



Badger Meter Europa



Flow Measurement and Control

Flow metering, batching, controlling



Quality is not a coincidence – it is the result of our company philosophy



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 1450 employees all around the world, Badger Meter is a leading marketer and manufacturer of flow measurement and control devices since 1905. Badger Meter was a pioneer in flow measurement and can look back today at many patents in that field.

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

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 Weights and Measures as test equipment according to the OIML R 117.

Customer accessibility and competence

We can help you in a timely manner to solve your measurement problems, advising you to assist in optimizing your measurement solution, technology and site location before you make a decision.

An extensive distributor and service network ensures the best service worldwide. Local representatives are a big advantage for our customers. The short distance and local language support provide efficient service. Our distributors are trained on Badger Meter products at their own facilities or in our training center.

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

Quality is a tradition

A company which has successfully been providing the industry with flow meters for 110 years is always aware of the importance of quality in its products. However, quality is an on-going process which we, as a company, embrace every day. At Badger Meter Europa GmbH, we consider quality in all aspects of our operation. It is the quality of our work, which you, as a customer, are entitled to expect from us. Quality begins with the individual, our employees, and requires a company philosophy which fits accordingly.

Our quality should accompany you throughout the process: from inquiry, through order to product and service.

No compromise in terms of quality.

Flow measuring, batching, controlling



We can measure the flow of liquids and gases in almost all branches of industry, in small and large applications including pressurized pipes, partially filled pipes and open channels with a great variety of measurement principles.

From our large product range there is a solution for almost any of your measurement applications in water and waste water, sewage plants, 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...

Our products

Electromagnetic flow meters	6	Rugged meters for harsh environments, high corrosive media or for food and pharmaceutical industry	19
Meters for conductive fluids – Detectors	7	1100/1200 and QuikSert® series for harsh applications	19
Detector type II for a great variety of applications	7	FloClean with 3-A sanitary standard approval	19
Detector type III with short lay length	8	B2800 / B2900 / B3000 flow monitors for the Blancett® series	21
Sanitary detector for liquid food flow measurement	8	Turbine meters for low viscosity, non-aggressive liquids	22
Amplifiers	10	The VISION series	22
Amplifier for a great variety of applications – ModMAG® M2000	10	Displays for the VISION series	23
Battery-powered amplifier for water supply – B-MAG M5000	11	Nutating disc meters	24
Low-cost amplifier for a great variety of applications – ModMAG® M1000	12	Meters for clean and moderately dirty fluids	25
Amplifier for hazardous areas – ModMAG® M3000/M4000	12	Recordall® fluid meter	25
Turbine meters	14	Meters for AdBlue® and aggressive media	28
Turbine meters with single rotor	15	Nutating disc meter Recordall® RCDL M 25	28
Precision series for a wide variety of applications	15	Oval gear meters for AdBlue®	28
LoFlo series for low flow rates	16	Batch systems	29
CPG gas series	16		
Dual rotor turbine meters	17		
The Exact series for highly precise flow measurements	17		

Impeller meters	30	Coriolis mass meters	62
Meters for irrigation systems, building management and general industry	31	Meters for mass measurement of fluids	63
Flow sensors	31	FCB 300 series for the water industry, chemistry/petrochemistry, paper industry	63
Monitors and transmitters for all flow sensor series	33	FCH 300 series for food or as remote version	64
Ultrasonic flow meters	34	Differential pressure flow meters/Venturi tubes	66
Meters for flow metering in full pipes	35	Differential pressure flow metering	67
TFX Ultra®, TFXL and DFX stationary devices	36	Coin® meter for fluids, gases, steam, air and slurry	67
DXN and UFX portable units	36	Ellipse® pitot for fluids, gases and steam	68
Flow and level measurement in open channels, partially filled pipes and tanks/reservoirs	38	Venturi tubes for fluids	68
Ultrasonic flow meter type iSonic 4000	38	Hydraulic diagnostics	70
Heat meters and accessories	40	Hydraulic testers and analyzers	71
Stationary and portable units for heat energy measurement	41	Flow calibrators	72
Ultrasonic energy meters DXN and TFX Ultra®	41	Flow calibrators for calibration and test of flow meters	73
Impeller meter Btu 380	42	Calibration services	73
Electromagnetic flow meter – ModMAG® M1000 / M2000	42	Fluid management systems	74
212 heat calculator	44	Wireless oil management systems	76
GSM / GPRS module for wireless data recording	44	LMS-RF system with ZigBee® technology	76
Oval gear meters	45	Cabled fluid management systems	78
Oval gear meters for industrial applications	46	Oil management system MDS 2000	78
The IOG series	46	Compact and easy system FMS Compact	79
The LM OG-I meters of the IOG series	48	Small control valves	80
Hose end meters for lubricants	50	ReCo® valves for R & D, pilot plants, technical plants and fine batching applications	81
Electronic meters	50	Process valves for the control of liquids, steam and gases in the process industry	82
Electronic meters for high flow	51	Sanitary valves for the hygienic, pharmaceutical and food industries	83
Mechanical meters for highly viscous lubricants	51	Positioners for communication with and monitoring a valve	84
In-line meters and pulse transmitters	52	RCVcalc – The smart sizing solution	85
The in-line meters	52		
The pulse transmitters – In line meters with pulse output	52		
Variable area flow meters	54		
Variable area flow measurement	55		
Low cost EZ-View® meter for oil, water and other liquids	55		
The H-series – Variable area in-line flow meters	56		
Flow transmitter Flow-Alert switch	57		
Flow transmitter MR series	57		
Vortex meters	58		
Highly precise meters for gas, digester gas, liquids and air	59		
Wafer gas meters in stainless steel – RWG and RWBG	59		
Stainless steel insertion meters – RNG	60		
Liquid meters in thermoplastic – RVL series	60		



Test stand and innovation center of Badger Meter

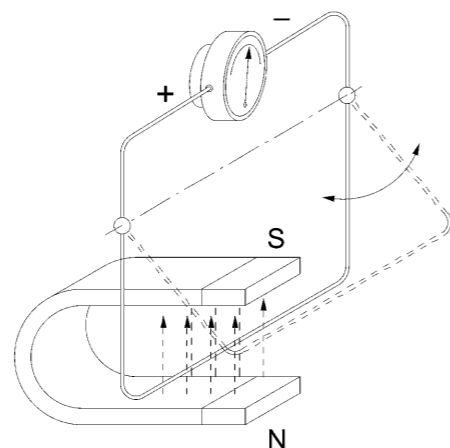
Electromagnetic flow meters

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



Meters for conductive fluids – Detectors

- Flange process connection
- Size DN 6 – 2000
- Nominal pressure up to PN 100



Detector type II for a great variety of applications

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



Detector type III with short lay length

Thanks to its very short lay length, the detector type III is often the right alternative for many applications.

Delivered with a PTFE liner, the detector type III has a standard nominal pressure of PN 40.



- Wafer connection
- Size DN 25 – 100
- Nominal pressure PN 40

Sanitary detector for liquid food flow measurement

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.



- Process connections Tri-Clamp® BS 4825/ISO 2852, DIN 11851
- Size DN 10 – 100
- Nominal pressure PN 10/16

Technical data: Detectors



Type	Type II	Type III	Type Food
Size	DN 6 – 2000 (1/4"…80")	DN 25 – 100 (1"…4")	DN 10 – 100 (3/8"…4")
Process connections	Flange: DIN, ANSI, JIS, AWWA u.a.	Wafer connection, (in-between flange mounting)	Tri-Clamp® BS 4825/ISO 2852, DIN 11851 among others
Nominal pressure	Up to PN 100	PN 40	PN 10/16
Protection class	IP 67, optional IP 68	IP 65, optional IP 68	IP 65, optional IP 68
Min. conductivity	5 $\mu\text{S}/\text{cm}$ (min. 20 $\mu\text{S}/\text{cm}$ for demineralized water)	5 $\mu\text{S}/\text{cm}$ (min. 20 $\mu\text{S}/\text{cm}$ for demineralized water)	5 $\mu\text{S}/\text{cm}$ (min. 20 $\mu\text{S}/\text{cm}$ 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	PTFE -40 up to +150 °C	PTFE -40 up to +150 °C
Electrodes materials	Hastelloy C (standard) Tantal Platinum / Gold plated Platinum / Rhodium	Hastelloy C (standard) Tantal Platinum / Gold plated Platinum / Rhodium	Hastelloy C (standard) Tantal Platinum / Gold plated Platinum / Rhodium
Housing	Carbon steel / optional stainless steel	Carbon steel / optional stainless steel	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 or according to ISO 13359	DN 25 – 50 100 mm DN 65 – 100 150 mm	Tri-Clamp® connection: DN 10 – 50 145 mm DN 65 – 100 200 mm DIN 11851 connection: DN 10 – 20 170 mm DN 25 – 50 225 mm DN 65 – 100 280 mm

Amplifiers

Amplifier for a great variety of applications – ModMAG® M2000



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

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

The standard amplifier has 4 programmable digital outputs, one digital input, analog output and different interfaces. Integrated system self check-up makes putting into operation and servicing easier.

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

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

Verification Device

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



Battery-powered amplifier for water supply – B-MAG | M5000

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

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

The B-MAG | M5000 has been designed for very harsh environmental measurement conditions. The meter has no moving parts and can be used to measure water containing particles like sand or gravel. The B-MAG | M5000 is encased in an IP 67 housing (optional IP 68), which makes it a reliable meter even when submerged.

The standard meter is equipped with an internal datalogger which can be read via an IrDA or M-Bus with ModBus® RTU protocol. The collected data can also be retrieved via radio frequency or GSM/GPRS. The data can thus be centrally compiled and evaluated.

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



BATTERY OPERATED

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



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

The ModMAG® M1000 amplifier is suited for bidirectional flow measurement of liquids $>5 \mu\text{S}/\text{cm}$ ($>20 \mu\text{S}/\text{cm}$ for demineralized water). It combines all the opportunities of price with high level performance. Information such as flow rate, total flow rates, daily flow rate or even an alert can easily be read from the LCD display.

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

Amplifier for hazardous areas – ModMAG® M3000/M4000

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

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

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

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

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



Technical data: Amplifiers

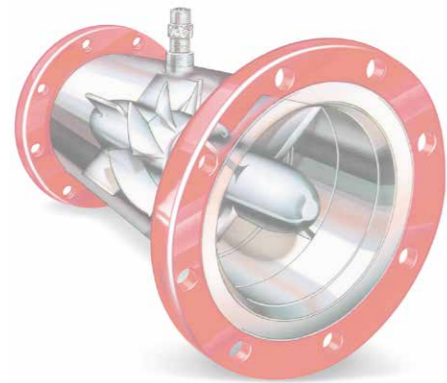


Type	ModMAG® M1000	ModMAG® M2000	ModMAG® M3000/M4000	B-MAG I M5000
Size	DN 6 – DN 200	DN 6 – DN 2000	DN 6 – DN 600 (M3000) DN 6 – DN 300 (M4000)	DN 15 – DN 600
Accuracy	$\pm 0,3\%$ of actual flow, $\pm 2 \text{ mm/s}$ of actual flow	$\pm 0,2\%$ of actual flow, $\pm 1 \text{ mm/s}$ of actual flow	$\pm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

Turbine meters

Turbine meters are best suited for low viscosity fluids and also gases.

