Test Report

ICON SOLAR-EN POWER TECHNOLOGIES PVT LTD

REPORT NUMBER: 4789049279.2.1-OTHERS-S1

PROJECT NUMBER: 4789049279.2.1

ULR NUMBER: N/A

Location (A)
UL India Pvt Limited,
Laboratory building,
Kalyani Platina Campus,
Sy.no.129/4, EPIP Zone,
Phase II, Whitefield,
Bangalore – 560 066
P:91-80-41384400

Location (B)
UL India Pvt Limited,
A-12, Sector 34, Infocity
Phase 1, Gurgaon – 122001

Location (C)
UL India Pvt Limited,
Site: UL Jain Fire
Laboratory, Jain University
Campus, Jakkasandra,
Kanakpura Taluk,
Ramanagara Dist. – 562112

TEST DISCIPLINE: ELECTRONICS
PRODUCT GROUP: SOLAR PANEL

GENERAL DETAILS

Customer / Applicant	Icon Solar-en Power Technologies Pvt. Ltd. PH No. 09, Gram-Dighari, Mandir Hasaud, Teh Arang, Raipur 492001, Chhattisgarh, India		
Manufacturer	Icon Solar-en Power Technologies Pvt. Ltd. PH No. 09, Gram-Dighari, Mandir Hasaud, Teh Arang, Raipur 492001, Chhattisgarh, India		
Program	Others		
Test Lab Location	(a) UL Bangalore	**Refer to Cover page for the UL address**	
Item Under Test	Solar PV Modules		
Model	ISEN320		
Number of Samples	3		
UL Sample Identification	2241969,2241970, 2241971	**Refer Summary of Test results for multiple samples**	
Manufacturer Serial Number (if any)	ICON32036A0504102005, ICON32036A0504102007, ICON32036A0504102002		
Condition of IUT on receipt	Good		
Date of Receipt	22 May 2019		
Applicable Standard	IEC 62804 – Test Methods for The Detection of Potential-Induced Degradation Part 1: Crystalline Silicon Photovoltaic Modules. Edition 1.0, 2015-08 [Negative Grounding]		
Date of Testing (Start date)	27 June 2019	**End Date**	16 July 2019
UL general^ ambient condition	**Temperature in °C**		23 ±5°C
	Relative humidity in %		<70 %
Date of Reporting	30 July 2019		
Test In-charge	Jyothi Swaroop Velidi		

Fill in the rows with information or add hyphen (-)

Reviewed by	Approved by
N.Srimathy Engineer Project Associate	Moumita Debnath Sr. Project Engineer

General Remarks (If any)

NA

Description of Item under Test (IUT)

Poly Crystalline PV Modules for PID testing. Total 2 samples were tested. 1 sample was control sample.

Sample Identification for PID Test				
Sl. No.	**Sample card Number**	**Sample Serial Number**	**Test**	**Product Identification & Serial Number**
1	2241969	ICON32036A0504102005	PID (Negative Grounding)	SOLAR PV MODULE, ISEN320
2	2241970	ICON32036A0504102007		SOLAR PV MODULE, ISEN320
3	2241971(CONTROL)	ICON32036A0504102002		SOLAR PV MODULE, ISEN320

Summary of Test Results

Test No.	Test Parameter	Standard & Clause Number	UL Sample Identification	Result
1	Preconditioning (Pre- PID Test)	IEC 62804	Refer individual test table	NA
2	Visual Inspection Test (Pre-PID Test)			P
3	Maximum Power Determination (Pre-PID Test)			P
4	Performance at low irradiance (Pre-PID Test)			P

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Reviewed by signature:

5	Wet Leakage Current Test (Pre-PID Test)			P
6	Electroluminescence at Isc and 0.1*Isc (Pre-PID Test)			NA
7	Ground continuity test (Pre-PID Test)			P
8	**PID Test: 3 Cycles at 85ºC ± 2ºC, 85 ± 3% of RH for 96Hrs – Total 288Hrs**			P
9	Maximum Power Determination (Post-PID Test)			P
10	Performance at low irradiance (Post-PID Test) - Final			P
11	Wet Leakage Current Test (Post-PID Test)			P
12	Electroluminescence at Isc and 0.1*Isc (Post-PID Test)			NA
13	Visual Inspection Test (Post-PID Test)			P
14	**PID Test: 3 Cycles at 85ºC ± 2ºC, 85 ± 3% of RH for 96Hrs – Total 288Hrs**			P
15	Maximum Power Determination (Post-PID Test)			P
16	Performance at low irradiance (Post-PID Test) - Final			P
17	Wet Leakage Current Test (Post-PID Test)			P
18	Electroluminescence at Isc and 0.1*Isc (Post-PID Test)			P
19	Visual Inspection Test (Post-PID Test)			P

20	**PID Test: 3 Cycles at 85ºC ± 2ºC, 85 ± 3% of RH for 96Hrs – Total 288Hrs**			P
21	Maximum Power Determination (Post-PID Test)			P
22	Performance at low irradiance (Post-PID Test) - Final			P
23	Wet Leakage Current Test (Post-PID Test)			P
24	Electroluminescence at Isc and 0.1*Isc (Post-PID Test)			NA
25	Visual Inspection Test (Post-PID Test)			P

P: Meets the requirements **F: Does not meet the requirement** **NA: Not applicable**

Reviewed by signature:

Master Equipment and Calibration details

Sl No.	Test Name	Id Number	Description	Expiration Date
1	Pre conditioning	69889	PYRANOMETER (PV LAB)	2022-AUG-23
2	Pre conditioning	70817	Datalogger	2020-MAY-07
3	Pre conditioning	71790	CONTINOUS SIMULATOR	
4	Visual Inspection	80703	Light Meters & Sensors	2020-MAR-25
5	Visual Inspection	160912	Fixture, For Testing, Table	N/A
6	Visual Inspection	76645	Magnifying Lens, Without Ruler	N/A
7	Maximum Power Determination	176313	REFERENCE MODULE (PV LAB)	2020-JAN-04
8	Maximum Power Determination	70683	Thermometer, Infrared	2020-FEB-11
9	Maximum Power Determination	158581	Measuring Tool, Ruler or Tape Measure	2019-SEP-18
10	Maximum Power Determination	70472	FLASH SOLAR SIMULATOR	N/A
11	Performance @ Low Irradiance	70472	FLASH SOLAR SIMULATOR	N/A
12	Performance @ Low Irradiance	70683	Thermometer, Infrared	2020-FEB-11
13	Performance @ Low Irradiance	158581	Measuring Tool, Ruler or Tape Measure	2019-SEP-18
14	Performance @ Low Irradiance	176313	REFERENCE MODULE (PV LAB)	2020-JAN-04
15	Wet Insulation Resistance test	177914	Meter, pH, Digital or Analog	2020-MAR-05
16	Wet Insulation Resistance test	167776	Fixture, For Testing, Water Tank	N/A
17	Wet Insulation Resistance test	159551	Timer, Digital or Analog, Wound or Battery Powered	2019-SEP-11
18	Wet Insulation Resistance test	67918	Indicator, Temperature	2020-JAN-10
19	Wet Insulation Resistance test	171342	Apparatus, Insulation Resistance Test	2020-JAN-11

20	Ground Continuity test	127260	EARTH CONTINUITY TESTER	2019-NOV-22
21	Ground Continuity test	159551	Timer, Digital or Analog, Wound or Battery Powered	2019-SEP-11
22	EL image	88424	Power Supply, DC	2020-JAN-04
23	EL image	85226	Electro Luminescence Test Station	N/A
24	EL image	85703	Electro Luminescence Test Station	N/A
25	EL image	85706	Electro Luminescence Test Station	N/A
26	PID 1st cycle	82207	Power Supply, DC	2020-FEB-04
27	PID 1st cycle	70978	Power Supply, DC	2020-JUN-05
28	PID 1st cycle	70973	Power Supply, DC	2020-JUN-05
29	PID 1st cycle	72838	Power Supply, DC	2020-JUN-06
30	PID 1st cycle	70912	Power Supply, DC	2020-JUN-05
31	PID 1st cycle	70913	Power Supply, DC	2020-JUN-06
32	PID 1st cycle	72923	Power Supply, DC	2020-JUN-05
33	PID 1st cycle	70586	Power Supply, DC	2020-JUN-05
34	PID 1st cycle	89932	RESISTOR	2020-MAR-29
35	PID 1st cycle	89936	RESISTOR	2020-MAR-29
36	PID 1st cycle	69921	Datalogger	2019-OCT-24
37	PID 1st cycle	70572	Chamber, Climatic, Temp and RH	2020-MAR-20
38	PID 1st Cycle	70978	Power Supply, DC	2020-JUN-05
39	PID 1st Cycle	70973	Power Supply, DC	2020-JUN-05
40	PID 1st Cycle	72838	Power Supply, DC	2020-JUN-06
41	PID 1st Cycle	70912	Power Supply, DC	2020-JUN-05
42	PID 1st Cycle	70913	Power Supply, DC	2020-JUN-06
43	PID 1st Cycle	72923	Power Supply, DC	2020-JUN-05

