

Hamilton Reference Guide

Syringes & Needles





Syringes

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Syringes

Hamilton syringes are the finest 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 for many years.

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 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.

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 please visit www.hamiltoncompany.com.

Hamilton's broad product offering includes more than 2000 syringe and accessory part numbers. This reference guide organizes these parts into logical groupings and provides supporting technical information for the most commonly asked questions.



Introduction

Product finder tutorials simplify the process of finding the right syringe. Not familiar with the terminology? Visit the Syringe 101 section for definitions and terminology.



Introduction

P. 6

General Syringes

Syringes for general use that are grouped based on their syringe type, series, termination, and needle, if applicable.



General Syringes

P. 14

Chromatography and Analysis Syringes

These syringes are organized by their intended application and instrument compatibility. Write down the make and model of your equipment and turn to this section to find a compatible syringe.



Chromatography and Analysis Syringes

P. 28

Life Science Syringes

This section contains syringes designed for animal injections and accessories that adapt standard syringes for use with tubing, infusion pumps, stereotaxic frames, and other specialty applications.



Life Science Syringes

P. 56

Syringe and Cleaning Accessories

These syringe accessories are designed to increase dispense reproducibility, prevent syringe damage, and increase syringe longevity through proper maintenance.



Syringe and Cleaning Accessories

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Syringe Technical Reference

This section contains the most frequently requested syringe reference information including: care and use, calibration, operating parameters, and more.



Syringe Technical Reference

P. 76





Find Your Product

I have a syringe, what's the part number?

If you need to reorder a syringe but cannot find the part number, this tutorial will help guide you to the most likely syringe part number. Use the five steps below to fill in information about your syringe and then turn to the series page to see the possible part numbers.

Use the steps below to fill in these syringe details:



Step 1

Type / Series

The silk screen tells you the Syringe Type and Syringe Model number. Record the Type in the space provided above and then use the chart below to determine the Syringe Series. Using the Syringe Series, find the page in this guide where the part numbers for that series are displayed.

| | | |
|-------------------|--|-------|
| Microliter | 600 Series Model Numbers 62 – 65 | P. 17 |
| | 700 Series Model Numbers 75 – 750 | P. 17 |
| | 800 Series Model Numbers 85 – 825 | P. 18 |
| | 7000 Series Model Numbers 7000.5 – 7105 | P. 19 |
| Gastight | 1000 Series Model Numbers 1001 – 1100 | P. 24 |
| | 1700 Series Model Numbers 1701 – 1750 | P. 21 |
| | 1800 Series Model Numbers 1801 – 1825 | P. 23 |
| | Super Syringe Model Numbers S0500 – S2000 | P. 25 |

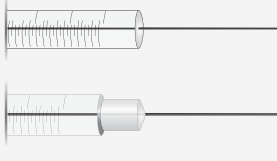

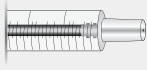

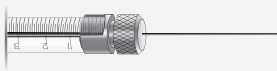
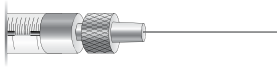
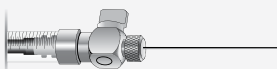
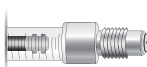
Step 2

Volume

The Syringe Model gives an indication of the syringe volume but it is easiest to read and record the volume by looking at the maximum volume silk screened onto the barrel.






Step 3 Termination

The syringe termination is the connection between the syringe and needle. The illustrations below are the most common terminations. Pick the termination that matches your syringe and record the termination in the space provided. To see a complete list of terminations turn to page 12.

| ID | Termination Style | Termination |
|--------------|---|--------------------------|
| N and SN |  | Cemented Needle |
| LTN and LTSN |  | Luer Tip Cemented Needle |
| LT |  | Luer Tip |
| TLL |  | PTFE Luer Lock |
| RN |  | Removable Needle |
| KH |  | Knurled Hub |
| SL |  | SampleLock™ |
| C |  | ChemSeal |

Step 4 Needle Style

Determine and record the needle point style by comparing the illustrations below to the needle on your syringe. For more information on point styles turn to page 13.

| ID | Point Style | Description |
|----|--|---|
| 2 |  | 10-12° sharp, beveled, curved non-coring |
| 3 |  | Blunt, electro-polished |
| 4 |  | Sharp 10-12° beveled needle |
| 5 |  | Conical with side port for penetration without coring |
| AS |  | Conical, non-coring designed to withstand multiple injections |

Step 5 Needle Length

The standard needle length for a Hamilton syringe is 51 mm. If the length of your needle is not 51 mm it is likely that the needle was a custom order using either a special cemented needle termination or a removable needle termination with the needle sold separately.

The needle gauge dictates the inner and outer diameter of the needle. The optimal needle gauge has been preselected for most syringes based on the syringe volume. For special applications, larger or smaller needle gauges may be ordered via the SN or LTSN terminations or separately as a custom needle. A complete needle gauge index can be found on page 119.





I know my dispense volume, which syringe is right?

Use the table below to find which Syringe Series are available for the desired dispense volume, then turn to the appropriate Series page to see which terminations and needles are available for that Series.

Visit the following pages for more information on Syringe Type (page 11), Series (page 11), Termination (page 12), and Needle Point (page 13).

The Hamilton Syringe Type to Series Chart

| Syringe Type | Delivery Volume | Syringe Series | Page |
|--------------------------|-----------------------------|----------------------------|----------------------------|
| Microliter (Liquid Only) | 0.05 μ L – 0.25 μ L | 7000 Series | P. 19 |
| | 0.25 μ L – 0.5 μ L | 600, 7000 Series | P. 17, P. 19 |
| | 0.5 μ L – 5 μ L | 600, 700, 800, 7000 Series | P. 17, P. 17, P. 18, P. 19 |
| | 5 μ L – 250 μ L | 700, 800 Series | P. 17, P. 18 |
| | 250 μ L – 500 μ L | 700 Series | P. 17 |
| Gastight (Gas/Liquid) | 1 μ L – 100 μ L | 1700, 1800 Series | P. 21, P. 23 |
| | 100 μ L – 250 μ L | 1000, 1700, 1800 Series | P. 24, P. 21, P. 23 |
| | 250 μ L – 500 μ L | 1000, 1700 Series | P. 24, P. 21 |
| | 500 μ L – 50 mL | 1000 Series | P. 24 |
| | 50 mL – 100 mL | 1000 Series, Super Syringe | P. 24, P. 25 |
| | 100 mL – 2 L | Super Syringe | P. 25 |

Note: For the highest accuracy and precision, avoid dispensing less than 10% of the total syringe volume.



I have a syringe, which needle do I need?

If you already have a syringe and need a Hamilton needle, review the three options below to determine which needle hub is compatible with your syringe. Once the needle hub is identified turn to the corresponding page to browse the available needle gauges, lengths, and point styles.

Option 1 I already know my syringe termination

Below are the syringe terminations that accept replacement needles. Identify your termination below and proceed to the corresponding needle hub page to see the compatible needle part numbers.

| Terminations | Needle Hubs | Page |
|---|------------------------|------------------|
| TLL - PTFE / Luer Lock | Metal Hub Kel-F Hub | P. 106 P. 105 |
| LT - Luer Tip | Kel-F Hub | P. 105 |
| RN - Removable Needle 100 μ L or Smaller | Small Hub RN | P. 109 |
| RN - Removable Needle 250 μ L or Larger | Large Hub RN | P. 108 |
| SL - Sample Lock | Large Hub RN | P. 108 |

Option 2 I know my syringe part number, but not the termination

If you know the syringe part number but do not know what termination it has, you can look up the part number in the index at the back of this guide. You will be directed to the page where the part number is displayed, indicating the syringe termination. Alternatively, you can search for the part number at www.hamiltoncompany.com where the product page will list the termination and the compatible needle hub. Once the termination is determined use Option 1 to find the page where the appropriate needles are listed.

Option 3 I have a plastic syringe and need a compatible needle

Many plastic syringes use an industry standard Luer or Luer Lock connector. For these syringes both the Hamilton Metal Hub (page 106) and the Kel-F Hub (page 105) needles are compatible.





Syringe 101:

Definitions and Terminology

This section is designed to provide a quick overview of the most popular Hamilton syringe series, plungers, needle connections, and

needle point styles. It is also intended to give an introduction to common terminology that will be used throughout the syringe reference guide.

Microliter Syringes

700 Series



P. 11

Modified Microliter Syringes

7000 Series



P. 11

Gastight Syringes

1700 Series and 1000 Series



P. 11

Reinforced Plunger Syringe

800 and 1800 Series



P. 12

Syringe Terminations

P. 12

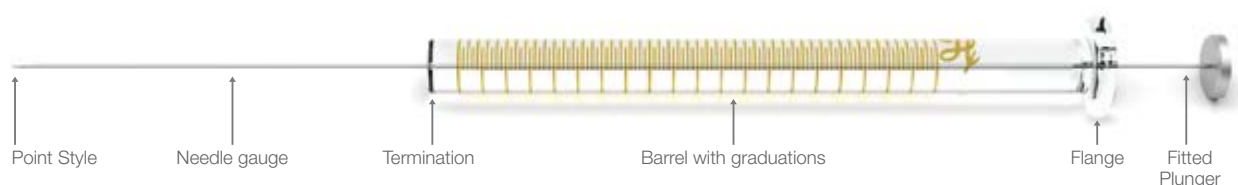
Needle Point Styles

P. 13



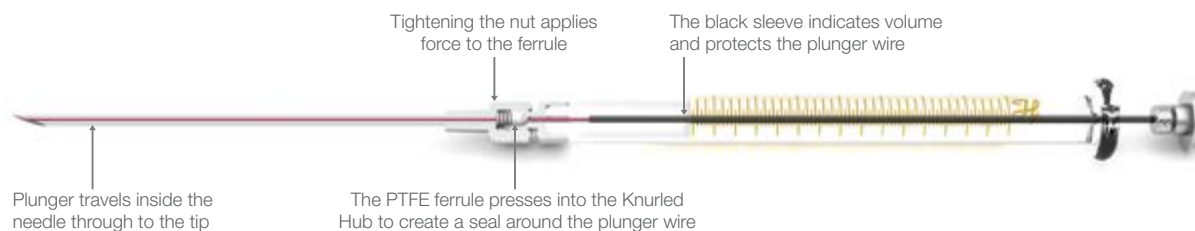
Microliter Syringes (700 Series)

Microliter syringes are used with liquid only. They feature a stainless steel plunger which is individually fitted to the glass barrel. The result is a liquid tight seal with nearly frictionless movement. These syringes are ideal for organic samples that are not prone to precipitation, crystallization, or bonding with glass. Plungers and barrels are not interchangeable or replaceable.



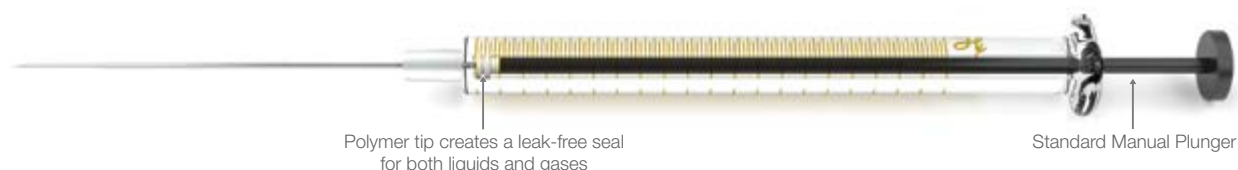
Modified Microliter Syringes (7000 Series)

These syringes are designed to dispense volumes below 5 μL . This requires an extremely small tungsten plunger wire that travels to the tip of the needle. The resulting design has zero dead volume and is accurate below 50 nL.



Gastight Syringes (1700 and 1000 Series)

Gastight syringes are ideal for dispensing both liquids and gases. They have a polymer plunger tip which creates a leak-free seal. Traditionally the tip is made from PTFE but other materials are used for selected applications. The polymer tip wipes the interior of the syringe barrel free of sample; extending the syringe life for samples with dissolved solids like salts, proteins, or DNA.





Gastight Syringes (1700 and 1000 Series) (Cont.)

Gastight syringes are used as the standard in syringe pumps. Syringes 1 mL and smaller are available with a plunger stop. This ensures that when the syringe pump bottoms out the stop hits on the glass before the fragile plunger tip is damaged. The stop is also tapped with a #6-32 hole in the back to enable connection to the syringe pump. Syringes larger than 1 mL also come standard with this threaded hole.





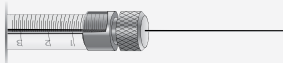
Reinforced Plunger Syringe (800 and 1800 Series)

Small volume syringes require extremely small plunger wires. For uses that are prone to bending and breaking these small plungers, it is recommended to use a reinforced plunger syringe. These plungers are available in both Microliter and Gastight versions.



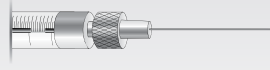
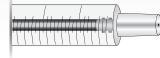

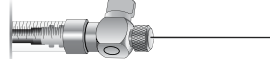
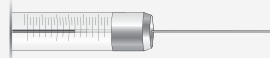
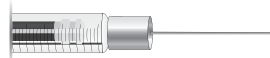

Syringe Terminations

Terminations are located at the end of the syringe barrel and function as the interface between the syringe and its mating connection such as the needle. Terminations are offered in a number of different needle and connection configurations to accommodate a broad range of applications.

| Termination | Abbreviation | Remark | Autoclavable |
|--|--------------|---|----------------------|
| Cemented Needle  | N | For low-volume syringes | No |
| Luer Tip Cemented Needle  | LTN | For mid-volume syringes | No |
| Removable Needle  | RN | No dead volume connection Use with Small Hub needles (2.5 µL – 100 µL) or Large Hub needles (250 µL – 10 mL) | Yes, if disassembled |









Syringe Terminations (Cont.)

| Termination | Abbreviation | Remark | Autoclavable |
|---|--------------|--|----------------------|
|  Knurled Hub | KH | For Modified Microliter syringes only | Yes, if disassembled |
|  Luer Tip | LT | Compatible with Kel-F needles and fittings | Yes, if disassembled |
|  PTFE Luer Lock | TLL | Compatible with Kel-F or Metal Hub needles and fittings | Yes, if disassembled |
|  SampleLock™ | SL | Integrated on/off valve Use with Large Hub needles | No |
|  Fixed Needle | FN | Found on CTC C-Line and X-Type syringes | No |
|  High Temp | HT | For headspace sampling up to 200 °C on a CTC autosampler | Yes, if disassembled |
|  ChemSeal™ | C | 1/4"-28 UNF/threaded connection | No |

Needle Point Styles

Hamilton offers several different needle point styles depending on the intended application. For most syringes and needles, the standard length is set to 51 mm. Customization of the length, gauge, and point style is possible to suit almost any application.

| ID | Point Style | Description | Application | Gauges |
|----|---|--|---|-------------------------|
| 2 |  | 10 – 12° sharp, beveled, curved non-coring | Gas chromatography, septum piercing | 33 – 10 ga |
| 3 |  | Blunt, electro-polished | High performance liquid chromatography (HPLC) injection, thin-layer chromatography (TLC), general liquid handling, controlled animal injections | 34 – 10 ga |
| 3T |  | Blunt, electro-polished, coated with PTFE 19 mm from the tip | Thin-Layer Chromatography (TLC) applications | 26s, 26, 22s, and 22 ga |
| 4 |  | Sharp 10 – 12° beveled needle; other angles available upon request | Life science/animal injections | 34 – 10 ga |
| 5 |  | Conical with side port for penetration without coring | Headspace, applications prone to needle clogging, causes minimal septum damage | 26 – 10 ga |
| AS |  | Conical, non-coring designed to withstand multiple injections | Autosampler injection, pre-pierced septa | 26 – 10 ga |





GENERAL SYRINGES

General Syringes

This section contains our most popular syringes, grouped by their physical characteristics and construction. Syringes are first organized by type; either Microliter or Gastight, then by series, termination, volume, point style, gauge, and finally, length.

The page numbers listed to the right mark the beginning of the part numbers available for each syringe series. For a detailed explanation of each syringe series refer to the Syringe 101 section on page 10.





Microliter™ Syringe Series

The result is a liquid tight seal with nearly frictionless movement. These syringes are ideal for organic samples that are not prone to precipitation, crystallization or bonding with glass.



Microliter Syringes

P. 16

Gastight® Syringe Series

Gastight syringes are ideal for dispensing both liquids and gases. They have a polymer plunger tip effectively which creates a leak-free seal. The polymer tip wipes the interior of the syringe barrel free of sample.



Gastight Syringes

P. 20

Calibrated Syringes

Simplify compliance by purchasing factory calibrated and serialized syringes.



Calibrated Syringes

P. 26

Digital Syringes

Eliminate the need for reading graduations and improve accuracy and precision with a factory calibrated Digital Syringe.



Digital Syringes

P. 27





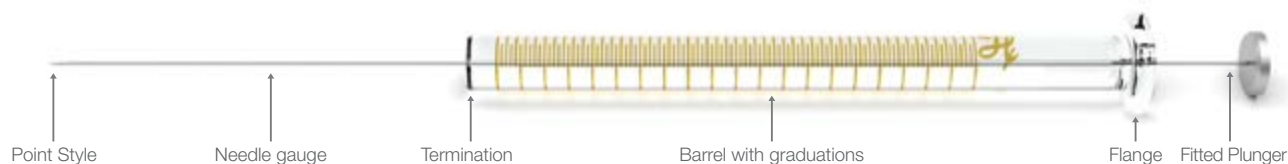
Microliter Syringes

Microliter syringes are for use with liquids only. They incorporate hand-fitted stainless steel plungers with precision bored syringe barrels. The hand fitting process enables the tightest possible seal with a plunger movement that is virtually frictionless. The result is a syringe with minimal plunger wear and an almost unlimited useful life when maintained properly.

These syringes are ideal for homogeneous samples that are not prone to precipitation or bonding with glass. However, when using

heterogeneous solutions, the user must be diligent about cleaning the syringe after each use. Refer to page 77 for care and use recommendations.

In some cases, even diligent cleaning is not sufficient and the barrel will become soiled. The deposits on the glass will compromise the tight tolerance between the glass and the plunger resulting in a frozen plunger. Plungers for Microliter syringes cannot be interchanged or replaced if damaged. For heterogeneous solutions, a Gastight syringe is the best option.



600 Series Syringes

2.5 μL to 5 μL



P. 17

700 Series Syringes

5 μL to 500 μL



P. 17

800 Series Syringes

5 μL to 250 μL



P. 18

7000 Series Syringes

0.5 μL to 5 μL



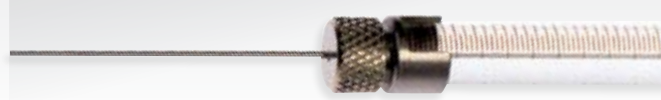
P. 19



600 Series Syringes

The 600 series syringes are a rugged, durable, and long lasting half stroke version of Hamilton's original 700 series syringes. They have a reinforced plunger which prevents plunger bending. Each plunger is individually fitted to the glass barrel and cannot be interchanged between syringes. This series of syringes is ideal for dispensing volumes from 0.25 μL up to 5 μL . Because of the shorter stroke length, the 600 series syringes can be used for one-handed applications.

Removable Needle Syringes



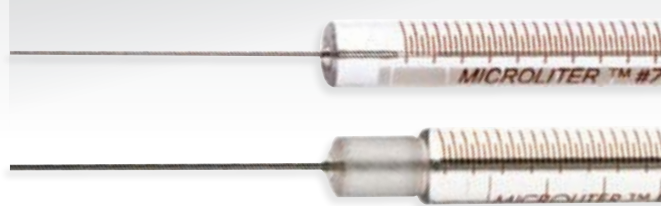
| P/N | Volume | Gauge | Length | Point |
|---------|-------------------|--------------------------------|--------|-------|
| 87942 | 2.5 μL | 22s ga | 51 mm | 3 |
| 7632-01 | 2.5 μL | NDL Sold Separately (Small RN) | | |
| 87943 | 5 μL | 22s ga | 51 mm | 3 |
| 7633-01 | 5 μL | NDL Sold Separately (Small RN) | | |



700 Series Syringes

The 700 series syringe is the original hand-fitted Hamilton syringe. The stainless steel plunger is manufactured to fit the glass barrel with a tolerance less than three thousandths of a millimeter, resulting in unsurpassed syringe life. This series of syringes is ideal for dispensing volumes from 0.5 μL up to 500 μL . A variety of different terminations and needle options are available.

Cemented Needle Syringes



| P/N | Volume | Gauge | Length | Point | Digital |
|-------|-------------------------|------------|-------------|----------------|---------|
| 87900 | 5 μL | 26s ga | 51 mm | 2 | Y |
| 87919 | 5 μL | 26s ga | 51 mm | 3 | N |
| 87908 | 5 μL | 33 – 18 ga | 10 – 304 mm | 2, 3, 4, 5, AS | N |
| 80300 | 10 μL | 26s ga | 51 mm | 2 | Y |
| 80339 | 10 μL | 26s ga | 51 mm | 5 | N |
| 80350 | 10 μL | 26s ga | 70 mm | 2 | N |
| 80365 | 10 μL | 22s ga | 51 mm | 3 | Y |
| 80366 | 10 μL – 6 pk | 26s ga | 51 mm | 2 | N |
| 80383 | 10 μL | 26s ga | 51 mm | 3 | Y |
| 80384 | 10 μL | 26s ga | 76 mm | 2 | N |
| 80308 | 10 μL | 33 – 18 ga | 10 – 304 mm | 2,3,4,5, AS | N |
| 80400 | 25 μL | 22s ga | 51 mm | 2 | Y |
| 80439 | 25 μL | 22s ga | 51 mm | 5 | N |
| 80465 | 25 μL | 22s ga | 51 mm | 3 | Y |
| 80408 | 25 μL | 33 – 18 ga | 10 – 304 mm | 2,3,4,5, AS | N |
| 80500 | 50 μL | 22s ga | 51 mm | 2 | Y |
| 80521 | 50 μL | 22 ga | 51 mm | 3 | N |
| 80539 | 50 μL | 22s ga | 51 mm | 5 | N |
| 80565 | 50 μL | 22s ga | 51 mm | 3 | Y |
| 80508 | 50 μL | 33 – 18 ga | 10 – 304 mm | 2,3,4,5, AS | N |



Point Styles

Point 2  Point 3  Point 4  Point 5  Point AS 



700 Series Syringes (Cont.)

Cemented Needle Syringes (Cont.)

| P/N | Volume | Gauge | Length | Point | Digital |
|-------|--------|------------|-------------|-------------|---------|
| 80600 | 100 µL | 22s ga | 51 mm | 2 | Y |
| 80621 | 100 µL | 22 ga | 51 mm | 3 | N |
| 80639 | 100 µL | 22s ga | 51 mm | 5 | N |
| 80665 | 100 µL | 22s ga | 51 mm | 3 | Y |
| 80608 | 100 µL | 33 – 18 ga | 10 – 304 mm | 2,3,4,5, AS | N |
| 80700 | 250 µL | 22s ga | 51 mm | 2 | Y |
| 80739 | 250 µL | 22 ga | 51 mm | 5 | N |
| 80765 | 250 µL | 22 ga | 51 mm | 3 | Y |
| 80708 | 250 µL | 33 – 18 ga | 10 – 304 mm | 2,3,4,5, AS | N |
| 80800 | 500 µL | 22 ga | 51 mm | 2 | Y |
| 80839 | 500 µL | 22 ga | 51 mm | 5 | N |
| 80865 | 500 µL | 22 ga | 51 mm | 3 | Y |
| 80808 | 500 µL | 33 – 18 ga | 10 – 304 mm | 2,3,4,5, AS | N |

Luer Tip Syringes



| P/N | Volume | Needle Hub | Digital |
|-------|--------|------------|---------|
| 80301 | 10 µL | Kel-F Hub | N |
| 80401 | 25 µL | Kel-F Hub | N |
| 80501 | 50 µL | Kel-F Hub | N |
| 80601 | 100 µL | Kel-F Hub | N |
| 80701 | 250 µL | Kel-F Hub | N |
| 80801 | 500 µL | Kel-F Hub | N |

Removable Needle Syringes



| P/N | Volume | Gauge | Length | Point | Digital |
|---------|--------------|--------------------------------|--------|-------|---------|
| 87930 | 5 µL | 26s ga | 51 mm | 2 | Y |
| 87931 | 5 µL | 32 ga | 51 mm | 3 | N |
| 7634-01 | 5 µL | NDL Sold Separately (Small RN) | | | N |
| 80330 | 10 µL | 26s ga | 51 mm | 2 | Y |
| 80336 | 10 µL – 6 pk | 26s ga | 51 mm | 2 | N |
| 80314 | 10 µL | 32 ga | 51 mm | 3 | N |
| 7635-01 | 10 µL | NDL Sold Separately (Small RN) | | | N |
| 80430 | 25 µL | 22s ga | 51 mm | 2 | Y |
| 7636-01 | 25 µL | NDL Sold Separately (Small RN) | | | N |
| 80530 | 50 µL | 22s ga | 51 mm | 2 | Y |
| 7637-01 | 50 µL | NDL Sold Separately (Small RN) | | | N |
| 80630 | 100 µL | 22s ga | 51 mm | 2 | Y |
| 7638-01 | 100 µL | NDL Sold Separately (Small RN) | | | N |
| 80730 | 250 µL | 22s ga | 51 mm | 2 | Y |
| 7639-01 | 250 µL | NDL Sold Separately (Large RN) | | | N |
| 80830 | 500 µL | 22 ga | 51 mm | 2 | Y |
| 7640-01 | 500 µL | NDL Sold Separately (Large RN) | | | N |

800 Series Syringes

The 800 series syringes are the reinforced plunger version of the 700 series syringes. Attached to the flange of the syringe is a blue syringe holder. The syringe holder provides an area to hold the syringe that prevents heat transfer, dispense inaccuracies, and plunger blow outs. Additionally, it provides support

to small volume plungers that are prone to bending during injection. This series of syringes is ideal for dispensing volumes from 0.5 µL up to 250 µL.



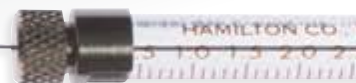
800 Series Syringes (Cont.)

Cemented Needle Syringes



| P/N | Volume | Gauge | Length | Point |
|-------|--------|--------|--------|-------|
| 84850 | 5 µL | 26s ga | 51 mm | 2 |
| 84852 | 10 µL | 26s ga | 51 mm | 2 |
| 84854 | 25 µL | 22s ga | 51 mm | 2 |
| 84856 | 50 µL | 22s ga | 51 mm | 2 |
| 84858 | 100 µL | 22s ga | 51 mm | 2 |

Removable Needle Syringes



| P/N | Volume | Gauge | Length | Point |
|---------|--------|--------------------------------|--------|-------|
| 84851 | 5 µL | 26s ga | 51 mm | 2 |
| 7641-01 | 5 µL | NDL Sold Separately (Small RN) | | |
| 84853 | 10 µL | 26s ga | 51 mm | 2 |
| 7642-01 | 10 µL | NDL Sold Separately (Small RN) | | |
| 84855 | 25 µL | 22s ga | 51 mm | 2 |
| 7643-01 | 25 µL | NDL Sold Separately (Small RN) | | |
| 84857 | 50 µL | 22s ga | 51 mm | 2 |
| 7644-01 | 50 µL | NDL Sold Separately (Small RN) | | |
| 84859 | 100 µL | 22s ga | 51 mm | 2 |
| 7645-01 | 100 µL | NDL Sold Separately (Small RN) | | |
| 84861 | 250 µL | 22s ga | 51 mm | 2 |
| 7646-01 | 250 µL | NDL Sold Separately (Large RN) | | |

7000 Series Syringes

The 7000 series syringes are modified Microliter syringes with a plunger-in-needle design. The 7000 series is the only zero dead volume syringe available. The fine gauge tungsten plunger wire extends to the tip of the needle, ensuring that all solvent is expelled dispensing volumes from 0.05 µL up to 5 µL.

