Installation, Operation and Maintenance Instructions

Sun-Ray SRX

Solar Water Pumping Systems

NOV Mono®

One Company, Unlimited Solutions

Contents

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Warranty

Warranty Statement

1. The Sun-Ray Solar SRX Water Pumping System manufactured by Mono Pumps are covered by warranty for a period not exceeding twenty-four months from purchase.

2. Mono Pumps will make good by repair, or at their option, the replacement of faulty parts under warranty, providing always that:

   (a) The equipment was correctly installed and properly used in accordance with Mono Installations and Operating instruction and accepted codes of good engineering practice.

   (b) The claim for goods under warranty arises solely from faulty design, material or workmanship.

   (c) The repair is carried out in the Mono Pumps factory or by an authorised agent or distributor appointed by Mono Pumps.

   (d) All freight costs to and from the factory or repair agent are to be paid by the purchaser.

3. In the case of equipment or components which are not of Mono Pumps manufacture, but supplied by them, the warranty is limited to that extended by the suppliers or manufacturers of such equipment.

4. Mono Pumps warranty does not cover any of the following:

   (a) Claims for third party liability of damage caused by failure of any of the company's products.

   (b) Damage caused by abnormal operating conditions, war, violence, storm cataclysm or any other force.

   (c) Damage caused by the equipment being used for an application for which it is not recommended.

   (d) Damage caused by sand or abrasive materials, corrosion due to salt water or electrolytic action.

   (e) Damage to the SMC if the SMC has been opened by removal of the back plate before being returned to Mono.

   (f) Damage to the motor if the motor is found to have been disassembled before being returned to Mono Pumps.

   (g) Damage caused by running the pump dry.

5. The decision of Mono Pumps in relation to any claims or disputes over warranty is final.

6. The warranty is in lieu of all other warranties and conditions expressed or implied, written or oral, statutory or otherwise, which are hereby negated and excluded.

7. This express warranty does not exclude any conditions or warranty implied by the Trade Practices Act 1974 or separate State laws and in addition to any other right, that the original purchasers or any subsequent purchaser may have at law.

In case of claim please contact your Authorised Mono Pumps dealer or contact Mono Pumps (Australia) Pty Ltd.

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Introduction

Intended Use

The Sun-Ray SRX Solar Water Pumping system is designed for pumping potable water using solar power. Do not use the system for any other purpose.

The protection provided by the equipment may be impaired if the equipment is used in any other manner than designed.

System Overview

Mono Pumps Sun-Ray Solar Water Pumping Systems are comprised of four main parts:

1   Either a stationary or tracking solar array.
2   Solar Motor Controller (SMC).
3   Brushless DC Motor (BLDC) with electrical cable and plugs
4   CP Pump (Wet End) which is direct coupled to the BLDC motor.

Additional items such as Floats, Termination Kits, Water Level Controllers (WLC's), Float Switches, etc. may also be supplied with the system. The pump suction, discharge piping and all equipment, foundations and ancillary structures, unless otherwise requested is the responsibility of the installer. The installation, operation and maintenance of the Solar Array are not covered in this manual. Please refer to the Solar Arrays manual for information on this part of the solar water pumping system.

Warnings

Solar arrays can deliver voltage levels up to 160V DC. Always unplug the SMC from the array before working on any electrical wiring on the SMC or Motor Cables. In the event that alterations are required to the array itself, it is essential to cover the front of the array with a blanket or other suitable material to completely stop electrical generation.

The output voltage from the SMC to the Motor is 180V DC. Always unplug the SMC from the array before working on any electrical wiring on the SMC or Motor Cables.

All electrical connections in the solar water pumping system are made via plug and socket. The solar array must be fitted with a switched socket to accept the plug from the SMC and to ensure that the system can be completely isolated from the power source when required.

Motors can get hot during operation. Ensure all motors protected from direct sun, and have good ventilation.

Ensure absent of any combustable items surrounding motor.

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Introduction

Solar Motor Controller (SMC)

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Do not handle electrical connections when wet. Electric shock can occur.

The SMC comprises a solar maximum power point tracker and brushless DC motor control electronics combined in the one enclosure.

The MPPT converts adjusts the voltage on the solar array to maximise power generation and increases or reduces this voltage to suit the demands of the motor controller.

The motor controller is an electronic commutator replacing the brushes in conventional DC motors. The motor controller senses back EMF voltages from the motor to determine the rotor position. This information is fed into a micro computer to calculate the energising sequence for the motor phases.

Features include:
*   Input power ranges from 150 Watts to 2400 Watts from solar modules (refer to specifications for voltage, current and power limits for each SMC model.)

*   Microprocessor controlled maximum power point tracking continuously changes the array voltage and monitors the input power level thus following changes in the maximum power point of the array. This technology extracts the maximum available power form the solar modules.

*   Remote On/Off control via float, pressure switch or water level control via probes placed in the bore hole.

*   Electronic pressure cutoff system.

*   Easily accessible On/Off switch.

*   Interface to an optional Hand Held Display Unit

*   Variable motor speed control via front panel or the optional Hand Held Display Unit.

*   Thermal overload protection

*   Input current overload protection detects if too many solar modules are connected to the SMC or if high currents are supplied from a battery source.

*   Output current overload protection stops the system if the discharge pressure from the pump is too high.

*   If the power output from the array is too low to start the pump, the system goes into "sleep" mode before attempting to restart the pump. This reduces load on the circuits and heating of DC motors.

*   Low motor speed cut off to reduce pump and motor wear.

*   Float Switch Input Protection prevents damage if accessory devices connected to the float switch socked are wired incorrectly.

*   Status lights to tell the operator what the system is doing.

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Introduction

Brushless DC Motor

The Mono Pumps Sun-Ray SRX System uses a high efficiency, brushless, sensorless, permanent magnet, DC, motor designed for coupling to the Mono Pumps Sun-Ray pump.

The motor has a permanent magnet rotor and supported by low lose bearings with all the drive electronics housed separately in the SMC. No sensor is required to determine rotor position within the motor.

Sun-Ray Pump Wet End

The progressing cavity pump has been designed specifically for use on the Sun-Ray SRX system. The wet end is either a CP25, CP800 or CP1600 type pump.

The high operating efficiency of the motor pump and SMC ensures that the maximum amount of water can be pumped over the whole day and during cloudy conditions.

Optional Level Probe or float

Part # SUN S0889 or SUN S0648
Mono can supply a separate level probe or float switch. This probe device plugs into the Float Switch outlet on the SMC.

The float switch/ level probe will protect the pump from dry running if the source water level drops to the level of the inlet to the pipework. The dropped float (open circuit) needs to be set above the height of the openning of the suction pipe.

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Dry running of the pump will damage the rubber stator in the pump. Damage resulting from dry running is not covered by the system warranty.

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Specifications

Specifications

Motor Specifications

Size Range

	700W	1400W
Output Power Rating	**700W**	**1400W**
Nominal Torque Rating	0.7Nm	1.5Nm
Nominal Speed at rated power	1800rpm	1800rpm
Variable Speed Control	Yes via SMC	Yes via SMC
Efficiency at Nominal Torque Rating	85 %	85 %

Electrical Characteristics

Maximum Operating Voltage (motor)	180V	180V
Input Voltage Range	0-180V DC	0-180V DC
Operating Frequency Range	0 - 100 Hz	0 - 100 Hz
Maximum Current	3 amps	5 amps

Materials	*All models*
Motor Cable	4 Core 1.5mm2
Casing, end caps, rotor can, shaft	Anoidized Aluminium
Studs, screws, nuts and washers	316 stainless steel
Magnets	NdFeBr (Neodymium Iron Boron)

Water Quality	
Maximum Water Temperature	35 deg C, also see Pump Specifications
pH range	8.5 to 6.0
Hardness Range	2000 Mg/L
Salt Concentration	500 ppm

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Specifications

Solar Motor Controller Specifications

Electrical

Solar Array Input

Series 2000 SMC
Voltage :   30 to 165 VDC
Current :   0 to 5 A
Solar Array: 700W Max.

Series 3000 SMC
Voltage :   30 to 165 VDC
Current :   0 to 15 A
Power: 1500W Max.
Solar Array: 3000W Max.

