Restek PAL SPME Arrow

Solid phase microextraction (SPME) fibers (Figure 1) and Arrows (Figure 2) are used to extract organic compounds from solid, liquid, and vapor matrices onto a stationary phase that is bonded to a fused silica fiber or to a stainless-steel tube, respectively. Restek PAL SPME Arrows have several advantages over traditional SPME fibers in that Restek PAL SPME Arrows have larger stationary phase volumes and greater mechanical stability. Following extraction, the analytes are typically thermally desorbed in the inlet of a gas chromatograph (GC). Prior to using this product, end users should read this instruction sheet and become familiar with SPME Arrow selection and proper conditioning procedures.

Figure 1: SPME fiber identification can be confirmed by the color of the hub.

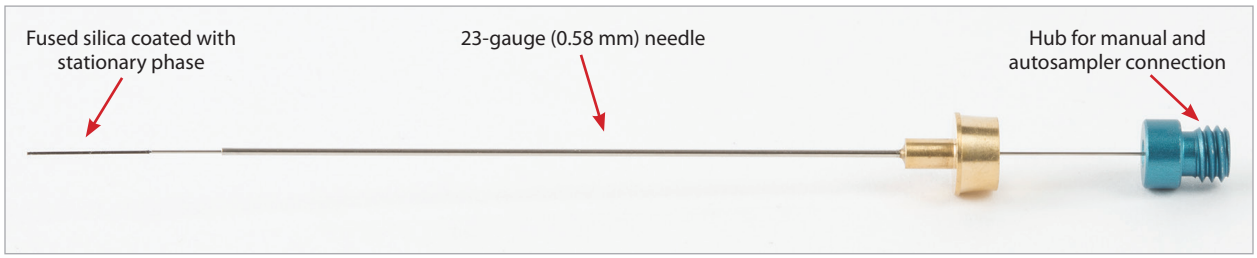
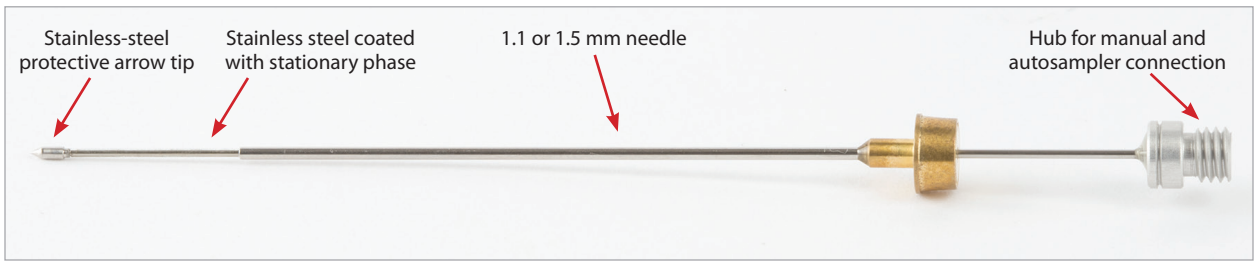


Figure 2: SPME Arrow identification can be confirmed by the color of the hub.



SPME Arrow Selection

Restek PAL SPME Arrows are available with different stationary phases and film thicknesses to support a wide range of analyte chemistries and sample matrices. Choose the best SPME Arrow for your application based on the properties of the compounds to be analyzed. Use Table I to select the proper type of SPME Arrow. (Types can be identified by the color of the hub.)

Table I: Select the correct SPME Arrow based on the properties of the target analytes.

Analytes	Molecular Weight*	Stationary Phase	Thickness (µm)	Needle Diameter (mm)	Hub Color	Each (cat.#)
Volatile**	60–275	Polydimethylsiloxane (PDMS)	100	1.1	Red	27485
Volatile	60–275	Polydimethylsiloxane (PDMS)	100	1.5	Red	27877
Volatile (high capacity)**	60–275	Polydimethylsiloxane (PDMS)	250	1.5	Black	27484
Polar, semivolatile**	80–300	Polyacrylate	100	1.1	Gray	27488
Highly volatile**	30–225	Carbon Wide Range (WR)/PDMS	120	1.1	Light Blue	27487
Highly volatile	30–225	Carbon Wide Range (WR)/PDMS	120	1.5	Light Blue	27879
Aromatic, semivolatile**	60–300	Divinylbenzene (DVB)/PDMS	120	1.1	Violet	27486
Aromatic, semivolatile	60–300	Divinylbenzene (DVB)/PDMS	120	1.5	Violet	27878
Volatile and semivolatile	40–275	DVB/Carbon WR/PDMS	120	1.1	Dark Gray	27875
Volatile and semivolatile	40–275	DVB/Carbon WR/PDMS	120	1.5	Dark Gray	27876
Method Development Kit (Set of five; includes one of each type listed above with a **)			See above**	See above**	See above**	27489

*These molecular weight ranges are a reasonable approximation; however, end users should verify suitability for their specific application.
All Restek PAL SPME Arrows have 20 mm of stationary phase bonded onto stainless steel.

