



Go Solar. Go Green.

— SOLAR PUMPING SYSTEMS —





C.R.I. PUMPS

Pumping trust. Worldwide.

T H E B E G I N N I N G

of C.R.I., way back in 1961, was a resolute attempt to produce a few irrigation equipments using the limited facilities of an in-house foundry. Eventually the founder's dream was coming true as the small production unit he started kept growing rapidly. Now, after more than five eventful decades, it is an enormous, widely reputed organization, which produces more than 1500 varieties of perfectly engineered pumps and motors and sells its products in numerous countries spread across 6 continents.

C . R . I . I S O N E A M O N G

the few pioneers in the world to produce 100% stainless steel submersible pumps. Having achieved a record production capacity of over 1.5 million pumps per annum, today C.R.I. is rubbing its shoulders with the best brands in the world, with advanced technology and safety standards as its hallmarks.

T H E I N F R A S T R U C T U R E

of C.R.I. is pretty comprehensive with state-of-the-art machineries and high potential in-house R&D recognised by the ministry of science and technology, Govt. of India - all within its own covered area of 200,000 square metres. The production environment is accredited with ISO 9001 & 14001 certifications and the products are CE, UR/UL, TSE & ISI certified. The R&D team always stays in tune with the changing scenario and seldom fails in coming up with outstanding solutions every time.

N E E D L E S S T O S A Y ,

behind this legendary growth lies the untiring, innovative, enthusiastic and dedicated team work. and, of course, a flawlessly maintained value system too. The name C.R.I. itself encapsulates the company's ethos: " Commitment, Reliability, Innovation".





C.R.I. PUMPS

Pumping trust. Worldwide.

Vision, Mission and values

To be the industry leader providing best - in - class fluid management solutions to individual and institutional customers and societies in our chosen markets.

We will achieve this through our dedicated efforts to enhance the welfare of all our stakeholders and by living by our values of commitment, reliability and Innovation.

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SOLAR PUMPING SYSTEMS

GENERAL INFORMATION

C.R.I. Pumps with 5 decades of engineering expertise in the pump industry, understanding the importance of usage of Green energy and the current need across the world and has extended comprehensive range of solar pumping systems both in deepwell submersible and surface pump ranges. These product ranges ensure that even in areas where there is little or no power distribution, the need for water is met. It is also part of the Company's initiatives to promote green energy powered by the sun. C.R.I. Solar Pumping systems are designed & developed using the most advanced technologies suitable for various applications and giving more thrust on high performance and durability in both AC & DC versions.

DC Solar Pumps are available with both Screw & Centrifugal impellers suitable for different head and flow ranges. The DC Submersible Solar Pumps are powered by C.R.I. Oil filled permanent magnet, brushless DC motors and the Surface Pumps are coupled to specially designed dry type brushless DC motors. With regard to AC Pumps, C.R.I. Solar Pump Controller is used to convert DC Power generated by PV modules to 3Phase AC Power and drive these pumps.

SOLAR PV MODULE FUNCTIONALITY

PV Modules collect solar radiation from the sun and actively convert that energy to electricity. PV Modules are comprised of several individual solar cells and function similarly to large semiconductors and utilize a large-area p-n junction diode. When the solar cells are exposed to sunlight, the p-n junction diodes convert the energy from sunlight into usable electrical energy.

The energy generated from photons striking the surface of the PV Module allows electrons to be knocked out of their orbits and released, and electric fields in the solar cells pull these free electrons in a directional current (D.C.), from which metal contacts in the solar cell can generate electricity. The more solar cells in a PV Module and the higher the quality, the more total electrical output the PV Module can produce. The conversion of sunlight to usable electrical energy is otherwise known as the Photovoltaic Effect. The photovoltaic effect arises from the properties of the p-n junction diode, as such there are no moving parts in a PV Module.

PV MODULE OUTPUT

Factors that affect the output of PV Modules are weather conditions, shade caused by obstructions to direct sunlight, and the angle and position at which the PV Module is installed.

PV Modules delivers the best output when placed in direct sunlight, away from obstructions that might cast shade, and in areas with high regional solar insolation ratings.

PV Module efficiency can be optimized by using dynamic mounts that follow the position of the sun in the sky and rotate the PV Module to get the maximum amount of direct exposure during the day as possible.

SOLAR ENERGY STORAGE SYSTEM

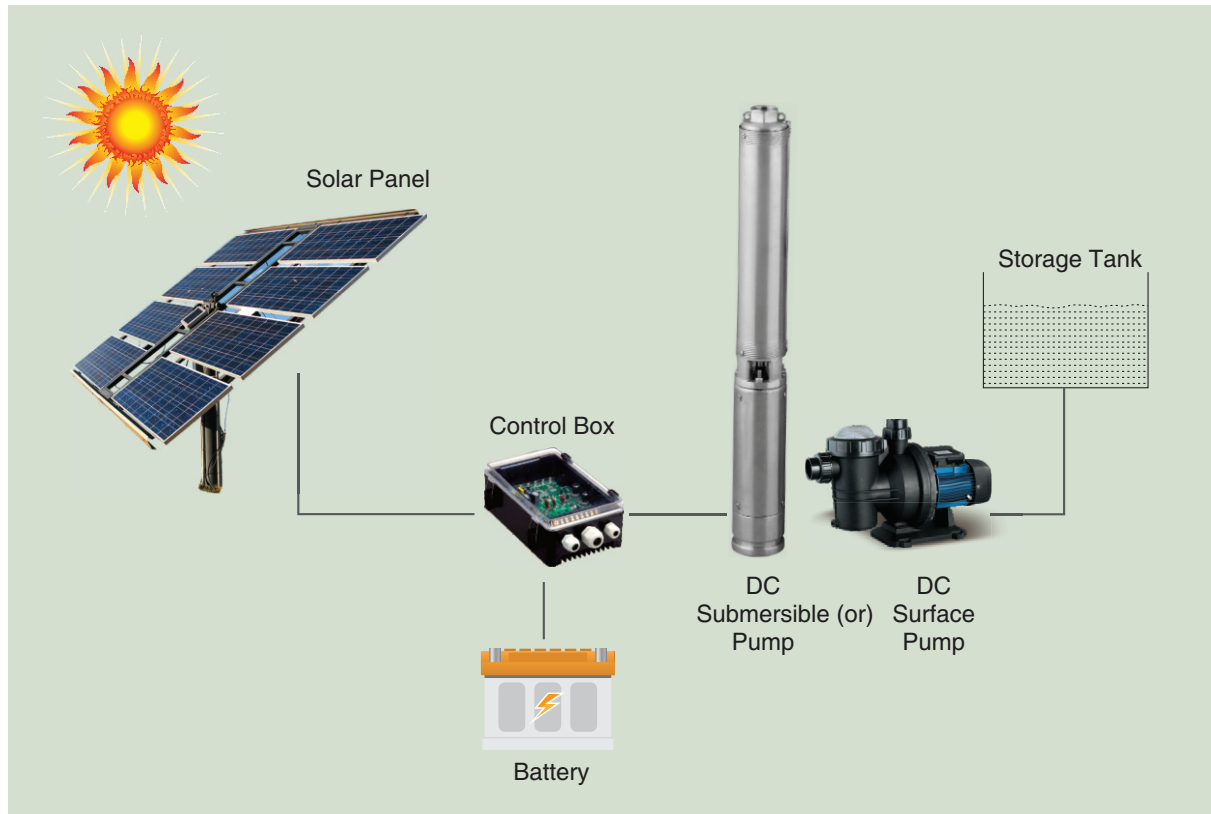
In our system the collecting device is lead acid battery which collect and stores DC energy Generated from PV Modules. This battery power storage option is available in DC solar pumps ranging upto 500W. The D.C. Power stored in the battery can be used to operate the pump directly. This process is usually integrated into solar photovoltaic system where energy collected and stored almost instantaneously.

DC Solar Pumps

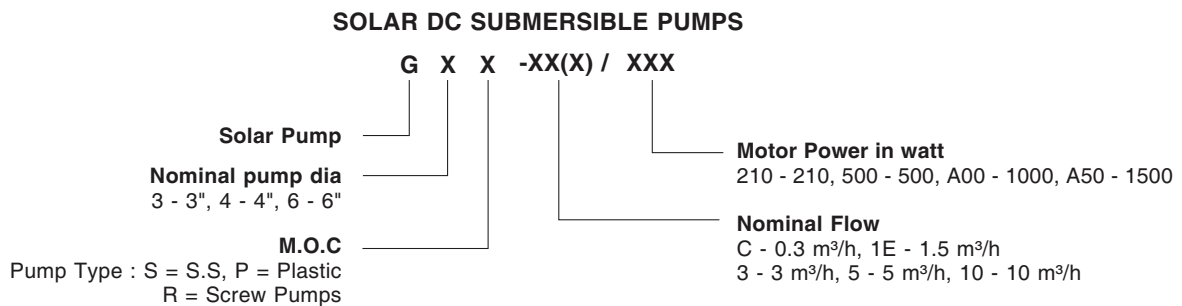
C.R.I. Solar D.C. Pump & Motor are supplied with necessary accessories like control box, level sensor probes, spare impeller, power cable to connect control box & panel & cables splicing kit as a complete set in a single carton packing.

Features : • Eco friendly • More Longevity & Hygiene • Uses only solar energy • Easy to dismantle & Repair • Rigid construction • Highly durable • Can handle upthrust load • Dry run protection • NEMA Mounting Standard (4") • Water level sensors for storage tank • Extremely hardwearing water lubricated bearings • Powered by brushless DC Motor for long life.

Applications : • Residential • Irrigation • Live stock farms • Small farms • Public water supply • De-watering • Industries • Golf course.

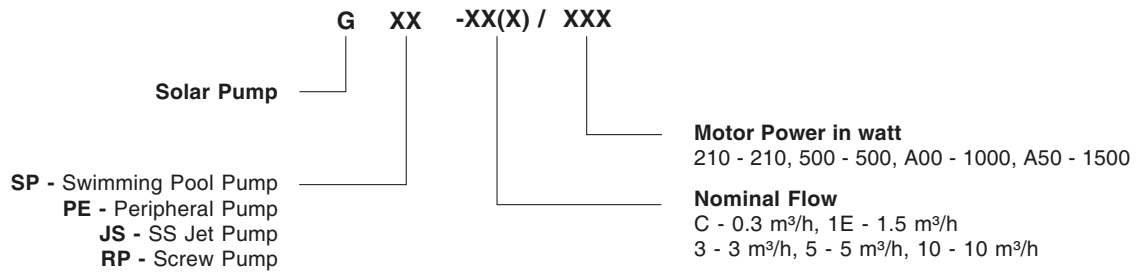


Model Identification Code



In view of continuous developments, the information / descriptions / specifications / illustrations are subject to change without notice.

