Certificate No: TC-5100

HI PHYSIX
testing & calibration laboratory

HI PHYSIX LABORATORY INDIA PVT. LTD.
B-32/1/2, MIDC, Ranjangaon, Pune, Maharashtra
info@hiphysix.com, infohplindia@gmail.com
Phone : 02138 - 232901, 232902, 232903
CIN : U74120DL2009PTC194754
Mobile 1 : +91 7768005400
Mobile 2 : +91 7768005411
Mobile 3 : +91 7768005422

SUMMARY OF TEST REPORT

TEST REPORT NO: HPLI/Test/2008029501/01 **DATE:** 01/12/2020

(Number of Pages in Test Report: Page no. 1 to 104)

TEST FORMAT AS PER IS 16221 (Part 2) : 2015/ IEC 62109-2 : 2011

1. **Name of the Manufacturer: Maitian Energy Co., Ltd. Wuxi Branch**
2. **Product:** PV Grid-tied Inverter
3. **Model:** F6000 (**Representative model)**
   F5300, F5000, F4600, F3600, F3000 (**Series models)**
4. **Model differences provided (if applicable): Yes**
5. **Model differences verified as per MNRE Guidelines for series formulation: Yes**
6. **Test Results:**

SL. NO.	TEST REQUIREMENT	CLAUSE	VERDICT
1.	General testing requirements	4.0	P
2.	Marking And Documentation	5.0	P
3	Environmental requirements and conditions	6.0	P
4.	Protection against electric shock and energy hazards	7.0	P
5.	Protection against mechanical hazards	8.0	P
6.	Protection against fire hazards	9.0	P
7.	Protection against sonic pressure hazards	10.0	P
8.	Protection against liquid hazards	11.0	N/A
9.	Protection against Chemical Hazards	12.0	N/A
10.	Physical requirements	13.0	P
11.	Components	14.0	P

HI PHYSIX LABORATORY INDIA PVT. LTD.
Ashutosh Pathak
(Chief Technical Manager)

Certificate No: TC-5100

HI PHYSIX
testing & calibration laboratory

HI PHYSIX LABORATORY INDIA PVT. LTD.
B-32/1/2, MIDC, Ranjangaon, Pune, Maharashtra
info@hiphysix.com, infohplindia@gmail.com
Phone : 02138 - 232901, 232902, 232903
CIN : U74120DL2009PTC194754
Mobile 1 : +91 7768005400
Mobile 2 : +91 7768005411
Mobile 3 : +91 7768005422

TEST REPORT NO: HPLI/Test/2008029501/01 **DATE:** 01/12/2020

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.

CONCLUSION:

1. Sample meets all relevant requirements of IS 16221 (Part 2): 2015/ IEC 62109-2: 2011
2. ~~Sample fails to meet the following test requirements.~~

I, hereby undertake that the verdict stated in the test reports for all the test matches with the test results. The sample meets all relevant requirements of IS 16221 (Part 2): 2015/ IEC 62109-2: 2011 ~~does not meet the requirements stated above~~.

HI PHYSIX LABORATORY INDIA PVT. LTD.
Ashutosh Pathak
(Chief Technical Manager)

Date: 01/12/2020

(Signature of Authorized person with Stamp)

TC-5100

HI PHYSIX
testing & calibration laboratory

Test Report No: HPLI/Test/2008029501/01	Page 1 of 104
	Issue Date: 01/12/2020

Discipline: *Group:*	ULR-TC510020000001653F Electronics Testing Miscellaneous Products (Power Conversion Equipment)		
Manufacturer:	**Maitian Energy Co., Ltd. Wuxi Branch** No.11, LiJiang Road, Xinwu District, Wuxi City, Jiangsu Province, China		
Test item:	PV Grid-tied Inverter		
Identification:	F6000 **(Representative model)** F5300, F5000, F4600, F3600, F3000 **(Series models)**	*Serial No.:*	661F6020063B005, 661F6020062B010
Receipt No.:	20080295	Date of receipt:	20/08/2020
Testing laboratory and its address:	**Hi Physix Laboratory India Pvt. Ltd.** B-32/1/2, MIDC, RANJANGAON, PUNE, MAHARASHTRA, PIN-412220.		
Test specification:	IS 16221 (Part 2) : 2015/ IEC 62109-2 : 2011		
Test Result:	*The test item passed / ~~failed~~ the test specification(s).*		
Other Aspects:	*Nil*		
	This test report relates to the test sample submitted.		

Tested by:	**Approved by / Authorized Signatory:**	**Issued by:**
	HI PHYSIX LABORATORY INDIA PVT. LTD. Ashutosh Pathak (Chief Technical Manager)	HI PHYSIX LABORATORY INDIA PVT. LTD. PUNE
(Pravin Zaware/ Testing Engineer)	**(Ashutosh Pathak/ Chief Technical Manager)**	**(K. K. Jayaswal/ Chief Quality Manager)**
Date: 01/12/2020	**Date:** 01/12/2020	**Date:** 01/12/2020

TC-5100

TEST REPORT
IS 16221 (Part 2):2015
Safety of Power Converter for use in Photovoltaic Power Systems Part 2: Particular requirements for inverters

	ULR-TC510020000001653F
Report Number..... :	HPLI/Test/2008029501/01
Date of issue ..... :	01/12/2020
Total number of pages .....:	104
Customer name..... :	**Maitian Energy Co., Ltd. Wuxi Branch**
Address..... :	No.11, LiJiang Road, Xinwu District, Wuxi City, Jiangsu Province, China
Test specification:	
Standard..... :	**IS 16221 (Part 2) : 2015**
Test procedure ..... :	Compliance Report
Non-standard test method..... :	N/A
Test Report Form No. ..... :	**TRF No. IS 16221 (Part 2) : 2015_V1.0**
Test Report Form(s) Originator .... :	**BIS**
Master TRF ..... :	**Dated: 03.10.2018**
Test item description.....:	PV Grid-tied Inverter
Trade Mark..... :	FoxESS
Manufacturer ..... :	**Maitian Energy Co., Ltd. Wuxi Branch**
Model/Type reference ..... :	F6000 **(Representative model)** F5300, F5000, F4600, F3600, F3000 **(Series models)**
Ratings ..... :	**Input side:** Nominal Operating voltage: 360Vdc, Max. DC current: 12.5A/12.5A, Isc PV: 15A/15A, MPPT Voltage range: 80-550Vdc, Absolute voltage: 600Vdc, Max. input power: 7800W **Output side:** Rated apparent power: 6000VA, Max. apparent power: 6000VA, Nominal Frequency: 50Hz, Nominal voltage: 220/230/240Vac, Nominal output current: 26.1A, Max. output current: 26.1A, Power factor: 1(±0.8 adjustable) **(Representative model)** **(For series models rating see copy of marking plate)**

HI PHYSIX LABORATORY INDIA PVT. LTD.
Ashutosh Pathak
(Chief Technical Manager)

Testing procedure and testing location:			
☒	**Testing Laboratory:**	Hi Physix Laboratory India Pvt. Ltd.	
Testing location/ address.....		B-32/1/2, Midc, Ranjangaon, Pune, Maharashtra, Pin-412220.	
☐	**Testing procedure:**		
Tested by (name+ signature).....:		(Pravin Zaware/ Testing Engineer)	
Approved by (name + signature).....		Ashutosh Pathak (Chief Technical Manager)	HI PHYSIX LABORATORY INDIA PVT. LTD. Ashutosh Pathak (Chief Technical Manager)

List of Attachments (including a total number of pages in each attachment):
Appendix A: User Manual & Installation Manual, pages 26 (page No: 70-95)
Appendix B: List of Critical Component, pages 3 (page No: 96-98)
Appendix C: List of Test and Engineering Rationale, pages 1 (page No: 100)
Appendix D: IS 16221 (Part 2) Test Datasheets, pages 7 (page No: 61-67)
Appendix E: Photos of Equipment, pages 4 (page No: 101-104)

Summary of testing:

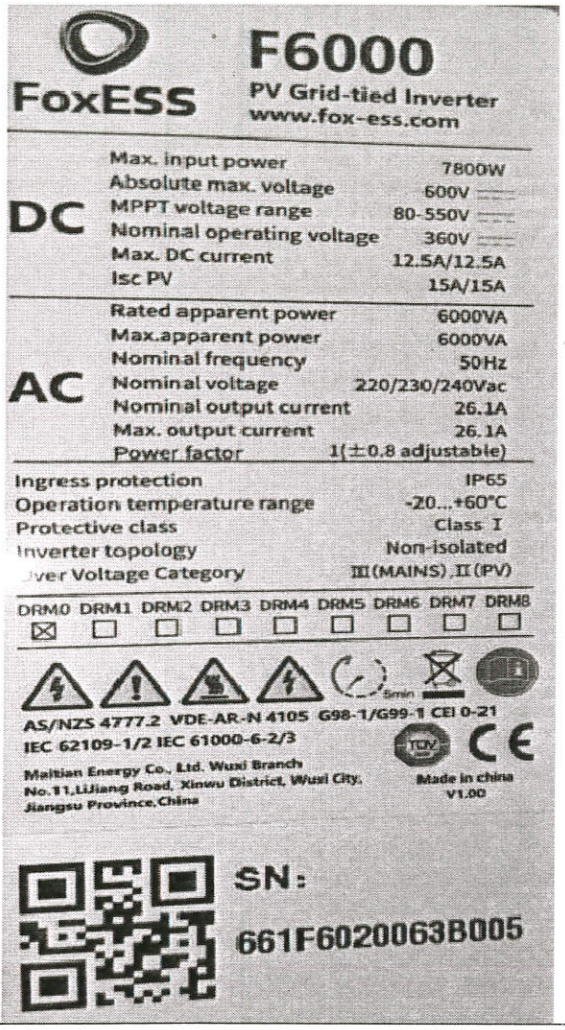
Tests performed (name of test and test clause):

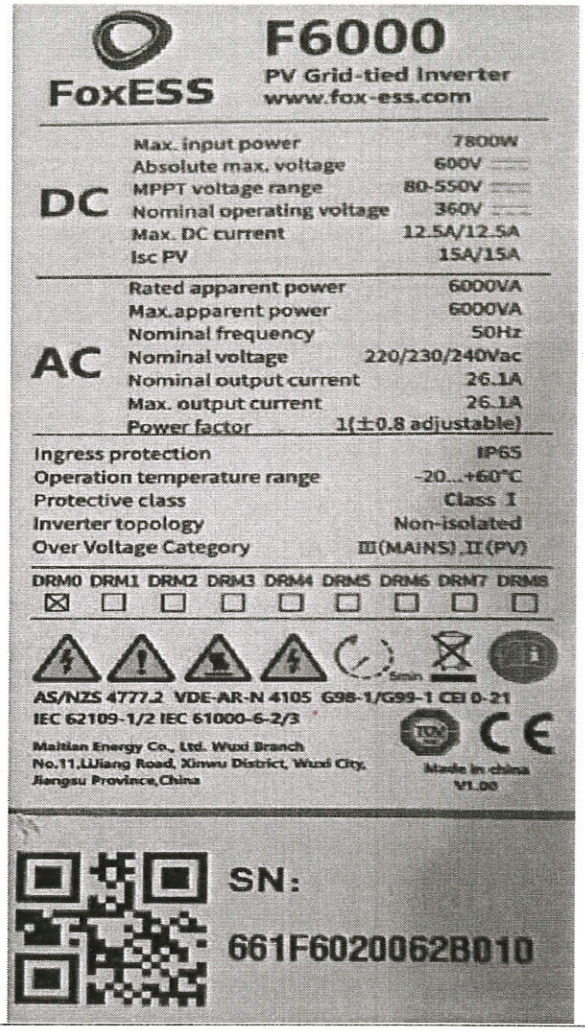
Test (s)	Clause (s)
General testing and requirements	4.0
Marking and documentation	5.0
Environmental requirements and conditions	6.0
Protection against electric shock and energy hazards	7.0
Protection against mechanical hazards	8.0
Protection against fire hazards	9.0
Protection against sonic pressure hazards	10.0
Physical requirements	13.0
Components	14.0

Testing location:
Hi Physix Laboratory India Pvt. Ltd.
B-32/1/2, M.I.D.C., Ranjangaon, Pune,
Maharashtra-412220

HI PHYSIX LABORATORY INDIA PVT. LTD.
Ashutosh Pathak
(Chief Technical Manager)

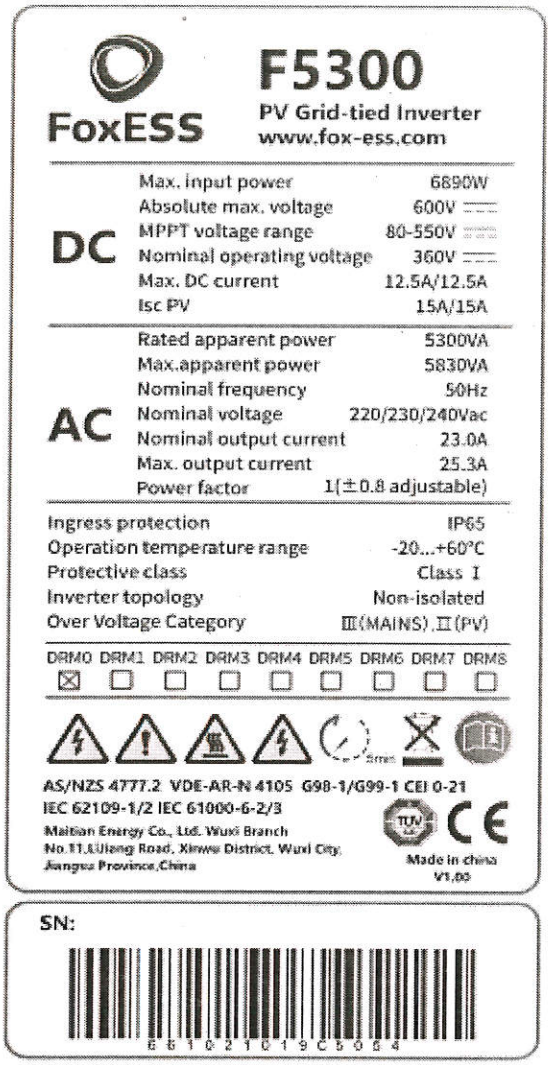
Copy of marking plate of the equipment: (Representative model)

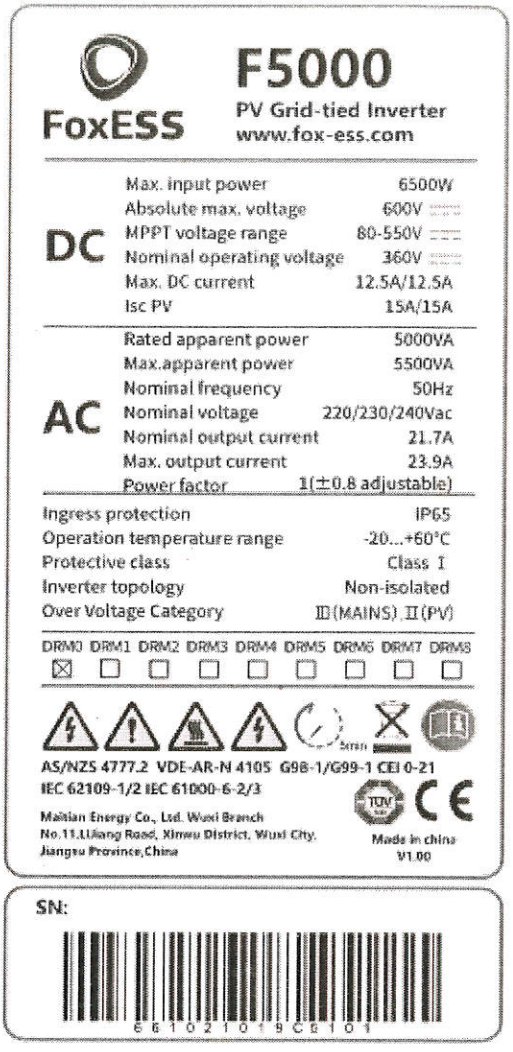




HI PHYSIX LABORATORY INDIA PVT. LTD.
Ashutosh pathak
(Chief Technical Manager)

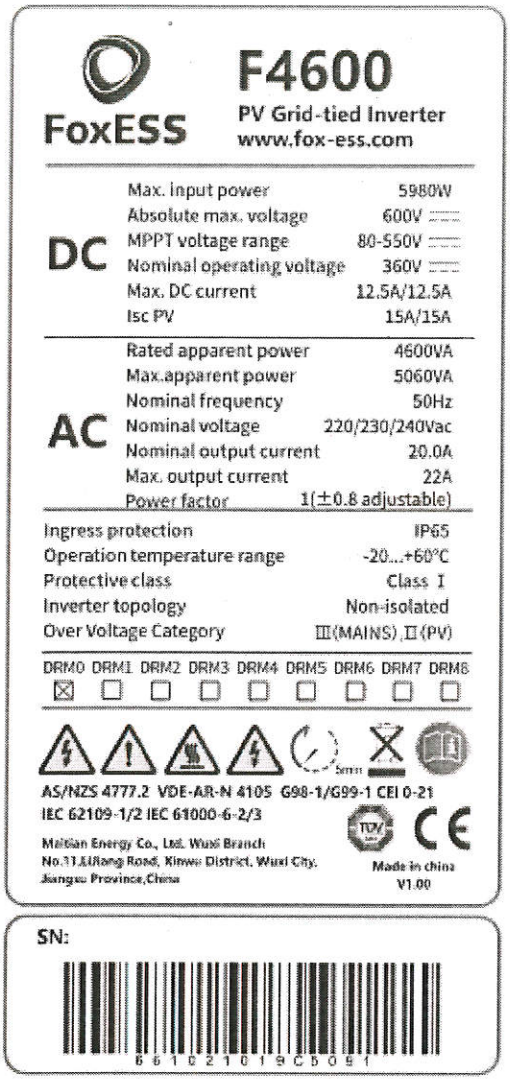
Copy of marking plate of the equipment: (Series models)

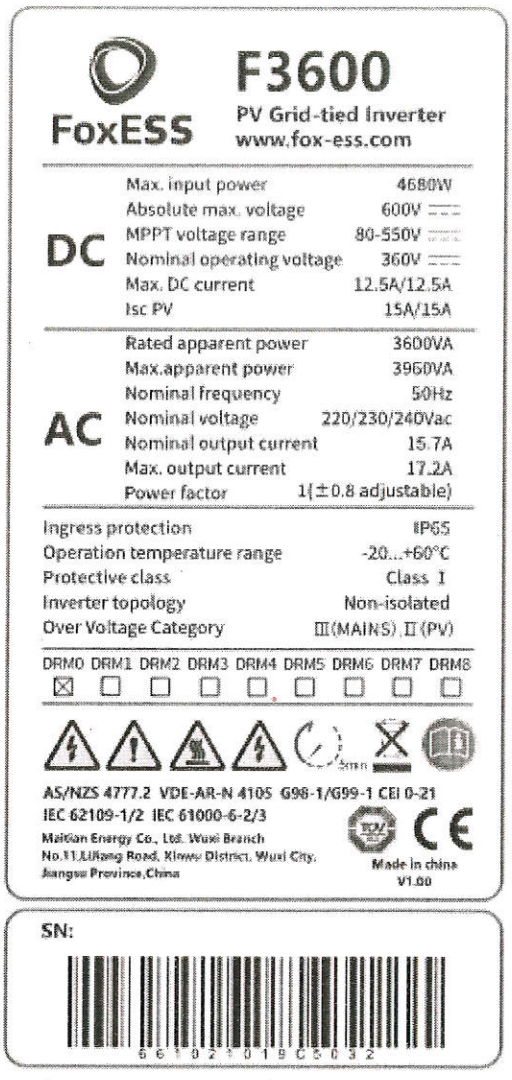




HI PHYSIX LABORATORY INDIA PVT. L...
Ashutosh Pathak
(Chief Technical Manager)

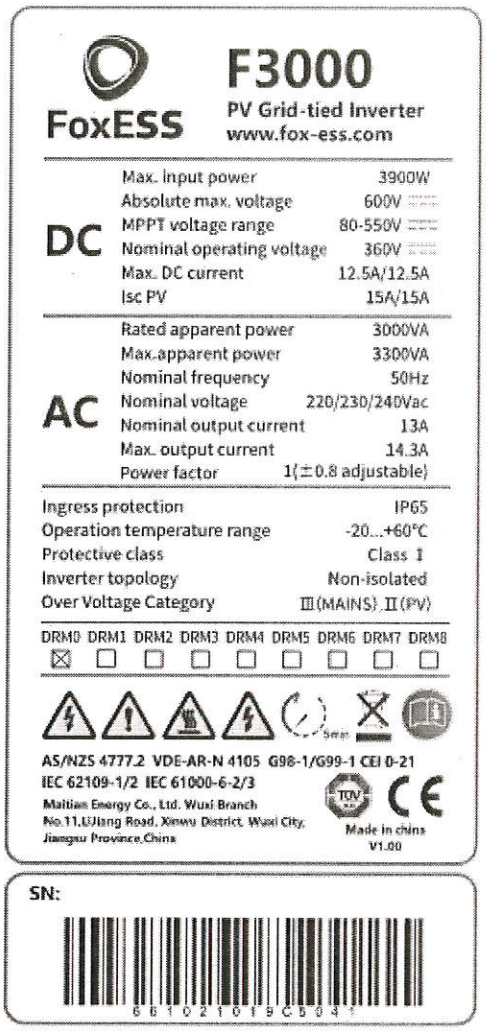
Copy of marking plate of the equipment: (Series models)





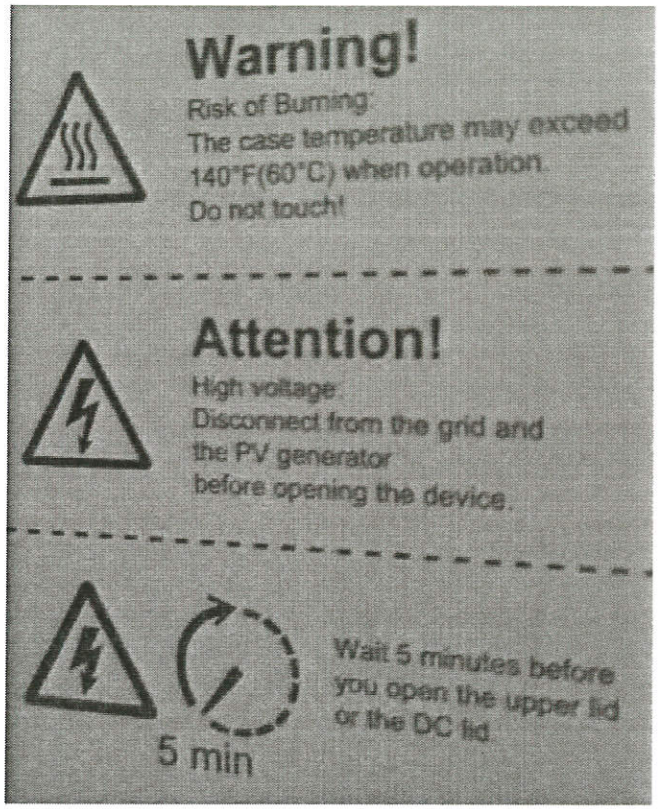
HI PHYSIX LABORATORY INDIA PVT. LTD.
Ashutosh Pathak
(Chief Technical Manager)

Copy of marking plate of the equipment: (Series model)



HI PHYSIX LABORATORY INDIA PVT. LTD.
Ashutosh Pathak
(Chief Technical Manager)

Warning label equipment:



HI PHYSIX LABORATORY INDIA PVT. L...
Ashutosh parbat
(Chief Technical Manager)

Test item particulars.....	: PV Grid-tied Inverter
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 conditioned
Over voltage category Mains.....	☐OVCI ☐OVCII ☒OVCIII☐ OVCIV
Over voltage category PV	☐OVCI ☒OVCII ☐OVCIII☐OVCIV
Mains supply tolerance (%)	-90 / +110 %
Tested for power systems	Yes(TN)
IT testing, phase-phase voltage (V)	: ---
Class of equipment	: ☒ Class I ☐ Class II ☐ Class III ☐Not classified
Mass of equipment (kg)	: 15.6 kg
Pollution degree	: ☐ PD1☐ PD2 (Inside) ☒PD3 (Outside)
IP protection class.....	: IP65

Possible test case verdicts:

-test case does not apply to the test object.....:	N/A
- test object does meet the requirement .....:	P (Pass)
–test object was not evaluated for the requirement	N/E
- test object does not meet the requirement.....:	F (Fail)

Testing.....:

Date of receipt of test item.....: 20/08/2020
Date (s) of performance of tests.....: 07/09/2020-25/11/2020

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.
The Management System is maintained in accordance with IS/ISO/IEC 17025:2017 and testing Standards/Instruments are traceable to National / International Standards
"(see Enclosure #)" refers to additional information appended to the report. "(see appended table)" refers to a table appended to the report.
Throughout this report a ☐ comma / ☒ point is used as the decimal separator.

