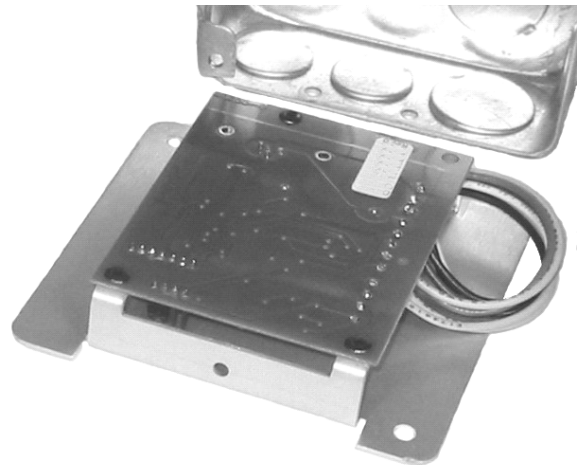


## Smart-Pump™ Variable Speed Controller

Smart-Pump is a compact, TRIAC based pump & motor control designed for the HVAC and hydronic heating controls markets. The Smart-Pump can automatically control most single phase AC pumps & motors used in applications such as heating control and zone mixing

### Overview

The Smart-Pump regulates motor speed from a 2-10VDC control signal or 4-20mA control signal. Automatic voltage and frequency detection, current rating of 3.0A and "4x4 job box" mount, make this microprocessor based design extremely flexible and economical. Benefits of using Smart-Pump include environmental, temperature regulation, greater system reliability, increased pump life, improved safety and energy savings.



### Features

- Power Supply: 95-240Vac, automatically detected
- Line Frequency: 50/60Hz, automatically detected
- Control Signal: 2-10VDC or 4-20mA
- AC Motor Compatibility: PSC or Shaded Pole, automatically detected
- Current Rating: 3.0A
- Connections: 4" 18AWG wires
- Mounting: in standard 4" x 4" electrical box
- Full-voltage start pulse
- UL Recognition pending
- FCC Compliance



## Operation

Smart-Pump is capable of controlling the speed of a PSC or shaded pole motor, with no switches or settings required. Confirm triac controllability with the pump manufacturer before installation. Attempting to control a pump that is not compatible could cause excessive heating and could permanently damage the pump motor. The outputs have a rating of 3.0A. The power to the motor is proportionate to the control signal, with the full supply voltage applied to the motor when the input signal is at its highest value. Smart-Pump is powered by 95-240Vac, 50/60Hz. No switches or settings are required for voltage or frequency selection. Smart-Pump accepts either a 2-10VDC or 4-20mADC control signal. The signal source is jumper-selectable (JP1). If the 2-10V signal is selected, the nominal input impedance is 150k $\Omega$ . The input impedance for the 4-20mA signal is 400 $\Omega$ . Smart-Pump will start pumps at full voltage for 2 seconds before throttling back to the set control speed.

## Control Method

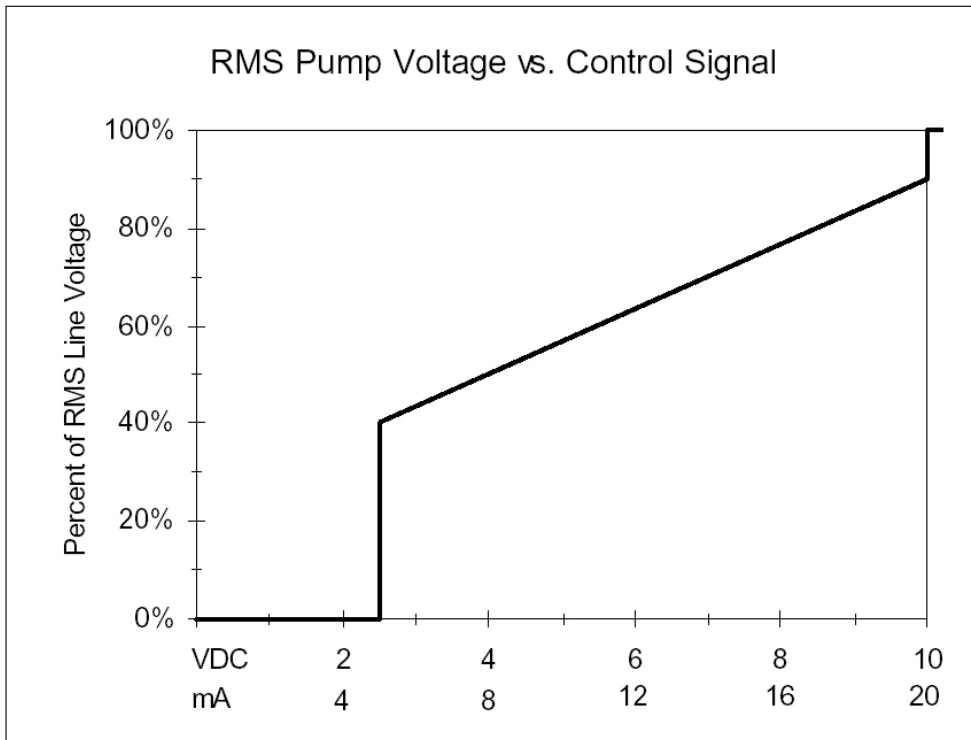
### Sequence

Smart-Pump continuously monitors the control signal input. The output voltage to the motor is set according to Figure 1. With the control signal at zero, the motor output is off. It remains off until the signal rises to 2V or higher. When the output is first turned on, it is set to 100% of the line voltage for 2 seconds to start the pump. The output level is then set to provide the appropriate RMS voltage by modulating the firing angle of the triac.

