



African **GREEN** Developments (Pty) Ltd.

Exclusive Agent

in Africa for **Green Power Worldwide™**

Reg. No.: 2006/027945/07, VAT- 9166387168 - 24 Smit Street, Bromhof,
Randburg, 2154, Gauteng, South Africa

tell: 27 11 2387809 ,Fax: 0865860886, cell: 27 82 2647781 - leon@gp-worldwide.com, skype: badajozinv -

www.greenpower-worldwide.com,

GPW HCPV 3kWp

Demo System Package



Contents

CPV tech theory

A

System specifications

B

Installation: on-ground

C

Installation: on-roof

D

E Monitoring system

F On-site installation

G Installation examples

A. CPV Technology and theory

Material with high efficiency

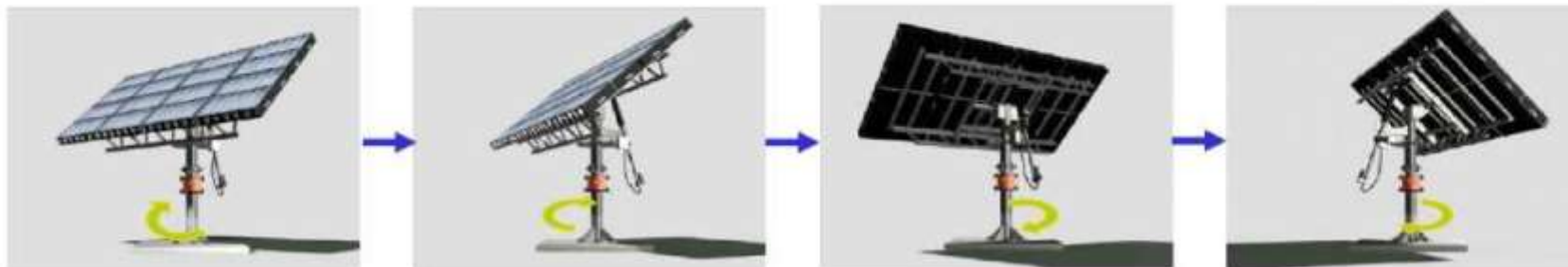
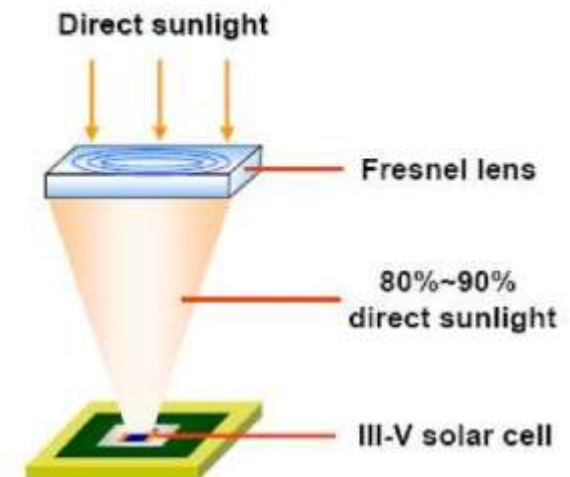
- III-V solar cell (GaAs) enables high efficiency up to **40%**

