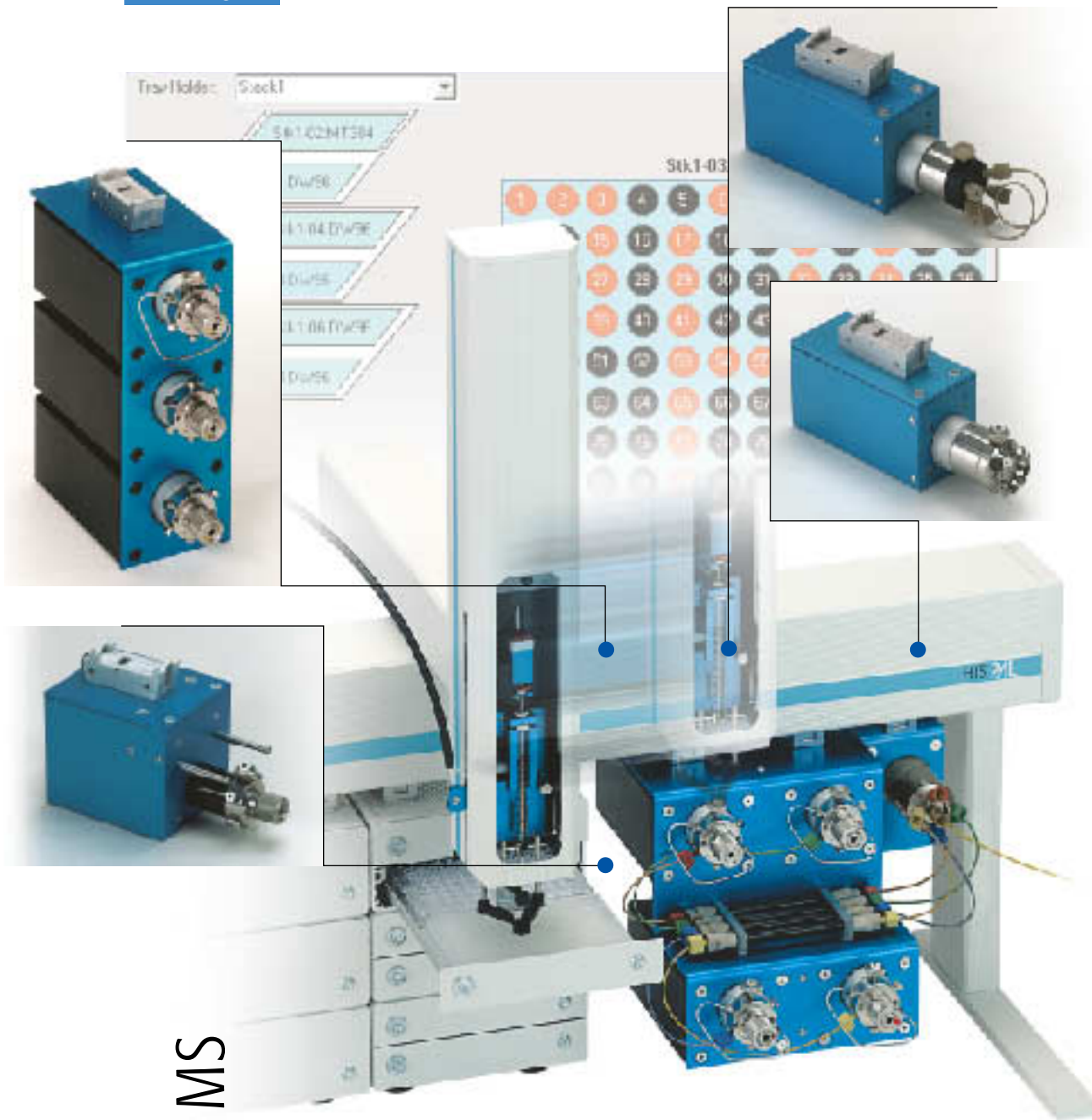


# HPLC PAL Valve Options



High Throughput Screening

Combinatorial Chemistry

Biopharmaceutical Research

Preclinical Research

Pharmaco-kinetic Studies

Drug Discovery | LC MS

**PAL** Parallel or staggered injections into 4 valves  
Overlapped injections for increased productivity

**PAL** Vertical injection port and syringe only concept  
No pre-valve tubing in sample path for transparent sample injection

