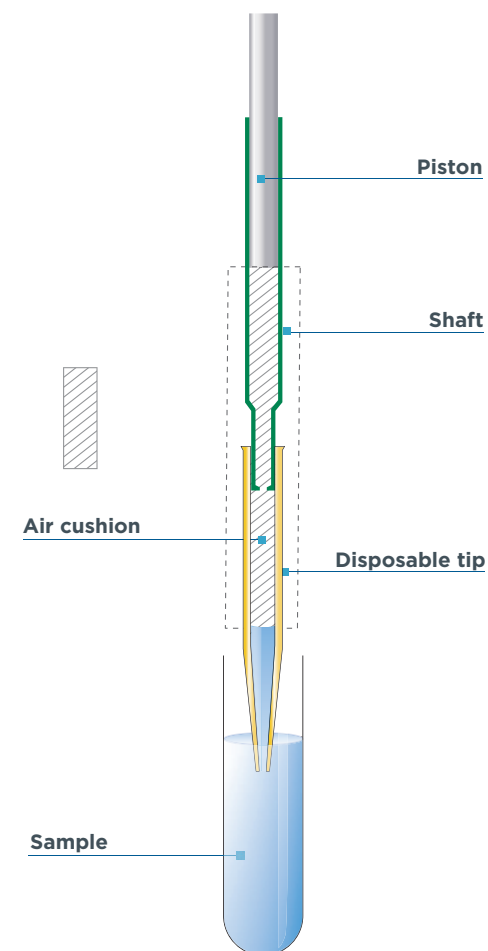




Working Principle of Pipettes

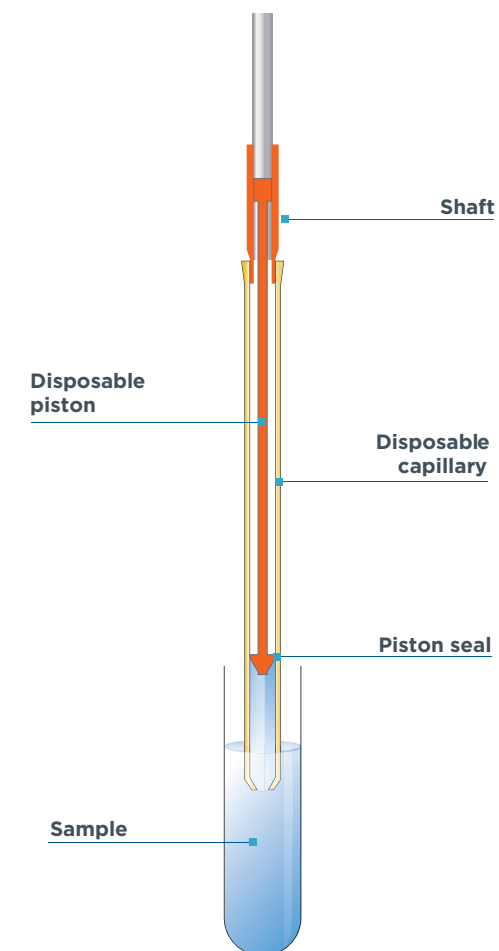
Air-Displacement Pipettes

- Recommended for aqueous samples and for general laboratory work.
- Always have a cushion of air (dead volume) between the pipette piston and the liquid sample.
- The piston is integrated into the lower part of the pipette.



