

### DESCRIPTION

The Badger Meter M-Series® M1000 meter is the result of years of research and field use of electromagnetic flow meter technology. Designed, developed and manufactured under strict quality standards, the M1000 features sophisticated, processor-based signal conversion with accuracies of  $\pm 0.3$  percent.

The M1000 can be chosen for a broad spectrum of applications and the wide selection of liner and electrode materials help ensure maximum compatibility and minimum maintenance over a long operating period.

### OPERATION

The operating principle of the electromagnetic flow meter is based on Faraday's law of magnetic induction: The voltage induced across any conductor, as it moves at right angles through a magnetic field, is proportional to the velocity of that conductor. The voltage induced within the fluid is measured by two diametrically opposed internally mounted electrodes. The induced signal voltage is proportional to the product of the magnetic flux density, the distance between the electrodes and the average flow velocity of the fluid.

### ELECTRODES

When looking from the end of the meter into the inside bore, the two measuring electrodes are positioned at three o'clock and nine o'clock. As a conductive fluid flows through the magnetic field, a voltage is induced across the electrodes. This voltage is proportional to the average flow velocity of the fluid and is measured by the two electrodes. This induced voltage is then amplified and processed digitally by the converter to produce an accurate analog or digital signal. The signal can then be used to indicate flow rate and totalization or to communicate to remote sensors and controllers.

M1000 mag meter also have an "empty pipe" detection feature. This is accomplished with a third electrode positioned in the meter between twelve o'clock and one o'clock. If this electrode is not covered by fluid for a minimum of five-seconds, the meter will display an "empty pipe" condition. When the electrode again becomes covered with fluid, the error message will disappear and the meter will continue measuring.

### DETECTOR

The flow meter is a stainless steel tube lined with a non-conductive material. Outside the tube, two DC powered electromagnetic coils are positioned opposing each other. Perpendicular to these coils, two electrodes are inserted into the flow tube. Energized coils create a magnetic field across the whole diameter of the pipe. With no moving parts, open flow tube design there is no pressure lost and practically no maintenance required



