



Prep and Load Platform

# DLW Option

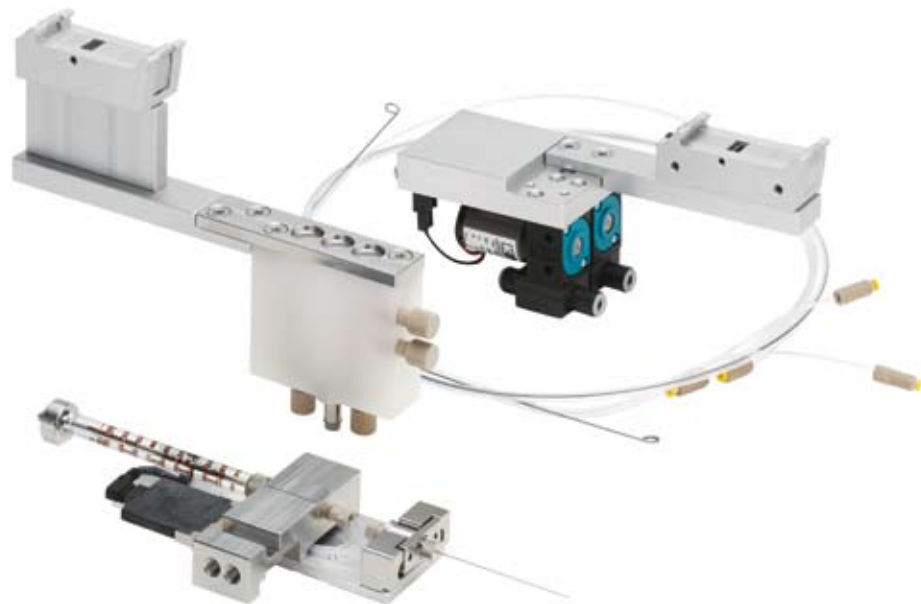
DLW – Fast and Clean  
LC/MS Loading



High Throughput Screening  
Environmental, Food Safety, Forensics  
Preclinical Research, Metabolomics  
Drug Metabolism, Pharmacokinetics  
Protein Biomarker Discovery



DLW wash station



DLW Upgrade kit including Syringe set, Pump and Wash Station

## Specifications DLW Option

Wetted parts material:	Stainless steel, PEEK
Syringe Size:	100µl
Reproducibility (partial loop):	better than 1 % RSD (under specific conditions)
Carry over:	Typically less than 0.003% (30ppm)
Typical Clean Cycle Time:	less than 1 Minute (Fast Cycle)

## Near Zero Carryover – Fast Cycles and exceptional reproducibility

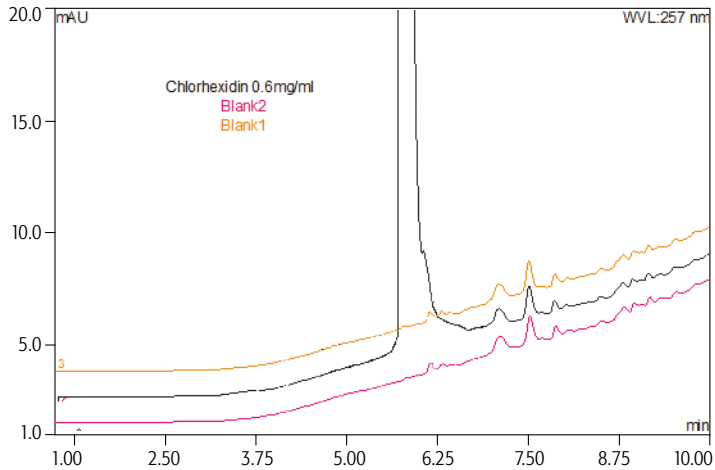
Today's Mass Spectrometers are so sensitive that carryover becomes an issue again. To meet today's requirements for fast, clean and reproducible LC/MS injection; CTC developed the DLW Option for the PAL system (Dynamic Load and Wash).

