

GC/GC-MS Syringe Selection Guide

CoreFocus



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Selection Guide



1-1. Overview

Optimal Syringe Selection

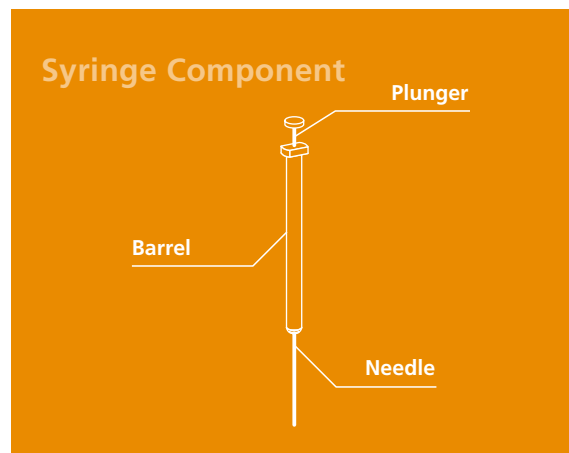
When selecting the optimal syringe, it is recommended that you start by using the following table as a reference.

| Considerations/Parameters | Explanation |
|---|--|
| (1) Autosampler | Special syringes are available for the AOC-30i/20i, AOC-6000 Plus, and other autosampler models. → 2-1. Autosampler Syringes (page 7) For manual injection, check here → 2-2. Manual Injection Syringes (page 10) |
| (2) Sample Type and Syringe Capacity | Select the syringe capacity to suit the sample type (liquid/gas). → 1-2. Syringe Selection Guide (page 4) |
| (3) Analysis Objectives, Applications, and Priorities | Select the optimal plunger and needle in accordance with the application and priority, such as trace volume analysis, analysis of water-soluble samples, or gas analysis. → 1-2. Syringe Selection Guide (page 4) |

Syringe Components

The main components of a syringe are the plunger, barrel, and needle.

To obtain the best analysis results, the optimal plunger, syringe capacity, and needle must be selected. Select the optimal items using this guide as a reference.



1-2. Syringe Selection Guide

Sample Type and Syringe Capacity

Samples are broadly classified into liquid samples and gas samples.

Liquid samples: Select a syringe to suit the sample type, such as an organic solvent, aqueous solvent, or high-viscosity sample.

Gas samples: Select a large-capacity gas-tight syringe or a PTFE tipped syringe. If the target components are at a sufficiently high concentration, a microsyringe can also be used.

The following table shows guidelines for sample type (liquid/gas) and sample injection volume for each injection port. Select a syringe based on the injection volume being about 10 to 20 % of the syringe capacity.

| Injection Method | Hot Injection | | | Cold Injection | |
|-------------------------|---|-----------|---|--------------------|---------------------------------|
| | Split | Splitless | Full Volume Injection | Cold On-Column | Programmed Heating Vaporization |
| Name of Injection Port | SPL | SPL | WBI, INJ | OCI ^{1,2} | PTV |
| Liquid Samples | ● | ● | ● | ● | ● |
| Gas Samples | ● | – *1 | ● | – | – |
| Sample Injection Volume | Liquid Samples: 2 µL max. Gas Samples: 1 µL max. | 2 µL max. | Liquid Samples: 2 µL max. Gas Samples: 0.5 µL max. | 0.5 to 2 µL | 1 to 8 µL |

Note 1: If a cryogenic valve unit (CRG) can be added, and the initial column temperature can be reduced to 0 °C or below, then some components may be compatible with a splitless analysis.

Note 2: With on-column analysis, the needle is inserted directly into the column, so a dual-tapered OCI syringe with a narrow needle tip is used.

Analysis Types and Applications

Gas analysis

With gas analysis, select a gas-tight syringe with a large capacity.

Selection

- PTFE tipped plunger
- Gas-tight syringe

Microinjection

If microinjection is required, a plunger-in-needle syringe, which has minimal dead volume, is used.

Selection

- Plunger-in-needle

Water soluble samples

Selecting a flexible plunger limits malfunctions caused by bending and sliding friction. It is also suitable for extended analyses.

Selection

- Titanium alloy plunger

Breakage prevention

This syringe prevents the plunger from bending back and forth during manual injection. It can also be used with confidence by analysts unfamiliar with using a syringe.

Selection

- Plunger guide equipped syringe

Needle replacement

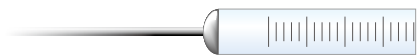
It is possible to replace just the needle. This type is economical, as the needle can be replaced if it becomes dirty or bent.

