

Solar Powered Borehole Pumps



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2. iSOLAR 4” Motor General Installation Notes

Water Source and Pump Installations Options

The water source must be “clean water”, free from contaminants such as, dirt, dust, loose rocks, decaying organic matter and other foreign bodies that could block the intake screen or foul the impeller stack. Sand content not to exceed 150g/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 FLOATSWITCH 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.

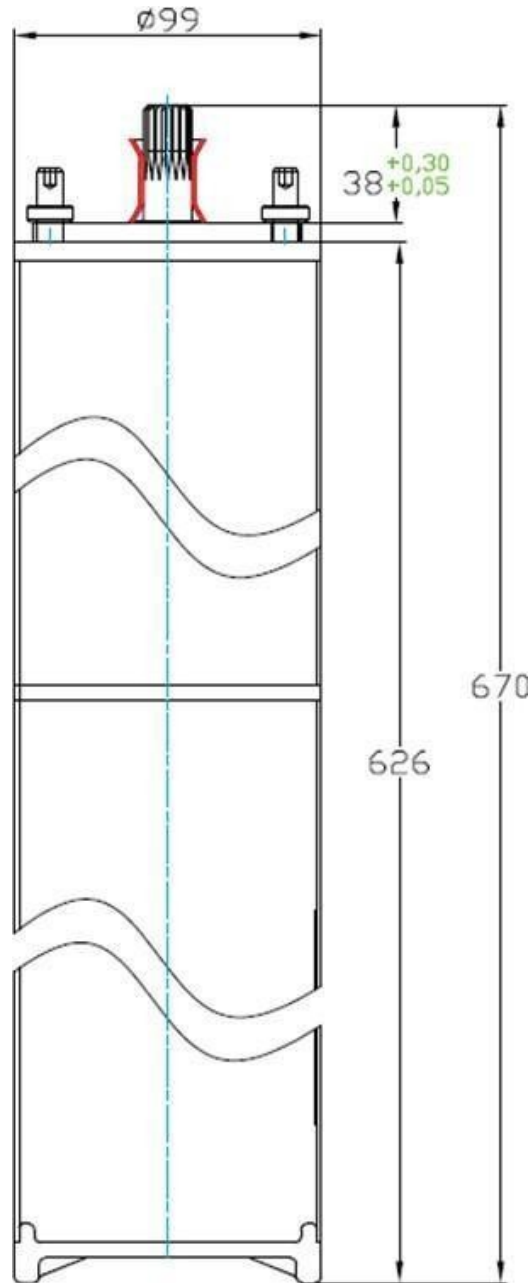
Ensure all energy sources and generator starting circuit is properly locked-out before working on the system.

Pump Installation Instructions. See the supplementary instruction manual “Installation and Operation Manual” for DAB S4 PLUS Submersible Pumps and iCON Solar motor at the end of this manual.

3. iSOLAR Motor Specifications

Dimensions: 670mm (H), 99mm (Dia)

Weight: 12kg



4. Cable Selection

Step1: Select your DC input power (Total wattage available from all the solar panels used for your system)

Step2: Under the Cable length column, choose corresponding length of the cable in meters and select the correct cable size.

Voc: Voltage Open Circuit **Vmpp:** Voltage at Max Power **Isc:** Short Circuit Current **Impp:** Current at Max Power

Solar Panel Input			Cable length (Upto 'X' Meters)												
DC Input Power Watts	Vmpp Volts	Impp Amps	10	25	50	75	100	125	150	200	250	300	CROSS SECTION MM ²		
600	60	10	2.5	6	16	25	25	35	35	50	70	70			
900	90	10	1.5	4	10	16	16	25	25	35	50	50			
1200	120	10	1.5	4	6	10	16	16	25	25	35	35			
1500	150	10	1.5	2.5	6	10	10	16	16	25	25	35			
1800	180	10	1.5	2.5	4	6	10	10	16	16	25	25			
2100	210	10	1.5	2.5	4	6	10	10	16	16	25	25			
2400	240	10	1.5	1.5	4	6	6	10	10	16	16	25			
2700	270	10	1.5	1.5	2.5	4	6	10	10	16	16	25			
3000	300	10	1.5	1.5	2.5	4	6	6	10	10	16	16			
3300	330	10	1.5	1.5	2.5	4	6	6	10	10	16	16			

*****This chart is to be used as a guide only, exact cable size will vary according to the input characteristics and technical specifications of the solar panel**
Please refer to our iSOLAR web selector for your selection - www.isolareselector.whiteint.com.au OR www.isolareselector.whiteint.co.nz

5. Solar Panel Data

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

DC voltage input range 55 – 380VMPP (440VOC) DC for BIA-M110SOL. DC voltage

input range 90 – 380VMPP (440VOC) DC for BIA-M240SOL. The panels would be wired in series or in combination of 1 string of panels in Series only.