SOLAR DC SURFACE PUMPS



DC Solar Submersible Pumps



- 3" Screw type Deepwell Submersible Pumps
- 3" Centrifugal Deepwell Submersible Pumps - Plastic Impeller
- 4" Screw type Deepwell Submersible Pumps
- 4" Centrifugal Deepwell Submersible Pumps - Plastic Impeller
- 4" Centrifugal Deepwell Submersible Pumps - SS Impeller

G3R Series

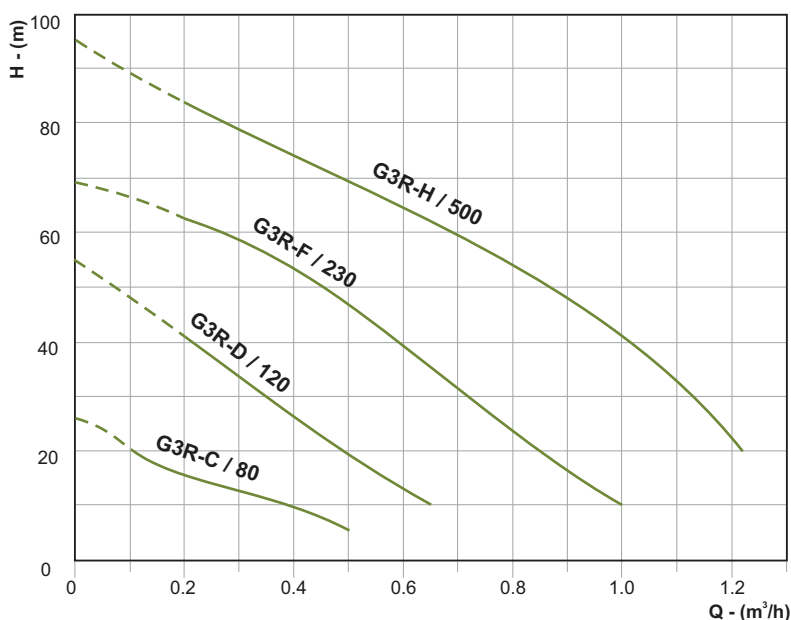
SPECIFICATIONS

Nominal Dia.	3"
Power range	80 - 500 W
Voltage	12 - 48 V, D.C.
Max. Head	95 m
Max. Discharge	1.2 m ³ /h
Max. Immersion depth	30 m
Motor type	Oil filled DC motor
Impeller	Screw type
Outlet size	¾"

MATERIALS OF CONSTRUCTION

Outlet	Stainless steel
Pump outer shell	Stainless steel
Motor outer shell	Stainless steel
Impeller	Stainless steel (Screw type)
Bearing	Ball bearing

PERFORMANCE CURVES



* Provide Non return valve (NRV) near the pump outlet to avoid water hammering / back flow of water.

PUMPSET CONSIST OF :

- Pump
- Motor
- Control box
- Level sensor probes
- Spare Screw impeller
- Power cable to connect control box & PV Module
- Cable splicing kit

PERFORMANCE TABLE

Model	Voltage (V)	Power (W)	Reqd. PV Input Power (W)	Max. Head (m)	Head Range (m)	Flow Range (LPD)*
G3R-C / 80	12	80	105	27	21 - 5	400 - 2000
G3R-D / 120	24	120	160	54	45 - 10	800 - 2600
G3R-F / 230	36	230	300	69	62 - 10	800 - 4000
G3R-H / 500	48	500	650	95	85 - 22	800 - 4800

The above performance curves are plotted under test condition with maximum DC input power.

* Flow range in LPD is calculated based on 4 hours bright sunny day.

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G3P Series

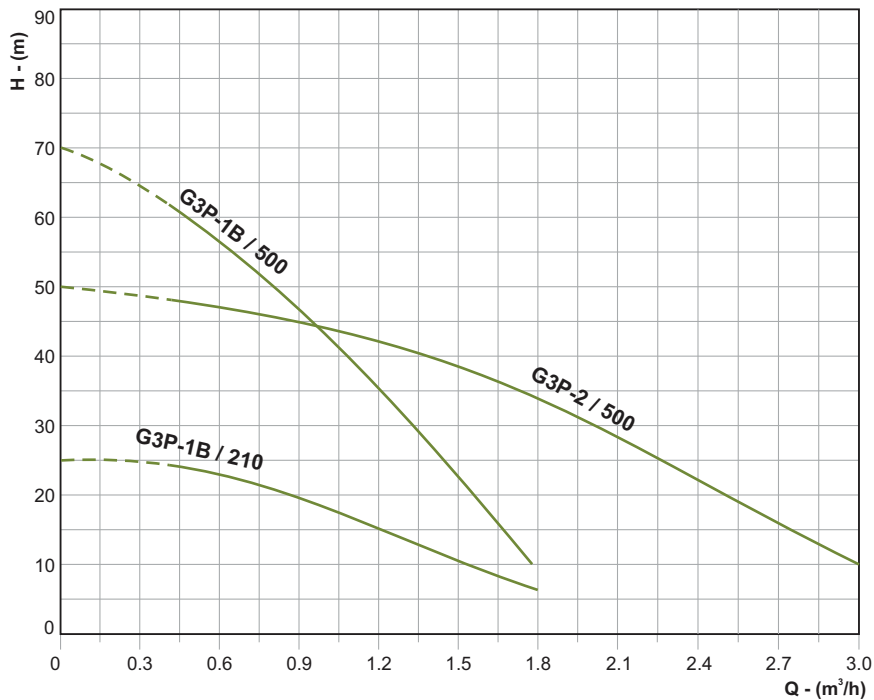
SPECIFICATIONS

Nominal Dia.	3"
Power range	210 - 500 W
Voltage	36 & 48 V, D.C.
Max. Head	70 m
Max. Discharge	3 m ³ /h
Max. Immersion depth	30 m
Motor type	Oil filled DC motor
Impeller	Multistage Centrifugal
Outlet size	1"

MATERIALS OF CONSTRUCTION

Outlet	Stainless steel
Pump outer shell	Stainless steel
Motor outer shell	Stainless steel
Impeller	Thermoplastic
Bearing	Ball bearing

PERFORMANCE CURVES



PUMPSET CONSIST OF :

- Pump
- Motor
- Control box
- Level sensor probes
- Spare Centrifugal impeller
- Power cable to connect control box & PV Modules
- Cable splicing kit.

PERFORMANCE TABLE

Model	Voltage (V)	Power (W)	Reqd. PV Input Power (W)	Max. Head (m)	Head Range (m)	Flow Range (LPD)*
G3P-1B / 210	36	210	270	25	23 - 6	1800 - 7200
G3P-1B / 500	48	500	650	70	62 - 10	1600 - 7200
G3P-2 / 500	48	500	650	50	47 - 10	1800 - 12000

The above performance curves are plotted under test condition with maximum DC input power.

* Flow range in LPD is calculated based on 4 hours bright sunny day.

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G4R Series

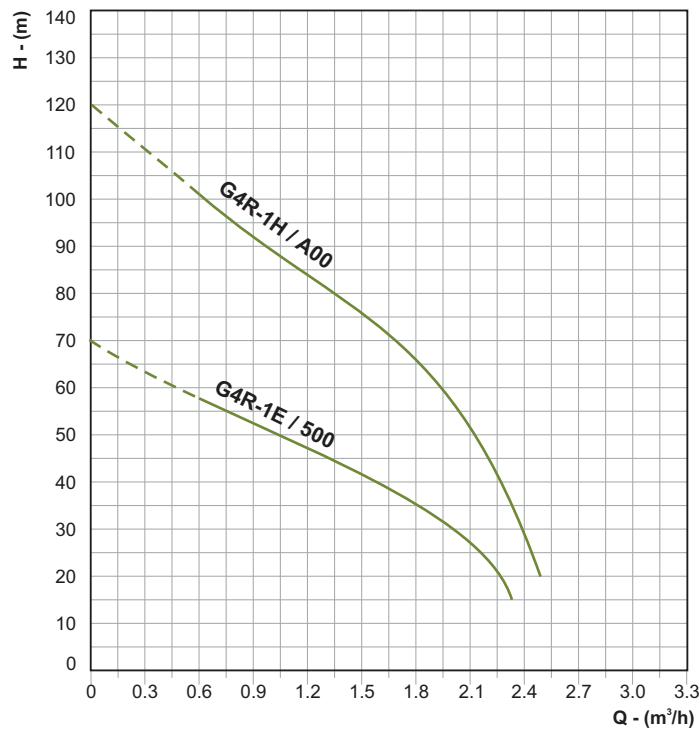
SPECIFICATIONS

Nominal Dia.	4"
Power range	500 - 1000 W
Voltage	48 & 110 V, D.C.
Max. Head	120 m
Max. Discharge	2.5 m ³ /h
Max. Immersion depth	30 m
Motor type	Oil filled DC motor
Impeller	Screw type
Outlet size	1"

MATERIALS OF CONSTRUCTION

Outlet	Stainless steel
Pump outer shell	Stainless steel
Motor outer shell	Stainless steel
Impeller	Stainless steel (Screw type)
Bearing	Ball bearing

PERFORMANCE CURVES



* Provide Non return valve (NRV) near the pump outlet to avoid water hammering / back flow of water.

PUMPSET CONSIST OF :

- Pump • Motor • Control box • Level sensor probes • Spare Screw impeller • Power cable to connect control box & PV Modules • Cable splicing kit.

PERFORMANCE TABLE

Model	Voltage (V)	Power (W)	Reqd. PV Input Power (W)	Max. Head (m)	Head Range (m)	Flow Range (LPD)*
G4R-1E / 500	48	500	650	70	58 - 15	2400 - 9000
G4R-1H / A00	110	1000	1400	120	100 - 20	2400 - 10000

The above performance curves are plotted under test condition with maximum DC input power.

* Flow range in LPD is calculated based on 4 hours bright sunny day.