Now the sample is no longer in contact with the syringe but it is aspirated into a holding loop. The syringe only acts as an aspirator and dispenser device in order to exactly measure the amount of sample which needs to be injected. This yields to excellent reproducibility. After injection, the whole sample path including the valve and the needle is washed from the rear with up to 2 different solvents. Active micro pumps deliver the required quantity of solvent fast and reliable. An active solenoid valve precisely stops solvent delivery or switches between solvents. At the end of the injection cycle all parts which have been in contact with the sample are completely clean. As a result, near-zero carryover is achieved for most components.

## Carryover Results UV and MS

These tests show the excellent performance of the DLW in both UV and MS mode.

### Carryover Test UV: Less than 30ppm carryover (Chlorhexidine)

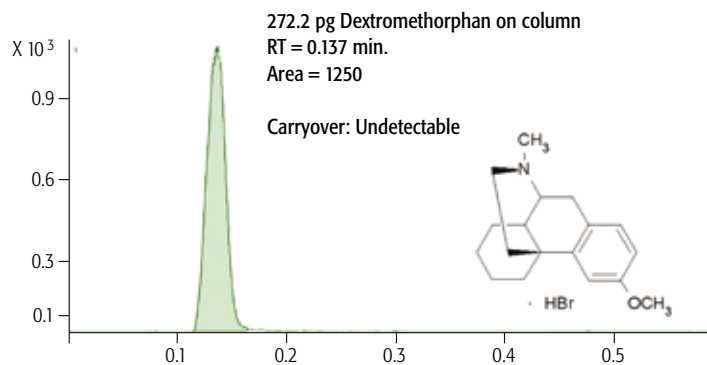


#### Conditions for UV carryover test

Column:	Halo C18 2.1x50mm, 2.8 $\mu$ m
Flow:	0.5ml/min
Injection:	Full Loop 2 $\mu$ l (PEEK)
Eluent:	A: H <sub>2</sub> O + 0.1% TFA / B: Acetonitrile + 0.1% TFA
Gradient:	10%B (0.5 min) – 10% to 90% B (7.5 min) – 90% B (1 min)
Wash1:	H <sub>2</sub> O + 0.1% TFA
Wash2:	Acetonitrile + 0.1% TFA
Detection:	UV, 257nm

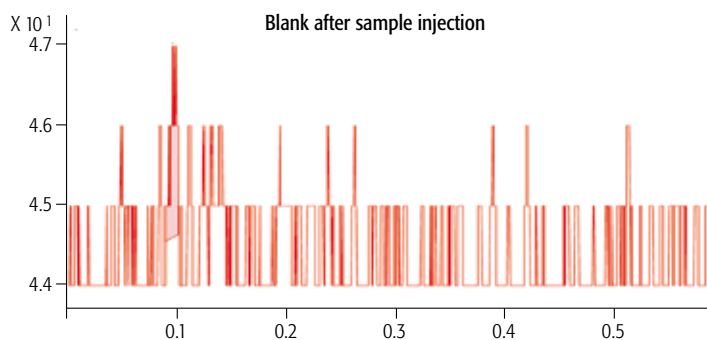
Injection of 1200 ng Chlorhexidine on column; followed by 2 blank injections using the new DLW option. Less than 0.003% (30ppm) of carryover could be detected.

