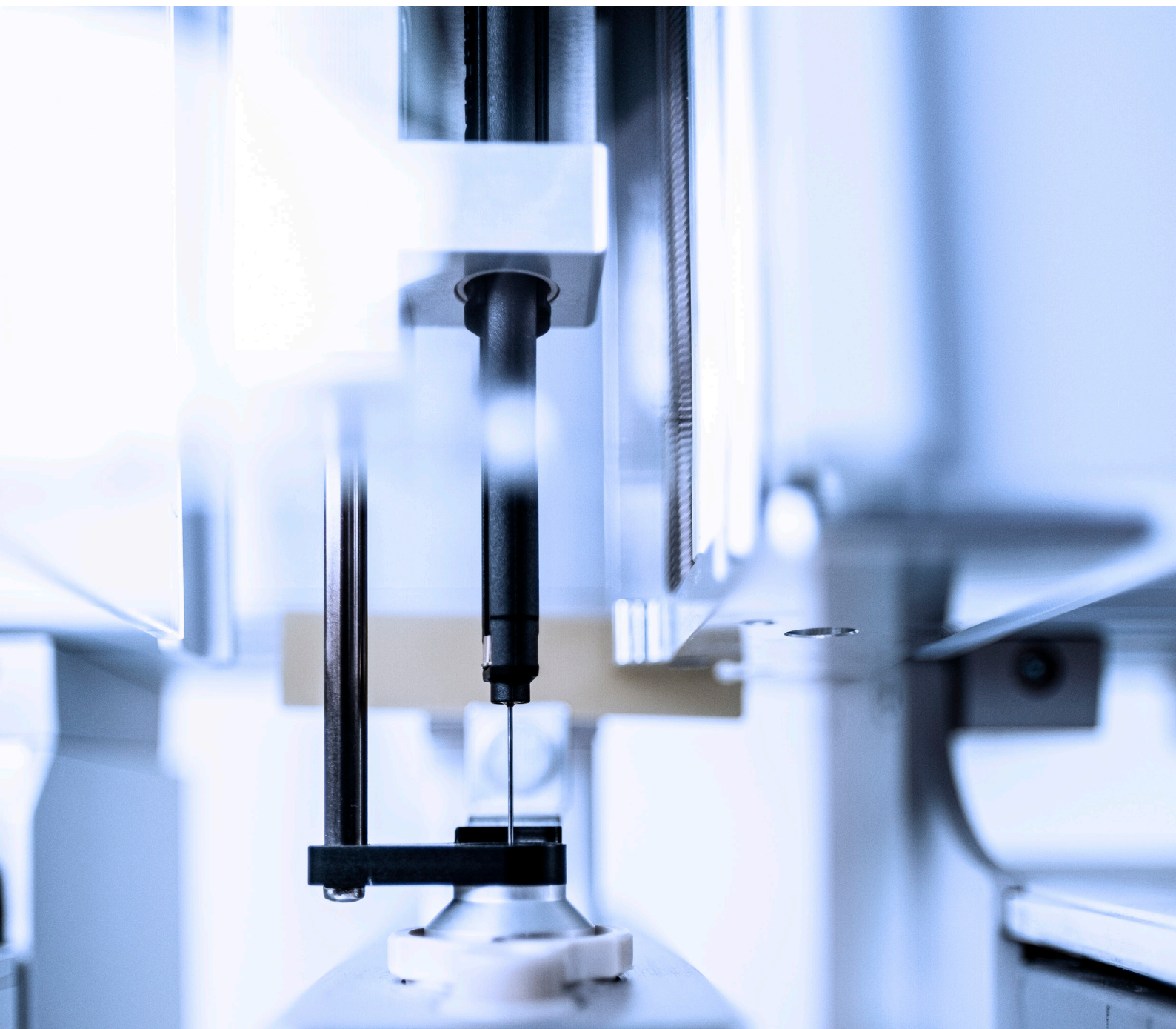


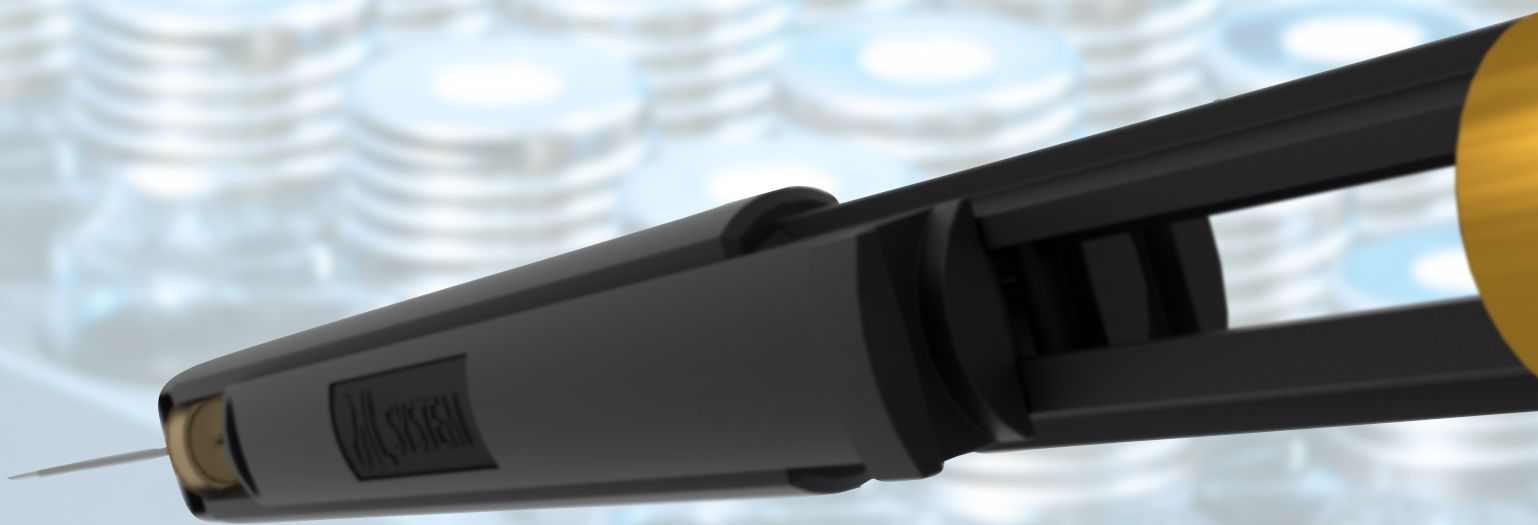
PAL Smart SPME Fibers Optimized for Automation



PAL3 Smart SPME Fibers

Excellent extraction properties combined with smart handling and operational safety

Full traceability



