INTERNATIONAL STANDARD

ISO 8655-5

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Piston-operated volumetric apparatus —

Part 5: Dispensers

Appareils volumétriques à piston —

Partie 5: Dispenseurs

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 8655-5 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 5:
Dispensers

1 Scope

This part of ISO 8655 specifies

— metrological requirements,

— maximum permissible errors,

— requirements for marking and

— information to be provided for users

for dispensers. It is applicable to dispensers with nominal volumes from 1 µl up to 200 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 dispensers, 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 8655-1 apply.

4 Principle of operation

Dispensers are used for the accurate repetitive delivery (dispensing) of preset liquid volumes. They are of two types:

— single-stroke dispensers providing a single delivery from each filling stroke;

— multiple-delivery dispensers or ratchet-based systems providing multiple deliveries from each filling stroke.

The piston can be operated manually, electrically, pneumatically or hydraulically. Drive mechanism, piston and cylinder can be a single unit or can be separable by simple hand actions, so that different pistons and cylinders (change-over units) can be used with the same drive mechanism.

During operation, the aspiration tube dips into the reservoir containing the fluid to be dispensed. After the system has been primed with fluid, assuring that it is free of any air, the piston aspirates fluid by moving in one direction and delivers the fluid to be measured by moving in the opposite direction.

Dispensers can be constructed with or without valves. The metrological characteristics of dispensers are dependent on, among other things, the material and workmanship of the aspiration and delivery tubing used. The supplier shall therefore deliver the necessary tubing with the dispenser or suggest or state the characteristics the tubing shall have in order to meet the metrological demands placed on the system.

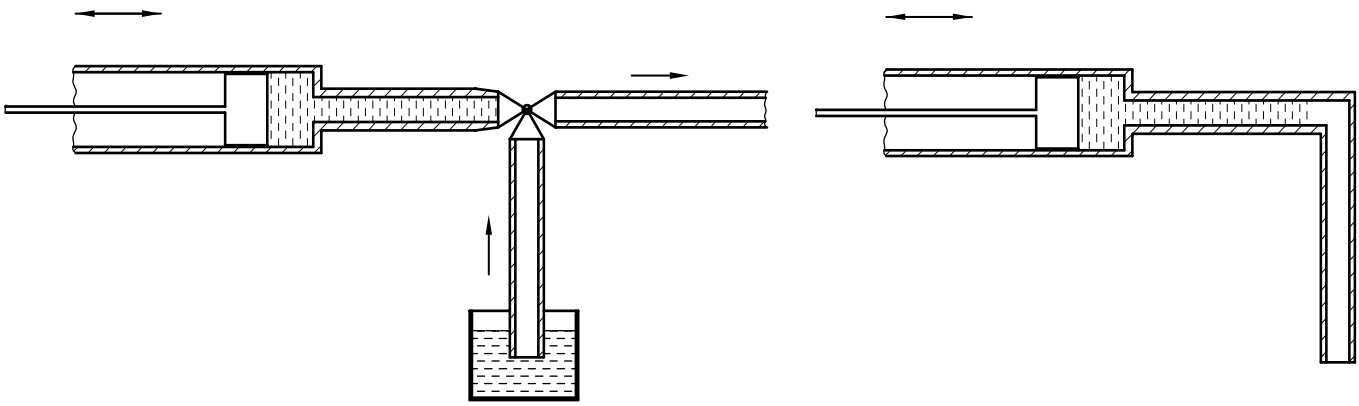

Figure 1 — Schematic drawing of dispensers with and without valves

5 Adjustment

5.1 A dispenser shall be adjusted by its supplier for the delivery (Ex) of its volume and for the standard reference temperature of 20 °C using grade 3 water as specified in ISO 3696.

