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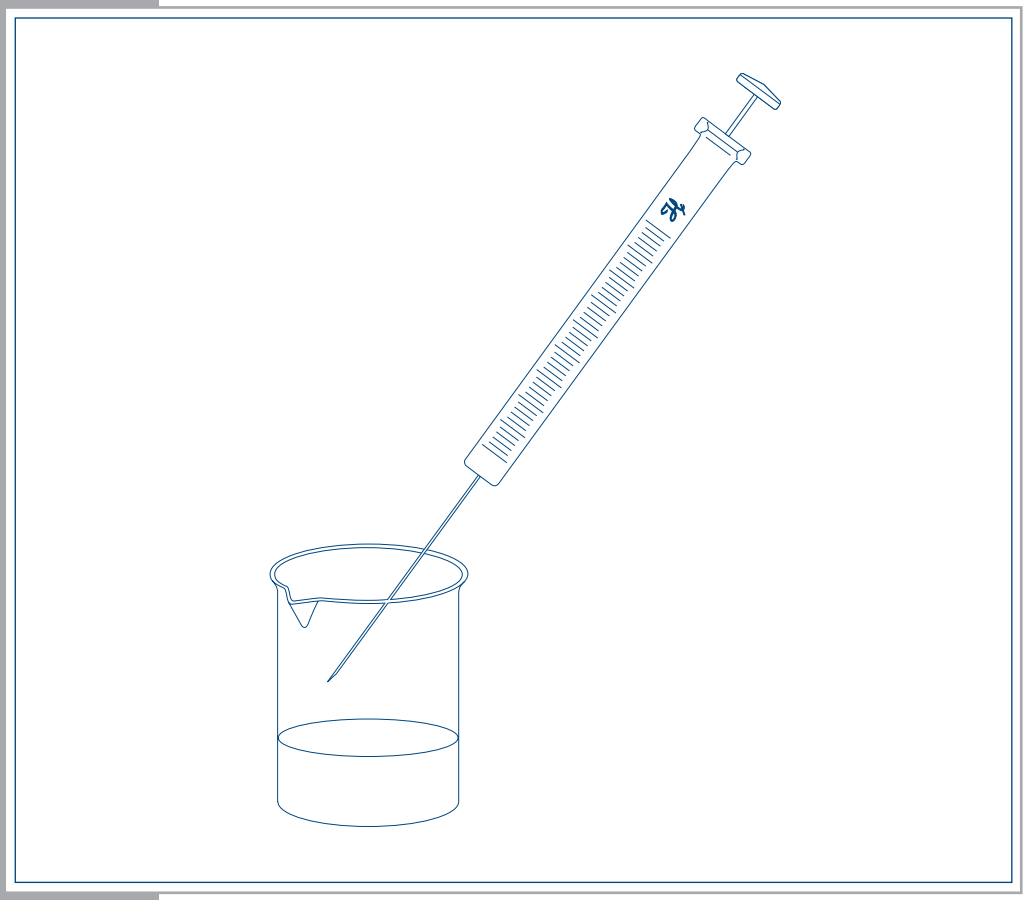
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SYRINGE CARE AND USE



Complete Guide to Maintaining and Using Hamilton GASTIGHT®, MICROLITER™, and Specialty Syringes

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THE MEASURE OF EXCELLENCE™

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Table of Contents

Introduction 3

Syringe Schematics 4

Syringe Use 5
- Daily Use Protocol 5

The Basics 7

Cleaning and Care 7
- Chemical Compatibility 7
- Cleaning 8
- Sterilizing, Autoclaving, and Disinfecting 8
- Plunger Care 9
- Needle Care 9

Accessories, Replacement Parts, and Services 10

Additional Technical Information 11

Technical Support 11

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Introduction

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

This guide covers daily syringe use along with safety information and trouble-shooting 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 ±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 type I glass, and PTFE used for most syringes.

All Hamilton products are unconditionally guaranteed to be free of defects in materials and workmanship for one year (12 months) from date of purchase. The Hamilton Company Quality System is ISO 9001-2000 Certified. 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. Consult our published specifications to determine the material compatibility of Hamilton products with your application.

Hamilton continuously researches new materials and methods to improve form, fit, and function of our syringes, so you can be confident that when you buy from Hamilton you are on the cutting edge. For the latest information on new products, detailed product and part descriptions, published specifications, and our *Guide to Selecting the Right Hamilton Syringe for Your Application*, please visit www.hamiltoncompany.com



