

Impact Pumps SolarPlex SPX-800-5 User Guide (V2.2)

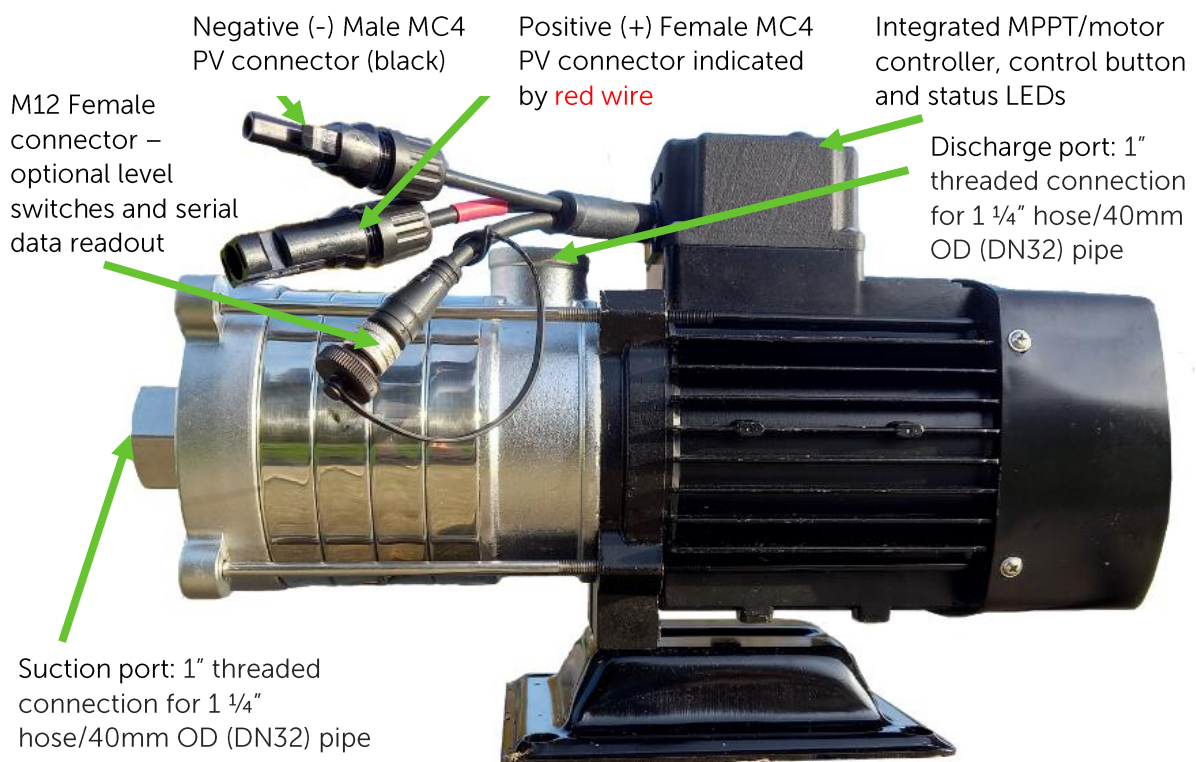
The SolarPlex SPX-800-5 is a horizontal 5-stage centrifugal surface pump designed for solar and other DC-powered applications. It features integrated advanced MPPT and Field-Oriented motor control and is fully scalable for power inputs from 100W-800W, setting a new benchmark in PV-powered water pumping. The SPX-800-5 also features overspeed, overheat and locked-rotor protections as standard, with optional level sensor inputs for shallow well and tank applications. The suction lift of the SPX-800-5 can be extended from 7m to up to 60m with Impact Pumps' FlexExtend range of Suction Lift Extenders.

1. Introduction



This guide explains how to operate the SolarPlex SPX-800-5 solar powered surface pump. Please ensure all installation requirements are met as per our warranty terms and manufacturers' guidance notes. Correctly operated, the SolarPlex SPX-800-5 has been designed to give years of trouble-free service and peace of mind.