Measuring principle



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

Turbine meters with single rotor

Precision series for a wide variety of applications

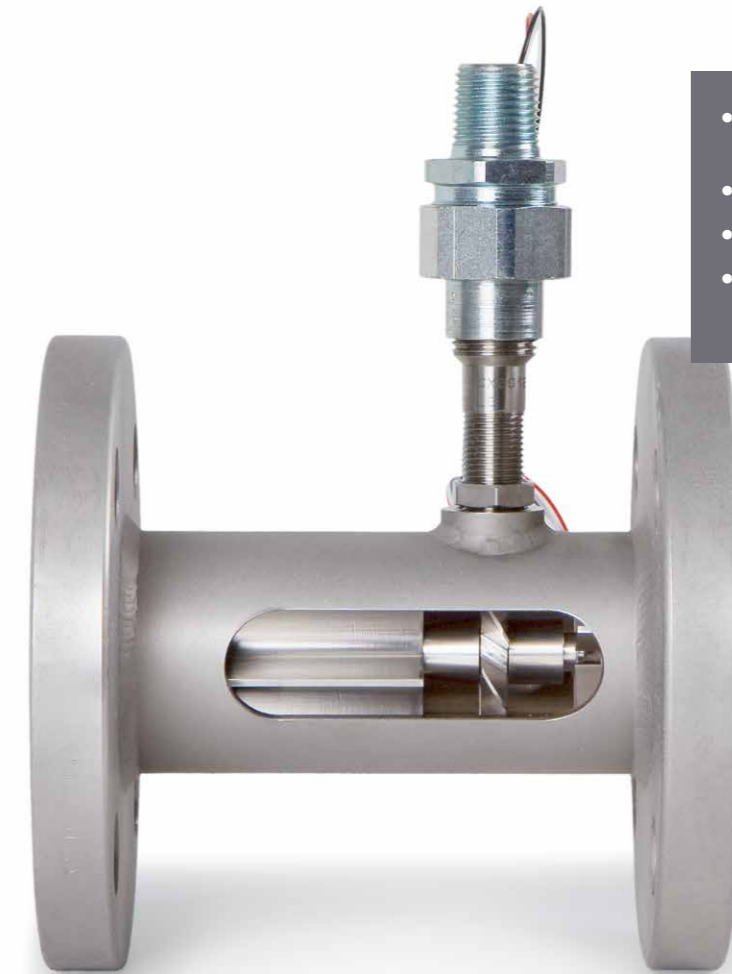
The highly precise stainless steel turbine meters have been designed to measure the flow of fluids and gases.

Pressure, viscosity and temperature compensation provides unbeatable repeatability and linearity. The turbine meters can be mounted in any orientation, either on horizontal or vertical pipes.

A calibration certificate is issued for each turbine meter by a NVLAP accredited test laboratory and there is also a great number of pulse transmitters, processors and displays available.

Typical applications:

- Measurement of cooling circuit performance
- Measurement of fuel consumption, gear oil, brake fluid and cooling water in calibrators



- Excellent accuracy of $\pm 0,25\%$ of actual flow
- Wide measurement range
- Many different process connections
- Also suitable for high pressure applications

LoFlo series for low flow rates

- Low mass of small internal components enables a fast response on changing flow rates
- Measurement of flow rates smaller than 5 l/min
- Low-cost precision turbine meter

The robust LoFlo axial meters provide an exceptional repeatability of $\pm 0,25\%$ of reading. When paired with the EC 80 flow computer, the calibration data is linearized to within $\pm 0,1\%$ of reading, allowing for precision flow measurement over the entire usable range of the meter.

Typical applications:

- Measurement of fuel consumption and coolants
- Leakage checks
- Ideal for water, hydrazine (N_2H_4) and cryogenic liquids



CPG gas series



- Pure gases with a density of 0,16 to 240 kg/m³ can be measured

The gas series has been designed for precise flow measurement of all compressible gases, while also providing a very low pressure drop. The series consists of three models: For gases with small, medium and high density. The various models enable an exact flow measurement at densities between 0,16 and 240 kg/m³ (for flow rates of 0,1 up to 180 l/s).

The series can measure the flow of any pure gas: Argon, air, helium, oxygen, ammonia, methane, nitrogen, etc.

A repeatability of $\pm 0,25\%$ of reading is provided. Response times as low as 30 ms are possible due to the design of the turbine.

Typical applications:

- Nitrogen cleaning
- Argon protective gas (for an oxygen-free environment)
- Compressed air
- Gas injection
- Coolants
- Ideal for argon, air, helium oxygen, ammonia, methane, nitrogen

Dual rotor turbine meters

The Exact series provides the most precise measurement and the widest flow range capability. Often used in aerospace, automotive, industrial and OEM applications.



- Highest precision turbine meter
- Capable of bidirectional measurements
- Rugged turbine bearings allows the meter to be resistant to external vibration
- Bearing diagnostics possible using dual rotor speed comparison
- Space-saving installation as no need for flow straighteners

The Exact series for highly precise flow measurements

The Exact meters' unique measurement accuracy is achieved due to the innovative dual rotor construction. UVC* curves improve the accuracy and extend the usable measurement range. Flow straighteners are not required to control process fluid swirl, as the dual rotor system cancels out rotor acceleration effects. 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 highly resistant to external vibration and minimizes space. This allows for direct coupling of electronics on a robust mount which has the benefit of a lower profile. Both integral and remote electronics are available to process the signal output. The meter is designed for bi-directional flow and high shock environments. The Exact meter utilizes a robust bearing system having dual ceramic

bearings on each rotor with the internals securely locked in place, resulting in excellent repeatability.

Typical applications:

- Measurement of cooling circuit performance
- Qualification of jet engines and aircraft components in test calibrators
- Fuel consumption and lubricant measurement
- Monitoring of hydraulic systems, measurement of propellant consumption in aircraft



*UVC = Universal viscosity curve

Technical data: Turbine meters Cox with single rotor



Type	Precision series	LoFlo series	CPG gas series
Flow range	0,8 – 2.300 l/min	0,02 – 5 l/min	Up to 1000 SCFM
Size	1/4" up to 2"	3/8"	1/2" up to 2"
Accuracy	± 0,25 % of actual value	± 0,5 % of actual value	± 2 % of actual value
Repeatability	± 0,02 % of actual value	± 0,25 % of actual value	± 0,25 % of actual value
Linearity with electronic flow processor	± 0,5 % of actual value ± 0,1 % of actual value	-	-
Pressure*	345 bar (AN)	410 bar (AN)	410 bar (NPT)
Housing	316 SST	316 SST	316 SST

*depending on end connections

Technical data: Turbine meters Cox with dual rotor



Type	Exact series
Flow range	0,1 – 5.700 l/min
Size	1/4" up to 4"
Accuracy	± 0,15 % of actual value
Repeatability	± 0,02 % of actual value
Linearity with electronic flow processor	± 0,1 % of actual value
Pressure*	210 bar (standard)
Housing	316 SST

*depending on end connections

Rugged meters for harsh environments, high corrosive media or for food and pharmaceutical industry



- Wide flow range
- Large choice of mechanical process connections
- Simple installation

1100/1200 and QuikSert® series for harsh applications

The Blancett® turbine meters have been designed for harsh industrial applications and the series 1200 for corrosive fluids. Stainless steel and tungsten carbide components ensure long life.

Blancett® meters are well-suited for high temperature and high pressure applications, for example in secondary oil recovery, semiconductor and chemical processing.



FloClean with 3-A sanitary standard approval

The FloClean 3-A sanitary turbine flow meter meets 3-A sanitary standards. The meter is perfectly adapted for use in the food, beverage and pharmaceutical industries.

Combined with the Blancett® monitor B2800/ B3000, the meter provides actual flow rate and total flow rate.

- Meets 3-A sanitary standard
- Stable against acid and alkaline cleaning agents and disinfectants



Technical data: Blancett® turbine meters



Type	1100	1200	1500	QuikSert®	
				for fluids	for gases
Material	Housing: 316 stainless steel Rotor: CD4MCU stainless steel Bearings: 316 stainless steel	Housing: 303 stainless steel Rotor: CD4MCU stainless steel Bearings: 440 stainless steel	Housing: 316 stainless steel Rotor: 17-4 stainless steel Bearings: Ceramic	Housing: 316 L stainless steel Rotor: CD4MCU stainless steel Bearings: Tungsten carbide	Housing: 316 L stainless steel Rotor: 410/304 stainless steel Bearings: Tungsten carbide
Measuring range	2,3 – 19.000 l/min	0,95 – 95 l/min	0,95 – 948 l/min	2,3 – 19.000 l/min	7 – 350 ACFM
Size	½" up to 10"	¼", ½", ¾"	¼", ⅜", ½", ⅝", ¾", 1", 1 ¼", 1 ½", 2"	¾" up to 10"	2"
Flow accuracy	± 1 % of reading for 7/8" and larger meters ± 1 % of reading over the upper 70 % of the measuring range for ¾", 1/2" and ¾/4" meters	± 0,5 % of actual value	± 0,5 % ± 0,25 % with linearization	± 1 % of reading for 7/8" and larger meters ± 1 % of reading over the upper 70 % of the measuring range for ¾", 1/2" and ¾/4" meters	± 2 % of reading over the specified measuring range
Repeatability	± 0,1 %	± 0,1 %	± 0,02 %	± 0,1 %	± 0,5 %
Calibration	Water (NIST traceable calibration); other media upon request	Water (NIST traceable calibration); other media upon request	Solvent (NIST traceable calibration) 10-point calibration	Water (NIST traceable calibration); other media upon request	-
Pressure ratings*	345 bar max.	275 bar max.	up to 408 bar	Depending of the chosen flange connections up to 255 bar	Vacuum 15.3 mPa max.
Operating temperature	Up to 177 °C	Up to 162 °C	-65 °C up to +148 °C	Up to 177 °C	-40 °C up to +165 °C
End connections	NPT, BSP, Victaulic®, Flange, Hose Barbed or Grayloc®	NPT	NPT Flange	Wafer-style ASME/ANSI B16.5 – 1996	Wafer-style ASME/ANSI B16.5 – 1996
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 N° 30 Met Labs File No. E112860 (For explosion proof models only)	-	-	For explosion proof models only: Class I Div 1 Groups C, D; Complies to UL 1203 and CSA 22.2 N° 30 Met Labs File N° E112860	Class I Div 1, Groups C, D; Complies to UL 913 and CSA 22.2 N° 157-92

* depending of the end connections



Type	FloClean
Material	Housing: 316 L stainless steel Bearings: CD4MCU stainless steel, nickel plated Standard bearings: Nickel bindery, tungsten carbide Bearing shaft: Nickel bindery, tungsten carbide
Measuring range	2,5 – 1.500 l/min
Size	¾" up to 2 ½"
Flow accuracy	± 1 %
Repeatability	± 0,1 %
Calibration	Water (NIST traceable calibration); other media upon request
Operating pressure	69 bar
Operating temperature	Up to 150 °C
End connections	Tri-Clamp®
Approvals	3-A sanitary standard

B2800 / B2900 / B3000 flow monitors for the Blancett® series

The B2800, 2900 and B3000 flow monitors complement the Blancett® turbine meters. They are user friendly and offer various mounting possibilities, such as swivel mounted models for flexible meter reading on site.



B2800 flow monitor



B2900 flow monitor



B3000 flow monitor

Type	B2800	B2900	B3000
Power supply	1.5 VDC alkaline battery or 4 – 20 mA / 30 VDC loop-powered	3.6 V lithium battery or 4 – 20 mA loop-powered	3.6 V lithium battery 4 – 20 mA loop-powered Solar-powered
Mounting possibilities	Meter mounted Remote mount Swivel mount Panel mount	Meter mounted Remote mount Swivel mount	Meter mounted Remote mount Swivel mount Explosion-proof model
Outputs	4 – 20 mA Pulse output	4 – 20 mA Pulse output ModBus® RTU Open collector	4 – 20 mA Pulse output ModBus® RTU over RS 485
Approvals	CSA intrinsically safe (for meter mounted, remote and swivel mounted): Class I, Division 1, Groups C & D / (Class II, Division 1, Groups E, F, G CE (for meter mounted, remote and swivel mounted): IEC 61326-1 CSA hazardous locations (explosion-proof): Class I, Division 1, Groups B, C & D / Class II, Groups E, F & G / Class III, Type 4, T6@70 C	Class I, Division 1, Groups C, D / Class II, Division 1, Groups E, F, G / Class III for USA and Canada. Corresponds to UL 913 and CSA C22.2 n° 153 EMC: IEC 61326-1; 2004/108/EC	B30 Advanced/Base/Solar: Class I, Division 1, Groups C, D / Class II, Division 1, Groups E, F, G / Class III for USA and Canada Corresponds to UL 913 and CSA C22.2 n° 157-92. B30 explosion-proof: Class I, Division 1, Groups B, C, D / Class II, Division 1, Groups E, F, G / Class III for USA and Canada. Corresponds to UL 1203 and CSA C22.2 n° 30-M1986. ATEX II 2 G Ex d IIC T4 Gb and ATEX II D Ex tb IIC T 125 °C Db

Turbine meters for low viscosity, non-aggressive liquids

The VISION series

The VISION turbine meters are ideal for the metering of small quantities of liquids. Instant and total flow can be displayed.

