

# Advanced Automation and Sample Introduction Systems

for PerkinElmer™ NexION™ 1000/2000 ICPMS



## NEW PRODUCTS FEATURED

### SampleSense *FAST* and prep*FAST*

SampleSense (Patent Pending) is a revolutionary valve for *FAST* and prep*FAST* systems that uses optical sensors to automatically sense and inject samples into NexION 1000/2000 ICPMS instruments to maximize productivity. (Pages 22-25)



### DXCi Autocorrecting Autosampler

DXCi autosamplers are the next generation of automation and productivity. They automatically realign – even if obstructed – correcting the probe position for all axes of motion. (Pages 4-7)

### prep*FAST* Systems

Automatically calibrates the ICPMS, autodilutes samples before analysis, and automatically dilutes overrange samples to bring them within the calibration range – all inline for ease of use and to avoid potential contamination. A full range of prep*FAST* systems are available for the NexION 1000/2000 ICPMS. (Pages 10-21)



### *pergo* 2000

Humidifies the nebulizer gas to prevent deposits in the nebulizer and improves stability. Highly recommended for clinical, environmental, and many other ICPMS applications. (Pages 66-67)

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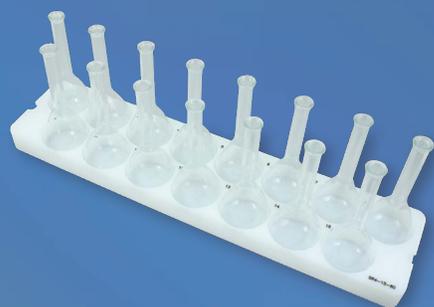
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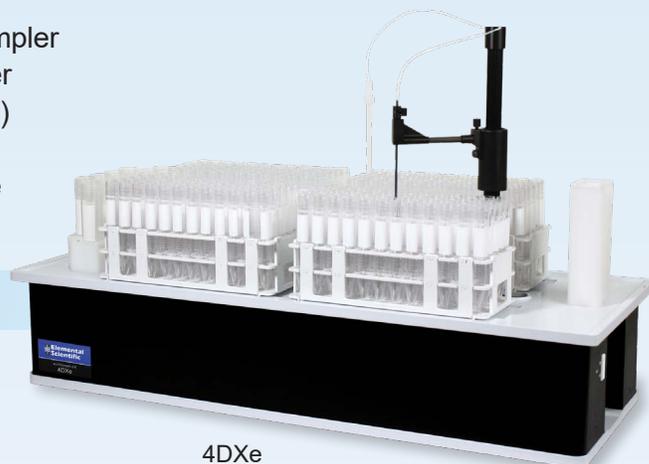
# DX-Series Autosamplers Support and Automate Every Inorganic Application

Elemental Scientific has the most complete range of autosampler offerings for metals analysis by ICP and ICPMS. Autosampler models range from the Micro DX autosampler (2 micro racks) to ultra-high sample capacity 14DX (14 large racks). These DX-autosampler models are now available with three feature sets to meet the needs of laboratories.

## DXe – Economical

Autosampler with superior features at a competitive price:

- Durable dual rail system
- Dual flowing rinse stations
- Precision sampling
- Reset probe – prevents probe damage
- Flexible rack configurations

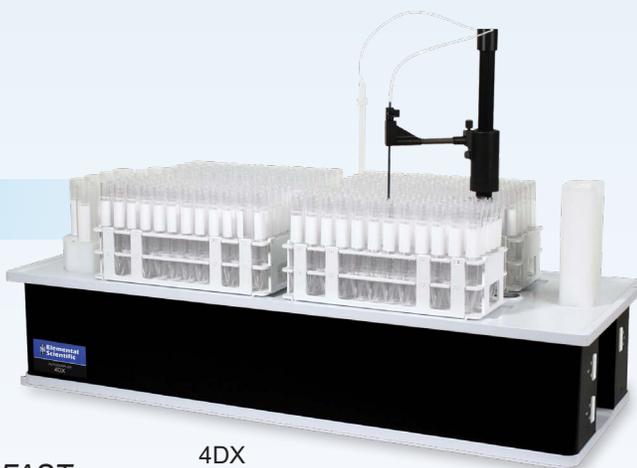


4DXe

## DX – FAST Ready

Includes the features of the DXe autosamplers **PLUS**:

- **Independently pumped** dual flowing rinse stations
- High throughput *FAST Ready*
  - Easily upgrade to *FAST* or SampleSense *FAST*
- Autodilution prep*FAST Ready*
  - Easily upgrade to prep*FAST* or SampleSense prep*FAST*

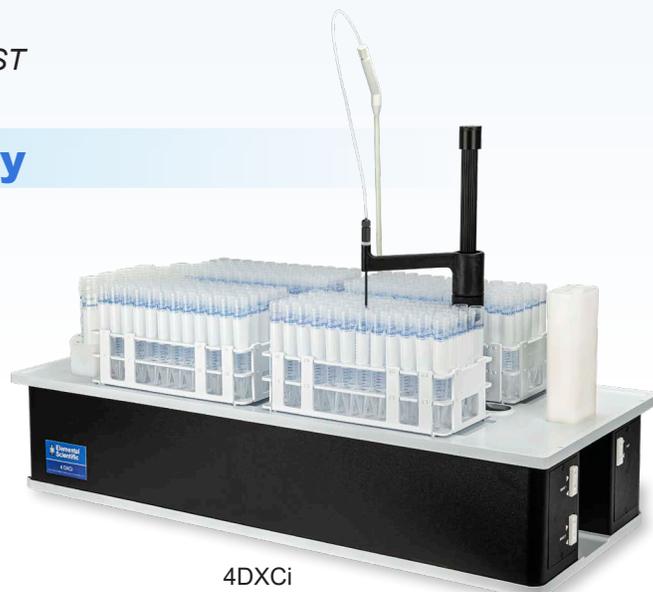


4DX

## DXCi – Autocorrecting *FAST Ready*

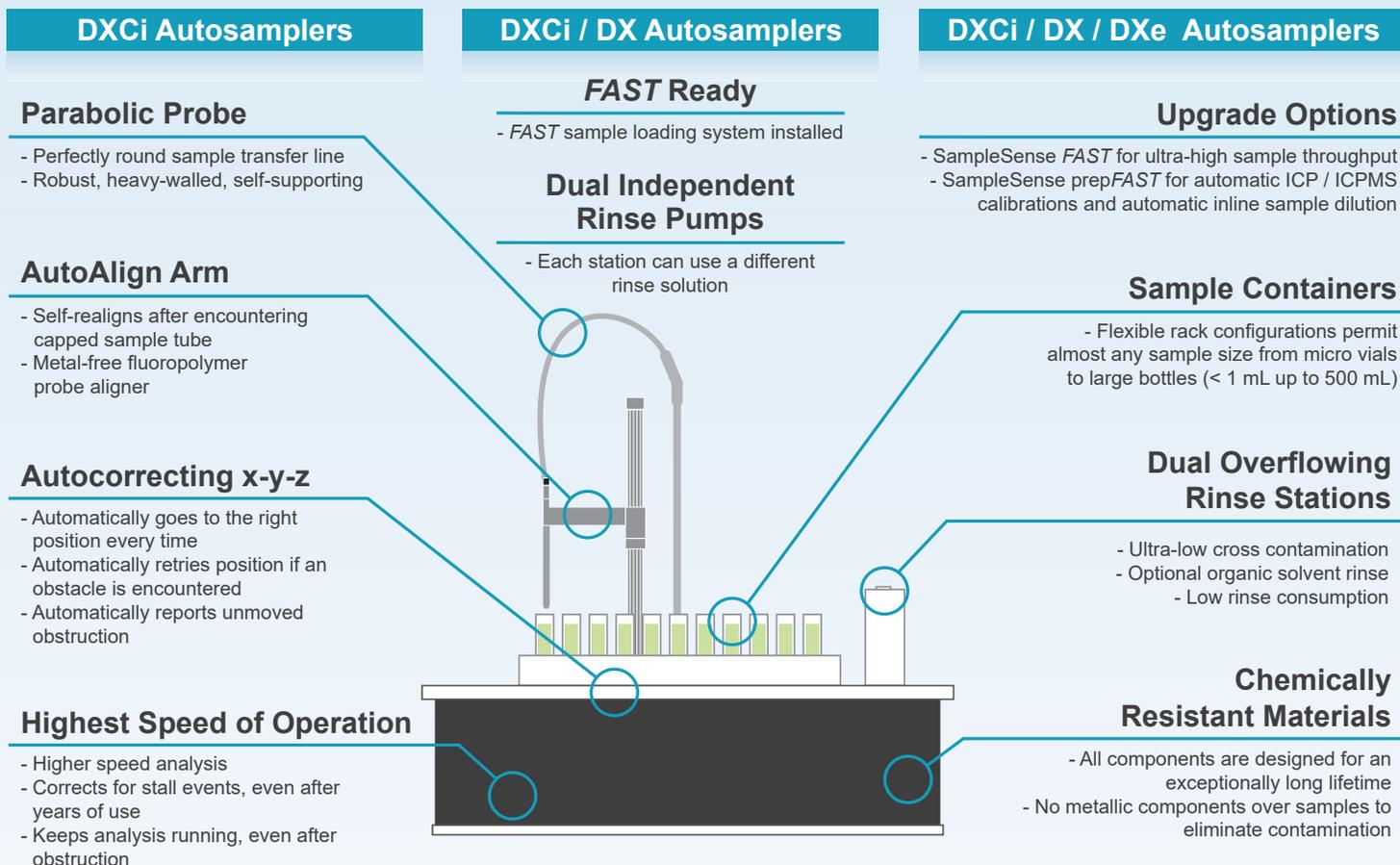
Includes the features of the DX autosamplers **PLUS**:

- High throughput intelligent position autocorrection
- Automatically goes to the correct sample position, even if accidentally obstructed
  - E.g. when an analyst blocks the autosampler movement while adding samples into an active analytical run
- Higher speed operation
  - Enhanced productivity
- Reports obstructions to instrument software
- AutoAlign Arm – Inert fluoropolymer probe holder (metal free)
- Septum piercing option available
- Parabolic probe – Anti-kinking probe
- High accuracy – Optimal for microplates and small samples



4DXCi

## DX-Autosamplers Features Diagram



# DXCi

the **ONLY AUTOSAMPLER**

that automatically

**CORRECTS** the probe

**Position**

even when **Obstructed!**



See it in Action!

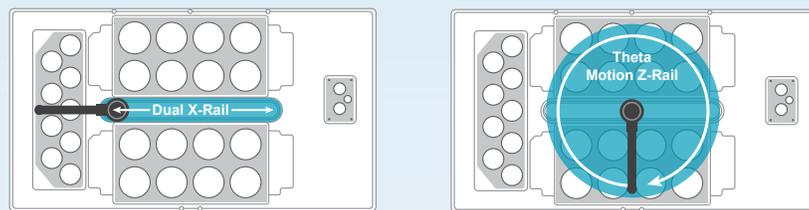
<http://www.icpms.com/products/autosampler-list-dxci.php>

DXe, DX and DXCi Hardware Configurations			
Hardware	DXe	DX	DXCi
Dual Flowing Rinse Stations	1	1	1
Rinse Pump	1	2	2
FAST Vacuum Pump	-	1	1
AutoAlign Arm	-	-	1
Parabolic Probe	-	-	1
X-Y-Z Autocorrecting	-	-	1

# DX-Autosampler Benefits

## Engineered for Precision and Durability

All DX-autosamplers are designed for the trace metal lab. They utilize a Dual X-rail design combined with a large diameter Z-rail with theta angular motion for precise sampling. All DX components are constructed using chemically resistant materials for an exceptionally long lifetime.

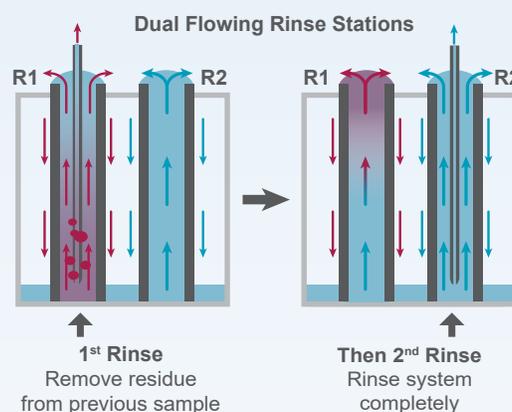


MicroDX autosampler shown

## Dual Rinse Stations Reduce Carryover and Cross Contamination

Eliminating carryover is vital for accurate data and paramount to the production laboratory.

All DX-autosamplers have adjustable dual overflowing rinse stations to minimize sample-to-sample carryover. Rinse liquid is supplied by an independent rinse pump split between two rinse station positions on the DXe models. With independent dual rinse pumps on the DX and DXCi models, each station can use a different rinse solution to effectively rinse wide-ranging sample types. The rinse pumps in all configurations supply solution only during the rinse events, significantly minimizing rinse solution consumption.

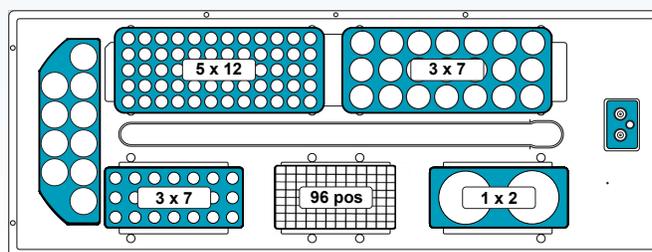


## DX-Autosamplers are Versatile and Upgradeable

DX-autosamplers are available in a range of sizes, with capacities from 2 micro racks to 14 large racks.

Flexible rack configurations permit almost any sample size, from micro vials up to 500 mL and larger bottles to be automatically analyzed.

All DX-autosamplers have the ability to upgrade to any FAST high-throughput or prepFAST autodilution system.



Versatile Rack Configurations

4DX shown with 5 x 12 and 3 x 7 large racks, 3 x 7 micro rack (MR), 96 well microplate, MR bottles - 2 x 250 mL

## Intelligently Finds Sample Position

The DXCi autosampler models automatically monitors and corrects positions for all axes of motion. When it experiences an accidental obstruction, the autosampler corrects the probe position. These unique capabilities permit the metal-free AutoAlign Arm to operate at the highest possible speeds and provide the highest accuracy for microplates and small sample volumes. Heavy-walled and self-supporting Parabolic Probe line resists kinking of the sample uptake line.



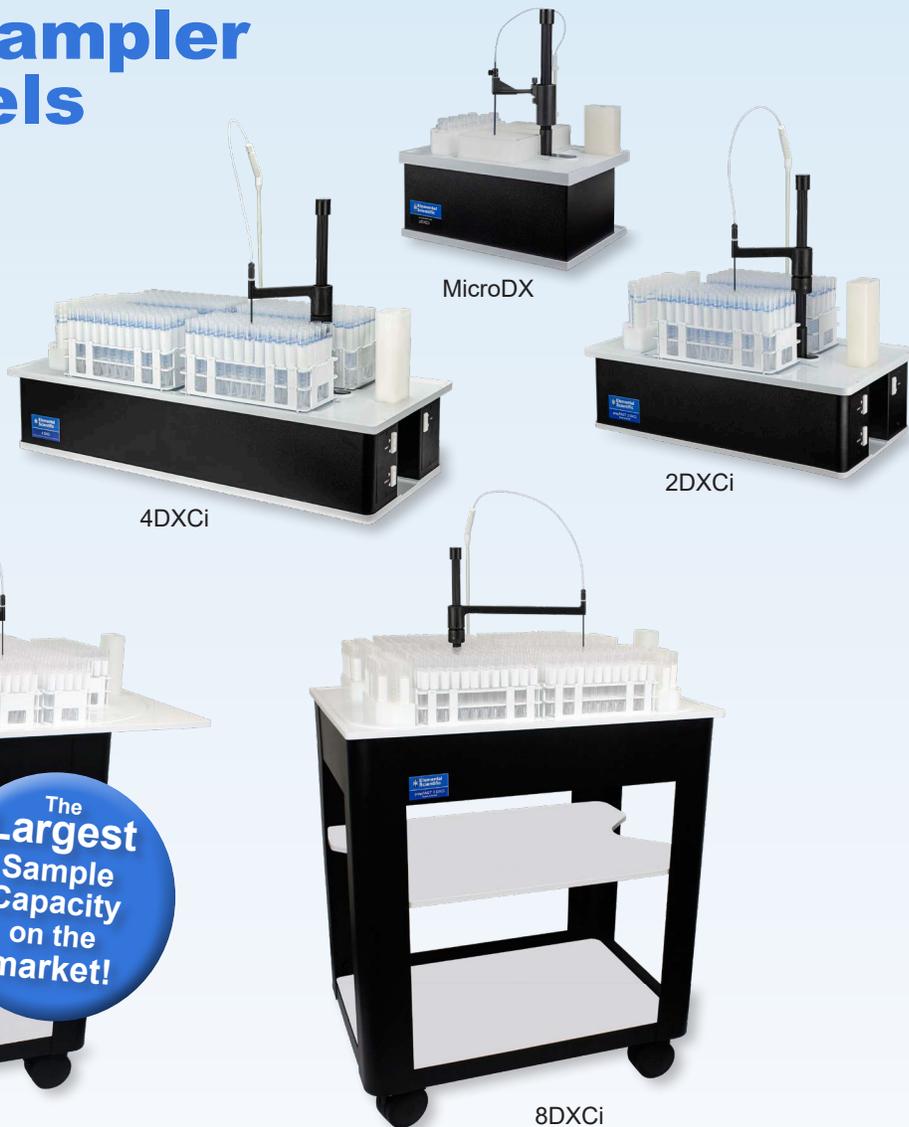
AutoAlign Arm and Parabolic Probe

# ESI DX-Autosampler Models

From **2** Micro Racks

**UP** To

**14** Large Racks



AUTOMATION

DX-Autosamplers Models	Part Number	Mobile Stand	Large Rack Capacity	Microplate/ Micro Rack Capacity	MAXIMUM SAMPLE CAPACITY			
					50mL	15mL	8mL	MT-96
MicroDX	m-DX	N/A	-	2	20	42	80	192
2DXe	2DXe	SC-1210-DX (optional)	2	4	52	120	180	384
2DX	2DX							
2DXCi	2DXCi							
4DXe	4DXe	SC-1410-DX (optional)	4	6	94	240	360	576
4DX	4DX							
4DXCi	4DXCi							
8DX Benchtop	8DX-BT	N/A	8	-	208	480	720	-
8DXCi Benchtop	8DXCi-BT							
8DX	8DX	Included	14	30*	304	840	1260	2880*
8DXCi	8DXCi							
14DX	14DX	Included	14	30*	304	840	1260	2880*
14DXCi	14DXCi							

\*Special version 14DX for microplates

# FAST SYSTEM

for NexION 1000/2000 ICPMS

The FAST is a high-throughput, automated sample introduction system for the NexION 1000/2000 ICPMS. The FAST system uses valve injection with rapid vacuum sample loading to more than double the productivity of the NexION ICPMS, minimize instrument maintenance, and reduce operating costs.

## FAST Benefits:

- High sample throughput
- FAST uptake, stabilization, and washout
- Specially-designed P-Series valve and loop combination has superb washout
- Options with and without segmented air bubbles ensures high precision for every application

## Improved Efficiency

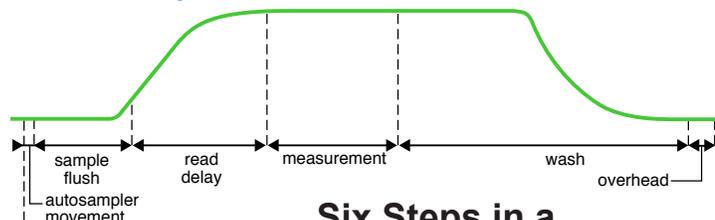
By presenting the sample for a short period of time during the measurement, ICPMS cone deposition is minimized, resulting in long stable analytical runs without maintenance. The FAST system reduces consumption of argon, power, and reagents.

## Increased Sample Throughput

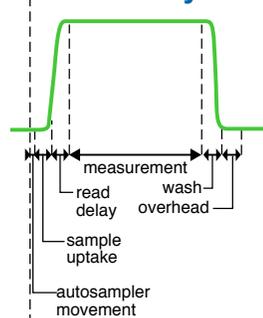
In addition to higher throughput gained by using an autosampler, the FAST system analyzes a sample 2-5 times faster than it takes a standard autosampler to perform the same task.

FAST also benefits labs with relatively few samples by reducing operating costs and shortening analytical runs.

### Normal Analysis



### FAST Analysis



### Six Steps in a Standard Analysis

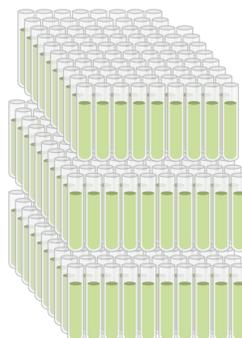
1. Autosampler Movement
2. Uptake
3. Stabilization
4. Measurement
5. Wash
6. Overhead



The FAST system has the fastest signal stabilization and most complete rinse-out of any sample introduction system. This reduces uptake and wash times while increasing sample throughput.



STANDARD ANALYSIS  
**96 SAMPLES**



FAST ANALYSIS  
**288 SAMPLES**

**2-5x** HIGHER SAMPLE THROUGHPUT  
WITH FAST SYSTEM  
DEPENDING ON APPLICATION

## Superior P-Series FAST Valve

- PFA rotors for long life and low maintenance
- Chemically resistant compression ring
  - Uniform pressure
  - Keyed for easy assembly
  - Prevents damage from overtightening
- All fluoropolymer flow path
- Internal components PTFE-coated to prevent corrosion
- In-valve mixing of internal standard (P7 valve)



P7 FAST Valve



Single Valve FAST DXi for NexION 1000/2000 ICPMS



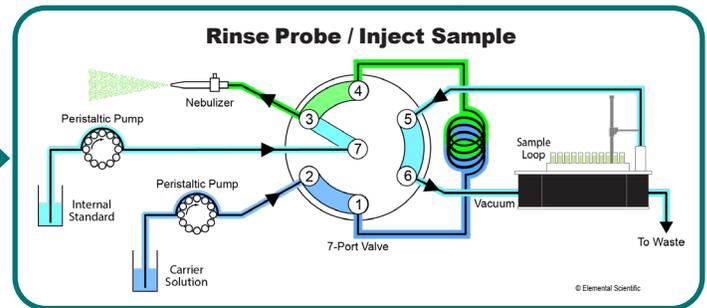
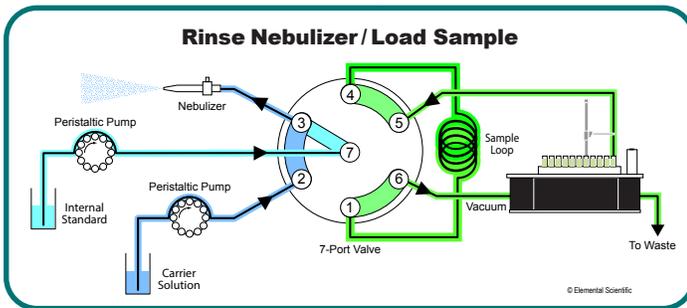
NexION 2000 ICPMS with FAST system

### FAST DXi:

- Integrated MP<sup>2</sup> peristaltic pump and FAST valve for the NexION 1000/2000 ICPMS
- High quality ceramic bearing peristaltic pump for long lifetime and high precision
- Upgradeable to prepFAST

The FAST loads the sample loop as the nebulizer and tubing are cleaned.

The autosampler probe and tubing are rinsed while the sample is analyzed.



### FAST SYSTEM PART NUMBERS FOR NexION 1000/2000 BC

Description	Nebulizer	2DX	4DX	8DX Benchtop	8DX	14DX
FAST Basic System for NexION 1000/2000 BC with DX Autosampler	✓	2DXF-64A	4DXF-64A	8DXF-BT-64A	8DXF-64A	14DXF-64A

See page 4 for more information on DX-autosamplers.

See page 22 for **SampleSense**  
**FAST** system

FAST with  
SampleSense Valve



# prepFAST™ Inline Dilution

## Variable Autodilution, Inline Autocalibration, and Overage Dilution

prepFAST automated inline dilution systems eliminate manual dilution, reduce reagent usage, and improve laboratory productivity. These systems combine the DX or DXCi autosampler, high-throughput FAST technology and a syringe module to perform precise and accurate inline dilutions of standards and samples.

### prepFAST Automates Daily Lab Functions

#### Autodilution

Samples are automatically inline syringe-diluted and prepared for analysis.

- Automatic inline dilution modes
  - Constant dilution (e.g. all samples diluted 10x)
  - Variable dilution (i.e. user-specified dilution factor sample-by-sample)
- Improve precision and accuracy
- Reduce vial and reagent usage
- Improve sample throughput and washout

#### Autocalibration

Automatically prepares ICPMS calibration standards

- Save time and improve laboratory efficiency
- Improve linearity, especially at low end of calibration curve
- Standards racks hold commercially available QC compliant standards.
- Save time and improve laboratory efficiency

#### Overrange Dilution

Automatically dilute and reanalyze samples having analyte concentrations above the calibration range.

- Autodilute overrange samples
- Automatic serial dilution brings even extremely high concentration samples into range
- Optimize laboratory throughput by generating reportable results from the initial sample run

### ESI Offers Three prepFAST Systems:

- prepFAST e – Economical two syringe dilution system; max dilution factor of 50x
- prepFAST – High-throughput dilution system with rapid washout; max dilution factor of 400x
- prepFAST M5 – High-throughput dilution system with ultimate washout and precision sample loading for viscous and small volume (<2-3 mL) samples; max dilution factor of 400x

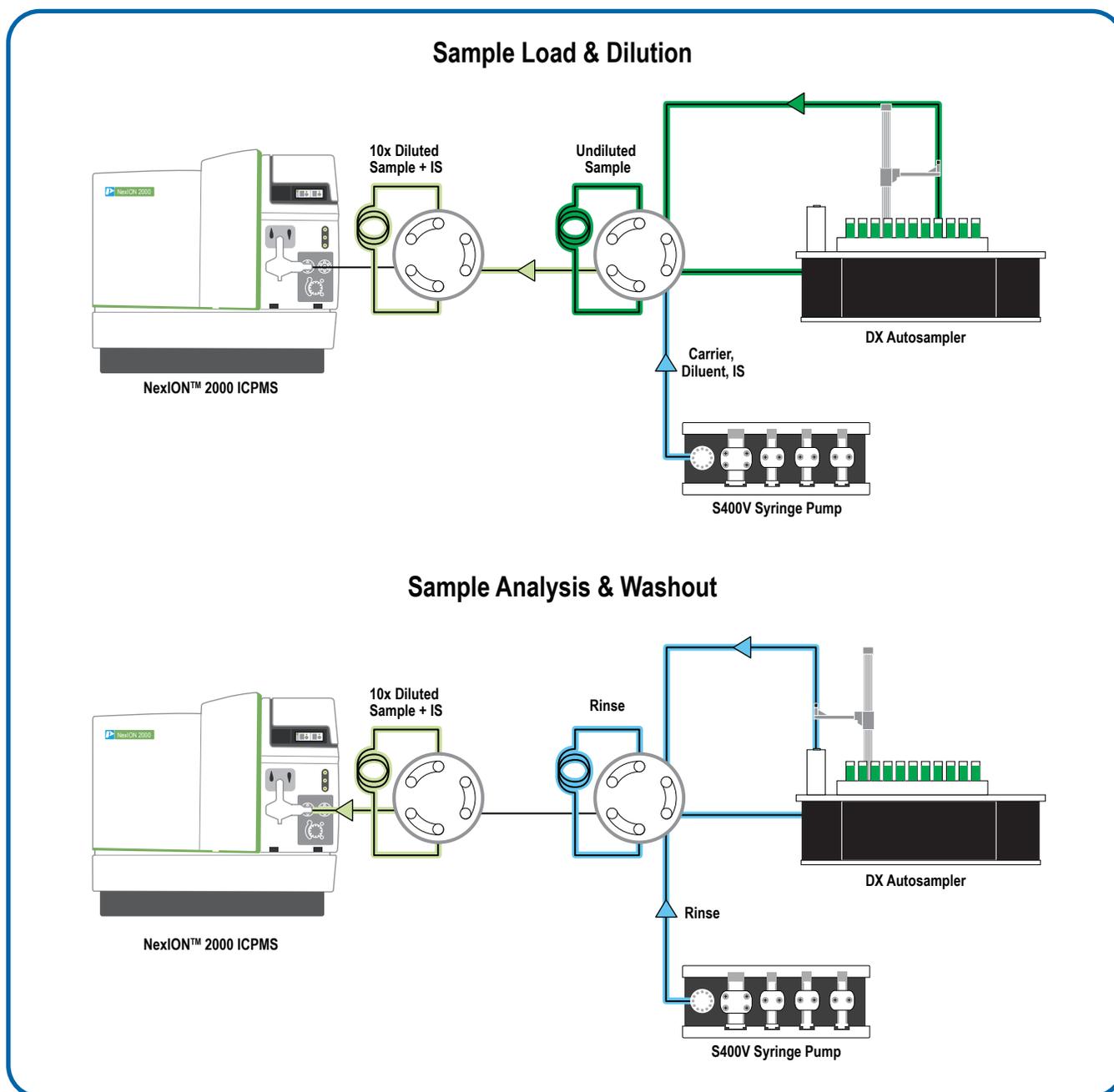


2DX prepFAST

# prepFAST™ Autodilution

## Rapid, Variable, In-Valve Autodilution

Samples are quickly vacuum-loaded (prepFAST e, prepFAST and prepFAST M5) or precision syringe-loaded (prepFAST M5) into a loop. Sample is mixed with diluent and internal standard using a patented mixing valve at the dilution factor prescribed by Syngistix™ software. The diluted and mixed sample is then introduced into the ICPMS while the sample loop is syringe rinsed and readied for the next sample. This sampling and dilution process takes place in seconds.



prepFAST dilution diagram for NexION™ 2000

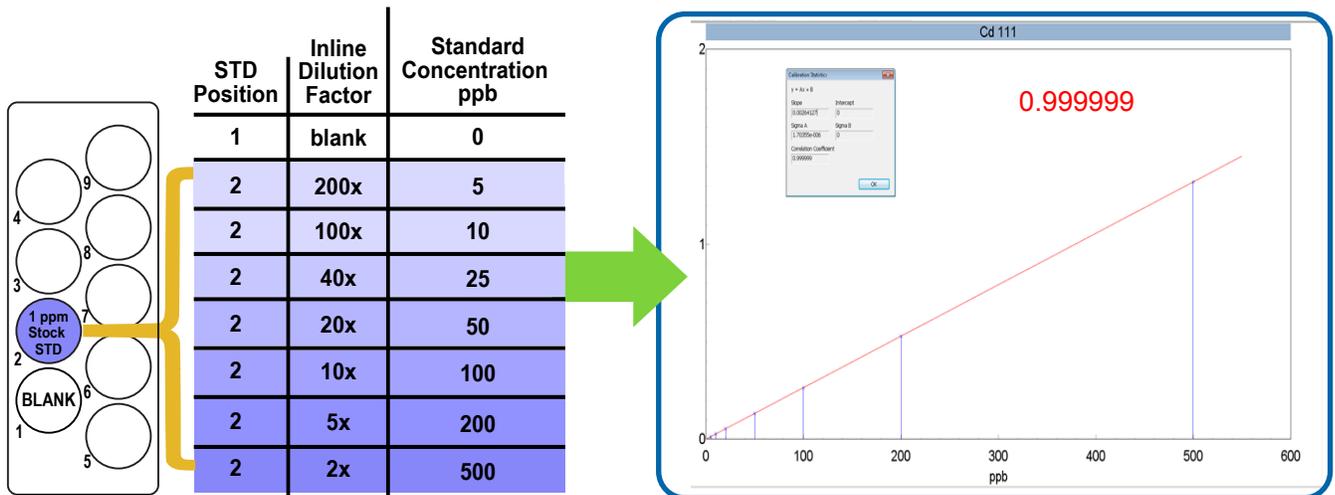
# prepFAST™ Autocalibration

## Autocalibration

Every prepFAST model can create multipoint calibration curves from a single bottle of stock standard. Each point of the calibration curve is prepared by autodilution of a single stock calibration standard placed on the autosampler deck. The prepFAST automatically generates highly linear and consistent ICPMS calibration curves. If necessary, multiple standards can be used for large concentration ranges or when standard matrices are incompatible.

### prepFAST Autocalibration

Inline Prep from 1 Blank + 1 Standard



Autocalibration of Cd from a 1ppm stock standard

Autocalibration improves laboratory efficiency by eliminating the need for labor-intensive and error prone standard preparation. It reduces laboratory waste by reducing calibration vial, reagent, and standard waste. prepFAST autocalibration is particularly important for low concentration standards near the detection limit.

## Manual Calibration vs. Autocalibration

**30+ MINUTES**  
- Manual Labor -

**5 MINUTES**  
- AUTOMATED -

- High Risk of -  
**HUMAN ERROR**

- Risk of -  
**CONTAMINATION**  
- Airborne, Pipettes,  
Vials -

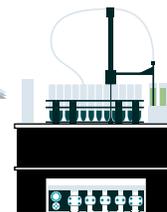
- High use of -  
**CONSUMABLES**



- Reduced -  
**HUMAN ERROR**

- Reduced Risk of -  
**CONTAMINATION**  
- Single high stock  
standard -

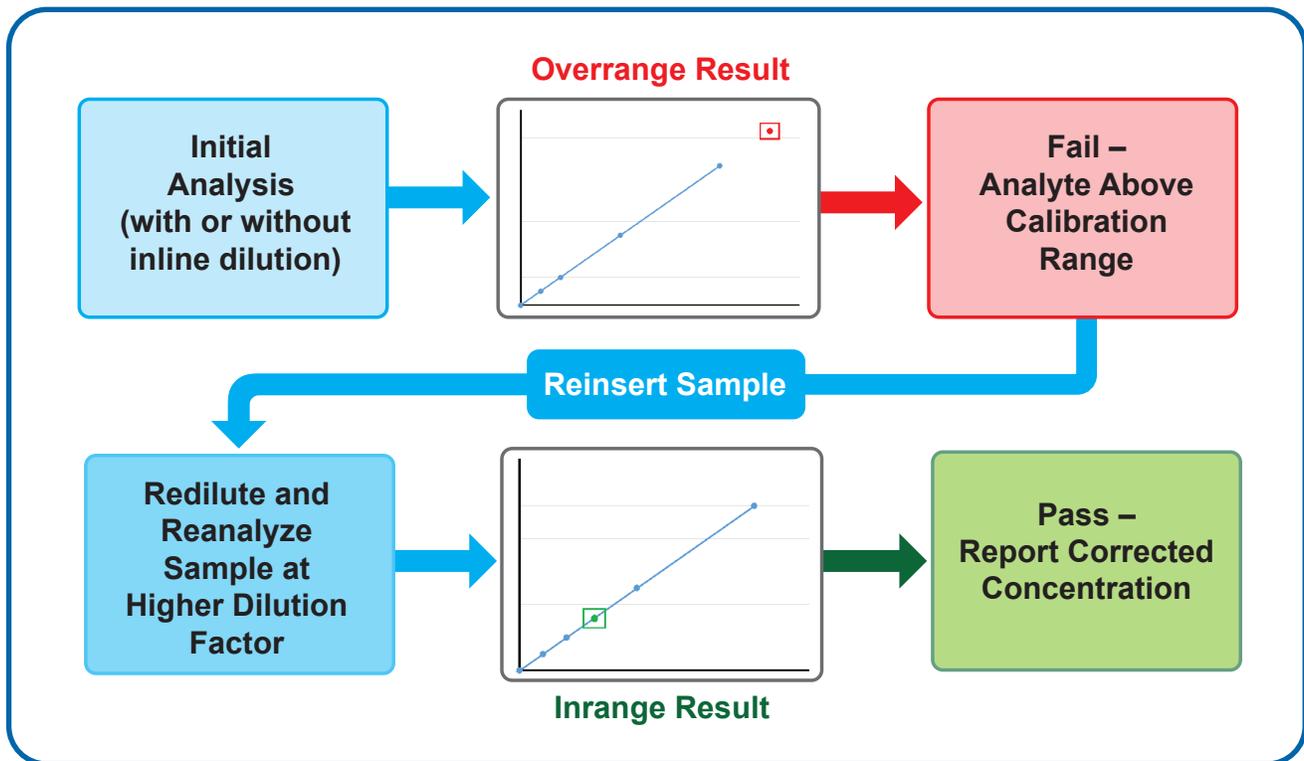
- Reduced use of -  
**CONSUMABLES**



# prepFAST™ Overrange Dilution

## Overrange Analyte Autodilution

The prepFAST automatically dilutes samples when an analyte goes above method-specified quality control levels. The sample is automatically reinserted into the sample list and reanalyzed at a higher dilution factor until the determined concentration falls within the specified range.



Automated overrange sample dilution maximizes laboratory throughput. Without this feature high concentration samples have to be manually diluted and rerun later. Overrange autodilution automatically dilutes samples into the appropriate range without any user input or time lost waiting for a result.

## Economical Inline Autodilution System

The prepFAST e economical inline dilution system provides low cost syringe dilution and laboratory automation. The prepFAST e is especially effective for applications having long analysis times or lower sample throughput requirements. Capable of dilution factors ranging from 1 to 50, the prepFAST e is recommended for use with sample volumes greater than 2-3 mL. The prepFAST e supports final analysis volumes between 0.5 and 6.0 mL.