44	PID 1st Cycle	70586	Power Supply, DC	2020-JUN-05
45	PID 1st Cycle	89932	RESISTOR	2020-MAR-29
46	PID 1st Cycle	89936	RESISTOR	2020-MAR-29
47	PID 1st Cycle	69921	Datalogger	2019-OCT-24
48	PID 1st Cycle	70572	Chamber, Climatic, Temp and RH	2020-MAR-20
49	Max Power Determination	176313	REFERENCE MODULE (PV LAB)	2020-JAN-04
50	Max Power Determination	70683	Thermometer, Infrared	2020-FEB-11
51	Max Power Determination	158581	Measuring Tool, Ruler or Tape Measure	2019-SEP-18
52	Max Power Determination	70472	FLASH SOLAR SIMULATOR	N/A
53	Performance @ Low Irradiance	70472	FLASH SOLAR SIMULATOR	N/A
54	Performance @ Low Irradiance	70683	Thermometer, Infrared	2020-FEB-11
55	Performance @ Low Irradiance	158581	Measuring Tool, Ruler or Tape Measure	2019-SEP-18
56	Performance @ Low Irradiance	176313	REFERENCE MODULE (PV LAB)	2020-JAN-04
57	Wet leakage current test	177913	Meter, pH, Digital or Analog	2020-MAR-04
58	Wet leakage current test	167776	Fixture, For Testing, Water Tank	
59	Wet leakage current test	159551	Timer, Digital or Analog, Wound or Battery Powered	2019-SEP-11
60	Wet leakage current test	67918	Indicator, Temperature	2020-JAN-10
61	Wet leakage current test	171342	Apparatus, Insulation Resistance Test	2020-JAN-11
62	EL imagining	88424	Power Supply, DC	2020-JAN-04
63	EL imagining	85226	Electro Luminescence Test Station	N/A
64	EL imagining	85703	Electro Luminescence Test Station	N/A
65	EL imagining	85706	Electro Luminescence Test Station	N/A

66	Visual Inspection	180089	Meter and/or Sensor, Light	2020-JUN-15
67	Visual Inspection	160912	Fixture, For Testing, Table	N/A
68	Visual Inspection	76645	Magnifying Lens, Without Ruler	N/A
69	PID 2nd cycle	82207	Power Supply, DC	2020-FEB-04
70	PID 2nd cycle	70978	Power Supply, DC	2020-JUN-05
71	PID 2nd cycle	70973	Power Supply, DC	2020-JUN-05
72	PID 2nd cycle	72838	Power Supply, DC	2020-JUN-06
73	PID 2nd cycle	70912	Power Supply, DC	2020-JUN-05
74	PID 2nd cycle	70913	Power Supply, DC	2020-JUN-06
75	PID 2nd cycle	72923	Power Supply, DC	2020-JUN-05
76	PID 2nd cycle	70586	Power Supply, DC	2020-JUN-05
77	PID 2nd cycle	89932	RESISTOR	2020-MAR-29
78	PID 2nd cycle	89936	RESISTOR	2020-MAR-29
79	PID 2nd cycle	69921	Datalogger	2019-OCT-24
80	PID 2nd cycle	70572	Chamber, Climatic, Temp and RH	2020-MAR-20
81	PID 2nd cycle	82207	Power Supply, DC	2020-FEB-04
82	PID 2nd cycle	70978	Power Supply, DC	2020-JUN-05
83	PID 2nd cycle	70973	Power Supply, DC	2020-JUN-05
84	PID 2nd cycle	72838	Power Supply, DC	2020-JUN-06
85	PID 2nd cycle	70912	Power Supply, DC	2020-JUN-05
86	PID 2nd cycle	70913	Power Supply, DC	2020-JUN-06
87	PID 2nd cycle	72923	Power Supply, DC	2020-JUN-05
88	PID 2nd cycle	70586	Power Supply, DC	2020-JUN-05
89	PID 2nd cycle	89932	RESISTOR	2020-MAR-29

90	PID 2nd cycle	89936	RESISTOR	2020-MAR-29
91	PID 2nd cycle	69921	Datalogger	2019-OCT-24
92	PID 2nd cycle	70572	Chamber, Climatic, Temp and RH	2020-MAR-20
93	Max Power Determination	176313	REFERENCE MODULE (PV LAB)	2020-JAN-04
94	Max Power Determination	70683	Thermometer, Infrared	2020-FEB-11
95	Max Power Determination	158581	Measuring Tool, Ruler or Tape Measure	2019-SEP-18
96	Max Power Determination	70472	FLASH SOLAR SIMULATOR	N/A
97	Performance @ Low Irradiance	70472	FLASH SOLAR SIMULATOR	N/A
98	Performance @ Low Irradiance	70683	Thermometer, Infrared	2020-FEB-11
99	Performance @ Low Irradiance	158581	Measuring Tool, Ruler or Tape Measure	2019-SEP-18
100	Performance @ Low Irradiance	176313	REFERENCE MODULE (PV LAB)	2020-JAN-04
101	Wet leakage current test	177913	Meter, pH, Digital or Analog	2020-MAR-04
102	Wet leakage current test	167776	Fixture, For Testing, Water Tank	N/A
103	Wet leakage current test	159551	Timer, Digital or Analog, Wound or Battery Powered	2019-SEP-11
104	Wet leakage current test	67918	Indicator, Temperature	2020-JAN-10
105	Wet leakage current test	171342	Apparatus, Insulation Resistance Test	2020-JAN-11
106	EL Imagining	88424	Power Supply, DC	2020-JAN-04
107	EL Imagining	85226	Electro Luminescence Test Station	N/A
108	EL Imagining	85703	Electro Luminescence Test Station	N/A
109	EL Imagining	85706	Electro Luminescence Test Station	N/A
110	Visual Inspection	180089	Meter and/or Sensor, Light	2020-JUN-15
111	Visual Inspection	160912	Fixture, For Testing, Table	N/A

112	Visual Inspection	76645	Magnifying Lens, Without Ruler	N/A
113	PID 3rd cycle	82207	Power Supply, DC	2020-FEB-04
114	PID 3rd cycle	70978	Power Supply, DC	2020-JUN-05
115	PID 3rd cycle	70973	Power Supply, DC	2020-JUN-05
116	PID 3rd cycle	72838	Power Supply, DC	2020-JUN-06
117	PID 3rd cycle	70912	Power Supply, DC	2020-JUN-05
118	PID 3rd cycle	70913	Power Supply, DC	2020-JUN-06
119	PID 3rd cycle	72923	Power Supply, DC	2020-JUN-05
120	PID 3rd cycle	70586	Power Supply, DC	2020-JUN-05
121	PID 3rd cycle	89932	RESISTOR	2020-MAR-29
122	PID 3rd cycle	89936	RESISTOR	2020-MAR-29
123	PID 3rd cycle	69921	Datalogger	2019-OCT-24
124	PID 3rd cycle	70572	Chamber, Climatic, Temp and RH	2020-MAR-20
125	PID 3rd cycle	82207	Power Supply, DC	2020-FEB-04
126	PID 3rd cycle	70978	Power Supply, DC	2020-JUN-05
127	PID 3rd cycle	70973	Power Supply, DC	2020-JUN-05
128	PID 3rd cycle	72838	Power Supply, DC	2020-JUN-06
129	PID 3rd cycle	70912	Power Supply, DC	2020-JUN-05
130	PID 3rd cycle	70913	Power Supply, DC	2020-JUN-06
131	PID 3rd cycle	72923	Power Supply, DC	2020-JUN-05
132	PID 3rd cycle	70586	Power Supply, DC	2020-JUN-05
133	PID 3rd cycle	89932	RESISTOR	2020-MAR-29
134	PID 3rd cycle	89936	RESISTOR	2020-MAR-29
135	PID 3rd cycle	69921	Datalogger	2019-OCT-24

136	PID 3rd cycle	70572	Chamber, Climatic, Temp and RH	2020-MAR-20
137	Max Power Determination	176313	REFERENCE MODULE (PV LAB)	2020-JAN-04
138	Max Power Determination	70683	Thermometer, Infrared	2020-FEB-11
139	Max Power Determination	158581	Measuring Tool, Ruler or Tape Measure	2019-SEP-18
140	Max Power Determination	70472	FLASH SOLAR SIMULATOR	N/A
141	Performance @ Low Irradiance	70472	FLASH SOLAR SIMULATOR	N/A
142	Performance @ Low Irradiance	70683	Thermometer, Infrared	2020-FEB-11
143	Performance @ Low Irradiance	158581	Measuring Tool, Ruler or Tape Measure	2019-SEP-18
144	Performance @ Low Irradiance	176313	REFERENCE MODULE (PV LAB)	2020-JAN-04
145	Wet leakage current test	177913	Meter, pH, Digital or Analog	2020-MAR-04
146	Wet leakage current test	167776	Fixture, For Testing, Water Tank	N/A
147	Wet leakage current test	159551	Timer, Digital or Analog, Wound or Battery Powered	2019-SEP-11
148	Wet leakage current test	67918	Indicator, Temperature	2020-JAN-10
149	Wet leakage current test	171342	Apparatus, Insulation Resistance Test	2020-JAN-11
150	EL Imagining	88424	Power Supply, DC	2020-JAN-04
151	EL Imagining	85226	Electro Luminescence Test Station	N/A
152	EL Imagining	85703	Electro Luminescence Test Station	N/A
153	EL Imagining	85706	Electro Luminescence Test Station	N/A
154	Visual Inspection	180089	Meter and/or Sensor, Light	2020-JUN-15
155	Visual Inspection	160912	Fixture, For Testing, Table	N/A
156	Visual Inspection	76645	Magnifying Lens, Without Ruler	N/A

Test methodology adopted

Table 10.1	MST 01 – VISUAL INSPECTION– INITIAL (Pre PID-TEST after Preconditioning) TEST DATE(DD/MM/YYYY): 06/27/2019	

Sample No.	Position in test sequence:		
2241969	Initial examination	Satisfactory	P
	Preconditioning:	Exposed for 5 kwh/m2	
	Final examination	Satisfactory	P
2241970	Initial examination	Satisfactory	P
	Preconditioning:	Exposed for 5 kwh/m2	
	Final examination	Satisfactory	P
2241971(CONTROL)	Initial examination	Satisfactory	P
	Preconditioning:	Exposed for 5 kwh/m2	
	Final examination	Satisfactory	P

10,2	TABLE: MAXIMUM POWER DETERMINATION – INITIAL (PRE PID-TEST AFTER PRECONDITIONING)	—
Test Date [DD/MM/YYYY]..... :	06/28/2019	—
Module temperature [°C]..... :	25	—
Irradiance [W/m²)..... :	1000	—

