DAB iCON

Solar Powered Borehole Pumps

Instruction Manual

DAB WATER•TECHNOLOGY

iCON SERIES

2017

WHITE INTERNATIONAL

CONTENTS

INTRODUCTION

ICON solar motor powers the new DAB system for the supply of clean water based on the most widely available renewable energy, the sun.

By means of the electric power supplied by a series of photovoltaic panels and taking advantage of the combination of a DAB S4 series 4" submersible pump with a built-in inverter type controller, the system is able to ensure a continuous drawing of water from a suitable source while the solar irradiation conditions may vary.

The permanent-magnet motor technology assures high efficiency of the system that, consequently, can require a smaller number of photovoltaic panels in order to work.

It is designed for easy use and requires no maintenance. It is the ideal solution for supplying water in remote areas, where the normal power supply of electricity from the power grid is inconsistent or completely unavailable.

To extend the flexibility of the system, each package is supplied with,

- DAB S4 Multistage 4" Water Pump to suit Head and Flow requirements
- iCON 4" Solar Motor AC/DC 2.2kW
- iSOLAR Controller
- Matched Solar panels (optional)
- Solar Panel mounting system (optional)
- Flow Switch (optional)

The iSOLAR Controller allows for the seamless integration of input signals such as level control, pressure switch or flow meter.

The controller will manage additional energy inputs such as grid supplied AC power, generator AC power and activate the starting of the generator when required.

CONSTRUCTION FEATURES OF THE DAB S4 PUMP

Multistage centrifugal type with radial or semi-axial impellers. Pump and motor directly coupled with rigid coupling.

Technopolymer impellers with stainless steel wearing parts, fitted on floating clearance rings made of synthetic low abrasion material, and technopolymer diffusers that impart significant wear resistance to the pump.

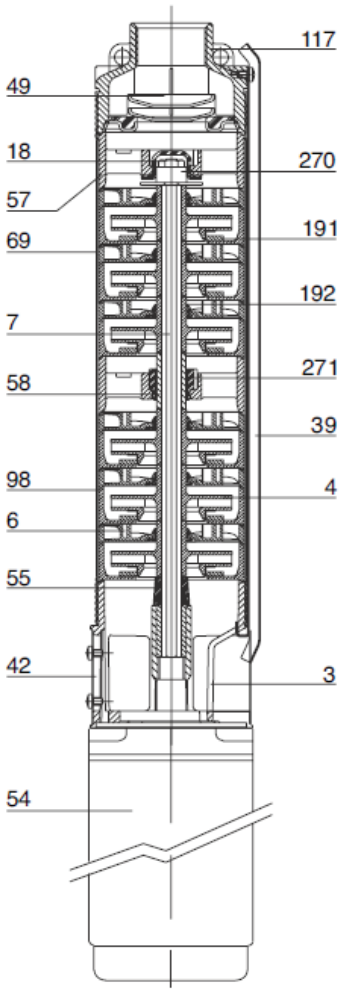
Pump liner, shaft and coupling, strainer and cable sheath in stainless steel. Base support and upper head in microcast AISI 304 stainless steel; check valve incorporated in the head.

The innovative wet end design gives the pump superior sand handling capabilities and provides maintenance free operation.

Maximum permitted amount of sand: 120 g/m3.

MATERIALS

N.	PART*	MATERIALS
3	BASE SUPPORT	AISI 304 MICROCAST STAINLESS STEEL
4	IMPELLER	TECHNOPOLYMER A with thrust in STAINLESS STEEL AISI 304 X5CrNi1810 - UNI 6900/71
6	DIFFUSER	TECHNOPOLYMER A
7	SHAFT WITH COUPLING	STAINLESS STEEL AISI 304 X5CrNi1810 - UNI 6900/71
18	LOCKING NUT	STAINLESS STEEL
39	CABLE SHEATH	STAINLESS STEEL AISI 304 X5CrNi1810 - UNI 6900/71
42	STRAINER	STAINLESS STEEL
49	VALVE	STAINLESS STEEL AISI 304 X5CrNi1810 - UNI 6900/71
54	MOTOR	STAINLESS STEEL AISI 304 X5CrNi1810 - UNI 6900/71
55	SPACER	TECHNOPOLYMER A
57	SUPPORT	TECHNOPOLYMER A
58	INTERMEDIATE BUSHING	STAINLESS STEEL AISI 304 X5CrNi1810 - UNI 6900/71
69	PUMP LINER	STAINLESS STEEL AISI 304 X5CrNi1810 - UNI 6900/71
98	DIFFUSER BODY	TECHNOPOLYMER A
117	UPPER HEAD	AISI 304 MICROCAST STAINLESS STEEL
191	FRONT THRUST RING	AISI 304 MICROCAST STAINLESS STEEL
192	REAR THRUST RING	AISI 304 MICROCAST STAINLESS STEEL
270	UPPER SHAFT GUIDE BUSH	RUBBER
271	INTERMEDIATE SHAFT GUIDE BUSH	ABRASION - PROOF SYNTHETIC MATERIAL



CONSTRUCTION FEATURES OF THE ICON SOLAR MOTOR

Innovative design allows the motor to be powered by both AC and DC power sources.

The motor is one size for all models with a maximum power output (P2) of 2200 W and is suitable for selected DAB pumps only. The speed range of the motor is 1800 rpm to 3000 rpm depending on the power input and load.

The motor uses rare earth permanent magnets, and has a built-in electronic unit comprising a frequency converter and motor controller. Vector control and MPPT are used to select the best operating point for the pump, based on the energy available from the input source.

The motor can be supplied with either AC or DC voltage.

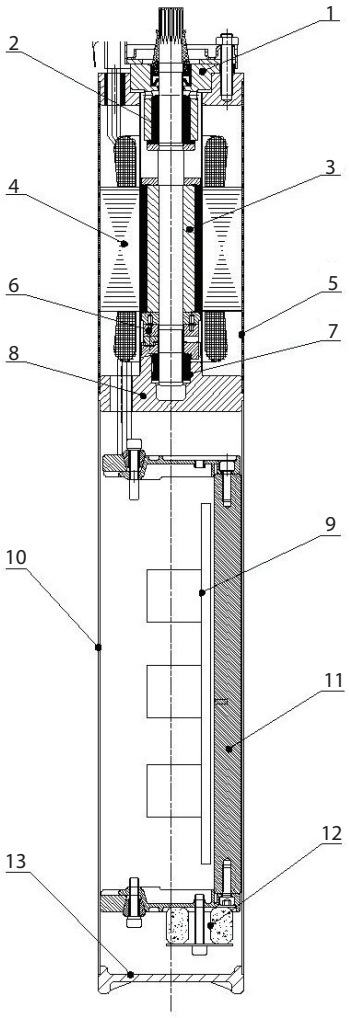
Note: Maximum axial thrust 3000N. Maximum Pump P2 load 1.5 kW (2hp).

MOTOR ENERGY INPUT CAPABILITIES

Voltage	Current	Energy
90 – 360V DC	12A DC (ISC)	Direct Current eg Solar
90 – 240V AC	10A AC	Alternating Current eg Generator or Mains Supply

MATERIALS

N.	PART*	MATERIALS
1	UPPER BEARING HOUSING	STAINLESS STEEL AISI 304 X5CrNi1810 - UNI 6900/71
2	UPPER BEARING	SILICON CARBIDE
3	PERMANENT MAGNET ROTOR	
4	STATOR	
5	MOTOR HOUSING	STAINLESS STEEL AISI 304 X5CrNi1810 - UNI 6900/71
6	THRUST BEARING	GRAPHITE
7	LOWER BEARING	SILICON CARBIDE
8	LOWER BEARING HOUSING	STAINLESS STEEL AISI 304 X5CrNi1810 - UNI 6900/71
9	CONTROL MODULE	
10	CONTROLLER HOUSING	STAINLESS STEEL AISI 304 X5CrNi1810 - UNI 6900/71
11	HEAT CONDUCTOR	ALUMINIUM
12	POWER FILTER COIL	
13	BASE	STAINLESS STEEL AISI 304 X5CrNi1810 - UNI 6900/71



iSOLAR CONTROLLER

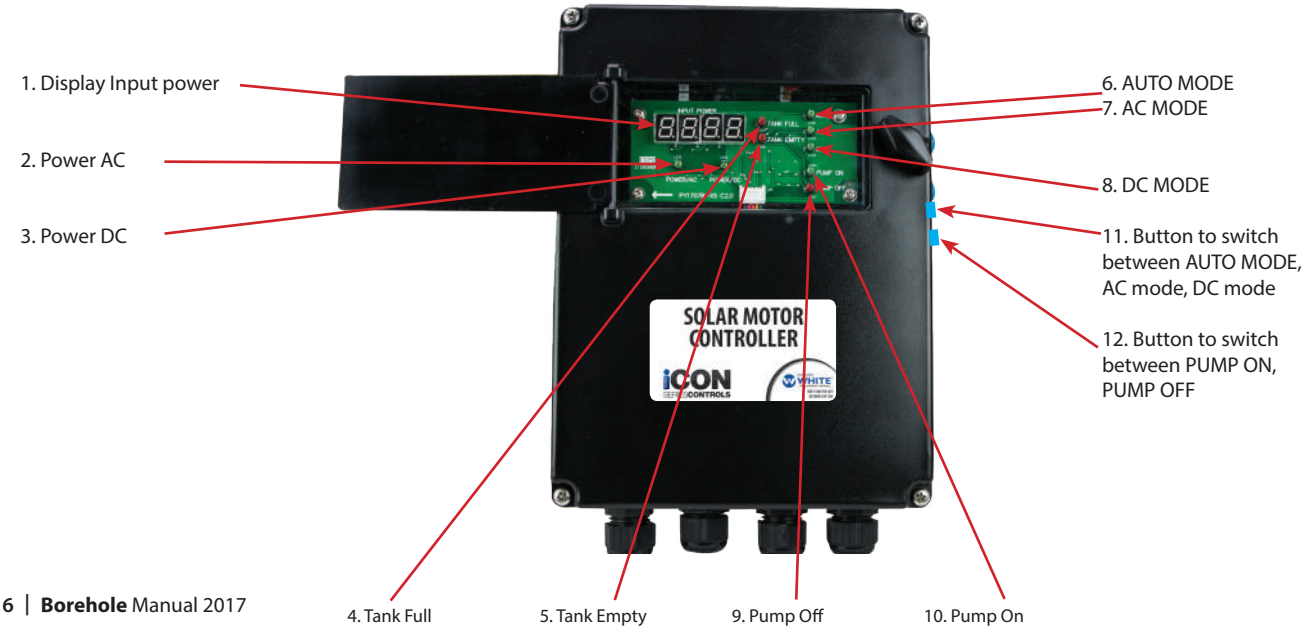
Operation and features

The iSOLAR controller is capable of the following functions:

1. Display input power
2. Display of mode of AC
3. Display of mode of DC
4. Display of tank full
5. Display of tank empty
6. AUTO MODE
7. Ability to select the incoming power source. In AC MODE, the incoming power source can be from Mains power supply or a generator.
8. Ability to select the incoming power source. In DC MODE, the power supply can be from either Solar Panels or Battery. However, DC will be the favoured power supply.
9. Pump ON
10. Pump OFF
11. Button to switch between AUTO MODE, AC MODE, DC MODE
12. Button to switch between Pump ON, Pump OFF

The iSOLAR controller is capable of the following features:

- The iSOLAR controller can take signals from two float switches placed in a tank or similar.
- The high level float switch signal indicates on SP Monitor that the reservoir/tank is full and at this point the controller stops the pump. When the water level of the storage tank drops, the float drops closed and the pump returns to operation after 10 minutes. Within 10min, the "TANK FULL" signal light remains on and the display starts counting down from "600" to "0." The countdown ends and the "TANK FULL" indicator goes off and the pump system restarts.
- The low level float switch signal indicates on SP Monitor that the reservoir/tank is empty and at this point the controller starts the pump. When the water wells or pools without water, the water under the float drop and closed, PV monitor "TANK EMPTY" signal indicator light, direct the pump system immediately shut down. When the water level rises, the float rises and falls, and the pump returns to operation after 10 minutes. Within 10 minutes, the "TANK EMPTY" signal light remains on and the display starts counting down from "600" to "0." The countdown is over and the "tank full" indicator goes off and the pump system restarts. On power up, if tank is not full, then the iSOLAR controller powers the pump to fill the tank.
- The iSOLAR controller is suitable for outdoor installation and is weather-proof, however, its location/positioning against direct sun light should be avoided.



iSOLAR CONTROLLER INSTALLATION

WARNING

- The power supply from any DC or AC supply can cause serious harm or death from electrocution.
- Apply appropriate safety procedures when working on or with any system component.
- Only suitably qualified personal should be involved in the electrical connection / disconnection and handling of the equipment. Off-grid electrical equipment is subject to applicable state, national and country electrical standards.
- The iCON Solar Motor contains capacitors that must be allowed to discharge before handling
- Allow a minimum of 1 MINUTE for stored energy to dissipate before handling the motor.
- The Solar panels will create electrical energy when exposed to light. Assume all panel cables are "live" at all times and handle with appropriate safety equipment and procedures.

Caution

Isolate all electrical sources before commencing any installation, servicing or repair on any component in the installation.
The iCON Control module is used to switch AC and DC power supplies and can automatically start a connected generator or switch between DC (Solar) or AC (Generator / Mains) power sources at ANY time.
Ensure all energy sources and generator starting circuit is properly locked-out before working on the system.

Electrical Component Selection

When using DC power such as supply from Solar Panels, any switches, contactors, sensors, meters, recorders used in the electrical connection and monitoring of the installation MUST BE selected according to the Input power available and rated for DC POWER supply.

Control Panel Mounting

The iCON Control Panel is IP65 Rated however it is recommended that the panel is not mounted in direct sunlight.
Mounting the controller Facing SOUTH and behind the Solar Panel array is often a good way to protect the panel.
Consideration should be given to mounting the control panel inside a steel cabinet (not included) to allow for easy access to isolation switches and termination of supply feeds and input control feeds.

Earthing

As most Solar installations are –off-grid, particular attention must be paid to earthing of the controller and pump motor. Follow the instructions in the controller manual and legislated electrical requirements for your area.

Switching between DC and AC supplies

The iSOLAR controller can be manually switched between a DC power supply and AC supply or the controller will perform the change when in AUTO mode.
During the switch over the controller in the iSOLAR 4" motor runs through an automatic discharge process to dissipate the electrical charge contained in the capacitors fitted to the electrical motor. This process cannot be sped up.

If the pump is not running when there is a suitable input power supply, firstly check the display panel to see if the changeover is taking place before further investigation.

The controller is biased to DC supply when in Automatic mode.

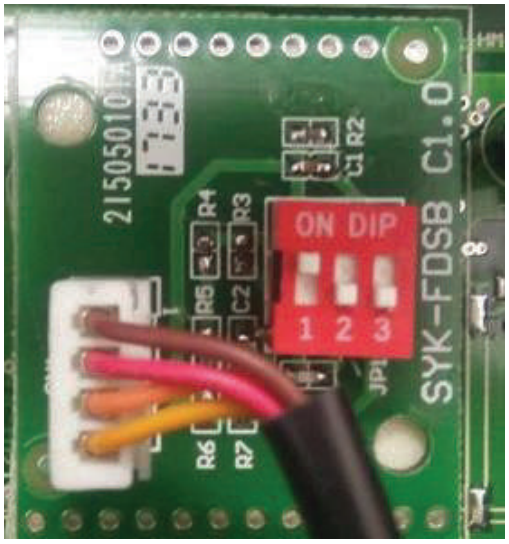
iSOLAR CONTROLLER
Controller Operating Instruction

1. Before operating any components in the system preform a visual inspection of the installation for damage cause by weather events, stock, pests or human interference. Solar panels should be clean and not in shade. All wiring terminated, no bare wires exposed.
2. Check pump is completely immersed when in a surface water source.
3. Turn any isolator switches to ON position. Open any valves.
4. Mains AC Supply present (if connected) – Indicated by LED light on controller
5. DC Supply present (Solar / Battery) - Indicated by LED light on controller
6. Generator (if connected) is topped up with fuel, generator starts and runs on demand and is connected to iSOLAR controller via "GEN Signal" wire.
7. Select **MODE** the Controller is required to operate in using the TOP BUTTON on the right hand side of the controller. Each time the button is pushed, the controller cycles through one of the operating modes indicated by the LED light on the display panel.
   i. AUTOMATIC MODE – Controller selects the power source and uses this to run the pump depending on input signals. Bias is always DC power source. When the system is using AC power, the AC led light pulses in 30 sec intervals ,the system is using DC power, the DC led light pulses in 30 sec intervals.
   ii. DC MODE - Controller only uses DC power source and uses this to run the pump depending on input signals and available power from Solar Panels or Batteries.
   iii. AC MODE - Controller only uses AC power source and uses this to run the pump depending on input signals and available power from grid supply or generator.
   a. Note, only one AC power supply can be used, either Grid Supplied AC 240V power or Generator supplied AC 240V power.
   CAUTION – When switching between modes, the motor needs to dissipate the energy stored within the internal capacitors. This process takes 1 minute. Repeated switching between modes will restart the dissipation cycle, causing extended delays before the pump will run.
8. Push PUMP ON button on the left hand side of the controller which is the BOTTOM BUTTON. LED light indicates pump on. Controller will start pump using selected power supply provided,
   i. The input energy is sufficient to run the motor
   ii. Motor has finished power dissipation cycle if required
   iii. The input signal devises indicate the unit should run. This would include,
      a. WWL – Well water level is "open" indicating sufficient water around pump(when fitted)
      b. TWL – Tank water level indicates tank requires filling (when fitted)
      c. TWL – Pressure switch indicates system pressure is low (when fitted)
      d. TWL is bridged meaning pump runs when input energy sufficient.
9. To stop pump, push **PUMP OFF** button on the right hand side of the controller which is the **BOTTOM BUTTON**. LED light indicates pump off.
10. When finished with the system, turn any electrical isolating switches and valves to the off position. Lock Out equipment from use as per your site specific procedures.

Technical specification

- The iSOLAR controller is a microcontroller, designed, developed and manufactured for the DAB ICON SOLAR pump.
- It is suitable for simultaneous AC and DC incoming power supplies.
- Manually or automatically switchable between two power supplies depending on solar irradiation.
- IP65 weatherproof enclosure.
- Suitable for up to 2.2 kW (3 hp) pumps.
- AC voltage input range 90 – 240 VAC. **Terminals L N & GRD**
- DC voltage input range 90 – 360 VDC. **Terminals + - & GRD**
- Input connections for 1 or 2 float switches. **TWL & WWL**
- Input connection for pressure switch. **WWL**
- Input connection for matching flow meter. **FLOW SIGNAL -> REF. Setting flow meter function (on next pg)**
- Indication for power on, input power, pump on, pump off, water tank full or tank empty.
- Auto operation via 1 or 2 float switches.
- Auto operation via pressure switch.
- Auto off via flow meter.
- Auto starting of generator via volt free contacts. **GEN SIGNAL**
- Manual operation.
- Auto switching from AC to DC supply with DC bias. DC switching point is 90V.

