



# Elemental Scientific

2012 Catalog  
ESI Products and Consumables

*Advanced Sample Introduction Systems For  
Thermo Scientific ELEMENT 2 & ELEMENT XR ICPMS*



# Elemental Scientific



Elemental Scientific designs and produces a range of sample introduction systems for the determination of trace element concentrations and isotope ratios in liquid samples when using inductively coupled plasma instrumentation. Our extensive product line contains sample introduction devices for all models of ICPMS instruments, including:

- Innovative SC-Series clean intelligent autosamplers
- Inert MicroFlow and PolyPro Nebulizers
- Inert autosampler and manual sampling probes
- Precision micro peristaltic pumps
- Inert, chemically resistant spray chambers and end caps
- Demountable o-ring-free injectors made from platinum, sapphire, or quartz
- Precision and standard quartz ICPMS torches
- apex family of high sensitivity, low contamination sample inlet systems
- PC<sup>3</sup> Peltier-cooled cyclonic spray chambers



**ESI Headquarters  
Omaha, Nebraska - USA**

Contact us by phone at 402.991.7800 or by e-mail at [esi@icpms.com](mailto:esi@icpms.com). Our years of experience in the laboratory and in the field are at your disposal to help answer your questions related to elemental analysis. We are pleased to provide our customers complimentary analytical advice from our on-staff chemists.

## **Ordering Information:**

You may contact us via phone, fax, e-mail, or through our website.

### **U.S. Business Hours:**

Central Time Zone  
Monday through Friday  
8:00 am to 6:00 pm

### **E-Mail:**

[esi@icpms.com](mailto:esi@icpms.com)

### **Address:**

1500 North 24th Street  
Omaha, NE 68110

### **Website:**

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

### **Phone:**

402.991.7800

### **Fax:**

402.991.7799



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## Application



### Clinical

Small volume and high matrix samples such as blood, urine and serum.



### Environmental

Drinking water, waste water, seawater, soils and other environmental samples.



### Geochemistry

Highly acidified mining samples for transition metals and platinum group elements.



### Nuclear

Samples containing Th, U, Pu or other actinides requiring small volumes and careful handling.



### Organic Solvents

Sample introduction wear oils and volatile organic samples for petrochemical applications.



### Remote Monitoring

Custom online monitoring and high efficiency sample transport for remote chemical baths.



### Semiconductor

Ultra-trace analysis of high matrix samples in clean room environments.

## Application Systems

### chromFAST

Online, low-pressure chromatographic speciation systems for Cr, As, Se or Hg using the SC-FAST. (Pg 6)

### hydrideFAST

hydrideFAST utilizes an integrated precision micro peristaltic pump to improve ICPMS detection limits for sub-ppt detection capabilities for hydride elements such as As, Se and Sb. (Pg 8)

### seaFAST

A completely automated sample introduction system for multi-mode determination of ultra-trace metals in undiluted seawater. seaFAST lowers procedural blanks and improves detection limits for a variety of elements through advanced, online sample preparation such as preconcentration, matrix elimination, online dilution, and hydride generation. (Pg 10)

### microFAST

Automate delivery and analysis of micro volume samples. The microFAST system enables the direct analysis of ultra-low-volume samples without waste using both syringes and micro peristaltic pumps. (Pg 12)

### TRUFAST

Measure low-ppq level Ra in natural waters using an automated SC-FAST system. Polyatomic interferences arising from Ba and Sr are automatically removed online using ion exchange techniques, providing extremely low background levels and superb detection limits. Alternate chemistries are available for other radionuclides such as Th and U. (Pg 15)

## Function



**FAST**



**Low Sample Consumption**



**Low Detection Limits**



**HF Resistant**



**High Precision / Isotope Ratio**



**Micro Samples**



**Preconcentration**



**High Throughput**

## Materials

### CTFE

Ethylene chlorotrifluoroethylene is a fluorocarbon-based polymer, a kind of plastic. ECTFE is used to minimize wear in high-friction applications.

### PTFE

Polytetrafluoroethylene is a synthetic fluoropolymer of tetrafluoroethylene. PTFE is hydrophobic: neither water nor water-containing substances wet PTFE.

### PEEK/PTFE Composite

Polyether ether ketone is a colorless organic polymer thermoplastic used in engineering applications. Because of its robustness, PEEK is used to fabricate items used in demanding applications, including bearings, piston parts, and pumps.

### PFA

Perfluoroalkoxy is a type of fluoropolymer with properties similar to PTFE. Due to its flexibility, extreme resistance to chemical attack and optical transparency, this material is used for plastic labware that involves critical or highly corrosive processes.

### Polyethylene

Polyethylene is a thermoplastic polymer consisting of long chains produced by combining the ingredient monomer ethylene. Polyethylene is a class of thermoplastics practically ubiquitous in consumer products.

### Polypropylene

Polypropylene (PP) is a thermoplastic polymer used in a wide variety of applications. This material is often chosen for its resistance to corrosion, heat and chemical leaching, and its resilience against most forms of physical damage, including impact and freezing.

### Polystyrene

Polystyrene is an aromatic polymer made from the monomer styrene, a liquid hydrocarbon that is manufactured from petroleum by the chemical industry. Polystyrene is one of the most widely used plastics.

## Terminology

**FAST** - A valve and loop combination that rapidly loads and injects the sample.


**MP<sup>2</sup>** - A precision micro peristaltic pump.

**PC<sup>3</sup>** - A Peltier cooled cyclonic spray chamber.

**SC-DX** - An inert chemically resistant autosampler constructed with dual x-rails, large diameter Z-rail and C6 carriage.

**SYRIX** - A compact, low-profile, high-precision laboratory syringe pump.

## Tubing Sizes

 **Red** - 0.15 mm i.d.

 **Yellow** - 0.30 mm i.d.

 **Gray** - 1.00 mm i.d.

 **Purple** - 0.20 mm i.d.

 **Orange** - 0.50 mm i.d.

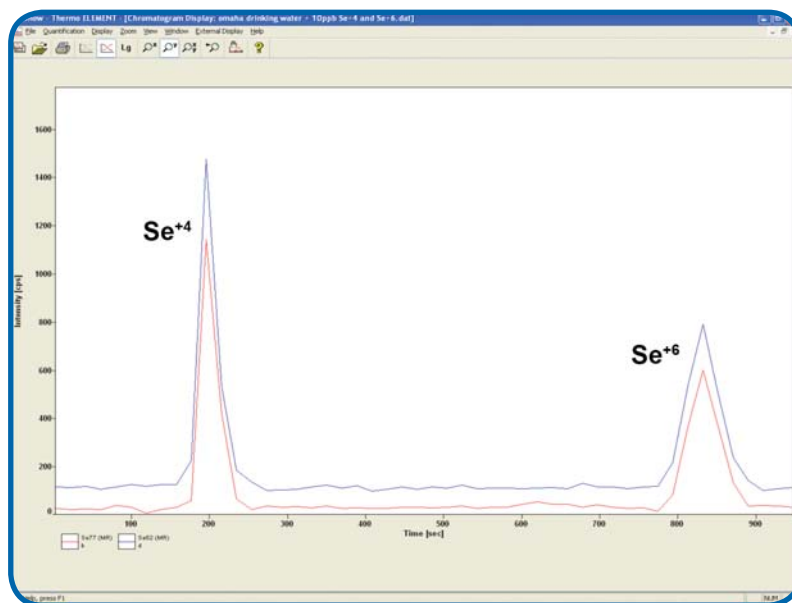
 **Green** - 0.25 mm i.d.

 **Blue** - 0.80 mm i.d.

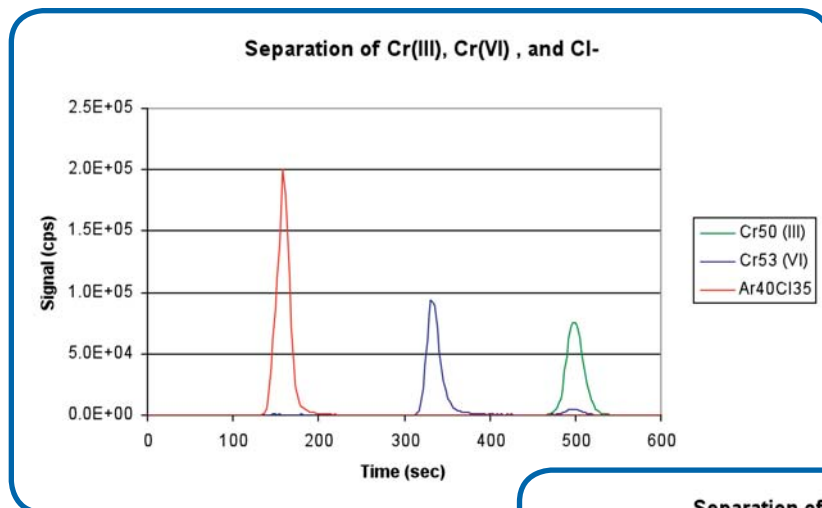


## Advantages of SC-FAST for Elemental Speciation

- Eluent delivered using an MP<sup>2</sup> micro peripump or standard instrument peripump
- Isocratic or step-gradient chromatographic FAST methods
- A variety of anion exchange and reverse phase columns available
- Timing of chromatographic injection controlled from ICPMS software
- Chromatographic method optimization for specialized separations is faster when using peripump-delivered eluents
- Easy switching between total element and speciation determinations

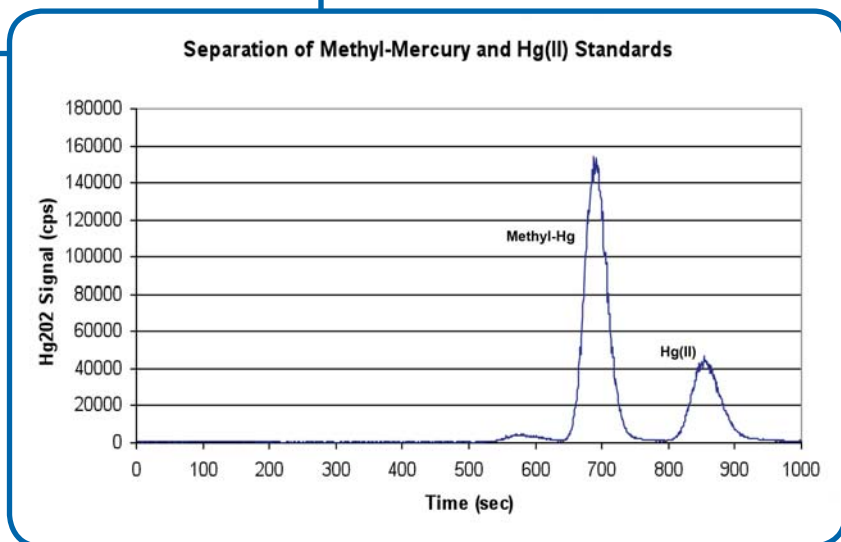


Separation of Se (IV and VI) from a 150 µL drinking water sample. The LR trace for <sup>77</sup>Se (red) and <sup>82</sup>Se (blue) are shown.



Separation of isotopically enriched Cr (III) and Cr (VI)

Low pressure separation of MeHg and Hg

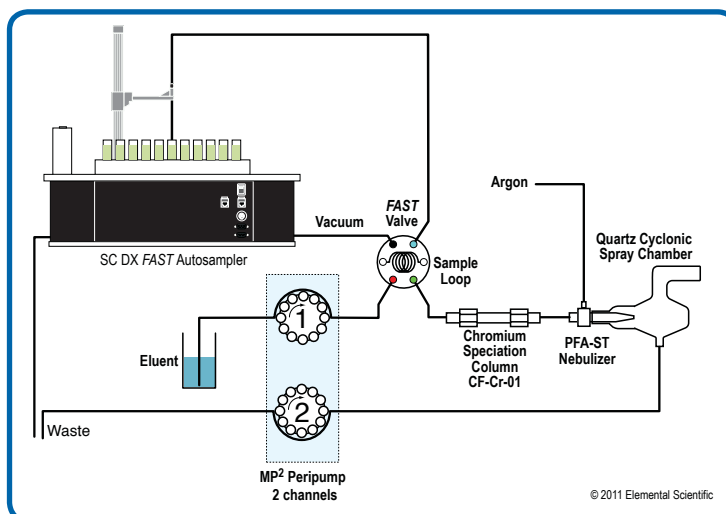


## Automated, Low-Pressure LC-ICPMS

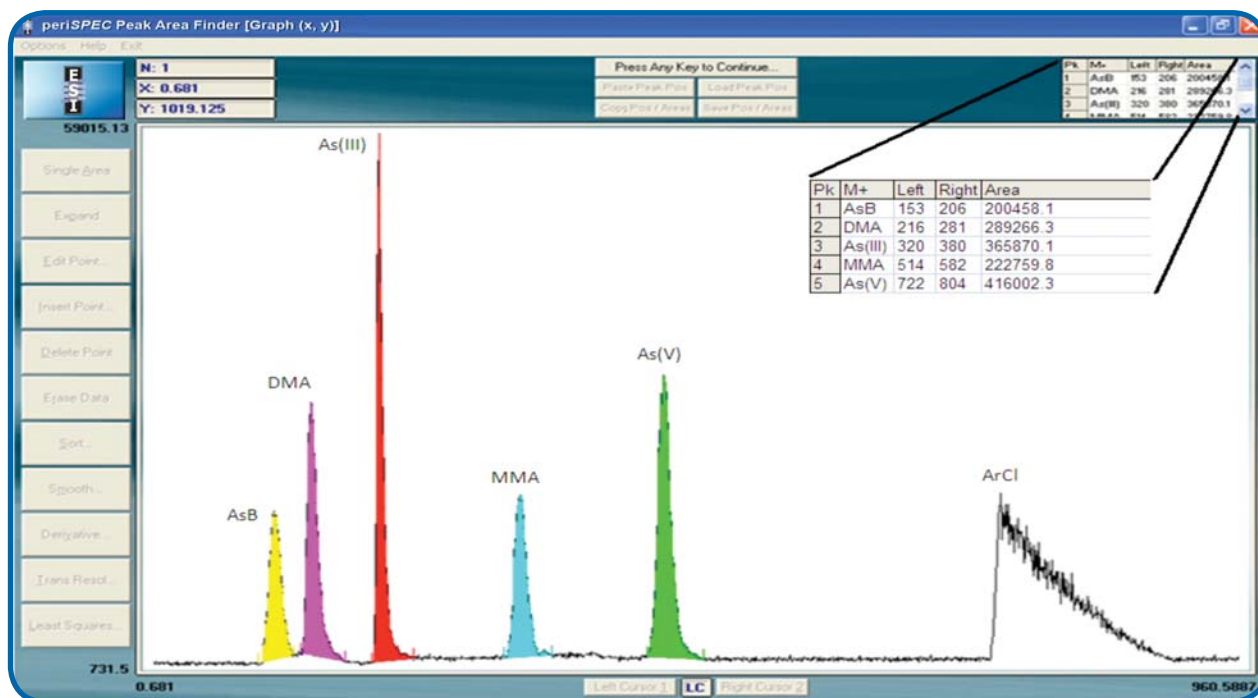
Low-pressure chromatographic speciation kits and the SC-FAST system coupled to the ELEMENT HR-ICPMS can separate and detect species of many elements, including As, Se, Cr, and Hg. The separation is independent of matrix components even in high mineral content groundwater samples. Detection limits of a few ppt or lower and excellent spike recoveries make this approach a viable and economical alternative to the more expensive and labor-intensive HPLC technology. In addition, the faster separation capability of this low pressure approach makes it ideally-suited to the demands of a high sample throughput environment.

Speciation Upgrade Kits for chromFAST	
Part Number	Description
CF-KIT-Cr36	Chromium 3/6 speciation kit for FAST
CF-KIT-Se46	Selenium 4/6 speciation kit for FAST
CF-KIT-As35	Arsenic 3/5 speciation kit for FAST
CF-KIT-MeHg	Methyl mercury speciation kit for FAST
periSPEC Chromatography Software	
ES-2999-4001	periSPEC chromatography peak area finder software

Requires an SC-DX FAST system



chromFAST System Diagram



ESI's periSPEC software is a convenient way to detect LC-ICPMS peaks. Here five arsenic species separated from  $\text{ArCl}^+$  using low pressure LC-ICPMS are detected and integrated.

# hydrideFAST™

## Simple, Accurate, and FAST Hydride Generation for ICPMS

hydrideFAST is an inline sample introduction system that minimizes the complexity of previous hydride generators while offering high sensitivity. hydrideFAST can simultaneously generate both nebulized sample aerosol and hydride gases. Both are introduced into the ICPMS for maximum sensitivity and productivity. The combination of the MP<sup>2</sup> precision micro peripump and the patent-pending hydrideFAST gas liquid separator are key to the excellent performance of the hydrideFAST.

Use the hydrideFAST in combination with chromFAST for enhanced sensitivity during speciation of As, Se and Hg.



SC-E4 DX hydrideFAST 2 system for Thermo Scientific ELEMENT 2 ICPMS

### All hydrideFAST 1 Systems Include:

- 1 SC-DX FAST autosampler
- 1 High-purity fluoropolymer injection valve and connections
- 1 Standalone 4-channel MP<sup>2</sup> precision micro peristaltic pump
- 1 Quartz cyclonic spray chamber
- 1 Gas-liquid separator

### hydrideFAST 1:

#### Channel MP<sup>2</sup> Micro Peripump

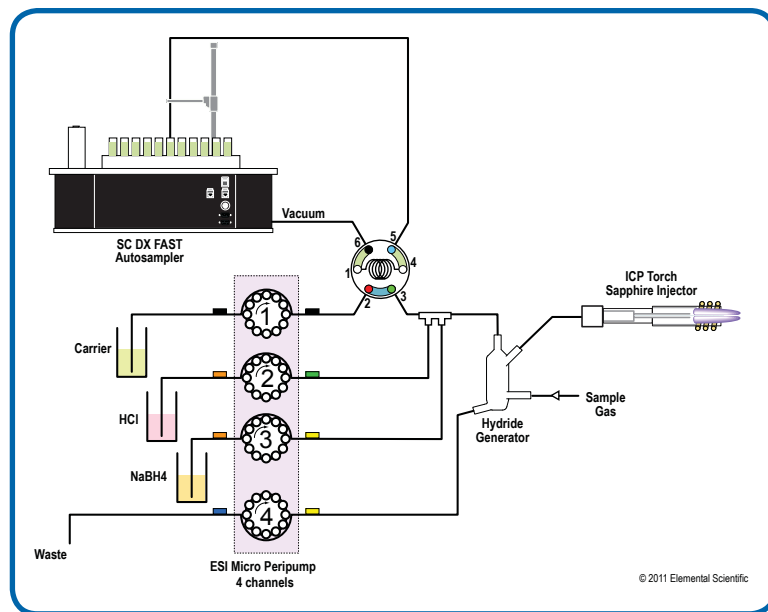
- Stable signal for improved detection limits
- Stable hydrogen gas formation

#### Gas-Liquid Separator

- Enhances sensitivity
- Small internal volume for low memory effect and rapid washout

#### Clean Samples

- Samples do not touch peripump tubing, which reduces dead volume and carryover.



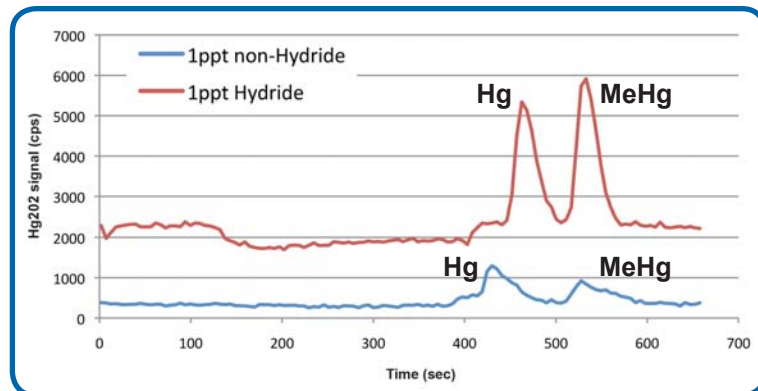
hydrideFAST 1 System

The hydrideFAST 1 system has one mode of operation:

Mode 1 (hydride generation only)

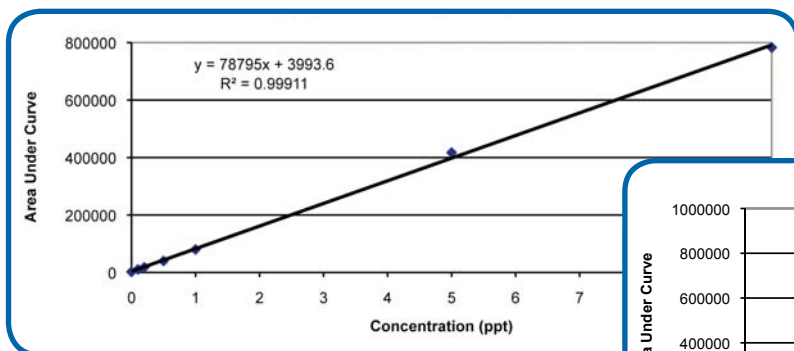
### hydrideFAST 1 System Elements

30	31	32	33	34
Zn	Ga	Ge	As	Se
48	49	50	51	52
Cd	In	Sn	Sb	Te
80	81	82	83	84
Hg	Tl	Pb	Bi	Po

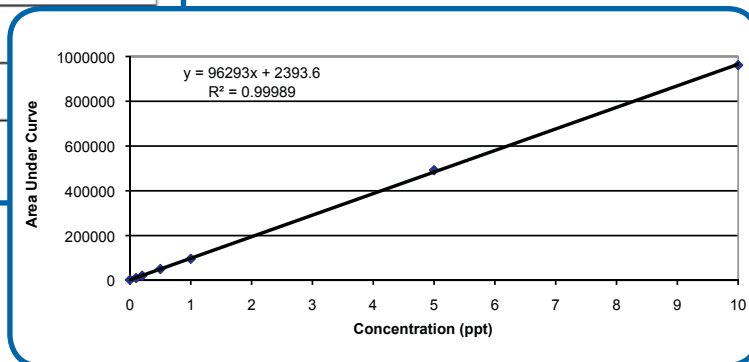


Separation of 1ppt MeHg and Hg with and without hydrideFAST





Hg Speciation: Inorganic-Hg Calibration (hydrideFAST 1)



Hg Speciation: Methyl-Hg Calibration (hydrideFAST 1)

### All hydrideFAST 2 Systems Include:

- 1 SC-DX FAST autosampler
- 1 High-purity fluoropolymer injection valve and connections
- 1 Standalone 8-channel MP<sup>2</sup> precision micro peristaltic pump
- 1 Quartz hydride cyclonic spray chamber
- 1 Gas-liquid separator
- 1 PFA-ST nebulizer
- 1 Sapphire injector

### hydrideFAST 2:

#### MP<sup>2</sup> Micro Peripump

- Stable signal for improved detection limits
- Stable hydrogen gas formation

#### Gas-Liquid Separator

- Enhances sensitivity
- Small internal volume for low memory effect and rapid washout

#### PFA ST-Nebulizer

- Produces a fine aerosol for high transport efficiency and high sensitivity

#### Quartz Hydride Cyclonic Spray Chamber

- Mixes the hydride gas with the sample for simultaneous hydride generation and FAST nebulization

### The hydrideFAST 2 system has three modes of operation:

**Mode 1** (Simultaneous hydride generation and FAST nebulization)

**Mode 2** (hydride generation only)

**Mode 3** (FAST nebulization only)

**hydrideFAST 2**

- Hydride-forming elements analyzed in modes 1 and 2
- Elements analyzed in nebulization modes 1 and 3

1	H																2	He																										
3	Li		Be												B		C		N		O		F		10		Ne																	
11	Na		Mg												Al		Si		P		S		Cl		Ar																			
19	K		Ca		Sc		Ti		V		Cr		Mn		Fe		Co		Ni		Cu		Zn		Ga		Ge		As		Se		Br		Kr									
37	Rb		Sr		Y		Zr		Nb		Mo		Tc		Ru		Rh		Pd		Ag		Cd		In		Sn		Sb		Te		I		Xe									
55	Cs		Ba												Hf		Ta		W		Re		Os		Ir		Pt		Au		Hg		Tl		Pb		Bi		Po		At		Rn	
57	La		Ce		Pr		Nd		Pm		Sm		Eu		Gd		Tb		Dy		Ho		Er		Tm		Yb		Lu															
89	Ac		Th		Pa		U																																					

Part Number	Description
HG-USCA-01	Universal spray chamber adapter for hydrideFAST 1
HG-GLS-001	Quartz hydride gas-liquid separator
HG-MK-1	Hydride generator mounting kit
HYF-UP1-52	hydrideFAST 1 upgrade for SC-DX FAST system
HYF-UP2-52	hydrideFAST 2 upgrade for SC-DX FAST system

hydrideFAST System Part Numbers for the ELEMENT 2 / ELEMENT XR				
System	SC-E2	SC-E4	SC-2 DX	SC-4 DX
hydrideFAST 1 system	E2HYF-1-52C	E4HYF-1-52C	2HYF-1-52C	4HYF-1-52C
hydrideFAST 2 system	E2HYF-2-52C	E4HYF-2-52C	2HYF-2-52C	4HYF-2-52C



A completely automated sample introduction system for multi-mode determination of ultra-trace metals in undiluted seawater. seaFAST lowers procedural blanks and improves detection limits for a variety of elements through advanced online sample preparation such as preconcentration, matrix elimination, online dilution and hydride generation.

## Features:

- Automated preconcentration and matrix elimination
- Simple, external calibration with acid standards
- ppt to ppq detection limits in undiluted seawater
- Eliminate manual sample preparation
- Reduced procedural blanks
- Up to 3 modes of operation available

## seaFAST systems include:

- 1 SC-DX FAST autosampler
- 2 High-purity fluoropolymer injection valves and connections (seaFAST 1)
- 1 PC<sup>3</sup> Peltier cooled cyclonic spray chamber
- 1 Integrated 6-channel MP<sup>2</sup> precision micro peristaltic pump
- 1 seaFAST column with all PFA construction and PTFE frits
- 2 Trace metals cleanup columns
- 1 Sapphire injector
- 1 Method guide
- 3 High-purity fluoropolymer injection valves and connections (seaFAST 2 and seaFAST 3)
- 1 Hydride continuum dual syringe pump system - 3 mL quartz/PTFE syringes (seaFAST 3)
- 1 PFA high-purity batch-mode hydride generation chamber (seaFAST 3)

## seaFAST 1

**Preconcentration Mode:** A chelation column binds transition metals and rare earth elements but allows matrix Na<sup>+</sup>, Cl<sup>-</sup>, Ca<sup>2+</sup> and Mg<sup>2+</sup> ions to be rinsed out. After the preconcentration step, analytes are eluted and detected by ICPMS. (2 valves)

## seaFAST 2

**Preconcentration and Direct Modes:** The capabilities of seaFAST 1, plus online dilution with internal standard during the same analytical run. (3 valves)

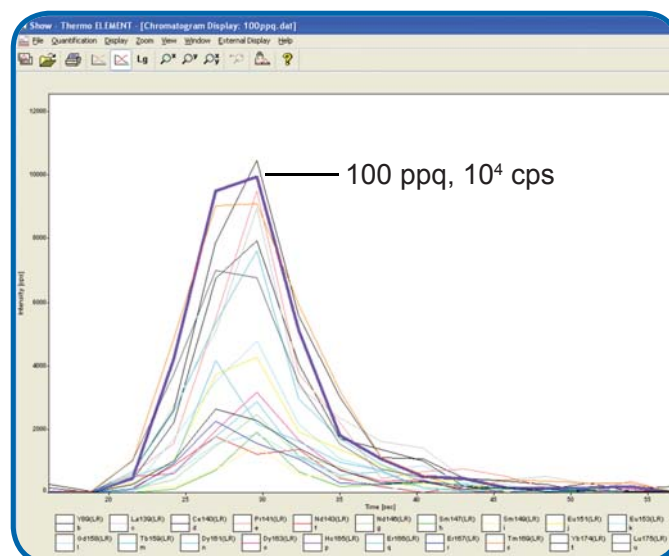
## seaFAST 3

**Preconcentration, Direct and Hydride Modes:** The capabilities of seaFAST 2, plus simultaneous batch-mode hydride generation for As, Se and other hydride forming elements. (5 valves, 2 syringes)

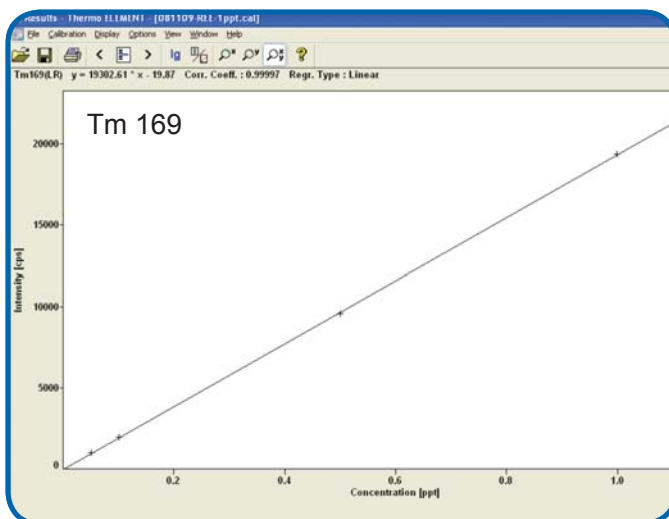
All seaFAST systems may be configured to operate as high throughput SC-FAST systems for direct sample analysis.



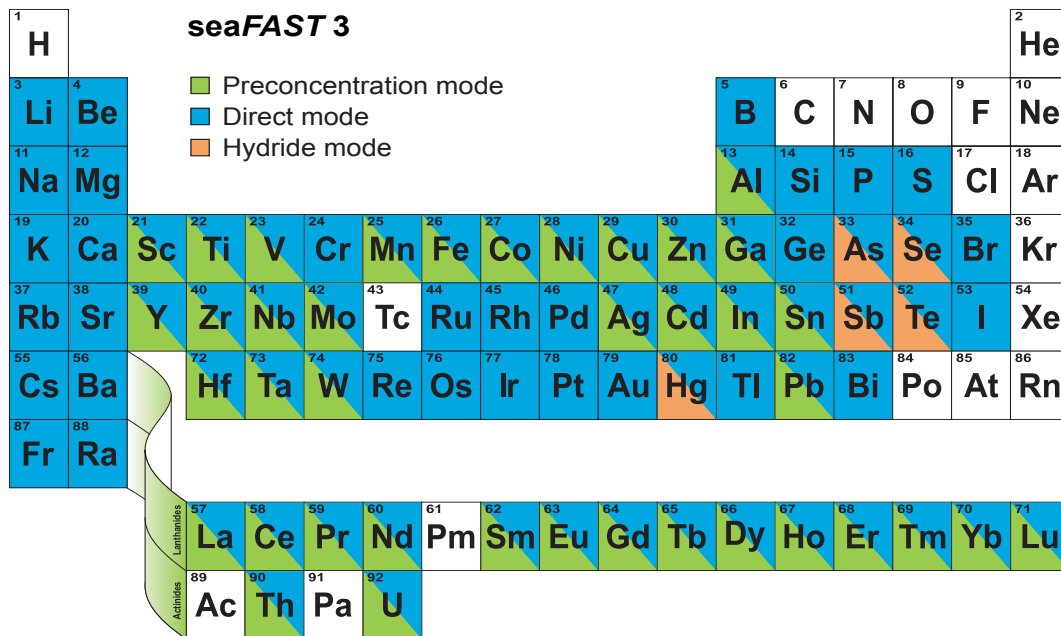
SC-E4 DX seaFAST system for Thermo Scientific ELEMENT 2 ICPMS



100 ppq elution profiles for 20 REE isotopes with the seaFAST using a Peltier cooled cyclonic spray chamber



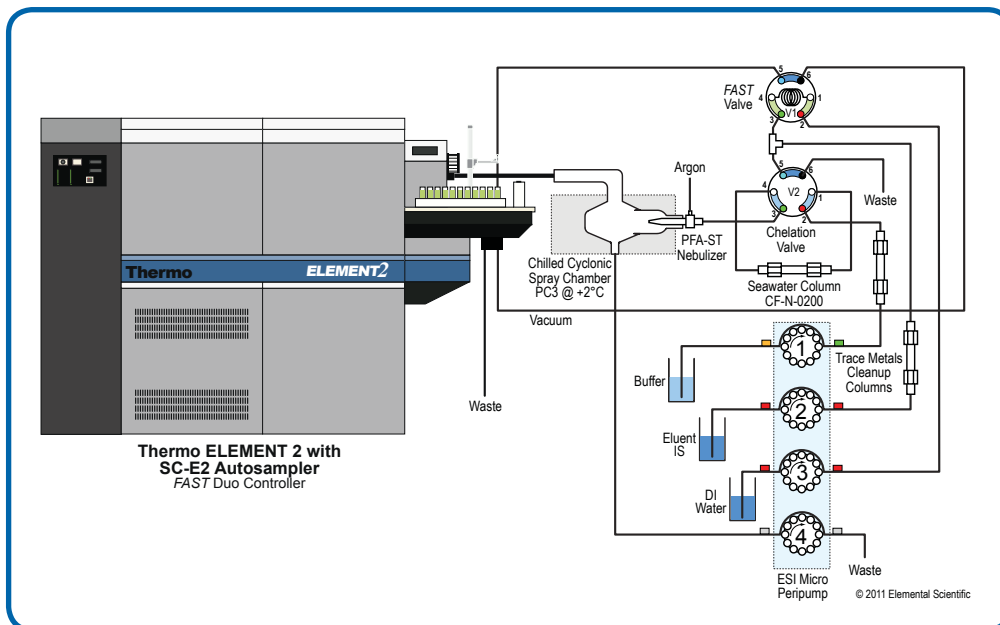
Calibration curve, 50 ppq - 1000 ppq for seaFAST / ELEMENT 2



**seaFAST  
Preconcentration  
Column**

seaFAST System Part Numbers for the ELEMENT 2 / ELEMENT XR				
System	SC-E2	SC-E4	SC-2 DX	SC-4 DX
seaFAST 1 system	E2SF-1-52C	E4SF-1-52C	2SF-1-52C	4SF-1-52C
seaFAST 2 system	E2SF-2-52C	E4SF-2-52C	2SF-2-52C	4SF-2-52C
seaFAST 3 system	E2SF-3-52C	E4SF-3-52C	2SF-3-52C	4SF-3-52C

Description	Part Number
Spare seaFAST preconcentration column	CF-N-0200
Spare seaFAST trace metal cleanup column	CF-IDA



seaFAST 1 System Diagram

# microFAST™

The microFAST is an automated, syringe-based sample delivery system for micro samples. A syringe accurately loads and injects micro samples (10s to 100s of  $\mu\text{L}$ ) into the spray chamber.

Achieve the best absolute detection limits of any sample introduction system with virtually 100% sample transport efficiency and almost no sample to waste to ensure the maximum number of observed ions per volume of sample.

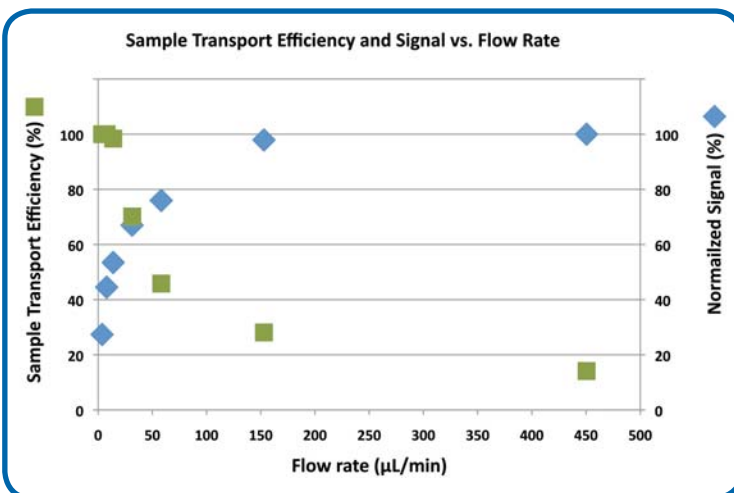
An HF-resistant version of microFAST 2 (microFAST HF2) is available with all fluoropolymer wetted parts, including syringe barrels and the spray chamber.

## microFAST 2 and microFAST HF2 systems include:

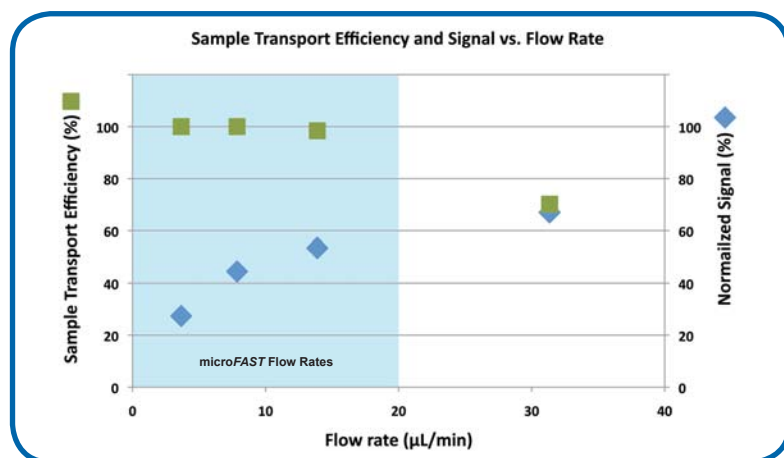
- 1 SC-DX FAST autosampler
- 1 PC<sup>3</sup> Peltier cooled SSI cyclonic/scott dual spray chamber
- 1 High-purity fluoropolymer injection valve and connections
- 1 Integrated 4-channel precision MP<sup>2</sup> micro peristaltic pump
- 1 Continuum dual syringe pump system
  - 3 mL quartz/PTFE syringe for microFAST 2
  - 3 mL PFA/PTFE syringe for microFAST HF2
  - 300  $\mu\text{L}$  quartz/PTFE syringe for microFAST 2
  - 300  $\mu\text{L}$  PFA/PTFE syringe for microFAST HF2
- 1 Sapphire injector
- 1 Quartz torch



SC-E4 DX microFAST 2 system for Thermo Scientific ELEMENT 2 ICPMS



Sample transport efficiency rapidly decreases with increasing flow rate. At 50  $\mu\text{L}/\text{min}$ , more than 50% of the sample goes to waste.



At flow rates below 20  $\mu\text{L}/\text{min}$ , sample transport efficiency approaches 100% and intensity becomes linear with flow rate.

## microFAST Applications



### Ultra-low total volume (tens of microliters) samples

- Controlled uptake and delivery of micro-samples
- Measure up to 100% of sample with high sensitivity
- Flow rates from as low as 1-5  $\mu\text{L}/\text{min}$  up to 10-15  $\mu\text{L}/\text{min}$
- Perform repeat multi-element analysis or precise isotope ratio measurements on a single sample as small as 50  $\mu\text{L}$
- Ideal for nuclear applications to minimize sample prep volume and waste



### Volatile high-purity organic solvents

- Reliable sample introduction at 5 and 10  $\mu\text{L}$  per minute allows samples to be analyzed using conditions similar to those used for water
- Reduced instrument drift, improved stability, and lower instrument maintenance
- SC-Autosamplers offer an optional metal free piercing probe for samples that are covered to reduce contamination and evaporation
- Optional continuum pump eliminates pump tubing
- Requires platinum cones and oxygen addition gas



### Climate research applications

- Particulates in seawater, starting with as few as 10 L of seawater
- Elemental and isotopic ratio analysis of a single planktonic foraminifera
- Micrometeorite multi-element analysis



### Clinical micro-samples

- Elemental analysis of limited volume cell samples
- Metal uptake in living tissue
- Elemental analysis of premature infant blood



### High TDS and high-purity metals

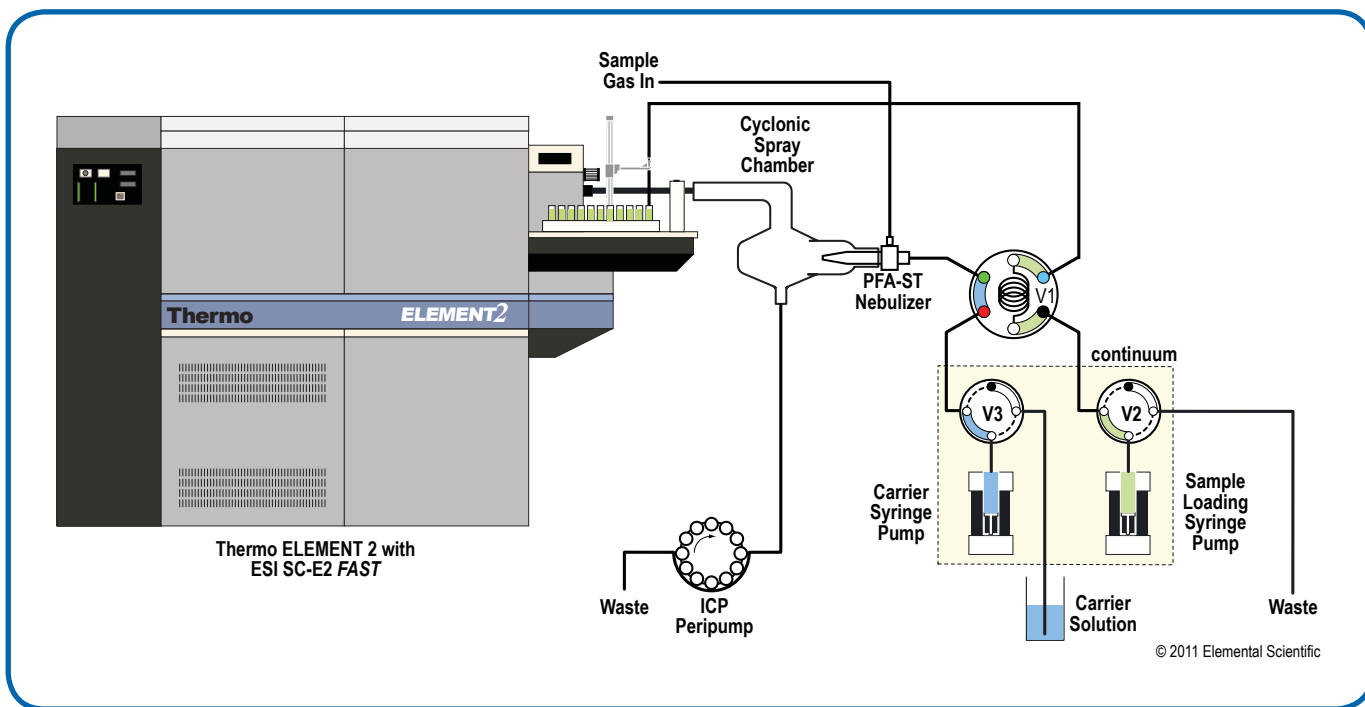
- Measure high-TDS or high-purity metal solutions without dilution
- Reduced matrix effects
- Prevent cone clogging
- Reduce amount of matrix reaching the ICPMS, reducing carryover and instrument contamination from matrix elements



### High precision isotope ratios with maximum absolute sensitivity

- Sample transport efficiency nears 100% at flow rates  $< 20 \mu\text{L}/\text{min}$
- Measure 100  $\mu\text{L}$  or smaller samples with high precision
- Highest sensitivity per unit volume for best precision

# microFAST™



microFAST 2 System Diagram

Time [min]	A	B
3.3688	7667939	8558145
3.4021	7690857	8341377
3.4354	7669419	8448720
3.4688	7601851	8328995
3.5021	7721991	8447726
3.5354	7721979	8486359
3.5687	7641920	8538104
Average(12)	7671196	8458803
RSD(12)	0.5840	0.9537

Stability at 10 µL/min

Syringe driven sample delivery eliminates peristaltic pump noise providing < 1% precision at micro flow rates.

See page 49 for more information on syringe barrels.



microFAST System Part Numbers for the ELEMENT 2 / ELEMENT XR				
System	SC-E2	SC-E4	SC-2 DX	SC-4 DX
microFAST 2 System	E2MF3-2-52C	E4MF3-2-52C	2MF3-2-52C	4MF3-2-52C
microFAST HF2 System <b>HF</b>	E2MF3-2-HF-52C	E4MF3-2-HF-52C	2MF3-2-HF-52C	4MF3-2-HF-52C

Upgrade	Part Number	Description
Continuum System Upgrade	SC-0700-DX	Continuum sampling and solvent delivery upgrade for the SC-DX FAST system. Converts SC-DX FAST to microFAST 2/HF 2. Pumps volatile solvents or aggressive carrier liquids. Replaces the MP <sup>2</sup> thereby eliminating peripump tubing wear, contamination and pulsation. Syringe delivery is accurate, precise and clean.
HF Continuum System Upgrade	SC-0700-DX-HF	

# TRUFAST™

The TRUFAST automatically performs online preconcentration of specific radionuclides to reduce matrix-related interferences and enhance sensitivity by an order of magnitude or more. TRUFAST can eliminate lengthy off-line sample preparation, speed analytical results, better control blanks, and improve detection limits for radioisotopes by ICPMS.

## All TRUFAST systems include:

- 1 SC-DX FAST autosampler
- 1 PC<sup>3</sup> Peltier cooled cyclonic spray chamber
- 1 Integrated 4-channel precision MP<sup>2</sup> micro peristaltic pump
- 2 High-purity fluoropolymer injection valves and all connections
- 2 Chelation columns
- 1 Sapphire injector
- 1 Quartz torch
- 1 Method guide



SC-E4 DX TRUFAST system for Thermo Scientific ELEMENT 2 ICPMS

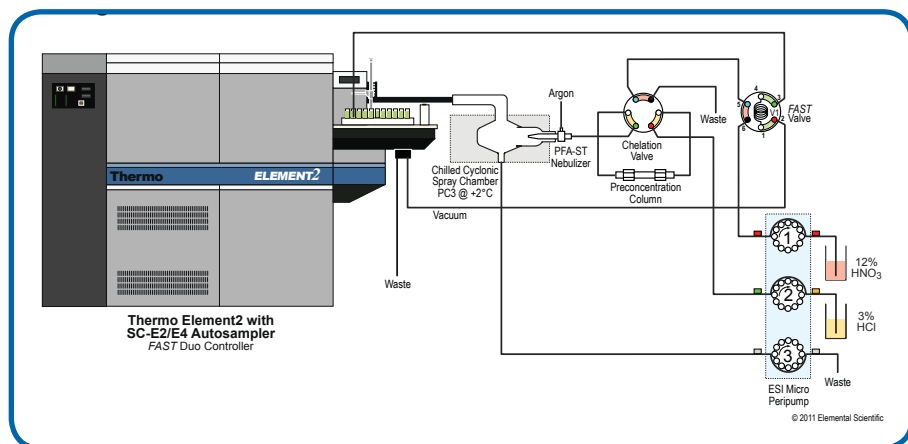


Various applications are available, including:

• **Ra**  
Radium analysis in natural waters: Polyatomic interferences arising from Ba and Sr are automatically removed online using ion exchange techniques, providing extremely low background levels and superb detection limits. (*Cation exchange column, Sr preconcentration column*)

• **Th, U**  
Th in transition metal matrices: Thorium impurities in high purity Cu may be measured by chelating Th while removing the Cu matrix ions via an ion exchange column. Thorium is then eluted and measured in an ICPMS. (*Th/U preconcentration column*)

Th and U may also be determined in high saline matrices using the seaFAST system.



TRUFAST configured for Th/U preconcentration.

Part Number	Description
CF-CX-2000-AG	Spare Cation exchange column
CF-Sr-0200	Spare Sr preconcentration column
CF-ThU-0200	Spare Th/U preconcentration column

For even greater sensitivity, add the apex Q to the TRUFAST (pg 24)

TRUFAST System Part Numbers for the ELEMENT 2 / ELEMENT XR				
System	SC-E2	SC-E4	SC-2 DX	SC-4 DX
TRUFAST Radium System	E2TF-Ra-52C	E4TF-Ra-52C	2TF-Ra-52C	4TF-Ra-52C
TRUFAST Th/U System	E2TF-ThU-52C	E4TF-ThU-52C	2TF-ThU-52C	4TF-ThU-52C

# SC-DX MP<sup>2</sup> PC<sup>3</sup> FAST SYSTEM



## *The Ultimate Sample Introduction System!*

- High Throughput Autosampler
- FAST Sample Delivery
- MP<sup>2</sup> Precision Micro Peristaltic Pump
- PC<sup>3</sup> Peltier Cooled Cyclonic Spray Chamber

Your Complete Source  
For Sample Introduction



**Elemental  
Scientific**



## Introduction to the SC-FAST system

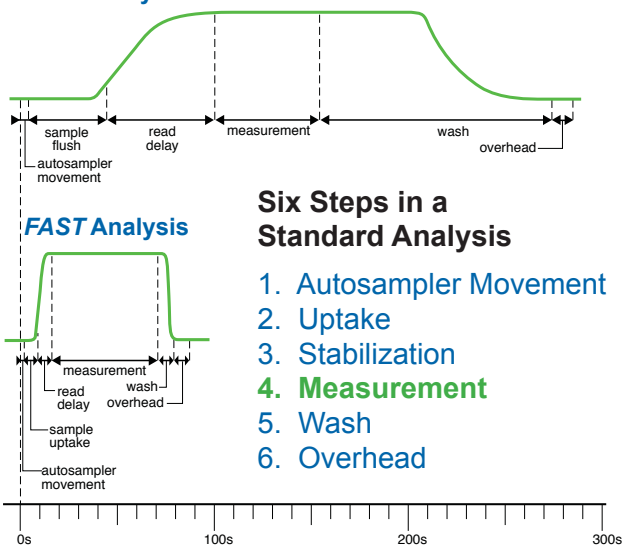
The SC-FAST is a reliable, high-throughput, high-matrix, automated sample introduction system for the ELEMENT 2 ICPMS. The combination of the SC-DX FAST autosampler with the ELEMENT 2 ICPMS provides the perfect platform to introduce even the most demanding high matrix samples.

- Adds a valve in the uptake line between the autosampler and the ELEMENT 2
- Rapid vacuum loading ( $0.5 \text{ mL sec}^{-1}$ ) of a 1 mL loop
- Switching the valve allows the sample to be delivered to the plasma through a low dead volume tube, nebulizer and spray chamber (5 sec)
- Rapid uptake and stabilization of sample signal (10 sec)
- During sample analysis, the probe arm travels to the rinse station and washes the uptake probe and tubing



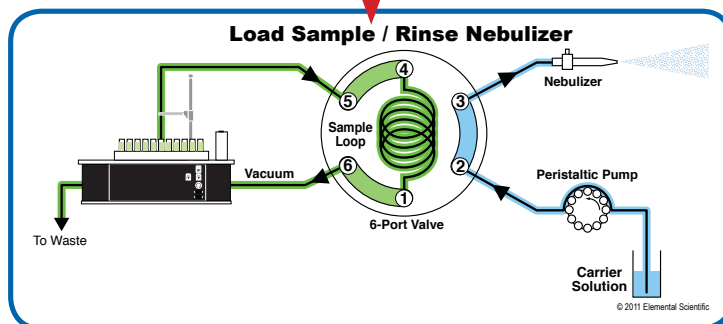
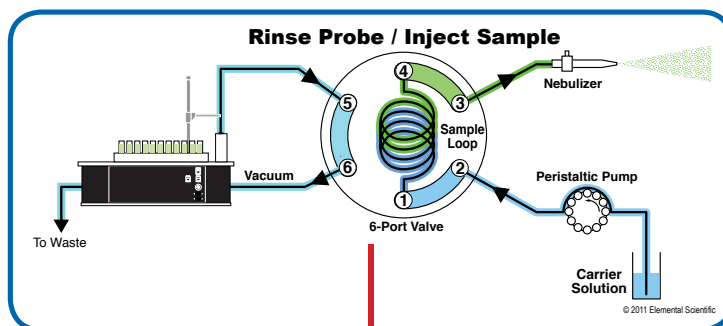
SC-DX FAST is available in four autosampler sizes, holding up to fourteen large sample racks.

### Normal Analysis



The SC-FAST system has the quickest signal stabilization and most complete rinse-out of any sample introduction system, reducing uptake and wash times while increasing sample throughput.

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



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

## SC-DX Systems for the ELEMENT 2 ICPMS



SC-DX MP<sup>2</sup> PC<sup>3</sup>  
FAST System

All SC-DX autosampler components are composed of inert chemically resistant materials for extended lifespan. Dual X-rails and large diameter Z-rail provide precise sampling, virtually eliminating missed samples—even on microtiter plates. Reduce uptake and wash times while increasing sample throughput by upgrading the SC-DX autosampler to a FAST system. Further improve your FAST system with a PC<sup>3</sup> Peltier cooled cyclonic spray chamber. With a PC<sup>3</sup> you gain the advantages of low memory effects, constant temperature, fast rinse-out and high sample transport efficiency.

Complete the FAST system with an MP<sup>2</sup> precision micro peristaltic pump. The design of the MP<sup>2</sup> minimizes the gaps between rollers, resulting in even pressure points along the tubing, which improves signal stability, data quality and detection limits. The SC-DX MP<sup>2</sup> PC<sup>3</sup> FAST system offers enhanced precision and the ability to add internal standard online at lower dilution factors.



**FAST**

High throughput /  
FAST washout



**PC<sup>3</sup> FAST**

Peltier cooled cyclonic  
spray chamber with FAST



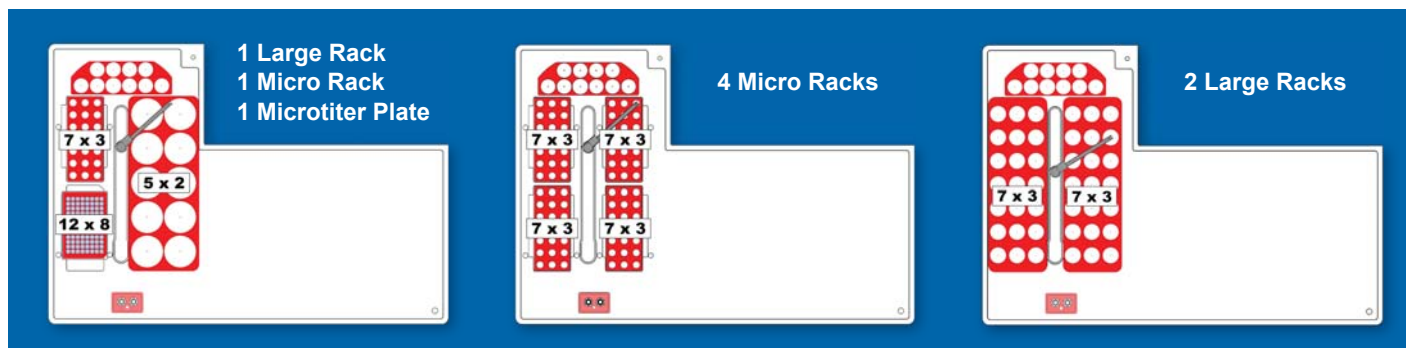
**MP<sup>2</sup>**

Integrated micro peripump

### SC-DX SYSTEMS

System	Description	PC <sup>3</sup>			
		SC-DX	FAST	FAST	MP <sup>2</sup>
SC-DX System	SC-DX FAST enabled autosampler with dual flowing rinse	✓			
SC-DX FAST System	SC-DX autosampler with FAST for high throughput and FAST washout	✓	✓		
SC-DX PC <sup>3</sup> FAST System	SC-DX autosampler and PC <sup>3</sup> Peltier cooled cyclonic spray chamber with FAST	✓	✓	✓	
SC-DX MP <sup>2</sup> PC <sup>3</sup> FAST System	SC-DX autosampler, PC <sup>3</sup> Peltier cooled cyclonic spray chamber with FAST and integrated MP <sup>2</sup> micro peristaltic pump	✓	✓	✓	✓

### EXAMPLES OF SC-E2 DX RACK CONFIGURATIONS



## SC-E2 DX



The variable capacity SC-E2 DX conveniently attaches directly to the ELEMENT 2, minimizing sample path to save time. It directly replaces the standard ELEMENT 2 tray and holds either 2 large sample racks or 4 micro sample racks and up to 10 standards/QC solutions (50 mL vials).

### SC-E2 DX System Includes:

- 2 Sample Probes
- 1 Standards Rack (10 positions)
- 4 Large Racks (21, 40, 60, 90 positions)
- 1 Pk (10 ea) 50 mL Standards Vials (10 ea)
- 1 Pk (60 ea) 15 mL Sample Vials (60 ea)

### SC-E2 DX FAST Systems Also Include:

- 1 FAST valve
- 1 PFA-ST MicroFlow Nebulizer
- 1 Sapphire Injector
- 1 Quartz Torch



SC-E2 DX Systems	Description	Part Number
SC-E2 DX System	SC-E2 DX autosampler with dual flowing rinse	E2DX
SC-E2 DX FAST System	SC-E2 DX autosampler with FAST for high throughput and FAST washout	E2DXF-A
SC-E2 DX PC <sup>3</sup> FAST System	SC-E2 DX autosampler and PC <sup>3</sup> Peltier cooled cyclonic spray chamber with FAST	E2DXF-52C
SC-E2 DX MP <sup>2</sup> PC <sup>3</sup> FAST System	SC-E2 DX autosampler with PC <sup>3</sup> Peltier cooled cyclonic spray chamber and integrated MP <sup>2</sup> precision micro peristaltic pump	E2DXFi-52C

See page 71 for SC-E2 DX dimensions.

## SC-E4 DX



The variable capacity SC-E4 DX conveniently attaches directly to the ELEMENT 2, minimizing sample path to save time. It directly replaces the standard ELEMENT 2 tray and holds either 4 large sample racks or 6 micro sample racks and up to 10 standards/QC solutions (50 mL vials).

### SC-E4 DX System Includes:

- 2 Sample Probes
- 1 Standards Rack (10 positions)
- 4 Large Racks (21, 40, 60, 90 positions)
- 1 Pk (10 ea) 50 mL Standards Vials (10 ea)
- 1 Pk (60 ea) 15 mL Sample Vials (60 ea)

### SC-E4 DX FAST Systems Also Include:

- 1 FAST valve
- 1 PFA-ST MicroFlow Nebulizer
- 1 Sapphire Injector
- 1 Quartz Torch



SC-E4 DX Systems	Description	Part Number
SC-E4 DX System	SC-E4 DX autosampler with dual flowing rinse	E4DX
SC-E4 DX FAST System	SC-E4 DX autosampler with FAST for high throughput and FAST washout	E4DXF-A
SC-E4 DX PC <sup>3</sup> FAST System	SC-E4 DX autosampler and PC <sup>3</sup> Peltier cooled cyclonic spray chamber with FAST	E4DXF-52C
SC-E4 DX MP <sup>2</sup> PC <sup>3</sup> FAST System	SC-E4 DX autosampler with PC <sup>3</sup> Peltier cooled cyclonic spray chamber and integrated MP <sup>2</sup> precision micro peristaltic pump	E4DXFi-52C

See page 71 for SC-E4 DX dimensions.

## SC-2 DX



The SC-2 DX *FAST* is a compact autosampler with dual flowing rinse stations that holds 2 large racks or 4 micro racks.

### SC-2 DX System Includes:

- 2 Sample Probes
- 1 Standards Rack (10 positions)
- 4 Large Racks (21, 40, 60, 90 positions)
- 1 Pk (10 ea) 50 mL Standards Vials (10 ea)
- 1 Pk (60 ea) 15 mL Sample Vials (60 ea)

### SC-2 DX *FAST* Systems Also Include:

- 1 *FAST* valve
- 1 PFA-ST MicroFlow Nebulizer
- 1 Sapphire Injector
- 1 Quartz Torch



SC-2 DX Systems	Description	Part Number
SC-2 DX System	SC-2 DX autosampler with dual flowing rinse	2DX
SC-2 DX <i>FAST</i> System	SC-2 DX autosampler with <i>FAST</i> for high throughput and <i>FAST</i> washout	2DXF-A
SC-2 DX PC <sup>3</sup> <i>FAST</i> System	SC-2 DX autosampler and PC <sup>3</sup> Peltier cooled cyclonic spray chamber with <i>FAST</i>	2DXF-52C
SC-2 DX MP <sup>2</sup> PC <sup>3</sup> <i>FAST</i> System	SC-2 DX autosampler with PC <sup>3</sup> Peltier cooled cyclonic spray chamber and integrated MP <sup>2</sup> precision micro peristaltic pump	2DXFi-52C

See page 72 for SC-2 DX dimensions.

## SC-4 DX



The SC-4 DX *FAST* is an autosampler with dual flowing rinse stations that holds 4 large racks or 6 micro racks. It is ideal for labs with moderate sample throughput needs.

### SC-4 DX System Includes:

- 2 Sample Probes
- 1 Standards Rack (10 positions)
- 4 Large Racks (21, 40, 60, 90 positions)
- 1 Pk (10 ea) 50 mL Standards Vials (10 ea)
- 1 Pk (60 ea) 15 mL Sample Vials (60 ea)

### SC-4 DX *FAST* Systems Also Include:

- 1 *FAST* valve
- 1 PFA-ST MicroFlow Nebulizer
- 1 Sapphire Injector
- 1 Quartz Torch



SC-4 DX Systems	Description	Part Number
SC-4 DX System	SC-4 DX autosampler with dual flowing rinse	4DX
SC-4 DX <i>FAST</i> System	SC-4 DX autosampler with <i>FAST</i> for high throughput and <i>FAST</i> washout	4DXF-A
SC-4 DX PC <sup>3</sup> <i>FAST</i> System	SC-4 DX autosampler and PC <sup>3</sup> Peltier cooled cyclonic spray chamber with <i>FAST</i>	4DXF-52C
SC-4 DX MP <sup>2</sup> PC <sup>3</sup> <i>FAST</i> System	SC-4 DX autosampler with PC <sup>3</sup> Peltier cooled cyclonic spray chamber and integrated MP <sup>2</sup> precision micro peristaltic pump	4DXFi-52C

See page 72 for SC-4 DX dimensions.

## SC-8 DXS



The high capacity SC-8 DXS holds 8 large sample racks and up to 40 standards/QC solutions (50 mL vials). It has the smallest footprint of any 8 rack autosampler and is ideal for labs with high sample throughput needs.

### SC-8 DXS System Includes:

- 2 Sample Probes
- 1 Standards Rack (10 positions)
- 4 Large Racks (21, 40, 60, 90 positions)
- 1 Pk (10 ea) 50 mL Standards Vials (10 ea)
- 1 Pk (60 ea) 15 mL Sample Vials (60 ea)

### SC-8 DXS FAST Systems Also Include:

- 1 FAST valve
- 1 PFA-ST MicroFlow Nebulizer
- 1 Sapphire Injector
- 1 Quartz Torch



SC-8 DXS Systems	Description	Part Number
SC-8 DX System	SC-8 DX autosampler with dual flowing rinse	8DX
SC-8 DX FAST System	SC-8 DX autosampler with FAST for high throughput and FAST washout	8DXF-A
SC-8 DX PC <sup>3</sup> FAST System	SC-8 DX autosampler and PC <sup>3</sup> Peltier cooled cyclonic spray chamber with FAST	8DXF-52C
SC-8 DX MP <sup>2</sup> PC <sup>3</sup> FAST System	SC-8 DX autosampler with PC <sup>3</sup> Peltier cooled cyclonic spray chamber and integrated MP <sup>2</sup> precision micro peristaltic pump	8DXFi-52C

See page 73 for SC-8 DX dimensions.

## SC-14 DXS



The high capacity SC-14 DXS holds 14 large sample racks and up to 10 standards/QC solutions (50 mL vials). It is ideal for labs with the highest sample throughput needs.

### SC-14 DXS System Includes:

- 2 Sample Probes
- 1 Standards Rack (10 positions)
- 4 Large Racks (21, 40, 60, 90 positions)
- 1 Pk (10 ea) 50 mL Standards Vials (10 ea)
- 1 Pk (60 ea) 15 mL Sample Vials (60 ea)

### SC-14 DXS FAST Systems Also Include:

- 1 FAST valve
- 1 PFA-ST MicroFlow Nebulizer
- 1 Sapphire Injector
- 1 Quartz Torch



SC-14 DXS Systems	Description	Part Number
SC-14 DX System	SC-14 DX autosampler with dual flowing rinse	14DX
SC-14 DX FAST System	SC-14 DX autosampler with FAST for high throughput and FAST washout	14DXF-A
SC-14 DX PC <sup>3</sup> FAST System	SC-14 DX autosampler and PC <sup>3</sup> Peltier cooled cyclonic spray chamber with FAST	14DXF-52C
SC-14 DX MP <sup>2</sup> PC <sup>3</sup> FAST System	SC-14 DX autosampler with PC <sup>3</sup> Peltier cooled cyclonic spray chamber and integrated MP <sup>2</sup> precision micro peristaltic pump	14DXFi-52C

See page 73 for SC-14 DX dimensions.

## SC-Micro DX



The SC-Micro DX is a small-footprint, low-cost autosampler with instrument pumped dual flowing rinse stations. It holds 2 microtiter plates or 2 micro racks and 10 standards vials.

### SC-Micro DX System Includes:

- 2 Sample Probes
- 1 Standards Rack (10 positions)
- 3 Microtiter Plates (24, 48, 96 positions)
- 3 Micro Racks (21, 40, 90 positions)
- 1 Pk (10 ea) 20 mL PFA Standards Vials
- 1 Pk (10 ea) 2 mL PFA Sample Vials



Part Number	Description
m-DX	SC-Micro DX autosampler with dual flowing rinse

Contact a sales representative to discuss customizing the SC-Micro DX with an optional diaphragm rinse pump or for glovebox applications.

## SC-2 DX Semiconductor



The SC-2 DX Semiconductor is an autosampler designed for ultrapure semiconductor applications where the lowest possible background levels are required. It has a PTFE autosampler deck and 2 independent rinse control valves.

### SC-2 DX Semiconductor System Includes:

- 1 Ultem Sample Probe
- 2 PTFE Sample Probes
- 1 Standards Rack (10 positions)
- 4 Large Racks (21, 40, 60, 90 positions)
- 1 Micro Rack (21 positions)
- 1 High purity PFA dual rinse kit
- 1 Pk (10 ea) 50 mL Standards Vials
- 1 Pk (60 ea) 15 mL Sample Vials
- 1 Pk (30 ea) 2 mL PFA Sample Vials



Part Number	Description
2DX-SEMI	SC-2 DX Semiconductor autosampler with dual flowing rinse

See page 72 for SC-2 DX dimensions.

Autosampler Capacity				
Autosampler	50 mL	15 mL	8 mL	Microtiter-96 (2 mL)
SC-2 DX (Super rack)	52 (64)	120 (160)	180	384
SC-4 DX	94	240	360	576
SC-8 DX	208	480	720	N/A
SC-14 DX	304	840	1260	2880*

\*Special version SC-14 for microtiter plates

# seaFAST™

**Automated Preconcentration  
and Matrix Elimination**




A completely automated sample introduction system for multi-mode determination of ultra-trace metals in undiluted seawater. seaFAST lowers procedural blanks and improves detection limits for a variety of elements through advanced online sample preconcentration and matrix elimination.



See page 10 for more information.





**Elemental  
Scientific**

## apex - High Sensitivity Desolvating Systems

**apex Q - Quartz Inlet System.** Features a quartz, o-ring-free flow path for high sensitivity, low background and rapid rinse-out of samples that do not contain hydrofluoric acid. 

**apex IR for Isotope Ratio Analysis.** Developed for isotope ratio analysis, the apex IR has a quartz flow path and includes an additional mixing chamber that further homogenizes and stabilizes the sample aerosol stream, resulting in a more stable signal.  

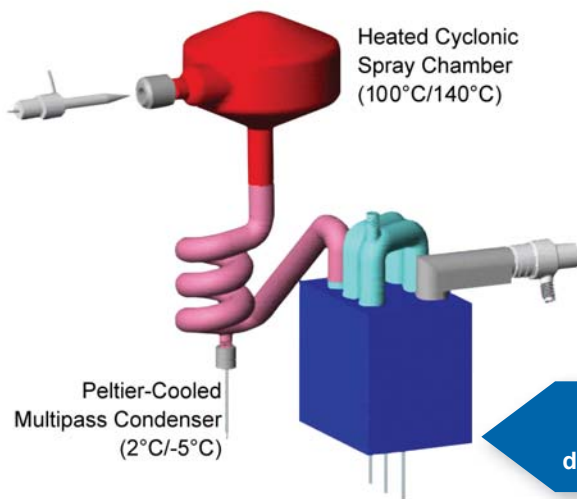
**apex HF for Hydrofluoric Acid Resistance.** Uses a high purity, o-ring-free PFA flow path for the introduction of samples containing hydrofluoric acid. The apex HF is recommended for many geochemical and semiconductor applications.  



ES-4552-1000-21  
apex IR



ES-4352-1000-21  
apex Q

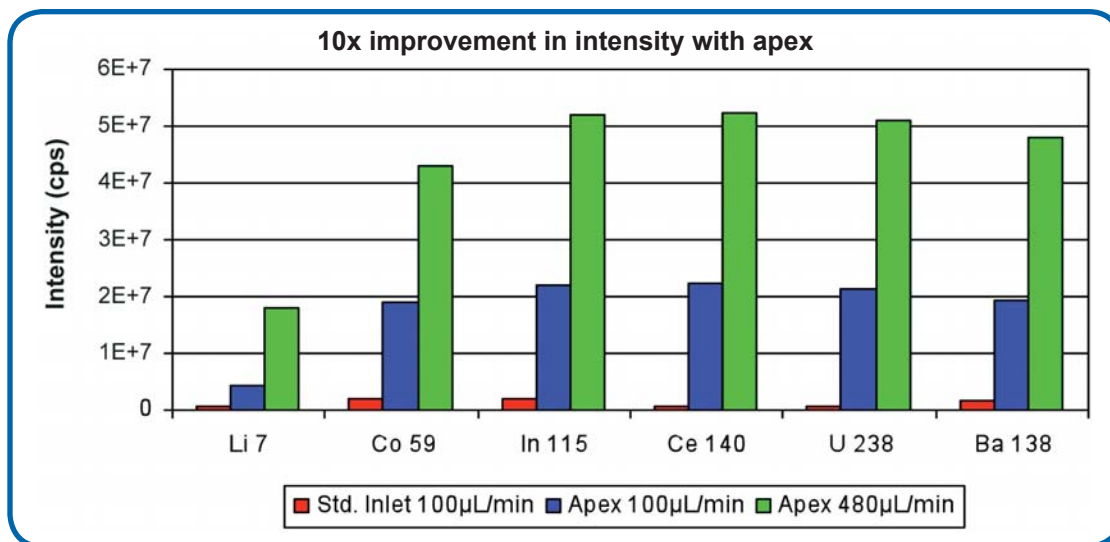


Total Internal Volume: 180mL

Preset dual temperature settings for heater and cooler. Patented flow path design ensures rapid wash-in / washout.



See Page 36 for information on the apex-100 PFA Nebulizer





## apex FAST High Sensitivity Desolvating Systems

The apex FAST is a compact, high performance sample introduction system. apex FAST is available in Q, HF and IR options. It can be controlled via any SC-DX Autosampler or oneFAST unit making it fully automated and integrated to any instrument.

Requires FAST-enabled autosampler.



apex FAST  
with injection valve  
adjacent to nebulizer  
ES-43FH-21-52



Model	Part Number	HF-Resistant	Integrated Valve	High Sensitivity	O-ring-free	Dual Temperature	Mixing Chamber for Isotope Ratios
apex Q	ES-4352-1000-21			✓	✓	✓	
apex IR	ES-4552-1000-21			✓	✓	✓	✓
apex HF	ES-4452-1000-21	✓		✓	✓	✓	
apex Q FAST	ES-43FH-21-52		✓	✓	✓		
apex IR FAST	ES-45FH-21-52		✓	✓	✓		✓
apex HF FAST	ES-44FH-21-52	✓	✓	✓	✓		

## spiro TMD

### Heated Membrane Desolvator

The spiro TMD is a heated macro-porous PTFE membrane desolvation module that reduces solvent-derived polyatomic interferences. Both aqueous and organic solutions can be desolvated, making the spiro ideal for HPLC applications.

- Heated macro-porous PTFE membrane
- Desolvation of aqueous & organic solutions
- Reduces solvent derived oxide, hydride and carbide polyatomic interferences
- Suitable for sample flow rates < 400 µL/min through apex
- Removes volatile acid matrix, i.e. HCl, HF
- Fast rinse-out
- Resistant to clogging
- Can be used with or without the apex
- Add membrane desolvation to standard introduction systems
- Easy to maintain and clean
- User-replaceable membrane sheets
- CeO<sup>+</sup>:Ce<sup>+</sup> ratio approximately 0.03%



ES-4599-3000 spiro TMD heated membrane desolvation module

Part Number	Description
ES-4599-3000	spiro TMD heated membrane desolvation module.



## Thermo Scientific ELEMENT 2 JET Interface

Thermo Scientific's JET high ion transmission interface uses a high capacity dry interface pump plus the novel JET sampler cone to increase HR-ICPMS sensitivity by up to 100 times when used in conjunction with the ESI apex desolvating nebulizer.

JET interface with apex is for any scientist who wants to explore new limits of elemental and isotopic analysis. It is the latest innovation that redefines limits of detection and quantification for ICPMS. JET is not restricted to any application area--it solves novel and yet-to-be-thought-of applications limited only by the creativity of HR-ICPMS scientists.



Jet interface and apex desolvation nebulizer

The need for higher sensitivity and lower detection limits for specific elements comes up most frequently in nuclear (e.g. Pu), chemical oceanography, hard rock geochemistry, meteoritics and glaciology. High sensitivity for Se and As opens new possibilities for ICPMS.

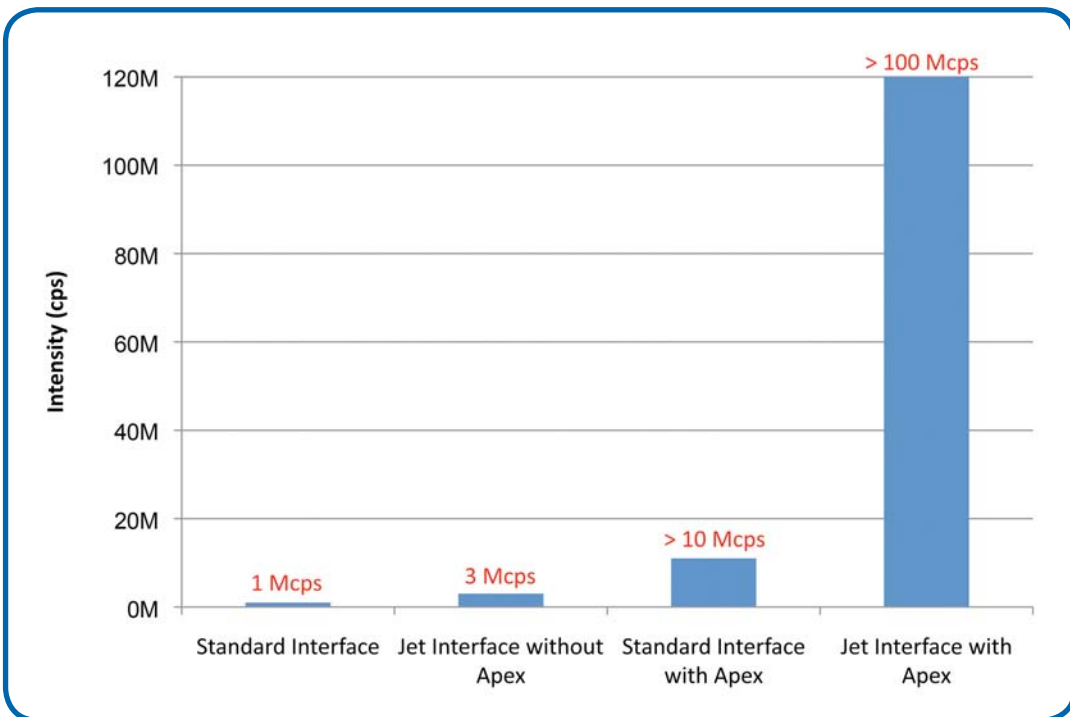
Analysis of biological material requires higher sensitivity because the abundances of much of the periodic table are below MDL for accurate multi-element analysis--especially for small samples.

Improved counting statistics is always an issue for improved precision for isotope ratio measurements in any field, including Pb, U and Pu. microFAST combined with the apex and JET Interface HR-ICPMS has the potential to analyze samples where LoD issues and precision issues intertwined--now permitting high precision Pb, U, Pu in vanishingly small samples.

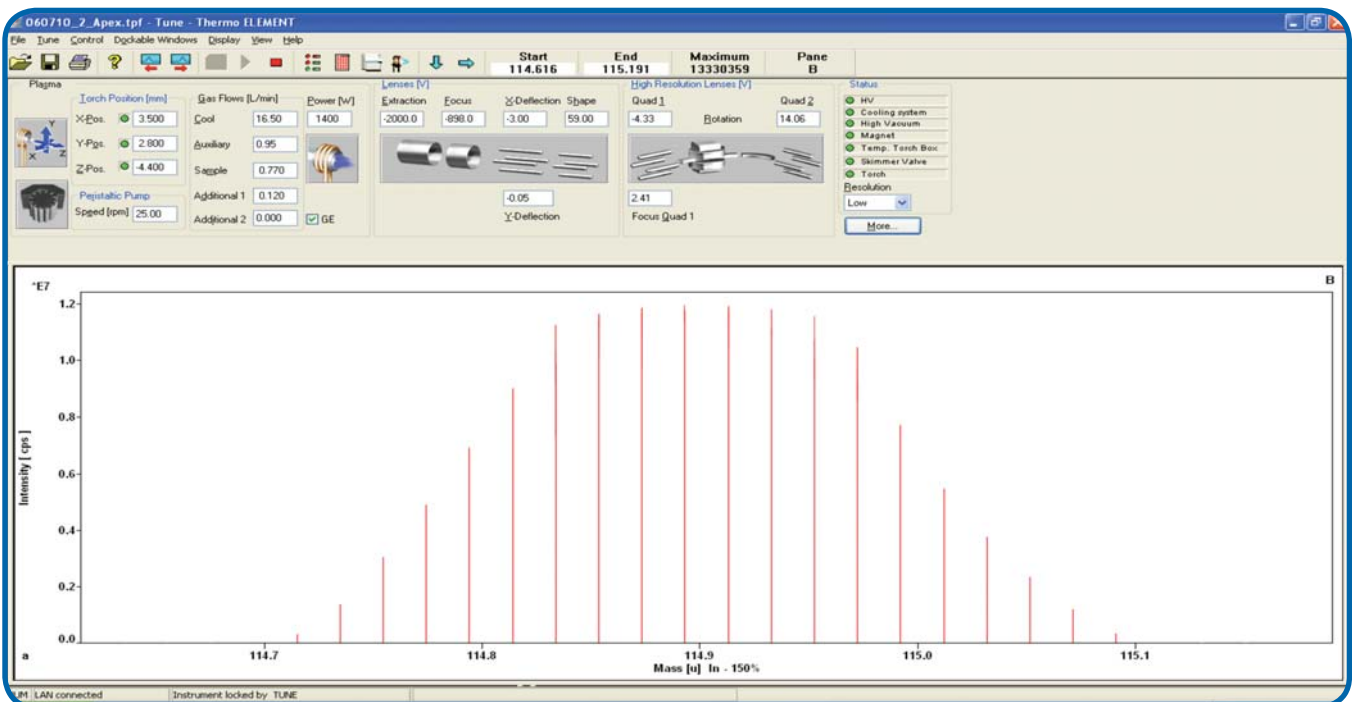


The JET Interface is available exclusively through Thermo Scientific and should be combined with an apex desolvation system.





Jet Interface with apex provides >100x sensitivity compared to standard interface and sample introduction. 1 ppb Indium with the Jet interface.



## PC<sup>3</sup> Peltier Cooler



The PC<sup>3</sup> is a small, robust Peltier cooled cyclonic spray chamber. The PC<sup>3</sup> offers the advantages of low memory effects, constant temperature, fast rinse-out and high sample transport efficiency. The cooled outer walls of the PC<sup>3</sup> spray chamber enhance long-term signal stability, reduce polyatomic interferences such as oxides, and reduce solvent loading when volatile organic solvents are analyzed.

### PC<sup>3</sup> / PC<sup>3</sup>-LT



The PC<sup>3</sup> has 2 preset temperatures +2°C / -5°C and is ideal for analysis of aqueous or aqueous/organic mixtures.

The PC<sup>3</sup>-LT operates at -20°C to reduce the solvent load on the plasma for analysis of 100% volatile organic solvents.

#### PC<sup>3</sup> / PC<sup>3</sup>-LT Kits Include:

- 1 Quartz injector
- 1 PFA-ST MicroFlow nebulizer
- 1 Quartz cyclonic spray chamber

#### HF PC<sup>3</sup> / PC<sup>3</sup>-LT Kits Include:

- 1 Sapphire injector
- 1 PFA-ST MicroFlow nebulizer
- 1 PFA cyclonic spray chamber



ES-4190-52-29  
PC<sup>3</sup>



ES-9190-52-29  
PC<sup>3</sup>-LT

Part Number	Description	Temperature	Additional Gas Port
ES-4190-52-29	PC <sup>3</sup> organic sample introduction kit - Peltier cooler	+2°C / -5°C	Yes
ES-4190-52-29-PFA	HF PC <sup>3</sup> organic sample introduction kit - Peltier cooler	+2°C / -5°C	Yes
ES-9190-52-29	PC <sup>3</sup> -LT organic sample introduction kit - Peltier cooler	+2°C / -20°C	Yes
ES-9190-52-29-PFA	HF PC <sup>3</sup> -LT organic sample introduction kit - Peltier cooler	+2°C / -20°C	Yes

All PC<sup>3</sup> kits include a PFA-ST nebulizer (ES-2040)

### Additional Spray Chambers Available for the PC<sup>3</sup>

Part Number	Description
ES-3152-1111-16	Quartz (7 mm baffle) cyclonic spray chamber with auxiliary gas port. Drain line included.



Part Number	Description
ES-3152-3111-11	PFA (7 mm baffle) cyclonic spray chamber with auxiliary gas port. Drain line included.



Both chambers shown fit the ELEMENT 2 PC<sup>3</sup>.

See page 42 for additional information on spray chambers.

# SSI Spray Chambers / PC<sup>3</sup> with SSI Spray Chamber

## SSI Cyclonic/Scott Dual Spray Chamber

The Stable Sample Introduction (SSI) cyclonic/scott dual spray chamber is an all quartz, o-ring-free spray chamber with an additional mixing chamber to homogenize sample aerosol prior to introduction to the ICPMS. The SSI chamber improves short-term stability for isotope ratio measurements.

The spray chamber may be combined with PC<sup>3</sup> to enhance long-term stability. The SSI or PC<sup>3</sup> with SSI chamber not only improves isotope ratio precision, but is useful for any analysis where better short- and/or long-term signal stability is desired.

### Benefits of SSI

- Improves signal stability up to 2x-3x
- Improves isotope ratio precision up to 5x
- Reduces cone deposition and improves rinse-out time

### Dimensions

SSI Chamber 14cm x 5cm x 14cm (LxWxH)

Part Number	Description
ES-2101-2003	Quartz SSI cyclonic/scott dual spray chamber with additional gas port, o-ring-free
ES-3252-3111	PFA SSI cyclonic/scott dual spray chamber



## PC<sup>3</sup> with SSI Cyclonic/Scott Dual Spray Chamber

### Benefits of SSI with PC<sup>3</sup>

- Thermal stabilization of spray chamber improves long-term stability
- Reduces oxides and interferences
- No separate chiller required
  - No antifreeze required
  - No algae growth
  - No water lines
- Robust, with very little maintenance, reducing the chance of accidental breakage
- Long lifetime
- Very low maintenance

### Dimensions

PC<sup>3</sup> with SSI 14cm x 13cm x 14cm (LxWxH)

Part Number	Description
ES-4252-1111	PC <sup>3</sup> Peltier cooler and quartz SSI cyclonic/scott dual spray chamber with ESI injector connection



## PC<sup>3</sup> FAST with SSI Spray Chamber

### PC<sup>3</sup> FAST with SSI Cyclonic/Scott Dual Spray Chamber

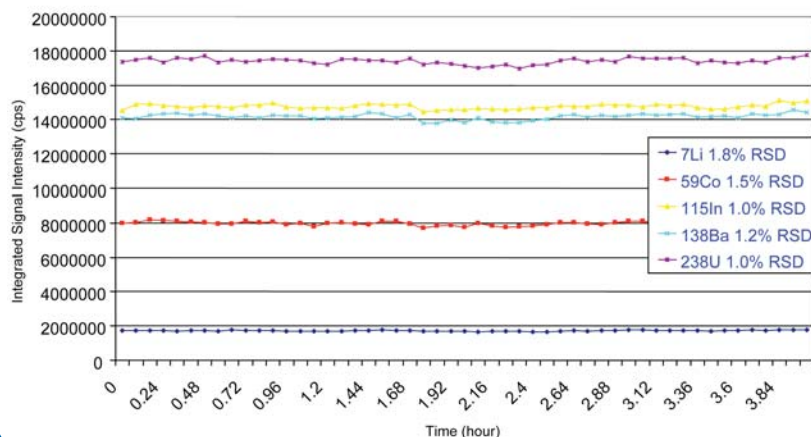
Combine the benefits of the PC<sup>3</sup> with an SSI spray chamber and the throughput and/or advanced automation capabilities of the FAST system into a single unit.



Part Number	Description
SC-4199-1210-52-SSI	PC <sup>3</sup> FAST Peltier cooler and quartz SSI cyclonic/scott dual spray chamber with ESI injector connection

Requires ESI autosampler with integrated FAST controller

#### 4 Hour Stability 1 ppb Tuning Solution Thermo Scientific ELEMENT 2 ICPMS



The cooled spray chamber reduces the amount of solvent reaching the plasma, which improves long-term stability and reduces oxide levels.

#### Short-Term (20 min) Signal Stability Scott vs PC<sup>3</sup> vs PC<sup>3</sup> with SSI chamber

Isotope	Standard Inlet	PC <sup>3</sup>	PC <sup>3</sup> -SSI
Co-59	1.03%	0.92%	0.53%
In-115	1.32%	1.08%	0.40%
Ba-138	0.96%	0.90%	0.48%
U-238	1.16%	0.93%	0.34%

n=10, 1 min read, 1 min delay, LR 10% mass window

The PC<sup>3</sup>-SSI cyclonic/scott dual spray chamber further homogenizes the sample aerosol stream giving improved stability. This system is ideally suited for high precision isotope ratio analysis.

# HF-Resistant Sample Introduction Kits

## PFA Sample Introduction Kits for ELEMENT 2



The PFA kit is a reliable, ultra-pure, chemically inert and clean sample introduction system. All wetted surfaces are PFA and sapphire. It is used by the majority of semiconductor labs worldwide for the analysis of semiconductor-grade chemicals and Si wafer samples.

### Benefits include:

- Easy installation
- Clean PFA components for lower background equivalent concentration (BEC) and detection limits
- O-ring-free connections—ensures lowest BEC's, highest chemical resistance and easy cleaning
- Chemically resistant—suitable for nearly all samples, including strong acids, alkalis and organic solvents
- Low sample consumption—ideal for VPD and preconcentrated samples



PFA-Sapphire HF Resistant Sample Introduction Kit



PFA-Platinum High Purity Sample Introduction Kit

Part Number	Description
ES-2180-1471-29	Complete HF-resistant sample introduction kit. Includes a PFA-ST Nebulizer, PFA PureCap endcap with additional gas port, PFA spray chamber, 1.8 mm sapphire injector, platinum shield disc and quartz torch.
ES-2181-1471-19	Complete high purity sample introduction kit. Includes two PFA-100 MicroFlow Nebulizers, PFA PureCap endcap with additional gas port, PFA spray chamber, platinum injector, platinum shield disc and quartz torch.

## High Purity PFA Pipette Tips



High purity PFA pipette tips are used to minimize contamination of semiconductor and biological samples.

Part Number	Volume	Qty	Description
ES-7000-0101	100 µL	10 pk	Pre-cleaned PFA Pure Tip pipette tips
ES-7000-1001	1000 µL	10 pk	Pre-cleaned PFA Pure Tip pipette tips



## oneFAST Systems

### Universal, High-Throughput Sample Introduction System

The oneFAST brings the field-proven capabilities of the SC-FAST to non-ESI autosamplers. The oneFAST hardware and software has been optimized and integrated with the ELEMENT 2 to immediately increase throughput by speeding stabilization time and rinse-out. The oneFAST reduces instrument maintenance and matrix exposure while improving long-term performance.

#### oneFAST Basic



The oneFAST increases throughput with non-ESI autosamplers.

- Includes:** 1 FAST Valve                      2 Probes-PFA/Carbon Fiber  
 1 oneFAST Controller                  All Required Tubing  
 1 PFA-ST Nebulizer



Part Number	Description
SC-0400	oneFAST basic system

#### oneFAST Complete

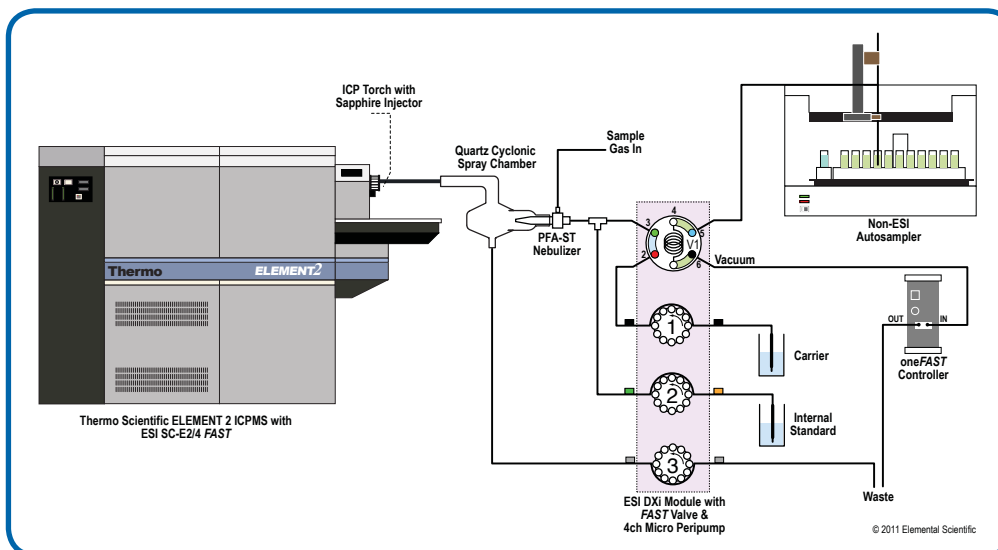


The oneFAST Complete includes an injector and spray chamber, making any non-ESI autosampler ready for increased throughput needs.

- Includes:** 1 FAST Valve                      1 Quartz Cyclonic Spray Chamber  
 1 oneFAST Controller                      1 Sapphire Injector  
 1 PFA-ST Nebulizer                        All Required Tubing  
 2 Probes - PFA/Carbon Fiber



Part Number	Description
SC-0452	oneFAST complete system



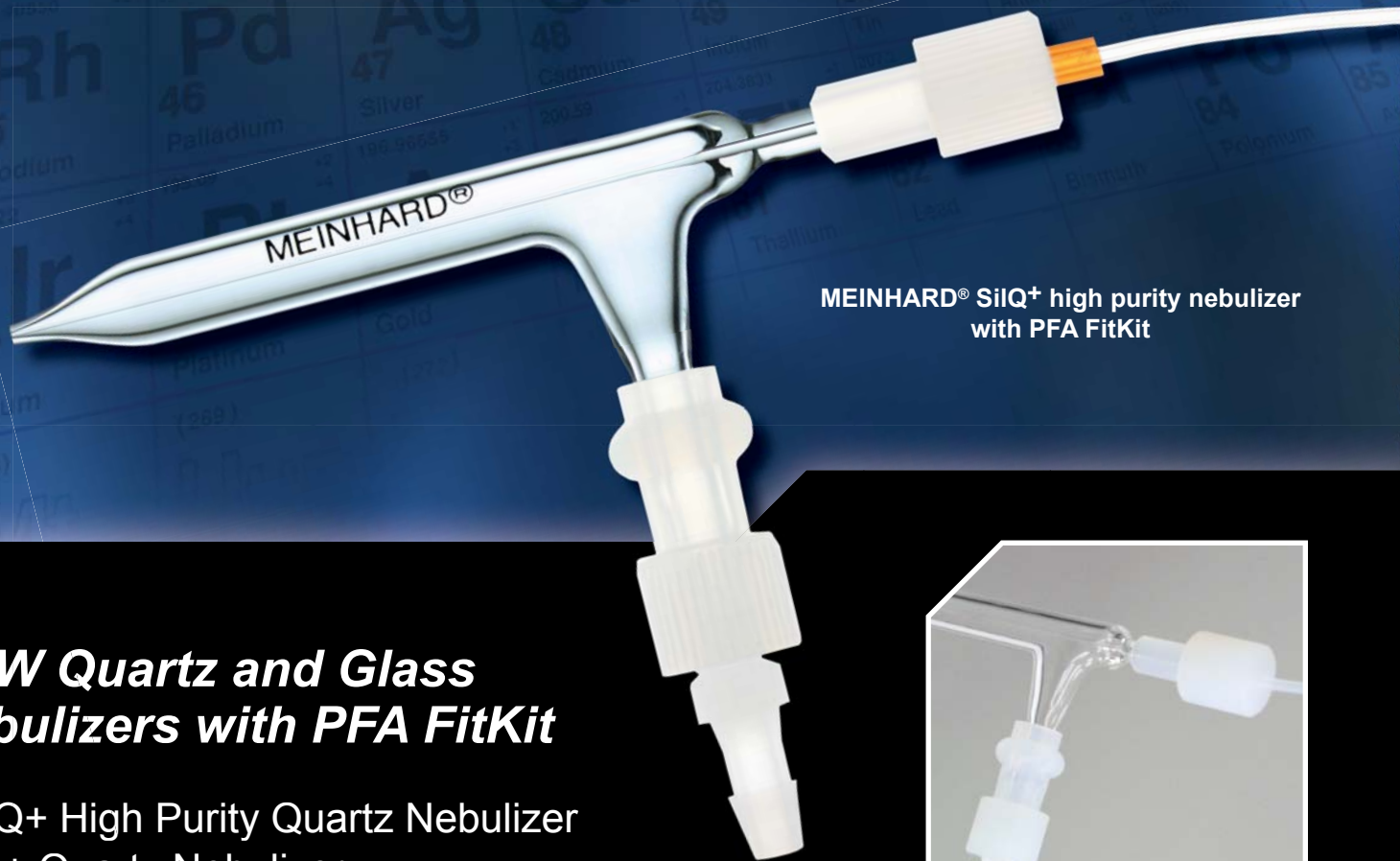
oneFAST Complete for Thermo Scientific ELEMENT 2 ICPMS



# MEINHARD®

## NEW PLUS NEBULIZERS

with PFA FitKit Quick Connects



MEINHARD® SilQ+ high purity nebulizer with PFA FitKit

### *NEW Quartz and Glass Nebulizers with PFA FitKit*

- SilQ+ High Purity Quartz Nebulizer
- TQ+ Quartz Nebulizer
- TR+ Glass Nebulizer

See page 38 for more information.



*Enhance Your Detection Limits,  
Reduce Sample Contamination*



**Elemental  
Scientific**



## PFA and Polypropylene High-Efficiency MicroFlow Nebulizers

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

### PFA-ST Nebulizers



The PFA-ST Nebulizer features the same high purity, HF resistance and high performance of the PFA MicroFlow nebulizers, along with an exchangeable external sample uptake capillary. The sample uptake rate is controlled by the diameter of the external capillary or probe.

- All PFA construction
- Exchangeable uptake capillaries allow one nebulizer to be used at different self-aspiration rates from 20 $\mu$ L/min to 700 $\mu$ L/min
- Chemically resistant—ideal for strong acids, alkalis and organics
- Can be pumped from < 0.1 mL/min to 3.0 mL/min
- Direct analysis of volatile and non-volatile organic solvents
- Longer lifetime than glass or quartz nebulizers



Part Number	Description
ES-2040	PFA-ST self-aspirating nebulizer with external 1/4-28 threaded connector.



Part Number	Description
ES-2030	PFA MicroFlow high solids large bore nebulizer with external 1/4-28 threaded connector. Ideal for strong acids, high solids, alkalis, organic solvents, soils and high salt solutions.



Part Number	Description
ST3-90	PFA-ST3 MicroFlow nebulizer with external 1/4-28 threaded connector. Designed for superior clog resistance and higher sensitivity compared to the standard PFA nebulizer.

### PolyPro-ST Nebulizer

The PolyPro-ST nebulizer is a low cost HF resistant alternative to the PFA nebulizer. The PolyPro nebulizer has a lower chemical resistance than the PFA nebulizer, but has the same high-efficiency aerosol generation. It is a robust nebulizer that can self-aspirate with an exchangeable external sample uptake capillary or can be used with a peristaltic pump.

Part Number	Description
ES-4040	Poly-pro self-aspirating nebulizer with external 1/4-28 threaded connector



### Syringe Flush Kit

Use syringe and white adapter to back-flush the carrier line or tee-line. Use syringe and red adapter to forward flush the carrier line, the side port of the tee-line, and to forward flush the PFA nebulizer.

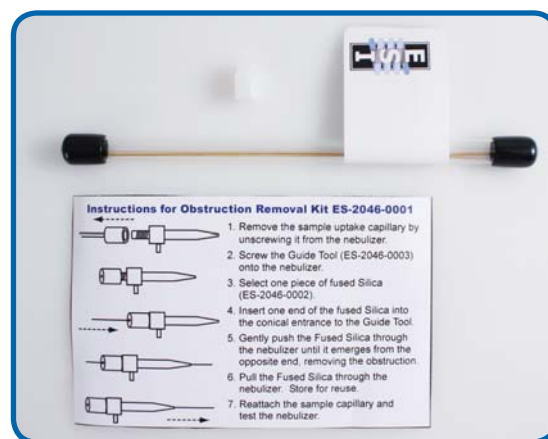
Part Number	Description
SC-0599-0109	Syringe flush kit. Includes 3 mL syringe, two luer to 1/4-28 adapters.



## Nebulizer Obstruction Removal Kit

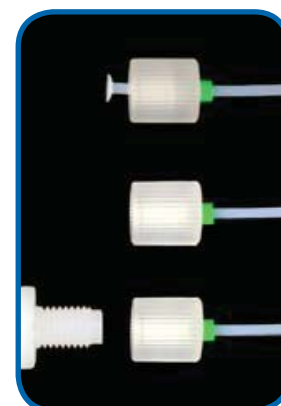
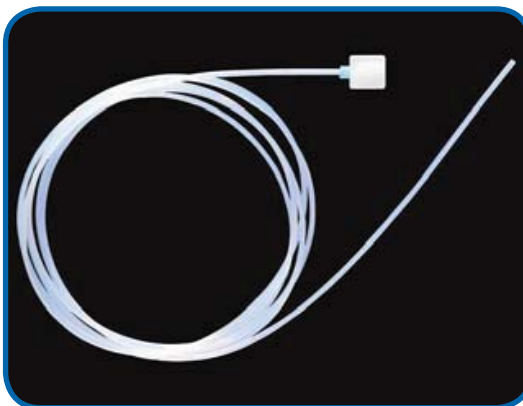
While naturally resistant to obstructions, PFA nebulizers may occasionally require maintenance. Use this kit to safely remove obstructions in all PFA-ST nebulizers for long-term high performance. Never back-flush a PFA-ST nebulizer.

Part Number	Description
ES-2046-0001	Fused silica obstruction removal kit for ST type nebulizers. Includes one guide, 10 pieces of fused silica and instructions.



## PFA Sample Capillaries for ST Nebulizers

Part Number	I.D.	Self-aspiration rate (@1L/m Ar)
ES-2045	0.15 mm	20 $\mu$ L/min <span style="color: red;">■</span> (red)
ES-2043	0.20 mm	50 $\mu$ L/min <span style="color: purple;">■</span> (purple)
ES-2042	0.25 mm	100 $\mu$ L/min <span style="color: green;">■</span> (green)
ES-2047	0.30 mm	200 $\mu$ L/min <span style="color: yellow;">■</span> (yellow)
ES-2041	0.50 mm	400 $\mu$ L/min <span style="color: orange;">■</span> (orange)
ES-2044	0.80 mm	700 $\mu$ L/min <span style="color: blue;">■</span> (blue)
ES-2049	1.00 mm	1 mL/min <span style="color: gray;">■</span> (gray)



## 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.

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

Part Number	Probe i.d.	Capillary Length	Self-aspiration rate (@1L/m Ar)
ES-5037-3250-080	0.25 mm	80 cm	100 $\mu$ L/min
ES-5037-3500-080	0.50 mm	80 cm	400 $\mu$ L/min
ES-5037-3250-100	0.25 mm	100 cm	100 $\mu$ L/min
ES-5037-3500-100	0.50 mm	100 cm	400 $\mu$ L/min



Also available with Ultem support

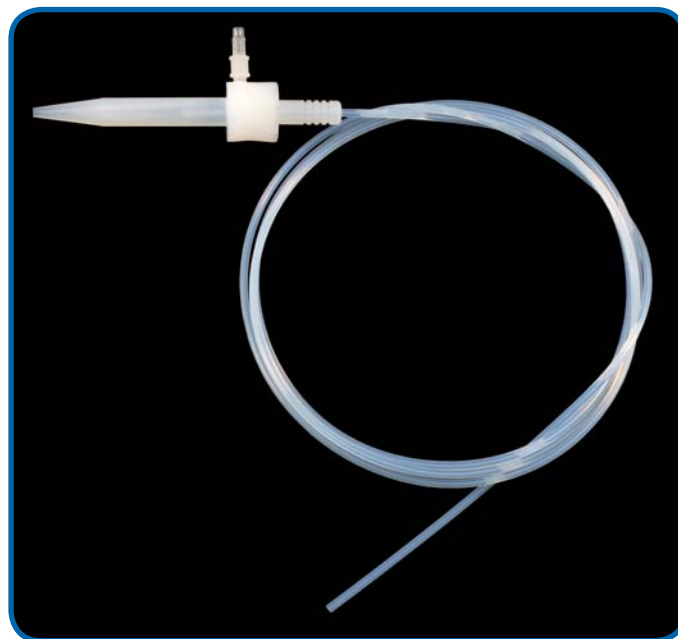
## PFA MicroFlow Self-Aspirating Nebulizers

### PFA Nebulizers with Integrated Capillaries



An integrated capillary PFA nebulizer for self-aspiration. PFA MicroFlow nebulizers are constructed entirely from chemically resistant fluoropolymers ideal for strong acids, alkalis, organics and high salt solutions. They are resistant to clogging and produce a fine aerosol for high transport efficiency and high sensitivity.

- Integrated capillary for self-aspiration, ideal for low flow, clean applications
- All PFA construction
- Chemically resistant—ideal for strong acids, alkalis, organics
- Low, spike-free background for important elements such as Fe and Ca
- Produces a fine aerosol for high transport efficiency and high sensitivity
- Direct analysis of volatile and non-volatile organic solvents



#### PFA Nebulizers with Integrated Fluoropolymer Capillaries

Model	Part Number	Measured self-aspiration rate (@1L/m Ar)
PFA-20	ES-2020	20 $\mu\text{L}/\text{min}$
PFA-50	ES-2000	50 $\mu\text{L}/\text{min}$
PFA-100	ES-2002	100 $\mu\text{L}/\text{min}$
PFA-200	ES-2003	200 $\mu\text{L}/\text{min}$
PFA-400	ES-2005	400 $\mu\text{L}/\text{min}$

Other flow rates made to order

### apex MicroFlow PFA Self-Aspirating Nebulizers



These nebulizers allow self-aspiration at low sample consumption rates with the apex high sensitivity desolvation system.

Part Number	Description
ES-2040-7000	High temperature apex-ST PFA MicroFlow nebulizer with external 1/4-28 threaded connector
ES-2002-7000	High temperature apex-100 PFA nebulizer with integrated 90-150 $\mu\text{L}/\text{min}$ self-aspiration capillary.
ES-2002-7205-080	High temperature apex-100 PFA nebulizer with Ultem manual sampling probe, 90-150 $\mu\text{L}/\text{min}$ , 80 cm capillary

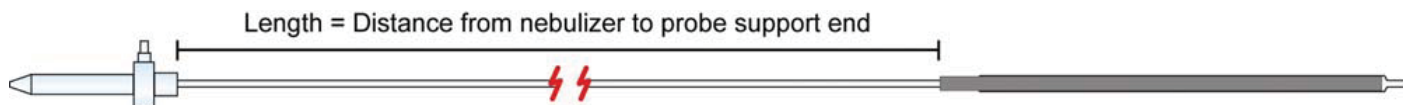


# PFA High-Efficiency MicroFlow Self-Aspirating Nebulizers

## Self-Aspirating PFA Nebulizers with Integrated Probes

These nebulizers self-aspirate at low-flow rates with any autosampler and provide the same benefits of the PFA MicroFlow nebulizer. The integrated sampling probe is constructed by encapsulating a rigid support material between layers of PFA 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 Nebulizer with Integrated Autosampler Probe (Carbon Fiber support) for Environmental/Clinical Applications

Model	Part Number	Self-aspiration rate (@1L/m Ar)	Length
PFA-20	ES-2020-3503-100	20 $\mu\text{L}/\text{min}$	100 cm
PFA-50	ES-2000-3503-100	50 $\mu\text{L}/\text{min}$	100 cm
PFA-100	ES-2002-3503-100	100 $\mu\text{L}/\text{min}$	100 cm
PFA-200	ES-2003-3503-100	200 $\mu\text{L}/\text{min}$	100 cm
PFA-400	ES-2005-3503-100	400 $\mu\text{L}/\text{min}$	100 cm



### PFA MicroFlow Nebulizer with Integrated Autosampler Probe (Ultem support) for High Purity Semiconductor Applications

Model	Part Number	Self-aspiration rate (@1L/m Ar)	Length
PFA-20	ES-2020-3505-100	20 $\mu\text{L}/\text{min}$	100 cm
PFA-50	ES-2000-3505-100	50 $\mu\text{L}/\text{min}$	100 cm
PFA-100	ES-2002-3505-100	100 $\mu\text{L}/\text{min}$	100 cm
PFA-200	ES-2003-3505-100	200 $\mu\text{L}/\text{min}$	100 cm
PFA-400	ES-2005-3505-100	400 $\mu\text{L}/\text{min}$	100 cm



Also available with PEEK support and for S10 Autosampler

## Glass and Quartz High Purity Nebulizers

### NEW SiIQ+ High Purity Quartz Nebulizer

The SiIQ+ nebulizer by MEINHARD® is perfect for applications requiring high sensitivity. Made from the highest purity synthetic quartz, the SiIQ+ nebulizer has low levels of trace elemental impurities, reducing the risk of sample contamination. SiIQ+ nebulizers improve wash-out rates and generate low, stable blanks that can enhance ICPMS detection limits.

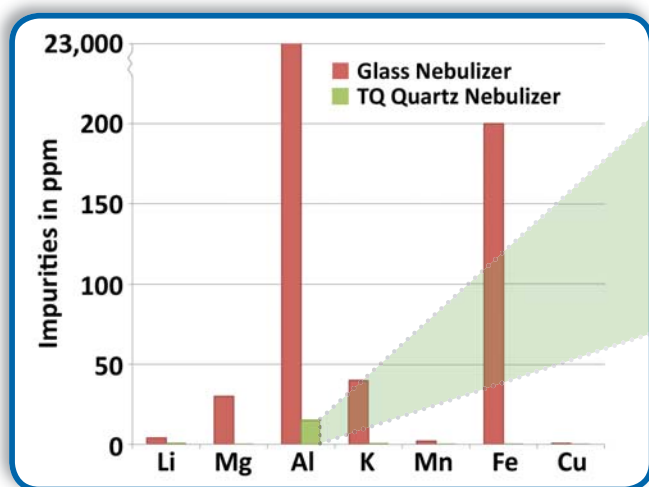
SiIQ+ comes equipped with PFA FitKit gas and sample quick connect fittings that eliminate contaminants from conventional connectors commonly used on other nebulizers. The fittings can be rapidly attached and removed. The gas quick connect creates a snug seal around the maria on the SiIQ+ sidearm.

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

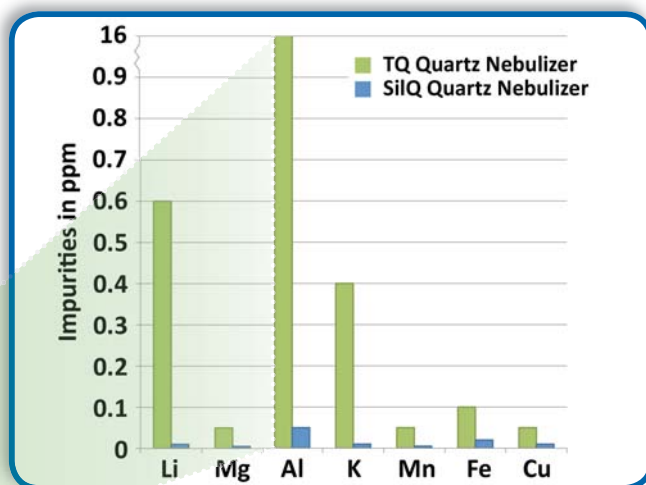


MEINHARD® SiIQ+ high purity nebulizer with PFA FitKit

### 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 SiIQ+ and TQ+ Quartz nebulizers.** SiIQ+ impurities on average are 60 times lower than standard quartz nebulizers. Aluminum impurities in SiIQ+ nebulizers are more than 400,000 times lower than glass.

# MEINHARD®

## Concentric Nebulizers for ICPMS

### Quartz Nebulizers

#### NEW SilQ+ Ultra High Purity Quartz Nebulizer (Low Internal Volume)

SilQ+ Ultra High Purity Quartz Nebulizer, low internal volume inlet. Self aspiration rate 0.5 mL/min with argon flow 1 L/min at 50 PSI (3.4 bar/345 kPa). Peristaltic pumped rate 0.3 mL/min to 3.0 mL/min. Includes FG Gas Quick Connect (PFA) and F2 Quick Connect with 0.5 mm i.d. ■ (orange marker) capillary 70 cm length.



Part Number	Application
SILQ-50	For use with all standard non-HF applications

#### NEW TQ+ Quartz Nebulizer (Low Internal Volume)

TQ+ Quartz High Performance A-type Nebulizer, low internal volume inlet. Self aspiration rate 0.5 mL/min with argon flow 1 L/min at 50 PSI (3.4 bar/345 kPa). Peristaltic pumped rate 0.3 mL/min to 3.0 mL/min. Includes FG Gas Quick Connect (PFA) and F2 Quick Connect with 0.5 mm i.d. ■ (orange marker) capillary 70 cm length.



Part Number	Application
TQP-50	For use with all standard non-HF applications

#### Type A Quartz Nebulizer (Standard)

Lapped flush nozzle, quartz, low background, general purpose, 3 mL/min and 1 L/min @ 30 PSI. Includes gas connection and F5 FitKit with 0.5 mm i.d. ■ (orange marker) standard integrated capillary 70 cm length.



Part Number	Application
TQ-30-A3	For use with all standard non-HF applications

### Glass Nebulizer

#### NEW TR+ Glass Nebulizer (Low Internal Volume)

TR+ Glass High Sensitivity Nebulizer, low internal volume inlet. Self aspiration rate 0.5 mL/min with argon flow 1 L/min at 50 PSI (3.4 bar/345 kPa). Peristaltic pumped rate 0.3 mL/min to 3.0 mL/min. Includes FG Quick Connect (PFA) and F2 Quick Connect with 0.5 mm i.d. ■ (orange marker) capillary 70 cm length.



Part Number	Application
TRP-50	For use with all standard non-HF applications

## NEW Plus Nebulizer PFA FitKit Quick Connects

### FG Gas Quick Connect for MEINHARD® Nebulizers

FG Gas Quick Connect for MEINHARD® nebulizers with maria for both small bore and standard bore nebulizers.



FG Gas Quick Connect with connector for PFA tubing

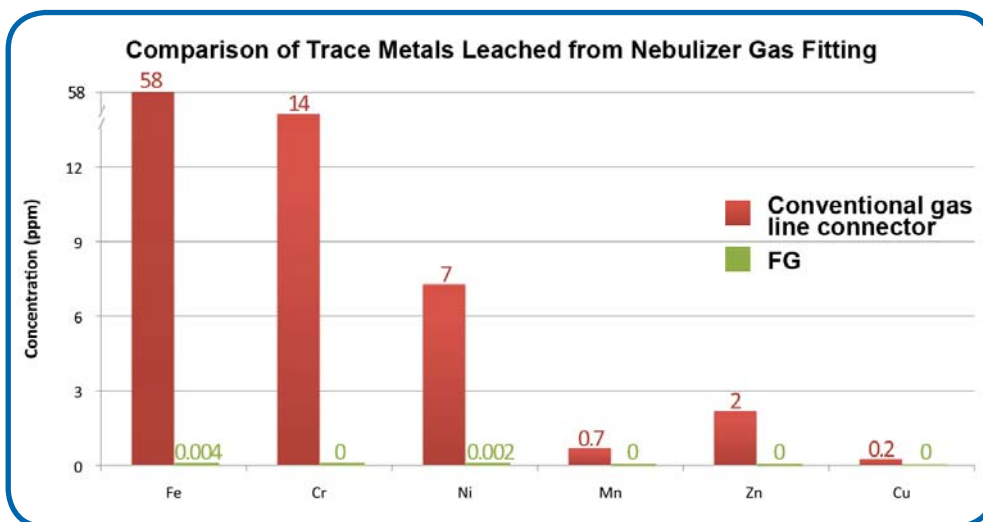
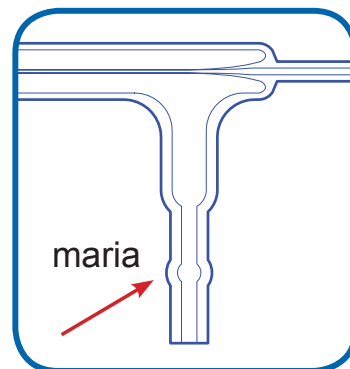
Part Number	Application
FG	For use with all MEINHARD® nebulizers

Elemental Scientific introduces the PFA FitKit Quick Connects, a revolutionary new gas and sample fitting system for MEINHARD® Plus nebulizers. The kit includes a gas connection (FG), standard integrated capillary sample connection (F2) and two other sample connection (F1 and F0) options to choose from.

**FG gas connection forms a tight seal over the maria on the sidearm of the MEINHARD® nebulizers.** FG offers the benefits of an easy-to-use quick connect while maintaining high purity for sensitive ICPMS applications. In a test that simulated a backflow event, FG produced concentrations of elements like Fe and Cr that were four orders of magnitude lower than concentrations leached from a conventional fitting (Figure 1).

#### Benefits include:

- High purity PFA fluoropolymer construction
- Easy to connect and disconnect
- One connection fits any MEINHARD® nebulizer



Conventional gas line connector



PFA FG quick connect gas line

**Figure 1.** Leach test of a conventional gas line connector and PFA FG



## Sample Tubing Options

The sample connector is a low dead-volume quick connect for MEINHARD® Plus nebulizers. It offers a fast stabilization time and a reliable seal with chemically resistant PFA. Three versions are available in a variety of flow rates for different ICPMS applications.

### Benefits include:

- Fast stabilization time and ultra-low dead-volume
- High purity PFA fluoropolymer construction
- Easy to connect and disconnect

### Sample connectors available:

**F2:** Standard integrated capillary for self-aspiration or pumping. Standard with all nebulizers.

**F0:** Encapsulated micro tubing for microflow rates with the lowest internal volume of any nebulizer.

**F1:** Detachable capillary for a wide range of applications.

### F2 Standard Integrated Capillary

F2 Standard integrated capillary for self-aspiration or pumping. Includes 0.5 mm i.d. ■ (orange marker) 70 cm long capillary.

Part Number	Application
F2-50	Compatible with all MEINHARD® Plus nebulizers.



### F0 Encapsulated Micro Tubing

F0 Encapsulated micro tubing for microflow rates with the lowest internal volume of any nebulizer. Includes 0.25 mm i.d. ■ (green marker) 70 cm long micro capillary.

Part Number	Application
F0-25	Compatible with all MEINHARD® Plus nebulizers.



### F1 Detachable Capillary

F1 Detachable capillary for a wide range of applications. Includes 0.80 mm i.d. ■ (blue marker) 70 cm long capillary.

Part Number	Application
F1-80	Compatible with all MEINHARD® Plus nebulizers.



# STANDARD SAMPLE INTRODUCTION

## Spray Chambers / Ball Joint Adapter, Connector and Clamp

### Spray Chambers

ESI cyclonic spray chambers feature secure, leak-free threaded drain port, o-ring-free connections to the nebulizer and torch injector, internal baffle and threaded auxiliary port for addition gas.

Part Number	Description	Application
ES-3152-1111-16	Quartz (7 mm baffle) cyclonic spray chamber with auxiliary gas port, drain line included (ES-2044-0002)	All-purpose for non-HF samples. Provides excellent sensitivity and stability with low background.



Part Number	Description	Application
ES-3452-1111-11	Quartz (7 mm baffle) micro cyclonic spray chamber with auxiliary gas port, drain line included (ES-2044-0002)	Fastest washout for concentrated samples or carryover-prone analytes in non-HF samples



Part Number	Description	Application
ES-3152-3111-11	PFA (7 mm baffle) cyclonic spray chamber with auxiliary gas port, drain line included (ES-2044-0002)	All-purpose, offers resistance to hydrofluoric acid while maintaining the benefits of cyclonic spray chambers.



Part Number	Description	Application
ES-2100-5471	PFA 47 mm PureChamber and PFA Purecap Endcap, drain line included (ES-2044-0002)	High aerosol transmission, and excellent short/long-term stability. Semiconductor, high-precision and HF samples.



See page 29 for information on the SSI cyclonic/scott dual spray chamber

### PFA-Quartz Ball Joint Socket Adapter and Connector

Part Number	Description	Application
ES-5509	PFA ball joint connector	Adapts ESI injector to 12/5 socket
ES-5510	Adapter, PFA/quartz. 12/5 ball joint to ESI Spray Chambers	Connects ESI spray chambers to standard ELEMENT 2 injector with glass ball joint inlet.



Part Number	Description	Application
ES-2110-0002	12/5 ball and socket clamp	Used to clamp the ball joint and socket together.



# Injectors for Standard Torch

## One-piece Quartz Torches with Injector

Part Number	Injector Size	Description
ES-1002-0010	1.0 mm	One-piece quartz torch with injector
ES-1002-0015	1.5 mm	One-piece quartz torch with injector
ES-1002-0020	2.0 mm	One-piece quartz torch with injector



## ELEMENT 2 Standard Quartz Torch

The standard quartz torch allows the use of different injectors depending on the application.

Part Number	Description
ES-1002	Standard demountable quartz torch. Use o-ring injectors with this torch. [The o-ring is not wetted by the sample.]



## Quartz Insulator Ring

Used to insulate the standard o-ring quartz torch.

Part Number	Length	Description
ES-1001-0002	60 mm	Quartz insulator ring



## Platinum Injectors for Standard ELEMENT 2 Torch



Platinum injectors are used for introducing volatile organic solvents and HF-containing semiconductor-grade chemicals.

Part Number	Size	Description
ES-1013-0100	1.0 mm	Platinum injector. [Pt cones recommended]
ES-1013-0150	1.5 mm	Platinum injector.
ES-1013-0200	2.0 mm	Standard platinum injector. For low-ppt Al determinations.



## Sapphire Injectors for Standard ELEMENT 2 Torch



Sapphire injectors are used for environmental, geochemistry, and HF applications.

Part Number	Size	Description
ES-1003-0150	1.5 mm	Sapphire injector. HF-resistant.
ES-1003-0180	1.8 mm	Sapphire injector. HF-resistant.



## Quartz Injectors for Standard ELEMENT 2 Torch



Quartz injectors are used for volatile organic solvent introduction and recommended for a wide range of non-HF applications.

Part Number	Size	Description
ES-1024-0100	1.0 mm	Quartz injector
ES-1024-0150	1.5 mm	Quartz injector
ES-1024-0200	2.0 mm	Quartz injector
ES-1024-0250	2.5 mm	Quartz injector. Improved stability for high matrix/high TDS environmental samples.



# STANDARD SAMPLE INTRODUCTION

## Injectors for O-Ring-Free Torch

### ELEMENT 2 Standard O-Ring-Free Quartz Torch

ppq

The reinforced base of the torch reduces the chance of accidental breakage and allows for the precision alignment of the o-ring-free injector.



Part Number	Description
ES-1002-1000	O-ring-free demountable quartz torch. Use with ESI o-ring-free injectors.

### O-Ring-Free Platinum Injectors for ELEMENT 2 Torch

ppq



Platinum injectors are used for introducing volatile organic solvents and HF-containing semiconductor-grade chemicals.

Part Number	Size	Description
ES-1013-1100 	1.0 mm	Platinum injector, o-ring-free. [Pt cones recommended]
ES-1013-1150	1.5 mm	Platinum injector, o-ring-free.
ES-1013-1200 	2.0 mm	Platinum injector, o-ring-free. For semiconductor HF applications.



### O-Ring-Free Sapphire Injectors for ELEMENT 2 Torch



Sapphire injectors are used for environmental, geochemistry, and HF applications.

Part Number	Size	Description
ES-1003-1150	1.5 mm	Sapphire injector, o-ring-free. HF-resistant.
ES-1003-1180	1.8 mm	Sapphire injector, o-ring-free. HF-resistant.



### O-Ring-Free Quartz Injectors for ELEMENT 2 Torch



Quartz injectors are used for volatile organic solvent introduction and recommended for a wide range of non-HF applications.

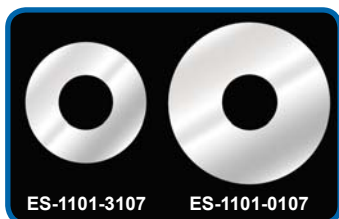
Part Number	Size	Description
ES-1024-1100 	1.0 mm	Quartz injector, o-ring-free.
ES-1024-1150	1.5 mm	Quartz injector, o-ring-free.
ES-1024-1200	2.0 mm	Quartz injector, o-ring-free.
ES-1024-1250 	2.5 mm	Quartz injector, o-ring-free. Improved stability for high matrix/high TDS environmental samples.



### Shield Discs for a PFA Injector Base



Platinum Shield Disc Installed



- Protects PFA injector base from damage caused by heat and light from the instrument
- Extends injector lifetime
- Improves long-term instrument stability

Part Number	Description
ES-1101-3107	Platinum shield disc for ESI o-ring-free injectors
ES-1101-0107	Platinum shield disc for ESI injectors

For platinum and sapphire injectors only



## Cones / Skimmers

### Aluminum Cone / Skimmer

Aluminum cones are recommended when measuring very low levels of Ni. Special precautions should be used when mounting or dismounting Al cones with the magnetic tool for the ELEMENT 2 ICPMS because Al is not magnetic. Polyatomic interferences may be slightly higher with Al cones compared to Ni and Pt cones.



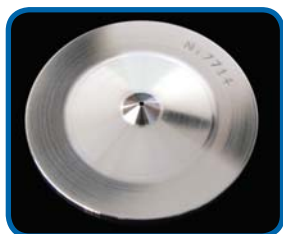
Part Number	Description
ES-3000-1803	Aluminum sampler cone



Part Number	Description
ES-3000-1805	Aluminum skimmer cone "H"

### Nickel Cone / Skimmer

Nickel cones are recommended for most applications.



Part Number	Description
ES-3000-1802	Nickel sampler cone



Part Number	Description
ES-3000-1812	Nickel skimmer cone "H"



Part Number	Description
ES-3000-1824	JET interface nickel sampler cone



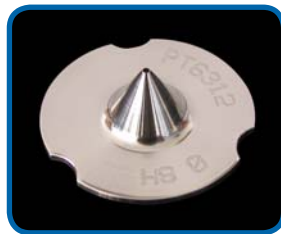
Part Number	Description
ES-3000-1820	Nickel skimmer cone "X"

### Platinum Cone / Skimmer

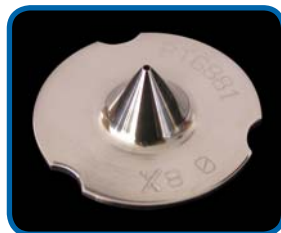
Platinum cones are recommended when oxygen is added to the plasma to reduce carbon deposition for organic solvent analysis. They also offer longer lifetime compared to other cones when analyzing high concentrations of acids.



Part Number	Description
ES-3000-1807	Platinum sampler cone



Part Number	Description
ES-3000-1809	Platinum skimmer cone "H"



Part Number	Description
ES-3000-1823	Platinum skimmer cone "X"

## Integrated MP<sup>2</sup> Precision Micro Peristaltic Pumps for the ELEMENT 2

The MP<sup>2</sup> (Micro Peristaltic Pump) provides better stability than standard peristaltic pumps. Roller configuration and precision machining minimize gaps between rollers, resulting in even pressure points along the pump tubing. Reduced pump pulsation improves signal stability, data quality and detection limits.

### BENEFITS:

- Pump design extends tubing lifetime
- Stand alone and integrated versions
- High chemical resistance
- Pump network software control
- Precision
- Low pulsation
  - 12 closely-spaced rollers improve signal stability
- Chemically resistant
  - Ceramic pins and PTFE-coated metal components are resistant to acids and organic solvents
- Optimized for low-flow rates
  - Accurate pumping across a wide range of rates from low 0.20 µL/min to 10 mL/min
- 1, 2, 3, 4, 6 and 8 channels (stand alone MP<sup>2</sup>)
- 3, 4 and 6 channels (integrated MP<sup>2</sup>)

### MP<sup>2</sup> ELEMENT 2 SPECIFICATIONS:

#### Channels:

1-8 Channels

#### Flow Rates:

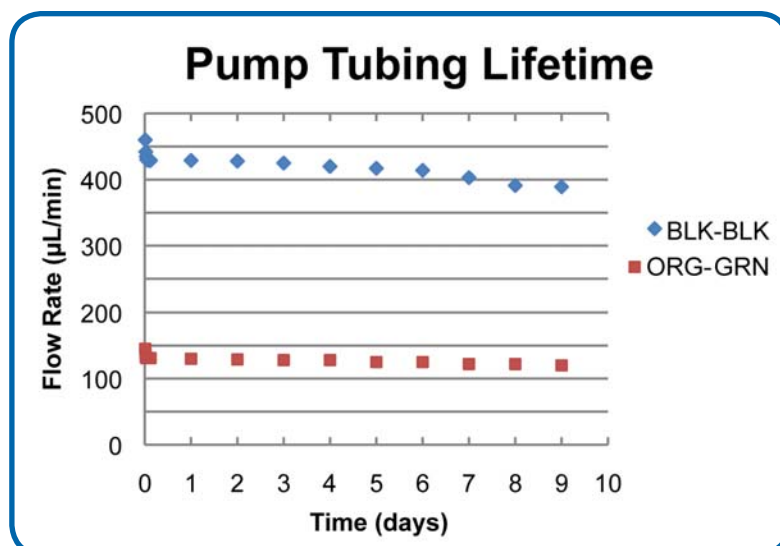
0.20 µL/min to 10 mL/min per channel

#### Tubing:

0.13 mm i.d. to 3.17 mm i.d.



MP2-4-52  
integrated precision  
micro peristaltic pump



Pump tubing flow rates measured over 9 days of continuously pumping. Stable flow after 1 hour "break-in" time.

Part Number	Description
MP2-3-52	MP <sup>2</sup> integrated 3 channel precision micro peristaltic pump
MP2-4-52	MP <sup>2</sup> integrated 4 channel precision micro peristaltic pump
MP2-6-52	MP <sup>2</sup> integrated 6 channel precision micro peristaltic pump

# 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 peripump 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.

### Interchannel Reproducibility at 125 nL/min

RPM	Ch. 1	Ch. 2	Ch.3	Ch. 4
0.2	126	124	128	124
RSD	<b>1.26 %</b>			

### CONTROLLED BY THE INSTRUMENT PC USB PORT



Part Number	Number of Channels
MP2-1-PC	1 channel MP <sup>2</sup> precision micro peristaltic pump
MP2-2-PC	2 channel MP <sup>2</sup> precision micro peristaltic pump
MP2-3-PC	3 channel MP <sup>2</sup> precision micro peristaltic pump
MP2-4-PC	4 channel MP <sup>2</sup> precision micro peristaltic pump
MP2-6-PC	6 channel MP <sup>2</sup> precision micro peristaltic pump
MP2-8-PC	8 channel MP <sup>2</sup> precision micro peristaltic pump

Includes: Cable to control with DX Autosampler





MP2-4-PC stand alone precision micro peristaltic pump

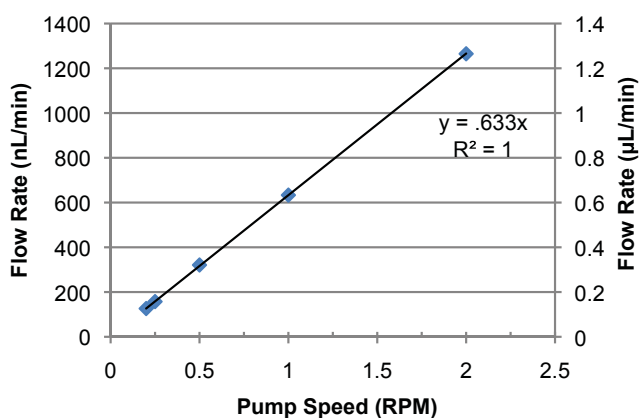
### CTFE PERIPUMP FITTINGS (Non-barbed) Used in Low Pressure Applications

Part Number	Qty	Size	
ES-2501-PPF1	1 ea.	Female (small)	
ES-2501-PPM1	1 ea.	Male (small)	

### CTFE PERIPUMP FITTINGS (Barbed) Used in High Pressure Applications

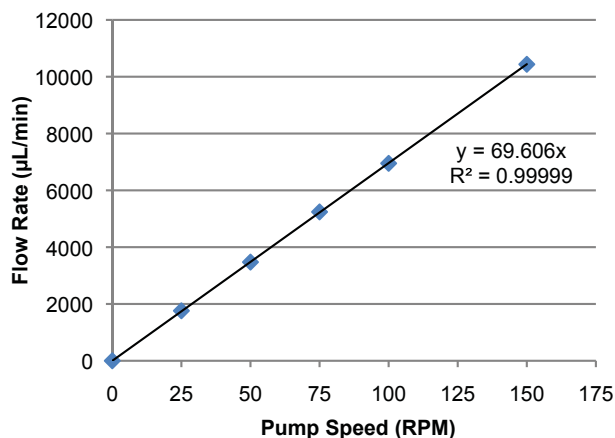
Part Number	Qty	Size	
ES-2501-PPF2	1 ea.	Female (small)	
ES-2501-PPM2	1 ea.	Male (small)	

**ORG BLK**



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

**BLK WHT**



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



## 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		
2.20 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**

**Non-Flared**

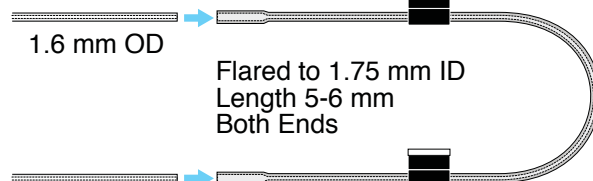


PVC

Santoprene

SOLVA

**Flared**



### MP<sup>2</sup> PUMP TUBING STARTER KIT

Part Number	Description
MPP-K-1	MP <sup>2</sup> Pump Tubing Starter Kit comprising 34 packs of 12 tubes, one package of each light-blue 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 Peripump 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).



# SYRIX Syringe Pump

SYRIX features an innovative drive mechanism for the precise control of liquid samples and reagents. Wetted parts are o-ring-free and offer the highest chemical resistance.

SYRIX is highly configurable for a wide range of applications such as micro sample loading and remote monitoring.

## Features:

- Wide flow rate range
  - < 10 µL/min to > 100 mL/min
- A variety of syringe sizes
  - 0.3 mL to 10.0 mL
- O-ring-free
- Syringe material
  - PTFE/Quartz
  - Fluoropolymer
- Optional integrated switching valve
- Convenient software control interface
- Connects directly to SC-DX autosampler



SYRIX syringe pump with valve (PF-6503-1030-DX)



SYRIX syringe pump (PF-6500-1030-DX)



With additional options, two syringe barrels may be operated with a single SYRIX drive mechanism for applications such as continuous dilution.



SYRIX SYRINGE PUMPS		
Part Number	Description	Application
PF-6500-1030-DX	SYRIX precision o-ring-free programmable syringe pump system without integrated 3-port valve.	Precise, controlled delivery of sample to the ELEMENT 2. Useful for volatile / viscous samples and for accurate online continuous dilution.
PF-6503-1030-DX	SYRIX precision o-ring-free programmable syringe pump system with integrated 3-port valve.	Accurately delivers micro-volume samples to the FAST loop.



3.0 mL quartz syringe (PF-0599-1030)



0.3 mL PFA syringe (PF-0599-3003)



SYRIX SYRINGE PUMP SPARES	
Part Number	Description
PF-0599-1003	0.3 mL quartz syringe
PF-0599-1030	3.0 mL quartz syringe
PF-0599-1100	10.0 mL quartz syringe
PF-0599-3003	0.3 mL HF resistant syringe
PF-0599-3030	3.0 mL HF resistant syringe
PF-0599-3100	10.0 mL HF resistant syringe
PF-A-33	PTFE adapter to mount both 0.3 mL and 3 mL syringe barrels on SYRIX



## SC-E2 and SC-E4 Enclosures for the Thermo Scientific ELEMENT 2 ICPMS

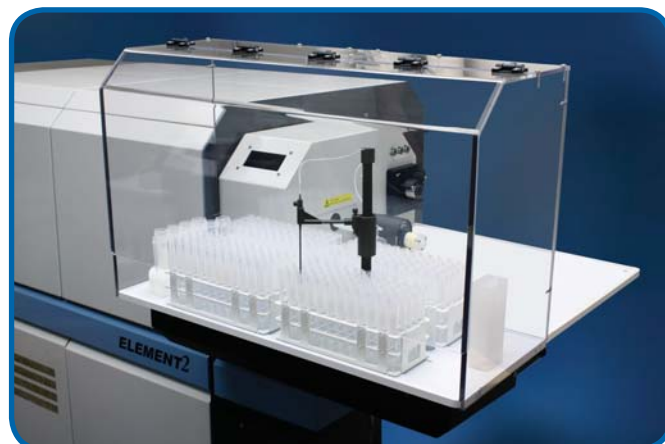
### SC-E2 / SC-E4 Enclosure

These enclosures connect directly to the SC-E2 and the SC-E4 autosamplers. 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.

Part Number	With ULPA Filter	Description
SC-1307-DX	SC-1307-DX-1000	Enclosure for SC-E2 Autosampler
SC-1317-DX	SC-1317-DX-1000	Enclosure for SC-E4 Autosampler



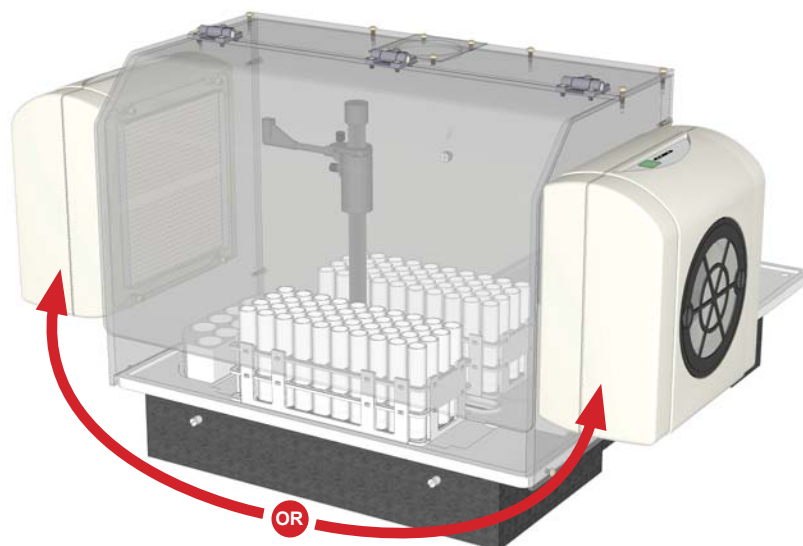
SC-E2 Enclosure on Thermo Scientific ELEMENT 2 ICPMS



SC-E4 Enclosure on Thermo Scientific ELEMENT 2 ICPMS

ULPA filter side plate available on the SC-E2 DX, SC-E4 DX, SC-2 DX and SC-4 DX for either the right or left side of the enclosure.

Autosampler Model	Left Panel Part Number	Right Panel Part Number
SC-E2 DX	SC-1307-1001	SC-1307-1002
SC-2 DX	SC-1107-0026	SC-1107-0026
SC-E4 DX	SC-1307-1001	SC-1307-1002
SC-4 DX	SC-1107-0026	SC-1107-0026



# Autosampler Enclosures / ULPA Filtered Environments

## Ultra-Low Particulate Arrester Air Filter

ppq

The ULPA (Ultra-Low Particle Arrester) 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.

### ULPA Filter Specifications

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

Part Number	Description
SC-0602	ULPA Filter for ESI enclosures.



SC-0602  
ULPA Filter

## Autosampler Enclosures

ppq

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.

SC-1807-DX  
Enclosure with SC-8 DX  
autosampler



SC-1207-DX-1000  
Enclosure with ULPA filter  
and SC-2 DX autosampler

Autosampler Model	Enclosure	Enclosure with ULPA Filter
Enclosure for SC-Micro DX	SC-1607-DX	
Enclosure for SC-E2 DX	SC-1307-DX	SC-1307-DX-1000
Enclosure for SC-2 DX	SC-1207-DX	SC-1207-DX-1000
Enclosure for SC-E4 DX	SC-1317-DX	SC-1317-DX-1000
Enclosure for SC-4 DX	SC-1407-DX	SC-1407-DX-1000
Enclosure for SC-8 DX	SC-1807-DX	SC-1807-DX-1000
Enclosure for SC-14 DX	SC-1107-DX	SC-1107-DX-1030



# AUTOSAMPLER ACCESSORIES

## Mobile Stands for SC-2 DX and SC-4 DX Autosampler

### SC-2 DX Mobile Stand



SC-1210-DX mobile stand with SC-2 DX autosampler

Part Number	Description
SC-1210-DX	Mobile stand for SC-2 DX (autosampler not included)

### SC-4 DX Mobile Stand



SC-1410-DX mobile stand with SC-4 DX autosampler

Part Number	Description
SC-1410-DX	Mobile stand for SC-4 DX (autosampler not included)

The mobile stand positions the autosampler close to the ELEMENT 2 ICPMS and offers the following benefits:

- Convenience – Autosampler, pumps, rinse and waste bottles contained in a single unit
- Compact – Footprint only slightly larger than autosampler itself, saving valuable lab space and maintaining accessibility to sample racks
- Mobile – Locking wheels easily unlatch to move autosampler for instrument maintenance
- Eliminates unnecessary external connections to rinse solution and waste reservoirs
- The intermediate shelf houses automation options such as syringe pumps or provides storage of optimization solutions
- The lower shelf holds rinse solution and waste bottles and allows the rinse container to be refilled in place



Storage space for racks, solutions and accessories



Accessible rinse bottle can be refilled in place

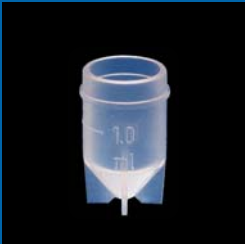
# PFA Sample Vessels

## PFA Vials

PFA vials are ideal for applications that require the highest sensitivity. Made of ultra-pure, 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-14-0311-CG-X	SR4-60-14 (pg 61), MR-21-14 (pg 59), MR-40-14 (pg 59)
V-14-0312-CG-X	
V-14-0314-CG-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 tall 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-14-0300-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-14-0301-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




# AUTOSAMPLER ACCESSORIES

## 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	MR-10-30 (pg 59), SR2-21-30 (pg 60)
V-31-30-X	MR-10-30 (pg 59), SR2-27-31 (pg 60), ST10-31 (pg 61)
V-31-60-X	LRM-21-30-R (pg 58), LR-21-30 (pg 58), HR-21-30 (pg 59), SR2-27-31 (pg 60), ST10-31 (pg 61)
V-28-0360-V	SR2-27-28 (pg 60), ST10-28 (pg 61)
V-50-0360	ST 2-9-50 (pg 62), ST 4-9-50 (pg 62), ST-PR-5 (pg 62), SR2-12-50 (pg 60), SR4-20-50 (pg 61)


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



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



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



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



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




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

# 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 concerns.


Vials	Fits Racks
V-8-0505	MR-60-08 (pg 59), MR-90-08 (pg 59)
V-13-0200-R	LRM-90-13-R (pg 58), LRM-90-13-R-3T (pg 58), LR-90-13-R (pg 58), ST-PR-5 (pg 62)
V-20-0290	LR-40-20 (pg 58)
V-16-0225	LRM-60-16-R (pg 58), LR-60-16 (pg 58), SR2-80-16 (pg 60), HR-60-16 (pg 59), ST-PR-5 (pg 62)
V-28-0260	SR2-27-28 (pg 60), ST10-28 (pg 61), ST-PR-5 (pg 62), ST-EX-5 (pg 62)
V-50-0460	ST 2-9-50 (pg 62), ST 4-9-50 (pg 62), ST-PR-5 (pg 62), SR2-12-50 (pg 60), SR4-20-50 (pg 61)
V-61-0661	ST7-60 (pg 62), ST-PR-5 (pg 62), ST-EX-5 (pg 62), SR4-15-60 (pg 61)




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-13-0200R-XC	90
V-13-0200R-D	500
Description	Volume
13 mm o.d. polystyrene tube with rounded bottom	8 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-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-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. polyethylene bottle with screw cap	50 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

## Microtiter Plates / Covers / XP Probe Arm

### Microtiter Plates

Microtiter plates are ideal for micro volume applications such as storage and sample transfer.

**All microtiter plates can be used on the following Elemental Scientific autosamplers:**

SC-2, SC-4, SC-E2 DX, SC-2 DX, SC-E4 DX, SC-4 DX, SC-Micro DX



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



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



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

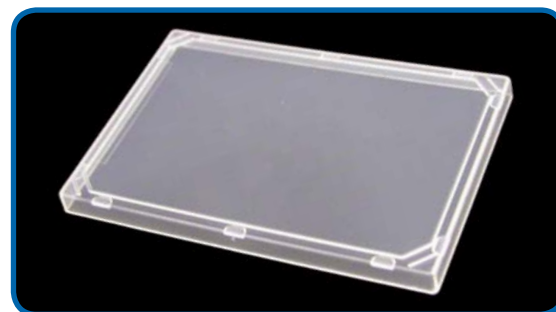


Part Number	Description
MT-96-2ML-02	1 Pk (5 ea) 96 well, 2 mL microtiter plate, square well, pyramid bottom

### Microtiter Plate Cover

This rigid plastic microtiter plate cover is primarily used to protect against environmental contamination.

Part Number	Qty	Description
MT-00-02	5	Polypropylene cover for microtiter plates



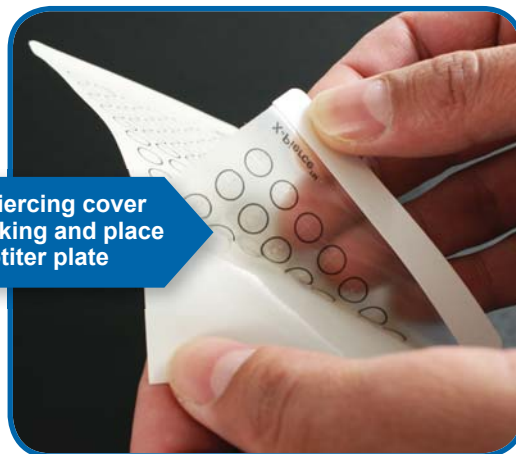


## X-Piercing Microtiter Plate Cover

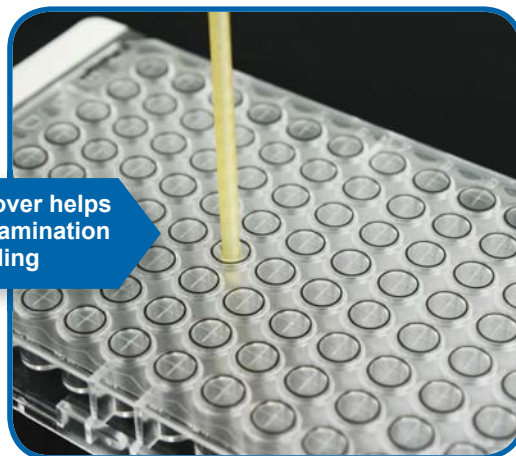
The X-piercing cover minimizes evaporation of micro samples awaiting analysis and protects against environmental contamination.



Remove X-Piercing cover from its backing and place on the microtiter plate



X-Piercing cover helps prevent contamination during sampling



Part Number	Qty	Description
MT-96-XP	25	X-Piercing film cover for 96 well microtiter plate

## 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 microtiter plate.

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



# AUTOSAMPLER ACCESSORIES

## SC-Autosampler Racks

### SC-Autosampler Racks (LR Size)

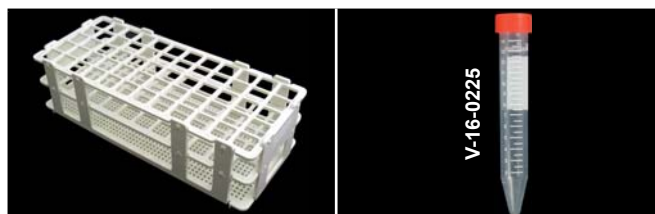
Plastic large racks are recommended for aqueous samples.

**All LR racks can be used on the following ESI autosamplers:**

SC-E2, SC-E4, SC-2, SC-4, SC-8, SC-14, SC-E2 DX, SC-2 DX, SC-E4-DX, SC-4 DX, SC-8 DX, SC-14 DX



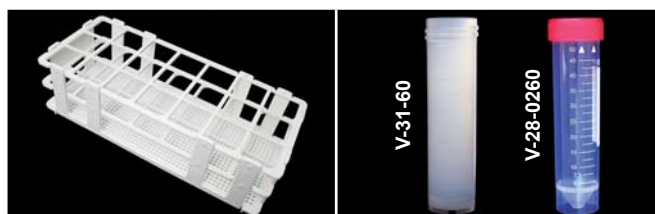
Part #	Diam.	Description
LR-90-13-R	13 mm	90 position large sample rack for 8 mL tubes



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



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



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

### SC-Autosampler Coated Metal Racks (LR Size)

Metal racks are coated with an epoxy paint that forms a protective barrier over the rack material. These racks are designed for organic solvents or oil samples which can dissolve plastic racks.

**All coated metal racks can be used on the following ESI autosamplers:**

SC-E2, SC-2, SC-E4, SC-4, SC-8, SC-14, SC-E2 DX, SC-2 DX, SC-E4 DX, SC-4 DX, SC-8 DX, SC-14 DX



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



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



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



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

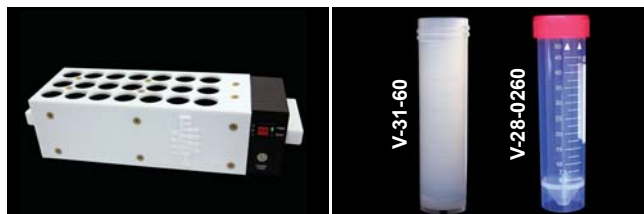
## SC-Autosampler Heated Racks (LR Size)

All heated racks can be used on the following Elemental Scientific autosamplers:

SC-E2, SC-2, SC-E4, SC-4, SC-8, SC-14, SC-E2 DX, SC-2 DX, SC-E4 DX, SC-4 DX, SC-8 DX, SC-14 DX



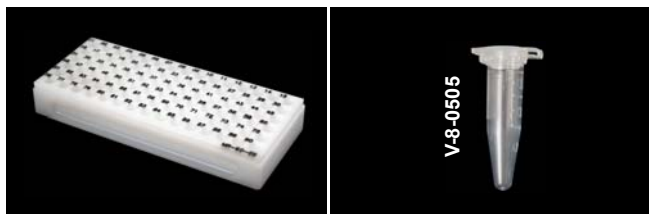
Part #	Diam.	Description
HR-60-16	16 mm	60 position heated large sample rack for 15 mL tubes



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

## SC-Autosampler Racks (MR Size)

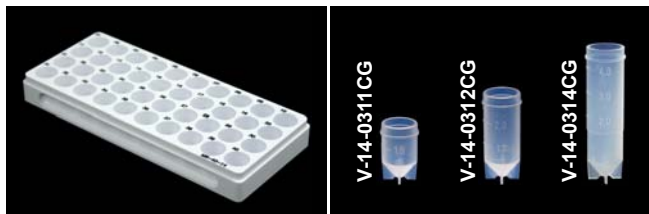
All MR racks can be used on the following Elemental Scientific autosamplers: SC-E2, SC-2, SC-E4, SC-4, SC-E2 DX, SC-2 DX, SC-E4 DX, SC-4 DX, SC-Micro DX



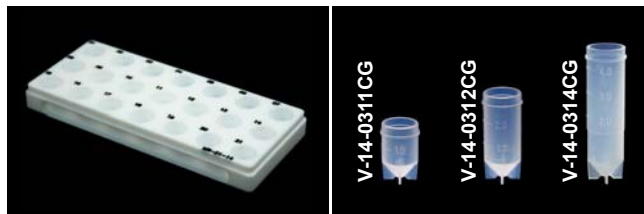
Part #	Diam.	Description
MR-90-08	8 mm	90 position CPVC micro sample rack for 0.5 mL tubes



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



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



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



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



Part #	Description
MR-00-01	Cover for SC-micro racks

# AUTOSAMPLER ACCESSORIES

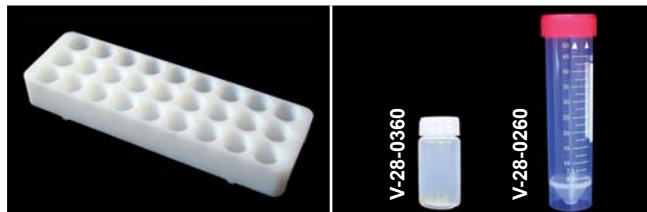
## SC-Autosampler Racks (SR2 Size)

All SR2 racks can be used on the following ESI autosamplers:

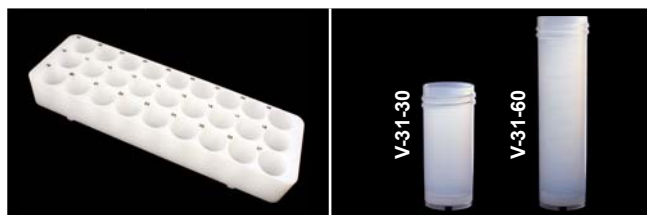
SC-E2, SC-2, SC-E2 DX, SC-2 DX



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



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



Part #	Diam.	Description
SR2-27-31	31 mm	27 position super sample rack for 30 mL and 60 mL tubes



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

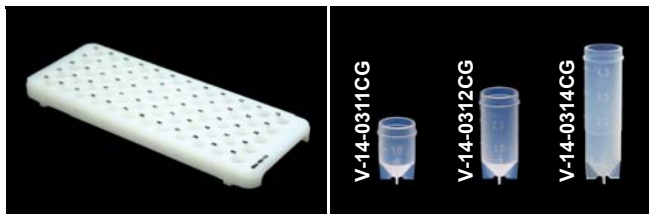


Part #	Diam.	Description
SR2-12-50	50 mm	12 position super sample rack for 125 mL bottles

### SC-Autosampler Racks (SR4 Size, Type 1)

All SR4 racks can be used on the following Elemental Scientific autosamplers:

SC-E2, SC-2, SC-E4, SC-4, SC-E2 DX, SC-2 DX, SC-E4 DX, SC-4 DX, SC-E2, SC-E4, SC-E2 DX, SC-E4 DX



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

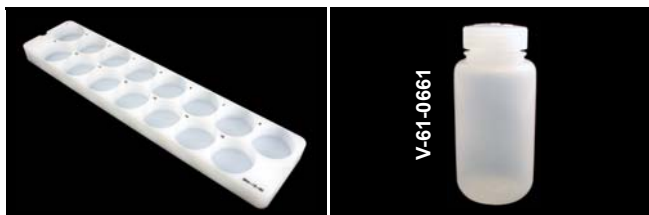


Part #	Description
SR4-00-01	Cover for 60 position SR-4 super rack

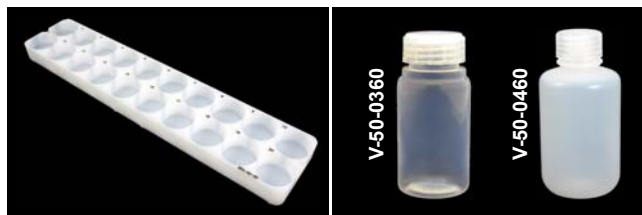
### SC-Autosampler Racks (SR4 Size, Type 2)

All ST type 1 racks can be used on the following ESI autosamplers:

SC-E4, SC-4, SC-E4 DX, SC-4 DX



Part #	Diam.	Description
SR4-15-60	60 mm	15 position super sample rack for 125 mL bottles



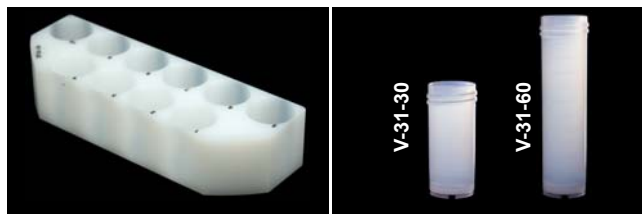
Part #	Diam.	Description
SR4-20-50	50 mm	20 position super sample rack for 250 mL bottles

### SC-Autosampler Racks (ST Size, Type 1)

All ST type 1 racks can be used on the following ESI autosamplers: SC-E2, SC-2, SC-E4, SC-4, SC-8, SC-14, SC-E2 DX, SC-2 DX, SC-E4 DX, SC-4 DX, SC-8 DX, SC-14 DX



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



Part #	Diam.	Description
ST10-31	31 mm	10 position standards rack for 30 mL and 60 mL tubes



# AUTOSAMPLER ACCESSORIES

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

The ST type 2 rack can be used on the following ESI autosamplers:

SC-E4 DX, SC-4 DX, SC-14, SC-14 DX



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



Part #	Diam.	Description
ST4-9-50	50 mm	9 position standards rack for 125 mL bottles. Recommended for prepFAST

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

All ST type 3 racks can be used on the following ESI autosamplers:

SC-E2, SC-2, SC-E2 DX, SC-2 DX



Part #	Diam.	Description
ST2-9-50	50 mm	9 position standards rack for 125 mL bottles. Recommended for prepFAST

# prepFAST

*The Next Stage of Automation*

- **FAST Inline Autodilution**
- **Autocalibration**
- **Over Range Sample Autodilution and Reanalysis**
- **Priority Sample Autodilution**
- **Automated Standard Additions**
- **Automated Isotope Dilution Spiking**



Thermo ELEMENT 2  
ICPMS

For more information visit  
[www.prepFAST.com](http://www.prepFAST.com)



**Elemental  
Scientific**

## High Purity Valves

High purity valve stators and rotors provide a liquid path with low contamination and low carryover for the best ICPMS results. PTFE rotors offer the cleanest, most chemically-resistant flow path. PEEK/PTFE composite rotors offer excellent chemical resistance and longer lifetimes than PTFE rotors. CTFE stators offer high impact strength, chemical and corrosion resistance over a wide temperature range — typically -76°C to +150°C (-105°F to +300°F).

### High-Flow Valves



#### 4 Port Valve P/N: SC-0599-1015

**Description:** CTFE High-flow 4 port valve head for SC-FAST  
**Specifications:** CTFE Stator, PTFE Rotor, 0.8 mm  
**Applications:** microFAST selection valve, oilFAST



#### 6 Port Valve P/N: SC-0599-1010 (PTFE Rotor) SC-0599-1011 (PEEK Composite Rotor)

**Description:** CTFE High-flow 6 port valve head for SC-FAST  
**Specifications:** CTFE Stator, PTFE or Composite Rotor, 0.8 mm  
**Applications:** Standard FAST, seaFAST, TRUFAST, chromFAST, apex FAST



#### 6 Port Valve P/N: SC-0599-1026 (PEEK Composite Rotor)

**Description:** CTFE High-flow 6 port valve head for SC-FAST  
**Specifications:** CTFE Stator, PTFE or Composite Rotor, 1 mm  
**Applications:** Standard FAST, TRUFAST



#### 6 Port Valve - FS P/N: SC-0599-1025

**Description:** CTFE High-flow 6 port FS valve head for SC-FAST  
**Specifications:** CTFE Stator, Composite Rotor, proprietary valve combines benefits of high-flow with fast stabilization times  
**Applications:** Standard FAST, geoFAST, soilFAST



The new FS valve has the fastest stabilization and rinse-out (<5 s)

#### 7 Port Valve P/N: SC-0599-1024 (PTFE Rotor) SC-0599-1033 (PEEK Composite Rotor)

**Description:** CTFE High-flow 7 port valve head for SC-FAST  
**Specifications:** CTFE Stator, PTFE or Composite Rotor proprietary valve combines benefits of high-flow and fast stabilization times with internal standard mixing  
**Applications:** Standard FAST, seaFAST



**NEW!**  
F7 FAST valve

#### 8 Port Valve P/N: SC-0599-1013

**Description:** CTFE High-flow 8 port valve head for SC-FAST  
**Specifications:** CTFE Stator, PTFE Rotor, 0.8 mm  
**Applications:** DINFAST, sample pre-loading



#### 10 Port Valve P/N: SC-0599-1012

**Description:** CTFE High-flow 10 port valve head for SC-FAST  
**Specifications:** CTFE Stator, PTFE Rotor, 0.8 mm  
**Applications:** Dual loop/dual carrier injection





## Low-flow Valves



### 4 Port Valve P/N: SC-0599-1022

**Description:** Low-flow 4 port valve head for SC-FAST  
**Specifications:** PEEK Stator, Composite Rotor, 0.4 mm  
**Applications:** microFAST



### 6 Port Valve P/N: SC-0599-1008

**Description:** Low-flow 6 port valve head for SC-FAST  
**Specifications:** CTFE Stator, PTFE Rotor, 0.4 mm  
**Applications:** microFAST, DINFAST



### 6 Port Valve P/N: SC-0599-1009

**Description:** Low-flow 6 port valve head for SC-FAST  
**Specifications:** PEEK Stator, Composite Rotor, 0.8 mm  
**Applications:** Low-flow

## Examples of Materials



**Description**  
 CTFE replacement stator for high-flow valve



**Description**  
 PTFE rotor for high-flow valve



**Description**  
 Composite (PEEK/PTFE) rotor for high-flow valve

## Spare Rotors and Stators for FAST Valves

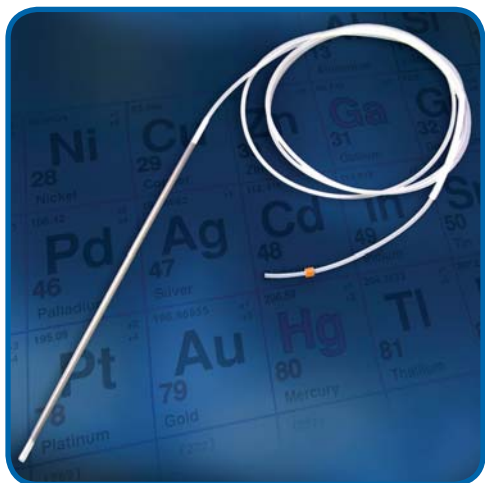
HIGH-FLOW VALVE WITH REPLACEMENT STATORS AND ROTORS						
# of Ports	Bore Size	Stator Material	Rotor Material	P/N Complete Valve	P/N Stator	P/N Rotor
4	0.8 mm	CTFE	PTFE	SC-0599-1015	SC-0599-1015-01	SC-0599-1015-02
6	0.8 mm	CTFE	PTFE	SC-0599-1010	SC-0599-1010-01	SC-0599-1010-02
6	1.0 mm	CTFE	PTFE	SC-0599-1028	SC-0599-1026-01	SC-0599-1026-02
6	0.8 mm	CTFE	Composite (PEEK/PTFE)	SC-0599-1011	SC-0599-1010-01	SC-0599-1010-05
6	1.0 mm	CTFE	Composite (PEEK/PTFE)	SC-0599-1026	SC-0599-1026-01	SC-0599-1026-05
6 - FS	FS	CTFE	Composite (PEEK/PTFE)	SC-0599-1025	SC-0599-1025-01	SC-0599-1025-05
6	1.6 mm	PPS	Composite (PEEK/PTFE)	SC-0599-1032	SC-0599-1032-01	SC-0599-1032-05
7 - F7	F7	CTFE	PTFE	SC-0599-1024	SC-0599-1024-01	SC-0599-1010-02
7 - FS7	FS7	CTFE	PTFE	SC-0599-1034	SC-0599-1024-01	SC-0599-1025-05
7 - F7	F7	CTFE	Composite (PEEK/PTFE)	SC-0599-1033	SC-0599-1024-01	SC-0599-1010-05
8	0.8 mm	CTFE	PTFE	SC-0599-1013	SC-0599-1013-01	SC-0599-1013-02
8	1.0 mm	CTFE	Composite (PEEK/PTFE)	SC-0599-1027	SC-0599-1027-01	SC-0599-1027-05
9 - F9	0.8 mm	CTFE	PTFE	SC-0599-1029	SC-0599-1029-01	SC-0599-1013-02
10	0.8 mm	CTFE	PTFE	SC-0599-1012	SC-0599-1012-01	SC-0599-1012-02
LOW-FLOW VALVE WITH REPLACEMENT STATORS AND ROTORS						
# of Ports	Bore Size	Stator Material	Rotor Material	P/N Complete Valve	P/N Stator	P/N Rotor
4	0.4 mm	PEEK	Composite (PEEK/PTFE)	SC-0599-1022	SC-0599-1022-01	SC-0599-1022-05
6	0.4 mm	CTFE	PTFE	SC-0599-1008	SC-0599-1008-01	SC-0599-1008-02
6	0.8 mm	PEEK	Composite (PEEK/PTFE)	SC-0599-1009	SC-0599-1009-01	SC-0599-1009-05



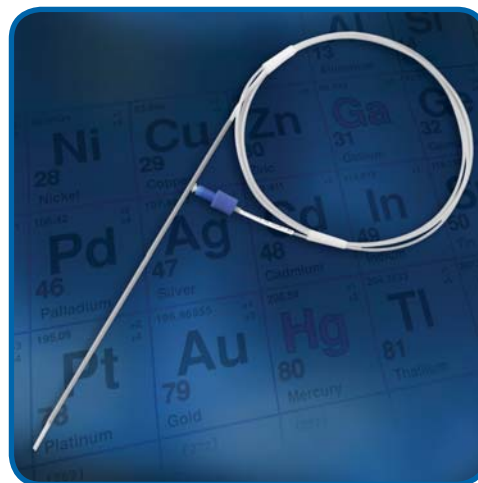
## FAST Probes / Tees / Lines

### FAST Probes

FAST probes offer high chemical resistance for applications involving strong acids, alkalis and organics. A contoured design reduces carry over, while an all PFA wetted sample flow path reduces contamination.



Part Number	Size	Description
SC-5037-3501	0.50 mm i.d. ■ (orange), 150 cm	PFA carrier / internal standard probe for SC-FAST valve

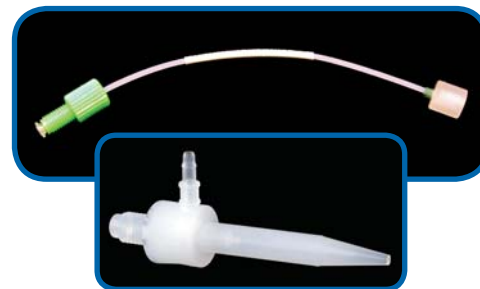


Part Number	Size	Description
SC-5037-3755-150	0.80 mm i.d. ■ (blue), 150 cm	PFA FAST sample probe for high-flow SC-FAST valve
SC-5037-3995-150	1.00 mm i.d. ■ (gray), 150 cm	carbon fiber supported

### FAST Valve Connecting Line for ESI ST-Nebulizer

Connects the FAST valve to an ESI ST-nebulizer to achieve fast signal stabilization time and short wash times.

Part Number (14 cm)	Description
SC-0317-0250	0.25 mm i.d. ■ (green) Attaches to port #3 of the FAST valve.
SC-0317-0500	0.50 mm i.d. ■ (orange) Attaches to port #3 of the FAST valve.



ESI PFA-ST Nebulizer (ES-2040)

### Internal Standard Addition Tee for ESI ST-Nebulizer

Specially designed mixing tee is perfect for online addition of internal standard or online dilution. Achieves excellent mixing with minimal dead volume. 0.5 mm i.d. capillary is recommended for applications with flow rates > 0.3 mL/min.

Part Number (14 cm)	Description
SC-0317-1250	0.25 mm i.d. ■ (green) Attaches to port #3
SC-0317-1500	0.50 mm i.d. ■ (orange) Attaches to port #3



ESI PFA-ST Nebulizer (ES-2040)

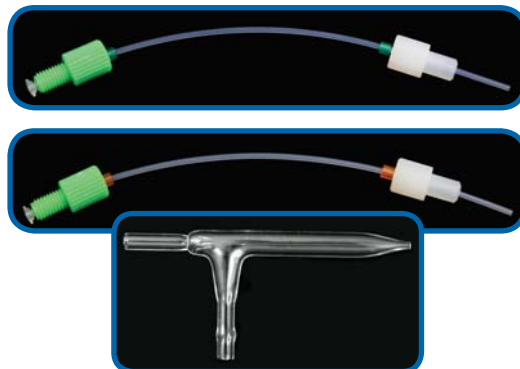
## SC-FAST Connecting Lines

Elemental Scientific recommends using its PFA-ST or MEINHARD® nebulizer with the SC-FAST system for optimum throughput and performance. ESI offers connecting lines for most nebulizers that laboratories may already have.

### FAST Valve Connecting Line for MEINHARD® Nebulizer

PTFE FAST valve line that connects the FAST valve (port #3) to a MEINHARD® nebulizer to achieve fast signal stabilization time and short wash times.

Part Number	Description
SC-0317-0250-MH	0.25 mm i.d. ■ (green), 14 cm. Attaches to port #3 of the FAST valve.
SC-3017-0500-MH	0.50 mm i.d. ■ (orange), 14 cm. Attaches to port #3 of the FAST valve.



MEINHARD® Glass Nebulizer (TQ-30-A3 Pg 39)

### FAST Valve Connecting Line for PerkinElmer Gem Cone Nebulizer

PTFE FAST valve line that connects the FAST valve (port #3) to a PerkinElmer Gem Cone nebulizer to achieve fast signal stabilization time and short wash times.

Part Number	Description
SC-0317-0500-GC	0.50 mm i.d. ■ (orange), 14 cm. Attaches to port #3 of the FAST valve.
SC-0317-0990-GC	1.00 mm i.d. ■ (gray), 14 cm. Attaches to port #3 of the FAST valve.

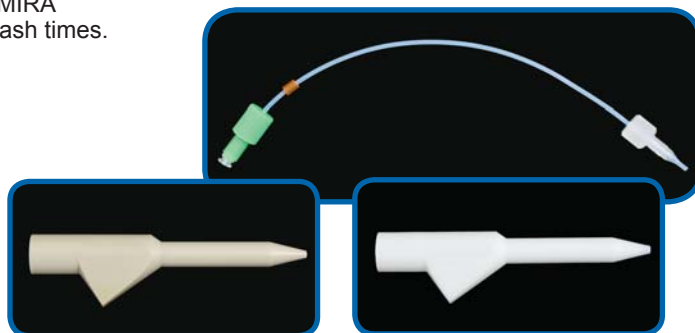


PerkinElmer Gem Cone Low-flow Nebulizer

### FAST Valve Connecting Line for MIRA MIST Nebulizer

PTFE FAST valve line that connects the FAST valve (port #3) to a MIRA MIST nebulizer to achieve fast signal stabilization time and short wash times.

Part Number	Description
SC-0317-0500-BG	0.50 mm i.d. ■ (orange), 17 cm. Attaches to port #3 of the FAST valve.
SC-0317-0990-BG	1.00 mm i.d. ■ (gray), 17 cm. Attaches to port #3 of the FAST valve.








MIRA MIST  
PEEK Nebulizer

MIRA MIST  
PTFE Nebulizer

## 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.

Part Number	Description	Quantity	Suggested Use	
SC-0599-0116-K	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-0599-0108-W	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-F16	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-F08	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-0599-0001	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)	

**HF**

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



SC-FAST Standard Spares Kit	
Part Number	Description
SC-0380	Assorted fittings and tubing for FAST systems.

SC-FAST Deluxe Spares Kit	
Part Number	Description
SC-0370	Includes all of the assorted fittings and tubing in the Standard Spares Kit with the addition of a PFA-ST nebulizer, spare FAST valve and internal standard tee.



## Sample Loops

PFA crimp free SC-FAST loops provide low resistance for fast loading and rinse out.

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

Part Number	Size	Description
SC-0319-01	100 µL loop	Multipurpose PFA FAST loops for high-flow valves. Recommended for use with 0.8 mm i.d. ■ (blue) probe. 1.6 mm o.d., 1/4-28 fittings.
SC-0319-02	200 µL loop	
SC-0319-03	300 µL loop	
SC-0319-05	500 µL loop	
SC-0319-10	1.0 mL loop	
SC-0319-15	1.5 mL loop	
SC-0319-20	2.0 mL loop	
SC-0319-25	2.5 mL loop	
SC-0319-30	3.0 mL loop	
SC-0319-40	4.0 mL loop	



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

Part Number	Size	Description
SC-0318-03	300 µL loop	Multipurpose PFA FAST loops for high-flow valves. Recommended for use with 1.0 mm i.d. ■ (gray) probe. 1.6 mm o.d., 1/4-28 fittings.
SC-0318-05	500 µL loop	
SC-0318-10	1.0 mL loop	
SC-0318-15	1.5 mL loop	
SC-0318-20	2.0 mL loop	
SC-0318-25	2.5 mL loop	
SC-0318-30	3.0 mL loop	
SC-0318-40	4.0 mL loop	



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

Part Number	Size	Description
SC-0315-025	250 µL loop	High volume and flow, fast-loading PFA FAST loops for high-flow valves. 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.
SC-0315-05	500 µL loop	
SC-0315-10	1.0 mL loop	
SC-0315-20	2.0 mL loop	
SC-0315-30	3.0 mL loop	
SC-0315-40	4.0 mL loop	
SC-0315-60	6.0 mL loop	
SC-0315-80	8.0 mL loop	



### 0.8 mm i.d. SC-FAST Low-Flow Sample Loops

Part Number	Size	Description
SC-0312-01	100 µL loop	Low volume, low-flow PFA FAST loops for low-flow valves. Recommended for use with 0.8 mm i.d. ■ (blue) or smaller probe. 1.6 mm o.d., M5/10-32 fittings.
SC-0312-02	200 µL loop	
SC-0312-03	300 µL loop	
SC-0312-05	500 µL loop	
SC-0312-10	1.0 mL loop	
SC-0312-20	2.0 mL loop	



## Silver Level ESI Installation & Training

The silver level installation and training package is a 1 day on-site installation and method development for SC-FAST or oneFAST on ICPMS in US, Canada, or Western Europe.

- Includes:** Hardware installation
- Software methods
  - Basic system familiarization
  - Travel time & expenses for ESI employee or contractor
  - SC-FAST standard spares kit (SC-0380)

Part Number	Description
FI-SC-01	On-site 1 day installation for SC-FAST high throughput system

**Elemental Scientific**  
Certificate for ESI On-Site Installation and Training

**CERTIFICATE #**

Thank you for your purchase of an ESI product. Use this certificate to call **402.991.7800** or email [install@icpms.com](mailto:install@icpms.com) to schedule your 1 day on-site installation and training with the product you have received.

**Installation and Training includes:**  
Hardware installation, and method optimization for environmental sample analysis. Manual and software files for SC-FAST™ or oneFAST™ and ICP or ICPMS methods included. Includes travel time and expenses for ESI employee or contractor. If you have any questions or concerns, please do not hesitate to call our staff for assistance.

Elemental Scientific, Inc. | 2440 Cuming St. | Omaha, NE 68131 USA  
Phone: 402.991.7800 | Fax: 402.991.7799 | Email: [esi@icpms.com](mailto:esi@icpms.com) | Web: [www.icpms.com](http://www.icpms.com)

## Gold Level ESI Installation & Training

The gold level installation and training package is a 2½ day on-site installation and method development for the SC-FAST or oneFAST on ICPMS in US, Canada, or Western Europe.

- Includes:** Hardware installation
- Software methods
  - Basic system familiarization
  - Necessary method validation
  - User training
  - Travel time & expenses for ESI employee or contractor
  - SC-FAST deluxe spares kit (SC-0370)

Part Number	Description
FI-SC-02	On-site 2½ day installation for SC-FAST complete high throughput system

**Elemental Scientific, Inc.**  
Certificate for ESI On-Site Installation and Training

**CERTIFICATE #**

Thank you for your purchase of an ESI product. Use this certificate to call **402.991.7800** or email [install@icpms.com](mailto:install@icpms.com) to schedule your 2½ day on-site installation and training with the product you have received.

**Installation and Training includes:**  
Hardware installation, and method optimization for environmental sample analysis. Manual and software files for SC-FAST™ or oneFAST™ and ICP or ICPMS methods included. Includes travel time and expenses for ESI employee or contractor. If you have any questions or concerns, please do not hesitate to call our staff for assistance.

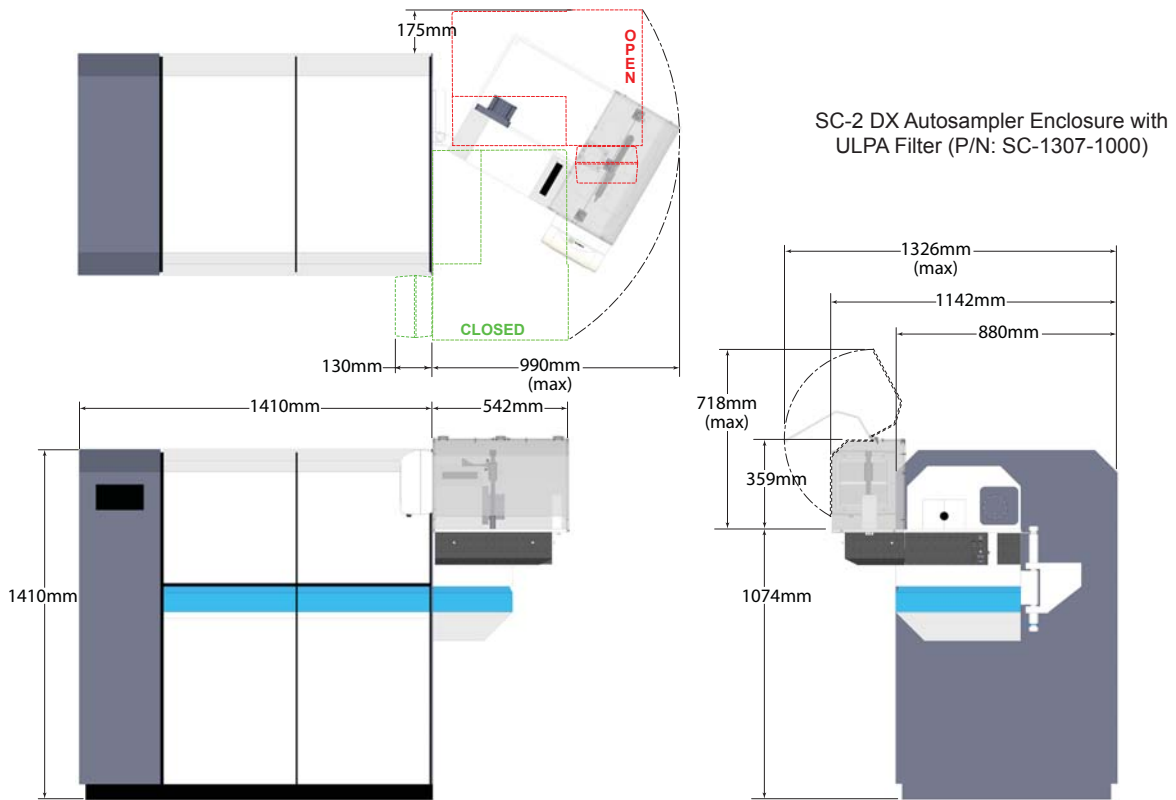
Elemental Scientific, Inc. | 2440 Cuming St. | Omaha, NE 68131 USA  
Phone: 402.991.7799 | Email: [esi@icpms.com](mailto:esi@icpms.com) | Web: [www.icpms.com](http://www.icpms.com)

The SC-FAST & oneFAST Consumables/Spares Kit is a great value at no extra expense with the Gold Installation & Training.

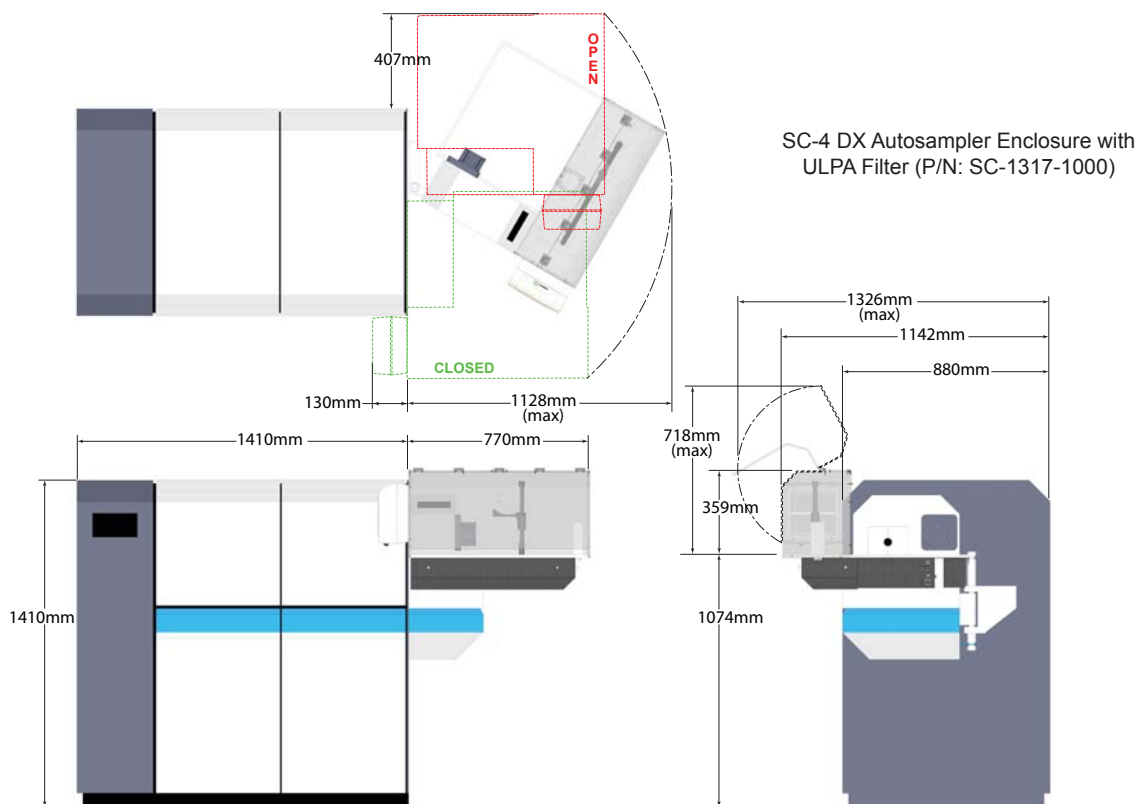


# SC-DX AUTOSAMPLER DIMENSIONS

## SC-E2 DX Autosampler with Enclosure and ULPA Filter Dimensions

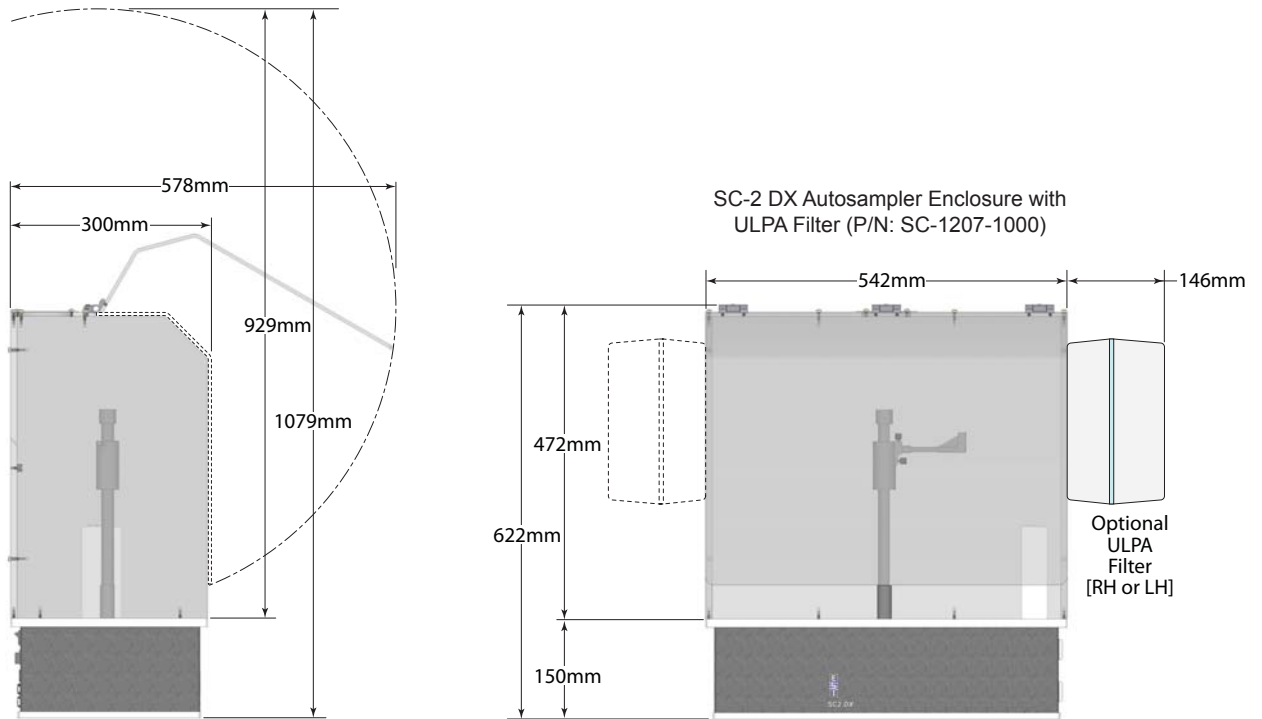


## SC-E4 DX Autosampler with Enclosure and ULPA Filter Dimensions

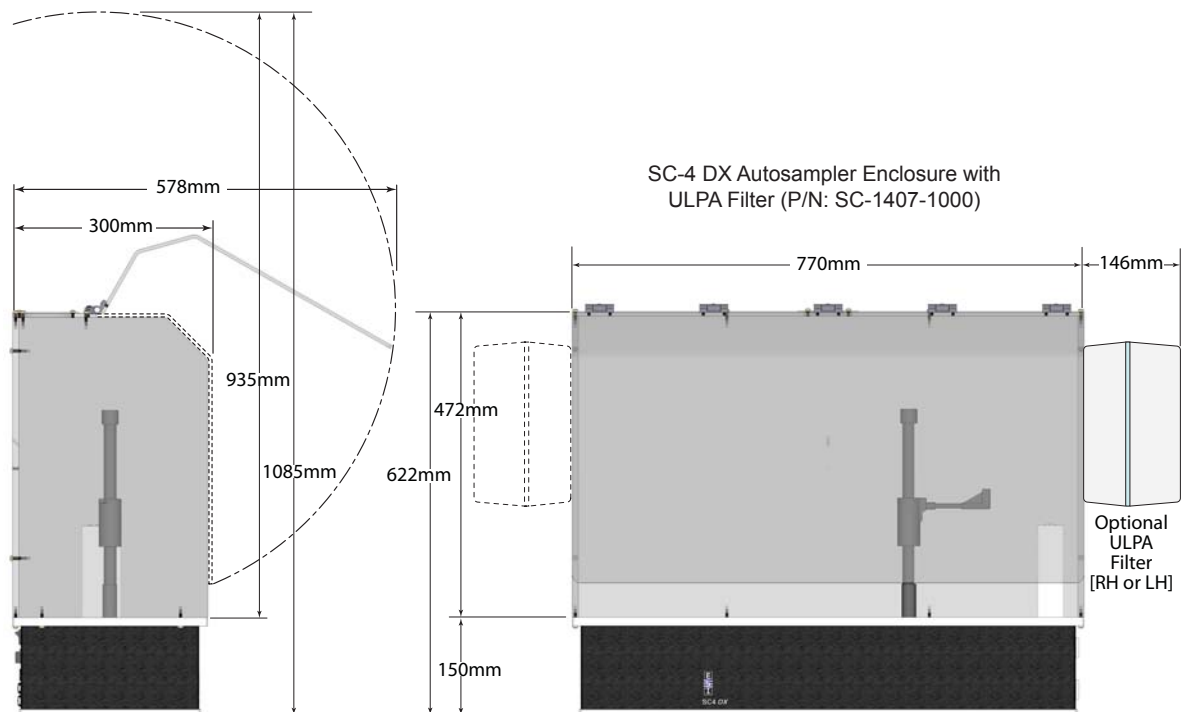


# SC-DX AUTOSAMPLER DIMENSIONS

## SC-2 DX Autosampler with Enclosure and ULPA Filter Dimensions

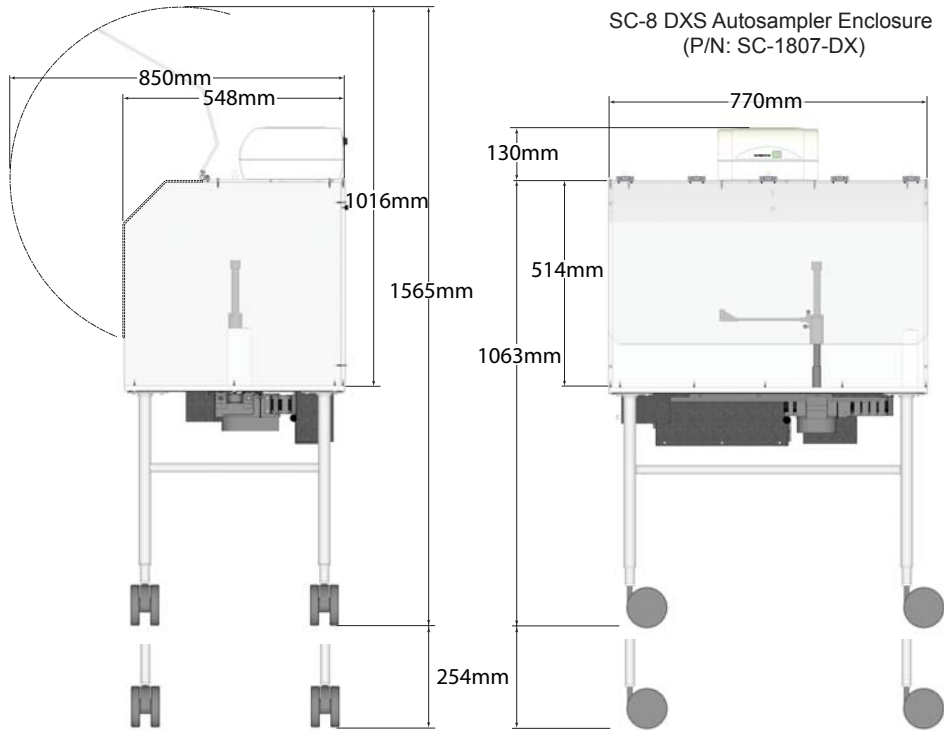


## SC-4 DX Autosampler with Enclosure and ULPA Filter Dimensions

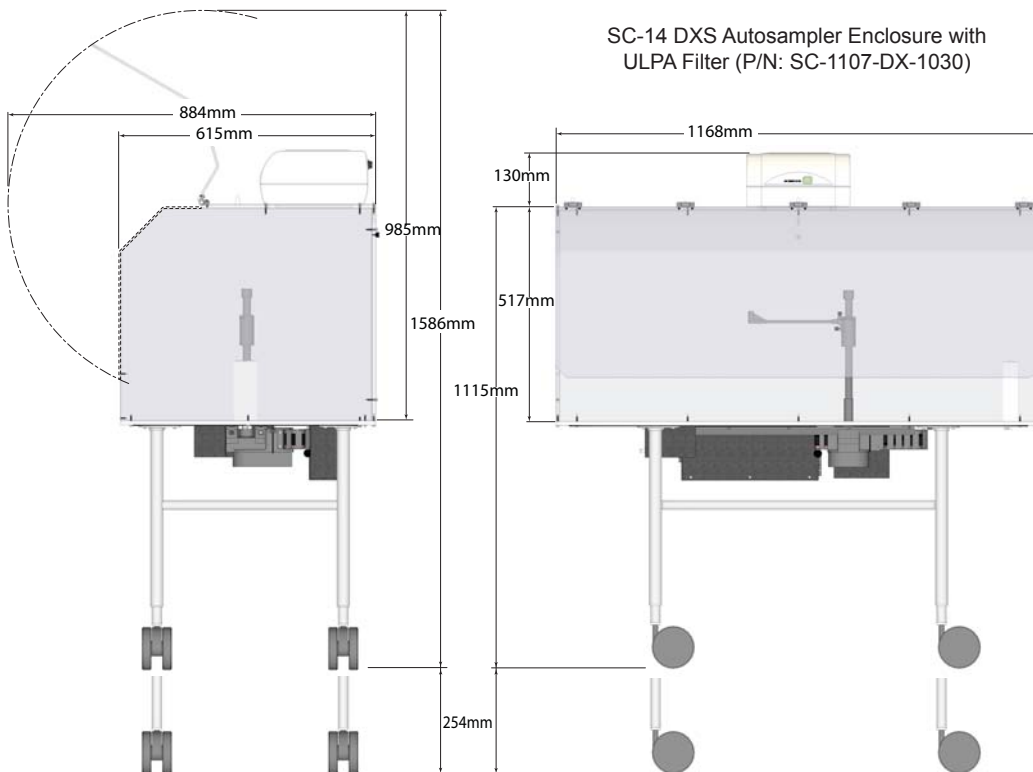




## SC-8 DXS Autosampler with Enclosure Dimensions



## SC-14 DXS Autosampler with Enclosure and ULPA Filter Dimensions



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