






Test Report issued under the responsibility of:



TEST REPORT IEC 61730-1 PV Module Safety Qualification Part 1: Requirements for construction	
Report Reference No.....	4786930293.1.1-NABL-MNRE-S1
Date of issue.....	09/09/2015
Total number of pages	30
Applicant's name.....	ICON SOLAR-EN POWER TECHNOLOGIES PVT LTD
Address	319-320, OFFIZO, 3RD FLOOR, MAGNETO MALL, G.E ROAD, RAIPUR, CHHATTISGARH 492001, INDIA
Test specification:	
Standard	IEC 61730-1 PHOTOVOLTAIC (PV) MODULE SAFETY QUALIFICATION PART 1: REQUIREMENTS FOR CONSTRUCTION - Edition 1.2 - Issue Date 2013/03/01
Test procedure	NA
Non-standard test method.....	NA
Test item description.....	Crystalline Silicon Photovoltaic Modules (Multi-Crystalline)
Trade Mark	
Manufacturer	ICON SOLAR-EN POWER TECHNOLOGIES PVT LTD
Address	VILLAGE DIGHARI,MANDIR HASAUD,TEHSIL ARANG - 49441,RAIPUR,CHHATTISGARH(INDIA)
Model/Type reference.....	IS-EN 310W
Ratings	Please refer to the below table:

Model Name	Wattage (Wp)	Maximum System Voltage (V dc)	Open Circuit Voltage @ STC, (V dc)	Rated Voltage @ STC, (V dc)	Rated Current @ STC, (A)	Short Circuit Current @ STC, (A)	Rated Maximum Power at STC, (Watts)	Maximum Series Fuse, (A)
ISEN200	200	1000	44.41	36.18	5.56	5.86	201.2	15
ISEN200	200	1000	29.64	24.14	8.31	8.74	200.6	15
ISEN205	205	1000	29.77	24.24	8.47	8.87	205.3	15
ISEN220	220	1000	33.19	27.06	8.15	8.61	220.5	15
ISEN225	225	1000	33.35	27.16	8.31	8.74	225.7	15
ISEN230	230	1000	33.46	27.25	8.45	8.84	230.3	15
ISEN250	250	1000	44.46	36.18	6.92	7.28	250.4	15
ISEN250	250	1000	37.05	30.12	8.31	8.75	250.3	15
ISEN255	255	1000	37.18	30.27	8.43	8.84	255.2	15
ISEN260	260	1000	37.28	30.58	8.51	8.93	260.2	15
ISEN265	265	1000	37.36	30.69	8.64	9.01	265.2	15
ISEN270	270	1000	40.58	33.08	8.17	8.62	270.3	15
ISEN275	275	1000	40.76	33.20	8.31	8.74	275.9	15
ISEN280	280	1000	40.89	33.29	8.43	8.84	280.6	15
ISEN300	300	1000	44.45	36.18	8.30	8.75	300.3	15
ISEN305	305	1000	44.59	36.33	8.40	8.83	305.2	15
ISEN310	310	1000	44.70	36.43	8.51	8.93	310.0	15
ISEN315	315	1000	44.85	36.52	8.63	9.02	315.2	15
ISEN320	320	1000	45.00	36.59	8.75	9.12	320.2	15
ISEN325	325	1000	45.02	36.73	8.85	9.16	325.1	15
ISEN330	330	1000	45.07	37.2	8.88	9.21	330.3	15

Testing procedure and testing location:	
<input checked="" type="checkbox"/> Testing Laboratory:	UL India Pvt. Ltd.
Testing location/ address	Kalyani Platina, Phase I, Whitefield, Bengaluru, KA-560066, INDIA
Tested by (name + signature) :	Srimathy N 
Approved by (+ signature)	Mahesh V 
<input type="checkbox"/> Testing procedure: TMP	NA
Tested by (name + signature)	
Approved by (+ signature)	
Testing location/ address	
<input type="checkbox"/> Testing procedure: WMT	NA
Tested by (name + signature)	
Witnessed by (+ signature)	
Approved by (+ signature)	
Testing location/ address	
<input type="checkbox"/> Testing procedure: SMT	NA
Tested by (name + signature)	
Approved by (+ signature)	
Supervised by (+ signature)	
Testing location/ address	
<input type="checkbox"/> Testing procedure: RMT	NA
Tested by (name + signature)	
Approved by (+ signature)	
Supervised by (+ signature)	
Testing location/ address	

Copy of marking plate:



Summary of testing:

Tests performed (name of test and test clause):

All tests required for Application Class A as listed in Table - 7 of IEC 61730-2.

Model IS-EN 310W, 310Wp was used for test purposes.

Testing location:

UL India Pvt. Ltd.

Kalyani Platina, Phase I, Whitefield,
Bengaluru, KA-560066, INDIA

Summary of compliance with National Differences: NA

Test item particulars:	
Accessories and detachable parts included in the evaluation	NA
Other options included	NA
.....	
.....	
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:	
CTI – Comparative Tracking Index	PD – Partial Discharge
FF – Fill factor	STC – Standard Test Conditions
I _{pm} – Maximum power current	RTI – Relative Thermal Index
I _{sc} – Short circuit current	V _{oc} – Open circuit voltage
MST – Module Safety Test	V _{pm} – Maximum power voltage
P _{max} – Maximum power	
Testing:	
Date of receipt of test item	: 04/07/2015
Date (s) of performance of tests	: See individual test table below
General remarks:	
<p>This report shall not be reproduced except in full without the written approval of the testing laboratory. The test results presented in this report relate only to the item(s) tested. "(see remark #)" refers to a remark appended to the report. "(see Annex #)" refers to an annex appended to the report. "(see appended table)" refers to a table in the CB Test Report. Throughout this report a point is used as the decimal separator.</p> <p>This Test Report Form is intended for the investigation of PV module in accordance with IEC 61730-1. It can only be used together with IEC 61730-2 Test Report.</p> <p>List of test equipment must be kept on file and available for review.</p>	

General product information:

PV module type reference..... : IS-EN 310W

Product Electrical Ratings at STC

Nominal maximum power (Pmax) : 310Wp
 Nominal open circuit voltage at (Voc) : 43.20V
 Nominal short circuit current at (Isc) : 8.77A
 Nominal maximum power voltage (Vpm) : 38.50V
 Nominal maximum power current (Ipm)..... : 8.10A

