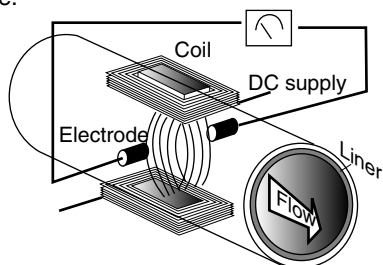


OVERVIEW

Badger Meter's M-Series® Model M-4000 electromagnetic (mag) flowmeter provides non-intrusive flow measurement in almost any conductive fluid or slurry. Targeted to a variety of industrial applications, the M-4000 is virtually unaffected by density, temperature, pressure and viscosity changes and provides an accurate and reliable long term metering solution. The state of the art microprocessor signal converter produces flow accuracies of $\pm 0.25\%$. The M-4000 is FM approved for Class I, Div 1 hazardous service and features a wide selection of optional liner, electrode and flange materials.

OPERATION

This flow meter is a stainless steel flow tube lined with a nonconductive material. Two DC powered electromagnetic coils are attached to the outside of the flow tube. The coils diametrically oppose each other. Two electrodes are located in the flow tube on an axis perpendicular to that of the coils. When the coils are energized, a magnetic field is created across the pipe diameter. As a conductive fluid flows through this magnetic field a voltage is induced across the electrodes. This voltage is proportional to the average fluid flow velocity and is picked up by the two electrodes. Processed digitally by the amplifier, this induced voltage produces a very accurate signal. Advantages of this technology are that with no parts in the flow stream there is no pressure loss and accuracy is not affected by temperature, pressure, viscosity, density, or flow profile. With no moving parts there is practically no required meter maintenance.

**APPLICATION**

Model M-4000 Mag Meters are designed for use in most industrial flow applications. Whether the fluid is water or something highly corrosive, very viscous, contains a moderate amount of solids or requires special handling, this meter is able to accurately measure it. The Model M-4000 electrode circuits are intrinsically safe. The design has been tested and approved by Factory Mutual (FM) in the United States and the Canadian Standards Association (CSA International) in Canada.



Model M-4000 Mag Meter

FEATURES

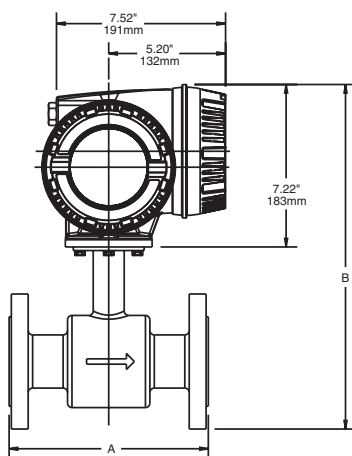
- $\pm 0.25\%$ accuracy independent of fluid viscosity, density and temperature
- Unaffected by most in-fluid solids
- Rated for Class I, Div 1 hazardous locations
- CSA Certified
- CE and FCC compliant
- NEMA 4X (IP66) Rating
- Pulsed DC magnetic field for zero point stability
- No pressure loss for low operational costs
- Long life, corrosion resistant liners
- Precise calibration
- Empty pipe detection
- Integral and remote Amplifier mounting capability
- Optional grounding rings or grounding electrode
- Measurement largely independent of flow profile

Electrodes

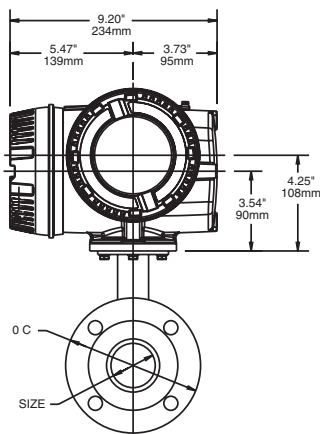
Looking into the flow tube from either end of the meter, the two measuring electrodes can be seen positioned at 3 o'clock and 9 o'clock. Badger® Mag meters have an "Empty Pipe Detection" feature. Empty Pipe Detection is accomplished by positioning a third electrode close to the 12 o'clock position. Any time this electrode is not covered by fluid, (for a minimum of five seconds), the meter displays an Empty Pipe Detection condition, sends out an error message if desired, and stops measuring to maintain accuracy. When the electrode is again covered with fluid, the error message disappears and the meter continues measuring.

As an option to grounding rings to assure proper grounding in a given installation, an optional grounding electrode (4th electrode) can be factory installed at the 6 o'clock position during the flow tube manufacturing process.