Selection

- Replaceable needle
- Luer tip/Luer lock type

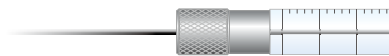
Needle Type

Needle connection style



Fixed needle

This is an inexpensive, general-purpose needle. There is no connection part, so there is limited carryover.



Replaceable needle

The needle can be replaced. This is suitable for sampling with salt deposition and when the needle is prone to bending. The outer diameter, length, and shape of the needle can be changed to suit the application.

Needle tip shape

Cone



This is for autosamplers and autoinjectors. This is designed to reduce damage to the septum and clogging of the needle during consecutive injections.

Bevel



Cut on an angle, this type is used for manual injection. It is designed for high septum penetrability, with minimal damage.

Side Hole Dome



With this type, the sample is injected and delivered through a side hole. This can prevent clogging of the needle tip during penetration of the septum, for instance, when a gas-tight syringe with a needle tip with a large outer diameter is used for gas samples.

LC



The needle tip is cut at a 90-degree angle and is suitable for HPLC injection.

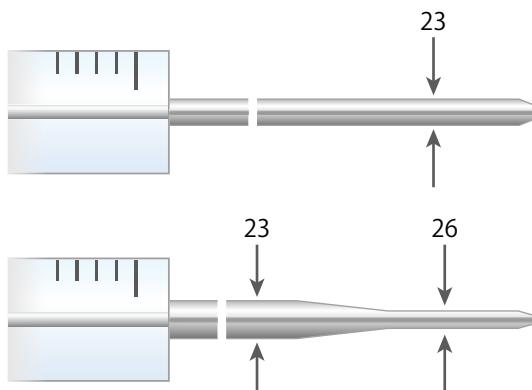
It is also suitable for pipetting liquids.

Needle gauge

The needle gauge is a measure of the thickness of the needle. The larger the number, the finer the needle. The thicker the needle, the more durable it is and the longer its operating life. In general, select a smallest gauge (i.e. thickest) needle that is compatible.

The suffix "s" means that the needle wall is thicker (the inner diameter is smaller) in comparison to needles without the suffix "s," so this type is more durable.

With on-column injection, the needle tip must fit inside the capillary column. Typically, a tapered dual syringe with a fine needle tip is used.



Single gauge Examples: 23, 23s, 26, 26s

Split/Splitless injection, Packed column injection

Tapered dual gauge Examples: 23s/26s

On-column injection, Split/Splitless injection

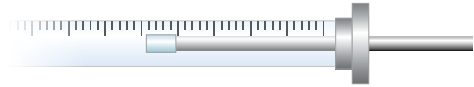
Plunger Types

Stainless Steel plunger (standard)



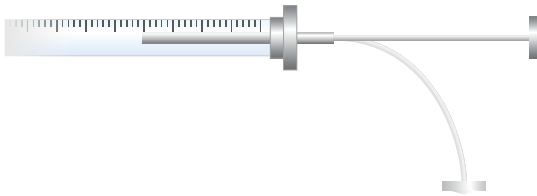
- This is a standard plunger made of stainless steel.
- The plunger cannot be replaced.
- The plunger can be removed for cleaning.

PTFE tipped plunger



- This is a highly gas-tight type with a PTFE plunger tip.
- It can be used for liquid or gas samples.
- Even with samples that tend to adhere to the syringe plunger, such as trace residual particles and components that react easily to metals, there are fewer injection problems with PTFE-tipped plungers.
- PTFE-tipped plungers are replaceable.
- The plunger can be removed for cleaning.
- They effectively reduce plunger adhesion when analyzing highly viscous liquid samples that are difficult to draw in with a stainless steel plunger. (This is limited to samples that are unaffected by contact with PTFE.)

Titanium alloy plunger



- Special titanium alloy plungers are highly flexible.
- This limits plunger malfunctions due to bending and sliding friction.
- The plunger cannot be replaced.
- Syringes with titanium alloy plungers are also recommended for analysis of water-soluble samples that are prone to adhesion.

Plunger-in-needle



- This type is suited to high-accuracy analyses of micro injections.
- The sample is collected into the needle, not the barrel.
- The plunger in the needle reaches all the way to the tip, so there is zero dead volume.
- Sample carryover is minimized.