Motor output

Series 2000   SMC
Voltage :   0 to 180V
3 Phase switched DC
Frequency: 0 to 100 Hz
Current :   0 to 4 A

Series 3000 SMC
Voltage :   0 to 180V
3 Phase switched DC
Frequency: 0 to 100 Hz
Current :   0 to 9 A

Float Switch connector

Switch input (pin 3,4)
Operation   Normally closed
                 Shutdown on open contact
Current: 3mA (closed circuit)
Voltage: 15V (open circuit)

Auxiliary Supply (pin 1,2)
Voltage: 15VDC Nominal
Current: 50mA max (10V)

Com Connector   RS232
                         9600 baud
                         rts/cts

Environmental
Storage Temperature: -10 to 60C
Operating Temperature: -10 to 50C
IP Rating: Type 3, Water and dust tight.
Humidity: 95% Max.

Dimensions & Weight

Dimensions (Carton)
390 x 275 x 290mm
Weight (in carton)   6.5Kg
Refer following page for further
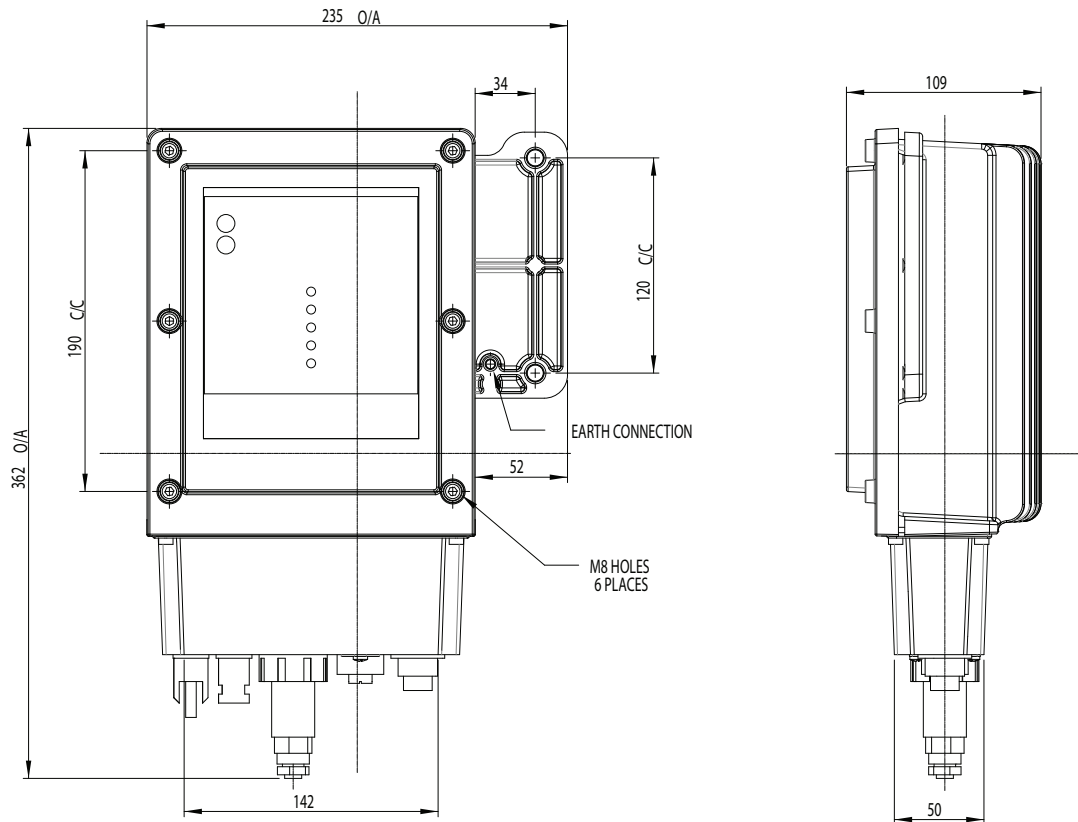dimensions.

Lightning Protection

In a solar water pumping system it is necessary to avoid having two earth points. (e.g. The motor itself and the earth rod attached to the solar array frame.) Mono recommends tying the pump safety wire to earth and bonding across to the earth stake with a 1.0"-2.0" galvanized earth strap.

The most vulnerable point is at the motor cable entry to the electronics where it is possible to receive an extreme earth potential rise after a lightning strike nearby.
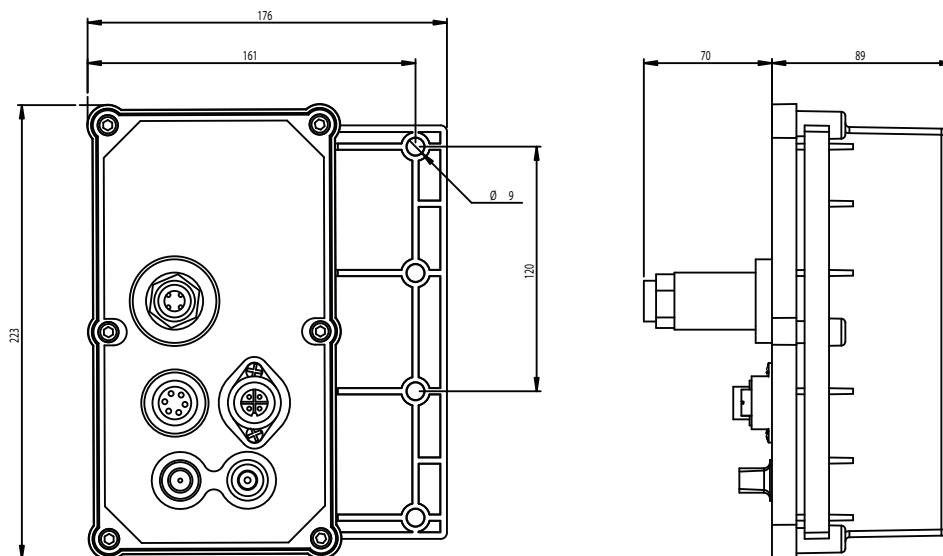
Metal Oxide Varistors are fitted on the array input and Transorbs on the Motor output.

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Specifications

Series 3000 SMC Dimensions

235 O/A
34
190 C/C
362 O/A
120 C/C
52
EARTH CONNECTION
M8 HOLES
6 PLACES
142
109
50

Series 2000 SMC Dimensions

176
161
Ø 9
223
120
70
89

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Specifications

Cable Specification

Motor

Motor Plug	180V, 9A	
Cable	Double Insulated	
	250V	
	4 Core	1.5mm² for lengths

Array

Array Plug	165V, 15A	
Cable	Double Insulated	
	1000V	
	Single Core	4mm²

Float Switch

Float Switch Plug	15V, 50mA	
Cable	Double Insulated	
	250V	
	4 Core 0.5mm²	Systems with two float switches
	2 core 0.5mm²	System with one float switch

Com Port

Com Port Plug	15V, 50mA
Cable	Double Insulated
	250V
	6 Core

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Specifications

|	CP25	CP800	CP1600
Size Range Model NumbersMaximum Speed [rpm]	1800	1800	1800
Flow at Maximum Speed [lpm]	28	68	130
Max Discharge Pressure [kPa]*	500	350	350
Max Suction Head (kPa)	6m	6m	3m
Max Differential Pressure (kPa)	500	350	350
Total Pump Weight (inc Motor)	10Kg	15Kg	18.5Kg

* At Flooded Suction

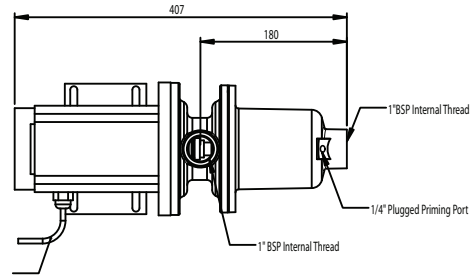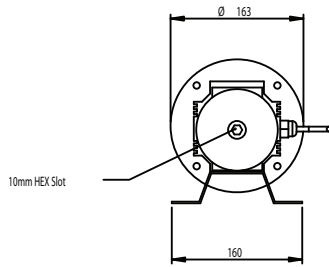| *Materials*	*All models*
Pump Housing	Acetyl Co-Polymer
Stator	Nitrile Rubber
Coupling/Motor Shaft	316 stainless steel
Rotor	316 stainless steel
Fasteners	316 stainless steel
Non Return Valve (if supplied)	Bronze with Nitrile seat and anti-rotating pin
O rings	Nitrile
Mechanical seal	Carbon / Ceramic

