PV module Installation Instructions

Applicable Product	PV Module Products
Applicable Model	HSxxxPA-AN1/ HSxxxPB-AN1/HSxxxPC-AN1/ HSxxxPD-AN1 HSxxxUA-AN1/ HSxxxUB-AN1/HSxxxUC-AN1/ HSxxxUD-AN1 HSxxxUE-AN1/ HSxxxUB-AH2/ HSxxxUD-AH2
Revision	REV.0.6
Certification	TUV

REV	DATE	REVISION
0.0	18/03/28	1th Edition
0.1	18/11/05	Additional temperature coefficient Revision Add electrical specification tolerance Revision
0.2	19/02/12	Model Revision -. HSxxxUE-AN1
0.3	19/03/08	Mechanical Specifications Revision -. HSxxxPB-AN1/HSxxxUB-AN1
0.4	19/04/24	Model Revision -. HSxxxUB-AH2/HSxxxUD-AH2
0.5	19/05/17	Mounting installation Revision
0.6	19/05/22	Electrical Specifications -. HSxxxUD-AH2

READ THIS INSTALLATION INSTRUCTION IN THIS ENTIRETY BEFORE INSTALLING, WIRING OR UISING THIS PRODUCTION IN ANY WAY.

Introduction

This manual contains important installation, maintenance and safety information. The word “module” as used in this manual refers to one or more photovoltaic modules. Please retain this manual for future reference.

◈ IMPORTANT ◈

Please read this sheet in its ENTIRETY before installing, wiring or using this product in any way. Failure to comply with these instructions will invalidate the Hansol Limited Warranty.

DISCLAIMER OF LIABILITY

Hansol accepts no liability for the usability and functionality of its solar modules if the instructions in this guide are not followed. Since compliance with this guide and the conditions and methods of installation, operation, use and maintenance of the modules are not checked or monitored by Hansol; Hansol accepts no liability for damage arising from improper use or incorrect installation, operation, use or maintenance.
The information in this manual is believed to be reliable, but does not constitute an expressed and/or implied warranty.

As part of Hansol’s policy of continuous improvement, Hansol reserves the right to change product specifications at any time without prior notice.

Electrical Specifications

HSxxxPA-AN1

Cell Type / Cells per module		156.75×156.75mm(6×6 inch) Multi-crystalline silicon / 54 cells (6×9 matrix)		
Maximum Power	Maximum Power Voltage	Maximum Power current	Open circuit voltage	Short circuit current
	Vmp (V)	Imp (A)	Voc (V)	Isc (A)
225 ±3%	26.8	8.40	32.8 ±3%	8.88 ±3%
230 ±3%	27.2	8.46	33.2 ±3%	8.94 ±3%
235 ±3%	27.6	8.52	33.6 ±3%	9.00 ±3%
240 ±3%	28.0	8.58	34.0 ±3%	9.06 ±3%
245 ±3%	28.4	8.63	34.4 ±3%	9.11 ±3%
250 ±3%	28.8	8.69	34.8 ±3%	9.17 ±3%
255 ±3%	29.2	8.74	35.2 ±3%	9.22 ±3%
260 ±3%	29.6	8.79	35.6 ±3%	9.27 ±3%
265 ±3%	30.0	8.84	36.0 ±3%	9.32 ±3%
270 ±3%	30.4	8.89	36.4 ±3%	9.37 ±3%

Electrical Specifications

HSxxxPB-AN1

Cell Type / Cells per module		156.75×156.75mm(6×6 inch) Multi-crystalline silicon / 60 cells (6×10 matrix)		
Maximum Power	Maximum Power Voltage	Maximum Power current	Open circuit voltage	Short circuit current
	Vmp (V)	Imp (A)	Voc (V)	Isc (A)
250 ±3%	29.7	8.43	36.5 ±3%	8.92 ±3%
255 ±3%	30.1	8.48	36.9 ±3%	8.97 ±3%
260 ±3%	30.5	8.54	37.3 ±3%	9.03 ±3%
265 ±3%	30.9	8.59	37.7 ±3%	9.08 ±3%
270 ±3%	31.3	8.64	38.1 ±3%	9.13 ±3%
275 ±3%	31.7	8.69	38.5 ±3%	9.18 ±3%
280 ±3%	32.1	8.73	38.9 ±3%	9.22 ±3%
285 ±3%	32.5	8.78	39.3 ±3%	9.27 ±3%
290 ±3%	32.9	8.83	39.7 ±3%	9.32 ±3%
295 ±3%	33.3	8.87	40.1 ±3%	9.36 ±3%
300 ±3%	33.7	8.91	40.5 ±3%	9.40 ±3%

Electrical Specifications

HSxxxPC-AN1

Cell Type / Cells per module		156.75×156.75mm(6×6 inch) Multi-crystalline silicon / 66 cells (6×11 matrix)		
Maximum Power	Maximum Power Voltage	Maximum Power current	Open circuit voltage	Short circuit current

	Vmp (V)	Imp (A)	Voc (V)	Isc (A)
275 ±3%	32.2	8.55	39.9 ±3%	9.05 ±3%
280 ±3%	32.6	8.60	40.3 ±3%	9.10 ±3%
285 ±3%	33.0	8.64	40.7 ±3%	9.14 ±3%
290 ±3%	33.4	8.69	41.1 ±3%	9.19 ±3%
295 ±3%	33.8	8.73	41.5 ±3%	9.23 ±3%
300 ±3%	34.2	8.78	41.9 ±3%	9.28 ±3%
305 ±3%	34.6	8.82	42.3 ±3%	9.32 ±3%
310 ±3%	35.0	8.86	42.7 ±3%	9.36 ±3%
315 ±3%	35.4	8.90	43.1 ±3%	9.40 ±3%
320 ±3%	35.8	8.94	43.5 ±3%	9.44 ±3%
325 ±3%	36.2	8.98	43.9 ±3%	9.48 ±3%
330 ±3%	36.6	9.02	44.3 ±3%	9.52 ±3%

Electrical Specifications

HSxxxPD-AN1

Cell Type / Cells per module		**156.75×156.75mm(6×6 inch) Multi-crystalline silicon / 72 cells (6×12 matrix)**		
Maximum Power	**Maximum Power Voltage**	**Maximum Power current**	**Open circuit voltage**	**Short circuit current**
	Vmp (V)	**Imp (A)**	**Voc (V)**	**Isc (A)**
300 ±3%	35.0	8.58	43.7 ±3%	8.95 ±3%
305 ±3%	35.4	8.62	44.1 ±3%	8.99 ±3%
310 ±3%	35.8	8.67	44.5 ±3%	9.04 ±3%
315 ±3%	36.2	8.71	44.9 ±3%	9.08 ±3%
320 ±3%	36.6	8.75	45.3 ±3%	9.12 ±3%
325 ±3%	37.0	8.79	45.7 ±3%	9.16 ±3%
330 ±3%	37.4	8.83	46.1 ±3%	9.20 ±3%
335 ±3%	37.8	8.87	46.5 ±3%	9.24 ±3%
340 ±3%	38.2	8.91	46.9 ±3%	9.28 ±3%
345 ±3%	38.6	8.94	47.3 ±3%	9.31 ±3%
350 ±3%	39.0	8.98	47.7 ±3%	9.35 ±3%
355 ±3%	39.4	9.02	48.1 ±3%	9.39 ±3%
360 ±3%	39.8	9.05	48.5 ±3%	9.42 ±3%

Electrical Specifications

HSxxxUA-AN1

Cell Type / Cells per module		**156.75×156.75mm(6×6 inch) Mono-crystalline silicon / 54 cells (6×9 matrix)**		
Maximum Power	**Maximum Power Voltage**	**Maximum Power current**	**Open circuit voltage**	**Short circuit current**
	Vmp (V)	**Imp (A)**	**Voc (V)**	**Isc (A)**
230 ±3%	26.5	8.70	33.2 ±3%	8.99 ±3%
235 ±3%	26.9	8.75	33.6 ±3%	9.04 ±3%
240 ±3%	27.3	8.81	34.0 ±3%	9.10 ±3%
245 ±3%	27.7	8.86	34.4 ±3%	9.15 ±3%
250 ±3%	28.1	8.91	34.8 ±3%	9.20 ±3%
255 ±3%	28.5	8.97	35.2 ±3%	9.26 ±3%

260 ±3%	28.9	9.01	35.6 ±3%	9.30 ±3%
265 ±3%	29.3	9.06	36.0 ±3%	9.35 ±3%
270 ±3%	29.7	9.11	36.4 ±3%	9.40 ±3%
275 ±3%	30.1	9.15	36.8 ±3%	9.44 ±3%
280 ±3%	30.5	9.20	37.2 ±3%	9.49 ±3%

Electrical Specifications

HSxxxUB-AN1

Cell Type / Cells per module		**156.75×156.75mm(6×6 inch) Mono-crystalline silicon / 60 cells (6×10 matrix)**		
Maximum Power	**Maximum Power Voltage**	**Maximum Power current**	**Open circuit voltage**	**Short circuit current**
	Vmp (V)	**Imp (A)**	**Voc (V)**	**Isc (A)**
255 ±3%	28.9	8.83	36.7 ±3%	9.34 ±3%
260 ±3%	29.3	8.88	37.1 ±3%	9.39 ±3%
265 ±3%	29.7	8.93	37.5 ±3%	9.44 ±3%
270 ±3%	30.1	8.98	37.9 ±3%	9.49 ±3%
275 ±3%	30.5	9.02	38.3 ±3%	9.53 ±3%
280 ±3%	30.9	9.07	38.7 ±3%	9.58 ±3%
285 ±3%	31.3	9.11	39.1 ±3%	9.62 ±3%
290 ±3%	31.7	9.16	39.5 ±3%	9.67 ±3%
295 ±3%	32.1	9.20	39.9 ±3%	9.71 ±3%
300 ±3%	32.5	9.24	40.3 ±3%	9.75 ±3%
305 ±3%	32.9	9.28	40.7 ±3%	9.79 ±3%
310 ±3%	33.3	9.32	41.1 ±3%	9.83 ±3%

Electrical Specifications

HSxxxUC-AN1

Cell Type / Cells per module		**156.75×156.75mm(6×6 inch) Mono-crystalline silicon / 66 cells (6×11 matrix)**		
Maximum Power	**Maximum Power Voltage**	**Maximum Power current**	**Open circuit voltage**	**Short circuit current**
	Vmp (V)	**Imp (A)**	**Voc (V)**	**Isc (A)**
285 ±3%	32.4	8.81	40.5 ±3%	9.30 ±3%
290 ±3%	32.8	8.85	40.9 ±3%	9.34 ±3%
295 ±3%	33.2	8.90	41.3 ±3%	9.39 ±3%
300 ±3%	33.6	8.94	41.7 ±3%	9.43 ±3%
305 ±3%	34.0	8.98	42.1 ±3%	9.47 ±3%
310 ±3%	34.4	9.02	42.5 ±3%	9.51 ±3%
315 ±3%	34.8	9.06	42.9 ±3%	9.55 ±3%
320 ±3%	35.2	9.10	43.3 ±3%	9.59 ±3%
325 ±3%	35.6	9.14	43.7 ±3%	9.63 ±3%
330 ±3%	36.0	9.18	44.1 ±3%	9.67 ±3%
335 ±3%	36.4	9.21	44.5 ±3%	9.70 ±3%
340 ±3%	36.8	9.25	44.9 ±3%	9.74 ±3%

Electrical Specifications

HSxxxUD-AN1

Cell Type / Cells per module		156.75×156.75mm(6×6 inch) Mono silicon / 72 cells (6×12 matrix)		
Maximum Power	Maximum Power Voltage	Maximum Power current	Open circuit voltage	Short circuit current
	Vmp (V)	Imp (A)	Voc (V)	Isc (A)
310 ±3%	36.1	8.59	43.8 ±3%	9.24 ±3%
315 ±3%	36.5	8.64	44.2 ±3%	9.29 ±3%
320 ±3%	36.9	8.68	44.6 ±3%	9.33 ±3%
325 ±3%	37.3	8.72	45.0 ±3%	9.37 ±3%
330 ±3%	37.7	8.76	45.4 ±3%	9.41 ±3%
335 ±3%	38.0	8.82	45.7 ±3%	9.46 ±3%
340 ±3%	38.3	8.88	46.1 ±3%	9.50 ±3%
345 ±3%	38.6	8.94	46.4 ±3%	9.55 ±3%
350 ±3%	38.9	9.00	46.7 ±3%	9.60 ±3%
355 ±3%	39.3	9.04	47.0 ±3%	9.64 ±3%
360 ±3%	39.7	9.07	47.4 ±3%	9.67 ±3%
365 ±3%	40.1	9.11	47.8 ±3%	9.71 ±3%
370 ±3%	40.5	9.14	48.2 ±3%	9.74 ±3%

Electrical Specifications

HSxxxUE-AN1

Cell Type / Cells per module		156.75×156.75mm(6×6 inch) Mono-crystalline silicon /78 cells (6×13 matrix)		
Maximum Power	Maximum Power Voltage	Maximum Power current	Open circuit voltage	Short circuit current
	Vmp (V)	Imp (A)	Voc (V)	Isc (A)
380 ±3%	40.1	9.48	49.7 ±3%	10.36 ±3%
385 ±3%	40.5	9.51	50.1 ±3%	10.39 ±3%
390 ±3%	40.9	9.54	50.5 ±3%	10.42 ±3%
395 ±3%	41.3	9.57	50.9 ±3%	10.45 ±3%
400 ±3%	41.7	9.60	51.3 ±3%	10.48 ±3%

