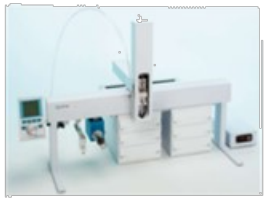
PAL3 Generation 2014

PAL3 Product portfolio

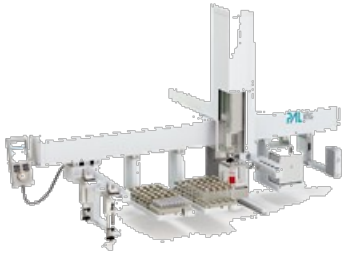
PAL HTX-*xt*



PAL HTS-*xt*

PAL HTC-*xt*

PAL COMBI-*xt*



PAL RTC

Robotic Tool Change
for sample preparation included in LCMS or GCMS frontend

PAL RSI

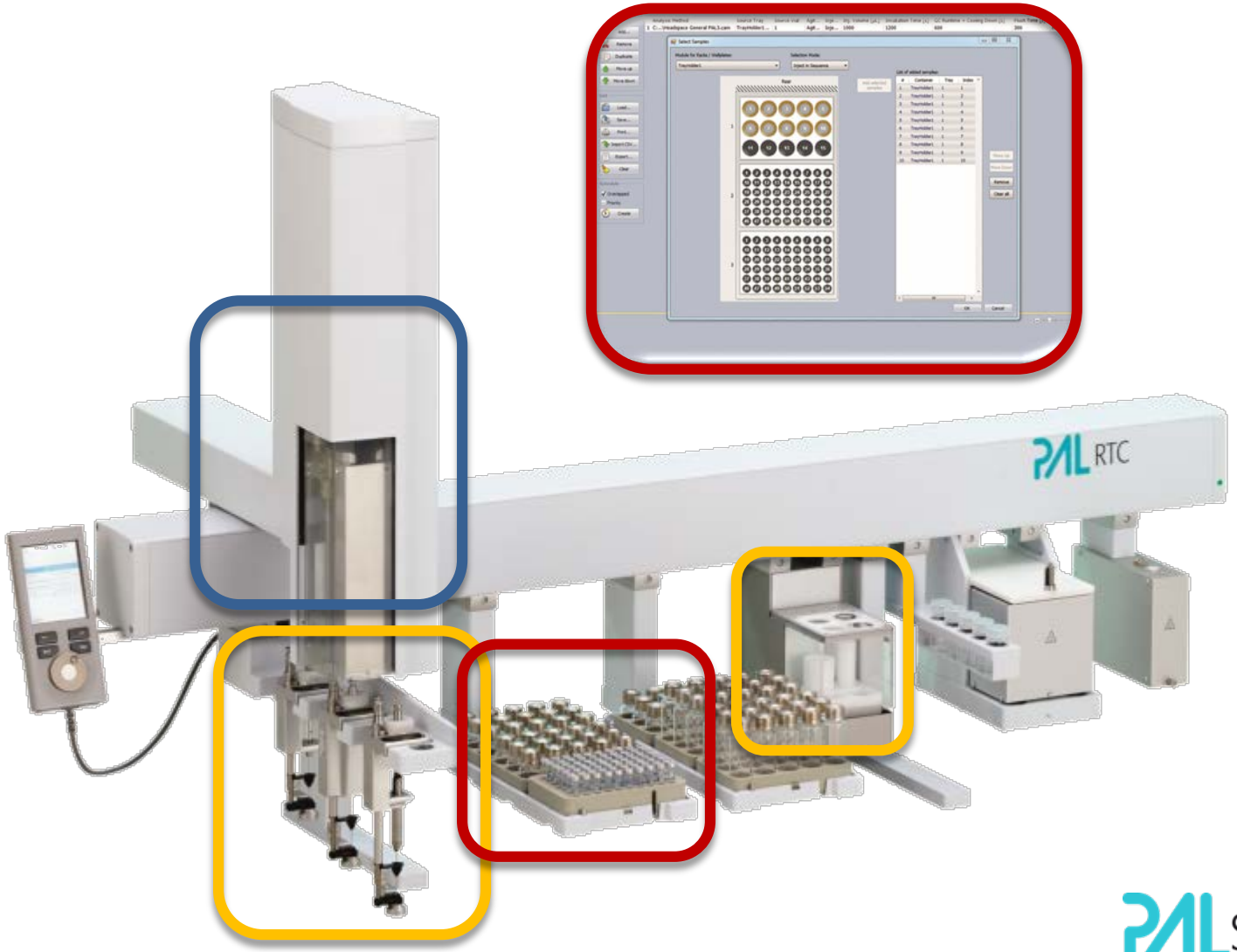
Robotic Sample Injection
(manual tool change)
>> successor of PAL-xt

