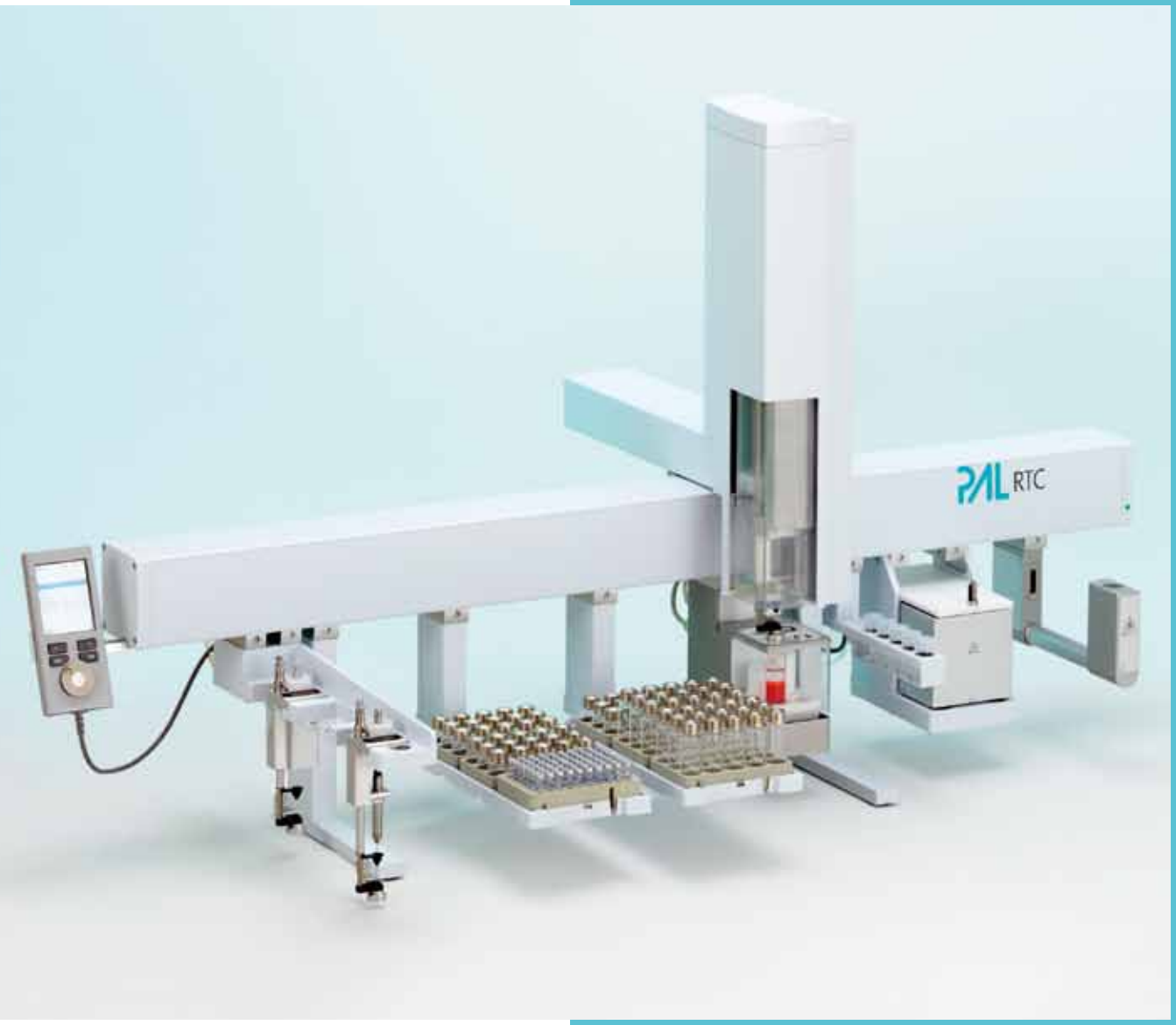
# PAL RTC

Prep and Load Platform

## Robotic Tool Change




Automated Sample Preparation
The possibilities are endless -
the limit is your imagination


PAL RTC xtended x-axis with Park Station, Tray Holder, Vortex Mixer, Standard Wash Module, Agitator and SPME Fiber Conditioning Module

## Content


PAL RTC standard x-axis with Park Station, Peltier Stack 6DW, Fast Wash Module and four Valve Modules.

PAL RTC

Prep and Load Platform

## Fully Automated Prep and Load Systems

The PAL RTC with **R**obotic **T**ool **C**hange is the logical (r)evolution of the successful PAL product line. Sample prep prior to Chromatography is no longer the bottleneck – Automate your sample preparation and sample injection - all in the PAL RTC.

The new PAL RTC is a robotic platform for efficient automated sample preparation steps. With the robotic tool change the PAL RTC increases productivity and widens the application range by using up to six different syringe types even in single cycle. The autosampler changes between Liquid Injection, Headspace and SPME methods within one sample list and without the need of manual operationin less than 30 seconds. The optional Vortex Mixer and different syringe volumes are the door opener to automate your sample preparation steps.

Liquid-liquid-extraction, derivatisations, standard addition and dilution by hand is no longer required – with the PAL RTC you choose the right tool for your needs.

The PAL RTC is controlled by the unique PAL Sample Control software. It is applicable with more than ten major CDS and MS-Data Systems.