The VISION 1000 series is most suited for small flow rates up to 2,5 l/min. The VISION series 2000 can be used in applications from 0,5 to 35 l/min and the VISION 3000 series offers a wider flow range of 5 to 65 l/min.

These 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 machines and dish washers, coffee machines, laser cooling systems, solar plants, bakery and steam cooking machines in large kitchen plants.

- Good price/performance ratio
- Compact construction
- Easy installation
- No maintenance
- High operating pressure
- Operates in any mounting position



VISION 1000
with DIN connector



VISION 2000
with DIN connector



VISION 3000
with DIN connector



VISION 2000
with AMP Faston



VISION 2000
with cable connection



VISION 2000
with cable connection

Displays for the VISION series



Electronic register of the ILR 700 series

The ILR 700 electronic display is available in two versions (ILR 701T and ILR 750T) and three models.

- As a wireless display, for remote reading of total flow rate over a 5 m range for the VISION 1000, 2000 and 3000 meters. Battery-powered (1 x CR123A battery), with 2,4 GHz radio frequency (model ILR 701T)
- As a battery-powered, meter mounted display for the VISION 2000 and VISION 3000 providing instant and total flow rate (model ILR 701T and ILR 750T)
- As a cabled version for remote reading for all VISION turbine meters (model ILR 701T and ILR 750 T)

Technical data: VISION turbine meters

Type	VISION 1000	VISION 2000	VISION 3000
Material	Trogamid (PA 12)	Trogamid / Brass	Trogamid
Viscosity range	0,8 - 16 mm ² /s	0,8 - 16 mm ² /s	0,8 - 16 mm ² /s
Accuracy	±3 % of value	±3 % of value	±3 % of value
Repeatability	< 0,5 %	< 0,5 %	< 0,5 %
Temperature range	-20 °C up to +100 °C	-20 °C up to +100 °C	-20 °C up to +100 °C
Operating pressure	25 bar max.	25 bar max.	25 bar max.
Electrical connection	Electrical connector EN 60529 or cable connection	Electrical connector EN 60529 / AMP Faston or cable connection	Electrical connector EN 60529 or cable connection
Power supply	5 - 24 VDC	5 - 24 VDC	5 - 24 VDC
Output signal	Open collector NPN pulse	Open collector NPN pulse	Open collector NPN pulse
Process connections	G 1/4", NPT 1/4"	G 3/8", NPT 3/8", o-ring	G 1/4", NPT 1/4"
Approvals	KTW, NSF, WRAS	KTW, NSF, WRAS	KTW, NSF, WRAS

Specifications

Type	1000 2F 66	2006 4F 44	2006 2F 66	2008 4F 16,5	2008 4F 22	2008 4F 44	2008 2F 66	3012 4F 17
Measuring range l/min	0,1 - 2,5	1 - 10	0,5 - 5	2 - 35	1,5 - 25	1 - 15	0,5 - 7,5	5 - 65
K factor PPL*	18.500 / 22.000	3300	6900	750	1000	2200	4700	210
Size DN (mm)	5	6	6	8	8	8	8	12

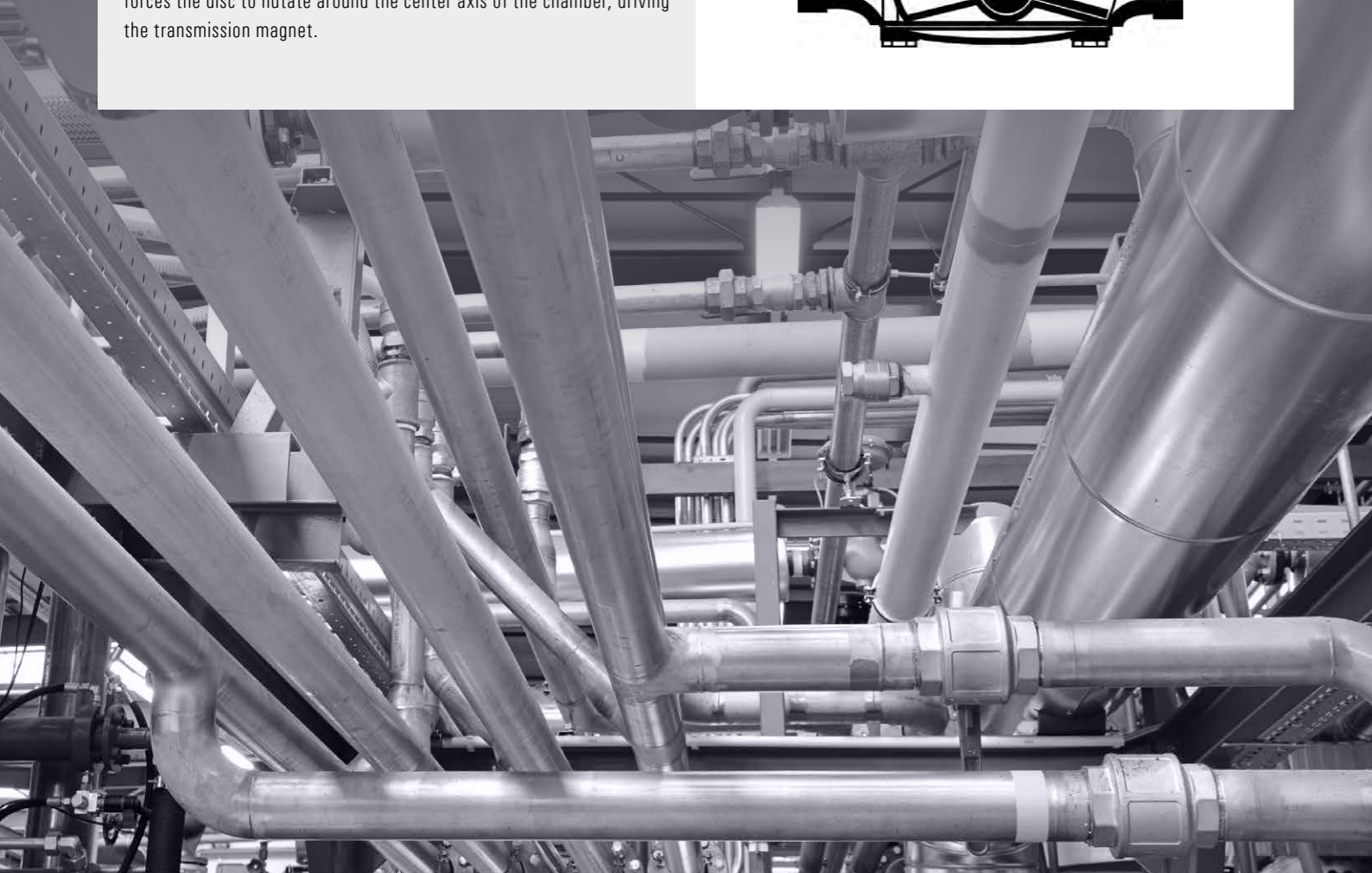
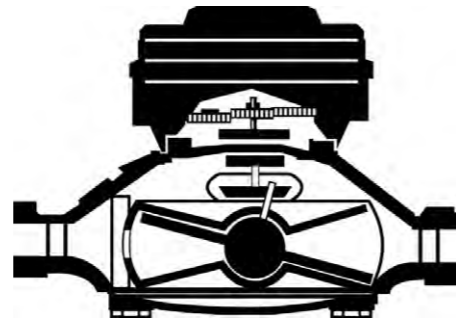
* PPL = pulses / liter

Nutating disc meters

Nutating disc meters are most suited for measuring flows 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.



Meters for clean and moderately dirty fluids

Recordall® fluid meter

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.

- Magnetic coupling
- Compatible with many liquids
- Wide flow range
- Low pressure loss
- Light weight



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



Nutating disc meter RCDL with bronze housing and electronic register



Nutating disc meter RCDL with bronze housing and electronic register



Nutating disc meter RCDL with stainless steel housing and electronic register



Nutating disc meter RCDL with stainless steel housing and electronic register



Nutating disc meter RCDL with plastic housing and mechanical register



Nutating disc meter RCDL M 25 for AdBlue® with electronic register



Nutating disc meter RCDL nickel-coated with ER-500



Nutating disc meter RCDL nickel-coated with F-series

Technical data: Recordall® meters

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

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	R ¾", 1"	R ¾", 1"	R 1"	R 1"	R 1 - ¼"	R 1 ¼"	R 1 - ¼"	1 - ½" NPT	2" NPT
Lay length	190	190	190	230	270	230	270	321	387
Width	122	122	110	133	151	135	184	223	240

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	Polykarbonat	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	Stainless steel	Cast iron C Nickel coat	Polycarbonate	Stainless steel	Cast iron C Nickel coat	Cast iron C Nickel coat	Cast iron C Nickel coat
Bottom (Vectra)	-	Bronze B Nickel coat	Stainless steel	B Nickel coat	-	Stainless 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

Nutating disc meter Recordall® RCDL M 25

The ultra pure 32,5% urea solution, also known by 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.



- Magnetic coupling
- Rugged construction
- Light weight
- Modular series

Recordall®
RCDL | Mechanical Flow Meters

AdBlue® is a trademark of the German Association of the Automotive Industry (VDA).

Oval gear meters for AdBlue®



Hose end meter LM OG-I-PVC

In-line meter LM OG-I-PVC

Pulse transmitter LM OG-TI-PVC

Type	RCDL M 25	RCDL M 40	LM OG-I-PVC	LM OG-TI-PVC
Connection	R ¾", R 1"	R 1 - ¼"	½" BSPP	½" BSPP
Max. operating pressure	16 bar	16 bar	10 bar	10 bar
Flow range	1 - 100 l/min	2 - 160 l/min	0,5 - 35 l/min	0,5 - 35 l/min
Temperature range	50 °C	50 °C	-10 °C up to +50 °C	-10 °C up to +50 °C
Accuracy	± 1,5 %	± 1,5 %	± 0,5 %	± 0,5 %
Viscosity range	-	-	1 - 2000 mPas	Up to 2000 mPas
Pulses per liter	100	23,7	-	100
Lay length	190 mm	270 mm	82 mm	82 mm
Protection class	IP 67	Depending of the flow transmitter	IP 67	IP 67

Batch systems

The electronic displays can be combined with any flow meter. Many of them can be used in hazardous zones. A wide variety of output signals are available.



Totalizer F012 / F110 / F131



Batch system PC200

From a simple display that can show instant and total flow rate up to batch monitoring. Models with ModBus®, HART® and other outputs are available.

Ideal for all batch processes. Also suited for switch cabinets.



Flow monitor ER-500

Available with the following outputs: 4 - 20 mA analogue output, pulse output, alarm outputs, ModBus® RTU over RS 485.



Flow monitor B3000

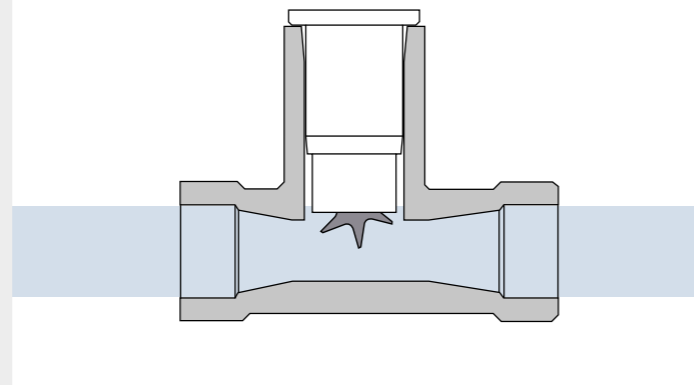
Similar to the ER-500, the B3000 also offers multitude outputs and an option for use in hazardous and explosion proof areas.

Impeller meters

Impeller meters are a low cost alternative in irrigation systems (sprinklers, chemical injection processes in water treatment, water management, etc.), in municipalities, in energy management (HVAC, building management, energy consumption monitoring, etc.) and in 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, automation in the film industry, etc.).

Measuring principle

The series features 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.



Meters for irrigation systems, building management and general industry

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



Series 200



Series 4000



Series SDI hot tap

Flow sensors

The 200 flow sensor series 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 from 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 from 1,5" up to 48". This sensor can be used for water applications or as a stainless steel version for corrosive fluids at high temperatures and pressure rates. Bidirectional flow measurement or battery driven systems are available as an option.

