Installation, Operation and Maintenance Instructions

Original Instructions

SUN-Ray SRX
Solar Water Pumping Systems

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1 Warranty

1.1 Warranty Statement

1 When supplying Goods to a consumer, the following mandatory statement applies: "Our Goods come with guarantees that cannot be excluded under the Australian Consumer Law. The Purchaser is entitled to a replacement or refund for a major failure and for compensation for any other reasonably foreseeable loss or damage. The Purchaser is 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.

2 The benefits of this warranty are in addition to any rights and remedies imposed by Australia State and Federal legislation that cannot be excluded. Nothing in this warranty is to be interpreted as excluding, restricting or modifying any State or Federal legislation applicable to the supply of Goods and Services which cannot be excluded, restricted or modified.

3 NOV warrants that, subject to the exclusions and limitations below, all parts of the manufacture and assembly of the Goods carried out by NOV will be free from defects in materials and workmanship for a period of 12 months from date of delivery or purchase, whichever occurs first.

4 The warranty is not transferable to a subsequent Purchaser if the Goods are sold by the original Purchaser during the warranty period.

5 If a defect appears in NOV's manufacture or assembly of the Goods before the end of the warranty period and NOV finds the product to be defective in materials or workmanship, NOV will in its sole discretion either:

(a) replace or repair the Goods or the defective part of the Goods free of charge; or
(b) cause the Goods or the defective part of the Goods to be replaced or repaired by a qualified repairer free of charge; or
(c) refund the purchase price for the item found to be defective; or
(d) resupply the Services; or
(e) issue a credit for the portion of the Services found to be defective.

6 NOV reserves the right to replace defective parts of the Goods with parts and components of similar quality, grade, and composition where an identical component is not available.

7 Goods presented for repair may be replaced by refurbished Goods of the same type rather than being repaired. Refurbished parts may be used to repair the Goods.

8 The warranty does not cover alleged defects arising from a cause beyond NOV's control including normal wear and tear, neglect, lack of maintenance, improper installation or operation, unauthorised servicing, repair or modification, misuse or use for purposes not recommended by NOV.

9 Where goods are returned and replaced under the warranty, title in the defective goods stays with NOV.

10 If a fault covered by this warranty occurs, the Purchaser must first contact NOV at the contact address listed below.

11 Any warranty claim must be accompanied by:

(a) proof of purchase;
(b) written details of the alleged defect; and
(c) appropriate documentation (such as maintenance records etc)

12 The Purchaser must make the Goods available to NOV or its authorised repair agent for inspection and testing. If such inspection and testing find no defect in the Goods, the Purchaser must pay NOV's usual costs of service work, evaluation and testing.

13 The Purchaser must bear the cost of the transport of the Goods to and from NOV or the authorised NOV repair agent, and all insurance of the Goods.

14 NOV makes no warranties or representations other than set out in this clause 15.

15 The absolute limit of NOV's liability under this express warranty, is:

(a) the repair or replacement of the Goods or part of the Goods; or
(b) a refund for the Goods found defective by NOV, or
(c) the resupply of the Services; or
(d) credit equivalent to the defective part of the Services.

16 NOV's contact details are:

(a) 75 Frankston Gardens Drive. Carrum Downs, VIC 3201
(b) phone number: 03 9773 7777

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2 Introduction

2.1 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.

2.2 System Overview

NOV 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. If 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 combustible items surrounding motor.

2.3 Solar Motor Controller (SMC)

2.3.1 SUN SMC 1000 and SUN SMC 2000

ELECTRICAL

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 microcomputer to calculate the energising sequence for the motor phases.

FEATURES INCLUDE:

- Input power ranges from 150 Watts to 2560 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 cut off 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.

2.3.2 SUN SMC550X

ELECTRICAL

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

The SUN Solar Motor Controller 550X is used to run and control NOV approved motors using solar power or AC interface such as the NOV SUN ACI. **The high operating efficiency of the NOV motor/PC pump and SMC 550X ensures that the maximum amount of water can be pumped over the whole day.**

The SUN SMC 550X comprises a solar maximum power point tracker and brushless DC motor control electronics combined in the one enclosure. Suitable on SUN SRX700, SUN MOT1000, and SUN MOT2000.

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.

FEATURES INCLUDE

- Input power ranges from 35-150VDC and 9A (250-1000W) (Refer to specifications for voltage, current, and power limits for SUN SMC550X model).
- Microprocessor controlled maximum power point tracking continuously changes the array voltage and monitors the input power level. This technology extracts the maximum available power from the solar modules.
- One Input providing multiple operating options such as measuring low water levels in the bore with a submersible probe and/or capturing full tank with a low voltage float switch. Float switch can be enabled or disabled via **MonoVue** smart phone App **(Available on Android/Apple phone)**.
- IP66 water resistant enclosure and maximum thermal characteristics for extreme climatic conditions.
- Supports **MonoVue** smart phone app **(Available on Android/Apple phone).**
- Electronic current/pressure cut-off system.
- Variable motor speed control via front panel or the optional **MonoVue** smart phone App.
- Thermal overload protection.
- 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 will go into “standby” mode before attempting to restart the pump. This reduces load on the output circuit and unnecessary heating of DC motors.
- Status lights to indicate the operator what the system is doing.
- Telemetry (automatic measurement of data) output available.
- MC4 solar panel connector compatible.
- RS485 MODBUS port.
- DC brushless motor compatible.

OPTIONAL BRUSHLESS DC MOTOR

The NOV Sun-Ray SRX System uses a high efficiency, brushless, sensorless, permanent magnet, DC, motor designed for coupling to the 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 or MAC3-10

NOV Australia Pty Ltd can supply a separate level probe or float switch. This probe device plugs into the Float Switch outlet on the SMC via a 50-metre cable.

The float switch/ level probe will protect the pump from dry running when the water level drops in the bore or in a tank via sending an open circuit signal to the controller. The level probe typically is set above the brass check valve on the pump wet end.

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.

OPTIONAL WATER PRESENCE SENSOR

NOV recommends fitting a water presence sensor to the pump suction to control the pump operation, when operated correctly it will identify a loss of prime in the suction line which can lead to dry running.

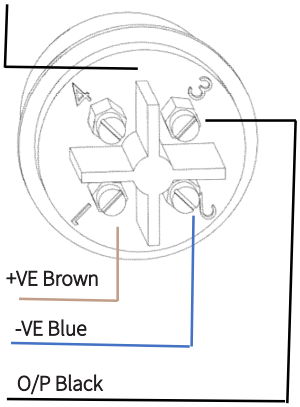
Part # SUN E1409

The easy to install water sensor that connects to the solar controller via the float switch input, its sensor detects when there is no water in the suction line and immediately stops the pump from operating. It is compatible with all SUN RAY SRX solar surface transfer systems with a float switch input.

Sensor

SMC Float SW Input

No Connection between 3-4



5m Cable

Notes: Cable runs up to 200m can be achieved. For greater lengths please contact NOV.

Installation

- Wire cable into SUN SMC controller float switch plug through points 1, 2 and 3 as per the colour sequence illustrated in the above diagram

  Note:

  The white wire is unused and can be left disconnected.

- Water Presence sensor should be mounted as shown in below Fig. 1.1. Photo shows mandatory fittings to be used for correct functionality of the sensor. User can choose other fittings depending on the pipework and its application.

  Note:

  If a thread needs to be cut to mount the sensor into the pipework, Refer to the thread specifications below

- Connect sensor to the other end of the cable.

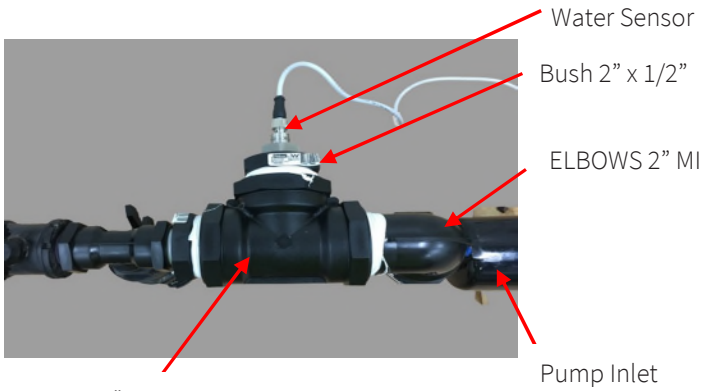


Fig. 1.1

Sensor Thread Specifications

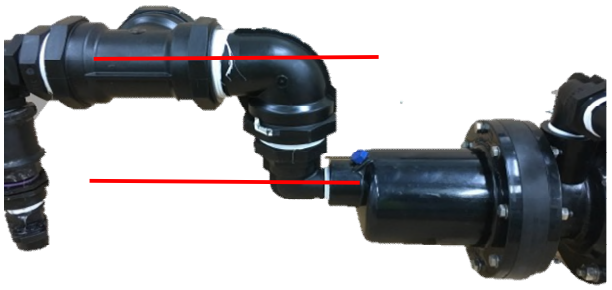
Thread Designation	Nominal Size	Thread Form Type	Tap Drill Diameter mm
G1/2	1/2"	BSPP	19.00

CAUTION

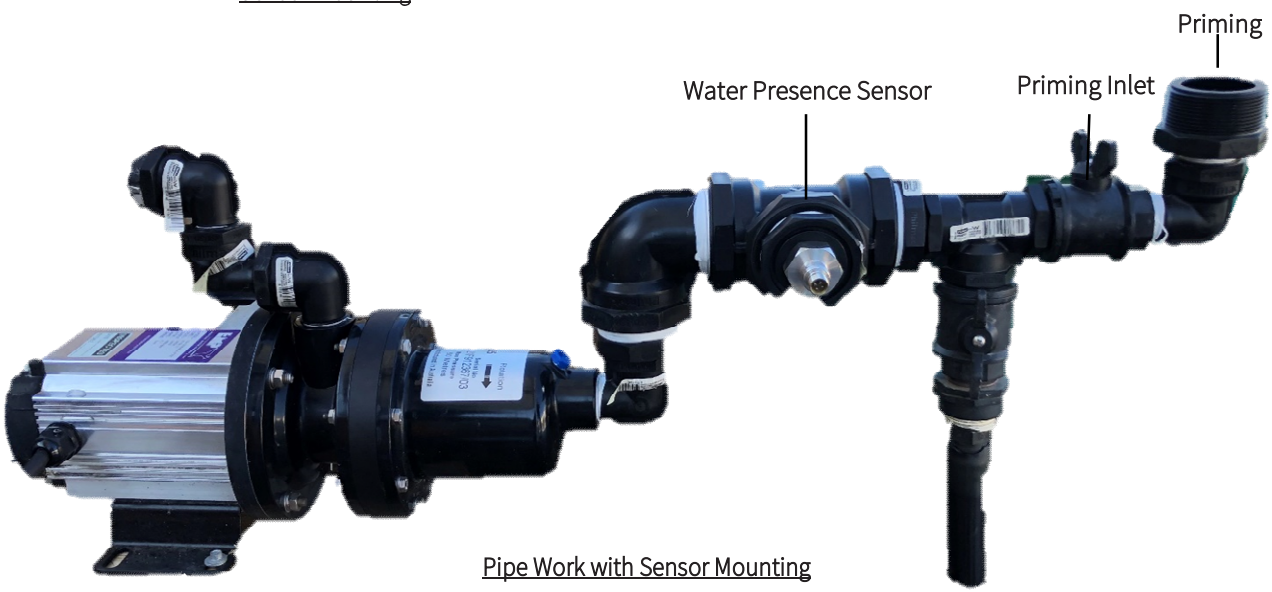
IMPORTANT NOTE:

- For optimum operation, ensure a foot valve is always installed at the end of the suction line.
- Sensor should be placed in direction shown in below photos. Sensor and the 2” Tee should always be above the pump with the sensor orientated in the horizontal plane.
- Priming: Pumps should be filled with water before starting for priming purposes. When the pump is stopped, sufficient liquid will normally be trapped between the rotor/stator pitches to enable priming upon restarting. If, however, the pump has been left standing for an appreciable time, moved to a new location, or has been dismantled and reassembled, it must be refilled with liquid and given a few turns before starting.

Sensor Mounting



2” Tee above the pump



Pipe Work with Sensor Mounting

3 Specifications

MOTOR SPECIFICATIONS

SIZE RANGE

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

ELECTRICAL CHARACTERISTICS

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

MATERIALS	ALL MODELS
Motor Cable	4 Core 1.5 mm^2
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 °C, also see Pump Specifications
pH range	8.5 to 6.0
Hardness Range	2000 Mg/L
Salt Concentration	500 ppm

3.1.1 SOLAR MOTOR CONTROLLER SPECIFICATIONS

ELECTRICAL

SERIES 2000 SMC

Voltage	30 to 165 VDC
Current	0 to 5 A
Solar Array	700 W Max

SERIES 3000 SMC

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

SUN SMC 550X

Voltage	35 to 150 VDC
Current	Maximum 9A
Solar Array	1000W Max

MOTOR OUTPUT

SERIES 2000 SMC

Voltage	0 to 180 V

3 PHASE SWITCHED DC

Frequency	0 to 100 Hz
Current	0 to 4 A

SERIES 3000 SMC

Voltage	0 to 180 V

3 PHASE SWITCHED DC

Frequency	0 to 100 Hz
Current	0 to 9 A

SUN SMC 550X

MOTOR OUTPUT BLDC

Voltage	35 to 180 VDC
Current	Maximum 9A
Solar Array	Maximum 650 W

FLOAT SWITCH CONNECTOR

SWITCH INPUT (PIN 3, 4)

Operation	Normally closed, Shutdown on open contact
Current	3 mA (closed circuit)
Voltage	15 V (Open circuit)

AUXILIARY SUPPLY (PIN 1, 2)

Voltage	15 VDC Nominal
Current	50 mA max (10 V)
Com Connector	RS232 9600 baud rts/cts

ENVIRONMENTAL

Storage Temperature	-10 to 60°C
Operating Temperature	-10 to 50°C
IP Rating	IP65
Humidity	95% Max

SUN SMC 550X

Storage Temperature	-10° to 60°
Operating Temperature	-10° to 50°
Ip Rating	IP66
Humidity	95% Max

LIGHTNING PROTECTION

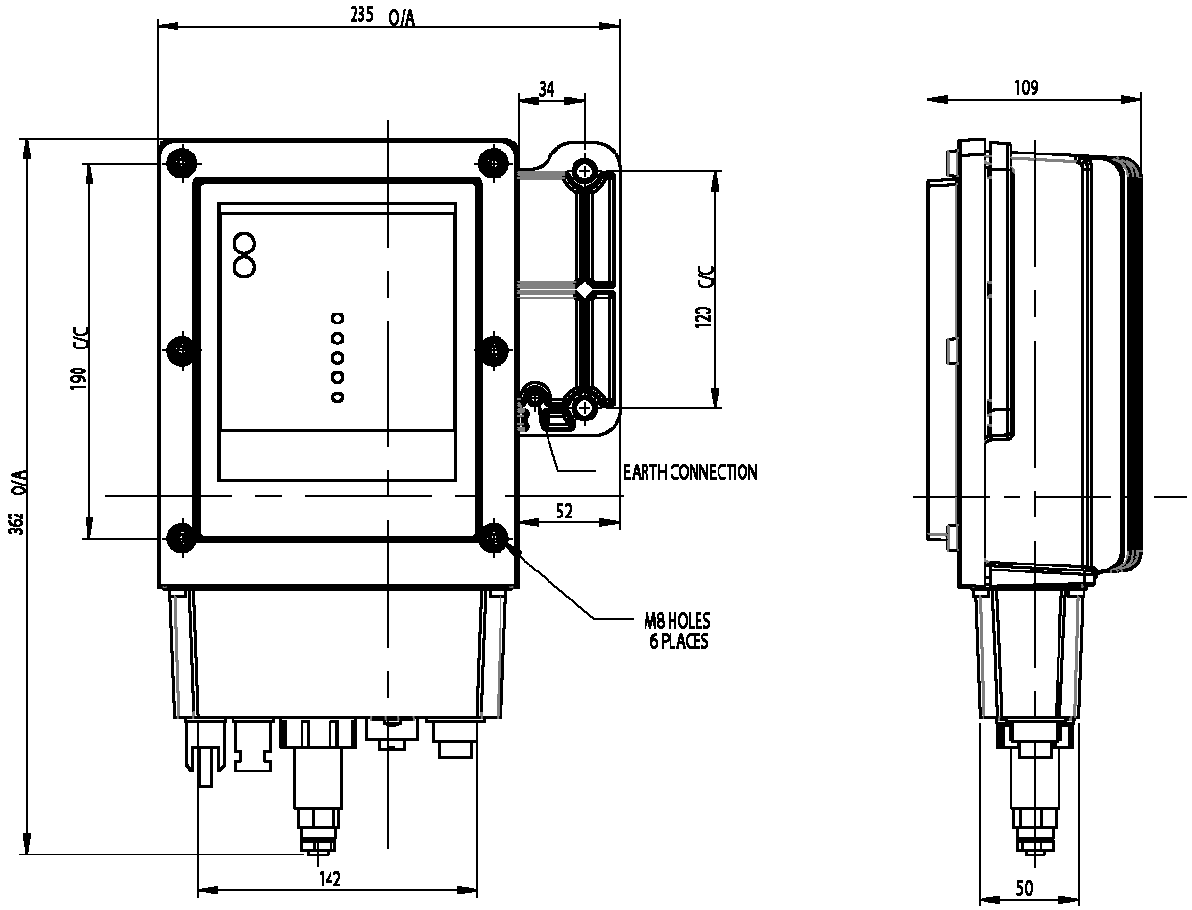
In a solar water pumping system, it is necessary to avoid having two earth points. (e.g., The motor itself and the earth rod attached to the solar array frame.) NOV Australia Pty Ltd recommends tying the pump safety wire to earth and bonding across to the earth stake with a 1.0”-2.0” galvanized earth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

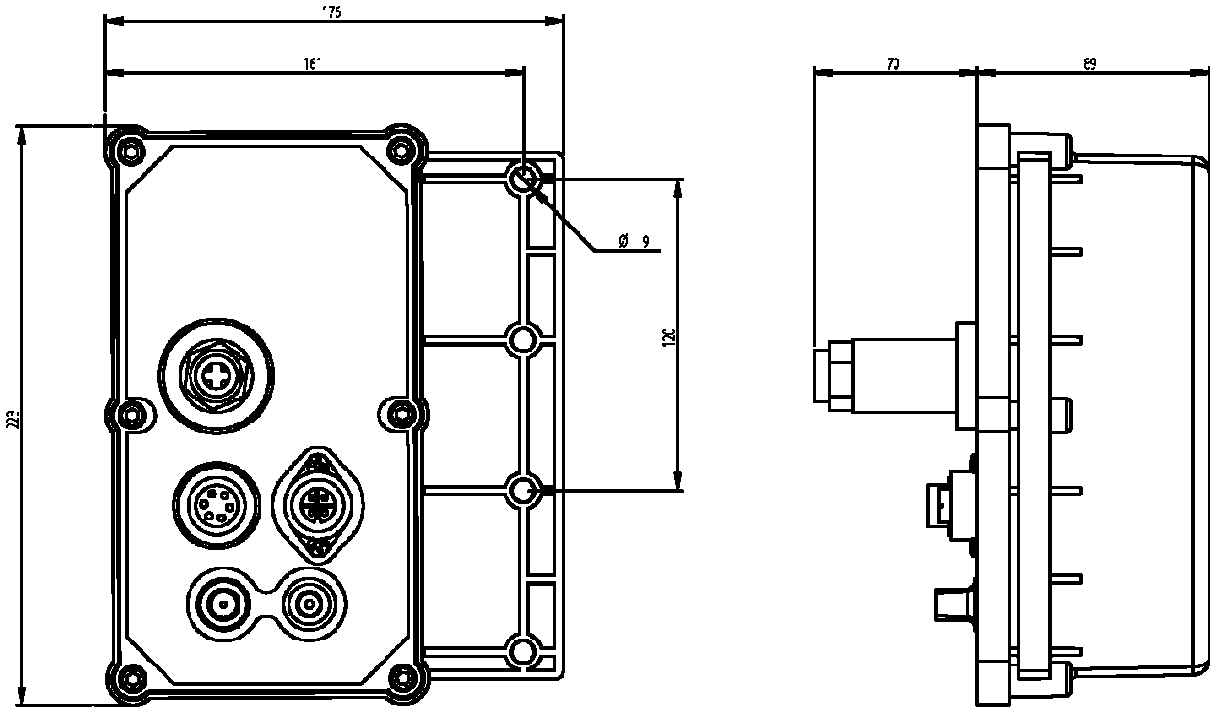
Metal Oxide Varistors are fitted on the array input and Transorbs on the Motor output.

