

Restek Sample Handling

# Set Your Sights on Superior Performance

## PAL Smart SPME Arrow

- Rugged, stainless-steel construction ensures longer lifetimes.
- Faster extraction means higher sample throughput.
- Better sensitivity allows lower LODs.
- Now with Smart technology.



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# Set Your Sights on Superior Performance

Solid phase microextraction (SPME) is a fast, automated sample preparation technology that reduces sample handling, extraction time, and solvent consumption, making it a popular choice in environmental, food, and clinical laboratories. However, traditional SPME fiber technology has some significant drawbacks, including poor mechanical stability and a small phase volume.

The PAL Smart SPME Arrow system is a revolutionary change in microextraction that combines exceptional robustness with faster extraction times and trace-level sensitivity (Table I). In contrast to traditional SPME fibers, SPME Arrows contain significantly more phase volume, which allows more target analyte to be extracted in less time. In addition, the stainless-steel construction, unique Arrow tip, inner stabilizing rod, and outer sheath design fully protect the phase, minimizing both mechanical damage and analyte loss during sample transfer.



**Table I:** Comparing Restek PAL SPME Arrow to Traditional SPME Fiber (Headspace Technique)

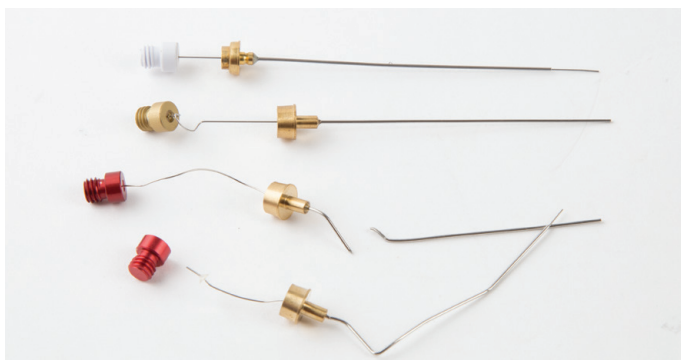
	Traditional Fibers	1.1 mm Arrow	1.5 mm Arrow	The Arrow Advantage
<b>Rugged, stainless-steel construction</b> <ul style="list-style-type: none"><li>• Protective sheath</li><li>• Stabilizing inner rod</li><li>• Arrow-shaped tip</li></ul>	No	Yes	Yes	<ul style="list-style-type: none"><li>• <b>Longer lifetimes:</b> Arrow construction protects the phase and minimizes both damage and analyte loss.</li><li>• <b>Less downtime</b> due to breakage.</li><li>• <b>Eliminates septa coring.</b></li></ul>
<b>Surface area</b>	9.4 mm <sup>2</sup>	44 mm <sup>2</sup>	63 mm <sup>2</sup>	Increase sample throughput—higher surface area lets you reduce extraction time and <b>analyze more samples per shift.</b>
<b>Phase (PDMS) volume</b>	0.6 µL	3.8 µL	12 µL	With significantly more phase, SPME Arrow provides better sensitivity so you can <b>lower detection limits with confidence.</b>

Our product line is continually expanding! See what's new at [www.restek.com/SPME](http://www.restek.com/SPME)

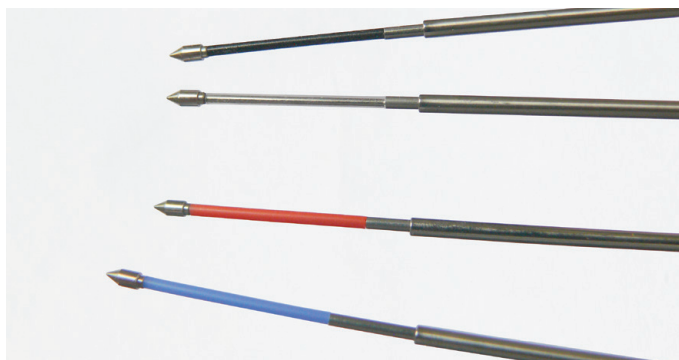
## On Target: Longer Lifetime

One of the main drawbacks to SPME fibers is their fragility. Even during routine use, they are easily damaged and can be irreparably broken (Figure 1). Busy labs will benefit greatly from the reliability of rugged Restek PAL Smart SPME Arrow. The unique, stainless-steel Arrow design includes a robust inner stabilizing rod that resists bending and breakage as well as an outer sheath that protects the phase coating and prevents both physical damage and analyte loss. Typically, SPME Arrows perform well for hundreds of extractions, lasting two to three times longer than traditional SPME fibers. In addition, the unique arrow-shaped tip pierces the septum cleanly and with little resistance, extending septum lifetime (Figure 2).

**Figure 1:** SPME fibers break easily during routine operation.



**Figure 2:** The rugged construction of the Restek PAL SPME Arrow prevents breakage under normal use.



## Which Restek PAL SPME Arrow is best for my application?

Restek PAL Smart SPME Arrows are suitable for a wide range of analyte chemistries and sample matrices. They are suitable for manual injection and are fully backwards compatible with any generation of PAL3 Systems. Choose the best SPME Arrow for your application based on the properties of your target compounds.

- Trace analysis in foodstuffs
- Drugs and pharmaceuticals
- Herbicides/pesticides
- Medical diagnostics
- Trace impurities in polymers and solid samples
- Solvent residues in raw materials
- Water analysis (organics in water)

Check your instrument manufacturer requirements or contact Restek Technical Support at [www.restek.com/contact-us](http://www.restek.com/contact-us) for further assistance.

