



TEST REPORT IEC 62716:2013 Photovoltaic (PV) modules - Ammonia corrosion testing	
Report Number.:	6217124B.51
Date of issue	2025-04-21
Total number of pages.....:	15
DEKRA Branch	DEKRA Testing and Certification (Shanghai) Ltd.
Applicant's name.....:	INTEGRATED BATTERIES INDIA PVT LTD.
Address	PLOT NO.40, ECOTECH-10, GREATER NOIDA, UTTAR PRADESH, 201301, INDIA
Test specification: Standards IEC 62716:2013 EN 62716:2013 Test procedure DEKRA Type Approved Seal Non-standard test method.....: N/A	
Test Report Form No.....:	AMM_A
Test Report Form(s) Originator	DEKRA Testing and Certification (Shanghai) Ltd.
Master TRF	2019-05-20
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Test item description: Photovoltaic (PV) Module(s)		
Trade Mark: lb SOLAR		
Manufacturer: INTEGRATED BATTERIES INDIA PVT LTD.		
Model/Type reference: IBMPF-xxx (xxx=380-400, in step of 5 W) IBMPH-xxx (xxx=405-640, in step of 5 W)		
Ratings: Refer to Annex 1 for more details.		
Testing procedure and testing location:		
☒	DEKRA Branch	DEKRA Testing and Certification (Shanghai) Ltd.
Testing location/ address:		3F #250, Jiangchangsan Road, Building 16, Headquarter Economy Park Shibe Hi-Tech Park, Jing'an District, Shanghai, 200436, P.R. China
☒	Associated Testing Laboratory	DEKRA Testing and Certification (Shanghai) Ltd.
Testing location/ address:		No.16, Lane 1288, Luoning Road, Baoshan District, Shanghai, 200949, P.R.China
Tested by (name, function, signature)		White Zhang 
Approved by (name, function, signature)		Kevin Lu 

List of attachments (including a total number of pages in each attachment):	
	attachment number / number of pages
Installation manual:	
Drawings mechanical:	
Circuit diagram:	
Photographs:	Annex 1 / 1 page
Component datasheets / certificates	
Others:	
IV curve for STC measurement	
EL-images	
List of measurement equipment	Annex 2 / 1 page
Statement of test uncertainty	Annex 3 / 1 page
History report	
Summary of testing:	
Tests performed (name of test and test clause): Visual inspection (MST 01) Maximum power determination (10.2) Dielectric withstand test (MST 16) Wet leakage current test (10.15) Ground continuity test (MST 13) Ammonia corrosion test Bypass diode functionality test (MST 07)	Testing location: DEKRA Testing and Certification (Shanghai) Ltd. No.16, Lane 1288, Luoning Road, Baoshan District, Shanghai, 200949, P.R. China

