Badger Meter

M-Series® M5000

Electromagnetic Flow Meter

DESCRIPTION

Designed, developed and manufactured under strict quality standards, the M-Series M5000 electromagnetic meter features sophisticated, processor-based signal conversion with accuracies of ± 0.50%. Based on Faraday's Law of Induction, these meters can measure well water, wastewater, reclaimed water, chemicals, pharmaceuticals, and bi-directional flow applications that have minimal electrical conductivity.

The flow meter is a stainless steel tube lined with a non-conductive material. Outside the tube are two DC-powered electromagnetic coils positioned opposite each other. Perpendicular to the coils are two electrodes inserted into the flow tube. The energized coils create a magnetic field across the diameter of the pipe.

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 digitally processed 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. In addition, the processor controls zero-flow stability, frequency outputs, serial communications, and other parameters.

With no moving parts in the flow stream, there is no pressure loss. Also, accuracy is not affected by temperature, pressure, viscosity, density or flow profile. There is practically no maintenance required.

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. M5000 mag meters 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 five-second duration, the meter will display an "empty pipe detection" condition, send out an error message, if desired, and stop measuring to maintain accuracy. When the electrode again becomes covered with fluid, the error message will disappear and the meter will continue measuring.

The wide selection of liner and electrode materials helps ensure maximum compatibility and minimum maintenance over a long operating period. The M5000 amplifier can be integrally mounted to the detector, or if necessary, mounted remotely. The amplifier is housed in a NEMA 4X (IP66) enclosure.

OPERATION

In addition to using grounding rings, a grounding electrode (fourth electrode) can be built into the meter during manufacturing to assure proper grounding. The position of this electrode is at five o'clock.

APPLICATION

The M5000 mag meter is designed for applications without power line access, where flow is continuous, and when indication of rate and totalization are required. The M5000 can accurately measure fluid flow—whether the fluid is water or a highly corrosive liquid, very viscous, contains a moderate amount of solids, or requires special handling. Today, electronic meters are successfully used in industries including food and beverage, pharmaceutical, water and wastewater, and chemical.

FEATURES

- Available in sizes 0.50"…24" (15…600 mm)
- Battery powered
- ± 0.50% accuracy independent of fluid viscosity, density and temperature
- Unaffected by most solids contained in fluids
- Pulsed DC magnetic field for zero point stability
- No pressure loss for low operational costs
- Corrosion resistant liners for long life
- Calibrated in state-of-the art facilities
- Integral and remote signal converter availability
- Optional grounding rings or grounding electrode
- Measurement largely independent of flow profile
- Low-power digital microcontroller (16 bit)
- Simple programming procedure
- Digital and infrared outputs
- Automatic zero-point stability
- Non-volatile programming
- NSF listed
- Data logging

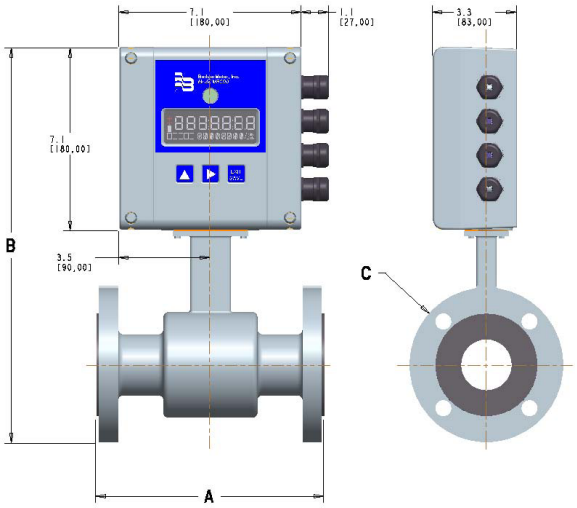
MAG-DS-00175-EN-02 (August 2013)

