



SPI Mag™  
MODEL 282L SINGLE POINT INSERTION  
ELECTROMAGNETIC FLOW METER  
1" SENSOR  
SUBMITTAL PACKAGE

From

McCROMETER, INC.  
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EQUIPMENT TO BE SUPPLIED BY McCROMETER, INC.

<u>Part Number</u>	<u>Description</u>	<u>Qty</u>
Model 282L	1" SPI Mag™ Meter , "L" Series Specify Pipe ID _____	_____
	(1) Converter, including: (1) IP67 Enclosure (1) Three-button Key Pad (1) Back-Lit Graphical LCD Display (1) Programmable Opto-Isolated Output (1) Digital Input for Batch Function Start, etc. (1) 4-20mA Output for Flow (1) 90 to 265VAC @ 0.25A Input Power (1) Electromagnetic Full Pipe Sensor including: (20) Feet of Inter-connecting Sensor Cable (1) Compression Seal (1) Choice of one Stainless Steel Insertion Tube with insertion hardware: 12" length                      Insert Tube Length: _____ 24" length 36" length (1) Instruction Manual	
	<u>Built-In Options</u>	
	Additional Sensor Cable: Specified Total Length: _____ Feet	_____
Special	18 to 45 VAC/DC Input Power @ 1.6A	_____
Special	10 to 35 VDC Input Power @ 1.5A	_____
	<u>Accessories</u>	
24511-13	Additional Instruction Manual	_____
24510-58	Additional Sensor Profiling Guide	_____
43801-1	Bronze Valve/Stainless Steel Nipple	_____
43802-1	Stainless Steel Valve/Stainless Steel Nipple	_____
0624B339001	Sun Shield	_____
170007101	Stainless Steel Tag	_____
75031	Insertion Tool (recommended for pipe ID greater than 24")	_____

## **SPI Mag™ SPECIFICATIONS**

Model 282L – 1”

### **General**

The flow meter shall consist of two components: an electromagnetic sensor and a converter for clean water only. The flow meter is for use in clean water applications only. The electromagnetic sensor shall be capable of operating in pipe diameters from 2” to 30” inches. The flow meter shall determine the volumetric flow rate by means of the Continuity Equation where flow rate “Q” equals mean velocity “V” times cross sectional area “A” ( $Q = V \times A$ ). The velocity measurement must be taken at a known location, then, through empirically established equations, the sensed velocity will be converted to a mean velocity. The meter shall be equivalent to the SPI Mag Model 282L Single Point Insertion Electromagnetic Flow Meter as manufactured by McCrometer, Inc., in Hemet, California.

### **Electronics**

The flow meter converter shall be microprocessor based with a keypad for instrument setup and LCD displays for totalized flow, flow rate, engineering units and velocity or totalized flow. The converter shall power the flow-sensing element and provide a galvanically isolated 4-20mA output for flow, and one flow proportional or frequency output (transistor type) for flow rate or for external totalizer. It shall be possible, in the test mode, to easily set the transmitter outputs to any desired value within their range. The 4-20mA scaling, time constant, pipe size, flow proportional output, engineering units and test mode values shall be easily set via the keypad and display. Two separate, fully programmable alarm outputs shall be provided to indicate high/low flow rates, empty pipe, fault conditions, reverse flow and over-range conditions. The transmitter shall periodically perform self-diagnostics and display any resulting error messages. All setup data and totalizer values may be protected by a password.

### **Sensor**

The flow-sensing element shall be of an electromagnetic single point type design and factory calibrated to traceable standards, such as NIST. The sensor shall be made of a polyurethane with pure carbon electrodes exposed to flow. Installation of the sensor shall be accomplished under flowing conditions through a 1-inch valve, with final location being located near the inside wall of the flow conduit or 1/8 pipe I.D. To eliminate erroneous readings due to pipe wall effects, the sensor must have its electrodes located at least 3/16” from pipe wall and be designed with a curved tip shape, so as not to collect debris while in the operating position. Flat tipped or Doppler sensors shall not be acceptable.

### **Sensor Cable**

The sensor cable is 20 feet of multi-conductor, abrasive resistant, jacketed cable flexible to -40°F. The sensor cable shall be permanently bonded to the sensor. Additional sensor cable, up to 300 feet, shall be available as an option.

### **Mounting Hardware**

A stainless steel insertion tube and retaining rods shall be provided for the smooth installation and operation of the velocity sensor. The stainless steel insertion tube and rod shall be of sufficient length to allow a full profile of the flow conduit. The stainless steel hardware shall be rated for 250 PSI @ 160°F. Hardware must allow sensor to be secured by bolts when the sensor is being inserted and retracted. A stainless steel compression seal assembly shall also be supplied.