PAL LSI

Liquid Sample Injection
for liquid sample injection and pick and place application

PAL SYSTEM
Ingenious sample handling

PAL3 Family (3rd Generation PAL Platform)

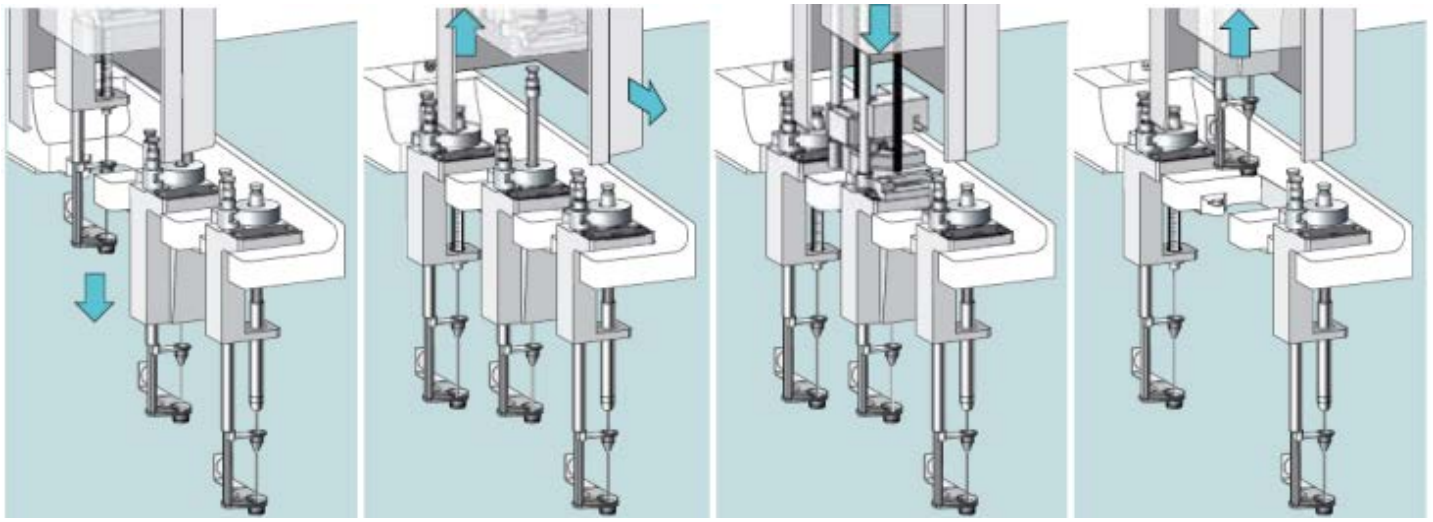


PAL SYSTEM
Ingenious sample handling

Robotic Tool Change (PAL RTC)

Increase of laboratory productivity and widens the application range

- **Sample Preparation Automation** thanks to higher degree of with Robotic Tool Change (up to 6 tools) >> standard addition, derivatisations
- **Over night run** thanks to automatic change of injection modes — Liquid Injection, Headspace and SPME
- **Workstation**: Sequential dilution, calibration dilution, sample preparation



PAL SYSTEM
Ingenious sample handling

PAL SYSTEM
Ingenious sample handling

Tools & Syringes for GC and LC

5x Liquid Syringe Tools

- 1µL – 100µL NL: 57mm or 85mm
- 250µL – 1000µL NL: 57mm or 85mm
- 10000µL NL: 57mm