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G4P Series

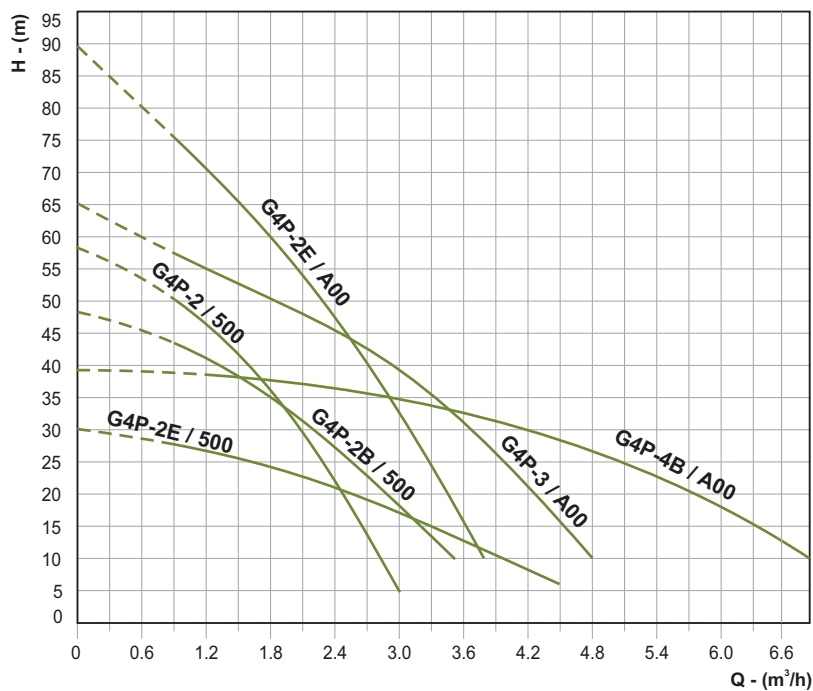
SPECIFICATIONS

Nominal Dia.	4"
Power range	500 - 1000 W
Voltage	48 & 110 V, D.C.
Max. Head	89 m
Max. Discharge	7 m ³ /h
Max. Immersion depth	30 m
Motor type	Oil filled DC motor
Impeller	Multistage centrifugal
Outlet size	1¼" & 2"

MATERIALS OF CONSTRUCTION

Outlet	Stainless steel
Pump outer shell	Stainless steel
Motor outer shell	Stainless steel
Impeller	Thermoplastic
Bearing	Ball bearing

PERFORMANCE CURVES



PUMPSET CONSIST OF :

- Pump
- Motor
- Control box
- Level sensor probes
- Spare Centrifugal impeller
- Power cable to connect control box & PV Modules
- Cable splicing kit

PERFORMANCE TABLE

Model	Voltage (V)	Power (W)	Reqd. PV Input Power (W)	Max. Head (m)	Head Range (m)	Flow Range (LPD)*
G4P-2 / 500	48	500	650	57	50 - 5	3600 - 12000
G4P-2B / 500	48	500	650	48	44 - 10	3600 - 14000
G4P-2E / 500	48	500	650	30	27 - 6	3600 - 18000
G4P-2E / A00	110	1000	1400	89	75 - 10	3600 - 15000
G4P-3 / A00	110	1000	1400	65	57 - 10	3600 - 19000
G4P-4B / A00**	110	1000	1400	39	37 - 10	5000 - 27600

The above performance curves are plotted under test condition with maximum DC input power.

* Flow range in LPD is calculated based on 4 hours bright sunny day.

** 2" Outlet

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G4S Series

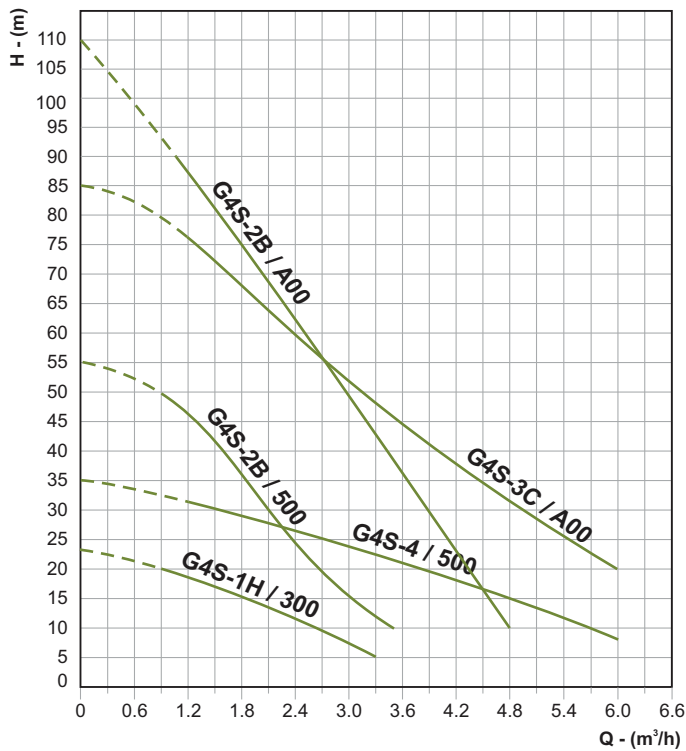
SPECIFICATIONS

Nominal Dia.	4"
Power range	300 - 1000 W
Voltage	36 & 110 V, D.C.
Max. Head	110 m
Max. Discharge	6 m ³ /h
Max. Immersion depth	30 m
Motor type	Oil filled DC motor
Impeller	Multistage centrifugal
Outlet size	1¼" & 1½"

MATERIALS OF CONSTRUCTION

Outlet	Stainless steel
Pump outer shell	Stainless steel
Motor outer shell	Stainless steel
Impeller	Stainless steel
Bearing	Ball bearing

PERFORMANCE CURVES



PUMPSET CONSIST OF :

- Pump ● Motor ● Control box ● Level sensor probes ● Spare Centrifugal impeller ● Power cable to connect control box & PV Modules ● Cable splicing kit

PERFORMANCE TABLE

Model	Voltage (V)	Power (W)	Reqd. PV Input Power (W)	Max. Head (m)	Head Range (m)	Flow Range (LPD)*
G4S-1H / 300	36	300	390	23	20 - 5	3600 - 13200
G4S-2B / 500	48	500	650	55	50 - 10	3000 - 14000
G4S-4 / 500	48	500	650	35	31 - 8	4800 - 24000
G4S-3C / A00**	110	1000	1400	85	76 - 20	4800 - 24000
G4S-2B / A00	110	1000	1400	110	90 - 10	4400 - 19200

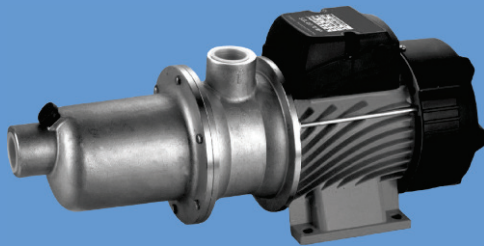
** 1½" Outlet

The above performance curves are plotted under test condition with maximum DC input power.

* Flow range in LPD is calculated based on 4 hours bright sunny day.

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DC Solar Surface Pumps



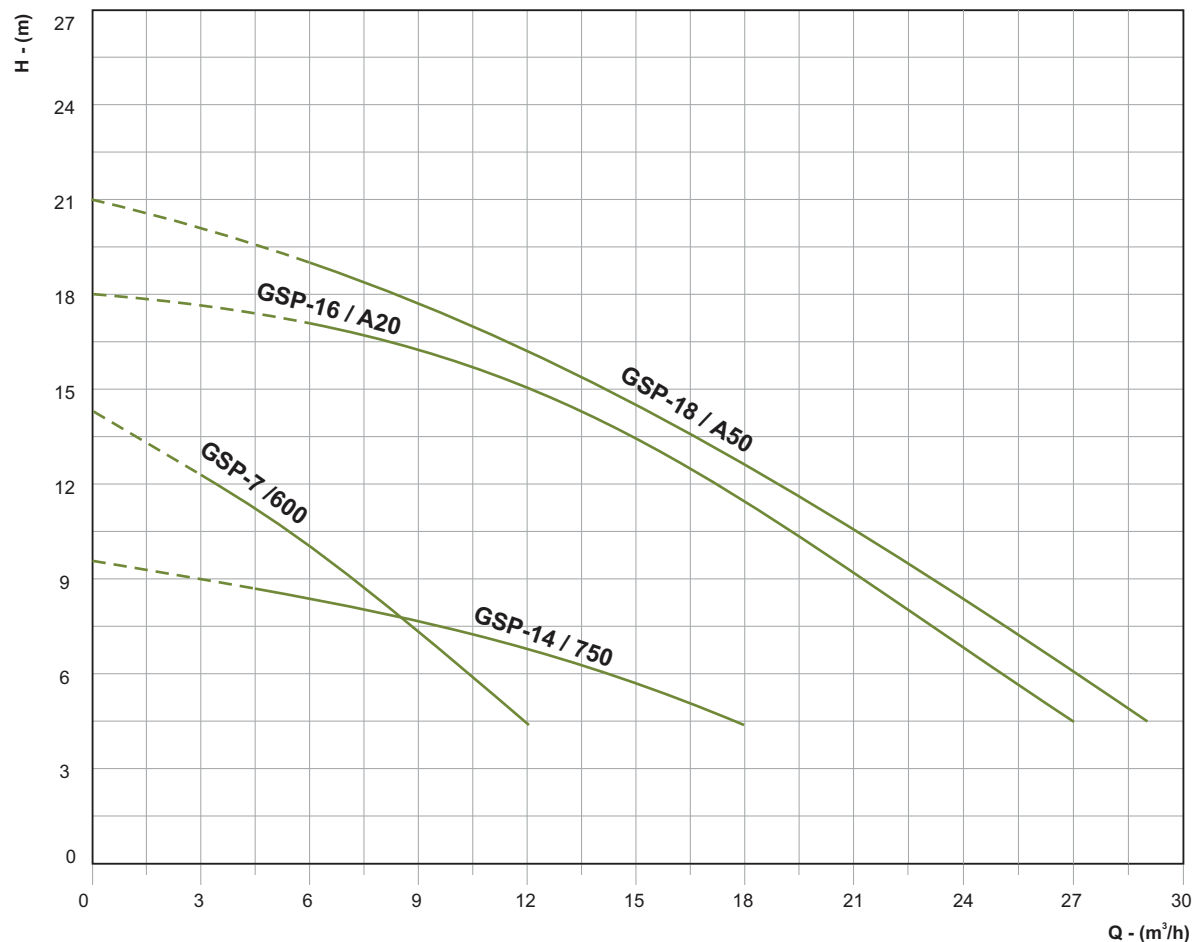
SOLAR SWIMMING POOL PUMPS
SOLAR PERIPHERAL PUMPS

SOLAR SS JET PUMPS
SOLAR SCREW PUMPS



Solar Pool Pumps -GSP Series

PERFORMANCE CURVES



SPECIFICATIONS

Power range	600 - 1500 W
Voltage	48 - 110 V, D.C.
Max. Head	21 m
Max. Discharge	29 m³/h
Pump size	1½" x 1½" & 3" x 3"



PUMPSET CONSIST OF :