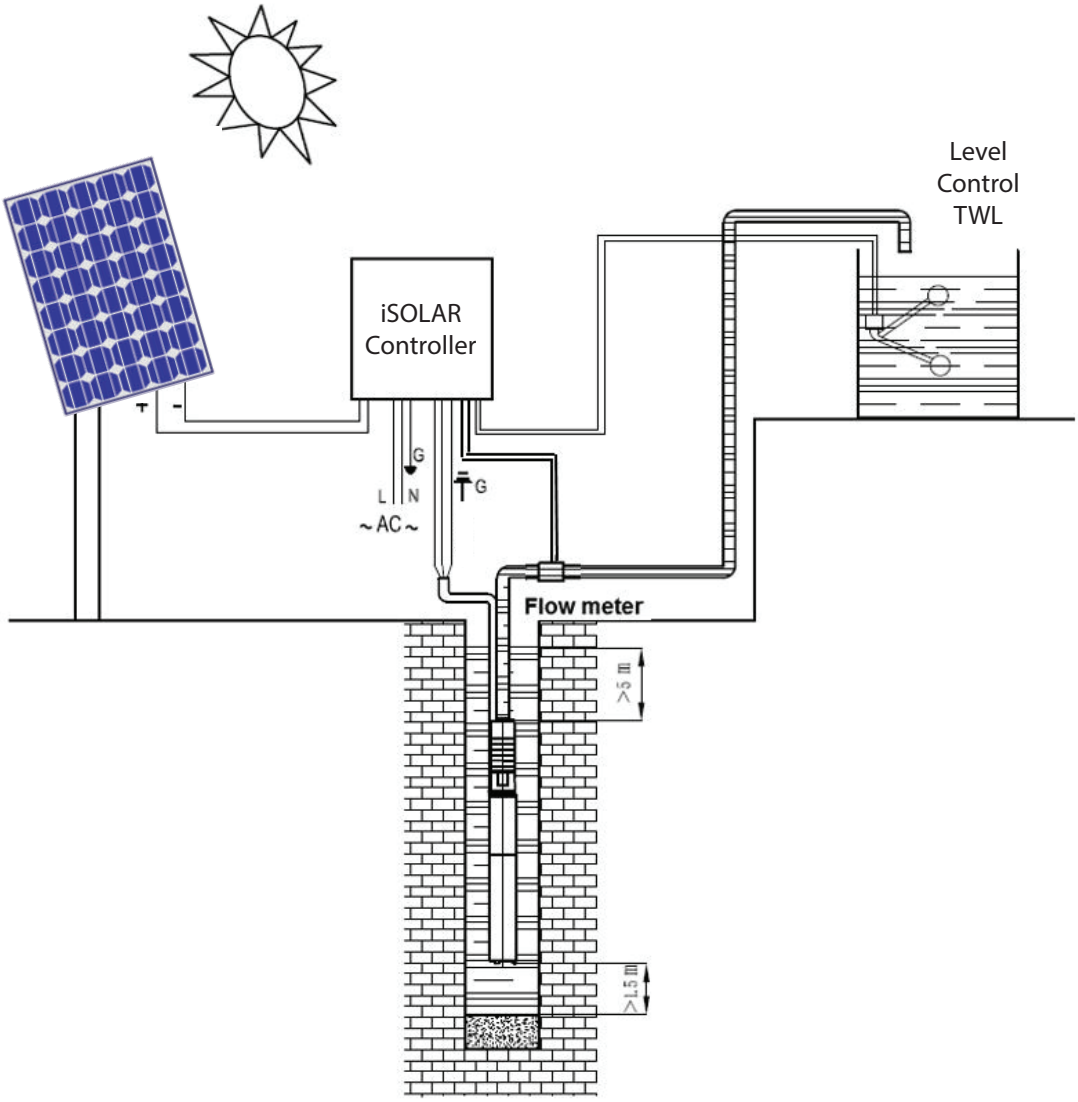
SETTING FLOW METER FUNCTION



- Without flow meter connected set switch 1, 2 & 3 to ”off” condition.
- With flow meter DN25 connected set switch 1 to “on” condition, switch 2 & 3 to “off” condition.
- With flow meter DN32 connected set switch 2 to “on” condition, switch 1 & 3 to “off” condition.
- With flow meter DN50 set switch 3 to “on” condition, switch 1 & 2 to “off” condition.

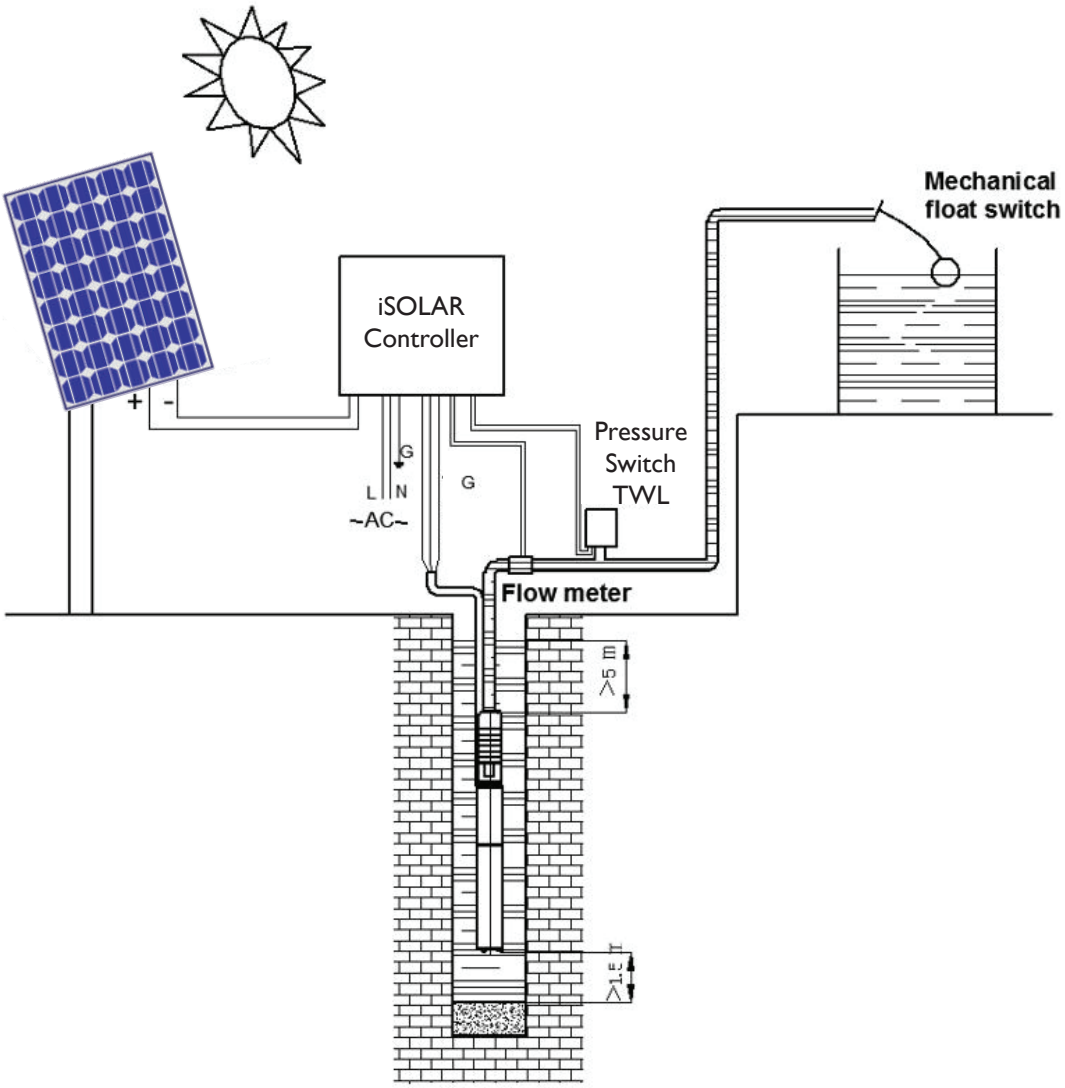
INSTALLATION OPTIONS

1. Electric Float Switch (One Or Two)



INSTALLATION OPTIONS

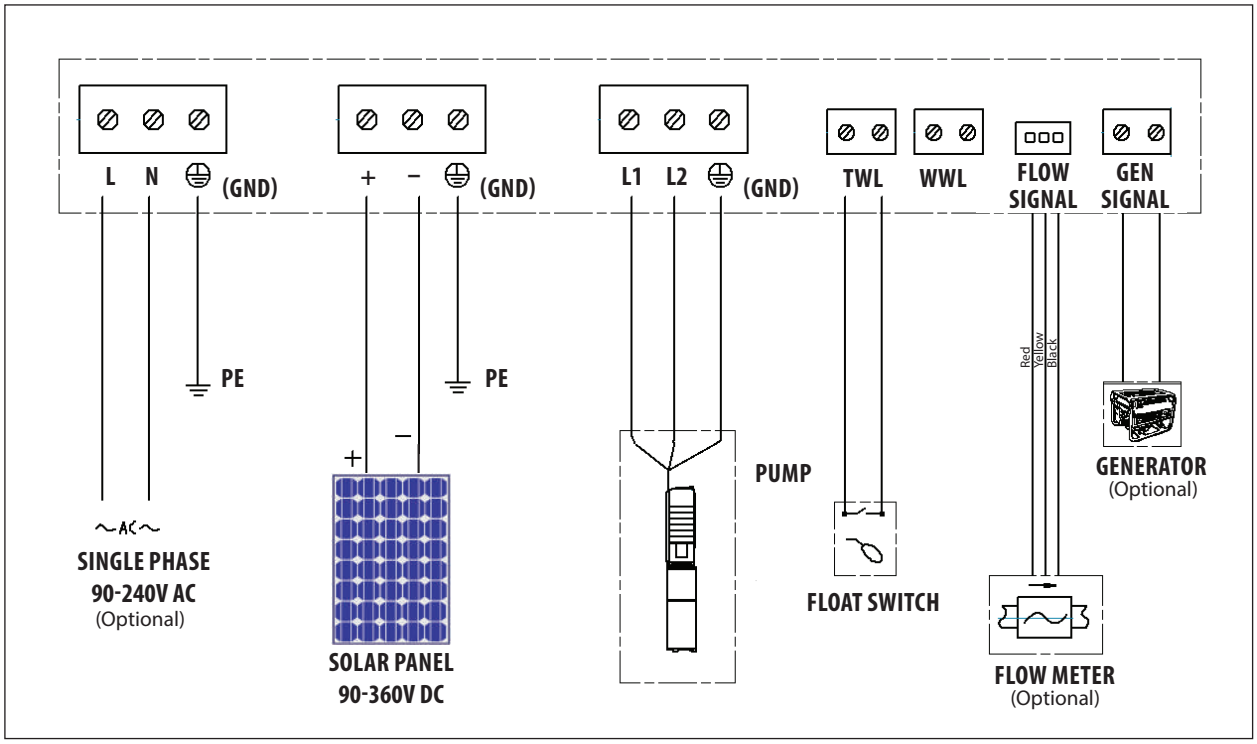
2. Mechanical Float Switch



iSOLAR CONTROLLER

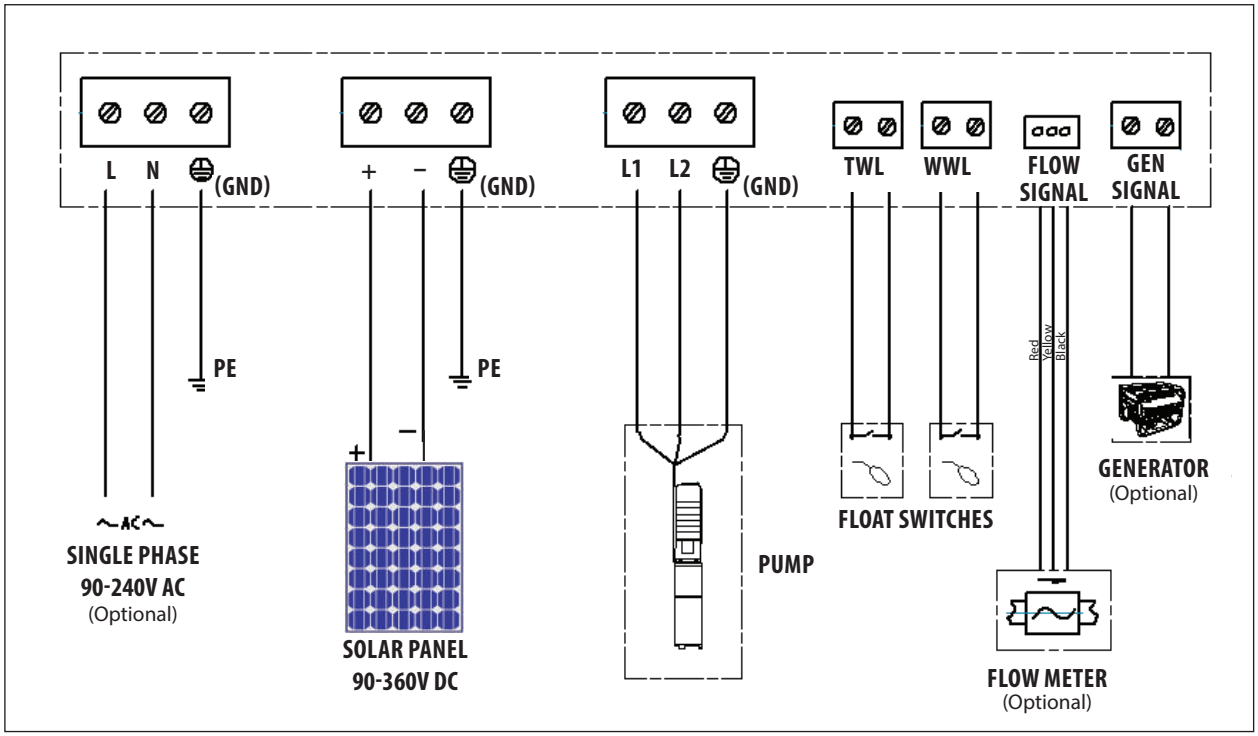
Electrical Connections

1. With One Float Switch.



TWL = TARGET TANK WATER LEVEL WWL = WELL WATER LEVEL
USE 3 WIRE FLOAT SWITCHES WIRED FOR TANK FILL (OPEN ON RISE - BLACK AND BLUE WIRES)

2. With Two Float Switches



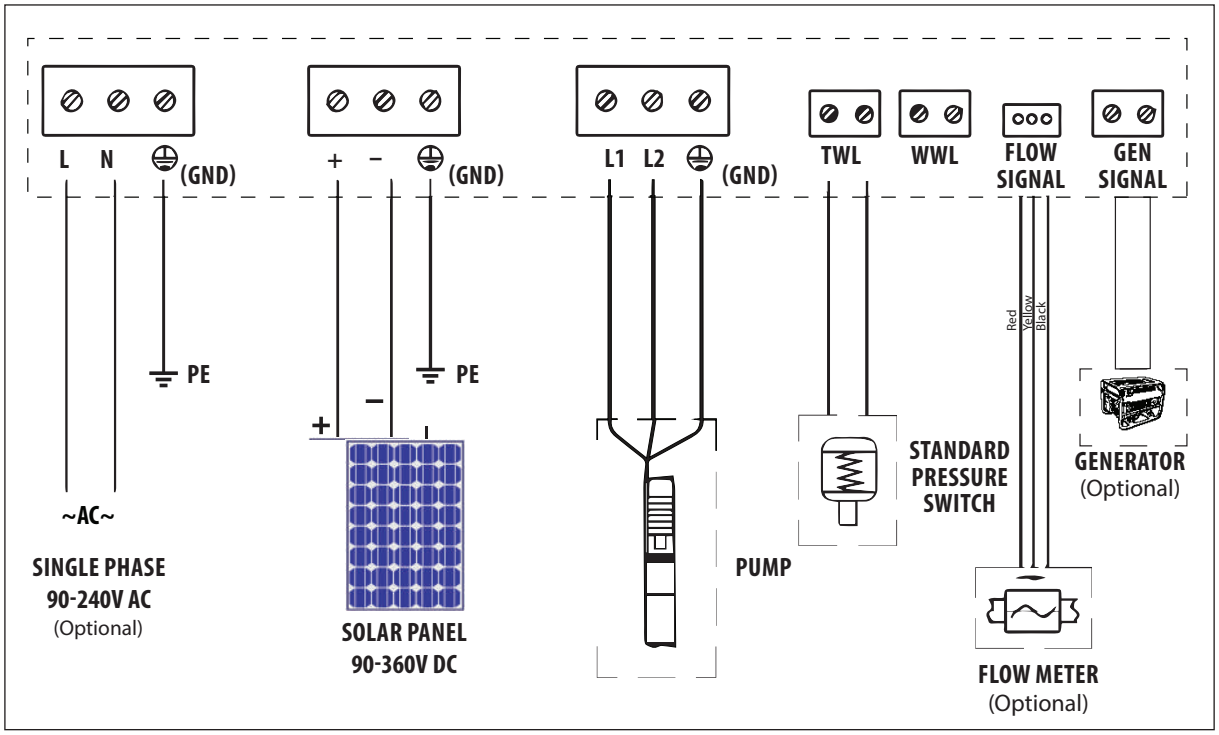
TWL = TARGET TANK WATER LEVEL WWL = WELL WATER LEVEL
BOTH FLOAT SWITCHES NEED TO BE 3 WIRE TANK FILL (OPEN ON RISE, BLACK AND BLUE WIRES)
GENERATOR CONTACT WILL CLOSE IF NO AC AND DC DROPS BELOW 90V.

FOR ALL WIRING OPTIONS ONLY ONE AC INPUT SOURCE CAN BE USED BY THE CONTROLLER – USE 240V AC MAINS SUPPLY or GENERATOR unless the Generator has an Auto Transfer System (ATS) to manage the switch over. Consult your Generator manual.

iSOLAR CONTROLLER

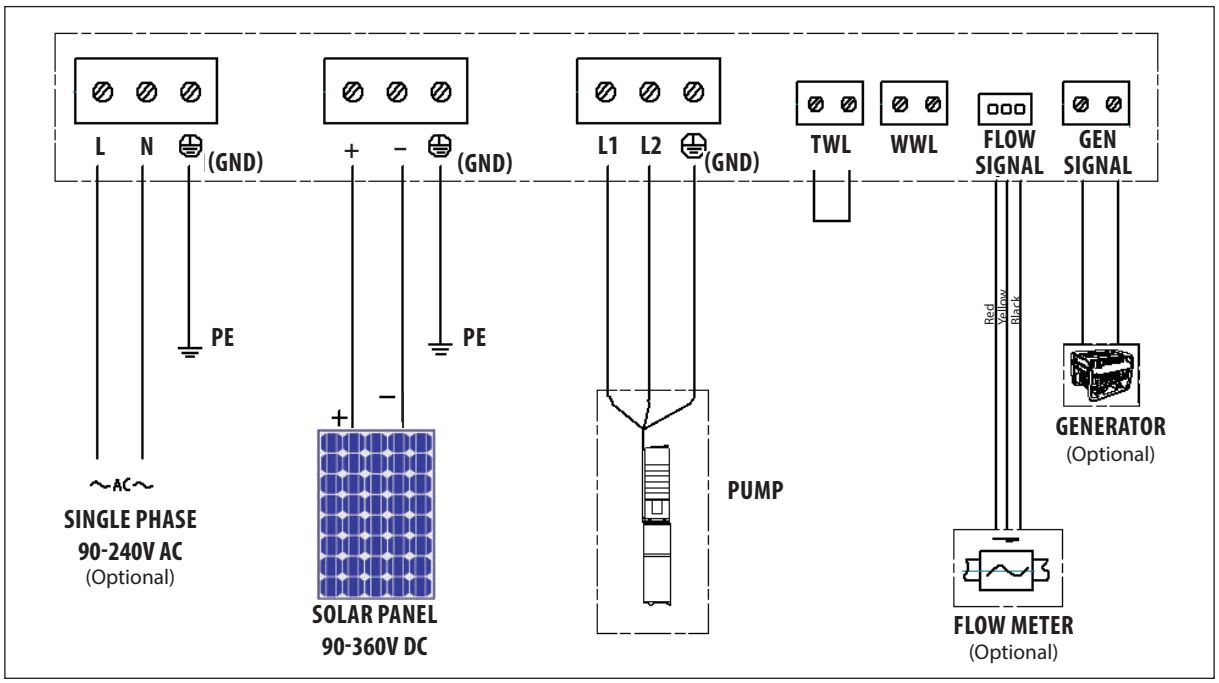
Electrical Connections

3. Pressure Switch



FOR PRESSURE SWITCH CONTROL, USE A NORMAL PRESSURE SWITCH OF SUITABLE RANGE – SWITCH OPENS ON PRESSURE RISE

4. No Switches



GENERAL NOTES FOR ALL SET UP CONFIGURTIONS

NORMAL PRESSURE SWITCH ON TWL
REVERSE ACTING PRESSURE SWITCH ON WWL WITH JUMPER ON TWL
GENERATOR CONTACT WILL CLOSE IF NO AC AND DC DROPS BELOW 90V.

