Pipette Calibration and Compliance: A Practical Guide to ISO 8655

Simplifying Progress

Get Started

SARTORIUS

Introduction

In today's highly regulated laboratory environments, precision and accuracy are critical.

ISO 8655:2022 is a standard that specifies the requirements and test methods for piston-operated volumetric instruments (POVA) and applies to pipettes, burettes, dilutors, dispensers, and manually operated precision laboratory syringes. It covers aspects such as accuracy, precision, and calibration procedures to ensure reliable and consistent performance in the laboratory, emphasizing the importance of regular calibration and maintenance to minimize errors and ensure consistent performance of liquid handling products. ISO 8655:2022 is essential for laboratories to maintain quality control and ensure the accuracy of liquid handling equipment.

This compendium is a comprehensive resource for laboratories, calibration facilities, and researchers, offering in-depth insights into ISO 8655:2022 requirements and effective strategies for pipette calibration. By aligning with the latest standards and leveraging innovative technologies, laboratories can achieve exceptional precision and reliability in volumetric measurements—crucial for advancing scientific discovery.

Sartorius, a leader in laboratory technology, provides a full suite of solutions to support ISO 8655 compliance. These include the Picus® 2 electronic pipette for enhanced accuracy and user guidance, Cubis® II ultra-high-resolution balances for gravimetric testing of single-channel pipettes, the SpeedCal Mobile for rapid ISO-compliant calibration of up to 12 channels, and the Arium® Advance EDI water purification system to ensure the availability of high-quality water for accurate calibration.

In addition to innovative solutions, Sartorius Service is accredited according to ISO/IEC 17025 in many countries and issues calibration certificates for pipettes and dispensers, as well as test reports for piston-operated volumetric instruments according to ISO 8655. A calibration certificate from an ISO 17025-accredited laboratory guarantees complete traceability of measuring instruments to national standards and ensures trust in your measurement and test results.

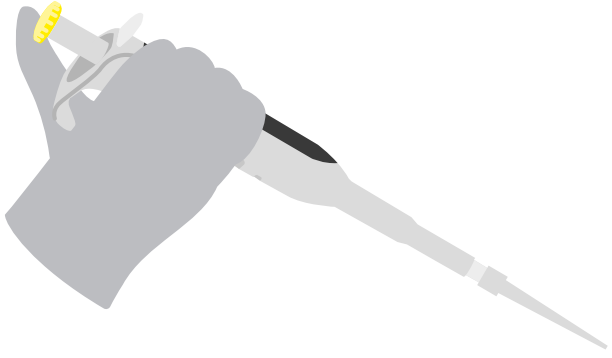
Table of Contents

ISO 8655:2022 – Pipette Calibration and Standards

Setting the requirements for calibration of pipette and piston-operated volumetric apparatus

ISO 8655:2022 details requirements for producing and in-use control of piston-operated volumetric apparatus (POVA) including testing methods, testing environment, testing equipment, reporting requirements, requirements for measurement uncertainty, and general requirements for how POVAs work.

Taking proper care of your pipettes is one of the critical factors affecting the quality of your work. Pipette performance can deteriorate over time due to drift of calibration, leakage, part wear, or contamination. The accuracy and precision of pipettes must be checked at regular intervals. Calibrating your pipettes is the only way to ensure they still work as intended.

