

FLOW METERS: WHAT ARE THEY & HOW DO THEY WORK?

THE INSIDER BLOG

BADGER METER

[HTTP://WWW.TECHNICALAIR.COM/](http://www.technicalair.com/)

INTRODUCTION

- Flow meters are instruments that monitor, measure or record the flow rate, volume or mass of a gas or liquid
 - also known as flow gauges, flow indicators, liquid meters or flow rate sensors
- Flow meters provide accurate monitoring and/or control of what moves through a pipe or pipeline, including water, air, steam, oil, gases and other liquids
- Application-specific flow meters allow facility managers, control contractors, consulting engineers and other stakeholders to:
 - Understand and monitor flow operations
 - Identify and improve efficiencies
 - Address equipment issues and wasteful behavior
- Having access to this accurate, timely and dependable flow data and control is essential for product quality, safer operations, cost control and regulatory compliance

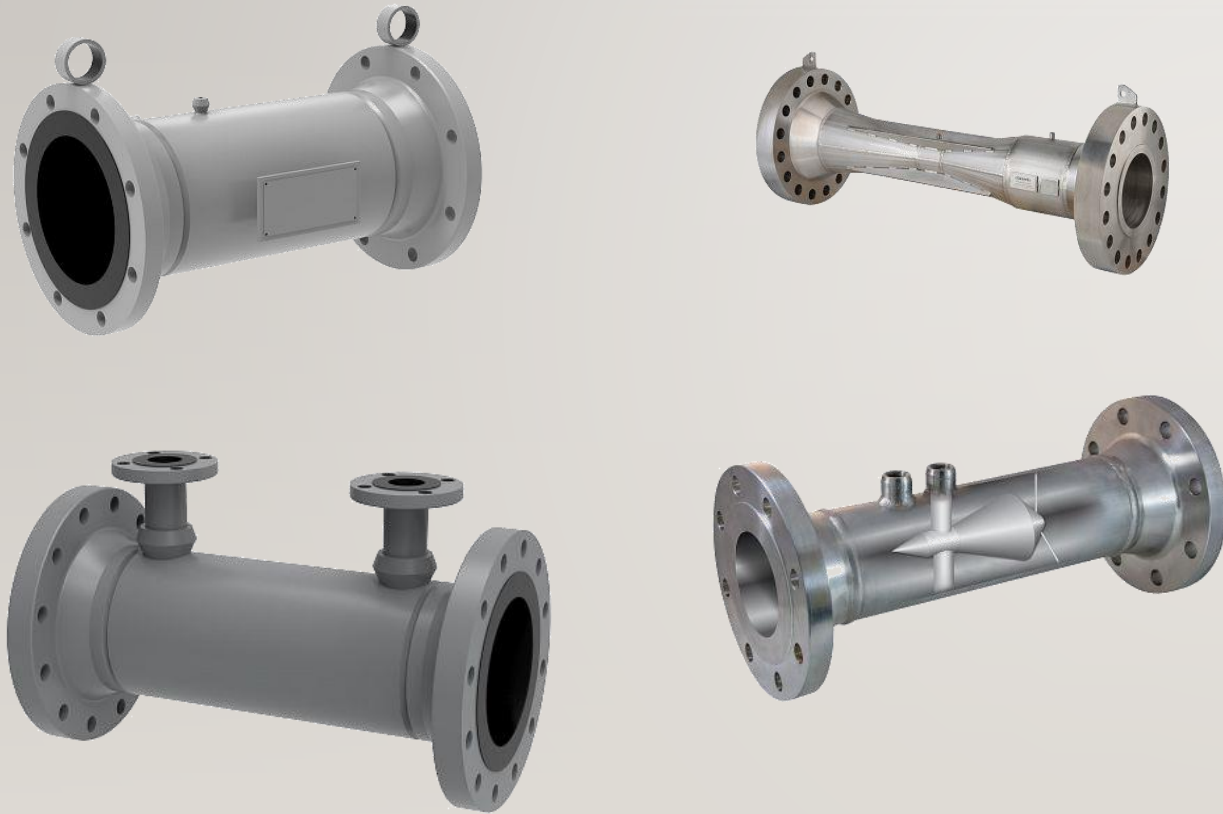


DIFFERENT TYPES OF FLOW METERS