## MEASUREMENT

Volumetric flow in filled flow conduits utilizing insertable velocity sensor. 1" meter = 2" to 30" pipe I.D. Flow indication in English std. or Metric units.

## FLOW MEASUREMENT

Method: Electromagnetic

Accuracy:  $\pm 2\%$  of reading  $\pm 0.03$  ft/s ( $\pm 0.009$  m/s)  
zero stability from 0.3 to 20 ft/s (0.09 to 6 m/s)  
velocity range

Velocity Range: +0.3 to +30 ft/s (+0.09 to +9 m/s)

Has reverse flow indication.

## CONDUCTIVITY

Minimum conductivity of  $5\mu\text{S/cm}$  ( $5\mu\text{mho/cm}$ )

## POWER REQUIREMENTS

AC: 90-265V 44-66 Hz (20W/25VA) or

DC: 10-35V at 20W.

AC or DC must be specified at time of ordering.

## MATERIALS

Sensor: Polyurethane exposed to flow

2" Sensor Mounting: PVC and Stainless Steel exposed to flow. (Stainless Steel Insertion Tube Optional)

Compression Seal: Buna "N" exposed to flow.

## OUTPUTS

Analog: 4-20mA 1000 Ohms galvanically isolated and fully programmable.

Pulse: 2 Pulse/Frequency/Alarm outputs programmable for high/low flow rates, percent of range, empty pipe, fault conditions, forward/reverse, polarity (normally open/close), analog over-range, pulse over-range, etc.

## DUAL ALARMS

2 separate outputs: Isolated and protected transistor switch capable of sinking  $<250\text{mA}$  @  $<35\text{V}$ . Note: Not isolated from frequency output. Fully programmable for high/low flow rates, % of range, empty-pipe, fault conditions, forward/reverse, polarity (normally open/close), analog over-range, pulse over-range, pulse cutoff, etc.

## CONVERTER ENCLOSURE

IP67 Die cast aluminum enclosure

5.75" H x 5.75" W x 6.69" D

(14.6 cm H x 14.6 cm W x 17 cm D ). Weight: 6.8 lbs. (3.1 kg)

## ELECTRICAL CONNECTIONS

Compression gland seals for 0.125" to 0.375" dia. round cable.

## ISOLATION

Galvanic separation to 50VDC between analog, pulse/alarm, and earth/ground.

## STANDARDS

CE Certified (Converter only)

## ENVIRONMENTAL

Pressure/Temperature Limits:

PVC Insertion Tube:

Up to 105°F (41°C) at 150 psi

Stainless Steel Insertion Tube:

Up to 160°F (71°C) at 250 psi

(McCrometer recommends the use of Stainless Steel)

Electronics: Operating and storage temperature: -4° to 140°F (-20°C to +60°C)

## KEYPAD AND DISPLAY

Can be used to access and change all set-up parameters using three membrane keys and LCD display.

## OPTIONS

DC Power

Sun shield

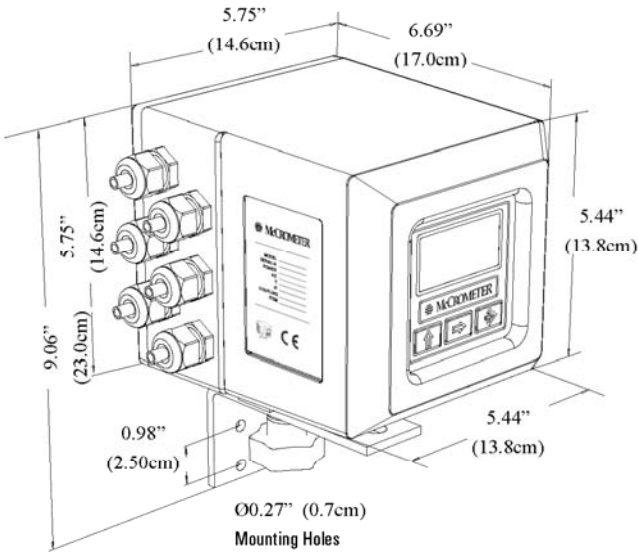
Sensor insertion tool

Stainless steel ID tag

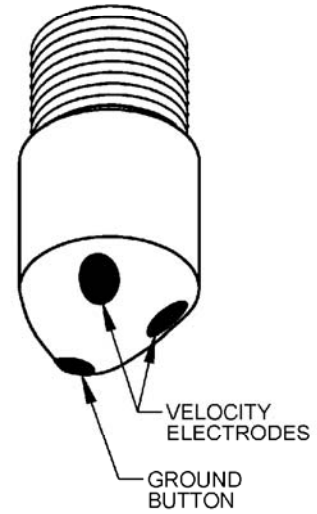
Valves

Additional sensor cable up to 300' (for longer lengths, consult factory)

