

# Technical Note

## MAG-DRIVE SOLAR PUMP™

TN6000.01 FEB/04



Thermo Dynamics Ltd.

101 Frazee Avenue  
Dartmouth, Nova Scotia  
Canada, B3B-1Z4

Tel: (902) 468-1001 Fax: (902) 468-1002

Email: solarinfo@thermo-dynamics.com

www.thermo-dynamics.com



Solar Pump™ P50140M

### 1.0 General Information

The Thermo Dynamics mag-drive Solar Pump™ is an advanced solar or battery powered pump. This pump is equipped with a magnetic drive between the DC motor and the pump, which increases efficiency and reliability.

### 2.0 Background

Thermo Dynamics (TDL) manufactures a line of pumps under the tradename Solar Pump™. The Solar Pump™ is designed for operation with photovoltaic (PV) modules, or another source of DC power, e.g., batteries or a conventional DC power supply. The Solar Pump™ includes a brushed, permanent magnet DC motor, the TDL Micro-Flo® motor, and a sliding-vane, rotary, positive displacement pump head. The "non-mag-drive" pump is fitted with a standard mechanical seal.

TDL has conducted extensive research and development on magnetic-drive pumps. The objective is to produce a more efficient and reliable pump to replace the shaft-driven pump fitted with mechanical seals (TDL models 10593, 10596). The mechanical seals can be a source of maintenance and they reduce the efficiency of the pump due to the power consumed in rotating the dynamic seal over the static seal.

After extensive testing in the laboratory and in the field, TDL is ready to ship mag-drive version of the Solar Pump™. The P24070M (P24070MAG) will complement the P24070, and the P50140M (P50140MAG) will complement the P50140. Currently there is no mag-drive replacement for the P118330.

### 3.0 Description of Mag-Drive

There is a powerful magnet on the shaft of the TDL Micro-Flo® motor, which rotates as the motor armature rotates. There is also a powerful magnet on the shaft of the pump rotor. The magnetic field produced by the rotating magnet on the motor shaft passes through the pump housing, and causes the pump rotor to turn. The rotor magnet, and the entire pump rotor, is sealed inside the pump housing. There is no rotating shaft to penetrate the pump housing, and therefore, no need for a mechanical seal.

### 4.0 Advantages of the Mag-Drive

The magnetic drive means

- lower starting torque, which means a smaller power source can be used for the mag-drive Solar Pump™
- higher reliability, with no mechanical seal to wear and possibly leak
- lower running torque, due to the elimination of the parasitic power consumption of the mechanical seal - allowing a further reduction in the size of the power source for the mag-drive Solar Pump™
- smoother, quieter running, due to the absence of any hard connection between the motor shaft and the pump rotor.

### 5.0 The TDL Micro-Flo® DC motor

With the introduction of the mag-drive pump, TDL has also introduced an improved DC motor. The new motor (Model 3B-2407112P) is slightly longer, to accommodate field magnets that are twice the size of the field magnets in the old motor (Model 3A-1402072P). This produces a more efficient motor, which requires less current to deliver the same shaft power.

With these improvements we have increased the efficiency of the Solar Pump™ by 25%, i.e., 25% less power required to produce the same flow and pressure. Where a 20 Wp photovoltaic module was required previously, now only a 15 Wp module is required. Given the high costs of photovoltaic power, the savings are significant.

### 6.0 Motor Drivers

An electronic motor driver is required when the TDL mag-drive Solar Pump™ is employed with PV modules. The motor driver, frequently referred to as a linear current booster (LCB), matches the DC motor load to the PV power supply. After several years of experimentation and trials, TDL has introduced two new LCB's - the Jolter™ and the Booster™. These are included as standard equipment with the mag-drive Solar Pump™. Read about the Jolter™ and Booster™ in their respective Technical Notes.

The mag-drive Solar Pump™, like its direct drive counterpart, can be operated over a wide ranges of motor voltages. In a PV powered system, the Solar Pump™ can be operated at 12 or 24 VDC, nominal PV voltage. Normally, the Solar Pump™ is operated at 12 VDC, nominal, i.e., with one PV module. For higher flow rates, the Solar Pump™ can be operated with 2 PV modules connected in series, to produce a 24 VDC nominal PV system.

### 7.0 Flow Rates

#### Solar Pump™ P24070M

12 V PV: 0.1 - 0.8 GPM (20 - 180 Lph)

24 V PV: 0.2 - 1.5 GPM (40 - 340 Lph)

#### Solar Pump™ P50140M

12 V PV: 0.2 - 1.4 GPM (40 - 320 Lph)

24 V PV: 0.2 - 2.8 GPM (40 - 640 Lph)

### 8.0 Pressure Ratings

These ratings indicate the maximum pressure increases produced by the Solar Pump™. Operating line pressures can be as high as 150 psi (10 bar) for all the mag-drive Solar Pumps™.

#### Solar Pump™ P24070M

12 V PV: 40 psi (2.8 bar)

24 V PV: 70 psi (5.0 bar)

#### Solar Pump™ P50140M

12 V PV: 45 psi (3.2 bar)

24 V PV: 50 psi (3.6 bar)

For higher pressure rises, TDL can supply high strength drive magnets. Contact TDL for your specific needs.