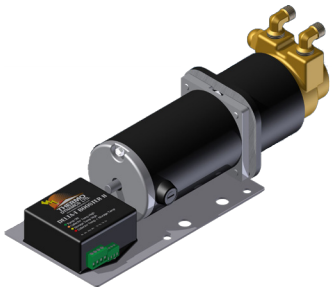
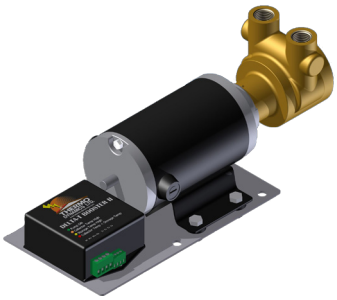
THERMO DYNAMICS LTD.

Solar Pump™

Sensible, Ecological, Economical, Reliable

The BEST Little Pumps in the World !!





Solar Pump™ Introduction

The sun powers the Thermo Dynamics Solar Pump™ - no batteries, no high-voltage electricity, no engine consuming gasoline or diesel fuel - only harmless, low-voltage, solar-generated electricity, eternally available and pollution free. The Solar Pump™ system consists of a rotary vane pump driven by a photovoltaic (PV) powered DC motor and controller. The PV module drives the DC motor via a built-in linear current booster (LCB) with differential temperature controller, and utilizes a proportional speed control strategy achieved by the variable output of the PV module. This ensures maximum performance at all levels of solar irradiance and enables the Solar Pump™ to begin pumping with as little as one watt of power (one-tenth of a full sun, 100 W/m2)!!

Flow rates of the Solar Pump™ range from 0.3 liters/minute (0.1 USGPM) to 12 L/m (3.2 USGPM) depending on the model. Head up to 35 m (115 ft). Pressure up to 3.5 bar (50 PSI).

Solar Pump™ Applications

The Thermo Dynamics Solar Pump™ is the perfect pump for solar water heaters. For most single-family homes, a 10 - 20 watt PV module provides all the electrical power necessary for the entire solar water heater! There are no AC powered electronic components and there is no high voltage wiring to install. All electronic components – the motor, linear current booster, and differential temperature controller - are all combined into one unit and are powered by low voltage DC power directly from the PV module. The PV module provides the precise amount of power required for circulation of fluid through the solar collectors any time heat is available for collection, and the Solar Pump™ ensures that the flow rate is proportional to solar irradiance, maximizing the delivery of energy from the solar collectors.

Installers love the Solar Pump™! It is so much easier to install than an AC-powered circulator system. The Solar Pump™ is a rotary vane pump unaffected by air bubbles and capable of high pressure (max 50 PSI / 3.5 bar), allowing installers and homeowners to save time and money by using smaller diameter tube, and avoiding the hassles of air separation. Homeowners also appreciate the fact that ALL the energy used to produce their solar heated water comes from the sun, and none from the electrical grid that delivers electricity generated by environmentally damaging technologies.

The Solar Pump™ is also the perfect pump for low-flow irrigation and general water pumping. It can be used to pump most liquids, including water and water/glycol solutions.

101 Frazee Ave • Dartmouth, N.S. • Canada • B3B-1Z4 • Tel: (902) 468-1001 • Fax: (902) 468-1002 • www.thermo-dynamics.com

Solar Pump™

Solar Pump™ Advantages

Typically, a solar water heater will run for 2,500 hours per year in mid-latitude countries consuming 80 watts of grid electricity during operation. Using the Thermo Dynamics Solar Pump™ in place of a grid-connected circulator and solar controller will save 200 kilowatt-hours (kWh) of purchased electricity each year. This translates to 2,000 kWh over the 10-year warranty period of the pump, or 4,000 kWh over the expected lifetime of the Solar Pump™. These savings will more than cover the additional cost of the Solar Pump™ relative to a standard "plug-in" pump, especially when considering the fact that electricity prices continue to rise year after year. Additional savings can also be realized by reducing the tube diameter that connects the Solar Pump™ to the solar collectors. The added pressure drop of the smaller diameter tubing is easily overcome by this powerful little pump.

Installing a Solar Pump™ can also reduce the time necessary to install a solar water heater providing further money savings. The Solar Pump™ is self-priming and will continue to pump anytime liquid is available, regardless of whether air is present. No air separator is necessary nor a charging pump. The Solar Pump™ can provide all the pressure necessary to completely charge a typical circulation loop.