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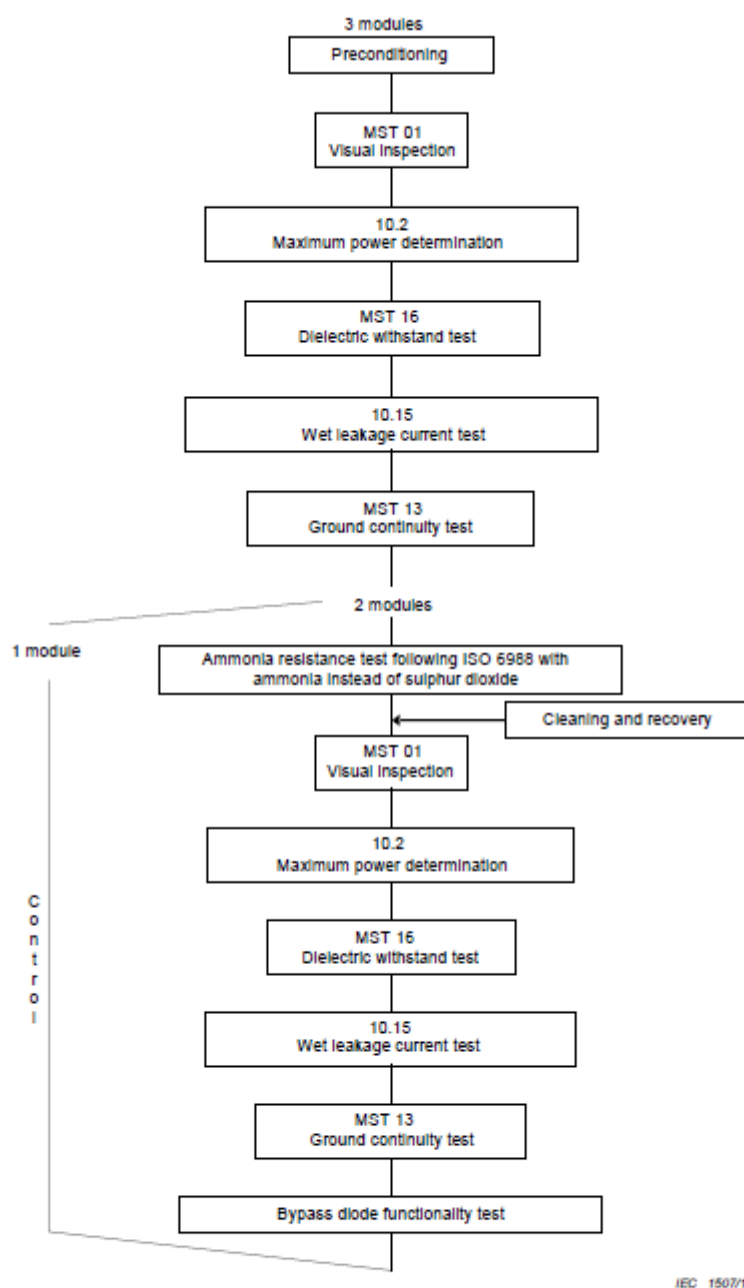
 Authorized: INTEGRATED BATTERIES INDIA PVT LTD. Plot No. 49 Ecotech 13 Gt. Noida-201301 Website: www.ibsolar.co.in Manufactured by: ISO 9001 certified facility in Greater Noida, INDIA	Model No :- IBMPH-640 POWER SPECIFICATION MEASURED AT STC IRRADIANCE : 1000W/M ² , AM : 1.5, CELL TEMPERATURE : 25°C Pmax : 640W ± 2% Voltage (Vmp) : 48.05V Current (Imp) : 13.72A Open Circuit Voltage (Voc) : 58.12V Short Circuit Current (Isc) : 14.51A Maximum System Voltage : 1500V Maximum series Fuse : 30A Application Class : A(Safety Class II) Fire Rating : Class C	 WARNING ELECTRICAL HAZARD This solar module produces DC electricity when exposed to light. * ALWAYS observe the recommended safety precautions and use the recommended personal protection equipment. * ALL installation and maintenance operations must be carried out by qualified personnel in accordance with local regulations. * BEWARE dangerous DC voltage and currents may exist when modules are installed. * DO NOT damage or scratch the rear surface of the module. * DO NOT handle or install modules when they are wet or if the backsheet is damaged. * WHEN connecting this solar module to other equipment then refer to the equipment manufacturer's instructions. Refer to the instruction sheet for more information.
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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 does not meet the requirement	F (Fail)
Abbreviations used in the report:	
P _{max} – Maximum power	α – Current temperature coefficient
V _{mp} – Maximum power voltage	β – Voltage temperature coefficient
I _{mp} – Maximum power current	δ – power temperature coefficient
I _{sc} – Short circuit current	NMOT – Nominal Module Operating Temperature (20°C, 800 W/m²)
V _{oc} – Open circuit voltage	V _{FM} rated – Rated diode(s) forward voltage
FF – Fill factor	V _{FM} – Measured diode(s) forward voltage
STC – Standard Test Conditions (25°C, 1 000 W/m²)	NP – Nameplate
t_1 – the manufacturer's rated lower production tolerance in % for P _{max}	t_2 – the manufacturer's rated upper production tolerance in % for V _{oc}
t_3 – the manufacturer's rated upper production tolerance in % for I _{sc}	r – P _{max} measurement reproducibility
m_1 – the measurement uncertainty in % of laboratory for P _{max}	m_2 – the measurement uncertainty in % of laboratory for V _{oc}
m_3 – the measurement uncertainty in % of laboratory for I _{sc}	
Testing Dates (YYYY-MM-DD)	
Date of first test item received	2025-02-24
Dates of tests (beginning/end).....	2025-02-26 / 2025-03-31

