



Pipette Calibration	Identifier: CSP-0012 Revision: 0 Page: 1 of 5
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ISU Chemistry Department	Stockroom Procedure	Effective Date: 05/01/2020
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1. INTRODUCTION

This procedure provides guidance in calibrating Nichipet variable channel micro/macro pipettes in the ISU Chemistry Stockroom. Pipettes should be calibrated at least annually if not semiannually.

2. PRECAUTIONS AND LIMITATIONS

2.1. None

3. APPARATUS AND MATERIALS

- 3.1. Pipettes
- 3.2. Pipette tips
- 3.3. Erlenmeyer flask, 50-100mL
- 3.4. Beaker, 250mL
- 3.5. Calculator
- 3.6. Thermometer
- 3.7. Analytical balance
- 3.8. Pipette manual

4. REAGENTS

- 4.1. Deionized water

5. INSTRUCTIONS

5.1. Testing

- 5.1.1. Fill a 250mL beaker with deionized water.
- 5.1.2. Set the pipette to its highest setting.
- 5.1.3. Fill a 50mL Erlenmeyer flask to ½ full with deionized water.
 - 5.1.3.1. Place the Erlenmeyer flask on an analytical balance.
 - 5.1.3.2. Zero the balance.
 - 5.1.3.3. Remove the Erlenmeyer flask from the balance using a gloved hand.
- 5.1.4. Immerse the pipette tip at least 1 cm into the beaker of water
 - 5.1.4.1. Slowly draw water into the tip
 - 5.1.4.2. Wait 3 seconds before removing the tip from the water.



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Note: For the first time with a new tip, depress the plunger to the second stop over the beaker of water and repeat to test the cleanliness of the tip and to allow visual inspection that no water remains in the tip.

5.1.5. Touch the tip to the side of the Erlenmeyer flask on the balance at a slight angle.

5.1.5.1. Depress the pipette plunger to the second stop.

5.1.5.2. Return the Erlenmeyer flask to the balance using a gloved hand.

5.1.5.3. Wait for the balance to stabilize.

5.1.6. Record the mass.

5.1.7. Repeat steps 5.1.4 through 5.1.6 for a total of 10 trials.

5.1.8. Set the pipette to a midrange setting.

5.1.8.1. Repeat steps 5.1.3.2 through 5.1.6 for a total of 10 trials.

5.1.9. Set the pipette to its lowest setting.

5.1.9.1. Repeat steps 5.1.3.2 through 5.1.6 for a total of 10 trials.

5.1.10. Calculate the accuracy and precision of the trials using equations 6.1, 6.2, and 6.3.

5.1.11. If accuracy is within 3% no adjustment is required

5.1.12. If accuracy is not within 3% proceed to step 5.2 to adjust as necessary.

5.2. Adjusting

5.2.1. Locate the adjustment screws on the pipette as shown in figure 6.1

5.2.2. With the pipette eject button depressed

5.2.2.1. Rotate the plunger until a socket screw appears.

5.2.2.2. Use a 1.5mm hex key to loosen the screw one turn.

5.2.2.3. Hold the hex key into the socket

5.2.2.3.1. Rotate the plunger clockwise to increase volume.

5.2.2.3.2. Rotate the plunger counterclockwise to decrease volume.

Note: Rotation guidelines for indicating relationship between amount of rotation and volume change are located in the pipette manual section 6.

5.2.2.4. Tighten the hex screw.

5.2.2.5. Retest the pipette per steps 5.1.3.2 through 5.1.6.



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6. Calculations

6.1. Precision

$$\text{Precision} = (H-L)/A * 100\%$$

Where:

H= Highest recorded value for 10 trials

L= Lowest recorded value for 10 trials

A= Average value for 10 trials

6.2. True

$$\text{True} = W * Z$$

Where:

W= Average weight of water weighed for 10 trials

Z= Water density conversion factor per table 6.2

6.3. Accuracy

$$\text{Accuracy} = (T-A)/T * 100\%$$

Where:

T= True value from 6.2

A= Average value for 10 trials

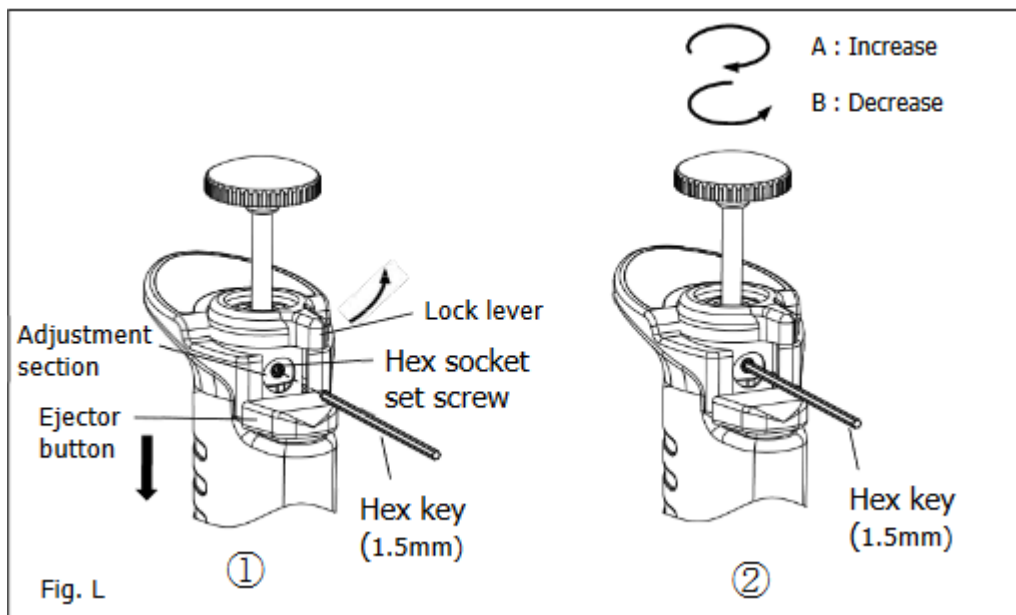


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7. Tables and Figures

7.1. Hex screw location





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7.2. Z-values

	Z-Values					
°C	800 mbar	853 mbar	907 mbar	960 mbar	1013 mbar	1067 mbar
15.0 °C	1.0018	1.0018	1.0019	1.0019	1.002	1.002
15.5 °C	1.0018	1.0019	1.0019	1.002	1.002	1.0021
16.0 °C	1.0019	1.002	1.002	1.0021	1.0021	1.0022
16.5 °C	1.002	1.002	1.0021	1.0022	1.0022	1.0023
17.0 °C	1.0021	1.0021	1.0022	1.0022	1.0023	1.0023
17.5 °C	1.0022	1.0022	1.0023	1.0023	1.0024	1.0024
18.0 °C	1.0022	1.0023	1.0024	1.0024	1.0025	1.0025
18.5 °C	1.0023	1.0024	1.0025	1.0025	1.0026	1.0026
19.0 °C	1.0024	1.0025	1.0025	1.0026	1.0027	1.0027
19.5 °C	1.0025	1.0026	1.0026	1.0027	1.0028	1.0028
20.0 °C	1.0026	1.0027	1.0027	1.0028	1.0029	1.0029
20.5 °C	1.0027	1.0028	1.0028	1.0029	1.003	1.003
21.0 °C	1.0028	1.0029	1.003	1.003	1.0031	1.0031
21.5 °C	1.003	1.003	1.0031	1.0031	1.0032	1.0032
22.0 °C	1.0031	1.0031	1.0032	1.0032	1.0033	1.0033
22.5 °C	1.0032	1.0032	1.0033	1.0033	1.0034	1.0035
23.0 °C	1.0033	1.0033	1.0034	1.0035	1.0035	1.0036
23.5 °C	1.0034	1.0035	1.0035	1.0036	1.0036	1.0037
24.0 °C	1.0035	1.0036	1.0036	1.0037	1.0038	1.0038
24.5 °C	1.0037	1.0037	1.0038	1.0038	1.0039	1.0039
25.0 °C	1.0038	1.0038	1.0039	1.0039	1.004	1.0041
25.5 °C	1.0039	1.004	1.004	1.0041	1.0041	1.0042
26.0 °C	1.004	1.0041	1.0042	1.0042	1.0043	1.0043
26.5 °C	1.0042	1.0042	1.0043	1.0043	1.0044	1.0045
27.0 °C	1.0043	1.0044	1.0044	1.0045	1.0045	1.0046
27.5 °C	1.0044	1.0045	1.0046	1.0046	1.0047	1.0047
28.0 °C	1.0046	1.0046	1.0047	1.0048	1.0048	1.0049
28.5 °C	1.0047	1.0048	1.0048	1.0049	1.005	1.005
29.0 °C	1.0049	1.0049	1.005	1.005	1.0051	1.0052
29.5	1.005	1.0051	1.0051	1.0052	1.0052	1.0053
30.0	1.0052	1.0052	1.0053	1.0053	1.0054	1.0055