- Pump
- Motor
- Control box
- Level sensor probes
- Power cable to connect control box & PV Modules

PERFORMANCE TABLE

Model	Voltage (V)	Power (W)	Reqd. PV Input Power (W)	Max. Head (m)	Head Range (m)	Flow Range (LPD)*
GSP-7 / 600	48	600	780	15	12 - 4.5	12000 - 48000
GSP-14 / 750	96	750	975	9.2	8.2 - 4.5	18000 - 72000
GSP-16 / A20	110	1200	1560	18	17 - 4.5	24000 - 108000
GSP-18 / A50	110	1500	1950	21	19 - 4.5	22000 - 114000

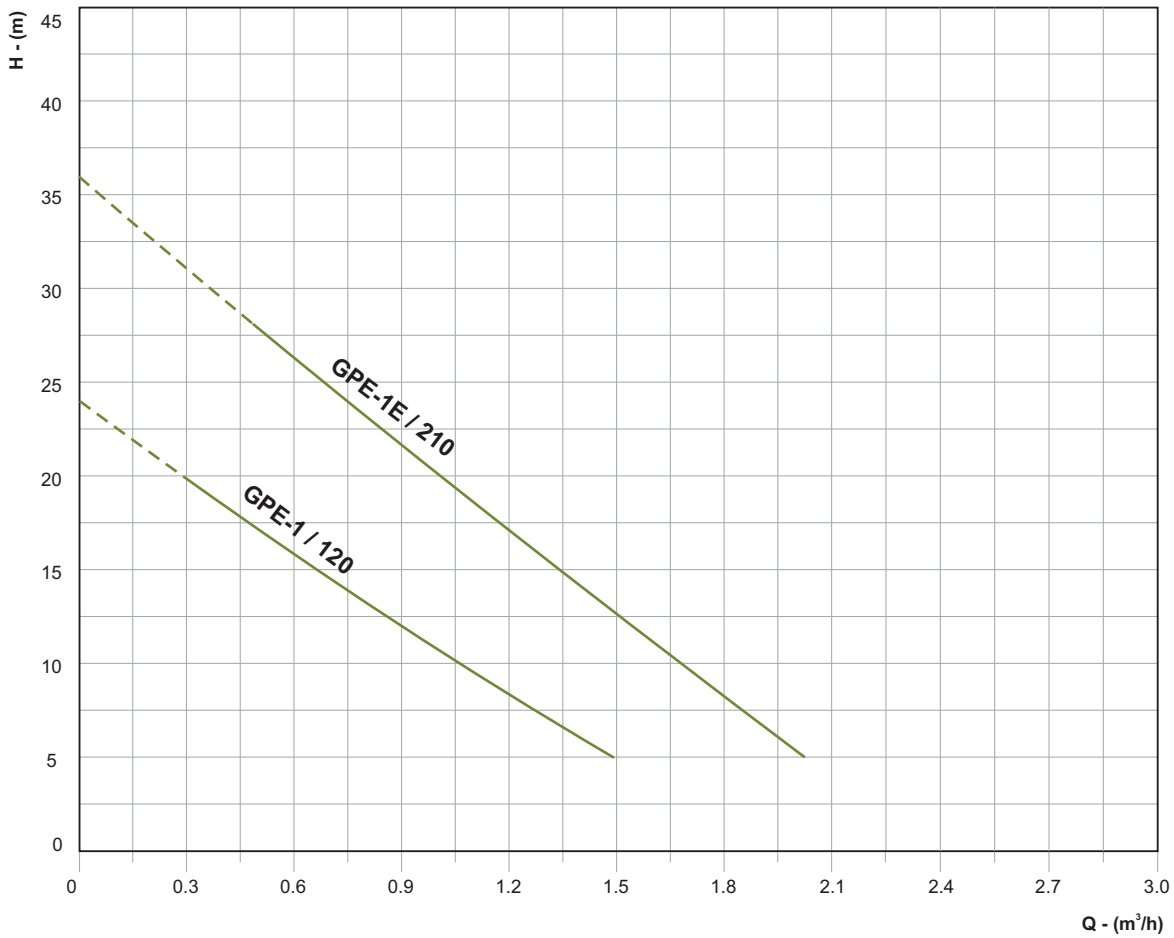
The above performance curves are plotted under test condition with maximum DC input power.

* Flow range in LPD is calculated based on 4 hours bright sunny day.

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Solar Peripheral Pumps - GPE Series

PERFORMANCE CURVES



SPECIFICATIONS

Power range	120 - 210 W
Voltage	24 & 36 V, D.C.
Max. Head	36 m
Max. Discharge	2 m³/h
Pump size	1" x 1"



PUMPSET CONSIST OF :

- Pump
- Motor
- Control box
- Level sensor probes
- Power cable to connect control box & PV Modules

PERFORMANCE TABLE

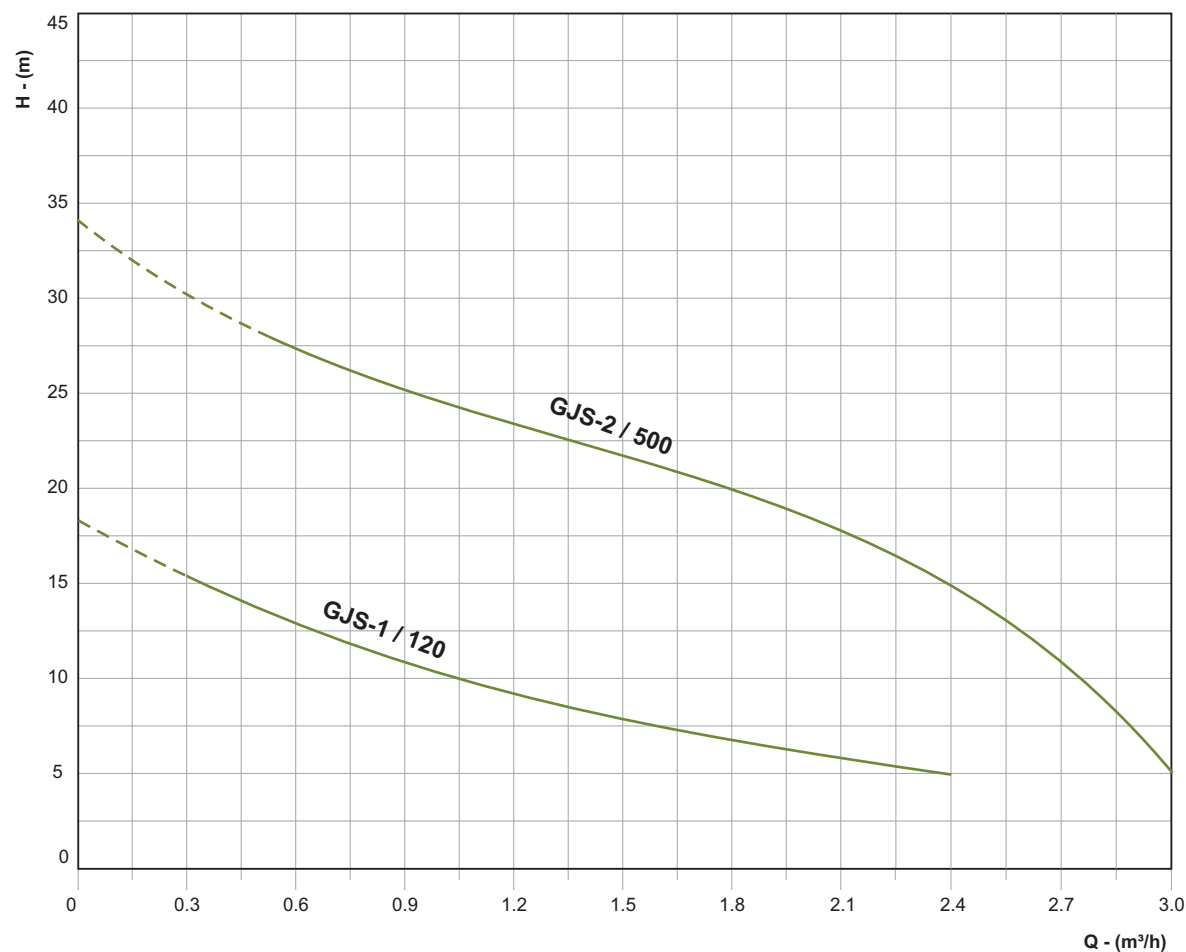
Model	Voltage (V)	Power (W)	Reqd. PV Input Power (W)	Max. Head (m)	Head Range (m)	Flow Range (LPD)*
GPE-1 / 120	24	120	160	23	20 - 5	1200 - 6000
GPE-1E / 210	36	210	275	36	28 - 5	2000 - 8000

The above performance curves are plotted under test condition with maximum DC input power.

* Flow range in LPD is calculated based on 4 hours bright sunny day.

Solar SS Jet Pumps - GJS Series

PERFORMANCE CURVES



SPECIFICATIONS

Power range	120 - 500 W
Voltage	24 & 48 V, D.C.
Max. Head	34 m
Max. Discharge	3 m³/h
Pump size	1" x 1"



PUMPSET CONSIST OF :

- Pump
- Motor
- Control box
- Level sensor probes
- Power cable to connect control box & PV Modules

PERFORMANCE TABLE

Model	Voltage (V)	Power (W)	Reqd. PV Input Power (W)	Max. Head (m)	Head Range (m)	Flow Range (LPD)*
GJS-1 / 120	24	120	160	18	15 - 5	1200 - 9600
GJS-2 / 500	48	500	650	34	28 - 5	2000 - 12000