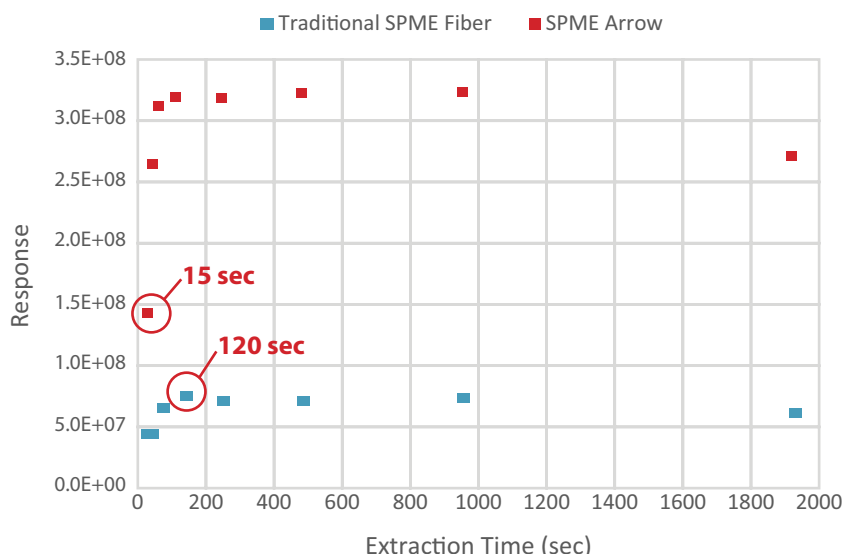
## On Target: Higher Sample Throughput

Restek PAL Smart SPME Arrows provide much faster extraction times than traditional SPME fibers because Arrows have much more phase volume. As shown in Figure 3, the increased phase volume allows more target analyte to be extracted in just seconds using an Arrow than can be extracted from a traditional fiber. Being able to extract what you need in a fraction of the time means more samples can be analyzed per day, which improves lab efficiency and profitability. The example in Table II demonstrates a nearly 50% increase in productivity!

**Figure 3:** Benchmark Comparison of 1.1 mm SPME Arrow vs. Standard SPME Fiber for 2.5 ppb Volatiles in Headspace

**Increase sample throughput by extracting more analyte in less time. With SPME Arrow, you can extract twice the amount in 15 sec than you can in 120 sec using a traditional fiber.**

*Arrow and fiber both have 100  $\mu$ m PDMS coatings. Data points are replicate averages of summed responses of approximately 90 volatile compounds at each extraction time.*



**Table II:** Analyze more samples per day with Restek PAL SPME Arrow.

Target Analytes	Sample Collection and Desorption Steps with Associated Times (sec)								Samples per Day
	Select Sample Vial	Vial Incubation / Fiber Conditioning	Vial Transfer	Sample Extraction (Headspace)	GC Equilibration	Desorb Fiber	Return Sample Vial	Total Time	
Traditional SPME Fiber	22	120	20	120	15	10	15	322	268
SPME Arrow	22	120	20	15	15	10	15	217	398 (~50% increase)

Note: Processes that take <10 sec to perform were omitted from the table. Actual samples per day is dependent on GC cycle time.

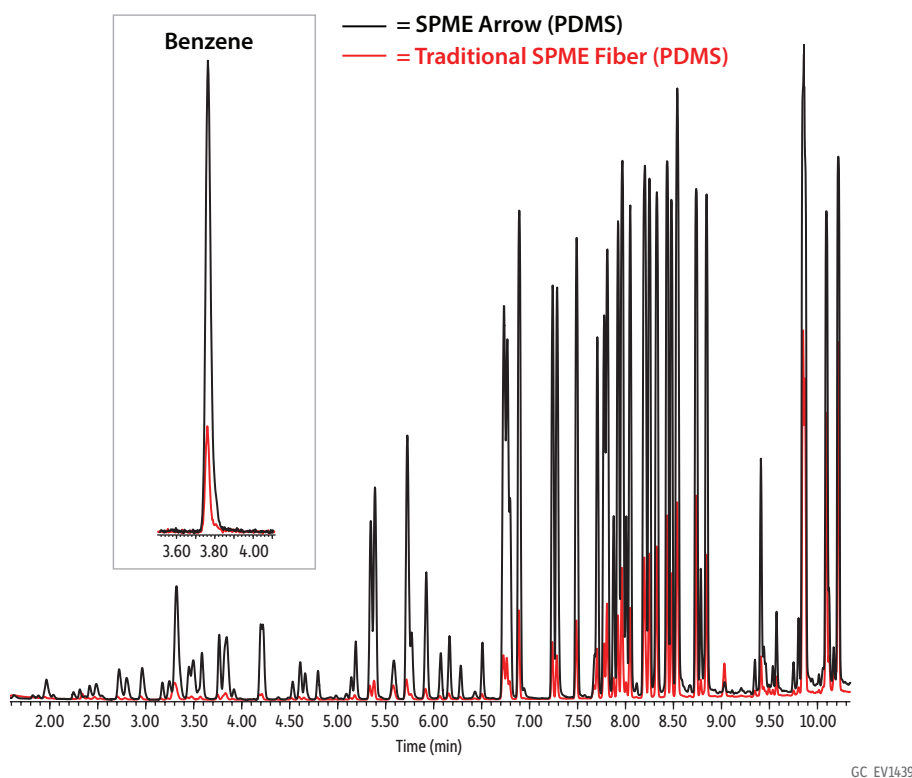
## On Target: Lower Detection Limits

Developing a new method or trying to improve the performance of an existing one? Restek PAL Smart SPME Arrows have more phase volume, so they provide much greater sensitivity than traditional fibers. To demonstrate this, 82 volatile compounds were analyzed under three different headspace extraction time and extraction volume combinations. Results under all experimental conditions definitively show that Arrow outperforms traditional SPME fiber and provides much higher analyte responses (Table III and Figure 4).