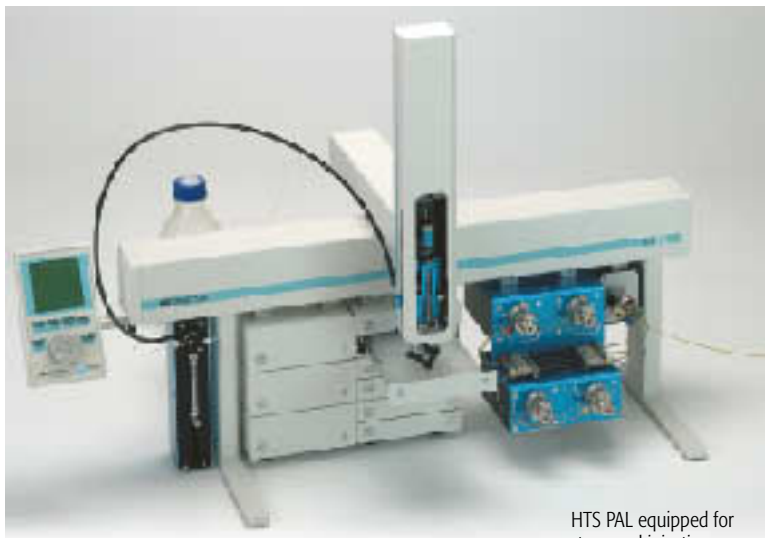
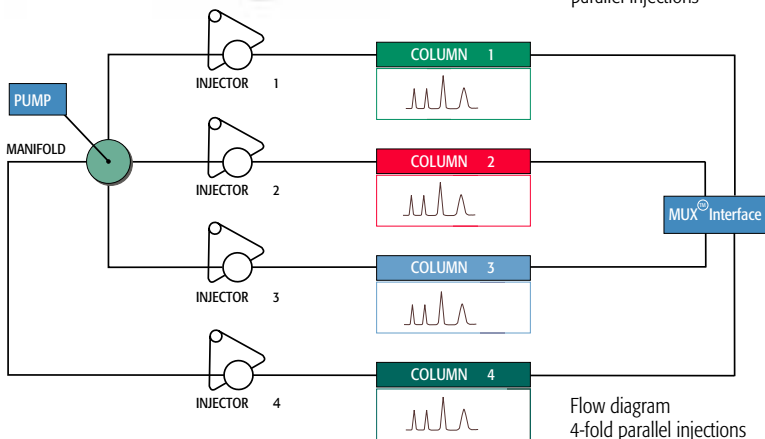
**PAL** Inert PEEK valves and sample loops for biological samples  
Microbore injection valves for capillary chromatography

**PAL** Pre-column sample cleanup or pre-column SPE  
Front- heart- and end-cut valve switching applications

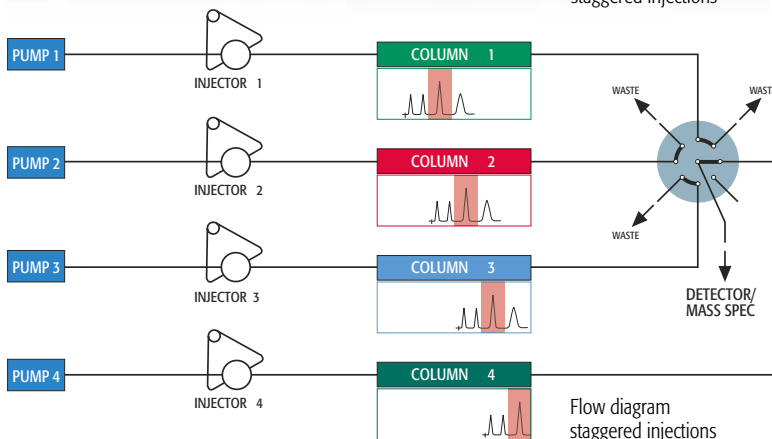
**PAL** Instrument drivers for Micromass Masslynx™, Agilent ChemStation™  
Applied Biosystems Analyst™ and ThermoFinnigan Xcalibur™



HTS PAL equipped for parallel injections



HTS PAL equipped for staggered injections



### Reliability is standard

Automated injection of sample sequences is certainly a key factor in increased laboratory productivity. Today, requirements in a sample injection system include high precision and accuracy, random access to individual samples and task-oriented programming along with options and accessories for additional sample handling routines. CTC Analytics' experience in the design and manufacture of automated GC and LC injection instruments, is reflected in their range of Prep and Load systems PAL. In all PAL instruments the latest electronic and mechanical developments are combined with a unique, stepper motor driven XYZ design. This combination ensures you precise sample handling for dependable analysis results.

