



Technical Note

Redefining Sample Pump Flow Measurement

History

The industrial hygiene profession has traditionally described pump calibrators as *primary standards* if the flow measurements involved the direct measurement of volume on the basis of the physical dimensions of a defined closed space. An example of a primary standard according to this definition is the soap bubble meter (film flowmeter). Historically, *secondary standards* have been described as instruments that trace their calibration to primary standards and maintain their accuracy with reasonable care and handling. Examples of secondary standards include rotameters and wet test meters.

Redefining Calibrators

In industrial hygiene, the terms “primary” and “secondary” have become accepted as general descriptions for various calibration devices, but they are not officially adopted industry standards. Even U.S. OSHA states in its Technical Manual (Appendix F) that it no longer considers inverted burets to be primary calibration standards. In addition, these historical descriptions should not be confused with precise definitions from the National Institute of Standards and Technology (NIST), the U.S. national standards laboratory and metrological traceability organization responsible for maintaining the physical standards upon which measurements in the U.S. are based. Following are what we find to be the clearest definitions of primary and secondary standards:

A *primary standard* in metrology is sufficiently accurate such that it is not calibrated by or subordinate to other standards. Primary standards are defined by quantities such as length, mass, and time. Their value is accepted without reference to other standards of the same quantity. *Standards used in industrial hygiene for calibrating sample pumps do not meet this strict definition of a primary standard.*

Secondary standards are calibrated with reference to a primary standard and are very close approximations of primary reference standards. *Calibration standards used in industrial hygiene meet this definition.*

Where does the SKC chek-mate Calibrator fit?

Using the definitions above, the SKC chek-mate Calibrator is technically a secondary standard; however, in the ACGIH publication *Air Sampling Instruments, 9th Edition (page 151)*, a highly accurate secondary standard calibrator is defined as follows: “Among secondary standards, however, there are a number of instruments that provide an accuracy nearly comparable to that of primary standards but which, of themselves, cannot be calibrated by internal volume measurement. These instruments are sometimes referred to as *intermediate standards* and provide an accuracy of approximately 1.0 %.” The SKC chek-mate Calibrator meets this definition with a volumetric accuracy of 1% of reading and high repeatability; therefore, **SKC identifies the chek-mate as an intermediate standard.** Each chek-mate is provided with a NIST-traceable calibration certificate from an ISO/IEC 17025:2005 accredited calibration laboratory. UKAS calibration and certificates are available for customers in the U.K. and other countries.

Summary

In the absence of industry standards for calibrator designations, health and safety professionals should base selection of a pump calibrator on its usability, stated accuracy, repeatability, and certificate of verification to a higher standard such as NIST and not on the principle of operation or designation. The SKC chek-mate Calibrator is very easy to use in the lab or field, provides accuracy nearly comparable to that of primary standards, and is NIST traceable. If a standard designation is required, the SKC chek-mate falls squarely in the **intermediate standard** category.

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