- Badger Meter offers flow meter solutions that improve operations within the building design and construction, oil and gas, water and wastewater and chemical and petrochemical industries, including these technologies:
 - Differential pressure (DP) meters
 - Positive displacement (PD) meters
 - Ultrasonic meters
 - Vortex meters
 - Coriolis meters
 - Electromagnetic meters
 - Variable area meters
 - Turbine meters

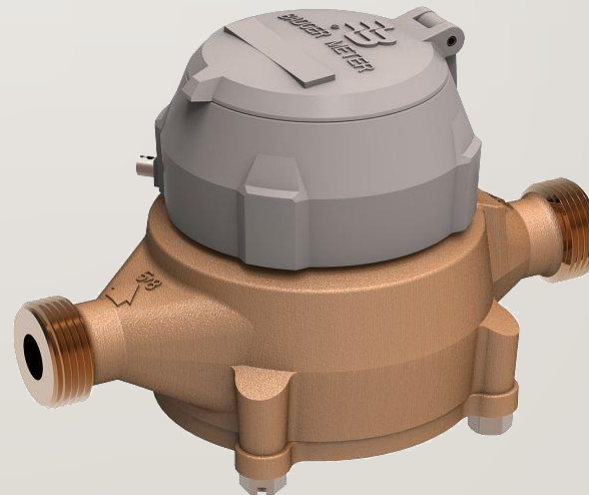
DIFFERENTIAL PRESSURE (DP) METERS



- Differential pressure meters measure the flow of liquid within a pipe by introducing a constriction that creates a pressure drop
- Pressure sensors measure the pressure before and after the constriction
 - The resulting pressure drop that occurs across the constriction is relative to the square of the flow rate
 - a higher pressure drop equals a higher flow rate
- Differential pressure meters are suitable for applications including across filters, heat exchangers, backflow preventers, pipelines, ducts and more
- One key reason why facility managers choose DP meters is because there are no moving parts, which means minimal maintenance