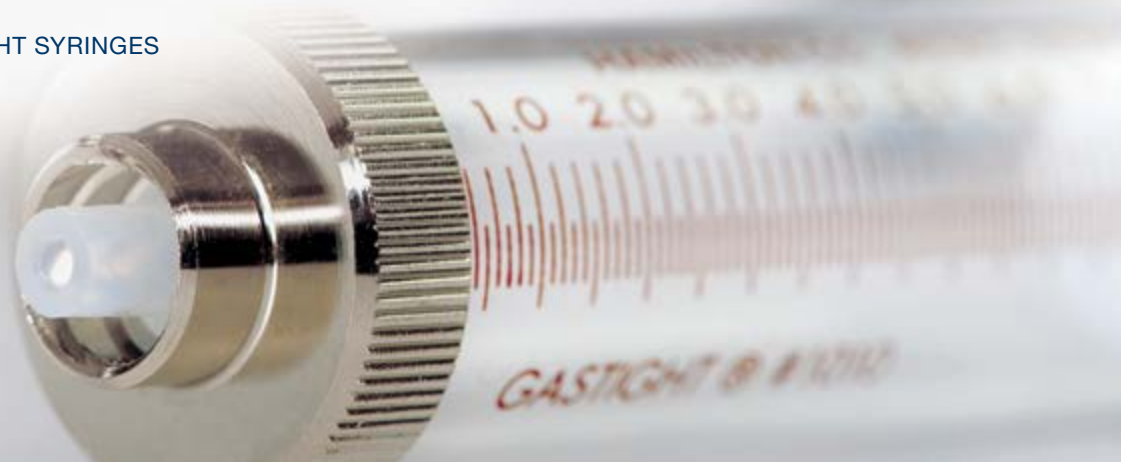


Knurled Hub Syringes



| P/N | Volume | Gauge | Length | Point | Digital |
|-------|--------|-------|-------------|------------|---------|
| 86259 | 0.5 µL | 25 ga | 70 mm | 2 | Y |
| 86250 | 0.5 µL | 25 ga | 70 mm | 3 | Y |
| 86257 | 0.5 µL | 32 ga | 100 mm | 3 | N |
| 80135 | 1 µL | 25 ga | 70 mm | 2 | Y |
| 86211 | 1 µL | 22 ga | 70 mm | 2 | Y |
| 80100 | 1 µL | 25 ga | 70 mm | 3 | Y |
| 86200 | 1 µL | 22 ga | 70 mm | 3 | Y |
| 80108 | 1 µL | 25 ga | 48 – 127 mm | 2, 3, or 4 | N |
| 88411 | 2 µL | 25 ga | 70 mm | 2 | Y |
| 88511 | 2 µL | 23 ga | 70 mm | 2 | Y |
| 88400 | 2 µL | 25 ga | 70 mm | 3 | Y |
| 88500 | 2 µL | 23 ga | 70 mm | 3 | Y |
| 88011 | 5 µL | 24 ga | 70 mm | 2 | Y |
| 88000 | 5 µL | 24 ga | 70 mm | 3 | Y |





Gastight Syringes

Gastight syringes are ideal for dispensing both liquids and gases. They have a precision-machined PTFE plunger tip which creates a leak-free seal. With the tight fit, the tip wipes the interior of the syringe barrel free of sample. This feature is particularly useful with heterogeneous samples as it reduces the chance that deposits will build up and cause the plunger to freeze.

The fluid path for all Gastight syringes is designed to be as chemically inert as possible. The liquid contact is borosilicate glass, PTFE, and stainless steel for all syringes except the Super Syringes which use acrylic and Buna-N in the barrel and plunger disc.

Polymer tip creates a leak-free seal for both liquids and gases



1700 Series Syringes
10 μ L to 500 μ L



P. 21

1800 Series Syringes
10 μ L to 250 μ L



P. 23

1000 Series Syringes
1 mL to 100 mL



P. 24

Super Syringes
500 mL to 2 L



P. 25



1700 Series Syringes

The 1700 series syringes are the Gastight version of the original 700 series syringes. This series of syringes is ideal for dispensing volumes from 1 µL up to 500 µL. A variety of different terminations and needle options are available in this series.



Cemented Needle Syringes



| P/N | Volume | Gauge | Length | Point | Digital |
|-------|--------|------------|-------------|----------------|---------|
| 80000 | 10 µL | 26s ga | 51 mm | 2 | Y |
| 80075 | 10 µL | 26s ga | 51 mm | 3 | Y |
| 80085 | 10 µL | 26 ga | 51 mm | 3 | N |
| 80039 | 10 µL | 26s ga | 51 mm | 5 | N |
| 80008 | 10 µL | 33 – 18 ga | 10 – 304 mm | 2, 3, 4, 5, AS | N |
| 80200 | 25 µL | 22s ga | 51 mm | 2 | Y |
| 80275 | 25 µL | 22s ga | 51 mm | 3 | Y |
| 80285 | 25 µL | 22 ga | 51 mm | 3 | N |
| 80239 | 25 µL | 22s ga | 51 mm | 5 | N |
| 80208 | 25 µL | 33 – 18 ga | 10 – 304 mm | 2, 3, 4, 5, AS | N |
| 80900 | 50 µL | 22s ga | 51 mm | 2 | Y |
| 80975 | 50 µL | 22s ga | 51 mm | 3 | Y |
| 80985 | 50 µL | 22 ga | 51 mm | 3 | N |
| 80939 | 50 µL | 22s ga | 51 mm | 5 | N |
| 80908 | 50 µL | 33 – 18 ga | 10 – 304 mm | 2, 3, 4, 5, AS | N |
| 81000 | 100 µL | 22s ga | 51 mm | 2 | Y |
| 81075 | 100 µL | 22s ga | 51 mm | 3 | Y |
| 81085 | 100 µL | 22 ga | 51 mm | 3 | N |
| 81039 | 100 µL | 22s ga | 51 mm | 5 | N |
| 81008 | 100 µL | 33 – 18 ga | 10 – 304 mm | 2, 3, 4, 5, AS | N |
| 81100 | 250 µL | 22s ga | 51 mm | 2 | Y |
| 81175 | 250 µL | 22s ga | 51 mm | 3 | Y |
| 81185 | 250 µL | 22 ga | 51 mm | 3 | N |
| 81139 | 250 µL | 22s ga | 51 mm | 5 | N |
| 81108 | 250 µL | 33 – 18 ga | 10 – 304 mm | 2, 3, 4, 5, AS | N |
| 81217 | 500 µL | 22 ga | 51 mm | 2 | Y |
| 81216 | 500 µL | 22 ga | 51 mm | 3 | N |
| 81243 | 500 µL | 22 ga | 51 mm | 5 | N |
| 81214 | 500 µL | 33 – 18 ga | 10 – 304 mm | 2, 3, 4, 5, AS | N |

Removable Needle Syringes



| P/N | Volume | Gauge | Length | Point | Digital |
|---------|--------|--------------------------------|--------|-------|---------|
| 80030 | 10 µL | 26s ga | 51 mm | 2 | Y |
| 80065 | 10 µL | 22s ga | 51 mm | 3 | Y |
| 80014 | 10 µL | 32 ga | 51 mm | 3 | N |
| 7653-01 | 10 µL | NDL Sold Separately (Small RN) | | | N |
| 80230 | 25 µL | 22s ga | 51 mm | 2 | Y |
| 80265 | 25 µL | 22s ga | 51 mm | 3 | N |
| 7654-01 | 25 µL | NDL Sold Separately (Small RN) | | | N |
| 80930 | 50 µL | 22s ga | 51 mm | 2 | Y |
| 80965 | 50 µL | 22s ga | 51 mm | 3 | N |
| 7655-01 | 50 µL | NDL Sold Separately (Small RN) | | | N |
| 81030 | 100 µL | 22s ga | 51 mm | 2 | Y |
| 81065 | 100 µL | 22s ga | 51 mm | 3 | N |
| 7656-01 | 100 µL | NDL Sold Separately (Small RN) | | | N |
| 81130 | 250 µL | 22s ga | 51 mm | 2 | Y |
| 81165 | 250 µL | 22 ga | 51 mm | 3 | N |
| 7657-01 | 250 µL | NDL Sold Separately (Large RN) | | | N |
| 81230 | 500 µL | 22 ga | 51 mm | 2 | Y |
| 81265 | 500 µL | 22 ga | 51 mm | 3 | N |
| 7658-01 | 500 µL | NDL Sold Separately (Large RN) | | | N |



Point Styles



1700 Series Syringes (Cont.)

Luer Tip Syringes



| P/N | Volume | Needle Hub | Digital |
|-------|--------|------------|---------|
| 80001 | 10 µL | Kel-F Hub | N |
| 80201 | 25 µL | Kel-F Hub | N |
| 80901 | 50 µL | Kel-F Hub | Y |
| 81001 | 100 µL | Kel-F Hub | N |
| 81101 | 250 µL | Kel-F Hub | N |
| 81201 | 500 µL | Kel-F Hub | N |

ChemSeal Syringes



| P/N | Volume | Needle Hub | Plunger Stop |
|-------|--------|---------------------|--------------|
| 80062 | 10 µL | No Needle Available | Yes |
| 80262 | 25 µL | No Needle Available | Yes |
| 80962 | 50 µL | No Needle Available | Yes |
| 81062 | 100 µL | No Needle Available | Yes |
| 81060 | 100 µL | No Needle Available | No |
| 81162 | 250 µL | No Needle Available | Yes |
| 81160 | 250 µL | No Needle Available | No |
| 81262 | 500 µL | No Needle Available | Yes |
| 81260 | 500 µL | No Needle Available | No |

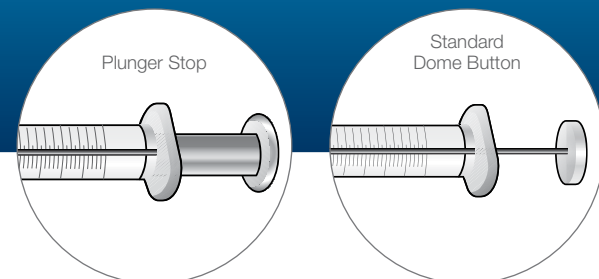
Luer Lock Syringes



| P/N | Volume | Needle Hub | Plunger Stop |
|-------|--------|--------------------|--------------|
| 80222 | 25 µL | Metal or Kel-F Hub | Yes |
| 80920 | 50 µL | Metal or Kel-F Hub | No |
| 80922 | 50 µL | Metal or Kel-F Hub | Yes |
| 81020 | 100 µL | Metal or Kel-F Hub | No |
| 81022 | 100 µL | Metal or Kel-F Hub | Yes |
| 81120 | 250 µL | Metal or Kel-F Hub | No |
| 81122 | 250 µL | Metal or Kel-F Hub | Yes |
| 81220 | 500 µL | Metal or Kel-F Hub | No |
| 81222 | 500 µL | Metal or Kel-F Hub | Yes |

Plunger Stop

For syringes 1 mL and smaller, the Plunger Stop replaces the standard dome button. The stop has a #6-32 threaded hole in the back for connecting to a syringe pump and is adjusted to protect the plunger tip from damage by hitting the syringe flange before the plunger tip bottoms out. Syringes larger than 1 mL come standard with a #6-32 threaded hole and do not require a plunger stop.



1800 Series Syringes

The 1800 series syringes are the reinforced plunger version of the 1700 series syringes. Attached to the flange of the syringe is a blue syringe holder. The syringe holder provides an area to hold the syringe that prevents heat transfer, dispense inaccuracies, and plunger blow outs. Additionally it provides support to small volume plungers that are prone to bending during injection. This series of syringes is ideal for dispensing volumes from 1 μL up to 250 μL .

Cemented Needle Syringes



| P/N | Volume | Gauge | Length | Point |
|-------|-------------------|--------|--------|-------|
| 84875 | 10 μL | 26s ga | 51 mm | 2 |
| 84878 | 25 μL | 22s ga | 51 mm | 2 |
| 84881 | 50 μL | 22s ga | 51 mm | 2 |
| 84884 | 100 μL | 22s ga | 51 mm | 2 |
| 84887 | 250 μL | 22s ga | 51 mm | 2 |

Removable Needle Syringes



| P/N | Volume | Gauge | Length | Point |
|---------|-------------------|--------------------------------|--------|-------|
| 84877 | 10 μL | 26s ga | 51 mm | 2 |
| 7659-01 | 10 μL | NDL Sold Separately (Small RN) | | |
| 84880 | 25 μL | 22s ga | 51 mm | 2 |
| 7660-01 | 25 μL | NDL Sold Separately (Small RN) | | |
| 84883 | 50 μL | 22s ga | 51 mm | 2 |
| 7661-01 | 50 μL | NDL Sold Separately (Small RN) | | |
| 84886 | 100 μL | 22s ga | 51 mm | 2 |
| 7662-01 | 100 μL | NDL Sold Separately (Small RN) | | |
| 84889 | 250 μL | 22s ga | 51 mm | 2 |
| 7663-01 | 250 μL | NDL Sold Separately (Large RN) | | |



Point Styles



1000 Series Syringes

The 1000 series syringes are a mid-volume Gastight syringe. This series of syringes is ideal for dispensing volumes from 100 µL up to 100 mL. A variety of different terminations and needle options are available in this versatile syringe series.



| P/N | Volume | Gauge | Length | Point |
|-------|--------|------------|-------------|-------------|
| 81317 | 1 mL | 22 ga | 51 mm | 2 |
| 81316 | 1 mL | 22 ga | 51 mm | 3 |
| 81343 | 1 mL | 22 ga | 51 mm | 5 |
| 81314 | 1 mL | 33 – 18 ga | 10 – 304 mm | 2,3,4,5, AS |
| 81416 | 2.5 mL | 22 ga | 51 mm | 3 |
| 81417 | 2.5 mL | 22 ga | 51 mm | 2 |
| 81443 | 2.5 mL | 22 ga | 51 mm | 5 |
| 81414 | 2.5 mL | 33 – 18 ga | 10 – 304 mm | 2,3,4,5, AS |
| 81516 | 5 mL | 22 ga | 51 mm | 3 |
| 81517 | 5 mL | 22 ga | 51 mm | 2 |
| 81543 | 5 mL | 22 ga | 51 mm | 5 |
| 81514 | 5 mL | 33 – 18 ga | 10 – 304 mm | 2,3,4,5, AS |
| 81616 | 10 mL | 22 ga | 51 mm | 3 |
| 81617 | 10 mL | 22 ga | 51 mm | 2 |
| 81643 | 10 mL | 22 ga | 51 mm | 5 |
| 81614 | 10 mL | 33 – 18 ga | 10 – 304 mm | 2,3,4,5, AS |

Luer Tip Cemented Needle Syringes



| P/N | Volume | Gauge | Length | Point |
|-------|--------|------------|-------------|-------------|
| 81317 | 1 mL | 22 ga | 51 mm | 2 |
| 81316 | 1 mL | 22 ga | 51 mm | 3 |
| 81343 | 1 mL | 22 ga | 51 mm | 5 |
| 81314 | 1 mL | 33 – 18 ga | 10 – 304 mm | 2,3,4,5, AS |
| 81417 | 2.5 mL | 22 ga | 51 mm | 2 |
| 81416 | 2.5 mL | 22 ga | 51 mm | 3 |
| 81443 | 2.5 mL | 22 ga | 51 mm | 5 |
| 81414 | 2.5 mL | 33 – 18 ga | 10 – 304 mm | 2,3,4,5, AS |
| 81517 | 5 mL | 22 ga | 51 mm | 2 |
| 81516 | 5 mL | 22 ga | 51 mm | 3 |
| 81543 | 5 mL | 22 ga | 51 mm | 5 |
| 81514 | 5 mL | 33 – 18 ga | 10 – 304 mm | 2,3,4,5, AS |
| 81617 | 10 mL | 22 ga | 51 mm | 2 |
| 81616 | 10 mL | 22 ga | 51 mm | 3 |
| 81643 | 10 mL | 22 ga | 51 mm | 5 |
| 81614 | 10 mL | 33 – 18 ga | 10 – 304 mm | 2,3,4,5, AS |

Removable Needle Syringes



| P/N | Volume | Gauge | Length | Point |
|---------|--------|--------------------------------|--------|-------|
| 81330 | 1 mL | 22 ga | 51 mm | 2 |
| 81365 | 1 mL | 22 ga | 51 mm | 3 |
| 7649-01 | 1 mL | NDL Sold Separately (Large RN) | | |
| 81430 | 2.5 mL | 22 ga | 51 mm | 2 |
| 7650-01 | 2.5 mL | NDL Sold Separately (Large RN) | | |
| 81530 | 5 mL | 22 ga | 51 mm | 2 |
| 7651-01 | 5 mL | NDL Sold Separately (Large RN) | | |
| 81630 | 10 mL | 22 ga | 51 mm | 2 |
| 7652-01 | 10 mL | NDL Sold Separately (Large RN) | | |



Point Styles



1000 Series Syringes (Cont.)

Luer Tip Syringes



| P/N | Volume | Needle Hub |
|-------|--------|------------|
| 81301 | 1 mL | Kel-F Hub |
| 81401 | 2.5 mL | Kel-F Hub |
| 81501 | 5 mL | Kel-F Hub |
| 81601 | 10 mL | Kel-F Hub |

ChemSeal Syringes



| P/N | Volume | Needle Hub |
|-------|--------|---------------------|
| 81360 | 1 mL | No Needle Available |
| 81460 | 2.5 mL | No Needle Available |
| 81560 | 5 mL | No Needle Available |
| 81660 | 10 mL | No Needle Available |

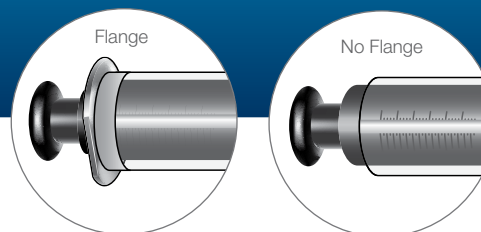
Luer Lock Syringes



| P/N | Volume | Needle Hub | With Flange |
|-------|--------|--------------------|-------------|
| 81320 | 1 mL | Metal or Kel-F Hub | Yes |
| 81420 | 2.5 mL | Metal or Kel-F Hub | Yes |
| 81520 | 5 mL | Metal or Kel-F Hub | Yes |
| 81620 | 10 mL | Metal or Kel-F Hub | Yes |
| 82520 | 25 mL | Metal or Kel-F Hub | Yes |
| 82521 | 25 mL | Metal or Kel-F Hub | No |
| 85020 | 50 mL | Metal or Kel-F Hub | Yes |
| 85021 | 50 mL | Metal or Kel-F Hub | No |
| 86020 | 100 mL | Metal or Kel-F Hub | Yes |

Syringe Without Flange

The flange on a 25 mL and 50 mL syringe can interfere with mounting the syringe into a syringe pump. For these cases the syringes are available without a flange.



Super Syringes

The Hamilton Super Syringe is a large volume Gastight syringe. These syringes are ideal for dispensing volumes from 50 mL up to 2 L. Super Syringes are the only Hamilton syringes that are made with an acrylic barrel instead of glass.

Super Syringes



| P/N | Volume | Needle Hub |
|-------|--------|--------------------|
| 86311 | 500 mL | Metal or Kel-F Hub |
| 86312 | 1 L | Metal or Kel-F Hub |
| 86313 | 1.5 L | Metal or Kel-F Hub |
| 86314 | 2 L | Metal or Kel-F Hub |





Calibrated Syringes

Hamilton Company offers a calibration service for precision Calibrated Syringes and Digital Syringes. A Certificate of Calibration is provided with the product and the procedure is performed with an unbroken chain of calibrations traceable to N.I.S.T. standards. Calibrated precision syringes are available only at the time of purchase. Most non-custom syringes

are available as calibrated; a complete listing of part numbers is available at hamiltoncompany.com. A calibrated syringe is ordered by adding the prefix "CAL" to the beginning of the syringe part number. For example, to order a calibrated 701N, 10 μ L syringe (part number 80300), part number CAL80300 should be requested.

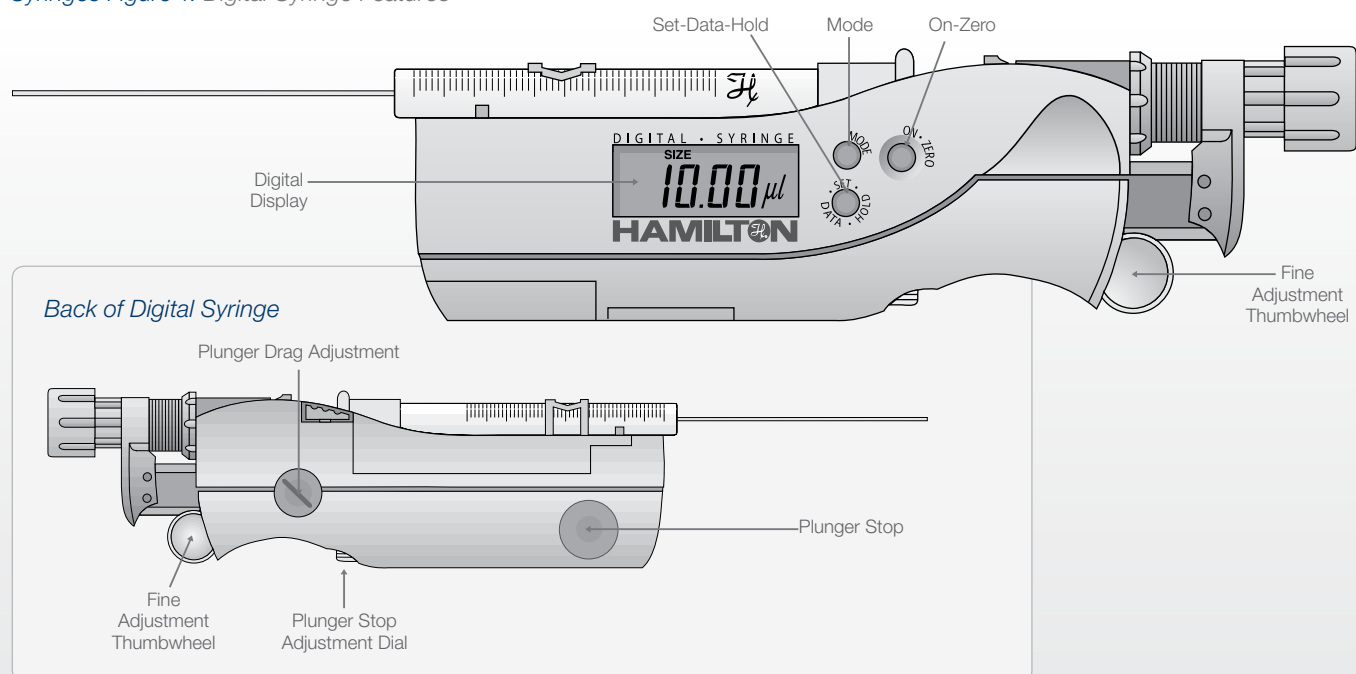


Digital Syringes

Reading graduations can be a challenge. The Hamilton Digital Syringe eliminates parallax errors by providing a digital readout on its integrated LCD screen. An adjustable plunger-stop guarantees reproducible plunger placement. Easily achieve precision while dispensing volumes ranging from 50 nL up to 500 μ L. This syringe is operated by manually moving the plunger.

The Digital Syringe base unit is compatible with the 700 (page 17), 1700 (page 21), and 7000 (page 19) series syringes. Not all syringes are available as a Digital Syringe; check the syringe series page for availability. A Digital Syringe is ordered by adding the prefix “DS” to the beginning of the syringe part number. For example, to order a digital 701N, 10 μ L syringe (part number 80300), part number DS80300 should be requested.

Syringes Figure 1. Digital Syringe Features





Chromatography and Analysis Syringes

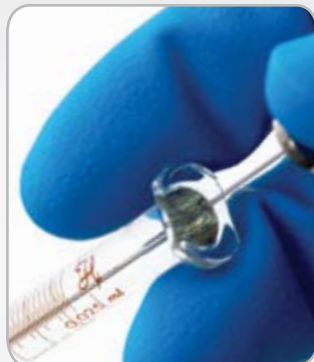
In the late 1940's while working in the radiation lab at UC Berkeley, Clark Hamilton developed various devices, including glove box syringes for handling radioactive material. By the early 1960's Clark learned about additional liquid handling needs in the field of gas chromatography during a visit to Perkin-Elmer where he set out and developed the first micro syringe for accurate sample injection into GC instruments. In the early 1960's, two major gas chromatography companies,

F&M Scientific and Wilkens Aerograph, approached Hamilton Company to produce high accuracy syringes for the purpose of introducing exact, small volume injections into their GC systems. F&M Scientific and Wilkens Aerograph later became Agilent and Varian, and Hamilton continues to provide syringes for manual and automated injection into their instruments as well as many other GC and HPLC manufacturers.



Manual HPLC Syringes

HPLC syringes are equipped with a point style 3 needle to fit HPLC injection valve seats without damaging the rotor seal.



Manual HPLC Syringes

P. 30

HPLC Autosampler Syringes

A wide variety of syringes are offered to fit most HPLC autosamplers on the market.



HPLC Autosampler Syringes

P. 33

Manual GC Syringes

GC syringes are fitted with a point style 2 or point style AS needle to pierce injection port septa without damage.



Manual GC Syringes

P. 39

GC Autosampler Syringes

A wide selection of syringes fit most GC autosamplers in the lab.



GC Autosampler Syringes

P. 44

Thin-Layer Chromatography (TLC) Syringes

The needle points on Thin-Layer Chromatography (TLC) syringes are coated with a PTFE layer to reduce the surface tension between the needle and the liquid for reproducible sample spotting.



Thin-Layer Chromatography (TLC) Syringes

P. 54

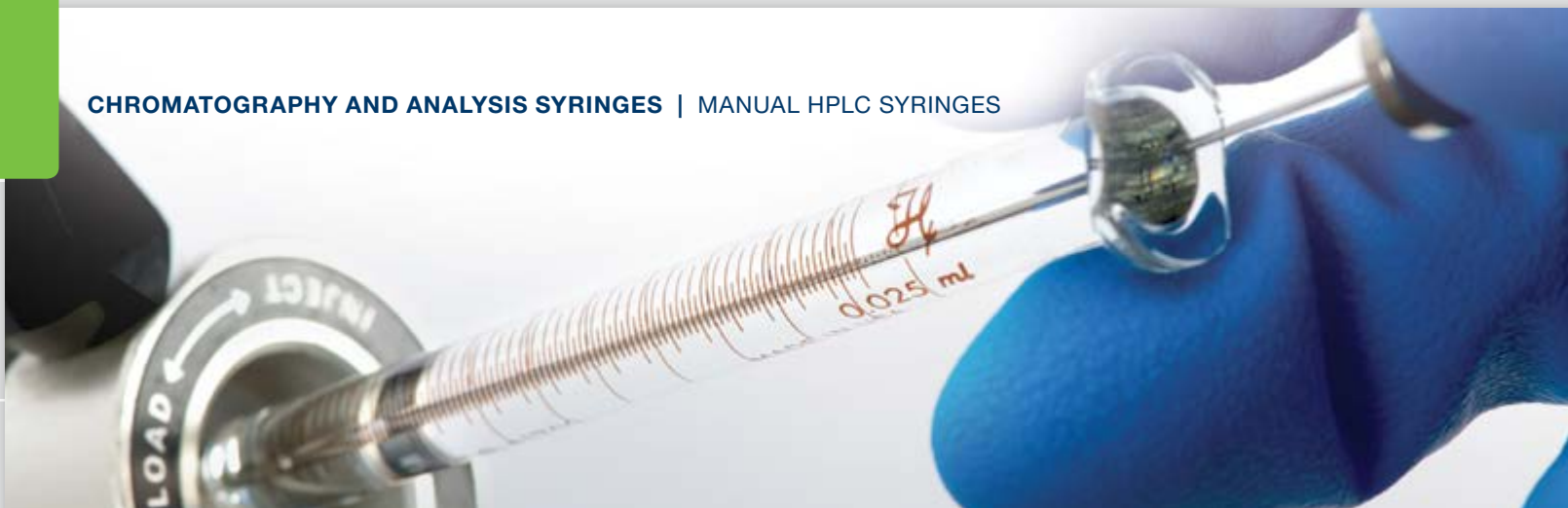
Carbon Analyzer Syringes

This family of syringes is designed for water analysis in Total Organic Carbon (TOC) analyzers.



Carbon Analyzer Syringes

P. 55



Manual HPLC Syringes

HPLC syringes are specifically designed for manual or automatic injection into high pressure ports. The needle is blunt and electro-polished to slide smoothly into the injection port, reducing the wear on critical seals. The selection of the appropriate syringe for HPLC applications takes the following three aspects into account: the type of injection valve, the sample properties,

and the injection volume. The volume of the syringe should be selected based on the volume and type of injection. In partial loop filling, the injection volume should not be greater than half of the loop capacity. In complete loop filling, where the loop size sets the injection volume, the syringe capacity should be greater than twice the loop volume.

Rheodyne, Valco, Beckman, and SSI Valves

2.5 μ L to 1 mL



P. 31

Constant Rate Syringes

20 μ L to 200 μ L



P. 31

Valco VISF-1 Injection Valves

25 μ L to 10 mL



P. 32

Waters Manual Syringes

10 μ L to 250 μ L



P. 32



Rheodyne, Valco, Beckman, and SSI Valves

Syringes for Rheodyne, Valco, Beckman, and SSI Valves. These syringes are available in Cemented Needle (N), Luer Tip Cemented Needle (LTN), and Removable Needle (RN) terminations. For more details on the terminations see page 12. The needles in this section are 51 mm in length and are point style 3.