Specifications

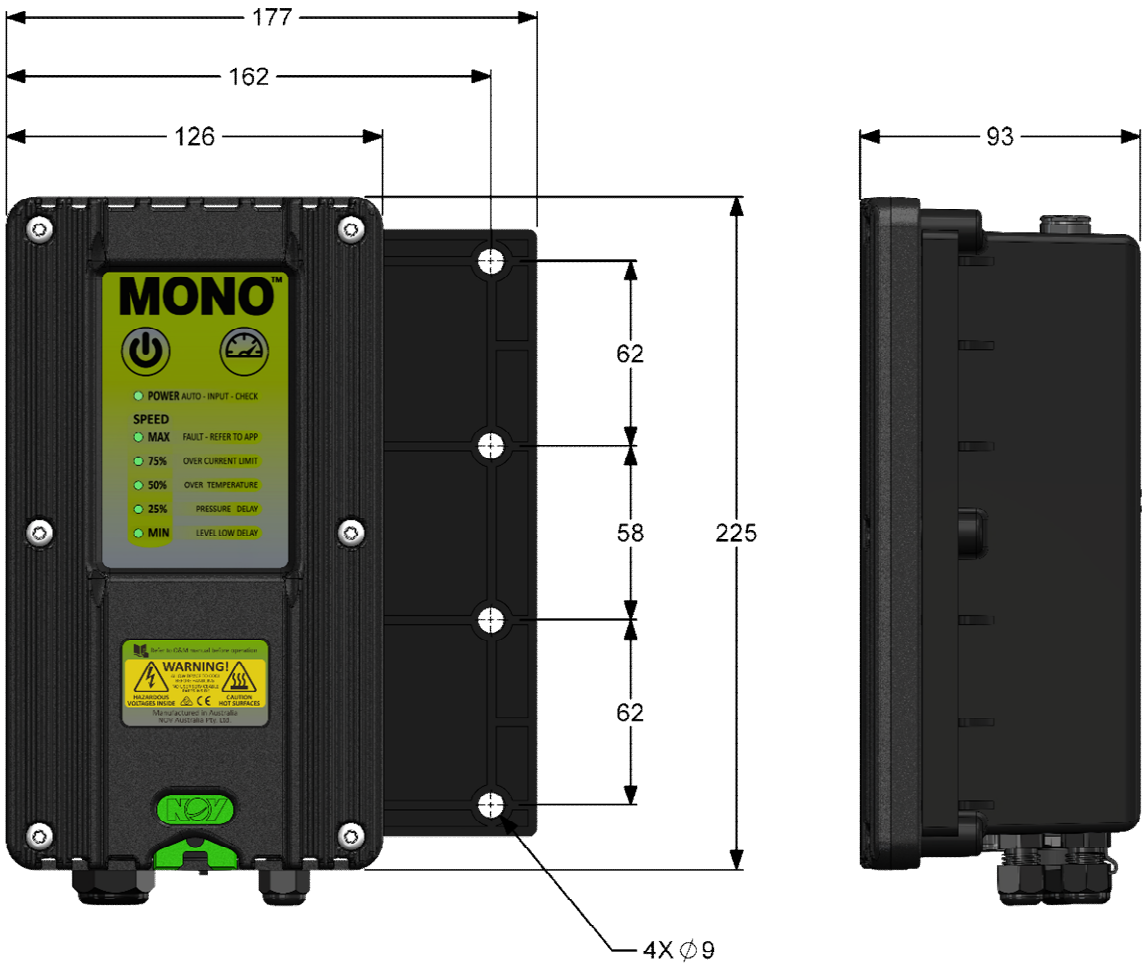
SERIES 3000 SMC DIMENSIONS



SERIES 2000 SMC DIMENSIONS



SMC DIMENSIONS/SMC 550



Weight in Carton – 1.5 Kg

CABLE SPECIFICATION

MOTOR

MOTOR PLUG	180 V, 9 A		SUN SMC 550X	
			230 V DC, 10A DC	
CABLE	Double Insulated		Double Insulated	
	250 V		250 V	
	4 Core	1.5 mm^2 for lengths	4 Core	1.5mm2

ARRAY

ARRAY PLUG	165 V, 15 A	
CABLE	Double Insulated	
	1000 V	
	Single Core	4 mm^2

FLOAT SWITCH

FLOAT SWITCH PLUG	15 V, 50 mA	
CABLE	Double Insulated	
	250 V	
	4 Core 0.5 mm^2	Systems with two float switches
	2 Core 0.5 mm^2	System with one float switch

COM PORT

COM PORT PLUG	15 V, 50 mA
CABLE	Double Insulated
	250 V
	6 Core

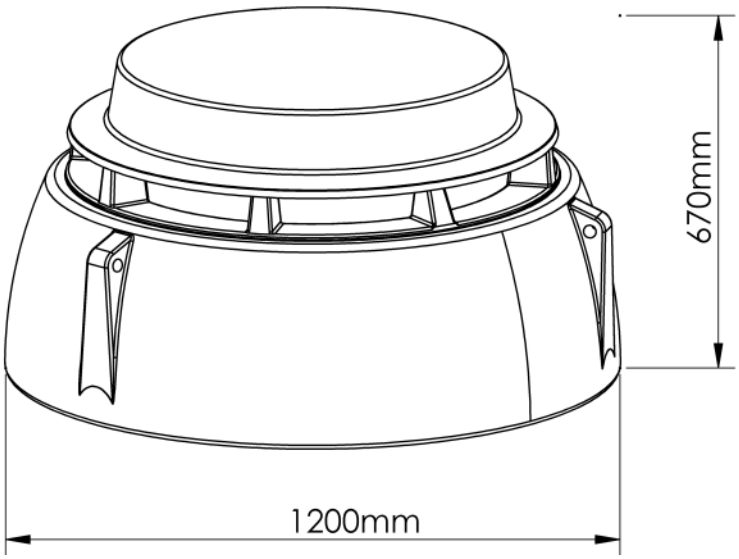
PUMP SPECIFICATIONS

SIZE RANGE

MODEL NUMBERS	CP25	CP800	CP1600
MAXIMUM 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)	10 Kg	15 Kg	18.5 Kg

