Elemental Scientific

2013 Catalog
ESI Products and Consumables

Sample Introduction For PerkinElmer Optima ICP

www.icpms.com

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

- Fully automated inline and offline dilution / standardization / QC systems
- *FAST* systems
- Innovative SC-DX Series clean, intelligent autosamplers
- Inert MicroFlow and PolyPro Nebulizers
- Inert autosampler and manual sampling probes
- Precision micro peristaltic pumps and syringe pumps
- Inert, chemically resistant spray chambers and end caps
- Demountable o-ring-free injectors made from platinum, sapphire, or quartz
- Precision and standard quartz ICP torches
- apex family of high sensitivity, low contamination sample inlet systems
- PC^3 Peltier-cooled cyclonic spray chambers

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.

Phone:
1.402.991.7800

E-Mail:
esi@icpms.com

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1.402.991.7799

Website:
www.icpms.com

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Glossary

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

prep*FAST*
prep*FAST* is a sample/standard system for *FAST* inline autodilution, autocalibration, auto QC dilution, priority sample autodilution and auto MSA. (Pg 18)

hydrideICP / hydride*FAST* 1 / hydride*FAST* 2
hydrideICP / hydride*FAST* utilizes an integrated hydride generator and precision micro peristaltic pump to obtain sub-ppt ICP detection limits for hydride elements such as As, Se and Sb. (Pg 24 / Pg 26 / Pg 28)

brine*FAST* S4
For laboratories supporting chlor-alkali process control and other applications requiring the determination of trace elements in brine. (Pg 30)

oil*FAST*
oil*FAST* improves both speed and data quality of wear metal analysis in diesel engines, increasing throughput by a factor of 2 when compared with other dedicated oil autosamplers. (Pg 32)

soil*FAST*
Highest throughput soil analysis system with new clog-resistant metal-free valve. (Pg 34)

micro*FAST* OSP
Analyze undiluted volatile organic solvents at low-flow rates using syringe pumps and eliminating peristaltic pump tubing. Complete sample transport ensures equal response for different analyte species in volatile solvents. Micro sample loading dramatically reduces waste. (Pg 36)

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. 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 (PEEK) is a tan colored organic polymer thermoplastic used to fabricate items for demanding applications, including bearings, piston parts, and pumps.

PFA
Perfluoroalkoxy is a superior fluoropolymer that is ultra clean, chemically inert and optically transparent. This material is used for advanced liquid handling, high performance nebulizers and labware.

Polyethylene
Polyethylene is a thermoplastic polymer used for laboratory sample tubes and vessels.

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 used for laboratory sample tubes and vessels.

Terminology

DXi - Integrated ESI precision micro peristaltic pump and *FAST* valve module.

FAST - Valve and loop combination that rapidly loads and injects the sample.

MP^2 - Precision micro peristaltic pump.

PC^3 - Peltier cooled cyclonic spray chamber.

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

SYRIX - Compact, low-profile, high-precision laboratory syringe pump.

Tubing Sizes

Red - 0.15 mm i.d.

Yellow - 0.3 mm i.d.

Gray - 1.0 mm i.d.

Purple - 0.2 mm i.d.

Orange - 0.5 mm i.d.

Green - 0.25 mm i.d.

Blue - 0.8 mm i.d.

prep*FAST*

The Next Stage of Automation

- ***FAST*** **Inline Autodilution**
- **Autocalibration**
- **Over Range Sample Autodilution and Reanalysis**
- **Priority Sample Autodilution**
- **Automated Standard Additions (MSA)**

PerkinElmer Optima 8300 ICP
with SC-2 DX and S400V

SC-2 DX
prep*FAST* with
mobile stand

See page 18 or visit
www.prep*FAST*.com
for more information

SC-DX Autosamplers and *FAST* System

The SC-DX *FAST* is a reliable, high-throughput, automated sample introduction system for the Optima ICP. The combination of the SC-DX *FAST* autosampler with the Optima ICP provides the perfect platform to introduce even the most demanding high matrix samples. The SC-DX *FAST* is available in four autosampler sizes, holding up to fourteen large sample racks.

PerkinElmer Optima with SC-2 *FAST* DXi

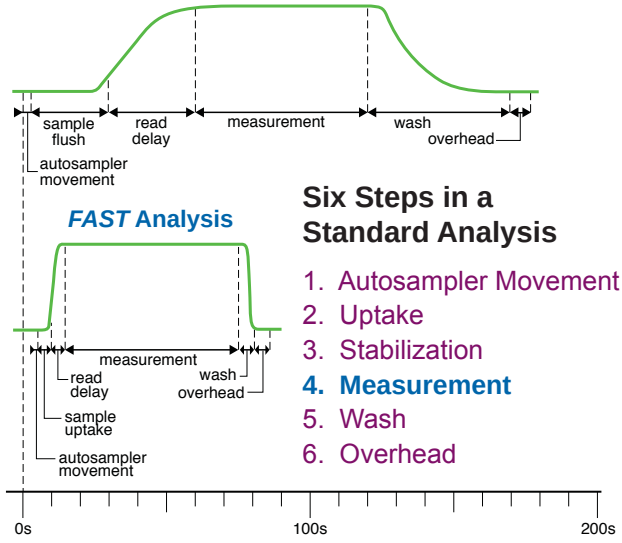
SC-DX BENEFITS:

- Robust dual rail system
- Dual flowing rinse station
- Precision micro sampling
- Reset probe - prevents probe damage
- Flexible rack configurations
  - micro samples to large bottles
- ULPA filter and cart options

FAST BENEFITS:

- *FAST* sample loading (0.5 mL sec^{-1})
- *FAST* stabilization time
- *FAST* washout
- *FAST* probe and loop rinsing
- Flexible for all applications

Normal Analysis

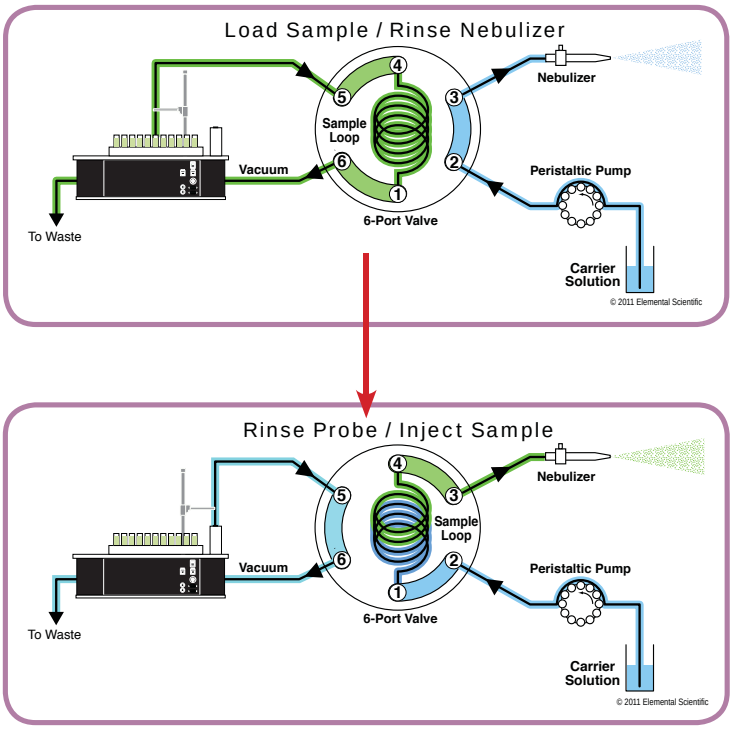


Six Steps in a Standard Analysis

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

The SC-*FAST* system has the fastest 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.

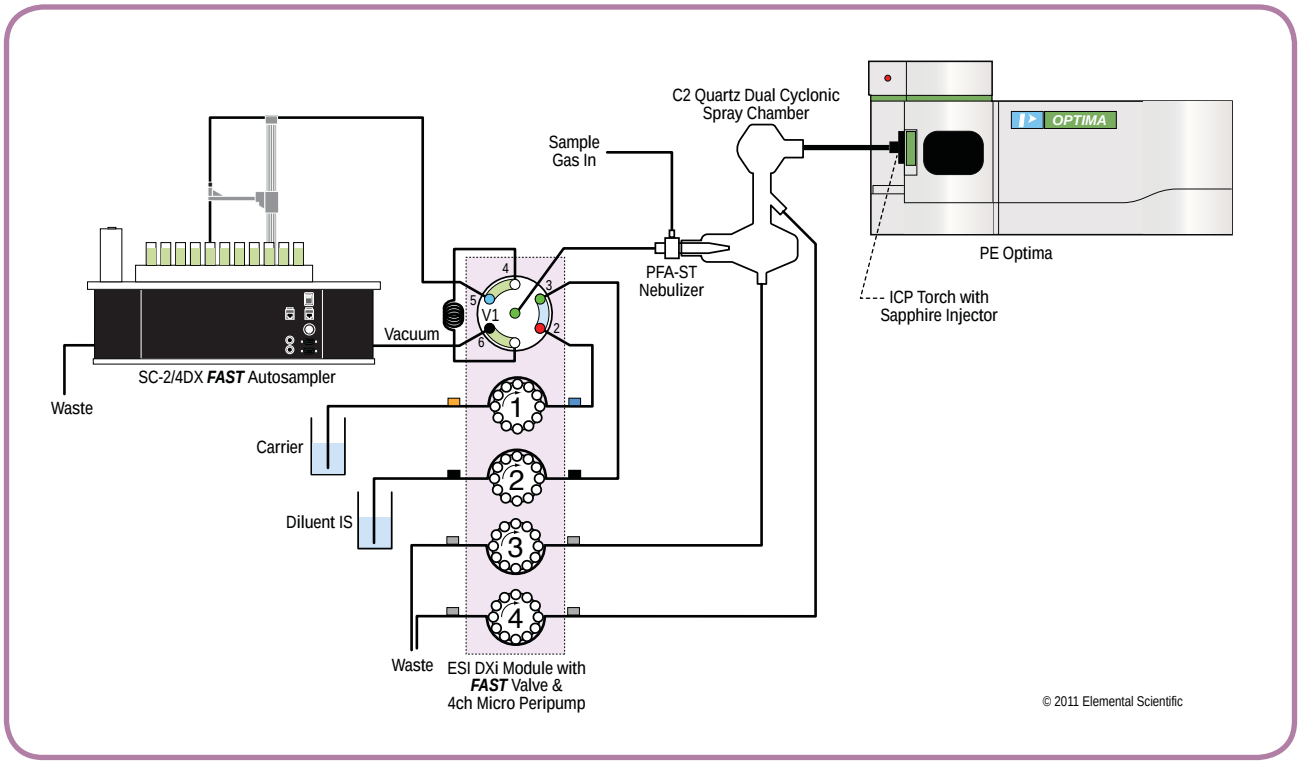
opti*FAST* DXi System

Improve sensitivity, precision, and detection limits while significantly increasing sample throughput with the best performing *FAST* system for the Optima. The opti*FAST* DXi combines the benefits of the integrated MP^2 precision micro peristaltic pump, the C2 quartz dual cyclonic spray chamber, and the new P7 valve.

- DXi fully integrates with the Optima
- MP^2 peripump improves precision
- C2 spray chamber improves sensitivity and precision
- Improved detection limits
- **New P7 valve**
  - Zero dead volume
  - Fastest stabilization time
  - In-valve internal standard mixing
  - Inert PFA rotor

PerkinElmer Optima with *FAST* DXi

opti*FAST* DXi integrated into the PE Optima showing a 4 channel MP^2 precision micro peripump, P7 *FAST* valve and quartz C2 spray chamber.

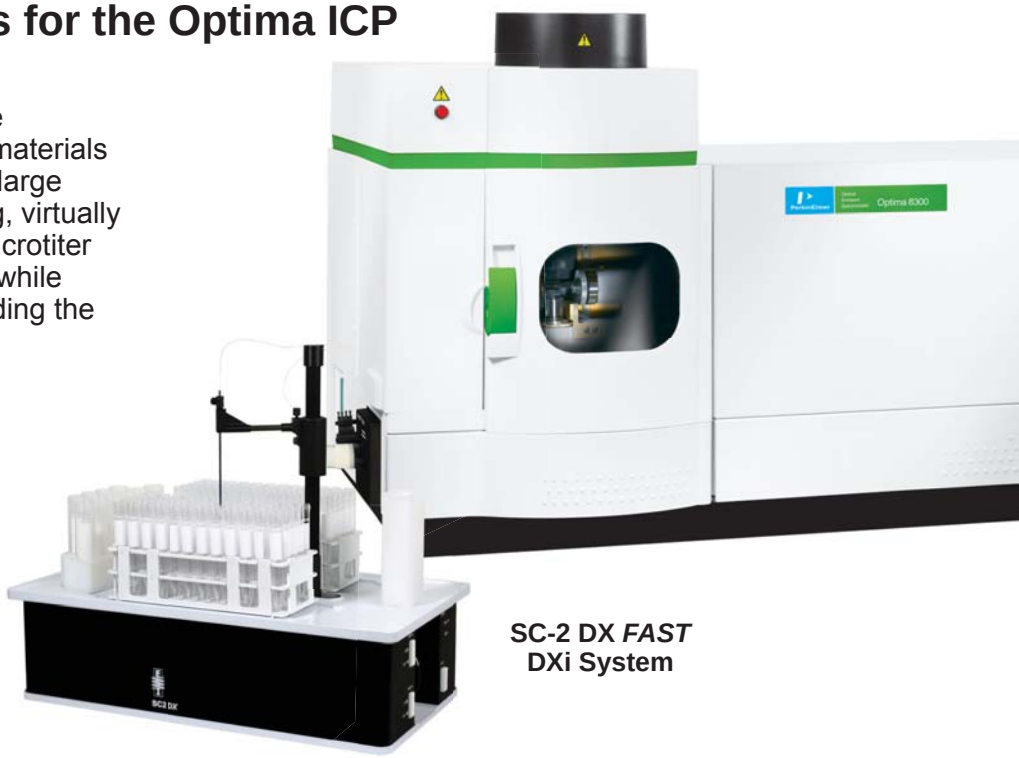


opti*FAST* DXi System Diagram

SC-DX and *FAST* Systems for the Optima ICP

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.

The SC-DX *FAST* DXi system offers enhanced precision and the ability to add internal standard online at lower dilution factors. The design of the MP^2 minimizes the gaps between rollers, resulting in even pressure points along the tubing, which improves signal stability, data quality and detection limits.



SC-2 DX *FAST* DXi System

SC-DX Systems for the PerkinElmer Optima

System	Description	SC-DX A/S	*FAST* Valve Module	*FAST* DXi Peripump & Valve	PFA-ST Nebulizer	Sapphire Injector	Quartz Cyclonic Chamber	P7 *FAST* Valve	Quartz C2 Spray Chamber
SC-DX System	SC-DX autosampler with dual flowing rinse	✓							
SC-DX *FAST* System	SC-DX autosampler with *FAST* for high throughput and *FAST* washout	✓	✓		✓	✓	✓		
SC-DX *FAST* DXi System	SC-DX autosampler and integrated MP^2 precision micro peristaltic pump with *FAST*	✓	✓	✓	✓	✓	✓		
SC-DX opti*FAST* DXi System	SC-DX autosampler, integrated MP^2 precision micro peristaltic pump with P7 *FAST* valve and quartz C2 spray chamber	✓	✓	✓	✓	✓		✓	✓

SC-DX System Includes:

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

***FAST* DXi**
Integrated MP^2 micro peristaltic pump with *FAST*

Quartz C2 Spray Chamber

SC-2 DX

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

SC-2 DX Systems	Description	Part Number
SC-2 DX	SC-2 DX autosampler with dual flowing rinse	2DX
SC-2 DX *FAST*	SC-2 DX autosampler with *FAST* for high throughput and *FAST* washout	2DXF-57C
SC-2 DX *FAST* DXi	SC-2 DX autosampler and integrated MP² precision micro peristaltic pump with *FAST*	2DXFi-57C
SC-2 DX opti*FAST* DXi	SC-2 DX autosampler, integrated MP² precision micro peristaltic pump with P7 *FAST* valve and quartz C2 spray chamber	2OPTF-87C

See page 85 for SC-2 DX dimensions.

SC-4 DX

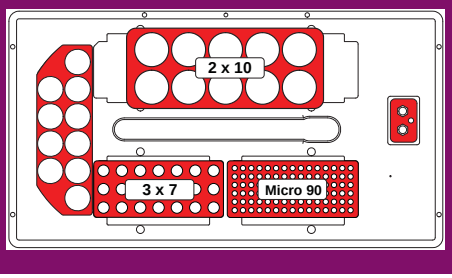
The SC-4 DX is an autosampler with dual flowing rinse stations that holds 4 large racks or 6 micro racks. It is ideal for labs with moderate sample throughput needs.

SC-4 DX Systems	Description	Part Number
SC-4 DX	SC-4 DX autosampler with dual flowing rinse	4DX
SC-4 DX *FAST*	SC-4 DX autosampler with *FAST* for high throughput and *FAST* washout	4DXF-57C
SC-4 DX *FAST* DXi	SC-4 DX autosampler and integrated MP² precision micro peristaltic pump with *FAST*	4DXFi-57C
SC-4 DX opti*FAST* DXi	SC-4 DX autosampler, integrated MP² precision micro peristaltic pump with P7 *FAST* valve and quartz C2 spray chamber	4OPTF-87C

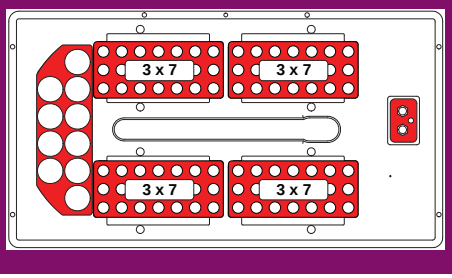
See page 85 for SC-4 DX dimensions.

EXAMPLES OF SC-2 DX RACK CONFIGURATIONS

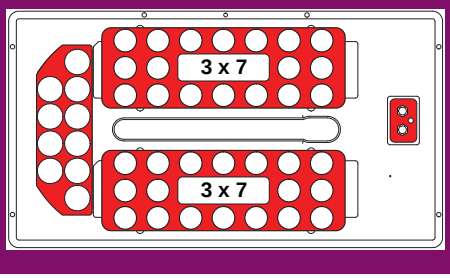
1 Large Rack 1 Microtiter Plate 1 Micro Rack



4 Micro Racks



2 Large Racks



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 Systems	Description	Cart Version Part Number	Benchtop Version Part Number
SC-8 DXS	SC-8 DXS autosampler with dual flowing rinse	8DX	8DX-BT
SC-8 DXS *FAST*	SC-8 DXS autosampler with *FAST* for high throughput and *FAST* washout	8DXF-57C	8DXF-BT-57C
SC-8 DXS *FAST* DXi	SC-8 DXS autosampler and integrated MP^2 precision micro peristaltic pump with *FAST*	8DXFi-57C	8DXFi-BT-57C
SC-8 DXS opti*FAST* DXi	SC-8 DXS autosampler, integrated MP^2 precision micro peristaltic pump with P7 *FAST* valve and quartz C2 spray chamber	8OPTF-87C	8OPTF-BT-87C

See page 86 for SC-8 DX dimensions.

SC-8 DXS benchtop version

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 Systems	Description	Cart Version Part Number	Benchtop Version Part Number
SC-14 DXS	SC-14 DXS autosampler with dual flowing rinse	14DX	14DX-BT
SC-14 DXS *FAST*	SC-14 DXS autosampler with *FAST* for high throughput and *FAST* washout	14DXF-57C	14DXF-BT-57C
SC-14 DXS *FAST* DXi	SC-14 DXS autosampler and integrated MP^2 precision micro peristaltic pump with *FAST*	14DXFi-57C	14DXFi-BT-57C
SC-14 DXS opti*FAST* DXi	SC-14 DXS autosampler, integrated MP^2 precision micro peristaltic pump with P7 *FAST* valve and quartz C2 spray chamber	14OPTF-87C	14OPTF-BT-87C

See page 86 for SC-14 DX dimensions.

Micro Sample and Semiconductor Autosamplers

SC-Micro DX

The SC-Micro DX is a small-footprint (330mm x 223mm), 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:

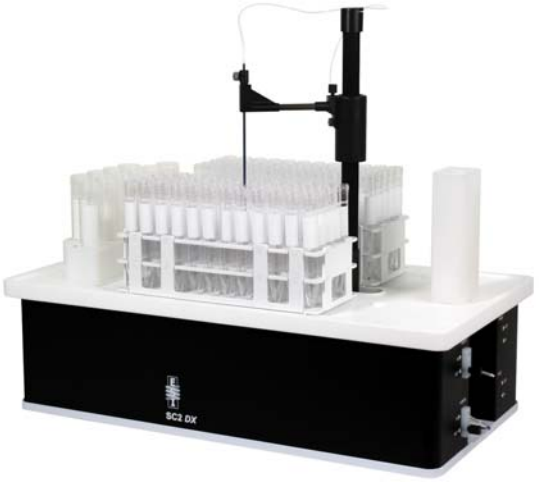
2 Sample Probes
Standards Rack (10 positions)
3 Microtiter Plates (24, 48, 96 positions)
3 Micro Racks (21, 40, 90 positions)
Pk (10 ea) 20 mL PFA Standards Vials
Pk (10 ea) 2 mL PFA Sample Vials

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 autosampler with a PTFE top is designed for ultra-pure semiconductor applications where the lowest possible background levels and chemical resistance are required.

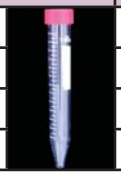
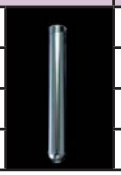


SC-2 DX Semiconductor System Includes:

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

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

PFA and PVDF vials recommended (see page 72-74)

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

optiFAST System Upgrades

The optiFAST System Upgrades allow any existing SC-FAST system to achieve the performance of the optiFAST (see page 9). Also included is a convertible sapphire injector, allowing Optima 8000 series injectors to be used with pre-8000 series Optima instruments.

optiFAST Upgrade (For Non-DXi FAST Systems)

This optiFAST System Upgrade is for labs that have a FAST system, but do not have a DXi integrated micro peristaltic pump.

optiFAST System Upgrade Includes:

- P7 FAST Valve
- Integrated MP^2 Precision Micro Peristaltic Pump
- Quartz C2 Spray Chamber
- PFA-ST3 MicroFlow Nebulizer
- Convertible Sapphire Injector

Part Number	Description
OPT-UP-A-57C	optiFAST upgrade for non-DXi FAST systems

optiFAST Upgrade (For Existing FAST DXi system)

This optiFAST System Upgrade is for labs that are currently using a FAST DXi in their sample introduction setup.

optiFAST System Upgrade Includes:

- P7 FAST Valve
- Quartz C2 Spray Chamber
- PFA-ST3 MicroFlow Nebulizer
- Convertible Sapphire Injector

Part Number	Description
OPT-UP-B-57C	optiFAST upgrade for DXi FAST systems

one*FAST*

Universal, High-Throughput Sample Introduction System

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

one*FAST* Basic

The one*FAST* increases throughput with non-ESI autosamplers.

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

Part Number	Description
SC-0400	one*FAST* basic system

one*FAST* Complete Optima

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

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

Part Number	Description
SC-0457	one*FAST* complete system for Optima

one*FAST* DXi Complete Optima

The one*FAST* DXi Complete includes a *FAST* DXi, injector and spray chamber, making any non-ESI autosampler ready for increased throughput needs.

Includes:
- *FAST* DXi Peripump & Valve
- 2 Probes - PFA/Carbon Fiber
- Quartz Cyclonic Spray Chamber
- Convertible Sapphire Injector
- one*FAST* Controller
- PFA-ST3 Nebulizer
- All Required Tubing

Part Number	Description
SC-0457-DXi	one*FAST* DXi complete system for Optima

Autosampler Enclosures and ULPA Filtered Environments

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. Enclosures can be purchased with or without an ULPA filter.

SC-1207-DX-1000 Enclosure with SC-2 DX autosampler

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

Autosampler Model	Enclosure Only	Enclosure with ULPA Filter
Enclosure for SC-Micro DX	SC-1607-DX	N/A
Enclosure for SC-2 DX	SC-1207-DX	SC-1207-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

Ultra-Low Particulate Arrester Air Filter and Mounting Plate

ppq

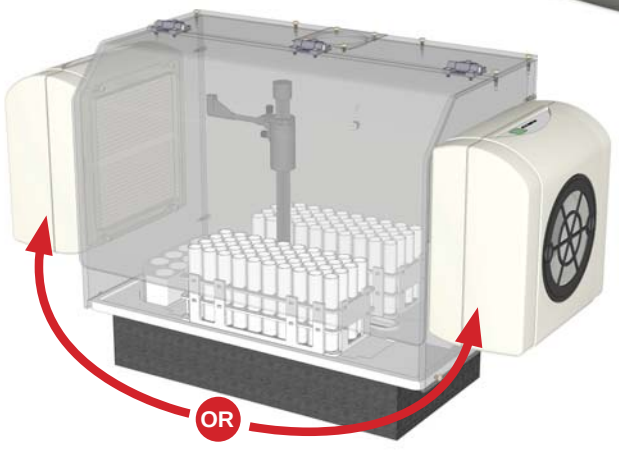
The ULPA (Ultra-Low Particle Arrester) filter creates a clean, positive pressure environment for samples and standards and prevents airborne contamination. The ULPA filter removes 99.999% of 0.12 micron particles.

(SC-0602) ULPA Filter

ULPA Filter Specifications		
Air Volume	Noise level	Power
1 m^3/min	56 dBA	25W

Part Number	Description
SC-0602	ULPA filter for ESI enclosures
SC-1107-0026	ULPA filter mounting plate for SC-2 DX or SC-4 DX

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



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

SC-2 DX and SC-4 DX Mobile Stands

The mobile stand provides a low-footprint platform for the SC-2 DX or SC-4 DX.

Benefits:
- Mobile with locking wheels for flexible positioning
- Convenient location for rinse and waste containers
- Shelf for additional sample introduction equipment, such as prep*FAST*

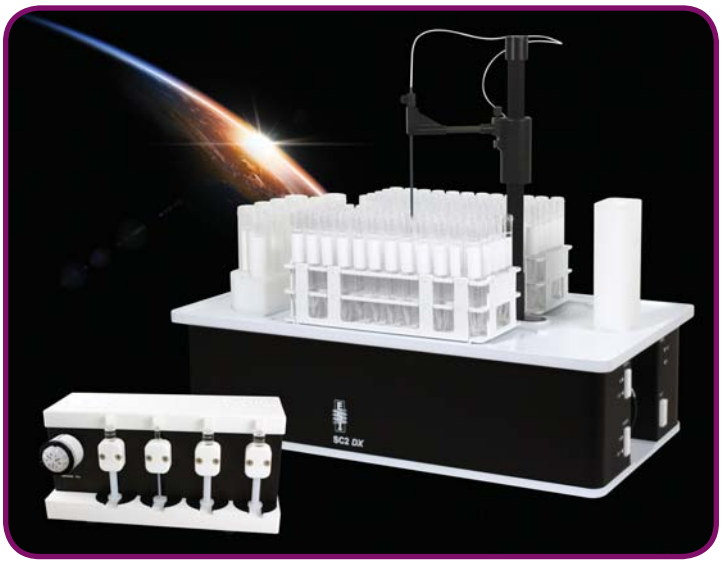
SC-1210-DX mobile stand with SC-2 DX autosampler

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

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

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

Inline Autocalibration, Variable Autodilution, and Auto QC Dilution



prep*FAST* is a dilution system that automatically performs precise and accurate inline dilutions for samples and standards.

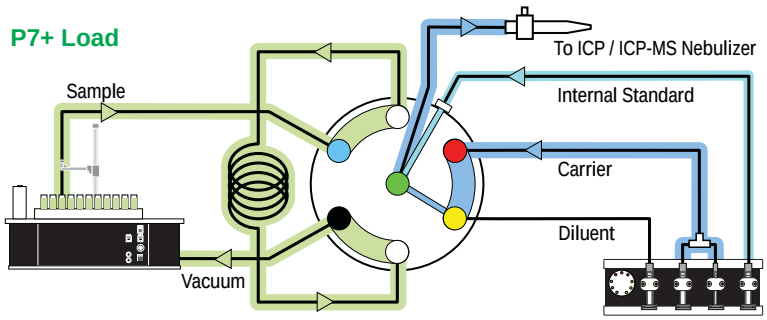
Benefits of prep*FAST*

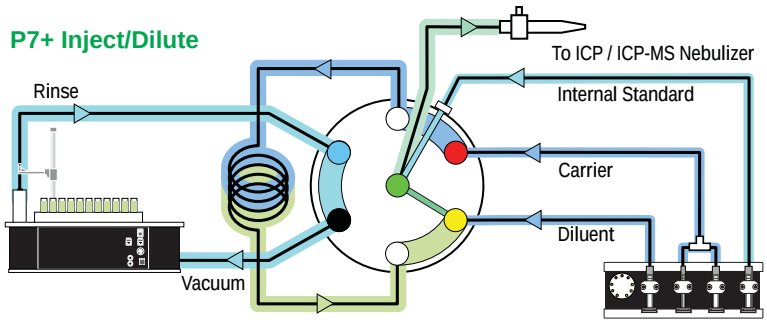
- Autodilution
- Autocalibration
- Auto QC dilution
- Auto MSA
- *FAST*

Samples are rapidly (0.5 mL/sec) and reproducibly vacuum loaded into a sample loop. Inside the valve, sample is mixed with the diluent and internal standard. The system delivers the diluted and mixed sample to the nebulizer with final dilutions ranging between 1x and 400x.

Central to the system is the S400V syringe pump module. Precise (<± 0.05%), accurate (<± 0.2%), smooth and balanced delivery of solution over a wide range of flow rates (1 to 1000 µL/min) ensures rapid and reliable inline dilutions.

Capable of up to 400x dilution, the prep*FAST* is the fastest, simplest way to ensure high quality data in every run.





The prep*FAST* uses *FAST* vacuum loading to rapidly fill a sample loop. After sample injection, variable syringe-driven carrier, diluent, and internal standard flows are mixed using the custom P7+ inline mixing valve. The result is variable, inline dilution with *FAST* stabilization and washout.

Autodilution in Seconds

Tedious manual preparation steps are automatically handled by the prep*FAST* system, making better use of time and resources. Automated dilution is used for both calibration and sample dilution. Dilutions are performed by accurately controlling the sample and diluent flow rates. Desired dilution factors are achieved in seconds by using in-valve mixing capabilities. Mixing inline eliminates the need to premix/dilute samples in discrete tubes prior to analysis and greatly improves sample throughput. Combined with *FAST* technology, rapid sample uptake and *FAST* washout times are independent of dilution factor, allowing rapid injection of the next sample.

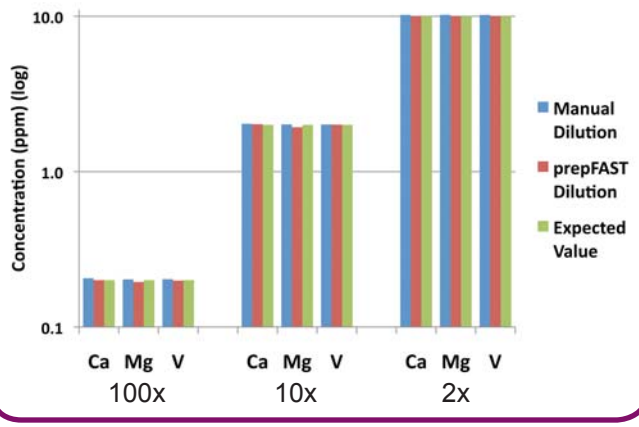
- Rapid vacuum loading
- Inline dilution as sample is injected
- Rapid uptake and stabilization of sample

Autocalibration

User predefined dilution factors for a single multi-element standard are used to build calibration curves. Accuracy of dilution is illustrated by excellent linearity of the calibration curve ($R^2 = 0.9999$).

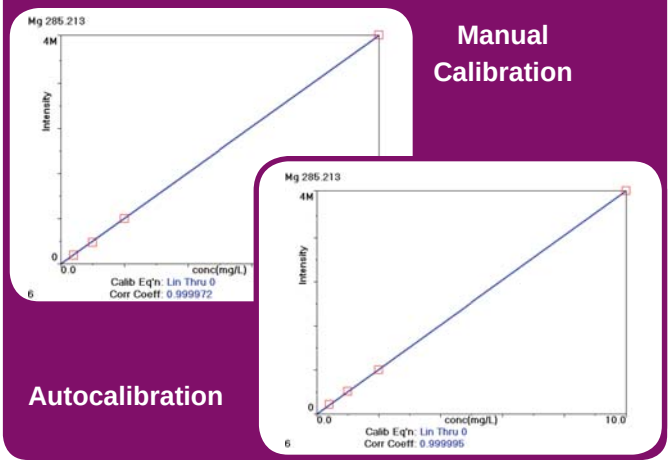
- Automatically calibrates the instrument from a single standard solution
- Improved linearity vs. calibrations prepared in separate tubes
- Prepare calibration from a single multi-element standard
- Easily create calibration curves with more points (weighted curves)
- One bottle or two bottles per method—leaves space in standards rack for more calibration curves and QC
- Eliminate manual dilution errors

Manual Dilution vs. prep*FAST* Autodilution



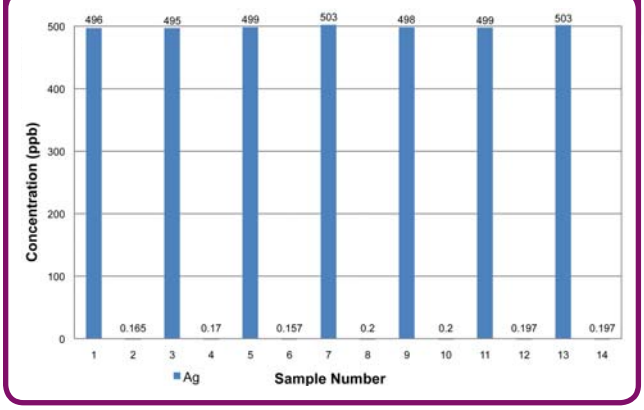
A 20 ppm standard was determined with various dilution factors by manual dilution and prep*FAST* autodilution. prep*FAST* inline autodilution is accurate and saves time.

Manual Calibration vs. prep*FAST* Autocalibration



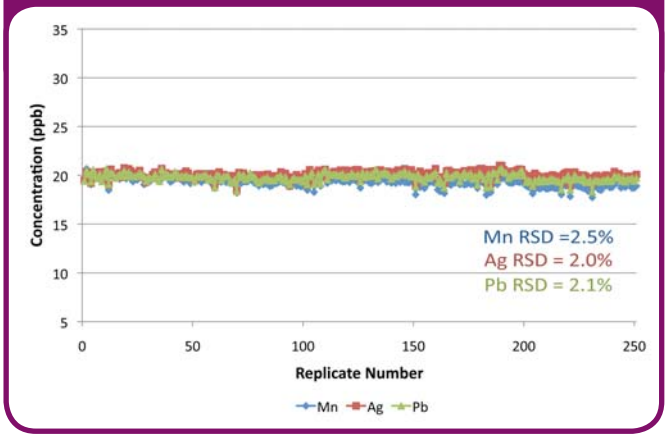
prep*FAST* autocalibration from a single multi-element standard saves time and improves accuracy.

2500x fold washout of Ag in seconds



FAST washout even for memory prone elements

< 2.5% RSD over 14 hours



Long-term stability

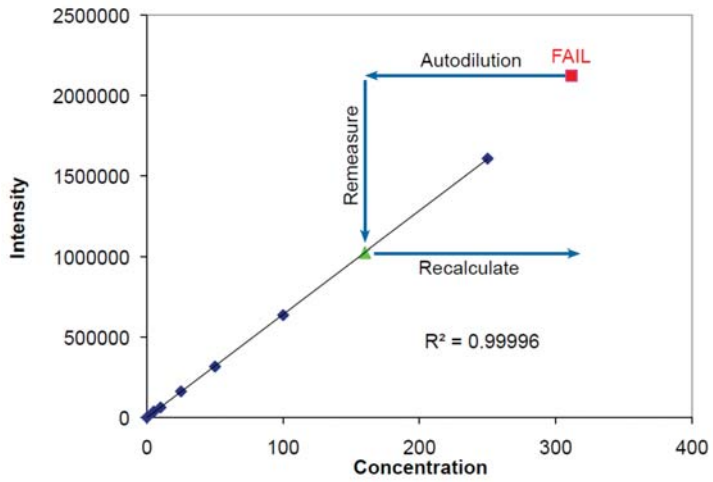
Automated QC Dilutions

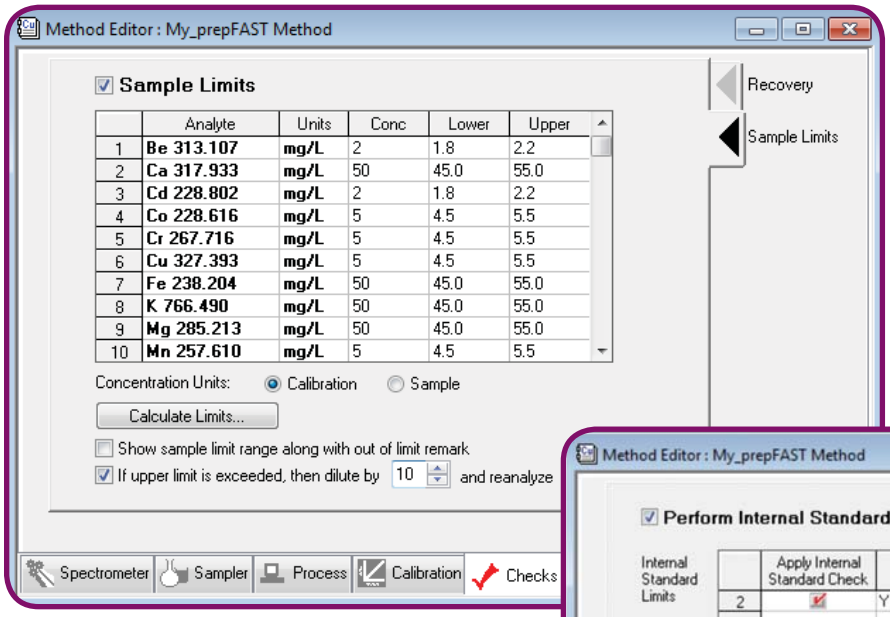
Optima Winlab 5.3 software automatically detects QC, internal standard, and sample limit failures and directs the prep*FAST* to automatically and immediately dilute and reanalyze samples.

Procedure:

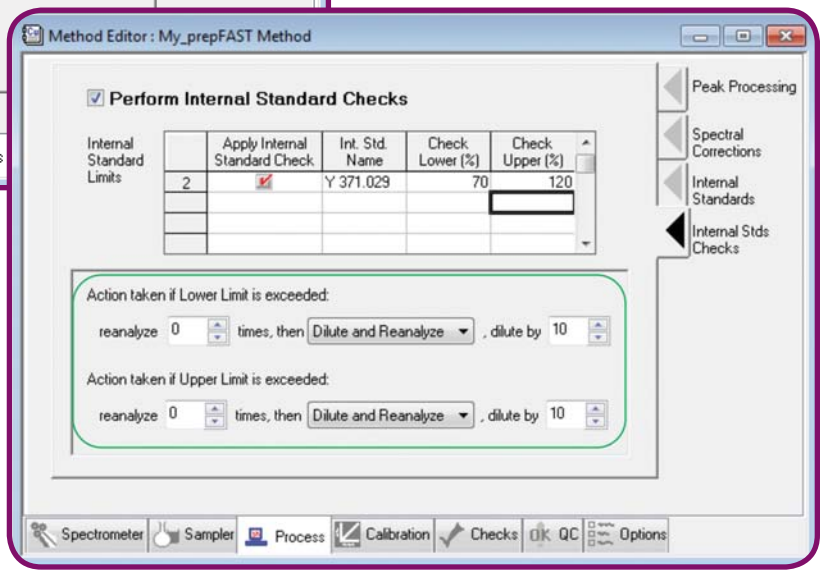
- Optima software detects QC, internal standard, or sample limit failure.
- prep*FAST* automatically dilutes the sample inline using a user-defined dilution factor (DF).
- If the diluted sample passes, the sequence continues.
- If the diluted sample fails again, the sample is automatically diluted by DF^2 up to DF = 400.

QC based automated dilution of over range samples





Sample limits and QC checks can be defined for each analyte in the Optima method.



Internal standard recovery can be monitored, and low or high recoveries trigger autodilution and reanalysis.

Automated MSA

prep*FAST* automatically performs method of standard additions to compensate for matrix effects in high matrix samples.

Procedure:

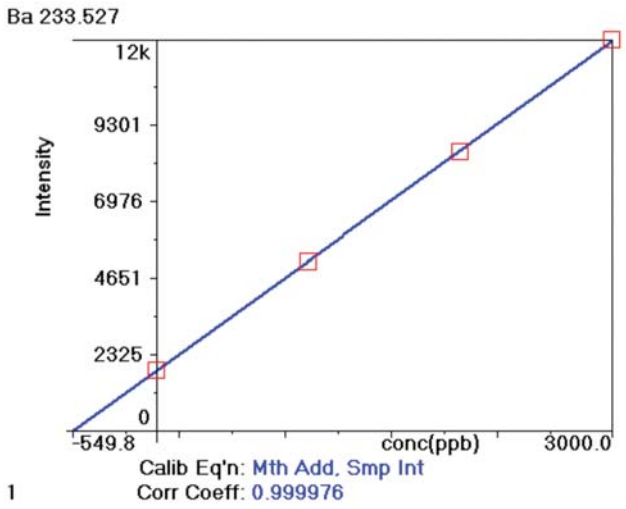
- Sample is introduced at the same flow rate for each point on the standard additions curve
- Different amounts of standard is added from a single stock solution
- Diluent flow keeps the total solution flow rate constant

Benefits:

- Best way to correct for matrix effects
- Completely automated, no manual dilutions

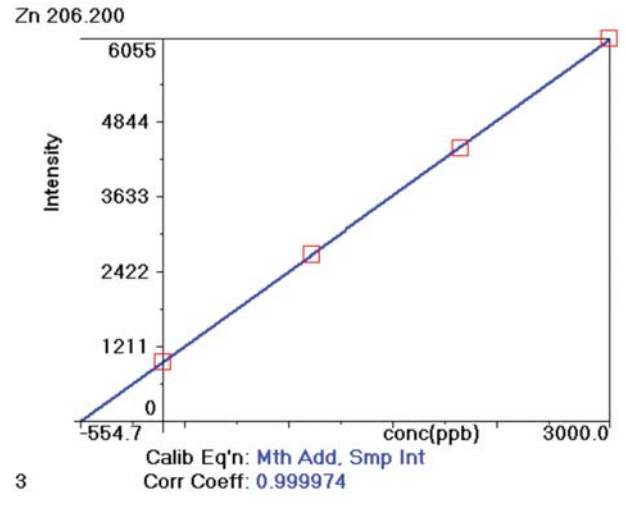
SC-2 DX prep*FAST*
(2ADFi-57C)

Ba in 10% Brine



Method of Standard Additions
curves in 10% Brine

Zn in 10% Brine



prep*FAST* Upgrade Path For PerkinElmer Optima

Step 1. Select a prep*FAST* complete system

prep*FAST* System	P/N
prep*FAST* SC-2 DXi complete	2ADFi-57C
prep*FAST* SC-4 DXi complete	4ADFi-57C
prep*FAST* SC-8 DXi complete	8ADFi-57C
prep*FAST* SC-14 DXi complete	14ADFi-57C

or

Step 1. To upgrade an existing *FAST*, *FAST* DXi or opti*FAST* system, select a prep*FAST* S400V module (one required)

prep*FAST*	P/N
prep*FAST* module	PF-S400V
*HF resistant prep*FAST* module	PF-S400V-HF

*ESI suggests the (M157-5470) PFA HF-resistant spray chamber with endcap

prep*FAST* Complete System includes:

- SC-DX *FAST* autosampler
- 4 Syringe pump dilution module (S400V)
- Quartz C2 spray chamber
- *FAST* DXi micro peripump
- Integrated P7+ *FAST* valve
- Sapphire injector
- PFA nebulizer
- prep*FAST* cart

PerkinElmer Optima 8300 ICP

Step 2. Verify that you have one of the following *FAST* systems (one required)

FAST Systems	P/N
SC-2 DX Opti*FAST*	2OPTF-87C
SC-2 *FAST* DXi	2DXFi-57C
SC-2 DX *FAST*	2DXF-57C
SC-4 DX Opti*FAST*	4OPTF-87C
SC-4 *FAST* DXi	4DXFi-57C
SC-4 DX *FAST*	4DXF-57C
SC-8 DX Opti*FAST*	8OPTF-87C
SC-8 *FAST* DXi	8DXFi-57C
SC-8 DX *FAST*	8DXF-57C
SC-14 DX Opti*FAST*	14OPTF-87C
SC-14 *FAST* DXi	14DXFi-57C
SC-14 DX *FAST*	14DXF-57C

opti*FAST* recommended

Step 3. (Optional) Select a prep*FAST* cart to match the SC-DX *FAST* autosampler

Cart	P/N
SC-2 DX prep*FAST* Cart	SC-1210-DX-PF
SC-4 DX prep*FAST* Cart	SC-1410-DX-PF
SC-8 DX prep*FAST* Shelf	SC-1103-DX-PF
SC-14 DX prep*FAST* Shelf	SC-1103-DX-PF

PC3x

PC3x Peltier Controlled Cyclonic Chamber

Thermally stabilized inlet system for the PerkinElmer Optima

PC3x Peltier Heated or Cooled Inlet System

- Temperature control from -10°C to +80°C
- Thermal stabilization of spray chamber improves long-term stability
- Last set temperature saved for stand alone operation
- USB or Bluetooth connectivity
- Remote monitoring and control

See page 64 for more information.

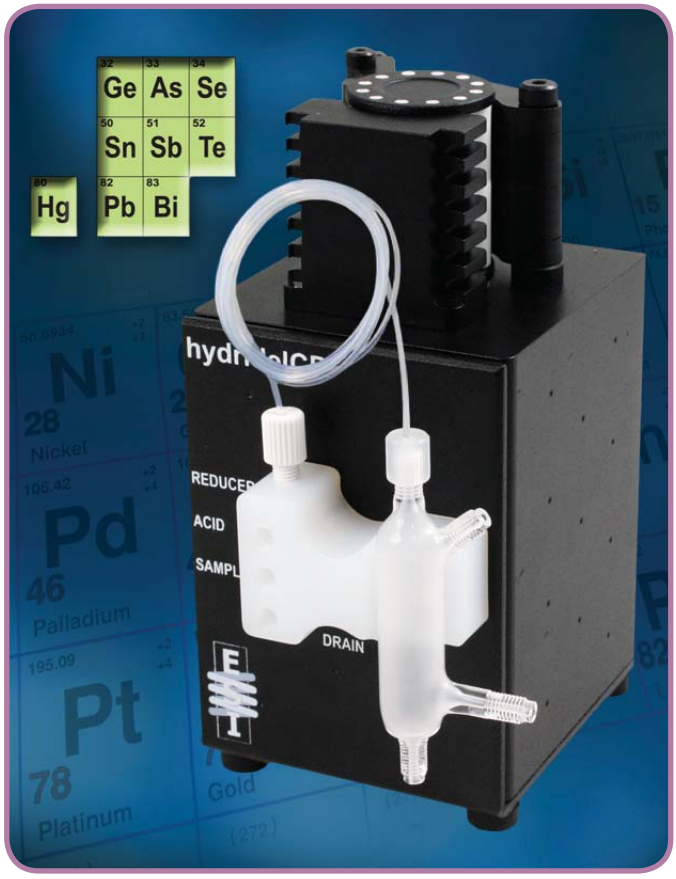
Heating Function Increases Sensitivity!

Elemental Scientific

hydrideICP™

A New, Compact Hydride Generation System for ICP with Improved Stability and Performance

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

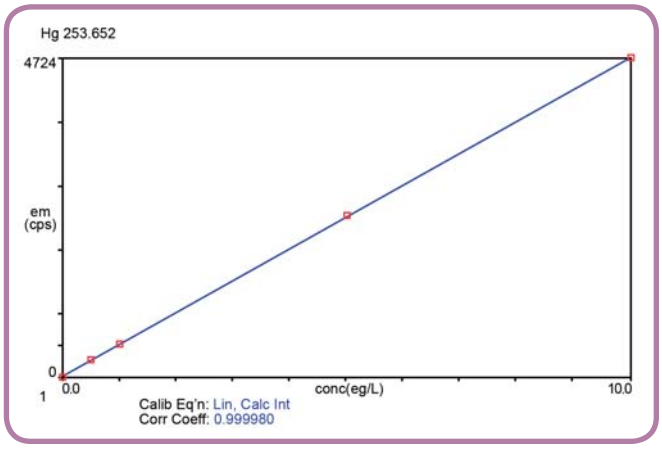


hydrideICP generation system for PerkinElmer ICP

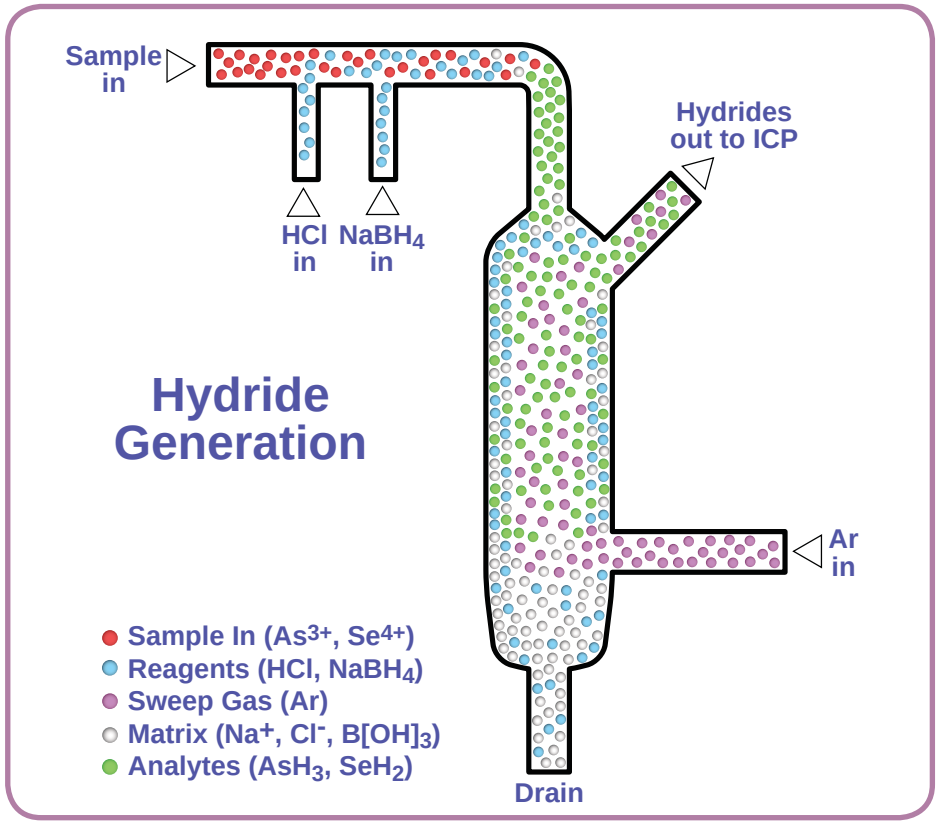
Benefits:

- Increased sensitivity, up to 100x for hydride-forming elements
- Improved detection limits for As, Hg, Se, Sb and other hydride-forming elements
- Improved stability
  - MP^2 micro peripump precisely mixes sample and reagents, producing a stable formation of H_2 gas and hydrides
- Compact
  - hydrideICP is the smallest system of its kind on the market (95 mm x 118 mm x 140 mm)
- Chemically resistant construction
  - MP^2 micro peripump with ceramic pins, a PFA mixing block and quartz GLS
- Convenient
  - hydrideICP includes a PFA mixing block, which is completely integrated into the MP^2 pump

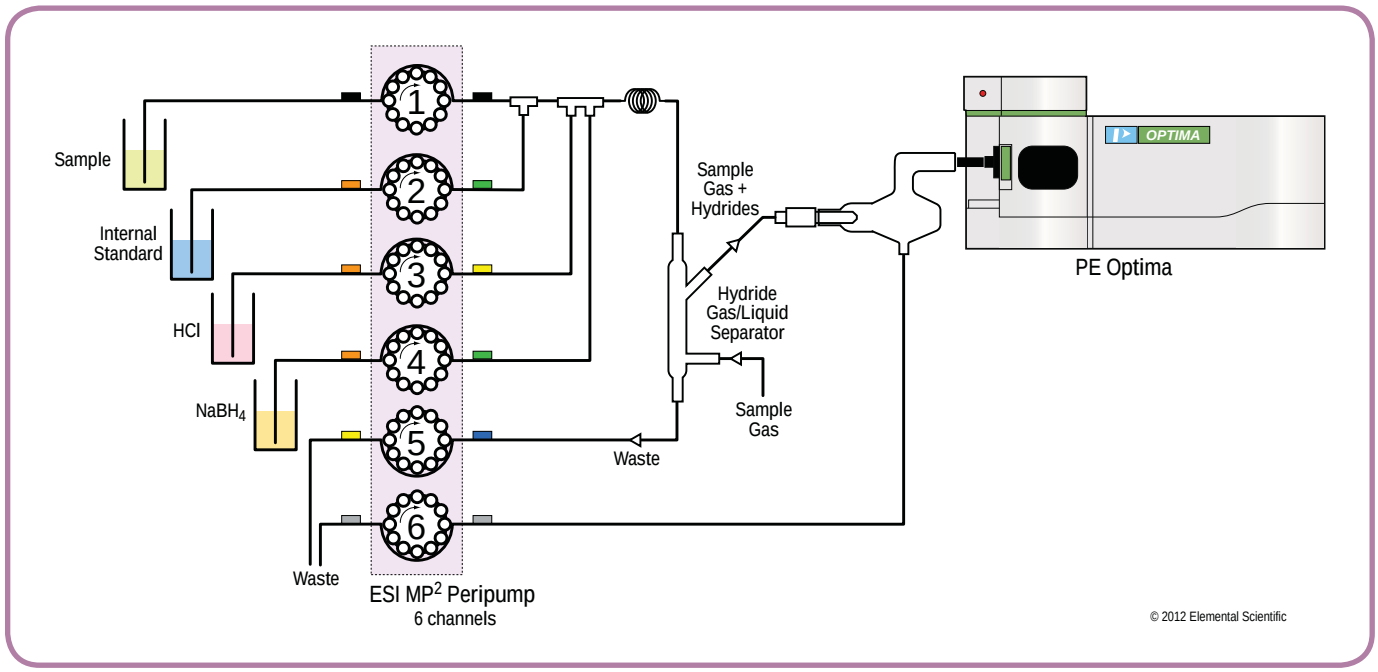
The universal spray chamber adapter is used to connect the hydride gas/liquid separator to any spray chamber.



Hg Calibration Curve – 0, 0.5, 1, 5, and 10 ppb (Normal Resolution)



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



hydrideICP with internal standard system diagram

Part Number	Description
HG-MP2-6-A	Hydride ICP Generation System. HydrideICP Generator Kit (Hydride quartz gas-liquid separator, four way tee, MP² precision micro peristaltic pump, universal spray chamber adapter and mounting plate).

Simple, Accurate, and *FAST* Hydride Generation for ICP

The hydride*FAST* 1 is a compact, inline, easy-to-use device that generates hydrides for ICP detection with high sensitivity and low detection limits. The combination of the MP^2 precision micro peripump and the patent-pending hydride*FAST* gas liquid separator provides high sensitivity and excellent detection limits.

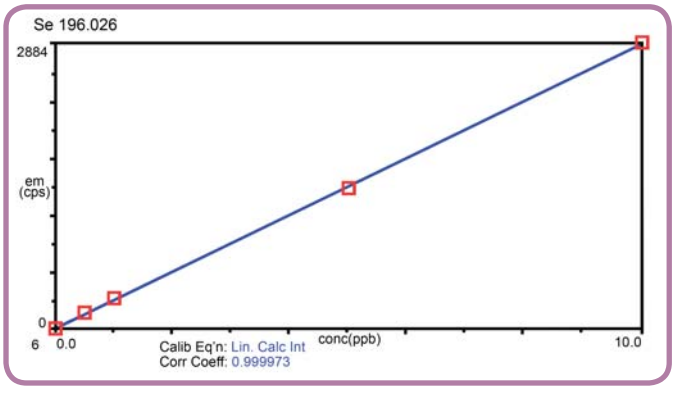
SC-4 DX hydride*FAST* 1 system for the PerkinElmer Optima

hydride*FAST* 1 System For PerkinElmer Optima				
System	SC-DX *FAST* A/S	8 Channel *FAST* DXi Peripump & Valve	Gas Liquid Separator	Quartz Cyclonic Spray Chamber
hydride*FAST* 1	✓	✓	✓	✓
hydride*FAST* 1 upgrade from *FAST*		✓	✓	

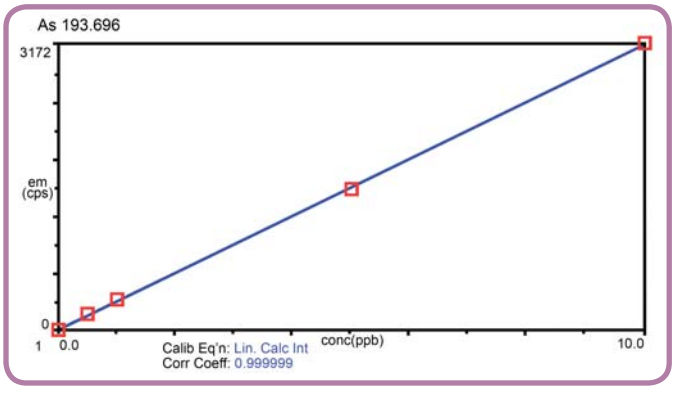
hydride*FAST* 1 for the PE Optima Detection limits (3s) for hydride-forming elements in hydride*FAST* mode	
Analyte	LOD (ppb)
As	0.05
Se	0.08
Hg	0.02
Sb	0.1

The hydride*FAST* 1 system has one mode of operation:

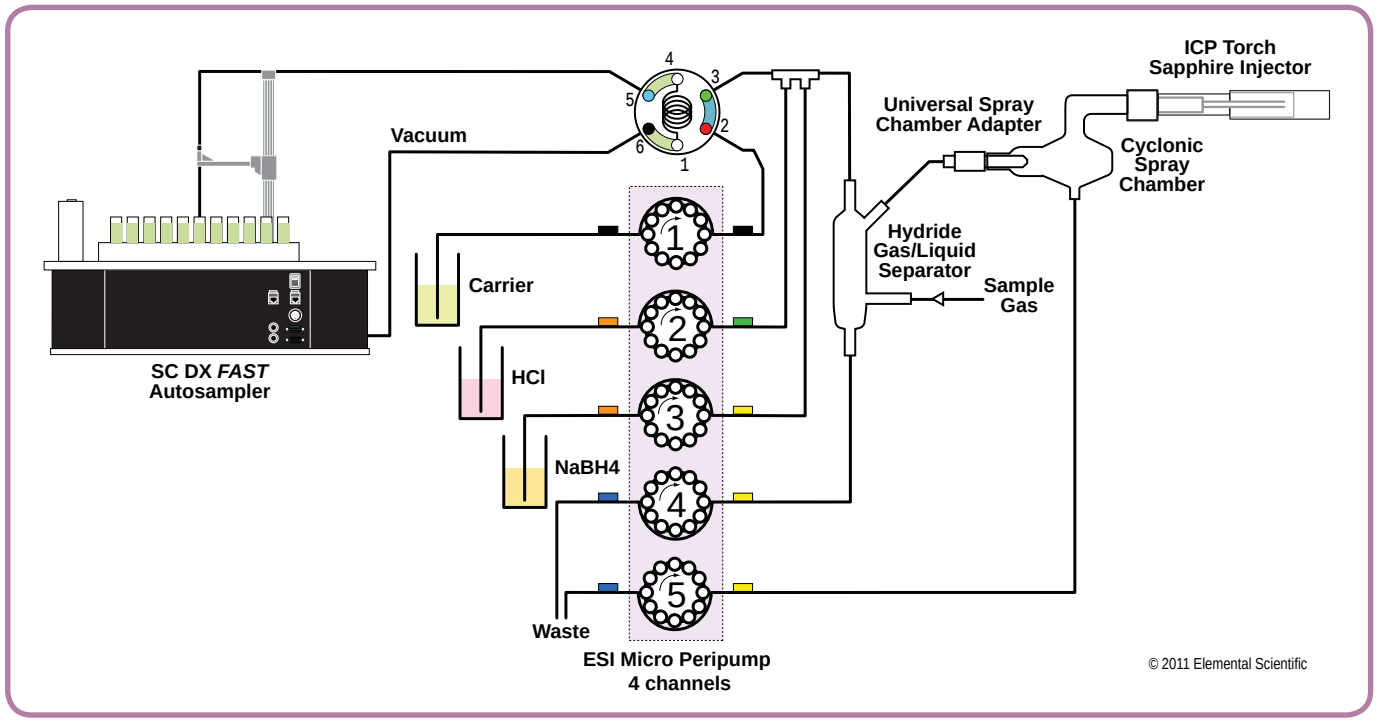
Mode 1 (hydride generation only)



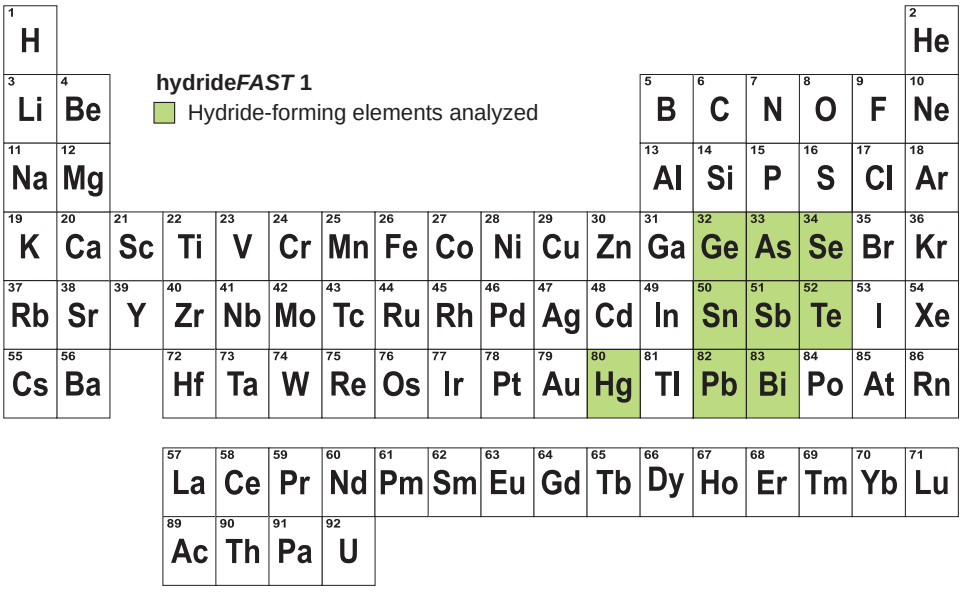
Calibration curve for Se.
Calibration points at 0, 0.5, 1, 5, and 10 ppb.



Calibration curve for As.
Calibration points at 0, 0.5, 1, 5, and 10 ppb.



hydride*FAST* 1 system diagram including autosampler and *FAST* valve



hydride*FAST* 1 Systems	
Part Number	**Description**
2HYF-1-57C	hydride*FAST* 1 system SC-2 DXi
4HYF-1-57C	hydride*FAST* 1 system SC-4 DXi
HYF-UP1-A-57	hydride*FAST* 1 upgrade from *FAST*

hydride*FAST* Spares	
Part Number	**Description**
HG-USCA-01	Universal spray chamber adapter for hydride*FAST* 1
HG-GLS-001	Quartz hydride gas-liquid separator
HG-MK-1	Hydride generator mounting kit

hydride*FAST* 2™

Simultaneous hydride generation and direct nebulization

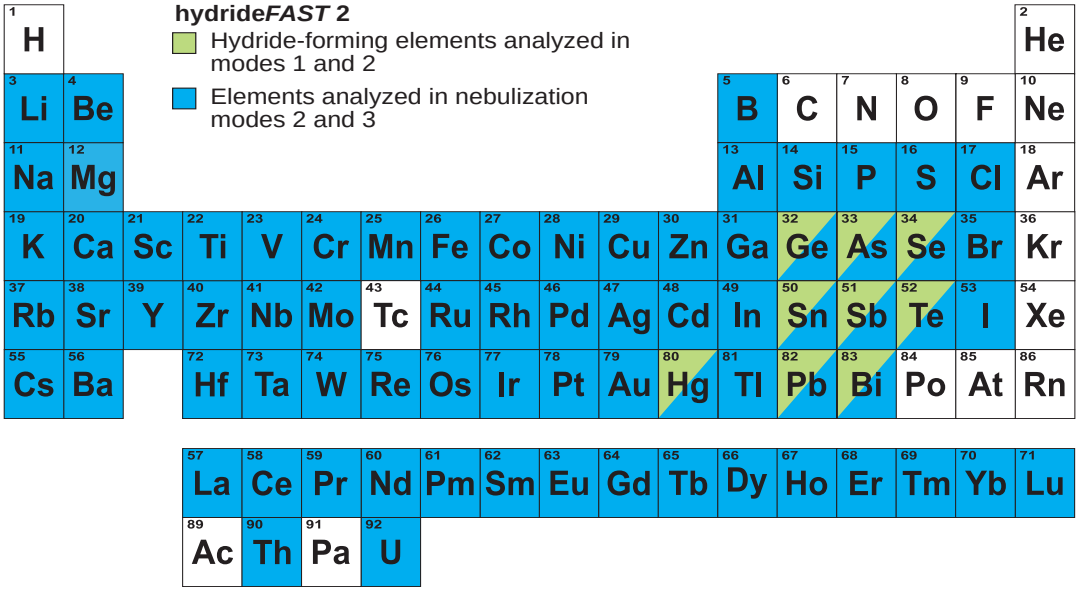
The hydride*FAST* 2 is an inline sample introduction system that combines hydride generation and direct nebulization for simultaneous determination of all analytes. This system improves sensitivity for hydride-forming elements while maintaining the multi-element capabilities of direct nebulization.

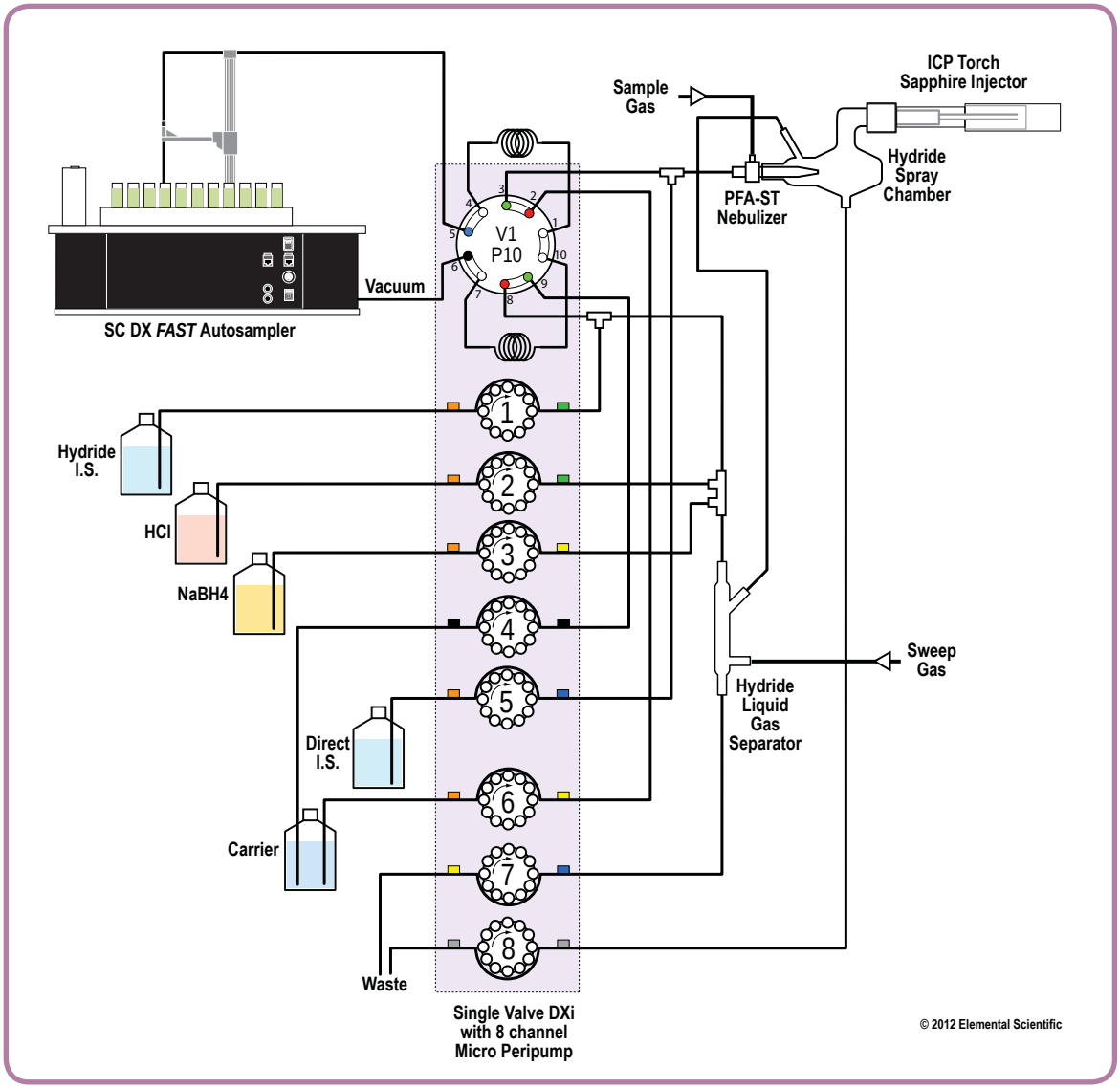
The combination of the MP^2 precision micro peripump, the hydride*FAST* gas liquid separator and the C2 dual cyclonic spray chamber are key to the excellent performance of the hydride*FAST 2*.

SC-4 DX hydride*FAST* 2 system for the PerkinElmer Optima

hydride*FAST* 2 System For PerkinElmer Optima

System	SC-DX *FAST* A/S	8 Channel *FAST* DXi Peripump & Valve	Gas Liquid Separator	Quartz Hydride C2 Chamber	PFA-ST Nebulizer	Convertible Sapphire Injector
hydride*FAST* 2	✓	✓	✓	✓	✓	✓
hydride*FAST* 2 upgrade from *FAST*		✓	✓	✓	✓	✓





hydride*FAST* 2 system diagram including autosampler and *FAST* valve

hydride*FAST* 2 for the PE Optima Detection limits (3s) for hydride-forming and non-hydride elements in hydride*FAST* mode	
Analyte	LOD (ppb)
As	0.08
Se	0.1
Hg	0.1
Sb	0.3
Ti	0.1
Mn	0.1

The hydride*FAST* 2 system has three modes of operation:

Mode 1 (hydride generation only)

Mode 2 (Simultaneous hydride generation and *FAST* nebulization)

Mode 3 (*FAST* nebulization only)

hydride*FAST* 2 Systems	
Part Number	**Description**
2HYF-2-57C	hydride*FAST* 2 system SC-2 DXi
4HYF-2-57C	hydride*FAST* 2 system SC-4 DXi
HYF-UP2-A-57	hydride*FAST* 2 upgrade from *FAST*

brine*FAST* S4™

The brine*FAST* S4 is the all-new sample introduction system for the determination of trace impurities in brines and other high matrix samples by ICPOES. Early detection of low and sub-ppb alkaline earth and transition metals in high purity brines improves chlor-alkali plant process control and prevents costly damage to fluoropolymer membrane cells. Undiluted 30% brines may be sampled and analyzed directly, eliminating sample preparation and reducing contamination.

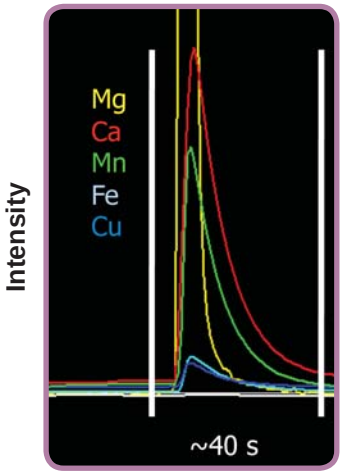
Features:

- Fully automated, inline preconcentration and matrix removal
- Direct mode with up to 50x fixed inline dilution
- Complete flexibility for preconcentration and direct analysis
  - Preconcentration
  - Direct
  - Preconcentration and Direct
- Eliminate peristaltic pump tubing
- Reduce carryover
- No daily maintenance
- Faster than the original brine*FAST*
- Detection limits in brine up to 400x better than traditional sample introduction

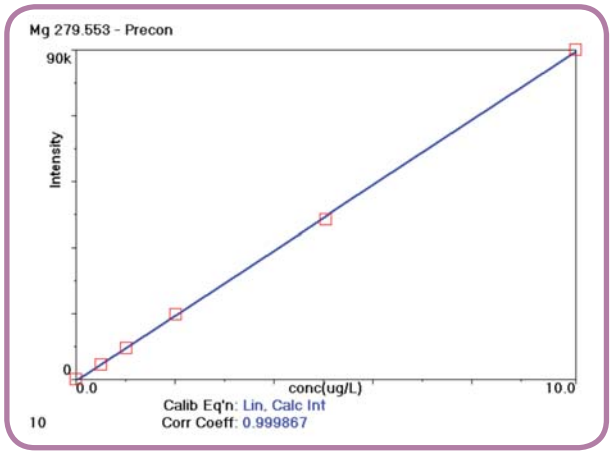
Applications:

- Preconcentration mode for determination of low and sub-ppb Ca, Mg, and other metals in 30% brine
- Chlor-alkali plant product monitoring for caustic soda and bleach
- Determination of alkali earth metals and many transition metals in any high salt matrix sample
- High throughput *FAST* analysis with inline dilution in Direct mode

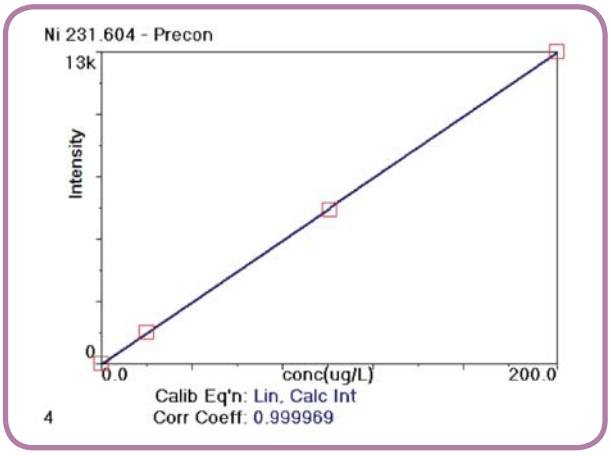
SC-2 DX brine*FAST* S4 system



Simultaneous elution profiles for preconcentration elements allows simple quantification after matrix removal.



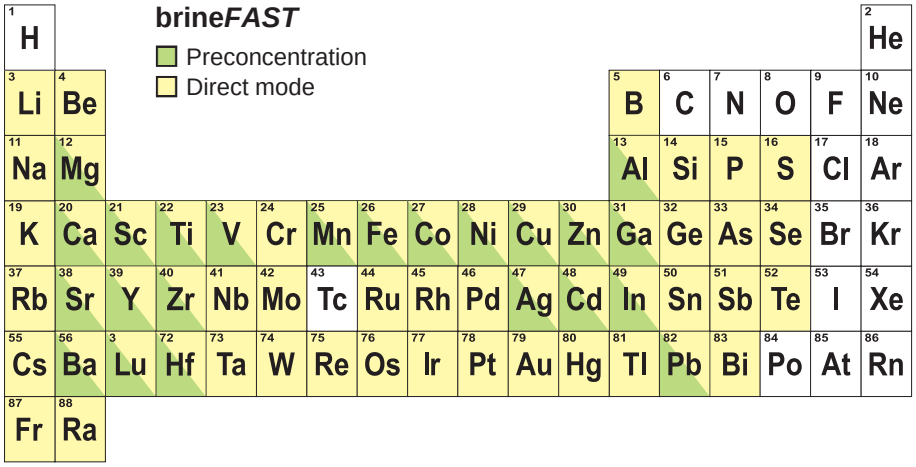
Typical calibration curve for ultra-pure brine, <10 ppb.

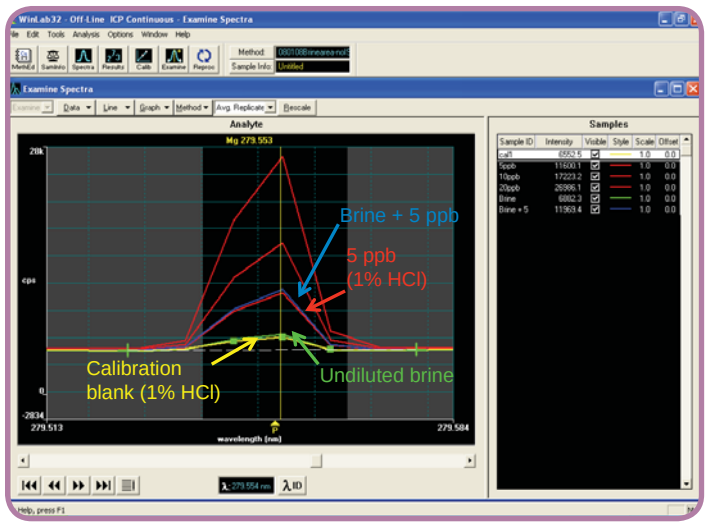


Typical calibration curve for 50% Caustic Soda (10x diluted) demonstrating linearity at higher concentrations. If needed, higher level calibrations at the ppm level are also linear.

All brine*FAST* S4 Systems Include:

- SC-DX *FAST* autosampler
- S400V syringe pump and valve module
- *FAST* DXi dual valve module and all connections
- brine*FAST* S4 concentrator column
- brine*FAST* S4 cleanup column
- Quartz C2 spray chamber
- Convertible sapphire injector





Spectral data shows equal response for a Mg spike in a 1% HCl standard and 30% brine.

Spike recovery in 50% caustic soda (10x diluted)	
Analyte	**% Recovery**
Fe	99
Ni	99
Cu	99
Pb	101

Spike recoveries in 50% Caustic soda (10x diluted) show excellent recovery against a calibration curve prepared in diluted nitric acid. Spike level is 50 ppb (500 ppb for Fe).

Percent Spike Recovery Comparison in 30% Brine		
Analyte	Traditional Introduction (spiked at 100 ppb)	brine*FAST* S4 (spiked at 5 ppb)
Ca	132	103
Mg	64	96
Fe	104	95
Ba	106	99
Sr	75	99
Mn	111	99

Comparison of spike recoveries for traditional analysis and the brine*FAST* S4 preconcentration technique. Note that the spike levels are 20x lower with the brine*FAST* S4 than with the original introduction system.

Method Detection Limits Comparison in 30% Brine			
Analyte	Traditional (ppb)	brine*FAST* S4 (ppb)	Improvement Factor
Ca	8.0	0.02	410
Mg	1.7	0.01	190
Fe	6.3	0.2	28
Ba	1.4	0.2	7
Sr	1.1	0.01	150
Mn	1.2	0.02	57

Part Number	Description
2BF-S4-57C	brine*FAST* S4 system SC-2 DXi
4BF-S4-57C	brine*FAST* S4 system SC-4 DXi

oil*FAST*™

The oil*FAST* is the fastest sample introduction system for the determination of wear metals in lubricating oils, with sample-to-sample time less than 20 seconds. When configured for inline mixing, the oil*FAST* can analyze up to 140 samples per hour.

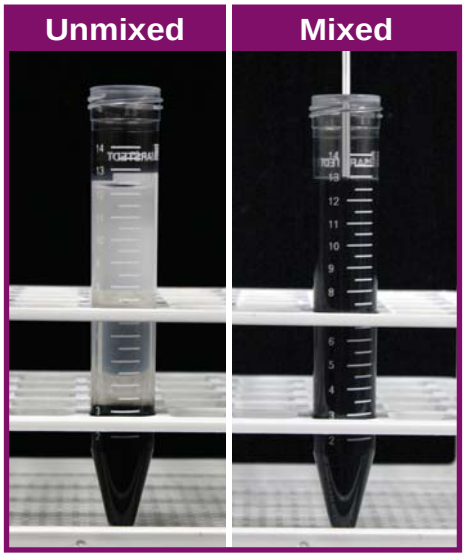
Benefits:

- Fastest sample throughput
- Fastest rinse-out
- Lowest carryover
- Reliable long-term performance with fewest moving parts
- Simple conversion from undiluted mixing
- Large channels for rapid sample loading
- Integrated sample mixing (oil*FAST* 2)
- The valve and pump module integrates to the ICP instrument

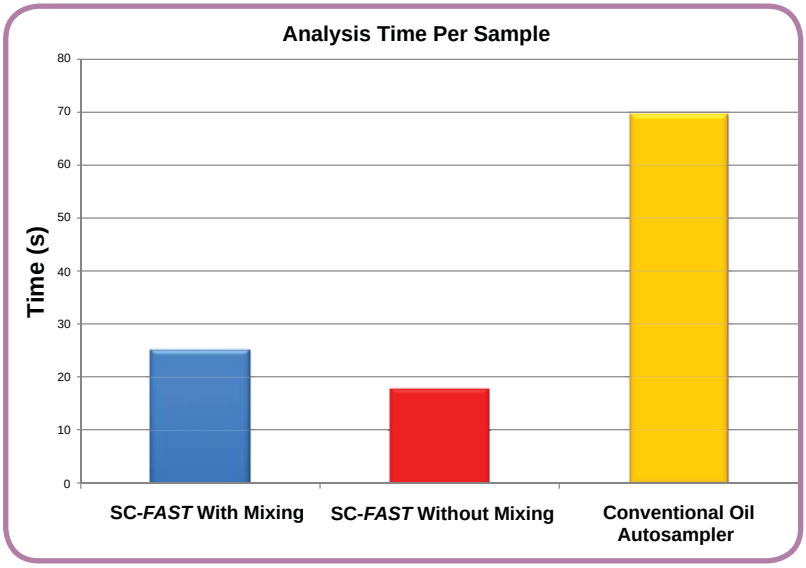
SC-4 DX oil*FAST* 2 system

oil*FAST* SYSTEMS FOR PERKINELMER OPTIMA

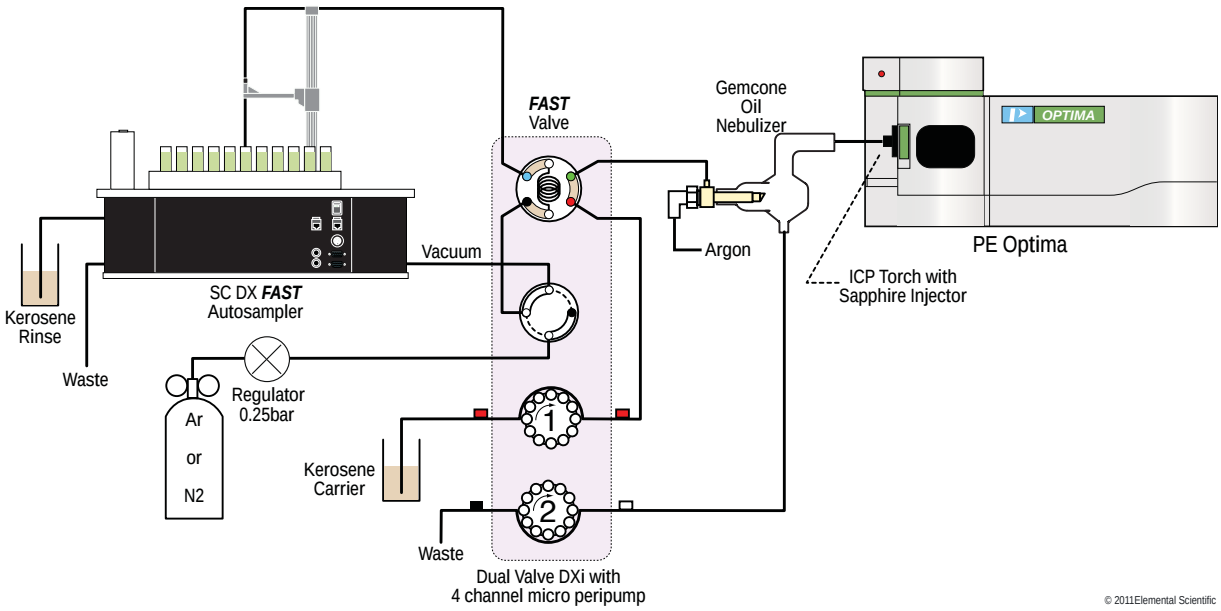
System	Description	SC-DX	Gem Cone Oil Nebulizer	Screen Tip Probe	*FAST* Injection	Sample Pre-mixing
oil*FAST* 1	SC-DX autosampler, integrated MP² precision micro peristaltic pump with *FAST* valve, Gem Cone oil nebulizer and screen tip probe	✓	✓	✓	✓	
oil*FAST* 2	SC-DX autosampler, integrated MP² precision micro peristaltic pump with dual *FAST* valves, Gem Cone oil nebulizer and screen tip probe	✓	✓	✓	✓	✓



Diesel engine oil sample with kerosene diluent, before and after 3-second mixing, using the oil*FAST 2*.



Compared to conventional autosamplers, the oil*FAST* improves sample-to-sample analysis time by a factor of 3.5 (< 17 seconds per sample).

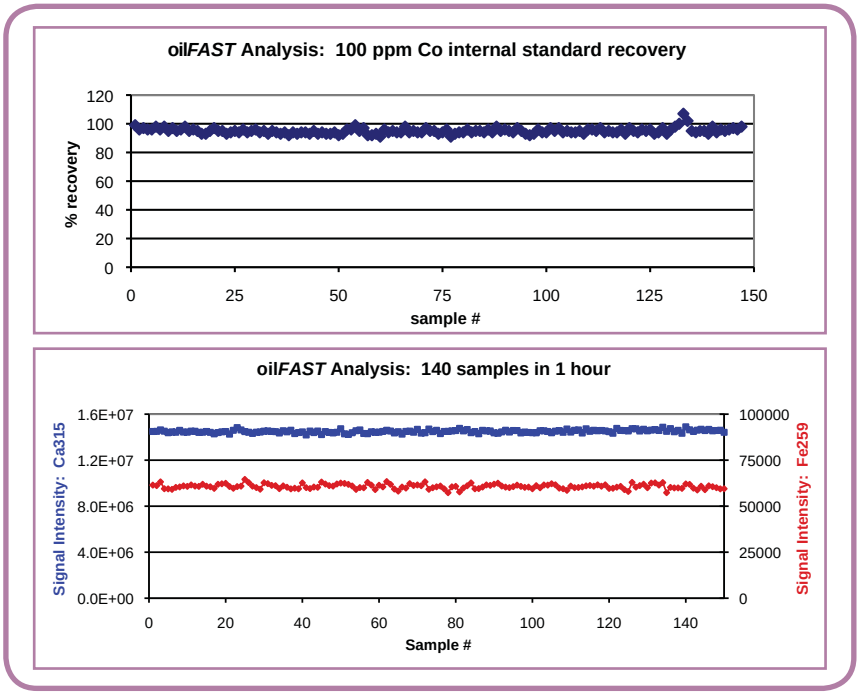


oil*FAST* 2 High-Speed ICP sample introduction system diagram, with sample pre-mixing.

Integrated sample mixing, through the ESI screen-tip mixing probe, is a low-maintenance, effective solution for mixing. The oil*FAST* 2 system can mix sample and diluent using inert gas probes. After 3 seconds bubble mixing is complete, the *FAST* vacuum loads the sample onto a loop for introduction.

Screen Tip Oil Probe

60 position metal sample rack
(See page 78 for more information)



Repeated analysis of a pooled oil sample containing Co internal standard and 21 analytes, including Ca at 4300 ppm and Fe at 8 ppm, showing stability over one hour.

Part Number	Description
4OF1-57A	oil*FAST* 1 system SC-4 DXi
8OF1-57A	oil*FAST* 1 system SC-8 DXi
4OF2-57A	oil*FAST 2* system SC-4 DXi
8OF2-57A	oil*FAST* 2 system SC-8 DXi

soil*FAST*™

The soil*FAST* combines a high-speed autosampler with fluoropolymer injection valve for robust, high-throughput sample analysis. Samples are vacuum loaded into a fluoropolymer loop in less than one second and injected into the nebulizer and micro spray chamber. Ninety Mehlich-3 soil extract samples may be determined in less than 11 minutes - only 7 seconds, sample-to-sample.

All soil*FAST* Systems Include:

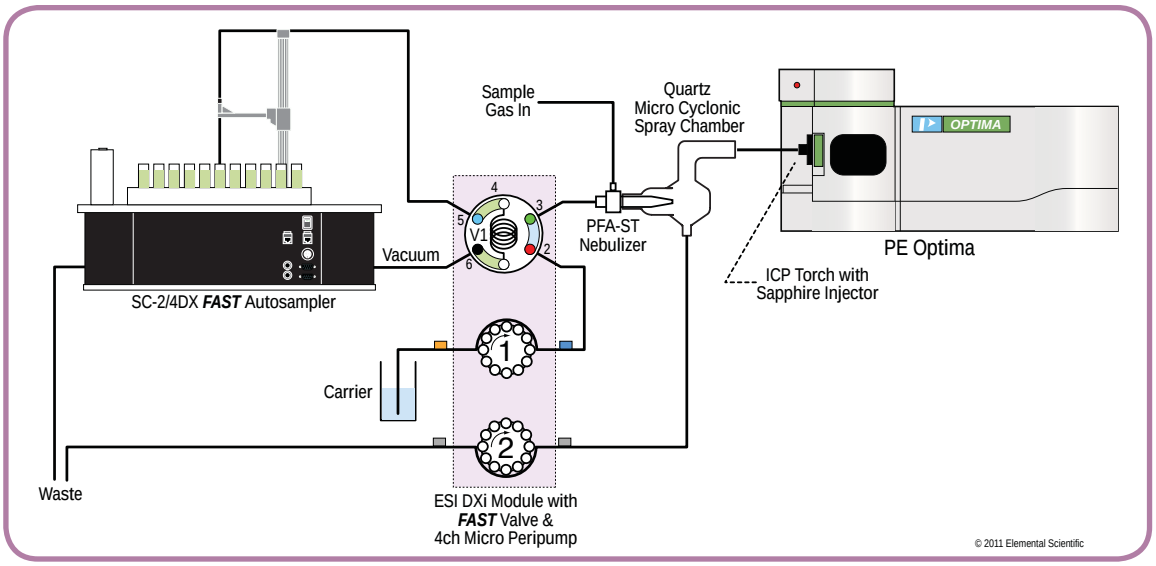
- SC-DX autosampler
- *FAST* DXi valve module and all connections
- Quartz micro cyclonic spray chamber
- Convertible sapphire injector

SC-2 DX soil*FAST* system

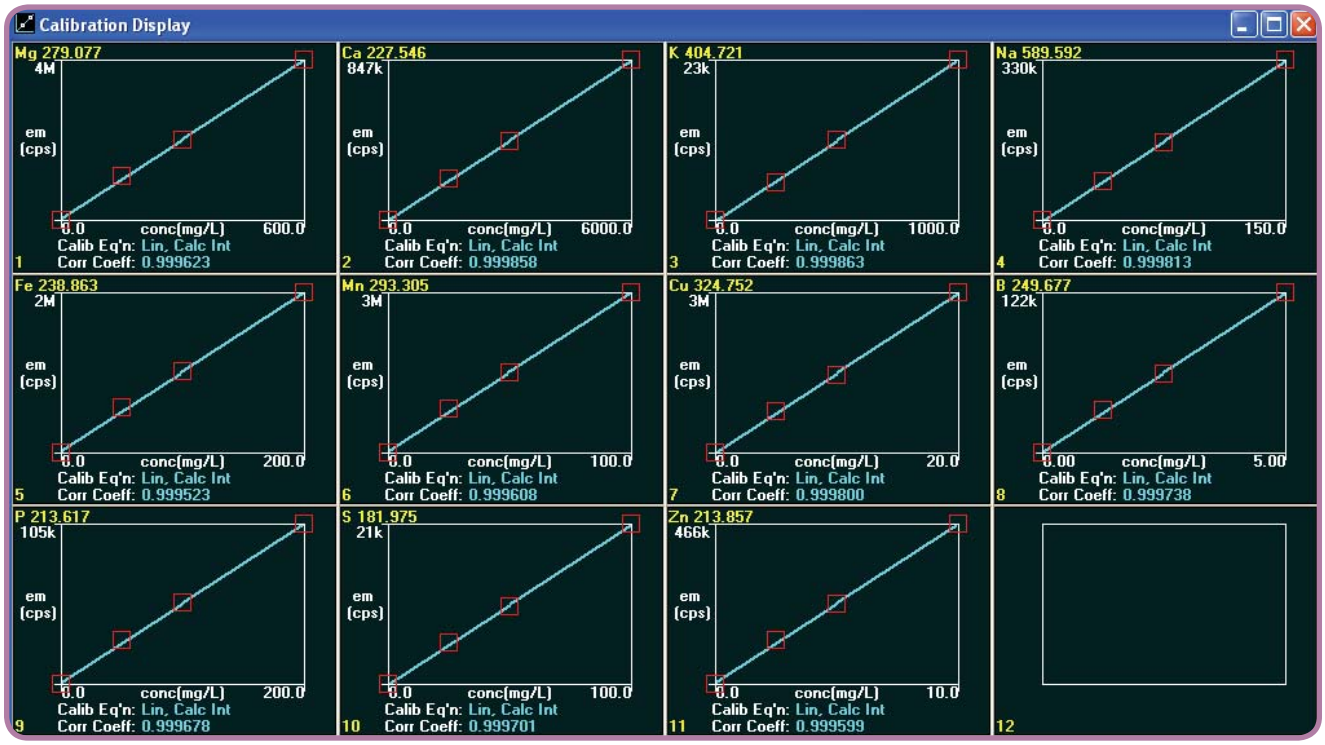
1 mm 6 port *FAST* valve and micro quartz cyclonic spray chamber

Concentration (ppm)			
Element	Spike	Determined	% Recovered
Mg	600	590	98
Ca	6000	5934	99
K	1000	968	97
Na	150	153	102
Fe	200	197	98
Mn	100	99	99
Cu	20	19.8	99
B	5	5.0	100
P	200	200	100
S	100	99	99
Zn	10	9.8	98

Typical soil*FAST* recoveries

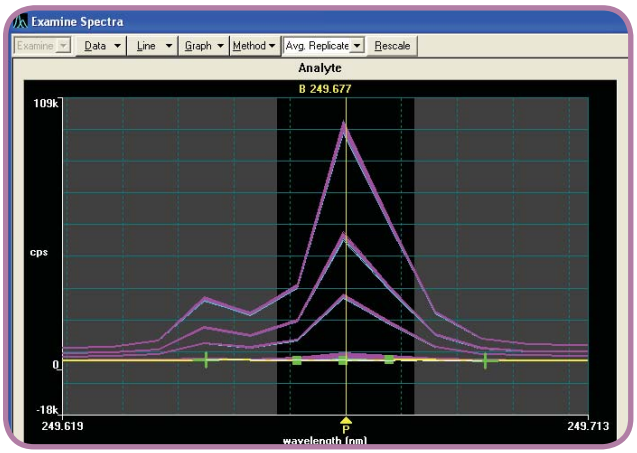


soil*FAST* system diagram



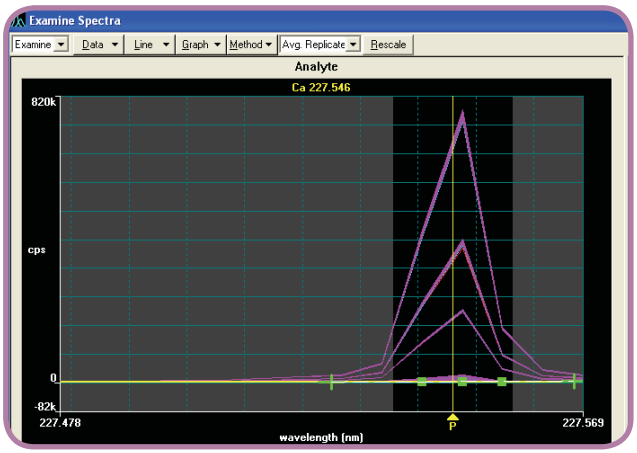
Calibration of SC-*FAST,* Optima 5300, 7 seconds sample-to-sample

Boron Reproducibility



244 boron spectral overlays. The blank, 1.25 ppm, 2.5 ppm, and 5 ppm boron standards are each analyzed 61 times.

Calcium Reproducibility



244 calcium spectral overlays. The blank, 1000 ppm, 3000 ppm, and 6000 ppm calcium standards are each analyzed 61 times.

Operating Parameters	
Sample Loop	0.1 mL
Fill Time	0.5 sec
ICP Read Delay	1 sec
Integration Parameters	Manual, 2 ms,100 reps
ICP Power	1500 W
Nebulizer Gas Flow Rate	0.5 L/min

Part Number	Description
2SLF-57C	soil*FAST* system SC-2 DXi
4SLF-57C	soil*FAST* system SC-4 DXi
8SLF-57C	soil*FAST* system SC-8 DXi
14SLF-57C	soil*FAST* system SC-14 DXi

microFAST OSP

The micro*FAST* OSP uses prep*FAST* technology to determine low ppb concentrations of metals in undiluted, volatile solvents such as methylbutane, hexane, octane, benzene, toluene, gasoline, and naphtha. One dedicated syringe loads a sample or standard onto a custom, inert injection valve. When the sample is injected into the ICP, three additional high-purity syringes, flowing at micro flow rates, perform the desired dilution and addition of internal standard.

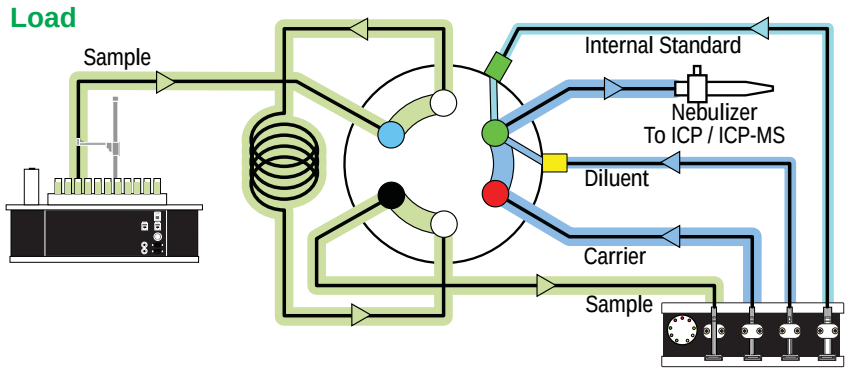
SC-2 DX micro*FAST* OSP system

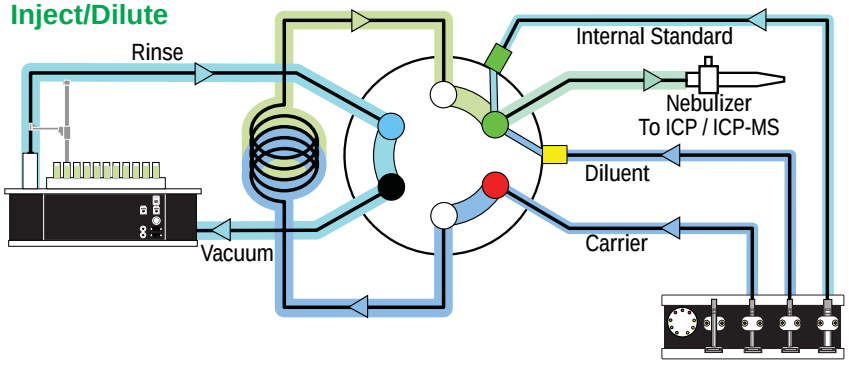
Benefits:

- All liquid flows are syringe driven
- Syringe loading of micro samples
- Autocalibration
- Automated addition of internal standard
- Inline dilution
- Analyze undiluted volatile solvents
- Micro flow rates from 5 to 40 µL/min
- High sensitivity
- Minimize or eliminate sensitivity differences due to speciation of Si and other elements

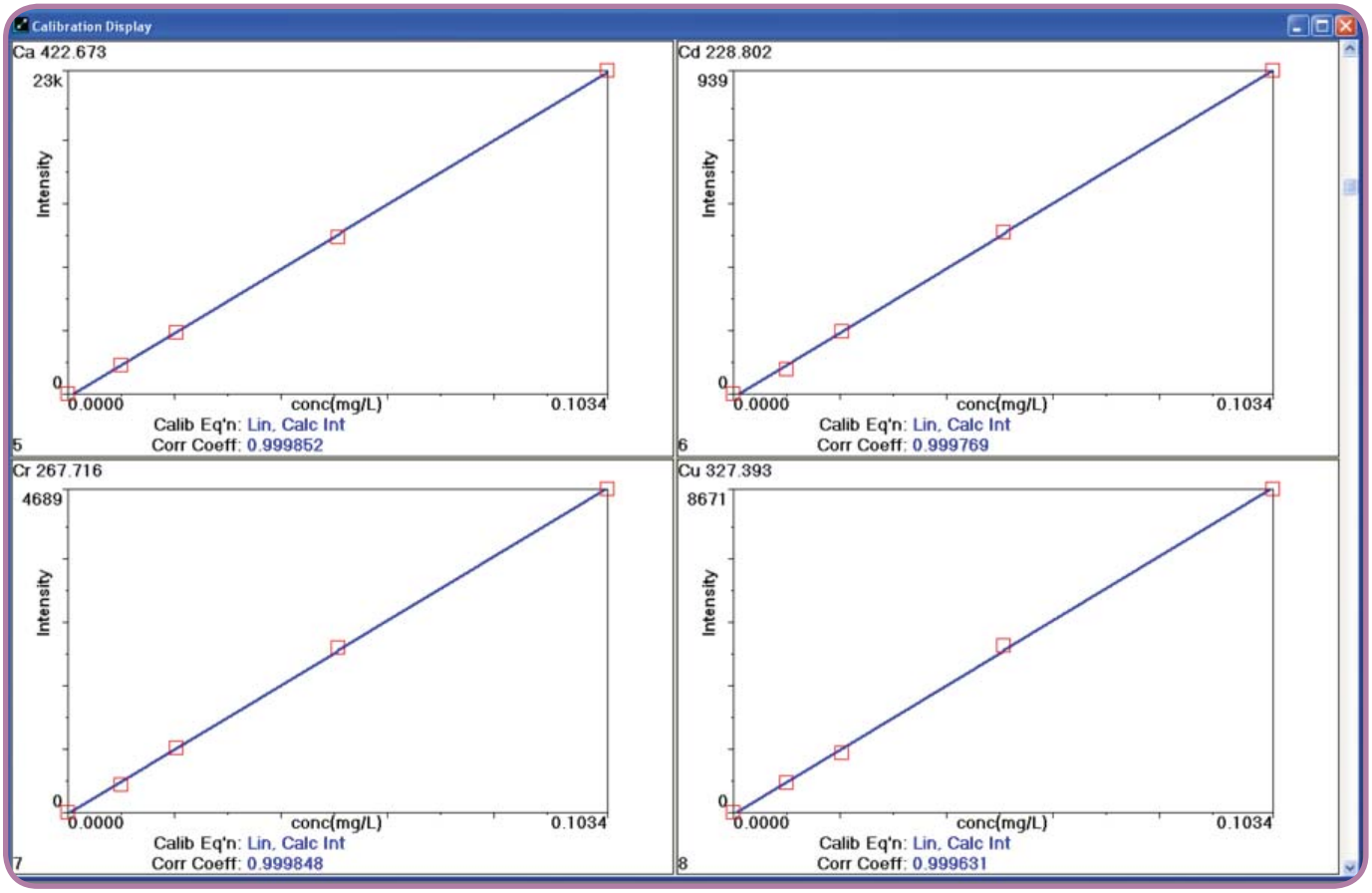
All micro*FAST* OSP Systems Include:

- SC-DX *FAST* autosampler
- *FAST* DXi valve module and all connections
- S400V syringe pump module
- Sapphire injector
- PC^{3x} Peltier controlled quartz drainless o-ring-free cyclonic spray chamber



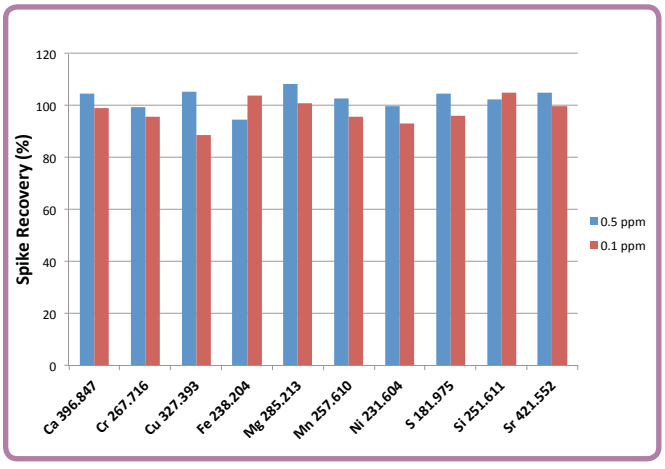


Autocalibration



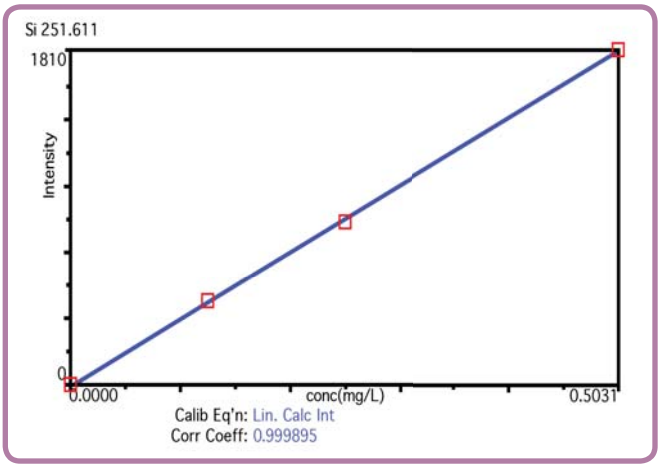
micro*FAST* OSP calibration curves prepared from a single stock standard in undiluted toluene, 10 ppb to 100 ppb.

Spike Recoveries in High TDS Organometallic Samples



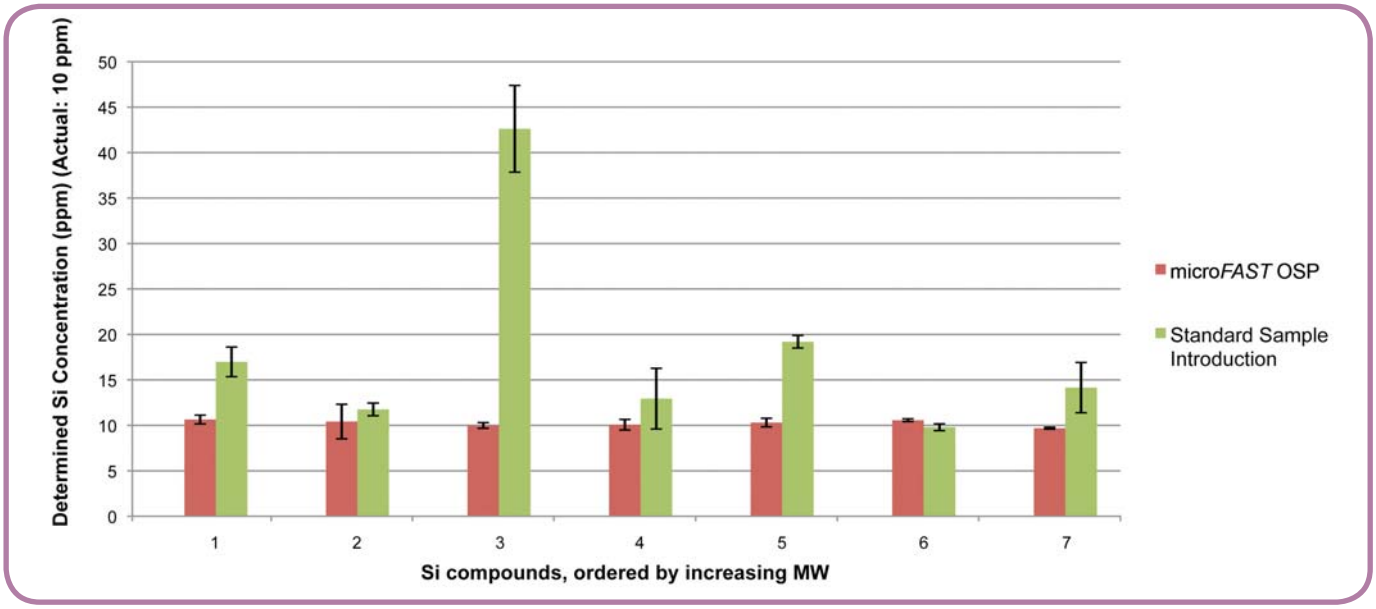
Trimethylaluminum (TMA) is a pyrophoric liquid used in semiconductor manufacturing processes. Elemental impurities in TMA can be determined by diluting it in toluene and measuring it directly with the micro*FAST* OSP. Spike recoveries at 0.1 and 0.5 ppm for various common contaminants are shown.

Calibration of Silicone Oil in Undiluted MIBK



Determination of silicone oil extracted in MIBK is of interest for quality control processes in the medical industry. The micro*FAST* OSP can automatically build the calibration from a single stock standard of silicone oil in MIBK for trace detection and determination of silicone oil in undiluted MIBK extractions.

Introduction of silanes and siloxanes in organic solvents



Instrument response from 10 ppm Si standards made from various silanes and siloxanes ranging in MW from 108 to 793. The micro*FAST* OSP dramatically reduces species-related intensity differences and allows more accurate determination of Si. Standard sample introduction: sample was diluted in kerosene and introduced at 0.8 mL/min with a PFA nebulizer and baffled quartz cyclonic spray chamber.

Detection Limits (ppb) (Sample flow rate, 10 µL/min)			
Analyte	**Heptane**	**Gasoline**	**Toluene**
Ag 328.068	1.5	25	1.4
Al 308.215	7.8	6.0	9.9
B 249.677	5.4	9.4	0.8
Ba 233.527	0.5	0.9	0.6
Ca 317.933	2.4	3.6	3.9
Cd 228.802	1.1	1.1	1.2
Cr 267.716	1	0.3	0.5
Cu 327.393	1.4	0.6	1.0
Fe 238.204	0.6	1.0	0.5
K 766.490	1.7	14	36
Mg 285.213	1.1	0.8	0.9
Mn 257.610	0.3	0.4	0.8
Mo 202.031	2.6	1.9	2.1
Ni 221.648	10	0.4	0.5
Pb 220.353	14	1.6	3.6
Sb 206.836	10	2.6	5
Si 251.611	2	1.1	0.5
Sn 189.927	4	1.5	1.6
Ti 334.940	1.3	0.7	0.6
V 290.880	0.8	0.7	0.4
Zn 206.200	1.2	1.4	0.6

MW	Si-containing Compound
108.64	chlorotrimethylsilane
144.33	tetraethylsilane
162.38	hexamethyldisiloxane
186.40	divinyltetramethyldisiloxane
222.47	hexamethylcyclotrisiloxane
296.61	octamethylcyclotetrasiloxane
793.19	octaphenylcyclotetrasiloxane

Part Number	Description
2MFP-57C	micro*FAST* OSP system SC-2 DXi
4MFP-57C	micro*FAST* OSP system SC-4 DXi

brine*FAST* S4™

Improved Detection Limits For Alkaline Earth And Transition Metals In High Purity Brines

The brine*FAST* is a fully-automated, online preconcentration and matrix removal system that improves detection limits for Ca, Mg, Fe, Ba, Sr, Mn and other elements in undiluted brines by more than an order of magnitude.

See page 30 for more information.

Elemental Scientific

PFA and Polypropylene High-Efficiency MicroFlow Nebulizers

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

PFA-ST Nebulizers

HF

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

Benefits:

- All PFA construction
- Exchangeable uptake capillaries allow one nebulizer to be used at different self-aspiration rates from 20 µL/min to 700 µL/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-2040-57	PFA-ST self-aspirating nebulizer with external 1/4-28 threaded connector.

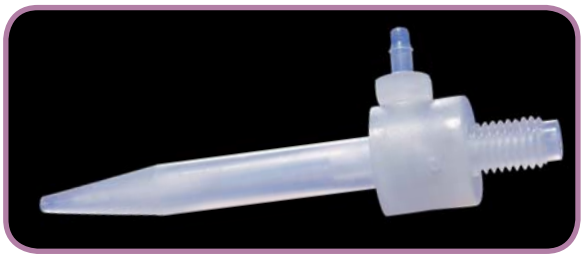
Part Number	Description
ST3-57	PFA-ST3 MicroFlow nebulizer with external 1/4-28 threaded connector. Designed for superior clog resistance and higher sensitivity compared to the standard PFA nebulizer.

Part Number	Description
ES-2030-57	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.

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-4040-57	Poly-pro self-aspirating nebulizer with external 1/4-28 threaded connector



apex MicroFlow PFA Self-Aspirating Nebulizers

HF ppq

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 µL/min self-aspiration capillary.
ES-2002-7205-080	High temperature apex-100 PFA nebulizer with Ultem manual sampling probe, 90-150 µL/min, 80 cm capillary

Syringe Flush Kit

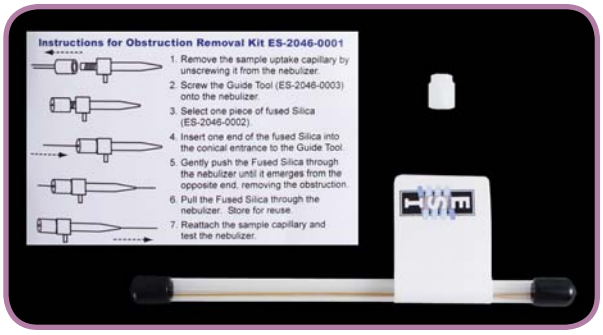
Use syringe and white adapter to back-flush the carrier line or tee-line. Use syringe and red adapter to forward flush the carrier line, the side port of the tee-line, and to forward flush the PFA nebulizer.

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.

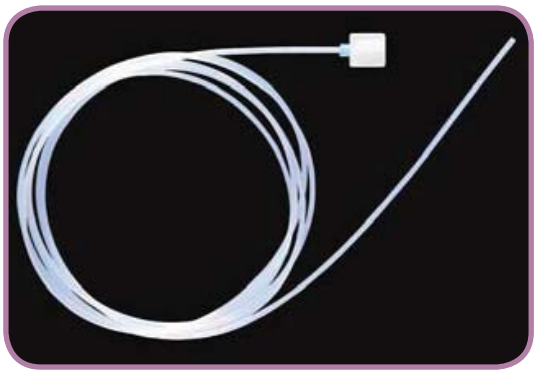
Part Number	Description
ES-2046-0001	Fused silica obstruction removal kit for ST-type nebulizers. Includes one guide, 10 pieces of fused silica and instructions.

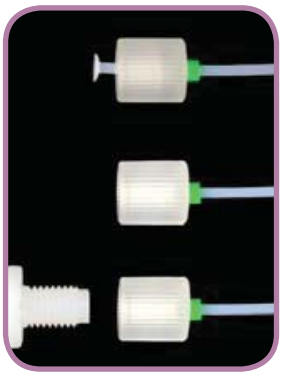


Sample Capillaries / Probes

PFA Sample Capillaries for ST Nebulizers

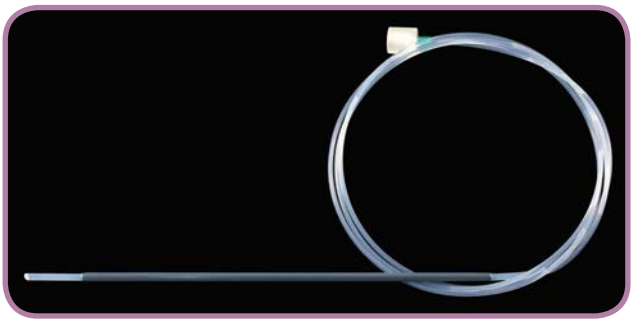
Part Number	I.D.	Self-aspiration rate (@1L/m Ar)
ES-2045	0.15 mm	20 µL/min (red)
ES-2043	0.20 mm	50 µL/min (purple)
ES-2042	0.25 mm	100 µL/min (green)
ES-2047	0.30 mm	200 µL/min (yellow)
ES-2041	0.50 mm	400 µL/min (orange)
ES-2044	0.80 mm	700 µL/min (blue)
ES-2049	1.00 mm	1 mL/min (gray)





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.



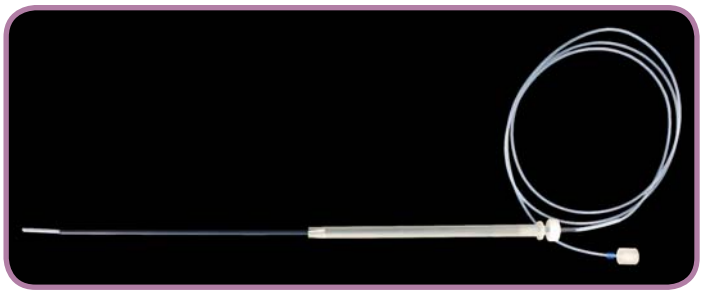
Probes for ESI SC Autosamplers			
Part Number	Probe i.d.	Capillary Length	Self-aspiration rate (@1L/m Ar)
ES-5037-3250-080	0.25 mm	80 cm	100 µL/min
ES-5037-3500-080	0.50 mm	80 cm	400 µL/min
ES-5037-3250-100	0.25 mm	100 cm	100 µL/min
ES-5037-3500-100	0.50 mm	100 cm	400 µL/min

Also available with Ultem support.

Probes for PE S10 Autosamplers			
Part Number	Probe i.d.	Capillary Length	Self-aspiration rate (@1L/m Ar)
ES-5037-9250-100	0.25 mm	100 cm	100 µL/min
ES-5037-9500-100	0.50 mm	100 cm	400 µL/min

Also available with Ultem support.

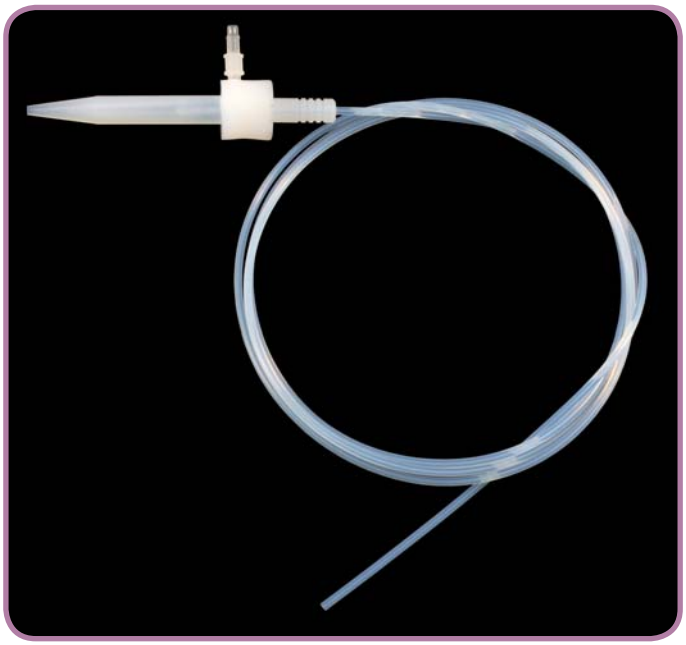
Probes can be custom-made to specific lengths and materials at no extra charge.



PFA Nebulizers with Integrated Capillaries

PFA Nebulizers with Integrated Capillaries

Self-aspirating 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.



Benefits:

- 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 µL/min
PFA-50	ES-2000	50 µL/min
PFA-100	ES-2002	100 µL/min
PFA-200	ES-2003	200 µL/min
PFA-400	ES-2005	400 µL/min

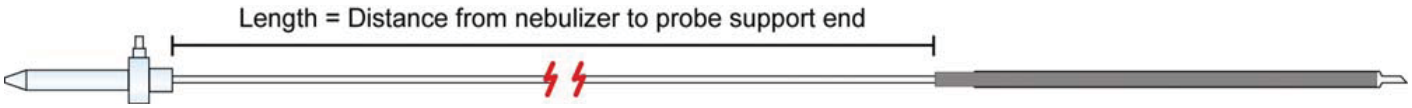
Other flow rates made to order

PFA Nebulizers with Integrated Probes

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 µL/min	100 cm
PFA-50	ES-2000-3503-100	50 µL/min	100 cm
PFA-100	ES-2002-3503-100	100 µL/min	100 cm
PFA-200	ES-2003-3503-100	200 µL/min	100 cm
PFA-400	ES-2005-3503-100	400 µL/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 µL/min	100 cm
PFA-50	ES-2000-3505-100	50 µL/min	100 cm
PFA-100	ES-2002-3505-100	100 µL/min	100 cm
PFA-200	ES-2003-3505-100	200 µL/min	100 cm
PFA-400	ES-2005-3505-100	400 µL/min	100 cm

Also available with PEEK support and for S10 Autosampler

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 46 for more information.

Enhance Your Detection Limits, Reduce Sample Contamination

Elemental Scientific

MEINHARD®

Concentric Nebulizers for ICPOES

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

Each MEINHARD® Plus nebulizer comes with the FitKit+ gas and sample quick connect fittings. The connections are made with high-purity PFA, minimizing the chance of contamination during backflow events. The gas connection fits snugly over the maria on the sidearm of the nebulizer.

Features for all MEINHARD® Plus Nebulizers:

- Self aspiration rate 0.5 mL/min with argon flow 1 L/min at 50 PSI (3.4 bar/345 kPa).
- Peristaltic pumped rate 0.1 mL/min to 3.0 mL/min.
- Includes FG Gas Quick Connect (PFA) and F2 Quick Connect with 0.5 mm i.d. ■ (orange marker) capillary, 70 cm.

Quartz Nebulizers

NEW SilQ+ Ultra-high Purity Quartz Nebulizer

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

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

NEW TQ+ Quartz Nebulizer

- Quartz
- Low blank levels compared to glass nebulizers

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

Glass Nebulizer

NEW TR+ Glass Nebulizer

- Borosilicate glass
- Economical

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

Quartz and Glass High Purity Nebulizers

NEW SilQ+ High Purity Quartz Nebulizer

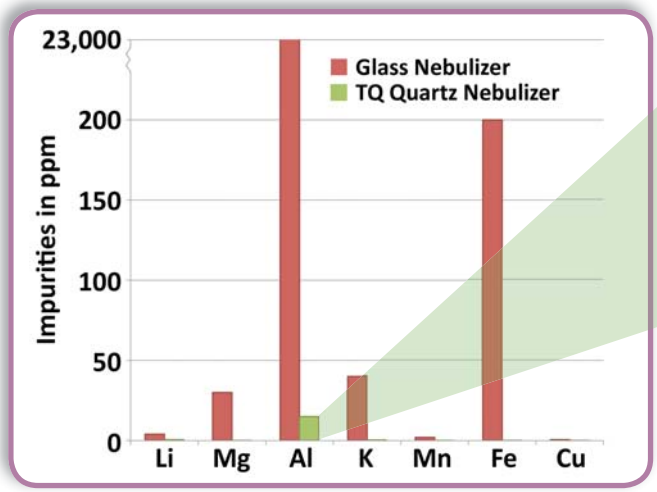
The SilQ$^+$ nebulizer by MEINHARD® is perfect for applications requiring high sensitivity. Made from the highest purity synthetic quartz, the SilQ$^+$ nebulizer has low levels of trace elemental impurities, reducing the risk of sample contamination. SilQ$^+$ nebulizers improve wash-out rates and generate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

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

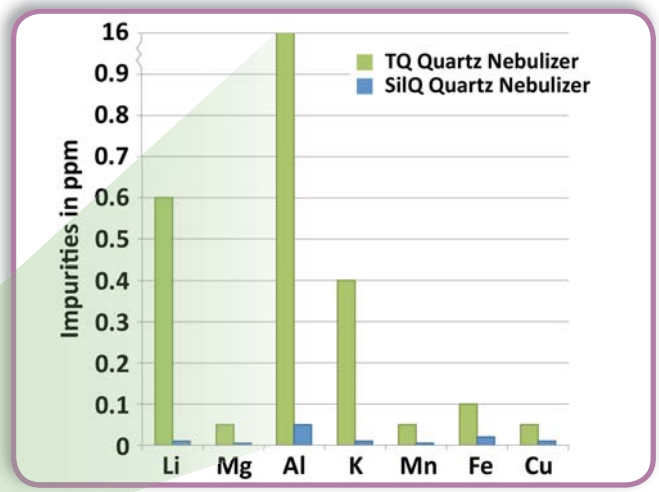
Each nebulizer is manufactured and tested to exacting specifications. The standard SilQ$^+$ nebulizer requires 50 psi for 1 L/min of argon carrier and 0.5 mL/min solution uptake. Other versions are available.

MEINHARD® SilQ$^+$ high purity nebulizer with 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 SilQ$^+$ and TQ$^+$ Quartz nebulizers. SilQ$^+$ impurities on average are 60 times lower than standard quartz nebulizers. Aluminum impurities in SilQ$^+$ nebulizers are more than 400,000 times lower than glass.

NEW Plus Nebulizer PFA FitKit Quick Connects

FG Gas Quick Connect for MEINHARD® Nebulizers

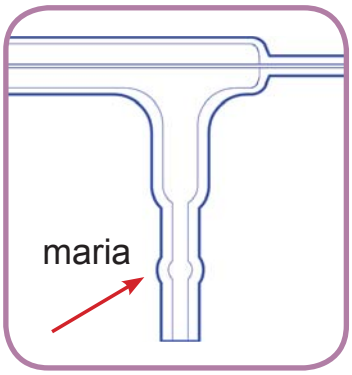
FG Gas Quick Connect for MEINHARD® Nebulizers with maria for both small bore and standard bore nebulizers.

Part Number	Application
FG	For use with all MEINHARD® nebulizers

FG Gas Quick Connect with connector for PFA tubing

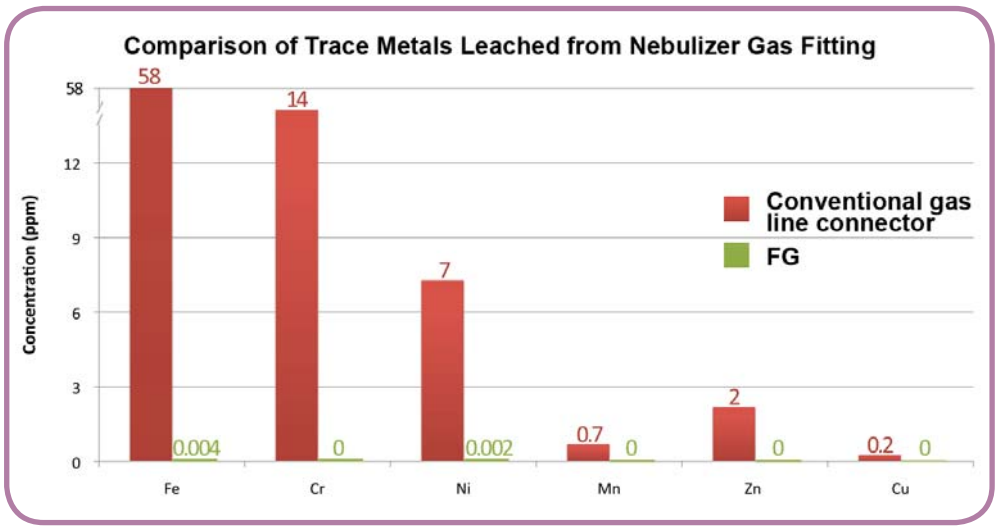
Elemental Scientific introduces the PFA FitKit Quick Connects, a revolutionary new gas and sample fitting system for MEINHARD® Plus nebulizers. The kit includes a gas connection (FG), standard integrated capillary sample connection (F2) and two other sample connection (F1 and F0) options to choose from.

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 ICP 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:

- 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

Convenient PFA Connectors

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 ICP applications.

Benefits:

- 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

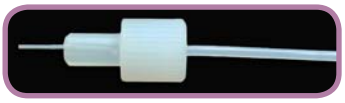
F2 Standard integrated capillary for self-aspiration or pumping. Includes 0.5 mm i.d. ■ (orange marker) 70 cm long capillary.

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

F0 Encapsulated Micro Tubing

F0 Encapsulated micro tubing for low uptake rates from 0.1 to 0.5 mL/min and the lowest internal volume of any nebulizer. Includes 0.25 mm i.d. ■ (green marker) 70 cm long micro capillary.

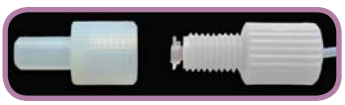
Part Number	Application
F0-25	Compatible with all MEINHARD® Plus nebulizers.



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.



pergo Nebulizer Gas Humidifier

pergo High Solids Accessory

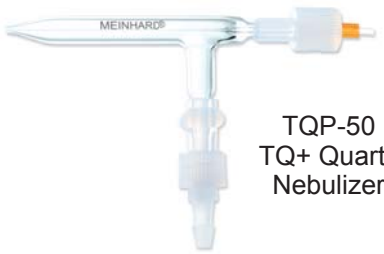
The *pergo* improves performance of all MEINHARD® nebulizers for the routine analysis of brines, fusion digests and other high TDS samples.

A high-pressure membrane positioned inside a temperature-controlled water reservoir perfuses water vapor into the ICP nebulizer gas stream. By increasing humidity in the argon nebulizer gas, the *pergo* prevents salt deposits at the nebulizer tip, improving short and long-term signal stability.

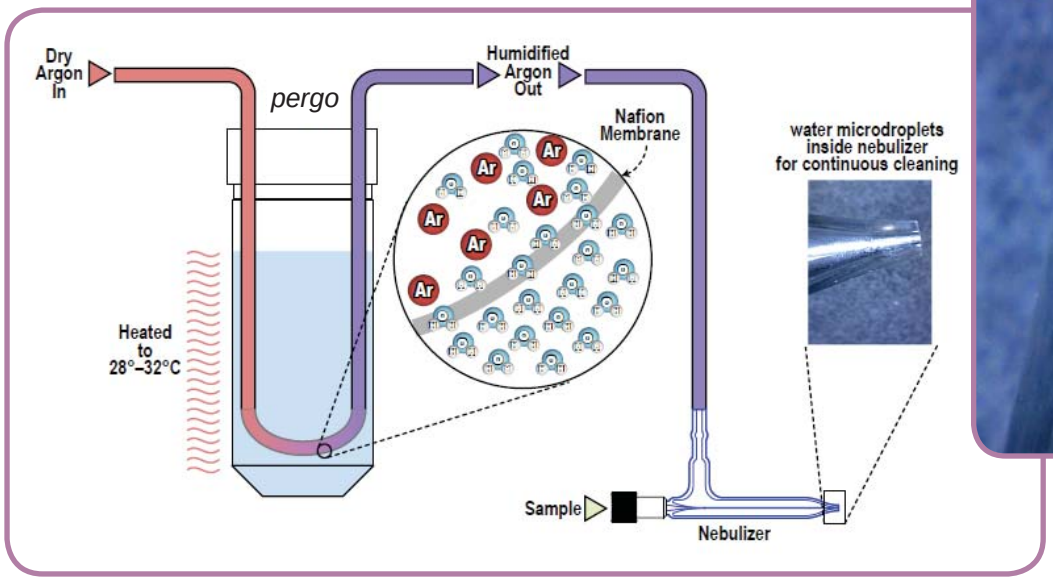
PRG-01-MAPlus *pergo* high solids accessory with TQ+ MEINHARD® nebulizer

Benefits:

- Improved RSDs
- Improved short and long-term stability
- Improved detection limits
- Faster washout
- Ability to use high sensitivity nebulizers for high TDS samples
- Reduce long-term drift
- Extends the length of analytical runs

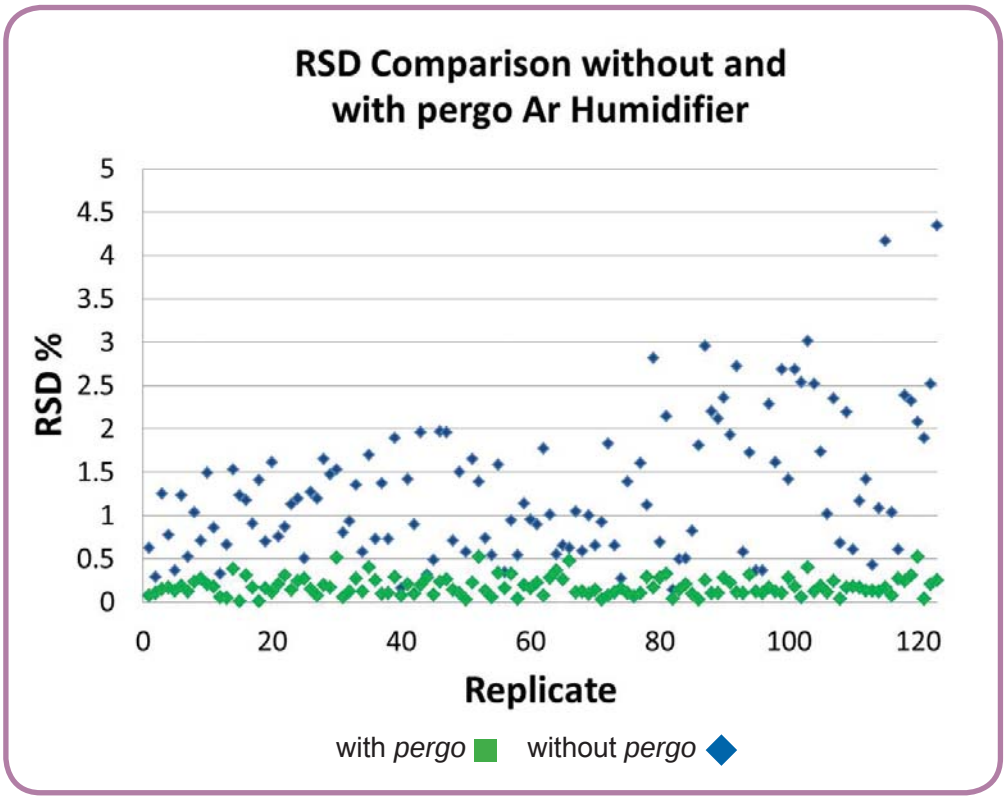


TQP-50
TQ+ Quartz
Nebulizer



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

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

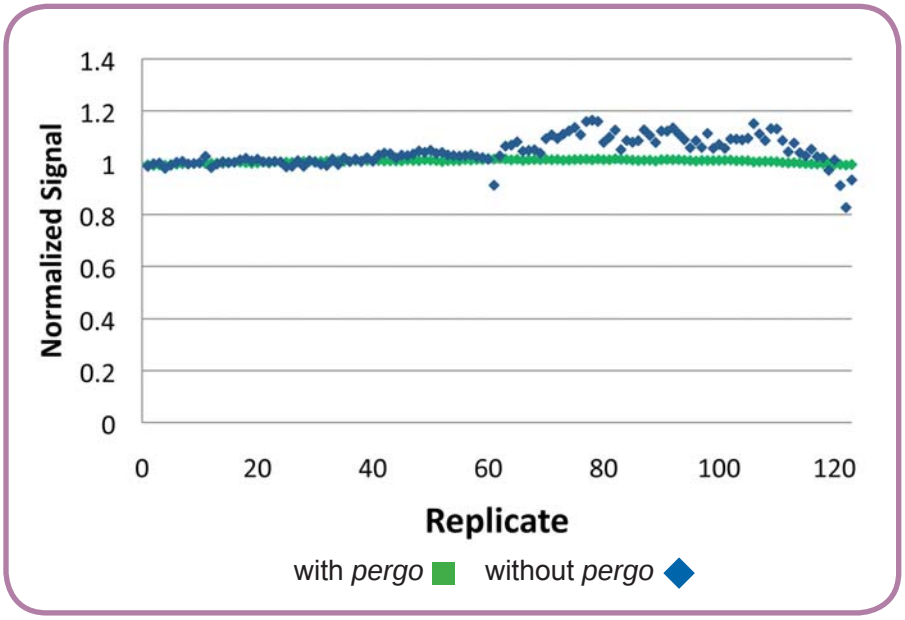


RSDs for seawater samples improve with the *pergo*.

The unique *pergo* design offers many advantages over other types of argon humidifiers.

Advantages:

- Higher, more consistent humidity
- Superior long-term stability for high TDS samples
- Safe and easy to use
  - Atmospheric pressure water reservoir
- Optional USB communication for programmable humidity levels



Long-term stability is improved with the *pergo*, reducing drift and extending the length of the analytical run when salty samples are analyzed.

Part Number	Description
PRG-01	*pergo* argon high solids accessory. Includes nebulizer gas line connector kit.
PRG-01-MAPlus	*pergo* argon high solids accessory. Includes a MEINHARD® Type A Plus high performance nebulizer.

Spray Chambers

NEW!

C2 Dual Cyclonic Spray Chambers

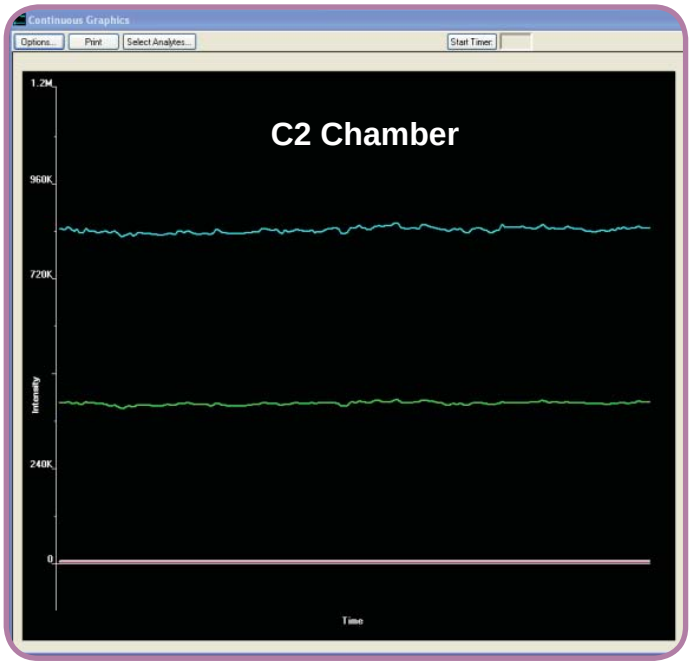
The C2 dual cyclonic spray chamber improves both sensitivity and precision with its unique dual cyclonic aerosol flow path, improving detection limits. Even at very high sample flow rates, the C2 chamber significantly reduces droplet buildup in the injector that can cause plasma instability or outages. The C2 chamber reduces the chance of accidental torch flooding events, preventing costly damage to the torchbox components.

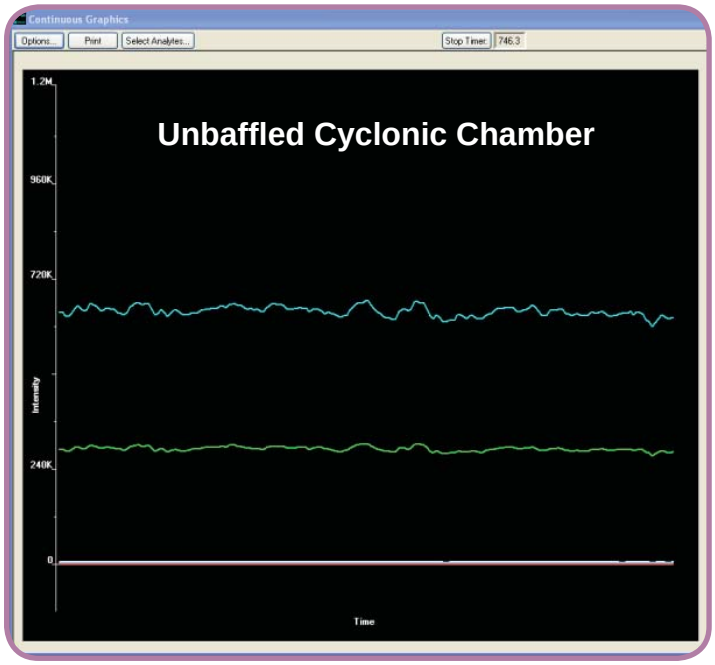
Part Number	Description	Application
ES-3D57-1111-19	Quartz C2 dual cyclonic spray chamber, threaded drain port, connection for ESI injector, drain line assembly included (ES-2044-0006)	Used for improved precision and low blanks.

C2 quartz chamber

Part Number	Description	Application
ES-3H57-1111-19	Quartz hydride C2 dual cyclonic spray chamber, threaded drain port, connection for ESI injector, hydride gas port, drain line assembly included (ES-2044-0006)	Used for improved precision and low blanks. Hydride gas port for use with hydride*FAST* or with any additional gas.

C2 quartz hydride chamber with additional gas port





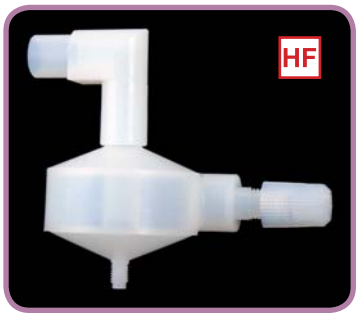
The C2 chamber improves sensitivity and precision compared to the standard unbaffled cyclonic chamber, which improves detection limits and analytical quality.

Spray Chambers / PFA Elbow Adapters

Part Number	Description	Application
ES-3157-1401-21	O-ring-free quartz cyclonic spray chamber, hydride gas port, drain line included (ES-2044-0002)	Chamber for hydride*FAST*, or additional gas. Provides low blanks.

Part Number	Description	Application
ES-3157-1001-21	Quartz (unbaffled) cyclonic spray chamber, drain line included (ES-2044-0002)	All-purpose for non-HF samples. Provides excellent sensitivity, stability and low blanks.
ES-3157-1011-21	Quartz (7 mm baffle) cyclonic spray chamber, drain line included (ES-2044-0002)	

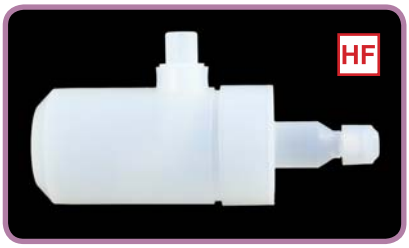
Part Number	Description	Application
ES-3157-3011-21	PFA (7 mm baffle) cyclonic spray chamber, drain line included (ES-2044-0002)	All-purpose, offers resistance to hydrofluoric acid while maintaining the benefits of cyclonic spray chambers.



Part Number	Description	Application
ES-5103-4090	PFA elbow adapter for PerkinElmer Optima injector	Connects ESI cyclonic spray chambers to standard Optima injector

Part Number	Description	Application
ES-5103-4070	PFA elbow adapter for ESI injector	Connects ESI cyclonic spray chambers to standard ESI injector

Part Number	Description	Application
M157-5470	PFA 47mm M100 spray chamber with o-ring-free PFA endcap, drain line included (ES-2044-0002)	All-purpose, offers resistance to hydrofluoric acid.



Spray Chambers

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-3457-1011-19	Quartz (7 mm baffle) micro cyclonic spray chamber, drain line included (ES-2044-0002)	Used with soil*FAST* and other aqueous applications

Part Number	Description	Application
ES-3457-1021-19	Quartz (5 mm baffle) micro cyclonic spray chamber with additional gas port, drain line included (ES-2044-0002)	Used with oil*FAST* and organic solvent applications, optional oxygen addition, not for use with aqueous solutions

G1 Cyclonic Spray Chambers for Optima

The new G1 o-ring-free cyclonic spray chamber connects to the standard Optima injector base, offering the advantages of sensitivity, washout, and solvent and chemical resistance.

Part Number	Material	Description	Application
G1-57-Q	Quartz	G1 o-ring-free unbaffled cyclonic spray chamber	For a wide range of non-HF applications. Quartz offers low blanks, while glass is more economical for many applications.
G1-57-P	Pyrex		
G1-57-BQ	Quartz	G1 o-ring-free baffled cyclonic spray chamber	
G1-57-BP	Pyrex		

Drain line included (ES-2044-0002)

ES-3157-1009-13 quartz cylonic spray chamber mounted to the Optima

PerkinElmer standard ceramic injector

Convertible Injectors for Optima

Convertible Sapphire Injector and Adapter

Sapphire injectors are used for environmental, geochemistry, and HF applications. This injector includes the black PEEK adapter (ES-5787) to convert for use with Optima 4000/5000/7000 series instruments.

Part Number	Size	Description
ES-1503-8157	1.5 mm	Convertible sapphire injector. HF-resistant.
ES-1503-8187	1.8 mm	Convertible sapphire injector. HF-resistant. Supplied with most *FAST* systems for the Optima

Convertible Quartz Injector and Adapter

Quartz injectors are recommended for non-HF applications. This injector includes the black PEEK adapter (ES-5787) to convert for use with Optima 4000/5000/7000 series instruments.

Part Number	Size	Description
ES-1524-8107	1.0 mm	Convertible quartz injector for organic solvents.
ES-1524-8157	1.5 mm	

Threaded Adapter for ESI Convertible Injectors

Part Number	Description
ES-5787	Replacement black PEEK threaded adapter for ESI convertible injectors

Injectors for Optima 8x00 Series Standard Torches

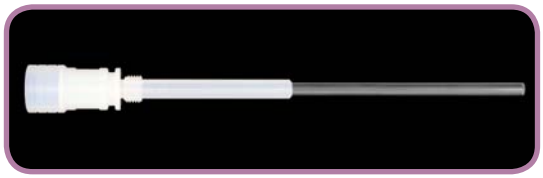
Optima 8x00 Series Quartz Torches

Part Number	Description
ES-1402-8000	Demountable quartz torch, no slot, short for organic solvents
ES-1402-8001	Demountable quartz torch, one slot, copper strip
ES-1402-8003	Demountable quartz torch, three slots

Sapphire Injectors

Sapphire injectors are used for environmental, geochemistry, and HF applications on the Optima 8x00 series instruments.

Part Number	Size	Description
ES-1503-8150	1.5 mm	Sapphire injector. HF-resistant.
ES-1503-8180	1.8 mm	
ES-1503-8250	2.5 mm	



Quartz Injectors

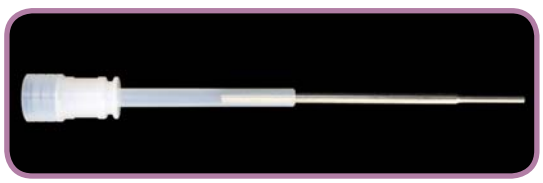
Optima 8x00 series quartz injectors are used for volatile organic solvent introduction and recommended for a wide range of non-HF applications.

Part Number	Size	Description
ES-1524-8100	1.0 mm	Quartz injector for organic solvents.
ES-1524-8150	1.5 mm	Quartz injector
ES-1524-8200	2.0 mm	Quartz injector
ES-1524-8250	2.5 mm	Quartz injector. Improved stability for high matrix/high TDS environmental samples.

Platinum Injectors

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

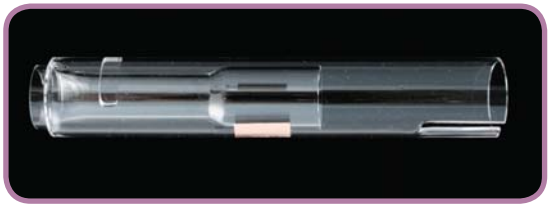
Part Number	Size	Description
ES-1513-8100	1.0	Platinum injector
ES-1513-8150	1.5	
ES-1513-8200	2.0	



Injectors for Optima 4x00, 5x00 and 7x00 Series Standard Torches

Optima 4x00, 5x00 and 7x00 Quartz Torches

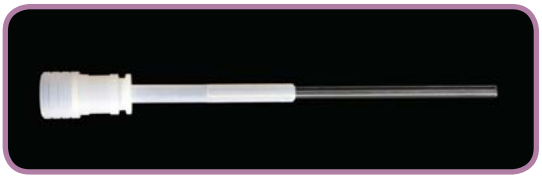
Part Number	Description
ES-1402-4001	Demountable quartz torch, no slot, short for organic solvents
ES-1402-4000	Demountable quartz torch, one slot, copper strip
ES-1402-4004	Demountable quartz torch, three slots



Sapphire Injectors

Sapphire injectors are used for environmental, geochemistry, and HF applications on the Optima 4x00, 5x00 and 7x00 series instruments.

Part Number	Size	Description
ES-1503-4150	1.5 mm	Sapphire injector. HF-resistant.
ES-1503-4180	1.8 mm	
ES-1503-4250	2.5 mm	



Quartz Injectors

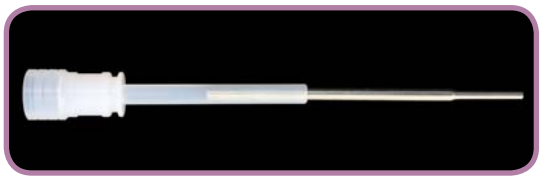
Quartz injectors for the Optima 4x00, 5x00 and 7x00 series instruments are recommended for a wide range of non-HF applications.

Part Number	Size	Description
ES-1524-4100	1.0 mm	Quartz injector for organic solvents.
ES-1524-4150	1.5 mm	Quartz injector
ES-1524-4200	2.0 mm	Quartz injector
ES-1524-4250	2.5 mm	Quartz injector. Improved stability for high matrix/ high TDS environmental samples.

Platinum Injectors

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

Part Number	Size	Description
ES-1513-4100	1.0	Platinum injector
ES-1513-4150	1.5	
ES-1513-4200	2.0	



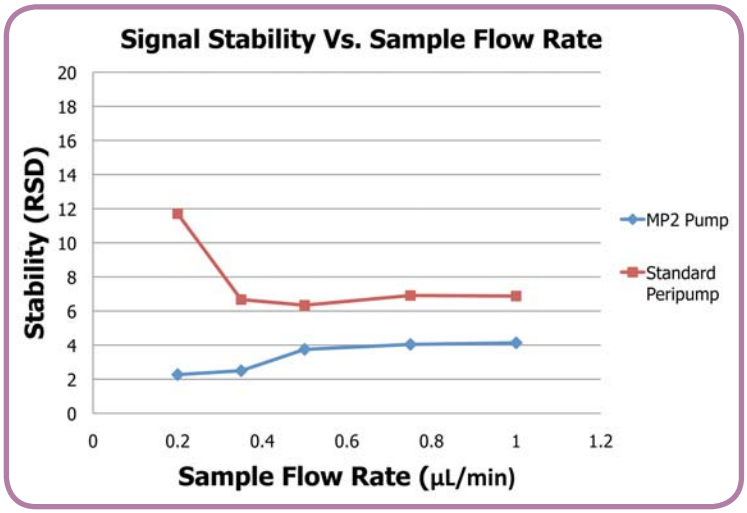
Integrated MP² Precision Micro Peristaltic Pumps for the PerkinElmer Optima

The MP² (Micro Peristaltic Pump) provides better stability than standard peristaltic pumps. Roller configuration and precision machining minimizes gaps between rollers, resulting in even pressure points along the pump tubing. Reduced pump pulsation improves signal stability, data quality and detection limits.

MP2-4-57
integrated precision
micro peristaltic pump

Benefits:

- Pump design extends tubing lifetime
- Stand alone and integrated versions
- Chemically resistant
  - Ceramic pins and PTFE-coated metal components are resistant to acids and organic solvents
- Pump network software control
- Precision
- Low pulsation
  - 12 closely-spaced rollers improve signal stability
- Optimized for all 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 MP²)
- 3, 4 and 6 channels (integrated MP²)



MP² shows improved low flow stability compared to a standard peripump

MP² Optima Specifications:

Channels:

1-6 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.

Part Number	Description
MP2-3-57	MP² integrated 3 channel precision micro peristaltic pump
MP2-4-57	MP² integrated 4 channel precision micro peristaltic pump
MP2-6-57	MP² integrated 6 channel precision micro peristaltic pump

Stand Alone MP² Precision Micro Peristaltic Pumps

MP² Precision Micro Peristaltic Pumps

The MP² 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 MP² uses either MPP tubing or standard 3-stop pump tubing.

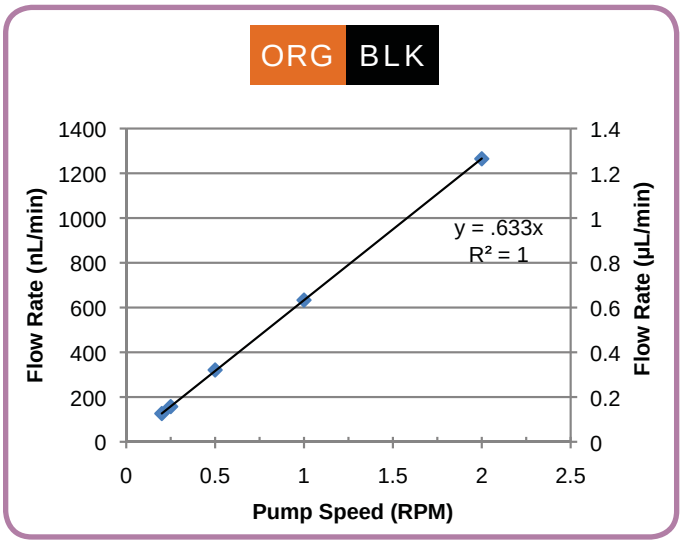
CONTROLLED BY THE INSTRUMENT PC USB PORT	
Part Number	**Number of Channels**
MP2-1-PC	1 channel MP² precision micro peristaltic pump
MP2-2-PC	2 channel MP² precision micro peristaltic pump
MP2-3-PC	3 channel MP² precision micro peristaltic pump
MP2-4-PC	4 channel MP² precision micro peristaltic pump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

Includes: Cable to control with DX Autosampler

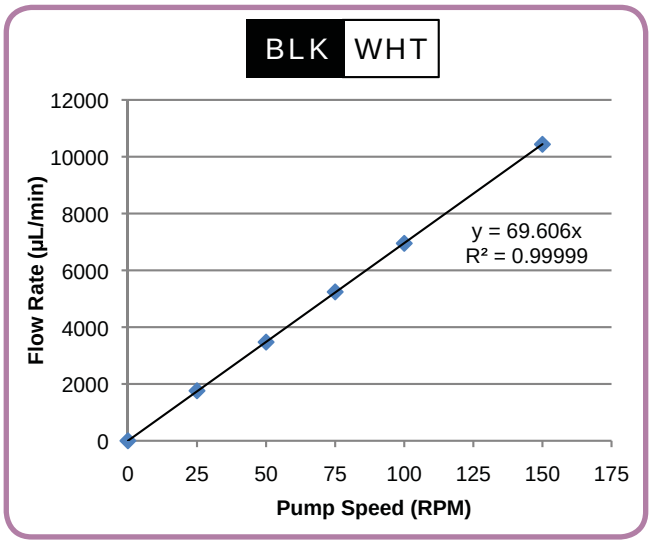
MP2-4-PC
stand alone precision
micro peristaltic pump

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)	



MP² pump linearity < 1 µL/min



MP² pump linearity up to 10 mL/min

SAMPLE INTRODUCTION

MP² Pump Tubing

Tubing for MP² Micro Peristaltic Pumps (Packs of 12)

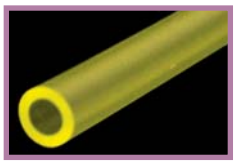
				Non-Flared			Flared*	
i.d.	Stop Colors		Calibration Slope (µL/min per RPM)	PVC 2-stop	Santoprene 2-stop	Solva 2-stop	PVC 2-stop	Solva 2-stop
0.13 mm	Orange	Black	0.6	MPP-013-PVC			MPP-013-F-PVC	MPP-013-F-S
0.19 mm	Orange	Red	1.3	MPP-019-PVC			MPP-019-F-PVC	MPP-019-F-S
0.27 mm	Orange	Blue	2.7	MPP-027-PVC			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		
Bridge Length				72 mm	72 mm	72 mm	72 mm	72 mm

*For easy insertion of PFA capillaries **i.d. = internal diameter**

Non-Flared

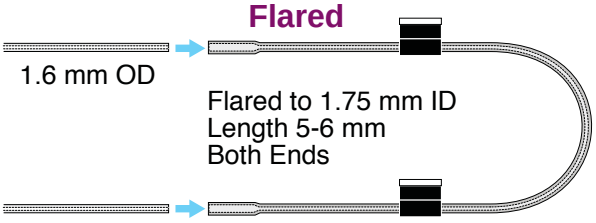
PVC

Santoprene



SOLVA

Flared



MP² PUMP TUBING STARTER KIT	
Part Number	**Description**
MPP-K-1	MP² Pump Tubing Starter Kit comprised of 34 packs of 12 tubes, one package of each light-purple 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 Pumps

SYRIX features an innovative drive mechanism for the precise control of liquid samples and reagents. Wetted parts are o-ring-free and offer high 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 > 40 mL/min
- A variety of syringe sizes
  - 0.3 mL to 3 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
(PF-6500-1030-DX)

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

3.0 mL quartz syringe
(PF-0599-1030)

0.3 mL quartz syringe
(PF-0599-1003)

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 Optima. 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.

SYRIX SYRINGE PUMP SPARES	
Part Number	**Description**
PF-0599-1003	0.3 mL quartz syringe
PF-0599-1030	3.0 mL quartz syringe
PF-0599-3003	0.3 mL HF resistant syringe
PF-0599-3030	3.0 mL HF resistant syringe

apex High Sensitivity Desolvating Systems

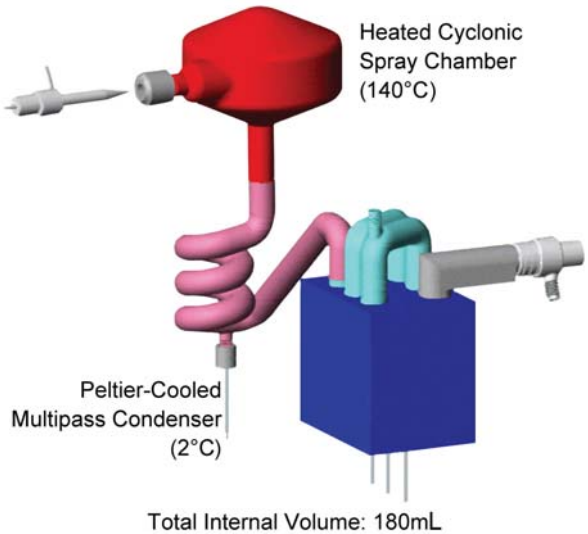
Sample transport efficiency is enhanced by nebulizing liquid samples into a heated cyclonic spray chamber using a special version of the PFA-ST nebulizer. A low-volume three-stage Peltier-cooled desolvation system is incorporated for online removal of solvent vapor. Self aspiration or an MP^2 precision micro peristaltic pump is recommended for the apex.

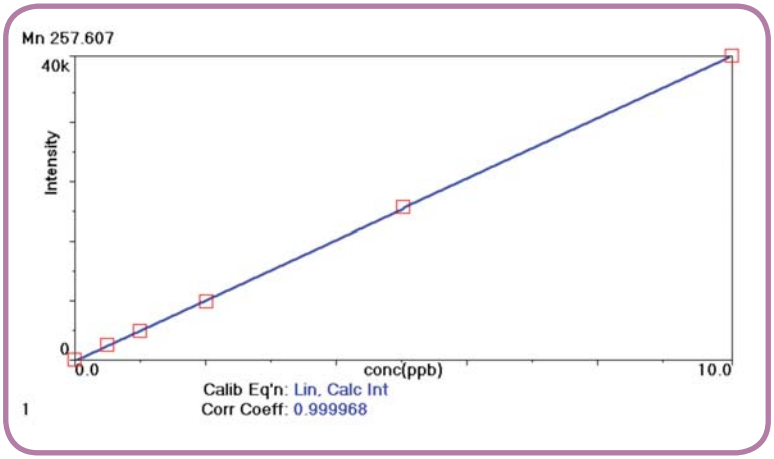
apex E - Inlet System. Features an o-ring-free pyrex flow path for high sensitivity and low background for samples that do not contain hydrofluoric acid. The apex E sample path design ensures rapid rinse-out of any high sensitivity ICP introduction system. ppt

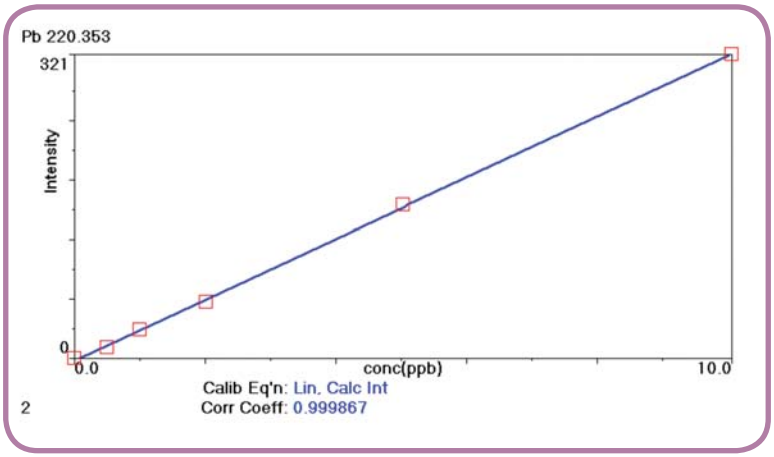
apex E Advantages:

- Increases sensitivity 3 to 10 fold.
- One switch operation.
- Pumped or self-aspirated nebulizer.
- Consumes less sample than standard introduction systems.
- Fast-rinsing.
- Small size—fits into even cramped laboratories.
- Integrated 4 channel peristaltic pump for waste removal.
- Designed for easy cleaning and low maintenance.

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







Calibration curves for Mn and Pb from 0.5 ppb to 10 ppb show sensitivity better than 4M counts/ppm Mn and 32k counts/ppm Pb.

apex *FAST* High Sensitivity Desolvating Systems

The apex *FAST* is a compact, high performance sample introduction system for the Optima. The apex *FAST* is available in E and HF options. It can be controlled via any SC-Autosampler or one*FAST* unit, making it fully automated and integrated to the Optima.

An MP^2 precision micro perstaltic pump or the *FAST* DXi is recommended for sample introduction with the apex *FAST*.

Requires FAST-enabled autosampler.

Combination of apex inlet system with *FAST* injection valve

Model	Part Number	Integrated *FAST* Valve	High Sensitivity	O-ring-free	Single Switch Operation
apex E	ES-4857-1000-21		✓	✓	✓
apex E *FAST*	ES-48FH-24-57	✓	✓	✓	✓

Optima Mounting Shelf

The mounting shelf for Optima is a multi-component shelf to position the nebulizer close to the injector. These components may include: *FAST* valves, apex, apex *FAST*, PC^3, PC^3 *FAST*, PC^{3x} and PC^3-LT.

Part Number	Description
ES-2999-5621	Two piece mounting shelf for PE Optima. For use with apex / PC^3-LT.

PC³ Peltier Cooled Cyclonic Spray Chambers

The PC³ is a small, robust Peltier cooled cyclonic spray chamber. The PC³ offers the advantages of low memory effects, constant temperature, fast rinse-out and high sample transport efficiency. The cooled outer walls of the PC³ spray chamber enhance long-term signal stability, reduce polyatomic interferences such as oxides, and reduce solvent loading when volatile organic solvents are analyzed.

PC³ / PC³-LT

The PC³ has 2 preset temperatures +2°C / -5°C and is ideal for analysis of aqueous or aqueous/organic mixtures.

The PC³-LT operates at -20°C to reduce the solvent load on the plasma for analysis of 100% volatile organic solvents.

PC³ / PC³-LT Kits Include:
Quartz Injector (DV only)
PFA-ST MicroFlow Nebulizer
Quartz Cyclonic Spray Chamber

HF PC³ / PC³-LT Kits Include:
Sapphire Injector (DV only)
PFA-ST MicroFlow Nebulizer
PFA Cyclonic Spray Chamber

Part Number	Injector Size	Description	Temperature	Additional Gas Port
ES-4190-57-29 (DV)	1.5 mm	PC³ organic sample introduction kit - Peltier cooler	+2°C / -5°C	Yes
ES-4190-57V-29 (V)	N/A			
ES-4190-57-29-PFA (DV)	1.5 mm	HF PC³ organic sample introduction kit - Peltier cooler	+2°C / -5°C	Yes
ES-9190-57-29 (DV)	1.0 mm	PC³-LT organic sample introduction kit - Peltier cooler	+2°C / -20°C	Yes
ES-9190-57V-29 (V)	N/A			

All PC³ kits include a PFA-ST nebulizer (ES-2040-57)

ES-4190-57-29
PC³

ES-9190-57-29
PC³-LT

NEW! PC³ˣ Peltier Controlled Heated or Cooled Cyclonic Chamber

The PC³ˣ is a compact Peltier heated and cooled inlet system which incorporates the ESI cyclonic spray chamber. The PC³ˣ heats or cools the outer walls of the cyclonic spray chamber, reducing the water or solvent vapor loading on the plasma, resulting in enhanced stability and performance. The PC³ˣ can be connected to any ICP.

- Temperature control from -10°C to +80°C
- Thermal stabilization of spray chamber improves long-term stability
- Last set temperature saved for stand alone operation
- USB or Bluetooth connectivity
- Remote monitoring and control

PC³ˣ Kit Includes:
PFA-ST MicroFlow Nebulizer
Quartz Injector
Quartz Cyclonic Spray Chamber

Part Number	Description
PC3X-57-29	PC³ˣ thermally stabilized inlet system

All PC³ kits include a PFA-ST nebulizer (ES-2040-57)

HF-Resistant Sample Introduction Kit / Pipette Tips

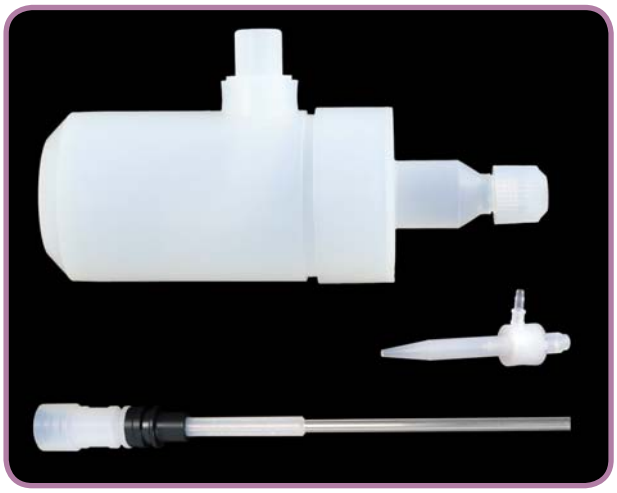
PFA Sample Introduction Kit for PE Optima

HF

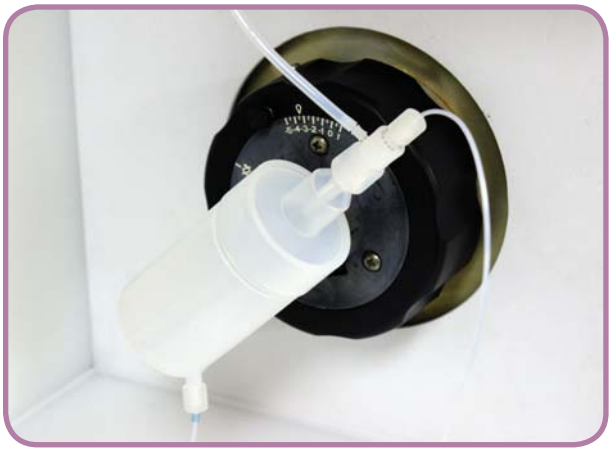
The PFA kit is an ultra-pure, HF-resistant introduction system for the Optima. All wetted surfaces are PFA and sapphire. It is used by a majority of semiconductor labs worldwide for the analysis of semiconductor-grade chemicals and other high purity chemicals.

Benefits:

- 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
- Fast washout



M257-DV Series HF-Resistant PFA Sapphire Sample Introduction Kit for PE Optima



M157-5470 PFA spray chamber on the PerkinElmer Optima

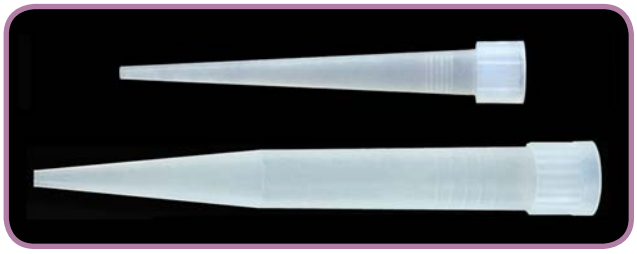
Part Number	Description
M257-DV	Complete HF-resistant sample introduction kit. Includes PFA-ST nebulizer, PureCap PFA endcap, 47 mm PFA spray chamber, 1.8 mm convertible sapphire injector and quartz torch. For the Optima DV (Axial)
M157-5470	PFA 47mm M100 spray chamber with o-ring-free PFA endcap

High Purity PFA Pipette Tips

ppq HF

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

Part Number	Volume	Qty	Description
ES-7000-0101	100-200 µL	10 pk	Pre-cleaned PFA Pure Tip pipette tips
ES-7000-0111	100-200 µL	96 pk	Pre-cleaned PFA Pure Tip pipette tips
ES-7000-1001	1000 µL	10 pk	Pre-cleaned PFA Pure Tip pipette tips



High Purity Valves

High purity valve stators and rotors provide a liquid path with low contamination and low carryover for the best ICP results. PFA rotors are durable, clean and chemically-resistant. CTFE stators offer high impact strength and chemical and corrosion resistance over a wide temperature range.

FAST Sample Injection 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: micro*FAST* selection valve, oil*FAST*

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,* sea*FAST,* TRU*FAST,* chrom*FAST,* apex *FAST*

6 Port Valve - P6 P/N: PF-P6

Description: P6 CTFE high-flow 6 port valve head for SC-*FAST*
Specifications: CTFE stator, PFA rotor, 1 mm, low maintenance
Applications: Standard *FAST*

NEW! P-Series Valves

7 Port Valve P/N: PF-P7 (CTFE stator)
PF-P7-8 (PPS stator)

Description: P7 CTFE high-flow 7 port valve head for SC-*FAST*
Specifications: CTFE stator, PFA rotor, 1 mm, 0.5 mm
Applications: Standard *FAST*, inline internal standard addition

8 Port Valve - P7+ P/N: PF-P7X

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

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: DIN*FAST*, sample pre-loading, dual loop single carrier

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

V-Series Syringe Loading Valves

6 Port Valve P/N: PF-V6

Description: 6 port syringe loading valve
Specifications: CTFE stator, PFA rotor, 1.0 mm
Applications: S200V syringe valve (not for sample injection)

9 Port Valve P/N: PF-V9

Description: 9 port syringe loading valve
Specifications: CTFE stator, PFA rotor, 1.0 mm
Applications: S400V syringe valve

12 Port Valve P/N: PF-V12

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

Examples of Materials

Description
CTFE replacement stator for high-flow valve

Description
1 mm PFA rotor

Description
PTFE rotor for high-flow valve

FAST Valves with Spare Rotors and Stators

HIGH-FLOW VALVES 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	1.6 mm	PPS	Composite (PEEK/PTFE)	SC-0599-1032	SC-0599-1032-01	SC-0599-1032-05
6 - P6	P6	CTFE	PFA	PF-P6	PF-P6S	PF-P6R
7 - P7	P7	CTFE	PFA	PF-P7	PF-P7S	PF-P6R
7 - P7	P7	PPS	PFA	PF-P7-8	PF-P7S-8	PF-P6R
8 - P7+	P7	CTFE	PFA	PF-P7X	PF-P7XS	PF-P6R
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
11-A11b	A11b	CTFE	PFA	PF-A11b	PF-A11bS	PF-A11bR
11-P11	1.0 mm	CTFE	PFA	PF-P11	PF-P11S	PF-P10R
V-SERIES VALVES WITH REPLACEMENT STATORS AND ROTORS						
# of Ports	Bore Size	Stator Material	Rotor Material	P/N Complete Valve	P/N Stator	P/N Rotor
6	1.0 mm	CTFE	PFA	PF-V6	PF-V6S	PF-V6R
9	1.0 mm	CTFE	PFA	PF-V9	PF-V9S	PF-V9R
12	1.0 mm	CTFE	PFA	PF-V12	PF-V12S	PF-V12R
13	1.0 mm	CTFE	PFA	PF-V13	PF-V13S	PF-V12R

FAST Probes / Tees / SC-*FAST* Connecting Lines

FAST Probes

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

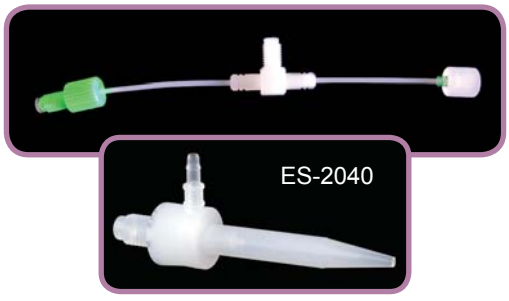
Part Number	Size	Description
SC-5037-3501	0.50 mm i.d. ■ (orange), 150 cm	PFA carrier / internal standard probe for SC-*FAST* valve

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, carbon fiber supported
SC-5037-3995-150	1.00 mm i.d. ■ (gray), 150 cm	

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)	DXi Part Number (25 cm)	Description
SC-0317-1250	SC-0317-1250-25	0.25 mm i.d. ■ (green) Attaches to port #3
SC-0317-1500	SC-0317-1500-25	0.50 mm i.d. ■ (orange) Attaches to port #3



ESI PFA-ST Nebulizer

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)	DXi Part Number (25 cm)	Description
SC-0317-0250	SC-0317-0250-25	0.25 mm i.d. ■ (green) Attaches to port #3 of the *FAST* valve.
SC-0317-0500	SC-0317-0500-25	0.50 mm i.d. ■ (orange) Attaches to port #3 of the *FAST* valve.

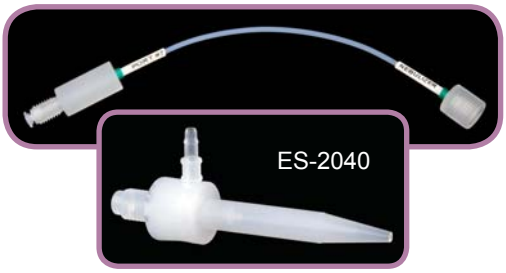
ESI PFA-ST Nebulizer

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 F7, P7 or P7+ *FAST* Valves

FAST valve line that connects the F7, P7 or P7+ *FAST* valve (port #7) to an ESI ST-nebulizer.

Part Number (14 cm)	DXi Part Number (25 cm)	Description
SC-0317-025X	SC-0317-025X-25	0.25 mm i.d. ■ (green) Attaches to port #3 of the *FAST* valve.
SC-0317-050X	SC-0317-050X-25	0.50 mm i.d. ■ (orange) Attaches to port #3 of the *FAST* valve.

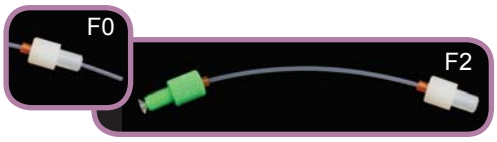


ESI PFA-ST Nebulizer

FAST Valve Connecting Line for MEINHARD® Nebulizers

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 (14 cm)	DXi Part Number (25 cm)	Fitting Type	Description
F0-25-14	F0-25-25	F0	0.25 mm i.d. ■ (green), 14 cm Attaches to port #3 of the *FAST* valve.
F2-25-14	F2-25-25	F2	
F0-50-14	F0-50-25	F0	0.50 mm i.d. ■ (orange), 14 cm Attaches to port #3 of the *FAST* valve.
F2-50-14	F2-50-25	F2	



MEINHARD® glass and quartz nebulizers

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.

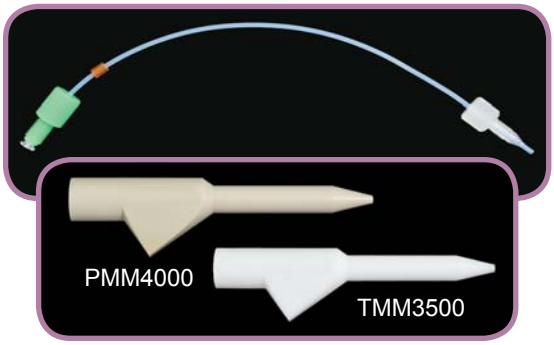
Part Number	Description
SC-0317-0500-25GC	0.50 mm i.d. ■ (orange), 25 cm. Attaches to port #3 of the *FAST* valve.
SC-0317-0990-25GC	1.00 mm i.d. ■ (gray), 25 cm. Attaches to port #3 of the *FAST* valve.

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 and PTFE Nebulizers

Fittings / PFA Tubing / Spares Kits

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	

SC-0319-10 1mL sample loop

Standard for *FAST* Systems

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	

SC-0318-25 2.5mL sample loop

1.6 mm i.d. SC-*FAST* High-Flow Sample Loops		
Part Number	**Size**	**Description**
SC-0315-025	250 µL loop	High volume, 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-0319-10	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-0312-06	6.0 mL loop	
SC-0312-08	8.0 mL loop	

SC-0315-30 3mL sample 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	

SC-0312-10 1mL sample loop

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

Vials	Fits Racks
V-14-0311-CG	MR-21-14 (pg 77), MR-40-14 (pg 77), SR4-60-14 (pg 79)
V-14-0312-CG	
V-14-0314-CG	

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-14-0312CG-X	10
Description	**Volume**
14 mm o.d. graduated PFA micro vial	2 mL Brim full 3 mL

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
ES-7225-0001	1
Description	
ETFE tweezers for removal of PFA cap with knob	

Part Number	Qty
V-14-0309-X	10
Description	
PFA cap for 14 mm micro vials	

Part Number	Qty
V-14-0300-X	10
Description	
PFA snap-on cap for 14 mm graduated PFA micro vials	

Part Number	Qty
V-14-0301-X	10
Description	
PFA cap with knob for 14 mm graduated PFA micro vials.	

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	SR2-21-30 (pg 78), MR-10-30 (pg 77)
V-31-30	SR2-27-31 (pg 78), MR-10-30 (pg 77), ST10-31 (pg 80)
V-31-60	LR-21-30 (pg 76), LMR-21-30-R (pg 76), SR2-27-31 (pg 78), HR-21-30 (pg 77), ST10-31 (pg 80)
V-28-0360	SR2-27-28 (pg 78), ST10-28 (pg 80)
V-50-0360	SR2-12-50 (pg 78), ST2-9-50 (pg 81), ST4-9-50 (pg 80), SR4-20-50 (pg 79)

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

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

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

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

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

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

Part Number	Qty
V-31-SC-X	10
Description	
Screw cap for 30 mm o.d. vials	

NEW!

2 mL PVDF Autosampler Vial

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

Elemental Scientific introduces new PVDF sample vials, a low-cost complement to our high-performance PFA vials. These high tensile strength, fluoropolymer vials can replace more expensive PFA vials in many applications.

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

V-14-0712
2 mL PVDF
autosampler vial

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

PVDF Vials and PFA Caps		
P/N	Qty	Description
V-14-0712-X	10	PVDF vial, 2 mL
V-14-0712-C	100	PVDF vial, 2 mL
V-14-0712-M	1000	PVDF vial, 2 mL
V-14-0309-X	10	PFA cap for V-14 vial
V-14-0309-C	100	PFA cap for V-14 vial

Pre-cleaned PVDF Vials and Caps		
P/N	Qty	Description
VPC-14-0712-C	100	Pre-cleaned PVDF vial, 2 mL
VPC-14-0309-C	100	Pre-cleaned PFA cap for V-14 vial

Bottles / Vials	Fits Racks
V-14-0712	MR-21-14 (pg 79), MR-40-14 (pg 79), SR4-60-14 (pg 81)

Non-PFA Sample Vessels

Non-PFA Vials, Tubes and Bottles

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

Vials	Fits Racks
V-8-0505	MR-60-08 (pg 77), MR-90-08 (pg 77)
V-13-0200-R	LR-90-13-R (pg 76), LMR-90-13-R (pg 76), LMR-90-13-R-3T (pg 76), ST-PR-5 (pg 81)
V-20-0290	LR-40-20 (pg 76)
V-16-0225	HR-60-16 (pg 77), LR-60-16 (pg 76), LMR-60-16-R (pg 76), SR2-80-16 (pg 78), ST-PR-5 (pg 81)
V-28-0260	HR-21-30 (pg 77), ST10-28 (pg 80), LR-21-30 (pg 76), LMR-21-30-R (pg 76), SR2-27-28 (pg 78), ST-PR-5 (pg 81), ST-EX-5 (pg 81)
V-50-0460	SR4-20-50 (pg 79), SR2-12-50 (pg 78), ST-PR-5 (pg 81), ST2-9-50 (pg 81), ST4-9-50 (pg 80)
V-61-0661	SR4-15-60 (pg 79), ST7-60 (pg 80), ST-PR-5 (pg 81), ST-EX-5 (pg 81)

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

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-2 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

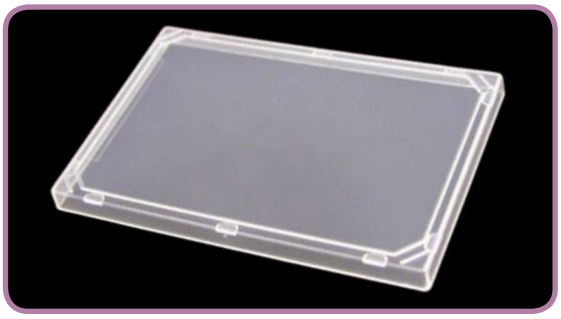
Part Number	Description
MT-48-5mL-02	1 Pk (5 ea) 48 well, 5 mL microtiter plate, square well, pyramid bottom

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
MT-96-500-05-V	1 Pk (5 ea) 96-well, 500µL microtiter plate, polystyrene

Microtiter Plate Cover

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

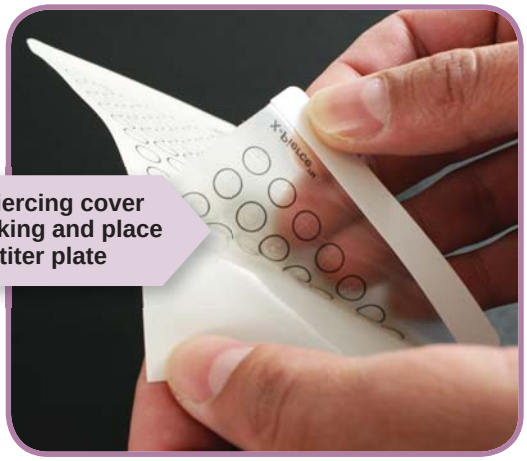


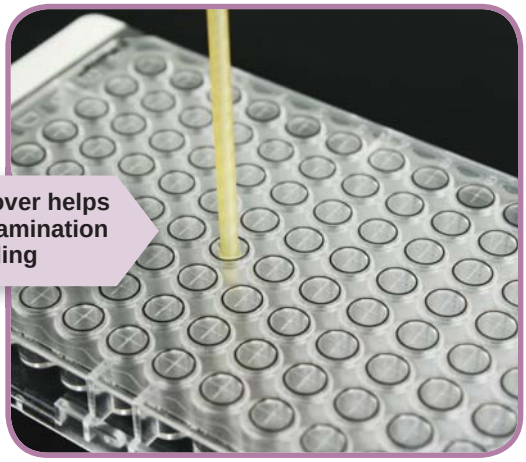
Part Number	Qty	Description
MT-00-02	5	Polypropylene cover for microtiter plates

X-Piercing Film Cover / XP Probe Arm

X-Piercing Microtiter Plate Cover

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





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

Large Autosampler Racks

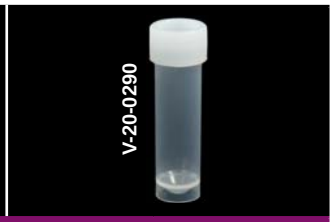
SC-Autosampler Racks (LR Size)

Plastic large racks are recommended for aqueous samples.

All LR racks can be used on the following ESI autosamplers:
SC-2, SC-4, SC-8, SC-14, SC-2 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.

All coated metal racks can be used on the following ESI autosamplers:
SC-2, SC-4, SC-8, SC-14, SC-2 DX, SC-4 DX, SC-8 DX, SC-14 DX


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


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


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


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

Heated and Micro Autosampler Racks

SC-Autosampler Heated Racks (LR Size)

All heated racks can be used on the following Elemental Scientific autosamplers:
SC-2, SC-4, SC-8, SC-14, SC-2 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

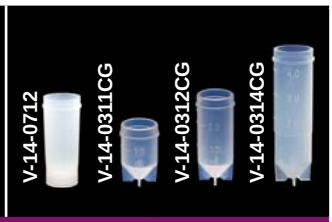

Part #	Diam.	Description
HR-21-30	30 mm	21 position heated large sample rack for 50 mL and 60 mL tubes

SC-Autosampler Racks (MR Size)

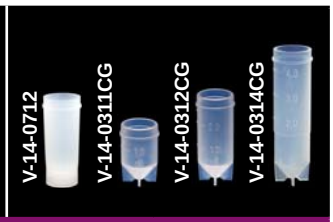
All MR racks can be used on the following Elemental Scientific autosamplers: SC-2, SC-4, SC-2 DX, SC-4 DX, SC-Micro DX


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

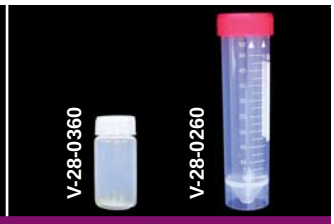
Super Autosampler Racks

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

SC-Autosampler Racks (SR2 Size)

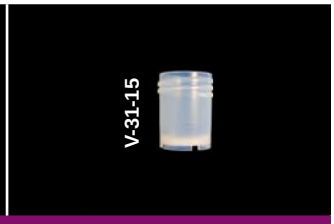
All SR2 racks can be used on the following ESI autosamplers:
SC-2, SC-2 DX


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 ESI autosamplers:
SC-2, SC-4, SC-2 DX, SC-4 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-4, SC-4 DX

Part #	Diam.	Description
SR4-15-60	60 mm	15 position super sample rack for 250 mL bottles

Part #	Diam.	Description
SR4-20-50	50 mm	20 position super sample rack for 125 mL bottles

The SR4-15-60 super rack will hold fifteen 100 mL volumetric flasks or 250 mL bottles

SR4-15-60 super rack with 100 mL volumetric flasks

Standards Autosampler Racks

SC-Autosampler Racks (ST Size, Type 1)

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

SC-Autosampler Racks (ST Size, Type 2)

All ST type 2 racks can be used on the following ESI autosamplers:
SC-2, SC-2 DX

Part #	Diam.	Description
ST2-9-50	50 mm	9 position standards rack for 125 mL bottles. Recommended for prep*FAST* with SC-DX

SC-Autosampler Racks (ST Size, Type 3)

The ST type 3 rack can be used on the following ESI autosamplers:
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 prep*FAST.*

SC-Autosampler Racks (ST Size, Type 4)

The ST type 4 rack can be used on the following ESI autosamplers:
SC-2 DX, SC-4 DX

Part #	Diam.	Description
ST-PR-5	60 mm	5 position priority samples rack for 8 mL, 15 mL, 50 mL, 125 mL and 250 mL bottles. Fits over SC-DX rinse station.

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

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 one*FAST* on ICP 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

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*, prep*FAST* or one*FAST* on ICP in US, Canada, or Western Europe.

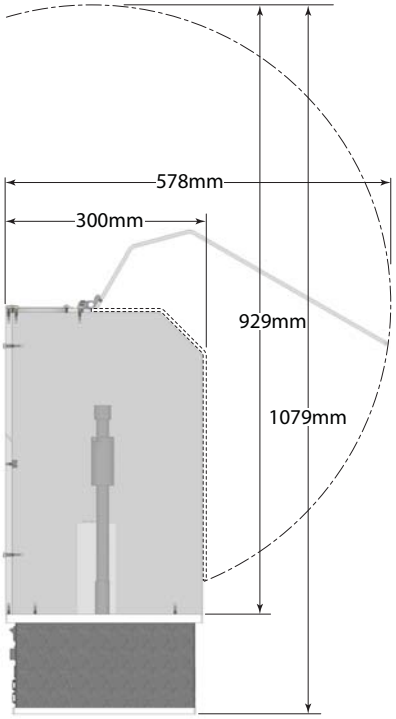
Includes: Hardware installation
Software methods
Basic system familiarization
Necessary method validation
User Training
Travel time & expenses for ESI employee or contractor
SC-*FAST* deluxe spares kit (SC-0370)

Part Number	Description
FI-SC-02	On-site 2½ day installation for SC-*FAST* or prep*FAST* high throughput systems

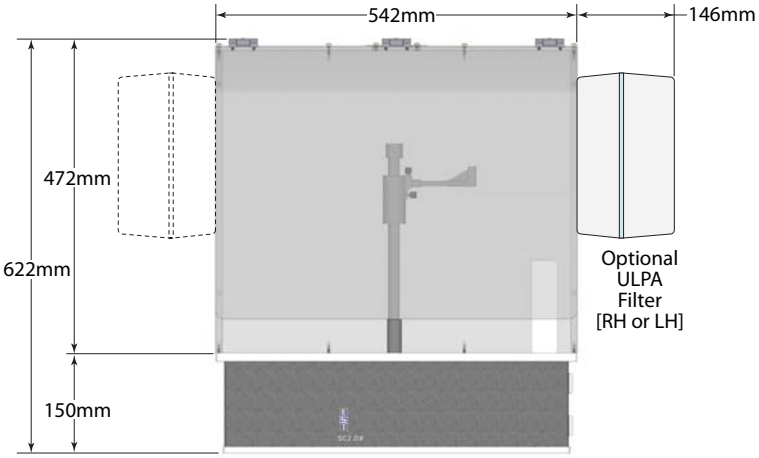
The SC-*FAST* & one*FAST* Consumables/Spares Kit is a great value at no extra expense with the Gold Installation & Training.

Autosampler Dimensions

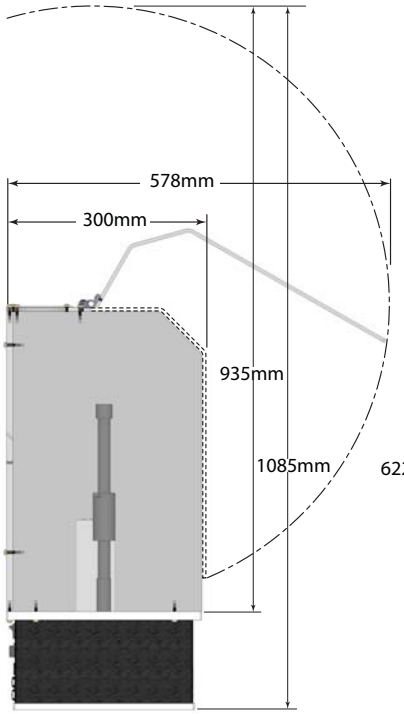
SC-2 DX Autosampler with Enclosure and ULPA Filter Dimensions



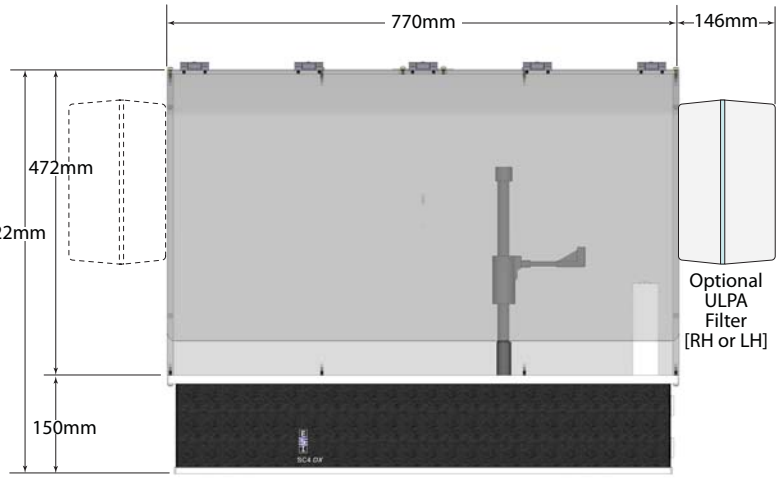
SC-2 DX Autosampler Enclosure with ULPA Filter (P/N: SC-1207-1000)



SC-4 DX Autosampler with Enclosure and ULPA Filter Dimensions

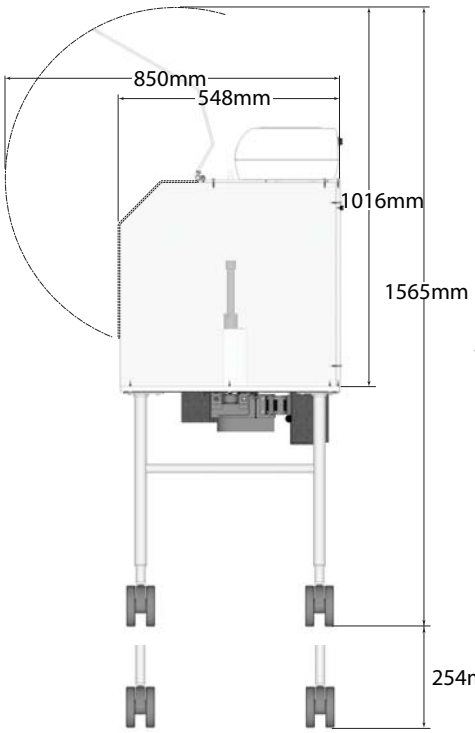


SC-4 DX Autosampler Enclosure with ULPA Filter (P/N: SC-1407-1000)

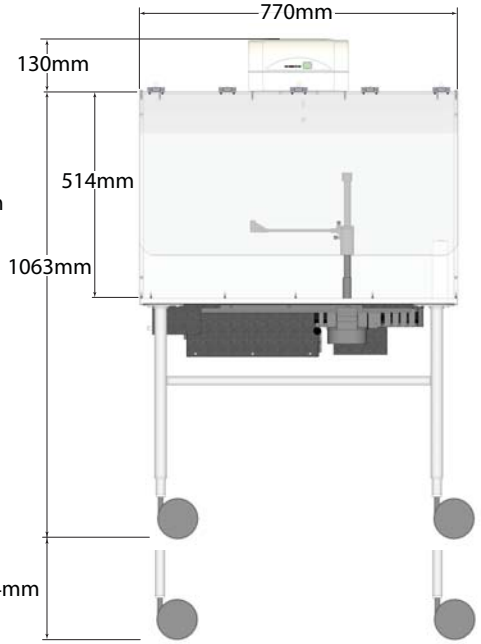


Autosampler Dimensions

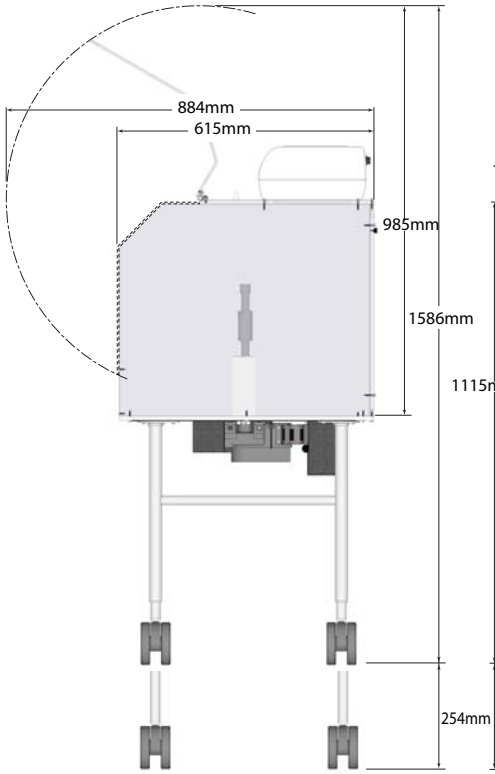
SC-8 DXS Autosampler with Enclosure Dimensions



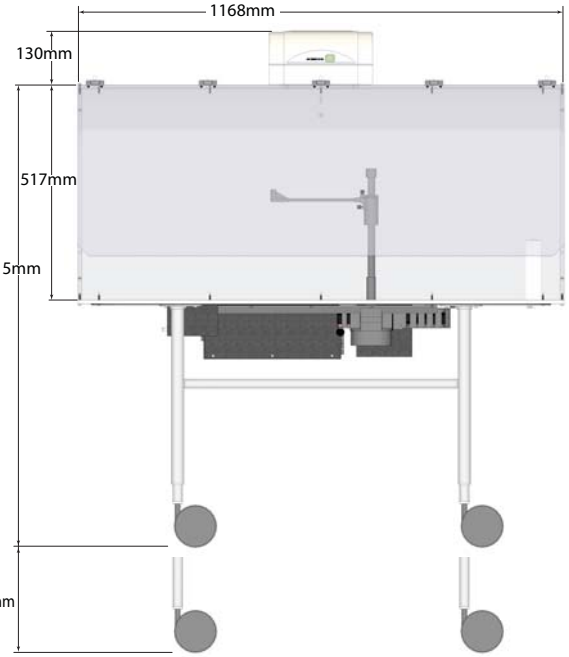
SC-8 DXS Autosampler Enclosure
(P/N: SC-1807-DX)



SC-14 DXS Autosampler with Enclosure and ULPA Filter Dimensions



SC-14 DXS Autosampler Enclosure with
ULPA Filter (P/N: SC-1107-DX-1030)



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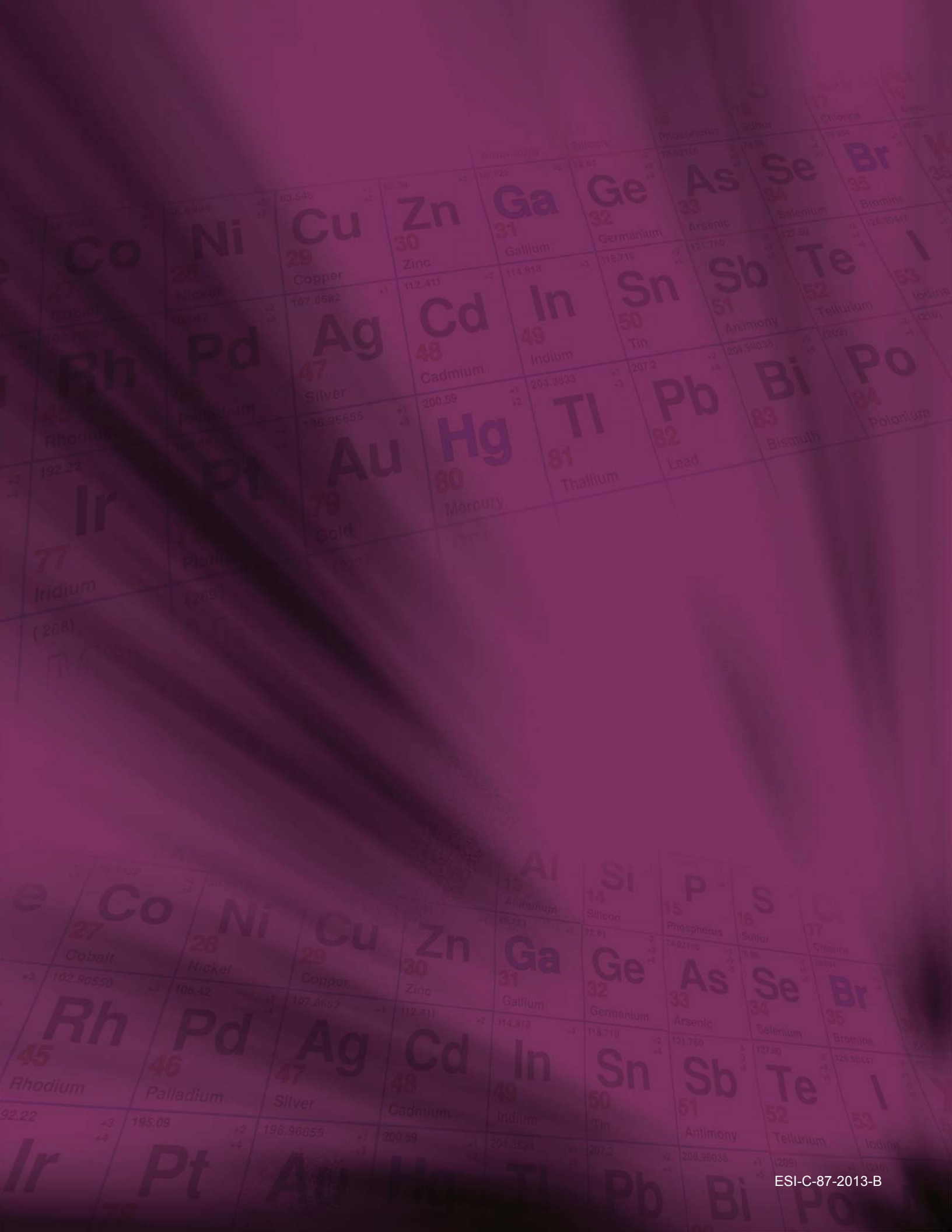

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