URS PRODUCTS AND TESTING PVT. LTD.

ULR No. : ULR-TC646824100009993F

DOC No.	:	24EE5F7N_1	A-29, Sector 5, Noida, Gautam Buddha Nagar, Uttar Pradesh, India - 201301
Telephone	:	+91 9871062220	
FAX	:	-	
E-Mail	:	testing.a29@urs-labs.com	
BO Code	:	NA	

Test REPORT AS PER : IS 14286 (2010)

QR Code/Barcode : 210259CRS

REPORT NO : SC24SPI02124_1 DATE : 27 Dec, 2024

PART A. PARTICULARS OF SAMPLE SUBMITTED

a) Customer Name & Address	:	INTEGRATED BATTERIES INDIA PVT LTD Plot No 40 Ecotech 10 Greater Noida, NA, Uttar Pradesh, India - 201301
b) Nature of sample	:	-
c) Grade/Variety/Type/Class Size etc	:	NA
d) Declare values, if any	:	-
e) Batch No. & Date of Manufacture	:	/
f) Quantity	:	8
g) Date of Receipt	:	15 Oct, 2024
h) BIS Seal	:	Verified by Sample Cell
i) IO's Signature	:	Verified by Sample Cell
j) Any other Information / Expiry Date, If any	:	/
k) Date of Commencement of Testing	:	24 Oct, 2024
l) Date of Completion of Testing	:	27 Dec, 2024
m) Section Code	:	24EE5F7N
n) Section Report No.	:	24EE5F7N_1
o) Report Type	:	New
p) Reference Report No.	:	
q) Remarks	:	

Anjali Kanojia
OIC SAMPLE CELL
(Authorized Signatory)
Authorized on: 27 Dec, 2024 20:44 PM

1.

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PART B. SUPPLEMENTARY INFORMATION

1.	Reference to sampling procedure, wherever applicable.	Not Applicable
2.	Supporting documents for the measurements taken and results derived like graphs, table sketches and or photographs as appropriate to test report, if any.	Yes
3.	Deviation from the test methods as prescribed in relevant ISS/Work instruction, if any.	Not Applicable
3.	NABL Report required ?	Yes

Paras Singh
OIC Electrical
(Authorized Signatory)
Authorized on: 27 Dec, 2024 18:27 PM

This is a Computer Generated Report.

PART C. TEST RESULT

S.No.	Clause No Table No. Sl. No	Parameter - Method of test	Test Description	Min Limit	Max Limit	Unit	Result/ Observation
1	10.18	Bypass diode thermal' test	-	-	-	-	Satisfactory (refer to attachment)
2	10.17	Hail test	-	-	-	-	Satisfactory (refer to attachment)
3	10.16	Mechanical load test	-	-	-	-	Satisfactory (refer to attachment)
4	10.15	Wet leakage current test	-	-	-	-	Satisfactory (refer to attachment)
5	10.14	Robustness of termination test	-	-	-	-	Satisfactory (refer to attachment)
6	10.13	Damp heat test	-	-	-	-	Satisfactory (refer to attachment)
7	10.12	Humidity freeze test	-	-	-	-	Satisfactory (refer to attachment)
8	10.11	Thermal cycling test	-	-	-	-	Satisfactory (refer to attachment)
9	10.10	UV preconditioning	-	-	-	-	Satisfactory (refer to attachment)
10	10.9	Hot-spot endurance test	-	-	-	-	Satisfactory (refer to attachment)
11	10.8	Outdoor exposure test	-	-	-	-	Satisfactory (refer to attachment)
12	10.7	Performance at low irradiance	-	-	-	-	Satisfactory (refer to attachment)
13	10.6	Performance at STC and NOCT	-	-	-	-	Satisfactory (refer to attachment)
14	10.5	Measurement of NOCT	-	-	-	-	Satisfactory (refer to attachment)
15	10.4	Measurement of temperature coefficients	-	-	-	-	Satisfactory (refer to attachment)
16	10.3	Insulation test	-	-	-	-	Satisfactory (refer to attachment)
17	10.2	Maximum power determination	-	-	-	-	Satisfactory (refer to attachment)
18	10.1	Visual inspection	-	-	-	-	Satisfactory (refer to attachment)
19	4	Marking	-	-	-	-	Satisfactory (refer to attachment)

Paras Singh
OIC Electrical
(Authorized Signatory)
Authorized on: 27 Dec, 2024 18:27 PM

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TC-6468

Section Report No. : 24EE5F7N_1

IS 14286 (2010)

PART D. REMARKS

Paras Singh
OIC Electrical
(Authorized Signatory)
Authorized on: 27 Dec, 2024 18:27 PM

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URS PRODUCTS AND TESTING PRIVATE LIMITED
A-29, Sector-5, Noida-201301
T +91 (120) 4516264-65 F +91 (120) 4750296
E info@urs-labs.com W www.urs-labs.com
CIN NO U21014UP1987PTC008956

TC-6468

SUMMARY OF TEST REPORT

TEST REPORT NO:SC24SPI02124_1 **DATE: 27/12/2024**

(Total Number of Pages in Test Report: 47)

TEST FORMAT AS PER IS 14286: 2010

1. **Name of the Manufacturer: INTEGRATED BATTERIES INDIA PVT LTD.**
2. **Product: Crystalline silicon terrestrial photovoltaic (PV) modules (Si wafer based).**
3. **Model Tested:** IBMPH-640 (**Representative Model) 156 Half cut cell family**

Series Models:

156 Half cut cell family

IBMPH-635, IBMPH-630, IBMPH-625, IBMPH-620, IBMPH-615, IBMPH-610, IBMPH-605

144 Half cut cell family

IBMPH-600, IBMPH-595, IBMPH-590, IBMPH-585, IBMPH-580, IBMPH-575, IBMPH-570, IBMPH-565, IBMPH-560, IBMPH-555, IBMPH-550

4. **Model differences provided (if applicable): Yes**

5. **Model differences verified as per MNRE Guidelines for series approval: Yes**

6. **Test Results:**

SL. NO.	TEST REQUIREMENT	CLAUSE	VERDICT
1	Marking	4.0	P
2	Visual Inspection	10.1	P
3	Maximum Power Determination	10.2	P
4	Insulation Test	10.3	P
5	Measurement of Temperature Coefficients.	10.4	P
6	Measurement of NOCT	10.5	P
7	Performance at STC and NOCT	10.6	P
8	Performance at low irradiance.	10.7	P
9	Outdoor exposure test	10.8	P
10	Hot-spot endurance test	10.9	P
11	UV preconditioning	10.10	P
12	Thermal cycling test	10.11	P

URS PRODUCTS & TESTING PVT. LTD.

13	Humidity freeze test	10.12	P
14	Damp heat test	10.13	P
15	Robustness of termination test	10.14	P
16	Wet leakage current test	10.15	P
17	Mechanical load test	10.16	P
18	Hail test	10.17	P
19	Bypass diode thermal test	10.18	P

General Information:

1. The conformity certificates of components/parts wherever applicable are verified to ensure complete testing of products under test and details regarding harmonized IEC standards (where IS standards are not available) are also provided in the list of components/parts (description of module construction) wherever applicable.

CONCLUSION:

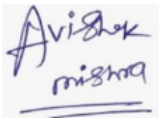
1. Sample meets all relevant requirements of IS 14286: 2010
2. Sample fails to meet the following test requirements: NA

I, hereby undertake that the verdict stated in the test reports for all the test matches with the test results. The sample meets/~~does not meets~~ all relevant requirements stated above of IS 14286: 2010.

Date: 27/12/2024

(Signature of Authorized person with Stamp)

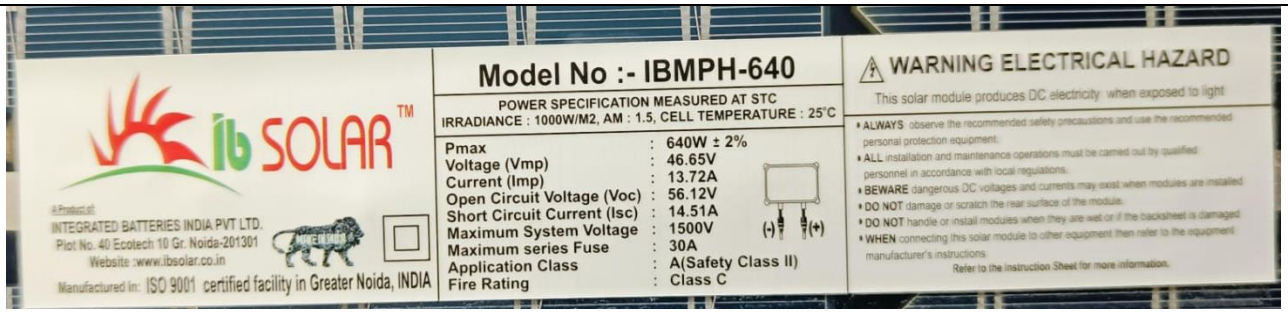
TEST REPORT **IS 14286:2010** **Crystalline Silicon Terrestrial Photovoltaic(PV) Modules** **-Design Qualification and Type Approval**	
Report Reference No.....: Date of issue.....: Total number of pages.....:	SC24SPI02124_1 27/12/2024 47
Testing Laboratory.....: Address.....	URS PRODUCTS AND TESTING PRIVATE LIMITED A-29, Sector 5, Noida-201301, India
Applicant's name.....: Address.....:	**INTEGRATED BATTERIES INDIA PVT LTD** Plot No 40 Ecotech 10 Greater Noida, Uttar Pradesh, 201301
Test specification.....:	
Standard.....: Test procedure.....: Non-standard test method.....:	IS 14286: 2010 Compliance report N/A
Test Report Form No. .....: Test Report Form Originator.....: Master TRF.....:	IS 14286_V1.0 Bureau of Indian Standards Dated: 19.02.2018
Test item description.....:	Crystalline Silicon Terrestrial Photovoltaic (PV) Modules (Si Wafer Based)
Trade Mark.....:	ib SOLAR™
Manufacturer.....:	**INTEGRATED BATTERIES INDIA PVT LTD.**
Factory.....:	Plot No 40 Ecotech 10 Greater Noida, Uttar Pradesh, 201301
Model/Type reference.....:	**Model Tested:** IBMPH-640 (**Representative Model) 156 Half cut cell family** **Series Models:** **156 Half cut cell family** IBMPH-635, IBMPH-630, IBMPH-625, IBMPH-620, IBMPH-615, IBMPH-610, IBMPH-605 **144 Half cut cell family** IBMPH-600, IBMPH-595, IBMPH-590, IBMPH-585, IBMPH-580, IBMPH-575, IBMPH-570, IBMPH-565, IBMPH-560, IBMPH-555, IBMPH-550
Ratings.....:	See copy of Marking label and General product information.

Testing procedure and testing location:		
☒ **Testing Laboratory**:	**URS PRODUCTS AND TESTING PRIVATE LIMITED**	
Testing location/ address.....:	A-29, Sector 5, Noida-201301, India	
Tested by (name + signature) .....:	Avishek Mishra (Analyst)	
Approved by (name + signature)....:	Paras Singh (General Manager Technical)	
Issued by (name + signature) .... :	Hebin Manuel (Lab Manager)	

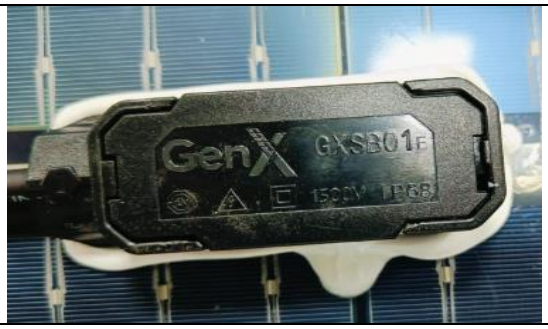
Summary of testing:	
Tests performed (name of test and test clause):	**Testing location:** **URS PRODUCTS AND TESTING PRIVATE LIMITED** **A-29, Sector 5, Noida-201301, India**
10.1 Visual Inspection	
10.2 Maximum Power Determination	
10.3 Insulation Test	
10.4 Measurement of Temperature Coefficients.	
10.5 Measurement of NOCT	
10.6 Performance at STC and NOCT	
10.7 Performance at low irradiance.	
10.8 Outdoor exposure test	
10.9 Hot-spot endurance test	
10.10 UV preconditioning	
10.11 Thermal cycling test	
10.12 Humidity freeze test	
10.13 Damp heat test	
10.14 Robustness of termination test	
10.15 Wet leakage current test	
10.16 Mechanical load test	
10.17 Hail test	
10.18 Bypass diode thermal test	

