



Calibration Line

Accuracy Specifications for Mensor Products

Accuracy for pressure instruments is defined by the instrument manufacturer and should address all variables. There are certain inherent variables common to pressure instruments that must be taken into account when defining the accuracy of an instrument. Pressure instruments are generally sold based on application (how they will be used) and their accuracy (how good is the measurement). Accuracy is represented in the terms %FS (Full Scale or Full Span), %R (Reading), or a combination of both. Therefore, for Mensor Instruments:

Accuracy Defined: Accuracy is the closeness of a measurement to the actual quantity being measured.

For Mensor Instruments accuracy is expressed as the ratio of the error to full scale (or reading) expressed as a percent of full scale (or reading).

The definition of accuracy for Mensor instruments includes the combined effects of: Linearity, repeatability, hysteresis, creep, and temperature effects over the compensated temperature range.

Re-Calibration

Stability over time is instrument specific and is reported on the specification sheet of each instrument. When an instrument is returned to Mensor for re-calibration, an "As Found" calibration is performed to determine whether the instrument meets or exceeds its specification, including span stability.

For the instrument to maintain its accuracy over span, the zero offset on absolute instruments should be periodically verified. As stated in the instrument manuals, Mensor sets the zero offset prior to As Found calibrations, but notes the amount adjusted on the Calibration Certificate. Depending on how the customer uses and maintains the instrument, the environment and application, the adjusted offset values need to be taken into account when evaluating the As Found data.

To insure the instrument's performance specifications are met, the appropriate quality standard(s) and procedures must be used. The Mensor calibration program adheres to NCSL recommended industry standard practices to assure our customers that competent measurements are made in the calibration of our instruments.

Calibration Ratios

Mensor uses applicable quality standards and manufacturer's recommendations for the estimation of total uncertainties to determine calibration test uncertainty ratio (TUR).

For the calibration of current Mensor products and applicable non-Mensor products, the expanded uncertainty ($k=2$) of the primary pressure standard (in psi) is compared to the accuracy of the device under test (in psi) to determine the TUR. The FS point is used since it will produce the worst case ratio.

A 4:1 or better TUR is achieved for the majority of calibrations performed at Mensor. For low pressure (< 1 psi) vacuum, bi-directional, or gauge instruments, and high pressure (> 1000 psi), the 4:1 TUR may not be maintained, but the uncertainty of the calibration standard(s) is reported on the calibration certificate to assist customers in determining their test ratios.

Precision

There is general confusion when it comes to the meaning of the terms "accuracy" and "precision". ANSI/NCSL Z540-2 specifically states that the term precision should not be used for accuracy. (Accuracy is the closeness of a measurement to the actual quantity being measured whereas precision is the ability of an instrument to repeat an output when measuring a given quantity under identical conditions.) Typically most customer applications cannot guarantee that an instrument will be subject to identical conditions therefore accuracy of a pressure instrument is frequently more significant than its precision.

Calibration Program

Calibrations performed at Mensor meet or exceed the requirements of ANSI/NCSL Z540-1, ISO 10012-1 and MIL-STD 45662A. The company is ISO 9001;2000 registered and the calibration laboratory is accredited to ISO/IEC 17025-1999 by A2LA. Mensor's Calibration Program has been audited by many of our customers and approved.

Reference Documents:

ISO/IEC 17025-1999

ANSI/NCSL Z540-1-1994

ANSI/NCSL Z540-2-1997

Mensor QSP 4.11.01.01