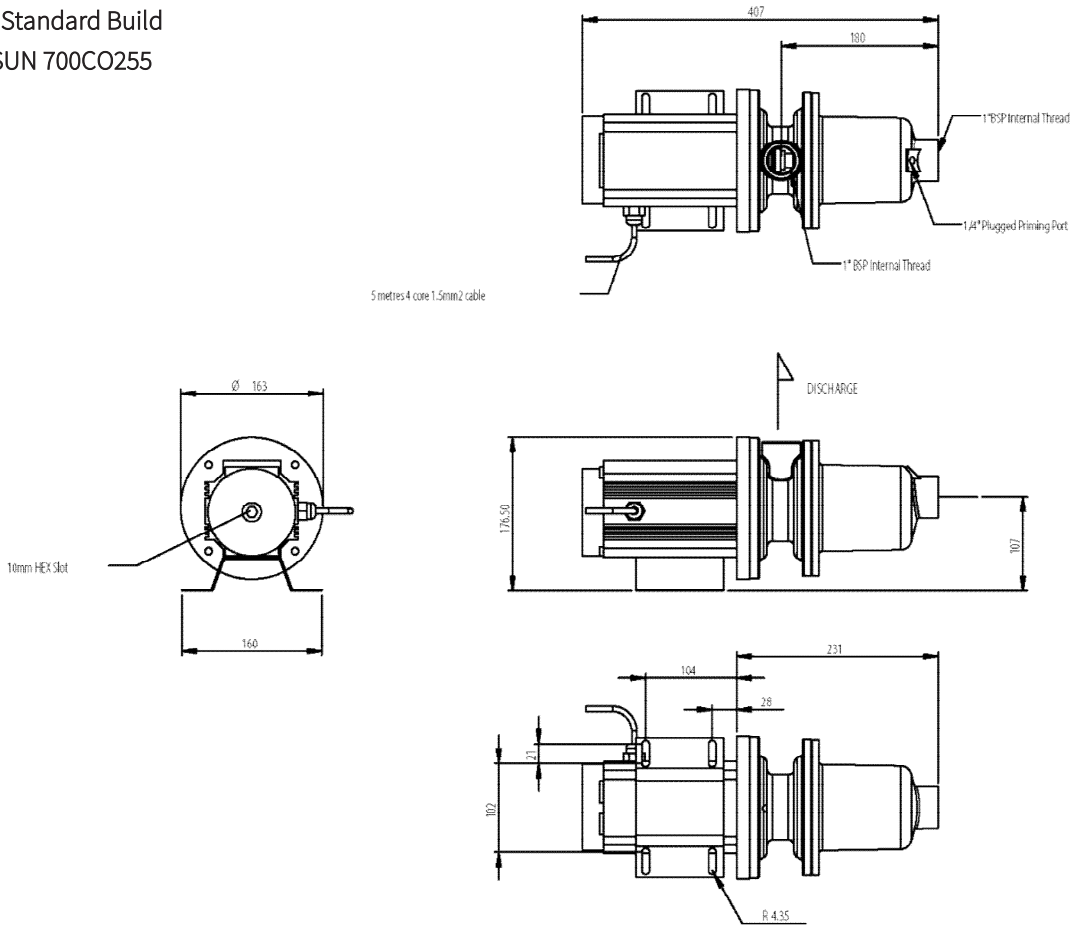
*At Flooded Suction

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/Cermic

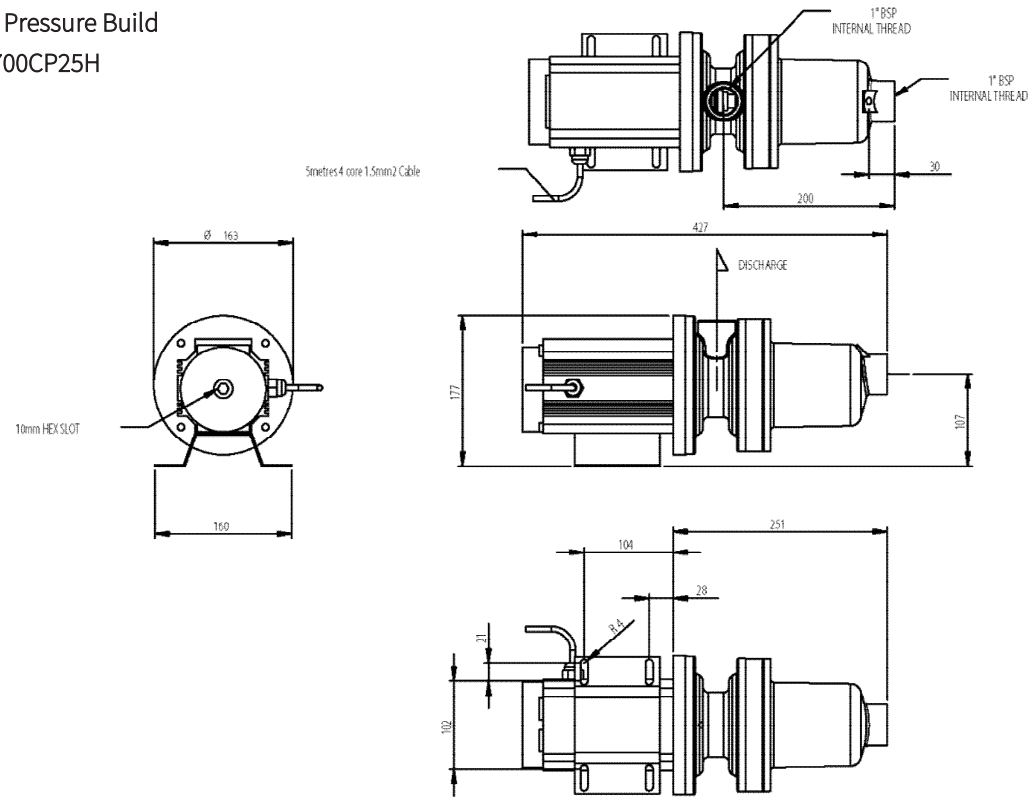


FLOAT DIAMETER	1200 mm
FLOAT HEIGHT	670 mm
FLOAT WEIGHT	27 Kg

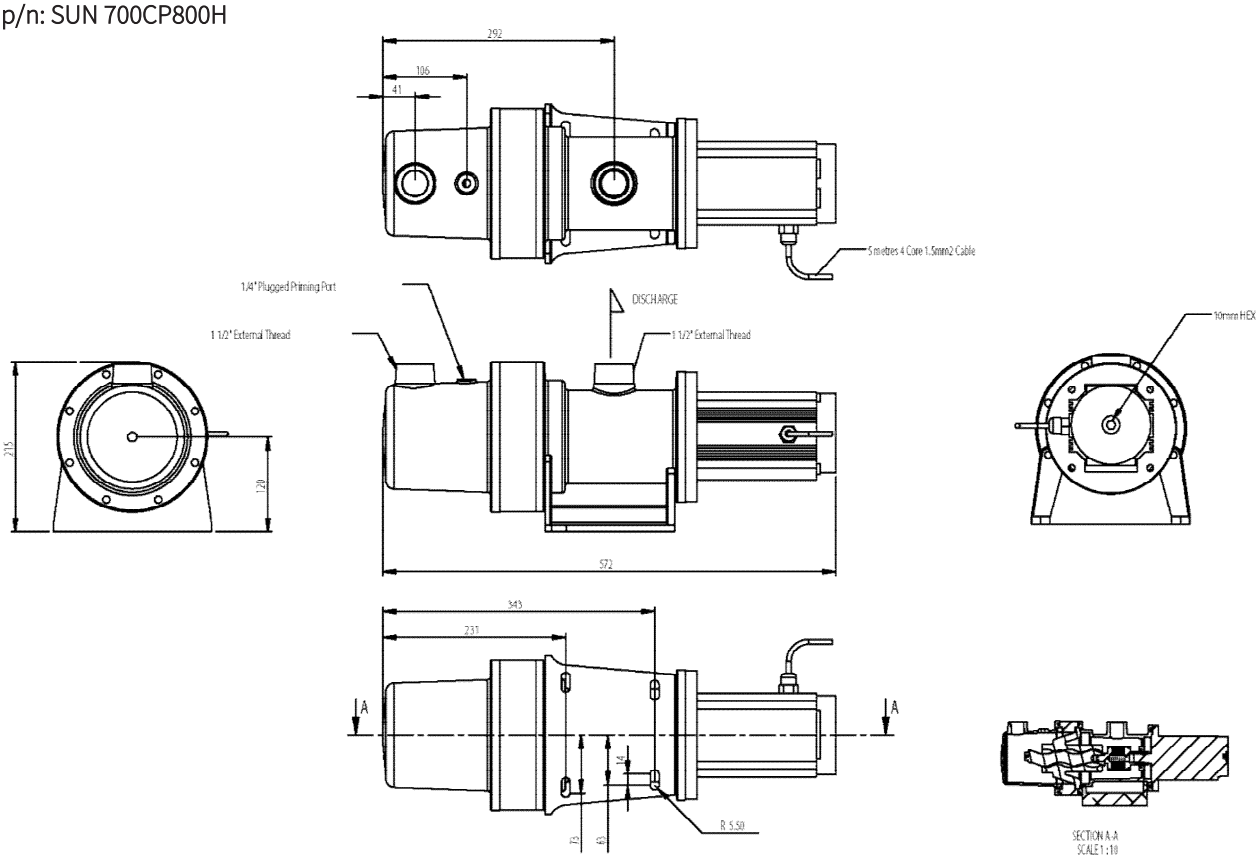
CP25 Standard Build
p/n: SUN 700CO255



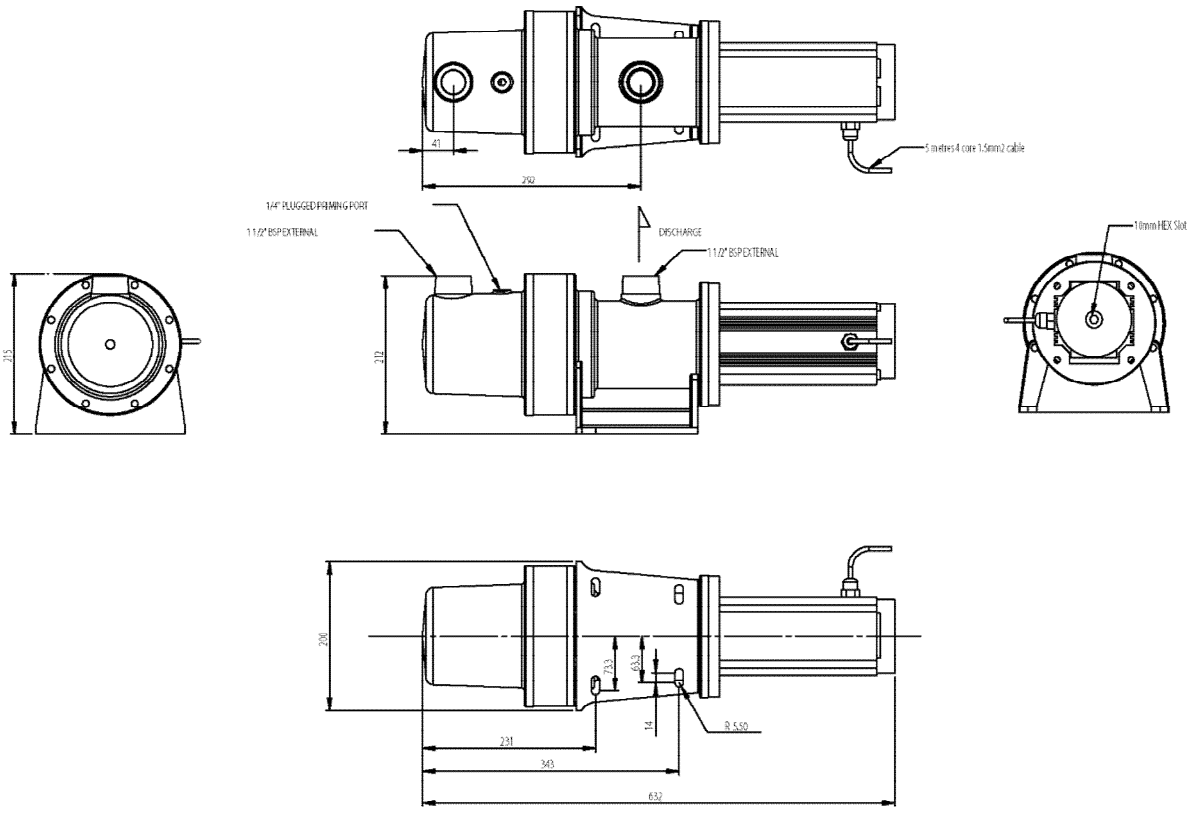
CP25 High Pressure Build
p/n: SUN 700CP25H

