APPLICATION KNOWLEDGE

Monitoring test equipment for air displacement pipettes

The way to simple and efficient implementation

Introduction

Monitoring test equipment in accordance with ISO 9001 and GLP is becoming increasingly important in laboratories. Regular pipette calibrations are an essential part of this process. Whether you choose in-house or external calibration, good preparation is a must. This technical note offers some useful tips. In each individual case, verification and application of the information is the user's responsibility.

In-house or external calibration?

Cost, speed and flexibility, among other things, play a role when deciding whether to calibrate a pipette in-house or externally.

External calibration services are offered by many pipette manufacturers and repair and service centers, which provide independent testing by specialists. External calibration can take longer, though, due to postal routes. There are costs associated with both external and in-house calibration. External calibration fees are easy to quantify. In house calibration may involve upfront costs for equipment as well as ongoing personnel costs associated with performing calibration.

As a pipette manufacturer, BRAND has employees who specialize in calibration, maintenance and repair, and offers the appropriate calibration service to meet every requirement – both factory calibrations and the DAkkS calibration service in accordance with DIN EN ISO/ IEC 17025.

Author: Kathrin Friedrich | BRAND GMBH + CO KG, Wertheim

In-house pipette calibration

Equipment | Preparation

The advantages of in-house calibration are flexibility, speed and, with an appropriate workload, possibly cost savings as well. Cost-effectiveness often depends on the number of pipettes. A combination of in-house and external calibration can also be worthwhile, so that the work done internally is validated by an independent, external result on a regular basis.

If in-house pipette calibration and maintenance is chosen, corresponding equipment and expertise are required. Many pipette manufacturers provide information and support for this.

The standard-compliant equipment of an in-house calibration lab includes test equipment that is traceable to national standards, such as a scale, a thermometer, a barometer, a hygrometer and possibly an appropriate air-conditioning system. For the calibration of small-volume pipettes, special accessories that are used for evaporation protection should also be included. Small-volume pipetting solutions, such as micro-weighing vessels or test tubes, are offered by BRAND.

It is also helpful to have a calibration software that can automatically calculate and evaluate the existing measured values of a pipette and document the instrument-specific test results. There are programs, such as BRAND's EASYCAL™ calibration software, that automatically transfer measurements from the scale. The test is then evaluated based on the previously defined tolerances.

Testing instructions

In addition to having the right equipment, specialist knowledge is also required. The extent to which this must be attained or refreshed is specified in the management system of the laboratory.

Skills can be learned in special seminars or with the aid of test instructions (SOPs), which describe the test in detail in accordance with DIN EN ISO 8655. These SOPs are typically available for download on the home page of pipette manufacturers. With this acquired knowledge, an in-house test instruction with the test sequence and tolerances must be defined.

BRAND provides suitable test instructions for many liquid handling instruments.

Standard operating procedures (SOPs) : **www.brand.de/en/service-support/application-database**

Implementation

The procedure for calibration in accordance with DIN EN ISO 8655 is generally always the same. If the ambient conditions required from the ISO (as for example a temperature between 15°C and 30°C or a humidity more than 50%) are present, the pipette must be placed in the calibration lab two hours before the test, so that the temperature of the pipette, ambient air and water are the same. The pipette is tested at nominal volume, 50% of nominal volume and 10% of nominal volume (or the lowest partial volume). Once the pipette is set to the target volume (= test volume), ten pipetting operations are dispensed into a vessel on the balance – in compliance with specific handling instructions , and the results recorded. By multiplying the mean value of these ten weight measurements by the applicable Z-factor (depending on air pressure and temperature), the actual pipetted volume is determined.

Evaluating the deviation between the actual volume and the target volume ultimately shows whether the pipette is within the defined tolerances or not.

Mean weighing values:
(Example for ten weighing values)

$$\bar{x} = \frac{x_1 + x_2 + x_3 + x_4 + x_5 + x_6 + x_7 \ldots x_{10}}{10}$$

Mean volume:

$$\bar{V} = \bar{x} \cdot Z$$

Z = Correction factor (e.g., 1.0029 µl/mg at 20 °C, 1013 hPa)

Figure 1
Calculating the mean mass, or the mean volume

Additional information and details about the test sequence and the calculation can be found in the BRAND test instructions (SOPs).