Electrical Specifications

HSxxxUB-AH2

Cell Type / Cells per module		158.75×158.75mm(6×6 inch) Mono-crystalline silicon /60 cells (6×10 matrix)		
Maximum Power	Maximum Power Voltage	Maximum Power current	Open circuit voltage	Short circuit current
	Vmp (V)	Imp (A)	Voc (V)	Isc (A)
305 ±3%	32.9	9.28	40.7±3%	9.79±3%
310 ±3%	33.3	9.31	41.1±3%	9.82±3%
315 ±3%	33.7	9.35	41.5±3%	9.86±3%
320 ±3%	34.1	9.39	41.9±3%	9.90±3%
325 ±3%	34.5	9.43	42.3±3%	9.94±3%

Electrical Specifications

HSxxxUD-AH2				
Cell Type / Cells per module		158.75×158.75mm(6×6 inch) Mono-crystalline silicon /72 cells (6×12 matrix)		
Maximum Power	Maximum Power Voltage	Maximum Power current	Open circuit voltage	Short circuit current
	Vmp (V)	Imp (A)	Voc (V)	Isc (A)
370 ±3%	38.9	9.52	47.5±3%	10.15±3%
375 ±3%	39.3	9.55	47.9±3%	10.18±3%
380 ±3%	39.7	9.58	48.3±3%	10.21±3%
385 ±3%	40.1	9.61	48.7±3%	10.24±3%
390 ±3%	40.5	9.64	49.1±3%	10.27±3%

※ Rated electrical characteristics are within 10 percent of measured values at Standard Test Conditions of: 1000 W/m^2, 25°C cell temperature and solar spectral irradiance per ASTM E 892

▶ NMOT(Nominal Module Operating Temperature, 800W/m², 25°C)

Model	NOCT(℃)
HSxxxPA-AN1/ HSxxxPB-AN1/HSxxxPC-AN1/ HSxxxPD-AN1 HSxxxUA-AN1/ HSxxxUB-AN1/HSxxxUC-AN1/ HSxxxUD-AN1 HSxxxUE-AN1/HSxxxUB-AH2/HSxxxUD-AH2	46.0±2

▶ Performance at NMOT

Model	Voc(V)	Vmp(V)	Isc(A)	Imp(A)	Pmp(W)
HS340UD-AN1	41.61	33.43	7.72	7.23	241.68

※ This standard is based on UD-AN1 report result

▶ Performance at low irradiance (200W/m², 25°C)

Model	Voc(V)	Vmp(V)	Isc(A)	Imp(A)	Pmp(W)
HS340UD-AN1	42.43	37.35	1.89	1.69	63.13

※ This standard is based on UD-AN1 report result

▶ Temperature coefficient

Model	Temperature coefficient(%/℃)	
HSxxxPA-AN1/ HSxxxPB-AN1 /HSxxxPC-AN1/ HSxxxPD-AN1	Voc	-0.33
	Isc	0.09
	Pmax	-0.43
HSxxxUA-AN1/ HSxxxUB-AN1 /HSxxxUC-AN1/ HSxxxUD-AN1 HSxxxUE-AN1	Voc	-0.33
	Isc	0.06
	Pmax	-0.44
HSxxxUB-AH2/HSxxxUD-AH2	Voc	-
	Isc	-
	Pmax	-

Mechanical Specifications

Model		HSxxxPA-AN1 HSxxxUA-AN1		HSxxxPB-AN1/ HSxxxUB-AN1 HSxxxUB-AH2								HSxxxPC-AN1 HSxxxUC-AN1		HSxxxPD-AN1 HSxxxUD-AN1 HSxxxUD-AH2	HSxxxUE-AN1
		PB-AN1		UB-AN1			PB-AN1 UB-AN1		PB-AN1 UB-AN1 UB-AH2						
Length	mm	1480		1630	1630	1644	1640		1670			1832		1994	2155
	inch	58.3		64.2	64.2	64.7	64.6		65.7			72.1		78.5	84.8
Width	mm	1000		982	982	992	992		1000			1000		1000	1000
	inch	39.4		38.7	38.7	39.1	39.1		39.4			39.4		39.4	39.4
Height	mm	35	40	35	40	40	35	40	35	40		35	40	40	40
	inch	1.4	1.6	1.4	1.6	1.6	1.4	1.6	1.4	1.6		1.4	1.6	1.6	1.6
Weight	Kg	16.8	18	17.7	18	19.5	18.5	19	18.9	20		20.2	21	22.5	23.8
	pound	37.0	39.7	39.0	39.7	43.0	40.8	41.9	41.7	44.1		44.5	46.3	49.6	52.5

System Integration Parameters	
Maximum system voltage	**1,500VDC**
Maximum series fuse rating	**20A**
Maximum reverse current	**20A**
Minimum Blocking Diode	**20A**
Module Fire Performance	**Class C**

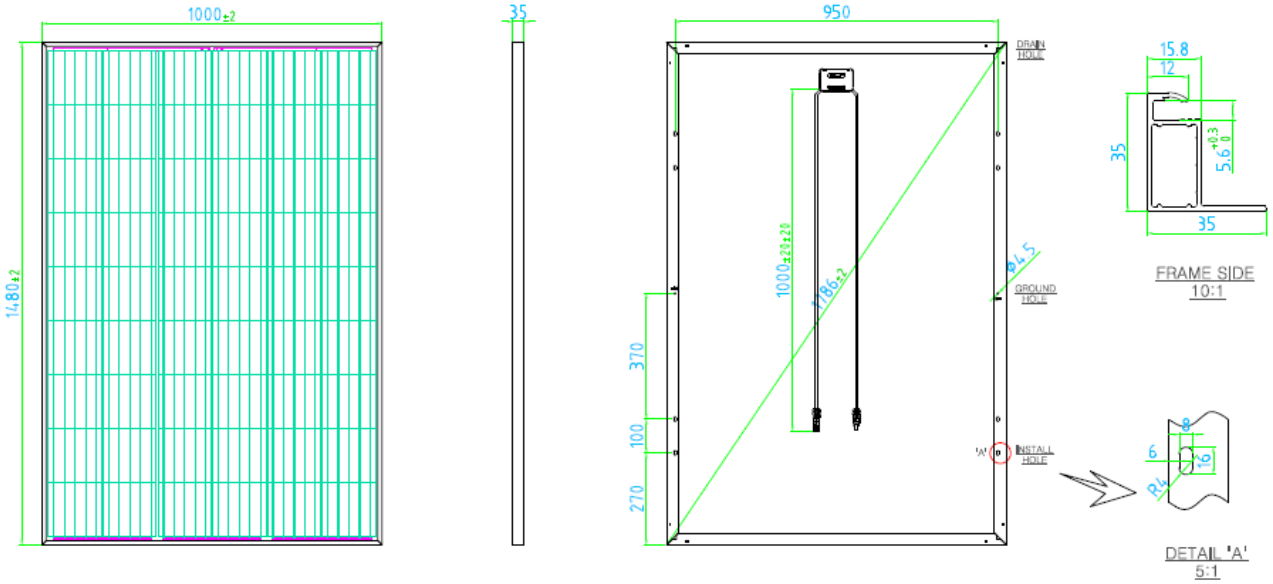


Figure 1.1 – Drawing

HSxxxPA-AN1 (1480 X 1000 X 35)

(6*9, 54cell module)

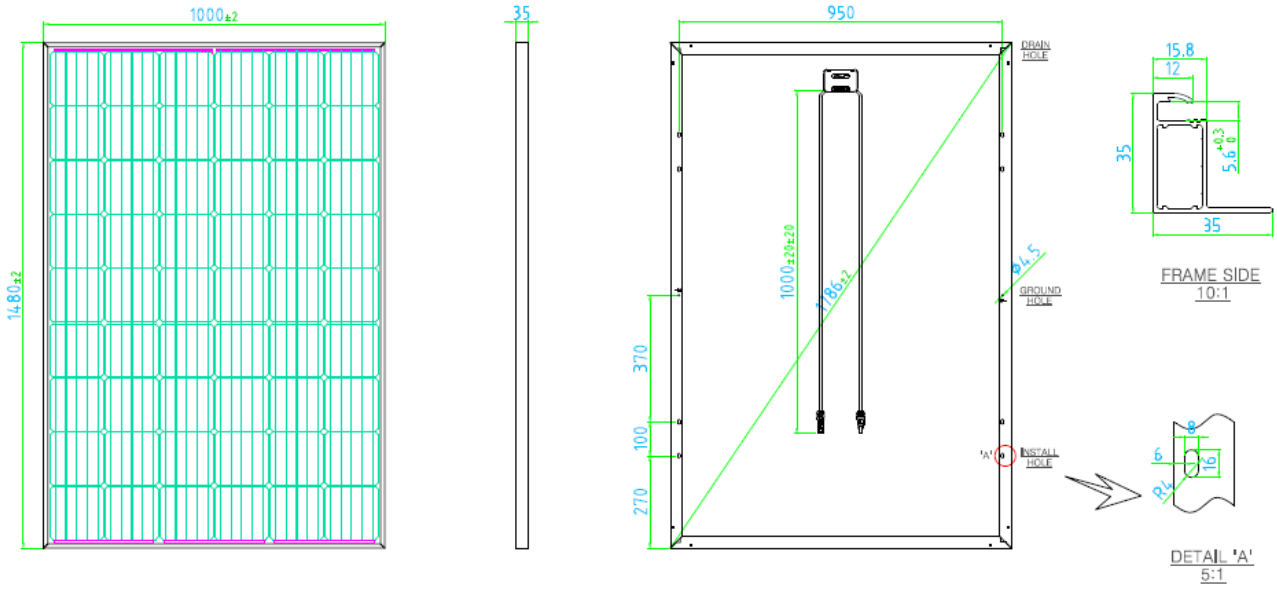


Figure 1.2 – Drawing

HSxxxUA-AN1 (1480 X 1000 X 35)

(6*9, 54cell module)

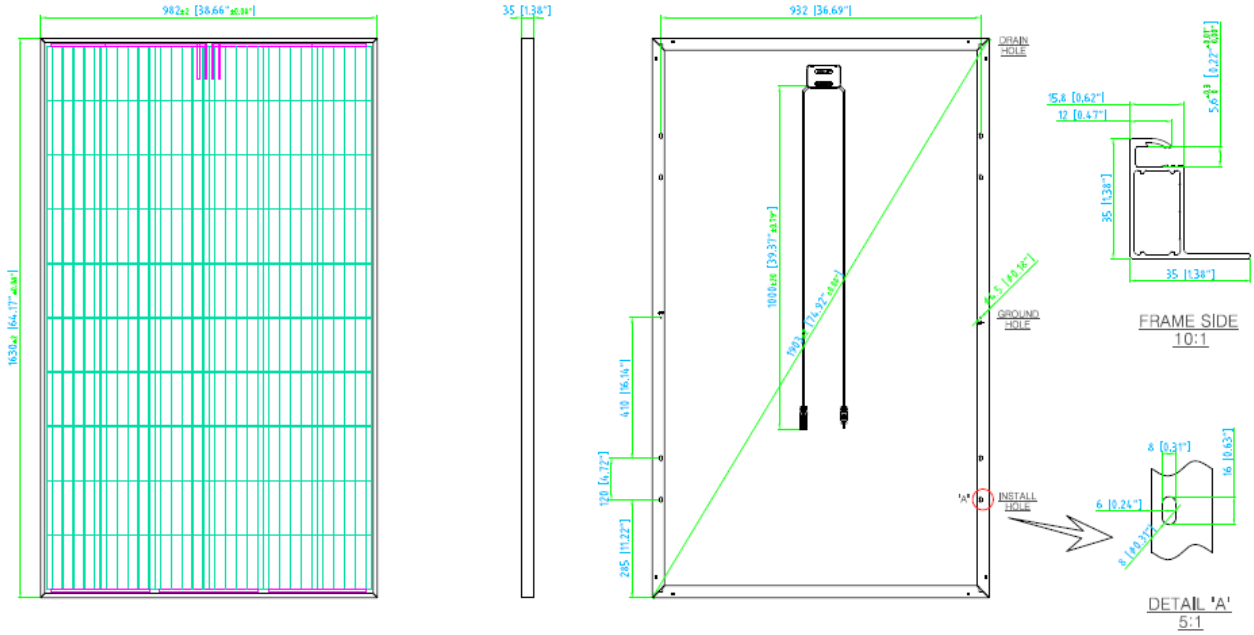


Figure 1.3 – Drawing

HSxxxPB-AN1 (1630 X 982 X 35)

(6*10, 60cell module)