Sample #	Voc [V]	Vmp [V]	Isc [A]	Imp [A]	Pmp [W]	FF [%]
2241969	46.14	37.99	9.16	8.61	327.00	77.00
2241970	46.16	37.79	9.14	8.63	326.28	77.00
2241971 (CONTROL)	46.12	37.94	9.16	8.65	328.08	78.00
Supplementary information: N/A						

10.7 B	TABLE: PERFORMANCE AT LOW IRRADIANCE- INITIAL (PRE PID-TEST)	--
Test Date [DD/MM/YYYY] ..... :	06/28/2019	—
Ambient air temperature [°C] ..... :	-	—
Irradiance [W/m2](200 W/m2)..... :	200	—
Module temperature [°C] ..... :	25	—
Test method ..... :	☒ Data corrected to a 25°C cell temperature and 200 W/m² irradiance ☐ Directly measured	—

Sample #	Voc [V]	Vmp [V]	Isc [A]	Imp [A]	Pmp [W]	FF [%]
2241969	42.63	36.32	1.84	1.73	62.83	80.00
2241970	42.63	36.37	1.84	1.73	62.89	80.00
2241971 (CONTROL)	42.62	36.24	1.84	1.73	62.87	80.00

Supplementary information: N/A

10,15	TABLE: Wet leakage current test- (Pre PID-Test)		
Test Date [DD/MM/YYYY] ..... :	06/28/2019		—
Test Voltage applied [V] ..... :	1500		—
--	**Required**	**Measured**	--
Solution resistivity [Ω cm] ..... :	< 3,500 Ω-cm at 22 ± 3°C	1760	--
Solution temperature [°C] ..... :	23.9		--

Sample #	Measured [GΩ]	Limit [MΩ]	Result
2241969	4.45	20.7	P
2241970	4.39	20.7	P
2241971(CONTROL)	4.10	20.7	P

Supplementary information: Size of module [m^2]: 1.93

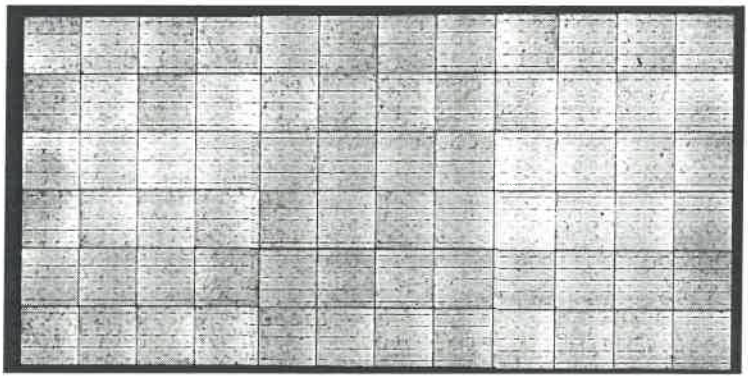
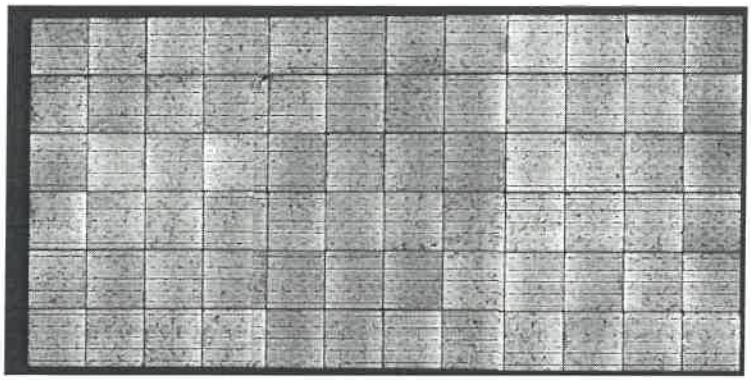
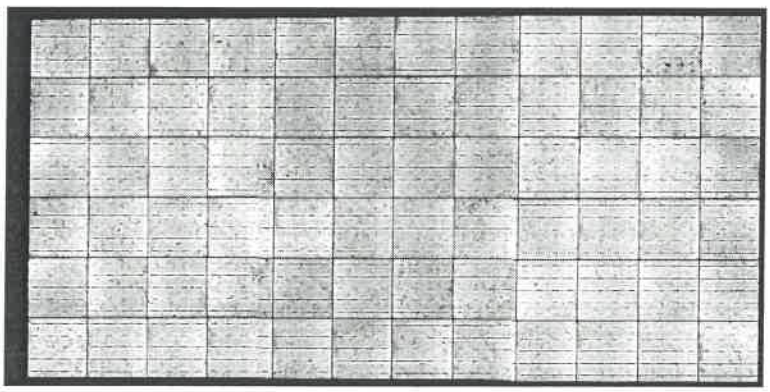
Table	ELECTROLUMINESCENCE IMAGES – INITIAL (PRE PID-TEST) TEST DATE(DD/MM/YYYY): 06/28/2019
Sample No.	Image At 0.1* Isc
2241969	
2241970	
2241971	

Table 10.4	MST 13 – GROUND CONTINUITY TEST (Pre PID-Test)			
	Maximum over-current protection rating (A):	*15*		—
	Current applied (A) .....:	*37.5*		—
	Location of designated grounding point.....:	*grounding holes on frames*		—
	Location of second contacting point .....:	*grounding holes on opposite frames*		—

Sample No.	Position in test sequence:	Voltage (V)	Resistance (mΩ)	P/F
2241969	Initial examination	0.28	7.46	P
	Final examination	0.29	7.73	P
2241970	Initial examination	0.30	8.00	P
	Final examination	0.31	8.26	P
2241971 (CONTROL)	Initial examination	0.27	7.20	P
	Final examination	0.28	7.46	P

Supplementary information Test date: 06/28/2019.

All values of resistance was less than 0.1Ω (100 mΩ) so declared as pass

POTENTIAL INDUCED DEGRADATION TEST **TEST START DATE(DD/MM/YYYY):** 07/02/2019 to 07/07/2019				
	Voltage across the terminal & frame	1500 V		—
	Chamber Temperature	85 ± 2 ºC		—
	Chamber RH (%)	85 ± 3 %		—
	Hours of exposure	**1st Cycle at 85ºC ± 2ºC, 85 ± 3% of RH for 96Hrs**		—
Sample No.	Position in test sequence:	Voltage (V)	Resistance (Ω)	
2241969	Negative connected to frame Positive connected to shorted terminals	1500	500	P
2241970	Negative connected to frame Positive connected to shorted terminals	1500	500	P
Supplementary information: N/A				

10,2	**TABLE: MAXIMUM POWER DETERMINATION (POST PID TEST) – AFTER 1ST CYCLE**						—
Test Date [DD/MM/YYYY]:		07/07/2019					—
Module temperature [°C]:		25.0					—
Irradiance [W/m²]:		1000					—
Sample #	Voc [V]	Vmp [V]	Isc [A]	Imp [A]	Pmp [W]	FF [%]	
2241969	46.22	37.41	9.18	8.69	324.96	77.00	
2241970	46.22	37.48	9.16	8.65	324.05	77.00	
2241971 (CONTROL)	45.98	37.80	9.16	8.67	327.75	78.00	
Supplementary information: N/A							

10.7 B	**TABLE: PERFORMANCE AT LOW IRRADIANCE (POST PID TEST) – AFTER 1ST CYCLE**	—
Test Date [DD/MM/YYYY] ..... :	07/07/2019	—
Ambient air temperature [°C] ..... :	NA	—
Irradiance [W/m2](200 W/m2)..... :	200	—
Module temperature [°C] ..... :	25	—
Test method ..... :	☒ Data corrected to a 25°C cell temperature and 200 W/m² irradiance ☐ Directly measured	—

Sample #	Voc [V]	Vmp [V]	Isc [A]	Imp [A]	Pmp [W]	FF [%]
2241969	42.98	36.36	1.86	1.73	62.98	79.00
2241970	42.95	36.40	1.85	1.71	62.37	78.00
2241971 (CONTROL)	42.75	36.33	1.84	1.72	62.43	79.00
Supplementary information: N/A						

10,15	**TABLE: Wet leakage current test- (Post PID Test) – After 1st Cycle**		—
Test Date [DD/MM/YYYY]..... :	07/07/2019		—
Test Voltage applied [V]..... :	1500		—
--	**Required**	**Measured**	---
Solution resistivity [Ω cm) ..... :	< 3,500 Ω-cm at 22 ± 3°C	1860	---
Solution temperature [°C]..... :	24.1		---

Sample #	Measured [GΩ]	Limit [MΩ]	Result
2241969	2.86	20.7	P
2241970	2.40	20.7	P
Supplementary information: Size of module [m^2]: 1.93			