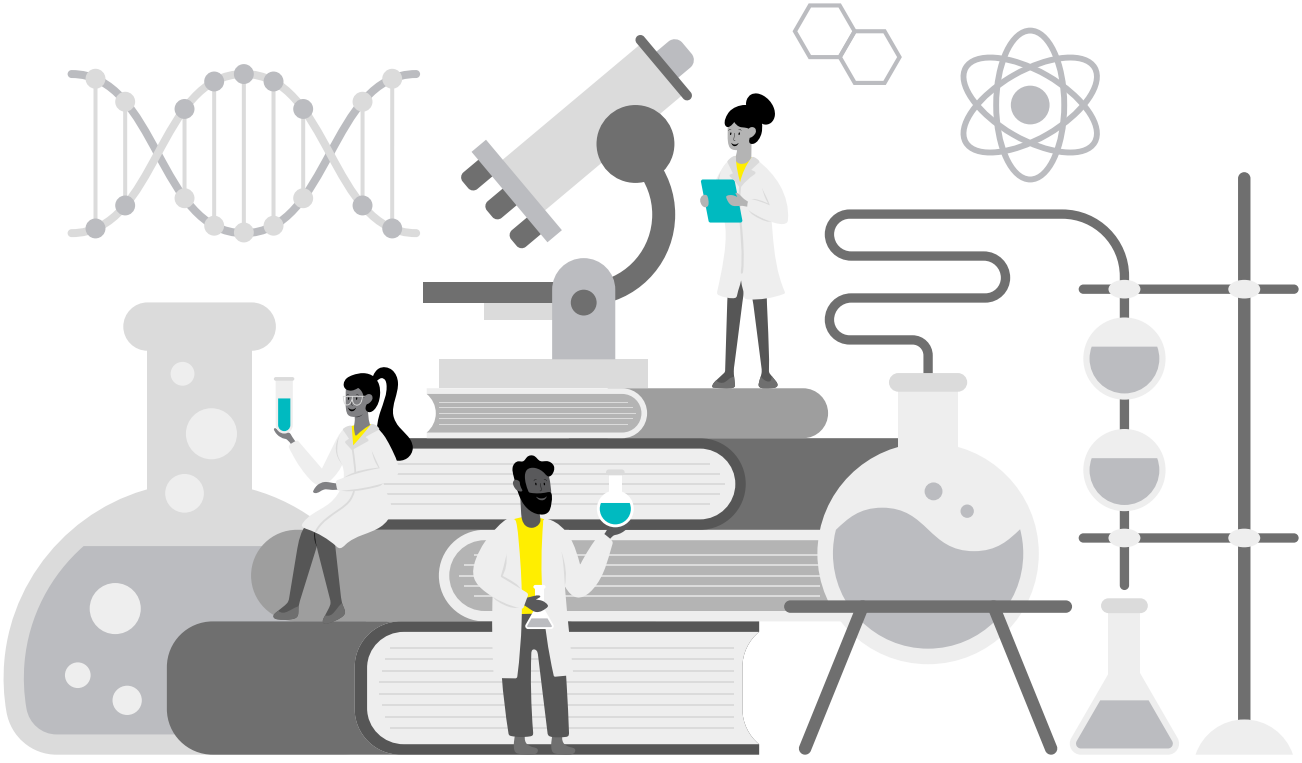


ISO 8655 is different from ISO 17025. The former describes how the calibration of a POVA is performed while the latter defines the requirements a calibration laboratory must meet to achieve valid calibration results

POVA Testing and Calibration

Calibration and test are operations that describe the relationship between the delivered volume and the corresponding selected volume of the apparatus. Measurement results are only comparable under the same conditions.

All variables that affect liquid properties must be controlled to ensure valid comparisons, POVA testing, and calibration.



Determining Calibration or Test Intervals

Factors to consider:

- Risk of application
- Frequency of use
- Number of users
- Type of liquid delivered and its vapors
- Acceptable maximum permissible errors
- Manufacturer information
- Liquid handling process

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What is new in ISO 8655:2022?

Two different reference measurement procedures for volume determination:

(i) Gravimetric (Part 6)

(ii) Photometric (Part 8)

Recommendation: Follow the new ISO once it is officially published in a country.

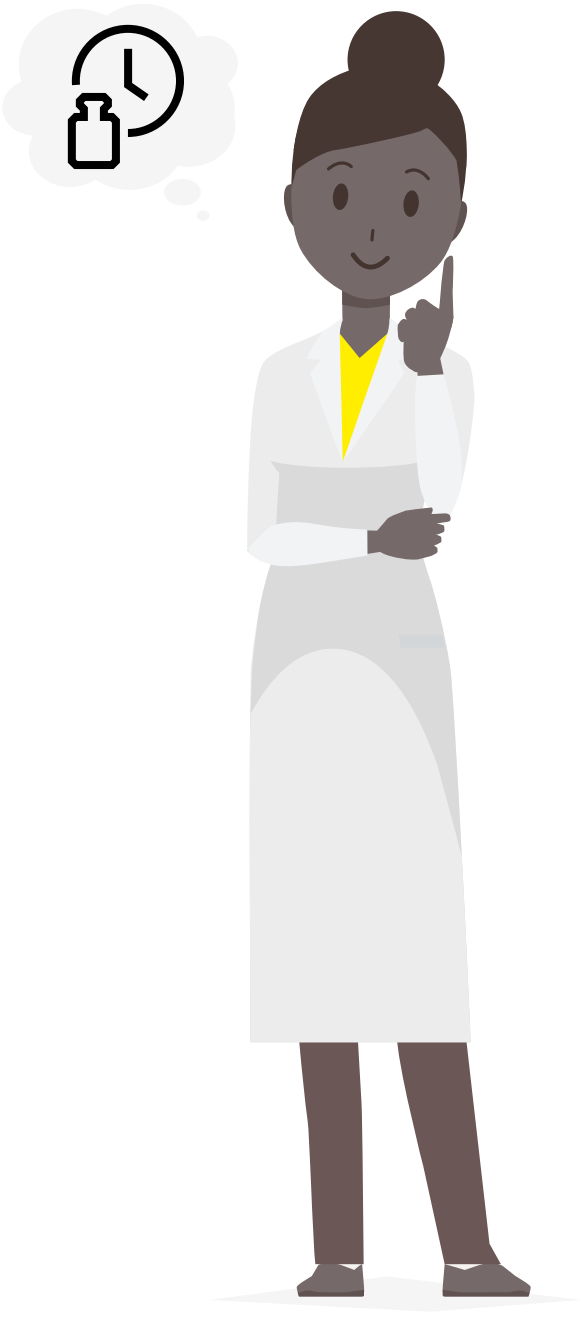
Adapting to calibration and maintenance tolerances

An as-found calibration or test should be carried out and a metrological confirmation should be considered before and after the maintenance or repair of a POVA. This can be done against the ISO 8655, manufacturer, or customer/user tolerances to ensure the ISO standard is fulfilled.

ISO parts 2, 6 and 7 require tolerances for the nominal volume, 50% of nominal volume, and 10% of nominal volume. The tests must be done with at least 10 repetitions per tested volume and at three points, minimum.

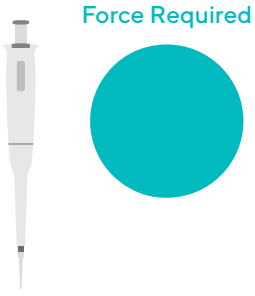
Additionally, part 6 gives the new minimum requirements for balances used for gravimetric calibration. The requirements were adapted and now ask for lower readabilities for pipettes up to 200 µL.

ISO 8655 Part 7 A.2 allows for deviations in test liquid and volumes.