Product Data Sheet

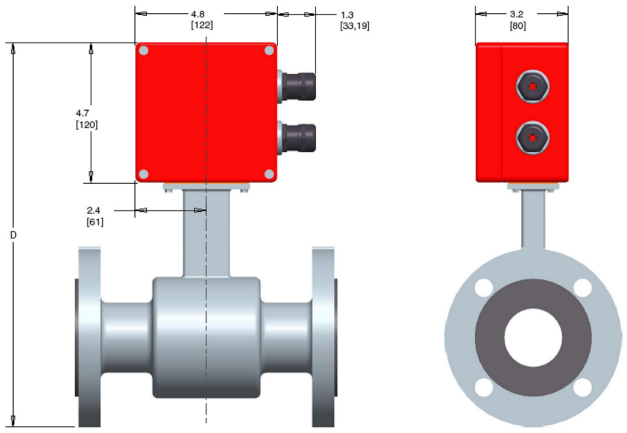
SPECIFICATIONS

Flow Range	0.1…32.8 ft/s (0.03…10 m/s)	
Accuracy	± 0.4% of rate for velocities greater than 1.64 ft/s (0.50 m/s), ± 0.0065 ft/s (± 2 mm/s) for velocities less than 1.64 ft/s (0.50 m/s)	
Minimum Fluid Conductivity	≥ 20 micro siemens/cm	
Pressure Limits	Maximum allowable non-shock pressure and temperature ratings for steel pipe flanges, according to American National Standard ANSI B16.5. Examples: 150-lb flange, rated 285 psi at ambient temperature; 300-lb flange rated 740 psi at ambient temperature.	
Fluid Temperature	**With Remote Amplifier:** PTFE 302° F (150° C), Hard rubber 178° F (80° C)	**With Meter-Mounted Amplifier:** PTFE 212° F (100° C), Hard rubber 178° F (80° C)
Ambient Temperature	– 4…140° F (–20…60° C)	
Flow Direction	Uni-directional or bi-directional. Two separate programmable totalizers for uni-directional measurement.	
Outputs (4 digital)	Galvanically isolated open collector, 30V DC maximum, 20 mA each, maximum output frequency at 100 Hz	
Outputs	ADE, High/low flow alarm (0…100% of flow), error alarm, empty pipe alarm, flow direction	
Communication	RS232 Modbus RTU, IrDA	
Empty Pipe Detection	Field-tunable for optimum performance based on specific application	
Min-Max Flow Alarm	Programmable outputs 0…100% of flow	
Low Flow Cut-Off	Programmable 0…10% of maximum flow	
Galvanic Separation	Functional 50 volts	
Pulse Width	Programmable 5…500 ms	
Coil Power	Pulsed DC	
Repeatability	± 0.1%	
Sampling Rate	Programmable from 1 to 63 seconds. Standard sampling period is 15 seconds.	
Display	Two lines x 15 characters (7 on top + 8 on bottom), LCD display	
Programming	Three external buttons	
Units of Measure	Gallons, ounces, MGD, liters, cubic meters, cubic feet, imperial gallon, barrel, hectoliter and acre feet	
Battery Life	10 years	
Power Supply	Internal lithium batteries 3.6 volt	
Processing	Low power microcontroller (16 bit)	
Amplifier Housing	NEMA 4X (IP66), cast aluminum, powder-coated paint	
Meter Housing Material	Standard: Carbon steel welded	
Pipe Spool Material	316 stainless steel	
Flanges	*Standard*: ANSI B16.5 Class 150 RF Cast steel; *Optional*: 316 stainless steel & 300 lb cast steel	
Liner Material	PTFE 0.5…24", Hard rubber 1…24"	
Electrode Materials	*Standard*: Alloy C; *Optional*: 316 stainless steel	
Mounting	Detector-mount or remote wall mount (bracket supplied)	
Meter Enclosure Classification	NEMA 4X (IP66); *Optional*: Submersible NEMA 6P (IP67)-remote amplifier required	
Junction Box Enclosure Protection	For remote amplifier option: Powder coated die-cast aluminum, NEMA 4 (IP66)	
NSF Listed	Models with hard rubber liner 4" size and up; PTFE liner, all sizes.	
Cable Entries	1/2" NPT Cord Grip	
Optional Stainless Steel Grounding Rings	Meter Size — Thickness (of 1 ring) Up through 1" — 0.135" 12…24" — 0.187"	