Positive-Displacement Pipettes

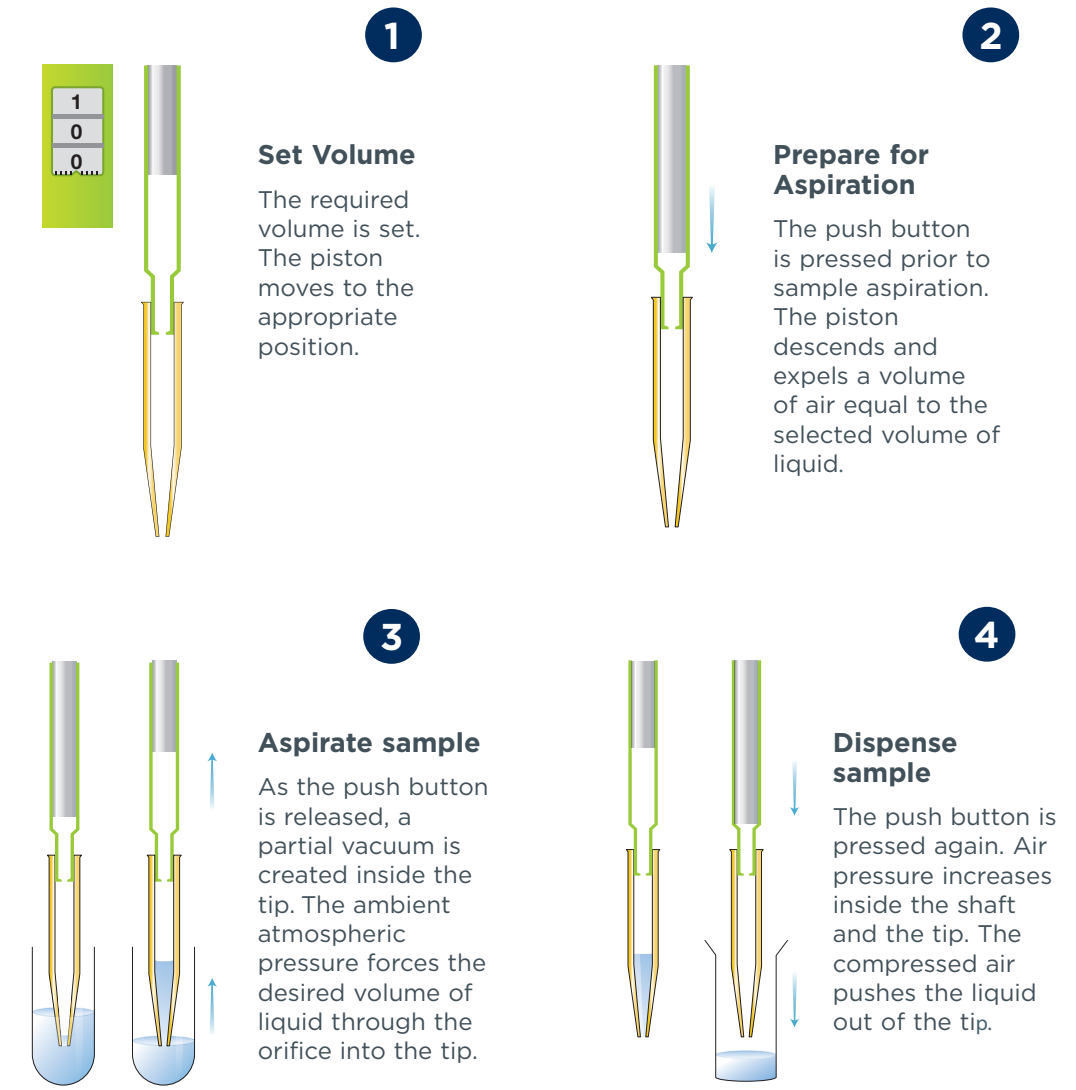
- Recommended for problem samples (viscous, dense, volatile, radioactive, corrosive, contaminating, hot and cold).
- Direct contact of the piston with the sample (no air cushion).
- The disposable piston is part of the tip (not integrated into the pipette).



Working Principle of Air-Displacement Pipettes

When the push button is pressed on an air-displacement pipette, the piston inside the instrument moves down to let air out. **Air is displaced by the piston.** The volume of air displaced is equivalent to the volume of liquid aspirated.