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GC Inlet Conversion Kits for Restek PAL SPME Arrows

Due to the relatively large diameter of Restek PAL SPME Arrows, it is necessary to modify the GC inlet prior to use. Conversion kits include the following instrument-specific parts: a GC injection port weldment, an adaptor cup, a 5-pack of liners, a 3-pack of septa, and a septum nut. Conversion kits are available for the following types of GCs:

GC	Conversion Kit Cat.#
Thermo TRACE Ultra	27495
Thermo TRACE 1300/1310	27494
Agilent GC 6890	27492
Agilent GC 7890	27493
Shimadzu GC 2010	27491

SPME Arrow Thermal Conditioning and Solvent Cleaning

General Precautions

- Never touch the stationary phase of a SPME Arrow, not even when wearing gloves.
- Never expose a SPME Arrow to heat without an inert gas present to protect the stationary phase.
- Never exceed the maximum recommended temperature of the SPME Arrow.
- Never soak a SPME Arrow in chlorinated solvents.
- Note that sampling technique may affect SPME Arrow lifetime (i.e., number of viable analyses). Immersion sampling in liquids containing complex matrices may reduce lifetime. In contrast, headspace sampling generally results in longer lifetimes.
- It is not possible to judge SPME Arrow quality visually, except for obvious major mechanical damage.
- Staining or discoloration does not give any indication of the remaining life span.

Thermal Conditioning

Prior to their first use, new SPME Arrows need an initial preconditioning at a specified temperature and duration (Table II) in an inert gas environment. In addition, all SPME Arrows should undergo conditioning at the beginning of the workday and between samples to prevent carryover. The life span of a SPME Arrow can be extended if it is not unnecessarily exposed to its maximum temperature. In general, a SPME Arrow should be conditioned at 20 °C above the planned operating temperature, without exceeding its maximum temperature threshold.

SPME Arrows may be conditioned in the inlet of a GC. However, to avoid contaminating the GC system, conditioning the SPME Arrow in a separate conditioning module is recommended. When conditioning in a GC inlet, always use an appropriate liner (1.8 mm ID). Never use an inlet liner with glass wool; if the SPME Arrow contacts wool, the stationary phase may be damaged. When conditioning in a GC inlet, be sure to use a high split ratio (e.g., 40 or higher) to reduce the amount of contaminants entering the GC column.

Solvent Cleaning

If thermal conditioning was inadequate and/or particulates are present on the SPME Arrow, solvents may be used to clean it. All SPME Arrows have bonded stationary phases, which may swell when exposed to certain solvents (particularly chlorinated solvents). If a swollen SPME Arrow is retracted into the needle, the needle may damage the stationary phase. Swelling may occur in both headspace and immersion modes; therefore, it is important to only use solvents that are compatible with each stationary phase (Table II). Never clean a SPME Arrow by mechanical means.

Table II: SPME Arrow Thermal Conditioning and Solvent Cleaning Parameters

Stationary Phase, Thickness (µm)	Max Temp (°C)	Recommended Operating Temp (°C)	Conditioning Temp (°C) Min / Max	Preconditioning Time (min) Min / Max	Conditioning Time (min) Min / Max	Cleaning Solvent*	Cleaning Time (min) Min / Max
PDMS, 100	300	200–300	200 / 300	15 / 120 (30 is recommended)	1 / 60 (5 is recommended)	MeOH / EtOH / IPA	0.5 / 10 (2 is recommended)
PDMS, 250	300	220–300	200 / 300	15 / 120 (60 is recommended)	1 / 60 (10 is recommended)	MeOH / EtOH / IPA	0.5 / 10 (2 is recommended)
Polyacrylate, 100	280	200–280	180 / 280	15 / 120 (30 is recommended)	1 / 60 (5 is recommended)	MeOH / aliphatic HC	0.5 / 10 (2 is recommended)
Carbon WR, 120	300	200–300	180 / 300	15 / 120 (30 is recommended)	1 / 60 (5 is recommended)	MeOH	0.5 / 10 (2 is recommended)
DVB, 120	300	220–300	200 / 300	15 / 120 (60 is recommended)	1 / 60 (10 is recommended)	MeOH / EtOH / IPA	0.5 / 10 (2 is recommended)
DVB/Carbon WR, 120	300	220–300	200 / 300	15 / 120 (60 is recommended)	1 / 60 (10 is recommended)	MeOH / EtOH / IPA	0.5 / 10 (2 is recommended)

*Cleaning solvents for a given SPME Arrow type may be used alone or mixed together.
MeOH = methanol, EtOH = ethanol, IPA = isopropyl alcohol, aliphatic HC = hexane (or similar)

Refer to the equipment owner's manual for proper installation and operation of a SPME Arrow within an autosampler or a Restek PAL SPME manual injection kit.

Questions about this or any other Restek product?
Contact us or your local Restek representative (www.restek.com/contact-us).

www.restek.com
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