HI PHYSIX LABORATORY INDIA PVT. L...
A...
(...)

Manufacturer's Declaration per Standard:

Similarities between the models: Representative models and series models have following similarities

1) Same rated Input/ Output voltage: Input voltage: 360Vdc/Output voltage: 220V/230V/240Vac
2) Same frequency: 50Hz
3) Number of Phases at output: Single phase
4) Same PCB design and layout : Same
5) Same Power Stage topology: Non-isolated
6) Same Insulation Class: Transformer less
7) Same Control Algorithm/firmware: Master/Slave/ARM:V1.10/V1.02/V1.02, Hardware version : V1.6, DSP maste : U29 DSP slave : U6 ARM : U20
8) Same Cabinet Design: IP65
9) Class of construction: Class I

Differences between the models: Representative models and series models have following differences Model description, Electrical rating (as mentioned in marking plate).

General product information:

The product covered under this test report is power converters for use in photovoltaic power systems.

The details of the product are stated below:

Manufacturer: Maitian Energy Co., Ltd. Wuxi Branch

Input rating: Nominal Operating voltage: 360Vdc, Max. DC current: 12.5A/12.5A, Isc PV: 15A/15A, MPPT Voltage range: 80-550Vdc, Absolute voltage: 600Vdc, Max. input power: 7800W

Output rating: Rated apparent power: 6000VA, Max. apparent power: 6000VA, Nominal Frequency: 50Hz, Nominal voltage: 220/230/240Vac, Nominal output current: 26.1A, Max. output current: 26.1A, Power factor: 1(±0.8 adjustable)

Class of equipment: Class I

Overvoltage category: OVC II (PV). OCV III(Mains)

Pollution degree: PD3

Connection to the mains: Permanent connection

Operating temperature range: -20°C to +60°C

IP protection class: IP65

Dimensions (W*H*D): 402*476.5*148mm

Sample code by online request is **"SC20SPF00524"**

HI PHYSIX LABORATORY INDIA PVT. LTD.

Ashutosh Pathak
(Chief Technical Manager)

IS 16221 (PART 2):2015			
Clause	**Requirement + Test**	**Result - Remark**	**Verdict**
4	**General testing requirements**	See below	P
4.1 /RD	General	Test carried out under reference test conditions and under both normal & single fault conditions.	P
4.2/RD	General conditions for testing	See below	P
4.2.1/RD	Sequence of tests	Considered as per MNRE guidelines	P
4.2.2/RD	Reference test conditions	See below	P
4.2.2.1/RD	Environmental conditions	Temperature:15 to 40°C Relative humidity: not more than 75% Air pressure: 75kPa to 106kPa No frost, dew, percolating water, rain, solar radiation	P
4.2.2..2/RD	State of equipment	All tests have been carried out on model which represent the future production unit with complete assemblies	P
4.2.2.3/RD	Position of equipment	The equipment were installed in accordance with the manufacturer's instructions	P
4.2.2.4/RD	Accessories	No accessories or operator Interchangeable parts used.	N/A
4.2.2.5/RD	Covers and removable parts	No covers and removable parts	N/A
4.2.2.6/RD	Mains supply a) Voltage: b) Frequency: c) Polarity: d) Earthing: e) Over-current Protection:	a) 220V/230V/240Vac b) 50/60Hz c) Not pluggable equipment type A d) Earthed supply system used e) 40A	P
4.2.2.7/RD	Supply ports other than the mains	See below	P
4.2.2.7.1/RD	Photovoltaic supply sources a) Open circuit voltage: b) Short-circuit current:	PV array simulator used with suitable compatibility	P
4.2.2.7.2/RD	Battery inputs	No battery used	N/A
4.2.2.8/RD	Conditions of loading for output ports	DC to AC inverter. A.C. output port was loaded with linear loads to obtain the maximum rated output power. Continuous operation ratings, until steady conditions are established.	P
4.2.2.9 /RD	Earthing terminals	Protective conductor terminal was connected to earth. No functional earth terminal.	P
4.2.2.10/RD	Controls	No mains selection devices and No combinations of settings devices	N/A
4.2.2.11/RD	Available short circuit current	Considered	P
4.3/RD	Thermal testing	See appended table 4.3	P
4.3.1/RD	General	See appended table 4.3	P
4.3.2/RD	Maximum temperatures	Tests of equipment rated for use in ambient temperatures up to 60°C	P
4.3.2.1/RD	General	See appended table 4.3	P

HI PHYSIX LABORATORY INDIA PVT. LTD.

Technical Manager)

IS 16221 (PART 2):2015			
Clause	**Requirement + Test**	**Result - Remark**	**Verdict**
4.3.2.2/RD	Touch temperatures	See appended table 4.3	P
4.3.2.3/RD	Temperatures limits for mounting surfaces	See appended table 4.3	P
4.4/RD	Testing in single fault condition	See appended table 4.4	P
4.4.1/RD	General	See appended table 4.4	P
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	Considered	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 shock hazards	P
4.4.3.2/RD	Protection against the spread of fire	No spread of fire	P
4.4.3.3/RD	Protection against other hazards	No other hazards	P
4.4.3.4/RD	Protection against parts expulsion hazards	No expulsion hazards	P
4.4.4	**Single fault conditions to be applied**	See below	P
4.4.4.1/RD	Component fault tests	See appended table 4.4	P
4.4.4.2 /RD	Equipment or parts for short-term or intermittent operation	For continuous operation	N/A
4.4.4.3 /RD	Motors	No motor used	N/A
4.4.4.4/RD	Transformer short circuit tests	See appended table 4.4	P
4.4.4.5/RD	Output short circuit	See appended table 4.4	P
4.4.4.6/RD	Backfeed current test for equipment with more than one source of supply	Only single source of supply used	N/A
4.4.4.7/RD	Output overload	See appended table 4.4	P
4.4.4.8/RD	Cooling system failure	See appended table 4.4	P
4.4.4.9/RD	Heating devices	No heating devices used	N/A
4.4.4.10/RD	Safety interlock systems	No such system used	N/A
4.4.4.11/RD	Reverse d.c. connections	Instructions provide in installation manual	P
4.4.4.12/RD	Voltage selector mismatch	No voltage selector	N/A
4.4.4.13/RD	Mis-wiring with incorrect phase sequence or polarity	Instructions provide in installation manual	P
4.4.4.14/RD	Printed wiring board short-circuit test	See appended table 4.4	P
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 appended table 4.4.4.15.1	P
	a)-The inverter ceases to operate	See above clause 4.4.4.15.1	P
	-Indicates a fault in accordance with13.9	See above clause 4.4.4.15.1	P
	-Disconnect from the mains	See above clause 4.4.4.15.1	P

HI PHYSIX LABORATORY INDIA PVT. LTD.

Ashutosh Pathak
(Technical Manager)

IS 16221 (PART 2):2015			
Clause	**Requirement + Test**	**Result - Remark**	**Verdict**
	-not re-connect after any sequence of removing and reconnecting PV power	See above clause 4.4.4.15.1	P
	-not re-connect after any sequence of removing and reconnecting AC power	See above clause 4.4.4.15.1	P
	-not re-connect after any sequence of removing and reconnecting both PV and AC power	See above clause 4.4.4.15.1	P
	b) The inverter continues to operate	Inverter ceases to operate	N/A
	the residual current monitoring system operates properly under single fault condition	See above clause 4.4.4.15.1	N/A
	c) The inverter continues to operate regardless of loss of residual current monitoring functionality	Inverter ceases to operate	N/A
	-not re-connect after any sequence of removing and reconnecting PV power	See above clause 4.4.4.15.1	N/A
	-not re-connect after any sequence of removing and reconnecting AC power	See above clause 4.4.4.15.1	N/A
	-not re-connect after any sequence of removing and reconnecting both PV and AC power	See above clause 4.4.4.15.1	N/A
	-Indicates a fault in accordance with13.9	See above clause 4.4.4.15.1	N/A
4.4.4.15.2	**Fault-tolerance of automatic disconnecting means**	Considered	P
4.4.4.15.2.1	**The means provided for automatic disconnection of a grid-interactive inverter from the mains shall:**	See below	P
	-disconnect all grounded current-carrying conductors from the mains	Disconnected all grounded current carrying conductors from the mains	P
	-disconnect all ungrounded current-carrying conductors from the mains	Disconnected 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.	Basic insulation is maintained between PV array and mains	P
4.4.4.15.2.2	**Design of insulation or separation complies with requirements of 7.3.7 of Part 1: report here Part1 comment and verdict.**	Complies	P

HI PHYSIX LABORATORY INDIA PVT. LTD.
Ashutosh Pathak

IS 16221 (PART 2):2015			
Clause	**Requirement + Test**	**Result - Remark**	**Verdict**
4.4.4.15.2.3	**For non-isolated inverter, automatic checking of the isolation provided by a disconnect means after single fault.**	The inverter automatic checking of the isolation after single fault occurred	P
	If the check fail: -any still functions disconnection means shall be left in the open position	Complies	P
	-at least basic or simple separation shall be maintained between the PV input and the mains	Basic insulation is maintained between PV array and mains	P
	-the inverter shall not start operation	Complies	P
	-the inverter shall indicate a fault in accordance with 13.9	The screen shows error information	P
4.4.4.16	**A stand-alone inverter with a transfer switch to transfer AC loads from the mains or other AC bypass source to the inverter output:**	Not a stand-alone inverter	N/A
	-shall continue to operate normally	See above clause no. 4.4.4.16	N/A
	-shall not present a risk of fire as the result of an out-of-phase transfer	See above clause no. 4.4.4.16	N/A
	- shall not present a risk of shock as the result of an out-of-phase transfer	See above clause no. 4.4.4.16	N/A
	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	See above clause no. 4.4.4.16	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.**	See appended table 4.4.4.17	P
	Test stop condition: time duration value or stabilized temperature .....:	See appended 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	Humidity: 92.5±2.5%RH Temperature: 40±2°C Duration: 48h	P
4.6/RD	Back feed voltage protection	See below	P
4.6.1/RD	Back feed tests under normal conditions	Input side: Positive to negative 6.00mV	P
4.6.2/RD	Back feed tests under single-fault conditions	Input side: Positive to negative 7.16mV	P
4.6.3/RD	Compliance with back feed tests	No hazards present after 15s	P
4.7	**Electrical ratings tests**	See below	P
4.7.1/RD	Input ratings	See appended table 4.7	P
4.7.1.1/RD	Measurement requirements for DC input ports	See appended table 4.7	P
4.7.2/ RD	Output ratings	See appended table 4.7	P

HI PHYSIX LABORATORY INDIA PVT. L

Ashutosh Pathak
(Chief Technical Manager)

IS 16221 (PART 2):2015			
Clause	**Requirement + Test**	**Result - Remark**	**Verdict**
4.7.3	Measurement requirements for AC output ports for standalone inverters	Not a standalone inverter	N/A
4.7.4	Stand-alone Inverter AC output voltage and frequency	Not a standalone inverter	N/A
4.7.4.1	General	See above clause no. 4.7.4	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.	See above clause no. 4.7.4	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.	See above clause no. 4.7.4	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 than1,5 s after application or removal of a resistive load.	See above clause no. 4.7.4	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 %.	See above clause no. 4.7.4	N/A
4.7.5	Stand-alone inverter output voltage waveform	Not a standalone inverter	N/A
4.7.5.1	General	See above clause no. 4.7.5	N/A
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%.	See above clause no. 4.7.5	N/A
4.7.5.3	Non-sinusoidal output waveform requirements	Not a standalone inverter	N/A
4.7.5.3.1	General	See above clause no. 4.7.5.3	N/A
4.7.5.3.2	The total harmonic distortion (THD) of the voltage waveform shall not exceed 40 %.	See above clause no. 4.7.5.3	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%and90%of the peak voltage for that half-cycle.	See above clause no. 4.7.5.3	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 exceed1,414 times 110% of the RMS value of the rated nominal AC output voltage.	See above clause no. 4.7.5.3	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.	See above clause no. 4.7.5.3	N/A

HI PHYSIX LABORATORY INDIA PVT. LTD.
Ashutosh Pathak

IS 16221 (PART 2):2015			
Clause	**Requirement + Test**	**Result - Remark**	**Verdict**
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 to4.7.5.3.	See above clause no. 4.7.5.3	N/A
	The combination of the inverter and dedicated load shall be evaluated to ensure that the output waveform does not cause any hazards in the load equipment and inverter, or cause the load equipment to fail to comply with the applicable product safety standards.	See above clause no. 4.7.5.3	N/A
	The inverter shall be marked with symbols 9 and 15 of Table C.1 of Part 1.	See above clause no. 4.7.5.3	N/A
	The installation instructions provided with the inverter Shall include the information in 5.2.3.13	See above clause no. 4.7.5.3	N/A
4.8	Additional tests for grid-interactive inverters	See below	P
4.8.1	General requirements regarding inverter isolation and array grounding	Non-isolated inverter	N/A
	- Type of Array grounding supported.....:	The EUT is intended to be used with ungrounded array	N/A
	- Inverter isolation.....:	Non-isolation inverter	N/A
4.8.2	Array insulation resistance detection for inverters for ungrounded and functionally grounded arrays	See below	P
4.8.2.1	Array insulation resistance detection for inverters for ungrounded arrays	See appended table 4.8.2	P
	Inverter shall have means to measure DC insulation resistance from PV input (array) to ground before starting operation	Complies	P
	Or Inverter shall be provided with instruction in accordance with 5.3.2.11.	The inverter can measure DC insulation resistance from PV input array to ground before starting operation	N/A
	Measured DC insulation resistance: .....:	See appended table 4.8.2	P
	Inverter measurement circuit shall be capable of detecting insulation resistance below the limit value R= V max/30mA under normal conditions	Complies	P
	Inverter measurement circuit shall be capable of detecting insulation resistance below the limit value R= V max / 30mA with ground fault in the PV array	Complies	P
	Isolated inverters shall indicate a fault if the insulation resistance is less than the limit value	The EUT is non-isolated inverter	N/A
	Isolated inverter fault indication maintained until insulation resistance has recovered to a value higher than the limit value	The EUT is non-isolated inverter	N/A
	Non-isolated inverters, or inverters with isolation not complying with the leakage current limits in the minimum inverter isolation requirements in Table 30:	See below	P
	- shall indicate a fault in accordance with13.9	The screen shows fault information	P

HI PHYSIX LABORATORY INDIA PVT. LTD.
Ashutosh Pathak

IS 16221 (PART 2):2015			
Clause	**Requirement + Test**	**Result - Remark**	**Verdict**
	- shall not connect to the mains	Not connect to the mains	P
4.8.2.2	Array insulation resistance detection for inverters for functionally grounded arrays	Not a functionally grounded array	N/A
	a-1) The value of the total resistance, including the intentional resistance for array functional grounding, the expected insulation resistance of the array to ground, and the resistance of any other networks connected to ground (for example measurement networks) must not be lower than R = (VMAX PV/30 mA) ohms.	See above clause no. 4.8.2.2	N/A
	a-2) The installation instructions shall include the Information required in 5.3.2.12.	See above clause no. 4.8.2.2	N/A
	b-1) As an alternative to a), or if a resistor value lower than in a) is used, the inverter shall incorporate means to detect, during operation, if the total current through the resistor and any networks (for example measurement networks) in parallel with it, exceeds the residual current values and times in Table 31	See above clause no. 4.8.2.2	N/A
	b-2) Inverter shall either disconnect the resistor or limit the current by other means .....:	See above clause no. 4.8.2.2	N/A
	b-3) If the inverter is a non-isolated inverter, or has isolation not complying with the leakage current limits in the minimum inverter isolation requirements in Table 30, it shall also disconnect from the mains.	See above clause no. 4.8.2.2	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.	See above clause no. 4.8.2.2	N/A
4.8.3	Array residual current detection	See below	P
4.8.3.1	General	Complies	P
4.8.3.2	30 mA touch current type test for isolated inverters	The EUT is non-isolated inverter	N/A
4.8.3.3	Fire hazard residual current type test for isolated inverters	The EUT is non-isolated inverter	N/A
4.8.3.4	Protection by application of RCD's	The EUT provides an integral RCD	N/A
	-The requirement for additional protection in4.8.3.1 can be met by provision of an RCD with a residual current setting of 30 mA, located between the inverter and the mains.	See above clause no. 4.8.3.4	N/A
	-The selection of the RCD type to ensure compatibility with the inverter must be made According to rules for RCD selection in Part 1.	See above clause no. 4.8.3.4	N/A
	-The RCD provided integral to the inverter, or	See above clause no. 4.8.3.4	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 per5.3.2.9.	See above clause no. 4.8.3.4	N/A
4.8.3.5	Protection by residual current monitoring	See below	P

HI PHYSIX LABORATORY INDIA PVT. L...

Authorised Signatory

IS 16221 (PART 2):2015			
Clause	**Requirement + Test**	**Result – Remark**	**Verdict**
4.8.3.5.1	**General**	The EUT provides an integral RCD	P
	Where required by Table 30, the inverter shall provide residual current monitoring that functions whenever the inverter is connected to the mains with the automatic disconnection means closed.	The residual current measured before EUT start up	P
	The residual current monitoring means shall measure the total (both a.c. and d.c. components) RMS current.	Complies	P
	As indicated in Table 30 for different inverter types, array types, and inverter isolation levels, detection may be required for excessive continuous residual current, excessive sudden changes in residual current, or both, according to the following limits:	Considered	P
	a) Continuous residual current: The inverter shall disconnect within 0.3 s and indicate a fault in accordance with 13.9 if the continuous residual current exceeds:	See appended table 4.8.3.5	P
	-maximum300mAforinverterswithcontinuous output power rating≤30kVA;	Complies	P
	-maximum 10 mA per kVA of rated continuous output power for inverters with continuous output power rating > 30 kVA.	See above	N/A
	The inverter may attempt to re-connect if the array insulation resistance meets the limit in 4.8.2.	Complies	P
	b) Sudden changes in residual current: The inverter shall disconnect from the mains within the time specified in Table 31	See appended table 4.8.3.5	P
	The inverter indicates a fault in accordance with 13.9, if a sudden increase in the RMS residual current is detected exceeding the value in the table.	See appended table 4.8.3.5	P
	The inverter may attempt to re-connect if the array insulation resistance meets the limit in 4.8.2.	Complies	P
4.8.3.5.2	**Test for detection of excessive continuous residual current: test repeated 5 times and time to disconnect shall not exceed 0.3 s.**	See appended table 4.8.3.5.2	P
4.8.3.5.3	**Test for detection of sudden changes in residual current repeated 5 times and each of the 5 results shall not exceed the time limit indicated in for each row (30mA, 60mA and150mA) of Table 31.**	See appended table 4.8.3.5.3	P
4.8.3.6	**Systems located in closed electrical operating areas**	Not located in the closed electrical operating area	N/A
	The protection against shock hazard is not required if the installation information provided with the inverter indicates the restriction for use in a closed electrical operating area, and	See above clause no. 4.8.3.6	N/A

HI PHYSIX LABORATORY INDIA PVT. LTD.

Ashutosh Pathak

IS 16221 (PART 2):2015			
Clause	**Requirement + Test**	**Result - Remark**	**Verdict**
	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.	See above clause no. 4.8.3.6	N/A
	The inverter shall be marked as in 5.2.2.6.	See above clause no. 4.8.3.6	N/A
5	**MARKING AND DOCUMENTATION**	See below	P
5.1	**Marking**	See below	P
5.1.1/RD	**General**	See below	P
	Equipment shall bear markings as specified in 5.1 and 5.2	The marking plate is on the outer surface of enclosure	P
	Graphic symbols may be used and shall be in accordance with Annex C or IEC 60417 as applicable	All used graphical symbols are in accordance with annex C	P
	Graphic symbols shall be explained in the documentation provided with the PCE	The explanations are provided in the manual	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	The label was subjected to the permanence of marking test. The label was rubbed with cloth soaked with water for 30 sec. and then again for 30 sec. with the cloth soaked with petroleum spirit. After the test, the markings are clearly legible There was neither loose nor curling on the edge of the label.	P
5.1.3/RD	Identification	See below	P
	The equipment shall, as a minimum, be permanently marked with:	See below	P
	a) the name or trade mark of the manufacturer or supplier	Trade mark :" FoxESS " marked on the label	P
	b) model number, name or other means to identify the equipment	Model no.: F6000 marked on the label	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.	Serial no.: 661F6020063B005, 661F6020062B010 marked on the label	P
5.1.4	**Equipment ratings**	See below	P
	PV input ratings:	See below	P
	- **Vmax PV (absolute maximum) (d.c. V)**	600Vdc	P
	- **Isc PV (absolute maximum) (d.c. A)**	15A/15A	P
	a.c. output ratings:	See below	P
	- **Voltage (nominal or range) (a.c. V)**	220Vac/ 230Vac/240Vac	P
	- **Current (maximum continuous) (a.c. A)**	26.1A	P
	- **Frequency (nominal or range)(Hz)**	50Hz	P
	- **Power (maximum continuous) (W or VA)**	6000VA	P
	- **Power factor range**	1 (±0.8 Adjustable)	P
	a.c input ratings:	No ac input used	N/A

HI PHYSIX LABORATORY INDIA PVT. LTD.
Ashish pathak
(Chief Technical Manager)

IS 16221 (PART 2):2015			
Clause	**Requirement + Test**	**Result - Remark**	**Verdict**
	- **Voltage (nominal or range) (a.c. V)**	No ac input used	N/A
	- **Current (maximum continuous) (a.c. A)**	No ac input used	N/A
	- **Frequency (nominal or range)(Hz)**	No ac input used	N/A
	d.c. output ratings:	No dc output used	N/A
	- **Voltage (nominal or range) (d.c. V)**	No dc output used	N/A
	- **Current (maximum continuous) (d.c. A)**	No dc output used	N/A
	Protective class (I or II or III)	Class I	P
	Ingress protection (IP) rating per part 1	IP 65	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.	No such application	N/A
5.1.5/RD	**Fuse identification**	No fuse used	N/A
	Marking shall be located adjacent to each fuse or fuse holders, or on the fuse holders, 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.	See above	N/A
	Where fuses with special fusing characteristics such as time delay or breaking capacity are necessary, the type shall also be indicated	See above	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.	See above	N/A
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.	Symbol 9 are marked on the EUT and user manual indicate the installation and safety of connection of connector, control and indicator	P
	Push-buttons and actuators of emergency stop devices, and indicator lamps used only to indicate a warning of danger or the need for urgent action shall be colored red.	No such devices used	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.	The EUT is not intended to connect to multiple-voltage and there is no voltage setting device	N/A
	A unit with d.c. terminals shall be plainly marked indicating the polarity of the connections, with:	See below	P

HI PHYSIX LABORATORY INDIA PVT. LTD.