Copy of Marking Plate

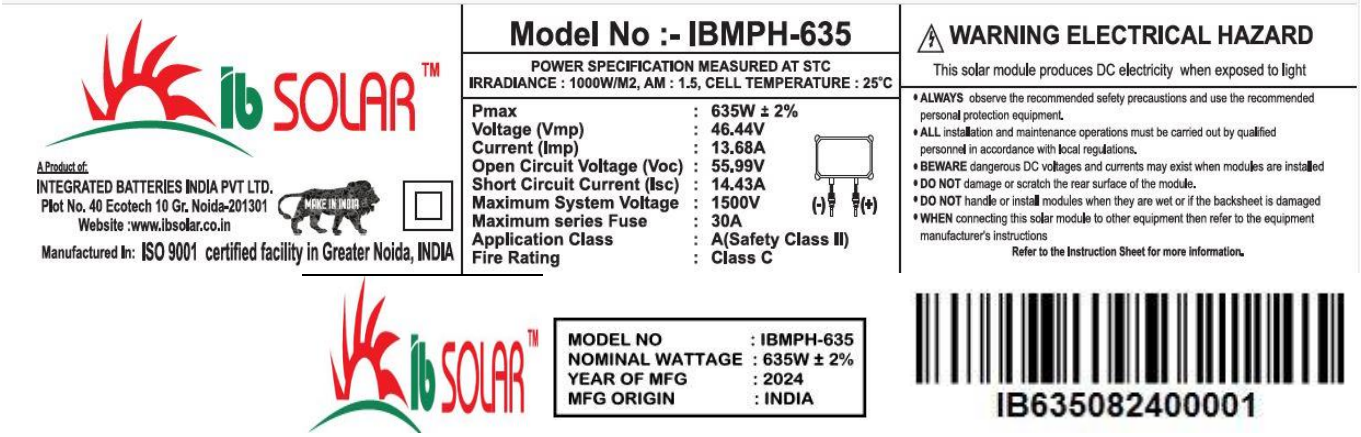
(Model Tested: IBMPH-640)



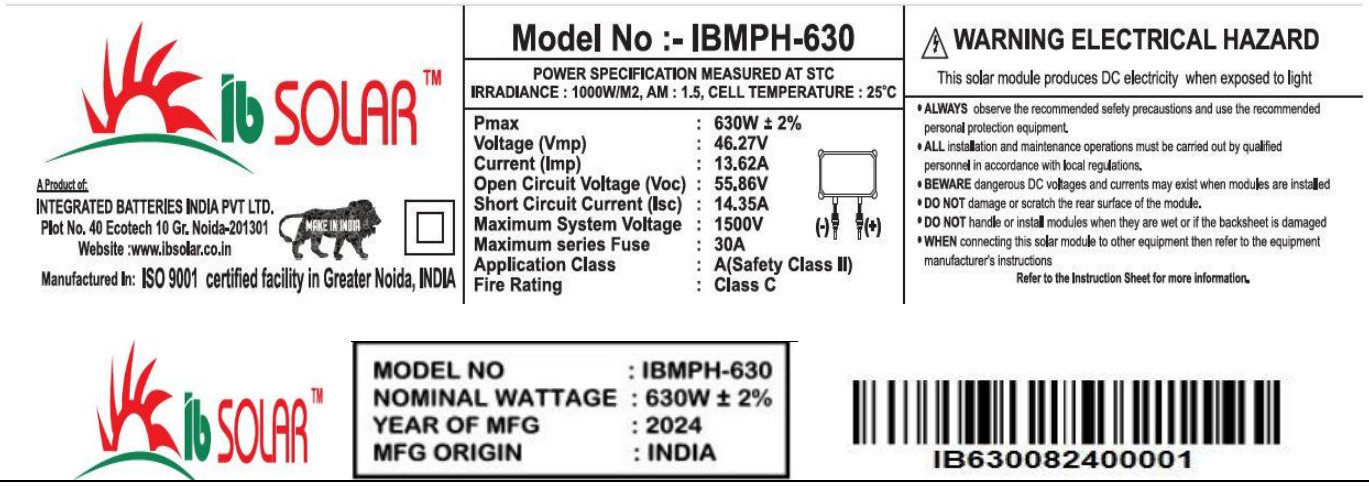
Date of manufacturing through serial no. traceability:
6th & 7th digit: 08(August)
8th & 9th digit: 24(Year 2024)
So, Date of manufacturing: 08/2024(MM/YYYY)

Polarity marking on Connectors	
	
Polarity marking on Junction Box	
	
The marking plate above represents all models covered by this report. See “General product information” for electrical ratings for all models.	

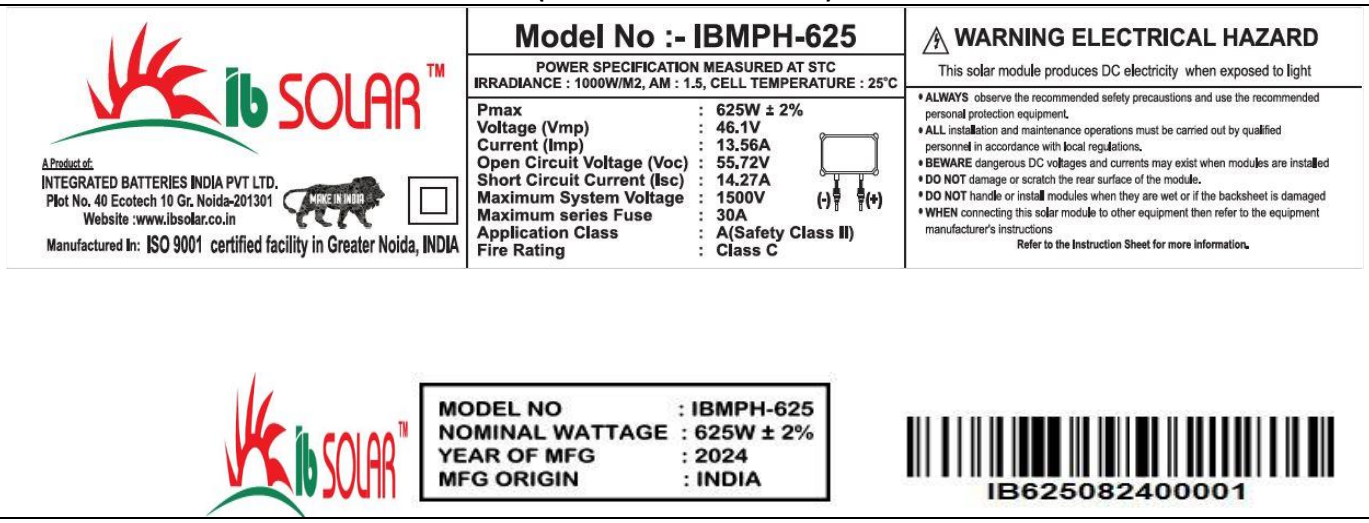
156 Half cut cell family Series Models: IBMPH-635



