % of the RMS value of the rated nominal AC output voltage.		N/A
4.7.5.4	Information requirements for non-sinusoidal waveforms The instructions provided with a stand-alone inverter not complying with 4.7.5.2 shall include the information in 5.3.2.6.		N/A
4.7.5.5	Output voltage waveform requirements for inverters for dedicated loads. For an inverter that is intended only for use with a known dedicated load, the following requirements may be used as an alternative to the waveform requirements in 4.7.5.2 to 4.7.5.3.		N/A
	The combination of the inverter and dedicated load shall be evaluated to ensure that the output waveform does not cause any hazards in the load equipment and inverter, or cause the load equipment to fail to comply with the applicable product safety standards.		N/A
	The inverter shall be marked with symbols 9 and 15 of Table C.1 of Part 1.		N/A
	The installation instructions provided with the inverter shall include the information in 5.3.2.13.		N/A
4.8	**Additional tests for grid-interactive inverters**		P
4.8.1	General requirements regarding inverter isolation and array grounding	See below	P
	- Type of Array grounding supported .....:	Functionally grounded array	P
	- Inverter isolation .....:	Isolated inverter	P
4.8.2	Array insulation resistance detection for inverters for ungrounded and functionally grounded arrays		P
4.8.2.1	Array insulation resistance detection for inverters for ungrounded arrays	Functionally grounded array	N/A
	Inverter shall have means to measure DC insulation resistance from PV input (array) to ground before starting operation		N/A
	Or Inverter shall be provided with instruction in accordance with 5.3.2.11.		N/A
	Measured DC insulation resistance: .....:		N/A
	Inverter measurement circuit shall be capable of detecting insulation		N/A

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

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Clause	Requirement + Test	Result – Remark	Verdict
	- The selection of the RCD type to ensure compatibility with the inverter must be made according to rules for RCD selection in Part 1.		N/A
	- The RCD provided integral to the inverter, or		N/A
	- The RDC provided by the installer if details of the rating, type, and location for the RCD are given in the installation instructions per 5.3.2.9.		N/A
4.8.3.5	Protection by residual current monitoring		N/A
4.8.3.5.1	General		N/A
	Where required by Table 30, the inverter shall provide residual current monitoring that functions whenever the inverter is connected to the mains with the automatic disconnection means closed.		N/A
	The residual current monitoring means shall measure the total (both a.c. and d.c. components) RMS current.		N/A
	As indicated in Table 30 for different inverter types, array types, and inverter isolation levels, detection may be required for excessive continuous residual current, excessive sudden changes in residual current, or both, according to the following limits:		N/A
	a) Continuous residual current: The inverter shall disconnect within 0,3 s and indicate a fault in accordance with 13.9 if the continuous residual current exceeds:		N/A
	- maximum 300 mA for inverters with continuous output power rating ≤30kVA;		N/A
	- maximum 10 mA per kVA of rated continuous output power for inverters with continuous output power rating > 30 kVA.		N/A
	The inverter may attempt to re-connect if the array insulation resistance meets the limit in 4.8.2.		N/A
	b) Sudden changes in residual current: The inverter shall disconnect from the mains within the time specified in Table 31		N/A
	The inverter indicates a fault in accordance with 13.9, if a sudden increase in the RMS residual current is detected exceeding the value in the table.		N/A
	Exceptions: – monitoring for the continuous condition in a) is not required for an inverter with isolation complying with 4.8.3.3;		N/A
	- monitoring for the sudden changes in b) is not required for an inverter with isolation complying with 4.8.3.2.		N/A
	The inverter may attempt to re-connect if the array insulation resistance meets the limit in 4.8.2.		N/A
4.8.3.5.2	Test for detection of excessive continuous residual current: test repeated 5 times and time to disconnect shall not exceed 0.3s.		N/A
4.8.3.5.3	Test for detection of sudden changes in residual current repeated 5 times and each of the 5 results shall not exceed the time limit indicated in for each row (30mA, 60mA and150mA) of Table 31.		N/A
4.8.3.6	Systems located in closed electrical operating areas	System is not for use in closed	N/A

Clause	Requirement + Test	Result – Remark	Verdict
		electrical operating area	
	The protection against shock hazard is not required if the installation information provided with the inverter indicates the restriction for use in a closed electrical operating area, and		N/A
	Installation information indicates what forms of shock hazard protection are and are not provided integral to the inverter, in accordance with 5.3.2.7.		N/A
	The inverter shall be marked as in 5.2.2.6.		N/A
5	**MARKING AND DOCUMENTATION**		P
5.1	Marking	See below	P
5.1.1/RD	General	Markings on external surface of enclosure with rating label and warning symbols, and other indication provided close to the relevant part. Refer to copy of marking plate.	P
	Equipment shall bear markings as specified in 5.1 and 5.2	Marked	P
	Graphic symbols may be used and shall be in accordance with Annex C or IEC 60417 as applicable	Symbols are in accordance to Annex C	P
	Graphic symbols shall be explained in the documentation provided with the PCE		P
5.1.2/RD	Durability of markings	See below	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	Marking is legible after the test, No curling occurs	P
5.1.3/RD	Identification	See below	P
	The equipment shall, as a minimum, be permanently marked with:		P
	a) the name or trade mark of the manufacturer or supplier	SLS	P
	b) model number, name or other means to identify the equipment	MSI1500	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.	111907A00025	P
5.1.4	Equipment ratings	See below	P
	PV input ratings:	See below	P
	- Vmax PV (absolute maximum) (d.c. V)	60Vdc	P
	- Isc PV (absolute maximum) (d.c. A)	15Adc*4	P
	a.c. output ratings:	See below	P
	- Voltage (nominal or range) (a.c. V)	230Vac	P
	- Current (maximum continuous) (a.c. A)	6.09Aac	P
	- Frequency (nominal or range) (Hz)	48-52Hz	P
	- Power (maximum continuous) (W or VA)	1400W	P
	- Power factor range	±0.8 adjustable	P

Clause	Requirement + Test	Result – Remark	Verdict
	a.c input ratings:		N/A
	- Voltage (nominal or range) (a.c. V)		N/A
	- Current (maximum continuous) (a.c. A)		N/A
	- Frequency (nominal or range) (Hz)		N/A
	d.c. input ratings:		N/A
	- Voltage (nominal or range) (d.c. V)		N/A
	- Current (maximum continuous) (d.c. A)		N/A
	d.c. output ratings:		N/A
	- Voltage (nominal or range) (d.c. V)		N/A
	- Current (maximum continuous) (d.c. A)		N/A
	Protective class (I or II or III)	Class I	P
	Ingress protection (IP) rating per part 1	IP67	P
	An inverter that is adjustable for more than one nominal output voltage shall be marked to indicate the particular voltage for which it is set when shipped from the factory.		N/A
5.1.5/RD	Fuse identification	See below	P
	Marking shall be located adjacent to each fuse or fuseholder, or on the fuseholder, or in another location provided that it is obvious to which fuse the marking applies, giving the fuse current rating and where fuses of different voltage rating value could be fitted, the fuse voltage rating.	Marked	P
	Where fuses with special fusing characteristics such as time delay or breaking capacity are necessary, the type shall also be indicated		N/A
	For fuses not located in operator access areas and for soldered-in fuses located in operator access areas, it is permitted to provide an unambiguous cross-reference (for example, F1, F2, etc.) to the servicing instructions which shall contain the relevant information.	Satisfactory	P
5.1.6/RD	Terminals, Connections, and Controls	See below	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.	Complied	P
	Push-buttons and actuators of emergency stop devices, and indicator lamps used only to indicate a warning of danger or the need for urgent action shall be coloured red.		N/A
	A multiple-voltage unit shall be marked to indicate the particular voltage for which it is set when shipped from the factory. The marking is allowed to be in the form of a paper tag or any other nonpermanent material.	Not intended to connect to multiple voltage and there is no voltage setting device	N/A
	A unit with d.c. terminals shall be plainly marked indicating the polarity of the connections, with:	See below	P
	–the sign "+" for positive and "-„ for negative; or	Marked with "+" and "-" sign	P
	–a pictorial representation illustrating the proper polarity where		N/A

Clause	Requirement + Test	Result – Remark	Verdict
	the correct polarity can be unambiguously determined from the representation		
5.1.6.1/RD	Protective Conductor Terminals	See below	P
	The means of connection for the protective earthing conductor shall be marked with:	Satisfactory	P
	–symbol 7 of Annex C; or	Symbol 7 of Annex C is marked adjacent to earth terminal	P
	–the letters "PE"; or		N/A
	–the colour coding green-yellow		N/A
5.1.7/RD	Switches and circuit-breakers		N/A
	The on and off-positions of switches and circuits breakers shall be clearly marked. If a push-button switch is used as the power switch, symbols 10 and 16 of Annex C may be used to indicate the on position, or symbols 11 and 17 to indicate the off position, with the pair of symbols (10 and 16, or 11 and 17) close together.		N/A
5.1.8/RD	Class II Equipment	Class I equipment	N/A
	Equipment using Class IIprotective 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/RD	Terminal boxes for External Connections		N/A
	Where required by note 1 of Table 2 as a result of high temperatures of terminals or parts in the wiring compartment, there shall be a marking, visible beside the terminal before connection, of either:		N/A
	a) the minimum temperature Rating and size of the cable to be connected to the TERMINALS; or		N/A
	b) a marking to warn the installer to consult the installation instruction. Symbol 9 of Annex C is an acceptable marking		N/A
5.2	**Warning markings**		P
5.2.1/RD	Visibility and legibility requirements for warning markings	See below	P
	Warning markings shall be legible, and shall have minimum dimensions as follows:	Complied	P
	- Printed symbols shall be at least 2,75 mm high	Complied	P
	- Printed text characters shall be at least 1.5 mm high and shall contrast in colour with the background	Complied	P
	- Symbols or text that are moulded, stamped or engraved in a material shall have a character height of at least 2,0 mm, and if not contrasting in colour from the background, shall have a depth or raised height of at least 0,5 mm.		N/A
	If it is necessary to refer to the instruction manual to preserve the	Symbol 9 of Annex C is marked	