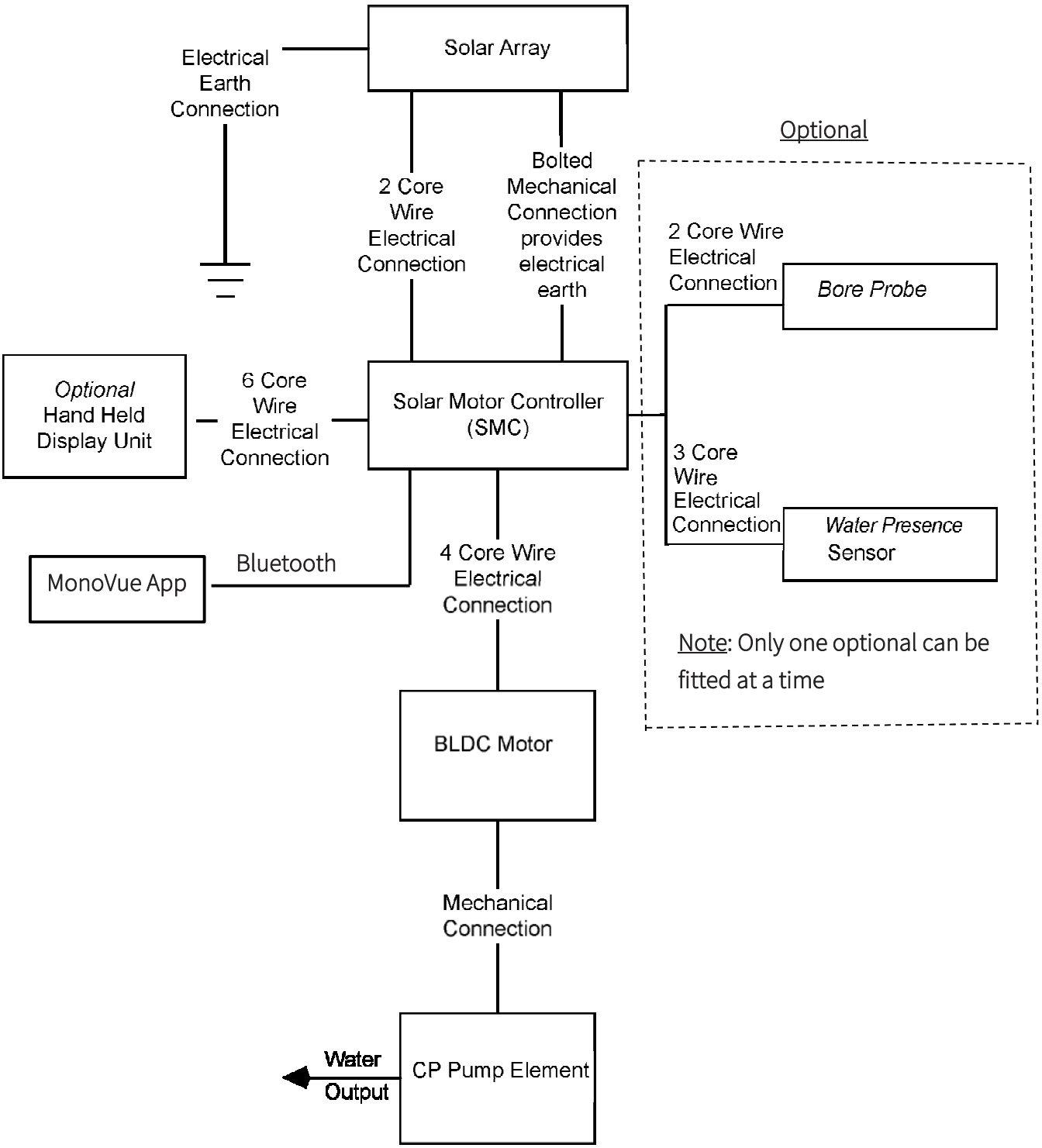


CP800 High Pressure Build
p/n: SUN 700CP800H



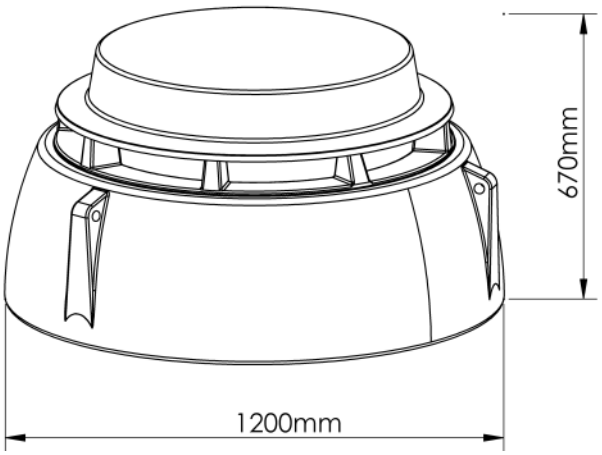
CP1600 High Pressure Build
p/n: SUN 1400CP1600H

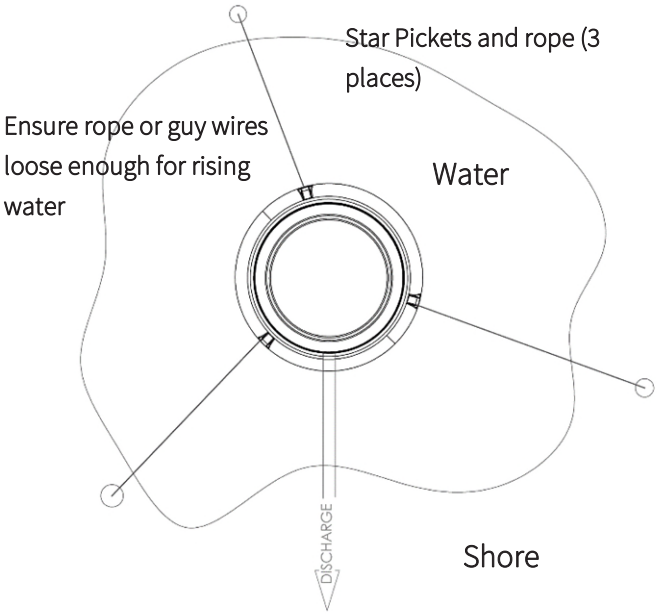




Note:

- SUN SMC550X and SUN SMC 2200 have inbuilt Bluetooth feature, to access MonoVue smart phone app (Available on Android/Apple phone).
- SUN CBLDC2000 require SUN M1471 dongle connected to its comm port, to access MonoVue smart phone app (Available on Android/Apple phone).





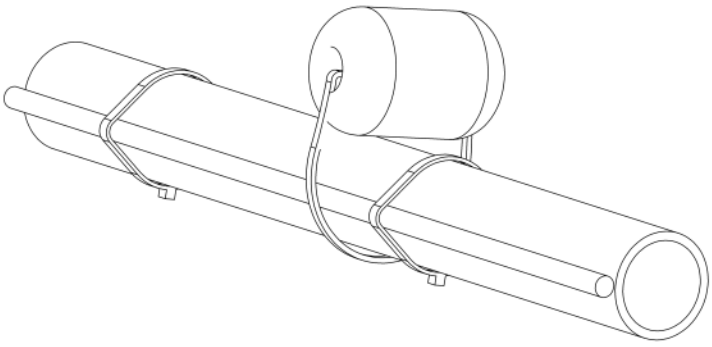
Floating Pontoon: (where applicable)

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.



ATTENTION

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.

4 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, NOV Australia Pty Ltd 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 commissioning 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.

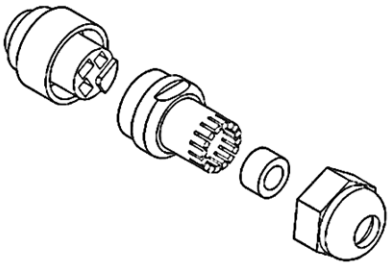
It is recommended that a low lose check valve be added to the discharge line of every pump, as close to the pump connection as possible. This will ensure no water leaks back through the pump when not running, ensuring the most efficient operation. This will also ensure the pump does not turbine, which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

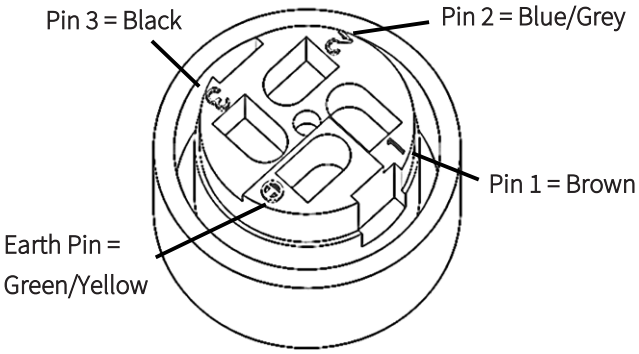
MOTOR PLUG

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





MOUNTING THE SOLAR MOTOR CONTROLLER (SMC)

WARNING

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

EARTHING THE SOLAR ARRAY

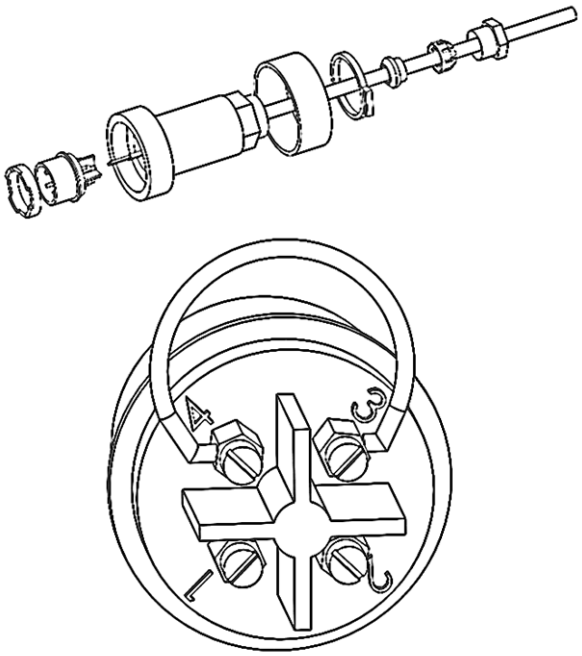
The post or one of the support legs of the solar array must be earthed to provide lightening protection for the system and to prevent the array structure from becoming “live” in the case of a fault with the array or SMC.

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

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.

5 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.

ELECTRICAL

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. If 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.

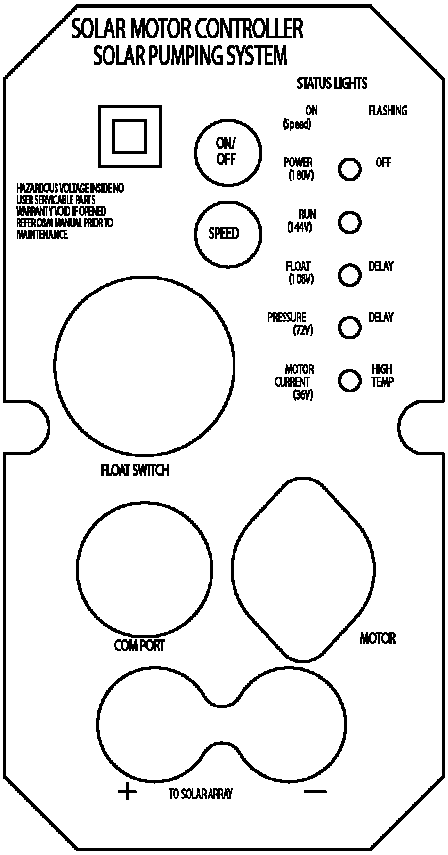
Turn the array isolation switch to the on position (if fitted).

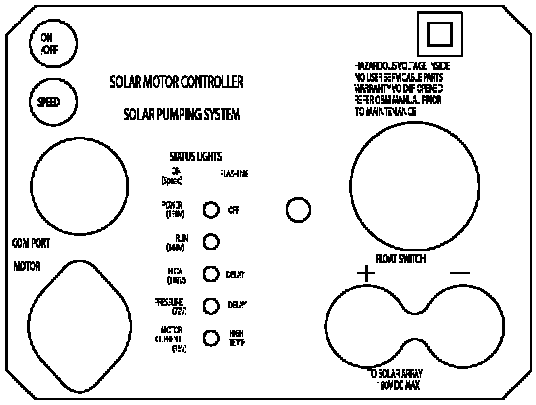
The Solar Power Status Light should light up indicating that power is available from the array.