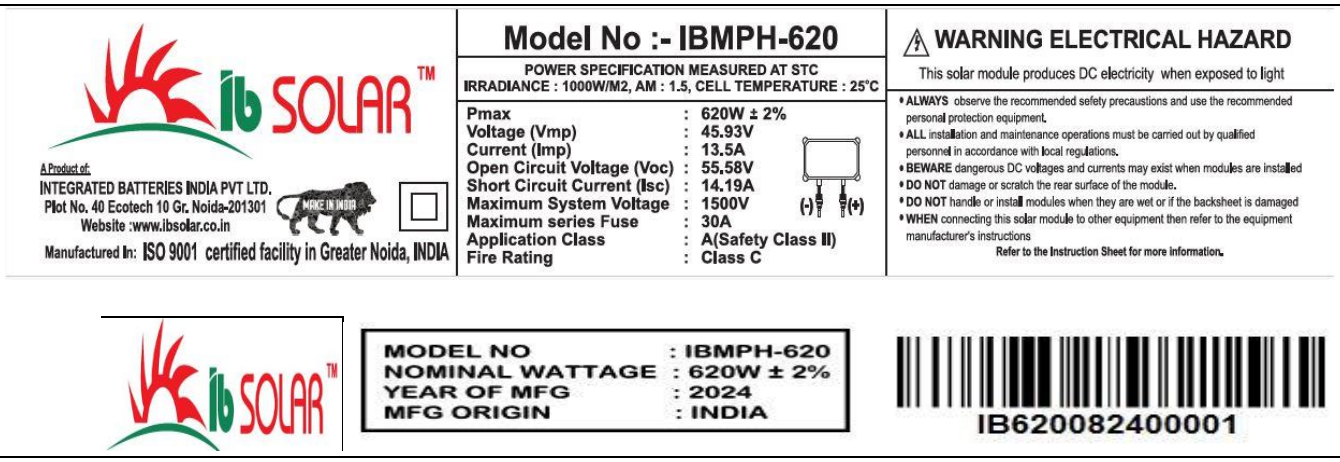
(Series Model: IBMPH-630**)**



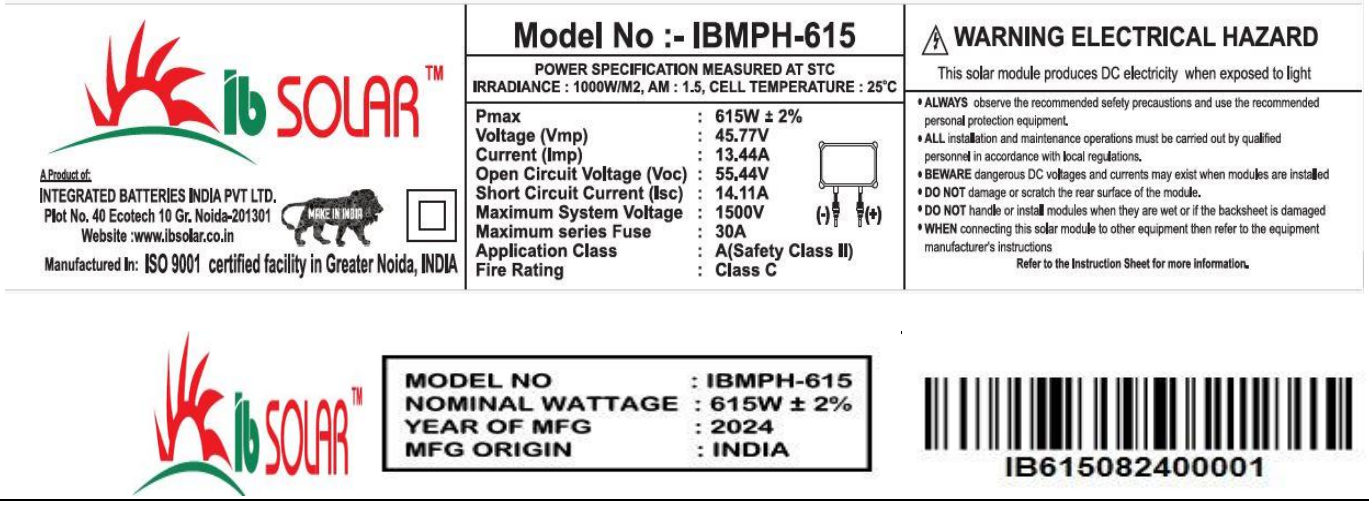
(Series Model: IBMPH-625**)**



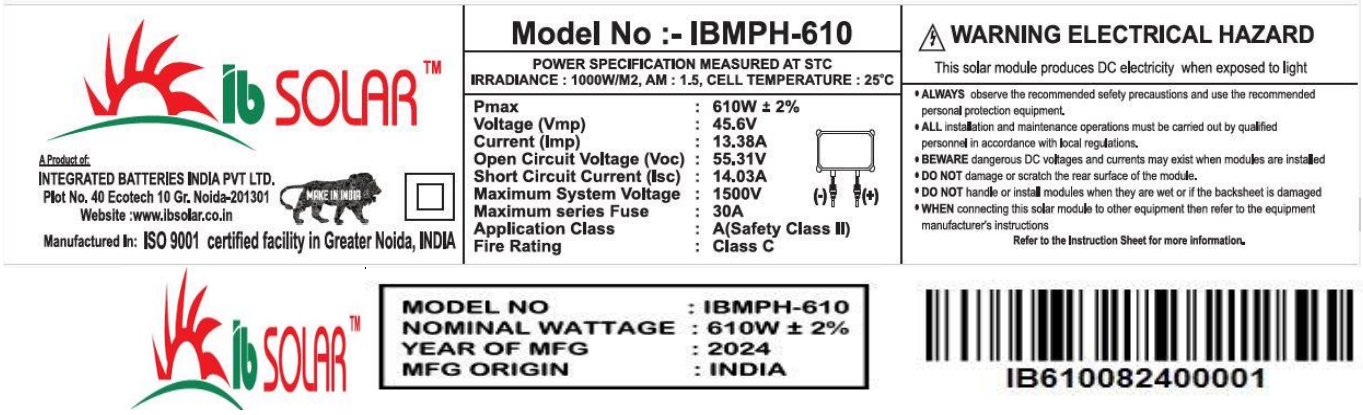
(Series Model:IBMPH-620**)**



(Series Model: IBMPH-615**)**



(Series Model: IBMPH-610**)**



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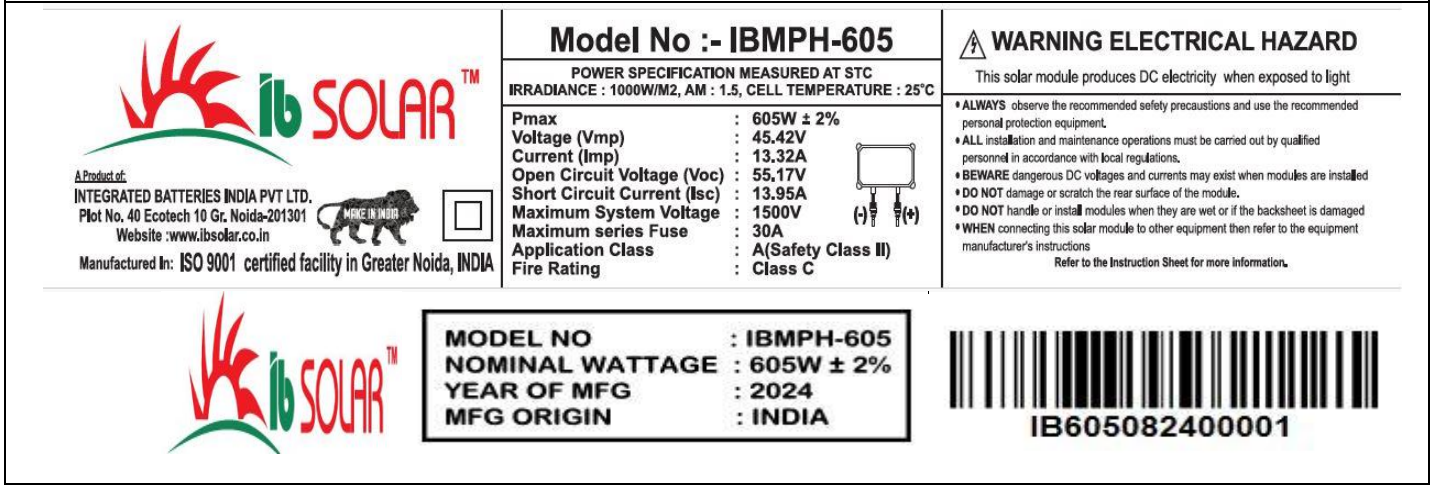
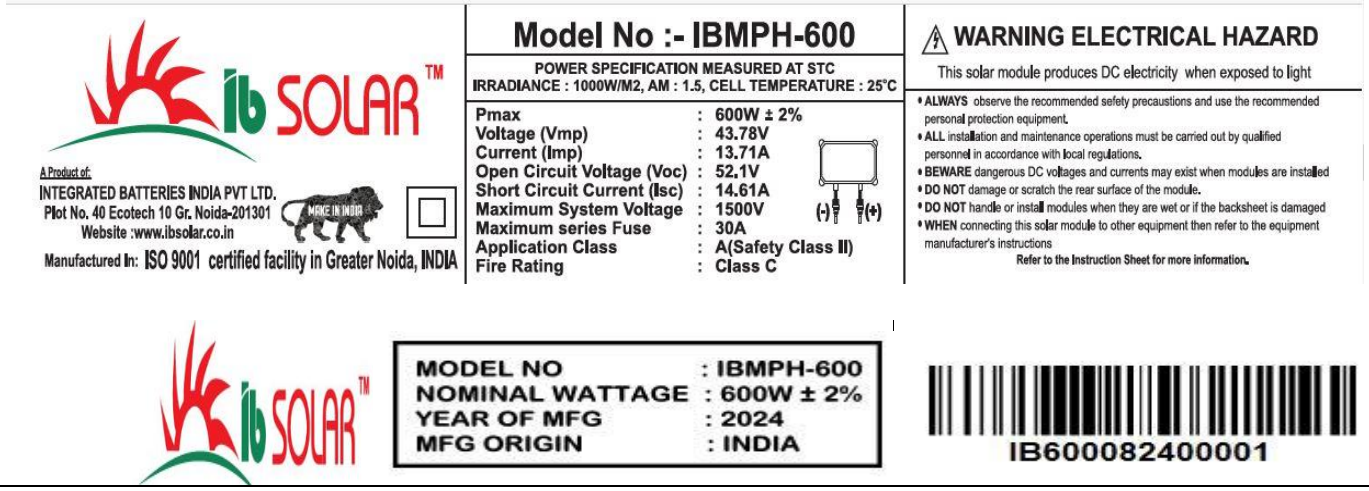
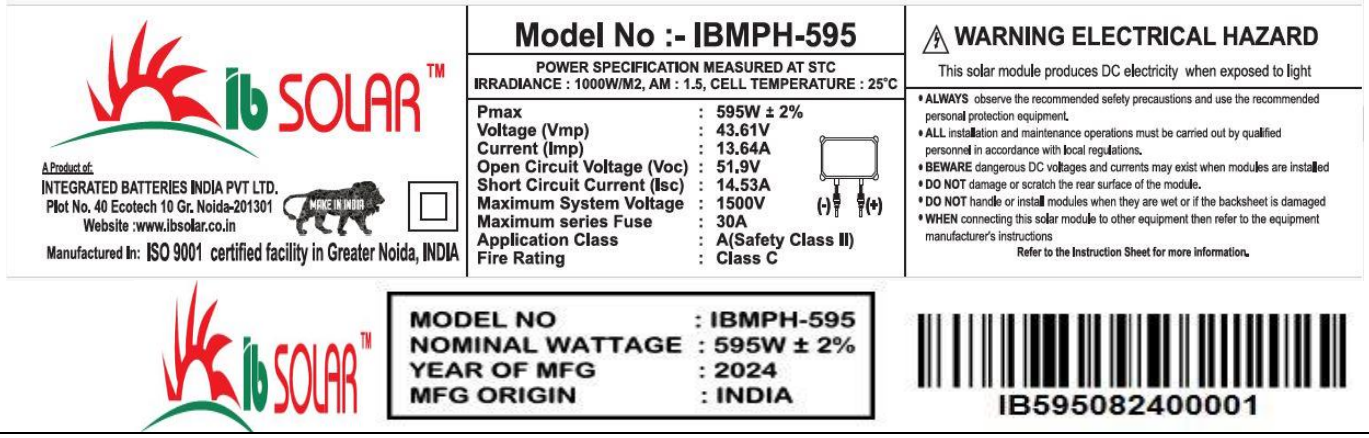
(Series Model: IBMPH-605**)**



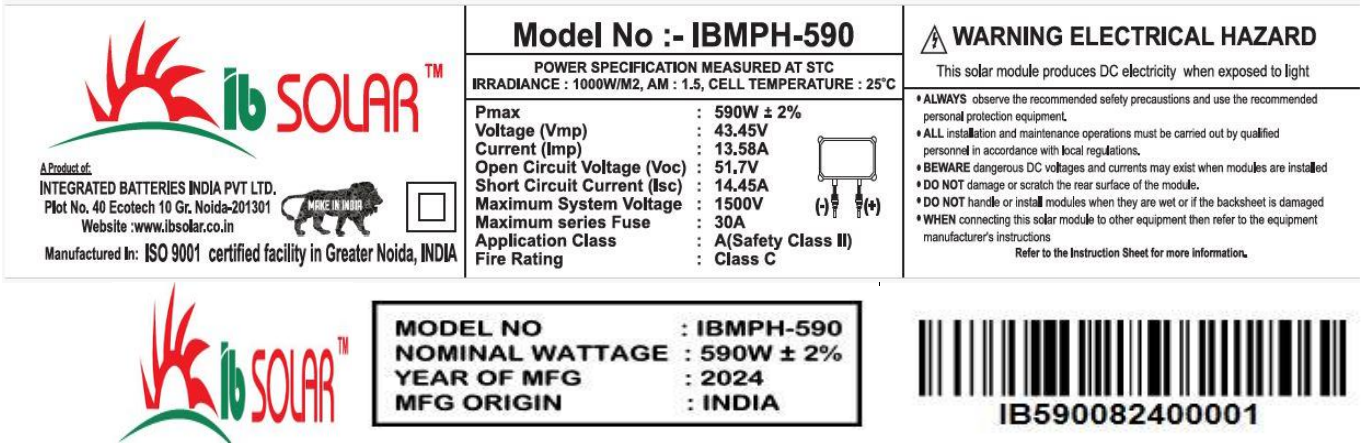
144 Half cut cell family (Series Model): IBMPH-600



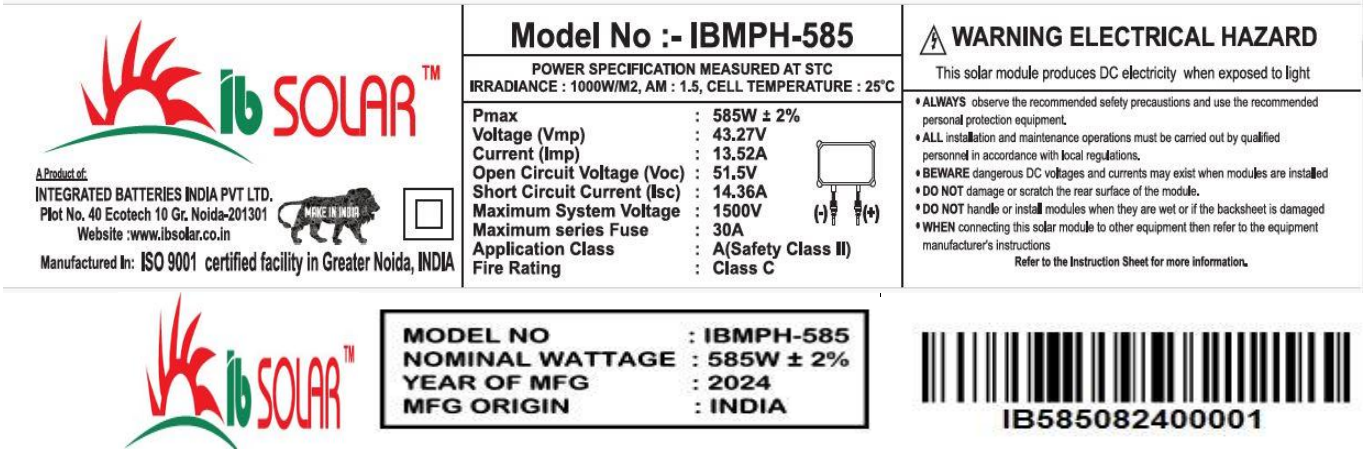
(Series Model: IBMPH-595**)**



(Series Model: IBMPH-590**)**

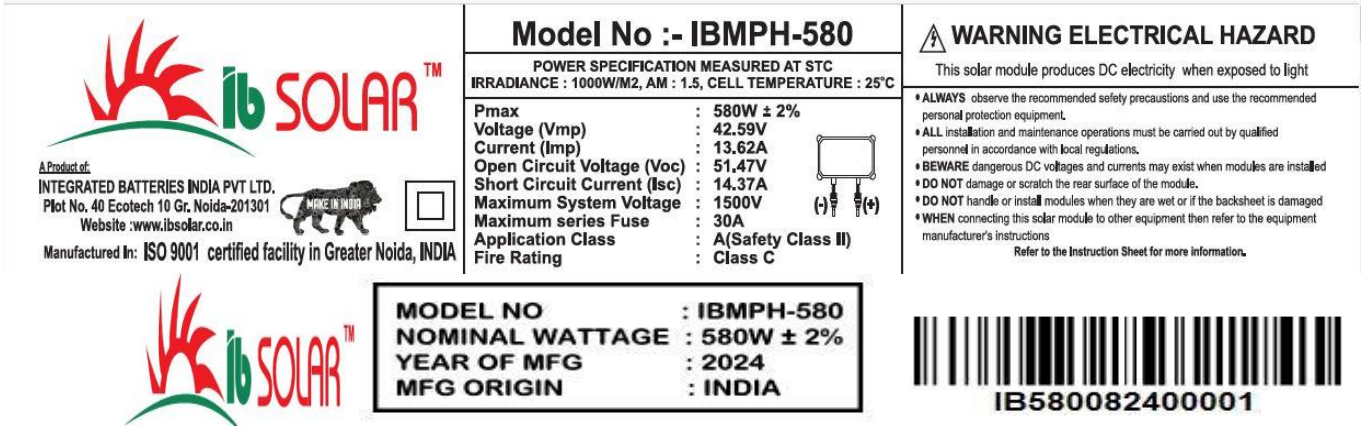


(Series Model: IBMPH-585**)**

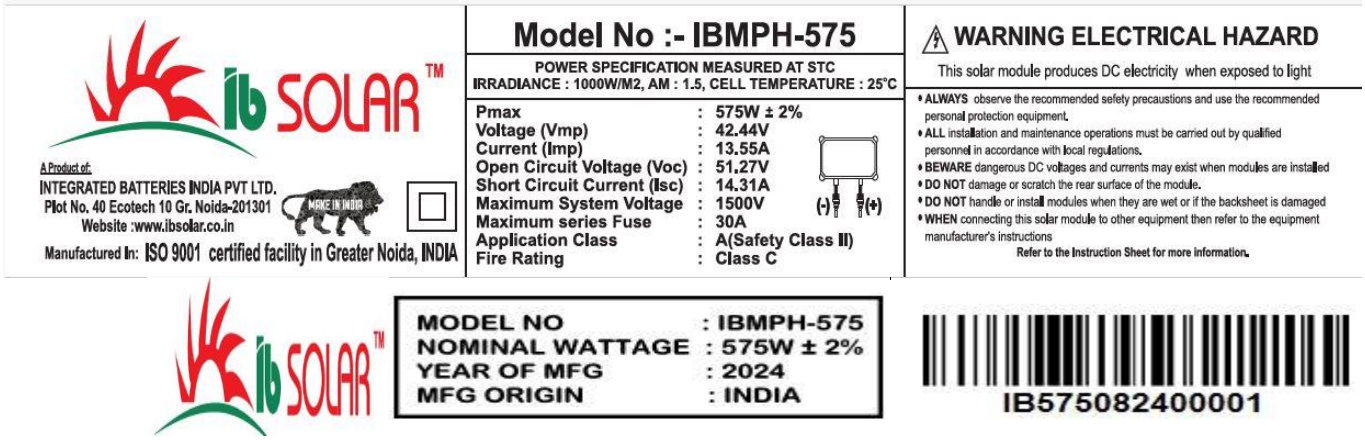


URS PRODUCTS & TESTING PVT. LTD.

