

GC/GC-MS Syringe Selection Guide

CoreFocus



Contents

Chapter

1

Selection Guide

- 1-1. Overview 3
- 1-2. Syringe Selection Guide 4

Chapter

2

Syringe Selection

- 2-1. Autoinjector Syringes 7
- 2-2. Manual Syringes 9

Selection Guide



1-1. Overview

Optimal Syringe Selection

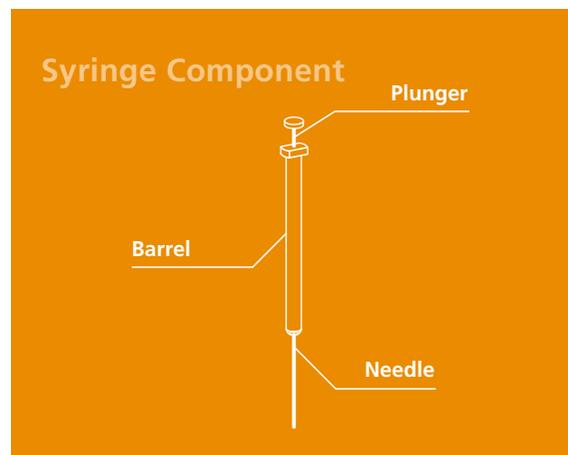
When selecting the optimal syringe, it is recommended that you start by using the following table as a reference.

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	Large Volume Injection (Solvent Vent)
Name of Injection Port	SPL, MMI	SPL, MMI	WBI, SINJ	OCI ^{1,2} , MMI	PTV, MMI	MMI
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	5 to 200 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.

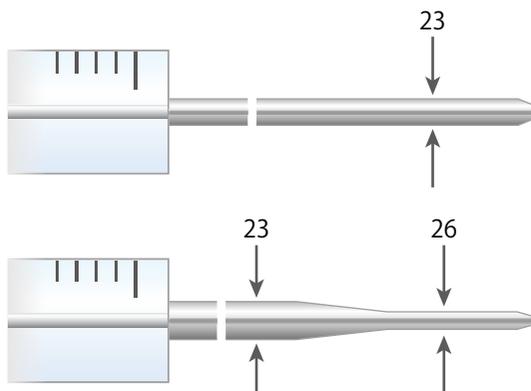
It is also suitable for pipetting liquids.

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)



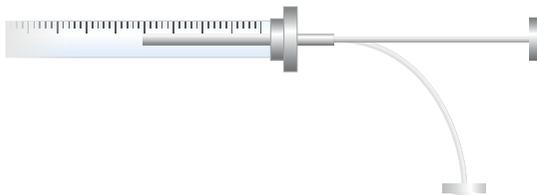
- This is a standard plunger made of stainless steel.
- The plunger cannot be replaced.
- The plunger can be removed for cleaning.

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	Side Hole Dome (Large Volume Injection)	227-35037-01	-	-
250 µL	42	23	0.63	Cone (Large Volume Injection)	227-35037-02	-	-

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

CoreFocus



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.

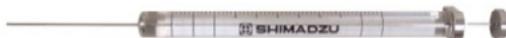
Capacity	Plunger Type	Needle Length (mm)	Needle Gauge	Needle Outer Diameter (mm)	Needle Tip	P/N	Application
5 µL	Stainless Steel	85	23	0.63	Cone	227-37160-01	Liquid Injection, LINEX
10 µL	Stainless Steel	85	23	0.63	Cone	227-37161-01	Liquid Injection, LINEX
10 µL	PTFE	85	23	0.63	Cone	227-37162-01	Liquid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



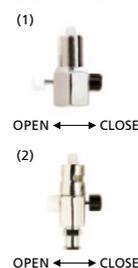
Luer lock needles

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)





CoreFocus is trademark of Shimadzu Corporation or its affiliates in Japan and other countries.



Shimadzu Corporation
www.shimadzu.com/an/

For Research Use Only. Not for use in diagnostic procedures.

This publication may contain references to products that are not available in your country. Please contact us to check the availability of these products in your country.

Company names, products/service names and logos used in this publication are trademarks and trade names of Shimadzu Corporation, its subsidiaries or its affiliates, whether or not they are used with trademark symbol "TM" or "®".

Third-party trademarks and trade names may be used in this publication to refer to either the entities or their products/services, whether or not they are used with trademark symbol "TM" or "®".

Shimadzu disclaims any proprietary interest in trademarks and trade names other than its own.

The contents of this publication are provided to you "as is" without warranty of any kind, and are subject to change without notice. Shimadzu does not assume any responsibility or liability for any damage, whether direct or indirect, relating to the use of this publication.