Product Description

The Pipettes are continuously adjustable, general purpose micropipettes for sampling and dispensing accurate liquid volume.

It operates on Air displacement principle (i.e. an air interface is present between the piston and liquid) and uses detachable, disposable tips. Desired volume is determined by the following formula:

$V = pr^2h$

Where V= Desired Volume
r= radius of piston
h= vertical distance traveled by the plunger

Six Models Cover a range from 0.5 µl to 300 µl.

Digital display

The adjustable volume micropipettes are fitted with easy to read digital display.

Raw Material

The Pipettes are made of mechanically durable and autoclavable materials.

Pipette Operation

Setting the delivery volume

1.Set the delivery volume using the push button on the top of the pipette.
To increase the delivery volume, turn the push button counterclockwise. To decrease the delivery volume, turn it clockwise.
2. Make sure that the desired

delivery volume clicks into place.
3. Do not set volume outside the pipette's specified volume range. Using excessive force to turn the push button outside the range may jam the mechanism and eventually damage the pipette.

Tip ejection

Each pipette is fitted with a tip ejector. This helps to eliminate the risk of contamination.
To eject the tip, point the pipette at suitable waste receptacle and press the ejector with your thumb.

Pipetting Techniques

Push and release the push button slowly at all times particularly when working with high viscosity liquids. Never allow the push button to snap back. Make sure that the tip is firmly attached to the tip cone. Check for foreign particles in the tip.
Before you begin your actual pipetting work, fill and empty the tip 2-3 times with the solution that you will be pipetting. Hold the pipette in an upright position while aspirating liquid. The grippy should rest on your index finger. Make sure that the tips, pipette and solution are at the same temperature.

Forward Technique

Fill a clean reagent reservoir with the liquid to be dispensed .
1.Depress the push button to the first stop.
2. Dip the tip under the surface of the liquid in the reservoir to a depth of about 3-4 mm. and slowly release the push button. Withdraw the tip from the liquid touching it against the edge of the reservoir to remove excess liquid
3. Deliver the liquid by gently depressing the push button to the first stop. After a delay of about one second, continue to depress the push button all the way to the second stop. This action will empty the tip
4. Release the push button to the ready position. If necessary, change the tip and continue pipetting.

Reverse Technique

The reverse technique is suitable for dispensing liquids that have a high viscosity or a tendency to foam easily. The technique is also recommended for dispensing very small volumes.
Fill a clean reagent reservoir with the liquid to be dispensed.

1. Depress the push button all the way to the second stop.
2. Dip the tip under the surface of the liquid in the reservoir to a depth of about

1 cm. and slowly release the push button. This action will fill the tip. Withdraw the tip from the liquid touching it against the edge of the reservoir to remove excess liquid.
3. Deliver the present volume by gently depressing the push button to the first stop. Hold the push button at the first stop. Some liquid will remain in the tip and this should not be included in the delivery.

4. The remaining liquid should either be discarded with the tip or pipetted back in to the container.

RepetitiveTechnique

The repetitive technique offers a rapid and simple procedure for repeated delivery of the same volume. Fill a clean reagent reservoir with the liquid to be dispensed.

1.Depress the push button all the way to the second stop.
2. Dip the tip under the surface of the liquid in the reservoir to a depth of about 1 cm. and slowly release the push button. This action will fill the tip. Withdraw the tip from the liquid touching against the edge of the reservoir to remove excess liquid.
3. Deliver the preset volume by gently depressing the push button to the first stop. Hold the push button at the

first stop. Some liquid will remain in the tip and this should not be included in the delivery.
4. Continue pipetting by repe ating step 3 and 4.

Pipetting of heterogeneous samples

for example,deproteinization in blood glucose determination
Use steps 1 and 2 of the forward technique to fill the tip with blood. Wipe the tip carefully with a dry clean tissue.
1. Immerse the tip into the reagent and depress the push button to the first stop, making sure the tip is well below the surface
2. Release the push button slowly to the ready position. This will fill the tip. Keep the tip in the solution.
3. Depress the push button to the first stop and release slowly. Keep repeating this procedure until the interior wall of the tip is clear.
4. Finally, depress the push button all the way to completely empty the tip.

