Clean LC-MS Sample Loading

Your LC-MS should detect everything…
…except carryover!

Clean LC-MS

High Throughput Screening

Environmental, Food Forensics Applications

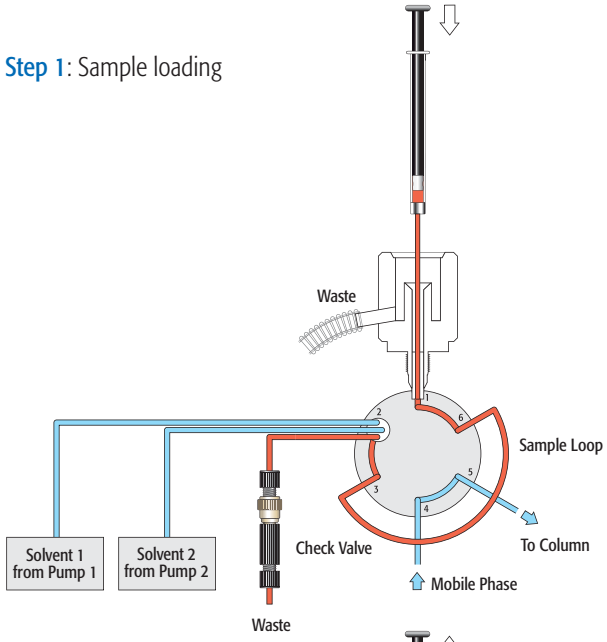
Preclinical Research Metabolomics

Drug Metabolism Pharmacokinetics

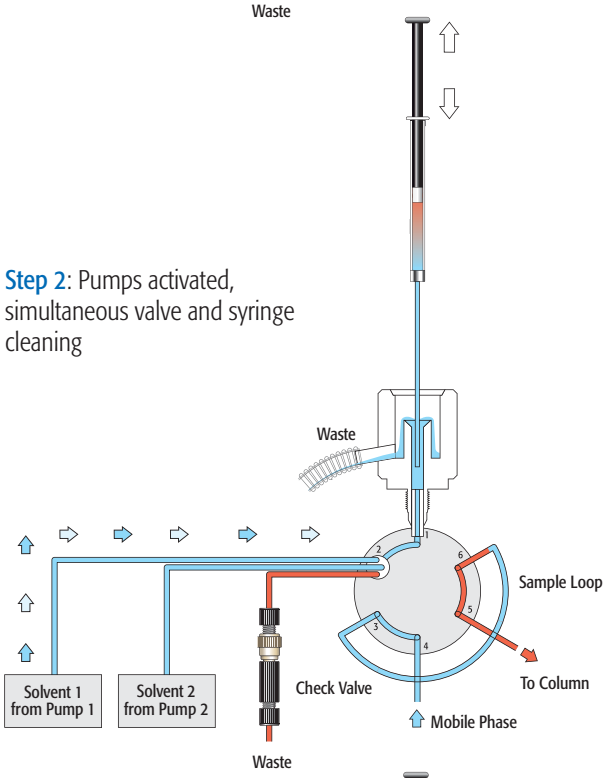
Proteine Biomarker Discovery

- Active WashStation for entire flow path cleaning in backflush direction. Rinses valve engravings, needle seal and syringe
- High throughput, cleans valve and syringe at the same time
  Upgradable to any existing HTS PAL or HTC PAL
- Integrated pumps for active wash solvent delivery
  Selectable wash cycle time for organic and aqueous solvents
- High performance ***X***-Type syringe, glass barrel inner surface polished and sealed for inertness
- Deactivated syringe needle by extremely smooth inorganic glass layer, prevents metal contact