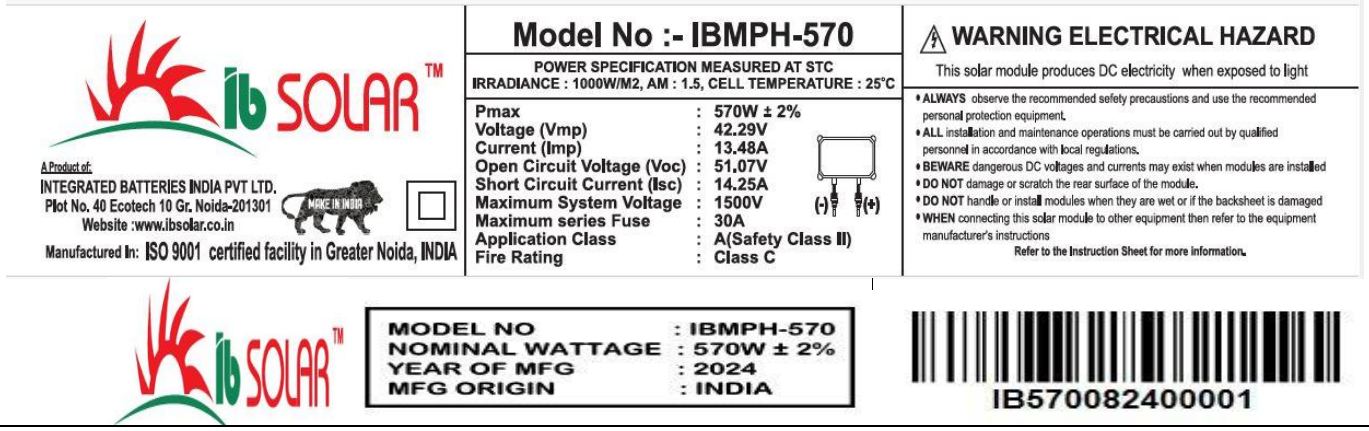
(Series Model: IBMPH-580**)**



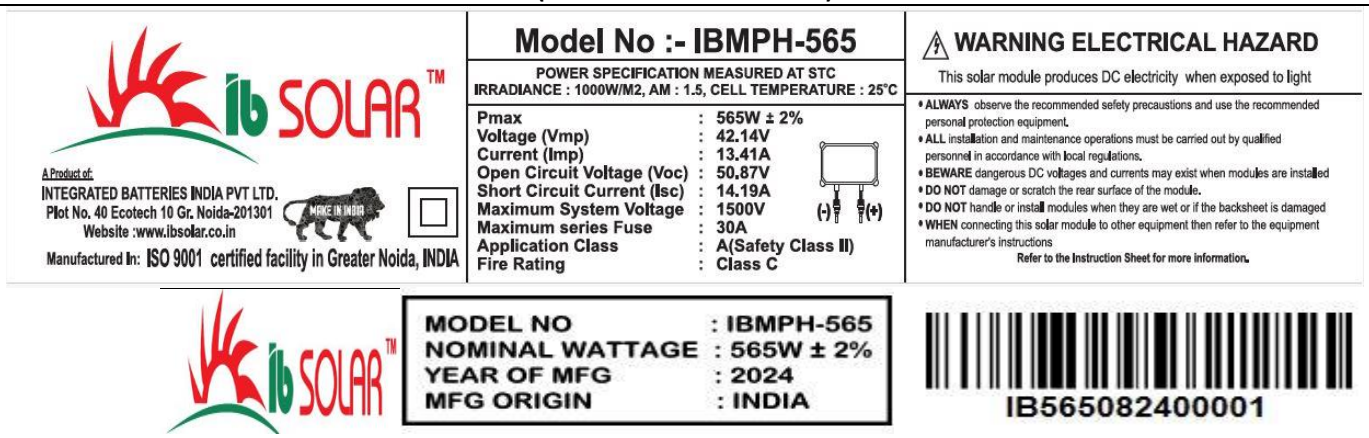
(Series Model: IBMPH-575**)**



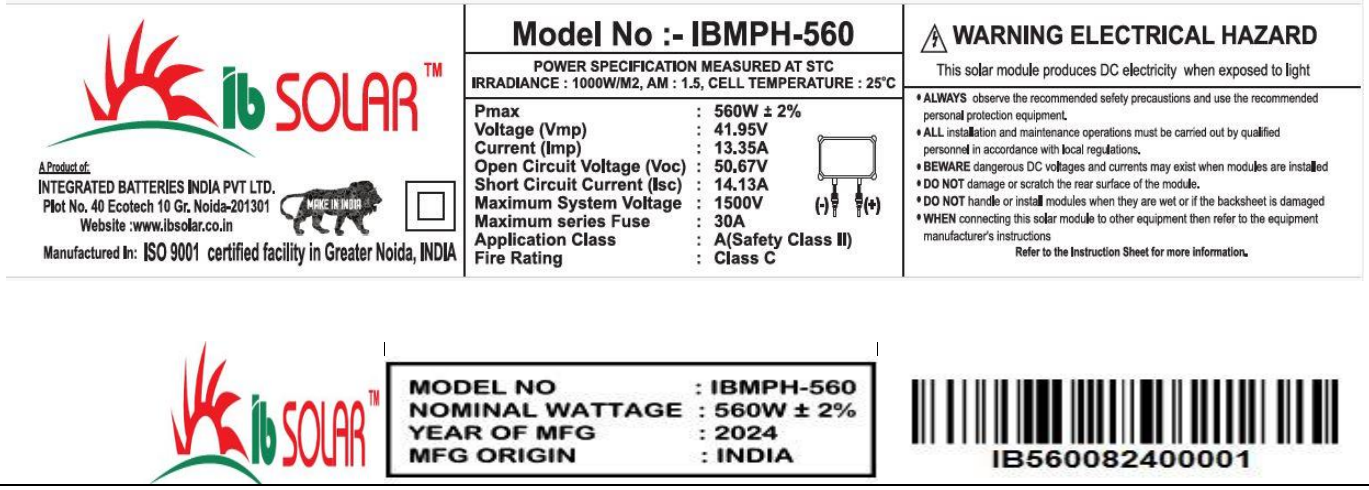
(Series Model: IBMPH-570**)**



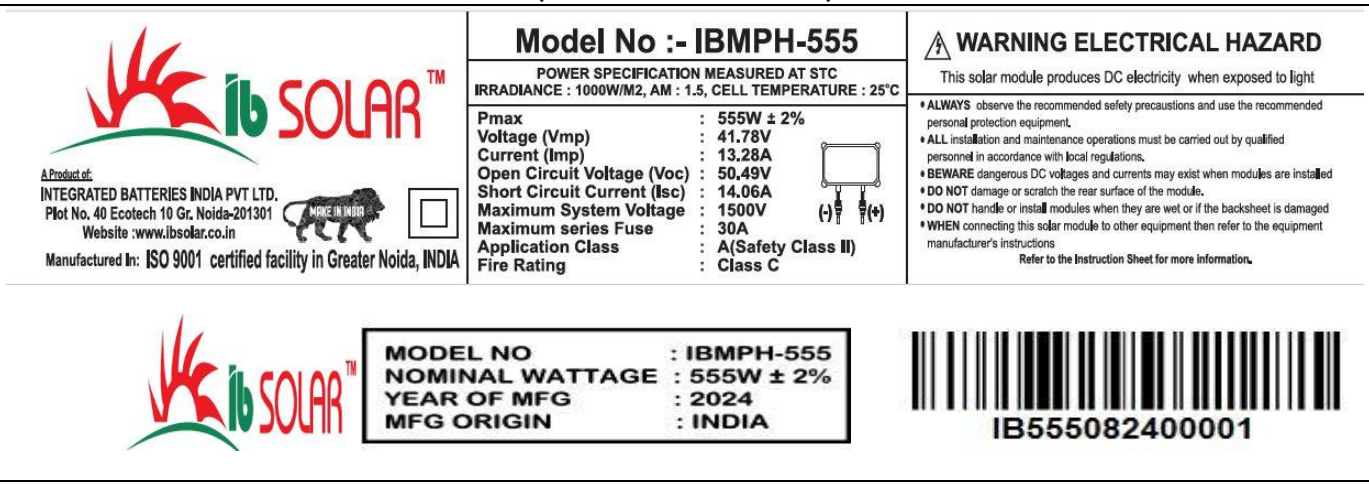
(Series Model: IBMPH-565**)**



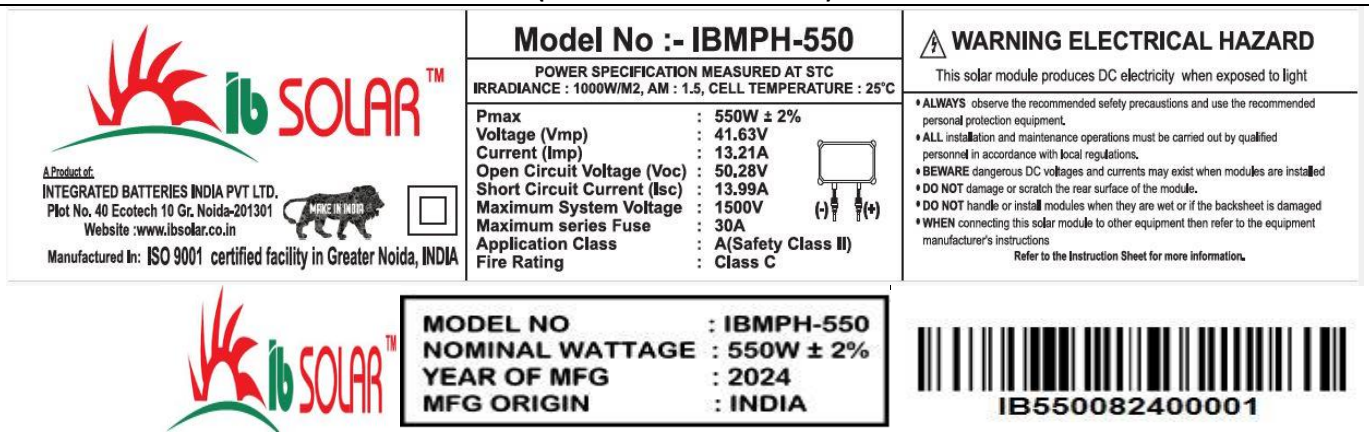
(Series Model: IBMPH-560**)**



(Series Model: IBMPH-555**)**



(Series Model: IBMPH-550**)**



GENERAL INFORMATION	
Test item particulars:	Crystalline Silicon Terrestrial Photovoltaic (PV) Modules (Si Wafer Based)
Accessories and detachable parts included in the evaluation.....:	N/A
Options included.....:	N/A
Abbreviations used in the report:	
HF–Humidity Freeze	TC–Temperature Cycling
DH–Damp Heat	Vmp–Maximum power voltage
Imp–Maximum power current	Voc–Open circuit voltage
Isc-Short circuit current	FF–Fill Factor
Pmp –Maximum power	α–Current temperature coefficient
NOCT–Nominal Operating Cell Temperature	β–Voltage temperature coefficient
STC –Standard Test Conditions	δ–power temperature coefficient
Possible test case verdicts: -test case does not apply to the test object.....:	N/A (Not Applicable)
-test object does meet the requirement.....:	Pass (P)
-test object does not meet the requirement.....:	Fail (F)

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.
"(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 point is used as the decimal separator.

General Product Information:

PV module type reference.....:IBMPH-640 **(Representative Model)**

Product Electrical Ratings at STC

Nominal maximum power (Pmax).....	:	640W
Nominal open circuit voltage at (Voc).....	:	56.62V
Nominal short circuit current at (Isc).....	:	14.51A
Nominal maximum power voltage (Vpm).....	:	46.65V
Nominal maximum power current (Ipm).....	:	13.72A

Product Safety Ratings

Maximum system voltage.....	:	1500 V
Maximum over-current protection rating.....	:	30A
Safety application class.....	:	Class A
Safety class in accordance with IS 61140.....	:	Class II
Fire safety class.....	:	Class C
Recommended maximum series/parallel module configurations.....	:	24 for 156 cell family series 28 for 144 cell family series

URS PRODUCTS & TESTING PVT. LTD.