**Table III:** Analyte response is much higher with SPME Arrow than with a traditional SPME fiber.

		Average % Increase in Response of Arrow vs. Traditional Fiber	
Extraction Time (min)	Extraction Volume (mL Water)	1.1 mm Arrow	1.5 mm Arrow
10	10	297%	527%
5	10	618%	896%
10	5	446%	634%

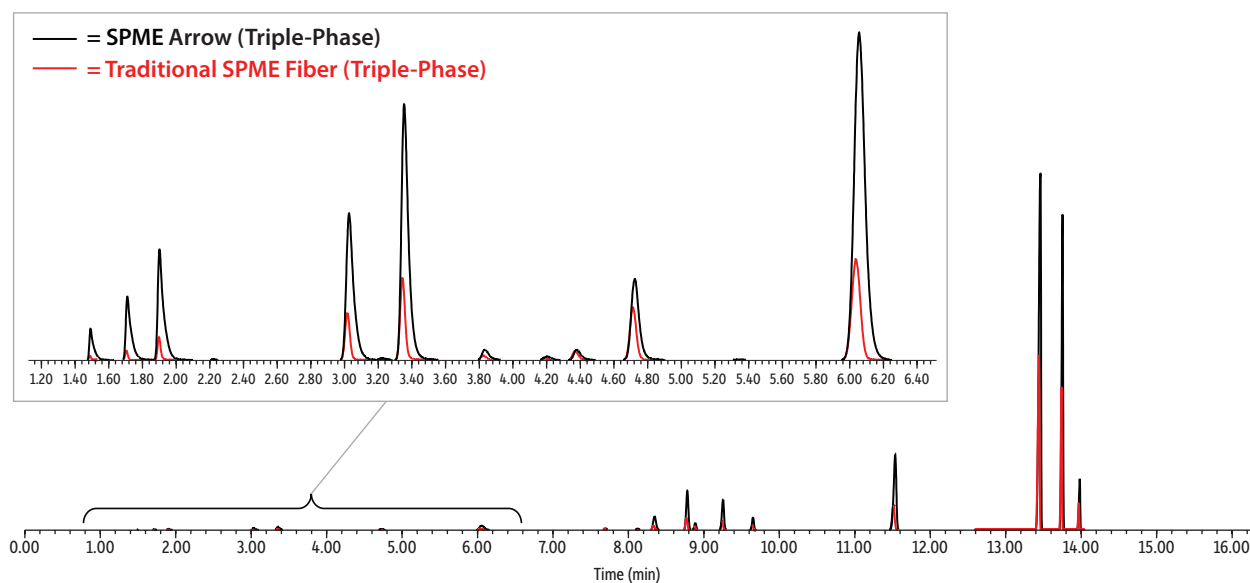
**Figure 4:** Restek PAL SPME Arrow extracts more target analyte from samples, allowing lower detection limits.



Total ion chromatogram (TIC). Black trace = 1.1 mm Arrow. Red trace = traditional SPME fiber.  
Both were 100  $\mu$ m PDMS run under identical headspace extraction, desorption, and analytical conditions.

Turning to the emerging cannabis market and the triple-phase (DVB/Carbon WR/PDMS) Arrow, you can also expect significantly higher analyte responses with residual solvents and other classes of compound (Figure 5).

**Figure 5:** Restek PAL SPME Arrow provides similarly superior results for residual solvents and other compounds.



GC\_GN1204

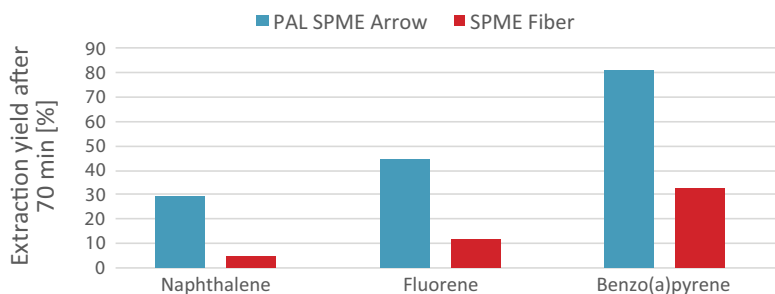
Total ion chromatogram (TIC). Black trace = 1.1 mm 120  $\mu$ m Arrow. Red trace = traditional 80  $\mu$ m SPME fiber. Both were triple-phase (DVB/Carbon WR/PDMS) run under identical headspace extraction, desorption, and analytical conditions.

Even after 70 minutes of immersion extraction, the compound concentration of PAHs for the traditional SPME fiber could not equal the amount obtained using a SPME Arrow (Figure 6).

**Figure 6:** Traditional SPME fibers cannot match the extraction yield of SPME Arrows (immersion extraction technique).

**SPME Arrows extract more analyte so you can lower LODs with confidence.**

Arrow and fiber both have 100  $\mu$ m PDMS coatings. Analytes were at 50 ng/L.



**Switch to SPME Smart Arrow, and  
Set Your Sights on Superior Performance!**



# Get set up for Superior SPME!

## Restek PAL Smart SPME Arrow

- Rugged, stainless-steel construction ensures longer lifetimes.
- Faster extraction means higher sample throughput.
- Better sensitivity allows lower LODs.
- Choose format based on sampling technique:
  - 1.1 mm sleeve, if only using headspace sampling.
  - 1.5 mm wide sleeve, if using direct immersion sampling (works for headspace, too).
- Now with Smart technology—each SPME Arrow is equipped with a unique Smart chip containing parameters, ranges, and usage history.

Recommended maximum GC inlet pressure is 50 psi or less.

All PAL SPME Smart Arrows have 20 mm of phase bonded onto stainless steel.

**PAL system compatibility:** Smart SPME Arrows are fully backwards compatible with any generation of PAL3 Systems. Additional hardware will be also required, including the SPME Arrow Tool, Heatex Stirrer, Arrow Conditioning Module, and Agitator Module with the perforated lid. The SPME Arrow is not supported on the HTS/Combi PAL systems.



Due to the relatively large diameter of PAL Smart SPME Arrows, you must modify the GC inlet using an instrument-specific conversion kit from Restek prior to use. Converted inlets are compatible with all standard injection techniques (SPME Arrow, liquid syringe, headspace, etc.); no need to switch inlets after installation.