Product Safety Ratings

Maximum system voltage..... : 1000 Vdc
 Maximum over-current protection rating : 15 A
 Safety application class : Class A
 Safety class in accordance with IEC 61140 : Class-II
 Fire safety class : NA
 Recommended maximum series/parallel module configurations .: 23Nos in series

Scope of Module Safety Qualification Testing

- Initial Module Safety Qualification
- Extension of Module Safety Qualification

Original Test Report Ref. No :

Model differences and modification:

- | | |
|---|---|
| <input type="checkbox"/> Change in cell technology | <input type="checkbox"/> Modification to junction box/el. termination |
| <input type="checkbox"/> Modification to encapsulation system | <input type="checkbox"/> Change in cell interconnect materials/ technique |
| <input type="checkbox"/> Modification to superstrate | <input type="checkbox"/> Change in el. circuit of an identical package |
| <input type="checkbox"/> Increase in module size | <input type="checkbox"/> Higher or lower output by 10% |
| <input type="checkbox"/> Modification to backsheet/substrate | <input type="checkbox"/> Removal of frame |
| <input type="checkbox"/> Modification to frame/mounting structure | |

Note (1) Use the “General product information” field to give any information on model differences within a product type family covered by the test report.

Note (2) Use the “General product information” field to describe the range of electrical and safety ratings, if the TRF covers a type family of modules.

Note (3) Use Annex 1 to list the used materials and components of the module (manufacturer, type reference)

IEC 61730-1			
Clause	Requirement + Test	Result - Remark	Verdict
3	APPLICATION CLASSES		
	The module has been evaluated for the following Application Class (Class A, B, C).....:	Class A	P
4	CONSTRUCTION REQUIREMENTS		P
4.1	General requirements		P
4.1.1	It is stated that the module is able to operate under environmental condition type AB8 according to IEC 60364-5-51.	Air temperature -50 to +40°C Relative humidity % 15 to 100 Absolute humidity g/m3 0.04 to 36	P
4.1.2	The module/s is/are completely assembled when shipped from the factory.	Complete module with frame fixed	P
	The module is provided in subassemblies.	No subassemblies	NA
4.1.3	Incorporation of a module into the final assembly does not require any alteration of the module from its originally evaluated form. If YES, specific details describing necessary modification(s) are provided in the installation instructions.	No assembly parts or alterations	NA
4.1.4	If the module must bear a definite relationship to another module, it is constructed to permit incorporation into the final assembly without the need for alteration.	Single module	NA
4.1.5	The construction of the module is such that ground continuity is not interrupted by installation.		P
4.1.6	Parts of the module are prevented from loosening or turning, if such loosening or turning may result in a risk of fire, electric shock, or injury to persons.		P
4.1.7	Friction between surfaces is not used as the sole means to inhibit the turning or loosening of a part.	Adhesives or direct positive securement used	P
4.1.8	Any adjustable or movable structural part is provided with a locking device to reduce the likelihood of unintentional movement.	Junction box cover has locking tab	P
4.2	Metal parts		P
	Metals used in locations that are exposed to moisture shall not be employed alone or in combinations that could result in deterioration, such that the product would not comply with the requirements in this standard.	Aluminium frame	P

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Clause	Requirement + Test	Result - Remark	Verdict
	Iron or mild steel serving as a necessary part of the module but not exposed to the weather are plated, painted, or enamelled for protection against corrosion.	No iron or mild steel used	NA
	Simple sheared or cut edges and punched holes are not required to be additionally protected.	Holes on aluminium frame	P
Supplementary information: NA			

5	POLYMERIC MATERIALS		P
5.1	General		P
	Polymeric materials serving as an enclosure for live metal parts.....:	See Subclause 5.2	—
	Polymeric materials serving as support for live metal parts.....:	See Subclause 5.3	—
	Polymeric materials serving as the outer surface for the module.....:	See Subclause 5.4	—
	Polymeric materials serving as barriers	See Subclause 5.5	—
	All polymeric materials have a minimum thermal index (electrical and mechanical, as defined by IEC 60216-5) of 20° C above the maximum measured operating temperature of said material in application, as measured during the Temperature Test MST 21 given in IEC 61730-2.		P
5.2	Polymers serving as an enclosure for live parts		P
	Information is provided that polymers serving as an enclosure for live parts comply with:		—
	a) 5-V flammability rating (IEC 60695-1-1)		P
	b) 5-V flammability rating, after water immersion and exposure of the end-product (IEC 60695-1-1)		P
	c) Ultraviolet radiation resistance (ANSI/UL 746C)		P
	d) Minimum hot wire ignition rating of 30 (IEC 60695-1-1)	HWI > 30	P
5.3	Polymers serving to support live parts		NA
	Information is provided that polymers serving to support live parts comply with:	No potting material used inside junction box	—
	a) Flammability classification and high-current arc ignition rating (IEC 60695-1-1) as given in Table 1 of IEC 61730-1		NA
	b) Comparative Tracking Index (CTI) \geq 250 V		NA

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Clause	Requirement + Test	Result - Remark	Verdict
	Comparative Tracking Index (IEC 60112) :		—
	c) Inclined plane tracking rating of 1 h, using the time to track method at 2.5 kV (ASTM D2303), if the maximum system operating voltage rating is in the range 600 – 1500 V.		NA
	Maximum system operating voltage rating (V):		—
	d) Ultraviolet radiation resistance (ANSI/UL 746C)		NA
5.4	Polymers serving as an outer surface		P
	Information is provided that polymeric substrates or superstrate used in the module have:	Polymeric Substrate: MADICO Specialty Films, Reflekt-Light (Thickness 259 μ m, Wt 285g/sqm, Density 1.14gm/sqcm). Superstrate (Upper surface) Gujarat Borosil Limited, Solar Tempered Glass 3.2 +/- 0.2mm.	—
5.4.1	a) A thermal index, both electrical and mechanical, as determined in accordance with IEC 60216 of at least 90°C.	Substrate thermal index is 100°C	P
	b) A thermal index of at least 20°C above the maximum measured operating temperature of the material as measured during the Temperature Test MST21 of IEC 61730-2.		P
5.4.2	Polymeric materials that serve as the outer enclosure for a module that (1) is intended to be installed in a multi-module or -panel system or (2) have an exposed surface area greater than 1 m ² or a single dimension larger than 2 m, has a maximum flame spread index of 100 as determined under ASTM E162-1990.		NA
5.4.3	If exposed to direct sunlight in the application, the polymeric material has been evaluated for ultraviolet (UV) radiation resistance as determined in accordance with ANSI/UL 746C.	JB is not exposed to direct sunlight	NA
5.4.4	Polymeric materials intended for use as a superstrate or substrate, without appropriate IEC insulation pre-qualification, comply with the requirements of the Partial Discharge Test MST 15 of IEC 61730-2.		P
5.5	Polymers serving as barriers		NA

