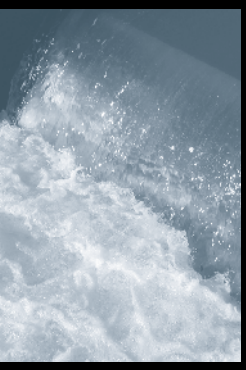
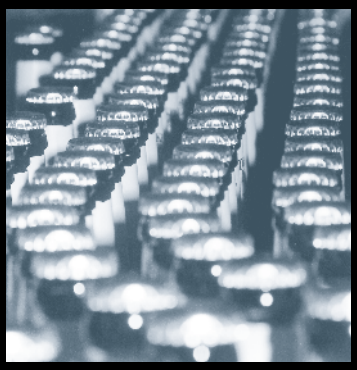
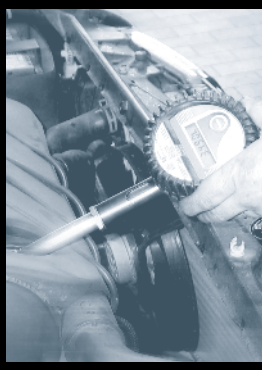
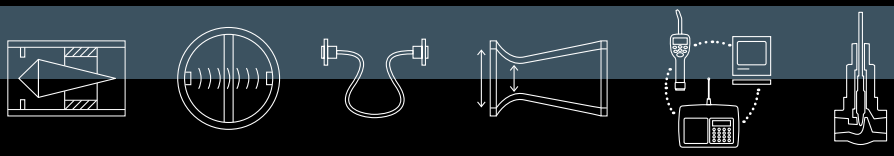
Flow Measurement & Control

Flow metering, batching, controlling









You can build on our experience

We measure and control the resources of our world

Badger Meter Europa

"Nothing in the world is as powerful as an idea whose time has come."
Victor Hugo

Badger Meter Europa GmbH in Neuffen, Germany

Badger Meter, Inc., Milwaukee, USA

Badger Meter, Inc., Tulsa, USA

Badger Meter Czech s.r.o. in Brno, Czech Republic

Badger Meter Slovakia s.r.o. in Bratislava, Slovakia

The company

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 1300 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 and Canada 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. Badger Meter Europa GmbH is DIN ISO 9001:2008 certified and, since 1997, one of the test stands is officially PTB-approved and certified from the Office of Weight and Measures as test equipment according to the OIML R 117.

Badger Meter Asia in Singapore

Long-term service and competence

We help you in a timely manner to solve your measurement problems, advise you and optimize your measurement solution, technology and site location before you make a decision. An extensive distributor and service network assures the best service all around the world. Local representatives are a big advantage for our customers. The short distance and the language make the assistance more efficient. Our distributors are trained on Badger Meter products in their own office or in our training center.

You can compare – we can´t!

Our name assures you that our products have been manufactured with the best care and in conformity with all DIN ISO 9001:2008 directives.

Test stand and innovation center of Badger Meter

Quality is a tradition

A company which has successfully been providing the industry with flow meters for more than 108 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 as of the whole. 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 the inquiry, to the order and the product up to the service.
No compromise in terms of quality.

Flow measuring, batching, controlling

We can measure the flow of all liquids in almost all branches of the industry, and in small and large applications including pressure pipes, semi-filled pipes and open channels with a great variety of measurement principles.
A large product range provide a solution for almost any of your measurement applications in the water and waste water industry, sewage plant, water conditioning, water supply, water discharge, chemical industry, process industry, heat transfer, pharmaceutical industry, concrete industry, food and beverage industry, shipyard industry, power plants, refineries, paper industry, metallurgical industry, automotive industry, photography industry, textile industry…

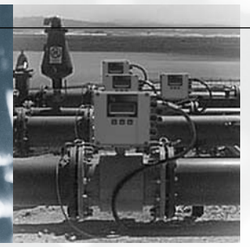
"Quality is not a coincidence; it is the result of our company philosophy."

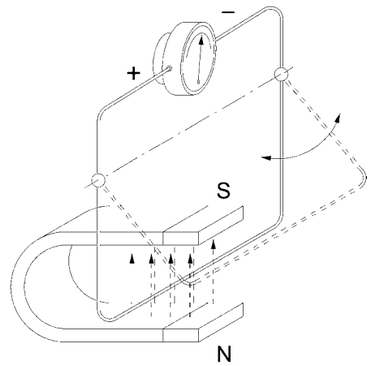
Our products

Every drop counts.

Electromagnetic flow meters

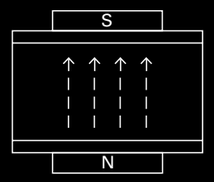
The electromagnetic flow meters are ideally suited for flow measurement of all liquids with a minimum conductivity of 5 µS/cm (20 µS/cm for demineralized water). These meters are very accurate and the flow measurement is independent of density, temperature and pressure of the medium.





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.



Detector type II

Flange process connection

Size DN 6 – 2000

Nominal pressure up to PN 100

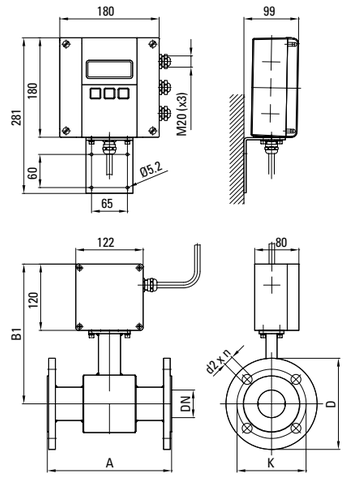
The electromagnetic detector type II is not only available in a number of different flange process connections (DIN, ANSI, JIS, AWWA, etc.) but also in a number of liners like hard rubber, soft rubber, PTFE, PFA or Halar.
The detector can be configured with up to four electrodes for measuring, empty pipe and grounding electrodes.

Available in sizes from DN 6 to DN 2000 and nominal pressures up to PN 100, the detector type II is best suited for a variety of applications in the industry and the water/waste water industry.

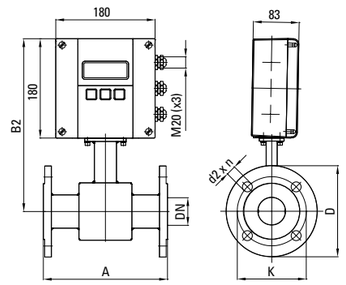
Lined measuring pipes with materials approved for drinking water: KTW/DVGW, NSF-61, WRAS, ACS.

Technical data			
Size	DN 6 – 2000 (1/4"...80")		
Process connections	Flange: DIN, ANSI, JIS, AWWA, etc.		
Nominal pressure	Up to PN 100		
Protection class	IP 67, optional IP 68		
Min. conductivity	5 µS/cm (20 µS/cm for demineralized water)		
Liner materials	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
Electrodes materials	Hastelloy C (standard) Tantal Platinum / Gold plated Platinum / Rhodium		
Housing	Carbon steel / Optional stainless steel		
Lay length	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	

Flange process connection
Wall mounted



Flange process connection
Meter mounted



Dimensions (mm)

DN		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.

Sanitary detector for food

Process connections Tri-Clamp® BS 4825/ISO 2852, DIN 11851

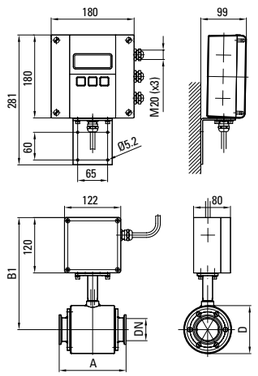
Size DN 10 – 100

Nominal pressure PN 10/16

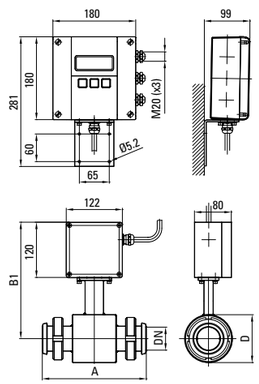
Technical data			
Size	DN 10 – 100 (3/8"...4")		
Process connections	Tri-Clamp® BS 4825/ISO 2852, DIN 11851 among others		
Nominal pressure	PN 10/16		
Protection class	IP 65, optional IP 68		
Min. conductivity	5 µS/cm (20 µS/cm for demineralized water)		
Liner materials	PTFE	-40 up to +150 °C	
Electrodes materials	Hastelloy C (standard) Tantal Platinum / Gold plated Platinum / Rhodium		
Housing	Stainless steel		
Lay length	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

The sanitary detector was developed for the flow measurement of liquid food. This model is available with Tri-Clamp® BS 4825/ISO 2852, DIN 11851 process connections and also with any special connections (customer specifications). The sanitary detector is delivered in a stainless steel housing and with PTFE lining.

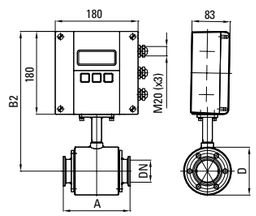
Tri-Clamp® process connection
Wall mounted



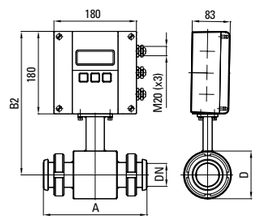
DIN 11851 process connection
Wall mounted



Tri-Clamp® process connection
Meter mounted



DIN 11851 process connection
Meter mounted



Dimensions (mm)
Type Food Tri-Clamp®

DN		A	B 1	B 2	D
10	3/8	145	228	305	74
15	1/2"	145	228	305	74
20	3/4"	145	228	305	74
25	1"	145	228	305	74
40	1 1/2"	145	238	315	94
50	2"	145	243	320	104
65	2 1/2"	200	256	333	129
80	3"	200	261	338	140
100	4"	200	269	346	156

Pressure rate PN 10

Dimensions (mm)
Type Food DIN 11851

DN		A	B 1	B 2	D
10	3/8"	170	238	315	74
15	1/2"	170	238	315	74
20	3/4"	170	238	315	74
25	1"	225	238	315	74
32	1 1/4"	225	243	320	84
40	1 1/2"	225	248	325	94
50	2"	225	253	330	104
65	2 1/2"	280	266	343	129
80	3"	280	271	348	140
100	4"	280	279	356	156

Pressure rate PN 16

Detector type III

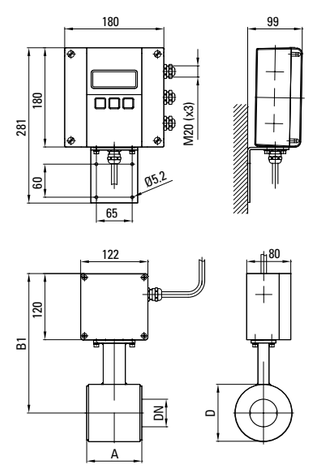
Wafer connection

Size DN 25 – 100

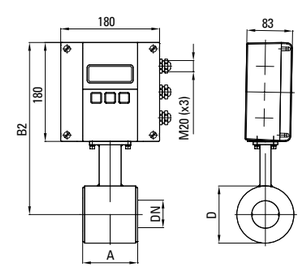
Nominal pressure PN 40

Thanks to its very short lay length, the detector type III is often the right alternative to a lot of applications. Delivered with a PTFE liner, the detector type III has a standard nominal pressure of PN 40.

Wafer connection
Wall mounted



Wafer connection
Meter mounted



Technical data		
Size	DN 25 – 100 (1"...4")	
Process connection	Wafer connection, (in-between flange mounting)	
Nominal pressure	PN 40	
Protection class	IP 65, optional IP 68	
Min. conductivity	5 µS/cm (20 µS/cm for demineralized water)	
Liner materials	PTFE	-40 up to +150 °C
Electrodes materials	Hastelloy C (standard) Tantal Platinum / Gold plated Platinum / Rhodium	
Housing	Carbon steel / optional stainless steel	
Lay length	DN 25 – 50	100 mm
	DN 65 – 100	150 mm

Dimensions (mm)

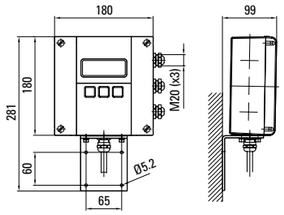
DN		A	B 1	B 2	D
25	1"	100	238	315	74
32	1 1/4"	100	243	320	84
40	1 1/2"	100	248	325	94
50	2"	100	253	330	104
65	2 1/2"	150	266	343	129
80	3"	150	271	348	140
100	4"	150	279	356	156

Pressure rate PN 40

Amplifier type ModMAG® M 2000

for all detectors

Dimensions



Accuracy ±0,2 % of actual flow

Flow range 0,03 – 12 m/s

DN 6 – DN 2000

IP 67 housing

Interfaces ModBus®, HART, M-Bus, Profibus DP

Technical data	
Power supply	85 – 265 VAC, 45 – 65 Hz, <20 VA or optional 9 – 36 VDC
Analog output	0/4 – 20 mA, ≤ 800 ohms, flow direction is displayed upon a separate status output
Pulse / Frequency output	24 V active, 20 mA, 30 V passive, 100 mA (open collector) max. 10 kHz
Status output	Min./max. alarm, preselection meter, flow direction, error message
Medium control EPD	Separate electrode
Programming	3 keys
Interface	RS 232/485, ModBus® RTU, HART, M-Bus, Profibus DP
Datalogger	Internal (optional); 32 MB/10.000 data records
Flow range	0,03 – 12 m/s
Accuracy	±0,2 % of actual flow, ±1 mm/s
Repeatability	0,1%
Flow direction	Bi-directional
Pulse length	Programmable up to 10 s
Outputs	Short circuit safe and galvanically isolated
Low flow cut off	0 – 10 %
Parameter back-up function	Optional
Display	LCD, 4 lines / 20 characters, backlight, actual flow, 2 totalizers, status display
Housing	Powder coated aluminium die cast
Protection class	IP 67
Cable insertion	Power and signal cable (outputs) 3 x M 20
Signal cable	From detector M 20
Ambient temperature	-20 °C up to +60 °C

The amplifier type ModMAG® M 2000 is best suited for bidirectional flow measurement of fluids with a conductivity > 5 µS/cm (> 20 µS/cm for demineralized water). ModMAG® M 2000 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 the putting into operation and the service easier.

Verification Device

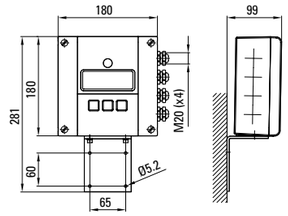
The verification device enables the electromagnetic flow meters types ModMAG® M 2000 and B-MAG™ | M 5000 to be checked on site in regular time intervals at a low cost and without interruption of the process.
All important parameters of the flow meter are measured, protocoled and evaluated.

Amplifier type B-MAG™ | M 5000

for flanged process connections

B-MAG™ Battery Operated | M5000

Dimensions



Up to 20 years battery life span

Accuracy better than ±0,4 % of actual flow

Measuring range of 0,03 to 12 m/s

Sizes from DN 15 to DN 600

LCD display

IP 67 / IP 68 protection class

IrDA, ModBus® RTU, M-Bus interfaces

The B-MAG™ | M 5000 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. Of course, the B-MAG™ | M 5000 can also be used with an available power supply. The meter can be powered with main voltage and in case of a main failure, it is powered by an internal battery. Important data are consequently saved.

The B-MAG™ | M 5000 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 B-MAG™ | M 5000 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 read-out 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.

Technical data	
Power supply	Internal Lithium batteries 3,6 V Optional battery back-up model (AC/DC)
Sizes	DN 15 to DN 600 (PTFE / hard rubber)
Battery life span	10 years, optional 20 years
Display	LCD, 2 lines
Programming	3 keys
Measuring range	0,03 – 12 m/s
Accuracy	±0,4 % of actual flow, ±2 mm/s
Repeatability	±0.1 %
Minimum fluid conductivity	20 µs/cm
Flow direction	Bidirectional
Medium control EPD	Separate electrode
Digital outputs	4 x open collector, passive 30 VDC/20 mA, max. 100 Hz
Status outputs	Min./max. alarm, flow direction, failure report
Serial communication	ModBus® RTU, IrDA, M-Bus External AMR or GSM/GPRS module (optional)
Datalogger	Integrated
Low-flow cut off	0 – 10 %
Pulse width	Programmable up to 500 ms.
Housing	Powder coated cast aluminium
Protection class	IP 67 (IP 68 optional)
Cable entry	Signal cable (outputs) M 20
Signal cable	From detector M 20
Remote version	Max. 30 m
Ambient temperature	-20 °C to 60 °C

Amplifier type ModMAG® M 1000

for all detectors

The low cost alternative

Accuracy ±0,3 % of actual flow

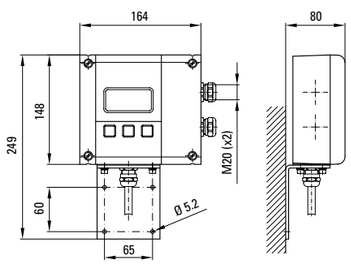
Flow range 0,03 – 12 m/s

DN 6 – DN 200

Technical data	
Power supply	92 – 275 VAC (50/60 Hz), <10 VA optional 9 – 36 VDC
Accuracy	±0,3 % of actual flow, ±2 mm/s
Repeatability	< 0,1 % of full scale
Flow range	0,03 – 12 m/s
Conductivity	Min. 5 µS/cm (min. 20 µS/cm for demineralized water)
Flow direction	Bi-directional
Display	LCD graphic display backlit Actual flow, 3 totalizers, status display
Programming	3 buttons optional RS 232
Interface	RS 232, RS 422, RS 485, ModBus® RTU, Ethernet
Analog output	0/4 – 20 mA / 0 – 10 mA, flow direction is displayed via a separate status output
Pulse output	2 open collectors, passive 32 VDC, 0 – 100 Hz 100 mA, 100 – 10.000 Hz 20 mA, optional active
Frequency output	Max. 10 kHz (open collector)
Status output	Min./max. alarm, preselection, flow direction, error message, free configurable
Empty pipe detection	Separate electrode
Low flow cut off	0 – 10 %
Housing	Powder coated aluminium die cast
Protection class	IP 67
Cable insertion	2 x M 20
Ambient temperature	-20 °C up to 60 °C

The amplifier type ModMAG® M 1000 is suited for bidirectional flow measurement of liquids >5 µS/cm (>20 µS/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 and can easily be read from the LCD display. Various inputs, outputs and interfaces allow a wide range of different applications with the M 1000.
Thanks to the IP 67 aluminium housing the ModMAG® M 1000 is ideal for outdoor applications in rugged environmental conditions.

