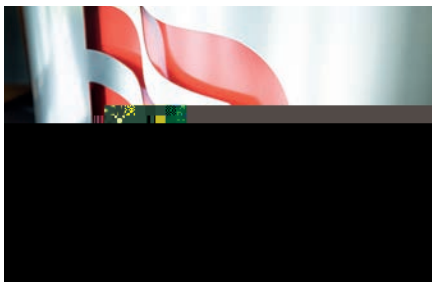




# Electromagnetic flow meters

## The company



### About us

Badger Meter Europa GmbH is a wholly owned subsidiary of Badger Meter, Inc., USA, based in Milwaukee, Wisconsin. With sales of more than 350 million Euro and the dedication of more than 1450 employees all around the world, Badger Meter is a leading marketer and manufacturer of flow measurement and control devices since 1905. Badger Meter was a pioneer in flow measurement and can look back today at many patents in that field.

Badger Meter Europa GmbH is responsible for the international operations worldwide, except for the United States, Mexico, Canada and Latin America which are operated from Badger Meter, Inc., USA. Highly qualified people as well as state-of-the-art production and test facilities ensure the best sales support and service for our customers.

### Customer proximity & competence

We can help you in a timely manner to solve your measurement problems, advising you to assist in optimizing your measurement solution, technology and site location before you make a decision. An extensive distributor and service network ensures the best service worldwide. Local representatives are a big advantage for our customers. The short distance and local language support provide efficient service. Our distributors are trained on Badger Meter products at their own facilities or in our training center. Our name assures you that our products have been manufactured with the best care and in conformity with all DIN ISO 9001:2008 directives.

### Quality is our tradition

A company which has successfully been providing the industry with flow meters for more than 110 years is always aware of the importance of quality in its products. However, quality is an on-going process which we, as a company, embrace every day. At Badger Meter Europa GmbH, we consider quality in all aspects of our operation. It is the quality of our work, which you, as a customer, are entitled to expect from us. Quality begins with the individual, our employees, and requires a company philosophy which fits accordingly. Our quality should accompany you throughout the process: from inquiry, through order to product and service. No compromise in terms of quality.

### Service



Urgent orders may be delivered overnight with our „Hot-Shot“ service.

# Electromagnetic flow meters

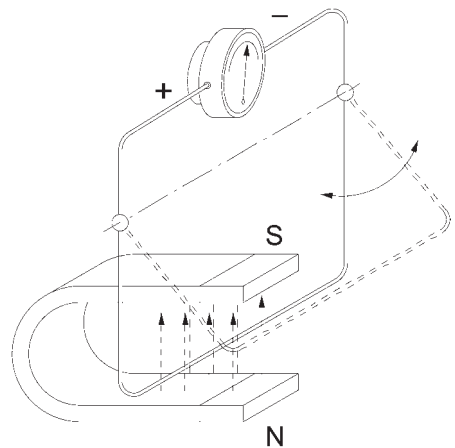
Electromagnetic flow meters are ideally suited for flow measurement of all liquids with a minimum conductivity of  $5 \mu\text{S}/\text{cm}$  ( $20 \mu\text{S}/\text{cm}$  for demineralized water).

These meters are very accurate and the flow measurement is independent of density, temperature and pressure of the medium.

## Measuring principle

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.







## Technical data: Detectors



Type	Type II	Type III	Type Food
<b>Size</b>	DN 6 – 2000 (1/4"…80")	DN 25 – 100 (1"…4")	DN 10 – 100 (3/8"…4")
<b>Process connections</b>	Flange: DIN, ANSI, JIS, AWWA u.a.	Wafer connection, (in-between flange mounting)	Tri-Clamp® BS 4825/ISO 2852, DIN 11851 among others
<b>Nominal pressure</b>	Up to PN 100	PN 40	PN 10/16
<b>Protection class</b>	IP 67, optional IP 68	IP 65, optional IP 68	IP 65, optional IP 68
<b>Min. conductivity</b>	5 µS/cm (min. 20 µS/cm for demineralized water)	5 µS/cm (min. 20 µS/cm for demineralized water)	5 µS/cm (min. 20 µS/cm for demineralized water)
<b>Liner materials</b>	Hard / soft rubber   from DN 25   0 up to +80 °C PTFE   DN 6 – 600   -40 up to +150 °C Halar (ECTFE)   from DN 300   -40 up to +150 °C	PTFE   -40 up to +150 °C	PTFE   -40 up to +150 °C
<b>Electrodes materials</b>	Hastelloy C (standard) Tantal Platinum / Gold plated Platinum / Rhodium	Hastelloy C (standard) Tantal Platinum / Gold plated Platinum / Rhodium	Hastelloy C (standard) Tantal Platinum / Gold plated Platinum / Rhodium
<b>Housing</b>	Carbon steel / optional stainless steel	Carbon steel / optional stainless steel	Stainless steel
<b>Lay length</b>	DN 6 – 20   170 mm DN 25 – 50   225 mm DN 65 – 100   280 mm DN 125 – 200   400 mm DN 250 – 350   500 mm DN 400 – 700   600 mm DN 750 – 1000   800 mm DN 1200 – 1400   1000 mm DN 1600   1600 mm DN 1800   1800 mm DN 2000   2000 mm or according to ISO 13359	DN 25 – 50   100 mm DN 65 – 100   150 mm	Tri-Clamp® connection: DN 10 – 50   145 mm DN 65 – 100   200 mm  DIN 11851 connection: DN 10 – 20   170 mm DN 25 – 50   225 mm DN 65 – 100   280 mm