### Features

- Autocalibration
- Autodilution - 1 to 50x
- Automatic overrange dilution
- Peristaltic-pumped internal standard addition
- Fast vacuum sample loading

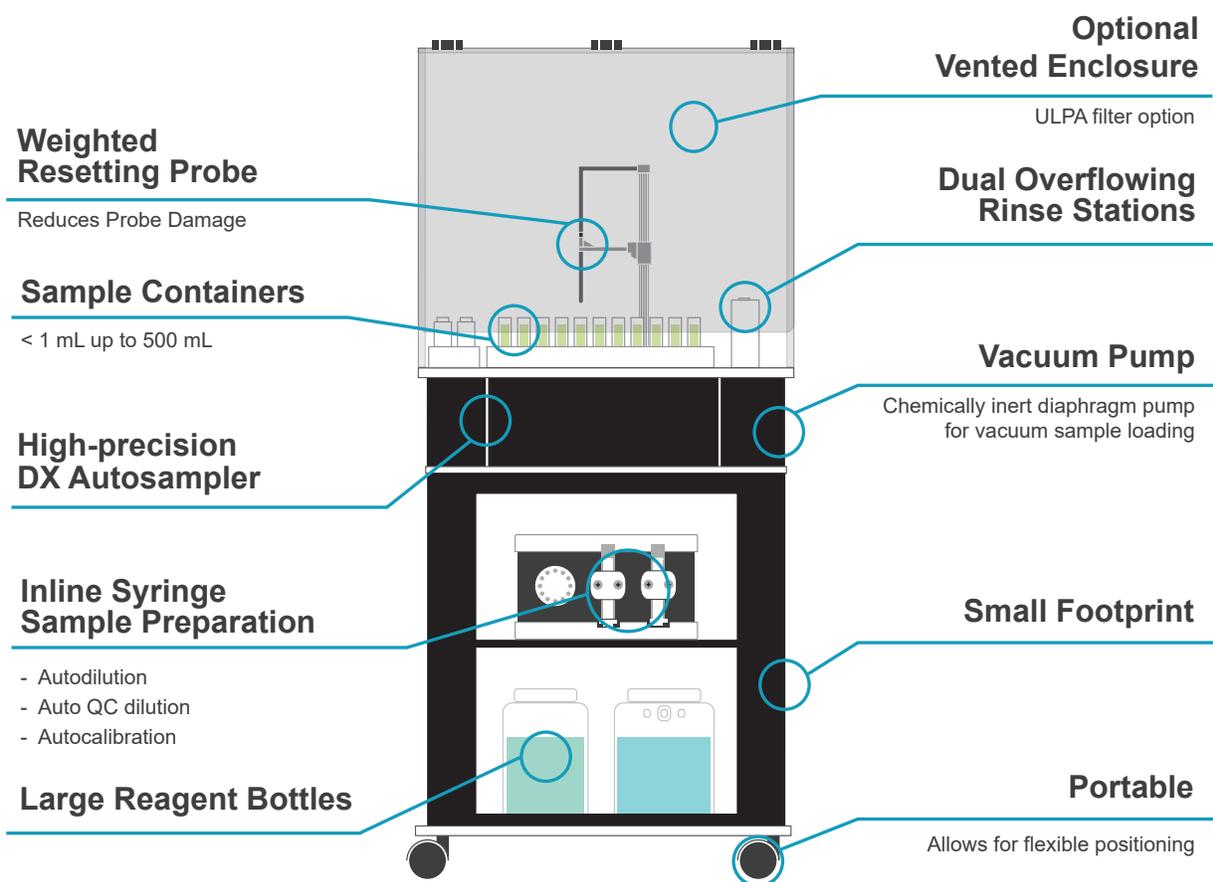
### Benefits

- Automate sample dilution
- Reduce laboratory waste
- Available in the following models: 2DX, 4DX, 8DX, and 14DX

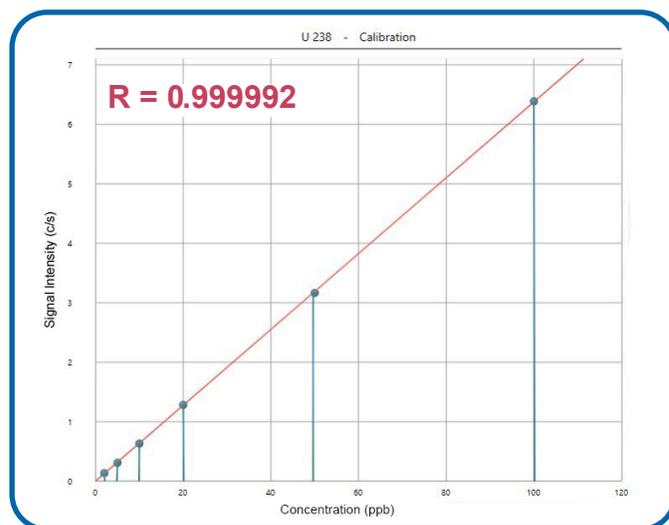
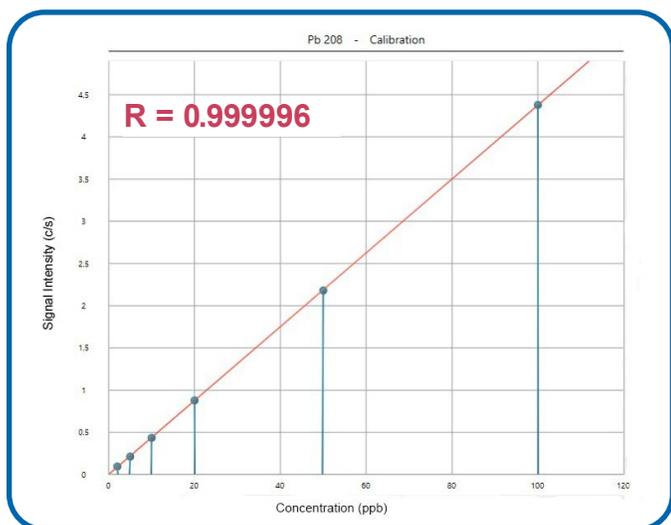


2DX  
prepFAST e

## prepFAST e Features Diagram



## prepFAST e Automated Calibrations



Autocalibrations on NexION 2000 with prepFAST e. Calibration standards automatically prepared at 2, 5, 10, 20, 50, and 100 ppb, from a 100 ppb stock standard.

# prepFAST™

for NexION 1000/2000 ICPMS

## Fully Automated Inline Dilution

The prepFAST inline dilution system fully automates laboratory dilutions while providing high sample throughput. The prepFAST delivers high precision autodilution, syringe-driven internal standard addition, and high-speed washout. Capable of dilution factors from 1 to 400, the prepFAST is suggested for labs requiring the highest sample throughput and where the available sample volume is about 2-3 mL or more.

### Features

- Autocalibration
- Autodilution – 1 to 400x
- Auto QC dilution
- Syringe-driven internal standard
- High-speed rinse
- FAST vacuum sample loading

### Benefits

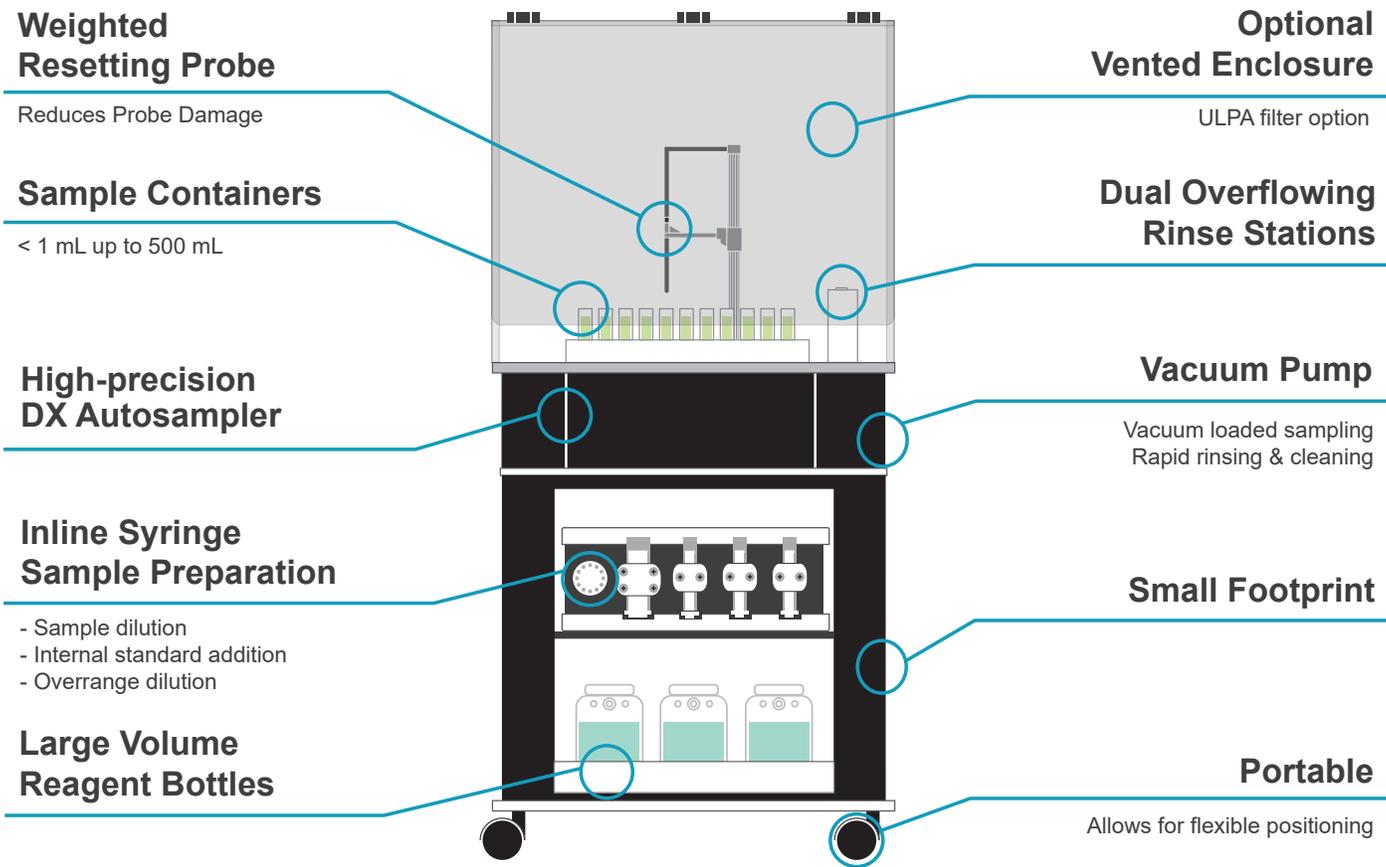
- Automate sample dilution
- Improve sample throughput
- Reduce laboratory waste
- Available in the following models: 2DX, 4DX, 8DX, and 14DX



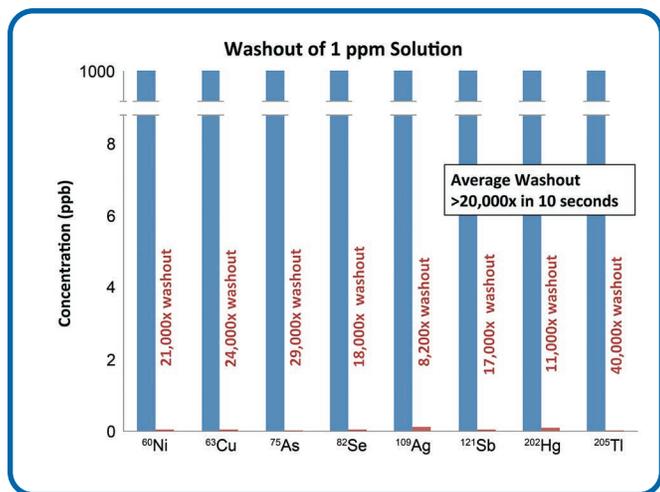
prepFAST with  
SampleSense Valve

See page 22 for **SampleSense**  
prepFAST system

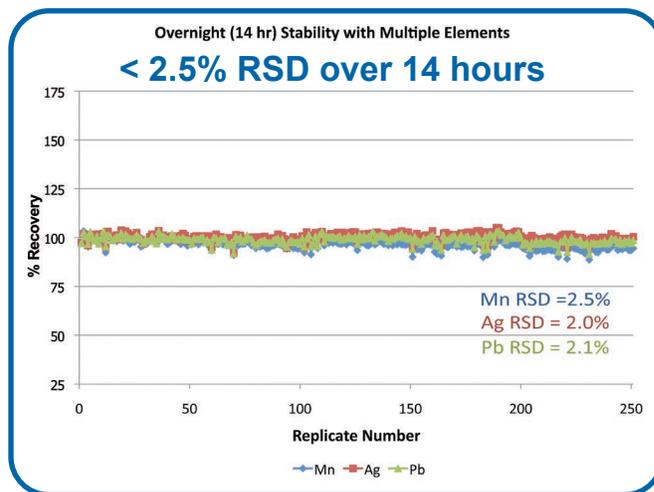
### prepFAST Features Diagram



### prepFAST Performance



FAST washout even for memory-prone elements



Long-term stability

# prepFAST M5™

for NexION 1000/2000 ICPMS

## Syringe Sample Loading + Syringe-driven Inline Dilution

The prepFAST M5 inline dilution system delivers maximum laboratory automation. The prepFAST M5 provides precision syringe loading of samples or high-throughput vacuum loading. Syringe loading is recommended when sample volumes are limited – 2-3 mL – or when sample viscosity becomes an issue, such as organic solvents, viscous brines or biological samples. FAST vacuum loading can be used when sample volumes are large – 2-3 mL – or when sample viscosity is not an issue. The prepFAST M5 delivers high-precision autodilution, syringe-driven internal standard addition, flexible sample loading and ultimate sample washout. Capable of dilution factors from 1 to 400, the prepFAST M5 is perfect for labs requiring high sample throughput and where available sample volumes are as low as **0.1 mL**.



S500V2 Syringe Module

### Features

- Autocalibration
- Autodilution – 1 to 400x
- Auto QC dilution
- Syringe-driven internal standard addition
- High-speed rinse
- Ultimate washout
- Precision syringe loading or high-speed vacuum loading
- High-pressure, syringe-driven probe rinsing

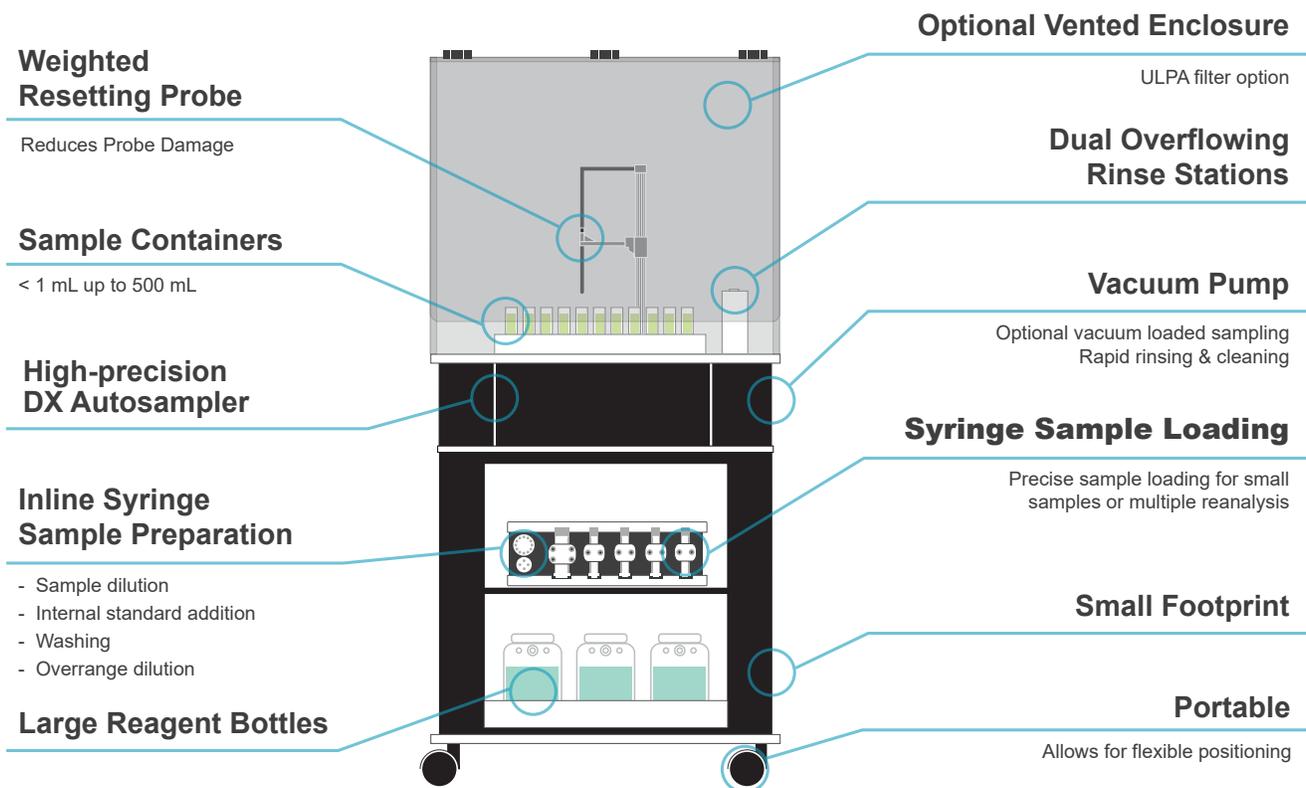
### Benefits

- Automate sample dilution
- High sample throughput
- Minimize sample use
- Reduce laboratory waste
- Best rinse-out performance
- Available in the following models: 2DX, 4DX, 8DX, and 14DX



4DX  
prepFAST M5

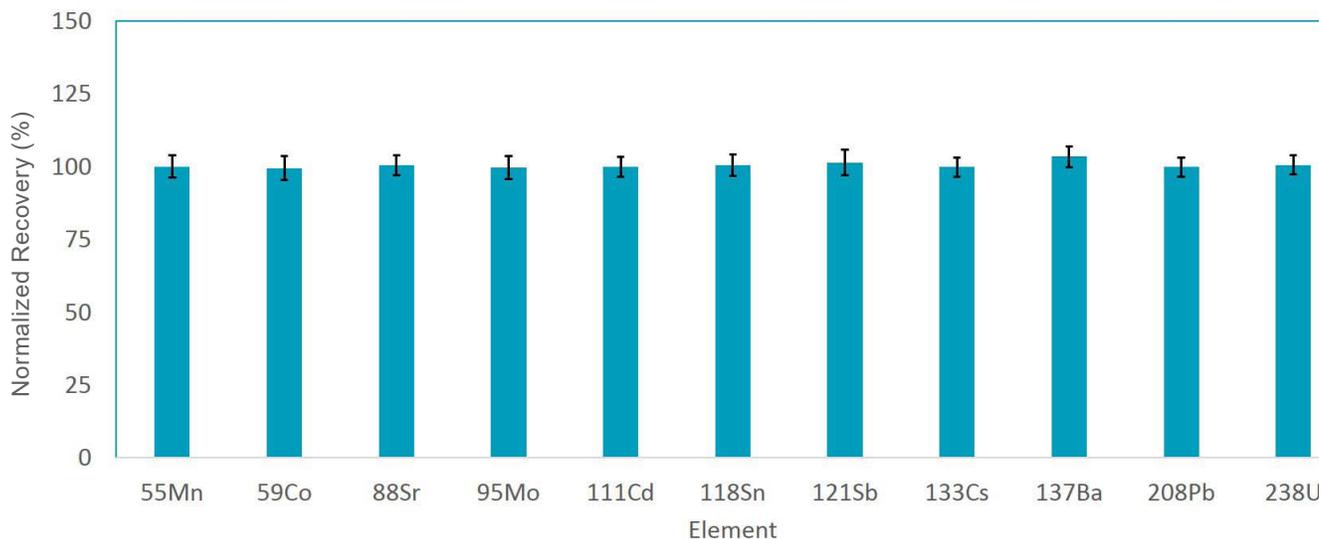
### prepFAST M5 Features Diagram



### Automated micro sample analysis in a difficult matrix

#### prepFAST M5 with 100µL Clinical Samples

250 Replicate Urine Analysis Average RSDs <4%



## prepFAST Systems Comparison

prepFAST inline dilution systems automatically perform precise and accurate dilutions for samples and standards, improving laboratory workflow, productivity, and data quality.



4DX Autosampler with Mobile Station

### prepFAST e Provides:

- Autocalibration
- Autodilution
- Auto overrange dilution
- Peristaltic pump driven internal standard addition
- Dilution range: 1-50

### prepFAST Provides:

- Autocalibration
- Autodilution
- Auto overrange dilution
- Improved washout and higher throughput
- Syringe-driven internal standard addition
- Dilution range: 1-400

### prepFAST M5 Provides:

- Autocalibration
- Autodilution
- Auto overrange dilution
- Precision syringe sample loading for micro or viscous samples
- Best washout performance of any sample introduction system
- Syringe-driven internal standard addition
- Dilution range: 1-400



prepFAST e



prepFAST



prepFAST M5

# prepFAST™ Ordering Information

## prepFAST Systems Comparison

ESI offers three versions of prepFAST: prepFAST e, prepFAST, and the prepFAST M5. Compare each system's features below to determine which prepFAST system is right for your lab.

Description	Autocalibration	Autodilution	Auto Overrange Dilution	Syringe-driven Internal Standard	High-pressure Rinse Ultimate Washout	Micro-volume Sample Analysis	Volatile Organic Solvent Analysis	Dilution Range
prepFAST e	✓	✓	✓					1 - 50
prepFAST	✓	✓	✓	✓				1 - 400
prepFAST M5	✓	✓	✓	✓	✓	✓	✓	1 - 400

### NexION 2000P\*

#### prepFAST e

Model	Part Number
2DX	2PFe-64-P
4DX	4PFe-64-P
8DX	8PFe-64-P
14DX	14PFe-64-P

### NexION 1000 & 2000B/C

#### prepFAST e

Model	Part Number
2DX	2PFe-64-BC
4DX	4PFe-64-BC
8DX	8PFe-64-BC
14DX	14PFe-64-BC

#### prepFAST

Model	Part Number
2DX	PF2A-2DX-P
4DX	PF2A-4DX-P
8DX	PF2A-8DX-P
14DX	PF2A-14DX-P

#### prepFAST

Model	Part Number
2DX	PF2A-2DX-BC
4DX	PF2A-4DX-BC
8DX	PF2A-8DX-BC
14DX	PF2A-14DX-BC

#### prepFAST M5

Model	Part Number
2DX	PFM5A-2DX-P
4DX	PFM5A-4DX-P
8DX	PFM5A-8DX-P
14DX	PFM5A-14DX-P

#### prepFAST M5

Model	Part Number
2DX	PFM5A-2DX-BC
4DX	PFM5A-4DX-BC
8DX	PFM5A-8DX-BC
14DX	PFM5A-14DX-BC

\* prepFAST upgrade from FAST system supplied with NexION 2000P

# Revolutionary New Valve for *FAST* & prep*FAST*

# **SAMPLESENSE**

SampleSense (Patent Pending) is a revolutionary valve for *FAST* and prep*FAST* systems that uses optical sensors to automatically sense and inject samples into NexION 1000/2000 ICPMS instruments.

## SampleSense Enhances

- Eliminates method timing parameters
  - Optimizes loading conditions for each sample matrix
  - Automatically loads loop with samples of varying viscosities
- Reduces sample consumption (< 1 mL)
- Actively detects and reports sample loading issues
- Automatically compensates for drift caused by kinked lines or partial blockages
- SampleSense triggers the ICPMS at exactly the right time



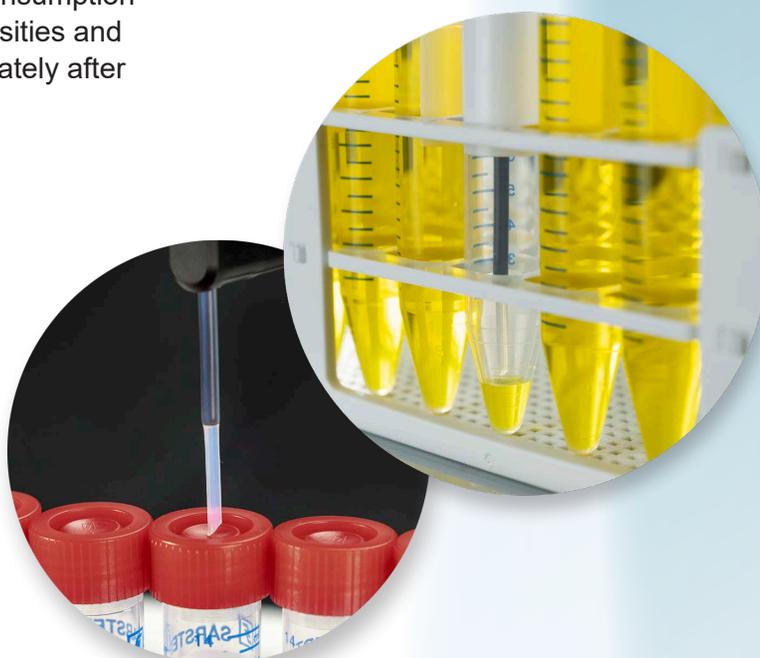
## How it Works

SampleSense simplifies method development by eliminating read delays as well as sample uptake and injection timers, allowing sample loop sizes and sample types to be changed without adjusting method settings. SampleSense also minimizes sample consumption by automatically loading samples of varying viscosities and switching the valve into the inject position immediately after the sample loop is successfully loaded.

## Detect Loading Issues

SampleSense monitors and logs sample loading issues caused by:

- Empty tubes or positions
- Vials inadvertently left capped
- Empty standard or QC
- Bubbles caused by incomplete loading



## SampleSense Advantages



### Innovative Sample Loading

SampleSense accounts for viscosity and automatically adjusts timing. One valve, one loop and one method for multiple sample types.



### Time Savings

Operator time for sample introduction method development is eliminated. Just run samples.



### Sample Savings

The sample is injected at precisely the right time. Every time. Even for small sample volumes.



### Error Notification

Incomplete sample loading or bubbles in the sample are detected and logged.

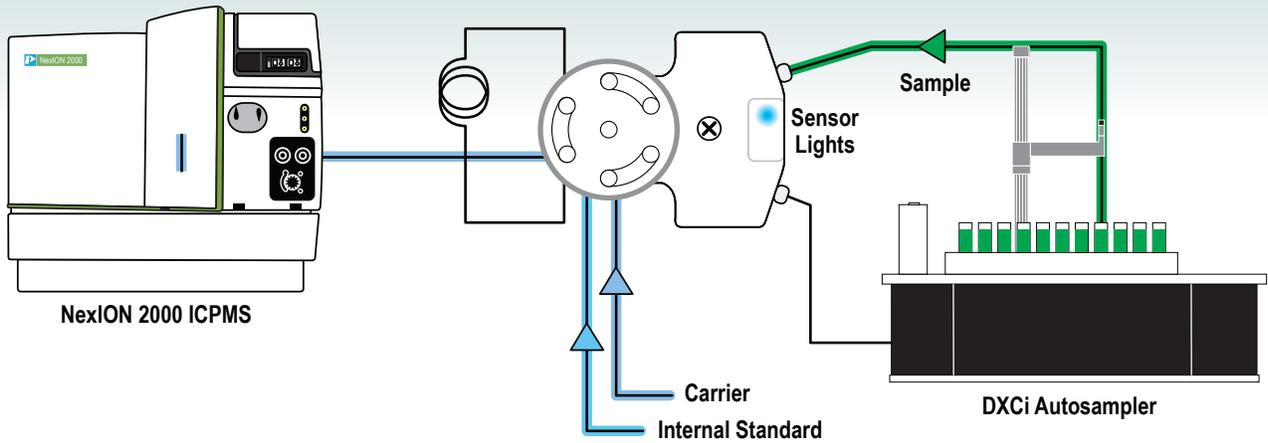
## Maximize Productivity

*FAST* high-throughput automated sample introduction technology combined with SampleSense maximizes productivity for any lab. It optimizes sample throughput and conserves valuable sample, argon, power, and reagents by drastically shortening analytical runs.

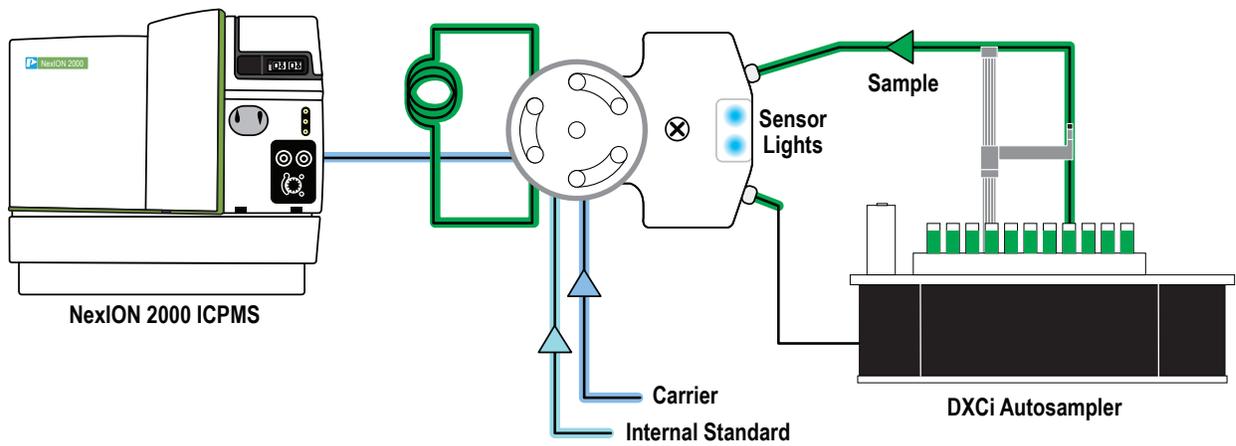


NexION 2000 with SampleSense

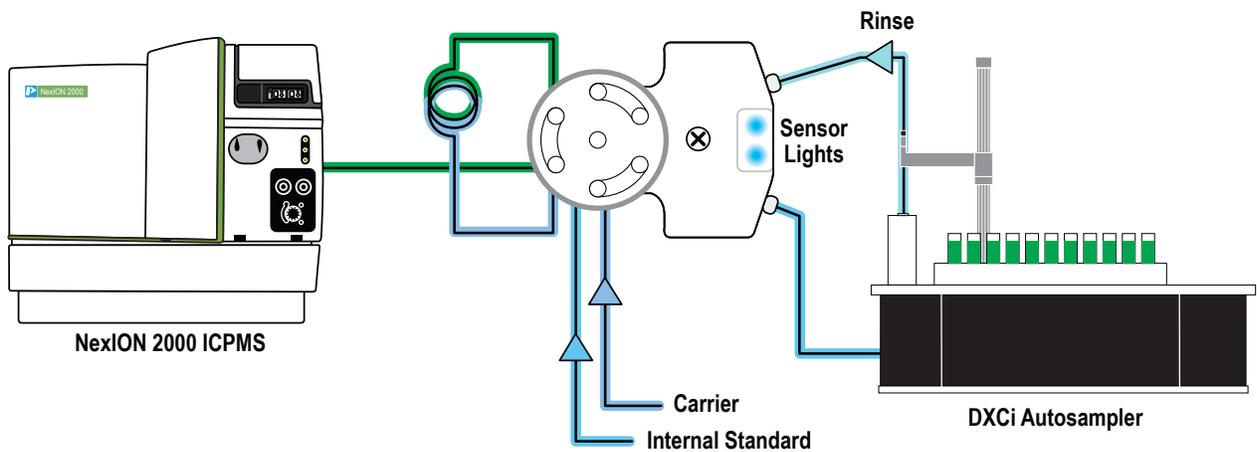
## Start Sample Load / Rinse Nebulizer



## Sample Load Complete / Rinse Nebulizer



## Rinse Probe / Inject Sample



# SAMPLESENSE FAST and prepFAST

## SampleSense FAST

**FAST** has been trusted for over a decade in thousands of ICPMS laboratories worldwide.

FAST is a valve injection automation system with rapid vacuum sample loading that more than doubles sample throughput, saving time, reagents and utility costs.

Combining FAST with SampleSense provides an even higher level of automation, ease-of-use and sample throughput. Liquid samples are instantly detected and injected followed by automatic acquisition triggered at precisely the right time.



NexION 1000/2000  
SampleSense FAST

## SampleSense prepFAST

**prepFAST** is an automated inline dilution system for ICPMS sample introduction.

The high-throughput prepFAST system eliminates manual dilution, reduces reagent usage and improves laboratory productivity.

SampleSense integrates fully with the prepFAST for an even higher level of automation and ease-of-use.



NexION 1000/2000  
SampleSense prepFAST

All SampleSense systems  
include a  
**DXCi Autocorrecting  
Autosampler**

### SampleSense FAST and prepFAST Systems for NexION 1000/2000 Part Numbers

Autosampler Model	SampleSense FAST P/N	SampleSense prepFAST P/N
2DXCi	2F-SS7-64	2PF-SS8-64
4DXCi	4F-SS7-64	4PF-SS8-64
8DXCi	8F-SS7-64	8PF-SS8-64
14DXCi	14F-SS7-64	14PF-SS8-64

# SAMPLESENSE FAST UHT CLINICAL

## Ultra-high Throughput Clinical Sample Analysis System

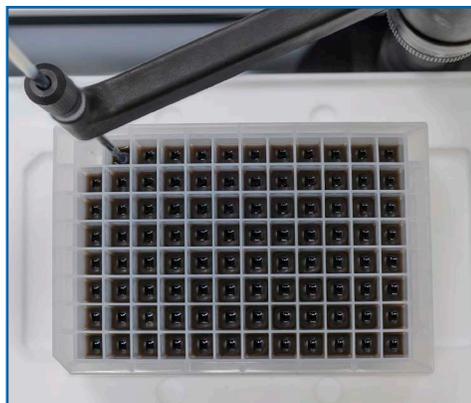
SampleSense *FAST* UHT is a customized automation solution designed for fast sample analysis where sample volume may be limited. All SampleSense *FAST* UHT systems incorporate a vacuum control valve to further reduce sample consumption while utilizing the sample detection capabilities of the SampleSense valve. By closing off the vacuum with this valve, valuable sample is conserved while allowing specialized rinse solutions to be loaded into the sample uptake path while the analysis is taking place.

