

Calibration of Hamilton syringes

Calibration procedure at Hamilton

The calibration of Hamilton syringes is done by means of a gravimetric measurement. At 80% of the nominal syringe volumes, 5 to 10 measurements are done, depending on the syringe type and volume. Measurements at other positions than 80% of the nominal volume are not necessary, because the inner diameter of the syringe barrel is constant. Therefore, the volume changes in a linear way when the plunger is moved.

Proceeding

1. Aspiration and dispensation of an exact volume of deionized water.
2. Determination of the mass of the dispensed water.
3. Calculation of the volume of the dispensed water with mass and density.
4. Documentation of the measurement values.
5. Statistical determination of accuracy (R).

Formula

$$\text{Accuracy R} = \frac{\text{average value} - \text{target value}}{\text{target value}} \cdot 100\%$$

Ambient conditions during measurement

Temperature range T	23.5 - 26.5°C
Relative humidity RH	>15%*

* The relative humidity RH of the environment is irrelevant within the syringe, because it is filled with liquid during calibration and there is no air inside it. This way, no liquid can evaporate inside the syringe.

Additionally, the sample vessel with the deionized water for calibration is placed in an evaporation protection (see figure 1). This ensures constant relative humidity where the liquid is aspirated.



Figure 1: Sample aspiration chamber

- ① Sample vessel with deionized water
- ② Evaporation protection

Distribution of calibrated syringes

Calibrated syringes receive an individual serial number and a calibration certificate (see figure 2).

The certificate contains the following items

- ▶ Part Number (P/N)
- ▶ Serial Number
- ▶ Syringe Model
- ▶ Work Order Number (WO)
- ▶ Calibration Method
- ▶ Customer P/N, if applicable
- ▶ Calibration Date
- ▶ Humidity in %
- ▶ Temperature in °C
- ▶ Nominal syringe volume
- ▶ Test volume

How to order a calibrated syringe

- ▶ Digital syringes are always calibrated.
- ▶ When ordering a new syringe, add the prefix „CAL“ in the beginning of the syringe part number, for example „CAL80300“. For new syringes, the price for the calibration is listed in the price list with P/N 202996
- ▶ If you are an authorized Hamilton distributor, you can send the syringe back to Hamilton for recalibration. This is covered by the Syringe Recalibration service P/N 202949. Please request a „Return Goods Authorization“ (RGA) before sending a syringe back.

Contact for returns: contact@hamilton.ch

Certificate of Calibration

Calibrated P/N:	Calibration Date:
Serial No:	Humidity: %
Syringe Model:	Temperature: °C
WO:	Nominal syringe volume:
Calibration Method: Gravimetric	Test volume:
Customer P/N:	

Calibration data:	
Repetition	Measurement
1	
2	
3	
4	
5	
Avg. Dispensed Volume	
Accuracy	%
Manuf. Spec.	1% of nominal volume

This calibration was performed pursuant to HAMILTON standard calibration process. This document can not be reproduced partially. Hamilton syringes are manufactured and specified to be accurate within 1.00% of nominal syringe volume. The Hamilton Quality System is EN ISO 9001:2008 certified.

Calibration reported by: _____
Calibration Technician Date

Figure 2: Hamilton calibration certificate



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