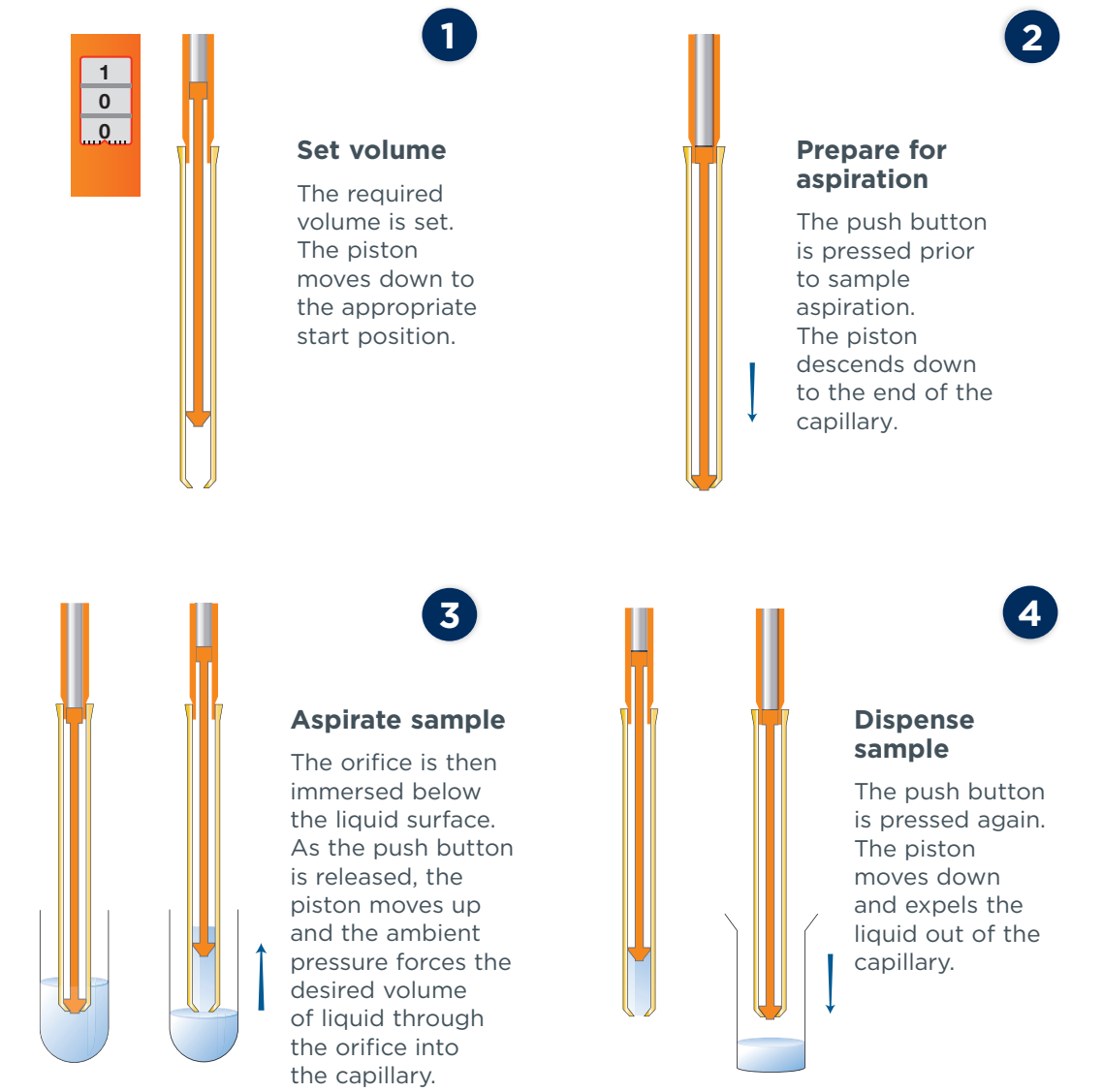
The schematic drawings show how the piston determines the volume of air displaced and subsequently the volume of sample aspirated.



Working Principle of Positive-Displacement Pipettes

Positive displacement pipettes, such as MICROMAN, work like a syringe. **There is no air cushion between the disposable piston and the sample.** With no elastic air cushion to expand or contract, the aspiration force remains constant, unaffected by the physical properties of the sample.