### Customized Design

- Automates sample uptake tasks, monitors sample loading and logs sample loading issues with SampleSense valve
- Minimizes sample consumption with vacuum control valve
- Introduces customized clinical rinse solutions in uptake path during analysis with unique rinse-trapping technology to ensure clinical sample components (blood, serum, urine) are removed
- Supports ultra-high sample throughput from small volume containers – including microplates – with optimized vertical travel and rinse station on DXCi autosampler
- Provides for duplicate analysis from a 2 mL microplate
- **SampleSense *FAST* UHT doubles or triples the normal ICPMS analysis rate for the highest possible sample throughput**



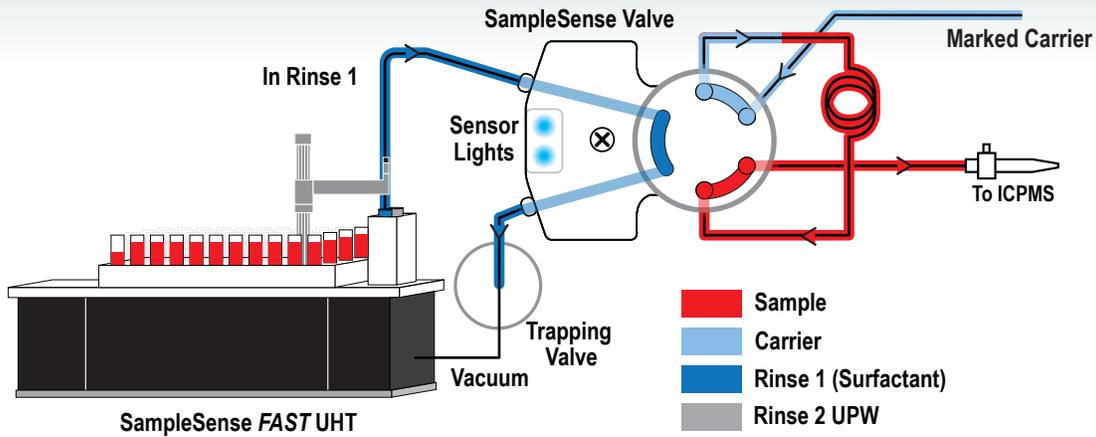
NexION 2000 ICPMS equipped with SampleSense *FAST* UHT clinical sample analysis system with optional enclosure



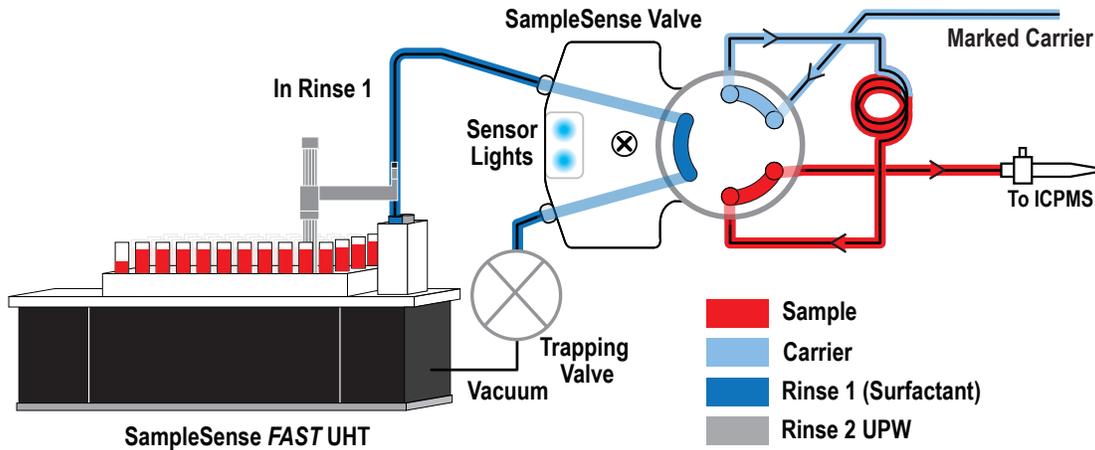
Closeup of autosampler probe sampling 50x diluted blood samples from 96 well microplates

# Function of the Trapping Valve for SampleSense FAST UHT

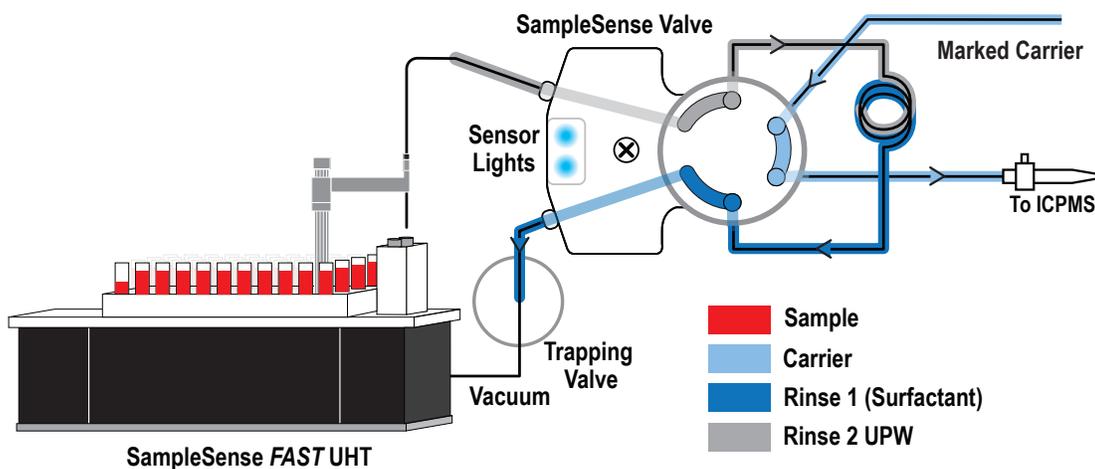
## 1. After the Sample is Loaded and Injected, Rinse 1 is Trapped in the Sample Probe



## 2. Probe Moves into Rinse 2 while Rinse 1 Remains Trapped in the Probe



## 3. After Analysis Trapping Valve Opens, Rinse 1 and Rinse 2 Rapidly and Completely Clean Out Sample Loop



# SampleSense FAST UHT Clinical System High-throughput Analysis of Blood Lead Application

- **Blood preparation**

- Samples diluted 50x in a solution of 0.4% (v/v) TMAH, 1% EtOH, 0.01% APDC, and 0.05% Triton X-100
- Dispensed into six 96-well microplates

- **Dual rinse 4DXCi autosampler configuration**

- Rinse 1: Blood diluent (trapped during sample analysis)
- Rinse 2: UPW

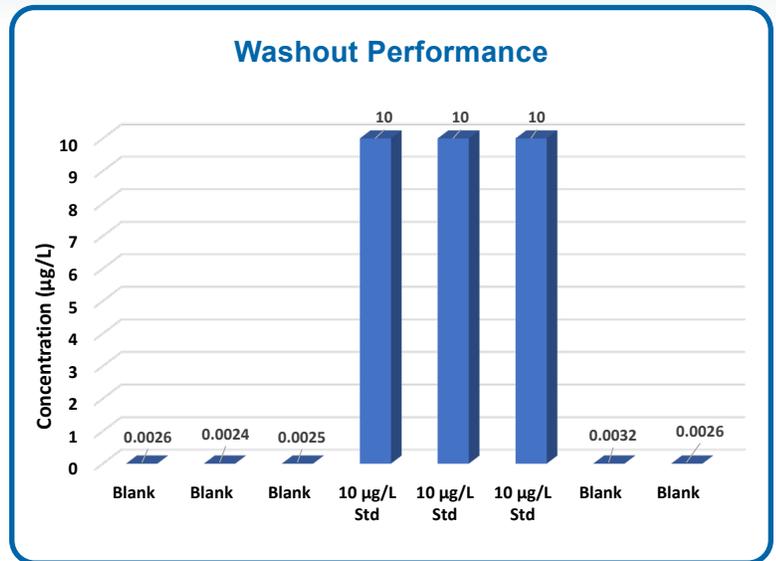
- **pergo 2000 for nebulizer and AMS gas humidification**

- **Analytes**

- Pb (206 + 207+ 208), Bi (I/S)
- Tm – marker element in carrier solution

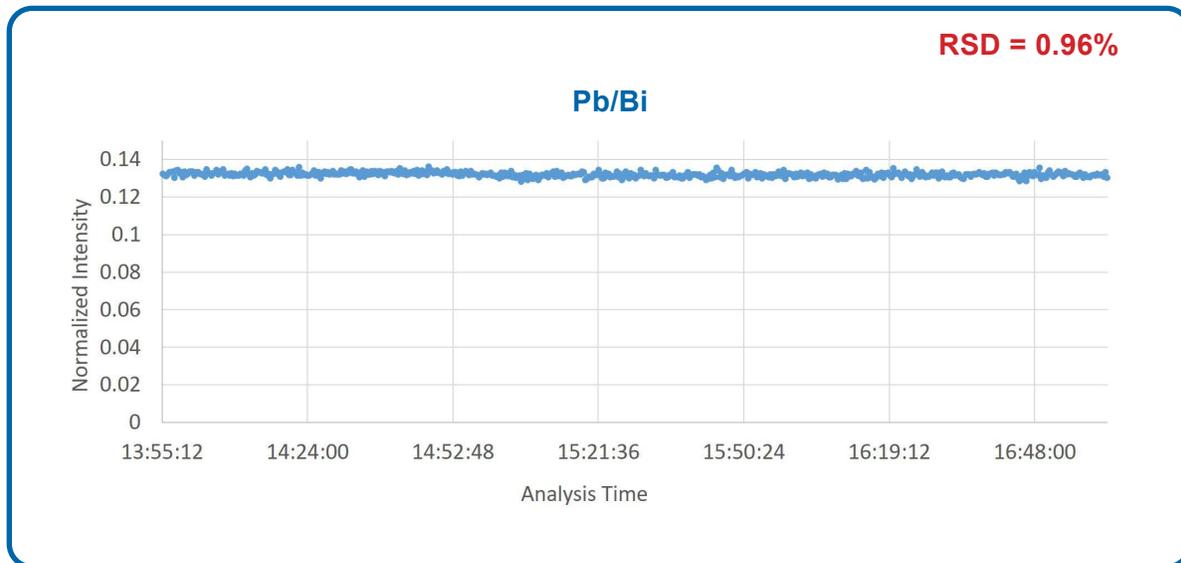
- **Total run time for 576 samples**

**3 h 12 min – 20 sec/sample**



Pb washout after high calibration standard run 3x in a row. With SampleSense FAST UHT, washout after one blank is >1000x, and Pb returns fully to baseline after two blanks.

## SampleSense FAST UHT Clinical System – Blood Lead Analysis



Sampling of 50x diluted blood from microplates on the NexION 2000 ICPMS with the SampleSense FAST UHT Clinical system. Blood lead analysis rate performed at 20 seconds/sample. Plot displays analysis of 6 microplates (576 samples). Excellent signal stability of <1 %RSD was observed over the 3 hr 12 min analysis.

**The only sample introduction valve  
with optical sensor technology!**



NexION 2000 with SampleSense,  
4DXCi prepFAST

To upgrade your existing  
**FAST or prepFAST**  
to **SampleSense**  
please contact your ESI representative  
or email [sales@icpms.com](mailto:sales@icpms.com)

## SampleSense FAST UHT Clinical Sample System

Automated ultra-high throughput valve injection system with optically-sensed sample loading, triggered analysis, and vacuum control valve to minimize sample consumption and support customized rinse trapping. Includes DXCi autosampler with PTFE top and optimized 14" vertical travel, SampleSense SS6 valve, vacuum control valve, PFA-ICN nebulizer, and FAST installation kit.

SampleSense FAST UHT Clinical Sample Systems for NexION 1000/2000 Part Numbers	
Autosampler Model	SampleSense FAST UHT Clinical System
2DXCi	2F-SS6-UHTC-64
4DXCi	4F-SS6-UHTC-64
8DXCi	8F-SS6-UHTC-64
14DXCi	14F-SS6-UHTC-64

# prepFAST S5F™

## Automated Sample Preparation and Introduction System for Semiconductor Applications

The prepFAST S5F has revolutionized the way ultrapure semiconductor grade chemicals are analyzed by ICPMS. The prepFAST S5F utilizes syringe-driven flows of UPW, semiconductor grade acids, and standard solution to automate both sample dilutions and standard curve generation. It eliminates manual handling of samples to deliver sub-ppt detection limit capabilities.

### prepFAST S5F Features:

- Ultraclean Fluorometric Autosampler
- Automated external and MSA calibrations
- Automated ultraclean sample preparation
- Automated acid addition
- Syringe-driven sample introduction
- Automated sample sensing and method adjustment for viscous samples
- Integrated ultraclean sample environment
  - Includes ultraclean air shower
  - Options include:
    - ULPA filter
    - Sample racks for PFA containers <1 mL to 500 mL)
- Continuously flowing high-purity UPW rinse (user-supplied UPW)
- UPW polishing columns
- PPT/PPQ detection limits for all semiconductor elements
- Capability to analyze all semiconductor grade chemicals

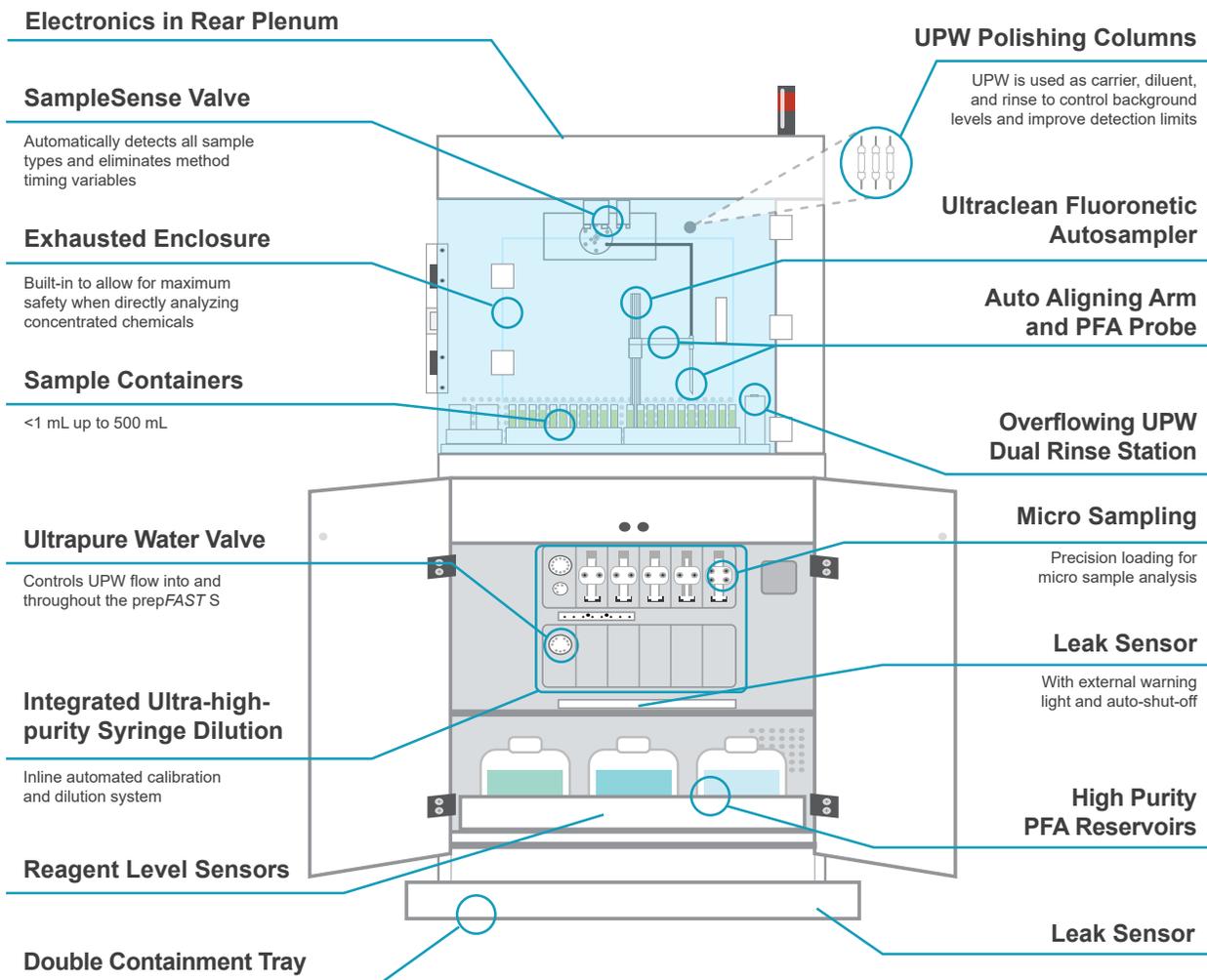


prepFAST S5F System

### prepFAST S5F System for the NexION 1000/2000

System	Integrated Fluorometrics Autosampler & Enclosure	Integrated FAST valve modules	FAST DXi Module	PFA Nebulizer with Integrated Capillary	PFA Sample Probes	Syringe Pump S500V2
prepFAST S5	✓	✓	✓	✓	✓	✓

## prepFAST S5F Features Diagram



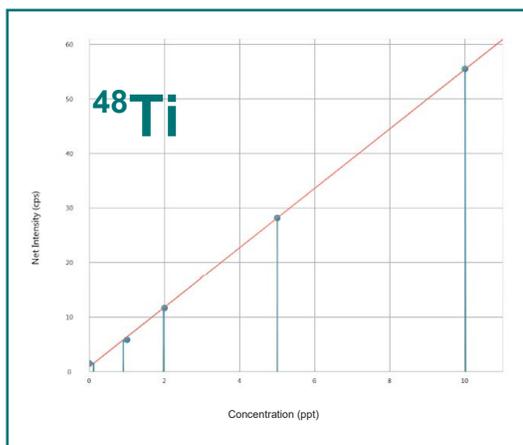
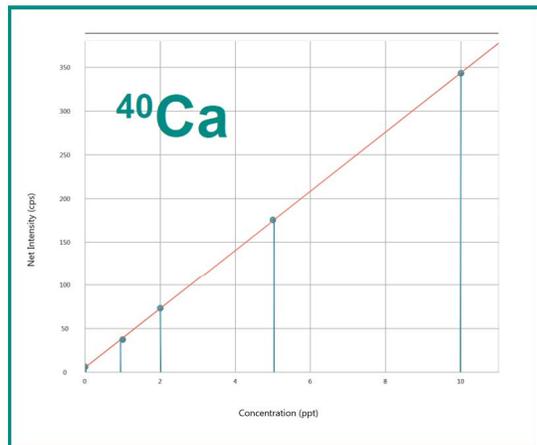
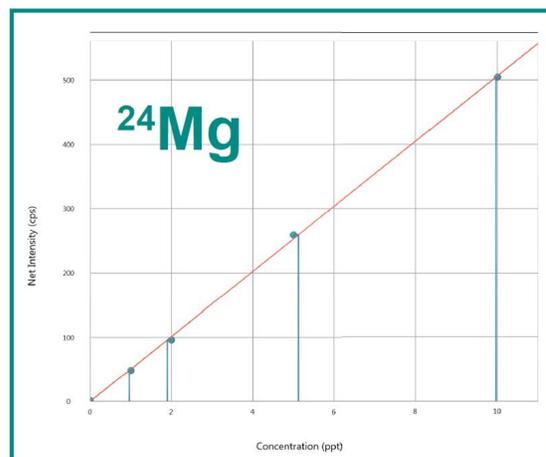
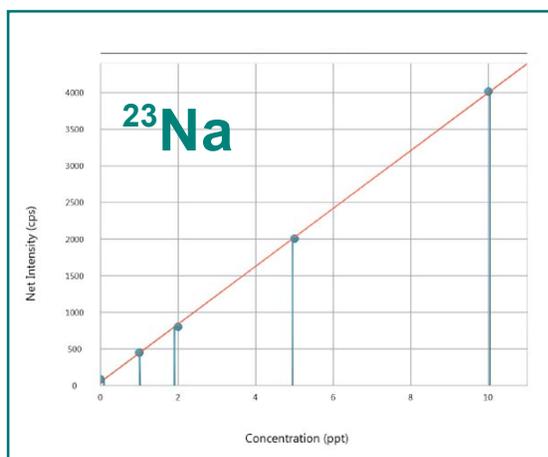
**Examples of semiconductor chemicals analyzed at the ppt level with prepFAST S5F**

Acids	Bases	Organics	Process Chemicals
98% H <sub>2</sub> SO <sub>4</sub>	22% NH <sub>4</sub> OH	IPA	BOE
89% H <sub>3</sub> PO <sub>4</sub>	2.38% TMAH	PGMEA/PGME	SC-1
70% HNO <sub>3</sub>	25% TMAH	Photoresist	SC-2
49% HF	KOH	NMP	BOE
35% HCl		Butyl Acetate	DSP
30% H <sub>2</sub> O <sub>2</sub>		Cyclohexanone	SPM
			FPM
			Etchant

This table contains only a partial list of chemicals which can be analyzed using prepFAST S5F

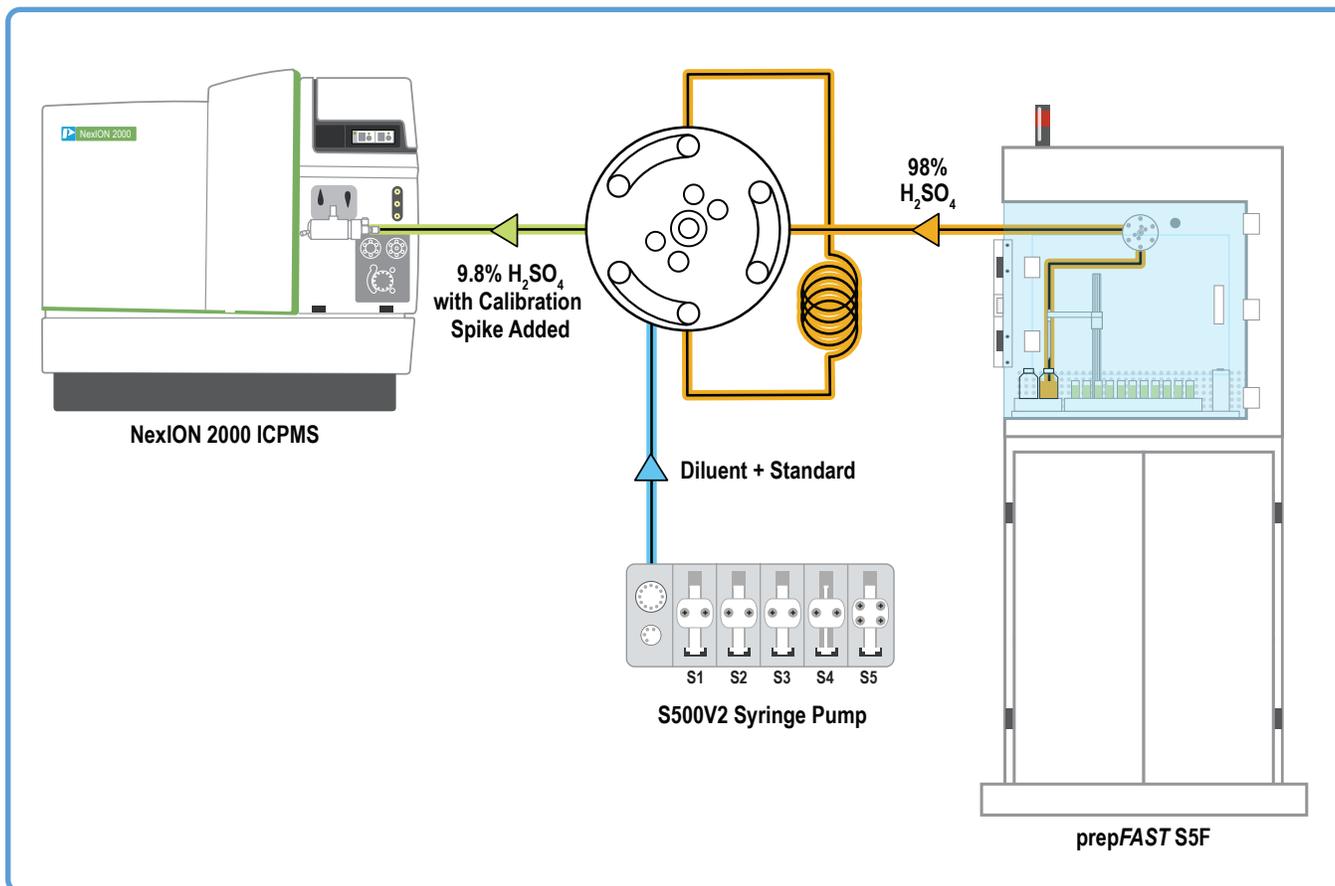
# prepFAST S5F™

## prepFAST S5F Autocalibration at 1, 2, 5, and 10 ppt for Na, Mg, Ca, and Ti in UPW



The prepFAST S5F automatically prepares calibration curves for over 70 elements controlled in semiconductor manufacturing processes. Calibrations are generated by automatically diluting an enclosed multielement stock standard. Automation with the high-purity prepFAST S5F achieves low to sub-ppt calibrations. Combined with the interference reduction modes of the NexION 2000 ICPMS (e.g. DRC, KED and cold plasma modes), the prepFAST S5F delivers ppq range detection of ICPMS accessible elements.

## prepFAST S5F Inline Dilution of Semiconductor-grade Chemicals



prepFAST S5F 10x inline dilution of concentrated  $H_2SO_4$

The prepFAST S5F allows dilution by volume or weight for all semiconductor-grade chemicals. Metals are quantified using automated inline MSA or external calibration. Automated direct analysis of concentrated chemicals eliminates sample contamination caused by manual dilution into a secondary container.

prepFAST S5F Systems	
Description	Part Number
prepFAST S5F, 2 FX system, 2 sample rack capacity	2PF-S5F-64
prepFAST S5F, 4 FX system, 4 sample rack capacity	4PF-S5F-64
ULPA (ultrapure air) Filter for 2 FX prepFAST S5 system	ULPA-2EX
ULPA (ultrapure air) Filter for 4 FX prepFAST S5 system	ULPA-4EX

# TRUFAST SP2™ for NexION 1000/2000 ICPMS

## Automated Online Preconcentration of Radionuclides

The TRUFAST SP2 automatically performs online preconcentration of specific radionuclides to reduce matrix-related interferences and enhances signal-to-background in real sample matrices by up to two orders of magnitude. Standard addition calibrations are performed by the system to fully automate the operations. TRUFAST can eliminate lengthy offline sample preparation, speed analytical results, provide better control blanks, and improve detection limits for radioisotopes when coupled to the NexION 1000/2000 systems.



TRUFAST SP2 System

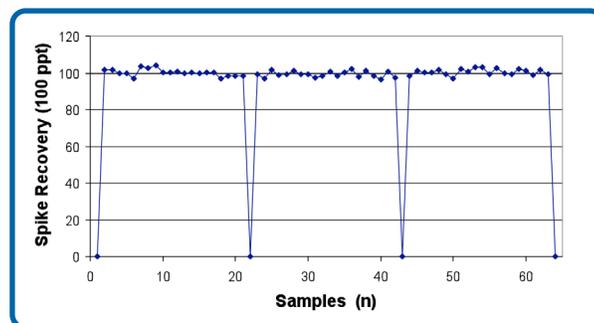
## 2-Column Preconcentration and Matrix Separation

- Ultrapure fluoropolymer path
- Eliminate contamination from manual sample handling
- Reusable resins may be used for many samples

## Applications

**Thorium in Transition Metal Matrices** – Th impurities in high-purity copper can be measured by chelating Th while removing the Cu matrix ions via an ion exchange column. Th is then eluted from the column and measured by ICPMS.

**Radium in Natural Waters** – Elevated concentrations of radium in groundwater can occur as a result of natural geological processes and from mining activities. Polyatomic interferences arising from Ba and Sr are automatically removed by the TRUFAST, which also performs direct analysis of water samples for routine environmental monitoring.



60 replicate determinations of 100 ppt Th in 1% Cu from three 100 mL sample bottles

Maximum Allowable Levels	Radium 226
Canada MAC	0.5 Bq/L
WHO Guidance Level in water	1 Bq/L
USEPA MCL	0.19 Bq/L (5 pCi/L)
<b>TRUFAST SP2 Estimated DL</b>	<b>&lt; 0.020 Bq/L</b>
*1 Bq/L = 27 pCi/L = 27 pq/L	

TRUFAST SP2 System for NexION 1000/2000							
System	Integrated Mobile 4GX Autosampler Enclosure	FAST Dual Valve Module and Tray	Cation Exchange Column	Sr Preconcentration Column	Th/U Preconcentration Column	Sapphire Injector	PFA-ST Nebulizer
TRUFAST	✓	✓	✓	✓	✓	✓	✓

TRUFAST System for the NexION 1000/2000	
Description	Part Number
TRUFAST SP2 System	4TF-SP2
Ra Preconcentration Column	CF-CX-0600
Sr Preconcentration Column	CF-Sr-1000
Th/U Preconcentration Column	CF-ThU-0200

# ICPMS Cones



AUTOMATION

Elemental Scientific offers ICPMS interface cones for the NexION 1000/2000. High purity metals and precision machining provide cones with:

- Extended lifetime
- High sensitivity
- Low oxide and doubly charged species
- Pt-tipped cones available
- Nickel cones available



See page

**71**

for more information

**E  
S  
I** **Elemental  
Scientific**

# prepFAST IC™

## Automated Speciation and Total Metal Analysis System

The prepFAST IC integrates ultra-clean high-pressure liquid chromatography technology along with an enclosed autosampler for both elemental speciation and total metal analysis.

The system is offered in a base model with a selection of options allowing the customization of the system. The fully featured prepFAST IC model automates calibration and the analysis of total metals, metal speciation, or both techniques combined using ICPMS detection. Also available is a gradient speciation module along with the prepFAST autodilution module. This offers users fully automated inline dilution capability at the time of analysis, eliminating potential species conversion. Other options include a SampleSense FAST introduction system, autotuning module, and an additional syringe for post column additions or a third chromatographic eluent.

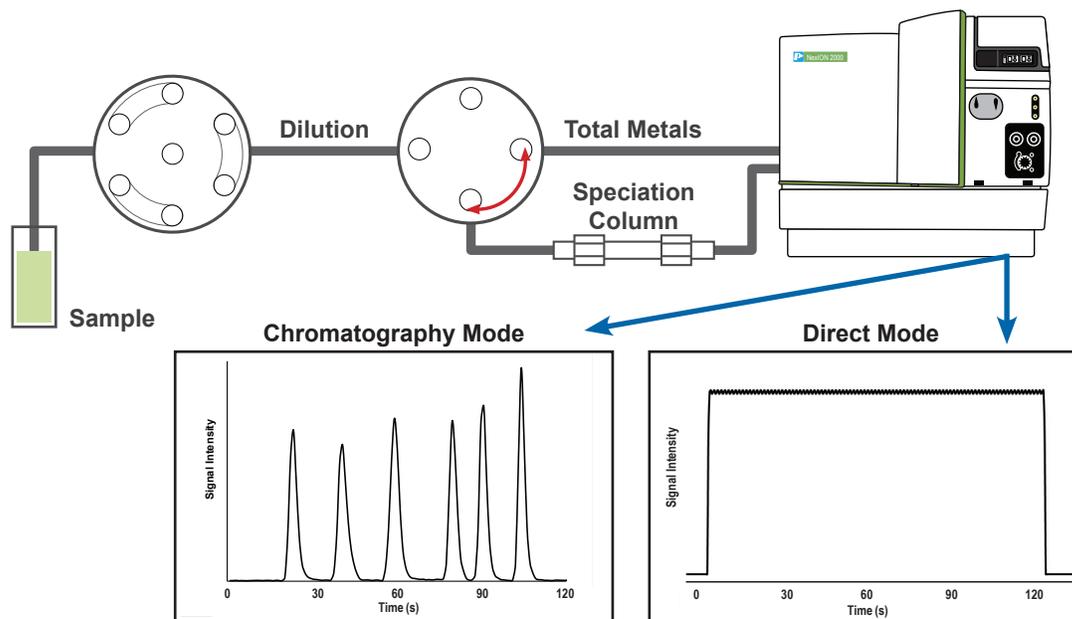
### Features and Options:

- High pressure eluent delivery (HPLC)
- Gradient elution option
- Automated in-line sample dilution and syringe-driven sample loading option
- Automated switching between total metal analysis and speciation option
- Micro sample compatible with selectable sample loop loading
- Enclosed mobile station with optional ULPA filter preserves sample integrity
- PFA-ICN nebulizer and PFA encased sample probes
- Xceleri Chromatography Data Software



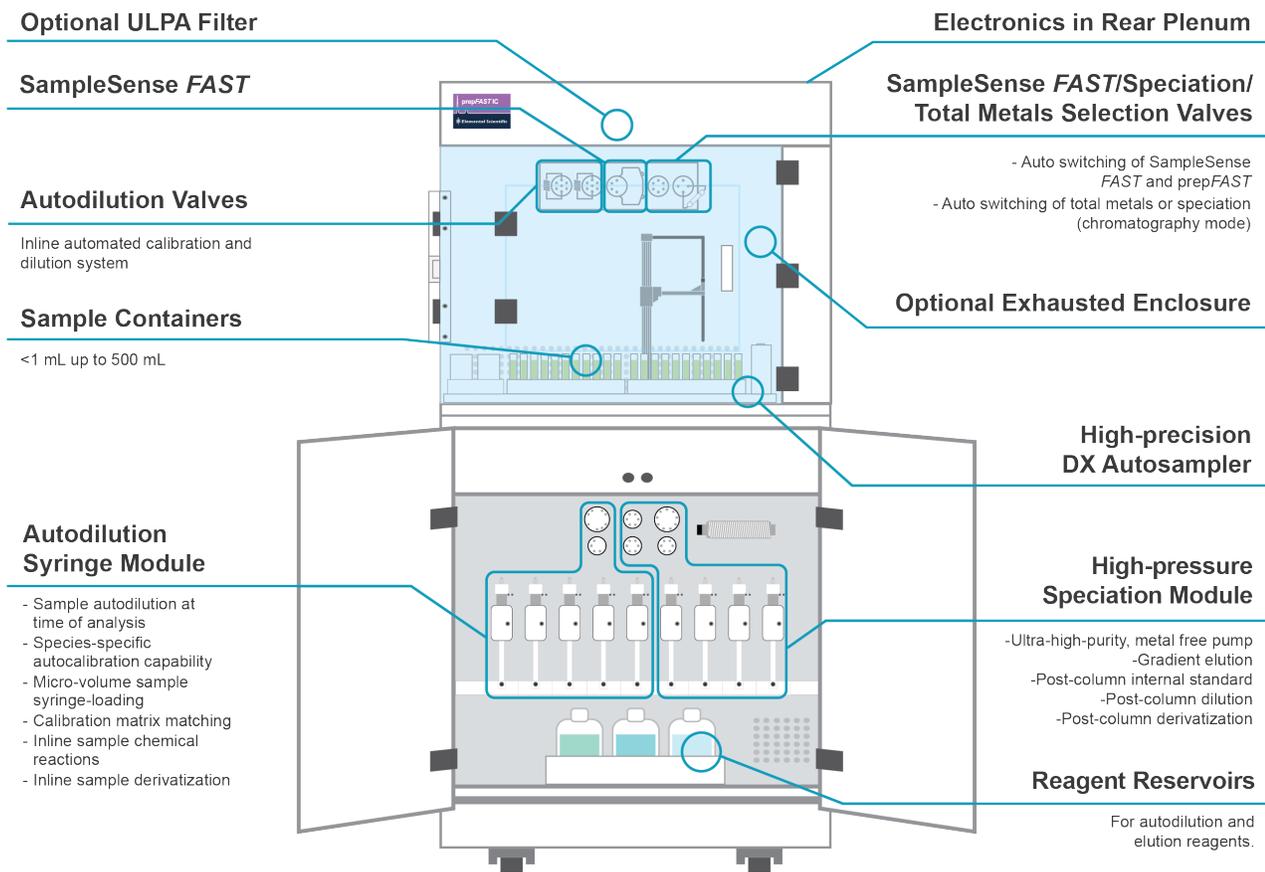
prepFAST IC System

### Unique Design Supports Unattended Analysis of Both Trace Metals and Speciation

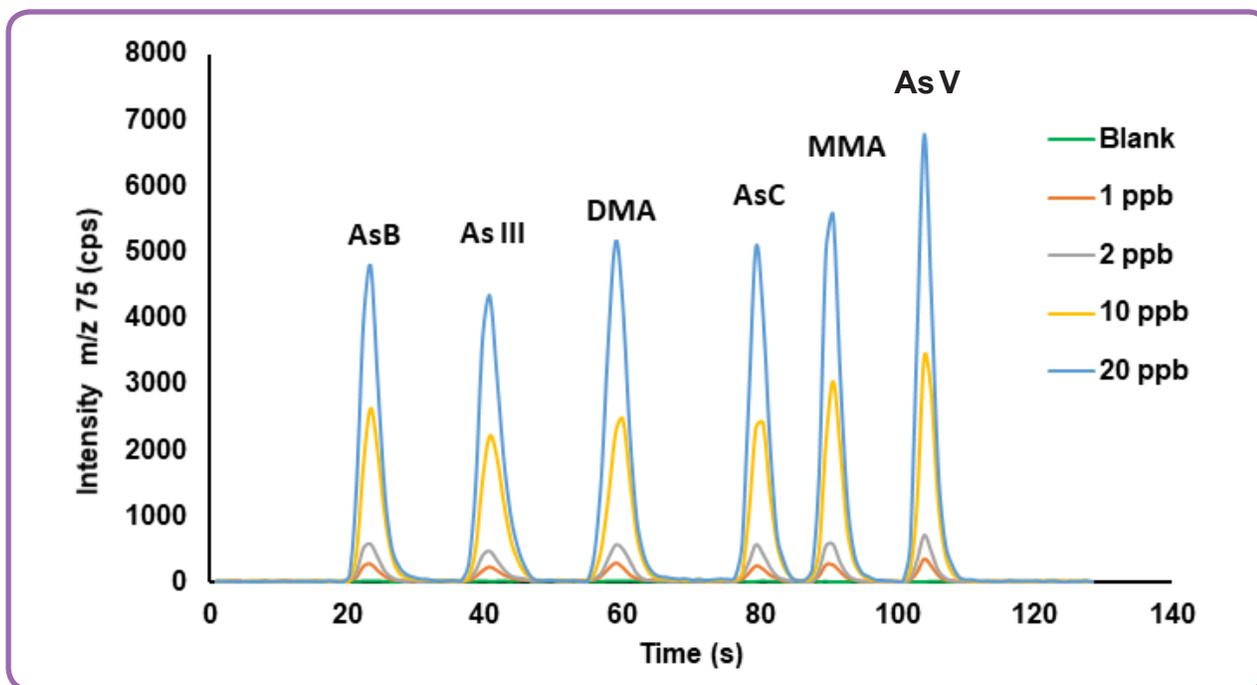


prepFAST IC Autoselects Chromatography Mode or Direct Mode

## prepFAST IC Features Diagram



## Species Autocalibration with prepFAST IC



prepFAST IC provides autodilution of calibration solutions and samples at the time of analysis. This minimizes effects of species conversion after preparation.

## Xceleri Software for Automated Speciation Analysis

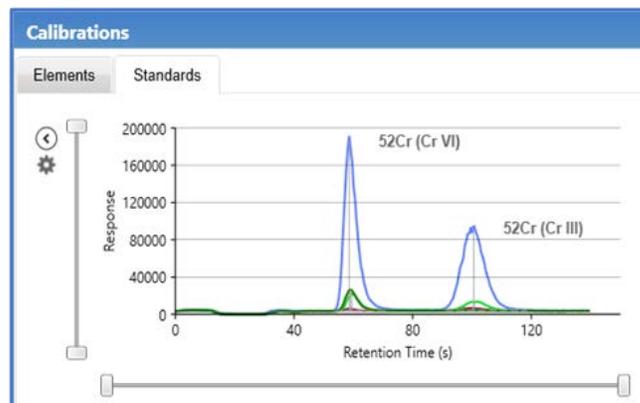
Xceleri is a simple but powerful tool that makes processing chromatographic data possible for any level of user.

