

# Rosemount DP Flowmeter Rangeability

## APPLICATION AND METER MAXIMUM (MYTH VS. REALITY)

One of the most common DP Flow Myths is that the rangeability of DP Flow technology is typically 3:1. This misperception is usually promoted by competing technologies that claim “high” rangeability of 20:1 or better.

Rangeability is usually defined as the ratio of maximum to minimum flow. There are two definitions of “maximum flow” which are commonly used in specifying the rangeability of a flow meter. It is important to understand the difference between the two methods of defining the maximum flow because it can mean the difference between a flow meter that can measure the flow range of interest and one that can’t. The first way to define “maximum flow” is the maximum flow rate that the flow meter can measure. This is how most flow meters specify rangeability in product literature.

The other way to define the “maximum flow” is the maximum flow rate that occurs in a particular application. This is how most DP flow meters are specified. DP rangeability is always referred to from the application maximum flow.

The distinction is critical because the specified meter maximum is often 2 - 3 times application maximum. In liquid applications, Vortex, Coriolis, Magnetic and Ultrasonic flowmeters are designed to measure maximum flow rates of 20-30 ft/sec. The optimum economic flowing velocity for liquids is about 5-6 ft/second, and they rarely flow over 10 ft/sec. That means that a flow meter with a 20 or 30:1 flow rangeability from meter maximum, typically measures less than a 10:1 flow range in most actual processes. For gas applications, meter maximum flows are also much higher than typical process maximum flows.

To achieve the advertised meter maximum flow and rangeability in a typical application, pipe size must be reduced at the meter.

This increases installation costs and permanent pressure loss, which may not be acceptable. For this reason, flow meter rangeability should be considered from application maximum, not the meter’s maximum specified flow rate.

It is also important to understand how the max to min flow ratio relates to percent of the flow range.

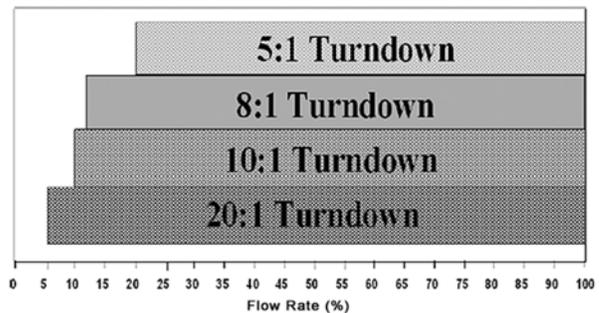


FIGURE 1. Relationship between rangeability and percent of maximum flow

Figure 1 shows the relationship between rangeability and percent of maximum flow. Notice that 10:1 rangeability will measure down to 10% of maximum flow. A meter with 20:1 rangeability will measure down to 5% of maximum flow; only 5% more of the flow range. Since a meter with a high rangeability can significantly increase the cost, care should be taken to specify no more rangeability than will actually be required in a particular application.

The orifice plate has traditionally been regarded as having a maximum rangeability of 3:1 or 4:1. This comes from the pneumatic transmitter days when the transmitter limited the measurement range. With a properly selected orifice and a modern DP transmitter, a rangeability of 5:1 to as high as 14:1 is certainly possible. With the 3051SMV and dynamic compensation, 14:1 rangeability with 0.65% of rate accuracy can be achieved.

Combining this multivariable rangeability with the ability to interchange orifice plates, a flow range of 200:1 can be measured without changing the pipe size or the transmitter!

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