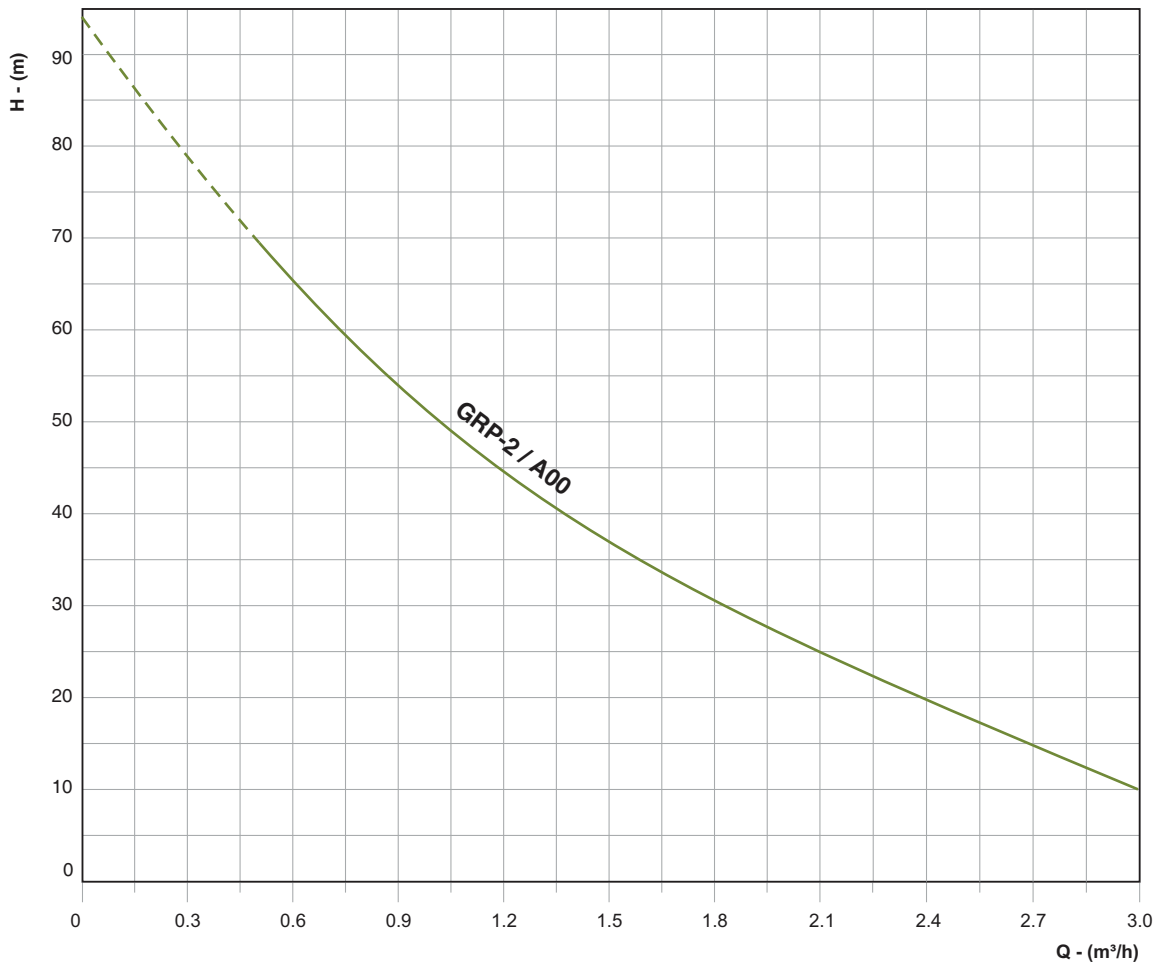
The above performance curves are plotted under test condition with maximum DC input power.

* Flow range in LPD is calculated based on 4 hours bright sunny day.

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Solar Screw Pumps - GRP Series

PERFORMANCE CURVES



SPECIFICATIONS

Power range	1000 W
Voltage	110 V, D.C.
Max. Head	95 m
Max. Discharge	3 m³/h
Pump size	1" x 1"



PUMPSET CONSIST OF :

- Pump
- Motor
- Control box
- Level sensor probes
- Power cable to connect control box & PV Modules

PERFORMANCE TABLE

Model	Voltage (V)	Power (W)	Reqd. PV Input Power (W)	Max. Head (m)	Head Range (m)	Flow Range (LPD)*
GRP-2 / A00	110	1000	1400	95	70 - 10	2000 - 12000

The above performance curves are plotted under test condition with maximum DC input power.

* Flow range in LPD is calculated based on 4 hours bright sunny day.

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DC Control Box types and Connection Details

Model	GT-12-24	GT-36-48	GT-72-110*
Pump Voltage	12 / 24V DC	36 / 48V DC	72 / 110V DC
PV Input Voltage	> 34V DC	> 68V DC	> 136V DC
PV Max. (VOC)	50V DC	100V DC	200V DC
Battery Input Voltage	12 / 24V DC	36 / 48V DC	-
Low Voltage Cut-off	11 / 22V DC	33 / 46V DC	70 / 108V DC
Restart Voltage	11.7 / 23.4V DC	35 / 47V DC	71 / 109V DC
Rated Current	10 A	10 A	12.5 A
Max. Power	200 W	500 W	1200 W
Max. Ambient Temp.	50°C	50°C	50°C



CABLE SIZE & SELECTION

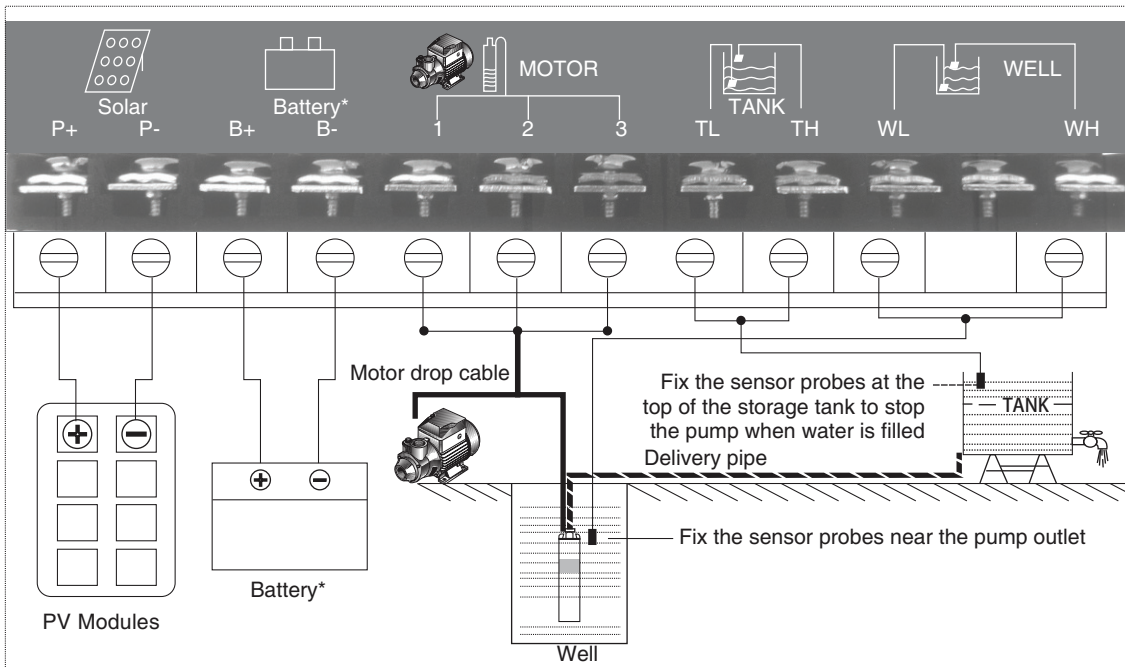
The lead out cable size for submersible pumps upto 500W is 1.5 sq.mm. Use 2 sq.mm cable when installed for more than 20m length.

The lead out cable size for submersible pumps for 1000W is 2 sq.mm. Use 2.5 sq.mm cable when installed for more than 20m length.

INSTALLATION PROCEDURE

1. Open the packing and inspect the pump, control box, PV Modules and other accessories are in good condition.
2. Install the pumpset as like normal submersible / Surface pump and connect it to the control box, PV Modules, battery (if required) & water level sensors as given in the below diagram (fig. 1).
3. The ON / OFF switch must be in middle position (OFF position) while installation

Installation Procedure



The above connection diagram is common for both submersible and surface pump installations.

FIG 1

Note :

1. Solar mode :
Switch position to "SOLAR"
2. Battery mode* :
Switch position to "BAT"

* Battery mode is not available for 1000 W pump models.

In view of continuous developments, the information / descriptions / specifications / illustrations are subject to change without notice.

PV Module Connections

Generally the PV Modules are available with specific Power (watts) and Voltage (volts) combinations. To get the reqd. D.C. output for operating the solar pump we need to either connect the panels in Series or Parallel or combination of Series & Parallel connections.

PV MODULES SELECTION

The power of PV Modules = power of pump x 1.3. The maximum Peak Voltage of the PV Modules must not exceeds the maximum Input Voltage of the system. In case of battery mode operation PV Modules power must be calculated as 1.5 times of pump power.

PV MODULES SELECTION CHART

Pump rating	PV Module Spec-Solar mode operation				PV Modules Connection Method	PV Module Spec-Battery mode operation			
	P _{max}	V _{mp}	V _{oc}	No. of Modules		P _{max}	V _{mp}	V _{oc}	No. of Modules
80W / 12V	105W	17-18	21-22	1	Direct	120W	17-18	21-22	1
120W / 24V	160W	34-36	42-44	1	Direct	180W	34-36	42-44	1
210W / 36V	90W	17-18	21-22	3	Series	110W	17-18	21-22	3
230W / 36V	100W	17-18	21-22	3	Series	115W	17-18	21-22	3
300W / 36V	130W	17-18	21-22	3	Series	150W	17-18	21-22	3
500W / 48V	85W	17-18	21-22	8	2x4 modules in series, 2 arrays in parallel	95W	17-18	21-22	8
600W / 48V	130W	24	29.5	6	2x3 modules in series, 2 arrays in parallel	150W	24	29.5	6
1000W / 110V	100W	17-18	21-22	14	2x7 modules in series, 2 arrays in parallel	NA	NA	NA	NA
1200W / 110V	100W	17-18	21-22	16	2x8 modules in series, 2 arrays in parallel	NA	NA	NA	NA
1500W / 110V	120W	17-18	21-22	16	2x8 modules in series, 2 arrays in parallel	NA	NA	NA	NA

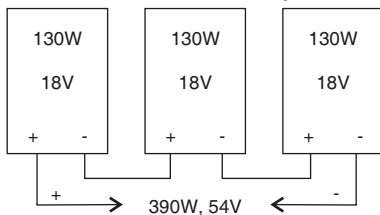
SERIES CONNECTIONS

When the PV Modules are connected in series the output Power as well as Voltage of each Module will gets added.

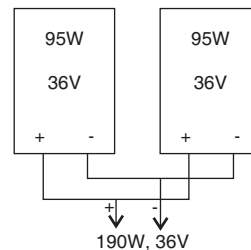
PARALLEL CONNECTIONS

When the PV Modules are connected in parallel the output Power of each Module alone gets added.