### Data Processing

- Transient signal data processing
- Easy to build methods
- Calibration fit tools
- Specifically designed for LC-ICP/ICPMS

### Data Viewing

- Automated or manual peak selection and integration techniques
- Visualization functions for easy comparisons of chromatograms for standards or samples



### Advanced Reporting Functions

- Automated read back functions for inline dilutions
- QC exporting to a single Excel file
- Report function offers comprehensive overview of the results including:
  - Calibration curves
  - Raw intensities
  - Calculated concentrations
  - Chromatograms

The screenshot shows the Xceleri software interface. The 'Data Report' window is open, displaying a table of results for chromium speciation. The table includes columns for Index, Arrived, Time, Description, 52Cr (Cr VI), and 52Cr (Cr III). Below the table, there are sections for 'Sample Concentration Details' and 'Calibration Curves'. Two calibration curves are shown: one for 52Cr Cr VI - Standards with the equation  $y = 44506.32x - 0$  and  $R = 0.999721$ , and one for 52Cr Cr III - Standards with the equation  $y = 46222.79x - 0$  and  $R = 0.999623$ .

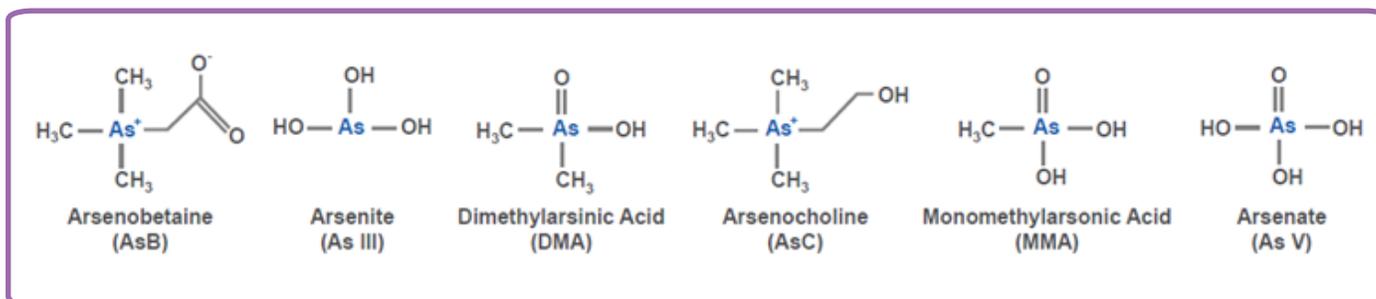
Index	Arrived	Time	Description	52Cr (Cr VI)	52Cr (Cr III)
1	<input type="checkbox"/>	12/12/2019 7:47:58 AM	Blank	0.00	0.00
2	<input type="checkbox"/>	12/12/2019 7:51:48 AM	Std-1	0.10	0.09
3	<input type="checkbox"/>	12/12/2019 7:55:36 AM	Std-2	0.21	0.21
4	<input type="checkbox"/>	12/12/2019 7:59:26 AM	Std-3	0.48	0.50
5	<input type="checkbox"/>	12/12/2019 8:03:14 AM	Std-4	1.03	1.04
6	<input type="checkbox"/>	12/12/2019 8:07:04 AM	Std-5	1.99	1.98
7	<input type="checkbox"/>	12/12/2019 9:00:32 AM	Drinking Water 1	0.64	0.27
8	<input type="checkbox"/>	12/12/2019 9:04:20 AM	Drinking Water 2	1.01	0.00
9	<input type="checkbox"/>	12/12/2019 8:56:42 AM	Drinking water 3	0.64	0.00

Elemental Scientific Xceleri chromatography software processed results for chromium speciation of drinking water performed with the prepFAST IC coupled to the NexION 2000

## Arsenic Speciation

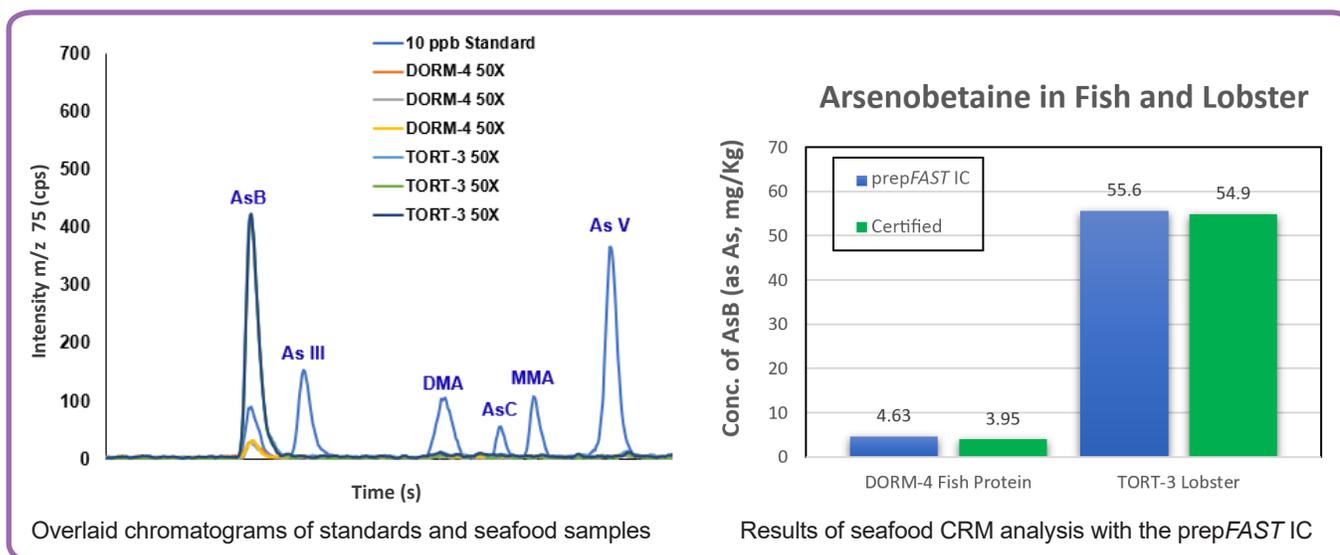
Both forms of inorganic arsenic (As III & As V) are considered toxic at low levels, while the organometallic forms are much less toxic. Determination of the chemical form(s) of the total arsenic metal present in a sample is often critical in sample determinations. The analysis of both total and speciated forms of arsenic in clinical, pharmaceutical, food, and environmental samples is fully automated with the prepFAST IC.

### Arsenic Species



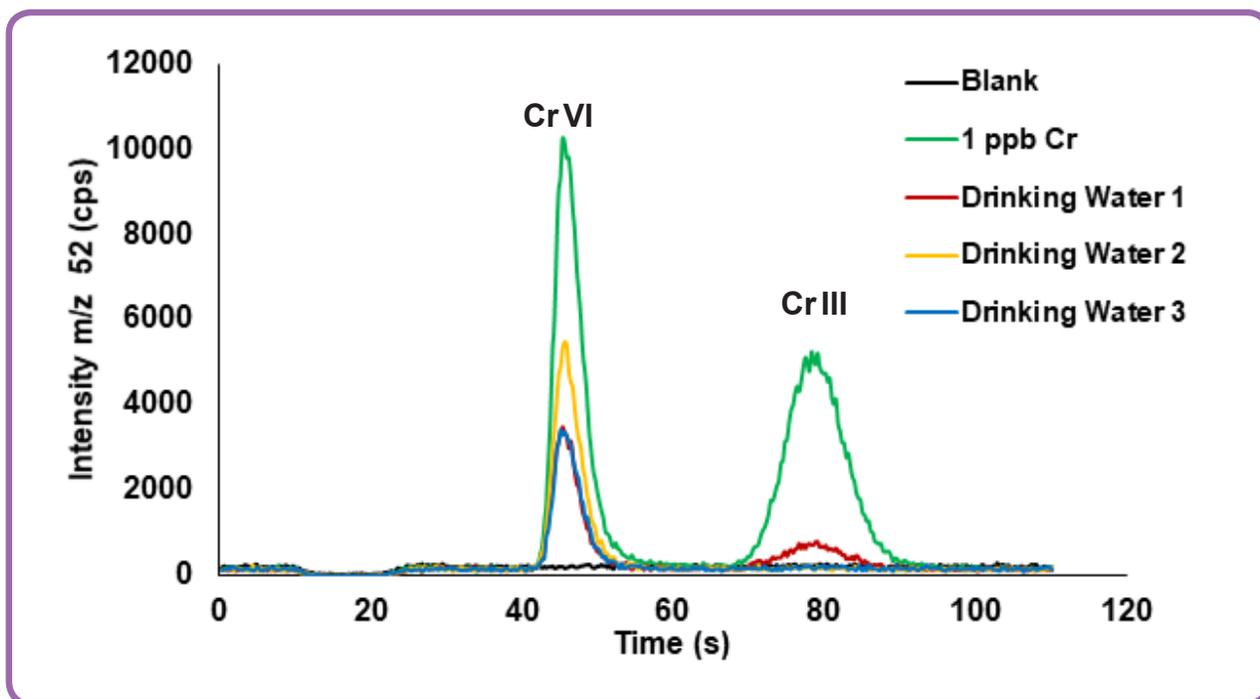
## Arsenobetaine in Food with prepFAST IC - Fish and Lobster

Agencies around the world are starting to require testing of seafood for arsenic species. Arsenobetaine (AsB) is often found to be the major As component present in many types of seafood. The more toxic forms of As III and As V can also be detected. The capability of the prepFAST IC to perform an inline dilution aids in properly performing the speciation analysis. Below are examples of the wide range of arsenic species concentrations that can be successfully determined with the prepFAST IC system.



## Chromium Speciation Analysis of Drinking Water

Chromium exists in the environment in several forms which differ significantly in their effects upon organisms. Chromium (III) is often considered an essential nutrient, but chromium (VI) is toxic and considered carcinogenic. This makes the identification of the specific forms of chromium present in a sample very critical. The prepFAST IC provides for fast automated analysis of both total and the speciated forms of chromium. Chromatograms below displays overlaid standards and samples response.



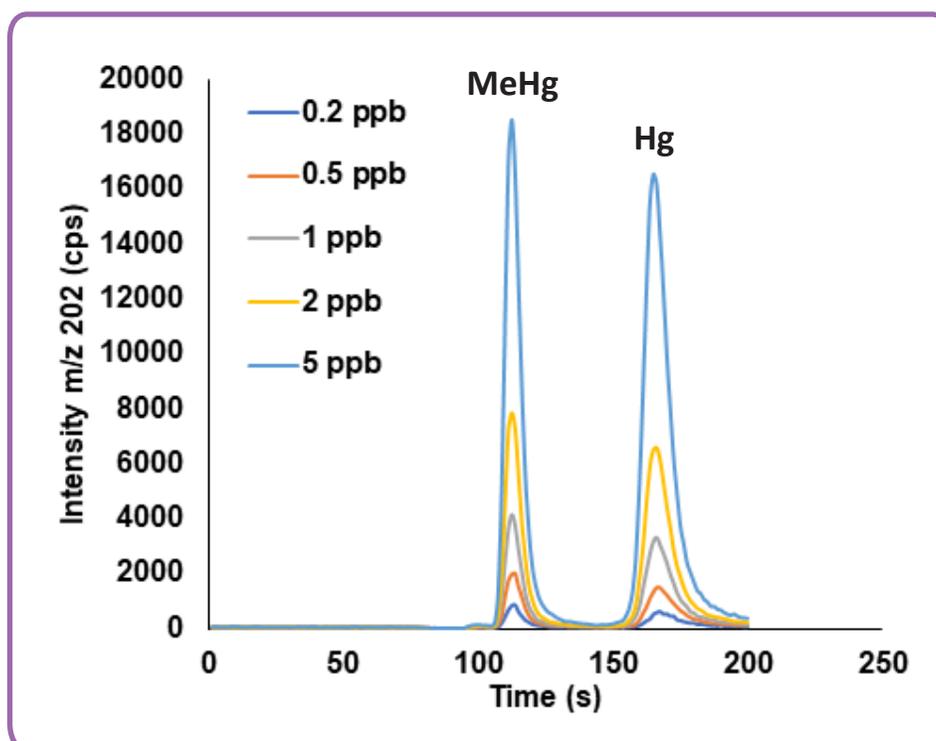
Chromium speciation analysis of drinking water samples performed with the prepFAST IC coupled to the NexION 2000

## Chromium Speciation Results for Drinking Waters

Sample	Cr VI Conc. (µg/L)	Cr III Conc. (µg/L)
Drinking Water 1	0.64	0.27
Drinking Water 2	1.01	0.00
Drinking Water 3	0.64	0.00

## Mercury Speciation

The presence of mercury in marine environments is of particular concern due to bioaccumulation that occurs in the tissues of marine organisms, like fish, oysters, and shrimp. With the toxicity of inorganic mercury (Hg) and especially the methyl mercury form (MeHg), significant public health concerns have arisen over the amount of fish consumed. At particular risk are pregnant or breast-feeding mothers due to the neurological impacts on fetal and infant development. The prepFAST IC provides autocalibration and inline dilution to aid in the quick determination of the individual forms of mercury present in fish tissues.



### Mercury Speciation - Analysis of MeHg in Fish Tissue with prepFAST IC

Sample	Experimental Results				
	Mass (g)	Volume (L)	Target Value ( $\mu\text{g/L}$ )	Measured Value ( $\mu\text{g/L}$ )	Recovery
NIST SRM 1946 Lake Superior Fish Tissue	0.250	0.03	<b>3.28</b>	<b>3.24</b>	100%
NRCC DORM-4 Fish Protein	0.250	0.03	<b>2.96</b>	<b>3.00</b>	100%

## prepFAST IC Configuration Options

The prepFAST IC is offered in a flexible configuration, with options added to the base system. The system can be configured to include the capabilities needed for your applications.

Description	Part Number
<b>Base FAST IC.</b> ICPMS chromatography system with Isocratic elution and syringe sample loading. Includes 4 rack ultraclean autosampler.	IC-0101
<b>Quarternary Gradient Elution Option</b> – Gradient elution capability for advanced chromatography	IC-0102
<b>prepFAST Option</b> – Autocalibration and autodilution capabilities	IC-0103
<b>Automated Speciation and Total Metals Option</b> – Automated switching between total metals and speciation	IC-0104
<b>ICPMS Autotuning Option</b> – Switching valve for introduction of tuning solutions	IC-0105
<b>Post-Column Option</b> – Additional syringe module	IC-0106
<b>SampleSense FAST UHT Option</b> – SampleSense optical sensing Injection valve	IC-0107
<b>pergo Option</b> – Nebulizer gas humidifier accessory	IC-0108
<b>Xceleri Chromatographic Software</b> – Powerful and easy-to-use data processing software	IC-0201

## prepFAST IC Speciation Kits

Elemental Scientific offers speciation kits for many elements to help laboratories quickly develop and implement methods for many speciation systems.

Kit Name	Description	Part Number
<b>As</b>	<b>Inorganic and Organometallic Arsenic Speciation Kit.</b> CF-As-01 column, single species standards for As III, As V, AsB, DMA, MMA (10 mg/L, 100 mL), and method guide. Also used for AsC and Roxarsone.	ICX-As35
<b>Se</b>	<b>Inorganic and Organometallic Selenium Kit.</b> CF-Se-01 column, single species standards for Se IV & Se VI, (1000 µg/mL, 100 mL) and method guide.	ICX-Se46
<b>Cr</b>	<b>Inorganic Chromium Speciation Kit.</b> CF-Cr-01 column, single species standards for Cr III, Cr VI, and Tm (1000 µg/mL, 100 mL), and method guide.	ICX-Cr36
<b>Hg</b>	<b>Inorganic and Organometallic Mercury Speciation Kit.</b> CF-Hg-01 column, single species standards for Hg <sup>+</sup> (1000 µg/mL, 50 mL) and MeHg <sup>+</sup> (1000 µg/mL, 25 mL), and method guide.	ICX-Hg
<b>Gd</b>	<b>Gadolinium Imaging Agents Speciation Kit.</b> CF-Gd-01 column, single species standard for Gd (1000 µg/mL, 100 mL) and method guide. Used for Gd <sup>+3</sup> and Gd-based contrast agents.	ICX-Gd
<b>Cu</b>	<b>Bound and Free Copper Speciation Kit.</b> CF-Cu-01 column and method guide. For determination of bound Cu and free Cu in serum.	ICX-Cu
<b>Fe</b>	<b>Inorganic Iron Speciation Kit.</b> CF-Fe-01 column, single species standards for Fe <sup>+2</sup> and Fe <sup>+3</sup> (1000 µg/mL, 100 mL), and method guide.	ICX-Fe23
<b>U</b>	<b>Trace Elements in Uranium Matrix Kit.</b> CF-UTEVA-02 column, single species standard for U (100,000 mg/L, 100 mL) and multielement standards (Al, As, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, An, Ba, Ce, Ga, Li, P, Sr, U, 1000 mg/L, 100 mL) and method guide. For removal of U matrix.	ICX-UTEVA
<b>Cl</b>	<b>Inorganic Chlorine Speciation Kit.</b> CF-Cl-01 column, single species standards for Cl <sup>-</sup> , ClO <sub>2</sub> <sup>-</sup> , ClO <sub>3</sub> <sup>-</sup> , ClO <sub>4</sub> <sup>-</sup> (1000 µg/L, 100 mL), and method guide.	ICX-CIClO3
<b>Br</b>	<b>Inorganic Bromine Speciation Kit.</b> CF-Br-01 column, single species standards for Br <sup>-</sup> & BrO <sub>3</sub> <sup>-</sup> (1000 µg/mL, 100 mL) and method guide.	ICX-BrBrO3
<b>I</b>	<b>Inorganic Iodine Speciation Kit.</b> CF-I-01 column, single species standards for I <sup>-</sup> & IO <sub>3</sub> <sup>-</sup> (1000 µg/mL, 100 mL) and method guide.	ICX-IIO3
<b>Cl Br I</b>	<b>Inorganic Halogens Speciation Kit.</b> CF-Halogen-01 column, single species standards for Cl <sup>-</sup> , ClO <sub>2</sub> <sup>-</sup> , ClO <sub>3</sub> <sup>-</sup> , ClO <sub>4</sub> <sup>-</sup> , Br <sup>-</sup> , BrO <sub>3</sub> <sup>-</sup> , I <sup>-</sup> , IO <sub>3</sub> <sup>-</sup> (1000 µg/mL, 100 mL), and method guide.	ICX-CIBrI

# Ultrapure Reagents

AUTOMATION



Elemental Scientific offers ultrapure reagents to support the analysis of difficult matrices such as seawater and clinical matrices.

## Features

- Purified and packaged under Class 100 clean room conditions
- Low-or sub-ppb contamination for most elements on the periodic table
- Certificate of analysis included

## Applications

- Improve accuracy for seawater or clinical samples with matrix-matched calibrations while maintaining excellent blanks
- Simulate complex clinical matrices for analyses such as urine, whole blood and serum/plasma

Description	Application	Part Number
seaBlank 10.5% ultrapure NaCl, 500 mL	Analysis of seawater, brines, environmental water or ultrapure matrix modifier for any high-saline application	seablank-0500
seaFAST ultrapure buffer, 1 L	Inline adjustment of pH for preconcentration and matrix removal	UPB-4M-1L
Ultrapure Clinical Matrix, 500 mL	Analysis of urine, whole blood, serum/plasma	CLIN-0500



**Elemental Scientific**

## Automated Seawater Analysis for the NexION 1000/2000 ICPMS

The seaFAST automatically prepares seawater and other high matrix samples for ICPMS analysis in <10 minutes to produce analytical results that might otherwise require time-consuming and contamination-prone offline sample preparation.

The accurate determination of trace metals in seawater is important both for scientific research and environmental monitoring. Because many transition metals and other analytes are present at low to sub-ppt concentrations in seawater, and because the saline matrix suppresses signal and causes mass spectral interferences, it is necessary to separate and concentrate analytes from the seawater matrix prior to ICPMS analysis.

seaFAST S-Series systems are syringe-driven sample introduction systems for multi-mode analysis of high matrix samples. For more complete automation and simple day-to-day usage, the seaFAST SP-Series systems have integrated prepFAST autocalibration and autodilution features.

### High Performance:

- Automated preconcentration
- Automated matrix elimination
- Ultraclean ultra-low blanks
- Applicable to seawater, groundwater, brines, or other high matrix samples



## seaFAST SP3

- Completely syringe-driven
- Multimode:
  - Preconcentration
  - Direct
  - Hydride
- Autocalibration, Autodilution
- Auto matrix matching
- Auto standard addition
- Ultratrace metals determination in high matrix samples

### seaFAST Systems

System	High-purity Autosampler Enclosure	Syringe Sample Loading	Offline Preconcentration	Online Preconcentration	Direct Mode Inline Dilution	Hydride Mode	Auto-calibration	Auto-dilution	Auto Matrix Matching/ Auto MSA
seaFAST S2	✓	✓	✓	✓	✓				
seaFAST S3	✓	✓	✓	✓	✓	✓			
seaFAST SP2	✓	✓	✓	✓	✓		✓	✓	✓
seaFAST SP3	✓	✓	✓	✓	✓	✓	✓	✓	✓

## seaFAST Systems Comparison

### seaFAST S2

#### Preconcentration and Direct Modes:

A chelation column concentrates transition metals and rare earth elements, but allows matrix  $\text{Na}^+$ ,  $\text{Cl}^-$ ,  $\text{Ca}^{2+}$  and  $\text{Mg}^{2+}$  ions to be rinsed out. After the preconcentration step, analytes are eluted and detected. Analytes that are not chelated by the preconcentration column are measured by direct dilution with internal standard during the same analytical run.

### seaFAST S3

#### Preconcentration, Direct and Hydride Modes:

Adds hydride generation to the capabilities of the seaFAST S2 to allow high-sensitivity detection of As, Se and other hydride-forming elements.

### seaFAST SP2

#### Preconcentration and Direct Modes with Autodilution:

The capabilities of seaFAST S2 plus autocalibration, autodilution, auto matrix matching, and auto method of standard addition (MSA) in both modes.

### seaFAST SP3

#### Preconcentration, Direct and Hydride Modes with Autodilution:

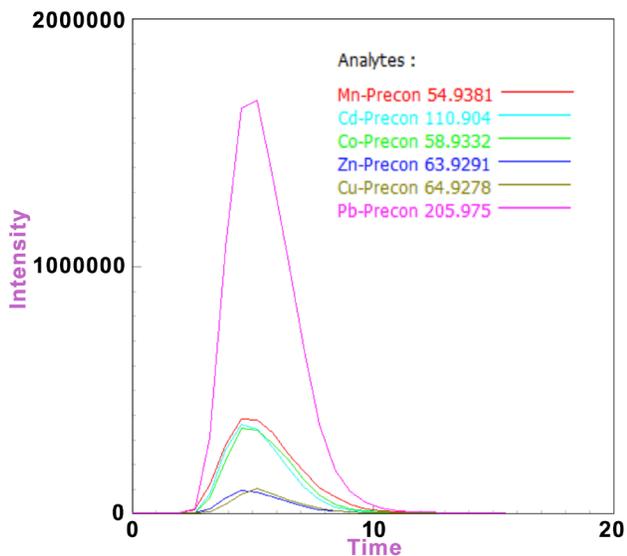
The capabilities of seaFAST S3 plus autocalibration, autodilution, auto matrix matching, and auto method of standard addition (MSA) in all modes.

**seaFAST**

1 H																	2 He	
3 Li	4 Be											5 B	6 C	7 N	8 O	9 F	10 Ne	
11 Na	12 Mg											13 Al	14 Si	15 P	16 S	17 Cl	18 Ar	
19 K	20 Ca	21 Sc	22 Ti	23 V	24 Cr	25 Mn	26 Fe	27 Co	28 Ni	29 Cu	30 Zn	31 Ga	32 Ge	33 As	34 Se	35 Br	36 Kr	
37 Rb	38 Sr	39 Y	40 Zr	41 Nb	42 Mo	43 Tc	44 Ru	45 Rh	46 Pd	47 Ag	48 Cd	49 In	50 Sn	51 Sb	52 Te	53 I	54 Xe	
55 Cs	56 Ba	Lanthanides 57 La		72 Hf	73 Ta	74 W	75 Re	76 Os	77 Ir	78 Pt	79 Au	80 Hg	81 Tl	82 Pb	83 Bi	84 Po	85 At	86 Rn
87 Fr	88 Ra			89 Ac	90 Th	91 Pa	92 U											
		Actinides		61 Pm	62 Sm	63 Eu	64 Gd	65 Tb	66 Dy	67 Ho	68 Er	69 Tm	70 Yb	71 Lu				

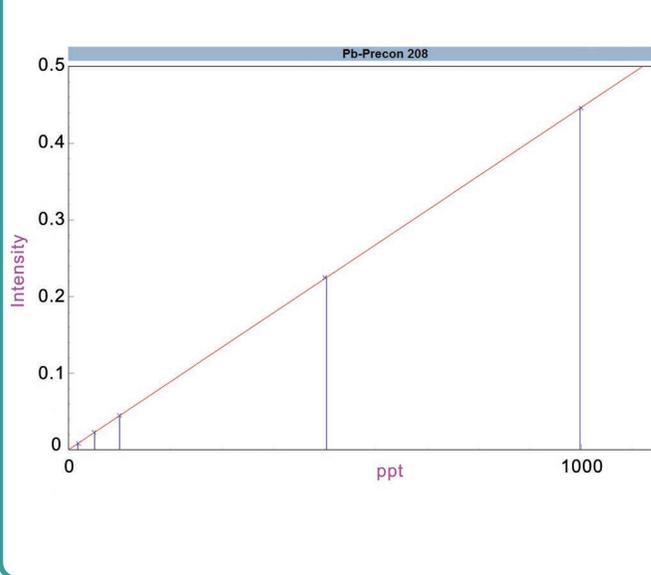
Preconcentration or Direct Mode  
 Direct mode  
 Hydride or Direct Mode (S3/SP3 only)

## Preconcentration and Matrix Removal



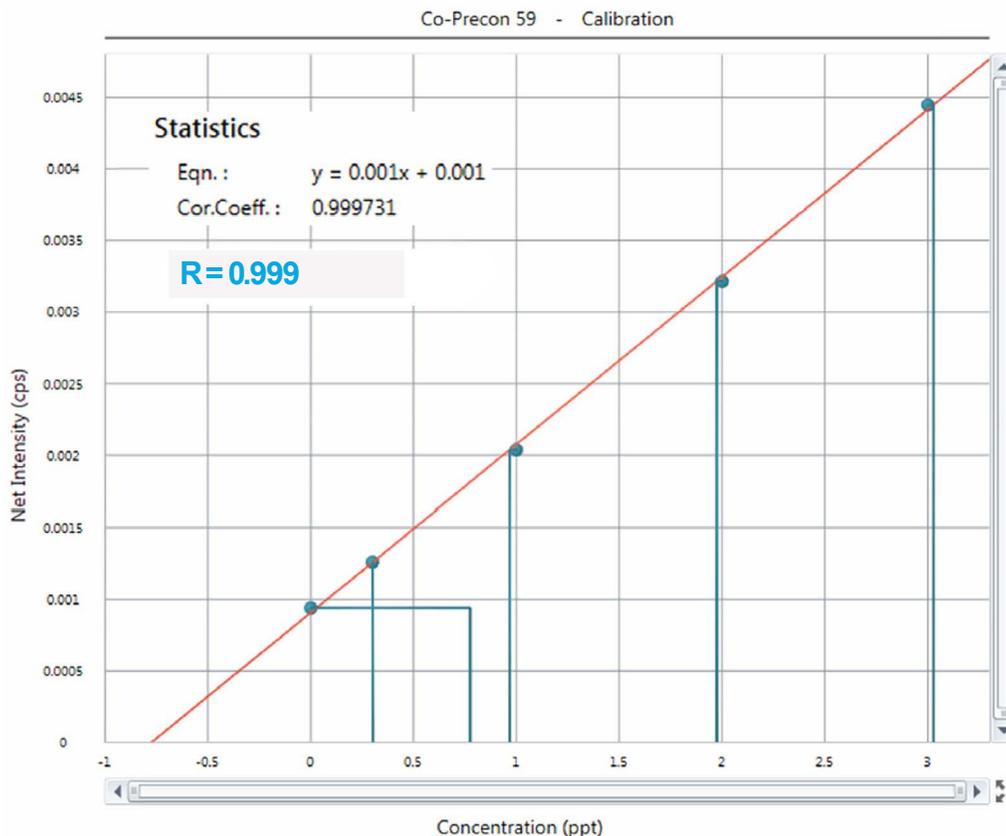
Simultaneous elution of six elements in Preconcentration mode, 1 ppb.

## Preconcentration Mode Autocalibration



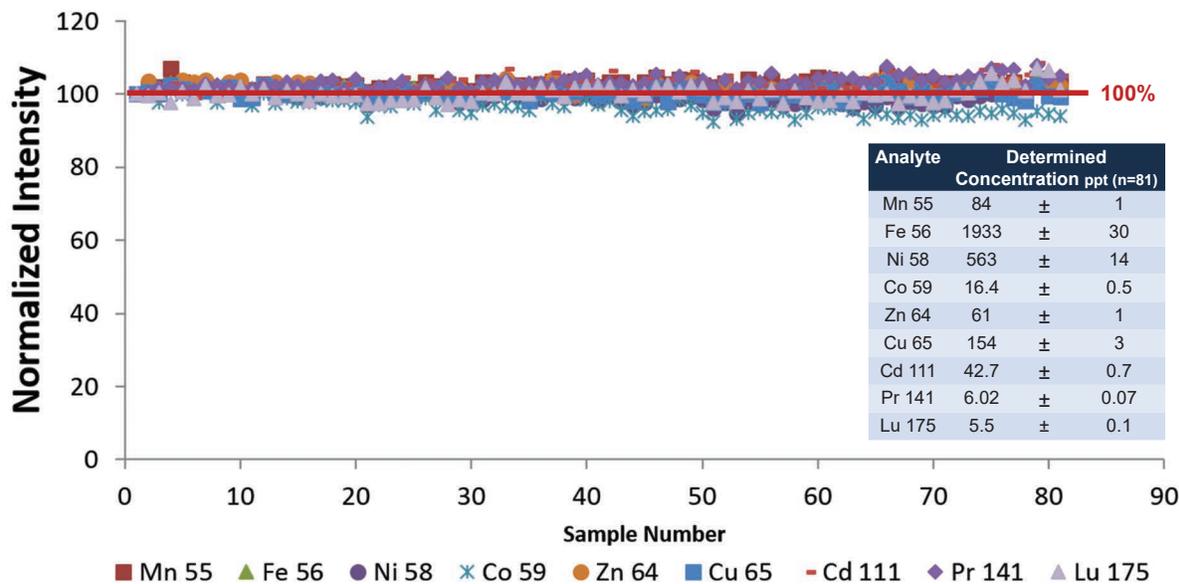
Autocalibrated from a single, 1 ppb standard. Auto Matrix Matched to 3% NaCl with seaBlank.

## Automatic Standard Addition Calibrations



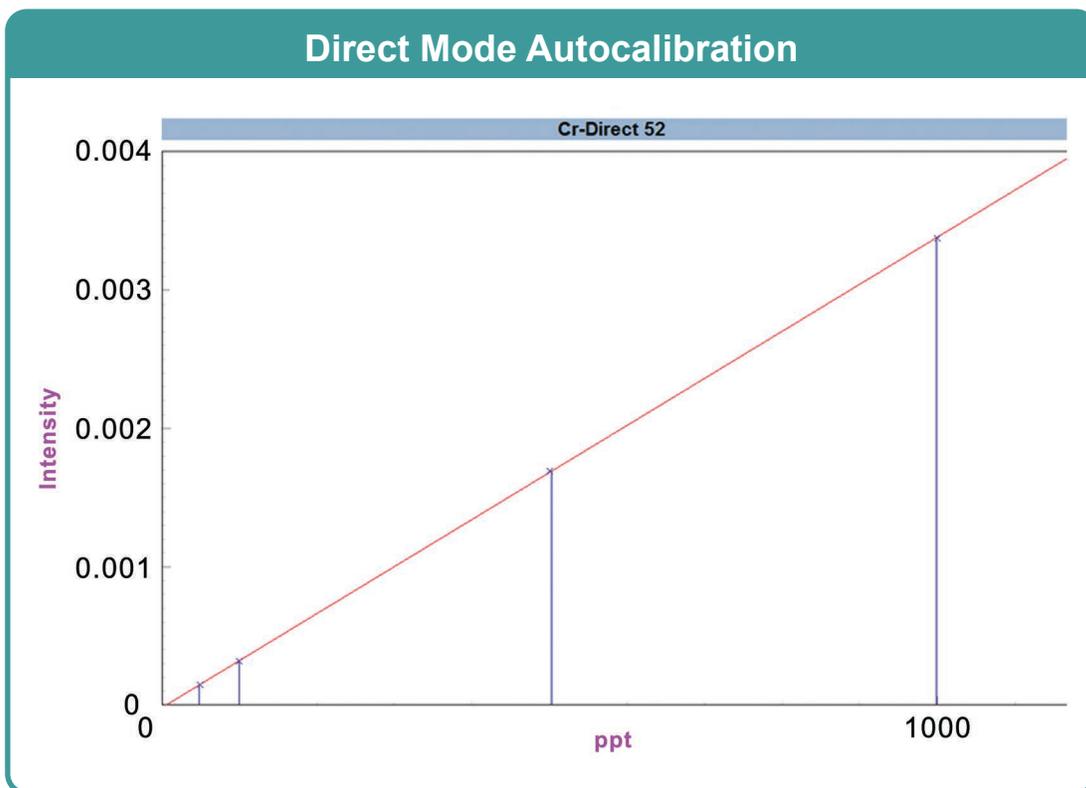
Automatic standard addition (MSA) calibration for Co in GSP North Pacific surface seawater. Analyte concentration is less than 1 ppt. Addition spikes at 0.25 ppt, 1 ppt, 2 ppt, and 3 ppt show seaFAST NexION capabilities to accurately and automatically measure extremely low concentrations of metals in saline samples.

### Long-term Stability



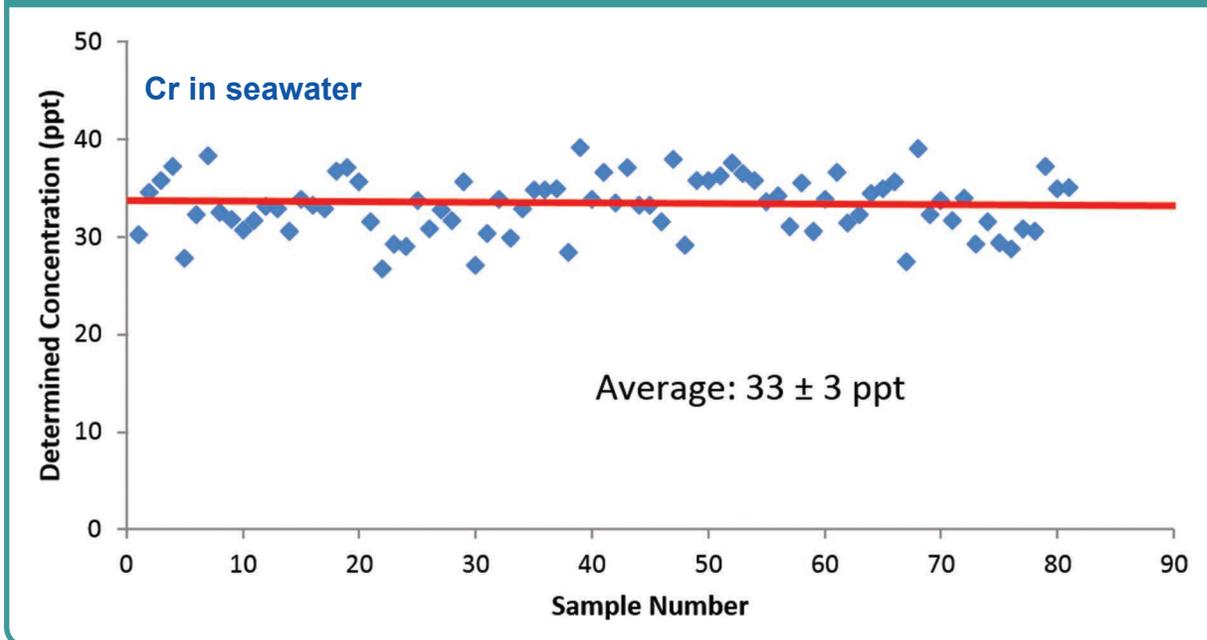
Common transition metals and selected rare earth elements (REEs) were determined in synthetic seawater consecutively for over 14 hours (n=81). Auto-matrix-matched blanks and QC standards not shown, for clarity. Average precision over 14 hours was better than 2% with internal standard correction. REEs were spiked at 5 ppt.