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 licenced electrician must make all electrical connections.

WARNING:

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

DC Volts Max: 380VMPP, 440VOC **DC Amps Max:** 12A ISC

AC Volts Max: 280V

AC Amps Max: 10A

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

6. 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.

e.g. **White International Pty Ltd Office**, 60 Ashford Ave, Milperra 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/>

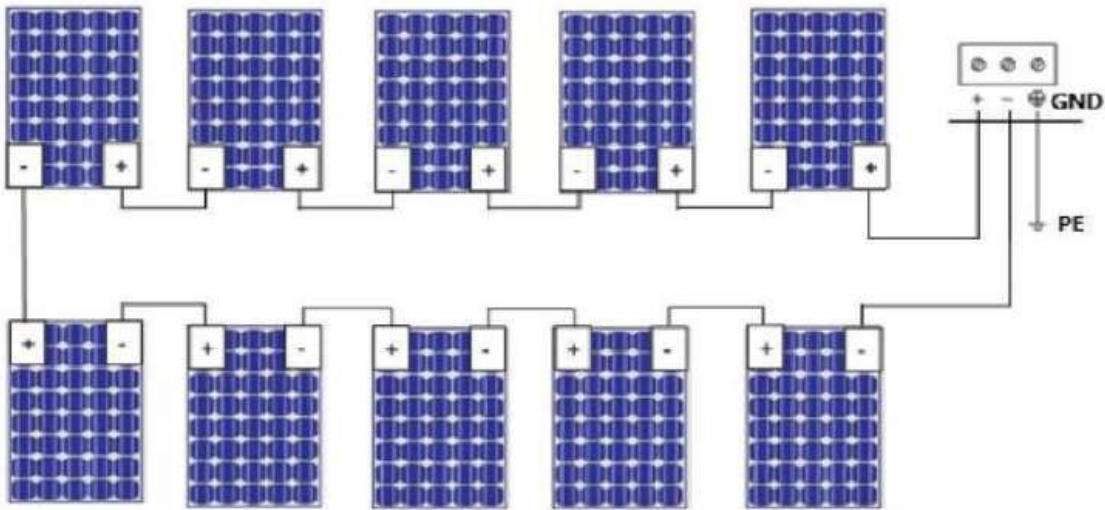
BOM in Australia <http://www.bom.gov.au/climate/data-services/solar-information.shtml>

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

7. Solar Panel Wiring

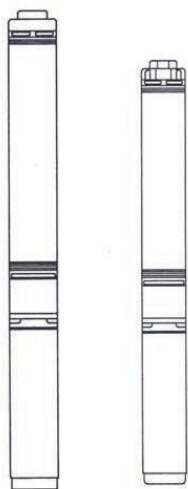
Wiring shown for 10 solar panels connected in series.

Note that operational DC input voltage ranges from 55 Vmpp to 380 Vmpp(Max: 440 Voc)



DAB S4 Submersible Pumps with iCON Solar Motors

S4/1 S4/2 S4/3 S4/4
S4/6 S4/8 S4/12 S4/16



9. S4 Plus Solar Submersible Pump Installation 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.

IMPORTANT: Please fit the strainer provided in the box onto the pump before installing.