Dimensions
ModMAG® M 1000



Amplifier type ModMAG® M 3000 / 4000

for all detectors

Ex-proof

Protection class IP 67

Accuracy ±0,2 % of actual flow

Flow range 0,03 – 12 m/s

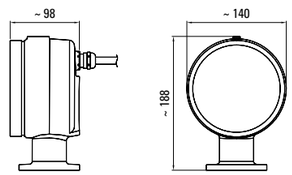
The amplifier with modular design allows flow measurements in ex-zones 1 and 2, in either the mounted or remote version.

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.

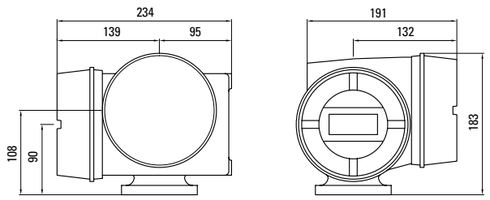
The programmable excitation frequency even enables the amplifier to be adjusted for difficult metering applications. The new developed process for amplifier compensation enables a high accuracy, especially in the lower flow range.

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

Dimensions
Junction box



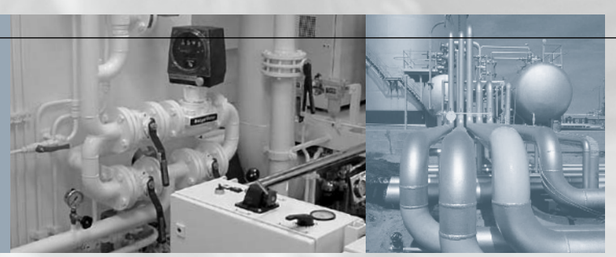
Dimensions
ModMAG® M 3000 / 4000

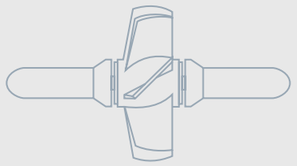


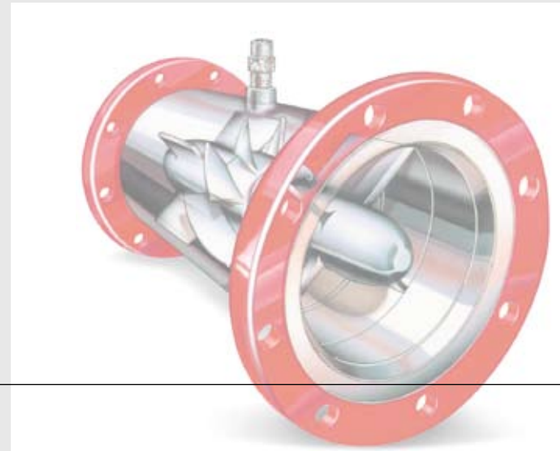
Technical data		
Power supply	85 – 265 VAC, 45 – 65 Hz < 20 VA, optional 24 VDC	
Accuracy	±0,2 % of actual flow, ±1 mm/s	
Repeatability	< 0,1 % of full scale	
Flow range	0,03 – 12 m/s	
Conductivity	Min. 5 µS/cm (min. 20 µS/cm for demineralized water)	
Flow direction	Bi-directional	
Display	LCD, 4 lines / 16 characters, backlit Actual flow, 3 totalizers, status display	
Programming	3 buttons or via magnetic pen	
Interface	RS 232 for measuring values and programming	
Analog output	0/4 – 20 mA ≤ 750 ohms Flow direction is displayed upon a separate status output	
Pulse output	Active / passive selectable	
	2 open collectors and 2 solid state relays	
	Open collector	Active 18 VDC, 25 mA
		Passive 24 VDC, 20 mA (max. 0,5 W)
	AC solid state relay: max. 24 VAC, 500 mA	
Frequency output	Max. 10 kHz (open collector)	
Status output	Min./max. alarm, preselection, flow direction, error message, free configurable	
Empty pipe detection	Separate electrode	
Low flow cut off	0 – 10 %	
Housing	Powder coated aluminium die cast	
Protection class	IP 67	
Cable insertion	3 x M 20	
Ambient temperature	-20 °C up to +60 °C	
Ex-proof version	FM/CSA class I, div. 1 / div. 2 M 3000 II 3 G Ex nA ia IIC T3 M 4000 II 2 G Ex d e ia IIC T3	

Turbine meters

Turbine meters are only meant for applications with low viscosity fluids and gases.

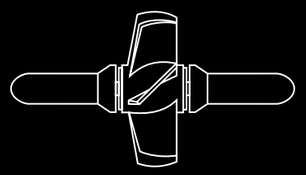






Measuring principle

Turbine meters are volumetric meters. When the fluid passes through, a rotor is activated and the movement is either electronically or mechanically transmitted outside.



Cx series and LoFlo™ series with single rotor

for standard and low flow applications

Ceramic ball bearings
Large flow range
High repeatability
Long lifetime

The standard turbine meters of the Cx series are more used in applications like coolant for cutting and forming operations, process control flow measurement, component test stands for the military, batch flow metering, fuel consumption measurement in machines, motors and actuator aggregates, as well as for a great number of R&D applications.

Coupled with an advanced EC 80 flow computer, these meter systems provide fully compensated precision flow measurements. The EC 80 flow computer will linearize the meter within ±0,1 % linearity over the entire repeatable range.

The robust axial meters of the LoFlo™ series provide an exceptional repeatability of ±0,25 % of reading. When paired with the EC 80 flow computer, the calibration data is linearized to within ±0,1 % of reading, allowing for precision flow measurement over the entire usable range of the meter. The series is not position-sensitive and can be mounted in any piping orientation.

The custom long-life, ceramic low-friction ball bearing system used in the LoFlo™ series meets the demands of water, hydrocarbons and cryogenic fluids. Capable of measuring flows as low as 0,024 l/min, this meter is an ideal solution for a multitude of applications.
Typical uses include fuel injection production systems, blending of costly chemical additives, onboard fuel consumption, refrigerants, dye injections, and more.

Cox is a division of Badger Meter, Inc.

Technical data: Cx series	
Calibrator uncertainty	< ±0,05 % of reading
Accuracy	±0,25 % of reading
Repeatability	±0,02 % of reading
Linearity with electronic linearizer	±0,5 % of reading ±0,1 % of reading
Max. frequency output	500 to 1500 Hz standard
Output signal	0 – 10 V (square wave pulse)
Response time	2 – 3 mS or better

Technical data: LoFlo™ series	
Accuracy	±0,25 % of reading
Repeatability	±0,25 %
Frequency output	1500 – 1800 Hz
Pressure rating	40 bar
Response time	20 – 30 mS
Body construction	316 SST, fittings -6 AN (MS)

Exact™ series with dual rotor

for highly-precise flow measurement

No need for flow straighteners
Enhanced performance due to helical rotors
Superior absolute accuracy
Excellent repeatability
Wide operating flow range
Extended UVC* flow range
Integral pickoff impervious to vibration
NVLAP calibration

The Exact™ series is the world's most precise meter of its kind, providing extended range performance not obtainable with traditional single rotor designs. It is used for aerospace, automotive, industrial and OEM applications.

The Exact™ series provides an extended flow range capability, which often eliminates the need for manifold systems and thus simplifies installation and lowers costs. The meter's exceptional performance, enabled by the innovative dual rotor configuration. UVC* curves improve the accuracy and extend the usable measurement flow range.

With the Exact™ series (standard model CDX/CDL), flow straighteners are not required to control process fluid swirl, as the dual rotor system cancels out the rotor acceleration effect. With flow straighteners, bearing diagnostics can be determined by monitoring the ratio of the rotors to detect wear or cleanliness. The Exact™ series meters also utilize a unique pickoff system, which is impervious to vibration and minimizes space. This allows for direct coupling of electronics on a robust mount having a lower profile. Both integral and remote electronics are available to process the signal output.

The dual rotor technology is ideal for a wide range of applications. The meter is designed for bi-directional flow and high shock environments. It utilizes a robust bearing system having dual ceramic bearings on each rotor with the internals securely locked in place, resulting in excellent repeatability. The dual rotor meter allows for installation in applications that do not have space for flow straighteners without loss of measurement accuracy. Pressures of up to 2065 bar can be contained, while compensating for viscosity changes using integrated pressure sensors.

Cox is a division of Badger Meter, Inc.

*UVC = Universal viscosity curve

Technical data	
Calibration uncertainty	< ±0,05 % of reading
Accuracy	±0,1 % of reading
Repeatability	±0,02 % of reading
Linearity (with linearizer)	±0,01 % of reading
Process temperature	-270 °C to +150 °C standard
Operating pressure	Up to 2065 bar depending on size and end-fittings
Pressure drop	0,9 bar at max. flow rate @1,2 cSt
Bearing	Ceramic std. (water and hydrocarbons)

Type 1100, QuikSert® and Flow monitor B 2800/B 3000

for harsh applications

Robust meter for rigorous applications

Meets highest demands

Simple installation

Low costs for maintenance

This rugged line of turbine meters is ideal for harsh industrial applications. Stainless steel and tungsten carbide components ensure long life. These products are also well-suited for industrial applications with high temperature and high pressure applications, for example in secondary oil recovery, semiconductor and chemical processing. Electronic options enable the meter to interface with most computers and PLCs.

Technical data 1100

Material	Body	316 SS
	Rotor	Stainless steel
	Rotor support	Stainless steel
	Rotor shaft	Tungsten carbide
Measure range	0,03 – 0,1 l/s to 30 – 315 l/s	
Pipe size	Installation in pipes from ½" to 10"	
Flow accuracy	±1 % of reading for 7/8" and larger meters	
	±1 % of reading over the upper 70 % of the measuring range for 3/8", 1/2" and 3/4" meters	
Repeatability	±0,1 %	
Calibration	Water (NIST traceable calibration)	
Pressure ratings	340 bar max.	
Turbine temperature	Up to 180 °C	
End connections	NPT, BSP, Victaulic®, Flange, Hose Barbed or Grayloc®	
Approvals	CSA Class I Div 1, Groups C & D; Class II Div 1, Groups E, F & G: intrinsically safe	
	CSA Class I Div 1 Groups C, D; complies to UL 1203 and CSA 22.2 No. 30	
	Met Labs File No. E112860 (For explosion proof models only)	

Technical data QuikSert®

		for fluids	for gases
Material	Body	Stainless steel	Stainless steel
	Rotor	Stainless steel	Stainless steel
	Rotor support/ shaft	Tungsten carbide	Tungsten carbide
Measuring range		10:1	–
Accuracy		±1 % of reading for 7/8" and larger meters	–
		±1 % of reading over the upper 70 % of the measuring range for 3/8", 1/2" and 3/4" meters	–
Repeatability		±0,1 %	±0,5 %
Calibration		Water (NIST traceable calibration)	
Pressure rating		10 to 100 bar	Vacuum 15.3 mPa max.
Operating temperature		Up to 180 °C	-40 °C to +165 °C
End connections		Wafer-style ASME/ANSI B16.5 – 1996	
Approvals		For explosion proof models only:	
		Class I Div 1 Groups C, D; Complies to UL 1203 and CSA 22.2 No. 30	
		Met Labs File No. E112860	

Technical data B 2800 / B 3000

Power supply Battery Loop powered	 1,5 VDC alkaline battery 4 – 20mA, loop powered 25 mA energy consumption max.
Pulse output signal	One pulse for each increment of the least significant digit of totalizer
Pulse type	Opto-isolated open collector transistors
Max. voltage	30 VDC
Max. pulse width	(On state) 20 ms/max. pulse rate 20 Hz
Current	(On state) 0.9 V drop at 5.0 mA or 0.7 V drop at 0.1 mA
Inputs	Magnetic pickup
Frequency range	1 to 3500 Hz
Trigger sensitivy	30 mV p-p
Over voltage protection	30 VDC
Accuracy	±0,1 %
Analog output	4 – 20 mA
Operating temperature	-30 °C to +70 °C
Units of measure (Rate/total)	l/min, m³/d, m³/h, gal/min, b/d
Units of measure (Total rate)	Liter, m³, Kg, gallons, oil barrels, MGal, Cubic Ft, liquid barrels, Lbs
Time intervals (rate)	Day, hour, minute, second
Approvals	
Meter, remote and swivel mount	CSA Class I, Div.1, Groups C & D intrinsically safe Class II, Division 1, Groups E, F & G intrinsically safe
	CE: IEC 61326-1
Explosion-proof model only	CSA Class I, Div 1, Groups B, C & D CSA Class II, Groups E, F & G CSA Class III, Type 4, T6 @ 70 C

Type FloClean™ 3-A

for sanitary applications

Long lifetime

Easy installation

Low maintenance costs

The FloClean™ 3-A sanitary turbine flow meter meets the requirements of 3-A sanitary standard and is recommended for use in clean out-of place (COP) and sanitize out-of place (SOP) applications. The meter is perfectly adapted for use in the food, beverage and pharmaceutical industries.
FloClean™ provides a local flow rate and volume totalization when used with the Blancett® B 2800 or B 3000 displays, as well as the ability to interface with a variety of PLCs and computers.

Technical data FloClean™

Material of construction	Body	316 L stainless steel
	Turbine	316 L stainless steel, Nickel plated
	Bearings standard	Nickel bindery, tungsten carbide
	Shaft	Nickel bindery, tungsten carbide
Measure range	0,03 – 0,1 to 2,5 – 25 l/s	
Accuracy	±1 % of reading	
Repeatability	±0,1 % of reading	
Calibration	Water (NIST traceable calibration)	
Operating pressure	65 bar (Tri-Clamp®)	
Operating temperature	Up to 150 °C	
End connections	Sanitary clamp end	
Mag. pick-up	NEMA 6; -100 °C to +150 °C	

Turbine meter type VISION® 1000

for low viscosity, non-aggressive liquids, for very low flows

Good price/performance ratio

Compact construction

Easy installation

No maintenance

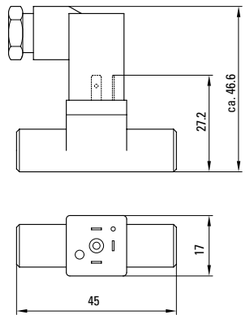
High operating pressure

Operates in any mounting position

The turbine meters of the VISION® series are for the exact metering of small quantities of liquids.
The actual flow as well as the flow already flowed through can be measured.
The VISION® 1000 series is best suited for small flow rates up to 2,5 l/min.

The meters are best suited for flow measurement of demineralized water, alkaline solutions, oils/ salad oil, fuel oil, beverage, water solutions or for fuel and fuel consumption. They are especially ideal for washing maschines and dish washers, coffee machines, laser cooling plants, solar plants, backery and steam cooking machines in large kitchen plants or CD cleaning.

Dimensions



Technical data	
Material	Trogamid (PA 12)
Viscosity range	0,8 – 16 mm²/sec
Accuracy	±3 % of value
Repeatability	< 0,50 %
Temperature range	-20 °C up to +100 °C
Operating pressure	Max. 25 bars
Burst pressure	200 bars
Electrical connection	Electrical connector EN 60529
Power supply	5 – 24 VDC
Current consumption	Ca. 8 mA
Output signal	Open collector NPN pulse
Pull-down resistor	1 – 2,2 kOhms
Process connections	G 1/4", NPT 1/4"

Specifications

Type	1000 2F 66
Measuring range l/min	0,1 – 2,5
K factor PPL*	18.500
Size DN (mm)	5

* PPL = pulses / liter

Pressure drop in bars for water

Type	1000 2F 66
0,5 l/min	0,02
1 l/min	0,05
1,5 l/min	0,15
2,5 l/min	0,25

Turbine meter type VISION® 2000

for low viscosity, non-aggressive liquids, for very low flows

Good price/performance ratio

Compact construction

Easy installation

No maintenance

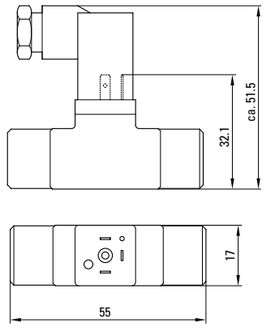
High operating pressure

Operates in any mounting position

The turbine meters of the VISION® series are for the exact metering of small quantities of liquids.
The actual flow as well as the flow already flowed through can be measured.
The VISION® 2000 series is used for flow rates up to 35 l/min.

The meters are best suited for flow measurement of demineralized water, alkaline solutions, oils/ salad oil, fuel oil, beverage, water solutions or for fuel and fuel consumption. They are especially ideal for washing maschines and dish washers, coffee machines, laser cooling plants, solar plants, backery and steam cooking machines in large kitchen plants or CD cleaning.

