
Complete Guide to the Merlin Microseal™ for Gas Chromatography



YOUR GLOBAL SCIENCE PARTNER

6 Kelvin Park Birkenhead Merseyside CH41 1LT United Kingdom

Tel: +44 (0) 151 649 4000 • E: info@greyhoundchrom.com • www.greyhoundchrom.com

Introduction

The Merlin Microseal™ from Greyhound Chromatography is a microvalve alternative to the conventional silicone rubber septa used in gas chromatography (GC). Its unique design gives it high pressure capability and resistance to wear which results in long life and excellent chromatographic performance. The Microseal is available for all major GC manufacturers' instruments.

FEATURES

- Eliminates septum coring and crumbling into the injection port liner
- Reliable performance during extended runs
- O-ring detail seals needle during injection
- Duckbill seals more tightly at higher pressures
- Low insertion force for easy manual injections

How the Microseal Works

A GC injection port septum performs two discrete functions. It seals the port while the syringe needle is inserted and also while the needle is not inserted. The Microseal is distinct from traditional septa in that the Microseal has two independent sealing mechanisms to perform these functions. O-rings seal the syringe needle during sample injection. A duckbill valve seals the injection port during analysis, but allows the needle to slide through without damage. In contrast, a conventional septum is repeatedly pierced by the syringe needle and eventually leaks or sheds septum particles into the injection port liner. Because the two seals perform separate, individual functions and are only slightly distorted in operation rather than being pierced, the Microseal can be made from a high-temperature, wear-resistant fluorocarbon elastomer. In combination with the cone-tipped needle, this means the Microseal will not shed pieces into the injection port, even after thousands of injections.

The cut-away views show the location of the individual seals and the diagram at the lower right illustrates the following sequence of Microseal functions.

1. Pressure in the injection port, aided by a stainless steel spring, squeezes the duckbill closed and maintains a tight seal on the port. Higher pressures seal it more tightly.
2. As the syringe needle enters the Microseal, the wiper rib removes any particles adhering to the needle.
3. The O-rings then make a sliding seal around the needle.
4. As the needle penetrates further, the tip pushes the duckbill valve open and slides into the injection port. The O-rings maintain the seal around the needle.
5. As the needle is withdrawn from the Microseal after sample injection, the spring pushes the duckbill valve closed before the needle leaves the O-rings. The port remains sealed during the injection process.

Types of Microseals



General Purpose, Low Pressure and SPME Microseal
P/N 410 P/N 310 P/N 21-01

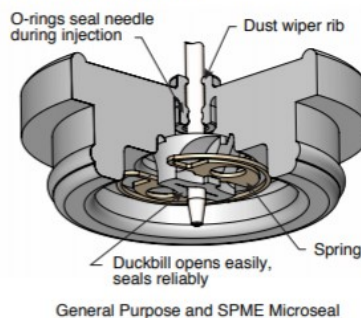
Microseals for use with 23 gauge Needle

General Purpose Microseal (P/N MM-410) - This Microseal is recommended for use in most GC applications with injection port pressures between 3 and 100 psi (20 - 690 Kpa). The General Purpose Microseal is the best choice for most GC applications.

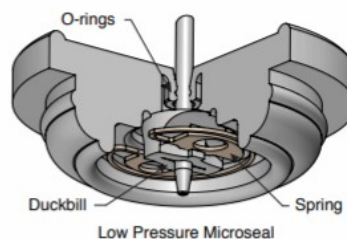
Low Pressure Microseal (P/N MM-310) - This is recommended for injection port pressures between 1 and 45 psi (7 -310 Kpa). Particularly useful for fast GC/MS applications with 530 micron columns.

SPME Microseal (P/N MM-21-01) - This Microseal was developed for 23 gauge SPME probes, which have a square end instead of the cone shaped tip characteristic of syringe needles. These probes can cause additional wear and this version provides extended lifetime for SPME.

Microseal Cut-Away Views:

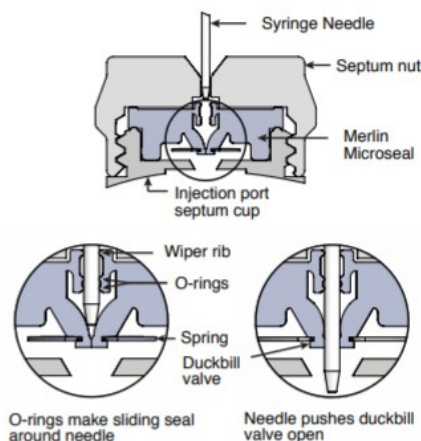


General Purpose and SPME Microseal



Low Pressure Microseal

Microseal Injection Sequence:



Injection Port Adapters for 23 gauge Microseals

All 23 gauge Microseals are compatible with the standard adapters shown here.