The possibilities are endless – the limit is your imagination.

# Key Features

- Unprecedented precision and repeatability
- Analytical flexibility with one instrument
- 24/7 fully unattended operation
- Robotic change between Liquid, Headspace and SPME Methods
- For sample preprarations with need for different syringe sizes during dilution, derivatisation and injection.
- Use of multiple SPME fibers for method development
- Highly variable volume range for injection by the use of different syringes

Precise and repeatable sample prep steps provided by the robotic tool change are:

- Sequential dilution
- Calibration dilution
- Standard addition
- Derivatisations

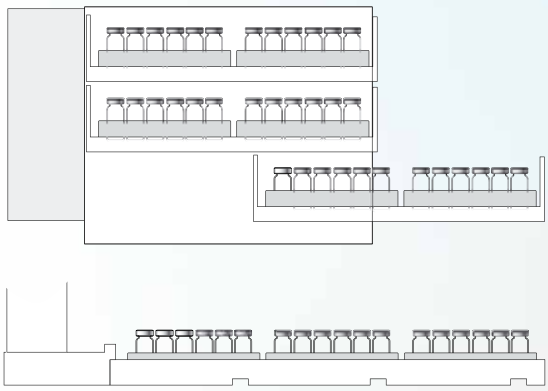
## Increased Vial Capacity

The extended working range for y-axis (255mm) enables processing up to 100% more samples in a single Tray Holder

Capacity:

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

With four Peltier Stacks up to 9'216 samples (384 MTP) or 1'269 2mL vials can be processed on one PAL RTC

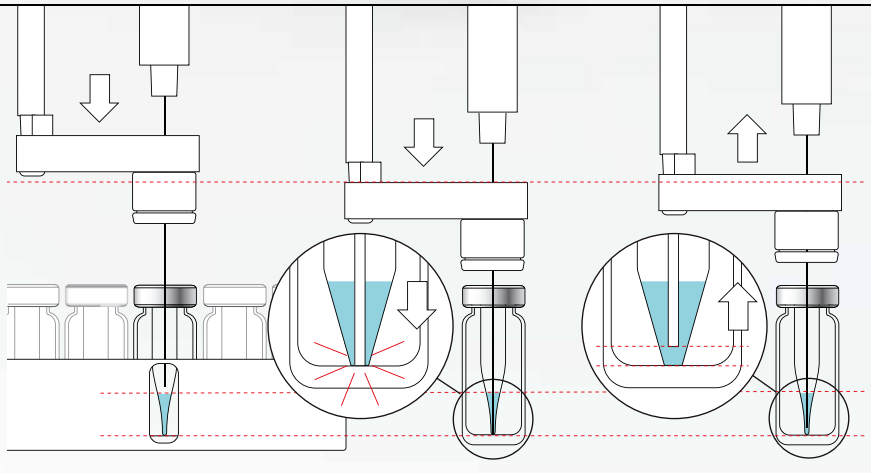


## Bottom Sensing

The vial bottom sensing allows reliable aspirations of small sample volumes even out of a few microliter samples.

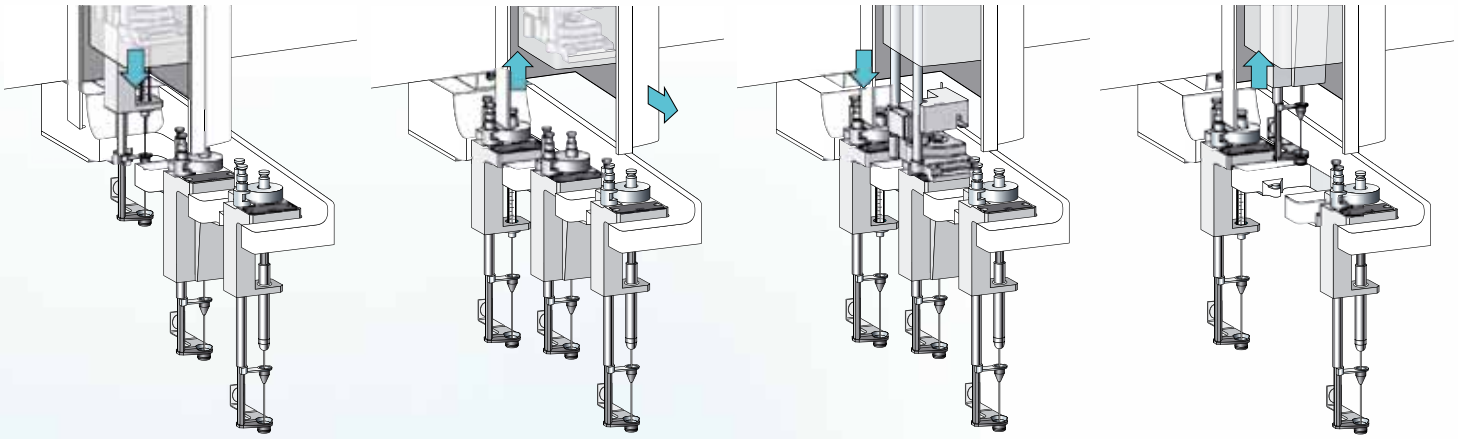
Definable needle retraction distance

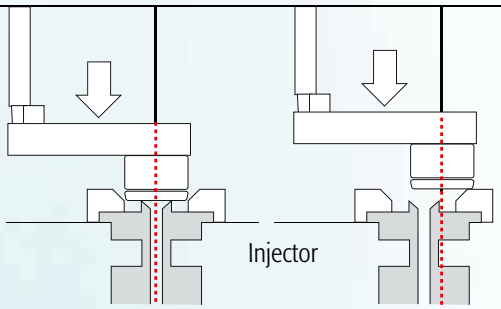
Example: Inject up to 3x 1µL out of only 5µL total sample volume