FOR ALL WIRING OPTIONS ONLY ONE AC INPUT SOURCE CAN BE USED BY THE CONTROLLER – USE 240V AC MAINS SUPPLY or GENERATOR unless the Generator has an Auto Transfer System (ATS) to manage the switch over. Consult your Generator manual.

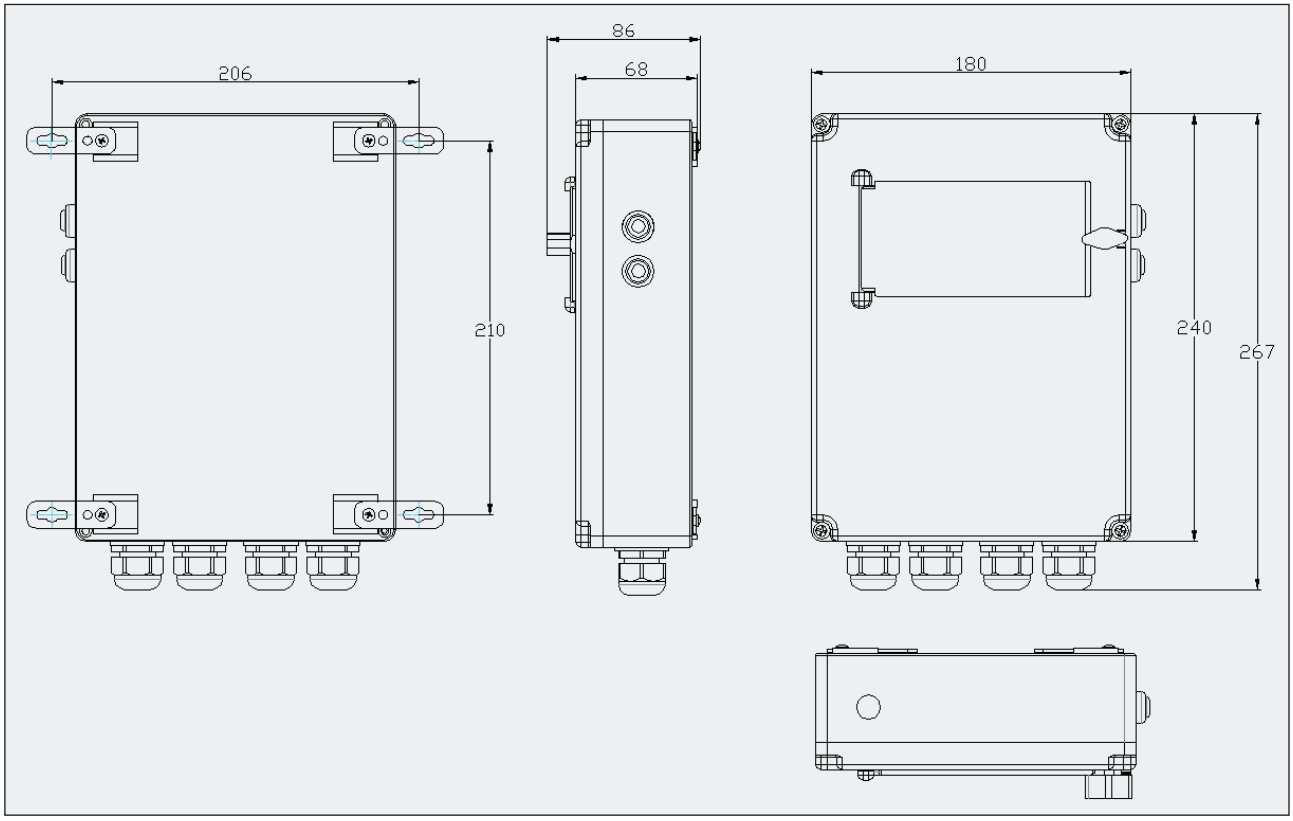
CABLE SELECTION

Metric Cable	KW (HP)	**0.37 (0.5)**	**0.44 (0.75)**	**0.75 (1.0)**	**1.1 (1.5)**	**1.5 (2.0)**	**2.2 (3.0)**
Stranding	Area mm^2	Metres	Metres	Metres	Metres	Metres	Metres
7/0.67	2.5	174	123	91	67	53	36
7/0.85	4.0	279	197	146	106	85	58
7/1.04	6.0	417	296	218	159	126	87
7/1.35	10	701	496	366	268	213	147
7/1.70	16	1117	791	585	426	339	235

Select the appropriate sized cable to use from the Energy source to the iCON 4" Motor.
Ensure when measuring to include depth of bore when fitting motor down a bore or well.

iSOLAR CONTROLLER

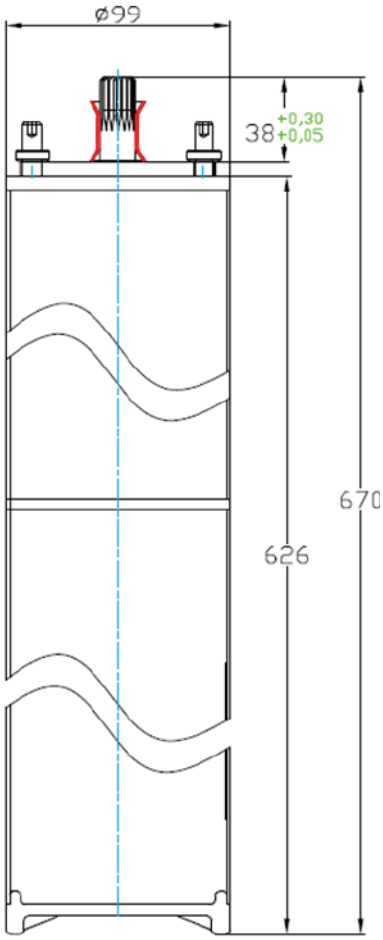
Dimensions



Dimensions: 267mm (H) x 180mm (W) x 86mm (D)

iSOLAR MOTOR

Dimensions:
670mm (H) x 99mm (Dia)
Weight 12 kg



iSOLAR 4" MOTOR GENERAL INSTALATION NOTES

Water Source and Pump Installations Options

The water source must be "clean water", free from contaminates such as, dirt, dust, loose rocks, decaying organic matter and other foreign bodies that could block the intake screen or fowl the impeller stack. Sand content not to exceed 120g/m3 of water pumped.

The iCON Solar motor and Pump can be installed,

- Vertically in a bore or well
- Horizontally in a stream or open body of water

In all installation positions the iCON Solar motor must be fully submerged and a minimum water flow across the motor during operation of 8cm / sec before entering the pump intake.

To induce the correct water flow across the motor use of a flow inducing sleeve should be used when:

- Well diameter too large relative to motor diameter to induce correct flow.
- Motor and Pump are in open water
- Motor and Pump are in a rock well or below casing
- The Bore is top feeding (water enters intake without passing over motor)
- Motor and Pump are set in screens

Power Connection

If there is a possibility of the water source running dry, fit a FLOAT SWITCH to terminals WWL as per the iSOLAR CONTROLLER electrical connection diagram 2/.

WARNING

- **The power supply from any DC or AC supply can cause serious harm or death from electrocution. Apply appropriate safety procedures when working on or with any system component.**
- **Only suitably qualified personal should be involved in the electrical connection disconnection and handling of the equipment. Off-grid electrical equipment is subject to applicable state, national and country electrical standards.**
- **The iCON Solar Motor contains capacitors that must be allowed to discharge before handling. Allow a minimum of 1 MINUTE for stored energy to dissipate before handling the motor.**
- **The Solar panels will create electrical energy when exposed to light. Assume all panel cables are "live" at all times and handle with appropriate safety equipment and procedures.**

Caution

Isolate all electrical sources before commencing any installation, servicing or repair on any component in the installation.

The iCON Control module is used to switch AC and DC power supplies and can automatically start a connected generator or switch between DC (Solar) or AC (Generator / Mains) power sources at ANY time.

Ensure all energy sources and generator starting circuit is properly locked-out before working on the system.

Pump Installation Instructions. See the supplementary instruction manual "Installation and Operating Manual for DAB 4" Submersible Pumps and iCON Solar 2.2kW motor" at the end of this manual.

SOLAR PANELS

For DC operation, power supplied by solar panels is required.

Motor is rated 90 – 360V DC, 12A.

Below is a selection table based on 200W solar panels.

The panels would be wired in series or in combination of 2 strings of panels in series, connected in parallel.

Solar Panel Recommendation								All Electrical Data @ STC							
Pump Model	Nominal Power	Panel Qty	Brand	Wattage	Size	DC Power	Strings	VOC (V)		VMPP (V)		ISC (A)		IMPP (A)	
DAB-S4A18SOL	550	4	Luxor Solar	200	72 cell	800	1	44.12	176.48	37.26	149.04	5.85	5.85	5.37	5.37
DAB-S4B12SOL	550	4	Luxor Solar	200	72 cell	800	1	44.12	176.48	37.26	149.04	5.85	5.85	5.37	5.37
DAB-S4C9SOL	550	4	Luxor Solar	200	72 cell	800	1	44.12	176.48	37.26	149.04	5.85	5.85	5.37	5.37
DAB-S4A36SOL	1100	8	Luxor Solar	200	72 cell	1600	1	44.12	352.96	37.26	298.08	5.85	5.85	5.37	5.37
DAB-S4B24SOL	1100	8	Luxor Solar	200	72 cell	1600	1	44.12	352.96	37.26	298.08	5.85	5.85	5.37	5.37
DAB-S4C19SOL	1100	8	Luxor Solar	200	72 cell	1600	1	44.12	352.96	37.26	298.08	5.85	5.85	5.37	5.37
DAB-S4D13SOL	1100	8	Luxor Solar	200	72 cell	1600	1	44.12	352.96	37.26	298.08	5.85	5.85	5.37	5.37
DAB-S4E8SOL	1100	8	Luxor Solar	200	72 cell	1600	1	44.12	352.96	37.26	298.08	5.85	5.85	5.37	5.37
DAB-S4B32SOL	1500	10	Luxor Solar	200	72 cell	2000	2	44.12	220.60	37.26	186.30	5.85	11.7	5.37	10.74
DAB-S4C25SOL	1500	10	Luxor Solar	200	72 cell	2000	2	44.12	220.60	37.26	186.30	5.85	11.7	5.37	10.74
DAB-S4D17SOL	1500	10	Luxor Solar	200	72 cell	2000	2	44.12	220.60	37.26	186.30	5.85	11.7	5.37	10.74
DAB-S4E12SOL	1500	10	Luxor Solar	200	72 cell	2000	2	44.12	220.60	37.26	186.30	5.85	11.7	5.37	10.74

VOLTS, AMPS and WATTS

- VOC (V) Volts open circuit, nothing connected
- VMPP (V) Volts maximum power point, under load
- ISC (A) Amps short circuit
- IMPP (A) Amps maximum power point
- DC Power in W = VMPP*IMPP

All equipment mentioned in this manual must be installed by skilled and qualified people.

A licensed electrician must make all electrical connections.

WARNING: Panel combinations must NOT exceed iCON 4" Solar Motor input limits

DC Volts Max: 360V MPP DC Amps Max: 12A ISC

AC Volts Max: 240V AC Amps Max:12A

Exceeding limits may cause serious harm or irreparable damage to the motor and VFD as well voiding the motor warranty.

SOLAR PANEL INSTALLATION

Power Connection for SOLAR PANELS

WARNING

– The power supply from a DC supply such as Solar Panels can cause SERIOUS HARM or DEATH from electrocution.

- Apply appropriate safety procedures when working on or with any system component.

-Only suitably qualified personal should be involved in the electrical connection / disconnection and handling of the equipment.

- Off-grid electrical equipment is subject to applicable state, national and country electrical standards.

-The Solar panels will create electrical energy when exposed to light. Assume all panel cables are "live" at all times and handle with appropriate safety equipment and procedures.

-Use only electrical cable and connectors supplied with the Solar Panels. Avoid cutting or joining cables by ordering correct lengths of cable and connectors at time of purchase.

Follow the instructions provided with the Solar Panels and mounting system to complete the framing support for the panels.

General Notes:
Mounting Frame must always face NORTH for panels fitted in the Southern Hemisphere. The orientation of the PANEL to the SUN is determined by the LATITUDE co-ordinate for the site location.

Use a GPS or other mapping app such as "Google Maps" to determine the latitude co-ordinate of the panel installation site. This becomes the angle the panels are orientated from the horizontal to face the sun directly.

eg: **White International Pty Ltd Office**, 60 Ashford Ave, Milpera NSW
-33.934217 Latitude / 150.98830 Longitude
Panel Orientation: 34 Degrees from horizontal facing NORTH

SOLAR AVAILABILITY
As a general rule-of-thumb panels will receive 3.5hr or more of solar irradiation during winter months. Actual average sun hours for each geographic region are available from NASA or your countries weather statistics recorder such as

NIWA in New Zealand https://solarview.niwa.co.nz/
BOM in Australia http://www.bom.gov.au/climate/data-services/solar-information.shtml

Possible pump flow capabilities should be based on minimum WINTER energy availability.

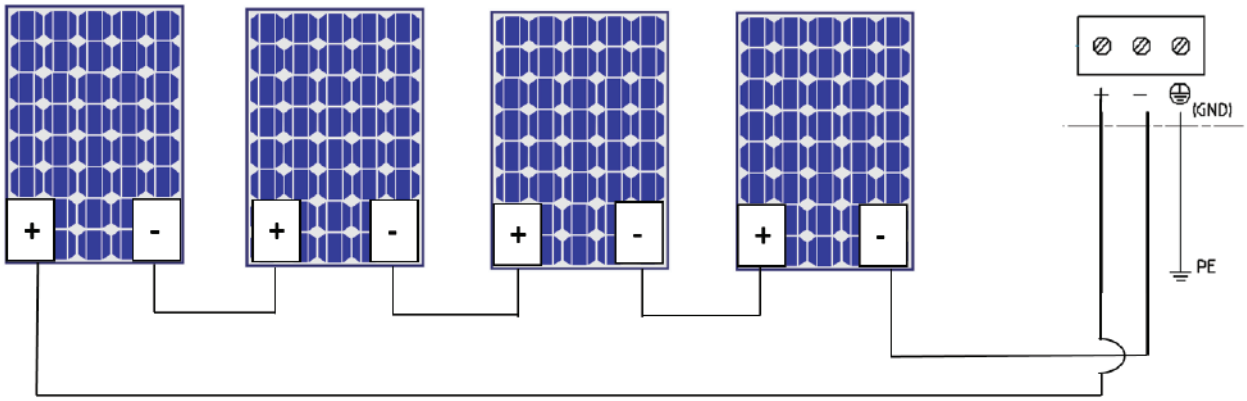
SOLAR PANELS WIRING

Series (Recommended for iSOLAR)

To wire solar panels in series, positive of one solar panel is wired to the negative of the next solar panel.

In this case:

- Output voltage multiplies by the number of panels. eg; 4 x 44.12 VOC = 176.48 Voc
- Output watts multiplies by the number of panels. eg; 4 x 200W = 800W
- Output amps remains the same as a single panel. eg; 5.85 ISC (A)



A group of panels wired in series as above is called a string.

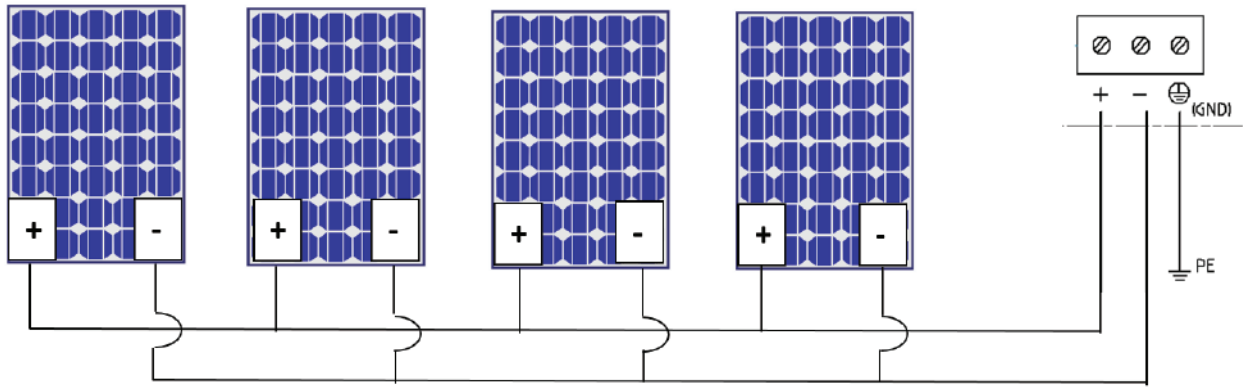
Note: in any combination, output Volts or Amps must not exceed stated limits.

Parallel (NOT recommended for iSOLAR)

To wire solar panels in parallel, the positives of each solar panel are wired together and the negatives of each solar panel are wired together.

In this case:

- Output voltage remains the same as a single panel. eg; 44.12 VOC
- Output watts multiplies by the number of panels. eg; 4 x 200W = 800W
- Output amps multiplies by the number of panels. eg; 4 x 5.85 ISC (A) = 23.4 ISC (A)



Note: in any combination, output Volts or Amps must not exceed stated limits.

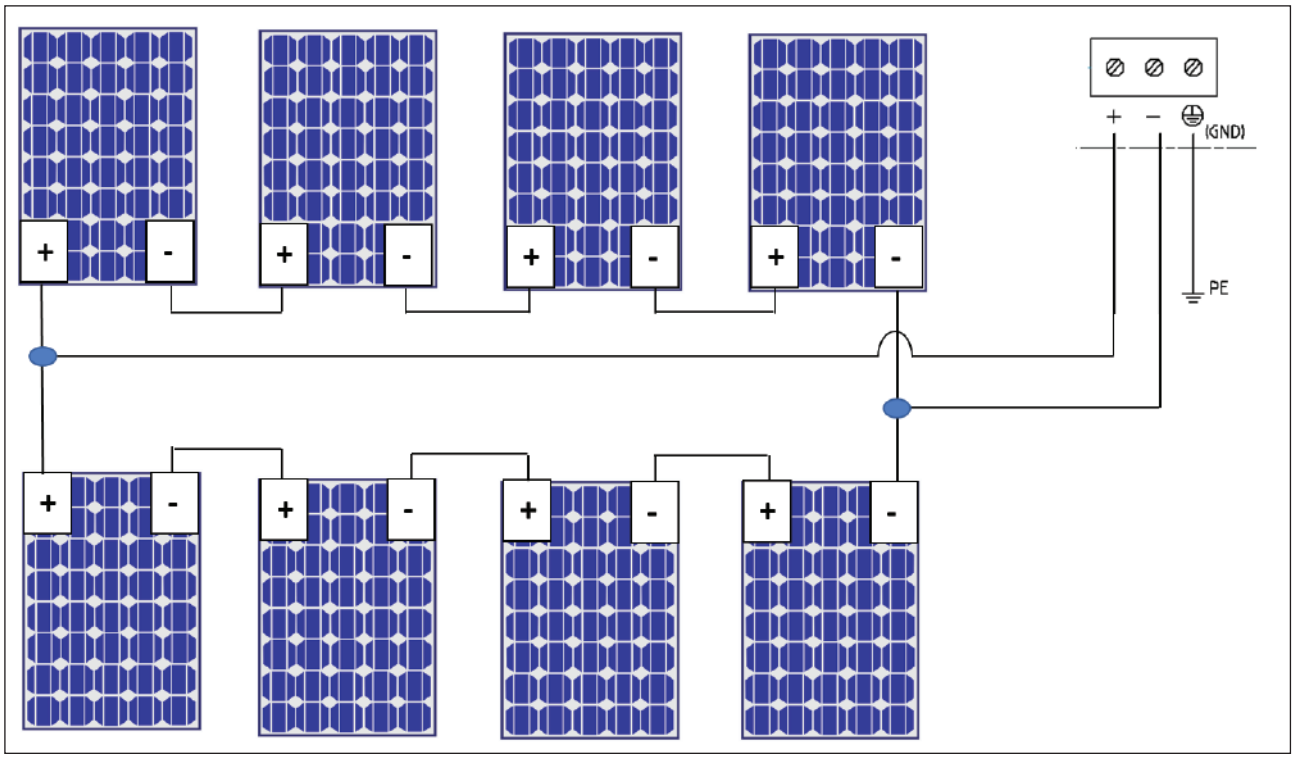
SOLAR PANEL WIRING

Combination of Series and Parallel (Recommended for iSOLAR)

To wire solar panels in combination, wire two or more strings (panels wired in series) in parallel.