Technical data: Flow sensors

Series	200			225		226	250	228			4000	SDI				
Material																
Brass	X			X		X		X					X			
Bronze							X									
Stainless steel		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

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

*Special models up to DN 3000 / 120"

**or larger upon request

Monitors and transmitters for all flow sensor series

- Universal
- Energy monitoring systems
- Batch controllers
- Various output options



Monitor 3000



Monitor 3050

Monitors

Type 3000	Wall mounted / Control panel mounted
Type 3100	Control panel mounted
Type 3050	BTU

Can be extended with signal outputs.

The 3000 series 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.

Model 3050 together with flow sensors of the 200 series 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.



Series 310



Series Btu 340 BN/MB



Series Btu 380

All flow sensors can be combined with 300 series transmitters, therefore enabling the connection to overriding plotting systems like SPS or simple monitors.

Transmitters

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

380 series transmitters

Mounting in pipe sizes DN	20 - 50 ¾" - 2"
Flow range in m/s (standard)	0,1 - 4,5
Accuracy (full scale / Qmax.)	± 2 %
Repeatability (full scale / Qmax.)	± 0,5 %

Ultrasonic flow meters

Ultrasonic flow meters are most suited for flow measurement of fluids in pressurized pipes as well as in channels and partially filled pipes.



Meters for flow metering in full pipes

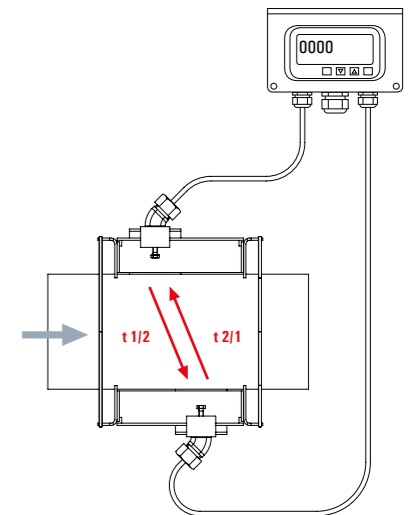
The ultrasonic flow meter series Dynasonics® – depending on the model – uses the Doppler or transit time method. Applications can be found in water and waste water treatment, cooling in semiconductor processes and in HVAC cooling and heating systems. The rugged construction ensures long life, even under extreme ambient conditions.



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.



TFX Ultra®, TFXL and DFX stationary devices

- Flexible to use
- Non-intrusive metering
- Long lifetime

Type TFX Ultra® is a liquid flow and energy meter with clamp-on sensors 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 outside of a pipe and is maintenance free.

The DFX is a Doppler technology flow meter with clamp-on ultrasonic sensors for use in fixed installations.

Type TFX Ultra®



Type TFXL



Type DFX



DXN and UFX portable units

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

The 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 or solids bearing liquids in closed pipes.



The UFX, a small, lightweight, battery-powered unit working according to the Doppler principle and is used for checking the flow in metal or synthetic pipes.



Technical data: Stationary units

Type	TFX Ultra®	TFXL	DFX (Doppler)
Liquid types	Most clean liquids or liquids with small amounts of suspended solids	Most clean liquids or liquids with small amounts of suspended solids	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
Pipe sizes	DN 15 up to DN 3000	DN 15 up to DN 3000	DN 6 up to DN 1500
Accuracy	± 1% of reading or ± 0.003 m/s whichever is greater	± 1%	± 2% full scale
Power supply	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	115/100/230 VAC 50/60 Hz ± 15% @ 17 VA max.; 12 – 28 VDC @ 7 VA max.
Ambient conditions	-40 °C up to +85 °C	-40 °C up to +85 °C	-40 °C up to +85 °C
Velocity range	Bi directional 0,03 up to 12 m/s	0,03 up to 12 m/s	0,05 up to 9 m/s
Display	Two line LCD, LED backlight	Two line LCD, LED backlight	Two line LCD, LED backlight

*ppm = Particel per million

Technical data: Portable units

Type	DXN (hybrid)	UFX (handheld)
Liquid types	Any single phase fluid which can be penetrated by ultrasonic signals	100 ppm* of 100 micron size suspended solids or entrained gases in pipes of DN 6 to DN 3050 (¼" to 120")
Accuracy	± 1% of reading under ideal conditions	± 2% of full scale
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 up to +45 °C (battery-powered) -30 °C up to +60 °C (externally powered)	-20 °C up to +60 °C
Sensor type	Clamp-on	Clamp-on
Velocity range	Bi directional 0.03...12 m/s	0,1 up to 9 m/s
Display	Touch screen	One line LCD
Units	Engineering units: m³, liter, million-liter, kg, feet, gallons, ft³ Flow units: second, minute, hour, day	l/sec, feet/sec
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 = Particel per million

Technical data: Sensors

Type	Sensors DXN		Sensors TFX Ultra®	
Pipe size	DN 15 – DN 3000		DN 15 – DN 3000	
Enclosure	DTTSU DTTL / DTTR / DT94 Doppler	Ultem® Ultem®	DTTR DTTC/DTTL / DTTN (IS) / DTTN/DTTL DTTH DTTS	Ultem® CVPC, Ultem® PTFE PVC, Ultem®
Pipe surface temperature	DTTSU / DTTL / DTTR DTTH DTTL DTTR	-40 °C up to +90 °C -40 °C up to +175 °C -40 °C up to +90 °C -40 °C up to +175 °C	DTTR DTTC / DTTL DTTN / DTTL DTTH DTTS	-40 °C up to +120 °C -40 °C up to +90 °C -40 °C up to +90 °C -40 °C up to +90 °C -40 °C up to +175 °C -40 °C up to +60 °C
Sensor frequency	DTTSU DTTR DTTL	2 MHz 1 MHz 500 kHz	DTTS / DTTC DTTR / DTTN / DTTH DTTL	2 MHz 1 MHz 500 KHz

Flow and level measurement in open channels, partially filled pipes and tanks/reservoirs



- Flow / Quantity
- Level and volume measurement
- Differential measurement
- Data collection
- High accuracy

Ultrasonic flow meter type iSonic 4000

The iSonic 4000 is an intelligent and versatile ultrasonic meter/controller designed to measure level, volume and open channel flow. iSonic 4000's unique features allow accurate measurements in harsh environments. The iSonic 4000 uses the measured signals for control purposes and for recording to an internal datalogger.

In fresh and waste water applications, iSonic 4000 measures level and calculates flow rates in combination with weirs or flumes using one of its preprogrammed conversion formulas or a 35 point conversion table. With the possibility of multi channel measurement, the unit can add, subtract and average. Totalizer functionality is provided for each channel.

iSonic 4000 is used for influent and effluent measurements, flow control and datalogging.

Technical data: Type iSonic 4000

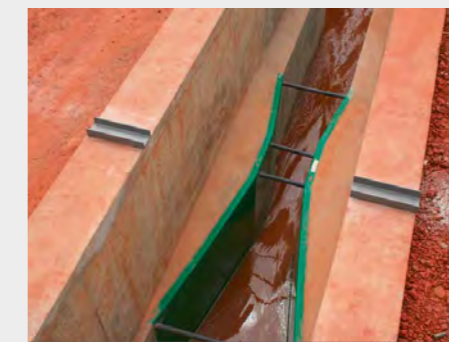
Type	iSonic 4000
Enclosure	Aluminium housing
Dimensions H x W x D	164 x 148 x 80 mm
Protection class	IP 67
Operating temperature range	-20 °C up to +60 °C
Outputs	1 analog output 0/4 – 20 mA / 0 – 10 mA, flow direction is displayed via a separate status output 1 pulse output, 2 open collectors, passive 32 VDC, 0 – 100 Hz 100 mA, 10 – 10.000 Hz 20 mA, optional active 1 frequency output, max. 10 kHz (open collector) 1 status output, min./max. alarm, preselection, flow direction, failure alarm, free programmable
Inputs	1 analog input 4 – 20 mA
Display function	Flow, total and status
Supply voltage	92 – 275 VAC or 9 – 36 VDC
Programming	PC with software (password protected)
Datalogger	SD card 2 MB, programmable time intervals, records available as table
Interface	Mini USB IP 67 RS232, RS422, RS485, ModBus®, RTU, Ethernet

Technical data: Sensors

Type	DL 10	DL 24	ULM 53	ULM 70
Measuring range	0 – 1250 mm	0 – 3000 mm	0 – 6000 mm	0 – 2000 mm
Measurement accuracy*	±0,5 %	±0,5 %	±0,5 %	±0,5 %
Offset	50 mm	100 mm	200 mm	200 mm
Beam angle	2°	2°	14°	10°
Material	PVDF	PVDF	PVC/PVDF	PVC/PVDF
Approval	-	-	-	II 1/2G Ex ia IIB T5

* within the total range

Flumes



Parshall flume

The Parshall flume is one of a large class of open channel primary elements known as critical flow venturi flumes. A distinguishing characteristic of the Parshall flume is the downward sloping invert of the throat. The Parshall flume is recommended for those applications in which moderate concentrations of sand, grit or other heavy solids exist and fluid velocities entering the flume are subcritical.



Manhole flume

The manhole flume is a low head loss, self-cleaning flow measurement device especially designed to easily fit into standard manholes. Selection of a manhole flume is dependent on manhole pipe size. Flumes are available for pipe sizes 100, 150, 200, 250 and 300 mm (4", 6", 8", 10" and 12") to accommodate a large percentage of metering applications.

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.



Stationary and portable units for heat energy measurement

Ultrasonic energy meters DXN and TFX Ultra®

- Ultrasonic technology
- DN 50 – DN 3000
- Accuracy of $\pm 1\%$ of reading
- $-40\text{ }^{\circ}\text{C}$ up to $+85\text{ }^{\circ}\text{C}/120\text{ }^{\circ}\text{C}$

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



Portable meter



Stationary meter

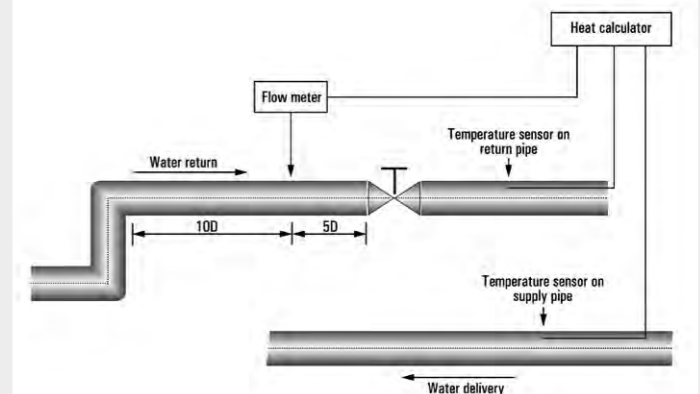
Dynasonics®
Ultrasonic Flow Meters

Measuring principle

Energy consumption measurement in heating and cooling systems using the example of ultrasonic flow measurement.

Two temperature sensors are installed on the supply and return pipe in addition to the ultrasonic flow meter. The thermal output of a pipe conduit network is based on a measurement of the difference between the supply and return flow temperatures and also the volumetric flow of the heat transfer medium.

The energy consumption is calculated by the electronics and can be displayed in units such as kWh, BTU, MBTU, MMBTU, watt, MW, joule, kJ and tons.



Impeller meter Btu 380

- Impeller technology
- DN 20 – DN 50
- Accuracy of $\pm 3\%$ of full scale
- -20 °C up to +60 °C



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.



Electromagnetic flow meter – ModMAG® M1000/M2000

- Electromagnetic technology
- DN 6 – 200 or 2000 (acc. to model)
- Accuracy of $\pm 0,2\%$ or $0,3\%$ of actual value (acc. to model)
- -20 °C up to +60 °C

The electromagnetic flow meters ModMAG® M1000 and ModMAG® M2000 display all necessary information such as flow rate, total flow rates, daily flow rate or even an alert. The information can be read-out from an LCD display. Both models offer various inputs, outputs and interfaces.

Those meters can ideally be used with the heat calculator 212 in cooling or heating system measurements.