- Each SPME Fiber is equipped with its unique Smart chip containing parameters, ranges and usage history.
- Automatic application of the correct parameters for the individual Smart SPME Fibers.
- Color coded for easy identification of coating type and thickness.



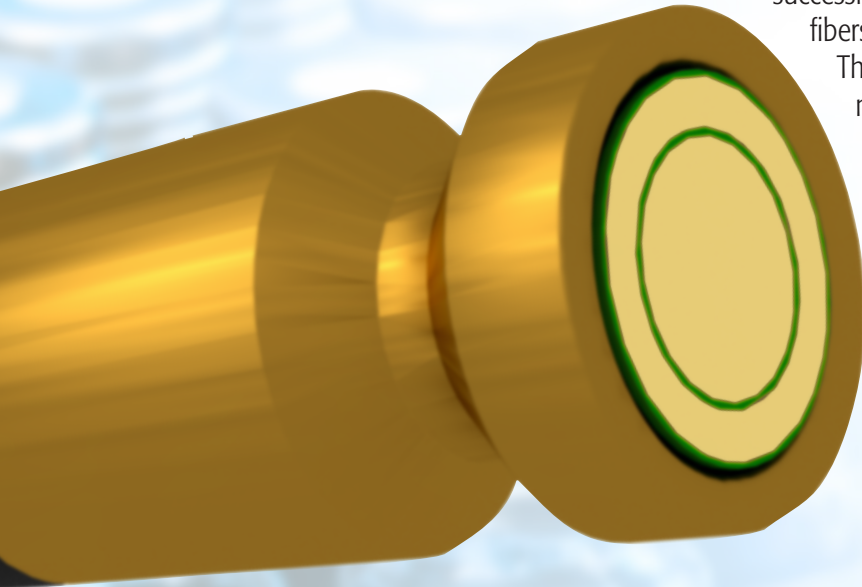
<https://www.palsystem.com/index.php?id=819>