DIMENSIONS IN INCHES (MILLIMETERS)



Meter with M5000 Amplifier



Meter with Junction Box for Remote M5000 Amplifier

Size		A		B		C		D		Est. Weight with Amplifier		Flow Range			
												GPM		LPM	
inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	lb	kg	min	max	min	max
1/2	15	6.7	170	13.4	342	3.5	89	13.9	351	17	7.7	0.06	20	0.23	76
3/4	20	6.7	170	13.6	347	3.9	99	14	356	17	7.7	0.14	45	0.51	171
1	25	8.9	225	13.8	352	4.3	108	14.2	361	18	8.8	0.24	80	0.91	304
1-1/4	32	8.9	225	14.6	372	4.6	117	15	381	20.3	9.2	0.38	125	1.4	475
1-1/2	40	8.9	225	14.8	376	5.0	127	15.2	386	22	10	0.54	181	2.1	684
2	50	8.9	225	15.3	389	6.0	152	15.7	398	26	11.7	0.96	321	3.6	1216
2-1/2	65	11.0	280	16.5	420	7.0	178	16.9	429	35	15.7	1.5	502	5.7	1900
3	80	11.0	280	16.7	426	7.5	191	17.2	435	38	17.1	2.2	723	8.2	2736
4	100	11.0	280	17.8	452	9.0	229	18.2	461	49	22.1	3.9	1285	15	4864
5	125	15.8	400	19	484	10.0	264	19.4	493	60	27.1	6.0	2008	23	7601
6	150	15.8	400	20	510	11.0	279	20.4	519	71	32.1	8.7	2891	33	10945
8	200	15.8	400	21.9	558	13.5	343	22.9	583	96	43.1	15	5140	58	19458
10	250	19.7	500	26.2	677	16.0	406	26.6	676	130	59.1	24	8031	91	30402
12	300	19.7	500	28.3	720	19.0	483	28.7	729	219	99.3	35	11565	131	43780
14	350	19.7	500	30.2	768	21.0	533	30.7	779	287	130.2	47	15742	179	59589
16	400	23.6	590	33.1	842	23.5	597	33.5	851	354	160.9	62	20561	233	77830
18	450	23.6	590	34.4	876	25.0	635	34.9	885	409	185.3	78	26022	296	98504
20	500	23.6	590	337.6	955	27.5	699	38	964	502	228.3	96	32126	365	121610
22	550	23.6	590	39	991	29.5	749	39.4	1000	532	241.3	117	38872	441	147148
24	600	23.6	590	41.6	1057	32.0	813	42	1066	561	255.3	139	46261	525	175118

www.mvandc.com | sales@mvandc.com | Phone: 877.566.3837 | Fax: 925.407.2903

www.badgermeter.com

The Americas | Badger Meter | 4545 West Brown Deer Rd | PO Box 245036 | Milwaukee, WI 53224-9536 | 800-876-3837 | 414-355-0400
México | Badger Meter de las Americas, S.A. de C.V. | Pedro Luis Ogazón N°32 | Esq. Angelina N°24 | Colonia Guadalupe Inn | CP 01050 | México, DF | México | +52-55-5662-0882
Europe, Middle East and Africa | Badger Meter Europa GmbH | Nurtinger Str 76 | 72639 Neuffen | Germany | +49-7025-9208-0
Czech Republic | Badger Meter Czech Republic s.r.o. | Mařikova 2082/26 | 621 00 Brno, Czech Republic | +420-5-41420411
Slovakia | Badger Meter Slovakia s.r.o. | Racianska 109/B | 831 02 Bratislava, Slovakia | +421-2-44 63 83 01
Asia Pacific | Badger Meter | 80 Marine Parade Rd | 21-04 Parkway Parade | Singapore 449269 | +65-63464836
China | Badger Meter | 7-1202 | 99 Hangzhong Road | Minhang District | Shanghai | China 201101 | +86-21-5763 5412

Legacy Document Numbers: ITB-193-02 and ITB-187-01