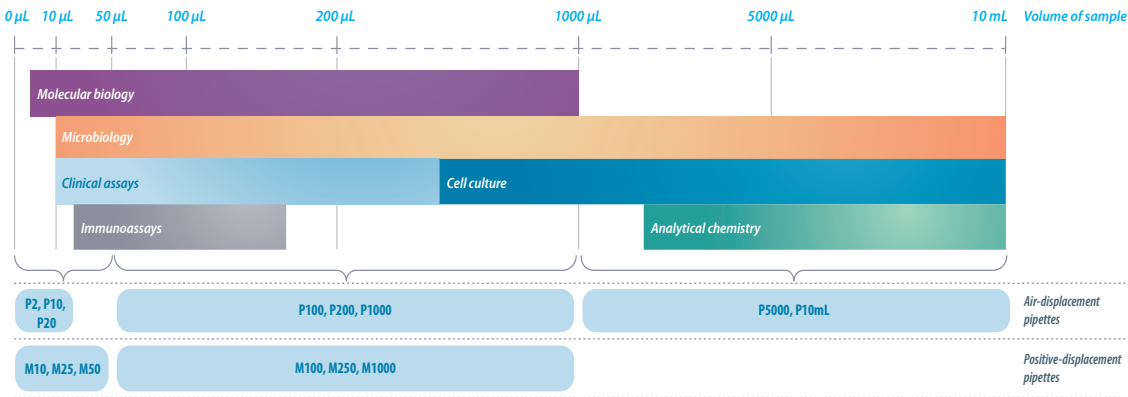
This allows the positive-displacement operator to pipette very viscous or high density samples, such as glycerol and blood.



The Right Choice for Your Application

The type of analysis to perform, the physical properties of the liquid, and the volume to be handled will determine which pipette to use. It is recommended to select a pipette with a nominal (maximum) volume as close as possible to the desired volume to transfer.

Recommendations for Pipetting Different Volumes



Consider the Physical Properties of Your Sample

For volumes higher than 10 mL, it is suggested to work with a pipette filler like the **MACROMAN** with plastic or serological pipettes. Regardless of the volume you require, the nature of the sample directly impacts precision and accuracy. Air-displacement pipettes will be better for aqueous liquids whereas positive-displacement pipettes should be used for problem liquids.

SAMPLE TYPES	EXAMPLES	RECOMMENDED PIPETTES
Aqueous	Water, sucrose, Tris, buffers with a pH of 7	Air-displacement.
Biological	DNA, RNA, proteins	Air-displacement with filter tips
Viscous	Glycerol, surfactants, oil	
Volatile	Ethanol, hexane, formaldehyde	
Hazardous	Radioactive isotopes, blood, infectious bacteria or viruses	
Corrosive	Acids such as hydrochloric acid or sulfuric acid, bases such as ammonium hydroxide, salts such as sodium chloride	Positive-displacement

Accuracy and Precision While Pipetting Problem Liquids

Positive-displacement pipettes like MICROMAN are the right solution for complete and rapid pipetting of viscous and dense liquids such as oil, syrup, cosmetic cream, liquefied food, paint, glycerol, or buffers.

Positive-displacement pipettes are the unique solution to avoid leakage when pipetting high vapor pressure liquids such as acetone, chloroform, alcohol, or other solvents.

