Merlin Microseal User Manual

Introduction

The Merlin Microseal™ 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.

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 As the needle is withdrawn from the Microseal after sample injection, the spring pushes the duckbill valve closed before the needle leaves the O-rings.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

23 gauge Microseals

General Purpose Microseal (P/N 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 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.

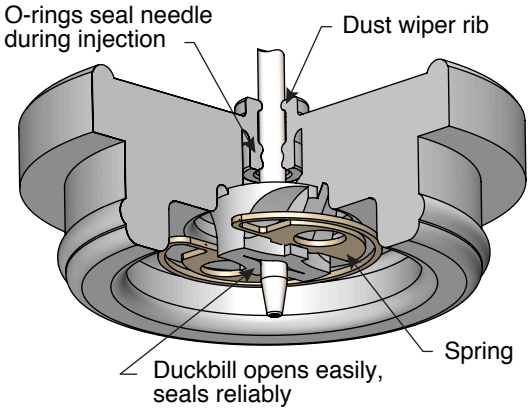
SPME Microseal (P/N 21-01) - This Microseal was developed for 23 gauge SPME probes, which have a square end instead of the cone shaped tip characteristic of syringe needles. These probes can cause additional wear and this version provides extended lifetime for SPME.

Microseals for other gauge sizes

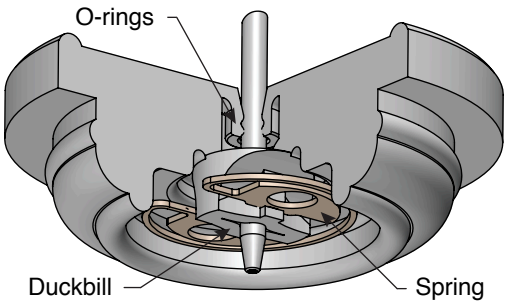
Microseals are now available for 26 ga syringes, PAL Arrow SPME probes, and custom gauge sizes. See page 3 for more information on these products.

General Purpose, Low Pressure, and SPME Microseals

Microseal Cut-Away Views:

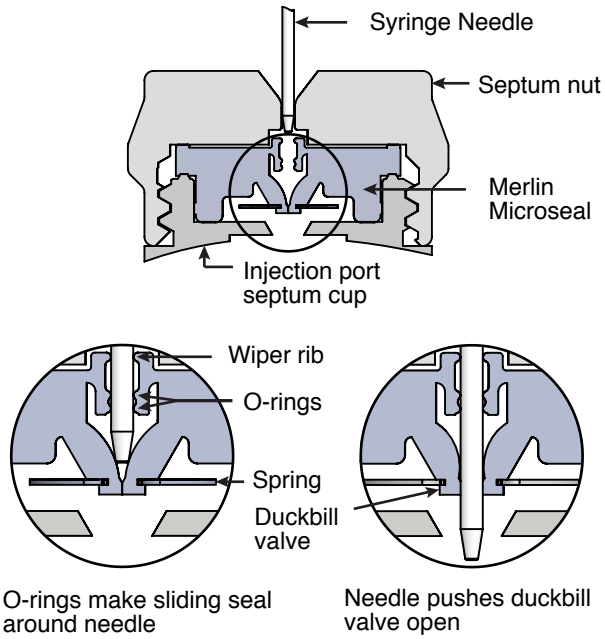


General Purpose and SPME Microseal



Low Pressure Microseal

Microseal Injection Sequence:



Injection Port Adapters for 23 ga Microseals

All 23 gauge Microseals are compatible with the standard adapters shown here. Additional information about individual adapters can be viewed at www.merlinic.com/products/merlin-microseal.

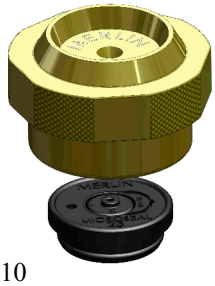
Agilent

Microseals fit directly in the Agilent septum cup and require only a Merlin Microseal nut. No additional adapter is required. The nut is compatible with Agilent autosamplers.

Thermo Scientific

For Thermo Trace 1300 Series with "Instant Connect" injectors, the Microseal fits directly in the septum cup, and requires only a Microseal compatible nut. Merlin has designed a nut for this injector which is available in Merlin Kit 81-12.

For Thermo Trace Ultra GCs, an adapter kit is required: Merlin P/N 85-10



Thermo Scientific Company also offers Microseal adapters.

For the Trace 1300 Series with the "Instant Connect" injector, Thermo Kit 19050735 contains their Microseal-compatible nut and a Microseal.

For Thermo Trace and Trace Ultra GCs (not Instant Connect) Thermo Kit 9050205 contains the parts to adapt Split/Splitless and PTV injectors for use with the Microseal. More information is available at www.merlinic.com/products/merlin-microseal/thermo-port-adapter.

Shimadzu

A Microseal adapter is available for injection ports on Shimadzu Models GC-2010, GC-2025, and GC-2030. The Microseal nut has alignment details for the Shimadzu AOC-20 series and AOC-5000 autoinjectors.