In this case:

- Output voltage multiplies by the number of panels in a string.
- Output watts multiplies by the number of panels in one series multiplied by the number of strings.
- Output amps are as per series connection multiplied by the number of strings.

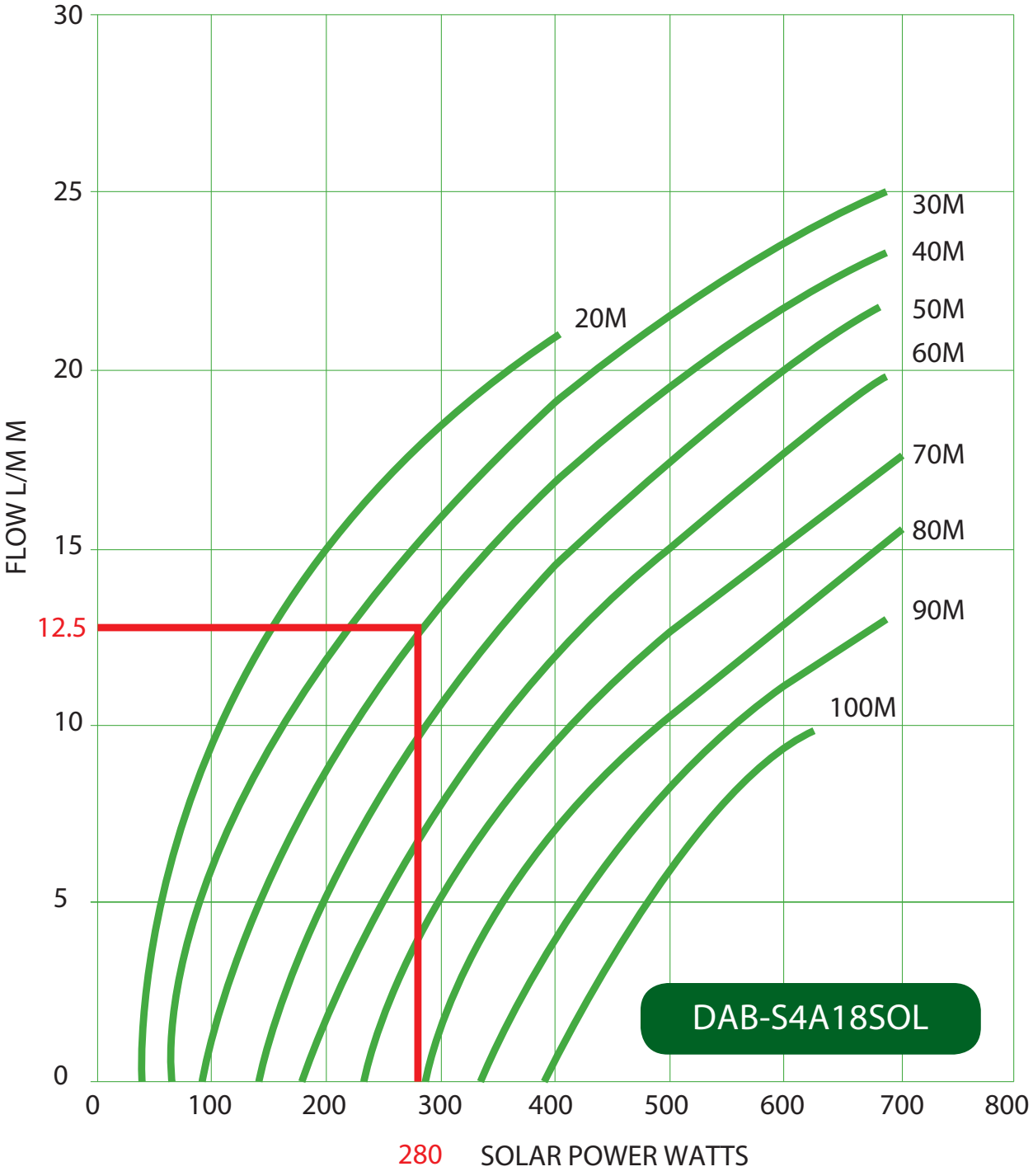


In this example each string of four panels		= 176.48 VOC, 800W, 5.85 ISC (A)
Output Voltage	= 176.48 x 2 strings	= 352.96 VOC
Output Watts	= 4 panels x 200W x 2 strings	= 1600W
Output Amps	= 5.85 ISC (A) x 2 strings	= 11.7 ISC (A)

PERFORMANCE CURVES

DAB-S4A18SOL

805147

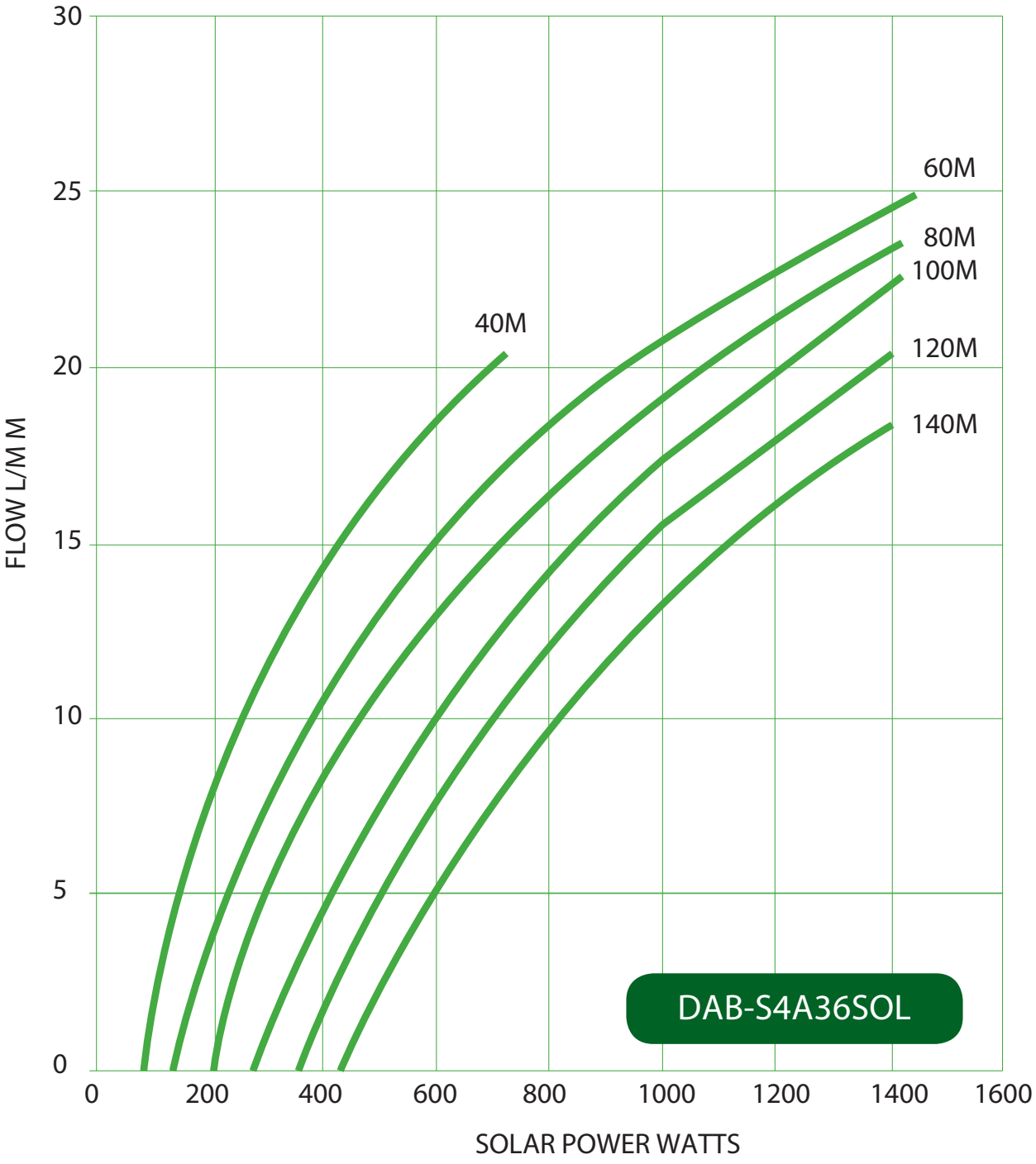


Example: DAB-S418SOL pump will deliver 12.5 l/min at 40 m head with 280 W energy from solar panels. Estimated daily delivery in winter with 4 solar hours per day = 12.5 l/min x 60 minutes x 4 hours = 3000 litres/day.

