



# FLOWMETER ACCURACY



**W**hen specifying a flowmeter, it is important to know the accuracy. The accuracy of a flow meter can be stated one of two ways; as a percentage of full scale (FS) or as a percentage of reading (RD, also referred to as percentage of rate). It is important to understand the meaning of both so that your flow meter performs as expected and with the desired accuracy.

## Percentage of Full Scale (FS) Accuracy:

A flow meter that has an accuracy expressed in FS has a fixed error band across the flow range of the meter. For example, a flow meter with a 1% FS accuracy that has a range of 10GPM-100GPM has an error band +/- 1% of 100GPM, which is equal to +/- 1 GPM. Therefore, since the accuracy of the flow meter is +/- 1 GPM throughout the flow range, this type of meter is most accurate at full scale, 100GPM, and becomes less accurate as the flow decreases. When the meter is measuring flow at 50GPM or 50% FS, the actual flow will be within +/- 1 GPM, or anywhere from 49GPM-51GPM. When you do the math, this works out to be +/- 2% accuracy at 50GPM,  $1/50 = 2\%$ . At the bottom end of the flow range, or 10GPM, the accuracy will be +/- 10%,  $1/10=10\%$ .

FS flow meters are often used in applications that have a constant flow rate usually at the upper range of the flow meter. These meters can also be used in fluctuating flow applications where accuracy is less important. These meters are less desirable in low flow applications.

## **Flow meters that are sometimes expressed in FS are:**

- Variable area meters
- Differential pressure meters
- Insertion impeller meters
- Rotameters

## Percentage of Reading (RD) Accuracy:

Most flow meter accuracies are expressed as %RD. The accuracy is expressed as a percentage of flowrate across the range of the flowmeter. The error band is not a fixed value as we saw with the FS accuracy. Instead, it is expressed as a percentage of rate. For example, a flow meter with a 1% RD accuracy that has a range of 10GPM-100GPM has an error band is +/- 1% at 100GPM, which is equal to +/- 1 GPM. At the lowest end of the flow range, the error band is +/- 1% of 10GPM, which is equal to +/- 0.1 GPM. When graphically represented as a percentage of rate, the %RD is constant, in this case always 1%.

RD flow meters are desirable when accuracy throughout the range of the meter is important,

especially at low flows. As seen in the graph below, these meters are just as accurate at low flows as they are at higher flows.

**Flow meters that are usually expressed in RD are:**

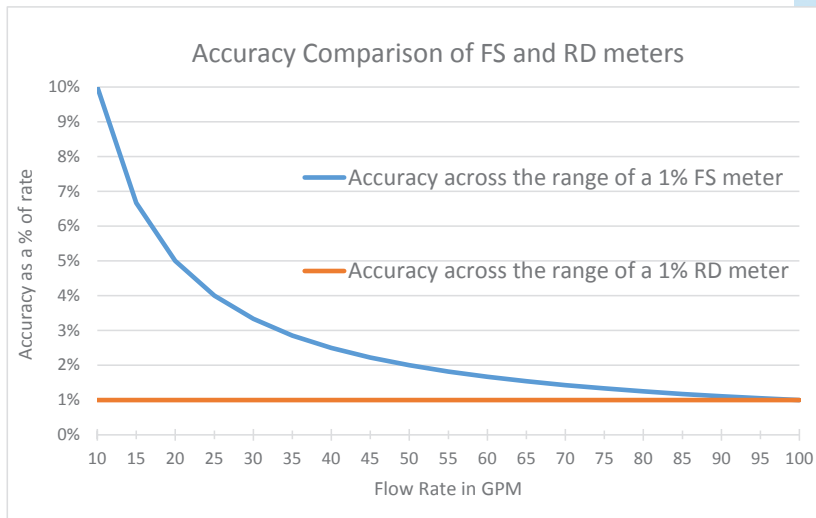
- Magnetic flow meters
- Turbine meters
- Positive displacement meters
  - oval gear, nutating disc, oscillating piston, etc.
- Ultrasonic meters
- Vortex shedding meters



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Jim has over 20 years' experience selling flow measurement and control products. He also holds a Bachelor's degree in Mechanical Engineering with experience analyzing and optimizing energy usage in buildings. In addition, he is a Certified Energy Manager accredited through the Association of Energy Engineers.



**Conclusion**

It is important to understand the difference between FS and RD accuracy. FS meters are most accurate at full scale and the accuracy falls off dramatically at lower flow rates. RD meters on the other hand maintain their accuracy throughout the range of the flowmeter.

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