

Coriolis Flow Meter Manufacturers

A practical guide to coriolis flow meter manufacturers, covering the reader intent, the relationship to coriolis flow meter manufacturers, key evaluation criteria, common risks, and the information the intended project audience should confirm before taking the next step.



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In the landscape of precision industrial instrumentation, mass flow measurement stands as a critical requirement for high-value process control, custody transfer, and chemical dosing. Coriolis flow meters are widely regarded as the most accurate instruments for these tasks because they measure mass flow directly, independent of changes in fluid temperature, pressure, or viscosity. For procurement engineers and plant managers, selecting the right Coriolis flow meter manufacturers involves more than just comparing price points; it requires a deep understanding of the underlying physics, tube geometries, and the manufacturer's ability to provide long-term calibration stability.

| Understanding the Coriolis Measurement Principle

Before evaluating specific Coriolis flow meter manufacturers, it is essential to understand how these devices operate. Unlike volumetric flow meters (such as magnetic or ultrasonic types) that calculate mass based on flow velocity and assumed density, a Coriolis meter relies on the physical properties of inertia.

| The Coriolis Effect in Flow Measurement

The core of the instrument consists of one or two measuring tubes. An internal driver coil causes these tubes to vibrate at their resonant frequency. When a fluid (liquid or gas) flows through the vibrating tubes, it is forced to take on the vertical momentum of the vibration. As the fluid moves toward the point of maximum vibration amplitude, it resists being pushed upward, exerting a force that causes the tube to lag. Conversely, as the fluid moves away from the peak, it resists the decrease in vibration, pushing the tube forward.

This results in a "twisting" motion or a phase shift across the tube. Sensors located at the inlet and outlet sections of the tube measure this time difference (Δt). This phase shift is directly proportional to the mass flow rate.

Simultaneous Density and Temperature Measurement

In addition to mass flow, Coriolis meters provide two other critical process variables:

1. **Density:** The resonant frequency at which the tubes vibrate depends on the total mass of the tube and the fluid inside it. By measuring this frequency, the meter calculates the fluid's density in real-time.
2. **Temperature:** Since the elasticity of the metal tubes changes with temperature, manufacturers embed an internal RTD (Resistance Temperature Detector) to compensate for these changes, providing a secondary temperature output for the process.

Key Evaluation Criteria for Coriolis Flow Meter Manufacturers

When sourcing from Coriolis flow meter manufacturers, technical departments must look beyond basic data sheets. The reliability of a mass flow system is rooted in the manufacturer's engineering standards and calibration capabilities.

Material Science and Tube Integrity

Coriolis tubes are subjected to constant high-frequency vibration. Manufacturers must use high-quality alloys to prevent fatigue failure. Common materials include:

316L Stainless Steel: The standard for most industrial applications and water treatment.

Hastelloy C22: Used for highly corrosive chemical applications where stainless steel would pit or corrode.

Tantalum: Reserved for extreme acids or reactive chemicals.

| Calibration and Traceability

Accuracy is the primary reason for choosing Coriolis technology. Reputable manufacturers should provide calibration certificates traceable to international standards (such as NIST or ISO/IEC 17025). High-end manufacturers often achieve accuracies of $\pm 0.1\%$ or even $\pm 0.05\%$ for liquids. For gas applications, accuracies typically range from $\pm 0.25\%$ to $\pm 0.5\%$.

| Transmitter Intelligence and Diagnostics

Modern Coriolis flow meter manufacturers integrate advanced electronics into the transmitter. Look for features such as "Smart Meter Verification," which allows the instrument to check the health of the measuring tubes and electronics without interrupting the process. This reduces the need for frequent physical recalibration and pull-out inspections.

| Technical Specifications and Selection Table

Choosing the correct meter geometry is a critical step in the selection process. Manufacturers generally offer two main designs: bent-tube (U-shape) and straight-tube.

Feature	Bent-Tube (U-Shape)	Straight-Tube
Sensitivity	Extremely high; better for low-flow rates.	Lower sensitivity; requires higher velocities.
Pressure Drop	Moderate to high due to flow path changes.	Minimal; similar to a standard length of pipe.
Cleanability	Difficult; prone to trapping solids or air.	Excellent; ideal for hygienic (CIP/SIP) applications.
Installation Space	Requires more vertical or horizontal space.	Compact; fits into tight piping runs.
Vibration Resistance	Generally more robust against external noise.	More sensitive to pipeline vibrations.
Typical Accuracy	$\pm 0.05\%$ to $\pm 0.1\%$	$\pm 0.1\%$ to $\pm 0.2\%$

| Installation Best Practices for Mass Flow Systems

Even the highest-quality instrument from premium Coriolis flow meter manufacturers will underperform if installed incorrectly. To ensure the accuracy of $\pm 0.1\%$, engineers must adhere to specific mechanical guidelines.