Bottom sensing Needle retraction

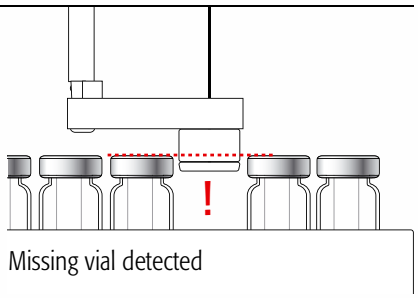
## Robotic Tool Change






correct position

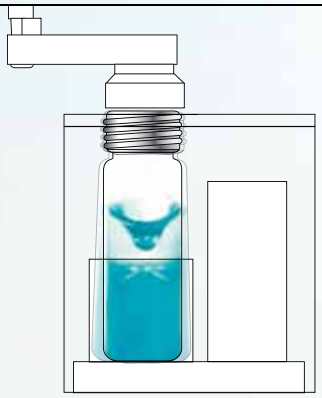
wrong position detected




Missing vial detected

### Position Detection

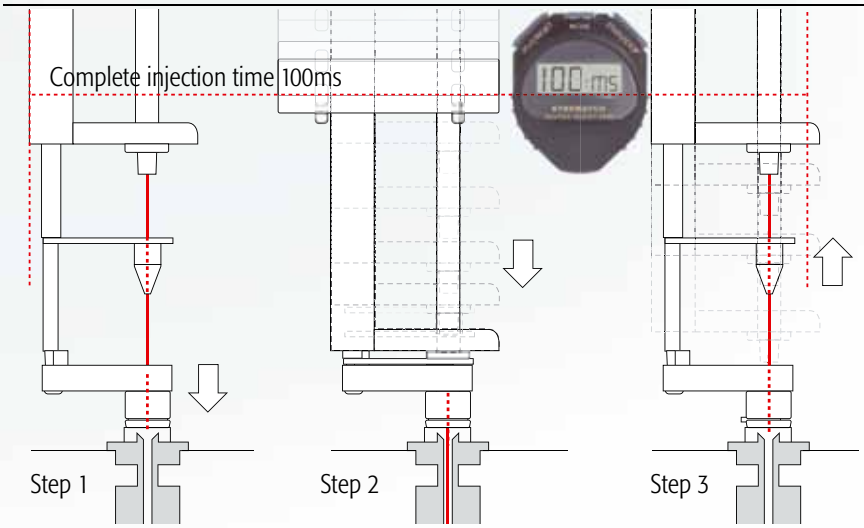
Definable Z-tolerance for detection of correct injector position or missing vials

### Vortex Mixer

For efficient mixing during liquid homogenization and extraction steps.

- Magnetic transportation
- Standard vial sizes: 2mL / 10mL / 20mL
- 1 additional slot for custom specific vials
- Provides efficient 2-phase mixing




### Cold Needle Injection

Faster GC injection times down to 100ms for reduced discrimination in Split and Splitless injections modes.

# Park Station & Tools

## Park Station

The unique Park Station allows a robotic tool change (syringes with different volumes or different tool types) for advanced sample preparation, liquid handling (dilutions), derivatization steps or any other time consuming repetitive step. The additional versatility in combination with the increased volume range are significant benefits and allow the definition of flexible tailor-made automation processes.

- Park Station for up to three injection tools
- Installation of up to 2 Park Stations on one PAL RTC
- Process safety by tool recognition and position control
- Designed for automated screening using different fibers with multiple tools

Park Station with Liquid, SPME and Headspace tools

## Liquid Syringe Tool

- Supports 57mm or 85mm Syringe needle lengths
- Syringes available:
  1.2µL / 5µL / 10µL / 100v/ 250µL / 500µL / 1'000µL / 10'000µL

## Headspace Tool

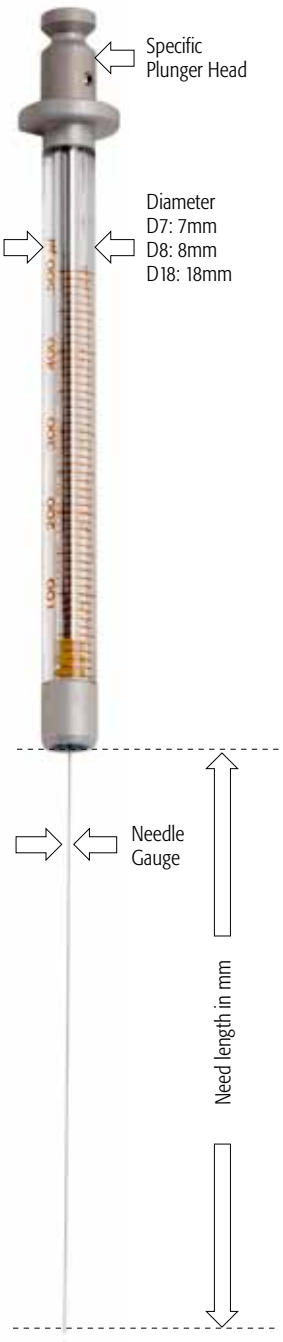
- Three different syringe volumes available:
  1'000µL / 2'500µL / 5'000µL
- Syringe temp 40°C up to 150°C in 1°C steps
- Syringe flush with inert gas flow through X-Y-Z rail
- Magnetic vial transport for 2mL, 10mL and 20mL vials