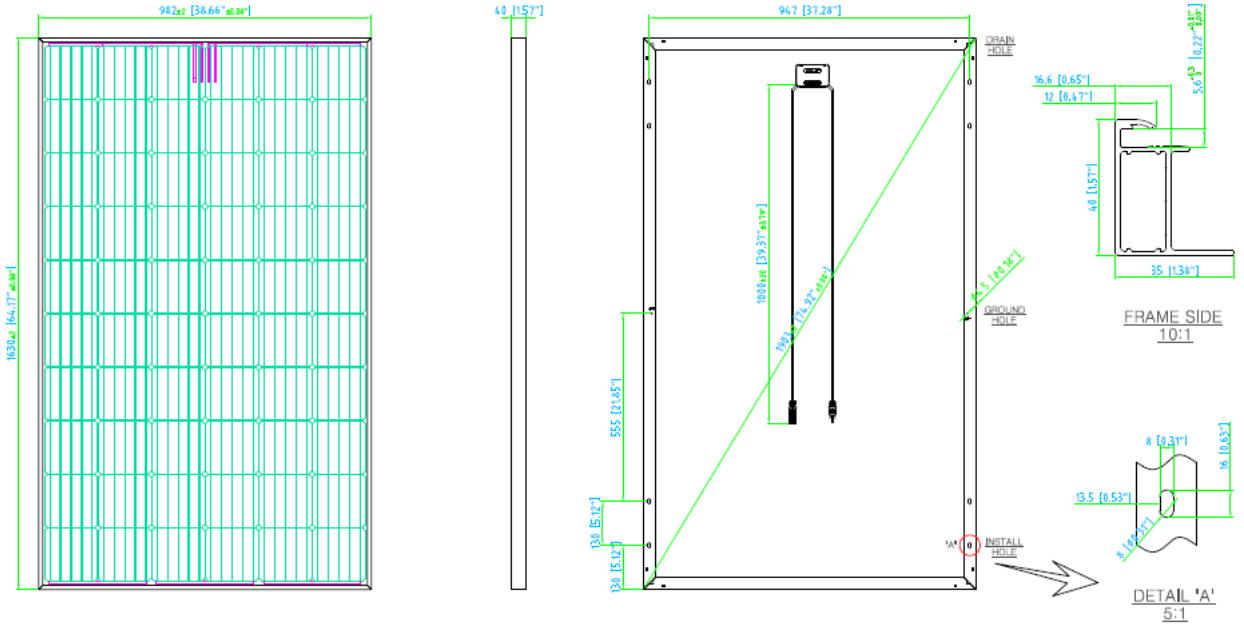


Figure 1.3 – Drawing

HSxxxUB-AN1 (1630 X 982 X 40)

(6*10, 60cell module)

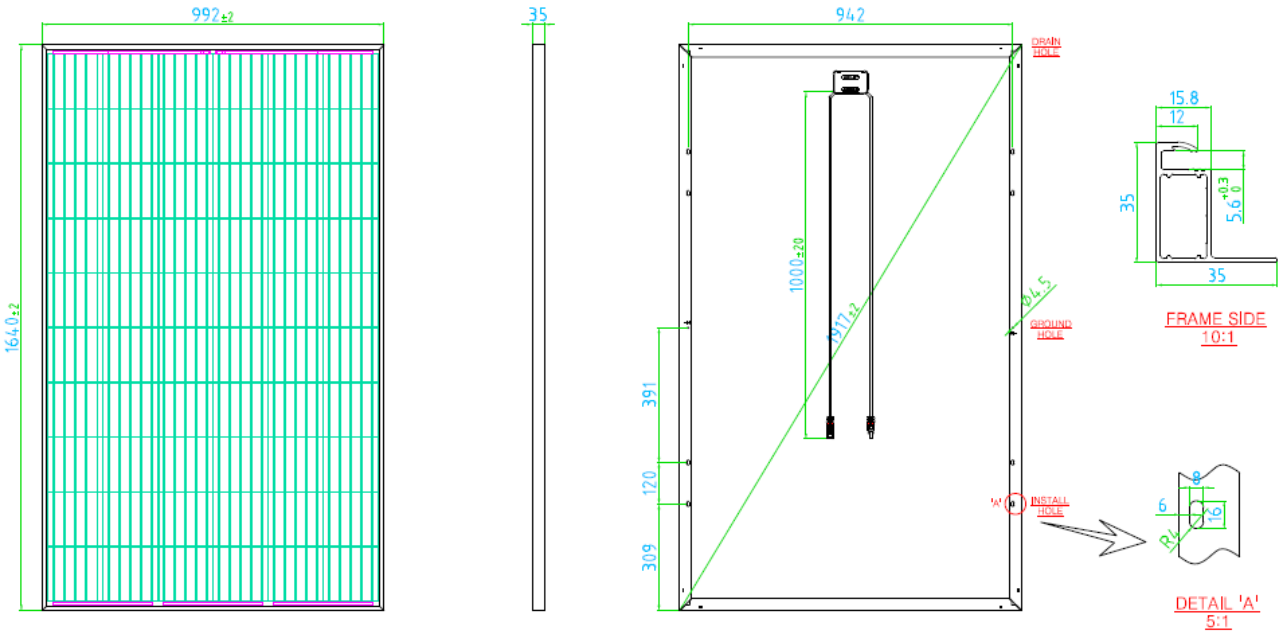


Figure 1.3 – Drawing

HSxxxPB-AN1 (1640 X 992 X 35)

(6*10, 60cell module)

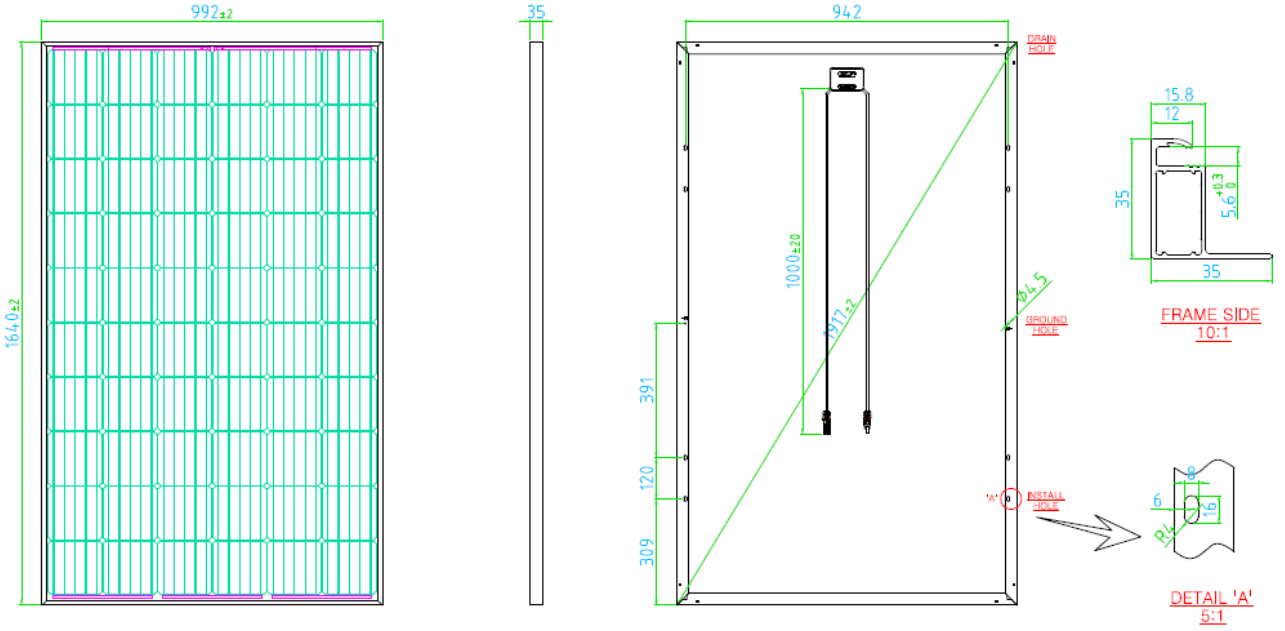


Figure 1.4 – Drawing

HSxxxUB-AN1 (1640 X 992 X 35)

(6*10, 60cell module)

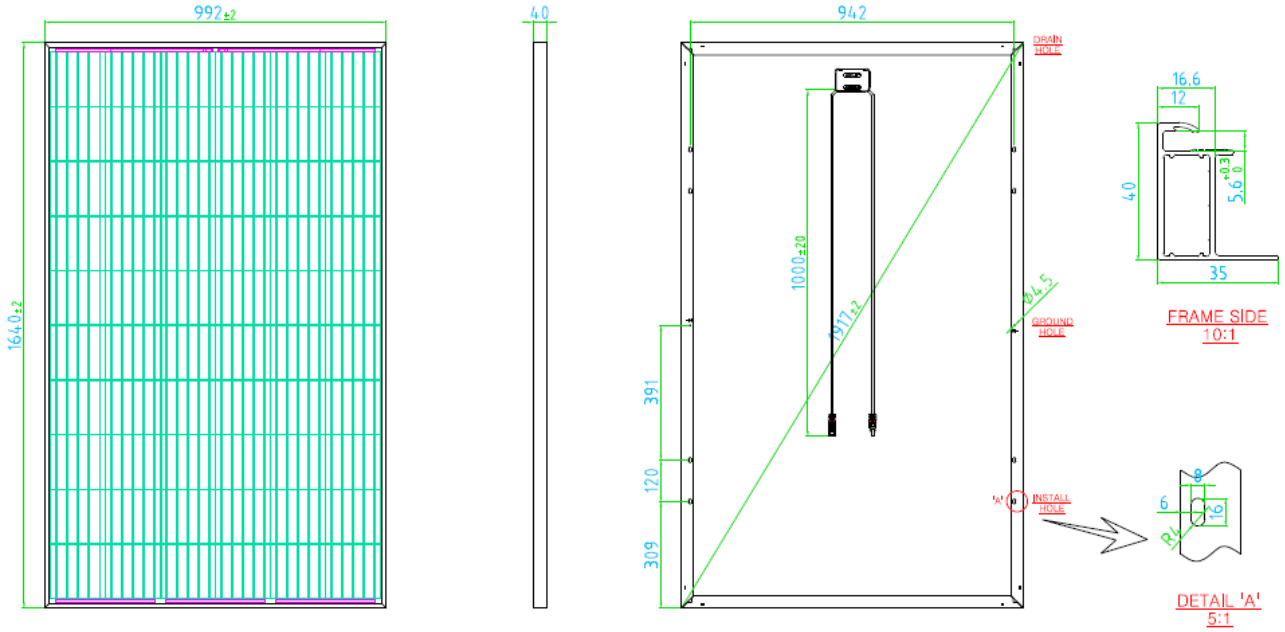


Figure 1.5 – Drawing

HSxxxPB-AN1 (1640 X 992 X 40)

(6*10, 60cell module)

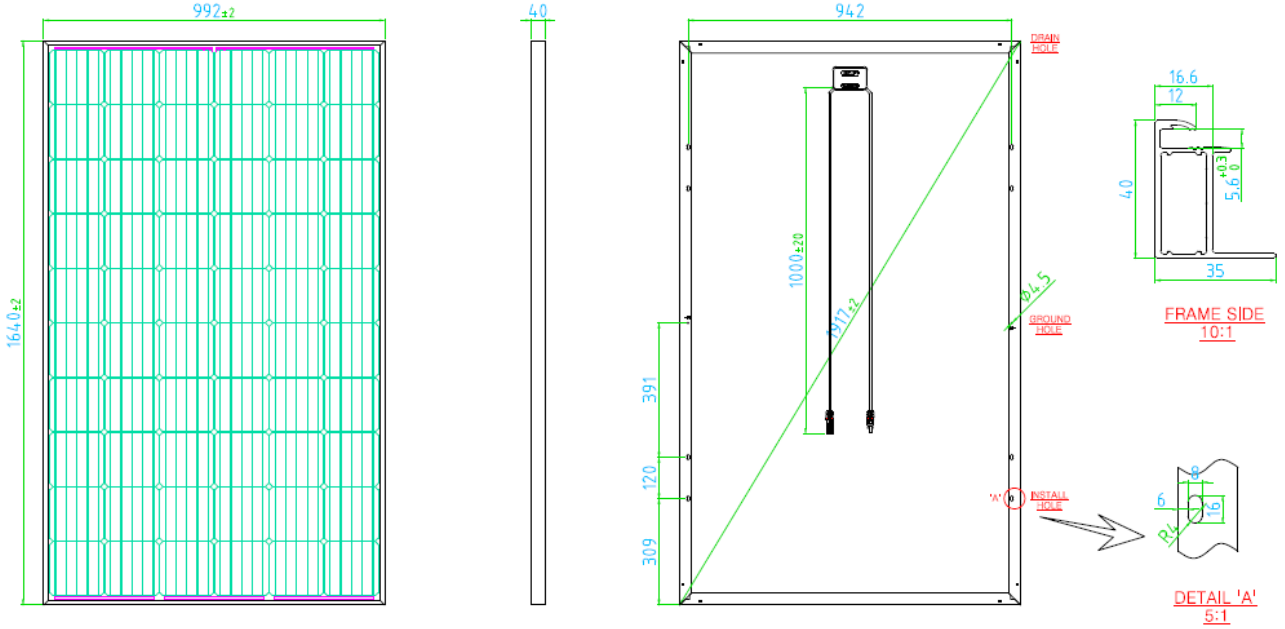


Figure 1.6 – Drawing

HSxxxUB-AN1 (1640 X 992 X 40)

(6*10, 60cell module)

