PAL SYSTEM
Ingenious sample handling

User Guidelines für PAL Smart SPME Fibers

- Set the PAL Gas Input pressure to 2bar when using Conditioning Module(s). This enables to reach a conditioning gas flow above 15mL/min.
- Do not extend conditioning times longer than necessary.
- The lifetime of SPME phase will decrease if exposed to maximum temperature for longer periods.
- Operating Temperatures include Conditioning and Desorption Temperatures in the Injector.
- Conditioning times can be applied for Pre- and Post-Conditioning.
- For liquid immersion extractions, a liquid wash step may help to reduce carryover.
- Thermal stress shortens the lifetime of the SPME Fibers. Depending on your application, choose the lowest necessary temperature, not the highest possible.
- Injector penetration depth is recommended to set close to maximum possible depth of the GC Injector.
- Injector septa change is recommended after 300 SPME Injections
- Early leakage of septa may occur if injector nuts are not tight enough or overtightened.
- Injectors may have a temperature gradient that can differ from the actual temperature. Therefore, the optimal Injection Depth may vary depending on the Injector Type.

No.	Stationary Phase	Color Code	Set of 1 Smart Fiber Description PNo.	Set of 3 Smart Fibers Description PNo.	Set of 5 Smart Fibers Description PNo.
	PDMS Smart SPME Fiber (Polydimethylsiloxane)				
1	7 µm	Green	SFIB-P-7/10-P1	SFIB-P-7/10-P3	SFIB-P-7/10-P5
2	30 µm	Golden	SFIB-P-30/10-P1	SFIB-P-30/10-P3	SFIB-P-30/10-P5
3	100 µm	Red	SFIB-P-100/10-P1	SFIB-P-100/10-P3	SFIB-P-100/10-P5
	Polyacrylate Smart SPME Fiber				
4	85 µm	Gray	SFIB-A-85/10-P1	SFIB-A-85/10-P3	SFIB-A-85/10-P5
	Carbon WR / PDMS SPME Smart Fiber (Carbon Wide Range / Polydimethylsiloxane)				
5	95 µm	Dark Blue	SFIB-C-WR-95/10-P1	SFIB-C-WR-95/10-P3	SFIB-C-WR-95/10-P5
	DVB / PDMS Smart SPME Fiber (Divinylbenzene / Polydimethylsiloxane)				
6	65 µm	Violet	SFIB-DVB-65/10-P1	SFIB-DVB-65/10-P3	SFIB-DVB-65/10-P5
	DVB /PDMS/ Carbon WR Smart SPME Fiber (Divinylbenzene / Polydimethylsiloxane / Carbon Wide Range)				
7	80 µm (50 µm / 30 µm)	Dark-Gray	SFIB-DVB/C-WR-80/10-P1	SFIB-DVB/C-WR-80/10-P3	SFIB-DVB/C-WR-80/10-P5
Smart Fiber Selections for method development (set of 5 different Smart SPME fiber types)					
Fiber Selection of Smart SPME Fiber No. 1, 2, 3, 4 and 5					SFIB-SEL5-S1
Fiber Selection of Smart SPME Fiber No. 3, 4, 5, 6 and 7					SFIB-SEL5-S2

Table 1. PAL Smart SPME Fiber Order Information.

All PAL Smart SPME Fibers have a standard length of 10 mm and the core material is Fused Silica.
PAL Smart SPME Fibers can be used for a wide range of GC and injector models.
PAL Smart SPME Fiber assortment and the range of applications will be constantly expanded and developed.
In order to receive first-hand information, register directly under the web page www.palsystem.com.

General Information for PAL Smart SPME Fiber

Note:

This data sheet contains important notes for the operator. It is highly recommended for operators to become familiarized with the product prior to use.

- PAL3 Firmware 3.1 or higher is required for the use of Smart SPME Fibers with the complete scope of functions.
- The use of the SPME Arrow or SPME Fiber Conditioning Module and the Agitator together with the Smart SPME Fibers is essential.
- The color code, as provided in table 1 reflects the type of the coating in combination with its thickness.