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.

6 Operation of the SMC

SUN SMC 1000 and SUN SMC 2000





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.

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 overheats

SUN SMC 550X LED DISPLAY FUNCTIONS

Press to **START** and **STOP** the SMC 550X Controller.

- Press to change the speed settings.
  - By default, MAX is selected. Press to increase or decrease the speed.
  - Speed options are Min, 25%, 50%, 75%, and Max.
- If you have multiple controllers in close proximity, you can disable Bluetooth on individual controllers **(Refer to MonoVue User Manual).**
  - Press and hold it for 5 seconds.
  - Purple light will be displayed indicating that Bluetooth in the controller is deactivated.

Note:

- Press not more than a second to check the speed settings.
- Only one phone can be connected to a controller at a time.

Operations	Green	Yellow	Red	Blue	Purple
POWER AUTO - INPUT - CHECK	Solar Power is available	Solar power is available and Maximum Power Point Tracking is active	**Flashing** Insufficient Solar Power	NA	**Quick Flash** Insufficient Power for Bluetooth
SPEED MAX FAULT - REFER TO APP	Motor is running at maximum speed	Refer to the **MonoVue** App	NA	Bluetooth Connected	Insufficient Solar Power **Flashing** Solar Power is available, connect to the Bluetooth after the flashing light goes off
75% OVER CURRENT LIMIT	Pump Speed Full/Med	Current limit exceeded	NA	NA	NA
50% OVER TEMPERATURE	Pump Speed Medium	NA	Maximum Temperature Reached		
25% PRESSURE DELAY	Pump Speed Low/Med	Pump over Pressure delay	NA	NA	NA
MIN LEVEL LOW DELAY	Motor is running at minimum speed	NA	Water Level low delay timer	NA	NA

Note:

- If the power light flashes Red and one or more speed light flashes Green, it is in Self-test mode.
- In some solar lightening conditions, the self-test might cycle multiple times.

FLOAT SWITCH INPUT

The SMC's Float switch input has been designed to operate on float switch (SUN S0648), single level probe (SUN S0889), water presence sensor (SUN E1409), 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/water presence switch the motor will be stopped and the Float Indicator will illuminate. Once the bore/float/water presence switch has re-closed, a 15-minute time delay will become active, the motor will not operate during this time. 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) FOR SUN SMC 1000 and SUN SMC 2000

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.

c) FOR SUN SMC550X and SUN SMC 2200

MONOVUE APP

To reduce the maximum pump speed using the **MonoVue** smart phone app, ((Available on Android/Apple phone) and follow these steps:

Example:

Enter *16#, to set the speed from 1 to 5
Display: SET SPEED (1-5)
SPEED = MIN
Enter 3#
Display: SPEED = 50%

SMC TOTALISER OPERATION

The SMC controllers have an inbuilt totaliser function. This function counts every revolution the pump has done since installation.

a) For SUN SMC 1000 and SUN SMC 2000

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 for 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 litre

b) For SUN SMC550X

Tip:

If the flow rate is known, the totaliser can be used to determine how much water has been pumped per revolution.

Example:

1) Enter 21#, to recall number of Pump Revolutions from the SUN SMC 550X
2) Calculate the volume of water pumped versus the number of revolutions required to pump it.

   Ex: Number of revolutions to fill 20 litres of water.

3) How many litres were pumped per revolution=Volume of water pumped /Number of Revolutions

6.1 SUN SMC 1000

6.1.1 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 cut off system. The pressure cut off 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 cut off 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 NOV 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 Cut off 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 Cut off point.

3) Set Pressure Cut off 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# etc.

   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 cut off system in active.

SUN SMC550X

Pump Speed Control

The pump speed button is used to set the speed of pump. This is useful when the peak flow needs to be reduced as in a low yielding bore.

The SUN SMC 550X has two methods of setting the motor speed:

a) Front Panel Speed Button 

- Press to increase or decrease the speed.
- Pressing the Speed button will increase the maximum speed by 20% on each press.

b) MonoVue App

CAUTION

To reduce the maximum pump speed using the MonoVue app, (Refer to MonoVue User Manual) and follow these steps:

Example: (Refer to MonoVue User Manual)

Enter *16#, to set the speed from 1 to 5
Display: SET SPEED (1-5)
SPEED = MIN
Enter 3#
Display: SPEED = 50%

Over Current Limit

ATTENTION

By default, the SMC 550X is configured to a maximum output current of 5A. The SMC 550X will shut down and restart whenever the current limit has been exceeded. The controller will be restarted once the over current/pressure timer has reached the preset time.

Scenario for Over Current/Pressure Limit:

- If 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 Current cut off system.
- Blockage in piping.

Example: (Refer to MonoVue User Manual)

Enter 12#, to check the maximum motor amps
Display: MAX M AMPS
Enter *12# to set the motor output current from the Controller. Press the desired Amps between 0 and 9.
Display: SET MAX MOTOR AMPS
Enter 350#
Display: MAX M AMPS = 3.50 A

Pressure Delay

The purpose of this system is to manage the filling of a remote water storage tank. The remote tank has a float valve that closes when the tank is full, causing pressure to build up in the system and tripping the Pressure/Current cut off mechanism. If the pump pressure climbs over the preset current limit, the pump will automatically stop for 30 minutes, after which the SUN SMC 550X will attempt to restart the pump. The pressure delay indication on the front panel indicates if the system has been turned off using the pressure cut-off technology. When the pressure limit is reached, the indicator will illuminate, and it will flash when the unit is counting down for 30 minutes.

ATTENTION

By default, the motor will restart after 30 minutes.

Example: (Refer to MonoVue User Manual)

Enter 18# to read the pressure delay time.
Display: FLOAT TIME = Value

Over Temperature

By default, the SMC 550X can operate between a minimum temperature of -10° C and maximum temperature of 50° C. If the temperature rises beyond 50° C, the SMC 550X will slow down and eventually shut down until the temperature returns to normal. The controller will restart after it has cooled down.

Example: (Refer to MonoVue User Manual)

Enter 9#, to read the internal temperature.
Display: TEMPERATURE = Value

6.1.2 Solar Display Unit (SUN SMC 1000 and SUN SMC 2000)

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

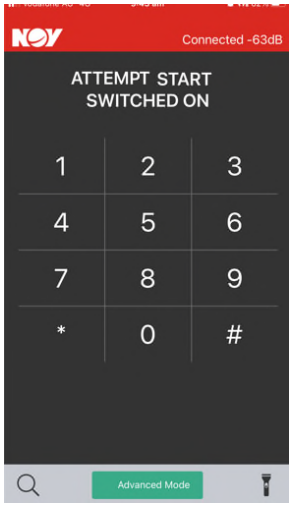
6 Set Maximum Motor Voltage

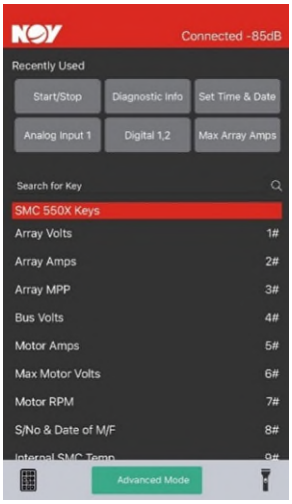
7 Set Pump Model (0 reads current setting)

8 Revolution Counter

9 Restores the SMC to the factory default settings

SOLAR DISPLAY UNIT (Refer to MonoVue app User Manual)





Note:

- SUN SMC550X and SUN SMC 2200 have inbuilt Bluetooth feature, to access MonoVue smart phone app (Available on Android/Apple phone).
- SUN SMC 1000 and SUN SMC 2000 require SUN M1471 dongle connected to its comm port, to access MonoVue smart phone app (Available on Android/Apple phone).

MONOVUE FUNCTIONALITY SUN SMC 550X MODEL

Enter Primary Function	**Parameters displayed in app**	**Enter Secondary Function (User can change the setting)**	**Parameters displayed in app**	**Example**
1#	ARRAY VOLTS	*1#	ARRAY POWER	DISPLAY ONLY
2#	ARRAY AMPS	*2#	SET MAX MOTOR AMPS	ENTER NUMBER FROM 0 to 900 Ex: ENTER 350# MAX M AMPS = 3.50 A
3#	MAXIMUM POWER POINT TRACKER DEFAULT: MPPT=AUTO	*3#	SET MPPT 0: AUTO	ENTER FROM 0 to 600 V Ex: ENTER 300# MPPT=SET:300V
4#	MOTOR BUS VOLT	*4#	MOTOR POWER	DISPLAY ONLY
5#	MOTOR AMP	*5#	MOTOR AMP	DISPLAY ONLY
6#	MAX MOTOR VOLT DEFAULT: MAX MOTOR VOLT=170 V	*6#	SET MAX MOTOR VOLT	ENTER FROM 0 to 170V Ex: ENTER 80# MAX MOTOR VOLT = 80V
7#	MOTOR RPM			
8#	SERIAL AND DATE	*8#	TOTAL REV	DISPLAY ONLY
9#	TEMPERATURE	*9#	DEFAULT RESET? 0#:NO, 1#: YES	0#: DEFAULT RESET CANCELLED SWITCHED ON 1#: DEFAULT RESET DONE SWITCHED ON
10#	SPEED MODE	*10#	SPEED MODE	DISPLAY ONLY