### Carryover Test MS: No Carryover detected (Dextromethorphan)

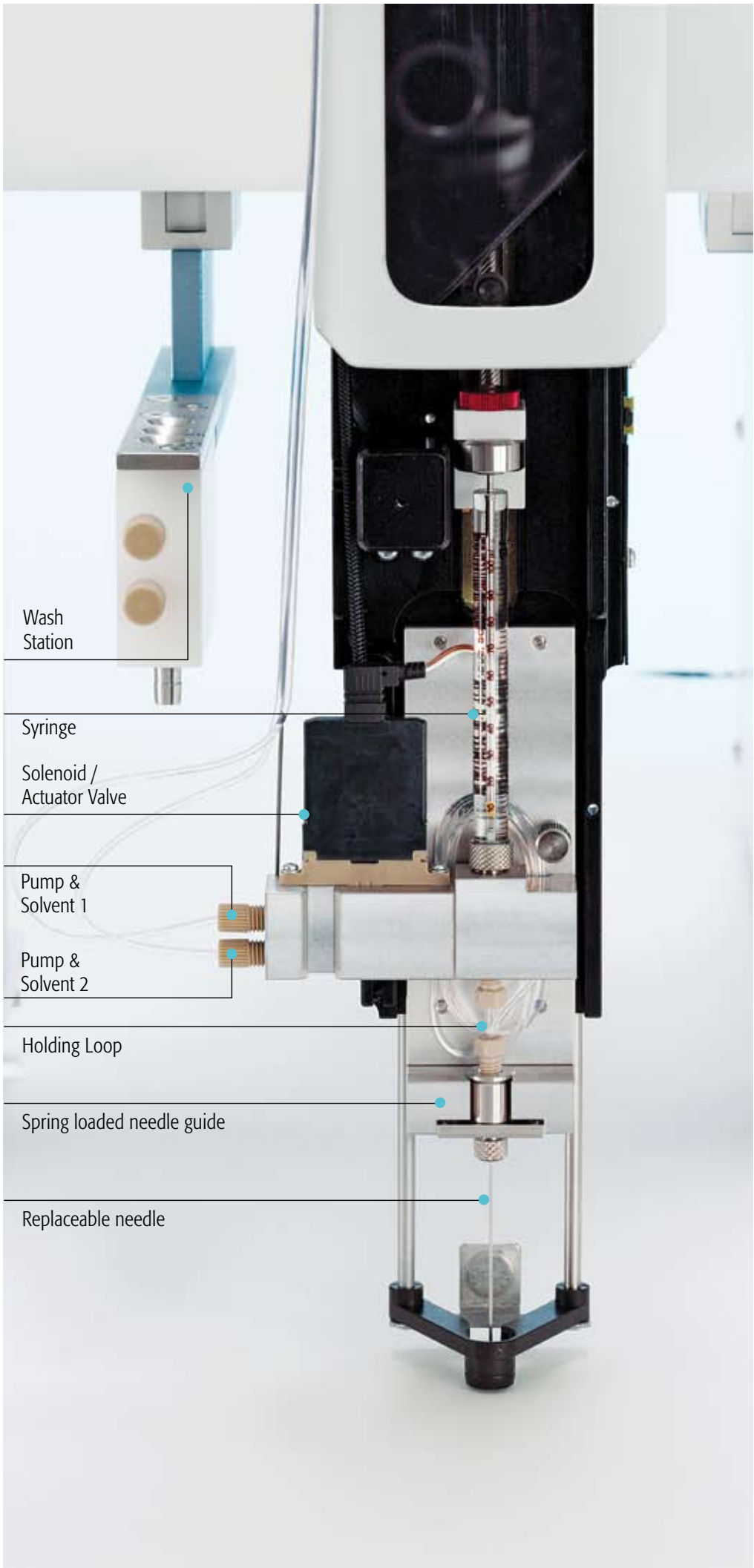


#### Conditions for MS carryover test

Flow:	0.8 ml/min
Injection:	Full Loop 2 $\mu$ l
Eluent	Isocratic: 40% A (H <sub>2</sub> O+0.1% TFA) & 60% B (Acetonitrile+0.1% TFA)
Wash1:	H <sub>2</sub> O + 0.1% TFA
Wash2:	Acetonitrile + 0.1% TFA
Detection:	MS (Agilent 6460 QQQ LC-MS/MS) +MRM: m/z 272.2 à m/z 215.2)
Dwell Time:	20ms
Interchannel delay:	3.5 ms
Cycle time =	50 ms



Injection of 272.2 pg Dextromethorphan on column; followed by blank injection  
No carryover could be detected.  
MS Data provided by Agilent Technologies.



