

### OVERVIEW

The innovative design of Badger's M-Series® Mag Meter Model M-4000 amplifier represents the next generation of electromagnetic (mag) flow meter signal processing. Incorporating the latest developments in microprocessor signal conditioning, the advanced design of the M-4000 allows an accuracy of better than  $\pm 0.25\%$  with a flow range of 300:1. The M-4000 amplifier can be integrally mounted to the detector or can be mounted remotely if necessary. Housed in a FM approved Class I, Div 1, NEMA 4X (IP66) enclosure, the amplifier is targeted to a variety of industrial applications.

### OPERATION

As the analog signal is received from the detector, the amplifier increases the signal amplitude and converts it into digital information. The internal microprocessor analyzes the signal and separates the electrical noise from the actual signal utilizing a series of sophisticated mathematical algorithms. Additionally, the microprocessor controls the zero flow stability, excitation frequency, analog and pulse outputs, user display interface and a variety of other parameters and settings. The 4 line by 16 character, LCD simultaneously indicates flow rate, forward and reverse totalization, and error and diagnostic messages. The LCD also prompts the user through an easy to use programming sequence that allows user-friendly and quick field set up.

Programmable parameters of the amplifier include: calibration factors, totalizer resets, unit of measure, analog and pulse output scaling, flow alarm functions, language selection, low-flow cutoff, noise dampening factor, and excitation frequency selection.

### APPLICATION

The M-4000 amplifier's primary function is to condition the electrical signal received from the detector. The unit is ideally suited for use in applications where the indication of rate and totalization is required. The ability to display flow parameters locally, at the flow meter, or remotely, by mounting the amplifier up to 100 ft. (30M) away from the detector provides a versatile solution for a variety of pit and meter vault applications. For applications where dedicated batch controllers, PLC's or computer control systems are in use, the M-4000 amplifier provides pulse and analog output signals that are compatible with most of these devices. The flow meter is powered by a standard AC line voltages or optionally utilizing a 24VDC power input. The design has been tested and approved by Factory Mutual (FM) in the United States and the Canadian Standards Association (CSA International) in Canada.



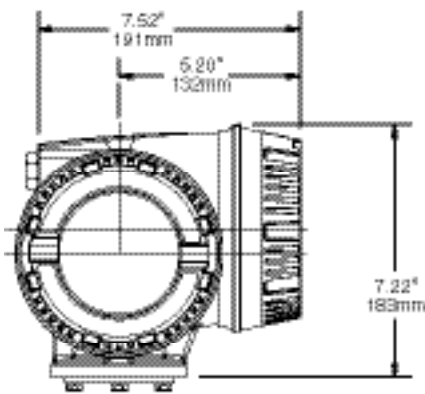
**BadgerMeter, Inc.**



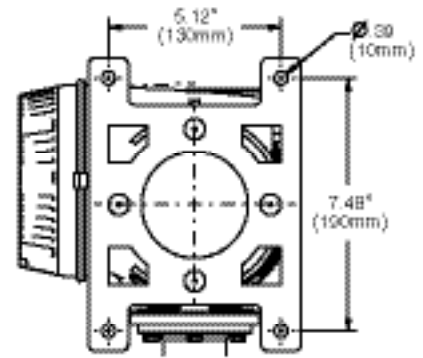
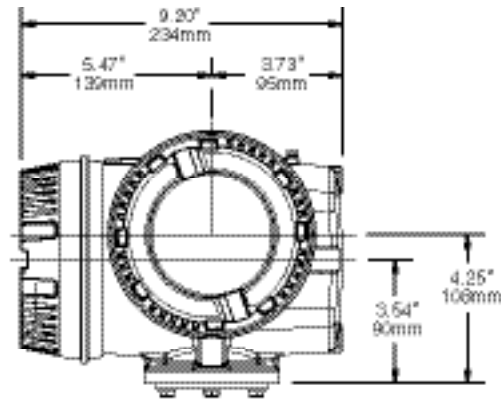
**M-4000 Amplifier**