PerkinElmer

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

Varian / Bruker / Scion

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

1079

1177 / Scion

23 ga Merlin Kits:

Kit Description	Merlin P/N
For Agilent Instruments:	
Low Presure Microseal Kit (nut and 2 #310 Microseals)	**304**
Low Presure Microseal Kit (nut and 1 #310 Microseal)	**305**
General Purpose Microseal Kit (nut and 2 #410 Microseals)	**404**
General Purpose Microseal Kit (nut and 1 #410 Microseal)	**405**
Microseal Nut	**403**
For Thermo Scientific Instruments:	
Microseal Kit for Thermo Trace 1300 series (nut and 2 #410 Microseals)	**81-12**
Microseal adapter for Thermo Trace 1300 series (nut only)	**81-10**
Microseal adapter for Thermo Trace Ultra (available 2018)	**85-10**
For Shimadzu Instruments:	
Microseal Kit for Shimadzu (nut, adapter assembly and 2 #410 Microseals)	**61-12**
For PerkinElmer Instruments:	
Microseal Kit for PerkinElmer (nut, adapter, O-ring, and 2 #410 Microseals)	**51-12**
For Varian / Bruker / Scion Instruments:	
Microseal Kit for Varian 1079 (nut, adapter, O-ring, and 1 #410 Microseal)	**21-11**
Microseal Kit for Varian 1177 (nut, adapter, O-ring, and 1 #410 Microseal)	**22-11**
Replacement Microseals:	
Low Pressure Microseal (1 - 45 psi)	**310**
General Purpose Microseal (for most applications, 3 - 100 psi)	**410**
Microseal for SPME applications (3 - 100 psi)	**21-01**

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. Larger needle or probe diameters may require different adapters or inlet modifications for your GC. We also offer support and specialty products for custom applications. Please contact us for more information about custom services and products.

Microseals for 26 ga or 23-26 ga Tapered Needles

GC users may discover several benefits to using 26 ga syringe needles. Most on-column injections will require the use of a 26 ga or 23-26 ga tapered needle. The smaller diameter of 26 ga 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 ga needle with conventional septa.

P/N 610 - 26 ga. Microseal - This Microseal is compatible with 26 ga and 23-26 ga tapered needles and can be used for injection port pressures between 3 and 100 psi (20 - 690 kPa). It is recommended for most 26 ga. users. This Microseal is compatible with the standard 23 ga. adapters and nuts for all instrument manufacturers as listed on page 2.

P/N 620 - This 26 ga Microseal is specifically designed to optimize performance for the Thermo Trace 1300 cold on-column GC/MS.

Microseals for 19 ga SPME

Merlin offers a 19 gauge Microseal for custom applications. Contact us for more information about operating specifications and recommended applications.

P/N 510 - 19 ga. Microseal

Microseals & Adapters for PAL Arrow SPME Probes

The PAL Arrow 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 your inlet will need to be modified to accept the large diameter of the Arrow probes. Contact your Arrow distributore for more information about inlet modification. Arrow Microseals are not compatible with the traditional 23 ga adapter kits listed on page 2, one of the Arrow adapter kits listed below is required.

Arrow Microseals:

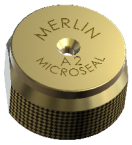
P/N 1100 - Microseal for 1.1 mm Arrow SPME probes

P/N 1500 - Microseal for 1.5 mm Arrow SPME probes

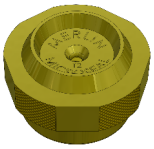
Arrow Adapter kits:

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

P/N 1000AG - Arrow Microseal Nut for Agilent inlets

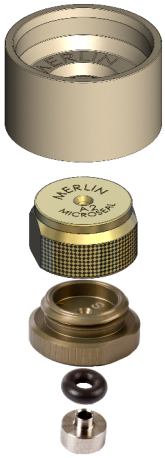


P/N 1000TS - Arrow Microseal Nut for Thermo Trace 1300 Series GCs



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

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



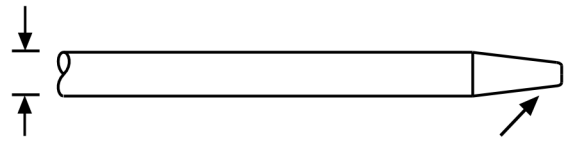
Microseal Installation

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 ga. 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. Further information about Microseal syringe selection, including links to tables of recommended syringe part numbers is available at www.merlinic.com/products/merlin-microseal/syringes-for-microseal.

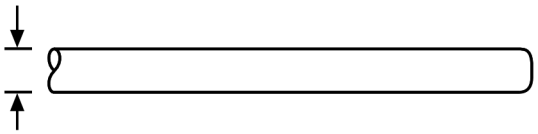
Microseal Compatible Syringe Needles:



Required : 23 gauge (0.63 mm, 0.025 inches)

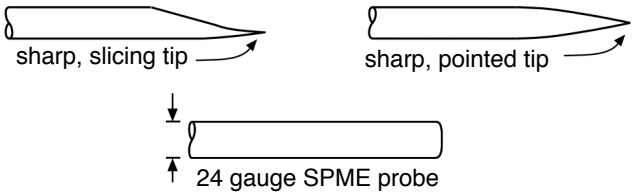
Preferred: cone shaped tip

Microseal Compatible SPME Probes:

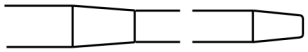


23 gauge (24 gauge will not seal reliably)

Do Not Use:



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



tapered dual gauge 23-26

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.

For more information visit our website at:

www.merlinic.com

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