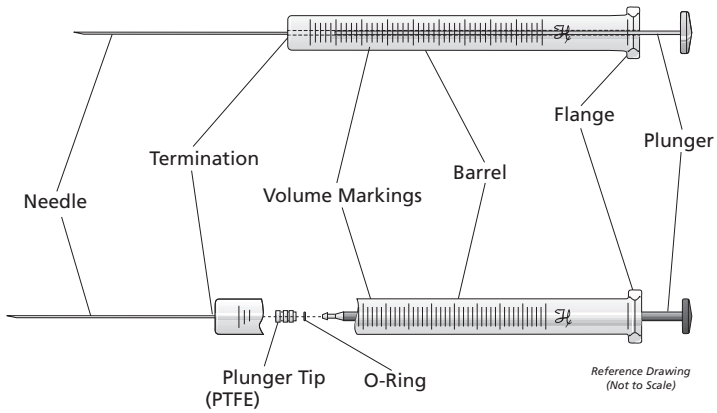
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Syringe Schematics

Examples of Hamilton MICROLITER and GASTIGHT Precision Syringes

700 Series MICROLITER Syringe
Cemented Needle (N)
Needle Point Style 2

For liquids



1700 Series GASTIGHT Syringe
Cemented Needle (N)
Needle Point Style 2

For gas and liquids

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 gasses. Replacement plunger assemblies are available for most GASTIGHT syringes.

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Syringe Use

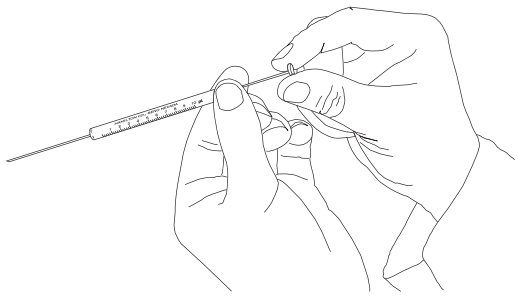
Below is a quick review of how to use your Hamilton syringe to achieve the highest level of accuracy and precision. Each step of the protocol includes references to the sections in this guide that cover specific care and use issues in greater detail.



Daily Use Protocol

1. Inspection

Check the syringe for damage such as cracks and dried residue from previous experiments. *(See Syringe Inspection, pg. 7 and Dry MICROLITER Syringe, pg. 9.)*

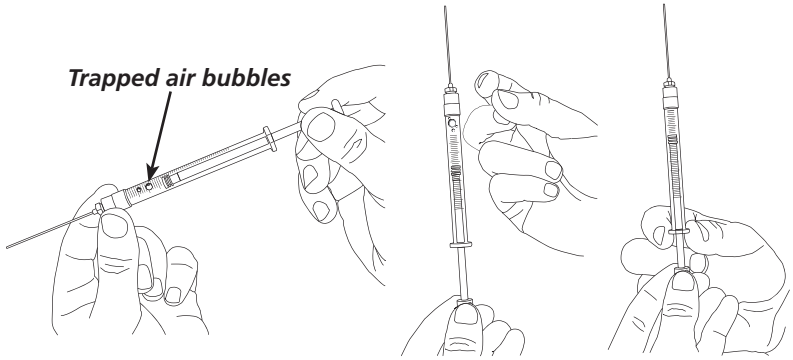


2. Grip

Grasp the syringe by the flange to reduce inaccuracy. *(See Room Temperature, pg. 7 and Body Heat, pg. 7.)*

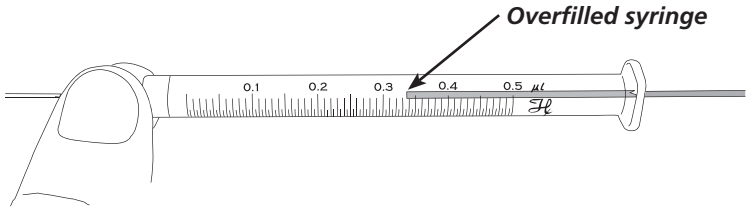
3. Priming

Fully prime the syringe by drawing and dispensing sample to remove trapped air which can cause inaccuracies. *(See Trapped Air, pg. 7.)*



4. Overfilling

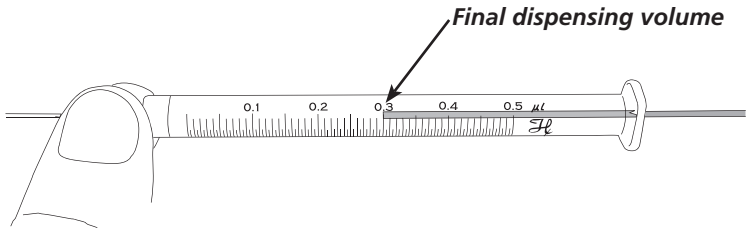
Fill the syringe with a small amount of excess sample. *(See Dispensing, pg. 7.)*



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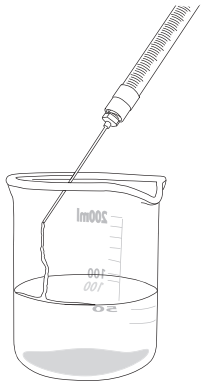
5. Required Volume

Slowly dispense the excess sample until only the required volume of sample remains in the syringe. *(See Dispensing, pg. 7.)*