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Clause	Requirement + Test	Result - Remark	Verdict
	Insulation barriers are of adequate thickness and of a material appropriate for the application, as defined by IEC 61140	No barriers are used	NA
5.6	Polymers serving as structural glazing materials		P
	Polymers serving as structural glazing materials comply with the requirements for safety glazing by material certification (ANSI Z97.1-93) or by testing in accordance with Module Breakage Test MST 32 of IEC 61730-2.	Module Breakage test was conducted	P
Supplementary information: NA			
6	INTERNAL WIRING AND CURRENT-CARRYING PARTS		P
	Any current-carrying part and wiring has the mechanical strength and current-carrying capacity necessary for its application.		P
6.1	Internal wiring		P
6.1.1	Wiring used within a module has an insulation rating for a minimum of 90°C, with a gauge and voltage rating acceptable for the application as defined by the requirements of IEC 60189-2.	See Annex 2 for constructional details	P
6.1.2	The wiring of a module is located so that after installation of the module in the intended manner the insulation is not exposed to degrading effects of direct sunlight.	Junction box leads are located such that they will not be exposed to direct sunlight	NA
6.2	Splices		NA
	Splices are insulated equivalent to that required for the wiring involved.		NA
6.3	Mechanical securement		P
6.3.1	Joints or connections are mechanically secure and provide electrical contact without strain on connections and terminals.		P
6.3.2	Uninsulated live parts are secured to its supporting surface so that they are prevented from turning or shifting in position.		P

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Clause	Requirement + Test	Result - Remark	Verdict

Supplementary information: NA

7	CONNECTIONS		P
7.1	Field connections – general requirements		NA
7.1.1	The module is provided with wiring terminals, connectors, or leads to accommodate current-carrying conductors of the load circuit.	Module is provided with wires and terminated in connector	P
7.1.2	Field connections are rated for exposure to direct sunlight as defined in Clause 5 of IEC 61730-1.	Connectors are not exposed to direct sunlight	P
	Field connections are exposed to the degrading effects of direct sunlight.	Connectors are not exposed to direct sunlight	NA
7.2	Field wiring terminals		NA
7.2.1	Field wiring terminal blocks are rated for the appropriate voltage and current for the application and constructed in compliance with IEC 60947-1.		NA
7.2.2	Wiring terminals integral to the construction of the terminal enclosure comply with the following requirements:		NA
7.2.2.1	a) Screws and nuts which clamp external conductors have a thread conforming with ISO 261 or ISO 262 (or comparable standards)		NA
	The screws and nuts used for field wiring do not serve to fix any other component.		NA
7.2.2.2	b) Terminal screws have a minimum nominal thread diameter as shown in Table 2 of IEC 61730-1.		NA
	Stud terminals are provided with nuts and washers.		NA
7.2.2.3	c) Terminals are designed that they clamp the conductor between metal surfaces with sufficient contact pressure and without damage to the conductor.		NA
	Terminals are designed or located that the conductor cannot slip out when the clamping screws or nuts are tightened.		NA
	Terminals are fixed suitably when the means of clamping the conductor is tightened or loosened:		NA
	- The terminal itself does not work loose,		NA
	- Internal wiring is not subjected to stress,		NA

IEC 61730-1			
Clause	Requirement + Test	Result - Remark	Verdict
	- Creepage distances and clearances are not reduced below the values specified in clause 9 of IEC 61730-1.		NA
7.3	Connectors		P
7.3.1	The connector intended for use in the output circuit of the module is rated for the appropriate voltage and current, as per the requirements of the IEC 60130 series.	See Annex 2 for constructional details	P
	Connectors comply with the requirements of Clause 5 of IEC 61730-1, with respect to flammability, comparative tracking index and relative thermal index for the support of live parts.		P
7.3.2	The connector has been appropriately evaluated for disconnect overload performance.	The connector is not evaluated for disconnect overload performance. So connector should not be disconnected overload. "Do Not Disconnect under Load" marking provided on the connectors	NA
7.3.3	Connectors intended for exposure to the outdoor environment are enclosed by material which complies with the following:		P
	a) UV resistance in accordance with the requirements of Clause 5.		P
	b) Resistance to inclusion of water acc. to IEC 60529 (equivalent to IP55)		P
	c) Steel ball impact test acc. to IEC 61721		P
	d) Accessibility Test MST 11 of IEC 61730-2		P
7.3.4	Separable multi-pole connectors are polarised.		NA
	If two or more separable connectors are provided, they are configured or arranged so that the other will not accept the mating connector for one.		NA
7.3.5	For a connector incorporating a grounding member, the grounding member is the first to make and the last to break contact with the mating connector.	No grounding member	NA

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Clause	Requirement + Test	Result - Remark	Verdict
7.3.6	Connectors that can be separated without the use of a tool do not have accessible conductive parts, as determined under the Accessibility Test MST 11 of IEC 61730-2.		P
7.4	Output lead or cables		P
	Leads extending from the module are rated for the appropriate system voltage, ampacity, wet locations and temperature and sunlight resistance.	Leads are suitable for voltage and ampacity, rated for wet locations, UV resistant and has temperature rating suitable based on the temperature test	P
Supplementary information: NA			

8	BONDING AND GROUNDING		P
8.1	If accessible conductive parts of the module form a perimeter framing or mounting system, or if the module has a conductive surface area of greater than 10 cm ² accessible after installation, then the module has provisions for grounding.		P
8.2	If the module is rated as safety class II and provided with provisions for functional grounding, the functional grounding is isolated from live parts by reinforced insulation (Subclause 7.3.2.2 of IEC 61140).		P
8.3	Each exposed conductive part of the module, that is assessable during normal operation, is bonded together, as verified by Ground Continuity Test MST 13 of IEC 61730-2. <i>Note: If conductive materials are used only as fasteners for installation and separated from the conductive components of the module by both appropriate insulation and spacing's, they are not required to be bonded.</i>		P
8.4	Routine maintenance of the module does not involve breaking or disturbing the bonding path.		P
	A bolt, screw, or other part used for bonding purposes is not intended for securing the complete device.	Mounting hardware is separate from hardware relied upon for bonding purposes	P

