

## DESCRIPTION

The innovative design of the Badger Meter M-Series® model M2000 amplifier represents the next generation of electromagnetic (mag) flow meter signal processing. The M2000 incorporates the latest developments in microprocessor signal conditioning. The advanced design of the M2000 meter allows for an accuracy of  $\pm 0.25$  percent with a flow range of 300:1.

The M2000 amplifier can be integrally mounted to the detector or can be remote-mounted, if necessary. The amplifier targets a variety of applications and is well suited for the diverse water and wastewater treatment industry.

## OPERATION

The M2000 amplifier receives the detector's analog signal, amplifies that signal and converts it into digital information. At the processor level, the signal is analyzed through a series of sophisticated software algorithms. After separating the signal from electrical noise, it is converted into both analog and digital signals that are used to display rate of flow and totalization.

In addition, the processor controls zero-flow stability, analog and frequency outputs, serial communications and a variety of other parameters. The large LCD display indicates rate of flow, forward and reverse totalizers and diagnostic messages. The display also serves to guide the user in simple terms through the user-friendly programmable routines.

Programmable parameters of the amplifier include, but are not limited to: 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.

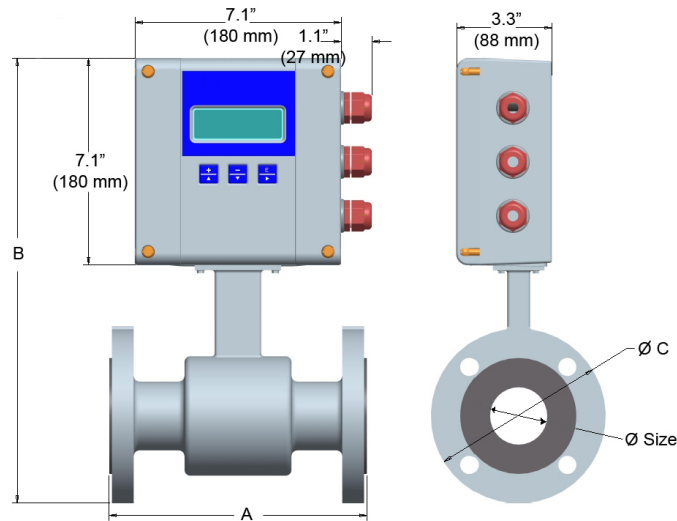
## APPLICATION

The M2000 amplifier's main function is to detect and condition flow information from the electromagnetic detector. The unit is ideally suited for measuring dynamic, non-continuous flow. In applications where a minimum and/or maximum flow rate must be tracked and monitored, the unit provides pulse signals that can be fed to dedicated batch controllers, PLCs and other more specialized instrumentation.



## FEATURES

- Digital signal processor (32 bit)
- User-friendly programming procedure
- Better than  $\pm 0.1\%$  repeatability
- Empty pipe detection
- Power loss totalization
- Modbus RTU via RS232
- Non-volatile programming memory
- Rotating cover
- Enhanced security options
- CSA certified



## SPECIFICATIONS

|                                   |  |
|-----------------------------------|--|
| <b>AC Power Supply</b>            | 85...265V AC   |
| Typical Power                     | 20V A or 15 W  |
| Max. Power                        | 26V A or 20 W  |
| <b>Optional DC Supply</b>         | 10...36V DC  |
| Typical Power                     | 10 W   |
| Max. Power                        | 14 W   |
| <b>Accuracy</b>                   | ± 0.2 percent of rate for velocities greater than 1.64 ft/s (0.50 m/s),<br>± 0.0032 ft/s (± 1 mm/s) for velocities less than 1.64 ft/s (0.50 m/s)  |
| <b>Repeatability</b>              | ± 0.1 percent  |
| <b>Flow Range</b>                 | 0.10...39.4 ft/s (0.03...12 m/s)   |
| <b>Fluid Conductivity</b>         | Minimum 5.0 micromhos/cm   |
| <b>Flow Direction</b>             | Unidirectional or bidirectional two separate totalizers (programmable)   |
| <b>Totalization</b>               | Programmable/resettable  |
| <b>Unidirectional</b>             | T1, T2   |
| <b>Bidirectional</b>              | T+ (Fwd), T- (Rev), Tn (Net)   |
| <b>Minimum Fluid Conductivity</b> | 5.0 micromhos/cm   |
| <b>Processing</b>                 | 32-bit DSP   |
| <b>Analog Output</b>              | 4...20 mA, 0...20 mA, 0...10 mA, 2...10 mA (programmable and scalable). Voltage sourced 24V DC isolated. Maximum loop resistance < 800 ohms  |
| <b>Digital Outputs</b>            | Four total, configurable 24V DC sourcing active output (up to 2), 100 mA total, 50 mA each; sinking open collector output (up to four), 30V DC max, 100 mA each; AC solid-state relay (up to 2), 48V AC, 500 mA max. |
| <b>Pulse Outputs</b>              | Scalable up to 10 kHz, passive open collector up to 10 kHz, active switched 24V DC. Up to two outputs (forward and reverse). Pulse width programmable from 1...1000 ms or 50 percent duty cycle.                     |

|                             |  |
|-----------------------------|--|
| <b>Frequency Output</b>     | Scalable up to 10 kHz, open collector up to 1 kHz, solid-state relay   |
| <b>Misc Outputs</b>         | High/low flow alarm (0...100 percent of flow), error alarm, empty pipe alarm, flow direction, preset batch alarm, 24V DC supply, ADE |
| <b>Noise Dampening</b>      | Programmable 0...30 seconds.   |
| <b>Empty Pipe Detection</b> | Field tunable for optimum performance based on specific application  |
| <b>Excitation Frequency</b> | 1 Hz, 3.75 Hz, 7.5 Hz or 15 Hz (factory optimized to pipe diameter)  |
| <b>Digital Input</b>        | Max. 30V DC (programmable – positive zero return, external totalizer reset or preset batch start)                                    |
| <b>Units of Measure</b>     | Ounce, pound, liter, US gallon, imperial gallon, barrel, hectoliter, megagallon, cubic meter, cubic feet, acre feet                  |
| <b>Galvanic Separation</b>  | 250 V  |
| <b>Low Flow Cutoff</b>      | Programmable 0...10 percent of max. flow   |
| <b>LCD Display</b>          | 4 x 20 character display with backlight  |
| <b>Programming</b>          | 3-button, external manual or remotely  |
| <b>Housing</b>              | Cast aluminum, powder-coated paint   |
| <b>Housing Rating</b>       | NEMA 4X (IP66)   |
| <b>Mounting</b>             | Meter mount or remote wall mount (bracket supplied)  |
| <b>Cable Connection</b>     | 1/2-inch NPT Cord Grip (3)   |
| <b>Ambient Temperature</b>  | -4...140° F (-20...60° C)  |
| <b>Communication</b>        | RS232/RS485 Modbus RTU, HART, Profibus DP  |
| <b>Logging</b>              | Power loss totalization  |
| <b>Relative Humidity</b>    | Up to 90 percent non-condensing  |
| <b>Locations</b>            | Indoor and outdoor   |
| <b>Token Features</b>       | Data Logging (Blue token)<br>Store/Restore (Red token)<br>Firmware Upgrade (Black token)   |

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