IS 16221 (PART 2):2015			
Clause	**Requirement + Test**	**Result - Remark**	**Verdict**
	– the sign "+" for positive and "-„ for negative; or	The "+" and "-" marking were provided adjacent to the DC input terminals	P
	– a pictorial representation illustrating the proper polarity where the correct polarity can be unambiguously determined from the representation	No pictorial representation illustration used	N/A
5.1.6.1/RD	**Protective Conductor Terminals**	See below	P
	The means of connection for the protective earthing conductor shall be marked with:	See below	P
	– symbol 7 of Annex C; or	The symbol 7 of Annex C was marked adjacent to the heat sink	P
	– the letters "PE";or	Marked on AC connector	P
	– the colour coding green-yellow	Symbol 7 of Annex C was used	N/A
5.1.7/RD	Switches and circuit-breakers	See below	P
	The on and off-positions of switches and circuits breakers shall be clearly marked. If a push-button switch is used as the power switch, symbols 10 and 16 of Annex C may be used to indicate the on position, or symbols 11 and 17 to indicate the off position, with the pair of symbols (10 and 16, or 11 and 17) close together.	Marked	P
5.1.8/RD	Class II Equipment	Class I equipment	N/A
	Equipment using Class II protective means throughout shall be marked with symbol 12 of Annex C. Equipment which is only partially protected by DOUBLE INSULATION or REINFORCED INSULATION shall not bear symbol 12 of Table Annex C.	See above cl. no. 5.1.8	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	See above cl. no. 5.1.8	N/A
5.1.9/RD	Terminal boxes for External Connections	See below	P
	Where required by note 1 of Table 2 as a result of high temperatures of terminals or parts in the wiring compartment, there shall be a marking, visible beside the terminal before connection, of either:	Complies	P
	a) the minimum temperature Rating and size of the cable to be connected to the TERMINALS; or	See below b)	N/A
	b) a marking to warn the installer to consult the installation instruction. Symbol 9 of Table D-1 is an acceptable marking	Symbol 9 marked on label	P
5.2	**Warning markings**	See below	P

HI PHYSIX LABORATORY INDIA PVT. LTD.
Ashutosh Pathak
(Chief Technical Manager)

IS 16221 (PART 2):2015			
Clause	**Requirement + Test**	**Result - Remark**	**Verdict**
5.2.1/RD	Visibility and legibility requirements for warning markings	Warning markings are be Visible and legible.	P
	Warning markings shall be legible, and shall have minimum dimensions as follows:	See below	P
	- Printed symbols shall be at least 2.75 mm high	Complies	P
	-Printed text characters shall be at least 1.5 mm high and shall contrast in colour with the background	Complies	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.	No such symbols.	N/A
	If it is necessary to refer to the instruction manual to preserve the protection afforded by the equipment, the equipment shall be marked with symbol 9 of Annex C	The manual provide necessary information for the warning marking	P
	Symbol 9 of Annex C is not required to be used adjacent to symbols that are explained in the manual	All symbols are explained in the manual	P
5.2.2	**Content for warning markings**	See below	P
5.2.2.1/RD	Ungrounded heat sinks and similar parts	Grounded heat sink & metal enclosure	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 maybe on or adjacent to 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.	See above cl. no. 5.2.2.1	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.	The symbol 14 of Annex C provided on the warning label	P
5.2.2.3/RD	Coolant	No coolant contained within the equipment	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:	See above cl. no. 5.2.2.3	N/A
	a) statement that coolant system servicing is to be done only by SERVICE PERSONNEL, or	See above cl. no. 5.2.2.3	N/A

HI PHYSIX LABORATORY INDIA PVT. LTD.
Ashutosh Pathak
(Chief Technical Manager)

IS 16221 (PART 2):2015			
Clause	**Requirement + Test**	**Result - Remark**	**Verdict**
	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	See above cl. no. 5.2.2.3	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 and " 5min " were provided on the label	P
5.2.2.5/RD	Motor guarding	No such devices	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).	See above	N/A
5.2.2.6	**Inverters for closed electrical operating areas**	Not located in closed electrical operating area	N/A
	Where required by 4.8.3.6, an inverter not provided with full protection against shock hazard on the PV array shall be marked with a warning that the inverter is only for use in a closed electrical operating area, and referring to the installation instructions.	See above cl. no. 5.2.2.6	N/A
5.2.3/RD	**Sonic hazard markings and instructions**	No sonic hazard	N/A
	If required by 10.2.1 a PCE shall:	See above cl. no. 5.2.3	N/A
	a) be marked to warn the operator of the sonic pressure hazard; or	See above cl. no. 5.2.3	N/A
	b) be provided with installation instructions that specify how the installer can ensure that the sound pressure level from equipment at its point of use after installation, will not reach a value, which could cause a hazard. These instructions shall include the measured sound pressure level, and shall identify readily available and practicable Protective materials or measures which may be used.	User manual provided that noise emission <30dB	N/A
5.2.4/RD	**Equipment with multiple sources of supply**	No multiple source of supply used	N/A

HI PHYSIX LABORATORY INDIA PVT. LTD.
Ashutosh Pathak
(Chief Technical Manager)

IS 16221 (PART 2):2015			
Clause	**Requirement + Test**	**Result - Remark**	**Verdict**
	A PCE with connections for multiple energy sources shall be marked with symbol 13 of Annex C and the manual shall contain the information required in 5.3.4.	See above cl. no. 5.2.4	N/A
	The symbol shall be located on the outside of the unit or shall be prominently visible behind any cover giving access to hazardous parts.	See above cl. no. 5.2.4	N/A
5.2.5/RD	**Excessive touch current**	See below	P
	Where required by 7.3.6.3.7 the PCE shall be marked with symbol 15 of Annex C. See also 5.3.2 for information to be provided in the installation manual.	Symbol 15 of Annex C Provided on the marking plate.	P
5	**Documentation**	See below	P
5.3.1/RD	General	All related information's Provided in the user's manual.	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:	See above cl. no. 5.3.1	P
	a) explanations of equipment makings, including symbols used	See above cl. no. 5.3.1	P
	b) location and function of terminals and controls	See above cl. no. 5.3.1	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:	See above cl. no. 5.3.1	P
	-ENVIRONMENTAL CATEGORY as per 6.1	Outdoor used	P
	-WET LOCATIONS classification fort he intended external environment as per 6.1	Yes	P
	-POLLUTION DEGREE classification for the intended external environment as per 6.2	PD3	P
	-INGRESS PROTECTION rating as per 6.3	IP65	P
	-Ambient temperature and relative humidity ratings	(-) 20°C-(+) 60°C, (0%-100%)	P
	-MAXIMUM altitude rating	3000m	P
	-OVERVOLTAGE CATEGORY assigned to each input and output port as per 7.3.7.1.2, accompanied by guidance regarding how to ensure that the installation complies with the required overvoltage categories;	PV side (OVCII), AC side (OVCIII)	P
	d) a warning that when the photovoltaic array is exposed to light, it supplies a d.c. voltage to the PCE	Considered	P
5.3.1.1/RD	Language	Instructions related to safety provided in english.	P
	Instructions related to safety shall be in a language that is acceptable in the country where the equipment is to be installed.	See above cl. No. 5.3.1.1	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.	Hardcopy provided with the equipment	P

HI PHYSIX LABORATORY INDIA PVT. LTD.

Ashutosh Parthak
(Chief Technical Manager)

IS 16221 (PART 2):2015			
Clause	**Requirement + Test**	**Result - Remark**	**Verdict**
	For equipment which requires the use of a computer for both installation and operation, documentation may be provided in electronic format without accompanying printed format.	Also provided in electronic format	P
5.3.2/RD	Information related to installation	All below related information's Provided in the user's manual.	P
	The documentation shall include installation and where applicable, specific commissioning instructions and, if necessary for safety, warnings against hazards which could arise during installation or commissioning of the equipment. The information provided shall include:	See above cl. no. 5.3.2	P
	a) assembly, location, and mounting requirements:	See above cl. no. 5.3.2	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 over current protection needed, including instructions that the installation position shall not prevent access to the disconnection means;	See above cl. no. 5.3.2	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 over current protection needed;	See above cl. no. 5.3.2	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)	See above cl. no. 5.3.2	P
	e) ventilation requirements;	See above cl. no. 5.3.2	P
	f) requirements for special services, for example cooling liquid;	No special service	N/A
	g) instructions and information relating to sound pressure level if required by 10.2.1;	No sound pressure hazard	N/A
	h) where required by 14.8.1.3, instructions for the adequate ventilation of the room or location in which PCE containing vented or valve regulated batteries is located, to prevent the accumulation of hazardous gases;	No battery used	N/A
	i) tightening torque to be applied to wiring terminals;	Provided	P
	j) Values of back feed short-circuit currents available from the PCE on input and output conductors under fault conditions, if those currents exceed the max. rated current of the circuit, as per 4.4.4.6;	No backfeed short-circuit current	N/A
	k) for each input to the PCE, the max value of short-circuit current available from the source, for which the PCE is designed; and	Considered	P
	l) compatibility with RCD and RCM;	Provided	P
	m) instructions for protective earthing, including the information required by 7.3.6.3.7 if a second protective earthing conductor is to be installed:	Provided	P
	n) where required by 7.3.8, the installation instructions shall include the following or equivalent wording:	RCD is build in the EUT	N/A

HI PHYSIX LABORATORY INDIA PVT. L

Ashutosh Pathak
(Chief Technical Manager)

IS 16221 (PART 2):2015			
Clause	**Requirement + Test**	**Result - Remark**	**Verdict**
	"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."	Instruction provided in manual	P
	o) for PCE intended to charge batteries, the battery nominal voltage rating, size, and type	No battery used	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.	Information given in user manual	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.**	See below	P
	PV input quantities :	See below	P
	- **Vmax PV (absolute maximum) (d.c. V)**	600Vdc	P
	- **PV input operating voltage range (d.c. V)**	80-550Vdc	P
	- **Maximum operating PV input current (d.c. A)**	12.5A/12.5A	P
	- **Isc PV (absolute maximum) (d.c. A)**	15A/15A	P
	- **Max. inverter backfeed current to the array (a.c. or d.c. A)**	0A	P
	a.c. output quantities:	See below	P
	- **Voltage (nominal or range) (a.c. V)**	220Vac/ 230Vac/240Vac	P
	- **Current (maximum continuous) (a.c. A)**	26.1A	P
	- **Current (inrush) (a.c. A, peak and duration)**	25.2A/1.75ms	P
	- **Frequency (nominal or range)(Hz)**	50Hz	P
	- **Power (maximum continuous) (W or VA)**	6000VA	P
	- **Power factor range**	1 (±0.8 Adjustable)	P
	- **Maximum output fault current (a.c. A, peak and duration or RMS)**	26.1A	P
	- **Maximum output overcurrent protection (a.c. A)**	40A	P
	a.c. input quantities:	No a.c input	N/A
	- **Voltage (nominal or range) (a.c. V)**	See above	N/A
	- **Current (maximum continuous) (a.c. A)**	See above	N/A
	- **Current (inrush) (a.c. A, peak and duration)**	See above	N/A
	- **Frequency (nominal or range)(Hz)**	See above	N/A
	d.c input (other than PV) quantities:	No d.c input	N/A
	- **Voltage (nominal or range) (d.c. V)**	See above	N/A
	- **Nominal battery voltage (d.c. V)**	See above	N/A
	- **Current (maximum continuous) (d.c. A)**	See above	N/A

HI PHYSIX LABORATORY INDIA PVT. L...
Ashutosh Pathak
(Chief Technical Manager)

IS 16221 (PART 2):2015			
Clause	**Requirement + Test**	**Result - Remark**	**Verdict**
	d.c. output quantities:	No d.c output	N/A
	- Voltage (nominal or range) (d.c. V)	See above	N/A
	- Nominal battery voltage (d.c. V)	See above	N/A
	- Current (maximum continuous) (d.c. A)	See above	N/A
	Protective class (I or II or III)	Class I	P
	Ingress protection (IP) rating per part 1	IP65	P
5.3.2.2	**Grid-interactive inverter set points**	See below	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	N/A
	The setting of field adjustable set points shall be accessible from the PCE	See above	N/A
5.3.2.3	**Transformers and isolation**	Transformerless EUT	N/A
	Whether an internal isolation transformer is provided, and if so, what level of insulation (functional, basic, reinforced, or double) is provided by that transformer. The instructions shall also indicate what the resulting installation requirements are regarding such things as earthing or not earthing the array, providing external residual current detection devices, etc.	See above cl. no. 5.3.2.3	N/A
	An inverter shall be provided with information to the installer regarding:	See above cl. no. 5.3.2.3	N/A
	-providing of internal isolation transformer	See above cl. no. 5.3.2.3	N/A
	-the level of insulation (functional, basic, reinforced, or double)	See above cl. no. 5.3.2.3	N/A
	The instructions shall also indicate what the resulting Installation requirements are regarding:	See above cl. no. 5.3.2.3	N/A
	-earthing or not earthing the array	See above cl. no. 5.3.2.3	N/A
	-providing external residual current detection devices	See above cl. no. 5.3.2.3	N/A
	requiring an external isolation transformer,	See above cl. no. 5.3.2.3	N/A
5.3.2.4	**Transformers required but not provided**	Transformer less EUT	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:	See above cl. no. 5.3.2.4	N/A
	-the configuration type	See above cl. no. 5.3.2.4	N/A
	-electrical ratings	See above cl. no. 5.3.2.4	N/A
	-environmental ratings	See above cl. no. 5.3.2.4	N/A

HI PHYSIX LABORATORY INDIA PVT. L...

Ashutosh Pathak

IS 16221 (PART 2):2015			
Clause	**Requirement + Test**	**Result - Remark**	**Verdict**
	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.	AC mains voltage not more than PV array maximum system voltage	N/A
5.3.2.5	**PV modules for non-isolated inverters**	See below	P
	Non-isolated inverters shall be provided with installation instructions that require PV modules that have an IEC 61730 Class A rating	Complies	P
5.3.2.6	**Non-sinusoidal output waveform information**	Grid connected inverter	N/A
	The instruction manual for a stand-alone inverter not complying with 4.7.5.2 shall include a warning that:	See above cl. no. 5.3.2.6	N/A
	- the waveform is not sinusoidal,	See above cl. no. 5.3.2.6	N/A
	- some loads may experience increased heating,	See above cl. no. 5.3.2.6	N/A
	-the user should consult the manufacturers of the intended load equipment before operating that load with the inverter	See above cl. no. 5.3.2.6	N/A
	The inverter manufacturer shall provide information regarding:	See above cl. no. 5.3.2.6	N/A
	-what types of loads may experience increased heating	See above cl. no. 5.3.2.6	N/A
	-recommendations for maximum operating times with such loads	See above cl. no. 5.3.2.6	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.:	See above cl. no. 5.3.2.6	N/A
	- THD	See above cl. no. 5.3.2.6	N/A
	- slope	See above cl. no. 5.3.2.6	N/A
	- peak voltage	See above cl. no. 5.3.2.6	N/A
5.3.2.7	**Systems located in closed electrical operating areas**	Not located in the closed electrical operating area	N/A
	Where required by 4.8.3.6, an inverter not provided with full protection against shock hazard on the PV array shall be provided with installation instructions:	See above cl. no. 5.3.2.7	N/A
	-requiring that the inverter and the array must be installed in closed electrical operating areas	See above cl. no. 5.3.2.7	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)	See above cl. no. 5.3.2.7	N/A
5.3.2.8	**Stand-alone inverter output circuit bonding**	Grid connected inverter	N/A
	Where required by 7.3.10, the documentation for an inverter shall include the following:	See above cl. no. 5.3.2.8	N/A

HI PHYSIX LABORATORY INDIA PVT. LTD.

(Chief Technical Manager)

IS 16221 (PART 2):2015

Clause	Requirement + Test	Result - Remark	Verdict
	- 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;	See above cl. no. 5.3.2.8	N/A
	- if the output circuit is intended to be floating, the documentation for the inverter shall indicate that the output is floating.	See above cl. no. 5.3.2.8	N/A
5.3.2.9	Protection by application of RCD's	See below	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	The RCD protection is integrated with inverter	N/A
	and shall specify its rating, type, and required circuit location	The RCD protection is integrated with inverter	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.	Com/ External wifi connectivity provided	P
5.3.2.11	External array insulation resistance measurement and response	Clause 4.8.2.1 complies	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:	EUT incorporates array insulation resistance measurement	N/A
	- for isolated inverters: an explanation of what aspects of array insulation resistance measurement and response are not provided, and	See above cl. no. 5.3.2.11	N/A
	- an instruction to consult local regulations to determine if any additional functions are required or not;	See above cl. no. 5.3.2.11	N/A
	- for non-isolated inverters: an explanation of what external equipment must be provided in the system, and	See above cl. no. 5.3.2.11	N/A
	- what the set points and response implemented by that equipment must be, and:	See above cl. no. 5.3.2.11	N/A
	- how that equipment is to be interfaced with the rest of the system.	See above cl. no. 5.3.2.11	N/A
5.3.2.12	Array functional grounding information	No functional grounding	N/A
	Where approach a) of 4.8.2.2 is used, the installation instructions for the inverter shall include all of the following:	See above cl. no. 5.3.2.12	N/A

HI PHYSIX LABORATORY INDIA PVT. LTD.

Ashutosh Pathak

IS 16221 (PART 2):2015			
Clause	**Requirement + Test**	**Result - Remark**	**Verdict**
	a) the value of the total resistance between the PV circuit and ground integral to the inverter	See above cl. no. 5.3.2.12	N/A
	b) the minimum array insulation resistance to ground that system designer or installer must meet when selecting the PV panel and system design, based on the minimum value that the design of the PV functional grounding in the inverter was based on .....;	See above cl. no. 5.3.2.12	N/A
	c) the minimum value of the total resistance R = VMAX PV/30 mA that the system must meet, with an explanation of how to calculate the total	See above cl. no. 5.3.2.12	N/A
	d) a warning that there is a risk of shock hazard if the total minimum resistance requirement is not met.	See above cl. no. 5.3.2.12	N/A
5.3.2.13	**Stand-alone inverters for dedicated loads**	Grid connected 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	See above cl. no. 5.3.2.13	N/A
	shall specify the dedicated load.	See above cl. no. 5.3.2.13	N/A
5.3.2.14	**Identification of firmware version(s)**	The firmware version is displayed on LCD display panel	P
	An inverter utilizing firmware for any protective functions shall provide means to identify the firmware version.	See above cl. no. 5.3.2.14	P
	This can be a marking, but the information can also be provided by a display panel, communications port or any other type of user interface	See above cl. no. 5.3.2.14	P
5.3.3	Information related to operation	All below related information Provided in the user's manual.	P
	Instructions for use shall include any operating instructions necessary to ensure safe operation, including the following, as applicable:	See above cl. no. 5.3.3	P
	- Instructions for adjustment of controls including the effects of adjustment;	See above cl. no. 5.3.3	P
	- Instructions for interconnection to accessories and other equipment, including indication of suitable accessories, detachable parts and any special materials;	See above cl. no. 5.3.3	P
	- Warnings regarding the risk of burns from surfaces permitted to exceed the temperature limits of 4.3.2 and required operator actions to reduce the risk; and	The temperature of the surfaces not exceed the limit of 4.3.2, however the symbol 14 marked on the label	N/A
	- Instructions, that if the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.	See above cl. no. 5.3.3	P

HI-PHYSIX LABORATORY INDIA PVT. L

Ashish Pathak
(Chief Technical Manager)

IS 16221 (PART 2):2015			
Clause	**Requirement + Test**	**Result - Remark**	**Verdict**
5.3.4	Information related to maintenance	All below related information provided in the user's manual.	P
	Maintenance instructions shall include the following:	See above cl. no. 5.3.4	P
	- Intervals and instructions for any preventive maintenance that is required to maintain safety (for example air filter replacement or periodic re-tightening of terminals);	See above cl. no. 5.3.4	P
	- Instructions for accessing operator access areas, if any are present, including a warning not to enter other areas of the equipment;	See above cl. no. 5.3.4	P
	- Part numbers and instructions for obtaining any required operator replaceable parts;	No any operator replaceable Part.	N/A
	- Instructions for safe cleaning (if recommended)	See above cl. no. 5.3.4	P
	- Where there is more than one source of supply energizing the PCE, information shall be provided in the manual to indicate which disconnect device or devices are required to be operated in order to completely isolate the equipment.	Only single source of supply	N/A
5.3.4.1	Battery maintenance	The EUT is Grid-connected inverter without battery energy Storage function.	N/A
	Where required by 14.8.5, the documentation shall include the applicable items from the following list of instructions regarding maintenance of batteries:	See above cl. no. 5.3.4.1	N/A
	- Servicing of batteries should be performed or supervised by personnel knowledgeable about batteries and the required precautions	See above cl. no. 5.3.4.1	N/A
	- When replacing batteries, replace with the same type and number of batteries or battery packs	See above cl. no. 5.3.4.1	N/A
	- General instructions regarding removal and installation of batteries	See above cl. no. 5.3.4.1	N/A
	- CAUTION: Do not dispose of batteries in a fire. The batteries may explode.	See above cl. no. 5.3.4.1	N/A
	- CAUTION: Do not open or damage batteries. Released electrolyte is harmful to the skin and eyes. It may be toxic.	See above cl. no. 5.3.4.1	N/A
	- CAUTION: A battery can present a risk of electrical shock and high short-circuit current. The following precautions should be observed when working on batteries:	See above cl. no. 5.3.4.1	N/A
	a) Remove watches, rings, or other metal objects.	See above cl. no. 5.3.4.1	N/A
	b) Use tools with insulated handles.	See above cl. no. 5.3.4.1	N/A
	c) Wear rubber gloves and boots.	See above cl. no. 5.3.4.1	N/A
	d) Do not lay tools or metal parts on top of batteries	See above cl. no. 5.3.4.1	N/A
	e) Disconnect charging source prior to connecting or disconnecting battery terminals	See above cl. no. 5.3.4.1	N/A

HI PHYSIX LABORATORY INDIA PVT. L...
Ashutosh Pathak
(Chief Technical Manager)

IS 16221 (PART 2):2015			
Clause	**Requirement + Test**	**Result - Remark**	**Verdict**
	f) Determine if battery is inadvertently grounded. If inadvertently grounded, remove source from ground. Contact with any part of a grounded battery can result in electrical shock. The likelihood of such shock can be reduced if such grounds are removed during installation and maintenance (applicable to equipment and remote battery supplies not having a grounded supply circuit).	See above cl. no. 5.3.4.1	N/A
6	**Environmental requirements and conditions**	See below	P
6.1/RD	**Environmental categories and minimum environmental conditions**	See below	P
6.1.1/RD	**Outdoor**	EUT is for outdoor use	P
6.1.2/RD	**Indoor, unconditioned**	EUT is for outdoor use	N/A
6.1.3/RD	**Indoor, conditioned**	EUT is for outdoor use	N/A
6.2/RD	**Pollution degree**	PD3	P
6.3/RD	**Ingress Protection**	IP65	P
6.4/RD	**UV exposure**	Certified component used outside the enclosure	P
6.5/RD	**Temperature and humidity**	(-20°C to 60°C), (0%-100%)	P
7	**Protection against electric shock and energy hazards**	See below	P
7.1/RD	**General**	Both normal and singe fault condition considered	P
7.3	**Protection against electric shock**	See below	P
7.3.1/RD	General	See cl. no. 7.3.2.1	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	Voltage not exceeding at DVC under fault	N/A
7.3.2.4/RD	Requirements for protection (according table 7)	Complies	P
7.3.2.5/RD	Connection to PELV and SELV circuits	The external signal communication interface are considered as SELV	P
7.3.2.6/RD	Working voltage and DVC	See below	P
7.3.2.6.1/RD	General	Considered	P
7.3.2.6.2/RD	AC working voltage (see Figure 2)	Considered	P
7.3.2.6.3/RD	DC working voltage (see Figure 3)	Considered	P
7.3.2.6.4/RD	Pulsating working voltage (see Figure 4)	Not considered	N/A
7.3.3/RD	Protective separation	See below	P
	Protective separation shall be achieved by:	See below	P
	- double or reinforced insulation, or	Double or reinforced insulation was provided	P

HI PHYSIX LABORATORY INDIA PVT. LTD.