A1.1	MODULE TYPE/S
	Model Tested: IBMPH-640

A1.2	MODULE DESIGN –DIMENSIONS	
	Module dimensions (L x W x H) [mm].....:	2466 x 1135x 35 for 156 cell family 2278 x 1134 x 35 for 144 cell family

A1.3	SOLAR CELL	
	Cell type reference.....:	**Primary:** TN182A-R16D1, Monocrystalline Bifacial TOPCon Cell, Manufactured by: Solar N Plus New Energy Technology Co., Ltd
	Cell dimensions L x W x T (± %) [mm].....:	**Primary:** 182mmx91mm (±0.5mm)
	Cell thickness [µm].....:	**Primary**: 130µm (±13µm)
	Cell area [cm²].....:	**Primary**: 165.62

A1.4	IDENTIFICATION OF MATERIALS	
	Front cover.....:	**Primary:** Low Iron Solar AR Coated Patterned Glass; Thickness: 2.0mm ± 0.2mm; Manufactured by: Borosil Renewables Limited **Alternative:** Low Iron Solar Anti-Reflective Coated Patterned Glass), Thickness: 2.0 mm ± 0.2 mm, Manufactured by: Triveni Renewables Pvt. Limited ***Alternate Front cover having same strengthening process and same surface treatment and same material all technical details are same as the main model, only change in manufacturer name as per declared by manufacturer***
	Rear cover.....:	**Primary:** Low Iron Solar AR Coated Patterned Glass; Thickness: 2.0mm ± 0.2mm; Manufactured by: Borosil Renewables Limited. **Alternative:** Low Iron Solar Anti-Reflective Coated Patterned Glass, Thickness: 2.0 mm ± 0.2 mm, Manufactured by: Triveni Renewables Pvt. Limited ***Alternate Rear cover having same strengthening process and same surface treatment and same material all technical details are same as the main model, only change in manufacturer name as per declared by manufacturer***
	Encapsulation material.....:	**Primary:**

		CONSERV P - 14 FC, Thickness: 0.45±5%, Width: upto 1240 mm, Manufactured by: Renewsys India Private Limited. **Alternative:** ALISHAN FC, Manufactured by: Alishan Green Energy Pvt. Ltd ***Alternate Encapsulation material having same technical details as per declared by Manufacturer.***
	Frame parts.....:	**Primary:** 6005 T6, Cross section: 35mm x 35 mm; Manufactured by Perfect Alex Pvt. Ltd. **Alternative:** DV-A-700, Cross section: 35mm x 35 mmManufactured by: Jiangsu Yuejia Metallic Technology Co.Ltd ***Alternate Frame having same technical details only change in manufacturer name as per declared by manufacturer***
	Mounting parts.....:	**as per installation manual**
	Adhesive for frame.....:	**Primary**: 1527 Silicone Sealant For PV Modules, White colour; Manufactured by Tonsan Adhesive, Inc. **Alternative:** Manufactured by: Shanghai Huitian new material Co., Ltd ***Alternate Adhesives having same technical details only change in manufacturer name as per declared by manufacturer***
	Cell connector.....:	**Primary:** Type: TPVIR2660, Sn60%/Pb40%, Dimensions [mm]: 0.26 mm; Manufactured by: VALEO PRODUCTS LLP **Alternative:** Manufactured by: VIDYA WIRES PVT LTD. ***Alternate cell connector having same technical details only change in manufacturer name as per declared by manufacturer.***
	String connector.....:	**Primary**: Type: TPV1603580, Sn60%/Pb40%, Dimensions [mm]: 6x 0.35mm Manufactured by: Valeo Products LLP **Alternative:** Manufactured by: VIDYA WIRES PVT LTD. ***Alternate string connector having same technical details only change in manufacturer name as per declared by manufacturer.***
	Fluxing agent.....:	**Primary**: 952-S, Low-Solids, No-Clean Liquid Flux, Manufactured by Kester

	Junction box.....:	**Primary:** GXSB-01, Rated voltage: 1.5KVDC, Rated Current: 45A, IP68, Ambient Temperature: -40°C to +85°C, Manufactured by GENX PV INDIA PRIVATE LIMITED. Certified by TUV SUD; certificate no.: B1157770002
	Cable	**Primary**: 1X4mm2, Electric Cables for Photovoltaic Systems for Rated Voltage 1500V d.c., for sizes upto and including 400 Sqmm, Conductor Class-5, Manufactured by APAR INDUSTRIES LTD (CM/L- 7100058704).
	Connector.....:	**Primary:** GXC-01, Rated voltage: 1500VDC, Rated current: 40A, IP68, Ambient Temperature: -40°C to 85°C, Manufactured by Genx Pv India Private Limited. Certificate no.: B 115777 0001 Rev. 00, Tested by TUV SUD.
	Bypass diode.....:	**Primary:** MK6045, Tj [°C]: -55 to +200°C, V_{RMS}: 45 V; I_{FSM}: 450A; RΘJC:1.2°C/W, VDC 45V, Manufactured by Genx Pv India Private Limited.
	Potting material.....:	**Primary:** 1521 Potting Materials, White colour; Manufactured by Tonsan Adhesive Inc. **Alternative:** Manufactured by: Shanghai Huitian new material Co., Ltd ***Alternate Potting material having same technical details only change in manufacturer name as per declared by manufacturer***
	Adhesive for junction box.....:	**Primary**: 1527 Silicone Sealant For PV Modules, White colour; Manufactured by Tonsan Adhesive, Inc. **Alternative:** Manufactured by: Shanghai Huitian new material Co., Ltd ***Alternate Adhesives having same technical details only change in manufacturer name as per declared by manufacturer***
	Soldering Material.....:	**Primary**: Alpha Telecore HF-850, Manufactured by: ALPHA Global
	Additional material (e. g. insulation tape)...:	N/A

A1.5	MODULE DESIGN - MINIMUM DISTANCES	
	Between cells.....:	1.4 mm
	Between cell and edge of laminate.....:	17 mm
	Between any current carrying part and edge of laminate...:	15 mm

A1.6	MODULE DESIGN - ELECTRICAL CONFIGURATION	
	Total number of cells.....:	156 for 156 cell family 144 for 144 cell family
	Serial-parallel connection of cells.....:	78 cells in series and parallel connection:2 72 cells in series and parallel connection:2
	Cells per bypass diode.....:	52 for 156 cell family 48 for 144 cell family
	No. of bypass diodes.....:	3

Note: Bill of material are same for all series family models.

Similarities & difference between representative model and series/family models:

Sr. No	Series/Family Models	Electrical Specifications						Model difference	Model similarities
		Maximum System Voltage, (Vdc)	Open Circuit Voltage @STC/Voc (Vdc)	Rated Voltage @ STC/ Vmp (V dc)	Short Circuit Current @ STC/Isc (A)	Rated Current @ STC/Imp (A)	Rated Maximum Power at STC, (Watts)		
1.	IBMPH-640 **(Representative Model)**	1500	56.12	46.65	14.51	13.72	640	• Pmp • Voc • Isc • Vmp • Imp • Module size	• Maximum System Voltage • Cell technology • Encapsulation • Superstrate • Module size • Backsheet/ substrate • Frame and/or mounting structure • Junction box/electrical termination • Cell interconnect materials or technique • Electrical circuit Of an identical package • Power output (by 10%) in the identical package including size and using the identical cell process. • Bypass diode
156 Half cut cell family(Series Models):									
2.	IBMPH-635	1500	55.99	46.44	14.43	13.68	635		
3.	IBMPH-630	1500	55.86	46.27	14.35	13.62	630		
4.	IBMPH-625	1500	55.72	46.10	14.27	13.56	625		
5.	IBMPH-620	1500	55.58	45.93	14.19	13.50	620		
6.	IBMPH-615	1500	55.44	45.77	14.11	13.44	615		
7.	IBMPH-610	1500	55.31	45.60	14.03	13.38	610		
8.	IBMPH-605	1500	55.17	45.42	13.95	13.32	605		
144 Half cut cell family(Series Models):									
9.	IBMPH-600	1500	52.10	43.78	14.61	13.71	600		
10.	IBMPH-595	1500	51.90	43.61	14.53	13.64	595		
11.	IBMPH-590	1500	51.70	43.45	14.45	13.58	590		
12.	IBMPH-585	1500	51.50	43.27	14.36	13.52	585		
13.	IBMPH-580	1500	51.47	42.59	14.37	13.62	580		
14.	IBMPH-575	1500	51.27	42.44	14.31	13.55	575		
15.	IBMPH-570	1500	51.07	42.29	14.25	13.48	570		
16.	IBMPH-565	1500	50.87	42.14	14.19	13.41	565		
17.	IBMPH-560	1500	50.67	41.95	14.13	13.35	560		
18.	IBMPH-555	1500	50.49	41.78	14.06	13.28	555		
19.	IBMPH-550	1500	50.28	41.63	13.99	13.21	550		

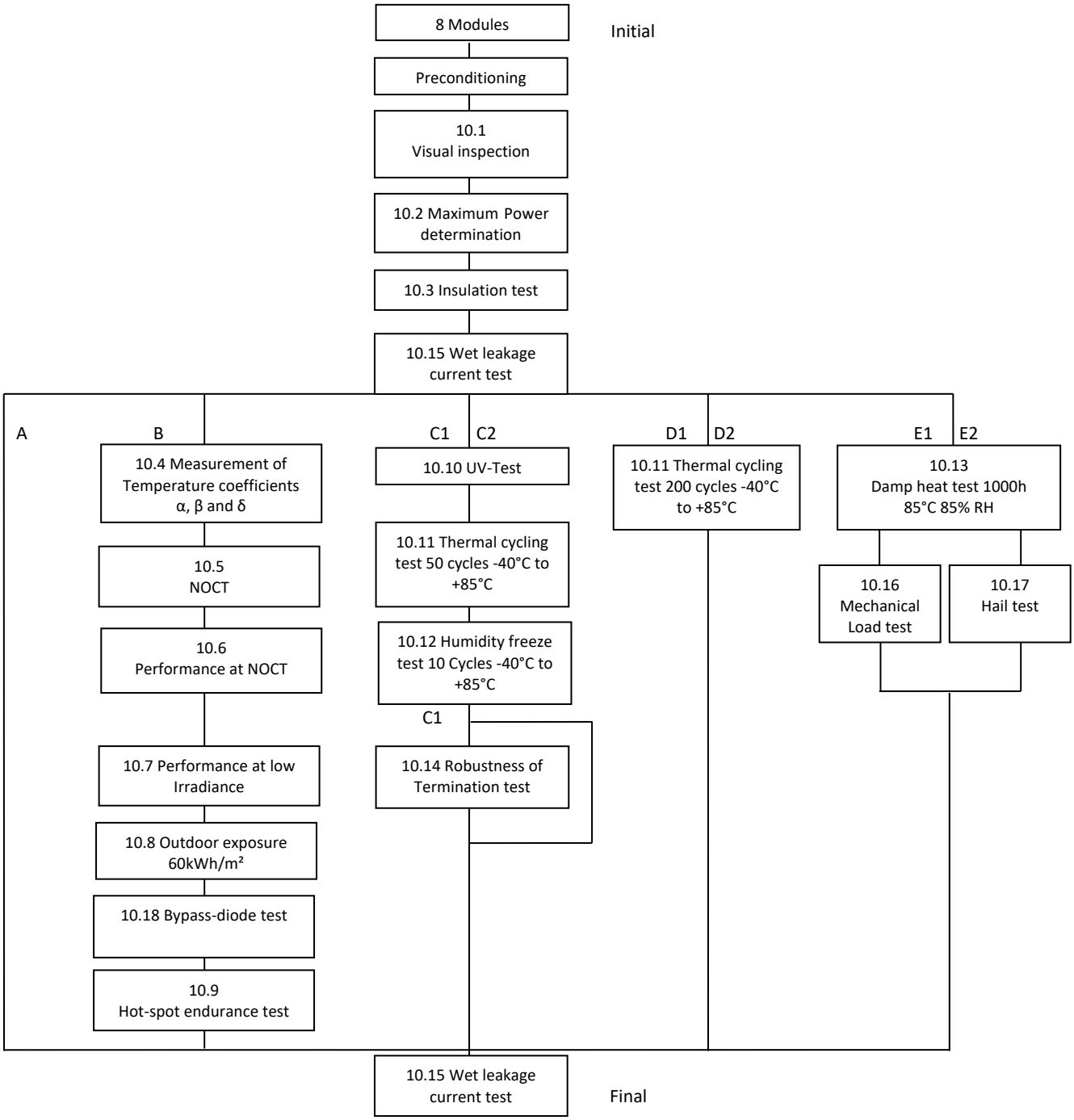
Testing Procedure
[X] New module type
[ ] Modifications (if yes, please choose the applicable modification according to the Retesting Guideline)
[ ] Change in cell technology
[ ] Modification to encapsulation system
[ ] Modification to superstrate
[ ] Increase in module size
[ ] Modification to back sheet/ substrate
[ ] Modification to frame and/ or mounting structure
[ ] Modification to junction box/ electrical termination
[ ] Change in cell interconnect materials or technique
[ ] Change in electrical circuit of an identical package
[ ] Higher or lower power output (by 10%) in the identical package including size and using the identical cell process
[ ] Qualification of a frameless module after the design has received certification as a framed module
[ ] Change in bypass diode or number of diodes

Module group assignment:

Sample #	Sample Group ID	Sample No. & Serial number
IBMPH-640	Full Testing	
	A	1 & IB640082400001
	B	2 & IB640082400002
	C1	3 & IB640082400003
	C2	4 & IB640082400004
	D1	5 & IB640082400005
	D2	6 & IB640082400006
	E1	7 & IB640082400007
	E2	8 & IB640082400008

10	TEST PROCEDURES (if it is not a full test, strikethrough non-performed test) Note: Deviations from test sequence are possible but must be documented.