Syringe Selection



2-1. Autoinjector Syringes

AOC-30i/AOC-20i Syringes (1 pc each)

Stainless Steel plunger

| Capacity | Needle Length (mm) | Needle Gauge | Needle Outer Diameter (mm) | Needle Tip | P/N |
|----------|--------------------|--------------|----------------------------|------------|--------------|
| 5 µL | 42 | 23 | 0.63 | Cone | 221-75173 |
| 5 µL | 42 | 23/26 | 0.63/0.47 | Cone | 227-35011-01 |
| 10 µL | 42 | 23 | 0.63 | Cone | 221-34618 |
| 10 µL | 42 | 23/26 | 0.63/0.47 | Cone | 227-35010-01 |
| 50 µL | 42 | 23 | 0.63 | Cone | 221-45243 |



Standard accessories (221-34618)

This includes a replacement plunger for the PTFE plunger and two replacement needles.

| Capacity | Needle Length (mm) | Needle Gauge | Needle Outer Diameter (mm) | Needle Tip | P/N | Replacement Plunger P/N | Replacement Needle P/N |
|----------|--------------------|--------------|----------------------------|------------|-----------|-------------------------|------------------------|
| 10 µL | 42 | 23 | 0.63 | Cone | 221-74469 | 221-75173-01 | - |
| 10 µL | 42 | 23 | 0.63 | Cone | 221-75174 | 221-75174-02 | 221-75174-01 |
| 250 µL | 42 | 23 | 0.63 | Cone | 221-45244 | 221-45244-01 | - |

Xtra Life microsyringe

Special titanium alloy plungers are highly flexible, so they can be used with confidence for extended analyses, with no concerns about plunger malfunctions due to bending or sliding friction. These syringes are recommended for analysis of water-soluble samples that are prone to adhesion with stainless steel plungers.

| Capacity | Needle Length (mm) | Needle Gauge | Needle Outer Diameter (mm) | Needle Tip | P/N | Remarks |
|----------|--------------------|--------------|----------------------------|------------|--------------|-------------------------------------|
| 5 µL | 42.5 | 23 | 0.64 | Cone | 227-35401-01 | Premium Item Titanium Alloy Plunger |
| 10 µL | 42.5 | 23 | 0.64 | Cone | 227-35400-01 | Premium Item Titanium Alloy Plunger |

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Plunger-in-needle microsyringe

With this microsyringe, the plunger is inside the needle. Measurement errors are minimized by retaining the sample liquid within the needle, making it suitable for trace sample analyses.

| Capacity | Needle Length (mm) | Needle Gauge | Needle Outer Diameter (mm) | Needle Tip | P/N |
|----------|--------------------|--------------|----------------------------|------------|--------------|
| 0.5 µL | 42 | 23/26 | 0.63/0.47 | Cone | 227-35002-01 |



Microsyringe for OCI analysis

The needle tip has been narrowed to ensure injection into the column tip.

| Capacity | Needle Length (mm) | Needle Gauge | Needle Outer Diameter (mm) | Needle Tip | P/N |
|----------|--------------------|--------------|----------------------------|----------------|--------------|
| 5 µL | 42 | 23/26 | 0.63/0.47 | Side Hole Dome | 227-35031-01 |
| 10 µL | 42 | 23/26 | 0.63/0.47 | Side Hole Dome | 221-37282-02 |



AOC-6000 Plus Syringes (1 pc each)

The Smart Syringe, which can be used with the AOC-6000 Plus, is equipped with a proprietary R/W chip that can store information on syringe type parameters, operational range, and usage logs. Smart Syringes are automatically recognized by the AOC-6000 Plus, so their lifetime can be tracked.

AOC-6000 Plus syringe can also be used for AOC-6000.

When using derivatization reagents, select a syringe with a PTFE plunger.

| Capacity | Plunger Type | Needle Length (mm) | Needle Gauge | Needle Outer Diameter (mm) | Needle Tip | P/N | Application |
|----------|-----------------|--------------------|--------------|----------------------------|----------------|--------------|---------------------|
| 10 µL | Stainless Steel | 57 | 23S | 0.64 | Cone | 227-35352-02 | Liquid Injection |
| 10 µL | PTFE | 57 | 26S | 0.47 | Cone | 227-35353-01 | Liquid Injection |
| 10 µL | PTFE | 57 | 23S | 0.64 | Cone | 227-35353-02 | Liquid Injection |
| 25 µL | PTFE | 57 | 26S | 0.47 | Cone | 227-35354-01 | Liquid Injection |
| 100 µL | PTFE | 57 | 26S | 0.47 | Cone | 227-35355-01 | Liquid Injection |
| 250 µL | PTFE | 57 | 26 | 0.46 | Cone | 227-35356-01 | Liquid Injection |
| 1000 µL | PTFE | 57 | 23 | 0.64 | Cone | 227-35358-01 | Liquid Injection |
| 1300 µL | PTFE | – | 23S | 0.64 | Side Hole Dome | 227-35385-01 | ITEX Injection |
| 2250 µL | PTFE | 65 | 23 | – | Side Hole Dome | 227-35387-01 | Headspace Injection |
| 2500 µL | PTFE | 65 | 23S | 0.64 | Side Hole Dome | 227-35359-01 | Headspace Injection |

