

Syringe Care and Use Guide

Complete Guide to Maintaining and Using Hamilton
Microliter,[™] Gastight[®] and Specialty Syringes



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Introduction

Hamilton syringes are the finest quality precision fluid measuring devices available. Top quality materials and skilled workmanship ensure Hamilton syringes consistently deliver the highest possible performance for reliable analyses. With proper care and handling, Hamilton syringes provide unsurpassed performance year after year.

This guide covers daily syringe use along with safety information and troubleshooting tips. Start by reviewing the syringe schematics and the Daily Use Protocol. Detailed explanations follow the Daily Use Protocol.

For manual dispenses, our syringes are accurate to within $\pm 1\%$ of nominal volume with a precision of 1% at 80% of the total volume. The fluid path of a Hamilton syringe is designed to be chemically inert with stainless steel, borosilicate glass and PTFE used for most syringes. N.I.S.T traceable certification is available as an additional service for the majority of the syringes in our product line.

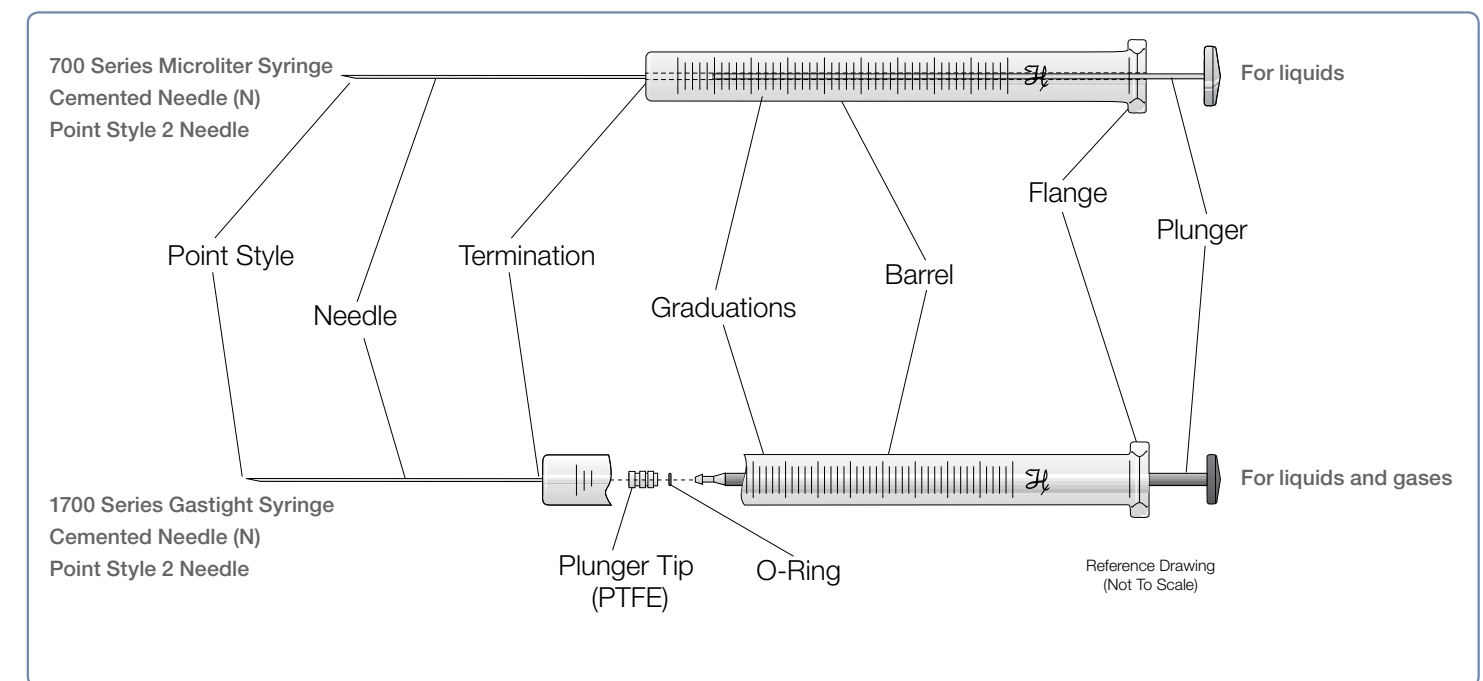
All Hamilton products are unconditionally guaranteed to be free of defects in materials and workmanship for one year (12 months) from date of purchase. Hamilton Company is ISO 9001 certified. Consult our published specifications to determine the material compatibility of Hamilton products with your application.