Removable Needle (RN)



| P/N | Volume | Series | Gauge |
|-------|--------|--------|--------|
| 87942 | 2.5 µL | 600 | 22s ga |
| 87943 | 5 µL | 600 | 22s ga |
| 80065 | 10 µL | 1700 | 22s ga |
| 80265 | 25 µL | 1700 | 22s ga |
| 80965 | 50 µL | 1700 | 22s ga |
| 81065 | 100 µL | 1700 | 22s ga |
| 81165 | 250 µL | 1700 | 22 ga |
| 81265 | 500 µL | 1700 | 22 ga |
| 81365 | 1 mL | 1000 | 22 ga |

Cemented Needle (N)



| P/N | Volume | Series | Gauge |
|-------|--------|--------|--------|
| 80365 | 10 µL | 700 | 22s ga |
| 80465 | 25 µL | 700 | 22s ga |
| 80275 | 25 µL | 1700 | 22s ga |
| 80565 | 50 µL | 700 | 22s ga |
| 80975 | 50 µL | 1700 | 22s ga |
| 80985 | 50 µL | 1700 | 22 ga |
| 80665 | 100 µL | 700 | 22s ga |
| 81075 | 100 µL | 1700 | 22s ga |
| 81085 | 100 µL | 1700 | 22 ga |
| 80765 | 250 µL | 700 | 22 ga |
| 80865 | 500 µL | 700 | 22 ga |

Luer Tip Cemented Needle (LTN)



| P/N | Volume | Series | Gauge |
|-------|--------|--------|--------|
| 81175 | 250 µL | 1700 | 22s ga |
| 81185 | 250 µL | 1700 | 22 ga |
| 81216 | 500 µL | 1700 | 22 ga |

Constant Rate Syringes

The CR700 Constant Rate Syringes have preset volumes that can be dispensed at a constant flow rate. The volume is adjustable with a precisely adjustable micrometer screw. The adjusted volume can be fixed with a locking ring. Reproducible injection speed is obtained by means of a spring. The sample is delivered by pressing the push button. Constant Rate Syringe needles are 51 mm in length and point style 3.



| P/N | Volume | Series | Gauge |
|-------|--------|--------|--------|
| 84301 | 20 µL | 1700 | 22s ga |
| 84303 | 50 µL | 1700 | 22 ga |
| 84302 | 200 µL | 1700 | 22 ga |



Valco VISF-1 Injection Valves

Syringes for Valco VISF-1 Injection Valves. These syringes have the Removable Needle (RN) termination. For more details on the terminations see page 12. The needles in this section are 19 mm in length and are point style 3.



| P/N | Volume | Series | Gauge | Replacement Needles |
|-------|--------|--------|--------|---------------------|
| 80231 | 25 µL | 1700 | 22s ga | 7787-01 |
| 80931 | 50 µL | 1700 | 22s ga | 7787-01 |
| 81031 | 100 µL | 1700 | 22s ga | 7787-01 |
| 81131 | 250 µL | 1700 | 22s ga | 7806-02 |
| 81231 | 500 µL | 1700 | 22 ga | 7787-02 |
| 81331 | 1 mL | 1000 | 22 ga | 7787-02 |
| 81431 | 2.5 mL | 1000 | 22 ga | 7787-02 |
| 81531 | 5 mL | 1000 | 22 ga | 7787-02 |
| 81631 | 10 mL | 1000 | 22 ga | 7787-02 |

Waters Manual Syringes

Gastight and Microliter series syringes come with a 25s gauge, 50 mm removable needle to work with the Waters U6K HPLC valve.



| P/N | Volume | Series | Gauge | Replacement Needles |
|-------|--------|--------|--------|---------------------|
| 84815 | 10 µL | 800 | 25s ga | 8647-01 |
| 84816 | 25 µL | 800 | 25s ga | 8647-01 |
| 80238 | 25 µL | 1700 | 25s ga | 8647-01 |
| 84980 | 25 µL | 1800 | 25s ga | 8647-01 |
| 84817 | 50 µL | 800 | 25s ga | 8647-01 |
| 80938 | 50 µL | 1700 | 25s ga | 8647-01 |
| 84983 | 50 µL | 1800 | 25s ga | 8647-01 |
| 84818 | 100 µL | 800 | 25s ga | 8647-01 |
| 81038 | 100 µL | 1700 | 25s ga | 8647-01 |
| 84986 | 100 µL | 1800 | 25s ga | 8647-01 |
| 84819 | 250 µL | 800 | 25s ga | 8648-01 |
| 81138 | 250 µL | 1700 | 25s ga | 8648-01 |
| 84989 | 250 µL | 1800 | 25s ga | 8648-01 |

Part number 84891 is a kit that consists of a 10, 25, 50, 100, and 250 µL 800 series barrel/plunger assemblies, holder assembly, six-pack (25s/50 mm/3) small hub needles, and six-pack (25s/50 mm/3) large hub needles.

Part number 81610 is a 10 mL TLL syringe used for priming Waters syringes which can be used with 90149 Kel-F Hub Needles or 90049 Metal Hub Needles.



Point Styles

Point 2  Point 3  Point 4  Point 5  Point AS 



HPLC Autosampler Syringes

HPLC autosamplers enable the automatic introduction of samples into the sample loop as well as some sample preparation. Automatic injection has become very common, as it provides improved reproducibility and speed. Hamilton offers a wide range of HPLC autosampler syringes.

The features of the autosampler syringes are adapted for an exact fit to a specific autosampler.

| Manufacturer | Model | For Syringes, See Model: | Page |
|-----------------|--|--|-------------------------|
| Agilent | 1290 Infinity LC Injector ProStar 410/420/430 | PAL LC HTC, HTS Syringes Spark Holland Syringes | P. 34 P. 37 |
| Antec | AS 100/110 | Spark Holland Syringes | P. 37 |
| Beckman Coulter | 508 | Spark Holland Syringes | P. 37 |
| CTC/LEAP | A200S PAL LC HTC, HTS Syringes | | P. 34 P. 34 |
| Dionex | ASI-100 ESA Model 540/540 MT/542 Ultimate 3000 | Spark Holland Syringes PAL LC HTC, HTS Syringes | P. 35 P. 37 P. 34 |
| Grace Alltech | Model 580 | Spark Holland Syringes | P. 37 |
| Hitachi LaChrom | L-2200, 7200, 7250, 8800, 8900, AS 1000, 2000 | | P. 35 |
| Kontron | 360, 460, 465 | | P. 36 |
| Perkin Elmer | Flexar FX-10, FX-15, Series 225 Series 220 | Spark Holland Syringes | P. 37 P. 36 |
| Shimadzu | SIL-6A SIL-10AF, SIL-10AP | | P. 36 P. 36 |
| Spark Holland | Midas, Triathlon, Endurance, Alias | | P. 37 |
| Thermo Finnigan | AS 100/300, AS 1000/3000/3500 SP 8780, SP 8875, SP 8880 | | P. 37 P. 38 |
| Varian | ProStar 410/420/430 9100 | Spark Holland Syringes | P. 37 P. 38 |
| Waters | 717 PLUS, WISP 2707 2777 | Spark Holland Syringes PAL LC HTC, HTS Syringes | P. 38 P. 37 P. 34 |



CTC LEAP Syringes

A200S

Cemented Needle Syringes



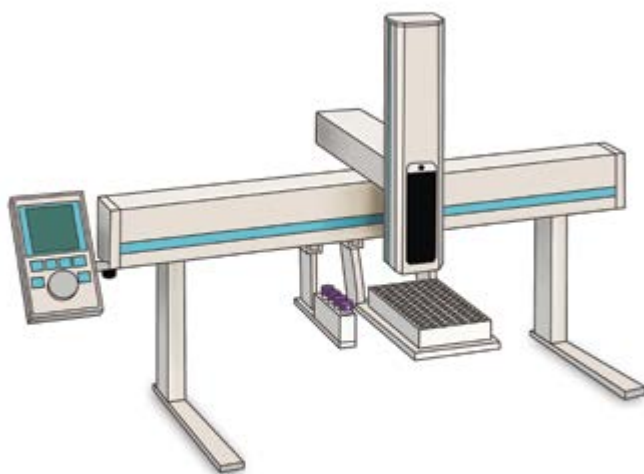
| P/N | Volume | Gauge | Length | Point |
|--------|--------|--------|--------|-------|
| 203560 | 10 µL | 22s ga | 51 mm | 3 |
| 203566 | 100 µL | 22s ga | 51 mm | 3 |

CTC PAL Syringes

PAL LC HTC, HTS

CTC PAL® autosamplers are one of the most popular sample injection systems for HPLC analyses. Customers rely on its ability to sample from many different vial and well types and on its ultimate platform flexibility. The syringe is at the heart of every injection that the LC PAL® system performs, and CTC chose Hamilton to provide this critical component.

This section has syringes for PAL LC instruments. This section also includes syringes for Agilent, Dionex, and Waters as these instruments are a private label for CTC.



S-Line Syringes

S-Line syringes are the cost-effective choice for CTC PAL autosampler applications. It incorporates a precision-machined PTFE plunger tip which creates a leak-free seal. With the tight fit in the glass barrel, the tip wipes the interior of the syringe barrel free of sample, minimizing sample carryover.

C-Line Syringes

C-Line syringes incorporate several unique design features that ensure superior performance. The unique flange alignment design aids in installation and results in fewer bent needles while the plunger button can be adjusted to prevent plunger tip damage. An innovative direct attachment design of the needle to the barrel minimizes sample carryover.

X-Type Syringes

X-Type syringes have a near zero carryover and a long-lasting plunger tip to meet the requirements of sensitive, high-throughput life science applications. The syringe glass barrel is polished and coated for chemical inertness and enhanced lifetime. The needle is deactivated and coated to reduce sample adsorption.

S-Line Syringes



| P/N | Volume | Barrel (O.D.) | Gauge | Point |
|----------|--------|---------------|--------|-------|
| 67444-01 | 10 µL | 6.6 mm | 22s ga | 3 |
| 67446-01 | 25 µL | 7.9 mm | 22s ga | 3 |
| 67450-01 | 50 µL | 6.6 mm | 22 ga | 3 |
| 67452-01 | 100 µL | 6.6 mm | 22s ga | 3 |
| 67442-01 | 250 µL | 7.9 mm | 22 ga | 3 |
| 67448-01 | 500 µL | 7.9 mm | 22 ga | 3 |



CTC PAL Syringes (Cont.)

C-Line Syringes



| P/N | Volume | Barrel (O.D.) | Gauge | Point |
|----------|--------|---------------|--------|-------|
| 203073* | 10 µL | 6.6 mm | 22s ga | 3 |
| 203194 | 10 µL | 6.6 mm | 22s ga | 3 |
| 203274 | 25 µL | 6.6 mm | 22s ga | 3 |
| 203075 | 25 µL | 7.9 mm | 22s ga | 3 |
| 203077 | 100 µL | 6.6 mm | 22s ga | 3 |
| 203235 | 100 µL | 6.6 mm | 22 ga | 3 |
| 203079 | 250 µL | 7.9 mm | 22 ga | 3 |
| 203349 | 500 µL | 7.9 mm | 22 ga | 3 |
| 203081** | 1 mL | 7.6 mm | 22 ga | 3 |
| 203083** | 2.5 mL | 9.65 mm | 22 ga | 3 |
| 203085** | 5 mL | 13.6 mm | 22 ga | 3 |

*This syringe is a Microliter Syringe.

**These syringes are a Luer Tip Cemented Needle (LTN) termination.

X-Type Syringes



| P/N | Volume | Barrel (O.D.) | Gauge | Point |
|---------|--------|---------------|--------|-------|
| 204475 | 25 µL | 7.9 mm | 22s ga | 3 |
| 204379 | 50 µL | 7.9 mm | 22s ga | 3 |
| 204452 | 100 µL | 6.6 mm | 22s ga | 3 |
| 204400 | 100 µL | 6.6 mm | 22 ga | 3 |
| 202668* | 100 µL | 6.6 mm | | |

* This part number is a Removable Needle (RN) termination.

Dionex Gina Syringes

ASI-100



Removable Needle (RN)



| P/N | Volume |
|------------------------------|--------|
| 7654-01 (no needle included) | 25 µL |
| 7657-01 (no needle included) | 250 µL |

Hitachi LaChrom Syringes

L-2200, L-7200,
L-7250, L-8800,
L-8900, AS1000,
AS2000



Special Termination



| P/N | Volume |
|---------|--------|
| 0160310 | 500 µL |



Point Styles

Point 2 Point 3 Point 4 Point 5 Point AS

Kontron HPLC Syringes

360, 460, 465



Accudil (AD)



| P/N | Volume |
|--------|--------|
| 201050 | 100 µL |

Perkin Elmer Syringes

SERIES 220



ChemSeal (C)



| P/N | Volume |
|-------|--------|
| 80962 | 50 µL |
| 81062 | 100 µL |
| 81162 | 250 µL |
| 81262 | 500 µL |
| 81360 | 1 mL |
| 81460 | 2.5 mL |

Shimadzu Syringes

SIL-6A



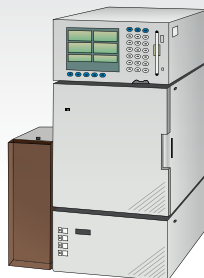
Removable Needle (RN)



| P/N | Volume |
|------------------------------|--------|
| 7656-01 (no needle included) | 100 µL |

Shimadzu Syringes

SIL-10AF,
SIL-10AP



ChemSeal (C)



| P/N | Volume |
|-------|--------|
| 81260 | 500 µL |
| 81460 | 2.5 mL |

Spark Holland Syringes

This section has syringes for Spark Holland instruments. This section also includes syringes for Agilent, Antec, Beckman, Dionex, Grace Alltech, Perkin Elmer, Varian, and Waters as these instruments are a private label for Spark Holland.

ChemSeal (C)



| P/N | Volume |
|----------|-------------|
| 62161-01 | 25 μ L |
| 54658-01 | 100 μ L |
| 54659-01 | 250 μ L |
| 54660-01 | 500 μ L |
| 54661-01 | 1 mL |
| 54662-01 | 2.5 mL |



Midas



Triathlon



Alias



Endurance

Thermo Finnigan Syringes

AS100/300,
AS1000/3000/3500



ChemSeal (C)



| P/N | Volume |
|-------|-------------|
| 81162 | 250 μ L |
| 81262 | 500 μ L |
| 81360 | 1 mL |
| 81460 | 2.5 mL |



Thermo Finnigan Syringes

SP 8780, SP 8875,
SP 8880



ChemSeal (C)



| P/N | Volume |
|--------|-------------|
| 202192 | 500 μ L |
| 81460 | 2.5 mL |

Varian Syringes

9100



ChemSeal (C)



| P/N | Volume |
|---------|-------------|
| 0159902 | 100 μ L |

Waters Syringes

717 PLUS, WISP



ChemSeal (C)



| P/N | Volume |
|-------|-------------|
| 80020 | 25 μ L |
| 80024 | 250 μ L |





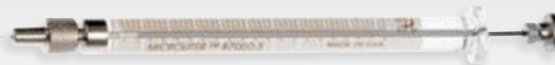
Manual GC Syringes

Hamilton provides a variety of syringes that are designed for use with manual GC injection ports. Our syringes are handmade with an unmatched attention to detail. The manufacturing process and quality assurance procedures ensure that every syringe we sell will provide superior

accuracy and precision as well as cycle life. The non-coring, point style 2 needles are ideal for penetrating septa while maximizing the life of the seal. Choose the sub category that is associated with your injection method to find the appropriate syringe for your application.

Standard Injection

0.5 μ L to 500 μ L



P. 40

Purge and Trap Syringes

5 mL and 25 mL



P. 42

SampleLock Syringes

50 μ L to 100 μ L



P. 42

On-Column Injection Syringes

0.5 μ L and 10 μ L



P. 43



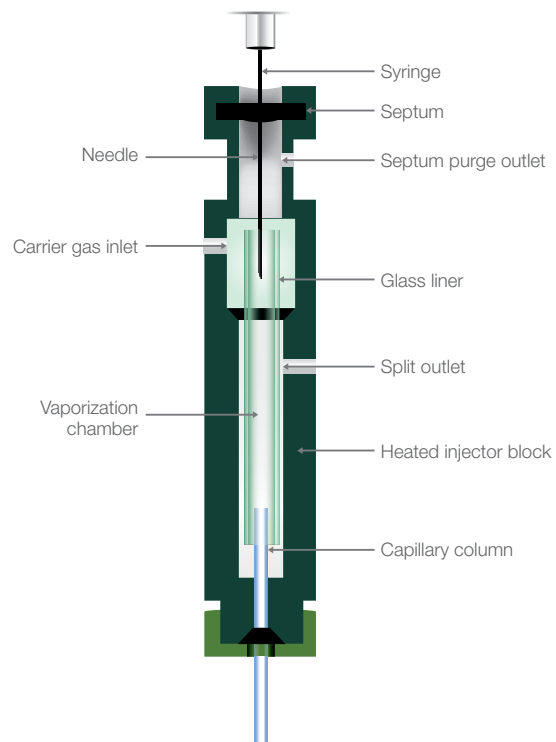
Standard Injection

A split/splitless injector consists of a heated chamber with a glass liner into which the sample is injected through the septum. A microsyringe is used to inject the sample through a rubber septum into a flash vaporizer chamber at the head of the column. The sample vaporizes to form a mixture of carrier gas, vaporized solvent, and vaporized analytes. In the split mode, only a proportion of this mixture reaches the column, while most sample exits through the split outlet. This avoids overloading the column. In the splitless mode, the split vent is closed so that the vaporized analyte passes onto the column. This mode is more sensitive and adequate for trace analysis.

Common syringe features for split/splitless injection include:

- Microliter syringes for liquid samples and Gastight syringes for gas and liquid samples
- Common volume range from 0.5 μL to 50 μL
- Needle with point style 2 to pierce the rubber septum
- Needle length of 51 mmww to reach the middle of the glass liner. Splitless injection of small volumes may be performed with a 70 mm needle to deliver the sample close to the column entrance.

Syringes Figure 2. Illustration of a split/splitless injector



Standard Injection (Cont.)

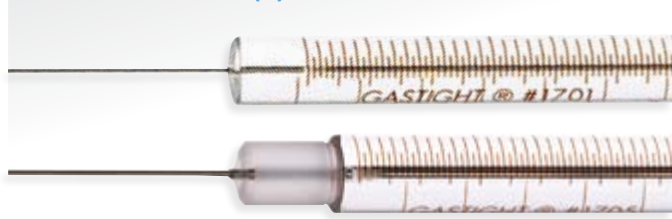
Knurled Hub (KH)



| P/N | Volume | Series | Gauge |
|-------|--------|--------|-------|
| 86259 | 0.5 µL | 7000 | 25 ga |
| 86211 | 1 µL | 7000 | 22 ga |
| 80135 | 1 µL | 7000 | 25 ga |
| 88511 | 2 µL | 7000 | 23 ga |
| 88411 | 2 µL | 7000 | 25 ga |
| 88011 | 5 µL | 7000 | 24 ga |

Note: The needle length for these syringes is 70 mm.

Cemented Needle (N)



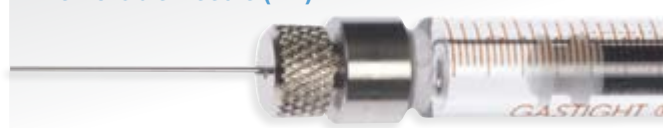
| P/N | Volume | Series | Gauge |
|-------|--------------|--------|--------|
| 87900 | 5 µL | 700 | 26s ga |
| 84850 | 5 µL | 800 | 26s ga |
| 80300 | 10 µL | 700 | 26s ga |
| 80366 | 10 µL – 6 pk | 700 | 26s ga |
| 84852 | 10 µL | 800 | 26s ga |
| 80000 | 10 µL | 1700 | 26s ga |
| 84875 | 10 µL | 1800 | 26s ga |
| 80400 | 25 µL | 700 | 22s ga |
| 84854 | 25 µL | 800 | 22s ga |
| 80200 | 25 µL | 1700 | 22s ga |
| 84878 | 25 µL | 1800 | 22s ga |
| 80500 | 50 µL | 700 | 22s ga |
| 84856 | 50 µL | 800 | 22s ga |
| 80900 | 50 µL | 1700 | 22s ga |
| 84881 | 50 µL | 1800 | 22s ga |
| 80600 | 100 µL | 700 | 22s ga |
| 84858 | 100 µL | 800 | 22s ga |
| 81000 | 100 µL | 1700 | 22s ga |
| 84884 | 100 µL | 1800 | 22s ga |
| 80700 | 250 µL | 700 | 22s ga |
| 84887 | 250 µL | 1800 | 22s ga |
| 80800 | 500 µL | 700 | 22 ga |

Luer Tip Cemented Needle (LTN)



| P/N | Volume | Series | Gauge |
|-------|--------|--------|--------|
| 81100 | 250 µL | 1700 | 22s ga |
| 81217 | 500 µL | 1700 | 22 ga |

Removable Needle (RN)



| P/N | Volume | Series | Gauge |
|-------|--------------|--------|--------|
| 87930 | 5 µL | 700 | 26s ga |
| 84851 | 5 µL | 800 | 26s ga |
| 80330 | 10 µL | 700 | 26s ga |
| 80336 | 10 µL – 6 pk | 700 | 26s ga |
| 84853 | 10 µL | 800 | 26s ga |
| 80030 | 10 µL | 1700 | 26s ga |
| 84877 | 10 µL | 1800 | 26s ga |
| 80430 | 25 µL | 700 | 22s ga |
| 84855 | 25 µL | 800 | 22s ga |
| 80230 | 25 µL | 1700 | 22s ga |
| 84880 | 25 µL | 1800 | 22s ga |
| 80530 | 50 µL | 700 | 22s ga |
| 84857 | 50 µL | 800 | 22s ga |
| 80930 | 50 µL | 1700 | 22s ga |
| 84883 | 50 µL | 1800 | 22s ga |
| 80630 | 100 µL | 700 | 22s ga |
| 84859 | 100 µL | 800 | 22s ga |
| 81030 | 100 µL | 1700 | 22s ga |
| 84886 | 100 µL | 1800 | 22s ga |
| 80730 | 250 µL | 700 | 22s ga |
| 84861 | 250 µL | 800 | 22s ga |
| 81130 | 250 µL | 1700 | 22s ga |
| 84889 | 250 µL | 1800 | 22s ga |
| 80830 | 500 µL | 700 | 22 ga |
| 81230 | 500 µL | 1700 | 22 ga |

Purge and Trap Syringes

These syringes are ideal for purge and trap applications because the plunger can be easily removed to load water samples into the syringe barrel. Internal standard or a surrogate spike can be added through the twist valve with a 10 μ L syringe. The sample syringe can also be connected directly to the purge and trap valve via the integral male luer fitting.

Hamilton 5 mL and 25 mL Purge and Trap syringes were designed for the analysis of drinking water samples according to EPA purge and trap concentration techniques (see EPA methods 502.1, 502.2, 503.1, 524.1, and 524.2).

Special Termination

| P/N | Volume |
|-------|--------|
| 81570 | 5 mL |
| 82570 | 25 mL |

Note: These syringes work with valve part number 86789.



SampleLock Syringes

The Hamilton SampleLock syringes allow the collection, storage, transportation, and analysis of liquid or gaseous samples without the danger of evaporative loss or environmental contamination. Syringes are available in sizes ranging from 50 μ L to 100 mL. An easy-to-use twist valve and a positive rear stop on SampleLock prevents loss of sample and plunger blowout. Optional male luer and female luer lock adapter threads on the SampleLock valve making the syringes compatible with a multitude of connectors and fittings. These adapters may be found on page 73. The needles in this section are 51 mm in length and are point style 2.

SampleLock (SL)



| P/N | Volume | Gauge |
|-------|-------------|--------|
| 80956 | 50 μ L | 22s ga |
| 81056 | 100 μ L | 22s ga |
| 81156 | 250 μ L | 22s ga |
| 81256 | 500 μ L | 22 ga |
| 81356 | 1 mL | 22 ga |
| 81456 | 2.5 mL | 22 ga |
| 81556 | 5 mL | 22 ga |
| 81656 | 10 mL | 22 ga |
| 86326 | 25 mL | 22 ga |
| 86336 | 50 mL | 22 ga |
| 86346 | 100 mL | 22 ga |



Point Styles

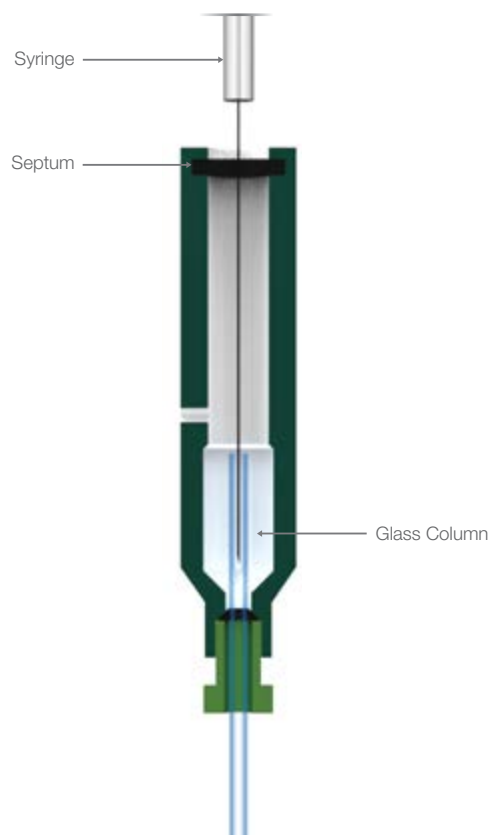
Point 2  Point 3  Point 4  Point 5  Point AS 

On-Column Injection Syringes


On-column injection employs the direct introduction of the liquid sample into the column. This is very useful for the analysis of thermally unstable samples and avoids boiling point discrimination. On-column injection uses point style 3 syringes with the following features:

- Small outer diameter needles adjusted to the inner diameter of the column (0.17 mm needle for columns with 0.25 mm inner diameter, 32 gauge for columns with 0.32 mm inner diameter, and 26 gauge for columns with a 0.53 mm inner diameter)
- Longer needles tailored to pass through the injector and reach within the capillary column
- Point style 3 adapted to the typical septum of the on-column injector

Syringes Figure 3. Illustration of an On-Column Injector



Knurled Hub (KH)



| P/N | Volume | Series | Gauge | Length |
|-------|--------|--------|-------|--------|
| 86257 | 0.5 µL | 7000 | 32 ga | 100 mm |

Cemented Needle (N)



| P/N | Volume | Series | Gauge | Length |
|-------|--------|--------|-------|--------|
| 80351 | 10 µL | 700 | 32 ga | 75 mm |

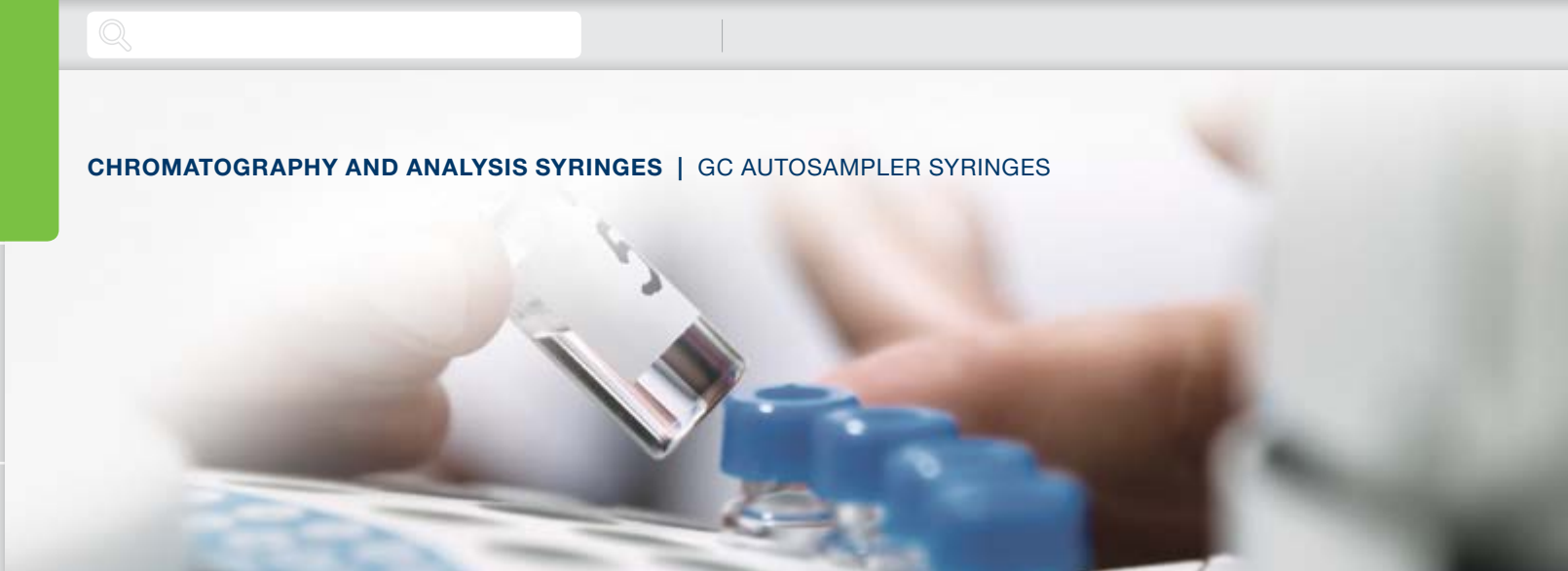
Removable Needle (RN)



| P/N | Volume | Series | Gauge | Length |
|--------|--------|--------|---------|--------|
| 80331 | 10 µL | 700 | 0.17 mm | 115 mm |
| 80386* | 10 µL | 700 | 32 ga | 125 mm |
| 87402 | 10 µL | 700 | 0.17 mm | 100 mm |
| 87404 | 10 µL | 1700 | 0.17 mm | 100 mm |
| 87405 | 10 µL | 1800 | 0.17 mm | 100 mm |

*This is a point style 2 needle.