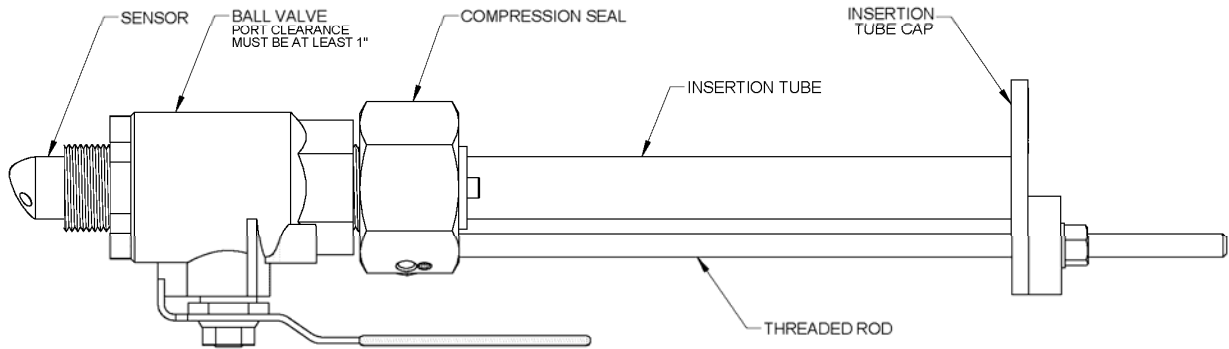
# SPI Mag 282L 1" Meter Technical Information



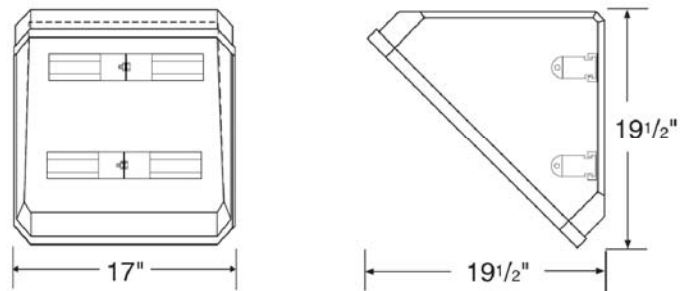
**"L" Series Converter Dimensions**



**1" Sensor**



**SPI Mag Parts Descriptions**



**Sun Shield (Optional)**

# SPI Mag 282L 1" Meter Electrical Cable Connections

**i CAUTION**  
Always disconnect the power cord before attempting any electrical connections.

All electrical cables enter the unit through compression fittings located on the side of the converter. Ensure that all unused fittings are plugged so the case remains sealed.

## 6.5 Terminal Board

All connections are made on the terminal board. To access the terminal board, loosen the four screws on the back of the converter to remove the rear cover.

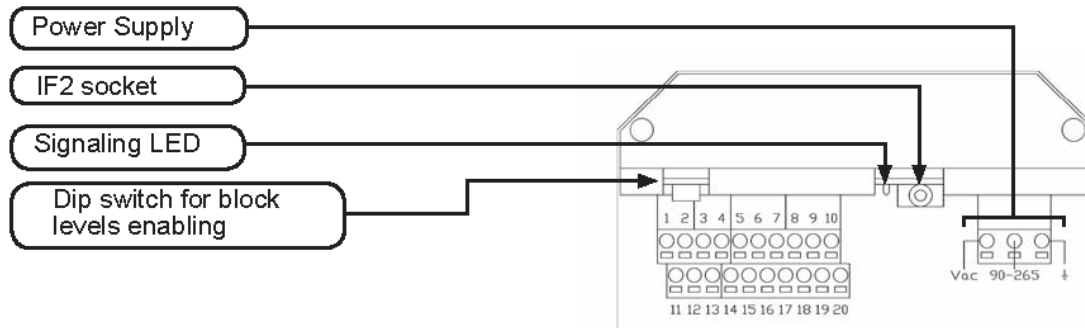


Figure 16: Terminal Board Descriptions

## 6.6 Sensor Cable

The terminals for the sensor cable connection are numbers 1, 2, 3, 11, 12 and 13 on Terminal Block M1. Connect the sensor cable wires using the color code table below. NOTE: the terminal blocks unplug from the circuit board for easy connection.

