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**Dankoff Solar Products, Inc.**  
Solar Water Pump Manufacturing  
Since 1983



# **Solaram™ Surface Pump**

**HIGH LIFT SOLAR WATER PUMP**

## **Instructions • Installation & Maintenance**

*Your pump will fail if not properly installed and maintained.  
Keep these instructions in a dry, safe place.*

Please Record your **Model Number** \_\_\_\_\_ **Serial Number** \_\_\_\_\_

SOLARAM SURFACE PUMP is a rugged, efficient and versatile pump for photovoltaic applications. It is designed for domestic, livestock and irrigation use where reliability and long-term economy are vital. It is designed for SURFACE water sources, such as shallow wells, springs, pond, river or holding tank. It can push uphill hundreds of vertical feet (1000 ft. max), over miles of pipeline, and can provide pressure for home and irrigation water. It can run directly from a photovoltaic array (through a Linear Current Booster or other pump controller) or from a battery system.

This is an "oil-filled diaphragm pump". It combines the high efficiency of piston action with the dirt and dry-run tolerance of rubber diaphragms. It is a high precision machine with strict maintenance requirements, so please follow these instructions carefully.

### PACKING LIST

- 1 PUMP/MOTOR UNIT OR MOTOR may be packed separately
- 1 3/4" FLEXIBLE HOSE (outlet) 5 or More Feet Long (DO NOT SHORTEN)
- 1 PRESSURE RELIEF VALVE (installed at end of outlet hose)
- 1 DIAPHRAGM REPLACEMENT KIT
- 1 QUART NON-TOXIC CRANKCASE OIL

**WARNING:** CHECK OIL in the sight-glass (one on 400-series, two on 200-series): OIL MUST be filled to the line. Air trapped in the crankcase may cause diaphragm rupture. If oil level is low, follow steps 8 - 10 under "Diaphragm Replacment" below.

### MOTOR ASSEMBLY

If your pump was received with the motor packed separately, mount the motor with the bolts provided. Adjust the position of the motor carefully, for proper belt alignment and tension. See "Maintenance" for further instructions.

### INTAKE PIPING

MAXIMUM SUCTION CAPACITY is 20 vertical feet at sea level. At higher elevations, subtract 1 foot per 1000 feet elevation. It is best to minimize the vertical lift and the distance on the intake side of the pump. Use minimum 1" pipe for intake. A short flexible hose is provided to make connection to the pump easy.

If a slapping noise is heard, then there is too much intake suction. Place the pump closer to the water source, or take other measures to reduce suction. Excessive noise is caused by "cavitation", which is the formation and collapse of vapor bubbles. This reduces performance and causes stress on the diaphragms. If you need further advice, call the factory.

**PRIMING:** If the pump is to be installed higher than the water level in the source, it must draw water upward by suction. In this case, install a pipe Tee and plug for priming. The pump will generally self-prime (by drawing partial vacuum) to 10 feet or more, but priming may be required if there is ever any imperfection in the system.

### **OUTLET PIPING**

A Length of flexible hose is provided for connection to the pump's outlet. The flexible hose helps absorb pressure pulsations caused by normal pumping action. Do not shorten or eliminate the flexible hose, or the pressure will pulsate excessively. Join the flex hose to a larger size of water pipe. Select a size from a pipe sizing chart, to minimize friction loss.

### **OVERLOAD PROTECTION is required:**

Install a fuse or DC-rated circuit breaker rated no larger than 10% more than the "Max. Amps" rating on the pump label. If your pump controller (Linear Current Booster) has a current rating lower than the of the pump, then do not exceed that rating my more than 10%. Failure to install the correct fuse or curcuit breaker will void the warranty. In a non-battery system, the pump controller multiplies the current to meet the demand of the motor. Therefore, the proper fuse or breaker must be installed BETWEEN THE PUMP CONTROLLER AND THE MOTOR, not between the array and the motor.

## **Safety Warning**

*The exposed belt drive can catch fingers or loose clothing, leading to serious injury.  
Provide covering for the machine. Keep children and unauthorized people away.*

### **MOTOR**

Solaram pumps use a PERMANENT MAGNET DC MOTOR, that runs efficiently at varying voltages and speeds. The motor is expected to run at voltages as high as 1.5 times its nameplate rating. Thus a "24 Volt" motor is expected to run as high as 36 volts under peak-sun conditions.

MOTOR BRUSHES are carbon blocks that conduct electric current to the spinning part of the motor. They will wear out in about 5-7 years of typical use. Remove covers on either side of motor to inspect brushes. Inspect annually and replace before they are 2/3 worn.

MOTOR BEARINGS are sealed for life and require no lubrication.

### **PRESSURE RELIEF VALVE**

Adjust as follows -- After pump has run sufficiently to fill the entire discharge pipe with water (it

is seeing maximum pressure) turn handle Counter Clockwise (loosening) until water begins to release from the valve. Now tighten slightly, only until the release of water stops.