## SPME Tool

- SPME Fiber Conditioning Module (separate module)
- New SPME holder for increased fiber protection
- Compatible with a variety of SPME fibers
- Easy fiber exchange by hand
- For 10mm or 20mm fiber length

Liquid Syringe Tool (LS Tool) Headspace Tool (HS Tool) SPME Tool

# Syringes




## Point Styles



AS / conical

3 / LC

5 / sideport

| Description | | Volume | Diameter | Needle Length | Gauge | Point Style | Bottom Sense |
|---|---|---|---|---|---|---|---|
| **D7/57 Tool** | | **1.2µL - 100µL** | **D7** | **57** | | | |
| GC | liquid syringe | 1.2µL | 7mm | 57mm | 23P | AS / conical | no |
| GC | liquid syringe | 1.2µL | 7mm | 57mm | 26P | AS / conical | no |
| GC | liquid syringe | 5µL | 7mm | 57mm | 23s | AS / conical | possible |
| GC | liquid syringe | 5µL | 7mm | 57mm | 26s | AS / conical | possible |
| LC | gastight syringe | 10µL | 7mm | 57mm | 22s | 3 / LC | possible |
| GC | liquid syringe | 10µL | 7mm | 57mm | 23s | AS / conical | possible |
| GC | gastight syringe | 10µL | 7mm | 57mm | 23s | AS / conical | possible |
| GC | liquid syringe | 10µL | 7mm | 57mm | 26s | AS / conical | possible |
| GC | gastight syringe | 10µL | 7mm | 57mm | 26s | AS / conical | possible |
| LC | X-type syringe | 25µL | 7mm | 57mm | 22s | 3 / LC | possible |
| GC | gastight syringe | 25µL | 7mm | 57mm | 23s | AS / conical | possible |
| GC | gastight syringe | 25µL | 7mm | 57mm | 26s | AS / conical | possible |
| LC | X-type syringe | 100µL | 7mm | 57mm | 22 | 3 / LC | possible |
| GC | gastight syringe | 100µL | 7mm | 57mm | 23 | 5 / sideport | possible |
| LC | X-type syringe | 100µL | 7mm | 57mm | 22s | 3 / LC | possible |
| GC | gastight syringe | 100µL | 7mm | 57mm | 23s | AS / conical | possible |
| GC | gastight syringe | 100µL | 7mm | 57mm | 26s | AS / conical | possible |
| **D8/57 Tool** | | **250µL - 1'000µL** | **D8** | **57** | | | |
| LC | gastight syringe | 250µL | 8mm | 57mm | 22 | 3 / LC | possible |
| GC | gastight syringe | 250µL | 8mm | 57mm | 23 | 5 / sideport | possible |
| GC | gastight syringe | 250µL | 8mm | 57mm | 26 | AS / conical | possible |
| LC | gastight syringe | 500µL | 8mm | 57mm | 22 | 3 / LC | possible |
| GC | gastight syringe | 500µL | 8mm | 57mm | 23 | 5 / sideport | possible |
| GC | gastight syringe | 500µL | 8mm | 57mm | 26 | AS / conical | possible |
| LC | gastight syringe | 1'000µL | 8mm | 57mm | 22 | 3 / LC | possible |
| GC | gastight syringe | 1'000µL | 8mm | 57mm | 23 | 5 / sideport | possible |
| GC | gastight syringe | 1'000µL | 8mm | 57mm | 23 | AS / conical | possible |
| **D18/57 Tool** | | **10'000µL** | **D18** | **57** | | | |
| GC/LC | gastight syringe | 10'000µL | 18mm | 57mm | 19 | 3 / LC | possible |
| **D7/85 Tool** | | **1.2µL - 100µL** | **D7** | **85** | | | |
| GC | liquid syringe | 1.2µL | 7mm | 85mm | 23P | AS / conical | no |
| GC | liquid syringe | 1.2µL | 7mm | 85mm | 26P | AS / conical | no |
| GC | liquid syringe | 5µL | 7mm | 85mm | 26s | AS / conical | no |
| GC | liquid syringe | 10µL | 7mm | 85mm | 23s | AS / conical | possible |
| GC | gastight syringe | 10µL | 7mm | 85mm | 23s | AS / conical | possible |
| GC | liquid syringe | 10µL | 7mm | 85mm | 26s | AS / conical | no |
| GC | gastight syringe | 10µL | 7mm | 85mm | 26s | AS / conical | no |
| GC | gastight syringe | 25µL | 7mm | 85mm | 23s | AS / conical | no |
| GC | gastight syringe | 25µL | 7mm | 85mm | 26s | AS / conical | no |
| GC | gastight syringe | 100µL | 7mm | 85mm | 23 | 5 / sideport | possible |
| GC | gastight syringe | 100µL | 7mm | 85mm | 26s | AS / conical | no |
| **D8/85 Tool** | | **250µL - 1'000µL** | **D8** | **85** | | | |
| GC | gastight syringe | 250µL | 8mm | 85mm | 23 | 5 / sideport | possible |
| GC | gastight syringe | 250µL | 8mm | 85mm | 26 | AS / conical | no |
| GC | gastight syringe | 500µL | 8mm | 85mm | 23 | 5 / sideport | possible |
| GC | gastight syringe | 500µL | 8mm | 85mm | 26 | AS / conical | no |
| GC | gastight syringe | 1'000µL | 8mm | 85mm | 23 | AS / conical | possible |
| **HS Tools** | | **1'000µL - 5'000µL** | | **65** | | | |
| GC | gastight syringe | 1'000µL | | 65mm | 23 | 5 / sideport | possible |
| GC | gastight syringe | 2'500µL | | 65mm | 23 | 5 / sideport | possible |
| GC | gastight syringe | 5'000µL | | 65mm | 23 | 5 / sideport | possible |