Catalog No.	Product Name	Color	Diameter	Material	Recommended Analytes	Units
28901	PAL Smart SPME Arrow Method Development Kit					kit
28903-1	PAL Smart SPME Arrow 1.10 mm: Carbon-WR/PDMS, Phase Thickness 120 $\mu$ m, Phase Length 20 mm, Light Blue, ea.	Light Blue	1.1 mm	120 $\mu$ m Carbon-WR/PDMS (Carbon Wide Range/Polydimethylsiloxane)	Highly volatile, 30–225 g/mol*	ea.
28903-3	PAL Smart SPME Arrow 1.10 mm: Carbon-WR/PDMS, Phase Thickness 120 $\mu$ m, Phase Length 20 mm, Light Blue, 3-pk.	Light Blue	1.1 mm	120 $\mu$ m Carbon-WR/PDMS (Carbon Wide Range/Polydimethylsiloxane)	Highly volatile, 30–225 g/mol*	3-pk.
28904-1	PAL Smart SPME Arrow 1.10 mm: DVB/Carbon-WR/PDMS, Phase Thickness 120 $\mu$ m, Phase Length 20 mm, Dark Gray, ea.	Dark Gray	1.1 mm	120 $\mu$ m DVB/Carbon-WR/PDMS (Divinylbenzene/Carbon Wide Range/Polydimethylsiloxane)	Volatile and semivolatiles, 40–275 g/mol*	ea.
28904-3	PAL Smart SPME Arrow 1.10 mm: DVB/Carbon-WR/PDMS, Phase Thickness 120 $\mu$ m, Phase Length 20 mm, Dark Gray, 3-pk.	Dark Gray	1.1 mm	120 $\mu$ m DVB/Carbon-WR/PDMS (Divinylbenzene/Carbon Wide Range/Polydimethylsiloxane)	Volatile and semivolatiles, 40–275 g/mol*	3-pk.
28905-1	PAL Smart SPME Arrow 1.10 mm: DVB/PDMS, Phase Thickness 120 $\mu$ m, Phase Length 20 mm, Violet, ea.	Violet	1.1 mm	120 $\mu$ m DVB/PDMS (Divinylbenzene/Polydimethylsiloxane)	Amines and polar compounds, 60–300 g/mol*	ea.
28905-3	PAL Smart SPME Arrow 1.10 mm: DVB/PDMS, Phase Thickness 120 $\mu$ m, Phase Length 20 mm, Violet, 3-pk.	Violet	1.1 mm	120 $\mu$ m DVB/PDMS (Divinylbenzene/Polydimethylsiloxane)	Amines and polar compounds, 60–300 g/mol*	3-pk.
28906-1	PAL Smart SPME Arrow 1.10 mm: PDMS, Phase Thickness 100 $\mu$ m, Phase Length 20 mm, Red, ea.	Red	1.1 mm	100 $\mu$ m PDMS (Polydimethylsiloxane)	Volatile, 60–275 g/mol*	ea.
28906-3	PAL Smart SPME Arrow 1.10 mm: PDMS, Phase Thickness 100 $\mu$ m, Phase Length 20 mm, Red, 3-pk.	Red	1.1 mm	100 $\mu$ m PDMS (Polydimethylsiloxane)	Volatile, 60–275 g/mol*	3-pk.
28902-1	PAL Smart SPME Arrow 1.10 mm: PA, Phase Thickness 100 $\mu$ m, Phase Length 20 mm, Gray, ea.	Gray	1.1 mm	100 $\mu$ m PA (Polyacrylate)	Polar, semivolatiles, 80–300 g/mol*	ea.
28902-3	PAL Smart SPME Arrow 1.10 mm: PA, Phase Thickness 100 $\mu$ m, Phase Length 20 mm, Gray, 3-pk.	Gray	1.1 mm	100 $\mu$ m PA (Polyacrylate)	Polar, semivolatiles, 80–300 g/mol*	3-pk.
28911-1	PAL Smart SPME Arrow 1.5 mm: PDMS, Phase Thickness 250 $\mu$ m, Phase Length 20 mm, Black, ea.	Black	1.5 mm	250 $\mu$ m PDMS (Polydimethylsiloxane)	Volatile, 60–275 g/mol (high capacity)*	ea.
28911-3	PAL Smart SPME Arrow 1.5 mm: PDMS, Phase Thickness 250 $\mu$ m, Phase Length 20 mm, Black, 3-pk.	Black	1.5 mm	250 $\mu$ m PDMS (Polydimethylsiloxane)	Volatile, 60–275 g/mol (high capacity)*	3-pk.
28907-1	PAL Smart SPME Arrow 1.50 mm Wide Sleeve: Carbon-WR/PDMS, Phase Thickness 120 $\mu$ m, Phase Length 20 mm, Light Blue, ea.	Light Blue	1.5 mm wide sleeve	120 $\mu$ m Carbon-WR/PDMS (Carbon Wide Range/Polydimethylsiloxane)	Highly volatile, 30–225 g/mol*	ea.
28907-3	PAL Smart SPME Arrow 1.50 mm Wide Sleeve: Carbon-WR/PDMS, Phase Thickness 120 $\mu$ m, Phase Length 20 mm, Light Blue, 3-pk.	Light Blue	1.5 mm wide sleeve	120 $\mu$ m Carbon-WR/PDMS (Carbon Wide Range/Polydimethylsiloxane)	Highly volatile, 30–225 g/mol*	3-pk.
28908-1	PAL Smart SPME Arrow 1.50 mm Wide Sleeve: DVB/Carbon-WR/PDMS, Phase Thickness 120 $\mu$ m, Phase Length 20 mm, Dark Gray, ea.	Dark Gray	1.5 mm wide sleeve	120 $\mu$ m DVB/Carbon-WR/PDMS (Divinylbenzene/Carbon Wide Range/Polydimethylsiloxane)	Volatile and semivolatiles, 40–275 g/mol*	ea.
28908-3	PAL Smart SPME Arrow 1.50 mm Wide Sleeve: DVB/Carbon-WR/PDMS, Phase Thickness 120 $\mu$ m, Phase Length 20 mm, Dark Gray, 3-pk.	Dark Gray	1.5 mm wide sleeve	120 $\mu$ m DVB/Carbon-WR/PDMS (Divinylbenzene/Carbon Wide Range/Polydimethylsiloxane)	Volatile and semivolatiles, 40–275 g/mol*	3-pk.
28909-1	PAL Smart SPME Arrow 1.50 mm Wide Sleeve: DVB/PDMS, Phase Thickness 120 $\mu$ m, Phase Length 20 mm, Violet, ea.	Violet	1.5 mm wide sleeve	120 $\mu$ m DVB/PDMS (Divinylbenzene/Polydimethylsiloxane)	Aromatic semivolatiles, 60–300 g/mol*	ea.
28909-3	PAL Smart SPME Arrow 1.50 mm Wide Sleeve: DVB/PDMS, Phase Thickness 120 $\mu$ m, Phase Length 20 mm, Violet, 3-pk.	Violet	1.5 mm wide sleeve	120 $\mu$ m DVB/PDMS (Divinylbenzene/Polydimethylsiloxane)	Aromatic semivolatiles, 60–300 g/mol*	3-pk.
28910-1	PAL Smart SPME Arrow 1.50 mm Wide Sleeve: PDMS, Phase Thickness 100 $\mu$ m, Phase Length 20 mm, Red, ea.	Red	1.5 mm wide sleeve	100 $\mu$ m PDMS (Polydimethylsiloxane)	Volatile, 60–275 g/mol*	ea.
28910-3	PAL Smart SPME Arrow 1.50 mm Wide Sleeve: PDMS, Phase Thickness 100 $\mu$ m, Phase Length 20 mm, Red, 3-pk.	Red	1.5 mm wide sleeve	100 $\mu$ m PDMS (Polydimethylsiloxane)	Volatile, 60–275 g/mol*	3-pk.