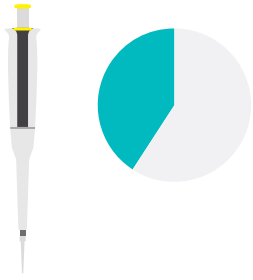


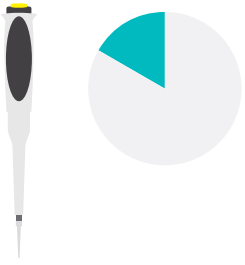
Recommendation: When using third-party pipette tips, it is recommended that the tip manufacturer proves that the whole system, pipette, and tip together meet the requirements and maximum permissible errors of ISO 8655. Pipette tips must be changed at least once per calibrated volume when performing calibration or testing under ISO 8655 Parts 6 – 8. This is not required for ISO 8655 Part 7 A.2.

Pipetting constitutes a large portion of bench time and can affect data reliability and the well-being of laboratory workers. Sartorius has combined ergonomic solutions with proper pipetting techniques enabling minimizations of errors due to fatigue and the risk of repetitive strain injuries.



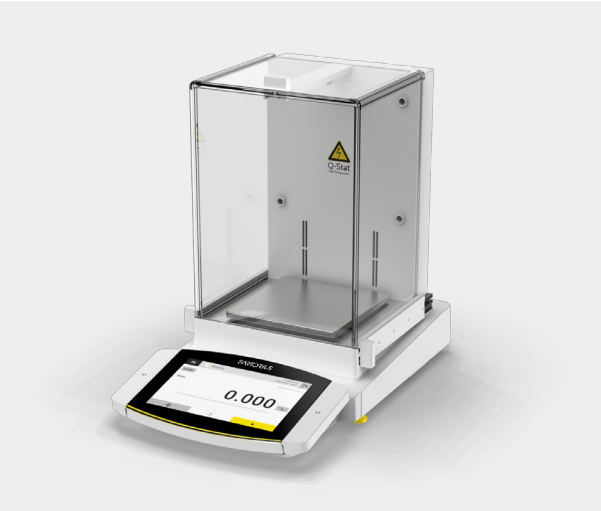
Heavy Mechanical Pipette


Light Mechanical Pipette (Sartorius Tacta®)


Electronic Pipette (Sartorius Picus®)

Calibrating the Sartorius Way

Sartorius' Cubis MPS and Speedcal Mobile systems combine accuracy, precision, speed, and convenience to provide professional pipette calibration.



Cubis MPS

- Motion control, quick opening of the draft shield
- Integrated humidity sensor
- White and Red LED tolerance alerts for weight and climate parameters
- Readability of 0.001 mg or 0.01 mg
- Weighing capacity of 6.1 g or 100 g

Speedcal Mobile

- Calibrates multi-channel pipettes
- Parallel connections up to 12 balances within 10 minutes
- Available with 4, 8, or 12 channels
- Conforms to ISO 17025 and ISO 8655 regulations
- Integrated web service interface for mobile service
- Weighing capacity of 21 g per channel
- Resolution of 0.01 mg
- Stabilization time < 4 s

POVAs constitute a large portion of laboratory equipment. ISO 8655:2022 details the relevant methods for testing and calibration of POVAs to meet a precision lab's needs and requirements. Sartorius' Cubis MPS and Speedcal Mobile systems provide an accurate, precise, fast, and convenient means of professional pipette calibration that enhance your lab's standards.

Gravimetric Calibration and Testing of Piston-Operated Volumetric Apparatus (POVA) According to Part 6 and 7 of the ISO 8655:2022

How to Perform a Norm Compliant Calibration or Test

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Abstract

Reliable and reproduceable liquid handling results depend crucially on the regular test and calibration of the instruments. The globally most accepted International Standardization Organization (ISO) standard that details requirements for producing and in-use control of piston-operated volumetric apparatus (POVA) is the ISO 8655.

The aim of this white paper is to present the requirements for gravimetric calibration and testing of piston-operated volumetric apparatus (POVA) according to part 6 and part 7 of the ISO 8655 revised in 2022.

This white paper presents the differences between calibration and testing according to chapters 6 and 7, describes the testing method as well as testing environment, testing equipment and reporting requirements.

Find out more: www.sartorius.com

Introduction

Liquid handling products are used daily in most laboratories to prepare samples, controls, and assay reagents.
As mechanical and electronical liquid handling products affect virtually every experiment, accuracy and repeatability are extremely important. Metrological confirmation by calibration or testing of all piston-operated volumetric apparatus (POVA) shall therefore be performed on a regular basis to ensure that the apparatus meets the requirements for its intended use.

The most important international standard on piston-operated volumetric apparatus (POVA) is the ISO 8655.
It is applicable to pipettes, burettes, dilutors, dispensers and manually operated precision laboratory syringes for volumes up to two liters.

The ISO 8655 standard was developed and published by the International Organization for Standardization (ISO), an international, independent, non-governmental organization. In 2022 a second edition of the ISO 8655 was published. The ISO 8655:2022 series has now nine parts (a part 10 is in preparation) and replaces the first edition from 2002.

ISO 8655 series is addressing the needs of POVA manufacturers as well as calibration laboratories and POVA users performing calibration or tests on POVAs.

The aim of this white paper is to describe the requirements for a gravimetric calibration or test according to part 6 and part 7 of the ISO 8655:2022. This includes testing methods, testing environment, testing equipment, and reporting requirements.

Part 6 and Part 7 of the ISO 8655:2022

Part 6 and 7 of the ISO 8655:2022 specifies gravimetric measurement procedures for the determination of volume of piston-operated volumetric apparatus (POVA).

Figure 1: *Gravimetric Calibration of a Pipette on a Single Channel Balance*

Part 6 of the ISO 8655 describes the gravimetric reference measurement procedure for the determination of volume.

