

Glass Expansion “Lunch and Learn”

2026 Winter Conference on Plasma Spectroscopy



Ryan Brennan, Ph.D.
President
Glass Expansion, Inc.



Justin Masone
Sales Manager
Glass Expansion, Inc.

Agenda

12:00 pm – 12:45 pm: Presentation

12:45 pm – 1:00 pm: Q&A / discussion

Topics for Discussion

- **Introduction:** Who is Glass Expansion?
- **Fundamentals:** The Role of the Sample Introduction System (SIS)
- **Selection Guidelines:** How to Select the Optimal SIS
- **Helpful Accessories:** Specialized Accessories for “Real World” Samples
- **Innovation Spotlight:** New Product Highlights
- **Resources & Support:** Where to find more information and technical help

Who is Glass Expansion?

Glass Expansion is a unique group of enthusiastic people who on a daily basis, work on new frontiers of science and technology.

- Formed in 1983
- World leaders in sample introduction components for ICP-OES and ICP-MS focused on:
 - Quality by design
 - Value
 - Analytical performance
 - Better usability
- OEM to every major ICP-OES and ICP-MS manufacturer
- Approximately 100 staff
- Locations Worldwide (Australia, United States, and Germany)



Email us at: geusa@geicp.com

Products Offered

- Autosampler Probes
- Pump Tubing
- Nebulizers
- Spray Chambers
- Torches
- Cones
- RF Coils
- Fittings, Connectors, & Adaptors
- Performance Enhancing Accessories



Manufacturers Supported

- Agilent Technologies®
- Analytik Jena
- GBC Scientific
- Hitachi
- Horiba
- Nu Instruments
- PerkinElmer®
- Shimadzu®
- SPECTRO (Ametek)
- Standard BioTools™ (Fluidigm)
- Teledyne CETAC
- Teledyne Leeman
- Thermo Fisher Scientific™

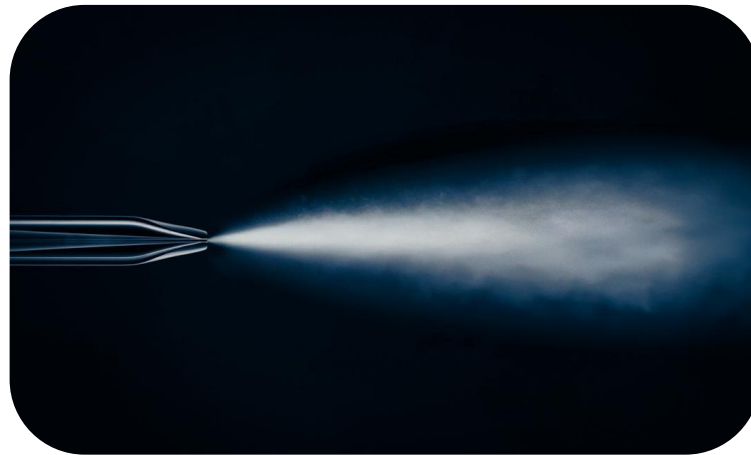
Support and Customer Service

Information for the ICP user:

- Application Notes
- E-News
- Catalogues
- Product Flyers
- Website
- Product care advice
- Operating instructions
- Videos
- Warranty



The Fundamentals of Sample Introduction



Why is sample introduction important?

95% of analytical problems occur within the sample introduction configuration



The sample introduction system has historically been called
“The Achilles’ heel of ICP”

Common Problems for the ICP Analyst

- Clogged nebulizers and injectors
- Torch devitrification
- Destabilization of plasma
- Increased oxide formation
- Long washout times
- Carryover
- Long stabilization times
- Signal suppression
- Signal drift
- Poor precision (RSDs)
- Carbon build-up
 - Orifice occlusion (on injector, cones)
 - Signal drift
 - Carbon-based polyatomic interferences

The solution to each of these problems lies within the sample introduction system

Importance of Optimizing Your SIS

The default or standard configuration that your instrument ships with is often not the best for your application.

“Optimize” can mean many things, so it is important to determine the needs of your system, such as:

- Maximum sensitivity
- Improved precision
- Robustness for “high matrix” samples
- Minimal carryover
- Improved washout for high throughput
- Considerations for low sample volume (e.g., low-flow neb, low-volume spray chamber, etc.)
- Compatibility with certain acids or solvents
- The list goes on...

Key Components of the Sample Introduction System

The primary purpose of the SIS is to generate a consistent aerosol containing fine droplets

The key components of an SIS include:

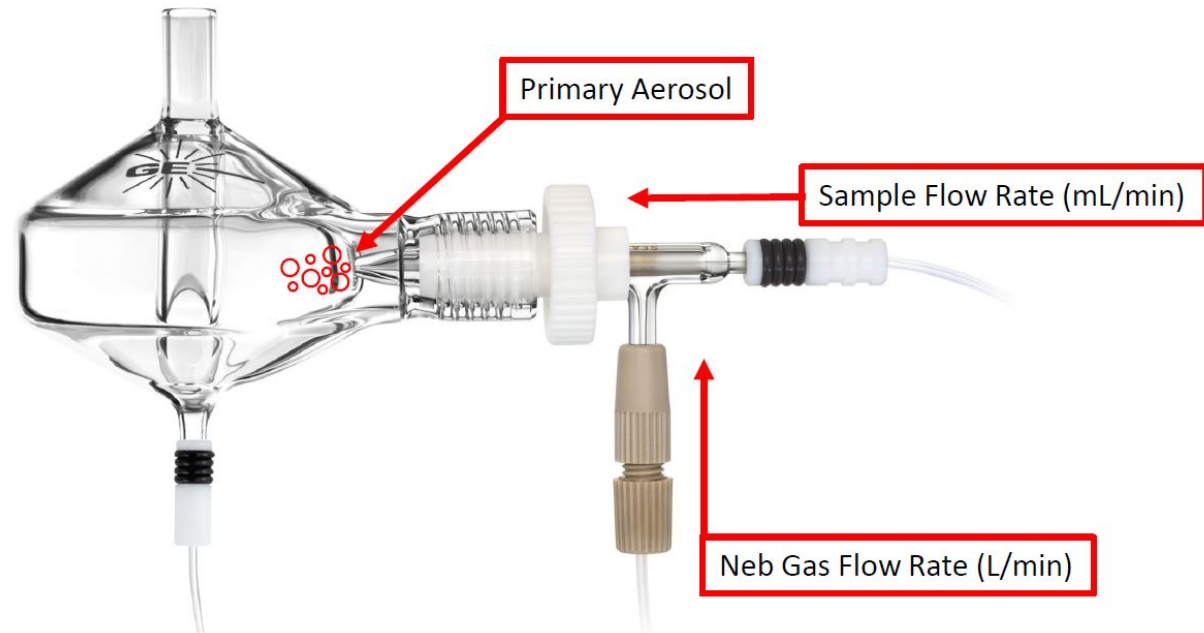
- Sample probe (manual or autosampler)
- Peristaltic pump tubing
- Nebulizer
- Spray chamber
- Torch and injector
- RF coil
- Cones (ICP-MS)



Basics of Aerosol Generation

Quality of Aerosol \propto Quality of Results

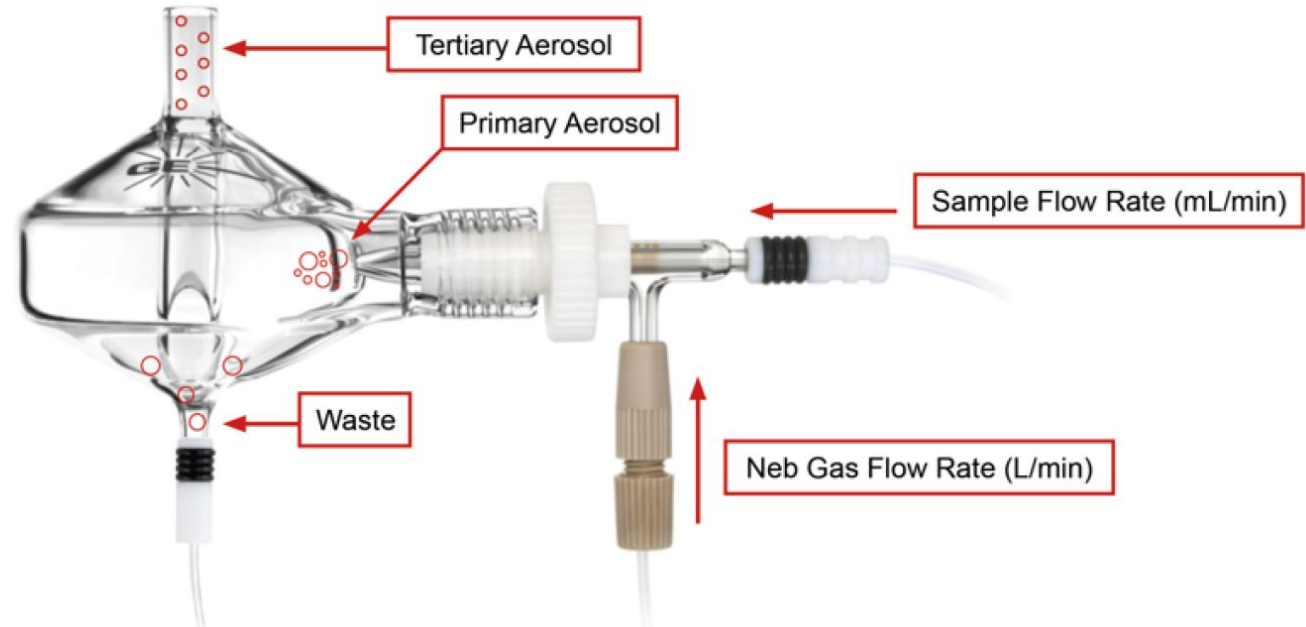
- Primary Aerosol produced by Nebulizer.
- Droplet size decreases as the argon gas velocity increases and sample liquid flow rate decreases.
- High argon flow and pressure combined with low sample flow rate yields the smallest droplet size.
- For high transport efficiency you want a higher concentration of droplets with a diameter $<10\ \mu\text{m}$.



Basics of Aerosol Generation

Quality of Aerosol \propto Quality of Results

- Tertiary Aerosol “filtered” by Spray Chamber, $<10 \mu\text{m}$.
- Smaller and more uniform droplet size requires less Energy from the plasma.
- Desolvation \rightarrow Vaporization \rightarrow Atomization \rightarrow Ionization \rightarrow Detector Signal.
- Less energy required, results in a more robust plasma condition.