Dimensions



Specifications

Type	2006 4F 44	2006 2F 66	2008 4F 16,5	2008 4F 23	2008 4F 44	2008 2F 66
Measuring range l/min	1 – 10	0,5 – 5	2 – 35	1,5 – 25	1 – 15	0,5 – 7,5
K factor PPL*	3300	6900	700	1000	2200	4600
Size DN (mm)	6	6	8	8	8	8

* PPL = pulses / liter

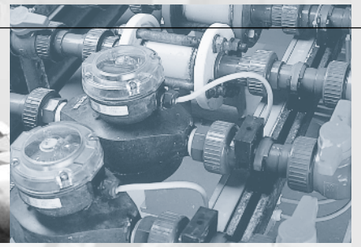
Pressure drop in bars for water

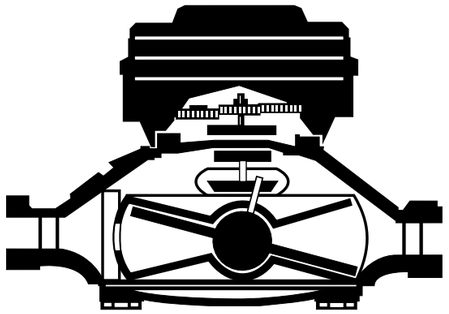
Type	2006 4F 44	2006 2F 66	2008 4F 16,5	2008 4F 23	2008 4F 44	2008 2F 66
0,5 l/min	–	–	–	–	–	–
1 l/min	~ 0	~ 0	~ 0	~ 0	~ 0	~ 0
1,5 l/min	–	–	–	–	–	–
2 l/min	0,06	~ 0	~ 0	~ 0	0,05	~ 0
5 l/min	0,2	0,12	~ 0	0,05	0,2	0,05
10 l/min	0,7	0,4	~ 0,12	0,17	0,4	0,2
15 l/min	–	0,9	~ 0,25	0,27	–	0,4
20 l/min	–	1,3	~ 0,45	0,48	–	0,7
25 l/min	–	–	~ 0,60	0,65	–	–
30 l/min	–	–	~ 0,92	0,97	–	–

Technical data	
Material	Grilamid TR 55 (PA 12)
Viscosity range	0,8 – 16 mm²/sec
Accuracy	±3 % of value
Repeatability	< 0,50 %
Temperature range	-20 °C up to +100 °C
Operating pressure	Max. 25 bars
Burst pressure	200 bars
Electrical connection	Electrical connector EN 60529 or cable connection
Power supply	5 – 24 VDC
Current consumption	Ca. 8 mA
Output signal	Open collector NPN pulse
Pull-down resistor	1 – 2,2 kOhms
Process connections	G 3/8", NPT 3/8", O-ring

Nutating disc meters

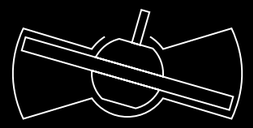
Nutating disc meters are best suited to measure flow and volume of low and medium viscosity fluids.





Measuring principle

Nutating disc meters are positive displacement meters. The top and lower part of the meter chamber are cone shaped. A ball bearing centralizes the disc between the two cones.
A nutating motion of the disc is generated when flow enters the meter chamber. Complete separation between inlet and outlet chamber volumes is always achieved by one dedicated disc diameter line. The inlet and outlet parts of the meter chamber are separated by a partition plate. The positioning bar forces the disc to nutate around the center axis of the chamber, driving the transmission magnet.



Recordall® fluid meter

for clean and moderately dirty fluids

Magnetic coupling

Compatible with many liquids

Wide flow range

Low pressure loss

Light weight

The Recordall® series is a positive displacement meter. The series is best suited for metering fluids up to a viscosity of 700 mPas and at an operating temperature of 50 °C up to 120 °C.

Typical applications are: Clean and moderately dirty liquids, hard and soft water, oils, fuel, solvents, etc.

The metering chamber includes disc, positioning bar and transmission magnet. The chamber is inserted into the meter body. A screen in the inlet side of the body protects the chamber against penetration of larger solid particles.

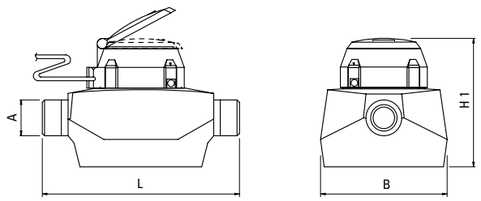
The meter system is modular and enables the combination of mechanical or electronic displays with any meter size.

RCDL M 25 for AdBlue®

see page 26

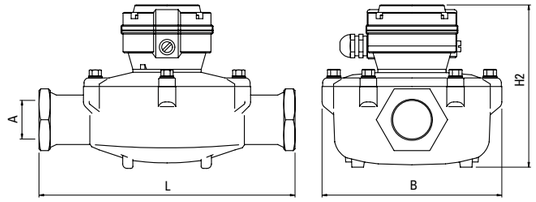
Dimensions

Plastic model



Dimensions

Bronze model



Dimensions (mm)

Type	M 25			M 35	M 40		M 70	M 120	M 170
	Plastic	Bronze Nickel coated	Stainless steel	Bronze Nickel coated	Plastic	Stainless steel	Bronze Nickel coated	Bronze Nickel coated	Bronze Nickel coated
Connection A	R 3/4", 1"	R 3/4", 1"	R 1"	R 1"	R 1 – 1/4"	R 1 1/4"	R 1 – 1/4"	1 – 1/2" NPT	2" NPT
Lay length L	190	190	190	230	270	230	270	321	387
Width B	122	122	110	133	151	135	184	223	240
Height register H 1	125	125	130	132	150	130	165	178	204
Height transmitter H 2	128	128	155	168	180	160	200	213	239

Technical data

Type	M 25			M 35	M 40		M 70	M 120	M 170
	Plastic	Bronze Nickel coated	Stainless steel	Bronze Nickel coated	Plastic	Stainless steel	Bronze Nickel coated	Bronze Nickel coated	Bronze Nickel coated
Size DN	15, 20	15, 20	20	20	25	25	25	40	50
Nominal pressure PN	16	16	16	16	16	16	16	16	16
Max. temperature (PPO)	50 °C	50 °C	50 °C	50 °C	50 °C	50 °C	50 °C	50 °C	50 °C
Max. temperature (Vectra)	–	120 °C	120 °C	–	–	–	120 °C	120 °C	–
Flow range l/min (PPO)	1 – 100	1 – 100	1 – 100	2 – 132	2 – 160	2 – 160	4 – 265	8 – 454	8 – 643
Flow range l/min (Vectra)	–	3 – 100	3 – 100	–	–	–	19 – 265	18 – 454	–
Accuracy (1:10)	±0,5 %	±0,5 %	±0,5 %	±0,5 %	±0,5 %	±0,5 %	±0,5 %	±0,5 %	±0,5 %
Accuracy (total range)	±1,5 %	±1,5 %	±1,5 %	±1,5 %	±1,5 %	±1,5 %	±1,5 %	±1,5 %	±1,5 %
Weight	1,2 kg	1,8 kg	5,8 kg	2,7 kg	1,8 kg	7 kg	5,5 kg	10,5 kg	13,6 kg

Materials

Type	M 25			M 35	M 40		M 70	M 120	M 170
Housing	Nylon	Bronze Nickel coated	Stainl. steel 1.4571	Bronze Nickel coated	Polycarbonate	Stainl. steel 1.4571	Bronze Nickel coated	Bronze Nickel coated	Bronze Nickel coated
Measuring chamber	PPO / Vectra	PPO / Vectra	PPO / Vectra	PPO	PPO	PPO	PPO / Vectra	PPO / Vectra	PPO
O-rings	Buna / Viton	Buna / Viton	Buna / Viton	Buna	Buna	Buna	Buna / Viton	Buna / Viton	Buna
Retainer strap (PPO)	Nylon								
Retainer strap (Vectra)	Stainless steel 316 / 316 S/S								
Screen	PPO								
Bottom (PPO)	Nylon	Cast iron C Nickel coat.	Stainl. steel	Cast iron C Nickel coat.	Polycarbonate	Stainl. steel	Cast iron C Nickel coat.	Cast iron C Nickel coat.	Cast iron C Nickel coat.
Bottom (Vectra)	–	Bronze B Nickel coat.	Stainl. steel	– B Nickel coat.	–	Stainl. steel	Bronze B Nickel coat.	Bronze B Nickel coat.	– B Nickel coat.
Retainer ring	Nylon	–	–	–	Polycarbonate	–	–	–	–
Magnet	Barium/Ferrite								
Crossbar	Nylon								
Thrust roller	Nylon								
Roller insert	Stainless steel 316 / 316 S/S								

Meters for AdBlue® and aggressive media

RCDL M 25, in-line meter LM OG-I-PVC, pulse transmitter LM OG-TI-PVC

Magnetic coupling
Rugged construction
Light weight
Modular series

The ultra pure 32,5 % urea solution, also known under the name of AdBlue®, is the basis for the reduction of toxic nitric oxides in exhaust gases from diesel operated goods vehicles.
AdBlue® is made synthetically. The high purity and quality are DIN V 70070 certified.
AdBlue® can be metered with a plastic Recordall® RCDL M 25 or M 40. All Badger Meter registers can be mounted on the meters.

Technical data

Type	RCDL M25	LM OG-I-PVC	LM OG-TI-PVC
Connection	R 3/4", R1"	1/2" BSPP	1/2" BSPP
Max. operating pressure	16 bars	10 bars	10 bars
Flow range	1 – 100 l/min	0,5 – 35 l/min	0,5 – 35 l/min
Temperature range	50 °C	-10 °C to +50 °C	-10 °C to +50 °C
Accuracy	±1,5 %	±0,5 %	±0,5 %
Viscosity range	–	1 – 2000 mPas	up to 2000 mPas
Pulse per liter	100 ppl		100 ppl
Lay length	190 mm	82 mm	82 mm

Batch systems

F 110

Totalizer, from easy display up to batch controller

PC 100

High quality batch system for all batch applications

ER-10

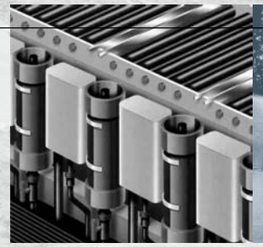
Totalizer, reversible to flow display with pulse output

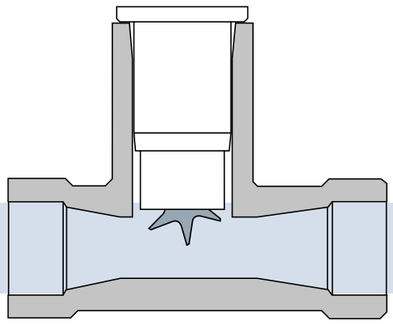
CUB 5

Multifunction register with two counters and flow displays

Impeller meters

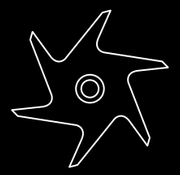
Impeller meters are a low cost alternative in irrigation systems (sprinklers, chemical injection processes in water treatment, water management, etc.), in municipalities (fluoridation, pump control, etc.) in the energy management (HVAC, building management, energy consumption monitoring, etc.) and in the general industry (batch processes for bakeries, adding color dye to water for textile, food processing, inks, and other color additive mixtures, adding liquid vitamins and nutrients to feed water for livestock, automatisation in the film industry, etc.).





Measuring principle

The series feature a six-bladed impeller design with a proprietary, non-magnetic sensing mechanism. The impeller shape coupled with the absence of magnetic drag provides accuracy and repeatability throughout the flow range of the sensors. As the liquid flow turns the impeller, a low impedance square wave signal is transmitted with a frequency proportional to the flow rate.



Flow sensors

a great versality

2" up to 48"
Special models up to 120"
Large temperature range and pressure rates
Bidirectional measurements possible
Very good price / performance ratio

Technical data I: Flow sensors

Type	200				225		226		250	228				4000		SDI	
Material																	
Brass	X				X		X			X						X	
Bronze									X								
Stainless steel		X				X		X			X						X
PVC			X										X	X			
PVDF															X		
PVCS				X													
Carbon steel												X					
Max. temperature in °C	105	150	60		105	150			105	105	150	105	60	60	104	135	150
Potted version (up to 66 °C)	X	X			X	X			X	X	X	X	X				
Max. pressure in bar																	
60 °C / 3 bar				X									X				
7 bar / 20 °C				X													
7 bar / 25 °C													X				
7 bar / 38 °C			X														
9,5 bar / 150 °C												X					
11 bar / 150 °C										X							
12 bar / 38 °C												X					
14 bar / 38 °C										X							
17 bar / 150 °C							X	X									
20 bar / 38 °C					X												
14 bar / 150 °C					X	X											
22 bar / 150 °C	X	X									X						
24 bar / 22 °C														X			
19 bar / 18 °C															X		
27 bar / 38 °C	X	X					X	X			X						
41 bar / 60 °C																X	
68 bar / 150 °C																	X

The series 200 flow sensor is an insertion style flow sensor constructed of metallic and non-metallic materials. These sensors are designed for service in corrosive and non-corrosive liquids. The series can be installed in pipe sizes of 3" up to 40" (special models up to 120") and includes a special potted version (IR models) for irrigation applications (enabling direct mounting in the earth).

T-type sensors offer another model variation. These models have been designed for indoor or protected area applications such as HVAC, heat / energy monitoring, water cooling systems, pump control and industrial process monitoring.

The 4000 series flow sensor is an inline, flow-through design using a tangential six-bladed impeller. The series is available in 1/2", 3/4", 1" pipe sizes and is molded of PVC or PVDF materials. The compact design allows the 4000 series be used in a wide range of industrial applications, among them the flow measurement of ultra pure water in the semiconductor industry.

The SDI series flow sensor offers unparalleled performance for liquid flow measurement in closed pipe systems. The impeller sensor is well suited for flow control, flow monitoring and batch type applications. The flow meter can be mounted in pipe sizes of 1,5" up to 48". This sensor can be used for water applications or as stainless steel version for corrosive fluids at high temperatures and pressure rates. Bidirectional flow measurement or battery driven systems are available as option.

Monitors and transmitters

for all flow sensor series

Universal
Energy monitoring systems
Batch controllers
Various output options

The series 2100 and 3000 are versatile flow monitors with alphanumeric LC display. They can be configured by the user to display actual flow, total flow or other parameters like optional relay status.

The batch controller type 2200 enables a large variety of flow batch processes which require volumetric or time based measurements.

Models 2300 and 3050 together with flow sensors of series 200 or SDI series offer an excellent unit for energy consumption monitoring in many buildings which are centrally controlled. HVAC processes in residential or large complexes as well as big industrial processes can be monitored.

All flow sensors can be combined with transmitters of the series 300 and 500 thus enabling the connection to overriding plotting systems like SPS or simple monitors.

Technical data: Transmitters

Type		
	310	Analog output, programmable
	320	Pulse output, programmable
	330	Relay output, programmable
	340	BTU
	340 LW-LonWorks®	BTU
	340 N2	BTU
	340 BN	BTU
	380	BTU

Technical data: Monitors

Type		
	2100	Wall mounted / Control panel mounted
	2200	Batch controller
	2300	BTU
	3000	Wall mounted / Control panel mounted
	3050	BTU

Can be extended with signal outputs.

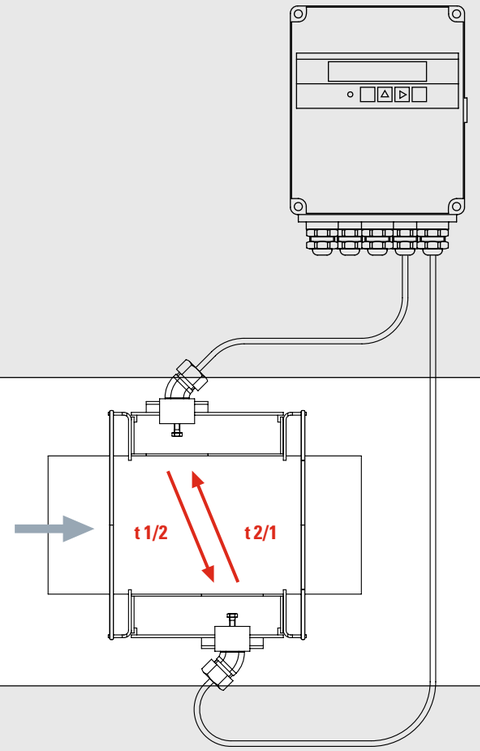
Technical data II: Flow sensors

Type	200	225 / 226	250	228		380	4000	SDI
					PVC			
Mounting in pipe sizes DN	80 – 1000	80 – 1200*	6 – 32	50 – 65	32 – 100	20 – 50	6 – 25	32 – 900**
	3 – 40"	3 – 48"	0,5 – 1,5"	2 – 2,5"	1,5 – 4"	3/4 – 2"	0,5 – 1"	1,5 – 36"
Flow range in m/s (standard)	0,15 – 9	0,15 – 9	0,1 – 4,5	0,15 – 9		0,1 – 4,5	0,6 – 6	0,1 – 6
Flow range in m/s (low flow)							0,09 – 2,5	
Accuracy (full scale / Qmax.)	±1 %	±1 %	±1 % v. M.	±1 %		±3 %	< 1 %	±1 %
Accuracy (of reading)	±4 %	±4 %						
Repeatability (full scale / Qmax.)	±0,3 %	±0,3 %	±0,7 %	±0,3 %		±0,5 %	±0,5 %	±0,5 %

*Special models up to DN 3000 / 120" **or larger upon request

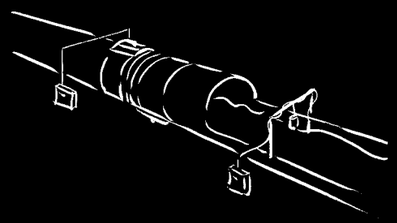
Ultrasonic flow meters

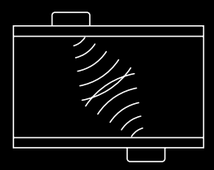
Ultrasonic flow meters are best suited for flow measurement of fluids in pressure pipes as well as in channels and semi-filled pipes.