Float Diameter	1200mm
Float Height	670mm
Float Weight	27kg

670mm

1200mm

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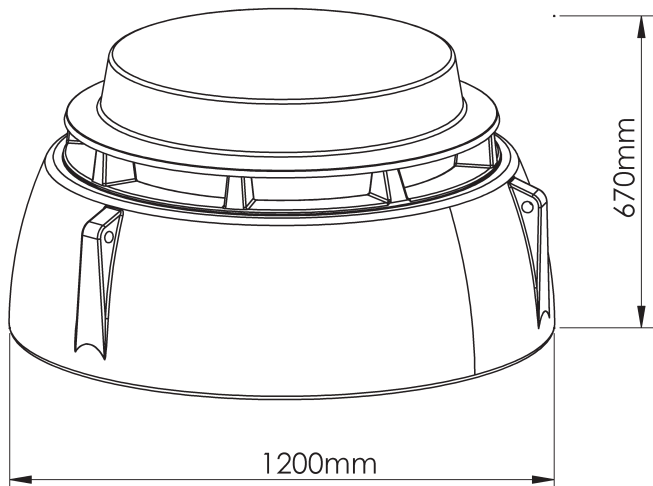
Specifications

CP25 Standard Build
p/n: SUN 700CP25S
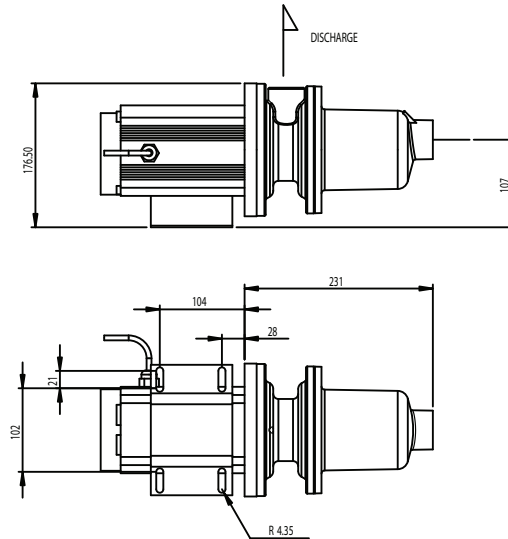
CP25 High Pressure Build
p/n: SUN 700CP25H

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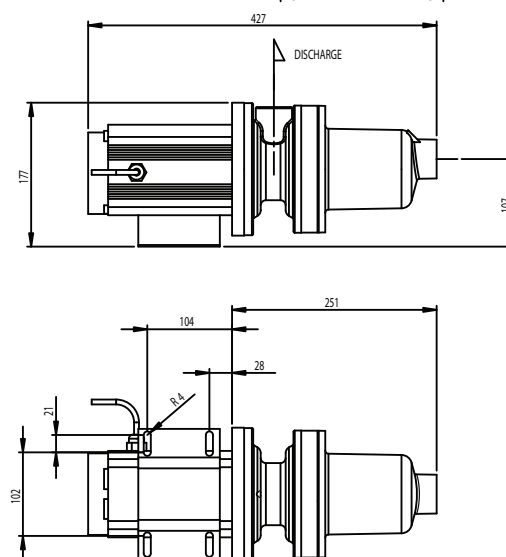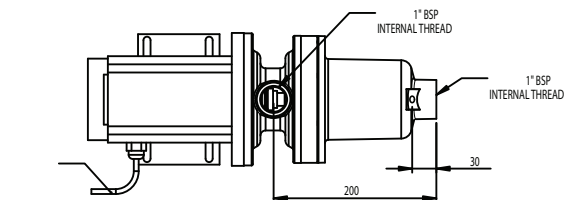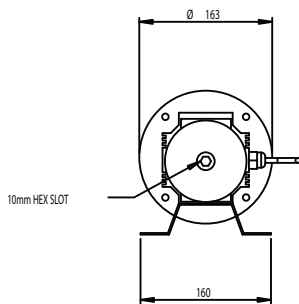
Specifications

CP800 High Pressure Build
p/n: SUN 700CP800H

1/4" Plugged Priming Port
1 1/2" External Thread
DISCHARGE
1 1/2" External Thread
5 metres 4 Core 1.5mm2 Cable
10mm HEX
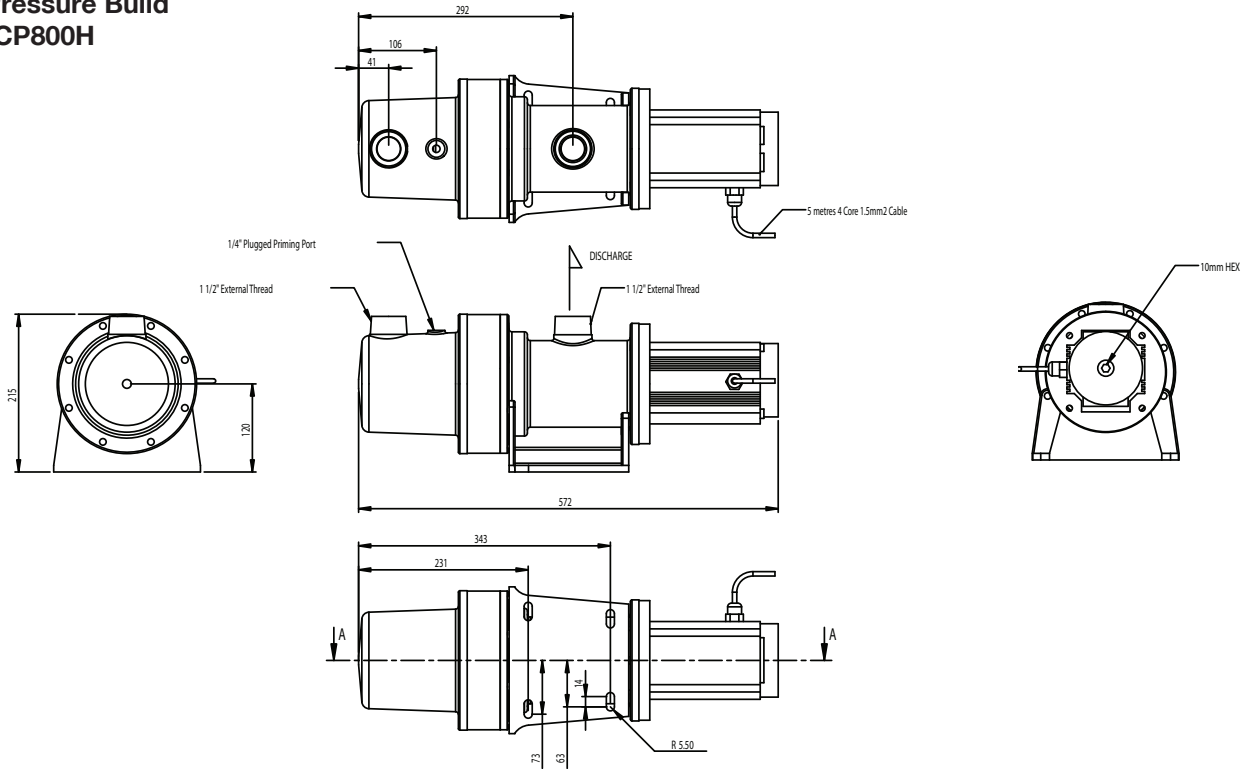
CP1600 High Pressure Build
p/n: SUN 1400CP1600H

1/4" PLUGGED PRIMING PORT
1 1/2" BSP EXTERNAL
DISCHARGE
1 1/2" BSP EXTERNAL
5 metres 4 core 1.5mm2 cable
10mm HEX Slot

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Installation

Solar Array

Electrical Earth Connection

2 Core Wire Electrical Connection

Bolted Mechanical Connection provides electrical earth

Optional Hand Held Display Unit

6 Core Wire Electrical Connection

Solar Motor Controller (SMC)

2 Core Wire Electrical Connection

Optional Bore Probe

Bore Probe

4 Core Wire Electrical Connection

BLDC Motor

Mechanical Connection

Water Output

CP Pump Element

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Installation

670mm

1200mm

Star Pickets and rope (3 places).

Ensure rope or guy wires loose enough for rising water.

Water

float

DISCHARGE

Shore

Floating Pontoon: (where applicable)

All floating pump units are fully wired in the factory and can be simply placed in a dam or creek after connecting the suction and discharge pipe work. Ensure that the pontoon is loosely located in position by ropes or guy wires connected to the tether points supplied on the pontoon. The other end of the guy wires should be connected to a fixed anchor on the bank such as a star picket. Ensure that the ropes are loose enough to enable the unit to rise and fall with changing water levels.