Nebulizer

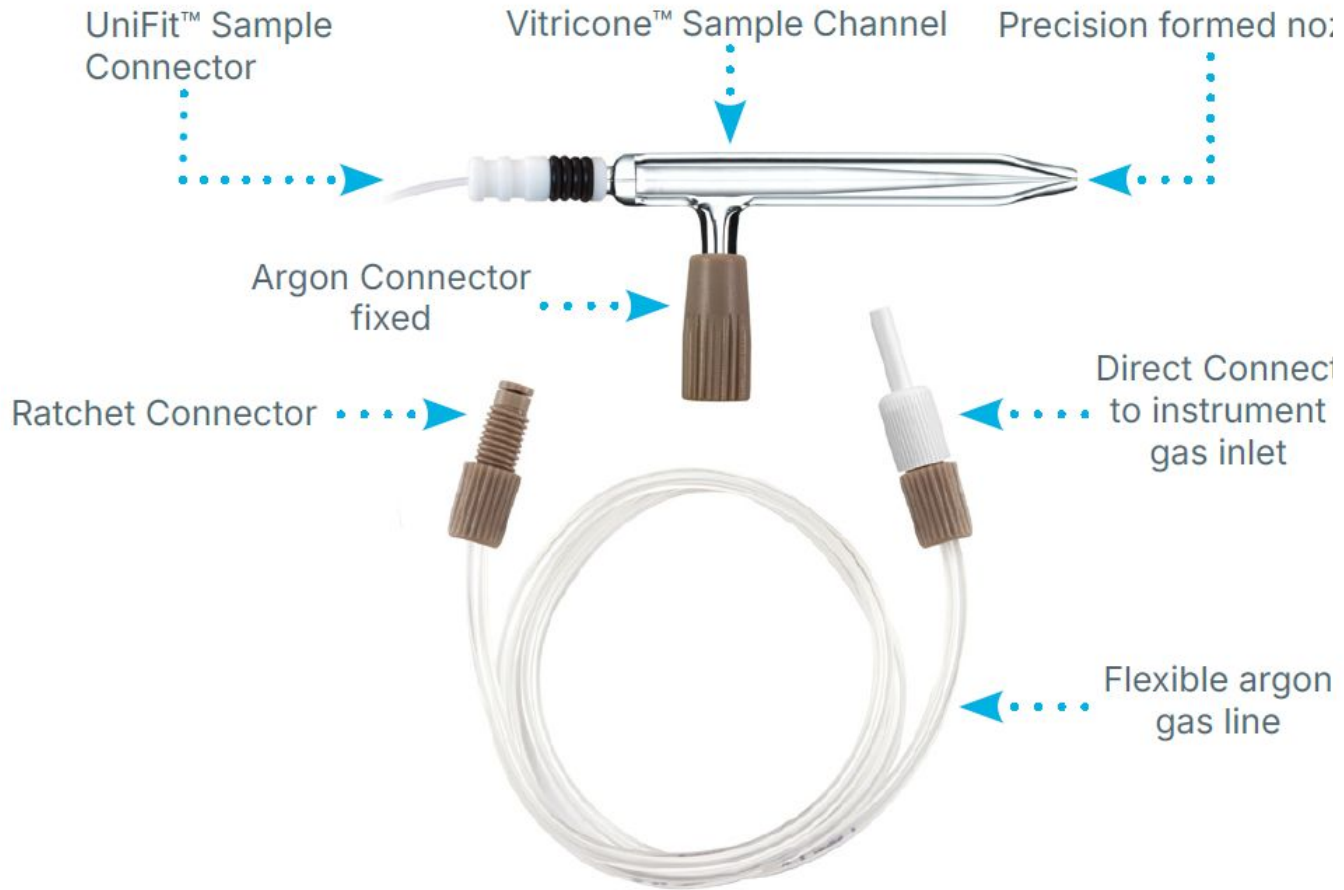
The core function of a nebulizer is to deliver liquid samples into the plasma, where intense heat/energy—around 6000-10,000 K—atomizes and ionizes analytes for detection



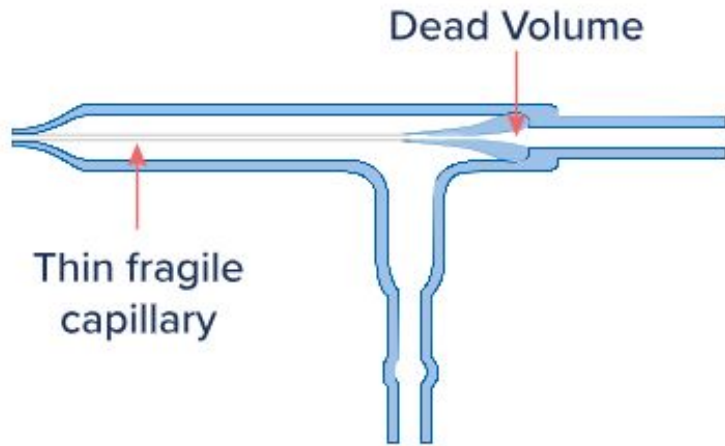
At the most fundamental level, effective nebulization is characterized by smaller droplet sizes and narrower distributions, as these factors determine how much of the sample reaches the plasma without overloading it—the plasma can only tolerate limited liquid loading before cooling or extinguishing it.