### Syringe only and vertical injection technology

The PAL System syringe only concept combines the manual sample injection procedure with the precision and throughput of a robotic liquid handling system. Samples are aspirated with a conventional syringe and are transferred directly into the sample loop. No error prone teflon tubing or transfer lines are involved during the sample loading process.

### 4 valve option for automated parallel LC-MS analysis

The 4 valve option was developed for automated parallel LC-MS analysis, especially required for multiplexed LC-MS interfaces. The accessory consists of 4 conical injection valves, which can be loaded in serial mode and switched to inject simultaneously. This allows to work with 4 LC columns in parallel which results in higher throughput. Compared to other products, CTC's single syringe design allows even for parallel analysis the "cherry picking" sampling mode (random access to single plate wells).

### 4 valve option and stream selector for staggered injection

Additionally the above described system can be equipped with a 8-port stream selector valve, which allows staggered sample injections. Using this configuration, important chromatogram parts only can be cut out and reach the LC-MS inlet. Beside enhanced throughput, this feature helps to keep clean the LC-MS inlet for a prolonged period of time.

### Specifications PAL 4-valve injection option

#### System requirements

HTS PAL / HTC PAL equipped with PAL Dilutor and/or Fast Wash Station  
max. 2 deepwell stacks (12 plates) or 2 Standard microplate stacks (24 plates) or 2 Trayholder (196 2ml vials)

#### Software requirements

Cycle Composer control software Vers. 1.5 or higher  
PAL Firmware 2.4 or higher  
appropriate third party instrument driver

#### PAL 4 Valve Module consisting of:

- 4 pcs. Valve drives
- 4 pcs. VICI Valco 6-port valves type W
- 4 pcs. Sample loops 20µl
- 1 pc Solvent manifold
- 1 set PEEK tubing kit including fittings
- 1 set Electrical connection cables
- 1 pc Power supply 90-264 Volt

#### PAL MuxKit Kit for Micromass MUX™ Interface consisting of:

- 4 pcs. Check valves for waste port

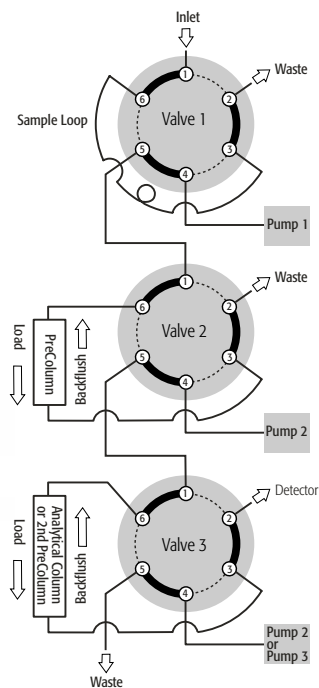
#### 8-port Selector valve consisting of:

Staggered injections require the PAL 4 Valve Module and additionally the PAL 8-port Selector valve.

- 1pc 8-port selector valve C5F
- 4pcs. Teflon tubing waste lines
- 1pc Valve drive
- 1pc Electrical connection cable