2. Ports and electrical connections



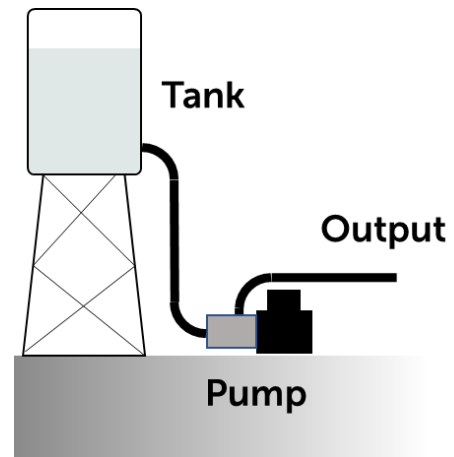


WARNING! ISOLATE ALL ELECTRICAL POWER CONNECTIONS BEFORE PRIMING. DO NOT OPERATE THE PUMP WITHOUT WATER INSIDE THE PUMP HEAD CHAMBER.

3. Pumping from a closed tank¹

(e.g. domestic water supply)

- Ensure the inlet pipe/hose is free from leaks and filled with water at all times;
- Ensure the outlet pipe/hose is raised above the SolarPlex where possible;
- Protect the SolarPlex from rain and particularly direct sunlight where possible.

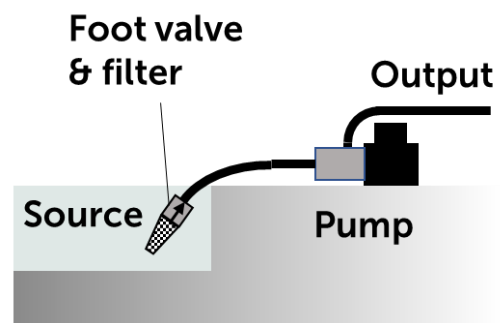


The SolarPlex SPX-800-5 can be used to lift water from up to 60m below in combination with Impact Pumps' **FlexExtend range of Suction Lift Extenders**. For further information, please consult www.impactpumps.com/the-flexextend/.

4. Pumping from an open water source²

(e.g. a lake, pond, river or shallow well)

- Locate the SolarPlex as close to the water level as possible in a dry location with no risk of flooding/partial immersion;
- Connect the suction port to a foot valve and inlet filter (purchase separately);
- Ensure the suction hose/connections are free from leaks;
- Locate the inlet end below the waterline;
- Protect the SolarPlex from rain and particularly direct sunlight where possible.



¹ In applications where the water source is located **above** the pump e.g. in a tank, as shown, a foot valve is not required. Note: This section also applies to deep-water lifting in combination with Impact Pumps' FlexExtend range of Suction Lift Extenders. For further information, please refer to the SolarPlex Extend User Guide at <https://www.impactpumps.com/support/>

² In applications where the water source is located **below** the pump e.g. in a shallow well, as shown.

5. Setup and priming

The pump should be primed full of water before use. The small priming port on top of the pump (shown to the right) may be used.

In closed tank applications, with positive pressure on the suction port, the pump may be primed through the suction port instead. In this case, trapped air should be released through the priming port. In open water source applications with negative pressure at the inlet (drawing water from below), the pump should be primed by filling with water through the priming port, as shown.



THE SUCTION HOSE/PIPE MUST ALSO BE FULL AND FREE OF AIR. Any air locks in the suction hose **must** be removed prior to start up. In open water source applications with negative inlet pressure, fitting a non-return valve (foot valve) to the suction hose (directly coupled to an inlet filter as shown below), will help to avoid further air locks after priming provided the inlet is submerged below the water line.

If you are pumping from an open water source like a river or pond you will need to install the following 2 parts at the inlet of the suction hose:

1. A non-return valve (NRV). In open water source applications, you will not be able to prime the pump with water without a Non-Return Valve (check valve) on the suction side.



2. An inlet filter should also be attached to the NRV/check valve to prevent the pump becoming blocked with debris. A filter may be fitted directly onto the NRV as shown in the image to the right here.



The SolarPlex SPX-800-5 is supplied with **1" BSP (G1") Female** threaded suction (inlet) and discharge (outlet) ports. These should be connected to your application with **1¼" (DN32) hoses or pipework** using standard full-bore pipe fittings, purchased separately. For information on Impact Pumps' latest range of surface accessories, see www.impactpumps.com/solarplex.