GC Autosampler Syringes

Autosamplers enable the automatic introduction of samples into the injector of the gas chromatograph (GC). Automatic injection has become very common as it improves reproducibility and speed.

Hamilton offers a wide range of autosampler syringes. The features of the autosampler syringes are adapted for an exact fit to a specific

autosampler. The point style AS (for autosampler) has been specifically designed to withstand repeated penetration through the GC septa. Syringes for headspace injection usually have a point style 5, which is ideal for large gas volume injection.

| Manufacturer | Model | For Syringes, See Model: | Page |
|-----------------|--|---------------------------------|-------|
| Agilent | 7670, 7671, 7672 ALS 7673, 7683, 6850 ALS 7693A ALS | | P. 45 |
| | | | P. 46 |
| | | | P. 48 |
| Bruker Varian | 8100, 8200 CP-8400/8410, CP-9010/9050 CP-9020/9025 | | P. 49 |
| | | | P. 49 |
| | | | P. 49 |
| CTC / LEAP | CombiPAL (Headspace) CTC/LEAP PAL GC | | P. 51 |
| | | | P. 50 |
| Gerstel | | CTC/LEAP PAL GC | P. 50 |
| Perkin Elmer | AutoSystem Clarus 500 GC | | P. 52 |
| | | | P. 52 |
| Shimadzu | AOC-9 AOC-14, AOC-17, AOC-20 AOC-5000 | | P. 52 |
| | | | P. 52 |
| | | CTC / LEAP CombiPAL (Headspace) | P. 51 |
| Thermo Finnigan | AI/AS 3000 TriPlus AS 800/2000 HS 250/500/850 TriPlus | | P. 53 |
| | | | P. 53 |
| | | | P. 53 |
| | | CTC/LEAP PAL GC | P. 50 |



Agilent Syringes

7670, 7671, 7672 ALS

Hamilton maintains a large variety of replacement syringes for the most popular gas chromatography (GC) autosamplers, including the Agilent Automatic Liquid Sampler (ALS) instrument.

Hamilton has designed a series of syringes specifically for Agilent ALS autosamplers that meets the instruments' requirements for dimensional accuracy, needle length, needle gauge, needle tip, and overall lifetime. Every Agilent syringe produced by Hamilton undergoes quality control procedures that ensure they meet the strictest standards for accuracy, precision, and product life cycle.

Cemented Needle (N)



| P/N | Volume | Gauge | Length | Point |
|--------|--------------|--------|--------|-------|
| 87900 | 5 µL | 26s ga | 51 mm | 2 |
| 80300 | 10 µL | 26s ga | 51 mm | 2 |
| 80366 | 10 µL – 6 pk | 26s ga | 51 mm | 2 |
| 80000* | 10 µL | 26s ga | 51 mm | 2 |

*This is a Gastight syringe.

Removable Needle (RN)



| P/N | Volume | Gauge | Length | Point |
|--------|--------|--------|--------|-------|
| 80338 | 10 µL | 26s ga | 51 mm | 2 |
| 80011* | 10 µL | 26s ga | 51 mm | 2 |

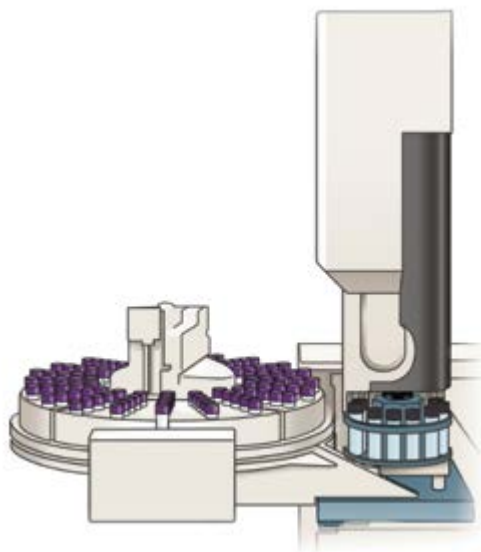
*This is a Gastight syringe.



Agilent Syringes

7673, 7683, 6850 ALS

The Agilent 7683 series automatic liquid sampler raises the standard for gas chromatography (GC) system performance and reliability. This is the automatic sampler to have for accuracy and ease of use, superior reproducibility with minimal rework, easy accommodation to changing needs, optimum injection flexibility, and enduring reliability.



Special Termination



| P/N | Volume | Gauge | Length | Point |
|-------|--------|-------|--------|-------|
| 86274 | 0.5 µL | 26 ga | 43 mm | AS |
| 86276 | 0.5 µL | 23 ga | 43 mm | AS |
| 80175 | 1 µL | 26 ga | 43 mm | AS |
| 80176 | 1 µL | 23 ga | 43 mm | AS |

Cemented Needle (N)



| P/N | Volume | Gauge | Length | Point |
|--------|--------------|--------------|--------|-------|
| 87992 | 5 µL | 26s ga | 43 mm | 2 |
| 87988 | 5 µL | 26s ga | 43 mm | AS |
| 87989 | 5 µL – 6 pk | 26s ga | 43 mm | AS |
| 87991 | 5 µL | 23s ga | 43 mm | 2 |
| 87987 | 5 µL | 23s ga | 43 mm | AS |
| 87990 | 5 µL – 6 pk | 23s ga | 43 mm | AS |
| 87993 | 5 µL | 23s – 26s ga | 43 mm | AS |
| 87994 | 5 µL – 6 pk | 23s – 26s ga | 43 mm | AS |
| 80399 | 10 µL | 26s ga | 43 mm | 2 |
| 80388 | 10 µL | 26s ga | 43 mm | AS |
| 80389 | 10 µL – 6 pk | 26s ga | 43 mm | AS |
| 80398 | 10 µL | 23s ga | 43 mm | 2 |
| 80387 | 10 µL | 23s ga | 43 mm | AS |
| 80390 | 10 µL – 6 pk | 23s ga | 43 mm | AS |
| 80080* | 10 µL | 23s ga | 43 mm | AS |
| 80094* | 10 µL – 6 pk | 23s ga | 43 mm | AS |
| 80393 | 10 µL | 23s – 26s ga | 43 mm | AS |
| 80391 | 10 µL – 6 pk | 23s – 26s ga | 43 mm | AS |
| 80079* | 10 µL | 23s – 26s ga | 43 mm | AS |
| 80096* | 10 µL – 6 pk | 23s – 26s ga | 43 mm | AS |

*These are Gastight syringes.

Removable Needle (RN)



| P/N | Volume | Gauge | Length | Point |
|--------|--------|--------------|--------|-------|
| 87958 | 5 µL | 26s ga | 43 mm | AS |
| 87957 | 5 µL | 23s ga | 43 mm | AS |
| 87959 | 5 µL | 23s – 26s ga | 43 mm | AS |
| 80358 | 10 µL | 26s ga | 43 mm | AS |
| 80088* | 10 µL | 26s ga | 43 mm | AS |
| 80357 | 10 µL | 23s ga | 43 mm | AS |
| 80087* | 10 µL | 23s ga | 43 mm | AS |
| 80359 | 10 µL | 23s – 26s ga | 43 mm | AS |
| 80089 | 10 µL | 23s – 26s ga | 43 mm | AS |

*These are Gastight syringes.



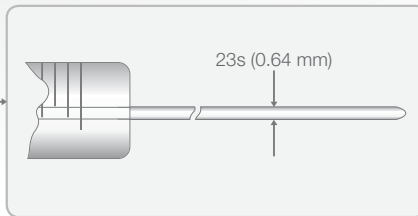
Point Styles

Point 2 Point 3 Point 4 Point 5 Point AS

Needle Gauges

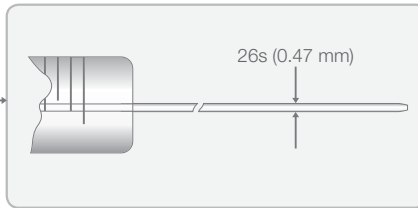
Choosing the Appropriate Agilent Needle

23s Gauge
Needle Syringes



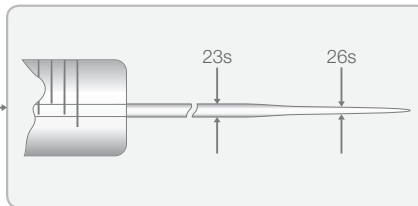
- Merlin Microseal™ septum and standard septum-equipped gas chromatographs
- Packed column injector ports
- Split/splitless injector ports

26s Gauge
Needle Syringes



- On-Column injector ports
- Split/splitless injector ports

23s – 26s (Tapered) Gauge
Needle Syringes

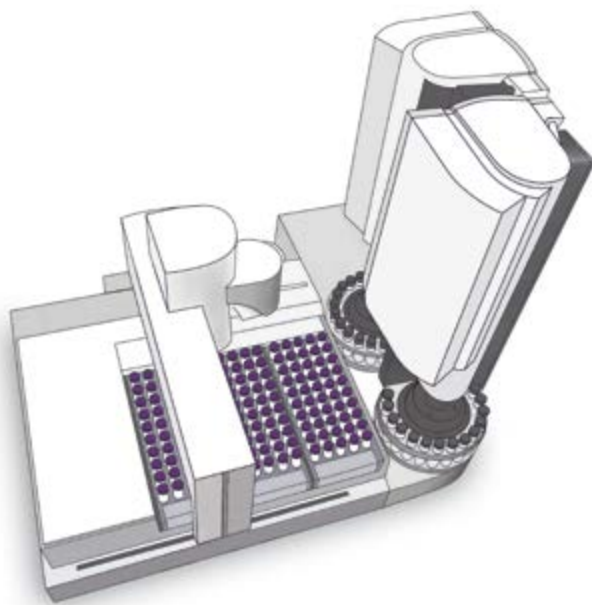


- Durability of a 23s gauge needle
- Ability of a 26s gauge needle to perform split/splitless and on-column injections

Agilent Syringes

7693A ALS

The 7693A builds on the proven Agilent Autosampler technologies that have worked reliably for customers in the past, including dual simultaneous injection and patented fast injection. The 7693A takes it one step further, adding basic sample preparation capabilities such as dilution, internal standard addition, heating, and more.



Special Termination



| P/N | Volume | Gauge | Length | Point |
|-------|--------|-------|--------|-------|
| 86274 | 0.5 µL | 26 ga | 43 mm | AS |
| 86276 | 0.5 µL | 23 ga | 43 mm | AS |
| 80176 | 1 µL | 23 ga | 43 mm | AS |

Cemented Needle (N)



| P/N | Volume | Gauge | Length | Point |
|--------|--------------|--------------|--------|-------|
| 87988 | 5 µL | 26s ga | 43 mm | AS |
| 87989 | 5 µL – 6 pk | 26s ga | 43 mm | AS |
| 87987 | 5 µL | 23s ga | 43 mm | AS |
| 87990 | 5 µL – 6 pk | 23s ga | 43 mm | AS |
| 87993 | 5 µL | 23s – 26s ga | 43 mm | AS |
| 87994 | 5 µL – 6 pk | 23s – 26s ga | 43 mm | AS |
| 80388 | 10 µL | 26s ga | 43 mm | AS |
| 80389 | 10 µL – 6 pk | 26s ga | 43 mm | AS |
| 80387 | 10 µL | 23s ga | 43 mm | AS |
| 80390 | 10 µL – 6 pk | 23s ga | 43 mm | AS |
| 80080* | 10 µL | 23s ga | 43 mm | AS |
| 80094* | 10 µL – 6 pk | 23s ga | 43 mm | AS |
| 80393 | 10 µL | 23s – 26s ga | 43 mm | AS |
| 80391 | 10 µL – 6 pk | 23s – 26s ga | 43 mm | AS |
| 80079* | 10 µL | 23s – 26s ga | 43 mm | AS |
| 80096* | 10 µL – 6 pk | 23s – 26s ga | 43 mm | AS |

*These are Gastight syringes.

Removable Needle (RN)



| P/N | Volume | Gauge | Length | Point |
|--------|--------|--------------|--------|-------|
| 87958 | 5 µL | 26s ga | 43 mm | AS |
| 87957 | 5 µL | 23s ga | 43 mm | AS |
| 87959 | 5 µL | 23s – 26s ga | 43 mm | AS |
| 80358 | 10 µL | 26s ga | 43 mm | AS |
| 80088* | 10 µL | 26s ga | 43 mm | AS |
| 80357 | 10 µL | 23s ga | 43 mm | AS |
| 80087* | 10 µL | 23s ga | 43 mm | AS |
| 80359 | 10 µL | 23s – 26s ga | 43 mm | AS |
| 80089* | 10 µL | 23s – 26s ga | 43 mm | AS |

*These are Gastight syringes.





Bruker Varian Syringes

8100, 8200



Special Termination



| P/N | Volume | Gauge | Length | Point |
|--------|--------|--------|---------|-------|
| 202880 | 10 µL | 26s ga | 50.5 mm | 5 |

Note: Replacement needles for this syringe are part number 202903.

Bruker Varian Syringes

CP-8400/8410,
CP-9010/9050



Cemented Needle (N)



| P/N | Volume | Gauge | Length | Point |
|--------|--------|--------|--------|-------|
| 80300 | 10 µL | 26s ga | 51 mm | 2 |
| 80339 | 10 µL | 26s ga | 51 mm | 5 |
| 80342 | 10 µL | 23s ga | 51 mm | AS |
| 80330* | 10 µL | 26s ga | 51 mm | 2 |

*This is a Removable Needle (RN) syringe.

Bruker Varian Syringes

CP-9020/9025

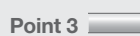
Luer Tip Cemented Needle (LTN)



| P/N | Volume | Gauge | Length | Point |
|--------|--------|-------|--------|-------|
| 202660 | 2.5 mL | 22 ga | 56 mm | 5 |



Point Styles



CTC / LEAP PAL GC Syringes

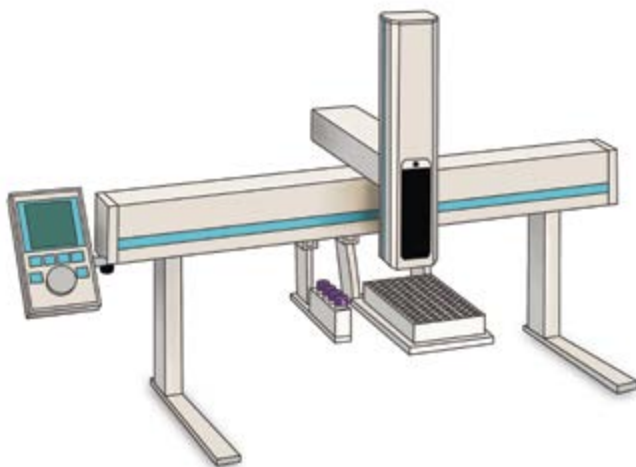
CTC PAL[®] autosamplers are one of the most popular sampling devices on the market today for GC and headspace analyses. Customers rely on its ability to sample from many different vial and well types and on its ultimate platform flexibility. The syringe is at the heart of every injection that the GC PAL[®] system performs, and CTC chose Hamilton to provide this critical component.

S-Line Syringes

S-Line syringes are the cost-effective choice for CTC PAL autosampler applications. S-Line syringes deliver great performance in everyday use for GC injections at an exceptional value. Fast injection speeds in GC analyses put considerable stress on syringe plungers and, as plungers wear the stresses increase, leading to broken syringes and unnecessary downtime and wasted money when samples cannot be analyzed.

C-Line Syringes

C-Line syringes incorporate several unique design features that ensure superior performance. The unique flange alignment design aids in installation and results in fewer bent needles while the plunger button can be adjusted to prevent plunger tip damage. An innovative direct attachment design of the needle to the barrel minimizes sample carryover.



S-Line Syringe



| P/N | Volume | Barrel (O.D.) | Gauge | Point |
|-----------|--------|---------------|--------|-------|
| 67436-01 | 5 µL | 6.6 mm | 26s ga | AS |
| 67438-01 | 10 µL | 6.6 mm | 26s ga | AS |
| 67440-01 | 10 µL | 6.6 mm | 23s ga | AS |
| 67454-01* | 10 µL | 6.6 mm | 23s ga | AS |
| 67430-01* | 25 µL | 7.9 mm | 23 ga | AS |
| 67434-01* | 100 µL | 6.6 mm | 23 ga | AS |

*These are Gastight syringes.

C-Line Syringes



| P/N | Volume | Barrel (O.D.) | Gauge | Point |
|-----------|--------|---------------|--------------|----------|
| 203185 | 1.2 µL | 6.6 mm | 26 ga | AS |
| 203189 | 5 µL | 6.6 mm | 26s ga | AS |
| 203197 | 5 µL | 6.6 mm | Custom | Custom |
| 203205 | 10 µL | 6.6 mm | 26s ga | AS |
| 203363 | 10 µL | 6.6 mm | 23s ga | 2 |
| 203361 | 10 µL | 6.6 mm | 23s ga | AS |
| 203362 | 10 µL | 6.6 mm | 23s – 26s ga | AS |
| 203198 | 10 µL | 6.6 mm | Custom | Custom |
| 203206* | 10 µL | 6.6 mm | Custom | Custom |
| 200740** | 10 µL | 6.6 mm | 32 ga | 4 at 45° |
| 200742*** | 10 µL | 6.6 mm | 32 ga | 4 at 45° |
| 203074* | 25 µL | 6.6 mm | 26s ga | AS |
| 203043* | 25 µL | 7.9 mm | 26s ga | AS |
| 203209* | 25 µL | 6.6 mm | Custom | Custom |
| 203076* | 100 µL | 6.6 mm | 26s ga | AS |
| 203226* | 100 µL | 6.6 mm | Custom | Custom |
| 203078* | 250 µL | 7.9 mm | 26 ga | AS |
| 203219* | 250 µL | 7.9 mm | Custom | Custom |
| 203080* | 500 µL | 7.9 mm | 26 ga | AS |
| 203225* | 500 µL | 7.9 mm | Custom | Custom |

*These are Gastight syringes.

**This part number is 85 mm in length.

***This part number is 75 mm in length.

CTC / LEAP CombiPAL (Headspace) Syringes



HD-Type and HDHT-Type Syringes

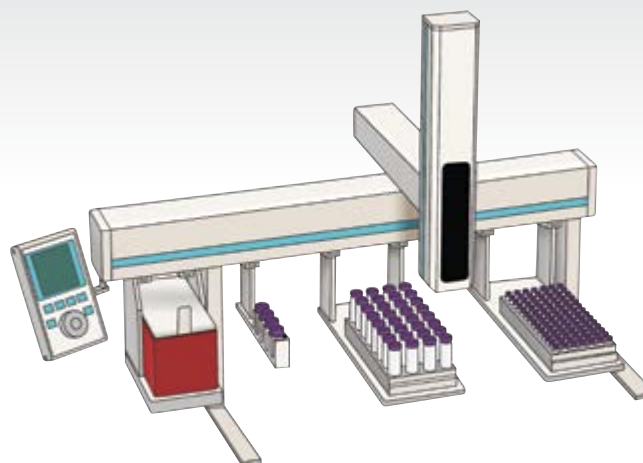
Modern GC headspace analysis requires injecting over large temperature ranges. Conventional headspace syringes on the market use a rubber O-ring sealed plunger which has a limited

sealing performance at high temperatures. This is due to varying thermal expansion between the different materials. The high dynamic HD-Type syringe and HDHT-Type syringes employ a unique spring in the plunger tip which compensates for the materials' different expansion coefficients, creating a superior seal over a larger temperature range, improving syringe lifetime.



HDHT-Type Syringes

A cement-free connection between the needle and the glass barrel make HDHT-Type syringes a perfect choice for applications where temperatures up to 200 °C will be used.



HD-Type Syringes (110 °C)



| P/N | Volume | Gauge | Point |
|--------|--------|-------|-------|
| 203141 | 1 mL | 26 ga | 5 |
| 203082 | 1 mL | 23 ga | 5 |
| 203181 | 2.5 mL | 26 ga | 5 |
| 203084 | 2.5 mL | 23 ga | 5 |
| 203182 | 5 mL | 26 ga | 5 |
| 203086 | 5 mL | 23 ga | 5 |

HDHT-Type Syringes (200 °C)

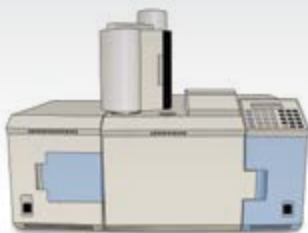


| P/N | Volume | Gauge | Point |
|--------|--------|-------|-------|
| 209682 | 1 mL | 26 ga | 5 |
| 209681 | 1 mL | 23 ga | 5 |
| 209684 | 2.5 mL | 26 ga | 5 |
| 209683 | 2.5 mL | 23 ga | 5 |
| 209686 | 5 mL | 26 ga | 5 |
| 209685 | 5 mL | 23 ga | 5 |



Perkin Elmer AutoSystem and Clarus Syringes

500 GC



Special Termination



| P/N | Volume | Gauge | Length | Point |
|-------|--------|---------|--------|-------|
| 88040 | 5 µL | 0.47 mm | 70 mm | 3 |
| 88035 | 5 µL | 0.63 mm | 70 mm | 3 |

Shimadzu Syringes

AOC-9

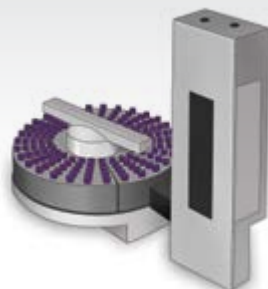
Removable Needle (RN)



| P/N | Volume | Gauge | Length | Point |
|-------|--------|--------|--------|-------|
| 87930 | 5 µL | 26s ga | 51 mm | 2 |
| 80330 | 10 µL | 26s ga | 51 mm | 2 |

Shimadzu Syringes

AOC-14,
AOC-17,
AOC-20



Removable Needle (RN)



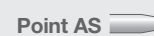
| P/N | Volume | Gauge | Length | Point |
|------------|--------|--------|--------|-------|
| 202630 | 5 µL | 22s ga | 43 mm | 2 |
| 202640 | 10 µL | 22s ga | 43 mm | 2 |
| 202643* | 10 µL | 23s ga | 43 mm | AS |
| 93898-01** | 10 µL | 23s ga | 43 mm | AS |

*Cemented Needle termination with metal flange

**Cemented Needle termination with a glass flange



Point Styles





Thermo Finnigan Syringes

AI/AS 3000
TRIPLUS



Cemented Needle (N)



| P/N | Volume | Gauge | Length | Point |
|--------|--------|--------|--------|-------|
| 204000 | 5 µL | 26s ga | 50 mm | 2 |
| 204051 | 5 µL | 26s ga | 50 mm | AS |
| 204001 | 10 µL | 26s ga | 50 mm | 2 |
| 204052 | 10 µL | 26s ga | 50 mm | AS |

Thermo Finnigan Syringes

AS 800/2000



Cemented Needle (N)



| P/N | Volume | Gauge | Length | Point |
|-------|--------|--------|--------|-------|
| 80318 | 10 µL | 26s ga | 80 mm | AS |

Thermo Finnigan Syringes

HS 250, 500, 850

Luer Tip Cemented Needle



| P/N | Volume | Gauge | Length | Point |
|--------|--------|-------|--------|-------|
| 202660 | 2.5 mL | 22 ga | 56 mm | 5 |





Thin-Layer Chromatography (TLC) Syringes

The first 19 mm of a Thin-Layer Chromatography needle is coated with PTFE. The coating reduces the surface tension between the needle and the liquid, making it ideal for reproducible sample

spotting. The TLC syringe is available as a cemented needle (SNTLC) or as a replacement needle to be installed into a standard removable needle (RN) syringe.

Cemented Needle (N)



| P/N | Volume | Gauge | Length | Point |
|-------|--------|--------|--------|-------|
| 80050 | 10 µL | 26s ga | 51 mm | 3T |
| 80250 | 25 µL | 22s ga | 51 mm | 3T |
| 80950 | 50 µL | 22 ga | 51 mm | 3T |
| 81050 | 100 µL | 22 ga | 51 mm | 3T |

Removable Needle (RN)



| P/N | Volume | Series | Needle |
|---------|--------|--------|---------|
| 7653-01 | 10 µL | 1700 | 8646-02 |
| 7654-01 | 25 µL | 1700 | 8646-03 |
| 7655-01 | 50 µL | 1700 | 8646-05 |
| 7656-01 | 100 µL | 1700 | 8646-05 |
| 7657-01 | 250 µL | 1700 | 8646-01 |
| 7658-01 | 500 µL | 1700 | 8646-01 |
| 7649-01 | 1 mL | 1000 | 8646-01 |
| 7650-01 | 2.5 mL | 1000 | 8646-01 |
| 7651-01 | 5 mL | 1000 | 8646-01 |
| 7652-01 | 10 mL | 1000 | 8646-01 |





Carbon Analyzer Syringes

These syringes are used for water analysis with Total Organic Carbon (TOC) analyzers. TOC syringes feature a unique termination that has a male, luer tapered hub that is cemented on the syringe barrel.

This special termination is designed to fit precisely into the inlet of a TOC analyzer. The wetted parts are stainless steel and borosilicate glass. The plungers and barrels are not interchangeable or replaceable.

Special Termination



| P/N | Volume | Gauge | Length | Point |
|-------|-------------|-------|--------|-------|
| 80550 | 50 μ L | 24 ga | 51 mm | 3 |
| 80551 | 50 μ L | 26 ga | 64 mm | 3 |
| 80660 | 100 μ L | 24 ga | 51 mm | 3 |
| 80770 | 250 μ L | 24 ga | 51 mm | 3 |





Life Science Syringes

Hamilton Company offers a wide variety of syringes for life science applications. From gel-loading syringes to custom needles and specialized syringes for animal injections, Hamilton has a solution for many precision liquid handling applications.





Neuros Syringes

Designed specifically for lab animal neuroscience injections. Neuros precisely delivers sample to the target with minimal damage.



Neuros Syringes

P. 58

Syringes Connected to:

A variety of different connections are available for connecting small gauge needles, glass capillaries, and PEEK tubing to Hamilton small hub removable needle syringes.



Syringes Connected to:

P. 60

Specialty Syringes

Specialty syringes include Threaded Plunger Syringes, Gel-Loading Syringes, and Micro Pipetting Syringes



Specialty Syringes

P. 64



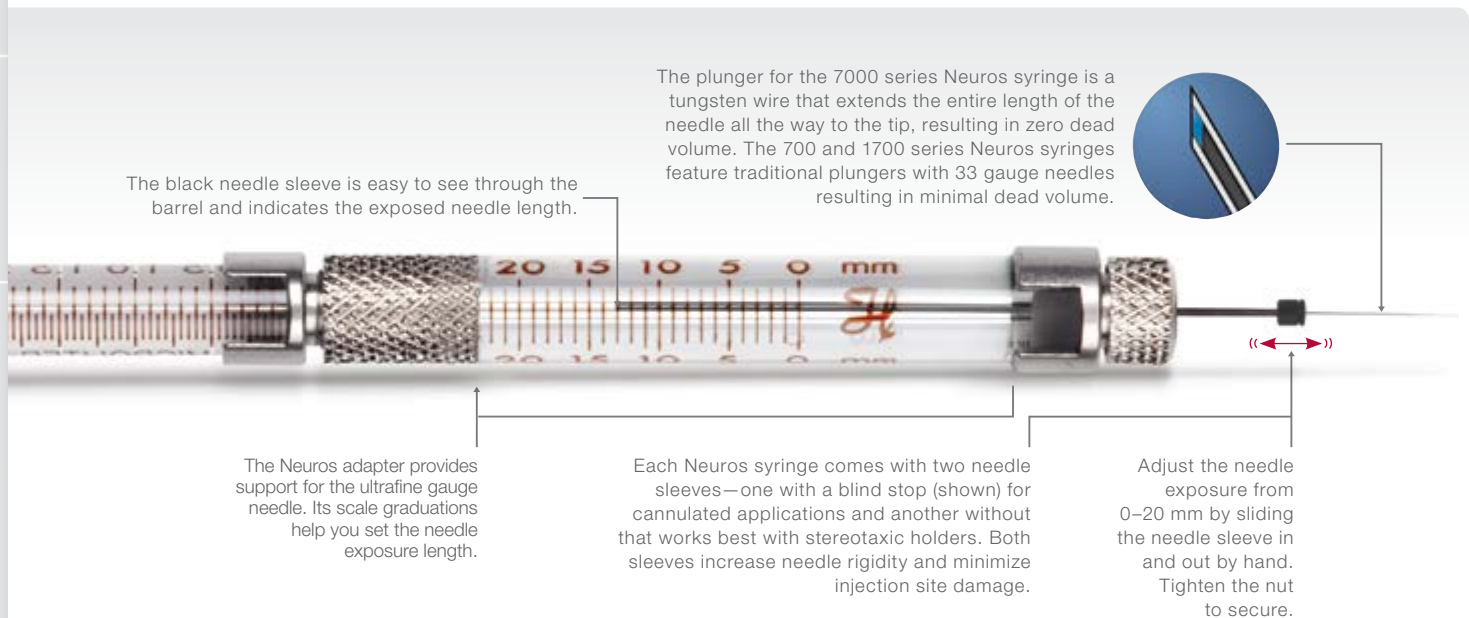


Neuros Syringes

Hamilton Neuros syringe technology provides unprecedented functionality for controlled animal injections. The Neuros accurately dispenses volumes between 50 nL and 100 μ L through an ultrafine needle. Developed specifically for neuroscience applications, the Neuros enables the delivery of microvolumes to an exact location while minimizing injection site damage. Neuros syringes come with two types of protective needle sleeves. The sleeve with a blind stop is perfect for cannulated applications and ensures targeted

administration with an adjustable penetration depth. The version without a blind stop works best with stereotaxic holders. Both models provide an adjustable needle exposure of 0 to 20 mm.