### Direct Mode Autocalibration



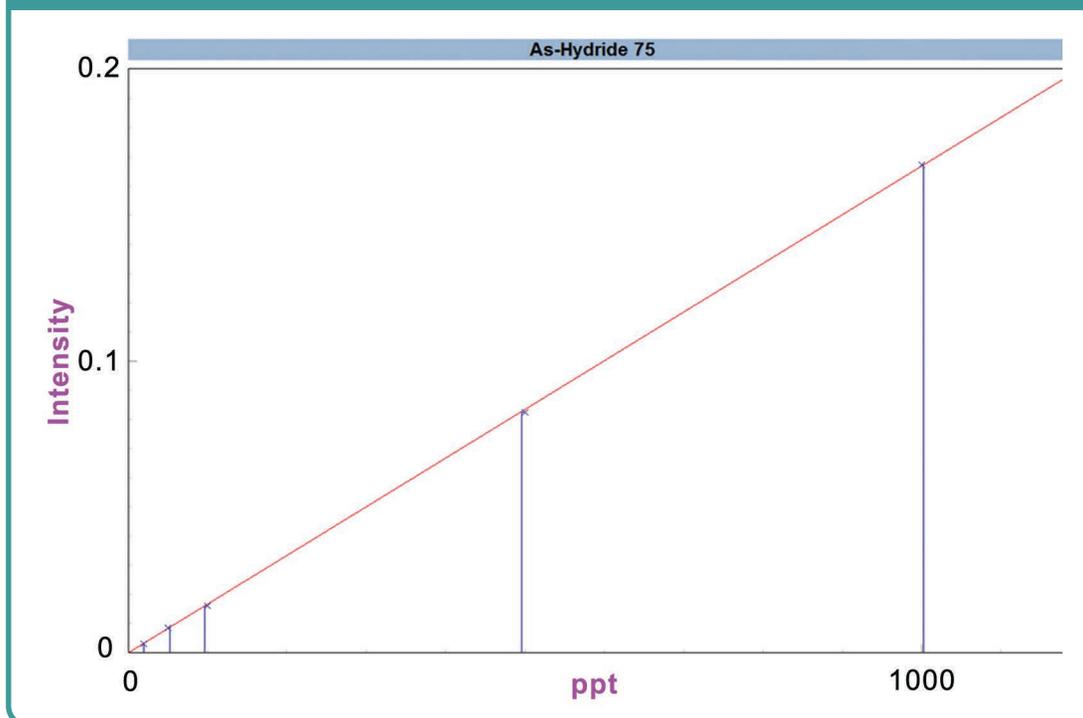
Autocalibrated from a single, 1 ppb standard. Auto Matrix Matched to 3% NaCl with seaBlank.

## Direct Mode Long-term Stability



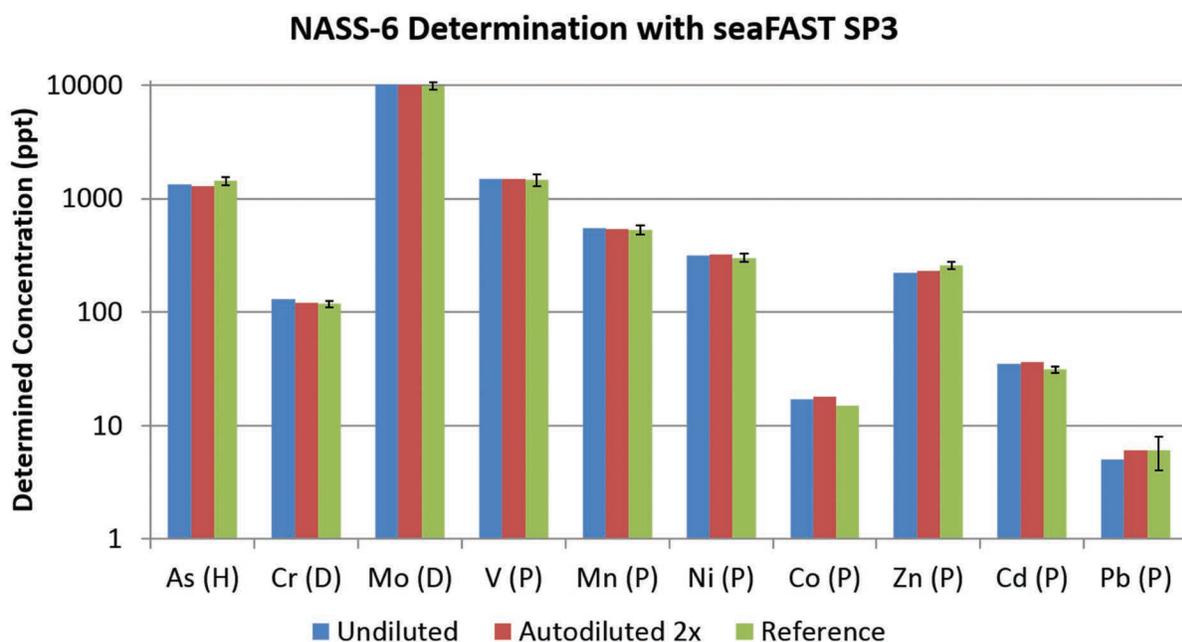
Chromium in synthetic seawater. > 14 hours of repeated determinations with internal standard correction. seaFAST operated in direct mode with 10x inline dilution, measured utilizing  $\text{NH}_3$  DRC mode. Determined concentration was  $33 \pm 3$  ppt.

## Hydride Mode Autocalibration



Autocalibrated from a single, 1 ppb standard. Auto Matrix Matched to 3% NaCl with seaBlank.

## NASS-6 Determination with seaFAST SP3



NASS-6 was analyzed in all three modes, Preconcentration (P), Direct with 10x inline dilution (D) and Hydride (H). NASS-6 was run undiluted and with a 2x autodilution using automatic, inline matrix matching with seaBlank ultrapure sodium chloride solution. The seaFAST achieves excellent accuracy in all three modes, with and without autodilution.

### Now with Syringe-driven Sample Loading

All seaFAST systems now include syringe-loading capability to ensure samples and standards are loaded accurately each and every time. Eliminate variable vacuum-loading times for samples with varying viscosities and simplify daily operation.

For offline preconcentration mode, the smaller-volume eluted fraction may be accurately syringe-loaded for analysis by seaFAST Direct mode.

#### seaFAST Systems

Description	4DX
seaFAST S2 system	4SF-S2-M5-PE-I
seaFAST S3 system	4SF-S3-M5-PE-I
seaFAST SP2 system	4SF-SP2-M5-PE-I
seaFAST SP3 system	4SF-SP3-M5-PE-I

#### seaFAST System Columns

Description	Part Number
Spare seaFAST preconcentration column	CF-N-0200
Spare seaFAST trace metal cleanup column	CF-P-0050
Spare seaFAST S2 trace metal cleanup column	CF-P-0200

#### seaFAST System Reagents

Description	Part Number
seaBlank 10.5% ultrapure NaCl, 500 mL	seablank-0500
seaFAST S-Series Ultrapure buffer, 1 L	UPB-4M-1L

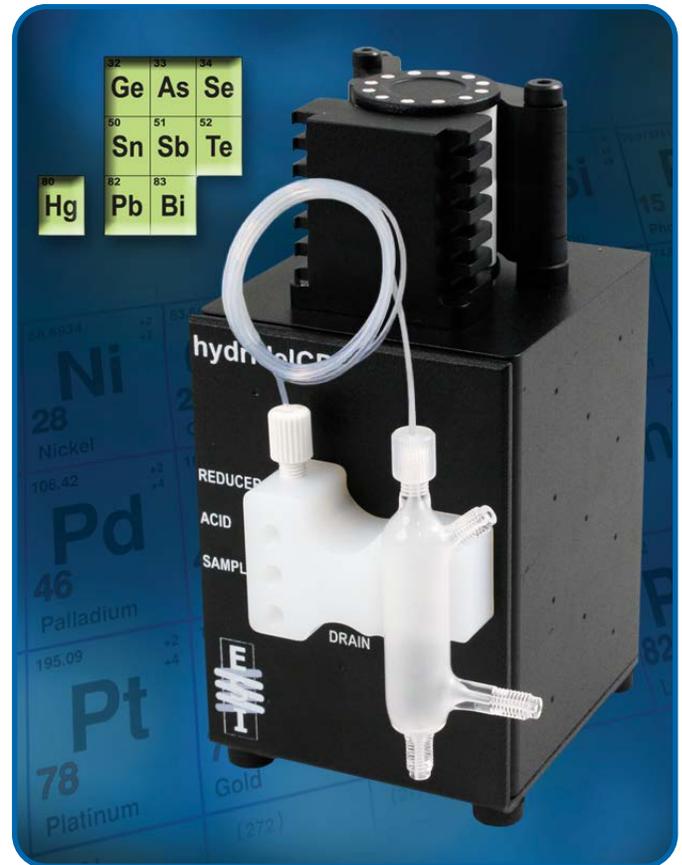
# hydrideICP™

## Compact Hydride Generation System for NexION 1000/2000 ICPMS

The hydrideICP, a standalone hydride generation system with precision micro peristaltic pump, provides ultralow detection limits for hydride-forming elements such as As, Se, Sb, and Hg.

### Benefits:

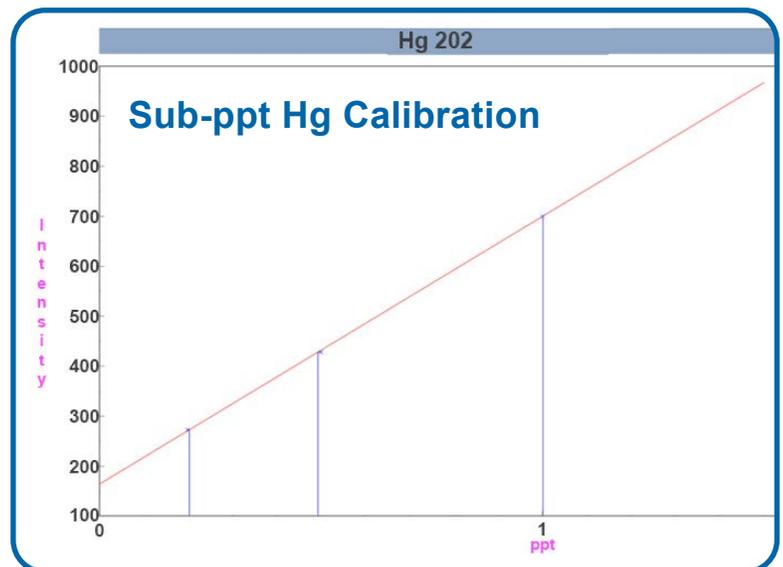
- Increased sensitivity, up to 100x for hydride-forming elements
- Improved detection limits for As, Hg, Se, Sb, and other hydride-forming elements
- Improved stability
  - MP<sup>2</sup> micro peristaltic pump precisely mixes sample and reagents, producing a stable formation of H<sub>2</sub> gas and hydrides
- Compact
  - hydrideICP is the smallest system of its kind on the market (95 mm x 118 mm x 140 mm)
- Chemically resistant construction
  - MP<sup>2</sup> micro peristaltic pump with ceramic pins, a PFA mixing block and quartz GLS
- Convenient
  - hydrideICP is completely integrated into the MP<sup>2</sup> pump



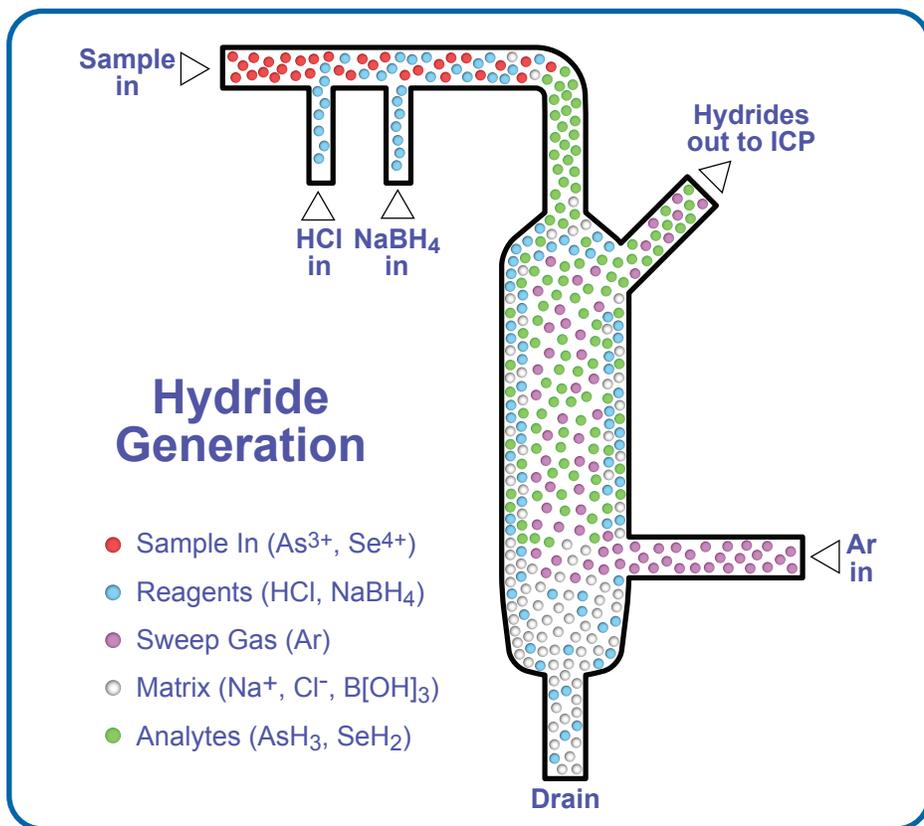
hydrideICP system



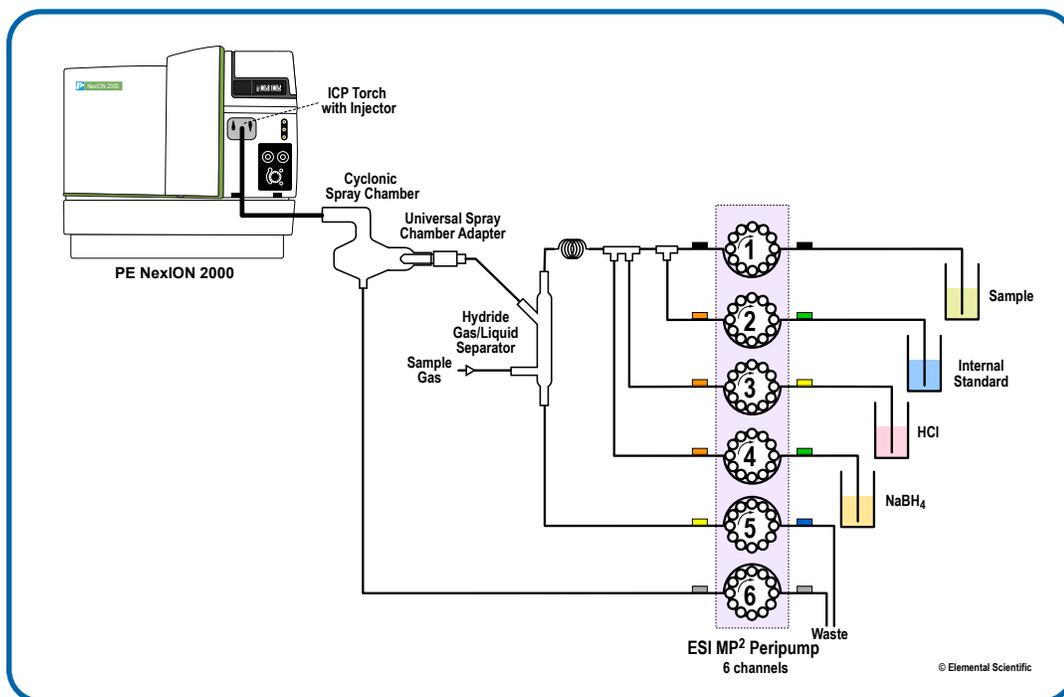
The universal spray chamber adapter is a gas-liquid separator to the NexION 1000/2000 spray chamber.



hydrideICP greatly increases Hg sensitivity, over 500 cp/s for 1 ppt Hg.



HydrideICP's gas liquid separator is the smallest, highest performing and most stable on the market. The design promotes rapid mixing of sample and reagents, resulting in an efficient reaction and separation of hydride gases from sample liquids in a small volume.



Description	Part Number
hydrideICP hydride generation system. hydrideICP Generator Kit (Hydride quartz gas-liquid separator, four way tee, MP <sup>2</sup> precision micro peristaltic pump, universal spray chamber adapter and mounting plate).	HG-MP2-6-A



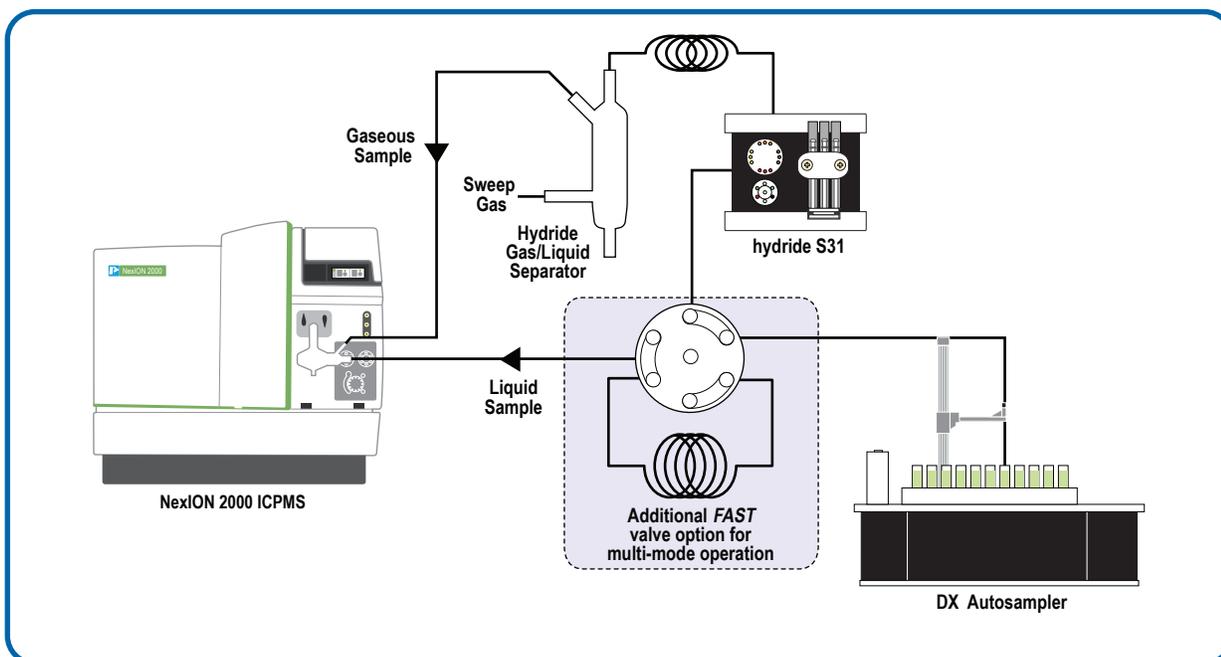
## Simultaneous Hydride Generation and Direct Nebulization with hydride S31

The integration of an additional *FAST* valve provides multi-mode functionality to the hydride S31 and the NexION 1000/2000 for the highest flexibility and sample throughput.

- Selection between the following modes of operation:
  - Simultaneous determination of hydride-forming elements with hydride generation and direct nebulization for other elements
  - Hydride and direct nebulization determinations run sequentially
  - Independent analysis by either hydride or direct nebulization



Single Valve *FAST* DXi for NexION 1000/2000 ICPMS required for simultaneous hydride and direct nebulization option (not included)



Hydride S31 configuration with additional *FAST* valve for high-throughput multi-mode analysis. Non-hydride forming elements are analyzed through the Liquid Sample pathway using a nebulizer. Hydride forming elements benefit from high-sensitivity hydride generation through Gaseous Sample pathway. The NexION 1000/2000 acquisition can be configured to analyze interfered elements (such as As, Se) when the nebulizer is introducing carrier liquid, thus avoiding Cl or other polyatomic interferences. Hydride S31 can also be operated simultaneously or sequentially with direct nebulization.

hydride S31 System	
Description	Part Number
hydride S31 module for any DX <i>FAST</i> system. Includes S31 module for hydride generation. (DX <i>FAST</i> autosampler and C3QX-64-AMS-H spray chamber required, not included)	HFX-64
Quartz AMS Hydride spray chamber; includes matrix gas port, AMS metal-free matrix gas line, additional hydride port, and drain line (see page 68)	C3QX-64-AMS-H

**Turn ANY DX *FAST* System Into a hydride S31 System!**

Just add the hydride S31 module

# SmartTuner

## SmartTuner

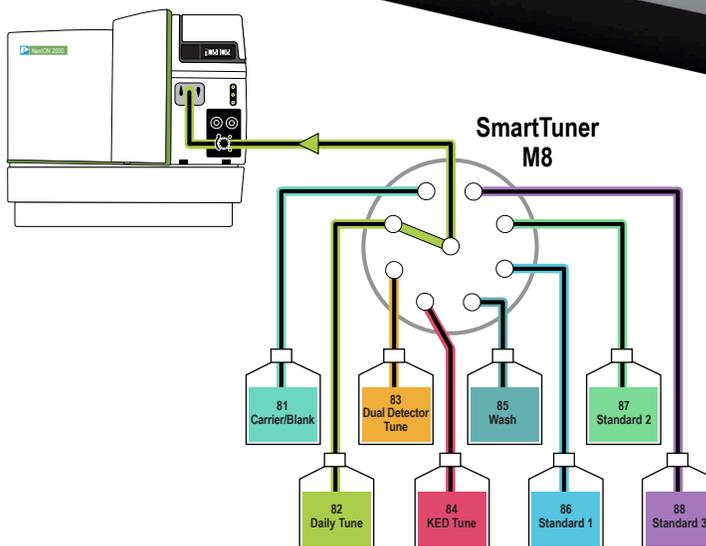
### Automated Tuning, Rinsing, and Calibration for NexION 1000/2000 ICPMS

The SmartTuner combines a multiposition valve with the NexION SmartTune software to automatically perform daily tuning and dual detector calibration. SmartTuner provides rapid and automated ICPMS calibration from standard solutions kept in enclosed bottles protected from evaporation and contamination. The SmartTuner can also supply custom rinse solutions, organic solvents, and even chromatography eluents to the ICPMS. Solutions can be changed on the fly, without manual probe movements.



### SmartTuner Features

- Automated daily tuning
- Automated dual detector calibration
- Automated ICPMS calibration from large standard reservoirs
- Delivery of special rinse solutions, organic solvents, and chromatography eluents
- NexION Scheduler allows for true automated instrument startup, tuning, and calibration routines



## SmartTune Scheduler

Syngistix Applications

Control Diagnostics | SmartTune Conditions LogBook | Method Sample Dataset | Reporter Realtime Interactive CalibView | Scheduler Review | Radian Status: Not installed

Scheduler

<input checked="" type="checkbox"/>	Task	Details	Status
<input checked="" type="checkbox"/>	AutoStart	7/4/2019 5:26:24 AM	
<input checked="" type="checkbox"/>	Warm-up	30 minutes	
<input checked="" type="checkbox"/>	SmartTune	SmartTunerM8 Daily.swz	
<input checked="" type="checkbox"/>	Wait		
<input checked="" type="checkbox"/>	Analyze Samples	Example.sam	
<input checked="" type="checkbox"/>	Wash	15 minutes	
<input checked="" type="checkbox"/>	AutoStop		

## SmartCalibration with SmartTuner

- Place calibration standards in the provided bottles, and the SmartTuner becomes the SmartCalibrator
- Calibration standards are automatically pumped into NexION 1000/2000
- Autosampler space not used for calibration standards
- Refill calibration standards less often

Report View								
Current Sample		Raw Intensities	Net Intensities	Concentrations	Unfactored Concentrations	Internal Standards	QC	
<input type="checkbox"/> Show RSDs								
	Sample Id	V 51 (ppb)	Co 59 (ppb)	Sr 88 (ppb)	Cd 111 (ppb)	Ba 138 (ppb)	Pb 208 (ppb)	U 238 (ppb)
1	Blank							
2	5	4.976	5.175	5.017	5.007	5.207	5.125	5.080
3	10	9.957	10.165	9.919	10.036	10.185	9.991	10.136
4	50	49.506	48.799	49.093	49.249	48.711	49.970	50.684
5	100	100.252	100.575	100.461	100.372	100.616	100.010	99.640
6	Calibration Curves							
7	5ppb QC	5.034	5.206	4.939	5.103	5.100	5.140	5.167
8	Blank QC	0.010	0.009	0.016	0.032	-0.030	-0.012	0.005

SmartTuner multielement calibration



**SmartTuner Rack**

SmartTuner rack with (1) 500 mL bottle, (3) 125 mL bottles, (4) 50 mL vials. Eight PTFE sample probes are included with each SmartTuner.

**SmartTuner Requires a DX Autosampler For Operation**

Description	Part Number
SmartTuner M8 for NexION 1000/2000. (DX autosampler required, not included). Includes chemically inert PTFE SmartTuner tray.	SMT-M8-64
Simplify and automate reagent-selection for daily, weekly, and monthly optimization procedures for NexION. Easily switch between different solvent types.	

## Autosampler Enclosures and ULPA Filtered Environments

### Autosampler Enclosures

Enclosures protect samples and standards from airborne contamination. An exhaust port (100 mm, included) may be connected to the laboratory ventilation system to exhaust acid fumes and protect the laboratory environment and equipment. Enclosures can be purchased with or without an ULPA filter.



SC-1207-DX-1200  
Enclosure for 2DX autosampler with  
ULPA Filter (autosampler not included)

### Enclosures for DXe, DX and DXCi Autosamplers

Autosampler Model	Enclosure Only	Enclosure with ULPA Filter
Enclosure for Micro DX	SC-1607-DX	SC-1607-DX-1000
Enclosure for 2DX	SC-1207-DX	SC-1207-DX-1200
Enclosure for 4DX	SC-1407-DX	SC-1407-DX-1200
Enclosure for 8DX	SC-1807-DX	SC-1807-DX-1000
Enclosure for 14DX	SC-1107-DX	SC-1107-DX-1030

See pages 100-101 for dimension specifications

### Ultra-Low Particulate Arrester Air Filter and Mounting Plate

The ULPA filter creates a clean, positive pressure environment for samples and standards and prevents airborne contamination. The ULPA filter removes 99.999% of 0.12 micron particles.



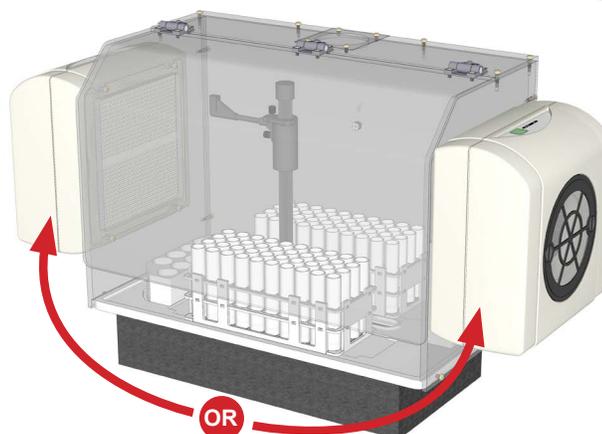
SC-0602  
ULPA Filter

#### ULPA Filter Specifications

Air Volume	Noise level	Power
1 m <sup>3</sup> /min	56 dBA	25W

Description	Part Number
ULPA filter for autosampler enclosure	SC-0602
ULPA filter mounting plate or 2DX and 4DX autosamplers	SC-1107-0026

The ULPA filter mounting plate fits the 2 and 4 on either the right or left side of the enclosure.



# Mobile Autosampler Stations

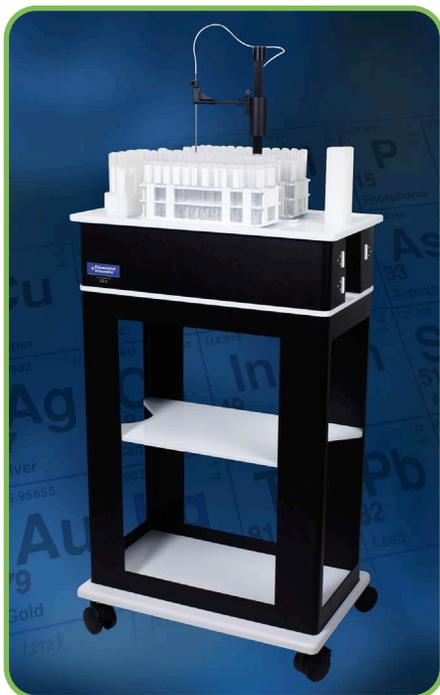
## Mobile Stations for DXe, DX and DXCi Autosamplers

### Mobile Autosampler Stations

The mobile autosampler station provides a small-footprint platform for 2 and 4 DX-series autosamplers.

**Benefits:**

- Mobile with locking wheels for flexible positioning
- Convenient location for rinse and waste containers
- Shelf for additional sample introduction equipment, such as prepFAST



SC-1210-DX mobile station with 2DX autosampler



SC-1410-DX mobile station with 4DX autosampler

Description	Part Number
Mobile autosampler station for 2DX autosampler including electrical conduit for D-type valves (autosampler not included)	SC-1210-DX-P
Mobile autosampler station for 2DX autosampler (autosampler not included)	SC-1210-DX

Description	Part Number
Mobile autosampler station for 4DX autosampler including electrical conduit for D-type valves (autosampler not included)	SC-1410-DX-P
Mobile autosampler station for 4DX autosampler (autosampler not included)	SC-1410-DX



Storage space for racks, solutions and accessories



## High-performance PFA Nebulizers for the NexION 1000/2000 ICPMS

### PFA-ICN Integrated Capillary Nebulizer

These high-performance PFA nebulizers are designed to directly connect to *FAST* and *prepFAST* valves. An integrated fitting on the nebulizer's sample capillary line connects directly into *FAST* and *prepFAST* valves making the systems even more user-friendly. The self-aspirating MicroFlow fluoropolymer nebulizers are chemically resistant and an essential part of the ICPMS laboratory.

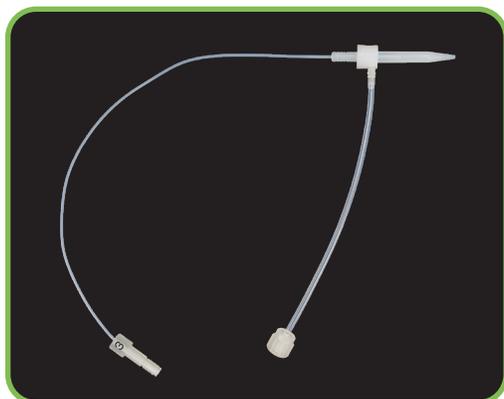
The PFA integrated capillary nebulizers produce a fine aerosol from aggressive acids, alkalis, organics, and high-salt solutions. They are resistant to clogging and produce high sensitivity at a low sample flow rate. They are the ideal nebulizer for *FAST* and *prepFAST* systems.



Integrated capillary nebulizer and *prepFAST* with SampleSense on a NexION 2000

### Benefits:

- Integrated capillary to eliminate additional connection at nebulizer
- Optimized flow rate for use with all *FAST* and *prepFAST* valve-equipped systems
- Custom capillary length to minimize dead volume and uptake delay on NexION 1000/2000 systems
- Coded fitting for direct and proper port connection to all *FAST* and *prepFAST* valves
- Chemically-resistant, ideal for strong acids, alkalis, and organic solvents
- Produces a fine aerosol for high transport efficiency and high-sensitivity
- Sample particulates collect at the easy to clean fitting end of the capillary rather than at the nebulizer tip
- Standard with all SampleSense, *prepFAST* S, and *prepFAST* IC systems



Model	Part Number
PFA-ICN Integrated Capillary Nebulizer for <i>FAST</i> and <i>prepFAST</i> (30 cm)	ICN30-64
PFA-ICN Integrated Capillary Nebulizer for <i>prepFAST</i> IC Elemental Speciation Applications (100 cm)	ICN100-64

## PFA High-Efficiency MicroFlow Nebulizers for the NexION 1000/2000 ICPMS

MicroFlow nebulizers are resistant to clogging and are reliably self-aspirated or pumped to produce a fine aerosol for high-transport efficiency and high sensitivity.

### PFA-ST Nebulizers

The PFA-ST MicroFlow nebulizer is made from high-purity, HF-resistant PFA. It has an exchangeable external sample uptake capillary. The sample uptake rate is controlled by the diameter of the external capillary or probe.

#### Benefits:

- All PFA construction
- Exchangeable uptake capillaries allow one nebulizer to be used at different self-aspiration rates from 20  $\mu\text{L}/\text{min}$  to 700  $\mu\text{L}/\text{min}$
- Chemically resistant – ideal for strong acids, alkalis and organics
- Can be pumped from < 0.02 mL/min to 3.0 mL/min
- Direct analysis of volatile and non-volatile
- Longer lifetime than glass or quartz nebulizers

Description	Application	Part Number
ST3 MicroFlow PFA nebulizer with external 1/4-28 threaded connector and gas line.	For general high sensitivity and high performance	ST3-64
PFA-ST for prepFAST self-aspirating nebulizer with external 1/4-28 threaded connector and gas line.	prepFAST	PF-2040-64
PFA MicroFlow high-solids large bore nebulizer with external 1/4-28 threaded connector and gas line. Ideal for strong acids, high-solids, alkalis, organic solvents, soils and high salt solutions.	High solids samples	ES-2030-64



# PFA ST-Nebulizers and Capillaries

## PFA-ST Nebulizers for the NexION 1000/2000 ICPMS

### apex MicroFlow PFA Self-Aspirating Nebulizers

apex nebulizers are specially designed to operate at extremely high efficiency and at elevated temperatures. These nebulizers are well-suited for apex applications or with heated PC<sup>3X</sup> or heated PCH Peltier systems.

Description	Part Number
High temperature apex PFA-ST MicroFlow nebulizer with external 1/4-28 threaded connector and gas line.	ES-2040-7000-64
High temperature apex-100 PFA nebulizer with integrated 90-150 µL/min self-aspiration capillary and gas line.	ES-2002-7000-64
High temperature apex-100 PFA nebulizer with Uitem manual sampling probe and gas line, 90-150 µL/min, 80 cm capillary	ES-2002-7205-080-64

See pages 76-77 for more information on particular systems

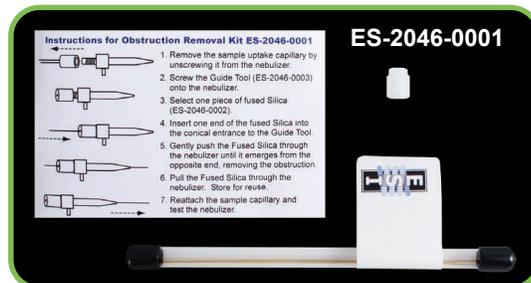


### Syringe Flush and Obstruction Removal Kits for Nebulizers

The syringe flush kit is used in two ways. With the white fitting it can back flush the sample capillary leading to the ST-nebulizer. With the red fitting, it can attach to the sample liquid port on the ST-nebulizer for foreflushing.

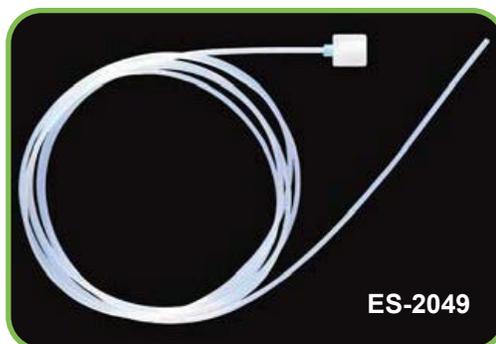
While naturally resistant to obstructions, PFA nebulizers may occasionally require maintenance. Use this kit to safely remove obstructions in all PFA-ST nebulizers for long-term high performance. Never back-flush a PFA-ST nebulizer.

Description	Part Number
Syringe flush kit. Includes 3 mL syringe, two luer to 1/4-28 adapters.	SC-0599-0109
Fused silica obstruction removal kit for ST-type nebulizers. Includes one guide, 10 pieces of fused silica and instructions.	ES-2046-0001



### Sample Capillaries for ST-Nebulizers

I.D.	Self-aspiration rate (@1L/min Ar)	Part Number
0.15 mm	20 µL/min (red)	ES-2045
0.20 mm	50 µL/min (purple)	ES-2043
0.25 mm	100 µL/min (green)	ES-2042
0.30 mm	200 µL/min (yellow)	ES-2047
0.50 mm	400 µL/min (orange)	ES-2041
0.80 mm	700 µL/min (blue)	ES-2044
1.00 mm	1 mL/min (gray)	ES-2049



Sample capillary attached to PFA Nebulizer

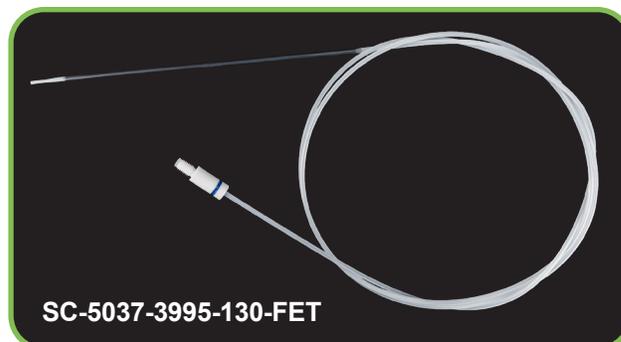
# Autosampler Probes

## Parabolic Probe for DXCi Autosamplers

### Parabolic Autosampler Probe

Parabolic Probes are heavy-walled, self-supporting autosampler probes with an anti-kinking sample transfer line. These probes are designed specifically for use with the DXCi autosamplers, and connect directly to any ESI *FAST* valve with a 1/4-28 threaded male fitting.