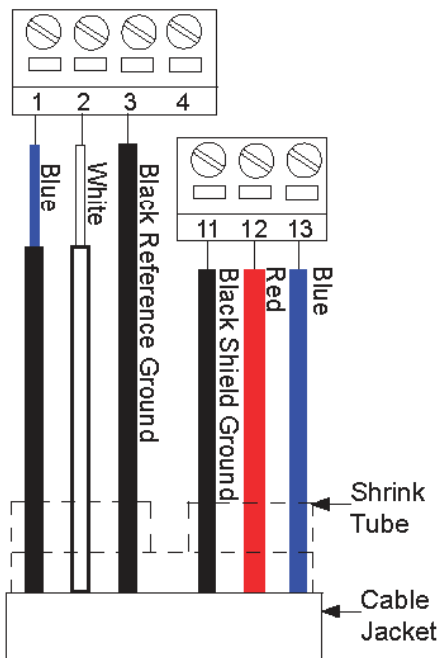


Figure 18: Sensor Cable Connections

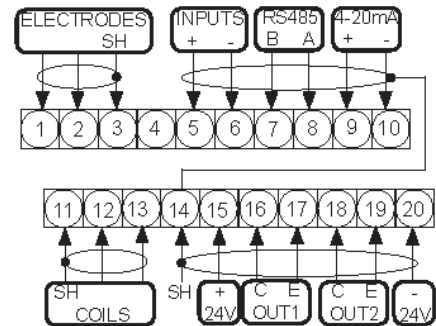


Figure 17: Terminal Block M1 Assignments

Terminal	Wire Color	Connected To
#1	Blue	Sensing electrode
#2	White	Sensing electrode
#3	Black	Reference ground
#11	Black	Magnet shield / overall cable shield
#12	Red	Coil
#13	Blue	Coil



## 6.7 4-20mA Hook-Up

Isolated 4-20mA current loops are used to output flow data to external devices. Maximum load impedance is 1,000Ω, and the maximum voltage without load is 27VDC. The converter has the capability to detect a loss of load on this output. To disable this function set the value “mA Val. Fault” (Section: Main Menu, Sec.. 4.7) under the ALARMS menu to zero. A graphical example of the usage of the current loop with external device is shown below:

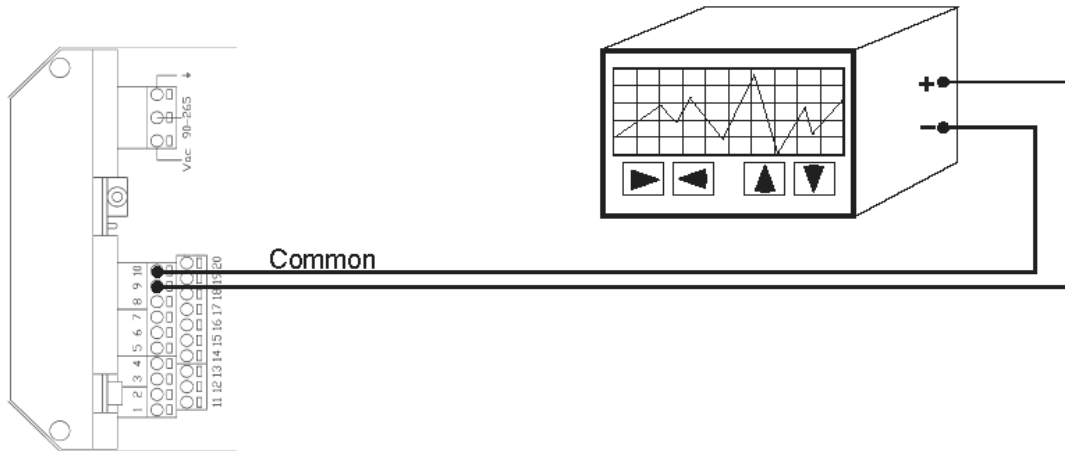


Figure 19: 4-20mA Hook-Up

If the external device requires a voltage input, a precision resistor placed across the input terminals of the external device will change the current to voltage. Calculate the required resistor using Ohm’s law ( $V = I \times R$ ). For example, a 250Ω resistor will provide an input voltage of one to five volts with the transmitter range being set from 4-20mA. An additional 4-20mA loop output is available

## 6.9 Opto-Isolated Pulse Output Hook-Up

The two pulse outputs are transistor outputs used to activate external devices when the flow reaches a predetermined set point.