Technical data: Heat meters

Type	DXN	TFX Ultra®	Btu 380
Pipe size	DN 15 – DN 3000	DN 15 – DN 3000	DN 20 – DN 50
Accuracy	$\pm 1\%$ of reading	$\pm 1\%$	$\pm 2\%$ of full scale
Repeatability	$\pm 0,1\%$ of reading	$\pm 0,5\%$ of reading	$\pm 0,5\%$
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 continuous operation with battery and indefinitely on external power	AC: 95–264 VAC 47–63 Hz @ 17 VA max. 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	-20 °C up to +45 °C (battery-powered) -30 °C up to +60 °C (externally powered)	-40 °C up to +85 °C	-20 °C up to +60 °C (cold water model BTU 380 CS) +4 °C up to +125 °C (warm water model BTU 380 HS)
Sensors DTTSU / DTTN / DTTL DTTH	-40 °C up to +120 °C -40 °C up to +175 °C		
Sensor type	RTD; 2 x platin 385, 1000 ohms, 3-wire PVC cable jacket	RTD; platin 385, 1000 ohms, 3-wire PVC cable jacket	–
Velocity	0,03 to 12 m/s, bi directional	> 12 m/s, bi directional	6 – 40 l/min depending on meter size
Display	Touch screen	Two line LCD, LED backlight	
Units	BTU, MBTU, MMBTU, joule, kJ, watt, kW, MW, tons	BTU, MBTU, MMBTU, tons, kJ, kW, MW	kBTU/min, kBTU/h, kW, MW, HP, tons, customer defined
Enclosure	Water/dust resistant (IP 64)	Type 4 (IP 65): powder coated aluminium, polycarbonate, stainless steel, polyurethane, nickel plated steel mounted brackets	Polycarbonate

Type	ModMAG® M1000	ModMAG® M2000
Pipe size	DN 6 – DN 200	DN 6 – DN 2000
Accuracy	$\pm 0,3\%$ of actual value, ± 2 mm/s of actual value	$\pm 0,2\%$ of actual value, ± 1 mm/s of actual value
Repeatability	0,1 %	0,1 %
Voltage input	Digital input	Digital input
Voltage output	Analog output 0/4–20 mA, 0–10 mA	Analog output 0/4–20 mA, 0/2–10 mA
Energy supply	92–275 VAC (50/60 Hz) <14 VA, optional 9–36 VDC, 4W	85–265 VAC (50/60 Hz) <20 VA, optional 9–36 VDC
Temperature	-40 °C up to +150 °C	-40 °C up to +150 °C
Sensor type	Type II and type III	Type II and type III
Velocity	0,03 – 12 m/s	0,03 – 12 m/s
Display	LCD graphic display	LCD 4 lines / 20 characters
Units	–	–
Enclosure	Aluminium, IP 67	Aluminium, IP 67

212 heat calculator

The 212 heat calculator has been designed to measure the energy consumed in hot water heating systems and chilled water cooling systems. The 212 is supplied with temperature probes and easily interfaces with our electromagnetic flow meters and impeller meters.



- Complies with OIML R75 and EN1434 standards
- Provides multilingual capability
- For hot water heating systems and chilled water cooling systems
- M-Bus and ModBus® RTU RS485 options
- Metric and English units
- 4-wire PT100 RTD temperature inputs
- Calculation and display of volume, energy and temperature
- IP 66 (Nema 4x)
- High accuracy
- 4 – 20 mA output option
- CE compliant

GSM / GPRS module for wireless data recording

- Wireless measuring sites
- Ideal for measuring sites in difficult areas
- Access via internet independently from location

For consumption monitoring and leakage 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 automatic 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, RCCL®, turbine meters, oval gear meters, impeller meters, ultrasonic flow meters and Coriolis mass meters.

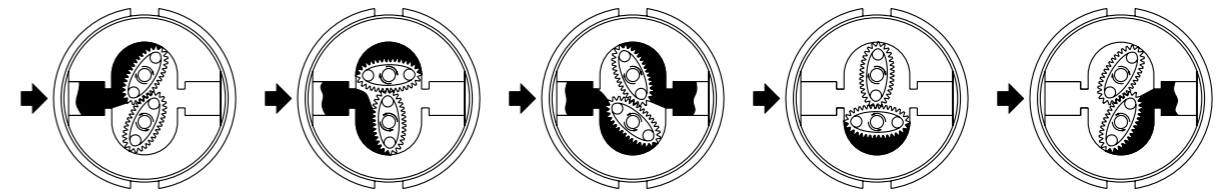


Oval gear meters

Oval gear meters are volumetric meters and are most 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.



Oval gear meters for industrial applications

The IOG series

The IOG series consists of modular meters with an economical yet highly accurate, rugged design. Due to the robust nature of this particular flow measurement technology, the meters can be used where other types of measurement technologies are not suited.

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.

- High accuracy and repeatability
- Flow ranges from 0,04–700 l/min
- Vertical or horizontal installation
- Low pressure drop
- Minimum of wearable parts for long product life
- Optional adjustment of lay lengths
- ATEX approval
- Conform to FDA standards



IOG Stainless steel



IOG Aluminium or stainless steel



IOG PVDF

Technical data: IOG series

	1/4" (l/min)		1/2" (l/min)		3/4" (l/min)		1" (l/min)		1" HF (l/min)		1 1/2" (l/min)		2" (l/min)		3" (l/min)			
Flow range	0,04 – 1,6	0,09 – 1,6	0,25 – 8,3	0,44 – 8,3	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. 500.000 mPas with oval gears for high viscous fluids. Contact factory.																	
Accuracy (%)	±1,0	±1,5	±1,0	±1,5	±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		66		43		17		9		3	
Operating temperature																		
Stainless steel	-30 °C up to +120 °C																	
Aluminium/PPS/LCP	-30 °C up to +80 °C																	
Pressure rating																		
NPT/BSP	100 bar (SS) 55 bar (Alu)		200 bar (SS) 135 bar (Alu)		200 bar (SS) 135 bar (Alu)		200 bar (SS) 135 bar (Alu)		200 bar (SS) 135 bar (Alu)		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	Viton, Aflas, EPDM, Kalrez																	

The LM OG-I meters of the IOG series



- Combinable with all electronic displays
- Various material combinations
- High pressure and temperature rates
- Contact-free magnetic drive
- Only two moving parts to reduce wear and the need for maintenance
- ATEX model available

The LM OG-I meters of the IOG series are coated meters and have been designed to measure flows up to 115 l/min. They can dispense fuels, hydrocarbons, water-based fluids, motor oils, gear oils, coolants and other similar liquids, as well as special and aggressive fluids.

LM OG-I PVC



LM OG-I HF



Pulse transmitter LM OG-TI HF



Technical data: Type LM OG-I / LM OG-I PVC / LM OG-I Stainless steel with register

Type	Coolant/windshield liquid*	Brake fluid / waste oil**	LM OG-I HF ¾"	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 bar	100 bar	up to 100 bar	up to 100 bar
Operating temperature	-10 up to +60 °C	-20 up to +45 °C	-10 up to +60/120 °C	-10 up 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	½" BSPP	½" BSPP	¾" BSP	1" BSP
Housing	Alu / PVC / Stainless steel	Alu / PVC / Stainless steel	Alu / Stainless steel	Alu / Stainless steel
Oval gears	Delrin / Vectra / Stainless steel	Delrin / Vectra / Stainless steel	Vectra / Stainless steel	Vectra / Stainless steel
Protection class	IP 67	IP 67	IP 67	IP 67

* 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.

Technical data: Type LM OG-TI with pulse transmitters

Type	LM OG-TI 100 Alu	LM OG-TI 100 PVC	LM OG-TI HF ¾" Alu	LM OG-TI HF 1" Alu
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 bar	0,30 – 10 bar	up to 100 bar	up to 100 bar
Operating temperature	-10 up to +60 °C	-10 up to +45 °C	-10 up to +60 °C	-10 up 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	½" BSPP	½" BSPP	¾" BSP	1" BSP
Protection class	IP 42	IP 42	IP 42	IP 42

Hose end meters for lubricants

Electronic meters

The electronic meters benefit from a modular design. Robustness, easy handling and easy maintenance are features of these meters.

Easy menu driven electronics, freely programmable dispense quantities, integrated memories and display of flow and large graphic display define the electronic preset meters of the LM OG-P series. The battery can be replaced very easily from outside without losing any saved data.

- Rugged construction
- User friendly
- Easy battery replacement



LM OG-CNDAM
MID approved

LM OG-PNDK

Technical data: Electronic meters type LM-OG



Type	LM OG-CNDAM	LM OG-PND	LM OG-PNDK	LM 1800 PG-E	LM OG-CND	LM OG-HF CND
Connection	½" BSP	½" BSP	½" BSP	½" BSP	½" BSP	¾" BSP
Max. operating pressure	100 bar	100 bar	100 bar	70 bar	100 bar	100 bar
Flow range	1 – 10 l/min	1 – 30 l/min	1 – 30 l/min	1 – 15 l/min	1 – 35 l/min	3 – 60 l/min
Temperature range	-10 °C up to +50 °C	-5 °C up to +50 °C	-5 °C up to +50 °C	-5 °C up to +50 °C	-10 °C up to +50 °C	-10 °C up to +50 °C
Accuracy	±0,3 %	±0,5 %	±0,5 %	±0,5 %	±0,5 %	±0,5 %
Viscosity range	8 – 2000 mPas	up to 2000 mPas	up to 2000 mPas	up to 50.000 mPas	up to 5000 mPas	up to 5000 mPas
Protection class	IP 67	IP 42	IP 42	IP 67	IP 67	IP 67
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

* Measuring units, free programmable: Liters, quarts, pints, gallons

Electronic meters for high flow

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 micro-processor based and powered by a Lithium battery. Measurement units such as liters, pints, quarts or gallons can be selected.

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 viscosity.

Type	LM OG-HF 1"	LM OG-HF ¾" LM OG-HF CND ¾"
Accuracy	±0,5 % of flow	±0,5 % of flow
Flow range	3 – 115 l/min	3 – 60 l/min
Max. operating pressure	100 bar	100 bar
Temperature range	-10 °C up to +60 °C	-10 °C up to +60 °C
Protection class	IP 67	IP 67

Mechanical meters for highly viscous lubricants

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 most suited for the measurement of high viscous mineral oils in non-custody transfer applications.



Type	LM 1800 PG-B	LM 1800 PG-M
Connection	½" BSP	½" BSP
Max. operating pressure	70 bar	70 bar
Flow range	1 – 15 l/min	1 – 15 l/min
Temperature range	-10 °C up to +70 °C	-10 °C up to +70 °C
Accuracy	±0,75 %	±0,75 %
Viscosity range	50 – 50.000 mPas	50 – 50.000 mPas
Protection class	IP 67	IP 67

In-line meters and pulse transmitters



In-line meter LM OG-AM



Pulse transmitter LM OG-T 100

The in-line meters

- High accuracy
- Rugged construction
- MID approved



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 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 easy maintenance are features of the meter series. The electronic unit is shockproof and insulated against oil ingress.

The mechanical inline UH-M meter is ideal for use in extreme temperature conditions. This meter has a resettable totalizer 1–10 litres and a non-resettable totalizer, 4 digit register.

The pulse transmitters – In line meters with pulse output

The LM OG-T 100 meter 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).

Ideal for applications in oil management systems for non-custody transfers and for electronic registers.

The pulse transmitter LM OG-TAERM with MID approval offers a two-line display, date and time display, an internal memory as well as an order-related traceability. This pulse transmitter can be calibrated and has a two channel output (100 ppl per channel, 90° offset).

Type LM OG-TK is best suited for fluids such as glycol and windscreen wash.