Measuring principle (transit time)

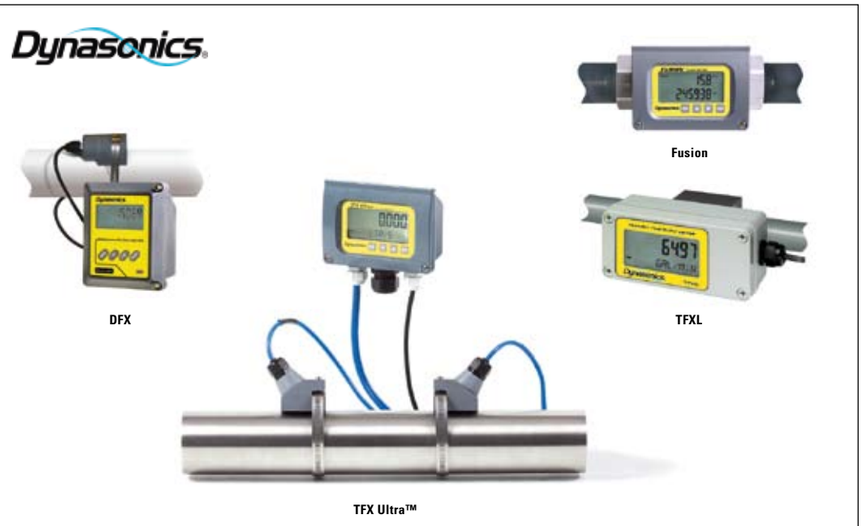
Ultrasonic signals are alternately sent in and against the flow direction. Ultrasonic energy bursts are transmitted and received via well-defined paths across the flow stream. The velocity of the flow is accurately measured by the difference in the arrival times of signals from the upstream and downstream transducers.
The transit time difference ($\Delta t = t\,2/1 - t\,1/2$) determines the average flow velocity.





Type DFX, TFX Ultra™, TFXL and Fusion

Stationary devices for flow metering in full pipes



Flexible to use
Non-intrusive metering
Long lifetime

The ultrasonic flow meter series Dynasonics® – depending on the model – uses the Doppler or transit time method. Applications can be found in water and wastewater treatment, oil and gas applications, methane extraction and underground coal gasification, power generation, cooling in semiconductor processes and in HVAC cooling and heating systems. The rugged construction ensures long life, even under extreme ambient conditions.
Type DFX is a Doppler fluid flow meter with clamp-on ultrasonic sensors for use in fixed installations.

Type TFX Ultra™ is a liquid flow and energy meter for use on many liquids and HVAC applications including hot and cold water.
Type TFXL is a low cost fixed liquid flow meter solution that can be clamped-on the outside of a pipe and does not need any maintenance.
Type Fusion is a hybrid device which automatically switches between Doppler and transit time methods to adapt the measurement to the liquid composition from clean to inpure/aerated. The device is ideal for use in fixed installations with clean, solids-bearing or gaseous liquids.

Technical data

Model	DFX (Doppler)	TFX Ultra®	TFXL	Fusion (Doppler/transit time)
Liquid types	Fluids with a minimum of 100 ppm* useful suspended sound reflectors greater than 35 microns, and at least 25 % of the total particle volume is greater than 100 microns	Most clean liquids or liquids with small amounts of suspended solids	Most clean liquids or liquids with small amounts of suspended solids	Clear, solids-bearing or gaseous liquids
Pipe sizes	DN 6 and higher	DN 15 to DN 3000	DN 15 to DN 3000	DN 15 to DN 50
Accuracy	±2 % full scale	±1 % of reading resp. ±0.003 m/s	±1 %	±1 %
Power supply	115/100/230 VAC 50/60 Hz ±15 % @ 17 VA max.; 12 – 28 VDC @ 7 VA max.	AC: 95 – 264 VAC 47 – 63 Hz @ 17 VA max. resp. 20 – 28 VAC 47 – 63 Hz @ 0,35 A max. DC: 10 – 28 VDC @ 5 W max.	11 – 28 VDC @ 0.25 A	12 – 30 VDC @ 0.1 A max.
Ambient conditions	-40 °C to +85 °C, 0 to 95 % rel. humidity (non-condensing)	-40 °C to +85 °C	-40 °C to +85 °C	-29 °C to +85 °C aluminium -29 °C to +204 °C stainless steel
Velocity range	0,05 to 9 m/s	Bi directional 0,03 bis 12 m/s	0,03 to 12 m/s	Bi directional 0,03 to 12 m/s
Display	Two line LCD, LED backlit	Two line LCD, LED backlit	Two line LCD, LED backlit	Two line LCD, LED backlit

*ppm = Particel per million

Type DXN and UFX

Portable units for flow measurement in full pipes

Quick and easy installation
Non-contact measurement
Battery powered
Clamp-on sensors

Type DXN is a fully portable flow and energy hybrid meter with clamp-on sensors, touch screen interface enabling quick and easy operation switching automatically between the most appropriate measuring principle (Hybrid, transit time and Doppler operation). The DXN benefits from an integrated data logger and is ideal for the non invasive flow measurement of clean, solids bearing or gaseous liquids in closed pipes.

Type UFX, a small, lightweight, battery powerd unit, used for checking the flow in metal or synthetic pipes.

Sensoren DXN	
Pipe size	DN 15 – DN 3000
Enclosure	
DTTSU	CPVC, Ultem® and anodized aluminum track system
Connection	Nickel-plated brass with Teflon® insulation
DTTN / DTTL / DT94 Doppler	CPVC, Ultem®
Connection	Nickel-plated brass with Teflon® insulation
Pipe surface termperature	
DTTSU / DTTN / DTTL	-40 °C to +120 °C
DT94 Doppler	-40 °C to +120 °C
Sensor frequency	
DTTSU	2 MHz
DTTN	1 MHz
DTTL	500 kHz
DT94 Doppler	625 kHz

Technical data

Model	DXN (hybrid)	UFX (handheld)
Liquid types	Liquid dominant fluids	100 ppm* of 100 micron size suspended solids or entraind gases
Accuracy	±1 % of reading	±2 % of full scale
Repeatability	±0,1 % of reading	
Power supply	Internal 11,1 V lithium-Ion battery, 6–9 hrs of continous operation with battery and indefinitely on external power.	Battery powered; non-rechargeable alkaline cells (four AAA cells), providing greater than 30 hours of continuous operation.
Ambient conditions	-20 °C to +45 °C -30 °C to +60 °C	-20 °C to +60 °C
Sensor type	Clamp-on	Clamp-on
Velocity	Bi directional 0.03…12 m/s	0,1 to 9 m/s
Display	Touch screen	One line LCD
Units	Engineering units: meter, m³, liter, million-liter, kg, feet, gallons, ft³, million-gal, barrels (Liquids & oil), acre-feet, lbs, Flow units: second, minute, hour, day	l/min, m³/h, gal/min, barrel per day
Enclosure	Water-/dust resistant (IP 64)	NEMA 4 (IP 65) ABS plastic; 0,7 kg
Dimensions	240 mm W x 197,6 mm H x 95,7 mm D	101,6 mm W x 195,6 mm H x 43,2 mm D

* ppm = Particels per million

Type MultySonic 8000

for flow measurement in open channels, fullfilled or partially filled pipes and channels, rivers up to 50 m width

Maintainance-free
Recording backflow and back up
No culverts required
Ex-approved
High accuracy
For channels from 0,2 to 50 m wide
For different channel profiles
Easy software updates via USB
Remote control via internet

The ultrasonic flow meter MultySonic 8000 has been especially designed for flow measurement of fluids in pipes (semi- or fullfilled pipes), rivers and streams with a width of 0.2 m – 50 m.
Measurements can take place in pressure pipes up to 100 bars and under highly variable levels. A variety of sensor forms and materials permit use under heavy mechanical load and in aggressive media with pH values from 3.5 to 10.

Accuracy

	Accuracies					
Inflow path	>10 D			<5 D		
Paths/Crosswise measurements	2	4	6	2 x 2	4 x 2	6 x 2
Filled pipes and filled rectangular crosssections	1,5 – 2 %	0,5 – 1 %	0,50 %	1,5 – 2 %	0,5 – 1 %	0,50 %
Open channels Partially filled pipes, running water	3 – 4 %	2 – 3 %	1 – 2 %	3 – 4 %	2 – 3 %	1 – 2 %

Technical data: Flow meter

Number of mesurement cards	1 – 4
Supply	90 – 230 VAC (24 VDC upon request)
System of protection	IP 65, optional Eexd
Display	Touchscreen, grafics, 320 x 240 points, LED background lit
Interfaces	USB, RS 232, LAN
Processor	64 Bit RISK
Operating system	Embedded Linux
Dimensions (b x h x t)	300 x 400 x 210 mm
Weight	Approx. 6 kg
Installation	Wall mounting, M 8 / M 10
Number of independent measurement points	1 – 8
Approvals	CE, Exd

Technical data: Ultrasonic board

Measurement principle	Transit-time
Number of ultrasonic transducers	8
Number of paths	4
Ultrasonic boards per measuring transducer	1 – 4 (1 – 16 measurement paths)
Number of measurement points	1 – 4
Frequency range	0,2 – 2 MHz
Path lengths	0,1 – 150 m
Measurement range	-20 to 20 m/s
Resolution	<0,001 m/s
Number of measurements	Up to 100/s (path length dependent)
	The I/O board works autonomously with its own processor
Approvals	CE, Exd

Technical data: I/O-board

Inputs 4 – 20 mA	8 counts, external or own supply
Outputs 4 – 20 mA	4 counts, external or own supply
Outputs digital	2 counts, open collector, external or self-supplied (24 VDC)
Relay	2 counts, basic / NO / NC
I/O boards per measure-ment transducer	1 or 2
	External or own supply is defined via a switch on the I/O board
	The I/O board works autonomously with its own processor

Technical data: Sensor

Sensor type	1,0 MHz	0,5 MHz	0,2 MHz	Quicklock
	For internal assembly	For internal assembly	For internal assembly	For pipe assembly from the outside
Frequency	1 MHz	0,5 MHz	0,2 MHz	1 MHz
Path lengths	0,1 – 10 m	0,5 – 40 m	3 – 150 m	0,1 – 10 m
Path angle	15 – 75° (45° Std.)	15 – 75° (45° Std.)	Freely selectable	15 – 75° (45° Std.)
Temperature range	-40 °C to +80 °C	-40 °C to +80 °C	-40 °C to +80 °C	-40 °C to +80 °C
Pressure range	Max. 10 bars	Max. 3 bars	Max. 2 bars	PN 6/16/40/100
Material (coming in contact with the medium)	PVC / PU / V4A (others upon request)	PVC / PU / V4A (others upon request)	PVC / PU / V4A (others upon request)	PVC / V4A (others upon request)
Cable length	10 – 150 m	10 – 150 m	30 – 300 m	10 – 150 m
Cable type	RG 58	RG 58	RG 58	RG 58
Delivery	By default, the sensor is supplied with a wall mounting, other mounting systems upon request.	By default, the sensor is supplied with a wall mounting, other mounting systems upon request.	The sensor mounting is specifically projected and manufactured depending on the application.	The sensor can be supplied in different structural shapes. Installing and dismantling under operating pressure possible as an option (Quicklock version).
Ex-proof version	Upon request	Upon request	Upon request	–

Type iSonic 2000, DataControl 2500 and L2 xx

for flow and level measurement in open channels, semi-filled pipes, tanks/reservoirs and stormwater overflow basins

Flow / Quantity

Level and volume measurement

Differential measurement

Pump monitoring

Data collection

High accuracy

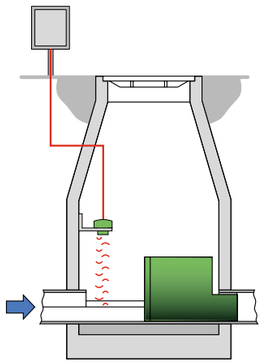
The iSonic 2000 is a versatile ultrasonic flow meter. The microprocessor-based meter was designed to measure levels/volumes in tanks or flows in open channels in combination with venturi channels, manhole flumes or effluent weirs.

The meter works according to the Echolot principle, which means that a free outlet in the channel/pipe is required for this measuring principle. Some Q/H relations are already stored in the memory. A 35 point graph can be programmed for unknown Q/H conversions.

When 2 sensors are in operation, the meter can be used for 2 channel measurements with separated totalizers or for differential measurement. The configuration of the flow meter is done via the front keypad or a PC. A data logger is integrated for recording measuring data. The memory has a capacity of approx. 44 000 records.

The DataControl 2500 is an evaluation device which can be connected to further equipments with analog or digital outputs. It is used for applications as already described for iSonic 2000. The features and functions are also similar to the iSonic 2000.

The L2 xx series is a 2-wire ultrasonic level sensor designed for continuous level measurement of liquids or viscous fluids. The maximum flow ranges are 6, 8, 10 and 15 meters depending on type at a bloc distance of ≥ 250 mm.



Manhole flume

Technical data: Type iSonic 2000 (2-channel measurement)

Housing material	Plastic, UV-resistant	
Dimensions H x L x W	240 x 270 x 76 mm	
Protection class	IP 65	
Operating temperature range	-20 °C to +60 °C	
Outputs	2 analog outputs 4 – 20 mA or 0 – 5 V, isolated	
	5 relays, max. 250 VAC / 6 A	
	2 digital outputs max. 80 VDC / 30 mA	
	RS 232 or RS 485	
	Voltage output 24 VDC / 50 mA and 12 VDC	
Inputs	2 analog inputs 4 – 20 mA, isolated	
	4 digital inputs 1,3 VDC / 2 mA, optically separated	
Display function	8-lines for level, flow rate, total, volume and distance	
Display language	English, German, Spanish, French	
Supply voltage	90 – 230 VAC or 12 – 14 VDC	
Programming	Via front keypad or PC with software (password protected)	
Measuring accuracy	BAT 78 L	±1,2 mm
	BAT 52 L	±4 mm
	BAT 35 L	±24 mm
	BAT 85	±2 mm
Data logger	2 MB flash, programmable time intervals, Capacity for approx. 44 000 records, Records available as table or graphics	

Technical data: Type DataControl 2500 (4-channel measurement)

Housing material	Plastic, UV-resistant
Dimensions H x L x W	240 x 270 x 76 mm
Protection class	IP 65
Operating temperature range	-20 °C to +60 °C
Outputs	2 analog outputs 4 – 20 mA or 0 – 5 V, isolated
	2 digital outputs max. 80 VDC / 30 mA
	6 relays, max. 250 VAC / 6 A
	RS 232 or RS 485
	Voltage output 24 VDC / 50 mA and 12 VDC
Inputs	4 analog inputs 4 – 20 mA, isolated
	4 digital inputs 1,3 VDC / 2 mA, optically separated
Display function	8-lines for level, flow rate, total, volume, distance, temperature, pH or pressure
Display language	English, German, Spanish, French
Supply voltage	90 – 230 VAC / 10 W
Programming	Via front keypad or PC with software (password protected)
Data logger	2 MB flash, programmable time intervals, Capacity for approx. 44 000 records, Table and graphics

Technical data: Sensors for iSonic 2000

Type	BAT 78 L	BAT 52 L	BAT 35 L	BAT 85
Measuring range	4 m	8 m	16 m	3 m
Offset	0,15 m	0,2 m	0,2 m	0,15 m
Beam angle	7°	8°	9°	3°
Temperature compensation	Integrated			
Cable lengths	Max. 1000 m			
Protection class	IP 68			

Technical data: Sensors L2 xx

Type	L2 08	L2 10	L2 15
Range	0,3 – 8,00 m	0,4 – 10,00 m	0,5 – 15,00 m
Current output	4 – 20 mA		
Accuracy	±0,25 % of maximum span		
Resolution	3 mm		
Point setting	With magnetic key		
Beam angle	11°		
Operating temperature	-20 °C bis 60 °C The sensor has internal temperature compensation		
Enclosure rating	IP 68		
Housing	ABS / Tefzel™, UV resistant	ABS / PVC, UV resistant	ABS / PVC, UV resistant
Supply voltage	17 V to 30 VDC (max.), 24 VDC typical operating voltage		
Approvals	EEx ia II C T6		

Weirs and flumes

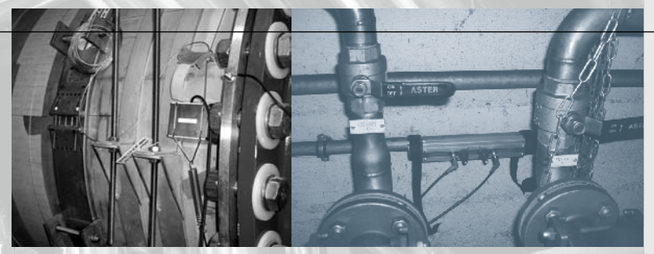
V-Weir
The weirs are calculated by us. Various shapes possible.