PAL3 Smart SPME Fiber

Since its introduction by Pawliszyn et al. (ref. 1) Solid Phase Micro Extraction (SPME) has seen a tremendous development. SPME is a very effective way of automated sample preparation. It is used for extracting organics from a matrix (solid, liquid or gaseous) into a stationary phase immobilized on a fiber. The analytes are thermally desorbed directly in the injector of a gas chromatograph.

PAL SPME Fibers have been developed and optimized for the most successful SPME sampler, the PAL System Autosampler. The fibers are offered with different coatings and film thicknesses. Their excellent extraction properties have been proven for many important applications.

Reference⁰¹: Detection of substituted benzenes in water at the pg/ml level using solid-phase microextraction and gas chromatography-ion trap mass spectrometry. Potter DW, Pawliszyn J., J Chromatogr. 1992 Nov 20;625(2):247-55.



PDMS Fiber, 7 μm



PDMS Fiber, 30 μm



PDMS Fiber, 100 μm



Acrylate Fiber, 85 μm



Carbon WR Fiber / PDMS, 95 μm



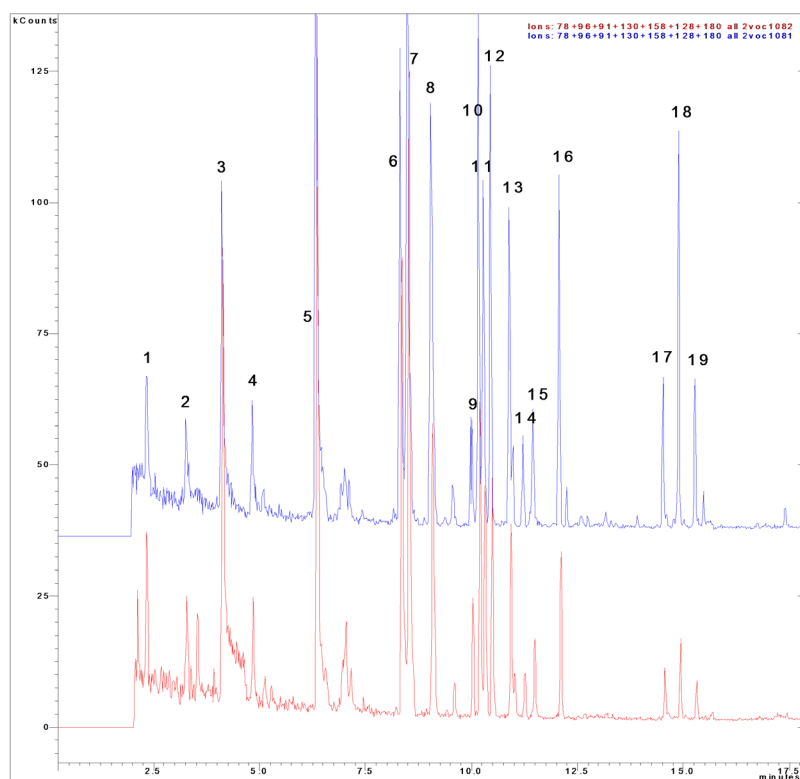
DVB / PDMS, 65 μm



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

Comparison of PAL Smart SPME Fibers with established Fibers

The new PAL SPME Fibers (PDMS fibers 7 µm, 30 µm, and 100 µm and the polyacrylate fiber) yield identical results when compared with the corresponding commercial fibers. For medium and high boiling compounds the PAL SPME Carbon WR Fiber in certain cases shows an even better performance than the established fibers.