Clause	Requirement + Test	Result – Remark	Verdict
	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	Considered	P
5.2.2	**Content for warning markings**	See below	P
5.2.2.1/RD	Ungrounded heat sinks and similar parts		N/A
	An ungrounded heat sink or other part that may be mistaken for a grounded part and involves a risk of electric shock in accordance with 7.3 shall be marked with symbol 13 of Annex C, or equivalent. The marking may be on or adjacent to the heat sink and shall be clearly visible when the PCE is disassembled to the extent that a risk of contact with the heat sink exists.	Grounded heat sinks and similar parts	N/A
5.2.2.2/RD	Hot Surfaces	See below	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 14 of Annex C is marked	P
5.2.2.3/RD	Coolant		N/A
	A unit containing coolant that exceeds 70 °C shall be legibly marked externally where readily visible after installation with symbol 15 of Annex C. The documentation shall provide a warning regarding the risk of burns from hot coolant, and either:	No coolant used	N/A
	a) statement that coolant system servicing is to be done only by SERVICE PERSONNEL, or		N/A
	b) instructions for safe venting, draining, or otherwise working on the cooling system, if these operations can be performed without OPERATOR access to HAZARDS internal to the equipment		N/A
5.2.2.4/RD	Stored energy	See below	P
	Where required by 7.3.9.2 or 7.4.2 the PCE shall be marked with Symbol 21 of Annex C and the time to discharge capacitors to safe voltage and energy levels shall accompany the symbol.	Symbol 21 of Annex C is marked	P
5.2.2.5/RD	Motor guarding		N/A
	Where required by 8.2 a marking shall be provided where it is visible to service personnel before removal of a guard, warning of the hazard and giving instructions for safe servicing (for example disconnection of the source before removing the guard).		N/A
5.2.2.6	Inverters for closed electrical operating areas	System is not for use in closed electrical operating area	N/A
	Where required by 4.8.3.6, an inverter not provided with full protection against shock hazard on the PV array shall be marked with a warning that the inverter is only for use in a closed electrical operating area, and referring to the installation instructions.		N/A
5.2.3/RD	**Sonic hazard markings and instructions**		N/A
	If required by 10.2.1 a PCE shall:	No sonic hazard	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		N/A

Clause	Requirement + Test	Result – Remark	Verdict
	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.		
5.2.4/RD	Equipment with multiple sources of supply	See below	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 is marked	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.	Complied	P
5.2.5/RD	Excessive touch current		N/A
	Where required by 7.3.6.3.7 the PCE shall be marked with symbol 15 of Annex C. See also 5.3.2 for information to be provided in the installation manual.	No excessive touch current observed (See table 7.3.6.3.7/RD)	N/A
5.3	**Documentation**	See below	P
5.3.1/RD	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:	Provided	P
	a) explanations of equipment makings, including symbols used		P
	b) location and function of terminals and controls		P
	c) all ratings or specifications that are necessary to safely install and operate the PCE, including the following environmental ratings along with an explanation of their meaning and any resulting installation requirements:	In compliance	P
	– ENVIRONMENTAL CATEGORY as per 6.1	Outdoor	P
	– WET LOCATIONS classification fort he intended external environment as per 6.1	Suitable for wet locations	P
	– POLLUTION DEGREE classification for the intended external environment as per 6.2	Pollution Degree 3	P
	– INGRESS PROTECTION rating as per 6.3	IP67	P
	– Ambient temperature and relative humidity ratings	-25 to 60˚C, 0 to 100%RH	P
	– MAXIMUM altitude rating	Upto 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;	OVC II for PV port& OVC III for mains	P
	d) a warning that when the photovoltaic array is exposed to light, it supplies a d.c. voltage to the PCE	Provided	P
5.3.1.1/RD	Language	See below	P

Clause	Requirement + Test	Result – Remark	Verdict
	Instructions related to safety shall be in a language that is acceptable in the country where the equipment is to be installed.	English	P
5.3.1.2/RD	Format	See below	P
	In general, the documentation must be provided in printed form and is to be delivered with the equipment.	Provided	P
	For equipment which requires the use of a computer for both installation and operation, documentation may be provided in electronic format without accompanying printed format.		N/A
5.3.2/RD	Information related to installation	Satisfactory	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:	See below	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;	Provided	P
	c) ratings and means of connection of any outputs from the PCE, and any requirements related to wiring and externals controls, colour coding of leads, or overcurrent protection needed;	Provided	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)		N/A
	e) ventilation requirements;		P
	f) requirements for special services, for example cooling liquid;		N/A
	g) instructions and information relating to sound pressure level if required by 10.2.1;		N/A
	h) where required by 14.8.1.3, instructions for the adequate ventilation of the room or location in which PCE containing vented or valveregulated batteries is located, to prevent the accumulation of hazardous gases;		N/A
	i) tightening torque to be applied to wiring terminals;	In-compliance	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 short-circuit current available from the source, for which the PCE is designed; and	In-compliance	P
	l) compatibility with RCD and RCM;		N/A
	m) instructions for protective earthing, including the information required by 7.3.6.3.7 if a second protective earthing conductor is to be installed:		N/A

Clause	Requirement + Test	Result – Remark	Verdict
	n) where required by 7.3.8, the installation instructions shall include the following or equivalent wording:		N/A
	"This product can cause a d.c. current in the external protective earthing conductor. Where a residual current-operated protective (RCD) or monitoring (RCM) device is used for protection in a case of direct or indirect contact, only an RCD or RCM of Type B is allowed on the supply side of this product."		N/A
	o) for PCE intended to charge batteries, the battery nominal voltage rating, size, and type		N/A
	p) PV array configuration information, such as ratings, whether the array is to be grounded or floating, any external protection devices needed, etc.	Complied	P
5.3.2.1	Ratings: Sub clause 5.3.2 of Part 1 requires the documentation to include ratings information for each input and output. For inverters this information shall be as in Table 33 below. Only those ratings that are applicable based on the type of inverter are required.		P
	PV input quantities :	See below	P
	- Vmax PV (absolute maximum) (d.c. V)	60Vdc	P
	- PV input operating voltage range (d.c. V)	22-55Vdc	P
	- Maximum operating PV input current (d.c. A)	10Adc*4	P
	- Isc PV (absolute maximum) (d.c. A)	15Adc*4	P
	- Max. inverterbackfeed current to the array (a.c. or d.c. A)	Less than 1Amp	P
	a.c. output quantities:	See below	P
	- Voltage (nominal or range) (a.c. V)	230Vac	P
	- Current (maximum continuous) (a.c. A)	6.09Aac	P
	- Current (inrush) (a.c. A, peak and duration)	25Amp (Peak and 100µs duration)	P
	- Frequency (nominal or range) (Hz)	48-52Hz (50Hz nominal)	P
	- Power (maximum continuous) (W or VA)	1400W	P
	- Power factor range	±0.8 adjustable	P
	- Maximum output fault current (a.c. A, peak and duration or RMS)	12Amp	P
	- Maximum output overcurrent protection (a.c. A)	12Amp	P
	a.c. input quantities:		N/A
	- Voltage (nominal or range) (a.c. V)		N/A
	- Current (maximum continuous) (a.c. A)		N/A
	- Current (inrush) (a.c. A, peak and duration)		N/A
	- Frequency (nominal or range) (Hz)		N/A
	d.c input (other than PV) quantities:		N/A
	- Voltage (nominal or range) (d.c. V)		N/A
	- Nominal battery voltage (d.c. V)		N/A
	- Current (maximum continuous) (d.c. A)		N/A
	d.c. output quantities:		N/A
	- Voltage (nominal or range) (d.c. V)		N/A
	- Nominal battery voltage (d.c. V)		N/A

Clause	Requirement + Test	Result – Remark	Verdict
	- Current (maximum continuous) (d.c. A)		N/A
	Protective class (I or II or III)	Class I	P
	Ingress protection (IP) rating per part 1	IP 67	P
5.3.2.2	Grid-interactive inverter setpoints		N/A
	For a grid-interactive unit with field adjustable trip points, trip times, or reconnect times, the presence of such controls, the means for adjustment, the factory default values, and the limits of the ranges of adjustability shall be provided in the documentation for the PCE or in other format such as on a website. Provided solution: …….	No adjustable setting available. Only the factory default values, however the adjustment shall be performed by distribution network operator.	N/A
	The setting of field adjustable setpoints shall be accessible from the PCE		N/A
5.3.2.3	Transformers and isolation	See below	P
	Whether an internal isolation transformer is provided, and if so, what level of insulation (functional, basic, reinforced, or double) is provided by that transformer. The instructions shall also indicate what the resulting installation requirements are regarding such things as earthing or not earthing the array, providing external residual current detection devices, etc.	Internal isolation transformersare provided	P
	An inverter shall be provided with information to the installer regarding:		-
	- providing of internal isolation transformer	Internal isolation transformers are provided	P
	- the level of insulation (functional, basic, reinforced, or double)	Reinforced insulation	P
	The instructions shall also indicate what the resulting installation requirements are regarding:		-
	- earthing or not earthing the array		P
	- providing external residual current detection devices		N/A
	- requiring an external isolation transformer,		N/A
5.3.2.4	Transformers required but not provided		N/A
	An inverter that requires an external isolation transformer not provided with the unit, shall be provided with instructions that specify, and for the external isolation transformer with which it is intended to be used:		N/A
	- the configuration type		N/A
	- electrical ratings		N/A
	- environmental ratings		N/A
5.3.2.5	PV modules for non-isolated inverters	Isolated inverter	N/A
	Non-isolated inverters shall be provided with installation instructions that require PV modules that have an IEC 61730 Class A rating		N/A
	If the maximum AC mains operating voltage is higher than the PV array maximum system voltage then the instructions shall require PV modules that have a maximum system voltage rating based upon the AC mains voltage.		N/A
5.3.2.6	Non-sinusoidal output waveform information		N/A
	The instruction manual for a stand-alone inverter not complying with 4.7.5.2 shall include a warning that:		N/A
	- the waveform is not sinusoidal,		N/A

