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**Piston-operated volumetric apparatus —
Part 7:
Non-gravimetric methods for the
assessment of equipment performance**

Appareils volumétriques à piston —

*Partie 7: Méthodes non gravimétriques pour l'estimation de la
performance d'équipement*



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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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 8655-7 was prepared by Technical Committee ISO/TC 48, *Laboratory glassware and related apparatus*, Subcommittee SC 6, *Laboratory and volumetric ware*.

ISO 8655 consists of the following parts, under the general title *Piston-operated volumetric apparatus*:

- *Part 1: Terminology, general requirements and user recommendations*
- *Part 2: Piston pipettes*
- *Part 3: Piston burettes*
- *Part 4: Dilutors*
- *Part 5: Dispensers*
- *Part 6: Gravimetric methods for the determination of measurement error*
- *Part 7: Non-gravimetric methods for the assessment of equipment performance*

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Introduction

The ISO 8655 series was developed in order to specify the differing types of piston-operated volumetric apparatus and to provide a reference method and alternative test methods for verifying their characteristics covering the volume range typically from:

- the smallest hand-held pipetting devices, e.g. 1 μl , up to
- the largest laboratory bench-standing volume dispensing instruments, e.g. 100 ml.

ISO 8655-1 provides general requirements and terminology. The detailed volumetric ranges for each type of apparatus specified in the ISO 8655 series are indicated in the appropriate tables of maximum permissible error, i.e. for piston pipettes (ISO 8655-2), for piston burettes (ISO 8655-3), for dilutors (ISO 8655-4) and for dispensers (ISO 8655-5).

ISO 8655-6 is the reference method for type testing and conformity testing. It is gravimetric and contains precise instructions designed to limit variation in procedure and thereby the potential for sources of error – a necessity for type and conformity testing.

The photometric and titrimetric methods described in this part of ISO 8655, are deliberately given as outline methods (see examples in the informative annexes), so that individual laboratories having their own equipment available, and working to different uncertainty requirements, may adapt either these methods, or the gravimetric method, accordingly. If the laboratories operate under ISO 9000 series regimes, or have accreditation to ISO 17025, the individually-adapted methods are usually validated to give results equivalent to those given by the gravimetric method specified in ISO 8655-6.

This part of ISO 8655 is applicable to the following types of testing:

- of piston-operated volumetric apparatus for purposes other than type testing or the conformity testing which is required prior to declarations or certification of conformity;
- in user locations, where there may be no suitable balance or facilities to perform the reference method given in ISO 8655-6, but which may have at their disposal a suitable photometer or automatic titrator.

As users have expressed the wish to have alternative tests available, the following observations are given to help them select the most appropriate test methods for their purposes.

- a) **Gravimetric method:** Uncertainty values can increase at volumes significantly below 1 μl , due to increasing balance uncertainty, especially in low humidity areas (where there is increased risk of evaporation) and due to the effects of static electricity. These effects are compensated for through the careful design of the test method specified in ISO 8655-6, which applies to the volume ranges specified in ISO 8655-2 to ISO 8655-5.
- b) **Photometric method:** This may be the method of choice for laboratories having a UV/VIS photometer of suitable wavelength and bandwidth. Uncertainty with this method tends to become lower as test volumes decrease and can be further reduced if the volumes used in dilution steps for the preparation of comparative standards use larger capacity Class A glassware (e.g. 100 ml of chromophore solution diluted to 1 000 ml can lead to lower uncertainty than 10 ml diluted to 100 ml).
- c) **Titrimetric method:** This may be the method of choice of a laboratory already having a titrator with the properties specified in 6.2 and C.4.1. in Annex C. The method is most suited to the testing of piston-operated volumetric apparatus working in the volume range above 500 μl . Again, uncertainty can be reduced if larger capacity Class A volumetric apparatus and larger weights of solid reagents are used to prepare standard solutions.

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If any of these methods is adapted, the expanded uncertainty of measurement needs to be calculated to enable comparison with the reference method. In any case, users will determine that the uncertainty of the chosen method is suitable for their intended purpose.

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