Not only is it economical to use the Solar Pump, but by using solar energy you reduce the pollution for which you are responsible when using a grid-connected pump. To produce 4,000 kilowatt-hours of electricity in a modern steam power plant will result in four tonnes of carbon dioxide emissions into the atmosphere!!

Consider all the advantages:

- 100% solar powered
- built-in differential temperature solar controller with linear current booster
- consumes 80% less energy than an equivalent grid-connected circulator and controller - *and the energy comes FREE from the sun!*
- high head (up to 35 m / 115 ft)
- high pressure (up to 3.5 bar / 50 PSI)
- self-priming
- no air separator required
- no charging pump required
- smaller diameter tube may be used
- easy and inexpensive to install
- life expectancy of over twenty years
- ten-year limited warranty
- no high-voltage electrical connections
- no certified electrician to install the pump
- no municipal electrical permit required
- no high-voltage electromagnetic fields

"Finally! A solar water heater that is 100% solar powered - the way it should be." - customer

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Solar Pump™

Solar Pump™ Models:

There are five models of Solar Pump™ available:

Model #	Style	Flow Range (LPM)	Flow Range (USGPM)	Port Size	Nominal Voltage (VDC)
P24070M	Mag Drive	0.3 - 2.4	0.1 - 0.6	3/8" FPT	12 / 24
P24070EM	e-Mag Drive	0.3 - 2.4	0.1 - 0.6	3/8" FPT	12
P50140M	Mag Drive	1.0 - 5.0	0.3 - 1.3	3/8" FPT	12 / 24
P50140EM	e-Mag Drive	1.0 - 5.0	0.3 - 1.3	3/8" FPT	12
P118330	Direct Drive	2.0 - 12.0	0.5 - 3.2	1/2" FPT	12 / 24

All Solar Pumps™ are supplied with differential temperature controller, linear current booster, and mount plate. Temperature sensors, connection fittings, and connection hoses are sold separately.

Options: *TDL stocks 10K NTC thermistor temperature sensors, 3/8" compression x 3/8" MPT fittings, and 1/2" hi-temperature rubber hose for use with the Solar Pump™. Should you wish TDL to supply fittings, hoses or temperature sensors with a Solar Pump™, please specify your requirements at the time of order.*

e-Mag Solar Pump™ with Brushless DC Motor
Model #'s: P24070EM & P50140EM

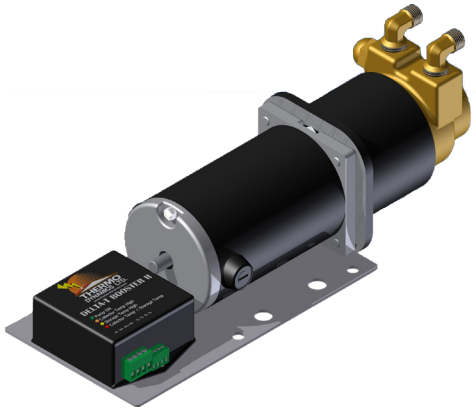
The e-Mag Solar Pump™ is the latest development in Solar Pump™ technology. The e-Mag Solar Pump™ features a brushless DC motor, integral differential temperature controller with linear current booster, and is available with two sizes of pump head (models: BP070M and BP140M). Flow rates range from 0.3 liters/minute (0.1 USGPM) to 5.0 L/m (1.3 USGPM), depending on the model. Pressure up to 3.5 bar (50 PSI).

Available in 12 VDC configuration only.

Mag-Drive Solar Pump™ with Brushed DC Motor
Model #'s: P24070M & P50140M

The Mag-Drive Solar Pump™ features a brushed DC motor, differential temperature controller with linear current booster, and is available with two sizes of pump head (models: BP070M and BP140M). Flow rates range from 0.3 liters/minute (0.1 USGPM) to 5.0 L/m (1.3 USGPM), depending on the model. Pressure up to 3.5 bar (50 PSI).

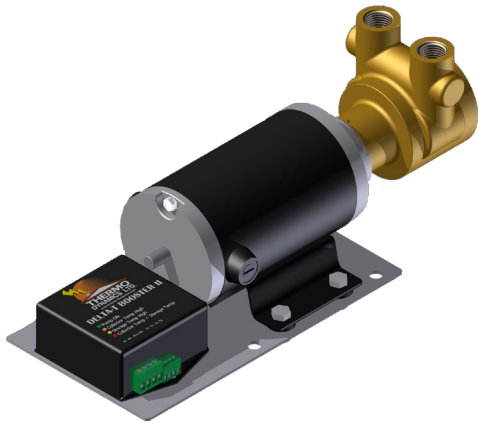
Available in 12 & 24 VDC configuration.