Select from the following syringes when using LINEX.

| Capacity | Plunger Type | Needle Length (mm) | Needle Gauge | Needle Outer Diameter (mm) | Needle Tip | P/N | Application |
|----------|-----------------|--------------------|--------------|----------------------------|------------|--------------|-------------------------|
| 10 µL | Stainless Steel | 85 | 26S | 0.47 | Cone | 227-35361-01 | Liquid Injection, LINEX |
| 10 µL | PTFE | 85 | 26S | 0.47 | Cone | 227-35361-02 | Liquid Injection, LINEX |
| 100 µL | PTFE | 85 | 26S | 0.47 | Cone | 227-35362-01 | Liquid Injection, LINEX |

AOC-6000 Syringes (1 pc each)

Please note that AOC-6000 Plus syringe can be used for AOC -6000, but AOC-6000 syringe cannot be used for AOC-6000 Plus.

When using derivatization reagents, select a syringe with a PTFE plunger.

| Capacity | Plunger Type | Needle Length (mm) | Needle Gauge | Needle Outer Diameter (mm) | Needle Tip | P/N | Application |
|----------|-----------------|--------------------|--------------|----------------------------|----------------|--------------|---------------------|
| 1 µL | Stainless Steel | 57 | 23 | 0.63 | Cone | 225-19744-01 | Liquid Injection |
| 5 µL | Stainless Steel | 57 | 26S | 0.47 | Cone | 225-19744-02 | Liquid Injection |
| 10 µL | Stainless Steel | 57 | 26S | 0.47 | Cone | 225-19744-03 | Liquid Injection |
| 10 µL | PTFE | 57 | 26S | 0.47 | Cone | 225-19744-04 | Liquid Injection |
| 25 µL | PTFE | 57 | 26S | 0.47 | Cone | 225-19744-05 | Liquid Injection |
| 50 µL | PTFE | 57 | 26S | 0.47 | Cone | 225-19744-06 | Liquid Injection |
| 100 µL | PTFE | 57 | 26S | 0.47 | Cone | 225-19744-07 | Liquid Injection |
| 250 µL | PTFE | 57 | 26S | 0.47 | Cone | 225-19744-08 | Liquid Injection |
| 500 µL | PTFE | 57 | 26S | 0.47 | Cone | 225-19744-09 | Liquid Injection |
| 1000 µL | PTFE | 57 | 22 | 0.72 | Cone | 225-19744-10 | Liquid Injection |
| 1300 µL | PTFE | – | 23S | 0.64 | Side Hole Dome | 227-35385-01 | ITEX Injection |
| 2500 µL | PTFE | 65 | 23 | 0.63 | Side Hole Dome | 225-19744-11 | Headspace Injection |

Select from the following syringes when using LINEX.

| Capacity | Plunger Type | Needle Length (mm) | Needle Gauge | Needle Outer Diameter (mm) | Needle Tip | P/N | Application |
|----------|-----------------|--------------------|--------------|----------------------------|------------|--------------|-------------------------|
| 5 µL | Stainless Steel | 85 | 23 | 0.63 | Cone | 227-37160-01 | Liquid Injection, LINEX |
| 10 µL | Stainless Steel | 85 | 23 | 0.63 | Cone | 227-37161-01 | Liquid Injection, LINEX |
| 10 µL | PTFE | 85 | 23 | 0.63 | Cone | 227-37162-01 | Liquid Injection, LINEX |
| 25 µL | PTFE | 85 | 23 | 0.63 | Cone | 227-37163-01 | Liquid Injection, LINEX |
| 50 µL | PTFE | 85 | 23 | 0.63 | Cone | 227-37164-01 | Liquid Injection, LINEX |
| 100 µL | PTFE | 85 | 23 | 0.63 | Cone | 227-37165-01 | Liquid Injection, LINEX |

2-2. Manual Syringes

Standard Syringes

General-purpose manual syringes are available with capacities ranging from 5 to 500 μL . They can be used in a wide range of laboratory work.