IS 16221 (PART 2):2015			
Clause	**Requirement + Test**	**Result - Remark**	**Verdict**
	-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, where by the screen is separated from live parts by at least basic insulation, or	All accessible metal parts were earthed and separated from live parts by at least basic insulation	P
	-protective impedance comprising limitation of current per 7.3.5.3 and of discharged energy per 7.3.5.4,or	No such device	N/A
	-limitation of voltage according to7.3.5.4.	No such device	N/A
	The protective separation shall be fully and effectively maintained under all conditions of intended use of the PCE	Complies	P
7.3.4/RD	Protection against direct contact	See below	P
7.3.4.1/RD	General	See below	P
	Protection against direct contact is employed to prevent persons from touching live parts that do not meet the requirements of 7.3.5 and shall be provided by one or more of the measure given in 7.3.4.2 (enclosures and barriers) and 7.3.4.3 (insulation).	Complies with the required of Cl. No. 7.3.4.2 and 7.3.4.3.	P
	Open type sub-assemblies and devices do not require protective measures against direct contact but the instruction provided with the equipment must indicate that such measures must be provided in the end equipment or in the installation.	No such device	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	No such device	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 provided	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).	Not removable without a tool and secured by screw.	P
	Polymeric materials used to meet these requirements shall also meet the requirements of 13.6	Certified component used	P
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:	Complies	P

HI PHYSIX LABORATORY INDIA PVT. L...
(Chief Technical Manager)

IS 16221 (PART 2):2015			
Clause	**Requirement + Test**	**Result - Remark**	**Verdict**
	a) decisive voltage classification A, (DVC A) - the probe may touch the live parts	The communication interface is considered as DVC A and probe may touch such parts.	P
	b) decisive voltage classification B, (DVC B) - the probe must not touch bare live parts	The DVC B circuit is not accessible by 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,	The DVC C circuit is not accessible by 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:	Complies	P
	a) Inspection; and	Complies	P
	b) Tests with the test finger (Figure D.1) and test pin (Figure D.2) of annex D, 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 fuse holders, and with operator access doors and covers open. It is permitted to leave lamps in place for this test. Connectors that can be separated by an operator without use of a tool, shall also be tested during and after disconnection. Any movable parts are to be put in the most unfavorable position.	Complies	P
	The test finger and the test pin are applied as above, without appreciable force, in every possible position, except that floor-standing equipment having a mass exceeding 40 kg is not tilted	Complies	P
	Equipment intended for building-in or rack mounting, or for incorporation in larger equipment, is tested with access to the equipment limited according to the method of mounting detailed in the installation instructions.	Not a building-in and rack mounting equipment	N/A
	c) Openings preventing the entry of the jointed test finger (Figure E-1 of 0E) during test b) above, are further tested by means of straight un jointed test finger (Figure E-3 of 0E), applied with a force of 30 N. If the unjointed finger enters, the test with the jointed finger is repeated except that the finger is applied using any necessary force up to 30 N.	Complies	P
	d) In addition to a) – c) above, top surfaces of enclosure shall be tested with the IP3X probe of IEC 60529. The test probe shall not penetrate the top surface of the enclosure when probed from the vertical direction ±5 ° only.	Complies	P

HI PHYSIX LABORATORY INDIA PVT. L...
A. Mukesh Pathak
(Chief Technical Manager)

IS 16221 (PART 2):2015			
Clause	**Requirement + Test**	**Result - Remark**	**Verdict**
7.3.4.2.4/RD	Service access areas	The EUT is not allowed to remove the covers during installation and maintenance when EUT energized. Symbol 21 of Annex C are marked on EUT and explained in user manual.	N/A
7.3.4.3/RD	Protection by means of insulation of live parts	Complies	P
	Where the requirements of 7.3.4.2 are not met, live parts shall be provided with insulation if:	Communication ports provided with decisive voltage class A.	P
	– their working voltage is greater than the maximum limit of decisive voltage class A, or	See above	P
	– for a DVC A or B circuit, protective separation from adjacent circuit of DVC C is not provided (see note "‡" under Table 7)	See above	P
7.3.5/RD	Protection in case of direct contact	See below	P
7.3.5.1/RD	General	See below	P
	Protection in case of direct contact is required to ensure that contact with live parts does not produce a shock hazard.	Complies	P
	The protection against direct contact according to 7.3.4 is not required if the circuit contacted is separated from other circuits according to 7.3.2.3, and:	See below	P
	– is of decisive voltage class A and complies with 7.3.5.2, or	Only DVC-A classified circuits can be touch directly	P
	– is provided with protective impedance according to 7.3.5.3, or	No such parts	N/A
	– is limited in voltage according to 7.3.5.4	No such parts	N/A
	In addition to the measures as given in 7.3.5.2 to 7.3.5.4, it shall be ensured that in the event of error or polarity reversal of connectors no voltages that exceed DVC A can be connected into a circuit with protective separation. This applies for example to plug-in-sub-assemblies or other plug-in devices which can be plugged-in without the use of a tool (key) or which are accessible without the use of a tool.	Complies	P
	Compliance is checked by visual inspection and trial insertion.	Complies	P
7.3.5.2/RD	Protection using decisive voltage class A	Complies	P
7.3.5.3/RD	Protection by means of protective impedance	No such parts	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.	See above cl. no. 7.3.5.3	N/A

HI PHYSIX LABORATORY INDIA PVT. LTD.
(Chief Technical Manager)

IS 16221 (PART 2):2015			
Clause	**Requirement + Test**	**Result - Remark**	**Verdict**
7.3.5.3.1/RD	Limitation of current through protective impedance	No such parts	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.	See above cl. no. 7.3.5.3.1	N/A
7.3.5.3.2 /RD	Limitation of discharging energy through protective impedance	No such parts	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.	See above cl. no. 7.3.5.3.2	N/A
7.3.5.4/RD	Protection by means of limited voltages	No such parts	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.	See above cl. no. 7.3.5.4	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.	See above cl. no. 7.3.5.4	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.	See above cl. no. 7.3.5.4	N/A
7.3.6/ RD	Protection against indirect contact	See below	P
7.3.6.1/ RD	General	See below	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)	Protective Class I.	P
	That part of a PCE meets the requirements of 7.3.6.2 and 7.3.6.3 is defined as protective class I	Class I	P
	That part of a PCE meets the requirements of 7.3.6.4 is defined as protective class II.	Class I	N/A
	That part of PCE which meets the requirements of decisive voltage class A and in which no hazardous voltages are derived, is defined as protective class III. No shock hazard is present in such circuits	Class I	N/A

HI PHYSIX LABORATORY INDIA PVT. L...
Abhijeet p...
(Chief Technical Manager)

IS 16221 (PART 2):2015			
Clause	**Requirement + Test**	**Result - Remark**	**Verdict**
	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.	Information provided	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	Complies. See Cl. 7.3.7.4 and Cl. 7.3.7.5	P
7.3.6.3 / RD	Protective class I – Protective bonding and earthing	See below	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:	Protective earthing is to be connected to terminal near AC terminal block	P
	a) accessible conductive parts that are protected by one of the measures in 7.3.5.2 to 7.3.5.4, or	DVC A circuit considered	P
	b) accessible conductive parts are separated from live parts of DVC-B or -C using double or reinforced insulation.	Communication circuit are separated from live parts used doubled or reinforced insulation	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:	See below	P
	a) through direct metallic contact;	Complies	P
	b) through other conductive parts which are not removed when the PCE or sub-units are used as intended ;	See above a)	N/A
	c) through a dedicated protective bonding conductor;	Complies	N/A
	d) through other metallic components of the PCE	See above a)	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.	No painted and coated	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.	No such parts	N/A

HI PHYSIX LABORATORY INDIA PVT. L...
(Chief Technical Manager)

IS 16221 (PART 2):2015			
Clause	**Requirement + Test**	**Result - Remark**	**Verdict**
	Metal ducts of flexible or rigid construction and metallic sheaths shall not be used as protective bonding conductors, unless the device or material has been investigated as suitable for protective bonding purposes.	No such parts	N/A
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.	Complies	P
	Protective bonding shall meet following requirements:	See below	P
	a) For PCE with an over current 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	>16A	N/A
	b) For PCE with an overcurrent protective device rating of more than 16A,thevoltagedropintheprotectivebonding test shall not exceed 2,5 V during or at the end of the test below.	Complies (see appended table 7.3.6.3.3)	P
	As alternative to a) and b) the protective bonding may designed according to the requirements for the external Protective earthing conductor in 7.3.6.3.5, in which case no testing is required.	Above test is carried out	N/A
	The impedance of protective bonding means shall be checked by passing a test current through the bond for a period of time as specified below. The test current is based on the rating of the overcurrent protection for the equipment or part of the equipment under consideration, as follows:	Complies	P
	a) For pluggable equipment type A, the overcurrent protective device is that provided external to the equipment (for example, in the building wiring, in the mains plug or in an equipment rack);	Not a pluggable equipment type A	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;	Not a pluggable equipment type B	N/A
	c) For a circuit or part of the equipment for which an overcurrent protective device is provided as part of the equipment, the rating of the provided overcurrent device.	Complies	P
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:	See below	P

HI PHYSIX LABORATORY INDIA PVT. L...
A...
(Chief Technical Manager)

IS 16221 (PART 2):2015			
Clause	**Requirement + Test**	**Result - Remark**	**Verdict**
	a) For PCE with an overcurrent protective device rating of 16 A or less, the test current is 200% of the overcurrent protective device rating, but not less than 32 A, applied for 120s. The impedance of the protective bonding means during and at the end of the test shall not exceed 0,1 Ω.	See below b)	N/A
	b) For PCE with an overcurrent protective device rating of more than 16 A, the test current is 200% of the overcurrent protective device rating and the duration of the test is as shown in Table 10 below. The voltage drop in the protective bonding means, during and at the end of the test, shall not exceed 2,5 V.	Complies (see appended table 7.3.6.3.3)	P
	c) During and after the test, there shall be no melting, loosening, or other damage that would impair the effectiveness of the protective bonding means.	No melting, loosening, or other damage after the test	P
	The test current is derived from an a.c or d.c supply source, the output of which is not earthed.	Complies	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.	No such application	N/A
7.3.6.3.4/RD	Protective bonding impedance (routine test)	Above test is carried out	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:	See above cl. no. 7.3.6.3.4	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:	See above cl. no. 7.3.6.3.4	N/A
	- the test duration may be reduced to no less than 2s	See above cl. no. 7.3.6.3.4	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.	See above cl. no. 7.3.6.3.4	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).	See above cl. no. 7.3.6.3.4	N/A
7.3.6.3.5/RD	External protective earthing conductor	See below	P

HI PHYSIX LABORATORY INDIA PVT. LTD.
(Chief Technical Manager)

IS 16221 (PART 2):2015			
Clause	**Requirement + Test**	**Result - Remark**	**Verdict**
	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.	Instruction regarding connection of earthing conductor provided in user manual.	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.	No such construction.	N/A
	- 2.5 mm² if mechanical protection is provided;	See above	N/A
	- 4 mm² if mechanical protection is not provided.	See above	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.	Not a cord-connected equipment	N/A
7.3.6.3.6/ RD	Means of connection for the external protective earthing conductor	External protective earthing conductor connected to enclosure body	P
7.3.6.3.6.1 / RD	General	Properly connected	P
	The means of connection for the protective earthing conductor shall be permanently marked with:	See below	P
	- symbol 7 of Annex C; or	Earthing symbol marked "⏚"	P
	- the colour coding green-yellow	See above	N/A
	Marking shall not be done on easily changeable parts such as screws.	Complies	P
7.3.6.3.7/ RD	Touch current in case of failure of the protective earthing conductor	See below	P
	For pluggable equipment type A, the touch current measured in accordance with 7.5.4 shall not exceed 3,5mA a.c. or mA d.c.	Not a pluggable equipment type A	P
	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.	Not exceeding the limit of 3.5mA ac. (See appended table 7.3.6.3.7)	P
	a) Permanently connected wiring, and:	See above	N/A
	-a cross-section of the protective earthing conductor of at least 10 mm² Cu or 16 mm² Al; or	See above	N/A
	-automatic disconnection of the supply in case of discontinuity of the protective earthing conductor; or	See above	N/A

HI PHYSIX LABORATORY INDIA PVT. L...

(Senior Technical Manager)

IS 16221 (PART 2):2015			
Clause	**Requirement + Test**	**Result - Remark**	**Verdict**
	-provision of an additional terminal for a second protective earthing conductor of the same cross- sectional area as the original protective earthing conductor and installation instruction requiring a second protective earthing conductor to be installed or	See above	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.	See above	N/A
7.3.6.4/ RD	Protective Class II – Double or Reinforced Insulation	Protective Class I	N/A
	Equipment or parts of equipment designed for protective class II shall have insulation between live parts and accessible surfaces in accordance with 7.3.4.3. The following requirements also apply:	No such application	N/A
	-Equipment designed to protective class II shall not have means of connection for the external protective earthing conductor. However this does not apply if the external protective earthing conductor is passed through the equipment to equipment series-connected beyond it. In the latter event, the external protective earthing conductor and its means for connection shall be insulated with basic insulation from the accessible surface of the equipment and from circuits that employ protective separation, extra-low voltage, protective impedance and limited discharging energy, according to 7.3.5. This basic insulation shall correspond to the rated voltage of the series-connected equipment;	No such application	N/A
	-metal-encased equipment of protective class II may have provision on its enclosure for the connection of an equipotential bonding conductor;	No such application	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;	No such application	N/A
	-Equipment employing protective class II shall be marked according to5.1.8.	No such application	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:	Considered	P
	pollution degree	PD3	P
	overvoltage category	The mains circuit: III, PV circuit : II	P
	supply earthing system	For TN system only.	P
	insulation voltage	Considered	P

HI PHYSIX LABORATORY INDIA PVT. L...
Ashutosh Pathak
(Senior Technical Manager)

IS 16221 (PART 2):2015			
Clause	**Requirement + Test**	**Result - Remark**	**Verdict**
	location of insulation	Considered	P
	type of insulation	Considered	P
	Compliance of insulation, creepage distances, and clearance distances, shall be verified by measurement or visual inspection, and the tests of 7.5.	Considered	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:	See below	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.	For TN system only	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;	See above	N/A
	IT system: has all live parts isolated from earth or one point connected to earth through an impedance, the accessible conductive parts of the installation being earthed independently or collectively to the earthing system.	See above	N/A
7.3.7.1.4 /RD	Insulation voltages	PV supply circuits: 4000V (VMAX PV : 600VDC) AC mains circuits: 4000V (Rated: 220V/230V/240AC)	P
7.3.7.2/RD	Insulation between a circuit and its surroundings	See below	P
7.3.7.2.1 / RD	General	Considered	P
7.3.7.2.2 / RD	Circuits connected directly to the mains	Clearances and solid insulation required according to the impulse voltage, temporary overvoltage, or working voltage, whichever gives the most severe requirement.	P
7.3.7.2.3/ RD	Circuits other than mains circuits	Clearances and solid insulation required according to the impulse voltage and recurring peak voltage.	P
7.3.7.2.4/RD	Insulation between circuit	Clearances and solid insulation according to the higher impulse voltages. Creepages according to the r.m.s. working voltage.	P

HI PHYSIX LABORATORY INDIA PVT. L...
Ashutosh Pathak
(Chief Technical Manager)

IS 16221 (PART 2):2015			
Clause	**Requirement + Test**	**Result - Remark**	**Verdict**
7.3.7.3/ RD	Functional insulation	Considered	P
7.3.7.4/RD	Clearance distances	See appended table 7.3.7.4	P
7.3.7.4.1/R D	Determination	Altitude: 3000m.	P
7.3.7.4.2 /RD	Electric field homogeneity	Not considered	N/A
7.3.7.4.3/R D	Clearance to conductive enclosures	Refer to subclause 7.3.7.4.1 and 13.7.	P
7.3.7.5/RD	Creepage distances	See appended table 7.3.7.5	P
7.3.7.5.1 /RD	General	See below	P
7.3.7.5.2 / RD	Voltage	The max. voltage: 220V/230/240Vac,600Vd.c	P
7.3.7.5.3/ RD	Materials	Insulating material group IIIb	P
7.3.7.6/ RD	Coating	No such parts	N/A
7.3.7.7/ RD	PWB spacings for functional insulating	Certified PCB used	P
7.3.7.8/ RD	Solid insulating	Certified component used	P
7.3.7.8.1/ RD	General	See above cl. no. 7.3.7.8	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	Passed the impulse withstand voltage and a.c. or d.c. voltage tests.(See appended table 7.5.1, 7.5.2 & 7.5.3)	P
7.3.7.8.2.2 / RD	Functional insulation	Complies	P
7.3.7.8.3/ RD	Thin sheet or tape material	See below	P
7.3.7.8.3.1 /RD	General	The transformer primary and secondary windings were separated by thin insulation sheet	P
7.3.7.8.3.2 / RD	Material thickness not less than 0.2 mm	See appended table 7.3.7	P
7.3.7.8.3.3 / RD	Material thickness less than 0.2 mm	Not used.	N/A
7.3.7.8.3.4 / RD	Compliance	See appended table 7.5.1, 7.5.2 & 7.5.3	P
7.3.7.8.4/ RD	Printed wiring boards	Certified PCB used	P
7.3.7.8.4.1 / RD	General	See above cl. no. 7.3.7.8.4	P

HI PHYSIX LABORATORY INDIA PVT. L

(Chief Technical Manager)

IS 16221 (PART 2):2015			
Clause	**Requirement + Test**	**Result - Remark**	**Verdict**
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	No such wound components.	N/A
7.3.7.8.6/ RD	Potting materials	No potting material used	N/A
7.3.7.9/ RD	Insulation requirements above 30 kHz	Considered	P
7.3.8/ RD	Residual Current-operated protective (RCD) or monitoring (RCM) device compatibility	The RCD is inbuilt within EUT	P
7.3.9/ RD	Protection against shock hazard due to stored energy	Considered	P
7.3.9.1/ RD	Operator access area	See below	P
	Equipment shall be so designed that there is no risk of electric shock in operator access areas from charge stored on capacitors after disconnection of the PCE.	The pins of connector cannot be touch by test finger due to design protection	P
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.	The symbol 21 of annex C with 5min was provided on the label.	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.	See above cl. no. 7.3.10	N/A
	The means used to bond the grounded conductor to protective earth provided within the inverter or	See above cl. no. 7.3.10	N/A
	as part of the installation	See above cl. no. 7.3.10	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.	See above cl. no. 7.3.10	N/A
	The means used to bond the grounded conductor to protective earth shall comply with the requirements for protective bonding in Part 1,	See above cl. no. 7.3.10	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.	See above cl. no. 7.3.10	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..	See above cl. no. 7.3.10	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	See above cl. no. 7.3.10	N/A

HI PHYSIX LABORATORY INDIA PVT. L
(Chief Technical Manager)

IS 16221 (PART 2):2015			
Clause	**Requirement + Test**	**Result - Remark**	**Verdict**
	Inverters intended to have a circuit conductor bonded to earth shall not impose any normal current on the bond except for leakage current.	See above cl. no. 7.3.10	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.	See above cl. no. 7.3.10	N/A
	The documentation for the inverter shall indicate that the output is floating as per 5.3.2.8.	See above cl. no. 7.3.10	N/A
7.3.11	**Functionally grounded arrays**	No such parts	N/A
	All PV conductors in a functionally grounded array shall be treated as being live parts with respect to protection against electric shock.	No such parts	N/A
7.4/RD	Protection against energy hazards	See below	P
7.4.1/RD	Determination of hazardous energy level	Hazardous energy level not present.	N/A
	A hazardous energy level is considered to exist if	See below	N/A
	a) The voltage is 2 V or more, and power available after 60 s exceeds 240 VA.	No such hazardous energy level exist.	N/A
	b) The stored energy in a capacitor is at a voltage. U of 2 V or more, and the stored energy. E, calculated from the following equation, exceeds 20J: $E = 0.5\ CU^2$	No such hazardous energy level exist.	N/A
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.	All hazardous energy parts were enclosed within earthed heat sink	P
7.4.3/ RD	Services Access Areas	The symbol 21 of annex C with 5 min was provided on the label	P
7.5/ RD	Electrical tests related to shock hazard	See below	P
7.5.1/ RD	Impulse voltage test (type test)	During the test no puncture, flashover, or spark over occurs. (See appended table 7.5)	P
7.5.2/ RD	Voltage test (dielectric strength test)	See below	P
7.5.2.1 / RD	Purpose of test	To verify the clearances and solid insulation and of assembled PCE has adequate dielectric strength to resist overvoltage's.	P
7.5.2.2/ RD	Value and type of test voltage	See appended table 7.5	P
7.5.2.3/ RD	Humidity pre-conditioning	Test performed as per cl. no. 4.5	P
7.5.2.4 / RD	Performing the voltage test	See appended table 7.5	P

HI PHYSIX LABORATORY INDIA PVT. LTD.

(Chief Technical Manager)

IS 16221 (PART 2):2015			
Clause	**Requirement + Test**	**Result - Remark**	**Verdict**
7.5.2.5/ RD	Duration of the a.c. or d.c. voltage test	Tested for 60s	P
7.5.2.6/ RD	Verification of the a.c. or d.c. voltage test	No electrical breakdown occurs and no abnormal current flow during the test	P
7.5.3/ RD	Partial discharge test	Certified component used	P
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 appended table 7.3.6.3.7	P
	For type tests on PCE for which wet locations requirements apply according to 6.1, the humidity pre-conditioning of 4.5 shall be performed immediately prior to the touch current test.	See appended table 7.3.6.3.7	P
7.5.5/RD	Equipment with multiple sources of supply	No multiple source of supply used	N/A
8	**Protection against mechanical hazards**	See below	P
8.1/ RD	**General**	See below	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 mechanical hazards under normal and single Fault condition	P
	Conformity is checked as specified in 8.2 to 8.6.	See 8.2 to 8.6	P
8.2/ RD	Moving parts	See below	P
	Moving parts shall not be able to crush, cut or pierce parts of the body of an OPERATOR likely to contact them, nor severely pinch the OPERATOR's skin. Hazardous moving parts of equipment, that is moving parts which have the potential to cause injury, shall be so arranged, enclosed or guarded as to provide adequate protection against the risk of personal injury.	No moving parts are accessible from outside	P
8.2.1/ RD	Protection of service persons	No such 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 Table D-1 shall be applied on or near the guard.	See above cl. no. 8.2.1	N/A
8.3/ RD	**Stability**	The EUT for wall mounting	N/A
	Equipment and assemblies of equipment not secured to the building structure before operation shall be physically stable in NORMAL USE.	See above cl. no. 8.3	N/A

HI PHYSIX LABORATORY INDIA PVT. LTD.

(Chief Technical Manager)

IS 16221 (PART 2):2015			
Clause	**Requirement + Test**	**Result - Remark**	**Verdict**
8.4/ RD	Provisions for lifting and carrying	No lifting and carrying	N/A
	If carrying handles or grips are fitted to, or supplied with, the equipment, they shall be capable of withstanding a force of four times the weight of the equipment.	See above	N/A
	Equipment or parts having a mass of 18 kg or more shall be provided with a means for lifting and carrying or directions shall be given in the manufacturer's documentation.	See above	N/A
8.5/ RD	**Wall mounting**	See below	P
	Mounting brackets on equipment intended to be mounted on a wall or ceiling shall withstand a force of four times the weight of the equipment.	No any damage after the test	P
8.6/RD	**Expelled parts**	See below	N/A
	Equipment shall contain or limit the energy of parts that could cause a HAZARD if expelled in the event of a fault.	No such parts	N/A
9	**Protection against fire hazards**	See below	P
9.1/ RD	Resistance to fire	Considered	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.	Components are verified at normal and abnormal tests	P
9.1.1/RD	Reducing the risk of ignition and spread of flame	Use of material with required flammability classes	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 is used	P
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 FIREENCLOSURE:	Considered	P
	-components in PRIMARYCIRCUITS	Considered	P
	-components in SECONDARY CIRCUITS supplied by power sources which exceed the limits for a LIMITED POWER SOURCE as specified in 9.2;	Considered	P
	-components in SECONDARY CIRCUITS supplied by a LIMITED POWER SOURCE as specified in 9.2, but not mounted on a material of FLAMMABILITYCLASS V-1;	No such devices	N/A

HI PHYSIX LABORATORY INDIA PVT. L...