Enter Primary Function	Parameters displayed in app	Enter Secondary Function (User can change the setting)	Parameters displayed in app	Example
	DEFAULT: FRONT (SUN SMC 550X CONTROLLER FRONT PANEL)		DEFAULT FRONT (SUN SMC 550X CONTROLLER FRONT PANEL)	
11#	ARRAY POWER	*11#	ARRAY POWER	DISPLAY ONLY
12#	MAX MOTOR AMPS DEFAULT: 5.00 A	*12#	SET MAX MOTOR AMPS	ENTER NUMBER FROM 0 to 900 Ex: ENTER 350# MAX M AMPS = 3.50 A
13#	AUTO START ENABLED	*13#	SET AUTO START 0#: DISABLE, 1#: ENABLE	#0 AUTO START DISABLED 1# AUTO START ENABLED
14#	UNIT TYPE 550W	*14#	UNIT TYPE 550W	DISPLAY ONLY
15#	FLOAT STATUS DEFAULT: ENABLED	*15#	SET FLOAT SWITCH 0#: DISABLE, 1#: ENABLE	0# FLOAT = DISABLED 1# FLOAT = ENABLED
16#	SPEED DEFAULT: MAX	*16#	SET SPEED (1-5) SPEED = SPEED STATUS	1# - MIN 2# - 25% SPEED 3# - 50% SPEED 4# - 75% SPEED 5# - MAX SPEED
17#	MOTOR TYPE	*17#	SET MOTOR TYPE	1# - MOT1000 2# - MOT2000 4# - SRX700
18#	FLOAT TIME = EN: 900S OR FLOAT TIME = DIS: 900S	*18#	FLOAT TIME = EN: 900S OR FLOAT TIME = DIS: 900S	DISPLAY ONLY
20#	MOTOR POWER	*20#	MOTOR POWER	DISPLAYED IN WATTS
21#	TOTAL REV	*21#	RESET REVS? 0:NO, 1:YES TOTAL REV = OUTPUT	0#: SWITCHED ON 1#: TOTAL REV = OUTPUT

Enter Primary Function	Parameters displayed in app	Enter Secondary Function (User can change the setting)	Parameters displayed in app	Example
22#	VERSION=21090900	*22#	VERSION =21090900	FIRMWARE VERSION
23#	SERIAL NUMBER	*23#	SERIAL NUMBER	DISPLAY ONLY
24#	MANUF DATE	*24#	MANUF DATE	DISPLAY ONLY
25#	RMS VOLTS	*25#	RMS VOLTS	DISPLAY ONLY
26#	MAXIMUM SUPPLY AMPS DEFAULT: 9.00 A	*26#	MAXIMUM SUPPLY AMPS	DISPLAY ONLY

MONOVUE FUNCTIONALITY 1000/2000/3000 SMC MODEL

Enter Primary Function	Parameters displayed in app	Enter Secondary Functions (User can change the settings)	Parameters displayed in app
1#	ARRAY VOLTS	*1#	ARRAY POWER
2#	ARRAY AMPS	*2#	AUTOMATIC CUT OUT PRESSURE LIMIT 0#: DISPLAY PRESENT SETTINGS ENTER 1# T0 200# (IN METERS) 45#: CUT OUT SET TO 45M 201#: PRESSURE CUT OUT DISABLED
3#	ARRAY MAXIMUM POWER POINT TRACKER	*3#	ARRAY MAXIMUM POWER POINT VOLTAGE 0#: AUTO MODE ENTER 1# TO 160# 50#: ARRAY MPP V=050V
4#	MOTOR VOLT	*4#	MOTOR POWER IN WATTS
5#	MOTOR AMPS	*5#	PUMP PRESSURE IN METERS NOTE: WILL ONLY PROVIDE AN ACCURATE READING IF THE CORRECT PUMP HAS BEEN PROGRAMMED VIA *7#
6#	MAX MOTOR VOLTS	*6#	SET MAXIMUM MOTOR VOLTAGE AND SPEED (BY DEFAULT = 180V WHICH ENABLES THE MOTOR TO RUN AT MAXIMUM SPEED) ENTER 36# TO 180# 90#:MAX MOTORV=90V
7#	MOTOR RPM	*7#	SETS PUMP SIZE TO ENABLE AUTO-PRESSURE CUT OUT 0#: DISPLAYS CURRENT PUMP SETTING EXAMPLE: 22#: PUMP = CP22
8#	SERIAL NUMBER AND DATE OF MANUFACTURE	*8#	NUMBER OF REVOLUTIONS
9#	UNIT ID	*9#	RESTORE FACTORY SETTINGS 1#: ACTIVATE FACTORY RESET MPPT INTO “AUTO” MODE AND MOTOR VOLTAGE SET TO 180V

6.1.3 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 NOV 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 NOV 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 Over pressured	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
FAULT REFER TO APP (Refer to MonoVue User Guide)	Yellow	Motor Stall	Check motor current settings (Refer to MonoVue app Manual)
			Check for obstructions and pipework

7 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 NOV for service.

ATTENTION

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 NOV for service.

ATTENTION

The Warranty on the motor is void if it is disassembled. All repairs and maintenance must be carried out at the NOV Australia Pty Ltd factory.

SUN-RAY PUMP WET END

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

WARNING

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.

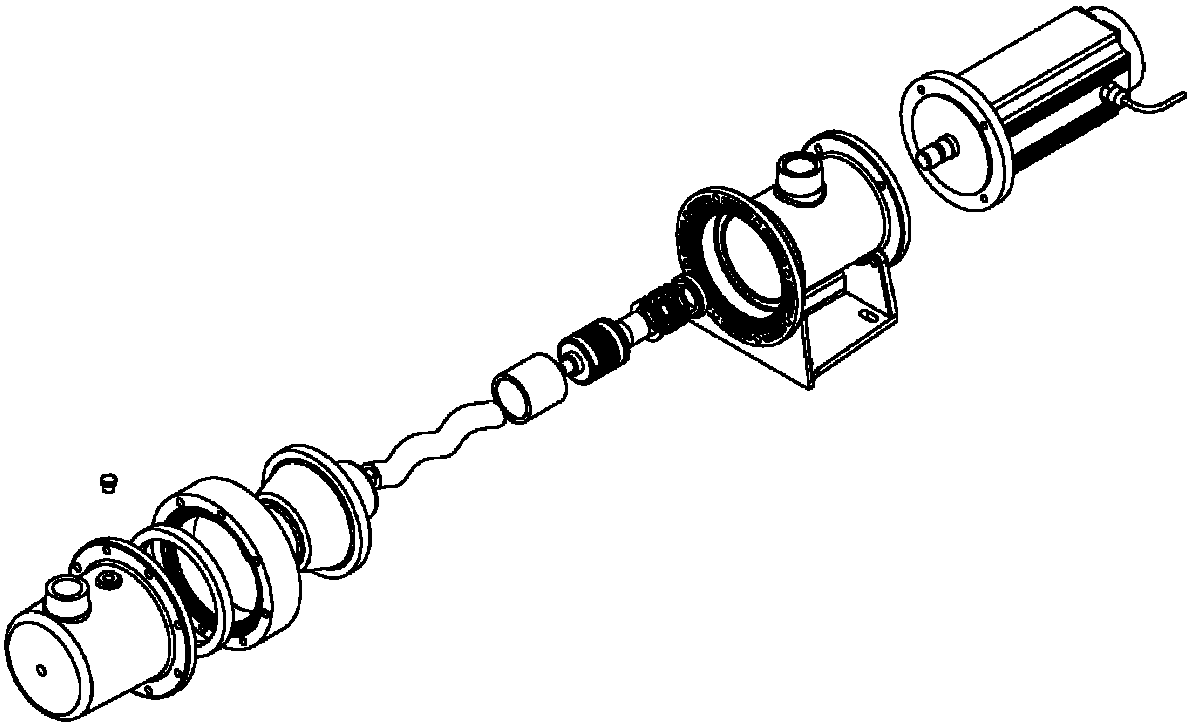
FINAL ASSEMBLY

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.

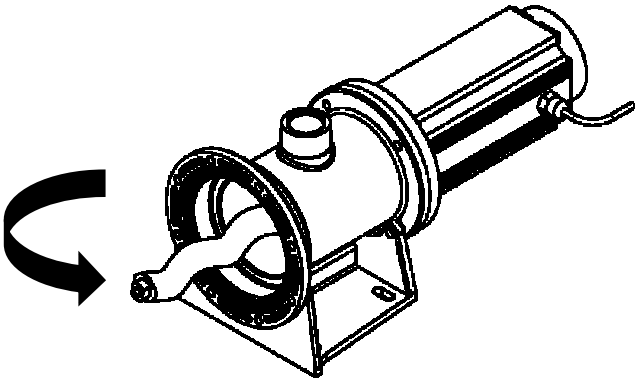
8 Disassembly

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.

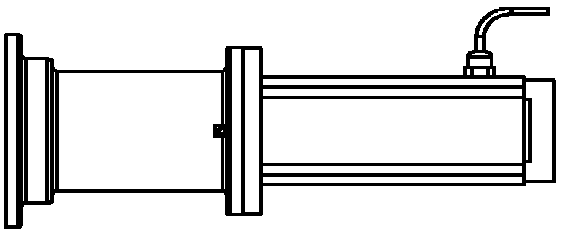


If the rotor unscrews on the coupling, to remove the coupling there are flats on the end which can be held using vice grips can turning in the same direction as above. If not, enough torque can be applied using this method, use a 5 mm pin into the shaft hole through the drain hole (as shown below). Then 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.