# Amplifiers

Amplifier for a great variety of applications – ModMAG® M2000



The amplifier type ModMAG® M2000 is best suited for bidirectional flow measurement of fluids with a conductivity  $> 5 \mu\text{S}/\text{cm}$  ( $> 20 \mu\text{S}/\text{cm}$  for demineralized water). ModMAG® M2000 shows a high accuracy, is easy to use and can be chosen for a large and flexible applications spectrum.

The backlight, four-line display shows all actual flow measuring data, daily and complete information, including alarm messages.

The standard amplifier has 4 programmable digital outputs, one digital input, analog output and different interfaces.

Integrated system self check-up makes putting into operation and servicing easier.

The back-up function enables retrieval of parameters while servicing the meter, without the need for reprogramming the device or transferring to another device.

- For all detectors
- Accuracy  $\pm 0,2\%$  of actual flow
- Flow range 0,03 – 12 m/s
- Size DN 6 – DN 2000
- Protection class IP 67
- Interfaces Modbus, HART®, M-Bus, Profibus DP

## Verification Device

The verification device enables the ModMAG® electromagnetic flow meters M2000 and B-MAG | M5000 to be checked on site in regular time intervals at a low cost and without interruption of the process. All important parameters of the flow meter are measured, recorded and evaluated.



## Battery-powered amplifier for water supply –ModMAG® M5000

The ModMAG® M5000 is a battery-powered electromagnetic flow meter with a very high accuracy even at very low flows. The excellent repeatability as well as the above-average battery life makes this innovative water meter indispensable for the water market. Typical applications are leak detection in water networks, water consumption measurements and irrigation plants.

The meter is best suited for applications without a power supply where exact consumption or flow rates are required. The ModMAG® M5000 can also be used with an available power supply. The meter can be powered with mains voltage and in case of a mains failure, it is powered by an internal battery. Important data is therefore saved.

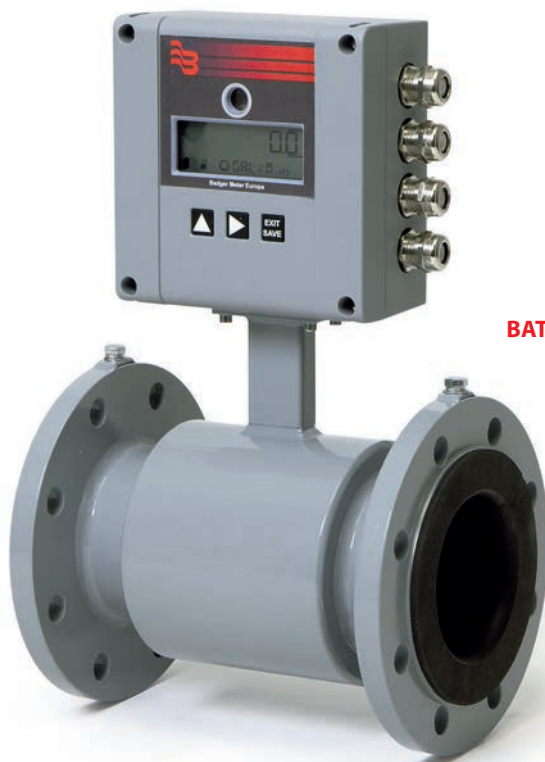
The ModMAG® M5000 has been designed for very harsh environmental measurement conditions. The meter has no moving parts and can be used to measure water containing particles like sand or gravel. The ModMAG® M5000 is encased in an IP 67 housing (optional

IP 68), which makes it a reliable meter even when submerged.

The standard meter is equipped with an internal datalogger which can be read via an IrDA or M-Bus with Modbus RTU protocol.