Be sure that any discharge from the valve will not do any damage or cause problems. A hose or pipe may be attached to relief valve outlet for this purpose.

### **SURGE TANK PRESSURE ADJUSTMENT**

This applies ONLY to 2-chamber models, where the model number's 3rd digit is 2 (example: Model 8121)

Built into your pump is a surge tank (air-filled pulsation damper). To assure smooth water flow and reliable operation of your pump, you must pressurize the tank with air equal to 1/2 THE OPERATING PRESSURE of your pump.

$$\text{PRESSURE (PSI)} = \frac{\text{Total Dynamic Head (Feet)}}{2.31} \quad \text{Total Dynamic Head} = \text{Vertical Lift} + \text{Pipe Friction Losses}$$

Example:

For 600 ft. lift (259 PSI), surge tank should be set to 1/2 (259) = 130 PSI.

Your surge tank is FACTORY PRESET to 130 PSI. Air is serviced or tested by way of a Schraeder fitting similar to that on vehicle tires. It is located on the red colored top of the pump.

## ***MAINTENANCE***

***BELT TENSION:*** Use a carpenter's square or straight-edge to insure that the motor shaft and the pump shaft are parallel. Do this very carefully. If the shafts are not parallel, tension on the belt will be uneven and it will fail early. Adjust for deflection of about 1/2 inch. Run the pump, and observe. If the belt runs off the edge of the large pulley, readjust the alignment.

### **DIAPHRAGM AND OIL CHANGES**

**WARNING** Diaphragms will eventually rupture, and leak water into the crankcase. If diaphragms and oil are not changed immediately, permanent damage will result due to lubrication failure and rusting of steel bearings. INSPECT THE SIGHT GLASS periodically. If oil appears "milky", there is water contamination. Diaphragms will last more than 1 year, but exact interval varies with running speeds, running hours, and pressure, and is difficult to predict. Preventive maintenance is essential.

***PREVENTIVE MAINTENANCE:*** CHANGE OIL AND DIAPHRAGMS ONCE PER YEAR if pump is in daily service -- before water is present in the oil.

**WARNING** The oil in this pump provides both lubricating and hydraulic action between pistons and diaphragms. Crankcase MUST be filled to the minimum oil level line at all times. AIR IN CRANKCASE WILL CAUSE DIAPHRAGM FAILURE and possible water damage.

### **CRANKCASE OIL**

A special NON-TOXIC 30-Weight oil is provided. Use the same or similar oil.

***Chevron FM, Amoco FG, or equivalent "food processing machine oil".***

Upon rupture of diaphragm, crankcase oil may contaminate drinking water. Non-toxic oil prevents health hazard. Ordinary 30-Wt oil may be substituted if toxicity is not a concern.

You may obtain non-toxic oil by the quart, from Dankoff Solar Products, or in larger quantities from some oil distributors. It is used in food processing and meat packing machinery.

## **DIAPHRAGM REPLACEMENT AND OIL FILL PROCEEDURE**

You need:

1. A clean place to work.
2. Diaphragm Kit.
3. Non-toxic lubricating oil (supplied by factory)
4. One each: 6mm and 8mm Hex Key (Allen Wrench)  
13mm wrench, open, box, or socket head.

If water has entered crankcase, you need:

4. Some alcohol
5. Compressed air

## **WARNING**

TO CORRECTLY INSTALL DIAPHRAGMS, PLEASE FOLLOW INSTRUCTIONS

This procedure insures that you have NO AIR in pump cavity, which would put additional load on diaphragms and rupture them. Correct displacement of air is essential.

1. Remove pipes from pump. Unbolt it so you can move it about freely.
2. Remove cylinder heads and diaphragms. Lay parts out carefully, noting their placement.
3. Pour ALL oil out of crankcase.
4. Pour a small amount of ALCOHOL into crankcase to help disperse mixed water and oil.
5. Blow out with air to insure it is clean. Repeat if necessary. Always use protective eyewear when using forced air.
6. Install new diaphragms. Replace them with the PART NUMBERS FACING OUT. Take care to not overtighten diaphragm bolts or you may strip threads in aluminum.
7. Replace the two small O-rings in each cylinder head. (They come with the diaphragm kit.)
8. Reinstall the cylinder heads.
9. IMPORTANT: Fill pump 1/3 full of oil and rock pump vigorously from side to side. Let sit 3-5 minutes. Repeat two more times until pump is full of oil and no bubbles appear in sight glass when you rock pump from side to side. Wipe the pump clean of oil.
10. Connect the pump intake line. Run at slow speed and no pressure for 2-3 minutes. Shut unit off and let oil settle.
11. Check oil level again and add oil if required. Look for any oil leaks.

*We wish you many years of successful solar pumping. If you have any questions, or need parts, please call your dealer or Dankoff Solar Products.*