Wash Station

Syringe

Solenoid /  
Actuator Valve

Pump &  
Solvent 1

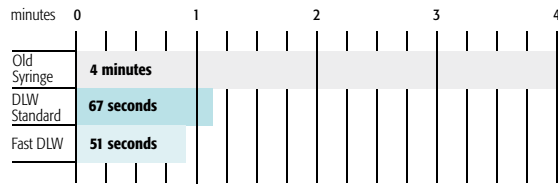
Pump &  
Solvent 2

Holding Loop

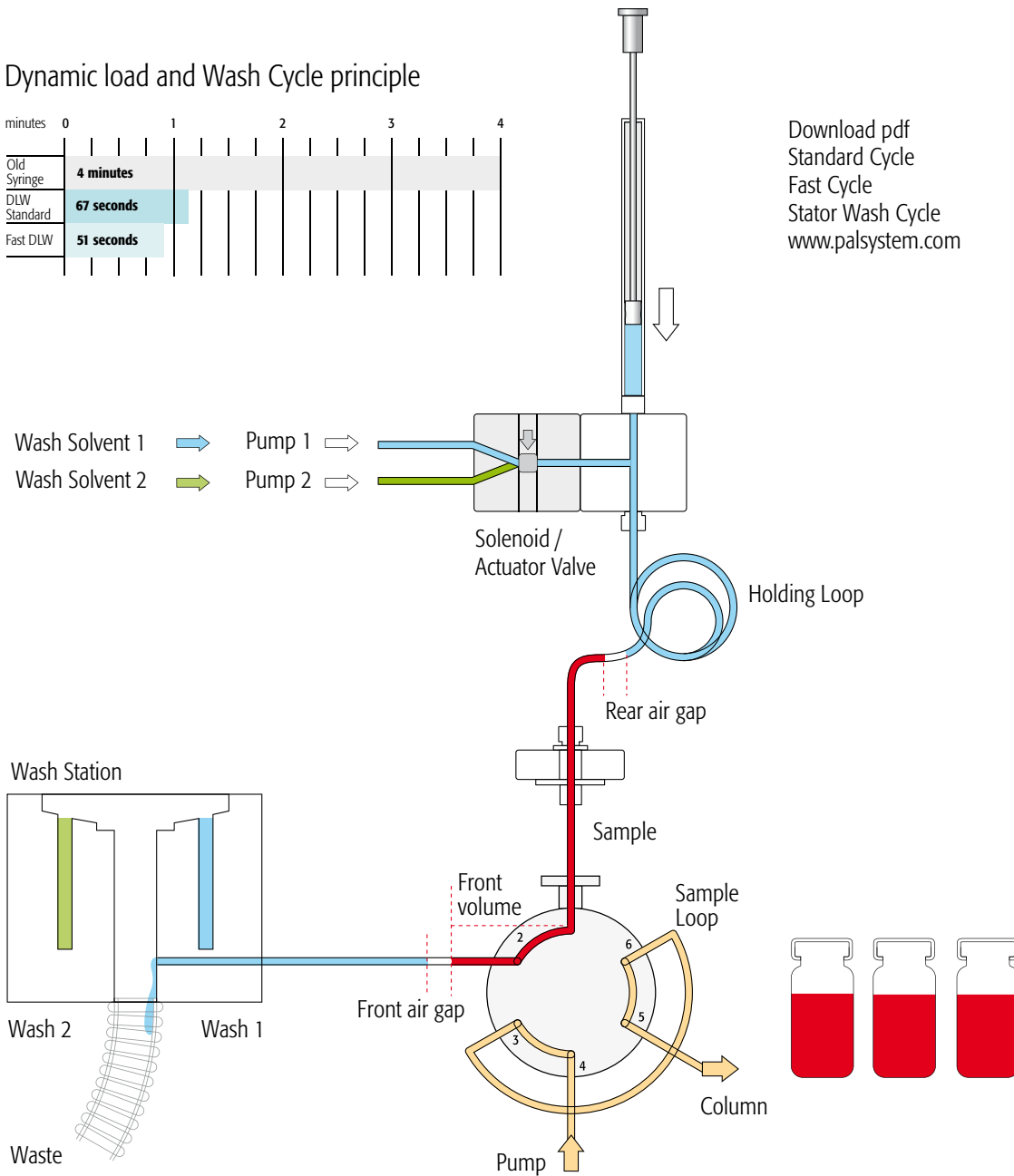
Spring loaded needle guide

Replaceable needle

# Dynamic load and Wash Cycle principle



Download pdf  
 Standard Cycle  
 Fast Cycle  
 Stator Wash Cycle  
[www.palsystem.com](http://www.palsystem.com)