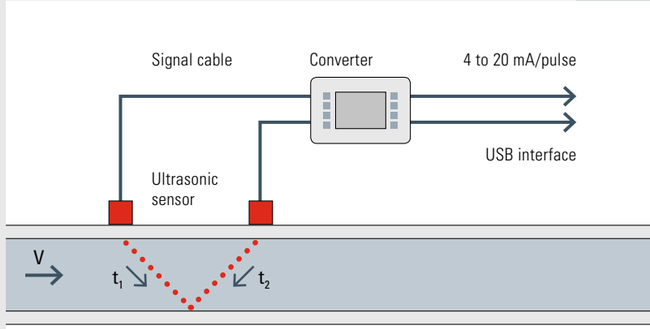
Parshall flume
available from DN 75 (Q_{max} 54 l/s) to DN 915 (Q_{max} 1577 l/s).

Manhole flume
available from DN 100 (Q_{max} 5,7 l/s) to DN 300 (Q_{max} 94,4 l/s).

Heat meters and accessories

Heat meters are used in building management, the chemical and petrochemical industry and in the food and beverage industry to measure the heat/cold quantity.

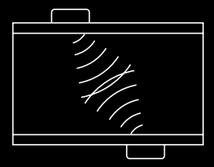




Measuring principle

The heat meters use the highly precise ultrasonic transit-time measuring principle, for which two ultrasonic sensors are externally mounted on the pipeline and connected to the electronic. The ultrasonic sensors work alternately as transmitter and receiver, and mutually send ultrasonic signals. During these transmissions, the respective signal transit times of the to-and-from signals (t_1, t_2) are measured.

The electronic measures the difference of the transit time of the ultrasonic signals going with and against the flow direction t_1 and t_2. These signals are either decelerated or accelerated by the medium flow.
The difference produced in both signal transit times is proportional to the flow rate and is used together with the pipeline geometry for a precise flow calculation.



Type DXN, TFX Ultra® and Btu 380

Stationary and mobile devices

Ultrasonic or impeller technology

DXN

TFX Ultra™

Btu 380

Technical data			
Model	DXN	TFX Ultra®	Btu 380
Pipe size	DN 50 – DN 3000	DN 50 – DN 3000	DN 20 – DN 50
Accuracy	±1 % of reading	±1 %	±3 % of full scale
Repeatability	±0,1 % of reading	±0,5 % of reading	±5 %
Voltage input	15-pin high density DSUB 0 – 5 V or 0 – 10 V, 1 % accuracy 2x RTDs PT1000 tab type; -85 °C to +300 °C measurement range 4–20 mA active/passive 1 % accuracy Rate pulse: 0 to 1000Hz	USB 2.0 RS 485 ModBus® RTU, BACnet® MS/TP (optional) 10/100 Base-T: RJ 45, Communication via ModBus® TCP/IP, EtherNet/IP™ or BACnet®/IP	ModBus® RTU BACnet® MSTP
Voltage output	0 – 5 V or 0 – 10 V output voltage, 1 % accuracy	Total pulse option: Opto isolated open collector transistor	Scaled pulses
Energy supply	Internal 11,1 V lithium-Ion battery, 6 – 9 hrs of continous operation with battery and indefinitely on external power	AC: 95–264 VAC 47–63 Hz @ 17 VA max. bzw. 20–28 VAC 47–63 Hz @ 0,35 A max. DC: 10–28 VDC @ 5 W max.	12–35 VDC 12–28 VAC
Temperature Unit Sensors DTTSU / DTTN / DTTL DT94 Doppler	 -20 °C to +45 °C -30 °C to +60 °C -40 °C to +120 °C	-40 °C to +85 °C	-20 °C to +60 °C (cold water model BTU 380 CS) +4 °C to +125 °C (warm water model BTU 380 HS)
Sensor type	RTD; 2 x platin 385, 1000 ohms, 3-wire PVC cable jacket	RTD; platin 385, 1000 ohms, 3-wire PVC cable jacket	RTD
Velocity	0,03 to 12 m/s, bi directional	> 12 m/s, bi directional	0,3 to 4,5 m/s
Display	Touch screen	Two line LCD, LED backlit	
Units	BTU, watt, joule, kilowatt	BTU, MBTU, MMBTU, tons, kJ, kW, MW	kBTU/min, kBTU/h, kW, MW, HP, tons, customer defined
Enclosure	Water/dust resistent (IP 64)	Type 4 (IP 65): powder coated aluminium, polycarbonate, stainless steell, polyurethane, nickle plated steel mounted brackets	Polycarbonate

For measurement of energy different measurement principles can be used.

The impeller model Btu 380 is used for simple in-line operations. Type Btu 380 provides BACnet® MSTP and ModBus® RTU protocols as standard. The chosen protocol can be user defined. Data about flow rates, total range, energy, total flow, temperature 1, temperature 2 and Δt can be transmitted with the RS 485.

The ultrasonic energy meters type DXN and TFX Ultra™ can be clamped-on outside of the pipe and do not contact the liquid. The energy flow meter measures energy usage in BTU, MBTU, MMBTU, tonns, kJ, kW, kWh, MW and is ideal for retrofit liquid and HVAC applications.

GSM / GPRS

for wireless data recording

Wireless measuring sites

Access via internet independently from location

Ideal for measuring sites in difficult areas

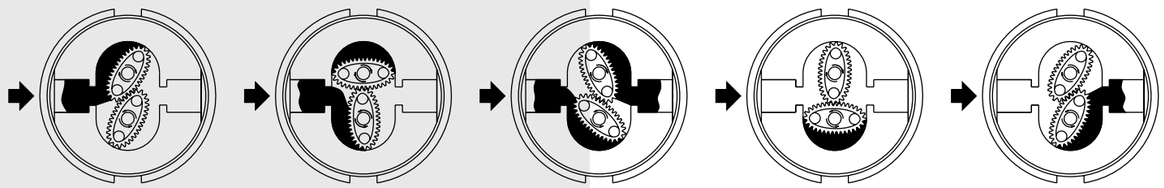
For consumption monitoring and leckage reduction in water supply systems, precise flow measurement in large channels and rivers for the monitoring of navigability and issue of flooding forecasts, or monitoring and alarm of overflow basins for rainwater, sewage plants, storm water overflow plants as well as for the control of irrigation plants or level monitoring, alarm for automatical filling and connection to the supplying system, Badger Meter offers the possibility to record wireless the measuring data coming from flow meters.

Those data are transmitted to and filed on a central server via a GPRS module. The information can be retrieved, visualised, evaluated and downloaded via a password protected access; the password is set by the customer.

The module is compatible with the following Badger Meter series: MAG meters, RCDL®, turbine meters, oval gear meters, impeller meters, ultrasonic flow meters and Coriolis mass meters.

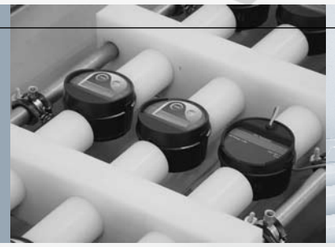
Oval gear meters

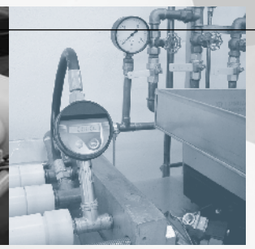
Oval gear meters are volumetric meters and are best suited for liquids with a viscosity up to 5.000 mPas. (special models up to 1.000.000 mPas.). Typical applications are mineral oils, hydraulic oils, solvents, brake fluids, coolants, transmission oils, etc.



Measuring principle

As fluid passes through the metering chamber by entering the inlet port, it forces the internal gears to rotate and exits through the outlet port. Each rotation of the gear displaces a given volume of fluid. Controlled clearances between the gears and chamber wall insure minimum leakage. As the gears rotate, a magnet on each end of the gear activates the reedswitch and forward the pulses to the display or to the pulse output.





TÜV Cert-Zertifizierungstelle der TÜV Management Service GmbH

Physikalisch-Technische Bundesanstalt Braunschweig und Berlin

Asanet

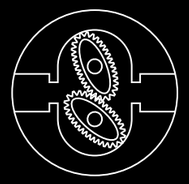
Eichdirektion Stuttgart des Landesgewerbeamts Baden-Württemberg

Bundesamt für Eich- und Vermessungswesen Österreich

National Weights and Measures Laboratory

International Organization of Legal Metrology

Český Metrologický Institut



IOG® series

for industrial applications

Combinable with all electronics and displays of the F-series

ATEX model

Various material combinations

High pressure and temperature rates

Leakproof, magnetic drive

Only two moving parts to reduce maintenance costs

The LM OG-I meters of the IOG® series are coated meters and have been designed to measure flows up to 115 l/m.

They can dispense fuels, hydrocarbons, water based fluids, motor oils, gear oils, coolants and other similar liquids, as well as special and aggressive fluids.

Technical data

Type	LM OG-TI 100	LM OG-TI 100 PVC	LM OG-TI HF 3/4“	LM OG-TI HF 1“
Flow range	0,5 – 35 l/min	0,5 – 35 l/min	3 – 60 l/min	3 – 115 l/min
Operating pressure	0,35 – 100 bars	0,30 – 10 bars	up to 100 bars	up to 100 bars
Operating temperature	-10 to +60 °C	-10 to +45 °C	-10 to +60 °C	-10 to +60 °C
Accuracy	±0,75 %	±0,5 %	±0,75 %	±0,75 %
Pulse rate	100 pulses/liter	100 pulses/liter	66,75 pulses/liter	66,75 pulses/liter
Max. reedswitch resistance	150 VAC @ 10 Watt	150 VAC @ 10 Watt	150 VAC @ 10 Watt	150 VAC @ 10 Watt
Weight	0,9 kg	0,9 kg	0,7 kg	0,7 kg
Inlet and outlet connections	1/2“ BSPP	1/2“ BSPP	3/4“ BSP	1“ BSP

Technical data type LM OG-I / LM OG-I PVC / LM OG-I stainless steel

	Coolant / windshield liquid*	Brake fluid / waste oil**	LM OG-I HF 3/4“	LM OG-I HF 1“
Flow range*	0,5 – 35 l/min	0,5 – 35 l/min	3 – 60 l/min	3 – 115 l/min
Operating pressure	10/100 bars	100 bars	up to 100 bars	up to 100 bars
Operating temperature	-10 to +60 °C	-20 to +45 °C	-10 to +60/120 °C	-10 to +60/120 °C
Accuracy (non-approved version)	±1,0 %	±0,5 %	±0,5 %	±0,5 %
Weight without handle	1,0 kg / 1,4 kg	1,0 kg / 1,4 kg	0,8 kg	0,8 kg
5-digit LCD display, 5/16“ high (8 mm)	Liters / Pints / Quarts / Gallons	Liters / Pints / Quarts / Gallons	Liters / Pints / Quarts / Gallons	Liters / Pints / Quarts / Gallons
Inlet and outlet connections	1/2“ BSPP	1/2“ BSPP	3/4“ BSP	1“ BSP
Housing	Alu / PVC / St. steel	Alu / PVC / St. steel	Alu / Stainless steel	Alu / Stainless steel
Oval gears	Delrin / Vectra / Stainless steel	Delrin / Vectra / Stainless steel	Vectra / St. steel	Vectra / St. steel

*Tested with water at ambient temperature.
**Tested with Mobil DTE-25 motor oil at ambient temperature. Min./max. flow rates will vary with fluid viscosity.

IOG® series

for industrial applications

High accuracy and repeatability

Flow ranges from 1–68 l/m

Vertical or horizontal installation

Low pressure drop

Minimum of wearable parts for long product life

Optional adjustment of lay lengthes

ATEX approval

The IOG® series is made of modular meters with economical yet highly accurate and rugged design. Due to the rugged nature of this particular flow measurement technology, the meters can be used in a number of applications where conventional meters are not acceptable.

The meters handle very viscous or highly corrosive fluids. They have been designed for a variety of chemical applications including petroleum based fluids, water solutions, and any other liquid compatible with the materials of construction.

Technical data

	1/4“ (l/h)				1/2“ (l/min)		3/4“ (l/min)		1“ (l/min)		1“ HF (l/min)		1 ½“ (l/min)		2“ (l/min)		3“ (l/min)	
Flow range	2,8-100	5,7-100	15-500	26,5-500	1-30	2-25	2-60	4,5-53	2,3-68	5,3-60	5,7-170	9,5-150	9,5-246	9,5-227	15-360	15-303	19-738	45-700
Viscosity (cP)	>5,0	<5,0	>5,0	<5,0	>5,0	<5,0	>5,0	<5,0	>5,0	<5,0	>5,0	<5,0	>5,0	<5,0	>5,0	<5,0	>5,0	<5,0
	Max. 1000 mPas. Consult factory for applications where a higher viscosity is required.																	
Accuracy (%)	±1,0	±2,5	±1,0	±2,5	±0,5	±2,0	±0,5	±2,0	±0,5	±2,0	±0,5	±1,0	±0,5	±1,0	±0,5	±1,0	±0,5	±1,0
Repeatability	±0,03 %																	
Pulses per liter	2170		390		100		66				43		17		9		3	
Operating temperature																		
Stainless steel	-30 °C up to +120 °C																	
Aluminium/PPS/ LCP	-30 °C up to +80 °C																	
Presure rating																		
NPT/BSP	10/55 bar				55 bar (800 psi)						200 bar (SS) 135 bar (Alu)		135 bar (SS) 100 bar (Alu)		100 bar (SS) 68 bar (Alu)		68 bar (SS) 50 bar (Alu)	
Flanged model	–				150 lbs – 285 psi (Alu, SS)													
	–				300 lbs – 740 psi (SS)													
	–				DIN PN 16, 16 bar													
	Please consult factory for higher pressure rates.																	
Housing/connections																		
Aluminium	NPT, BSP				NPT, BSP, 150#, 300#, PN 16													
Stainless steel	NPT, BSP				NPT, BSP, 150#, 300#, PN 16													
Materials																		
Housing	Stainless steel / Aluminium																	
Cover	Stainless steel / Aluminium																	
Rotors	Stainless steel				Stainless steel or LCP (plastic)						Stainless steel							
O-ring	Buna-N/Viton/EPDM/Aflas				Standard: Stainless steel, Aflas, Aluminium, Viton Optional: Buna, EPDM, Aflas, Viton						Aflas/Viton							

Electronical meters

for lubricants, approved and non-approved


LM OG-CNDA
LM OG-CNDA
MID approved


LM OG-PNDK
LM OG-PND(A)


LM OG-CND
LM 1800 PG-E

Rugged construction
Easy battery exchange
User friendly

The electronical meters are of modular design. The electronic register is controlled by wetted magnets.
Robustness, easy handling and maintenance are features of the meter series.

Easy menu driven electronic, freely programmable dispense quantities, integrated memories, display of flow and large grafic display define the electronic preset meters of the LM OG-P series. The battery can be exchanged very easily from outside while saved data remain untouched.
This series is available as either approved version or non approved version.

Technical data

Type	LM OG-CND(A)	LM OG-PND(A)*	LM OG-PNDK	LM 1800 PG-E	LM OG-CND	LM OG-HF CND
Connection	1/2" BSP	1/2" BSP	1/2" BSP	1/2" BSP	1/2" BSP	3/4" BSP
Max. operating pressure	100 bars	100 bars	100 bars	70 bars	100 bars	100 bars
Flow range	1 – 35 l/min (1 – 10)*	1 – 30 l/min (1 – 10)*	1 – 30 l/min	1 – 15 l/min	1 – 35 l/min	3 – 60 l/min
Temperature range	-10 °C to +50 °C	-5 °C to +50 °C	-5 °C to +50 °C	-5 °C to +50 °C	-10 °C to +50 °C	-10 °C to +50 °C
Accuracy	±0,5 % (±0,3)*	±0,5 % (±0,3)*	±0,5 %	±0,5 %	±0,5 %	±0,5 %
Viscosity range	20 – 2000 mPas	up to 2000 mPas	up to 2000 mPas	up to 50.000 mPas	up to 5000 mPas	up to 5000 mPas
Display	5-digit LCD display	5-digit LCD display**	6-digit LCD display	6-digit LCD display	6-digit LCD display	6-digit LCD display
Calibration	can be calibrated	can be calibrated	can be calibrated	can be calibrated	can be calibrated	can be calibrated

* Data in brackets are for approved versions.
** Measuring units, free programmable: Liters, quarts, pints, gallons

Pistol grip PG-121
with 1/2" swivel

Swivel PG-107
1/2" BSP inside, 1/2" BSP outside

Sight glass PG-113

Electronical meters

for high flow


LM OG-HF CND

Low pressure loss
Rugged construction
Large flow range
High pressure rates up to 100 bars
No wearing parts

The High Flow meter series LM OG-HF has been designed to measure flows up to 115 l/min. The meters are modular, of rugged construction and shockproof.

The electronic register is microprocessed and powered by a Lithium battery. Measuring units like liters, pints, quarts or gallons can be entered.

The meters are used to dispense lubricants in non-custody transfers in repair and service workshops.

Typical fluids metered are motor oils and automatic transmission oils up to 5.000 mPas.