Use of optical element

- Fresnel Lens
- Concentration ratio: **476 x**

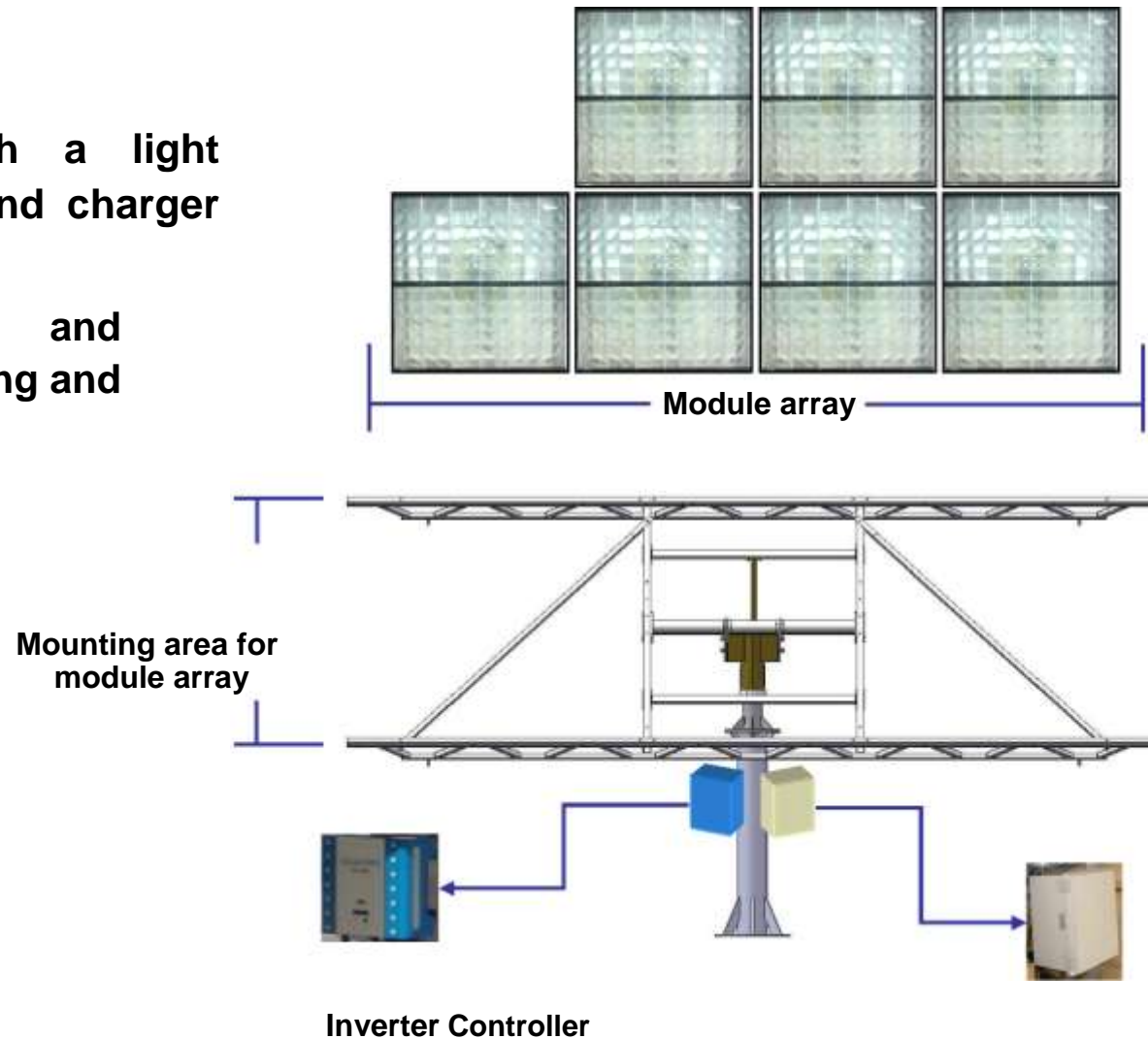
Use of tracker with high precision

- Dual Axis movement (tracking accuracy: **± 0.3 degree**)
- Strengthening the effect of irradiation concentration



B. System Specifications

- HCPV Module Array: 400W Module × 8
 - DC wiring and connector
- Tracking system
 - Tracker
 - Controller (with a light sensor) – Battery and charger (optional)
- Inverter
 - DC wiring and connector – AC wiring and connector

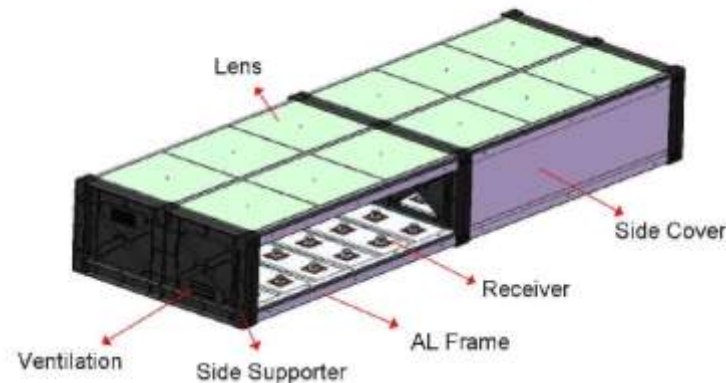


B. System Specifications

1. HCPV Module (400W)

GPW 's CPV modules feature in the adaption of III-V triple junction solar cell (GaAs) together with high concentration optical element (Fresnel lens). This specialized combination endows our modules with an efficiency ranged from 22 to 24% at a concentration ratio of about 500 suns under the standard DNI condition (Direct Normal Irradiation, 850 w/m^2).

The CPV module is constructed with lightweight Al frame and plastic PBT side supports, where the mechanical robustness is verified by mechanical load test and hail impact test of IEC 62108 qualification standard. A concentrator receiver comprises 24 cell assemblies mounted onto an aluminum plate at the bottom of the CPV module providing thermal dissipation. Light weight of module implies the loading on tracker is relatively lower, which in turns reduces the construction cost of the tracker.

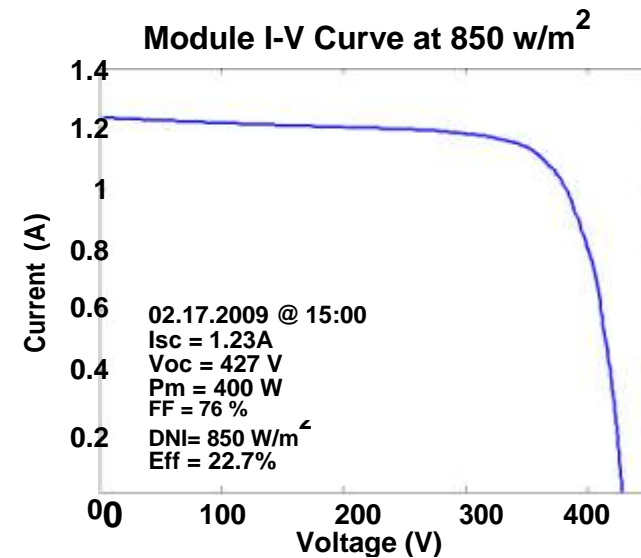
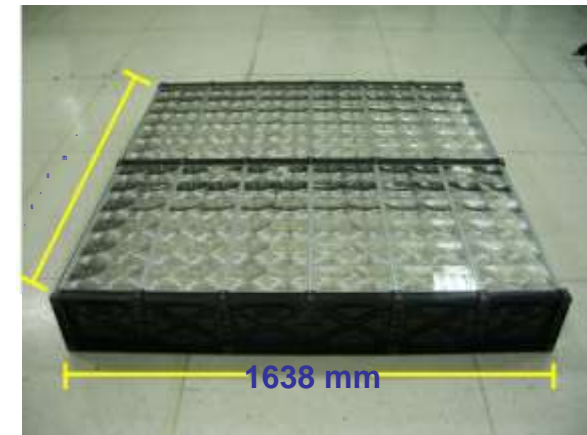