Discharge pipe work is not supplied with the systems. When selecting pipe work take into account the friction loss that will occur if smaller bore pipes are used, such friction losses can dramatically affect daily flow of the system.
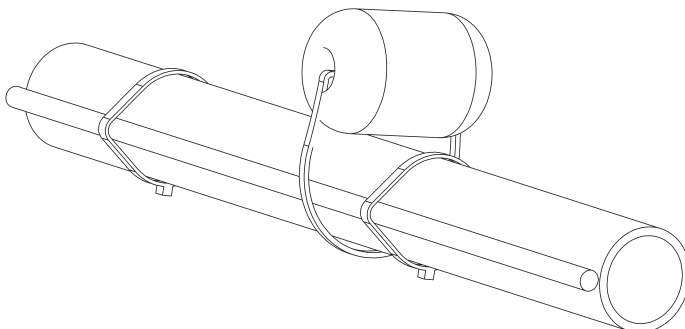
The power cable should be attached to the discharge pipe work with cable ties, and then fixed to the floats supplied with cable ties, as shown below.

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If the discharge pipe work is not floated on the surface, there is a likelihood that the pontoon may roll over due to the weight of the water in the pipe work.

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Installation

Installation Procedure

General

The following describes the installation of the Pump and SMC. Refer to the separate Solar Arrays manual for information on installing the Solar Array.

The Warranty does not cover damage due to running the pump dry. If there is a possibility that the pump suction will drop below the water level, Mono Pumps recommend that a Level float is fitted to the system.

It is recommended that all pumps be protected from direct sunlight. This can be done using a small sheet metal cover.

All pumps to be mounted on a secure base such as a concrete pad. This will ensure all pipework is fully supported to limit the forces on pipe fittings.

On long suction lines, it is suggested that the following steps be followed:

a. A foot valve be added to the end of the suction pipe to ensure the suction pipe does not empty when the pump is off

b. Prior to commisioning the pump the suction line is fully water changed

c. A 'goose neck' pipe arrangement is applied on the suction connection to the pump. This is done to ensure the pump holds more water.

d. The end of the suction pipe is clear from obstruction (i.e the bottom of the dam) and also clear of water surface, so not to suck in any air.

e. For long suction lines, it is recommended that the suction pipe be buried. Unburied pipe will heat the water in the suction line which can effect pump performance and life.

It is recommended that a low lose check valve be added to the discharge line of every pump, as close to the pump connection as possible. This will ensure no water leaks back through the pump when not running, ensuring the most efficient operation. This will also ensure the pump does not turbine, which may effect the system life.
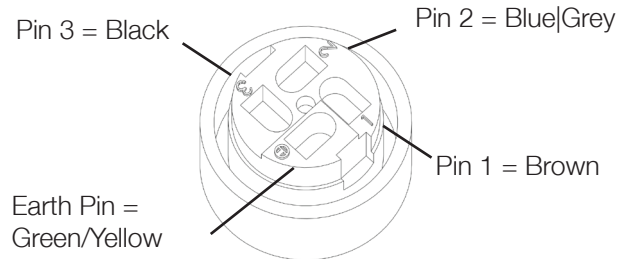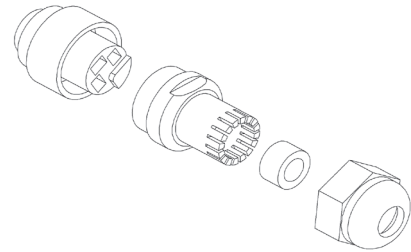
Motor Plug

The output voltage from the SMC to the Motor is 180V DC. Always unplug the SMC from the array before working on any electrical wiring on the SMC or Motor Cables.

SMC End

If the motor plug was removed from the cable during the installation process it is important that the wires are reconnected correctly to ensure that the pump runs in the correct direction.

Pin 3 = Black
Pin 2 = Blue|Grey
Pin 1 = Brown
Earth Pin = Green/Yellow

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Installation

Mounting the Solar Motor Controller (SMC)

Attach the SMC to the bracket on the array frame using stainless steel M8 bolts, nuts and washers.

Earthing the Solar Array

The post or one of the support legs of the solar array must be earthed to provide lightening protection for the system and to prevent the array structure from becoming "live" in the case of a fault with the array or SMC.

Refer to the Commissioning section on the following page for instructions on connecting the electrical wiring and starting the system for the first time.

Wiring the Float Switch Plug

Warning: Ensure that all plugs are fitted correctly to the SMC. Failure to fit the plugs correctly will allow water to enter into the SMC leading to failure. This is not covered by warranty.

The Float Switch is fitted with a blanking plug as standard. The assembly of the float switch plug and wiring of the blanking plug are shown below.
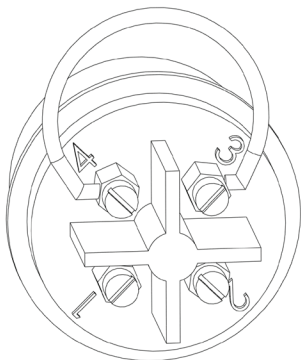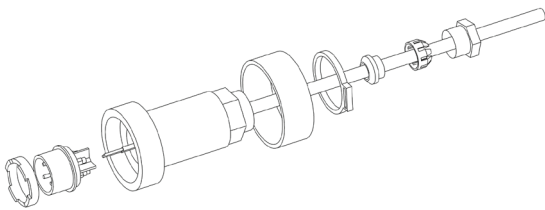
The SMC will only operate when pins 3 and 4 of the float switch are connected. The blanking plug contains a link wire to connect these two pins. External switches can be wired into the float switch to remotely start and stop the pump.

Float Switch Pin Connections

Pins 1 is the positive output of 15 volt DC power supply used to power the optional water level controller.

Pin 2 is the negative output of the 15 volt DC power supply

Pin 3 is the positive connection to the float switch.

Pin 4 is the negative connection to the float switch.

Note: The 15 Volt power supply is not suitable for charging lead acid batteries.

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Commissioning

(Starting the system for the first time)

Warning: Incorrectly connecting the positive and negative wires between array and the SMC will result in damage to the electronics inside the SMC.

Electrical Connections

The Solar Motor controllers utilise 2 "MC" style leads to connect the SMC to the Solar array.

Switch the SMC off using the On/Off Switch on the front of the SMC.

Plug the Motor Plug into the motor socket on the SMC. Ensure that the motor cable is adequately protected from damage by animals or livestock. The cable should be attached to the array post or support frame with electrical ties to prevent the motor plug from being accidentally pulled out of the SMC.

Solar arrays can deliver voltage levels up to 160V DC. Always unplug the SMC from the array before working on any electrical wiring on the SMC or Motor Cables. In the event that alterations are required to the array itself, it is essential to cover the front of the array with a blanket or other suitable material to completely stop electrical generation.

Warning: Removing the motor plug from the SMC or shorting the wires together when the SMC is operation, could result in damage to the electronics in the SMC.

Warning: Ensure that all plugs are fitted correctly to the SMC. Failure to fit the plugs correctly will allow water to enter into the SMC leading to failure. This is not covered by warranty.

Switch the isolation switch on the array to the off position (if fitted).

Connect the 2 metre MC cables between the SMC and solar array switch located on the back of the solar array.

Fit the blank float switch plug into the float switch socket on the front of the SMC. The SMC will not operate without either the blank plug or a correctly wired accessory plug fitted to the SMC. For the initial system test, it is recommended to use the jumper plug. Other accessories such as the Water Level probe can be installed if necessary after the operation of the SMC and motor is confirmed.

Starting the system

When starting the system for the first time it is recommended that the discharge pipe is not connected to the pump. Ensure that the suction line is also within the allowable suction height. If the suction line is long it is recommended that a foot valve be installed on the line and also a goose neck arrangement be added to the pump.