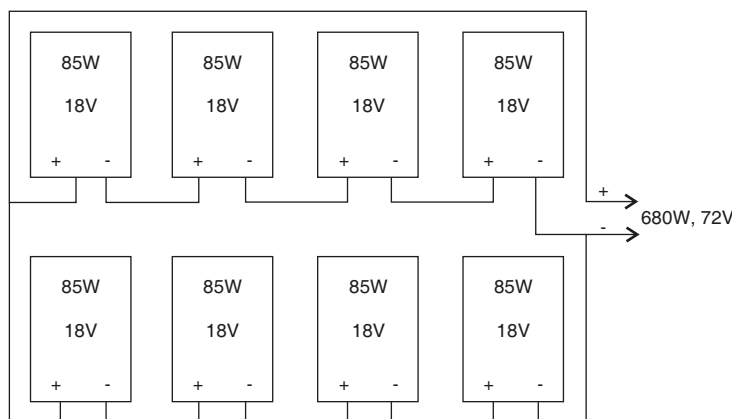
**Series connection diagram for 300W,
36V DC Solar Pump**



**Parallel connection diagram for 150W,
24V DC Solar Pump**



Combination of series & parallel connection diagram for 500W, 48V DC Solar Pump



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Battery Mode Operation

The battery mode option is only available upto 500W DC Solar Pumps & higher power rating pumps do not have this facility. Connect the battery terminals with the control box terminal connections as shown in fig.1 (page 13).

Set the selector switch in the control box to battery mode so that the PV Modules array charges the battery and simultaneously supplies power to run the pump. While the system is operated with battery, the output power of solar modules should be 1.5 times of pump power, so that the battery can get charged and pump can also run simultaneously. When there is low / no sunlight the control box will take required power from batteries to run the pump.

Please refer below table for suitable battery capacities based on the pump voltage.

Pump Voltage	Battery Capacity	Qty	Connection
• 12V D.C. Solar Pump	150AH, 12V Battery	1 No	Direct
• 24V D.C. Solar Pump	150AH, 12V Battery	2 Nos.	Series connection
• 36V D.C. Solar Pump	150AH, 12V Battery	3 Nos.	Series Connection
• 48V D.C. Solar Pump	150AH, 12V Battery	4 Nos.	Series Connection

BATTERY SELECTION PROCEDURE

To calculate the battery capacity : $AH = \frac{T \times P}{V \times 0.6}$

To find the operating time of Pump : $T = \frac{AH \times V \times 0.6}{P}$

T - Pump running time in hours
 P - Pump power in Watts
 V - Battery voltage
 AH - Ampere hour (Battery capacity)

Note : To get the desired Voltage to run the Solar Pumps suitable no. of batteries can be connected in series.

Eg. To run a 24V D.C. Solar Pump, 12V battery x 2nos. need to be connected in series.

Example 1 (Pump running time calculation)

If the pump power is 200W, the battery capacity is 100AH, the battery voltage is 12V and when the battery is fully charged, then the pumpset running hour is calculated as : $100 \times 0.6 / (200 / 12) = 3.6$ hours.

Example 2 (Battery capacity calculation)

If the pump power is 200W, the battery voltage is 12V, and the battery need to be used for 3.6 hours, then the battery capacity is calculated as : $(3.6 / 0.6) \times (200 / 12) = 100AH$.

Note : The storage battery and frames required for solar panel mounting have to be sourced at customer end or contact our authorized dealer.

In view of continuous developments, the information / descriptions / specifications / illustrations are subject to change without notice.

AC Solar Pumping Systems



ANY AC SUBMERSIBLE OR SURFACE PUMPS (upto 110KW)

AC Solar Pump Controller (inverter to Operate AC Pumps)



VFD CUM INVERTER

C.R.I. AC Solar Pump Controller is used to convert DC Power generated from the PV Modules to 3Phase AC Power that drives any AC 3Phase Submersible or Surface Pumps.

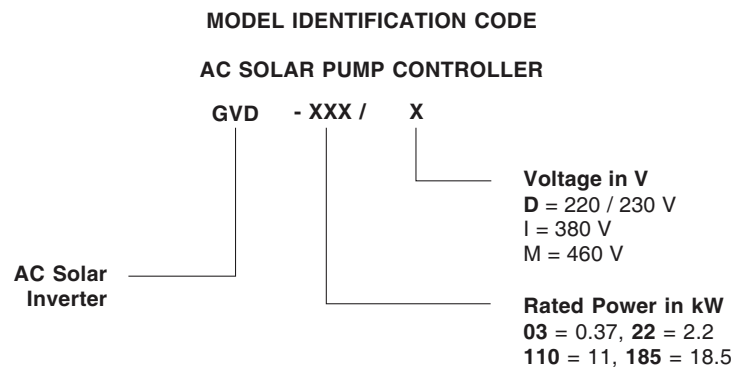
It consists of an efficient, programmed drive which acts as an inverter to change the DC power generated from the solar modules to AC power and operates the pump. In addition it gives complete protection to the pump connected to the system & controls its functions. The MPPT (max. power point tracking) function of the controller improves the overall system efficiency.

FEATURES

- Both DC & 3Ph AC input - with manual / Auto change over switch
- Can run both 50Hz & 60Hz pumps
- Maximum power point tracking (MPPT) function to improve the system efficiency
- Self diagnostic & protection
- Auto start / stop based on solar light intensity
- Water level sensors for storage tank
- Protects from dry run, high / low voltage, over / under load operations, phase failures, etc.
- Indicators for faulty operations
- Output filter
- Battery Charging & backup provision (upto 2.2kW - Optional)

APPLICATIONS

These solar pump controllers are used to operate regular AC pumps using solar power in • Residential • Irrigation • Live stock farms • Public water supply • Small farms • De-watering • Industries • Golf course, etc.,



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SPECIFICATIONS

Power range	0.37 - 7.5 kW - 220V output controller 1.1 - 18.5 kW - 380V output controller
Versions	3Ph - 220V / 230V in both 50 & 60Hz 3Ph - 380V in both 50 & 60Hz 3Ph - 460V in 60Hz
Input variants	DC input from PV Modules & 3Ph - AC input from Generator / Grid
Degree of Protection	IP 42
Ambient Temperature	-10 to +40°C

CONTROLLER INPUT REQUIREMENTS

For 220 / 230 V Pumps - 50 / 60Hz

Controller Specification						Recommended PV Module Specification						PV Module Output		
Model	Rated Power in kW	Rated Amps (A)	Input DC Power (W)	Input DC Voltage range (Vmp)	Voc	Pmax (W)	Vmp	Voc	Imax (A)	Isc (A)	Panel Qty.	No. of Array	Power (W)	Voltage (V DC)
GVD - 03D	0.37	3.5	810	270 - 370	400	90	35.2	44	2.56	2.74	9	1	810	316.8
GVD - 05D	0.55	4.7	810	270 - 370	400	90	35.2	44	2.56	2.74	9	1	810	316.8
GVD - 07D	0.75	6.7	1190	270 - 370	400	70	18	22.5	3.89	4.16	17	1	1190	302.9
GVD - 11D	1.1	7.5	1620	270 - 370	400	90	35.2	44	2.56	2.74	18	2	1620	316.8
GVD - 15D	1.5	9.8	2430	270 - 370	400	90	35.2	44	2.56	2.74	27	3	2430	316.8
GVD - 22D	2.2	13.3	3060	270 - 370	400	170	35.2	44	4.83	5.17	18	2	3060	316.8
GVD - 30D	3	17.6	4590	270 - 370	400	170	35.2	44	4.83	5.17	27	3	4590	316.8
GVD - 40D	4	24.4	5310	270 - 370	400	295	36.4	45	8.10	8.87	18	2	5310	327.6
GVD - 55D	5.5	31	7560	270 - 370	400	280	35.8	44.4	7.82	8.37	27	3	7560	322.2
GVD - 75D	7.5	46.2	10080	270 - 370	400	280	35.8	44.4	7.82	8.37	36	4	10080	322.2

* Optional AC Input Voltage = 3Ph, 200 - 240V ±10%

For 380 V Pumps - 50 / 60Hz

Controller Specification						Recommended PV Module Specification						PV Module Output		
Model	Rated Power in kW	Rated Amps(A)	Input DC Power (W)	Input DC Voltage range (Vmp)	Voc	Pmax (W)	Vmp	Voc	Imax (A)	Isc (A)	Panel Qty.	No. of Array	Power (W)	Voltage (V DC)
GVD - 11I	1.1	4.1	1620	500-650	800	90	35.2	44	2.56	2.74	18	1	1620	633.6
GVD - 15I	1.5	5.6	2380	500-650	800	70	18	22.5	3.89	4.16	34	1	2380	598.4
GVD - 22I	2.2	7.3	3300	500-650	800	110	18	22.5	6.11	6.54	30	1	3300	540
GVD - 30I	3	8.8	4420	500-650	800	130	18	22.3	7.22	8.12	34	1	4420	612
GVD - 40I	4	12.5	5440	500-650	800	170	35.2	44	4.83	5.17	32	2	5440	563.2
GVD - 55I	5.5	15.6	7480	500-650	800	110	18	22.5	6.11	6.54	68	2	7480	612
GVD - 75I	7.5	23.1	10080	500-650	800	280	35.8	44.4	7.82	8.37	36	2	10080	644.4
GVD - 110I	11	31	15120	500-650	800	280	35.8	44.4	7.82	8.37	54	3	15120	644.4
GVD - 150I	15	38	20160	500-650	800	280	35.8	44.4	7.82	8.37	72	4	20160	644.4
GVD - 185I	18.5	44	25200	500-650	800	280	35.8	44.4	7.82	8.37	90	5	25200	644.4

* Optional AC Input Voltage = 3Ph, 380 - 480V ±10%

The above recommended PV module specifications can be changed on availability at installation place, provided the total operating DC input power & voltage (Pmax, Vmp, Voc) are nearest to the above given values.