B. System Specifications

● Module specifications

Item	Description
Cell Type	Triple junction cells
Cell Efficiency	> 37.5%
Cells per Module	144
Geometric Concentration	476x
Nominal DC Power	400 W
Maximum Power Voltage	360V
Maximum Power Current	1.1 A
Module DC Efficiency	22.7%
Dimension	1680 x 1640 x 247 mm
Weight	60 kg
Acceptance Angle	$\pm 0.6^\circ$

GPW 400W module



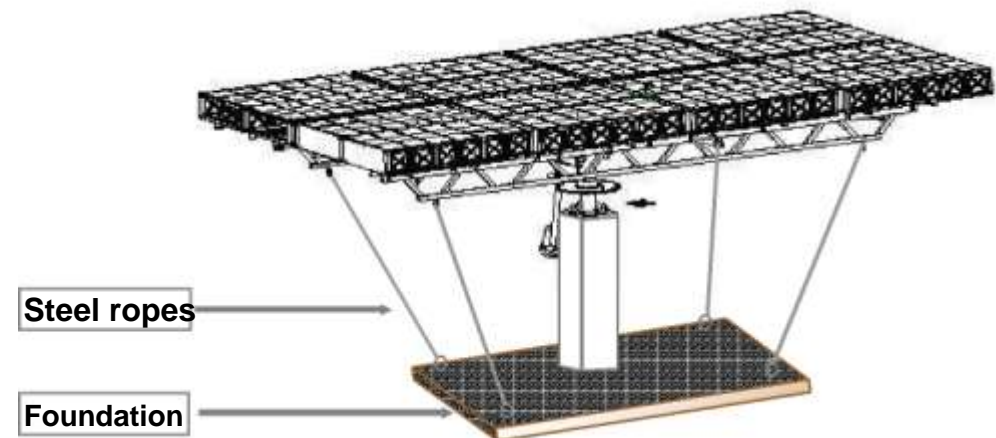
B. System Specifications

2. Dual Axis tracker

HouYi-1A is a dual-axis tracking system that tracks the sun in multiple angles. In addition to the mechanical components, the system also includes a controlling unit and with light sensor which boosts the tracking function. It also features in a tracking accuracy at ± 0.3 degree, with such the performance of tracking is further strengthened.

HouYi-1A is also endowed with safety mode incase the occurrence of any windy situation (e.g. hurricane or typhoon). When encountering a strong blast, Hou-Yi-1A can automatically switch itself to a safety position with the module array lied flatly.

In case a real happening of typhoon, safety prearrangement can be done by tying the steel rings attached on the truss and on the foundation surface respectively.



B. System Specifications

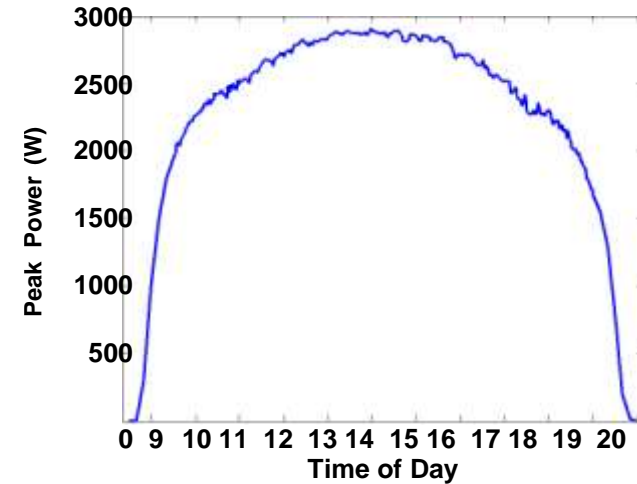
Tracker specifications

Item	Description
Azimuth Range	0 ~ 270 degree
Elevation Range	0 ~ 80 degree
Tracking Accuracy	0.2 degree
Wind Stow Condition	12 m/s
Communication	RS-485
Loaded Weight	1013 kg
Peak Capacity	3kW

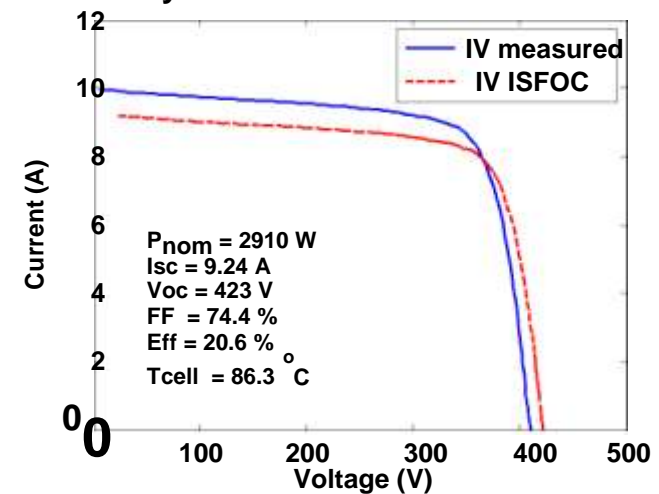
System specifications

Item	Description
Nominal Peak Power	3kW
Nominal Efficiency	20~21%
System Optical Area	16.6 m ²
Module Array Area	23.1 m ²
Maximum Power Voltage	360 V
Maximum Power Current	8.2 A