Measures to be taken when tolerances are exceeded

If evaluation of the calibration data for a pipette results in the tolerances being exceeded, this is caused by a leak in the pipette in 95% of all cases. In case of such a result, BRAND recommends conducting a leak test afterwards. The BRAND PLT unit can be used for all single- and multi-channel air displacement pipettes – regardless of the pipette manufacturer.

Pipette maintenance | repair

If the leak test reveals that there is a leak, the cause can systematically be determined by means of various test options. Through targeted maintenance or repair in an in-house laboratory, the pipette can be resealed and thus regain its original precision. Figure 2 shows the recommended course of action.

Figure 2
Determining a pipette cause for the leak with the BRAND PLT unit

Measures to be taken when tolerances are exceeded (continued)

Adjusting the pipette

If the leak test (dynamic and with pipette tip), which is performed in connection with the calibration, does not reveal any errors, and technique handling and ambient conditions can be excluded as the cause of error, the pipette must be adjusted. In most systems on the market, an adjustment involves correcting the piston stroke length. The disadvantage of this procedure is that a careful approach must be taken and as a result readjustment may be required in a further step. In addition, a tool is usually required. Adjustment on BRAND Transferpette® *S* and Transferpette® electronic pipettes is quite simple with the help of Easy Calibration technology: change the display to the actual measured volume on the decoupled pipette – without tools and within a few seconds. This quick and easy procedure is shown in Figure 3, using the Transferpette® *S* as an example.

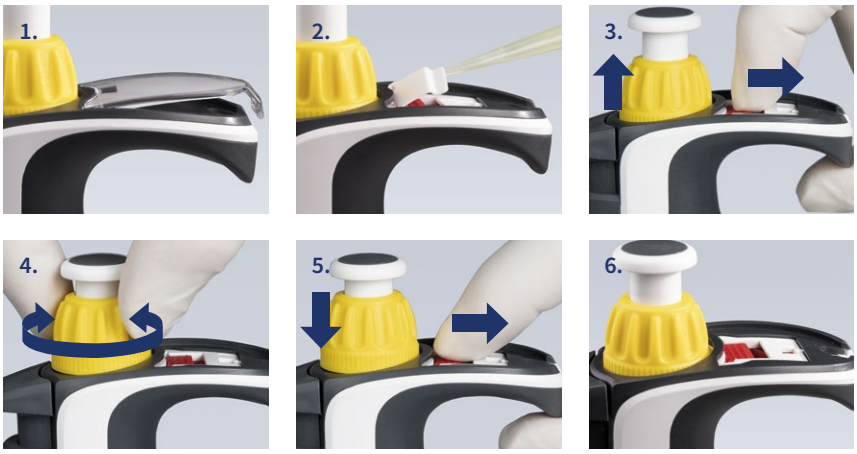


Figure 3
Quick and easy adjustment of the Transferpette® *S*

Because the Easy Calibration function is a safe and field-tested method, it can be assumed that no significant deviation will occur after the adjustment. Nevertheless, the volume should always be checked again after doing so.

Monitoring in between calibrations

Leak test with the BRAND PLT unit

ISO 8655 requires regular calibration of pipettes, but a calibration interval is not specified. This depends on the frequency of use of the pipette and whether aggressive media is used with the pipette. If a deviation is found during pipette calibration and the pipette lies outside the ISO tolerances, an examination must be conducted to find the cause for this and correct (repair) it. In critical fields, such a deviation forces laboratories to retrace the use of the pipette since the last documented calibration and make a decision about the implications. Therefore, to ensure process reliability in critical fields, the calibration interval is kept short – often at 3 months.