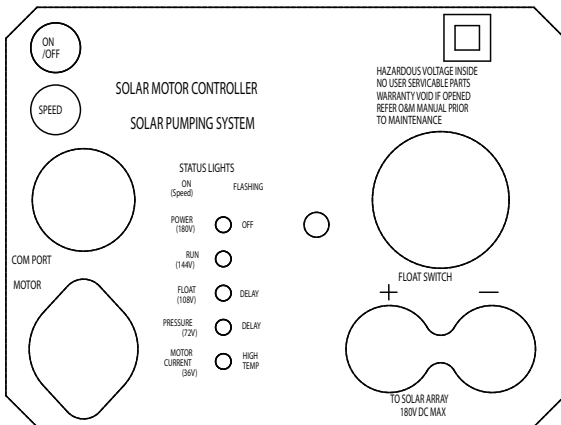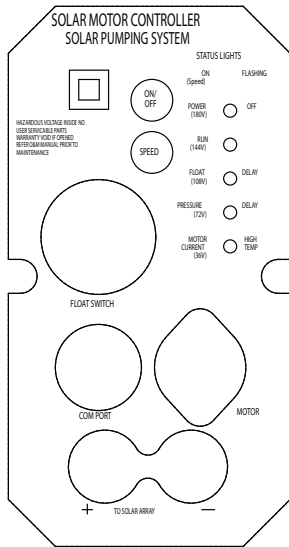Fill the suction of pump in all cases and for long suction runs fill the suction line.

Turn the array isolation switch to the on position (if fitted).

The Solar Power Status Light should light up indicating that power is available from the array.

Switch the SMC On using the On/Off switch on the SMC. The Motor Start Status Light should flash indicating that the pump is starting. When the pump has started the Motor Start Status Light will turn off and the Max Speed / Motor Run Status Light will flash or turn on continuously.

Operation

Operation of the SMC

Max Speed / Motor Run
Lights up fully when the motor is running at maximum speed

Flashes proportional to the speed of the motor at lower speeds

Float Indicator
The indicator lights up when the float switch input is open

It flashes when the SMC is in the float switch delay mode

Pressure
The pressure indicator lights up when the pump pressure exceeds the preset limit

The indicator flashes when the SMC is in the pressure delay mode

Overload / Input/Temp
Lights up if the motor is overloaded

Flashes slow if the input current reaches the maximum value

Flashes fast if the SMC over heats

Status Lights
The SMC features five multifunction system status lights (LED's). The first function of each light is indicated by continuous illumination of the LED. A flashing LED indicates the second function. The functions of the LED's are as follows:

SMC's Diagnostic Indicators

Solar Power / Low Power
Lights up when solar power is available.

The indicator flashes when the unit is turned off via the On/Off switch or via the Com Port.

The indicator turns off if insufficient power is available to the SMC.

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Operation

Float Switch input

The SMC's Float switch input has been designed to operate on float switch (SUN S0648), single level probe (SUN S0889) or tank float switch. The SMC will attempt to start the motor if the there is a closed electrical connection across the float switch input (Pins 3,4). If the circuit is opened via the bore/float switch the motor will be stopped and the Float Indicator will illuminate. Once the bore/float switch has re-closed, a 15 minute time delay will become active, continuing to stop the motor. The Float indicator will flash as the timer is counting down. When 15 minutes has elapsed the SMC will attempt to start the Motor and the indicator will turn off.

Pushing the On/Off button will cancel the time delay on the float switch input.

The float switch input can be configured to run the optional Mono tank and bore level controller (SUN 0415).

Pump Speed Control

The pump speed feature can be used to limit the maximum speed of pump, therefore reducing the peak flow of the pump. This is useful when the peak flow needs to be reduced as in a low yielding bore.

These SMC's have 2 methods of reducing the maximum motor speed, firstly by pushing the front panel speed switch or by using the Solar Display unit.

a/   Front Panel Speed Button
     Pushing the Speed button will increase the maximum speed by 20% each push. The initial push will illuminate the number of indicators corresponding to the current maximum speed setting, if the switch is pushed again the maximum speed will be increased by 20% (36V). Once the absolute maximum setting of 100% (180V) has been attained the next push will revert back to the 20% setting.

b/   Solar Display Unit (SDU)
     To reduce the maximum pump speed using the SDU, plug the SDU into the SMC and follow these steps:
     i/   Press enter (#) on the SDU to clear any previous operation.

     ii/   Press * 6 # , the display should read "Max Motor Volt ?"

     iii/ Enter the desired maximum motor voltage between 36 and 180V, for 100V press 100# , the display should now read "Max MotorV=100V".

Note: The SDU setting will override the maximum available Speed button setting, therefore the front panel switch can only increment the speed up to the SDU setting.

SMC Totaliser Operation

The SMC controllers have an inbuilt totaliser function. This function counts every revolution the pump has done since installation. This reading can be used as a method for totalising the flow from the installation.

1/   To recall number of Pump Revolutions from the SMC enter *8# on the Solar display unit f*or 150, 300, 600, 1200W SMCs (software V1.3 or greater) enter *7# on the Solar display unit.*

2/   Pump conversion factors

CP25	(pressure below 20m)	12
CP25	(pressure above 20m)	13.5
CP800	(pressure below 20m)	27
CP800	(pressure above 20m)	33
CP1600	(pressure below 20m)	56
CP1600	(pressure above 20m)	67

3/   To calculate litres pumped
     Total Litres = Revolutions/Pump Factor
     e.g. 1340000 Revs CP25 Pump at 40m
           1340000/13.5 = 99,259 litres

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Operation

Pressure Cut off system.

This system has been designed for use as a method for controlling the filling of a remote storage tank. A float valve is fitted in the remote tank, once the tank is full the valve closes, this causes the pressure to build up in the system tripping the Pressure cutoff system. The pressure cutoff system electronically monitors the Pumps operating pressure, if the pump pressure rises above the preset limit the pump will automatically stop for 30 minutes, after 30 minutes has elapsed the SMC will then attempt to restart the pump. The pressure indicator on the front panel shows whether the system has been shut down via the pressure cutoff system. The indicator will illuminate when the pressure limit has been reached, it will flash when the unit is counting down for 30 minutes.

SETUP (The Mono Pumps Solar Display Unit "SDU" is required for this operation)

1/ Program the Pump model (Normally programmed before the unit is shipped from Mono).

   If you want to check which pump model is selected, press * 7 # on the SDU keypad, the SDU will now ask for a Pump Model. Press 0 # ,the SDU will now display the current pump selection.

   To change the Pump model ,using the SDU press * 7 #, the SDU will now ask for a Pump Model. Enter the 3 number pump code corresponding to the Pump model fitted to the motor then push the # key.

   Example. CP025=025#, CP800=800#, CP1600=160#

2/ Measure Pump Pressure.
   Start the pump, when the pump is running at its maximum speed and the pipes and tanks are full, measure the pressure using the SDU. Using the SDU press * 5 # ,this will give a dynamic pressure reading. Once you have determined the maximum operating pressure add a minimum of 20 metres (to allow for any variances) to the value, this will give you the Pressure cut off point.

   Example.   SDU maximum reading 25M
              Pressure Cutoff Point = 45M

   Note: A pressure gauge fitted to the pump outlet will be helpful in determining the maximum pressure of the system, but importantly the SDU pressure displayed is measured at the Pump not the top of the bore. Allowance must be made for this when programming the cutoff point.

3/ Set Pressure Cutoff Point
   Using the SDU press * 2 #, the SDU will now ask for a pump pressure. Enter the require pressure limit then press the # key. e.g. 65 Metres=65# , 35 Metres=35# ect.

   If you want to check what the trip pressure is set to, press * 2 #, the SDU will now ask for a pump pressure. Press 0 # the SDU will now display the current pressure trip setting.

4/ Test the system.
   Close the float valve fitted in the tank to simulate a full tank. This should make the pressure in the system increase over the trip point, the pressure indicator should turn on and the pump shutdown. The pressure Indicator will flash to indicate the system is in delay mode. If a SDU is connected to the SMC it will display the time to restart in Minutes.

   Pushing the On/Off button will cancel the time delay once the pressure cutoff system in active.

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Operation

Solar Display Unit
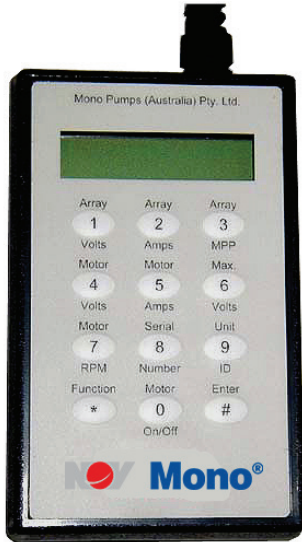
The Solar Display Unit is an optional accessory that allows the operator to extract data from the SMC and change software settings within the SMC. The unit has a two line display. The first line displays information on the current operating mode of the SMC. E.g. Motor Starting, Input current overload, maximum motor speed etc. The second line of the display shows information depending on the currently selected function. The primary functions are listed on the keypad on the front of the unit. E.g. To see the array voltage press key 1 then the Enter key. The second line will now display the array voltage. The voltage will be updated continuously until a new function is selected.