### FEATURES

- FM approved for Class I, Div 1 hazardous locations
- CSA Certified
- Digital Signal Processor (DSP) based
- CE and FCC compliant
- Large 4 line by 16 character, back-lit, LCD display
- User friendly programming and set-up
- Digital and analog outputs
- Optional 24VDC power input
- NEMA 4X (IP66) enclosure
- Detector or remote wall mount
- Bi-directional flow sensing/totalization
- Automatic zero point stability
- Better than 0.1% repeatability
- Measures fluids with as low as 5.0 micromhos/cm conductivity
- Empty pipe detection
- Language available in English, Spanish, French, or German
- Self diagnostics



M-4000 Meter Mount Amplifier



M-4000 Remote Mount Amplifier  
(shown with mounting bracket)

## SPECIFICATIONS

### Power Supply: AC or optional DC

AC Power Supply - 85-265VAC 45-65Hz

Voltage Fluctuation =  $\pm 10\%$  of nominal

Over Voltage = Category II

Power Consumption = 20W

DC Power Supply - (optional) 24VDC  $\pm 10\%$  8W

**Accuracy:**  $\pm 0.25\%$  of rate for velocities greater than 1.64 ft/s (0.50 m/s)

$\pm 0.004$  ft/s ( $\pm 0.001$  ft/s) for velocities less than 1.64 ft/s (0.50 m/s)

**Repeatability:** 0.1% of rate

**Flow Range:** 0.10 to 39.4 ft/s (0.03 to 12 m/s)

**Fluid Conductivity:** Min. 5.0 micromhos/cm

**Flow Direction:** Uni-directional or bi-directional (programmable)

**Totalization:** 3 separate displayable totalizers – 10 digits (programmable - forward, reverse and net)

**Analog Outputs:** 0-10mA, 0-20mA, 4-20mA (programmable and scalable)

Voltage sourced (18VDC) – isolated

Max. loop resistance = 750  $\Omega$

**Frequency Output:** Open Collector – Max. full scale flow = 10KHz

### Digital Outputs:

(2) Open Collector, (programmable – scaled pulse, flow alarm, status, or frequency output) Max. 24VDC, 0.5W

**Communication:** RS232C serial, standard ANSI terminal compatible data stream

**Pulse Width:** Open Collector, 5ms to 1 second (programmable) or automatic 50% duty cycle

**Min-Max Flow Alarm:** Open collector (programmable – 0 to 100% of flow)

**Empty Pipe Detection:** Field tunable for optimum performance based on specific application

**Excitation Frequency:** Programmable - 3.75Hz, 7.5Hz or 15Hz

**Auxiliary Input:** Max. 24VDC (programmable – positive zero return, external totalizer reset or preset batch start)

**Noise Dampening:** 1 to 30 seconds (programmable)

**Units of Measure:** U.S. gallons, imperial gallons, million gallons per day, cubic feet, cubic meters, liters, oil barrels, pounds, ounces, acre feet (programmable)

**Low Flow Cut-Off:** 0 to 100% of full scale (programmable)

**Zero-Point Stability:** Automatic correction

**LC Display:** 4 line by 16 character, alphanumeric – back light Displays: 3 totalizer values, flow rate, alarm status, output status, error/diagnostic messages

**Programming:** Internal 3 button or external magnetic wand

**Galvanic Separation:**  $\leq 500$  volts

**Electrical Classification:** FM approved for Class I, Div 1 Groups B-D, Class II, Div 1 Groups E, F and G, – CSA Certified

**Housing:** Amplifier enclosure and remote junction enclosure: cast aluminum, (powder coated paint)

**Housing Rating:** Amplifier enclosure and remote junction enclosure – NEMA 4X (IP66)

**Mounting:** Direct detector mount or remote wall mount – bracket included. (for remote mount, max. cable distance = 100 ft (30M))

**Field Wiring Entry Ports:** (3)  $\frac{1}{2}$ " NPT, internal thread

**Ambient Temperature:** -4 to 122°F (-20 to 50°C)

**Relative Humidity:** Up to 90% non-condensing

**Locations:** Indoor and outdoor

**Altitude:** Maximum 6500 feet (2000m)

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[www.badgermeter.com](http://www.badgermeter.com)  
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