6. Electrical power input connections



Once the SolarPlex SPX-800-5 suction and discharge connections have been made and the pump has been primed, it may be connected to a PV array or another suitable **DC** power supply.



WARNING! ENSURE THAT ALL CONNECTORS ARE CLEAN AND DRY. THE POWER SUPPLY VOLTAGE SHOULD NOT EXCEED 100V.

Note: Red sleeved lead connections are 'positive'

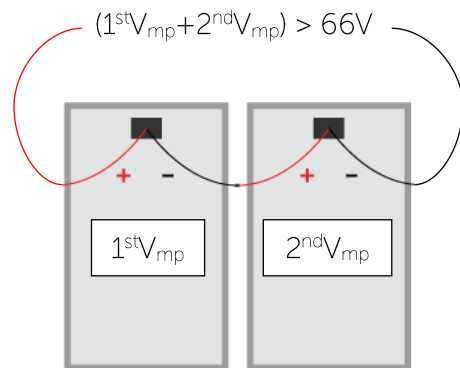
Connect PV panels to the NEG (negative) and POS (positive) terminals. The SPX-800-5 is provided with standard MC4 solar connectors as shown on page 1. The open-circuit panel voltage should always be in the range 30-105V and the short-circuit current should not exceed 20A. For further information on input voltages, please consult the [IMPACT PUMPS SPX-800-5 datasheet](#).

When the PV panels are connected, the  **POWER** LED light on the pump controller box will show constant **amber** and the pump will auto-start after 5 seconds. The pump will initially start in default 800W maximum power mode, and the  **POWER** LED light will show constant **blue**.

Minimum Vmp Voltage

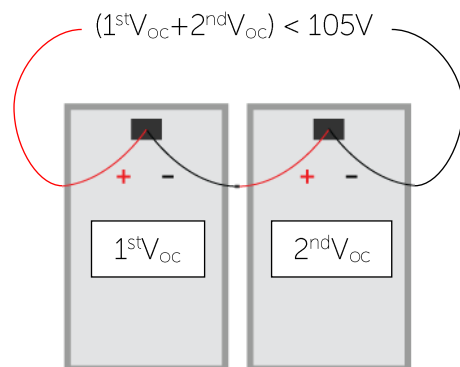
To deliver the full 800W of power to the SolarPlex, the PV panels must have a combined **maximum power voltage (V_{mp}) of more than 66V**. This is likely to require at least 2 panels, connected in series as shown.

For the minimum input voltage needed to obtain lower power ratings, please consult the [IMPACT PUMPS SPX-800-5 datasheet](#).



Maximum Voc Voltage

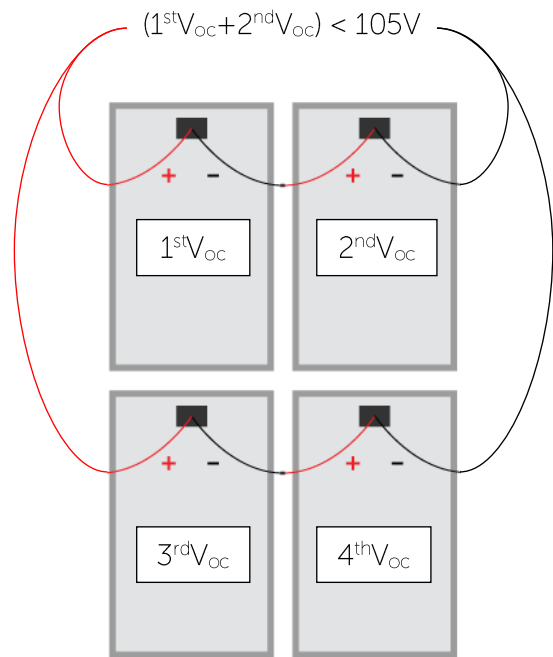
The total sum **open circuit voltage (V_{oc})** of any PV panels wired in series should always be **less than 105V**. If the Voc is higher than 105V the overvoltage protection will stop the pump from running. The two panels shown in this diagram are wired in series.