PAL 3-Valve Module



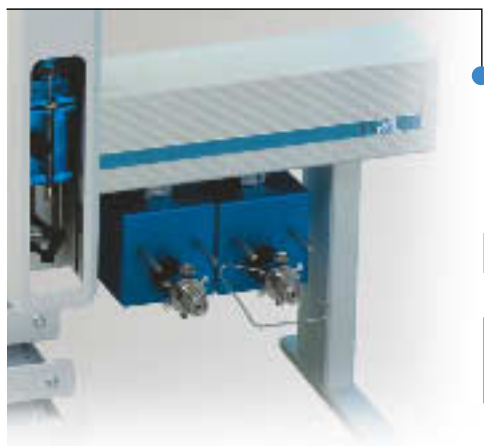
Flow diagram 1

### PAL 3-Valve Module

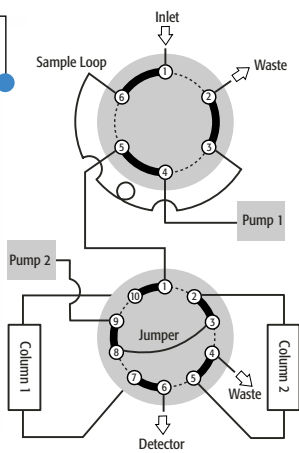
The PAL 3-Valve Drive Module consists of 3 individually controlled valve drives which are arranged in a vertical stack. The top valve acts as injection valve, while the remaining 2 valves are used as switching valves. Typical applications are pre-column SPE, pre-column cleanup, sample desalting etc. For increased sample throughput the accessory can be used for time staggered "heart-cuts" of two independent gradient systems. Important chromatogram parts only reach the detector through a selector valve just in time, while the front- and end-cut goes to waste. The compact arrangement results in a space saving setup with very short connection lines. Precise switching times are provided by the PAL control software Cycle Composer. The module is compatible either with 4- 6- or 10-port injection valves or with a 8-port stream selector valve. Furthermore the different valve types can also be mixed on the same 3-Valve Drive Module.

#### Flow diagram 1

- Valve 1 **Injection valve** Early valve switch for washing and prep ahead next sample.
- Valve 2 **Pre-column or SPE cartridge** Front cut to eliminate e.g. proteins or other high molecular compounds.
- Valve 3 **Analytical column or 2nd pre-column** Early backflush of late eluting compounds



HTS PAL equipped with 2 Valve Drives



Flow diagram 2

When columns must be regenerated following each analysis, this technique permits automation of the process. While one column performs the analysis, the second column undergoes regeneration by use of an auxiliary pump. Once the first analysis is complete, the valve is switched and the regenerated column is now ready for analytical use.

#### Flow diagram 2 (alternate column regeneration)

- Injection on column 1, column 2 will be regenerated
- At valve toggle (switch) the injection is performed on column 2 and column 1 will be regenerated (conditioned) for next injection.
- The column can be an analytical or a pre-column for fast elimination of high molecular compounds.



PAL 6-port Microbore Injection Valve

### 6-port Microbore Injection Valve

A 6-port Cheminert Injection Valve with 0.25mm bore is available used for microbore applications. It can replace the standard valves with bore 0.40mm. The Cheminert Microbore Valve is recommended for flow rates ~ 10 - 400µl/min. and LC column ID's of 0.3 - 2mm. It is shipped with a special 10µl sample loop (0.025mm ID).

Technique	Column ID	Flow Rate	Valve Bore
Analytical	4mm	0.75 - 2 ml/min	0.40mm
Narrowbore	2mm	200 - 400µl/min	0.25mm
Microbore	1mm	25 - 75µl/min	0.25mm
Capillary	300µm	1 - 10µl/min	0.25mm



PAL Cheminert PEEK Valve

### Metal free Injection Valve

Some LC analyses require an inert, metal free solvent/sample path (e.g. bioanalysis, Ion chromatography). For such applications a metal free LC Injection Valve is available. The inert valve kit consists of a 6-port Cheminert flat plate rotary valve with PAEK stator, a 20 µl PEEK sample loop, a PEEK needle guide and 6pcs. PEEK fittings/ferrules 1/16 inch.



# HPLC Valve Options

## Order details PAL Valve Drive Options

### PAL 4VlvDrv-DC6

PAL 4 Valve Module consisting of:  
 4 pcs Valve Drives  
 4 pcs VICI Valco 6-port valves type WK  
 4 pcs Sample loops 20µl  
 1 pc Solvent manifold  
 1 set PEEK tubing kit including PEEK fittings  
 1 set Electrical connection cables  
 1 pc Power supply 100-240 Volt  
 (compatible with HTS and HTC PAL)

### PAL MuxKit

Kit for Micromass MUX™ Interface consisting of:  
 4 pcs Check valve for waste port

### PAL SelVlv

8-port Selector valve consisting of:  
 1pc 8-port Selector valve C5F  
 4pcs Teflon tubing waste lines  
 1pc Valve Drive  
 1pc Electrical connection cable

### PAL 3VlvDrv

PAL 3 Valve Drive Module consisting of:  
 3 pcs Valve Drive with bracket  
 1 pc Needle guide  
 3 pcs Needle seals  
 1 pcs Teflon tubing waste line  
 1 set Electrical connection cable  
 1 pc Power supply 100-240 Volt  
 (requires LC Valves, type DCxWK or C2V)