PV module selection details for higher rating inverter (above 18.5 kW) can be provided on request.**60Hz for 460V 3Ph solar controllers can also be supplied on request.**

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Terminal Connection Diagram

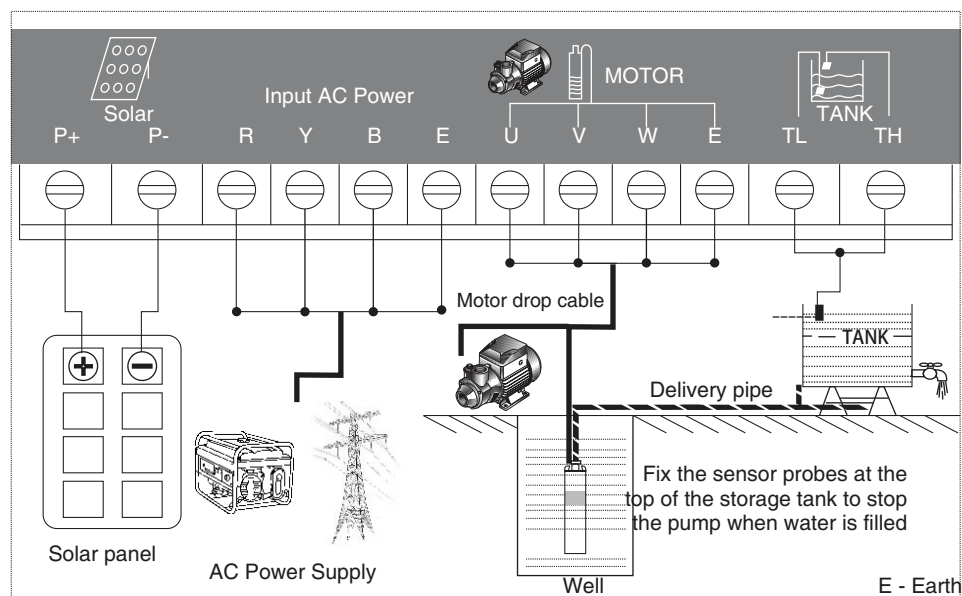


FIG 2

- Connect the required DC Power from the PV Modules to the DC Input terminals (P+, P-).
- To operate the pump when low / No sun light, connect 3Ph AC supply from generator or AC grid to the AC input terminals (R, Y, B & E).
- Select the desired input power (DC / AC) using the rotary manual selector switch. (Not applicable for auto changeover models)
- Connect the 3Ph motor cable leads to the AC output terminals (U, V, W & E).
- Connect the float switch cable to the tank level control terminals (TL, TH) to control the water level in the storage tank.
- In case of dry run, the system will trips off automatically and restart after every one hour interval.
- In case of any faulty operation Indications, reset the system with Reset button or by switching OFF & ON.
- For installation above 75mts, an output filter (choke) need to be provided.

Solar Photo Voltaic (PV) Modules



THE POWER OF SUN IS ABUNDANT. LET'S HARNESS IT FOR PRODUCTIVE USAGE FOR ALL.

Solar energy produced by PV Modules is well known as a clean and reliable source of green energy without polluting our environment. C.R.I. offers high-quality, efficient Photo Voltaic modules for all solar needs.

PV Modules collect solar radiation from the sun and actively convert that energy to electricity. PV Modules are comprised of several individual solar cells and function similarly to large semiconductors and utilize a large-area p-n junction diode. When the solar cells are exposed to sunlight, the p-n junction diodes convert the energy from sunlight into usable electrical energy.

The energy generated from photons striking the surface of the PV Module allows electrons to be knocked out of their orbits and released, and electric fields in the solar cells pull these free electrons in a directional current (D.C.), from which metal contacts in the solar cell can generate electricity. The more solar cells in a PV Module and the higher the quality, the more total electrical output the PV Module can produce. The conversion of sunlight to usable electrical energy is otherwise known as the Photovoltaic Effect. The photovoltaic effect arises from the properties of the p-n junction diode, as such there are no moving parts in a PV Module.

Factors that affect the output of PV Modules are weather conditions, shade caused by obstructions to direct sunlight, and the angle and position at which the PV Module is installed. PV Modules delivers the best output when placed in direct sunlight, away from obstructions that might cast shade, and in areas with high regional solar insolation ratings. PV Module efficiency can be optimized by using dynamic mounts that follow the position of the sun in the sky and rotate the PV Module to get the maximum amount of direct exposure during the day as possible.

Features

- High quality solar cells - Polycrystalline & Monocrystalline.
- Modules ranging from 35 Wp to 300 Wp
- Strong aluminium alloy frame, tempered glass and water proof lamination result in rugged protection against hostile conditions & withstand high levels of ultra violet radiation & moisture.
- Junction box with IP 65 protection.
- IEC 61215 certified Solar PV Modules.
- Bypass diodes to avoid partial shading.

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Solar Module Specifications

Model	GPP-35/18	GPP-45/18	GPP-50/18	GPP-65/18	GPP-70/18	GPP-80/18	GPP-85/18	GPP-90/36
Power (Pmax)	35W	45W	50W	65W	70W	80W	85W	90W
Max. Power Voltage (Vmax)	17.6V	17.6V	18.0V	17.6V	18.0V	17.6V	18.0V	35.2V
Max. Current (Imp)	1.99A	2.56A	2.78A	3.69A	3.89A	4.55A	4.72A	2.56A
Open Circuit Voltage (Voc)	22.0V	22.0V	22.5V	22.0V	22.5V	22.0V	22.5V	44.0V
Short Circuit Current (Isc)	2.13A	2.74A	2.97A	3.95A	4.16A	4.86A	5.05A	2.74A
Max. System Voltage	600V	600V	600V	600V	600V	600V	600V	600V
Series Fuse rating	10A	10A	10A	10A	10A	10A	10A	10A
Temp. Co-efficient Voltage	-60.8mV/°C	-60.8mV/°C	-60.8mV/°C	-60.8mV/°C	-60.8mV/°C	-60.8mV/°C	-60.8mV/°C	-60.8mV/°C
Temp. Co-efficient Current	2.2mA/°C	2.2mA/°C	2.2mA/°C	2.2mA/°C	2.2mA/°C	2.2mA/°C	2.2mA/°C	2.2mA/°C
Cell efficiency	16.40%	15.89%	17.65%	15.30%	16.40%	15.30%	16.20%	15.80%
Number of cells	36	36	36	36	36	36	36	72
Max. Power tolerance	5%	5%	5%	5%	5%	5%	5%	5%
Dimention	508*508 *25	668*541 *35	668*541 *35	760*670 *35	760*670 *35	900*668 *35	900*668 *35	1020*670 *35
Weight	3.5kg	5.0kg	5.0kg	7.0kg	7.0kg	8.3kg	8.3kg	9.5kg
Mounting holes Pitch (Y-mm)	254	493	493	380	380	450	450	510
Mounting holes Pitch (X-mm)	471	334	334	622	622	620	620	622

Model	GPP-95/36	GPP100/18	GPP-105/18	GPP-110/18	GPP-120/18	GPP-125/18	GPP-130/18	GPP-135/18
Power (Pmax)	95W	100W	105W	110W	120W	125W	130W	135W
Max. Power Voltage (Vmax)	36.0V	17.6V	17.8V	18.0V	17.6V	17.8V	18.0V	17.8V
Max. Current (Imp)	2.64A	5.68A	5.9A	6.11A	6.82A	7.02A	7.22A	7.58A
Open Circuit Voltage (Voc)	45.0V	22.0V	22.3V	22.5V	22.0V	22.3V	22.5V	22.3V
Short Circuit Current (Isc)	2.82A	6.08A	6.31A	6.54A	7.30A	7.51A	7.73A	8.12A
Max. System Voltage	600V	600V	600V	600V	600V	600V	600V	600V
Series Fuse rating	10A	10A	10A	10A	10A	10A	10A	10A
Temp. Co-efficient Voltage	-60.8mV/°C	-60.8mV/°C	-60.8mV/°C	-60.8mV/°C	-60.8mV/°C	-60.8mV/°C	-60.8mV/°C	-60.8mV/°C
Temp. Co-efficient Current	2.2mA/°C	2.2mA/°C	2.2mA/°C	2.2mA/°C	2.2mA/°C	2.2mA/°C	2.2mA/°C	2.2mA/°C
Cell efficiency	16.70%	15.40%	16.70%	17.00%	15.40%	16.50%	16.70%	16.70%
Number of cells	72	36	36	36	36	36	36	36
Max. Power tolerance	5%	5%	5%	5%	5%	5%	5%	5%
Dimention	1020*670 *35	1100*670 *35	1100*670 *35	1100*670 *35	1320*670 *35	1320*670 *36	1320*670 *37	1390*670 *36
Weight	9.5kg	10.2kg	10.2kg	10.2kg	12.2kg	12.2kg	12.2kg	12.8kg
Mounting holes Pitch (Y-mm)	510	550	550	550	660	660	660	695
Mounting holes Pitch (X-mm)	622	622	622	622	622	622	622	622

All above specification are at standard test condition - 25°C cell temperature & 1000 W / m² irradiance.

Note: Cables and connectors are optional, IP-65 Junction Box, Mc4 compatible M/F connectors along with 1 meter cables shall be provided against request.

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Solar Module Specifications

Model	GPP-140/18	GPP-145/18	GPP-150/36	GPP-155/36	GPP-160/36	GPP-165/36	GPP-170/36	GPP-175/36
Power (Pmax)	140W	145W	150W	155W	160W	165W	170W	175W
Max. Power Voltage (Vmax)	18.0V	18.0V	35.2V	35.6V	36.0V	36.0V	35.2V	35.6V
Max. Current (Imp)	7.78A	8.06A	4.26A	4.35A	4.44A	4.58A	4.83A	4.92A
Open Circuit Voltage (Voc)	22.5V	22.5V	44.0V	44.6V	45.0V	45.0V	44.0V	44.6V
Short Circuit Current (Isc)	8.32A	8.62A	4.56A	4.66A	4.76A	4.90A	5.17A	5.26A
Max. System Voltage	600V	600V	600V	600V	600V	600V	600V	600V
Series Fuse rating	10A	15A	10A	10A	10A	10A	10A	10A
Temp. Co-efficient Voltage	-60.8mV/°C	-60.8mV/°C	-60.8mV/°C	-60.8mV/°C	-60.8mV/°C	-60.8mV/°C	-60.8mV/°C	-60.8mV/°C
Temp. Co-efficient Current	2.2mA/°C	2.2mA/°C	2.2mA/°C	2.2mA/°C	2.2mA/°C	2.2mA/°C	2.2mA/°C	2.2mA/°C
Cell efficiency	17.00%	17.60%	16.10%	16.50%	17.00%	16.40%	16.20%	16.40%
Number of cells	36	36	72	72	72	72	72	72
Max. Power tolerance	5%	5%	5%	5%	5%	5%	5%	5%
Dimension	1390*670 *37	1475*665 *35	1110*982 *35	1110*982 *35	1110*982 *35	1186*982 *35	1258*982 *35	1258*982 *35
Weight	12.8kg	13.5kg	15kg	15kg	15kg	16.0kg	17.0kg	17.0kg
Mounting holes Pitch (Y-mm)	695	737.5	555	555	555	593	629	629
Mounting holes Pitch (X-mm)	622	617	934	934	934	934	934	934