Technical data: In-line meters



Type	LM OG-AM	LM OG	LM OG-K	UH-M
Connection	½" BSP	½" BSP	½" BSP	½" BSP
Max. operating pressure	100 bar	100 bar	100 bar	70 bar
Flow range	1 – 10 l/min	1 – 35 l/min	1 – 35 l/min	1 – 15 l/min
Temperature range	-10 °C up to +50 °C	-10 °C up to +50 °C	-10 °C up to +50 °C	-10 °C up 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
Protection class	IP 67	IP 67	IP 67	IP 67
Calibration	can be calibrated	can be calibrated	can be calibrated	-

Technical data: Pulse transmitters



Type	LM OG-T 100	LM OG-TAERM	LM OG-TK 100	LM OG-HFT ¾"	LM OG-HFT 1"
Connection	½" BSP	½" BSP	½" BSP	¾" BSP	1" BSP
Max. operating pressure	100 bar	100 bar	100 bar	100 bar	100 bar
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 up to +50 °C	-10 °C up to +50 °C	-10 °C up to +50 °C	-10 °C up to +60 °C	-10 °C up 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	100 per channel	100	66,75	66,75
Protection class	IP 42	IP 67	IP 42	IP 42	IP 42
Calibration	-	can be calibrated	-	-	-

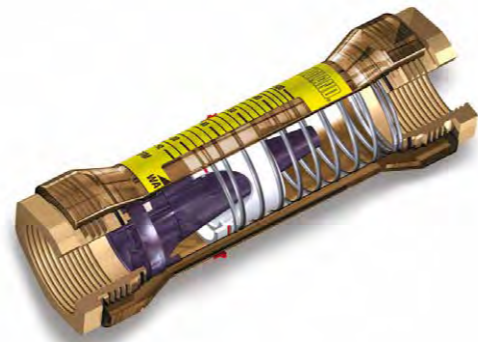
* Data in brackets is for approved versions.

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 gases. Hedland® meters are recommended 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 external indicating magnet, which moves precisely in direct response to movement of the piston therefore providing a visual display of the flow rate.



Variable area flow measurement

Low cost EZ-View® meter for oil, water and other liquids

- Rugged construction
- Horizontal or vertical installation
- Shock and vibration insensitive
- Instantaneous direct reading
- High pressure range



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

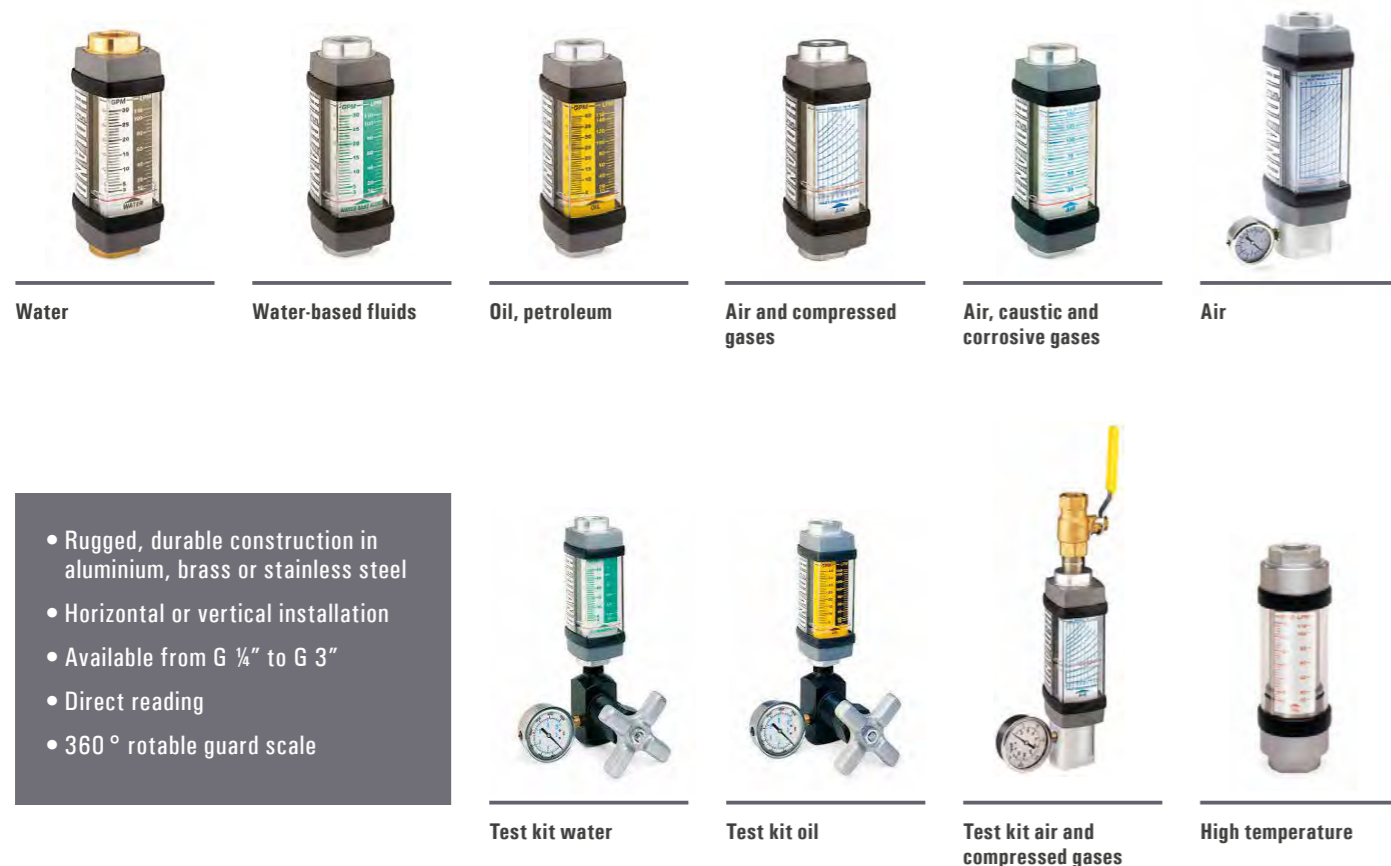
The EZ-View® variable area flow meters are rugged, low-cost direct reading meters. They are simple to install in any orientation, vertically, horizontally or even up side down, etc. without sacrificing measurement performance. Flow straighteners, located in the inlet and outlet, allow the flow meter to be less sensitive 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 in addition to allowing the internal flow rate indicator line to be easily seen.



The H-series – Variable area in-line flow meters



- Rugged, durable construction in aluminium, brass or stainless steel
- Horizontal or vertical installation
- Available from G ¼" to G 3"
- Direct reading
- 360 ° rotatable guard scale

The unique spring loaded design of this variable area flow meter for common fluids reduces viscosity sensitivity. 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.

Type	Basic model	Test kit	High temperature
Meter for liquid applications			
Version 240/410 bar (3500/6000 psi)			
Petroleum-based	X	X	X
Phosphate 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	

Flow transmitter Flow-Alert switch

The Flow-Alert switch flow meters are rugged, long-term variable area flow meters for measurement 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.

- Mounting in any position
- Automatically signal alarms



Flow transmitter MR series

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 and viscosity for liquid versions, while also providing pressure and temperature compensation for pneumatic versions is an additional benefit.



Vortex meters

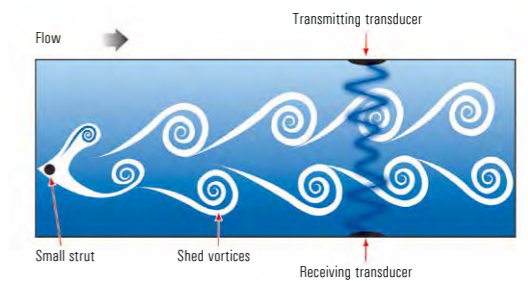
Vortex flow meters utilize ultrasonic sensing technology, allowing the meters to perform with an extremely small bluff body. As a result, system pressure drop and meter turndown ratio are greatly improved. The meters benefit from a wide measuring range (up to 70:1) and high accuracy (1 % of reading).

By using intelligent electronic and HART® communications vortex meters are ideal for biogas, process engineering systems and refineries. The unit has no moving parts and is maintenance free.

Highly precise meters for gas, digester gas, liquids and air

Measuring principle

Within the flow meter, as flowing media moves across the strut or "bluff bar", vortices are shed. 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 is modulated. 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.



Wafer gas meters in stainless steel – RWG and RWBG

The RWG and RWBG models are designed for high accuracy and extremely low pressure drop. There are no moving parts and after installation there is no need for maintenance. The RWG models can be used with most gases.

Type RWBG has a similar construction and is ideal for use with biogas digester applications, e.g. $\text{CH}_4 + \text{CO}_2$ mixtures. All meters use a two-wire technology offering HART® communication for easier programming and system integration.

- High accuracy
- Low pressure drop
- HART® communication protocol



Stainless steel insertion meters – RNG

- High accuracy
- Low pressure drop
- HART® communication protocol

The RNG insertion meter provides highly precise measurements for gases. The RNG is suitable for applications such as metering of flare gas, stack gas, natural gas, biogas and air.



Liquid meters in thermoplastic – RVL series

The RVL series meters utilize 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 VDC 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 ultrapure water to highly corrosive chemicals and polishing slurries. Units may be recalibrated 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).

- For corrosive fluids and de-ionized water
- High accuracy
- No moving parts



Liquid meter RVL-Inline



Liquid meter RVL-Inline flare end



Liquid meter RVL Wafer

Technical data: Vortex meters

Type	RWG / RWBG	RNG Insertion
Medium	Gas/digester gas	Gas/air
Flow range	0,1 – 7,5 to 9,5 – 280 l/s	0,6 – 43 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
Repeatability	0,5 % of reading	0,5 % of reading
Output signal	2-wire, 4 – 20 mA loop	2-wire, 4 – 20 mA loop
Input power	24 VDC	24 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

Technical data: RVL series

Type	RVL-Inline	RVL-Inline flare end	RVL Wafer
Connections	Butt or NPT-thread	Pipe (flare-end)	Wafer
Pipe size	DN 15 – DN 50 (½" to 2")	DN 15 – DN 25 (½" to 1")	DN 15 – DN 75 (½" to 3")
Flow range	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

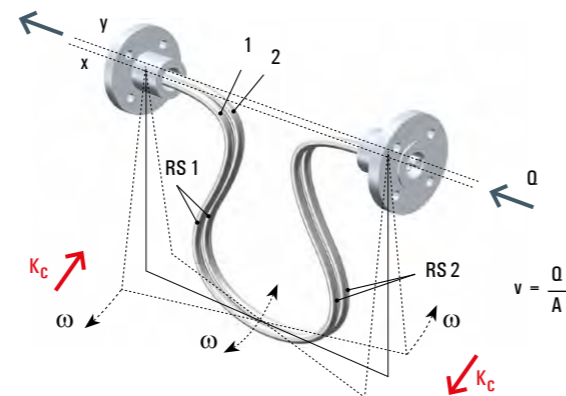
Coriolis mass meters

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.

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.

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



Meters for mass measurement of fluids

FCB 300 series 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



The Coriolis MultyMass FCB 330 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.

FCH 300 series 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 FCH 330 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 FCH 330 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.



Technical data: Sensor

Type	FCB 300 for standard applications	FCH 300 for hygienic applications		
Process connections				
- Flange DIN 2501 / EN 1092-1	DN 10 to 200, PN 40 to 100	-		
- Flange ASME B16.5	DN ¼" to 8" PN CL150 to CL600	-		
- Threaded pipe connection DIN 11851	DN 10 to 100 (¼" to 4")	DN 25 to 80 (1" to 3")		
- Tri-Clamp®	DIN 32676 (ISO 2852) BPE Tri-Clamp® DN 10 to 100 (¼" to 4")	DIN 32676 (ISO 2852) BPE Tri-Clamp® DN 20 to 100 (¼" to 4")		
- Other connections	On request			
Wetted materials				
	Stainless steel Nickel-Alloy C4/C22	Stainless steel, polished 1.4404 (AISI 316L) or 1.4435 (AISI 316L)		
Degree of protection acc. to EN 60529				
	IP 65/67, NEMA 4X	IP 65/67, NEMA 4X		
Approvals and certificates				
- Explosion protection ATEX / IECEx	Zone 0, 1, 2, 21, 22	Zone 0, 1, 2, 21, 22		
- Explosion protection cFMus	Class I Div. 1, Class I Div. 2, Zone 0, 1, 2, 20, 21	Class I Div. 1, Class I Div. 2, Zone 0, 1, 2, 20, 21		
- Explosion protection NEPSI	Zone 0, 1, 2, 21, 22	Zone 0, 1, 2, 21, 22		
- Hygienic and sterile requirements	-	EHEDG, FDA		
- Other approvals	On request			
Enclosure				
	Integral mount design, remote mount design			
Measuring accuracy for liquids				
	FCB 330	FCB 350	FCH 330	FCH 350
- Mass flow*	0,4 % and 0,25 %	0,1 % and 0,15 %	0,4 % and 0,25 %	0,1 % and 0,15 %
- Volume flow*	0,4 % and 0,25 %	0,15 %	0,4 % and 0,25 %	0,15 %
- Density	0,01 kg/l	0,002 kg/l 0,001 kg/l (option) 0,0005 kg/l**	0,01 kg/l	0,002 kg/l 0,001 kg/l (option) 0,0005 kg/l**
- Temperature	1 K	0,5 K	1 K	0,5 K
Measuring accuracy for gases*				
	1 %	0,5 %	1 %	0,5 %
Permissible temperature of the medium being measured				
	-50 °C to 160 °C	-50 °C to 200 °C	-50 °C to 160 °C	-50 °C to 200 °C

* Stated measuring accuracy in % of rate (% of reading) ** Measuring accuracy following on-site calibration under operating conditions

Technical data: Transmitter

Type	Transmitter FCT xxx	
Enclosure	Integral mount design	Remote mount design
Cable length	Maximum 10 m, remote mount design only	
Power supply	100 - 230 V AC, 24 V AC/DC	
Current output	Current output 1: 0/4 - 20 mA active or 4 - 20 mA passive Current output 2: 4 - 20 mA passive	
Pulse output	Active (not Zone 1 / Div. 1) or passive	
External output zero return	Yes	
External totalizer reset	Yes	
Forward/reverse flow metering	Yes	
Communication	HART® protocol	
Empty pipe detection	Yes, based on preconfigured density alarm < 0.5 kg/l	
Self-monitoring and diagnostics	Yes	
Local display / totalization	Yes	
Field optimization for flow and density	Yes	
Degree of protection acc. to EN 60529	Integral mount design: IP 65/67, NEMA 4X	Remote mount design: 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 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.

