**Recalibration procedure for single- and multichannel pipettes DISCOVERY *Comfort* (D/DV) and DISCOVERY+/DISCOVERY LABMATE *Pro* (LMP), LABMATE *Soft* (LM) and LABMATE+/LABMATE (LM/L), OPTIPETTE (OP)**

HTL pipettes are calibrated by gravimetric method, using distilled water, at the temperature 20±1°C, according to EN ISO 8655 standard. If during pipette operation you find that the accuracy error (the difference between the real aspirated volume and the preset volume) exceeds the permissible value given in the Instruction Manual, the pipette recalibration procedure should be carried out. Before starting the recalibration it is necessary to check whether the following requirements have been fulfilled during error determination:

- the ambient temperature, and the temperature of the pipette, tips and water was identical
- the density of the liquid used is close to that of distilled water
- a balance with appropriate sensitivity has been used
- mg/µl conversion factor has been taken into account

| Temperature [°C] | Pressure [kPa] | | |
|---|---|---|---|
| | 95.0 | 101.3 | 105.0 |
| 20 | 1.0028 | 1.0029 | 1.0029 |
| 21 | 1.0030 | 1.0031 | 1.0031 |
| 22 | 1.0032 | 1.0033 | 1.0033 |
| 23 | 1.0034 | 1.0035 | 1.0036 |
| 24 | 1.0037 | 1.0038 | 1.0038 |
| 25 | 1.0039 | 1.0040 | 1.0040 |

**Recalibration conditions:**
- Ambient temperature and the temperature of the pipette, tips and liquid should be within the range 20-25°C and stabilized during weighing within ±0.5°C
- Measurements should be conducted using distilled water
- Balance sensitivity should be suitable for the volume to be controlled
- Calculate average aspirated volume [µl]: multiply your weighing result (an average) [mg] by the density coefficient of distilled water [µl/mg], which is related with temperature and pressure, as shown in the following table. Density coefficient values for distilled water are given in the Table 1.

**STEP 1A. Testing the single channel pipette**:
- DISCOVERY *Comfort* (D/DV) and DISCOVERY+ / DISCOVERY
- LABMATE *Pro* (LMP), LABMATE *Soft* (LM) and LABMATE+ / LABMATE (LM/L)
- OPTIPETTE (OP)

Set the "calibration volume" - suggested the minimal volume of the pipette, as shown in the table 2.

| Pipette volume range [µl] | Calibration volume [µl] | Volume range permitted [µl] | Volume change by turning the key ΔV [µl] | |
|---|---|---|---|---|
| | | | by full turn | by 1 division |
| 0.1 - 2 | 0.2 | 0.176 - 0.224 | 0.06 | 0.003 |
| 0.5 - 10 | 0.5 | 0.48 - 0.52 | 0.33 | 0.014 |
| 2 - 20 | 2 | 1.92 - 2.08 | 0.63 | 0.026 |
| 5 - 50 | 5 | 4.875 - 5.125 | 2.50 | 0.104 |
| 10 - 100 | 10 | 9.84 - 10.16 | 2.50 | 0.104 |
| 20 - 200 | 20 | 19.76 - 20.24 | 6.30 | 0.26 |
| 50 - 250 | 50 | 49.5 - 50.5 | 6.30 | 0.26 |
| 100 - 1000 | 100 | 98.4 - 101.6 | 25.00 | 1.04 |
| 1000 - 5000 | 1000 | 994 - 1006 | 125.00 | 5.20 |
| 1000 - 10000 | 1000 | 975 - 1025 | 250.00 | 10.40 |

Perform 5 aspirations, weigh each one and calculate the average value of the aspirations
Calculate average aspirated weight [mg]
Calculate your result into the volume [µl] - using the calculation table at the top of the page
Compare the result with the values from the table, column 3.

**STEP 1B. Testing the multichannel pipette:**
- DISCOVERY *Comfort* (DV8/12) and DISCOVERY+ / DISCOVERY
- LABMATE Pro (LMP8/12)
- OPTIPETTE (OP8/12)

Set the "calibration volume" - suggested the minimal volume of the pipette, as shown in the table 3

| Pipette volume range [µl] | Calibration volume [µl] | Volume range permitted [µl] | Volume change by turning the key ΔV [µl] | |
|---|---|---|---|---|
| | | | by full turn | by 1 division |
| 1 - 10 (0.5-10) | 1 | 0.92 - 1.08 | 0.33 | 0.014 |
| 5 - 50 | 5 | 4.8 - 5.2 | 1.67 | 0.07 |
| 20 - 200 | 20 | 19.6 - 20.4 | 6.30 | 0.26 |
| 50 - 300 | 50 | 49.2 - 50.8 | 10.00 | 0.42 |

Perform three aspiration series (each series should include the aspirations from all channels), weigh each time
Calculate average aspirated weight [mg]
Calculate your result into the volume [µl] - using the calculation table at the top of the page
Compare the result with the values from the table, column 3

**STEP 2. Determination of the value of correction (continuation of step 1A+B)**
If the average aspirated volume exceeds the permissible value, the calibration setting must be changed. The adjustment is performed with the calibration key. It's circumference has 24 divisions, which represent the volume adequate to pipette model selected - these values can be found in the table, column 4 and 5.

This is a very precise method of applying the volume correction. The amount of volume (accuracy error) ΔV must be calculated into number of divisions, which will be used then to turn the calibration screw (in the pipette).

**STEP 3. Pipette recalibration:**
Remove the pushbutton and insert the calibration key onto the arbor
*Note 1: The pipetting pushbutton in pipette series Discovery and Labmate consists of 2 parts: the pushbutton (color cap) and knob. After removal of the pushbutton, the two parts will separate. In pipettes Optipette and Labmate+ the pushbutton is made of single piece.*
Lock the volume setting knob (Discovery Comfort) or hold it (other pipettes) in order to protect it against rotation
Turn the key with the number of divisions determined
*Note 2: Turning the key clockwise decreases the volume, counter-clockwise increases the volume*
Remove the key and fix the pushbutton back (in case of 2-piece version, fix the parts separately - knob first, then the cap).

**STEP 4. Checking the pipette**
Pipette requires a weighing check after re-calibration - the average volume must be within the permissible range given in the table.
If the volume still exceeds the values stated, the recalibration procedure should be repeated.
*Note: The recalibration can be performed within one full turn of the key to the right or left.*