Model	GPP-180/36	GPP-185/36	GPP-190/36	GPP-185/24	GPP-190/24	GPP-195/24	GPP-205/36	GPP-210/36
Power (Pmax)	180W	185W	190W	185W	190W	195W	205W	210W
Max. Power Voltage (Vmax)	36.0V	35.6V	36.0V	24.0V	24.2V	24.6V	35.2V	35.6V
Max. Current (Imp)	5.00A	5.20A	5.28A	7.71A	7.85A	7.93A	5.82A	5.90A
Open Circuit Voltage (Voc)	45.0V	44.6V	45.0V	29.5V	29.7V	30.0V	44.0V	44.6V
Short Circuit Current (Isc)	5.35A	5.56A	5.65A	8.25A	8.40A	8.48A	6.23A	6.31A
Max. System Voltage	600V	600V	600V	600V	600V	600V	600V	600V
Series Fuse rating	10A	10A	10A	15A	15A	15A	10A	10A
Temp. Co-efficient Voltage	-60.8mV/°C	-60.8mV/°C	-60.8mV/°C	-60.8mV/°C	-60.8mV/°C	-60.8mV/°C	-60.8mV/°C	-60.8mV/°C
Temp. Co-efficient Current	2.2mA/°C	2.2mA/°C	2.2mA/°C	2.2mA/°C	2.2mA/°C	2.2mA/°C	2.2mA/°C	2.2mA/°C
Cell efficiency	17.20%	16.40%	16.90%	16.30%	16.70%	17.20%	16.20%	16.60%
Number of cells	72	72	72	48	48	48	72	72
Max. Power tolerance	5%	5%	5%	5%	5%	5%	5%	5%
Dimension	1258*982 *35	1318*982 *35	1318*982 *35	1324*982 *35	1324*982 *35	1324*982 *35	1475*982 *45	1475*982 *45
Weight	17.0kg	17.8kg	17.8kg	17.9kg	17.9kg	17.9kg	19.0kg	19.0kg
Mounting holes Pitch (Y-mm)	629	659	659	662	662	662	737.5	737.5
Mounting holes Pitch (X-mm)	934	934	934	934	934	934	919	919

All above specification are at standard test condition - 25°C cell temperature & 1000 W / m² irradiance.

Note: Cables and connectors are optional, IP-65 Junction Box, Mc4 compatible M/F connectors along with 1 meter cables shall be provided against request.

In view of continuous developments, the information / descriptions / specifications / illustrations are subject to change without notice.

Solar Module Specifications

Model	GPP-205/24	GPP-210/24	GPP-215/24	GPP-220/24	GPP-230/30	GPP-235/30	GPP-240/30	GPP-245/30	GPP-250/36
Power (Pmax)	205W	210W	215W	220W	230W	235W	240W	245W	250W
Max. Power Voltage (Vmax)	26.2V	26.4V	24.6V	26.8V	29.6V	29.8V	30.0V	30.2V	35.6V
Max. Current (Imp)	7.81A	7.95A	8.08A	8.21A	7.77A	7.89A	8.00A	8.11A	7.02A
Open Circuit Voltage (Voc)	32.96V	33.2V	33.5V	33.8V	36.63V	36.8V	37.0V	37.2V	44.2V
Short Circuit Current (Isc)	8.36A	8.51A	8.65A	8.78A	8.31A	8.44A	8.56A	8.68A	7.51A
Max. System Voltage	600V	600V	600V	600V	600V	600V	600V	600V	600V
Series Fuse rating	15A	15A	15A	15A	15A	15A	15A	15A	10A
Temp. Co-efficient Voltage	-60.8mV/°C	-60.8mV/°C	-60.8mV/°C	-60.8mV/°C	-60.8mV/°C	-60.8mV/°C	-60.8mV/°C	-60.8mV/°C	-60.8mV/°C
Temp. Co-efficient Current	2.2mA/°C	2.2mA/°C	2.2mA/°C	2.2mA/°C	2.2mA/°C	2.2mA/°C	2.2mA/°C	2.2mA/°C	2.2mA/°C
Cell efficiency	16.00%	16.40%	16.80%	17.20%	16.20%	16.40%	16.80%	17.30%	16.00%
Number of cells	54	54	54	54	60	60	60	60	72
Max. Power tolerance	5%	5%	5%	5%	5%	5%	5%	5%	5%
Dimention	1475*983*45	1475*983*45	1475*983*45	1475*983*45	1640*982*45	1640*982*45	1640*982*45	1640*982*45	1798*982*50
Weight	19.0kg	19.0kg	19.0kg	19.0kg	20.0kg	20.0kg	20.0kg	20.0kg	23kg
Mounting holes Pitch (Y-mm)	737.5	737.5	737.5	737.5	820	820	820	820	899
Mounting holes Pitch (X-mm)	919	919	919	919	919	919	919	919	909

Model	GPP-255/36	GPP-260/36	GPP-265/36	GPP-270/36	GPP-275/36	GPP-280/36	GPP-285/36	GPP-290/36	GPP-295/36
Power (Pmax)	255W	260W	265W	270W	275W	280W	285W	290W	295W
Max. Power Voltage (Vmax)	35.8V	36.0V	36.2V	36.0V	36.2V	35.8V	36.0V	36.2V	36.4V
Max. Current (Imp)	7.12A	7.22A	7.32A	7.50A	7.60A	7.82A	7.92A	8.01A	8.10A
Open Circuit Voltage (Voc)	44.4V	44.6V	44.8V	44.6V	44.8V	44.4V	44.6V	44.8V	45.0V
Short Circuit Current (Isc)	7.62A	7.73A	7.83A	8.03A	8.13A	8.37A	8.47A	8.57A	8.67A
Max. System Voltage	600V	600V	600V	600V	600V	600V	600V	600V	600V
Series Fuse rating	10A	10A	10A	10A	10A	15A	15A	15A	15A
Temp. Co-efficient Voltage	-60.8mV/°C	-60.8mV/°C	-60.8mV/°C	-60.8mV/°C	-60.8mV/°C	-60.8mV/°C	-60.8mV/°C	-60.8mV/°C	-60.8mV/°C
Temp. Co-efficient Current	2.2mA/°C	2.2mA/°C	2.2mA/°C	2.2mA/°C	2.2mA/°C	2.2mA/°C	2.2mA/°C	2.2mA/°C	2.2mA/°C
Cell efficiency	16.40%	16.70%	17.00%	16.70%	17.00%	16.40%	16.70%	17.00%	17.40%
Number of cells	72	72	72	72	72	72	72	72	72
Max. Power tolerance	5%	5%	5%	5%	5%	5%	5%	5%	5%
Dimention	1798*982*50	1798*982*50	1798*982*50	1870*982*50	1870*982*50	1956*982*50	1956*982*50	1956*982*50	1956*982*50
Weight	23kg	23kg	23kg	24kg	24kg	25kg	25kg	25kg	25kg
Mounting holes Pitch (Y-mm)	899	899	899	935	935	978	978	978	978
Mounting holes Pitch (X-mm)	909	909	909	909	909	909	909	909	909

All above specification are at standard test condition - 25°C cell temperature & 1000 W / m² irradiance.

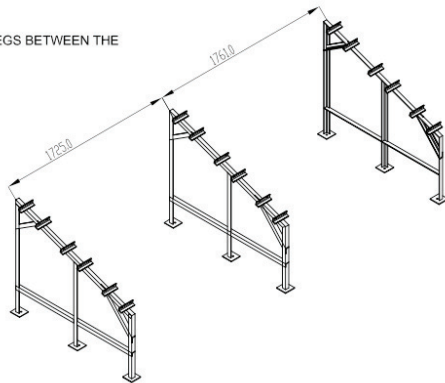
Note: Cables and connectors are optional, IP-65 Junction Box, Mc4 compatible M/F connectors along with 1 meter cables shall be provided against request.

In view of continuous developments, the information / descriptions / specifications / illustrations are subject to change without notice.

Solar PV Module Mounting Structures - (Fixed Type)

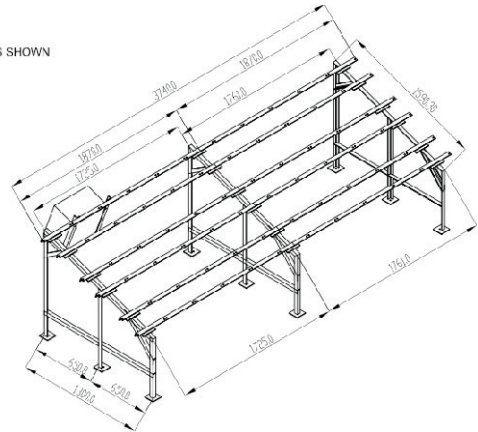
STEP -1

FIX THE STRUCTURE LEGS BETWEEN THE MENTIONED DISTANCE



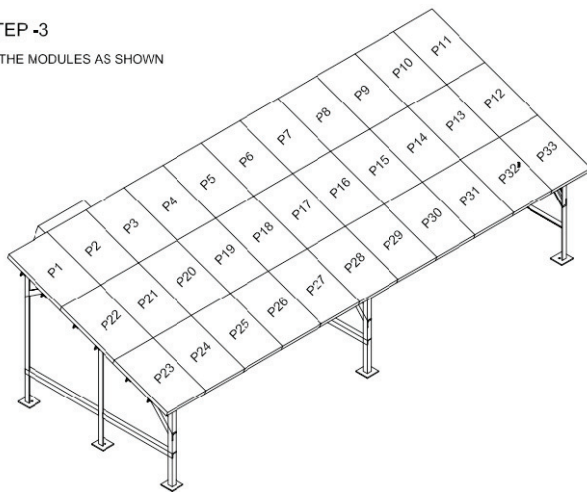
STEP -2

FIX THE L' ANGLES AS SHOWN



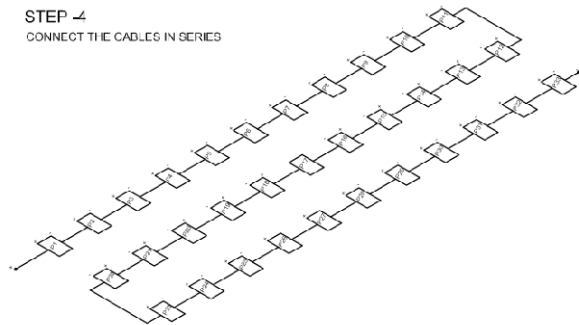
STEP -3

FIX THE MODULES AS SHOWN



STEP -4

CONNECT THE CABLES IN SERIES



The above solar PV module structures are indicative only and are designed with the dimensions of the 20 Wp Solar PV modules with a quantity of 33 nos.

The design, dimensions and structure may vary according to the requirement and site conditions. While installing the solar PV module structures it can be inclined by 10 to 20 angle at towards North-South direction.

Appropriate tracking systems (optional) shall be used to increase the efficiency of the solar PV modules power output. The place of the mounting structures should be a plain floor, concreted, shadow free from trees or buildings location.

The mounting structures are designed to withstand a wind speed of 150 km per hour. Appropriate protections systems should be in place for protecting the PV Modules against wind & any other exhaust climatic conditions.

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