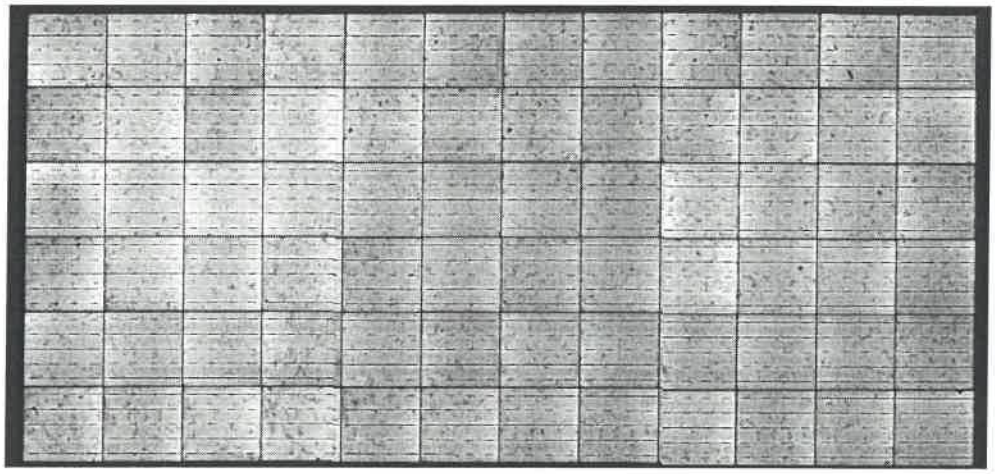
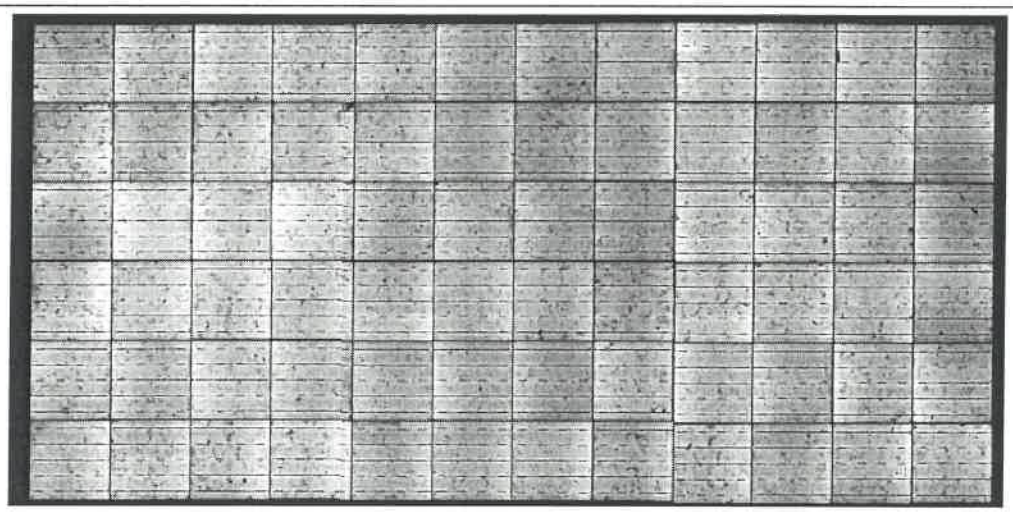
Table	ELECTROLUMINESCENCE IMAGES (PRE PID-TEST) – AFTER 1ST CYCLE TEST DATE(DD/MM/YYYY): 07/07/2019
Sample No.	Image At Isc * 0.1
2241969	
2241970	

Table 10.1	MST 01 – VISUAL INSPECTION – FINAL (Post PID Test) – AFTER 1ST CYCLE TEST DATE(DD/MM/YYYY): 07/07/2019		
Sample No.	Position in test sequence:	Comments	
2241969	Horizontal	No Visual defects found	P
2241970	Horizontal	No Visual defects found	P

Total Degradation Observed:

Sample (2241969): -0.62%

Sample (2241970): -0.68%

Note and other observations from Lab: Degradation was calculated from Initial to Post PID on first cycle.

POTENTIAL INDUCED DEGRADATION TEST **TEST START DATE(DD/MM/YYYY):** 07/07/2019 to 07/11/2019				—
	Voltage across the terminal & frame	1500 V		—
	Chamber Temperature	85 ± 2 ºC		—
	Chamber RH (%)	85 ± 3 %		—
	Hours of exposure	**2nd Cycle at 85ºC ± 2ºC, 85 ± 3% of RH for 96Hrs**		—
Sample No.	Position in test sequence:	Voltage (V)	Resistance (Ω)	
2241969	**Negative connected to frame Positive connected to shorted terminals**	1500	500	P
2241970	**Negative connected to frame Positive connected to shorted terminals**	1500	500	P
Supplementary information:				

10,2	**TABLE: MAXIMUM POWER DETERMINATION (POST PID TEST) – AFTER 2ND CYCLE**						---
Test Date [DD/MM/YYYY]:		07/11/2019					—
Module temperature [°C]:		25					—
Irradiance [W/m²]:		1000					—
Sample #	Voc [V]	Vmp [V]	Isc [A]	Imp [A]	Pmp [W]	FF [%]	
2241969	45.81	37.51	9.13	8.63	323.62	77.00	
2241970	45.80	37.43	9.13	8.61	322.40	77.00	
2241971 (CONTROL)	45.97	37.67	9.16	8.70	327.68	78.00	
Supplementary information: N/A							

Reviewed by signature:

10.7 B	**TABLE: PERFORMANCE AT LOW IRRADIANCE (POST PID TEST) – AFTER 2ND CYCLE**	--
Test Date [DD/MM/YYYY] ..... :	07/11/2019	—
Ambient air temperature [°C] ..... :	NA	—
Irradiance [W/m2](200 W/m2)..... :	200	—
Module temperature [°C] ..... :	25	—
Test method ..... :	☒ Data corrected to a 25°C cell temperature and 200 W/m² irradiance ☐ Directly measured	—

Sample #	Voc [V]	Vmp [V]	Isc [A]	Imp [A]	Pmp [W]	FF [%]
2241969	42.57	36.24	1.83	1.70	61.59	79.00
2241970	42.52	35.91	1.83	1.70	60.95	78.00
2241971 (CONTROL)	42.73	36.32	1.84	1.72	62.41	79.00
Supplementary information: N/A						

10,15	**TABLE: Wet leakage current test- (Post PID Test) – After 2nd Cycle**		---
Test Date [DD/MM/YYYY]..... :	07/11/2019		—
Test Voltage applied [V]..... :	1500		—
--	**Required**	**Measured**	--
Solution resistivity [Ω cm) ..... :	< 3,500 Ω-cm at 22 ± 3°C	1960	--
Solution temperature [°C]..... :	24		--

Sample #	Measured [GΩ]	Limit [MΩ]	Result
2241969	1.50	20.7	P
2241970	1.65	20.7	P
Supplementary information: Size of module [m²]: 1.93			

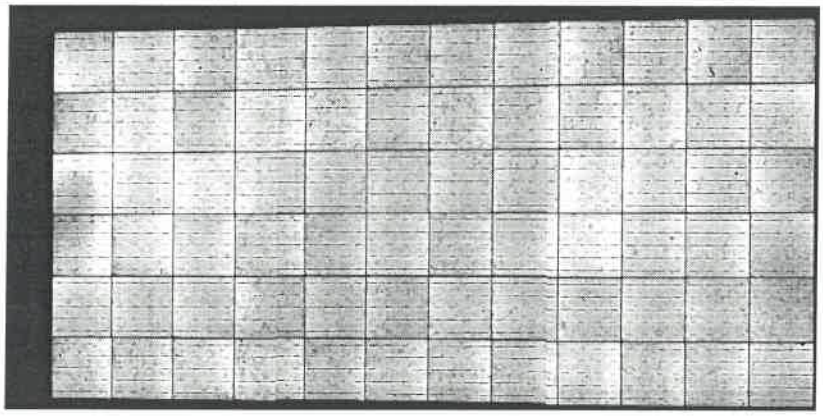
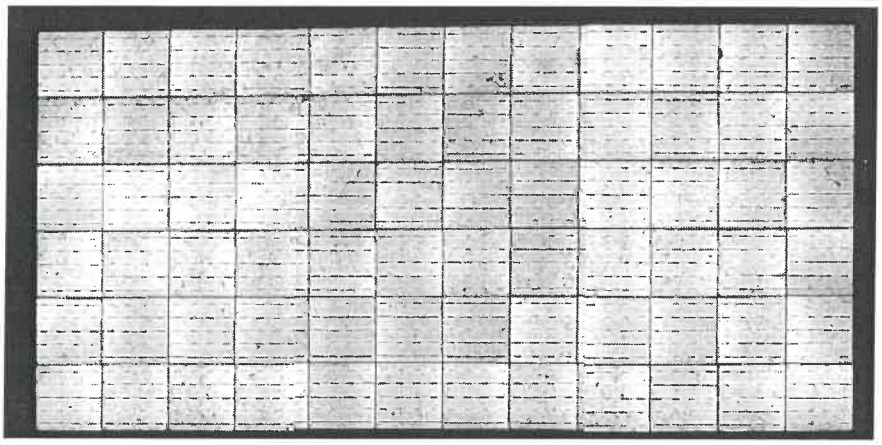
Table	ELECTROLUMINESCENCE IMAGES (PRE PID-TEST) – AFTER 2ND CYCLE TEST DATE(DD/MM/YYYY): 07/11/2019	
Sample No.	Image At Isc	Image At 0.1* Isc
2241969		
2241970		

Table 10.1	MST 01 – VISUAL INSPECTION – FINAL (Post PID Test) – AFTER 2ND CYCLE TEST DATE: (DD/MM/YYYY): 07/11/2019		
Sample No.	Position in test sequence:		
2241969	Horizontal	No Visual defects found	P
2241970	Horizontal	No Visual defects found	P

Total Degradation Observed:

Sample (2241969): -0.41%

Sample (2241970): -0.50%

Note and other observations from Lab: Degradation was calculated from Post PID on first cycle to Post PID on second cycle.