Clause	Requirement + Test	Result – Remark	Verdict
	- some loads may experience increased heating,		N/A
	- the user should consult the manufacturers of the intended load equipment before operating that load with the inverter		N/A
	The inverter manufacturer shall provide information regarding:		N/A
	- what types of loads may experience increased heating		N/A
	- recommendations for maximum operating times with such loads		N/A
	The inverter manufacturer shall specify for the waveforms as determined by the testing in 4.7.5.3.2 through 4.7.5.3.4.:		N/A
	- THD		N/A
	- slope		N/A
	- peak voltage		N/A
5.3.2.7	Systems located in closed electrical operating areas		N/A
	Where required by 4.8.3.6, an inverter not provided with full protection against shock hazard on the PV array shall be provided with installation instructions:		N/A
	- requiring that the inverter and the array must be installed in closed electrical operating areas		N/A
	- indicating which forms of shock hazard protection are and are not provided integral to the inverter (for example the RCD, isolation transformer complying with the 30 mA touch current limit, or residual current monitoring for sudden changes)		N/A
5.3.2.8	Stand-alone inverter output circuit bonding		N/A
	Where required by 7.3.10, the documentation for an inverter shall include the following:		N/A
	- if output circuit bonding is required but is not provided integral to the inverter, the required means shall be described in the installation instructions, including which conductor is to be bonded and the required current carrying capability or cross-section of the bonding means;		N/A
	- if the output circuit is intended to be floating, the documentation for the inverter shall indicate that the output is floating.		N/A
5.3.2.9	Protection by application of RCD's		N/A
	Where the requirement for additional protection in 4.8.3.1 is met by requiring an RCD that is not provided integral to the inverter, as allowed by 4.8.3.4, the installation instructions shall state the need for the RCD,.		N/A
	and shall specify its rating, type, and required circuit location		N/A
5.3.2.10	Remote indication of faults	See below	P
	The installation instructions shall include an explanation of how to properly make connections to (where applicable), and use, the electrical or electronic fault indication required by 13.9.	Provided in user manual	P
5.3.2.11	External array insulation resistance measurement and response		N/A
	The installation instructions for an inverter for use with ungrounded arrays that does not incorporate all the aspects of the insulation resistance measurement and response requirements in 4.8.2.1, must include:		N/A

Clause	Requirement + Test	Result – Remark	Verdict
	- for isolated inverters: an explanation of what aspects of array insulation resistance measurement and response are not provided, and		N/A
	- an instruction to consult local regulations to determine if any additional functions are required or not;		N/A
	- for non-isolated inverters: an explanation of what external equipment must be provided in the system, and		N/A
	- what the setpoints and response implemented by that equipment must be, and:		N/A
	- how that equipment is to be interfaced with the rest of the system.		N/A
5.3.2.12	Array functional grounding information		P
	Where approach a) of 4.8.2.2 is used, the installation instructions for the inverter shall include all of the following:		-
	a) the value of the total resistance between the PV circuit and ground integral to the inverter ……	Refer 4.8.2.2	P
	b) the minimum array insulation resistance to ground that system designer or installer must meet when selecting the PV panel and system design, based on the minimum value that the design of the PV functional grounding in the inverter was based on ……;	Satisfactory	P
	c) the minimum value of the total resistance R = VMAX PV/30 mA that the system must meet, with an explanation of how to calculate the total ……;	Refer 4.8.2.2	P
	d) a warning that there is a risk of shock hazard if the total minimum resistance requirement is not met.	Provided in user manual	P
5.3.2.13	Stand-alone inverters for dedicated loads	Not a stand-alone inverter	N/A
	Where the approach of 4.7.5.5 is used, the installation instructions for the inverter shall include a warning that the inverter is only to be used with the dedicated load for which it was evaluated, and		N/A
	Shall specify the dedicated load.		N/A
5.3.2.14	Identification of firmware version(s)		N/A
	An inverter utilizing firmware for any protective functions shall provide means to identify the firmware version.		N/A
	This can be a marking, but the information can also be provided by a display panel, communications port or any other type of user interface…….		N/A
6	**Environmental requirements and conditions**	Satisfactory	P
6.1/RD	Environmental categories and minimum environmental conditions	See below	P
6.1.1/RD	Outdoor	Outdoor equipment	P
6.1.2/RD	Indoor, unconditioned		N/A
6.1.3/RD	Indoor, conditioned		N/A
6.2/RD	Pollution degree	PD3	P
6.3/RD	Ingress Protection	IP67	P

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Clause	Requirement + Test	Result – Remark	Verdict
6.4/RD	UV exposure		N/A
6.5/RD	Temperature and humidity	-25 to 60˚C, 0 to 100%RH	P
7	**Protection against electric shock and energy hazards**	See below	P
7.1/RD	General	In compliance	P
7.2/RD	Fault conditions		P
7.3	Protection against electric shock	See below	P
7.3.1/RD	General	In-compliance	P
7.3.2/RD	Decisive voltage classification	See below	P
7.3.2.1/RD	Use of decisive voltage class (DVC)	Working voltage and protective measures are considered	P
7.3.2.2/RD	Limits of DVC (according table 6)	Considered	P
7.3.2.3/RD	Short-terms limits of accessible voltages under fault conditions		P
7.3.2.4/RD	Requirements for protection (according table 7)	Single fault condition is considered. Accessible conductive parts are separated from DVC-C circuits by basic insulation. Accessible unearthed conductive parts separated from DVC C circuit by reinforce insulation.	P
7.3.2.5/RD	Connection to PELV and SELV circuits	Gateway communication port is considered for direct contact	P
7.3.2.6/RD	Working voltage and DVC	See below	P
7.3.2.6.1/RD	General		P
7.3.2.6.2/RD	AC working voltage (see Figure 2)	230Vac	P
7.3.2.6.3/RD	DC working voltage (see Figure 3)	60Vdc	P
7.3.2.6.4/RD	Pulsating working voltage (see Figure 4)		N/A
7.3.3/RD	Protective separation	See below	P
	Protective separation shall be achieved by:		P
	- double or reinforced insulation, or	DVC-A and DVC-C circuits are separated by reinforced insulation	P
	- protective screening, i.e. by a conductive screen connected to earth by protective bonding in the PCE, or connected to the protective earth conductor itself, whereby the screen is separated from live parts by at least basic insulation, or		N/A
	- protective impedance comprising limitation of current per 7.3.5.3 and of discharged energy per 7.3.5.4, or		N/A
	- Limitation of voltage according to 7.3.5.4.		N/A
	The protective separation shall be fully and effectively maintained under all conditions of intended use of the PCE	Complied	P
7.3.4/RD	Protection against direct contact	See below	P
7.3.4.1/RD	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	Enclosure provided	P

Clause	Requirement + Test	Result – Remark	Verdict
	7.3.4.2 (enclosures and barriers) and 7.3.4.3 (insulation).		
	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.	No such open type assemblies and devices	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/RD	Protection by means of enclosures and barriers	See below	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 prevent access to live parts	P
7.3.4.2.1/RD	General	See below	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 with screws	P
	Polymeric materials used to meet these requirements shall also meet the requirements of 13.6		N/A
7.3.4.2.2 / RD	Access probe criteria	See below	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	DVC-A circuits safe to touch with test probe	P
	b) decisive voltage classification B, (DVC B) - the probe must not touch bare live parts	DVC-B circuit is not accessible with test probe	P
	c) decisive voltage classification C, (DVC C) – the probe must have adequate clearance to live parts, based on the clearance for Basic insulation using the recurring peak working voltage involved,	DVC-C circuit is not accessible with test probe	P
7.3.4.2.3/RD	Access probe tests	See below	P
	Compliance with 7.3.4.2.1 is checked by all of the following:		P
	a) Inspection; and	.	P
	b) Tests with the test finger (Figure D.1) and test pin (Figure D.2) of 0E, the results of which shall comply with the requirements of 7.3.4.2.1 a), b), and c) as applicable. Probe tests are performed on openings in the enclosures after removal of parts that can be detached or opened by an operator without the use of a tool, including fuseholders, and with operator access doors and covers open. It is permitted to leave lamps in place for this test. Connectors that can be separated by an operator without use of a tool, shall also be tested during and after disconnection. Any movable parts are to be put in the most unfavourable position.	Complied	P
	The test finger and the test pin are applied as above, without appreciable force, in every possible position, except that floor-		P

Clause	Requirement + Test	Result – Remark	Verdict
	standing equipment having a mass exceeding 40 kg is not tilted		
	Equipment intended for building-in or rack mounting, or for incorporation in larger equipment, is tested with access to the equipment limited according to the method of mounting detailed in the installation instructions.		N/A
	c) Openings preventing the entry of the jointed test finger (Figure D.1 of Annex D) during test b) above, are further tested by means of straight unjointed test finger (Figure D.3 of Annex D), applied with a force of 30 N. If the unjointed finger enters, the test with the jointed finger is repeated except that the finger is applied using any necessary force up to 30 N.	No openings	N/A
	d) In addition to a) – c) above, top surfaces of enclosure shall be tested with the IP3X probe of IEC 60529. The test probe shall not penetrate the top surface of the enclosure when probed from the vertical direction ±5 ° only.	No opening on top surface of the enclosure	N/A
7.3.4.2.4/RD	Service access areas	Installation or maintenance is not allowed, when PCE is energized.	P
7.3.4.3/RD	Protection by means of insulation of live parts	See below	P
	Where the requirements of 7.3.4.2 are not met, live parts shall be provided with insulation if:	The earthed enclosure provide basic insulation from live parts	P
	– their working voltage is greater than the maximum limit of decisive voltage class A, or		P
	– for a DVC A or B circuit, protective separation from adjacent circuit of DVC C is not provided (see note "2" under Table 7)		P
7.3.5/RD	Protection in case of direct contact	See below	P
7.3.5.1/RD	General		P
	Protection in case of direct contact is required to ensure that contact with live parts does not produce a shock hazard.	Gateway communication port is considered for direct contact	P
	The protection against direct contact according to 7.3.4 is not required if the accessible circuit	See below	P
	– is of decisive voltage class A and complies with 7.3.5.2, or	Gateway communication port is DVC-A and reinforced insulated from live parts	P
	– is provided with protective impedance according to 7.3.5.3, or		N/A
	– is limited in voltage according to 7.3.5.4		N/A
	In addition to the measures as given in 7.3.5.2 to 7.3.5.4, it shall be ensured that in the event of error or polarity reversal of connectors no voltages that exceed DVC A are present on circuits that are not protected against direct contact. 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.	Complied	P
	Compliance is checked by visual inspection and trial insertion.		P
7.3.5.2/RD	Protection using decisive voltage class A	Gateway communication port is DVC-	P