\*These molecular weight ranges are a reasonable approximation; however, end users should verify suitability for their specific application.

## Restek PAL SPME Arrow GC-Specific Conversion Kits

Conversion kits designed for use with 1.1 and 1.5 mm Restek PAL SPME Arrows. Compatible with Smart SPME Arrows and non-smart SPME Arrows.

**Due to the relatively large diameter of Restek PAL SPME Arrows, you must modify the GC inlet using an instrument-specific conversion kit prior to use. Converted inlets are compatible with all standard injection techniques (SPME Arrow, liquid syringe, headspace, etc.); so there is no need to switch inlets after installation.**

Restek PAL SPME Arrow GC-Specific Conversion Kits are easy to install. For the weldment, install according to your instrument's owner's manual.



Description	Includes	Instrument	qty.	cat. #
Restek PAL SPME Arrow Conversion Kit	Topaz 1.8 mm ID straight/SPME inlet liner, 5-pk. (cat.# 23280); Thermolite Plus septa, 3-pk. (cat.# 23864); Split/splitless weldment; large, canister-type filter (cat.# 27502); Septum nut for 6890 split/splitless weldments (cat.# 27503); Injector adaptor cup (cat.# 27496)	for Agilent 6890 Split/Splitless Injector (for canister-type filters)	kit	27492
Restek PAL SPME Arrow Conversion Kit with 1.1 mm Merlin Microseal	Topaz 1.8 mm ID Straight/SPME inlet liner, 5-pk. (cat.# 23280); 1.1 mm Microseal (cat.# 23232); Split/Splitless Weldment; Large Canister Type Filter (cat.# 27502); Adaptor Cup (cat.# 27496); Nut (cat.# 23228)	for Agilent 6890 Split/Splitless Injector (for canister-type filters)	kit	27356
Restek PAL SPME Arrow Conversion Kit with 1.5 mm Merlin Microseal	Topaz 1.8 mm ID Straight/SPME inlet liner, 5-pk. (cat.# 23280); 1.5 mm Microseal (cat.# 23233); Split/Splitless Weldment and Large Canister Type Filter (cat.# 27502); Adaptor Cup (cat.# 27496); Nut (cat.# 23228)	for Agilent 6890 Split/Splitless Injector (for canister-type filters)	kit	27361
Restek PAL SPME Arrow Conversion Kit	Topaz 1.8 mm ID straight/SPME inlet liner, 5-pk. (cat.# 23280); Thermolite Plus septa, 3-pk. (cat.# 23864); Agilent split/splitless weldment and septum nut (cat.# 27504); Injector adaptor cup (cat.# 27496)	for Agilent 7890 Split/Splitless Injector	kit	27493
Restek PAL SPME Arrow Conversion Kit with 1.1 mm Merlin Microseal	Topaz 1.8 mm ID Straight/SPME inlet liner, 5-pk. (cat.# 23280); 1.1 mm Microseal (cat.# 23232); Agilent Weldment (cat.# 27504); Adaptor Cup (cat.# 27496); Nut (cat.# 23228)	for Agilent 7890 Split/Splitless Injector	kit	27357
Restek PAL SPME Arrow Conversion Kit with 1.5 mm Merlin Microseal	Topaz 1.8 mm ID Straight/SPME inlet liner, 5-pk. (cat.# 23280); 1.5 mm Microseal (cat.# 23233); Agilent Weldment (cat.# 27504); Adaptor Cup (cat.# 27496); Nut (cat.# 23228)	for Agilent 7890 Split/Splitless Injector	kit	27362
Restek PAL SPME Arrow Conversion Kit with 1.1 mm Merlin Microseal	Topaz 1.8 mm ID Straight/SPME inlet liner, 5-pk. (cat.# 23280); 1.1 mm Microseal (cat.# 23232); Agilent Weldment (cat.# 28933); Adaptor Cup (cat.# 27496); Nut (cat.# 23228)	for Agilent 8890 Split/Splitless Injector	kit	28934
Restek PAL SPME Arrow Conversion Kit	Topaz 1.8 mm ID straight/SPME inlet liner, 5-pk. (cat.# 23279); Thermolite Plus septa, 3 pk. (cat.# 23872); Injection port weldment (cat.# 27500); Needle guide/septum nut (cat.# 27501); Injector adaptor cup (cat.# 27497)	for Shimadzu GC-2010 Split/Splitless Injector (not compatible with SE or Plus models)	kit	27491
Restek PAL SPME Arrow Conversion Kit with 1.1 mm Merlin Microseal	Topaz 1.8 mm ID Straight/SPME inlet liner, 5-pk. (cat.# 23279); 1.1 mm Microseal (cat.# 23232); Port Weldment (cat.# 27500); Adaptor Cup (cat.# 27497); Adaptor Kit (cat.# 23229)	for Shimadzu GC-2010 Split/Splitless Injector (not compatible with SE or Plus models)	kit	27355
Restek PAL SPME Arrow Conversion Kit with 1.5 mm Merlin Microseal	Topaz 1.8 mm ID Straight/SPME inlet liner, 5-pk. (cat.# 23279); 1.5 mm Microseal (cat.# 23233); Port Weldment (cat.# 27500); Adaptor Cup (cat.# 27497); Adaptor Kit (cat.# 23229)	for Shimadzu GC-2010 Split/Splitless Injector (not compatible with SE or Plus models)	kit	27360
Restek PAL SPME Arrow Conversion Kit	Topaz 1.8 mm ID straight/SPME inlet liner, 5-pk. (cat.# 23279); Thermolite Plus septa, 3 pk. (cat.# 23872); Injection port Shimadzu 2030 GC; Needle guide/septum nut (cat.# 27501); Injector adaptor cup (cat.# 27497)	for Shimadzu GC-2030 Split/Splitless Injector	kit	27886
Restek PAL SPME Arrow Conversion Kit	Topaz 1.8 mm ID straight/SPME inlet liner, 5-pk. (cat.# 23278); Premium non-stick BTO septa, 3-pk. (cat.# 27090); Septum cap (cat.# 27505); Liner cap/septum holder (cat.# 27506); Injector adaptor cup (cat.# 27498)	for Thermo TRACE 1300/1310, 1600/1610 Split/Splitless Injector	kit	27494
Restek PAL SPME Arrow Conversion Kit with 1.1 mm Merlin Microseal	Topaz 1.8 mm ID Straight/SPME inlet liner, 5-pk. (cat.# 23278); 1.1 mm Microseal (cat.# 23232); Liner Cap/Septum Holder (cat.# 27506); Adaptor Cup (cat.# 27498); Nut (cat.# 23230)	for Thermo TRACE 1300/1310, 1600/1610 Split/Splitless Injector	kit	27358
Restek PAL SPME Arrow Conversion Kit with 1.5 mm Merlin Microseal	Topaz 1.8 mm ID Straight/SPME inlet liner, 5-pk. (cat.# 23278); 1.5 mm Microseal (cat.# 23233); Liner Cap/Septum Holder (cat.# 27506); Adaptor Cup (cat.# 27498); Adaptor Kit (cat.# 23230)	for Thermo TRACE 1300/1310, 1600/1610 Split/Splitless Injector	kit	27363
Restek PAL SPME Arrow Conversion Kit	2.0 mm ID straight inlet liner, 5-pk. (cat.# 22267); Premium non-stick BTO septa, 3-pk. (cat.# 27096); Septum holder and support (cat.# 27507); Liner cap (cat.# 27508); Injector adaptor cup (cat.# 27499)	for Thermo TRACE Ultra Split/Splitless Injector	kit	27495
Restek PAL SPME Arrow Conversion Kit with 1.1 mm Merlin Microseal	2.0 mm ID straight inlet liner, 5-pk. (cat.# 22267); 1.1 mm Microseal (cat.# 23232); Liner Cap (cat.# 27508); Adaptor Cup (cat.# 27499); Adaptor Kit (cat.# 23231)	for Thermo TRACE Ultra Split/Splitless Injector	kit	27359
Restek PAL SPME Arrow Conversion Kit with 1.5 mm Merlin Microseal	2.0 mm ID straight inlet liner, 5-pk. (cat.# 22267); 1.5 mm Microseal (cat.# 23233); Liner Cap (cat.# 27508); Adaptor Cup (cat.# 27499); Adaptor Kit (cat.# 23231)	for Thermo TRACE Ultra Split/Splitless Injector	kit	27364