Agilent Injection Ports

The Microseal fits directly onto the septum cup of the Agilent Split/Splitless injection port. It requires a Microseal nut.

Recommendations for Use:

Merlin Microseal is compatible with all Agilent autosamplers & Split/Splitless ports (including 5890, 6890, 7890, 8890, and Intuvo series).

Tighten the Microseal nut finger tight only. Do not overtighten.

Injection port temperature range: 50- 400°C.

Requires a blunt, cone tip, 23 gauge syringe or 23 gauge SPME probes.

Microseal #410 is recommended for most applications (3-100 psi).

Use Microseal #310 for lower injection port pressures (1-45 psi).

Use Microseal # 21-01 Microseal for SPME.



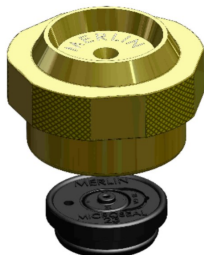
Thermo Scientific Injection Ports

The Merlin Microseal can be used with Thermo Trace 1300 series GCs and Thermo Trace Ultra GCs.

Thermo Trace 1300 series GCs - The Microseal fits directly in the inlet of the Trace 1300 series (with "Instant Connect" injectors) and requires only a Merlin Microseal™ nut (septum cap).

Merlin P/N 81-12, the Thermo Trace 1300 Starter kit, includes the Microseal nut and two General Purpose Microseals. Merlin P/N 81-10 includes the Trace 1300 Microseal nut only (Microseal sold separately). These kits are compatible with both the Trace 1300 SSL and PTV inlets.

Thermo Trace Ultra SSL Inlets - An adapter kit, Merlin P/N 85-10, is required to use the Microseal with Trace Ultra SSL inlet. Note that Microseals are sold separately, none are included in this adapter kit. This kit is only compatible with SSL inlets, not PTV inlets.



PerkinElmer Injection Ports

The Microseal adapter for the PerkinElmer injection ports mounts directly to the port. The Microseal nut has the correct autosampler alignment detail.

Recommendations for Use:

Tighten the adapter finger tight to compress the O-ring seal.

Tighten the Microseal nut finger tight. Do not overtighten.

Injection port temperature range: 50- 400°C.

Requires a blunt, cone tip, 23 gauge syringe or 23 gauge SPME probes.

Microseal #410 is recommended for most applications (3-100 psi).

Use Microseal #310 for lower injection port pressures (1-45 psi).

Use Microseal # 21-01 Microseal for SPME.



Shimadzu Injection Ports

The Microseal adapter kit for Shimadzu GC injection ports provides a convenient way for Shimadzu Models GC-2010, GC-2025 and GC-2030 to use a Microseal. The Microseal adapter works with the AOC-20 series and AOC-5000 autoinjectors or manual injection.

Recommendations for Use:

Compatible with Shimadzu models GC-2010, GC-2025, GC-2030.

Not compatible with Shimadzu models GC-17 or earlier.

Compatible with Split/Splitless (S/S) and S/S Plus inlet systems.

Compatible with PTV/OCI inlet system in PTV mode only.

Injection port temperature range: 50- 450°C.

Requires a blunt, cone tip, 23 gauge syringe or 23 gauge SPME probes.

Microseal #410 is recommended for most applications (3-100 psi).

Use Microseal #310 for lower injection port pressures (1-45 psi).

Use Microseal # 21-01 Microseal for SPME.



Varian / Bruker / Scion GCs

Separate Microseal adapters are available for Varian 1079 and Scion/Bruker/Varian 1177 injection ports. The Microseal nuts incorporate the microswitch start assemblies.

Recommendations for Use:

Tighten the adapter finger tight to compress the O-ring seal.

Tighten the Microseal nut finger tight only. Do not overtighten.

Injection port temperature range: 50- 400°C.

Requires a blunt, cone tip, 23 gauge syringe or 23 gauge SPME probes.

Because of syringe compatibility, the Varian 8200 autosampler is limited to SPME only with the Microseal.

Microseal #410 is recommended for most applications (3-100 psi).

Use Microseal #310 for lower injection port pressures (1-45 psi).

Use Microseal # 21-01 Microseal for SPME.