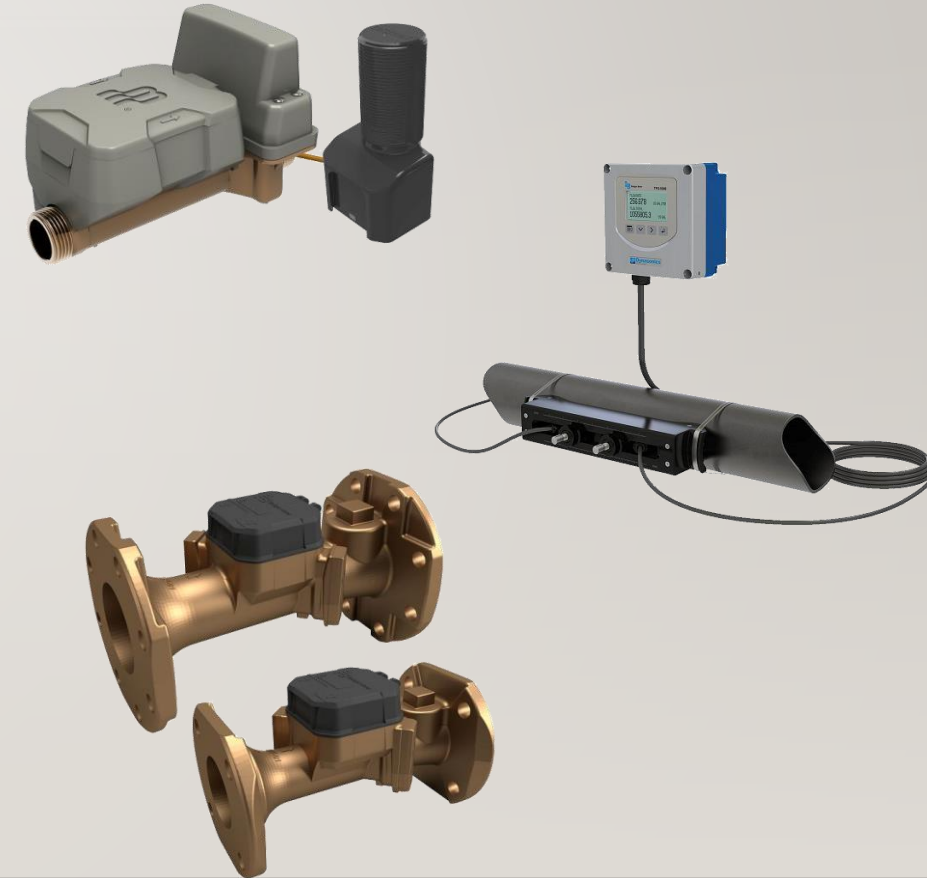
POSITIVE DISPLACEMENT (PD) METERS

- Positive displacement meters measure volumetric flow rate of a liquid or gas passing through the meter by repeatedly entrapping it with rotating parts, which measures the volume
- Specific types of positive displacement meters include
 - oscillating piston
 - nutating disc
 - industrial gear and others
- These meters are often selected for their high accuracy, excellent repeatability and wide turndown ratios



ULTRASONIC METERS

- Ultrasonic meters measure the velocity of a fluid flowing through a pipe
- The two types of ultrasonic flow technologies include Doppler and transit time
 - Doppler technology measures the difference in sound wave frequency reflected off gas bubbles or particles in the flow stream
 - It's suitable for aerated or dirty liquids
 - Transit time technology measures the time differential between signals sent upstream and downstream. The differential is directly proportional to the velocity of the water
- Ultrasonic meters are often selected for their exceptional accuracy, minimal maintenance and low cost of ownership
- Ultrasonic clamp-on meters offer non-invasive solutions and simple installation since there is no cutting into the pipe or interruption of service



VORTEX METERS



- Vortex meters use a principle called the von Kármán effect to measure liquids, gases and vapors
- Vortex meters measure by placing an obstruction (called a shredder bar) in the flow path, which creates vortices of alternating differential pressure
 - These vortices cause a small sensor device to oscillate with a frequency directly proportional to the velocity of the moving fluid
- The sensing element then converts the oscillation rate into an electrical signal, which is converted into a quantifiable velocity reading
- Vortex meters are a common choice for their wide rangeability, repeatability and accuracy in measuring liquids, gases and saturated steam

CORIOLIS METERS

- Coriolis meters measure mass flow and density through inertia
- This unobstructed, open-flow meter identifies flow rate by directly measuring fluid mass over a wide range of temperatures with a high degree of accuracy
- As fluid flows through the sensor tubes, forces induced by the mass flow cause the tubes to twist, which is proportional to the mass
- Coriolis meters are recognized for their impressive accuracy, ease of installation and ability to measure both mass flow and density



