INTERNATIONAL STANDARD

ISO 8655-3

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Piston-operated volumetric apparatus —

Part 3: Piston burettes

Appareils volumétriques à piston —

Partie 3: Burettes à piston

Reference number
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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 3.

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 part of ISO 8655 may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

International Standard ISO 8655-3 was prepared by Technical Committee ISO/TC 48, *Laboratory glassware and related apparatus*, Subcommittee SC 1, *Volumetric instruments*.

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*

The following part is under preparation:

Part 7: Non-gravimetric methods for the determination of measurement error

Introduction

ISO 8655 addresses the needs of:

— suppliers, as a basis for quality control including, where appropriate, the issuance of supplier's declarations;

— test houses and other bodies, as a basis for independent certification;

— users of the equipment, to enable routine checking of accuracy.

The tests specified should be carried out by trained personnel.

Piston-operated volumetric apparatus —

Part 3: Piston burettes

1 Scope

This part of ISO 8655 specifies

— metrological requirements,

— maximum permissible errors,

— requirements for marking and

— information to be provided for users,

for piston burettes. It is applicable to piston burettes with nominal volumes up to 100 ml, designed to deliver their volume (Ex).

NOTE General requirements and definitions of terms for piston-operated volumetric apparatus are given in ISO 8655-1. Conformity testing (type evaluation) of piston-operated volumetric apparatus is given in ISO 8655-6. Alternative test methods such as photometric and titrimetric methods will be the subject of a future Part 7 to ISO 8655. For all other tests (e.g. quality assurance by the supplier, analytical and measuring equipment quality assurance by the user) see ISO 8655-6 or alternative test methods. For safety requirements of electrically powered piston burettes, see IEC 61010-1.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of ISO 8655. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this part of ISO 8655 are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

ISO 3696, *Water for analytical laboratory use — Specification and test methods*

ISO 8655-1:2002, *Piston-operated volumetric apparatus — Part 1: Terminology, general requirements and user recommendations*

ISO 8655-6:2002, *Piston-operated volumetric apparatus — Part 6: Gravimetric methods for the determination of measurement error*

3 Terms and definitions

For the purposes of this part of ISO 8655, the terms and definitions given in ISO 8655-1 apply.

4 Principle of operation

Piston burettes are used for the accurate delivery of liquids. In contrast with piston pipettes, dispensers and dilutors, which are designed to dispense accurately preselected volumes, piston burettes are required to dispense volumes of

liquids until external criteria such as pH or conductivity are met, at which point it is necessary to know the accurate volume dispensed.

The piston can be operated manually, electrically, pneumatically or hydraulically. The volume delivered can be indicated mechanically or by electronic means. The drive, the piston and the cylinder can be one unit, or modular to permit the use of different pistons and cylinders (change-over units) with the same drive.

Prior to delivery, the piston system is charged by aspiration of liquid from a reservoir. After air-bubble-free filling of the system, movement of the piston in one direction dispenses the liquid whose volume is to be measured; movement in the other direction recharges the system from the reservoir (see Figure 1).

Piston burettes may or may not be equipped with valves or may have several piston/cylinder systems which dispense continuously.

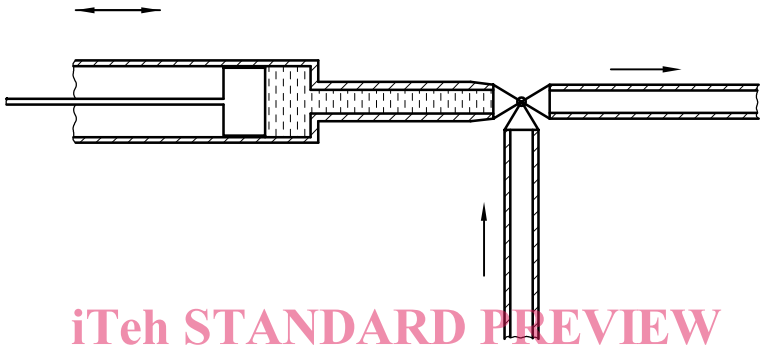

Figure 1 — Schematic drawing of a piston burette

5 Adjustment

5.1 A piston burette shall be adjusted by its manufacturer for the delivery of its volume and for the standard reference temperature of 20 °C, using grade 3 water as defined in ISO 3696.