1177 / Scion



1079

New Microseal Gauge Sizes

The Merlin Microseal™ has traditionally been compatible only with 23 gauge syringe needles and SPME probes. However, Merlin now offers a new selection of Microseals for different gauge sizes.

Microseals for 26 gauge or 23-26 gauge Tapered Needles

GC users may discover several benefits to using 26 gauge syringe needles. Most on-column injections will require the use of a 26 gauge or 23-26 gauge tapered needle. The smaller diameter of 26 gauge syringes can also reduce coring of sample vial septa. The low insertion force of the Microseal prevents needle bending during injection that is common when using a 26 gauge needle with conventional septa.

P/N 610 - 26 gauge Microseal - This Microseal is compatible with 26 gauge and 23-26 gauge tapered needles and can be used for injection port pressures between 3 and 100 psi (20 - 690 kPa). It is recommended for most 26 gauge users. This Microseal is compatible with the standard 23 gauge adapters and nuts for all instrument manufacturers as listed on page 3.

Microseals & Adapters for PAL Arrow SPME Probes

The PAL SPME Arrow probes are large diameter SPME probes with a rugged construction that ensures longer life than traditional SPME probes. The larger diameter of these probes does require the GC inlet to be modified but allows for faster analysis and better sensitivity. The Merlin Microseal for PAL Arrow SPME probes reduces the insertion force for injections and is an excellent long-life alternative to traditional inlet septa. The Arrow Microseal is available for most instruments and both Arrow sizes (1.1 mm and 1.5 mm).

Note that all GCs require inlet modification and an adapter or nut specifically for Arrow Microseals. Arrow Microseals are not compatible with the traditional 23 gauge adapter kits.

ARROW MICROSEALS

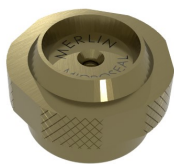
P/N 1100 – Microseal for 1.1 mm SPME Arrow Probes

P/N 1500 – Microseal for 1.5 mm SPME Arrow Probes

ARROW MICROSEAL ADAPTERS/NUTS

The adapter kits listed below contain the hardware necessary for using a Microseal with SPME Arrow.

Arrow Microseals are sold separately.



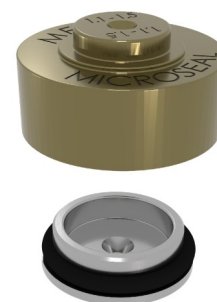
P/N 1000TS
Arrow Microseal Nut
for Thermo Trace 1300 Series GCs



P/N 1000SH
Arrow Microseal Adapter Kit
for Shimadzu 2010, 2025, and 2030 GCs



P/N 1000AG
Arrow Microseal Nut
for Agilent Inlets



P/N 1000TU
Arrow Microseal Adapter kit
for Thermo Trace Ultra GCs

Merlin Microseal™

Kits for Gas Chromatography



Part Description	Part No.
Replacement Microseals:	
Low Pressure Microseal (1 - 45 psi)	MM-310
General Purpose Microseal (for most applications, (3 - 100 psi)	MM-410
Microseal for SPME applications (3 - 100 psi)	MM-21-01
26 Gauge Microseal for 26 gauge or 23/26 gauge. tapered needles	MM-610
26 Gauge Microseal for Thermo Trace 1300 cold on-column GC/MS	MM-620
For Agilent Instruments:	
Low Pressure Microseal Kit (nut and 2 #310 Microseals) (1 - 45 psi)	MM-304
Low Pressure Microseal Kit (nut and 1 #310 Microseal) (1 - 45 psi)	MM-305
General Purpose Microseal Kit (nut and 2 #410 Microseals) (3 - 100 psi)	MM-404
General Purpose Microseal Kit (nut and 1 #410 Microseal) (3 - 100 psi)	MM-405
Microseal Nut	MM-403
For Thermo Scientific Instruments:	
Microseal Kit for Thermo Trace 1300 series (nut and 2 #410 Microseals) (3 - 100 psi)	MM-81-12
Microseal adapter for Thermo Trace 1300 series (nut only)	MM-81-10
Microseal adapter for Thermo Trace Ultra (Microseal sold separately)	MM-85-10
For Shimadzu Instruments:	
Microseal Kit for Shimadzu (nut, adapter assembly and 2 #410 Microseals) (3 - 100 psi)	MM-61-12
For PerkinElmer Instruments:	
Microseal Kit for PerkinElmer (nut, adapter, O-ring, and 2 #410 Microseals) (3 - 100 psi)	MM-51-12
For Varian / Bruker / Scion Instruments:	
Microseal Kit for Varian 1079 (nut, adapter, O-ring, and 1 #410 Microseal) (3 - 100 psi)	MM-21-11
Microseal Kit for Varian 1177 (nut, adapter, O-ring, and 1 #410 Microseal) (3 - 100 psi)	MM-22-11
For Arrow SPME - Adapters & Nuts	
Arrow Microseal Nut for Agilent Inlets	MM-1000AG
Arrow Microseal adapter kit for Shimadzu 2010 & 2025 GCs	MM-1000SH
Arrow Microseal Nut for Thermo Trace 1300 Series GCs	MM-1000TS
Arrow Microseal adapter kit for Thermo Trace Ultra GCs	MM-1000TU
For Arrow SPME - Replacement Microseals	
Microseal for 1.1mm Arrow SPME probes	MM-1000
Microseal for 1.5mm Arrow SPME probes	MM-1500