The collected data can also be retrieved via radio frequency or GSM/GPRS. The data can thus be centrally compiled and evaluated.

- For flanged process connections
- Accuracy better than  $\pm 0,4\%$  of actual flow
- Flow range 0,03 to 10 m/s
- Size DN 15 – DN 600
- Protection class IP 67 / IP 68
- Interfaces IrDA, Modbus RTU, M-Bus
- Up to 20 years battery life span



**BATTERY OPERATED**



## Low-cost amplifier for a great variety of applications – ModMAG® M1000



- For all detectors
- Accuracy  $\pm 0,3\%$  of actual flow
- Flow range 0,03 – 12 m/s
- Size DN 6 – DN 200

The ModMAG® M1000 amplifier is suited for bidirectional flow measurement of liquids  $> 5 \mu\text{S/cm}$  ( $> 20 \mu\text{S/cm}$  for demineralized water).

It combines all the opportunities of price with high level performance. Information such as flow rate, total flow rates, daily flow rate or even an alert can easily be read from the LCD display.

Various inputs, outputs and interfaces allow a wide range of different applications with the ModMAG® M1000. Thanks to the IP 67 aluminium housing the ModMAG® M1000 is ideal for outdoor applications in rugged environmental conditions.

## Amplifier for hazardous areas – ModMAG® M3000/M4000

The amplifier with modular design allows flow measurements in ex-zones 1 and 2, in either the mounted or remote version. The amplifier housing, made of powder-coated aluminium, is available in protection class IP 67 and with a separate connection space.

Programming can be done either with closed housing thanks to a magnetic pen or with open housing via three buttons. The four-line display shows all necessary data like actual flow, totalizer and status messages.

The programmable excitation frequency even enables the amplifier to be adjusted for difficult metering applications. The newly developed process for amplifier compensation enables a high accuracy, especially in the lower flow range.

The ModMAG® M3000/M4000 is especially suited for flow measurements in chemical and pharmaceutical industries, as well as water and waste water plants with explosion-proof zones.

- For all detectors
- Accuracy  $\pm 0,2\%$  of actual flow
- Flow range 0,03 – 12 m/s
- Protection class IP 67
- Ex-proof



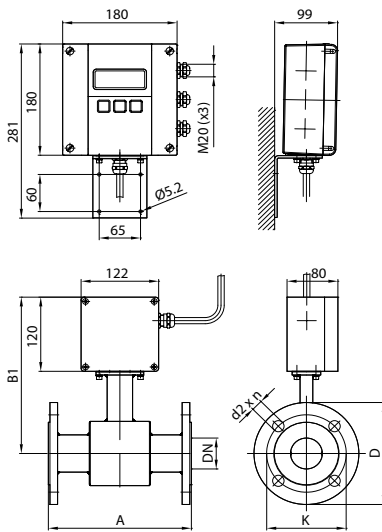
## Technical data: Amplifiers



Type	ModMAG® M1000	ModMAG® M2000	ModMAG® M3000/M4000	ModMAG® M5000
Size	DN 6 – DN 200	DN 6 – DN 2000	DN 6 – DN 600 (M3000) DN 6 – DN 300 (M4000)	DN 15 – DN 600
Accuracy	±0,3 % of actual flow, ±2 mm/s of actual flow	±0,2 % of actual flow, ±1 mm/s of actual flow	±0,2 % of actual flow, ±1 mm/s of actual flow	±0,4 % of actual flow, ±2 mm/s of actual flow
Repeatability	0,1 %	0,1 %	0,1 %	0,1 %
Flow range	0,03 – 12 m/s	0,03 – 12 m/s	0,03 – 12 m/s	0,03 – 10 m/s
Conductivity	Min. 5 µS/cm (min. 20 µS/cm for demineralized water)	Min. 5 µS/cm (min. 20 µS/cm for demineralized water)	Min. 5 µS/cm (min. 20 µS/cm for demineralized water)	Min. 20 µS/cm
Power supply	92 – 275 VAC (50/60 Hz) < 14 VA, optional 9 – 36 VDC, 4 W	85 – 265 VAC (50/60 Hz) < 20 VA, optional 9 – 36 VDC	85 – 265 VAC (50/60 Hz) < 20 VA, optional 24 VDC	Internal Lithium batteries 3,6 V Optional battery back-up model (100 – 240 VAC or 9 – 36 VDC)
Display	LCD graphic display	LCD 4 lines / 20 characters	LCD 4 lines / 16 characters	LCD, 2 lines
Digital outputs	2 x open collector 1 x relay	4 x open collector 2 x relays	2 x open collector 2 x relays (M3000)	4 x open collector
Digital inputs	Yes	Yes	Yes	Yes
Analog output	0/4 – 20 mA, 0 – 10 mA	0/4 – 20 mA, 0/2 – 10 mA	0/4 – 20 mA, 0 – 10 mA	–
Interface	Modbus RTU RS232/RS485 Modbus TCP/IP M-Bus, HART®	Modbus RTU RS232/RS485 Profibus DP, M-Bus, HART®	–	Modbus RTU RS232 (optional RS485), M-Bus, IrDA
Empty pipe detection	Separate electrode	Separate electrode	Separate electrode	Separate electrode
Datalogger	30.000 measuring values	10.000 measuring values (optional)	–	7.224 measuring values
Housing	Aluminium, IP 67	Aluminium, IP 67	Aluminium, IP 67 (NEMA 4x)	Aluminium, IP 67 (optional IP 68)
Remote version	Max. 50 m	Max. 100 m	Max. 30 m	Max. 30 m
Ambient temperature	-20 °C up to +60 °C	-20 °C up to +60 °C	-20 °C up to +50 °C	-20 °C up to +60 °C
Approvals	–	OIML R49-1, MID MI-001 in process	M3000 ATEX Zone 2, FM/CSA Class I, Div. 2 M4000 ATEX Zone 1, FM/CSA Class I, Div. 1	OIML R49-1, MID MI-001