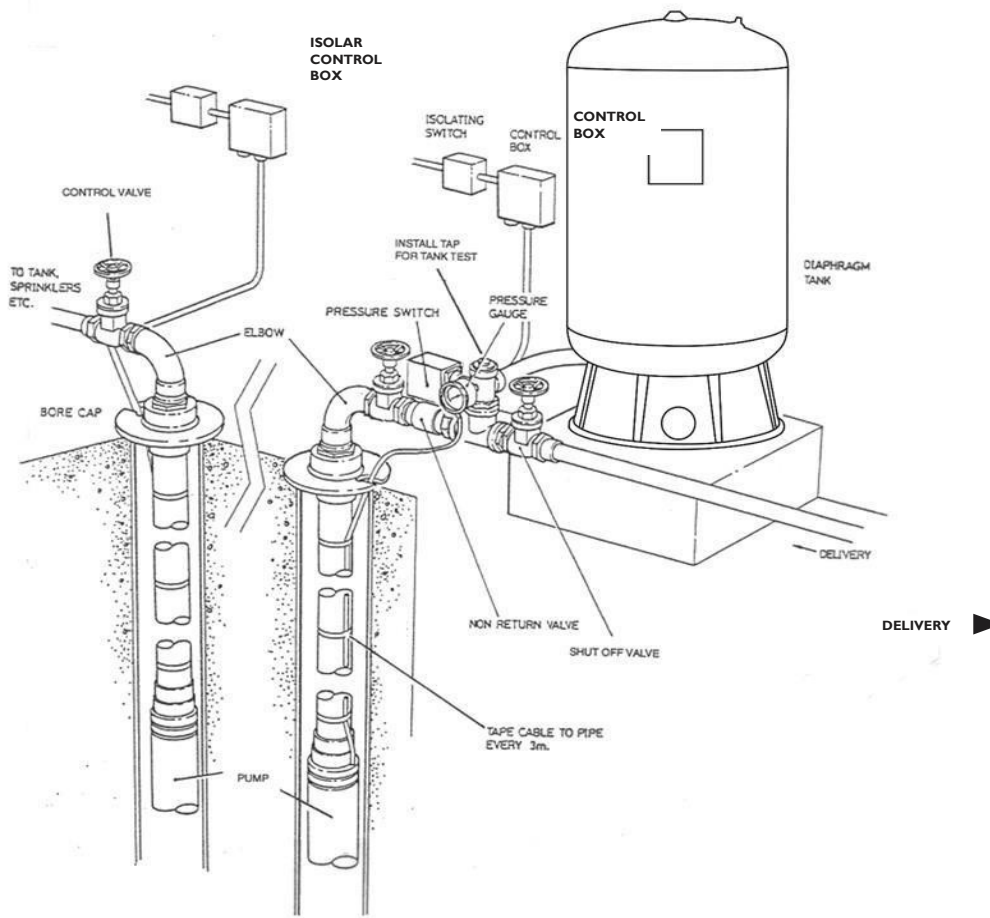
WARRANTY

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 55/90 - 380 VMP DC / 240VAC.
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 meters, 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 meters (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 meter 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.

10. Typical Submersible Installation



Pump connected for manual operation

Submersible water pressure system incorporating 100 litre pressure tank

11. Depth of Installation

Make sure that the unit is at least one meter above any gravel layer and one meter 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.

MAX SUBMERGENCE DEPTH IS 150 METRES

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-meter 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 breakdown 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.

12. Wiring & Cable Selection

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)	Area mm ²	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		meters	meters	meters	meters	meters	meters
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.

13. Checklist

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-meter 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.

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-meter 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.

NEVER OPEN THE GATE VALVE ABRUPTLY

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 meter 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 & MAXIMUM FLOW CONDITIONS

MINIMUM FLOW RATE			MAXIMUM FLOW RATE		
MODEL	LPM	GPM	MODEL	LPM	GPM
S41	5	1.1	S41	25	5.5
S42	10	2.2	S42	50	11
S43	20	4.4	S43	70	15.4
S44	30	6.6	S44	90	19.8
S46	40	8.8	S46	140	30.8
S48	50	11	S48	180	39.6
S412	90	19.8	S412	240	52.8
S416	140	35.2	S416	360	79.3

14. 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 pressurized. Use only nominal 30 litre draw off tanks or larger. Do not at any time use smaller tanks. If cut out pressures exceed 5bar (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.*

15. Troubleshooting

ISSUE / CONCERN	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.

16. 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 unrepaid.

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. 3 YEAR WARRANTY.

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 Act 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**



www.whiteint.com.au
www.whiteint.co.nz

Please always refer to our website for further technical information & new product innovations

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