Microseals for SPME applications



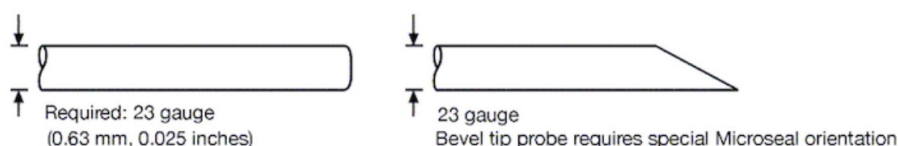
The two separate sealing mechanisms of the Merlin Microseal™ make it the preferred choice for Solid Phase MicroExtraction (SPME). The duckbill seal allows the SPME probe to push through while the O-rings maintain a seal.

SPME probes typically have square or bevelled ends which can core or damage conventional silicone rubber septa. This results in short septum lifetimes and often causes septum crumbs to fall into the injection port liner, where they can interfere with the analysis.

As a solution to this problem, the Microseal is recommended by manufacturers and distributors of SPME probes and is specifically required for bevelled tip probes. The Merlin P/N 21-01 Microseal has been developed specifically to resist wear when used with SPME probes.

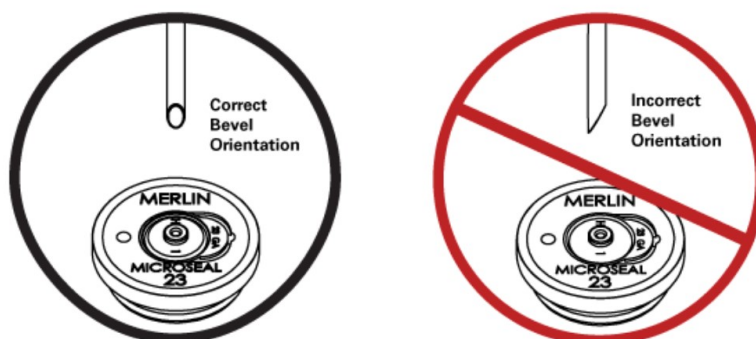
The Microseal requires 23 gauge SPME probes to seal properly during desorption. Do not use 24 gauge probes, they are too small in diameter to seal in the Microseal.

Microseal Compatible SPME Probes



Bevelled Probes

The orientation of the bevel on the SPME probe with respect to the Microseal is critical so that the beveled probe can push through the lips of the duckbill without damaging them. Incorrect orientation of the bevel on the probe will cause the tip to pierce or damage the inside surface of the Microseal. The figure below shows the correct orientation of the bevel with respect to the Microseal. A suggested procedure is to record the orientation of the Microseal in the port and then to install the SPME Probe in the autosampler so that the bevel on the probe is aligned properly as shown in the figure.



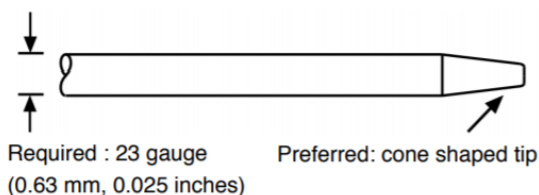
Microseal Installation

1. Follow the standard procedure to prepare the instrument for a septum change.
2. Remove the injection port nut and the septum. Remove any pieces of septum that are stuck to the injection port. Clean or replace the injection port liner to remove any septum particles which may have accumulated from silicone rubber septa.
3. If your instrument requires a Microseal adapter, mount it on the injection port finger-tight.
4. Place the Microseal in the septum cup. Push it down gently with your finger to seat it in the septum cup.
5. Screw on the Microseal nut finger-tight. Do not overtighten.