Daily Power Generation



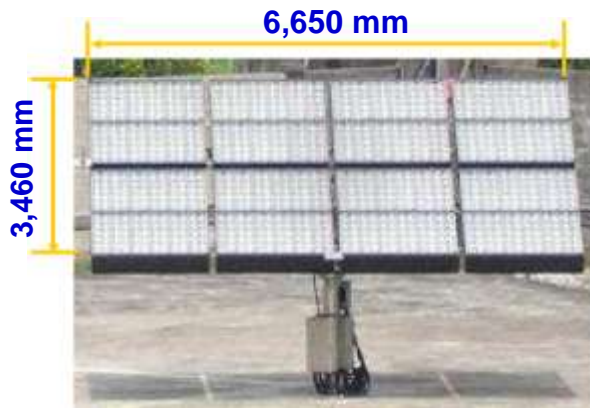
System I-V Curve at 850 w/m²



B. System Specifications

● System specifications

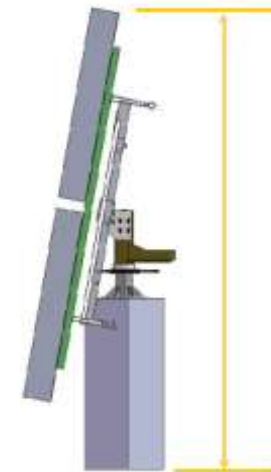
Item	Description
Wind resistance	67 km/hr (CPV array standing) 211 km/hr (CPV array lied)
Foundation size	2,300 x 2,300 x 900 mm
Dimension of concrete pillar	450 mm x 450 mm x 1,500 mm



Dimension of the module array (8 PCS)



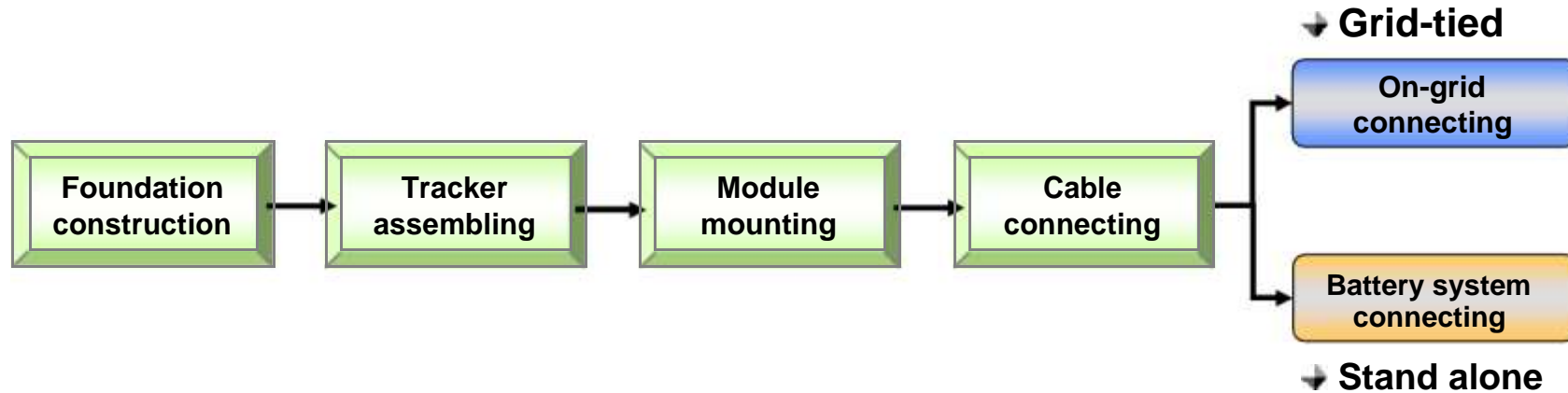
Ground-to-module array distance (at safety position)



Ground-to-module array distance (at array elevated position)

C. Installation: on-ground

● Installation Progress



● Factors for evaluation

There are a number of factors needed to be taken into consideration:

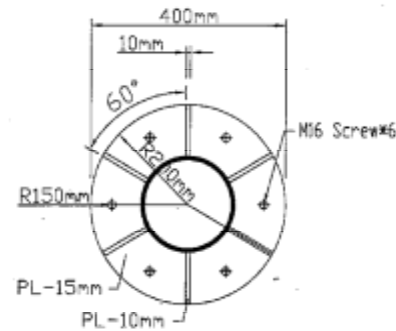
- Shadowing effect (height of surrounding buildings)
- Dead load (whole system)
- Wind resistance (wind speed / pressure)
- Earthquake force
- Soil texture and stress resistance