Hamilton continuously researches new materials and methods to improve the form, fit and function of our syringes. You can be confident that when you buy from Hamilton you are receiving a top-quality instrument. For the latest information on new products, detailed product and part descriptions, published specifications, and our Syringe Selection Guide, please visit www.hamiltoncompany.com.

Syringes and needles manufactured by Hamilton Company are intended for scientific research and laboratory use only and are not intended for human *in vivo* use.



Examples of Hamilton Microliter and Gastight Precision Syringes



Microliter syringes have a stainless steel plunger which is individually hand-fitted to its matching glass barrel. The hand-fitting process is finely controlled to create a liquid-tight seal between the barrel and the plunger. Plungers for Microliter syringes cannot be interchanged or replaced if damaged.

Gastight syringes have a precision machined PTFE plunger tip which provides a tight seal for both liquids and gases. Replacement plunger assemblies are available for most Gastight syringes.

Syringe Use

Below is a quick review of how to use your Hamilton syringe to achieve the highest level of accuracy and precision. Each step of the protocol includes references to the sections in this guide that cover specific care and use issues in greater detail.

Daily Use Protocol

1. Inspection

Check the syringe for damage such as cracks and dried residue from previous experiments. (See Syringe Inspection, page 8 and Dry Microliter Syringe, page 10)

2. Grip

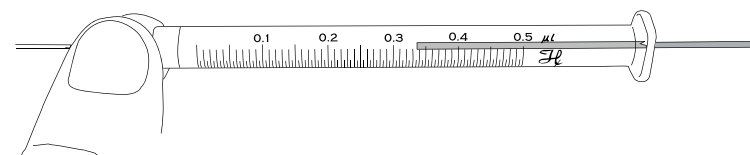
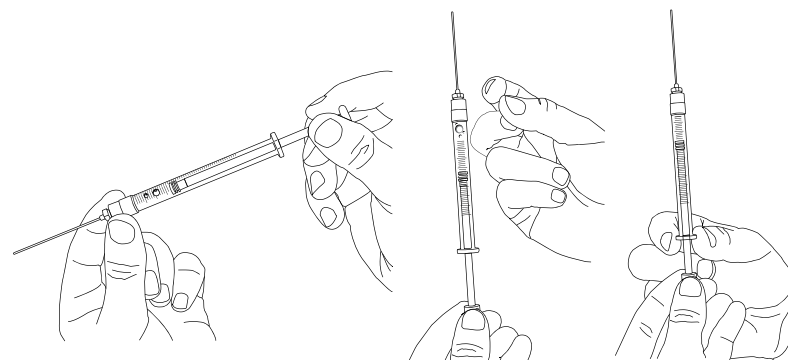
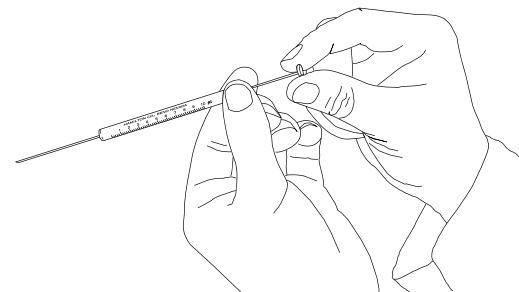
Grasp the syringe by the flange to reduce inaccuracy. (See Room Temperature and Body Heat, page 8)

3. Priming

Fully prime the syringe by aspirating and dispensing sample to remove trapped air which can cause inaccuracies. (See Trapped Air, page 8)