Technical data

Type	LM OG-HF 1"	LM OG-HF 3/4"	LM OG-HF CND 3/4"
Accuracy	±0,5 % of flow	±0,5 % of flow	±0,5 % of flow
Flow range	3 – 115 l/min	3 – 60 l/min	3 – 60 l/min
Max. operating pressure	100 bars	100 bars	100 bars
Operating temperature	-10 °C to +60 °C	-10 °C to +60 °C	-10 °C to +60 °C

Outlet PG-114
Outlet 1/2", BSP, 90° flexible with swivel

Outlet PG-1011
Metallic outlet 30° bent, antidrop, with adjusting nut

Mechanical meters

for high viscous lubricants


LM 1800 PG-B


LM 1800 PG-M

Rugged construction
Reliable
Very large viscosity range

The hose end meters are used in combination with overhead hose reels in the automotive servicing industry to dispense motor and automatic transmission oils.
The meters are best suited for the measurement of high viscous mineral oils in non-custody transfer applications.

Technical data

Type	LM 1800 PG-B	LM 1800 PG-M
Connection	1/2" BSP	1/2" BSP
Max. operating pressure	70 bars	70 bars
Flow range	1 – 15 l/min	1 – 15 l/min
Temperature range	-10 °C to +70 °C	-10 °C to +70 °C
Accuracy	±0,75 %	±0,75 %
Viscosity range	50 – 50.000 mPas	50 – 50.000 mPas

In-line meters

Approved and non approved

LM OG-A

LM OG

LM OG-K

UH-M

High accuracy

Rugged construction

The meters are of modular design and have been designed as inline meters and hose end meters for wall-mounting in oil lines.
They are best suited for approved and/or non-approved consumption measurements of lubricants in repair centers.
Typical liquids measured are motor oil and automatic transmission oil up to 5.000 mPas.

The electronic register is controlled by wetted magnets. Robustness, easy handling and maintenance are features of the meter series.
The electronic unit is shockproof and insulated against oil.

The mechanical inline meter type UH-M is ideal for the use in extreme temperature conditions. This meter has a resettable totalizer 1–10 l and a non-resettable totalizer, 5 digit register.

Technical data

Type	LM OG-A	LM OG	LM OG-K	UH-M
Connection	1/2" BSP	1/2" BSP	1/2" BSP	1/2" BSP
Max. operating pressure	100 bars	100 bars	100 bars	70 bars
Flow range	1 – 10 l/min	1 – 35 l/min	1 – 35 l/min	1 – 15 l/min
Temperature range	-10 °C to +50 °C	-10 °C to +50 °C	-10 °C to +50 °C	-10 °C to +70 °C
Accuracy	±0,3 %	±0,5 %	±0,5 %	±0,5 %
Viscosity range	20 – 2000 mPas	up to 5000 mPas	up to 5000 mPas	50 – 50.000 mPas
Calibration	can be calibrated	can be calibrated	can be calibrated	–

Pulse transmitters

Approved and non approved

LM OG-T 100

LM OG-TAER 200

LM OG-TK 100

LM OG-HFT

Rugged construction

Type LM OG-T 100 is an in-line meter with pulse output.
Registers are available with either one channel pulse output (100 ppl) or two channels pulse output (100 ppl per channel, 90° offset).

Type LM OG-TAER 200 is an in-line meter for custody transfers with PTB approval for installation into any management system.
This meter can be calibrated and has a two channels output (100 ppl per channel, 90° offset).

Type LM OG-TK is best suited for fluids like brake fluids and other media.

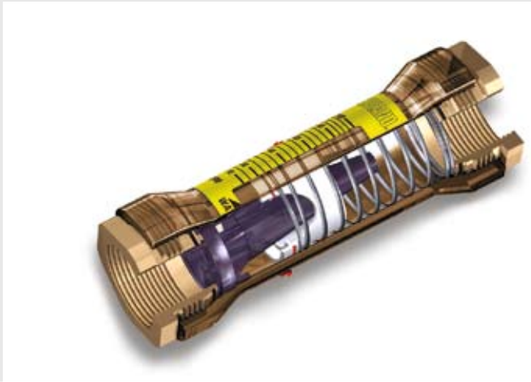
Technical data

Type	LM OG-T 100	LM OG-TAER 200	LM OG-TK 100	LM OG-HFT 3/4"	LM OG-HFT 1"
Connection	1/2" BSP	1/2" BSP	1/2" BSP	3/4" BSP	1" BSP
Max. operating pressure	100 bars	100 bars	100 bars	100 bars	100 bars
Flow range	1 – 35 l/min	1 – 35 l/min (1 – 10)*	1 – 35 l/min	3 – 60 l/min	3 – 115 l/min
Temperature range	-10 °C to +50 °C	-10 °C to +50 °C	-10 °C to +50 °C	-10 °C to +60 °C	-10 °C to +60 °C
Accuracy	±0,5 %	±0,3 %	±0,5 %	±0,5 %	±0,5 %
Viscosity range	up to 5000 mPas	20 – 2000 mPas	up to 5000 mPas	up to 5000 mPas	up to 5000 mPas
Pulses per liter	100 ppl	100 ppl per channel	100 ppl	66,75 ppl	66,75 ppl
Calibration	–	can be calibrated	–	–	–

* Data in brackets are for approved versions.

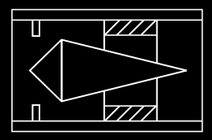
Variable area flow meters

Hedland® variable area flow meters are the industry benchmark. This product line has grown to over 15.000 flow meters constructed of aluminium, brass or stainless steel with variable measuring area for liquids, oil, water, compressed air and many other fluids and gases.
Hedland® meters are recommanded for use in machine cooling and lubrication, packaging, semiconductor production, high pressure and hose applications, automotive and aviation industry as well as in the mining industry.



Measuring principle

The variable area flow measurement method allows fluids (liquids and gases) volume streams to be determined. A moving sharp-edged orifice is located within the piston assembly, forming an annular opening with the contoured metering cone. The piston assembly carries a cylindrical PPS/ceramic magnet that is magnetically coupled to an eternal indicating magnet, which moves precisely in direct response to movement of the piston therefore providing a visual display of the flow rate.



Type EZ-View®

Low cost meter for oil, water and other liquids

HEDLAND®

Rugged construction

Installation in any position

Shock and vibration insensitive

Instantaneous direct reading

The EZ-View® variable area flow meters are rugged, low-cost direct reading meters.They are simple to install in any orientation from vertical to horizontal, upside down etc. without sacrificing measurement performance. Flow straighteners, located in the inlet and outlet, allow the flow meter to be less sensitiv to turbulent flow conditions. Further straighteners or other special installation is not required.
Constructed of high impact PPSU, the EZ-View® product line offers excellent structural integrity and chemical compatibility with a wide range of industrial chemicals.

EZ-View® flow meters provide instantaneous, direct-reading flow rate measurement of liquids in closed piping systems. The transparent PPSU body allows visual inspection of the fluid condition as well as viewing of the internal flow indicator relative to al calibrated flow scale. EZ-View® does not require electrical connections.

Technical data

Fluid	Flow range
Water based fluids	2 to 100 l/min
Water	2 to 380 l/min
Oil	10 to 380 l/min

The H-Series

Variable area in-line flow meters

HEDLAND®

Rugged, durable construction in aluminium, brass or stainless steel

Installation in any position

Available from ¼" to 2" and 3"

Direct reading

360 ° rotable guard scale

The unique spring loaded design of this variable area flow meter for common fluids reduces viscosity sensitivity. Variable area meters are in-line meters.

The Hedland® variable area flow meters are the most readable products in their class to monitor a wide range of liquids, petroleum-based fluids, phosphate ester liquids, water, water-based fluids or water/oil emulsions. A pneumatic series is also available for metering air and compressed gases.
All meters are available as basic flow meters, test kits or for high temperatures, corrosive liquids and gases.

Technical data

Meter for fluids			
Version 240/410 bar (3500/6000 psi)	Basic model	Test kit	High temperature
Petroleum-based	x	x	x
Phosphat ester based	x	x	x
Water-based, water/oil	x	x	x
Water and other fluids	x		x
Oil, caustic and corrosive fluids	x		
Meter for pneumatic applications			
Version 70/100 bar (1000/1500 psi)	x		
Version 41 bar (600 psi)		x	

MR series and Flow-Alert™ switch

For fluids, air and compressed gases

Mounting in any position

Automatically signal alarms

The Hedland® MR series can operate as part of a totally integrated electronic process control/data acquisition system with digital flow rate and total flow indication and non-contact sensor electronic integration. In-field compensation for specific gravity, viscosity, pressure and temperature of pneumatic system is also available.

The Flow-Alert™ switch flow meters are rugged, long-term variable area flow meters for measurment of flow volumes. This product provides a local flow indication and automatically signals the operator or PLC if flow is too high or too low.
Special scales are available according to customers request. Flow-Alert™ flow meters are available in single switch, double switch, reed switch and micro switch versions.
There is no need for flow straighteners or special piping requirements.

Type Vista-Gage™, Vista-Gage™ Vacuum, Vista-Cator™, Vista-Monitor™

High pressure, low pressure and vacuum pressure indicators, accumulator monitor

Rugged brass construction

Pressure range from 0.8 to 345 bar

Temperature range from -40 °C to +116 °C

Mounting in any position

The Vista-Gage™ Hi-Pressure is a unique piston-type pressure indicator, specifically designed to withstand machine vibration, shock, pulsation, pressure surges and other rigorous conditions that create problems for conventional pressure gauges with fragile bourdon tube mechanisms.
The Vista-Gage™ is ideal for heavy duty construction vehicles and other off-the-road-mobile equipment, as well as hazardous industrial applications, such as injection molding or die casting operations.
Vista-Gage™ is easy and less costly to install. It can operate in any position, from vertical to horizontal. The cylindrical pressure indicator scale provides full 360 ° readability. There is no need for snubbers, needle valves, isolator valves or other costly components to protect the gage.

Vista-Gage™ Lo-pressure offers the same rugged features and operation reliability of the high pressure Vista-Gage™, with the added safeguard of a built-in Buna-N diaphragm seal to eliminate even the smallest possibility of a leak. The low pressure gage is available with pressure range from 0.83 to 6.9 bar.

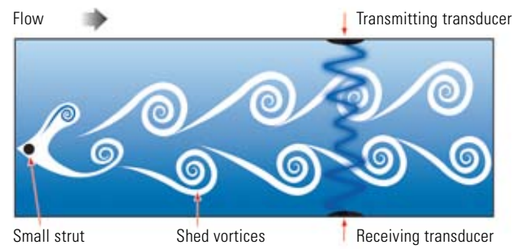
VistaGage™ Vacuum ist designed to monitor vacuum pumps and other process system components in vacuum ranges. This unique gage is able to withstand pulsations and surges well beyond its rated capacity, without damage. The built-in EPM® diaphragm seal eliminates the risk of leaks, making it ideal for industrial-class vacuum system applications.

Vista-Cator™ is a simple GO/NO-GO pressure indicator, with a broadband tri-color scale, designed to function as an emergency warning device in applications that do not require a precise indication of minor fluctuation in operating pressure.

Vista-Monitor™ is a permanent accumulator monitor, operating with liquids or gases in a pressure range of 1.4 to 207 bar and temperature range of -40 °C to +116 °C. Vista-Monitor™ is designed with a rugged construction. It withstands shock, vibration and over-pressurization. Easy to install and maintaining.

Vortex meters

Racine® vortex flow meters utilize ultrasonic sensing technology, allowing the meters to perform with an extremely small bluff body. As a result, system pressure drop and meter turn-down ratio are greatly improved. The meters benefit from a wide measuring range (up to 70:1) and high accuracy (1 % of reading). By using intelligent electronic and HART® communications Racine® vortex meters are ideal for process engineering systems and refinery. The unit does not use moving parts and requires little or no maintenance.



Measuring principle

Within the flow meter as flowing media moves across the strut or "bluff bar" vortices are also shed, but on a smaller scale. The meter transmits an ultrasonic beam through the vortex pattern downstream of the strut. As vortices are shed, the carrier wave of the ultrasonic signal modulates. The modulation of the carrier wave is measurable and proportional to the number of vortices shed. Digital processing enables the vortices to be counted, and this value is converted into a velocity.

Type RWG & RWBG, RNG insertion and RNL in-line

Wafer gas meters, insertion meters, in-line meters in stainless steel

High accuracy

Low pressure drop

HART® communication protocol

The models RWG and RWGB are designed for high accuracy and extremly low pressure drop. There are no moving parts necessary and after installation there is nearly no need of maintenance. The models RWG are usable for most of gases.

Type RWBG has a similar construction and is ideal for use with digester gas applications as p. e. $CH_4 + CO_2$ mixtures. Meters of this series are built with two-wire technology with standard HART® communication for easier programming and system integration.

Type RNG insertion gives highly precise measurements for liquids and the RNG is used in applications of metering gases (flare gas, stack gas, natural gas, biogas) and air.

The insertion-style meter Type RNL is characterized by very low pressure drop and is used in cooling towers, pools and waterparks. It also is used in the municipal water treatment, ground water monitoring or in irrigation systems.

Technical data

Model	RWG / RWBG	RNG Insertion	RNL Insertion
Medium	Gas/air	Gas/air	Fluids
Flow range	0,1 – 7,5 to 9,5 – 280 l/s	0,6 – 43 m/s	0,6 – 5,5 m/s
Accuracy	±1 % of reading over the upper 90 % of the flow range	±1 % of reading over the upper 90 % of the flow range	±2 % of reading
Repeatability	0,5 % of reading	0,5 % of reading	0,5 % of reading
Output signal	2-wire, 4 – 20 mA loop	2-wire, 4 – 20 mA loop	2-wire, 4 – 20 mA loop 3-wire, 4 – 20 mA and/or pulse
Input power	24 VDC	24 VDC	13 to 32 VDC
Certification	CE: EN61326-1:2002 Optional: ATEX II 2G Ex ib IIB T4 Zone 1 Group IIB T4 and AEx ib IIB T4	CE: EN61326-1:2002 Optional: ATEX II 2G Ex ib IIB T4 Zone 1 Group IIB T4 and AEx ib IIB T4	CE

RVL series

In-line and wafer liquid meters / thermoplastic

For corrosive fluids

High accuracy

No moving parts

The RVL series meter utilizes vortex-shedding technology to provide a repeatable flow measurement accurate to 1 percent of full scale. The meter has no moving parts, and any potential for fluid contamination is eliminated by the meter's corrosion-resistant all plastic construction. The meter includes a compact two-wire (4 – 20 mA) or three-wire (0...5 Volt DC or pulse) transmitter, contained within a conveniently replaceable plug-in electronic module. All electronics are housed in a corrosion-resistant enclosure.

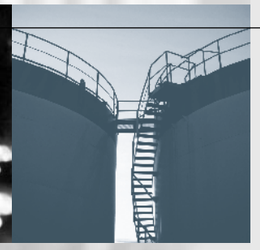
Unlike meters containing metal or moving parts, the RVL is perfect for aggressive or easily contaminated fluids. Applications range from ultra-pure water to highly corrosive chemicals and slurries. Units may be re-calibrated and the meter output span reprogrammed in the field. RVL meters are available in the following materials of construction: CPVC, PVC, PVDF and Polypropylene (PP).

Technical data

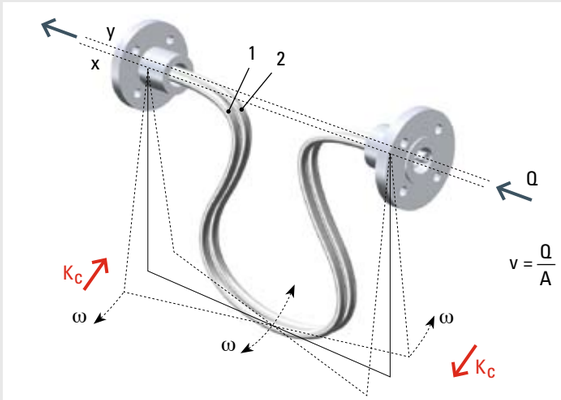
Model	RVL-Inline	RVL-Inline flare end	RVL Wafer
Connections	Butt or NPT-thread	Pipe (flare-end)	Wafer
Pipe size	DN 15 – DN 50 (1/2" to 2")	DN 15 – DN 25 (1/2" to 1")	DN 15 – DN 75 (1/2" to 3")
Flow ranges	2 – 18 l/min to 60 – 750 l/min	2,3 – 18,9 l/min to 7,9 – 94,6 l/min	4,7 – 56,8 l/min to 94,6 – 1135,5 l/min
Accuracy	±1 % of full scale, 4 – 20 mA and 0 – 5 VDC ±2 % of full scale, frequency pulse		
Repeatability	±0,25 % actual flow		
Output signal	4 – 20 mA, 0 – 5 VDC or frequency pulse (source/sink-driver; 1A source / 1.5A sink; typical output resistance 10 ohms)		
Input power	13 to 30 VDC		
Certification	CSA standard C22.2 no. 0-M and no. 142-M, CE		
Material options	PVC, CPVC, PVDF	PVDF	PVC, CPVC, PP, PVDF

Coriolis mass meters

Coriolis mass meters are recommended for the direct, continuous measurement of the mass of flowing liquids independently of their conductivity, density, temperature, pressure and viscosity in the food, chemical and petrochemical industries. They are best suited to measure chemicals, liquid food, suspensions, molasses, inks, lacquers, pastes, etc.



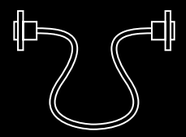
A	Cross section of pipe
M	Mass
ω	Angular velocity
v	Flow velocity
Q	Flow
K_C	Coriolis force
1 and 2	Measuring tubes



Measuring principle

Coriolis mass flow metering is based on the physical principle that a force, the so-called Coriolis force, acts on a mass that is moving towards or away from the point of rotation within a rotating system.