Differential pressure flow metering

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 (p_2 = dynamic pressure) results in the accumulation of the medium and at the outlet of the constriction the highest pressure is forming (p_1 = static pressure). The pressure difference (incompressible, without friction) for liquids generated by the Bernoulli equation.

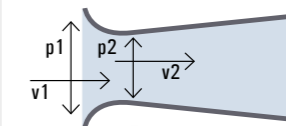
Pitot tubes also work on the basics of the Bernoulli equation. In contrast to the venturi tube, work is done with the help of a second tube which is oriented parallel to the flow of the medium, such that the flow impinging on a front pipe opening. In front of the tube is formed the dynamic pressure,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

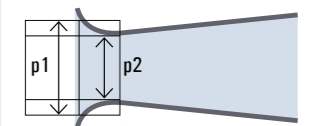
Bernoulli equation

$$\frac{v_1^2 + p_1}{2D_s} = \frac{v_2^2 + p_2}{2D_s}$$



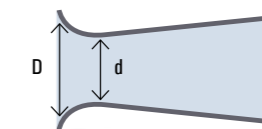
Differential pressure

$$p_1 - p_2$$



Beta ratio

$$d/D$$



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

Coin® meter for fluids, gases, steam, air and slurry

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 applications.

You get accurate, reliable results from the Coin® flow meter.

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 and especially good with high viscosity low velocity liquids.

- High accuracy
- Low pressure drop



Ellipse® pitot for fluids, gases and steam

- DN 50 to DN 3050 (2" to 120")
- Accuracy $\pm 0,75\%$ of reading
- Low pressure drop

The Preso® Ellipse® pitot 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 $\pm 0,75\%$ of reading.



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.



Orifice plate



Venturi model SSL



Venturi V-series



Venturi model SSM

Technical data: Type Ellipse®

Type	Fluid	Pipe size	Pressure	Temperature	Accuracy	Material
Ellipse® AR – annular	Liquids, gases	DN 50 to DN 1800	55 bar max.	425 °C max.	$\pm 0,75\%$ 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	$\pm 0,75\%$ of reading	Stainless steel
Ellipse® AS – annular for steam	Steam	DN 50 to DN 1200	40 bar	250 °C max.	$\pm 0,75\%$ of reading	Stainless steel
Ellipse® ASF – annular for steam, flanged	Steam	DN 50 to DN 1200	Vary per flange ratings	Vary per flange ratings	$\pm 0,75\%$ of reading	Stainless steel
Ellipse® AHR – annular, low pressure	Air, liquids, gases	DN 50 to DN 900	5/10 bar	65 °C	$\pm 0,75\%$ of reading	Stainless steel
Ellipse® AHL – Pitot tube, high pressure	Air, liquids, gases	DN 50 to DN 750	55 bar max.	425 °C max.	$\pm 0,75\%$ of reading	Stainless steel
Ellipse® AHL-GD – high pressure	Air, liquids, gases	DN 50 to DN 750	55 bar max.	425 °C	$\pm 0,75\%$ of reading	Stainless steel, carbone steel
Ellipse® AHS – Pitot tube threaded for steam	Saturated and super-heated steam	DN 50 to DN 600	55 bar max.	425 °C max.	$\pm 0,75\%$ 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	$\pm 0,75\%$ 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	$\pm 0,75\%$ of reading	Stainless steel, brass, polycarbonate

Technical data: Venturi tubes

Type	Application	Material
SSL – Classical (Herschel) design	Fluids, gas, steam	To suit application
SSM – Hydraulic design (Nozzle type)	Fluids, gas, steam	Stainless steel, carbone steel, brass
LPL – Low-loss design (short form)	Fluids, gas, steam	Stainless steel
VISL – Insert type, classical design	Fluids, gas, steam	Stainless steel
VISSM – Insert type, hydraulic design	Fluids, gas, steam	Stainless steel
VILPL – Insert type, low-loss design	Fluids, gas, steam	Stainless steel
CV series	Fluids, gas	Carbone steel, polycarbonate, brass
V-series – Low-loss design	Industrial applications	Stainless steel, polycarbonate, brass

Technical data: Coin® meters

Type	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

Hydraulic diagnostics



Hydraulic testers and analyzers

Flo-tech portable hydraulic testers are compact and portable units, designed for fast troubleshooting and diagnostics of mobile and stationary hydraulic systems.



**Portable digital hydraulic tester
PFM6**



**Bidirectional hydraulic tester
PFM6 BD**



**Hydraulic tester with dynamometer
PFM8**



**Flo-Check® USB
USB hydraulic system analyzer**



Sensor array Activa/Ultima



**Handheld hydraulic system analyzer
MC 4000**

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. Activa and Ultima sensor arrays are system testers for flow, temperature and pressure.

The diagnostic test equipment MC 4000 is a handheld system analyzer with inputs for two pressure sensors, one temperature sensor, one flow sensor and one active pick-up for RPM¹ measurements.

Model	PFM6	PFM6 BD	PFM8	Activa/Ultima	Flo-Check® USB	MC 4000
	Portable hydraulic tester	Bi directional hydraulic tester	Digital hydraulic tester with dynamometer	Sensor array	USB hydraulic system analyzer	Portable hydraulic system analyzer
Enclosure	Anodized aluminium					Plastic
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			10 - 24 VDC for 4 - 20 mA output	+ 4,6 VDC min., + 5,25 VDC max.	5 sensor inputs

1) Revolution per minute

Flow calibrators

Besides calibration services, our calibrators are also provided for sale.

Flow Dynamics® calibrators – a division of Badger Meter, Inc. – are highly-precise calibrators capable of performing flow calibrations on many types of flow meters.



Flow calibrators for calibration and test of flow meters

- NIST-traceable
- Printed, plotted calibration data
- Automated data acquisition
- Uncertainty $< \pm 0,05\%$ 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 changes in viscosity and temperature. They ensure extremely high precision fluid flow measurement.

With a repeatability of $\pm 0,01\%$ of reading, the calibrators are extremely precise. Metrological institutes from all over the world deploy this type of calibrator for their meter calibrations.

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 1/8" to 4" meters or smaller.

The PDLC calibrators are capable of performing flow calibrations on various types of flow meters, including turbine, differential pressure orifice plate, Coriolis and other types of special meter designs.



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)	0,39 – 1515 l/min (0,1 – 400 GPM)
Viscosity range	0,5 – 1000 mPas		
Uncertainty	$\pm 0,05\%$ of reading		
Fluid operating temp.	4 – 60 °C		
Operating pressure	Up to 8 bar		

Calibration services

Badger Meter is also able to offer calibration services for manufacturers and users of flow meters.

We verify the accuracy of all kinds of flow meters: Electromagnetic, ultrasonic, turbine, oval gear, nutating disc, oscillating piston, impeller, variable area, primary flow elements and heat meters.

Our in house volumetric calibrator can test flow meters from DN 2 to DN 150 at flow ranges from 0,37 to 1.515 l/min, providing a measurement uncertainty of $\pm 0,05\%$.

- Accredited calibrations/ recalibrations
- For all manufacturing brands
- Individual calibration certificates
- Traceability to recognized international standards
- Optional 24 hours hot shot quick turnaround service

Fluid management systems



The systems for controlled dispensing of fluids

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

Oil management systems that dispense volumes of fluids in automotive workshops require highly accurate flow meters and pulse transmitters, trouble-free and secured manipulation in remote transmission equipment in addition to durable data memory that is able to retrieve dispense data, quantities and oil products at any time. The radio frequency based systems with MID approval offer the advantage of a wireless communication between the dispensing terminal and meter.



Wireless oil management systems

LMS-RF system with ZigBee® technology

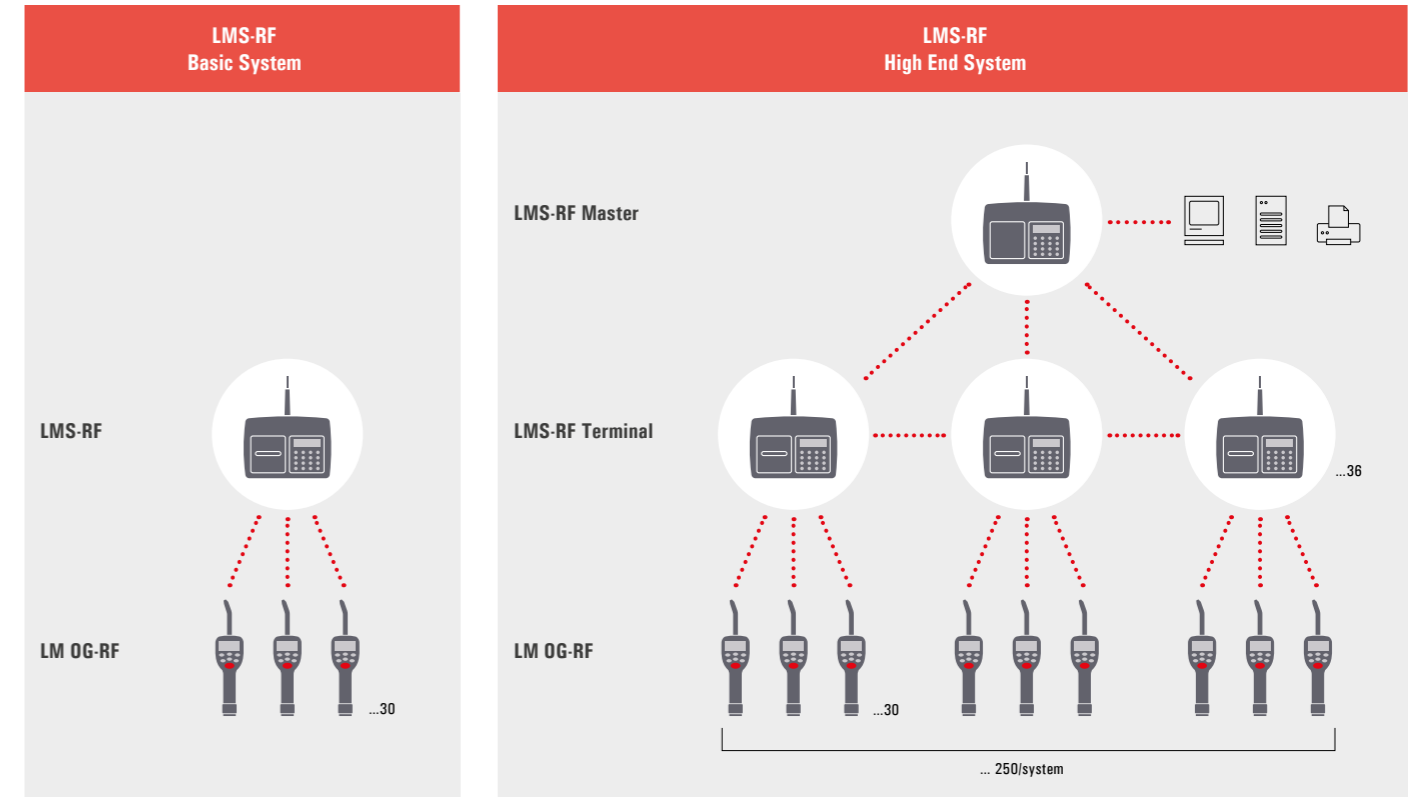
The LMS-RF oil management system offers a cablefree communication between the dispensing terminal and meter using radio frequency technology which has been specially developed for garages. The system can communicate with any host computer within the workshop using a free programmable RS 232 interface. In combination with a trolley, the LMS-RF system becomes a fully stand alone unit.