Conformity with Part 6 can only be given if all the requirements described in this part are met. Part 7 specifies alternative measurement procedures for the determination of volume. Annex A of part 7 of the ISO is entitled with “Gravimetric procedure”.

Both in part 6 and part 7 the test procedures apply to the entire system which comprises the basic apparatus and all disposable (e.g.: pipette tips) or reusable parts that are selected for use with the apparatus. This means calibration and test results according to the ISO 8655 are only valid for the entire system. Thus, when different types of disposable or reusable parts or disposable or reusable parts from different manufacturers are used, different systems are in use, and each requires its own calibration or testing.

Part 6 and Part 7 of the ISO 8655 distinguish between calibration, test, and routine testing. All are defined as a set of operations that establish the relationship between the delivered volume and the corresponding selected volume of the apparatus. The difference between calibration and test according to the ISO 8655 is that the calculation of the measurement uncertainties is required for a calibration, while this is optional when testing a POVA. As measurement results are, strictly speaking, incomplete if they are not accompanied by a statement of the associated measurement uncertainty and measurement uncertainty is also crucial in measurement comparison and measurement traceability, calibration has a much higher value then just testing.

According to the ISO 8655:2022 a metrological confirmation of a POVA shall be performed on a regular basis to ensure that the apparatus meets the requirements for its intended use. Such a metrological confirmation can be given by both calibration and test and as well under Part 6 and Part 7 of the ISO 8655.

The ISO 8655:2022 clearly states that an as-found calibration or test should be carried out and a metrological confirmation should be considered before and after the maintenance or repair of a POVA.

While the main target of calibration and test lays at the metrological confirmation routine testing shall be performed at shorter time intervals than metrological confirmations and follows Part 7 of the ISO 8655.

	ISO 8655-6	ISO 8655-7	ISO 8655-7 A.2
Test Types	Calibration, Test	Calibration, Test, Routine testing	Calibration, Test, Routine testing
Metrological confirmation	Yes	Yes, if the measurement procedure is validated by comparison to the reference procedure	Yes, if the measurement procedure is validated by comparison to the reference procedure and at least 10 measurements per volume are taken

Balance Used for Gravimetric Calibration and Test

Gravimetric calibration and tests are performed by dispensing the test liquid several times on a balance. Single-channel balances can be used for calibration and test of single and multi-channel instruments while a multi-channel balance shall only be used for multi-channel pipettes.

The minimum requirements for the balance used for calibration and test are the same under Part 6 and Part 7 of the ISO. The following minimum requirements need to be met:

Nominal Volume of the POVA	Resolution (*d*) (mg)	Repeatability (*s*) (mg)	Expanded Uncertainty in use (U_{gl} [*W*]) (mg)
0.5 µL ≤ V < 20 µL	0.001[a] 0.01[b]	0.006 [a] 0.0 3[b]	0.012[a] 0.06 [b]
20 µL ≤ V < 200 µL	0.01	0.025	0.05
200 µL ≤ V ≤ 10 mL	0.1	0.2	0.4
10 mL <V ≤ 1,000 mL	1	2	4
1,000 mL < V ≤ 2,000 mL	10	10	40

[a] Single-channel balance
[b] Multi-channel balance (to be used below 20 µL only if the expanded uncertainty in use is less than ¼ of the maximum permissible systematic error of the apparatus)

Resolution is quite simple – when knowing the nominal volume of the POVA the needed resolution | scale interval (*d*) of the balance can directly be taken from the table above.

An evaluation if the balance meets the requirements on repeatability (*s*) and the expanded uncertainty in use (U_{gl} [*W*]) is only possible by taking these values from an actual calibration certificate of the balance. It is important that the balance has been calibrated at the place of use and that both values, the repeatability (*s*) as well as the expanded uncertainty in use are stated in the calibration certificate.

In particular the expanded measurement uncertainty in use (U_{gl} [*W*]) is not specified on calibration certificates from all service providers. It is represented by a formula and allows the measurement uncertainty to be calculated for all loads. In contrast to the measurement uncertainty that is given on of the expanded uncertainty in use takes additional uncertainty contributions into account, such as effects when taring the balance, environmental influences or rounding effects.

Calibration certificates from Sartorius that follow the EURAMET cg-18 guideline do always state the expanded uncertainty in use. With a special attachment to the calibration certificate the Sartorius service can provide a document confirming the use of the balance for calibrations of POVAs of different nominal volumes.

Test Equipment Used for Gravimetric Calibration and Test

The minimum requirements for the test equipment to measure the environmental condition during calibration or test slightly differ between Part 6 and Part 7 of the ISO 8655:2022. The following minimum requirements shall be met:

	ISO 8655-6	ISO 8655-7	ISO 8655-7 A.2
Test equipment	All measurements done by test equipment shall be traceable to the International System of Units (SI) and shall meet the uncertainty requirements of ISO 8655-6	Shall be chosen such that the required uncertainty of measurement can be obtained	
Air temperature	Minimum requirements to be met: ▪ Resolution: 0.1 °C ▪ Expanded uncertainty of measurement (k = 2): 0.3 °C		
Water temperature	Minimum requirements to be met: ▪ Resolution: 0.1 °C ▪ Expanded uncertainty of measurement (k = 2): 0.2 °C	Minimum requirements: ▪ Resolution: 0.1 °C ▪ Expanded uncertainty of measurement (k = 2): 0.3 °C	
Air humidity	Minimum requirements to be met: ▪ Resolution: 1% relative humidity ▪ Expanded uncertainty of measurement (k = 2): 5 % relative humidity		
Air pressure	Minimum requirements to be met: ▪ Resolution: 0.1 kPa ▪ Expanded uncertainty of measurement (k = 2): 1 kPa		
Test liquid	Minimum requirements to be met: ▪ Distilled or deionized water conforming at least grade 3 as specified in ISO 3696:1987		

