Coriolis Mass Flow Meters



Advanced flow measurement made easy.



Introducing Coriolis Mass Flow Meters

The Badger Meter RCT1000 Coriolis mass flow meter identifies flow rate by directly measuring fluid mass over a wide range of temperatures with a high degree of accuracy. For fluids consisting of two liquids or a liquid with suspended solids, the RCT1000 Coriolis system can derive the concentration and mass of each fluid based on the density measurement. Furthermore, the unobstructed, open flow design makes it suitable for a variety of fluids such as slurries and other viscous, nonconductive fluids that are difficult to measure with other technologies.



Advantages:

- Unobstructed open flow design
- Low-maintenance operation with no free-moving parts
- Modbus RTU, Modbus TCP/IP, HART[®], and EtherNet I/P network options
- Advanced fluid diagnostic tools
- Batching and PID control

Specifications:

- Pipe size: 1/16...3 in. (1.6...76.2 mm)
- Accuracy:
 - \diamond Liquids: up to \pm 0.1% of flow rate
 - \diamond Density: up to ± 0.0005 g/cm³
- Zero stability: up to \pm 0.025% of full scale
- Repeatability: up to \pm 0.05% of flow rate
- Process temperature range: -40...392° F (-40...200° C)
- Wetted material: 316L stainless steel
- General area or hazardous location

Simultaneous measurement of

- Mass flow
- Density
- Temperature



Hazardous Location Transmitter



Advanced Software



Applications

Unlike many flow measurement technologies, Coriolis mass flow meters can directly and accurately measure the mass flow of fluids over a wide range of fluid temperatures and viscosities. The Coriolis design and measurement principle allows the meter to be an exceptional device in measuring:

- Vegetable oils and fats
- Homogeneous suspensions and slurries
- · Adhesive, glue or binding materials
- Coatings and hardeners
- Dyes, fragrances, vitamins and other additives
- Oil and fuels









- Chemical
- Pet food
- Textiles
- Combustion control
- Asphalt
- Engine test stands



How Coriolis Technology Works

Coriolis flow meters simultaneously measure mass flow rate, density and temperature. As fluid flows through the vibrating sensor tube, forces induced by the flow cause the tube to twist slightly. These small deflections are measured by carefully placed sensors. A phase shift occurs between sensor signals that is directly proportional to mass flow rate. As the fluid density varies, the resonant frequency at which the tube vibrates changes which is also measured by the sensors. Temperature is measured by an internal RTD in order to calculate thermal effects on the tube vibrating frequency.

Types of Measurement

Mass flow rate	Derived from the phase shift between inlet and	l outlet sensing coils				
Density	Derived from vibration frequency					
Temperature	Measured and used to correct for changes in th	e stiffness of the vibrating tubes				
Internal Operation (U-Tube design)	U-Tubes					
Phase Shift	NO FLOW Bottom View $\Delta T = 0$	FLOW Bottom View \downarrow \downarrow \downarrow \downarrow \downarrow \downarrow \downarrow \downarrow \downarrow \downarrow				
Density Frequency	HIGH DENSITY					
the formation of a	mass flow meters operate at low frequencies which hir slugs in liquids with entrained air. This operation ogeneous and provides less erratic readings.					



Controls & System Integration

RCT1000 transmitters provide a variety of ways to integrate the meter output into new and existing operations. The batch and PID functionality enables direct control of devices, such as valves, by use of digital or analog outputs. Digital outputs can also be programmed to indicate low and high alarm conditions.

Network options

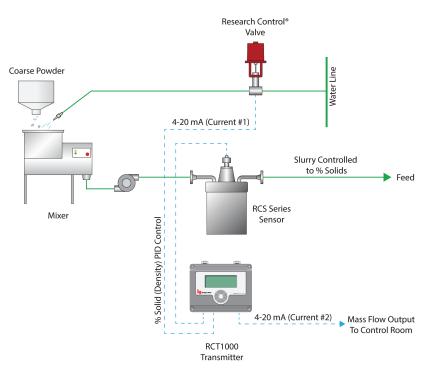
- EtherNet/IP
- Modbus TCP/IP
- Modbus RTU
- HART®

PID Loop Control Example

Signal outputs

- Frequency
- Pulse
- PWM
- 4...20 mA (Qty 3)

Slurries are used in many products, but the proper mix needs to be controlled. As a slurry is pumped through the Badger Meter Coriolis flow meter, the meter measures the percentage of concentrate. Based on this measurement, the PID controller output from the RCT1000 transmitter will modulate the water addition to the mixer to ensure the exact concentration is achieved. In conjunction to the PID control function, the RCT1000 transmitter can also supply analog output or network connectivity for continuous monitoring of the percentage of solids as well as flow rate information to the control room.



- Quick configuration
- Easy-to-read
 LCD screen
- Remote or integral mounting



RCT Console Software

Every RCT1000 Coriolis mass flow meter comes with RCT Console software. RCT Console is specifically designed to provide users maximum operational flexibility and ease-of-use. By allowing users quick access to configure measurement parameters through the RCT Console software or the LCD interface on the transmitter, the meter can be set up and measuring flow in a matter of minutes.

RCT Console software offers much more than configuration features. Users are able to obtain advanced data logging and performance trending analysis, as well as system verification provided by the unique HealthTrack feature.