### Accuracy & Hysteresis

The actual start point of 2.5V (5mA) is accurate to within  $\pm 0.4$ VDC ( $\pm 0.8$ mA). In addition, a hysteresis of  $\pm 2-3\%$  reduces on/off cycling near the start point.

**Figure 1: RMS Pump Voltage vs. Control Signal**



## Precautions

### General



This symbol is intended to alert the user to the presence of important installation and maintenance (servicing) instructions in the literature accompanying the equipment.



**Warning:** Electrical shock hazard. Disconnect **ALL** power sources when installing or servicing this equipment to prevent electrical shock or equipment damage.

Make all wiring connections in accordance with these instructions and in accordance with pertinent national and local electrical codes. Use only copper conductors that are suitable for 167° F (75° C).

### Static Electricity

Static charges produce voltages that can damage this equipment. Follow these static electricity precautions when handling this equipment.

- Work in a static free area.
- Touch a known, securely grounded object to discharge any static charge you may have accumulated.
- Use a wrist strap when handling printed circuit boards. The wrist strap must be secured to earth ground.

### Location

Avoid locations where corrosive fumes, excessive moisture, vibration or explosive vapors are present.

Avoid electrical noise interference. Do not install near large contactors, electrical machinery, or welding equipment.

This equipment is intended for indoor use only. Operate where ambient temperatures do not exceed 160° F (70° C) or fall below -13° F (-25° C) and relative humidity does not exceed 95%, non-condensing.

## Smart-Pump Installation

Figure 2: Control Signal Type (JP1)



The Smart-Pump is factory set to control pumps in the Control Signal mode. Select the type of control signal you are using [**V** for 2-10VDC (15VDC max.) or **I** for 4-20mA (30mA max.)] using the jumper on header J1.

### Mounting

The Smart-Pump is supplied in circuit board form with a cover, ready to mount in a standard 4" x 4" electrical box (1½" minimum depth). Connections are made through 4.0" (10cm), 18AWG wires. Wires should be terminated using wire connectors (not included) according to local electrical codes.

### Power Connections

It is recommended that an adequately sized circuit breaker be connected between the power service and the Smart-Pump to permit fail-safe removal of power before making adjustments or connections. Connect line power to wires N (white) and L (black).

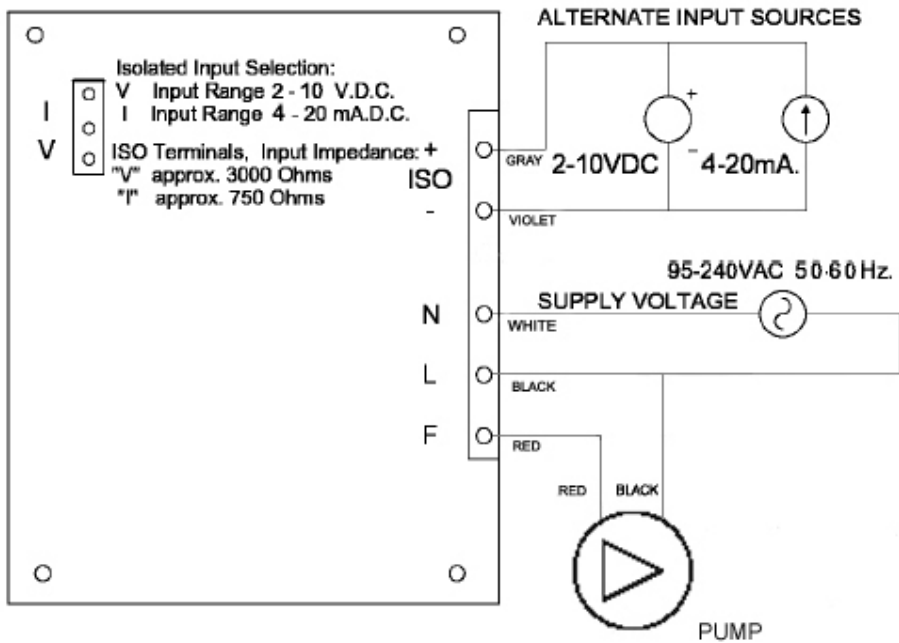
### Pump Connections

Connect pump to positions marked F (red) and L (black).

### Control Signal Connections

Connect a 2-10VDC or 4-20mA control signal to -ISO (violet) and ISO+ (gray).

Figure 3: Wiring Connections



## Specifications

### Electrical

#### Input Power

- Power Source: 95-240VAC
- Frequency: 50/60Hz

#### Input Control Signal

- 2-10VDC or 4 to 20mA

#### Output Power

- Current Rating: 3.0A

#### Connections

- 18 AWG with 300V insulation

### Mechanical

#### Housing

- Dimensions: 4 1/8" square, 7/8" deep
- Aluminum cover plate

#### Environmental

- Operating Temperature: -13° to 160°F (-25° to 70°C)
- Storage Temperature: -40°F to 260°F (-40°C to 125°C)
- Humidity: 5 to 95% RH, non-condensing, drip-free environment

Figure 4: Device Dimensions