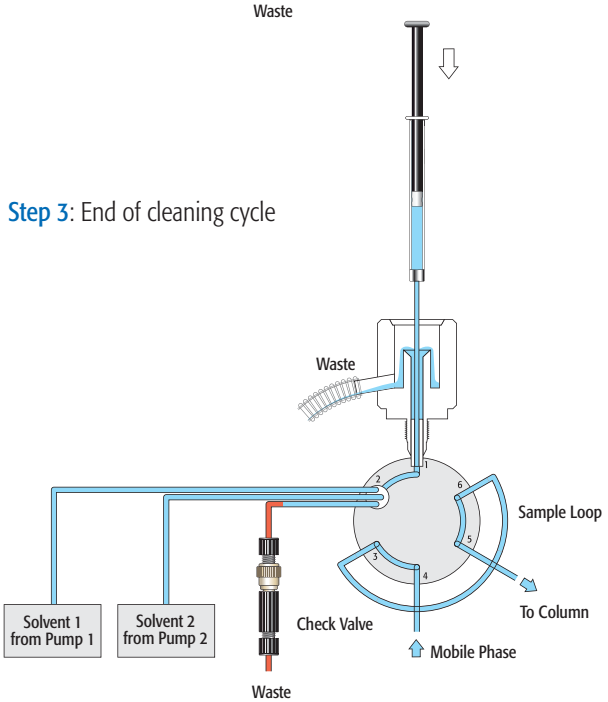
Step 1: Sample loading



Step 2: Pumps activated, simultaneous valve and syringe cleaning



Step 3: End of cleaning cycle



Recent developments in Mass Spectrometer technology increased the sensitivity of LC-MS systems to levels never seen before. Detection limits decrease constantly and sample carryover becomes an issue in almost any high performance LC-MS system. One component of these systems are autosamplers which may contribute their part to sample carryover. Looking at the flow path from top to bottom, carryover can occur in the syringe, valve inlet, valve rotor, tubing connections, rotor, stator or tubing material, column inlet frit (clogging), column packing, and finally also in the detector.

CTC Analytics adopted several different measures to address the above described issue for it's LC product line. For sample handling ***X***-Type syringes are available which show a significantly lower carryover for difficult samples than regular syringes (read more on page 3).

As an additional improvement a new type of syringe/valve cleaning device called "Active Washstation" is available. The Active Washstation consists of two self priming PTFE micro pumps mounted next to the valve drive, a special needle guide assembly and a tubing set including check valve. The IN ports of the pumps are connected to the wash solvent bottles. The OUT ports are connected to the waste port of the injection valve. After sample loading and valve switch the pumps are activated. Cleaning solvent flows through the valve groove, the inside of the needle seal and is aspirated with the injection syringe. After the selected syringe cleaning time the injection syringe needle is lowered and the remaining sample between valve waste port and check valve is flushed. As with the regular CTC Fast Washstation two different solvents can be used. (e.g. organic and aqueous).

The Active Washstation setup enables entire sample flow path cleaning in backflush direction and rinses valve engravings, needle seal and syringe at the same time. It can be ordered optionally together with new instruments or as upgrade to existing HTS PAL / HTC PAL's.

Ordered together with new instruments

Part no.	Description
PAL WashActive-22	1pc Washstation 1pc Pump holder incl. 2 micropumps 1pc Electrical connection cable 1pc Teflon tubing kit incl. check valve 2pc 1 liter Wash solvent bottles 2pc Tube sets incl. PEEK solvent filter 10µm 1pc CD-ROM (requires PAL HTS9 or PAL HTC9)

Ordered as an upgrade to an existing HTS PAL or HTC PAL

Part no.	Description
PAL WashActive-22Upgrd	1pc Washstation 1pc Pump holder incl. 2 micropumps 1pc Electrical connection cable 1pc Teflon tubing kit incl. check valve 1pc CD-ROM

Adjustable plunger, protects plunger tip from squeezing

Colour coded flange indicating needle gauge and internal diameter

Plunger stem sealed with temperature and solvent stable material

Glass barrel inner surface polished and sealed for inertness. Stable against organic solvents, acids and base

New inert plunger tip polymer with significant longer lifetime

Direct needle fixation to barrel
No sample contact with glue or cement

Deactivated needle by extremely smooth inorganic glass layer, prevents metal contact. Stable against organic solvents, acids and base

X-Type feature overview

X-Type syringes available in various sizes

The changes in LC-MS applications, driven by the life science, proteomics and screening market, forced the manufacturers to take a second look at established analytical tools. In these application segments as many injection cycles are gone through in one night as used to be done in a month or more. An injection every 30 seconds is not just one syringe plunger cycle. Including the fill strokes and wash cycles, there are 5 to 10 strokes per sample. Such a pace is very stressful for a device that was invented almost 60 years ago. The new design and the careful selection of new materials for CTC's ***X***-Type syringe enhanced the lifetime of the syringe plunger up to 100'000 strokes without any loss of leak tightness. The extended syringe lifetime enables true 24 hour nonstop high throughput analysis for your LC-MS assay.