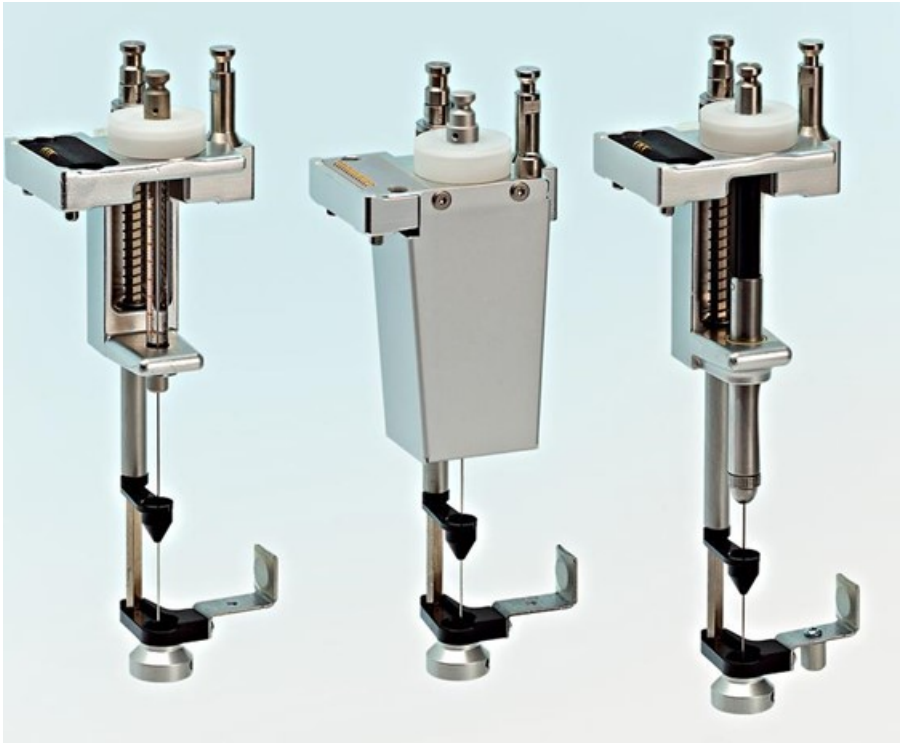
3x specific Headspace Tools

Temp: RT- 150°C, Purge Gas on tool

- 1000µL NL: 65mm
- 2500µL NL: 65mm
- 5000µL NL: 65mm

1x SPME Tools

Patented design for a large variety of SPME fiber types



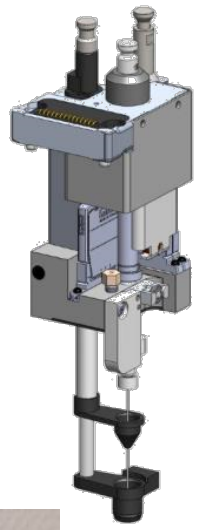
Liquid Syringe Tool | Headspace Tool | SPME Tool

PAL SYSTEM
Ingenious sample handling

Tools & Syringes for GC and LC

1 LCMS Tool

- Time between UHPLC Runs approx. 10 sec. (if look ahead)
- Total Cycle Time: < 60 seconds
- LCMS Tool for fast and clean injections wit lowest carry over for LC-MS applications



1 Dilutor Tool with 2 Dilutor option (1c and 5c)

The Module for Sample Prep: LLE, Dilutions, prepare Standard Dilution curves, fast micro SPE or LC Injections…..

PAL SYSTEM
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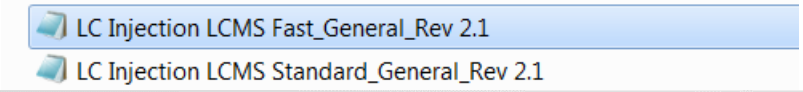
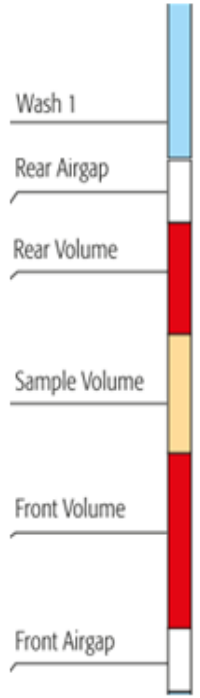
LCMS Tool (fast injection)

- PAL Sample Control Method: LC Injection LCMS Fast General Rev 2.1





PAL SYSTEM
Ingenious sample handling

Vortex Mixer (PAL RTC, PAL RSI, PAL LSI)