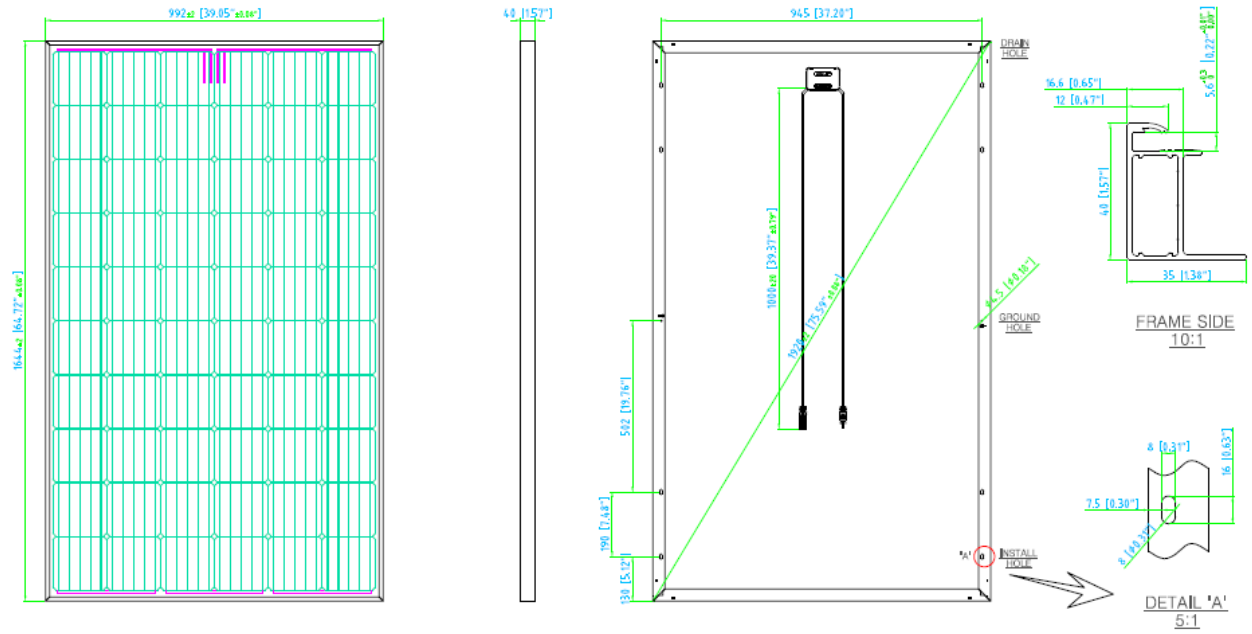


Figure 1.6 – Drawing

HSxxxUB-AN1 (1640 X 992 X 40)

(6*10, 60cell module)

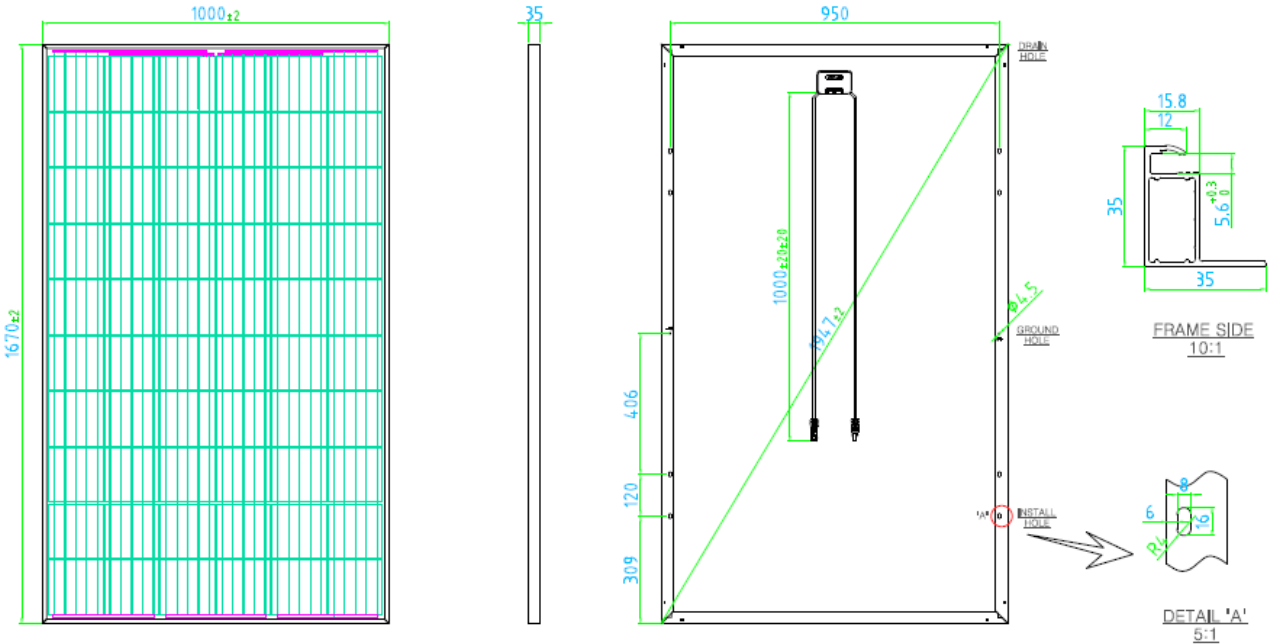


Figure 1.7 – Drawing

HSxxxPB-AN1 (1670 X 1000 X 35)

(6*10, 60cell module)

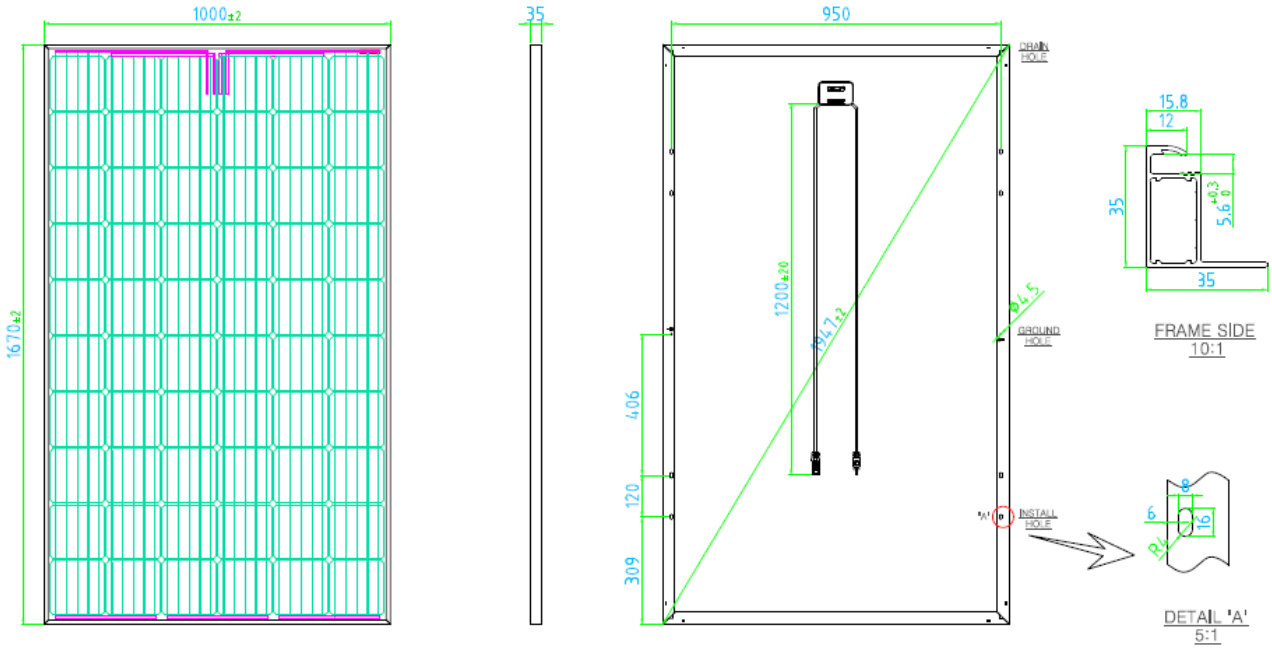


Figure 1.8 – Drawing

HSxxxUB-AN1 (1670 X 1000 X 35)

(6*10, 60cell module)

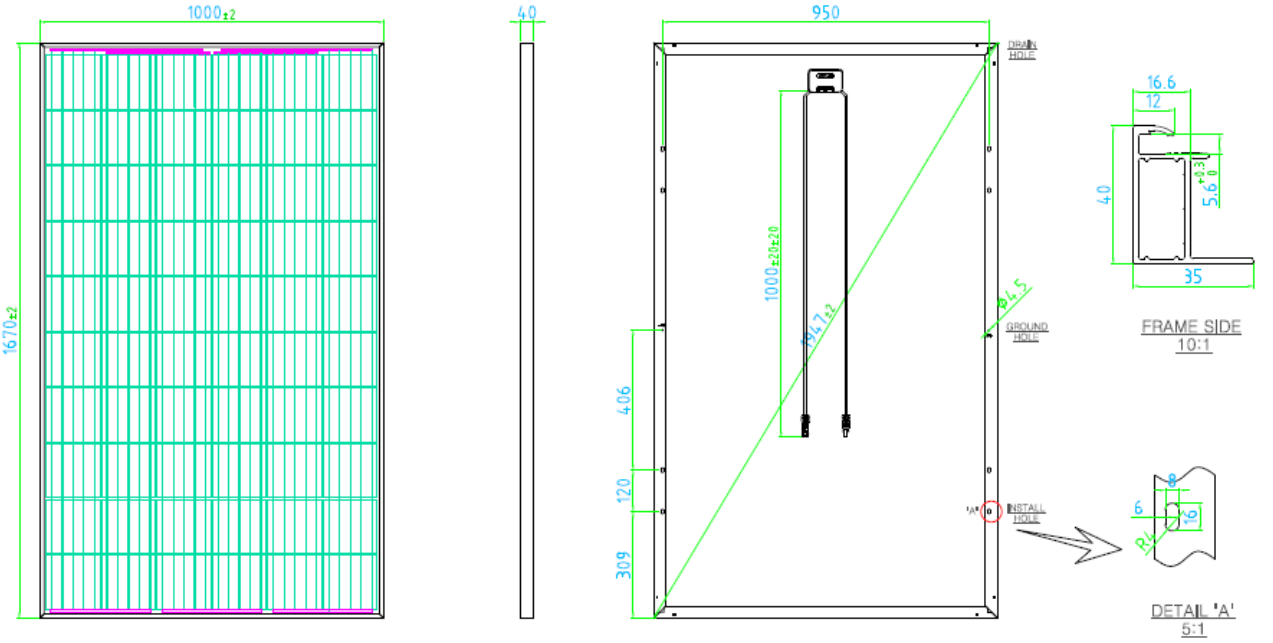


Figure 1.9 – Drawing

HSxxxPB-AN1 (1670 X 1000 X 40)

(6*10, 60cell module)

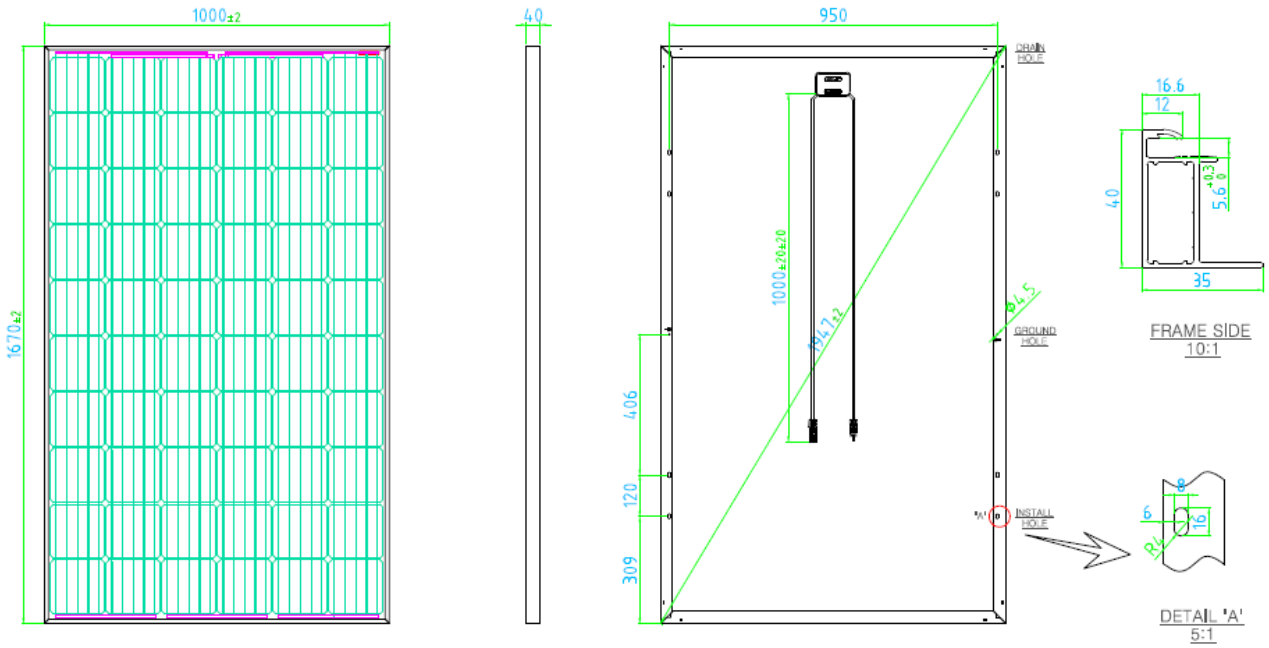


Figure 1.10 – Drawing

HSxxxUB-AN1 (1670 X 1000 X 40)

(6*10, 60cell module)