More sample ≠ better results

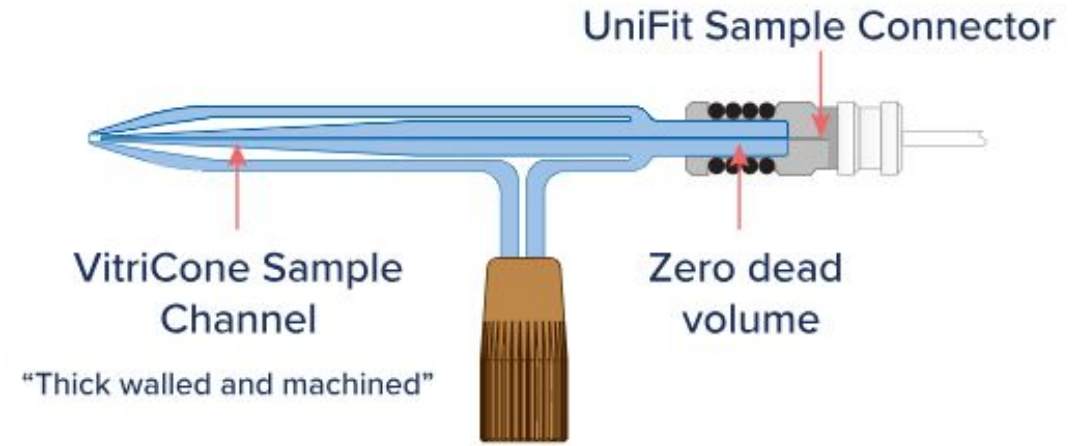
Components of a Modern Nebulizer



VitriCone™ Construction



Other brands



Glass Expansion nebulizer

VitriCone™ Construction

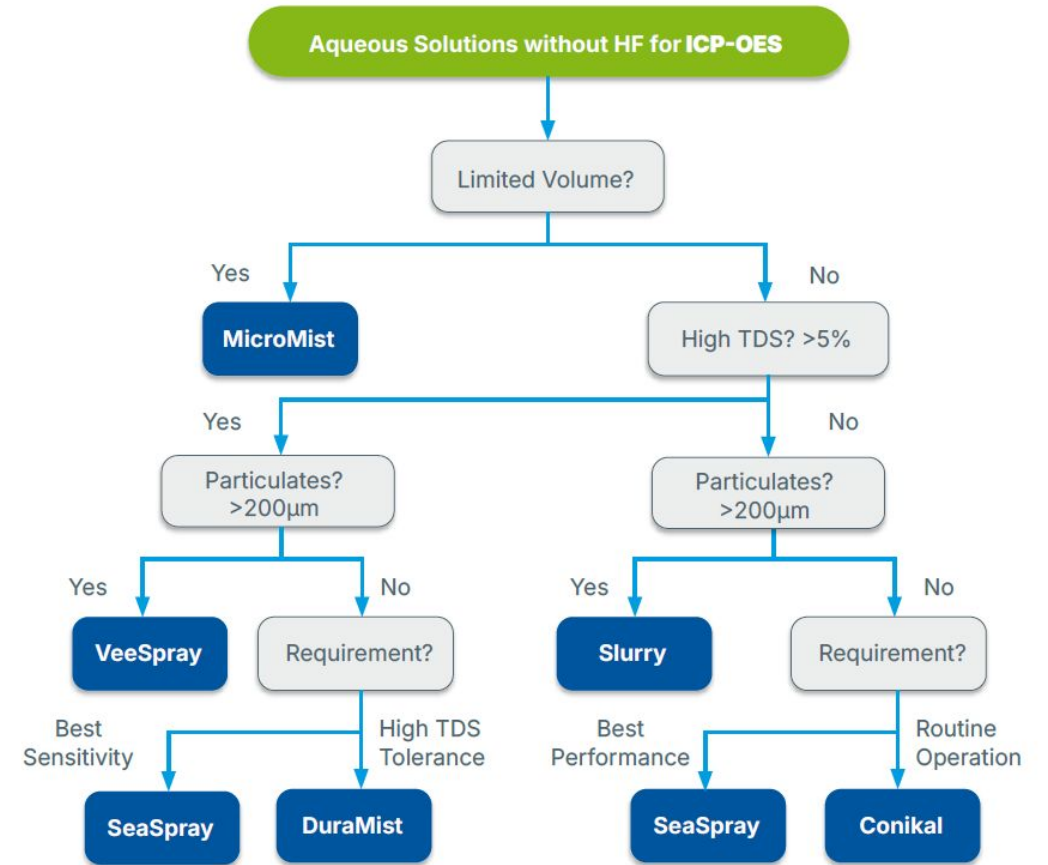
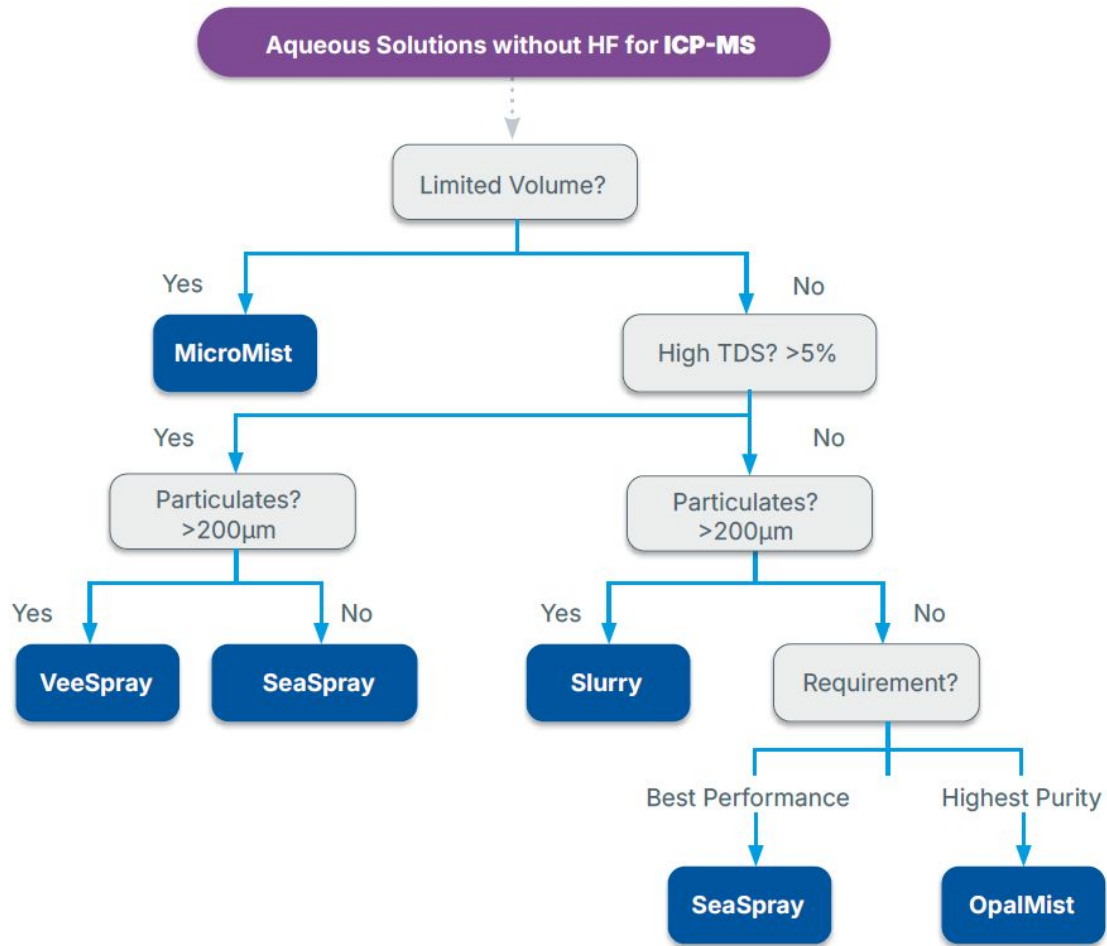
With some brands of glass concentric nebulizers, the sample channel is constructed from drawn-out capillary tubing. The problems with this type of construction are:

- The tube is tapered, encouraging salt deposition as the tube narrows.
- The tubing is very fragile and easily broken.
- The tubing can vibrate under the influence of the high-speed argon flow, leading to poor precision.
- It is very difficult to reproduce the same performance with different nebulizers.

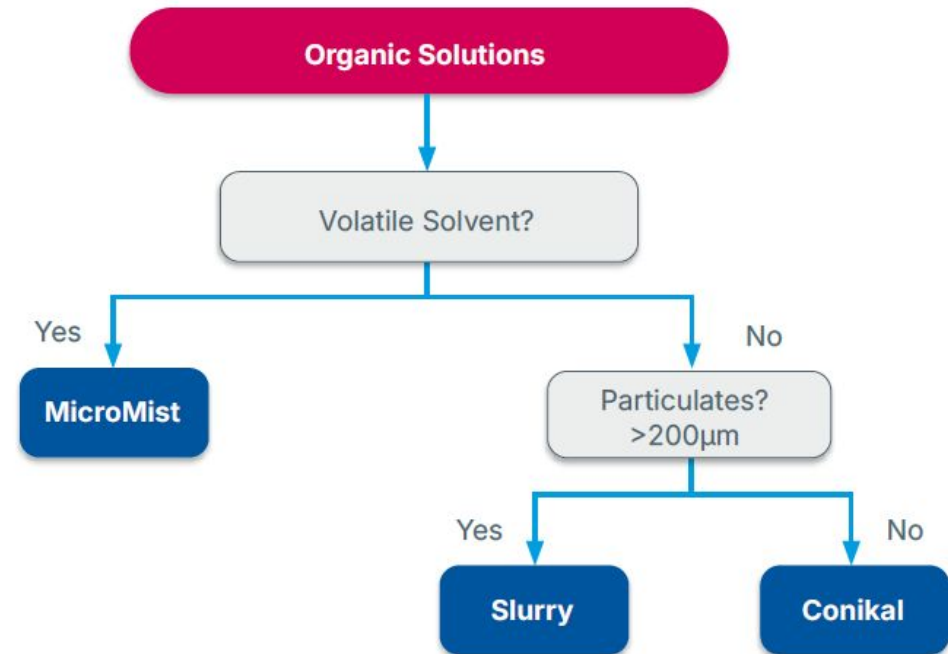
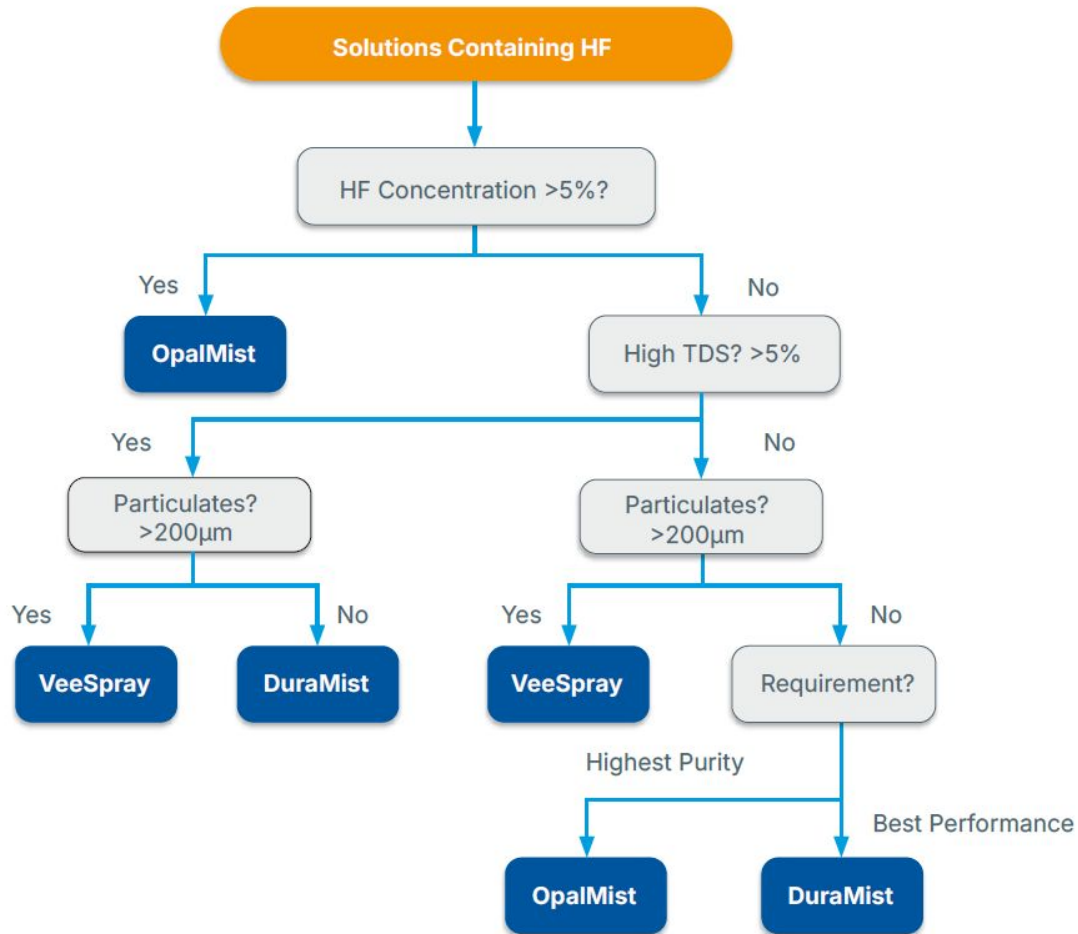
All Glass Expansion concentric glass nebulizers use the unique VitriCone construction for the sample channel. With the VitriCone design, the sample channel is constructed from a heavy glass capillary which is machined to very high tolerances. The benefits of the VitriCone construction are:

- The sample channel is guaranteed uniform and thus resistant to clogging.