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Clause	Requirement + Test	Result - Remark	Verdict
8.5	Bonding is by a positive means, such as clamping, riveting, bolted or screwed connections, or welding, soldering or brazing.	Bonding provided via screwed connection	P
	The bonding connection penetrates all nonconductive coatings, such as paint, anodised coatings or vitreous enamel.		P
8.6	All joints in the bonding path are mechanically secure.		P
8.7	If the bonding connection depends upon screw threads, two or more screws or two full threads of a single screw engage the metal.		P
8.8	The diameter of the grounding screw or bolt is sized appropriately to the gauge of the bonding conductor, as per Table 2 of IEC 61730-1.	See Annex 2 for construction details	P
8.9	Ferrous metal parts in the grounding path are protected against corrosion by metallic or non-metallic coatings.		NA
8.10	The module has metal-to-metal multiple-bearing pin-type hinges. These are considered to be an acceptable means for bonding.		NA
8.11	A wiring terminal or bonding location is identified with the appropriate symbol (IEC 60417-5019) or has a green-coloured part.		P
	No other terminal or location is identified in this manner.		P
8.12	If a marking is used to identify an equipment grounding terminal, it is located on or adjacent to the terminal or on a wiring diagram affixed to the module or panel near the terminal.		P
Supplementary information: NA			

9	Creepage and Clearance distances		P
9.1	Creepage and clearance distances between uninsulated live parts not of the same potential and between a live part and an accessible metal part, are not less than the values specified in Tables 3 and 4 of IEC 61730-1.	Cell to right frame – 10.35mm Cell to left frame – 10.40mm Cell to cell – 2.39mm Lower Busbar to frame – 9.20mm Upper Busbar to frame – 17.98mm	P
	Minimum measured creepage and clearance distances between field wiring terminals (mm) :	No field wiring terminal	—

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Clause	Requirement + Test	Result - Remark	Verdict
	Minimum Measured clearance distances between internal current carrying parts and accessible points (mm)		—
9.2	Creepage and clearance distances at field wiring terminals have been judged on module open-circuit voltage (V_{oc}).		NA
	If additional unmarked terminals exist in the terminal block, or if wiring terminals are marked specifically for grounding, the creepage and clearance distances have been judged on the basis of the maximum system operating voltage.		NA
9.3	The spacing's at a field-wiring terminal have been measured with and without wire connected to the terminal.		NA
	If the terminal will properly accommodate it, and if the product was not marked to restrict its use, the wire is one size larger than that required, otherwise, the wire is of the required size.		NA
9.4	Surfaces separated by a gap of 0,4 mm or less have been considered to be in contact with each other.	There is no surface separated by a gap of 0.4mm.	NA
Supplementary information: NA			

10	FIELD WIRING COMPARTMENTS WITH COVERS		NA
10.1	General		NA
	If the module is designed for the application of a permanently attached wiring system by an installer in the field, it is to be provided with an enclosed wiring compartment		NA
10.2	Wall thickness		NA
	If the wiring compartment is intended for the attachment of a field-applied permanent wiring system, the minimum wall thickness for the material complies with Table 5 of IEC 61730-1.	See Annex 2 for constructional details	NA
10.3	Internal volume		NA
	The internal volume for each intended conductor complies with the requirements of Table 6 of IEC 61730-1.	See Annex 2 for constructional details	NA
	In the space comprising the minimum required volume, no enclosure dimension is less than 20 mm.		NA

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Clause	Requirement + Test	Result - Remark	Verdict
10.4	Openings		NA
	All openings are provided with appropriate coverings, whose functions comply with the requirements of:		NA
	- Subclause 5.2.1 of IEC 61730-1		NA
	- Wet leakage Current test of Subclause 10.20 of IEC 61646 or 10.17 of IEC 61215 Ed. 2.		NA
	- Accessibility test MST 11 of IEC 61730-2		NA
	Coverings can only be removed by the use of a tool		NA
10.5	Gaskets and seals		P
	Gaskets and seals do not deteriorate beyond limits during accelerated ageing, and are not used where they may be subject to flexing during normal operation.	Gasket complies with the accelerated aging test under component evaluation and not subjected to flexing during normal operation.	P

10.6	Strain relief		P
	Any strain relief is provided so that stress on a lead intended for field connection, or otherwise likely to be handled in the field, including a flexible cord, is not transmitted to the electrical connection inside the module. <i>Note: Mechanical securement means which comply with Sub clause 10.14 (Robustness of Terminations Test) of IEC 61215 meet this requirement.</i>	Module complied with Mechanical Securement Test	P
10.7	Sharp edges		P
10.7.1	The enclosure is smooth and free from sharp edges, burrs, or the like that may damage insulation or conductors.		P
10.7.2	The inner edges of conduit openings and knockouts are smooth and free from sharp edges, burrs, or the like that may damage insulation or conductors.		P
10.8	Conduit applications – Metallic		NA

IEC 61730-1			
Clause	Requirement + Test	Result - Remark	Verdict
10.8.1	Any threaded hole in a metal wiring compartment intended for the connection of rigid metal conduit is reinforced to provide metal not less than 6,4 mm thick.		NA
	Any threaded hole is tapered unless a conduit end stop is provided.		NA
10.8.2	If threads for the connection of conduit are tapped all the way through a hole in a compartment wall, there are not less than 3.5 nor more than 5 threads in the metal and the construction. was such that a conduit bushing can be attached as intended.		NA
	The construction is such that a conduit bushing can be attached as intended.		NA
10.8.3	If threads for the connection of conduit are not tapped all the way through a hole in a compartment wall, there are not less than 5 full threads in the metal. and there was a smooth, rounded inlet hole for the conductors.		NA
	There are smooth, rounded inlet holes for the conductors.		NA
10.8.4	For a non-threaded opening in a metal wiring compartment intended to accommodate rigid metallic conduit, a flat surface of sufficient area is provided around the opening to accept the bearing surfaces of the bushing and lock washer.		NA
10.8.5	Conduit complies with the Conduit bending test MST 33 of IEC 61730-2.		NA