The symmetrical arranged measuring tubes 1 and 2 are vibrated against each other in the X and Y axis. The limbs RS 1 and RS 2 of the measuring tube 1 and the limbs RS 1 and RS 2 of the measuring tube 2 oscillate on a circular segment in case of zero flow.



Coriolis mass meter type MMC2

for the water industry, chemistry / petrochemistry, paper industry

Accuracy of 0,1 % of range

Sturdy design

Virtually wear-free

Heatable up to 200 °C

Insensitive to noise for example from external vibrations or from gas and solid content in the fluid

Ex-proof

Flow meter sensor		
Model number	MMC2	
Flange DIN 2501 / EN 1092-1	DN 15 – DN 150	PN 40 – PN 100
Flange ASME B16.5	1/2" – 6"	CL 150 – CL 600
Threaded pipe connection DIN 11851	DN 15 – DN 100 (1/2 – 4")	
Tri-Clamp®	DIN 32676 (ISO 2852) DN 15 – DN 100 (1/2 – 4")	
Aseptic flange DIN 11864-2	DN 15 – DN 100 (1/2 – 4")	
„G" threaded pipe connection	–	
NPT threads pipe connection	–	
Accuracy of mass flow rate	0,1 % / 0,15 % / 0,25 % / 0,4"	
Accuracy of density	0,005 kg/l, 0,001 kg/l	
Accuracy of temperature	1 K	
Materials in contact with fluid	Stainless steel, Hastelloy C-4	
Protection class acc. to EN 60529	IP 67	
Fluid temperature	-50 °C to +200 °C	
Transmitter		
Model number	MME2 / MMC23, MMC27	
Housing	Separate, field-mount housing/compact housing	
Cable length	Up to 50 m; 300 m on request	
Supply power	100 – 230 V AC, 24 V AC/DC	
Current output 1	Active: 0,4 – 20 mA or passive: 4 – 20 mA	
Current output 2	Passive: 4 – 20 mA	
Pulse output	Active (non-ignition-proof) or passive	
Ext. output switch-off	Yes	
Ext. totalizer reset	Yes	
Forward / reverse flow metering	Yes	
Communication	HART® protocol, PROFIBUS® PA, FOUNDATION, Fieldbus®	
Pipe empty detection	Yes, based on preconfigured density alarm < 0,5 kg/l	
Self-monitoring, diagnostics	Yes	
On-site desplay / totalization	Yes	
Field optimized flow / density	Yes	
Protection class acc. to EN 60529	MME2: IP 65 / 67, NEMA 4X MMC: IP 67, NEMA 4X	

The Coriolis MultyMass MMC2 enables the measurement of mass and volume flow, density, concentration and temperature with a single measuring instrument. It is also well-proven for lime milk density measurement. Other typical applications are the dosing of expensive biocides and high-precision fuel supply to burners in power plants where an important increase in efficiency is achieved through direct fuel mass flow measurement.

In the chemistry and petrochemistry it is ideal for filling or dosing of oils, solvents and chemicals.
It measures online the mass and volume flow, density, concentration and temperature of different fluids.

In the pulp and paper industry the Coriolis sets the standards in color and coating kitchens. It is perfect for the measurement of expensive chemicals, for air content measurement around the head box and especially for precise measurement of high viscosity fluids whilst maintaining a huge turndown ratio.

Approvals	
Explosion protection conforming to ATEX, IEC (KEM 08 ATEX 0150X / 0151X), (IECEx KEM08 00.0034X)	Zone 0 / 1 / 2 Dust-ignition-proof
FM explosion protection (PID: 3015261)	Class I Div. 1 Class I Div. 2
Other approvals for potentially explosive areas	On request
Hygienic and sterile requirements	FDA

Coriolis mass meter type MMC2 Hygiene and MME2

for food or as remote version

Accuracy of 0,1 % of range

Excellent cleanability, EHEDG certified

CIP and SIP suitable up to 200 °C

Polished fluid wetted parts

Insensitive to noise for example from external vibrations or from gas and solid content in the fluid

The Coriolis MultyMass MMC2 is used for many applications in dairies, breweries, the alcohol industry, the beverage industry and starch production.
Direct calculation of concentration like Brix, Plato or Baumé provides advantages for blending processes of, for example, fruit juices or for the fat content adjustment of milk.

As the Coriolis MultyMass MMC2 is insensitive to noise from gas or solid content in the fluid it is ideal for the most demanding applications in the pharmaceutical, food and beverage industry.

Approvals	
Explosion protection conforming to ATEX, IEC (KEM 08 ATEX 0150X / 0151X), (IECEx KEM08 00.0034X)	Zone 0 / 1 / 2 Dust-ignition-proof
FM explosion protection (PID: 3015261)	Class I Div. 1 Class I Div. 2
Other approvals for potentially explosive areas	On request
Hygienic and sterile requirements	FDA, EHEDG

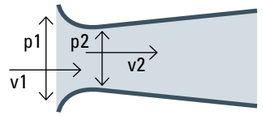
Flow meter sensor	
Model number	MMC2 _ _ _3
Flange DIN 2501/EN 1092-1	–
Flange ASME B16.5	–
Threaded pipe connection DIN 11851	DN 20 – DN 80 (3/4 – 3")
Tri-Clamp®	DIN 32676 (ISO 2852) DN 20 – DN 80 (3/4 – 3")
Aseptic flange DIN 11864-2	DN 20 – DN 80 (3/4 – 3")
„G" threaded pipe connection	–
NPT threads pipe connection	–
Accuracy of mass flow rate	0,1 % / 0,15 % / 0,25 % / 0,4"
Accuracy of density	0,005 kg/l, 0,001 kg/l
Accuracy of temperature	1 K
Materials in contact with fluid	Stainless steel 1.4435 (316 L)
Protection class acc. to EN 60529	IP 67
Fluid temperature	-50 °C to +200 °C
Transmitter	
Model number	MME2 / MMC23, MMC27
Housing	Separate, field-mount housing/compact housing
Cable length	Up to 50 m; 300 m on request
Supply power	100 – 230 V AC, 24 V AC/DC
Current output 1	Active: 0,4 – 20 mA or passive: 4 – 20 mA
Current output 2	Passive: 4 – 20 mA
Pulse output	Active (non-ignition-proof) or passive
Ext. output switch-off	Yes
Ext. totalizer reset	Yes
Forward/reverse flow metering	Yes
Communication	HART® protocol, PROFIBUS® PA, FOUNDATION, Fieldbus®
Pipe empty detection	Yes, based on preconfigured density alarm < 0,5 kg/l
Self-monitoring, diagnostics	Yes
On-site desplay/totalization	Yes
Field optimized flow/density	Yes
Protection class acc. to EN 60529	MME2: IP 65 / 67, NEMA 4X MMC: IP 67, NEMA 4X

Differential pressure flow meters/Venturi tubes

Venturi tubes are low-cost and work absolutely maintenance-free. Primary flow elements are used to provide accurate differential pressure readings, to obtain flow rate information for gases and liquids and industrial steam processes.
Pitot meters are used in aircraft or shipbuilding for applications with water, clean liquids, air, gas and steam producing processes by saturation or heating. The standard pressure and temperature values are in the range of 55 bar and 425 °C.
Hot-tap systems are specifically designed for use at high temperatures and high pressures.

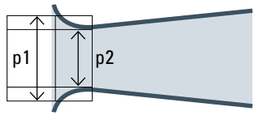
Bernoulli equation

$$\frac{v1^2 + p1}{2D_s} = \frac{v2^2 + p2}{2D_s}$$



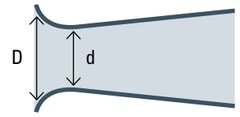
Differential pressure

p1 - p2



Beta ratio

d/D



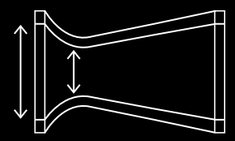
d	Throat diameter
D	Pipe ID diameter
p1	Pressure before flowmeter
p2	Pressure at restriction
v1	Velocity measurement #1
v2	Velocity measurement #2
D_s	Density of fluid

Measuring principle

Due to the conical design of the venturi tubes, the flow of a fluid (gas, water, air) at the narrowest point of the low-pressure (p2 = dynamic pressure) results in the accumulation of the medium and at the outlet of the constriction the highest pressure is forming (p1 = static pressure). The pressure difference (incompressible, without friction) for liquids generated by the Bernoulli equation.

Pitot tubes also work on the basics of the Bernoulli equation. In contrast to the venturi tube, work is done with the help of a second tube which is oriented parallel to the flow of the medium, such that the flow impinging on a front pipe opening. In front of the tube is formed the dynamic pressure, behind the tube, the static pressure. This remains constant.

By different shaped pipe openings, measurement results can be affected. By the elliptical shape of the shaft, lowest permanent pressure loss (type Ellipse®) is achieved.
In contrast trapezoidal pipe openings create strong vortex shedding in the measuring body and thus impede the flow, resulting in a very high flow resistance.
All devices can be used both vertically and horizontally.



Type Ellipse®

for fluids, gases and Steam

DN 50 to DN 3050 (2″ to 120″)
Accuracy ±0,75 %
Low pressure drop

The type Ellipse® of Preso® covers the whole range of differential pressure flow measurement. Preso's patented elliptical design outperforms and provides great turndown ratio 17:1 and lowest pressure drop.

The model measures liquids, gases or steam in pipe sizes from DN 50 to DN 3050 (2 "to 120") with an accuracy of ±0.75 % of reading.

Technical data

Ellipse®	Fluid	Pipe size	Pressure	Temperature	Accuracy	Material
Ellipse® AR – annular	Liquids, gases	DN 50 to DN 1800	55 bar max.	425 °C max.	±0,75 % of reading	Stainless steel
Ellipse® AF – Pitot tube, annular, flanged	Air, liquids, gases	DN 50 to DN 1800	Vary per flange ratings	Vary per flange ratings	±0,75 % of reading	Stainless steel
Ellipse® AS – annular for steam	Steam	DN 50 to DN 1200	40 bar	250 °C max.	±0,75 % of reading	Stainless steel
Ellipse® ASF – annual for steam, flanged	Steam	DN 50 to DN 1200	Vary per flange ratings	Vary per flange ratings	±0,75 % of reading	Stainless steel
Ellipse® AHR – annular, low pressure	Air, liquids, gases	DN 50 to DN 900	5/10 bar	65 °C	±0,75 % of reading	Stainless steel
Ellipse® AHL – Pitot tube, high pressure	Air, liquids, gases	DN 50 to DN 750	55 bar max.	425 °C max.	±0,75 % of reading	Stainless steel
Ellipse® AHL-GD – high pressure	Air, liquids, gases	DN 50 to DN 750	55 bar max.	425 °C	±0,75 % of reading	Stainless steel, carbone steel
Ellipse® AHS – Pitot tube threaded for steam	Saturated and superheated steam	DN 50 to DN 600	55 bar max.	425 °C max.	±0,75 % of reading	Stainless steel
Model BIN – annular round	Air, gas	DN 50 to DN 150	27 bar	120 °C		Stainless steel
BAR Ellipse® – Pitot tube, annular	Liquids, gases	DN 50 to DN 600	27 bar	120 °C	±0,75 % of reading	Stainless steel, brass, polycarbonate
BHL Ellipse® – Pitot tube, Hot-tap	Liquids, gases	DN 50 to DN 600	27 bar	120 °C		Stainless steel, brass, polycarbonate
PFA – Water pump system Ellipse®	Liquids	DN 50 to DN 400	27 bar	120 °C	±0,75 % of reading	Stainless steel, brass, polycarbonate

Venturi tubes

for fluids

The Preso® Venturi offers reduced operating costs, proven accuracy, and greater rangeability.
Low permanent pressure loss characteristics, due to the Venturi's "low-loss" unique design, reduced energy costs and result in the lowest operating cost.

Preso® Venturi can be installed in any position. The Venturi is suitable for a wide range of conditions in water/wastewater, industrial, institutional, HVAC applications and the food and process industry.

Technical data

Venturi model	Application	Material
SSL – Classical (Herschel) design	Fluids, gas, steam	To be specified
SSM – Hydraulic design (Nozzle type)	Fluids, gas, steam	Stainless steal, carbone steel, brass
LPL – Low-loss design (short form)	Fluids, gas, steam	Stainless steal
VISSL – Insert type, classical design	Fluids, gas, steam	Stainless steal
VISSM – Insert type, hydraulic design	Fluids, gas, steam	Stainless steal
VILPL – Insert type, low-loss design	Fluids, gas, steam	
CV Serie	Fluids, gas	Carbone steel, polycarbonate, brass
V-Serie – Low-loss design	Industrial applications	Stainless steal, polycarbonate, brass

Venturi orifice plate

Type Coin®

for fluids, gases, steam, air and slurry

High accuracy
Low pressure drop

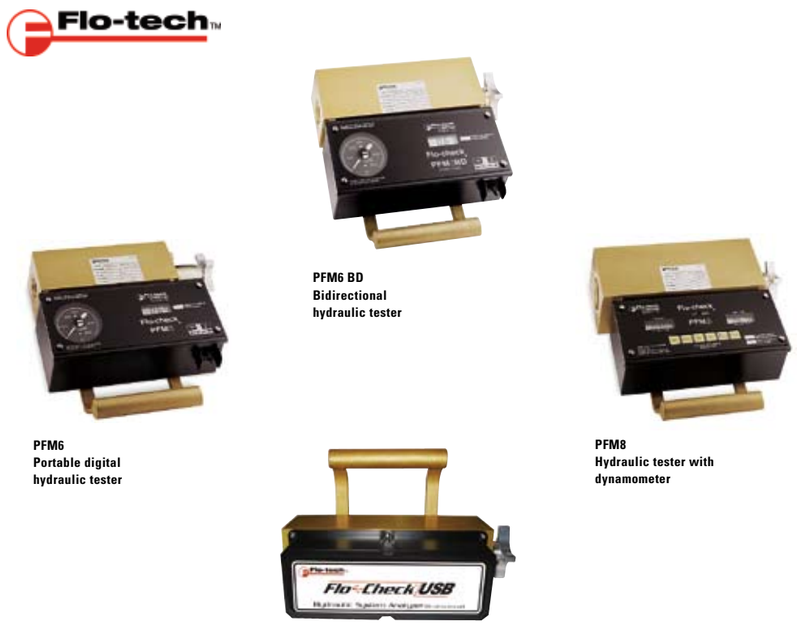
The basic flow equation for the Coin® series is derived from Bernoulli's theorem (energy balance and the continuity equation). An engineered restriction creates a differential pressure that equates to a mass or volumetric rate of flow. Different height (H) over diameter (D) ratios are specified to handle different flow ranges. A Coin® flow meter can solve your most difficult flow measurement applicatons.
You get accurate, reliable results from the Coin® flowmeter.
Due to its rugged construction, the Coin® flow meter can accommodate most flows, clean fluids, steam, gas, air, slurries, even the most abrasive and corrosive processes including high viscosity fluids.

Technical data

Coin®	Material	Pressure	Temperature
Coin® NW Wafer NPT	Stainless steel, carbonate steel or others	20 bar max.	90 °C
Coin® NN NPT	Stainless steel, carbonate steel or others	68 bar max.	200 °C
Coin® NB Butt weld NPT pressure taps	Stainless steel, carbonate steel or others	68 bar max.	200 °C
Coin® NF flanged with pressure taps	Stainless steel, carbonate steel or others	Dependent on flange ratings	Dependent on flange ratings
Coin® FF flanged with pressure taps	Stainless steel, carbonate steel or others	Dependent on flange ratings	Dependent on flange ratings
Coin® Chem flanged with chemical-tee pressure taps	Stainless steel, carbonate steel or others	20 bar max.	425 °C
TransCoin® flanged with integral transmitter	Stainless steel, carbonate steel or others	100 bar max.	150 °C
MassCoin® flanged with integral transmitter and temperature sensor	Stainless steel, carbonate steel or others	100 bar max.	150 °C

Type PFM, Flo-Check®

Hydraulic testers, analyzers



PFM6 BD
Bidirectional
hydraulic tester

PFM6
Portable digital
hydraulic tester

PFM8
Hydraulic tester with
dynamometer

Compact

Portable

High pressure levels

High temperature

Flo-tech™ portable hydraulic testers are compact and portable units, designed for fast, diagnostic trouble-shooting of mobile and stationary hydraulic systems. Models available include the versatile PFM6, the PFM6 BD for bi directional applications and the digital PFM8 testers with integrated dynamometer.

The Flo-Check® USB Hydraulic system analyzer utilizes a data acquisition module to record the operating parameters of the hydraulic system and then transfers them to the user's laptop computer, where multiple operating parameters (bi directional flow, pressure, temperature, power) may be monitored in real-time. Flo-Check® is an ideal tool for testing, fault diagnosis and repair of mobile and industrial hydraulic applications.

Technical data

Model	PFM6 Portable hydraulic tester	PFM6 BD Bi directional hydraulic tester	PFM8 Digital hydraulic tester with dynamometer	Flo-Check® USB hydraulic system analyzer
Enclosure	Anodized aluminium			
Accuracy	±1 % of full scale			
Repeatability	±0,2 %			
Temperature	-20 °C to +150 °C			-40 °C to +85 °C
Pressure	Up to 414 bar			
Connections	4 AA Alkaline batteries			+4,6 VDC min., +5,25 VDC max.