- The rugged precision machined capillary resists vibration and delivers the best possible precision.
- The industry's tightest tolerances ensure that each nebulizer will perform to the same high standards as the previous one.









Nebulizer Selection Criteria



Nebulizer Selection Criteria



Nebulizer Selection

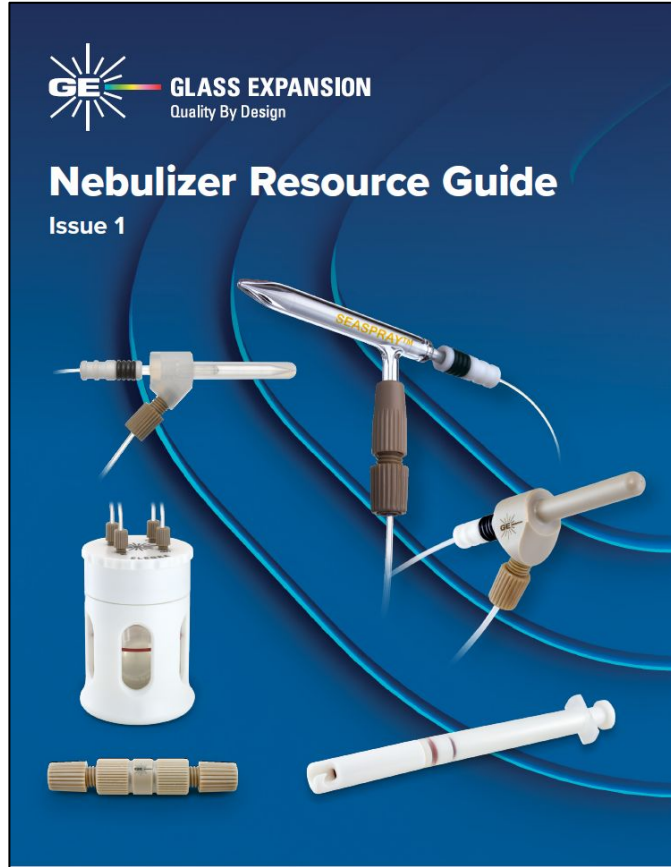
Nebulizer	Dead Volume V_0 (μL)	TDS (%)	Particulates (μm)	HF	Precision	Purity	Material
SeaSpray™ 	4	20	*200	No	High	Good	Glass
MicroMist™ 	1	15	*100	No	High	Good	Glass
Conikal™ 	5	5	210	No	High	Good	Glass
Slurry™ 	11	1	280	No	High	Good	Glass
Quartz SeaSpray™ 	5	20	210	No	High	Excellent	Quartz
OpalMist™ 	4	15	*200	Yes	High	Excellent	PFA
DuraMist™ 	4	30	*200	Yes	High	Good	PEEK
VeeSpray™ 	100	30	550	Yes	Moderate	Good	Ceramic