10.9	Conduit applications – Non-metallic		NA
10.9.1	The thickness of sides, end walls, and bottom of a non-metallic wiring enclosure specified for conduit applications is not less than the values specified in Table 7 of IEC 61730-1.		NA
10.9.2	A non-metallic wiring compartment intended to accommodate non-metallic conduit fulfils the following requirements:		NA
	a) It has one or more unthreaded conduit-connection sockets;		NA
	b) It has one or more threaded or unthreaded openings for a conduit-connection socket, or one or more knockouts that comply with the requirements of Knockout Test MST 44 of IEC 61730-2;		NA

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Clause	Requirement + Test	Result - Remark	Verdict
	c) It complies with the Conduit Bending Test MST 33 of IEC 61730-2, if intended for rigid non-metallic conduit.		NA
10.9.3	Sockets for the connection of non-metallic conduit provide a positive end stop for the conduit.		NA
	The socket diameters, the throat diameter at the entrance to the box, the socket depths, and the wall thickness of the socket are within the limits specified in the applicable conduit system.		NA
10.9.4	A knockout or opening in a non-metallic wiring compartment intended to accommodate rigid non-metallic conduit complies with the dimensional requirements of the applicable conduit system.		NA
Supplementary information: NA			

11	MARKING		P
11.1	The module includes the following clear and indelible markings:		P
	– Name, monogram or symbol of manufacturer		P
	– Type or model number		P
	– Serial number		P
	– Polarity of terminals or leads		P
	– Maximum system voltage		P
	– Safety class (IEC 61140)		P
	The date and place of manufacture are marked on the module or are traceable from the serial number.		P
	International symbols are used where applicable.		P
11.2	The following additional markings are applied to either the module or placed into the instruction and installation data (required documents).		P
	– Voltage at open-circuit		P
	– Current at short-circuit		P
	– Maximum over-current protection rating, as verified by the Reverse Current Overload Test MST 26 of IEC 61730-2		P
	– Recommended maximum series/parallel module configurations	Maximum 23 modules can be connected in series	P

IEC 61730-1			
Clause	Requirement + Test	Result - Remark	Verdict
	– Application class		P
	All electrical data are given relative to Standard Test Conditions (1000W/m ² @ 25°C)		P
11.3	Connectors suitable only for field assembly of modules are marked “Do not disconnect under load” .	Marking provided	P
11.4	For modules with open-circuit voltage in excess of 50 V, and/or modules rated for maximum system voltage in excess of 50 V, a highly visible warning label regarding the shock hazard is applied near the means of connection to the module.	N/A. Module open circuit voltage rating is less than 50Vdc	NA
Supplementary information: NA			

12	REQUIREMENTS FOR SUPPLIED DOCUMENTS		P
12.1	The module or panel is supplied with installation instructions describing the methods of electrical and mechanical installation and the electrical ratings of the module.		P
	The instructions state the application class under which the module was qualified and any specific limitations required for that application class.	Application Class A	P
12.2	When the fire rating is dependent on a specific mounting structure, specific spacing, or specific means of attachment to the roof or structure, details of the specific parameter or parameters are included in the instructions.		P
12.3	The electrical installation instructions include a detailed description of the wiring method.		P
	The description of the wiring method includes the following information:		P
	– Grounding method		P
	– Size, type, and temperature rating of the conductors		P
	– Recommended maximum series/parallel module configurations	23 modules in series	P
– Type of over-current protection and diode bypassing to be used	VF Schottky Barrier Diode SL1515B, 40V/20A	P	

IEC 61730-1			
Clause	Requirement + Test	Result - Remark	Verdict
	– Minimum cable diameters when the wiring method is cable	4sqmm / 12AWG	P
	– Any limitations on wiring methods that apply to the wiring compartment or box		NA
12.4	The mechanical installation instructions for roof mounting include:		NA
	– A statement indicating the minimum mechanical means for securing the module or panel to the roof		NA
	– A statement that the assembly is to be mounted over a fire resistant roof covering rated for the application (only for non-integral modules or panels)		NA
	– Indication of any slope required for maintaining a fire class rating		NA
12.5	The installation instructions include a statement advising that artificially concentrated sunlight shall not be directed on the module or panel.		P
12.6	Assembly instructions are provided with a product shipped in subassemblies, and are detailed and adequate to the degree required to facilitate total assembly of the product.		NA
12.7	The installation instructions include the proposed statement given in this Subclause (or equivalent) to allow for increased output of the module resulting from certain conditions of use.		P

ANNEX 1: PRODUCT DESCRIPTION SHEET (MANUFACTURERS AND TYPE REFERENCES)

A1.1	MODULES TYPE/S	
	Type No.	310Wp - IS-EN 310W
A1.2	SOLAR CELL	
	Cell type reference	SUNTECH,STP156M,Polycrystalline
	Cell dimensions L x W (mm)	156 X156 +/- 0.5
	Cell thickness (µm).....	180 - 200 +/-20
	Cell area (cm ²)	243.360
A1.3	IDENTIFICATION OF MATERIALS	
	Front cover	Gujarat Borosil Limited, Solar Tempered Glass 3.2 +/-0.2mm
	Rear cover.....	MADICO Specialty Films, Reflekt-Light (Thickness 259µm, Wt 285g/sqm, Density 1.14gm/sqcm)
	Encapsulant.....	TPI All seasons company Limited , Thailand, Grade ST 308 Fast cure EVA
	Frame	ULTRA Aluminum Pvt Ltd, Raipur, Model:6063 T6
	Adhesive for frame	Pentagon Tapes Pvt. Ltd. (BOW tape) , PT390W(1mm Polyethylene foam Double side adhesive)
	Adhesive for junction box	Sikasil AS-60 CN
	Potting material	Not Used
	Internal wiring	Luvata Malaysia 1.5x0.18mm Cell Interconnect snpb 60/40 15 to 25 µm and 5x0.3 mm Bus bar Snpb 60/40 15 to 25 µm
	Soldering material	Sri bhavani metals Pvt Ltd, 63/37 Sn/PB single core
	Other	NA
A1.4	IDENTIFICATION OF COMPONENTS	
	Junction box	Tyco Electronics Middle East FZE, Model Code: Z-CLA4GBN3K Part No : 8-2152080-6
	Cable	PV1-F, 4 mm2
	Connector	PV 4,1000 VDC ,40 A
	Bypass diode	Schottky Barrier Rectifier - SL1515B, 40V/20A
A1.5	MODULE DESIGN –DIMENSIONS	
	Module dimensions L x W x H (mm)	1956x980x42
A1.6	MODULE DESIGN - MINIMUM DISTANCES	
	Between cells	2.39mm
	Between cell and edge of laminate	10.35mm
	Between any current carrying part and edge of laminate	9.20mm
A1.7	MODULE DESIGN - ELECTRICAL CONFIGURATION	
	Total number of cells	72
	Serial-parallel connection of cells	All in Series

