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Why Calibrate a Pipette?

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You expect your micropipettes to work accurately¹ and precisely,² and you depend upon them to produce reliable results. In order to ensure that these sensitive and important laboratory instruments are delivering expected volumes, it is imperative that they receive regular service. In addition to receiving proper care and use, pipettes should undergo regular performance verifications, preventive maintenance and calibration.

CALIBRATION

Your pipette is a sensitive instrument. Its ability to deliver accurate and precise volumes is dependent upon the environment,³ the laboratory technician's skill, and its own configuration. You can help reduce error in pipetting by providing a stable and suitable working environment, by practicing good technique, and by ensuring that your instrument is clean and calibrated⁴ and used with a tip that ensures a solid pipetting system.

Pipettes need to be calibrated. Even with normal use,⁵ all pipettes drift over time. In fact, you should expect your instrument to drift anywhere from 0.1-1.0% every year.⁶ Recognizing the inevitability of drift, pipette manufacturers recommend that instruments are calibrated at least every six months to a year, and as often as four times a year. The ISO 8655 Guide (standard for pipette manufacturing, among other things) recommends regular pipette calibration for the same reason.

PREVENTIVE MAINTENANCE



Above: A corroded Rainin piston. Our technicians are able to repair and/or replace pistons to ensure the continued life, accuracy and precision of your pipette.

Over time and with use, parts within your instrument begin to break down, causing either silent failures(!) or noticeable problems in the functionality of your pipette. Silent failures can be caused by a sealing mechanism that may be old, a shaft that may be worn or cracked, a piston that may be corroded and needs to be cleaned, or even the use of an incorrect tip. About 5% of the instruments our technicians work on require extensive repairs. Without these repairs, dysfunctional parts cause your instruments to deliver grossly inaccurate volumes if they continue to work at all.

Preventive maintenance should happen along with calibration on a regular basis to ensure that your instrument continues to function properly. A good preventive maintenance process involves thoroughly cleaning and inspecting the working parts of your instrument, replacing grease and/or seals, checking for corrosion, and repairing and/or replacing parts as necessary. Through this process, each pipette's life is

¹ Accuracy refers to the closeness of a measured volume to the true volume as specified by the volume setting of the pipette.

² Precision refers to the closeness of agreement among the individual volume samples.

³ Temperature, humidity and barometric pressure all effect volume.

⁴ Calibration is the set of operations which establish, under specified conditions, the relationship between values indicated by a measuring instrument or measuring system, or values represented by a material, and the corresponding known values of an instrument.

⁵ Leora Schiff notes in her "Difficulties in Achieving Well-Characterized Accuracy and Reproducibility In Micropipettes" (*Callab* Nov-Dec (1998): 24-27) that it is the rare instrument that is subject to "normal" use. Most pipettes experience wear and tear due to "abusive, abnormal conditions" (25).

⁶ Schiff, 25.



lengthened; and in fact, it's almost like getting a new instrument entirely. You can maintain an instrument with regular preventive maintenance and calibration for approximately 10%-20% of the cost of replacing a pipette outright.

OUTSOURCING CALIBRATION

Most organizations prefer to outsource their pipette services due to the tedious and complicated nature of the task. Pipette calibration is predominately undertaken by gravimetric analysis and is the preferred method by laboratories accredited to ISO 17025 (the international standard for testing and calibration laboratories). Utilizing at least a five-place microbalance and distilled water, the accuracy and precision of your pipette is checked through a weight-to-volume conversion using the environmental conditions of temperature, barometric pressure, and humidity (recorded as the Z-factor) present in your lab.⁷ Depending on the findings of the initial check, the calibration mechanism of the pipette is adjusted and volumes are checked again until the instrument falls within your laboratory's tolerances.

FOR MORE INFORMATION

We invite you to contact us if you have questions about creating a solid pipette calibration program, using proper pipetting technique, or ensuring that your pipettes are functioning like you need them. As America's Oldest and Largest Independent Pipette Service, if there's one thing we know, it's pipettes.

⁷ Just as pipettes require calibration, so do the tools that are used to assist the calibration process: the weights, the balance, thermometer and hygrometer. If conducting an in-house verification or calibration, ensure that the equipment you are using has received a NIST traceable calibration and is within tolerance limits.