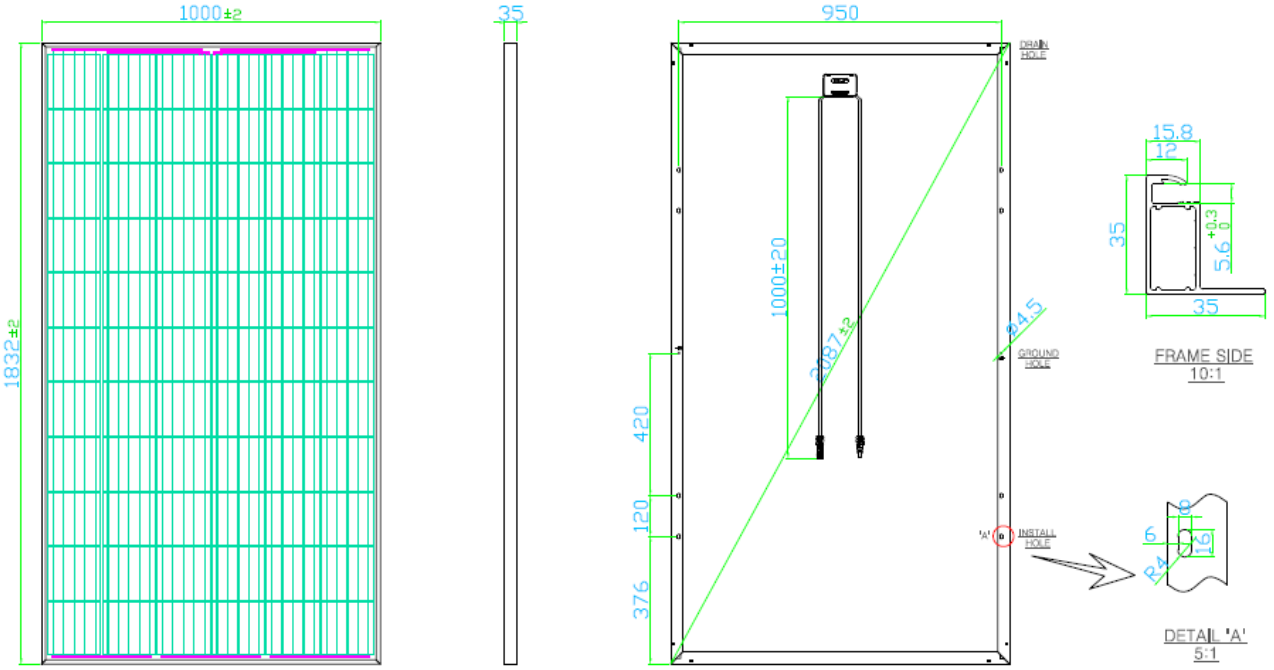


Figure 1.11 – Drawing

HSxxxPC-AN1 (1832 X 1000 X 35)

(6*11, 66cell module)

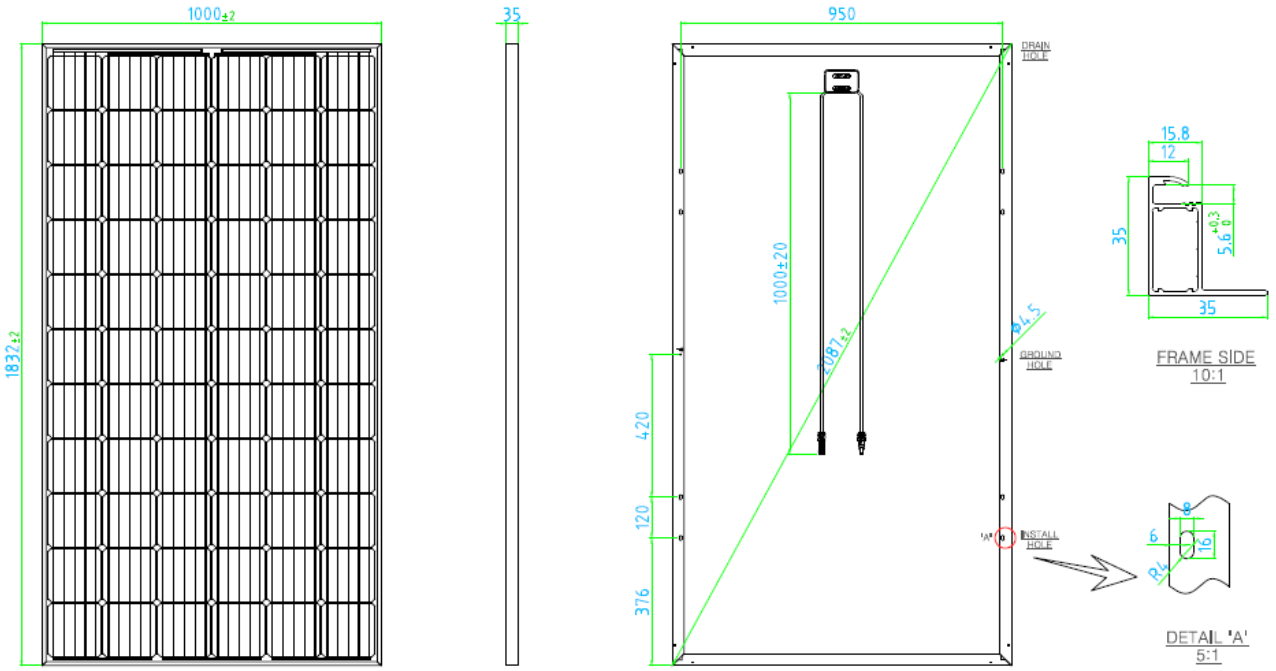


Figure 1.12 – Drawing

HSxxxUC-AN1 (1832 X 1000 X 35)

(6*11, 66cell module)

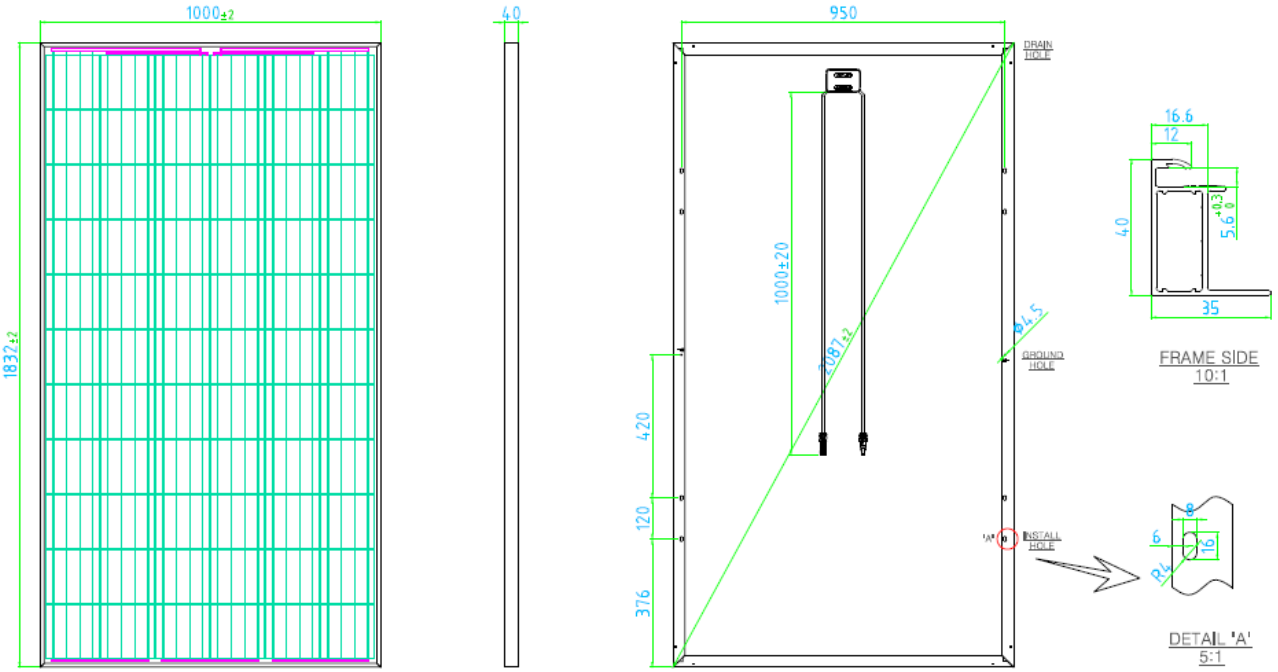


Figure 1.13 – Drawing

HSxxxPC-AN1 (1832 X 1000 X 40)

(6*11, 66cell module)

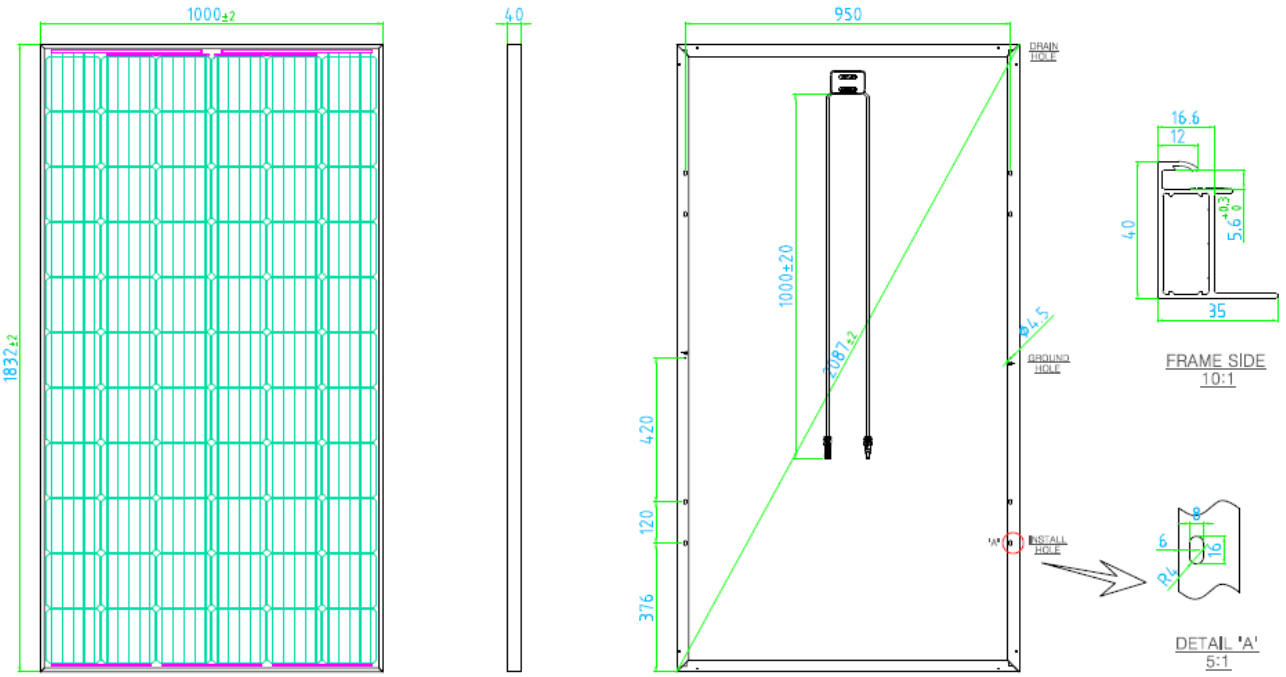


Figure 1.14 – Drawing

HSxxxUC-AN1 (1832 X 1000 X 40)

(6*11, 66cell module)

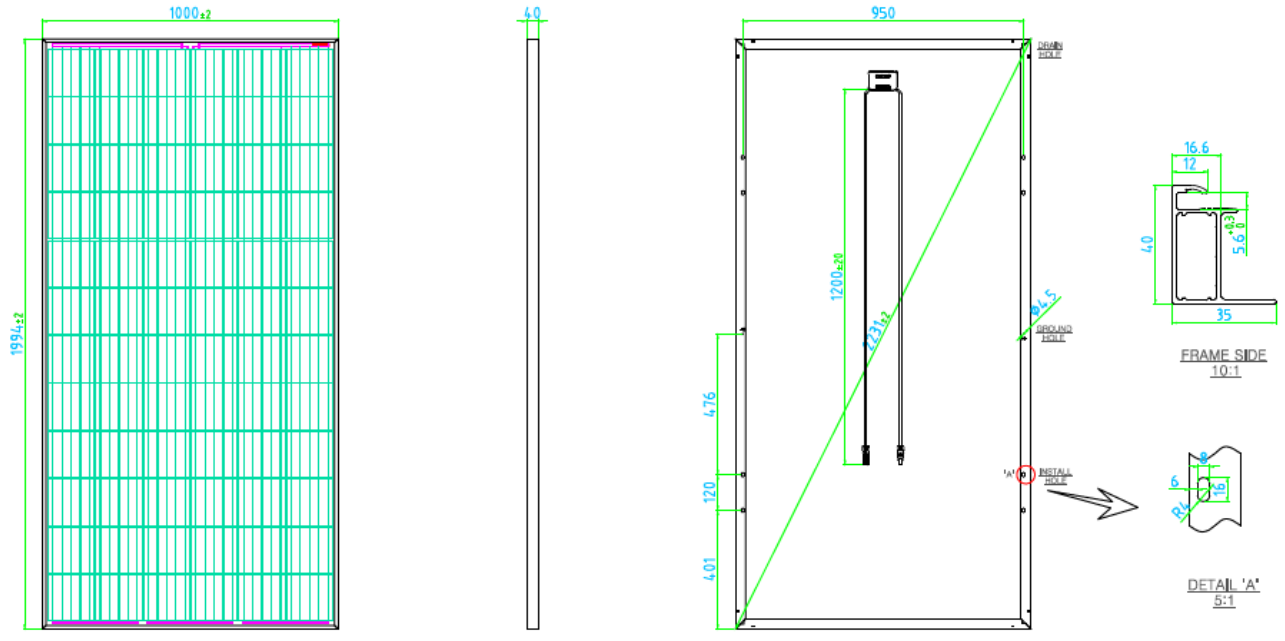


Figure 1.15 – Drawing

HSxxxPD-AN1 (1994 X 1000 X 40)