Clause	Requirement + Test	Result – Remark	Verdict
		A and reinforced insulated from live parts	
7.3.5.3/RD	Protection by means of protective impedance		N/A
	Circuits and conductive parts do not require protection against direct contact if any connection to circuits of DVC-B or DVC-C is through protective impedance, and the accessible circuit or part is otherwise provided with protective separation from circuits of DVC-B or DVC-C according 7.3.3.		N/A
7.3.5.3.1/RD	Limitation of current through protective impedance		N/A
	The current available through protective impedance to earth and between simultaneously accessible parts, measured at the accessible live parts, shall not exceed a value of 3,5 mA a.c. or 10 mA d.c. under normal and single-fault conditions.		N/A
7.3.5.3.2 /RD	Limitation of discharging energy through protective impedance		N/A
	The discharging energy available between simultaneously accessible parts protected by protective impedance shall not exceed the charging voltage and capacitance limits given in Table 9, which applies to both wet and dry locations, under normal and single fault conditions. Refer to figure 8.		N/A
7.3.5.4/RD	Protection by means of limited voltages	No such design	N/A
	That portion of a circuit that has its voltage reduced to DVC-A by a voltage divider that complies with the following requirements, and that is otherwise provided with protective separation from circuits of DVC-B or DVC-C according to 7.3.3, does not require protection against direct contact.		N/A
	The voltage divider shall be designed so that under normal and single fault conditions, including faults in the voltage division circuit, the voltage across the output of the voltage divider does not exceed the limit for DVC-A.		N/A
	This type of protection shall not be used in case of protective class II or unearthed circuits, because it relies on protective earth being connected.		N/A
7.3.6/ RD	Protection against indirect contact	See below	P
7.3.6.1/ RD	General		P
	Protection against indirect contact is required to prevent shock-hazardous current being accessible from conductive parts during an insulation failure. This protection shall comply with the requirements for protective class I (basic insulation plus protective earthing), class II (double or reinforced insulation) or class III (limitation of voltages)	Satisfactory	P
	That part of a PCE meets the requirements of 7.3.6.2 and 7.3.6.3 is defined as protective class I	Earthed metal enclosure is basic insulated from live parts	P
	That part of a PCE meets the requirements of 7.3.6.4 is defined as protective class II.	PV connector reinforced insulation from live parts	P

Clause	Requirement + Test	Result – Remark	Verdict
	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	operator access gateway Communication port: DVC A	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.	Complied	P
7.3.6.2/ RD	Insulation between live parts and accessible conductive parts	See below	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	See table 7.3.7/RD	P
7.3.6.3 / RD	Protective class I – Protective bonding and earthing		P
7.3.6.3.1/ RD	General	See below	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:	Enclosure is earthed through bonding 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	Satisfactory	P
	b) accessible conductive parts are separated from live parts of DVC-B or -C using double or reinforced insulation.	Accessible conductive parts are reinforced insulated from live parts	P
7.3.6.3.2/RD	Requirements for protective bonding	See below	P
	Electrical contact with the means of connection of the external protective earthing conductor shall be achieved by one or more of the following means:		P
	a) through direct metallic contact;	The connection of external protective earthing conductor is direct metal contact via a terminal with screw	P
	b) through other conductive parts which are not removed when the PCE or sub-units are used as intended ;		N/A
	c) through a dedicated protective bonding conductor;	Complied	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 metal enclosure is reliably penetrated earthed	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		N/A

Clause	Requirement + Test	Result – Remark	Verdict
	device or material has been investigated as suitable for protective bonding purposes.		
7.3.6.3.3/ RD	Rating of protective bonding	See below	P
	Protective bonding shall withstand the highest thermal and dynamic stresses that can occur to the PCE item(s) concerned when they are subjected to a fault connecting live parts to accessible conductive parts. The protective bonding shall remain effective for as long as a fault to the accessible conductive parts persists or until an upstream protective device removes power from the part.	Complied	P
	Protective bonding shall meet following requirements:	See below	P
	a) For PCE with an overcurrent protective device rating of 16 A or less, the impedance of the protective bonding means shall not exceed 0,1 Ω during or at the end of the test below	See Table 7.3.6.3.3/RD	P
	b) For PCE with an overcurrent protective device rating of more than 16 A, the voltage drop in the protective bonding test shall not exceed 2,5 V during or at the end of the test below.		N/A
	As alternative to a) and b) the protective bonding may designed according to the requirements for the external protective earthing conductor in 7.3.6.3.5, in which case no testing is required.	Protective bonding wire size is same as output cable (See Cl. 7.3.6.3.5)	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 test current is based on the rating of the overcurrent protection for the equipment or part of the equipment under consideration, as follows:		N/A
	a) For pluggable equipment type A, the overcurrent protective device is that provided external to the equipment (for example, in the building wiring, in the mains plug or in an equipment rack);	Not a pluggable type A equipment	N/A
	b) For pluggable equipment type B and fixed equipment, the maximum rating of the overcurrent protective device specified in the equipment installation instructions to be provided external to the equipment;		P
	c) For a circuit or part of the equipment for which an overcurrent protective device is provided as part of the equipment, the rating of the provided overcurrent device.		N/A
7.3.6.3.3.1/RD	Test current, duration, and acceptance criteria	See below	P
	The test current, duration of the test and acceptance criteria are as follows:		P
	a) For PCE with an overcurrent protective device rating of 16 A or less, the test current is 200% of the overcurrent protective device rating, but not less than 32 A, applied for 120s. The impedance of the protective bonding means during and at the end of the test shall not exceed 0,1 Ω.	See table 7.3.6.3.3/RD	P
	b) For PCE with an overcurrent protective device rating of more than 16 A, the test current is 200% of the overcurrent protective		N/A

Clause	Requirement + Test	Result – Remark	Verdict
	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.		
	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.	No melting, loosening or other damage which impair the effectiveness of protective bonding	P
	The test current is derived from an a.c or d.c supply source, the output of which is not earthed.	AC current is applied	P
	As an alternative to Table 10, where the time current characteristic of the overcurrent protective device that limits the fault current in the protective bonding means is known because the device is either provided in the equipment or fully specified in the installation instructions, the test duration may be based on that specific device's time-current characteristic,. The tests are conducted for a duration corresponding to the 200% current value on the time-current characteristic.		N/A
7.3.6.3.4/RD	Protective bonding impedance (routine test)		N/A
	If the continuity of the protective bonding is achieved at any point by a single means only (for example a single conductor or single fastener), or if the PCE is assembled at the installation location, then the impedance of the protective bonding shall also be tested as a routine test. The test shall be as in 7.3.6.3.3, except for the following:		N/A
	- the test current may be reduced to any convenient value greater than 10 A sufficient to allow measurement or calculation of the impedance of the protective bonding means:		N/A
	- the test duration may be reduced to no less than 2 s		N/A
	For equipment subject to the type test in 7.3.6.3.3.1a), the impedance during the routine test shall not exceed 0,1Ω.		N/A
	For equipment subject to the type test in 7.3.6.3.3.1b) the impedance during the routine test shall not exceed 2,5 V divided by the test current required by 7.3.6.3.3.1b).		N/A
7.3.6.3.5/ RD	External protective earthing conductor	See below	P
	A protective earthing conductor shall be connected at all times when power is supplied to PCE of protective class I. Unless local wiring regulations state otherwise, the protective earthing conductor cross-sectional area shall be determined from Table 11 or by calculation according to IEC 60364- 5-54.	The protective earthing conductor is fixed permanently and the minimum cross-sectional area is 2.5mm².	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.	Complied	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:	Separate terminal for protective earthing conductor provided	P

Clause	Requirement + Test	Result – Remark	Verdict
	- 2,5 mm² if mechanical protection is provided;	Satisfactory	P
	- 4 mm² if mechanical protection is not provided.		N/A
	For cord-connected equipment, provisions shall be made so that the external protective earthing conductor in the cord shall, in the case of failure of the strain-relief mechanism, be the last conductor to be interrupted.	Complied	P
7.3.6.3.6/ RD	Means of connection for the external protective earthing conductor	See below	P
7.3.6.3.6.1 / RD	General		P
	The means of connection for the protective earthing conductor shall be permanently marked with:	Earthing conductor routed through means of disconnection & a separate terminal provided on enclosure	P
	- symbol 7 of Annex C; or	Symbol 7 of Annex C is marked	P
	- the colour coding green-yellow		P
	Marking shall not be done on easily changeable parts such as screws.	Satisfactory	P
7.3.6.3.7/ RD	Touch current in case of failure of the protective earthing conductor	See below	N/A
	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.	Touch current doesn't exceed 3.5mA (See table 7.3.6.3.7/RD)	N/A
	a) Permanently connected wiring, and:		N/A
	- a cross-section of the protective earthing conductor of at least 10 mm² Cu or 16 mm² Al; or		N/A
	- automatic disconnection of the supply in case of discontinuity of the protective earthing conductor; or		N/A
	- provision of an additional terminal for a second protective earthing conductor of the same cross-sectional area as the original protective earthing conductor and installation instruction requiring a second protective earthing conductor to be installed or		N/A
	b) Connection with an industrial connector according to IEC 60309 and a minimum protective earthing conductor cross-section of 2,5 mm² as part of a multi-conductor power cable. Adequate strain relief shall be provided.		N/A
7.3.6.4/ RD	Protective Class II – Double or Reinforced Insulation	See below	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:	Gateway communication port is DVC-A and reinforced insulated from live parts	P
	- 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		N/A

Clause	Requirement + Test	Result – Remark	Verdict
	conductor is passed through the equipment to equipment series-connected beyond it. In the latter event, the external protective earthing conductor and its means for connection shall be insulated with basic insulation from the accessible surface of the equipment and from circuits that employ protective separation, extra-low voltage, protective impedance and limited discharging energy, according to 7.3.5. This basic insulation shall correspond to the rated voltage of the series-connected equipment;		
	- metal-encased equipment of protective class II may have provision on its enclosure for the connection of an equipotential bonding conductor;		N/A
	- equipment of protective class II may have provision for the connection of an earthing conductor for functional reasons or for damping of overvoltages; it shall, however, be insulated as though it is a live part;		N/A
	- equipment employing protective class II shall be marked according to 5.1.8.		N/A
7.3.7/RD	Insulation Including Clearance and Creepage Distance	See below	P
7.3.7.1/RD	General	Considered	P
	Insulation shall be selected after consideration of the following influences:	See below	P
	pollution degree	PD3	P
	overvoltage category	OVC II for PV port&OVC III for mains	P
	supply earthing system	TN System	P
	insulation voltage	PV circuit: 2500V(Rated:60Vdc) Mains:4000V(Rated:230Vac)	P
	location of insulation	See table 7.3.7/RD	P
	type of insulation	See table 7.3.7/RD	P
	Compliance of insulation, creepage distances, and clearance distances, shall be verified by measurement or visual inspection, and the tests of 7.5.	Complied	P
7.3.7.1.3/RD	Supply earthing systems	See below	P
	Three basic types of earthing system are described in IEC 60364-1. They are:	Inverter is intended to be installed in TN system	P
	TN system: has one point directly earthed, the accessible conductive parts of the installation being connected to that point by protective conductors. Three types of TN systems, TN-C, TN-S and TN-C-S, are defined according to the arrangement of the neutral and protective conductor.	TN System	P
	TT system: has one point directly earthed, the accessible conductive parts of the installation being connected to earth electrodes electrically independent of the earth electrodes of the power system;		N/A