Test Conditions

The environmental conditions need to be measured and reported during gravimetric calibration and test of a POVA. The following environmental conditions must be met:

	ISO 8655-6	ISO 8655-7	ISO 8655-7 A.2
Test conditions in test room	▪ Draft free ▪ Stable environment ▪ Relative Humidity: 45 % – 80 % relative humidity ▪ Temperature: (20 ± 3) °C ▪ Air pressure: to be recorded ▪ Temperature variation during test ≤ 0.5 K	▪ Draft free ▪ Stable environment ▪ Relative Humidity: to be recorded ▪ Temperature: to be recorded ▪ Air pressure: to be recorded ▪ Temperature variation during test ≤ 0.5 K	
Test liquid	The water temperature shall be within 0.5 K of ambient air temperature	Test liquid shall be acclimatized to the test room temperature	Not specified

Test Procedure

Depending on the part of the ISO 8655 and the test type the requirements on the measurement procedure differ. The following requirements are given under the different parts of the ISO and for the different test types:

	ISO 8655-6	ISO 8655-7	ISO 8655-7 A.2
Test volumes	**Calibration and test** At least at the following 3 volumes: ▪ nominal volume ▪ 50 % of the nominal volume ▪ The lower limit of the usable volume range or 10% of the nominal volume (whichever is greater).	**Calibration and test** At least at the following 3 volumes: ▪ nominal volume ▪ 50 % of the nominal volume ▪ The lower limit of the usable volume range or 10% of the nominal volume (whichever is greater). **Routine testing** Fewer than 3 volumes might be tested	**All test types** At least 1volume
Number of measurements	**Calibration and test** At least 10 measurements per volume	**Calibration and test** At least 10 measurements per volume **Routine testing** At least 4 measurements per volume	**All test types** At least 4 measurements per volume
Tip change	At least once per volume	At least once per volume	No tip change required
Specific requirement when testing a multi-channel pipettes	▪ All channels must be tested individually ▪ All channels shall be tested on a multi-channel balance in parallel ▪ When testing on a single-channel balance test liquid shall be aspirated by all channels together. The volume of the channel to be measured shall be delivered into the weighing vessel, while the volumes from all other channels shall be discarded		

Test Evaluation and Reporting of Results

	ISO 8655-6	ISO 8655-7	ISO 8655-7 A.2
Volume calculation	The corrected weighing values shall be converted to volume by using the general formula 2 according to ISO 8655-6 or using the Z correction table		
Systematic error of measurement	$e_s = \overline{V} - V_s$ e_s is the systematic error of measurement, expressed in units of volume V_s is the selected test volume at the POVA under test $\overline{V}$ is the average of the measured volume		
Random error of measurement	$s_r = \sqrt{\frac{\sum_{i=1}^{n} (V_i - \overline{V})^2}{n-1}}$ where s_r is the standard deviation, expressed in units of volume		
Tolerances	Results can be compared against following tolerances: ▪ ISO 8655 (given in the technology related chapters of the ISO) ▪ Manufacturer ▪ Own customer requirements		
Reporting of results	▪ Identification of the POVA ▪ Identification of tips | exchangeable parts ▪ Basis of the test (Ex) or (In) ▪ Reference temperature and cubic thermal expansion coefficient γ, if a correction for cubic thermal expansion of the POVA is made ▪ Test conditions under which the test was performed ▪ Volumetric measurement results for each delivered volume ▪ Total number of replicate measurements made per selected volume ▪ Systematic and random measurement errors ▪ Tolerances to which the test results are compared, if applicable ▪ Expanded uncertainty of the mean delivered volume, for each selected volume and channel, if required ▪ Date of the test ▪ Identification of the operator performing the test		
	▪ Reference to ISO 8655-6:2022 ▪ Any variation from the reference measurement procedure specified under ISO 8655-6 ▪ Reference to the formula used to convert weighing values into volume	▪ Reference to ISO 8655-7:2022 ▪ Any deviation from the employed procedure described under ISO 8655-7 ▪ Type of test liquid ▪ Recommendation for the next test date (if agreed upon	▪ Reference to ISO 8655-7:2022, A.2 ▪ Any deviation from the employed procedure described under ISO 8655-6 ▪ Type of test liquid ▪ Recommendation for the next test date (if agreed upon)

Conclusion and Sartorius Recommendations

- Testing and calibration are only valid for the entire system (basic apparatus and all disposable or reusable parts) – therefore when using different kinds of disposable or reusable parts with your POVA the test or calibration must be performed separately per entire system
- Balances that are used for calibration and test of POVA need to meet the requirements on resolution | scale interval (d), repeatability (s) and the expanded uncertainty in use (U_{gl} [W])
- A metrological confirmation should be considered before and after the maintenance or repair of a POVA.
- When performing calibration or test the requirements for the balance and all other test equipment must be met
- When performing a calibration, the calculation and reporting of measurement uncertainties is required
- Test and calibration according to part 6 and 7 of the ISO 8655:2022 require at least one tip change per measured volume
- The test results can be compared against ISO 8655:2022, manufacturer, or customer tolerance settings

References

ISO 8655:2022 Piston-operated volumetric apparatus
Part 1: Terminology, general requirements and user recommendations
Part 2: Pipettes
Part 6: Gravimetric reference measurement procedure for the determination of volume
Part 7: Alternative measurement procedures for the determination of volume
International Organization for Standardization, Geneva, Switzerland

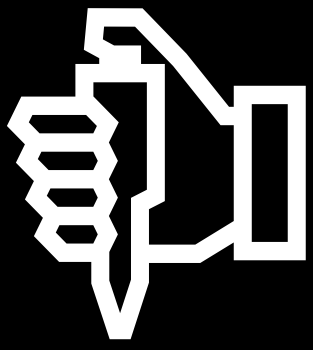
ISO 8655:2022 Part 10: How to Achieve Pipetting Compliance

In 2024, ISO 8655:2022 was expanded to include a new Part 10, providing essential guidelines for setting up an ISO-compliant laboratory environment. Learn how these updates effect your pipetting workflows.