- Needle rigidity improves insertion path accuracy
- Minimal tissue damage reduces injection variability
- Reduced sample loss saves money and materials
- A fine gauge needle creates smaller injection sites
- Compatibility with most infusion pumps and stereotaxic holders means an easy integration into existing processes



Neuros Syringe Assemblies

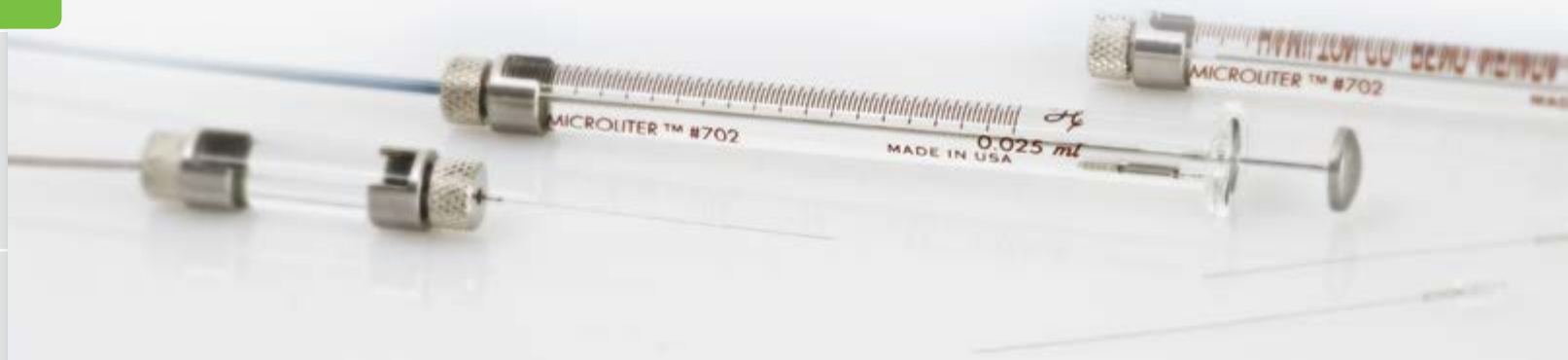
| P/N | Volume | Gauge | Point | Series |
|----------|--------|-------|-------|--------|
| 65457-01 | 0.5 µL | 32 ga | 3 | 7000 |
| 65457-02 | 0.5 µL | 32 ga | 4 | 7000 |
| 65458-01 | 1.0 µL | 32 ga | 3 | 7000 |
| 65458-02 | 1.0 µL | 32 ga | 4 | 7000 |
| 65459-01 | 2.0 µL | 30 ga | 3 | 7000 |
| 65459-02 | 2.0 µL | 30 ga | 4 | 7000 |
| 65460-02 | 5 µL | 33 ga | 3 | 700 |
| 65460-03 | 5 µL | 33 ga | 4 | 700 |
| 65460-05 | 10 µL | 33 ga | 3 | 1700 |
| 65460-06 | 10 µL | 33 ga | 4 | 1700 |
| 65460-10 | 25 µL | 33 ga | 3 | 1700 |
| 65460-11 | 25 µL | 33 ga | 4 | 1700 |
| 65460-15 | 50 µL | 33 ga | 3 | 1700 |
| 65460-16 | 50 µL | 33 ga | 4 | 1700 |
| 65460-20 | 100 µL | 33 ga | 3 | 1700 |
| 65460-21 | 100 µL | 33 ga | 4 | 1700 |

Neuros Replacement Parts

| P/N | Volume | Gauge | Point |
|----------|--|-------|-------|
| 65461-01 | Needle 5 – 100 µL – 6pk | 33 ga | 3 |
| 65461-02 | Needle 5 – 100 µL – 6pk | 33 ga | 4 |
| 65460-01 | Adapter Kit for 5 – 100 µL RN syringes | 33 ga | 3 |
| 65460-04 | Adapter Kit for 5 – 100 µL RN syringes | 33 ga | 4 |

No replacement parts are available for the 7000 Series Neuros Syringes.



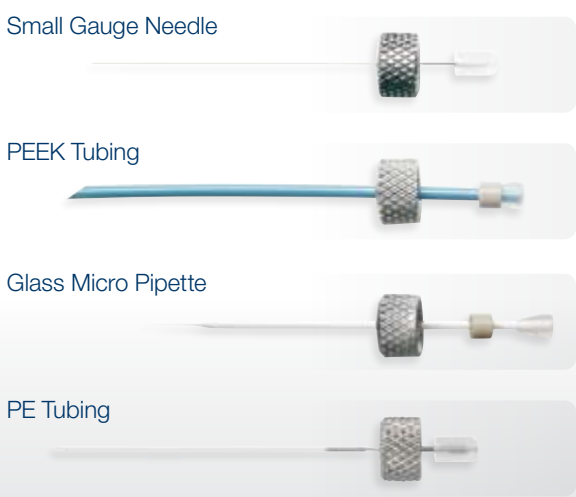


Syringes Connected to:

Small Gauge Needles, Glass Micro Pipettes, PE Tubing, and PEEK Tubing

Life science applications often require connection of syringes to a variety of different needle and tubing options. The accessories in this section enable a robust and low dead volume connection to any RN syringe 100 μ L and smaller.

Adapters



Syringe with Small RN Termination



Priming Your Tubing

Connecting a small volume syringe to tubing adds dead volume and makes the system difficult to prime. In these cases remove the plunger and use the priming kit to load buffer or mineral oil through the back of the syringe. Visit page 63 for more information on Priming Kits.





Removeable Needle Syringes Without Needle

These syringes have a robust, low dead volume connection that can be used with all the needle and tubing connectors in this section.



| P/N | Volume | Series |
|---------|--------|--------|
| 7632-01 | 2.5 µL | 600 |
| 7633-01 | 5 µL | 600 |
| 7634-01 | 5 µL | 700 |
| 7635-01 | 10 µL | 700 |
| 7653-01 | 10 µL | 1700 |
| 7636-01 | 25 µL | 700 |
| 7654-01 | 25 µL | 1700 |
| 7637-01 | 50 µL | 700 |
| 7655-01 | 50 µL | 1700 |
| 7638-01 | 100 µL | 700 |
| 7656-01 | 100 µL | 1700 |

Convert 7000 Series to Small RN Hub

For ultra-low dispense volumes the 7000 series syringes can be adapted to a removable needle termination using the adapters below.



Knurled Hub Syringes

| P/N | Volume | Series |
|-------|--------|--------|
| 86250 | 0.5 µL | 7000 |
| 80100 | 1.0 µL | 7000 |
| 88400 | 2.0 µL | 7000 |





Small Gauge Needles

Fine gauge needles are used for animal injections to limit tissue damage and sample loss. Removable needles have minimal dead volume and for this reason are recommended over a luer or luer lock connection. These needles are compatible with RN syringes 100 μ L and smaller. At the time of ordering specify the desired length and point style.



Small Hub Removable Needles

| P/N | Gauge | Length | Point |
|---------|--------|----------------------|------------|
| 207434 | 34 ga | 10, 13, 25, or 38 mm | 3 or 4 |
| 7803-05 | 33 ga | 10 – 304 mm | 2, 3, or 4 |
| 7803-04 | 32 ga | 10 – 304 mm | 2, 3, or 4 |
| 7803-03 | 31 ga | 10 – 304 mm | 2, 3, or 4 |
| 7803-07 | 30 ga | 10 – 304 mm | 2, 3, or 4 |
| 7803-06 | 29 ga | 10 – 304 mm | 2, 3, or 4 |
| 7803-02 | 28 ga | 10 – 304 mm | 2, 3, or 4 |
| 7803-01 | 27 ga | 10 – 304 mm | 2, 3, or 4 |
| 7804-04 | 26s ga | 10 – 304 mm | 2, 3, or 4 |
| 7804-03 | 26 ga | 10 – 304 mm | 2, 3, or 4 |
| 7804-10 | 25s ga | 10 – 304 mm | 2, 3, or 4 |
| 7804-05 | 25 ga | 10 – 304 mm | 2, 3, or 4 |
| 7804-08 | 24 ga | 10 – 304 mm | 2, 3, or 4 |
| 7804-09 | 23s ga | 10 – 304 mm | 2, 3, or 4 |
| 7804-07 | 23 ga | 10 – 304 mm | 2, 3, or 4 |
| 7804-02 | 22s ga | 10 – 304 mm | 2, 3, or 4 |
| 7804-01 | 22 ga | 10 – 304 mm | 2, 3, or 4 |

Glass Micro Pipettes

Glass micro pipettes are widely used in neuroscience because the point can be pulled to an incredibly small diameter and maintain the rigidity to penetrate tissue. Additionally, the dispense orifice exits from the very tip of the needle so the wound track can be minimized.

The 1 mm RN compression fitting allows for quick connection to standard 1 mm capillary glass. Pull your own needle and attach it to an RN syringe without wax or glue.

1 mm Compression Fitting



P/N Description

55750-01 RN Compression Fitting 1 mm

Hamilton does not offer 1 mm glass capillary tubing.

PE Tubing

Polyethylene (PE) tubing is frequently used for lab animal applications. Connect PE tubing to a syringe by pressing the tubing onto the tip of a needle. The table shows the needle gauge that is properly sized for a press fit with PE 10, PE 20, and PE 50 tubing.

Needle Gauges for PE Tubing

| Tubing Size | Compatible Needle Gauge |
|-------------|-------------------------|
| PE 10 | 30 ga |
| PE 20 | 27 ga |
| PE 50 | 23 or 23s ga |



Point Styles

Point 2

Point 3

Point 4

Point 5

Point AS

PEEK Tubing

Polyether ether ketone (PEEK) tubing is widely used in chromatography for its small dead volume, chemical biocompatibility, and high pressure rating. These features also make it ideal for lab animal applications. Use the compression fitting to connect any 1/16th inch (1.6 mm) outer diameter PEEK tubing to a 100 µL or smaller RN syringe.

PEEK Compression Fittings



| Part Number | Description |
|-------------|----------------------------------|
| 55751-01 | RN Compression Fitting 1/16 inch |

Note: Hamilton does not sell PEEK tubing; it needs to be sourced through a third party.

Dual RN Coupler

Connect an RN needle to the end of PEEK tubing with the small RN to RN connector (P/N 55752-01).



Priming Kit

Connecting glass or plastic tubing to a syringe increases the dead volume and makes priming difficult. This can be overcome by removing the plunger and using the priming kit to load or fill the system from the back. The kit contains one 250 µL syringe (P/N 81120), one six-pack of 30 gauge needles (P/N 90030), and one pack of 25 septa (P/N 75826).

Priming Kit

| P/N | Description |
|--------|---------------------|
| PRMKIT | Syringe Priming Kit |





Specialty Syringes

Threaded Plunger Syringes

Threaded Plunger Syringes are used for precise manual positioning of the plunger. Rotation of the plunger aspirates or dispenses a defined volume of liquid. The Luer Tip connection is compatible with Kel-F Hub needles, tubing, and fittings.

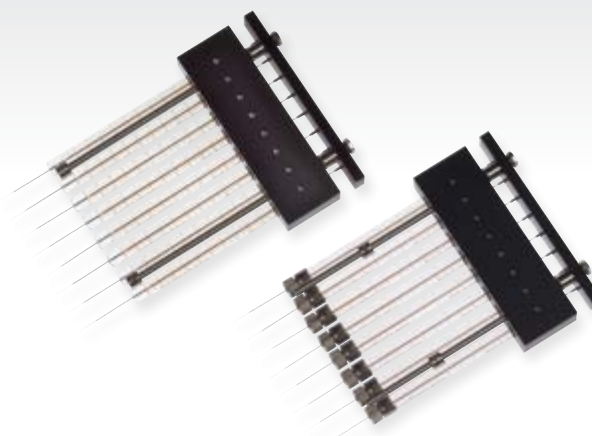
Threaded Plunger Syringes

| P/N | Volume | Plunger Type | $\mu\text{L}/\text{Revolution}$ |
|-------|-------------------|------------------|---------------------------------|
| 80266 | 25 μL | Sleeve Type | 0.33 μL |
| 81041 | 100 μL | Sleeve Type | 1.32 μL |
| 81242 | 500 μL | Threaded Plunger | 6.62 μL |
| 81341 | 1 mL | Threaded Plunger | 13.23 μL |
| 81441 | 2.5 mL | Threaded Plunger | 37.79 μL |



Gel-Loading Syringes

Multi-Channel Gel-Loading Syringes (GLS) are designed for multiplex DNA sequencing methodologies. Rapidly transfer 1, 8, or 12 samples to sequencing gels, 96-well plates, or nylon membranes. The fixed, 25 mm long, blunt needles are spaced 9 mm apart and are available with three needle outer diameters for optimized sample transfers. The adjustable volume stop allows faster, more accurate reloading and excellent reproducibility.



Gel-Loading Syringes (Cont.)

Cemented Needle Syringes



| P/N | Description | Needle OD |
|-------|----------------|-----------|
| 80081 | Single Channel | 0.2 mm |
| 84505 | Single Channel | 0.3 mm |
| 84504 | Single Channel | 0.4 mm |
| 84511 | 8-Channel | 0.2 mm |
| 84503 | 8-Channel | 0.3 mm |
| 84502 | 8-Channel | 0.4 mm |
| 84501 | 12-Channel | 0.3 mm |
| 84500 | 12-Channel | 0.4 mm |

Removable Needle Syringes



| P/N | Description | Needle OD |
|---------|-------------------------|-----------|
| 80091 | Single Channel | 0.2 mm |
| 84711 | 8-Channel | 0.2 mm |
| 8651-01 | Replacement Needle 6 pk | 0.2 mm |
| 8651-02 | Replacement Needle | 0.3 mm |
| 8651-03 | Replacement Needle | 0.4 mm |

Adjustable Gel-Loading Syringes

Adjustable, Multi-Channel Gel-Loading Syringes (GLS) simplify and speed sample loading of 96-lane gels. They are compatible with a 96-lane ABI 377 DNA sequencing instrument. These syringes have an easy-to-use design for adjustment of needle spacing from 9 mm to 10.8 mm.

Adjustable Gel Loading Syringes

| P/N | Description | Needle OD | Termination |
|-------|-------------------------|-----------|-------------|
| 84611 | 8-Channel Adjustable | 0.2 mm | RN |
| 78633 | Replacement Needle 4 pk | 0.2 mm | RN |



Micro Syringe Pipette

Disposable tip pipetting for samples that are not compatible with traditional polypropylene pipette tips. The sample only wets the disposable PTFE tip, eliminating sample cross-contamination. The spring-loaded plunger and adjustable stops ensure excellent reproducibility of volumes from 0.2 μ L to 3 μ L. The 19 mm electro-tapered needle enables easy attachment of the PTFE tips.

Micro Pipette and Tips

| P/N | Description |
|-------|--|
| 84250 | 0.2 – 3 μ L, Model 701 N Micro Syringe Pipette |
| 84255 | Disposable PTFE Tip – 100 pk |





Syringe and Cleaning Accessories

Hamilton manufactures a variety of syringe accessories to improve or modify the functionality of a standard syringe. We offer tools to prevent plunger bending, to increase reproducibility, and to clean the syringe for a prolonged lifetime.



Plunger Support Accessories

For applications requiring additional plunger support and reproducibility, Hamilton manufactures several syringe series with reinforced plungers as well as plunger support accessories that are mounted to standard syringe series.



Plunger Support Accessories

P. 68

Syringe and Needle Cleaning

Proper care and maintenance is critical for attaining maximum syringe life. Hamilton offers a variety of tools including needle cleaning wires, cleaning solutions, and storage racks.



Syringe and Needle Cleaning

P. 71

Syringe Termination Adapters

Adapt the end of a removable needle syringe to a Luer or Luer Lock connection or add a septum or sample lock valve to a Luer or Luer Lock Syringe.



Syringe Termination Adapters

P. 73

PB-600 Repeating Dispenser

This syringe accessory is used for precise aliquot dispensing from syringes between 10 μ L to 2.5 mL.



PB-600 Repeating Dispenser

P. 75





Plunger Support Accessories

Small plunger diameters and rapid dispense speeds occasionally lead to misalignment and bent plungers. Hamilton offers several syringe series and accessories to address plunger bending and improve syringe life.

Reproducibility (Chaney) Adapters



P. 69

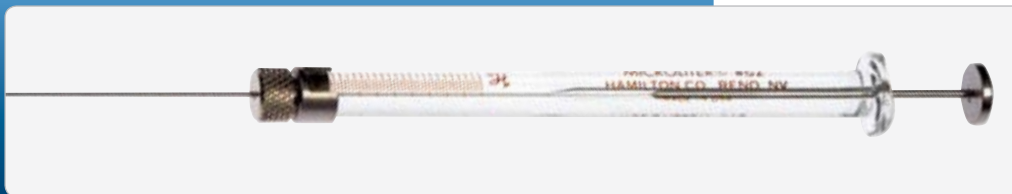
Syringe Guides



P. 70

600 Series Syringes

Combines a thick plunger to resist bending during operation with a fine plunger wire for small volume accuracy (page 17).



800/1800 Series Syringes

A blue syringe holder is attached to the back of the syringe. The holder has a thick plunger and the smaller syringe plunger is protected during operation (page 18/page 23).

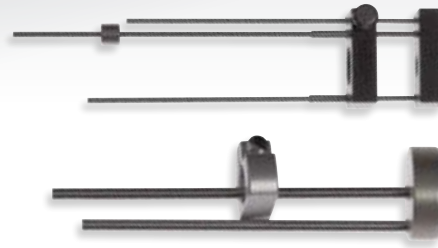


Reproducibility (Chaney) Adapters

The Hamilton Reproducibility (Chaney) Adapter assures repetitive and identical syringe plunger location. Once the stop rod is adjusted to the desired fill volume the plunger can be repeatedly positioned without continuously reading the graduations.



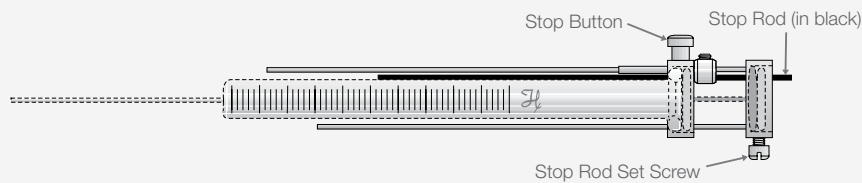
Reproducibility (Chaney) Adapters



| P/N | Volume | Series |
|-------|------------------|----------|
| 14700 | 5 – 10 μ L | 700/1700 |
| 14725 | 25 – 500 μ L | 700/1700 |
| 32146 | 5 – 250 μ L | 800/1800 |

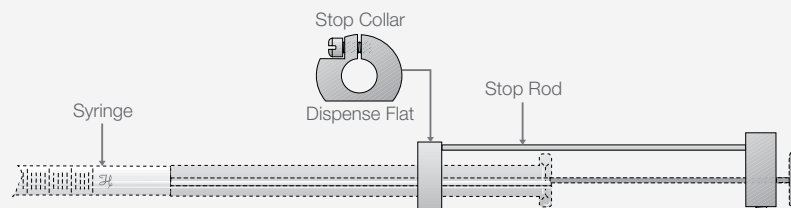
Syringes Figure 4. 700/1700/7000 Series

Loosen the set screw and adjust the Stop Rod until it hits the Stop Button at the desired volume. Press the Stop Button to engage the stop, then release to dispense.



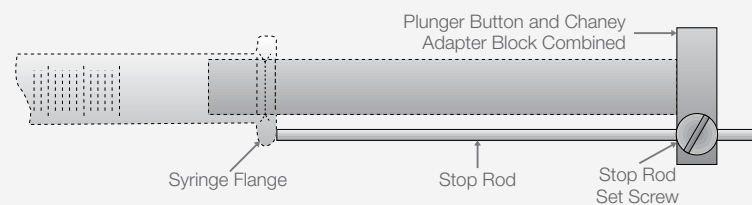
Syringes Figure 5. 800/1800 Series

Adjust the Stop Collar until the Stop Rod hits at the desired volume. To dispense, rotate the plunger so the Stop Rod travels past the Dispense Flat.



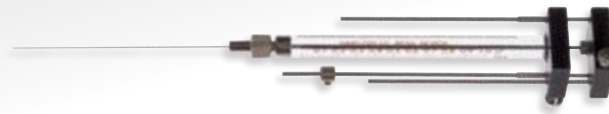
Syringes Figure 6. 1000 Series

Adjust the Stop Rod until it hits the Syringe Flange at the desired volume. To dispense, rotate the plunger so the Stop Rod travels past the dispense flat in the flange.



Reproducibility (Chaney) Adapters (Cont.)

7000 Series Built-in Chaney Adapters



| P/N | Volume | Series | Length | Point |
|-------|--------|--------|--------|-------|
| 86252 | 0.5 µL | 25 ga | 70 mm | 3 |
| 80104 | 1 µL | 25 ga | 70 mm | 3 |
| 86204 | 1 µL | 22 ga | 70 mm | 3 |
| 88404 | 2 µL | 25 ga | 70 mm | 3 |
| 88504 | 2 µL | 23 ga | 70 mm | 3 |
| 88004 | 5 µL | 24 ga | 70 mm | 3 |

1000 Series Built-in Chaney Adapter



| P/N | Volume | Series | Length | Point |
|-------|--------|-----------------|--------|-------|
| 81318 | 1 mL | 22 ga | 51 mm | 2 |
| 81324 | 1 mL | Luer Lock (TTL) | | |
| 81418 | 2.5 mL | 22 ga | 51 mm | 2 |
| 81403 | 2.5 mL | Luer Tip (LT) | | |
| 81424 | 2.5 mL | Luer Lock (TTL) | | |
| 81518 | 5 mL | 22 ga | 51 mm | 2 |
| 81524 | 5 mL | Luer Lock (TTL) | | |
| 81618 | 10 mL | 22 ga | 51 mm | 2 |
| 81624 | 10 mL | Luer Lock (TTL) | | |

Syringe Guides

The Syringe Guide is a cost effective way to prevent plunger damage during normal syringe operation. The guide is compatible with 700 and 1700 series syringes. It is also compatible with 7000 series syringes but requires the delicate removal and reinsertion of the plunger wire. For this reason the most popular 7000 series syringes can be ordered preassembled with the proper guide.

Syringe Guides

| P/N | Volume | Series |
|-------|-------------|----------|
| 14806 | 5 – 10 µL | 700/1700 |
| 14906 | 25 – 500 µL | 700/1700 |

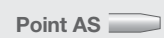
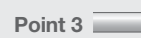
7000 Series Built-in Syringe Guides



| P/N | Volume | Gauge | Length | Point |
|-------|--------|-------|--------|-------|
| 86254 | 0.5 µL | 25 ga | 70 mm | 3 |
| 80107 | 1 µL | 25 ga | 70 mm | 3 |
| 86207 | 1 µL | 22 ga | 70 mm | 3 |
| 88407 | 2 µL | 25 ga | 70 mm | 3 |
| 88507 | 2 µL | 23 ga | 70 mm | 3 |
| 88007 | 5 µL | 24 ga | 70 mm | 3 |



Point Styles





Syringe Storage and Cleaning

Syringe Rack

P. 71

Needle Cleaning

P. 72

Syringe Rack

The brushed stainless steel Syringe Rack stores up to five 700, 1700, or 7000 series syringes. The rack keeps your syringes from making contact with other syringes and minimizes the risk of sample contamination. Prevent breakage on the benchtop or save space by mounting to the wall.

Syringe Rack

| P/N | Description |
|--------|-------------------------|
| 204880 | 5-Position Syringe Rack |





Needle Cleaning

To clean syringes it is best to use a solvent known to be effective in solvating. Ideally the solvent would be non-alkaline, non-phosphate, and non-detergent based. Hamilton offers a biodegradable, non-phosphate, cleaning concentrate that is suitable for many common sample types.

For some needle obstructions, mechanical cleaning may be necessary. For this purpose Hamilton provides various sized tungsten cleaning wires that can be threaded through the needle to clear a blockage.



Needle Cleaning Kit

| P/N | Volume |
|--------|---|
| 76620A | Kit includes 10 of each wire and 70 mL of concentrate |

Cleaning Concentrate

| P/N | Volume |
|-------|--------|
| 18311 | 500 mL |
| 18310 | 70 mL |

Tungsten Cleaning Wires

| P/N | For Gauges | Wire OD | Package |
|-------|--------------------------|----------|---------|
| 18304 | 22, 23 ga, and larger | 0.306 mm | 10 pk |
| 18303 | 24 – 26 ga | 0.207 mm | 10 pk |
| 18302 | 27 ga | 0.167 mm | 10 pk |
| 18301 | 22s, 25s, and 28 – 30 ga | 0.126 mm | 10 pk |
| 18300 | 26s and 31 – 33 ga | 0.089 mm | 10 pk |
| 18306 | 23s ga | 0.076 mm | 10 pk |

See “Syringe Care and Use” in the technical reference section for cleaning tips on page 77.





Syringe Termination Adapters

Removable Needle to Luer Adapters

250 μ L or Larger



P. 73

Inert Sampling Valve



P. 74

Septum Adapter



P. 74

Removable Needle to Luer Adapters

These adapters convert a Hamilton specific termination to an industry standard luer connection. They are compatible with SampleLock (SL) or Removable Needle (RN) syringes 250 μ L and larger. The internal diameter is 1 mm making it possible to spike samples with an internal standard using a 26 gauge needle or smaller.

RN to Luer Adapters

| P/N | Description |
|-------|------------------|
| 35081 | Female Luer Lock |
| 35083 | Male Luer Lock |
| 35080 | Male Luer |





Inert Sampling Valve

The Inert Sampling Valve is a lever-actuated on/off valve used for storing and transporting samples. Connect to a Gastight syringe via the female luer lock, and use the male luer to attach to a needle, adapter, or tubing assembly. The valve is autoclavable with a 1 mm internal diameter and a pressure rating up to 0.7 MPa.

Inert Gas Sampling Valve

| P/N | Description |
|-------|--------------------|
| 86580 | MTB Sampling Valve |



Septum Adapter

The Septum Adapter turns any luer syringe into a sealed reaction container. Samples can be added or removed from the sealed container using another syringe to pierce the replaceable septum.

Luer Lock Septum Adapter

| P/N | Description |
|-------|-------------------------|
| 31335 | Adapter and 12 septa |
| 75810 | Replacement Septa 12 pk |





PB-600 Repeating Dispenser

The PB-600 Repeating Dispenser is a low cost high accuracy accessory for repetitive dispensing. Each press of the button dispenses 1/50th of the syringe volume. The repeating dispenser is compatible with the cemented needle (N), removable needle (RN), luer tip (LT), or PTFE Luer Lock (TLL) syringes from 10 μ L to 2.5 mL. Syringes are sold separately.