- 1,1-Dichloroethene
- cis-1,2-Dichloroethene
- Benzene
- Trichloroethylene
- Toluene
- Ethylbenzene
- m-,p- Xylene
- o-Xylene
- Bromobenzene
- 2-Chlorotoluene
- 1,3,5-Trimethylbenzene
- 4 Chlorotoluene
- tert-Butylbenzene
- 1,2,4-Trimethylbenzene
- sec-Butylbenzene
- n-Butylbenzene
- 1,2,4-Trichlorobenzene
- Naphthalene
- 1,2,3-Trichlorobenzene

Fig. 1: Comparison of fibers for the analysis of VOCs: PAL SPME Carbon WR Fiber 95 µm (blue) and Brand X Carboxen® fiber (red).

Choose the right Fiber for your Analytes

Typical applications for the SPME technique are:

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

The type of the fiber corresponds to the polarity and the molecular weight of the analytes:

- For nonpolar samples a PDMS coated fiber should be chosen.
- For low molecular weights or volatile compounds a 100 µm PDMS-coated fiber is usually the best choice.
- Larger molecular weights or semi-volatile compounds are more effectively extracted using a 30 µm, or 7 µm PDMS-coated fiber.

- For an effective extraction of analytes with a very high polarity from polar samples, the 85 µm polyacrylate-coated fiber is the best alternative.
- For trace-level volatiles analysis, use the 95 µm Carbon WR (Carbon Wide Range / PDMS) coated fiber.

Note: The 100 µm and 30 µm PDMS-coated fibers cannot be used with hexane.

A SPME Tool together with a corresponding holder for the SPME Fibers is available for the PAL RSI and PAL RTC as well as for the PAL and PAL-*xt* System models dedicated for SPME technique such as Combi PAL or PAL COMBI-*xt*. The main features of the SPME Tools are:

- Easy fiber exchange by hand
- Maximum fiber protection
- Compatible with a variety of different SPME fibers 10 mm or 20 mm fiber length supported