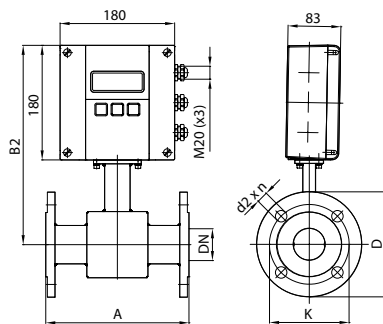
### Flange process connection

Wall mounted



### Flange process connection

Meter mounted



Dimensions (mm)											
DN (mm)	Size (inches)	A Std*	A ISO**	B 1	B 2	with ANSI-flanges			with DIN flanges		
						Ø D	Ø K	Ø d2 x n	Ø D	Ø K	Ø d2 x n
6	1/4"	170	–	228	305	88,9	60,3	15,9 x 4	90	60	14 x 4
8	3/10"	170	–	228	305	88,9	60,3	15,9 x 4	90	60	14 x 4
10	3/8"	170	–	228	305	88,9	60,3	15,9 x 4	90	60	14 x 4
15	1/2"	170	200	238	315	88,9	60,3	15,9 x 4	95	65	14 x 4
20	3/4"	170	200	238	315	98,4	69,8	15,9 x 4	105	75	14 x 4
25	1"	225	200	238	315	107,9	79,4	15,9 x 4	115	85	14 x 4
32	1 1/4"	225	200	253	330	117,5	88,9	15,9 x 4	140	100	18 x 4
40	1 1/2"	225	200	253	330	127	98,4	15,9 x 4	150	110	18 x 4
50	2"	225	200	253	330	152,4	120,6	19 x 4	165	125	18 x 4
65	2 1/2"	280	200	271	348	177,8	139,7	19 x 4	185	145	18 x 4
80	3"	280	200	271	348	190,5	152,4	19 x 4	200	160	18 x 8
100	4"	280	250	278	355	228,6	190,5	19 x 8	220	180	18 x 8
125	5"	400	250	298	375	254	215,9	22,2 x 8	250	210	18 x 8
150	6"	400	300	310	387	279,4	241,3	22,2 x 8	285	240	22 x 8
200	8"	400	350	338	415	342,9	298,4	22,2 x 8	340	295	22 x 12
250	10"	500	450	362	439	406,4	361,9	25,4 x 12	395	350	22 x 12
300	12"	500	500	425	502	482,6	431,8	25,4 x 12	445	400	22 x 12
350	14"	500	550	450	527	533,4	476,2	28,6 x 12	505	460	22 x 16
400	16"	600	600	475	552	596,9	539,7	28,6 x 16	565	515	26 x 16
450	18"	600	–	500	577	635,0	577,8	31,7 x 16	615	565	26 x 20
500	20"	600	–	525	602	698,5	635,0	31,7 x 20	670	620	26 x 20
550	22"	600	–	550	627	749,3	692,1	34,9 x 20	–	–	–
600	24"	600	–	588	665	812,8	749,3	34,9 x 20	780	725	30 x 20
650	26"	600	–	613	690	869,9	806,4	34,9 x 24	–	–	–
700	28"	600	–	625	702	927,1	863,6	35,1 x 28	895	840	30 x 24
750	30"	800	–	650	727	984,2	914,4	34,9 x 28	–	–	–
800	32"	800	–	683	760	1060,5	977,9	41,3 x 28	1015	950	33 x 24
850	34"	800	–	708	785	1111,2	1028,7	41,3 x 32	–	–	–
900	36"	800	–	725	802	1168,4	1085,8	41,3 x 32	1115	1050	33 x 28
950	38"	800	–	750	827	1238,3	1149,4	41,3 x 32	–	–	–
1000	40"	800	–	790	867	1346,2	1257,3	41,3 x 36	1230	1160	36 x 28
1200	48"	1000	–	900	977	1511,5	1422,4	41,3 x 44	1455	1380	39 x 32
1350	54"	1000	–	975	1052	1682,8	1593,9	47,8 x 44	–	–	–
1400	56"	1000	–	1000	1077	–	–	–	1675	1590	42 x 36
Standard											
with ANSI flanges			from DN 6 to 1400			Lbs 150					
with DIN flanges			from DN 6 to 200			PN 16					
			from DN 250 to 1400			PN 10					
**Standard    **ISO 13359											
Sizes DN 1600 – 2000 upon request.											

