GLASS EXPANSION
Quality By Design

Better Solutions for Clean ICP Workflows

Dr. Ryan Brennan
President, Glass Expansion, Inc.

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Introduction

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Our goal is to achieve cleaner workflows and reduce the frequency of maintenance intervals, enabling longer, more stable ICP analyses.

- Guardian Autosampler Probe
- Automated Rinse Sequence
- Nebulizer Maintenance Tips
- Spray Chamber Maintenance Tips & Washout Efficiency
- Ceramic Torch Benefits
- Cone Material Benefits & Maintenance Tips
- Elegra Argon Humidifier

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Support and Customer Service

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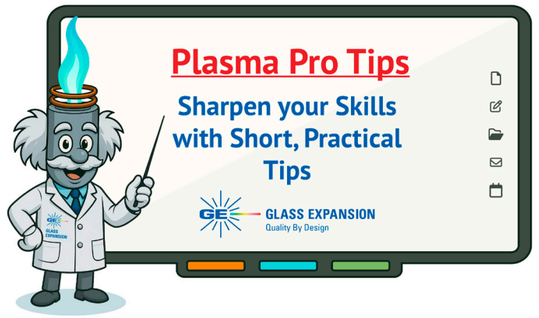
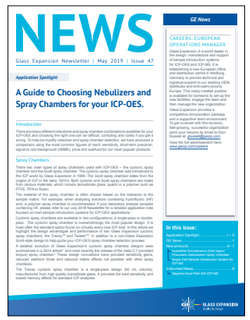
- Over 40 years of expertise
- Fully equipped R&D ICP Laboratory
- Technical team
- Application notes
- Industry News (***NEW***)
- Plasma Professor (***NEW***)
- Catalogs (***NEW***)
- Product flyers
- Website
- Product care advice
- Operating instructions
- Videos



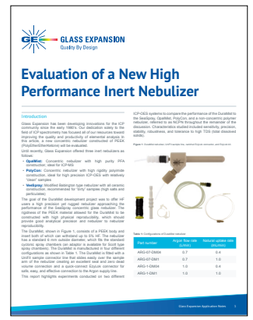
Plasma Professor

Flyers

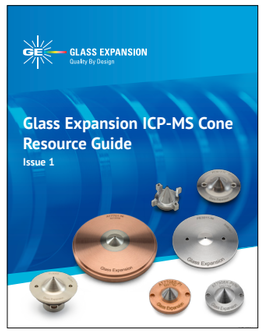


Newsletters

Instructions



Application Notes



Catalogs

Website

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Guardian Autosampler Probe

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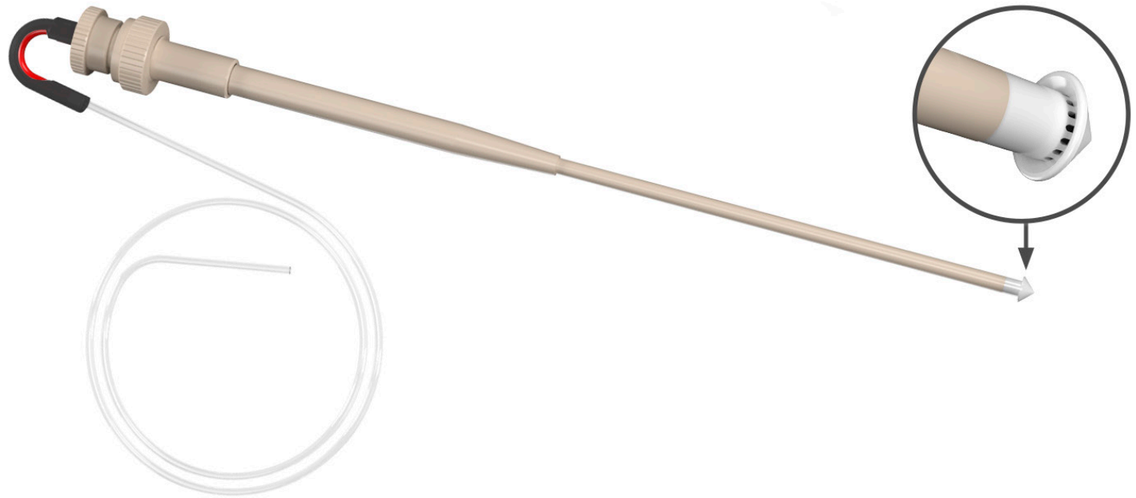
Key Features:

- **Enhanced surface finish** reduces residual carryover between samples
- **Robust tip design** helps prevent crushed or damaged tips from misalignment.
- **Drip-resistance** to minimize cross-contamination, especially with oils.
- **Unique inbuilt particle filtering** prevents blockages in your nebulizer and capillary tubing.
- **Optimized ceramic filter tip** to minimize dripping and particulate blockages.
- **Completely inert construction** (Ceramic, PEEK, and PTFE) for strong acid/solvent resistance.



