

Advanced

Sample Introduction Systems

For PerkinElmer Avio 200 & 500 ICP



**Elemental
Scientific**

Quick Reference

Introduction to Automation

DX Autosamplers

Durable, chemically inert autosamplers featuring dual flowing rinse stations to reduce carryover. DX autosamplers are *FAST* ready and have two rinse pumps to supply independent solutions to each rinse station, while DXe autosamplers have a common rinse pump that uses a tee connection to supply single rinse solution to both stations. (Pages 4-5)

FAST

High-throughput, automated sample introduction system that uses valve injection with rapid vacuum sample loading to more than double the productivity, minimize instrument maintenance, and reduce operating costs. (Pages 6-7)

prepFAST

Automated inline dilution system that eliminates manual dilution, reduces reagent usage, and improves laboratory productivity. These systems use a syringe module to perform precise and accurate inline dilutions of standards and samples. prepFAST, base version; prepFAST e, economical; prepFAST M5, syringe-driven sample loading. (Pages 8-19)

Application Systems

Advanced automation systems that combine *FAST* and prepFAST technologies with application specific sample introduction components to allow for the analysis of nanoparticles, high matrix samples, semiconductor chemicals and chromatography samples. (Pages 20-29)

pergo

Argon humidifier with a water vapor permeable membrane that improves performance and stability of all concentric nebulizers, specifically when analyzing brines, fusion digests, and high TDS samples. (Pages 42-43)

PC^{3X}

Peltier-cooled or heated inlet system for cyclonic spray chambers that provides thermal stabilization to improve short and long-term stability. (Page 56)

PC^{3-LT}

Peltier-cooled low temperature inlet system for cyclonic spray chambers that reduces the solvent load on the plasma for the analysis of 100% organic solvents. (Page 57)

Terminology

Rinse Pump	Supplies solution to rinse station; DXe has common rinse pump that uses a tee connection to supply single rinse solution to each station; DX has two rinse pumps to supply independent rinse solutions to each station.
Dual Rinse	DX autosamplers come with two rinse stations; the first to remove residue from the previous sample from the probe exterior, and the second for vacuuming rinse solution to rinse the entire system.
MP²	Precision micro peristaltic pump.
FAST (DXe & DX)	Valve and loop combination that rapidly vacuum loads and injects sample.
FAST Pump	Allows rapid, vacuum sample loading into a loop on a <i>FAST</i> valve.
FAST Basic	<i>FAST</i> system that includes nebulizer.
FAST Complete	<i>FAST</i> system that includes torch, injector, spray chamber, nebulizer, and PC. ³

TABLE OF CONTENTS

Automation

DX family of autosamplers	4-5
FAST high sample throughput system	6-7
prepFAST inline dilution system	8-11
prepFAST e economical autodilution system	12-13
prepFAST (prepFAST 2) autodilution system	14-15
prepFAST M5 syringe sample loading autodilution system	16-17
prepFAST complete systems comparison	18
prepFAST Ordering information	19

Application Systems

prep3 inline peristaltic pump dilution system	20-23
brineFAST S4 preconcentration system	24-25
hydrideICP system	26-27
hydride S31	28-29

Autosampler Accessories

Enclosures and ULPA filtered environments	30
Mobile autosampler stations	31

Nebulizers, Spray Chambers, Torches and Injectors

PFA and polypro ST nebulizers and accessories	33-34
Probes and Capillaries for ST-nebulizers	35
PFA nebulizers with integrated sample capillaries	36
PFA nebulizers with integrated autosampler probes	37
MEINHARD® glass nebulizers	38
PFA FitKit MEINHARD® nebulizer connectors	39-40
Pearl concentric nebulizer cleaner	41
pergo argon nebulizer gas humidifier	42-43
Online mixing kits for addition of internal standard	44
Spray chambers and accessories	45-46
ZipTorches and Injectors	47-51

Peristaltic and Syringe Pumps

FAST DXi integrated peristaltic pumps with FAST valve	52
Stand alone peristaltic pumps	53
MP ² peristaltic pump tubing	54
Spare syringes and pipette tips	55

High Performance Sample Introduction

Peltier coolers and heaters	56-57
HF-resistant sample introduction kit	59

Consumables

High purity valves, stators and rotors	60-61
Manual sampling probes / nebulizer lines	62-63
Fittings, tubing and sample loops	64-65
High purity HF-resistant sample vials and bottles	66-68
PVDF autosampler vials	67
Sample vessels	69
Microplates and accessories	70-71
Large autosampler racks	72
Heated and micro autosampler racks	73
Super autosampler racks	74-75
Standards autosampler racks	76-77
FAST Spares Kits	78

Installation and Training	79
---------------------------------	----

Autosampler Dimensions	80-81
------------------------------	-------



AUTOMATION

SAMPLE INTRODUCTION

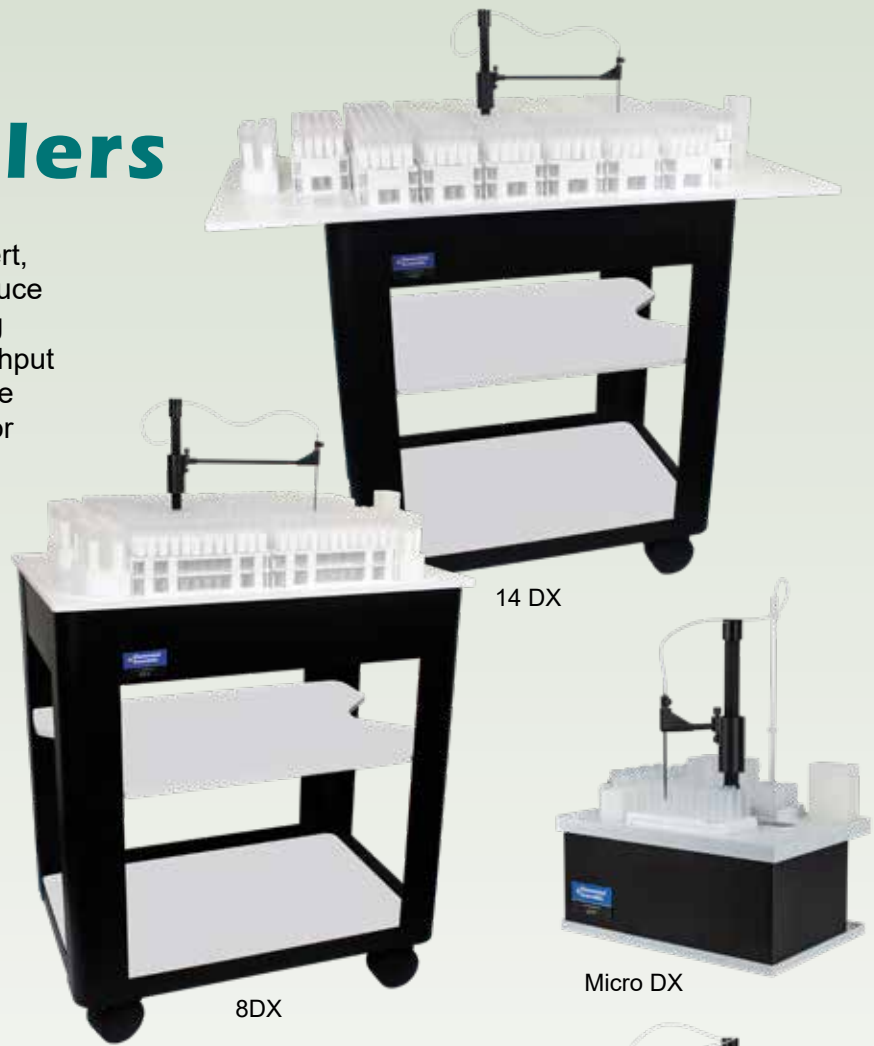
CONSUMABLES

DX Family of Autosamplers

DX autosamplers are durable, chemically inert, and feature dual flowing rinse stations to reduce carryover. Versatile rack configurations along with the ability to upgrade to any high-throughput FAST or autodiluting prepFAST system, make the DX autosampler the perfect foundation for automation in any trace metal lab. They are available in seven models having five capacities ranging from the Micro DX to the 14DX, the largest on the market.

Benefits:

- Durable dual rail system
- Dual flowing rinse stations
- Precision sampling
- Reset probe – prevents probe damage
- Flexible rack configurations
- Upgradeable to FAST or prepFAST
- 2DXe and 4DXe economical versions available



14 DX

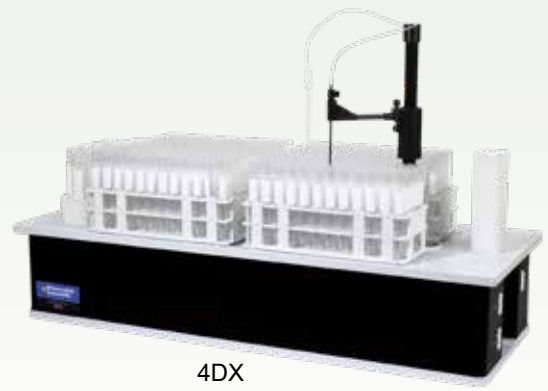
8DX



Micro DX

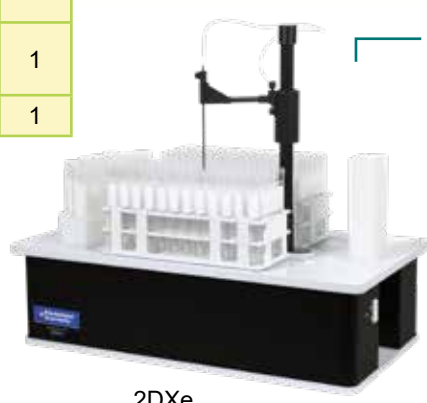


2DX



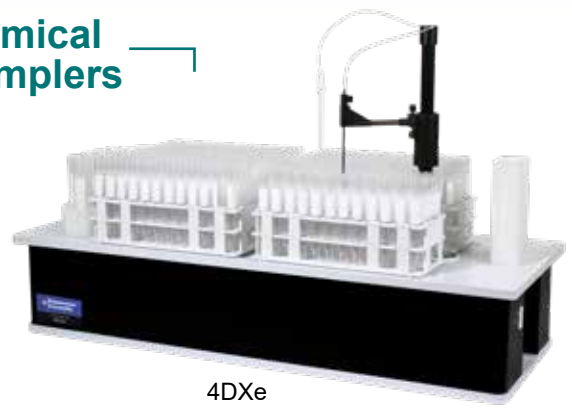
4DX

DXe Economical Autosampler vs. DX FAST Ready Autosampler		
Configurations	DX	DXe
Probe	2	1
Sample & Standards Rack Pkg	1	1
Polypropylene Rinse Bottle (4L)	2	1
FAST Vacuum Pump	1	0
Dual Flowing Rinse Stations	1	1
Rinse Pump	2	1



2DXe

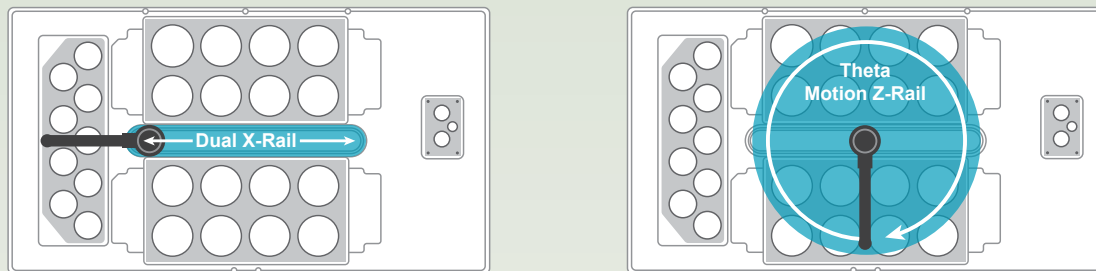
Economical Autosamplers



4DXe

DX Autosamplers are Engineered to be Precise and Durable

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

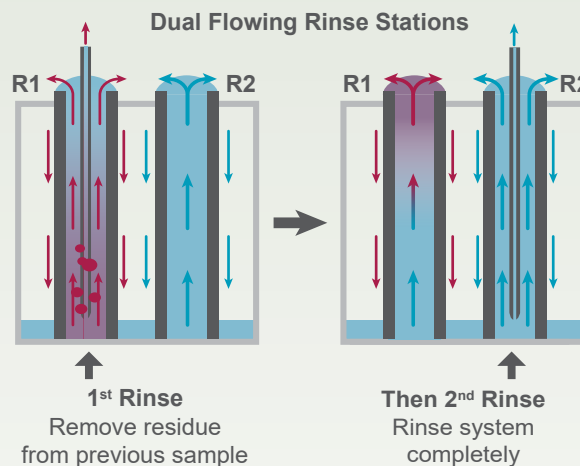


Micro DX autosampler shown

Dual Rinse Stations Reduce Carryover

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

All DX and DXe autosamplers have dual rinse stations to minimize sample-to-sample carryover. Rinse liquid is supplied by a common rinse pump (DXe) split between two rinse stations or with two independent rinse pumps (DX), one for each rinse station. With independent rinse pumps, each station can use a different rinse solution to effectively rinse wide-ranging sample types while minimizing rinse solution consumption.



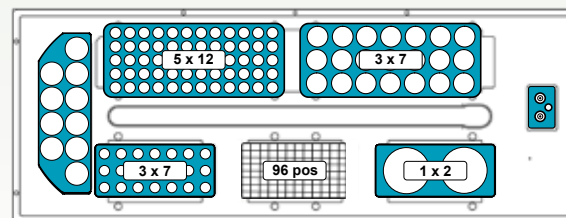
DX Autosamplers are Versatile and Upgradeable

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

Flexible rack configurations permit almost any sample size, from microplates and 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



4 DX 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

Model	Part Number	Large Rack Capacity	Microplate/ Micro Rack Capacity	MAXIMUM SAMPLE CAPACITY			
				50mL	15mL	8mL	MT-96
Micro DX	m-DX	0	2	20	42	80	192
2DX	2DX	2	4	52	120	180	384
2DXe	2DXe						
4DX	4DX	4	6	94	240	360	576
4DXe	4DXe						
8DX	8DX	8	-	208	480	720	-
14DX	14DX	14	30*	304	840	1260	2880*

*Special version 14DX for microplates

FAST SYSTEM

for Avio 200/500 ICP

The FAST is a high-throughput, automated sample introduction system for the Avio 200/500 ICP. The FAST system uses valve injection with rapid vacuum sample loading to more than double the productivity of the Avio ICP, minimize instrument maintenance, and reduce operating costs.

FAST Benefits:

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

Improved Efficiency

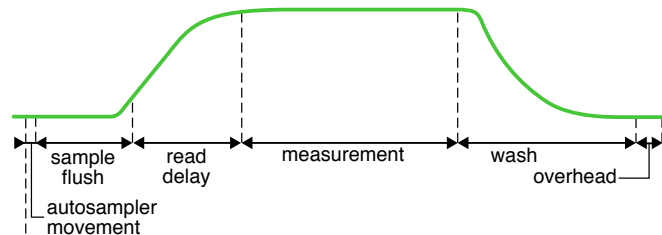
By presenting the sample for a short period of time while the measurement is being performed, contamination of the sample introduction system is minimized, resulting in stable analytical runs with reduced sample carryover and maintenance. The FAST reduces consumption of argon, power, and reagents.

Increased Sample Throughput

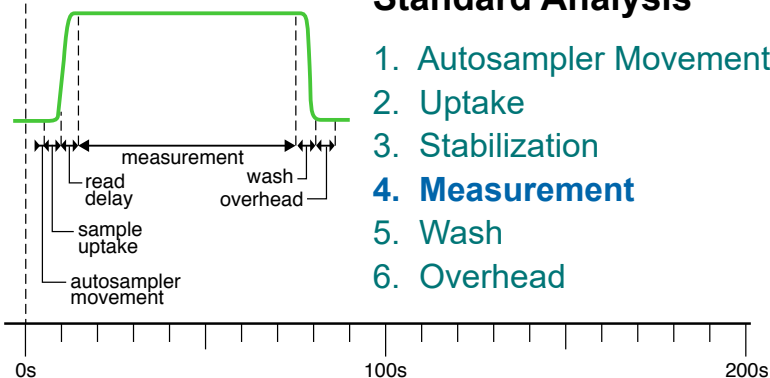
In addition to higher throughput gained by using an autosampler, the FAST system analyzes a sample 2-5 times faster than it takes a standard autosampler to perform the same task.

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

Normal Analysis



FAST Analysis



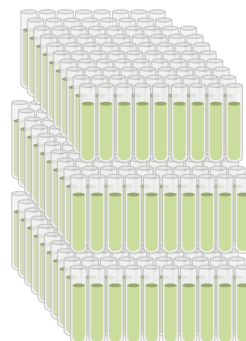
Six Steps in a Standard Analysis

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

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



STANDARD ANALYSIS
96 SAMPLES



FAST ANALYSIS
288 SAMPLES

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

Superior P-Series FAST Valve

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



P7 FAST Valve

Avio 500 ICP

FAST DXi:

- Integrated MP² peristaltic pump and FAST valve for the Avio 200/500 ICP
- High quality ceramic bearing peristaltic pump for long lifetime and high precision
- Upgradeable to prepFAST

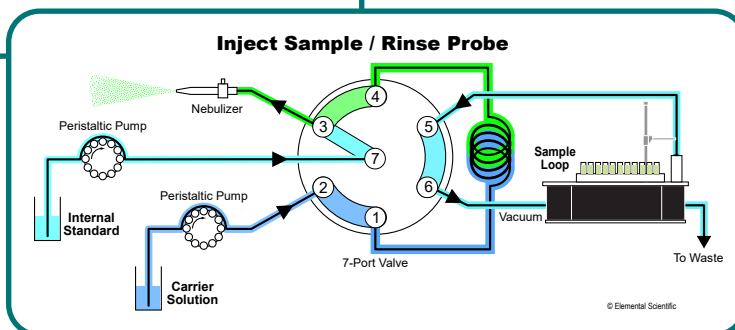
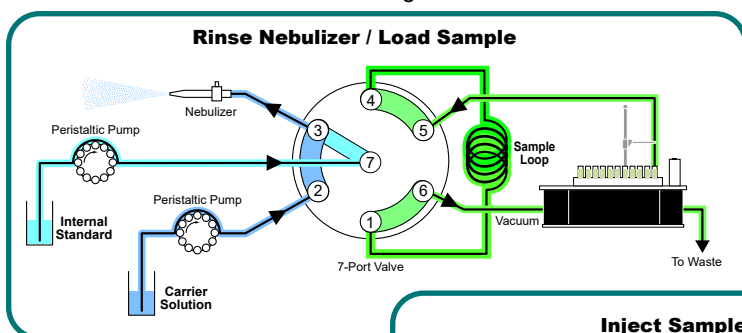


Single Valve FAST DXi for Avio 500 ICP



Single Valve FAST DXi for Avio 200 ICP

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



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

FAST SYSTEM PART NUMBERS FOR AVIO 200 & 500 ICP

Description		2 DX FAST	4 DX FAST	8 DX FAST	14 DX FAST
FAST basic systems for high throughput and FAST washout (Includes DX autosampler)	Avio 200	2DXF-47A	4DXF-47A	8DXF-47A	14DXF-47A
	Avio 500	2DXF-37A	4DXF-37A	8DXF-37A	14DXF-37A

See page 4 for more information on DX autosamplers.

prepFAST™ Inline Dilution

Variable Autodilution, Inline Autocalibration, and Overage Dilution

The prepFAST is an automated inline dilution system. The prepFAST eliminates manual dilution, reduces reagent usage, and improves laboratory productivity. These systems combine the DX autosampler, high-throughput FAST technology and a syringe module to perform precise and accurate inline dilutions of standards and samples.

prepFAST Automates Daily Lab Functions

Autodilution

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

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

Autocalibration

Automate inline preparation of ICP calibration standards.

- Save time and improve laboratory efficiency
- Improve linearity
- Standards rack (9 x 125 mL) holds both calibration and QC compliance standards
- Save time and improve laboratory efficiency

Overrange Dilution

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

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

PerkinElmer Offers Three prepFAST Systems:

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

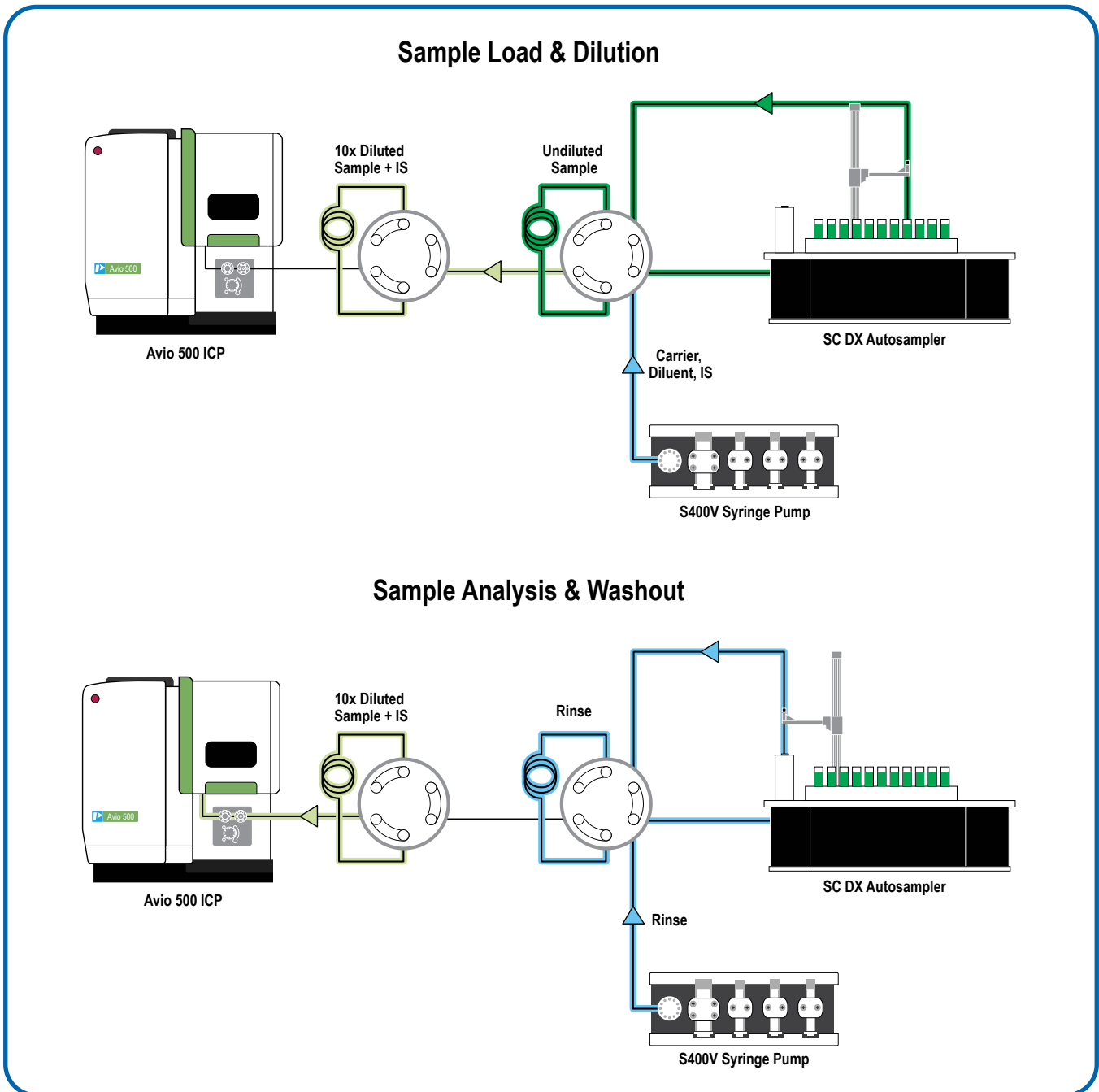


2 DX prepFAST

prepFAST™ Autodilution

Rapid, Variable, In-Valve Autodilution

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



prepFAST dilution diagram for Avio 500 ICP

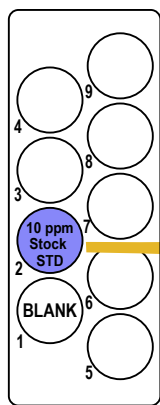
prepFAST™ Autocalibration

Autocalibration

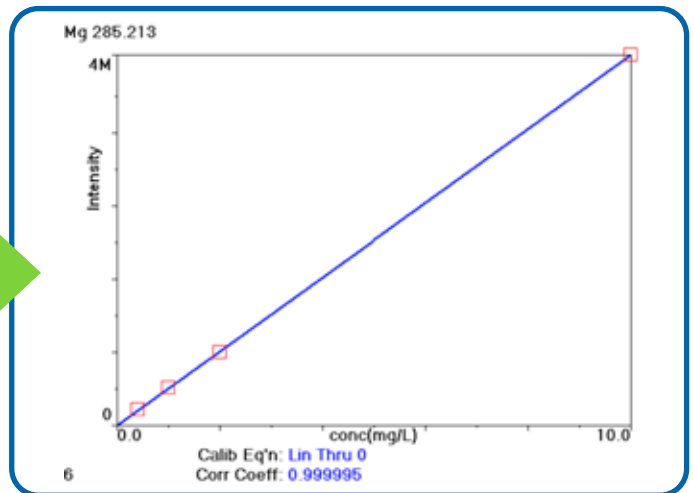
The prepFAST can create multipoint calibration curves from a single bottle of stock standard. Each point of the calibration curve is prepared by autodilution of a single stock calibration standard placed on the autosampler deck. The prepFAST automatically generates highly linear and consistent ICP calibration 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



STD Position	Inline Dilution Factor	Standard Concentration ppm
1	blank	0
2	20x	0.5
2	10x	1
2	5x	2
2	1x	10



Autocalibration of Mg from a 10ppm stock standard

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

Manual Calibration vs. Autocalibration

30+ MINUTES
- Manual Labor -



5 MINUTES
- AUTOMATED -

- High Risk of -
HUMAN ERROR

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

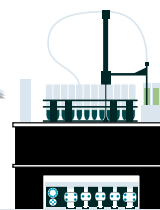


- High use of -
CONSUMABLES



- Reduced -
HUMAN ERROR

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

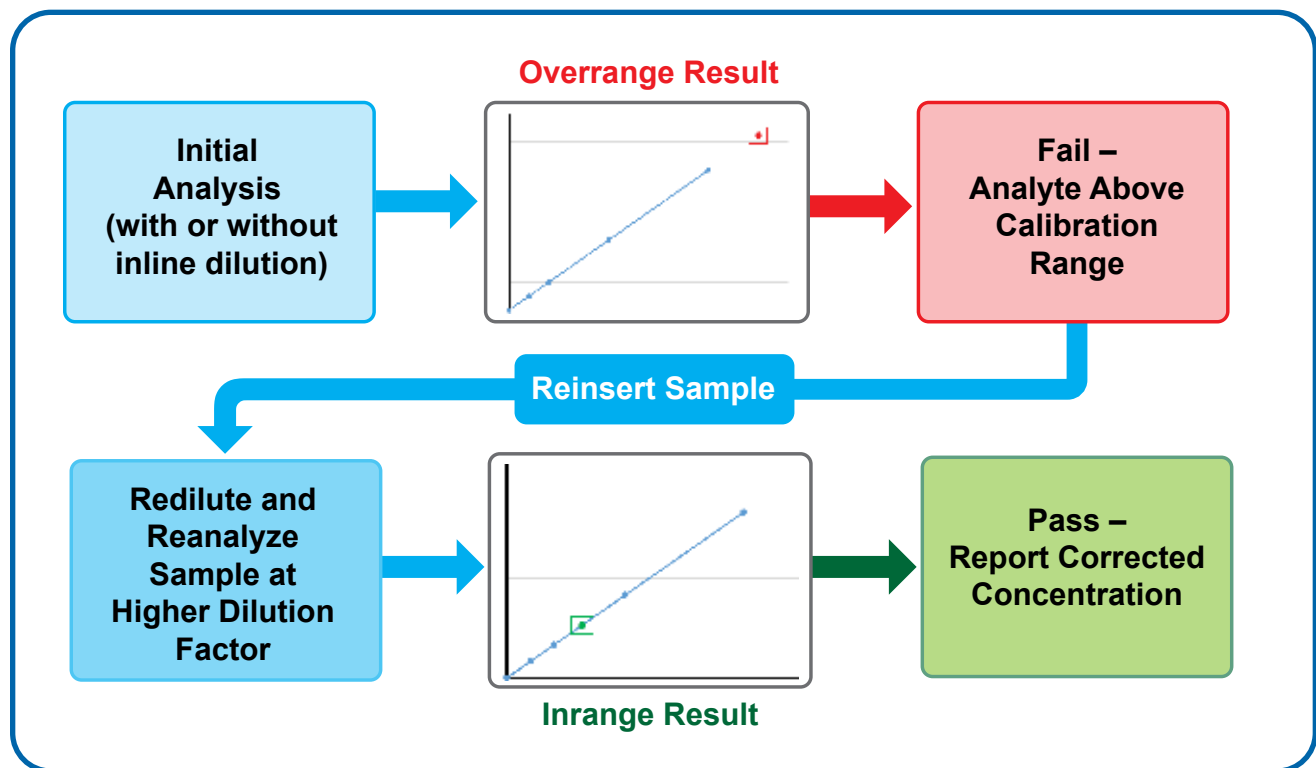


- Reduced use of -
CONSUMABLES

prepFAST™ Overrange Dilution

Overrange Analyte Autodilution

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



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

Out-of-Range Internal Standard Autodilution

Internal standard out-of-range conditions occur when a high matrix present in a sample causes response changes in the ICP signal, which is identified by monitoring internal standard recoveries. Syngistix can be configured to automatically detect these limit failures, and instructs the prepFAST to automatically dilute the sample for reanalysis during the same analysis run.

prepFAST eTM for Avio 200/500 ICP

Economical Inline Autodilution System

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

Features

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

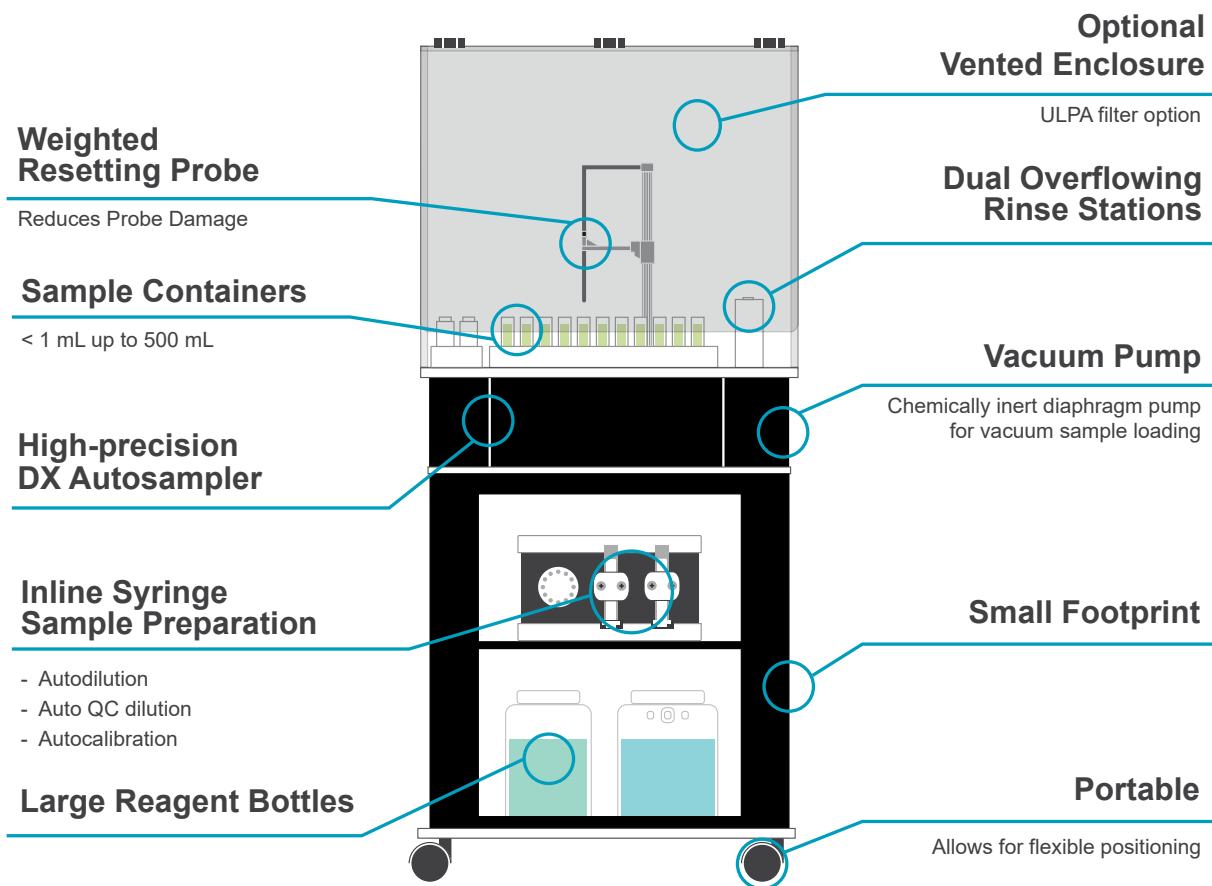
Benefits

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

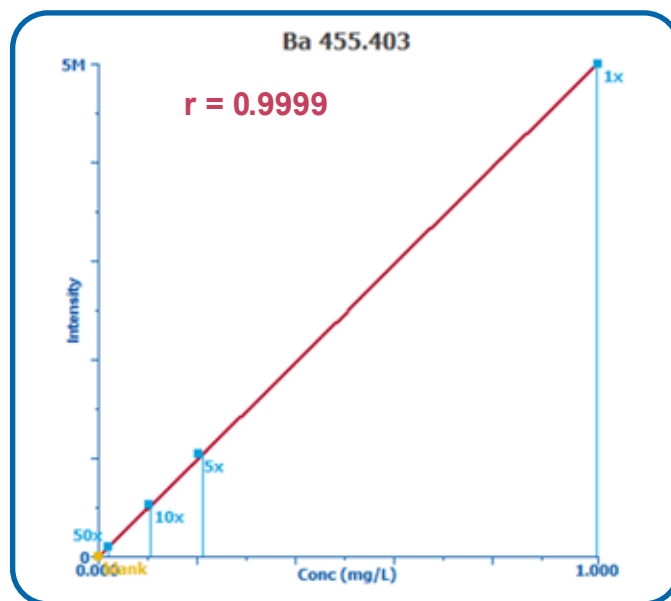
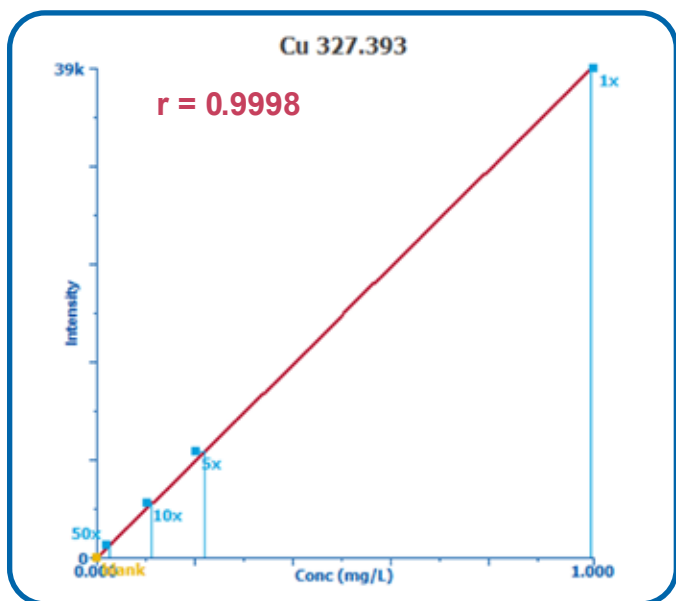


2DX
prepFAST e

prepFAST e Features Diagram



prepFAST e Automated Calibrations



Autocalibrations on Avio 500 with prepFAST e. Standard concentrations prepared at 20, 100, 200, and 1000 µg/L.

prepFAST™

for Avio 200/500 ICP

Fully Automated Inline Dilution

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

Features

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

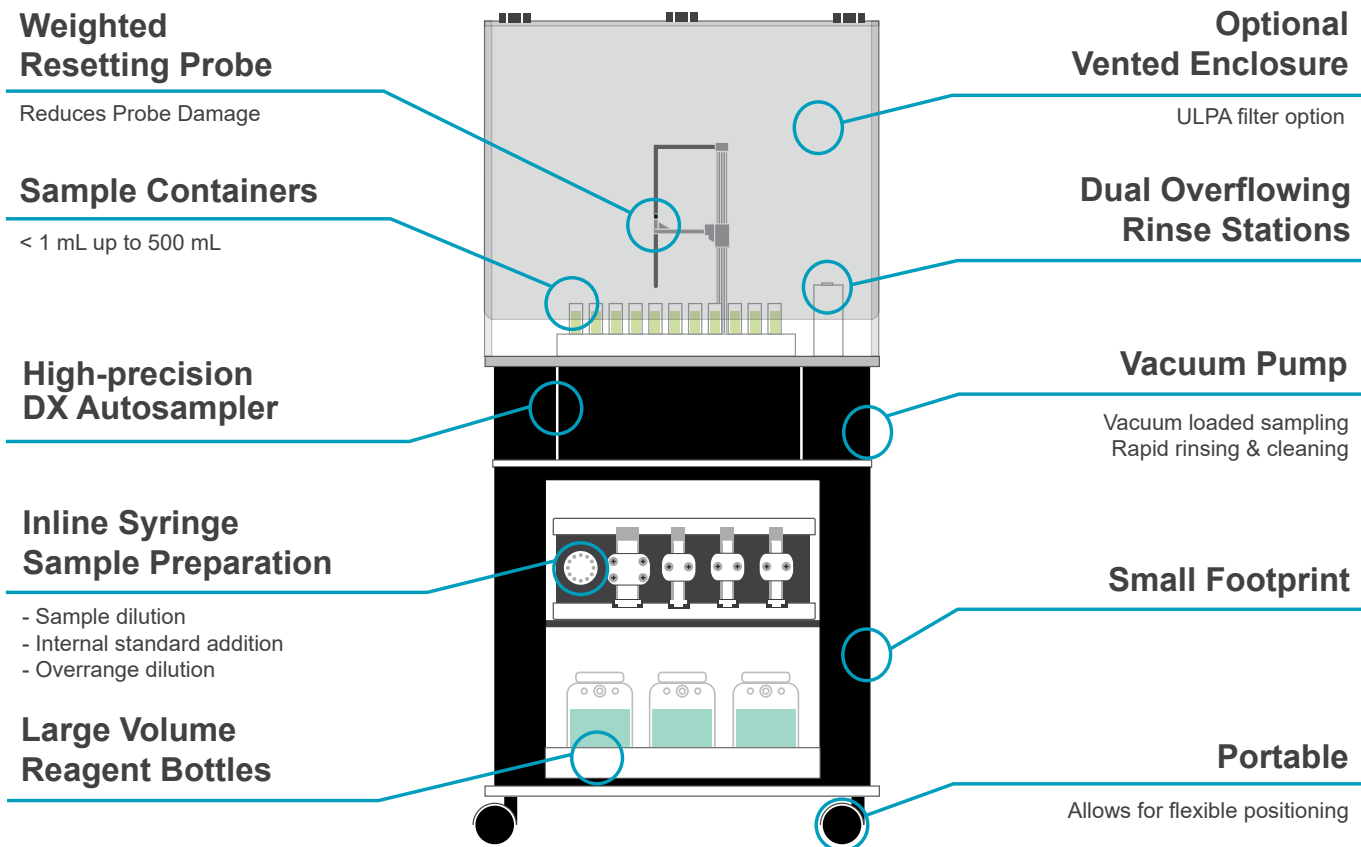
Benefits

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

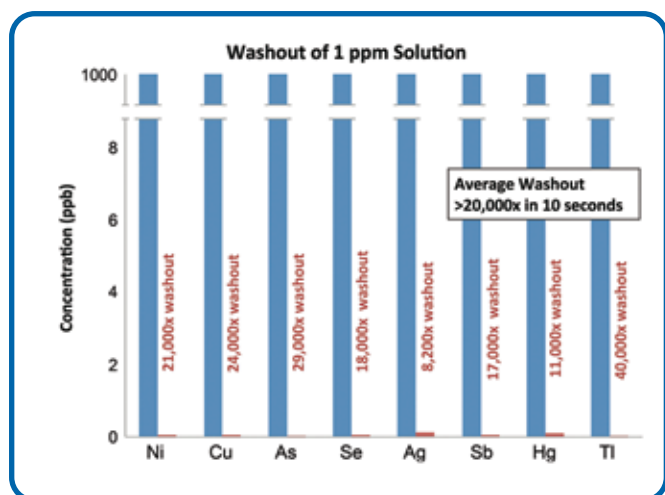


4DX prepFAST

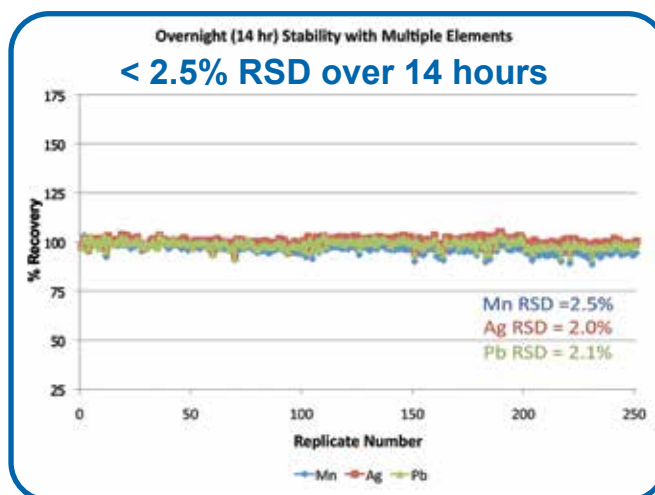
prepFAST Features Diagram



prepFAST Performance



FAST washout even for memory-prone elements



Long-term stability

prepFAST M5TM for Avio 200/500 ICP

Syringe Sample Loading + Syringe-driven Inline Dilution

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



S500V2 Syringe Module

Features

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

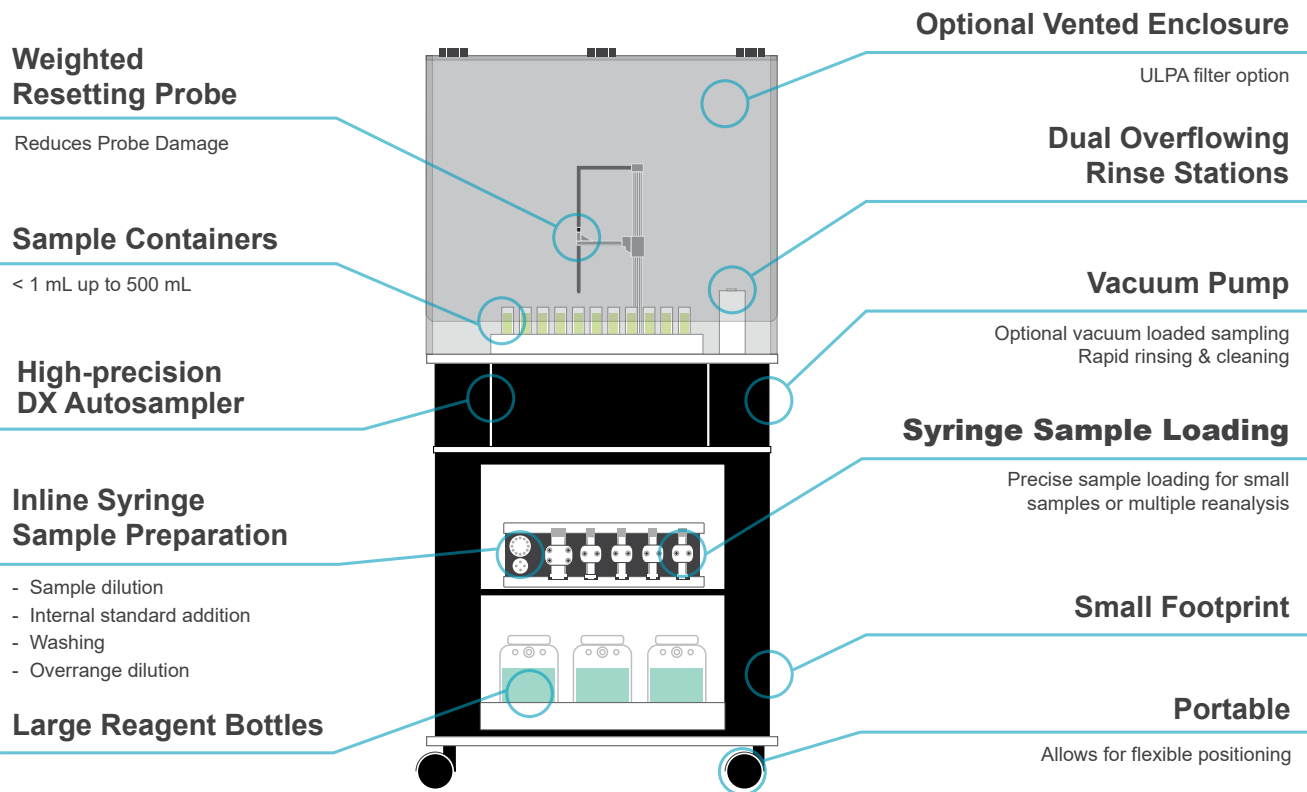
Benefits

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



4DX
prepFAST M5

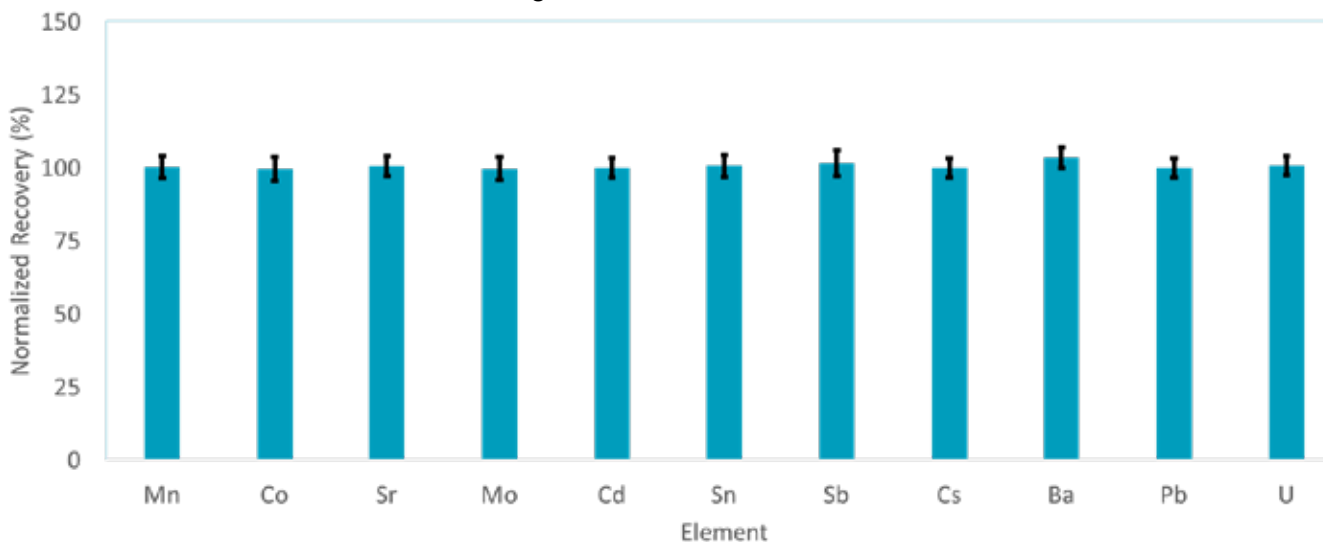
prepFAST M5 Features Diagram



Automated micro sample analysis in a difficult matrix

prepFAST M5 with 100µL Urine Samples

250 Replicate Urine Analysis
Average RSDs <4%



prepFAST Systems Comparison

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



4DX Autosampler with Mobile Station

prepFAST e Provides:

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

prepFAST Provides:

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

prepFAST M5 Provides:

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



prepFAST e

prepFAST

prepFAST M5

prepFAST™ Ordering Information

prepFAST Systems Comparison

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

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

Avio 200

prepFAST e

	Part Number
2DX	2PF _e -47
4DX	4PF _e -47
8DX	8PF _e -47
14DX	14PF _e -47

prepFAST

	Part Number
2DX	2ADFi-47A
4DX	4ADFi-47A
8DX	8ADFi-47A
14DX	14ADFi-47A

prepFAST M5

	Part Number
2DX	2PF-M5-47A
4DX	4PF-M5-47A
8DX	8PF-M5-47A
14DX	14PF-M5-47A

Avio 500

prepFAST e

	Part Number
2DX	2PF _e -37
4DX	4PF _e -37
8DX	8PF _e -37
14DX	14PF _e -37

prepFAST

	Part Number
2DX	2ADFi-37A
4DX	4ADFi-37A
8DX	8ADFi-37A
14DX	14ADFi-37A

prepFAST M5

	Part Number
2DX	2PF-M5-37A
4DX	4PF-M5-37A
8DX	8PF-M5-37A
14DX	14PF-M5-37A

Automated Inline Dilution System for PerkinElmer Avio

prep3 is an inline dilution system which uses peristaltic pumps to perform precise and accurate inline dilution of samples and standards. Syngistix software controls three microperistaltic pumps that deliver sample, diluent, and internal standard to an inline, low-volume mixing device and then into the nebulizer. The total liquid flow is constant, but the ratio of sample to diluent varies to perform the inline dilutions.

Features

- Triple low-pulsing microperistaltic pump
 - P1 = Carrier
 - P2 = Diluent
 - P3 = Internal standard
- Low-volume mixing device

Benefits

- Automatic calibration from stock standard solution(s)
- Automatic sample dilution
- Automatic over-range dilution
- Automatic internal standard out-of-range dilution
- Analyze samples from undiluted to up to 25x diluted
- Fully supported by Syngistix software

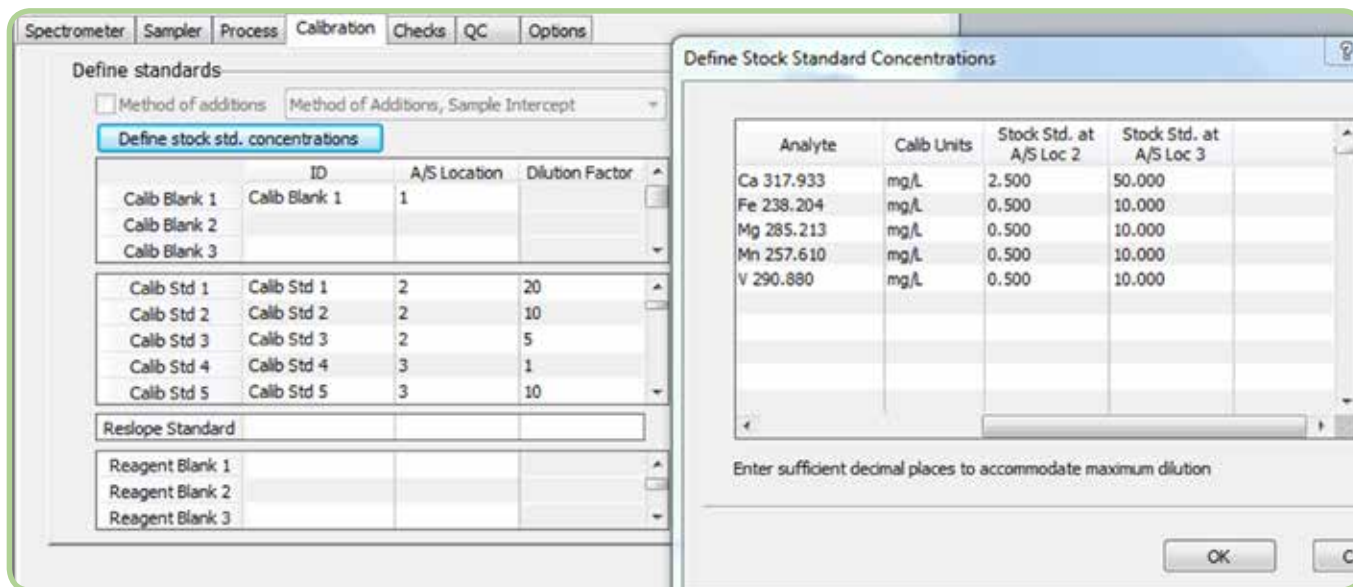


2DXe prep3 on the Avio 200 ICP

Manual Calibration vs. Autocalibration with Avio prep3

<p>30+ MINUTES - Manual Labor -</p>	<p>5 MINUTES - AUTOMATED -</p>
<p>- Risk of - AIRBORNE CONTAMINATION</p> <p>- High Risk of - HUMAN ERROR</p> <p>- High use of - CONSUMABLES</p>	<p>- Reduced Risk of - CONTAMINATION</p> <p>- Reduced - HUMAN ERROR</p> <p>- Reduced use of - CONSUMABLES</p>

Autocalibration of multiple stock standards



Defining stock standard concentration and autosampler location in Syngistix software is performed in the calibration tab. In this example, autocalibration from two stock standards creates a calibration curve from 0.025 ppm to 10 ppm for Fe, Mg, Mn, V, and 2.5 ppm to 50 ppm for Ca. Syngistix uses the stock standard locations, concentrations, and dilutions to autocalibrate the Avio.

Automatic predefined dilution of samples to eliminate manual offline dilution of samples

Sample No	A/S Location	Sample ID	Auto Dil. Factor #
1	101	Sample 1	10
2	102	Sample 2	10
3	103	Sample 3	10
4	104	Sample 4	10
5	105	Sample 5	10
6	106	Sample 6	10
7	107	Sample 7	10
8	108	Sample 8	10

Sample No	A/S Location	Sample ID	Auto Dil. Factor #
1	101	Sample 1	20
2	102	Sample 2	20
3	103	Sample 3	
4	104	Sample 4	1
5	105	Sample 5	10
6	106	Sample 6	5
7	107	Sample 7	15
8	108	Sample 8	25

Syngistix flexibility allows autodilution factors to be the same for all samples (example A) or sample specific (example B). The prep3 eliminates offline manual dilution of samples.

Autodilution of over-range samples for over-range analytes

Sample limits

Concentration units: Calibration Sample

Show sample limit range along with out of limit remark

If upper limit is exceeded, then dilute by **5** (B) and reanalyze

	Analyte	Units	Conc	Lower	Upper
1	Ca	317.933	mg/L		
2	Fe	238.204	mg/L		11.0 (A)
3	Mg	285.213	mg/L		11.0
4	Mn	257.610	mg/L		11.0
5	V	290.880	mg/L		11.0

The upper concentration range for one or more analytes can be defined for automatic dilution of over-range samples. Set the upper limit (A) and the over-range dilution factor (B).

Autodilution for out-of-range internal standard

Perform internal standard checks

Action taken if lower limit is exceeded

Reanalyze times, , dilute by **5** (Dilute Further)

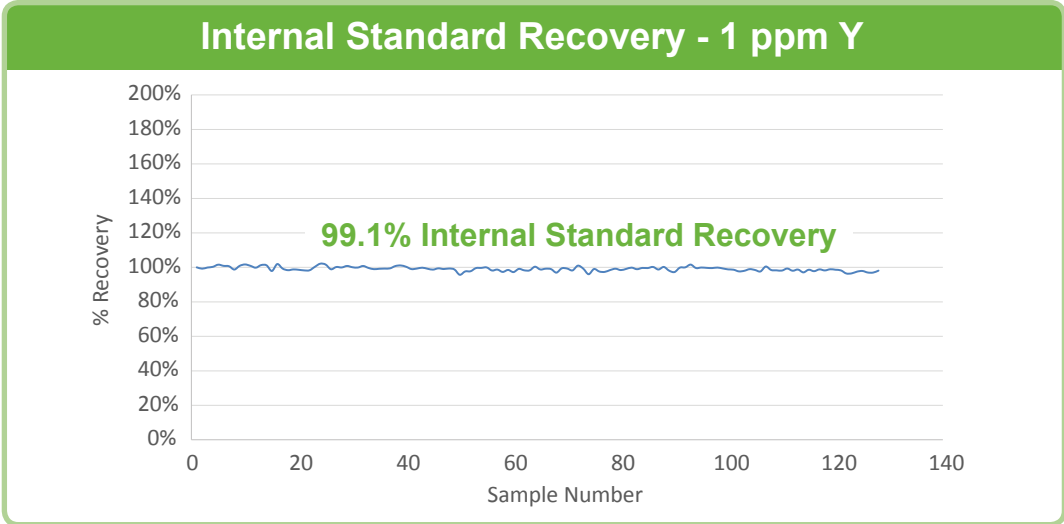
Action taken if Upper Limit is exceeded:

Reanalyze times, , dilute by **5**

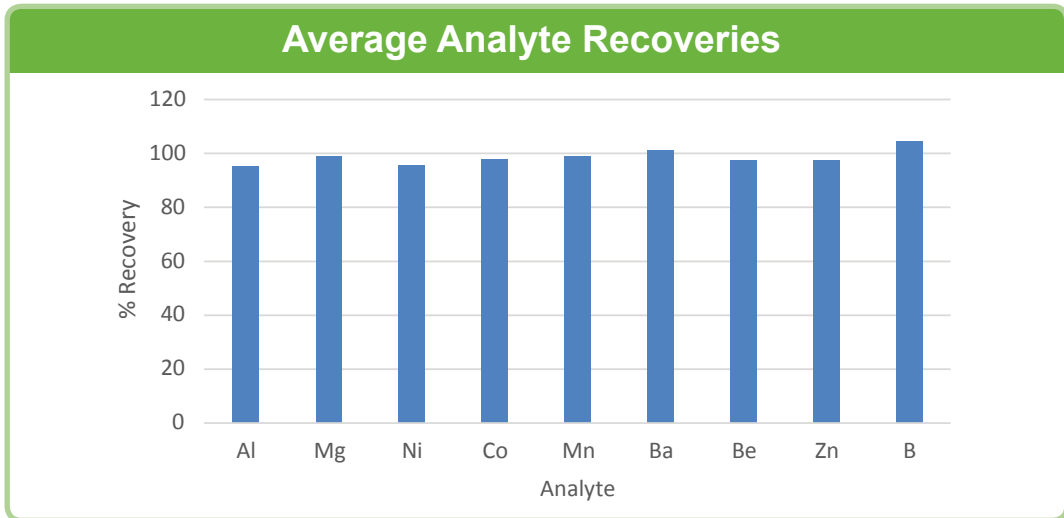
Internal standard limits

	Apply Limits	Int. Std. Name	Check Lower (%)	Check Upper (%)
6	<input checked="" type="checkbox"/>	Y 371.029	80	120 (Range)

Syngistix monitors the internal standard and the prep3 automatically dilutes out-of-range samples further for reanalysis.

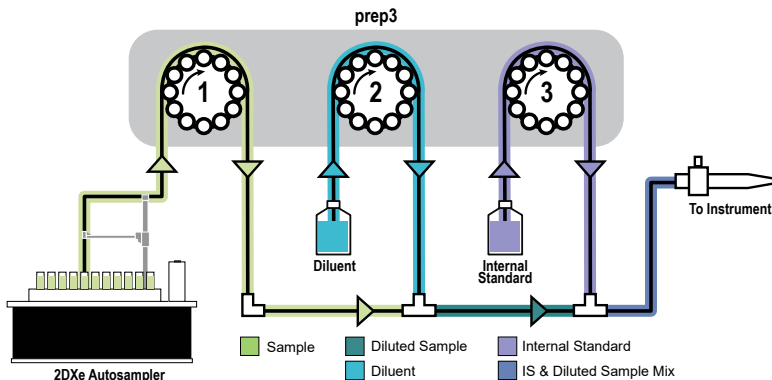


10 hours internal standard recovery. Average recovery: 99.1%



Average recovery for 10 ppm analytes over 13 hours of continuous test. Average recovery: 98.6%

prep3 Flow Path



Description	Part Number
prep3 Inline Autodilution System for PerkinElmer Avio: Includes nebulizer, Triple micro peristaltic pump and autodilution tee assembly, lines, and fittings. (DX Autosampler required, not included)	prep3-87A
2DXe prep3 Inline Autodilution System for PerkinElmer Avio: Includes 2DXe autosampler, triple micro peristaltic pump and autodilution tee assembly, nebulizer, lines, and fittings.	2Prep3-87A
4DXe prep3 Inline Autodilution System for PerkinElmer Avio: Includes 4DXe autosampler, triple micro peristaltic pump and autodilution tee assembly, nebulizer, lines, and fittings.	4Prep3-87A

brineFAST S4™ for Avio 500 ICP

Improve Detection Limits For Alkaline Earth and Transition Metals In High Purity Brines

The brineFAST is a fully-automated, online preconcentration and matrix removal system that improves detection limits for Ca, Mg, Fe, Ba, Sr, Mn and other elements in undiluted brines by more than an order of magnitude making trace impurity analysis possible with ICP.

Early detection of low and sub-ppb alkaline earth and transition metals in high-purity brines improves chlor-alkali plant process control and prevents costly damage to fluoropolymer membrane cells. Undiluted 30% brines may be sampled and analyzed directly, eliminating sample preparation and reducing contamination.

Features:

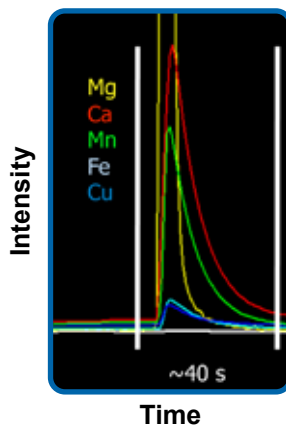
- Fully automated, inline preconcentration and matrix removal
- Direct mode with up to 50x fixed inline dilution
- Syringe-driven reagents
 - Consistent chemistry
 - Maximum throughput
 - Cleanliness
- No daily maintenance
- Detection limits in brine up to 400x better than traditional sample introduction

Applications:

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

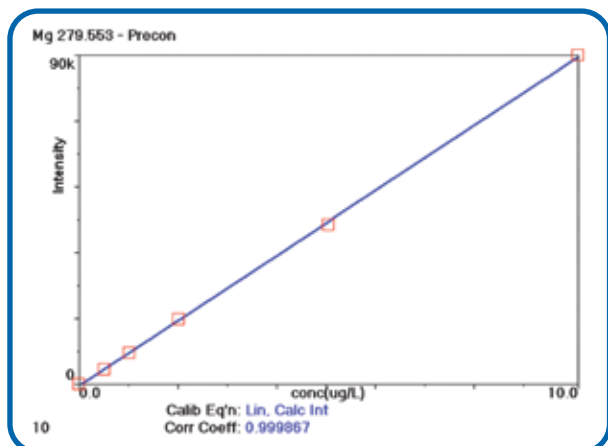


2DX brineFAST S4 system for PerkinElmer Avio 500

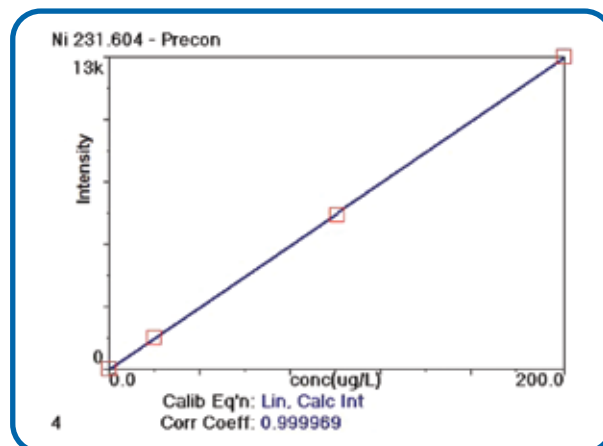


Elution Profiles

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



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

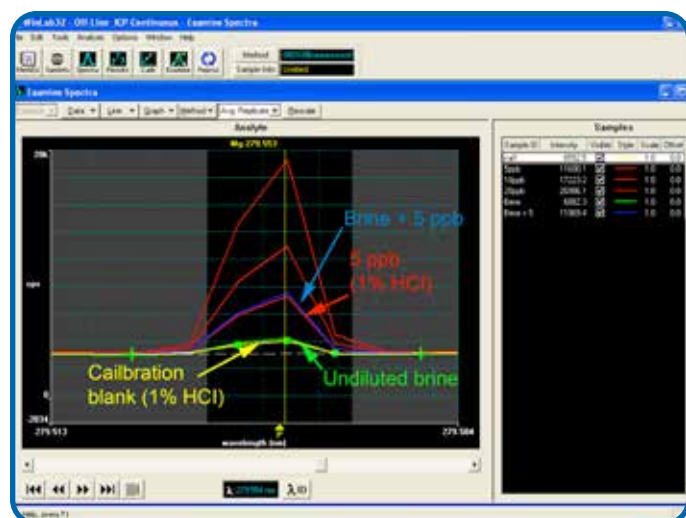


Typical calibration for ultra-pure brine, <10 ppb.

All brineFAST S4 Systems Include:

- DX FAST autosampler
- S400V syringe pump module
- FAST DXi dual valve module and all connections
- brineFAST S4 concentrator column
- brineFAST S4 cleanup column
- Mobile autosampler station

brineFAST																							
<div style="display: flex; align-items: center;"> <div style="width: 15px; height: 15px; background-color: #90EE90; border: 1px solid black; margin-right: 5px;"></div> Preconcentration or Direct Mode </div> <div style="display: flex; align-items: center;"> <div style="width: 15px; height: 15px; background-color: #66B3FF; border: 1px solid black; margin-right: 5px;"></div> Direct mode </div>																							
1															2								
	H															He							
3	Li	Be													5	B	C	N	O	F	10	Ne	
11	Na	Mg													13	Al	Si	P	S	17	Cl	18	Ar
19	K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	31	Ga	Ge	As	Se	Br	36	Kr			
37	Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	49	In	Sn	Sb	Te	I	54	Xe			
55	Cs	Ba	Lu	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	81	Tl	Pb	Bi	Po	85	At	86	Rn		
87	Fr	Ra																					



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

Analyte	Traditional Introduction (spiked at 100 ppb)	brineFAST S4 (spiked at 5 ppb)
Ca	132	103
Mg	64	96
Fe	104	95
Ba	106	99
Sr	75	99
Mn	111	99

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

Analyte	% Recovery
Fe	99
Ni	99
Cu	99
Pb	101

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

Analyte	Traditional (ppb)	brineFAST S4 (ppb)	Improvement Factor
Ca	8.0	0.02	410
Mg	1.7	0.01	190
Fe	6.3	0.2	28
Ba	1.4	0.2	7
Sr	1.1	0.01	150
Mn	1.2	0.02	57

Description	Part Number
2DX brineFAST S4 system for Avio 500	2BF-S4-37C
Spare brine preconcentration column	CF-IDA
Spare trace metals cleanup column	CF-M-0600

hydrideICP™

Compact Hydride Generation System for Avio 200/500 ICP

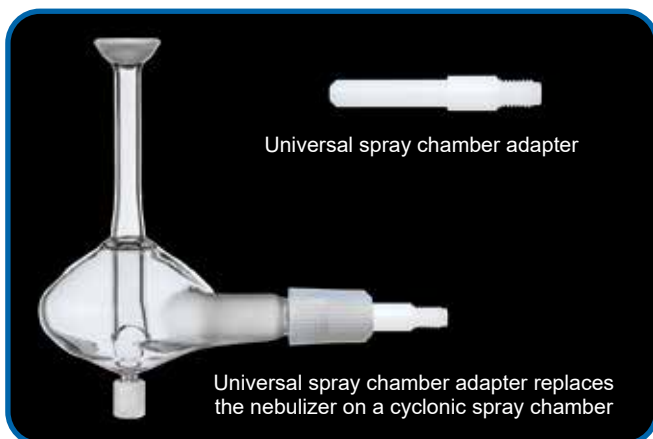
The hydrideICP, a standalone hydride generation system with precision micro peristaltic pump, provides sub-ppb detection limits for hydride-forming elements such as As, Se, Sb and Hg.

Benefits:

- Increased sensitivity, up to 100x for hydride-forming elements (As, Hg, Se, Sb,)
- Simultaneous hydride generation and nebulization for high sensitivity multielement analysis
- 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 GLS
- Convenient
 - hydrideICP is completely integrated into the MP² pump



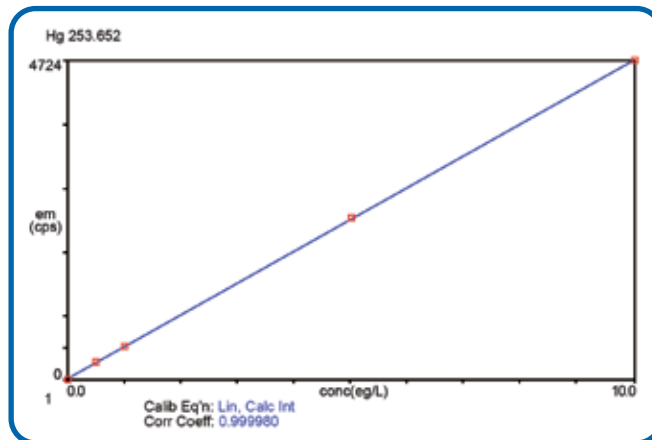
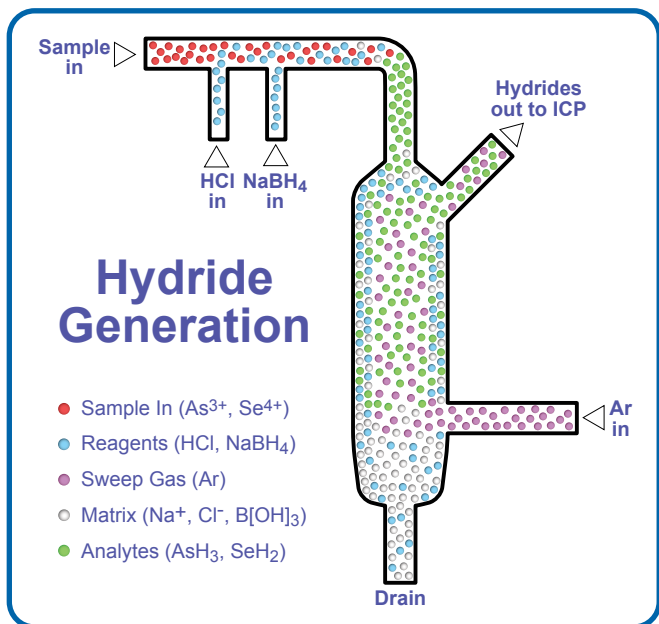
hydrideICP System



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

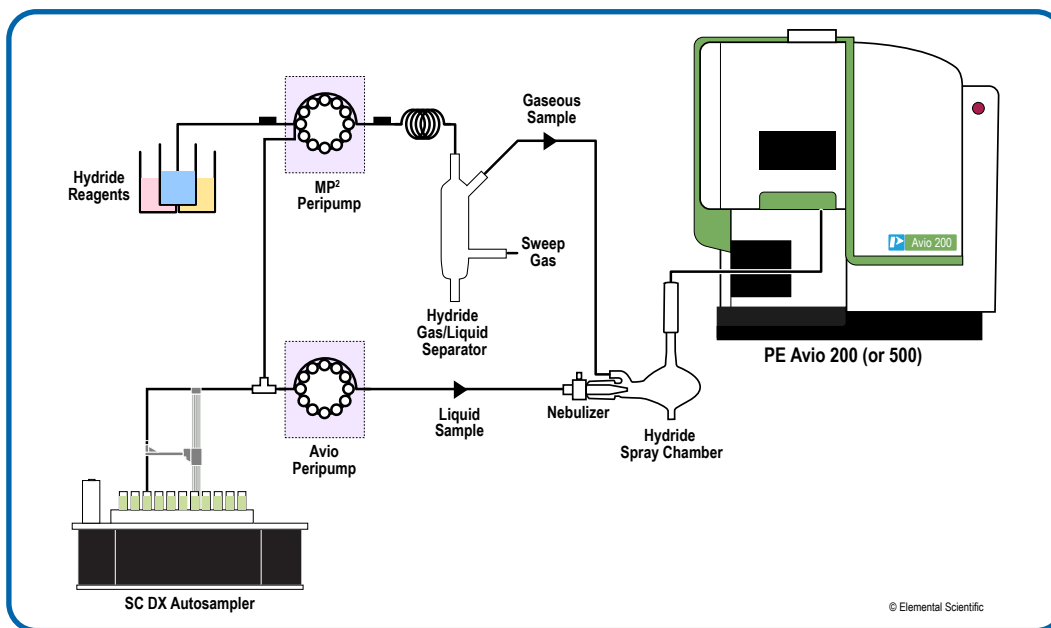


Dual-Inlet spray chamber (P/N C3Q-37-H) used with hydrideICP operating in simultaneous hydride and direct nebulization mode.



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.

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



HydrideICP configured to operate in simultaneous mode with both hydride generation and direct nebulization introduction being analyzed in one analysis.

Description	Part Number
HydrideICP 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. Supports simultaneous hydride and direct nebulization modes with the hydrideICP.	C3Q-37-H

hydride S31™ for Avio 500 ICP

Hydride Generation with hydride S31 FAST

The hydride S31 is a compact, syringe-driven hydride generation system that produces ultra-low detection limits for hydride-forming elements.

The 3-in-1 syringe barrel on the syringe module provides pulse-free reagent delivery for the best precision, and the patent-pending hydride gas liquid separator provides high sensitivity. The FAST sample valve in the S31 system provides high sample throughput and excellent analyte washout.



hydride S31 system for the Avio 500 ICP

Design Features:

- Syringe-driven reagents for hydride generation; no peristaltic pump reagent lines to replace
- FAST for high-throughput and excellent washout
- Sub-ppb detection limits for hydride-forming elements
- Simple operation with Avio 500 ICP and DX autosamplers

hydride S31 for the PerkinElmer Avio 500 ICP		
Detection limits (3s) for hydride-forming elements (in hydride mode)	Analyte	LOD (ppb)
	As	0.08
	Se	0.1
	Sb	0.3
	Hg	0.1

hydride S31																	
■ Hydride-forming elements, analyzed in hydride or nebulization modes																	
■ Direct nebulization elements																	
1	2															10	
H	He															Ne	
3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18		
Li	Be	B	C	N	O	F	Ne	Na	Mg	Al	Si	P	S	Cl	Ar		
19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr
37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54
Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe
55	56		72	73	74	75	76	77	78	79	80	81	82	83	84	85	86
Cs	Ba		Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn
57	58	59	60	61	62	63	64	65	66	67	68	69	70	71			
La	Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu			
89	90	91	92														
Ac	Th	Pa	U														

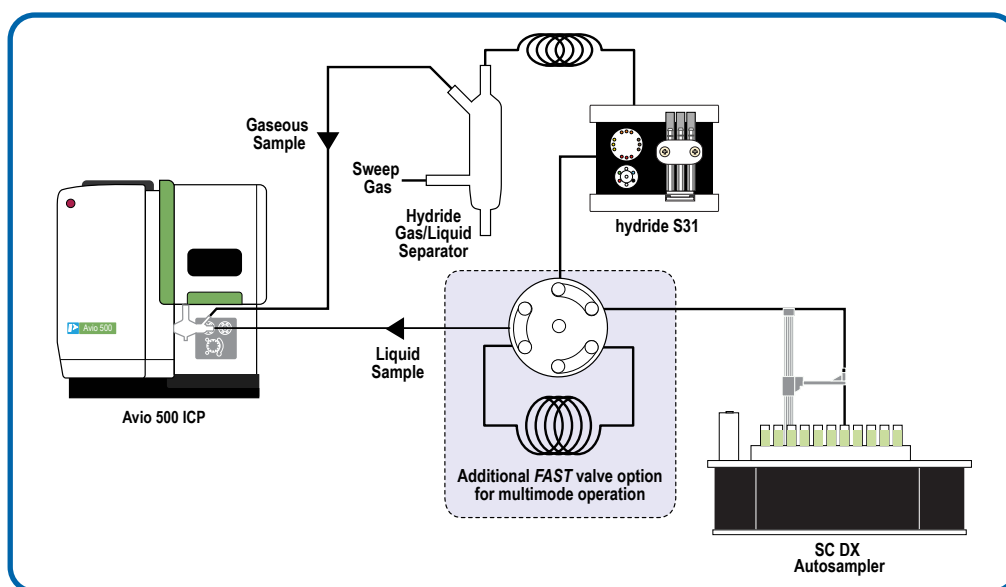
Simultaneous Hydride Generation and Direct Nebulization with hydride S31

The integration of an additional *FAST* valve provides multi-mode functionality to the hydride S31 and the Avio 500 for the highest flexibility and sample throughput.

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



Single Valve *FAST* DXi for Avio 500 ICP required for simultaneous hydride and direct nebulization option (not included)



hydride S31 system diagram including autosampler and *FAST* valve

Hydride S31 configuration with additional *FAST* valve for high throughput multi-mode analysis. Non-hydride forming elements are analyzed through the Liquid Sample pathway using a nebulizer. Hydride forming elements benefit from high sensitivity hydride generation through Gaseous Sample pathway. The Avio 500 acquisition can be configured to analyze hydride-forming elements while the nebulizer is introducing carrier liquids, thus analyzing only for the hydride species. Hydride S31 can also be operated simultaneously or sequentially with direct nebulization.

hydride S31 System	
Description	Part Number
hydride S31 module for any DX <i>FAST</i> system. Includes S31 module for hydride generation. (DX <i>FAST</i> autosampler and C3Q-37-H spray chamber required, not included)	HFX-57
Avio 500 hydride baffled quartz cyclonic spray chamber with 8mm ZipFit connector for ZipTorch. Includes hydride gas inlet at nebulizer entrance and drain line. (see page 46). For use with Avio ZipTorches (see page 47).	C3Q-37-H

Turn **ANY DX *FAST* System** Into a **hydride S31 System!**
Just add the hydride S31 module

Autosampler Enclosures and ULPA Filtered Environments

Autosampler Enclosures

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



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

Autosampler Model	Enclosure Only	Enclosure with ULPA Filter
Enclosure for Micro DX	SC-1607-DX	SC-1607-DX-1000
Enclosure for 2 DX	SC-1207-DX	SC-1207-DX-1200
Enclosure for 4 DX	SC-1407-DX	SC-1407-DX-1200
Enclosure for 8 DX	SC-1807-DX	SC-1807-DX-1000
Enclosure for 14 DX	SC-1107-0030	SC-1107-DX-1030

Ultra-Low Particulate Arrester Air Filter and Mounting Plate

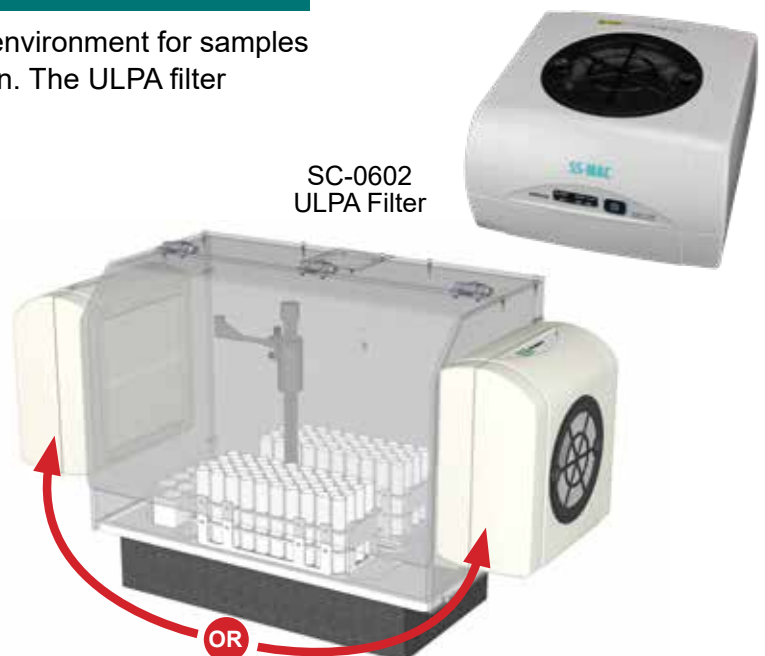
The ULPA filter creates a clean, positive pressure environment for samples and standards and prevents airborne contamination. The ULPA filter removes 99.999% of 0.12 micron particles.

ULPA Filter Specifications

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

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

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



Mobile Autosampler Stations

Mobile Stations for 2DX and 4DX Autosampler

2DX and 4DX Mobile Autosampler Stations

The mobile autosampler station provides a small-footprint platform for the 2DX or 4DX.

Benefits:

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



SC-1210-DX mobile station with 2 DX autosampler



SC-1410-DX mobile station with 4 DX autosampler

Description	Part Number
Mobile autosampler station for 2 DX including electrical conduit (autosampler not included)	SC-1210-DX-PF
Mobile autosampler station for 2 DX (autosampler not included)	SC-1210-DX

Description	Part Number
Mobile autosampler station for 4 DX including electrical conduit (autosampler not included)	SC-1410-DX-PF
Mobile autosampler station for 4 DX (autosampler not included)	SC-1410-DX



brineFAST™

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



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

See page 24 for more information.

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

PFA and Polypropylene ST-Nebulizers

PFA and Polypropylene High-Efficiency MicroFlow Nebulizers for the Avio 200 and 500 ICP

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

PFA-ST Nebulizers

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

Benefits:

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

Description	Application	Part Number
ST3-70 MicroFlow PFA nebulizer with external 1/4-28 threaded connector.	For general high sensitivity and high performance	ST3-57
PFA-ST for prepFAST self-aspirating nebulizer with external 1/4-28 threaded connector.	prepFAST	PF-2040



PolyPro-ST Nebulizer

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

Description	Part Number
Poly-pro self-aspirating nebulizer with external 1/4-28 threaded connector.	ES-4040-57



Syringe Flush Kit / Nebulizer Gas Line / Obstruction Removal

Syringe Flush Kit for ST 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.

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



Nebulizer Gas Line

The Nebulizer Gas Line connects the nebulizer to the argon gas supply on the instrument. This nebulizer gas line contains quick connects for a secure connection to any PFA-ST nebulizer.

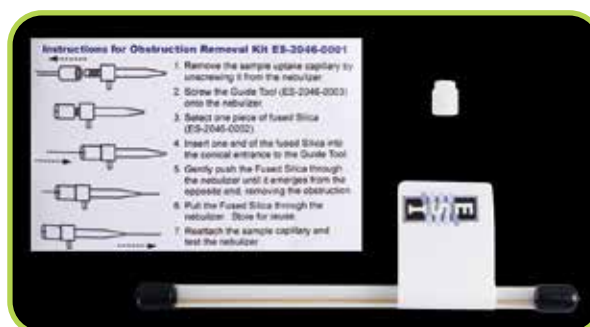
Description	Part Number
Gas line for PFA-ST nebulizers	GL-ST-57



Nebulizer Obstruction Removal Kit

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

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

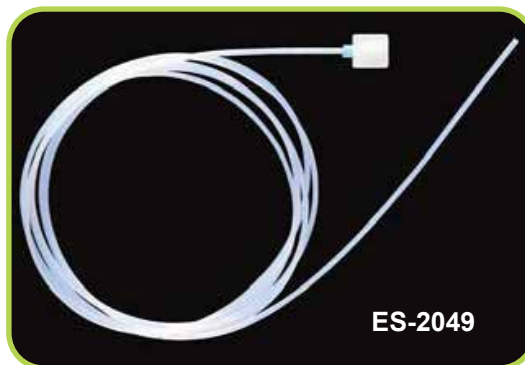


Probes and Capillaries for ST-Nebulizers

Sample Capillaries / Probes

Sample Capillaries for ST Nebulizers

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



Sample capillary attached to PFA Nebulizer

Carbon Fiber Supported Autosampler Probes for ST Nebulizers

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

Probes for DX Autosamplers			
Probe i.d.	Capillary Length	Self-aspiration rate (@1L/m Ar)	Part Number
0.25 mm	80 cm	100 μ L/min	ES-5037-3250-080
0.50 mm	80 cm	400 μ L/min	ES-5037-3500-080
0.25 mm	150 cm	100 μ L/min	ES-5037-3255-150
0.50 mm	150 cm	400 μ L/min	ES-5037-3505-150

Also available with Ultem support.



PFA Nebulizers with Integrated Capillaries for the Avio 200/500 ICP

PFA Nebulizers with Integrated Capillaries

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

Benefits:

- Integrated capillary for connection-free introduction of samples at low flow rates
- Available with self-aspiration rates between 20 and 400 microliters per minute
- Chemically-resistant, ideal for strong acids, alkalis, and organic solvents
- Produces a fine aerosol for high transport efficiency and high-sensitivity
- Can be peristaltic pumped when introducing organic solvents



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

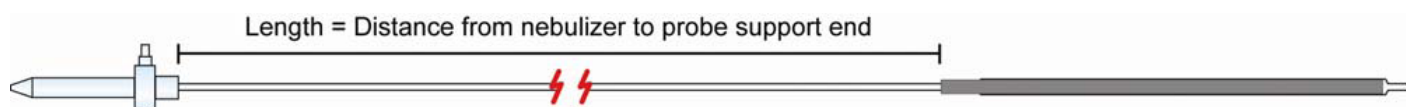
Other flow rates made to order

PFA Nebulizers with Integrated Probes for the Avio 200/500 ICP

Self-Aspirating PFA Nebulizers with Integrated Probes

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

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



PFA MicroFlow Nebulizers with Integrated Autosampler Probe

Model	Autosampler Type	Self-aspiration rate (@1L/m Ar)	Length	Support Material	Application	Part Number
PFA-20	Micro DX DX	20 μ L/min	80 cm	Carbon Fiber	Environmental/Clinical	ES-2020-3503-080
			100 cm	Ultem	High Purity Semiconductor	ES-2020-3505-080
PFA-50	Micro DX DX	50 μ L/min	80 cm	Carbon Fiber	Environmental/Clinical	ES-2000-3503-080
			100 cm	Ultem	High Purity Semiconductor	ES-2000-3505-080
PFA-100	Micro DX DX	100 μ L/min	100 cm	Carbon Fiber	Environmental/Clinical	ES-2002-3503-100
				Ultem	High Purity Semiconductor	ES-2002-3505-100
PFA-200	Micro DX DX	200 μ L/min	100 cm	Carbon Fiber	Environmental/Clinical	ES-2003-3503-100
				Ultem	High Purity Semiconductor	ES-2003-3505-100
PFA-400	Micro DX DX	400 μ L/min	100 cm	Carbon Fiber	Environmental/Clinical	ES-2005-3503-100
				Ultem	High Purity Semiconductor	ES-2005-3505-100

MEINHARD®

Concentric Nebulizers for Avio 200/500 ICP

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

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

Features for all MEINHARD® Plus Nebulizers:

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

Glass Concentric Nebulizers

The Type K borosilicate glass nebulizer is an economical concentric nebulizer used for high solids.

Description	Part Number
MEINHARD® borosilicate glass, high solids nebulizer, Type K, 0.7mL/min, 50 PSI	TRP-50-K1

TR+ glass high sensitivity concentric nebulizer with low internal volume.

Description	Part Number
MEINHARD® TR+ glass nebulizer, Type K, low internal volume	TR-50-K1



MEINHARD TR+,
Type K low dead volume
high performance nebulizer

Nebulizer Lines



Description	Part Number
FAST connector for MEINHARD® Plus Series Nebulizer (F2), 0.25mm i.d	F-F2-25-14



Description	Part Number
4 mm nebulizer liquid-end connector kit F2.	F2-50-026-ZZ



Description	Part Number
Nebulizer gas line for MEINHARD® concentric nebulizers	GL-5747

Plus Nebulizer PFA Liquid Quick Connectors

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

Benefits:

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

Sample connectors available:

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

F1: Detachable solution capillary for a wide range of applications, optional for all Plus-series nebulizers.

F2: Integrated solution capillary for self-aspiration or pumping, included with all Plus-series nebulizers.

F0 Encapsulated Micro Tubing

F0 Encapsulated micro tubing for low uptake rates from 0.1 to 0.5 mL/min and the lowest internal volume of any nebulizer.

Includes	Part Number
0.25 mm i.d. ■ (green marker) 70 cm long micro capillary.	F0-25



F1 Detachable Capillary

F1 Detachable capillary for a wide range of applications.

Includes	Part Number
0.80 mm i.d. ■ (blue marker) 70 cm long capillary.	F1-80

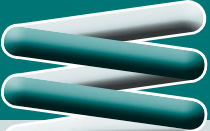


F2 Standard Integrated Capillary

F2 Standard integrated capillary for self-aspiration or pumping.

Includes	Part Number
0.5 mm i.d. ■ (orange marker) 70 cm long capillary.	F2-50





Plus Nebulizer PFA FitKit Nebulizer Gas Quick Connect

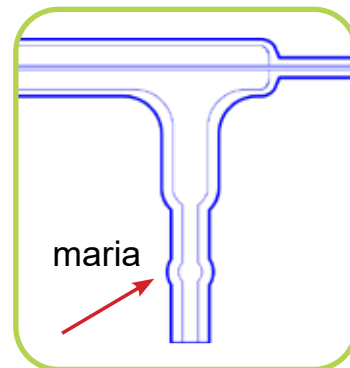
The PFA FitKit Quick Connects are, a revolutionary new gas and sample fitting system for MEINHARD® Plus nebulizers. The kit includes a gas connection (FG), standard integrated capillary sample connection (F2) and two other sample connection (F1 and F0) options to choose from.

FG gas connection forms a tight seal over the maria on the sidearm of the MEINHARD® nebulizers.

FG offers the benefits of an easy-to-use quick connect while maintaining high purity for sensitive ICP applications. In a test that simulated a backflow event, FG produced concentrations of elements like Fe and Cr that were four orders of magnitude lower than concentrations leached from a conventional fitting (Figure 1).

Benefits:

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



FG Gas Quick Connect for MEINHARD® Nebulizers

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



FG Gas Quick Connect with connector for PFA tubing

Application	Part Number
For use with all MEINHARD® nebulizers	FG

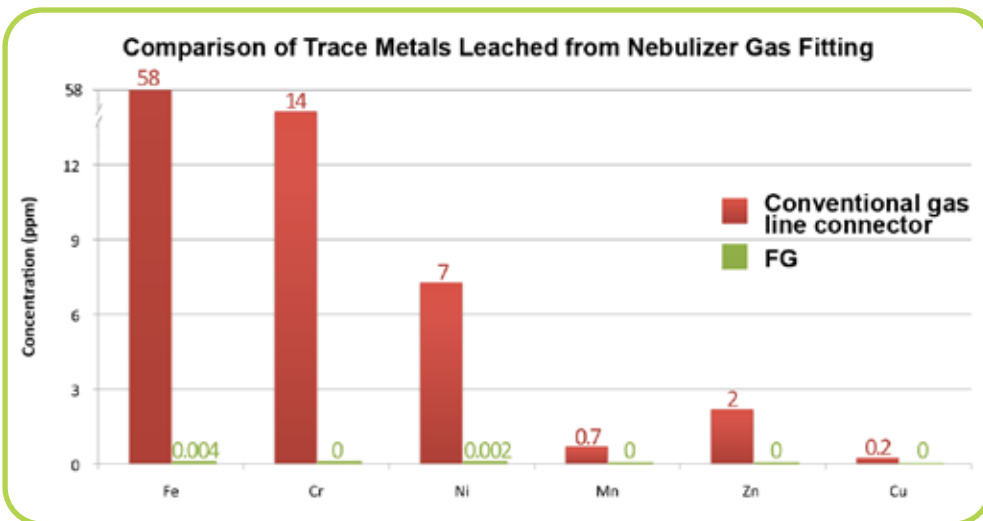


Figure 1. Leach test of a conventional gas line connector and PFA FG



Conventional gas line connector



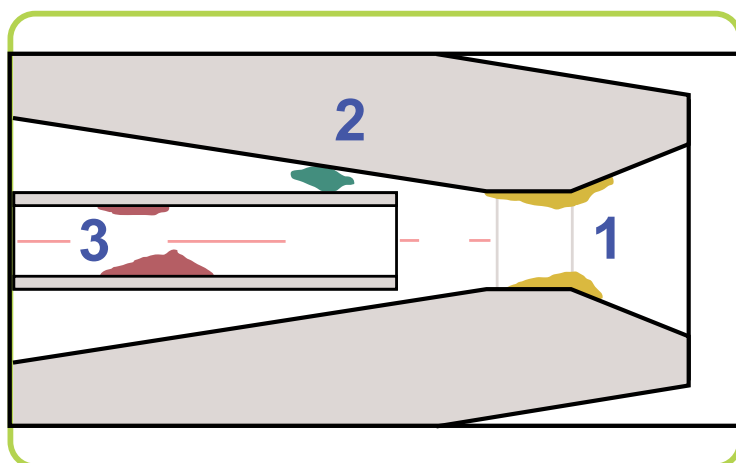
PFA quick connect gas line (FG)

Pearl Nebulizer Cleaner

Pearl Nebulizer Cleaner For All Quartz And Glass Concentric Nebulizers

With this device a cleaning solution can be pumped manually in reverse, through both the sample and gas passages. Recommended cleaning solutions are - Sigma-Aldrich RBS-25 diluted about 20x, Deconex similarly diluted; - or - either of these, but 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.



PRL-02
Nebulizer
Cleaner



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.



Pumping cleaning solution through concentric nebulizer.

Description	Part Number
Pearl nebulizer cleaner for all glass and quartz concentric nebulizers	PRL-02

pergo High Solids Accessory

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

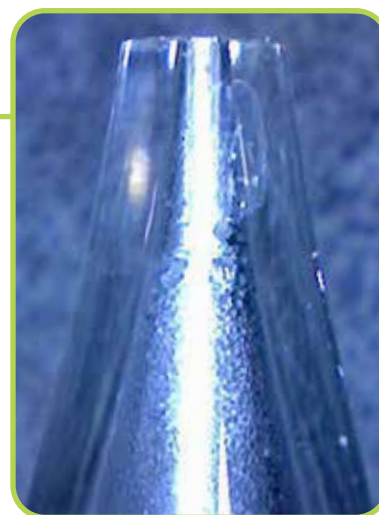
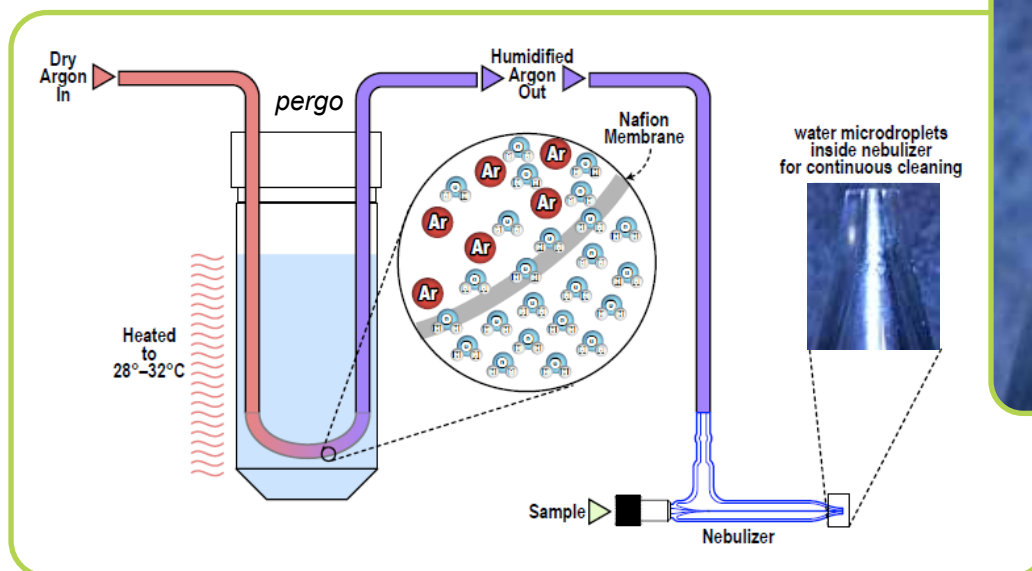
A water vapor permeable membrane humidifies the ICP nebulizer gas stream. By increasing humidity in the argon nebulizer gas, the *pergo* prevents salt deposits at the nebulizer, improving short and long-term signal stability.

Benefits:

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



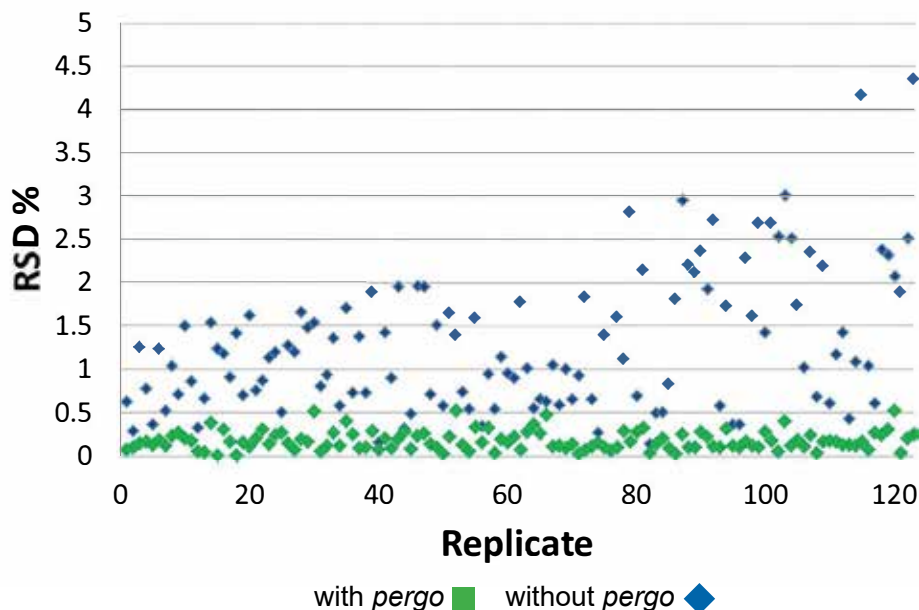
PRG-01 *pergo*
high solids accessory



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

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

Stability Within Sample Replicates with *pergo* Ar Humidifier



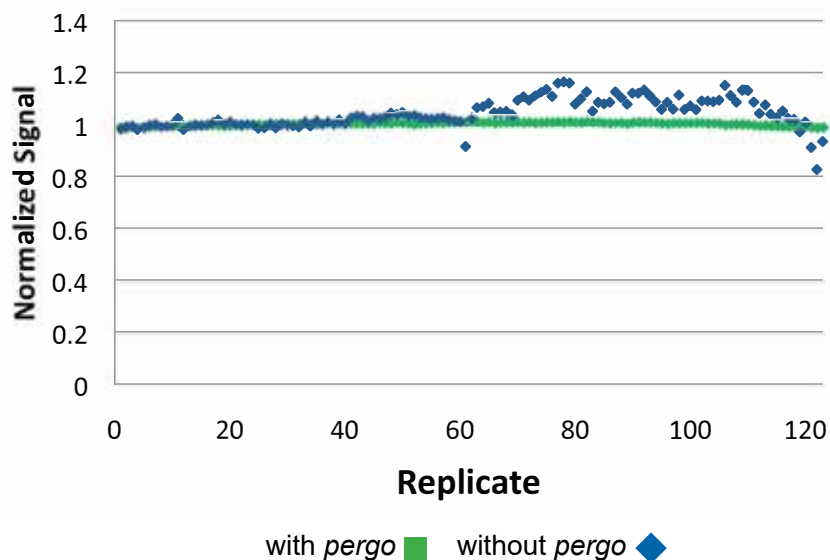
RSDs for seawater samples improve significantly when the *pergo* is utilized

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

Advantages:

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

Long Term Stability with *pergo* Ar Humidifier



Improved long term stability is achieved when utilizing the *pergo*, reducing signal drift and extending the length of analysis runs.

Description	<i>pergo</i> Part Number
<i>pergo</i> argon high solids accessory.	PRG-01
<i>pergo</i> argon high solids accessory. Includes a MEINHARD® TR+ high performance nebulizer.	PRG-01-MCPlus
<i>pergo</i> argon high solids accessory. Includes a PFA-ST HF-resistant high performance nebulizer.	PRG-01-ST

Online Mixing Kits for Addition of Internal Standard

Online Mixing Kit

The kit for online addition of internal standard is an easy way to use internal standards without having to manually spike each sample with internal standard. The kit can also be used to mix any two reagents for other purposes. The low dead-volume, fluoropolymer mixing tee ensures good mixing at all typical ICP flow rates for a wide variety of liquids, including HF.

Includes:

- Low dead-volume, fluoropolymer mixing tee
 - 0.25 mm I.D. (green) for flow rates < 1 mL/min
 - 0.5 mm I.D. (orange) for flow rates > 0.3 mL/min
- Internal standard probe and addition line
- Fluoropolymer peripump fittings
- Peristaltic pump tubing starter pack

Online Dilution:

The online mixing kits include a starter pack of peristaltic pump tubing for the MP² micro peristaltic pump. Approximate dilution factors are defined by choosing the size of the sample and internal standard peristaltic pump tubing. Other pump tubing sizes are available.

Online mixing kit for addition of internal standard



Dilution Factors with Starter Pack Tubing

Sample Tubing		IS / Diluent Tubing					
		Orange	Green	Black	Black	Red	Red
Orange	Green	2		5		10	
Black	Black	1.25		2		3.25	
Red	Red	1.11		1.44		2	

Online Mixing Kits

Part Numbers		
0.25 mm I.D. (Green)	0.5 mm I.D. (Orange)	Description
IS-ST-25	IS-ST-50	For use with PFA-ST nebulizers.
IS-MP-25	IS-MP-50	For use with MEINHARD® Plus nebulizers.*
N/A	IS-BRG-50	For use with MiraMist and similar nebulizers.

Online Mixing Kits with Nebulizer Included

Part Numbers		
0.25 mm I.D. (Green)	0.5 mm I.D. (Orange)	Description
ISN-ST54-25	N/A	For use with PFA-ST nebulizers. Includes PFA-ST nebulizer.
N/A	ISN-TRP-50	For use with MEINHARD® Plus nebulizers. Includes TR+ high sensitivity glass nebulizer.

* Adapter below for other glass nebulizers

Spray Chambers

Quartz Cyclonic Spray Chambers

Press Fit Cyclonic Spray Chambers for ZipTorch

Description	Avio 200 Part Number	Avio 500 Part Number	Addition Gas Port	Hydride	PC ³ Compatible
Quartz cyclonic baffled cyclonic spray chamber with PFA outlet connection for One-Piece ZipTorch	ES-3147-1011-20	ES-3137-1011-20			✓
Quartz cyclonic baffled cyclonic spray chamber with addition gas port and PFA outlet connection for One-Piece ZipTorch	C3QX-47-P	C3QX-37-P	✓		✓
Quartz cyclonic baffled cyclonic spray chamber with hydride gas port and PFA outlet connection for One-Piece ZipTorch	C3Q-47-H	C3Q-37-H		✓	✓



Used with one-piece ZipTorches on page 47, 51.

Ball/Socket Cyclonic Spray Chambers for Standard Avio Torch

Description	Avio 200 Part Number	Avio 500 Part Number	Addition Gas Port	Hydride	PC ³ Compatible
Quartz cyclonic baffled cyclonic spray chamber with 12/5 socket connection for standard Avio injector	ES-3147-1018-20	ES-3137-1018-20			✓
Quartz cyclonic baffled cyclonic spray chamber with addition gas port and 12/5 socket connection for standard Avio injector	C3QX-47	C3QX-37	✓		✓
Quartz baffled cyclonic spray chamber with hydride gas port and 12/5 socket connection for standard Avio injector	C3Q-37-H-S			✓	



High Performance HF-resistant PFA Spray Chambers

High Performance PFA Spray Chambers

HF resistant, high sensitivity PFA spray chambers for high purity applications.

Description	Application	Part Number
High Performance PFA spray chamber with o-ring-free PFA endcap	HF resistant, high sensitivity PFA spray chamber for semiconductor and other high purity applications.	M200-5370
High Performance PFA spray chamber with o-ring-free PFA endcap and additional gas port		M200-5371



Spray Chamber Accessories

Spray Chamber Clamp

The socket clamp maintains a secure connection between the 12/5 injector ball and spray chamber socket.



Description	Part Number
Clamp for 12/5 socket.	ES-2110-0002

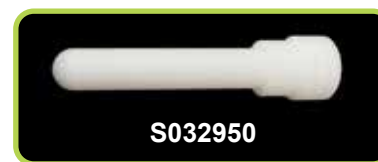
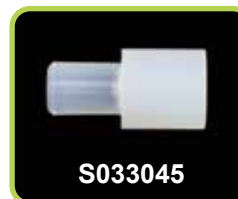
Spare Spray Chamber Drain Line

Description	Part Number
Spray chamber drain line kit for Avio 200/500. Includes 32 cm line leading from spray chamber drain to peripump and 160 cm line from peripump to waste bottle. 32 cm line has 1/4-28 fitting common to all Avio 200/500 spray chamber drain ports.	ES-2044-64



Spray Chamber Plugs

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



PFA Secure Nut

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



Spray Chamber Adapter

Description	Application	Part Number
Avio 200/500 cyclonic spray chamber adapter	Adapts cyclonic spray chamber to Avio sapphire and platinum injectors.	S011361



Innovative ZipTorch for Avio 200 & 500 ICP

Avio 200 and 500 Interchangeable ZipTorches

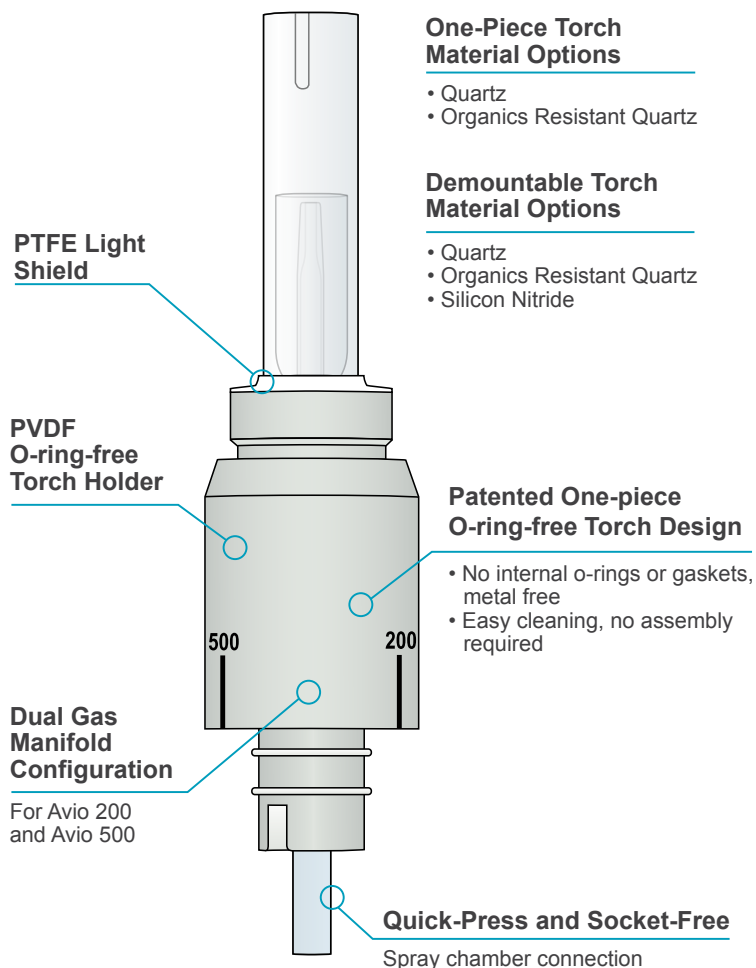
The ZipTorch is a new torch design for Avio 200 and Avio 500 ICPs. ZipTorches can be used interchangeably between the two systems. They are available with fixed or demountable injector options to work with any application on either – or both – Avio systems.

ZipTorch Design

- One-piece base
- Dual gas connections to support both Avio 200 & 500
- No internal o-rings
- Quick-press and socket-free spray chamber connection
- Available in
 - One-piece or demountable
 - Silicon nitride, quartz or organics quartz

ZipTorch Benefits

- Easy cleaning
- Highly reproduceable installation position
- No user contact with torch tubes
- One torch for both Avio 200 and 500
- Torch or injector can be exchanged in seconds
- Eliminate ground glass ball joint connectors and clamps



ZipTorch For Avio – Ease of Installation

The interchangeable ZipTorch can be installed in seconds in either the Avio 200 or 500



Installing a ZipTorch on Avio 200



Installing a ZipTorch on Avio 500

Ultimate in Chemical Resistance and Extended Lifetime

The Nitride ZipTorch is a direct replacement for the standard Avio 200 & 500 torches. It provides substantial enhancements in chemical resistance over standard quartz torches, significantly reducing both replacement costs and observed backgrounds levels.



Nitride torch while nebulizing Yttrium on the Avio ICP



Silicon Nitride Material Benefits Over Quartz



ZTN-D-37
Demountable Nitride
ZipTorch

Strength

- Silicon nitride is a ceramic material that is not compromised by the high temperatures of the argon plasma.
- Heat is conducted more evenly across the silicon nitride torch body, reducing thermal stress and resulting in significant advantages over quartz torches that can form stress cracks and fail.

Chemical Resistance

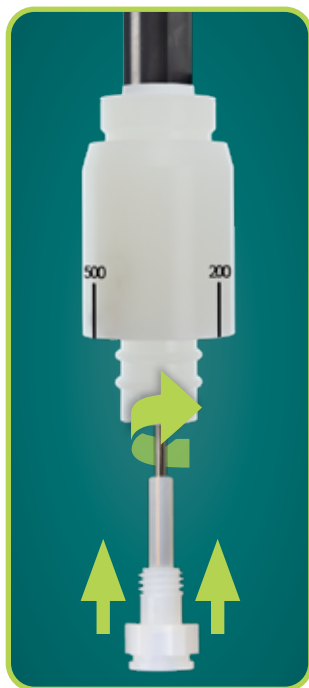
- The Nitride torch is highly resistant to chemical attack by high matrix components in the plasma. Nitride torches do not devitrify and have a long lifetime.
- Nitride ZipTorch is the optimal torch for analyzing samples high in salts, fusion digests, and organic solvents.
- Low background levels for silicon measurements are achieved.

Economical

- Compared to quartz, up to 100x lifespan can be expected when running high matrix samples.
- Eliminating frequent replacement of quartz torches results in significantly reduced operating costs.



Nitride ZipTorch installed in Avio 500



Quickly and easily
install injectors into
demountable torches

Nitride ZipTorch Design Advantages

- Direct replacement of standard Avio 200 and 500 torches
- No impact on analytical performance – same detection capability
- Utilizes the same interchangeable injectors (quartz, sapphire, and platinum) as the Quartz Demountable ZipTorch for flexibility when application demands change
- Unique construction with both the intermediate and outer tubes made from silicon nitride provides the longest life and highest possible chemical resistance

Every ICP-OES System Should Experience the Benefits of a Silicon Nitride ZipTorch

Selecting the Best Torch for your Application(s)



= Good



= Better



= Best

1-1.5 mm injectors for organic solvents, 2 mm standard size, and 2.5 mm for high matrix samples

Torch	Aqueous	Low Volatility Organics	High Volatility Organics	High Salt Matrix / Fusion	Benefits
Quartz One-Piece	✓	✓			Simplicity with one-piece design
Quartz Demountable	✓	✓	✓		Flexibility to change injectors, injector material, injector diameter
Quartz One-Piece Organic	✓	✓	✓		-Greater resistance to cracking from heat -Simplicity with one-piece design
Quartz Demountable Organic	✓	✓	✓		-Greater resistance to cracking from heat -Added flexibility to change injectors
Silicon Nitride Demountable	☑	☑	☑	☑	-No devitrification from sample matrix -Greatly extended life without replacement--lower cost -Flexibility to change injectors -Appropriate for all sample types

One-piece ZipTorches

The one-piece ZipTorch has an integrated quartz injector for simplicity, easy maintenance and quick torch alignment.

Description	Injector Size	Avio 200/500 Part Number
Quartz one-piece ZipTorch with injector and PVDF o-ring-free holder for Avio ICP	1 mm	T10Q-37
	1.5 mm	T15Q-37
	2 mm	T20Q-37
	2.5 mm	T25Q-37
Organics quartz one-piece ZipTorch with injector and PVDF o-ring-free holder for Avio ICP	1 mm	T10-O-37
	1.5 mm	T15-O-37
	2 mm	T20-O-37



T20Q-37 One-piece ZipTorch

Demountable ZipTorches

The demountable ZipTorch utilizes a removable and replaceable injector. Recommended for use with HF applications (using sapphire or Pt injectors) or when the user prefers to remove the injector for cleaning without dismounting the torch.

Description	Avio 200/500 Part Number
Demountable quartz ZipTorch with PVDF o-ring-free holder for Avio ICP	DTQ-37
Demountable organic ZipTorch with PVDF o-ring-free holder for Avio ICP	DTO-37
Demountable silicon nitride ZipTorch with PVDF o-ring-free holder for Avio ICP	ZTN-D-37



DTQ-37
Demountable
Quartz
ZipTorch

DTO-37
Demountable
Quartz Organics
ZipTorch

ZTN-D-37
Demountable
Silicon Nitride
ZipTorch

Injectors for Demountable ZipTorches

These injectors are designed for use with the quartz, organics and silicon nitride demountable torches.

- Quartz is used for wide range of non-HF aqueous applications and organic solvents
- Sapphire is utilized for environmental, geochemistry, and HF applications
- Platinum is used with volatile organic solvents and HF-containing semiconductor-grade chemicals

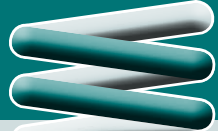
Description	Size	Avio 200/500 Part Number
Quartz demountable injectors for Avio ZipTorches	1 mm	IDQ10-37
	1.5 mm	IDQ15-37
	2 mm	IDQ20-37
	2.5 mm	IDQ25-37
Sapphire demountable injectors for Avio ZipTorches	1.5 mm	IDS15-37
	2 mm	IDS20-37
Platinum demountable injector for Avio ZipTorches	2 mm	IDPt20-37



IDQ15-37
Quartz
Injector

IDS15-37
Sapphire
Injector

IDPt20-37
Platinum
Injector



FAST DXi

Upgradable Integrated Precision Micro Peristaltic Pump for Avio 200/500

The *FAST DXi* is a microperistaltic pump integrated to the Avio 200/500. It can be easily upgraded to *FAST*, prep*FAST* or other automation applications by adding valve actuators and other necessary components. It allows laboratories the flexibility to start with a high-quality, long-lived peristaltic pump and add automation components as needed.

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

Precision

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

Low Pulsation

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

Chemical Resistance

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



ES-5599-V1-47
FAST valve actuator



DXi-4-47-FR2
FAST DXi populated with a dual valve actuator.
(Valve shown but not included)

DXi-4-47-FR1
FAST DXi populated with a single valve actuator.
(Valve shown but not included)

FAST DXi's for Avio 200/500

Description	# of Valve Actuators	Avio 200 Part Number	Avio 500 Part Number
FAST DXi integrated 4 channel MP ² peripump with single FAST valve actuator	1	DXi-4-47-FR1	DXi-4-37-FR1
FAST DXi integrated 4 channel MP ² peripump with dual FAST valve actuators	2	DXi-4-47-FR2	DXi-4-37-FR2

Valve not included with actuators.

FAST Valve Actuator

Description	Avio 200 Part Number	Avio 500 Part Number
Additional FAST valve actuator to convert integrated MP ² to FAST with one actuator for FAST.	ES-5599-V1-47	ES-5599-V1-37
Additional FAST valve actuator to convert FAST DXi from FAST to prepFAST with two actuators for prepFAST.	ES-5599-V2-47	ES-5599-V2-37

Stand Alone 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 from 0.20 µL/min to 10 mL/min and is available with one to eight channels. Optimized for low-flow rates, the MP² uses either MPP tubing or standard 3-stop pump tubing.





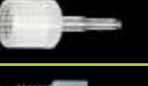

MP2-4-PC stand-alone, precision micro peristaltic pump

CONTROLLED BY THE INSTRUMENT PC USB PORT



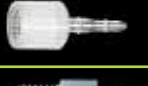

Number of Channels	Part Number
1 channel MP ² precision micro peristaltic pump	MP2-1-PC
2 channel MP ² precision micro peristaltic pump	MP2-2-PC
3 channel MP ² precision micro peristaltic pump	MP2-3-PC
4 channel MP ² precision micro peristaltic pump	MP2-4-PC
6 channel MP ² precision micro peristaltic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

Includes: Cable to control with DX Autosampler

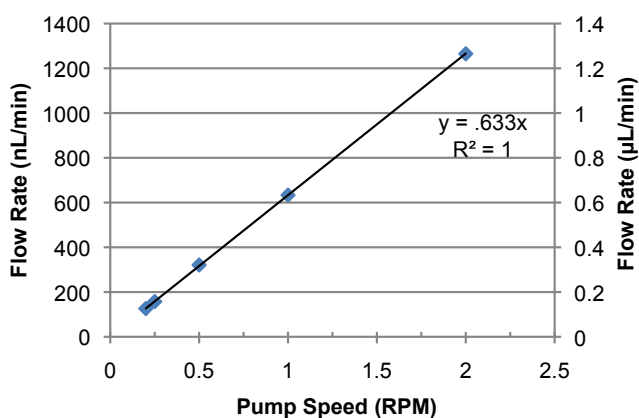
CTFE PERIPUMP FITTINGS (Non-barbed) Used in Low Pressure Applications

	Qty	Size	Part Number
	1	Female (small)	ES-2501-PPF1
	1	Male (small)	ES-2501-PPM1
	5	Female	S033156-V
	5	Male	S032956-V

CTFE PERIPUMP FITTINGS (Barbed) Used in High Pressure Applications

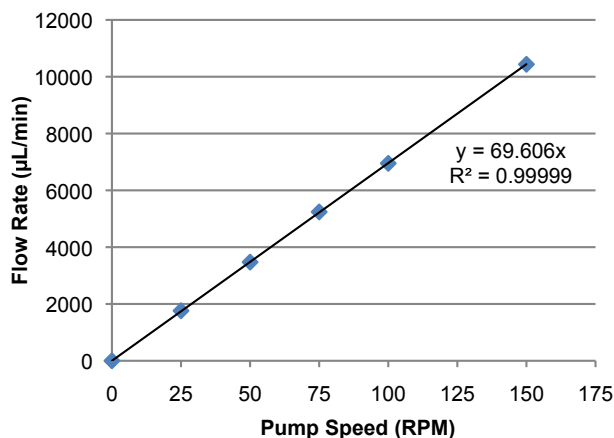
	Qty	Size	Part Number
	1	Female (small)	ES-2501-PPF2
	1	Male (small)	ES-2501-PPM2
	5	Female	S032955-V
	5	Male	S032956-V

ORG BLK



MP² pump linearity < 1 µL/min

BLK WHT



MP² pump linearity up to 10 mL/min

MP² Peristaltic Pump Tubing

MP² Pump Tubing



Tubing for MP² Micro Peristaltic Pumps (Packs of 12)

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

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

Non-Flared

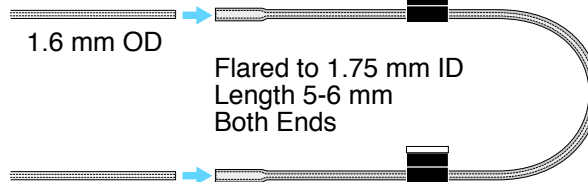


PVC

Santoprene®

SOLVA

Flared



1.6 mm OD

Flared to 1.75 mm ID
Length 5-6 mm
Both Ends

MP² PUMP TUBING KIT

Description

MP² Pump Tubing Kit comprised of 34 packs of 12 tubes, one package of each white highlighted part number in the table above. Includes: 26 packs of PVC tubing (0.13 to 3.17 mm i.d.) 3 packs of *Santoprene® tubing and 5 packs of Solva tubing. Kit also includes: 30 CTFE Fluoropolymer Peristaltic pump Fittings: 5 small female, 5 small male, 5 medium female, 5 medium male, 5 large female and 5 large male.

Part Number

MPP-K-1

*Santoprene® is a product of ExxonMobil.

Replacement Syringes for Syringe Pumps

Syringes

Replacement Syringes			
Size	Material	Application	Part Number
0.3 mL	Quartz	Micro volume applications	PF-S1003
0.3 mL	CTFE	Micro volume applications	PF-S3003
3 mL	Quartz	prepFAST	PF-S1030
3 mL	CTFE	HF applications	PF-S3030
6 mL	Quartz	prepFAST e	PF-S1060
6 mL	CTFE	HF applications	PF-S3060
12 mL	PFA	prepFAST	PF-S3120



0.3 mL quartz syringe
PF-S1003



3 mL quartz syringe
PF-S1030



6 mL Quartz syringe
PF-S1060



12 mL PFA syringe
PF-S3120

High Purity PFA Pipette Tips

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

Description	Volume	Qty	Part Number
Pre-cleaned PFA Pure Tip pipette tips	100-200 μ L	10 pk	ES-7000-0101
Pre-cleaned PFA Pure Tip pipette tips	100-200 μ L	96 pk	ES-7000-0111
Pre-cleaned PFA Pure Tip pipette tips	1000 μ L	10 pk	ES-7000-1001
Pre-cleaned PFA Pure Tip pipette tips	1000 μ L	60 pk	ES-7000-1011



PC³ Peltier Cooled Cyclonic Spray Chambers

The PC³ is a small, robust Peltier cooled cyclonic spray chamber. The PC³ spray chambers offer the advantages of low memory effects, constant temperature, fast rinse-out, and high sample transport efficiency when coupled with the Avio 200/500 ICP systems. The cooled outer walls of the PC³ spray chamber enhances long-term signal stability and reduces solvent loading when both aqueous and organic solvents are analyzed. For low flow rate applications, the heating mode can be used to improve sensitivity by increasing transport efficiency into the plasma.



PC3X-47-29 PC^{3X} on the Avio 200

PC^{3X} Peltier Cooler / Heater

The PC^{3X} is a compact, Peltier-cooled or heated inlet system which incorporates the Avio cyclonic spray chamber. It operates in both cooling and heating modes for the spray chamber. The thermal stabilization of the spray chamber improves the long-term stability of the ICP response by isolating the sample introduction from laboratory temperature changes during the analysis.

System Design

- Temperature control from -10°C to +80°C
- Temperature stability +/- 0.1 °C
- Improved long-term stability through thermal stabilization of spray chamber
- Completely o-ring-free for organic solvent analysis

PC^{3X} Complete Kit for Avio Includes:

- PFA-ST MicroFlow Nebulizer
- Quartz Cyclonic Spray Chamber
- PC³ Adjustable Mounting Shelf

Description	Avio 200 Part Number	Avio 500 Part Number
PC ^{3X} Complete system for Avio ICP	PC3X-47-29	ES-4190-37-29
PC ^{3X} thermally stabilized inlet system for Avio cyclonic spray chamber (Spray chamber and mounting shelf not included)	PC3X-37	
PC ^{3X} adjustable mounting shelf for Avio ICP	ES-2999-4721-R1	ES-2999-3721-R1



PC3X-47-29 PC^{3X} on the Avio 200



PC-LT on the Avio 500 for volatile organic solvent analysis

PC³-LT

The PC³-LT is a low temperature Peltier cooler for cyclonic spray chambers on the Avio 200 / 500 ICP systems. It provides lower temperatures to reduce the solvent load on the plasma for the analysis of volatile organic solvents.

System Design

- Temperature control from -20°C to +2°C
- Temperature stability +/- 0.1 °C
- Completely o-ring-free for organic solvent analysis

PC-LT Complete Kit for Avio Includes:

- PFA-ST MicroFlow Nebulizer
- Quartz Cyclonic Spray Chamber
- Transfer Line

Description	Temperature	Part Number
PC ³ -LT Peltier-cooled sample introduction system with spray chamber for Avio.	+2°C / -20°C	ES-9190-37-29



Direct ICP Analysis of Solid Samples

NWR Series Laser Ablation

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

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

Elemental Scientific has a complete laser product portfolio including:

- UV Femtosecond
- Infrared
- 193 nm Eximer
- Imaging Systems
- 213 nm Solid State
- Automated Sampling
- 266 nm Solid State



NWR
Platform

Applications Include*:

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

Materials Include*:

Alloys
Rocks
Minerals
Glasses
Plastics
Powders
Biological
Thin films
Ceramics
Metals

*The lists above are not exhaustive.



INNOVATION to ILLUMINATE

HF Resistant Sample Introduction Kit

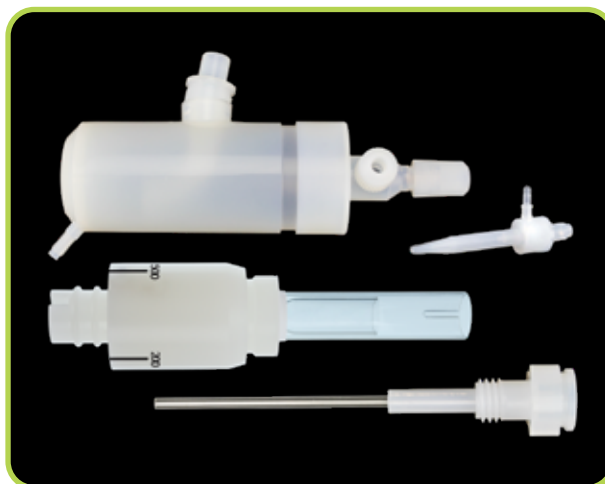
HF-Resistant Sample Introduction Kit

Sample Introduction Kit

The PFA kit is an ultra-pure, HF-resistant introduction system for the Avio ICP. All wetted surfaces are PFA and the injector is sapphire. It is used for the analysis of HF-containing samples for mining, semiconductor and other applications.

Benefits:

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



M237-DV-29 Series HF-Resistant PFA Sapphire Sample Introduction Kit for PE Avio

SAMPLE INTRODUCTION



M237-DV-29 HF-Resistant Sample Introduction Kit installed on the Avio 500

Description	Part Number
Complete HF-resistant sample introduction kit for PerkinElmer Avio ICP. Includes: High Performance PFA spray chamber with PFA PureCap endcap, ST3 High Pressure MicroFlow PFA nebulizer, Demountable quartz torch with PVDF o-ring-free holder and 2mm demountable sapphire injector.	M237-DV-29

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 ICP results.

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



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 - P7	Part Number: PF-P7
Description: 7 port syringe loading valve		
Specifications: CTFE stator, PFA rotor, 1.0 mm		
Applications: FAST, prepFAST e		



12	Port Syringe Valve - V12	Part Number: PF-V12
Description: 12 port syringe loading valve		
Specifications: CTFE stator, PFA rotor, 1.0 mm		
Applications: S400V, brineFAST syringe valve		



8	Port Valve - M8	Part Number: PF-M8
Description: M8 CTFE high-flow 8 port stream selector valve		
Specifications: CTFE stator, PFA rotor		
Applications: SmartTuner		



11	Port Syringe Valve - S11	Part Number: 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 Rotors and Stators

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	P6	CTFE	PFA	PF-P6	PF-P6S	PF-P6R
7 - P7	P7	CTFE	PFA	PF-P7	PF-P7S	PF-P6R
7 - P7	P7	PPS	PFA	PF-P7-8	PF-P7S-8	PF-P6R
8 - P7+	P7	CTFE	PFA	PF-P7X	PF-P7XS	PF-F6R
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	A11b	CTFE	PFA	PF-A11b	PF-A11bS	PF-A11bR
13 - P13	P13	CTFE	PFA	PF-P13	PF-P13S	PF-P13R
5 - A5e	A5e	CTFE	PFA	PF-A5e	PF-A5eS	PF-A5eR
7 - A7 μ	A7 μ	CTFE	PFA	PF-A7u	PF-A7uS	PF-A7uR
6 - PM6	0.4 mm	CTFE	PFA	PF-PM6	PF-PM6S	PF-PM6R
8 - PM7+	0.4 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

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
9 - V9	1.0 mm	CTFE	PFA	PF-V9	PF-V9S	PF-V9R
12 - V12	1.0 mm	CTFE	PFA	PF-V12	PF-V12S	PF-V12R
13 - V13	1.0 mm	CTFE	PFA	PF-V13	PF-V13S	PF-V13R
V8C	1.0 mm	CTFE	PFA	PF-V8C	PF-V8CS	PF-V12R
V9H	1.6 mm	CTFE	PFA	PF-V9H	PF-V9HS	PF-V9HR

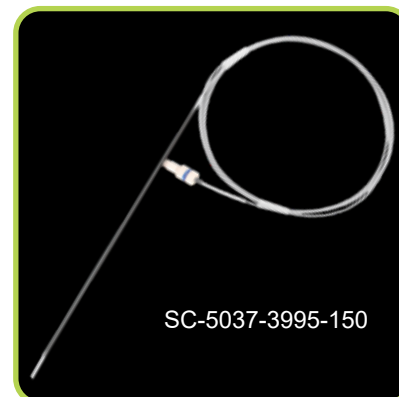
M-SERIES STREAM SELECTION VALVE						
# of Ports	Bore Size	Stator Material	Rotor Material	Part Number Complete Valve	Part Number Stator	Part Number Rotor
3 - M3H	1.6 mm	CTFE	PFA	PF-M3H	PF-M3HS	PF-M3HR
4 - M4	M4	CTFE	PFA	PF-M4	PF-M4S	PF-M4R
6 - M6	M6	CTFE	PFA	PF-M6	PF-M6S	PF-M6R
8 - M8	M8	CTFE	PFA	PF-M8	PF-M8S	PF-M8R
10 - M10	M10	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	S4	CTFE	PFA	PF-S4	PF-S4S	PF-S4R
9 - S9	S9	CTFE	PFA	PF-S9	PF-S9S	PF-S9R
11 - S11	S11	CTFE	PFA	SDX-S11	PF-S11S	PF-S11R

Manual Sampling Probes

Probes

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



Description	Size	Part Number
PFA carrier / internal standard probe for FAST valve	0.50 mm i.d. ■ (orange), 150 cm	SC-5037-3501
PFA internal standard probe for use with standard addition tee or P7 FAST valve internal standard addition line		SC-5037-3503

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

Internal Standard Addition Tee for PFA-ST Nebulizer

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

Description	Part Number (14 cm)	DXi Part Number (25 cm)
0.25 mm i.d. ■ (green) Attaches to port #3	SC-0317-1250	SC-0317-1250-25
0.50 mm i.d. ■ (orange) Attaches to port #3	SC-0317-1500	SC-0317-1500-25

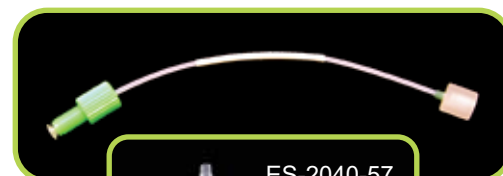


PFA-ST Nebulizer

FAST Valve Connecting Line for PFA-ST Nebulizer

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

Description	Part Number (14 cm)	DXi Part Number (25 cm)
0.25 mm i.d. ■ (green) Attaches to port #3 of the FAST valve.	SC-0317-0250	SC-0317-0250-25
0.50 mm i.d. ■ (orange) Attaches to port #3 of the FAST valve.	SC-0317-0500	SC-0317-0500-25



PFA-ST Nebulizer

PFA-ST or MEINHARD® nebulizers are recommended for use with the FAST system for optimum throughput and performance. Connecting lines are offered for most nebulizers that laboratories may already have.

Internal Standard Addition Line for P7 FAST Valve

Connects the internal standard peripump tubing or probe to a P7 valve for online addition of internal standard.



Description	Part Number
Internal standard line for P7 valve with XL fitting. 0.5 mm i.d. ■ (orange)	SC-0317-450P-10

FAST Valve Connecting Line for MEINHARD® Plus Nebulizers

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



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



MEINHARD® glass and quartz nebulizers

See page 39 for more information about the F0 and F2 fittings.

FAST Valve Connecting Line for PerkinElmer Gem Cone Nebulizer

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

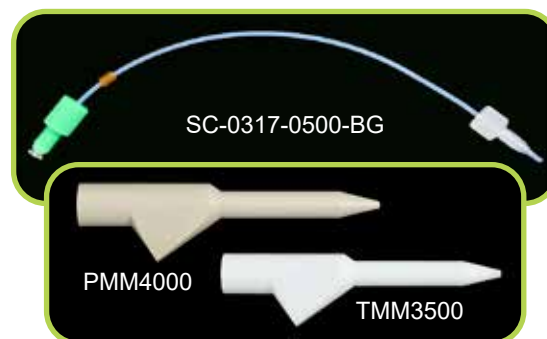


Description	Part Number
0.50 mm i.d. ■ (orange), 25 cm. Attaches to port #3 of the FAST valve.	SC-0317-0500-25GC
1.00 mm i.d. ■ (gray), 25 cm. Attaches to port #3 of the FAST valve.	SC-0317-0990-25GC

PerkinElmer Gem Cone Low-flow Nebulizer

FAST Valve Connecting Line for MIRA MIST Nebulizer

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










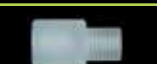
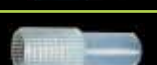


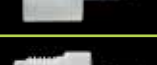



Description	Part Number
0.50 mm i.d. ■ (orange), 17 cm. Attaches to port #3 of the FAST valve.	SC-0317-0500-BG
1.00 mm i.d. ■ (gray), 17 cm. Attaches to port #3 of the FAST valve.	SC-0317-0990-BG

MIRA MIST PEEK and PTFE Nebulizers

Fittings / PFA Tubing / Spares Kits

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

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

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



Sample Loops

PTFE crimp free *FAST* or *prepFAST* 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
	1.0 mL loop	SC-0318-10
	1.5 mL loop	SC-0318-15
	2.0 mL loop	SC-0318-20
Applications	2.5 mL loop	SC-0318-25
<i>FAST</i> , <i>prepFAST</i> , <i>prepFAST</i> M5, <i>prepFAST</i> e, <i>brineFAST</i> , <i>seaFAST</i>	3.0 mL loop	SC-0318-30
	4.0 mL loop	SC-0318-40



SC-0318-25 2.5mL 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
	1.0 mL loop	SC-0319-10
	1.5 mL loop	SC-0319-15
Applications	2.0 mL loop	SC-0319-20
Legacy <i>FAST</i> systems, and special applications	2.5 mL loop	SC-0319-25
	3.0 mL loop	SC-0319-30
	4.0 mL loop	SC-0319-40



SC-0319-10 1mL 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
	1.0 mL loop	SC-0315-10
	2.0 mL loop	SC-0315-20
Applications	3.0 mL loop	SC-0315-30
soil <i>FAST</i> , oil <i>FAST</i> , and large volume <i>FAST</i>	4.0 mL loop	SC-0315-40
	6.0 mL loop	SC-0315-60
	8.0 mL loop	SC-0315-80



SC-0315-30 3mL sample loop


PFA Sample Vessels


PFA Vials


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

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


Vials	Fits Racks
V-14-0311CG-X	MR-21-14 (pg 73), MR-40-14 (pg 73), SR4-60-14 (pg 75)
V-14-0312CG-X	
V-14-0314CG-X	


	Part Number	Qty
	V-14-0311CG-X	10
	Description	Volume
	14 mm o.d. graduated PFA micro vial	1 mL Brim full 2 mL


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

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

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

	Part Number	Qty
	V-14-0314CG-X	10
	Description	Volume
	14 mm o.d. graduated PFA micro vial	4 mL Brim full 4.5 mL

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


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



PFA 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 74), MR-10-30 (pg 73)
V-31-30-X	SR2-27-31 (pg 74), MR-10-30 (pg 73), ST10-31 (pg 76)
V-31-60-X	LR-21-30 (pg 72), LMR-21-30-R (pg 72), SR2-27-31 (pg 74), HR-21-30 (pg 73), ST10-31 (pg 76)
V-28-0360-V	SR2-27-28 (pg 74), ST10-28 (pg 76)
V-50-0360	SR2-12-50 (pg 74), ST2-9-50 (pg 77), ST4-9-50 (pg 77), SR4x-20-50 (pg 75)


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


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

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

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

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

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

	Part Number	Qty
	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



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



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

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

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

Bottles / Vials	Fits Racks
V-14-0712-X	MR-21-14 (pg 73), MR-40-14 (pg 73), SR4-60-14 (pg 75)


Sample Vessels

Non-PFA Sample Vessels


Non-PFA Vials, Tubes and Bottles

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


Vials	Fits Racks
V-8-0505-C	MR-60-08 (pg 73), MR-90-08 (pg 73)
V-13-0200-R-XC	LR-90-13-R (pg 72), LMR-90-13-R (pg 72), LMR-90-13-R-3T (pg 72), ST-PR-5 (pg 76)
V-20-0290-D	LR-40-20 (pg 72)
V-16-0225-LX	HR-60-16 (pg 73), LR-60-16 (pg 72), LMR-60-16-R (pg 72), SR2-80-16 (pg 74), ST-PR-5 (pg 76)
V-28-0260-L	HR-21-30 (pg 73), ST10-28 (pg 76), LR-21-30 (pg 72), LMR-21-30-R (pg 72), SR2-27-28 (pg 74), ST-PR-5 (pg 76), ST-EX-5B (pg 76)
V-50-0460-XII	SR4x-20-50 (pg 75), SR2-12-50 (pg 74), ST-PR-5 (pg 76), ST2-9-50 (pg 77), ST4-9-50 (pg 77)
V-61-0661-XII	SR4x-15-60 (pg 75), ST7-60 (pg 77), ST-PR-5 (pg 76), ST-EX-5B (pg 76)




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

Microplates

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

All microplates can be used on the following DX autosamplers:

2DX, 4DX



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



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



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



Description	Part Number
1 Pk (5 ea) 96 well, 2 mL microplate, square well, pyramid bottom	MT-96-2mL-02
1 Pk (5 ea) 96-well, 500 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.

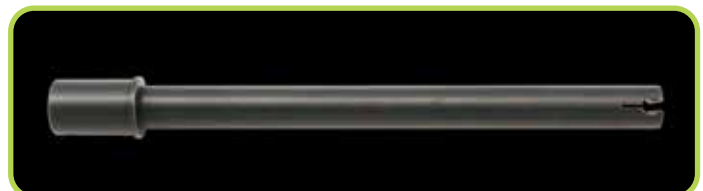


Description	Qty	Part Number
X-Piercing film cover for 96 well microplate	25	MT-96-XP-50

XP Probe Arm

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

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

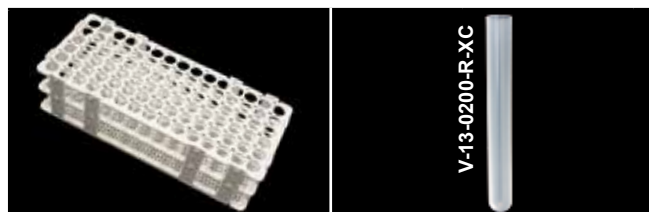


Large Autosampler Racks

Autosampler Racks (LR Size)

Plastic large racks are recommended for aqueous samples.

All LR racks can be used on the following DX autosamplers: 2DX / 2DXe, 4DX / 4DXe



Description	Diam.	Part Number
-------------	-------	-------------

90 position large polypropylene sample rack for 8 mL tubes	13 mm	LR-90-13-R
--	-------	------------



Description	Diam.	Part Number
-------------	-------	-------------

60 position large polypropylene sample rack for 15 mL tubes	16 mm	LR-60-16
---	-------	----------



Description	Diam.	Part Number
-------------	-------	-------------

40 position large polypropylene sample rack for 20 mL tubes	20 mm	LR-40-20
---	-------	----------



Description	Diam.	Part Number
-------------	-------	-------------

21 position large polypropylene sample rack for 50 mL and 60 mL tubes	30 mm	LR-21-30
---	-------	----------

Autosampler Coated Metal Racks (LR Size)

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

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



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
---	-------	-------------



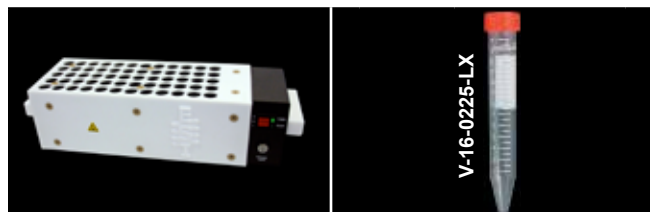
Description	Diam.	Part Number
-------------	-------	-------------

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 DX autosamplers: 2 DX / 2DXe, 4DX / 4DXe



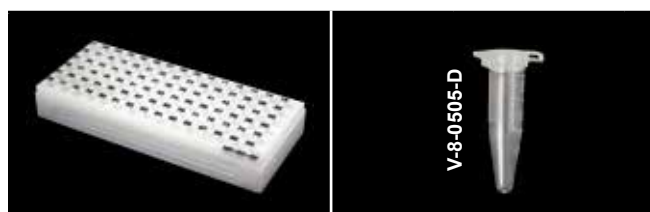
Description	Diam.	Part Number
60 position heated large sample rack for 15 mL tubes	16 mm	HR-60-16



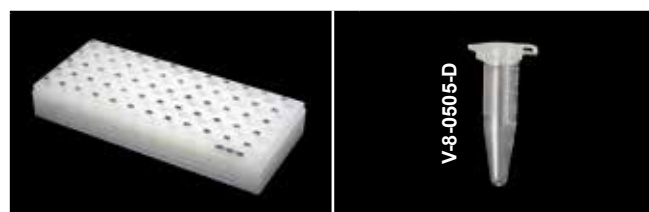
Description	Diam.	Part Number
21 position heated large sample rack for 50 mL and 60 mL tubes	30 mm	HR-21-30

Autosampler Racks (MR Size)

All MR racks can be used on the following DX autosamplers: 2DX / 2DXe, 4DX / 4DXe, Micro DX



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 CPVC micro sample rack for 15 mL and 30 mL tubes	30 mm	MR-10-30



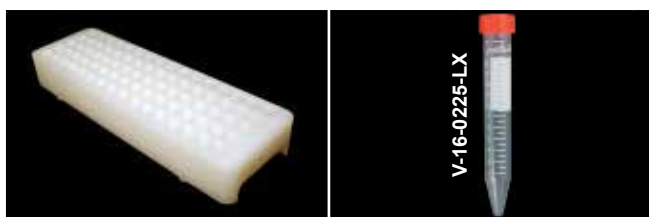
Description	Part Number
CPVC Cover for micro racks	MR-00-01

Super Autosampler Racks

Large-volume samples can be analyzed using Avio 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 DX autosamplers: 2DX / 2DXe



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



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



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



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



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

Autosampler Racks (SR4 Size, Type 1)

All SR4 racks can be used on the following DX autosamplers: 2 DX / 2DXe, 4DX / 4DXe



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



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

Autosampler Racks (SR4 Size, Type 2)

All SR4 type 2 racks can be used on the following DX autosamplers: 4 DX / 4DXe

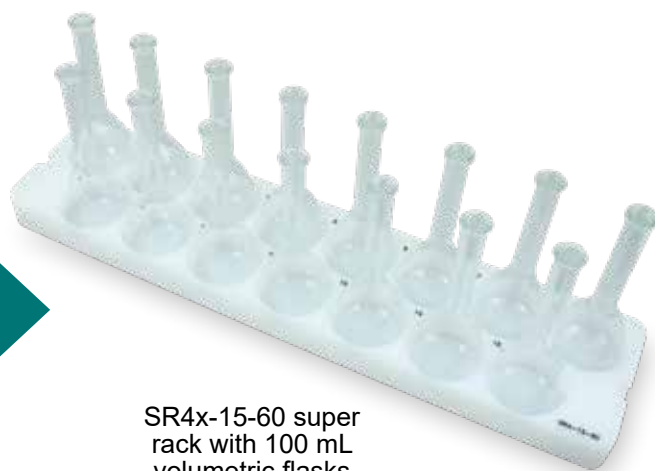


Description	Diam.	Part Number
15 position HMPE super sample rack for 250 mL bottles	60 mm	SR4x-15-60



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

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



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

Standards Autosampler Racks

Autosampler Racks (ST Size, Type 1)

All ST type 1 racks can be used on the following DX autosamplers: 2DX / 2DXe, 4DX / 4DXe



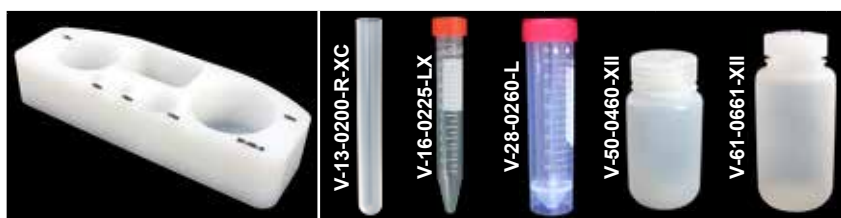
Description	Diam.	Part Number
10 position PVDF standards rack for 20 mL and 50 mL tubes	28 mm	ST10-28



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



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



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

Autosampler Racks (ST Size, Type 2)

All ST type 2 racks can be used on the following DX autosamplers: 2DX / 2DXe



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)

The ST type 3 rack can be used on the following DX autosamplers: 4DX / 4DXe



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



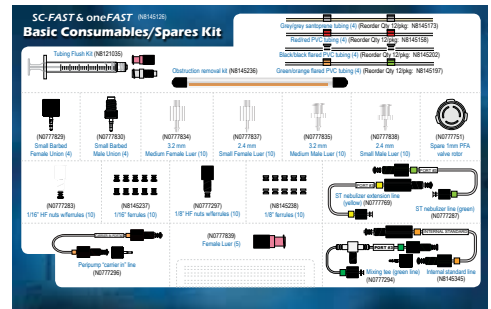
Description	Diam.	Part Number
9 position HMPE standards rack for 125 mL bottles. Recommended for prepFAST. Includes 9, 125 mL HDPE wide mouth standard bottles w/caps.	50 mm	ST4-9-50

FAST Spares Kits

FAST Spares Kit

Assorted fittings and tubing for FAST systems.

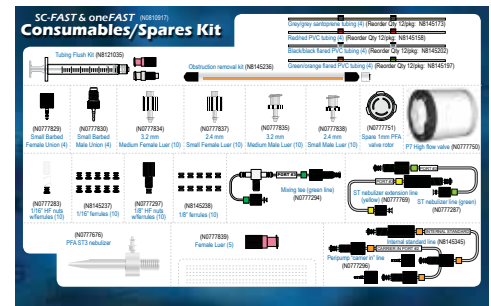
Description	Part Number
FAST Spares Kit for Avio 200/500	SC-0380-R1



FAST Deluxe Spares Kit

All of the assorted fittings and tubing in the FAST Spares Kit with the addition of a PFA-ST nebulizer, spare FAST valve, and internal standard tee.

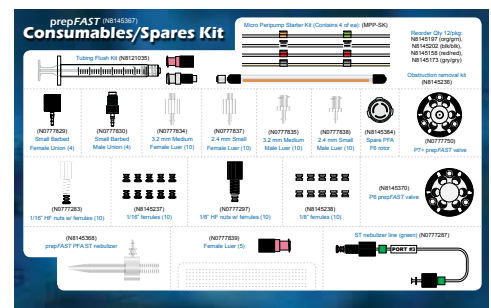
Description	Part Number
FAST Deluxe Spares Kit for Avio 200/500	SC-0370-37-D



prepFAST Spares Kit

Includes prepFAST PFA-ST3 nebulizer, P7+ and P6 valves, PFA F6 rotor, tubing flush kit, ST nebulizer line, and spare fittings and tubing for prepFAST.

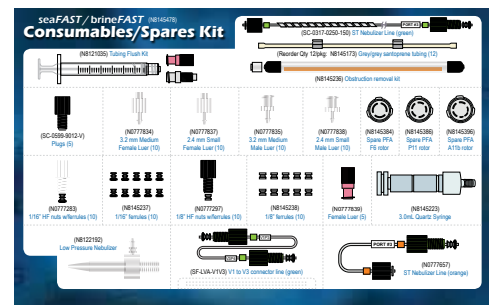
Description	Part Number
prepFAST Spares Kit	PF-0370



seaFAST / brineFAST Spares Kit

Includes all of the assorted fittings and tubing in the FAST Spares Kit with the addition of a PFA-ST nebulizer, 3 mL quartz syringe, and assorted fittings.

Description	Part Number
seaFAST/brineFAST Spares Kit	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 SC-FAST.

- Includes:** Hardware installation
 Software methods
 Basic system familiarization
 Travel time & expenses for ESI employee or contractor
 SC-FAST standard spares kit (SC-0380-R1)

Description	Part Number
On-site, 1-day installation and application development for SC-FAST 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 SC-FAST and prepFAST.

- 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)

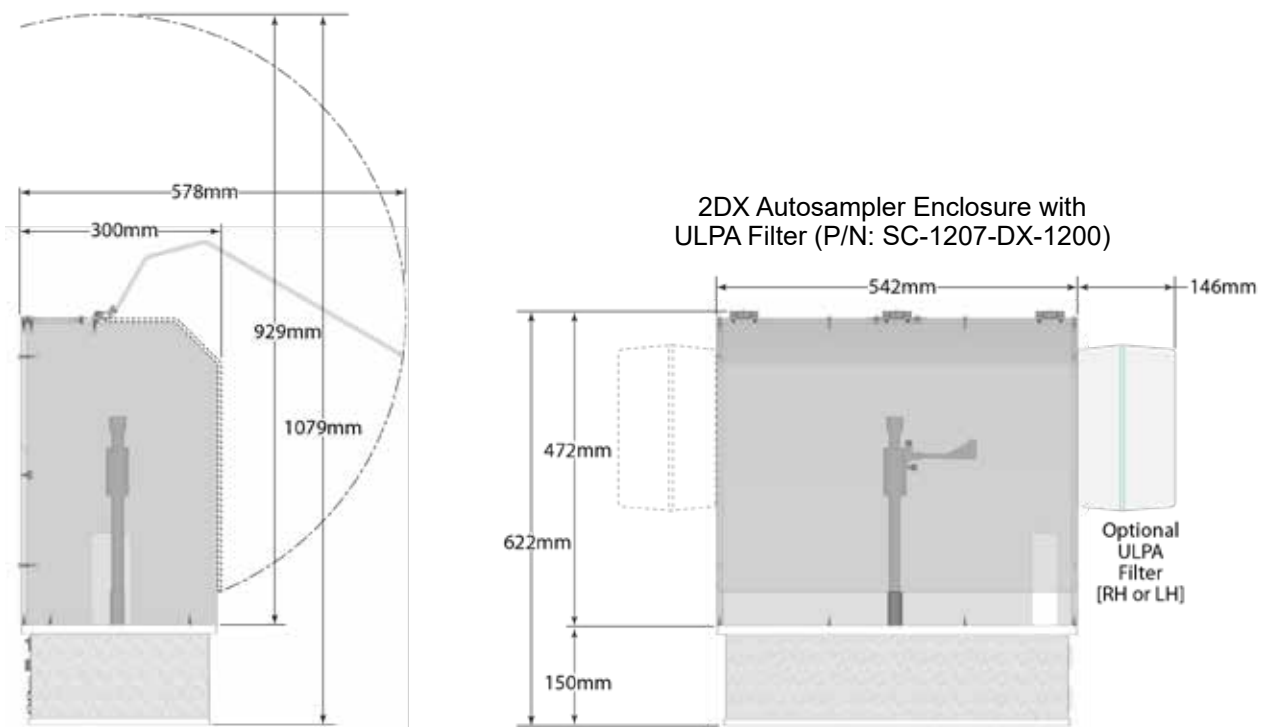
Description	Part Number
On-site, 2½-day installation and application development for SC-FAST systems	FI-SC-02-54
On-site, 2½-day installation and application development for prepFAST systems	FI-PF-02
On-site, 2½-day installation and application development for seaFAST/brineFAST systems	FI-SF-02



The FAST Deluxe, prepFAST, or seaFAST/brineFAST Spares Kit is included with the Gold Installation & Training.

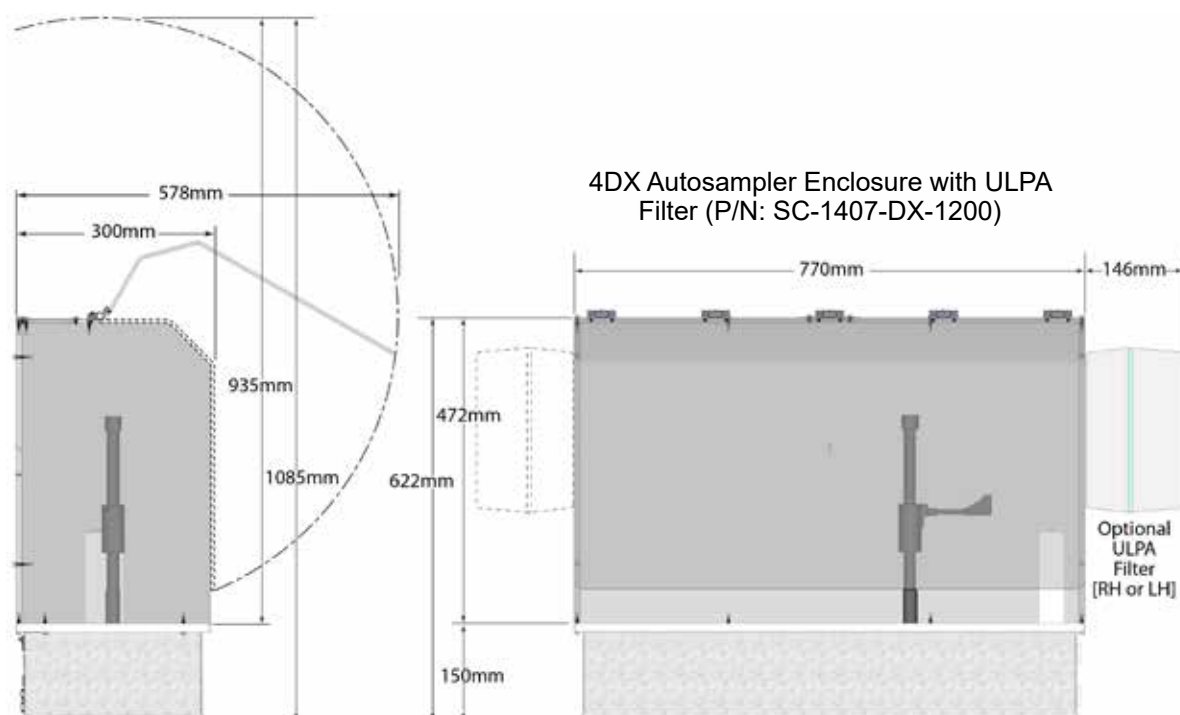


2DX Autosampler with Enclosure and ULPA Filter Dimensions

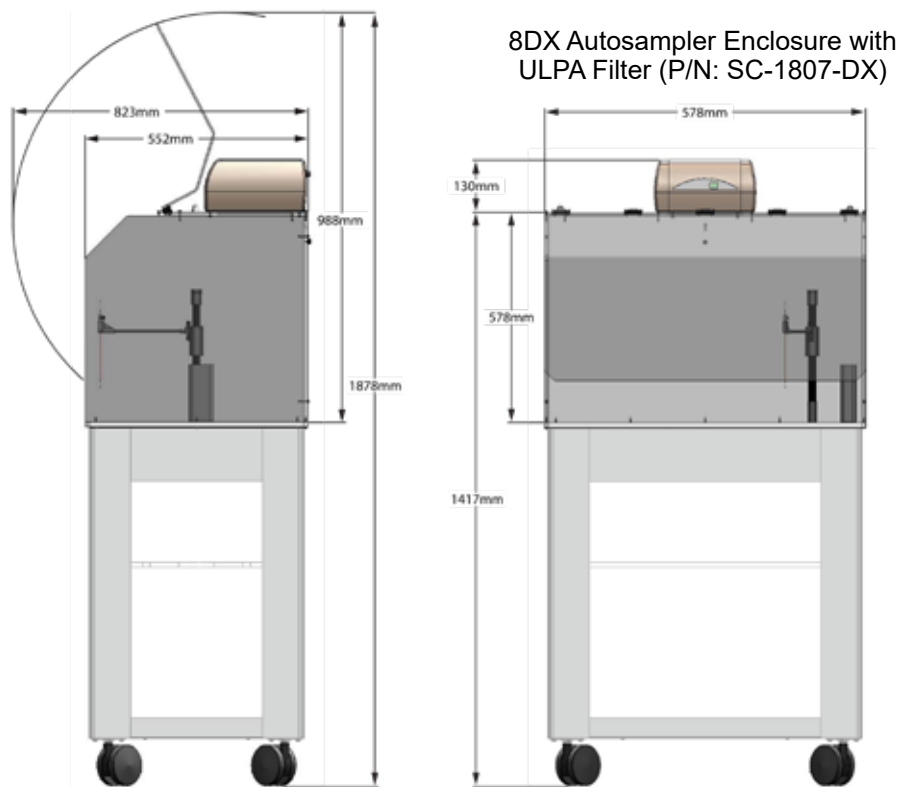


2DX autosampler with mobile stand and enclosure and ULPA Filter, W x D X H: 54.2 cm x 34.6 cm x 127.3 cm

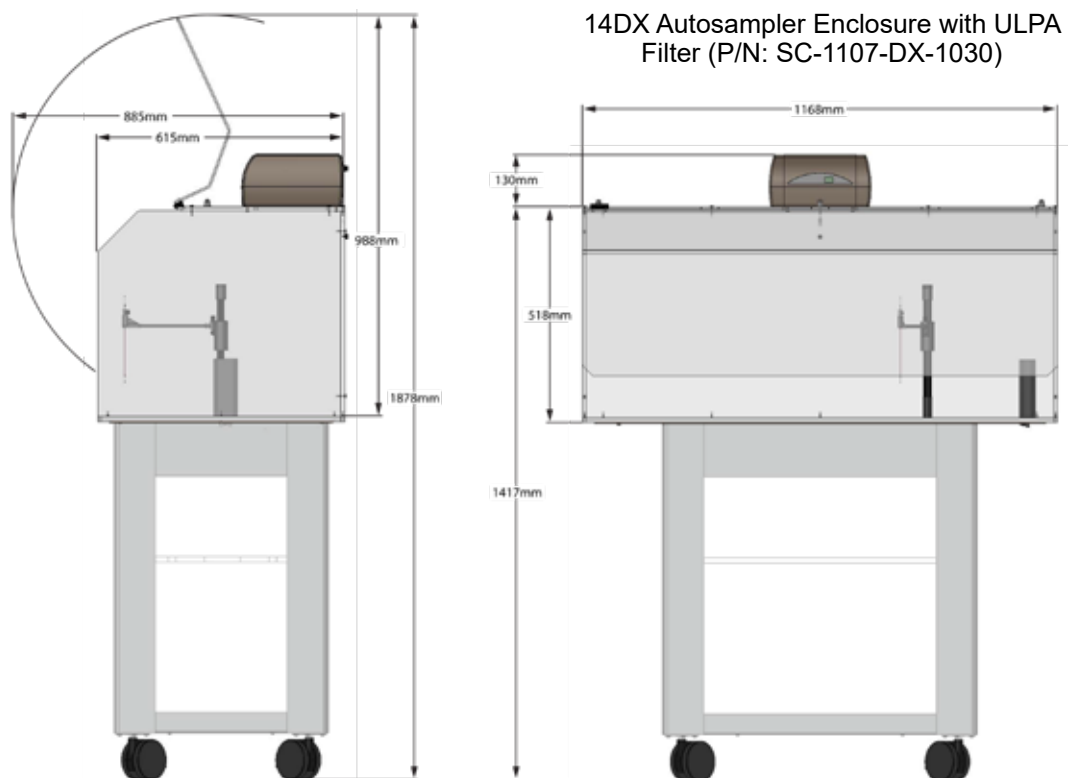
4DX Autosampler with Enclosure and ULPA Filter Dimensions



8DX Autosampler with and ULPA Filter Enclosure Dimensions



14DX Autosampler with Enclosure and ULPA Filter Dimensions



Index

Item #	Page	Item #	Page	Item #	Page	Item #	Page	Item #	Page
2ADFi-37A	19	C3QX-37	45	ES-5037-3500-080 ..	35	LR-21-30	72	MPP-102-F-PVC	54
2ADFi-47A	19	C3QX-37-P	45	ES-5037-3505-150 ..	35	LR-40-20	72	MPP-102-F-S	54
2BF-S4-37C	25	C3QX-47	45	ES-5599-V1-37	52	LR-60-16	72	MPP-102-PVC	54
2DX	5	C3QX-47-P	45	ES-5599-V1-47	52	LR-90-13-R	72	MPP-102-S	54
2DXe	5	CF-IDA	25	ES-5599-V2-37	52	M200-5370	45	MPP-109-F-PVC	54
2DXF-37A	7	CF-M-0600	25	ES-5599-V2-47	52	M200-5371	45	MPP-109-F-S	54
2DXF-47A	7	DTO-37	51	ES-7000-0101	55	M237-DV-29	59	MPP-109-PVC	54
2PFe-37	19	DTQ-37	51	ES-7000-0111	55	m-DX	5	MPP-109-S	54
2PFe-47	19	DXi-4-37-FR1	52	ES-7000-1001	55	MP2-1-PC	53	MPP-114-F-PVC	54
2PF-M5-37A	19	DXi-4-37-FR2	52	ES-7000-1011	55	MP2-2-PC	53	MPP-114-PVC	54
2PF-M5-47A	19	DXi-4-47-FR1	52	ES-7225-0001	66	MP2-3-PC	53	MPP-114-S	54
2Prep3-87A	23	DXi-4-47-FR2	52	ES-9190-37-29	57	MP2-4-PC	53	MPP-122-PVC	54
4ADFi-37A	19	ES-2000	36	F0-25	39	MP2-6-PC	53	MPP-122-S	54
4ADFi-47A	19	ES-2000-3503-080 ..	37	F0-25-14	63	MP2-8-PC	53	MPP-130-PHR	54
4DX	5	ES-2000-3505-080 ..	37	F0-25-25	63	MPP-013-F-PVC	54	MPP-130-PVC	54
4DXe	5	ES-2002-0002	36	F0-50-14	63	MPP-013-F-S	54	MPP-130-S	54
4DXF-37A	7	ES-2002-3503-100 ..	37	F0-50-25	63	MPP-013-PVC	54	MPP-142-PVC	54
4DXF-47A	7	ES-2002-3505-100 ..	37	F1-80	39	MPP-019-F-PVC	54	MPP-142-S	54
4PFe-37	19	ES-2003-0002	36	F2-50	39	MPP-019-F-S	54	MPP-152-PHR	54
4PFe-47	19	ES-2003-3503-100 ..	37	F2-50-25	63	MPP-019-PVC	54	MPP-152-PVC	54
4PF-M5-37A	19	ES-2003-3505-100 ..	37	F2-50-026-ZZ	38	MPP-027-F-PVC	54	MPP-152-S	54
4PF-M5-47A	19	ES-2005-0002	36	F-F2-25-14	38, 63	MPP-027-F-S	54	MPP-165-PVC	54
4Prep3-87A	23	ES-2005-3503-100 ..	37	F-F2-25-25	63	MPP-027-PVC	54	MPP-165-S	54
5MT-1	64	ES-2005-3505-100 ..	37	F-F2-50-14	63	MPP-038-F-PVC	54	MPP-175-PVC	54
5MT-02	64	ES-2020	36	FG	40	MPP-038-F-S	54	MPP-175-S	54
5MT-03	64	ES-2020-3503-080 ..	37	FI-PF-02	79	MPP-038-PHR	54	MPP-185-PVC	54
5MT-05	64	ES-2020-3505-080 ..	37	FI-SC-01	79	MPP-038-PVC	54	MPP-185-S	54
5MT-08	64	ES-2041	35	FI-SC-02-54	79	MPP-044-F-PVC	54	MPP-206-PVC	54
5MT-015	64	ES-2042	35	FI-SF-02	79	MPP-044-F-S	54	MPP-206-S	54
5MT-16	64	ES-2043	35	GL-ST-57	34	MPP-044-PVC	54	MPP-220-PVC	54
5MT-025	64	ES-2044	35	HFX-57	29	MPP-051-F-PVC	54	MPP-220-S	54
8ADFi-37A	19	ES-2044-64	46	HG-MP2-6-A	27	MPP-051-F-S	54	MPP-254-PVC	54
8ADFi-47A	19	ES-2045	35	HR-21-30	73	MPP-051-PVC	54	MPP-254-S	54
8DX	5	ES-2046-0001	34	HR-60-16	73	MPP-057-F-PVC	54	MPP-279-PVC	54
8DXF-37A	7	ES-2047	35	IDPt20-37	51	MPP-057-F-S	54	MPP-279-S	54
8DXF-47A	7	ES-2049	35	IDQ10-37	51	MPP-057-PVC	54	MPP-317-PHR	54
8PFe-37	19	ES-2110-0002	46	IDQ15-37	51	MPP-064-F-PVC	54	MPP-317-PVC	54
8PFe-47	19	ES-2501-PPF1 ..53, 64		IDQ20-37	51	MPP-064-F-S	54	MPP-317-S	54
8PF-M5-37A	19	ES-2501-PPF2 ..53, 64		IDQ25-37	51	MPP-064-PVC	54	MPP-K-1	54
8PF-M5-47A	19	ES-2501-PPM1 ..53, 64		IDS15-37	51	MPP-076-F-PVC	54	MR-00-01	73
14ADFi-37A	19	ES-2501-PPM2 ..53, 64		IDS20-37	51	MPP-076-F-S	54	MR-10-30	73
14ADFi-47A	19	ES-2999-3721-R1	56	IS-BRG-50	44	MPP-076-PHR	54	MR-21-14	73
14DX	5	ES-2999-4721-R1	56	IS-MP-25	44	MPP-076-PVC	54	MR-40-14	73
14DXF-37A	7	ES-3137-1011-20	45	IS-MP-50	44	MPP-076-S	54	MR-60-08	73
14DXF-47A	7	ES-3137-1018-20	45	ISN-ST54-25	44	MPP-089-F-PVC	54	MR-90-08	73
14PFe-37	19	ES-3147-1011-20	45	ISN-TRP-50	44	MPP-089-F-S	54	MT-24-10mL-02	70
14PFe-47	19	ES-3147-1018-20	45	IS-ST-25	44	MPP-089-PVC	54	MT-48-5mL-02	70
14PF-M5-37A	19	ES-3199-0003-R	46	IS-ST-50	44	MPP-089-S	54	MT-48-7.5mL-02	70
14PF-M5-47A	19	ES-4040-57	33	LMR-21-30-R	72	MPP-095-F-PVC	54	MT-96-2mL-02	70
C3Q-37-H	27, 29, 45	ES-4190-37-29	56	LMR-60-16-R	72	MPP-095-F-S	54	MT-96-500-05-V	70
C3Q-37-H-S	45	ES-5037-3250-080 ..	35	LMR-90-13-R	72	MPP-095-PVC	54	MT-96-XP-50	71
C3Q-47-H	45	ES-5037-3255-150 ..	35	LMR-90-13-R-3T	72	MPP-095-S	54	PC3X-37	56

Item #	Page	Item #	Page	Item #	Page	Item #	Page	Item #	Page
PC3X-47-29	56	PF-P10	61	PRL-02	41	SC-0370-37-D	78	T20Q-37	50
PF-0370	78	PF-P10R	61	S011361	46	SC-0380-R1	78	T25Q-37	50
PF-2040	33	PF-P10S	61	S032950	46	SC-0599-0001	64	TR-50-K1	38
PF-A5e	61	PF-P11	61	S032955-V	53	SC-0599-0108-W	64	TRP-50-K1	38
PF-A5eR	61	PF-P11S	61	S032956	64	SC-0599-0109	34	V-8-0505-C	69
PF-A5eS	61	PF-P13	61	S032956-V	53, 64	SC-0599-0116-K	64	V-8-0505-D	69
PF-A7u	61	PF-P13R	61	S033045	46	SC-0599-F08	64	V-13-0200R-D	69
PF-A7uR	61	PF-P13S	61	S033048	46	SC-0599-F16	64	V-13-0200-R-XC	69
PF-A7uS	61	PF-PM6	61	S033101	64	SC-0602	30	V-14-0309-C	68
PF-A11b	61	PF-PM6R	61	S033156	64	SC-1107-0026	30	V-14-0309-X	66, 68
PF-A11bR	61	PF-PM6S	61	S033156-V	53, 64	SC-1107-0030	30	V-14-0311CG-X	66
PF-A11bS	61	PF-PM7X	61	S033161	64	SC-1107-DX-1030	30	V-14-0312CG-X	66
PFA-K29-X	67	PF-PM7XS	61	SC-0105-DX-XP	71	SC-1207-DX	30	V-14-0314CG-X	66
PF-F6R	61	PF-S4	61	SC-0315-05	65	SC-1207-DX-1200	30	V-14-0712-C	68
PF-M3H	61	PF-S4R	61	SC-0315-10	65	SC-1210-DX	31	V-14-0712-M	68
PF-M3HR	61	PF-S4S	61	SC-0315-20	65	SC-1210-DX-PF	31	V-14-0712-X	68
PF-M3HS	61	PF-S9	61	SC-0315-025	65	SC-1407-DX	30	V-15-0300-X	66
PF-M4	61	PF-S9R	61	SC-0315-30	65	SC-1407-DX-1200	30	V-15-0301-X	66
PF-M4R	61	PF-S9S	61	SC-0315-40	65	SC-1410-DX	31	V-16-0225-D	69
PF-M4S	61	PF-S11R	61	SC-0315-60	65	SC-1410-DX-PF	31	V-16-0225-LX	69
PF-M6	61	PF-S11S	61	SC-0315-80	65	SC-1607-DX	30	V-20-0290-D	69
PF-M6R	61	PF-S1003	55	SC-0317-0250	62	SC-1607-DX-1000	30	V-20-0290-L	69
PF-M6S	61	PF-S1030	55	SC-0317-0250-25	62	SC-1807-DX	30	V-28-0260-D	69
PF-M8	61	PF-S1060	55	SC-0317-450P-10	63	SC-1807-DX-1000	30	V-28-0260-L	69
PF-M8R	61	PF-S3003	55	SC-0317-0500	62	SC-5037-3501	62	V-28-0360-V	67
PF-M8S	61	PF-S3030	55	SC-0317-0500-25	62	SC-5037-3503	62	V-31-15-X	67
PF-M10	61	PF-S3060	55	SC-0317-0500-25GC63	63	SC-5037-3755-150	62	V-31-30-X	67
PF-M10R	61	PF-S3120	55	SC-0317-0500-BG	63	SC-5037-3995-150	62	V-31-60-X	67
PF-M10S	61	PF-V6	61	SC-0317-0990-25GC63	63	SDX-S11	61	V-50-0360	67
PF-P3	61	PF-V6H	61	SC-0317-0990-BG	63	SF-0370	78	V-50-0460-XII	69
PF-P3R	61	PF-V6HR	61	SC-0317-1250	62	SR2-12-50	74	V-50-0460-XXIV	69
PF-P3S	61	PF-V6HS	61	SC-0317-1250-25	62	SR2-21-30	74	V-61-0661-C	69
PF-P4	61	PF-V6R	61	SC-0317-1500	62	SR2-27-28	74	V-61-0661-XII	69
PF-P4H	61	PF-V6S	61	SC-0317-1500-25	62	SR2-27-31	74	VPC-14-0309-C	68
PF-P4HR	61	PF-V8C	61	SC-0318-03	65	SR2-80-16	74	VPC-14-0712-C	68
PF-P4HS	61	PF-V8CS	61	SC-0318-05	65	SR4-00-01	75	ZTN-D-37	51
PF-P4R	61	PF-V9	61	SC-0318-10	65	SR4-60-14	75		
PF-P4S	61	PF-V9H	61	SC-0318-15	65	SR4x-15-60	75		
PF-P5H	61	PF-V9HR	61	SC-0318-20	65	SR4x-20-50	75		
PF-P5HS	61	PF-V9HS	61	SC-0318-25	65	ST2-9-50	77		
PF-P6	61	PF-V9R	61	SC-0318-30	65	ST3-57	33		
PF-P6R	61	PF-V9S	61	SC-0318-40	65	ST4-9-50	77		
PF-P6S	61	PF-V12	61	SC-0319-01	65	ST7-60	77		
PF-P7	61	PF-V12R	61	SC-0319-02	65	ST10-28	76		
PF-P7-8	61	PF-V12S	61	SC-0319-03	65	ST10-31	76		
PF-P7S	61	PF-V13	61	SC-0319-05	65	ST-EX-5B	76		
PF-P7S-8	61	PF-V13R	61	SC-0319-10	65	ST-PR-5	76		
PF-P7X	61	PF-V13S	61	SC-0319-15	65	T10-O-37	50		
PF-P7XS	61	prep3-87A	23	SC-0319-20	65	T10Q-37	50		
PF-P8	61	PRG-01	43	SC-0319-25	65	T15-O-37	50		
PF-P8R	61	PRG-01-MCPlus	43	SC-0319-30	65	T15Q-37	50		
PF-P8S	61	PRG-01-ST	43	SC-0319-40	65	T20-O-37	50		