Pipette and Tip Selection

Pipette:

- **Volume Range:** Match nominal volume to intended delivery.
- **Liquid Properties:** Consider viscosity and volatility.
- **Type & Size:** Choose based on application and frequency.
- **Performance:** Align with performance needs.



Pipette Tip:

- **Compatibility:** Ensure fit with pipette model.
- **Material & Design:** Minimize liquid retention.
- **Sterility:** Use sterile, defect-free tips.

Pipette and tip make a complete system

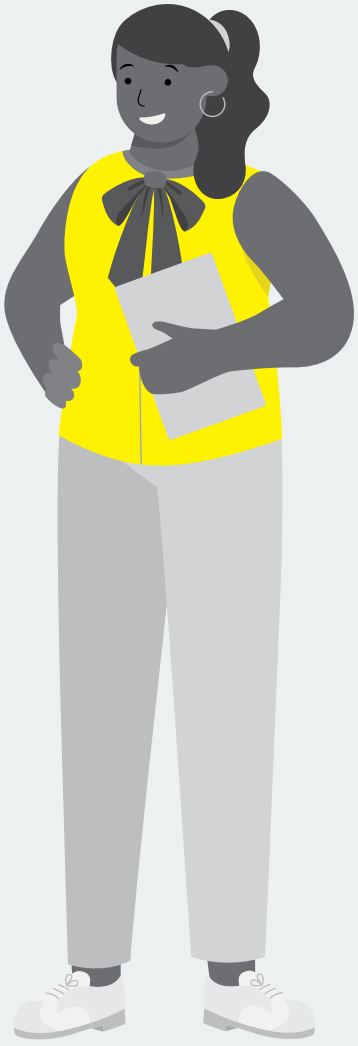
Sartorius Recommendations

- **Fixed vs. Variable Volume:** Fixed for repetitive tasks; variable for flexibility
- **Single vs. Multichannel:** Single for individual sample precision; multichannel for high-throughput
- **Mechanical vs. Electronic:** Electronic for higher ergonomics and efficiency
- **Volume Lock:** Prevents accidental changes
- **Maintenance:** Easy to disassemble, clean and autoclave
- **Tip Type:** Use validated original tips according to application needs

Pipetting Technique

General Use:
Use air-displacement pipettes for aqueous solutions. Apply reverse pipetting technique for non-aqueous liquids.

Environment:
Maintain thermal equilibrium between pipette, tip, and liquid.



Technique:
Use consistent speed, correct immersion angle, and pre-wet tips to minimize errors.

Maintenance:
Perform regular calibration, maintenance, and checks.

Pipette Qualification | Re-qualification

Regular assessment is critical to qualify your pipette for its intended use.

- Set calibration and testing requirements.
- Consider maximum permissible errors.
- Establish process tolerances.
- Perform routine testing and maintenance.

User Qualification

Pipetting technique directly impacts the quality and reliability of results.

- Require comprehensive training on pipette use.
- Perform regular assessments to ensure proper technique.
- Keep detailed documentation of training and assessments.

ISO 9001 Certified Pipetting Academy

- Learn how to establish a Maintenance and Calibration Program.
- Understand why pipetting technique matters.
- Identify sources of error.
- Get tips for working with different liquids and conditions.

Sartorius Services

Maintenance and Calibration Services

- Onsite and workshop ISO 8655-compliant services
- Calibration services per ISO|IEC 17025
- Maintenance and repair for all makes and models

Talk to one of our experts about our services →

Learn about the ISO 8655 Standard →

Simplifying Pipette Calibration

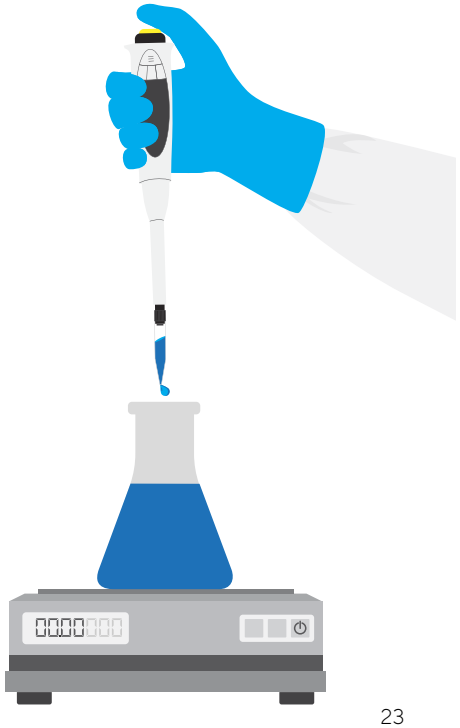
A smart solution for rapid, compliant multi-channel pipette calibration

Taking care of your pipettes is important to ensure the quality of work performed in the laboratory. In addition to cleaning and performing routine maintenance, the accuracy and precision should be checked at regular intervals. Smart solutions for pipette calibration can help laboratories achieve:

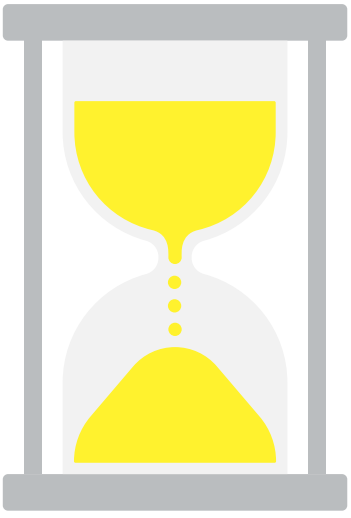
- Compliance
- Fewer errors
- Increased efficiency
- Lower calibration costs

Gravimetric analysis

This method compares dispensed volumes against manufacturer specifications. Typically, a series of samples of water are aspirated and dispensed at a predetermined volume into a vessel on an analytical balance. Using a weight-to-volume calculation—which also takes into consideration environmental factors—and statistical analysis, the user can determine the accuracy and precision of the pipette.



Achieving and maintaining compliance



Laboratories that are certified according to ISO 9001, accredited according to ISO 17025, or work according to Good Laboratory Practices (GLP) or Good Manufacturing Practices (GMP), must check their pipettes at least once per year—ideally, every three to six months.

ISO 8655 specifies the standard for pipette calibration, including procedures and equipment, based on the gravimetric method.

Calibrating a 12-channel pipette according to DIN EN ISO 8655 requires 360 measurements, 10 repetitions of the three volumes:

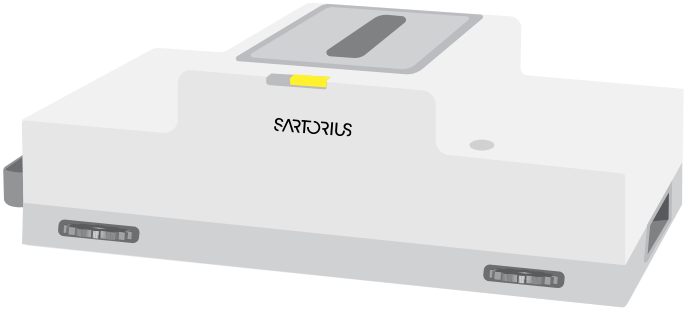
- **10%** of nominal volume
- **50%** of nominal volume
- **100%** of nominal volume

x 12 channels

—this process can take up to 1.5 hours!

A smart solution for rapid, compliant calibration

The Sartorius Speedcal mobile calibration unit enables rapid, compliant calibration of multi-channel pipettes in 6-8 minutes (one ISO 8655 calibration of a variable 12 channel pipette). It enables parallel connection of upto 12 balances, which simultaneously determine the dispensed volumes from a multi-channel pipette.



Speedcal is easy to transport, features connectivity through Ethernet interface, and can be operated without additional software via a web user interface. It is easily integrated into your Pipette Calibration Software via open REST webservice interface.

Key features:

- Available with 4, 8, or 12 channels, with the option to upgrade at a later time
- Resolution: 0.01 mg
- Weighing capacity: 21 g/channel
- Stabilization time: <4 sec

Accurate, precise pipetting is vital for every application. The Sartorius Speedcal Mobile is a unique system designed for rapid, compliant calibration of multi-channel pipettes.

Achieving Excellence in Pipette Calibration

Comprehensive Solutions for Meeting ISO 8655:2022 Requirements with Sartorius

This sectrion discusses the updates to ISO 8655:2022 and their impact on pipette calibration. It highlights the changes made to improve the accuracy of POVAs and the requirements for calibration and testing. Sartorius offers solutions to meet these new standards, including the use of Cubis® II balances, evaporation traps, and Ingenix software for pipette verification. The section also mentions the Speedcal Mobile system for multichannel pipette calibration and the importance of using the right quality of water, which is where the Arium® Advance EDI comes in. Sartorius provides a complete solution for pipette calibration and supports laboratories in outsourcing or internalizing the verification and control of their POVAs.

ISO 8655:2022 and Sartorius Solutions for Pipette Calibration

ISO 8655:2022 is an essential update for laboratories looking to ensure the accuracy and reliability of their volumetric pipetting values. This international standard, which defines the requirements for the calibration and verification of Piston-Operated Volumetric Apparatus (POVA), has been revised to include stricter guidelines and clarified reference measurement procedures.

ISO 8655:2022 makes significant changes to improve the accuracy of POVAs.

- It is now divided into 10 parts for more comprehensive coverage of POVA calibration and testing.
- Introduction of two distinct methods for determining volume: a gravimetric (Part 6) and a photometric (Part 8), with an overview of the alternatives in Part 7.
- Part 9 introduces manually operated precision laboratory syringes.
- Tolerances are set as a proportion of the nominal volume of the apparatus, making measurements more accurate, particularly for small volumes.
- The pipette and tip are a single system that must comply with the maximum permissible errors.
- The tips must be validated by their manufacturer to ensure compatibility with the pipette.