Guardian Probe for SPS3, SPS4, SPS6, & AIMS

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Guardian Autosampler Probe

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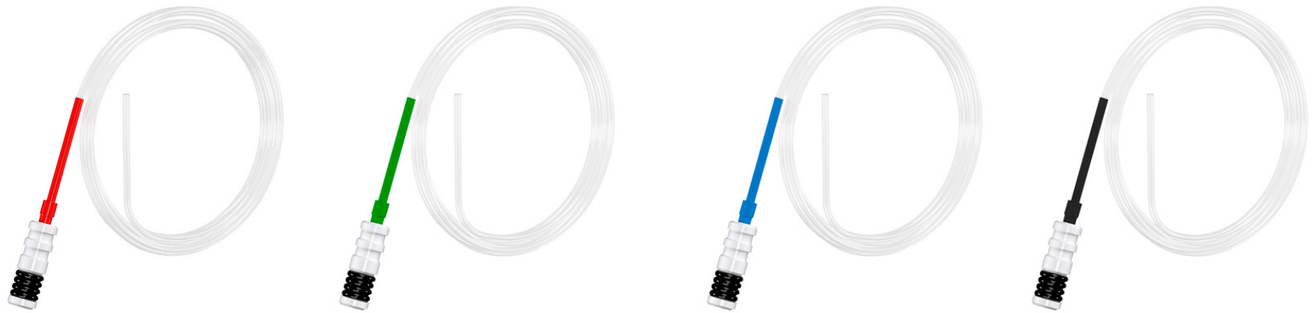

- Interchangeable UniFit™ sample lines IDs: 0.3, 0.50, 0.75 and 1.0mm - Easy to replace and maintain clean sample path.

Part Number	Description
70-803-1803	Guardian Probe Cetac ASX-200, 500, 800, 0.75mm Probe Connecting Line (Red)
70-803-1957	Guardian Probe for SPS3, SPS4, AIMS, 0.75mm Probe Connecting Line (Red)
70-803-2097	Guardian Probe for PerkinElmer S20 Series, 0.75mm Probe Connecting Line (Red)
70-803-2851	Guardian Probe for PerkinElmer S10, 0.75mm Probe Connecting Line (Red)
70-803-2836	Guardian Probe for PerkinElmer AS93, 0.75mm Probe Connecting Line (Red)
70-803-2872	Guardian Probe for Shimadzu AS-10 & AS-20 with Arm Assembly, 0.75mm Probe Connecting Line (Red)
70-803-2940	Guardian Probe for Cetac ASX-7400, 7600, 0.75mm Probe Connecting Line (Red)
70-803-2106	Guardian Probe for Thermo ISC-65, 0.75mm Probe Connecting Line (Red)

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Rinse Protocols

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- Start each analysis by nebulizing a mildly acidic blank and verify blank readings
- Ensure the rinse solution matches your sample matrix
- Rinse between samples
  - Can opt for “smart rinse” if software feature is available
- End each analysis with an automated rinse sequence
  - Nebulizing a dilute laboratory grade cleaning solution like Fluka RBS-25 for 5 mins
  - Followed by a mildly acidic blank for 5 mins
  - End with DIW for 5 mins

Regular Maintenance

- Inspect peristaltic pump tubing - replace daily for ideal performance
- Clean nebulizer, spray chamber, and torch regularly (cones as needed)
- Check the condition of windows, seals, gaskets and replace as needed
- Establish cleaning and replacement intervals

General Tips: Nebulizer Maintenance

1. Eluo Nebulizer Cleaner

Why use it?

- **How it helps:** Safe, controlled cleaning using a controlled stream of liquid
- Extends nebulizer life and maintains consistent performance
- Use mildly acidic solution or dilute RBS-25 for initial flush, can soak over night and back flush with DI water
- **DI Water and methanol alone are not sufficient cleaning solutions**

P/N 70-ELUO

P/N 70-ELUO-OPD

2. Magnifier Inspection Tool

Why use it?

- Nebulizer tips and sample introduction components are tiny and hard to inspect
- Salt deposits or physical damage may go unnoticed until performance drops
- **How it helps:** Provides a clear, close-up view of nebulizer or injector tips
- Quickly identify wear, blockages, or salt build-up before issues escalate

Magnifier Inspection Tool
P/N 70-803-1923

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General Tips: Spray Chamber Maintenance

Suggestions:

- **Do not:** use HF, sonicate, nor use metal or ceramic brushes.
- **Daily cleaning:** Start and end analysis by nebulizing mildly acidic blank followed by DI water.
- **Initial cleaning:** Nebulize 2.5% Fluka RBS-25 for 15 mins followed by DI water.
- **Thorough cleaning:** Overnight soak in 25% Fluka followed by DI water rinse.
- Check Helix CT seal and UniFit drain line, replace as needed.

Important note: Our glassware nebulizers, spray chambers, and torches are supplied clean and ready to use.