4. Overfilling

Fill the syringe with a small amount of excess sample. (See Dispensing, page 8)



5. Required Volume

Slowly dispense the excess sample until only the required volume of sample remains in the syringe. (See Dispensing, page 8)

6. Final Dispense

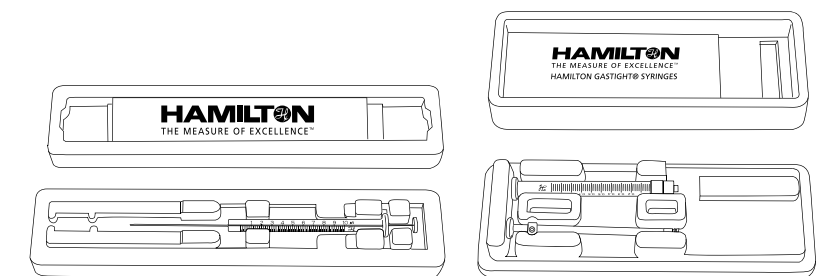
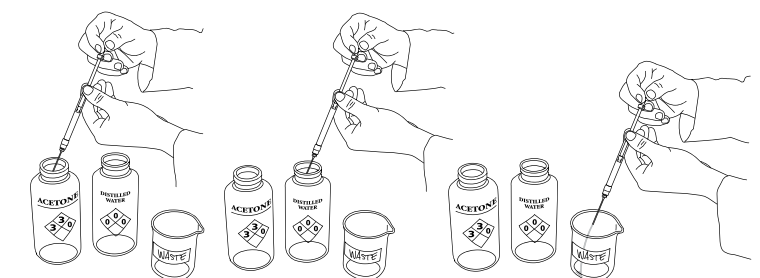
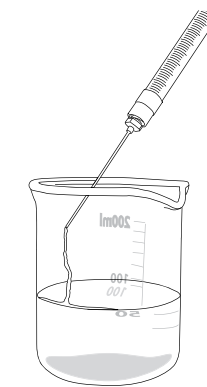
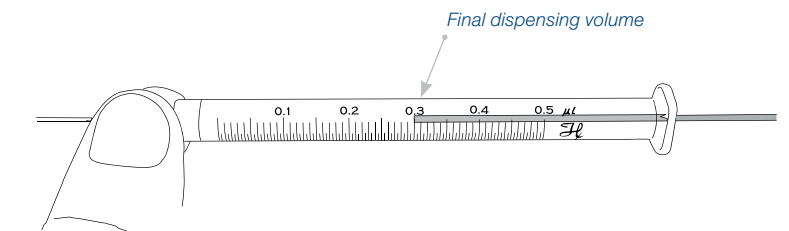
Dispense the final sample volume into an appropriate receptacle. (See Dispensing, page 8)

7. Cleaning

Rinse the syringe with an appropriate cleaning solvent followed by water and then finish with acetone. (See Chemical Compatibility and Cleaning, page 9)

8. Storage

Store the syringe in its original packaging to protect against breakage. (See Storage, page 8)



The Basics

Syringe Inspection

Before each use, thoroughly inspect the syringe barrel for cracks and the needle point for burrs. Replace a cracked barrel with a new syringe. Do not use a needle with burrs. Burrs may tear GC septa leading to sample loss or poor peak shape. See more about burrs on page 11.

Room Temperature

Syringes should be used at a constant temperature. Accuracy and reproducibility specifications are determined at 25 °C.

Body Heat

Avoid variations in liquid measure due to body heat by grasping the syringe flange and plunger as you draw and dispense fluids.

Trapped Air

Eliminate trapped air, which is compressible and affects syringe accuracy and precision, by completely priming the syringe with sample. Immerse the needle point 2 to 3 mm into the sample solution. Then draw and dispense sample into the solution until bubbles are no longer visible in the syringe barrel. Alternatively, remove air bubbles by turning barrel upright and allowing the air bubbles to rise to the needle exit. Then dispense both the air bubbles and the sample. Clean the exterior surface of the needle with a lint-free tissue. Avoid wicking sample with the tissue by making sure it does not come in contact with the needle opening.