C. Installation: on-ground

● Foundation design

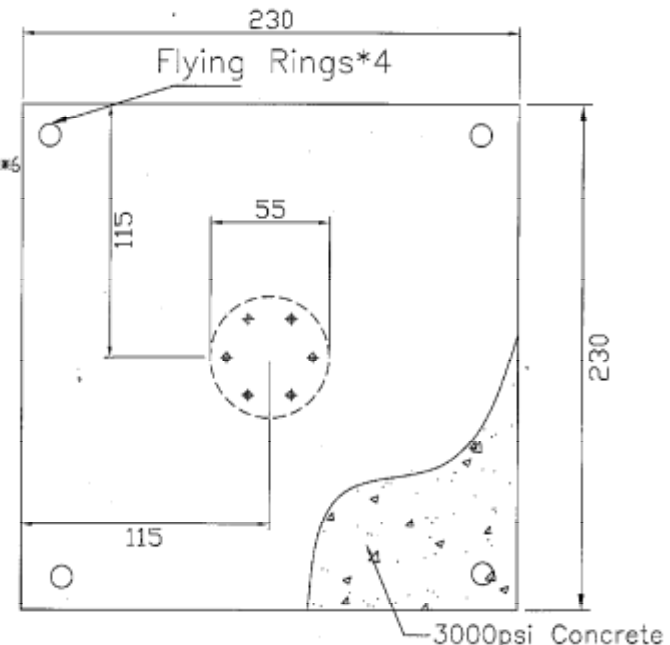
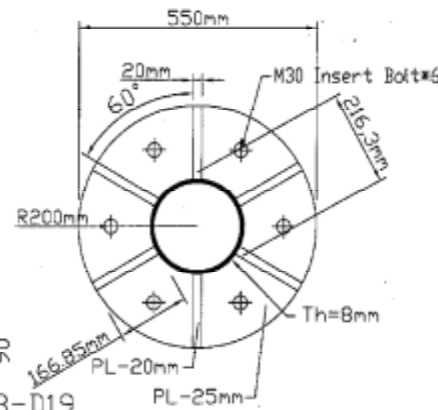
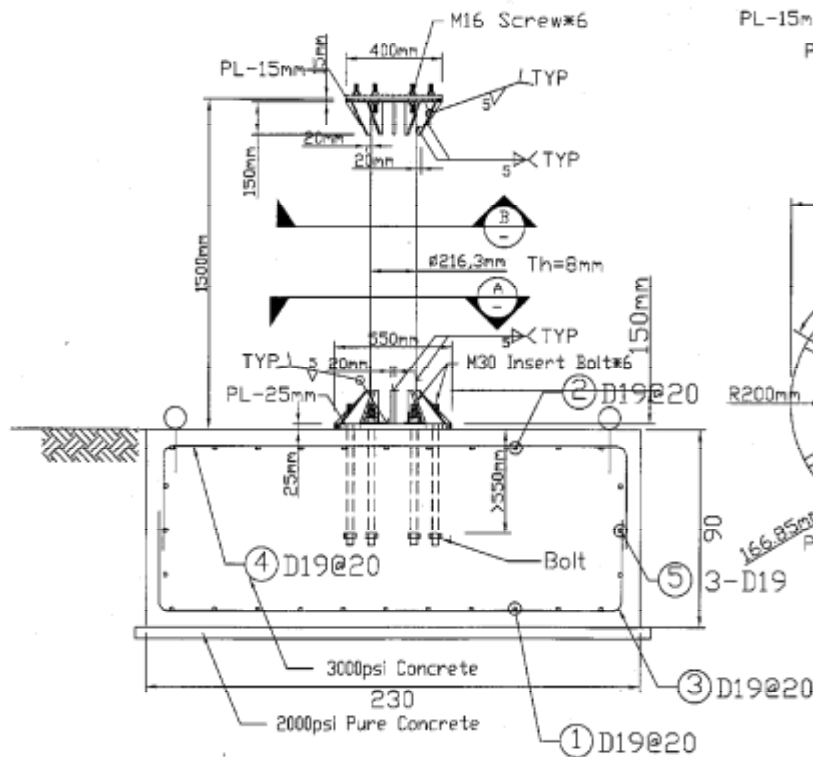
3.2KW System Foundation

140kg/cm ² concrete	0.3M ³ /set
210kg/cm ² Concrete	4.8M ³ /set
Rebar	384.3kg/set
Forming	8.3M ² /set



Steel bar table

Item	Shape	Diameter	we wgt	Length	Amount	Weight	Remarks
①		D19	2.25	3.20	11	79.2	@20
②		D19	2.25	3.20	11	79.2	@20
③		D19	2.25	3.20	11	79.2	@20
④		D19	2.25	3.20	11	79.2	@20
⑤		D19	2.25	2.50	12	67.5	@20
total:						384.3KG	