Soak in 25% Fluka RBS-25

Replace Helix CT seal,
e.g. **P/N 70-803-1456**

Replace UniFit drain line,
e.g. **P/N UFT-16-75**

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PCC™ Kit for Enhanced Washout

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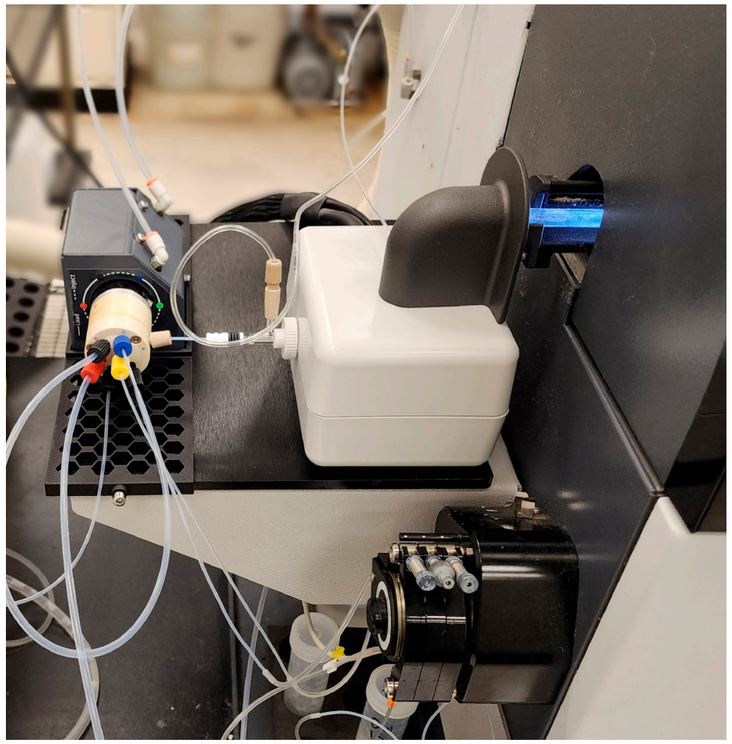
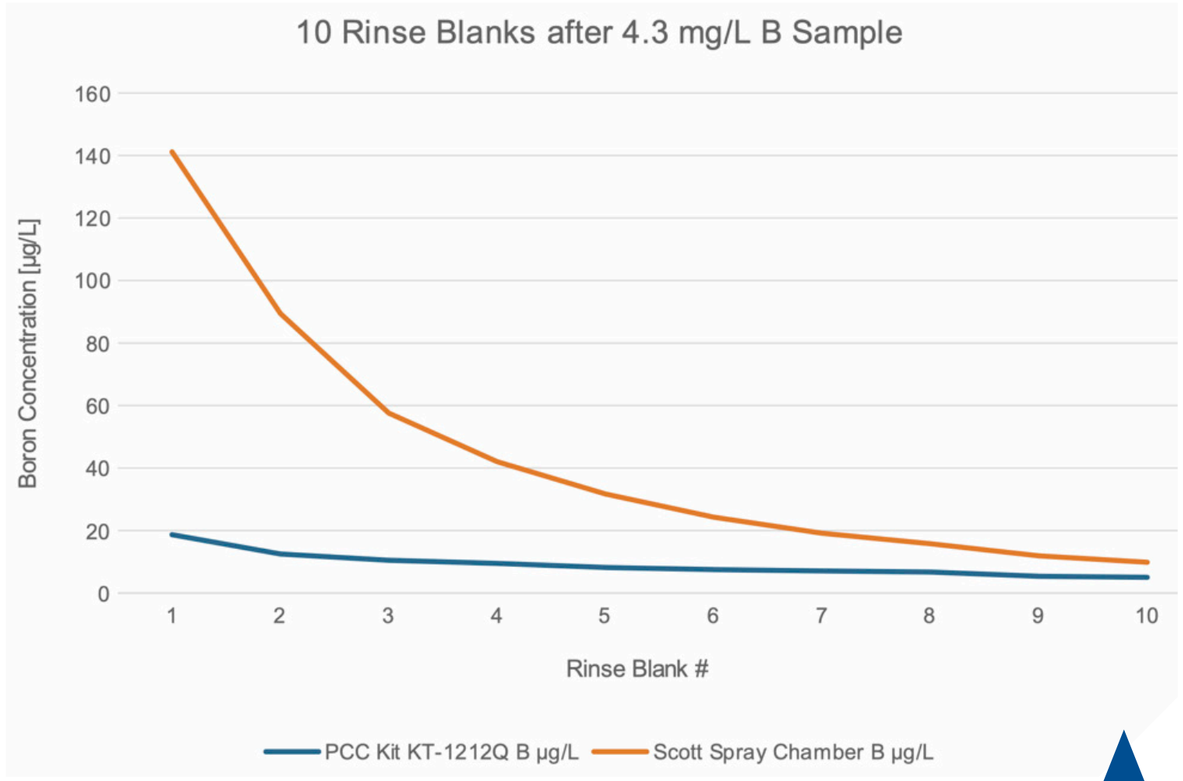
✓ In this example, a **61% improvement** in B washout time, resulted in a much higher throughput and much lower potential for any carryover.