Tip: Parallel Wiring

There is no limit to the number of PV panels that can be wired in parallel to the SolarPlex. Parallel wiring increases available current and not voltage. The SolarPlex SPX-800-5 automatically limits the maximum current drawn from the PV panels to within the safe limit of 13A or 800W.

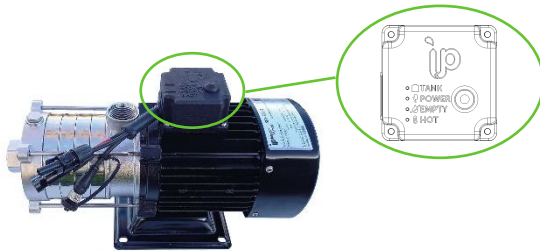
For example, if all the voltages of the 4 panels shown in this diagram are the same then the voltage of 3rd and 4th PV panels would not add any extra voltage to the total sum open circuit voltage of the 1st and 2nd panels. Instead, the 3rd and 4th panels will add to the available current and power up to the safe automatic limit set by the pump.



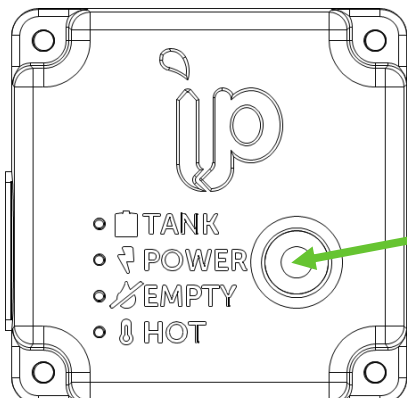
7. Connecting, stopping and starting the pump



WARNING! ISOLATE OR COVER PV PANELS WHEN CONNECTING THE PUMP. ENSURE ALL MECHANICAL AND ELECTRICAL CONNECTIONS HAVE BEEN FITTED SECURELY BEFORE UNCOVERING PANELS OR SWITCHING ON POWER SUPPLY.



The control button and status LED lights can be found on the motor controller box as shown.

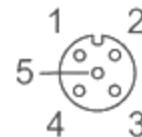


Once a power connection is made, the SolarPlex SPX-800-5 will automatically start in its default MPPT mode, operating at the maximum power available from the connected PV array or power supply up to a maximum rated power of 800W. To **stop and start** the pump, **short-press** the control button indicated (for up to 2 seconds). For further information on alternative operating modes and LED light display information, refer to sections 9 & 10.

8. Level switches and data communications

The SPX-800-5 is fitted with a standard 5-pin Female M12 connector which allows for optional connection to up to two level switches using a mating M12 connector cable which is available separately from Impact Pumps for those customers wishing to install level sensing. If left disconnected (open circuit), the SPX-800-5 will default to running unless stopped with the control button (see section 9). The dust cap provided should be used to prevent short circuits if level sensing and data readout are not required. Pins 1 to 4 are for level sensing, the 5th pin on the M12 connector provides a serial data readout, which can be accessed using the SPX Data Logger. If you require data logging, contact your dealer for further information.

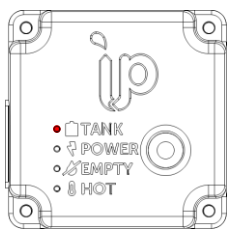
M12 pinout is shown in the diagram to the right




Connections

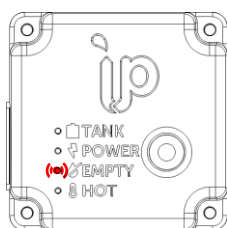
1. Brown – pump stops when switch connects Brown to COM (Common Ground)
2. White – pump stops when switch connects White to COM (Common Ground)
3. Blue – COM (Common Ground)
4. Black – COM (Common Ground)
5. Grey – Serial RX - contact Impact Pumps for information

Example level switch connections and LED light status display when using the optional add-on M12 connector cable




Tank full level sensor

If the brown wire (pin 1) of the M12 connector cable is connected to the blue wire (pin 3) by a Normally Open (NO) level switch or otherwise, the pump will **stop** and the  TANK LED light will show constant **red**. This channel may be used (for example), to stop the pump if it is delivering to a full tank.