Calibration and adjustment

All pipettes are factory calibrated and adjusted to give the volume as specified with distilled or deionized water using the forward pipetting technique. It should be noted that the use of other pipetting techniques may affect the calibration results. The pipettes are constructed to permit re-adjustment for other pipetting techniques or

liquids of different temperature and viscosity.

Device requirements and test conditions

An analytical balance must be used. The scale graduation value of the balance should be chosen according to the selected test volume of the pipette.

Volume Range Readablity

Graduation under 10 µl	0.001 mg
10 100 µl	0.01 mg
above 100 µl	0.1 mg

Test liquid Water, distilled or deionized “grade 3” water conforming ISO 3696. Tests are done in a draft-free room at a constant (±0.5°C) temperature of water, pipette and air between 15°C to 30°C. The relative humidity must be above 50%. Especially with volumes under 50 µl the air humidity should be as high as possible to reduce the effect of evaporation loss. Special accessories, such as the evaporation trap, are recommended.

Procedure to check calibration

The pipette is checked with the maximum volume (nominal volume) and with the minimum volume. A new tip is first pre-wetted 3-5 times and a series of ten pipetting is done with both volumes A pipette is always adjusted for delivery (Ex) of

the selected volume. Use of forward pipetting technique is recommended. The maximum permissible errors are designed for forward method.

Procedure

1. Do 10 pipetting with the minimum volume.
2. Do 10 pipetting with the maximum volume.
3.Calculate the inaccuracy (A) and imprecision (cv) of both series.
4.Compare the results to the limits in the Table 1
If the calculated results within the selected limits, the adjustment of pipette is correct

volume range	vol. µl	Acc. ±%	CV. ±%
0.5-10µl	1	16	10
	5	3.2	2
	10	1.6	1
02-20µl	2	8	4
	10	1.6	0.8
	20	0.8	0.4
05-50µl	5	8	4
	25	1.6	0.8
	50	0.8	0.4
10-100µl	10	8	3
	50	1.6	0.6
	100	0.8	0.3
20-200µl	20	8	3
	100	1.6	0.6
	200	0.8	0.3
40-300µl	40	8	3
	150	1.6	0.6
	300	0.8	0.3

Adjustment

Adjustment is done with the service tool.
1. Place the service tool into the openings of the calibration nut at the top of the handle
2.Turn the service tool clockwise to increase, or counterclockwise to decrease the volume
3.After adjustment check the calibration according to the instructions above.

Formulas for calculating results
Conversion of mass to volume

V= (w+e) x Z
v= volume (µl)
w= weight (mg)
e= evaporation loss (mg)
z= conversion factor for µl/mg

Conversion

Evaporation loss can be significant with low volumes. To determine mass loss, dispense water to the weighing vessel, note the reading and start a stopwatch. See how much the reading decreases during 30 seconds (i.e. 6mg = 0.2 mg/s) Compare this to the pipetting time from taring to reading. Typically pipetting time might be 10 seconds and the mass loss is 2 mg (10s x 0.2mg/s) in this example. If an evaporation trap or lid on the vessel is used the correction of evaporation is usually unnecessary.
The factor Z is for converting the weight of the water to volume at test temperature and pressure A typical value is 1.0032 µl/mg at 22°C and 95 kPa.

See the conversion table below.