Scott Style Spray Chamber



PCC Kit (KT-1212Q)



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Tracey™ BC Spray Chamber

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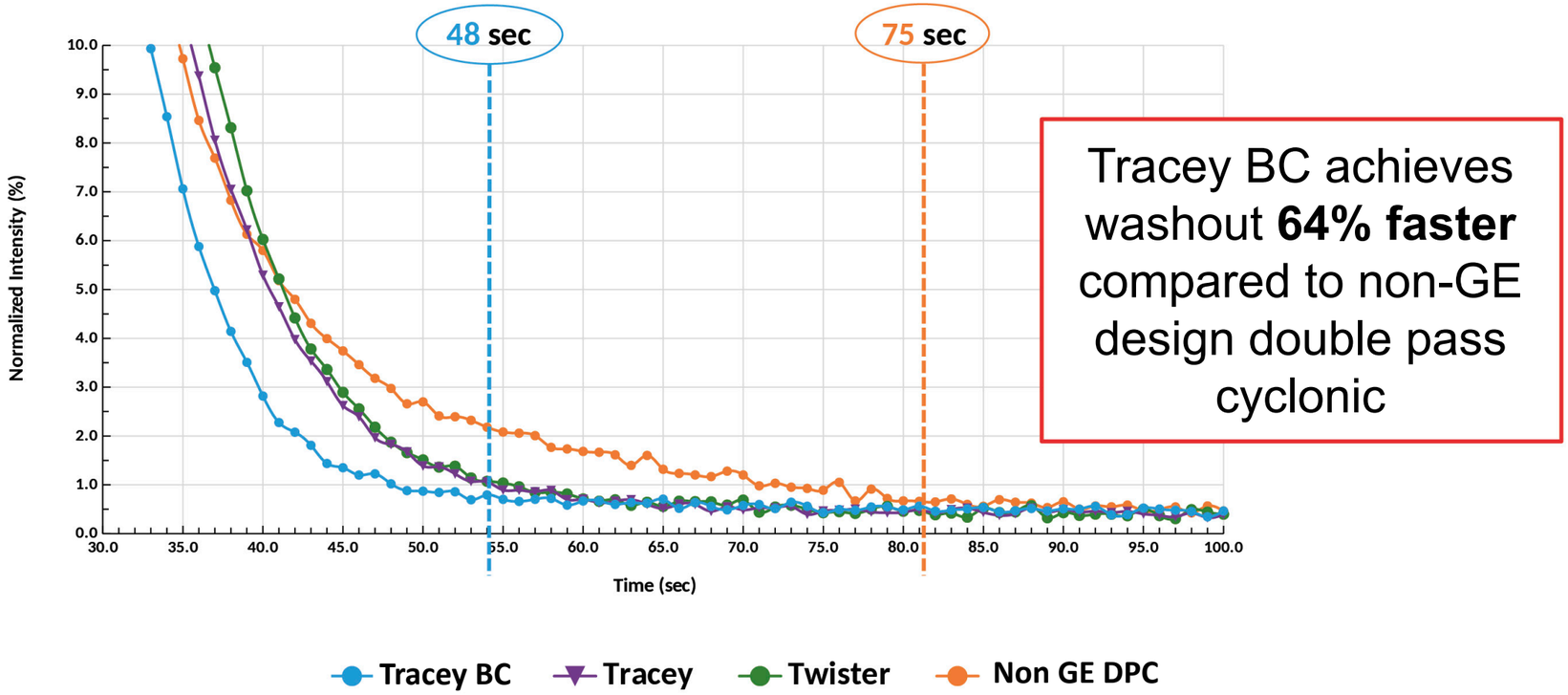
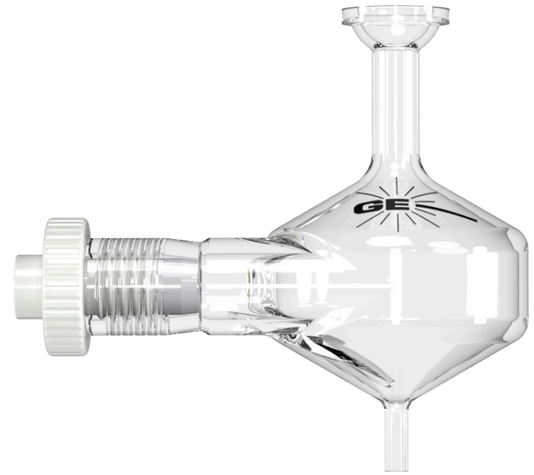
Washout Profiles for 1 ppm Hg:



Tracey BC achieves washout **64% faster** compared to non-GE design double pass cyclonic



Tracey™ BC Spray Chamber

- **Efficient Washout:** 30mL low-volume cyclonic chamber with Helix CT technology.