PDMS - 7 µm

PDMS - 30 µm

PDMS - 100 µm

Acrylate - 85 µm

Carbon WR - 95 µm

DVB / PDMS - 65 µm

DVB /PDMS/ Carbon WR - 80 µm (50 µm / 30 µm)

No.	Stationary Phase Fiber Type	Maximum Temperature (°C)	Recommended Operating Temperature (°C)	Preconditioning Temperature (°C) Min | Max	Preconditioning Time (min.) Min | Max | Recom.	Conditioning Temperature (°C) Min | Max	Conditioning Time (min.) Min | Max | Recom.	Fiber Rinsing Solvent	Fiber Rinsing Time (min.) Min | Max |Recom.
	PDMS Smart SPME Fiber								
1	7 µm	340	200 - 340	200 | 340	15 | 120 | 30	200 | 340	1 | 60 | 5	MeOH | EtOH | iProp	0.5 | 10 | 2
2	30 µm	280	200 - 280	180 | 280	15 | 120 | 30	180 | 280	1 | 60 | 5	MeOH | EtOH | iProp	0.5 | 10 | 2
3	100 µm	280	200 - 280	180 | 280	15 | 120 | 30	180 | 280	1 | 60 | 5	MeOH | EtOH | iProp	0.5 | 10 | 2
	Polyacrylate Smart SPME Fiber								
4	85 µm	280	200 - 250	180 | 280	15 | 120 | 30	180 | 280	1 | 30 | 5	MeOH | aliphatic HC	0.5 | 2 | 1
	Carbon WR / PDMS Smart SPME Fiber								
5	95 µm	300	220 - 300	200 | 300	15 | 120 | 60	200 | 300	1 | 60 | 10	MeOH | EtOH | iProp	0.5 | 10 | 2
	DVB / PDMS Smart SPME Fiber								
6	65 µm	300	220 - 300	200 | 300	15 | 120 | 60	180 | 280	1 | 60 | 10	MeOH | EtOH | iProp	0.5 | 10 | 2
	DVB / Carbon WR / PDMS Smart SPME Fiber								
7	80 µm (50 µm / 30 µm)	300	220 - 300	200 | 300	15 | 120 | 60	180 | 280	1 | 60 | 10	MeOH | EtOH | iProp	0.5 | 10 | 2

MeOH = Methanol EtOH = Ethanol iProp = Iso-Propanol (2-Propanol) aliphatic HC = aliphatic hydrocarbons (e.g. n-Hexane)

Table 2. Operational Parameters for PAL Smart SPME Fibers.

PAL System certified Vials and Caps are recommended for SPME Applications:

Vial-20-DC20-CG-100	PAL System Vial 20CV, 20 mL clear glass for headspace. 75.5 x 22.5 mm, 1st class hydrolytic glass, DIN-crimp neck, Pk of 1000 pcs
Cap-DC20-St-SP15-100	PAL System Crimp Cap for Headspace, SPME Fiber and SPME Arrow. 20 mm with 8 mm center hole, silicone / PTFE septa 3.0 mm with thinned center 1.5 mm. Pk of 100 pcs

PAL Smart SPME Fiber Conditioning and Cleaning

Caution:

Without gas protection the fiber surface will be damaged, if exposed to elevated temperatures.

Fiber Preconditioning

Prior to analytical use, it is mandatory to precondition each fiber at a specified temperature in an inert gas phase environment. The life span of the fiber can be extended if the fiber is not unnecessarily preconditioned at maximum temperature.

Generally, it is recommended to precondition the fiber 20°C above the planned operating temperature, but not above the maximum allowed temperature of the specific Smart SPME Fiber. Recommended temperatures and conditioning times are givenin Table 2.

Fiber Conditioning

It is part of the analytical process to condition the fiber after thermal desorption of the analytes has been completed. This conditioning is a preparatory step for the next analytical run.
It is necessary to eliminate all possible contaminants from the fiber which have not been desorbed and transferred to the GC column.

To avoid contamination of the GC inlet system and/or the GC column, it is recommended to remove the fiber after the thermal desorption step from the GC injector and move the SPME Tool to a SPME Conditioning Module for the conditioning step.

The large surface of the fiber can trap impurities from the ambient atmosphere if a fiber has been left in the open. Considering this, it is good recommended practice to run a blank prior to running a series of analytical samples. Evaluating the baseline level of the GC detector helps to ensure that the entire system, such as the fiber, the GC inlet, the GC column, and detector, is free from any contaminants.