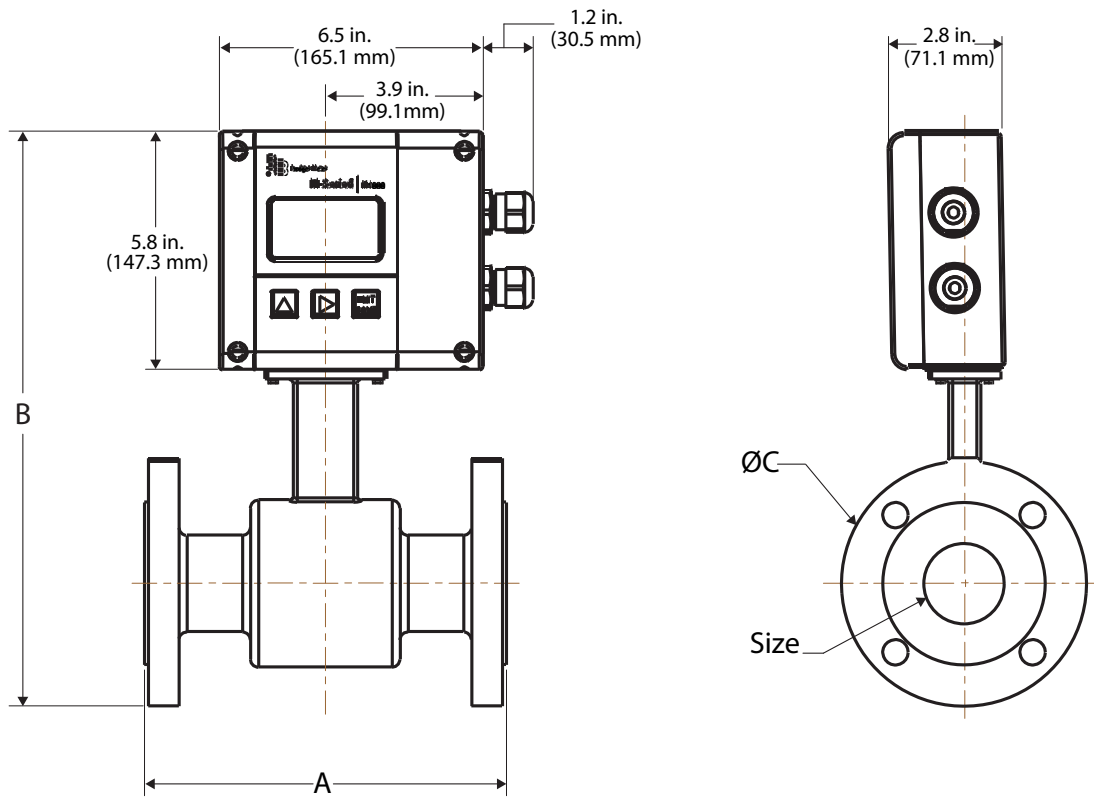
### APPLICATION

The M1000 has been specifically designed for industrial water/wastewater, machinery plants, vehicles and batching process applications. Available in sizes from 1/4" to 8" and nominal pressures up to PN100, the meter is best suited for bidirectional flow measurements of fluid  $> 5 \mu\text{S/cm}$  ( $> 20 \mu\text{S/cm}$  for demineralized water). The amplifier can be integrally mounted to the detector, or if necessary, mounted remotely. The amplifier is housed in a NEMA 6 (IP67) enclosure and the measuring pipes are lined with material approved for drinking water: KTW/DVGW, NSF-61, WRAS, ACS.

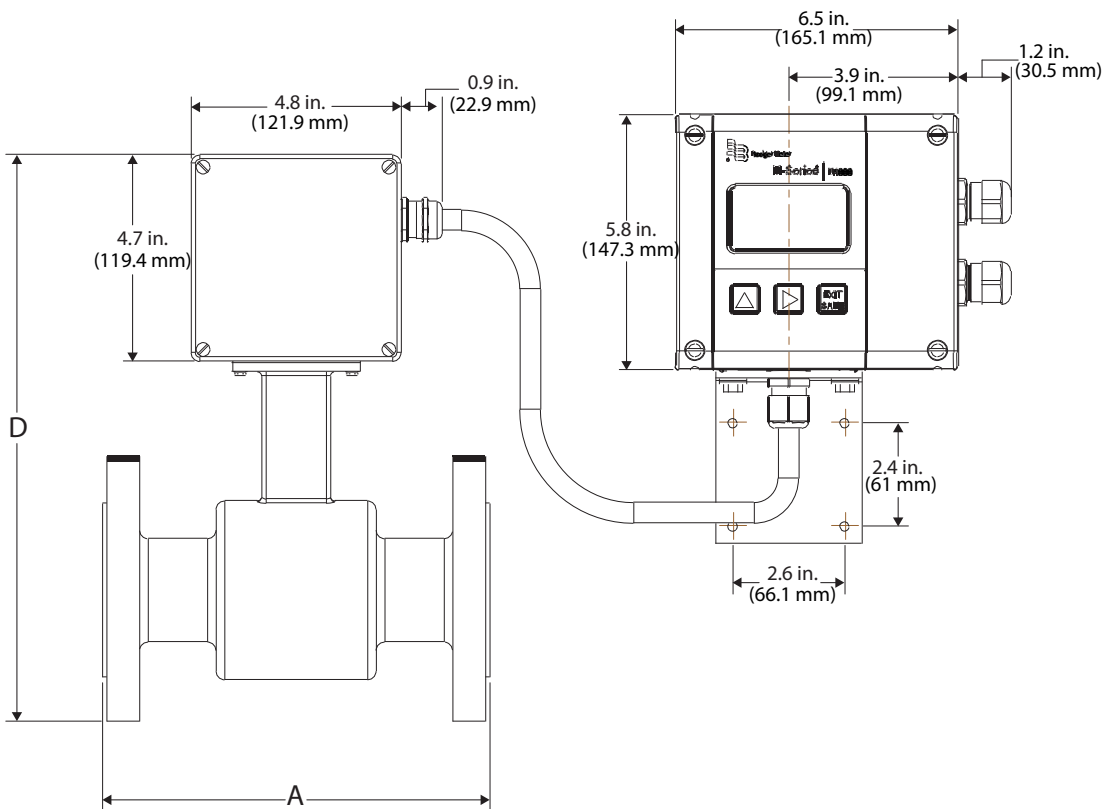
### FEATURES

- Accuracy  $\pm 0.3\%$
- Flow range 0.03...12 m/s
- Sizes 1/4 ... 8 in. (6...200 DN)
- LCD display
- Power supply 92...275V AC, 9...36V DC

