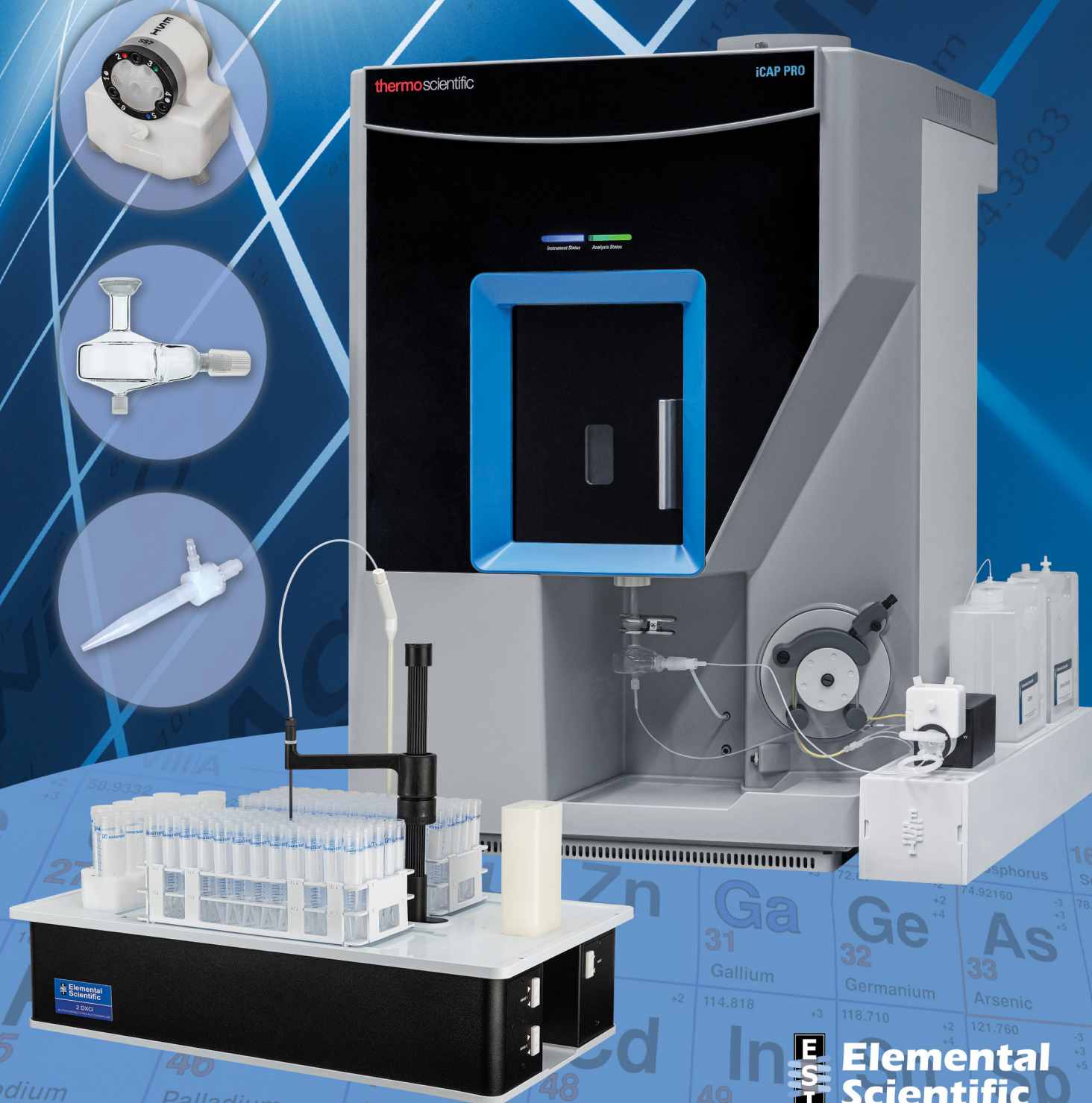


Advanced Automation and Sample Introduction Systems

for Thermo Fisher Scientific™ iCAP™ PRO
and 6000/7000 Series ICP-OES



**Elemental
Scientific**

FEATURED PRODUCTS

DXCi Autocorrecting Autosamplers

DXCi autosamplers are the next generation of automation and productivity. They automatically realign – even if obstructed – correcting the probe position for all axes of motion. (Pages 4-9)



SampleSense *FAST* and *prepFAST X*

Inert injection valve with optical detection of the sample for ultra-high throughput and reliability. Maximizes productivity, simplifies method development, monitors sample loading, minimizes sample consumption and compensates for changes in the sample uptake pathway. Equipped with new FlexRack to support valves, line connections, and solution bottles. (Pages 10-29)

prepFAST X Autodilution & Autocalibration

Every lab needs to improve productivity and further automate metal analysis. The single valve prepFAST X inline autodilution system automatically calibrates the ICP, autodilutes samples and autodilutes overrange samples to bring them into range. prepFAST autodilution systems elevate performance of all iCAP 6000/7000/PRO Series ICP-OES systems with SampleSense automated sample loading. (Pages 20-29)



pergo 500 Argon Nebulizer Gas Humidifier

The *pergo 500* humidifies the nebulizer gas to prevent deposits in the nebulizer and improve stability. Highly recommended for environmental, brines, and many other ICP applications. (Pages 48-49)

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AUTOMATION

SAMPLE INTRODUCTION

CONSUMABLES



DX Series Autosamplers

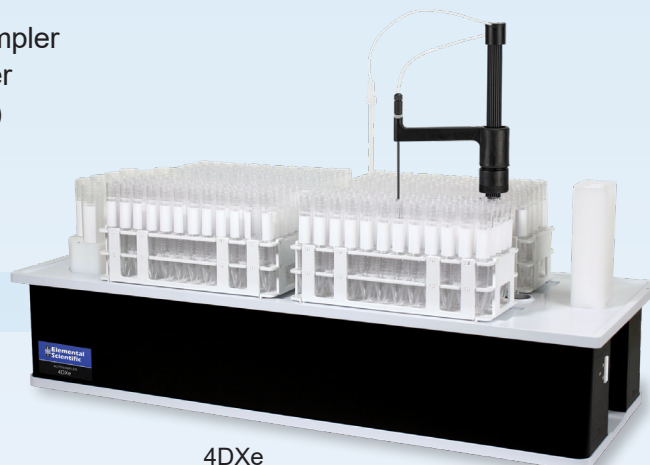
Support and Automate Every Inorganic Application

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

DXe – Economical

Autosamplers with superior features at a competitive price:

- Durable dual rail system
- Dual flowing rinse stations
- AutoAlign Arm with inert fluoropolymer probe guide
- Reset probe – prevents probe damage
- Flexible rack configurations

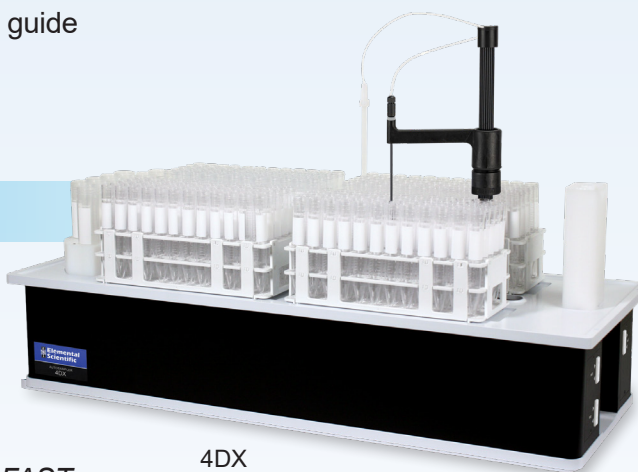


4DXe

DX – FAST Ready

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

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



4DX

DXCi – Autocorrecting Autosamplers

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

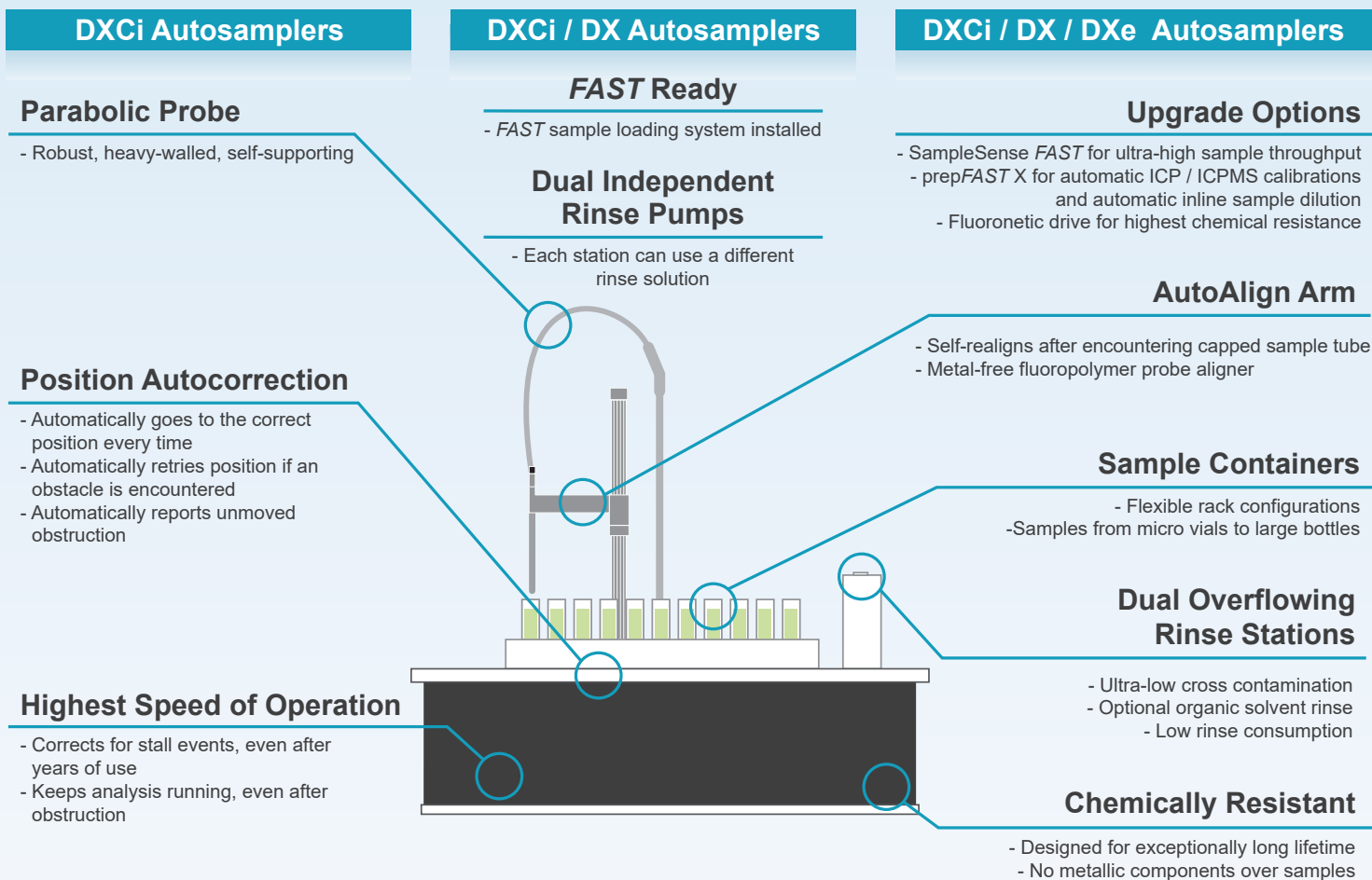
- Intelligently autocorrects position, even if accidentally obstructed
- Ultra high throughput compatible
 - Enhances productivity
- Reports obstructions to instrument software
- Septum piercing option available
- Parabolic probe – Anti-kinking probe
- High accuracy – Optimal for microplates and small samples



4DXCi

Now available with chemically-resistant Fluoronetic drive option.
See pages 8-9

DX Autosamplers Features Diagram



DXCi

the **ONLY AUTOSAMPLER**

that automatically

CORRECTS the probe
Position
even when **Obstructed!**



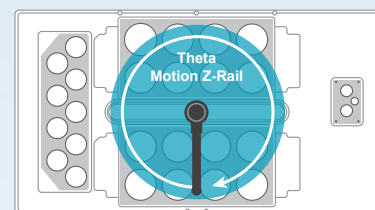
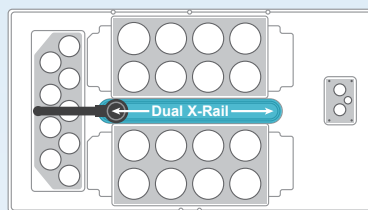
See it in
Action!

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

DX Autosampler Benefits

Engineered for Precision and Durability

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

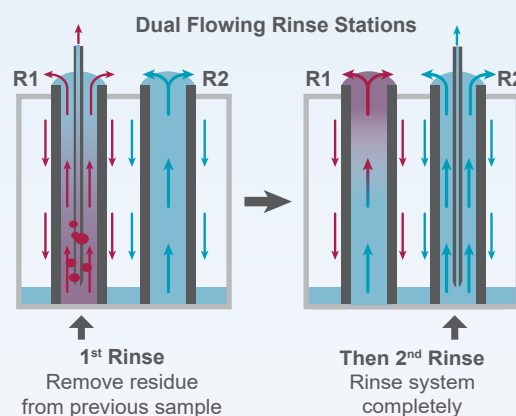


MicroDX autosampler shown

Dual Rinse Stations Reduce Carryover and Cross Contamination

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

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

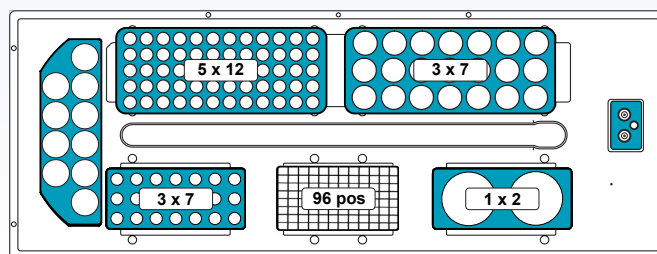


DX Autosamplers are Versatile and Upgradeable

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

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

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



Versatile Rack Configurations

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

Intelligently Finds Sample Position

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



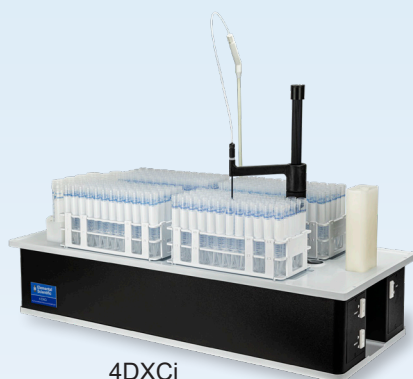
AutoAlign Arm and Parabolic Probe

ESI DX Autosampler Models

From **2** Micro Racks

UP To

14 Large Racks



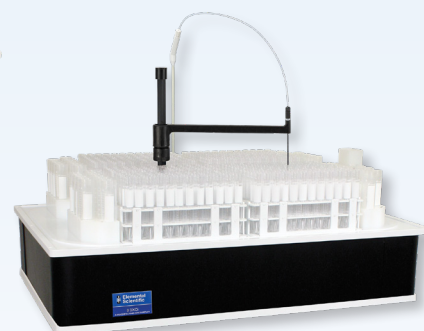
4DXCi



MicroDX



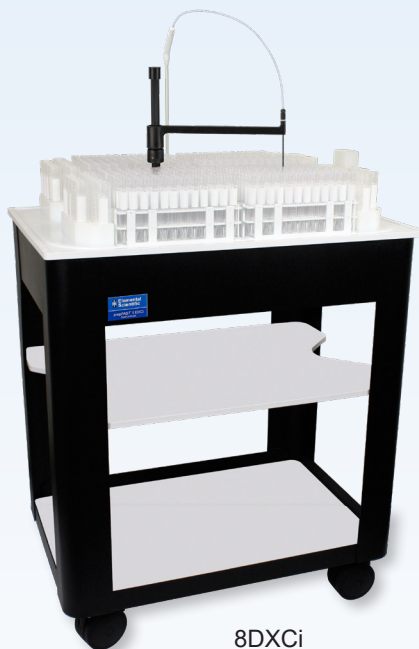
2DXCi



8DXCi
Benchtop



14DXCi



8DXCi

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

*Special version 14DX for microplates

Fluoronetic Autosamplers

Most Robust, Chemically Resistant Autosamplers on the Market

100% fluoropolymer magnetically coupled linear drive provides the highest level of chemical resistance. Recommended for semiconductor, geochem and other applications where aggressive acids are analyzed and where lowest detection limits possible are required.

Fluoronetic Autosampler Features:

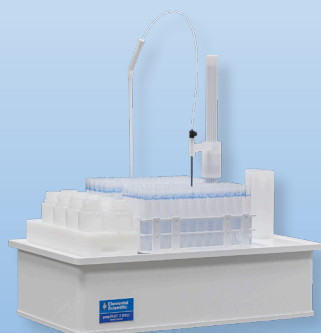
- Ultra-high chemical resistance
- Long lasting and low maintenance
- Available in two types:
 - Semiconductor ultra-high purity chemicals
 - Highly acidic geological samples
- Autocorrecting x-y-z Autosampler
 - Automatically goes to the correct sample tube position every time
 - ▶ *Even when temporarily obstructed*
 - Highest speed of operation
 - Upgradable to SampleSense FAST / prepFAST



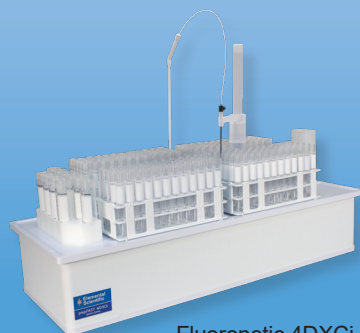
Fluoronetic autosampler configured for semiconductor grade ultra-pure chemical analysis



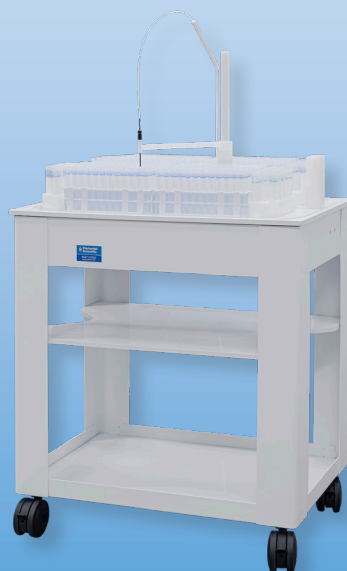
See it in Action!



Fluoronetic 2DXCi



Fluoronetic 4DXCi



Fluoronetic 8DXCi



Fluoronetic 8DXCi Benchtop



Fluoronetic 14DXCi

Models shown here in Geochem configuration with carbon fiber supported probe.

Fluoronetic Autosampler Features Diagram

Parabolic Probe

- Perfectly round sample transfer line
- Robust, heavy-walled, self-supporting

AutoAlign Arm

- Self-realigns after encountering capped sample tube
- Metal-free fluoropolymer probe aligner

Sample Containers

- <1 mL up to 500 mL

PTFE Autosampler Deck

- Chemically resistant for long lifetime

Position Autocorrection

- Automatically goes to the correct position every time
- Automatically retries position if there is an obstacle
- Automatically reports unmoved obstruction

Highest Speed of Operation

- Corrects for stall events, even after years of use
- Keeps analysis running, even after obstruction

Fluoronetic Drive

- True fluoropolymer mechanical action
- Magnetically coupled linear drive
- Long-lived; chemically resistant

Dual Overflowing Rinse Stations

- Ultra-low cross-contamination
- Optional organic solvent rinse
- Independently pumped for low rinse consumption

SampleSense FAST Option

- Ultra-high sample throughput
- Automates and eliminates sample introduction timing variables
- Minimizes sample consumption

SampleSense prepFAST Option

- Automatic ICP or ICPMS calibration
- Automatic inline sample dilution

Fluoronetics Drive Delivers



**Superior Chemical/
Corrosion Resistance**



**Chemically Inert
Non-contaminating**



**Magnetic Coupling
Eliminates Metal Components**



**Intelligent Autocorrection
Always Finds Sample Position**

Fluoronetic Autosamplers for iCAP 6000/7000/PRO Series ICP-OES Part Numbers

Description	# Rack Positions	Geochem Configuration	Semicon Configuration
Fluoronetic 2DXCi Autosampler	2	2FNX	2FNX-S
Fluoronetic 4DXCi Autosampler	4	4FNX	4FNX-S
Fluoronetic 8DXCi Autosampler	8	8FNX	8FNX-S
Fluoronetic 8DXCi Autosampler Benchtop	8	8FNX-BT	8FNX-BT-S
Fluoronetic 14DXCi Autosampler	14	14FNX	14FNX-S

**Contact ESI to learn about Fluoronetic
upgrade options for your existing autosampler**

FAST Automation

for iCAP 6000/7000/PRO Series ICP-OES

FAST is a high-throughput, automated sample introduction system for ICP and ICPMS. The *FAST* system uses valve injection with rapid vacuum sample loading to speed sample introduction

High Throughput

- *FAST* uptake, stabilization, and washout
- High performance economical P-Series and automatic SampleSense valve option
- Operation with or without segmented air bubbles to optimize every application

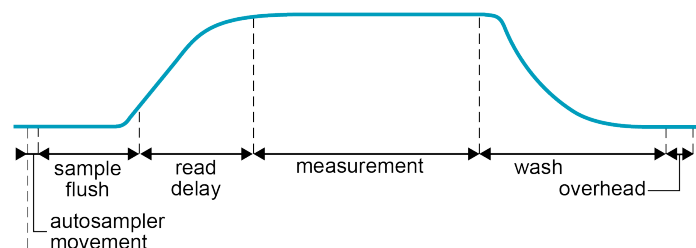
Improved Efficiency

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

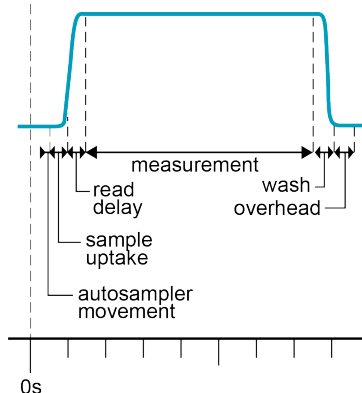
Increased Lab Productivity

- The *FAST* system analyzes samples 2-5 times faster than a standard autosampler
- Reduces cost per analysis by reducing operating costs and shortening analytical runs

Normal Analysis



FAST Analysis



Six Steps in a Standard Analysis

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

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



STANDARD ANALYSIS
96 SAMPLES



FAST ANALYSIS
288 SAMPLES

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

Superior P-Series *FAST* Valve

- PFA rotors for long life and low maintenance
- Chemically resistant compression ring
- All fluoropolymer flow path
- In-valve mixing of internal standard (P7 valve)



P-Series *FAST* Valve

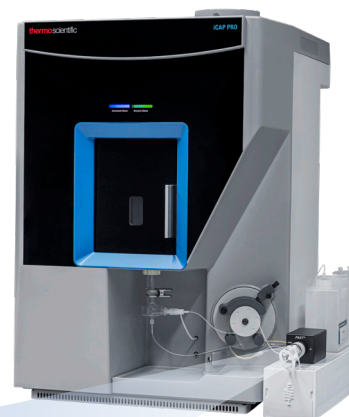


SampleSense Automated Uptake Valve

- *FAST* valve with optical sensors that monitor for sample arrival
- Provides fully automated sample loading – no timings required
- Automatically triggers sample injection and triggers instrument analysis
- Unsensed samples are reported to Qtegra software



SampleSense *FAST* Valve



FlexRack

- Chemically-resistant rack supports *FAST* valves, manages peripump tubing & waste connections, routes cables, and locates two 2 L bottles for internal standard and carrier solutions
- Located directly next to sample introduction area
- Delivers quick and simplified installation for *FAST* and prep*FAST* X valves on iCAP PRO Series ICP-OES systems



SAMPLESENSE

Revolutionary New Valve for *FAST* and *prepFAST*

SampleSense is a revolutionary valve for *FAST* and *prepFAST* systems that uses optical sensors to automatically sense and inject samples into iCAP 6000/7000/PRO Series ICP-OES instruments.

Enhance Workflow

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

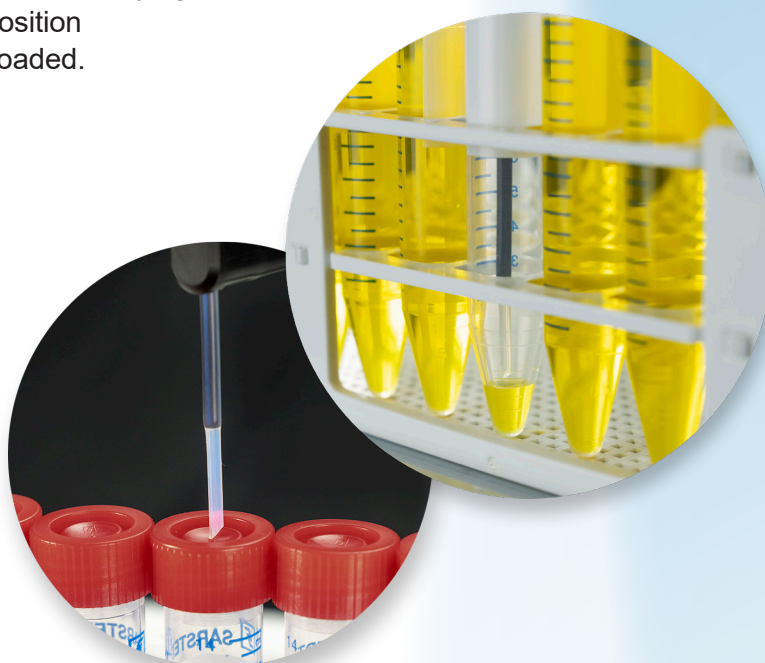
How it Works

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

Detect Loading Issues

SampleSense monitors and logs sample loading issues caused by:

- Empty tubes or positions
- Vials inadvertently left capped
- Empty standard or QC
- Bubbles caused by incomplete loading
- Operation fully integrated into Qtegra™ software



SampleSense Advantages



Innovative Sample Loading

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



Time Savings

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



Sample Savings

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



Error Notification

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

Maximize Productivity

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

**Sample not present,
sensors not activated**

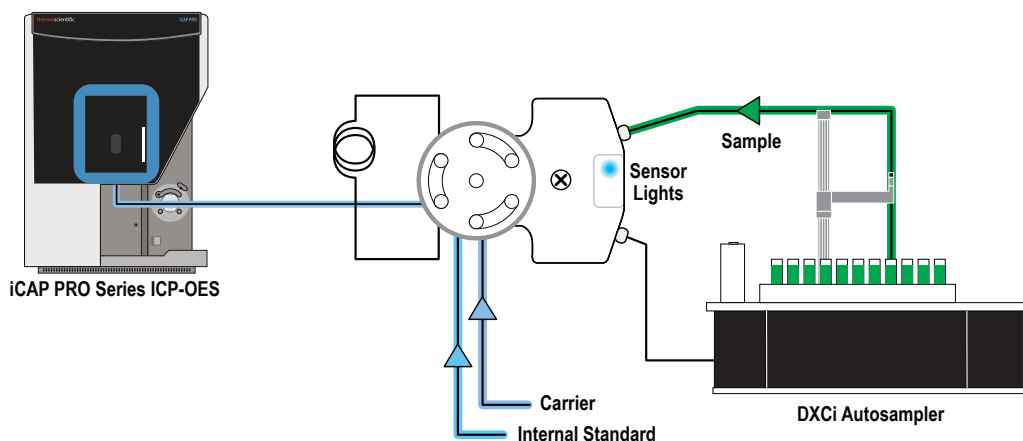


**Valve sensors activated,
sample is sensed**

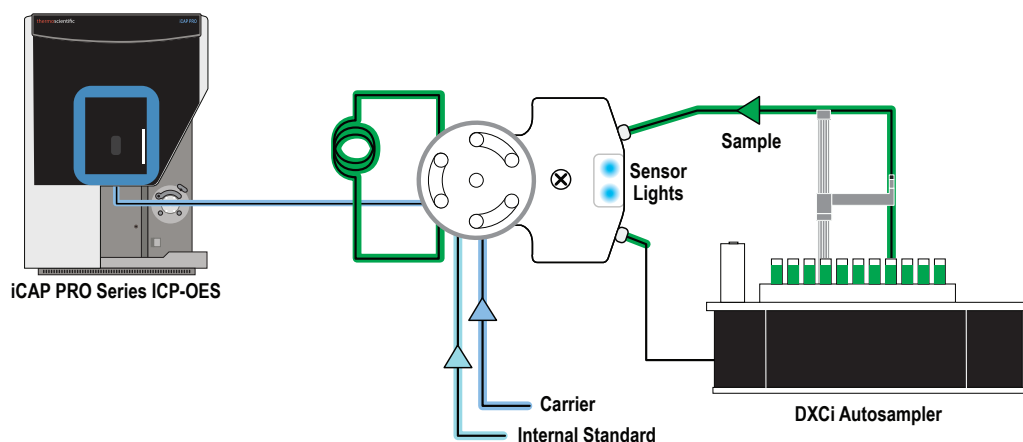


SAMPLESENSE Automated Loading

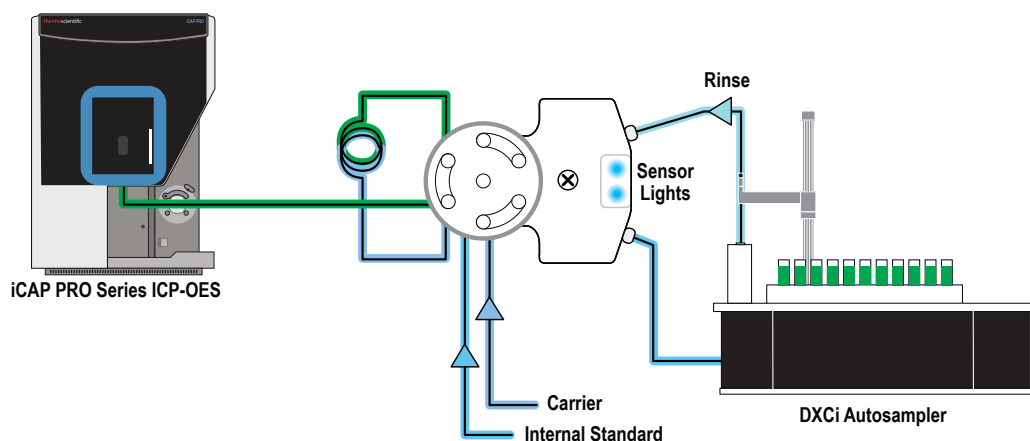
Start Sample Load / Rinse Nebulizer



Sample Sensed / Automatically Injects Sample



Rinse Probe while Sample is Analyzed



SampleSense FAST operation with iCAP PRO Series ICP-OES

FAST SYSTEMS *Ordering Information*



4DX FAST System for iCAP PRO Series
ICP-OES 4DXF-68A



4DXCi SampleSense FAST System for
iCAP PRO Series ICP-OES 4F-SS7-68

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

FAST Systems for iCAP 6000/7000/PRO Series ICP-OES

Description	Nebulizer	Probe	2DX	4DX	8DX	14DX
FAST System for iCAP Series ICP-OES. Includes DX autosampler (*benchtop version available)	✓	✓	2DXF-68A	4DXF-68A	8DXF-68A (*8DXF-BT-68A)	14DXF-68A
SampleSense FAST System for iCAP Series ICP-OES. Includes DXCi autosampler (*benchtop version available)	✓	✓	2F-SS7-68	4F-SS7-68	8F-SS7-68 (*8F-BT-SS7-68)	14F-SS7-68

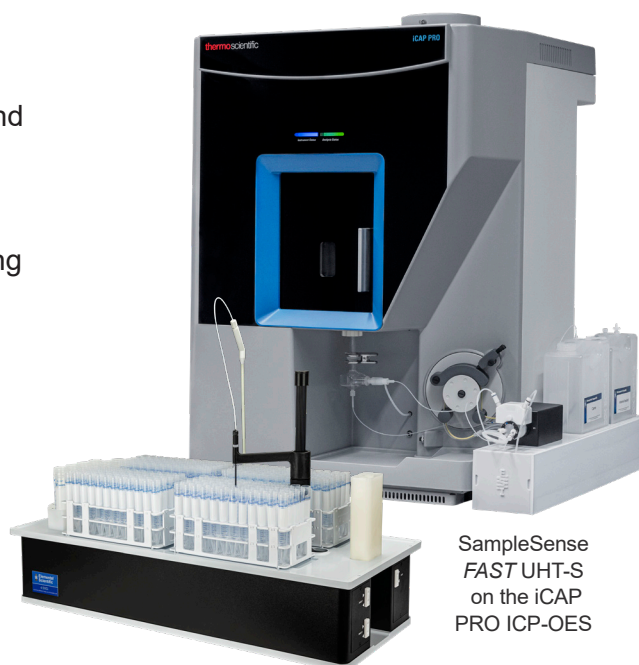
SAMPLESENSE FAST UHT-S

Ultra-high Throughput (UHT) Soil Analysis System

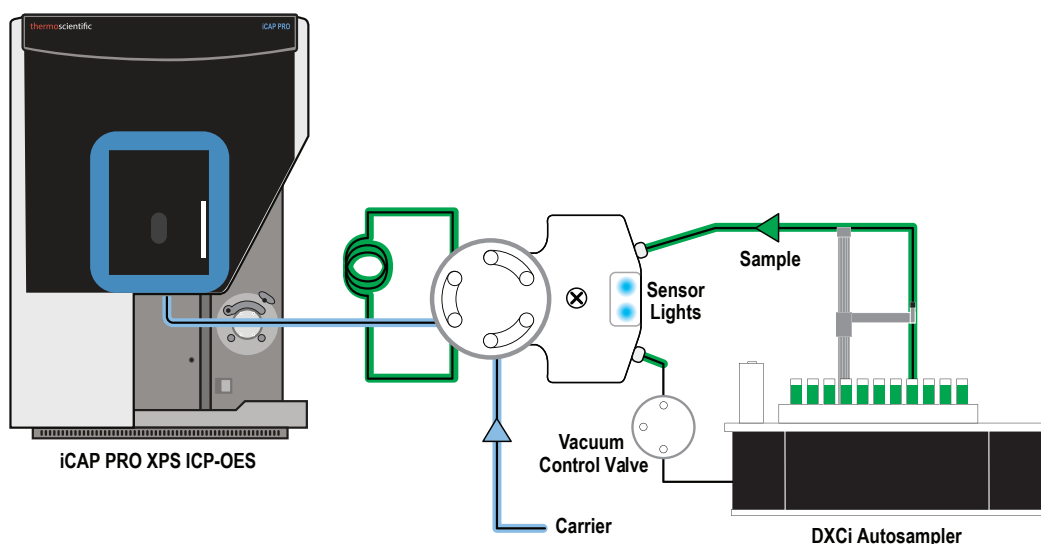
SampleSense *FAST* UHT-S is a customized automation solution designed for fast sample analysis where sample volume may be limited. All SampleSense *FAST* UHT-S systems incorporate a vacuum control valve to further reduce sample consumption while utilizing the sample detection capabilities of the SampleSense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

Advanced Automation Features

- Automates sample uptake tasks, monitors sample loading and logs sample loading issues with SampleSense valve
- Minimizes sample consumption with vacuum control valve
- Allows rinse solutions to be introduced into uptake path during the sample analysis with unique rinse-trapping technology to ensure previous sample components are quickly removed
- DXCi autosampler automatically goes to the correct sample position – even when accidentally obstructed
- Supports ultra-high sample throughput from small volume containers – with optimized vertical travel and rise station
- **SampleSense *FAST* UHT-S doubles or triples the normal ICP analysis rate for the highest sample throughput**



SampleSense *FAST* UHT-S Flow Diagram



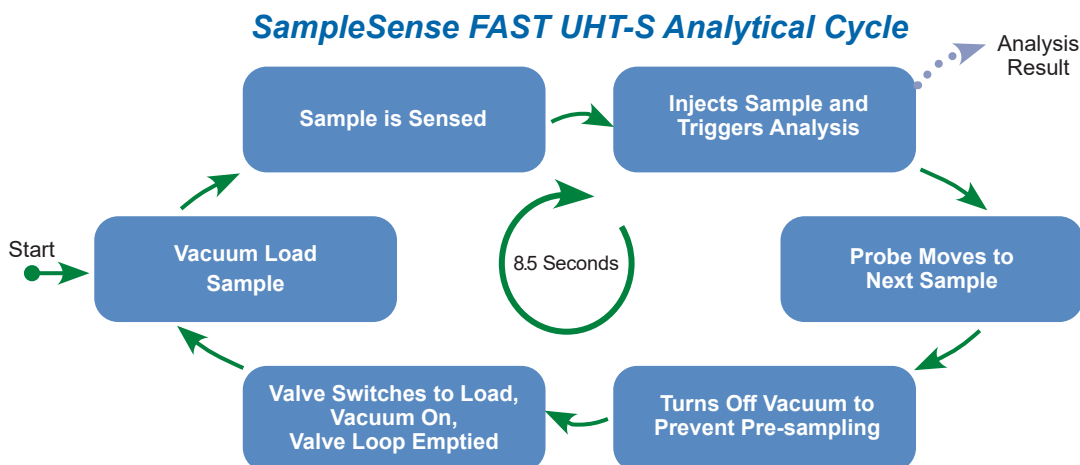
High-throughput Analysis of Soil Extracts

• Sample Preparation

- Soil samples dried, weighed, and extracted per Mehlich-3 process
- Liquid samples dispensed into 10 mL test tubes
- Samples analyzed on iCAP PRO XPS ICP-OES with SampleSense FAST UHT-S

• Method Conditions

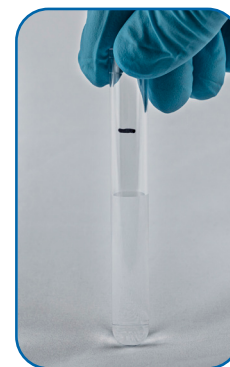
- iCAP PRO XPS Radial ICP-OES System
- Analytes: S, P, Zn, B, Mn, Fe, Mg, Ca, Cu, Na, K
- PFA-ICN Nebulizer
- 250 μ L sample loop



SampleSense FAST UHT-S iCAP PRO XPS ICP-OES Method Performance

Plasma View	Integration Time(s)	# of Replicates	Sample to Sample Time(s)	Sample Consumption (mL)
Radial	1	1	8.5	<2
	1	2	10.5	<2

SampleSense FAST UHT-S and the iCAP PRO XPS ICP-OES performs the Mehlich 3 soil extract analysis in 8.5 seconds (sample to sample) performing one replicate, and 10.5 seconds with two replicate measurements. Image on the right shows the remaining sample consumption is <2 mL – the black line indicates the original sample level of the 6 mL extract. Multiple sample analyses can be performed without re-extraction.



SampleSense FAST UHT-S Systems for iCAP 6000/7000/PRO Series ICP-OES	
Description	Part Numbers
SampleSense FAST UHT-S 2DXCi	2F-SS-Soil-68
SampleSense FAST UHT-S 4DXCi	4F-SS-Soil-68
SampleSense FAST UHT-S 8DXCi	8F-SS-Soil-68
SampleSense FAST UHT-S 14DXCi	14F-SS-Soil-68

SAMPLESENSE FAST UHT-O

Ultra-high Throughput Oil Analysis System

The SampleSense FAST UHT-O system for iCAP 6000/7000/PRO Series ICP-OES provides ultra-high throughput analysis for in service oil laboratories running ASTM Method D5185. The SampleSense FAST UHT-O system provides in service lubricant laboratories an entirely new level of performance. SampleSense FAST UHT-O combines ultra-high throughput ICP-OES analysis, minimizes ICP system maintenance, maximizes profit per sample and provides significantly improved data.

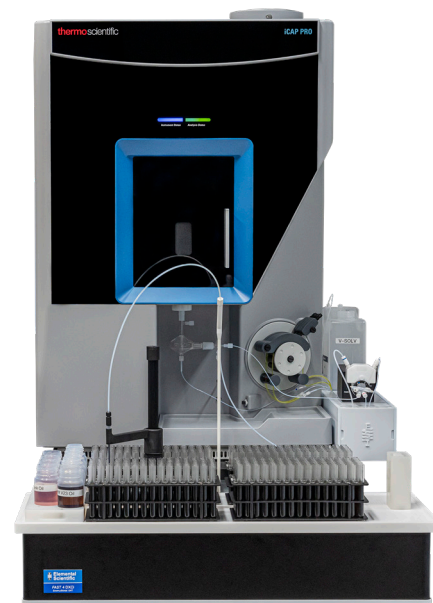
SampleSense FAST UHT-O is a complete, automated sample introduction system for oil analysis. It combines the DXCi Autocorrecting Autosampler with SampleSense technology to fully automate the sample loading process. After the sample is mixed, the unique SampleSense valve automatically detects the presence of sample as it is loaded rapidly from the autosampler. Once the sample loop fill is confirmed by the sensors, the sample is automatically injected and the ICP-OES analysis is triggered for a tightly timed analytical sequence.

Features:

- SampleSense optically monitored sample loading
 - Fully automated sample loading – no timings required
 - Automatically adjusts for samples of varying viscosity
 - Unsensed samples are reported to Qtegra™ software
- DXCi Autocorrecting Autosampler
 - Intelligently autocorrects probe position
 - ▶ *Even if accidentally obstructed*
 - Highest speed probe movement
- Gas infusion mixing option provides rapidly controlled sample homogenization just prior to uptake
- Patent-pending probe design that eliminates sample drips and resulting cross contamination

Benefits:

- Reduces carbon buildup on torch
- Maximizes profit per sample
- Eliminates oil drips from sample probe
- Improves stability for longer, more productive runs
- Up to 180 samples per hour



4DXCi SampleSense FAST UHT-O Analysis System with iCAP PRO XPS



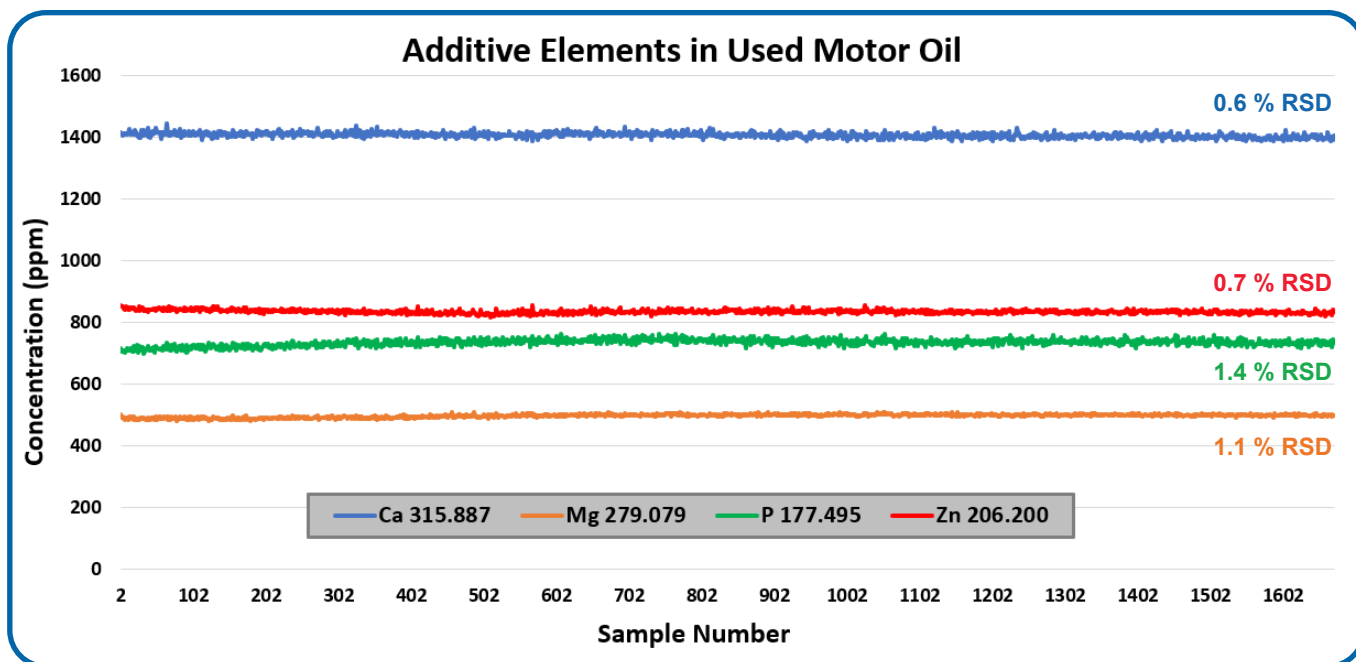
See it in Action!



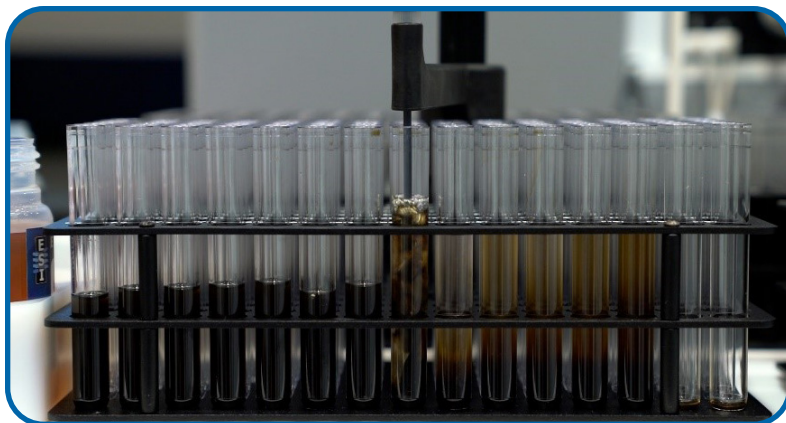
SampleSense SS6 Valve

SampleSense FAST UHT-O Sample Throughput Performance

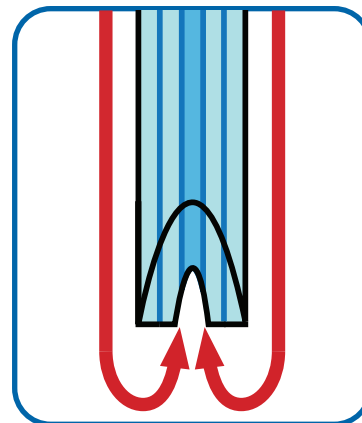
	1 Minute	1 Hour	8 Hours	24 Hours
# Oil Samples Analyzed per	3	180	1440	4320



SampleSense *FAST* UHT-O System 11+ hour stability run on iCAP PRO XPS for 4 additive elements



Controlled gas infusion mixing of used oil and solvent with SampleSense *FAST* UHT-O system just prior to analysis on iCAP PRO XPS ICP-OES



Closeup diagram of V-shaped tapered tip probe on SampleSense *FAST* UHT-O system. The probe design allows the applied vacuum to efficiently remove sample droplets to eliminate contamination of other samples

SampleSense <i>FAST</i> UHT-O Systems for iCAP 6000/7000/PRO Series ICP-OES			
Description	Total Sample Capacity	iCAP 6000/7000 Part Number	iCAP PRO Part Number
2DXCi SampleSense <i>FAST</i> UHT-O for iCAP	180	2F-SSOil-88	2F-SSOil-68
4DXCi SampleSense <i>FAST</i> UHT-O for iCAP	360	4F-SSOil-88	4F-SSOil-68
8DXCi SampleSense <i>FAST</i> UHT-O for iCAP	720	8F-SSOil-88	8F-SSOil-68
14DXCi SampleSense <i>FAST</i> UHT-O for iCAP	1260	14F-SSOil-88	14F-SSOil-68

prepFAST™ X Inline Dilution

for iCAP 6000/7000/PRO Series ICP-OES

Fully Automated Single Valve Sample Preparation with Inline Dilution

prepFAST is a line of automated inline dilutions systems which eliminates manual dilution, reduces reagent usage and improves laboratory productivity. These systems combine the DXCi autosampler, high-throughput automatic SampleSense FAST valve technology and a syringe module to perform precise and accurate dilutions of standards and samples.

prepFAST Automates Daily Lab Functions

Automatic Sample Loading

SampleSense valve with optical sensors automatically senses samples during loading.

- Eliminates method timing parameters
- Automatically loads samples of varying viscosities
- Automatically triggers sample preparation and analysis
- Actively detects and reports sample loading issues to Qtegra
- Autocorrecting Autosampler – monitors and corrects probe position

Autodilution

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

- User specified dilution factor, on sample-by-sample basis
- Improve precision and accuracy
- Reduce vial and reagent usage
- Improve sample throughput and washout

Autocalibration

Automate inline preparation of ICP calibration standards.

- Save time and improve laboratory efficiency
- Improve calibration linearity
- Standards rack holds both calibration and QC standards

Overrange Dilution

Automatically dilute and reanalyze samples.

- Autodilute samples with concentrations above the calibration range
- Automatically dilute high matrix samples that cause internal standard recoveries to fall outside of acceptable ranges
- Optimize laboratory throughput by generating reportable results from the initial sample run



Thermo Scientific Qtegra™
software plugin control available
for all prepFAST systems

prepFAST X Single Valve Autodilution

Rapid, Variable, In-Valve Autodilution with SampleSense

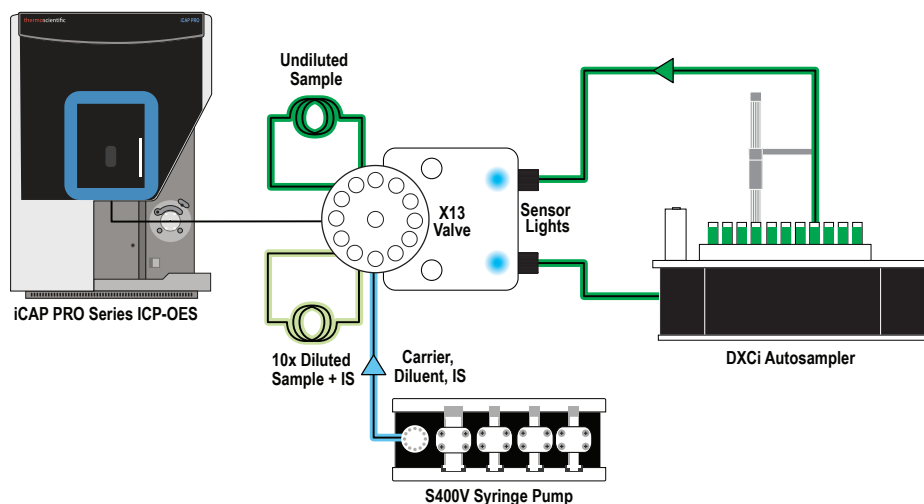
Samples are quickly loaded into a loop while the SampleSense optical sensors automatically monitor the sample arrival. The sample is next mixed with a diluent and internal standard into another loop - at the dilution factor described in Qtegra. The diluted and mixed sample is then introduced into the ICP while the sample loop is syringe rinsed and readied for the next sample. This sampling and dilution process takes place in seconds in the SampleSense prepFAST X system.

- Automated sample loading – no required method
- Both sample loops supported in the single prepFAST X valve
- Actively monitors and reports sample loading issues
- Automatic, rapid and accurate in-line dilutions

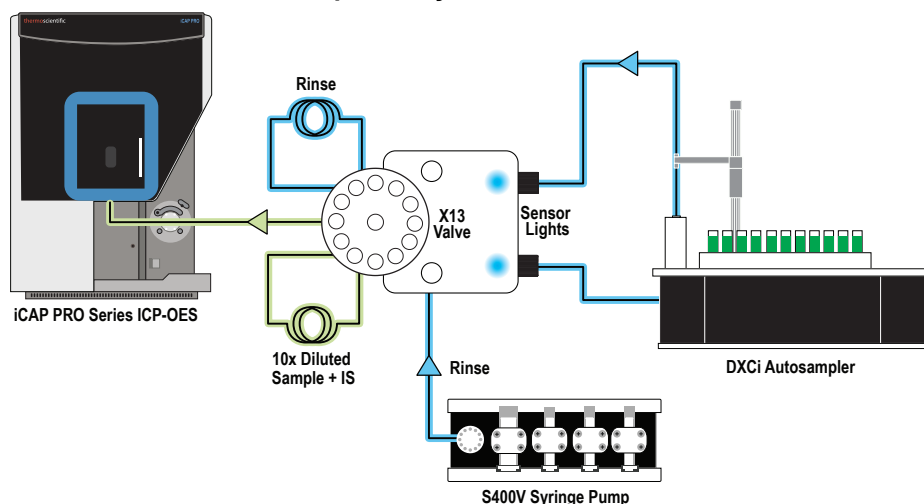
SampleSense
X13 Valve



Sample Load Sensed / Sample Diluted



Sample Analysis and Washout



SampleSense prepFAST X dilution diagram for iCAP PRO Series ICP-OES

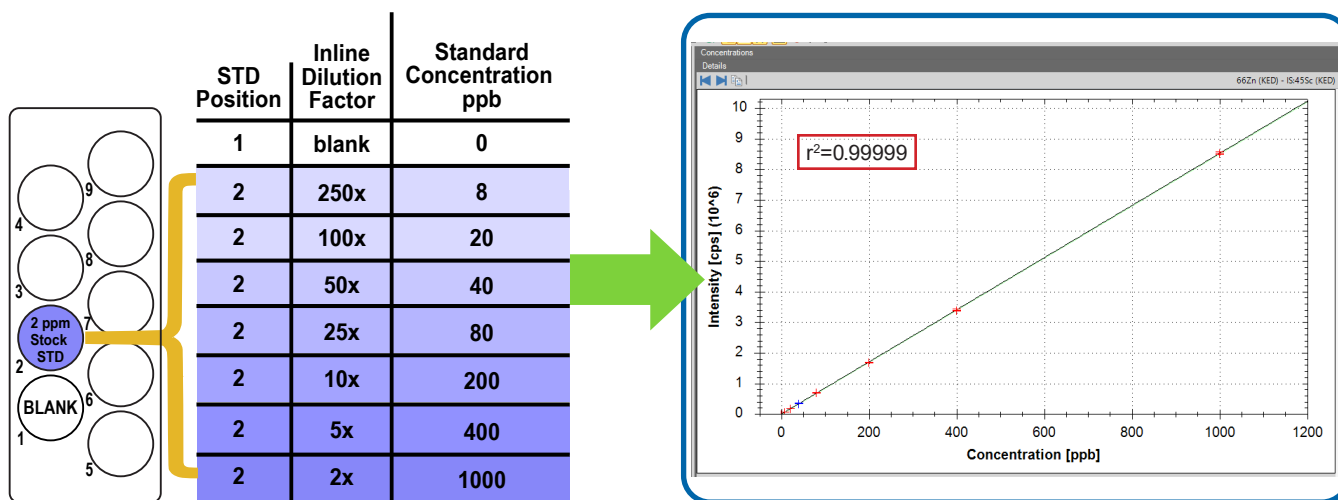
prepFAST X Autocalibration

Autocalibration

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

prepFAST Autocalibration

Inline Prep from 1 Blank + 1 Standard



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

Manual Calibration vs. Autocalibration

30+ MINUTES
- Manual Labor -



5 MINUTES
- AUTOMATED -

- High Risk of -
HUMAN ERROR

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

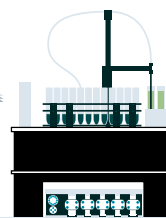


- High use of -
CONSUMABLES



- Reduced -
HUMAN ERROR

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



- Reduced use of -
CONSUMABLES

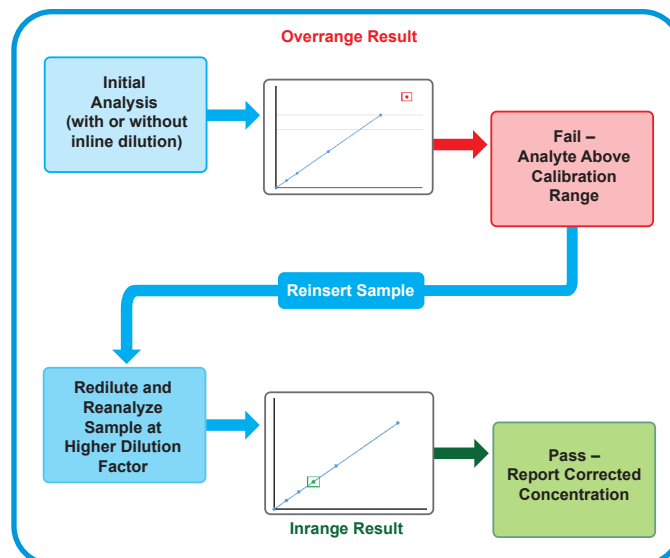
prepFAST X Overrange Dilution

Overrange Analyte Autodilution

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

Maximize laboratory throughput by:

- Save operator time with required dilutions automatically identified and performed by prepFAST
- Original samples and required dilutions analyzed within the in same analysis run



Out-of-Range Internal Standard Autodilution

Internal standard out-of-range conditions occur when a high matrix sample causes response changes in the ICP, which is identified by monitoring the internal standard recoveries. Qtegra is easily configured to automatically detect these limit failures, and directs the prepFAST to automatically perform a dilution.

prepFAST Systems Comparison

prepFAST systems are available in three configurations, each with unique performance capabilities for your laboratory requirements. These capabilities are summarized in the table below, and specifics on these models are provided in the following pages.

prepFAST Systems Comparison for iCAP 6000/7000/PRO Series ICP-OES									
Model	SampleSense	Auto calibration	Auto dilution	Auto Overrange Dilution	Syringe-driven Internal Standard	High Speed Rinse Ultimate Washout	Micro-volume Sample Analysis	Volatile Organic Solvent Analysis	Dilution Range
prepFAST X	✓	✓	✓	✓	✓				1 - 400x
prepFAST MX	✓	✓	✓	✓	✓	✓	✓	✓	1 - 400x
prepFAST MAX	✓	✓	✓	✓	✓	✓	✓	✓	1 - 40,000x

prepFAST X for iCAP 6000/7000/PRO Series ICP-OES

Single Valve Fully Automated Inline Dilution

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

Features

- Automated SampleSense FAST vacuum sample loading
- Actively monitors and reports sample loading issues
- Autocalibration
- Auto QC dilution
- Syringe-driven internal standard
- High-speed washout
- Autocorrecting Autosampler

Benefits

- Automated sample loading with SampleSense – no required method timings
- Calibration standards prepared inline
- Automatic sample dilutions
- Reduce laboratory waste
- Autosampler automatically corrects probe position – even when accidentally obstructed
- Available autosampler models: 2DXCi, 4DXCi, 8DXCi, and 14DXCi
- Fastest probe speed and highest accuracy for microplates and small sample volumes
- Chemically-resistant FlexRack supports valve, manages peristaltic pump tubing and waste connections, routes cables, and locates solution bottles



4DXCi prepFAST X

prepFAST X Features Diagram

AutoAlign Arm

- Self-realigns after encountering capped sample tube
- Metal-free fluoropolymer probe aligner

Sample Containers

- Flexible rack configurations
- Samples from micro vials to large bottles

Autocorrecting x-y-z

- Automatically goes to the correct position every time
- Automatically retries position if an obstacle is encountered

Highest Speed of Operation

- Corrects for stall events, even after years of use
- Keep analysis running, even after obstruction

Inline Syringe Sample Preparation

- Sample dilution
- Internal standard addition
- Overrange dilution

Large Volume Reagent Bottles

Parabolic Probe

- Robust, heavy-walled, self-supporting

Optional Vented Enclosure

- ULPA filter option

Dual Overflowing Rinse Stations

- Ultra-low cross-contamination
- Optional organic solvent rinse
- Independently pumped for low rinse consumption

Vacuum Pump

- Vacuum loaded sampling
- Rapid rinsing & cleaning

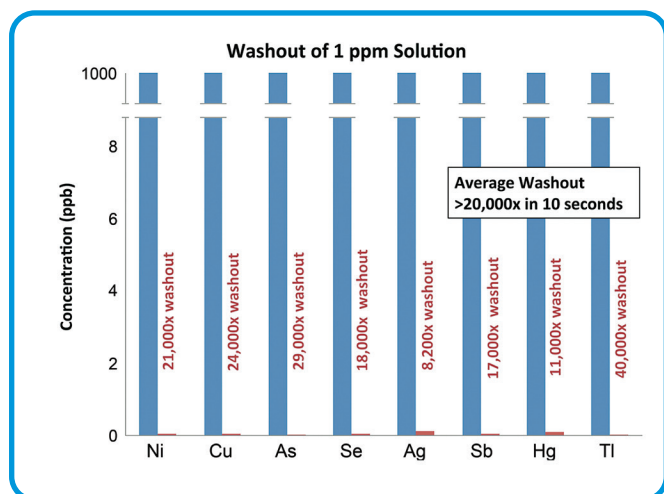
Chemically Resistant

- Designed for exceptionally long lifetime
- No metallic components above samples

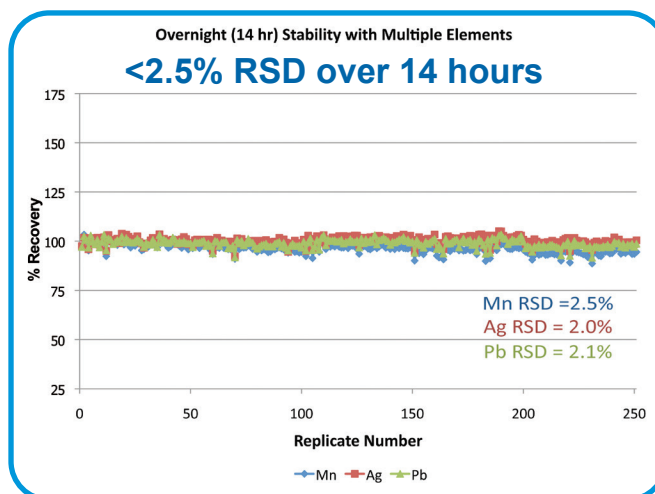
SampleSense Valve Module

- Automatic optically-sensed sample loading
- Single valve 400x dilution range

prepFAST X Performance



FAST washout even for memory-prone elements



Long-term stability

prepFAST™ MX & MAX

Syringe Sample Loading + Syringe-driven Inline Dilution

The prepFAST MX inline dilution systems maximize laboratory automation and ultimate sample washout. The prepFAST MX provides both precision syringe loading of samples and high-throughput vacuum sample loading. Syringe loading is recommended when sample volumes are limited (0.1-3 mL) or when increased sample viscosity becomes an issue. This can include organic solvents, viscous brines or biological sample. Vacuum loading with the prepFAST MX can be used when sample volumes are larger or when sample viscosity is not an issue. The prepFAST MX provides dilution factors from 1 to 400x, and the prepFAST MAX delivers additional dilution factors of 1 to 40,000x via dual-stage dilution.



S500V2 Dilution Module
for prepFAST MX

Features

- Precision syringe sample loading
- Automated SampleSense FAST vacuum sample loading
- Actively monitors and reports sample loading issues
- Autocalibration
- Inline dilution
 - 1 to 400x (MX)
 - 1 to 40,000x (MAX)
- Auto QC dilution
- Syringe-driven internal standard addition
- High-pressure syringe-driven probe rinsing
- High-speed rinse with ultimate washout
- Autocorrecting Autosampler

Benefits

- Automate sample dilutions
- High sample throughput
- Minimize sample usage
- Reduce laboratory waste
- Best rinse-out performance
- Autosampler automatically corrects probe position
 - even when accidentally obstructed
- Available autosampler models: 2DX, 4DX, 8DX, and 14DX
- Fastest probe speed and highest accuracy for microplates and small sample volumes
- Chemically-resistant FlexRack supports valve, manages peristaltic pump tubing and waste connections, routes cables, and locates solution bottles



4DXCi prepFAST MX

prepFAST MX / MAX Features Diagram

AutoAlign Arm

- Self-realigns after encountering capped sample tube
- Metal-free fluoropolymer probe aligner

Sample Containers

- Flexible rack configurations
- Samples from micro vials to large bottles

Autocorrecting x-y-z

- Automatically goes to the correct position every time
- Automatically retries position if an obstacle is encountered

Highest Speed of Operation

- Corrects for stall events, even after years of use
- Keep analysis running, even after obstruction

Inline Syringe Sample Preparation

- Sample dilution
- Internal standard addition
- Washing
- Overrange dilution

Large Volume Reagent Bottles

Parabolic Probe

- Robust, heavy-walled, self-supporting

Optional Vented Enclosure

- ULPA filter option

Dual Overflowing Rinse Stations

- Ultra-low cross-contamination
- Optional organic solvent rinse
- Independently pumped for low rinse consumption

Vacuum Pump

- Vacuum loaded sampling
- Rapid rinsing & cleaning

Syringe Sample Loading

- Precise sample loading for small samples or multiple reanalysis

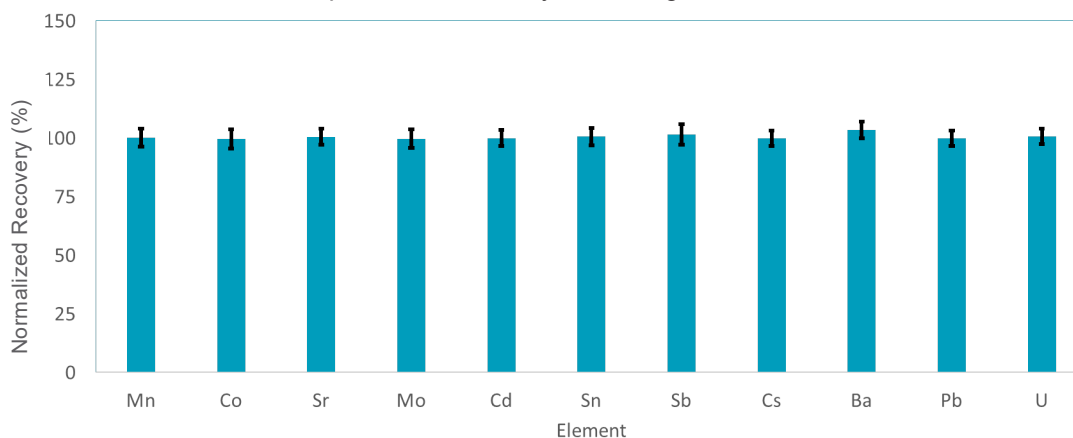
SampleSense Valve Module

- Automatic optically-sensed sample loading
- Single valve 400x dilution range (MX)
- Dual-stage 40,000x dilution range (MAX)

Automated micro sample analysis in a difficult matrix

prepFAST MX with 100 μ L Clinical Samples

250 Replicate Urine Analysis Average RSDs <4%



prepFAST Systems Ordering Information

prepFAST Models

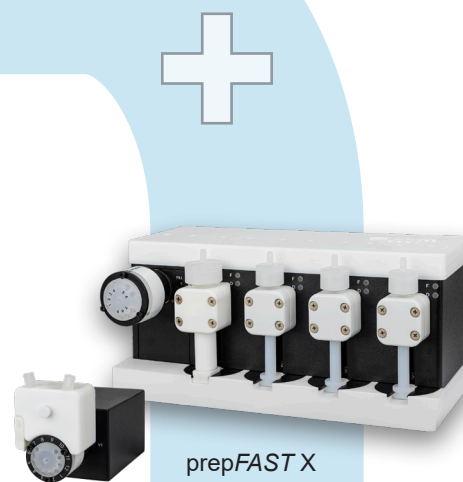
prepFAST inline dilution systems automatically perform precise and accurate dilutions for sample and standards, improving laboratory workflow, productivity, and data quality.



4DXCi Autosampler
with Mobile Station

prepFAST X Provides:

- Autocalibration
- Autodilution and Auto overrange dilution
- SampleSense automated vacuum sample loading
- Improved washout and higher throughput
- Syringe-driven internal standard addition
- Autocorrecting Autosampler
- Dilution range: **1-400x**



prepFAST X

prepFAST MX Provides:

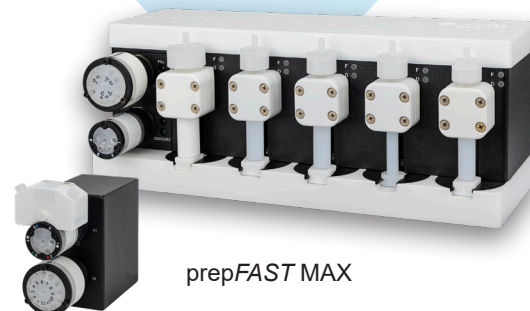
- Autocalibration
- Autodilution and Auto overrange dilution
- Precision syringe sample loading
- SampleSense automated vacuum sample loading
- Enhanced washout performance
- Syringe-driven internal standard addition
- Autocorrecting Autosampler
- Dilution range: **1-400x**



prepFAST MX

prepFAST MAX Provides:

- Autocalibration
- Autodilution and Auto overrange dilution
- Precision syringe sample loading
- SampleSense automated vacuum sample loading
- Enhanced washout performance
- Syringe-driven internal standard addition
- Autocorrecting Autosampler
- Dilution range: **1-40,000x**



prepFAST MAX

prepFAST Ordering Information

prepFAST X Systems for iCAP PRO and 6000/7000 Series ICP-OES Part Numbers

Autosampler Model	prepFAST X	prepFAST MX	prepFAST MAX
2DXCi	2PFXSS-68	2PFMX-68	2PFMAX-68
4DXCi	4PFXSS-68	4PFMX-68	4PFMAX-68
8DXCi	8PFXSS-68	8PFMX-68	8PFMAX-68
14DXCi	14PFXSS-68	14PFMX-68	14PFMAX-68



4DXCi SampleSense
prepFAST MX



4DXCi SampleSense
prepFAST X



4DXCi SampleSense
prepFAST MAX

Automated Speciation and Total Metal Analysis System

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

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

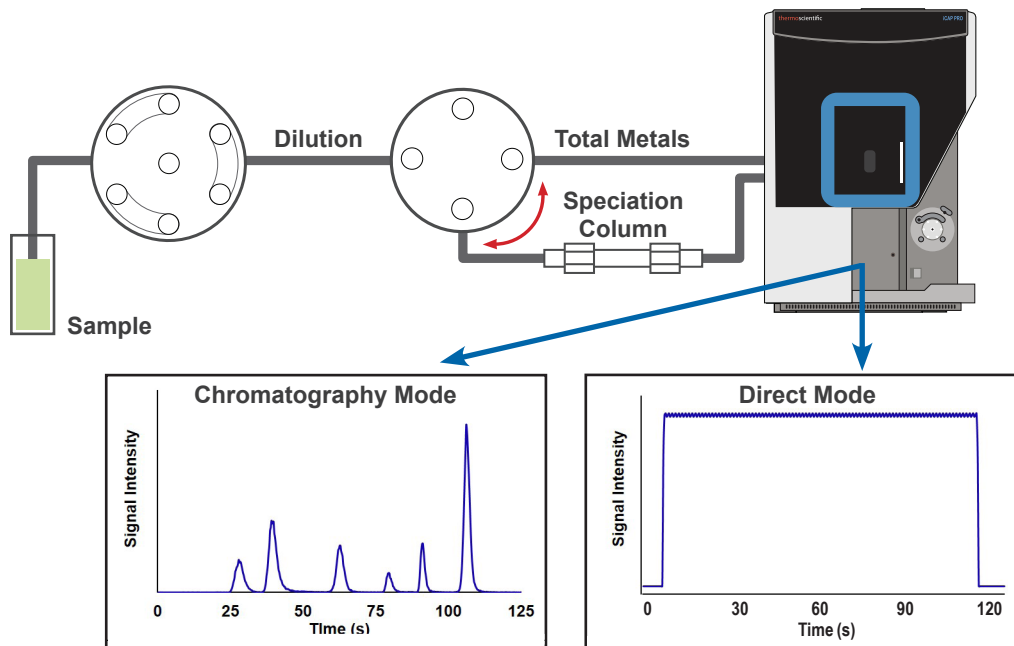


prepFAST IC System

prepFAST IC Features:

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

Unique Design Supports Unattended Analysis of Both Trace Metals and Speciation



prepFAST IC Autoselects Chromatography Mode or Direct Mode

prepFAST IC Features Diagram

Optional ULPA Filter

SampleSense FAST

Autodilution Valves

- Inline automated calibration and dilution system

Sample Containers

- <1 mL up to 500 mL

Electronics in Rear Plenum

SampleSense FAST/Speciation/
Total Metals Selection Valves

- Auto switching of SampleSense FAST and prepFAST
- Auto switching of total metals or speciation (chromatography mode)

Exhausted Enclosure

High-precision
DX Autosampler

Autotuning

Autodilution
Syringe Module

- Sample autodilution at time of analysis
- Species-specific autocalibration capability
- Micro-volume sample syringe-loading
- Calibration matrix matching
- Inline sample chemical reactions
- Inline sample derivatization

High-pressure
Speciation Module

- Ultra-high-purity, metal-free pump
- Gradient elution
- Post-column internal standard
- Post-column dilution
- Post-column derivatization

Reagent Reservoirs

- For autodilution and elution reagents

Xceleri Software for Automated Speciation Analysis

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

Data Processing

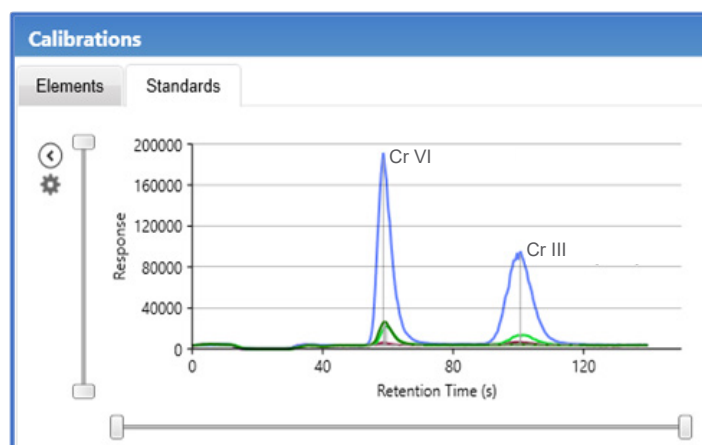
- Transient signal data processing
- Easy to build methods
- Calibration fit tools
- Specifically designed for LC-ICP/ICPMS

Data Viewing

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

Advanced Reporting Functions

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

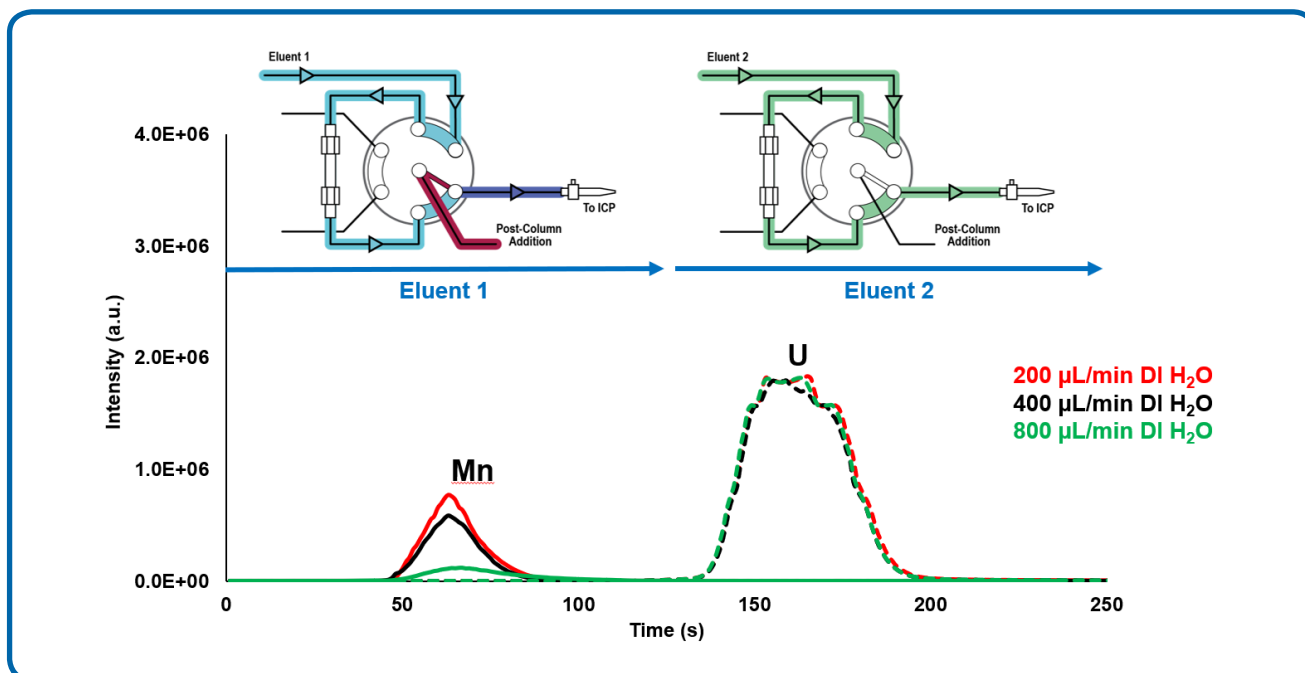


prepFAST IC

prepFAST IC with ICP-OES Performance: Separation of Trace Metals from a Uranium Matrix

The determination of trace elements in uranium (U) materials are an important for several areas in the nuclear industry including exploration/mining, refining, fuel production, operational monitoring, decommissioning/storage and environmental monitoring. This method described here allows the uranium rich matrix to be sent to waste while the trace elements are detected on an ICP. In order to analyze trace elements in the presence of uranium by ICP, the emission rich uranium matrix must be removed. The prepFAST IC fully automates this process, providing for interference-free analysis of the trace elements. This significantly reduces sample preparation time (often performed manually off-line), user exposure, and the consumption of required reagents. (commonly done by gravity-fed chromatography) which has reduced the time, sample volume, and reagents consumption required.

Uranium Matrix Removal



Separation of trace element impurities (e.g., 5 $\mu\text{g}/\text{mL}$ Mn) from uranium matrix (1 vol. % U) using three post-column addition flow rates (200, 400, and 800 $\mu\text{L}/\text{min}$ DI water). The arrows depict the timing for switching the method from eluent 1 to eluent 2.

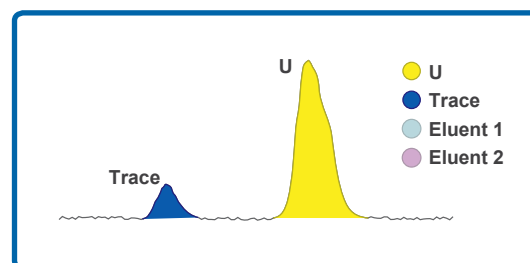
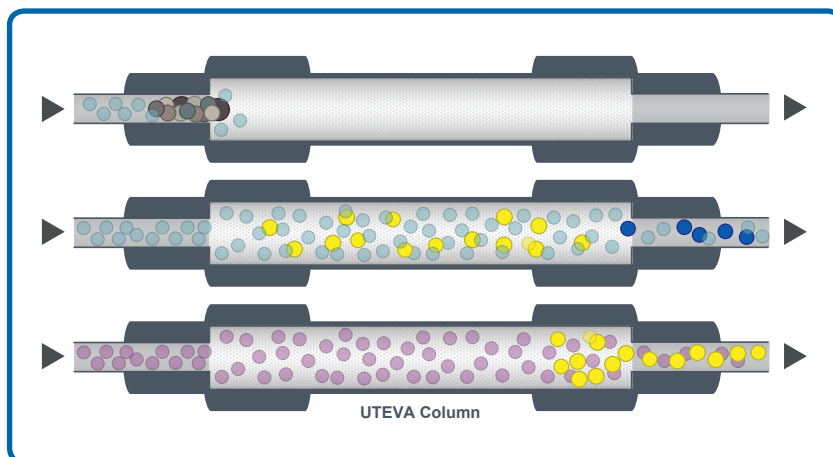


Illustration of the chromatographic separation of trace metals and uranium matrix using an UTEVA resin column.

prepFAST IC Configuration Options

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

Description	Part Number
Isocratic Base System (FAST IC). Includes 4-rack autosampler in polypropylene enclosure, PFA-ICN nebulizer, syringe and vacuum sample loading, system pressure readback and FAST total metal sample introduction.	IC-0101
Binary Gradient Option – Binary gradient elution capability for advanced chromatography	IC-0109
Quarternary Gradient Elution Option – Quarternary gradient elution for advanced chromatography	IC-0102
prepFAST Option – Autocalibration and autodilution capabilities	IC-0103
Automated Speciation and Total Metals Option – Automated switching between total metals and speciation	IC-0104
Autotuning Option – Switching valve for introduction of tuning solutions	IC-0105
Post-Column Option/ 3rd Eluent Option – Additional syringe module	IC-0106
SampleSense FAST UHT Option – Adds high-throughput SampleSense UHT optically-sensed injection valve	IC-0107
pergo Option – Argon humidifier for nebulizer gas accessory	IC-0108
SampleSense Option – Adds SampleSense FAST automated loading and analysis triggering injection valve	IC-0110
Analytical Station Option – IC hardware integrated into instrument bench with monitor & storage	IC-0111
Xceleri Chromatographic Software – Chromatographic data processing tools	IC-0201

prepFAST IC Speciation Kits

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

Kit Name	Description	Part Number
Cr	Inorganic Chromium Speciation Kit. CF-Cr-01 column, single species standards for Cr III, Cr VI, and Tm (1000 µg/mL, 100 mL), and method guide.	ICX-Cr36
Fe	Inorganic Iron Speciation Kit. CF-Fe-01 column, single species standards for Fe ⁺² and Fe ⁺³ (1000 µg/mL, 100 mL), and method guide.	ICX-Fe23
U	Trace Elements in Uranium Matrix Kit. CF-UTEVA-02 column, single species standard for U (100,000 mg/L, 100 mL) and multielement standards (Al, As, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, An, Ba, Ce, Ga, Li, P, Sr, U, 1000 mg/L, 100 mL) and method guide. For removal of U matrix.	ICX-UTEVA

hydrideICP™

Compact Hydride Generation System for iCAP 6000/7000/PRO Series ICP-OES

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

Benefits:

- Increased sensitivity, up to 100x for hydride-forming elements
- Improved detection limits for As, Hg, Se, Sb, and other hydride-forming elements
- Improved stability
 - MP² micro peristaltic pump precisely mixes sample and reagents, producing a stable formation of H₂ 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
 - MP² micro peristaltic pump with ceramic pins, a PFA mixing block and quartz gas liquid separator
- Convenient
 - hydrideICP is completely integrated into the MP² pump



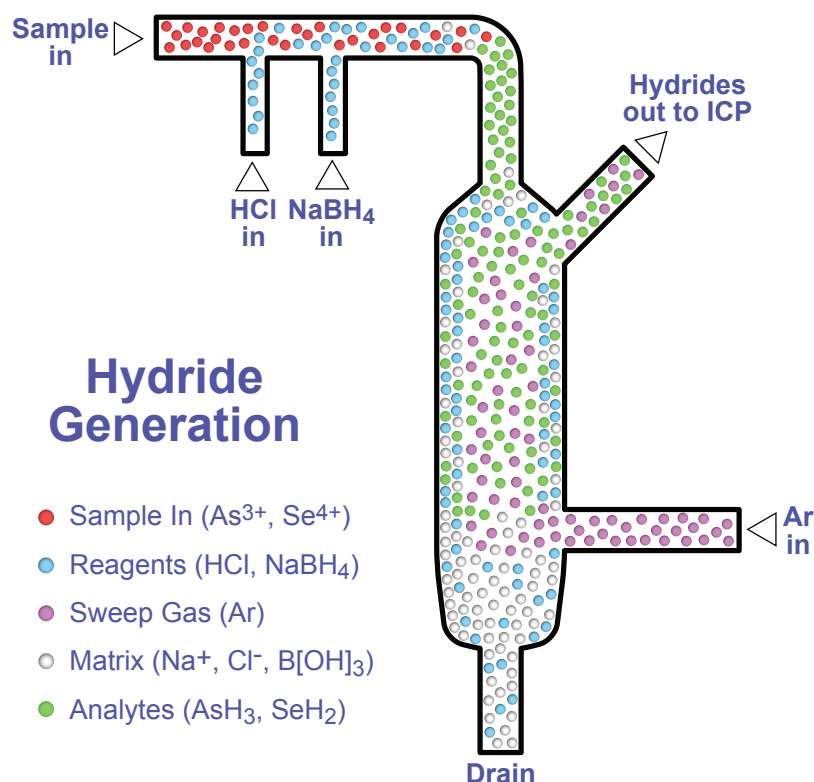
hydrideICP system



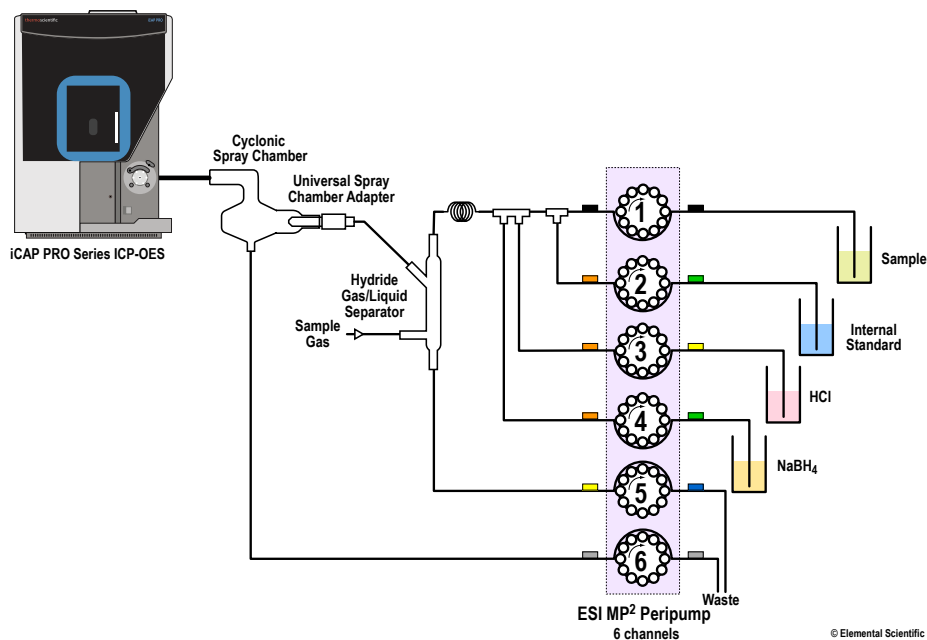
Universal spray chamber adaptor (P/N HG-USCA-01) used with hydrideICP operating in hydride-only mode.



Dual-Inlet spray chamber (P/N ES-3173-1411-21) used with hydrideICP operating in simultaneous hydride and direct nebulization mode.



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



hydrideICP with internal standard system diagram

Description	Part Number
hydrideICP hydride generation system. HydrideICP Generator Kit (hydride quartz gas-liquid separator, four-way tee, MP ² precision micro peristaltic pump, universal spray chamber adapter and mounting plate).	HG-MP2-6-A
Quartz spray chamber with two inlets, for iCAP 6000/7000/PRO series ICP-OES. Supports simultaneous hydride and direct nebulization modes with the hydride ICP.	ES-3173-1411-21

Autosampler Enclosures and ULPA Filtered Environments

Autosampler Enclosures

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

Enclosures for DXe, DX and DXCi Autosamplers

Autosampler Model	Enclosure Only	Enclosure with ULPA Filter
Enclosure for MicroDX	SC-1607-DX	SC-1607-DX-1000
Enclosure for 2DX	C3V2	C3V2-ULPA
Enclosure for 4DX	C3V4	C3V4-ULPA
Enclosure for 8DX	C3V8	C3V8-ULPA
Enclosure for 14DX	C3V14	C3V14-ULPA



C3V2-ULPA
Enclosure for 2DX autosampler with
ULPA Filter

Ultra-Low Particulate Arrestor Air Filter and Mounting Plate

The ULPAClean 10 filter creates a clean, positive pressure environment for samples and standards and prevents airborne contamination. The ULPAClean 10 removes 99.9995% of 0.1 μm particles or larger.

ULPAClean 10 can run off the autosampler power or can be plugged directly into an outlet (24VDC operation). Two air volume settings are available for quiet operation, 1.0 or 0.5 m^3/min .

Description	Part Number
ULPAClean 10 filter for autosampler enclosure	ULPA10



ULPA10
ULPAClean 10 Filter

Mobile Autosampler Stations

Mobile Stations for 2DX and 4DX Autosamplers

2DX and 4DX Mobile Autosampler Stations

The mobile autosampler station provides a small-footprint platform for these autosamplers.

Benefits:

- Mobile with locking wheels for flexible positioning
- Frees up valuable laboratory bench space
- Convenient location for rinse, internal standard, and waste containers
- Shelf for additional sample introduction equipment, such as prepFAST



2DX autosampler with mobile station



4DX autosampler with mobile station

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

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



Storage space for racks, solutions and accessories



Accessible rinse bottle can be refilled in place

Direct ICPMS Analysis of Solid Samples

Laser Ablation (LA) is a solid sample introduction technique for ICPMS/ICP and LIBS. Used to directly analyze solid samples, which are placed inside a sample cell and ablated by high power laser pulses. With a beam size ranging from a few microns to hundreds of microns in diameter, spatial imaging or bulk analysis can be performed. The aerosol generated is swept into the ICP/ICPMS via a simple transport line for analysis.

ESL offers a complete range of innovative laser ablation systems and accessories for diverse applications including:

imageBIO266: A purpose-built laser system dedicated to high-speed elemental imaging of biological samples, designed to minimize contamination from the substrate common when using glass microscope slides.

imageGEO193: A purpose-built laser system for high-speed and high-resolution elemental imaging of challenging geological matrices that require high energy.

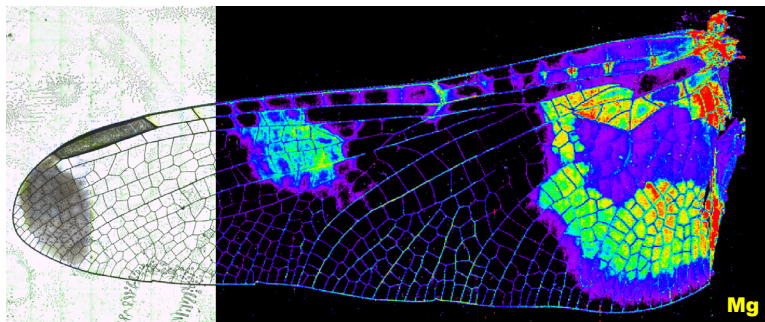
ESL193/ESL213: Reliable laser systems for routine applications in UV/near-UV

Laser SC/LaserTRAX: The only fully automated autosampling systems for laser ablation in high production environments in mining, metallurgy and materials.

TwoVol3: The *FASTEST* ablation chamber offering ultra-short sample transfer/washout required for imaging applications. It is also convertible for conventional quantitative analysis and upgradable to ES Lumen for LIBS data acquisition.

ES Lumen: A LIBS spectrometer that uses light emitted from the laser hitting the samples to capture additional spectral information – for elements not measured by ICPMS such as Fluorine.

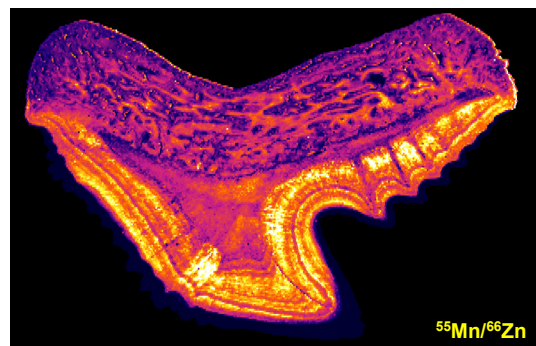
iolite 4: A comprehensive data processing software and reporting tool for quantitative measurements, imaging, and isotopic abundance calculations.



Dragonfly Wing; imageBIO266



INNOVATION to ILLUMINATE



Tiger Shark Tooth; imageGEO193^{LIBS}



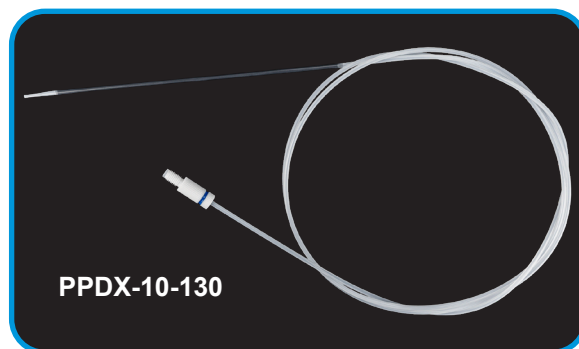
imageGEO193

Autosampler Probes

Parabolic Probe for DXCi Autosamplers

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

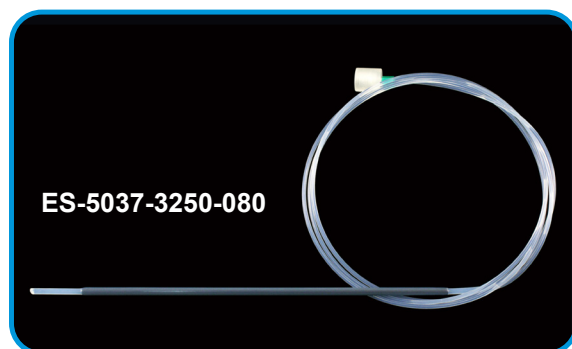
Description	Part Number
Sample Probe: carbon fiber support, 1.0 mm ID (gray marker) 130 cm fully encapsulated capillary with 1/4-28 fitting with tapered tip	PPDX-10-130



Probes for DXe and DX Autosamplers

Proper autosampler probes are critical for cleanly sampling both standards and samples for transport for ICP or ICPMS. The probes are constructed with a rigid carbon fiber support material encapsulated between layers of fluoropolymer, which provides a chemically-resistant probe that is mechanically stable and resilient. These probes are available in various I.D. sizes to provide several self-aspiration rates.

- Probes for use on 2DX, 4DX, 8DX, and 14DX autosamplers come supplied with 150 cm capillary length
- 80 cm capillary probes utilized on small autosamplers (including MicroDX) to minimize dead volume
- Probes for DXe & DX autosamplers supplied with 1/4-28 threaded fitting to direct connection to PFA-ST nebulizers. Add CTFE peristaltic pump fitting (ES-2501-PPM2) for connection to peristaltic pump tubing
- Probes for DX autosamplers equipped with *FAST* and *prepFAST* come equipped with a fitting to connect directly to the ESI *FAST* valve



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

Also available with Ultem support

PFA High-performance MicroFlow OneTouch Nebulizers for the iCAP 6000/7000/PRO Series ICP-OES

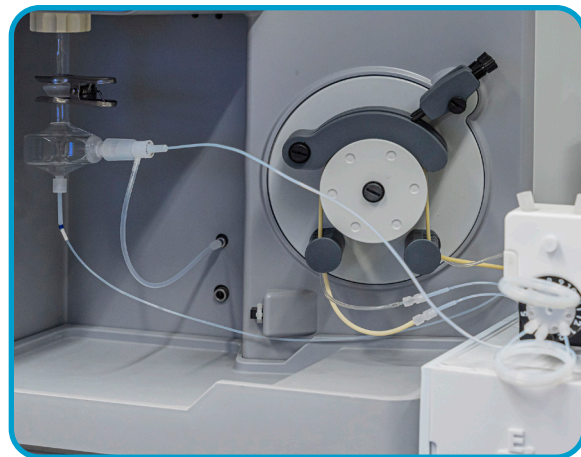
PFA-ICN Integrated Capillary OneTouch Nebulizers

These high-performance PFA nebulizers feature a fluoropolymer fitting on the integrated sample capillary to minimize connections and provide ease-of-use. They are pre-fitted with a OneTouch gas fitting for secure connection to the instrument. Both the liquid line and the gas line are ultra clean, chemically inert and manufactured to the exact length for the Thermo Fisher Scientific ICP-OES systems. These nebulizers are ready for quick installation and offer high performance with ease-of-use.

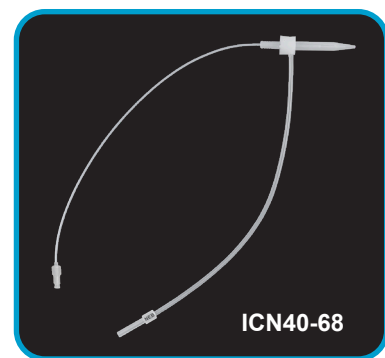
The self-aspirating MicroFlow OneTouch fluoropolymer nebulizers are chemically resistant and an essential part of the ICP laboratory. The PFA integrated capillary nebulizers produce a fine aerosol from aggressive acids, alkalis, organics, and high-salt solutions. They are resistant to clogging and produce high sensitivity at a low sample flowrate. They are the ideal nebulizer for *FAST* and *prepFAST* systems as well as for direct connection to peristaltic pump tubing.

Benefits:

- Integrated capillary eliminates additional connection at nebulizer
 - Optimized internal diameter for use with all *FAST* and *prepFAST* valve-equipped systems with coded fitting for proper valve port connection
 - Customized length OneTouch liquid capillary to minimize dead volume and uptake delay
 - Sample particulates collect at the easy-to-clean fitting end of the capillary rather than at the nebulizer tip
 - Models for direct connection to *FAST*/*prepFAST*/*prepFAST* IC valves and for direct connection to peristaltic pump tubing
- Equipped with custom-length OneTouch gas line connector for easy and secure installation on iCAP 6000/7000/PRO Series ICP-OES systems



PFA MicroFlow OneTouch nebulizer with SampleSense prepFAST X on iCAP PRO Series ICP-OES



PFA MicroFlow OneTouch nebulizer for *FAST* and *prepFAST*



OneTouch nebulizer gas fitting for argon gas supply from instrument

Description	Usage	iCAP 6000/7000 Part Number	iCAP PRO Part Number
PFA MicroFlow OneTouch nebulizer for <i>FAST</i> and <i>prepFAST</i> , with OneTouch gas connector and 40 cm liquid capillary with 1/4-28 fitting	<i>FAST</i> , <i>prepFAST</i>	ICN40-88	ICN40-68
PFA MicroFlow OneTouch nebulizer for <i>prepFAST</i> X, with OneTouch gas connector and 40 cm liquid capillary with M5 sample fitting	<i>prepFAST</i> X	ICN40X-88	ICN40X-68
PFA MicroFlow OneTouch nebulizer for <i>prepFAST</i> IC, with OneTouch gas connector and 100 cm liquid capillary with 1/4-28 sample fitting	<i>prepFAST</i> IC	ICN100-88	ICN100-68
PFA MicroFlow OneTouch nebulizer for direct connection to peristaltic pump tubing, with OneTouch gas connector and OneTouch sample capillary with barbed fitting	General high sensitivity & high performance	PFA88	PFA68

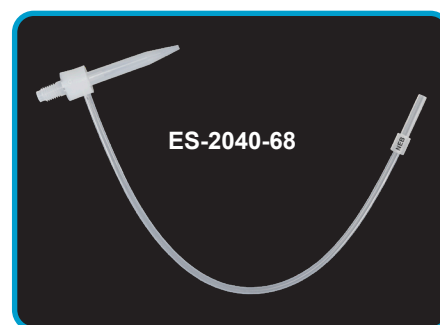
PFA-ST High-efficiency MicroFlow OneTouch Nebulizers for the iCAP 6000/7000/PRO Series ICP-OES

PFA-ST MicroFlow OneTouch Nebulizers

The PFA-ST MicroFlow OneTouch 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. They are resistant to clogging and are reliably self-aspirated or pumped to produce a fine aerosol for high-transport efficiency and high sensitivity.

Benefits:

- All PFA construction
- Exchangeable uptake capillaries allow one nebulizer to be used at different self-aspiration rates from 20 to 700 $\mu\text{L}/\text{min}$. Includes two sample capillaries (100 & 400 $\mu\text{L}/\text{min}$)
- Chemically resistant – ideal for strong acids, alkalis and organics
- Can be pumped from <0.02 to 3.0 mL/min
- Direct analysis of volatile and non-volatile organic solvents
- Longer lifetime than glass or quartz nebulizers
- Equipped with custom length OneTouch gas connector for easy and secure installation on iCAP 6000/7000/PRO Series ICP-OES systems



PFA-ST MicroFlow OneTouch nebulizer with pre-fitted, customized length gas line for quick and secure connection to iCAP PRO ICP-OES

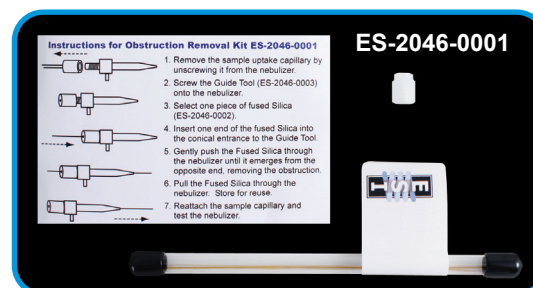
Description	Usage	iCAP 6000/7000 Part Number	iCAP PRO Part Number
PFA-ST MicroFlow OneTouch nebulizer with external 1/4-28 threaded connector and OneTouch gas line	General high sensitivity and high performance	ES-2040-88	ES-2040-68
PFA-ST MicroFlow OneTouch nebulizer for prepFAST equipped systems. Self-aspirating nebulizer with external 1/4-28 threaded connector and OneTouch gas line	prepFAST equipped systems	PF-2040-88	PF-2040-68
PFA-ST MicroFlow OneTouch high-solids large bore PFA nebulizer with external 1/4-28 threaded connector and OneTouch gas line	Ideal for strong acids, high-solids, alkalis, organic solvents, soils & high-salt samples	ES-2030-88	ES-2030-68

Syringe Flush and Obstruction Removal Kits for PFA Nebulizers

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

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

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



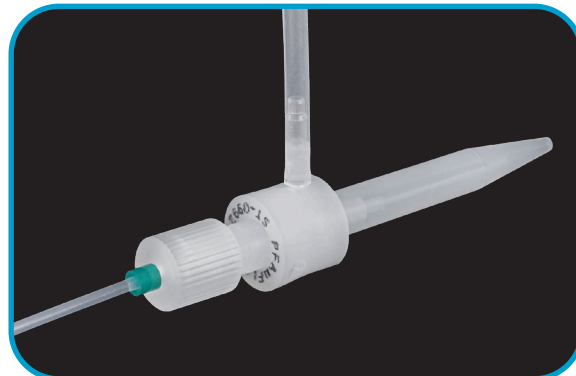
Capillaries for PFA-ST MicroFlow OneTouch Nebulizers

Sample Capillaries for PFA-ST MicroFlow OneTouch Nebulizers

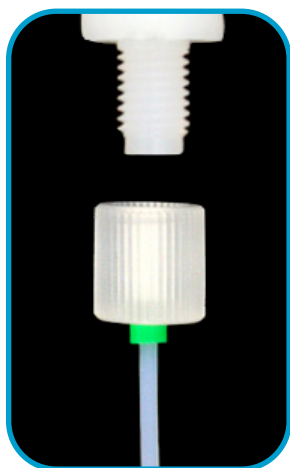
The sample uptake rate of PFA-ST nebulizers is controlled by the dimension of the external capillary or probe. These exchangeable uptake capillaries allow one nebulizer to be used at different self-aspiration rates, from 20 $\mu\text{L}/\text{min}$ to 700 $\mu\text{L}/\text{min}$.

Benefits:

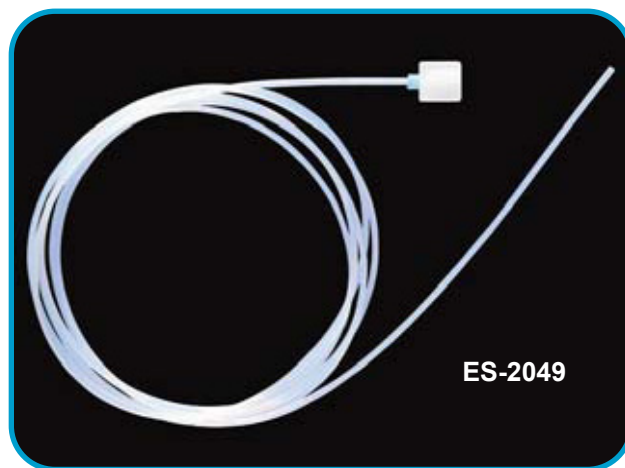
- All PFA construction provides chemical resistance
- Can be peristaltically pumped from 0.1 to 3.0 mL/min
- Supports direct analysis of both volatile and non-volatile solvents



Sample capillary attached to PFA-ST MicroFlow nebulizer



Use one of the sample uptake capillaries or autosampler probes for self-aspiration or directly attach peristaltic pump tubing to the PFA-ST MicroFlow nebulizer



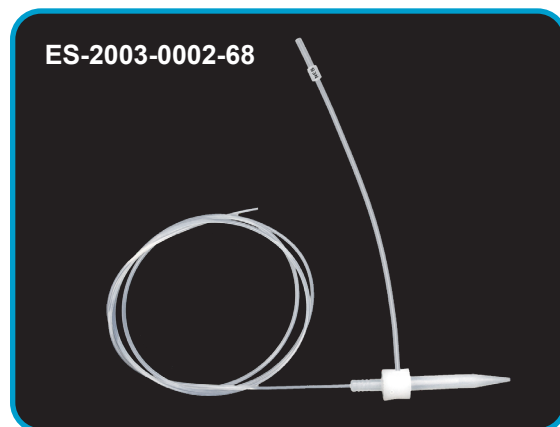
Sample capillary for PFA-ST MicroFlow nebulizer

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

PFA MicroFlow OneTouch Nebulizers with Integrated Sample Capillaries for iCAP 6000/7000/PRO Series ICP-OES

PFA MicroFlow OneTouch Nebulizers with Integrated Capillaries

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



Sample aspirating PFA-ST MicroFlow OneTouch nebulizer

Benefits:

- Integrated capillary for connection-free introduction of samples at low flow rates
- Available with self-aspiration rates between 20 and 400 $\mu\text{L}/\text{min}$
- Chemically-resistant, ideal for strong acids, alkalis and organic solvents
- Produces a fine aerosol for high transport efficiency and high-sensitivity
- Integrated OneTouch gas line with easy and secure installation on iCAP 6000/7000/PRO Series ICP-OES

PFA MicroFlow OneTouch Nebulizers with Integrated Capillaries			
Model	Self-aspiration Rate (@1 L/m Ar)	iCAP 6000/7000 Part Number	iCAP PRO Part Number
PFA-20	20 $\mu\text{L}/\text{min}$	ES-2020-88	ES-2020-68
PFA-50	50 $\mu\text{L}/\text{min}$	ES-2000-88	ES-2000-68
PFA-100	100 $\mu\text{L}/\text{min}$	ES-2002-0002-88	ES-2002-0002-68
PFA-200	200 $\mu\text{L}/\text{min}$	ES-2003-0002-88	ES-2003-0002-68
PFA-400	400 $\mu\text{L}/\text{min}$	ES-2005-0002-88	ES-2005-0002-68

Other flow rates made to order



MEINHARD®

OneTouch Nebulizers

Ready to Install. Ready to Perform.

MEINHARD® OneTouch nebulizers include patented 100% fluoropolymer one-touch gas connectors and integrated fluoropolymer peristaltic pump barbed sample lines. Both the gas line and the sample line are ultra clean, chemically-inert and manufactured to the exact length for the iCAP 6000/7000/PRO Series ICP-OES systems. They are ready for quick installation and offer high performance with ease-of-use.

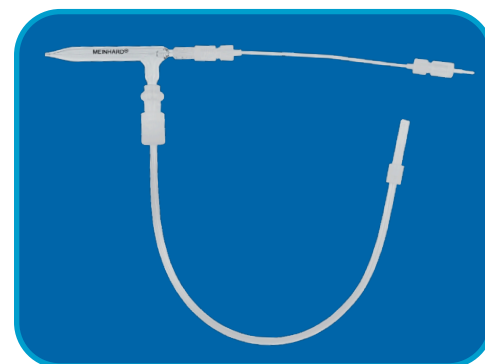
The K68 and K88 MEINHARD® OneTouch nebulizers are recommended for Thermo Scientific iCAP PRO and iCAP 6000/7000 ICP-OES, combining high sensitivity performance with high total dissolved solids (TDS) capability. They are suitable for almost all non-HF applications.

MEINHARD® OneTouch Nebulizers Provide:

- Quick installation with pre-fitted gas and liquid lines
 - OneTouch nebulizer gas fitting for instrument connection
 - OneTouch liquid fitting for easy connection to peristaltic pump tubing
- Secure fitting designs safeguard against gas and sample leaks
- Line lengths customized for iCAP 6000/7000/PRO Series ICP-OES systems
- High sensitivity performance combined with high TDS capability
- Performance verified with ICP test data supplied for each nebulizer
- Peristaltic pumped rate 0.1 to 3.0 mL/min



MEINHARD® OneTouch K68 glass nebulizer



MEINHARD® OneTouch K68 nebulizer for iCAP PRO Series ICP-OES

Description	iCAP PRO Part Number	iCAP 6000/7000 Part Number	Similar OEM Part Number
MEINHARD® OneTouch glass nebulizers, with pre-fitted gas and liquid lines	K68	K88	842312051431

Designed for Quick and Secure Installation

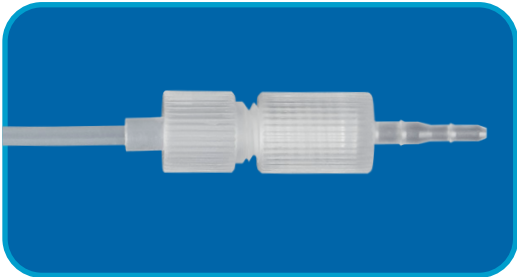
All MEINHARD® OneTouch nebulizers come equipped with customized gas and sample lines to provide quick and secure installation on iCAP 6000/7000/PRO Series ICP-OES systems.



MEINHARD® OneTouch nebulizer includes pre-fitted fluoropolymer liquid and gas lines. Shown installed on iCAP PRO Series ICP-OES



OneTouch nebulizer gas fitting for argon gas supply from instrument

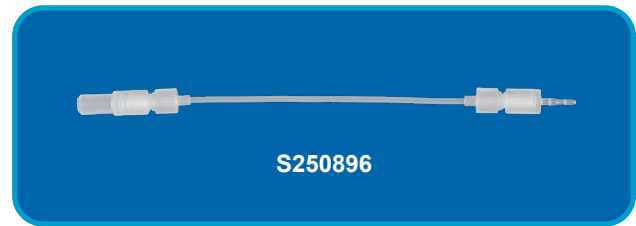


OneTouch sample line with barbed fluoropolymer connector for both flared and unflared peristaltic pump tubing

MEINHARD® OneTouch Liquid Lines for iCAP 6000/7000/PRO Series ICP-OES

MEINHARD® OneTouch Spare Liquid Lines for Peristaltic Pumping

Description	Application	iCAP PRO Part Number	iCAP 6000/7000 Part Number
MEINHARD® spare OneTouch nebulizer liquid line for Thermo Fisher Scientific iCAP ICP-OES systems, 0.5 mm ID ■ (orange marker) and peristaltic pump barb fitting	For all MEINHARD® glass and quartz nebulizers	S250896	S250904

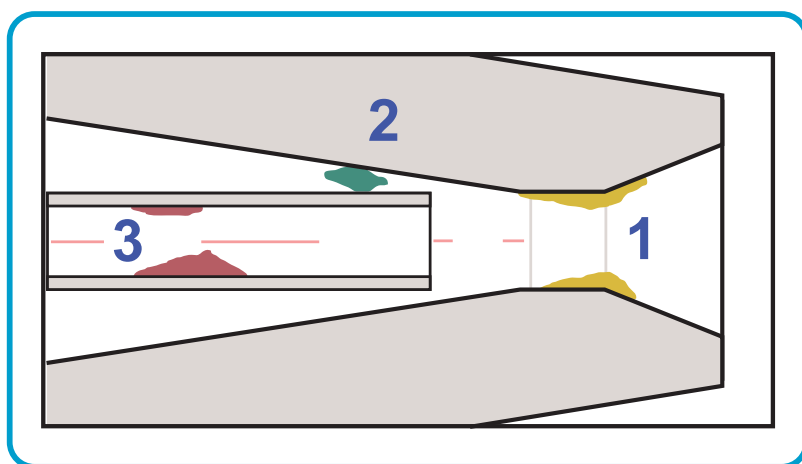


Pearl Nebulizer Cleaner for Glass and Quartz Concentric Nebulizers

With the Pearl, the user is able to quickly and easily backflush cleaning solution through both the sample and gas passages. Recommended cleaning solutions are:

- Sigma-Aldrich RBS-25 diluted approximately 20x
- Deconex diluted approximately 20x
- Either of above, with the addition of 10% methanol

When the wet-cleaning process is finished, rinse with DI water and flush dry with compressed air or inert gas. The diagram below shows the 3 main types of blockages that can occur in pneumatic concentric nebulizers.

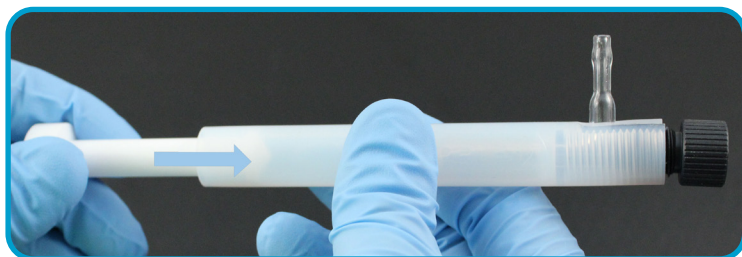


1. Deposits at this point are typically composed of salts coming out of solution. Such deposits can usually be removed by repeated rinsing of a concentric nebulizer with an appropriate solvent.

2. This sort of obstruction is the worst type, capable of breaking the tip of a glass capillary. If the deposit is insoluble, the only sure way to remove it is with a Pearl cleaner.

3. Deposits inside the capillary may go unnoticed for quite a while, particularly if the sample is pumped. Paper and textile fibers are often at fault.

PRL-03
Nebulizer
Cleaner



Pumping cleaning solution through concentric nebulizer.

Description	Part Number
Pearl nebulizer cleaner for glass and quartz concentric nebulizers	PRL-03

MEINHARD® Specialty Liquid Quick Connectors

These PFA sample connectors are low dead-volume quick connectors for MEINHARD® OneTouch nebulizers. They offer fast stabilization time and a reliable seal with chemically resistant PFA construction. Three specialized 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:

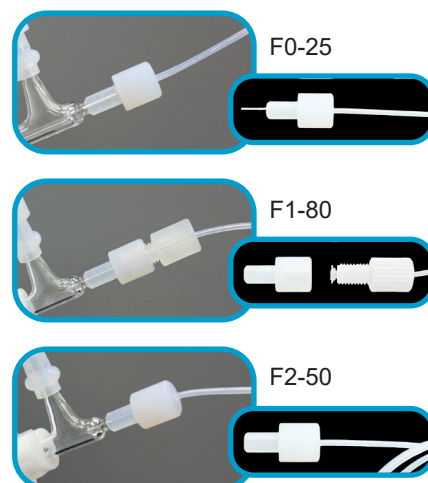
F0: Encapsulated micro tubing for microflow rates (0.1 to 0.5 mL/min)

F1: Detachable solution capillary for speciation and when a detachable connection is desired

F2: Integrated solution capillary for self-aspiration or pumping

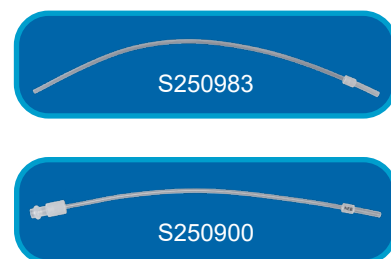
MEINHARD Specialty Liquid Quick Connectors

Description	Part Number
F0 PFA Microflow Nebulizer Quick Connector. Includes 0.25 mm ID ■ (green marker) 70 cm long micro PTFE capillary.	F0-25
F1 PFA Detachable Nebulizer Quick Connector. Includes 0.8 mm ID ■ (blue marker) 70 cm long PTFE capillary with 1/4-28 fittings.	F1-80
F2 PFA Self-Aspiration Nebulizer Quick Connector. Includes 0.5 mm ID ■ (orange marker) 70 cm long PTFE capillary.	F2-50



Gas Lines for PFA MicroFlow and MEINHARD® OneTouch Nebulizers

Description	Application	iCAP PRO Part Number	iCAP 6000/7000 Part Number
OneTouch gas line for PFA MicroFlow Nebulizers for Thermo Fisher Scientific ICP-OES systems	All PFA MicroFlow nebulizers	S250983	S250984
OneTouch gas line for MEINHARD® OneTouch Nebulizers for Thermo Fisher Scientific ICP-OES systems	All MEINHARD OneTouch nebulizers	S250900	S250940



pergo Argon Nebulizer Gas Humidifier

The *pergo* improves performance of all concentric nebulizers. It maintains nebulizer efficiency – which decreases long before a clogged tip is detected – and improves sensitivity and stability by preventing salt crystals from forming in the nebulizer tip. Over time, these virtually invisible salt crystals can cause premature failure of the nebulizer and shorten its useful lifetime.

pergo Models – Single or Dual Channel

- *pergo* 500
 - Room temperature vessel for environmental analysis and most applications
- *pergo* / *pergo* D
 - Heated housing provides elevated humidification for high TDS samples, with dual channel model to support sheath gas accessory for brine samples

Benefits:

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

Features:

- Higher and consistent humidity
- Superior long-term stability
- Easy to use with solid PFA reservoir and friction-fit cap
- Atmospheric pressure water reservoir; no pressurized vessel utilized
- Supports both MENHARD® and PFA MicroFlow nebulizers
- Optional USB communication for programmable humidity levels on heated housing *pergo*
- Dual channel *pergo* model to support humidification of both nebulizer gas and optional sheath gas accessory on iCAP 6000/7000 and iCAP PRO for brine samples



pergo 500-68

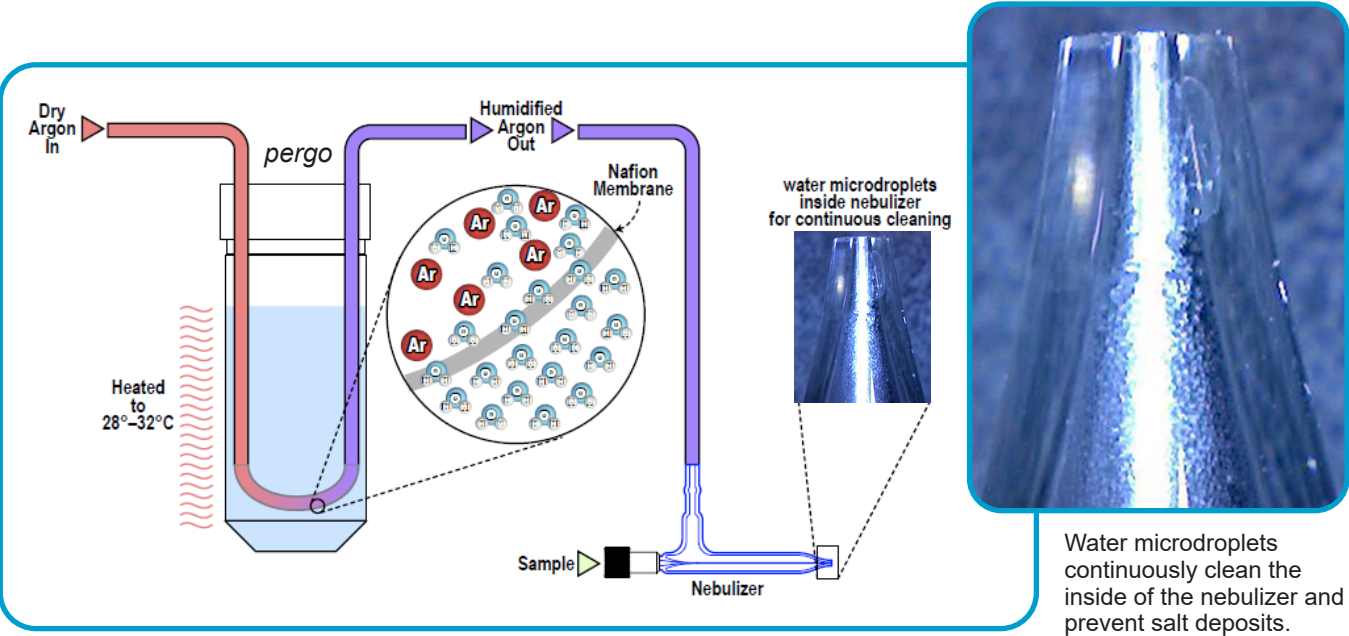
pergo heated humidifier
PRG-01-68



pergo 500-68 installed on the
iCAP PRO XPS ICP-OES

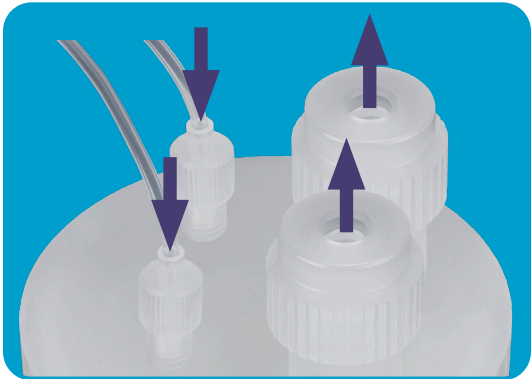
How *pergo* Works

A water vapor permeable membrane humidifies the nebulizer gas stream. By increasing humidity in the argon in the nebulizer the *pergo* prevents salt deposits in the nebulizer, improving short- and long-term signal stability.



Dual Channel *pergo* Model

The dual channel humidification provided on the *pergo* D adds a second channel to support the optional sheath gas accessory. This enhances performance on brine samples on the iCAP 6000/7000/PRO Series ICP-OES systems.



<i>pergo</i> Argon Nebulizer Gas Humidifiers for iCAP 6000/7000/PRO Series ICP-OES		
Description	Application	Part Number
<i>pergo</i> 500 – Single channel model	Environmental and most applications	<i>pergo</i> 500-68
<i>pergo</i> – Single channel, heated vessel model	High Salts, high TDS samples	PRG-01-68
<i>pergo</i> – Dual channel, heated vessel model	Brines with Sheath Accessory	PRG-02-68

Spray Chambers and Accessories

Quartz Spray Chambers for iCAP 6000/7000/PRO Series ICP-OES

Description	Instrument Model	Application	Part Number	Similar OEM Part Number
Non-baffled quartz o-ring-free cyclonic spray chamber with threaded drain, Easy-Seal threaded nebulizer inlet with PFA cap, and 18/9 socket outlet	iCAP PRO iCAP 6000/7000 Radial and Duo	Aqueous Non-HF	ES-3188-1006-10 (quartz)	842312051411 (glass)
Baffled quartz o-ring-free cyclonic spray chamber with threaded drain, Easy-Seal threaded nebulizer inlet with PFA cap, and 18/9 socket outlet	iCAP PRO iCAP 6000/7000 Radial and Duo	Aqueous Non-HF, High Solids, Organic solvents	ES-3188-1016-10 (quartz)	842312051311 (glass)

ES-3188-1006-10



ES-3188-1016-10



Glass Spray Chambers for iCAP 6000/7000/PRO Series ICP-OES

Description	Instrument Model	Application	Part Number	Similar OEM Part Number
Non-baffled glass cyclonic spray chamber with 18/9 socket outlet, Easy-Seal threaded nebulizer inlet and PFA cap	iCAP PRO iCAP 6000/7000 Radial and Duo	Aqueous Non-HF	ML128010ES	842312051411
Non-baffled glass cyclonic spray chamber with 18/9 socket outlet	iCAP PRO iCAP 6000/7000 Radial and Duo	Aqueous Non-HF	ML128010	842312051411
Baffled glass cyclonic spray chamber with 18/9 socket outlet, Easy-Seal Threaded Nebulizer Inlet and PFA cap	iCAP PRO iCAP 6000/7000 Radial and Duo	Aqueous Non-HF, High solids, Organic solvents	ML128012ES	842312051311
Baffled glass cyclonic spray chamber with 18/9 socket outlet	iCAP PRO iCAP 6000/7000 Radial and Duo	Aqueous Non-HF, High solids, Organic solvents	ML128012	842312051311
Glass spray chamber adapter for Radial iCAP 6000/7000 and all iCAP PRO ICP-OES systems	iCAP PRO iCAP 6000/7000 Radial and Duo	Aqueous Non-HF, Organic solvents	ML128020	842312051151
Glass spray chamber adapter for Duo iCAP 6000/7000 Series ICP-OES	iCAP 6000/7000 Duo	Aqueous Non-HF, Organic solvents	ML128021	842312051251

ML128010ES



ML128010



ML128012ES



ML128012



ML128020



ML128021



HF Resistant Spray Chambers and Injectors

PFA Spray Chambers for iCAP 6000/7000/PRO Series ICP-OES

HF-resistant, high-sensitivity PFA spray chambers for mining, semiconductor, and other high-purity applications. These barrel style chambers provide improved sensitivity and stability over cyclonic chamber models. Use with ESI sapphire injectors shown below and PFA nebulizers (p 38-41).

Description	Instrument Model	Application	Part Number	Similar OEM Part Number
M-200 47 mm PFA Spray Chamber. Includes PFA endcap, no additional gas port, straight adapter for 1/2" OD ESI injectors and 12" threaded drain line.	iCAP PRO iCAP 6000/7000 Radial	HF Resistant	ES-2168-5472	842312051451 (cyclonic)
M-200 47mm PFA Spray Chamber. Includes PFA endcap, no additional gas port, elbow adapter for use with 1/2" OD ESI injectors and 12" threaded drain line.	iCAP 6000/7000 Duo	HF Resistant	ES-2188-5472	842312051461 (cyclonic)



Sapphire Injectors for iCAP 6000/7000/PRO Series ICP-OES

For use with PFA spray chambers shown above for HF resistance and high purity applications.

Description	Instrument Model	Application	Part Number
ESI 1.8 mm ID Sapphire Injector for Thermo iCAP Series ICP-OES torch, 1/2" OD inlet	iCAP PRO iCAP 6000/7000 Radial & Duo	HF Resistant	ES-1603-0180-88
ESI 1.5 mm ID Sapphire Injector for Thermo iCAP Series ICP-OES torch, 1/2" OD inlet	iCAP PRO iCAP 6000/7000 Radial & Duo	HF Resistant, Organic Solvents	ES-1603-0150-88



**See pages 40-43 for
HF-resistant PFA nebulizers**

Thermally Stabilized Inlet Systems for iCAP 6000/7000/PRO Series ICP-OES

Compact Peltier Cooled Inlet Systems

The PC^{3X} and PC³-LT are compact Peltier cooled inlet systems which incorporate ESI cyclonic spray chambers. The PC^{3X} 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 spray chamber can incorporate and 6 mm nebulizer but is ideally suited to PFA-ST nebulizers.

Benefits:

- Thermal stabilization of spray chamber improves long-term stability
- Fast rinse-out with o-ring-free quartz cyclonic spray chamber and Easy-Seal nebulizer insert
- Air cooled operation eliminates water lines and connections
- 18/9 socket connection for coupling to Thermo Fisher Scientific ICP systems
- PC^{3X} provides software control of spray chamber temperature of $\pm 0.1^\circ\text{C}$ from -10°C to 80°C for aqueous or organic solvent analysis
- PC³-LT delivers software control of spray chamber of $\pm 0.1^\circ\text{C}$ from -20°C to 2°C . This lower temperature capability reduces solvent loading on plasma when introducing volatile organic solvents



PC^{3X} Peltier Cooler
PC3X-88



ES-3188-1016-10 spray chamber
for use in PC^{3X} and PC³-LT



PC³-LT Peltier Cooler for
volatile organic solvents
ES-9190-88

Description	Part Number
PC ³ Peltier Cooler for iCAP 6000/7000/PRO Series ICP-OES. Includes baffled quartz spray chamber with threaded drain connector and 18/9 socket outlet. <i>Nebulizer not included.</i>	PC3X-88
PC ³ -LT Peltier Cooler for iCAP 6000/7000/PRO Series ICP-OES. Includes baffled quartz spray chamber with threaded drain connector and 18/9 socket outlet, PFA-ST nebulizer, and aerosol transfer line.	ES-9190-88
Baffled quartz spray chamber for use with PC ^{3X} and PC ³ -LT. For iCAP 6000/7000/PRO Series ICP-OES. O-ring-free chamber equipped with Easy-Seal nebulizer insert, threaded drain, and 18/9 socket outlet.	ES-3188-1016-10

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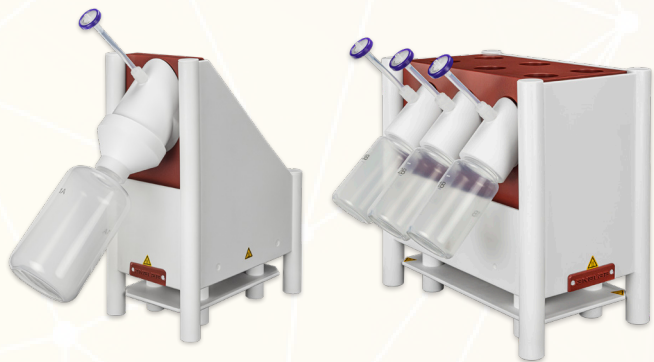
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Torches and Injectors

Quartz Torches for iCAP 6000/7000/PRO Series ICP-OES

Description	Instrument Model	Part Number	Similar OEM Part Number
Quartz EMT Radial Torch	iCAP 6000/7000/PRO Radial	ML128052	842312051741
Quartz EMT Duo Torch for iCAP PRO	iCAP PRO Duo	ML128074	BRE0012328
Quartz EMT Duo Torch for iCAP 6000/7000	iCAP 6000/7000 Duo	ML128050	842312051841
Quartz Periscope Sleeve for Duo iCAP 6000/7000	iCAP 6000/7000 Duo	ML128073	842312051591

ML128052



ML128074



ML128050



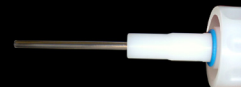
ML128073



ESI Injectors for iCAP 6000/7000/PRO Series ICP-OES

Description	Instrument Model	Application	Part Number
ESI 1.8 mm ID Sapphire Injector for Thermo EMT torch, 1/2 in OD inlet	Radial and Duo	HF-resistant	ES-1603-0180-88
ESI 1.5 mm ID Sapphire Injector for Thermo EMT torch, 1/2 in OD inlet	Radial and Duo	HF-resistant organic solvents	ES-1603-0150-88
ESI 2 mm ID Quartz Injector for Thermo EMT torch, 1/2 in OD inlet	Radial and Duo	Standard for Duo high solids for Radial	ES-1623-0200-88
ESI 1.5 mm ID Quartz Injector for Thermo EMT torch, 1/2 in OD inlet	Radial and Duo	Standard for Radial	ES-1623-0150-88
ESI 1 mm ID Quartz Injector for Thermo EMT torch, 1/2 in OD inlet	Radial and Duo	Organic solvents	ES-1623-0100-88

ES-1603-0180-88



ES-1623-0200-88



Injectors Tubes for iCAP 6000/7000/PRO Series ICP-OES

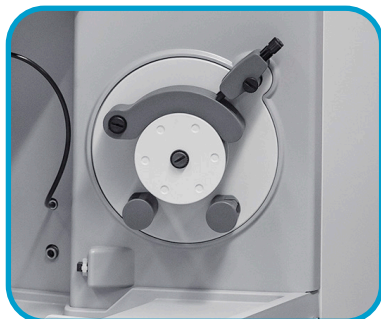
Requires large polymer injector holder supplied with iCAP 6000/7000/PRO Series ICP-OES systems.

Description	Instrument Model	Application	Part Number	Similar OEM Part Number
Quartz Injector for EMT torch, 2 mm ID	Radial and Duo	Standard for Duo high solids for Radial	ML128072	842312051971
Quartz Injector for EMT torch, 1.5 mm ID	Radial and Duo	Standard for Radial	ML128071	842312051951
Quartz Injector for EMT torch, 1 mm ID	Radial and Duo	Organic solvents Radial and Duo	ML128070	842312051941



ML128071

Peristaltic Pump Tubing



2-Stop Pump Tubing



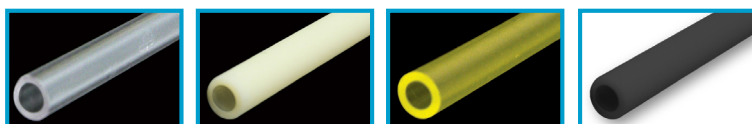
Tubing for iCAP 6000/7000/PRO Series ICP-OES (Packs of 12)

Standard pump on iCAP PRO Series ICP-OES

		Non-Flared				Flared*	
i.d.	Stop Colors	PVC 2-stop	Santoprene 2-stop	Solva 2-stop	Viton	PVC 2-stop	Solva 2-stop
0.13mm	Orange Black	ES-4398-1013				ES-4397-1013	ES-4396-3013
0.19mm	Orange Red	ES-4398-1019				ES-4397-1019	ES-4396-3019
0.27mm	Orange Blue	ES-4398-1027	ES-4398-2027			ES-4397-1027	ES-4396-3027
0.38mm	Orange Green	ES-4398-1038	ES-4398-2038			ES-4397-1038	ES-4396-3038
0.44mm	Green Yellow	ES-4398-1044				ES-4397-1044	ES-4396-3044
0.51mm	Orange Yellow	ES-4398-1051	ES-4398-2051		ES-4398-7051	ES-4397-1051	ES-4396-3051
0.57mm	White Yellow	ES-4398-1057				ES-4397-1057	ES-4396-3057
0.64mm	Orange White	ES-4398-1064	ES-4398-2064		ES-4398-7064	ES-4397-1064	ES-4396-3064
0.76mm	Black Black	ES-4398-1076	ES-4398-2076	ES-4396-1076	ES-4398-7076	ES-4397-1076	ES-4396-3076
0.89mm	Orange Orange	ES-4398-1089	ES-4398-2089	ES-4396-1089	ES-4398-7089	ES-4397-1089	ES-4396-3089
0.95mm	White Black	ES-4398-1095		ES-4396-1095		ES-4397-1095	ES-4396-3095
1.02mm	White White	ES-4398-1102	ES-4398-2102	ES-4396-1102	ES-4398-7102	ES-4397-1102	ES-4396-3102
1.09mm	White Red	ES-4398-1109		ES-4396-1109		ES-4397-1109	ES-4396-3109
1.14mm	Red Red	ES-4398-1114	ES-4398-2114	ES-4396-1114	ES-4398-7114	ES-4397-1114	
1.22mm	Red Grey	ES-4398-1122		ES-4396-1122		ES-4397-1122	
1.30mm	Grey Grey	ES-4398-1130	ES-4398-2130	ES-4396-1130	ES-4398-7130	ES-4397-1130	
1.42mm	Yellow Yellow	ES-4398-1142	ES-4398-2142	ES-4396-1142	ES-4398-7142	ES-4397-1142	
1.52mm	Yellow Blue	ES-4398-1152	ES-4398-2152	ES-4396-1152	ES-4398-7152	ES-4397-1152	
1.65mm	Blue Blue	ES-4398-1165	ES-4398-2165	ES-4396-1165	ES-4398-7165		
1.75mm	Blue Green	ES-4398-1175		ES-4396-1175			
1.85mm	Green Green	ES-4398-1185	ES-4398-2185	ES-4396-1185	ES-4398-7185		
2.06mm	Purple Purple	ES-4398-1206	ES-4398-2206	ES-4396-1206	ES-4398-7206		
2.20mm	Purple Black	ES-4398-1220	ES-4398-2220	ES-4396-1220			
2.54mm	Purple Orange	ES-4398-1254	ES-4398-2254	ES-4396-1254	ES-4398-7254		
2.79mm	Purple White	ES-4398-1279	ES-4398-2279	ES-4396-1279	ES-4398-7279		
3.17mm	Black White	ES-4398-1317		ES-4396-1317			
~ Bridge Length		151 mm	150 mm	140 mm	127 mm	151 mm	140 mm

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

Non-Flared



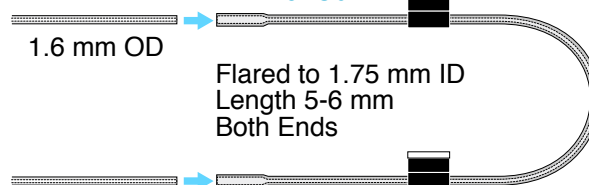
PVC

Santoprene

Solva

Viton

Flared



Peristaltic Pumps



Stand Alone MP² Precision Micro Peristaltic Pumps

MP² Precision Micro Peristaltic Pumps

The MP² is a compact, precise, stand-alone micro peristaltic pump with a flow rate range of 0.20 $\mu\text{L}/\text{min}$ to 10 mL/min and is available with one to eight channels. Both computer controlled and manual controlled models of these pumps are available to meet your specific needs. Optimized for low-flow rates, the MP² uses either MP² pump tubing or standard 3-stop pump tubing.

MP ² Precision Micro Peristaltic Pumps		
MP ² Pump Capacity	Computer Controlled Part Number	Manual Controlled Part Number
1 channel	MP2-1-PC	MP2-1-S
2 channel	MP2-2-PC	MP2-2-S
3 channel	MP2-3-PC	MP2-3-S
4 channel	MP2-4-PC	MP2-4-S
6 channel	MP2-6-PC	MP2-6-S
7 channel	MP2-7-PC	MP2-7-S
8 channel	MP2-8-PC	MP2-8-S

Computer Controlled model comes equipped with control cable and control software

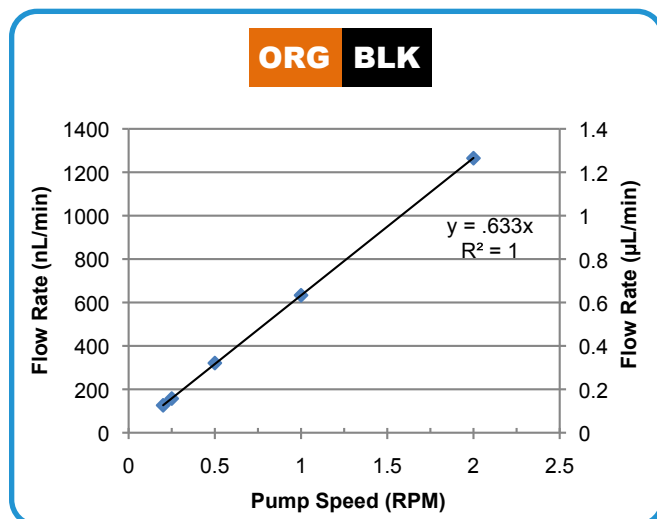
Perilink Fittings (Barbed) Adapts 10/32 to pump tubing			
	Qty	Size	Part Number
	5	Female	S032955-V
	5	Male	S032956-V



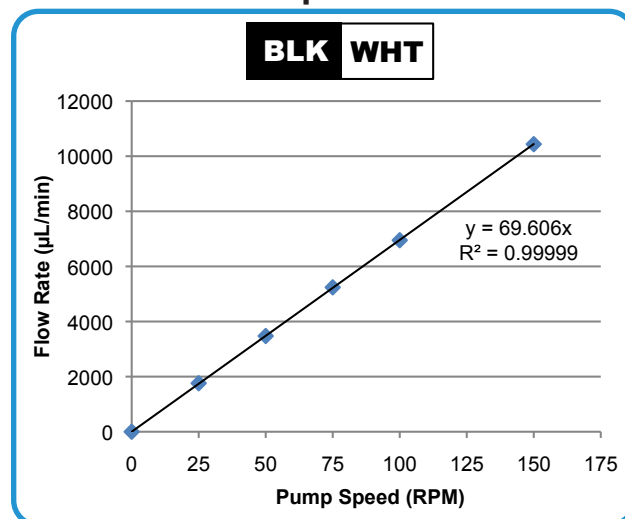
MP2-4-S
Manual controlled stand-alone, precision micro peristaltic pump

MP2-4-PC
Computer controlled stand-alone, precision micro peristaltic pump

Nanoliter flow rates



Flow rates up to 10 mL/min



MP² pumps can control flow from the nanoliters well into the mL range

MP² Peristaltic Pump Tubing

MP² Pump Tubing



Tubing for MP² Micro Peristaltic Pumps (Packs of 12)

				Non-Flared			Flared*	
i.d.	Stop Colors		Calibration Slope ($\mu\text{L}/\text{min}$ 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	Gray	46	MPP-122-PVC		MPP-122-S		
1.30 mm	Gray	Gray	47	MPP-130-PVC	MPP-130-PHR	MPP-130-S		
1.42 mm	Yellow	Yellow	50	MPP-142-PVC		MPP-142-S		
1.52 mm	Yellow	Blue	51	MPP-152-PVC	MPP-152-PHR	MPP-152-S		
1.65 mm	Blue	Blue	55	MPP-165-PVC		MPP-165-S		
1.75 mm	Blue	Green	58	MPP-175-PVC		MPP-175-S		
1.85 mm	Green	Green	61	MPP-185-PVC		MPP-185-S		
2.06 mm	Purple	Purple	64	MPP-206-PVC		MPP-206-S		
2.29 mm	Purple	Black	65	MPP-220-PVC		MPP-220-S		
2.54 mm	Purple	Orange	67	MPP-254-PVC		MPP-254-S		
2.79 mm	Purple	White	69	MPP-279-PVC		MPP-279-S		
3.17 mm	Black	White	70	MPP-317-PVC	MPP-317-PHR	MPP-317-S		
Bridge Length				72 mm	72 mm	72 mm	72 mm	72 mm

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

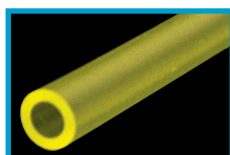
Non-Flared



PVC

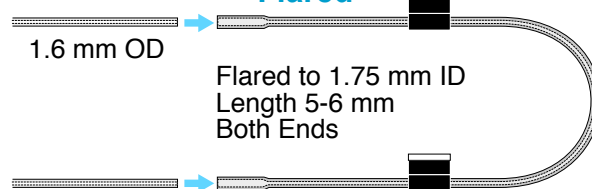


Santoprene®



Solva

Flared



MP² PUMP TUBING KIT

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

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High-purity Valves

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

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



8

Port Valve – P7+

Part Number: PF-P7X

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



6

Port Valve – SS6

Part Number: VSS-6

Description: 6 port SampleSense Valve
Specifications: CTFE stator, PFA rotor, 1.00 mm
Applications: SampleSense FAST



12

Port Syringe Valve – V12

Part Number: PF-V12

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



4

Port Valve – M4

Part Number: PF-M4

Description: M4 CTFE high-flow 4 port stream selector valve
Specifications: CTFE stator, PFA rotor
Applications: GetReady



11

Port Syringe Valve – S11

Part Number: SDX-S11

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

Examples of a Stator and Rotor



Description

CTFE replacement stator
for V12 FAST valve



Description

1 mm PFA rotor

High-purity Valves with Spare Stators and Rotors

P-SERIES VALVES WITH REPLACEMENT STATORS AND ROTORS						
# of Ports	Bore Size	Stator Material	Rotor Material	Part Number Complete Valve	Part Number Stator	Part Number Rotor
3 - P3	1.0 mm	CTFE	PFA	PF-P3	PF-P3S	PF-P3R
4 - P4	1.0 mm	CTFE	PFA	PF-P4	PF-P4S	PF-P4R
6 - P6	1.0 mm	CTFE	PFA	PF-P6	PF-P6S	PF-P6R
6 - P6-8	1.0 mm	PPS	PFA	PF-P6-8	PF-P6S-8	PF-P6R
7 - P7	0.5/1.0 mm	CTFE	PFA	PF-P7	PF-P7S	PF-P6R
7 - P7-8	0.5/1.0 mm	PPS	PFA	PF-P7-8	PF-P7S-8	PF-P6R
8 - P7+	0.5/1.0 mm	CTFE	PFA	PF-P7X	PF-P7XS	PF-F6R
P7+IC	1.0 mm	CTFE	PFA	PF-P7XIC	PF-P7XS	PF-P6R
8 - P8	1.0 mm	CTFE	PFA	PF-P8	PF-P8S	PF-P8R
10 - P10	1.0 mm	CTFE	PFA	PF-P10	PF-P10S	PF-P10R
11-P11	1.0 mm	CTFE	PFA	PF-P11	PF-P11S	PF-P10R
11-A11b	0.5/1.0 mm	CTFE	PFA	PF-A11b	PF-A11bS	PF-A11bR
13 - P13	0.5/1.0 mm	CTFE	PFA	PF-P13	PF-P13S	PF-P13R
5 - A5e	0.5/1.0 mm	CTFE	PFA	PF-A5e	PF-A5eS	PF-F6R
7 - A7e	0.5/1.0 mm	CTFE	PFA	PF-A7e	PF-A7eS	PF-F6R
7 - A7μ	1.0 mm	CTFE	PFA	PF-A7u	PF-A7uS	PF-A7uR
6 - PM6	0.5 mm	CTFE	PFA	PF-PM6	PF-PM6S	PF-PM6R
7 - PM7	0.5 mm	CTFE	PFA	PF-PM7	PF-PM7S	PF-PM6R
8 - PM7+	0.5 mm	CTFE	PFA	PF-PM7X	PF-PM7XS	PF-PM6R
4 - P4H	1.6 mm	CTFE	PFA	PF-P4H	PF-P4HS	PF-P4HR
5 - P5H	1.6 mm	CTFE	PFA	PF-P5H	PF-P5HS	PF-P4HR
6 - P6H	1.6 mm	CTFE	PFA	PF-P6H	PF-P6HS	PF-P6HR
7 - P7H	1.6 mm	CTFE	PFA	PF-P7H	PF-P7HS	PF-P6HR
7 - P7-8H	1.6 mm	PPS	PFA	PF-P7-8H	PF-P7-8HS	PF-P6HR
7 - P7HP	0.5 mm	CTFE	PEEK/PTFE	PF-P7HP	PF-P7HPS	PF-P6HPR
8 - P7HP	0.5 mm	CTFE	PEEK/PTFE	PF-P7XHP	PF-P7XHPS	PF-P6HPR

SAMPLESENSE VALVES						
# of Ports	Description	Bore Size	Stator Material	Rotor Material	Part Number Complete Valve	
6	SS6 SampleSense FAST	1.0 mm	CTFE	PFA	VSS-6	
7	SS7 SampleSense FAST with I/S addition	0.5/1.0 mm	CTFE	PFA	VSS-7	
8	SS7+ SampleSense prepFAST with I/S addition	0.5/1.0 mm	CTFE	PFA	VSS-8	
11	SS11 SampleSense for prepFAST S and Scout DX	1.0 mm	CTFE	PFA	VSS-11	
13	SS13 SampleSense for prepFAST X	1.0 mm	CTFE	PFA	2SS13-X	

High-purity Valves, Stators and Rotors

V-SERIES VALVES WITH REPLACEMENT STATORS AND ROTORS

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

M-SERIES STREAM SELECTION VALVE

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

S-SERIES VALVES WITH REPLACEMENT STATORS AND ROTORS

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

X-SERIES VALVES WITH REPLACEMENT STATORS AND ROTORS

# of Ports	Bore Size	Stator Material	Rotor Material	Part Number Complete Valve	Part Number Stator	Part Number Rotor
11-X11	1.0 mm	CTFE	PFA	PF-X11	PF-X11S	PF-P10R
13-X13	1.0 mm	CTFE	PFA	PF-X13	PF-X13S	PF-P13R

Metal Free Syringes

Metal Free Syringes for Syringe Pumps

0.3 mL Syringes

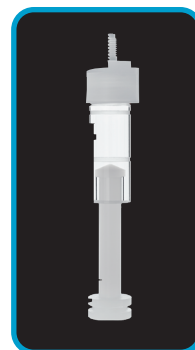
Description	Part Number
0.3 mL quartz syringe, o-ring free for prepFAST Syrix syringe pump	PF-S1003
0.3 mL fluropolymer syringe, o-ring free for prepFAST syringe pump	PF-S3003
0.3 mL quartz syringe, thick walled, for prepFAST X	PF-TW1003



PF-TW1003

3 mL Syringes

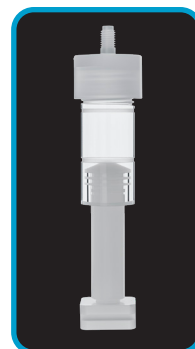
Description	Part Number
3 mL quartz syringe	PF-S1030
3 mL quartz syringe, pre-cleaned for prepFAST S	PF-S1030C
3 mL CTFE syringe	PF-S3030
3 mL CTFE syringe, pre-cleaned for prepFAST S	PF-S3030C
3 mL quartz syringe, tall, high pressure, for prepFAST IC	PF-HS1030
3 mL quartz syringe, thick walled, for prepFAST X	PF-TW1030
3 mL quartz syringe, thick walled, pre-cleaned for prepFAST S	PF-TW1030-C



PF-TW1030

6 mL Syringes

Description	Part Number
6 mL quartz syringe for prepFAST Offline	PF-S1060
6 mL quartz syringe, pre-cleaned for prepFAST S	PF-S1060C
6 mL CTFE syringe	PF-S3060
6 mL CTFE syringe, pre-cleaned for prepFAST S	PF-S3060C
6 mL quartz syringe, tall high pressure, for prepFAST IC	PF-HS1060
6 mL quartz syringe, thick walled, for prepFAST X	PF-TW1060



PF-TW1060-C

12 mL Syringe

Description	Part Number
12 mL PFA syringe	PF-S3120
12 mL quartz syringe, tall high pressure, for prepFAST IC	PF-HS1120
12 mL quartz syringe, thick-walled, for prepFAST X	PF-TW1120



PF-TW1120

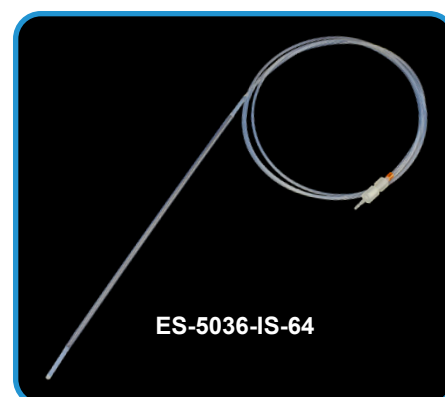
Manual Sampling Probes

Probes

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

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

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



Nebulizer Lines

Low Volume Nebulizer Sample Lines

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



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



Internal Standard Addition Kits

Internal Standards Kits

The iCAP 6000/7000/PRO Series ICP-OES internal standards kits utilize a low-internal volume mixing tee for inline addition of internal standard with the sample. Kits are available for both PFA-ST and MEINHARD® Plus nebulizers.

For Addition of Internal Standard with PFA-ST Nebulizers

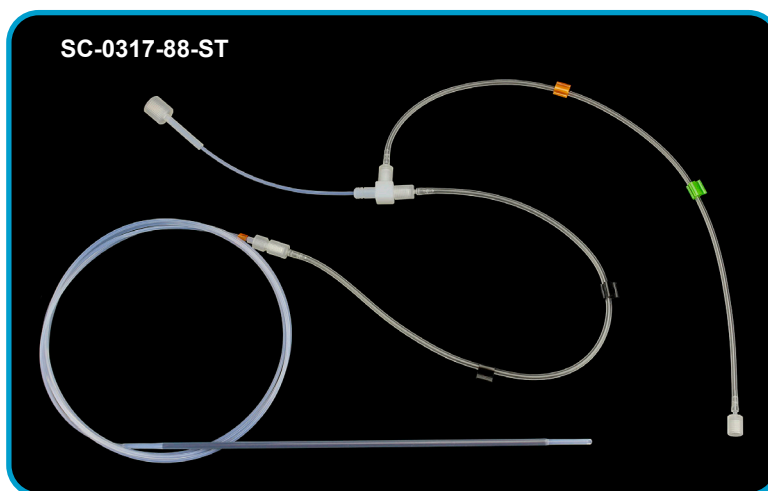
Includes:

- Fluoropolymer mixing tee (0.5 mm i.d.)
- Internal standard probes
- Fluoropolymer peristaltic pump fittings
- MP² peristaltic pump tubing

For Addition of Internal Standard with MEINHARD® Plus Nebulizers

Includes:

- Fluoropolymer mixing tee (0.5 mm i.d.)
- Internal standard probes
- Fluoropolymer peristaltic pump fittings
- MP² peristaltic pump tubing



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

Internal Standard Addition Tees

Internal Standard Addition Tees

The iCAP 6000/7000/PRO Series ICP-OES internal standard mixing tee for online addition of internal standard or online dilution. Achieves excellent mixing with minimal dead volume.














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

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



Fittings

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

	Description	Qty	Suggested Use	P/N
	Black, high-flow nut (1/4-28) for FAST valve and 1/16" (1.6 mm) ferrule	10	Use with 1/16" (1.6 mm) o.d. PFA tubing for low and moderate flow rates (0.1 mL/min - 2 mL/min)	SC-0599-0116-K
	White, high-flow nut (1/4-28) for FAST valve and 1/8" (3.2 mm) ferrule	10	Use with 1/8" (3.2 mm) o.d. PFA tubing for high-flow rates and vacuum applications (>2 mL/min)	SC-0599-0108-W
	1/16" (1.6 mm) Ferrule for high-flow fitting (1/4-28)	10	Use with 1/16" (1.6 mm) o.d. PFA tubing	SC-0599-F16
	1/8" (3.2 mm) Ferrule for high-flow fitting (1/4-28)	10	Use with 1/8" (3.2 mm) o.d. PFA tubing	SC-0599-F08
	PFA 10/32 Long Ferrule	10	Use with 1/16" tubing for 10/32 fittings	S032958
	Long 10-32 Male Barbed Fitting	1	Use for adapting 10/32 fittings to pump tubing	S250633
	Long 10-32 Male Fitting	1	Use for spare 10/32 valve fittings	S250715
	Female Perilink fitting, barbed	1	Adapts 10/32 to pump tubing	S033156
	Male Perilink fitting, barbed	1	Adapts 10/32 to pump tubing and for use with internal standard tee	S032956
	PFA-ST Nebulizer to Micro Fitting Adapter, PFA	1	Adapts 10/32 fitting to liquid sample inlet on PFA-ST nebulizers	S033161
	MEINHARD® Plus Nebulizer to micro fitting adapter	1	Adapts 10/32 fitting to liquid sample inlet on MEINHARD® nebulizers	S033101
	CTFE peristaltic pump fittings, female, barbed	1	For use in high pressure applications	ES-2501-PPF2
	CTFE peristaltic pump fittings, male, barbed	1	For use in high pressure applications	ES-2501-PPM2

PFA Tubing

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



Sample Loops

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

Standard for *FAST* Systems

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

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



SC-0318-25 2.5 mL sample loop

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

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



SC-0319-10 1 mL sample loop

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

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



SC-0315-80 8 mL sample loop


PFA Sample Vessels

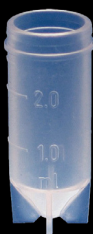
PFA Vials


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


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

Vials	Fits Racks
V-14-0311CG	MR-21-14 (pg 71), MR-40-14 (pg 71), SR4-60-14 (pg 73)
V-14-0312CG	
V-14-0314CG	


	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

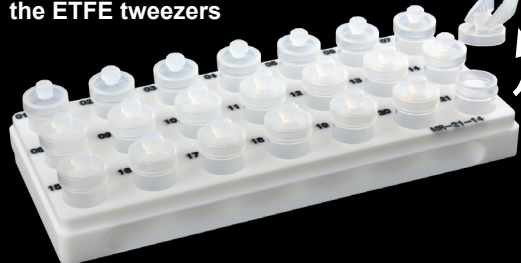
	Part Number	Qty
	ES-7225-0001	1
	Description	
	ETFE tweezers for removal of PFA cap with knob	

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

	Part Number	Qty
	V-15-0300-X	10
	Description	
	PFA snap-on cap for 14 mm graduated PFA micro vials	

	Part Number	Qty
	V-15-0301-X	10
	Description	
	PFA cap with knob for 14 mm graduated PFA micro vials.	

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



PFA Bottles and Vials


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

Bottles / Vials	Fits Racks
V-31-15-X	SR2-21-30 (pg 72), MR-10-30 (pg 71)
V-31-30-X	SR2-27-31 (pg 72), MR-10-30 (pg 71), ST10-31 (pg 74)
V-31-60-X	LR-21-30 (pg 70), LMR-21-30-R (pg 70), SR2-27-31 (pg 72), HR-21-30 (pg 71), ST10-31 (pg 74)
V-28-0360-V	SR2-27-28 (pg 72), ST-10-28 (pg 74)
V-50-0360	SR2-12-50 (pg 72), ST2-9-50 (pg 75), ST4-9-50 (pg 75), SR4x-20-50 (pg 73)

	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-V	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
	PFA-K29-X	10
	Description	Screw cap for 30 mm o.d. vials

2 mL PVDF Autosampler Vial

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

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

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

PVDF Vials and PFA Caps

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

Pre-cleaned PVDF Vials and Caps

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

Bottles/Vials Fits Racks

Bottles/Vials	Fits Racks
VPC-14-0712	MR-21-14 (pg 71), MR-40-14 (pg 87), SR4-60-14 (pg 71)



VPC-14-0712
2 mL PVDF
autosampler vial



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


**Contact ESI
for barcoding
and cleaning**


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 71), MR-90-08 (pg 71)
V-13-0200-R	LR-90-13-R (pg 70), LMR-90-13-R (pg 70), LMR-90-13-R-3T (pg 70), ST-PR-5 (pg 74)
V-20-0290	LR-40-20 (pg 70)
V-16-0225	LR-60-16 (pg 70), LMR-60-16-R (pg 70), SR2-80-16 (pg 72), ST-PR-5 (pg 74), HR-60-16 (pg 72)
V-28-0260	ST-10-28 (pg 74), LR-21-30 (pg 70), LMR-21-30-R (pg 70), SR2-27-28 (pg 72), ST-PR-5 (pg 74), ST-EX-5 (pg 74), HR-21-30 (pg 71)
V-50-0460	SR4x-20-50 (pg 73), SR2-12-50 (pg 72), ST-PR-5 (pg 74), ST2-9-50 (pg 75), ST4-9-50 (pg 75)
V-61-0661	SR4x-15-60 (pg 73), ST7-60 (pg 75), ST-PR-5 (pg 74), ST-EX-5 (pg 74)

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


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

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

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

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

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

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

Microplates for DX Series Autosampler

Microplates

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

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



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



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



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



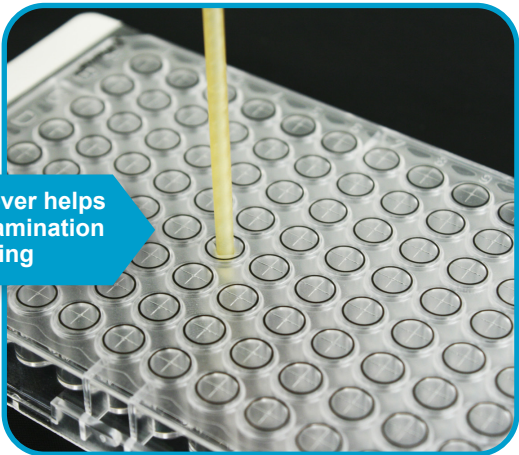
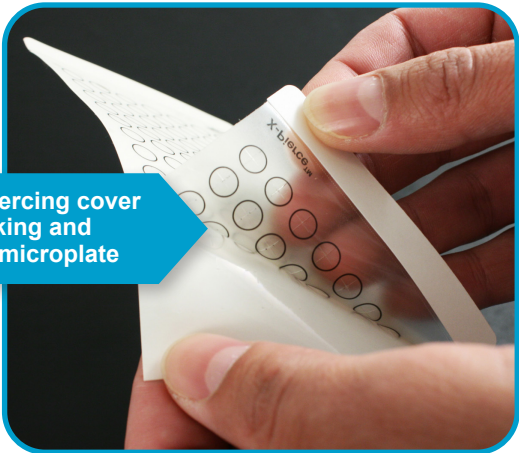
MT-96-2mL-02

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

X-Piercing Film Cover / XP Probe Arm

X-Piercing Microplate Cover

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

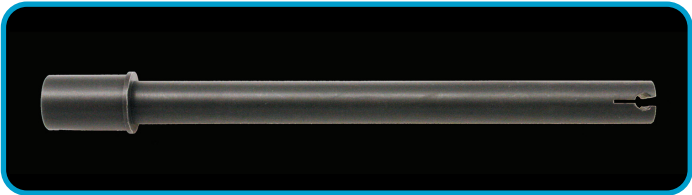


Description	Qty	Part Number
X-Piercing film cover for 96 well microplate	50	MT-96-XP

XP Probe Arm

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

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



Large Autosampler Racks

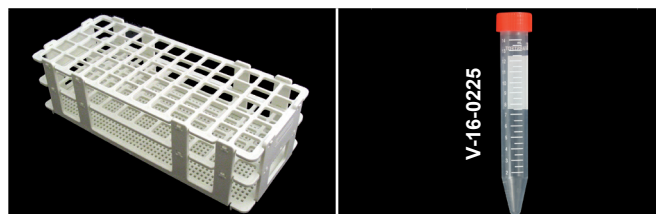
Autosampler Racks (LR Size)

Plastic large racks are recommended for aqueous samples.

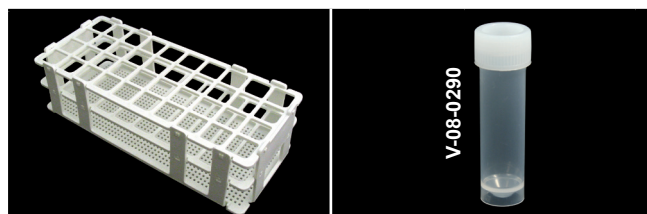
All LR racks can be used on the following DXe, DX and DXCi autosampler models: 2, 4, 8 and 14



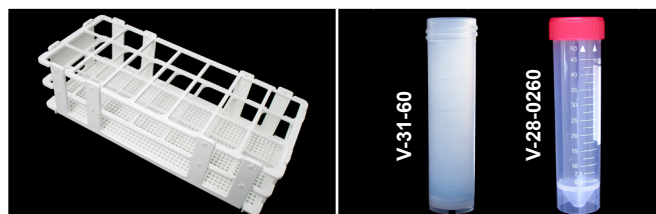
Description	Diam.	Part Number
90 position large polypropylene sample rack for 8 mL tubes	13 mm	LR-90-13-R



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



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



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

Autosampler Coated Metal Racks (LR Size)

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

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



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



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



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

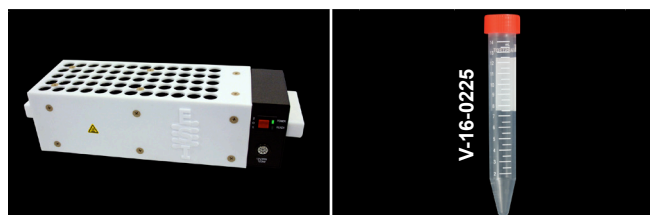


Description	Diam.	Part Number
21 position metal large sample rack for 50 mL and 60 mL tubes	30 mm	LMR-21-30-R

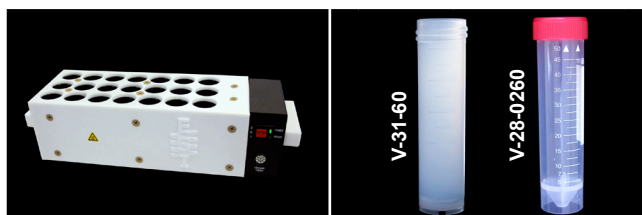
Heated and Micro Autosampler Racks

Autosampler Heated Racks (LR Size)

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



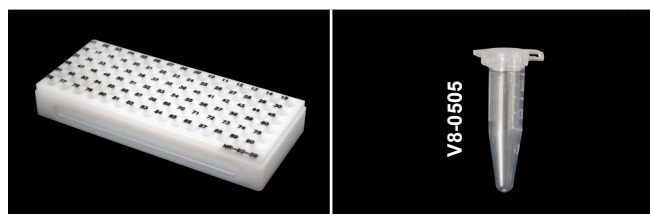
Description	Diam.	Part Number
60 position heated large sample rack for 15 mL tubes	16 mm	HR-60-16



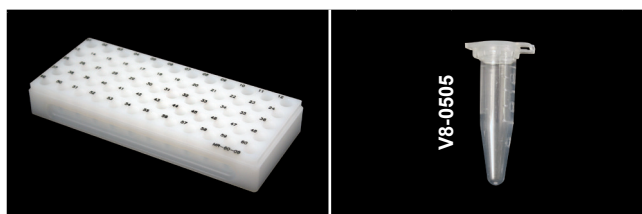
Description	Diam.	Part Number
21 position heated large sample rack for 50 mL and 60 mL tubes	30 mm	HR-21-30

Autosampler Racks (MR Size)

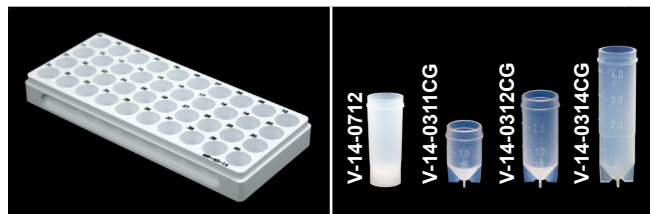
All MR racks can be used on the following DXe, DX and DXCi autosampler models: Micro, 2 and 4



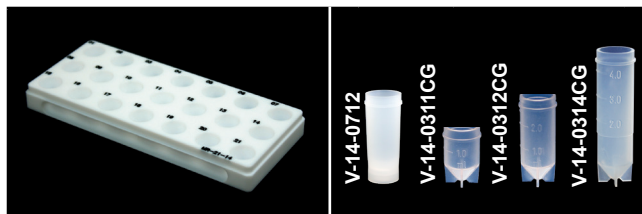
Description	Diam.	Part Number
90 position CPVC micro sample rack for 0.5 mL tubes	8 mm	MR-90-08



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



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



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



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



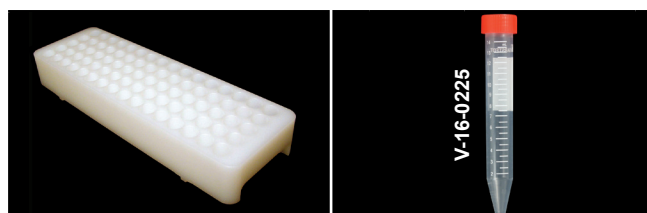
Description	Part Number
PVCC Cover for micro racks	MR-00-01

Super Autosampler Racks

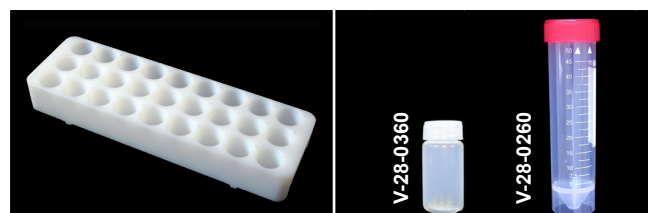
Large-volume samples can be analyzed using ESI super racks without transferring the sample to a smaller tube, reducing prep time and chance of contamination.

Autosampler Racks (SR2 Size)

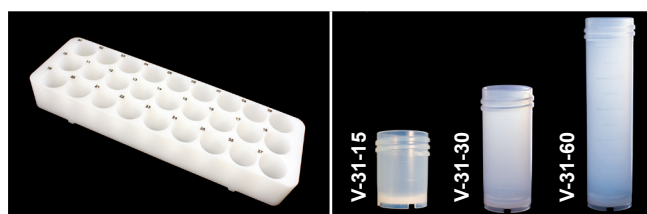
All SR2 racks can be used on the following DXe, DX and DXCi autosampler model: 2



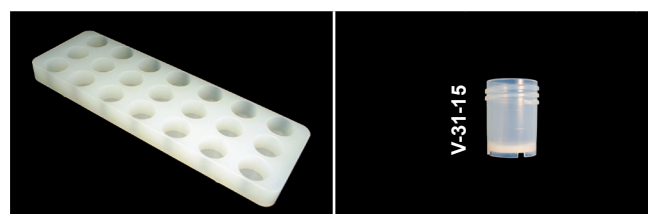
Description	Diam.	Part Number
80 position HMPE super sample rack for 15 mL tubes	16 mm	SR2-80-16



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



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



Description	Diam.	Part Number
21 position HMPE super sample rack for 15 mL tubes	31 mm	SR2-21-30



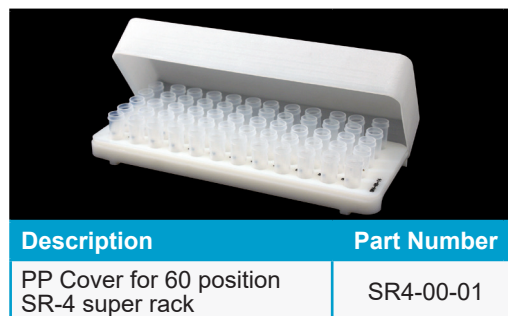
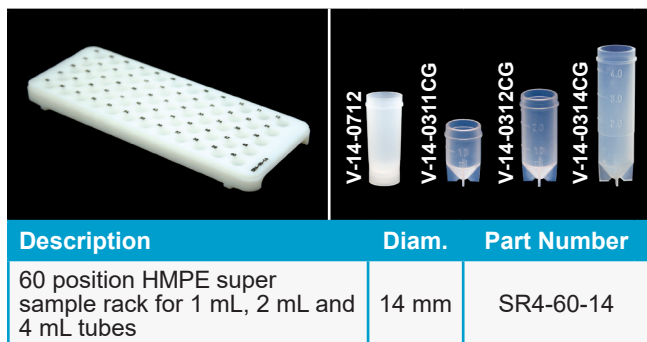
Description	Diam.	Part Number
21 position super sample rack for 125 mL bottles	35 mm	SR2-21-35



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

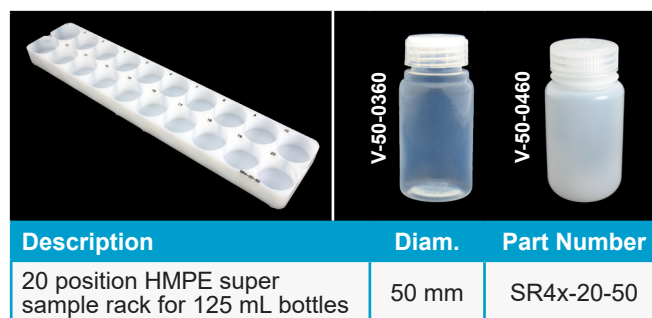
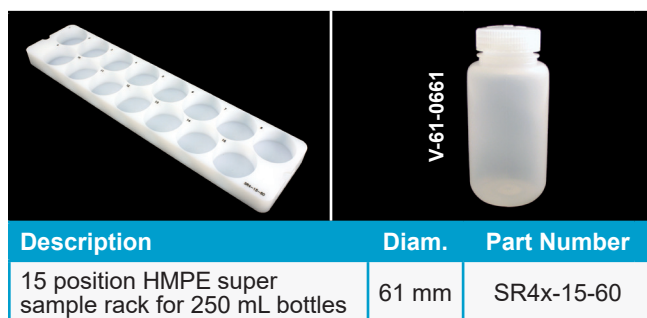
Autosampler Racks (SR4 Size, Type 1)

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



Autosampler Racks (SR4 Size, Type 2)

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




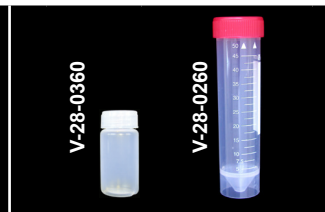
The SR4x-15-60 super rack will hold fifteen 100 mL volumetric flasks or 250 mL bottles



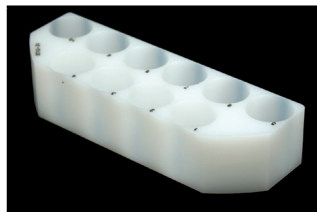

Standards Autosampler Racks

Autosampler Racks (ST Size, Type 1)

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


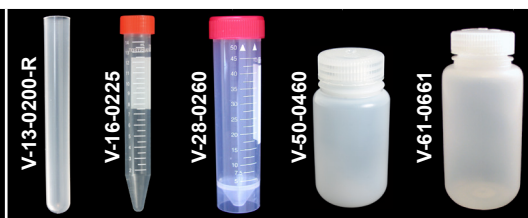
Description	Diam.	Part Number
10 position PVDF standards rack for 20 mL and 50 mL tubes	28 mm	ST10-28


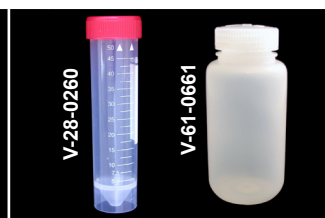
Description	Diam.	Part Number
10 position PP high purity standards rack for 30 mL and 60 mL tubes	30 mm	ST10-31

Static Rinse/Organic Rinse Racks

All static and organic rinse racks can be used on the following DXe, DX and DXCi autosampler models: 2, 4, 8 and 14. Accessible through ESI SC software.

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

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



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



Autosampler Racks (ST Size, Type 2)


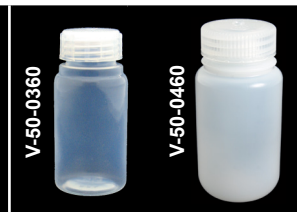
All ST type 2 racks can be used on the following DXe, DX and DXCi autosampler model: 2

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

Autosampler Racks (ST Size, Type 3)

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

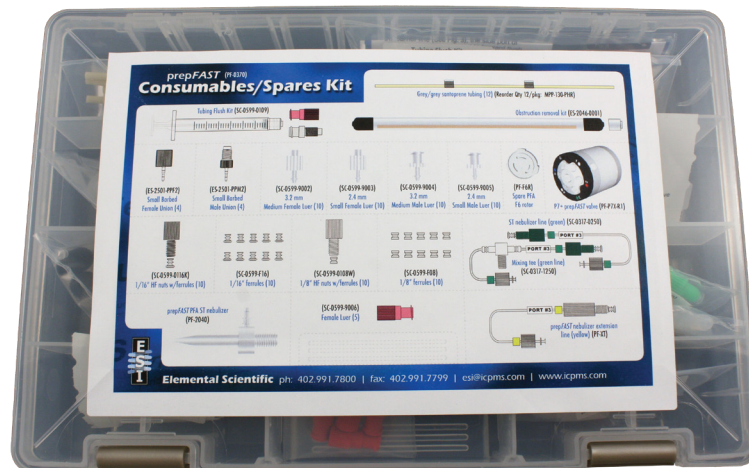
 		
Description	Diam.	Part Number
7 position HMPE standards rack for 250 mL bottles	60 mm	ST7-60

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

FAST Spares Kits for iCAP 6000/7000/PRO Series ICP-OES

These kits contain all the consumable components to help maintain your ESI FAST valves at their peak operating performance. All of the required fittings and tubing are included in each of the individual kits, organized in a convenient case with individual component information for secure storage and easy reordering. Components included in various kits are:

- Fittings and ferrules
- Tubing flush kit
- Lines and peristaltic pump tubing
- Spare valves and rotors
- Kits with PFA nebulizers include nebulizer obstruction kit



FAST Spares Kits for iCAP 6000/7000/PRO Series ICP-OES		
Description	Major Components	Part Number
FAST Spares Kit	Assorted fittings, ferrules, lines & tubing P6 rotor	SC-0380
FAST Deluxe Spares Kit	Assorted fittings, ferrules, lines & tubing P7 FAST valve with rotor PFA-ST nebulizer	SC-0370-D
prepFAST Spares Kit	Assorted fittings, ferrules, lines & tubing P7+ valve with rotor & F6 rotor prepFAST PFA-ST nebulizer	PF-0370
prepFAST X Spares Kit	Assorted fittings, ferrules, lines & tubing X13 valve with rotor PFA-ICN40 nebulizer	PFX-0370-68
SampleSense FAST Spares Kit	Assorted fittings, ferrules, lines & tubing P6 rotor PFA-ICN40 nebulizer	F-0370-SS-68
SampleSense prepFAST Spares Kit	Assorted fittings, ferrules, lines & tubing P6 valve with rotor & F6 rotor PFA-ICN40 nebulizer	F-0370-SS-68
prepFAST IC Spares Kit	Assorted fittings, ferrules, lines & tubing V6 & P7 high pressure valves with rotors 6 mL tall quartz syringe & PFA-ST nebulizer	PFIC-0370-HP
seaFAST / brineFAST Spares Kit	Assorted fittings, ferrules, lines & fittings Spare P6, P11, P11b rotors 3 mL quartz syringe & PFA-ST nebulizer	SF-0370

Installation and Training

Silver Level ESI Installation & Training

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

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

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



Gold Level ESI Installation & Training

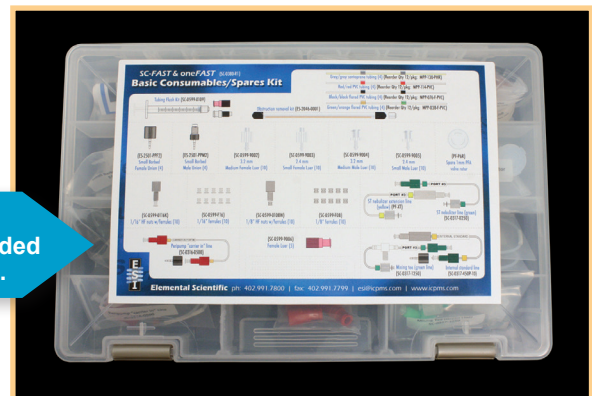
The gold level installation and training package is a 2½-day, on-site installation and method development for the *FAST* and prep*FAST*.

Includes: Hardware installation
Software methods
Basic system familiarization
Necessary method validation
User training
Travel time & expenses for ESI employee or contractor
Spares kit (see page 78)

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



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



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