- 2,4 GHz
- No cutting into existing pipes
- 2-way exchange of data
- Easy upgrades
- Incl. PC software package (for High End)
- Connection for barcode reader



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

The LMS-RF system is available in two versions



Technical data: LMS-RF oil management system

	LMS-RF Basic System		LMS-RF High End System		Meter LM OG-RF
	Dispense terminal	Master terminal	Dispense terminal		
Display	2-line LCD display	2-line LCD display			Graphic display
Users per system	1 - 49	1 - 250			Preselection
Dispense terminals per system	1	1 - 36			No dispense possible without prior dispense release from the dispense keypad
Meters per system	1 - 30	1 - 250			Integrated solenoid valve
Oil types	1 - 8	1 - 16			Manual override still tracks totals dispensed
Tanks	1 - 8	1 - 16			Easy battery replacement
Oil product management	Yes	Yes			Standard 1,5 V AA batteries
Dispense memory	No	Yes (MID optional, 32.000 dispenses)			Battery lifetime of 15 000 dispenses
RS 232 serial port	Printer Barcode	PC software Printer Host/DMS*	Printer Barcode		
Protection class	IP 42	IP 42			

* Network connection upon software

Cabled fluid management systems

Oil management system MDS 2000

- CAN-Bus technology
- Compatible with asanet
- Connection to garage software
- Protection class IP 42
- PTB approved

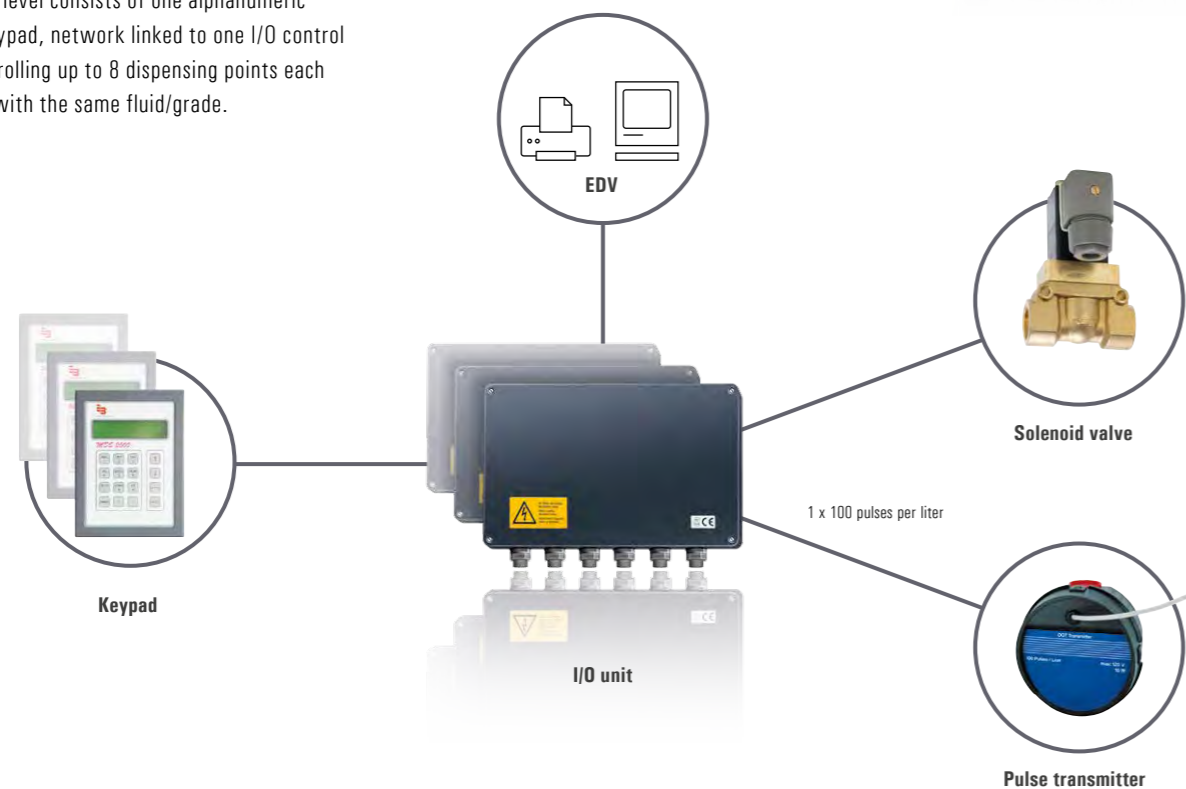
The oil management system MDS 2000 has been designed to control and manage lubricants to achieve product accountability and profit center protection. The system is especially designed to be installed in small or large garages, car pools, forwarders and industry.

The entry level consists of one alphanumeric keypad, network linked to one I/O control unit, controlling up to 8 dispensing points each of which with the same fluid/grade.

Transaction data is retrieved on a standard serial printer. The system upgrades easily to control up to 64 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 workshop host computer by means of a free programmable RS 232 interface.



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

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

The valves enable the preselected dispense quantity to switch off at the precise moment. The pulse transmitters are the actual measuring units of the MDS system and the pulses are transmitted to the main control unit.



Compact and easy system FMS Compact



Solenoid valve



Pulse transmitter

The FMS Compact is a compact and easy to use fluid management system for up to 4 dispense points (tank management). The system is equipped with an integral printer, alphanumeric keypad and internal large graphic display.

Due to its intelligent control, the system only allows operation by entering a personal code (up to 99 authorised operators). It prints a ticket after each transaction and stores up to 1600 transactions in its memory for eventual download to a PC computer. All the inputs and outputs of the system are wired by means of terminal clamps located inside the enclosure ensuring an easy "plug & play" installation without the need of opening the housing.

The rugged steel housing and high quality plug connectors guarantee reliable operation in harsh conditions. Customized versions with firmware adaption, LCR pulse scalers or internal pulse isolators are available upon request.

The FMS Compact can be used as a batch control and tank management system. It can be combined and managed with many mechanical and electronic flow meters via the pulse output/input offering a broad range of applications – from the management of mineral oils, fuels, hydrocarbons, water, detergents, alcohols, paints, etc. to the batching of fuel additives and concrete process additives.

- 4 dispense points
- 4 fluids
- Integrated ticket printer
- Alphanumeric keypad
- RS 232 serial port for PC or printer
- Connection for barcode reader
- Protection class IP 42

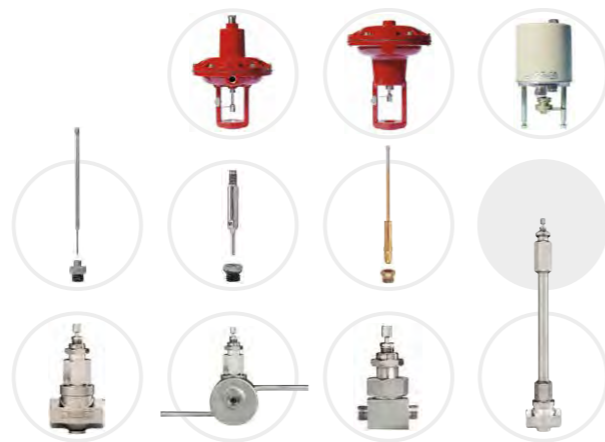
Small control valves

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 innervalue sizes.

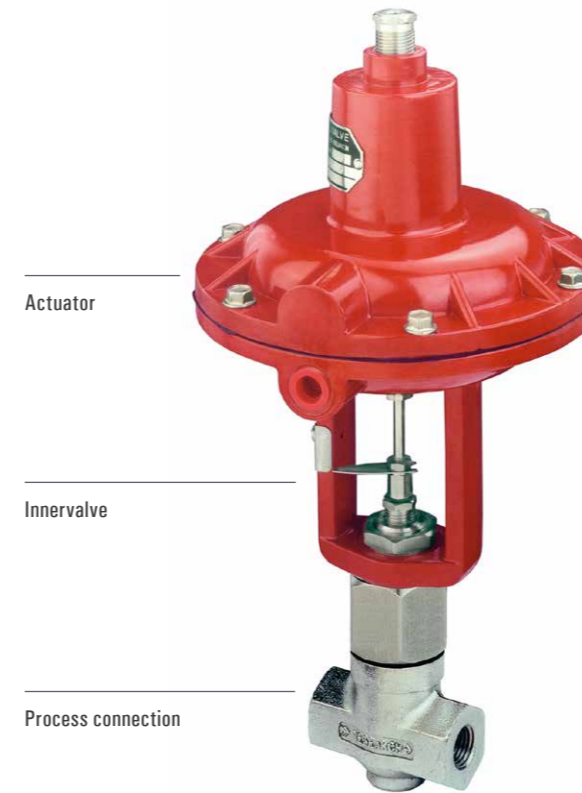


Customized valves

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



SERVICE

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

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.

The ReCo® valves



Type	Standard valve	Flanged valve	Angle valve	High pressure valve	Cryogenic valve	Barstock valve	3-way valve
Process connections	NPT internal threads or BSP-P	Welded-on flanges	NPT internal threads	NPT internal threads or Autoclave 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 innervalves.

Technical data: Process valves



Type	Standard valve	Flanged valve	Cryogenic valve	Bronze valve
Process connections	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 ¾" - 2"
Cvs	0.02 - 25	0.02 - 25	0.02 - 25	8 - 54
Max. operating 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 industries

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.

- No dead volume
- Easy to clean



Globe casted sanitary valve

Technical data: Sanitary valves



Type	Globe casted sanitary valve	Barstock sanitary valve
Process connections	Tri-Clamp® connection	Tri-Clamp® connection
Size	DN 1" - 2"	DN ½" - 2"
Cvs	0.05 - 50	0.05 - 50
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 communication with and monitoring a valve

Whichever you prefer – I/P-positioners, digital or analogue, or pneumatic 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).

- Able to give a diagnostic
- Reliable
- Sure



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)

RCVcalc – The smart sizing solution



RCVcalc is a sizing software that adapts to the process requirements of the plant and guides the user through selecting the right control valve for any new project.

With more than 2000 different media – ranging from gas, liquid, bi-phase or steam – RCVcalc provides accurate, versatile information, automatic phase identification of standard media and offers the possibility to create customized media to better reflect the system parameters of the plant.

The software enables the user to visualize the operation set points and to review various trims and characteristics that are filtered for the application. It provides real-time scenarios to review trims and control points while considering the rangeability of each innervalve. For low flow calculations, RCVcalc implemented enhanced formulas to cover transitional and laminar flow situations. It also allows the user to enter a vast range of units. The sizing software identifies the actuator shut off forces, including the friction at the packing and shut off class.

Used in combination with the RefProp package from NIST, RCVcalc will add the information into the database, thus allowing to leverage thermodynamic equations of various fluid states providing higher accuracy for high pressure and/or low temperature applications.

The new sizing software finally provides real-time system alerts (cavitation and operational alarms) to create scenarios with operating points to better define system limitations and better valve selections.



Customer accessibility and competence

We can help you in a timely manner to solve your measurement problems, advising you to assist in optimizing your measurement solution, technology and site location before you make a decision. An extensive distributor and service network ensures the best service worldwide.

Local representatives are a big advantage for our customers. The short distance and local language support provide efficient service. Our distributors are trained on Badger Meter products at their own facilities or in our training center. Our name assures you that our products have been manufactured with the best care and in conformity with all DIN ISO 9001:2008 directives.

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Service hotline free of charge within Germany



You can reach us within Germany free of charge on 0800-588 897 801.

From outside Germany
 Phone +49-7025 9208-0

Monday through Friday
 8.00 – 12.00 and 13.00 – 17.00 (CET)



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