PERFORMANCE CURVES

DAB-S4A36SOL

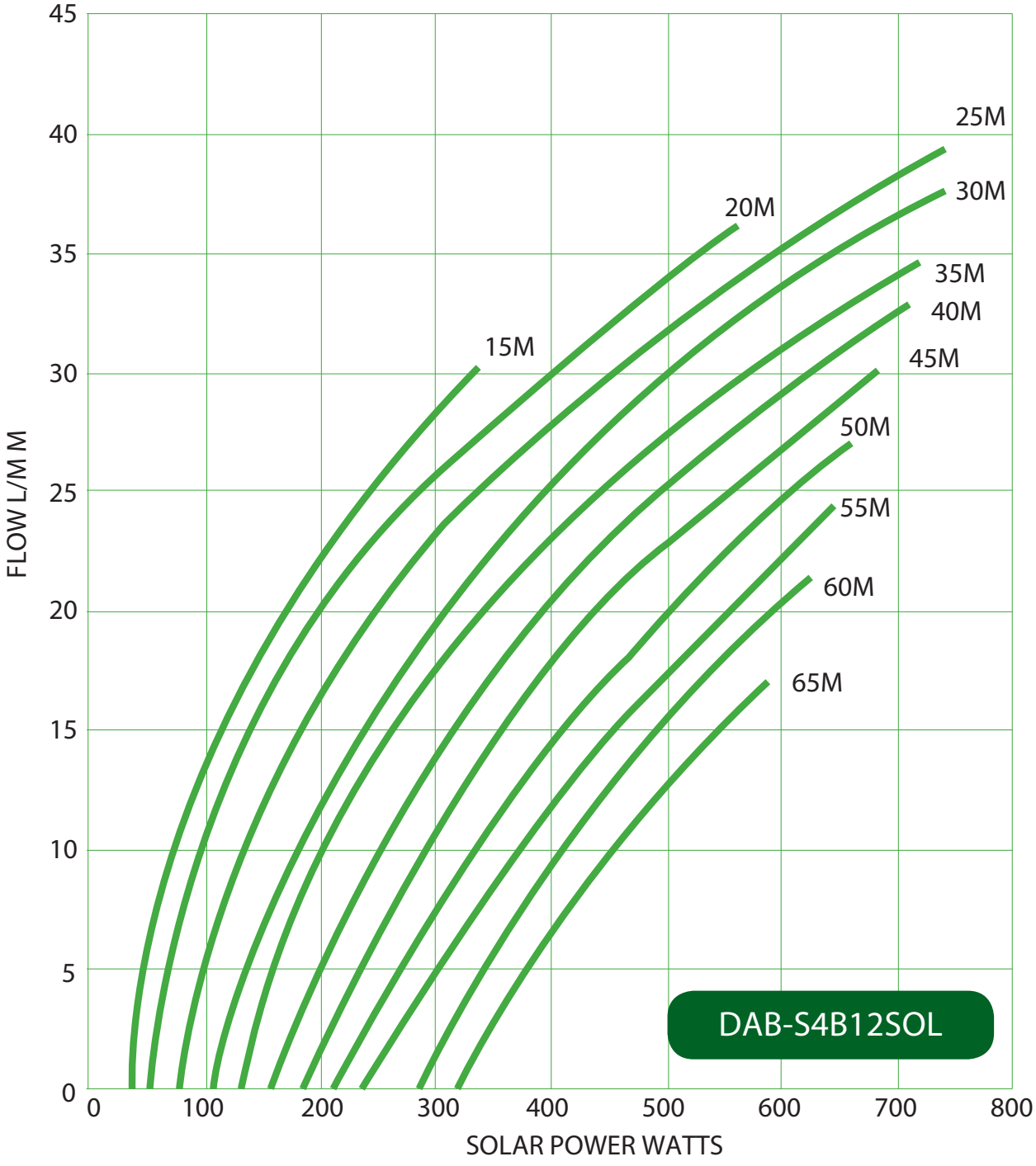
805150



PERFORMANCE CURVES

DAB-S4B12SOL

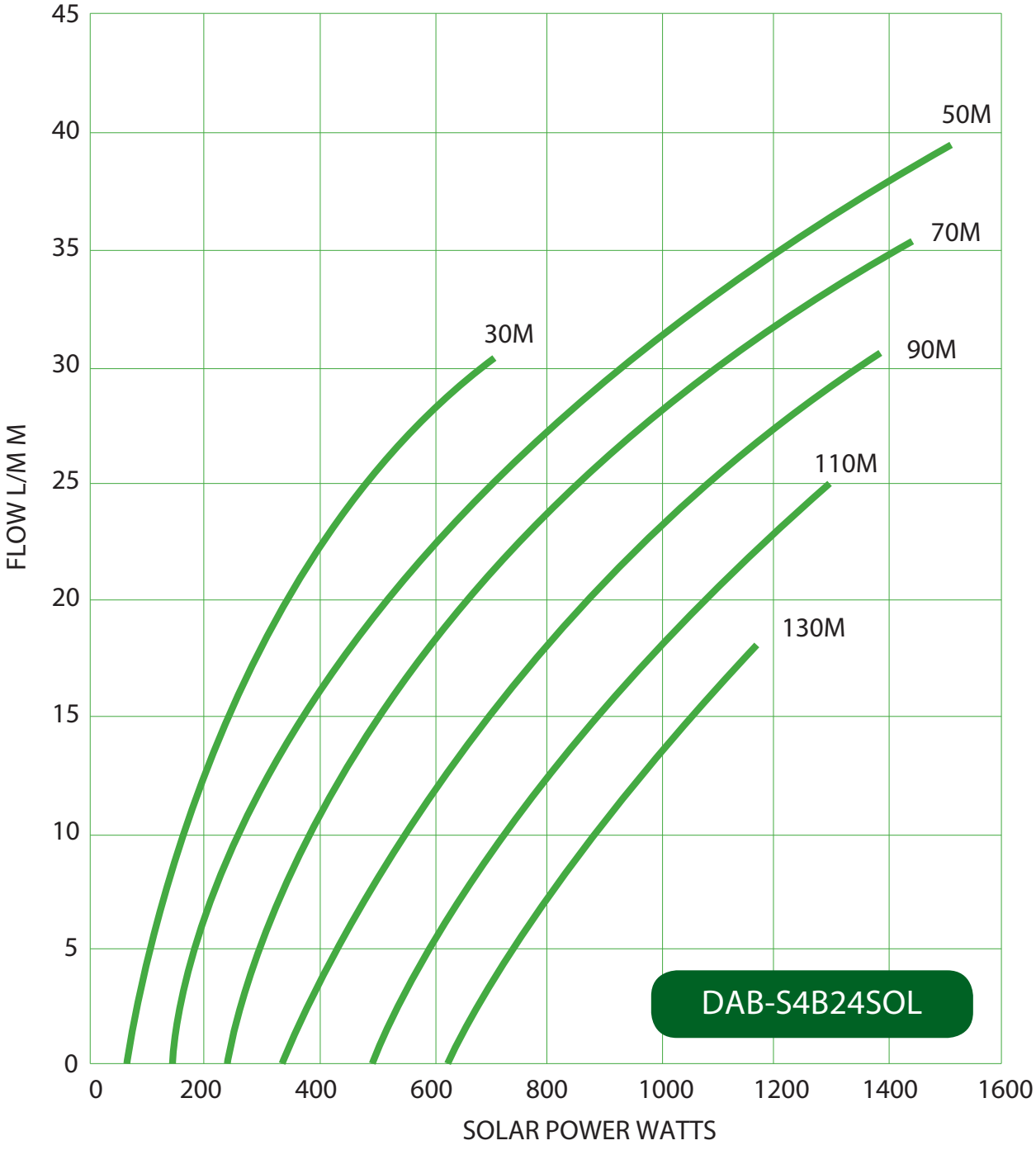
805148



PERFORMANCE CURVES

DAB-S4B24SOL

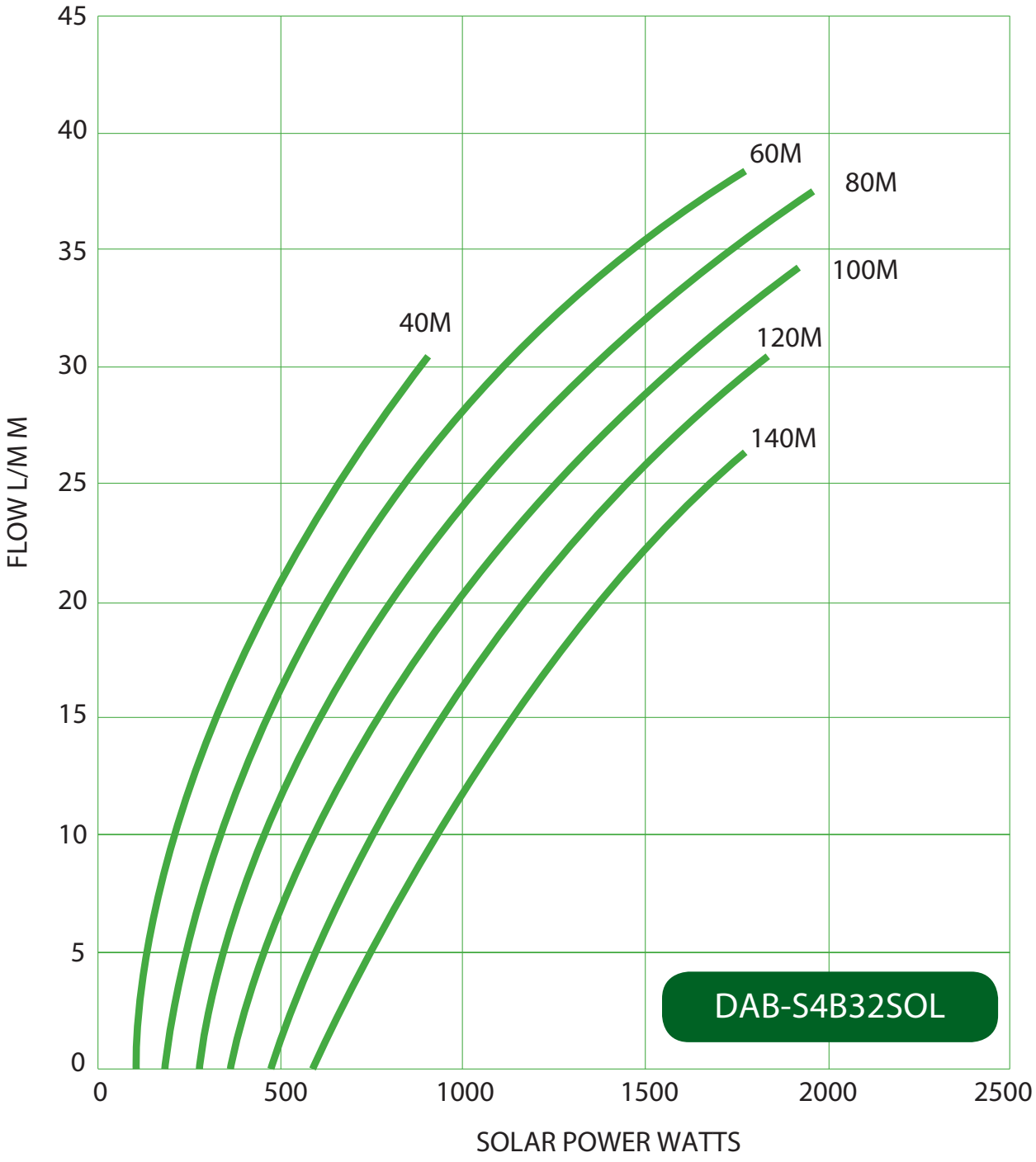
805151



PERFORMANCE CURVES

DAB-S4B32SOL

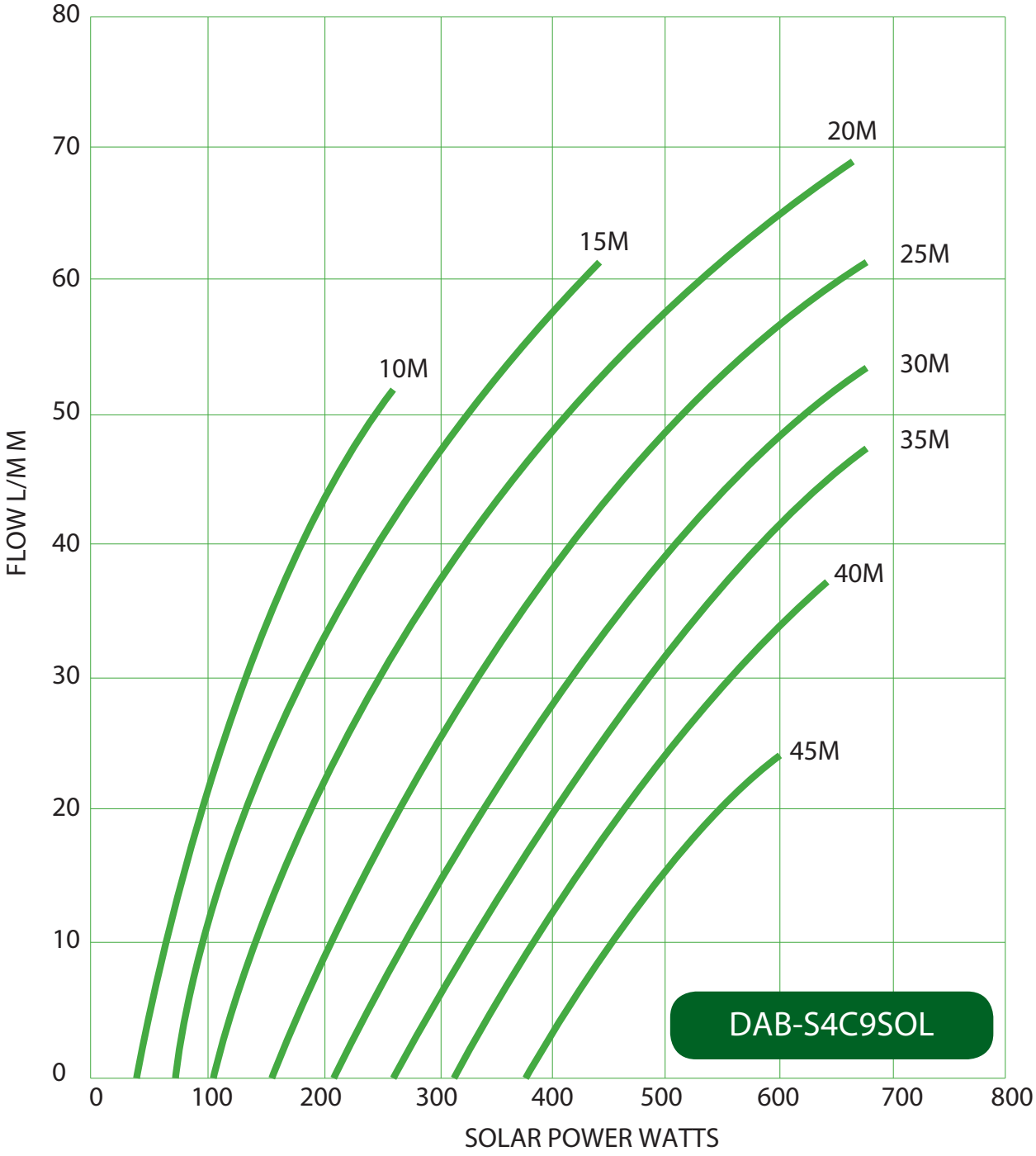
805364



PERFORMANCE CURVES

DAB-S4C9SOL

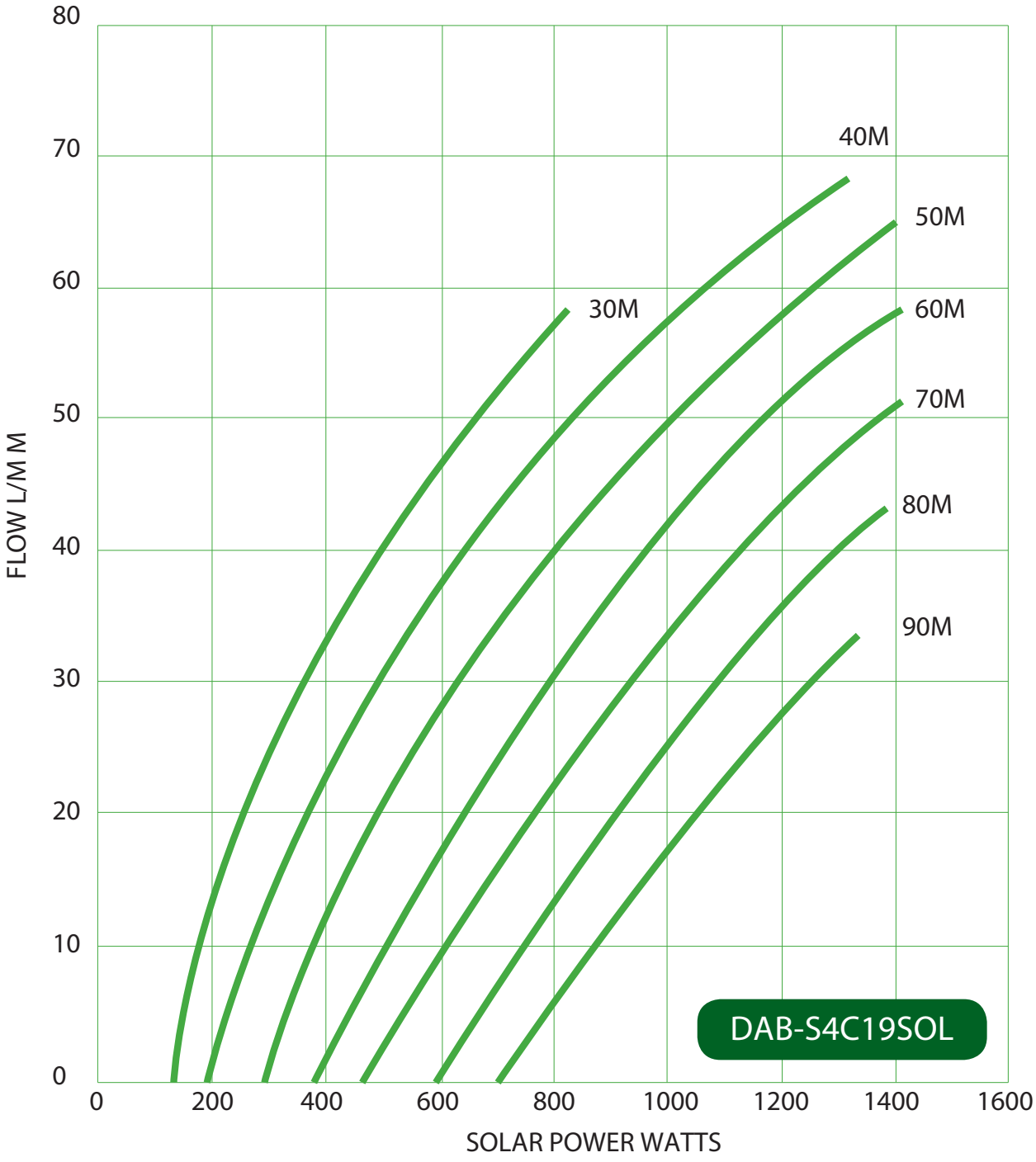
805149



PERFORMANCE CURVES

DAB-S4C19SOL

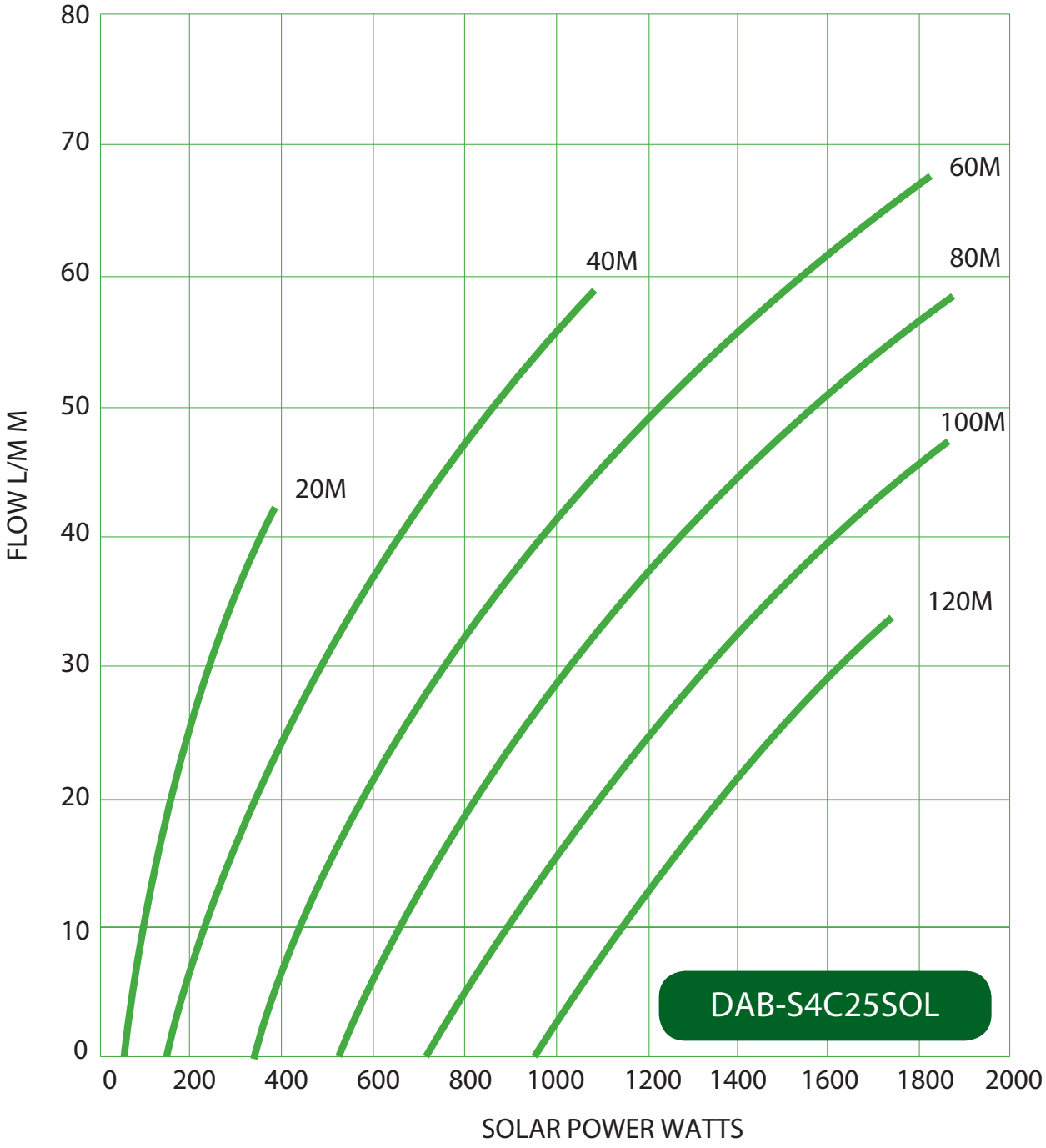
805152



PERFORMANCE CURVES

DAB-S4C25SOL

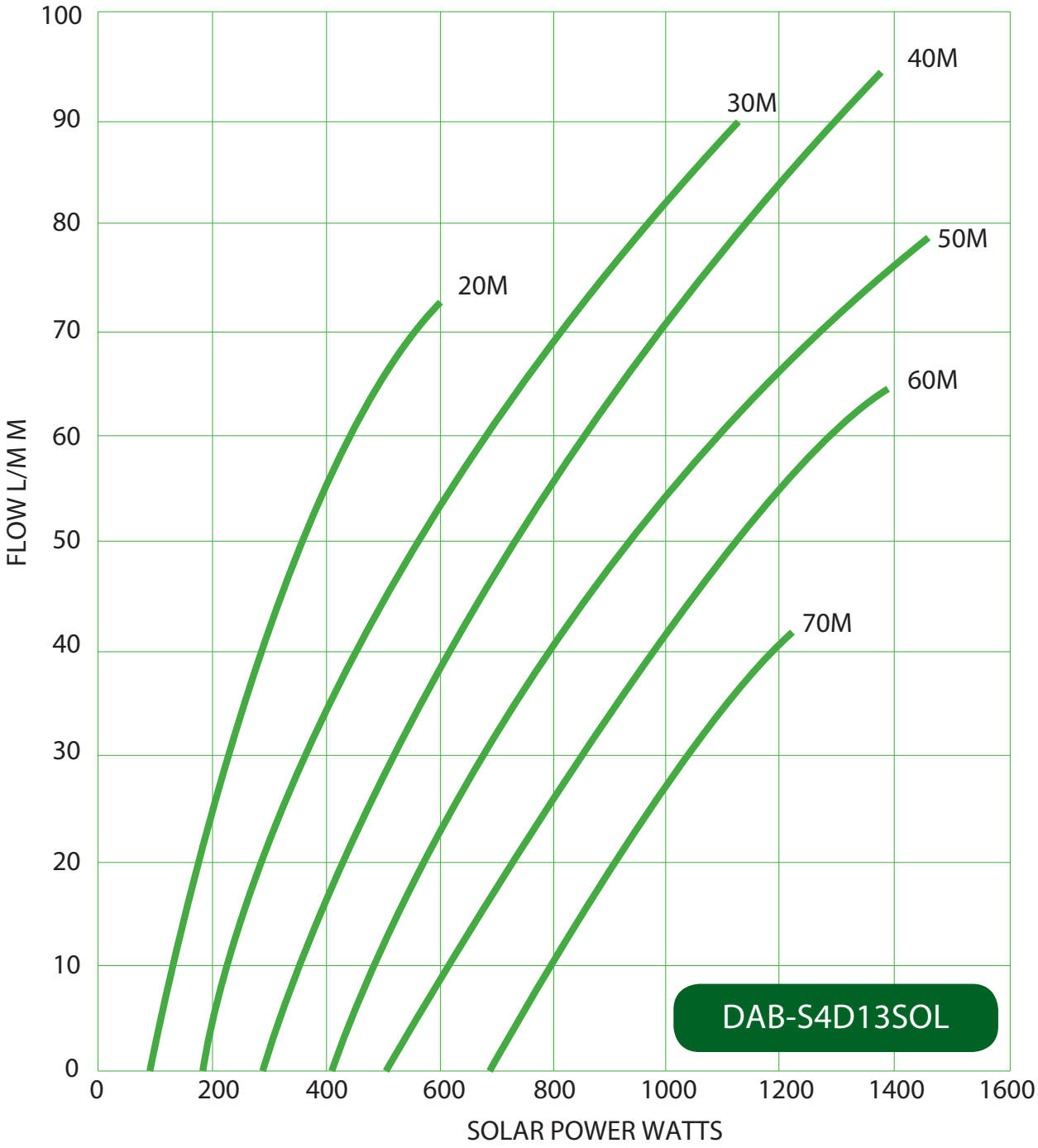
805365



PERFORMANCE CURVES

DAB-S4D13SOL

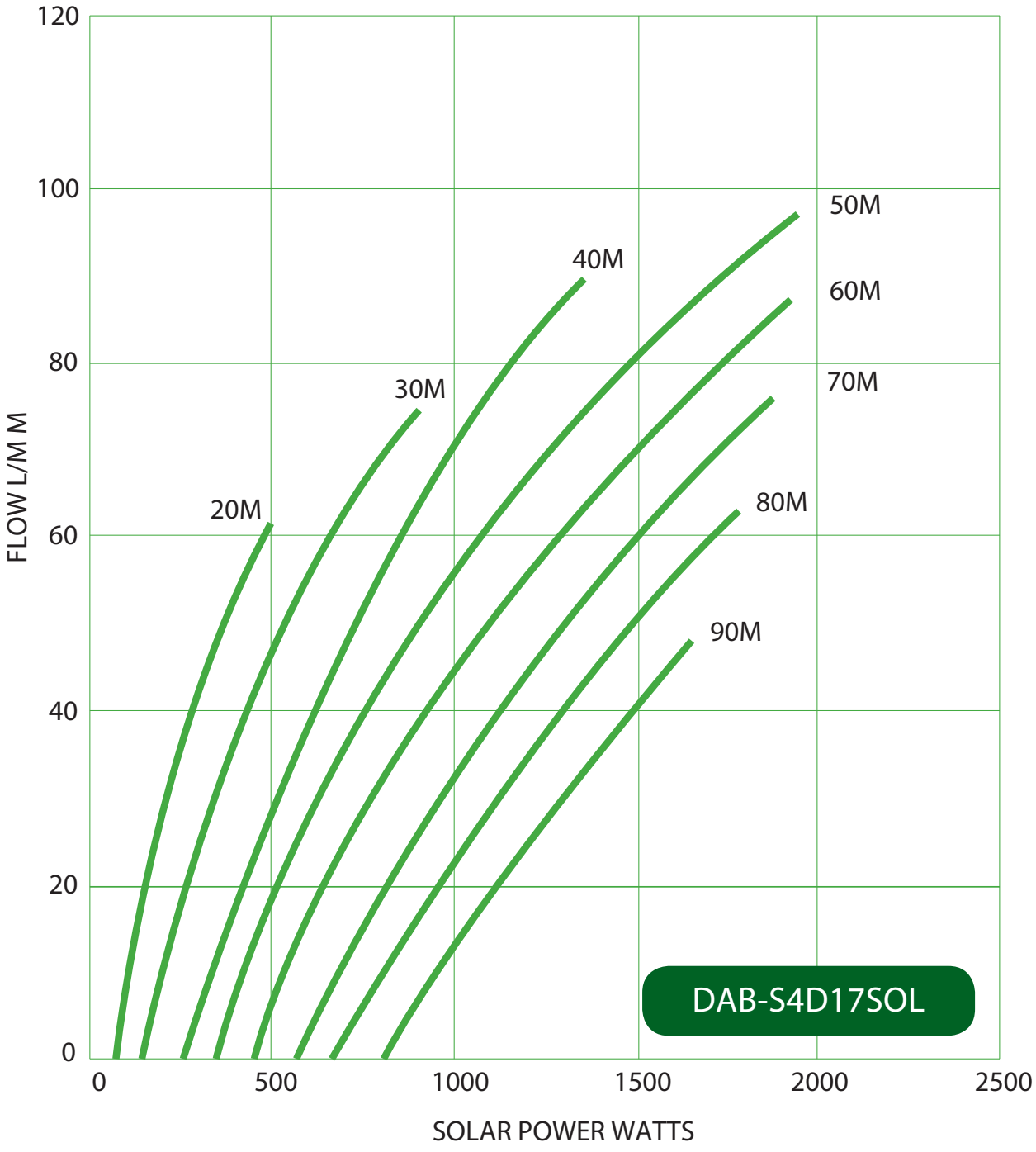
805153



PERFORMANCE CURVES

DAB-S4D17SOL

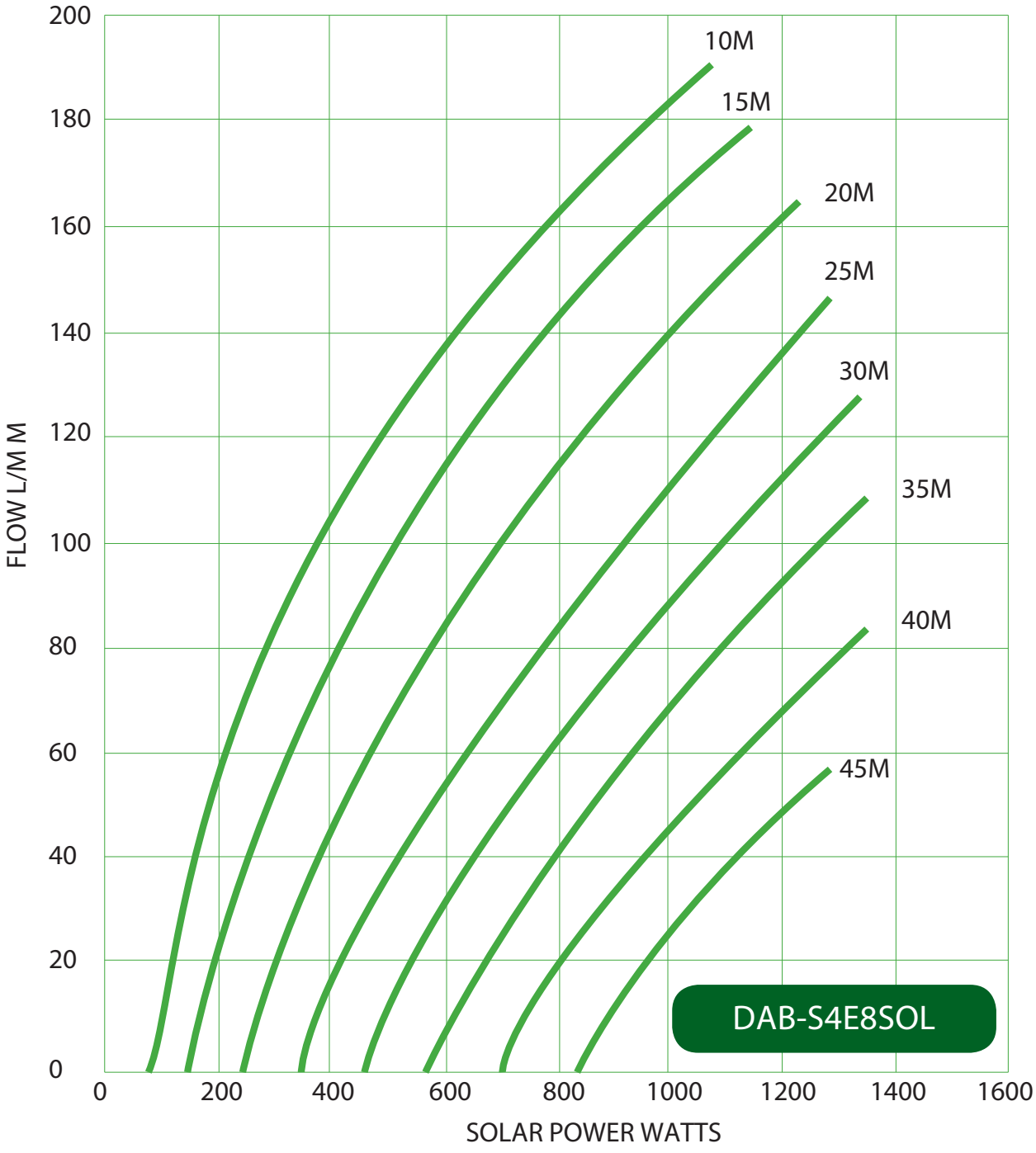
805366



PERFORMANCE CURVES

DAB-S4E8SOL

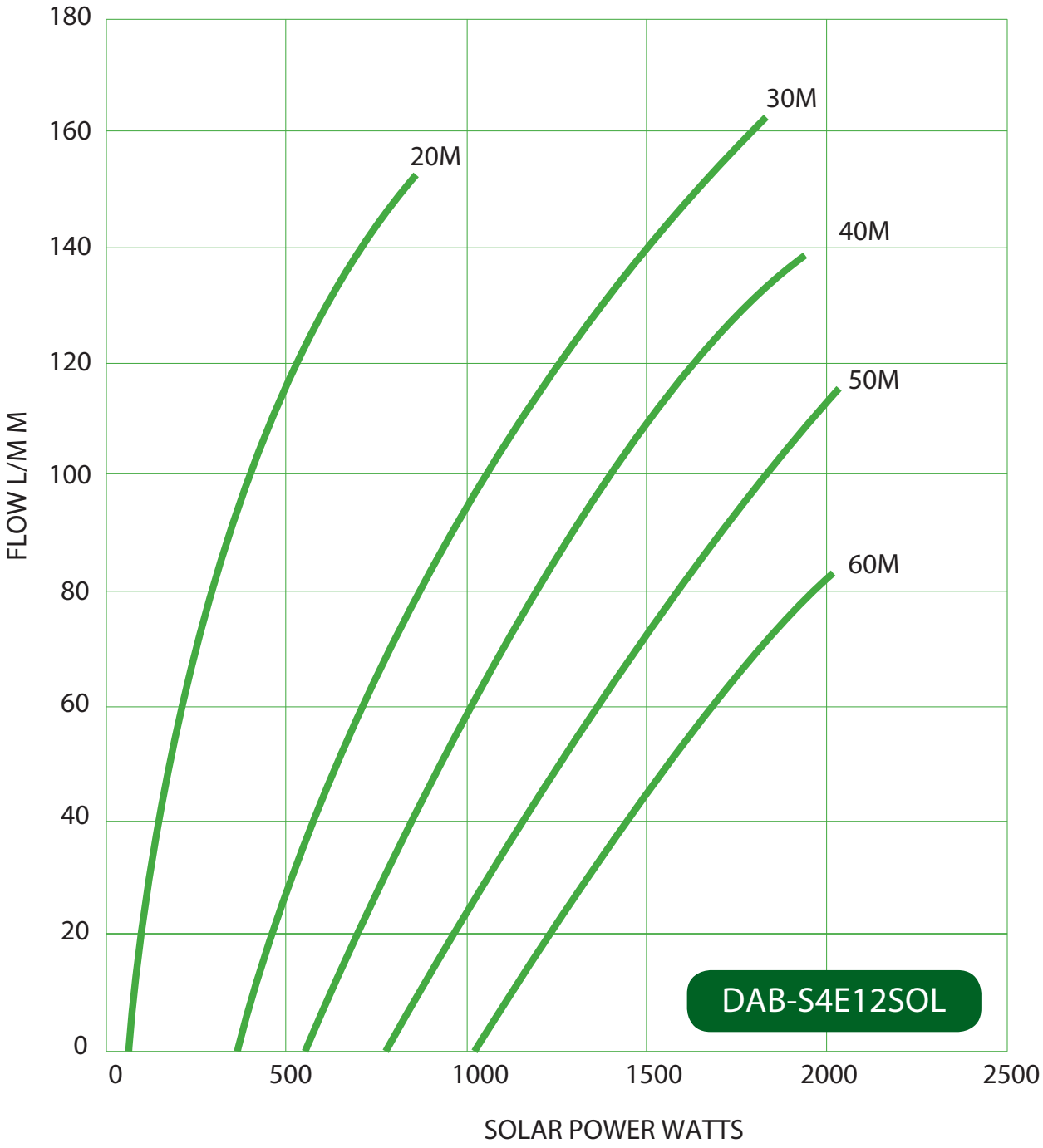
805154



PERFORMANCE CURVES

DAB-S4E12SOL

805367



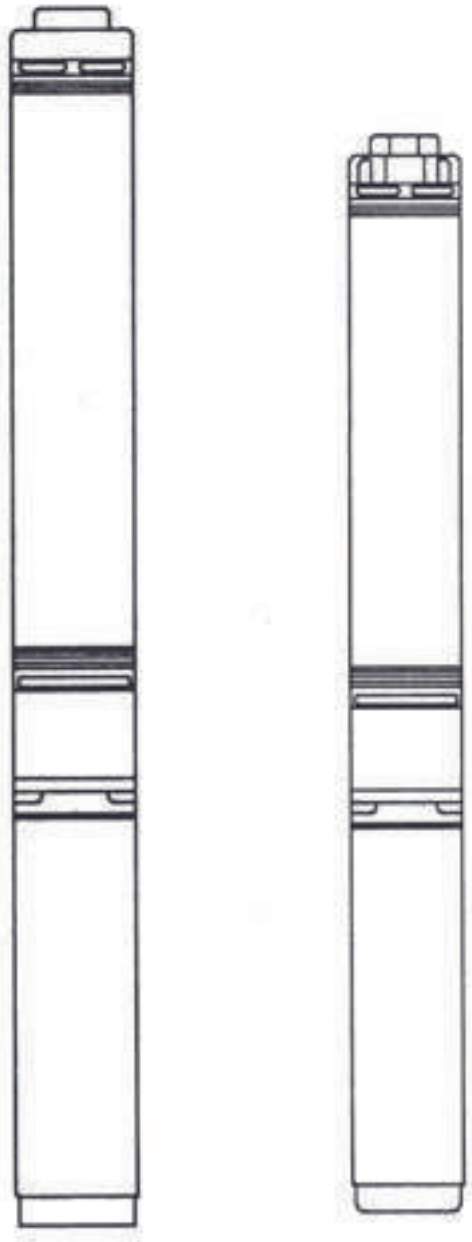
iSOLAR BOREPUMP SELECTION BASED ON AVERAGE 6 SOLAR HOURS/DAY SUMMER, 4 SOLAR HOURS/DAY WINTER																				LITRES/MIN, LITRES/DAY
HEAD M	200 W		400 W		600 W		800 W		1000 W		1200 W		1400 W		1600 W		2000 W	
	SUMMER	WINTER	SUMMER	WINTER	SUMMER	WINTER	SUMMER	WINTER	SUMMER	WINTER	SUMMER	WINTER	SUMMER	WINTER	SUMMER	WINTER	SUMMER	WINTER
10	S4C9SOL																	
	43	43																
	15480	10320																
10			S4E8SOL	S4E8SOL	S4E8SOL	S4E8SOL	S4E8SOL	S4E8SOL	S4E8SOL	S4E8SOL	S4E8SOL	S4E8SOL						
			103	103	137	137	163	163	183	183	191	191						
			37080	24720	49320	32880	58680	39120	65880	43920	68760	45840						
15	S4B12SOL	S4B12SOL																
	22	22																
	7920	5280																
15	S4C9SOL	S4C9SOL	S4C9SOL	S4C9SOL														
	33	33	58	58														
	11880	7920	20880	13920														
15			S4E8SOL	S4E8SOL	S4E8SOL	S4E8SOL	S4E8SOL	S4E8SOL	S4E8SOL	S4E8SOL	S4E8SOL	S4E8SOL						
			77	77	116	116	143	143	165	165	180	180						
			27720	18480	41760	27840	51480	34320	59400	39600	64800	43200						
20	S4A18SOL	S4A18SOL	S4A18SOL															
	15	15	21	21														
	5400	3600	7560	5040														
20	S4B12SOL	S4B12SOL																
	20	20																
	7200	4800																
20	S4C9SOL	S4C9SOL	S4C9SOL	S4C9SOL	S4C9SOL	S4C9SOL	S4C9SOL	S4C9SOL										
	22	22	49	49	65	65	69	69										
	7920	5280	17640	11760	23400	15600	24840	16560										
20			S4D13SOL	S4D13SOL	S4D13SOL	S4D13SOL												
			55	55	72	72												
			19800	13200	25920	17280												
20					S4E8SOL	S4E8SOL	S4E8SOL	S4E8SOL	S4E8SOL	S4E8SOL	S4E8SOL	S4E8SOL	S4E8SOL	S4E8SOL				
					84	84	115	115	140	140	161	161	165	165				
					30240	20160	41400	27600	50400	33600	57960	38640	59400	39600				
20			S4E12SOL	S4E12SOL	S4E12SOL	S4E12SOL	S4E12SOL	S4E12SOL										
			100	100	125	125	144	144										
			36000	24000	45000	30000	51840	34560										
30	S4A18SOL	S4A18SOL	S4A18SOL	S4A18SOL	S4A18SOL	S4A18SOL	S4A18SOL	S4A18SOL										
	12	12	19	19	23	23	25	25										
	4320	2880	6840	4560	8280	5520	9000	6000										
30	S4B12SOL	S4B12SOL	S4B12SOL	S4B12SOL	S4B12SOL	S4B12SOL	S4B12SOL	S4B12SOL										
	12	12	25	25	33	33	37	37										
	4320	2880	9000	6000	11880	7920	13320	8880										