PB-600 Repeating Dispenser

| P/N | Dispense | Syringe | Series |
|-------|-------------|-------------|-----------------|
| 83700 | 0.2 μ L | 10 μ L | 1700 Series |
| | 0.5 μ L | 25 μ L | 700/1700 Series |
| | 1 μ L | 50 μ L | 700/1700 Series |
| | 2 μ L | 100 μ L | 700/1700 Series |
| | 5 μ L | 250 μ L | 700/1700 Series |
| | 10 μ L | 500 μ L | 700/1700 Series |
| | 20 μ L | 1 mL | 1000 Series |
| | 50 μ L | 2.5 mL | 1000 Series |



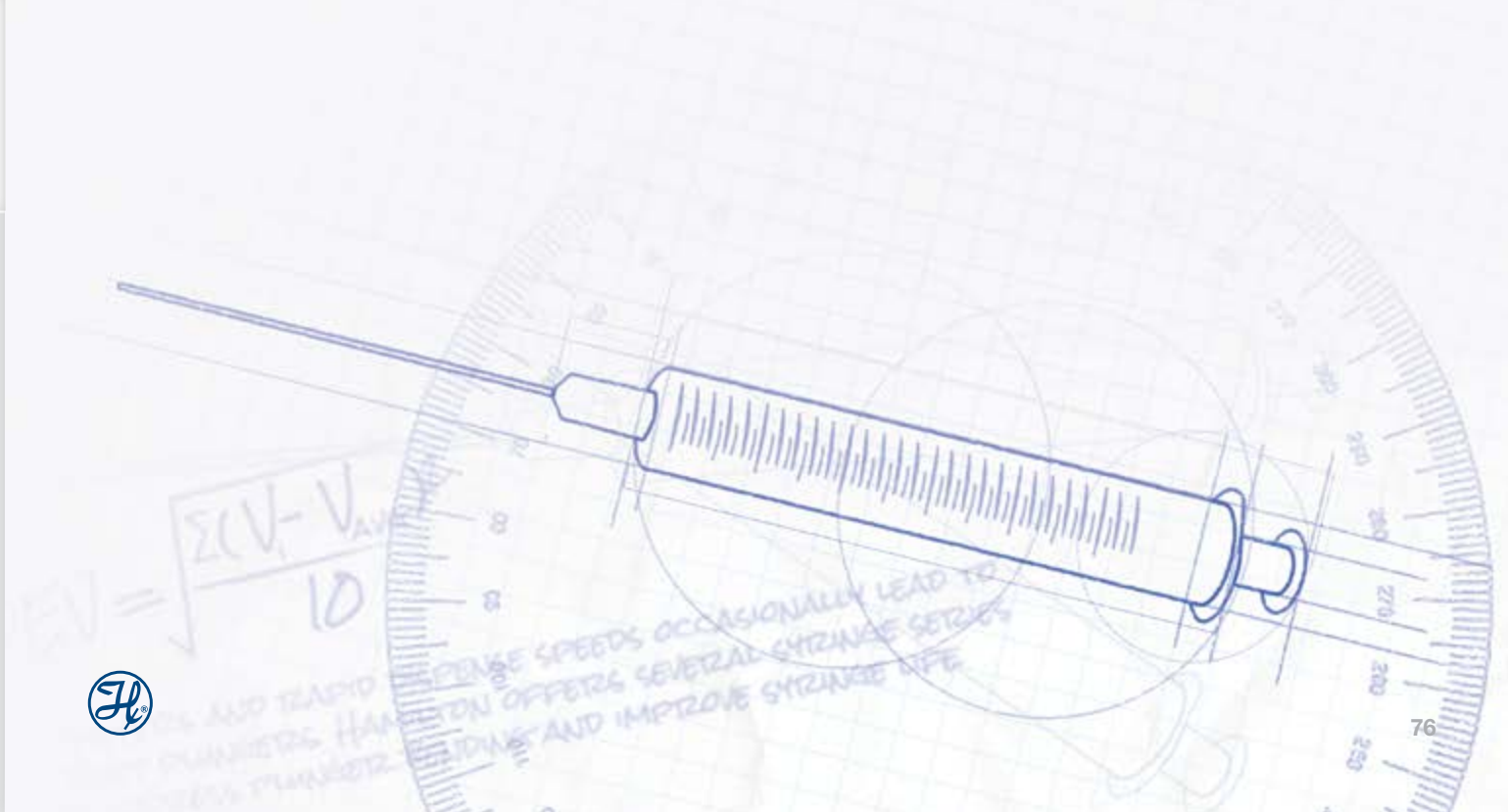


Syringe Technical Reference

The Syringe Technical Reference section includes detailed information on the operation, maintenance, and physical properties of most Hamilton syringes. The information is intended

as a general guideline. For specific details on a part number or application search for the part number on our website or contact a local Hamilton representative.

| | | |
|---------------------------------------|--|--|
| Syringe Care and Use | Daily Use Protocol, Plunger Care, Needle Care | P. 77, P. 79, P. 79 |
| Syringe Specifications | Operating Parameters, Syringe Dimensions, Graduations | P. 80, P. 80, P. 81 |
| Syringe Replacement Parts | 800, 1000, 1700, 1800, 7000 Series, Super Syringe | P. 82, P. 83, P. 83, P. 83, P. 84, P. 84 |
| Sterilization and Disinfection | | P. 85 |
| Frequently Asked Questions | | P. 86 |
| Syringe Calibration | Equipment and Materials, Calibration Procedure, Calculating Accuracy and Precision | P. 89, P. 90, P. 91 |





Syringe Care and Use

Operation of a syringe is relatively straight forward but there are some tips and tricks that will improve the performance and longevity of Hamilton syringes. This section is dedicated to best practices of operating and maintaining a syringe.

Daily Use Protocol

Step-by-step guide to syringe inspection, operation, cleaning, and storage.

P. 77

Plunger Care

The dos and don'ts of plunger maintenance.

P. 79

Needle Care

Tips on needle selection, inspection, and care.

P. 79

Daily Use Protocol

Step 1

Inspection

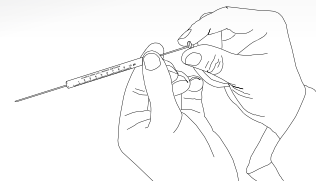
Before each use, thoroughly inspect the syringe for damage such as cracks and dried residue. Check the needle point for burrs from previous experiments. Do not use a needle with burrs. Burrs may tear GC septa leading to sample loss or poor peak shape.



Step 2

Grip

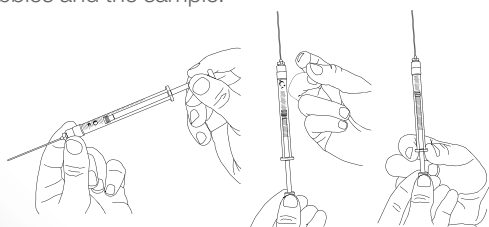
Avoid variations in liquid measure due to body heat by grasping the syringe flange and plunger as you draw and dispense fluids. Syringes should be used at a constant temperature. Accuracy and reproducibility specifications are determined at 25 °C.



Daily Use Protocol (Cont.)

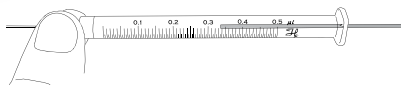
Step 3 Priming

Eliminate compressible trapped air by completely priming the syringe with sample. Immerse the needle point 2 mm to 3 mm into the sample solution. Then rapidly draw and dispense sample into the syringe until bubbles are no longer visible in the syringe barrel. Alternatively, remove air bubbles by turning the barrel upright and allowing the air bubbles to rise to the needle exit. Then dispense both the air bubbles and the sample.



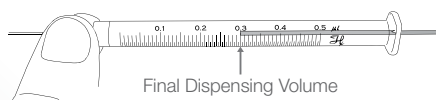
Step 4 Overfilling

Fill the syringe with a small amount of excess liquid.



Step 5 Required Volume

Slowly dispense the excess sample until only the required volume of sample remains in the syringe. Visually check to see that the syringe scale and sample meniscus are parallel. It is optional to 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.



Step 6 Final Dispense

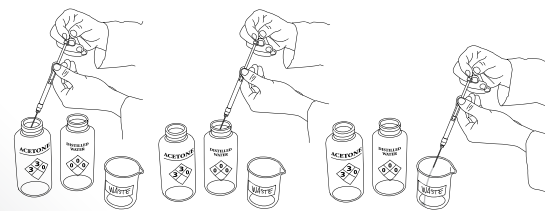
Dispense the final sample volume into an appropriate vessel.



Step 7 Cleaning

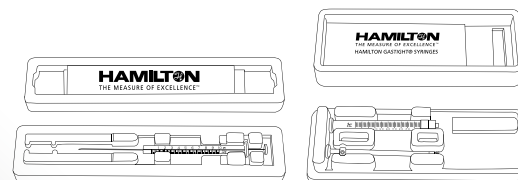
Rinse the syringe with a cleaning solvent known to solubilize the sample. Then rinse with deionized water, and finally rinse with high purity acetone. Allow time for the acetone to evaporate before storing the syringe. Do not soak or submerge the entire syringe in any cleaning agent.

The preferred cleaning agents are non-alkaline, non-phosphate, and non-detergent based. Hamilton offers a biodegradable, non-phosphate, organic Cleaning Solution Concentrate (P/N 18311).



Step 8 Storage

Store the syringe in its original packaging or the Syringe Rack (P/N 204880) to protect against breakage.



Step 9 Solvent 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.



Plunger Care

Plungers are made of solid stock material and push the sample out of the syringe. Hamilton makes two types of plungers. The plungers on Microliter syringes are hand-fitted and are 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 deionized water 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 apply force to move a plunger. Too much pressure can irretrievably bend the plunger or crack the syringe glass barrel. Try using an appropriate solvent and wiping with a lint-free cloth.

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 applications. All Hamilton needles are electro-polished to assure smooth and burr-free products.

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.

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.

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.

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 could 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.





Syringe Specifications

Operating Parameters

Operating temperature and pressure varies based on syringe size, plunger type, and syringe termination. In the table below are the general operating parameters for Hamilton syringes. Part number specific data sheets are available by searching the part number at www.hamiltoncompany.com.

Operating Parameters

| Volume | Series | Pressure | Temperature |
|----------------|---------------|----------|--------------------------|
| 0.5 – 10 μL | 7000 | 41 MPa | 10 – 115 °C ¹ |
| | 600 | 14 MPa | 10 – 115 °C ¹ |
| | 700 | 14 MPa | 10 – 115 °C ¹ |
| | 800 | 14 MPa | 10 – 115 °C ¹ |
| | 1700 | 7 MPa | 10 – 115 °C ¹ |
| | 1800 | 7 MPa | 10 – 115 °C ¹ |
| 25 – 100 μL | 700 | 7 MPa | 10 – 115 °C ¹ |
| | 800 | 7 MPa | 10 – 115 °C ¹ |
| | 1700 | 7 MPa | 10 – 115 °C ¹ |
| 250 μL – 10 mL | 1800 | 7 MPa | 10 – 115 °C ¹ |
| | 700 | 7 MPa | 10 – 115 °C ¹ |
| | 800 | 7 MPa | 10 – 115 °C ¹ |
| | 1700 | 3 MPa | 10 – 115 °C ¹ |
| 25 – 100 mL | 1800 | 3 MPa | 10 – 115 °C ¹ |
| | 1000 | 1 MPa | 10 – 115 °C ¹ |
| 25 – 100 mL | 1000 | 0.7 MPa | 10 – 80 °C |
| 0.5 – 2 L | Super Syringe | 0.2 MPa | 0 – 80 °C |

¹ If the syringe termination is a cemented needle or luer tip cemented needle then the maximum temperature is 50 °C.

Syringe Dimensions

Most Hamilton syringes are standardized to a 60 mm plunger stroke length, and where possible, the same barrel outer diameter is used. For each syringe volume the inner diameter will change to accommodate the desired dispense volume.

Syringe Dimensions

| Volume | Barrel OD | Barrel ID | Stroke Length |
|-------------------------|-----------|-----------|---------------|
| 0.5 μL | 7.8 mm | 0.104 mm* | 60 mm |
| 1.0 μL | 7.8 mm | 0.145 mm* | 60 mm |
| 2.0 μL | 7.8 mm | 0.206 mm* | 60 mm |
| 2.5 μL | 6.6 mm | 0.34 mm | 27 mm |
| 5 μL 600 Series | 6.6 mm | 0.48 mm | 27 mm |
| 5 μL 700, 800 Series | 6.6 mm | 0.34 mm | 54 mm |
| 5 μL 7000 Series | 7.8 mm | 0.325 mm* | 60 mm |
| 10 μL 700, 800 Series | 6.6 mm | 0.49 mm | 54 mm |
| 10 μL 1700, 1800 Series | 6.6 mm | 0.46 mm | 60 mm |
| 25 μL | 7.7 mm | 0.73 mm | 60 mm |
| 50 μL | 7.7 mm | 1.03 mm | 60 mm |
| 100 μL | 7.7 mm | 1.40 mm | 60 mm |
| 250 μL | 7.7 mm | 2.30 mm | 60 mm |
| 500 μL | 7.7 mm | 3.26 mm | 60 mm |
| 1.0 mL | 9.0 mm | 4.61 mm | 60 mm |
| 2.5 mL – Thin Wall | 9.7 mm | 7.29 mm | 60 mm |
| 2.5 mL | 10.3 mm | 7.29 mm | 60 mm |
| 5 mL | 13.5 mm | 10.30 mm | 60 mm |
| 10 mL | 17.7 mm | 14.57 mm | 60 mm |
| 25 mL | 27.1 mm | 23.03 mm | 60 mm |
| 50 mL | 36.9 mm | 32.54 mm | 60 mm |
| 100 mL | 36.9 mm | 32.54 mm | 120 mm |
| 500 mL | 75 mm | 62 mm | 166 mm |



Syringe Dimensions (Cont.)

Syringe Dimensions (Cont.)

| Volume | Barrel OD | Barrel ID | Stroke Length |
|--------|-----------|-----------|---------------|
| 1.0 L | 100 mm | 87 mm | 167 mm |
| 1.5 L | 100 mm | 87 mm | 250 mm |
| 2.0 L | 100 mm | 87 mm | 334 mm |

*For the 7000 series syringes the ID measurement is based on the OD of the plunger wire.

Syringes Figure 7. Syringe dimensions



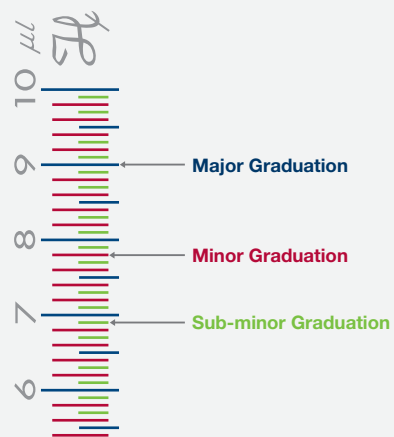
Graduations

All manual Hamilton syringes have silkscreened graduations to assist in the precise positioning of the plunger. To simplify reading of the silkscreen there are three different types of graduation marks: major, minor, and sub-minor.

Graduations

| Volume | Major | Minor | Sub-minor |
|----------------------|---------------|---------------|---------------|
| 0.5 μ L | 0.05 μ L | 0.01 μ L | 0.005 μ L |
| 1 μ L | 0.1 μ L | 0.02 μ L | 0.01 μ L |
| 2 μ L | 0.2 μ L | 0.04 μ L | 0.02 μ L |
| 2.5 μ L | 0.5 μ L | 0.1 μ L | 0.05 μ L |
| 5 μ L 600 Series | 1.0 μ L | 0.2 μ L | 0.1 μ L |
| 5 μ L | 0.5 μ L | 0.1 μ L | 0.05 μ L |
| 10 μ L | 1.0 μ L | 0.2 μ L | 0.1 μ L |
| 25 μ L | 2.5 μ L | 0.5 μ L | 0.25 μ L |
| 50 μ L | 5.0 μ L | 1.0 μ L | 0.5 μ L |
| 100 μ L | 10 μ L | 2.0 μ L | 1.0 μ L |
| 250 μ L | 25 μ L | 5.0 μ L | 2.5 μ L |
| 500 μ L | 50 μ L | 10 μ L | 5.0 μ L |
| 1 mL | 100 μ L | 20 μ L | 10 μ L |
| 2.5 mL | 250 μ L | 50 μ L | 25 μ L |
| 5.0 mL | 500 μ L | 100 μ L | 50 μ L |
| 10 mL | 1,000 μ L | 200 μ L | 100 μ L |
| 25 mL | 2,500 μ L | 500 μ L | 250 μ L |
| 50 mL | 5,000 μ L | 1,000 μ L | 500 μ L |
| 100 mL | 5,000 μ L | 1,000 μ L | 500 μ L |
| 0.5 – 2.0 L | 100 mL | 20 mL | N/A |

Syringes Figure 8. Graduation marks



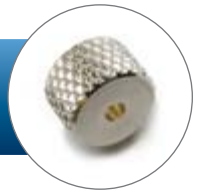


Syringe Replacement Parts

A limited selection of replacement parts and accessories are available for Hamilton syringes. For Gastight syringes most common plungers are available. For Microliter syringes the plunger is hand-fit to the barrel so a replacement plunger is not offered.

Removable Needle Nut

All Removable Needle (RN) syringes use part number 30902 for the replacement nut.



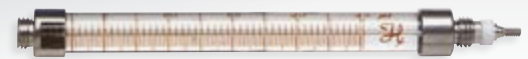
800 Series Syringe Replacement Parts

Holder Assembly



| P/N | Volume |
|-------|------------|
| 32135 | 5 – 250 µL |

Barrel/Plunger Assembly



| P/N | Volume | Termination | Gauge |
|-------|--------|------------------|-----------|
| 32150 | 5 µL | Cemented Needle | 26s ga |
| 32134 | 5 µL | Removable Needle | No Needle |
| 32151 | 10 µL | Cemented Needle | 26s ga |
| 32165 | 10 µL | Removable Needle | 26s ga |
| 32129 | 10 µL | Removable Needle | No Needle |
| 32166 | 25 µL | Removable Needle | 22s ga |
| 32117 | 25 µL | Removable Needle | No Needle |
| 32120 | 50 µL | Removable Needle | No Needle |
| 32168 | 100 µL | Removable Needle | 22s ga |
| 32123 | 100 µL | Removable Needle | No Needle |
| 32169 | 250 µL | Removable Needle | 22s ga |
| 32126 | 250 µL | Removable Needle | No Needle |

Note: All included needles are 51 mm long with a point style 2.



Point Styles



1000 Series Syringe Replacement Parts

Spindle/Tip Assembly

| P/N | Volume |
|----------|--------|
| 52343-01 | 100 mL |

Plunger Assembly



| P/N | Volume |
|---------|--------|
| 1359-01 | 1 mL |
| 1360-01 | 2.5 mL |
| 13230 | 5 mL |
| 13231 | 10 mL |
| 13271 | 25 mL |
| 13272 | 50 mL |

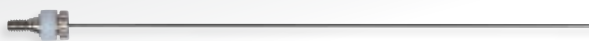
1800 Series Syringe Replacement Parts

Holder Assembly



| P/N | Volume |
|-------|-------------|
| 32135 | 10 – 250 µL |

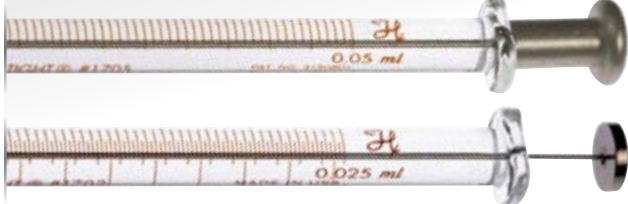
Plunger Assembly



| P/N | Volume |
|---------|--------|
| 32193 | 10 µL |
| 1160-01 | 25 µL |
| 1161-01 | 50 µL |
| 1161-02 | 100 µL |
| 4871-01 | 250 µL |

1700 Series Syringe Replacement Parts

Plunger Assembly



| P/N | Volume | Plunger Stop |
|---------|--------|--------------|
| 13205 | 10 µL | No |
| 1122-01 | 25 µL | No |
| 13269 | 25 µL | Yes |
| 1162-01 | 50 µL | No |
| 1117-01 | 50 µL | Yes |
| 1162-02 | 100 µL | No |
| 1117-02 | 100 µL | Yes |
| 1162-03 | 250 µL | No |
| 1117-03 | 250 µL | Yes |
| 1169-01 | 500 µL | No |
| 1120-01 | 500 µL | Yes |

Glass Barrel



| P/N | Volume | Termination | Gauge |
|-------|--------|------------------|-----------|
| 32175 | 10 µL | Cemented Needle | 26s ga |
| 32187 | 10 µL | Removable Needle | No Needle |
| 32188 | 25 µL | Removable Needle | No Needle |
| 32189 | 50 µL | Removable Needle | No Needle |
| 32190 | 100 µL | Removable Needle | No Needle |
| 32191 | 250 µL | Removable Needle | No Needle |

Note: All included needles are 51 mm long with a point style 2.

7000 Series Syringe Replacement Parts

Replacement Plunger and Needle Assemblies

| P/N | Volume | Gauge | Length | Point |
|-------|---------------|-------|--------|-------|
| 17887 | 0.5 µL | 25 ga | 70 mm | 2 |
| 17187 | 0.5 µL | 25 ga | 100 mm | 3 |
| 86258 | 0.5 µL | 32 ga | 70 mm | 3 |
| 17888 | 1.0 µL (7001) | 25 ga | 70 mm | 2 |
| 17188 | 1.0 µL (7001) | 25 ga | 70 mm | 3 |
| 17890 | 1.0 µL (7101) | 22 ga | 70 mm | 2 |
| 17190 | 1.0 µL (7101) | 22 ga | 70 mm | 3 |
| 17891 | 2.0 µL (7002) | 25 ga | 70 mm | 2 |
| 17191 | 2.0 µL (7002) | 25 ga | 70 mm | 3 |
| 17192 | 2.0 µL (7102) | 23 ga | 70 mm | 3 |
| 17893 | 5.0 µL | 24 ga | 70 mm | 2 |
| 17193 | 5.0 µL | 24 ga | 70 mm | 3 |

The 7000 series syringes have a plunger wire that runs inside the needle. The kit comes with a replacement plunger and needle so both can be changed at the same time. The plunger wire is extremely delicate and care must be taken not to cause damage during installation.

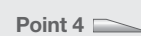
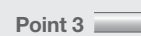
Super Syringe Replacement Parts

Plunger Replacement Parts

| P/N | Volume | Description |
|-------|-------------|--------------------|
| 18007 | 0.5 – 2.0 L | Piston Rod Knob |
| 18005 | 0.5 – 1.0 L | Piston Rod |
| 18053 | 0.5 L | Piston Disk |
| 18054 | 1.0 – 2.0 L | Piston Disk |
| 16160 | 0.5 L | Piston Disk O-ring |
| 16161 | 1.0 – 2.0 L | Piston Disk O-ring |



Point Styles





Sterilization and Disinfection

Cycling a syringe in an autoclave can result in damage caused by the metal and glass parts expanding at different rates. The table below shows the recommended chemicals

for disinfection and the syringe types that can withstand repeated autoclave cycles. As an alternative to the autoclave, all glass syringes can be sterilized using ethylene oxide.

Sterilization and Disinfection Table

| Product | Autoclave Sterilization | Chemical Disinfection ¹ |
|------------------------------------|------------------------------|------------------------------------|
| Cemented Needle Syringes | No | Yes, no bleach |
| Luer Tip Cemented Needle Syringes | No | Yes, no bleach |
| Fixed Needle Syringes | No | Yes, no bleach |
| Luer Tip Syringes | Yes | Yes |
| PTFE Luer Lock Syringes | Yes, except 25 mL and larger | Yes |
| Removable Needle Syringes | Yes | Yes, no bleach |
| Knurled Hub Syringes | Yes | Yes |
| SampleLock Syringes | No | Yes, no bleach |
| ChemSeal Syringes | Yes | Yes |
| Carbon Analyzer Syringes | No | Yes, no bleach |
| Constant Rate Syringes | No | Yes, no bleach |
| Neuros Syringes | Yes | Yes |
| Removable Needles (18 – 26s gauge) | Yes | Yes |
| Removable Needles (27 – 34 gauge) | Yes | Yes |
| Metal Hub Needles | Yes | Yes |
| Kel-F Hub Needles | Yes | Yes |
| PTFE Tubing | Yes | Yes |
| Kel-F Fittings | Yes | Yes |

¹Recommended disinfecting chemicals are Microcide SQ® (P/N 3995-01), 10% bleach, acetone, or ethanol.

Syringes should be disassembled prior to autoclaving at 120 °C for 20 min.





Frequently Asked Questions

Below is a list of commonly asked questions. Find your question and then turn to the page to see the answer. If your question is not listed please contact your Hamilton representative.

Syringe Questions

- 1 → What is the accuracy of Hamilton syringes? P. 87
- 2 → Can Hamilton syringes be used on humans? P. 87
- 3 → Are the plungers for the Microliter syringes (600, 700, and 800 series) interchangeable? P. 87
- 4 → The plungers on the 700 series syringes move when very little force is applied. Can this be prevented? P. 87
- 5 → What are the most versatile syringes made by Hamilton? P. 87
- 6 → Why doesn't my RN adapter fit into my RN syringe? P. 87
- 7 → How do I adjust the needle exposure on my Neuros syringe? P. 87
- 8 → Do the 7000 Series Neuros syringes have replacement parts? P. 87
- 9 → How do you backfill syringes? P. 87

Needle Questions

- 10 → How do I find my needle for my syringe? P. 88
- 11 → Is the needle dead volume part of the total volume of the dispensed fluid? P. 88
- 12 → What does the "s" mean in a 22s or 26s gauge needle? P. 88
- 13 → Does Hamilton offer a needle sheath? P. 88
- 14 → Can disposable needles work with Hamilton syringes? P. 88





Syringe Questions

1 What is the accuracy of Hamilton syringes?

Hamilton syringes are manufactured to be accurate within $\pm 1\%$ of nominal volume, and with precision within 1%, measured at 80% of total scale volume. Our ISO 9001-2008 certified Quality System uses rigorous testing and quality checks to ensure the highest levels of accuracy and precision. To obtain a syringe-specific certificate the syringe must be purchased as a Calibrated Syringe (page 26).

2 Can Hamilton syringes be used on humans?

No, Hamilton syringes are labeled “Not for Human Use”. To discuss potential off label uses for Hamilton syringes please contact us.

3 Are the plungers for the Microliter syringes (600, 700, and 800 series) interchangeable?

No, each plunger is hand-fitted to the corresponding syringe barrel. Be very careful to keep each plunger with its original syringe barrel in order to maximize syringe performance.

4 The plungers on the 700 series syringes move when very little force is applied. Can this be prevented?

The plungers on Microliter syringes are designed to move freely to enable rapid injection into a GC. If more resistance is desired a Gastight syringe is recommended. The Gastight plunger uses a plastic seal between the plunger and syringe barrel, resulting in additional drag force to move the plunger.

5 What are the most versatile syringes made by Hamilton?

In our opinion, Gastight syringes with the Removable Needle termination are the most versatile. The plungers and the needles are replaceable if they get bent or wear out. Additionally, the dead volume of the Removable Needle termination is as small as a Cemented Needle syringe which is critical for small volume syringes.

6 Why doesn't my RN adapter fit onto my RN syringe?

The RN adapters are compatible with any SampleLock syringes or with Removable Needle syringes between 250 μL – 10 mL. If the proper size syringe is being used it is possible that the white ferrule from the previously installed needle is still stuck in the hub. This must be removed prior to installation of the RN adapter.

7 How do I adjust the needle exposure on my Neuros syringe?

To expose the needle loosen the RN nut on the end of the adapter, and then gently push the needle sleeve down. Be careful not to put your finger over the needle hole when moving the needle sleeve down. Sometimes the needle sleeve may be a little tight when using it for the first time.

8 Do the 7000 series Neuros syringes have replacement parts?

No, due to the design of the 7000 series needle plunger assembly the 7000 series Neuros syringes do not have any replacement parts.

9 How do you backfill syringes?

Backfilling a syringe can be useful when the syringe is connected to a needle or tubing with a large dead volume. Excessive dead volume makes the system difficult to prime and filling from the back may be the only option. Backfilling should not be used if the needle is clogged because reinsertion of the plunger can result in excessive backpressure and a cracked syringe barrel.

To backfill a Hamilton syringe, simply remove the plunger and load the solution from the back using a second syringe. Once the air bubbles are flushed out remove the second syringe and reinsert the plunger. For this purpose Hamilton offers a Priming Kit (P/N PRMKIT) which is recommended for syringes as small as 5 μL .

Note: This procedure is valid for 700 and 1700 series syringes only.



Needle Questions

10

How do I find a needle for my syringe?

Use the tutorial on page 9 to determine what needles are compatible with your syringe. Then turn to the Needles section to find a part number.

11

Is the needle dead volume part of the total volume of the dispensed fluid?

No, the liquid in the needle is not part of the dispense volume. The needle contains a constant dead volume throughout the aspirate and dispense steps.

When performing a GC injection one thing to consider is that the sample is aspirated at room temperature. When the sample is dispensed the needle starts to warm up to the temperature of the GC inlet. If the sample trapped in the needle is volatile it may begin to expand and result in the introduction of additional sample into the GC. To minimize this effect it is critical that the injection timing is the same for all injections.

12

What does the “s” mean in a 22s or 26s gauge needle?