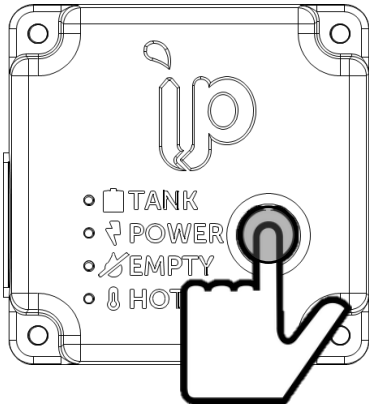


Tank or well low level sensor

If the white wire (pin 2) of the M12 connector cable is connected to the black wire (pin 4) by a Normally Open (NO) level switch or otherwise, the pump will **stop** and the  EMPTY LED light will flash **red**. This channel may be used to stop the pump if it is drawing water from a tank or well if the level descends too low.

9. Control button actions

The SolarPlex SPX-800-5 may be stopped, started or operated in “**power limited modes**” using the control button on the integrated MPPT/motor control box.



1 short-press (up to 2 seconds) will stop the pump. The ● ↕ POWER LED light will change from constant **blue** to constant **amber** (● ↕ POWER).

When stopped, **1 short-press** (up to 2 seconds) will start the pump. It will start in its default 800W Maximum Power mode unless a **power limited mode** has previously been selected and saved to memory. In this mode, the ● ↕ POWER LED light will show constant **blue**.

Power limited modes

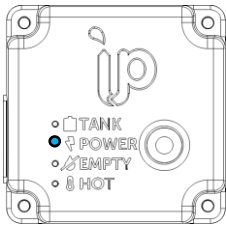
In some applications³, it may be useful to limit the power of the SolarPlex SPX-800-5. For example, if a large solar array is used to benefit from good performance at the ends of the day or in cloud and;

- your water source is routinely running dry and/or unable to yield the daily volumes that the SolarPlex SPX-800-5 can pump in the middle day;
- the SolarPlex SPX-800-5 is delivering to a system that may be damaged by its high (75m) maximum output head at 800W input power;
- the SolarPlex SPX-800-5 is delivering to a system that may be damaged by its high (4.5 m³/h) maximum output flow rate at 800W input power;
- you don't need the high daily volumes that the SolarPlex SPX-800-5 can deliver and wish to prioritise maximising the service life of your system;

you may consider limiting its power rating⁴ to a lower maximum level than 800W.

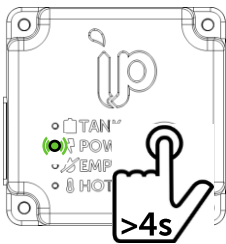
³ When operating in combination with Impact Pumps' standard FlexExtend model (SLX-40-S), the SolarPlex SPX-800-5 should be operated in 600W maximum power mode or lower to avoid unnecessary safety valve actuations. The SolarPlex SPX-800-5 can be operated at any power level in combination with the High-Flow FlexExtend (SLX-40-HF).

⁴ Note that the SolarPlex will automatically switch into Maximum Power mode and continue to extract as much power as possible from your PV solar array or DC power source (up to a limit of 800W) when the power available drops below its set power limit in power limited modes.




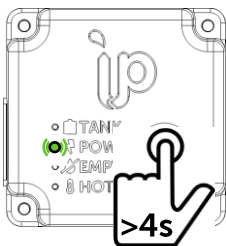
Default 800W Maximum Power mode

In the default setting, the  POWER LED light shows constant **blue**, to indicate that the pump is running at full power and will accept up to 800W of electrical power input when available.




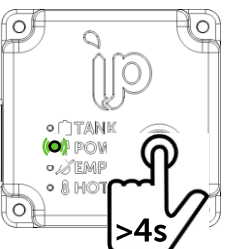
100W maximum power mode

Push and hold the control button once for at least **4 seconds** to enter 100W power limited mode. In this mode, the  POWER LED light will intermittently show **one green** flash.