Cells per bypass diode	24
No. of bypass diodes	3

ANNEX 2: CONSTRUCTION DETAILS

A. PHOTOGRAPHS

B. USER INSTRUCTION MANUAL

A. PHOTOGRAPHS







B. USER INSTRUCTION MANUAL

1. Introduction

This manual contains information regarding the safe installation and handling of photovoltaic (PV) modules produced by ICON SOLAR-EN POWER TECHNOLOGIES PVT LTD. All the instructions given in this manual should be read carefully and understood before attempting to install the modules. If there are any questions, please contact us for further explanation. The instructions and requirements of this manual refer to the following crystalline modules manufactured by ICON SOLAR-EN POWER TECHNOLOGIES PVT LTD.

Polycrystalline:

ICON SOLAR-EN POWER TECHNOLOGIES PVT LTD Module Series ranging from 3W to 310W

1.1 Disclaimer of liability

The use of this manual and the conditions or methods of installation, operation, utilization and maintenance of PV product are beyond ICON SOLAR-EN POWER TECHNOLOGIES PVT LTD control. Therefore, ICON SOLAR-EN POWER TECHNOLOGIES PVT LTD will not accept any responsibility and expressly denies any liability damage, or expense arising out of or in any way connected with such installation, operation, utilization or maintenance.

No responsibilities will be assumed by ICON SOLAR-EN POWER TECHNOLOGIES PVT LTD for any infringement of patents or other rights of third parties, which may result from use of the PV module. No license is granted by implication or otherwise under any patent or patent rights. The information in this manual is based on ICON SOLAR-EN POWER TECHNOLOGIES PVT LTD knowledge and experience and it is believed to be reliable. Nevertheless, such information including product specification (without limitations) and suggestions do not constitute a warranty, expressed or implied. ICON SOLAR-EN POWER TECHNOLOGIES PVT LTD reserves the right to change the manual, the PV module, the specifications, or product information sheets without prior notice.

1.2 Product identification

Each module can be identified by means of the following embedded information:

Nameplate:

It is located on the reverse side of the module. According to IEC 61215, IEC 61730 & IEC 61701 Ed 1 directives it gives information about the main parameters of the module: Product Type, Maximum Power, Current at Maximum Power, Voltage at Maximum power, Open Circuit Voltage, Short Circuit Current, all as measured under Standard Test Conditions, weight, dimensions, Maximum System Voltage, etc.

Serial number:

Each individual module is identified by a unique serial number accompanied with a barcode. They are permanently inserted inside the laminate, under the front glass of the module, visible when viewed from the front of the module. There is only one unique serial number accompanied with one barcode on the module.

1.3 Quality and Safety Standards

ICON SOLAR photovoltaic modules meet all the requirements of the following official Standards in terms of Quality and Safety:

- IEC 61215: design qualification and type approval
- IEC 61730-1 and 2: photovoltaic module safety qualification
- IEC 61701- Standard for Salt Mist Corrosion Testing of Photovoltaic (PV) Modules, First Edition, Issued on 1995

1.4 Limited warranty

The warranty conditions applied to the module by ICON SOLAR-EN POWER TECHNOLOGIES PVT LTD are described in the document: "Limited Warranty for PV Modules" – the current version is available on our website. Ignoring the instructions in this manual may give ICON SOLAR-EN POWER TECHNOLOGIES PVT LTD cause to invalidate the warranty where negligence can be proven (improper installation or use). Please contact us for any question about warranties.

Beyond the obligatory requirements imposed by ICON SOLAR-EN POWER TECHNOLOGIES PVT LTD for installation and use of the modules covered by ICON SOLAR-EN POWER TECHNOLOGIES PVT LTD Limited Warranty, this manual carries out a series of recommendations in order to facilitate, optimize or increase security and effectiveness of the module installation. In these cases in which ICON SOLAR-EN POWER TECHNOLOGIES PVT LTD is giving just suggestions and not specific obligations, different technical choices by the installer may not cause the withdrawal of the warranty.

2. Safety

ICON SOLAR-EN POWER TECHNOLOGIES PVT LTD PV modules have passed all the required safety tests according to the IEC EN 61730 Directive with Application Class A and they are certified as Safety Class II.

2.1 General Safety

- All PV modules should be installed according to all local and national applicable standards, codes and regulations.
- Installation should be performed only by qualified persons. Installers should assume the risk of all injury that might occur during installation including, without limitation, the risk of electric shock.
- All safety precautions specified even for the other components of the system should be checked and followed.
- Rooftop installations should be placed over fire resistant roof coverings only.
- Do not attempt to disassemble the modules, and do not remove any attached nameplates or components from the modules.
- Do not apply paint or adhesive to module top surface.
- Do not use mirrors or other magnifiers to artificially concentrate sunlight on the modules. Do not expose back sheet foils directly to sunlight.



2.2 Handling Safety

- Do not exceed the maximum height of pallets stacked on top of each other. Maximum height is 2 pallets. Standard packaging for shipment in 40 ft. High-Cube Containers.
- Do not damage or scratch the PV module surfaces.
- Do not use the junction boxes and the cables as a grip.
- Do not stand or step on module.
- Do not drop module or allow objects to fall on module.
- To avoid glass breakage, do not place any heavy objects on the module.
- Do not set the module down hard on any surface.
- Inappropriate transport and installation may break modules.



2.3 Installation Safety

- Installing solar PV systems requires specialized skills and knowledge.
- One individual module may generate DC voltages greater than 30 V when exposed to light of any intensity. Contact with a DC voltage of 30 V or more is potentially hazardous.
- To avoid electrical arcing, do not disconnect modules under load. Keep connectors dry and clean.
- PV modules will generate electricity whilst exposed to light. Generation will only stop when the PV module is either removed from light or covered with a dark opaque material. When working with modules without any cover, regard the safety regulations for live electrical equipment.
- Do not wear metallic rings, watchbands, ear, nose, lip rings or other metallic devices while installing or troubleshooting PV systems in order to avoid risk of electric shock.
- Use only insulated tools that are approved for working on electrical installations. Abide with the safety regulations for all other components used in the PV system, including wiring and cables, connectors, charging regulators, inverters, storage batteries and rechargeable batteries, etc.
- Use only equipment, connectors, wiring and support frames suitable for a solar electric system. Always use the same type of module within a particular PV system.
- Do not attempt to repair any part of the PV module.