Sample Carryover

Eliminate sample carryover by flushing the syringe 5 to 10 times with solvent. Discard the first 2 to 3 solvent washes to avoid sample contamination.

Dispensing

Overfill the syringe and dispense the excess sample until the desired volume is reached. Visually check to see that the syringe scale and sample meniscus are parallel. Draw the plunger back slightly and clean the exterior surface of the needle with a lint-free tissue. Avoid wicking sample with the tissue by making sure it does not come in contact with the needle opening. Then inject your sample.

Storage

Flush the syringe with a solvent in which your sample is highly soluble. As needed, flush the syringe with other miscible solvents. Following the use of any cleaning agent, rinse the syringe with deionized water and then acetone. Clean the exterior of the syringe if needed. Air dry. Store the syringe in its shipping box for protection. See the Cleaning and Care section on page 9 for cleaning agents.

Cleaning and Care

The life of your Hamilton syringe is directly related to its cleanliness and proper care. In general, solvents suitable for routine cleaning include methanol, acetonitrile and acetone. Use solvents of high purity grade. Halogenated hydrocarbons should not be used because they may damage some glue joints.

Chemical Compatibility

The adhesive used to affix needles and hubs to Hamilton Microliter and Gastight syringes is the most chemically resistant available. However, with prolonged exposure, some solvents may attack and deteriorate this highly resistant adhesive. In particular, caution should be exercised with solvents containing halogenated hydrocarbons such as dichloromethane (methylene chloride). For applications using these solvents, Removable Needle (RN) syringes are recommended because no adhesive is present in the fluid path. Be sure to rinse the syringe thoroughly after each use with a solvent that is known to solubilize your sample followed by a solvent such as acetone to ensure that the glue does not remain in contact with a potentially harmful solvent.

Cleaning

Cleaning Agents — Syringes

To clean Hamilton syringes, it is best to use solvents known to be effective in solvating the sample. Preferred cleaning agents are non-alkaline, non-phosphate and non-detergent based. A biodegradable, non-phosphate, organic Cleaning Solution Concentrate is available from Hamilton (p/n 18311).

Cleaning Syringes

Rinse the syringe after use with an appropriate solvent or cleaning agent. Following the use of a cleaning agent, rinse the syringe with deionized water and finally acetone. Wipe the exterior surfaces of the syringe barrel and needle with a lint-free tissue. Make sure that there is no residual cleaning agent in the syringe before using or storing the syringe. Do not soak or submerge the entire syringe in any cleaning agent. Prolonged contact with cleaning agents may damage bonded parts.

Lubricating Syringes

A clean syringe does not require any lubricating grease. Grease should not be used. The use of grease may lead to a variety of problems including sample cross-contamination and seizing of the plunger in the barrel.

Cleaning Agents — Needles

Hamilton provides a Needle Cleaning Kit (p/n 76620A). The kit includes the Cleaning Solution Concentrate described above and a selection of various diameter tungsten wires to aid in removing residue in needles.

Clogged Needles

For a partially clogged needle, flush the syringe with an appropriate solvent to solubilize the clog. For a completely clogged needle, do not attempt to clean by forcing liquid or compressed air through the syringe. Excessive pressure will split the glass barrel. Alternatively, use the Hamilton Needle Cleaning Kit (p/n 76620A). Start by using the cleaning wires to dislodge any foreign material. Then flush with the Cleaning Solution Concentrate to further dissolve the clog. Once the clog is removed, rinse the syringe and needle thoroughly with deionized water. Wipe the exterior surfaces of the syringe barrel and needle dry with a lint-free tissue. Make sure that there is no residual cleaning agent in the syringe before using or storing the syringe. For more about storage, see page 7.

 **NOTE:** All solvents used for flushing should be of high purity grade. Poor grade solvents often contain impurities that remain in the syringe barrel and cause the plunger to seize or stick in the barrel.