Direct-Drive Solar Pump™ with Brushed DC Motor
Model #: P118330

The Direct-Drive Solar Pump™ is the largest Solar Pump™ and features a brushed DC motor, differential temperature controller with linear current booster, and a standard size pump head (model: BP330). Flow rates range from 2.0 liters/minute (0.5 USGPM) to 12 L/m (3.2 USGPM). Pressure up to 3.5 bar (50 PSI).

Available in 12 & 24 VDC configuration.



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Solar Pump™

Solar Pump™ Configuration:

- brass rotary vane pump
- DC motor
- differential temperature controller with linear current booster
- mount plate

Options: *TDL stocks 10K NTC thermistor temperature sensors, 3/8" compression x 3/8" MPT fittings, and 1/2" hi-temperature rubber hose for use with the Solar Pump™. Should you wish TDL to supply fittings, hoses or temperature sensors with a Solar Pump™, please specify your requirements at the time of order.* ***All fittings, hoses and temperature sensors sold separately.***

Brass Rotary Vane Pump
The pump is a brass body, vane-type, positive displacement pump. The pump has special clearances and seals for high temperature protection up to 100°C. Depending on which Solar Pump™ model, the pump has either 3/8" or 1/2" FPT inlet and outlet ports, and comes equipped with standard compression fittings for 3/8" OD tube (9.40 mm OD) or 1/2" OD tube (12.7 mm OD). Should your application require fittings or hoses of a different size, metric or imperial, substitutions are possible. Please contact us for more information.

The Solar Pump™ is engineered for long life and super efficient operation to enable you to use the lowest possible power PV module. No parts are subject to corrosion - all wetted parts are stainless steel, brass or carbon. Each Solar Pump™ is backed by a 10-year limited warranty.

The Solar Pump™ is a positive displacement pump, which means there is no waste of time or money on equipment to purge air from the circulation loop. It is also self-priming, with a maximum suction lift of 2 meters (6 feet).

Brushless DC Motor ***(models: P24070EM & P50140EM)***
The e-Mag Solar Pump™ utilizes a 12 VDC brushless DC motor coupled directly to the pump via a rotating electro-magnetic field. The motor's electro-magnetic field interacts with a magnet secured to the shaft of the pump rotor. As the electro-magnetic field rotates, so does the pump rotor causing the pump to circulate. Commutation of the brushless DC motor is achieved by an on-board motor control circuit that utilizes hall effect sensors and a motor control IC. The motor control circuit also features a built-in differential temperature solar controller with linear current booster for a complete solar water heater control package.

Brushed DC Moter ***(models: P24070M, P50104M, and P118330)***
The Mag-Drive and Direct-Drive Solar Pumps™ utilize a 12/24 VDC brushed DC motor that, because of its efficient design, is slightly larger than pumps designed to operate at 110, 220 or 240 volts. Permanent magnets are used, whereas standard motors use electrical coils and electric current to create the magnetic field. This wastes precious electricity. However, permanent magnets are heavy and bulkier than the equivalent electrical windings. To produce the torque required to boost the pressure of the pumped liquid, a heavy-duty, large-diameter armature with thick copper windings is used, thus reducing parasitic power consumption by the motor. The result is amazing! - even in very weak sun the motor produces enough power to start the pump, power that is produced in the "greenest" of all possible methods.

Differential Temperature Controller
The Solar Pump™ controller provides all the control functionality necessary for a typical solar water heater powered 100% by the sun. Two 10K NTC thermistor temperature sensors can be connected directly to the Solar Pump™ for complete differential temperature control operations. By comparing the value of the two temperature sensors the controller ensures that the Solar Pump™ is only activated when the solar collector sensor is hotter than the storage sensor. The controller also features high and low temperature limits, including an adjustable high storage temperature limit (adjustable from 35ºC to 90ºC [95ºF to 194ºF]), and fail-safe protection in the event of an open or short-circuited temperature sensor. If differential temperature control functionality is not required, it may be bypassed by installing the Service Plug (included).