30			S4B24SOL	S4B24SOL	S4B24SOL	S4B24SOL	S4B24SOL	S4B24SOL										
			22	22	27	27	27	27										
			7920	5280	9720	6480	9720	6480										
30			S4C9SOL	S4C9SOL	S4C9SOL	S4C9SOL	S4C9SOL	S4C9SOL										
			27	27	48	48	54	54										
			9720	6480	17280	11520	19440	12960										
30			S4C19SOL	S4C19SOL	S4C19SOL	S4C19SOL	S4C19SOL	S4C19SOL										
			33	33	47	47	57	57										
			11880	7920	16920	11280	20520	13680										
30			S4D13SOL	S4D13SOL	S4D13SOL	S4D13SOL	S4D13SOL	S4D13SOL	S4D13SOL	S4D13SOL	S4D13SOL	S4D13SOL						
			34	34	53	53	69	69	82	82	90	90						
			12240	8160	19080	12720	24840	16560	29520	19680	32400	21600						
30			S4D17SOL	S4D17SOL	S4D17SOL	S4D17SOL	S4D17SOL	S4D17SOL										
			37	37	57	57	70	70										
			13320	8880	20520	13680	25200	16800										
30							S4E8SOL	S4E8SOL	S4E8SOL	S4E8SOL	S4E8SOL	S4E8SOL	S4E8SOL	S4E8SOL				
							63	63	88	88	112	112	128	128				
							22680	15120	31680	21120	40320	26880	46080	30720				
30							S4E12SOL	S4E12SOL	S4E12SOL	S4E12SOL	S4E12SOL	S4E12SOL	S4E12SOL	S4E12SOL	S4E12SOL	S4E12SOL	S4E12SOL	S4E12SOL
							76	76	96	96	112	112	128	128	147	147	163	163
							27360	18240	34560	23040	40320	26880	46080	30720	52920	35280	58680	39120
40	S4A18SOL	S4A18SOL	S4A18SOL	S4A18SOL	S4A18SOL	S4A18SOL	S4A18SOL	S4A18SOL										
	8	8	17	17	22	22	23	23										
	2880	1920	6120	4080	7920	5280	8280	5520										
40			S4B12SOL	S4B12SOL	S4B12SOL	S4B12SOL	S4B12SOL	S4B12SOL										
			21	21	28	28	33	33										
			7560	5040	10080	6720	11880	7920										
40			S4B24SOL	S4B24SOL	S4B24SOL	S4B24SOL	S4B24SOL	S4B24SOL										
			19	19	25	25	25	25										
			6840	4560	9000	6000	9000	6000										
40			S4B32SOL	S4B32SOL	S4B32SOL	S4B32SOL	S4B32SOL	S4B32SOL										
			18	18	28	28	28	28										
			6480	4320	10080	6720	10080	6720										
40					S4C9SOL	S4C9SOL	S4C9SOL	S4C9SOL										
					34	34	37	37										
					12240	8160	13320	8880										
40			S4C19SOL	S4C19SOL	S4C19SOL	S4C19SOL	S4C19SOL	S4C19SOL	S4C19SOL	S4C19SOL	S4C19SOL	S4C19SOL	S4C19SOL	S4C19SOL	S4C19SOL	S4C19SOL		
			23	23	38	38	48	48	58	58	64	64	68	68	68	68		
			8280	5520	13680	9120	17280	11520	20880	13920	23040	15360	24480	16320	24480	16320		
40			S4C25SOL	S4C25SOL	S4C25SOL	S4C25SOL	S4C25SOL	S4C25SOL	S4C25SOL	S4C25SOL	S4C25SOL	S4C25SOL						
			26	26	36	36	46	46	54	54	58	58						
			9360	6240	12960	8640	16560	11040	19440	12960	20880	13920						
40					S4D13SOL	S4D13SOL	S4D13SOL	S4D13SOL	S4D13SOL	S4D13SOL	S4D13SOL	S4D13SOL	S4D13SOL	S4D13SOL	S4D13SOL	S4D13SOL		
					38	38	56	56	71	71	83	83	94	94	94	94		
					13680	9120	20160	13440	25560	17040	29880	19920	33840	22560	33840	22560		
40					S4D17SOL	S4D17SOL	S4D17SOL	S4D17SOL	S4D17SOL	S4D17SOL	S4D17SOL	S4D17SOL	S4D17SOL	S4D17SOL	S4D17SOL	S4D17SOL		
					40	40	57	57	70	70	80	80	90	90	90	90		
					14400	9600	20520	13680	25200	16800	28800	19200	32400	21600	32400	21600		
40											S4E8SOL	S4E8SOL	S4E8SOL	S4E8SOL				
											68	68	84	84				
											24480	16320	30240	20160				
40									S4E12SOL	S4E12SOL	S4E12SOL	S4E12SOL	S4E12SOL	S4E12SOL	S4E12SOL	S4E12SOL	S4E12SOL	S4E12SOL
									60	60	81	81	99	99	117	117	140	140
									21600	14400	29160	19440	35640	23760	42120	28080	50400	33600