Sartorius, a leader in laboratory metrology field, offers complete solutions to meet the requirements of this new standard. Sartorius' gravimetric checking and calibration services are ISO 8655 compliant, ensuring reliable and qualified results for pipettes, dispensers, dilutors and burettes.*

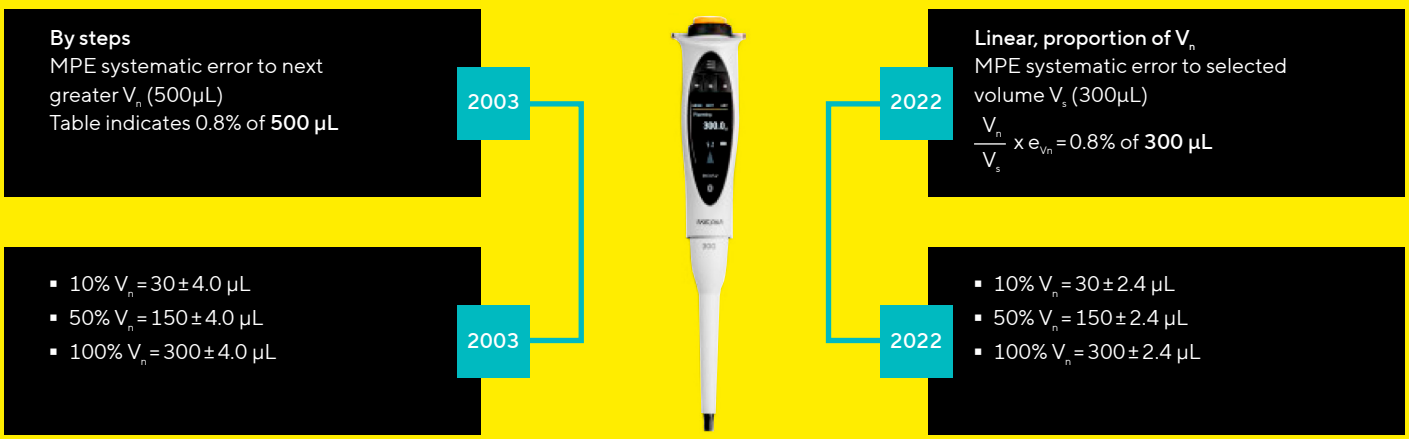
*Check availability in your country

Figure 1: *Picus® 2 Electronic Pipette Calibration with Cubis® II Balance, Evaporation Trap and Ingenix Software*

Sartorius' Cubis® II balances can be equipped with an evaporation trap and can be used with the built-in **Pipette Check QApp** app to guide the user through the complete pipette verification process, following the recommendations of ISO 8655:2022. For increased traceability, the Advanced Pipette Calibration module in the Ingenix software suite is ISO 8655:2022 and CFR 21 part 11 compliant, provides simplified management and tracking of pipette fleet calibration.

Example for a Nominal Volume V_n = 300 µL, According to ISO 8655-2

Figure 2: *Example of Impact on MPE Accuracy – ISO 8655:2003 vs ISO 8655:2022*



For multichannel pipettes calibration, Sartorius has developed Speedcal Mobile, a **proprietary system** that enables fast and compliant verification and calibration of multichannel pipettes in less than 10 minutes. The Speedcal Mobile can control 4, 8 or 12 channels simultaneously, determining the volumes dispensed by a multichannel pipette in real-world conditions. Easy to transport or set up permanently in your lab, the Speedcal Mobile can connect to **Ingenix Advanced Calibration** software suite for compliance tailored to pipette volume, environmental conditions, and channel count.

Figure 3: *Speedcal Mobile System for Unique and Simultaneous Verification of up to 12 Channels*

To ensure the accuracy and compliance of pipettes in the laboratory, the use of the right quality of water is essential. According to ISO 8655-6, it is imperative to use at least "Grade 3" water, as defined in ISO 3696, as a test liquid when checking pipettes. This is where the Sartorius Arium® Advance EDI becomes an essential ally for metrology laboratories.

The Arium® Advance EDI maximizes laboratory efficiency with its easy-to-use color touchscreen that displays the quality and temperature of the water produced in real time. No matter your water source, the **Arium® Advance EDI** fits perfectly thanks to its innovative bag technology, ensuring type 2 water at all times.

Figure 4: *Arium® Advance EDI — Water Production Adapted to Your Needs*

Sartorius offers a complete solution for pipette calibration and supports laboratories that aspire to outsource or internalize the verification and control of their POVAs.

Visit our webpage **ISO 8655 | Sartorius**

Frequently Asked Questions: **Piston-Operated Volumetric Apparatus | Sartorius**

Discover Sartorius Lab Essentials

Picus® 2 Electronic Pipettes
Picus® 2 supports compliance-focused labs by connecting seamlessly to your mobile device via the Sartorius Pipetting mobile app. This enables guided, standardized workflows for sample preparation and ensures consistent pipette settings across users—reducing the risk of manual errors. The app also supports software updates, helping you maintain traceability and meet regulatory requirements with ease.

Find out More

SpeedCal Mobile
SpeedCal Mobile delivers ISO17025 and ISO8655-compliant calibration for up to 12 channels in just 8 minutes. Its portable, upgradeable design ensures fast, accurate pipette calibration wherever it's needed—streamlining compliance, reducing downtime, and integrating easily with existing software systems.

Find out More

Cubis® II Ultra-High Resolution balances
Cubis® II Ultra-High Resolution balances deliver exceptional accuracy and compliance support, eliminating environmental errors like drafts and vibrations. The built-in Cleaning QApp ensures traceable, guided cleaning, while upgradeable hardware and software provide long-term adaptability for regulated lab environments.

Find out More

Arium® laboratory water purification
Arium® laboratory water purification systems deliver reliable pure and ultrapure water tailored to your application needs. Fully customizable and easy to integrate, they streamline daily lab workflows while supporting consistent, cost-effective operation over the long term.

Find out More

Learn More: For more Sartorius Lab Essentials visit our website today!

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ISO-8655-Compendium-ebook-en-Sartorius Status: 08 | 2025