Flow range					
DN (mm)	Size (inches)	0,03 m/s	2,5 m/s	10 m/s	12 m/s
6	1/4"	0,05 l/min	4,2 l/min	17 l/min	20 l/min
8	3/10"	0,09 l/min	7,5 l/min	30,2 l/min	36 l/min
10	3/8"	0,14 l/min	12 l/min	47,1 l/min	57 l/min
15	1/2"	0,32 l/min	27 l/min	106 l/min	127 l/min
20	3/4"	0,57 l/min	47 l/min	188,5 l/min	226 l/min
25	1"	0,88 l/min	74 l/min	294,5 l/min	353 l/min
32	1 1/4"	1,45 l/min	121 l/min	483 l/min	579 l/min
40	1 1/2"	2,3 l/min	188 l/min	754 l/min	905 l/min
50	2"	3,5 l/min	295 l/min	1178 l/min	1414 l/min
65	2 1/2"	6,0 l/min	498 l/min	1991 l/min	2389 l/min
80	3"	9,0 l/min	754 l/min	3016 l/min	3619 l/min
100	4"	14 l/min	1178 l/min	4712 l/min	5655 l/min
125	5"	1,33 m³/h	110 m³/h	442 m³/h	530 m³/h
150	6"	1,9 m³/h	159 m³/h	636 m³/h	763 m³/h
200	8"	3,4 m³/h	283 m³/h	1131 m³/h	1357 m³/h

Flow range					
DN (mm)	Size (inches)	0,03 m/s	2,5 m/s	10 m/s	12 m/s
250	10"	5,3 m³/h	442 m³/h	1767 m³/h	2121 m³/h
300	12"	7,6 m³/h	636 m³/h	2545 m³/h	3054 m³/h
350	14"	10,4 m³/h	866 m³/h	3464 m³/h	4156 m³/h
400	16"	14 m³/h	1131 m³/h	4524 m³/h	5429 m³/h
450	18"	17 m³/h	1431 m³/h	5725 m³/h	6870 m³/h
500	20"	21 m³/h	1767 m³/h	7068 m³/h	8482 m³/h
550	22"	26 m³/h	2138 m³/h	8553 m³/h	10263 m³/h
600	24"	31 m³/h	2545 m³/h	10178 m³/h	12214 m³/h
700	28"	42 m³/h	3464 m³/h	13854 m³/h	16625 m³/h
750	30"	48 m³/h	3976 m³/h	15904 m³/h	19085 m³/h
800	32"	54 m³/h	4523 m³/h	18096 m³/h	21714 m³/h
900	36"	69 m³/h	5725 m³/h	22902 m³/h	27482 m³/h
1000	40"	85 m³/h	7068 m³/h	28274 m³/h	33929 m³/h
1200	48"	122 m³/h	10178 m³/h	40714 m³/h	48857 m³/h
1400	55"	166 m³/h	13854 m³/h	55416 m³/h	66499 m³/h

Larger diameters upon request

# Product line overview

Electromagnetic flow meters  
Ultrasonic flow meters  
Weirs and flumes  
Turbine meters  
Nutating disc meters  
Impeller meters  
Vortex meters  
Variable area flow meters  
Differential pressure flow meters  
Venturi tubes  
Mass meters  
Heat meters  
Hydraulic testers  
Flow calibrators  
Lubrication meters  
Oil management systems  
Control valves  
Concrete finishing products



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Every drop counts.