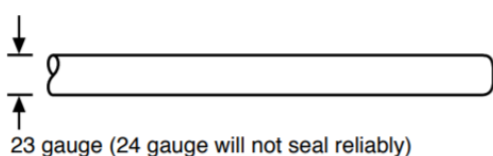
Choosing a Syringe for 23 gauge Microseals

The correct 23 gauge syringe needle diameter and needle tip shape is all that is required for the Microseal to function properly. Autosampler compatibility determines the other syringe parameters such as needle length, syringe barrel, and plunger configuration. Microseals also work well with manual injection including the Merlin Microshot.

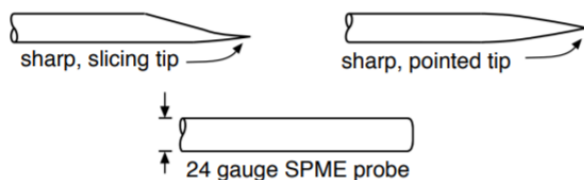
Microseal Compatible Syringe Needles:



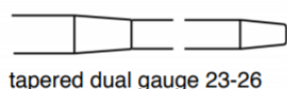
Microseal Compatible SPME Probes:



Do Not Use:



Requires 26 ga. Microseal (P/N 610):



Microseal Performance

Microseals function well over the entire range of GC injection port temperatures (50-400C) and within the specified pressure ranges of 3-100 psi (20-690 Kpa) for the General Purpose and SPME versions and 1-45 psi (7-310 Kpa) for the Low Pressure version. The resistance to wear is valuable in keeping the injection port liner free of septum particles which can cause sample adsorption or decomposition. Because the duckbill seal is enhanced by increase pressure,

Microseals perform very well at higher injection port pressures. Microseal lifetimes can vary depending on sample composition, operating conditions and laboratory environment. Lifetimes range from over 10,000 injections to as few as 1,000. Microseals should be replaced when the leak rate reaches several mL/min or when the inlet system will no longer hold column pressure. Thermal conductivity leak detectors used with helium or hydrogen carrier gas are extremely sensitive and may show full scale signal with a few microliters/minute leak rate. This is useful when searching for column fitting leaks but are not helpful in measuring Microseal leaks. Most all gas chromatographs use pressure controlled inlet systems so retention times remain stable with minor variations in total inlet flow. Small Microseal leaks, which add to septum purge flow, are not as critical as leaks at a column fitting, for example.

When leaks occur they are typically caused by the accumulation of material in the duckbill lips. Traces of samples containing derivitizing reagents or high concentrations of non-volatile material can leave traces on the needle tip. The residue can gradually accumulate in the duckbill lips which can interfere with the ability of the duckbill to seal. A small amount of glass wool in the injection port liner can wick away sample from the tip of the needle to alleviate this problem.