Description	Part Number
Sample Probe: carbon fiber support, 1.0 mm ID (gray marker) 130 cm fully encapsulated capillary with 1/4-28 fitting with tapered tip	SC-5037-3995-130-FET



### Carbon Fiber Supported Autosampler Probes for ST-Nebulizers

ST-nebulizer probes connect directly to any ST-type nebulizer. The 1/4-28 threaded fitting provides a secure, zero-dead-volume connection with no additional fittings required.

- Shorter 80 cm capillary length normally utilized in small autosamplers (including Micro DX model) to minimize dead volume to nebulizer
- Standard 150 cm capillary length is standard on 2, 4, 8, and 14 DX-series autosamplers
- Probes for DX autosamplers come equipped with a 1/4-28 threaded fitting to connect directly to a PFA-ST nebulizer
- Probes for DX autosamplers equipped with *FAST* and *prepFAST* come equipped to connect directly to the ESI *FAST* valve



Probe I.D. (mm)	Capillary Length (cm)	Self-aspiration rate (@1L/min Ar)	Autosampler Probes		
			DX Autosamplers Probe Part Number	<i>FAST</i> & <i>prepFAST</i> Autosamplers Probe Part Number	MicroDX Autosamplers Probe Part Number
0.25	80	100 µL/min	ES-5037-3255-080	-	ES-5037-3250-080
0.50	80	400 µL/min	ES-5037-3505-080	-	ES-5037-3500-080
0.80	80	700 µL/min	ES-5037-3755-080	-	ES-5037-3750-080
1.00	80	1 mL/min	ES-5037-3995-080	-	-
0.25	150	100 µL/min	ES-5037-3255-150	SC-5037-3255-150	ES-5037-3250-150
0.50	150	400 µL/min	ES-5037-3505-150	SC-5037-3505-150	ES-5037-3500-150
0.80	150	700 µL/min	ES-5037-3755-150	SC-5037-3755-150	ES-5037-3750-150
1.00	150	1 mL/min	ES-5037-3995-150	SC-5037-3995-150	-

Also available with Ultem support

## PFA Nebulizers with Integrated Self-Aspirating Capillaries for the NexION 1000/2000 ICPMS

### Self-Aspirating PFA Nebulizers with Integrated Capillaries

Self-aspirating PFA MicroFlow fluoropolymer nebulizers are chemically resistant and an essential part of the ICPMS laboratory. PFA nebulizers can produce a fine aerosol from aggressive acids, alkalis, organics, and high-salt solutions. They are resistant to clogging and produce high sensitivity at a low sample flow rate. They are the ideal nebulizer for ICPMS instruments with a wide range of sample types or when unknown samples are analyzed.

#### Benefits:

- Integrated capillary for connection-free introduction of samples at low flow rates
- Available with self-aspiration rates between 20 and 400 microliters per minute
- Chemically-resistant, ideal for strong acids, alkalis and organic solvents
- Produces a fine aerosol for high transport efficiency and high-sensitivity
- Permanent gas line connector with easy installation on NexION 1000/2000
- Can be peristaltic pumped organic solvents



PFA Nebulizers with Integrated Fluoropolymer Capillaries		
Model	Measured self-aspiration rate (@1L/min Ar)	Part Number
PFA-20	20 $\mu$ L/min	ES-2020-64
PFA-50	50 $\mu$ L/min	ES-2000-64
PFA-100	100 $\mu$ L/min	ES-2002-0002-64
PFA-200	200 $\mu$ L/min	ES-2003-0002-64
PFA-400	400 $\mu$ L/min	ES-2005-0002-64

Other flow rates made to order

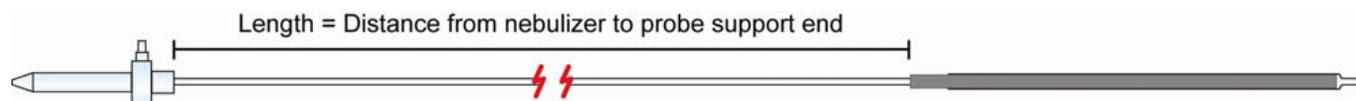
# PFA Nebulizers with Integrated Autosampler Probes

## PFA Nebulizers with Integrated Self-Aspirating Autosampler Probes for the NexION 1000/2000 ICPMS

### Self-Aspirating PFA Nebulizers with Integrated Probes

These nebulizers self-aspirate at low flow rates with the same benefits of the PFA MicroFlow nebulizer. The integrated sampling probe is constructed by encapsulating a rigid support material between layers of fluoropolymer to provide a chemically-resistant probe that is mechanically stable and resilient.

**Probes can be custom made to specific lengths and materials at no extra charge.**



### PFA MicroFlow Nebulizers with Integrated Autosampler Probe

Model	Autosampler Model	Self-aspiration rate (@1L/min Ar)	Length	Support material	Application	Part Number
PFA-20	MicroDX	20 µL/min	80 cm	Carbon Fiber	Environmental/Clinical	ES-2020-3503-080-64
	2DX, 4DX		100 cm	Ultem	High Purity/Semiconductor	ES-2020-3505-100-64
PFA-50	MicroDX	50 µL/min	80 cm	Carbon Fiber	Environmental/Clinical	ES-2000-3503-080-64
	2DX, 4DX		100 cm	Ultem	High Purity/Semiconductor	ES-2000-3505-100-64
PFA-100	MicroDX	100 µL/min	100 cm	Carbon Fiber	Environmental/Clinical	ES-2002-3503-100-64
	2DX, 4DX			Ultem	High Purity/Semiconductor	ES-2002-3505-100-64
PFA-200	MicroDX	200 µL/min	100 cm	Carbon Fiber	Environmental/Clinical	ES-2003-3503-100-64
	2DX, 4DX			Ultem	High Purity/Semiconductor	ES-2003-3505-100-64
PFA-400	MicroDX	400 µL/min	100 cm	Carbon Fiber	Environmental/Clinical	ES-2005-3503-100-64
	2DX, 4DX			Ultem	High Purity/Semiconductor	ES-2005-3505-100-64

SAMPLE INTRODUCTION



## MEINHARD®

### Concentric Nebulizers for the NexION 1000/2000 ICPMS

MEINHARD® Plus Nebulizers have the lowest dead volume of any glass or quartz nebulizer. The low dead volume and high sensitivity provide excellent detection limits and washout.

Each MEINHARD® Plus nebulizer comes with the FitKit+ gas and sample quick-connect fittings. Patented permanent non-degradable PFA connector eliminates contamination risk and risk of leak. The gas connection fits snugly over the maria on the sidearm of the nebulizer.

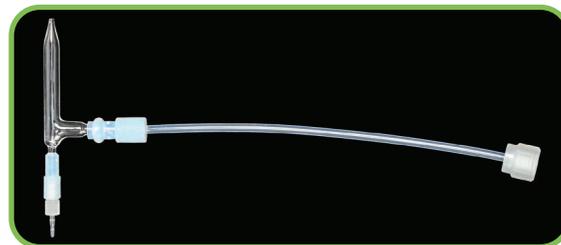
#### Features for all MEINHARD® Plus Nebulizers:

- Self-aspiration rate 0.5 mL/min with argon flow 1 L/min at 50 PSI (3.4 bar/345 kPa).
- Peristaltic pumped rate 0.1 mL/min to 3.0 mL/min.
- Includes FG Gas Quick Connect (PFA).

#### SilQ+ Ultra-high Purity Quartz Nebulizer

- Highest purity quartz
- Lowest contamination, especially for Al, Fe, K

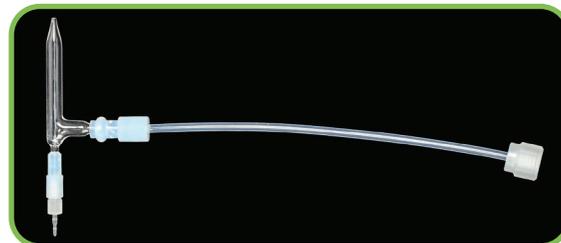
Description	Part Number
MEINHARD® SilQ Plus High-sensitivity, High-purity quartz concentric nebulizer	SilQ-50-C0.5



#### TQ+ Quartz Nebulizer

- Quartz
- Low blank levels compared to glass nebulizers

Description	Part Number
MEINHARD® TQ+ quartz concentric nebulizer	TQP-50-C0.5



#### TR+ Glass Nebulizer

- Borosilicate glass
- Economical high-performance nebulizer

Description	Part Number
MEINHARD® TR+ quartz concentric nebulizer	TRP-50-C0.5



#### Nebulizer Cleaner

Description	Application	Part Number
Pearl nebulizer cleaner for all glass and quartz concentric nebulizers	The pearl backflushes glass and quartz nebulizers to remove blockages.	PRL-03



Note: Do not use Pearl to clean PFA nebulizers

## SilQ+ High-purity Quartz Plus Nebulizer

The SilQ+ nebulizer by Meinhard is made from the highest purity synthetic quartz. SilQ nebulizers have low levels of Al, Fe, Mg and other contaminants, generating low, stable blanks that can enhance ICPMS detection limits. SilQ nebulizers are recommended for the analysis of high-purity chemicals that do not contain HF.

SilQ+ nebulizers come equipped with a patented PFA gas connection (FG+) and FitKit quick sample connector. The fittings can be rapidly attached and removed. The gas quick connect creates a snug seal around the maria on the SilQ+ sidearm.

Each nebulizer is manufactured and tested to exact specifications. The standard SilQ+ nebulizer requires 50 psi for 1 L/min of argon carrier and 0.5 mL/min solution uptake. Other versions are available.

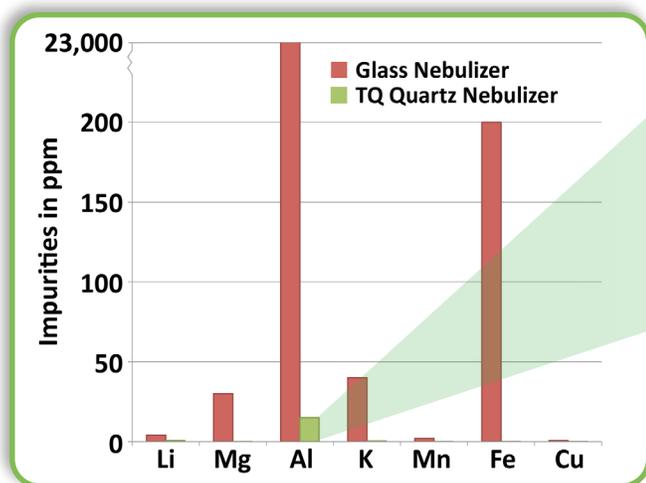


MEINHARD® SilQ+ high-purity nebulizer with FG+ PFA gas fitting SilQ-50-C0.5

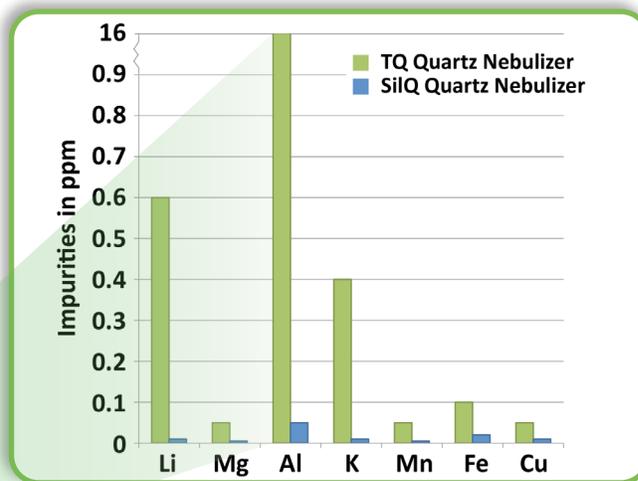


MEINHARD® Plus Nebulizer to micro fitting adapter S033101

### Potential Blank from Nebulizer



**Comparison of metal impurity in Glass and TQ+ Quartz nebulizers.** Glass nebulizers have high levels of impurity for elements such as Al, Fe, K, Mg.



**Comparison of metal impurity in SilQ+ and TQ+ Quartz nebulizers.** SilQ+ impurities on average are 60 times lower than standard quartz nebulizers. Aluminum impurities in SilQ+ nebulizers are more than 400,000 times lower than glass.

# pergo 2000 Argon Nebulizer Gas Humidifiers

The *pergo* 2000 improves performance of all concentric nebulizers. It maintains nebulizer efficiency – which decreases long before a clogged tip is detected – and improves sensitivity and stability by preventing unnoticed salt crystals from forming in the nebulizer tip.

A water vapor permeable membrane humidifies the ICPMS nebulizer gas stream. By increasing humidity in the argon nebulizer, the *pergo* 2000 prevents salt deposits in the nebulizer, improving short and long-term signal stability. The dual channels provided on the *pergo* 2000 AMS (All Matrix Solution) model also provides humidification to the AMS gas flow, greatly enhancing the AMS performance.

## Benefits:

- Dissolves salt crystals in nebulizer tip
- Improves short and long-term stability
- Improves detection limits
- Speeds up washout
- Reduces long-term drift
- Extends the length of productive analytical runs

## Features:

- Safe and easy to use with atmospheric pressure water reservoir
- Solid PFA reservoir with friction-fit cap for easy access
- Allows use of high-sensitivity nebulizers for high matrix samples
- Supports both MEINHARD® and PFA MicroFlow nebulizers
- *pergo* 2000 AMS model also enhance AMS performance with a second port that additionally humidifies the AMS argon gas steam



*pergo* 2000 argon humidifier



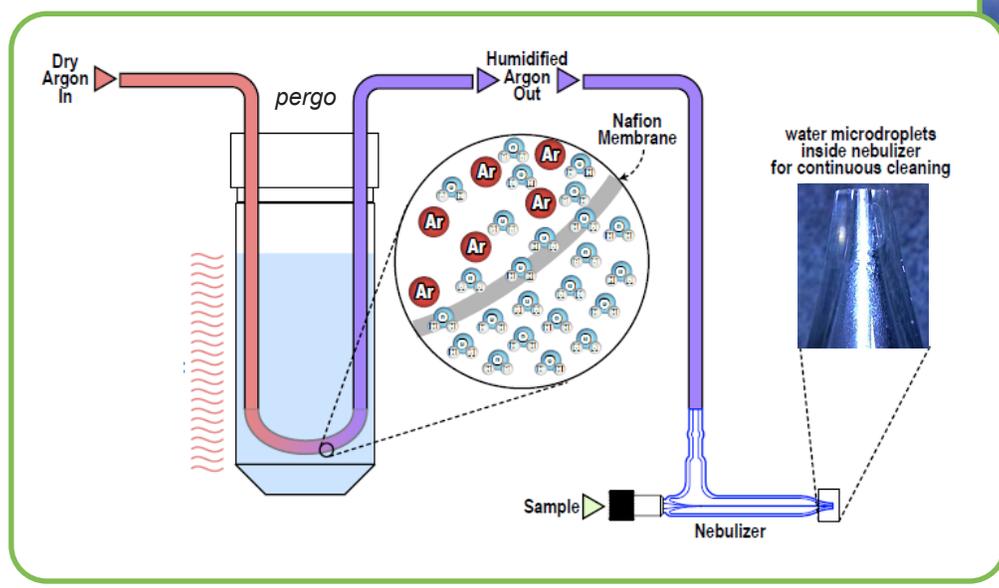
NexION 1000/2000  
with the integrated *pergo* 2000



Dual channels on *pergo* 2000 AMS provide humidity to both the nebulizer and AMS matrix gas



*pergo* 2000 systems mount onto existing NexION 1000/2000 pumps as well as FAST and prepFAST DXi modules



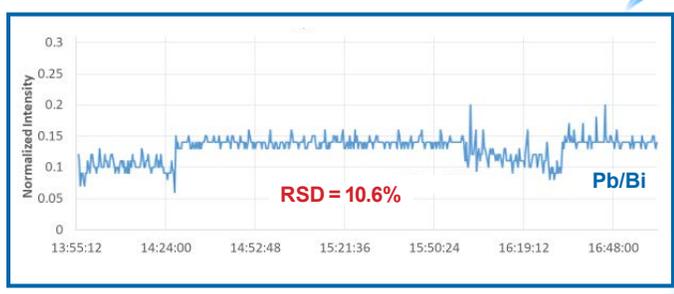
Water microdroplets continuously clean the inside of the nebulizer and prevent salt deposits.

Ar nebulizer gas is humidified using a tube-shaped membrane placed in a PFA water reservoir at atmospheric pressure. The water vapor condenses inside the nebulizer tip, preventing salt build-up.

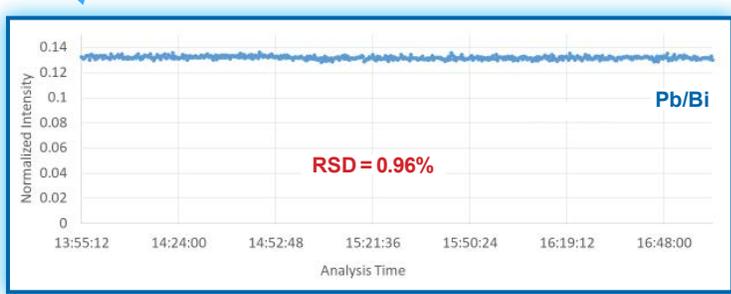
## Productivity Enhancement by Maintaining Stability

- Analysis of 50x diluted blood on NexION 2000
- Plots compare analysis of same samples, with and without *pergo* 2000 AMS
- Use of *pergo* 2000 AMS significantly reduces signal drift and delivers excellent long-term stability

### Analysis of 550 Blood Samples without AMS and without *pergo* 2000 AMS



### Analysis of 550 Blood Samples with AMS and *pergo* 2000 AMS

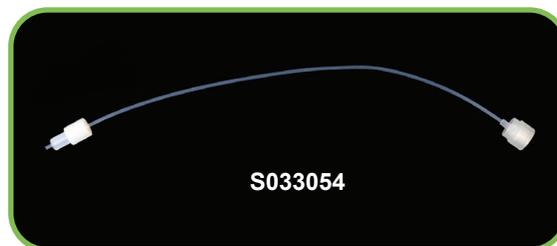


Description	Part Number
<i>pergo</i> 2000 integrated humidifier for NexION 1000/2000	<i>pergo</i> 2000
<i>pergo</i> 2000 AMS integrated humidifier for NexION 1000/2000	<i>pergo</i> 2000 AMS

## Cyclonic Spray Chamber Lines

### Matrix Port Gas Line

Description	Part Number
AMS matrix gas line (gas dilution) (0.25 mm i.d.) for cyclonic spray chamber	S033054
Addition gas line (e.g. 20% O <sub>2</sub> 80% Ar) (0.8 mm i.d.) for cyclonic spray chamber	S033064



Description	Part Number
Spray chamber drain line kit for NexION 1000/2000. Includes 32 cm line leading from spray chamber drain to peripump and 160 cm line from peripump to waste bottle. 32 cm line has 1/4-28 fitting common to all NexION 1000/2000 spray chamber drain ports.	ES-2044-64



## High Performance HF-resistant PFA Spray Chambers

### PFA Spray Chambers

This HF-resistant PFA Spray Chamber is designed for use with geological samples containing HF, semiconductor-grade samples and other high-purity applications requiring ultra-clean sample aerosol transport. Directly compatible with the NexION 1000/2000 ICPMS systems.

Description	Application	Part Number
High Performance PFA spray chamber with o-ring-free PFA endcap	HF resistant, high sensitivity PFA spray chamber for semiconductor and other high purity applications.	ES-2164-5472
High Performance PFA spray chamber with o-ring-free PFA endcap		ES-2164-5473-L



PFA spray chamber for PCH Peltier Cooler/Heater  
See page 70

## Spray Chamber Accessories

### Light Shields

Description	Application	Part Number
Cyclonic spray chamber/cassette light shield	UV shield for cyclonic spray chamber	UVS-64
PC <sup>3X</sup> UV shield	UV shield for PC <sup>3X</sup> Peltier cooler/heater	PC3-UVS-64



### Spray Chamber Plugs

Description	Application	Part Number
Cyclonic spray chamber AMS matrix gas plug	Plugs the matrix gas port when AMS gas is not used or during storage	S033045
Spray chamber nebulizer port plug	Plugs the nebulizer port to prevent contamination during storage	S032950
Spray chamber outlet plug	Plugs the spray chamber outlet to prevent contamination	S033048



### PFA Secure Nut

Description	Application	Part Number
Long (6mm) PFA spray chamber secure nut	Secures nebulizer to NexION spray chamber	ES-3199-0003-R



### Spray Chamber Adapter

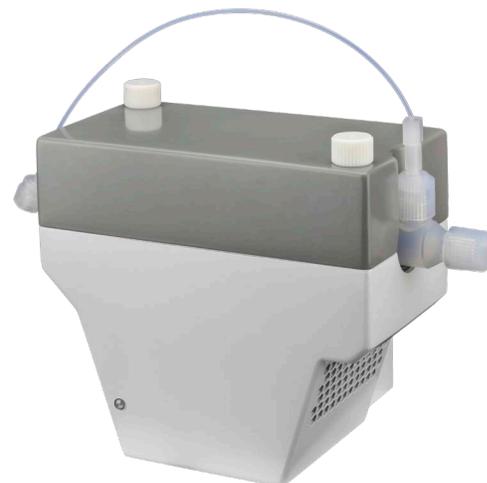
Description	Application	Part Number
NexION 1000/2000 cyclonic spray chamber adapter	Adapts cyclonic spray chamber to NexION sapphire and platinum injectors	S011361



## PCH Peltier Cooler/Heater

### PCH for High Performance PFA Spray Chamber

PCH is a Peltier cooler/heater for the high-performance PFA spray chamber. It is a temperature controlled inlet system that offers the advantages of low memory effects, rapid wash-out, and high sample transport efficiency for HF containing samples. The outer walls of the PCH spray chamber can be cooled to reduce the water or solvent vapor loaded on the plasma, achieving enhanced stability and performance. In heating mode, sensitivity can be improved for low-flow applications. Temperature control is available from -10°C to +80°C.



Description	PCH	SC	PFA Neb	Part Number
PCH Peltier cooler/heater thermally stabilized inlet system with PFA spray chamber and PFA-ST nebulizer	✓	✓	✓	PCH-HP-64X-GL
PCH Peltier cooler/heater thermally stabilized inlet system with PFA spray chamber (Nebulizer not included)	✓	✓		PC3X-HP-64
PCH Peltier cooler/heater thermally stabilized inlet system for PFA spray chamber (Spray chamber and nebulizer not included)	✓			PC3X-HP-64X

## PFA Spray Chamber for PCH

### High-performance PFA Spray Chamber

Description	Application	Part Number
High performance PFA spray chamber with end cap. Fits PCH Peltier cooler/heater for NexION 1000/2000. (PCH not included.) Includes o-ring-free PFA end cap and gas port with 1/4-28 fitting.	HF resistant, high sensitivity PFA spray chamber for semiconductor and other high-purity or HF applications.	ES-2164-5473-L

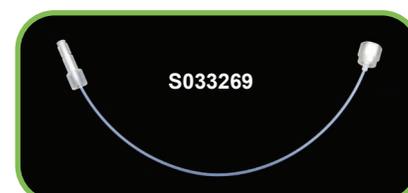


High Performance PFA Spray Chamber with end cap

## PFA Spray Chamber Lines

### Addition Gas Line for High Performance PFA Spray Chamber

Description	Part Number
Addition Gas Line for PFA Spray Chamber (0.8 mm i.d.) used for adding 20% O <sub>2</sub> /80% Ar when organic solvents are analyzed	S033269



Addition Gas Line for High Performance PFA Spray Chamber

# Interface Cones

## Interface Cones for NexION ICPMS Systems

### MEINHARD® Cones

MEINHARD® cones for the NexION ICPMS systems are precisely manufactured and have been extensively tested for:

- Long-life
- High Sensitivity
- Low oxide and doubly charged ions
- Nickel and Platinum-tipped cone models



Description	Part Number	Similar to OEM P/N
Nickel Sampler Cone for PE NexION series	MC-33612	W1033612
Nickel Skimmer Cone for PE NexION series	MC-26356	W1026356
Aluminum Hyper Skimmer for PE NexION series	MC-33995	W1033995
Platinum Sampler Cone for PE NexION series	MC-33614	W1033614
Platinum Skimmer Cone for PE NexION series	MC-26907	W1026907

## Interface Cone Sets for NexION ICPMS Systems

### MEINHARD® Cone Sets for NexION ICPMS Systems

Description	Part Number
Three Cone Set for PE NexION series, includes: Ni Sampler Cone (MC-33612) Ni Skimmer Cone (MC-26356) Al Hyper Skimmer Cone (MC-33995)	CS-364-Ni
Two Cone Set for PE NexION series, includes: Ni Sampler Cone (MC-33612) Ni Skimmer Cone (MC-26356)	CS-264-Ni



SAMPLE INTRODUCTION

## ICPMS Cones Recycling Go Green Trade-In Program

### Aluminum Recycling

**\$10** credit for each aluminum sampler or skimmer cone returned

### Nickel & Copper Recycling

**\$10** credit for each nickel or nickel/copper skimmer cone returned

**\$20** for each nickel or nickel/copper sampler cone returned



### Platinum Recycling

We will accept damaged platinum cones or shields and return credit to you based on the current, average market value of the platinum alloy extracted from the returned cones.

- There is no limit to the number of cones being returned using this program, and the total amount accumulated may be used towards the purchase of any cone that ESI carries up to a maximum of 20% off list price.
- The ICPMS Cones Recycling Program credit cannot be combined with any other discounts or special offers.

## FAST DXi™

### Upgradable Integrated Precision Micro Peristaltic Pump for NexION 1000/2000

The FAST DXi is a microperistaltic pump integrated to the NexION 1000/2000. It can be easily upgraded to FAST, prepFAST or other automation applications by adding valve actuators and other necessary components. It allows laboratories the flexibility to start with a high-quality, long-lived peristaltic pump and add automation components as needed.

- Direct replacement for standard peristaltic pump
- Connects to any DX autosampler
- Integrated to Syngistix software control

#### Precision

- Accurate pumping across a wide range of rates from low 0.20 µL/min to 10 mL/min
- Faster analysis with high precision.

#### Low Pulsation

- 12 closely-spaced rollers maintain consistent flow rate and improve signal stability

#### Chemical Resistance

- Ceramic pins and PTFE-coated metal components are resistant to acids and organic solvents
- Long-life motor and drive assembly



DXi-4-64-FR1  
FAST DXi™ populated with a single valve actuator (Valve shown but not included)

FAST DXi's for NexION 1000/2000		
Description	# of Valve Actuators*	Part Number
FAST DXi MP <sup>2</sup> Peristaltic pump NexION 1000/2000, 4 ch, with upgrade ports for FAST and prepFAST, including controller	0	MP2-4-64
FAST DXi MP <sup>2</sup> Peristaltic pump NexION 1000/2000, 4 ch, with FAST actuator	1	DXi-4-64-FR1
FAST DXi MP <sup>2</sup> Peristaltic pump NexION 1000/2000, 4 ch, with two actuators for prepFAST	2	DXi-4-64-FR2

\*Valve not included with actuators

# Stand Alone MP<sup>2</sup> Precision Micro Peristaltic Pumps

## MP<sup>2</sup> Precision Micro Peristaltic Pumps

The MP<sup>2</sup> is a compact, precise, stand-alone micro peristaltic pump with a flow rate range from 0.20 µL/min to 10 mL/min and is available with one to eight channels. Optimized for low-flow rates, the MP<sup>2</sup> uses either MPP tubing or standard 3-stop pump tubing.



MP<sup>2</sup>-4-PC stand-alone, precision micro peristaltic pump

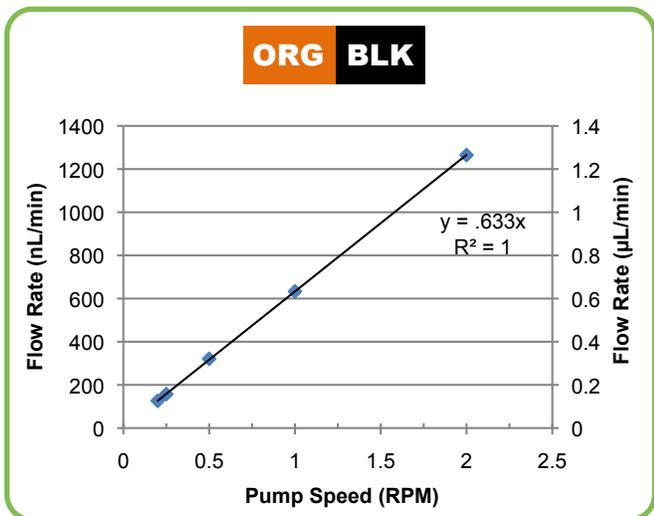
SAMPLE INTRODUCTION

CONTROLLED BY THE INSTRUMENT PC USB PORT	
Number of Channels	Part Number
1 channel MP <sup>2</sup> precision micro peristaltic pump	MP2-1-PC
2 channel MP <sup>2</sup> precision micro peristaltic pump	MP2-2-PC
3 channel MP <sup>2</sup> precision micro peristaltic pump	MP2-3-PC
4 channel MP <sup>2</sup> precision micro peristaltic pump	MP2-4-PC
6 channel MP <sup>2</sup> precision micro peristaltic pump	MP2-6-PC
8 channel MP <sup>2</sup> precision micro peristaltic pump	MP2-8-PC

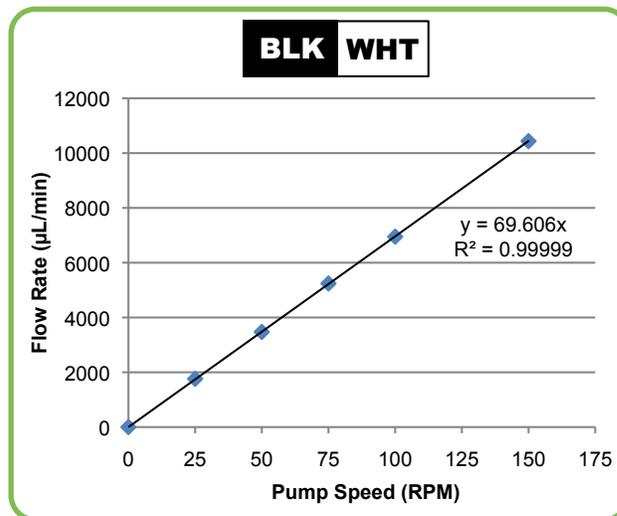
**Includes:** Cable to control with stand alone software

Perilink Fittings Adapts 10/32 to pump tubing			
	Qty	Size	Part Number
	5	Female	S033156-V
	5	Male	S032956-V

Perilink Fittings (Barbed) Adapts 10/32 to pump tubing			
	Qty	Size	Part Number
	5	Female	S032955-V
	5	Male	S032956-V



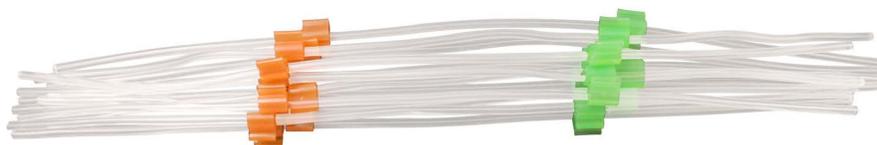
MP<sup>2</sup> pump linearity < 1 µL/min



MP<sup>2</sup> pump linearity up to 10 mL/min

# MP<sup>2</sup> Peristaltic Pump Tubing

## MP<sup>2</sup> Pump Tubing

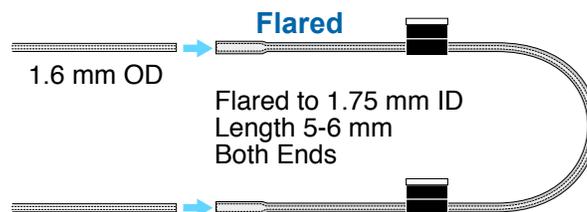


Tubing for MP<sup>2</sup> Micro Peristaltic Pumps (Packs of 12)

i.d.	Stop Colors		Calibration Slope ( $\mu\text{L}/\text{min}$ per RPM)	Non-Flared			Flared*	
				PVC 2-stop	**Santoprene® 2-stop	Solva 2-stop	PVC 2-stop	Solva 2-stop
0.13 mm	Orange	Black	0.6	MPP-013-PVC			MPP-013-F-PVC	MPP-013-F-S
0.19 mm	Orange	Red	1.3	MPP-019-PVC			MPP-019-F-PVC	MPP-019-F-S
0.27 mm	Orange	Blue	2.7	MPP-027-PVC			MPP-027-F-PVC	MPP-027-F-S
0.38 mm	Orange	Green	4.7	MPP-038-PVC	MPP-038-PHR		MPP-038-F-PVC	MPP-038-F-S
0.44 mm	Green	Yellow	7.6	MPP-044-PVC			MPP-044-F-PVC	MPP-044-F-S
0.51 mm	Orange	Yellow	9.5	MPP-051-PVC			MPP-051-F-PVC	MPP-051-F-S
0.57 mm	White	Yellow	11	MPP-057-PVC			MPP-057-F-PVC	MPP-057-F-S
0.64 mm	Orange	White	14	MPP-064-PVC			MPP-064-F-PVC	MPP-064-F-S
0.76 mm	Black	Black	19	MPP-076-PVC	MPP-076-PHR	MPP-076-S	MPP-076-F-PVC	MPP-076-F-S
0.89 mm	Orange	Orange	24	MPP-089-PVC		MPP-089-S	MPP-089-F-PVC	MPP-089-F-S
0.95 mm	White	Black	28	MPP-095-PVC		MPP-095-S	MPP-095-F-PVC	MPP-095-F-S
1.02 mm	White	White	31	MPP-102-PVC		MPP-102-S	MPP-102-F-PVC	MPP-102-F-S
1.09 mm	White	Red	33	MPP-109-PVC		MPP-109-S	MPP-109-F-PVC	MPP-109-F-S
1.14 mm	Red	Red	35	MPP-114-PVC		MPP-114-S	MPP-114-F-PVC	
1.22 mm	Red	Grey	46	MPP-122-PVC		MPP-122-S		
1.30 mm	Grey	Grey	47	MPP-130-PVC	MPP-130-PHR	MPP-130-S		
1.42 mm	Yellow	Yellow	50	MPP-142-PVC		MPP-142-S		
1.52 mm	Yellow	Blue	51	MPP-152-PVC	MPP-152-PHR	MPP-152-S		
1.65 mm	Blue	Blue	55	MPP-165-PVC		MPP-165-S		
1.75 mm	Blue	Green	58	MPP-175-PVC		MPP-175-S		
1.85 mm	Green	Green	61	MPP-185-PVC		MPP-185-S		
2.06 mm	Purple	Purple	64	MPP-206-PVC		MPP-206-S		
2.29 mm	Purple	Black	65	MPP-220-PVC		MPP-220-S		
2.54 mm	Purple	Orange	67	MPP-254-PVC		MPP-254-S		
2.79 mm	Purple	White	69	MPP-279-PVC		MPP-279-S		
3.17 mm	Black	White	70	MPP-317-PVC	MPP-317-PHR	MPP-317-S		
<b>Bridge Length</b>				72 mm	72 mm	72 mm	72 mm	72 mm

\*For easy insertion of PFA capillaries

i.d. = internal diameter



MP <sup>2</sup> PUMP TUBING KIT	
Description	Part Number
MP <sup>2</sup> Pump Tubing Kit comprised of 34 packs of 12 tubes, one package of each white highlighted part number in the table above. Includes: 26 packs of PVC tubing (0.13 to 3.17 mm i.d.) 3 packs of Santoprene® tubing and 5 packs of Solva tubing. Kit also includes: 30 CTFE Fluoropolymer Peristaltic pump Fittings: 5 small female (ES-2501-PPF1), 5 small male (ES-2501-PPM1), 5 medium female (ES-2501-PPF3), 5 medium male (ES-2501-PPM3), 5 large female (ES-2501-PPF5) and 5 large male (ES-2501-PPM5).	MPP-K-1

\*\*Santoprene® is a product of ExxonMobil

# Direct ICPMS Analysis of Solid Samples

## Elemental Scientific Lasers – Laser Ablation Platform

Laser Ablation (LA) is a direct, solid sample introduction technique for Inductively Coupled Plasma Mass Spectrometry (ICPMS) and Optical Emission Spectroscopy (OES). LA can be used to directly analyze any solid sample. The sample is accommodated inside an ablation cell and interrogated by a high power, pulsed laser ranging from a few microns (for high resolution spatial analysis) or hundreds of microns (for bulk analysis) in diameter. The aerosol generated is swept to the ICP/ICPMS for subsequent vaporization and ionization via a simple transport line.

The laser ablation platform was designed and developed with an emphasis on superior performance and analytical results, application flexibility, operating convenience and reliability.