iSOLAR BOREPUMP SELECTION BASED ON AVERAGE 6 SOLAR HOURS/DAY SUMMER, 4 SOLAR HOURS/DAY WINTER																			LITRES/MIN, LITRES/DAY	
HEAD M	**200 W**		**400 W**		**600 W**		**800 W**		**1000 W**		**1200 W**		**1400 W**		**1600 W**		**2000 W**	
	SUMMER	**WINTER**	**SUMMER**	**WINTER**	**SUMMER**	**WINTER**	**SUMMER**	**WINTER**	**SUMMER**	**WINTER**	**SUMMER**	**WINTER**	**SUMMER**	**WINTER**	**SUMMER**	**WINTER**	**SUMMER**	**WINTER**
50	S4A18SOL	S4A18SOL	S4A18SOL	S4A18SOL	S4A18SOL	S4A18SOL	S4A18SOL	S4A18SOL										
	5	5	14	14	20	20	22	22										
	1800	1200	5040	3360	7200	4800	7920	5280										
50			S4B12SOL	S4B12SOL	S4B12SOL	S4B12SOL	S4B12SOL	S4B12SOL										
			15	15	25	25	27	27										
			5400	3600	9000	6000	9720	6480										
50			S4B24SOL	S4B24SOL	S4B24SOL	S4B24SOL	S4B24SOL	S4B24SOL	S4B24SOL	S4B24SOL	S4B24SOL	S4B24SOL	S4B24SOL	S4B24SOL	S4B24SOL	S4B24SOL	S4B24SOL	S4B24SOL
			16	16	22	22	27	27	32	32	35	35	39	39	40	40		
			5760	3840	7920	5280	9720	6480	11520	7680	12600	8400	14040	9360	14400	9600		
50			S4B32SOL	S4B32SOL	S4B32SOL	S4B32SOL	S4B32SOL	S4B32SOL										
			15	15	22	22	26	26										
			5400	3600	7920	5280	9360	6240										
50					S4C19SOL	S4C19SOL	S4C19SOL	S4C19SOL	S4C19SOL	S4C19SOL	S4C19SOL	S4C19SOL	S4C19SOL	S4C19SOL	S4C19SOL	S4C19SOL		
					28	28	40	40	50	50	58	58	65	65	65	65		
					10080	6720	14400	9600	18000	12000	20880	13920	23400	15600	23400	15600		
50					S4C25SOL	S4C25SOL	S4C25SOL	S4C25SOL	S4C25SOL	S4C25SOL	S4C25SOL	S4C25SOL						
					30	30	40	40	48	48	55	55						
							14400	9600	17280	11520	19800	13200						
50							S4D13SOL	S4D13SOL	S4D13SOL	S4D13SOL	S4D13SOL	S4D13SOL	S4D13SOL	S4D13SOL	S4D13SOL	S4D13SOL		
							40	40	53	53	66	66	76	76	79	79		
							14400	9600	19080	12720	23760	15840	27360	18240	28440	18960		
50							S4D17SOL	S4D17SOL	S4D17SOL	S4D17SOL	S4D17SOL	S4D17SOL	S4D17SOL	S4D17SOL	S4D17SOL	S4D17SOL	S4D17SOL	S4D17SOL
							44	44	57	57	66	66	76	76	84	84	98	98
							15840	10560	20520	13680	23760	15840	27360	18240	30240	20160	35280	23520
50													S4E12SOL	S4E12SOL	S4E12SOL	S4E12SOL	S4E12SOL	S4E12SOL
													63	63	82	82	113	113
													22680	15120	29520	19680	40680	27120
60			S4A18SOL	S4A18SOL	S4A18SOL	S4A18SOL	S4A18SOL	S4A18SOL										
			12	12	17	17	20	20										
			4320	2880	6120	4080	7200	4800										
60			S4B12SOL	S4B12SOL	S4B12SOL	S4B12SOL	S4B12SOL	S4B12SOL										
			10	10	20	20	22	22										
			3600	2400	7200	4800	7920	5280										
60			S4B24SOL	S4B24SOL	S4B24SOL	S4B24SOL	S4B24SOL	S4B24SOL	S4B24SOL	S4B24SOL	S4B24SOL	S4B24SOL	S4B24SOL	S4B24SOL	S4B24SOL	S4B24SOL		
			13	13	20	20	25	25	30	30	33	33	36	36	37	37		
			4680	3120	7200	4800	9000	6000	10800	7200	11880	7920	12960	8640	13320	8880		
60			S4B32SOL	S4B32SOL	S4B32SOL	S4B32SOL	S4B32SOL	S4B32SOL	S4B32SOL	S4B32SOL	S4B32SOL	S4B32SOL	S4B32SOL	S4B32SOL	S4B32SOL	S4B32SOL	S4B32SOL	S4B32SOL
			13	13	20	20	24	24	28	28	32	32	34	34	36	36	38	38
			4680	3120	7200	4800	8640	5760	10080	6720	11520	7680	12240	8160	12960	8640	13680	9120
60							S4C19SOL	S4C19SOL	S4C19SOL	S4C19SOL	S4C19SOL	S4C19SOL	S4C19SOL	S4C19SOL	S4C19SOL	S4C19SOL		
							30	30	42	42	51	51	58	58	58	58		
							10800	7200	15120	10080	18360	12240	20880	13920	20880	13920		
60					S4C25SOL	S4C25SOL	S4C25SOL	S4C25SOL	S4C25SOL	S4C25SOL	S4C25SOL	S4C25SOL	S4C25SOL	S4C25SOL	S4C25SOL	S4C25SOL	S4C25SOL	S4C25SOL
					23	23	34	34	42	42	48	48	54	54	61	61	68	68
					8280	5520	12240	8160	15120	10080	17280	11520	19440	12960	21960	14640	24480	16320
60									S4D13SOL	S4D13SOL	S4D13SOL	S4D13SOL	S4D13SOL	S4D13SOL	S4D13SOL	S4D13SOL		
									42	42	55	55	64	64	64	64		
									15120	10080	19800	13200	23040	15360	23040	15360		
60							S4D17SOL	S4D17SOL	S4D17SOL	S4D17SOL	S4D17SOL	S4D17SOL	S4D17SOL	S4D17SOL	S4D17SOL	S4D17SOL	S4D17SOL	S4D17SOL
							32	32	46	46	56	56	66	66	74	74	87	87
							11520	7680	16560	11040	20160	13440	23760	15840	26640	17760	31320	20880
70			S4A18SOL	S4A18SOL	S4A18SOL	S4A18SOL	S4A18SOL	S4A18SOL										
			9	9	15	15	17	17										
			3240	2160	5400	3600	6120	4080										
70			S4B24SOL	S4B24SOL	S4B24SOL	S4B24SOL	S4B24SOL	S4B24SOL	S4B24SOL	S4B24SOL	S4B24SOL	S4B24SOL	S4B24SOL	S4B24SOL	S4B24SOL	S4B24SOL		
			11	11	18	18	23	23	28	28	32	32	35	35	36	36		
			3960	2640	6480	4320	8280	5520	10080	6720	11520	7680	12600	8400	12960	8640		
70			S4B32SOL	S4B32SOL	S4B32SOL	S4B32SOL	S4B32SOL	S4B32SOL	S4B32SOL	S4B32SOL	S4B32SOL	S4B32SOL	S4B32SOL	S4B32SOL	S4B32SOL	S4B32SOL	S4B32SOL	S4B32SOL
			10	10	17	17	23	23	26	26	29	29	32	32	34	34	37	37
			3600	2400	6120	4080	8280	5520	9360	6240	10440	6960	11520	7680	12240	8160	13320	8880
70							S4C19SOL	S4C19SOL	S4C19SOL	S4C19SOL	S4C19SOL	S4C19SOL	S4C19SOL	S4C19SOL	S4C19SOL	S4C19SOL		
							22	22	33	33	43	43	51	51	51	51		
							7920	5280	11880	7920	15480	10320	18360	12240	18360	12240		
70							S4C25SOL	S4C25SOL	S4C25SOL	S4C25SOL	S4C25SOL	S4C25SOL	S4C25SOL	S4C25SOL	S4C25SOL	S4C25SOL	S4C25SOL	S4C25SOL
							27	27	36	36	43	43	49	49	55	55	62	62
							9720	6480	12960	8640	15480	10320	17640	11760	19800	13200	22320	14880
70									S4D17SOL	S4D17SOL	S4D17SOL	S4D17SOL	S4D17SOL	S4D17SOL	S4D17SOL	S4D17SOL	S4D17SOL	S4D17SOL
									32	32	44	44	56	56	65	65	76	76
									11520	7680	15840	10560	20160	13440	23400	15600	27360	18240
80			S4A18SOL	S4A18SOL	S4A18SOL	S4A18SOL	S4A18SOL	S4A18SOL										
			7	7	13	13	15	15										
			2520	1680	4680	3120	5400	3600										
80					S4B24SOL	S4B24SOL	S4B24SOL	S4B24SOL	S4B24SOL	S4B24SOL	S4B24SOL	S4B24SOL	S4B24SOL	S4B24SOL	S4B24SOL	S4B24SOL		
					15	15	21	21	26	26	29	29	33	33	34	34		
					5400	3600	7560	5040	9360	6240	10440	6960	11880	7920	12240	8160		
80					S4B32SOL	S4B32SOL	S4B32SOL	S4B32SOL	S4B32SOL	S4B32SOL	S4B32SOL	S4B32SOL	S4B32SOL	S4B32SOL	S4B32SOL	S4B32SOL	S4B32SOL	S4B32SOL
					15	15	20	20	25	25	28	28	31	31	33	33	37	37
					5400	3600	7200	4800	9000	6000	10080	6720	11160	7440	11880	7920	13320	8880
80									S4C19SOL	S4C19SOL	S4C19SOL	S4C19SOL	S4C19SOL	S4C19SOL	S4C19SOL	S4C19SOL		
									25	25	35	35	43	43	43	43		
									9000	6000	12600	8400	15480	10320	15480	10320		
80							S4C25SOL	S4C25SOL	S4C25SOL	S4C25SOL	S4C25SOL	S4C25SOL	S4C25SOL	S4C25SOL	S4C25SOL	S4C25SOL	S4C25SOL	S4C25SOL
							20	20	30	30	37	37	44	44	50	50	59	59
							7200	4800	10800	7200	13320	8880	15840	10560	18000	12000	21240	14160
80											S4D17SOL	S4D17SOL	S4D17SOL	S4D17SOL	S4D17SOL	S4D17SOL	S4D17SOL	S4D17SOL
											33	33	46	46	56	56	63	63
											11880	7920	16560	11040	20160	13440	22680	15120

iSOLAR BOREPUMP SELECTION BASED ON AVERAGE 6 SOLAR HOURS/DAY SUMMER, 4 SOLAR HOURS/DAY WINTER LITRES/MIN, LITRES/DAY																			
HEAD M	**200 W**		**400 W**		**600 W**		**800 W**		**1000 W**		**1200 W**		**1400 W**		**1600 W**		**2000 W**	
	SUMMER	**WINTER**	**SUMMER**	**WINTER**	**SUMMER**	**WINTER**	**SUMMER**	**WINTER**	**SUMMER**	**WINTER**	**SUMMER**	**WINTER**	**SUMMER**	**WINTER**	**SUMMER**	**WINTER**	**SUMMER**	**WINTER**
90					S4A18SOL		S4A18SOL											
					11	11	13	13										
					3960	2640	4680	3120										
90					S4B24SOL	S4B24SOL	S4B24SOL	S4B24SOL	S4B24SOL	S4B24SOL	S4B24SOL	S4B24SOL	S4B24SOL	S4B24SOL	S4B24SOL	S4B24SOL		
					12	12	18	18	23	23	27	27	31	31	32	32		
					4320	2880	6480	4320	8280	5520	9720	6480	11160	7440	11520	7680		
90					S4B32SOL	S4B32SOL	S4B32SOL	S4B32SOL	S4B32SOL	S4B32SOL	S4B32SOL	S4B32SOL	S4B32SOL	S4B32SOL	S4B32SOL	S4B32SOL	S4B32SOL	S4B32SOL
					12	12	18	18	23	23	26	26	29	29	32	32	36	36
					4320	2880	6480	4320	8280	5520	9360	6240	10440	6960	11520	7680	12960	8640
90											S4C19SOL	S4C19SOL	S4C19SOL	S4C19SOL	S4C19SOL	S4C19SOL		
											28	28	34	34	34	34		
											10080	6720	12240	8160	12240	8160		
90									S4C25SOL	S4C25SOL	S4C25SOL	S4C25SOL	S4C25SOL	S4C25SOL	S4C25SOL	S4C25SOL	S4C25SOL	S4C25SOL
									23	23	32	32	37	37	44	44	54	54
									8280	5520	11520	7680	13320	8880	15840	10560	19440	12960
90													S4D17SOL	S4D17SOL	S4D17SOL	S4D17SOL	S4D17SOL	S4D17SOL
													34	34	46	46	48	48
													12240	8160	16560	11040	17280	11520
100					S4A18SOL	S4A18SOL	S4A18SOL	S4A18SOL										
					9	9	10	10										
					3240	2160	3600	2400										
100							S4B24SOL	S4B24SOL	S4B24SOL	S4B24SOL	S4B24SOL	S4B24SOL	S4B24SOL	S4B24SOL	S4B24SOL	S4B24SOL		
							15	15	21	21	25	25	28	28	28	28		
							5400	3600	7560	5040	9000	6000	10080	6720	10080	6720		
100					S4B32SOL	S4B32SOL	S4B32SOL	S4B32SOL	S4B32SOL	S4B32SOL	S4B32SOL	S4B32SOL	S4B32SOL	S4B32SOL	S4B32SOL	S4B32SOL	S4B32SOL	S4B32SOL
					11	11	16	16	21	21	24	24	27	27	30	30	34	34
					3960	2640	5760	3840	7560	5040	8640	5760	9720	6480	10800	7200	12240	8160
100											S4C25SOL	S4C25SOL	S4C25SOL	S4C25SOL	S4C25SOL	S4C25SOL	S4C25SOL	S4C25SOL
											26	26	32	32	38	38	48	48
											9360	6240	11520	7680	13680	9120	17280	11520
110							S4B24SOL	S4B24SOL	S4B24SOL	S4B24SOL	S4B24SOL	S4B24SOL	S4B24SOL	S4B24SOL	S4B24SOL	S4B24SOL		
							12	12	17	17	23	23	25	25	25	25		
							4320	2880	6120	4080	8280	5520	9000	6000	9000	6000		
110							S4B32SOL	S4B32SOL	S4B32SOL	S4B32SOL	S4B32SOL	S4B32SOL	S4B32SOL	S4B32SOL	S4B32SOL	S4B32SOL	S4B32SOL	S4B32SOL
							13	13	18	18	23	23	26	26	28	28	32	32
							4680	3120	6480	4320	8280	5520	9360	6240	10080	6720	11520	7680
110											S4C25SOL	S4C25SOL	S4C25SOL	S4C25SOL	S4C25SOL	S4C25SOL	S4C25SOL	S4C25SOL
											20	20	27	27	34	34	39	39
											7200	4800	9720	6480	12240	8160	14040	9360
120							S4B24SOL	S4B24SOL	S4B24SOL	S4B24SOL	S4B24SOL	S4B24SOL	S4B24SOL	S4B24SOL	S4B24SOL	S4B24SOL	S4B24SOL	S4B24SOL
							10	10	15	15	20	20	21	21	21	21		
							3600	2400	5400	3600	7200	4800	7560	5040	7560	5040		
120							S4B32SOL	S4B32SOL	S4B32SOL	S4B32SOL	S4B32SOL	S4B32SOL	S4B32SOL	S4B32SOL	S4B32SOL	S4B32SOL	S4B32SOL	S4B32SOL
							12	12	17	17	21	21	24	24	27	27	31	31
							4320	2880	6120	4080	7560	5040	8640	5760	9720	6480	11160	7440
120													S4C25SOL	S4C25SOL	S4C25SOL	S4C25SOL	S4C25SOL	S4C25SOL
													22	22	28	28	34	34
													7920	5280	10080	6720	12240	8160
130									S4B24SOL	S4B24SOL	S4B24SOL	S4B24SOL	S4B24SOL	S4B24SOL	S4B24SOL	S4B24SOL		
									13	13	17	17	17	17	17	17		
									4680	3120	6120	4080	6120	4080	6120	4080		
130									S4B32SOL	S4B32SOL	S4B32SOL	S4B32SOL	S4B32SOL	S4B32SOL	S4B32SOL	S4B32SOL	S4B32SOL	S4B32SOL
									15	15	18	18	22	22	25	25	28	28
									5400	3600	6480	4320	7920	5280	9000	6000	10080	6720
140									S4B32SOL	S4B32SOL	S4B32SOL	S4B32SOL	S4B32SOL	S4B32SOL	S4B32SOL	S4B32SOL	S4B32SOL	S4B32SOL
									13	13	17	17	20	20	23	23	26	26
									4680	3120	6120	4080	7200	4800	8280	5520	9360	6240
150									S4B32SOL	S4B32SOL	S4B32SOL	S4B32SOL	S4B32SOL	S4B32SOL	S4B32SOL	S4B32SOL	S4B32SOL	S4B32SOL
									10	10	14	14	18	18	22	22	23	23
									3600	2400	5040	3360	6480	4320	7920	5280	8280	5520

INSTALLATION AND OPERATION MANUAL FOR DAB 4" SUBMERSIBLE PUMPS WITH ICON SOLAR 2.2 KW MOTOR

S4A – S4B – S4C – S4D – S4E



DAB ICON 4" SOLAR SUBMERSIBLE PUMP INSTALLATION AND OPERATING INSTRUCTIONS

These instructions supply the necessary information for the installation and operation of 4" submersible pumps, and should be thoroughly read and understood before installation is attempted.

WARRANTY

The following Warranty conditions shall apply to DAB ICON SOLAR submersible pump installation. White International shall not be held responsible for damage caused by improper installation, use of cable and control boxes or level controls which are not approved by White International, negligent or careless handling, lightning, improper voltage supply, corrosion due to impure water, wear caused by sand, gravel or other abrasives in the water being pumped.

IMPORTANT PRECAUTIONS

1. Damage to pump or motor caused by abrasive or corrosive water is not covered by the Warranty; however, to guard against installing a pump in aggressive water, it is suggested that an analysis of the bore water be carried out prior to installation to ensure pump suitability.

2. The bore should be clean before installation. The submersible pump must not be used to bail a new bore. Guarantee does not cover failure or wear due to abrasives in the water.

3. Be sure voltage and frequency as shown on the nameplate of the control box and motor the same as the voltage and frequency on the line to which the motor is to be connected. Minimum voltage at the motor must be 90 to 360 VDC / 240V AC.

4. Do not allow pump to run unless it is properly connected to the iSolar control box.

5. Do not allow pump to run dry, against a closed discharge or full open discharge. Refer to table showing minimum and maximum flow conditions.

6. In addition to the check valve built into the pump, it may be necessary to install an additional check valve. This is mandatory for heads greater than 80 metres, or on pressure systems. This will reduce water hammer shocks to the pump.

7. Know the total depth of the bore and ensure that the pump does not rest on the bottom or in sand. Ensure 1.5 metres (5 feet) clear below the pump to the bottom of the bore.

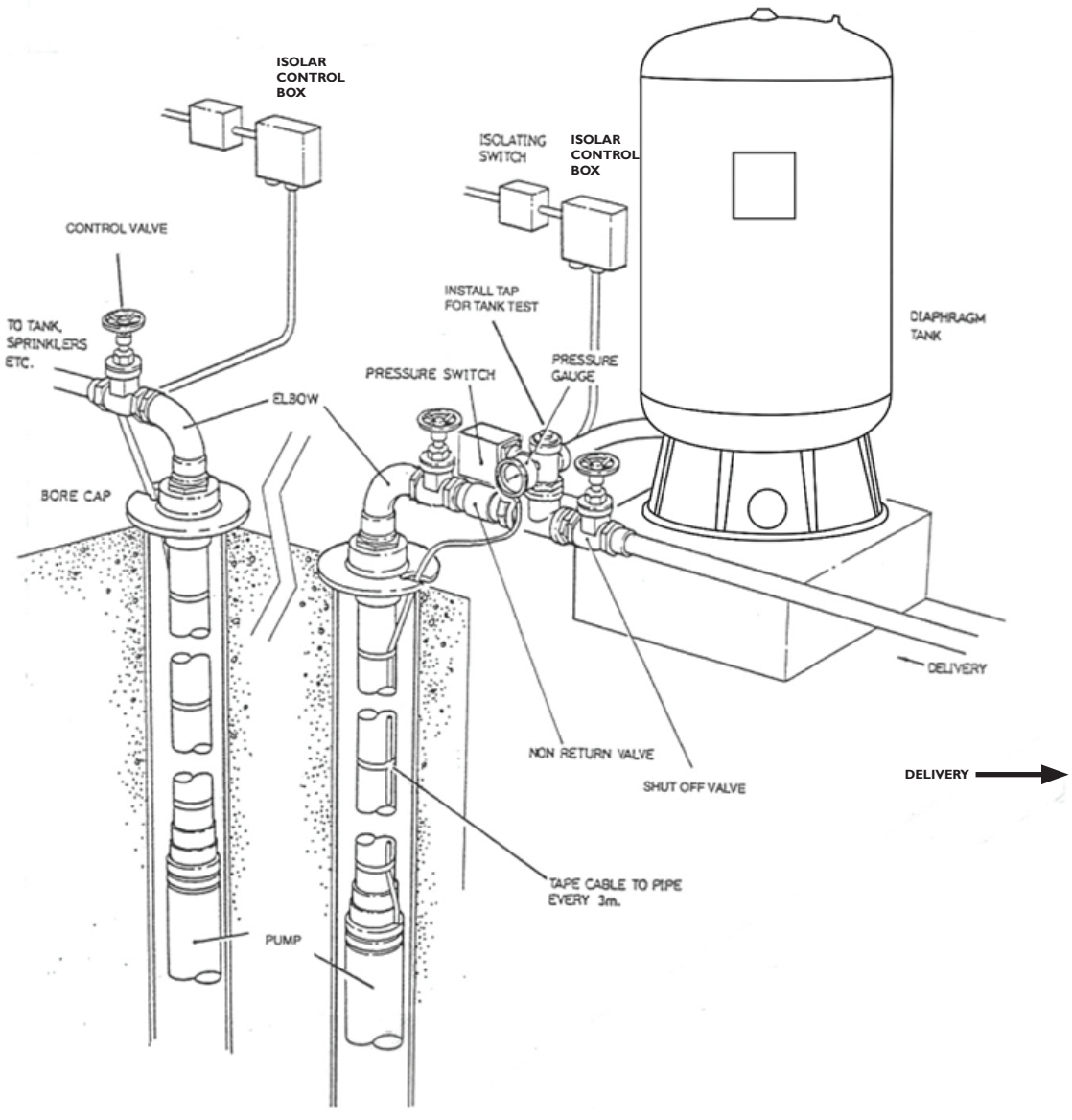
8. Know the pumping level of the bore and ensure that the pump remains submerged at all times. Use of level controller is recommended. If probe type is used, the probe should be located to switch the pump off when the bore water level drops within 1 metre of the pump suction.