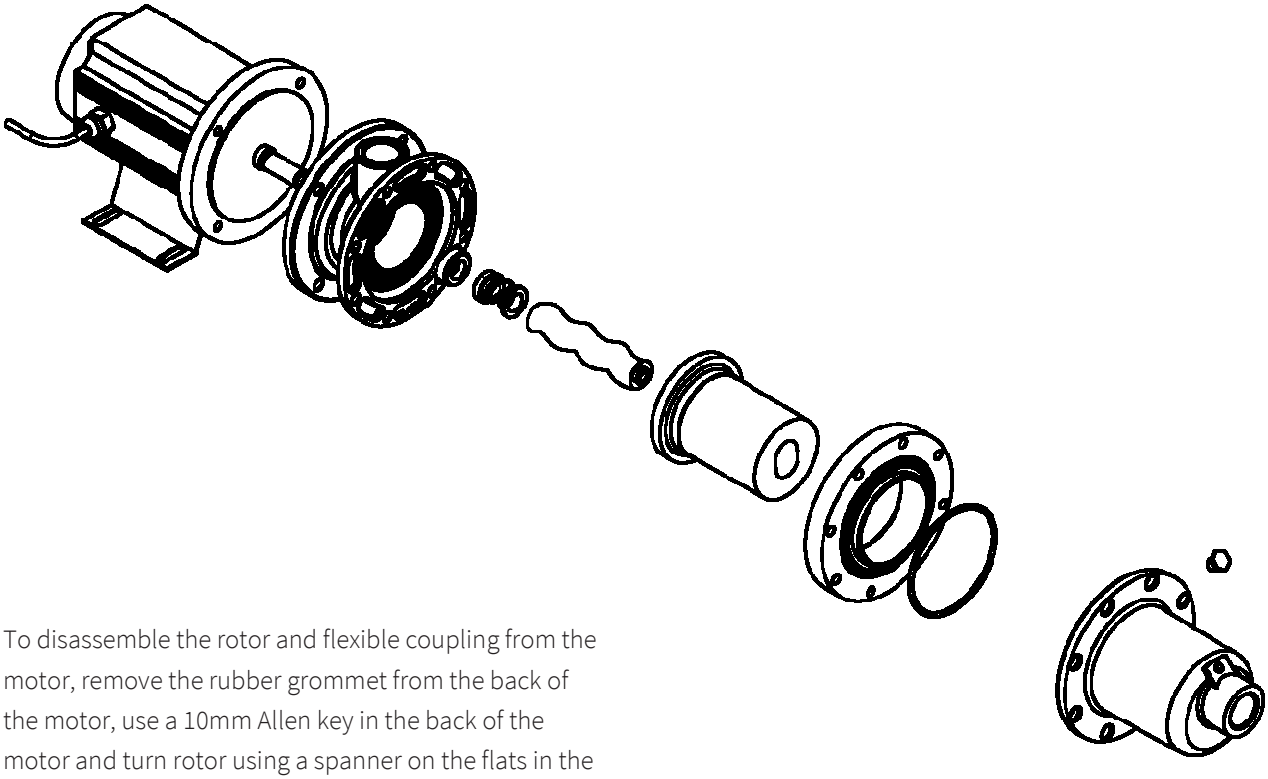
Drain



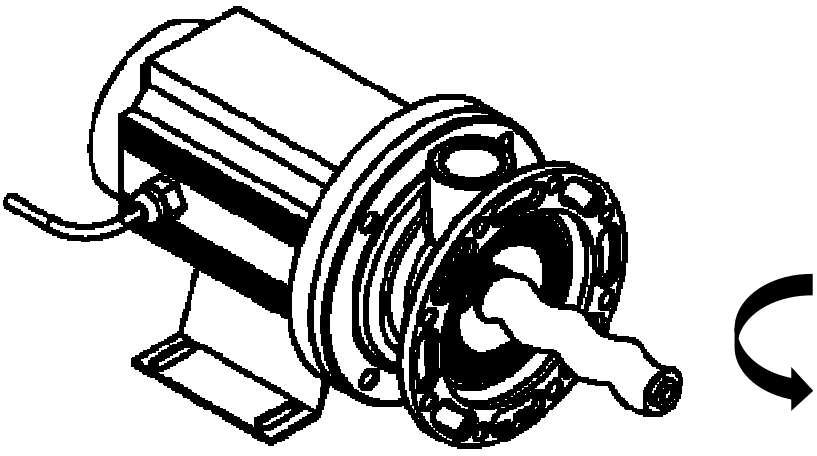
DISASSEMBLY

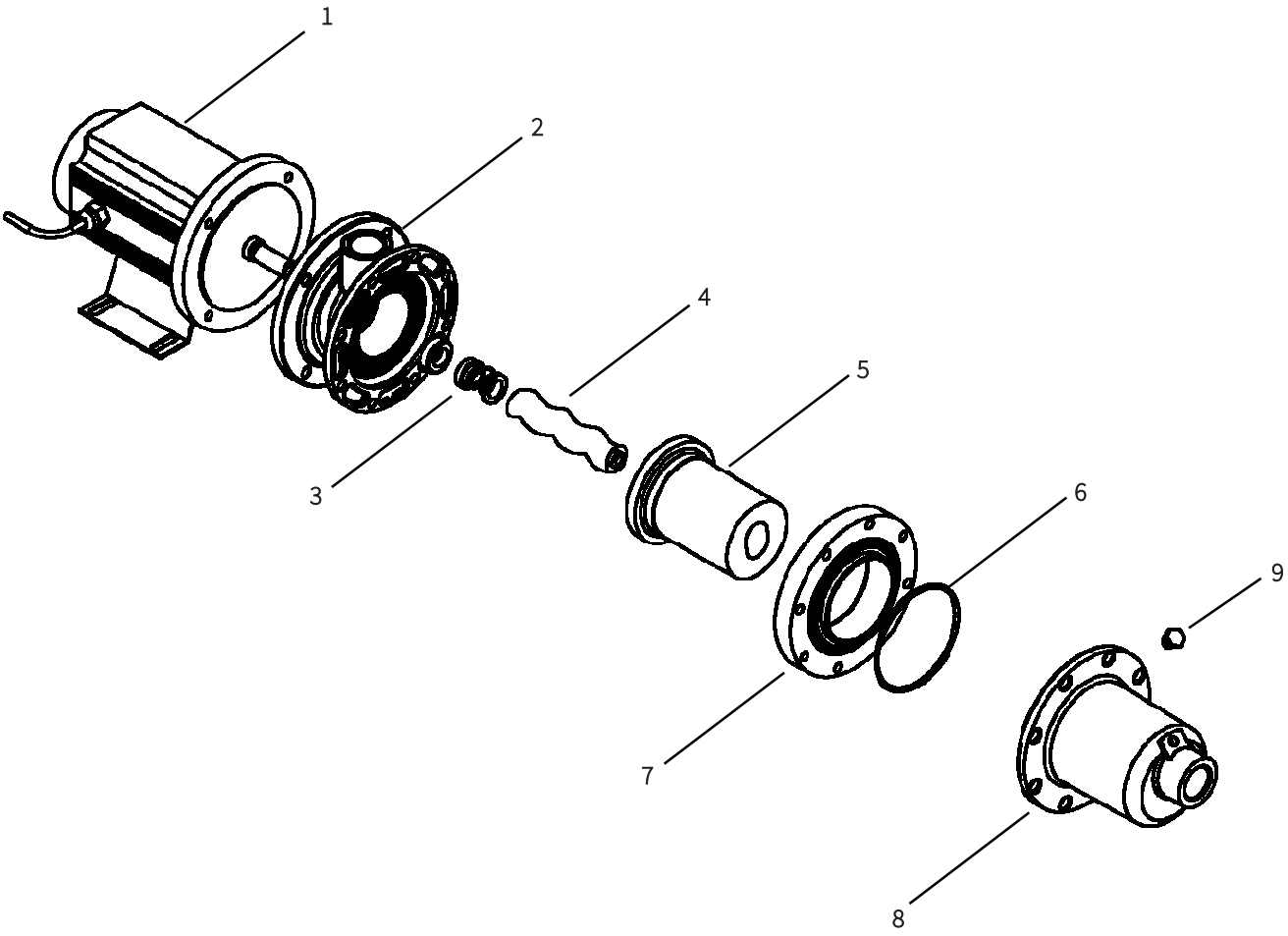
CP25 SRX

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.

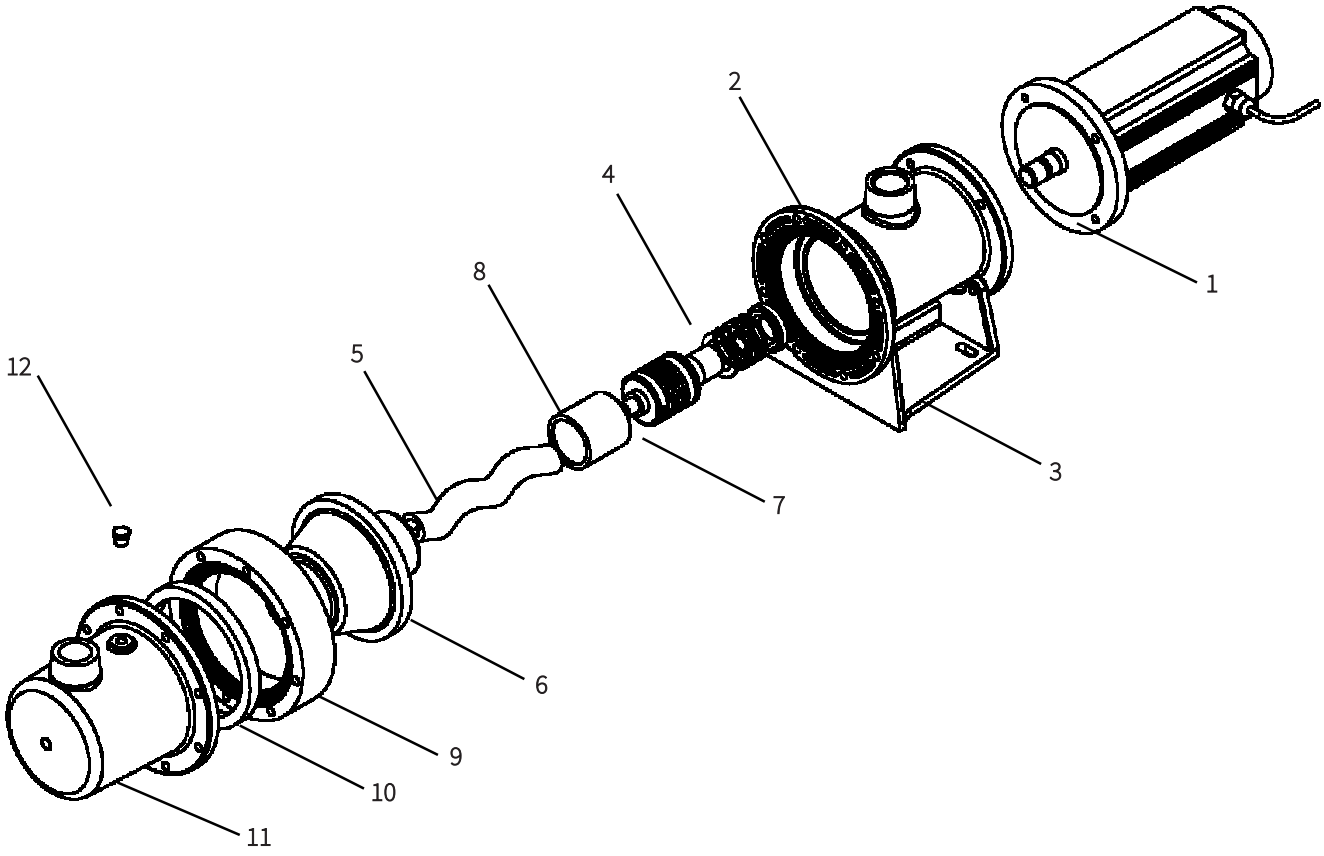




SUNRAY SRX CP25 HIGH PRESSURE P/N: SUN 700CP25H

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

9 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 1060OO	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	1
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	N113100	12
Not Shown	M8 Washer	W113051F	W113051F	20
Not Shown	M8 Spring Washer	W113251F	W113251F	12

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