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Clause	Requirement + Test	Result – Remark	Verdict
	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 /RD	Insulation voltages	PV circuit: 2500V(Rated:60Vdc) Mains:4000V(Rated:230Vac)	P
7.3.7.2/RD	Insulation between a circuit and its surroundings	See below	P
7.3.7.2.1 / RD	General		P
7.3.7.2.2 / RD	Circuits connected directly to the mains	230Vac for mains circuit	P
7.3.7.2.3/ RD	Circuits other than mains circuits	60Vdc for PV circuits	P
7.3.7.2.4/RD	Insulation between circuits	Complied	P
7.3.7.3/ RD	Functional insulating		P
7.3.7.4/RD	Clearance distances	See below	P
7.3.7.4.1/RD	Determination	See table 7.3.7/RD	P
7.3.7.4.2 /RD	Electric field homogeneity		N/A
7.3.7.4.3/RD	Clearance to conductive enclosures	Complied	P
7.3.7.5/RD	Creepage distances	See below	P
7.3.7.5.1 /RD	General	See table 7.3.7/RD	P
7.3.7.5.2 / RD	Voltage	PV circuit: 60Vdc Mains: 230Vac	P
7.3.7.5.3/ RD	Materials	Material group IIIb	P
7.3.7.6/ RD	Coating	No coating provided for insulation	N/A
7.3.7.7/ RD	PWB spacings for functional insulating	Functional insulation comply with Cl.7.3.7.4 and 7.3.7.5	N/A
7.3.7.8/ RD	Solid insulation	See below	P
7.3.7.8.1/ RD	General	Complied	P
7.3.7.8.2/ RD	Requirements for electrical withstand capability of solid insulation	See below	P
7.3.7.8.2.1/ RD	Basic, supplemental, reinforced, and double insulation	See table 7.5/RD	P
7.3.7.8.2.2/ RD	Functional insulation		P
7.3.7.8.3/ RD	Thin sheet or tape material	See below	P
7.3.7.8.3.1/RD	General	Complied	P
7.3.7.8.3.2/ RD	Material thickness not less than 0,2 mm	See table 7.5/RD	P
7.3.7.8.3.3/ RD	Material thickness less than 0,2 mm		N/A
7.3.7.8.3.4/ RD	Compliance	See table 7.5/RD	P
7.3.7.8.4/ RD	Printed wiring boards	See below	P
7.3.7.8.4.1/ RD	General	Complied	P
7.3.7.8.4.2/ RD	Use of coating materials	No coating material used	N/A
7.3.7.8.5/ RD	Wound components		P
7.3.7.8.6/ RD	Potting materials	See table 7.5/RD	P
7.3.7.9/ RD	Insulation requirements above 30 kHz		N/A
7.3.8/ RD	Residual Current-operated protective (RCD) or monitoring (RCM) device compatibility	No RCM or RCD protection provided	N/A
7.3.9/ RD	Protection against shock hazard due to stored energy	See below	P

Clause	Requirement + Test	Result – Remark	Verdict
7.3.9.1/ RD	Operator access area		N/A
	Equipment shall be so designed that there is no risk of electric shock in operator access areas from charge stored on capacitors after disconnection of the PCE.		N/A
7.3.9.2/RD	Service access areas	See below	P
	Capacitors located behind panels that are removable for servicing, installation, or disconnection shall present no risk of electric shock or energy hazard from charge stored on capacitors after disconnection of the PCE.	No risk of electric shock or energy hazard from stored charge after disconnection	P
7.3.10	Additional requirements for stand-alone inverters	Not a stand-alone inverter	N/A
	One circuit conductor bonded to earth to create a grounded conductor and an earthed system.		N/A
	The means used to bond the grounded conductor to protective earth provided within the inverter or		N/A
	as part of the installation		N/A
	If not provided integral to the inverter, the required means shall be described in the installation instructions as per 5.3.2.8.		N/A
	The means used to bond the grounded conductor to protective earth shall comply with the requirements for protective bonding in Part 1,		N/A
	If the bond can only ever carry fault currents in stand-alone mode, the maximum current for the bond is determined by the inverter maximum output fault current.		N/A
	Output circuit bonding arrangements shall ensure that in any mode of operation, the system only has the grounded circuit conductor bonded to earth in one place at a time..		N/A
	Switching arrangements may be used, in which case the switching device used is to be subjected to the bond impedance test along with the rest of the bonding path		N/A
	Inverters intended to have a circuit conductor bonded to earth shall not impose any normal current on the bond except for leakage current.		N/A
	Outputs that are intentionally floating with no circuit conductor bonded to ground, must not have any voltages with respect to ground that are a shock hazard in accordance with Clause 7 of Parts 1 and 2.		N/A
	The documentation for the inverter shall indicate that the output is floating as per 5.3.2.8.		N/A
7.3.11	Functionally grounded arrays		P
	All PV conductors in a functionally grounded array shall be treated as being live parts with respect to protection against electric shock.	Complied	P
7.4/RD	Protection against energy hazards	See below	P
7.4.1/RD	Determination of hazardous energy level	No such high energy level presented in the operator access area.	P

Clause	Requirement + Test	Result – Remark	Verdict
	A hazardous energy level is considered to exist if		P
	a) The voltage is 2 V or more, and power available after 60 s exceeds 240 VA.	Considered	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: $E = 0,5\ CU^2$	Stored energy is less than 20J after disconnection of the power output terminals	P
7.4.2/ RD	Operator Access Areas	See below	P
	Equipment shall be so designed that there is no risk of energy hazard in operator access areas from accessible circuits.	No energized parts in the operator access area	P
7.4.3/ RD	Services Access Areas	Symbol 21 of Annex C marked, Stored energy is less than 20J after 15min	P
7.5/ RD	Electrical tests related to shock hazard	See below	P
7.5.1/ RD	Impulse voltage test (type test)	See table 7.5/RD	P
7.5.2/ RD	Voltage test (dielectric strength test)	See table 7.5/RD	P
7.5.2.1 / RD	Purpose of test	Complied	P
7.5.2.2/ RD	Value and type of test voltage	See table 7.5/RD	P
7.5.2.3/ RD	Humidity pre-conditioning	Satisfactory	P
7.5.2.4 / RD	Performing the voltage test	Considered	P
7.5.2.5/ RD	Duration of the a.c. or d.c. voltage test	60s	P
7.5.2.6/ RD	Verification of the a.c. or d.c. voltage test	No breakdown or flashover occurred	P
7.5.3/ RD	Partial discharge test		N/A
7.5.4/ RD	Touch current measurement (type test)	See below	P
	The touch current shall be measured if required by 7.3.6.3.7 and shall not be greater than 3.5 mA a.c. or 10 mA d.c. or special measures of protection as given in 7.3.6.3.7 are required.	See table 7.3.6.3.7/RD	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.	Satisfactory	P
7.5.5/RD	Equipment with multiple sources of supply		P
8	**Protection against mechanical hazards**	See below	P
8.1/ RD	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.	No sharp edges or corners	P
	Conformity is checked as specified in 8.2 to 8.6.	See Cl. 8.2 to 8.6	P
8.2/ RD	Moving parts	No moving parts	N/A

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Clause	Requirement + Test	Result – Remark	Verdict
	Moving parts shall not be able to crush, cut or pierce parts of the body of an OPERATOR likely to contact them, nor severely pinch the OPERATOR's skin. Hazardous moving parts of equipment, that is moving parts which have the potential to cause injury, shall be so arranged, enclosed or guarded as to provide adequate protection against the risk of personal injury.		N/A
8.2.1/ RD	Protection of service persons	No moving parts	N/A
	Protection shall be provided such that unintentional contact with hazardous moving parts is unlikely during servicing operations. If a guard over a hazardous moving part may need to be removed for servicing, the marking of symbol 15 of Annex C shall be applied on or near the guard.		N/A
8.3/ RD	Stability	See below	N/A
	Equipment and assemblies of equipment not secured to the building structure before operation shall be physically stable in NORMAL USE.		N/A
8.4/ RD	Provisions for lifting and carrying	See below	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.	Satisfactory	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.		N/A
8.5/ RD	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.	Not a wall mounted equipment	N/A
8.6/RD	Expelled parts		N/A
	Equipment shall contain or limit the energy of parts that could cause a HAZARD if expelled in the event of a fault.	No expelled part	N/A
9	**Protection against fire hazards**		P
9.1/ RD	Resistance to fire	See below	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.	Considered	P
9.1.1/RD	Reducing the risk of ignition and spread of flame	See below	P
	For equipment or a portion of equipment, there are two alternative methods of providing protection against ignition and spread of flame that could affect materials, wiring, wound components and electronic components such as integrated circuits, transistors, thyristors, diodes, resistors and capacitors.	Method 1 is used	P
9.1.2/RD	Conditions for a fire enclosure	See below	P
	A FIRE ENCLOSURE is required for equipment or parts of equipment for which Method 2 is not fully applied and complied with.	Fire enclosure cover all parts	P

Clause	Requirement + Test	Result – Remark	Verdict
9.1.2.1/ RD	Parts requiring a fire enclosure	See below	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:	In compliance	P
	- components in PRIMARY CIRCUITS	Satisfactory	P
	- components in SECONDARY CIRCUITS supplied by power sources which exceed the limits for a LIMITED POWER SOURCE as specified in 9.2;		P
	- components in SECONDARY CIRCUITS supplied by a LIMITED POWER SOURCE as specified in 9.2, but not mounted on a material of FLAMMABILITY CLASS V-1;		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;	Complied	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		N/A
	- insulated wiring, except as permitted in 9.1.2.2		N/A
9.1.2.2/ RD	Parts not requiring a fire enclosure	PVC insulating cables, Plug and connectors	P
9.1.3/RD	Materials requirements for protection against fire hazard	See below	P
9.1.3.1/RD	General	Satisfactory	P
	ENCLOSURES, components and other parts shall be so constructed, or shall make use of such materials, that the propagation of fire is limited.	Propagation of fire is minimized through the enclosure and components material and construction (See table 14)	P
9.1.3.2/ RD	Materials for fire enclosures	See below	P
	If an enclosure material is not classified as specified below, a test may be performed on the final enclosure or part of the enclosure, in which case the material shall additionally be subjected to periodic SAMPLE testing.	Metallic enclosure is used as fire enclosure	P
9.1.3.3/ RD	Materials for components and other parts inside fire enclosures	See below	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.	Material for components inside fire enclosure are of min. V-2 classmaterial	P
9.1.3.4/ RD	Materials for air filter assemblies	No such construction	N/A
9.1.4/ RD	Openings in fire enclosures		N/A
9.1.4.1/ RD	General	IP67 enclosure without openings	N/A
	For equipment that is intended to be used or installed in more than one orientation as specified in the product documentation, the following requirements apply in each orientation.		N/A

