

Standard Operation Procedure (SOP)

Burette

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1. Introduction

The standard DIN EN ISO 8655 describes both the design and the testing of the bottle-top burette continuous. The following testing instruction for the bottle-top burette VITLAB continuous describe how to apply the ISO standard in practice.

We recommend a testing of the burette every 3-12 months. This interval may be adjusted to individual requirements. For example, when working very intensely or when using aggressive media, the instrument should be tested more frequently.

These instructions may also be used as a basis for the supervision of testing devices according to DIN EN ISO 9001, DIN EN ISO 10012 and respectively to DIN EN ISO/IEC 17025. For the regular examinations required by DIN EN ISO 9001, DIN EN ISO 10012 und DIN EN ISO/IEC 17025, we additionally provide a calibration service (see page 11). Your instrument will be returned to you within a few days together with a test report. For more detailed information, please contact your labware supplier or VITLAB directly.



2. Preparation for testing and visual examination

2.1. Type and serial number

- | | | | |
|---|--|---|--|
|  | Determine instrument type and nominal capacity. | ⇒ | Record capacity in test report (1. Instrument) and mark with a cross |
|  | Identify serial number (embossed on valve block) | ⇒ | Record number in test report (1. Instrument) |
|  | Get customer's identification, if present. | ⇒ | Record identification in test report (1. Instrument) |

2.2. Items supplied

■ VITLAB continuous E/RS complete with:

- Discharge tube
- Telescopic intake tube
- Tool
- Operating manual

⇒ Please hold ready

2.3. Cleaning

- | | | | |
|---|--|---|-------------------------------|
|  | Rinse the instrument with a suitable cleaning agent followed by distilled water. | ⇒ | see operating manual page 11f |
|---|--|---|-------------------------------|

2.3. Visual examination for damage

- | | | |
|---|---|--|
| Examine the instrument on scratches and other rough mechanical damages. | ⇒ | record findings in test report (2. Damage) |
|---|---|--|

Possible faults and resulting actions

Fault	Action
Filling tube or discharge tube bent or damaged.	⇒ Safety risk! Replace part (see operating manual "Accessories").
Mechanically damaged connections.	⇒ Safety risk! Return instrument for repair!
Faulty operating or display elements	⇒ Return instrument for repair!

2.5. Temperature adjustment

-  Place the burette and accessories into the testing room for at least 1 hour in unpacked condition. ⇒ Allow instrument to adjust to room temperature.

2.6. Required equipment for testing

- Bottle filled with distilled or deionized water ⇒ Allow instrument to adjust to water and room temperature.
- Recipient (e.g. Griffin beaker or Erlenmeyer flask) filled with water ⇒ Bottom of the vessel should be covered with water
- Balance with required accuracy: ⇒ 0,001 g (> 5ml nominal volume)
0,0001 g (≤ 5ml nominal volume)
- Thermometer with accuracy: ⇒ 0,2°C

Referring the test procedure to the national standard

The use of calibrated testing devices (balance and thermometer) fulfils the requirements of DIN EN ISO 9001, DIN EN ISO 10012 and DIN EN ISO/IEC 17025 after return to the test national standard. The calibration of the balance e.g., can be done either by official certification of the balance or by calibrating the balance with officially certified weights (accuracy F1). The calibration of the thermometer can also be done by official certification or by a comparison with officially certified thermometers (under defined conditions).

3. Functional test

3.1. Prepare test setup

- Mount telescopic intake tube
- Mount burette onto the bottle (see operating manual page 8)
- Prime the burette (see operating manual S.9 + S.15)
- Examine the piston movement During priming. Follow the instructions in the operating manual (see page 15) if faults occur.

4. Gravimetric test

1. Determine temperature of the testing water.  Record the (ascertained) temperature into the test report (4.).
2. After the last titration press the "Start" and "▼" key together to set display to 0,00.
3. Place recipient on the balance and tare the balance afterwards.
4. Place recipient under the discharge tube and dispense the entire nominal volume (25 ml or 50 ml) without interruption (the dispensing tube should not touch the inner wall of the recipient).  Dispense with both hands to facilitate smooth dispensing without interruption.
 Wipe off any drop at the discharge tube before weighing.
5. Place recipient upon the balance. Write down the value.
6. Repeat points 3 to 5 another five times  Record the (ascertained) value into the test report (5.).
7. Then carry out five more weighings each by dispensing 50% resp.10% of the nominal volume.  Record the (ascertained) values into the test report (5.).

5. Evaluation of gravimetric test results

The values obtained by weighing during the gravimetric test are mass values of the dispensed volume only. In order to obtain the actual volume, an adjustment calculation has to be done. To facilitate your calculations and evaluations, we recommend the use of a calibration software.