POTENTIAL INDUCED DEGRADATION TEST **TEST START DATE(DD/MM/YYYY):** 07/12/2019 to 07/16/2019				—
	Voltage across the terminal & frame	1500 V		—
	Chamber Temperature	85 ± 2 ºC		—
	Chamber RH (%)	85 ± 3 %		—
	Hours of exposure	**3rd Cycle at 85ºC ± 2ºC, 85 ± 3% of RH for 96Hrs**		—
Sample No.	Position in test sequence:	Voltage (V)	Resistance (Ω)	
2241969	**Negative connected to frame Positive connected to shorted Terminals**	1500	500	P
2241970	**Negative connected to frame Positive connected to shorted terminals**	1500	500	P
Supplementary information: N/A				

10,2	TABLE: MAXIMUM POWER DETERMINATION (POST PID TEST) – AFTER 3RD CYCLE	---
Test Date [DD/MM/YYYY]:	07/16/2019	—
Module temperature [°C]:	25	—
Irradiance [W/m²]:	1000	—

Sample #	Voc [V]	Vmp [V]	Isc [A]	Imp [A]	Pmp [W]	FF [%]
2241969	45.80	37.37	9.09	8.61	321.79	77.00
2241970	45.81	37.62	9.08	8.53	320.77	77.00
2241971 (CONTROL)	45.96	37.65	9.16	8.70	327.63	78.00

Supplementary information: N/A

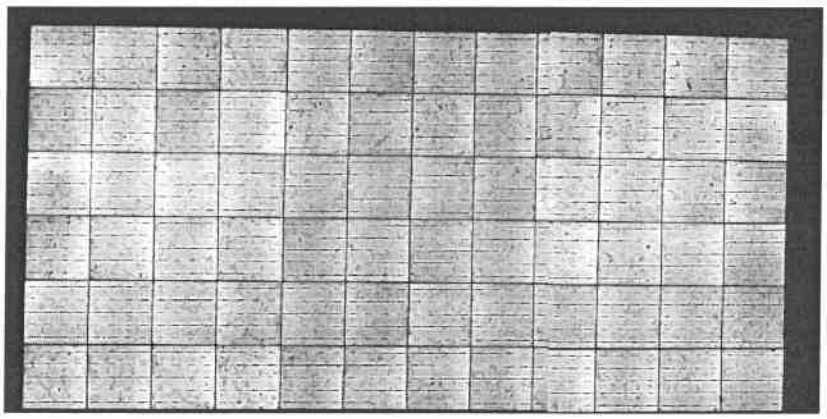
10.7 B	TABLE: PERFORMANCE AT LOW IRRADIANCE (POST PID TEST) – AFTER 3RD CYCLE	---
Test Date [DD/MM/YYYY] ..... :	07/16/2019	—
Ambient air temperature [°C] ..... :	NA	—
Irradiance [W/m2](200 W/m2)..... :	200	—
Module temperature [°C] ..... :	25	—
Test method ..... :	☒ Data corrected to a 25°C cell temperature and 200 W/m² irradiance ☐ Directly measured	—

Sample #	Voc [V]	Vmp [V]	Isc [A]	Imp [A]	Pmp [W]	FF [%]
2241969	42.53	36.17	1.83	1.69	60.94	78.00
2241970	42.50	35.76	1.82	1.69	60.38	78.00
2241971 (CONTROL)	42.73	36.32	1.84	1.72	62.37	79.00

Supplementary information: N/A

10,15	TABLE: Wet leakage current test- (Post PID Test) – After 3rd Cycle		---
Test Date [DD/MM/YYYY]..... :	07/16/2019		—
Test Voltage applied [V]..... :	1500		—
--	**Required**	**Measured**	---
Solution resistivity [Ω cm)..... :	< 3,500 Ω-cm at 22 ± 3°C	2006	---
Solution temperature [°C]..... :	24.1		---

Sample #	Measured [GΩ]	Limit [MΩ]	Result
2241969	1.07	20.7	P
2241970	1.04	20.7	P
Supplementary information: Size of module [m^2]: 1.93			

Table	**ELECTROLUMINESCENCE IMAGES (PRE PID-TEST) – AFTER 3RD CYCLE** **TEST DATE (DD/MM/YYYY): 07/16/2019**
Sample No.	Image At 0.1* Isc
2241969	

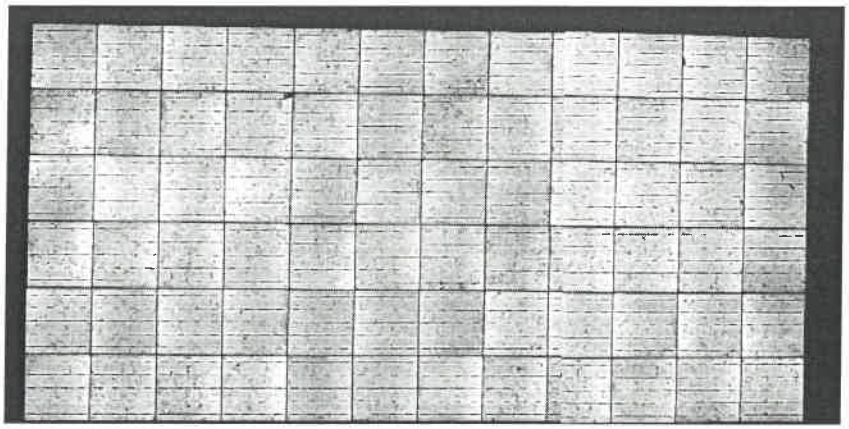
2241970	

Table 10.1	MST 01 – VISUAL INSPECTION – FINAL (Post PID Test) – AFTER 3RD CYCLE – FINAL CYCLE TEST DATE(DD/MM/YYYY): 07/16/2019		
Sample No.	Position in test sequence:		
2241969	Horizontal	No Visual Defects found	P
2241970	Horizontal	No Visual Defects found	P

Total Degradation Observed: Final Degradation

Sample (2241969): -0.56%

Sample (2241970): -0.50%

Note and other observations from Lab: Degradation was calculated from Post PID on second cycle to Post PID on third cycle.

Reviewed by signature:

Test Observation (If any)

NA

Appendix

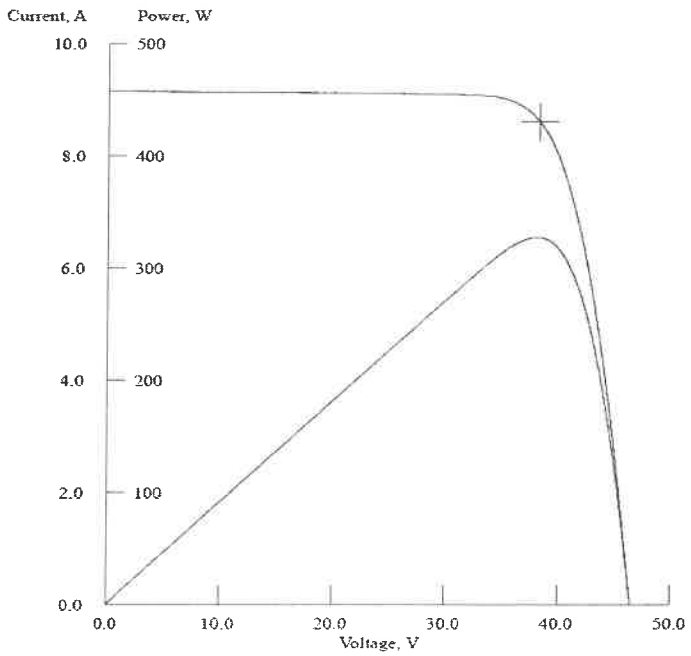
Annexure-1 PIV graphs

Annexure-2 Module Photo

Schematic Diagrams (If any)

Photographs (If any)

2241969

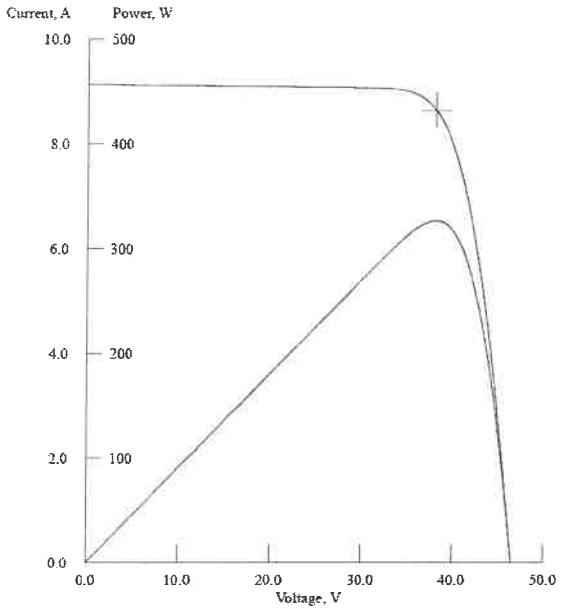


SPI-Sun Simulator 4600 SLP

Title: ICON EN POWER
Comment: INITIAL PIV
ID: 2241969 (ICON32036A0504102005)
10:42:14 6/28/2019
Measured Temperature = 25.2°C
Corrected Temperature = 25.0°C
Irr Meas = 100.0mW/cm²
Irr Corr = 100.0mW/cm²
Voc = 46.14V
Isc = 9.16A
Pmax = 327.00W
Vpm = 37.99V
Ipm = 8.61A
FF = 0.77
Eff.m = 16.88%
Eff.c = 18.66%
Rs = 0.51 Ohm
Rsh = 223.72 Ohm

Load Voltage: 6.300 V
IV Points: 3703

2241970

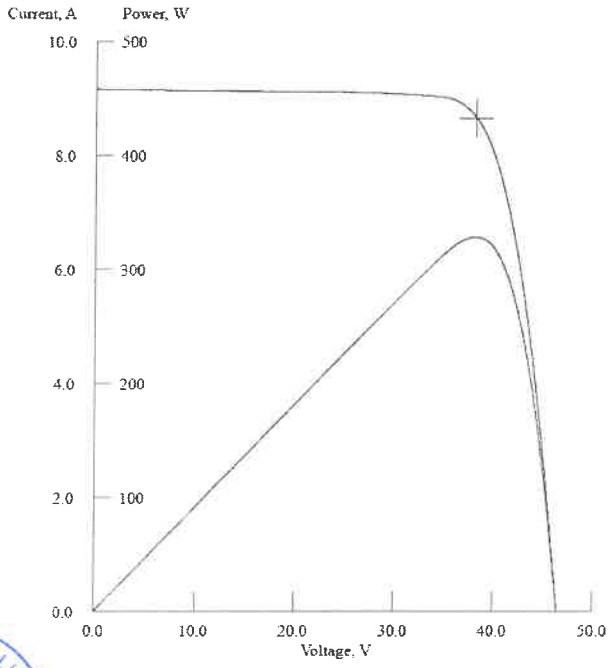


SPI-Sun Simulator 4600 SLP

Title: ICON EN POWER
Comment: INITIAL PIV
ID: 2241970 (ICON32036A0504102007)
10:44:51 6/28/2019
Measured Temperature = 25.0°C
Corrected Temperature = 25.0°C
Irr Meas = 100.0mW/cm²
Irr Corr = 100.0mW/cm²
Voc = 46.16V
Isc = 9.14A
Pmax = 326.28W
Vpm = 37.79V
Ipm = 8.63A
FF = 0.77
Eff,m = 16.84%
Eff,c = 18.62%
Rs = 0.50 Ohm
Rsh = 258.04 Ohm