### PAL 1VlvDrv

PAL Single Valve Drive Module consisting of:  
 1 pc Valve Drive with bracket  
 1 pc Needle guide  
 3 pcs Needle seals  
 1 pcs Teflon tubing waste line  
 1 set Electrical connection cable  
 1 pc Power supply 100-240 Volt  
 (requires LC Valves, type DCxWK or C2V)

### PAL VlvDrv

Valve Drive for LC valve type DCxWK  
 (without Valve)

### PAL C2VDrive

Valve Drive for LC valve type C2V  
 (without Valve)

## Order details PAL Valves

### DC10WK

LC-Valve 10 Port, 5000 psi 50°C, Type WK  
 (requires PAL VlvDrv, PAL 1VlvDrv or PAL 3VlvDrv)

### DC6WK

LC-Valve 6 Port, 5000 psi 50°C, Type WK  
 (requires PAL VlvDrv, PAL 1VlvDrv or PAL 3VlvDrv)

### DCI4WK.5/1

LC-Valve 4 Port, 5000 psi 50°C, Type WK  
 Internal sample loop 0.5/1.0 µl  
 (requires PAL VlvDrv, PAL 1VlvDrv or PAL 3VlvDrv)

### C2V-1006D-CTC 6-port

Cheminert Injection Valve 0.25mm bore (microbore)  
 including 10µl sample loop 0.025mm ID  
 (requires PAL C2VDrive, PAL 1VlvDrv or PAL 3VlvDrv)

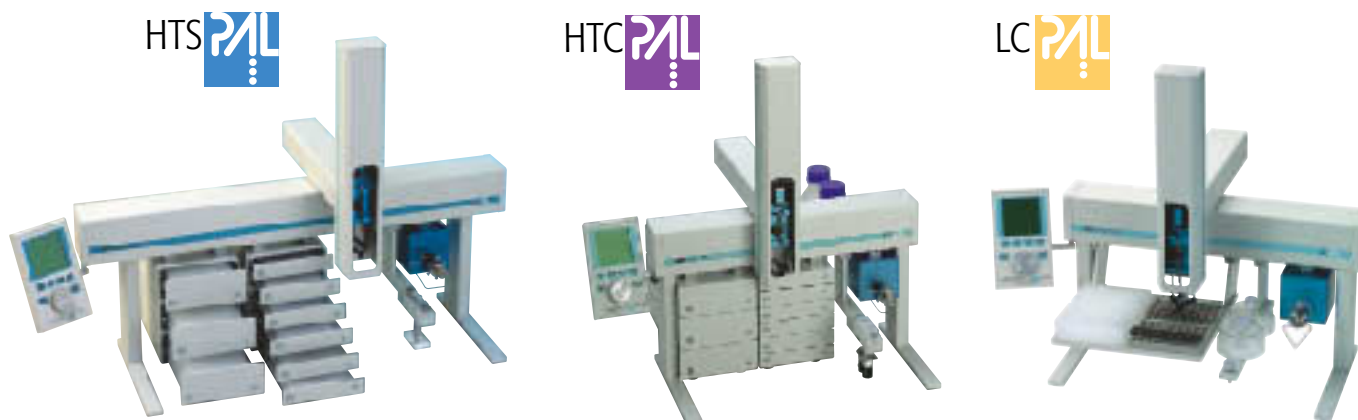
### C2V-2006D-CTC

6-Port Cheminert Injection Valve 0.40 bore (standard)  
 (requires PAL C2VDrive, PAL 1VlvDrv or PAL 3VlvDrv)

### C2V-2346D-CTC

PEAK Injection Valve consisting of:  
 1pc 6-port Cheminert injection valve, 5000psi, 75°C  
 1pc PAEK stator incl. 6 pcs. PEEK fittings/ferrules  
 1pc Sample loop 20ml PEEK  
 1pc Needle guide PEEK  
 (requires PAL C2VDrive, PAL 1VlvDrv or PAL 3VlvDrv)

## ...PAL LC sample injection systems



Distributed by:

CTC Analytics has dedicated the last 10 years to the continued development and high reliability of advanced sample injection technology. To learn more about the unique PAL Series of LC/LC-MS sample handling systems or any of our GC/GC-MS sample injection systems contact your CTC Analytics distributor.

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