A. Suresh Pathak
(Chief Technical Manager)

IS 16221 (PART 2):2015			
Clause	**Requirement + Test**	**Result - Remark**	**Verdict**
	-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;	No such devices	N/A
	-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	No such devices	N/A
	-insulated wiring, except as permitted in9.1.2.2	No such devices	N/A
9.1.2.2/ RD	Parts not requiring a fire enclosure	Connectors.	P
9.1.3/RD	Materials requirements for protection against fire hazard	See below	P
9.1.3.1/RD	General	See below	P
	ENCLOSURES, components and other parts shall be so constructed, or shall make use of such materials, that the propagation of fire is limited.	Metal enclosure and certified components used.	P
9.1.3.2/ RD	Materials for fire enclosures	Metal enclosure is used.	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.	See above cl. no. 9.1.3.2	P
9.1.3.3/ RD	Materials for components and other parts inside fire enclosures	Certified component used	P
9.1.3.5/ RD	Materials for air filter assemblies	No such material used	N/A
9.1.4/ RD	Openings in fire enclosures	No opening in fire enclosure	N/A
9.1.4.1/ RD	General	See above cl. no. 9.1.4.1	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.	See above cl. no. 9.1.4.1	N/A
	These requirements are in addition to those in the following sections:	See above cl. no. 9.1.4.1	N/A
	- 7.3.4, Protection against direct contact;	See above cl. no. 9.1.4.1	N/A
	- 7.4, Protection against energy hazards;	See above cl. no. 9.1.4.1	N/A
	- 13.5, Openings in enclosures	See above cl. no. 9.1.4.1	N/A
9.1.4.2 / RD	Side openings treated as bottom openings	No side opening	N/A
9.1.4.3/ RD	Openings in the bottom of a fire enclosure	No bottom opening	N/A

HI PHYSIX LABORATORY INDIA PVT. L...
(Chief Technical Manager)

IS 16221 (PART 2):2015			
Clause	**Requirement + Test**	**Result - Remark**	**Verdict**
	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.	See above cl. no. 9.1.4.3	N/A
9.1.4.4/ RD	Equipment for use in a CLOSED ELECTRICAL OPERATING AREA	Not intend use at this 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:	See above 9.1.4.4	N/A
	WARNING: FIRE HAZARD SUITABLE FOR MOUNTING ON CONCRETE OR OTHER NONCOMBUSTIBLE SURFACE ONLY	See above 9.1.4.4	N/A
9.1.4.5/ RD	Doors or covers in fire enclosures	No any door or covers 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	No limited power source used.	N/A
9.2.1/ RD	General	See above cl. no. 9.2	N/A
9.2.2/ RD	Limited power source tests	See above cl. no. 9.2	N/A
9.3	**Short-circuit and overcurrent protection**	See below	P
9.3.1/ RD	General	Considered	P
	The PCE shall not present a hazard, under short circuit or overcurrent conditions at any port, including phase-to-phase, phase-to-earth and phase-to-neutral, and adequate information shall be provided to allow proper selection of external wiring and external protective devices.	The short circuit and over current are protected by circuit design. When short-circuit or over current of components occurred. the EUT will shut down from grid immediately	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 above cl. no. 9.3	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.	See above cl. no. 9.3	P

HI PHYSIX LABORATORY INDIA PVT. L...
...sh Pathak
(Chief Technical Manager)

IS 16221 (PART 2):2015			
Clause	**Requirement + Test**	**Result - Remark**	**Verdict**
9.3.4	**Inverter backfeed current onto the array**	See below	P
	The backfeed current testing and documentation requirements in Part 1 apply, including but not limited to the following.	See below	P
	Inverter backfeed current onto the PV array maximum value.....	<0A	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.	<0A,provided in user manual	P
10	**Protection against sonic pressure hazards**	No sonic pressure hazards.	P
10.1/RD	**General**	See below	P
	The equipment shall provide protection against the effect of sonic pressure. Conformity tests are carried out if the equipment is likely to cause such HAZARDS.	No sonic pressure hazards.	P
10.2/ RD	**Sonic pressure and Sound level**	See below	P
10.2.1/ RD	Hazardous noise levels	Less than<30dB(A)	P
11	**Protection against liquid hazards**	No liquid containment system used	N/A
11.1/RD	Liquid Containment, Pressure and Leakage	See above cl. no. 11	N/A
	The liquid containment system components shall be compatible with the liquid to be used.	See above cl. no. 11	N/A
	There shall be no leakage of liquid onto live parts as a result of:	See above cl. no. 11	N/A
	a) Normal operation, including condensation;	See above cl. no. 11	N/A
	b) Servicing of the equipment; or	See above cl. no. 11	N/A
	c) Inadvertent loosening or detachment of hoses or other cooling system parts over time.	See above cl. no. 11	N/A
11.2/RD	Fluid pressure and leakage	See above cl. no. 11	N/A
11.2.1/RD	Maximum pressure	See above cl. no. 11	N/A
11.2.2/RD	Leakage from parts	See above cl. no. 11	N/A
11.2.3/RD	Overpressure safety device	See above cl. no. 11	N/A
11.3/ RD	Oil and grease	See above cl. no. 11	N/A
12	**Protection against Chemical Hazards**	No chemical hazards	N/A
12.1/ RD	**General**	No chemical hazards	N/A
13	**Physical requirements**	See below	P
13.1/RD	Handles and manual controls	Complies	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.	Complies	P

HI PHYSIX LABORATORY INDIA PVT. L...
Ashutosh parhak
(Chief Technical Manager)

IS 16221 (PART 2):2015			
Clause	**Requirement + Test**	**Result - Remark**	**Verdict**
13.1.1/ RD	Adjustable controls	No adjustable control	N/A
13.2/RD	Securing of parts	All screws locked with star washer	P
13.3/RD	Provisions for external connections	See below	P
13.3.1/ RD	General	Complies	P
13.3.2/RD	Connection to an a.c. Mains supply	Connector provided	P
13.3.2.1/RD	General	Certified AC connectors are used. Installation manual provide information for the disconnection means	P
	For safe and reliable connection to a MAINS supply, equipment shall be provided with one of the following:	See below	P
	– terminals or leads or a non-detachable power supply cord for permanent connection to the supply; or	Screw terminal for permanent connection to supply	P
	– a non-detachable power supply cord for connection to the supply by means of a plug	See above	N/A
	– an appliance inlet for connection of a detachable power supply cord; or	See above	N/A
	– a mains plug that is part of direct plug-in equipment as in 13.3.8	See above	N/A
13.3.2.2/ RD	Permanently connected equipment	Connector is used for AC connection	P
13.3.2.3/ RD	Appliance inlets	No appliance inlet used	N/A
13.3.2.4/ RD	Power supply cord	No such supply cord used	N/A
13.3.2.5/RD	Cord anchorages and strain relief	No such supply cord used	N/A
	For equipment with a non-detachable power supply cord, a cord anchorage shall be supplied such that:	See above cl. no. 13.3.2.5	N/A
	– the connecting points of the cord conductors are relieved from strain; and	See above cl. no. 13.3.2.5	N/A
	– the outer covering of the cord is protected from abrasion.	See above cl. no. 13.3.2.5	N/A
13.3.2.6/ RD	Protection against mechanical damage	No sharp points or cutting edge at the bushing.	N/A
13.3.3/RD	Wiring terminals for connection of external conductors	See below	P
13.3.3.1/ RD	Wiring terminals	Complies	P
13.3.3.2/ RD	Screw terminals	Complies	P

HI PHYSIX LABORATORY INDIA PVT. L...
(Chief Technical Manager)

IS 16221 (PART 2):2015			
Clause	**Requirement + Test**	**Result - Remark**	**Verdict**
13.3.3.3/ RD	Wiring terminal sizes	Complies	P
13.3.3.4/ RD	Wiring terminal design	Terminal design with appropriate fixing hardware for conductor so that can't slip out	P
13.3.3.5/ RD	Grouping of wiring terminals	Input and output terminals located in proximity to each other.	P
13.3.3.6/ RD	Stranded wire	Not used.	N/A
13.3.4/ RD	Supply wiring space	Complies	P
13.3.5/RD	Wire bending space for wires 10 mm² and greater	No such application	N/A
13.3.6/RD	Disconnection from supply sources	Installation manual instruct the disconnect device shall be provided before connecting AC mains and PV array	P
13.3.7/RD	Connectors, plugs and sockets	AC connector used. Plug and sockets not used.	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	All wires were used suitably and are fixed well to prevent mechanical damaged during installation	P
13.4.2/RD	Routing	All wires were routed away from all parts which would abrade the insulation of wires	P
13.4.3/RD	Colour coding	Green/yellow wire only used for protective earthing conductor	P
13.4.4/RD	Splices and connections	All wire with core cable ends.	P
13.4.5/RD	Interconnections between parts of the PCE	Special construction of connectors to prevent from misconnection.	P
13.5/RD	Openings in enclosures	IP65 enclosure without openings	N/A
13.5.1/RD	Top and side openings	IP65 enclosure without openings	N/A

HI PHYSIX LABORATORY INDIA PVT. L...
A...ish Prakash
(Chief Technical Manager)

IS 16221 (PART 2):2015			
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	See above cl. no. 13.5.1	N/A
13.6/RD	Polymeric Materials	Metal enclosure used and Certified connector, Certified DC Switch used outside the enclosure.	P
13.6.1/RD	General	See above cl. no. 13.6	P
13.6.1.1/RD	Thermal index or capability	See above cl. no. 13.6	P
13.6.2/RD	Polymers serving as enclosures or barriers preventing access to hazards	See above cl. no. 13.6	N/A
13.6.2.1/RD	Stress relief test	See above cl. no. 13.6	P
13.6.3/RD	Polymers serving as solid insulation	See above cl. no. 13.6	P
13.6.3.1/RD	Resistance to arcing	See above cl. no. 13.6	P
13.6.4/RD	UV resistance	Certified Component used outside the enclosure	P
	Polymeric parts of an OUTDOOR ENCLOSURE required for compliance with this standard shall be sufficiently resistance to degradation by ultra-violet (UV) radiation	See above cl. no. 13.6.4	P
13.7/RD	Mechanical resistance to deflection, impact, or drop	See below	P
13.7.1/RD	General	Complies	P
13.7.2/RD	250-N deflection test for metal enclosures	No hazard	P
13.7.3/RD	7-J impact test for polymeric enclosures	No hazard	P
13.7.4/RD	Drop test	Not a hand-held, direct-plug in and transportable equipment	N/A
13.8/RD	Thickness requirements for metal enclosures	Complies with 13.7	N/A
13.8.1/RD	General	See above cl. no. 13.8	N/A
13.8.2/RD	Cast metal	See above cl. no. 13.8	N/A
13.8.3/RD	Sheet metal	See above cl. no. 13.8	N/A
13.9	**Fault indication**	See below	P
	Where this Part 2 requires the inverter to indicate a fault, both of the following shall be provided:	LCD display and interface connected to PC as fault indication	P
	a) a visible or audible indication, integral to the inverter, and detectable from outside the inverter, and	LCD display shows fault indication	P
	b) an electrical or electronic indication that can be remotely accessed and used.	RS485 connectivity provided	P
	The installation instructions shall include information regarding how to properly make connections (where applicable) and use the electrical or electronic means in b) above, in accordance with 5.3.2.10.	The instructions are specified in the manual	P

HI PHYSIX LABORATORY INDIA PVT. L...
A...ash Prakash
(Chief Technical Manager)

IS 16221 (PART 2):2015			
Clause	**Requirement + Test**	**Result - Remark**	**Verdict**
14	**Components**	See below	P
14.1/RD	General	Considered	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:	See below	P
	a) Applicable safety requirements of a relevant IEC standard. Conformity with other requirements of the component standard is not required. If necessary for the application, components shall be subjected to the test of this standard, except that it is not necessary to carry out identical or equivalent tests already performed to check conformity with the component standard;	Certified component used according to their relevant safety standards. (see list of critical component)	P
	b) the requirements of this standard and, where necessary for the application, any additional applicable safety requirements of the relevant IEC component standard;	Certified component used (see list of critical component)	P
	c) if there is no relevant IEC standard, the requirements of this standard;	Certified component used and also verified/tested according to this standard. (see list of critical component)	P
	d) applicable safety requirements of a non-IEC standard which are at least as high as those of the applicable IEC standard, provided that the component has been approved to the non-IEC standard by a recognized testing authority.	Certified component used which are harmonized to relevant IEC standards. (see list of critical component)	P
	Components such as optocouplers, capacitors, transformers, and relays connected across basic, supplemental, reinforced, or double insulation shall comply with the requirements applicable for the grade of insulation being bridged, and if not previously certified to the applicable component safety standard shall be subjected to the voltage test of 7.5.2 as routine test.	Certified component used (see list of critical component)	P
14.2/ RD	Motor Over temperature Protection	See below	P
	Motors which, when stopped or prevented from starting (see 4.4.4.3), would present an electric shock HAZARD, a temperature HAZARD, or a fire HAZARD, shall be protected by an over temperature or thermal protection device meeting the requirements of 14.3.	Power limited by temperature control in single fault condition or high temperature environment condition	P
14.3/RD	Over temperature protection devices	Impedance protected motor	P
14.4/RD	Fuse holders	No such device	N/A
14.5/RD	MAINS voltage selecting devices	See below	P
14.6/RD	Printed circuit boards	V-0 class of PCBs used	P

HI PHYSIX LABORATORY INDIA PVT. L...
(Chief Technical Manager)

IS 16221 (PART 2):2015			
Clause	**Requirement + Test**	**Result - Remark**	**Verdict**
	Printed circuit boards shall be made of material with a flammability classification of V-1 of IEC 60707 or better	See above	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.	No such PCBs used	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.	See cl. no. 14.6	P
14.7/RD	Circuits or components used as transient overvoltage limiting devices	Certified components used.	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.	See above	P
14.8/RD	Batteries	No battery used	N/A
	Equipment containing batteries shall be designed to reduce the risk of fire, explosion and chemical leaks under normal conditions and after a single fault in the equipment including a fault in circuitry within the equipment battery pack.	See above cl. no. 14.8	N/A
14.8.1/RD	Battery Enclosure Ventilation	See above cl. no. 14.8	N/A
14.8.1.1/ RD	Ventilation requirements	See above cl. no. 14.8	N/A
14.8.1.2/ RD	Ventilation testing	See above cl. no. 14.8	N/A
14.8.1.3/ RD	Ventilation instructions	See above cl. no. 14.8	N/A
14.8.2/ RD	Battery Mounting	See above cl. no. 14.8	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	See above cl. no. 14.8	N/A
14.8.3/RD	Electrolyte spillage	See above cl. no. 14.8	N/A
	Battery trays and cabinets shall have an electrolyte resistant coating.	See above cl. no. 14.8	N/A
14.8.4/RD	Battery Connections	See above cl. no. 14.8	N/A

HI PHYSIX LABORATORY INDIA PVT. L...
Ashutosh parbat
(Chief Technical Manager)

IS 16221 (PART 2):2015			
Clause	**Requirement + Test**	**Result - Remark**	**Verdict**
	Reverse battery connection of the terminals shall be prevented if reverse connection could result in a hazard within the meaning of this Standard	See above cl. no. 14.8	N/A
14.8.5/RD	Battery maintenance instructions	See above cl. no. 14.8	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.	See above cl. no. 14.8	N/A
14.8.6/RD	Battery accessibility and maintainability	See above cl. no. 14.8	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.	See above cl. no. 14.8	N/A

HI PHYSIX LABORATORY INDIA PVT. L...
(Chief Technical Manager)

IS 16221 (PART 2):2015			
Clause	**Requirement + Test**	**Result - Remark**	**Verdict**

4.2.2.6/4.7 RD	**TABLE: mains supply electrical data in normal condition/ Electrical ratings tests**					**P**
Type	**U (V) DC**	**I (A) DC**	**P (kW) DC**	**U (V) AC**	**I (A) AC**	**P (kW) AC**
F6000	250	23.56	5.88	198.00	26.21	5.01
		23.46	5.85	207.00	25.10	5.10
		23.20	5.80	216.11	24.36	5.16
		23.40	5.85	220.10	23.85	5.18
		23.23	5.80	230.00	22.20	5.05
		23.78	5.92	240.00	21.19	5.01
		23.65	5.90	242.13	21.07	5.02
		23.64	5.90	253.20	19.80	4.96
	360	17.60	6.31	198.06	25.55	5.04
		17.63	6.30	207.13	25.14	5.19
		17.59	6.59	216.00	23.33	5.02
		17.65	6.33	220.05	23.11	5.07
		17.66	6.35	230.15	23.00	5.26
		17.62	6.34	240.18	22.16	5.30
		17.64	6.33	242.07	21.98	5.31
		17.28	6.22	253.19	21.00	5.29
	550	12.00	6.52	198.13	26.50	5.23
		12.06	6.60	207.10	26.00	5.36
		12.13	6.64	216.13	25.96	5.59
		12.04	6.61	220.14	25.88	5.65
		12.25	6.69	230.11	25.00	5.70
		12.02	6.56	240.22	24.66	5.86
		12.15	6.65	242.00	24.19	5.83
		12.11	6.63	253.09	24.03	5.97

HI PHYSIX LABORATORY INDIA PVT. L
(Chief Technical Manager)

IS 16221 (PART 2):2015			
Clause	**Requirement + Test**	**Result - Remark**	**Verdict**

4.3/RD	**TABLE: Thermal Testing**								**P**
Type/Model:	F6000								---
Temperature t of part/at	**t 1(°C):** 55.3, **t 1(°C):** 55.4								**Permitted t (°C)**
Test Condition	DC Input: 360Vdc AC Output: 198.10	DC Input: 360Vdc AC Output: 207.22	DC Input: 360Vdc AC Output: 216.08	DC Input: 360Vdc AC Output: 220.11	DC Input: 360Vdc AC Output: 230.15	DC Input: 360Vdc AC Output: 240.00	DC Input: 360Vdc AC Output: 242.10	DC Input: 360Vdc AC Output: 253.11	---
Ambient (°C)	55	55	55	55	55	55	55	55	----
Metal enclosure	65.1	65.0	63.0	63.9	65.5	65.3	66.6	66.8	70
Internal wire to AC connector	68.2	68.4	67.5	68.6	67.9	69.9	70.3	71.0	105
Internal wire to DC connector	66.8	67.0	66.6	70.0	70.5	71.3	69.8	70.6	105
PCB	74.0	76.1	73.5	73.7	75.0	74.4	73.3	75.4	130
Relay (RY5)	72.2	72.5	73.0	72.8	70.7	74.0	74.4	74.8	85
Optocoupler (U22)	71.0	72.2	73.4	74.6	75.1	75.6	76.4	77.0	115
Varistor (MOV1)	68.3	67.7	68.2	68.7	69.0	70.6	71.1	71.0	85
Inductor (L1)	78.6	76.0	79.2	78.8	78.0	79.6	79.9	80.0	130
Transformer (TX1)	80.4	79.7	79.0	81.0	82.4	82.7	85.0	83.3	110
Transformer (TX2)	83.7	83.9	84.3	82.5	80.7	81.0	86.9	88.1	110
Supplementary information: Temperature test of transformer winding is determined by thermocouple T1 is start temperature and T2 is the end of test temperature									

HI PHYSIX LABORATORY INDIA PVT. L

(Authorised Signatory)

IS 16221 (PART 2):2015			
Clause	**Requirement + Test**	**Result - Remark**	**Verdict**

4.3/RD	**TABLE: Thermal Testing**								**P**
Type/Model:	F6000								---
Temperature t of part/at	**t 1(°C):** 55.2, **t 1(°C):** 55.1								**Permitted t (°C)**
Test Condition	DC Input: 550Vdc AC Output: 198.00	DC Input: 550Vdc AC Output: 207.11	DC Input: 550Vdc AC Output: 216.00	DC Input: 550Vdc AC Output: 220.33	DC Input: 550Vdc AC Output: 230.10	DC Input: 550Vdc AC Output: 240.05	DC Input: 550Vdc AC Output: 242.15	DC Input: 550Vdc AC Output: 253.06	----
Ambient (°C)	55	55	55	55	55	55	55	55	----
Metal enclosure	65.0	65.3	63.5	63.7	66.0	65.8	67.0	67.0	70
Internal wire to AC connector	68.3	68.6	67.6	68.7	67.6	69.7	70.4	71.1	105
Internal wire to DC connector	66.5	67.3	66.8	70.2	70.3	71.2	69.7	70.3	105
PCB	73.3	75.8	73.3	73.6	74.4	74.6	73.5	75.6	130
Relay (RY5)	72.1	72.4	73.2	72.6	70.5	73.7	74.2	74.3	85
Optocoupler (U22)	70.0	72.1	73.1	74.3	74.0	75.5	76.2	76.5	115
Varistor (MOV1)	68.1	67.5	68.1	68.4	67.7	70.4	71.0	69.7	85
Inductor (L1)	78.4	75.5	79.0	78.6	76.2	79.4	79.2	79.6	130
Transformer (TX1)	80.0	79.5	78.2	80.2	82.1	82.6	84.4	83.0	110
Transformer (TX2)	83.5	83.6	84.0	82.1	80.2	80.5	86.5	87.7	110
Supplementary information: Temperature test of transformer winding is determined by thermocouple T1 is start temperature and T2 is the end of test temperature									

HI PHYSIX LABORATORY INDIA PVT. L...
Ashutosh Parbat
(Chief Technical Manager)

IS 16221 (PART 2):2015			
Clause	**Requirement + Test**	**Result - Remark**	**Verdict**

4.4.4	**TABLE: Single fault condition to be applied**		**P**
	Ambient temperature (°C)..... :	25°C	—
	Power source for EUT: Manufacturer, model/type, output rating..... :	Maitian Energy Co., Ltd Wuxi Branch, F6000, 6000W	—

4.4.4.15.1 Fault-tolerance of residual current monitoring

Component No.	Fault	Supply voltage (V)	Test time	Fuse #	Fuse current (A)	Observation
Output Line-Earth	Short circuited	PV input : 360Vdc AC output: 253.03	10min	---	---	Inverter cut off Immediately after short- circuit, No damage, no hazard, no fire.
Output	Overload	PV input : 360Vdc AC output: 253.30	30min	---	---	Unit works in fault mode, No damage, no hazard, no fire.
Input	Over-voltage	PV input :555Vdc AC output: 253.12	5min	---	---	Inverter cannot start up. No damage ,no hazard ,no fire
Relay (RY5)	Contact Short circuited before startup inverter	PV input :360Vdc AC output: 253.00	5 min	---	---	Unit does not start-up, the inverter did not connect to the grid. No damage, no hazard, no fire.
Relay (RY5)	Contact Short circuited before startup inverter	PV input :360Vdc AC output: 253.09	5 min	---	---	Unit does not start-up, the inverter did not connect to the grid. No damage, no hazard, no fire.
PV+ to PV-	Short-circuited	PV input :360Vdc AC output: 253.11	10 min	---	---	Inverter cannot start up. No output no power feed into grid. No damage ,no hazard ,no fire
Transformer (TX2)	Short-circuited	PV input :360Vdc AC output: 253.06	10min	---	---	Unit shut down, No damage , no hazard ,no fire
Inverter	Cooling system failure, blanketing	PV input :360Vdc AC output: 253.16	7 hour	---	---	No damage, no hazard, no fire.
Printed wiring board	Short-circuited	PV input :360Vdc AC output: 253.00	10 min	---	---	Inverter cut off Immediately after short- circuit, No damage, no hazard, no fire.
Check that the residual current monitoring operates properly						Yes
Supplementary information: Nil						

HI PHYSIX LABORATORY INDIA PVT. L...

Ashutosh Pathak
(Technical Manager)

IS 16221 (PART 2):2015			
Clause	**Requirement + Test**	**Result - Remark**	**Verdict**

4.4.4.17	**Cooling system failure – Blanketing test**			**P**
	Test voltage (Vdc).....:	360	550	---
	Test current (Idc)	17.26	12.10	---
	Test voltage (Vac).....:	253.10	253.05	---
	Test current (Iac)-----:	20.98	24.00	
	t_{amb1} (°C).....:	55	55	---
	t_{amb2} (°C).....:	55	55	---
maximum temperature T of part/at::		**T (°C)**		**T_{max} (°C)**
	Enclosure top	66.9	68.6	90
	Enclosure side	67.7	67.5	90
	Enclosure bottom	68.0	69.1	90
Supplementary information: Nil				

4.7.4	**TABLE: Steady state Inverter AC output voltage and frequency**		**N/A**
	Nominal DC input (V) **Nominal output AC voltage (V) :**		---
AC output U (V)	**Frequency (Hz)**	**Condition/status**	**Comments**
----	----	Without load	---
----	----	Resistive load application	---
----	----	Resistive load removal	---
Supplementary information: The PCE is not a standalone unit; therefore, the Steady State Inverter AC output voltage and frequency is not deemed applicable.			

HI PHYSIX LABORATORY INDIA PVT. L
(Senior Technical Manager)

IS 16221 (PART 2):2015			
Clause	**Requirement + Test**	**Result - Remark**	**Verdict**

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

DC Voltage below minimum operating voltage (V)	DC Voltage for inverter begin operation (V)	Resistance between ground and PV input terminal (kΩ)	Required Insulation resistance $R = (V_{MAX\ PV}/30mA)$ (kΩ)	Result
DC+				
80	360	18	20	Unit can't start up, Error message on display Isolation fault
80	550	18	20	Unit can't start up, Error message on display Isolation fault
DC-				
80	360	18	20	Unit can't start up, Error message on display Isolation fault
80	550	18	20	Unit can't start up, Error message on display Isolation fault

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: Nil

HI PHYSIX LABORATORY INDIA PVT. L...

IS 16221 (PART 2):2015			
Clause	**Requirement + Test**	**Result - Remark**	**Verdict**

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:

- **ThetouchcurrentmeasurementcircuitofIEC60990, Figure 4 is connected from each terminal of the array to ground, one at a time.**

4.8.3.3	TABLE: Fire hazard residual current type test for isolated inverters		N/A
Condition		**Current (mA)**	**Limit (300mA or 10mA per kVA)**
DC+ to PE		---	---
DC- to PE		---	---

Supplementary information:

HI PHYSIX LABORATORY INDIA PVT. L

IS 16221 (PART 2):2015			
Clause	**Requirement + Test**	**Result - Remark**	**Verdict**

4.8.3.5	**TABLE: Protection by residual current monitoring**	**P**
Test conditions:	Output power (W) : 6000 Input voltage (V_{DC}):360 Frequency (Hz): 50 Output AC Voltage (V_{AC}): 230.0	

4.8.3.5.2	**Test for detection of excessive continuous residual current**	**P**

Fault Current (mA)		**Disconnection time (ms)**	
Measured Fault Current	**Limit 300mA for output power ≤30 kVA 10mA per kVA for output power > 30 kVA**	**Measured Disconnection time**	**Limit**
+ PV to N:			
220	300	173	300
218	300	180	300
222	300	175	300
233	300	183	300
225	300	188	300
- PV to N:			
226	300	170	300
230	300	166	300
229	300	164	300
228	300	160	300
227	300	168	300

Note:

– maximum 300mA for inverters with continuous output power rating ≤30kVA;
– maximum 10mA per kVA of rated continuous output power for inverters with continuous output power rating > 30kVA.

