

Flow Meter Installation Guidelines

This page details mounting and installation guidelines pertaining to paddle wheel flow meters. This is not a troubleshooting guide for mechanical/electrical issues. Most flow metering issues are traceable back to 3 fundamental principles.

1. The flow rate must be within the recommended range for the pipe size.
2. The pipe must be full of liquid at all times.
3. There must be a sufficient length of straight pipe before and after the meter.

Number 1 —

All flow meters have a minimum measurable flow rate for a given pipe size. This minimum flow rate is determined by the velocity required to keep the paddle wheel rotating consistently. As flow velocity decreases, the paddle wheel eventually stops responding linearly to the flow rate. Just prior to this point represents the lowest flow rate a meter can accurately measure. If velocity drops further, the paddle wheel may stop rotating entirely and the meter will indicate 0 flow, even though some liquid may still be flowing.

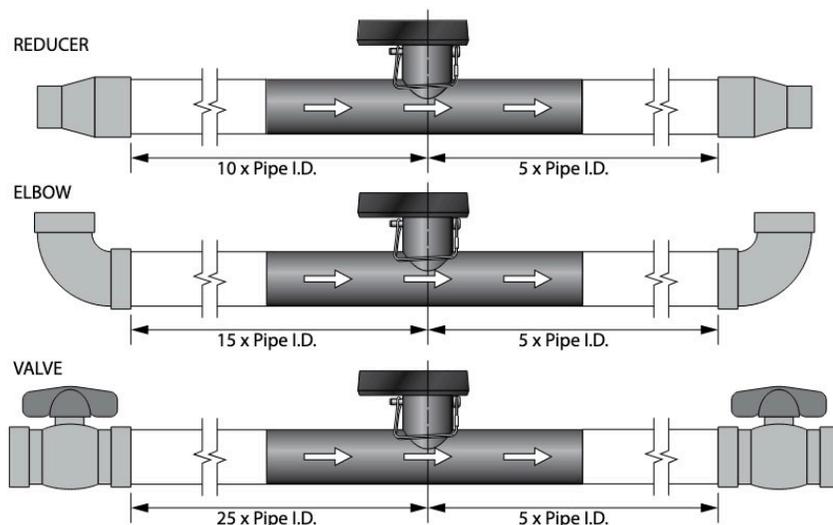
If the flow rate is below the recommended minimum for the pipe size, one possible solution is to reduce the pipe diameter, which increases the velocity of the liquid and improves meter performance. Higher flow velocity also helps reduce the buildup of biological growth or debris on the paddle wheel.

Number 2 —

For accurate measurement, the pipe must remain full of liquid at all times. Partially filled pipes can cause unstable or inaccurate readings. This issue most commonly occurs in vertical pipes with downward flow, where the pipe may not remain completely full. In horizontal piping systems, partially filled pipes may result in no flow reading if the paddle wheel is not submerged, or erratic readings if the flow intermittently contacts the paddle. Whenever possible, it is best practice to install the meter in a section of pipe where the flow direction is upward. If this is not possible, installing a partially closed downstream valve can help maintain a full pipe.

Number 3 —

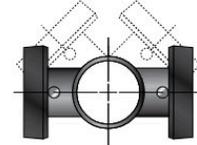
Paddle wheel flow meters measure flow at a specific point within the pipe rather than across the entire cross-section. For the measurement to represent the overall flow rate, the flow profile inside the pipe must be uniform. A uniform flow profile develops only after the liquid has traveled through a sufficient length of straight pipe. For this reason, straight pipe sections should be provided both upstream and downstream of the meter. The diagram below illustrates the recommended straight pipe lengths needed to develop a uniform flow profile and achieve accurate results.



Upper Half of Flow Range



Lower Half of Flow Range



If sufficient straight pipe length is not available, some reduction in measurement accuracy may occur. In many cases, however, the resulting error remains relatively consistent across the operating flow range. If the actual flow rate can be determined using another method, the MIC meter reading can be adjusted to account for this difference. For smaller pipe sizes, this can often be done by directing the flow into a tank with a known volume for a measured period of time. Dividing the collected volume by the elapsed time will determine the flow rate (gallons per minute), which can then be used to adjust the meter reading. The instruction manual includes an example of this procedure.

Common Question: “How inaccurate will my meter be if I don’t have enough straight run of pipe?”

This question is impossible to answer due to many variables affecting the flow profile. However, a lack of straight run in the pipe will still give good repeatability even if the accuracy is compromised. In some applications, repeatability is more important than accuracy, allowing the meter to reliably indicate changes in system performance. MIC meters can monitor changes or trends in flow over time, such as daily or weekly variations. In these cases, repeatability is the needed function of the meter, not flow rate accuracy.

For example, an aquarium system can be monitored by installing a MIC meter. An operator records the daily flow reading and compares it to the previous day's value. A decline in the flow rate will often indicate an emerging issue. Catching the problem early - by checking filters and other system components - can prevent the loss of product or aquatic life.