For needles the gauge indicates the outer diameter of the needle tubing. The difference between a 26 gauge needle and a 26s gauge needle is the thickness of the tubing wall. The “s” needles have a thicker wall which results in a more rigid needle and a smaller dead volume. Smaller dead volume needles come standard on small volume syringes to make them practical to prime.

A table of available needle gauges and their dimensions can be found on page 119.

13

Does Hamilton offer a needle sheath?

No, Hamilton does not offer a needle sheath. Our syringes are not for human use, and our needles do not come with a medical point. If a sheath is required it is possible to buy a third party Luer Lock needle and attach it to a Hamilton Luer Tip or Luer Lock syringe.

14

Can disposable needles work with Hamilton syringes?

Yes, our Luer Tip (LT) and PTFE Luer Lock (TLL) syringes can accept most industry standard disposable luer lock needles.





Syringe Calibration

This syringe calibration procedure is based on determining the mass of deionized water samples delivered by the syringe. True volume is calculated based on the density of water at

the calibration temperature. This method is not recommended for volumes below 2 μL . There is no upper volume limit.

Equipment and Materials

Step 1

Laboratory balances required for the test method should meet or exceed the following performance specifications and should be regularly maintained and calibrated with the appropriate N.I.S.T. traceable weights.

| Test Volume (μL) | Balance Sensitivity (mg) |
|-------------------------------|--------------------------|
| 1 – 10 | 0.001 |
| 10 – 100 | 0.01 |
| 100 – 1,000 | 0.1 |

Step 2

Use a balance table, or suitable equivalent to minimize vibration.

Step 3

Use a weighing vessel that has a total volume 12 to 40 times larger than the test volume, or 500 μL , whichever is larger (this is for evaporation control). If possible, use a cover that fits over the outside of the vessel top (do NOT allow the cover to come into contact with the test liquid). The vessel should be plastic, glass, metal, or some other non-porous material. The cross-sectional area of the opening should be as small as possible to further minimize evaporation.

Step 4

Handle the vessel with forceps or tweezers.

Step 5

Use deionized water that has equilibrated to room temperature.

Step 6

Use a calibrated thermometer to measure the temperature of the water.





Calibration Procedure

Step 1

Allow all test materials to equilibrate to room temperature (Note: For best results, this procedure should be performed at 22 °C – 26 °C.)

Step 2

Place a small amount of deionized water in the weighing vessel (between 2 and 30 test volumes).

Step 3

Fill a reservoir with deionized water and aspirate water into the syringe. Remove any bubbles by slowly aspirating and quickly dispensing the water several times.

Step 4

Place the weighing vessel on the balance pan and close the door of the balance chamber.

Step 5

Aspirate the sample to be measured. Hamilton uses 80% of the nominal volume for calibration.

Step 6

Tare the balance. Retrieve the weighing vessel from the balance chamber, dispense the volume of water, and return the vessel to the balance pan, closing the door to the weighing chamber. Record the mass of the deionized water.

Step 7

Weigh 10 samples into the weighing vessel and record each sample mass after delivery. Replicate all motions and time intervals in each sampling cycle as precisely as possible. Keep the distance between the balance and the syringe to a minimum.

Step 8

Measure and record the water temperature.



Calculating Accuracy and Precision

Step 1

Calculate the volume of each dispense (V_i) by dividing each mass value by the density of water at the measured temperature. Refer to the table below for density values.

Density of Water at Various Temperatures

| °C | g/mL |
|----|----------|
| 18 | 0.998595 |
| 19 | 0.998405 |
| 20 | 0.998203 |
| 21 | 0.997992 |
| 22 | 0.997770 |
| 23 | 0.997538 |
| 24 | 0.997296 |
| 25 | 0.997044 |
| 26 | 0.996783 |
| 27 | 0.996512 |
| 28 | 0.996232 |
| 29 | 0.995944 |
| 30 | 0.995646 |

Data from CRC Handbook of Chemistry and Physics, 50th Edition, 1969, page F-4

Step 2

Calculate the average dispensed volume from the individual dispensed volumes, V_i (where i is 1 to 10):

$$V_{avg} = \frac{(V_1 + V_2 + V_3 + \dots + V_{10})}{10}$$

Step 3

Calculate the syringe accuracy (where V_0 is equal to the expected dispense volume):

$$Accuracy (\%) = \left[\frac{(V_{avg} - V_0)}{V_0} \right] \times 100\%$$

Step 4

Calculate the standard deviation (STDEV) of the calculated volumes:

$$STDEV = \sqrt{\frac{\sum(V_i - V_{avg})^2}{10}}$$

Step 5

Determine the precision (coefficient of variation – CV):

$$CV (\%) = \frac{STDEV}{V_{avg}} \times 100\%$$



Hamilton Reference Guide
Needles





Needles

Introduction 95

I have a syringe, which needle do I need? 96

Needles 101: Definitions and Terminology97

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Needles

Hamilton needles are manufactured with top quality materials and skilled workmanship ensuring the highest possible performance for reliable analyses. With proper care and handling, Hamilton needles provide unsurpassed performance.

Introduction

Product finder tutorials to simplify finding the right needle. Not familiar with the terminology? Visit the Needle 101 section for definitions and terminology.



Introduction

P. 96

Needles

Needles are grouped based on needle type such as Luer Lock, Removable Needles, Specialty Needles, and Needle Cleaning Accessories.



Needles

P. 102

Needle Technical Reference

This section contains the most frequently requested needle reference information including: needle care and use, sterilization and disinfection, and needle dimensions.



Needle Technical Reference

P. 114

Find Your Product

I have a syringe, which needle do I need?

If you already have a syringe and need a Hamilton needle, review the three options below to determine which needle hub is compatible with your syringe. Once the needle hub is identified turn to the corresponding page to browse the available needle gauges, lengths, and point styles.

Option 1

I already know my syringe termination

Below are the syringe terminations that accept replacement needles. Identify your termination below and proceed to the corresponding needle hub page to see the compatible needle part numbers.

| Terminations | Needle Hubs | Page |
|---|------------------------|------------------|
| TLL - PTFE / Luer Lock | Kel-F Hub Metal Hub | P. 105 P. 106 |
| LT - Luer Tip | Kel-F Hub | P. 105 |
| RN - Removable Needle 100 μ L or Smaller | Small Hub RN | P. 109 |
| RN - Removable Needle 250 μ L or Larger | Large Hub RN | P. 108 |
| SL - SampleLock | Large Hub RN | P. 108 |

Option 2

I know my syringe part number, but not the termination

If you know the syringe part number but do not know what termination it has, you can look up the part number in the index at the back of this guide. You will be directed to the page where the part number is displayed, indicating the syringe termination. Alternatively, you can search for the part number at www.hamiltoncompany.com where the product page will list the termination and the compatible needle hub. Once the termination is determined use Option 1 to find the page where the appropriate needles are listed.

Option 3

I have a plastic syringe and need a compatible needle

Many plastic syringes use an industry standard Luer or Luer Lock connector. For these syringes both the Hamilton Metal Hub (page 106) and the Kel-F Hub (page 105) needles are compatible.





Needles 101:

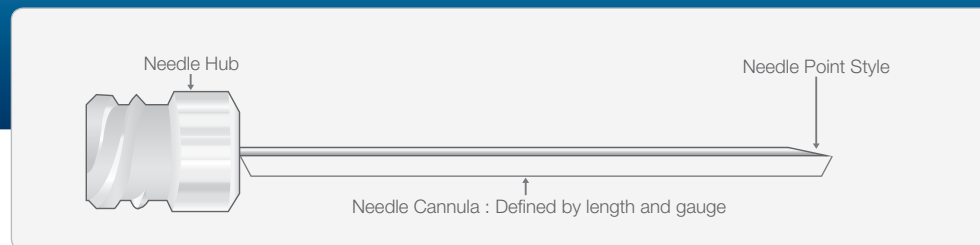
Definitions and Terminology

This section is designed to provide an overview of the different types of needles that Hamilton offers including a discussion of hub

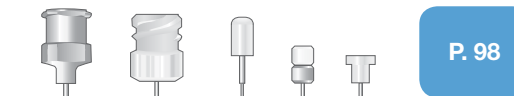
styles, needle point styles with a discussion on calculating the bevel length, needle lengths, and choosing a needle gauge for an application.

Anatomy of a Needle

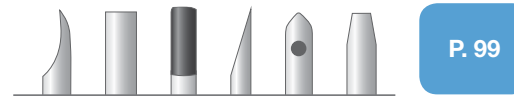
The needle hub is attached to the needle cannula and is used to connect the needle to a syringe, tube, or fitting. The opposite end of the needle is shaped into a needle point style that is appropriate for the application.



Needle Hub Styles



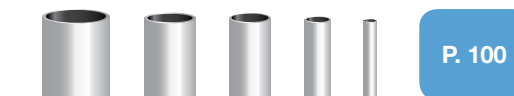
Needle Point Styles



Specifying Needle Length



Choosing the Appropriate Gauge



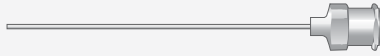



Needle Hub Styles

The tables below discuss the different hub styles that Hamilton offers.

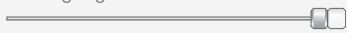
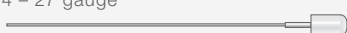

Luer Lock Needle Hubs

Designed to fit any standard Luer or Luer Lock syringe or fitting.

| | Needle Hub Style | Needle Gauge | Compatible with: |
|------------------|--|---------------|---|
| Metal Hub Needle |  | 33 – 10 gauge | 25 µL to 2 L – PTFE Luer Lock (TLL) Syringes |
| Kel-F Hub Needle |  | 31 – 10 gauge | 25 µL to 2 L – PTFE Luer Lock (TLL) Syringes 10 µL to 10 mL – Luer Tip (LT) Syringes |

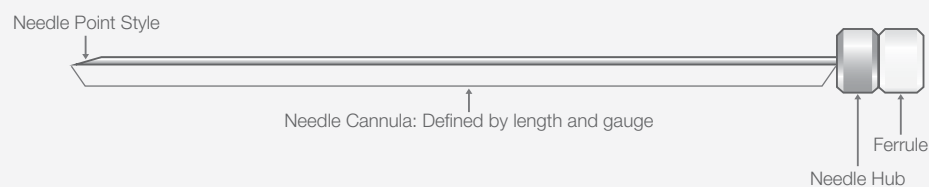
Removable Needle Hubs

Seated at the zero line of the syringe, minimizing dead volume, and enabling complete priming of small volume syringes. The difference between a Small and Large Hub Removable Needle (RN) is the outer diameter of the hub and ferrule. There are two versions of the Small Hub RN because at smaller than 27 gauge the tubing wall is too thin to stake the hub in place.

| | Needle Hub Style | Needle Gauge | Compatible with: |
|----------------------------|--|----------------|--|
| Small Hub Removable Needle | 26 – 18 gauge  | 34 – 18 gauge | 2.5 µL to 100 µL – Removable Needle (RN) Syringes |
| | 34 – 27 gauge  | | |
| Large Hub Removable Needle |  | 26s – 20 gauge | 250 µL to 10 mL – Removable Needle (RN) Syringes 50 µL to 100 mL – SampleLock (SL) Syringes |


Detachable Ferrules

Some Removable Needles have a detachable ferrule as shown below.



Valve Port Needle Hubs







Used to connect the needle to a tubing port on a Hamilton valve.

| | Needle Hub Style | Needle Gauge | Compatible with: |
|------------|---|---------------|---|
| Hat Needle |  | 26 – 14 gauge | Connected directly to a 1/4"-28 flat bottom valve port using needle bushing part number 35056 |



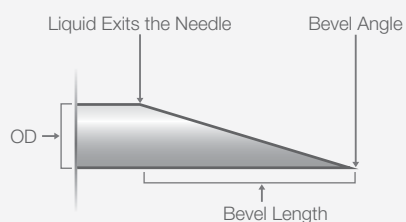
Needle Point Styles

Hamilton offers several different needle point styles depending on the intended application. For most syringes and needles, the standard length is 51 mm. Customization of the needle gauge, length, and point style is possible to suit almost any application.

| ID | Point Style | Description | Application | Gauges |
|----|---|--|---|---------------------|
| 2 |  | 10 – 12° sharp, beveled, curved non-coring | Gas Chromatography (GC), septum piercing | 33 – 10 ga |
| 3 |  | Blunt, electro-polished | High Performance Liquid Chromatography (HPLC) injection, Thin-Layer Chromatography (TLC), general liquid handling, controlled animal injections | 34 – 10 ga |
| 3T |  | Blunt, electro-polished, coated with PTFE 19 mm from the tip | Thin-Layer Chromatography (TLC) applications | 26s, 22s, and 22 ga |
| 4 |  | Sharp 10 – 12° beveled needle; other angles available upon request | Life science/animal injections | 34 – 10 ga |
| 5 |  | Conical with side port for penetration without coring | Headspace, applications prone to needle clogging, causes minimal septum damage | 26 – 10 ga |
| AS |  | Conical, non-coring designed to withstand multiple injections | Autosampler injection, pre-pierced septa | 26 – 10 ga |

Calculating Point Style 4 Bevel Length

Neuroscience injections require precise positioning of the needle in the brain. Liquid exits the needle from the start of the bevel so knowing the bevel length is critical. It is possible to calculate the bevel length by knowing the outer diameter (OD) of the needle tubing and the bevel angle.



$$\text{Bevel Length} = \frac{\text{OD}}{\tan(\text{Bevel Angle})}$$


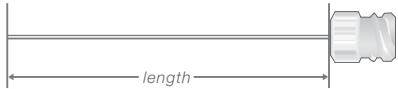


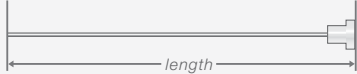
For example: A 27 gauge needle (OD = 0.413) with a point style 4 beveled at 30 degrees:
Bevel length = 0.413 mm / tan30 = 0.715 mm



Specifying Needle Length

The needle length for most standard Hamilton needles is 51 mm \pm 1 mm. If a custom length is desired, it is critical to understand how to specify the desired length. The table below shows the length that is specified when ordering each hub style.

Custom needles are available in lengths from 10 mm to 304 mm. If a longer needle is required, contact your local representative to determine available possibilities.

| Hub Style | Length Determination | Image |
|---------------------------|--|---|
| Metal Hub Needle | Needle length is specified from the needle point to the start of the hub. |  |
| Kel-F Hub Needle | Needle length is specified from the needle point to the start of the hub. |  |
| Standard RN Hub Needle | Needle length is specified from the needle point to the start of the RN nut. The distance from the needle point to the hub is Length + 1.8 mm. |  |
| Small Gauge RN Hub Needle | Needle length is specified from the needle point to the start of the support sleeve. |  |
| Hat Hub Needle | Needle length is specified from the needle point to the end of the hub. |  |

Choosing the Appropriate Gauge

Needle gauge specifies the outer diameter of the tubing used to make the needle. As the needle gauge increases the outer diameter of the needle decreases, i.e. 10 gauge is larger than 33 gauge. The same gauge tubing is available with different wall thicknesses resulting in different inner diameters. Hamilton designates the thick wall version of the tubing by adding an “s” to the gauge. For example, 26s is the thick walled version of 26 gauge tubing. To see the dimensions of the tubing Hamilton uses for needles, turn to the Gauge Index on page 119.

Considerations for Syringes 250 μ L and Smaller

For syringes 250 μ L and smaller it is recommended to use the “s” gauge tubing and a Cemented or Removable Needle. With small volume syringes the needle dead volume becomes critical. If the dead volume is too large it will be difficult to prime the syringe. If a thick walled version of the desired gauge is not available or if a Luer Lock hub is desired, special priming techniques may be required. Ideally the dead volume will not exceed 20% of the syringe’s nominal dispense volume.

What is Dead Volume?

Dead volume is defined as the volume of solution that remains in the needle after an injection. To achieve a precise dispense the dead volume must be completely primed with sample by rapidly filling and dispensing until the air bubbles are flushed from the system. Once primed the dead volume does not contribute to the volume aspirated or dispensed by the syringe.



Choosing the Appropriate Gauge (Cont.)

Calculating Needle Dead Volume

The dead volume and dimensions of the needle tubing are listed in the Gauge Index (page 119). The dead volume can be calculated by the equation $(\text{inner diameter}/2)^2(\pi)(\text{needle length})$. Add this to the dead volume of the needle hub to get the needle's total dead volume. For a Metal or Kel-F Luer Lock Needle connected to a Hamilton syringe add 10 μL , and for a Removable Needle there is no additional dead volume.

Considerations for Syringes 500 μL and Larger

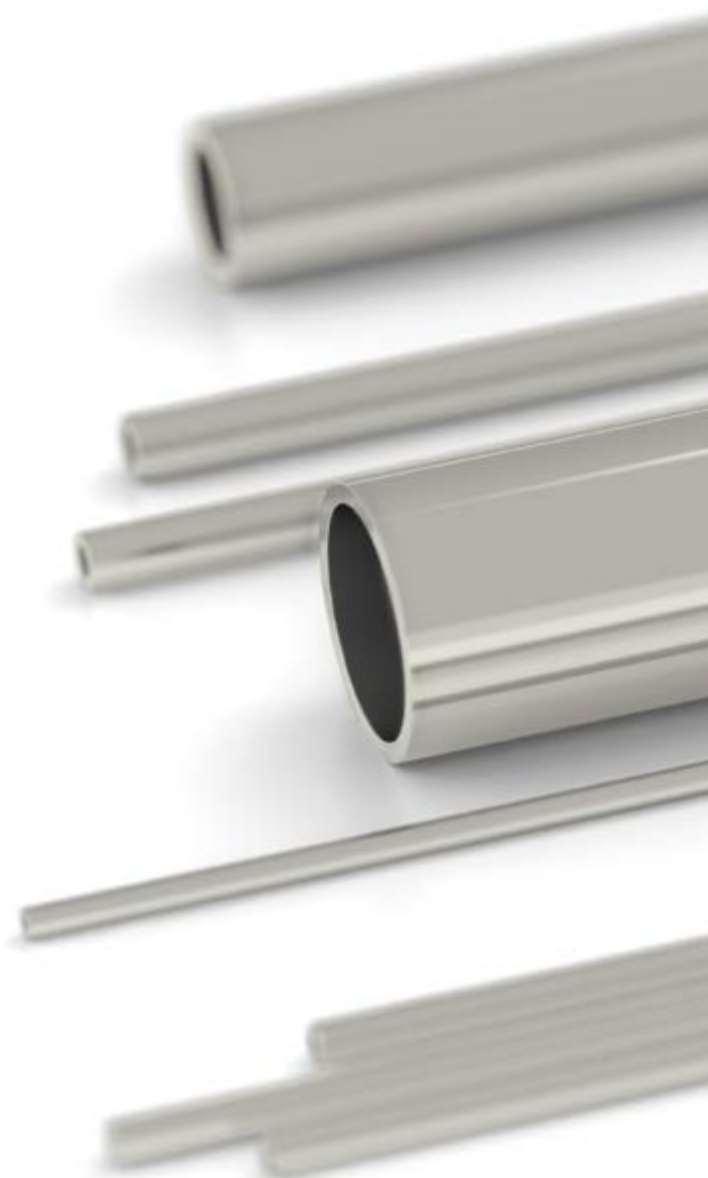
For syringes of this size, flow rate and backpressure are the biggest considerations. It is possible to use a 27 gauge and smaller needle with these syringes. However, the force to press the plunger will increase, and the dispense rate must be slow. When possible, it is always recommended to use the thin-walled tubing in lieu of the "s" gauge tubing.

Small Gauge Needle Bending with Length

As needle diameter decreases, the needle becomes less rigid. For applications that require a small gauge needle but still need rigidity for penetration, it is recommended to order the shortest needle that is still suitable for the application. The Neuros syringe on page 58 may also be an option. It has a protective sleeve to improve the rigidity of a small gauge needle.

Using 34 Gauge Needles

A 34 gauge needle is significantly smaller than a 33 gauge needle. For some applications the smaller size is a real advantage but has inherent complications. 34 gauge tubing requires special cutting tools to ensure the tubing is not crimped shut. Due to this limitation the needles are only available in restricted lengths and point styles. The small inner diameter (ID) results in a needle more prone to clogging, and cleaning wires are not available for this size. The small ID also makes it difficult to aspirate water with a fitted Microliter syringe; therefore, a Gastight syringe must be used with a 34 gauge needle.





NEEDLES

Needles

Hamilton Company offers the widest variety of standard and custom needles in the industry. All needles are built from high quality materials including 304 stainless steel tubing to ensure chemical resistance. Custom needle part numbers are used to deliver all common gauge, length, and point style combinations with quick turnaround. For more complicated custom requests contact a Hamilton representative.





Luer Lock Needles

Metal and plastic hub needles designed to connect with industry standard Luer syringes and fittings.



Luer Lock Needles

P. 104

Removable Needles

For use with Hamilton Removable Needle Syringes to create a tight, low dead volume connection.



Removable Needles

P. 107

Specialty Needles

Application specific needle connections such as: cut tubing, glass micro pipettes, Thin-Layer Chromatography, Gel-Loading, PEEK, and Valve Port needles.



Specialty Needles

P. 110

Needle Cleaning Accessories

This section includes products for caring for the needles such as: a Needle Cleaning Kit, Cleaning Wires, and Cleaning Solution Concentrate.



Needle Cleaning Accessories

P. 113





Luer Lock Needles

Hamilton Luer Lock Needles are designed to fit any standard Luer or Luer Lock syringe or fitting. They are specifically designed to minimize dead volume when connected with a Hamilton PTFE Luer Lock (TLL) or Luer Tip (LT) syringe.

Excessive dead volume can make it impossible to completely prime syringes smaller than 100 μ L. Complete priming of the syringe and needle is critical to achieving the stated accuracy and precision.

Kel-F Hub Needles



P. 105

Metal Hub Needles



P. 106



Kel-F Hub Needles

The Kel-F hub is made from CTFE plastic. Needles are available from 31 to 10 gauge. This hub is recommended when connecting to a rigid male Luer like a Luer Tip (LT) syringe because the plastic is more pliable and creates the best seal. All needles are sold in six-packs and the standard needles are 51 mm long. For all custom needles, the length and point style will need to be specified prior to placing an order.



Standard Kel-F Hub Needles

| Length | Gauge | Point 2 | Point 3 | Point 5 |
|--------|--------|---------|---------|---------|
| 51 mm | 31 ga | 90131 | 90531 | |
| | 30 ga | 90130 | 90530 | |
| | 29 ga | 90129 | 90529 | |
| | 28 ga | 90128 | 90528 | |
| | 27 ga | 90127 | 90532 | |
| | 26s ga | 90139 | 90539 | 7746-12 |
| | 26 ga | 90126 | 90533 | 7746-10 |
| | 25 ga | 90125 | 90525 | 7746-09 |
| | 24 ga | 90124 | 90524 | 7746-08 |
| | 23 ga | 90123 | 90523 | 7746-07 |
| | 22s ga | 90138 | 90534 | 7746-11 |
| | 22 ga | 90122 | 90134 | 7746-06 |
| | 21 ga | 90121 | 90521 | 7746-05 |
| | 20 ga | 90120 | 90520 | 7746-04 |
| | 19 ga | 90119 | 90519 | 7746-13 |
| | 18 ga | 90118 | 90535 | 7746-03 |
| | 17 ga | 90117 | 90517 | 7746-02 |
| | 16 ga | 90116 | 90516 | 7746-01 |
| | 15 ga | 90115 | 90515 | 7746-14 |
| | 14 ga | 90114 | 90514 | 7746-15 |
| 13 ga | 90113 | 90513 | | |
| 12 ga | 90112 | 90512 | | |
| 11 ga | 90111 | 90511 | | |
| 10 ga | 90110 | 90536 | 7746-16 | |

Custom Kel-F Hub Needles

| Length | Gauge | Point 2, 3, or 4 | Point 5 or AS |
|-------------|---------|------------------|---------------|
| 10 – 304 mm | 31 ga | 7750-22 | |
| | 30 ga | 7750-21 | |
| | 29 ga | 7750-20 | |
| | 28 ga | 7750-19 | |
| | 27 ga | 7750-18 | |
| | 26s ga | 7750-24 | 7752-19 |
| | 26 ga | 7750-17 | 7752-17 |
| | 25s ga | 7750-26 | 7752-21 |
| | 25 ga | 7750-16 | 7752-16 |
| | 24 ga | 7750-15 | 7752-15 |
| | 23s ga | 7750-25 | 7752-20 |
| | 23 ga | 7750-14 | 7752-14 |
| | 22s ga | 7750-23 | 7752-18 |
| | 22 ga | 7750-13 | 7752-13 |
| | 21 ga | 7750-12 | 7752-12 |
| | 20 ga | 7750-11 | 7752-11 |
| | 19 ga | 7750-10 | 7752-10 |
| | 18 ga | 7750-09 | 7752-09 |
| | 17 ga | 7750-08 | 7752-08 |
| | 16 ga | 7750-07 | 7752-07 |
| 15 ga | 7750-06 | 7752-06 | |
| 14 ga | 7750-05 | 7752-05 | |
| 13 ga | 7750-04 | 7752-04 | |
| 12 ga | 7750-03 | 7752-03 | |
| 11 ga | 7750-02 | 7752-02 | |
| 10 ga | 7750-01 | 7752-01 | |





Metal Hub Needles

The Metal hub is made from nickel plated brass. Needles are available from 33 to 10 gauge. This hub makes the most rigid connection to the needle making it perfect for repetitive septum piercing. Metal hub needles are compatible with PTFE Luer Lock (TLL) syringes. All needles are sold in six-packs and the standard needles are 51 mm long. For all custom needles, the length and point style will need to be specified prior to placing an order.



Standard Metal Hub Needles

| Length | Gauge | Point 2 | Point 3 | Point 5 |
|--------|--------|---------|---------|---------|
| 51 mm | 33 ga | 90033 | 91033 | |
| | 32 ga | 90032 | 91032 | |
| | 31 ga | 90031 | 91031 | |
| | 30 ga | 90030 | 91030 | |
| | 29 ga | 90029 | 91029 | |
| | 28 ga | 90028 | 91028 | |
| | 27 ga | 90027 | 91027 | |
| | 26s ga | 90039 | 91039 | 7729-01 |
| | 26 ga | 90026 | 91026 | 7729-03 |
| | 25s ga | 90052 | | |
| | 25 ga | 90025 | 91025 | 7729-04 |
| | 24 ga | 90024 | 91024 | 7729-05 |
| | 23 ga | 90023 | 91023 | 7729-06 |
| | 22s ga | 90038 | 91038 | 7729-02 |
| | 22 ga | 90022 | 91022 | 7729-07 |
| | 21 ga | 90021 | 91021 | 7729-08 |
| | 20 ga | 90020 | 91020 | 7729-09 |
| | 19 ga | 90019 | 91019 | 7729-14 |
| | 18 ga | 90018 | 91018 | 7729-10 |
| | 17 ga | 90017 | 91017 | 7729-11 |
| | 16 ga | 90016 | 91016 | 7729-12 |
| | 15 ga | 90015 | 91015 | 7729-13 |
| | 14 ga | 90014 | 91014 | 7730-01 |
| | 13 ga | 90013 | 91013 | 7730-02 |
| | 12 ga | 90012 | 91012 | 7730-03 |
| | 11 ga | 90011 | 91011 | 7730-04 |
| | 10 ga | 90010 | 91010 | 7730-05 |

Custom Metal Hub Needles

| Length | Gauge | Point 2, 3, or 4 | Point 5 or AS |
|-------------|---------|------------------|---------------|
| 10 - 304 mm | 33 ga | 7747-01 | |
| | 32 ga | 7747-02 | |
| | 31 ga | 7748-17 | |
| | 30 ga | 7748-16 | |
| | 29 ga | 7748-15 | |
| | 28 ga | 7748-14 | |
| | 27 ga | 7748-13 | |
| | 26s ga | 7748-19 | 7751-19 |
| | 26 ga | 7748-12 | 7751-17 |
| | 25s ga | 7748-21 | 7751-21 |
| | 25 ga | 7748-11 | 7751-16 |
| | 24 ga | 7748-10 | 7751-15 |
| | 23s ga | 7748-20 | 7751-20 |
| | 23 ga | 7748-09 | 7751-14 |
| | 22s ga | 7748-18 | 7751-18 |
| | 22 ga | 7748-08 | 7751-13 |
| | 21 ga | 7748-07 | 7751-12 |
| | 20 ga | 7748-06 | 7751-11 |
| | 19 ga | 7748-05 | 7751-10 |
| | 18 ga | 7748-04 | 7751-09 |
| 17 ga | 7748-03 | 7751-08 | |
| 16 ga | 7748-02 | 7751-07 | |
| 15 ga | 7748-01 | 7751-06 | |
| 14 ga | 7749-05 | 7751-05 | |
| 13 ga | 7749-04 | 7751-04 | |
| 12 ga | 7749-03 | 7751-03 | |
| 11 ga | 7749-02 | 7751-02 | |
| 10 ga | 7749-01 | 7751-01 | |



Point Styles





Removable Needles

Hamilton Removable Needles provide the benefits of a replaceable needle with the smallest dead volume necessary for complete priming of the syringe. The unique connection installs the needle precisely at the zero line and the compression seal between the glass barrel and the PTFE or CTFE seal is chemically inert.