ELECTROMAGNETIC METERS



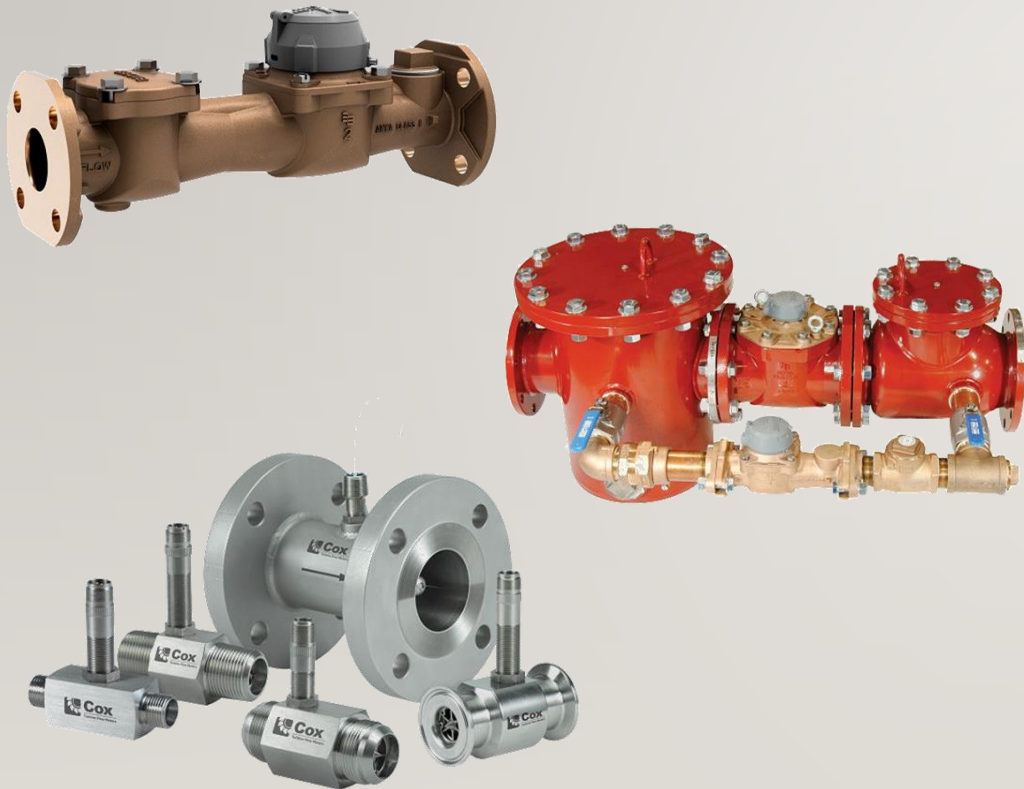
- Electromagnetic meters operate under Faraday's Law of Electromagnetic Induction to measure liquid velocity
 - The law states that a conductor moving through a magnetic field produces an electrical signal within the conductor, which is directly proportional to the velocity of the water moving through the field
 - As fluid flows through the magnetic field, conductive particles in the fluid create changes in voltage across the magnetic field. This measures and calculates the velocity of water flow through the pipe
- Because electromagnetic meters have no moving parts, they are an ideal option for wastewater applications or any dirty liquid that is conductive or water-based
- Benefits of electromagnetic meters include minimal maintenance, wide turndowns and compatibility with corrosive chemicals as well as an ability to meet sanitary requirements for food applications

VARIABLE AREA METERS

- Variable area meters measure volumetric flow of liquids and gases
- An orifice is positioned within the piston assembly and forms an annular opening with the contoured metering cone
- The piston assembly carries a cylindrical ceramic magnet that is coupled to an external flow indicator that moves precisely in direct response to the piston movement
- A calibrated spring opposes flow in the forward direction, decreasing viscosity sensitivity
- Key benefits of variable area meters include that they are low cost, simple to operate and maintain and require no electronics to obtain a reading



TURBINE METERS



- Turbine meters use the mechanical energy of a liquid to rotate a rotor in the flow stream
- The rotational speed of the rotor is directly proportional to the velocity of the fluid traveling through the meter
- Turbine meters reliably measure the velocity of liquids, gases and vapors, and are often selected for these key benefits:
 - durable meter structure
 - high accuracy range at a low cost
 - notable repeatability under a wide range of temperatures and pressures

CONTACT THE EXPERTS

- Learn more about Badger Meter's. entire flow meter line by going to <http://www.technicalair.com/badger-meter>
- Contact the Technical Air Systems' Sales Engineering Team at 973-285-0333 or by email at solutions@technicalair.com
- Check out more Building Performance & Controls articles along with Air Handling & Air Distribution and Commercial Kitchen articles at [Technical Air Systems' Engineering Corner!](#)

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