3. Installation

3.1 Design considerations

To maximize efficiency, PV modules should be installed in a location where they will receive the maximum amount of sunlight throughout the year. In the Northern Hemisphere modules should face the South, while in the Southern Hemisphere modules should face the North. Therefore, modules facing more than 30 degrees away from true South (or North) could lose approximately 10% to 30% of their power output (depending on the latitude of the installation site: the higher the latitude, the higher the loss).

It is recommended that where PV modules are connected in series they should be installed at same orientation and tilt angle.

Different orientations or angles may cause a loss of power output due to the change in sunlight exposure.

While designing the final layout of the modules in the PV system (on the ground or on the roof), we recommend the designer to keep suitable access space to allow easy maintenance and inspection works.

Ensure that ICON SOLAR-EN POWER TECHNOLOGIES PVT LTD PV modules are installed and stored in the following conditions:

- Operating ambient temperature: from -40°C to +85°C
- Storage temperature: from -40°C to +60°C
- Humidity: below 85 RH%

Provide adequate ventilation under a module for cooling. ICON SOLAR-EN POWER TECHNOLOGIES PVT LTD recommends 10 cm minimum air space between module and mounting surface. ICON SOLAR-EN POWER TECHNOLOGIES PVT LTD recommends that PV modules are mounted at a minimum tilt angle of 10° with respect to the horizon, in order to facilitate the self cleaning of their front glass from dirt during ordinary raining. ICON SOLAR-EN POWER TECHNOLOGIES PVT LTD Modules should not be mounted in mobile applications (except solar trackers) or in locations where aggressive substances such as salt or salt-water or any other type of corrosive agent could affect the performance and/or safety of the PV modules.

3.2 Mechanical installation

Use always structures and materials specifically developed and certified for PV modules installation.

We can connect total 23 modules in a series, the minimum distance between two fixed modules for linear thermal expansion of the module frames should be 5 mm. Nevertheless, the recommended distance between two modules is 20 mm to allow wind circulation, in order to reduce pressure loads and improve module ventilation. The PV module should not be mounted in such a way that the drain holes of the module can become blocked.

ICON SOLAR-EN POWER TECHNOLOGIES PVT LTD PV modules are suitable for mechanical mounting both in portrait and landscape orientation. In choosing the orientation, please keep in mind the internal PV module by-pass diode configuration to ensure the optimum electrical behavior from any potential shading over the modules.

Galvanic corrosion can occur between the aluminum frame of the PV module and the mounting hardware if such hardware is composed of dissimilar metals, especially in harsh environments such as high humidity. In these cases, to prevent corrosion, neoprene tape, PVC washers or stainless steel washers should be placed between the PV module frame and the support structure.

Additionally, all module support structures used to support PV modules at correct tilt angles should be wind and snow load rated by appropriate local and civil Directives prior to installation.

NOTICE: Do not disassemble the PV module and do not remove, drill or modify the frame in any way, as this will invalidate the warranty. Please contact us if module mounting procedure is not clear.

3.2.1. Installation using the frame mounting holes

Modules must be securely fixed to the mounting structure using the four pre-drilled mounting holes **Dia 10.00 mm** placed in the long frame rails at 400 mm from the top and bottom frames. Use M8 stainless steel hardware, spring washers and flat washers with a torque of approximately 10 Newton meter [Nm] for normal installation. Galvanized or hot dipped zinc plated hardware is also acceptable.

3.2.2. Installation using pressure clamps

Installation using pressure clamps may be executed along both sides of the module.

The obligatory position of the clips along the frame depends on which side of the module is used for the installation as follows:

- Fixing on the long side: The clamps must be mounted along the frame at the position of the mounting hole, with a tolerance of 10% of the module total length to the edge of the frame.
- Fixing on the short side: The clamps must be mounted along the frame at the edges of the module, with a tolerance of 25% of the module total width to the middle of the frame.

Note that on both sides of the module the pressure clamps always should be mounted in a symmetric position with respect to the center line for a proper load distribution.



Clamps must be installed according to the manufacturer's specific instructions. Do not apply excessive pressure on the frame such that the frame deforms. ICON SOLAR-EN POWER TECHNOLOGIES PVT LTD recommends a torque of approximately 10 Newton meter [Nm],

The clamps should have contact only with the module frame and, to avoid shadowing effects and possible damage, should not overlap onto or over the module glass.

Do not install the modules with pressure clamps mounted out of the specified areas, otherwise the module mechanical resistance may be affected.

3.2.3. Insertion systems

Insertion systems on the short sides of the module may be used with a limitation on the maximum load resistance of 2400 Pa. Insertion systems on the long side of the module are not affected by any limitation and may be used with a maximum of 5400 Pa for snow load.

When using insertion systems where the modules are installed sliding through the inner side of the rails, ICON SOLAR-EN POWER TECHNOLOGIES PVT LTD recommends the use of PVC frame protectors in order to prevent damage to the anodized surface of the frame.

3.2.4. Module load resistance

Wind Load: 2400 Pa

According to IEC 61215 Directive, 2400 Pa corresponds to a wind pressure of 130 km/h (approximately +/-800 Pa) with a safety factor of 3 for gusty winds.

3.3 Electrical installation

Modules electrically connected together in a series/parallel configuration generate DC electrical energy which may be converted to AC by means of a solar inverter. The resulting PV system may be therefore connected to the local utility grid system. As local utilities' policies and technical rules on connecting a renewable energy system to their power grids vary from region to region, consult a qualified system designer or integrator to design such a system to comply with the Directives. Permits are normally required for installing a PV system and the utility will formally approve and inspect the system before its connection to the grid can be accepted.

The PV system electrical installation should be executed in accordance with the respective National Electrical Code or applicable National Regulations.

Use only insulated tools that are approved for working on electrical installations. Abide by the safety regulations for all the components used in the system, including wiring and cables, connectors, charge regulators, inverters, storage batteries etc.

3.3.1. General considerations

Modules are fitted with two pre-assembled sunlight resistant cable leads, which are terminated with PV fast connectors. The positive (+) terminal has a female connector while the negative (-) terminal has a male connector. These cable leads and connectors must not be removed or cut off.