## Restek PAL SPME Manual Injection Kits

Designed to house SPME Arrows (1.1 and 1.5 mm) and SPME fibers during extraction and injection steps. Kits available for non-smart SPME Arrows and Fibers (27490) and Smart SPME Arrows and Fibers (28912).

Description	Includes	qty.	cat.#
PAL Smart SPME Arrow/Fiber Manual Injection Kit	SPME manual holder, SPME manual extraction guide, SPME manual injection guide	kit	28912

Due to the relatively large diameter of Restek PAL SPME Arrows, you must modify the GC inlet using an instrument-specific conversion kit from Restek prior to use.



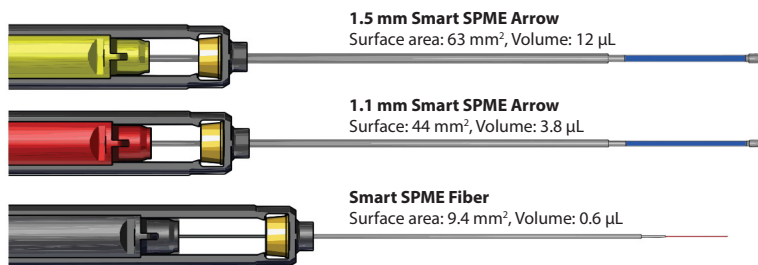
## Accessories for SPME Arrows

Description	Instrument	qty.	cat.#
Injector adaptor cup	for Agilent GC 6890/7890/8890 Split/Splitless Injector	ea.	27496
	for Shimadzu GC 2010 and GC 2030 Split/Splitless Injector	ea.	27497
	for Thermo GC TRACE 1300/1310, 1600/1610 Split/Splitless Injector	ea.	27498
Injection port weldment	for Thermo GC TRACE Ultra Split/Splitless Injector	ea.	27499
	for Shimadzu GC 2010 Split/Splitless Injector	ea.	27500
Needle guide/septum nut	for Shimadzu GC 2030 Split/Splitless Injector	ea.	27893
	for Shimadzu GC 2010 Split/Splitless Injector	ea.	27501
Split/splitless weldment; large, canister-type filter	for Agilent GC 6890 Split/Splitless Injector	ea.	27502
Septum nut for split/splitless weldments	for Agilent GC 6890/7890 Split/Splitless Injector	ea.	27503
Split/splitless weldment and septum nut	for Agilent GC 7890 Split/Splitless Injector	ea.	27504
	for Agilent 8890 Split/Splitless Injector	ea.	28933
Septum cap	for Thermo GC TRACE 1300/1310, 1600/1610 Split/Splitless Injector	ea.	27505
Liner cap/septum holder	for Thermo GC TRACE 1300/1310, 1600/1610 Split/Splitless Injector	ea.	27506
Septum holder and support	for Thermo GC TRACE Ultra Split/Splitless Injector	ea.	27507
Liner cap	for Thermo GC TRACE Ultra Split/Splitless Injector	ea.	27508