Fixed needles



Stainless Steel plungers

| Capacity | Needle Length (mm) | Needle Gauge | Needle Outer Diameter (mm) | Needle Tip | P/N |
|-------------------|--------------------|--------------|----------------------------|------------|--------------|
| 5 μL | 50 | 26 | 0.47 | Bevel | 221-75170 |
| 10 μL | 50 | 26 | 0.47 | Bevel | 670-12552-01 |
| 10 μL | 51 | 22 | 0.71 | LC | 670-12554-01 |
| 25 μL | 50 | 25 | 0.5 | Bevel | 670-12510-31 |
| 25 μL | 51 | 22 | 0.71 | LC | 670-12554-02 |
| 50 μL | 50 | 25 | 0.5 | Bevel | 670-12510-36 |
| 50 μL | 51 | 22 | 0.71 | LC | 670-12554-03 |
| 100 μL | 50 | 25 | 0.5 | Bevel | 670-12510-18 |
| 100 μL | 51 | 22 | 0.71 | LC | 670-12554-04 |
| 250 μL | 50 | 25 | 0.5 | Bevel | 670-12510-19 |
| 250 μL | 51 | 22 | 0.71 | LC | 670-12554-05 |
| 500 μL | 50 | 25 | 0.5 | Bevel | 670-12510-20 |
| 500 μL | 51 | 22 | 0.71 | LC | 670-12554-06 |

PTFE plungers

| Capacity | Needle Length (mm) | Needle Gauge | Needle Outer Diameter (mm) | Needle Tip | P/N | Replacement Plunger P/N |
|-------------------|--------------------|--------------|----------------------------|------------|--------------|-------------------------|
| 10 μL | 50 | 26 | 0.47 | Bevel | 221-75170-01 | 221-75170-02 |
| 25 μL | 50 | 25 | 0.5 | Bevel | 221-75171 | 221-75171-01 |
| 50 μL | 50 | 25 | 0.5 | Bevel | 221-75172 | 221-75172-03 |
| 100 μL | 50 | 25 | 0.5 | Bevel | 221-75172-01 | 221-75172-04 |
| 250 μL | 50 | 25 | 0.5 | Bevel | 221-75172-02 | 221-75172-05 |

Replaceable needles



| Capacity | PTFE Tipped Plunger | Needle Length (mm) | Needle Gauge | Needle Outer Diameter (mm) | Needle Tip | P/N | Replacement Plunger P/N | Replacement Needle P/N |
|-------------------|---------------------|--------------------|--------------|----------------------------|------------|--------------|-------------------------|------------------------|
| 10 μL | ○ | 50 | 26 | 0.47 | Bevel | 670-12553-21 | 670-12553-33 | 670-12510-95 |
| 25 μL | – | 50 | 25 | 0.5 | Bevel | 670-12510-74 | 670-12553-34 | – |
| 50 μL | – | 50 | 25 | 0.5 | Bevel | 670-12510-75 | – | – |
| 100 μL | – | 50 | 25 | 0.5 | Bevel | 670-12510-76 | 670-12553-36 | – |
| 250 μL | – | 50 | 25 | 0.5 | Bevel | 670-12510-77 | – | – |
| 500 μL | – | 50 | 25 | 0.5 | Bevel | 670-12510-78 | – | – |

Syringes by Application

Plunger-in-needle microsyringes (trace analysis)

With this microsyringe, the plunger is inside the needle. Measurement errors due to the sample liquid retained within the needle are minimized, making it suitable for high-accuracy trace sample analyses.

| Capacity | Needle Length (mm) | Needle Outer Diameter (mm) | Needle Tip | P/N |
|----------|--------------------|----------------------------|------------|--------------|
| 0.5 µL | 70 | 0.64 | Cone | 670-12510-71 |
| 1 µL | 70 | 0.64 | Cone | 670-12510-72 |
| 5 µL | 70 | 0.64 | Cone | 670-12510-73 |

Elastic plunger microsyringes (extended analyses and aqueous analyses)

This microsyringe uses a titanium alloy plunger that is highly elastic and chemical resistant. The plunger does not break easily because it recovers flexibly when bent, so even the small capacity 5 µL size can be used with confidence. With an outer tip diameter of 0.43 mm, it can also be used for capillary on-column injection (OCI).