Clause	Requirement + Test	Result – Remark	Verdict
	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 / RD	Side openings treated as bottom openings		N/A
9.1.4.3/ RD	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/ RD	Equipment for use in a CLOSED ELECTRICAL OPERATING AREA	Not intended to use in a closed electrical operating area	N/A
	The requirements of 9.1.4.3 do not apply to FIXED EQUIPMENT intended only for use in a CLOSED ELECTRICAL OPERATING AREA and to be mounted on a concrete floor or other noncombustible surface. Such equipment shall be marked as follows:		N/A
	WARNING: FIRE HAZARD SUITABLE FOR MOUNTING ON CONCRETE OR OTHER NONCOMBUSTIBLE SURFACE ONLY		N/A
9.1.4.5/ RD	Doors or covers in fire enclosures	No doors or cover in fire enclosure	N/A
9.1.4.6/ RD	Additional requirements for openings in transportable equipment	Not a transportable equipment	N/A
9.2/ RD	**LIMITED POWER SOURCES**	See below	P
9.2.1/ RD	General		P
9.2.2/ RD	Limited power source tests	See table 9.2/RD	P
9.3	**Short-circuit and overcurrent protection**	See below	P
9.3.1/ RD	General		P
	The PCE shall not present a hazard, under shortcircuit 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.	Satisfactory	P
9.3.2/ RD	Protection against short-circuits and over currents 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 over current hazard is presented by short circuits and overloads.	See table 4.4.4	P
9.3.3/ RD	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.	Satisfactory	P

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Clause	Requirement + Test	Result – Remark	Verdict
9.3.4	Inverter backfeed current onto the array		P
	The backfeed current testing and documentation requirements in Part 1 apply, including but not limited to the following.		P
	Inverter backfeed current onto the PV array maximum value.....:	No backfeed current that can flow onto the PV input terminals	P
	This inverter backfeed current value shall be provided in the installation instructions regardless of the value of the current, in accordance with Table 33.		P
10	**Protection against sonic pressure hazards**		N/A
10.1/RD	General		N/A
	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.		N/A
10.2/ RD	Sonic pressure and Sound level		N/A
10.2.1/ RD	Hazardous noise levels		N/A
11	**Protection against liquid hazards**		N/A
11.1/RD	Liquid Containment, Pressure and Leakage	No liquid is used	N/A
	The liquid containment system components shall be compatible with the liquid to be used.		N/A
	There shall be no leakage of liquid onto live parts as a result of:		N/A
	a) Normal operation, including condensation;		N/A
	b) Servicing of the equipment; or		N/A
	c) Inadvertent loosening or detachment of hoses or other cooling system parts over time.		N/A
11.2/RD	Fluid pressure and leakage		N/A
11.2.1/RD	Maximum pressure		N/A
11.2.2/RD	Leakage from parts		N/A
11.2.3/RD	Overpressure safety device		N/A
11.3/ RD	Oil and grease		N/A
12	**Protection against Chemical Hazards**		N/A
12.1/ RD	General	No such hazard	N/A
13	**Physical requirements**	See below	P
13.1/RD	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.	Molded Handle is used	P
13.1.1/ RD	Adjustable controls		N/A
13.2/RD	Securing of parts	Screws used	P
13.3/RD	Provisions for external connections	See below	P
13.3.1/ RD	General	Complied	P

Clause	Requirement + Test	Result – Remark	Verdict
13.3.2/RD	Connection to an a.c. Mains supply		P
13.3.2.1/RD	General	See below	P
	For safe and reliable connection to a MAINS supply, equipment shall be provided with one of the following:	Satisfactory	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	Complied	P
	– an appliance inlet for connection of a detachable power supply cord; or		N/A
	– a mains plug that is part of direct plug-in equipment as in 13.3.8		N/A
13.3.2.2/ RD	Permanently connected equipment	Complied	P
13.3.2.3/ RD	Appliance inlets		N/A
13.3.2.4/ RD	Power supply cord	Power supply cord is provided	P
13.3.2.5/RD	Cord anchorages and strain relief	Complied	P
	For equipment with a non-detachable power supply cord, a cord anchorage shall be supplied such that:		P
	– the connecting points of the cord conductors are relieved from strain; and	Satisfactory	P
	– the outer covering of the cord is protected from abrasion.	Satisfactory	P
13.3.2.6/ RD	Protection against mechanical damage		N/A
13.3.3/RD	Wiring terminals for connection of external conductors	See below	P
13.3.3.1/ RD	Wiring terminals	Satisfactory	P
13.3.3.2/ RD	Screw terminals		P
13.3.3.3/ RD	Wiring terminal sizes	Complied	P
13.3.3.4/ RD	Wiring terminal design	Complied	P
13.3.3.5/ RD	Grouping of wiring terminals	Terminals are located in proximity to each other	P
13.3.3.6/ RD	Stranded wire	Satisfactory	P
13.3.4/ RD	Supply wiring space	Complied	P
13.3.5/RD	Wire bending space for wires 10 mm² and greater	Complied	P
13.3.6/RD	Disconnection from supply sources		P
13.3.7/RD	Connectors, plugs and sockets	Satisfactory	P
13.3.8/RD	Direct plug-in equipment	Not a direct plug-in equipment	N/A
13.4/RD	Internal wiring and connections	See below	P
13.4.1/RD	General	Complied	P
13.4.2/RD	Routing	Internal wires are routed in a way to avoid sharp edges and overheating	P
13.4.3/RD	Colour coding	Green wire is used for protective bonding	P
13.4.4/RD	Splices and connections	Satisfactory	P
13.4.5/RD	Interconnections between parts of the PCE	Complied	P
13.5/RD	Openings in enclosures	enclosure without openings	N/A
13.5.1/RD	Top and side openings		N/A

Clause	Requirement + Test	Result – Remark	Verdict
	Openings in the top and sides of ENCLOSURES shall be so located or constructed that it is unlikely that objects will enter the openings and create hazards by contacting bare conductive parts		N/A
13.6/RD	Polymeric Materials		N/A
13.6.1/RD	General	Metal enclosure used	N/A
13.6.1.1/RD	Thermal index or capability		N/A
13.6.2/RD	Polymers serving as enclosures or barriers preventing access to hazards		N/A
13.6.2.1/RD	Stress relief test		N/A
13.6.3/RD	Polymers serving as solid insulation		N/A
13.6.3.1/RD	Resistance to arcing		N/A
13.6.4/RD	UV resistance		N/A
	Polymeric parts of an OUTDOOR ENCLOSURE required for compliance with this standard shall be sufficiently resistance to degradation by ultra-violet (UV) radiation		N/A
13.7/RD	Mechanical resistance to deflection, impact, or drop	See below	P
13.7.1/RD	General		P
13.7.2/RD	250-N deflection test for metal enclosures	Satisfactory	P
13.7.3/RD	7-J impact test for polymeric enclosures		N/A
13.7.4/RD	Drop test		N/A
13.8/RD	Thickness requirements for metal enclosures	See below	P
13.8.1/RD	General		P
13.8.2/RD	Cast metal	Satisfactory	P
13.8.3/RD	Sheet metal	In compliance, Thickness: 1.65mm	P
13.9	**Fault indication**		P
	Where this Part 2 requires the inverter to indicate a fault, both of the following shall be provided:		P
	a) a visible or audible indication, integral to the inverter, and detectable from outside the inverter, and	Provided	P
	b) an electrical or electronic indication that can be remotely accessed and used.		N/A
	The installation instructions shall include information regarding how to properly make connections (where applicable) and use the electrical or electronic means in b) above, in accordance with 5.3.2.10.	Provided	P
14	**Components**		P
14.1/RD	General	See below	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:	Complied	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	Approved component used (See table 14)	P

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Clause	Requirement + Test	Result – Remark	Verdict
	check conformity with the component standard;		
	b) the requirements of this standard and, where necessary for the application, any additional applicable safety requirements of the relevant IEC component standard;		N/A
	c) if there is no relevant IEC standard, the requirements of this standard;		N/A
	d) applicable safety requirements of a non-IEC standard which are at least as high as those of the applicable IEC standard, provided that the component has been approved to the non-IEC standard by a recognized testing authority.		N/A
	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.	Approved capacitor and relays are used (See table 14)	P
14.2/ RD	Motor Over temperature Protection		N/A
	Motors which, when stopped or prevented from starting (see 4.4.4.3), would present an electric shock HAZARD, a temperature HAZARD, or a fire HAZARD, shall be protected by an over temperature or thermal protection device meeting the requirements of 14.3.		N/A
14.3/RD	Over temperature protection devices		N/A
14.4/RD	Fuse holders	**No such construction**	N/A
14.5/RD	MAINS voltage selecting devices		N/A
14.6/RD	Printed circuit boards	See below	P
	Printed circuit boards shall be made of material with a flammability classification of V-1 of IEC 60707 or better	See table 14	P
	This requirement does not apply to thin-film flexible printed circuit boards that contain only circuits powered from limited power sources meeting the requirements of 9.2.		N/A
	Conformity of the flammability RATING is checked by inspection of data on the materials. Alternatively, conformity is checked by performing the V-1 tests specified in IEC 60707 on three samples of the relevant parts.		N/A
14.7/RD	Circuits or components used as transient overvoltage limiting devices	See below	P
	If control of transient overvoltage is employed in the equipment, any overvoltage limiting component or circuit shall be tested with the applicable impulse withstand voltage of Table 7-10 using the test method from 7.5.1 except 10 positive and 10 negative impulses are to be applied and may be spaced up to 1 min apart.	Approved MOV used (See table 14)	P
14.8/RD	Batteries		N/A
	Equipment containing batteries shall be designed to reduce the risk of fire, explosion and chemical leaks under normal conditions and		N/A

