Coriolis
Mass Flow Meters

Badger Meter

Advanced flow measurement made easy.

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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.

Simultaneous measurement of
- Mass flow
- Density
- Temperature

Hazardous Location Transmitter

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:
    ◊ Liquids: up to ± 0.1% of flow rate
    ◊ Density: up to ± 0.0005 g/cm^3
- Zero stability: up to ± 0.025% of full scale
- Repeatability: up to ± 0.05% of flow rate
- Process temperature range: –40…392° F (–40…200° C)
- Wetted material: 316L stainless steel
- General area or hazardous location

Advanced Software

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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

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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 outlet sensing coils
Density	Derived from vibration frequency
Temperature	Measured and used to correct for changes in the stiffness of the vibrating tubes

Internal Operation
(U-Tube design)

Inlet   Outlet

Sensing Coils

Drive Coil

U-Tubes

Phase Shift

NO FLOW

Bottom View

$\Delta T = 0$

FLOW

Bottom View

$\Delta T > 0$

Density Frequency

HIGH DENSITY

LOW DENSITY
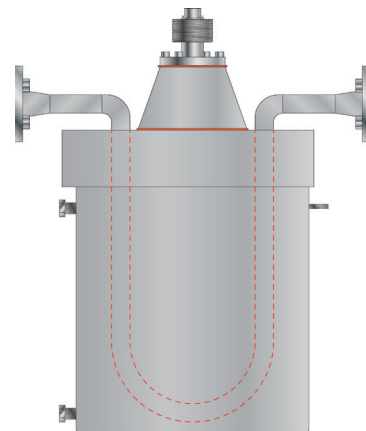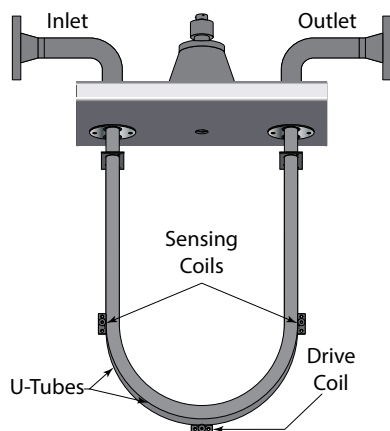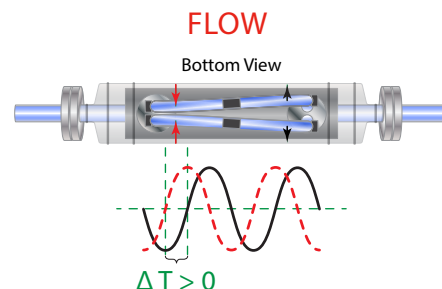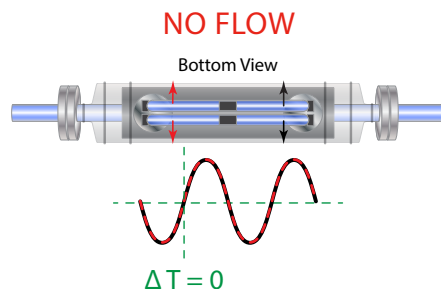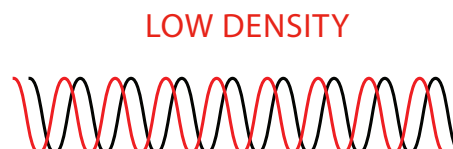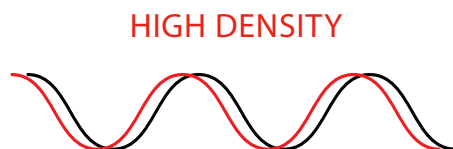
RCT1000 Coriolis mass flow meters operate at low frequencies which reduce the formation of air slugs in liquids with entrained air. This operation keeps liquids more homogeneous and provides less erratic readings.

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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®

Signal outputs
- Frequency
- Pulse
- PWM
- 4…20 mA (Qty 3)

PID Loop Control Example

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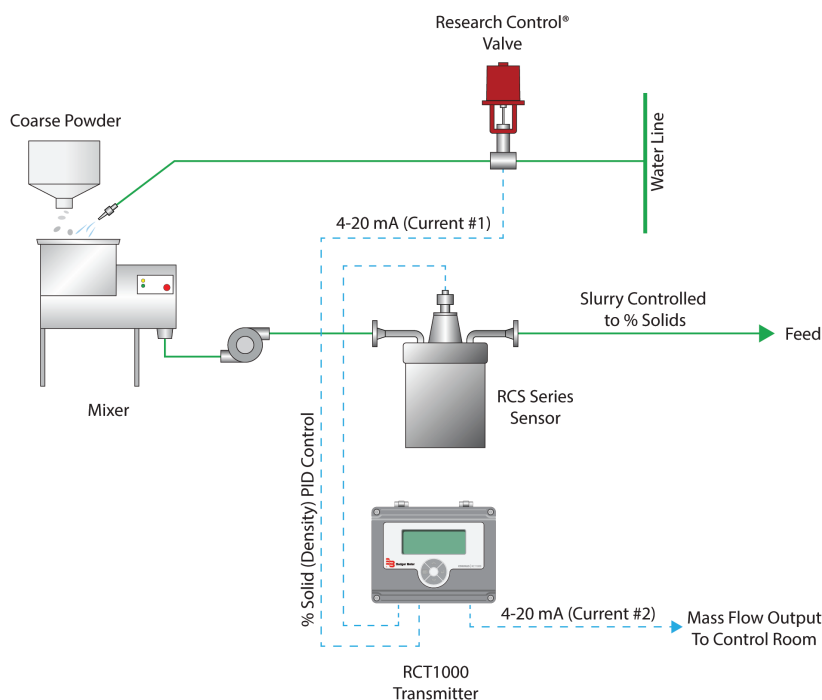
- Quick configuration
- Easy-to-read LCD screen
- Remote or integral mounting

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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.

- Data logging
- Trending
- HealthTrack system verification

Trend Graphing

HealthTrack System Verification

Remote Display

Data Logging

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About Badger Meter

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

Industrial Oval Gear Flow Meters

Dynasonics® Ultrasonic Flow Meters

Research Control® Valves and Positioners

Hedland® Variable Area Flow Meters
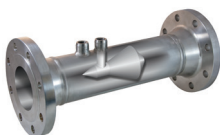
Recordall® Disc Flow Meters

Impeller Flow Meters

Cox & Blancett® Turbine Flow Meters

Vortex Flow Meters

Preso® Differential Pressure Flow Meters

Flo-Tech Hydraulic Fluid Testing

Flexible Network Connectivity Options

- **Control**
- **Manage**
- **Optimize**

**Flow Dynamics®
calibration services**

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

NVLAP
CALIBRATION
NVLAP LAB CODE 200668-0

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

Control. Manage. Optimize.

www.badgermeter.com