Temperature °C	Air pressure kPa						
	80	85	90	95	100		
15.0	1.0017	1.0018	1.0019	1.0019	1.0020	1.0020	1.0020
15.5	1.0018	1.0019	1.0019	1.0020	1.0020	1.0020	1.0021
16.0	1.0019	1.0020	1.0020	1.0021	1.0021	1.0021	1.0022
16.5	1.0020	1.0020	1.0021	1.0021	1.0022	1.0022	1.0022
17.0	1.0021	1.0022	1.0022	1.0022	1.0023	1.0023	1.0023
17.5	1.0022	1.0022	1.0023	1.0023	1.0024	1.0024	1.0024
18.0	1.0022	1.0023	1.0023	1.0024	1.0025	1.0025	1.0025
18.5	1.0023	1.0024	1.0024	1.0025	1.0025	1.0026	1.0026
19.0	1.0024	1.0025	1.0025	1.0026	1.0026	1.0027	1.0027
19.5	1.0025	1.0026	1.0026	1.0027	1.0027	1.0028	1.0028
20.0	1.0026	1.0027	1.0027	1.0028	1.0028	1.0029	1.0029
20.5	1.0027	1.0028	1.0028	1.0029	1.0029	1.0030	1.0030
21.0	1.0028	1.0029	1.0029	1.0030	1.0031	1.0031	1.0031
21.5	1.0030	1.0031	1.0031	1.0031	1.0032	1.0032	1.0032
22.0	1.0031	1.0032	1.0032	1.0032	1.0033	1.0033	1.0033
22.5	1.0032	1.0033	1.0033	1.0033	1.0034	1.0034	1.0034
23.0	1.0033	1.0034	1.0034	1.0034	1.0035	1.0035	1.0036
23.5	1.0034	1.0035	1.0035	1.0036	1.0036	1.0036	1.0037
24.0	1.0035	1.0036	1.0036	1.0037	1.0037	1.0038	1.0038
24.5	1.0037	1.0038	1.0038	1.0038	1.0039	1.0039	1.0039
25.0	1.0038	1.0039	1.0039	1.0039	1.0040	1.0040	1.0040
25.5	1.0039	1.0040	1.0040	1.0041	1.0041	1.0041	1.0042
26.0	1.0040	1.0041	1.0041	1.0042	1.0042	1.0043	1.0043
26.5	1.0042	1.0043	1.0043	1.0043	1.0044	1.0044	1.0044
27.0	1.0043	4.0044	4.0044	4.0045	4.0045	4.0045	4.0046
27.5	4.0045	1.0046	1.0046	1.0046	1.0047	1.0047	1.0047
28.0	1.0046	1.0047	1.0047	1.0047	1.0048	1.0048	1.0048
28.5	1.0048	1.0048	1.0048	1.0049	1.0049	1.0050	1.0050
29.0	1.0049	1.0050	1.0050	1.0050	1.0051	1.0051	1.0051

Inaccuracy (systematic error)
Inaccuracy is the difference between the dispensed volume and the selected volume of a pipette.
$A = V - V_0$
A = inaccuracy
V = mean volume
V_0 = nominal volume
Inaccuracy can be expressed as a relative value
$A\% = 100\% \times A / V_0$
Imprecision (random error)
Imprecision refers to the repeatability of the pipetting. It is expressed as standard deviation (s) or coefficient of variation (cv)

$$S = \sqrt{\frac{\sum_{i-1}^{n} (V_i - \bar{V})^2}{n-1}}$$

s=standards deviation
v=mean volume
n=number of mesurements

Standard deviation can be expressed as a relative value (CV) $CV = 100\% \times S / V_1$

Sterlization

The entire pipette can be sterlized by autoclaving it at 121°c (252°F)(minimum) 20 minutes) no special preprations are needed for autoclacing. steam sterlization bags can be used if needed,
must be cooled to room temperature for atleast two hours. before pipetting, make sure that the pipette is dry.
We recommended that you check the calibration after every sterlization cycle to achive the best possible accuracy.

Trouble Shooting

The Table below lists possible problem and thier solutions.

Defect	Possible reason	Solution
Leakage	Tip incorrectly attached Foreign particles between tip and tip cone Foreign particles between the piston, the o-ring and the cylinder Insufficient amount of grease on cylinder and o-ring, O-ring Damaged	Attach firmly Clean tip cones attach new tip Clean and grease O-ring and Cylinder Grease accordingly Change the O-ring
Inaccurate dispensing	Incorrect operation Tip incorrectly attached calibration altered caused misuse,for examples	Follow instruction carefully attach firmly Recalibration according to instructions
Inaccurate dispensing with certain liquids	Unsuitable calibration High viscosity liquids may require recalibration	Recalibration with the liquids in quistion

Package

The pipette is shipped in a specially designed package containing the following items.
1.The Pipette
2.Service Tool
3.Tip Sample
4.Instruction manual
5.Calibration certificate
6.Shelf hanger
7.Reagent Trough

CAUTION

The is designed to allow easy in-lab service. If you would prefer to have us or your local representative service your pipette, please make sure that the pipette has been decontaminated before you sent it to us.

Please note that the postal authorities in your country may prohibit or restrict the shipment of contaminated material by mail.

Operation Manual
MICROPIPETTE