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: Nil

HI PHYSIX LABORATORY INDIA PVT. L

IS 16221 (PART 2):2015			
Clause	**Requirement + Test**	**Result - Remark**	**Verdict**

4.8.3.5.3	TABLE: Test for detection of sudden changes in residual current	P
	+PV to N	
Limit (mA)	**U_N Disconnection time (ms)**	**Limit (ms)**
30	185	300
30	180	300
30	183	300
30	179	300
30	178	300
60	100	150
60	103	150
60	99	150
60	101	150
60	105	150
150	30	40
150	20	40
150	28	40
150	24	40
150	26	40
	-PV to N	
Limit (mA)	**U_N Disconnection time (ms)**	**Limit (ms)**
30	182	300
30	176	300
30	190	300
30	187	300
30	195	300
60	93	150
60	86	150
60	92	150
60	98	150
60	100	150

HI PHYSIX LABORATORY INDIA PVT. L...

IS 16221 (PART 2):2015			
Clause	**Requirement + Test**	**Result - Remark**	**Verdict**

150	20	40
150	15	40
150	13	40
150	18	40
150	22	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: Nil

7.3.6.3.3/RD	TABLE: Protective equipotential bonding			P
Measured between	**Test Current (A)**	**Voltage drop (V)**	**Resistance (mΩ)**	**Result**
Earth terminal to metal screw (nearest distance)	80	0.55	6.88	No melting, No loosening, No damage
Earth terminal to metal screw (longest distance)	80	0.56	7.00	No melting, No loosening, No damage

Supplementary information: Nil

7.3.6.3.7/RD	TABLE: Touch current measurement		P
Measured between	**Measured (mA)**	**Limiit (mA)**	**Comments/Conditions**
External protective earthing conductor and earthing terminal of PCE	1.50	3.5	---

Supplementary information: Nil

HI PHYSIX LABORATORY INDIA PVT. L
Technical Manager

IS 16221 (PART 2):2015			
Clause	**Requirement + Test**	**Result - Remark**	**Verdict**

7.3.7/RD	TABLE: Clearance and creepage measurements						P
Measured between	**Up (V)**	**U r.m.s (V)**	**Require d cl (mm)**	**cl (mm)**	**Required cr (mm)**	**Cr (mm)**	
PV1+ to ground across capacitor (C237) (BI)	600	---	3.42	5.72	3.42	5.72	
PV1+ to PV- (FI)	600	---	3.42	4.56	3.42	4.56	
AC mains terminal to ground (BI)	326	230	3.42	5.90	3.42	5.90	
Terminal GL to Terminal GN (FI)	326	230	3.42	6.93	3.42	6.93	
Optocoupler (U37) Primary to secondary on PCB (RI)	600	---	6.27	7.89	6.27	7.89	
Supplementary information: BI: Basic insulation, RI: Reinforced insulation							

7.3.7/RD	TABLE: Distance through insulation measurement				P
Distance through insulation	**U r.m.s (V)**	**Test volatge (V)**	**Required di (mm)**	**Di (mm)**	
Transformer insulation tape	230.0	3000	0.2	>0.2	
Supplementary information: Nil					

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**	
PV input terminal to PE (BI)	1500	4000	---	Pass	
AC mains terminal to PE (BI)	1500	4000	---	Pass	
PV terminal to communication port (RI)	3000	6000	---	Pass	
AC mains terminal to communication port (RI)	3000	6000	---	Pass	
Supplementary information: BI: Basic insulation, RI: Reinforced insulation					

HI PHYSIX LABORATORY INDIA PVT. L...

IS 16221 (PART 2):2015			
Clause	**Requirement + Test**	**Result - Remark**	**Verdict**

9.2/RD	TABLE: Limited power sources	N/A

Circuit output tested

Components	Uoc (V)	Isc (A)		VA
		Meas.	Limit	
---	---	---	---	---

Supplementary information:

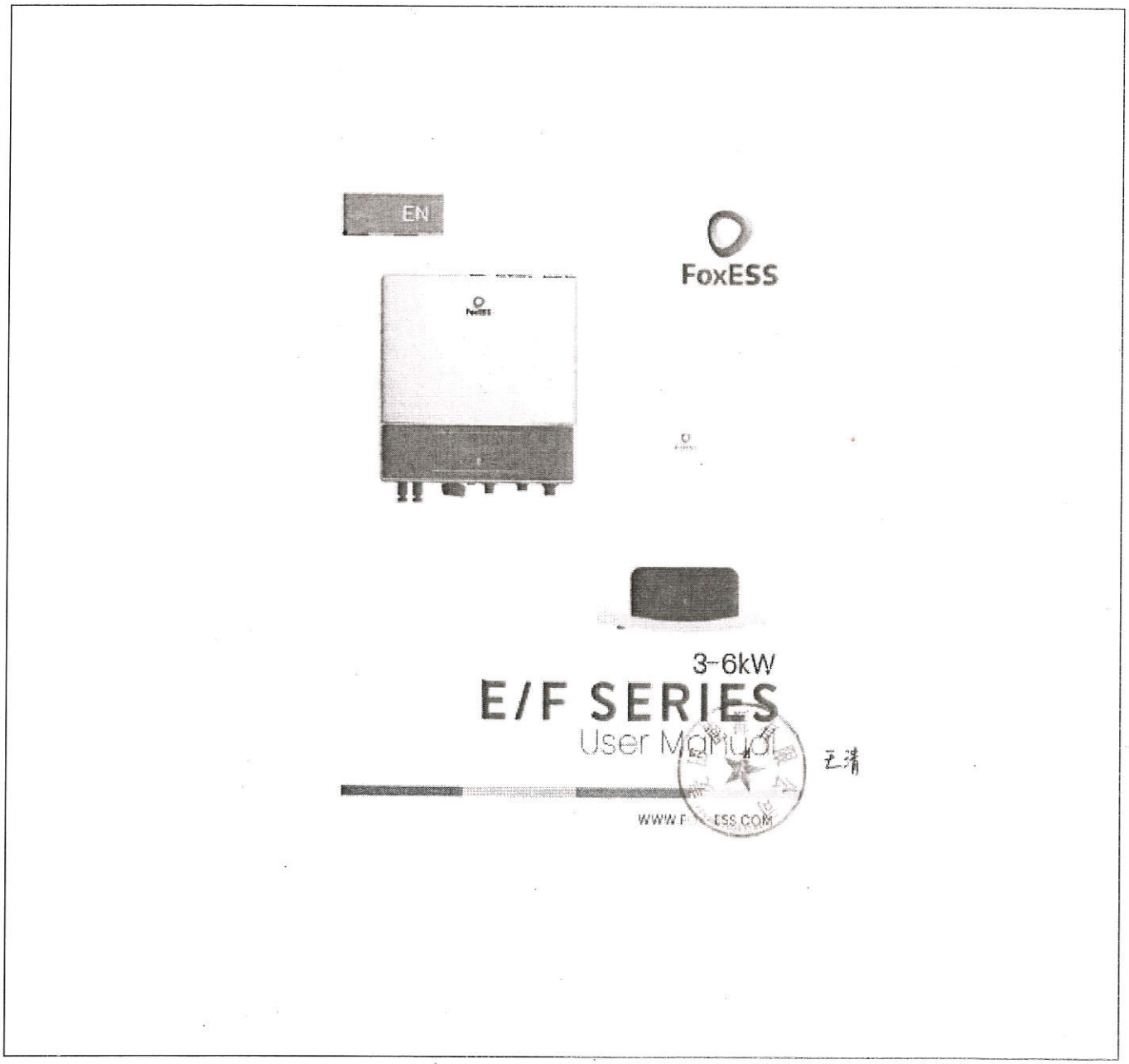
HI PHYSIX LABORATORY INDIA PVT. L

Senior Technical Manager

IS 16221 (PART 2):2015			
Clause	**Requirement + Test**	**Result - Remark**	**Verdict**

Appendix A

USER MANUAL



HI PHYSIX LABORATORY INDIA PVT. L

Abhijeet Pathak
(Technical Manager)

IS 16221 (PART 2):2015			
Clause	**Requirement + Test**	**Result - Remark**	**Verdict**

Table of Contents

HI PHYSIX LABORATORY INDIA PVT. L

(Chief Technical Manager)

IS 16221 (PART 2):2015			
Clause	**Requirement + Test**	**Result - Remark**	**Verdict**

1. Important Notes

1.1 Scope

This manual describes the assembly, installation, commissioning, maintenance and troubleshooting of the following model(s) of FoxESS products:

E Series:

E3000 E3600 E4600
E5000 E5300+ E6000

P Series:

P3000 P3600 P4600
P5000 P5300+ P6000

Note: Please keep this manual where it will be accessible at all times.
+India only

1.2 TargetGroup

This manual is for qualified personnel only. The tasks described in this manual will need to be performed by professional, suitably qualified technicians only.

1.3 Symbols Used

The following types of safety instructions and general information appear in the document as described below:

Danger!
"Danger" indicates a hazardous situation which, if not avoided, will result in death or serious injury.

Warning!
"Warning" indicates a hazardous situation which, if not avoided, could result in death or serious injury.

Caution!
"Caution" indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

Note!
"Note" provides important tips and guidance.

1.4 Symbols Explanation

This section explains the symbols shown on the inverter and on the type label:

Symbols	Explanation
CE	Symbol Explanation CE mark. The inverter complies with the requirements of the applicable CE guidelines.

HI PHYSIX LABORATORY INDIA PVT. LTD.
(Chief Technical Manager)

IS 16221 (PART 2):2015			
Clause	**Requirement + Test**	**Result - Remark**	**Verdict**

Beware of hot surface. The inverter can become hot during operation. Avoid contact during operation.

Danger of high voltages.
Danger to life due to high voltages in the inverter!

Danger
Risk of electric shock!

Danger to life due to high voltage.
There is residual voltage in the inverter which needs 5 min to discharge.
Wait 5 min before you open the upper lid or the DC lid.

TUV certification

Read the manual

Product should not be disposed as household waste

The E Series and F Series inverter is designed and tested in accordance with international safety requirements. However, certain safety precautions must be taken when installing and operating the inverter. The installer must read and follow all instructions, cautions and warnings in the installation manual.

* All operations including transport, installation, start-up and maintenance, must be carried out by qualified, trained personnel.
* The electrical installation & maintenance of the inverter shall be conducted by a licensed electrician and shall comply with local wiring rules and regulations.
* Before installation, check the unit to ensure it is free of any transport or handling damage, which could affect insulation integrity or safety clearances. Choose the installation location carefully and adhere to specified cooling requirements. Unauthorized removal of necessary protections, improper use, incorrect installation and operation may lead to serious safety and shock hazards or equipment damage.
* Before connecting the inverter to the power distribution grid, contact the local power distribution grid company to get appropriate approvals. This connection must be made only by qualified technical personnel.
* Do not install the equipment in adverse environmental conditions such as in close proximity to flammable or explosive substances, in a corrosive environment, where there is exposure to extreme high or low temperatures, or where humidity is high.
* Do not use the equipment when the safety devices do not work or are disabled.
* Use personal protective equipment, including gloves and eye protection during the installation.
* Inform the manufacturer about non-standard installation conditions.

Page | 3

IS 16221 (PART 2):2015			
Clause	**Requirement + Test**	**Result - Remark**	**Verdict**

- Do not use the equipment if any operating anomalies are found. Avoid temporary repairs.
- All repairs should be carried out using only approved spare parts, which must be installed in accordance with their intended use and by a licensed contractor or authorized Fox-ESS service representative.
- Liabilities arising from commercial components are delegated to their respective manufacturers.
- Any time the inverter has been disconnected from the public network, please be extremely cautious as some components can retain charge sufficient to create a shock hazard. Prior to touching any part of the inverter please ensure surfaces and equipment are under touch-safe temperatures and voltage potentials before proceeding.

2.2 PE Connection and Leakage Current

- The end-use application shall monitor the protective conductor by residual current operated protective device (RCD) with rated fault current 3I≤ 280mA which automatically disconnects the device in case of a fault.
- DC differential currents are created (caused by insulation resistance and through capacitor of the PV generator). In order to prevent unwanted triggering during operation, the rated residual current of the RCD has to be min 240mA. The device is intended to connect to a PV generator with a capacitance limit of approx. 700nF.

WARNING!

High leakage current! Earth connection essential before connecting supply.

- Incorrect grounding can cause physical injury, death or equipment malfunction and increase electromagnetic interference.
- Make sure this grounding conductor is adequately sized as required by safety regulations.
- Do not connect the ground terminals of the unit in series in case of a multiple installation. This product can cause current with a DC component. Where a residual current operated protective device (RCD) or monitoring device (RCM) is used for protection in case of direct or indirect contact, only an RCD or RCM of type B is allowed on the supply side of this product.

For UK

- The installation that connects the equipment to the supply terminals shall comply with the requirements of BS 7671.
- Electrical installation of PV system shall comply with requirements of BS 7671 and IEC 60634-7-712.
- No protection settings can be altered.
- User shall ensure that the equipment is so installed, designed and operated to maintain at all times compliance with requirements of ESQCR22(1)(a).

For AU

Electrical installation and maintenance shall be conducted by licensed electrician and shall comply with Australia National Wiring Rules.

2.3 Surge protection devices (SPDs) for PV installation

WARNING!

Over-voltage protection with surge arresters should be provided when the PV power system is

PV Series User Manual www.fox-ess.com Page | 4

HI PHYSIX LABORATORY INDIA PVT. L...

(Senior Technical Manager)

IS 16221 (PART 2):2015			
Clause	**Requirement + Test**	**Result - Remark**	**Verdict**

installed. The grid connected inverter is not fitted with SPDs in both PV input side and mains side.

Lightning will cause damage either from a direct strike or from surges due to a nearby strike.

Induced surges are the most likely cause of lightning damage in majority of installations, especially in rural areas where electricity is usually provided by long overhead lines. Surges may impact on both the PV array conductors and the AC cables leading to the building. Specialists in lightning protection should be consulted during the grid use application. Using appropriate external lightning protection, the effect of a direct lightning strike into a building can be mitigated in a controlled way, and the lightning current can be discharged into the ground.

Installation of SPDs to protect the inverter against mechanical damage and excessive stress include a surge arrester in case of a building with external lightning protection system (LPS) when separation distance is kept. To protect the DC system, surge suppression device (SPD type2) should be fitted at the inverter and of the DC cabling and at the array located between the inverter and the PV generator, if the voltage protection level (VP) of the surge arresters is greater than 1100V, an additional SPD type 3 is required for surge protection for electrical devices.

To protect the AC system, surge suppression devices (SPD type2) should be fitted at the main incoming point of AC supply (at the consumer's cutout) located between the inverter and the meter/distribution system. SPD (test impulse D1) for signal line according to EN 61643-1. All DC cables should be installed to provide as short a run as possible, and positive and negative cables of the string or main DC supply should be bundled together.

Avoiding the creation of loops in the system. This requirement for short runs and bundling includes any associated earth bonding conductors. Spark gap devices are not suitable to be used in DC circuits since conducting they won't stop conducting until the voltage across their terminals is typically below 30 volts.

3. About Product

3.1 About E Series and F Series Inverter

EP series inverters cover 3kW systems up to 6kW and are integrated with 2 MPP trackers with high efficiency and reliability.

3.2 Basic Features

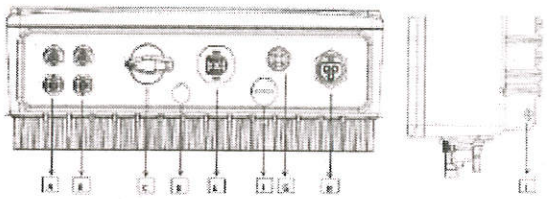
- Advanced DSP control technology;
- Utilizes the latest high-efficiency power components;
- Optimal MPPT technology;
- Two independent MPP trackers
- Wide MPPT input range
- Advanced anti-islanding solutions
- IP65 protection level
- Max. Efficiency up to 97.4%, EU efficiency up to 96.8%, THD<3%
- Safety & Reliability: transformerless design with software and hardware protection
- Export limitation (CT/Meter/DRM/RESTOP)

HI PHYSIX LABORATORY INDIA PVT. L
Ashutosh pathak
(Chief Technical Manager)

IS 16221 (PART 2):2015			
Clause	**Requirement + Test**	**Result - Remark**	**Verdict**

- Power factor regulation: Friendly HMI
- LED status indications
- LCD display technical data, human- machine interaction through touch key
- PC remote control
- Upgrade through USB interface

3.3 Terminals Introduction



Item	Description
A	DC Connector
B	DC Connector
C	DC Switch (Optional)
D	Waterproof Lock Valve
E	Communication Port
F	USB Port (For Upgrade)
G	WiFi/GPRS/LAN (Optional)
H	AC Connector
I	Grounding Screw

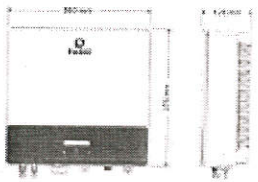
Note: Only authorized personnel are permitted to set the connection.

HI PHYSIX LABORATORY INDIA PVT. L...
Ashutosh pathak
(Chief Technical Manager)

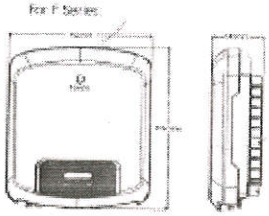
IS 16221 (PART 2):2015			
Clause	**Requirement + Test**	**Result - Remark**	**Verdict**

3.4 Dimension

For E Series:



For F Series:



4. Technical Data

4.1 DC Input

Model	E3000 F3000	E3600 F3600	E4600 F4600	E5000 F5000	E5300* F5300*	E6000 F6000
Max. recommended DC power [W]	3900	4680	5980	6500	6850	7800
Max. DC voltage [V]	600	600	600	600	600	600
Nominal DC operating voltage[V]	360	360	360	360	360	360
MPPT voltage range [V]	80-550	80-550	80-550	80-550	80-550	80-550
MPPT voltage range @ full load [V]	130 -550	150 -550	200 -550	210 -550	250 -550	250 -550
Max. input current [A]	12.5/12.5	12.5/12.5	12.5/12.5	12.5/12.5	12.5/12.5	12.5/12.5
Max. short circuit current [A]	15/15	15/15	15/15	15/15	15/15	15/15
Max. inverter backfeed current to the array (mA)	0					
Start output voltage [V]	120	120	120	120	120	120
No. of MPP trackers	2	2	2	2	2	2
Strings per MPP tracker	1	1	1	1	1	1
DC Switch	Optional					

4.2 AC Output

Model	E3000 F3000	E3600 F3600	E4600 F4600	E5000 F5000	E5300* F5300*	E6000 F6000
Rated output power [W]	3000	3600	4600	5000	5300	6000
Max. apparent AC power [VA]	3300	3960	5060	5500	5830	6000
Rated grid voltage and range [V]	220/230/240					
Rated AC frequency and range [Hz]	50 /60					
AC nominal current [A]	13	15.7	20	21.7	23.0	26.1
Max. output fault current [A]	14.3	17.2	22	23.9	25.3	26.1
Inrush current	25.2A, 1.75ms					
THD	<3%					

HI PHYSIX LABORATORY INDIA PVT. L
(Chief Technical Manager)

IS 16221 (PART 2):2015			
Clause	**Requirement + Test**	**Result - Remark**	**Verdict**

Displacement power factor	1 (Adjustable from 0.8 leading to 0.8 lagging)
Feed in phase	Single phase
Over voltage category	PV: OVC II Mains: OVC III

4.3 Efficiency, Safety and Protection

Model	E3000 F3000	E3600 F3600	E4600 F4600	E5000 F5000	E5300* F5300*	E6000 F6000
Max. MPPT efficiency	98.00%	98.00%	98.00%	98.00%	98.00%	98.00%
Euro efficiency	96.80%	96.80%	96.80%	96.80%	96.80%	96.80%
Max. efficiency	97.40%	97.40%	97.40%	97.40%	97.40%	97.40%
Safety & Protection						
DC Reverse-polarity protection	YES					
Insulation monitoring	YES					
DC injection monitoring	YES					
AC Short-circuit protection	YES					
Residual current detection	YES					
Anti-islanding protection	YES					
AC Output overcurrent protection	YES					
AC Output overvoltage protection	YES					

4.4 General Data

Model	E3000 F3000	E3600 F3600	E4600 F4600	E5000 F5000	E5300* F5300*	E6000 F6000
Dimension (W/H/D)(mm)	360×370×128 (E series) 402×476.5×148 (F series)					
Net weight (kg)	13.5 (E series) 15.5 (F series)					
Installation	Wall-mounted					
Operating temperature range (°C)	-20...+60 (derating at 45)					
Storage temperature (°C)	-40...+70					
Storage/Operation relative humidity	0%~100%, no condensation					
Max. Operating Altitude	3000m (derating when >2000m)					
Ingress Protection	IP65 (for outdoor use)					
Isolation type	Transformerless					
Protective Class	I					
Night-time consumption	<1W					
Pollution Degree	II					
cooling	Natural					
Noise level	<30dB					
Monitoring Module(optional)	External WiFi/GPRS					
Communication	Meter/CT/DRM/USB update/RS485					

*India market only.

HI PHYSIX LABORATORY INDIA PVT. L...

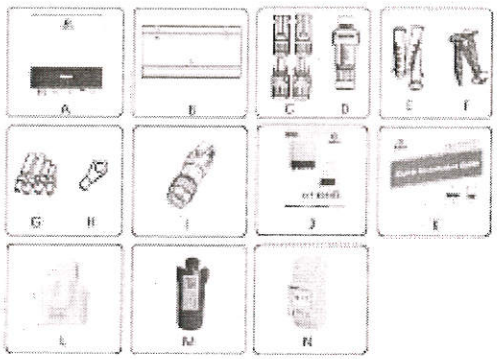
(Senior Technical Manager)

IS 16221 (PART 2):2015			
Clause	**Requirement + Test**	**Result - Remark**	**Verdict**

5. Installation

5.1 Packing List

Please un-pack the box, check and make sure you received all items as listed below before installation (excluding optional items)



Object	Quantity	Description	Object	Quantity	Description
A	1	Inverter	I	1	Communication connector
B	1	Bracket	J	1	Product manual
C	4	DC connector (F/M)	K	1	Quick installation guide
D	1	AC connector	L	1	CT (Optional)
E	3	Expansion tube	M	1	WiFi/Lan/GPRS (Optional)
F	3	Expansion screw	N	1	Meter (Optional)
G	4	DC pin contact (2=positive, 2=negative)			
H	1	Earth terminal			

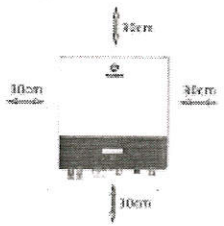
5.2 Preparation

- Please refer to the Technical Data to make sure the environmental conditions fit the inverter's requirements (degree of protection, temperature, humidity, altitude, etc.)
- Please avoid direct sunlight, rain exposure and snow build-up during installation and operation.
- To avoid overheating, always make sure the air flow around the inverter is not blocked.
- Do not install in places where gas or flammable substances may be present.
- Avoid electromagnetic interference that can compromise the correct operation of electronic equipment.
- The slope of the wall should be within ±5°.

HI PHYSIX LABORATORY INDIA PVT. L...
(Senior Technical Manager)

IS 16221 (PART 2):2015			
Clause	**Requirement + Test**	**Result - Remark**	**Verdict**

5.3 Installation Space Required



Position	Min Size
Left	30cm
Right	30cm
Top	30cm
Bottom	30cm
Front	30cm

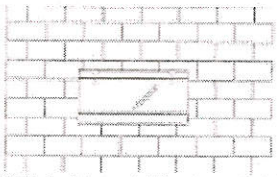
5.4 Tools Required

- Manual wrench;
- Electric drill (drill bit set 8mm);
- Crimping pliers;
- Stripping pliers;
- Screwdriver.

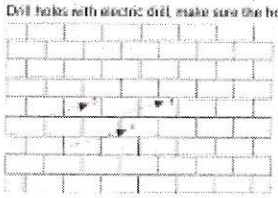
5.5 Installation Steps

Step 1:Fix the bracket on the wall

➢ Choose the place you want to install the inverter. Place the bracket on the wall and mark the position of the 5 holes from bracket.



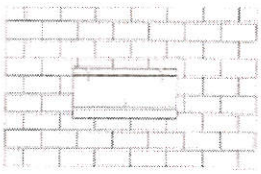
➢ Drill holes with electric drill, make sure the holes are at least 60mm deep, and then tighten the expansion tubes.