Sterilizing, Autoclaving and Disinfecting

Please refer to Hamilton's published specifications for each syringe series to determine whether a product can be autoclaved. Avoid rapid temperature changes, which can lead to splitting of the syringe glass barrel.

Sterilizing

Hamilton syringes may be sterilized with appropriate sterilizing agents such as ethylene oxide.

Autoclaving

Chemical sterilizers are the best means for sterilizing syringes. Hamilton syringes may be sterilized with ethylene oxide. LT, TLL and disassembled RN syringes may be autoclaved at a temperature of up to 115 °C. However, repeated autoclaving will shorten syringe life. When autoclaving is required, remove the plunger from the syringe. Autoclaving cemented needle syringes is not recommended as glass and metal expands at different rates which would compromise the glued connection.

Disinfecting

If your application only requires disinfection, Hamilton recommends the use of Microcide SQ® (p/n 3995-01). This disinfectant is rated to eliminate the majority of commonly encountered bacteria, viruses, fungus and mildew. Use of other common chemicals like 10% bleach, acetone or ethanol are acceptable but are not rated to be as effective as Microcide SQ®.

Plunger Care

Do not apply force to move a plunger. Too much pressure can irretrievably bend the plunger or crack the syringe glass barrel. Refer to the cleaning instructions on page 9 and the information below.

P plungers are made of solid material and push the sample out of the syringe. Hamilton makes two types of plungers. The plungers on Microliter syringes are hand-fitted and only liquid-tight. The plungers are not replaceable for Microliter syringes except for the 7000 series. The plungers on Gastight syringes have a PTFE tip and are replaceable. The PTFE tip creates a gas-tight fit against the interior of the glass barrel, making these syringes ideal for gases and liquids.

Dry Microliter Syringes

Always pull liquid into a syringe barrel to wet the interior surface. Avoid unnecessary moving or pumping of the plunger in a dry syringe. Excessive dry pumping increases plunger wear, shortens syringe life expectancy and may lead to damage beyond repair.

Touching the Plunger

Avoid touching the plunger with your fingers. Abrasions, scratches or oil due to handling the plunger with your fingers may interfere with proper plunger operation.

Accidental Plunger Removal

If the plunger is inadvertently removed from the syringe barrel, wipe it carefully with a lint-free tissue. Reinsert the plunger into the barrel and pump deionized water or acetone through the needle and syringe. In the case of Gastight plungers, dip the PTFE plunger tip into your solvent to re-wet it prior to reinserting the plunger into the barrel.

Binding Plungers

If the plunger feels like it is binding or rough, it may be soiled or bent. Do not force the plunger. Try using an appropriate solvent and wiping with a lint-free cloth. Then follow the cleaning procedure on page 9 to clean the barrel and try again.

Needle Care

Use extreme caution in handling needles to avoid bending, contamination or accidental personal injury. A variety of needle point styles and lengths are offered to meet the requirements of different injection systems. All Hamilton needles are electro-polished to assure smooth and burr-free products.

Needle Burrs and Surface

Burrs, rough edges at the needle opening and a rough needle surface can be removed by gently rubbing with a fine emery cloth or fine carborundum paper. Make sure to thoroughly rinse and dry the needle before using.

Needle Bending

Avoid bending needles by selecting the largest needle outside diameter suitable for your application. Generally, bent needles cannot be straightened adequately for reliable operation.

Sample Viscosity

Needles are designed to draw samples of normal viscosity. Samples with higher viscosity may need to be diluted. You may also consider using a needle with a larger inner diameter.

Dead Volume

Once your sample is dispensed, a small residual amount of sample remains in the needle. The amount of dead volume depends on the needle inner diameter and termination style. For example, with cemented or removal needles, the dead volume is generally less than 1 µL for small volume syringes and as much as 6.8 µL for large volume syringes.

Accessories, Replacement Parts and Services

Hamilton offers a variety of accessories to improve durability and reproducibility, including the ones described below, as well as replacement parts for our syringes. Details can be found at www.hamiltoncompany.com.