Efficient mixing for liquid homogenization and extraction steps

- Magnetic transportation of 2mL, 10mL and 20mL vials.
  (1 additional slot for custom specific vials)
- Provides efficient 2-phase mixing for : l/l extraction, dilution, derivatisation,…

PAL SYSTEM
Ingenious sample handling

PAL SYSTEM
Ingenious sample handling

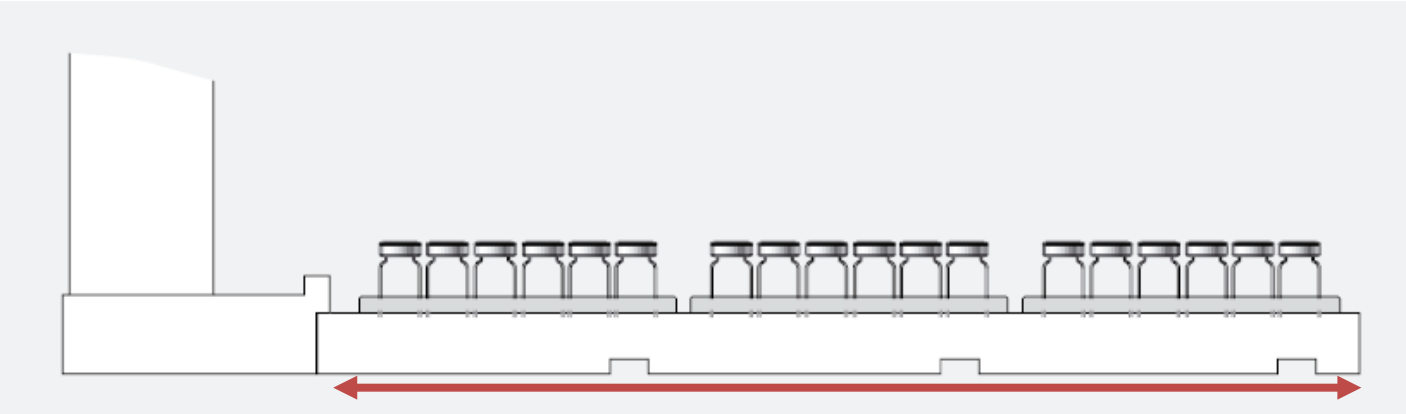
Increased vial capacity (PAL RTC, PAL RSI, PAL LSI)

Up to 50% more samples in a single Tray Holder

Due to extended working range for y-axis (255mm) we have additional capacity per tray holder:

- 162 x 2mL vials
- 60 x 10/20mL vials
- 3 x Microtiter plates

With two Peltier Stacks up to 13‘824 samples (384 MTP)



PAL SYSTEM
Ingenious sample handling

X,Y,Z axes, needle guide and plunger are moved by servo drives (PAL RTC, “PAL RSI”, “PAL LSI”)