Safety

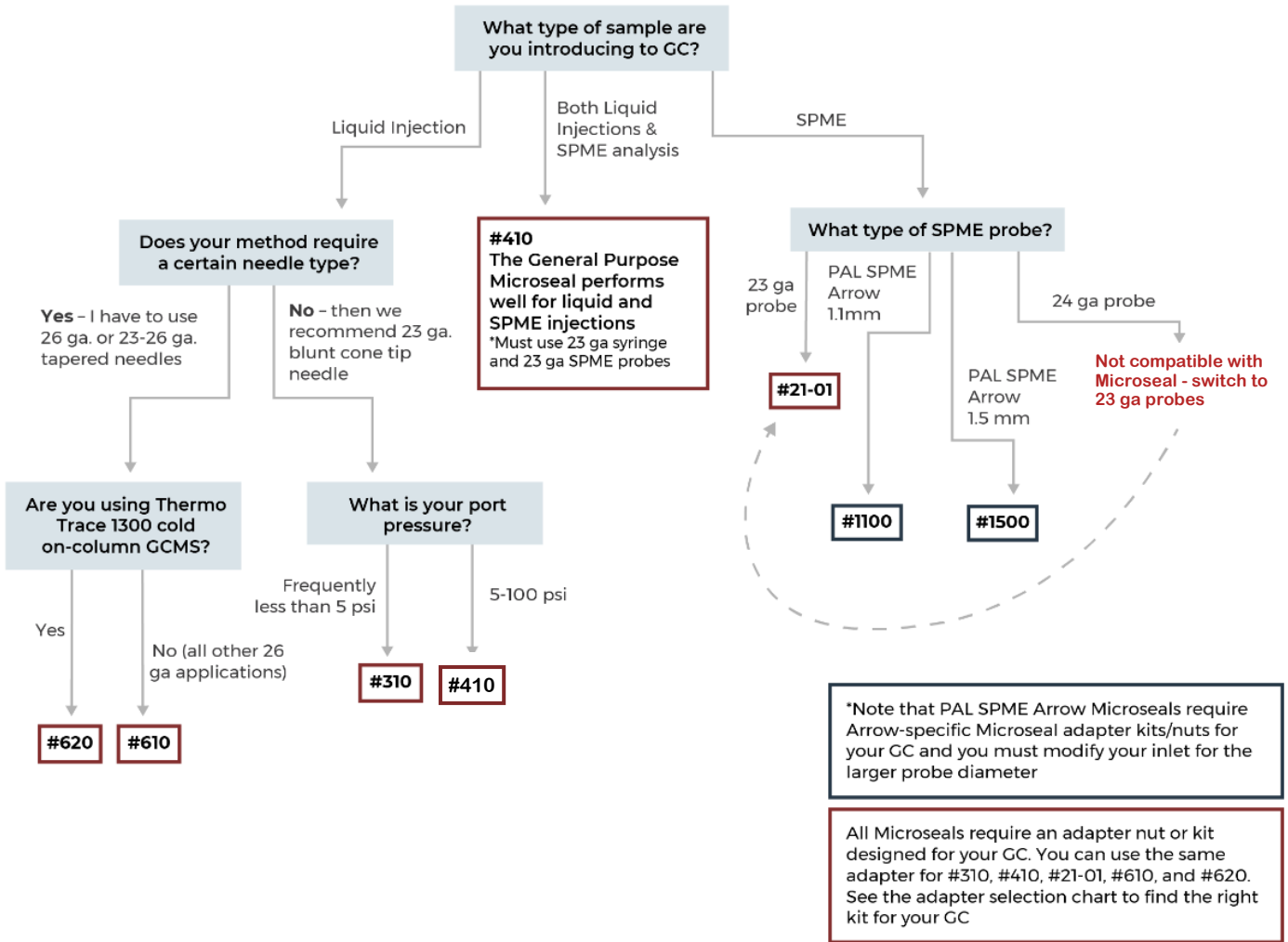
Read and follow the directions and safety precautions in the instrument manual for replacing the septum.

1. The injection port and nut may be hot.
2. The injection port may be under pressure.
3. Wear safety glasses as you always do in the laboratory.
4. Use particular caution with flammable carrier gases like hydrogen.

The 21-01 Microseal should last for over 1,000 insertions when used with SPME probes.

In testing, the P/N 410 General Purpose Microseal will also give reasonable lifetimes with square tipped probes but is not recommended for use with bevelled probes.

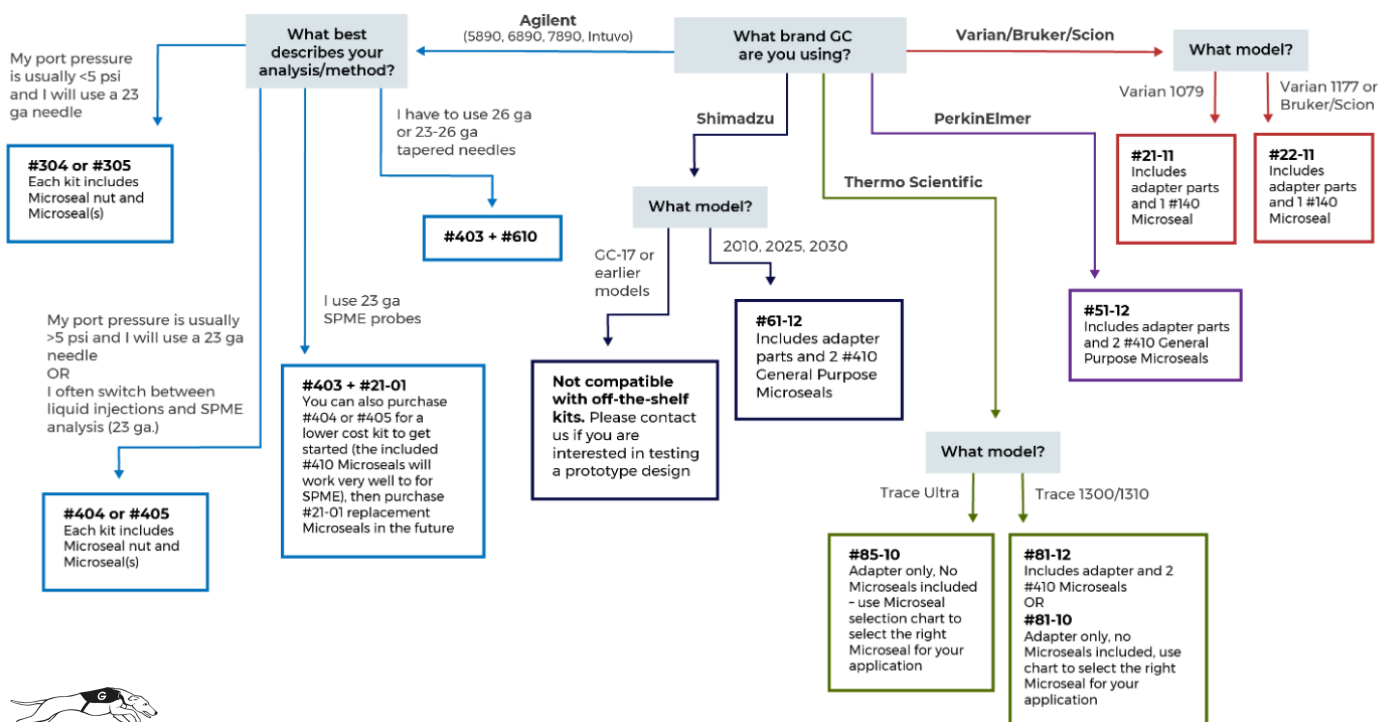
Which Microseal should I use?