9. A Flow Inducer Sleeve or shroud which ensures that the water is drawn into the pump from below the motor is required when the pump is in open water (i.e. water tank, river or dam), is in a rock well, below casing or set in screens, or well diameter is too large.
10. Do not install borehole submersibles in a crooked bore without gauging first. Lower a

gauge which is the same diameter and length as the pump to be used into the bore. If the gauge does not bind, it is safe to install the pump.

11. Never support the weight of the pump by the drop (power) cable or by the safety rope. Refer instructions in section PUMP DROP PIPE.

TYPICAL SUBMERSIBLE INSTALLATION



Pump connected for manual operation

Submersible water pressure system incorporating 100 litre pressure tank

DEPTH OF INSTALLATION

Make sure that the unit is at least one metre above any gravel layer and one metre below the minimum drawdown level. If during the initial operation, the pump lowers the well water level until suction is discontinued, then lower the pump where feasible, or install a protection device, or reduce the flow rate of the pump to prevent over-pumping.

PUMP DROP PIPE (Pipe Down The Bore)

Polythene drop pipe may be used, provided the pressures and depths indicated in the tables below are not exceeded.

PN RATING	MAX PUMP HEAD (M) BY CURVE	MAX KPA AT TOP OF BORE	MAX PSI AT TOP OF BORE	MAX DEPTH (M)	MAX DEPTH (FT)
6.3	63	0	0	63	207
6.3	63	138	20	49	161
6.3	63	276	40	35	114
6.3	63	414	60	21	68
6.3	63	552	80	7	22
8	80	0	0	80	262
8	80	138	20	66	216
8	80	276	40	52	170
8	80	414	60	38	124
8	80	552	80	24	78
8	80	689	100	10	32
10	100	0	0	100	328
10	100	138	20	86	282
10	100	276	40	72	236
10	100	414	60	58	190
10	100	552	80	44	144
10	100	689	100	30	97
10	100	827	120	16	51
10	100	965	140	2	5
12.5	125	0	0	125	410
12.5	125	138	20	111	364
12.5	125	276	40	97	318
12.5	125	414	60	83	272
12.5	125	552	80	69	226
12.5	125	689	100	55	179
12.5	125	827	120	41	133
12.5	125	965	140	27	87
12.5	125	1103	160	13	41
12.5	125	1172	170	5	18

PN RATING	MAX PUMP HEAD (M) BY CURVE	MAX KPA AT TOP OF BORE	MAX PSI AT TOP OF BORE	MAX DEPTH (M)	MAX DEPTH (FT)
16	160	0	0	160	525
16	160	138	20	146	479
16	160	276	40	132	433
16	160	414	60	118	387
16	160	552	80	104	340
16	160	689	100	90	294
16	160	827	120	76	248
16	160	965	140	62	202
16	160	1103	160	48	156
16	160	1172	170	40	133
16	160	1241	180	33	110
16	160	1379	200	19	64
16	160	1517	220	5	17

Polythene drop pipe can be selected by reference to the pump curve and its suitability can be checked on site by checking the maximum pressure read at the top of the bore reference to the maximum depth allowed.

An unstrained safety rope must be connected to all pumps suspended on polythene pipe. This line should be fastened to the lifting hook of the pump. The other end should be fastened at the top of the bore casing or bore cap. The safety rope should be affixed at three metre intervals by a suitable underwater tape with the rope having some slackness between each interval to compensate for the expansion of the polythene pipe when under load.

Care should be exercised to ensure that the polythene pipe is securely fastened to reliable fittings.

If galvanized steel drop pipe is used, it is best installed in three meter lengths to enable easy handling and all threads should be treated against corrosion.

It may be necessary, as a safety precaution to install a non-return valve at the top of the bore. This is in addition to the non-return valve fitted in the pump. This will assure a break down of the water hammer and consequently a reduction of shocks on the hydraulic components (which occurs in any pump system) immediately after each shutdown.

This non-return valve is mandatory where the pump heads (pressure at the top of the bore plus pump depth) exceed 80 m (785 kPa or 262 ft) or where the pump is part of an automatic pressure system.

WIRING

Wiring should conform to the requirements of local and national electrical codes. If in any doubt, contact your Electricity Supply Authority.

CAUTION

The use of smaller cable than specified below may cause premature motor failure and will void the warranty. Larger sized cables may be used.

The use of old drop cable or white flat is not recommended. Use water-proof cable only, i.e, Aquaflex AQM rated for immersion to 100 m (500m immersion rated also available) obtainable from White International.

The table indicates the correct size electrical drop cable and maximum lengths to be used.

SINGLE PHASE 240 VOLT CABLE SELECTION

MOTOR kW (HP)		0.37 (0.5)	0.55 (0.75)	0.75 (1.0)	1.1 (1.5)	1.5 (2.0)	2.2 (3.0)
Metric Cable Stranding	Area mm2	metres	metres	metres	metres	metres	metres
7/0.50	1.5	94	67	49	36	29	19
7/0.67	2.5	174	123	91	67	53	36
7/0.85	4.0	279	197	146	106	85	58
7/1.04	6.0	417	296	218	159	126	87
7/1.35	10	701	496	366	268	213	147
7/1.70	16	1117	791	585	426	339	235

EARTHING PUMPS

The Pump motor is equipped with an earth lead which must be connected to the earth of the control module. If testing or used outside a well, the motor must be connected to the power supply earth lead to prevent a lethal shock hazard.

ELECTRICAL CHECK LIST

It is recommended that where possible, all electrical connections be carried out before delivery to site.

Always check that the motor gland is tight.

Check control boxes, motors and pumps are as ordered and correctly matched.

Make sure that the water proof heat shrink is heated sufficiently to cause resin to flow to create a water tight seal.

If possible, it is good to practice run the pump briefly in a container of water (water must be over the suction inlet) to check on operation before installation in the bore.

Drop cable should be affixed at three metre intervals by a suitable underwater tape with the cable having some slackness between each interval to compensate for the expansion of the polythene pipe when under load.

DELIVERY PIPING

Large diameter pipe should be used for long runs to compensate for pressure losses due to friction.
Long pipe runs can cause water hammer and damage to pumping systems. Consult your local borehole specialist as additional check valve and water hammer arrestor (pressure tank) may need to be fitted.

PUMP SWITCHING
By Float Switches, Pressure Switches, Timers etc.

(See also section headed "Pressure System Installation"

Use the supplied ICON SOLAR control module to manage input and output signals and voltage.

NOTE: Any automatic switching of the pump greater than 20 starts per hour will shorten the motor life and may void warranty.

INITIAL STARTING

Before connecting the pump outlet pipe from the bore, bend and gate valve should be screwed into the top of the bore cap as a pump valve.

With the gate valve just slightly open, start the pump.

NEVER START THE PUMP AT FULL FLOW FOR THE FIRST TIME

Immediately the pump has been started, catch some of the discharge water in a large container and allow the solids to settle out. If little or no sand appears, open the gate valve to 1/3 and pump until the water is clean.

For the first 10 to 20 minutes of operation, it is suggested to keep the gate valve only partially open, to maintain a low flow which will prevent turbulence in the well near the pump and possible seizing of the pump due to excessive sand in the water.

If excessive amounts of sand or other solids are being pumped, shut the pump down, and have the bore attended to before restarting the pump.

Submersible pumps are not guaranteed against failure due to pumping sand. Pumping of sand of even very fine small quantities will shorten the effective life of any pump.

NEVER OPEN THE GATE VALVE ABRUPTLY

as this may raise sand and deposits.

The pump should be run for a period of 30 minutes to check that it does not pump the bore dry. This would be obvious by large fluctuations on the pressure gauge and the ammeter as the pump flow surges. Continuing operation in this manner could cause serious damage to the pump and motor due to shock pressures as the pump alternately takes up and loses the hydraulic load. This effect is generally referred to as "snoring".

If in doubt about the draw down level of the bore, the use of level controller is recommended. If probe type is used, the probe should be located to switch the pump off when the bore water level drops within 1 metre of the pump suction. The use of a high level probe to automatically turn the pump on is not desired, as a rapid cycling of the pump could occur causing severe damage to the unit. Time clock or manual restart is recommended.

MINIMUM FLOW CONDITIONS

Premature pump failure may result if pumps are continuously run at flow rates less than the following:

	MINIMUM FLOW RATE	
MODEL	LPM	GPM
S4A	6	1.3
S4B	10	2.2
S4C	20	4.4
S4D	33	7.3
S4E	66	14.5

MAXIMUM FLOW CONDITIONS

Premature pump failure may result if pumps are run for more than a short period at flow rates greater than the following:

	MAXIMUM FLOW RATE	
MODEL	LPM	GPM
S4A	25	5.5
S4B	40	8.8
S4C	72	15.8
S4D	100	22.0
S4E	190	41.8

PRESSURE SYSTEM INSTALLATION

When a submersible pump is to be used as a pressure system, the following items are required.

A pressure tank of at least 30 litres draw off. A pressure switch, which is available from White International in a kit complete with pressure gauge and 3 way tee piece which allows plumbing to the pressure tank. A non-return valve at the top of the bore in addition to the pump's in-built non-return valve is required for pressure system application. It is recommended to install an additional gate valve (isolating valve) to allow blow down of the pressure tank to facilitate pressure pre-charge checking.

The pressure tank connected must be large enough to provide the storage capacity and draw off to limit pump starts to 5 per hour. Use more than one tank if necessary. Do not use "air volume control" tanks from old model pressure systems or primitive non-diaphragm type tanks.

CAUTION: *If the available pump pressure at the bore head can exceed the pressure tank's maximum working pressure should there be a pressure switch failure, then a pressure relief valve should be fitted in the delivery line to prevent the tank being over pressurised. Use only nominal 30 litre draw off tanks or larger. Do not at any time use smaller tanks. If cut out pressures exceed 5 bar (500 kPa, 73 psi) fit a 12 bar switch. Pressure switches operated outside their design working range can fatigue and cause pump and fittings failures and void warranty.*

THE TROUBLE IS?	WHAT TO LOOK FOR
Pump doesn't start	Faulty pressure switch Control box in sun or near heat source Wrong control box being used Defective control box Hydraulic overload Water logged pressure tank Low voltage supply to motor (low solar irradiation) ISOLAR controller switching between energy sources
No water delivered	Low solar irradiation Broken pump shaft or coupling Check valve installed backwards Check valve stuck closed Inlet screen clogged Water level too low in well Hole in delivery pipe below top of bore
Low water delivery	Fittings stopping check valve opening fully Water level too low in well Discharge pipe clogged, corroded or ruptured Pump installed too low in well and covered with sand or other solids Inlet screen partial clogged Worn pump Leak in outlet pipe below top of bore Check valve stuck partially closed
Pump doesn't shut off	Pipe ruptured Defective or improperly adjusted pressure switch Water level too deep for pump. Check selection Pump is air or gas bound Worn pump Pipe obstruction Pump needs adjusting
Pump starts and stops too often (i.e. more than 5 per hour)	Incorrect pressure switch, see pressure system installation Defective air valve or tank diaphragm Pressure switch differential adjustment failure Pressure tank is too small
Electric shock from water pipe Note: A motor down to earth or defective cable will not cause a shock.	Defective (grounded) incoming power leads Defective control box Earth wire connected to wrong control box terminal
Pressure gauge oscillates, flow surges (snoring)	Water level too low in the well. (Flow through pump greater than flow into well)
Electrolysis on motor and pump	Insufficient earth / earth leakage Broken earth wire

NOTE: Always install borehole submersibles with ON/OFF switches and approved circuit breaker to protect against motor damage and electrocution.

SERVICING AND MAINTENANCE INSTRUCTIONS

S4 SERIES

DISMANTLING

REMOVAL OF THE VALVE BODY (117): Unscrew the four screws (52), which hold the strainer and cable guard. Remove the strainer (42) and cable guard (39). Loosen and remove the nuts and washers that attach the pump to the motor and separate the pump and motor. Using an oil filter wrench grip the liner (69) and secure the wrench in a vice. Use a spanner to unscrew the valve body (117) from the liner (69). N.B. The thread is left hand. Take care to unscrew the components in the correct direction.

REMOVAL OF THE PUMP LINER (69): Grip the pump support (3) in a vice taking care not to damage the support. Using an oil filter wrench, unscrew the liner (69) from the pump support (3). N.B. The thread is left hand. Take care to unscrew the components in the correct direction.

DISMANTLING THE STAGES: Remove the upper support (57) complete with pilot bush (270), unscrew and remove the nut (18) and the washer (66). Slide off each stage comprising of diffuser (6), impeller (4), wear ring (191) and diffuser body (98). N.B. Some models have one or two intermediate supports (57) complete with pilot bush (271) and shaft sleeve (58). With a texta mark these supports as the intermediate support and note their position with respect to the pump stages. When all stages have been removed, the spacer bush (55) can be slid from the shaft.

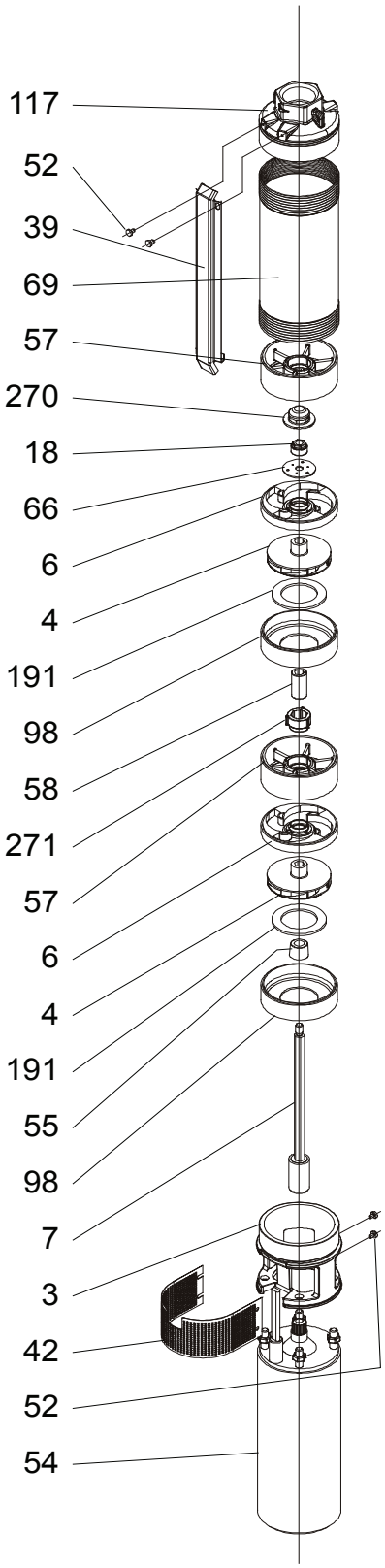
ASSEMBLY OF THE STAGES

Fit the pump shaft (7) onto the motor and ensure that the coupling engages fully. Fit the spacer bush (55) and the support (3) over the shaft. Secure the support with the motor nuts and washers. Fit the first diffuser body (98) on to the support, followed by the first wear ring (191) and the first impeller (4). Ensure that the impeller metal neck ring fits inside the wear ring. Fit the first diffuser with the conical section of the diffuser's internal wear ring facing up. Repeat this for all stages taking care that impellers fit inside wear ring. Some models will require their intermediate supports (57) complete with pilot bush (271) and shaft sleeve (58) to be fitted at the locations that were previously marked. Fit the washer (66) and tighten the nut (18), and fit the upper support (57) complete with pilot bush (270).

FITTING OF THE PUMP LINER (69): Grip the pump support (3) in a vice taking care not to damage the support. Using an oil filter wrench, screw the liner (69) onto the pump support (3). N.B. The thread is left hand. Take care to tighten the components in the correct direction.

FITTING OF THE VALVE BODY (117): Using an oil filter wrench, grip the liner (69) and secure the wrench in a vice. Use a spanner to screw the valve body (117) into the liner (69). N.B. The thread is left hand. Take care to tighten the components in the correct direction. Fit the strainer (42) and cable guard (39) using the four screws (52).

S4A-S4B-S4C-S4D- S4E



2 YEAR PUMP WARRANTY

Notes

2 YEAR WARRANTY

White International Pty Ltd
Limited Product Warranties
TERMS & CONDITIONS
This warranty is given in addition to the consumer guarantees found within the Australian Competition and Consumer Act 2010 (Cth) for goods purchased in Australia and the Consumer Guarantees Act 1993 NZ for goods purchased in New Zealand:

1) White International Pty Ltd / White International NZ Ltd (White International) warrant that all products distributed are free from defects in workmanship and materials, for their provided warranty period as indicated on the top or opposite side of this document. Subject to the conditions of the warranty, White International will repair any defective products free of charge at the premises of our authorised service agents throughout Australia and New Zealand if a defect in the product appears during the warranty period. If you believe that you have purchased a defective product and wish to make a claim under this warranty, contact us on our Sales Hotline on 1300 783 601, or send your claim to our postal address or fax line below and we will advise you as to how next to proceed. You will be required to supply a copy of your proof of purchase to make a claim under this warranty.

2) This warranty excludes transportation costs to and from White International or its appointed service agents and excludes defects due to non-compliance with installation instructions, neglect or misuse, inadequate protection against the elements, low voltage or use or operation for purposes other than those for which they were designed. For further information regarding the suitability of your intended application contact us on our Sales Hotline on 1300 783 601. If you make an invalid claim under this warranty, the original product will be sent back to you unrepaired.

3) This warranty refers only to products sold after the 1st January 2012, and is not transferable to another product type and only applies to the original owner, purchaser or end user, and is in addition to the consumer guarantees found within the Competition and Consumer Act 2010 (Cth) for goods purchased in Australia and the Consumer Guarantees Act 1993 (NZ) for goods purchased in New Zealand.

4) Our goods come with guarantees that cannot be excluded under the Australian Consumer Law. You are entitled to a replacement or refund for a major failure and for compensation for any other reasonably foreseeable loss or damage. You are also entitled to have the goods repaired or replaced if the goods fail to be of acceptable quality and the failure does not amount to a major failure.

5) To the fullest extent permitted by law, White International excludes its liability for all other conditions or warranties which would or might otherwise be implied at law. To the fullest extent permitted by law, White International's liability under this warranty and any other conditions, guarantees or warranties at law that cannot be excluded, including those in the Competition and Consumer Act 2010 (Cth), is expressly limited to:

(a) in the case of products, the replacement of the product or the supply of equivalent product, the payment of the cost of replacing the product or of acquiring an equivalent product or the repair of the product or payment of the cost of having the product repaired, is at the discretion of White
International or a 3rd party tribunal elected under the Competition and Consumer Act 2010 (Cth) for goods purchased in Australia and the Consumer Guarantees Act 1993 (NZ) for goods purchased in New Zealand; and

6) To the fullest extent permitted by law, this warranty supersedes all other warranties attached to the product or its packaging.

7) In the case of services, supplying the services again or the payment of the cost of having the services supplied again, is at the discretion of White International or a 3rd party tribunal elected under the Competition and Consumer At 2010 (Cth) for goods purchased in Australia and the Consumer Guarantees Act 1993 (NZ) for goods purchased in New Zealand.

8) Our warranty commences from the date of purchase of the above mentioned pumps. Proof of purchase is required before consideration under warranty is given. Record your date of purchase in the space below and retain this copy for your records.

Date of Purchase .....

Model Purchased .....

WHITE INTERNATIONAL PTY LTD
60 Ashford Ave Milperra NSW 2214
PO Box 304 Milperra LPO NSW 2214
Customer Service Hotline 1300 783 601
Fax 02 9783 6001
Email Sales: pumpsales@whiteint.com.au
www.whiteint.com.au

WHITE INTERNATIONAL NZ LTD
15G Kerwyn Avenue
East Tamaki, Auckland 2013, New Zealand
Customer Service Hotline 0800 509 506
Customer Service Faxline 0800 804 344
Email Sales: sales@whiteint.co.nz
www.whiteint.co.nz

P_AU/NZ_DAB_MANUAL_BOREHOLE_RANGE