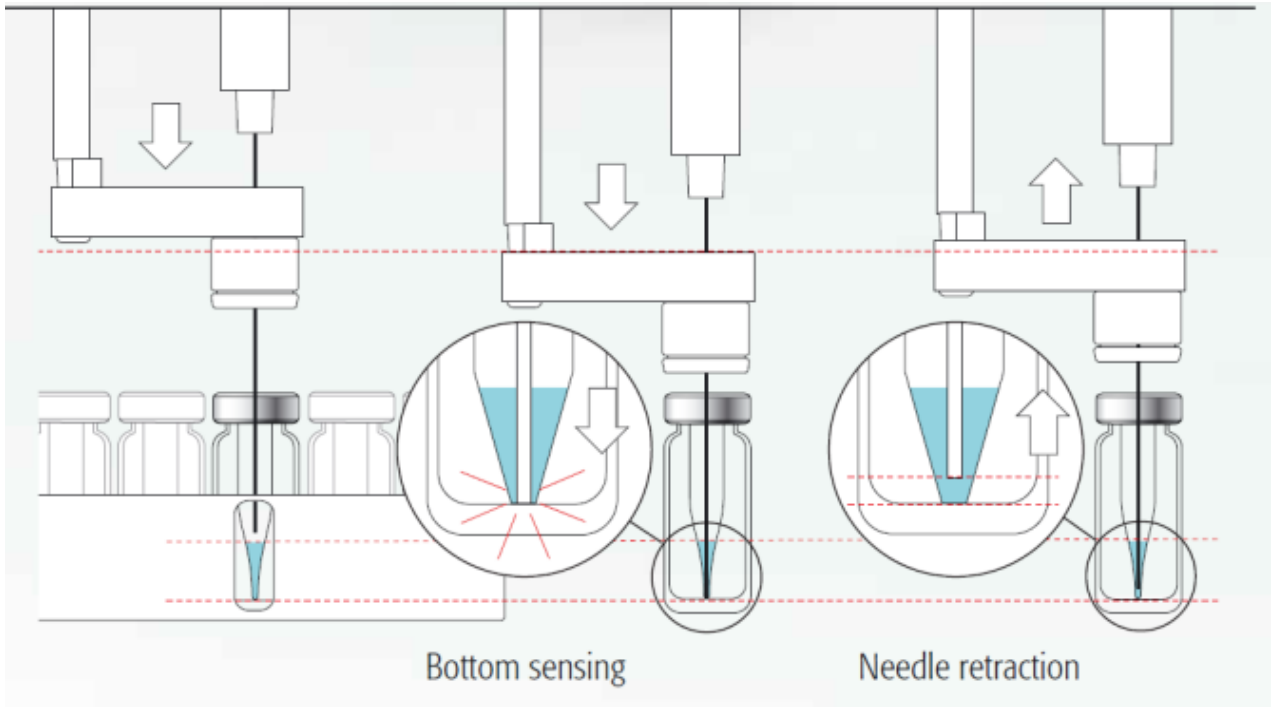
- **Higher reliability:** no risk of loosing steps, homing is only necessary once at startup
- **Small sample volume**: features such as touch down or bottom sense become possible as drives can act as a force sensor
- **Higher efficiency**: improved dynamics and higher speeds due to parallel movement of all drives
- **Reduced noise**: silent and smooth operation
- **Discrimination free GC Injection**: cold needle injection (100ms)

PAL SYSTEM
Ingenious sample handling

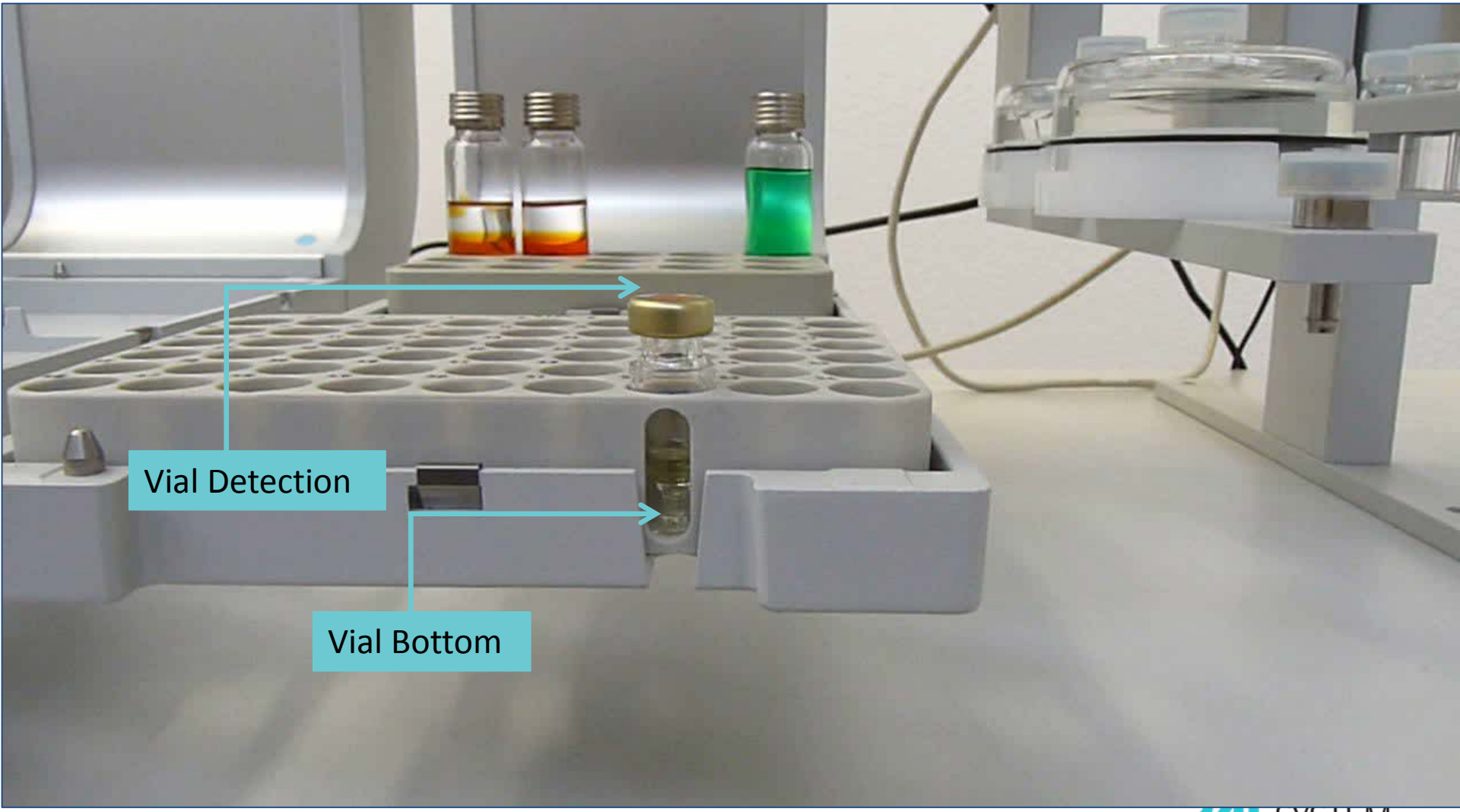
Bottom Sense (PAL RTC, “PAL RSI”, “PAL LSI”)

