



Elemental Scientific
ICP | ICPMS

Automated Introduction Semiconductor Chemicals

Fluoronic prepFAST S
Ultraclean Sample Introduction System



prepFAST S™

Automated Sample Preparation and Introduction System for Semiconductor Applications

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

prepFAST S Autocalibration

The prepFAST S automatically prepares calibration curves for over 40 elements controlled in semiconductor manufacturing processes. Calibrations are generated by automatically diluting an enclosed multielement stock standard. Automation with the high-purity prepFAST S achieves low to sub-ppt calibrations.



prepFAST S
System

High Purity Automation with PPT/PPQ results

Automation

- Automatic external and MSA calibrations
- Automated sample sensing
 - accounts for viscosity and automatically adjusts timing
 - detects and injects the sample and triggers the ICPMS
- Automated syringe-driven sample introduction
 - Sample loading
 - Sample preparation
 - Inline dilution
 - Acid addition

Ultraclean

- Ultraclean sample preparation
- Integrated ultraclean sample environment
 - Includes ultraclean fluoronetic autosampler and air shower
 - Options include:
 - UHPA (Ultrapure air) filter
 - Sample racks for PFA containers (<1 mL to 500 mL)
- Continuously-flowing high purity UPW rinse (user-supplied UPW)
- UPW polishing columns for low background

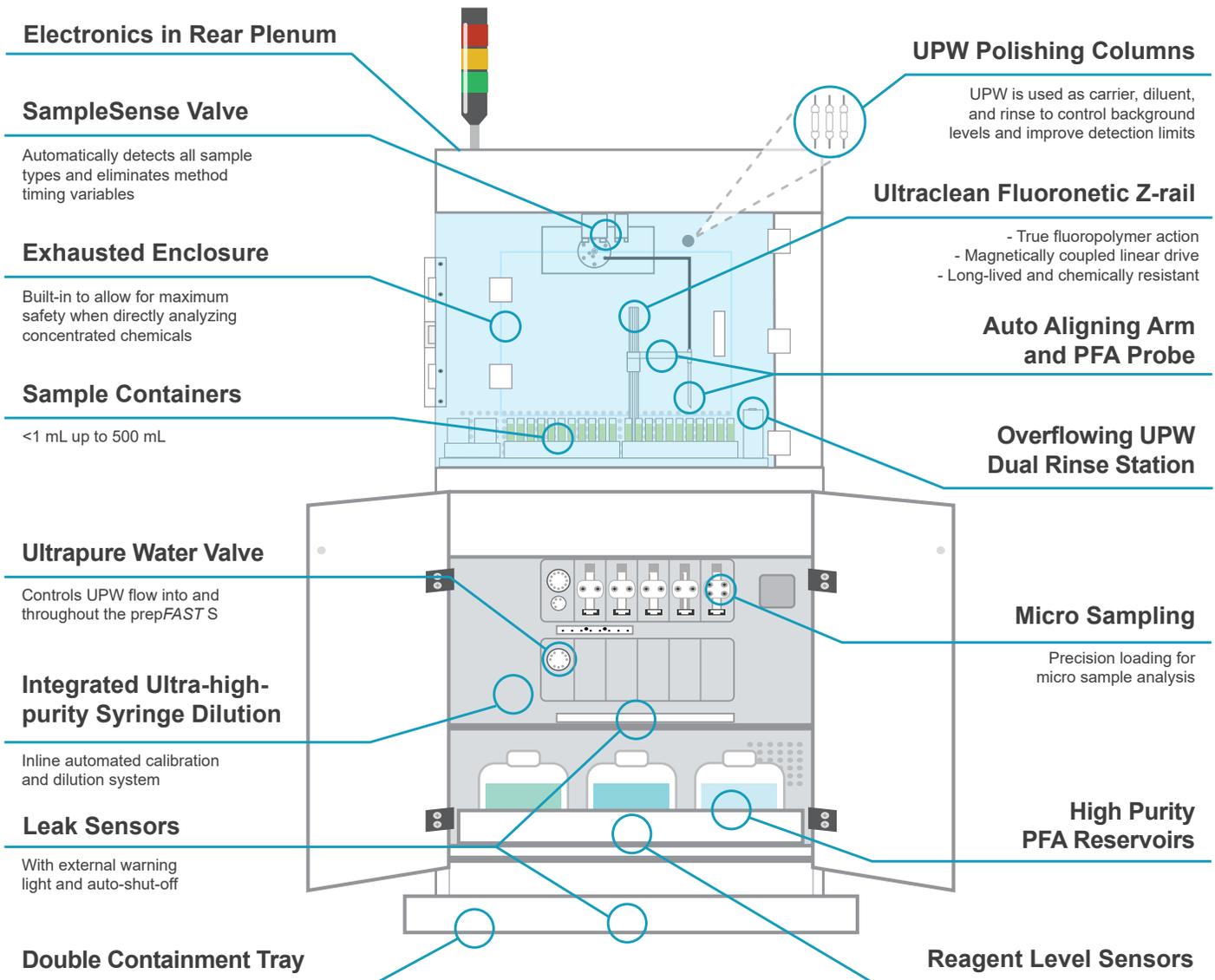
PPT/PPQ Results

- Capability to analyze all semiconductor grade chemicals
- PPT/PPQ detection limits for all semiconductor elements

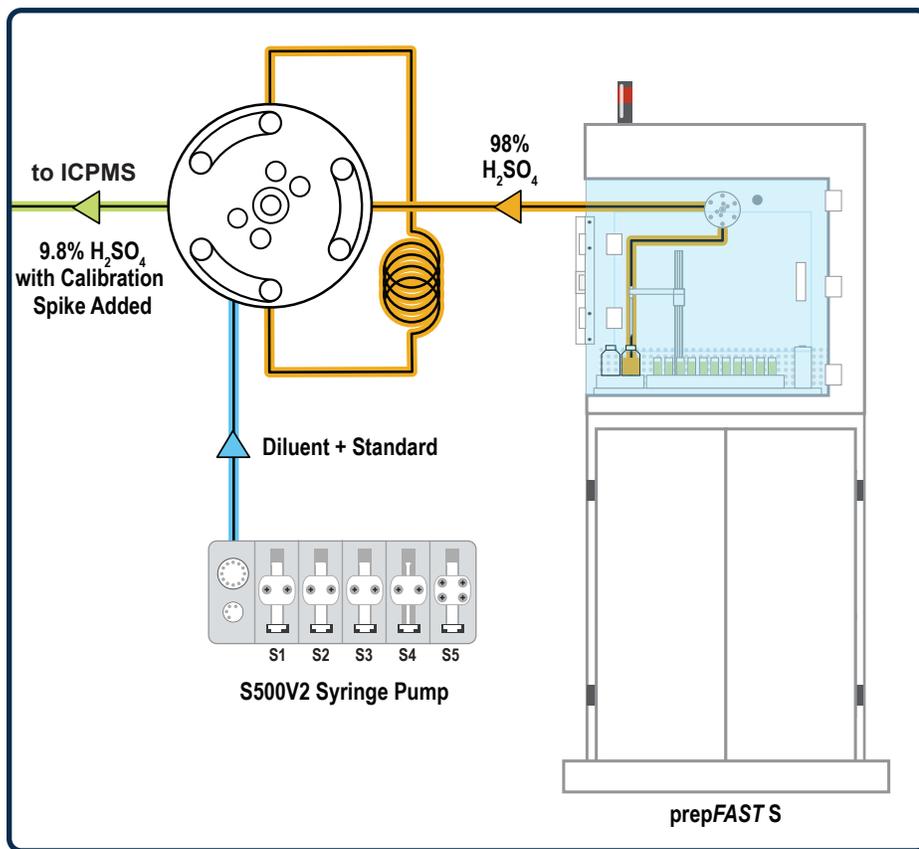
prepFAST S System						
System	Integrated Mobile Autosampler & Enclosure	Ultraclean Air Shower	Integrated FAST valve modules	PFA Nebulizer with Integrated Capillary	PFA Sample Probes	Syringe Pump S500V2
prepFAST S	✓	✓	✓	✓	✓	✓

Pure Automation

prepFAST S



prepFAST S Inline Dilution of Semiconductor-grade Chemicals



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

Diagram showing 10x inline dilution of concentrated H₂SO₄ with prepFAST S.

Examples of Semiconductor Chemicals Analyzed at the ppt Level with prepFAST S						
Acids	98% H ₂ SO ₄	89% H ₃ PO ₄	70% HNO ₃	49% HF	35% HCl	30% H ₂ O ₂
Bases	22% NH ₄ OH	2.38% TMAH	25% TMAH	KOH		
Organics	IPA	PGMEA/PGME	Photoresist	NMP	Butyl Acetate	Cyclohexanone

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

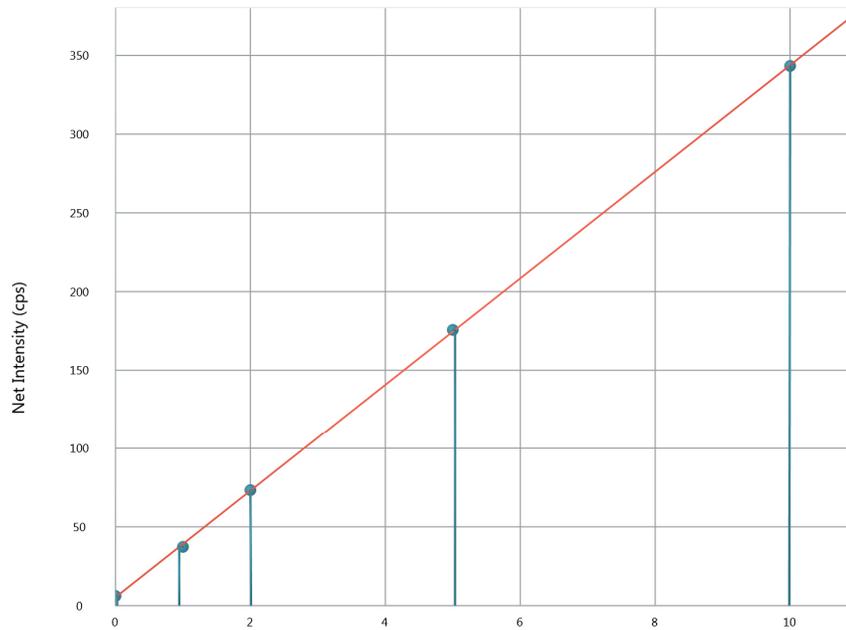
Detection Limits

Example of Detection Limits in Non-cleanroom environment

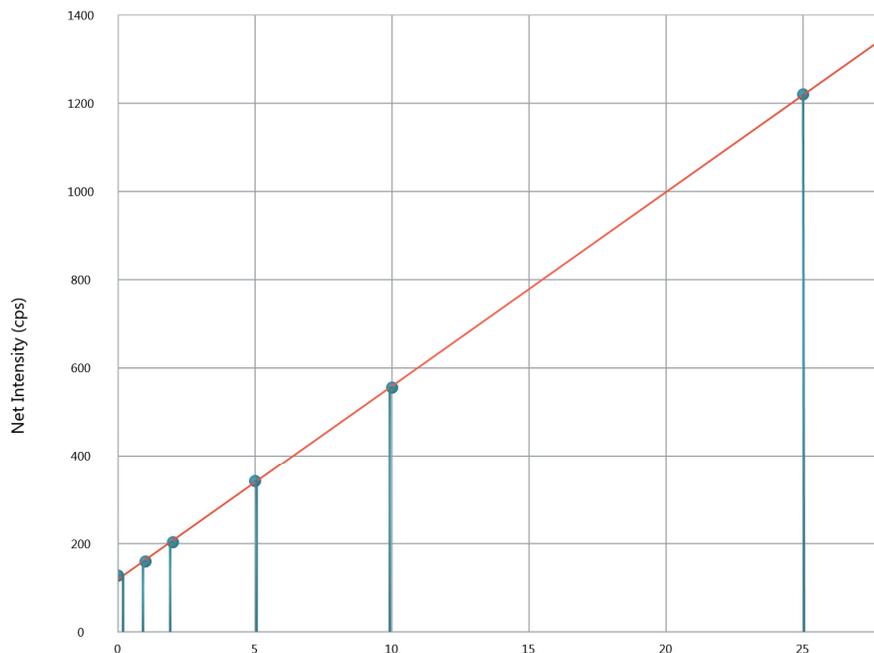
Element	DL (ppt)	Element	DL (ppt)
⁷ Li	0.02	⁷² Ge	0.04
⁹ Be	0.007	⁷⁵ As	0.2
¹¹ B	0.9	⁸⁵ Rb	0.008
²³ Na	0.07	⁸⁸ Sr	0.008
²⁴ Mg	0.01	⁹⁰ Zr	0.004
²⁷ Al	0.03	⁹³ Nb	0.002
³⁹ K	0.06	⁹⁵ Mo	0.5
⁴⁰ Ca	0.4	¹¹¹ Cd	0.07
⁴⁸ Ti	0.02	¹¹⁵ In	0.004
⁵¹ V	0.1	¹¹⁸ Sn	0.05
⁵² Cr	0.1	¹²¹ Sb	0.05
⁵⁵ Mn	0.009	¹³⁷ Ba	0.04
⁵⁶ Fe	0.04	¹⁷⁸ Hf	0.003
⁵⁸ Ni	0.01	¹⁸¹ Ta	0.01
⁵⁹ Co	0.007	¹⁸² W	0.01
⁶⁰ Ni	0.01	²⁰⁵ Tl	0.002
⁶³ Cu	0.03	²⁰⁸ Pb	0.005
⁶⁴ Zn	0.04	²³² Th	0.000
⁷¹ Ga	0.002	²³⁸ U	0.003

Autocalibration

UPW Autocalibration for ^{40}Ca



HCl Autocalibration for ^{56}Fe





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