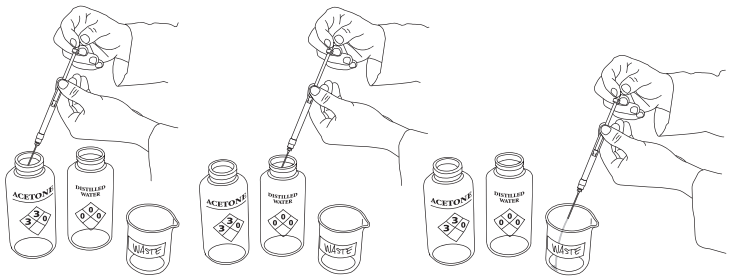
6. Final Dispense

Dispense the final sample volume into an appropriate receptacle. *(See Dispensing, pg. 7.)*



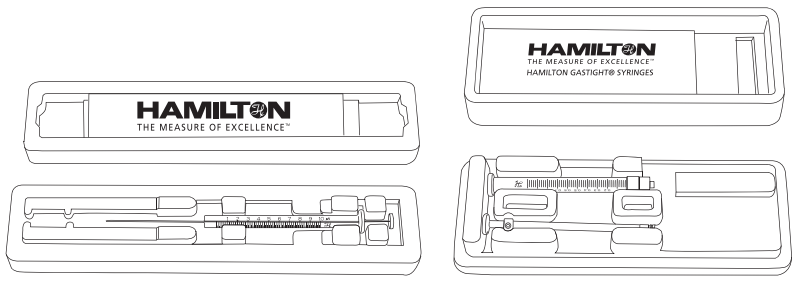
7. Cleaning

Rinse the syringe with an appropriate cleaning solvent followed by water and then finished with acetone. *(See Chemical Compatibility, pg. 7 and Cleaning, pg. 8.)*



8. Storage

Store the syringe in its original packaging to protect against breakage. *(See Storage, pg. 7.)*



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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 8.

Room Temperature

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

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 finally acetone. Clean the exterior of the syringe if needed. Air dry. Store the syringe in its shipping box for protection. See below for cleaning agents. Note: All solvents used for flushing should be of high purity grade. Poorer grade solvents often contain impurities that remain in the syringe barrel and cause the plunger to seize or stick in the barrel.

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 GASTIGHT and MICROLITER 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 dichlormethane (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.

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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 Concentrate is available from Hamilton (Part No. 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 dry 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 submerse 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 (Part No. 76620). The kit includes the Cleaning 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 (Part No. 76620). Start by using the cleaning wires to dislodge any foreign material. Then flush with the Cleaning 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 6.

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's glass barrel.

Sterilizing

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

Autoclaving

For Hamilton syringes which may be autoclaved, typically syringes with a Luer tip termination, take the temperature up to 115 °C. However, please be aware that over time autoclaving will shorten the syringes' life expectancy. Stainless steel expands faster than glass upon heating, so for most terminations, autoclaving strains glued surfaces and may eventually lead to adhesive deterioration and leakage. Autoclaving cemented needle syringes is not recommended. When autoclaving is required, remove the plunger from the syringe. Make sure to keep matched plunger and barrel assemblies together.

Disinfecting

If your application only requires disinfection, then Hamilton recommends the use of Microcide SQ (Hamilton Part. No. 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.

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Plunger Care

Do not apply force to move a plunger. Too much pressure can irretrievably bend the plunger or easily crack the syringe's glass barrel. Refer to the cleaning instructions above and the information below.

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 other than 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 gas and equally suitable for 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 8 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 O.D. (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 or consider using a needle with a larger I.D. (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 ID and the 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 6.7 µL for large volume syringes.

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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 Concentrate

The concentrate is a biodegradable cleaning agent for removal of stubborn residues. Hamilton Part No. 18311 (500 mL).

Needle Cleaning Kit

Contains a selection of various diameter tungsten wires as well as a biodegradable cleaning concentrate for cleaning plugged needles. Hamilton Part No. 76620. Additional cleaning wires and 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 No. 76610 (120VAC) and Part No. 76615 (220VAC).

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.

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 precision and accuracy. Four models are available to accommodate a range of syringe volumes and series.

PB600 Repeating Dispenser

The PB600 (Hamilton Part No. 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's 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 RGA Number (Returned Goods Authorization Number). Include the syringe part number used with the base unit on the RGA 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 calibrations 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 No. 80300) as a calibrated syringe, request Part No. CAL80300.

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Additional Technical Information at www.hamiltoncompany.com

The following information is available on our web site and as pdfs.

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 *Guide to Selecting the Right Hamilton GASTIGHT®, MICROLITER™, and Specialty Syringe for Your Application.*

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 9001-2000 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

Occasionally, users have asked for 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.

Technical Support

Frequently Asked Questions

Many of your questions can be answered by visiting the FAQ page of our web site at www.hamiltoncompany.com

Online

Our technical staff will promptly answer questions sent by email to sales@hamiltoncompany.com

Telephone

For all other technical issues, call 1-888-525-2123 for Hamilton Technical Service assistance.
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