The display unit is powered from the SMC but also contains a 9 volt battery. If the SMC is running the display unit takes power from the SMC (i.e. it will operate even if the internal battery is flat.) If the SMC is not connected to an array or the array is not generating any power, the display unit will run of the internal battery. The display unit will also power up the microprocessor on the Power Master so that settings can be changed in the SMC without the SMC being connected to a solar system. When the SMC is running of the Solar Display Unit the Solar Power / Low Power light on the SMC will flash indicating that there is insufficient power to operate the pump.

A list of the primary functions is shown below.

Primary Functions

0   Motor On/Off (turns the system on or off)   1 Array Volts

2   Array Amps

3   Array Maximum Power Point (Normally auto but if the voltage has been fixed the set voltage will be displayed.)

4   Motor Volts

5   Motor Amps

6   Max Motor Volts (The default is 180 volts but by setting a lower maximum motor voltage the maximum speed of the pump can be controlled. This is useful in applications where the yield of the bore is low.)

7   Motor RPM

8   Serial Number and Date of Manufacture of the SMC

9   Unit ID of the Solar Display Unit

Second Functions

There are additional functions that can be accessed by pressing the * key followed by the number key and enter then the value and enter. E.g. To set a new maximum motor voltage of 90 volts press * 6 enter 9 0 enter.

1 Array Power

2 Set Pressure Limit (0 reads current setting)

3 Set Array MPP (Used to turn off the maximum power point tracking and set the voltage to a fixed value. 0 returns to auto mode.)

4 Motor Power

5 Pump Pressure

6 Set Maximum Motor Voltage

7 Set Pump Model (0 reads current setting)

8 Revolution Counter

9 Restores the SMC to the factory default settings

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Operation

Trouble Shooting Guide

Status Light	State	Possible Problem	Solution
Solar Power	Off	Loose array connection	Test array & rectify problem
		Faulty array	Test array & rectify problem
		Faulty SMC	Return to Mono for assessment
		Not enough solar power	Check array position or wait for more sun light
	Flashing	On/Off switch set to off	Push On/Off switch
		Remote control set to off	Push On/Off switch
Motor Speed	On but no flow from pump	Motor disconnected from pump	Reconnect motor to pump / check direction of rotation
		Broken Shaft /Coupling	Replace Flexishaft / Coupling
	Flashing / slow	Array partially faulty	Test array & rectify problem
		Pump load increased	Check for obstruction in the pump non-return valve or increased head due to pipe blockage
	Off	System is waiting for enough power	Need more solar power
		Stuck pump	Clear or prime pump
		Faulty motor	Return to Mono for assessment
Off/Float	On	Pins 3,4 of float switch connector open circuit	Check link in dummy plug
		Float / pressure switch open circuit	Check operation of float / pressure switch
	Flashing	In delay mode	Push On/Off switch twice
Pressure	On	Pump Overpressured	Release Pressure in system
	Flashing	In delay mode	Push On/Off switch twice
Overload	On	Motor overload	Check system head
		Pump over pressured	Remove source of flow obstruction
	Flashing	Wrong array configuration	Test array & rectify problem
	Flashing/fast	SMC too hot	Check SMC location for ventilation

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Maintenance

Solar Motor Controller (SMC)

There are no user serviceable parts inside the SMC. If the SMC is not functioning correctly it must be returned to Mono Pumps for service.

Any disassembly of the SMC by unauthorized personnel will invalidate all warranty. The back plate/heat sink must not be removed under any circumstances.

Motor

There are no user serviceable parts inside the Motor. If the Motor is not functioning correctly it must be returned to Mono Pumps for service.

The Warranty on the motor is void if it is disassembled. All repairs and maintenance must be carried out at the Mono Pumps factory.

Sun-Ray Pump Wet End

This process is outlined on the next few pages via exploded views.

WARNING: Do not use grease, soap, hand cream, etc. to lubricate the Stator. These products will damage the natural rubber stator and result in seizure of the pump. When assembling the rotor into the stator it is only necessary to wet the components in water.

Final Assembly

Wet the rotor and stator with water and slide the stator assembly over the rotor assembly. Some resistance will be felt as the rotor is pushed into the stator.