Clause	Requirement + Test	Result – Remark	Verdict
	after a single fault in the equipment including a fault in circuitry within the equipment battery pack.		
14.8.1/RD	Battery Enclosure Ventilation		N/A
14.8.1.1/RD	Ventilation requirements		N/A
14.8.1.2/RD	Ventilation testing		N/A
14.8.1.3/RD	Ventilation instructions		N/A
14.8.2/ RD	Battery Mounting		N/A
	Compliance is verified by the application of the force to the battery's mounting surface. The test force is to be increased gradually so as to reach the required value in 5 to 10 s, and is to be maintained at that value for 1 min. A non-metallic rack or tray shall be tested at the highest normal condition operating temperature		N/A
14.8.3/RD	Electrolyte spillage		N/A
	Battery trays and cabinets shall have an electrolyte resistant coating.		N/A
14.8.4/RD	Battery Connections		N/A
	Reverse battery connection of the terminals shall be prevented if reverse connection could result in a hazard within the meaning of this Standard		N/A
14.8.5/RD	Battery maintenance instructions		N/A
	The information and instructions listed in 5.3.4.1 shall be included in the operator manual for equipment in which battery maintenance is performed by the operator, or in the service manual if battery maintenance is to be performed by service personnel only.		N/A
14.8.6/RD	Battery accessibility and maintainability		N/A
	Battery terminals and connectors shall be accessible for maintenance with the correct TOOLS. Batteries with liquid electrolyte, requiring maintained shall be so located that the battery cell caps are accessible for electrolyte tests and readjusting of electrolyte levels.		N/A

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4.2.2.6/4.7 RD	TABLE: mains supply electrical data in normal condition/ Electrical ratings tests					P
U (V)	I (A)	P (W)	U (V) AC	I (A) AC	P (W) AC	Remarks
PV mode*:						
55	27.56	1515.8	230.12	6.16	1400	At UPF and full load
22	41.23	907.06	230.08	6.13	1400	At UPF and full load
Supplementary information:						

4.3/RD	TABLE: Thermal Testing		P
Type/Model:	MSI1500		-
Temperature t of part/at	**t (°C)**		**Permitted t (°C)**
Test Condition	22Vdc (PV Mode)	55Vdc (PV Mode)	-
Ambient	25.2	25.1	-
Metal enclosure (outside)	56.5	48.2	70
PCB	49.1	42.0	130
Internal wire	43.5	38.8	105
PV wire(input)	49.2	43.2	105
Power supply cord (AC output)	45.2	39.8	90
Transformer (TX1) winding	58.1	51.7	110
PV Connector	36.3	31.3	90
AC output connector	38.2	33.6	90
AC input connector	37.1	33.4	90
X2 Capacitor(C202)	50.3	47.6	110
Inductor (T6) winding	51.5	46.2	110
Supplementary information:			

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4.4.4	TABLE: Single fault condition to be applied		P
	Ambient temperature (°C) .....:	26.1	-
	Power source for EUT: Manufacturer, model/type, output rating .....:	--	-

4.4.4.15.1	Fault-tolerance of residual current monitoring	N/A

Component No.	Fault	Supply voltage (V)	Test time	Fuse #	Fuse current (A)	Observation
PV mode:						
Output	Overload	55Vdc	30sec	F1	27.65	Equipment shutdownafter overload sensing, No fire or hazards occurred
Output	Short circuit	55Vdc	2sec	F1	0	Equipment shutdown immediately No fire or hazards occurred
Resistor (R285)	Short circuit	55Vdc	10min	F1	27.24	Fault indication, No fire or hazards occurred
X2 Capacitor (C203)	Short circuit	55Vdc	10min	F1	27.16	Fault indication, No fire or hazards occurred
Diode (D80)	Short circuit	55Vdc	5min	F1	27.43	Fault indication, No fire or hazards occurred
Q7 (D-G)	Short circuit	55Vdc	10min	F1	0	Equipment shutdown immediately No fire or hazards occurred
Relay (RY1) (3-4)pin	Short circuit	55Vdc	3min	F1	0	Equipment shutdown immediately No fire or hazards occurred
Supplementary information:						

4.4.4.17	Cooling system failure – Blanketing test			P
	Test voltage (Vdc) .....:	**22Vdc**	**55Vdc**	----
	Test current (Idc)	41.23	27.56	----
	Test voltage (Vac).....:	230.12	230.08	----
	Test current (Iac)	6.16	6.13	----
	t_{amb1} (°C) .....:	25.1	25.2	----
	t_{amb2} (°C) .....:	25.1	25.2	----

maximum temperature T of part/at::	**T (°C)**		**T_{max} (°C)**
Metal enclosure (outside)	57.5	51.3	70
PCB	50.7	45.6	130
Internal wire	45.9	41.5	105
PV wire(input)	51.6	46.4	105
Power supply cord (AC output)	47.8	41.3	90
Transformer (TX1) winding	59.3	53.1	110
PV Connector	39.5	34.4	90
AC output connector	40.1	35.5	90
AC input connector	39.7	35.1	90
X2 Capacitor(C202)	52.4	49.6	110
Inductor (T6) winding	53.2	49.6	110

4.4.4.17	Cooling system failure – Blanketing test	P
Supplementary information:	Fault : Air-intake blocked.	

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4.7.4	TABLE: Steady state Inverter AC output voltage and frequency		P
	Nominal DC input (V): **Nominal output AC voltage (V) :**		22Vdc & 55Vdc (PV mode) 230Vac
AC output U (V)	**Frequency (Hz)**	**Condition/status**	**Comments**
230.42	50.01	Without load	Min. voltage 22Vdc in PV mode
230.28	50.01	Resistive Load	
230.35	50.00	Resistive load application (Transient effect)	
230.26	50.01	Resistive load removal (Transient effect)	
230.27	50.01	Without load	Max. voltage 55Vdc in PV mode
230.21	50.00	Resistive Load	
230.28	50.00	Resistive load application (Transient effect)	
230.19	50.02	Resistive load removal (Transient effect)	
Supplementary information:			

4.8.2	TABLE: Array insulation resistance detection for inverters for ungrounded and functionally grounded arrays				N/A
4.8.2.1	Array insulation resistance detection for inverters for ungrounded arrays				N/A
DC Voltage below minimum operating voltage (V)	**DC Voltage for inverter begin operation (V)**	**Resistance between ground and PV input terminal (Ω)**	**Required Insulation resistance R = ($V_{MAX\ PV}$ / 30mA) (Ω)**	**Result**	
DC+					
DC-					

Note:

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

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

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

Supplementary information:

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

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

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

Supplementary information:

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

Fault Current (mA)		Disconnection time (ms)	
Measured Fault Current	**Limit** **300mA for output power ≤ 30 kVA** **10mA per kVA for output power > 30 kVA**	**Measured Disconnection time**	**Limit**
+ PV to N:			
----	----	----	300
----	----	----	300
----	----	----	300
----	----	----	300
----	----	----	300
- PV to N:			
----	----	----	300
----	----	----	300
----	----	----	300
----	----	----	300
----	----	----	300

Note:

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

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

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

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

Supplementary information:

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4.8.3.5.3	TABLE: Test for detection of sudden changes in residual current	N/A
	+PV to N	
Limit (mA)	**U_N Disconnection time (ms)**	**Limit (ms)**
30	----	300
30	----	300
30	----	300
30	----	300
30	----	300
60	----	150
60	----	150
60	----	150
60	----	150
60	----	150
150	----	40
150	----	40
150	----	40
150	----	40
150	----	40
	-PV to N	
Limit (mA)	**U_N Disconnection time (ms)**	**Limit (ms)**
30	----	300
30	----	300
30	----	300
30	----	300
30	----	300
60	----	150
60	----	150
60	----	150
60	----	150
60	----	150
150	----	40
150	----	40
150	----	40
150	----	40
150	----	40
Note: The capacitive current is risen until disconnection. Test condition: I_c + 30/60/150mA <= I_{cmax}. R_1 is set that 30/60/150mA Flow and switch S is closed.		
Supplementary information:		

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7.3.6.3.3/RD	TABLE: Protective equipotenial bonding			P
Measured between	**Test Current (A)**	**Voltage drop (V)**	**Resistance (mΩ)**	**Result**
Protective earthing terminal to body	32	1.21	50.42	Pass
Supplementary information: Tested current 32A applied for 4min				

7.3.6.3.7	TABLE: Touch current measurement		P
Measured between	**Measured (mA)**	**Limit (mA)**	**Comments/Conditions**
Live part to metal enclosure	0.39	3.5	---
Supplementary information:			

7.3.7/RD	TABLE: Clearance and creepage measurements					P
Measured between	**Up (V)**	**U r.m.s (V)**	**Required cl (mm)**	**cl (mm)**	**Required cr (mm)**	**Cr (mm)**
Line to neutral(Output) "BI"	325	230	3.0	6.61	2.5	6.61
PV terminal to earth "BI"	60	-	0.5	3.94	1.6	3.94
Across PV terminal, "+" to "–" "BI"	60	-	0.5	7.71	1.6	7.71
Supplementary information: "BI"- Basic insulation, "RI"- Reinforced insulation						

7.3.7/RD	TABLE: Distance through insulation measurement			N/A
Distance through insulation	**U r.m.s (V)**	**Test volatge (V)**	**Required dti (mm)**	**dti (mm)**
-	-	-	-	-
Supplementary information:				

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7.5/RD	TABLE: electric strength measurements, impulse voltage test and partial discharge test			P
Test voltage applied between	**Test volatge (V)**	**Impulse withstand voltage (V)**	**Partial discharge voltage (V)**	**Results**
Live part to earthed metal part "BI"	1500	4000	-	No breakdown occurred
Live part To SELV circuits "RI"	3000	6000	-	No breakdown occurred
DC input terminal to earthed metal part "BI"	240	2500	-	No breakdown occurred
Live part to Enclosure "RI"	3000	6000	-	No breakdown occurred
Supplementary information: "BI"- Basic insulation, "RI"- Reinforced insulation				

9.2/RD	TABLE: Limited power sources				P
Circuit output tested:					
Components	**Uoc (V)**	**Isc (A)**		**VA**	
		Meas.	**Limit**	**Meas.**	**Limit**
Gateway communication port	5.162	3.12mA	8.0	16.11mVA	40.0
Supplementary information:					