## More phase volume and robust construction mean Restek PAL SPME Arrows outperform traditional fibers.

- Rugged, stainless-steel construction ensures longer lifetimes.
- Faster extraction increases productivity.
- Better sensitivity for lower LODs.



## GC Inlet Liners for SPME



### Topaz 0.75 mm ID Straight/SPME Inlet Liner

for Bruker/Varian GCs w/1078/1079 Inlets

Geometry	Deactivation	Material	ID x OD x Length	qty	cat.#
Straight/SPME	Premium	Borosilicate Glass	0.75 mm x 5.0 mm x 54 mm	5-pk.	23465



### Topaz 0.75 mm ID Straight/SPME Inlet Liner

for PerkinElmer Clarus 590/690 GCs

Geometry	Deactivation	Material	ID x OD x Length	qty	cat.#
Straight/SPME	Premium	Borosilicate Glass	0.75 mm x 6.35 mm x 78.5 mm	5-pk.	23803



### Topaz 0.75 mm ID Straight/SPME Inlet Liner

for Agilent GCs

Geometry	Deactivation	Material	ID x OD x Length	qty	cat.#
Straight/SPME	Premium	Borosilicate Glass	0.75 mm x 6.35 mm x 78.5 mm	5-pk.	23434



### Topaz 1.8 mm ID Straight/SPME Inlet Liner

for Shimadzu GCs 17A, 2010, 2014, and 2030 GCs

Geometry	Deactivation	Material	ID x OD x Length	qty	cat.#
Straight/SPME	Premium	Borosilicate Glass	1.8 mm x 5.0 mm x 95 mm	5-pk.	23279



### Topaz 1.8 mm ID Straight/SPME Inlet Liner

for Agilent GCs

Geometry	Deactivation	Material	ID x OD x Length	qty	cat.#
Straight/SPME	Premium	Borosilicate Glass	1.8 mm x 6.5 mm x 78.5 mm	5-pk.	23280



### Topaz 1.8 mm ID Straight/SPME Inlet Liner

for Thermo TRACE 1300/1310, 1600/1610 GCs w/SSL Inlets

Geometry	Deactivation	Material	ID x OD x Length	qty	cat.#
Straight/SPME	Premium	Borosilicate Glass	1.8 mm x 6.5 mm x 78.5 mm	5-pk.	23278

More GC inlet liners for SPME are available at [www.restek.com](http://www.restek.com)



### SPME Performance Test Mix

(2 components)

- Essential mix for establishing the performance of SPME fibers and SPME Arrows.
- Verified composition and stability.

Nitrobenzene (98-95-3)

2-Nitrotoluene (88-72-2)

Conc. in Solvent	CRM?	Min Shelf Life on Ship Date	Max Shelf Life on Ship Date	Shipping Conditions	Storage Temperature	qty.	cat.#
<b>SPME Performance Test Mix</b>							
1 µg/mL in water:methanol (99:1), 1 mL/ampul	Yes	6 months	36 months	Ambient	10 °C or colder	3-pk.	31015

# SPME Vials, Caps, and Septa

## Magnetic Screw-Thread Caps, 18 mm

Description	Type	Cap Size	Septa Material	qty.	cat.#
Magnetic Caps and Septa for SPME	Screw-Thread	18-425	Blue PTFE/Silicone, 1.5 mm thick	100-pk.	23090
	Screw-Thread	18-425	Blue PTFE/Silicone, 1.5 mm thick	1000-pk.	23091
	Screw-Thread	18-425	Red PTFE/Silicone, 1.9 mm thick	100-pk.	23092
Magnetic Caps and Septa	Screw-Thread	18-425	Red PTFE/Silicone, 1.9 mm thick	1000-pk.	23093
	Screw-Thread	18-425	PTFE/Red Chlorobutyl	100-pk.	23094
	Screw-Thread	18-425	PTFE/Red Chlorobutyl	1000-pk.	23095



23091

## SPME MicroCenter Caps and Septa

Description	Type	Cap Size	Color	Septa Material	qty.	cat.#
SPME Vial Cap	Screw-Thread	18-425		MicroCenter PTFE/Silicone, 0.040" (+/-0.005")	100-pk.	23852
	Screw-Thread	18-425		MicroCenter PTFE/Silicone, 0.040" (+/-0.005")	1000-pk.	23853
	Bi-Metal Crimp	20 mm	Blue	MicroCenter PTFE/Silicone, 0.065" (+/-0.005")	100-pk.	23854
	Bi-Metal Crimp	20 mm	Blue	MicroCenter PTFE/Silicone, 0.065" (+/-0.005")	1000-pk.	23855
	Bi-Metal Crimp	20 mm	Red	MicroCenter PTFE/Silicone, 0.065" (+/-0.005")	100-pk.	23856
	Bi-Metal Crimp	20 mm	Red	MicroCenter PTFE/Silicone, 0.065" (+/-0.005")	1000-pk.	23857
	Steel Crimp	20 mm	Gold	MicroCenter PTFE/Silicone, 0.065" (+/-0.005")	100-pk.	23858
	Steel Crimp	20 mm	Gold	MicroCenter PTFE/Silicone, 0.065" (+/-0.005")	1000-pk.	23859
SPME Vial Septa, 18 mm				MicroCenter PTFE/Silicone, 0.040" (+/-0.005")	100-pk.	23850
				MicroCenter PTFE/Silicone, 0.040" (+/-0.005")	1000-pk.	23851



23852



23854

Cat.# 23850 and 23851 not for use with 20 mm caps.