*Note that PAL SPME Arrow Microseals require Arrow-specific Microseal adapter kits/nuts for your GC and you must modify your inlet for the larger probe diameter

All Microseals require an adapter nut or kit designed for your GC. You can use the same adapter for #310, #410, #21-01, #610, and #620. See the adapter selection chart to find the right kit for your GC

Which items or adapter/starter kit do I need to get started with the Microseal?



MERLIN MICROSEAL SYRINGE COMPATIBILITY GUIDE

Agilent Autosampler Syringes

Note: All part numbers in this table are 23 gauge needles

Volume (uL)	Termination	Tip	Description (other)	Agilent P/N	Hamilton P/N	SGE P/N
0.5	Fixed	Cone		G4513-80229		
0.5	Removable	Cone			86276	000410
1	Fixed	Cone		G4513-80215 5188-5246		
1	Removable	Cone			80176	000610
2	Fixed	Cone		5188-5247		
5	Fixed	Cone		G4513-80213 9301-0892	87987	001810
5	Removable	Cone		G4513-80234	87957	001815
10	Fixed	Cone		G4513-80209 9301-0713	80387	002810
10	Fixed	Cone	PTFE tipped plunger/Gas	G4513-80220 5181-8809	80080	002812
10	Fixed	Cone	Superflex Plunger			002835
10	Removable	Cone		G4513-80235 5181-8806	80357	002815
10	Removable	Cone	PTFE tipped plunger	G4513-80219 5181-8813	80087	002818
10	Removable	Cone	Superflex Plunger			002845
25	Removable	Cone		G4513-80228 5183-0316		003665
50	Removable	Cone		G4513-80221 5183-0318		004665
100	Fixed	Cone		G4513-80230		
100	Removable	Cone		5183-2058		005665
1000	Fixed	Cone	Headspace	G6500-80107		
1000	Removable	Cone	Headspace	G4200-80101		
2500	Fixed	Cone	Headspace	G6500-80109		
2500	Removable	Cone	Headspace	G4200-80107		
5000	Fixed	Cone	Headspace	G6500-80111		
5000	Removable	Cone	Headspace	G4200-80108		

MERLIN MICROSEAL SYRINGE COMPATIBILITY GUIDE

CTC CombiPAL and GC PAL Autosampler Syringes

Note: All part numbers in this table are 23 gauge needles

Volume (uL)	Termination	Tip	Description (other)	CTC P/N	Hamilton P/N	SGE P/N
0.5	Removable	Cone				000492
5	Fixed	Cone				001981
5	Removable	Cone				001984
10	Fixed	Cone		SYRC-L10-23S-AS	203361	002981
10	Fixed	Cone	PTFE tipped plunger			002987
10	Removable	Cone	PTFE tipped plunger Needle 51.5 mm			002965
10	Removable	Cone				002984
10	Removable	Cone	PTFE tipped plunger			002985
25	Fixed	Cone	PTFE tipped plunger			003987
100	Fixed	Cone	PTFE tipped plunger			005335
100	Removable	Side Hole /Dome	PTFE tipped plunger			005337
1000	Fixed	Side Hole /Dome	Headspace	SYRC-HS1.0-23-5	203082	008130
2500	Fixed	Side Hole /Dome	Headspace	SYRC-HS2.5-23-5	203084	008630
5000	Fixed	Side Hole /Dome	Headspace	SYRC-HS5.0-23-5	203086	