# Modules

## Vortex Mixer Module

Enables efficient mixing for liquid homogenization and extraction steps.

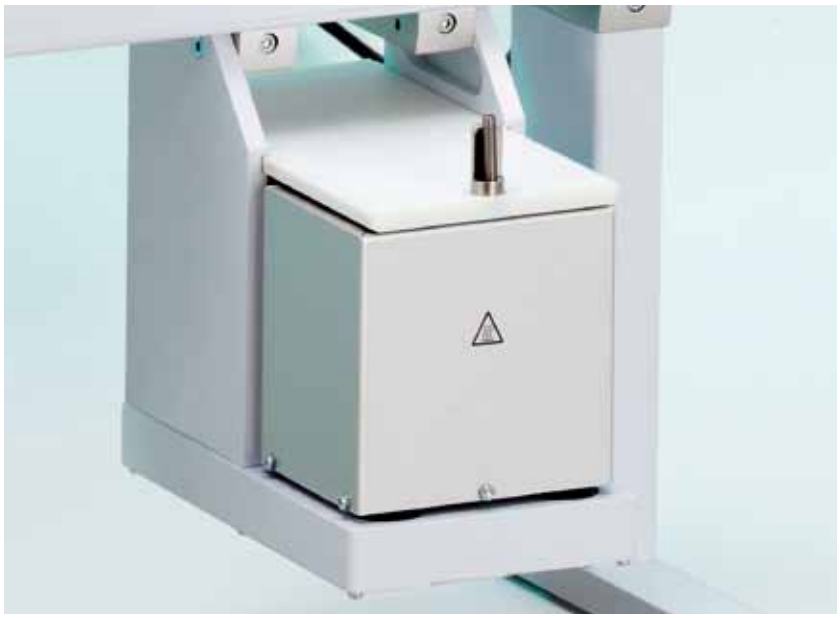
- Magnetic transportation
- Standard vial sizes: 2mL / 10mL / 20mL
- 1 additional slot for custom specific vials
- Provides efficient 2-phase mixing

Vortex Mixer showing fully automated Liquid / Liquid Extraction Process

## Agitator Module

For the incubation and agitation of samples.

- 6 positions for 20mL vials
- Temperature range 40-200°C
- Agitation speed 250-750rpm
- Optional adapters for 2mL or 10mL vials

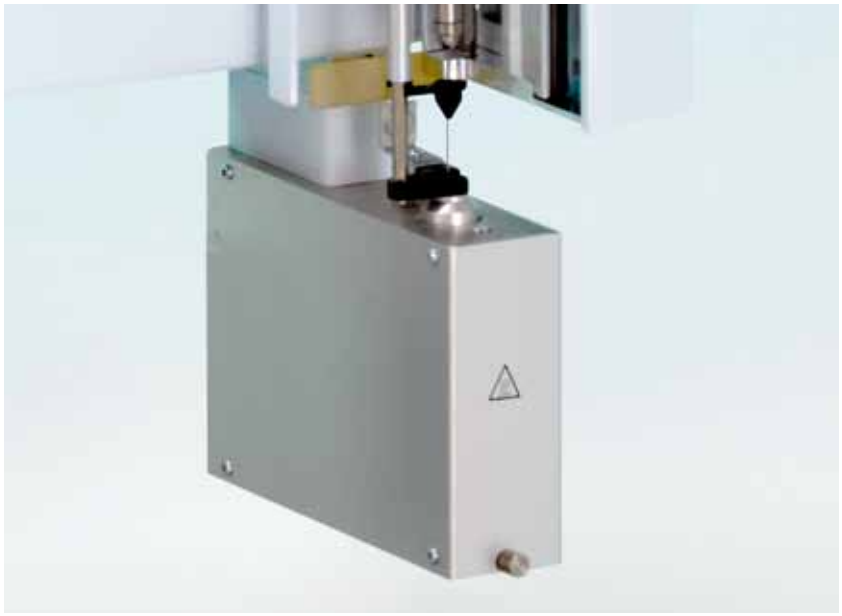


Agitator

## SPME Fiber Conditioning Module

For the conditioning of SPME fibers prior to sample collection.

- Temperature range up to 350°C
- Purge gas connection for more efficiency
- Additional port for a replacement fiber



SPME Fiber Conditioning Module

# Modules

## Valve Drive Module

Universal Valve Drive for all applications like sample injection, column switching for online LC-LC/MS or online SPE-LC/MS, Multiplexing, column selection and many more.