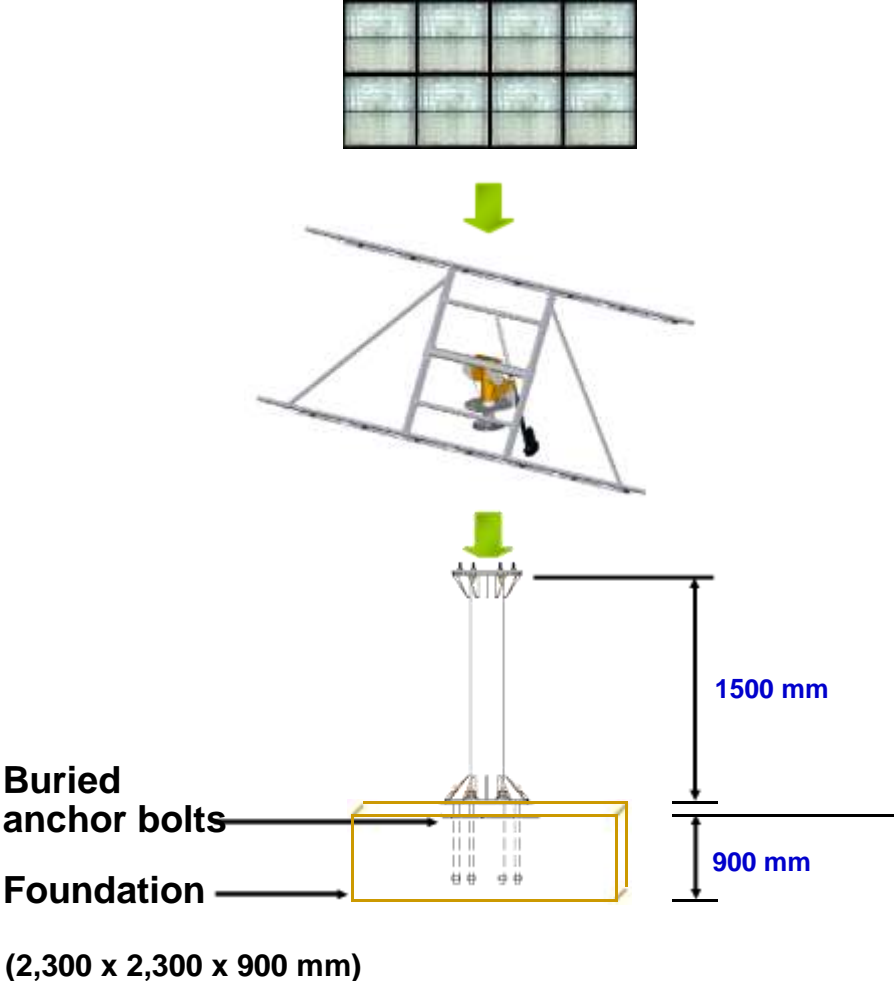


Remark: The foundation is an example which based on the soil condition and civil engineering regulation. It is changeable subject to the actual conditions in different countries.

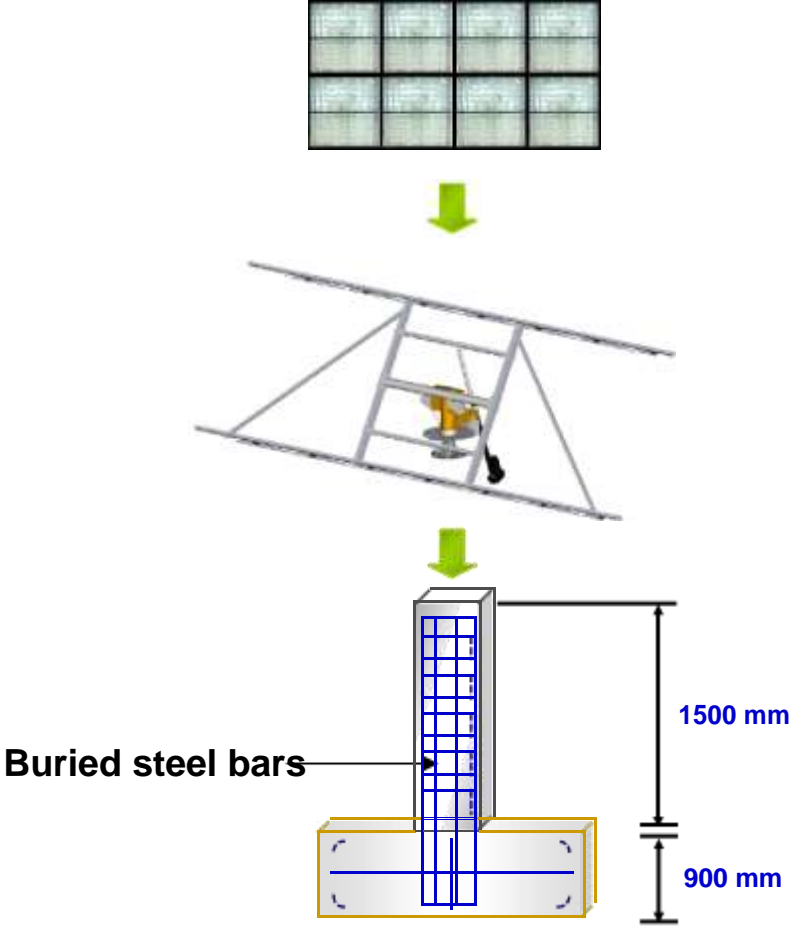
C. Installation: on-ground

● Installation steps illustration

Type A- Steel pillar

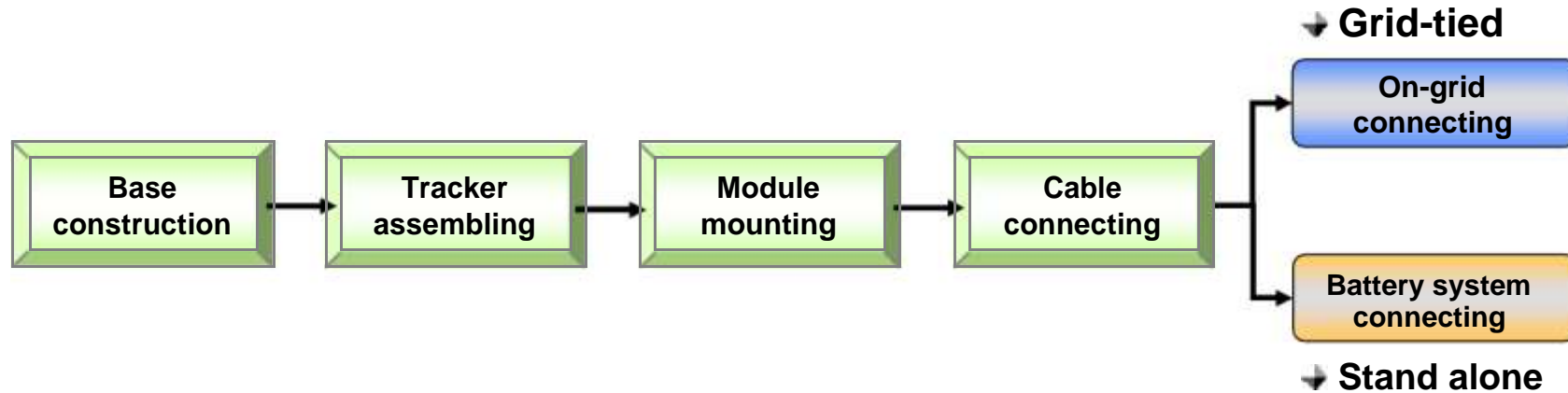


Type B- Concrete pillar



D. Installation: on-roof

● Installation Progress



● Factors for evaluation

There are a number of factors needed to be taken into consideration:

- Shadowing effect (height of surrounding buildings)
- Dead load (whole system)
- Wind resistance (wind speed / pressure)
- Earthquake force
- Ultimate stress of the roof floor

D. Installation: on-roof

● Base design

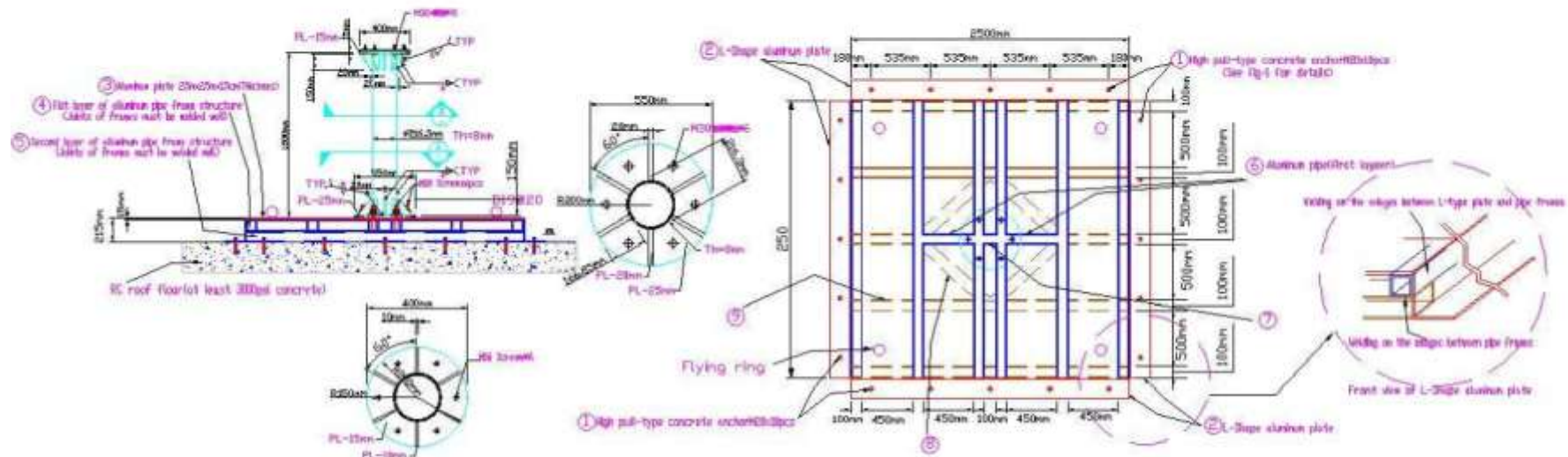
Table of materials

NO	Name/Shape	Dimension	Length(cm)	Pieces	Sub total length(cm)	Memo/position
2	aluminum L-type plate	21.5cmx19cmx1cm		4		
3	aluminum top plate	250cmx250cmx1.5cm		1		
4	aluminum rectangular pipe	10cmx10cmx1cm(Thickness)	250	6	1500	for first layer frame
5	aluminum rectangular pipe	10cmx10cmx1cm(Thickness)	250	4	1000	for second layer frame
6	aluminum rectangular pipe	10cmx10cmx1cm(Thickness)	45	2	90	for first layer frame
7	aluminum rectangular pipe	10cmx10cmx1cm(Thickness)	10	1	10	for first layer frame
8	aluminum rectangular pipe	10cmx10cmx1cm(Thickness)	72	4	288	for second layer frame
9	aluminum rectangular pipe	10cmx10cmx1cm(Thickness)	55	2	110	for second layer frame

Specs of M20 high pull-type concrete anchor



Whole length 203mm
 Outer diameter 27.6mm
 Inner diameter 20mm
 Drill depth 145mm
 Ultimate tensile stress 12428kgf
 Concrete stress no less than 3000psi
 Total 20pcs