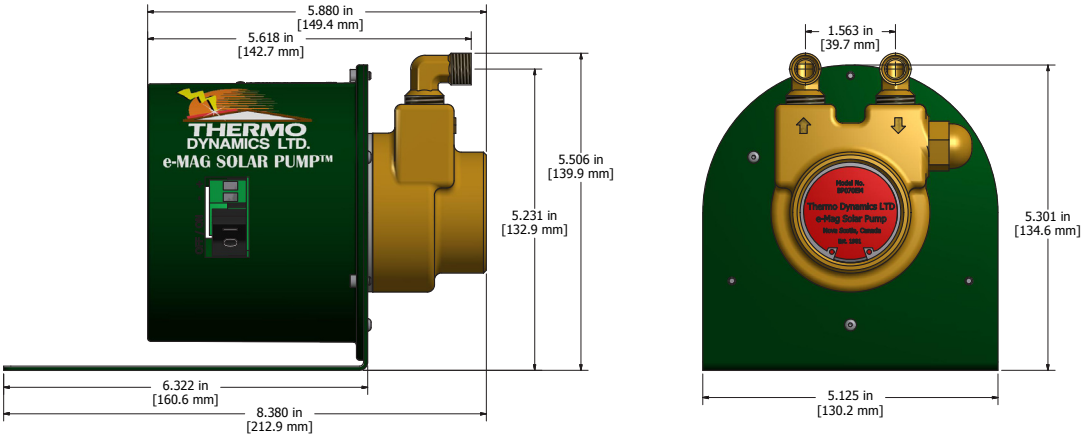
Linear Current Booster
A linear current booster (LCB) matches the power delivery of the PV module to the DC motor under varying sunlight conditions. At full sun the PV module runs the motor at rated speed. At lower sunlight levels the LCB transforms the voltage into current to start the motor and keep it running at low RPM. The motor runs at reduced speed at lower sunlight levels providing a flow rate proportional to the intensity of the solar radiation.

PV Module ***(sold separately)***
Typically, a 10 to 50 watt PV module powers the Solar Pump™. The size of the PV module is dependent on the flow and pressure requirements of the application. A PV module with Vmp of at least 16-17 volts is required, which is typical of most PV modules. Tell us your flow and pressure requirements and we will specify the correct pump model number and PV module, or use our online Solar Pump™ selection guide.

Weight & Dimensions

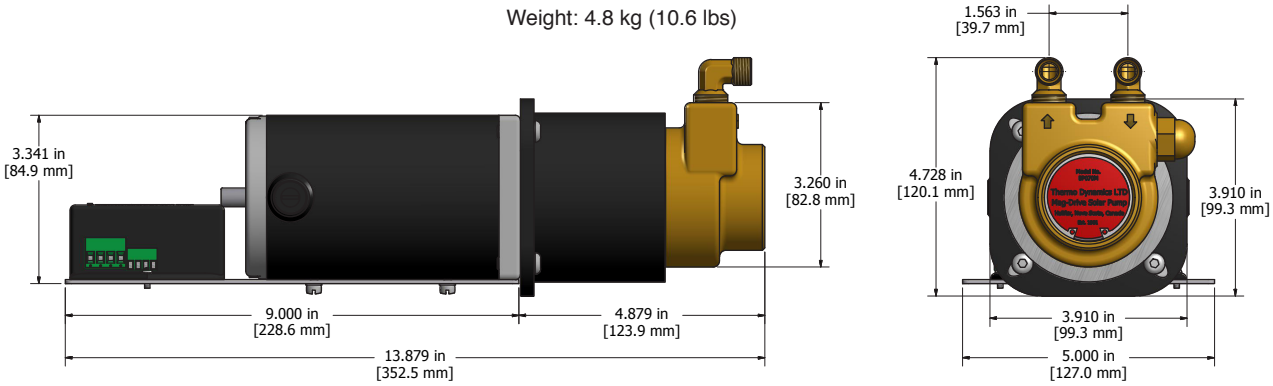
e-Mag Solar Pump™

Models: P24070EM & P50140EM
Weight: 3.4 kg (7.5 lbs)



Mag-Drive Solar Pump™

Models: P24070M & P50140M
Weight: 4.8 kg (10.6 lbs)



Direct-Drive Solar Pump™

Models: P118330
Weight: 4.3 kg (9.5 lbs)