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High Purity PCC™ Kit

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Element	Standard Inert Kit	GE PFA PCC Kit
	Detection Limit (ppt)	Detection Limit (ppt)
Aluminum	8.20	0.19
Boron	10.7	3.15
Calcium	14.4	4.12
Potassium	8.00	0.52
Magnesium	9.11	0.05
Sodium	30.9	0.05

KT-1116P

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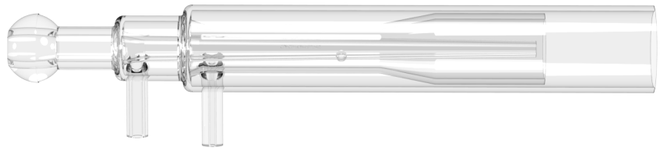
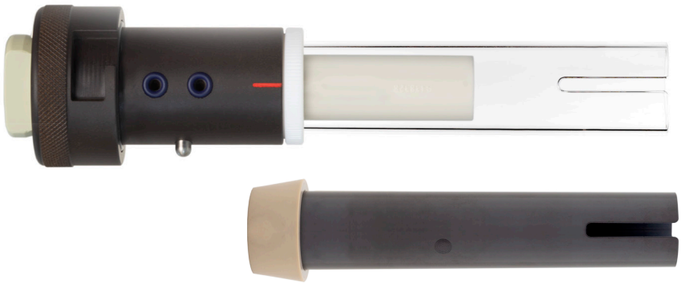
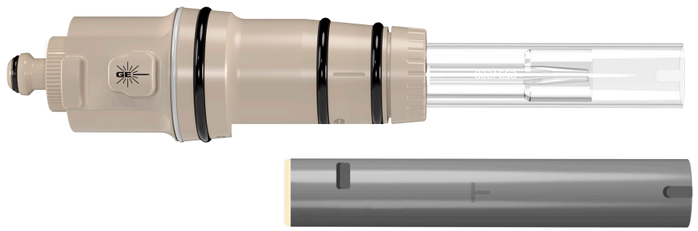
Torch Selection







ICP Torch Designs:

1. Single piece quartz torch:

General use torch: Lower initial cost structure with no removable parts

2. Semi-demountable torch:

Enables injector interchangeability without torch replacement and easier maintenance

3. D-Torch:

Removable: injector, outer tube (optional ceramic)

4. E-Torch:

Removable: injector, torch body (optional ceramic)

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High Purity Semi-demountable Torch

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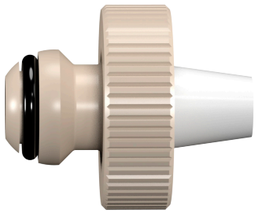

Injector Adaptor

Interchangeable Injectors

High Purity Quartz Torch Body

*** Platinum injector** for ultra-trace analysis of ultra-pure HF-containing, semiconductor-grade process chemicals, solvents, and other demanding applications where the lowest detection limits for Al, Si, B, Na, K etc. are necessary.

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Ceramic Outer Tube

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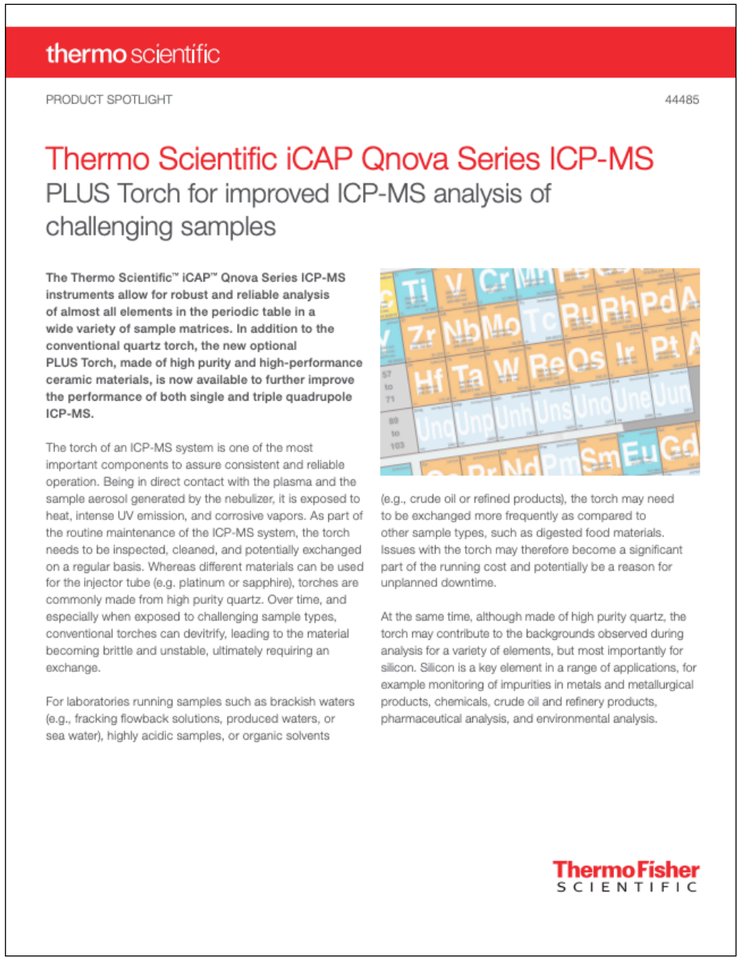

