



BSI Standards Publication

Piston-operated volumetric apparatus

Part 10: User guidance, and requirements for competence, training, and POVA suitability

National foreword

This British Standard is the UK implementation of ISO 8655-10:2024.

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Piston-operated volumetric apparatus —

Part 10: User guidance, and requirements for competence, training, and POVA suitability

Appareils volumétriques à piston —

*Partie 10: Recommandations d'utilisation et exigences relatives
aux compétences et à la formation des utilisateurs, ainsi qu'à
l'adéquation des AVAP*

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO document should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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This document was prepared by Technical Committee ISO/TC 48, *Laboratory equipment*.

A list of all parts in the ISO 8655 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

This document addresses the needs of piston-operated volumetric apparatus (POVA) users and quality and laboratory managers, and serves as a basis for:

- user guidance, training, and qualification;
- establishing POVA performance and test requirements to ensure fitness for their intended use;
- selecting pipetting equipment.

The tests specified in the ISO 8655 series are intended to be carried out by trained personnel.

Piston-operated volumetric apparatus —

Part 10:

User guidance, and requirements for competence, training, and POVA suitability

1 Scope

This document provides user guidance regarding the selection of piston-operated volumetric apparatus (POVA) (including exchangeable parts) and best practices for their use.

This document also specifies requirements for user training and competence. Further, this document introduces performance tolerances and testing of POVA to ensure fitness for their intended use.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 8655-1, *Piston-operated volumetric apparatus — Part 1: Terminology, general requirements and user recommendations*

ISO/IEC Guide 2, *Standardization and related activities — General vocabulary*

ISO/IEC Guide 99, *International vocabulary of metrology — Basic and general concepts and associated terms (VIM)*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 8655-1, ISO/IEC Guide 2, and ISO/IEC Guide 99 apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <https://www.electropedia.org/>

4 Requirements and best practices

4.1 Selection of POVA

All POVA shall be selected based on their suitability for the intended use. To achieve the best volumetric performance, it is recommended to select a POVA with a nominal volume close to the volume to be delivered. The following factors should be considered when selecting apparatus:

- smallest and largest liquid volume to be delivered;
- liquid properties;

- its application;
- the resulting impact of delivering inaccurate volumes;
- performance requirements (maximum permissible errors and/or process tolerances);
- type and size of POVA equipment;
- single-channel or multi-channel POVA;
- delivery of constant volumes during repeated steps;
- frequency of use.

NOTE Refer to [Table A.1](#) for the selection of pipettes.

4.2 Selection of exchangeable parts

Exchangeable parts, such as pipette tips, shall be designed to match the design of the POVA. Changes in material, size of tip orifice, taper (angle), dead air volume, and retained liquid impact the performance of the pipetting system.

The overall system performance (POVA and exchangeable parts) shall be suitable for its intended purpose.

NOTE Refer to [A.2](#) for the selection of pipette tips.

Tips made of plastic for air-displacement pipettes are designed for single use. They shall not be cleaned for reuse as their metrological characteristics will no longer be reliable.

Single use of a pipette tip means mounting the tip to the pipette only once and then discarding it after use. While the tip is mounted to the pipette, it may be used to handle several replicate aspiration and delivery cycles, as long as a tight seal between the tip and pipette's tip cone is maintained, and no risk for cross-contamination exists.

4.3 Best practices

4.3.1 General

Reference shall be made to the user's manual for the POVA.

The performance of many laboratory instruments, including POVA, is subject to the user's technique (operator effect). When using pipettes, the user's pipetting technique is usually the largest contribution to volumetric error.^[1] Guidance for the use of air-displacement pipettes is given in [4.3.3](#), and for the use of positive displacement pipettes in [4.3.5](#). Guidance for the use of burettes, dilutors, dispensers, and syringes is described in [4.3.6](#), [4.3.7](#), [4.3.8](#), and [4.3.9](#) respectively.

When handling non-aqueous liquids such as viscous, volatile, biological, surfactant-added, or corrosive liquids, it is generally recommended to use positive displacement devices. When using air-displacement pipettes for these liquids, reverse pipetting technique should be applied.

NOTE ISO 8655-2:2022, Annex A, identifies and quantifies possible sources of error for air-displacement pipettes. The report of EURAMET project no. 1295^[2] also quantifies common errors when using air-displacement pipettes.

4.3.2 Setting of the volume (variable volume POVA)

Setting the volume of the POVA to the desired volume is critical for the trueness of the delivered volumes. Pipettes with screw-type plunger mechanisms should be turned at least one third of a revolution (where possible) above the desired volume and then turned down to the desired volume. Dialling down ensures that the micro bolt gears align in the same configuration every time a volume is set.

Adjustable-volume POVA should be returned to the nominal volume setting for storage.