Flow calibrators

for calibration and test of flow meters

NIST-traceable

Printed, plotted calibration data

Automated data acquisition

Uncertainty
< ±0,05 % of reading

Positive displacement liquid calibrators are volumetric type measurement devices, which measure the exact volume of fluid that passes through the flow meter under test while compensating for fluid viscosity and temperature. They ensure extremely high precision fluid flow measurement.

With a repeatability of ±0,01 % of reading, the calibrators are most precise. The NIST fluid flow measurement laboratory uses this type of calibrator for their liquid flow meter calibrations requiring high accuracy. The calibrators are easy to maintain and will last 50 years or more in service. They conform to the guidelines of NIST for Round Robin Testing.

Three models of calibrators provide calibration for 4" to 1/2" meters or smaller. The PDLC calibrators are capable of performing flow calibrations on various types of flow meters, including turbine, differential pressure orifice plate, variable area, Coriolis and other types of special meter designs.

Technical data

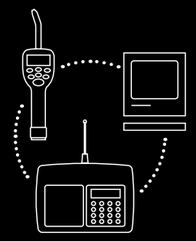
Model	PDLC 10	PDLC 60	PDLC 400
Fluid	Hydrocarbons and water		
Flow range	0,003 – 38 l/min (0,001 – 10 GPM)	0,2 – 225 l/min (0,06 – 60 GPM)	0,03 – 1515 l/min (0,01 – 400 GPM)
Viscosity range	0,5 – 1000 mPas		
Uncertainty	±0,05 % of reading		
Ambient operating temperature	15 – 32 °C		
Fluid operating temp.	4 – 60 °C		
Operating pressure	Up to 8 bar		

Fluid management systems

Whether as wireless or cabled systems, the Badger Meter oil management systems have been designed to control and manage the dispense of oil products in the automotive workshop.

Approved oil management systems dispensing volumes of fluids in the automotive workshops require highly accurate flow meters and pulse transmitters, trouble-free and secured manipulation in the remote transmission equipments as well as a durable data memory able to retrieve dispense data, quantities and oil products at any time.

The radio frequency based systems with PTB and BEV approvals offer the advantage of a wireless communication between dispense terminal and meter.



LMS RF system

Wireless oil management systems with ZigBee® technology

2,4 GHz

More than 80 % saving in installation time and cost

No cutting into existing pipes

Easy upgrades

No more cabeling mistakes

2-way exchange of data, 128 bit coded

Ideal for mobile systems

Troublefree and reliable

Incl. PC software package

Connection for barcode reader

Mobile systems
In combination with a trolley, the RF system becomes a fully stand alone unit.

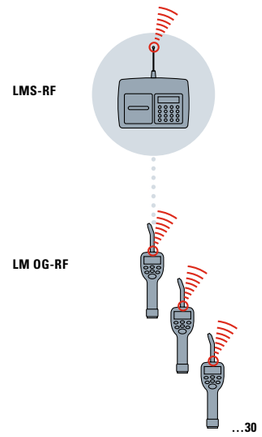
Optimized for garages
The recording and transfering of data is reliable and convenient.

The LMS RF oil management system offers a cablefree communication between dispense terminal and meter upon a radio frequency technology which has specially been developed for the garages. The system can communicate with any host computer of the workshop upon a free programmable RS 232 interface.

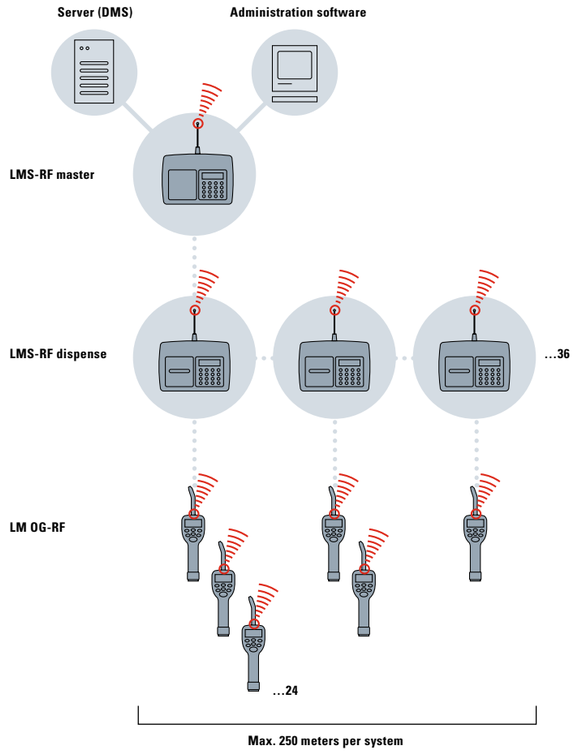
ZigBee® is a trademark of ZigBee® Alliance, Inc.

asanetwork

LMS-RF Basic system



LMS-RF High end system

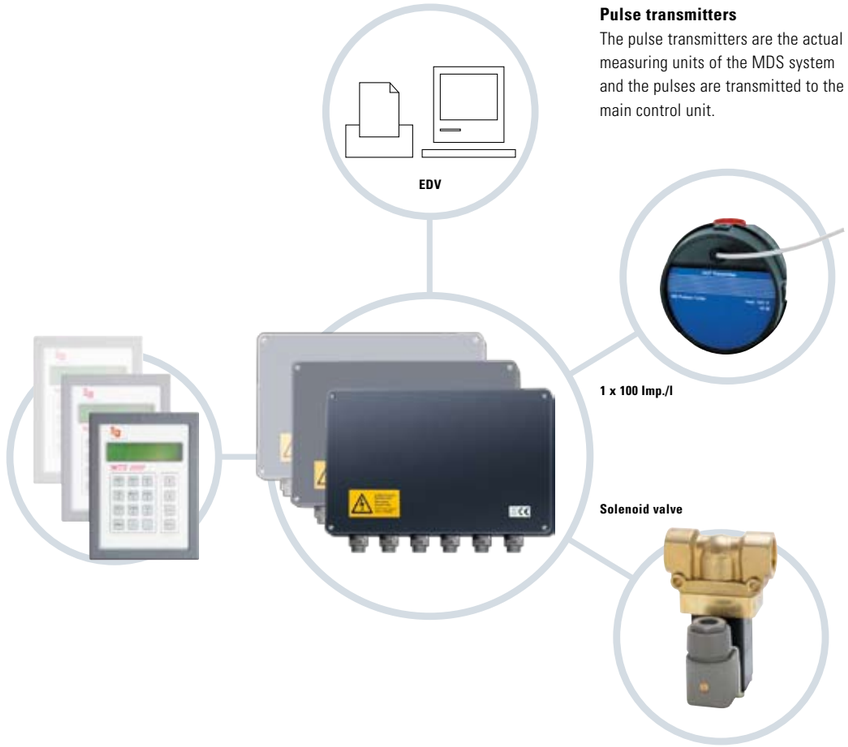


Technical data

LMS-RF Basic system	LMS-RF High end system		LM OG-RF meter
	Master terminal	Dispense terminal	
	1 RF master terminal with a 2-line LCD display	1 RF dispense keypad with a 2-line LCD display	Graphic display
Up to 49 users per system	Up to 250 users per system		Preselection or free dispense
1 dispense keypad	Up to 36 dispense keypads	Up to 24 meters per dispense keypad Max. 250 meters per system	No dispense possible without prior dispense release from the dispense keypad
Up to 8 oil types	Up to 16 oil types		Integrated solenoid valve
Up to 8 tanks	Up to 16 tanks		Manual override still tracks totals dispensed
Oil product management	Oil product management		Easy battery replacement
All dispenses and deliveries are kept in memory	All dispenses and deliveries are kept in memory		Standard 1,5 V AA batteries
RS 232 serial port	RS 232 serial port		Battery lifetime of 15 000 dispenses
Printer port (serial)	Printer port (serial)		
–	Network connection upon software		

MDS 2000

Cabled fluid management systems



Pulse transmitters
The pulse transmitters are the actual measuring units of the MDS system and the pulses are transmitted to the main control unit.

Keypad
The alphanumeric keypad enables the dispensing of fluids and configuration of the MDS system.

I/O unit
The I/O unit is the heart of the MDS system and governs all control and switch functions.

Valves
The valves enable the preselected dispense quantity to switch off at the precise moment.

CAN-Bus technology

Compatible with asanet

Connection to garage software

The oil management system MDS 2000 has been designed to control and manage lubricants to achieve product accountability and profit center protection. The system is especially designed to be installed in small or large garages, car pools, forwarders and the industry.

The entry level consists of one alphanumeric access keypad, network linked to one I/O control unit, controlling up to 8 (4)* dispensing points each of which could be a different fluid/grade or the same fluid/grade. Transaction data are retrieved on a standard serial printer. The system upgrades easily to control up to 64 (32)* dispensing points, all working simultaneously with multiaccess keypads.

Transaction ticket printers can be connected on each keypad to hold the mechanic accountable and/or to print the data at different workshop departments. The data can be archived, restored and exported to the main workshop computer. The system can communicate with any host computer of the workshop upon a free programmable RS 232 interface.

* Data in brackets are for the approved version.

asanetwork

FMS Compact

Compact and easy systems

4 dispense points

4 fluids

Integrated ticket printer

Alphanumeric keypad

RS 232 serial port for PC or printer

Connection for barcode reader

The FMS Compact system is an easy batch controller with integrated ticket printer. Up to four flow meters and four solenoid valves can be connected. Inventories and batchings can be monitored and documented thanks to the tank monitoring function. The system also manages minimum tank levels. PIN numbers can be entered for the users to protect from unauthorized access.

All inputs and outputs of the system are realized through plug contact. Thus, it is not necessary to open the housing to reach the connectors and to put the system into operation. The "plug & play" technology facilitates the installation and the putting into operation. The rugged housing – available in various materials – and high quality plug connectors guarantee a reliable operation, even in harsh environments. Equipped with an integral printer, an alphanumeric keypad and grafic display, the system is best suited for all user and dispense applications.

An additional PC software is optionally available to read-out and analyze the data history on the PC.

Small control valves

Badger Meter's control valves are specifically designed for controlling small to medium flow rates of liquid or vapor, in pipe sizes from 1/4" to 2". They cover a Cv range from 0.0000018 to 54 in different innervalve sizes.

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

$$F_d = \frac{N_{31} \cdot v \cdot F_L^2 \cdot F_R^2 \sqrt{C \cdot F_L}}{Q\left[1 + N_{32}\left(\frac{C}{d^2}\right)^{2/3}\right]}$$

Theoretically, there are millions of possible combinations of valves that can be configured to suit a wide variety of applications or specific requirements. The choices range from process valves (standard bronze valves, flanged stainless steel or other exotic material), to hygienic valves (barstock or cast, tube or clamp ends), to special valves (3-way, angle, high-pressure, high-temperature and cryogenic).

Valves can be made with most flange types and sizes, welded connections, NPT or tube fittings. Although the standard material is stainless steel, many other materials are available for corrosive applications, including solid Titanium and Tantalum. The valves are available with a wide variety of innervalves, many individually made by hand, standard and special bonnets, conventional and low-emission seals, pneumatic, electric or manual actuation, along with many accessories to meet almost any application requirement.

ReCo® valves

for R & D, pilot plants, technical plants and fine batching applications

Large material choice
Large innervalve choice
Customerized

The RC series is the classical standard line of small control valves originally developed for pilot plant and research applications for customers in all types of process industries. In addition to standard stainless steel housings, many other materials can be used. The wide range of material combinations, innervalves and other components is almost unlimited.

The pneumatic actuator can be enhanced with positioners, regulators, solenoid valves and pressure gauges, all in a compact design adjusted to the valve size. Upon request, one-of-a-kind valve solutions can be produced.

Technical data

Type	Standard valve	Flanged valve	Angle valve	High pressure valve	Cryogenic valve	Barstock valve	3-way valve
Internal threads	NPT internal threads or BSP-P	Welded-on flanges	NPT internal threads	NPT internal threads or Auto-clave conn.	NPT internal threads or BSP-P	NPT internal threads	NPT internal threads
Size	DN 1/4" – 1"	DN 1/2" – 1"	DN 1/4" – 1"	DN 1/4" – 1/2"	DN 1/4" – 1"	DN 1/4" – 1"	DN 1/4" – 1"
Cvs	0.0000018 – 6.0	0.00008 – 6.0	0.0000018 – 6.0	0.0000018 – 2.5	0.0000018 – 6.0	0.0000018 – 6.0	0.05 – 5.0
Max. op. pressure	up to PN 340	up to PN 340	up to PN 340	up to PN 700	up to PN 170	up to PN 340	up to PN 100
Temperature range	-70 °C to +530 °C	-70 °C to +530 °C	-70 °C to +530 °C	-70 °C to +530 °C	-270 °C to +530 °C	-70 °C to +530 °C	-70 °C to +530 °C

Process valves

for the control of liquids, steam and gases in the process industry

Rugged construction
Easy maintenance
Non corrosive
Easy handling

This series of valves is especially suited for the harsh demands of certain process industries. These valves are designed for modulating control of liquids, vapors and gases in industrial applications where performance, quality and small physical size are important. The rugged, corrosion-resistant construction offers features and performance normally found in more expensive designs. The compact, high performance, all-steel actuator, along with standard body assembly construction of stainless steel, is designed to provide years of service and simple easy maintenance.

A few more standard features include: adjustable spring preload, adjustable travel stop, heavy body cross section and replaceable seals on all reduced inner-valves.

Technical data

Type	Standard valve	Flanged valve	Cryogenic valve	Bronze valve
Internal threads	Clamped between flanges with NPT internal threads	Welded-on flanges	Clamped between flanges with NPT internal threads	NPT internal threads
Size	DN 1" – 2"	DN 1" – 2"	DN 1" – 2"	DN 3/4" – 2"
Cvs	0.02 – 25	0.02 - 25	0.02 - 25	8 – 54
Max. op. pressure	up to PN 50	up to PN 50	up to PN 50	up to PN 20
Temperature range	-70 °C to +530 °C	-70 °C to +530 °C	-270 °C to +530 °C	-30 °C to +200 °C

Sanitary valves

for the hygienic, pharmaceutical and food industry

Globe casted sanitary valve

Globe casted sanitary valve

Barstock sanitary valve

No dead volume

Easy to clean

The SC series has been designed to meet the demand of hygienic, pharmaceutical or food applications. Valves with flanges or special pipe connections, extended bonnets for hot or cold fluids, and 3-way valves. All designs can be provided with pneumatic actuators and a wide variety of accessories.

Technical data

Type	Globe casted sanitary valve	Barstock sanitary valve
Internal threads	Tri-Clamp© connection	Tri-Clamp© connection
Size	DN 1" – 3"	DN 1/2" – 2"
Cvs	0.05 – 90	0.05 – 4.0
Max. operating pressure	up to PN 20	up to PN 20
Temperature range	-20 °C to +150 °C	-20 °C to +150 °C

Positioners

for the communication with and monitoring of a valve

SRD 991 / SRI 990 (Eckardt)
Badger Meter specification

8049 digital (Schubert & Salzer)

BLRA / TLDA (Badger Meter)

3730 (Samson)

TZID-C (ABB)

SIPART PS 2 (Siemens)

Able to give a diagnostic

Reliable

Sure

Whichever you prefer – I/P-positioners, digital or analogue, or pneumatical positioners, you get the positioner of your choice. I/P-converter, solenoid valves, regulators and manometers are available in different types and from various manufacturers.

The positioners can be used for all three series (RC, OR and SC series).

Product line overview

- Electromagnetic flow meters
- Ultrasonic flow meters
- Weirs and flumes
- Turbine meters
- Oscillating piston 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

For worldwide operations
Badger Meter Europa GmbH
Nürtinger Str. 76
72639 Neuffen
Germany
Tel. +49-70 25-92 08-0
Fax +49-70 25-92 08-15
badger@badgermeter.de
www.badgermeter.de

For the USA and Canada
Badger Meter, Inc.
P.O. Box 245036
Milwaukee, WI 53224-9536
USA
Tel. +1-414-355-04 00
Fax +1-414-355-74 99
infocentral@badgermeter.com
www.badgermeter.com

For Mexico
Badger Meter de las Americas S. A. de C. V.
Pedro Luis Ogazon #32
Col. Guadalupe Inn
Mexico, D. F. 01020
Mexico
Tel. +52-55-56 62-08 82
Fax +52-55-56 62-75 81
bmdla@badgermeter.com

For Asia
Badger Meter Asia
Singapore Representative Office
80 Marine Parade Road
#21–04 Parkway Parade
Singapore 449269
Singapore
Tel. +65-63 46 48 36
Fax +65-63 46 48 37
awang@badgermeter.com

For China
Badger Meter, Inc.
Shanghai Representative Office 7-1202
99 Hangzhong Road
Minhang District
Shanghai 201101
China
Tel +86-21-57 63-54 12
Fax +86-21-57 63-54 12
robertxtc@126.com

For Slovakia
Badger Meter Slovakia s. r. o.
Racianska 109 / B
83102 Bratislava
Slovakia
Tel. +421-2-44 63 83 01
Fax +421-2-44 63 83 03
badger@badgermeter.sk
www.badgermeter.sk

For the Czech Republic
Badger Meter Czech Republic s. r. o.
Maríkova 2082/26
62100 Brno
Czech Republic
Tel. +420-5-41 42 04 11
Fax +420-5-41 22 97 24
itomas@badgermeter.cz
www.badgermeter.cz

®
Badger Meter Europa

Catalogue BME-KAT-SD-02-1304