(6*12, 72cell module)

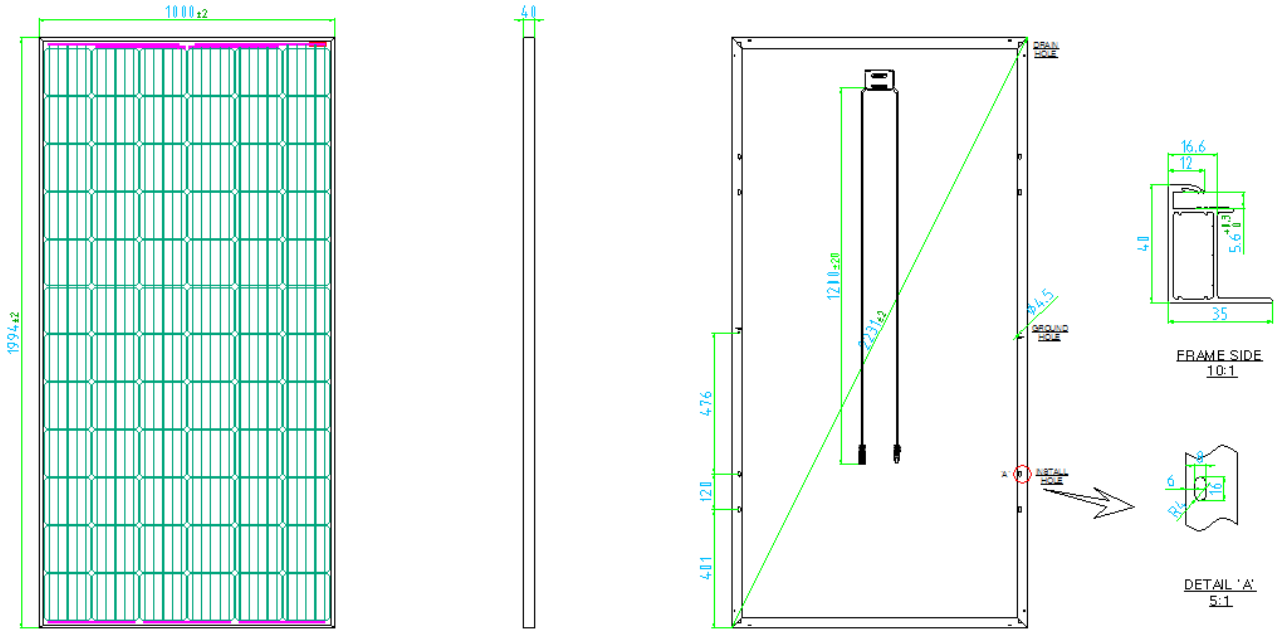


Figure 1.16 – Drawing

HSxxxUD-AN1 (1994 X 1000 X 40)

(6*12, 72cell module)

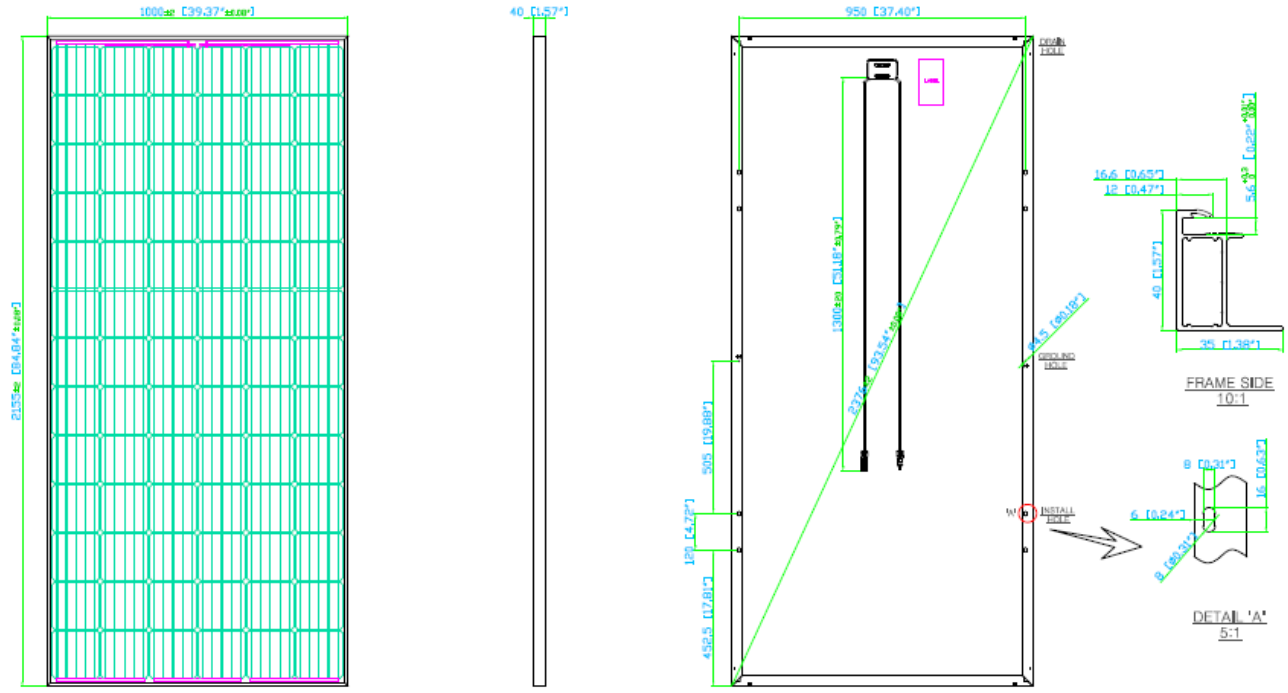


Figure 1.20 – Drawing

HSxxxUE-AN1 (2155 X 1000 X 40)

(6*13, 78cell module)

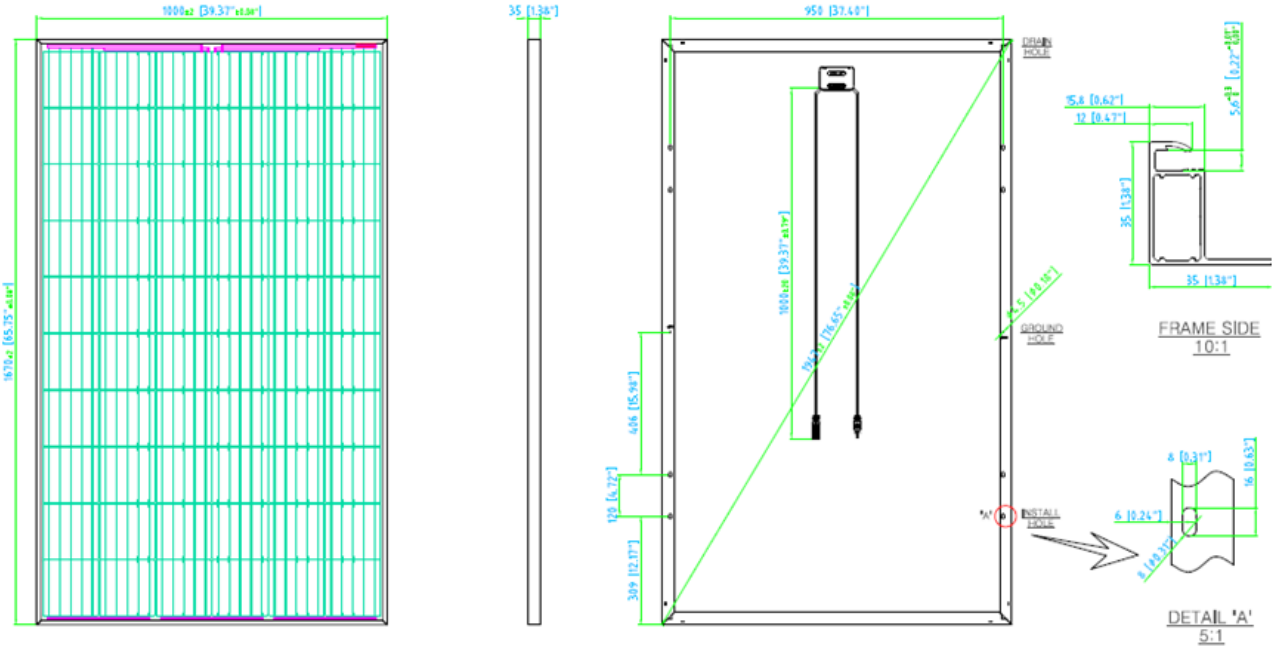


Figure 1.21 – Drawing

HSxxxUB-AH2 (1670 X 1000 X 35)

(6*10, 60cell module)

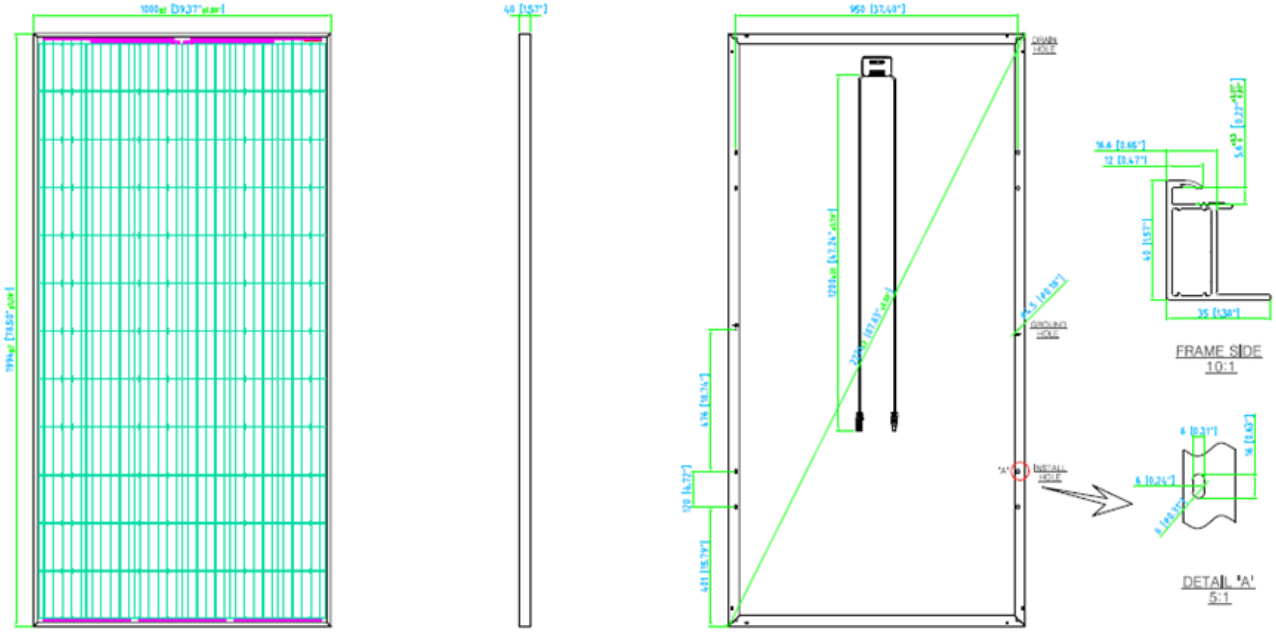


Figure 1.22 – Drawing

HSxxxUD-AH2 (1994 X 1000 X 40)

(6*12, 72cell module)

General safety information

All safety instructions in this document should be read and understood before installing this device.

Before installing modules, contact the appropriate authorities to determine permissions, installation and inspection requirements, which should be followed. Refer to applicable regional and local codes.

◈ WARNING ◈

Module interconnection cables pass direct current (DC) and are sources of voltage when the module is under load and when it is exposed to light.
Direct current can arc across gaps and may cause injury or death if improper connection or disconnection is made, or if contact is made with modules that are frayed or torn.
Do not connect or disconnect modules when current from the modules or an external source is present.
Installation should be performed only by authorized personnel.

Installing a PV system requires specialized knowledge, especially the installation and wiring of the PV modules. This work should only be carried out by suitably qualified and authorized persons.

TO AVOID THE HAZARD OF ELECTRIC SPARKS, SHOCK, FIRE, BURNS, DAMAGE AND INJURY;

Children and animals should not be allowed near the installation while work is being carried out.

Avoid electrical discharges when installing, cabling, starting-up, or performing maintenance on the module.

A module generates electricity when it is exposed to sunlight or to other sources of light. Completely cover surface of the module with an opaque material before making or breaking electrical connections.

Do not install or handle the modules or tools when they are wet or during periods of high wind.

Do not install the module where there are gases or flammable vapors, as they can create sparks.

Remove all metallic jewelry prior to installing this product to reduce the chance of accidental exposure to live circuits.

Wear suitable clothing, guards, and gloves to prevent you from direct contact with 30 VDC or greater.

Use insulated tools to reduce your risk of electric shock.

There are no user serviceable parts within the module.

Do not attempt to repair any part of the module.

Do not stand on, drop, scratch, or allow object to fall on modules.