In addition to calibration, BRAND recommends regular (ideally daily) monitoring of air displacement pipettes by means of a leak test. In the period between calibrations, this can also ensure that the pipette is able to transfer liquid reliably and accurately. Conducting a leak test with the BRAND PLT unit can detect even the smallest leaks and thus changes in volume, for example. As a result, regular monitoring can prevent an instrument from exceeding ISO volume tolerances. If an instrument fails the leak test, we recommend conducting a gravimetric test. In consultation with the auditor, it may be possible to extend the calibration interval and thus save costs by performing a daily leak test on pipettes.

Documentation

In the context of overall test equipment monitoring, documentation is also an essential component – both in terms of internal quality management and for audits. Unless otherwise stipulated in the laboratory management system, test results should normally be stored for as long as the pipette is in use. This applies to the regular calibration certificate – both certificates from an external service center and certificates for calibrations performed in-house. If a calibration software is used for in-house evaluation, certificates can usually be printed and archived for every test. The EASYCAL™ software from BRAND also contains a test history, which shows the results of every test and a timeline of each pipette.

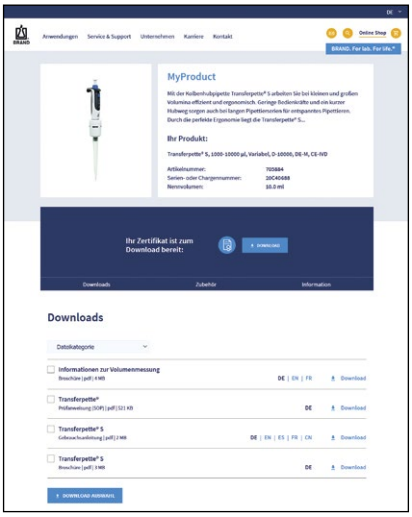
Documentation of leak test results is also recommended, so that a trend toward a possible leak can be detected. In combination with the BRAND PLT unit, the PLT connect software can also be used to create and document test certificates.

When putting a new pipette into operation for the first time, the original test values must be adhered to before use. An in-house calibration is usually not carried out immediately after a new pipette is acquired; instead, the manufacturer's quality certificate serves as the basis. This is created as part of the manufacturer's quality control measures and is usually included in the scope of delivery. If, before an audit, you should discover that this quality certificate has been lost, you can normally request it from the manufacturer.

MyProduct online service

At BRAND, the MyProduct online service provides an option to download the quality certificate with the test results for a specific instrument on an article and serial number basis. BRAND MyProduct also makes documents available for download, such as the above-mentioned test instructions. If service is required, an instrument-specific list of suitable accessories and spare parts can also be found here.

Test certificate of the PLT connect software



"MyProduct" online service
www.brand.de/en/service-support/myproduct

Conclusion

With the right preparation and the right equipment, in-house or external test equipment monitoring, or a combination of both options, can be easier and more efficient. While the procedure for the actual calibration is specified in DIN EN ISO 8655, a functional leak test and the Easy Calibration technology can help to save time and money and increase reliability at the same time. Pipette manufacturers provide support for the user-friendly implementation of test equipment monitoring on air displacement pipettes – whether it concerns service offers or suitable calibration accessories. This support is often complemented by helpful information on the home page and documents in the download section.

Our technical literature is intended to inform and advise our customers. However, the validity of general empirical values, and of results obtained under test conditions, for specific applications depends on many factors beyond our control. Please appreciate, therefore, that no claims can be derived from our advice. The user is responsible for checking the appropriateness of the product for any particular application.
California Residents: For more information concerning California Proposition 65, please refer to www.brand.de/calprop65.

Subject to technical modification without notice. Errors excepted.

More information about our products:

Standard operating procedures (SOPs) :
www.brand.de/en/service-support/application-database

Manuals:
www.brand.de/en/service-support/downloads

Quality certificate and individual spare parts:
www.brand.de/en/service-support/myproduct

EASYCAL™ calibration software:
https://shop.brand.de/en/easycaltm-4-0-calibration-software-p74.html

All information about our PLT unit can be found at **shop.brand.de**

BRAND GMBH + CO KG
Postfach 1155 | 97861 Wertheim | Germany
T +49 9342 808 0 | F +49 9342 808 98000 | info@brand.de | www.brand.de

BRAND. For lab. For life.®

0621