M-4000 Meter Mount Amplifier on Detector



M-4000 Remote Mount Junction Box on Detector

Size		A		B		C		D		Est.Weight with Amplifier		Flow Range			
												GPM		LPM	
inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	Lbs	Kg	Min	Max	Min	Max
1/4	6	6.7	170	13.4	342	3.5	89	13.9	351	17	7.7	0.02	5	0.063	20
5/16	8	6.7	170	13.4	342	3.5	89	13.9	351	17	7.7	0.03	9	0.114	34
3/8	10	6.7	170	13.4	342	3.5	89	13.9	351	17	7.7	0.05	14	0.177	53
1/2	15	6.7	170	13.4	342	3.5	89	13.9	351	17	7.7	0.11	33	0.416	125
3/4	20	6.7	170	13.6	347	3.9	99	14	356	17	7.7	0.2	59	0.75	225
1	25	8.9	225	13.8	352	4.3	108	14.2	361	18	8.8	0.3	93	1.20	350
1 1/4	32	8.9	225	14.6	372	4.6	117	15	381	20.3	9.2	0.5	152	2.00	575
1 1/2	40	8.9	225	14.8	376	5.0	127	15.2	386	22	10	0.8	239	3.00	900
2	50	8.9	225	15.3	389	6.0	152	15.7	398	26	11.7	1	373	4.70	1400
2 1/2	65	11.0	280	16.5	420	7.0	178	16.9	429	35	15.7	2	631	8	2400
3	80	11.0	280	16.7	426	7.5	191	17.2	435	38	17.1	3	956	12	3600
4	100	11.0	280	17.8	452	9.0	229	18.2	461	49	22.1	5	1493	19	5600
5	125	15.8	400	19	484	10.0	254	19.4	493	60	27.1	8	2334	30	8800
6	150	15.6	400	20	510	11.0	279	20.4	519	71	32.1	11	3361	40	12,700
8	200	15.8	400	21.9	558	13.5	343	22.9	583	95	43.1	20	5975	75	22,600
10	250	19.7	500	26.2	677	16.0	406	26.6	676	130	59.1	30	9336	120	35,300
12	300	19.7	500	28.3	720	19.0	483	28.7	729	219	99.3	45	13,444	170	50,800

SPECIFICATIONS

Flow Range: 0.1 to 39.4 ft/s (0.03 – 12 m/s)

Flow Direction: Uni-directional or Bi-directional

Sizes: 1/4" to 12" (6 to 300mm)

Conductivity: Min. 5 micromhos/cm

Accuracy: ± 0.25% of rate for velocities greater than 1.64 ft/s (0.50 m/s)
± 0.004 ft/s (± 0.001 m/s) for velocities less than 1.64 ft/s (0.50 m/s)

Electrode Materials: Alloy C, 316 stainless steel, gold/platinum plated, tantalum or platinum/rhodium

Liner Material: PFA from 1/4" to 3/8" (6 to 10mm), PTFE from 1/2" to 12" (15 to 300mm), soft and hard rubber from 1" to 12" (25 to 300mm)

Fluid Temperature:

With remote mounted amplifier

PFA & PTFE: -4°F to 248°F (-20°C to 120°C) @ Max. ambient temp. of 122°F (50°C)

Soft & hard rubber: 32°F to 178°F (0°C to 80°C) @ Max. ambient temp. of 122°F (50°C)

With meter mounted amplifier

PFA & PTFE: -4°F to 212°F (-20°C to 100°C) @ Max. ambient temp. of 122°F (50°C)

Soft & hard rubber: 32°F to 178°F (0°C to 80°C) @ Max. ambient temp. of 122°F (50°C)

Coil Power: Pulsed DC

Pipe Spool Material: 316 stainless steel

Spool Housing Material: Carbon Steel, welded - NEMA 4 (IP66)

Junction Enclosure Material: (for remote mounted amplifier option) Cast aluminum (powder coated paint), NEMA 4X (IP66)

Flanges: Carbon steel or 316 stainless steel (ANSI B16.5 Class 150 RF)

Grounding Rings (optional, 2 required): 316 stainless steel or Alloy C

Meter Size **Thickness (one ring)**

1/4" to 10" (6 to 250mm) .135" (3.43mm)

10" to 24" (250 to 600mm) .187" (4.75mm)

Grounding Electrode (optional): Alloy C, 316 stainless steel, gold/platinum plated, tantalum, or platinum/rhodium

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

Pressure Limits: Max. 150 psi (10 bar)

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

Locations: Indoor and outdoor

Altitude: Maximum 6500 feet (2000m)

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



BadgerMeter, Inc.

P.O. Box 245036, Milwaukee, WI 53224-9536

Telephone: (414) 355-0400 / (800) 456-5023

Fax: (414) 355-7499 / (866) 613-9305

www.badgermeter.com