Today's Mass Spectrometer can easily handle a linear dynamic range of 10^6 or even more. This feature right away suggests a new approach of measuring carryover. A highly concentrated standard is injected (upper limit of quantification, ULOQ), followed by a blank. The carry-over should be significantly below the lower limit of quantification (LLOQ). This comparison gives the analyst an indication as to whether the results in the lowest-level range can be reliably used for quantification or not. The first device which is in contact with the sample is always the syringe. Clearly, any effort to improve the syringe has to include the challenging task of eliminating carryover as much as possible. The ***X***-Type syringe showed that carryover with critical compounds like phospholipids, proteins or basic molecules could be reduced by a factor of 5 to 10. These results are outstanding. Any remaining carryover can not be attributed directly to the syringe anymore.

X-Type syringes are exclusively available through CTC Analytics AG in 25µl, 50µl and 100µl volume sizes.

Part no.	Description
PAL SyrLCX25µl	Kit LC X-Syringe 25µl 1 pc syringe adapter incl. plunger holder 2 pc syringe SYRX G25-22S-3
PAL SyrLCX50µl	Kit LC X-Syringe 50µl 1 pc syringe adapter incl. plunger holder 2 pc syringe SYRX G50-22S-3
PAL SyrLCX100µl	Kit LC X-Syringe 100µl 1 pc syringe adapter incl. plunger holder 2 pc syringe SYRX G100-22S-3
PAL SyrLCX100µl-22	Kit LC X-Syringe 100µl 1 pc syringe adapter incl. plunger holder 2 pc syringe SYRX G100-22-3
SYRX G25-22S-3	Syringe X-type gastight 25µl Fixed needle, gauge 22S,Pointstyle 3
SYRX G50-22S-3	Syringe X-type gastight 50µl Fixed needle, gauge 22S,Pointstyle 3
SYRX G100-22-3	Syringe X-type gastight 100µl Fixed needle, gauge 22, Pointstyle 3 (fast aspiration speed)
SYRX G100-22S-3	Syringe X-type gastight 100µl Fixed needle, gauge 22S,Pointstyle 3 (low dead volume)
PLG X25	3 pcs. Replacement plunger for SyrLCX 25
PLG X50	3 pcs. Replacement plunger for SyrLCX 50
PLG X100	3 pcs. Replacement plunger for SyrLCX 100

PAL SYSTEMS

HTX PAL — High End System XL

HTS PAL — High End System

HTC PAL — Mid Range System

LC PAL — Entry Level System

PAL LC Versions General Specifications

System Type
XYZ robot with syringe only concept, no tubing in sample path

Local User Interface
Control panel with 4 function keys, graphical LCD display,
unique scroll knob for teach functions

Remote Control
Cycle Composer control software Windows 2000 / XP
Third party instrument drivers for all major LC/LC-MS Systems

Maintenance
Accessibility to all maintenance parts from front
Preventative maintenance kits and IQ/OQ documents available

Electrical Control
up to 2x RS232
up to 3x TTL Input
up to 2x Opto Coupler Inpu
up to 2x Relay Outputt

Power Requirements
100-240V, 120W, 50/60Hz

Electrical Safety Standards
CAN/CSA C22.2 No. 61010-1 / ANSI/UL 61010-1 / EN 61010-1

Environment
4°C - 40°C constant temperature, < 80% humidity (non condensing)

Weight
~ 10kg (without accessories)

Sample Capacity*

up to	1400	1ml micro vials
	1296	2ml vials
	224	10ml or 20ml vials
	24	deepwell microplates (96/384 wells)
	24	standard microplates (96/384 wells)

(* depends on PAL model)

Third Party Instrument Drivers
Drivers are available either through CTC Analytics or the instrument vendor

Agilent ChemStation
Agilent EZChrom
Applied Biosystems Analyst
Bruker Daltonics Compass
DataApex Clarity
Dionex Chromeleon
Justice Software Chromperfect
Shimadzu LCMSsolution
Shimadzu LCSolution
Thermo Xcalibur
Varian Galaxie
Waters Masslynx
Waters Empower

Instrument Options
PAL MALDI Spotter / Fraction Collection
PAL Dilutor
PAL Multi Valve Drives
PAL Sample StackCooler / TrayCooler
4- 6- 10- port Injection and Switching Valves
UPLC Injection Valves up to 1000 bar / 15'000psi
PAL Column Selector Valve
PAL Barcode Reader

Specifications are subject to change without notice

PAL LC Sample Injection Systems
perfect sample loader for leading Mass Spectrometers




Distributed by:

CTC Analytics has dedicated the last 20 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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Where design meets performance

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ISO 9001 SQS

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