Microsample injection

The vial bottom sense allows reliable aspirations of small sample volumes even out of a few microliter samples. Definable Needle Retraction Distance Example: Inject up to 3 x **1µL** out **of only 5µL** total sample volume.



PAL SYSTEM
Ingenious sample handling

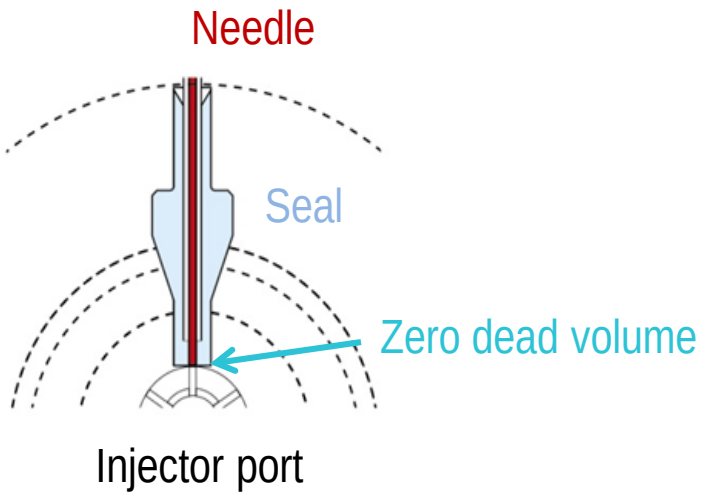


PAL SYSTEM
Ingenious sample handling

Minimized Carryover with PAL RTC & RSI

- Constant Force/ Bottom Sense Technology
  - Automatic detection of the correct needle position in the injector port/needle seal avoids dead volumes/carryover
  - No more manual adjustment of needle position required

- New design of the needle seal
  - No dead volumes → reduced Carry-
  - Lifetime > 30'000 injections
  - Compatible with Vici and Rheodyne