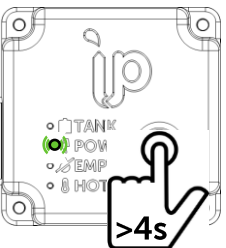
200W maximum power mode

Push and hold the control button again for at least **4 seconds** to enter 200W power limited mode. In this mode, the  POWER LED light will intermittently show **two green** flashes.




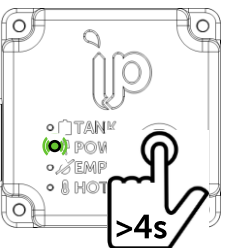
300W maximum power mode

Push and hold the control button again for at least **4 seconds** to enter 300W power limited mode. In this mode, the  POWER LED light will intermittently show **three green** flashes.




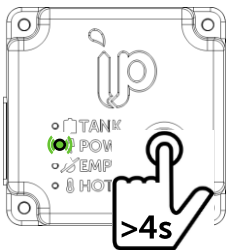
400W maximum power mode

Push and hold the control button again for at least **4 seconds** to enter 400W power limited mode. In this mode, the  POWER LED light will intermittently show **four green** flashes.




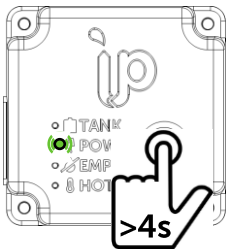
500W maximum power mode

Push and hold the control button again for at least **4 seconds** to enter 500W power limited mode. In this mode, the  POWER LED light will intermittently show **five green** flashes.




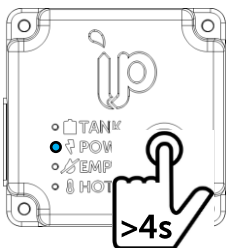
600W maximum power mode

Push and hold the control button again for at least **4 seconds** to enter 600W power limited mode. In this mode, the  **POWER** LED light will intermittently show **six green** flashes.




700W maximum power mode

Push and hold the control button again for at least **4 seconds** to enter 700W power limited mode. In this mode, the  **POWER** LED light will intermittently show **seven green** flashes.



Return to default 800W Maximum Power mode

Push and hold the control button once more for at least **4 seconds** to return to the default maximum power output mode. In this mode, the LED light  **POWER** will once again show **constant blue**.

Tip: To remove a reduced power limit from the pump quickly, simply push and hold the button down until the  **POWER** LED light turns from **green to blue**⁵.



WARNING: POWER LIMITED MODES ARE ONLY SAVED TO MEMORY AFTER 4 MINUTES OF OPERATION. IF POWERED DOWN SOONER, THE PUMP WILL RESTART IN DEFAULT 800W MAXIMUM POWER MODE OR THE PREVIOUSLY SAVED MODE IF THERE WAS ONE.

⁵ i.e. you do not have to scroll through the power limits to return to the default setting.

10. Pump reset and protection features

The SolarPlex comes with an innovative controller board with reset and protection features. The board will respond to various circumstances that could be dangerous or cause damage. LED lights denote different pump protection modes.

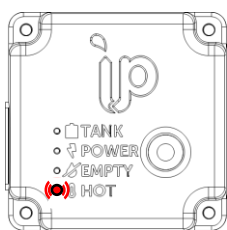
If the pump stops but **no error code is displayed by the LED lights**, this indicates power supply interruption or overspeed due to trapped air or dry-running. If this occurs, isolate the pump and bleed air or re-prime it through the priming port (see section 5). Check all electrical connections before attempting to re-start.


Coded error warnings

Most error states are accompanied by a warning indicated by the LED lights on the motor controller box. Please consult the table below to diagnose your problem before attempting to solve it yourself or contact your dealer.

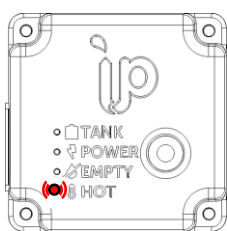
Overheat warnings!


The SolarPlex SPX-800-5 is actively fan cooled and will turn itself off to prevent damage if the power electronics temperature exceeds 70°C or the internal motor windings exceed 100°C. These high temperatures will only occur if the pump is left in direct sunlight, without shading, in a hot climate and while running at high power. We strongly recommend that the SolarPlex SPX-800-5 is shaded from full sunlight, wherever possible, in operation.