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GENERAL REMARKS:				
According to the inquiry, test procedure was in accordance with IEC 62716:2013, EN 62716:2013. Test procedure is according to client's requirements. Test results are documented within this test report. Maximum System Voltage: 1500 V Hours: 8h including heating up(1 test section), 16h including cooling(2 test section) NH3 concentration: 6667ppm(1 test section), 0ppm(2 test section) Temperature: 60°C(1 test section), 18°C -28°C(2 test section) Relative humidity: nearly 100%(1 test section), max. 75%(2 test section) Duration: 20 cycles = 480 hours (20 days) Product material information is listed as below: All tests were performed in this test report. "(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.				
Name and address of factory (factories).....:		INTEGRATED BATTERIES INDIA PVT LTD. PLOT NO.40, ECOTECH-10, GREATER NOIDA, UTTAR PRADESH, 201301, INDIA		
PRODUCT ELECTRICAL RATINGS:				
Module type	IBMPH-640	-	-	-
Voc [V]	56.12	-	-	-
Vmp [V]	46.65	-	-	-
Imax [Adc]	13.72	-	-	-
Isc [Adc]	14.51	-	-	-
Pmp [W]	640	-	-	-
Maximum system voltage [V]	1500	-	-	-
Maximum Over-Current Protection Rating [A]	25	-	-	-
Note:				

TEST SEQUENCE:

IEC 1507/13

NOTE 1 Preconditioning and tests 10.2 and 10.15 are taken from IEC 61215:2005. Tests MST 01, MST 13 and MST 16 are taken from IEC 61730-2:2004.

NOTE 2 The control module should be used as a check every time the test modules are measured to evaluate the effect of the salt mist test.

Remark: Figure 1 of standard IEC 62716:2013

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IEC 62716:2013			
Clause	Requirement + Test	Result - Remark	Verdict

MODULE GROUP ASSIGNMENT:			
Sample #	Type/model	Sample S/N	Remark
1	IBMPH-640	IB6400125197148	Control
2	IBMPH-640	IB6400125197143	Ammonia
3	IBMPH-640	IB6400125197145	Ammonia
Remarks:N/A			

TESTING OVERVIEW			—
Initial Visual inspection (MST 01)	See Table 01		P
Initial Maximum power determination (10.2)	See Table 02		—
Initial Dielectric withstand test (MST 16)	See Table 03		P
Initial Wet leakage current test (10.15)	See Table 04		P
Initial Ground continuity test (MST 13)	See Table 05		P
Ammonia corrosion test	See Table 06		—
Final Visual inspection (MST 01)	See Table 07		P
Final Maximum power determination (10.2)	See Table 08		P
Final Dielectric withstand test (MST 16)	See Table 09		P
Final Wet leakage current test (10.15)	See Table 10		P
Final Ground continuity test (MST 13)	See Table 11		P
Bypass diode functionality test (MST 07)	See Table 12		P

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IEC 62716:2013			
Clause	Requirement + Test	Result - Remark	Verdict
Table 01: Initial Visual inspection			
Test Date (YYYY-MM-DD).....:		2025-02-26	—
Sample # 1	Findings	☐ Yes..... ☒ No	P
	Nature and position of findings – comments or attach photos	-	—
Sample # 2	Findings	☐ Yes..... ☒ No	P
	Nature and position of findings – comments or attach photos	-	—
Sample # 3	Findings	☐ Yes..... ☒ No	P
	Nature and position of findings – comments or attach photos	-	—
Supplementary information: N/A			

Table 02: Initial Maximum power determination							
Test Date [YYYY-MM-DD]				2025-02-26		—	
Irradiance (W/m ²)				1000		—	
Module temperature (°C)				25		—	
Test method				☒ Simulator ☐ Natural sunlight		—	
Sample #	I_{sc} [A]	V_{oc} [V]	I_{mp} [A]	V_{mp} [V]	P_{max} [W]	FF [%]	Result
1	14.517	56.142	13.750	46.646	641.355	78.69	—
2	14.518	56.091	13.733	46.642	640.524	78.66	—
3	14.512	56.154	13.744	46.644	641.088	78.67	—
Supplementary information: After Stabilization procedure							