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Attachment – 1	Table: List of critical components	P
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Object/ part No.	Manufacturer/ trademark	Type/model	Technical data	Standard	Mark(s) of conformity
PCB	SHENZHEN ZHONG LUO ELECTRONICS CO LTD	ZL-04	V-0, 130°C	UL 94 (Flammability test equivalent to IEC 60695-11-10)	UL E255554
PV Connector	DONGGUAN ZERUN ELECTRONICS CO LTD	SL4-11	35A, 1000V DC, IP68	UL 6703 (No equivalent IEC standard)	UL : E351402
AC output connector	SUZHOU EXCEEDCONN TECHNOLOGY CO LTD	Female: EN030-2026-0001	25A, 250Vac, IP68	UL 2238 (No equivalent IEC standard)	UL E464733
AC input connector	SUZHOU EXCEEDCONN TECHNOLOGY CO LTD	Male: EN030-1026-0001	25A, 250Vac, IP68	UL 2238 (No equivalent IEC standard)	UL E464733
Power supply cord (AC output)	SUZHOU BAOHING ELECTRIC WIRE & CABLE CO LTD	TC-ER	3 core, 600V, 90°C, 10AWG	UL 1277 (No equivalent IEC standard)	UL E335648
Transformer (T2, T3, T4, T5)	SHENZHEN HENGSIDA INDUSTRY CO LTD	HSD	Class B, 130°C	IS 16221-2:2015	Tested with appliance
Winding wire Transformer (T2, T3, T4, T5)	SHENZHEN DARUN SCIENCE AND TECHNOLOGY CO LTD	DRTIW-F	0.15-1.0mm, 155°C	UL 2353 (Harmonized with Annex U of IEC 60950-1)	UL E335841
Bobbin of Transformer (T2, T3, T4, T5)	SUMITOMO BAKELITE CO LTD	PM-9820	Phenolic (PF), V-0, 150°C	UL 94 (Equivalent to IEC 60695-11-10)	UL E41429
Insulation tape of transformer (T2, T3, T4, T5)	3M COMPANY ELECTRICAL MARKETS DIV (EMD)	1350F-1(b)	130°C	UL 510A (Equivalent to IEC 60454)	UL E17385
Relay (RY1)	ZETTLER RELAY（XIAMEN） CO `LTD	AZ7628-1AB-12DF 001	16A, 277Vac	UL 60947-1 (Equivalent to IEC 60947-1)	UL E469841
Y Capacitor (C85, C143, C197, C207)	VISHAY ELECTRONIC GMBH	VY1	Y1, 4700pF, 500Vac, 125°C	UL 60384-14 (Equivalent to IEC 60384-14)	UL E183844 VDE 40012673
Capacitor (C217, C265)	XIAMEN FARATRONIC CO LTD	MKP63 or C43	100nF, 630V, 105*C	UL 60384-14 (Equivalent to IEC 60384-14)	UL E186600
X2 Capacitor (C202)	XIAMEN FARATRONIC CO LTD	C4B	X2, 1.0µF, 350Vac, 110°C	UL 60384-14 (Equivalent to IEC 60384-14)	UL E186600
X2 Capacitor (C203)	XIAMEN FARATRONIC CO LTD	C4B	X2, 1.5µF, 350Vac, 110°C	UL 60384-14 (Equivalent to IEC 60384-14)	UL E186600
Transformer (TX1)	SHENZHEN HENGSIDA INDUSTRY CO LTD	HSD	130°C , Class B	IS 16221-2:2015	Tested within appliance
Winding wire of Transformer (TX1)	SHENZHEN DARUN SCIENCE AND TECHNOLOGY CO LTD	DRTIW-F	0.15-1.0mm, 155°C	UL 2353 (Harmonized with Annex U of IEC 60950-1)	UL E335841

Bobbin of Transformer (TX1)	CHANG CHUN PLASTICS CO LTD	T375J (G5)(G6)	V-0, 150℃	UL 94 (Equivalent to IEC 60695-11-10)	UL E59481
Insulation tape of Transformer (TX1)	JINGJIANG YAHUA PRESSURE SENSITIVE GLUE CO LTD	CT-280B	130°C	UL 510A (Equivalent to IEC 60454)	UL E165111
Fuse (F1, F2)	LITTELFUSE INC	215012EP	12A, 250Vac	UL 248-1 (Equivalent to IEC 60127-2)	UL E10480
Alternate	LITTELFUSE INC	215	12A, 250Vac	IEC 60127-1:2006/AMD1:2011 IEC 60127-1:2006/AMD2:2015 IEC 60127-2:2014	VDE 40016610
Alternate	LITTELFUSE INC	215	12A, 250Vac	UL 248-1 (Equivalent to IEC 60127-2)	UL E10480
Alternate	LITTELFUSE INC	215/615	12A, 250Vac	IEC 60127-2	CSA 29862
Fuse (F3)	LITTELFUSE INC	391	1A , 65V	UL 248-1 (Equivalent to IEC 60127-2)	UL E67006
Varistor (RV1, RV3, RV5)	TDK (ZHUHAI FTZ) CO., LTD.	S20K320E2	320Vac, 105°C	UL 1449 (Equivalent to IEC 61051 standard)	UL E321126
Internal Wire	SHANGHAI JINGFENG WIRE & CABLE CO LTD	1015	105°C, 600Vac, 14AWG	UL 758 (No equivalent IEC standard)	UL E320487
Internal Wire	SHEN ZHEN HANGDIAN ELECTRIC CO LTD	1015	105°C, 600Vac, 14AWG	UL 758 (No equivalent IEC standard)	UL E252861
Inductor (T6)	SHENZHEN HENGSIDA	HQ19-T2201-0032	1.74mH, 130°C	IS 16221-2:2015	Tested with appliance
Shrinkable Tube of Inductor (T6)	CHANGYUAN ELECTRONICS GROUP CO LTD	CB-HFT	600Vac, 125°C	UL 224 (No equivalent IEC standard)	UL E180908
Winding wire of Inductor (T6)	DONG GUAN YIDA INDUSTRIAL CO LTD	2UEW/130	130°C	UL 1446 (Equivalent to IEC 60851-3 & IEC 60851-5)	UL E344055
Inductor (L20)	SHENZHEN HENGSIDA INDUSTRY CO LTD	HSD	Ln=55uH, 130°C	IS 16221-2:2015	Tested with appliance
Current Transducer (U28)	LEM SWITZERLAND S A	CASR 6-NP	7V, 20xIpnA, 110°C	UL 508 (No equivalent IEC standard)	UL E189713

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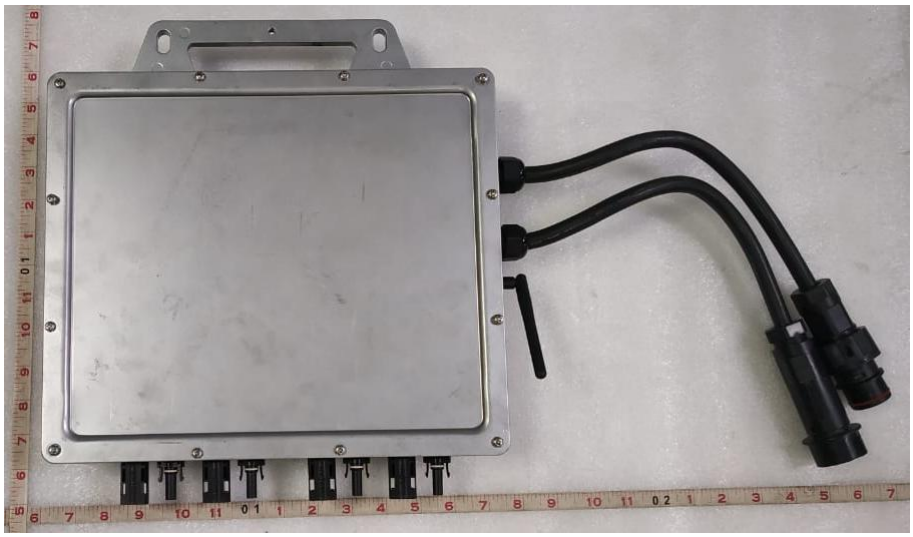
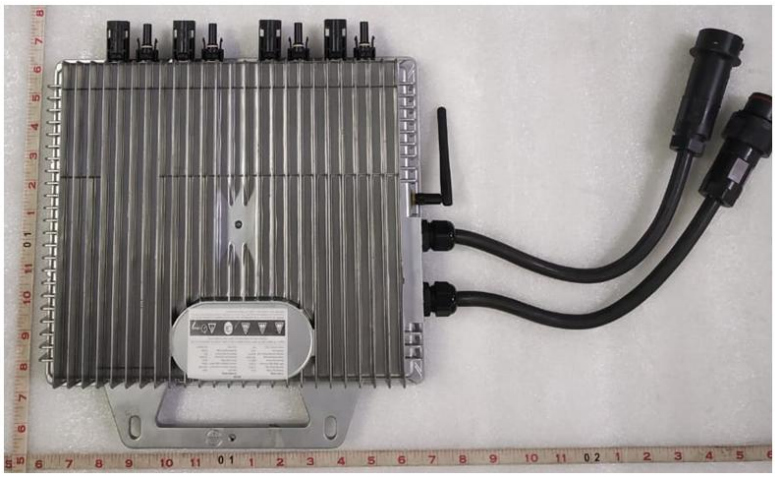
Attachment – 2	Photo Document



External front view



External back view

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	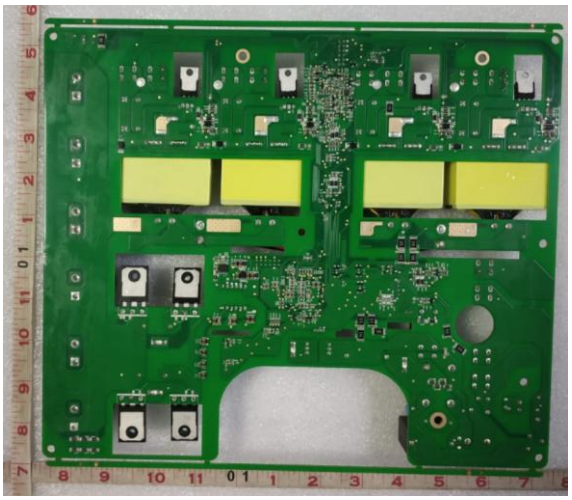
PCB Front View	**PCB Back View**

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