5.2 If dispensers are designed to have their factory-preset adjustment altered by the user, the design shall prevent unintentional readjustment. If the user readjusts the dispenser, it shall be clearly and unequivocally indicated on the outside of the dispenser 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 dispenser 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 dispenser comprising the drive and, if applicable, the change-over unit (see clause 4) including aspiration and delivery tubing. The conformity test is carried out in accordance with ISO 8655-6 by

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

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

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

Table 1 — Maximum permissible errors for single-stroke dispensers

Nominal volume	Maximum permissible systematic error		Maximum permissible random error	
ml	± %	± µl [a]	± % [b]	± µl [c]
0,01	2,0	0,2	1,0	0,1
0,02	2,0	0,4	0,5	0,1
0,05	1,5	0,75	0,4	0,2
0,1	1,5	1,5	0,3	0,3
0,2	1,0	2,0	0,3	0,6
0,5	1,0	5,0	0,2	1,0
1	0,6	6,0	0,2	2,0
2	0,6	12,0	0,2	4,0
5	0,6	30,0	0,2	10,0
10	0,6	60,0	0,2	20,0
25	0,6	150,0	0,2	50,0
50	0,6	300,0	0,2	100
100	0,6	600,0	0,2	200
200	0,6	1 200	0,2	400

[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 multiple-delivery dispensers

Nominal volume	Maximum permissible systematic error		Maximum permissible random error	
ml	± %	± µl [a]	± % [b]	± µl [c]
0,001	5,0	0,05	5,0	0,05
0,002	5,0	0,1	5,0	0,1
0,003	2,5	0,075	3,5	0,11
0,01	2,0	0,2	2,5	0,25
0,02	1,5	0,3	2,0	0,4
0,05	1,0	0,5	1,5	0,75
0,1	1,0	1,0	1,0	1,0
0,2	1,0	2,0	1,0	2,0
0,5	1,0	5,0	0,6	3,0
1	1,0	10	0,4	4,0
2	0,8	16	0,4	8,0
5	0,6	30	0,3	15
10	0,5	50	0,3	30
25	0,5	125	0,3	75
50	0,5	250	0,25	125
100	0,5	500	0,25	250
200	0,5	1 000	0,25	500

[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).

If a supplier's declaration of conformity is 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 dispensers 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 errors of a single-stroke dispenser with a nominal volume of 75 ml are ± 600 µl, and its maximum permissible random errors are ± 200 µl.

In the conformity test, the maximum permissible errors for the nominal volumes in Tables 1 and 2 apply for every selectable volume throughout the useful volume range of the dispenser; i.e. the maximum permissible systematic errors of a single-stroke dispenser with a useful volume range of 1 ml to 10 ml are ± 60 µl and the maximum permissible random errors are ± 20 µl for every selected volume.

7 User information

Each dispenser shall be accompanied by user information in accordance with ISO 8655-1:2002, 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 clause 8, item 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 in accordance with clause 6;

d) correct handling;

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

f) advice about air-bubble-free filling.

The following information should preferably also be included:

g) systematic and random errors of measurement with reference to the procedures for their testing by the user in this part of ISO 8655 and in ISO 8655-6 (if included, the systematic and random errors of measurement shall be specified at the nominal volume, at 50 % of the nominal volume, and either at 10 % of the nominal volume or at the smallest dispensable volume observing the maximum permissible errors specified in this part of ISO 8655).

If applicable, information shall be provided regarding the purpose and procedure for user adjustment.

8 Marking

The following data shall be permanently marked on each dispenser:

a) nominal volume; where this is not practicable due to a modular design, the volumetric modules shall be marked either with their nominal volumes or information to enable the user to obtain the nominal volume from the user information [see clause 7, item b)];

b) supplier’s name and/or trademark;

c) supplier’s apparatus name;

d) unit of measurement;

e) serial number of the dispenser;

The following information should preferably also be permanently marked:

f) abbreviation “Ex” and the reference temperature “20 °C”;

g) reference to this part of ISO 8655, i.e. “ISO 8655-5”.

Where appropriate, a conformity mark may be affixed to the dispenser.

Bibliography

[1] IEC 61010-1, *Safety requirements for electrical equipment for measurement, control and laboratory use — Part 1: General requirements*

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Price based on 5 pages