Table 03: MST 16 - Initial Dielectric withstand test					
Test Date (YYYY-MM-DD).....:				2025-02-26	
Test Voltage applied (V, DC)				8000/1500	
Sample #	Measured	Required	Dielectric breakdown		Result
	MΩ	MΩ	Yes (description)	No	
1	>5000	14.29	-	No	P
2	>5000	14.29	-	No	P
3	>5000	14.29	-	No	P
Supplementary information: The insulation tester can measure up to 5000MΩ.					

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IEC 62716:2013			
Clause	Requirement + Test	Result - Remark	Verdict
Table 04: Initial Wet leakage current test			
Test Date (YYYY-MM-DD)	2025-02-26		—
Test Voltage applied (V, dc)	1500		—
Solution resistivity (Ω cm)	2675		—
Solution temperature ($^{\circ}$ C)	22.5		—
Size of module [m^2]	2.80		—
Sample #	Required Resistance [$M\Omega$]	Measured [$M\Omega$]	Result
1	14.29	>5000	P
2	14.29	>5000	P
3	14.29	>5000	P
Supplementary information: The insulation tester can measure up to 5000M Ω .			

Table 05: MST 13 – Initial Ground continuity test		
Test Date Initial examination (YYYY-MM-DD)	2025-02-26	—
Maximum over-current protection rating (A)	25	—
Current applied (A)	62.5	—
Location of designated grounding point	The center of one longer side	—
No. of other conductive parts tested	The center of the other longer side The center of one shorter longer side The center of the other shorter side	—
Sample #	Resistance [$m\Omega$]	Result
1	0.488 0.512 0.522	P
2	0.509 0.508 0.489	P
3	0.480 0.512 0.528	P
Supplementary information: N/A		

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IEC 62716:2013			
Clause	Requirement + Test	Result - Remark	Verdict
Table 06: Ammonia corrosion test			
Test Date (YYYY-MM-DD / YYYY-MM-DD):	2025-02-28 / 2025-03-20		—
NH3 concentration [ppm]	6667		
Temperature [°C]	60		
Relative humidity [%]	100		
Course of cycle	- exposure of NH3 for 8 hours and 60°C with nearly 100% condensation on the samples - drying for 16 hours at normal atmosphere (18°C - 28°C and max. 75% rel. humidity)		
Duration	20 cycles = 480 hours (20 days)		
Comment	According to DIN EN ISO 3231/DIN EN ISO 6988 DIN 50018		
Sample #	—		—
2	-		—
3	-		—
Supplementary information: N/A			

Table 07: Final Visual inspection			
Test Date (YYYY-MM-DD).....:		2025-03-24	—
Sample # 1	Findings	☐ Yes..... ☒ No	P
	Nature and position of findings – comments or attach photos	-	—
Sample # 2	Findings	☐ Yes..... ☒ No	P
	Nature and position of findings – comments or attach photos	-	—
Sample # 3	Findings	☐ Yes..... ☒ No	P
	Nature and position of findings – comments or attach photos	-	—
Supplementary information: N/A			

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IEC 62716:2013								
Clause	Requirement + Test				Result - Remark			Verdict
TABLE 08: Final Maximum power determination								
Test Date [YYYY-MM-DD]				2025-03-24				—
Test method				☒ Simulator ☐ Natural sunlight				—
Irradiance [W/m²]				1000				—
Module temperature [°C]				25				—
Sample #	I_{sc} [A]	V_{oc} [V]	I_{mp} [A]	V_{mp} [V]	P_{max} [W]	FF [%]	Degradation [%]	Result
1	14.506	56.176	13.731	46.802	642.630	78.86	0.20	P
2	14.485	56.072	13.699	46.519	637.246	78.46	-0.51	P
3	14.488	56.129	13.706	46.453	636.679	78.30	-0.69	P
Supplementary information: N/A								

Table 09: MST 16 - Final Dielectric withstand test					
Test Date (YYYY-MM-DD)				2025-03-24	
Test Voltage applied (V, DC)				8000/1500	
Sample #	Measured	Required	Dielectric breakdown		Result
	MΩ	MΩ	Yes (description)	No	
1	>5000	14.29	-	No	P
2	>5000	14.29	-	No	P
3	>5000	14.29	-	No	P
Supplementary information: The insulation tester can measure up to 5000MΩ.					