| Mounting and Support

Coriolis meters are vibration-based instruments. Therefore, they must be isolated from external pipeline vibrations. The meter should be supported by the piping itself, with pipe hangers or supports located as close to the meter flanges as possible. Avoid mounting the meter directly to a vibrating pump or motor housing.

| Orientation and Entrained Air

For Liquids: The meter should ideally be installed in a vertical pipe with the flow moving upward. This ensures the tubes remain full and prevents air bubbles from becoming trapped, which can cause measurement noise.

For Gases: The meter should be installed with the tubes pointing downward (in a U-tube configuration) to allow any condensed liquids to drain out.

Horizontal Installation: If installed horizontally, U-tubes should point downward for liquids (to avoid air pockets) and upward for gases (to avoid liquid accumulation).

| Zero Calibration

After installation and once the system is filled with the process fluid at operating temperature and pressure, a "zero-point calibration" must be performed. This involves closing valves on both sides of the meter to ensure a state of absolute zero flow while the meter is full. This step calibrates the sensor to the specific mechanical stresses of the installed piping.

| Limitations and Application Constraints

While Coriolis meters are highly versatile, they are not a universal solution for every application. Understanding their limitations is vital for risk management.

1. **Initial Capital Cost:** Coriolis meters are significantly more expensive than electromagnetic or vortex meters. They are typically reserved for applications where mass flow accuracy or density measurement justifies the investment.
2. **Pressure Drop:** In U-tube designs, the change in flow direction creates a pressure drop. In high-viscosity applications, this can lead to significant energy losses or the need for larger pumps.
3. **Line Size Restrictions:** While manufacturers produce meters for very small flows (down to 1 kg/h), the cost and physical size of Coriolis meters for pipes larger than 300 mm (12 inches) often become prohibitive.
4. **Two-Phase Flow:** While modern digital signal processing (DSP) has improved performance in aerated liquids, excessive entrained gas (slug flow) can dampen the tube vibration and cause the meter to "stall" or report significant errors.

| Integrating Flow and Level Measurement Solutions

In complex industrial environments such as chemical processing or water treatment, flow measurement is often paired with level measurement to provide a complete picture of mass balance. While Coriolis meters track the movement of material into and out of a system, level sensors provide the inventory status within tanks and silos.

For engineers seeking a comprehensive approach to process monitoring, it is often beneficial to work with manufacturers who understand the interplay between these technologies. For instance, in a blending tank, a Coriolis meter ensures the precise mass of each ingredient is added, while a radar level meter monitors the total volume to prevent overfills. To explore professional-grade level measurement instruments that complement high-precision flow systems, you can [Review product options and application support at the Welk Main Page.](#)

| Frequently Asked Questions (FAQs)

| Can Coriolis flow meters measure steam?

Coriolis meters can measure high-pressure steam, but they are generally not the first choice for low-pressure or saturated steam due to the high velocities and potential for erosion. Vortex meters are more common for standard steam applications, whereas Coriolis is used when mass balance of high-value steam is required.

| How often do Coriolis meters need to be recalibrated?

If the process fluid is non-corrosive and non-abrasive, the mechanical geometry of the tubes remains constant, and the meter can stay in calibration for years. However, in abrasive applications where the tube wall might thin over time, annual calibration or the use of onboard diagnostic verification is recommended.

| Do Coriolis meters require straight pipe runs?

One of the significant advantages of Coriolis technology is that it does not require the long straight upstream and downstream pipe runs (e.g., 10D/5D) required by orifice plates or turbine meters. Because it measures mass inertia rather than velocity profile, it is relatively immune to flow disturbances like elbows or valves.

| What is the maximum temperature rating for these meters?

Most standard Coriolis flow meter manufacturers offer sensors rated up to 200°C (392°F). For specialized applications, high-temperature versions can reach 350°C (662°F) or higher, though these often require remote-mounted electronics to protect the transmitter from heat.

| How do I handle high-viscosity fluids?

Coriolis meters are excellent for high-viscosity fluids (like resins or syrups) because they measure mass directly. However, the pressure drop will be much higher. It is common to size the meter one size larger than the pipe or use a straight-tube design to mitigate this pressure loss.

By carefully selecting Coriolis flow meter manufacturers based on their material quality, calibration standards, and diagnostic capabilities, industrial operators can ensure long-term accuracy and safety in their most critical process loops.