Several modules are connected in series and then in parallel to form a PV array, especially for applications with high operating voltage. When modules are connected in series, the total voltage of the resulting string is the sum of the individual voltages of the modules. Do not use different types of modules in the same circuit as this will cause mismatch, power loss and/or damage to the PV system.

When selecting the size of the cables that connect the module strings to the solar inverter, it is recommended to refer to the Name plate electrical parameters of the related module type.

For electrical design considerations, the values given in the module label or datasheet of the related model type should be multiplied by a factor of 1.25 for Short Circuit Current (Isc) and 1.10 for Open Circuit Voltage (Voc), when determining component voltage ratings, conductor current ratings, fuse sizes and the rest of electrical hardware connected to the module strings.

Nevertheless, consult rated local wiring regulations to determine system wire size, type, and temperature allowed for your installation.

3.3.2. Bypass diodes

When a module is connected in series with other modules, partial shading can cause a reverse voltage across the shaded area of the module. The current generated is therefore forced through the shaded area by the other modules.

When a bypass diode is wired in parallel with the PV cell strings, such a forced current will flow through the diode and

bypass the current generated by the non-shaded cells, thereby minimizing module heating, current losses, and damage to the module.

ICON SOLAR-EN POWER TECHNOLOGIES PVT LTD modules are fitted with internal bypass diodes wired inside the junction box to reduce the effects of partial shadings. Do not open the junction box to change the diodes even if they are defective. This should be done only by qualified personnel.

3.3.3. PV System Grounding

ICON SOLAR-EN POWER TECHNOLOGIES PVT LTD Modules are certified for Class A applications, Safety Class II, 1000Vdc Maximum System Voltage. Refer to respective National Electrical Code requirements and standards for safety-related grounding of racking system and/or module frames.

When executing the grounding of the module frames, ICON SOLAR-EN POWER TECHNOLOGIES PVT LTD recommends taking into account the following considerations:

- The long frame rails are equipped with pre-drilled grounding holes in their centre (Dia 5mm). These holes should be used only for grounding purposes and not for mounting purposes.
- Proper grounding is achieved by connecting the module frame(s) and structural members contiguously using a suitable grounding conductor. The grounding wire should be properly fastened to the module frame to assure good electrical contact. Use copper, copper alloy or any other conductive material accepted by the applicable National Electrical Regulation.
- Make electrical contact by penetrating the anodized coating of the aluminum frame. To break the anodized layer, ICON SOLAR-EN POWER TECHNOLOGIES PVT LTD suggests a stainless steel toothed washer to be inserted between the nut and the frame.
- When carrying out the grounding of the modules, the aluminum frame must not be in permanent direct contact with dissimilar Metals, this could result in a galvanic corrosion. Stainless steel flat washers may be inserted between frame and grounding lug.
- ICON SOLAR-EN POWER TECHNOLOGIES PVT LTD recommends the use of stainless steel grounding bolts or grounding lugs specifically designed for PV applications.

4. Commissioning and maintenance

Test all electrical and electronic components of the system before using it. Follow the instructions in the manuals supplied with the components and equipment. Commission and Maintenance works should only be performed by specialized and properly trained personnel.

4.1 Commissioning

Check the Open Circuit Voltage of every string of modules connected in series with a digital multi meter. The measured overall values should correspond to the sum of the Open Circuit Voltage of the individual modules.

Be aware that the measured overall voltage can be lower than expected, due the normal decrease of Open Circuit Voltage of the individual modules, caused by the temperature rising of solar cells or low irradiance. The rated voltage at STC will be found in the name plate or technical datasheet of the module type used in the PV system.

In any case, the measured overall voltage should be never below 20% of the estimated one. Excessively low voltage is typically caused by improper connections at the terminals or defective bypass diodes. Please contact us if the problem cannot be resolved.

Once the commissioning has been executed, check the operating current through every series of the PV installation. It can be measured directly by a DC clamp meter. All measurements should be in the same value range, but they may vary from the maximum current measured at STC specified in the datasheet. The measured values are dependent on the solar inverter, but they should be proportional to the solar irradiance present at the moment.

4.2 Maintenance

ICON SOLAR-EN POWER TECHNOLOGIES PVT LTD recommends the following maintenance in order to ensure optimum performance of the module:

- Check the electrical and mechanical connections every six months to verify that they are clean, secure and undamaged;
- Check that mounting hardware, terminal screws and grounding components are tightly secured with no corrosion;
- Check that modules are not shaded by vegetation or any unwanted obstacles;
- Do not touch live parts of cables and connectors;
- Use appropriate safety equipment (insulated tools, insulating gloves, etc.) when handling modules;
- If any problem with the system or individual module arises, have them investigated by a competent specialist;
- Replacement modules must be the same type of those to be replaced;
- Modules generate high voltage when exposed to sunlight. Please cover the front surface of modules with an opaque non scratch material when repairing. Repairing works must be performed by specialized and properly trained personnel only;

NOTICE: Follow the maintenance instructions for all components used in the system, such as support frames, charge regulators, inverters, batteries etc.

4.2.1. Cleaning

Dirt and dust can accumulate on the glass surface of the PV module over time, particularly in low inclination installations. This can cause a general decrease of power output and also sedimentation on the lower edge of the modules due to dirt accumulation. ICON SOLAR-EN POWER TECHNOLOGIES PVT LTD recommends periodic cleaning of PV modules to ensure maximum power output, especially in regions with high quantity of dust in the air or low precipitations, as follows:

- Under most weather conditions, normal rainfall is enough to keep the PV module glass surface clean. Clean the glass surface of the module as necessary and consider that lower inclination requires more cleaning frequency;
- Always use water and a soft sponge or cloth for cleaning. A mild, non-abrasive cleaning agent can be used to remove stubborn dirt. High mineral content water is not recommended, as it may leave residual deposits on the module;
- To avoid any damage to this layer do not clean the modules with high pressure washers, steam or corrosive chemicals. Do not use abrasive sponges or aggressive tools that could scratch the module surface;
- To avoid a possible thermal shock clean the modules during early morning, when the module is still cold. This is specially recommended in regions with hotter temperatures;
- In cold environments with snow do not try to remove the frozen snow or ice from the module scratching on the front glass. Only soft snow can be removed gently with a soft brush in order to improve the production;
- Do not clean modules having broken glass or exposed wiring. This could cause a general electrical failure of the module and/or electrical shock hazard.

Contact Details:



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----- END OF THE REPORT IEC 61730-1A -----