If the front glass is broken, or the back sheet is torn, contact with any module surface or module frame can cause electric shock. Do not puncture, cut, scratch or damage the glass or back sheet of a module. Back sheet damage will void a module’s Limited Warranty and may cause fire. Never use modules with a damaged back sheet.

Broken junction-boxes and/or broken connectors are electrical hazards as well as laceration hazards. The dealer or installers should remove the module from the array and contact the supplier for disposal instructions.

Never rest or leave a module unsupported or unsecured.

Artificially concentrated sunlight shall not be directed on the module or panel.

Do not expose backside of the module to sunlight

Do not touch the junction box terminals.

Do not change the wiring of bypass diodes.

If batteries are used with the module, follow all recommendations indicated by the battery manufacturer for safety.

Completely ground all modules.

When installing on a roof, ensure that the module is attached with a mechanical fastening. The roof should have an adequate level of fire-resistance for the application. (Fire Class rating “Type 1 or Type 2”)

The fire rating of this module is valid only when mounted in the manner specified in the mechanical mounting instructions.

Contact your module supplier if maintenance is necessary.

◈ CAUTIONS ◈

Use a module for its intended purpose only. Do not treat the back sheet, frame, or front surface with paint or adhesives, to avoid reducing its functionality, damage and causing inoperable conditions, and other unknown troubles.

Unpacking and storing modules

GENERAL

Warnings and instructions on the packaging should be observed. A record of the module serial numbers should be made before installation and this should be included in the system documentation. Hansol modules are sent in boxes that are specially designed to provide the proper protection during shipping. It is advised to not remove the modules from the boxes until installation. If it is necessary to put the modules into temporary storage, they should be kept in dry and properly ventilated room. The solar modules must be installed and operated according to the latest available procedures.

Modules should be handled with care

The following points need to be observed when the modules are being unpacked, transported or stored:

Ware non-slip gloves and carry a module by its frame with two or more people.

Modules should be carried using both hands; the junction box should NOT be used as a grip.

Modules should not be allowed to sag or bow under their own weight when being carried.

Modules should not be subjected to loads/stresses and should not be stepped on or dropped.

All electrical contacts should be kept clean and dry.

Installation

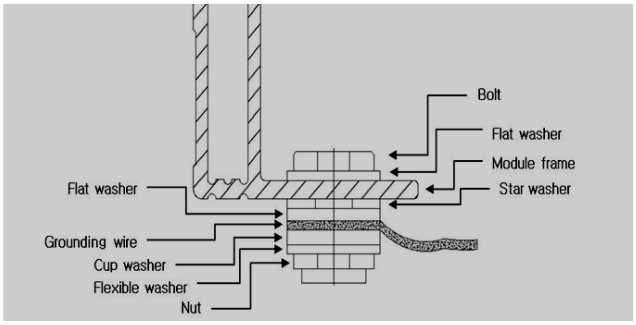


Figure 2 – Grounding method

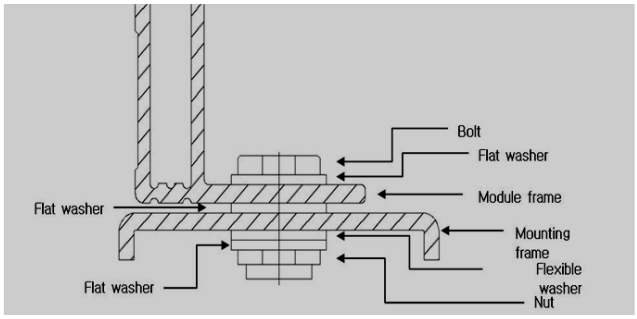
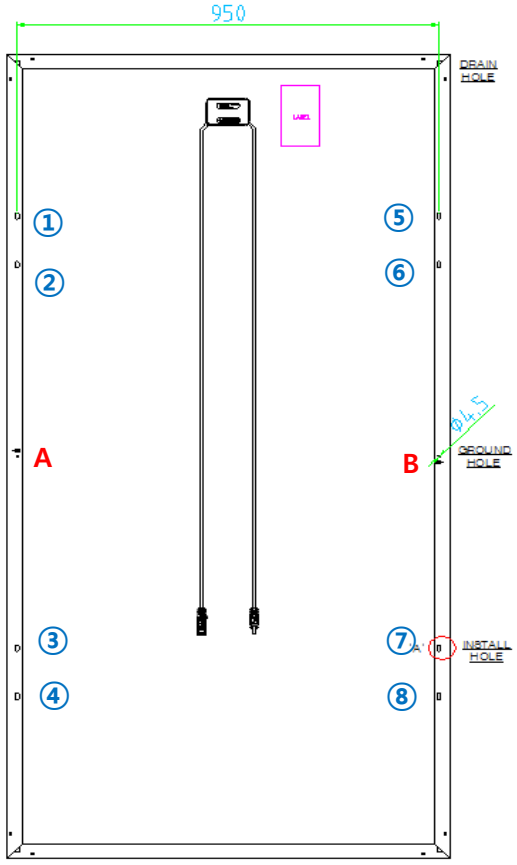


Figure 3 – Module mounting method



Hole	Point
Mounting Hole	① ~ ⑧
Grounding Hole	A, B

Grounding hardware	Dimension & material	Remarks
Hexagon bolt & nut	M4 stainless	Length of bolt: 20 mm
Flat washer	M4 stainless	-
Flexible washer	M4 stainless	-
Star washer	M4 stainless	-
Cup washer	M4 stainless	-
Grounding wire	12AWG Copper	-

Mounting hardware	Dimension & material	Remarks
Hexagon bolt & nut	M6 stainless	Length of bolt: 20 mm
Flat washer	M6 stainless	-
Flexible washer	M6 stainless	-

MECHANICAL INSTALLATION

Any module without a frame (laminate) shall not be considered to comply with the requirements of UL 1703 unless the module is mounted with hardware that has been tested and evaluated with the module under this standard or by a field Inspection certifying that the installed module complies with the requirements of UL 1703.

Modules must be securely fastened using support frames or mounting kit specialized for PV applications.

Modules should be firmly fixed in place in a manner suitable to withstand all expected loads, including wind and snow loads.

Install modules where they are not shaded by obstacles like buildings and trees. Especially pay attention to avoid partially shading the modules by objects during the daytime.

Care must be taken to avoid low tilt angles which may cause dirt to build-up on the glass against the frame edge.

Clearance between the roof surface and module frame is required to allow cooling air to circulate
around the back of the module. This also allows any condensation or moisture to dissipate. Install modules so that air can circulate between the roof and the module. (100 mm: 4 inch gap minimum)

In order to prevent water from entering the junction box, which could present a safety hazard, modules should not be mounted such that the front glass faces downward (e.g. on a tracking structure that positions the modules with the junction box facing skyward during sleep mode).

Great care should be exercised to ensure that corrosion caused by the grounding means be avoided.

Metals used in locations that are exposed to moisture shall not be employed alone or in combinations that could result in deterioration or corrosion. Thus, all fasteners (nuts, bolts, washers, screws, etc.) must be stainless steel unless otherwise specified.

Refer to the applicable regional and local codes on grounding PV arrays and mounting frames for specific requirements. (E.g. lightning protection). In the US the array frame shall be grounded in accordance with NEC Article 250.

Recommendation of the gap between modules is 10mm or more

Length of self-tapping screw or bolt should not be more than 0.78'' (20 mm) in order to avoid contacting the back-sheet of the module.

Recommendation of bolt torque value :
>. Grounding : 5 Nm
>. Mounting : 10 Nm

Contact an Authorized Representative with questions regarding mounting profiles for modules if needed.

※References to NEC and UL/CSA are for USA/Canada installations only'

GROUNDING

Where common grounding hardware (nuts, bolts, star washers, spilt-ring lockwashers, flat washers and the lik e) is used to attach a listed grounding/bonding device, the attachment must be made in conformance with the

grounding device manufacturer's instructions.
Common hardware items such as nuts, bolts, star, washers, lock washers and the like have not been evaluated for electrical conductivity or for use as grounding devices and should be used only for maintaining mechanical connections and holding electrical grounding devices in the proper position for electrical conductivity. Such devices, where supplied with the module and evaluated through the requirements in UL 1703, may be used for grounding connections in accordance with the instructions provided with the module.

Attach an equipment ground conductor with stainless steel hardware at one of the two designated Ø4 groundings holes on the module frame. Please refer to NEC Article 690 on grounding PV arrays for special requirements.

Modules can be grounded using third-party grounding washer provided they have been tested and certified to local regulation on anodized aluminum frame and are installed according to the manufacture's specified instructions.

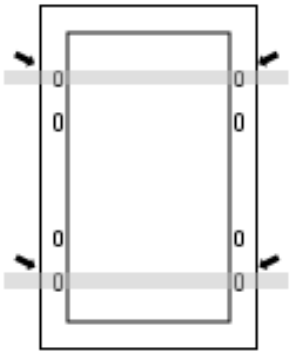
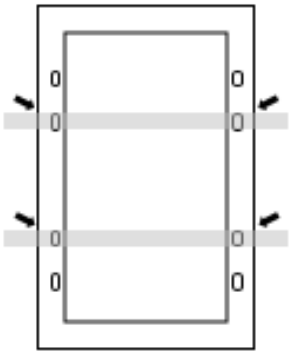
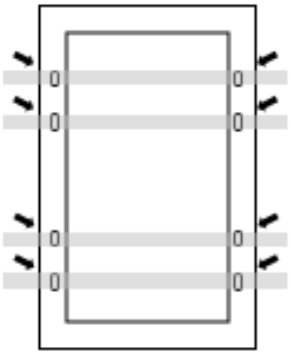
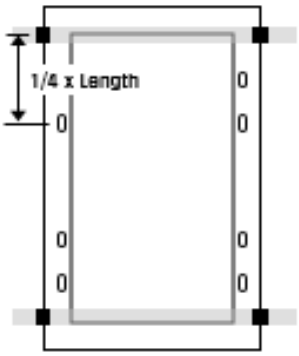
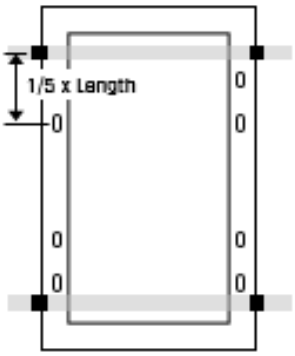
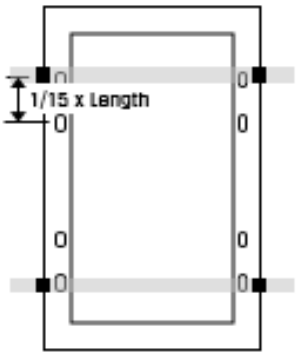
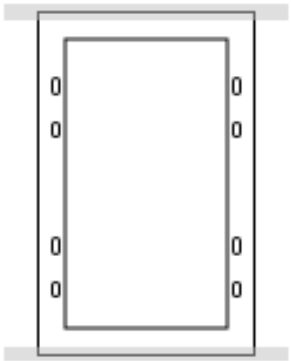
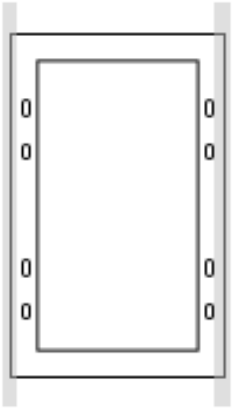
If the grounding method above is adopted, please choose one of the two grounding holes (Figure 2) and use the grounding hardware with appropriate tools such as a wrench to ground the wires in accordance with the requirements imposed by the above hardware.

CNL model installation shall be in accordance with CSA C22.1, Safety Standard for Electrical Installations, Canadian Electrical Code, Part 1.

A module with exposed conductive parts is considered to be in compliance with UL 1703 only when it is electrically grounded in accordance with the instructions presented below and the requirements of the National Electrical Code.

MOUNTING

Always follow the mounting equipment vendors' installation instructions in addition to these instructions. In cases where the vendors' instructions are more stringent than those of Hansol, the vendors' instruction shall apply.
Currently we have no internal specification for using 3rd party clamping, thus we can not guarantee with our standard warranty.
Please note that the point mounting system is a recommendation.

TYPE OF INSTALLATION	FRONT ALLOWED STATIC ROAD		
POINT MOUNTIONG SYSTEM (BOLT & NUT)			
	5,400 Pa		
POINT MOUNTING SYSTEM (CLAMPS)			
	2,400 Pa	3,600 Pa	5,400 Pa
LINEAR MOUNTING SYSTEM (Rail/Slide)			
	2,400 Pa	5,400 Pa	

Frame Holes:

Secure the module to the structure using the factory mounting holes (Figure 3). Four 1/4” stainless steel bolts, with nuts washers and lock washers are recommended per module.

ELECTRICAL INSTALLATION

Under normal conditions, a photovoltaic module is likely to experience conditions that produce more current and/or voltage than reported at standard test conditions. The requirements of the National Electrical Code (NEC) in Article 690 shall be followed to address these increased outputs. In installations not under the requirements of the NEC, the values of ISC and VOC marked on this module should be multiplied by a factor of 1.25 when determining component voltage ratings, conductor ampacities, overcurrent device ratings, and size of controls connected to the PV output.

The modules should not be configured in such way that they create a voltage higher than the permitted system voltage.

National electrical codes and regulations should be strictly followed.

PV Modules may be connected in series or parallel to achieve the desired electrical output as long as certain conditions are met. Use only the same type of modules in a combined source circuit.