## Headspace Crimp Vials, 20 mm

Description	Modification	Type	Volume	Color	Deactivation	Size	qty.	cat.#
Headspace Vial Flat Bottom	Flat Bottom	20 mm Crimp-Top	6 mL	Clear		22 x 38 mm	100-pk.	21166
	Flat Bottom	20 mm Crimp-Top	6 mL	Clear		22 x 38 mm	1000-pk.	21167
	Flat Bottom	20 mm Crimp-Top	10 mL	Clear		23 x 46 mm	100-pk.	24683
	Flat Bottom	20 mm Crimp-Top	10 mL	Clear		23 x 46 mm	1000-pk.	24684
Headspace Vial Rounded Bottom	Rounded Bottom	20 mm Crimp-Top	10 mL	Clear		23 x 46 mm	100-pk.	21164
	Rounded Bottom	20 mm Crimp-Top	10 mL	Clear		23 x 46 mm	1000-pk.	21165
	Rounded Bottom	20 mm Crimp-Top	10 mL	Clear	Deactivated	23 x 46 mm	1000-pk.	21165-221
Headspace Vial Flat Bottom	Flat Bottom	20 mm Crimp-Top	20 mL	Clear		23 x 75 mm	100-pk.	24685
	Flat Bottom	20 mm Crimp-Top	20 mL	Clear		23 x 75 mm	1000-pk.	24686
Headspace Vial Rounded Bottom	Rounded Bottom	20 mm Crimp-Top	20 mL	Clear		23 x 75 mm	100-pk.	21162
	Rounded Bottom	20 mm Crimp-Top	20 mL	Clear		23 x 75 mm	1000-pk.	21163
Headspace Vial Flat Bottom	Flat Bottom	20 mm Crimp-Top	27 mL	Clear		30 x 60 mm	100-pk.	21160
	Flat Bottom	20 mm Crimp-Top	27 mL	Clear		30 x 60 mm	1000-pk.	21161



21166

Vial-to-instrument compatibility is designated in Instrument Reference Chart for Headspace Vials at [www.restek.com](http://www.restek.com).

## Headspace Screw-Thread Vials, 18 mm

Description	Modification	Type	Volume	Color	Size	qty.	cat.#
Headspace Vial Rounded Bottom	Rounded Bottom	18-425 Screw-Thread	20 mL	Clear	22 x 75 mm	100-pk.	23082
	Rounded Bottom	18-425 Screw-Thread	20 mL	Clear	22 x 75 mm	1000-pk.	23083
	Rounded Bottom	18-425 Screw-Thread	20 mL	Amber	22 x 75 mm	100-pk.	23086
	Rounded Bottom	18-425 Screw-Thread	20 mL	Amber	22 x 75 mm	1000-pk.	23087
	Rounded Bottom	18-425 Screw-Thread	10 mL	Clear	22 x 45 mm	100-pk.	23084
	Rounded Bottom	18-425 Screw-Thread	10 mL	Clear	22 x 45 mm	1000-pk.	23085
	Rounded Bottom	18-425 Screw-Thread	10 mL	Amber	22 x 45 mm	100-pk.	23088
	Rounded Bottom	18-425 Screw-Thread	10 mL	Amber	22 x 45 mm	1000-pk.	23089

Caps not included (sold separately).

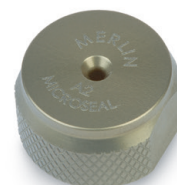


23082

## Merlin Microseals for SPME Arrow

### Merlin Microseal Nut for SPME Arrow for Agilent GCs

Description	Includes	Instrument	Type	Vendor cat.#	qty.	cat.#
Merlin Microseal Nut for SPME Arrow	nut (1)	Agilent	SPME Arrow Application Nut (3 to 100 psi)	1000AG	ea.	23228



23228

### Merlin Microseal Adaptor Kit for SPME Arrow for Shimadzu 2010, 2025, and 2030 GCs

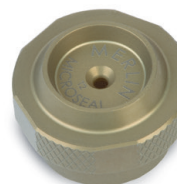
Description	Includes	Instrument	Type	Vendor cat.#	qty.	cat.#
Merlin Microseal Adaptor Kit for SPME Arrow	nut (1); adaptor (1); O-rings (4)	Shimadzu 2010, 2025, and 2030	SPME Arrow Application Adaptor Kit (3 to 100 psi)	1000SH	kit	23229



23229

### Merlin Microseal Nut for SPME Arrow for Thermo TRACE 1300/1310, 1600/1610 GCs

Description	Includes	Instrument	Type	Vendor cat.#	qty.	cat.#
Merlin Microseal Nut for SPME Arrow	nut (1)	TRACE 1300/1310 TRACE 1600/1610	SPME Arrow Application Nut (3 to 100 psi)	1000TS	ea.	23230



23230

### Merlin Microseal Adaptor Kit for SPME Arrow for Thermo TRACE Ultra GCs

Description	Includes	Instrument	Type	Vendor cat.#	qty.	cat.#
Merlin Microseal Adaptor Kit for SPME Arrow	nut (1); adaptors (3); O-rings (4)	Thermo TRACE Ultra	SPME Arrow Application Adaptor Kit (3 to 100 psi)	1000TU	kit	23231



23231

### Merlin Microseal Replacement Septa

Description	Type	Vendor cat.#	qty.	cat.#
Replacement Microseal	General-Purpose Microseal (most applications, 3 to 100 psi)	410	ea.	22812
	Low-Pressure Microseal (1 to 45 psi)	310	ea.	22815
	Microseal for Traditional SPME Fiber Applications (3 to 100 psi)	21-01	ea.	22782
	Microseal for 1.1 mm SPME Arrow Applications (3 to 100 psi)	1100	ea.	23232
	Microseal for 1.5 mm SPME Arrow Applications (3 to 100 psi)	1500	ea.	23233
	Microseal for 26 gauge or 23/26 gauge tapered needles (5 to 100 psi)	610	ea.	22264



22812

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