5.2 If piston burettes are designed to have their factory-preset adjustment altered by the user, the design shall prevent unintentional readjustment. If the user readjusts the piston burette, it shall be clearly and unequivocally indicated on the outside of the piston burette that readjustment has been effected, for example by means of a mark, a broken seal, or a label affixed by the user.

5.3 Type testing of the adjustment shall satisfy the performance requirements specified in clause 6 when the burette is tested in accordance with ISO 8655-6.

6 Metrological performance requirements

The conformity test (type evaluation) specified in ISO 8655-6 evaluates the total system of the piston burette consisting of the drive and, if applicable, the change-over unit (see clause 4). The conformity test shall be carried out in accordance with ISO 8655-6 by

— the supplier prior to the issuance of a supplier's declaration of conformity or a calibration certificate, or

— a test house or other authorized body prior to the issuance of a certificate of conformity.

For conformity tests, the maximum permissible errors of Tables 1 and 2 shall apply.

If supplier declarations of conformity or calibration certificates are issued for change-over units, the supplier shall specify the combination of drive and change-over unit to which the declaration of conformity applies.

For the maximum permissible errors of piston burettes with intermediate nominal volumes between those given in Tables 1 and 2, the absolute values for the next greater nominal volume shall apply.

NOTE This means that the maximum permissible systematic error of a motor-driven piston burette (see Table 1) with a nominal volume of 15 ml is ± 40 µl and its maximum permissible random error is ± 14 µl.

Table 1 — Maximum permissible errors for motor-driven piston burettes

Nominal volume	Maximum permissible systematic error		Maximum permissible random error	
ml	± %	± µl [a]	± % [b]	± µl [c]
⩽ 1	0,6	6,0	0,1	1,0
2	0,5	10	0,1	2,0
5	0,3	15	0,1	5,0
10	0,2	20	0,07	7,0
20	0,2	40	0,07	14
25	0,2	50	0,07	17,5
50	0,2	100	0,05	25
100	0,2	200	0,03	30

[a] Expressed as the deviation of the mean of a tenfold measurement from the nominal volume or from the selected volume, (see ISO 8655-6:2002, 8.4).

[b] Expressed as the coefficient of variation of a tenfold measurement (see ISO 8655-6:2002, 8.5).

[c] Expressed as the repeatability standard deviation of a tenfold measurement (see ISO 8655-6:2002, 8.5).

Table 2 — Maximum permissible errors for hand-driven piston burettes

Nominal volume	Maximum permissible systematic error		Maximum permissible random error	
ml	± %	± µl [a]	± % [b]	± µl [c]
⩽ 1	0,6	6,0	0,1	1,0
2	0,5	10	0,1	2,0
5	0,3	15	0,1	5,0
10	0,3	30	0,1	10
20	0,2	40	0,1	20
25	0,2	50	0,1	25
50	0,2	100	0,1	50
100	0,2	200	0,1	100

[a] Expressed as the deviation of the mean of a tenfold measurement from the nominal volume or from the selected volume, (see ISO 8655-6:2002, 8.4).

[b] Expressed as the coefficient of variation of a tenfold measurement (see ISO 8655-6:2002, 8.5).

[c] Expressed as the repeatability standard deviation of a tenfold measurement (see ISO 8655-6:2002, 8.5).

7 User information

Each piston burette shall be accompanied by user information in accordance with ISO 8655-6:2002, clause 6. The instructions for use shall contain information regarding at least the following items:

a) adjustment (Ex) and reference temperature (20 °C);

b) nominal volume; where this is not practicable [see 8.1 a)], information shall be provided to enable the nominal volume to be correctly identified from markings on the appropriate unit or module;

c) smallest volume which can be delivered observing the maximum permissible errors according to clause 6;

d) correct handling;

e) information regarding the care, cleaning and maintenance of the piston burette;