Table 10: Final Wet leakage current test			
Test Date (YYYY-MM-DD)		2025-03-24	
Test Voltage applied (V, dc)		1500	
Solution resistivity (Ω cm).....		2344	
Solution temperature (°C).....		24.8	
Size of module [m ²].....		2.80	
Sample #	Required Resistance [MΩ]	Measured [MΩ]	Result
1	14.29	>5000	P
2	14.29	>5000	P
3	14.29	>5000	P
Supplementary information: The insulation tester can measure up to 5000MΩ.			

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IEC 62716:2013			
Clause	Requirement + Test	Result - Remark	Verdict
Table 11: MST 13 – Final Ground continuity test			
Test Date Final examination (YYYY-MM-DD)		2025-03-25	—
Maximum over-current protection rating (A)		25	—
Current applied (A)		62.5	—
Location of designated grounding point.....		The center of one longer side	—
No. of other conductive parts tested		The center of the other longer side The center of one shorter longer side The center of the other shorter side	—
Sample #	Resistance [mΩ]		Result
1	0.489 0.418 0.433		P
2	0.501 0.508 0.512		P
3	0.455 0.432 0.412		P
Supplementary information: N/A			

Table 12: Bypass diode functionality test						
Test Date (YYYY-MM-DD) :				2025-03-25		—
Sample #	IV curve after shading					Result
	Diode 1 working properly		Diode 2 working properly		Diode 3 working properly	
1	☒ Yes	☐ No	☒ Yes	☐ No	☒ Yes ☐ No	P
2	☒ Yes	☐ No	☒ Yes	☐ No	☒ Yes ☐ No	P
3	☒ Yes	☐ No	☒ Yes	☐ No	☒ Yes ☐ No	P
Supplementary information: N/A						

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Annex 1: Photographs of test sample

Module type: IBMPH-640



Fig. 1: front view of test sample



Fig. 2: rear view of test sample

Annex 2: List of measurement equipment

Measurement / testing	Testing / measuring equipment / material used, (Equipment ID)	Range used	Last Calibration date	Calibration due date
Visual inspection test	Visual inspection bench BS-PV 010	-	-	-
	Illumination photometer BS-PV 036	2000lx	2025-02-27	2026-02-26
Maximum power determination test	Pulse solar simulator BS-PV 057	A+AA+	2024-07-29	2025-07-28
	Electrical Load BS-PV 057-02	-15V~420V -50A~50A	2024-07-29	2025-07-28
	Reference Module BS-PV 057-05	-	2024-07-08	2025-07-09
Dielectric withstand test	Insulation tester BS-PV 090	Test voltage: 0~10kV Result range: 0~50000MΩ	2024-05-22	2025-05-21
Wet leakage current test	Water tank BS-PV 047-01	22 ± 2°C	2024-05-22	2025-05-21
	Insulation resistance tester BS-PV 090	Test voltage: 0~10kV Result range: 0~50000MΩ	2024-05-22	2025-05-21
	Conductivity meter BS-PV 047-02	0~1999μs/cm, 10.0~40.0°C	2024-05-22	2025-05-21
Ground continuity test	Ground Resistance Tester BS-PV 025	10~60A	2024-03-27	2025-03-26
Ammonia resistance test	Ammonia test Chamber BS-PV 112	30~60°C 45%~98%RH 0~6667ppm	2024-06-24	2025-06-23
Bypass diode functionality test	Pulse solar simulator BS-PV 057	A+AA+	2024-07-29	2025-07-28

Annex 3: Statement of test uncertainty

The total measuring uncertainty of P_{mpp} is ≤ 2.47%

The total measuring uncertainty of I_{sc} is ≤ 2.35%

The total measuring uncertainty of V_{oc} is ≤ 0.84%