More Information: Nebulizer Resource Guide

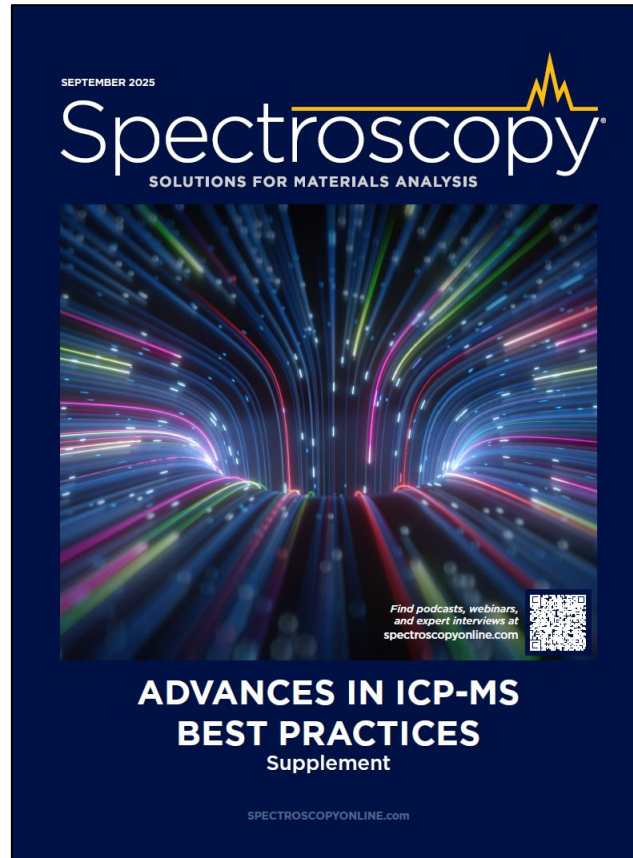
Just Released!

The new **Nebulizer Resource Guide** covers everything you need to know about nebulizers, including:

- Information about design and construction
- The different nebulizers manufactured by Glass Expansion
- Selection guide
- Accessories
- Maintenance procedures
- Complete troubleshooting guide



More Information: Spectroscopy Supplement



FEATURED ARTICLE

The Role of the Nebulizer in ICP-MS: Design Considerations, Selection Criteria, and Optimization Guidelines

Justin Masone

Nebulizers play a pivotal role in the sample introduction systems of inductively coupled plasma mass spectrometry (ICP-MS), a technique that has revolutionized elemental analysis since its development in the early 1980s. Primarily designed for liquid samples, which constitute the majority of ICP-MS applications, nebulizers convert solutions into fine aerosols that can be transported to the plasma for desolvation, atomization, ionization and detection. However, the sample introduction system—encompassing the nebulizer and spray chamber—has long been regarded as the “Achilles’ heel” of ICP-MS (1). This stems from its inherent inefficiency, where typically only 1-2% of the sample reaches the plasma, with the remainder lost to waste. Despite these limitations, advancements in nebulizer technology have significantly mitigated such issues, contributing to improved transport efficiencies and analytical outcomes.

The core function of a nebulizer is to deliver liquid samples into the plasma, where intense heat/energy—around 6000-10,000 K—atomizes and ionizes analytes for detection. Early designs focused on basic aerosol generation, but modern iterations prioritize precision, durability, and

compatibility with challenging matrices. This evolution has been driven by the need to handle diverse samples, from trace-level environmental waters to high-matrix industrial effluents, while minimizing matrix interferences and maximizing signal stability. By understanding nebulizer mechanics, analysts can optimize parameters like gas flow rates and sample uptake, directly influencing aerosol quality and instrument performance.

The Importance of Nebulizer Droplet Size and Transport Efficiency

At the most fundamental level, effective nebulization is characterized by smaller droplet sizes and narrower distributions, as these factors determine how much of the sample reaches the plasma without overloading it—the plasma can only tolerate limited liquid loading before cooling or extinguishing it. Ideally, the sample introduction system should deliver 40 $\mu\text{L}/\text{min}$ of water to the plasma or less, and exceeding 80 $\mu\text{L}/\text{min}$ can extinguish the plasma (2). Additionally, if droplets are too large, they will not desolve completely, significantly reducing plasma temperature and causing some elements to be released before others. This results in a higher signal for easily-ionizable elements (such as

Na, K, and Al, for example) as compared to poorly-ionizable elements (such as Hg, As, and Se, for example). Thus, consistent droplet size is critical for accurate analysis. While all nebulizers generate a wide distribution of droplet sizes, nebulizers which generate a more consistent and narrower distribution will lead to better sensitivity and precision, as droplets over about 10 μm do not fully vaporize.

