



Kessler-Ellis Application Note F022

Accuracy Statements

One of the most confusing aspects of instrumentation is the statement of accuracy, whether it be for a flow meter or for a calculation device.

We commonly see statements such as, "accuracy $\pm 0.5\%$," what we should really be talking about is a measurement uncertainty of $\pm 0.5\%$ or an accuracy of 99.5%.

The statement of a measurement uncertainty for a flow meter may be given as $\pm 0.5\%$, but what is it 0.5% of, and over what range? Any given flow meter is prevented, for reasons of sensitivity or by the limitations of the physical phenomenon that makes it operate, from reading down to a flow of zero.

Any statement of flow meter measurement uncertainty is meaningless unless it provides the following information.

- a statement in percentage of measurement uncertainty
- a statement of what the percentage is a percentage of (e.g.) rate, span etc.
- gives the turndown range over which the statement is applicable

Turndown is defined as maximum flow divided by minimum flow, hence a flow meter that operates from 100 gpm down to 10 gpm has a turndown of 10:1.

Typical complete uncertainty statements are:

- $\pm 1\%$ of rate over a turndown of 12:1
- $\pm 0.5\%$ of span over a turndown of 5:1
- $\pm 0.1\%$ of span plus 0.5% of rate over a turndown of 7:1

Uncertainty statements made for flow computers and batch controllers follow the same general principles as uncertainty statements made for flow meters. Usually a turndown is not specified for a flow secondary instrument as its turndown abilities far exceed that of the flow meter.

The graph below illustrates the comparison in absolute error between a $\pm 0.25\%$ of rate device (solid line) and a $\pm 0.1\%$ of span device (dotted line) over a turndown of 10: 1

Comparison of Uncertainty Statements