thermo scientific

PRODUCT SPOTLIGHT 44485

Thermo Scientific iCAP Qnova Series ICP-MS

PLUS Torch for improved ICP-MS analysis of challenging samples

The Thermo Scientific™ iCAP™ Qnova Series ICP-MS instruments allow for robust and reliable analysis of almost all elements in the periodic table in a wide variety of sample matrices. In addition to the conventional quartz torch, the new optional PLUS Torch, made of high purity and high-performance ceramic materials, is now available to further improve the performance of both single and triple quadrupole ICP-MS.

The torch of an ICP-MS system is one of the most important components to assure consistent and reliable operation. Being in direct contact with the plasma and the sample aerosol generated by the nebulizer, it is exposed to heat, intense UV emission, and corrosive vapors. As part of the routine maintenance of the ICP-MS system, the torch needs to be inspected, cleaned, and potentially exchanged on a regular basis. Whereas different materials can be used for the injector tube (e.g. platinum or sapphire), torches are commonly made from high purity quartz. Over time, and especially when exposed to challenging sample types, conventional torches can devitrify, leading to the material becoming brittle and unstable, ultimately requiring an exchange.

For laboratories running samples such as brackish waters (e.g., fracking flowback solutions, produced waters, or sea water), highly acidic samples, or organic solvents (e.g., crude oil or refined products), the torch may need to be exchanged more frequently as compared to other sample types, such as digested food materials. Issues with the torch may therefore become a significant part of the running cost and potentially be a reason for unplanned downtime.

At the same time, although made of high purity quartz, the torch may contribute to the backgrounds observed during analysis for a variety of elements, but most importantly for silicon. Silicon is a key element in a range of applications, for example monitoring of impurities in metals and metallurgical products, chemicals, crude oil and refinery products, pharmaceutical analysis, and environmental analysis.

ThermoFisher SCIENTIFIC

A significant improvement of the resulting backgrounds and, subsequently, the achievable detection limits can be observed for silicon.

"We are extremely pleased with the performance of the ceramic torches. With our instrument use and high matrix (salinity) samples, we were going through 3 or 4 torches a month at times for $200+ each... so the increased upfront cost equals a definite savings..."

- Environmental Laboratory

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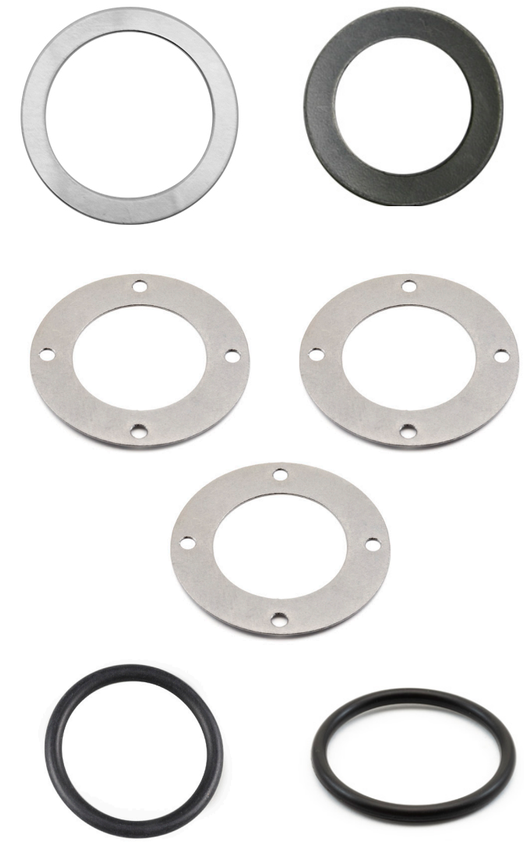
General Tips: ICP-MS Cones



Suggestions:

- Always check gaskets or O-rings before installing cones

Cone Conditioning:

- To ensure the lowest background levels of Cu and Ni, conditioning before use is recommended for **uniform coating that leads to improved long-term stability.**
- To condition your cones, prepare the following conditioning solutions:
  - 1% nitric acid blank
  - 50ppm calcium in 1% nitric acid
- Install the new cones or cleaned cones into the instruments. Turn on the plasma.
  - **Aspirate the 50ppm calcium solution for 10 minutes**
  - **Change to 1% Nitric acid blank solution and aspirate for a further 10 minutes**

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General Guidelines on Cone Material