PAL SYSTEM
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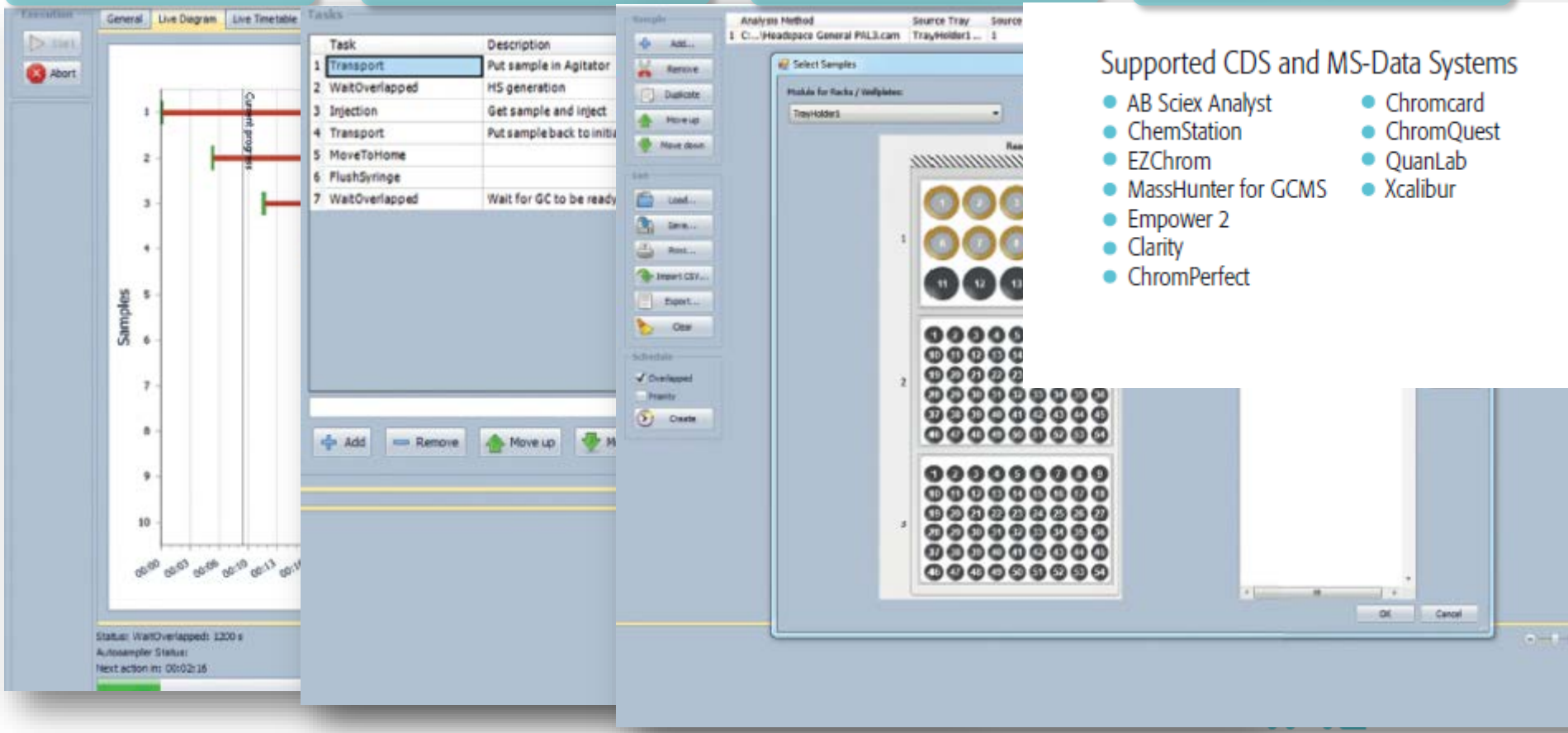
PAL3 for LC Applications

PAL SYSTEM
Ingenious sample handling

PAL Sample Control

Intelligent Automation for Sample Prep

Time schedules | **Method Editor** | **Sample selection** | **CDS compatibility**



Ingenious sample handling

PAL SPME

PAL SYSTEM
Ingenious sample handling

PAL SPME

Phase	Color Code	Set of 1 Fiber Description PNo.	Set of 3 Fibers Description PNo.	Set of 5 Fibers Description PNo.
PDMS Fiber (Polydimethylsiloxane)				
7 µm	Green	FIB-P-7/10-P1	FIB-P-7/10-P3	FIB-P-7/10-P5
30 µm	Golden	FIB-P-30/10-P1	FIB-P-30/10-P3	FIB-P-30/10-P5
100 µm	Red	FIB-P-100/10-P1	FIB-P-100/10-P3	FIB-P-100/10-P5
Acrylate Fiber (Polyacrylate)				
85 µm	Grey	FIB-A-85/10-P1	FIB-A-85/10-P3	FIB-A-85/10-P5
Carbon WR Fiber / PDMS (Carbon Wide Range / PDMS)				
95 µm	Dark Blue	FIB-C-WR-95/10-P1	FIB-C-WR-95/10-P3	FIB-C-WR-95/10-P5
Fiber Collection – Development Kit (1 Fiber of each Fiber Type | Set of 5)				
various				Fiber Collection FIB-SEL5-S1

