Badger® Series 200 Flow Sensors	Troubleshooting Aid - Circuit Block Diagram Interface Recommendations	Technical Brief

Early versions of the Badger® Series 200 flow sensors, had circuitry that clamped the signal at 8VDC, which caused problems for some Programmable Logic Controllers (PLC), and OEM interfaces, and lacked tolerance for customer mis-wiring and power surges.

Starting in late September 2000 Badger Meter discontinued earlier versions of the Series 200 flow sensors in favor of new advanced surface mount circuitry. This circuitry produces an output that is backward compatible with all earlier versions of this series, and has many advanced features that enhance greatly the reliability, signal stability, and protection features of this product. For most customers, only the part number (usually located on the cable) has changed. Dimensional, and outward appearance remains the same.

Because the new electronics can be used in applications where the older versions cannot, new part numbers have been issued.

Old #	New #	Description
22xBRxxxx0-xxxx	22xBRxxxx5-xxxx	Brass Flow Sensor
22xSSxxxx0-xxxx	22xSSxxxx5-xxxx	Stainless Steel Flow Sensor
22xBRxxxx1-xxxx	22xBRxxxx6-xxxx	Irrigation Brass Flow Sensor
22xSSxxxx1-xxxx	22xSSxxxx6-xxxx	Irrigation Stainless Steel Flow Sensor
813009-xxxx	813124-xxxx	Replacement Series 220B Sleeve Assembly
813131-xxxx	813124-xxxx	Replacement IR Series 220B Sleeve Assembly
813025-xxxx	813144-xxxx	Replacement Series 225/226B Sleeve Assembly
813138-xxxx	813138-xxxx	Replacement IR Series 225/226B Sleeve Assembly
813001-xxxx	813107-xxxx	Replacement Series 250B/228PV Insert Assembly
813128-xxxx	813141-xxxx	Replacement IR Series 250B/228PV Insert Assembly

Advanced features include:

1. Superior reliability of advanced surface mount technology.
2. Designed to meet CE, transient and EMI emission and susceptibility standards
3. Current limiting circuitry for protection from mis-wiring or energy transients.
4. Simplicity of the equivalent circuit makes interfacing with non-Badger Meter input devices such as PLC's, Data Loggers, etc. much easier. In fact, many industrial PLC models include an internal 24VDC power supply, allowing direct sensor interface into high speed pulse inputs often with no additional external components.

The signal across our sensor will be as follows.

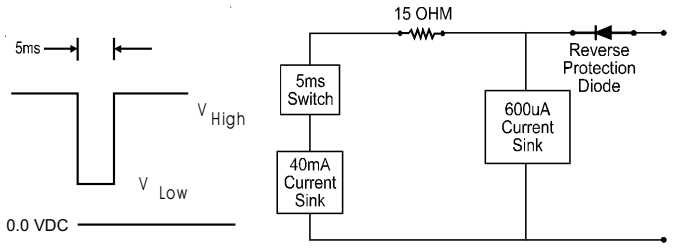
V_{HIGH} = Input device's OPEN CIRCUIT VOLTAGE less IR drop from devices source impedance with sensor's 600uA leakage current. 8VDC Minimum - 35VDC Maximum

V_{LOW} = Input device's SHORT CIRCUIT CURRENT, through sensor's 15W + 1 Diode Drop (0.6VDC)Maximum = 1.2VDC @ 40mA limit

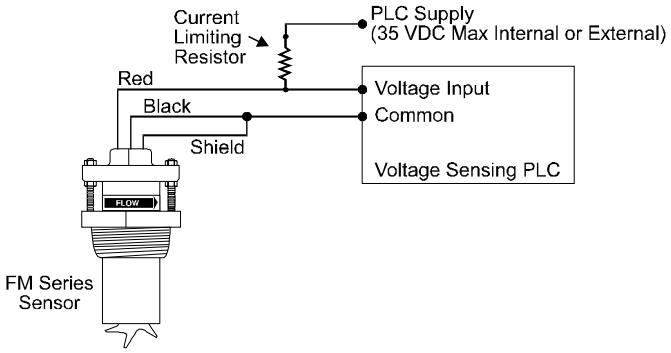
V_{HIGH} and V_{LOW} will be a function of the Flow Monitor/Transmitter input circuitry as stated above.

When interfacing with non-Badger meter devices, care must be taken to insure that the input threshold levels of the device are reliably crossed, and that the 5ms pulse width is long enough to be recognized by device's circuitry.

See other side for Badger Meter interface wiring recommendations



WIRING TO A PLC WITH A HIGH PERFORMANCE VOLTAGE INPUT



The Current Limiting Resistor should be selected such that V_{HIGH} will cross the PLC's V_{IN} Logic 1 threshold level, and V_{LOW} will cross it's V_{IN} Logic 0 threshold level.

For example: If using a 24VDC power supply, a 2KΩ resistor, and a PLC with a 10KΩ input impedance.

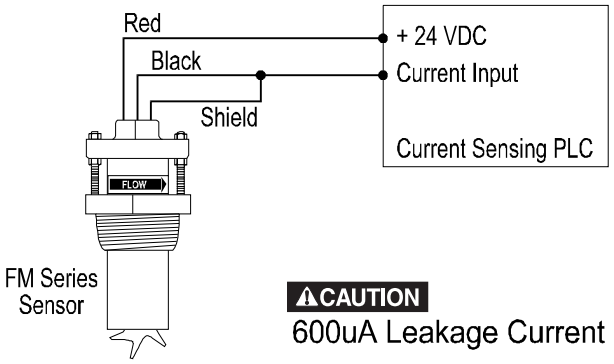
V_{HIGH} would be Supply Voltage - (Sensor Current + PLC Current) * 2K = 24VDC - (2.0 + 0.6mA) * 2K = 18.8VDC.

V_{LOW} would be (Sensor Current) * Sensor Impedance) + Internal Diode =
(24VDC/2.015K) * 15Ω) + 0.6VDC = 0.778VDC

In this example PLC absolute trigger threshold levels would have to be no less than 18.8VDC for a Logic 1, and no more that 0.788 VDC for a Logic 0. If the thresholds are to be reliably crossed, allowance for system tolerances must also be taken into account. Careful review of the subject PLC specifications are required to determine the allowances required.

CURRENT DETECTING (PLC WITH CURRENT PULSE INPUT ONLY)

For example, if our sensor was connected to an opto-isolator type PLC input, with a input impedance of 3K plus one 1.2V Photo-Diode drop, then the absolute trigger thresholds would have to be no less than 600uA for a Logic 0, or more than (24VDC-1.2VDC-0.6)/3K = 7.4mA for a Logic 1. If the thresholds are to be reliably crossed, allowance for system tolerances must also be taken into account. Again, careful review of the PLC specifications are required to determine the allowances for component and system variables.



Data Industrial®

Please see our website at **www.badgermeter.com** for specific contacts.

BadgerMeter, Inc.
P.O. Box 581390, Tulsa, Oklahoma 74158
(918) 836-8411 / Fax: (918) 832-9962
www.badgermeter.com