TEST PROCEDURES



Clause	Requirement + Test	Result-Remark	Verdict
4	MARKING		P
	Name, monogram or symbol of manufacturer.....:	Integrated Batteries India Pvt Ltd.	P
	Type or model number.....:	IBMPH-640	P
	Serial number.....:	Marked	P
	Polarity of terminals or leads.....:	Marked	P
	Maximum system voltage.....:	1500V	P
	The date and place of manufacture.....:	Marked	P
	Initial examination	All Modules	-
10	Preconditioning.....:	5.0 kWh/m^2	P
10.1	Visual inspection.....:	See table 10.1 Int	P
10.2	Maximum power determination.....:	See table 10.2 Int	P
10.3	Insulation test.....:	See table 10.3 Int	P
10.15	Wet leakage current test	See table 10.15 Int	P
Group A	Control Module	Sample Group ID A	-
Group B	1 Module	Sample Group ID B	-
10.4	Measurement of temperature coefficients	See table 10.4 B	P
10.5	Measurement of Nominal Operating Cell Temperature [NOCT,°C].....:	See table 10.5 B	P
10.6	Performance at STC and NOCT.....:	See table 10.6 B	P
10.7	Performance at low irradiance.....:	See table 10.7 B	P
10.8	Outdoor exposure test	See table 10.8 B	P
10.18	Bypass diode thermal test	See table 10.18 B	P
	Maximum allowed junction temperature.....:	200°C	P
	Measured junction temperature.....:	See table 10.18 B	P
10.9	Hot spot endurance test.....:	See table 10.9 B	P
Group C	2Modules	Sample Group ID C1, C2	P
10.10	UV test.....:	15 kWh/m^2	P
	Final measurements	See table 10.10 C	P
10.11	Thermal cycling test (50cycles).....:	50	P
	Final measurements	See appended table 10.11 C	P
10.12	Humidity freeze (10cycles).....:	10	P
	Final measurements	See table 10.12 C	P
Group C1	1 Module	Sample Group ID C1	P
10.14	Robustness of terminations test.....:	Type A	P
	Final measurements	See table 10.14 C1	P

Clause	Requirement + Test	Result-Remark	Verdict
Group D	2 Modules	Sample Group ID D1, D2	P
10.11	Thermal cycling test (200 cycles).....:	200	P
	Final measurements	See table 10.11 D	P
Group E	2 Modules	Sample Group ID E1, E2	P
10.13	Damp heat test.....:	1000h	P
	Final measurements	See table 10.13 E	P
Group E1	1 Module	Sample Group ID E1	P
10.16	Mechanical load test.....:	2400Pa & 5400Pa	P
10.16.4	-No open-circuits or ground faults detected		P
	Final measurements	See table 10.16 E1	P
Group E2	1 Module	Sample Group ID E2	P
10.17	Hail test	25 mm	P
	Number of points impacted.....:	11	P
	Final measurements	See table 10.17 E2	P
	Final measurement	All modules	P
10.15	Wet leakage current test	See table 10.15 F	P

Clause	Requirement + Test	Result-Remark	Verdict

10.1 Initial	**TABLE: Visual inspection (Initial)**	P
Test Date [MM/DD/YYYY].....:	09/24/2024	-
Sample #	Nature and position of initial findings – comments or attach photos	-
1	No visual defect	P
2	No visual defect	P
3	No visual defect	P
4	No visual defect	P
5	No visual defect	P
6	No visual defect	P
7	No visual defect	P
8	No visual defect	P
Supplementary information: Nil		

10.2 Initial	**TABLE: Maximum power determination (Initial)**					P
Test Date [MM/DD/YYYY].....:	10/24/2024					-
Module temperature [°C].....:	25					-
Irradiance [W/m^2].....:	1000					-
Sample#	Voc[V]	Vmp [V]	Isc [A]	Imp [A]	Pmp [W]	FF[%]
1	56.18	46.69	14.518	13.731	641.10	78.60
2	56.16	46.68	14.514	13.730	640.92	78.63
3	56.14	46.67	14.511	13.721	640.36	78.61
4	56.12	46.66	14.502	13.731	640.69	78.72
5	56.13	46.67	14.498	13.725	640.55	78.71
6	56.08	46.66	14.489	13.716	639.99	78.76
7	56.15	46.65	14.487	13.731	640.55	78.75
8	56.14	46.67	14.482	13.712	639.94	78.71
Supplementary information: Nil						

10.3 Initial	**Table: Insulation test (initial)**			P
Test Date [MM/DD/YYYY].....:		10/24/2024		-
Test Voltage applied [V].....:		4000V for 1min & 1500V for 2min		-
Sample#	Measured GΩ	Required MΩ	Dielectric break down Yes(description)/No	Result
1	18.35	14.29	No	P
2	18.24	14.29	No	P
3	17.49	14.29	No	P
4	17.97	14.29	No	P
5	18.51	14.29	No	P
6	18.01	14.29	No	P
7	17.77	14.29	No	P
8	17.89	14.29	No	P
Supplementary information: Area of module 2.80[m^2].				

Clause	Requirement + Test	Result-Remark	Verdict

10.15 Initial	**TABLE: Wet leakage current test (Initial)**			P
Test Date [MM/DD/YYYY].....:		10/24/2024		-
Test Voltage applied [V].....:		1500V		-
Solution resistivity [Ω cm].....:		<3500 at 22 ± 3°C	2585	-
Solution temperature [°C].....:		24.2		-
Sample#	Measured[GΩ]	Limit[MΩ]		Result
1	10.19	14.29		P
2	11.26	14.29		P
3	12.13	14.29		P
4	10.83	14.29		P
5	10.35	14.29		P
6	12.23	14.29		P
7	10.09	14.29		P
8	11.48	14.29		P
Supplementary information: Area of module 2.80[m^2].				

10.4 B	**TABLE: Measurement of temperature coefficients**		P
Test Date [MM/DD/YYYY].....:		11/11/2024	-
Ambient air temperature [°C].....:		25	-
Irradiance [W/m^2].....:		1000	-
Module temperature [°C] high/low.....:		65 /25	-
Sample#	Parameter	Calculated Value	-
2	Short circuit current α [%/°C].....:	0.0469	-
	Open circuit voltage β [%/°C].....:	-0.2681	-
	Peak power δ [%/°C].....:	-0.3218	-
Supplementary information: Nil			

10.5 B	**TABLE: Measurement of Nominal Operating Cell Temperature [NOCT, °C]**			P
Test Date [MM/DD/YYYY].....:	11/16/2024	11/17/2024	11/18/2024	-
Wind velocity [m/s] high/low.....:	1.11/0.69	1.08/0.75	1.14/0.78	-
Ambient temperature [°C] high/low.....:	34.11/28.29	34.28/26.48	33.89/26.84	-
Irradiance [W/m^2] high/low.....:	871.2/452.9	821.4/418.4	810.4/429.4	-
Module temperature [°C] high/low.....:	49.38/35.76	46.48/32.38	48.48/34.30	-
Wind velocity [m/s] (average).....:	0.91	0.95	0.93	-
Ambient temperature [°C] (average).....:	33.27	32.94	31.02	-
NOCT correction factor [°C].....:	1	1	1	-
Calculated NOCT [°C].....:	46.98	45.22	46.48	-
Sample#	Average NOCT[°C]			
2	46.23			
Supplementary information: Nil				

Clause	Requirement + Test	Result-Remark	Verdict

10.6 B	**TABLE: Performance at STC and NOCT**						P
Sample No.....:		2					
Test Date [MM/DD/YYYY].....:		11/21/2024					-
Wind velocity [m/s] high/low.....:		N/A					-
Test method.....:		[X]	Indoor	[ ]	Outdoor		-
Ambient air temperature [°C].....:		25					-
Irradiance [W/m^2] High/Low.....:		1000					-
Module temperature [°C] high/low.....:		25°C for STC / 46.23°C for NOCT					-
Condition	Voc [V]	Vmp [V]	Isc [A]	Imp [A]	Pmp [W]	FF[%]	
STC	56.16	46.68	14.512	13.730	640.92	78.64	
NOCT	49.42	41.35	10.258	9.647	398.90	78.69	
Supplementary information: Nil							

10.7 B	**TABLE: Performance at low irradiance**					P
Test Date [MM/DD/YYYY].....:		11/21/2024				-
Ambient air temperature [°C].....:		N/A				-
Irradiance [W/m^2].....:		200				-
Module temperature [°C].....:		25				-
Test method.....:		[X] Data corrected to a 25°C cell temperature and 200W/m^2 irradiance [ ] Directly measured				-
Sample#	Voc[V]	Vmp[V]	Isc[A]	Imp[A]	Pmp [W]	FF[%]
2	40.82	35.61	3.912	3.524	125.49	78.58
Supplementary information: Nil						

10.8 B	**TABLE: Outdoor exposure test**	P
Sample No.....:	2	-
Test Date [MM/DD/YYYY] start/end.....:	11/21/2024 to 11/29/2024	
Total irradiation dosage [kWh/m^2].....:	60	-
Supplementary information: Nil		

(10.1 Visual inspection after outdoor exposure test)		P
Test Date [MM/DD/YYYY].....:	11/29/2024	-
Sample#	Nature and position of initial findings – comments or attach photos	-
2	No visual defect	P
Supplementary information: Nil		

Clause	Requirement + Test	Result-Remark	Verdict

(10.2 Maximum power determination after outdoor exposure test)						P
Test Date [MM/DD/YYYY].....:		11/29/2024				-
Module temperature [°C].....:		25				-
Irradiance [W/m^2].....:		1000				-
Sample#	Voc[V]	Vmp[V]	Isc[A]	Imp[A]	Pmp [W]	FF[%]
2	56.12	46.60	14.505	13.698	638.33	78.42
1(control)	56.15	46.68	14.515	13.730	640.92	78.64
Pmp degradation after this test [%] ≤ 5%.....:			-0.40 for Sample 2			
(10.3 Insulation test after outdoor exposure test)						P
Test Date [MM/DD/YYYY].....:			11/29/2024			-
Test Voltage applied [V].....:			4000V for 1min & 1500V for 2min			-
Sample#	Measured	Required	Dielectric breakdown			Result
	GΩ	MΩ	Yes(description)	No		
2	12.52	14.29	No	-		P
Supplementary information: Area of module 2.80[m^2], Minimum requirement according to the standard is 40MΩm^2						

10.18B	**TABLE: Bypass diode thermal test**			P
Sample No.....:	2			-
Test Date [MM/DD/YYYY] start/end.....:	12/03/2024			-
Module temperature [°C].....:	75±5			-
Number of diodes in junction box.....:	3			-
Diode manufacturer.....:	Genx Pv India Private Limited.			-
Diode type designation.....:	MK6045			-
Max. permissible junction temperature T_{jmax} [°C] (according to diode datasheet).....:	200			-
	Diode1	Diode2	Diode3	Result
Current flow applied [A].....:	14.51	14.51	14.51	-
Max. diode surface temperature [°C] a or b:	135.5	132.5	136.5	-
Voltage drop [V].....:	0.42	0.39	0.41	-
Power dissipation [W].....:	6.09	5.66	5.95	-
Thermal resistance junction to leads (RTHJL)/to case (RTHJC) [K/W] (according to datasheet).....:	1.2	1.2	1.2	-
Calculated max. junction temperature T_{jcalc} [°C] a or b..... :	142.81	139.29	143.64	-
T_{jcalc}<T_{jmax} (test passed)? Yes/No.....:	Yes	Yes	Yes	-
Current flow (1.25 * Isc) [A].....:	18.14	18.14	18.14	-
Max. diode surface temperature [°C] a or b :	146.95	143.8	148.5	-
Remarks: After completion of the test, diode is still functional. (a: measured at diode case or ambient near diode case, b: measured at diode leads)				

Clause	Requirement + Test	Result-Remark	Verdict

(10.1 Visual inspection after bypass diode thermal test)							P
Test Date [MM/DD/YYYY].....:		12/03/2024					-
Sample#	Nature and position of initial findings – comments or attach photos						-
2	No visual defect						P
Supplementary information: Nil							
(10.2 Maximum power determination after bypass diode thermal test)							P
Test Date [MM/DD/YYYY].....:			12/03/2024				-
Module temperature [°C].....:			25				-
Irradiance [W/m^2].....:			1000				-
Sample#	Voc[V]	Vmp[V]	Isc[A]	Imp[A]	Pmp [W]		FF[%]
2	56.10	46.51	14.495	13.665	635.56		78.16
1 (control)	56.15	46.67	14.515	13.729	640.73		78.62
Pmp degradation after this test [%] ≤5%.....:			-0.43 for Sample 2				-
Supplementary information: Nil							
(10.3 Insulation test after bypass diode thermal test)							P
Test Date [MM/DD/YYYY].....:			12/03/2024				-
Test Voltage applied [V].....:			4000V for 1min & 1500V for 2min				-
Sample#	Measured	Required	Dielectric breakdown				Result
	GΩ	MΩ	Yes(description)		No		
2	12.34	14.29	No		-		P
Supplementary information: Area of module 2.80[m^2], Minimum requirement according to the standard is 40MΩm^2							

10.9 B	**TABLE: Hot-spot endurance test**							P
Sample No. .....:		2						-
Test Date [MM/DD/YYYY] start/end.....:		12/04/2024						-
Cell interconnection circuit.....:		[ ]	S	[X]	SP	[ ]	SPS	-
Module temperature at thermal equilibrium [°C].....:		53.1						-
Determination of worst case cell								-
Maximum measured cell temperature in 5hours [°C]:		76.4						-
Shading rate [%].....:		100						-
Supplementary information: Nil								
(10.1 Visual inspection after hot-spot endurance test)								P
Test Date [MM/DD/YYYY].....:		12/04/2024						-
Sample#	Nature and position of initial findings							-
2	No visual defect							P
Supplementary information: Nil								

Clause	Requirement + Test	Result-Remark	Verdict

(10.2 Maximum power determination after hot-spot endurance test)						P
Test Date [MM/DD/YYYY].....:		12/04/2024				-
Module temperature [°C].....:		25				-
Irradiance [W/m^2].....:		1000				-
Sample#	Voc[V]	Vmp[V]	Isc[A]	Imp[A]	Pmp [W]	FF[%]
2	56.09	46.35	14.489	13.641	632.26	77.80
1(control)	56.11	46.66	14.511	13.729	640.60	78.68
Pmp degradation after this test [%] ≤5%.....:		-0.52 for Sample 2				
Supplementary information: Nil						

(10.3 Insulation test after hot-spot endurance test)					P
Test Date [MM/DD/YYYY].....:		12/04/2024			-
Test Voltage applied [V].....:		4000V for 1min & 1500V for 2min			-
Sample#	Measured	Required	Dielectric breakdown		Result
	GΩ	MΩ	Yes(description)	No	
2	11.17	14.29	No	-	P
Supplementary information: Area of module 2.80[m^2], Minimum requirement according to the standard is 40MΩm^2					

10.10C	**TABLE: UV preconditioning test**		P
Test Date [MM/DD/YYYY] start/end.....:		10/28/2024 to 11/05/2024	-
Module temperature [°C].....:		60 ± 5	-
Total UV Irradiation 280-400nm [kWh/m^2].....:		15.0	-
Irradiation 280-320nm [kWh/m^2].....:		5.0	-
Sample#	Open circuits (Yes/No)		-
3	No open circuit found		P
4	No open circuit found		P
Supplementary information: Nil			

