

M-Series® Mag Meter

Model M-3000 Detector (Non Hazardous Rating)

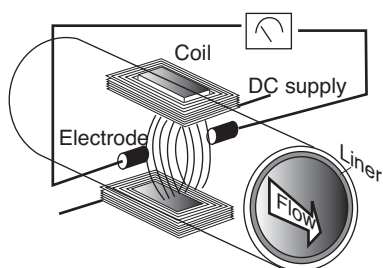
Technical Brief

OVERVIEW

Badger Meter's M-Series® Model M-3000 electromagnetic (mag) flowmeter provides non-intrusive flow measurement in almost any conductive fluid or slurry. Targeted to a variety of industrial and municipal applications, the M-3000 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-3000 features a wide selection of line sizes, 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-3000 Mag Meters are designed for use in most industrial and municipal 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.



Model M-3000 Mag Meter

FEATURES

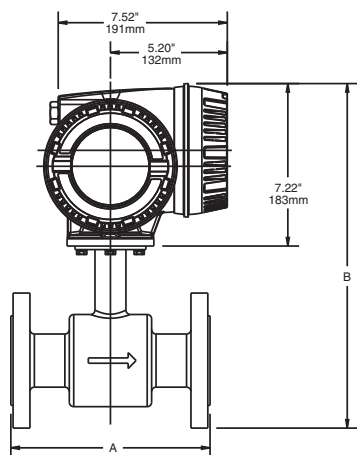
- $\pm 0.25\%$ accuracy independent of fluid viscosity, density and temperature
- Unaffected by most in-fluid solids
- CE and FCC compliant
- NEMA 4X/6P (IP66/IP67) Rating
- Pulsed DC magnetic field for zero point stability
- No pressure loss for low operational costs
- Long life, corrosion resistant 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

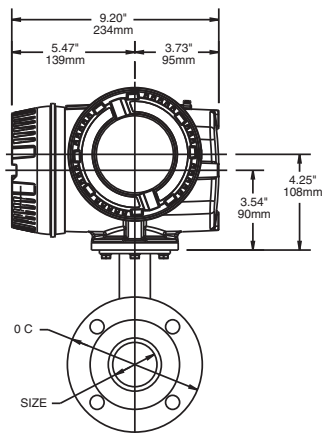
Looking into the flow tube from either end of the meter, the two measuring electrodes can be seen positioned at 3 o'clock and 9 o'clock. Badger® Mag meters have an "Empty Pipe Detection" feature. Empty Pipe Detection is accomplished by positioning a third electrode close to the 12 o'clock position. Any 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.

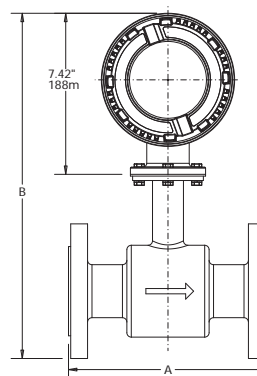




M-3000 Meter Mount Amplifier on Detector



M-3000 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	15.8	400	20	510	11.0	279	20.4	519	71	32.1	11	3361	40	12700
8	200	15.8	400	21.9	558	13.5	343	22.9	583	95	43.1	20	5975	75	22600
10	250	19.7	500	26.2	677	16.0	406	26.6	676	130	59.1	30	9336	120	35300
12	300	19.7	500	28.3	720	19.0	483	28.7	729	219	99.3	45	13444	170	50800
14	350	19.7	500	30.2	768	21.0	533	30.7	779	287	130.2	60	18299	230	69200
16	400	23.6	590	33.1	842	23.5	597	33.5	851	354	160.9	80	23901	300	90400
18	450	23.6	590	34.4	876	25.0	635	34.9	885	409	185.3	100	30250	380	114000
20	500	23.6	590	337.6	955	27.5	699	38	964	502	228.3	125	37346	470	140000
22	550	23.6	590	39	991	29.5	749	39.4	1000	532	241.3	150	45188	570	170000
24	600	23.6	590	41.6	1057	32.0	813	42	1066	561	255.3	180	53778	680	200000

NOTE: Custom flange to flange lay lengths are available. Consult factory.

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 24" (6 to 600mm)

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, platinum/rhodium

Liner Material: PFA from 1/4" to 3/8" (6 to 10mm), PTFE from 1/2" to 24" (15 to 600mm), soft and hard rubber from 1" to 24" (25 to 600mm), Halar® from 12" (300mm) to 24" (600mm)

NSF Listed:

Models with hard rubber liner, 4-inch size and larger
PTFE liner - all sizes

Fluid Temperature:

With remote mounted amplifier

PFA, PTFE & Halar: -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 & Halar: -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)

Pressure Limits: Max. 150 psi (10 bar)

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

Coil Power: Pulsed DC

Pipe Spool Material: 316 stainless steel

Spool Housing Material: Carbon steel, welded - NEMA 4X/6P (IP66/IP67)

Junction Enclosure Material: (for remote mounted amplifier option)

Cast aluminum (powder coated paint), NEMA 4X/6P (IP66/IP67)

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

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

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

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www.badgermeter.com

for specific contacts.

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