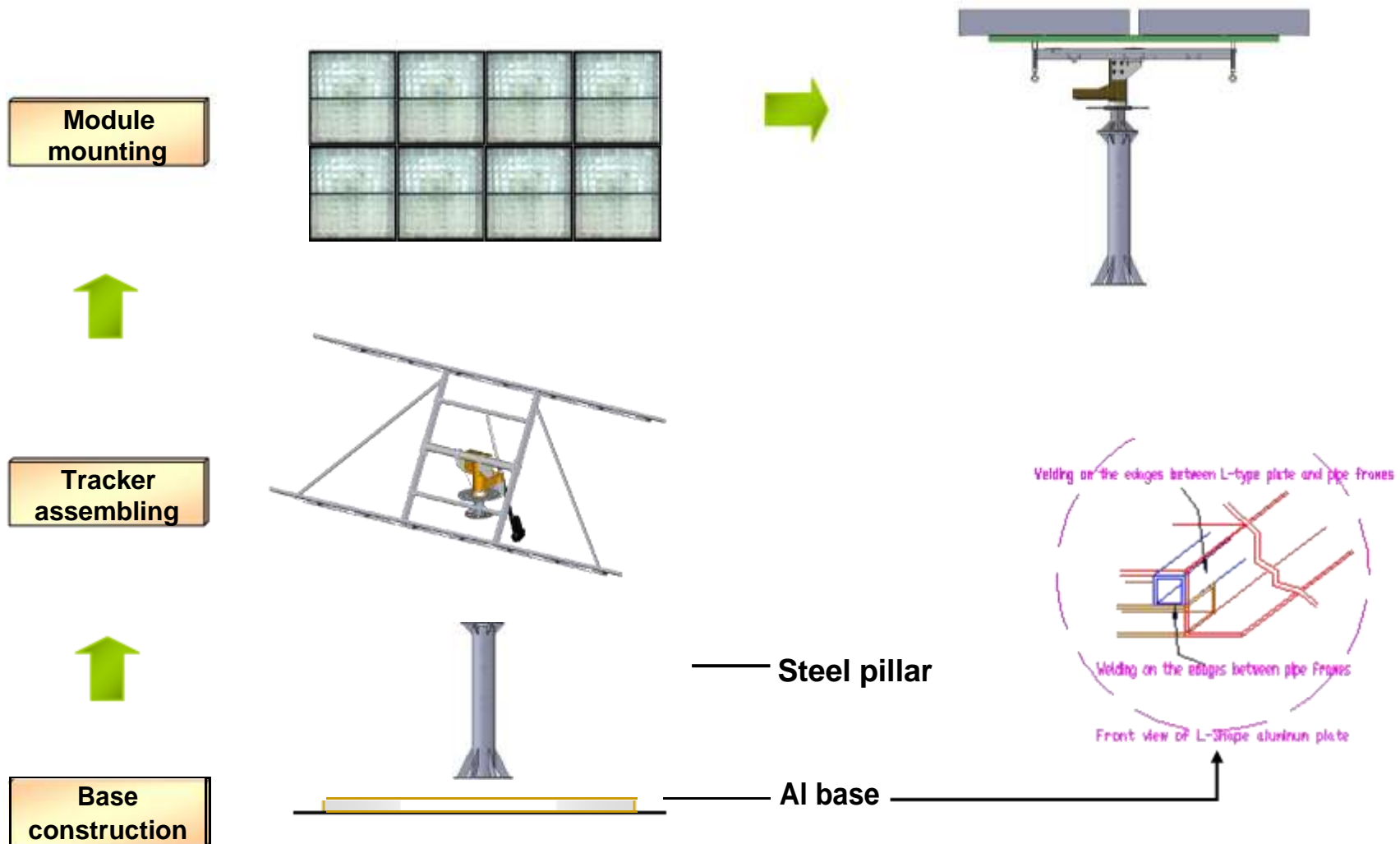


Base for steel pillar

Remark: The foundation is an example which based on the soil condition and civil engineering regulation in Taiwan. It is changeable subject to the actual conditions in different countries.

D. Installation: on-roof

● Installation steps illustration



D. Installation: on-roof

● Installation example



E. Monitoring system

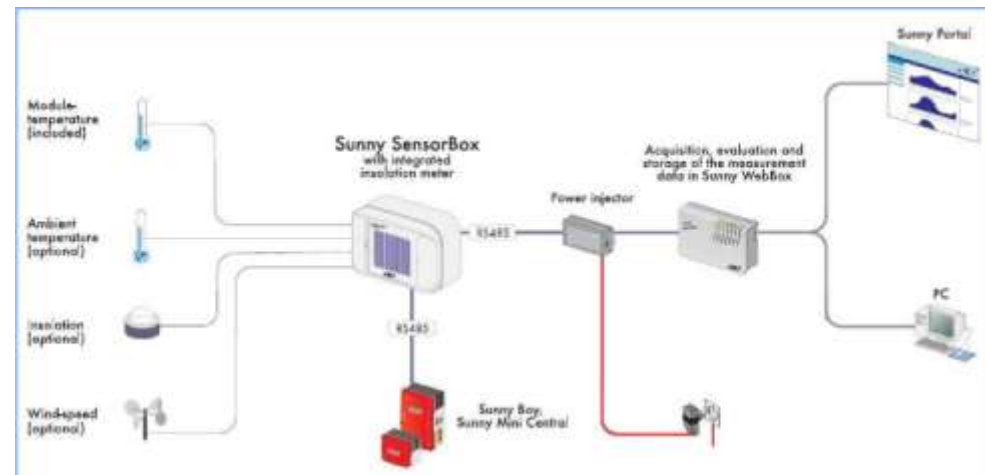
SCADA (Supervisory Control And Data Acquisition)

a system that collects data from various sensors at the solar power plant or in other remote locations and then sends this data to a central computer which then manages and controls the data. It is an optional choice depending on customers' specific needs.

- Monitoring objectives:
DC and AC output
ambient condition

Inclusion of a SCADA system:

Server (hard & software)	
DC/AC meter	/
Data logger	
Inverter	
DNI meter	
Environmental sensors	
-Temperature	
-Humidity	
-Wind speed	
-Wind direction	



Example for SMA Sunny Boy system

F. On-site installation

● Installation consulting service coverage

Item	Object	Remark
1	Tracker assembling	Dual Axis Tracker
2	Module mounting	400W module
3	Horizontal adjustment	Inclinometer is needed
4	Cables connection	(1) Modules (2) Module-to-inverter
5	Operation demonstration after the completion of installation	(1) Elevation / azimuth rotation (2) Controller

● Inspection & examination after installation

Item	Object	Remark
1	Installation completion	
2	Appearance	
3	Operation-Auto tracking mode	At general operation condition
4	Operation-Manual operating mode	At general operation condition
5	Operation- Inverter display	At general operation condition
6	Monitoring system connection	When needed
7	Real performance measurement	When needed

G. Installation examples

Global examples

• Milan, Italy



• Taiwan



• Sunchon, Korea



• Beijing, China



• Jiangsu, China



• Valedenas, Spain