Large Hub Removable Needles



P. 108

Small Hub Removable Needles



P. 109



Large Hub Removable Needles

The Large Hub Removable Needle (RN) is compatible with RN syringes from 250 µL to 10 mL and all SampleLock syringes. Needles are available from 26s to 20 gauge. All needles are sold in six-packs and the standard needles are 51 mm long. For all custom needles, the length and point style will need to be specified prior to placing an order.



Standard Large Hub RN Needles

| Length | Gauge | Point 2 | Point 3 | Point 5 |
|--------|--------|---------|---------|---------|
| 51 mm | 26s ga | 7779-02 | 7780-01 | 7784-03 |
| | 26 ga | 7779-04 | 7780-02 | 7784-04 |
| | 22s ga | 7779-03 | 7780-03 | 7784-01 |
| | 22 ga | 7779-01 | 7780-04 | 7784-02 |

Custom Large Hub RN Needles

| Length | Gauge | Point 2, 3, or 4 | Point 5 or AS |
|-------------|---------|------------------|---------------|
| 10 - 304 mm | 26s ga | 7806-04 | 7732-04 |
| | 26 ga | 7806-03 | 7732-03 |
| | 25s ga | 7806-09 | 7732-09 |
| | 25 ga | 7806-07 | 7732-05 |
| | 24 ga | 7806-06 | 7732-07 |
| | 23s ga | 7806-08 | 7732-08 |
| | 23 ga | 7806-05 | 7732-06 |
| | 22s ga | 7806-02 | 7732-02 |
| | 22 ga | 7806-01 | 7732-01 |
| | 21 ga | 7806-11 | 7732-11 |
| 20 ga | 7806-10 | 7732-10 | |

Point Styles





Small Hub Removable Needles

The Small Hub Removable Needle (RN) is compatible with RN syringes from 2.5 μL to 100 μL . Needles are available from 34 to 18 gauge. All needles are sold in six-packs and the standard needles are 51 mm long. For all custom needles, the length and point style will need to be specified prior to placing an order.



Standard Small Hub RN Needles

| Length | Gauge | Point 2 | Point 3 | Point 5 |
|--------|--------|---------|---------|---------|
| 38 mm | 33 ga | | 7762-06 | |
| | 32 ga | | 7762-05 | |
| | 31 ga | | 7762-04 | |
| | 30 ga | | 7762-03 | |
| 51 mm | 28 ga | | 7762-02 | |
| | 27 ga | | 7762-01 | |
| | 26s ga | 7758-02 | 7768-01 | 7784-07 |
| | 26 ga | 7758-04 | 7768-02 | 7784-08 |
| | 22s ga | 7758-03 | 7770-01 | 7784-05 |
| | 22 ga | 7758-01 | 7770-02 | 7784-06 |

Custom Small Hub RN Needles

| Length | Gauge | Point 2, 3, or 4 | Point 5 or AS | |
|----------------------|-------------|------------------|---------------|---------|
| 10, 13, 25, or 38 mm | 34 ga | 207434* | | |
| | 33 ga | 7803-05 | | |
| | 32 ga | 7803-04 | | |
| | 31 ga | 7803-03 | | |
| | 30 ga | 7803-07 | | |
| | 29 ga | 7803-06 | | |
| | 28 ga | 7803-02 | | |
| | 27 ga | 7803-01 | | |
| | 26s ga | 7804-04 | 7731-02 | |
| | 26 ga | 7804-03 | 7731-01 | |
| | 10 – 304 mm | 25s ga | 7804-10 | 7731-06 |
| | | 25 ga | 7804-05 | 7731-05 |
| | | 24 ga | 7804-08 | 7731-09 |
| | | 23s ga | 7804-09 | 7731-08 |
| 23 ga | | 7804-07 | 7731-07 | |
| 22s ga | | 7804-02 | 7731-04 | |
| 22 ga | | 7804-01 | 7731-03 | |
| 21 ga | | 7804-12 | 7731-11 | |
| 20 ga | | 7804-11 | 7731-10 | |
| 19 ga | | 207419 | 7731-13 | |
| 18 ga | 7804-06 | 7731-12 | | |

* Only available as a point style 3 or 4



Specialty Needles

Stainless Steel Tubing



P. 110

Glass Micro Pipettes



P. 111

Thin-Layer Chromatography Needles



P. 111

Gel-Loading Needles



P. 112

PEEK Needles



P. 112

Valve Port Needles



P. 112



Stainless Steel Tubing (Cont.)

Stainless Steel Tubing (Cont.)

| Gauge | Cut Tubing | Point 2, 3, or 4 | Point 5 or AS |
|--------|------------|------------------|---------------|
| 29 ga | 21029A | 22029-01 | |
| 28 ga | 21028A | 22028-01 | |
| 27 ga | 21027A | 22027-01 | |
| 26s ga | 21039A | 22039-01 | 22039-02 |
| 26 ga | 21026A | 22026-01 | 22026-02 |
| 25s ga | 21058A | 22058-01 | 22058-02 |
| 25 ga | 21025A | 22025-01 | 22025-02 |
| 24 ga | 21024A | 22024-01 | 22024-02 |
| 23s ga | 21041A | 22041-01 | 22041-02 |
| 23 ga | 21023A | 22023-01 | 22023-02 |
| 22s ga | 21038A | 22038-01 | 22038-02 |
| 22 ga | 21022A | 22022-01 | 22022-02 |

| Gauge | Cut Tubing | Point 2, 3, or 4 | Point 5 or AS |
|-------|------------|------------------|---------------|
| 21 ga | 21021A | 22021-01 | 22021-02 |
| 20 ga | 21020A | 22020-01 | 22020-02 |
| 19 ga | 21019A | 22019-01 | 22019-02 |
| 18 ga | 21018A | 22018-01 | 22018-02 |
| 17 ga | 21017A | 22017-01 | 22017-02 |
| 16 ga | 21016A | 22016-01 | 22016-02 |
| 15 ga | 21015A | 22015-01 | 22015-02 |
| 14 ga | 21014A | 22014-01 | 22014-02 |
| 13 ga | 21013A | 22013-01 | 22013-02 |
| 12 ga | 21012A | 22012-01 | 22012-02 |
| 11 ga | 21011A | 22011-01 | 22011-02 |
| 10 ga | 21010A | 22010-01 | 22010-02 |

Glass Micro Pipettes

Glass micro pipettes are widely used in Neuroscience because the point can be pulled to an incredibly small diameter and maintain the rigidity to penetrate tissue. Additionally, the dispense orifice exits from the very tip of the needle so the wound track can be minimized. The 1 mm RN compression fitting allows for quick connection to standard 1 mm capillary glass. Pull your own needle and attach it to an RN syringe without wax or glue.

1 mm Compression Fitting



| P/N | Description |
|----------|-----------------------------|
| 55750-01 | RN Compression Fitting 1 mm |

Hamilton does not offer 1 mm glass capillary tubing.



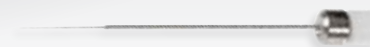


NEEDLE TECHNICAL REFERENCE

Gel-Loading Needles

These are replacement needles for a Fixed or Adjustable Gel-Loading syringes. The needles are available in a variety of outer diameters for compatibility with different sized loading wells. For more information on Gel-Loading Syringes turn to page 64.

Replacement Gel-Loading Needles



| Syringe Type | Needle OD | Quantity | Part Number |
|--------------------------------|-----------|----------|-------------|
| Fixed Gel-Loading Syringe | 0.2 mm | 6 pk | 8651-01 |
| | 0.3 mm | 6 pk | 8651-02 |
| | 0.4 mm | 6 pk | 8651-03 |
| Adjustable Gel-Loading Syringe | 0.2 mm | 4 pk | 78633 |
| | 0.3 mm | 4 pk | 78631 |

PEEK Needles

Some applications call for a non-metallic needle. These plastic needles are made from PEEK HPLC tubing that is both chemically and physical robust. PEEK needles are sold in six-packs.

PEEK Needles



| P/N | Hub | Length | Outer Diameter | Inner Diameter |
|---------|----------|--------|----------------|----------------|
| 8649-01 | Kel-F | 51 mm | 1.6 mm | 0.8 mm |
| 8650-01 | Large RN | 51 mm | 1.6 mm | 0.8 mm |

Valve Port Needles

Hat type needles are designed to be connected directly to a flat bottom valve port. Use the needle bushing part number 35056 to connect the needle directly to any 1/4"-28 Hamilton valve. Hat needles are sold in three-packs.

Hat Needles



| Length | Gauge | Point 2, 3, or 4 |
|-------------|----------|------------------|
| 10 - 304 mm | 26 gauge | 90826 |
| | 25 gauge | 90825 |
| | 24 gauge | 90824 |
| | 23 gauge | 90823 |
| | 22 gauge | 90822 |
| | 21 gauge | 90821 |
| | 20 gauge | 90820 |
| | 19 gauge | 90819 |
| | 18 gauge | 90818 |
| | 17 gauge | 90817 |
| | 16 gauge | 90816 |
| | 15 gauge | 90815 |
| | 14 gauge | 90814 |



Point Styles

Point 2

Point 3

Point 4

Point 5

Point AS



Needle Cleaning Accessories

To extend the life of a needle it is critical to thoroughly clean before storage. It is much easier to flush out contaminants before they dry and harden. Be sure to flush the needle with a solvent known to solubilize the sample. One common mistake is to flush salts, protein, or DNA with organic solvents. This tends to precipitate the contaminants, resulting in clogs instead of preventing them.

Hamilton's Needle Cleaning Kit includes a biodegradable, non-phosphate Cleaning Solution Concentrate that is suitable for many common sample types and various sized tungsten cleaning wires that can be threaded through the needle to clear a blockage.

Needle Cleaning Kit

| P/N | Volume |
|--------|---|
| 76620A | Kit includes 10 of each wire and 70 mL of concentrate |

Cleaning Solution Concentrate

| P/N | Volume |
|-------|--------|
| 18311 | 500 mL |
| 18310 | 70 mL |

Tungsten Cleaning Wires

| P/N | For Gauges | Wire OD | Package |
|-------|--------------------------|----------|---------|
| 18304 | 22, 23 ga, and larger | 0.306 mm | 10 pk |
| 18303 | 24 – 26 ga | 0.207 mm | 10 pk |
| 18302 | 27 ga | 0.167 mm | 10 pk |
| 18301 | 22s, 25s, and 28 – 30 ga | 0.126 mm | 10 pk |
| 18300 | 26s and 31 – 33 ga | 0.089 mm | 10 pk |
| 18306 | 23s ga | 0.076 mm | 10 pk |





Needle Technical Reference

The Needle Technical Reference section includes information on the operation, maintenance, and dimensions of the needles. The information is intended as a general guideline.

For specific details on a part number or application search the part on our website or contact a local Hamilton representative.

| | |
|--------------------------------|--------|
| Needle Care and Use | P. 115 |
| Sterilization and Disinfection | P. 118 |
| Gauge Index | P. 119 |





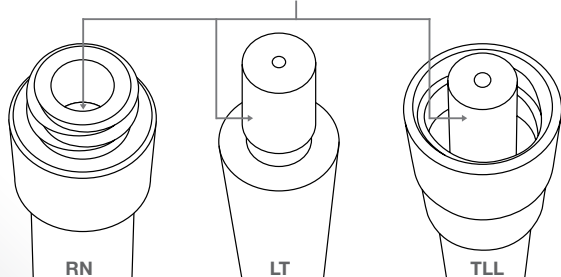
Needle Care and Use

Step 1 Inspection

Inspect the sealing surfaces

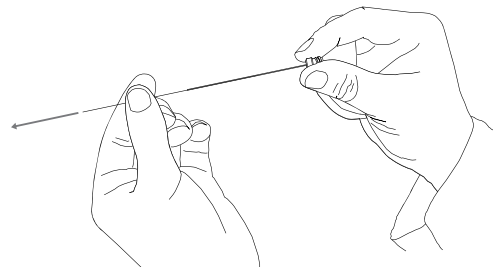
Inspect the connection between the needle hub and the syringe termination. Confirm that the sealing surfaces are free of major damage, scratches, or chips that could hinder sealing.

This is the sealing surface. Make sure there are no cracks, chips, obstructions, or damage.



Remove cleaning wire

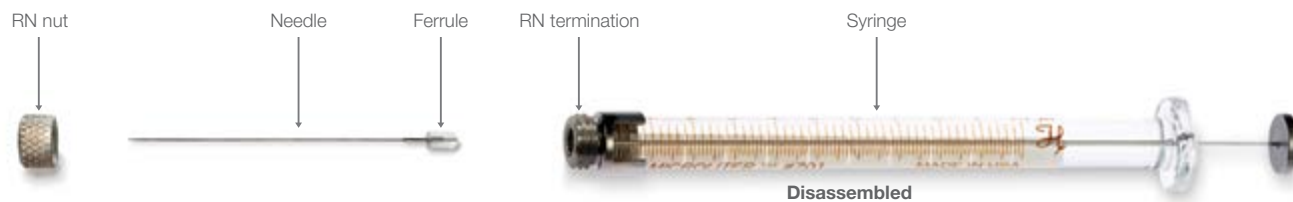
Hamilton 27 – 33 gauge needles ship with cleaning wires installed in the needle tubing. Be sure to remove this wire prior to installing the needle. In one hand grab the needle by the hub and in the other hand grab the cleaning wire. Gently pull the cleaning wire until it is completely removed from the needle tubing. Discard the used cleaning wire.



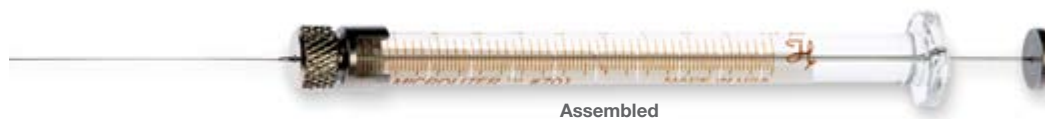
Step 2 Installation

Removable Needle Syringes

Remove the nut of the syringe, then insert the needle into the syringe hub. Thread the nut over the needle, and tighten onto the syringe. Make sure this connection is finger-tight to make a leak-free seal.



After placing the needle and ferrule into the RN hub, thread the RN nut over them and tighten onto the syringe.

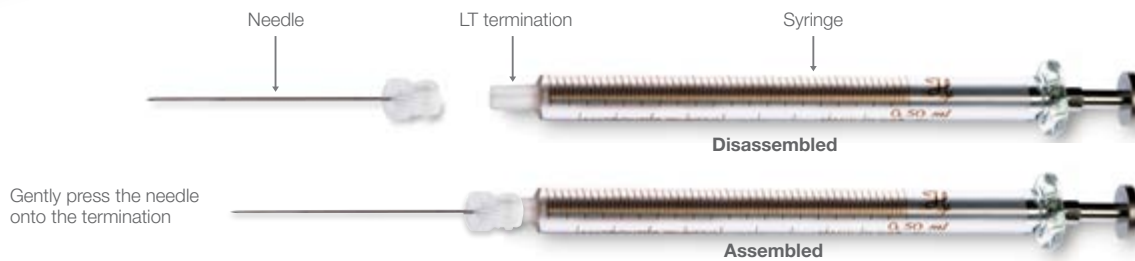


Needle Care and Use (Cont.)

Installation (Cont.)

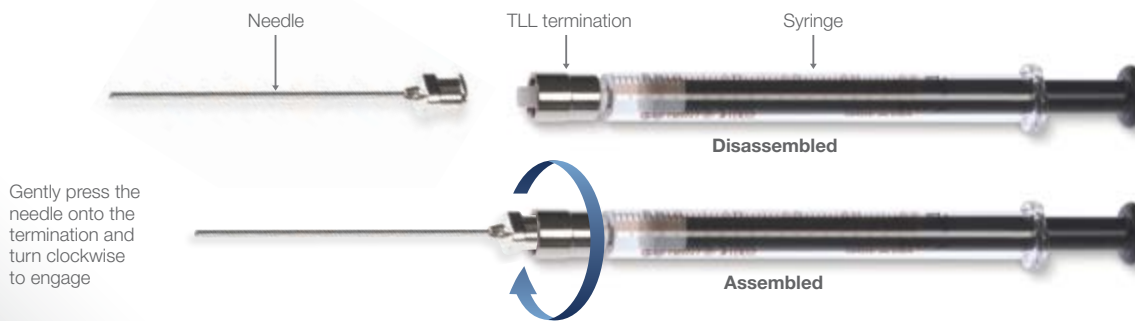
Luer Tip Syringes

Press the Kel-F needle hub onto the ground glass Luer Tip (LT) termination, and rotate slightly to ensure a tight seal.



PFTE Luer Lock Syringes

Press the Metal or Kel-F needle hub onto the PTFE Luer Lock (TLL) termination until the threads engage. Rotate the hub clockwise. The threads will pull the hub onto the termination resulting in a tight seal.

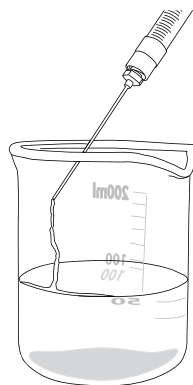


Step 3

Priming

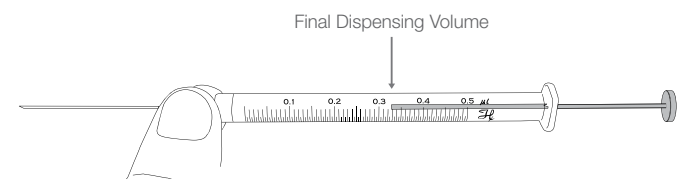
If dead volume is less than 20% of the syringe volume

When priming, the needle should be immersed in the sample. Rapidly draw and dispense sample into the syringe until bubbles are no longer visible in the syringe barrel. For larger syringes it is possible to remove air bubbles by turning the barrel upright and allowing the air bubbles to rise to the needle exit. Then dispense the air bubbles from the needle.



If dead volume is greater than 20% of the syringe volume

With such a large dead volume it may not be possible to prime the syringe with the above method. In this case backfilling the system may be the best option. For this method the plunger is removed from the syringe and a second syringe is used to load sample from the back of the syringe. Once the system is completely primed, the plunger is reinserted and ready for use. For these instances Hamilton offers a Priming Kit which is shown on page 63.



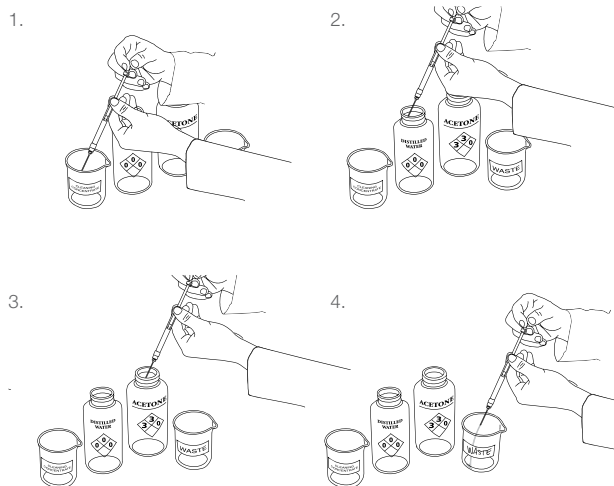
Needle Care and Use (Cont.)

Step 4

Cleaning

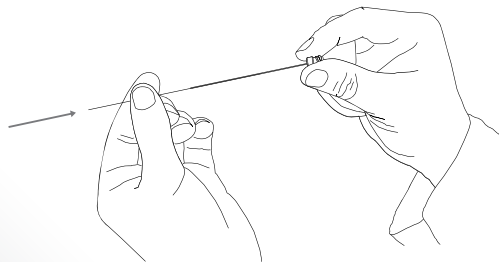
Immediately after use

After each use it is critical to flush the sample from the needle. If the sample contained dissolved particles it is critical to use a solvent known to dissolve the particles. For example, if the sample contains proteins, DNA, or salts then flushing with an organic solvent could precipitate these particles resulting in a clog. In this case it is better to flush with a detergent like Hamilton Cleaning Solution Concentrate (page 113), then with deionized water, and finally with acetone to ensure the needle dries quickly.



After a needle has become clogged

If the needle is clogged and it is not possible to flush with cleaning solution it is time to use the cleaning wires. Start with the smallest cleaning wire that can be pushed through the needle inner diameter. Slowly increase the cleaning wire up to the size specified for the needle gauge. Once the clog has been removed, rinse the needle as described above.



Step 5

Storage

After the needle is cleaned according to Step 4, store the needle with the syringe in the syringe packaging or in the original needle packaging to keep it protected and clean for future applications.



Sterilization and Disinfection

The table below shows the autoclavability of our needles as well as the recommended chemicals for disinfection. As an alternative to the autoclave, all needle types may be sterilized using ethylene oxide.

Sterilization and Disinfection Table

| Product | Autoclave Sterilization | Chemical Disinfection ¹ |
|-------------------|-------------------------|------------------------------------|
| Removable Needles | Yes | Yes |
| Metal Hub Needles | Yes | Yes |
| Kel-F Hub Needles | Yes | Yes |
| PTFE Tubing | Yes | Yes |
| Kel-F Fittings | Yes | Yes |

¹Recommended disinfecting chemicals are Microcide SQ® (P/N 3995-01), 10% bleach, acetone, or ethanol.



Gauge Index

The Gauge Index contains the nominal inner and outer dimensions of the tubing used in Hamilton needles. If the needle dead volume exceeds 20% of the nominal syringe volume then special priming steps may be required. The index lists the dead volume in $\mu\text{L}/\text{cm}$ so it is easier to determine if the gauge is suitable for the desired syringe volume.

Gauge Index

| Gauge | Nominal OD | Nominal ID | Volume |
|-------|------------|------------|------------------------------|
| 34 | 0.159 mm | 0.051 mm | 0.02 $\mu\text{L}/\text{cm}$ |
| 33 | 0.210 mm | 0.108 mm | 0.09 $\mu\text{L}/\text{cm}$ |
| 32 | 0.235 mm | 0.108 mm | 0.09 $\mu\text{L}/\text{cm}$ |
| 31 | 0.261 mm | 0.133 mm | 0.14 $\mu\text{L}/\text{cm}$ |
| 30 | 0.312 mm | 0.159 mm | 0.20 $\mu\text{L}/\text{cm}$ |
| 29 | 0.337 mm | 0.184 mm | 0.27 $\mu\text{L}/\text{cm}$ |
| 28 | 0.362 mm | 0.184 mm | 0.27 $\mu\text{L}/\text{cm}$ |
| 27 | 0.413 mm | 0.210 mm | 0.35 $\mu\text{L}/\text{cm}$ |
| 26s | 0.474 mm | 0.127 mm | 0.13 $\mu\text{L}/\text{cm}$ |
| 26 | 0.464 mm | 0.26 mm | 0.53 $\mu\text{L}/\text{cm}$ |
| 25s | 0.515 mm | 0.153 mm | 0.18 $\mu\text{L}/\text{cm}$ |
| 25 | 0.515 mm | 0.260 mm | 0.53 $\mu\text{L}/\text{cm}$ |
| 24 | 0.566 mm | 0.311 mm | 0.76 $\mu\text{L}/\text{cm}$ |
| 23s | 0.642 mm | 0.116 mm | 0.11 $\mu\text{L}/\text{cm}$ |
| 23 | 0.642 mm | 0.337 mm | 0.89 $\mu\text{L}/\text{cm}$ |
| 22s | 0.718 mm | 0.152 mm | 0.18 $\mu\text{L}/\text{cm}$ |
| 22 | 0.718 mm | 0.413 mm | 1.34 $\mu\text{L}/\text{cm}$ |
| 21 | 0.819 mm | 0.514 mm | 2.07 $\mu\text{L}/\text{cm}$ |
| 20 | 0.908 mm | 0.603 mm | 2.86 $\mu\text{L}/\text{cm}$ |
| 19 | 1.07 mm | 0.686 mm | 3.70 $\mu\text{L}/\text{cm}$ |
| 18 | 1.27 mm | 0.838 mm | 5.52 $\mu\text{L}/\text{cm}$ |
| 17 | 1.47 mm | 1.07 mm | 8.94 $\mu\text{L}/\text{cm}$ |
| 16 | 1.65 mm | 1.19 mm | 11.2 $\mu\text{L}/\text{cm}$ |
| 15 | 1.83 mm | 1.37 mm | 14.8 $\mu\text{L}/\text{cm}$ |
| 14 | 2.11 mm | 1.80 mm | 25.6 $\mu\text{L}/\text{cm}$ |
| 13 | 2.41 mm | 1.80 mm | 25.6 $\mu\text{L}/\text{cm}$ |
| 12 | 2.77 mm | 2.16 mm | 36.6 $\mu\text{L}/\text{cm}$ |
| 11 | 3.05 mm | 2.39 mm | 44.8 $\mu\text{L}/\text{cm}$ |
| 10 | 3.40 mm | 2.69 mm | 57.0 $\mu\text{L}/\text{cm}$ |



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| 86204 | 70 | 90027 | 106 | 90516 | 105 | 91019 | 106 |

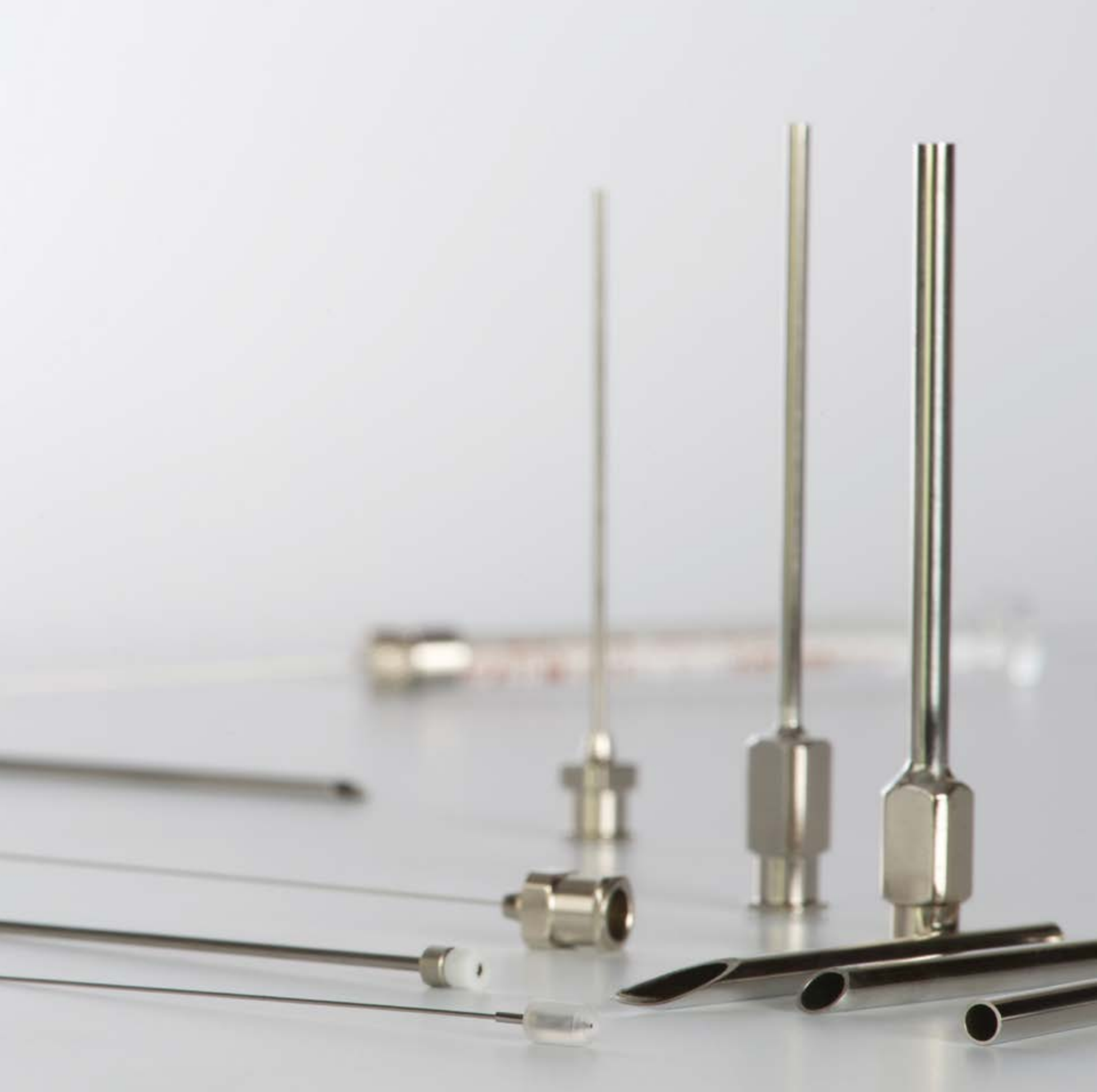




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