PAL SYSTEM
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SPME – Comparison Supelco - CTC

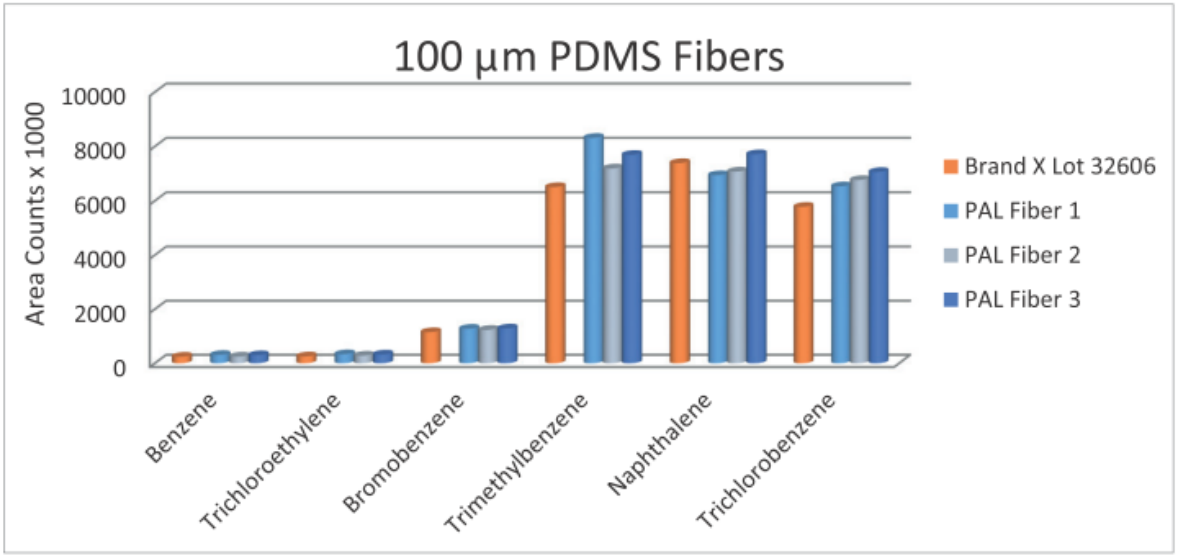
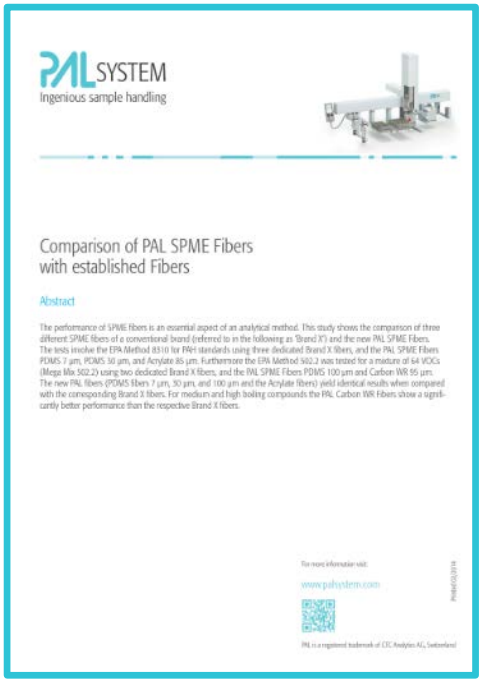


Figure 5: Quantitative Comparison of PAL 100 µm PDMS Fiber and Brand X Fiber for Six selected Target Molecules.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Comparison of PAL SPME Fibers with established Fibers

Abstract

- Identical results for all PDMS fibers and the Acrylate fiber

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