- Valve Drive supports VICI/Valco and Rheodyne valve types
- Injection port bottom sensing: no more teaching of the needle penetration in injector
- Constant Force Technology to reduce dead volume during injection process
- UHPLC/HPLC: up to 50% faster switching times for optimum system performance and prolonged column life time
- Stackable design to reduce the space demand and allow any flexible configuration
- Huge flexibility to arrange multiple valve solutions
- Fast Wash Module is also stackable below a Valve Drive

Three Injection Valves and one selector valve. Staggered injection configuration reduces space required on the RTC x-rail

## Fast Wash Module

- Cleans syringes of all gauges (Gauge 19 to 26)
- Integrated pumps for active wash solvent delivery
- Supports two different wash solvents (aqueous and organic)
- Reduce wash solvent consumption by automatic flow adjustments
- Stackable with Valve Drives to minimize required working space

Fast Wash Moduke

# Modules

## Tray Holder Module

For the precise positioning of racks or plates:

Capacity:

- 3x MTP 4-384
- 3x DW 6-96
- 3x VT12, VT15, VT54 or VT70
- 1x Rack R60
- Combination of MTP, DW and VT racks possible

Tray Holder

## Peltier Stack 2DW Module

For the storage of two racks or plates under defined temperature conditions between 4°C and 40°C. Offers the use of standard transparent vials even with light sensitive compounds.

Capacity:

- 2x MTP 4-384
- 2x DW
- 2x VT15 (only 10mL vials)
- 2x VT54 or VT70

Peltier Stack 2DW

## Peltier Stack 6DW Module

For the storage of six racks or plates under defined temperature conditions between 4°C and 40°C. Offers the use of standard transparent vials even with light sensitive compounds.

Capacity:

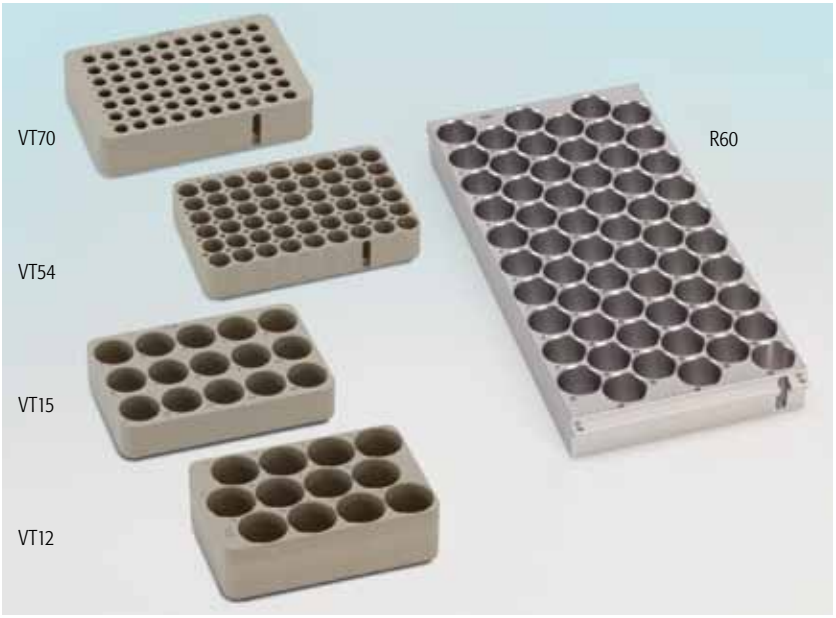
- 6x MTP
- 6x DW
- 6x VT15 (only 10 mL vials
- 6x VT54 or VT 70
- Combinations possible

Peltier Stack 6DW

## Racks

For precise positioning of standard vials:

- VT12: 12x 40mL vials
- VT15: 15x 10 or 20mL vials
- VT54: 54x 2mL vials
- VT70: 70x 1mL vials
- R60: 60x 10 or 20 mL vials




Racks: VT70, VT54, VT15, VT12 and R60

# Modules

## Standard Wash Module

Wash Module for low volume injections:

- 4x 10mL wash solvent vials
- 1x 10mL waste vial
- Optional Waste Port Adapter to connect a tube to a waste bottle

Standard Wash Module

## Large Wash Module

Wash Module for large volume injections:

- 2x 100mL solvent vials
- Waste port with tubing olive to connect waste bottle

Large Wash Module

## Solvent Module

For large solvent demands, e.g. to prepare Dilution rows:

- 3x 100mL solvent volume

Solvent Module

## Barcode Reader Module

This unique Barcode Reader allows the PAL RTC Autosampler to read the barcode labels on 2mL, 10mL and 20mL vials regardless of the orientation on the vials. Therefore it ensures highest process safety and traceability.

- Barcode Reader for horizontal barcode lines on vials
- Barcode Reader with two scan modules allows identification on vials in any orientation
- Standard vial sizes: 2mL / 10mL / 20mL

Barcode Reader

# Instrument Setup

The instrument setup and all configurations can be done either by the Handheld Terminal or the PC Terminal software.

## Terminal

The PAL Terminal controller is the ideal solution for displaying the instrument status, facilitating setup and maintance right in front of the Autosampler.