MERLIN MICROSEAL SYRINGE COMPATIBILITY GUIDE

Manual Injection Syringes

Note: All part numbers in this table are 23 gauge needles

Volume (uL)	Termination	Tip	Description (other)	Agilent P/N	Hamilton P/N	SGE P/N
0.5	Fixed	Cone	Nanovolume 6.5 Barrel OD			000300
0.5	Fixed	Cone	Nanovolume 8.0 Barrel OD			000310
0.5	Removable	Cone		5190-0464		
1	Fixed	Cone	Nanovolume 50mm needle length			000500
1	Fixed	Cone	Nanovolume 70mm needle length			000505
1	Fixed	Cone	Nanovolume 115mm needle length			000510
1	Removable	Cone		5190-1464		
2	Removable	Cone		5190-1471		
5	Fixed	Cone				008139
5	Fixed	Cone	Nanovolume 50mm needle length			000800
5	Fixed	Cone	Nanovolume 70mm needle length			000802
5	Fixed	Cone	Nanovolume 115mm needle length			000804
5	Removable	Cone		5190-1475		
10	Fixed	Cone			80343	002839
10	Fixed	Cone	Superflex Plunger			002108

MERLIN MICROSEAL SYRINGE COMPATIBILITY GUIDE

Shimadzu Autosampler Syringes

Note: All part numbers in this table are 23 gauge needles

Volume (uL)	Termination	Tip	Description (other)	Shimadzu P/N	Hamilton P/N	SGE P/N
0.5	Removable	Cone				000445
5	Fixed	Cone				001988
10	Fixed	Cone		221-34618-00		
10	Removable	Cone		220-90282-20		002898
10	Removable	Cone	PTFE tipped plunger	220-90624-00		002902
50	Fixed	Cone				004682
250	Fixed	Cone	PTFE tipped plunger			006682
1000	Fixed	Cone	Headspace	220-94500-05	203082	008130
2500	Fixed	Cone	Headspace	220-94500-04	203084	008630
5000	Fixed	Cone	Headspace	220-94500-02	203086	

Perkin Elmer Autosampler Syringes

Volume (uL)	Termination	Tip	Description (other)	PE P/N	Hamilton P/N	SGE P/N
0.5	Removable	Cone		N6101252		000478
5	Fixed	Cone		N6101390		001954
5	Fixed	Cone	PTFE tipped plunger	N6103240		001957
5	Fixed	Blunt			88035	
50	Fixed	Cone		N6101760		004670

Varian/Bruker Autosampler Syringes

Volume (uL)	Termination	Tip	Description (other)	Varian P/N	Hamilton P/N	SGE P/N
10	Fixed	Cone	50 mm needle length		80342	002981

MERLIN MICROSEAL SYRINGE COMPATIBILITY GUIDE

Thermo Scientific Autosampler Syringes

Note: All part numbers in this table are 23 gauge needles

Volume (uL)	Termination	Tip	Description (other)	Thermo P/N	Hamilton P/N	SGE P/N
0.5	Fixed	Cone		36504045		
0.5	Removable	Cone	50 mm needle length			000492
5	Fixed	Cone		365C3701		001981
10	Fixed	Cone	80 mm needle length	36520061		002989
10	Fixed	Cone	PTFE tipped plunger 50 mm needle length	365D3741		002987
10	Fixed	Cone	50 mm needle length	36520060		002981
10	Removable	Cone	50 mm needle length	365D3731		002984
100	Removable	Cone		36500495		
100	Removable	Side Hole / Dome		36500495		
250	Removable	Side Hole / Dome		36520051		
1000	Fixed	Side Hole / Dome				008130
2500	Fixed	Side Hole / Dome				008630

Complete Guide to the Merlin Microseal™ for Gas Chromatography



YOUR GLOBAL SCIENCE PARTNER

6 Kelvin Park Birkenhead Merseyside CH41 1LT United Kingdom

Tel: +44 (0) 151 649 4000 • E: info@greyhoundchrom.com • www.greyhoundchrom.com

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