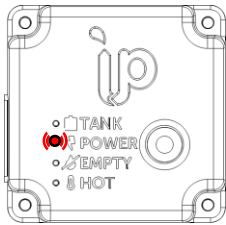
Pump too hot The  HOT LED light will **fast-flash red**, on and off for equal durations, **two times every second**. The pump will attempt to auto-restart after 60s. This may occur if the pump is operated for long periods in direct sunlight, without shading, in a hot climate and while running at high power. Consider providing shading or moving pump to a cooler location or selecting a **power**


limited mode (see section 9). If the problem persists, disconnect power, wait several minutes and reconnect.

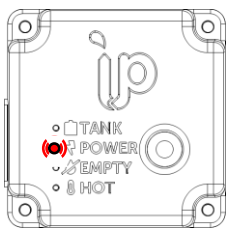



Pump too cold The  HOT LED light will **slow-flash red**, on and off for equal durations, **two times every four seconds**. The pump will attempt to auto-restart after 60s. This will only occur in extreme cold weather in which there is a danger of ice formation in the pump head. If the problem persists, disconnect power, wait several minutes and reconnect.

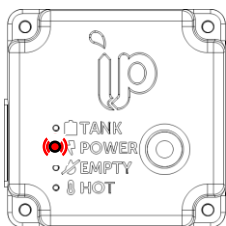
Input Power Warnings!



Input voltage TOO HIGH The  POWER LED light will **fast-flash red**, on and off for equal durations, **two times every second**. This may indicate that the open-circuit voltage (V_{oc}) of the PV array or power supply is too high. Immediately isolate or disconnect to avoid damage to equipment and refer to section 6 of this guide.

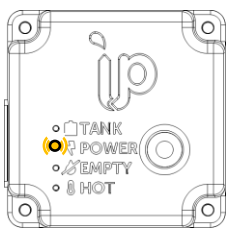



Input current TOO HIGH The  POWER LED light will intermittently show **2 red flashes**. This may indicate a short circuit or locked pump rotor. Immediately isolate or disconnect to avoid damage to equipment. Remove the pump and inspect the pump ports, wiring and pump head for blockage, rotor seizure or damage to electrical wiring.

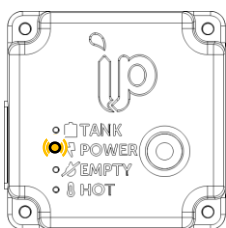



Motor current TOO HIGH The  POWER LED light will intermittently show **3 red flashes**. This may indicate a short circuit in the motor electronics. Immediately isolate or disconnect to avoid damage to equipment. Remove the pump and inspect the pump for any damage.

Low power warnings

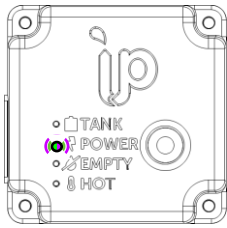



Input voltage too low The  POWER LED light will flash **amber once every two seconds**. This may indicate that the maximum-power voltage (V_{mp}) of the PV array or power supply is too low or that sunlight levels are too low for your pump to operate. The pump will attempt to auto-restart every 60 seconds.



Input current too low The  POWER LED light will flash **amber once every two seconds**. This may indicate that the maximum-power current (I_{mp}) of the PV array or power supply is too low or that sunlight levels are too low for your pump to operate. The pump will attempt to auto-restart every 60 seconds.

Non-user serviceable error codes



Error codes shown by intermittent **green** and **purple** flashes of the  POWER LED light are not user serviceable. Nonetheless, they may indicate faults with level sensors or serial data communications, if relevant.

If any LED colour or flashing codes appear which are not listed here, please make a careful note of:

1. Which LED is showing an error warning;
2. The colours and flashing sequence of the warning including the duration of any flashes.

Most problems can be resolved simply by:

1. Disconnecting or isolating power supply (e.g. PV array);
2. Disconnecting level sensors if any are connected;
3. Allowing the pump to cool down;
4. Restarting without level sensors connected;
5. Replacing broken or damaged level sensors.

If the problem persists, please visit our website for troubleshooting information or contact your dealer.