(10.1 Visual inspection after UV preconditioning test)			P
Test Date [MM/DD/YYYY].....:		11/05/2024	-
Sample#	Nature and position of initial findings		-
3	No visual defect		P
4	No visual defect		P
Supplementary information: Nil			

(10.2 Maximum power determination after UV preconditioning test)						P
Test Date [MM/DD/YYYY].....:			11/05/2024			-
Module temperature [°C].....:			25			-
Irradiance [W/m^2].....:			1000			-
Sample#	Voc[V]	Vmp[V]	Isc[A]	Imp[A]	Pmp [W]	FF[%]
3	56.12	46.52	14.482	13.691	636.91	78.37
4	56.08	46.48	14.502	13.682	635.94	78.20
1 (Control)	56.05	46.65	14.511	13.728	640.41	78.74
Pmp degradation after this test [%] ≤5%.....:			-0.54 & -0.74 for Sample 3 & 4 respectively			-
Supplementary information: Nil						

(10.3 Insulation test after UV preconditioning test)					P
Test Date [MM/DD/YYYY].....:			11/05/2024		-
Test Voltage applied [V].....:			4000V for 1min & 1500V for 2min		-
Sample#	Measured	Required	Dielectric breakdown		Result
	GΩ	MΩ	Yes(description)	No	
3	11.26	14.29	No	-	P
4	12.43	14.29	No	-	P
Supplementary information: Area of module 2.80[m^2], Minimum requirement according to the standard is 40MΩm^2					

10.11C	**TABLE: Thermal cycling 50 test**	P
Test Date [MM/DD/YYYY] start/end.....:	11/11/2024 to 11/23/2024	-
Total cycles (50).....:	50	-
Sample#	Open circuits (Yes/No)	-
3	No open circuit found	P
4	No open circuit found	P
Supplementary information: Nil		
(10.1 Visual inspection after thermal cycling 50 test)		P
Test Date [MM/DD/YYYY].....:	10/23/2024	-
Sample#	Nature and position of initial findings	-
3	No visual defect	P
4	No visual defect	P
Supplementary information: Nil		

(10.2 Maximum power determination after thermal cycling 50 test)						P
Test Date [MM/DD/YYYY].....:			10/23/2024			-
Module temperature [°C].....:			25			-
Irradiance [W/m^2].....:			1000			-
Sample#	Voc[V]	Vmp[V]	Isc[A]	Imp[A]	Pmp [W]	FF[%]
3	56.05	46.25	14.475	13.682	632.79	78.00
4	56.06	46.21	14.498	13.646	630.58	77.59
1 (Control)	56.02	46.64	14.508	13.728	640.27	78.78
Pmp degradation after this test [%] ≤5%.....:			-0.65 & -0.84 for Sample 3 & 4 respectively			-
Supplementary information: Nil						

(10.3 Insulation test after thermal cycling 50 test)					P
Test Date [MM/DD/YYYY].....:			10/23/2024		-
Test Voltage applied [V].....:			4000V for 1min & 1500V for 2min		-
Sample#	Measured	Required	Dielectric breakdown		Result
	GΩ	MΩ	Yes (description)	No	
3	11.86	14.29	No	-	P
4	12.19	14.29	No	-	P
Supplementary information: Area of module 2.80[m^2], Minimum requirement according to the standard is 40MΩm^2					

10.12C	**TABLE: Humidity freeze 10 test**		P
Test Date [MM/DD/YYYY] start/end.....:		11/24/2024 to 12/05/2024	-
Total cycles (10).....:		10	-
Sample#	Open circuits(Yes/No)		-
3	No open circuit found		P
4	No open circuit found		P
Supplementary information: Nil			

(10.1 Visual inspection after humidity freeze 10 test)			P
Test Date [MM/DD/YYYY].....:		12/05/2024	-
Sample#	Nature and position of initial findings		-
3	No visual defect		P
4	No visual defect		P
Supplementary information: Nil			

(10.2 Maximum power determination after humidity freeze 10 test)						P
Test Date [MM/DD/YYYY].....:			12/05/2024			-
Module temperature [°C].....:			25			-
Irradiance [W/m^2].....:			1000			-
Sample#	Voc[V]	Vmp[V]	Isc[A]	Imp[A]	Pmp [W]	FF[%]
3	56.02	46.12	14.471	13.612	627.79	77.44
4	55.95	46.08	14.492	13.559	624.80	77.06
1(Control)	55.97	46.63	14.503	13.727	640.09	78.85
Pmp degradation after this test [%] ≤5%.....:			-0.79 & -0.92 for Sample 3 & 4 respectively			-

(10.3 Insulation test after humidity freeze 10 test)					P
Test Date [MM/DD/YYYY].....:			12/05/2024		-
Test Voltage applied [V].....:			4000V for 1min & 1500V for 2min		-
Sample#	Measured	Required	Dielectric breakdown		Result
	GΩ	MΩ	Yes(description)	No	
3	11.29	14.29	No	-	P
4	10.46	14.29	No	-	P
Supplementary information: Area of module 2.80[m^2], Minimum requirement according to the standard is 40MΩm^2					

10.14C1	**TABLE: Robustness of terminations test**		P
Test Date [MM/DD/YYYY] start/end...:		12/05/2024	-
Types of terminations		Type A	-
Applied force in all directions [N]..... :		40 for tensile test, 20 for bending test	-
Sample#	Open circuits(Yes/No)		-
4	No open circuit found		P
Supplementary information: Nil			
(10.1 Visual inspection after robustness of terminations test)			P
Test Date [MM/DD/YYYY].....:		12/05/2024	-
Sample#	Nature and position of initial findings		-
4	No visual defect		P
Supplementary information: Nil			

(10.2 Maximum power determination after robustness of terminations test)						P
Test Date [MM/DD/YYYY].....:			12/05/2024			-
Module temperature [°C].....:			25			-
Irradiance [W/m^2].....:			1000			-
Sample#	Voc[V]	Vmp[V]	Isc[A]	Imp[A]	Pmp [W]	FF[%]
4	55.92	46.05	14.491	13.551	624.02	77.01
1 (Control)	55.85	46.63	14.503	13.727	640.09	79.02
Pmp degradation after this test [%] ≤5%.....:			-0.12 for Sample 4			-
Supplementary information: Nil						

(10.3 Insulation test after robustness of terminations test)					P
Test Date [MM/DD/YYYY].....:			12/05/2024		-
Test Voltage applied [V].....:			4000V for 1min & 1500V for 2min		-
Sample#	Measured	Required	Dielectric breakdown		-
	GΩ	MΩ	Yes(description)	No	
4	12.16	14.29	No	-	P
Supplementary information: Area of module 2.80[m^2], Minimum requirement according to the standard is 40MΩm^2					

10.11D	**TABLE: Thermal cycling 200 test**		P
Test Date [MM/DD/YYYY] start/end.....:		11/09/2024 to 12/25/2024	-
Total cycles (200).....:		200	-
Applied current [A].....:		13.72A	-
Sample#	Open circuits(Yes/No)		-
5	No open circuit found		P
6	No open circuit found		P
Supplementary information: Nil			
(10.1 Visual inspection after thermal cycling 200 test)			P
Test Date [MM/DD/YYYY].....:		26/12/2024	-
Sample#	Nature and position of initial findings		-
5	No visual defect		P
6	No visual defect		P
Supplementary information: Nil			

(10.2 Maximum power determination after thermal cycling 200 test)						P
Test Date [MM/DD/YYYY].....:			26/12/2024			-
Module temperature [°C].....:			25			-
Irradiance [W/m^2].....:			1000			-
Sample#	Voc[V]	Vmp[V]	Isc[A]	Imp[A]	Pmp [W]	FF[%]
5	55.91	46.23	14.495	13.623	629.79	77.71
6	56.02	46.12	14.481	13.612	627.79	77.39
1 (Control)	55.81	46.62	14.482	13.727	639.95	79.18
Pmp degradation after this test [%] ≤5%.....:			-1.74 & -1.96 for Sample 5 & 6 respectively			-
Supplementary information: Nil						

Clause	Requirement + Test	Result-Remark	Verdict

(10.3 Insulation test after thermal cycling 200 test)					P
Test Date [MM/DD/YYYY].....:		26/12/2024			-
Test Voltage applied [V].....:		4000V for 1min & 1500V for 2min			-
Sample#	Measured	Required	Dielectric breakdown		Result
	GΩ	MΩ	Yes(description)	No	
5	11.55	14.29	No	-	P
6	12.42	14.29	No	-	P
Supplementary information: Area of module 2.80[m^2], Minimum requirement according to the standard is 40MΩm^2					

10.13E	**TABLE: Damp heat 1000 test**				P
Test Date [MM/DD/YYYY] start/end:		10/28/2024 to 12/10/2024			-
Total hours (1000).....:		1000			-
Sample#	Open circuits(Yes/No)				-
7	No open circuit found				P
8	No open circuit found				P
Supplementary information: Nil					
(10.1 Visual inspection after damp heat 1000 test)					P
Test Date [MM/DD/YYYY].....:		12/10/2024			-
Sample#	Nature and position of initial findings				-
7	No visual defect				P
8	No visual defect				P
Supplementary information: Nil					
(10.3 Insulation test after damp heat 1000 test)					P
Test Date [MM/DD/YYYY].....:		12/10/2024			-
Test Voltage applied [V].....:		4000V for 1min & 1500V for 2min			-
Sample#	Measured	Required	Dielectric breakdown		Result
	GΩ	MΩ	Yes(description)	No	
7	11.83	14.29	No	-	P
8	12.56	14.29	No	-	P
Supplementary information: Area of module 2.80[m^2], Minimum requirement according to the standard is 40MΩm^2					

(10.15 Wet leakage current test after damp heat 1000 test)				P
Test Date [MM/DD/YYYY].....:	12/10/2024			-
Test Voltage applied [V].....:	1500V			-
Solution resistivity [Ωcm].....:	< 3500 Ω cm at 22 ± 3°C		2558	-
Solution temperature [°C].....:	23.5			-
Sample#	Measured[GΩ]	Limit[MΩ]		Result
7	8.95	14.29		P
8	9.47	14.29		P
Supplementary information: Area of module 2.80[m^2], Minimum requirement according to the standard is 40MΩm^2				

Clause	Requirement + Test	Result-Remark	Verdict

(10.2 Maximum power determination after damp heat 1000 test)						P
Test Date [MM/DD/YYYY].....		12/10/2024				-
Module temperature [°C].....		25				-
Irradiance [W/m^2].....		1000				-
Sample#	Voc[V]	Vmp[V]	Isc[A]	Imp[A]	Pmp [W]	FF[%]
7	56.12	46.12	14.481	13.645	629.31	77.44
8	56.11	46.04	14.475	13.635	627.76	77.29
1 (Control)	55.75	46.61	14.481	13.726	639.77	79.25
Pmp degradation after this test [%]≤5%.....		-1.76 & -1.90 for Sample 7 & 8 respectively				-
Supplementary information: Nil						

10.16E1	**TABLE: Mechanical load test**			P
Sample#.....		7		-
Test Date [MM/DD/YYYY].....		12/16/2024		-
Mounting method.....		As per manual	As per manual	-
Load applied to.....		Front side	Back side	-
Mechanical load [Pa].....		2400	2400	-
First cycle time (start/end).....		10:30 to 11:30	11:45 to 12:45	-
Intermittent open-circuit (Yes/No).....		No	No	-
Mechanical load [Pa].....		2400	2400	-
Second cycle time (start/end).....		12:55 to 13:55	14:20 to 15:20	-
Intermittent open-circuit (Yes/No).....		No	No	-
Mechanical load [Pa].....		5400	2400	-
Third cycle time (start/end).....		15:30 to 16:30	16:45 to 17:45	-
Intermittent open-circuit (Yes/No).....		No	No	-
Supplementary information: Nil				

Clause	Requirement + Test	Result-Remark	Verdict

(10.1 Visual inspection after mechanical load test)						P
Test Date [MM/DD/YYYY].....:		12/17/2024				-
Sample#	Nature and position of initial findings					-
7	No visual defect					P
Supplementary information: Nil						
(10.2 Maximum power determination after mechanical load test)						P
Test Date [MM/DD/YYYY].....:		12/17/2024				-
Module temperature [°C].....:		25				-
Irradiance [W/m^2].....:		1000				-
Sample#	Voc[V]	Vmp[V]	Isc[A]	Imp[A]	Pmp [W]	FF[%]
7	56.05	46.01	14.480	13.632	627.21	77.28
1 (Control)	55.72	46.58	14.478	13.726	639.36	79.25
Pmp degradation after this test [%] ≤5%.....:			-0.33 for Sample 7			-
Supplementary information: Nil						

(10.3 Insulation test after mechanical load test)					P
Test Date [MM/DD/YYYY].....:			12/17/2024		-
Test Voltage applied [V].....:			4000V for 1min & 1500V for 2min		-
Sample#	Measured	Required	Dielectric breakdown		Result
	GΩ	MΩ	Yes(description)	No	
7	10.15	14.29	No	-	P
Supplementary information: Area of module 2.80[m^2], Minimum requirement according to the standard is 40MΩm^2					