Trend Graphing

Decate HealthTrack To start HealthTrack please click on Sta Constants" once and deplays their val Count" these after which HealthTrack o deplays these info. Click on the Preview "Snapshots" taken from current HealthT	ue. The items marked as " alculates Average, Range v button below if you wan	ariables" will b and Standard	e read "Samp Deviation and	e i			
B B G Sample Count 20 121 23							
liem	Value	Average	Range	9a -			
- 🚰 75. Density KT Factor	0.000218 [-]						
- 🚰 80. Mass Totalizer	2549.075 lb						
- 261, MAINCPU Crystal Frequency	25000000.000000 Hz						
- 262, Voltage Reference	2500.000000 mV						
 263. Mass increment 	?						
 271. IFCPU Crystal Frequency 	25000000.000000 Hz			۰.			
- 🚰 33. Phase	39.996 µs	40.000 µs	0.018 µs	0.0			
2 56, Net mass flow rate	0.000 lb/h	0.000 lbh	0.000 lbh	0.0			
- 🚰 57, Net volumetric Bow rate	0.000 gph	0.000 gph	0.000 gph	0.0			
- 2 53, Mass Flow Rate	63.254 lb/m	63.241 lb/m	0.027 lb/m	0.0			
- 🚰 60. Tube Frequency	104.993 Hz	105.000 Hz	0.018 Hz	0.0			
TO. Density				ш.			

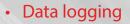
HealthTrack System Verification

mFlo mTot Dens	3.395 kg/h 102.348 kg 0.8250 gr/cc
m%8	0.00 %

Remote Display

Serple	Time	33 Phase	50 Tube Frequency	183. Coll A Voltage	154. Oniver Output	105. Coll & Voltac
	141	15	Ha	eli	2	w//
1	0.355	-0.018321750685572634	88.507252666015625	60.0019416809082	63.021713256835937	55 978321075439
2	1.045	0.0089403438973424819	88.516281127929488	53 999141693115234	49.029747009277344	55-57696974609
3	2.075	0.044337108721269836	88.521278381347656	63.000080108642578	65.03057861328125	58,9730110168
4	3,105	-0.059953189693523407	88.511688232421875	40.009830474853516	69.027748107910156	58,9715680613
5	4,134	0.021696289760828018	88.5118637084961	53.991420745849629	68.026771545410156	59.969928741455
6	5.164	0.0795641223182215	88.512863159179688	55 994338965257813	69.0417533056664063	58.967929540087
7	6.123	0.029011240229010582	08.503567260742187	59-2900-4003203125	63.006247253417963	53.965499677929
8	7.223	006253632307052612	88.510772795078125	53 999370574951172	63.035362243652344	58 967361452195
2	0.253	0.061536430367796437	00.491100412021075	53 200531512451172	63 009588928222656	53 9675407405
10	9.292	-0 1050340011715889	88.511962890625	55/95452890625	6503460693358375	58 963081358963
11	10,312	-0.015541370278596878	00.50120173020125	62.005135432373047	63.020430523735156	58 596783703363
12	11.341	-0.0635964487923851	88.487077541894531	63.01631.9645507813	69.017707824707001	58 9632903523
13	12,137	-0.00923190638422966	88.508542749023438	53 997470855712891	63.000545642069544	53 571458435058
14	13.167	0.11063340306282943	88.502738952636719	40.005491528320312	43.027137756347456	59.976548602294
15	14.196	0.023042159155011177	88.499702453613281	55 993961334229516	69.000676147460908	58.969009399414
16	15.226	-0.057191379368305206	88,509368896484375	40.004070291983422	69.027626007597656	58.979610992431
17	16.256	0.000795749514102906	88.512100219726563	58 993301397607563	65 03558349608375	59.963150482177
10	17,205	0.006112096905706313	88.518013005488291	53 904431011523438	63 042220038730463	53.971001066455
12	18.315	-0.10414709095848228	00.516101945000701	53.997970531054687	63.004095764160156	55 97052001953
20	19.344	-0.034267728368235892	88.5077996118164	53 990085416503906	63.008200376417969	58.971920013427
21	20.031	0.002753609120645795	88.5064697265625	59 35407950904375	63 009588928222656	53.900729145414
22	21.060	0.0646323710680008	88.501480102539062	58 99655 15 1067 1875	69.027915952589544	58.966128302978
23	22.050	0.000642613391391933	88.583471374511719	60.015238715576172	63.015998548332001	53 555502507548
				PR. CO. LANSING CO. LANSING		1 Da

Data Logging



- Trending
- HealthTrack system
 verification



About Badger Meter

Badger Meter Flow Instrumentation understands that companies cannot manage what they cannot measure—and leverages more than a century of flow measurement expertise and a technology-rich portfolio to optimize customer applications worldwide.

An industry leader in both mechanical and electronic flow metering technologies, Badger Meter offers one of the broadest flow control and measurement portfolios in the industry—a portfolio that includes eight out of the ten major flow meter technologies. Simply put, Badger Meter Flow Instrumentation provides technology to measure and control whatever moves through a pipe or pipeline—including water, air, steam, oil, other liquids and gases.

Variety of Flow Instrumentation Solutions





ModMAG® Electromagnetic Flow Meters



Research Control® Valves and Positioners



Impeller Flow Meters



Preso[®] Differential **Pressure Flow Meters**

Industrial Oval Gear Flow Meters



Hedland[®] Variable Area Flow Meters



Cox & Blancett® **Turbine Flow Meters**



Flo-Tech Hydraulic Fluid Testing



Dynasonics® Ultrasonic Flow Meters



Recordall[®] Disc Flow Meters



Vortex Flow Meters



Flexible Network **Connectivity Options**



- Control
- Manage
- Optimize

Flow Dynamics® calibration services



- Calibration for most meter types
- OEM production calibrations
- NIST-traceable primary standards



Note: NVLAP accreditation applies only to the Badger Meter Flow Dynamics calibration Lab, located in Racine, WI



Control. Manage. Optimize.

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