Elemental Scientific Lasers has a complete product portfolio for:

- **Automated Sampling**
- **193 nm Eximer**
- **213 nm Solid State**
- **266 nm Solid State**
- **Laser Imaging**
- **UV Femtosecond**
- **Infrared**
- **Micromilling**



NWR  
Platform

### Applications Include\*:

Geochemistry  
Geochronology  
Fluid Inclusions  
Elemental ratios  
Isotope ratios  
Purity testing  
Material characterization  
Bulk Analysis  
Failure Analysis  
(Bio-) Imaging/Mapping  
Depth Profiling

### Materials Include\*:

Alloys  
Rocks  
Minerals  
Glasses  
Plastics  
Powders  
Biological  
Thin films  
Ceramics  
Metals



INNOVATION to ILLUMINATE

## apex Omega and apex 2 High-sensitivity Sample Introduction Systems

The next generation of the highly successful apex system features software control of temperatures for the heated spray chamber and Peltier-cooled condenser (and heated membrane for apex Omega). The software also controls addition gas and sweep gas flows using precise mass flow controllers (MFC).

The systems maximize ICPMS sensitivity, up to 10x, by nebulizing liquid samples into a heated cyclonic spray chamber. The multi-stage Peltier-cooled condensing systems remove the solvent vapor, reducing oxides. The new apex systems are available in either quartz or HF-resistant PFA models with options for additional membrane desolvation or mixing chambers.

### apex 2 and apex Omega:

- Available with quartz or HF-resistant PFA flow path
- Have complete software control of:
  - Heated spray chamber temperature
  - Peltier-cooled condenser temperature
  - N<sub>2</sub> addition gas mass flow controller
  - Ar addition gas mass flow controller
  - Micro peristaltic pump drain

### Key Benefits:

#### apex 2

- Enhanced sensitivity

#### apex Omega

- Enhanced sensitivity
- Ultra-low oxides (0.01% CeO+/Ce+)
- Detection of smaller nanoparticles
- Heated membrane module with integrated software control
- Two stage desolvation (Peltier-cooled and EPTFE membrane) imparts matrix tolerance higher than any membrane desolvator on the market



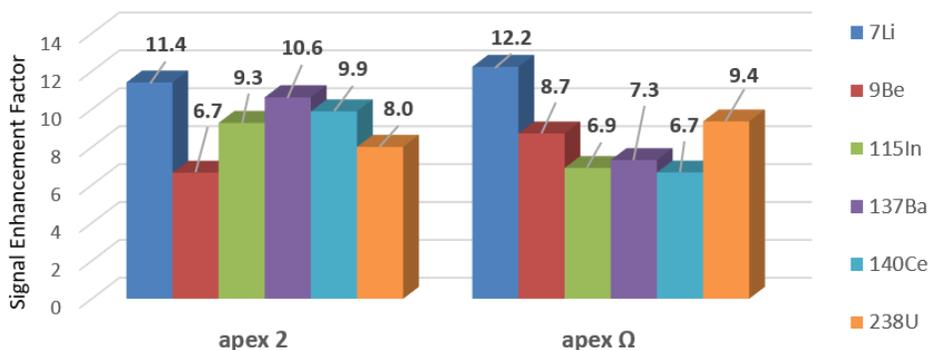
apex 2 Q



apex Omega

Model	Description	Part Number
apex Omega	apex Omega high-performance membrane desolvation system with quartz spray chamber, Peltier-cooled quartz condenser, and EPTFE membrane desolvator.	APX-O
apex Omega HF	apex Omega HF high-performance membrane desolvation system with PFA spray chamber, Peltier-cooled PFA condenser, and EPTFE membrane desolvator.	APX-O-HF
apex 2 Q	apex 2 Q desolvation system with quartz spray chamber and Peltier-cooled quartz condenser.	APX-2Q
apex 2 HF	apex 2 HF desolvation system with PFA spray chamber and Peltier-cooled PFA condenser.	APX-2HF

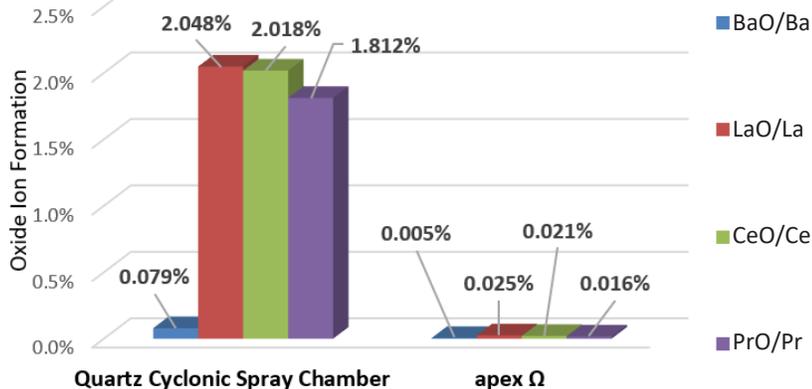
apex Signal Enhancement from Standard Cyclonic Spray Chamber



## Enhanced Sensitivity

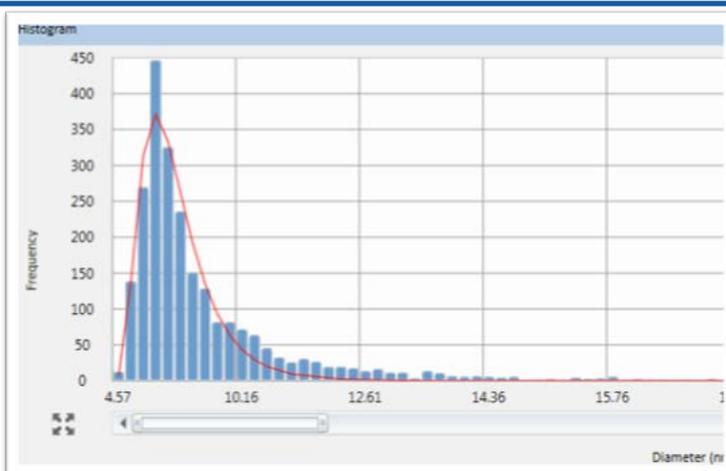
- Signal enhancement obtained for apex 2 and apex Omega shown for Li, Be, In, Ba, Ce, and U
- Signal enhancements of 6 -10X commonly obtained with NexION 1000/2000

Rare Earth Oxide Levels



## Ultra-low Oxide and Hydroxide Interferences

- apex Omega with its two stage desolvation significantly reduces REE and other oxide hydroxide ion interferences by 100X



## Enhanced Nanoparticle Detection

- Dry particles produced by apex Omega provide higher transport efficiency and produce a narrower distribution of ions in ICP
- Results in narrower and higher signals
- Higher signals above dissolved background improves detectability for smaller nanoparticles
- Fe nanoparticle with most frequent size of 7 nm shown in semiconductor grade IPA

**Classic apex Systems are still available  
apex Q, apex IR and apex HF**

Please contact ESI sales@icpms.com



## High-purity Valves

High purity valve stators and rotors provide for the selection of liquid flow path with low contamination and low carryover for the optimum ICPMS results.

- P-Series** Two position sampling valves
- V-Series** Syringe pump refill valves
- M-Series** Multiposition stream selector/flow director valves
- S-Series** Semiconductor grade ultra-high-purity valves
- X-Series** Dual stage dilution valve

8
Port Valve - P7+
Part Number: PF-P7

**Description:** P7+ CTFE high-flow 8 port valve head for prepFAST  
**Specifications:** CTFE stator, PFA rotor, 1 mm, 0.5 mm  
**Applications:** prepFAST, inline dilution and internal standard addition

7
Port Valve - P7
Part Number: PF-P7

**Description:** 7 port syringe loading valve  
**Specifications:** CTFE stator, PFA rotor, 1.0 mm  
**Applications:** FAST, prepFAST e

12
Port Syringe Valve - V12
Part Number: PF-V12

**Description:** 12 port syringe loading valve  
**Specifications:** CTFE stator, PFA rotor, 1.0 mm  
**Applications:** S400V, brineFAST syringe valve

8
Port Valve - M8
Part Number: PF-M8

**Description:** M8 CTFE high-flow 8 port stream selector valve  
**Specifications:** CTFE stator, PFA rotor  
**Applications:** SmartTuner

11
Port Syringe Valve - S11
Part Number: PF-S1030

**Description:** 11 port syringe loading valve  
**Specifications:** CTFE stator, PFA rotor, 1.0 mm  
**Applications:** prepFAST S and scoutDX

## Examples of a Stator and Rotor

**Description**

CTFE replacement stator for V12 FAST valve

**Description**

1 mm PFA rotor

## High-purity Valves with Spare Stators and Rotors

P-SERIES VALVES WITH REPLACEMENT STATORS AND ROTORS						
# of Ports	Bore Size	Stator Material	Rotor Material	Part Number Complete Valve	Part Number Stator	Part Number Rotor
3 - P3	1.0 mm	CTFE	PFA	PF-P3	PF-P3S	PF-P3R
4 - P4	1.0 mm	CTFE	PFA	PF-P4	PF-P4S	PF-P4R
6 - P6	1.0 mm	CTFE	PFA	PF-P6	PF-P6S	PF-P6R
6 - P6-8	1.0 mm	PPS	PFA	PF-P6-8	PF-P6S-8	PF-P6R
7 - P7	0.5/1.0 mm	CTFE	PFA	PF-P7	PF-P7S	PF-P6R
7 - P7-8	0.5/1.0 mm	PPS	PFA	PF-P7-8	PF-P7S-8	PF-P6R
8 - P7+	0.5/1.0 mm	CTFE	PFA	PF-P7X	PF-P7XS	PF-F6R
P7+IC	1.0 mm	CTFE	PFA	PF-P7XIC	PF-P7XS	PF-P6R
8 - P8	1.0 mm	CTFE	PFA	PF-P8	PF-P8S	PF-P8R
10 - P10	1.0 mm	CTFE	PFA	PF-P10	PF-P10S	PF-P10R
11-P11	1.0 mm	CTFE	PFA	PF-P11	PF-P11S	PF-P10R
11-A11b	0.5/1.0 mm	CTFE	PFA	PF-A11b	PF-A11bS	PF-A11bR
13 - P13	0.5/1.0 mm	CTFE	PFA	PF-P13	PF-P13S	PF-P13R
5 - A5e	0.5/1.0 mm	CTFE	PFA	PF-A5e	PF-A5eS	PF-F6R
7 - A7e	0.5/1.0 mm	CTFE	PFA	PF-A7e	PF-A7eS	PF-F6R
7 - A7 $\mu$	1.0 mm	CTFE	PFA	PF-A7u	PF-A7uS	PF-A7uR
6 - PM6	0.5 mm	CTFE	PFA	PF-PM6	PF-PM6S	PF-PM6R
7 - PM7	0.5 mm	CTFE	PFA	PF-PM7	PF-PM7S	PF-PM6R
8 - PM7+	0.5 mm	CTFE	PFA	PF-PM7X	PF-PM7XS	PF-PM6R
4 - P4H	1.6 mm	CTFE	PFA	PF-P4H	PF-P4HS	PF-P4HR
5 - P5H	1.6 mm	CTFE	PFA	PF-P5H	PF-P5HS	PF-P4HR
6 - P6H	1.6 mm	CTFE	PFA	PF-P6H	PF-P6HS	PF-P6HR
7 - P7H	1.6 mm	CTFE	PFA	PF-P7H	PF-P7HS	PF-P6HR
7 - P7-8H	1.6 mm	PPS	PFA	PF-P7-8H	PF-P7-8HS	PF-P6HR
7 - P7HP	0.5 mm	CTFE	PVDF	PF-P7HP	PF-P7HPS	PF-P6HPR

# High Purity Valves, Stators and Rotors

## V-SERIES VALVES WITH REPLACEMENT STATORS AND ROTORS

# of Ports	Bore Size	Stator Material	Rotor Material	Part Number Complete Valve	Part Number Stator	Part Number Rotor
6 - V6	1.0 mm	CTFE	PFA	PF-V6	PF-V6S	PF-V6R
6 - V6H	1.6 mm	CTFE	PFA	PF-V6H	PF-V6HS	PF-V6HR
6 - V6HP	0.5 mm	CTFE	PVDF	PF-V6HP	PF-V6HPS	PF-V6HPR
9 - V9	1.0 mm	CTFE	PFA	PF-V9	PF-V9S	PF-V9R
10 - V9(cp)	1.0 mm	CTFE	PFA	PF-V9 (cp)	PF-V9S (cp)	PF-V9R (cp)
12 - V12	1.0 mm	CTFE	PFA	PF-V12	PF-V12S	PF-V12R
12 - V12H	1.6 mm	CTFE	PFA	PF-V12H	PF-V12HS	PF-V12HR
13 - V13	1.0 mm	CTFE	PFA	PF-V13	PF-V13S	PF-V13R
18-V18H	1.6 mm	CTFE	PFA	PF-V18H	PF-V18HS	PF-V18HR
V8C	1.0 mm	CTFE	PFA	PF-V8C	PF-V8CS	PF-V12R
V9H	1.6 mm	CTFE	PFA	PF-V9H	PF-V9HS	PF-V9HR

## M-SERIES STREAM SELECTION VALVE

# of Ports	Bore Size	Stator Material	Rotor Material	Part Number Complete Valve	Part Number Stator	Part Number Rotor
3 - M3	1.0 mm	CTFE	PFA	PF-M3	PF-M3S	PF-M3R
3 - M3H	1.6 mm	CTFE	PFA	PF-M3H	PF-M3HS	PF-M3HR
4 - M4	1.0 mm	CTFE	PFA	PF-M4	PF-M4S	PF-M4R
6 - M6	1.0 mm	CTFE	PFA	PF-M6	PF-M6S	PF-M6R
8 - M8	1.0 mm	CTFE	PFA	PF-M8	PF-M8S	PF-M8R
8 - M8H	1.6 mm	CTFE	PFA	PF-M8H	PF-M8HS	PF-M8HR
8 - M8HP	0.5 mm	CTFE	PVDF	PF-M8HP	PF-M8HPS	PF-M8HPR
10 - M10	1.0 mm	CTFE	PFA	PF-M10	PF-M10S	PF-M10R

## S-SERIES VALVES WITH REPLACEMENT STATORS AND ROTORS

# of Ports	Bore Size	Stator Material	Rotor Material	Part Number Complete Valve	Part Number Stator	Part Number Rotor
4 - S4	0.5/1.0 mm	CTFE	PFA	PF-S4	PF-S4S	PF-S4R
9 - S9	1.0 mm	CTFE	PFA	PF-S9	PF-S9S	PF-S9R
11 - S11	1.0 mm	CTFE	PFA	SDX-S11	PF-S11S	PF-S11R

## X-SERIES VALVES WITH REPLACEMENT STATORS AND ROTORS

# of Ports	Bore Size	Stator Material	Rotor Material	Part Number Complete Valve	Part Number Stator	Part Number Rotor
11-X11	1.0 mm	CTFE	PFA	PF-X11	PF-X11S	PF-P10R

# Metal Free Syringes

## Metal Free Syringes for Syringe Pumps

0.3 mL Syringes	
Description	Part Number
0.3 mL o-ring free quartz syringe for prepFAST Syrix syringe pump	PF-S1003
0.3 mL fluropolymer, o-ring free syringe for prepFAST syringe pump	PF-S3003



PF-S1003

3 mL Syringes	
Description	Part Number
3 mL quartz syringe	PF-S1030
3 mL quartz syringe, pre-cleaned for prepFAST S	PF-S1030C
3 mL CTFE syringe	PF-S3030
3 mL CTFE syringe, pre-cleaned for prepFAST S	PF-S3030C
3 mL quartz syringe, tall, high-pressure for prepFAST IC	PF-HS1030



PF-S1030

6 mL Syringes	
Description	Part Number
6 mL quartz syringe for prepFAST e	PF-S1060
6 mL quartz syringe, pre-cleaned for prepFAST S	PF-S1060C
6 mL CTFE syringe	PF-S3060
6 mL CTFE syringe, pre-cleaned for prepFAST S	PF-S3060C
6 mL quartz syringe, tall, high-pressure for prepFAST IC	PF-HS1060



PF-S1060

12 mL Syringe	
Description	Part Number
12 mL quartz syringe	PF-S3120-R2
12 mL quartz syringe, tall, high-pressure for prepFAST IC	PF-HS1120



PF-S3120-R2

## Manual Sampling Probes

### Probes

These probes were designed for manual sampling when analyzing a small number of samples or when automation is not required. With their stiffened internal support, these probes ensure the end of the probe stays in the sample – not curling out of the liquid as occurs frequently with simple tubing line. Probes are also useful for sampling from bottles – for the addition of internal standards, rinse solutions, and carrier solutions.

These all fluoropolymer sample flow path probes offer high chemical resistance and reduced contamination for applications involving strong acids, alkalis and organic solvents with their all fluoropolymer sample flow path. They are available with an encapsulated carbon fiber support appropriate for most applications, as well an Ultem support for high purity semiconductor samples.



Description	Size	Part Number
Manual sample probe with carbon fiber support. Includes fluoropolymer micro fitting	0.50 mm i.d. ■ (orange), 150 cm length	ES-5036-IS-64
Manual sample probe with Ultem support. Includes fluoropolymer micro fitting	0.50 mm i.d. ■ (orange), 150 cm length	ES-5046-IS



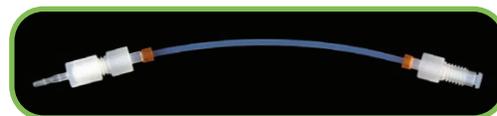
## Nebulizer Lines

### Low Volume Nebulizer Sample Lines

Description	Part Number
Sample line 0.5 mm i.d. ■ (orange) for PFA-ST nebulizer	SL-50-64



Description	Part Number
Sample line 0.5 mm i.d. ■ (orange) for MEINHARD® Plus nebulizer	S090004



### Nebulizer Gas Lines

Description	Part Number
PFA nebulizer gas line for PFA-ST nebulizer; includes 1/8" Swagelok	S033370



Description	Part Number
6" metal free nebulizer gas line for glass and quartz nebulizers on NexION 2000	S033055-R3

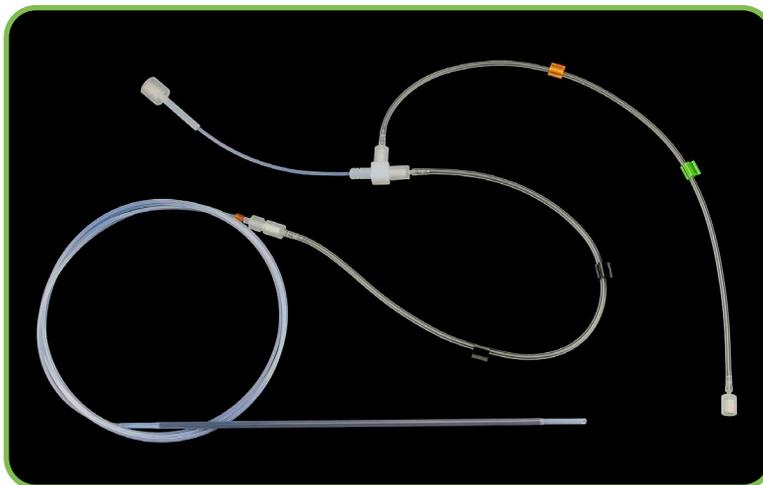


# Internal Standard Addition Kits and Tees

## Internal Standard Addition Kits

### Internal Standards Kits

NexION 1000/2000 internal standards kits utilize a low-internal volume mixing tee for inline addition of internal standard with the sample. Kits are available for both PFA-ST and MEINHARD® Plus nebulizers.



### For Addition of Internal Standard with PFA-ST Nebulizers

#### Includes:

- Fluoropolymer mixing tee (0.5 mm i.d.)
- Internal standard probes
- Fluoropolymer peristaltic pump fittings
- MP<sup>2</sup> peristaltic pump tubing

### For Addition of Internal Standard with MEINHARD® Plus Nebulizers

#### Includes:

- Fluoropolymer mixing tee (0.5 mm i.d.)
- Internal standard probes
- Fluoropolymer peristaltic pump fittings
- MP<sup>2</sup> peristaltic pump tubing

Description	Type	Part Number
Internal Standards Kit for MEINHARD® Nebulizer. Includes PFA tee, fittings, IS probe, SPP Starter Flared Pump Tubing Pack (org/grn, blk/blk, pharmed gry/gry)	MEINHARD®	SC-0317-64
Internal Standards Kit for PFA-ST Nebulizer. Includes PFA tee, fittings, IS probe, SPP Starter Flared Pump Tubing Pack (org/grn, blk/blk, pharmed gry/gry)	PFA-ST	SC-0317-64-ST
Organic Solvent IS Kit for MEINHARD® Nebulizer. Includes PFA tee, fittings, IS probe, SPP Starter Viton Pump Tubing Pack (PVC org/grn/ viton blk/blk, viton gry/gry)	MEINHARD®	SC-0317-64-OS

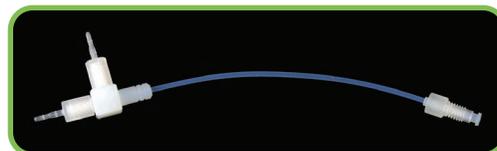
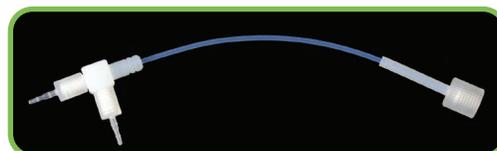
## Internal Standard Addition Tees

### Internal Standard Addition Tees

NexION 1000/2000 internal standard mixing tee for online addition of internal standard or online dilution. Achieves excellent mixing with minimal dead volume.

Description	Part Number
Internal standard addition tee 0.5 mm i.d. ■ (orange) for PFA-ST nebulizer.	IST-25-64

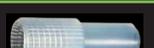
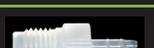
Description	Part Number
Internal standard addition tee 0.5 mm i.d. ■ (orange) for MEINHARD® Plus nebulizer.	IS-MP-64



# Fittings, Tubing and Loops

## Fittings / PFA Tubing

Easy to use, ultra-clean fittings and PFA tubing are ideal for all trace metal analysis applications. Ferrules install quickly and easily for high-flow applications. Low-flow valve fittings have low dead volume, leak-free integrated ferrule connections.

	Description	Qty	Suggested Use	P/N
	Black, high-flow nut (1/4-28) for FAST valve and 1/16" (1.6 mm) ferrule	10	Use with 1/16" (1.6 mm) o.d. PFA tubing for low and moderate flow rates (0.1 mL/min - 2 mL/min)	SC-0599-0116-K
	White, high-flow nut (1/4-28) for FAST valve and 1/8" (3.2 mm) ferrule	10	Use with 1/8" (3.2 mm) o.d. PFA tubing for high-flow rates and vacuum applications (> 2 mL/min)	SC-0599-0108-W
	1/16" (1.6 mm) Ferrule for high-flow fitting (1/4-28)	10	Use with 1/16" (1.6 mm) o.d. PFA tubing	SC-0599-F16
	1/8" (3.2 mm) Ferrule for high-flow fitting (1/4-28)	10	Use with 1/8" (3.2 mm) o.d. PFA tubing	SC-0599-F08
	Black, low-flow nut (M5/10-32) for FAST valve	10	Use with 1/16" (1.6 mm) o.d. PFA tubing for low-flow rates (<0.1 mL/min)	SC-0599-0001
	Female Perilink fitting, barbed	1	Adapts 10/32 to pump tubing	S033156
	Female Perilink fitting	5	Adapts 10/32 to pump tubing	S033156-V
	Male Perilink fitting, barbed	1	Adapts 10/32 to pump tubing and for use with internal standard tee	S032956
	Male Perilink fitting	5	Adapts 10/32 to pump tubing and for use with internal standard tee	S032956-V
	PFA-ST Nebulizer to Micro Fitting Adapter, PFA	1	Allows for use of tubing with 10/32 fitting with PFA-ST nebulizer	S033161
	MEINHARD® Plus Nebulizer to micro fitting adapter	1		S033101
	CTFE peristaltic pump fittings, female	1	For use in low-pressure applications.	ES-2501-PPF1
	CTFE peristaltic pump fittings, female, barbed	1	For use in high-pressure applications	ES-2501-PPF2
	CTFE peristaltic pump fittings, male	1	For use in low-pressure applications	ES-2501-PPM1
	CTFE peristaltic pump fittings, male, barbed	1	For use in high-pressure applications	ES-2501-PPM2

High-purity Fluoropolymer Tubing (5 m coil)			
I.D.	O.D.	Color Code	Part Number
0.006" (0.15 mm)	1/16" (1.6 mm)	■ (red)	5MT-015
0.008" (0.20 mm)	1/16" (1.6 mm)	■ (purple)	5MT-02
0.010" (0.25 mm)	1/16" (1.6 mm)	■ (green)	5MT-025
0.014" (0.30 mm)	1/16" (1.6 mm)	■ (yellow)	5MT-03
0.019" (0.50 mm)	1/16" (1.6 mm)	■ (orange)	5MT-05
0.031" (0.80 mm)	1/16" (1.6 mm)	■ (blue)	5MT-08
0.039" (1.00 mm)	1/16" (1.6 mm)	■ (gray)	5MT-1
0.063" (1.60 mm)	1/8" (3.2 mm)		5MT-16



## Sample Loops

PTFE crimp free *FAST* or prep*FAST* loops provide low resistance for fast loading and rinse-out.

### Standard for *FAST* Systems

#### 1 mm i.d. *FAST* High-Flow Sample Loops

Description	Size	Part Number
Recommended for use with 1.0 mm i.d. ■ (gray) probe. 1.6 mm o.d., 1/4-28 fittings.	300 µL loop	SC-0318-03
	500 µL loop	SC-0318-05
	1 mL loop	SC-0318-10
	1.5 mL loop	SC-0318-15
	2 mL loop	SC-0318-20
<b>Applications</b>		
<i>FAST</i> , prep <i>FAST</i> , prep <i>FAST</i> M5, prep <i>FAST</i> e, brine <i>FAST</i> , sea <i>FAST</i>	2.5 mL loop	SC-0318-25
	3 mL loop	SC-0318-30
	4 mL loop	SC-0318-40



SC-0318-25 2.5 mL sample loop

#### 0.8 mm i.d. *FAST* High-Flow Sample Loops

Description	Size	Part Number
Recommended for use with 0.8 mm i.d. ■ (blue) probe. 1.6 mm o.d., 1/4-28 fittings.	100 µL loop	SC-0319-01
	200 µL loop	SC-0319-02
	300 µL loop	SC-0319-03
	500 µL loop	SC-0319-05
	1 mL loop	SC-0319-10
<b>Applications</b>		
Legacy <i>FAST</i> systems, and special applications	1.5 mL loop	SC-0319-15
	2 mL loop	SC-0319-20
	2.5 mL loop	SC-0319-25
	3 mL loop	SC-0319-30
	4 mL loop	SC-0319-40



SC-0319-10 1 mL sample loop

#### 1.6 mm i.d. *FAST* High-Flow Sample Loops

Description	Size	Part Number
Recommended for use with 1.0 mm i.d. ■ (gray) probes and applications requiring larger sample volumes or high flow rates. 3.2 mm o.d., 1/4-28 fittings.	250 µL loop	SC-0315-025
	500 µL loop	SC-0315-05
	1 mL loop	SC-0315-10
	2 mL loop	SC-0315-20
<b>Applications</b>		
soil <i>FAST</i> , oil <i>FAST</i> , and large volume <i>FAST</i>	3 mL loop	SC-0315-30
	4 mL loop	SC-0315-40
	6 mL loop	SC-0315-60
	8 mL loop	SC-0315-80



SC-0315-80 8 mL sample loop

## PFA Sample Vessels

### PFA Vials

PFA vials are ideal for applications that require the highest purity. Made of ultrapure, ultra-chemically resistant material, these vials are an excellent choice for high purity, semiconductor and micro samples.

- Non-contaminating
- Graduated
- Temperature range of -200 °C to 260 °C
- HF-resistant
- Conical bottom
- Self-standing

Vials	Fits Racks
V-14-0311CG-X	MR-21-14 (pg 93), MR-40-14 (pg 93), SR4-60-14 (pg 95)
V-14-0312CG-X	
V-14-0314CG-X	



Part Number	Qty
V-14-0311CG-X	10

Description	Volume
14 mm o.d. graduated PFA micro vial	1 mL Brim full 2 mL



Part Number	Qty
V-14-0309-X	10

Description
PFA cap for 14 mm micro vials



Part Number	Qty
V-14-0312CG-X	10

Description	Volume
14 mm o.d. graduated PFA micro vial	2 mL Brim full 3 mL



Part Number	Qty
V-15-0300-X	10

Description
PFA snap-on cap for 14 mm graduated PFA micro vials



Part Number	Qty
V-14-0314CG-X	10

Description	Volume
14 mm o.d. graduated PFA micro vial	4 mL Brim full 4.5 mL



Part Number	Qty
V-15-0301-X	10

Description
PFA cap with knob for 14 mm graduated PFA micro vials.



Part Number	Qty
ES-7225-0001	1

Description
ETFE tweezers for removal of PFA cap with knob



PFA cap with knob allows for precise removal with the ETFE tweezers

## PFA Bottles and Vials

PFA bottles and vials are ideal for a wide range of demanding fluid handling and storage applications in general laboratory, semiconductor, and environmental industries.

Bottles / Vials	Fits Racks
V-31-15-X	SR2-21-30 (pg 94), MR-10-30 (pg 93)
V-31-30-X	SR2-27-31 (pg 94), MR-10-30 (pg 93), ST10-31 (pg 96)
V-31-60-X	LR-21-30 (pg 92), LMR-21-30-R (pg 92), SR2-27-31 (pg 94), HR-21-30 (pg 93), ST10-31 (pg 96)
V-28-0360-V	SR2-27-28 (pg 94), ST10-28 (pg 96)
V-50-0360	SR2-12-50 (pg 94), ST2-9-50 (pg 97), ST4-9-50 (pg 97), SR4x-20-50 (pg 95)

	<b>Part Number</b>	<b>Qty</b>
	V-28-0360-V	5
	<b>Description</b>	<b>Volume</b>
	28 mm o.d. PFA bottle and cap	20 mL

	<b>Part Number</b>	<b>Qty</b>
	V-50-0360	1
	<b>Description</b>	<b>Volume</b>
	50 mm o.d. PFA bottle and cap with TFM insert	125 mL

- Semiconductor, high-purity, and aggressive chemical applications
- The most translucent PFA vials available
- Low absorption of biological materials for many research applications

	<b>Part Number</b>	<b>Qty</b>
	V-31-15-X	10
	<b>Description</b>	<b>Volume</b>
	30 mm o.d. graduated PFA vial	15 mL

	<b>Part Number</b>	<b>Qty</b>
	V-31-30-X	10
	<b>Description</b>	<b>Volume</b>
	30 mm o.d. graduated PFA vial	30 mL

	<b>Part Number</b>	<b>Qty</b>
	V-31-60-X	10
	<b>Description</b>	<b>Volume</b>
	30 mm o.d. graduated PFA vial	60 mL

	<b>Part Number</b>	<b>Qty</b>
	PFA-K29-X	10
	<b>Description</b>	
	Screw cap for 30 mm o.d. vials	

## 2 mL PVDF Autosampler Vial

A low cost alternative to PFA for many ultra-trace metal analyses

PVDF sample vials are a lower cost alternative to our high-performance PFA vials. These high-tensile-strength, fluoropolymer vials can replace more expensive PFA vials in many applications.

- Semiconductor-grade PVDF fluoropolymer
- High dielectric and mechanical strength, flexible
- Excellent for the analysis of nitric acid, hydrochloric acid, hydrofluoric acid, or ammonium hydroxide
- Resistant to most mineral and organic acids, as well as aliphatic and aromatic hydrocarbons, alcohols, halogenated solvents, and oxidizing agents
- Self-standing
- Conical internal bottom for micro-sample analysis
- Suitable for most semiconductor pure chemicals
- Not recommended for ketones, acetone, ethyl acetate, and MIBK
- Optional PFA enclosures
- Available standard or pre-cleaned



V-14-0712-X  
2 mL PVDF  
autosampler vial



V-14-0712-X  
2 mL PVDF autosampler  
vial with PFA cap

### PVDF Vials and PFA Caps

Description	Qty	Part Number
PVDF vial, 2 mL	10	V-14-0712-X
PVDF vial, 2 mL	100	V-14-0712-C
PVDF vial, 2 mL	1000	V-14-0712-M
PFA cap for V-14 vial	10	V-14-0309-X
PFA cap for V-14 vial	100	V-14-0309-C

### Pre-cleaned PVDF Vials and Caps

Description	Qty	Part Number
Pre-cleaned PVDF vial, 2 mL	100	V-14-0712-C
Pre-cleaned PFA cap for V-14 vial	100	VPC-14-0309-C

### Bottles/Vials Fits Racks

Bottles/Vials	Fits Racks
V-14-0712-X	MR-21-14 (pg 95), MR-40-14 (pg 95), SR4-60-14 (pg 95)

# Sample Vessels

## Non-PFA Sample Vessels

### Non-PFA Vials, Tubes and Bottles

Non-PFA sample vessels manufactured from plastics, such as polypropylene, polyethylene, and polystyrene, are a sensible alternative to consider when breakage, surface inertness, and/or disposal costs are a concern.

Vials	Fits Racks
V-8-0505	MR-60-08 (pg 93), MR-90-08 (pg 93)
V-13-0200-R	LR-90-13-R (pg 92), LMR-90-13-R (pg 92), LMR-90-13-R-3T (pg 92), ST-PR-5 (pg 96)
V-20-0290	LR-40-20 (pg 92)
V-16-0225	HR-60-16 (pg 93), LR-60-16 (pg 92), LMR-60-16-R (pg 92), SR2-80-16 (pg 94), ST-PR-5 (pg 96)
V-28-0260	HR-21-30 (pg 93), ST10-28 (pg 96), LR-21-30 (pg 92), LMR-21-30-R (pg 92), SR2-27-28 (pg 94), ST-PR-5 (pg 96), ST-EX-5B (pg 96)
V-50-0460	SR4x-20-50 (pg 95), SR2-12-50 (pg 94), ST-PR-5 (pg 96), ST2-9-50 (pg 97), ST4-9-50 (pg 97)
V-61-0661	SR4x-15-60 (pg 95), ST7-60 (pg 97), ST-PR-5 (pg 96), ST-EX-5B (pg 96)



Part Number	Qty
V-8-0505-C	100
V-8-0505-D	500
Description	Volume
8 mm o.d. centrifuge tube	0.5 mL



Part Number	Qty
V-13-0200-R-XC	90
V-13-0200R-D	500
Description	Volume
13 mm o.d. polypropylene tube with rounded bottom	8 mL



Part Number	Qty
V-16-0225-LX	60
V-16-0225-D	500
Description	Volume
16 mm o.d. polypropylene tube with screw cap	15 mL



Part Number	Qty
V-20-0290-L	50
V-20-0290-D	500
Description	Volume
20 mm o.d. polypropylene tube with screw cap	20 mL



Part Number	Qty
V-28-0260-L	50
V-28-0260-D	500
Description	Volume
28 mm o.d. polypropylene tube with screw cap	50 mL



Part Number	Qty
V-50-0460-XII	12
V-50-0460-XXIV	24
Description	Volume
50 mm o.d. HDPE wide mouth bottle with cap	125 mL



Part Number	Qty
V-61-0661-XII	12
V-61-0661-C	100
Description	Volume
61 mm o.d. polyethylene wide mouth bottle	250 mL

## Microplates for DX-Autosamplers

### Microplates

Microplates are ideal for micro-volume applications such as storage and sample transfer.

**All microplates can be used on the following DXe, DX and DXCi autosampler models:**  
2, 4 and 14 with special top



Description	Part Number
1 Pk (5 ea) 24 well, 10 mL microplate, square well, pyramid bottom	MT-24-10mL-02



Description	Part Number
1 Pk (5 ea) 48 well, 5 mL microplate, square well, pyramid bottom	MT-48-5mL-02



Description	Part Number
1 Pk (3 ea) 48 well, 7.5 mL microplate, square well, pyramid bottom	MT-48-7.5mL-02

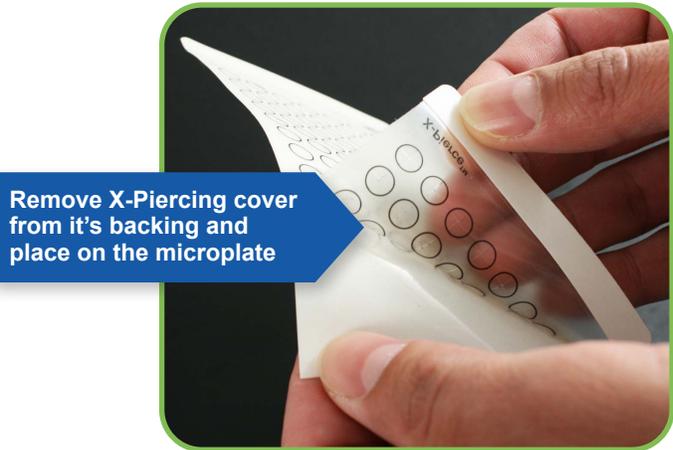


Description	Part Number
1 Pk (5 ea) 96 well, 2 mL microplate, square well, pyramid bottom	MT-96-2mL-02
1 Pk (5 ea) 96-well, 500 $\mu$ L microplate, polystyrene	MT-96-500-05-V

# X-Piercing Film Cover / XP Probe Arm

## X-Piercing Microplate Cover

The X-piercing cover minimizes evaporation of micro samples awaiting analysis and protects against environmental contamination.