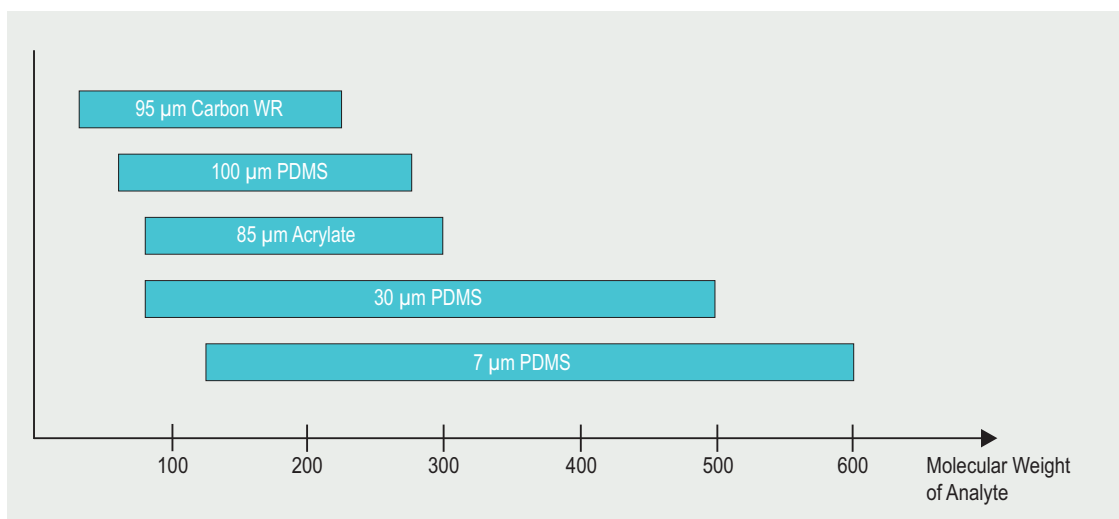


Fig. 2: Correlation between molecular weight of the analyte and the fiber type

Type of Analyte	Molecular Weight	Recommended Fiber
Non-polar high molecular weight compounds	125 - 600	7 μm PDMS (Polydimethylsiloxane)
Non-polar semi-volatiles	80 - 500	30 μm PDMS (Polydimethylsiloxane)
Polar semi-volatiles	80 - 300	85 μm PA (Polyacrylate)
Volatiles	60 - 275	100 μm PDMS (Polydimethylsiloxane)
Gases and low molecular weight compounds	30 - 225	95 μm Carbon WR /PDMS (Carbon Wide Range / Polydimethylsiloxane)

Table 3: Which fiber for which type of analyte?

PAL Smart SPME Fiber Order Information

The PAL Smart SPME Fibers are available in order quantities of one, three or five fibers per box. For method development, a set of each fiber type (set of five) is available.

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	Grey	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)	Black	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.

PAL SPME Accessories




To use the SPME technique with a PAL System a dedicated kit is required. Detailed information about the various kits can be obtained from CTC Analytics or directly from the web page www.palsystem.com.

An Agitator is highly recommended for temperature controlled extractions. Furthermore the agitation speeds up the equilibration process.

A second optional module is the SPME Fiber Conditioning Station (PAL and PAL-xt Systems) or the SPME Fiber Conditioning Module for the PAL3 System. The conditioning station has two functions. The first function is the cleaning (bake-out) of the inserted fiber after the analytical process to prepare for the next analysis. The second function is to condition a new fiber in an inert gas atmosphere. 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.

PAL RTC / PAL RSI

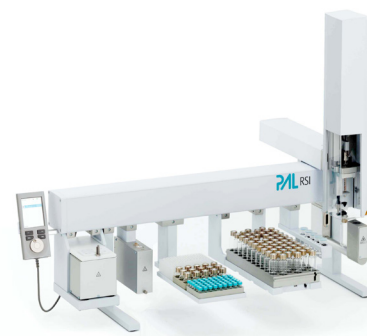
The robotic tool change exclusively available with the PAL RTC allows for the automatic exchange of fibers, e.g. for the automated development of SPME methods.

<p>Smart SPME Kit</p> <p>PNo.: PAL3-SPME-SFib-Kit</p>	 A vertical robotic tool with a black handle and a silver base, used for fiber exchange.	<p>Kit containing</p> <ul style="list-style-type: none">- SPME Tool- Smart SPME Fiber Collection (one of each type)- SPME Performance Evaluation Mix
<p>SPME Arrow Conditioning Module</p> <p>PNo.: PAL3-SPME-ArrowCond</p>	 A rectangular module with a silver front panel and a black top section, used for conditioning fibers.	<ul style="list-style-type: none">- For the conditioning of Smart SPME fibers and Smart SPME Arrows prior to sample collection- Temperature range up to 350°C- Purge gas connection for more efficiency
<p>Agitator Module</p> <p>PNo.: PAL3-Agitator</p>	 A rectangular module with a silver front panel and a black top section, used for incubation and agitation of samples.	<p>The Agitator Module provides 6 positions for 20 mL vials for incubation and agitation of samples.</p> <ul style="list-style-type: none">- Temperature range 40 – 200 °C- Agitation speed 250 – 750 rpm- Optional adapters for 2 mL or 10 mL vials

Note: For details about the technical specifications of the modules/kit for the PAL-*xt* please contact your CTC Analytics representative or visit our web page www.palsystem.com.

PAL SYSTEM

Ingenious sample handling



Distributed by:

For more information on the PAL System visit:

www.palsystem.com



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