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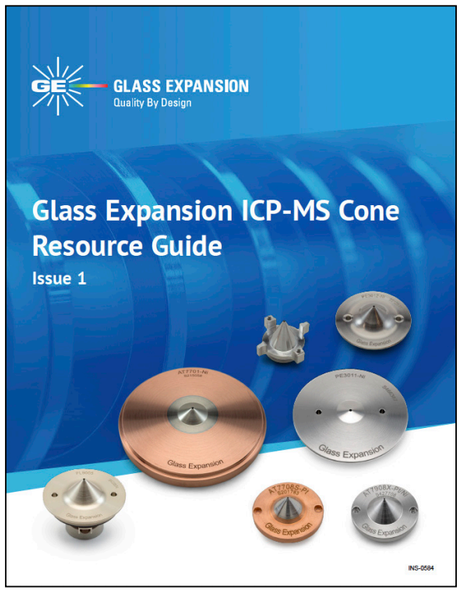
Nickel Cones:

- **Balanced cost & performance;** standard for many applications
- Good **thermal & chemical resistance;** less prone to corrosion and deposition
- Runs hotter than copper, stays cleaner for longer, more stable signals
- Suitable for **routine aqueous samples** (<5% acid, non-HF, non organic)

Platinum Cones:

- **Most durable, longest-lasting,** but **highest cost**
- Excellent **chemical resistance** — ideal for **high-matrix, high-acid,** or **organic solvent** samples
- Available with **copper, nickel-plated, or solid nickel bases** to balance heat transfer and resistance
- **Larger platinum tips** (10-18mm) significantly extend cone life
- **Least efficient** heat transfer → runs **hotter, <u>stays cleaner longer</u>**
- Can be **refurbished 2-3 times** and **recycled** for reclaim value toward future purchases



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Tools to Minimize Interuption

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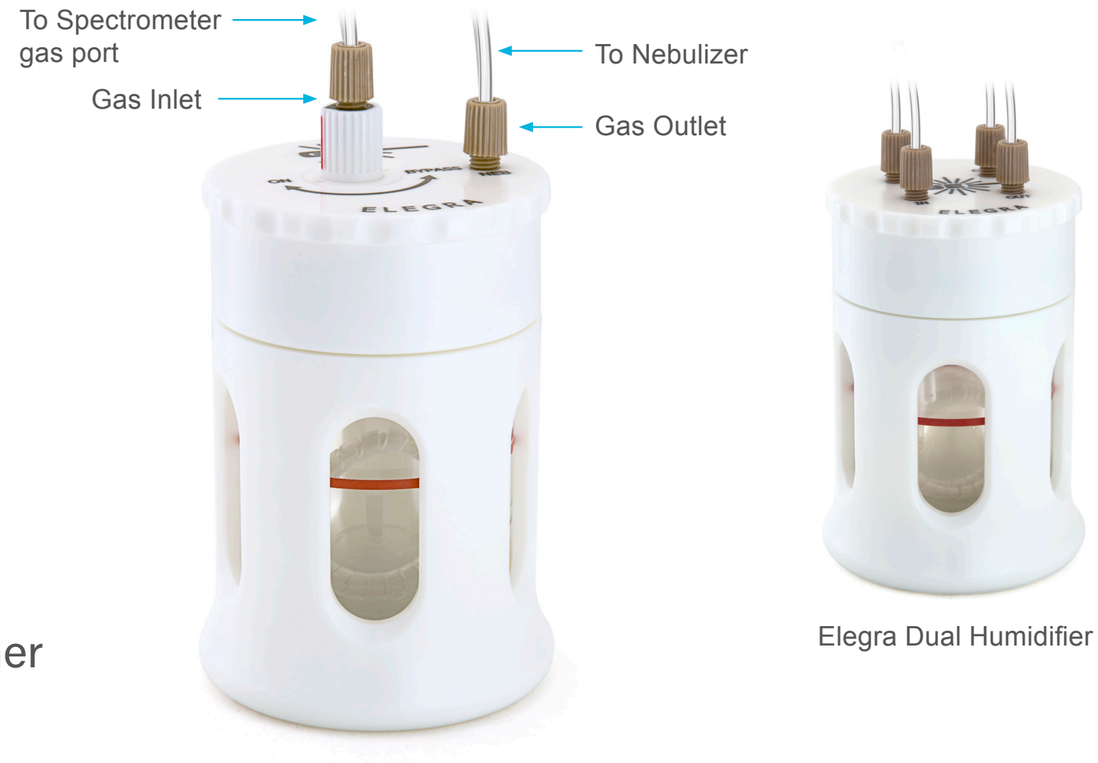
Elegra Argon Humidifier:

Features:

- No heating or electric power required
- Membrane humidification technology
- Improved signal stability for samples with high TDS
- Inert metal free construction
- Dual-Channel version (ICP-MS)

Other tips for high TDS:

- Increasing the auxiliary argon flow will lift the plasma higher off the injector, slowing salt buildup at the injector tip.
- Extended rinses in between each sample.