- Opto-isolated output with collector and emitter terminals floating and freely connectable
- Maximum switching voltage: 40 VDC
- Maximum switching current: 100mA
- Maximum saturation voltage between collector and emitter @100mA: 1.2V
- Maximum switching frequency (load on the collector or emitter,  $R_L=470\Omega$ ,  $V_{OUT}=24VDC$ ): 1250Hz
- Maximum reverse current bearable on the input during an accidental polarity reversion (VEC): 100mA
- Insulation from other secondary circuits: 500 V

A common application of a relay (pulse) output should be connected as follows:

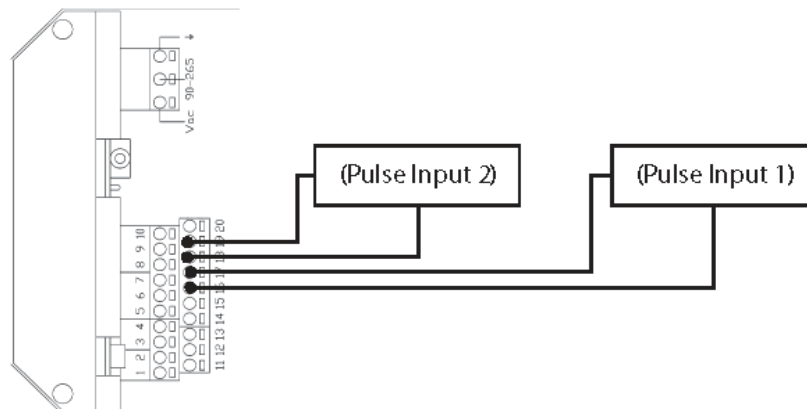


Figure 21: Opto-Isolated Pulse Output Diagram



## 6.10 Dual Opto-isolated Pulse Output Hook-up

A typical application of two isolated pulse outputs is provided below:

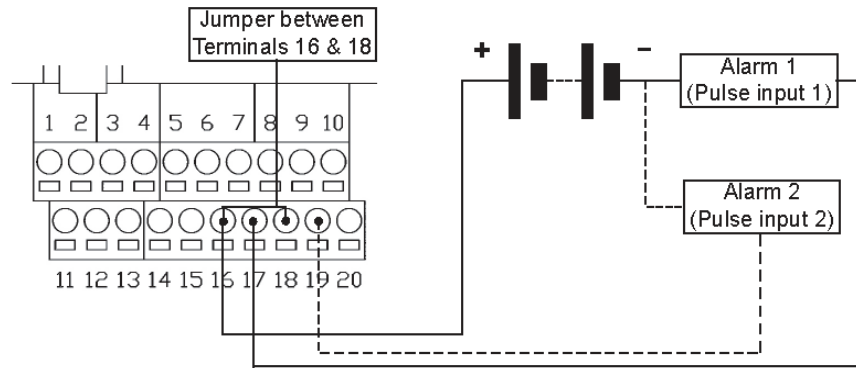


Figure 22: Pulse output hook-up with external power supply

**NOTE:** Pulse outputs can be used without external power supplies. Terminals 15 and 20 should be used to properly connect internal power supply to the scheme shown above. Please consult the factory with any questions. Please consult the table in Section "Menu 6-Outputs" for all the possible applications for the two outputs.

## 6.11 Converter Power Hook-Up



**WARNING!!** Hazardous supply voltage can shock, burn, or cause death.

The power supply line must be equipped with external surge protection for current overload (fuse or circuit breaker with limiting capacity not greater than 10A). It must be easily accessible for the operator and clearly identified.

Power connection is made using the power terminal block on the upper right side of the terminal board. **NOTE:** the terminal block unplugs from the circuit board for easy connection. Connect earth ground to the protective grounding terminal before making other connections. The power supply of a standard converter is 90-265VAC, 44-60Hz at maximum 20W. DC converter is available as an option.

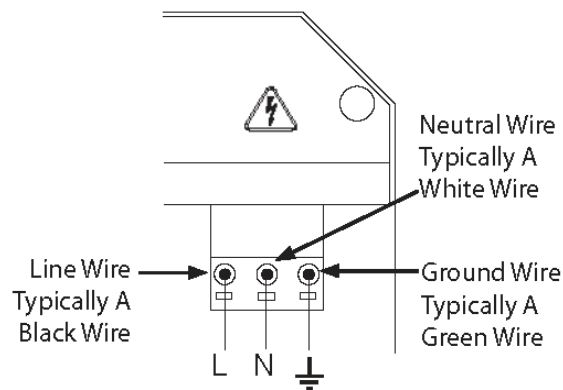


Figure 23: Power Supply Terminal Block