- Status control and direct access
- User friendly operation with multiple user levels
- Each user level allows to access to its own discarde and sections of the software
- Guided teaching wizards for Tools and Modules


Terminal

## PC Terminal software

The virtual Terminal is ideal to check the status of the PAL RTC from any computer connected to the local area network.

The communication via 'PALbus' increases the flexibility to add active Modules and to control the modules in a bidirectional manner. A self-detection mode simplifies the addition of a Module to the System configuration. The bidirectional communication allows the control of the module at any given time or position. Data stored in a log-file not only gives the user a high degree of security but also facilitates the tractabilty of cycle performance, providing easy access to essential information which may be requested by inspection authorities.

PC Terminal software

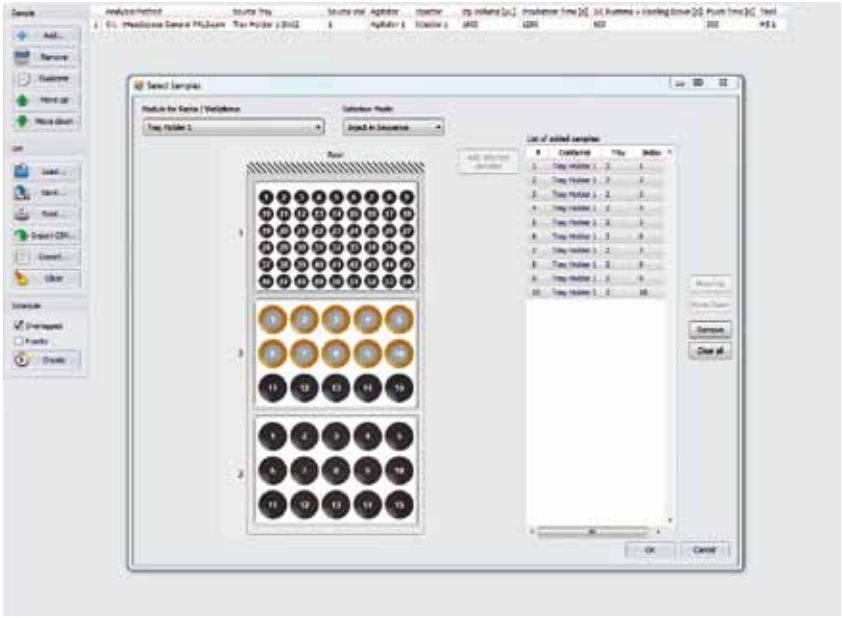
# PAL Sample Control

## Intelligent Automation for Sample Preparation

PAL Sample Control is the control software for efficiently automating any sample preparation steps with the PAL RTC robot systems and will be delivered withevery system.

Numerous interfaces, for example to Xcalibur, ChemStation, Analyst and MassHunter, guarantee integration into existing chromatograpy data systems (CDS).The software exchanges data with other systems and controls all of the processes. Based on intelligent time management the software considerably increases the throughput of the analytical systems.

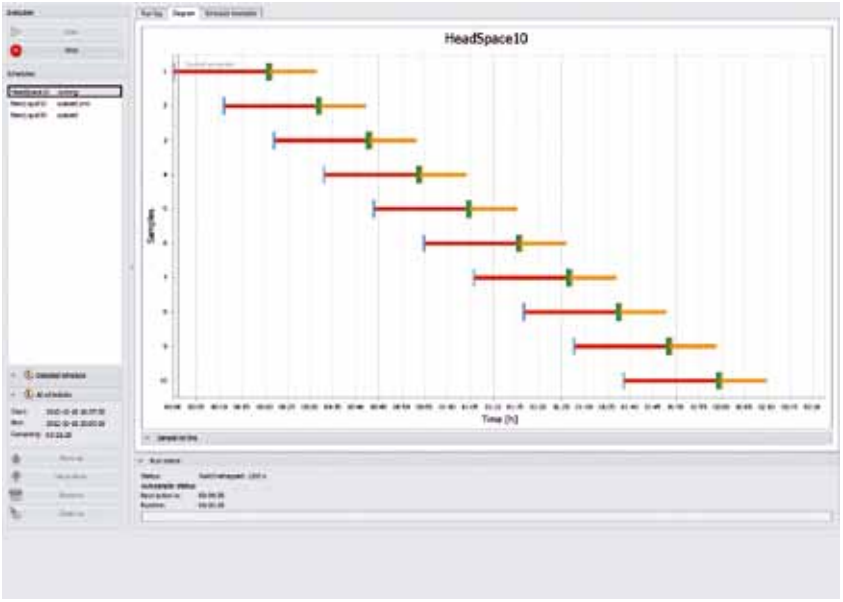
While the analysis is running the next sample preparation is already taking place. The software truly simplifies sample prep by making many of the tasks such as the creation of methods or sample lists very easy.



Create sample lists easy with the Sample Selector

## Time Schedules

After submitting the sample list the software automatically calculates the optimized schedule for run times. The result of this calculation will be shown graphically. The actual status will always be displayed either as a graph or in a table. By clicking on “Start” the first of the calculated schedules will be started. Further schedules will be started when the previous one is finished. Priority samples can be added at any point in time during the run.