Load Voltage: 6.300 V
IV Points: 3671

2241971

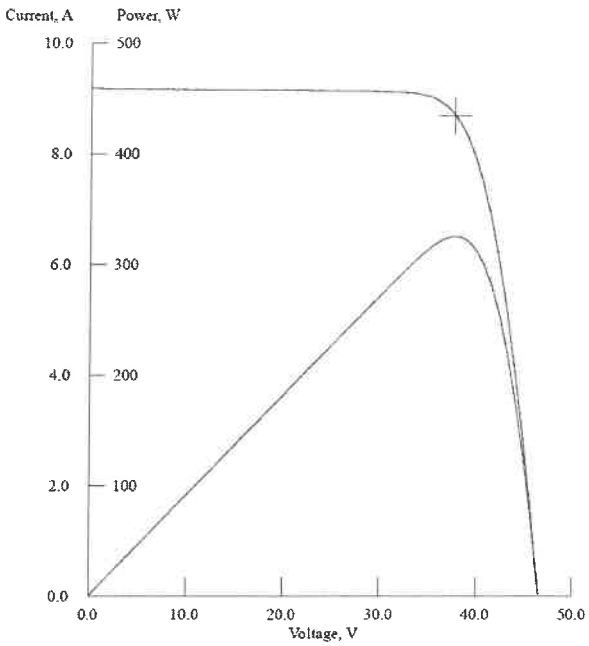


SPI-Sun Simulator 4600 SLP

Title: ICON EN POWER
Comment: INITIAL PIV
ID: 2241971 (ICON32036A0504102002)
10:47:42 6/28/2019
Measured Temperature = 24.7°C
Corrected Temperature = 25.0°C
Irr Meas = 100.0mW/cm²
Irr Corr = 100.0mW/cm²
Voc = 46.12V
Isc = 9.16A
Pmax = 328.08W
Vpm = 37.94V
Ipm = 8.65A
FF = 0.78
Eff,m = 16.93%
Eff,c = 18.72%
Rs = 0.46 Ohm
Rsh = 253.84 Ohm

Load Voltage: 6.300 V
IV Points: 3701

Post PID Test Graphs : 1st cycle : 2241969

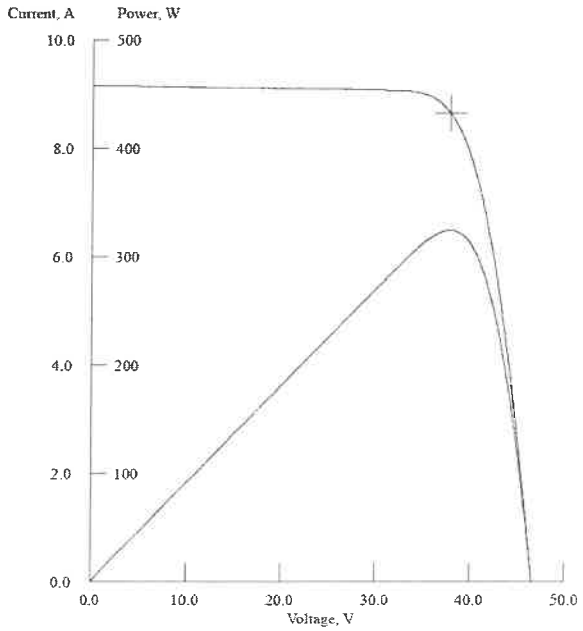


SPI-Sun Simulator 4600 SLP

Title: ICON EN POWER
Comment: POST PID
ID: 2241969
11:05:48 7/7/2019
Measured Temperature = 24.8°C
Corrected Temperature = 25.0°C
Irr Meas = 100.0mW/cm²
Irr Corr = 100.0mW/cm²
Voc = 46.22V
Isc = 9.18A
Pmax = 324.96W
Vpm = 37.41V
Ipm = 8.69A
FF = 0.77
Eff.m = 16.77%
Eff.c = 18.55%
Rs = 0.58 Ohm
Rsh = 254.41 Ohm

Load Voltage: 6.300 V
IV Points: 3729

2241970

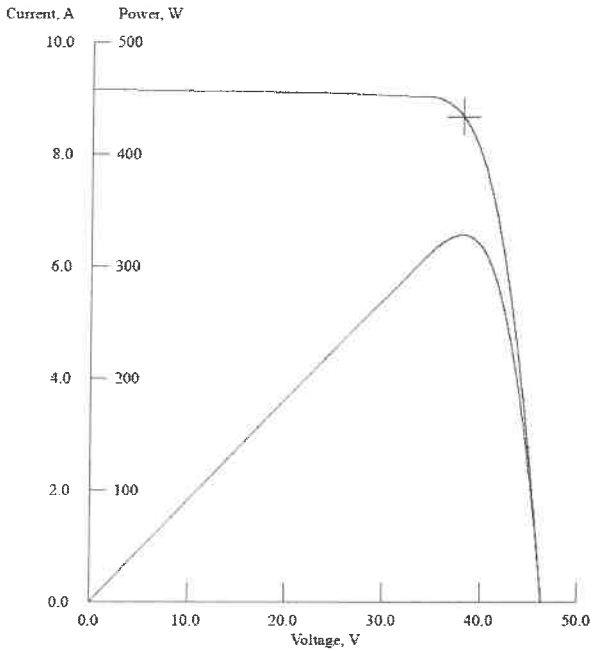


SPI-Sun Simulator 4600 SLP

Title: ICON EN POWER
Comment: POST PID
ID: 2241970
11:09:29 7/7/2019
Measured Temperature = 25.2°C
Corrected Temperature = 25.0°C
Irr Meas = 100.0mW/cm²
Irr Corr = 100.0mW/cm²
Voc = 46.22V
Isc = 9.16A
Pmax = 324.05W
Vpm = 37.48V
Ipm = 8.65A
FF = 0.77
Eff.m = 16.73%
Eff.c = 18.49%
Rs = 0.56 Ohm
Rsh = 287.37 Ohm

Load Voltage: 6.300 V
IV Points: 3707

2241971



SPI-Sun Simulator 4600 SLP

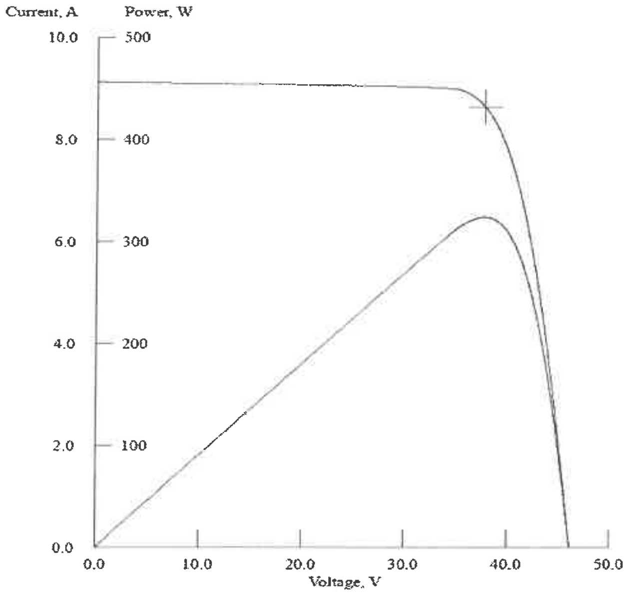
Title: ICON EN POWER
Comment: POST PID
ID: 2241971
11:14:12 7/7/2019
Measured Temperature = 24.8°C
Corrected Temperature = 25.0°C
Irr Meas = 100.0mW/cm²
Irr Corr = 100.0mW/cm²
Voc = 45.98V
Isc = 9.16A
Pmax = 327.75W
Vpm = 37.80V
Ipm = 8.67A
FF = 0.78
Eff.m = 16.92%
Eff.c = 18.71%
Rs = 0.51 Ohm
Rsh = 309.87 Ohm

Load Voltage: 6.300 V
IV Points: 3602

Post PID Test Graphs :

2nd cycle :

2241969

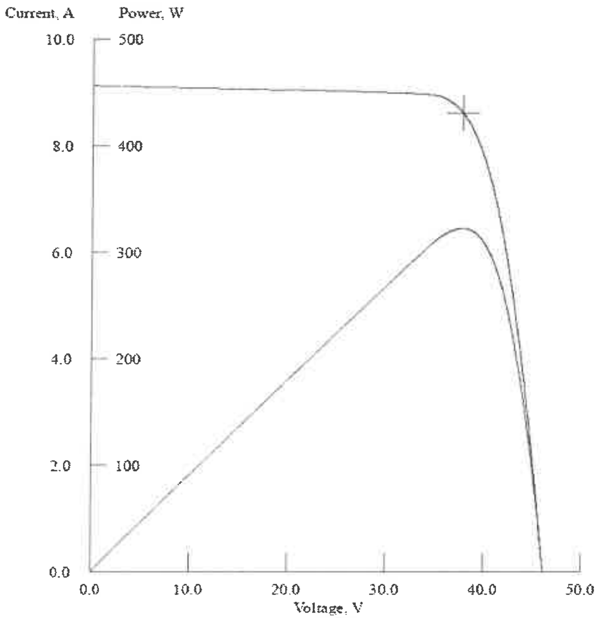


SPI-Sun Simulator 4600 SLP

Title: ICON EN POWER
Comment: POST PID
ID: 2241969
15:25:54 7/11/2019
Measured Temperature = 25.0°C
Corrected Temperature = 25.0°C
Irr Meas = 100.0mW/cm²
Irr Corr = 100.0mW/cm²
Voc = 45.81V
Isc = 9.13A
Pmax = 323.62W
Vpm = 37.51V
Ipm = 8.63A
FF = 0.77
Eff,m = 16.70%
Eff,c = 18.47%
Rs = 0.50 Ohm
Rsh = 306.67 Ohm