Cleaning Solution Concentrate

The concentrate is a biodegradable cleaning agent for removal of stubborn residues. Hamilton part number 18311 (500 mL).



Needle Cleaning Kit

Contains a selection of various diameter tungsten wires as well as a biodegradable Cleaning Solution Concentrate for cleaning clogged needles. Hamilton part number 76620A. Additional cleaning wires and Cleaning Solution Concentrate can be purchased separately.



Syringe Cleaner

The unit is designed to clean 7000 series Microliter syringes with only heat (370 °C) or add a vacuum source (0.1 mm mercury) to remove suspected residuals. Hamilton part number 76610 (120 VAC) and part number 76615 (220 VAC).



Syringe Guide

The guide is easily installed on a syringe to prevent the plunger from bending or being pulled out. Two models are offered for different syringe volumes and series. Hamilton part number 14806 (5–10 µL) and 14906 (25–500 µL).



Reproducibility (Chaney) Adapter

The Chaney Adapter is easily installed on a syringe for consistent, reproducible injections. Also, the adapter prevents plunger bending while an adjustable stop provides increased accuracy and precision. Three models are available to accommodate a range of syringe volumes and series. Hamilton part numbers 14700 (5–10 µL 700 and 1700 series), 14725 (25–500 µL 700 and 1700 series) and 32146 (5–250 µL 800 and 1800 series).



PB600–1 Repeating Dispenser

The PB600–1 Hamilton part number 83700 can be used with liquids or gases to consistently dispense 1/50th of the syringe volume. The dispenser fits Microliter and Gastight syringes with volumes up to 2.5 mL.



Digital Syringe

The base unit can be used with Hamilton syringes in the 700, 1700 and 7000 series with nominal volumes between 0.5 µL and 500 µL. An easy-to-read LCD screen displays the volume contained in the syringe to within ±0.5% of the syringe nominal volume. The Digital Syringe is ordered by adding 'DS' as a prefix to the required syringe part number.

Digital Syringes are automatically N.I.S.T. traceably calibrated to the base unit prior to shipment. Recalibration service is available for the Digital Syringe. Contact Hamilton Customer Service Department to obtain an RMA number (Returned Materials Authorization number). Include the syringe part number used with the base unit on the RMA and return the digital unit without the syringe. The customer will be charged the calibration fee plus the cost of a new syringe.



N.I.S.T. Traceable Certification

This calibration service is available for most of our precision syringes. A Certificate of Calibration is shipped with the product and the procedure is performed with an unbroken chain of calibration with N.I.S.T. traceable weights. Calibrated syringes must be specified at the time of ordering by adding the prefix 'CAL' to the beginning of the syringe's part number. For example, to order a 701N, 10 µL syringe Hamilton part number 80300 as a calibrated syringe, request part number CAL80300.



Additional Technical Information

The following information is available on our website in the Syringes & Needles section.

Selecting the Right Hamilton Syringe

We make it easy to choose the ideal syringe for your application. See step-by-step instructions, a worksheet, and detailed descriptions in our complete Syringe Selection Guide.

Determining the Performance of Hamilton Syringes

Follow the protocol on this document to confirm the accuracy of a syringe. The Hamilton Company Quality System is ISO 9001 certified.

Inner and Outer Dimensions

For applications and projects where the physical dimensions of a syringe are important, specifications are provided for the most popular syringes in our product line.

Product Instruction Sheets

Electronic versions of the documentation shipped with new products containing information on assembly, use, replacement parts, etc. Refer to these sheets if you have misplaced an original instruction sheet or would like to see more information on a specific product prior to purchase.

Syringe Graduations

Hamilton provides information relating to the scale divisions on a syringe to the delivery volume. A series of tables detail this information for all of our syringes.

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Frequently Asked Questions

Many of your questions can be answered by visiting the FAQ located in the Technical Information drop-down menu within the Syringes & Needles section of www.hamiltoncompany.com.





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Lit. No. L20081/05.2012

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