The following calculations must be carried out:

1. Mean weight:

$$\bar{x} = \frac{x_1 + x_2 + x_3 + x_4 + x_5}{5}$$

2. Mean volume:

$$\bar{V} = \bar{x} \cdot z$$



For factor z see table 1
Record value into test report (6.a).

3. Standard deviation:

$$s = z \cdot \sqrt{\frac{(x_1 - \bar{x})^2 + (x_2 - \bar{x})^2 + (x_3 - \bar{x})^2 + (x_4 - \bar{x})^2 + (x_5 - \bar{x})^2}{4}}$$



For factor z see table 1
Record value into test report (6.b).

4. Accuracy:

$$A [\%] = \frac{\bar{V} - V_{\text{nominal value}}}{V_{\text{nominal value}}} \cdot 100$$



Record value into test report (6.c).

5. Coefficient of variation:

$$CV [\%] = \frac{100 \cdot s}{\bar{V}}$$



Record value into test report (6.d).

6. Comparison actual/nominal values:



Use the tolerance limits of table 2



Record value into test report (6.e, f).

7. Result:

If calculated values A [%] and CV [%] are smaller than or equal to the error margins, the instrument is in good working order. If the calculated values are larger than the error margins:

- ▶ Verify if all above instructions have been done carefully and completely.
- ▶ Observe the advice under "Troubleshooting" in the operating manual.
- ▶ Calibrate the burette according to the instructions in the operating manual.

If these actions are not successful, you may send the instrument to the manufacturer for calibration.

Table 1:

Abstract from DIN EN ISO 8655.
Table refers to 1013 hPa.

Temperature [°C]	Factor z [ml/g]
15	1,0020
15,5	1,0020
16	1,0021
16,5	1,0022
17	1,0023
17,5	1,0024
18	1,0025
18,5	1,0026
19	1,0027
19,5	1,0028
20	1,0029
20,5	1,0030
21	1,0031
21,5	1,0032
22	1,0033
22,5	1,0034
23	1,0035
23,5	1,0036
24	1,0038
24,5	1,0039
25	1,0040
25,5	1,0041
26	1,0043
26,5	1,0044
27	1,0045
27,5	1,0047
28	1,0048
28,5	1,0050
29	1,0051
29,5	1,0052
30	1,0054

Table 2:

Volume tolerances for VITLAB Burettes

The stated volume tolerances are final test values relating to the nominal capacity. These tolerances are valid for new instruments tested under optimized conditions (qualified operators and standardized ambience conditions).

Prior to calibration, the error limits have to be defined. The following information may give you helpful information:

- ☐ If required by the application and if the optimized conditions for measuring are present, the stated tolerances can also be expected from used volumetric instruments being in good working order.
- ☐ In analogy to the German regulations for official testing, it is also admissible to apply the limits which are typical for practice. These practice limits are twice the limits for official testing. In this case, the values found in table 2 have to be doubled.
- ☐ The user may also define his own individual tolerance limits for his particular application, and apply these tolerances for the calibration of his instrument.

The above procedures fulfil the requirements of DIN EN ISO 9001, DIN EN ISO 10012 und DIN EN ISO/IEC 17025.

Nominal volume ml	Accuracy*		Coefficient of variation*	
	Value 6e		Value 6f	
	≤ ± [%]		≤ [%]	
50 (nominal volume)	0,2	100	0,1	50
25 (50%)	0,4	100	0,2	50
5 (10%)	2	100	1	50
25,0 (nominal volume)	0,2	50	0,1	25
12,5 (50%)	0,4	50	0,2	25
2,5 (10%)	2	50	1	25

* Note: For checking of partial volumes the values for A [%] and CV [%] which are related to the nominal volume have to be converted.

Table 3:

Error margins (EM) according to DIN EN ISO 8655.

Nominal Volume ml	Error margins for systematic errors		Error margins for random errors	
	± % [A]	± µl	% [CV]	µL [s]
< 1	0,6	6	0,1	1
2	0,5	10	0,1	2
5	0,3	15	0,1	5
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

Test:
10 single measurements per test volume according to DIN EN ISO 8655.
For definition of A, CV and s see sample calculation in chapter 5.

Possible faults and resulting measures:

Fault	Possible causes	Actions
Volume too large	➡ Remaining drop at the discharge tube ➡ Dispensed too fast.	➡ Before weighing, wipe off any drop into the recipient and tare the balance afterwards. ➡ Repeat the test and dispense more slowly and steadily.
Volume too small	➡ Intake valve / dispensing tube leaking or damaged ➡ Air bubbles in the instrument	➡ Repeat the functional test; valves must be tightened or replaced; discharge tube or filling tube must be mounted properly. ➡ Instrument has to be primed
Other causes	➡ Instrument calibrated to different medium ➡ Jerky movement of hand wheels during titration ➡ Temperature adjustment between instrument, room and water temperature not completed	➡ Revert to original calibration. ➡ Turn the wheel evenly and without exerting any pressure. ➡ Repeat temperature adjustment.