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Maintenance

**Disassembly**
CP800 and CP1600 SRX

Below shows a general exploded view of the unit
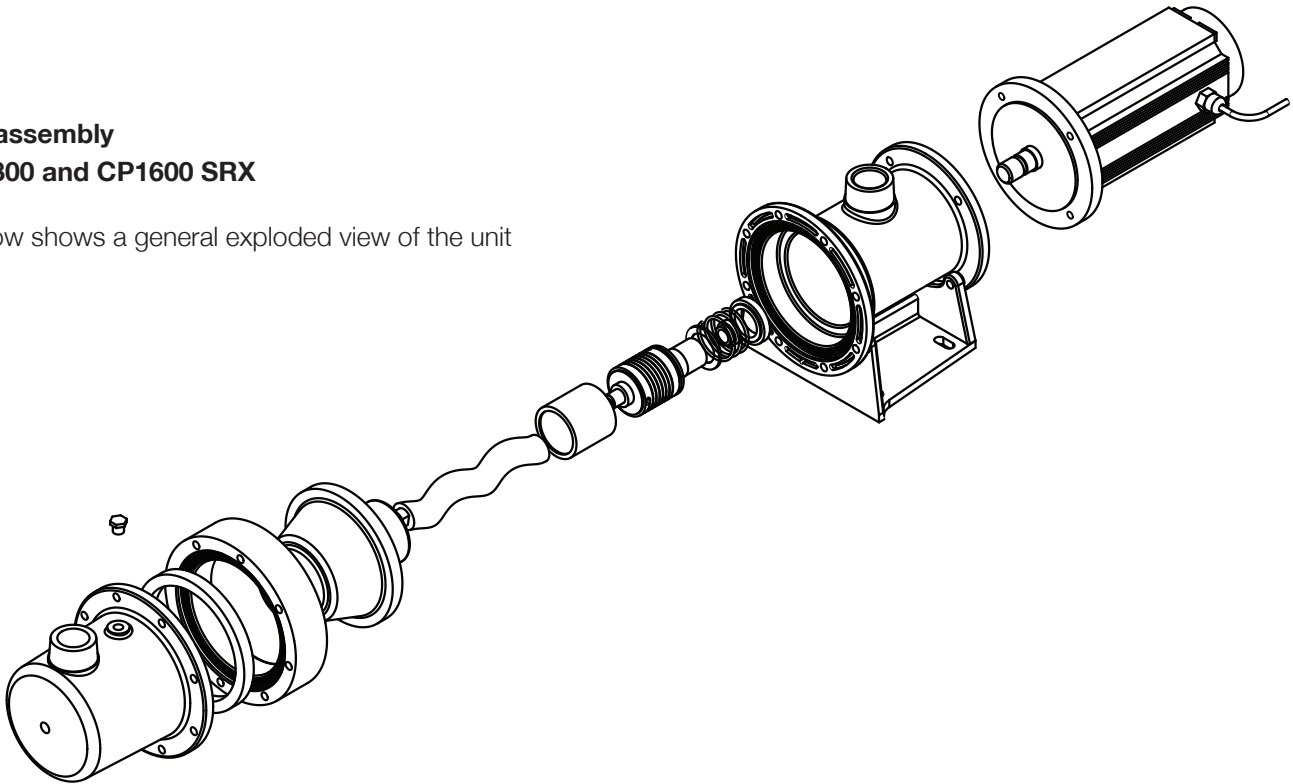
To disassemble the rotor and flexible coupling from the motor, remove the rubber grommet from the back of the motor , use a 10mm Allen key in the back of the motor and turn rotor using a spanner on the flats in the direction shown.
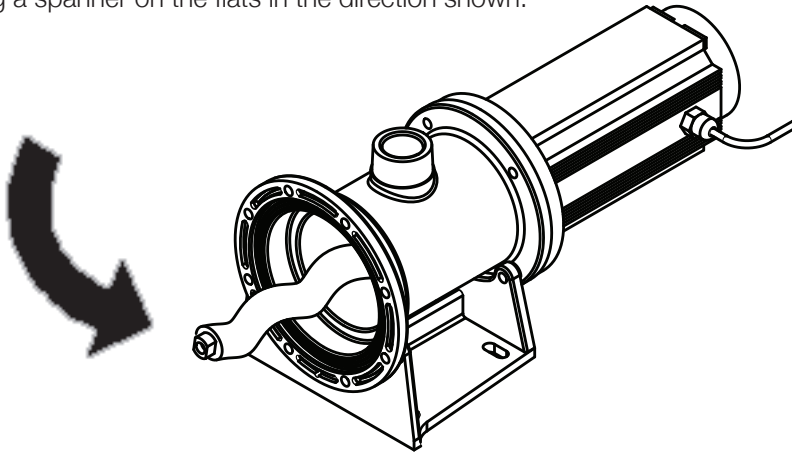
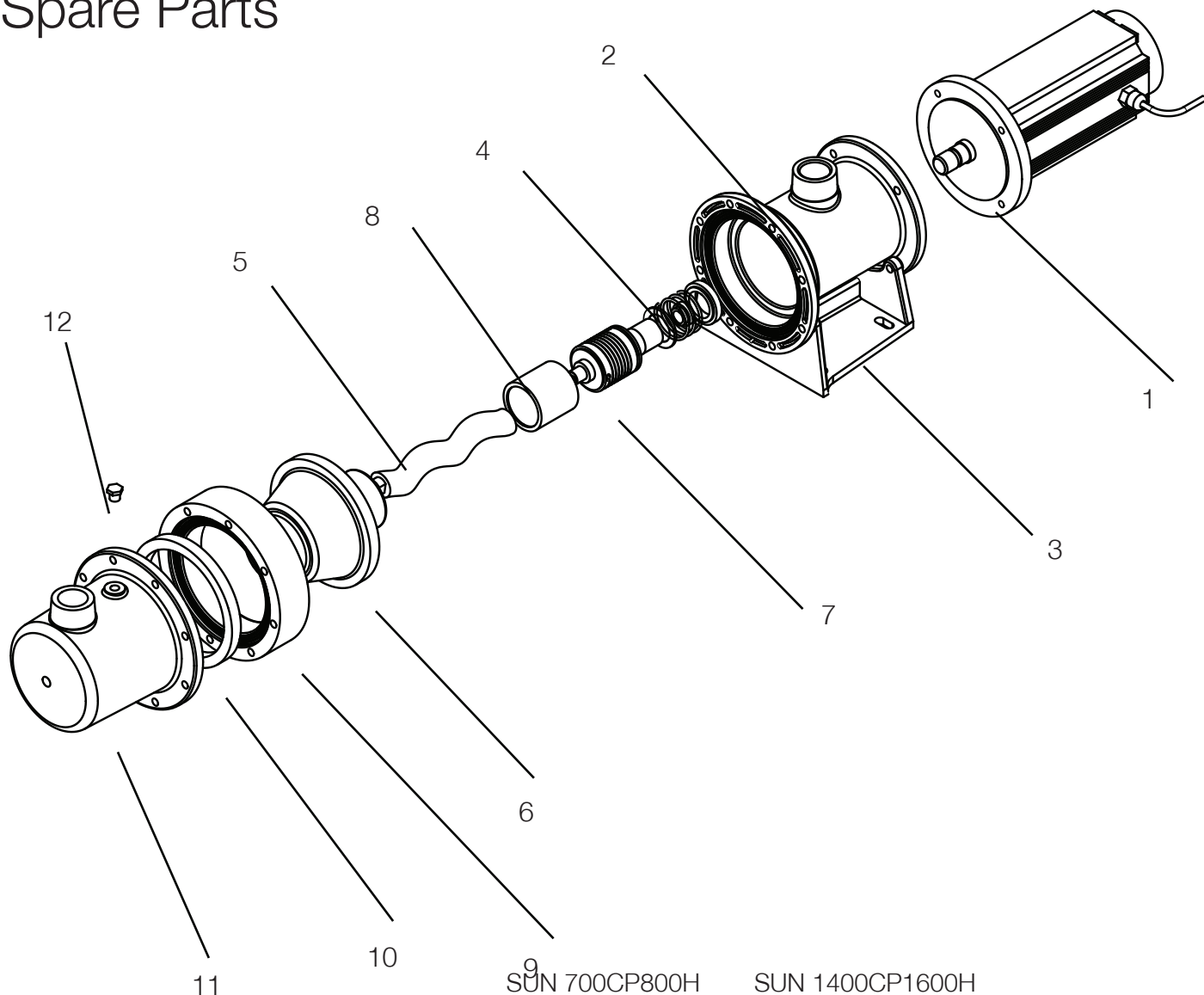If the rotor unscrews on the coupling, to remove the coupling there are flats on the end which can be held using vice grips can turning in the same direction as above. If not enough torque can be applied using this method, use a 5 mm pin into the shaft hole through the drain hole (as shown below). Then turn the allen key in the direction as shown above.
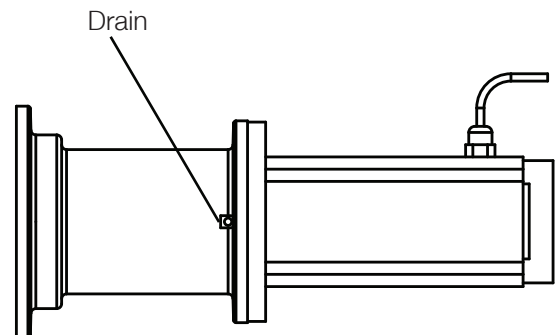
Notes

For reassembly use nickel anti-seaze on the flexible coupling to motor shaft connection.

Drain

Maintenance

Disassembly
CP25 SRX

Below shows a general exploded
view of the unit
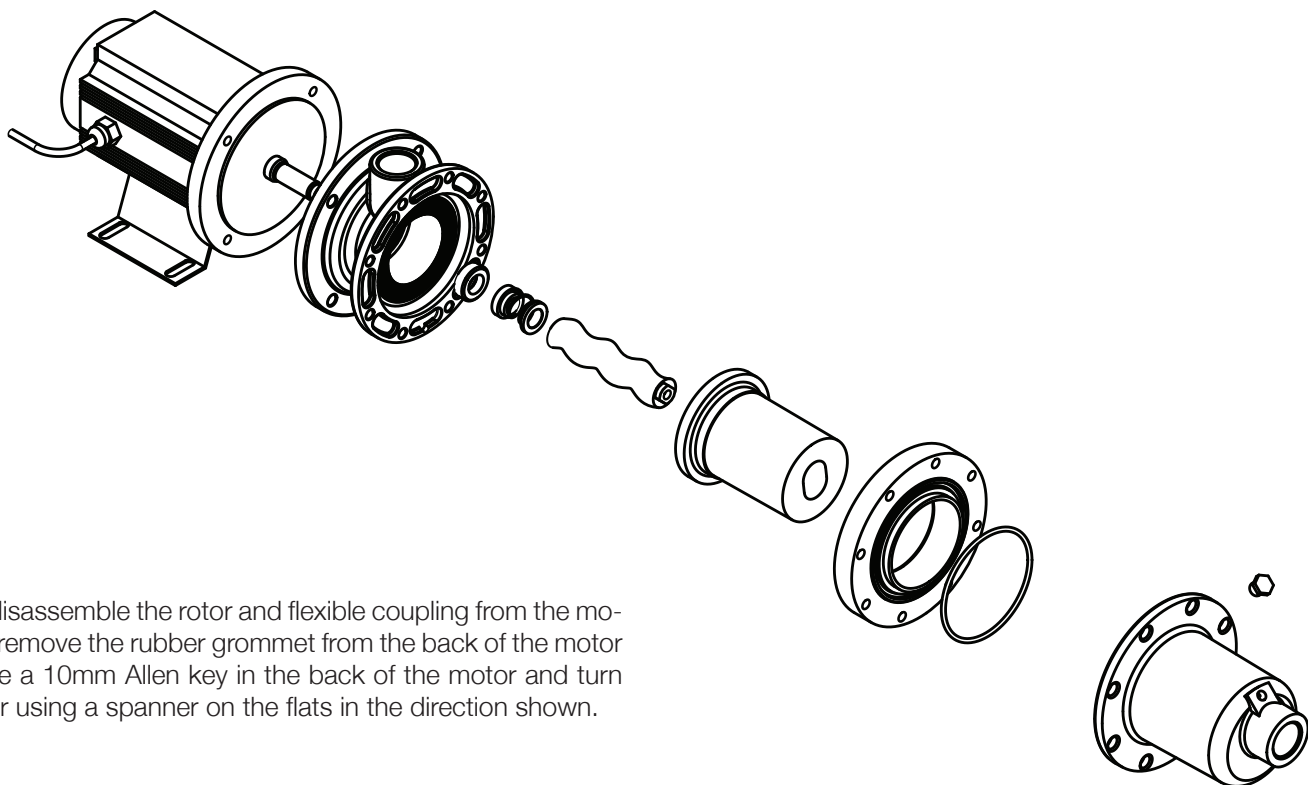
To disassemble the rotor and flexible coupling from the motor, remove the rubber grommet from the back of the motor , use a 10mm Allen key in the back of the motor and turn rotor using a spanner on the flats in the direction shown.