## DIMENSIONS



Meter mounted



Remote mounted with mounting bracket

Size		A		B		C		D		Finish Est. Wt.		Flow Range			
inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	lb	kg	LPM		GPM	
												min.	max.	min.	max.
1/4	6	6.7	170	12.8	324	3.5	89	11.3	288	9	4.1	0.05	20.36	0.01	5.38
5/16	8	6.7	170	12.8	324	3.5	89	11.3	288	9	4.1	0.09	36.19	0.02	9.56
3/8	10	6.7	170	12.8	324	3.5	89	11.3	288	9	4.1	0.14	56.55	0.04	14.94
1/2	15	6.7	170	12.8	324	3.5	89	11.3	288	9	4.1	0.32	127.26	0.08	33.62
3/4	20	6.7	170	13.0	329	3.9	99	11.5	293	11	5.1	0.46	183.24	0.12	48.41
1	25	8.9	225	13.1	334	4.3	108	11.7	298	17	7.6	0.79	317.65	0.21	83.91
1-1/4	32	8.9	225	13.9	354	4.6	117	12.5	318	19	8.6	1.48	593.63	0.39	156.82
1-1/2	40	8.9	225	14.1	358	5.0	127	12.7	322	20	9.1	2.08	833.83	0.55	220.28
2	50	8.9	225	14.6	371	6.0	152	13.2	335	24	11.1	3.58	1430.71	0.94	377.95
2-1/2	65	11.0	280	15.8	402	7.0	178	14.4	366	51	23.1	6.18	2470.80	1.63	652.72
3	80	11.0	280	16.1	408	7.5	191	14.6	372	53	24.1	8.36	3344.16	2.21	883.43
4	100	11.0	280	17.1	434	9.0	229	15.7	398	55	25.1	12.49	4996.67	3.30	1319.98
5	125	15.7	400	18.3	466	10.0	254	16.9	430	56	25.6	20.02	8007.72	5.29	2115.42
6	150	15.7	400	19.4	492	11.0	279	18.0	456	58	26.6	29.72	11889.52	7.85	3140.88
8	200	15.7	400	21.3	540	13.5	343	20.4	518	85	38.6	59.41	23764.77	15.69	6277.99

## SPECIFICATIONS

<b>Flow Range</b>	0.03...12 m/s	
<b>Accuracy</b>	± 0.3% of reading, ± 2 mm/s	
<b>Conductivity</b>	Min. 5 µS/cm (20 µS/cm for demineralized water)	
<b>Fluid Temperature</b>	<b>With Remote Amplifier:</b> PTFE 302° F (150° C), Hard rubber 178° F (80° C)	<b>With Meter-Mounted Amplifier:</b> PTFE 212° F (100° C), Hard rubber 178° F (80° C)
<b>Ambient Temperature</b>	-4...140° F (-20...60° C)	
<b>Flow Direction</b>	Uni-directional or bi-directional	
<b>Analog Output</b>	0/4...20 mA / 0...10 mA, flow direction is displayed on a separate status output	
<b>Pulse Output</b>	2 open collectors, passive 32V DC, 0...100 Hz 100 mA, 100...10,000 Hz 20 mA, optional active	
<b>Frequency Output</b>	Max. 10 kHz (open collector)	
<b>Communication</b>	RS232, RS422, RS485 Modbus RTU	
<b>Empty Pipe Detection</b>	Field-tunable for optimum performance based on specific application	
<b>Min-Max Flow Alarm</b>	Programmable outputs 1...100% of flow	
<b>Low Flow Cutoff</b>	Programmable 0...10% of maximum flow	
<b>Galvanic Separation</b>	Functional 500 volts	
<b>Pulse Width</b>	Programmable 5...2000 ms	
<b>Coil Power</b>	Pulsed DC	
<b>Repeatability</b>	0.1%	
<b>Display</b>	Two lines x 15 characters (7 on top + 8 on bottom), LCD display	
<b>Programming</b>	3 external buttons	
<b>Units of Measure</b>	Gallons, ounces, MGD, liters, cubic meters, cubic feet, imperial gallon, barrel, hectoliter and acre feet	
<b>Power Supply</b>	92...275V AC (50 / 60 Hz), <10 VA optional 9...36V DC	
<b>Amplifier Housing</b>	Powder-coated aluminium die cast	
<b>Detector Housing</b>	Carbon steel	
<b>Linear Materials</b>	Hard Rubber, PFA, PTFE	
<b>Electrodes Materials</b>	<i>Standard:</i> Hastelloy C	
<b>Optional Grounding Rings</b>	Stainless steel	
<b>Mounting</b>	Detector-mount or remote wall mount	
<b>NSF Listed</b>	Models with hard rubber liner 4" size and up; PTFE liner, all sizes, listing in process	
<b>Cable Insertion</b>	2 x M 20	
<b>Process Connection</b>	Flange: DIN, ANSI, JIS, AWWA	
<b>Nominal Pressure</b>	Up to 232 psi (16 bar)	
<b>Protection Class</b>	<i>Standard:</i> NEMA 4X (IP66); <i>Optional:</i> NEMA 6P (IP67)	

## Control. Manage. Optimize.

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