## DLW Standard Cycle

### cycle start

1. aspirate rear air segment
2. get sample aspirate rear, inject and front volume.
3. aspirate front air segment
4. passive needle clean outside in wash position 1
5. dispense front air segment and front sample volume to waste
6. valve to load position and load inject volume
7. valve to inject position and start chromatography
8. dispense rear sample and air segment to waste
9. valve clean with wash liquid 2
10. active needle wash with wash liquid 2
11. valve clean with wash liquid 1
12. active needle wash with wash liquid 1

### cycle end

## DLW Fast Cycle

### cycle start

1. aspirate rear air segment
2. get sample aspirate rear, inject and front volume.
3. aspirate front air segment
4. dispense front air segment and front sample volume to waste
5. valve to load position and load inject volume
6. valve to inject position and start chromatography
7. dispense rear sample and air segment to waste
8. valve clean with wash liquid 2
9. valve clean with wash liquid 1
10. active needle wash with wash liquid 1

### cycle end

## LC/LC-MS General Specifications

### System Type

XYZ robot with injection unit

### 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 major LC/LC-MS Systems

### Maintenance

Accessibility to all maintenance parts from front  
Preventative maintenance kits available

### Electrical Control

1x RS232 / 1 x LAN (with optional PAL-xt Electronics)  
3x TTL Input  
2x Opto Coupler Input  
2x Relay Output

### Power Requirements

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

### Environment

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

### Weight

~ 10kg (without accessories)

### Electrical Safety Standards

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

### Sample Capacity\*

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

(\* depends on PAL model)

### 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

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.

## Ordering details

### PAL DLW-HTS-xt

DLW Option including HTS-xt Upgrade Kit  
1 pc DLW Injection Adapter with sample holding loop and syringe 100µl  
1 pc Wash Station  
1 pc Wash Solvent Pump Station with 2 active micro pumps  
2 pcs 1 Liter Wash Solvent bottles  
2 pcs Solvent bottle transfer line including PEEK solvent filter 10µm  
1 pc System CD ROM DLW including Cycles  
1 pc Manual DLW Option  
1 pc Kit HTS-xt (Control Board-xt for PAL System - Firmware 4.0.X)  
**Choose this kit if you want to upgrade an existing HTS PAL to the DLW Option**

### PAL DLW-HTC-xt

DLW Option including HTC-xt Upgrade Kit  
1 pc DLW Injection Adapter with sample holding loop and syringe 100µl  
1 pc Wash Station  
1 pc Wash Solvent Pump Station with 2 active micro pumps  
2 pcs 1 Liter Wash Solvent bottles  
2 pcs Solvent bottle transfer line including PEEK solvent filter 10µm  
1 pc System CD ROM DLW including Cycles  
1 pc Manual DLW Option  
1 pc Kit HTC-xt (Control Board-xt for PAL System - Firmware 4.0.X)  
**Choose this kit if you want to upgrade an existing HTC PAL to the DLW Option**

### PAL DLW Option\*

DLW Option for fast and clean LC Cycles  
1 pc DLW Injection Adapter with sample holding loop and syringe 100µl  
1 pc Wash Station  
1 pc Wash Solvent Pump Station with 2 active micro pumps  
2 pcs 1 Liter Wash Solvent bottles  
2 pcs Solvent bottle transfer line including PEEK solvent filter 10µm  
1 pc System CD ROM DLW including Cycles  
1 pc Manual DLW Option  
requires but does not include xt-Upgrade for PAL and Firmware 4.0.X  
**Choose this kit if your PAL is already equipped with the xt-Upgrade**

\* only if HTS/HTC is equipped with xt Upgrade

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- Clean and efficient removal of carryover in the entire flow path
- Holding loop for effective rinsing of the complete sample path
- Integrated pumps for active wash solvent delivery  
selectable wash time for organic and aqueous solvents
- Spring loaded syringe needle positioning in  
needle guide – no dead volume
- Existing PAL Systems can be upgraded
- X-Type Syringe based



**PAL** SYSTEM

[www.palsystem.com](http://www.palsystem.com)