| Capacity | Needle Length (mm) | Needle Outer Diameter (mm) | P/N | Replacement Needle P/N | Remarks |
|----------|--------------------|----------------------------|--------------|------------------------|--------------------|
| 5 µL | 50 | 0.43/0.52 | 670-12580-21 | - | Fixed Needle |
| 10 µL | 50 | 0.43/0.52 | 670-12580-22 | - | Fixed Needle |
| 5 µL | 50 | 0.43/0.52 | 670-12580-25 | 670-12580-31 (5 pc) | Replaceable Needle |
| 10 µL | 50 | 0.43/0.52 | 670-12580-26 | 670-12580-31 (5 pc) | Replaceable Needle |

Plunger guide-equipped microsyringes (breakage prevention)

With small-capacity syringes with narrow plungers, there are concerns about breaking the plunger if the analyst is inexperienced. This type uses the latter half of the barrel as a guide, and is especially designed to make the plunger grip thicker, which solves the issue of plunger bending. It can be used with confidence, even by novices.



| Capacity | Needle Length (mm) | Needle Outer Diameter (mm) | P/N | Replacement Needle P/N | Remarks |
|----------|--------------------|----------------------------|--------------|------------------------|--------------------|
| 5 µL | 50 | 0.5 | 670-12510-86 | 670-12510-94 (5 pc) | Replaceable Needle |
| 10 µL | 50 | 0.5 | 670-12510-80 | 670-12510-95 (5 pc) | Replaceable Needle |

Microsyringes with guide bar (breakage prevention)

Bending of the plunger is prevented by a guide bar set parallel to the plunger. By adjusting the stopper position, a set volume of sample can be collected each time without checking the markings.



| Capacity | P/N | Replacement Needle P/N | Remarks |
|----------|--------------|------------------------|--------------------|
| 10 µL | 670-12504-25 | - | Fixed Needle |
| 10 µL | 670-12504-22 | 670-12504-86 (5 pc) | Replaceable Needle |

Gas Tight Syringes

Luer lock syringes

The needle is easy to detach, so sampling and delivery can be performed with a different needle. The needle is screwed in, so it is highly pressure resistant.

| Capacity | PTFE Tipped Plunger | Needle Tip | P/N | Replacement Plunger P/N |
|----------|---------------------|------------|--------------|-------------------------|
| 1 mL | ○ | Bevel | 221-54778-01 | 221-54778-11 |
| 5 mL | ○ | Bevel | 221-54778-02 | 221-54778-12 |
| 10 mL | ○ | Bevel | 221-54778-03 | 221-54778-13 |
| 25 mL | ○ | Bevel | 221-54778-04 | 221-54778-14 |
| 50 mL | ○ | Bevel | 221-54778-05 | 221-54778-15 |
| 100 mL | ○ | Bevel | 221-54778-06 | 221-54778-16 |



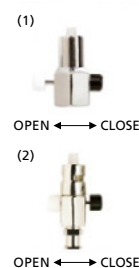
Luer lock needles

| Needle Length (mm) | Needle Gauge | Needle Outer Diameter (mm) | Needle Tip | Quantity | P/N |
|--------------------|--------------|----------------------------|------------|----------|--------------|
| 50 | 23 | 0.63 | Bevel | 5 | 221-54778-51 |
| 50 | 19 | 1.07 | Bevel | 5 | 221-54778-52 |
| 50 | 14 | 2.1 | Bevel | 5 | 221-54778-54 |

Luer tip syringes

The needle can be detached. Sampling and discharge can easily be performed with a different needle. The needle is only press fitted into the tapered cone, so this type is not pressure resistant.

| # | Capacity | Application | Quantity | P/N |
|---|-------------|------------------------------|----------|--------------|
| 1 | 5 mL to 2L | Luer lock needle | 1 | 221-54778-49 |
| 2 | 50 µL to 2L | Luer lock and tipped syringe | 1 | 221-54778-50 |



Gas-tight syringes with replaceable needles

This is a milliliter-sized gas-tight syringe. The needle is 30 mm long and screws in, so it is easily replaced.

| Capacity | P/N | Replacement Needle P/N |
|----------|--------------|------------------------|
| 0.25 mL | 670-12504-28 | 670-12504-85 (5 pc) |
| 0.5 mL | 670-12504-29 | 670-12504-85 (5 pc) |
| 1 mL | 670-12504-30 | 670-12504-85 (5 pc) |
| 2.5 mL | 670-12504-31 | 670-12504-85 (5 pc) |
| 5 mL | 670-12504-32 | 670-12504-85 (5 pc) |
| 10 mL | 670-12504-33 | 670-12504-85 (5 pc) |





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