If the modules are to be connected together in series they should have the same amperage.

If they are to be connected in parallel they should have the same voltage. String configuration should be planned and carried out in accordance with inverter manufacturer's instructions.

The number of modules connected to an inverter should be within the inverter voltage limits/operating range and the design of the string configuration(s) should comply with the inverter's manufacturer's guidelines.

.

Blocking diodes prevent current flowing from the battery to the module when no electricity is being generated. It is recommended to use blocking diodes when a charging regulator is not used.

When installing the modules, keep attention that the voltage of parallel connection should not exceed maximum system voltage.

OPERATING CONDITIONS

All Hansol modules require that modules be operated within the following Operating Conditions:

1. Terrestrial applications only – no outer space or Special Conditions (see below)

2. The ambient temperature must be within -40°C(-40°F) to +90°C(194°F).

3. The wind pressure load of the installation site should be less than 50lb/ft² (2400 Pa).

4. Some environmental conditions could apply. Please refer to Hansol's warranty exclusions.

5. The modules have been evaluated by UL for a maximum positive and negative design loading of 50 lb/ft²

Wiring

GENERAL

All wiring should be done in accordance with applicable electrical codes.

A qualified, licensed professional should do all wiring.

Wiring should be protected to help ensure personal safety and to prevent its damage.

All modules connected in series should be of the same model number and/or type.

MODULE WIRING

Check local temperature conditions and follow the National Electric Code (eg. NEC 690.7 for USA, DIN VDE 0100 Teil 712 for Germany) to ensure compliance with maximum voltage limitations.

Modules are not designed for “off-grid” or battery charging systems, because of their operating voltage. Therefore, it is not recommended to use them to charge batteries.

These modules contain factory installed bypass diodes. If these modules are incorrectly connected to each other, the bypass diodes, cable, or junction box may be damaged.

The minimum cable diameter for wiring: H1Z2Z2-K, 1X4.0mm2
>. Wire management: QC Solar(Suzhou) Corporation

ARRAY WIRING

The term “array” is used to describe the assembly of several modules on a support structure with associated wiring.

Hansol recommends that all wiring be double insulated with a minimum rating of 90°C(194°F).
All wiring should use flexible copper (Cu) conductors. The minimum size should be determined by the applicable codes.

PV Modules may be wired in series to produce the desired voltage output. Do not exceed the maximum system voltage.

PV Modules may be wired in parallel to produce the desired current output. Refer to the applicable regional and local codes for additional fusing requirements and limitations on the maximum number of PV Modules in parallel.

MODULE TERMINATIONS

A junction box as a terminal enclosure is equipped for electrical connections.

JUNCTION BOX AND TERMINALS

The junction boxes of the modules are in the back of the modules.

Each module is equipped with one junction box containing terminals for both positive and negative polarity, and bypass diodes.

The polarity should be respected in the connections to ensure the correct operation of the modules with the polarity symbols engraved onto the body of the junction box.

The model & type of Connector :
>. Supplier : QC Solar(Suzhou) Corporation
>. Type: QC4.10-35 (1500V)

Fuses

Fuses may be required in many places in a photovoltaic power system, both on the ac side and the dc side, depending on its complexity and size. This section will deal with the need for overcurrent devices in the photovoltaic array portion of the system only - that is between the modules and the array dc junction box.

The values of all over current devices in the system are the responsibility of the system installer. The installer must install the module protective fuses described below and any other overcurrent devices required by the NEC.

In order to protect the internal current paths of the module, an external module protective fuse must be installed in series with each module or string of series connected modules. The series fuse may have a maximum value up to *, as marked on the back of the module. If multiple modules are connected in series only one fuse is required for each string of series connected modules. When the fuses are located in the multiple string/module junction box where the separate modules or strings of modules are connected in parallel, then these fuses may also be used to provide the over current protection for the module interconnections cables required by the NEC.

The NEC requires that every ungrounded conductor be protected by an overcurrent device (fuse or circuit breaker). In a photovoltaic system with multiple sources of power (modules, batteries, battery chargers, generators, power conditioning systems, inverters, etc.) the overcurrent devices must protect the conductor from overcurrent from any source connected to that conductor. Blocking diodes, charge controllers, and inverters are NOT considered overcurrent devices and must be considered as zero-resistance wires.

If the photovoltaic system is directly connected to the load without battery storage or other source of power, then no overcurrent protection is required if the conductors are sized at 156% of the short-circuit current.

In all other cases, over-current devices (fuses or circuit breakers) are required.
The main purpose for using over-current devices in an array field is to protect the wires interconnecting the modules, and the dc bus wires connecting groups of modules or sub-arrays, from seeing currents that exceed their ratings and pose a fire hazard.

As the conductor size, used in the array wiring, increases to accommodate higher shortcircuit currents of paralleled modules or groups of source circuits, each new conductor size must be protected by an appropriately sized overcurrent device.

DIODES

The shading of a cell can cause it to have reserve voltage. This cell will therefore consume the power generated by the others cells in the series, producing an undesired heating of the shaded cell.

A hot spot effect is existent when a solar cell within a module generates less current than the string current of the module or of the PV generator. This occurs when the cell is totally or partially shaded, damaged, or when cells are electrically mismatched. The shaded cell becomes reverse biased and dissipates power in the form of heat.
The use of protection, or bypass, diodes reduces the risk of heating of the shaded cells, limiting the current that can circulate through them and thereby avoiding breaks.

All modules are equipped with factory installed bypass diodes. These diodes provide proper circuit protection for the systems within the specified system voltage, so that you do not need any other additional bypass diodes. Contact your Hansol Authorized Representative for proper diode type, if it is necessary to add or change diodes due to system specifications.

The type & ratings of bypass diode
>. Supplier : QC Solar(Suzhou) Corporation
>. Type : SB3050DY
>. Ratings : IEC 1500V / UL 1500V

Maintenance

If you need electrical or mechanical inspection or maintenance, it is recommended to have a licensed authorized professional carry out the inspection or maintenance to avoid the hazards of electric shock or injury.

MAINTENANCE COVERS THE FOLLOWING PROCESSES:

Periodic cleaning of the module

Visual inspection of possible internal deterioration of the water-tightness of the module

Control of the state of the electrical connections and wiring

Eventually, control of the electrical characteristics of the module

PERIODIC CLEANING OF THE MODULE

Dirt on the module surfaces causes cell shading and can lead to reduced power output.

It is recommended to clean the surface of the module with water and a soft cloth or sponge, twice or more per year.

Under no circumstances should dirt be scraped or rubbed off the modules when dry, as this can cause micro-scratches on the surface of the modules and reduce the transparency of the module glass. Instead, a mild non-abrasive detergent may be applied for persistent dirt.

VISUAL INSPECTION OF THE MODULE

Possible breaks in the glass

All fasteners are secure, tight and free of corrosion.

All electrical connections are secure, tight, clean, and free of corrosion.

The mechanical integrity of the cables is intact.

All bonding points to Earth Ground are tight, secure, and free of corrosion to ensure continuity between the modules and ground.

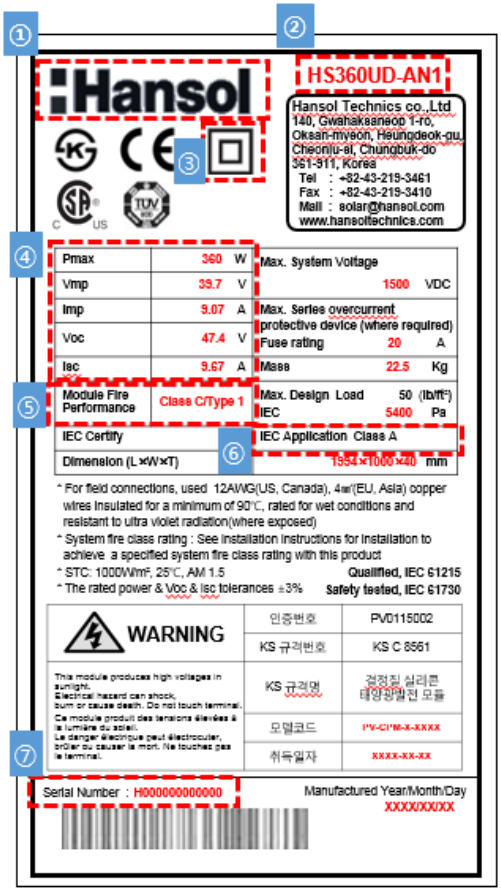
CONNECTION AND WIRING CONTROL

Electrical and mechanical connections should be preventively inspected every 6 month

Check the fastening and state of the module’s terminals of the connection cables

Check the water-tightness of the terminal box

Module Labeling



※ The example of labeling is as following.

① Symbol of manufacturer

② Model Number

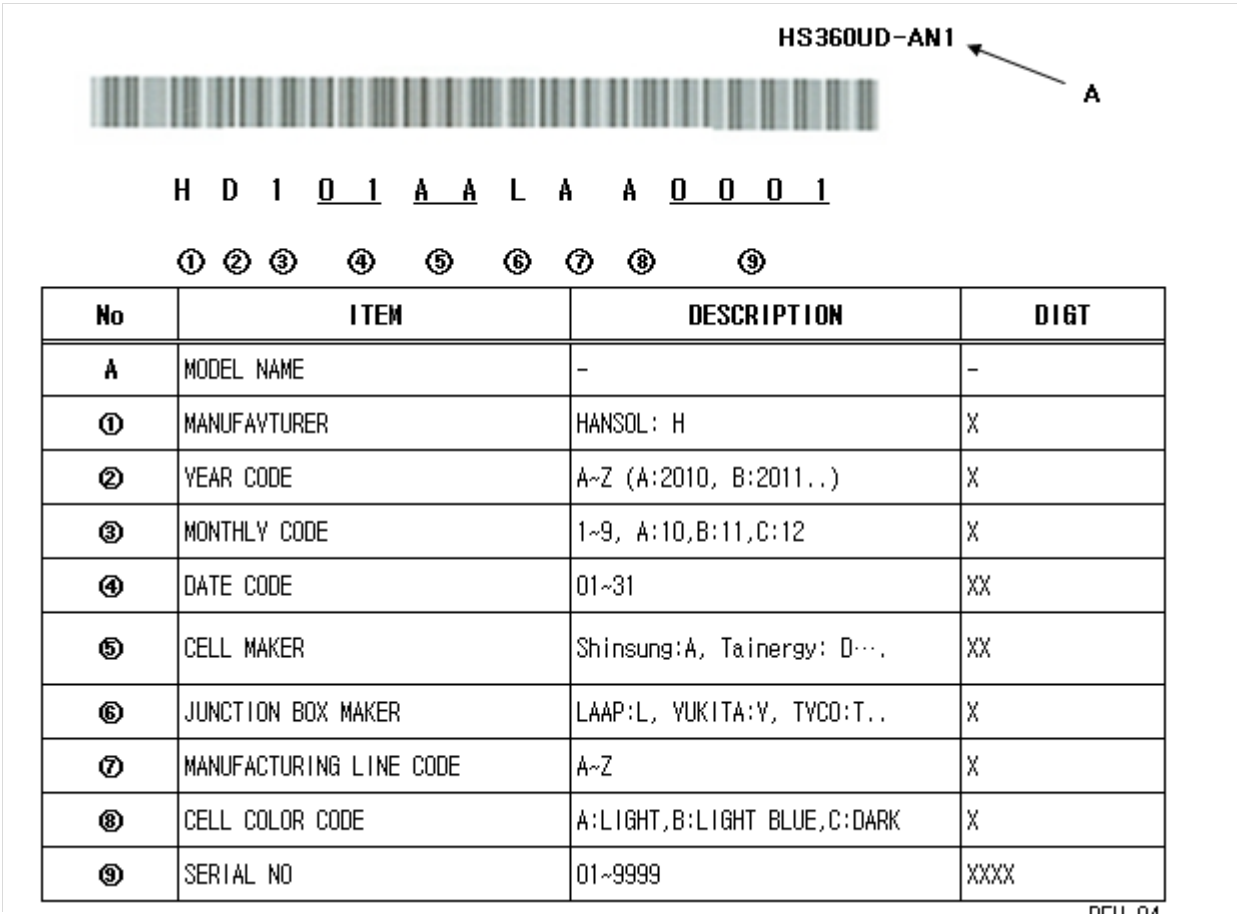
③ Safety Class II Mark

④ Electrical ratings

⑤ Fire Rating

⑥ Application Class

⑦ Serial number



No	ITEM	DESCRIPTION	DIGT
A	MODEL NAME	-	-
①	MANUFAVTURER	HANSOL: H	X
②	YEAR CODE	A~Z (A:2010, B:2011..)	X
③	MONTHLY CODE	1~9, A:10,B:11,C:12	X
④	DATE CODE	01~31	XX
⑤	CELL MAKER	Shinsung:A, Tainergy: D….	XX
⑥	JUNCTION BOX MAKER	LAAP:L, YUKITA:Y, TYCO:T..	X
⑦	MANUFACTURING LINE CODE	A~Z	X
⑧	CELL COLOR CODE	A:LIGHT,B:LIGHT BLUE,C:DARK	X
⑨	SERIAL NO	01~9999	XXXX

Disposal considerations

This product must be disposed of in accordance with all relevant local, state and federal laws and regulations. It is the responsibility of the customer to ensure that his product is disposed of properly.

Please contact your local Hansol representative concerning the proper disposal of this product.
The return of any modules will not be accepted by Hansol unless prior written authorization has been given by Hansol.