HI PHYSIX LABORATORY INDIA PVT. LTD.
Authorised Signatory
(Chief Technical Manager)

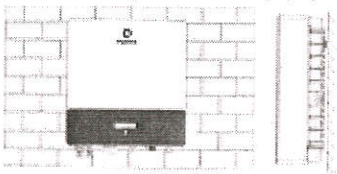
IS 16221 (PART 2):2015			
Clause	**Requirement + Test**	**Result - Remark**	**Verdict**

- Insert the expansion tubes into the holes and tighten them. Install the bracket with the expansion screws.



Step 2: Match the inverter with wall bracket

- Hang the inverter over the bracket, slightly lower the inverter, and make sure the 2 mounting bars on the back are fixed with the 2 grooves from bracket properly.



5.6 Wiring Steps

Step 1:PV String Connection

EVF series inverters can be connected with 2 strings of PV modules. Please select suitable PV modules with high reliability and quality. Open circuit voltage of module array connected should be less than 600V, and operating voltage should be within the MPPT voltage range.

Note

Please choose a suitable external DC switch if the inverter does not have a built-in DC switch.

Warning!

PV module voltage is very high and within a dangerous voltage range, please comply with the electric safety rules when connecting.

Warning

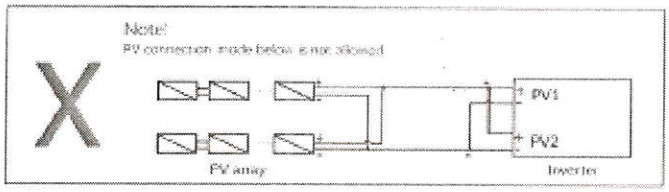
Please do not make PV positive or negative to ground!

Note!

PV modules – please ensure they are the same type, have the same output and specifications, are aligned identically, and are tilted to the same angle. In order to save cable and reduce DC loss, we recommend installing the inverter as near to the PV modules as possible.

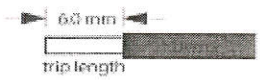
HI PHYSIX LABORATORY INDIA PVT. L...
Ashutosh pathak
(Chief Technical Manager)

IS 16221 (PART 2):2015			
Clause	**Requirement + Test**	**Result - Remark**	**Verdict**

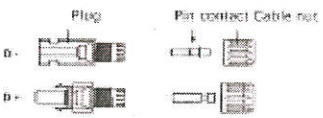


Step 2:DC Wiring

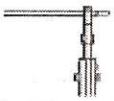
- Turn off the DC switch.
- Choose 12 AWG wire to connect the PV module.
- Trim 6mm of insulation from the wire end.



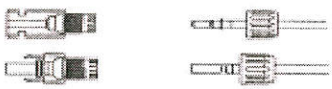
- Separate the DC connector as below.



- Insert striped cable into pin contact and ensure all conductor strands are captured in the pin contact.
- Crimp pin contact by using a crimping plier. Put the pin contact with striped cable into the corresponding crimping pliers and crimp the contact.



- Insert pin contact through the cable nut to assemble into back of the male or female plug. When you feel or hear a "click" the pin contact assembly is seated correctly.



- Unlock the DC connector
  - Use the specified wrench tool.
  - When separating the DC+ connector, push the tool down from the top.
  - When separating the DC - connector, push the tool down from the bottom.
  - Separate the connectors by hand.
- Grid Connection

  E/F series inverters are designed for single-phase grid. Voltage range is 220/230/240V, frequency is 50/60Hz.

E/F Series User Manual www.ss-mps.com Page | 12

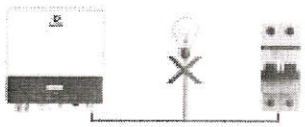
HI PHYSIX LABORATORY INDIA PVT. L...
(Chief Technical Manager)

IS 16221 (PART 2):2015			
Clause	**Requirement + Test**	**Result - Remark**	**Verdict**

Other technical requests should comply with the requirement of the local public grid.

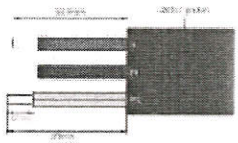
Model	E3000 F3000	E3600 F3600	E4600 F4600	E5000 F5000	E5300 F5300	E6000 F6000
Cable	4mm²	4mm²	6mm²	6mm²	6mm²	6mm²
Micro-Breaker	25A	25A	40A	40A	40A	40A

Note: A micro- breaker should be installed between inverter and grid; any load SHOULD NOT be connected with the inverter directly.



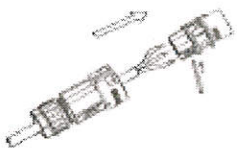
Step3: AC Wiring

- Check the grid voltage and compare with the permitted voltage range (refer to technical data).
- Disconnect the circuit-breaker from all the phases and secure against re-connection.
- Trim the wires:
  - Trim all the wires to 52.5mm and the PE wire to 55mm.
  - Use the crimping pliers to trim 12mm of insulation from all wire ends as below.



- Separate the AC plug into three parts as below:
  - Hold the middle part of the female insert, rotate the back shell to loosen it, and detach it from female insert.
  - Remove the cable nut (with rubber insert) from the back shell.

- Slide the cable nut and then the back shell onto the cable.

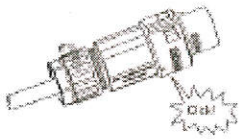


HI PHYSEX LABORATORY INDIA PVT. L

(Senior Technical Manager)

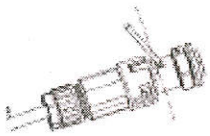
IS 16221 (PART 2):2015			
Clause	**Requirement + Test**	**Result - Remark**	**Verdict**

➢ Push the threaded sleeve into the socket, tighten up the cap on the terminal



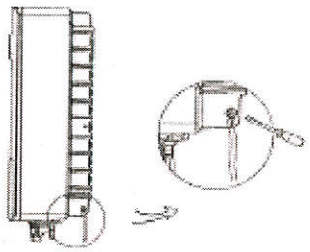
➢ Push the threaded sleeve to connection terminal until both are locked tightly on the inverter

➢ Remove the AC connector, press the bayo-nut out of the slot with a small screwdriver or the unlock tool and pull it out, or unscrew the threaded sleeve, then pull it out.



5.7 Earth Connection

Screw the ground screw with screwdriver as shown below.



5.8 Communication Device Installation (Optional)

This E/F Series inverter is available with multiple communication options such as WiFi, LAN, GPRS, RS485, Meter, and USB with an external device.

Operating information like output voltage, current, frequency, fault information, etc. can be monitored locally or remotely via these interfaces.

E/F Series User Manual www.ice-ev.com Page | 14

HI PHYSIX LABORATORY INDIA PVT. L

Santosh gorhak
(Senior Technical Manager)

IS 16221 (PART 2):2015			
Clause	**Requirement + Test**	**Result - Remark**	**Verdict**

➢ WiFi/LAN/GPRS (Optional)

The inverter has an interface for WiFi/LAN/GPRS devices that allow the device to collect information from inverter, including inverter working status, performance etc., and update that information to monitoring platform. the WiFi/Lan/GPRS device is available to purchase from your local supplier.

Connection steps:

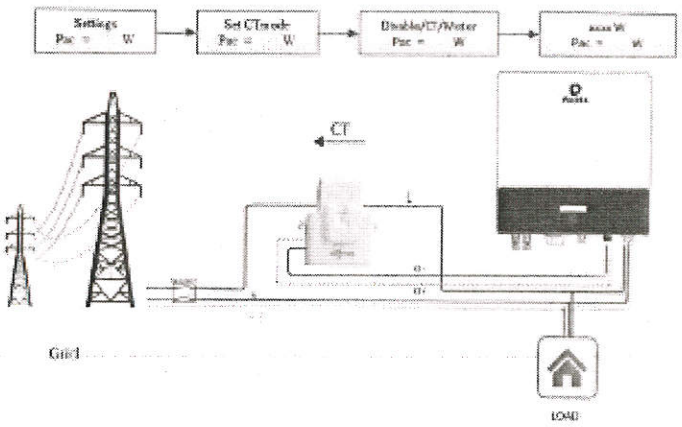
1. For GPRS device: Please insert the SIM Card (please refer to the GPRS product manual for more details)
2. For LAN device: please complete the wiring between router and LAN device (please refer to the LAN product manual for more details)
3. Plug the WiFi/LAN/GPRS device into "WiFi/GPRS" port at the bottom of the inverter
4. For WiFi device: Connect the WiFi with the local router, and complete the WiFi configuration (please refer to the WiFi product manual for more details)
5. Set-up the site account on the FoxESS monitoring platform (please refer to the monitoring user manual for more details).

➢ CT (optional)

This inverter has an integrated export management function. To enable this function, a power meter or CT must be installed. The CT should be clamped on the main live line of the grid side. The arrow on the CT should be pointing towards the grid. The white cable connects to CT+, and the black cable connects to CT-.

Export limitation setting:

Short press the touch key to switch display or make the number +1. Long press the touch key to confirm your setting.



Note!

For a precise reading and control of power, a meter can be used instead of a CT. If the CT is fitted in the wrong orientation, anti-backflow function will fail.

P/F Series User Manual Version: 1.0 Page | 15

HI PHYSIX LABORATORY INDIA PVT. L
(Chief Technical Manager)

IS 16221 (PART 2):2015			
Clause	**Requirement + Test**	**Result - Remark**	**Verdict**

➢ RS485/Meter

- RS 485

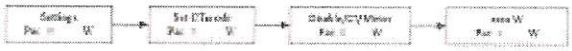
RS485 is a standard communication interface which can transmit the real time data from inverter to PC or other monitoring devices.

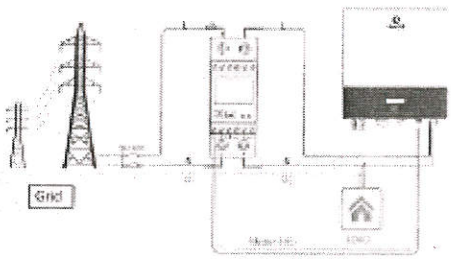
- Meter (optional)

The inverter has integrated export limitation functionality. To use this function, a power meter or a CT must be installed. for Meter installation, please install it on the grid side.

Export limitation setting:

Short press the touch key to switch display or make the Value +1. Long press the touch key to confirm your setting.





➢ DRM0/ESTOP

Model	Socket Asserted by shorting pin		Function
DRM0	5	6	Operate the disconnection device
ESTOP	5	8	Emergency stop the inverter

HI PHYSIX LABORATORY INDIA PVT. LTD.

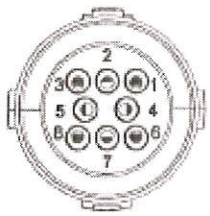
Ashutosh Pathak
(Chief Technical Manager)

IS 16221 (PART 2):2015			
Clause	**Requirement + Test**	**Result - Remark**	**Verdict**

DRM0 setting

Short press the touch key to switch display or make the value+1. Long press the touch key to confirm your setting

The PIN definitions of CT/RS485/DRM0/ESTOP interface are as below:



PIN	1	2	3	4	5	6	7	8
Definition	CT+	CT-	METER 485-	METER 485+	GND	DRM0	NC	ESTOP

➢ Upgrade

The inverter firmware can be updated locally through a U-disk. Please refer to following Steps.

a. Please contact our service support team to get the latest firmware, and copy the files to U-disk using the following file path:

Master: "Update\master\xxxxx_Master_Vxx.xx.hex"

Slave: "Update\slave\xxxxx_Slave_Vxx.xx.hex"

Manager: "Update\manager\xxxxx_manager_Vxx.xx.hex

Note: Vxx.xx is version number

Warning!

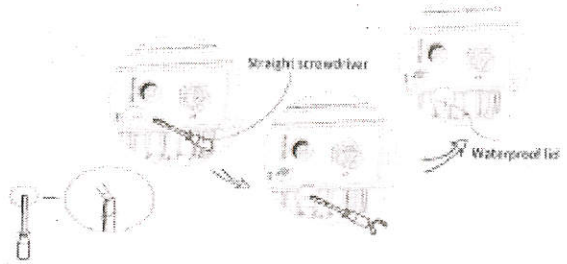
Make sure the directory structure is strictly in accordance with the above. Do not modify the program file name! It may cause the inverter to cease functioning.

b. Make sure the DC switch (if no DC switch, please disconnect the PV connector) is off and the AC is disconnected from the grid. Unscrew the waterproof lid of the USB port using a flat-headed screwdriver as below.

HI PHYSIX LABORATORY INDIA PVT. L

Ashutosh pathak
(Chief Technical Manager)

IS 16221 (PART 2):2015			
Clause	**Requirement + Test**	**Result - Remark**	**Verdict**



c. Wait until the LCD is off, then insert the U-disk and turn on the DC switch or re-connect the PV connector. the LCD will show picture as below.

d. Short press on the button to select the type of firmware you want to upgrade, then long press on the button, the inverter will start the upgrade process automatically.

Note

Make sure you have put the correct file on the U-disk, if you only want to upgrade one chip, simply add the one relevent file onto the U-disk. if you want to upgrade all chips, you need add all files.

e. After the upgrade is complete, please turn off the DC switch or disconnect the PV connector again, then remove the U-disk and insert the waterproof cover.

Warning!

Make sure the input voltage is more than 120V (preferably in good illumination conditions), and do not remove the U-disk during update, otherwise the update may fail. If there is any problem or error during the upgrade, please contact our service team for help.

f. Turn on the DC switch or connect the PV connector to power on the inverter to finish the upgrade process.

- Isolation Fault (For Australia Market Only)
  The Isolation fault alarm is an additional detection, as required by AS 4777.2 and AS/NZS 5033, it will give an "Isolation Fault" alarm and trigger the buzzer once the earth impedance of the PV arrays is less than 100K Ω.
- Reactive Power Control
  The Power Factor can be amended from 0.8 leading to 0.8 lagging to achieve the reactive power control. It can

HI PHYSIX LABORATORY INDIA PVT. LTD.
(Chief Technical Manager)

IS 16221 (PART 2):2015			
Clause	**Requirement + Test**	**Result - Remark**	**Verdict**

be amended via the FoxESS phone application with following steps:

a) Login to your installer account on the phone application.
b) Select the station that needs to be amended.
c) Select the inverter SN that need to be amended from the Device page.
d) Press the 'Setting Params' button.
e) Select the 'Reactive control', and amend the parameters accordingly.

5.9 Inverter Start Up

Please refer to the following steps to start-up the inverter:

a) Check if device is fixed well on the wall.
b) Make sure all DC breakers and AC breakers are disconnected.
c) Ensure AC cable is connected to the grid correctly.
d) All PV panels are connected to inverter correctly. DC connectors that are not used should be sealed by cover.
e) Turn on the external AC and DC connectors.
f) Turn the DC switch to the "ON" position (if equipped with DC switch on the inverter).

If the LED is not green, please check the below:

- All the connections are correct.
- All the external disconnect switches are closed.
- The DC switch of the inverter is in the "ON" position.

Below are the three possible inverter states indicating that the inverter has started up successfully:

Waiting Inverter is waiting to check the DC input voltage from panels is greater than 80V (lowest start-up voltage) but less than 120V (lowest operating voltage), display will indicate the Waiting status and green LED will flash.
Checking Inverter will check DC input environment automatically when DC input voltage from the PV panels exceeds 120V and PV panels have enough energy to start inverter, display will indicate the Checking status and green LED will flash.
Normal Inverter begins to operate normally with green light on. Meanwhile feedback energy to grid. LCD displays present output power.
Note: You can go to the setting interface on the display to follow the instructions if it is the first time to start up.

Note!

Please set-up the inverter if it is the first time to start-up. The above steps are for the regular start-up of the inverter. If it is the first time to start up the inverter, you need to carry-out the initial set-up of the inverter.

Warning!

Power to the unit must be turned on only after installation work has been completed. All electrical connections must be carried out by qualified personnel in accordance with legislation in force in the country of installation.

5.10 Inverter Switch Off

Please follow the below steps to switch off the inverter:

HI PHYSIX LABORATORY INDIA PVT. LTD.
(Chief Technical Manager)

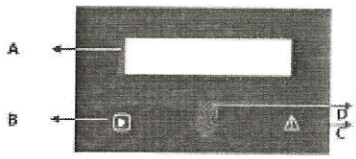
IS 16221 (PART 2):2015			
Clause	**Requirement + Test**	**Result - Remark**	**Verdict**

a) Switch off the inverter AC isolation switch.

b) Switch off the DC isolation switch and allow 5 minutes for the inverter to power down completely.

6. Operation

6.1 Control Panel



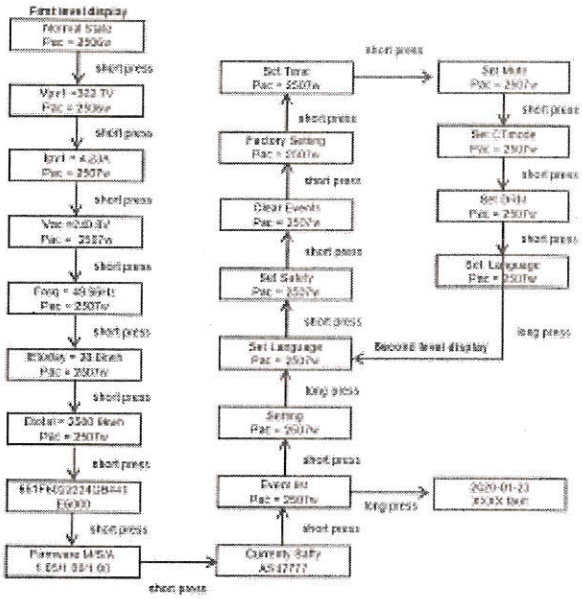
Object	Name	Function
A	LCD Screen	Display the information of the inverter.
B C	Indicator LED	Green: The inverter is in normal state. Red: The inverter is in fault mode.
D	Touch Key	The touch key is used to set the LCD to display different parameters. Press time <1s (short press): Next. Press time >2s(long press): Enter. Wait time 15s: return to start.

HI PHYSIX LABORATORY INDIA PVT. L

(Chief Technical Manager)

IS 16221 (PART 2):2015			
Clause	**Requirement + Test**	**Result - Remark**	**Verdict**

6.2 Function Tree



7. Maintenance

This section contains information and procedures for solving possible problems with the Fox ESS inverters and provides you with troubleshooting tips to identify and solve most problems that can occur.

7.1 Alarm List

Fault Code	Solution
SPS Fault	- Turn off the PV and grid, reconnect them - Please seek for help from us if it does not go back to normal state.
Bus OVP	- Disconnect PV (+), PV (-) with DC. - After the LCD switches off, reconnect and check again. - Please seek for help from us if it does not go back to normal state.

HI PHYSIX LABORATORY INDIA PVT. L...

Authorised Signatory
(Chief Technical Manager)

IS 16221 (PART 2):2015			
Clause	**Requirement + Test**	**Result - Remark**	**Verdict**

Fault Code	Solution
DCI Fault	- Wait for one minute after the inverter reconnects to grid. - Disconnect PV (+), PV (-) with DC. - After the LCD switches off, reconnect and check again. - Please seek for help from us if it does not go back to normal state.
EEPROM Fault	- Disconnect PV (+), PV (-) with DC. - After the LCD switches off, reconnect and check again. - Please seek for help from us if it does not go back to normal state.
GFC fault	- Disconnect DC and AC connector, check the surrounding equipment on the AC side. - Reconnect the input connector and check the state of inverter after troubleshooting. - Please seek for help from us if it does not go back to normal state.
GFCD fault	- Disconnect PV (+), PV (-) with DC. - After the LCD switches off, reconnect and check again. - Please seek for help from us if it does not go back to normal state.
Grid 10Min OVP	- System will reconnect if the grid is back to normal. - Or seek for help from us if it does not go back to normal state.
Grid Freq fault	- Wait for one minute, grid may go back to normal working state. - Make sure that grid voltage and frequency complies with standards. - Or, please seek for help from us.
Grid Lost Fault	- Please check grid-connection, e.g. wires, interface etc. - Checking grid usability. - Or seek for help from us.
VGridTransient Fault	- Disconnect PV (+), PV (-) with DC. - After the LCD switches off, reconnect and check again. - Please seek for help from us if it does not go back to normal state.
Grid voltage fault	- Wait for one minute, grid may go back to normal working state. - Make sure that grid voltage and frequency complies with standards. - Or, please seek for help from us.
Consistent fault	- Disconnect PV (+), PV (-) with DC. - After the LCD switches off, reconnect and check again. - Please seek for help from us if it cannot go back to normal state.
Isolation fault	- Check the impedance among PV (+), PV (-) and ground. Impedance should be >1Mohm. - Please seek for help from us if it cannot be detected or the impedance is <1Mohm.
Ground fault	- Check the voltage of neutral and PE. - Check AC wiring. - Restart inverter, if error message persists, seek for help from us.

HI PHYSIX LABORATORY INDIA PVT. L

(Chief Technical Manager)

IS 16221 (PART 2):2015			
Clause	**Requirement + Test**	**Result - Remark**	**Verdict**

Fault Code	Solution
OCP	- Turn off the PV and grid, reconnect them - Or seek for help from us if it does not go back to normal.
PLL Fault	- System will reconnect if the utility is back to normal - Or seek for help from us if it does not go back to normal state
PV OVP	- Check the panel's open-circuit voltage whether the value is similar or already >550Vdc - Please seek help from us when voltage >550Vdc.
Relay fail	- Disconnect PV (+), PV (-) with DC - After the LCD switches off, reconnect and check again - Please seek for help from us if it does not go back to normal state.
Sample fault	- Disconnect PV (+), PV (-) with DC - After the LCD switches off, reconnect and check again - Please seek for help from us if it cannot go back to normal state
Comm lost	- Disconnect PV+, PV-, reconnect them - Or seek for help from us if it does not go back to normal state.
M8 comm lost	- Disconnect PV (+), PV (-) with DC - After the LCD switches off, reconnect and check again - Please seek for help from us if it cannot go back to normal state.
Over Temp	- Check if the environment temperature is over the limit. - Or seek for help from us.

7.2 Troubleshooting

a. Please check the fault message on the System Control Panel or the fault code on the inverter information panel. If a message is displayed, record it before doing anything further.

b. Attempt the solution indicated in table above.

c. If your inverter information panel is not displaying a fault light, check the following to make sure that the current state of the installation allows for proper operation of the unit:

(1) Is the inverter located in a clean, dry, adequately ventilated place?
(2) Have the DC input breakers opened?
(3) Are the cables adequately sized?
(4) Are the input and output connections and wiring in good condition?
(5) Are the configurations settings correct for your particular installation?
(6) Are the display panel and the communications cable properly connected and undamaged?

Contact FoxESS Customer Service for further assistance. Please be prepared to describe details of your system installation and provide the model and serial number of the unit.

7.3 Routine maintenance

➢ Safety check

A safety check should be performed at least every 12 months by a qualified technician who has adequate training, knowledge and practical experience to perform these tests. The data should be recorded in an equipment log. If the device is not functioning properly or fails any of the tests, the device has to be repaired. For safety check details, refer

FoxESS Smart Hybrid [illegible] Page | 23

HI PHYSIX LABORATORY INDIA PVT. L

(Authorised Technical Manager)

IS 16221 (PART 2):2015			
Clause	**Requirement + Test**	**Result - Remark**	**Verdict**

to section 2 of this manual.

➢ Maintenance checking list

During the process of using the inverter, the responsible person shall examine and maintain the machine regularly. The required actions are as follows.

- ✓ Check that if the cooling fins at the rear of the inverters are collecting dust/dirt, and the machine should be cleaned when necessary. This work should be conducted periodically.
- ✓ Check that if the indicators of the inverter are in normal state, check if the display of the inverter is normal. These checks should be performed at least every 6 months.
- ✓ Check if the input and output wires are damaged or aged. This check should be performed at least every 6 months.
- ✓ Get the inverter panels cleaned and their security checked at least every 6 months.

Note: Only qualified individuals may perform the following works.

8. Decommissioning

8.1 Dismantling the Inverter

- Disconnect the inverter from DC input and AC output. Wait for 5 minutes for the inverter to fully de-energize.
- Disconnect communication and optional connection wirings. Remove the inverter from the brackets.
- Remove the bracket if necessary.

8.2 Packaging

If possible, please pack the inverter with the original packaging. If it is no longer available, you can also use an equivalent box that meets the following requirements.

- Suitable for loads more than 20 kg.
- Contains a handle.
- Can be fully closed.

8.3 Storage and Transportation

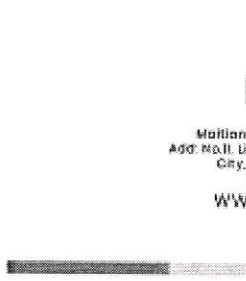
Store the inverter in dry place where ambient temperatures are always between -40°C ~ + 70°C.