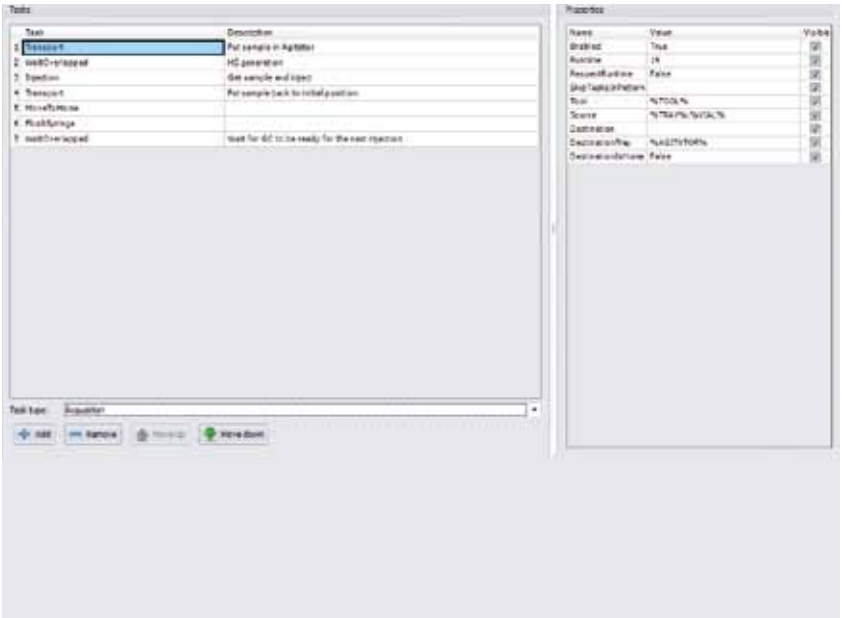



Graphical display of optimized run schedule for overlapped Headspace injection

## Method Editor

Applicable with more than ten CDS, methods can be prepared in straightforward simple way by using prepared tasks. The sample list can be created with methods in a flexible but still simple way. Subsequently it can be passed on to the analytical systems.

Applicable with most common CDS systems.

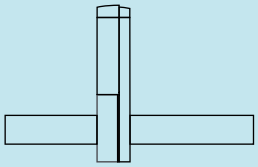


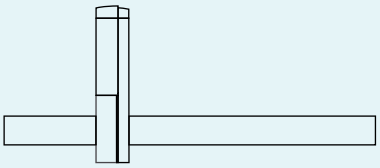
Create methods by using prepared tasks

## Supported CDS and MS-Data Systems

- Analyst
- ChemStation
- Chromcard
- ChromPerfect
- ChromQuest
- Clarity
- Empower 2
- EZChrom
- MassHunter for GCMS
- QuanLab
- Xcalibur

# Specifications





| | **PAL RTC** standard x-axis length | **PAL RTC** xtended x-axis length |
|---|---|---|
| Working Space | Width: 735mm (28.9 inches)<br>Depth: 255mm (10.0 inches)<br>Height: 419mm (16.5 inches) | Width: 1090mm (43.0 inches)<br>Depth: 255mm (10.0 inches)<br>Height: 419mm (16.5 inches) |
| Instrument dimensions | Width: 850mm (33.5 inches)<br>Depth: 503mm (19.8 inches)<br>Height: 547mm (21.5 inches) | Width: 1205mm (47.5 inches)<br>Depth: 503mm (19.8 inches)<br>Height: 547mm (21.5 inches) |
| Sample Capacity | 4 Tray Holders<br>Up to 840 1mL vials<br>648 2mL vials<br>240 10/20mL vials<br>18 MT/DW plates | 6 Tray Holders<br>Up to 1260 1mL vials<br>972 2mL vials<br>360 10/20mL vials<br>24 MT/DW plates |
| Sample Capacity Thermostatted | 2 Peltier Stacks<br>Up to 840 1mL vials<br>648 2mL vials<br>180 10/20mL vials<br>12 MT/DW plates | 4 Peltier Stacks<br>Up to 1680 1mL vials<br>1296 2mL vials<br>360 10/20mL vials<br>24 MT/DW plates |

| **Available Modules** | | |
|---|---|---|
| Vortex Mixer Module | Yes | Yes |
| Agitator Module | Yes | Yes |
| Valve Drive Module | Yes | Yes |
| Barcode Reader Module | Yes | Yes |
| Peltier Stack 2DW Module | Yes | Yes |
| Peltier Stack 6DW Module | Yes | Yes |
| Fast Wash Module | Yes | Yes |
| Standard Wash Module | Yes | Yes |
| Large Wash Module | Yes | Yes |
| Solvent Module | Yes | Yes |
| SPME Fiber Conditioning Module | Yes | Yes |
| MHE Module | Yes | Yes |

| **Supported Injection Techniques** | | |
|---|---|---|
| **Tool** | | |
| Liquid Injection | Yes | Yes |
| Headspace Injection | Yes | Yes |
| SPME | Yes | Yes |
| MHE | Yes | Yes |

Distributed by:

- Robotic Tool Change
- Higher productivity and wider application range
- Automated sample prep prior to injection
- Up to 100% more vial capacity at same x-rail width
- Unprecedented precision and repeatability
- Ultimate flexibility
- Unique PAL Sample Control software


PAL SYSTEM

www.palsystem.com

Visit our homepage to learn more about the PAL RTC and its unique features or contact your local PAL System distributor.



Part No. PAL Broch-RTC Systems-2012 | Rev 2.0 – December 2012