

Practical Tips for Choosing the Bottle-top Dispenser for Your Lab



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Application
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Points to consider
when choosing a
bottle-top dispenser.

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Introduction

Bottle-top dispensers are common tools used in various laboratories. They are used to safely dispense a set amount of liquid, usually between 1 and 60 ml, from a bottle or a container to a receiving container.

There are differences to consider, between makes and models, when choosing the most suitable bottle-top dispenser. This application note presents criteria to consider when evaluating various models. After all, it is a long term investment.

Chemical Resistance and Durability

One of the first things to consider, is what chemicals the bottle-top dispenser is going to be used for. The chemical resistance of the device should tolerate the liquids used in the laboratory. Also note that chemicals may behave differently in different air pressures and temperatures.

All bottle-top dispensers operate on the positive displacement principle, meaning that the piston and certain other internal parts are in direct contact with the liquid. However, to form a seal that enables liquids to be aspirated and dispensed without leakage, two methods of sealing are commonly used:

- sealing with O-ring or a with coating
- liquid seal between piston and cylinder which are made with extremely tight tolerances

Seals, O-rings, coated pistons and cylinders are subject to wear. As they wear down, they affect the bottle-top dispenser's functioning and resistance to chemicals. Worn, or damaged, O-rings and coated parts will also cause the bottle-top dispenser to leak and it would need to be repaired. In addition, if the piston and cylinder (and possibly the seal) have different thermal properties, they may expand at different rates when using hot or cold liquids, causing the unit to either leak or jam.

For trouble-free performance, choose a bottle-top dispenser which uses components that are highly resistant to a wide range of chemicals and have stable thermal characteristics, for example a pure ceramic piston and a glass cylinder, and a liquid seal mechanism.

Consult the manufacturer or reseller for chemical compatibility.

Accuracy and Precision

Bottle-top dispensers, as with any other measurement instruments, are subject to systematic and random error.

Selecting a bottle-top dispenser which has the nominal volume (maximum volume) as close as possible to the amounts to be dispensed gives the best possible results, as the same error limits (in millilitres) usually apply to whole volume range. For example if the systematic error limit is 0,06 ml for a 2-10 ml bottle-top dispenser, it's 0,06 ml for all selectable volumes (according to ISO standard; may vary between manufacturers).

The consistency of piston strokes is what makes the dispensing repeatable. Manufacturers have implemented volume setting in many ways. When accuracy and repeatability is important, the volume setting that locks into place, is the best option. Also the volume indicator on the bottle-top dispenser should be easy to read, and leave no room for interpretation.



Media Recirculation System

When priming (the filling of bottle-top dispenser's internal tubes and cylinder with liquid, at the start, when attaching it to a bottle) a dispenser, some liquid goes to waste, causing loss of media. Pumping the last air bubbles out of the system can take quite many piston strokes and each stroke causes more media loss. A media recirculation system drastically reduces wastage, as most of the liquid used for priming is returned to the bottle. Only the amount used to prime the dispensing tube, which is minimal, goes to waste.

The media recirculation system can also be used to return any undispensed liquid from the dispenser back to the bottle. For example when the liquid is already aspirated into the bottle-top dispenser but is no longer needed for dispensing.



Comfort of Use

Dispensing is like any other repetitive laboratory work, so it is important to have ergonomic controls and light piston movement. Using a dispenser requires the movement of the hand, arm, and the upper body. The more the force needed to operate the dispenser, the greater the stress on muscles and joints. Prolonged use in awkward positions might even lead to a Repetitive Strain Injury (RSI).

The following points are important to consider:

- 1. Ergonomic handle and controls.** Controls that fit the hand and have smooth edges causes less strain and discomfort for the user.
- 2. Light operating forces.** A bottle-top dispenser that operates smoothly ensures comfort during use. Consistent movement of the piston gives the best results. Incidentally, this factor differs greatly between makes and models.
- 3. Easy to attach aspiration tubes.** The aspiration tube is the part that is immersed in the liquid, inside the bottle. In some models aspiration tubes are held in place just by friction, so attaching them and getting them to stay attached poses a challenge. Select a model where the aspiration tube is easy to attach, with threaded connector, for example.

Maintenance and Cleaning

As internal parts of the dispenser are in direct contact with liquid, the unit requires regular cleaning and care. The need to clean increases with liquids that may clog the valves, e.g. liquids that have a tendency to crystallize. Autoclave the bottle-top dispenser when using a liquid that needs to be handled in sterile conditions. Some bottle-top dispensers are fully autoclavable and others have only some autoclavable parts. Always refer to the original user manual before performing maintenance work.

Ease of maintenance and availability of spares reduces the time needed for cleaning. Regular maintenance extends the lifetime of the unit.

Easy steps to select a bottle-top dispenser:

- Check chemical resistance
- Check ease of maintenance and availability of spares
- Test the ease and repeatability of the volume setting
- Check the manufacturer's specifications
- Evaluate the need for media recirculation system
- Test the convenience and lightness of dispensing

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