

FLOWMETER



Flowmeter Selection and Installation Guide

Introduction: Selecting the appropriate flowmeter involves a combination of understanding the different types of meters available and applying empirical knowledge gained through experience. While many first consider the types of meters, their features, and associated hardware and software, the process often begins with a clear definition of the application requirements. Here, we will review the primary types of flow measurement devices, discuss how to select an appropriate device, and cover essential considerations for flowmeter installation.

Types of Flowmeters:

- 1. Positive Displacement Meters:**
 - **Description:** These meters are used for both liquids and gases and are renowned for their high accuracy. They operate by capturing a fixed volume of fluid and then measuring how many times this volume is transferred through the meter.
 - **Types:** Oval gear, reciprocating piston, nutating disc, and rotary piston meters.
 - **Operation:** These meters emulate a bucket system where one bucket of fluid enters and another exits, ensuring precise measurement.
- 2. Differential Pressure-Based Meters:**
 - **Description:** This method is widely used in process industries due to its simplicity, cost-effectiveness, and integration with existing pressure transmitters.
 - **Operation:** It measures flow by creating a pressure drop across a constriction in the flow path and calculating the flow rate based on this differential pressure.
- 3. Volumetric Mechanical Meters:**
 - **Description:** These meters, which include turbines, paddlewheels, impellers, and propellers, measure flow by converting the rotational speed of a rotor into a volumetric flow rate.



- **Accuracy:** Can range from high precision (1% of reading) to less accurate (5% of span).
 - **Types:** Spool-piece style, bar-stock style, and insertion devices.
4. **Magmeters:**
- **Description:** Magnetic flowmeters, or magmeters, measure the average velocity of the fluid directly by using Faraday's law of electromagnetic induction.
 - **Accuracy:** Spool-piece magmeters are highly accurate for flow measurement.
 - **Comparison:** Other technologies that offer similar accuracy include correlation-type ultrasonic flowmeters with calibrated spool pieces and Coriolis mass flowmeters. Point-velocity insertion magmeters provide accuracy comparable to paddlewheel meters due to their measurement of flow in a small cross-sectional area.
5. **Ultrasonic Flowmeters:**
- **Description:** Ultrasonic meters use sound waves to measure flow and are available in two types: transit time and Doppler.
 - **Applications:** Although they were initially overpromised as a universal solution, they have found specific applications where they excel.
 - **Considerations:** Care must be taken to avoid issues related to fluid temperature and application suitability.
6. **Thermal Dispersion Flowmeters:**
- **Description:** These meters are used for accurate flow measurement in low-flow applications and can also measure mass flow of gases.
 - **Considerations:** Sensitivity to abrupt changes in fluid temperature requires careful application.
7. **Vortex Shedding and Fluidic Flowmeters:**
- **Description:** These meters use the fluid flow itself to create oscillations or vortices. They have no moving parts and can be installed with minimal upstream straight run.
 - **Types:** Traditional vortex shedding meters use a bluff body to produce oscillations, while swirl meters use a stationary rotor-like device and a restriction. Coanda-effect flowmeters employ hydraulic feedback for oscillation.

Selection Recommendations:

- **For High Accuracy:**
 - **Coriolis Mass Flowmeter:** Offers exceptional accuracy for both liquid and gas flow measurement.
 - **Spool-Piece Style Magmeter:** Provides reliable and accurate flow measurement, suitable for a range of applications.
- **For Open Channel Applications:**
 - **Flow Restriction:** The primary measurement device is the flow restriction itself, such as a flume or weir.
 - **Level Sensor:** The instrument used in conjunction with the restriction is a level sensor that automates the measurement process. Simple tools like a yardstick can provide accurate measurements in these setups.

By understanding the various types of flowmeters and their applications, you can make an informed choice that meets the specific needs of your flow measurement requirements.