Elegra Dual Humidifier

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Improve Stability and Reduce Downtime

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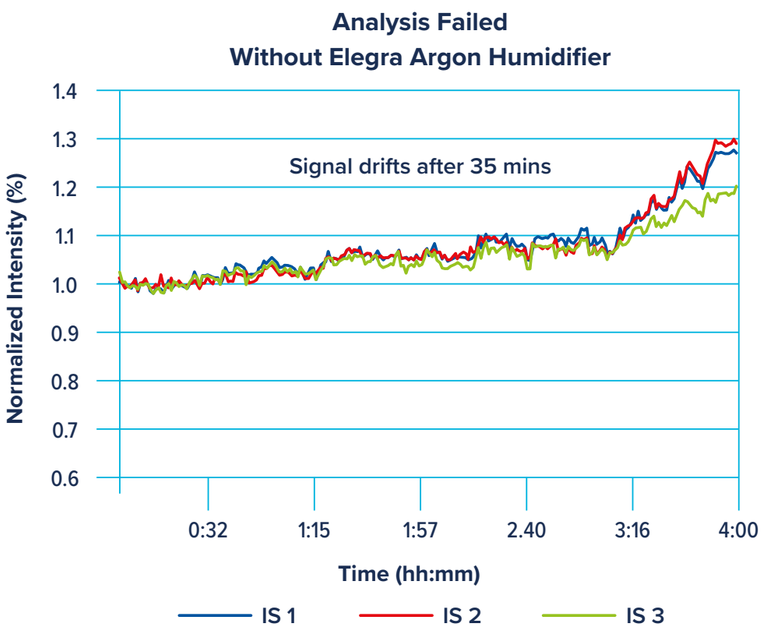
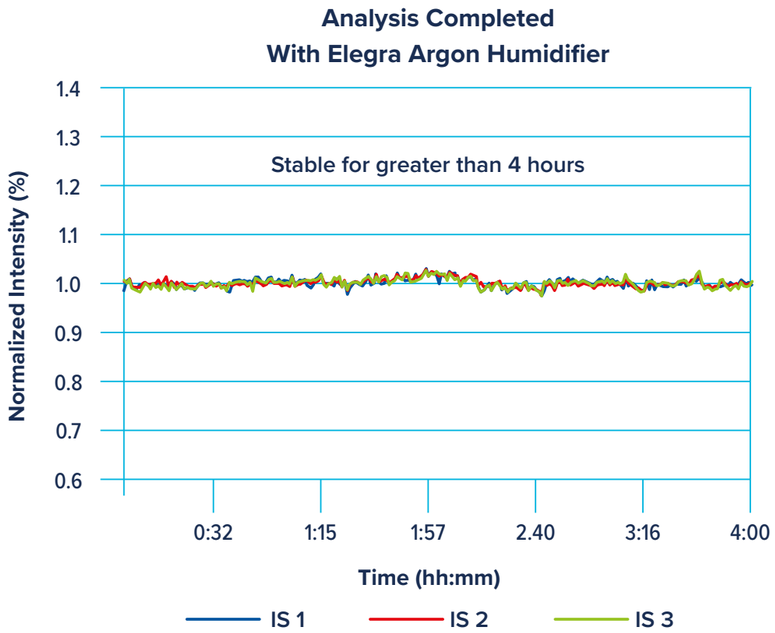
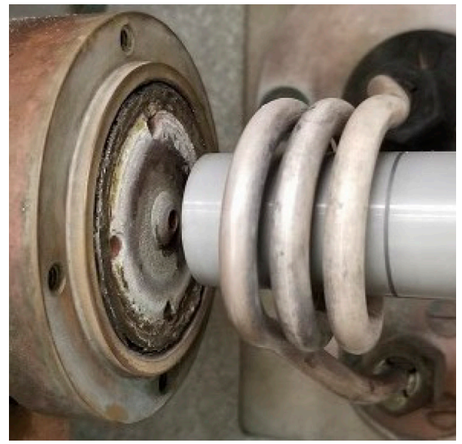
Internal Standard for Three Lines - Stability in 0.5% Lithium Metaborate:

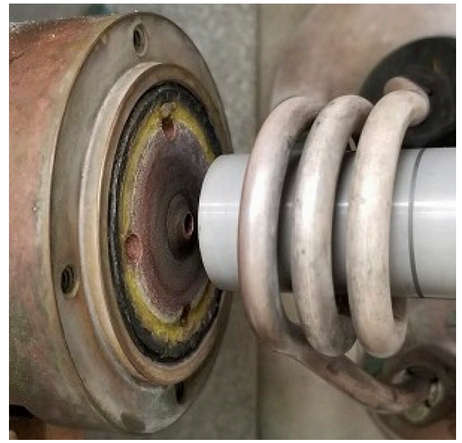




Without Elegra:



With Elegra:



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Want a FREE review of your Sample Introduction System?

Please contact us by email (geusa@geicp.com) to:

- Optimize your sample introduction system components.
- Identify performance enhancing accessories available for your ICP.
- Discuss any sample introduction challenges.
- Explore ways to reduce operating costs.
- Obtain quotes.

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Thank You

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