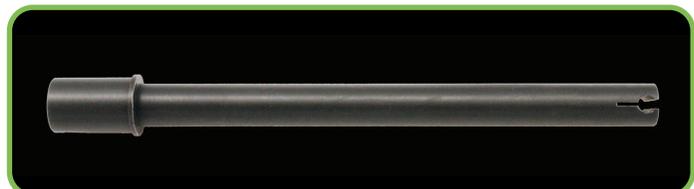


Description	Qty	Part Number
X-Piercing film cover for 96 well microplate	50	MT-96-XP-50

## XP Probe Arm

The XP probe arm must be used in place of the reset probe arm when an X-Piercing cover has been applied to a 96 well microplate.

Description	Qty	Part Number
XP Probe arm for 2DX / 4DX Autosampler	1	SC-0105-DX-XP



# Large Autosampler Racks

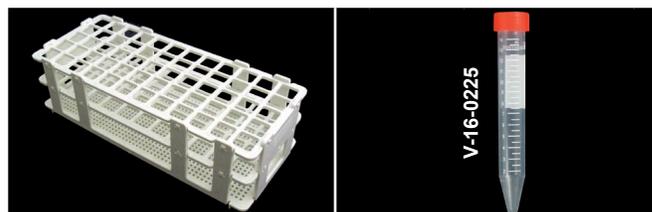
## Autosampler Racks (LR Size)

Plastic large racks are recommended for aqueous samples.

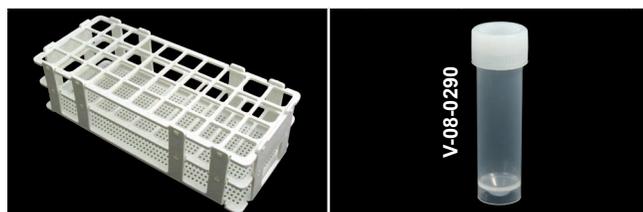
All LR racks can be used on the following DXe, DX and DXCi autosampler models: 2, 4, 8 and 14



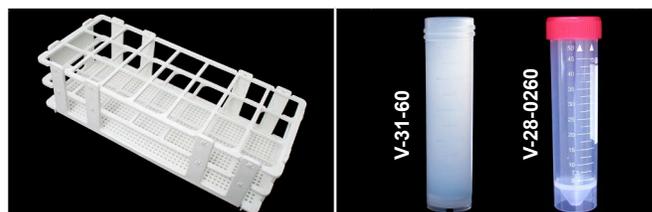
Description	Diam.	Part Number
90 position large polypropylene sample rack for 8 mL tubes	13 mm	LR-90-13-R



Description	Diam.	Part Number
60 position large polypropylene sample rack for 15 mL tubes	16 mm	LR-60-16



Description	Diam.	Part Number
40 position large polypropylene sample rack for 20 mL tubes	20 mm	LR-40-20



Description	Diam.	Part Number
21 position large polypropylene sample rack for 50 mL and 60 mL tubes	30 mm	LR-21-30

## Autosampler Coated Metal Racks (LR Size)

Metal racks are coated with an epoxy paint that forms a protective barrier over the rack material.

All coated metal racks can be used on the following DX autosamplers: 2DX/2DXe, 4DX/4DXe, 8DX and 14DX



Description	Diam.	Part Number
90 position metal large sample rack for 8 mL tubes	13 mm	LMR-90-13-R



Description	Diam.	Part Number
90 position 3 tier metal large sample rack for 8 mL tubes	13 mm	LMR-90-13-R-3T



Description	Diam.	Part Number
60 position metal large sample rack for 15 mL tubes	16 mm	LMR-60-16-R

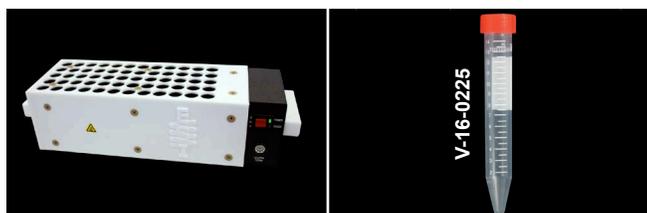


Description	Diam.	Part Number
21 position metal large sample rack for 50 mL and 60 mL tubes	30 mm	LMR-21-30-R

# Heated and Micro Autosampler Racks

## Autosampler Heated Racks (LR Size)

All heated racks can be used on the following DXe, DX and DXCi autosampler models: 2 and 4



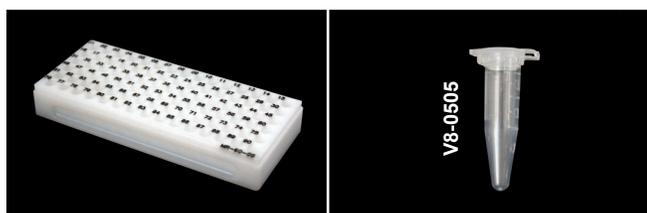
Description	Diam.	Part Number
60 position heated large sample rack for 15 mL tubes	16 mm	HR-60-16



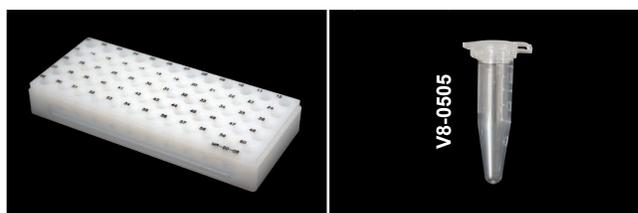
Description	Diam.	Part Number
21 position heated large sample rack for 50 mL and 60 mL tubes	30 mm	HR-21-30

## Autosampler Racks (MR Size)

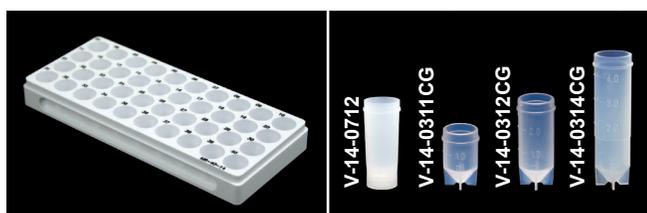
All MR racks can be used on the following DXe, DX and DXCi autosampler models: Micro, 2 and 4



Description	Diam.	Part Number
90 position CPVC micro sample rack for 0.5 mL tubes	8 mm	MR-90-08



Description	Diam.	Part Number
60 position CPVC micro sample rack for 0.5 mL tubes	8 mm	MR-60-08



Description	Diam.	Part Number
40 position CPVC micro sample rack for 1 mL, 2 mL and 4 mL tubes	14 mm	MR-40-14



Description	Diam.	Part Number
21 position CPVC micro sample rack for 1 mL, 2 mL and 4 mL tubes	14 mm	MR-21-14



Description	Diam.	Part Number
10 position PVCC micro sample rack for 15 mL and 30 mL tubes	30 mm	MR-10-30



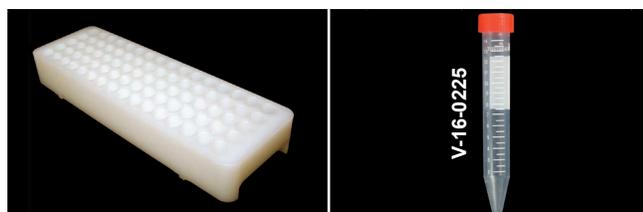
Description	Part Number
PVCC Cover for micro racks	MR-00-01

# Super Autosampler Racks

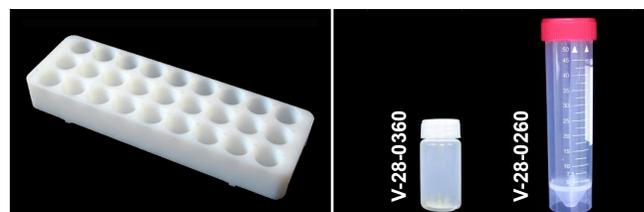
Large-volume samples can be analyzed using NexION super racks without transferring the sample to a smaller tube, reducing prep time and chance of contamination.

## Autosampler Racks (SR2 Size)

All SR2 racks can be used on the following DXe, DX and DXCi autosampler model: 2



Description	Diam.	Part Number
80 position HMPE super sample rack for 15 mL tubes	16 mm	SR2-80-16



Description	Diam.	Part Number
27 position HMPE super sample rack for 20 mL and 50 mL tubes	28 mm	SR2-27-28



Description	Diam.	Part Number
27 position HMPE super sample rack for 15 mL, 30 mL and 60 mL tubes	31 mm	SR2-27-31



Description	Diam.	Part Number
21 position HMPE super sample rack for 15 mL tubes	30 mm	SR2-21-30



Description	Diam.	Part Number
21 position super sample rack for 125 mL bottles	35 mm	SR2-21-35



Description	Diam.	Part Number
12 position HMPE super sample rack for 125 mL bottles	50 mm	SR2-12-50

## Autosampler Racks (SR4 Size, Type 1)

All SR4 type 1 racks can be used on the following DXe, DX and DXCi autosampler models: 2 and 4



Description	Diam.	Part Number
60 position HMPE super sample rack for 1 mL, 2 mL and 4 mL tubes	14 mm	SR4-60-14



Description	Part Number
PP Cover for 60 position SR-4 super rack	SR4-00-01

## Autosampler Racks (SR4 Size, Type 2)

All SR4 type 2 racks can be used on the following DXe, DX and DXCi autosampler model: 4



Description	Diam.	Part Number
15 position HMPE super sample rack for 250 mL bottles	60 mm	SR4x-15-60



Description	Diam.	Part Number
20 position HMPE super sample rack for 125 mL bottles	50 mm	SR4x-20-50

The SR4x-15-60 super rack will hold fifteen 100 mL volumetric flasks or 250 mL bottles

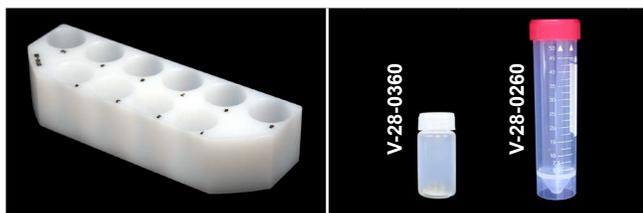


SR4x-15-60 super rack with 100 mL volumetric flasks

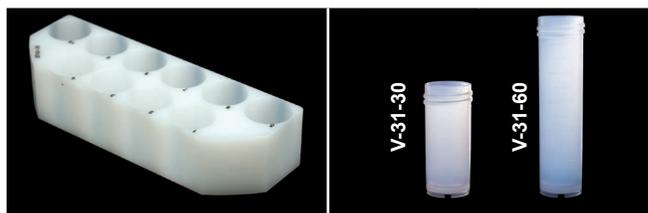
# Standards Autosampler Racks

## Autosampler Racks (ST Size, Type 1)

All ST type 1 racks can be used on the following DXe, DX and DXCi autosampler models: 2, 4, 8 and 14



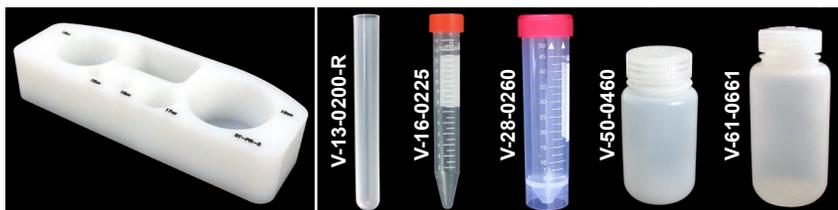
Description	Diam.	Part Number
10 position PVDF standards rack for 20 mL and 50 mL tubes	28 mm	ST10-28



Description	Diam.	Part Number
10 position PP high purity standards rack for 30 mL and 60 mL tubes	30 mm	ST10-31

## Static Rinse/Organic Rinse Racks

All static and organic rinse racks can be used on the following DXe, DX and DXCi autosampler models: 2, 4, 8 and 14



Description	Diam.	Part Number
5 position HMPE priority samples rack for 8 mL, 15 mL, 50 mL, 125 mL and 250 mL bottles. Fits over DX rinse station. For PE prepFAST only.	13 mm	ST-PR-5
	16 mm	
	28 mm	
	50 mm	
	60 mm	



Description	Diam.	Part Number
5 position HMPE extra standards rack for 50 mL and 250 mL bottles. Fits over DX rinse station.	28 mm 60 mm	ST-EX-5B



Extra position can be used for static rinse, organic rinse, or additional sample or tuning locations

### Autosampler Racks (ST Size, Type 2)

All ST type 2 racks can be used on the following DXe, DX and DXCi autosampler model: 2



Description	Diam.	Part Number
9 position HMPE standards rack for 125 mL bottles. Recommended for prepFAST with DX. Includes 9, 125 mL HDPE bottles w/cap.	50 mm	ST2-9-50

### Autosampler Racks (ST Size, Type 3)

All ST type 3 racks can be used on the following DXe, DX and DXCi autosampler models: 4 and 14



Description	Diam.	Part Number
7 position HMPE standards rack for 250 mL bottles	60 mm	ST7-60



Description	Diam.	Part Number
9 position HMPE standards rack for 125 mL bottles. Recommended for prepFAST. Includes 9, 125 mL HDPE wide mouth standard bottles w/caps.	50 mm	ST4-9-50



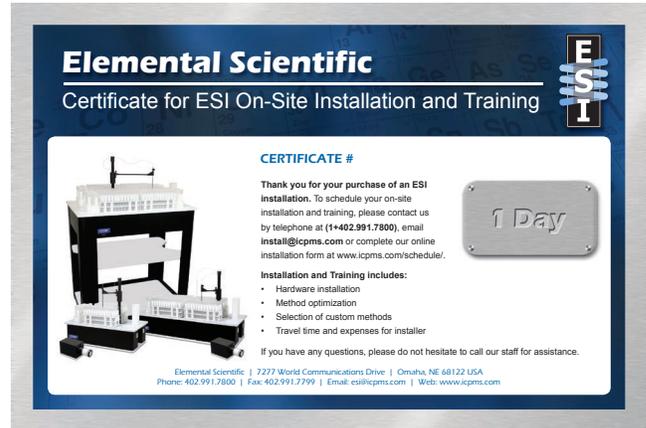
# Installation and Training

## Silver Level ESI Installation & Training

The silver level installation and training package is a 1-day on-site installation and method development for *FAST*.

- Includes:** Hardware installation  
 Software methods  
 Basic system familiarization  
 Travel time & expenses for ESI employee or contractor  
*FAST* standard spares kit (SC-0370-64)

Description	Part Number
On-site, 1-day installation and application development for <i>FAST</i> high throughput system	F1-SC-01



## Gold Level ESI Installation & Training

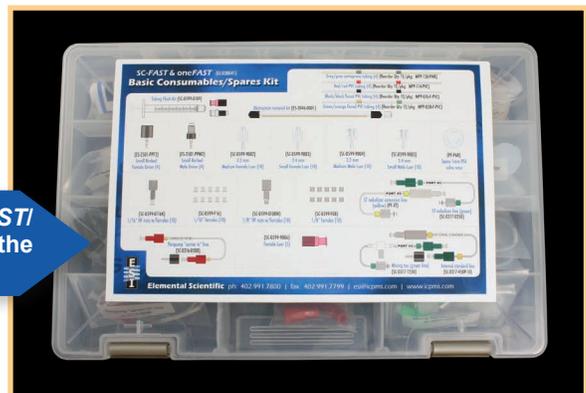
The gold level installation and training package is a 2½-day, on-site installation and method development for the *FAST* and prep*FAST*.

- Includes:** Hardware installation  
 Software methods  
 Basic system familiarization  
 Necessary method validation  
 User training  
 Travel time & expenses for ESI employee or contractor  
 Spares kit (see page 92)

Description	Part Number
On-site, 2½-day installation and application development for <i>FAST</i> systems	F1-SC-02-54
On-site, 2½-day installation and application development for prep <i>FAST</i> systems	F1-PF-02
On-site, 2½-day installation and application development for sea <i>FAST</i> /brine <i>FAST</i> systems	FI-SF-02
On-site, 4-day installation and application development for prep <i>FAST</i> IC systems	FI-PFIC-04

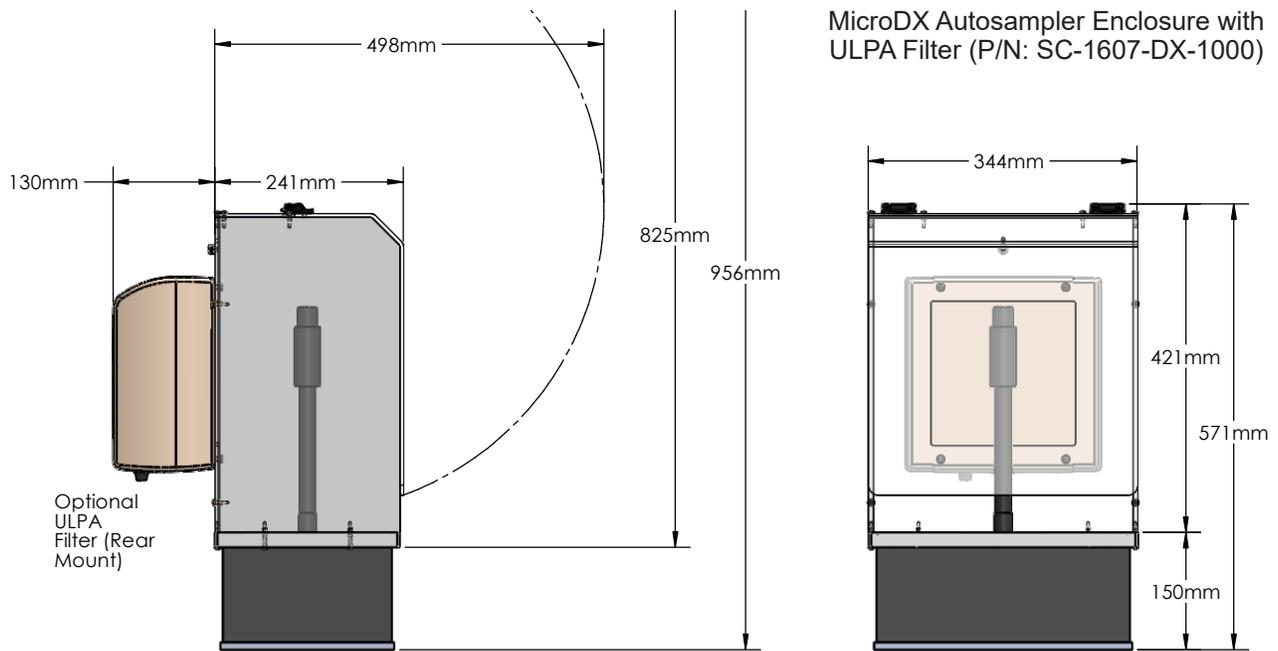


The *FAST* Deluxe, prep*FAST*, or sea*FAST*/brine*FAST* Spares Kit is included with the Gold Installation & Training.



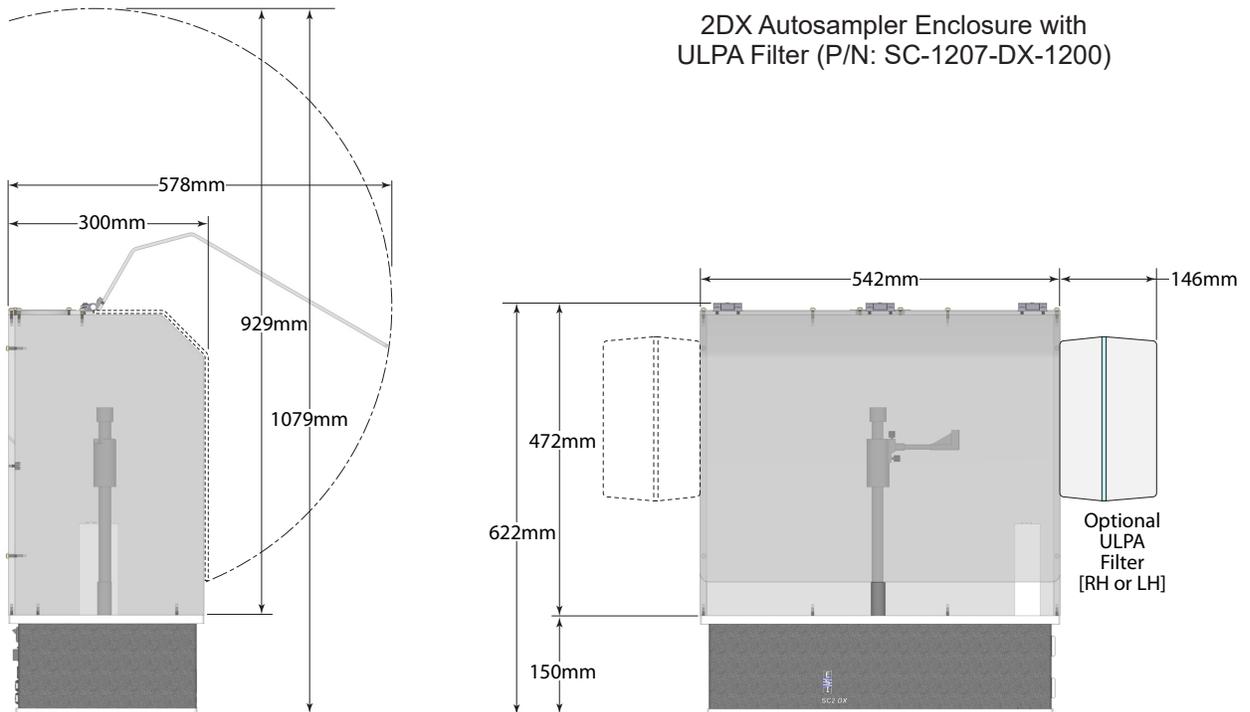
# Autosampler Dimensions

## MicroDX Autosampler with Enclosure and ULPA Filter Dimensions



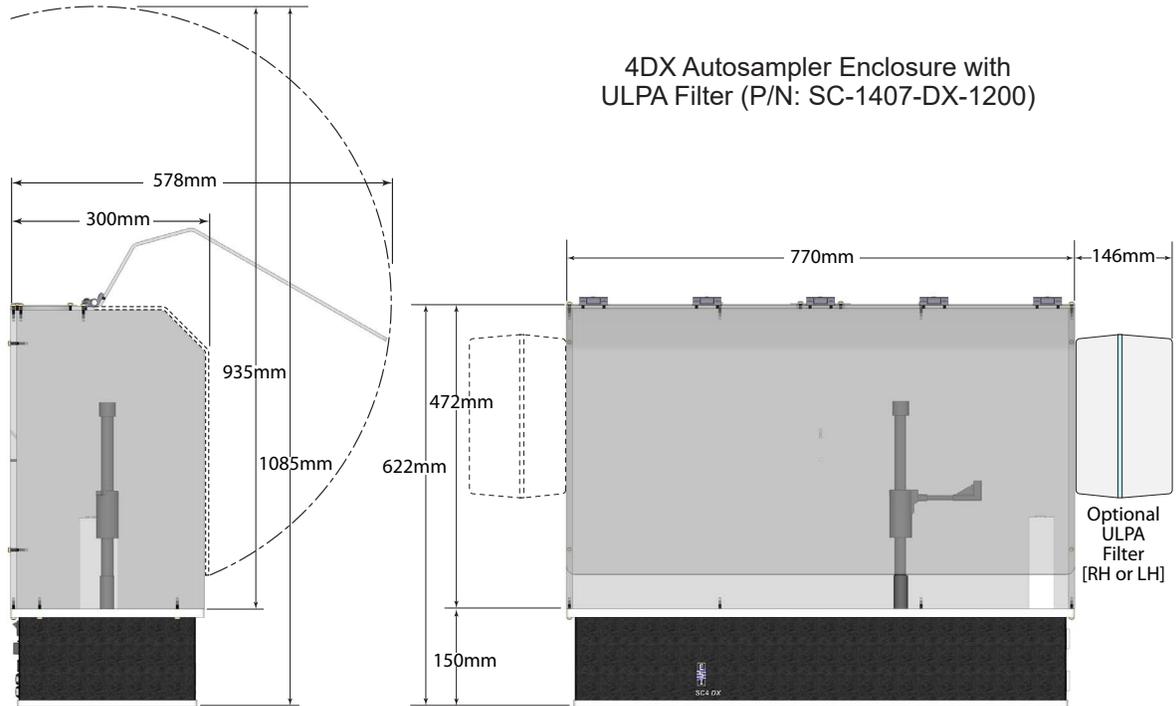
MicroDX autosampler and enclosure and ULPA Filter, W x D X H: 34.4 x 37.1 x 57.1 cm

## 2DX Autosampler with Enclosure and ULPA Filter Dimensions



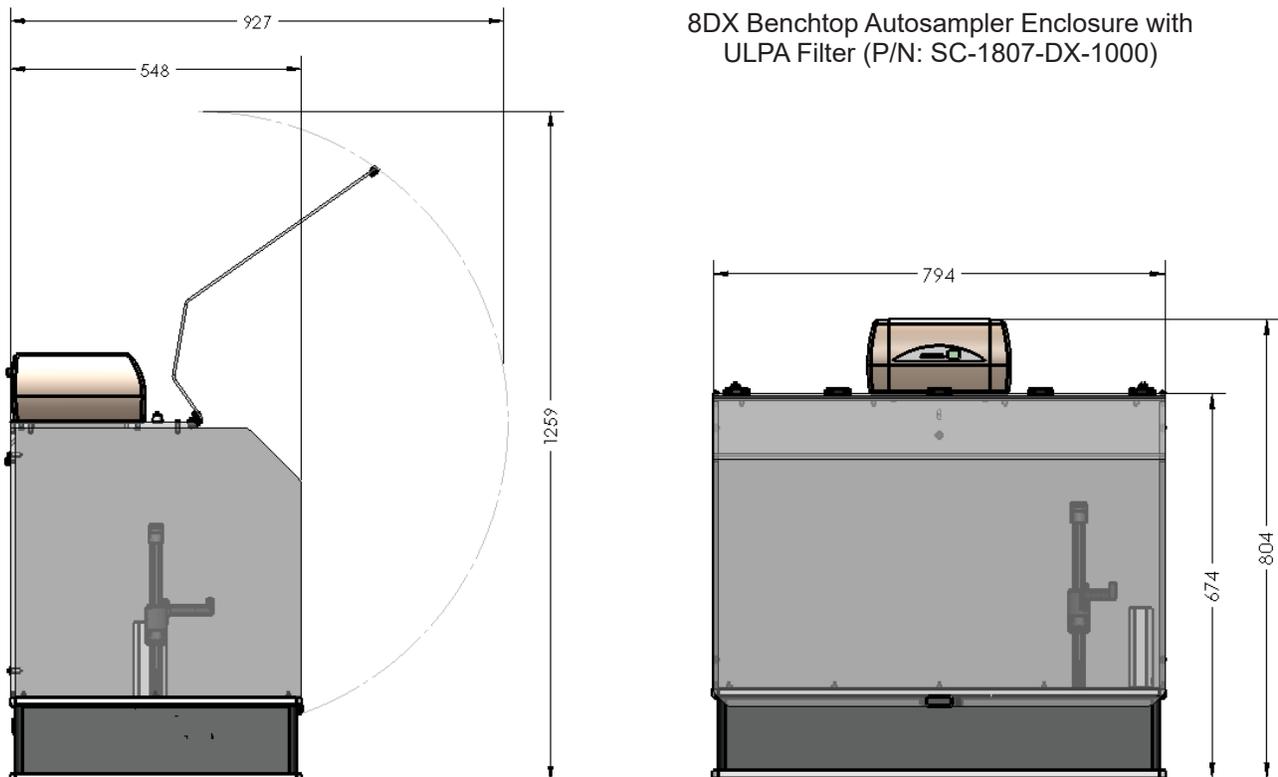
2DX autosampler with mobile stand and enclosure and ULPA Filter, W x D X H: 54.2 x 34.6 x 127.3 cm

## 4DX Autosampler with Enclosure and ULPA Filter Dimensions



4DX autosampler with mobile stand and enclosure and ULPA filter, W x D X H: 91.6 x 30.0 x 62.2. cm

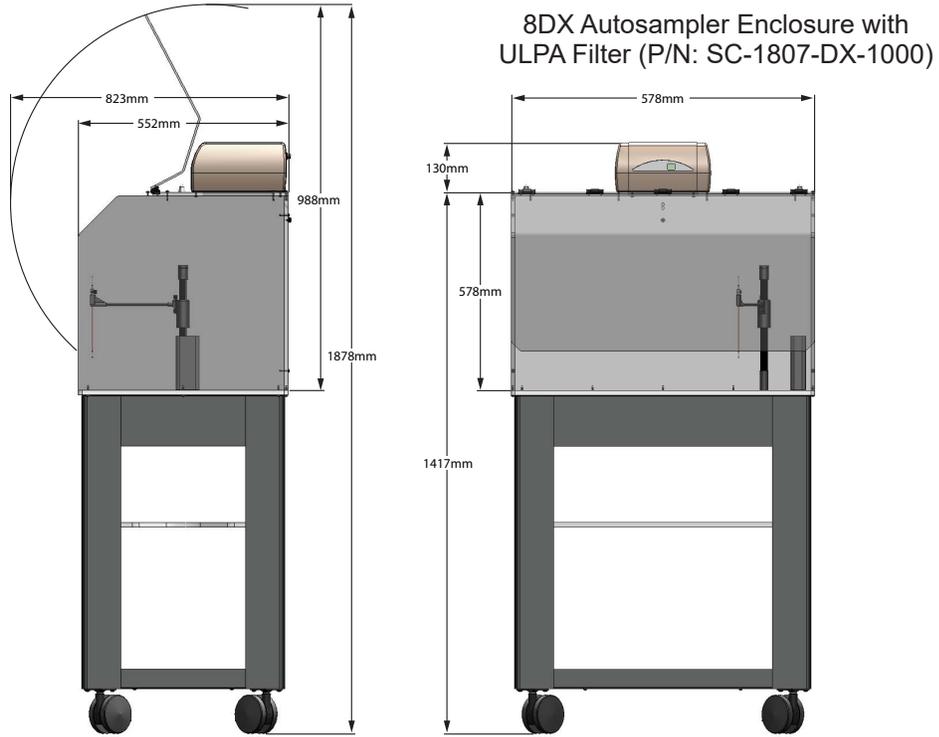
## 8DX Benchtop Autosampler with Enclosure and ULPA Filter Dimensions



8DX Benchtop autosampler and ULPA filter, W x D x H: 79.4 x 54.8 x 80.4 cm

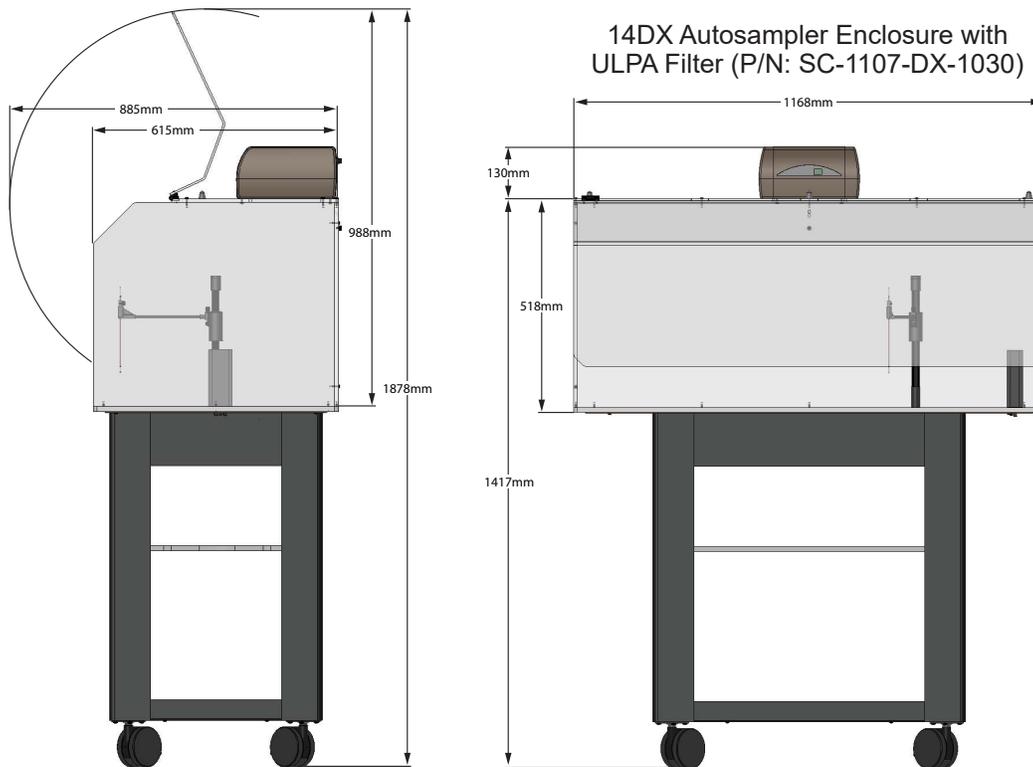
# Autosampler Dimensions

## 8DX Autosampler with Enclosure and ULPA Filter Dimensions



8DX autosampler and ULPA filter, W x D X H: 57.8 x 55.2 x 154.7 cm

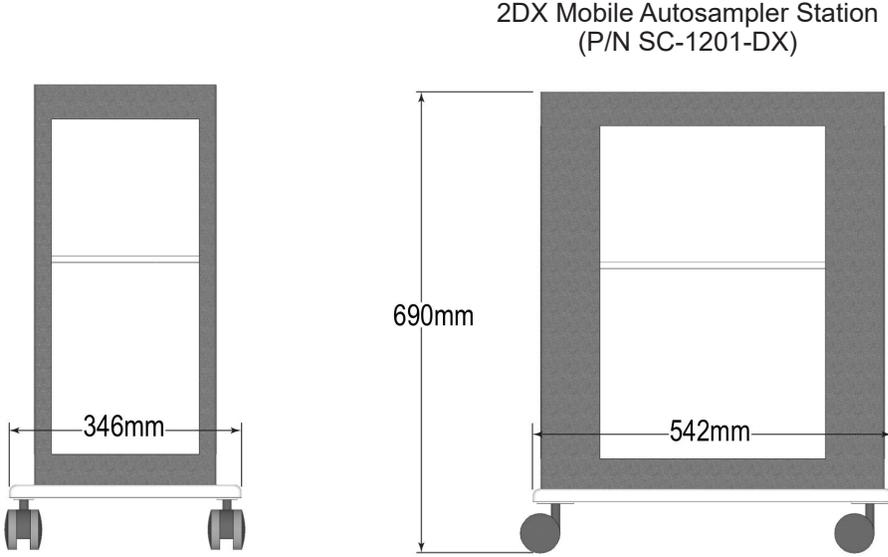
## 14DX Autosampler with Enclosure and ULPA Filter Dimensions



14DX autosampler with mobile stand and enclosure and ULPA filter, W x D X H: 116.8 x 61.5 x 154.7 cm

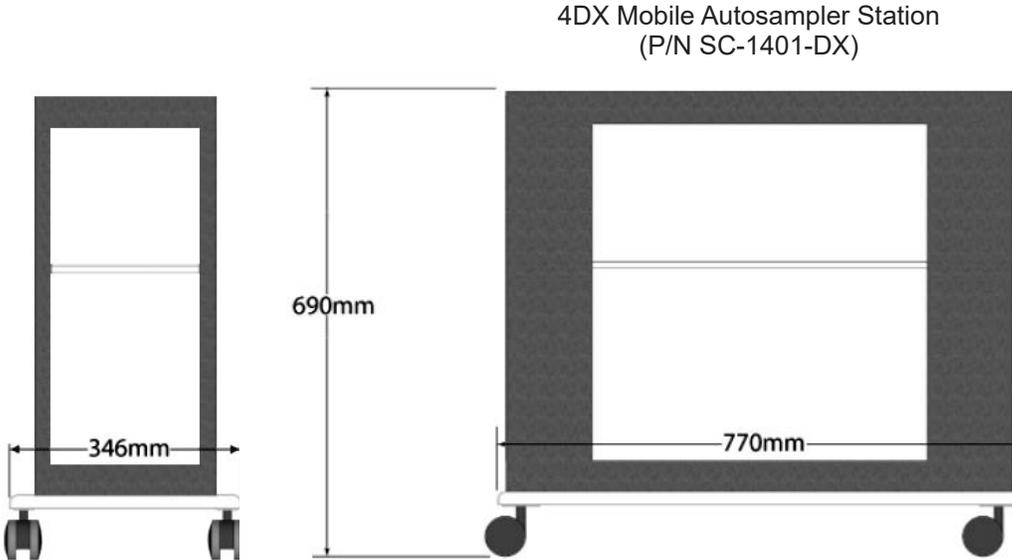
# Mobile Autosampler Station Dimensions

## 2DX Mobile Autosampler Station Dimensions



2DX Mobile Autosampler Station W x D x H:54.2 x 34.6 x 69.0 cm

## 4DX Mobile Autosampler Station Dimensions



4DX Mobile Autosampler Station W x D x H:77.0 x 34.6 x 69.0 cm

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