Rinsing of Fibers

It is possible to clean the fiber using an organic solvent, should the fiber be subject to inappropriate storage, e.g keeping the fiber in the open at ambient environment without protection for a prolonged period, or if obvious dust particles are sticking to the fiber. The recommended types of solvents are listed in Table 2. Do not use any other solvents than those mentioned here.

Other solvents can cause a swelling of the fiber which would lead to significant damage. It is important that a fiber is not cleaned mechanically by any means; do not touch the fiber with fingers, not even when wearing gloves. The cleaning process can be done manually by dipping the fiber into a container filled with the appropriate solvent or in an automated manner by defining a vial for cleaning.

To avoid a potential misunderstanding, do not use a wash or waste solvent of the Wash Module from the PAL System. This solvent can be contaminated or the solvent in use may not be suitable for the particular fiber type.

General Remarks for Fiber Conditioning and Cleaning

Table 2 summarizes the various parameters for conditioning and cleaning. The values provided are empirical values which are suitable for a number of applications and give reliable results.

Typical Lifetime

The life span of a fiber depends to a great degree on the field and type of application. Using the SPME technique, by inserting the fiber into a liquid with a high degree of matrix, the number
of analyses can vary from a few to approximately 100 analyses. If the fiber is positioned in the headspace of a vial and avoids any contact with liquid and matrix, it is typically possible to run several hundred extractions. The table below gives an average value for each of the two possible uses of the Smart SPME Fibers, in order to be able to estimate the lifetime.

Technique	Immersion	Headspace
Number of analyses	50	500

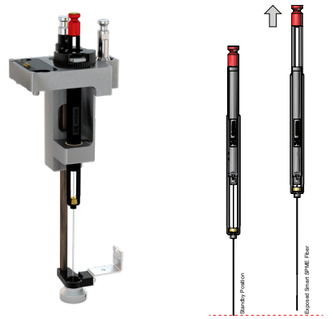
It is not possible to visually judge the fiber quality if there are no obvious signs of major mechanical damage, such as a fiber fracture.

Any sign of staining, caused by a starting vitrification of the surface in case of a PDMS fiber, or signs of a yellowish discoloration in the case of a Polyacrylate fiber, does not give any indication on the remaining life span of the particular fiber.

As a rule of thumb, the life span of a fiber can be extended if its exposure to high temperatures is minimized. Do not exceed the maximum temperature for each fiber type as shown in Table 2.

Prerequisites
Mandatory Tool and Modules for the use of Smart SPME Fibers

The PAL Smart SPME Fibers are compatible with the following Tool and Modules:



SPME Fiber Tool

The SPME Fiber Tool and the Smart SPME Fiber collection can be used with the PAL3 System models PAL RTC and PAL RSI or with the corresponding products and models distributed under different names by OEM partners. For the PAL3 System, the Smart SPME Fibers allow a maximum needle penetration depth of 70 mm.
Note: This tool can not be used with Smart SPME Arrows and is not compatible with previous PAL and PAL-xt Systems.

Agitator

An Agitator has to be part of the PAL System configuration. This allows performing the analysis temperature control; agitation also allows speeding up of the equilibration process.

SPME Arrow Conditioning Module

The SPME Arrow Conditioning Module can be used for Smart SPME Arrows as well as for Smart SPME Fibers. It offers the functionality to clean (bake-out) the inserted Smart SPME Fiber in an inert gas phase after the analytical process to prepare it for the next analysis. This module is strongly recommended since it will help to protect the GC injection port from contamination and free up the port after thermal desorption.

Comparison between Smart SPME Fiber and Smart SPME Arrow 1.1 mm and 1.5 mm

The SPME Arrow Conditioning Module offers the conditioning of Smart SPME fibers and Smart SPME Arrows. SPME Arrow is the enhanced version of SPME, offering higher robustness, larger surface and larger volume of the stationary phases. A comparison between a Smart Fiber and two Smart Arrows in with different diameters is shown in the picture below.

Smart SPME Arrow 1.5 mm

Smart SPME Arrow 1.1 mm

Smart SPME Fiber

Find more at: **www.palsystem.com/consumables**
In order to receive first-hand information, register directly under the web page www.palsystem.com