Test Report for Volumetric Instruments

1. Instrument:

- ☐ Burette VITLAB continuous E/RS
- ☐ Dispenser VITLAB simplex
- ☐ Dispenser VITLAB genius
- ☐
- ☐
- ☐

Type:

- ☐ fix
- ☐ variable
- ☐ digital

Nominal capacity:.....

Serial number:

Customer's identification:.....

2. Damage:

- ☐ None
- ☐ Type of damage:.....
- ☐ Damage repaired

3. Functional defects:

- ☐ None
- ☐ Type of functional defect:
- ☐ Functional defect repaired

4. Water temperature:..... °C

Balance:.....

Thermometer:.....

5. Results of gravimetric test:

Weighing-No.	Nominal volume	50 %	10 %
X ₁			
X ₂			
X ₃			
X ₄			
X ₅			

6. Evaluation of gravimetric test:

Procedure	Nominal volume	50 %	10 %
a $\bar{V}$			
b s			
C A [%] found			
D CV [%] found			
E A [%] nominal			
F CV [%] nominal			
G Result			

The testing was carried out according to DIN EN ISO 8655.

Date:

Signature:

Declaration on the Absence of Health Hazards

To be sent together with the instruments or via Mail (if urgent by **Fax in advance**).

To
VITLAB GMBH
Linus-Pauling-Straße 1

63762 Grossostheim

Fax: (0 6026) 9 77 99 - 30

We intend to give our staff a maximum of protection from health hazards caused by contaminated instruments. We therefore ask for your understanding that we cannot carry out any calibration / repair unless this declaration is submitted completed and signed.

For consignment dd. **/ for Delivery Note no.**

The Undersigned hereby declares:

- ◆ That the instruments have been carefully cleaned and decontaminated before shipment.
- ◆ That the instruments pose no danger through bacteriological, chemical, radiological or viral contamination.
- ◆ To be authorised to make declarations on behalf of the Institution represented.
- ◆ That he / she is aware that shipment of contaminated instruments is a violation of law, and that he / she personally and the Institution represented may be held liable for any damages caused by contaminated instruments.
- ◆ For calibrating service only: minor repairs of a value up to € 25,- + VAT will be carried out and invoiced without further queries (cross out if not applicable).

Company / Laboratory (Stamp)

Tel./Fax/E-Mail:

.....
Name

.....
Position

.....
Date, Signature

- ◆ In case of return for repair, please provide us with the following supplementary information:
Detected defect:
.....

- ◆ Media which the instrument has been used with:
.....

6. Calibration Service and DKD calibration for Liquid Handling Instruments

On demand VITLAB offers a full calibration service including instrument adjustment and repair if necessary. Instruments are normally returned within three working days. Please feel free to contact your dealer or VITLAB directly in case of any queries.

Additional we also offer the possibility of a DKD calibration. The DKD calibration is available for new instruments directly from the factory as well as for those already in use regardless of their make. Furthermore we offer adjustment and for VITLAB liquid handling products repair.

DKD The DKD was founded in 1977 as a joint task of state and economy and constitutes the link between the measuring equipment in industrial and research laboratories, testing institutions and authorities and the national standards of the PTB (the German Institute of Physics and Metrology). It effectively supplements the existing verification system which serves above all the purposes of consumer protection.

The DKD-Calibration Certificate with the DKD-Calibration Symbol documents officially on a high level the traceability of measuring results to national and international standards and to international SI-units, as required by standards like DIN EN ISO 9001, DIN EN ISO 10012, DIN EN ISO/IEC 17025 and DIN EN 45000 for monitoring of measuring devices. The major difference between traditional manufacturer calibration services and PTB-accredited calibration laboratories is the accurate determination of uncertainty of each measurement, guaranteed by the accredited laboratory and supervised by the PTB.

DKD-Calibration Certificates are issued when calibrations of an accredited laboratory are requested, when high level calibrations are necessary, when national and international standards are demanded and when reference instruments have to be calibrated.

For ordering information on DKD Calibration Certificates for volumetric instruments please consult your dealer or VITLAB directly.

Volumetric instruments for which you can obtain DKD Calibration Certificates:

- ◆ **Bottletop burettes**, from 5 µl - 200 ml
- ◆ **Bottletop dispensers**, from 5 µl - 100 ml
- ◆ **Volumetric instruments of plastic**, class A, adjusted to contain (TC, In) from 1 ml to 2000 ml
- ◆ **Volumetric instruments of plastic**, class A, adjusted to deliver (TD, Ex) from 1 ml to 100 ml