Take care of the inverter during the storage and transportation; keep less than 4 cartons in one stack.

When the inverter or other related components need to be disposed of, please ensure it is carried out according to local waste handling regulations. Please be sure to deliver any inverter that needs to be disposed from sites that are appropriate for the disposal in accordance with local regulations.

HI PHYSIX LABORATORY INDIA PVT. L...
Authorised signatory
(Senior Technical Manager)

IS 16221 (PART 2):2015			
Clause	**Requirement + Test**	**Result - Remark**	**Verdict**



HI PHYSIX LABORATORY INDIA PVT. L

(Senior Technical Manager)

IS 16221 (PART 2):2015			
Clause	**Requirement + Test**	**Result - Remark**	**Verdict**

Appendix B

14	TABLE: List of critical components				P
Object/part no.	Manufacturer/ trademark	Type/model	Technical data	Standard	Mark(s) of conformity [1]
Whole Unit					
Metal enclosure	Jiaxing ZLIA Electric Co. LTD	ADC12	370*360*120mm	IS 16221 (Part 2):2015/ IEC 62109-2:2011	Tested with equipment
PV connector	Dongguan Vaconn Electronic Technology Co., Ltd.	VP-D4B-PHSMO-N VP-D4B-PHSFO-N	-40~85℃ 1100Vdc	IEC 62852:2014	TUV Rh. (R 50396796)
Internal wire connected to (PV connector)	SHENZHEN WOER HEAT-SHRINKABLE MATERIAL CO LTD	1015	105°C, 600V	UL 758 (IEC Standard not available)	UL (E227566)
AC connector	Dongguan Vaconn Electronic Technology Co.,	VPAC03EP-3P5-00	-40~85℃ 500Vac	EN 61984:2009 (Harmonized with IEC 61984)	TUV Rh. (R 50235418)
Internal wire connected to (AC connector)	SHENZHEN WOER HEAT-SHRINKABLE MATERIAL CO	1015	105°C, 600V	UL 758 (IEC Standard not available)	UL (E227566)
DC Load Switch	Santon International BV	XBE+3310/6	1000V, 8A	EN 60947-3:2009+A1+A2 (Harmonized with IEC 60947-3)	TUV Rh. (R 50423069)
Internal wire connected to (DC Switch)	SHENZHEN WOER HEAT-SHRINKABLE MATERIAL CO LTD	1015	105°C, 600V	UL 758 (IEC Standard not available)	UL (E227566)
Boost inductor	HUIZHOU INDUCTANCE ELECTRONIC TECHNOLOGY CO.,LTD	T305-13497A	1mH 130℃	IS 16221 (Part 2):2015/IEC 62109-2:2011	Tested with equipment
Internal wire (To boost inductor)	GUANGDONG HAERKN NEW ENERGY CO LTD	1015	105°C, 600V	UL 758 (IEC Standard not available)	UL (E300956)

HI PHYSIX LABORATORY INDIA PVT. LTD.

Ashutosh Pathak
(Chief Technical Manager)

IS 16221 (PART 2):2015			
Clause	**Requirement + Test**	**Result - Remark**	**Verdict**

(20-011-10001-00) Board					
PCB	ZHEJIANG JUNHAO ELECTRONICS CO., LTD	JH-1	V-0, 130°C	UL 796 (IEC standard not available)	UL (E250425)
Transformer (TX1)	BO LUO DA XIN ELECTRONIC CO.,LTD	KB2341-26813	1.11mH 155℃	IS 16221 (Part 2):2015/ IEC 62109-2:2011	Tested with equipment
Transformer (TX2)	BO LUO DA XIN ELECTRONIC CO.,LTD	KB2341-26838	1.0mH 155℃	IS 16221 (Part 2):2015/ IEC 62109-2:2011	Tested with equipment
Transformer (TX3)	BO LUO DA XIN ELECTRONIC CO.,LTD	KB2341-26879	≥1.6mH 155℃	IS 16221 (Part 2):2015/ IEC 62109-2:2011	Tested with equipment
Inductor (L1)	BO LUO DA XIN ELECTRONIC CO.,LTD	HX2341-DX2063	130℃	IS 16221 (Part 2):2015/ IEC 62109-2:2011	Tested with equipment
Inductor (L2)	BO LUO DA XIN ELECTRONIC CO.,LTD	HX2341-DX2058	1.58mH	IS 16221 (Part 2):2015/ IEC 62109-2:2011	Tested with equipment
Inductor (L12)	BO LUO DA XIN ELECTRONIC CO.,LTD	HX2341-DX2059	0.6mH	IS 16221 (Part 2):2015/ IEC 62109-2:2011	Tested with equipment
Relay (RY5, RY6)	Xiamen Hongfa Electroacoustic Co., Ltd.	HFD3-VI/12	2A, 30VDC	IEC 61810-1:2015	TUV Rheinland (R 50433438)
Relay (RY1, RY2, RY3, RY4)	Xiamen Hongfa Electroacoustic Co., Ltd.	HF161F-W	31A, 250VAC	IEC 61810-1:2015	VDE (40031410)
Optocoupler (U10,U22, U34,U35,U36U 37)	Fairchild Semiconductor Pte Ltd	A817	Maximum Input current: 400mA, Cr: ≥7.0mm, Cl: ≥7.0mm, Operating temperature: -55 to 115°C	IEC 60747-5-5: 2007/ AMD1 :2013	VDE (40026857)
Capacitor (C20, C32, C138, C201, C204, C217,C228, C237,C238)	Xiamen Faratronic	MKP63	300V, 4700pF	EN 60384-14: 2013 +A1(Harmonized with IEC 61071)	ENEC-SEMKO (0366-2D)
Capacitor (C18, C30)	Xiamen Faratronic	MKP63	300V, 33nF	EN 60384-14: 2013 +A1(Harmonized with IEC 61071)	ENEC-SEMKO (0366-2D)

HI PHYSIX LABORATORY INDIA PVT. L

A. Ganesh Pandey
(Chief Technical Manager)

IS 16221 (PART 2):2015			
Clause	**Requirement + Test**	**Result - Remark**	**Verdict**

Capacitor (C208, C230)	Xiamen Faratronic Co., Ltd.	C3D	800VDC, 10 µF	IEC 61071:2007	TÜV Rheinland (AN 50267748)
Capacitor (C167)	Xiamen Faratronic Co., Ltd.	C6A	8.0 µF, 350VAC, 40/85/56	IEC 61071:2007 IEC 61881-1:2010	TUV Rheinland (R 50266136)
Capacitor (C25)	Xiamen Faratronic	C4B	350V, 1.5µF	EN 61071:2007 (Harmonized with IEC 61071)	ENEC-SEMKO (0366-6B)
Current transducer (HCT1)	LEM SWITZERLAND S A	HLSR32-P	32A	UL 508 (Harmonized IEC standard not available)	UL (E189713)
Varistor (MOV1, MOV2, MOV3, MOV4, MOV5, MOV6, MOV7	Brightking (Shenzhen) Co., Ltd.	561KD10	560V, Withstanding Surge Current: I (A) Standard: 2500, I (A) High Surge: 3500	IEC 61051-2:1991/AMD1:2009	VDE (40027827)
DIODE (D53,D59)	Fairchild semiconductor	FFH60UP60S	High Speed Switching, trr < 80ns , Low Forward Voltage, VF < 1.7V	IS 16221 (Part 2):2015/IEC 62109-2:2011	Tested with equipment
IGBT (Q28,Q34, Q101,Q102,Q103, Q201,Q202,Q203)	ON semiconductor	FGH75T65SHD	650V, 75A	IS 16221 (Part 2):2015/ IEC 62109-2:2011	Tested with equipment
(20-011-10009-00) Board					
PCB	ZHEJIANG JUNHAO ELECTRONICS CO., LTD	JH-1	V-0, 130°C	UL 796 (IEC standard not available)	UL (E250425)
Supplementary information: [1]. Evidence provided by the manufacturer for the listed components are verified by us and the evidence are conforming to the requirement of relevant standard					

HI PHYSIX LABORATORY INDIA PVT. L...

(Senior Technical Manager)

IS 16221 (PART 2):2015			
Clause	**Requirement + Test**	**Result - Remark**	**Verdict**

List of measurement units used for investigation

Sr. no.	Unit	Type	Calibration date	Expiration date	Fixtures-No.
1	Solar array simulator	PVS1200	08/01/2020	07/01/2021	HPLI/T-E/535
2	Anti-islanding test load	PV-RLC385-200K	13/01/2020	12/01/2021	HPLI/T-E/533
3	Grid simulator Programmable AC Power source	PVS7200T	13/01/2020	12/01/2021	HPLI/T-E/532
4	Digital power harmonic Analyzer with CT	PW3337	03/10 to 06/10/2020 & 24/03/2020	02/10/2021 & 23/03/2021	HPLI/T-E/518
5	Power quality analyser	PQ3100-94	18/01/2020	17/01/2021	HPLI/T-E/579
6	Data Logger (16 Chanel)	DL-35W	23/12/2019	22/12/2020	HPLI/T-E/336
7	Data Logger (16 Chanel)	DL-35W	23/12/2019	22/12/2020	HPLI/T-E/334
8	H.V. Breakdown Tester-2	Digital	16/12/2019	15/12/2020	HPLI/T-E/007
9	Humidity Conditioning Chamber	---	06/02/2020	05/02/2021	HPLI/T-E/36-A
10	Stop Watch	Digital	25/12/2019	24/12/2020	HPLI/T-E/023
11	Oscilloscope	TBS1102	25/01/2020	25/01/2021	HPLI/T-E/173
12	Digimatic Caliper	Digital	18/12/2019	17/12/2020	HPLI/T-E/306
13	Dust Proof Chamber	---	17/12/2019	16/12/2020	HPLI/T-E/052
14	IP machine with Standard nozzle		17/12/2019 & 26/08/2019	16/12/2020 & 25/08/2021	HPLI/T-E/087 & HPLI/T-E/088(a)
15	PAES Test Apparatus	Digital	19/12/2019	18/12/2020	HPLI/T-E/340
16	Impulse tester	IT16kV	03/08/2020	02/08/2021	HPLI/U2/T-E/052
17	Jointed Test Finger	---	20/04/2019	19/04/2021	HPLI/T-E/295
18	Test Pin	---	31/01/2019	30/01/2021	HPLI/T-E/299
19	Touch current network Figure 4 of IEC 60990: 1999 with multimeter	Analog	18/12/2019	17/12/2020	HPLI/T-E/308
20	Sonic pressure and sound level measuring instrument	SL-4001	18/07/2020	17/07/2021	HPLI/T-E/253
21	Residual current meter with Adjustable resistances	DM3058E	13/01/2020	12/01/2021	HPLI/T-E/534
22	D.C. High Voltage tester	Digital	18/12/2019	17/12/2020	HPLI/U2/TEST/151
23	Hot air oven	Digital	27/12/2019	26/12/2020	HPLI/U2/TEST/190

Supplementary information: Nil

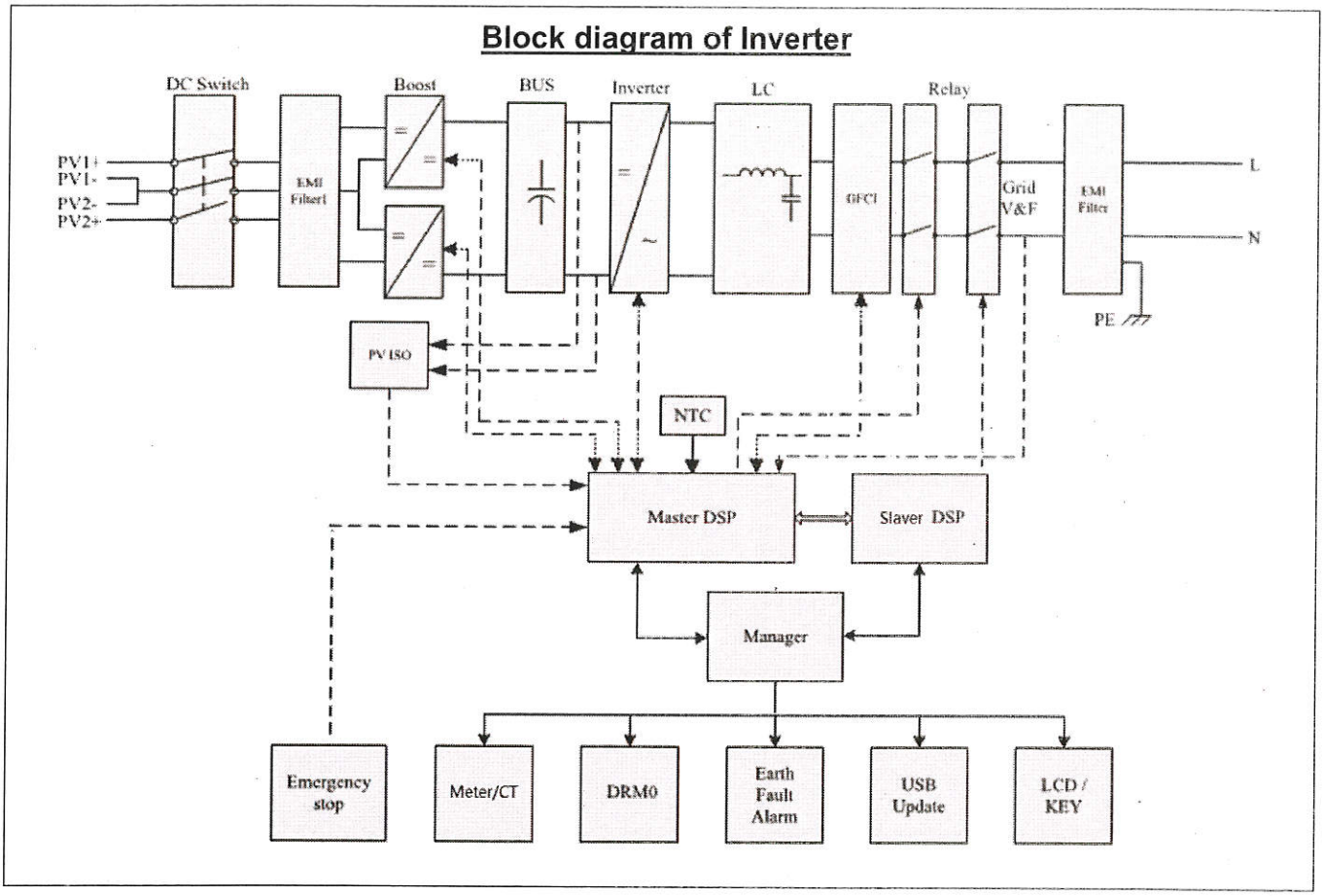
HI PHYSIX LABORATORY INDIA PVT. LTD.

Ashutosh Pathak
(Chief Technical Manager)

IS 16221 (PART 2):2015			
Clause	**Requirement + Test**	**Result - Remark**	**Verdict**

Appendix C

Block diagram of Inverter



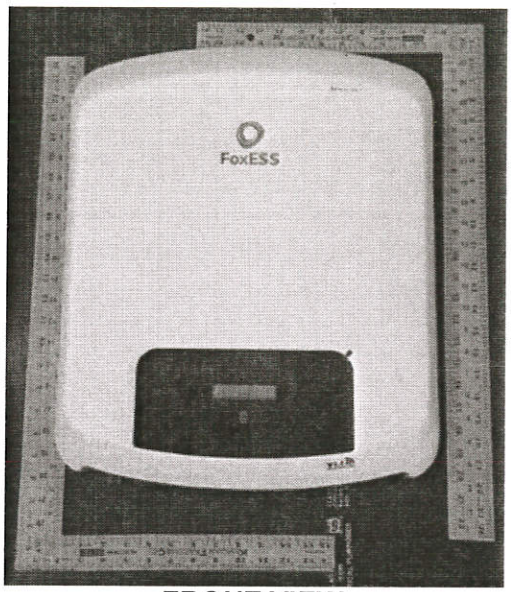
HI PHYSIX LABORATORY INDIA PVT. L

(Chief Technical Manager)

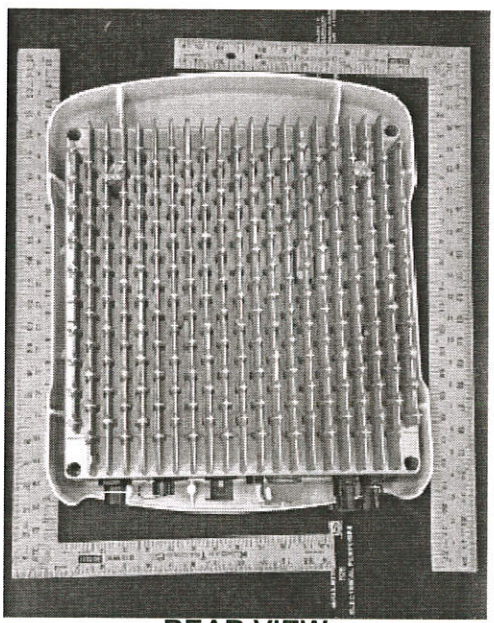
IS 16221 (PART 2):2015			
Clause	**Requirement + Test**	**Result - Remark**	**Verdict**

Appendix D

PHOTO DOCUMENTS



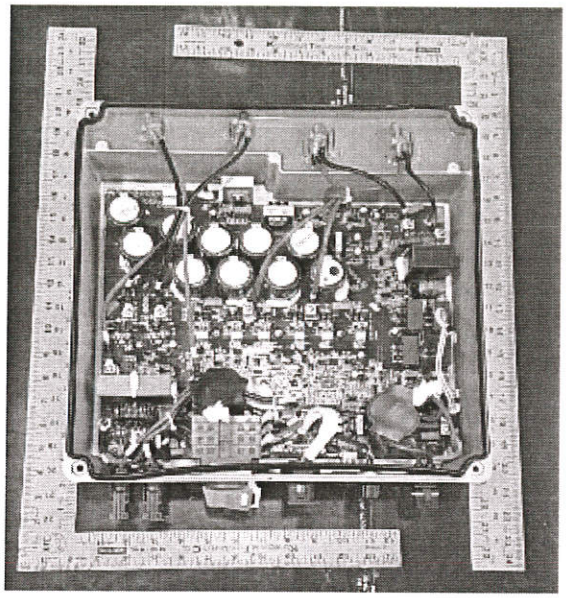
FRONT VIEW



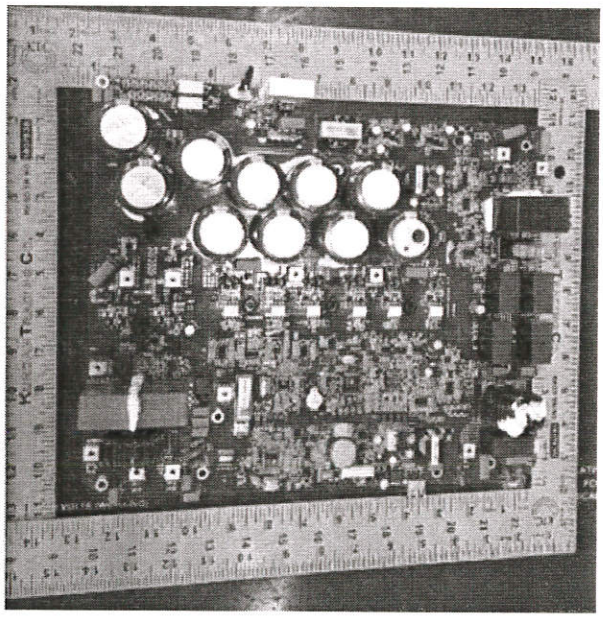
REAR VIEW

HI PHYSIX LABORATORY INDIA PVT. L...

IS 16221 (PART 2):2015			
Clause	**Requirement + Test**	**Result - Remark**	**Verdict**



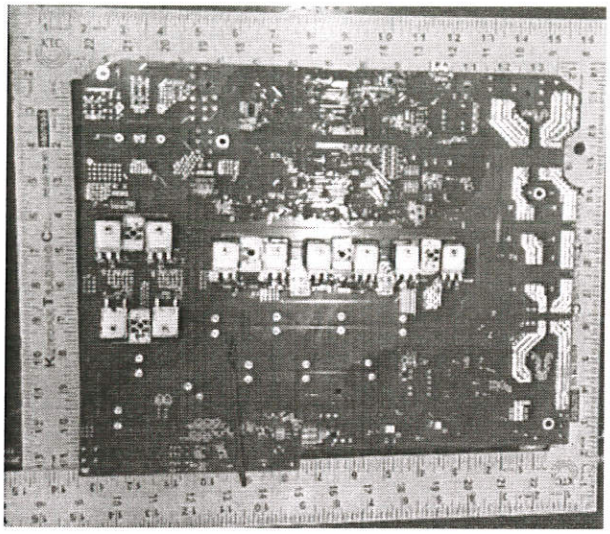
INTERNAL VIEW



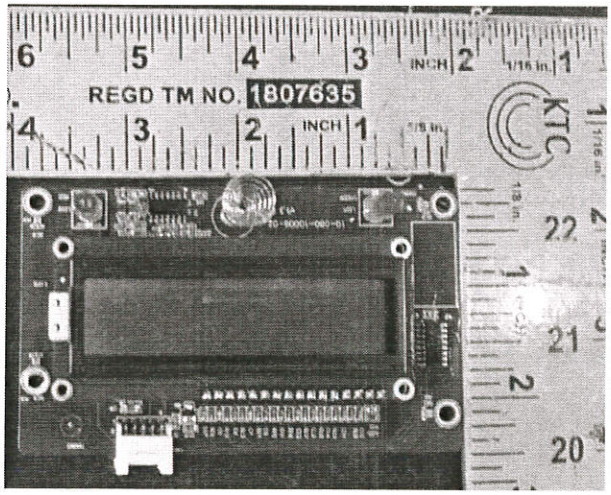
PCB BOARD COMPONENT SIDE VIEW

HI PHYSIX LABORATORY INDIA PVT. L

IS 16221 (PART 2):2015			
Clause	**Requirement + Test**	**Result - Remark**	**Verdict**



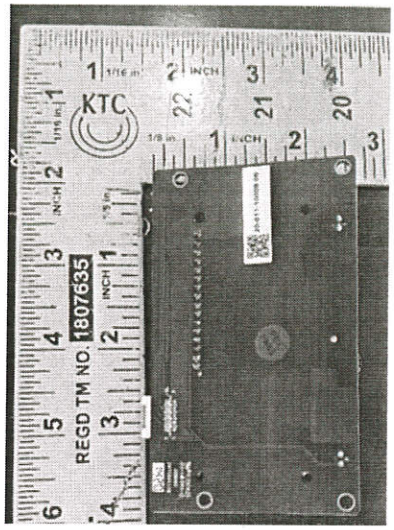
PCB BOARD SOLDER SIDE VIEW



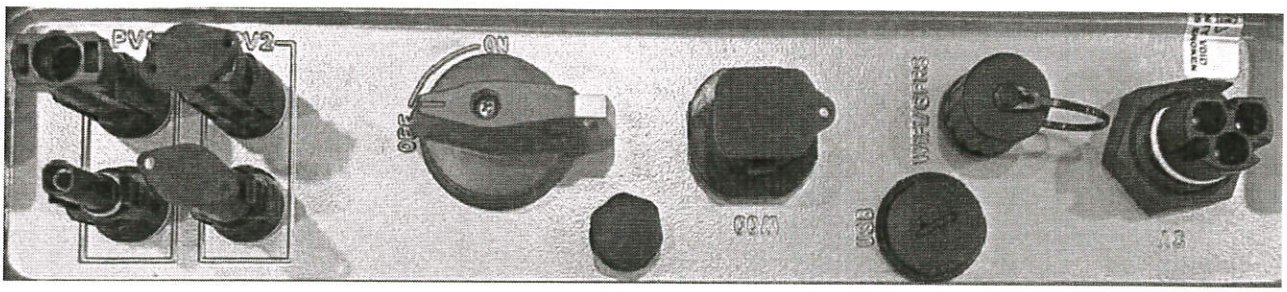
DISPALY BOARD COMPONENT SIDEVIEW

HI PHYSIX LABORATORY INDIA PVT. L

IS 16221 (PART 2):2015			
Clause	**Requirement + Test**	**Result - Remark**	**Verdict**



DISPALY BOARD SOLDER SIDE VIEW



PV CONNECTORS, DC SWITCH, COM,WIFI/GPRS, AC OUTPUT PORT

--- End of Test Report ---

HI PHYSIX LABORATORY INDIA PVT. L
Authorised Technical Manager

TRF No. IS 16221 (Part 2): 2015_V1.0