% Systematic error

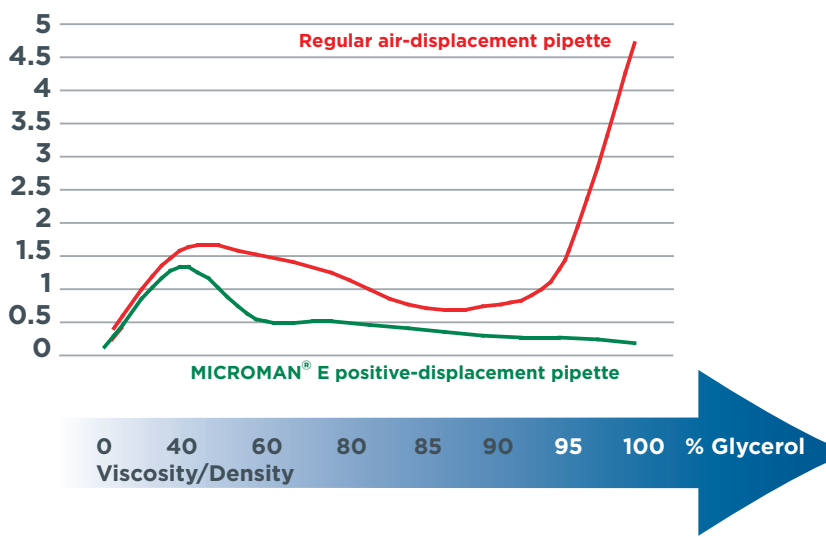


Figure 3
MICROMAN® E, Positive-displacement pipette, Systematic error

% Random error

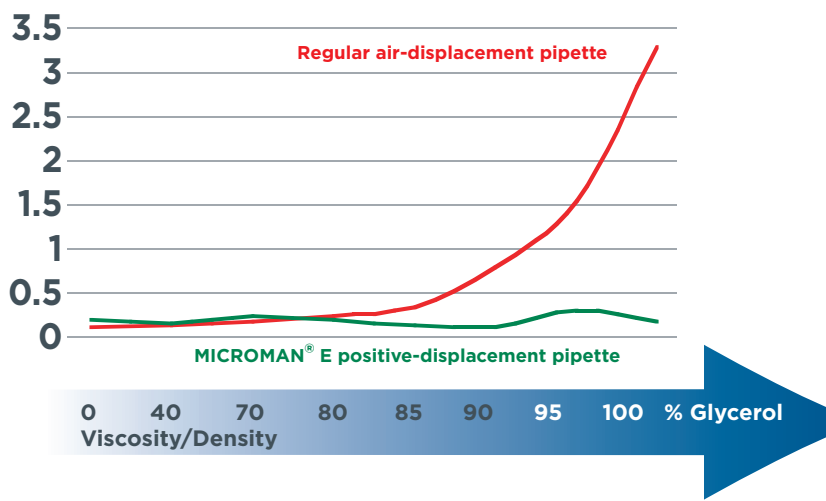


Figure 4
MICROMAN® E, Positive-displacement pipette, Random error



Specific Pipettes for Specific Vessels



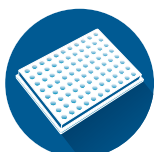
Test tubes and centrifuge tubes are used with **all single channel pipettes** for sample preparations, such as qPCR templates.



Long test tubes, also called assays tubes, are used with **positive-displacement pipettes and pipette fillers** with plastic or glass pipettes: these devices are specially designed to reach the bottom of these tubes.



Reagent reservoirs are ideal for dispensing reagents, especially with **multichannel pipettes**.



96-well and 384-well microplates, as well as **8-well strips**, are commonly used with **air-displacement multichannel pipettes** for applications like ELISA, but also with single channel pipettes.

Multichannel pipettes allow transferring 8 to 12 different samples in one shot and filling a microplate 8 to 12 times faster than a single channel pipette.



High Throughput and Repetitive Pipetting

When pipetting in a high throughput setting it is important to have reliable results and to be as efficient as possible. Reliable results means not only having reproducible results with one technician's samples, but also among all technicians in the lab. There are a variety of ways to improve reliability and efficiency, some of which include using motorized pipettes and/or repetitive pipettes.

User-to-User Variability

Motorized pipettes can help reduce variability between users. There are many factors that can affect your pipetting results, which include setting the volume, pipetting technique, and the rate of aspirating and dispensing. With a motorized pipette you can set the exact volume on the digital display — the motor uses the same pipetting force every time and maintains the same rate of speed when aspirating and dispensing a sample.

Aliquoting

To deliver several aliquots without refilling, you may either choose the repetitive mode of **a motorized air-displacement pipette**, or **use a positive-displacement repeater**.

Repeaters enable up to 125 aliquots, whereas the number of aliquots with air-displacement motorized pipettes will depend on the pipette volume.

For operations fewer than ten aliquots, using a motorized air-displacement pipette might be the better option.