Load Voltage: 6.300 V
IV Points: 3570

2241970



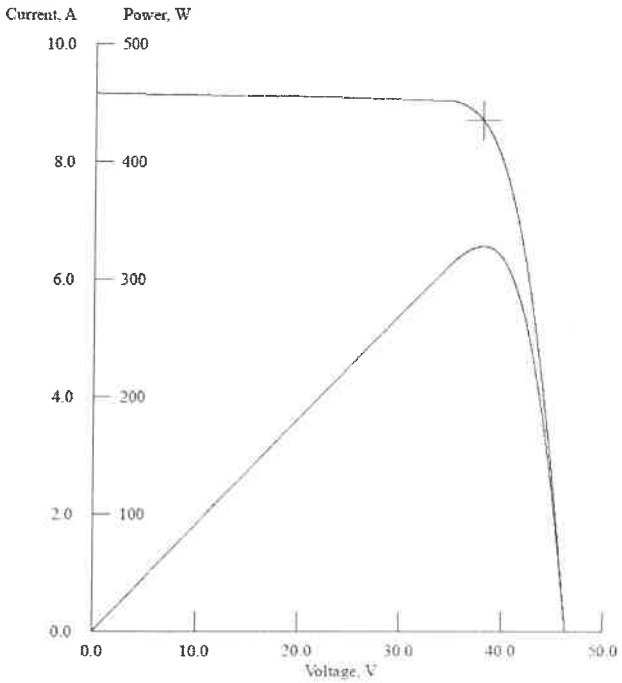
SPI-Sun Simulator 4600 SLP

Title: ICON EN POWER
Comment: POST PID
ID: 2241970
15:22:52 7/11/2019
Measured Temperature = 24.9°C
Corrected Temperature = 25.0°C
Irr Meas = 100.0mW/cm²
Irr Corr = 100.0mW/cm²
Voc = 45.80V
Isc = 9.13A
Pmax = 322.40W
Vpm = 37.43V
Ipm = 8.61A
FF = 0.77
Eff,m = 16.64%
Eff,c = 18.40%
Rs = 0.48 Ohm
Rsh = 158.97 Ohm

Load Voltage: 6.300 V
IV Points: 3574

Reviewed by signature:

2241971

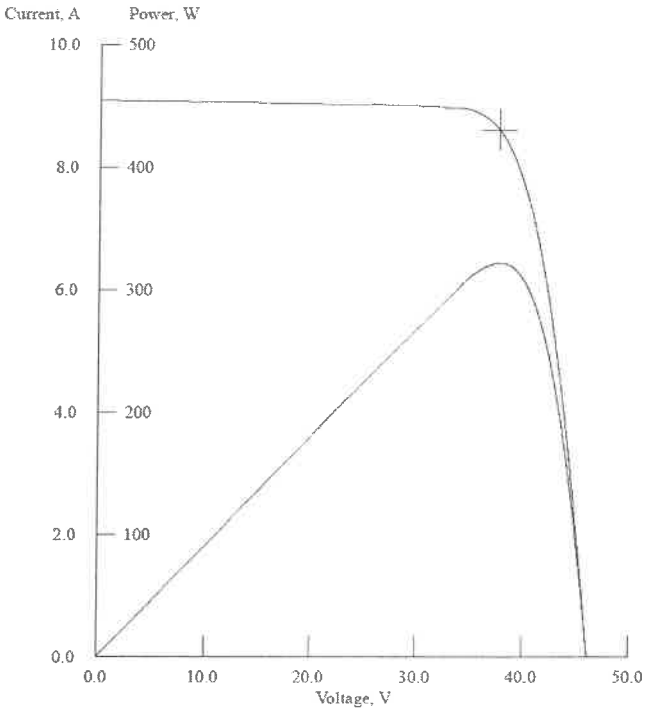


SPI-Sun Simulator 4600 SLP

Title: ICON EN POWER
Comment: POST PID
ID: 2241971
15:33:06 7/11/2019
Measured Temperature = 24.9°C
Corrected Temperature = 25.0°C
Irr Meas = 100.0mW/cm²
Irr Corr = 100.0mW/cm²
Voc = 45.97V
Isc = 9.16A
Pmax = 327.68W
Vpm = 37.67V
Ipm = 8.70A
FF = 0.78
Eff.m = 16.91%
Eff.c = 18.70%
Rs = 0.49 Ohm
Rsh = 238.34 Ohm

Load Voltage : 6.300 V
IV Points : 3607

Post PID Test Graphs : 3rd cycle :2241969

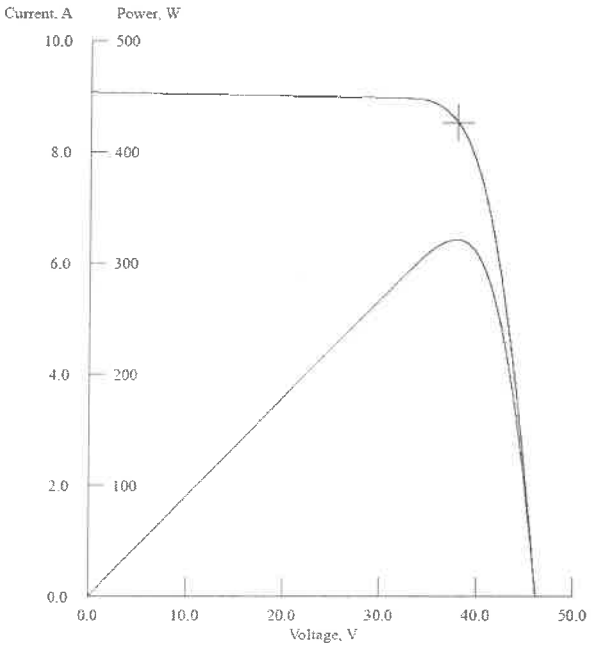


SPI-Sun Simulator 4600 SLP

Title: ICON EN POWER
Comment: POST PID
ID: 2241969
15:55:02 7/16/2019
Measured Temperature = 24.8°C
Corrected Temperature = 25.0°C
Irr Meas = 100.0mW/cm²
Irr Corr = 100.0mW/cm²
Voc = 45.80V
Isc = 9.09A
Pmax = 321.79W
Vpm = 37.37V
Ipm = 8.61A
FF = 0.77
Eff.m = 16.61%
Eff.c = 18.37%
Rs = 0.51 Ohm
Rsh = 493.75 Ohm

Load Voltage: 6.300 V
IV Points: 3535

2241970

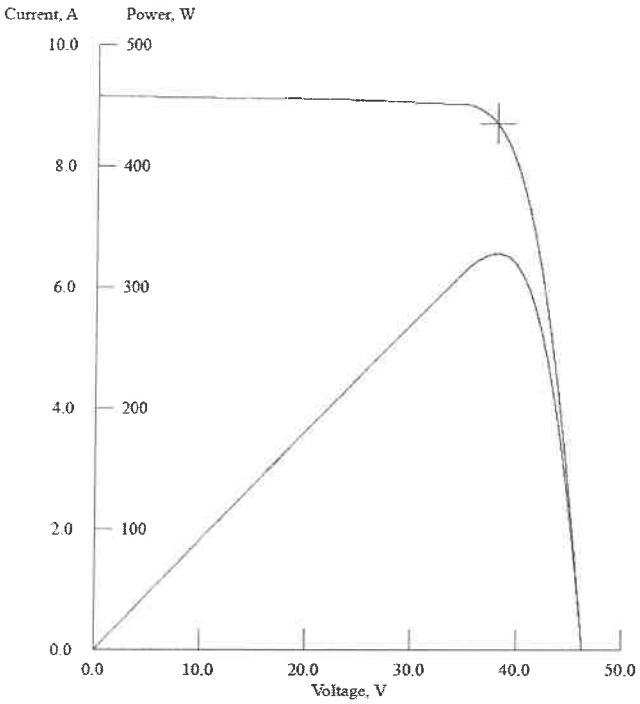


SPI-Sun Simulator 4600 SLP

Title: ICON EN POWER
Comment: POST PID
ID: 2241970
15:51:53 7/16/2019
Measured Temperature = 24.8°C
Corrected Temperature = 25.0°C
Irr Meas = 100.0mW/cm²
Irr Corr = 100.0mW/cm²
Voc = 45.81V
Isc = 9.08A
Pmax = 320.77W
Vpm = 37.62V
Ipm = 8.53A
FF = 0.77
Eff.m = 16.56%
Eff.c = 18.31%
Rs = 0.48 Ohm
Rsh = 270.96 Ohm