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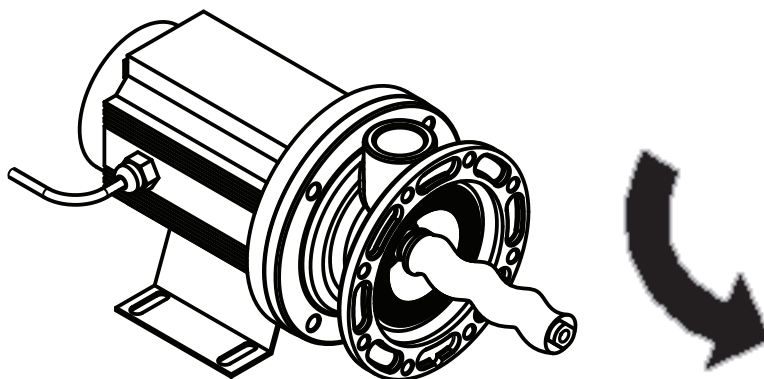
Maintenance
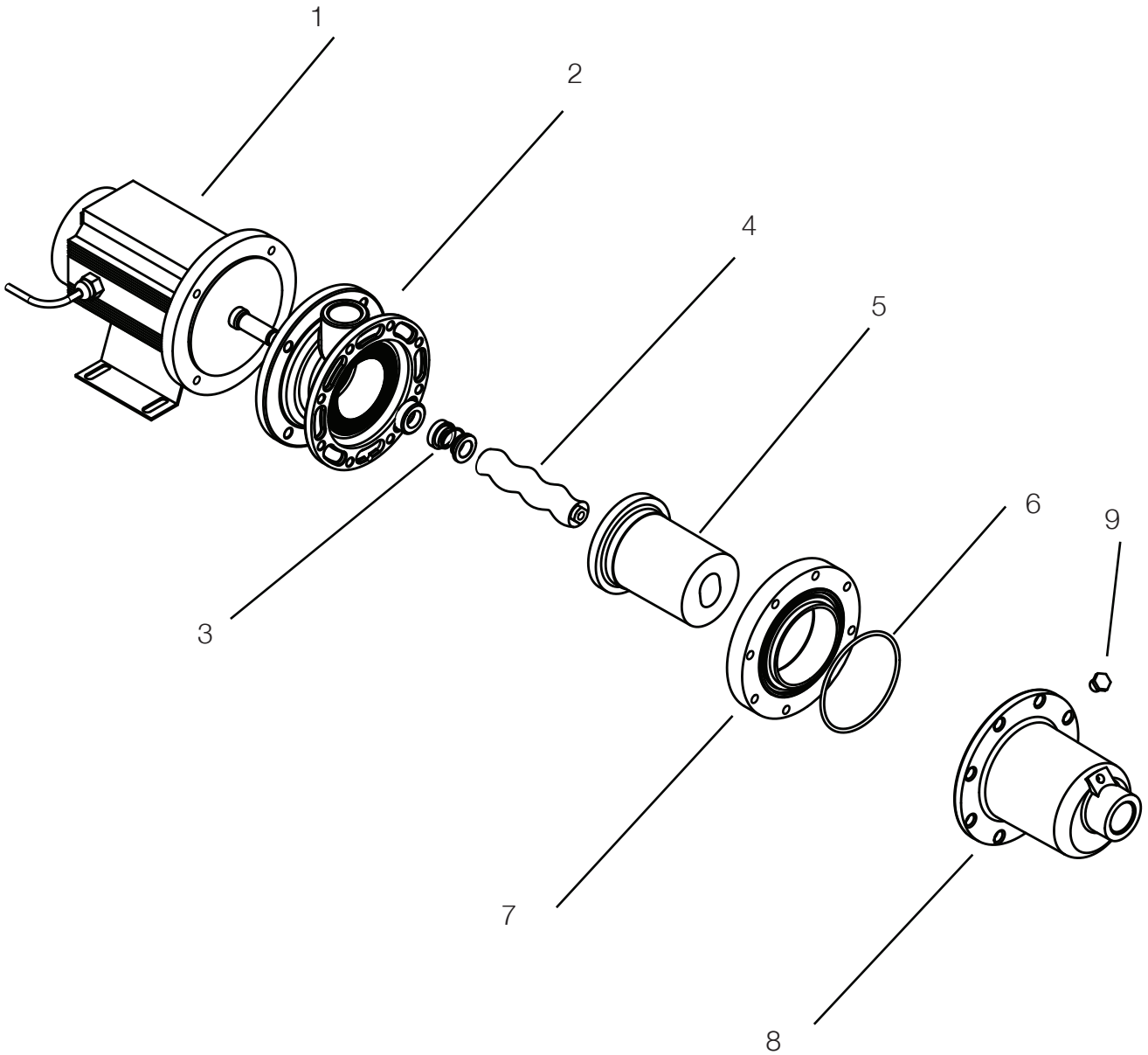
SUNRAY SRX CP25 HIGH PRESSURE   P/N: SUN 700CP25H

ITEM	DESCRIPTION	PUMP NUMBER	QUANTITY
1	Motor Surface BLDC	SUN-BLDC700CP25	1
2	Pump Body	AC CP11 0100	1
3	Mechanical Seal kit	MPK-SK011	1
4	Pump Rotor	SF CP25 2520	1
5	Pump Stator	RR CP25 2210	1
6	O Ring	Part of MPK-SK01	1
7	Expansion Ring	SUN S0996	1
8	End Cover	AC CP11 2400	1
9	TAPER PLUG 1/4' BSPT	OO CP00 0430	1
Not Shown	M8x40 S/S Stud	SUN M0254	4
Not Shown	M8 Plain Washer S/S	W113051F	20
Not Shown	M8 Spring Washer S/S	W113251F	12
Not Shown	M8 Nut S/S	N113100F	12
Not Shown	Electrical Plug	SUN 23565-3	1

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Spare Parts

ITEM	DESCRIPTION	SUN 700CP800H PUMP NUMBER	SUN 1400CP1600H PUMP NUMBER	QUANTITY
1	Motor Surface BLDC	SUN-BLDC700W	SUN-BLDC1400W	1
2	Pump Body	AC CP1600 0100	AC CP1600 0100	1
3	Pump Foot	AL CP1600 6200	AL CP1600 6200	1
4	Mechanical Seal kit	OO CP800 1060	OO CP800 1060	1
5	Pump Rotor	SF SWP800 2500	SF SWP1600 2500	1
6	Pump Stator	RR CP800 2210	RR CP1600 2210	1
7	Flexible Coupling	SUN S0996	SUN S0995	1
8	Coupling Sleeve	SUN S0991	SUN S0991	1
9	Expansion Ring	SUN S0997	SUN S0997	1
10	Expansion Seal	SUN S0990	SUN S0990	1
11	End Cover	AC CP800 2400	AC CP800 2400	1
12	Hex 1/4" Plug	OO CP00 0430	OO CP00 0430	1
Not Shown	Electrical Plug	SUN 23565-3	SUN 23565-3	1
Not Shown	M8X40 316S/ST STUD	SUN M0254	SUN M0254	2
Not Shown	M8X50 316S/ST	SUN M0417	SUN M0417	2
Not Shown	M8 X 90 HEX HD BOLT S/S	K113381F	K113381F	4
Not Shown	M8 X 80 HEX HD BOLT S/S	K113361F	K113361F	4
Not Shown	M8 Nut S/S	N113100F	N113100F	12
Not Shown	M8 Washer	W113051F	W113051F	20
Not Shown	M8 Spring Washer	W113251F	W113251F	12

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