10.17E2	**TABLE: Hail impact test**		P
Test Date [MM/DD/YYYY].....:		12/18/2024	-
Ice ball size [mm].....:		25	-
Ice ball weight [g].....:		7.61	-
Ice ball velocity [m/s].....:		23.15	-
Number of impact locations.....:		11	-
Sample#	Open circuits (Yes/No)		-
8	No open circuit found		
Supplementary information: Nil			
(10.1 Visual inspection after hail impact test)			P
Test Date [MM/DD/YYYY].....:		12/18/2024	-
Sample#	Nature and position of initial findings		-
8	No visual defect		P
Supplementary information: Nil			

Clause	Requirement + Test	Result-Remark	Verdict

(10.2 Maximum power determination after hail impact test)						P
Test Date [MM/DD/YYYY].....:		12/18/2024				-
Module temperature [°C].....:		25				-
Irradiance [W/m^2].....:		1000				-
Sample#	Voc[V]	Vmp[V]	Isc[A]	Imp[A]	Pmp [W]	FF[%]
8	56.05	46.02	14.472	13.628	627.16	77.32
1 (Control)	55.68	46.58	14.476	13.726	639.36	79.32
Pmp degradation after this test [%] ≤5%.....:			-0.09 for Sample 8			-
Supplementary information: Nil						

(10.3 Insulation test after hail impact test)					P
Test Date [MM/DD/YYYY].....:			12/18/2024		-
Test Voltage applied [V].....:			4000V for 1min & 1500V for 2min		-
Sample#	Measured	Required	Dielectric breakdown		Result
	GΩ	MΩ	Yes(description)	No	
8	11.45	15.50	No	-	P
Supplementary information: Area of module 2.80[m^2], Minimum requirement according to the standard is 40MΩm^2					

10.2 F	**TABLE: Maximum power determination (Final)**							P
Test Date [MM/DD/YYYY].....:			12/04/2024 to 12/25/2024					-
Module temperature [°C].....:			25					-
Irradiance [W/m^2].....:			1000					-
Sample#	Voc[V]	Vmp[V]	Isc[A]	Imp[A]	Pmp [W]	FF[%]	Degradation [%]	Limit[%]
1	55.68	46.58	14.476	13.726	639.36	79.32	-0.27	- 8
2	56.09	46.35	14.489	13.641	632.26	77.80	-1.35	- 8
3	56.02	46.12	14.471	13.612	627.79	77.44	-1.96	- 8
4	55.92	46.05	14.491	13.551	624.02	77.01	-2.60	- 8
5	55.91	46.23	14.495	13.623	629.79	77.71	-1.68	- 8
6	56.02	46.12	14.481	13.612	627.79	77.39	-1.91	- 8
7	56.05	46.01	14.480	13.632	627.21	77.28	-2.08	- 8
8	56.05	46.02	14.472	13.628	627.16	77.32	-2.00	- 8
Supplementary information: Nil								

Clause	Requirement + Test	Result-Remark	Verdict

10.15F	**TABLE: Wet leakage current test (Final)**			P
Test Date [MM/DD/YYYY].....:		12/12/2024		-
Test Voltage applied [V].....:		1500V		-
Solution resistivity [Ωcm].....:		< 3500 Ω cm at 22 ± 3°C	2598	-
Solution temperature [°C].....:		23.2		-
Sample#	Measured[GΩ]	Limit[MΩ]		Result
1	5.35	14.29		P
2	6.93	14.29		P
3	7.24	14.29		P
4	5.94	14.29		P
5	6.39	14.29		P
6	5.87	14.29		P
7	5.93	14.29		P
8	6.92	14.29		P
Supplementary information: Area of module 2.80[m^2], Minimum requirement according to the standard is 40MΩm^2				

List of Annexes

- Annex 1: List of measurement equipment
- Annex 2: Spectrum of the lamp used for the UV pre-screening test (Optional)
- Annex 3: Statement of the estimated uncertainty of the test results
- Annex 4: Enclosures (Photographs)
- Annex 5: Electrical rating of series models

Annex 1: List of measurement equipment

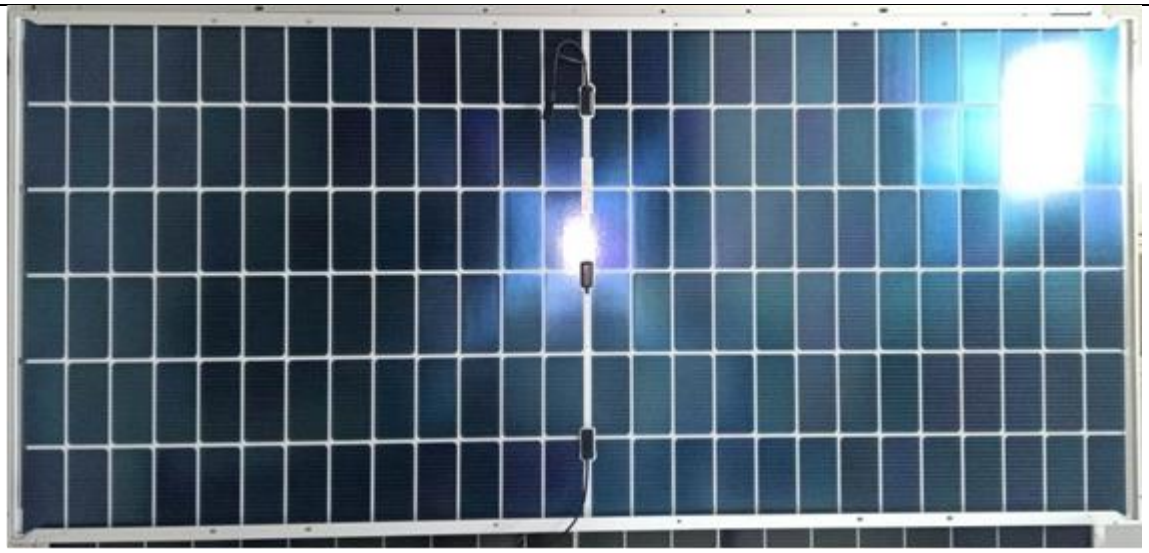
Description	Identification#	Application
Visual inspection test setup	URS/LAB/Lab/1323	Visual inspection test
Sun simulator	URS/LAB/Lab/841	Maximum power determination, Performance at STC, Performance at low irradiance, Measurement of temperature coefficient
IV Curve tracer	URS/LAB/Lab/1046	Performance at low irradiance, Hot spot endurance test, Bypass diode functionality test,
DC Power supply	URS/LAB/Lab/847	Insulation test, Wet leakage test
Hipot tester	URS/LAB/Lab/874	Insulation test, Wet leakage test
Thermal imager	URS/LAB/Lab/640	Hot spot endurance test
Bypass diode tester	URS/LAB/Lab/856	Bypass diode test
NMOT/NOCT	URS/LAB/Lab/846	NOCT test, Temperature test, Outdoor exposure test
UV chamber	URS/LAB/Lab/859	UV preconditioning
Damp heat chamber	URS/LAB/Lab/860	Damp heat test
Humidity freeze chamber	URS/LAB/Lab/861	Temperature cycling test
Damp heat chamber	URS/LAB/Lab/1381	Temperature cycling test, Bypass diode test
DC Power supply	URS/LAB/Lab/926	Temperature cycling test,
Temperature data logger	URS/LAB/Lab/925	Temperature cycling test, Bypass diode test
Continuity tester	URS/LAB/Lab/852	Continuity test
Robustness of termination	URS/LAB/Lab/842	Robustness of termination test
Wet leakage tester	URS/LAB/Lab/855	Wet leakage test
Glass Thermometer	URS/LAB/Lab/979	Wet leakage test
Mechanical load	URS/LAB/Lab/853	Mechanical load test
Hail tester	URS/LAB/Lab/849	Hail tester test
Vernier caliper	URS/LAB/Lab/898	For dimension
Measuring tape	URS/LAB/Lab/937.1	For dimension

Annex 2: Spectrum of the lamp used for the UV pre-screening test (Optional)

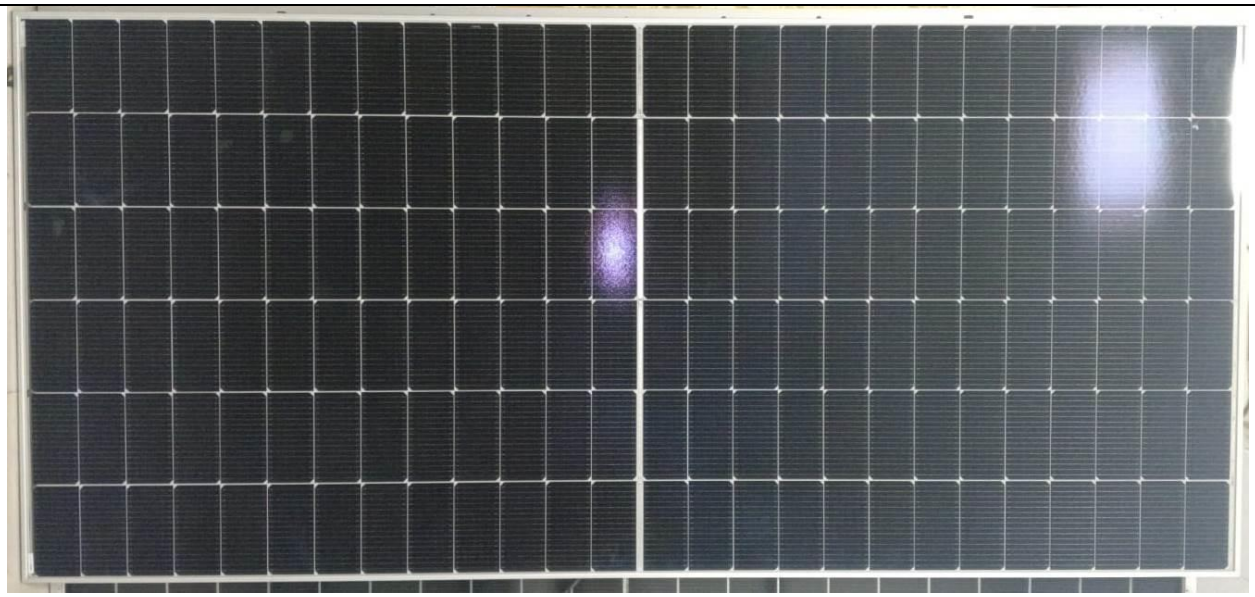
Annex 3: Statement of the estimated uncertainty of the test results

For Pmp – Measurement uncertainty is ±2.4%
For Isc – Measurement uncertainty is ±2.1%
For Voc – Measurement uncertainty is ±1.8%

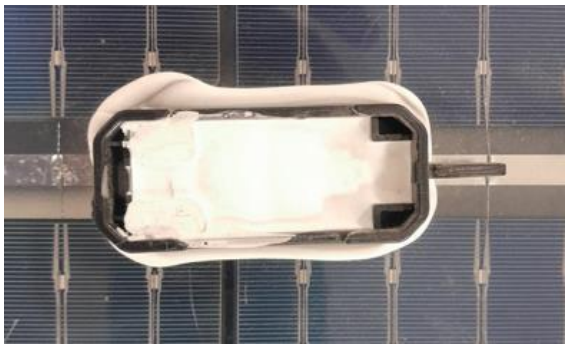
Annex 4: Enclosures (**Photographs**)



Rear view



Front view

	
Junction Box closed view	Junction Box opened view
	
Negative Connector	Positive Connector

Annex 5: Electrical rating of series models

Model	System Voltage (V)	Electrical Rating					Fuse Rating (A)	Dimension			Total no. of cells (Half cut cells) (no.)	No of cells per by bypass diode (no.)
		Voc (V)	Vm (V)	Isc (A)	Im (A)	Pm (W)		L (mm)	W (mm)	H (mm)		
IBMPH-640	1500	56.12	46.65	14.51	13.72	640	30	2466	1135	35	156	52
IBMPH-635	1500	55.99	46.44	14.43	13.68	635	30	2466	1135	35	156	52
IBMPH-630	1500	55.86	46.27	14.35	13.62	630	30	2466	1135	35	156	52
IBMPH-625	1500	55.72	46.1	14.27	13.56	625	30	2466	1135	35	156	52
IBMPH-620	1500	55.58	45.93	14.19	13.5	620	30	2466	1135	35	156	52
IBMPH-615	1500	55.44	45.77	14.11	13.44	615	30	2466	1135	35	156	52
IBMPH-610	1500	55.31	45.6	14.03	13.38	610	30	2466	1135	35	156	52
IBMPH-605	1500	55.17	45.42	13.95	13.32	605	30	2466	1135	35	156	52
IBMPH-600	1500	52.10	43.78	14.61	13.71	600	30	2278	1134	35	156	52
IBMPH-595	1500	51.90	43.61	14.53	13.64	595	30	2278	1134	35	144	48
IBMPH-590	1500	51.70	43.45	14.45	13.58	590	30	2278	1134	35	144	48
IBMPH-585	1500	51.50	43.27	14.36	13.52	585	30	2278	1134	35	144	48
IBMPH-580	1500	51.47	42.59	14.37	13.62	580	30	2278	1134	35	144	48
IBMPH-575	1500	51.27	42.44	14.31	13.55	575	30	2278	1134	35	144	48
IBMPH-570	1500	51.07	42.29	14.25	13.48	570	30	2278	1134	35	144	48
IBMPH-565	1500	50.87	42.14	14.19	13.41	565	30	2278	1134	35	144	48
IBMPH-560	1500	50.67	41.95	14.13	13.35	560	30	2278	1134	35	144	48
IBMPH-555	1500	50.49	41.78	14.06	13.28	555	30	2278	1134	35	144	48
IBMPH-550	1500	50.28	41.63	13.99	13.21	550	30	2278	1134	35	144	48

……End of Test report……