Load Voltage: 6.300 V
IV Points: 3516

2241971



SPI-Sun Simulator 4600 SLP

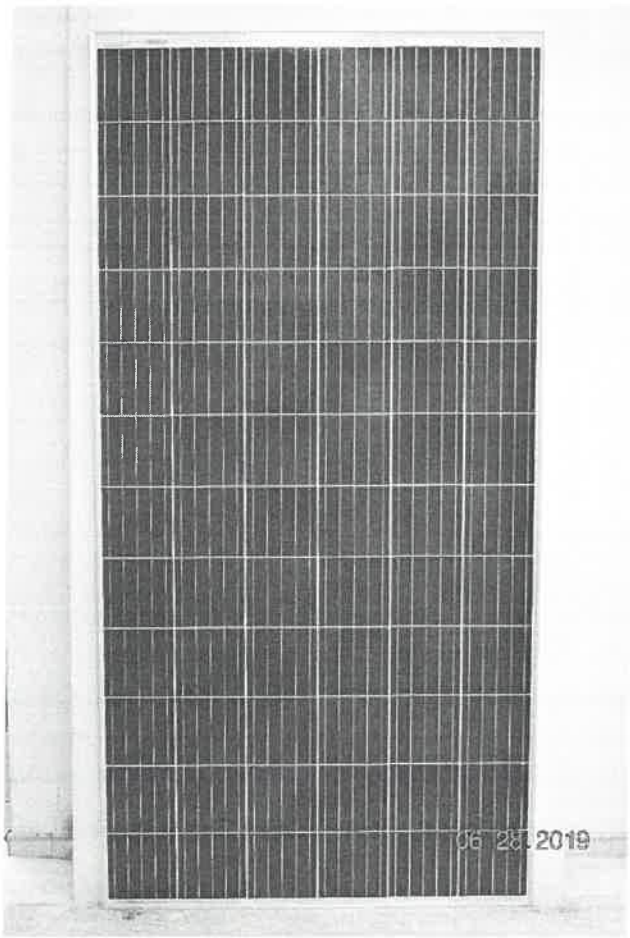
Title: ICON EN POWER
Comment: POST PID
ID: 2241971
16:05:53 7/16/2019
Measured Temperature = 24.9°C
Corrected Temperature = 25.0°C
Irr Meas = 100.0mW/cm²
Irr Corr = 100.0mW/cm²
Voc = 45.96V
Isc = 9.16A
Pmax = 327.63W
Vpm = 37.65V
Ipm = 8.70A
FF = 0.78
Eff,m = 16.91%
Eff,c = 18.70%
Rs = 0.48 Ohm
Rsh = 245.54 Ohm

Load Voltage: 6.300 V
IV Points: 3608

Annexure-2

Photos – Lab to provide

PV Module (Front and Back view Pre PID)



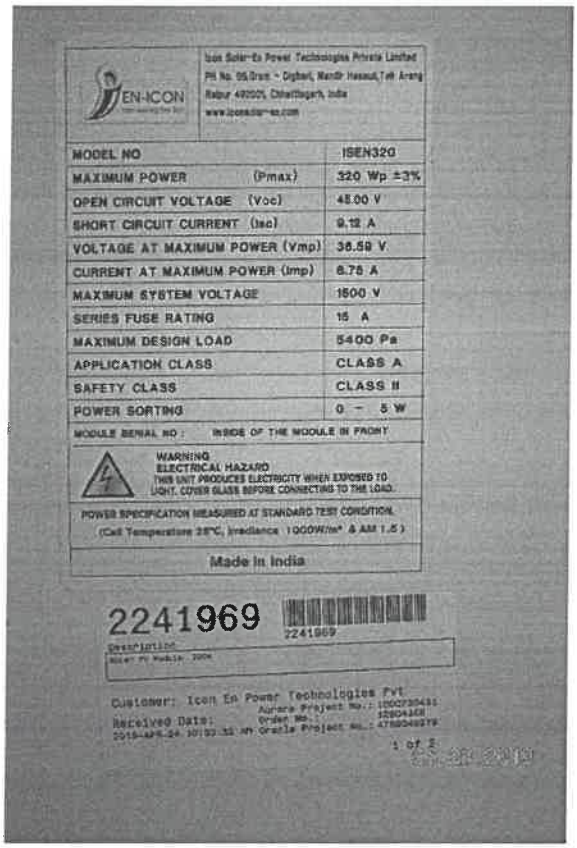
Front view

Back view

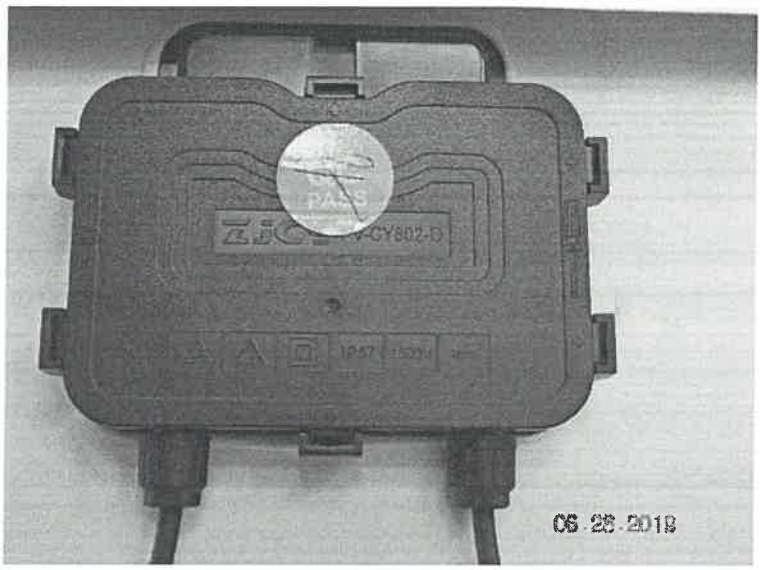
Photos – Lab to provide

PV Module (Front and Back view Pre PID)

Nameplate



Junction box



PV BOM details and the Electrical data

Date: 30/07/2019

Company: Icon Solar-En Power Technologies Private Limited

This is to certify that the (ISEN320)PID tested module from UL Indiais built with identical raw materials. components and production parameters of IECtested module **ISEN320 (320Wp) from UL India**(TRF Nos. 4788560221-bis-s1, 4788560221-bis-S2 & 4788560221-bis-S3), is therefore following modules are belongs to same module type family.

Module to be covered PID.

ISEN350, ISEN345, ISEN340, ISEN335, ISEN330, ISEN325, ISEN320, ISEN315, ISEN310, ISEN305& ISEN300.

PV Module Model Name	Wattage (Wp)	Maximum System Voltage, (V dc)	Open Circuit Voltage @ STC, (Voc)	Rated Voltage @ STC/Vmp (V dc)	Rated Current @ STC/Imp (A)	Short Circuit Current @ STC/Isc (A)	Rated Maximum Power at STC, (Watts)	Maximum Series Fuse, (A)
ISEN350	350	1500	45.78	37.14	9.43	9.69	350.2	15
ISEN345	345	1500	45.66	37.04	9.32	9.59	345.2	15
ISEN340	340	1500	45.52	36.97	9.20	9.50	340.1	15
ISEN335	335	1500	45.40	36.87	9.09	9.41	335.1	15
ISEN330	330	1500	45.25	36.80	8.97	9.31	330.1	15
ISEN325	325	1500	45.14	36.69	8.86	9.23	325.1	15
ISEN320	320	1500	45.00	36.59	8.75	9.12	320.2	15
ISEN315	315	1500	44.85	36.52	8.63	9.02	315.2	15
ISEN310	310	1500	44.70	36.43	8.51	8.93	310.0	15
ISEN305	305	1500	44.59	36.33	8.40	8.83	305.2	15
ISEN300	300	1500	44.45	36.18	8.30	8.75	300.3	15

Debkumar Banerjee

GM-Technical

ICON SOLAREN POWER TECHNOLOGIES PVT. LTD. RAIPUR (C.G.)

Icon Solar-En Power Technologies Pvt. Ltd.
Regd. Office: 317-320, 3rd Floor, Office, Magneto Mall, G.E. Road, Raipur 492 001, Chhattisgarh (India)
Tel.: +91-771-4065755 E-mail: info.iconsolaren@gmail.com Website: www.iconsolaren.com
Factory: Village: Dighari, Mandir Hasaud, Tehsil Arang 493441, Raipur, Chhattisgarh (India)
PAN No.: AADCI5761L TIN No.: 27761704727 CIN No.: U7930/CT2013PTC001259
GSTIN. 22AADCI5761L1ZC

UL INDIA PRIVATE LIMITED BANGALORE SEO OFFICE

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BOM-BIS/CB/PID/SALT MIST

Item Description	Material / Rating	Supplier / Manufacturer
SOLDER WIRE	SN63 PB37 1.0mm ANS-J-STD-006C, 92-6337-8846	KESTER
Cell Interconnects	SnPb 60/40	TELISON
Bus Bars	SnPb 60/40	TELISON
Al Frame	Alloy 6063 T6 15µ Anodized (35 x 30 x 1.3 mm)& (22 x 24 x 1.3 mm)	ALOM EXTRUSIONS LTD.
PV Junction Box	PV-CY802-D , 4-RAIL DIODE 30SQ45 -1500V QC SOLAR QC102032, 3-RAIL DIODE 20SQ45 -1000V	ZJCY & QC SOLAR
Junction Box cables	PV 4 1500 VDC 30 A	ZJCY
Junction box connectors	PV 4 1500 VDC 30 A	ZJCY
Aluminium corner Key/ screws	Alloy 6063 T6 (40.2 x 40.2 x 1.5)	ALOM EXTRUSIONS LTD.
EVA ENCAPSULANT	Conserve F360-14EC	RENEWSYS INDIA PVT. LTD.
BACKSHEET	Preserve A 125 WN / A 275WN	RENEWSYS INDIA PVT. LTD.
CELL Mono/MULTI	156.75 x 156.75 Multi Si_Cys	YINGFA
Sealant	HT906Z	HUITIAN
GLASS	Tempered Glass 3.2 ± 0.2mm 1958x 980 mm	GUJARAT BOROSIL LTD
JB SEALANT -JB FIXING	HT906Z	HUITIAN
FLUX	952S	KESTER

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Tel.: +91-771-4065755 E-mail: info.iconsolaren@gmail.com Website: www.iconsolar-epl.com
Factory: Village Dighan, Mandir Hasaud, Tehsil Arang - 493 441, Raipur, Chhattisgarh (India)
PAN No.: AADCI5761L TIN No.: 22761704727 CIN No.: U35907CT2014PTC001359
GSTIN: 22AADCI5761L1ZC

As declared by the customer

******End of Report******

UL INDIA PRIVATE LIMITED BANGALORE-560 067

Reviewed by signature: