



**Elemental Scientific**

prepFAST S

# Automated Introduction Semiconductor Chemicals

Fluorometric prepFAST S  
Ultraclean Sample Introduction System



ICP | ICPMS

## 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 (Ultrahigh purity 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

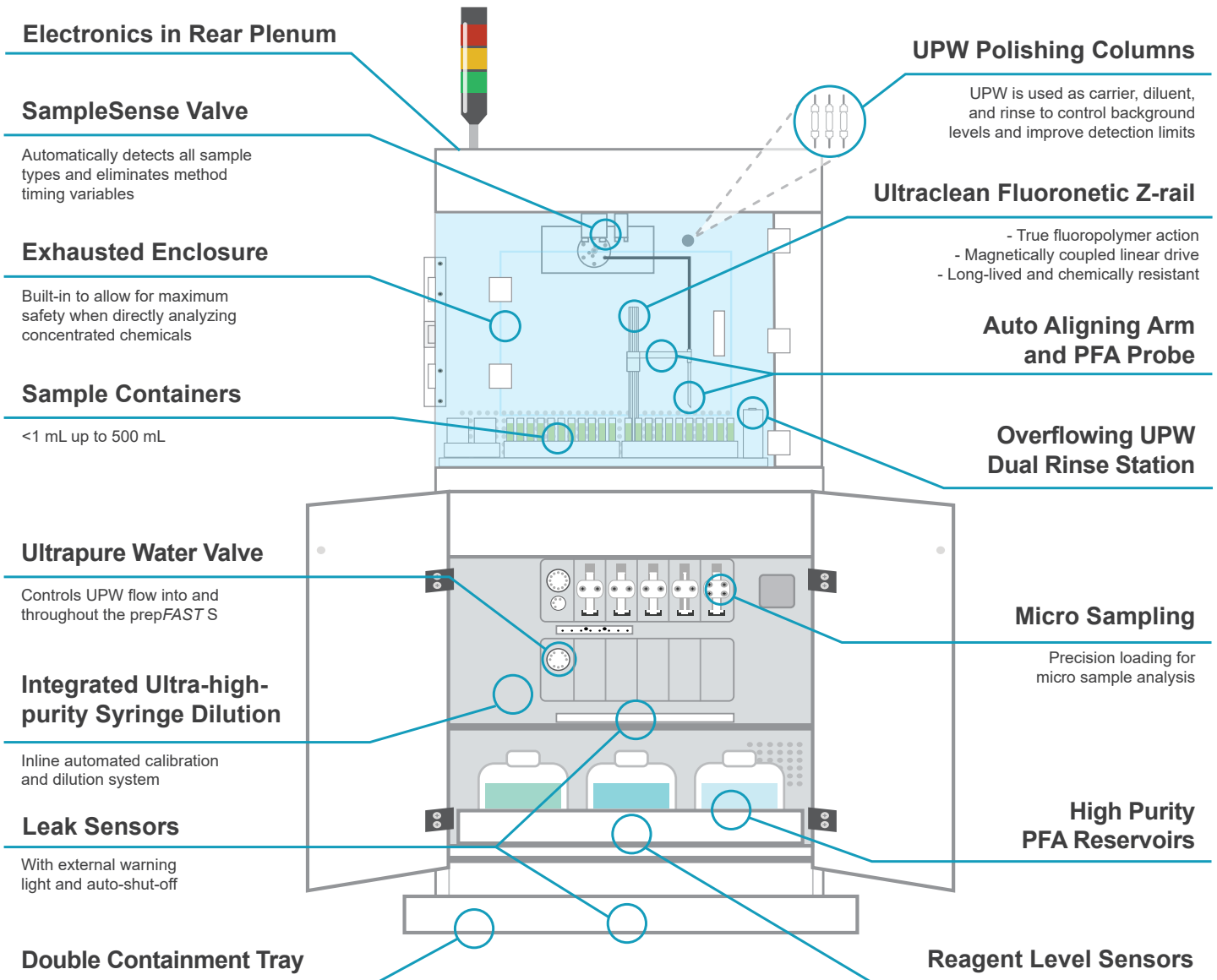
prepFAST S System

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	✓	✓	✓	✓	✓	✓

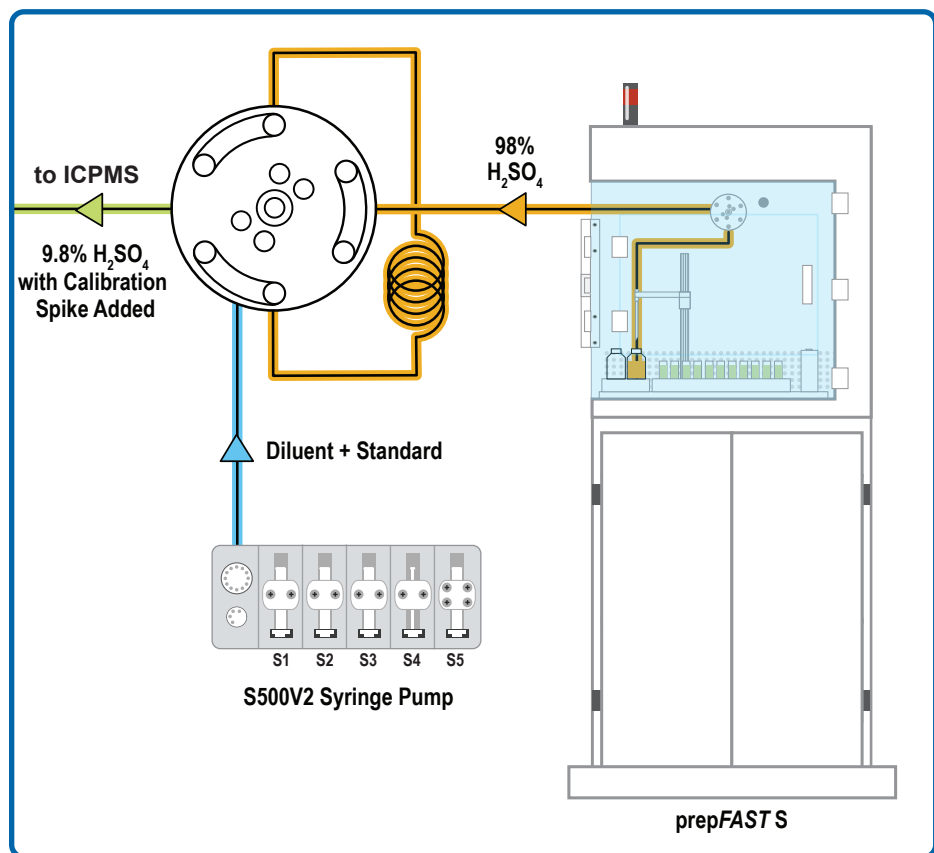


# Pure Automation

## 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 H<sub>2</sub>SO<sub>4</sub> with prepFAST S.

## Examples of Semiconductor Chemicals Analyzed at the PPT Level with prepFAST S

<b>Acids</b>	98% H <sub>2</sub> SO <sub>4</sub>	89% H <sub>3</sub> PO <sub>4</sub>	70% HNO <sub>3</sub>	49% HF	35% HCl	30% H <sub>2</sub> O <sub>2</sub>
<b>Bases</b>	22% NH <sub>4</sub> OH	2.38% TMAH	25% TMAH	KOH		
<b>Organics</b>	IPA	PGMEA/PGME	Photoresist	NMP	Butyl Acetate	Cyclohexanone

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

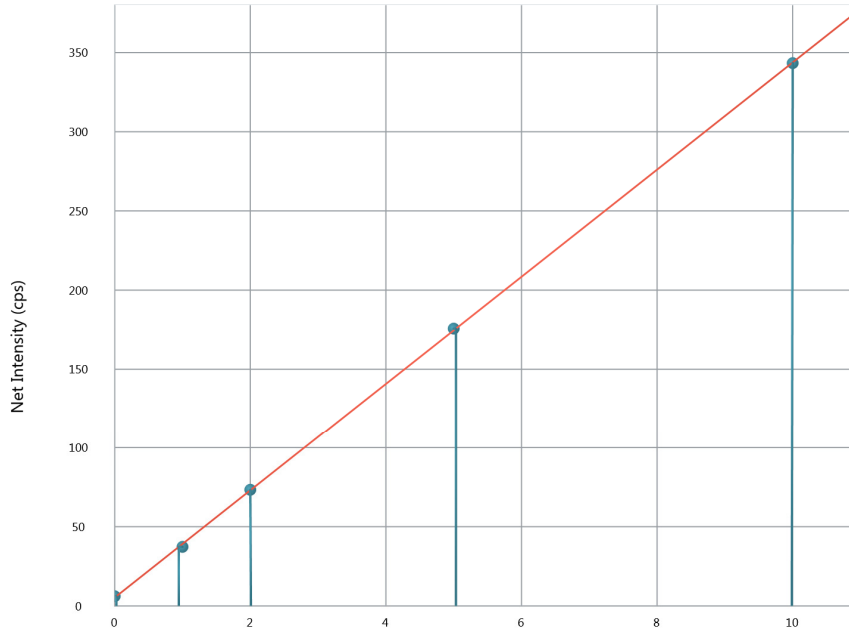
# Detection Limits

Example of Detection Limits in Non-Cleanroom Environment

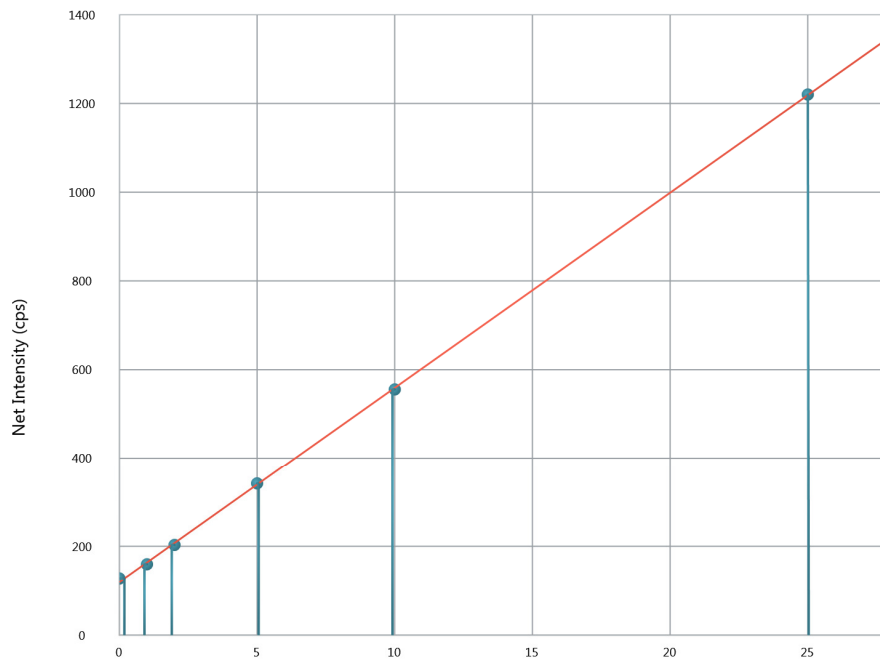
Element	DL (PPQ)	Element	DL (PPQ)
<sup>7</sup> Li	0.02	<sup>72</sup> Ge	0.04
<sup>9</sup> Be	0.007	<sup>75</sup> As	0.2
<sup>11</sup> B	0.9	<sup>85</sup> Rb	0.008
<sup>23</sup> Na	0.07	<sup>88</sup> Sr	0.008
<sup>24</sup> Mg	0.01	<sup>90</sup> Zr	0.004
<sup>27</sup> Al	0.03	<sup>93</sup> Nb	0.002
<sup>39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

# Autocalibration

## UPW Autocalibration for $^{40}\text{Ca}$



## HCI Autocalibration for $^{56}\text{Fe}$







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

© Elemental Scientific | +1 402-991-7800 | [sales@icpms.com](mailto:sales@icpms.com) | 7277 World Communications Drive | Omaha, NE 68122

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