It is important to differentiate between what is called the primary aerosol and the tertiary aerosol. The primary aerosol is the aerosol that is produced from the nebulizer (as seen in Figure 1), whereas the tertiary aerosol is the aerosol that exits the spray chamber (and transfer tube, if used) and is injected into the plasma. As previously mentioned, all nebulizers produce a wide range of droplet sizes, and spray chambers are necessary to remove these larger droplets, with the smaller droplets going to the plasma and the larger droplets going to waste. This ratio of the amount of sample volume entering the plasma to the amount that is initially aspirated by the nebulizer is referred to as transport efficiency and is typically estimated by measuring the volume of waste draining from the spray chamber versus the total sample uptake volume.

Spectroscopy

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Advances in ICP-MS Best Practices | September 2025



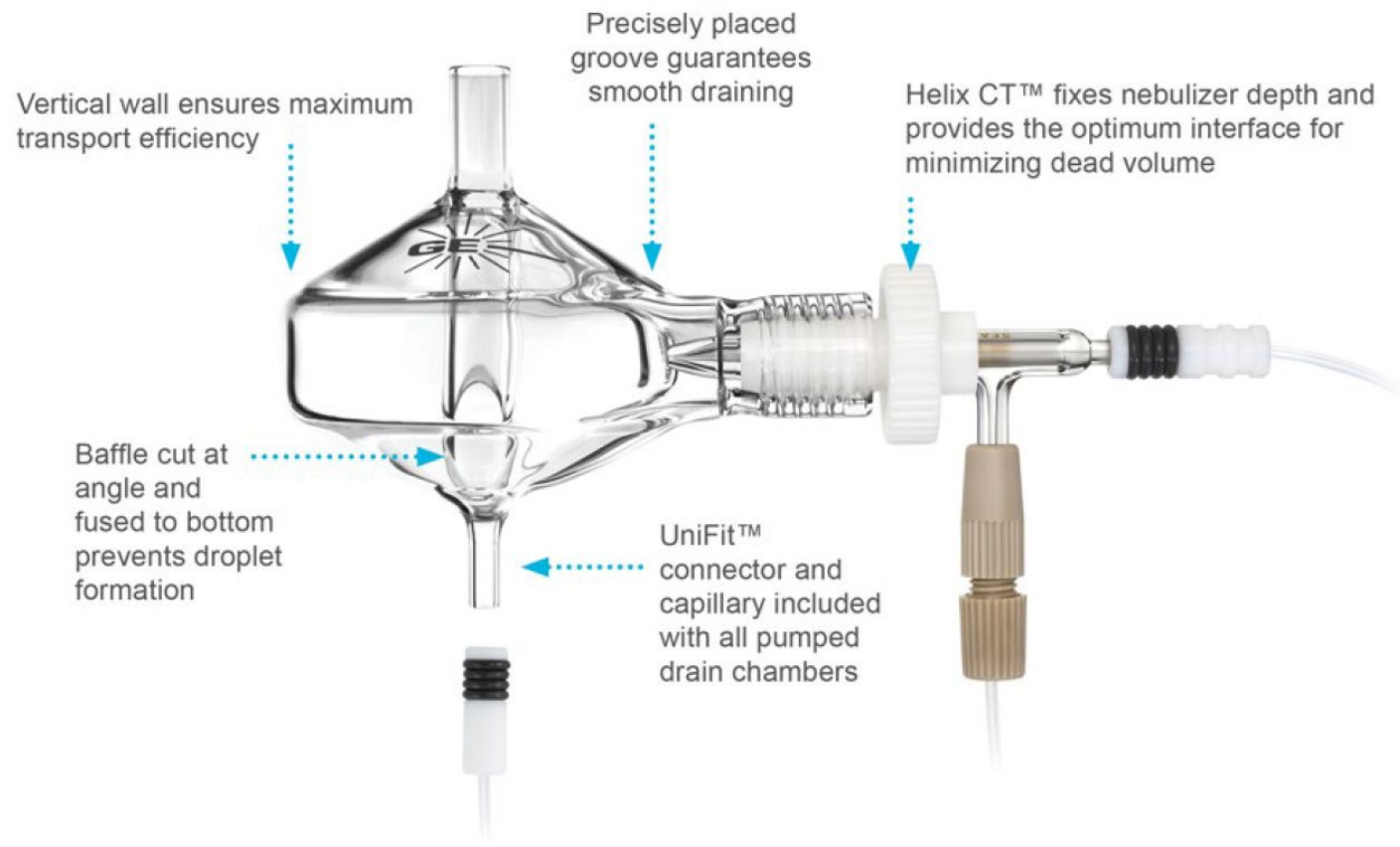
Spray Chamber

The core function of the spray chamber is to remove larger aerosol droplets produced by the nebulizer, allowing only fine droplets (typically $<8\text{--}10\ \mu\text{m}$) to reach the plasma for efficient atomization, excitation, and ionization while also helping to smooth out pulsations caused by the peristaltic pump and reduce signal noise.

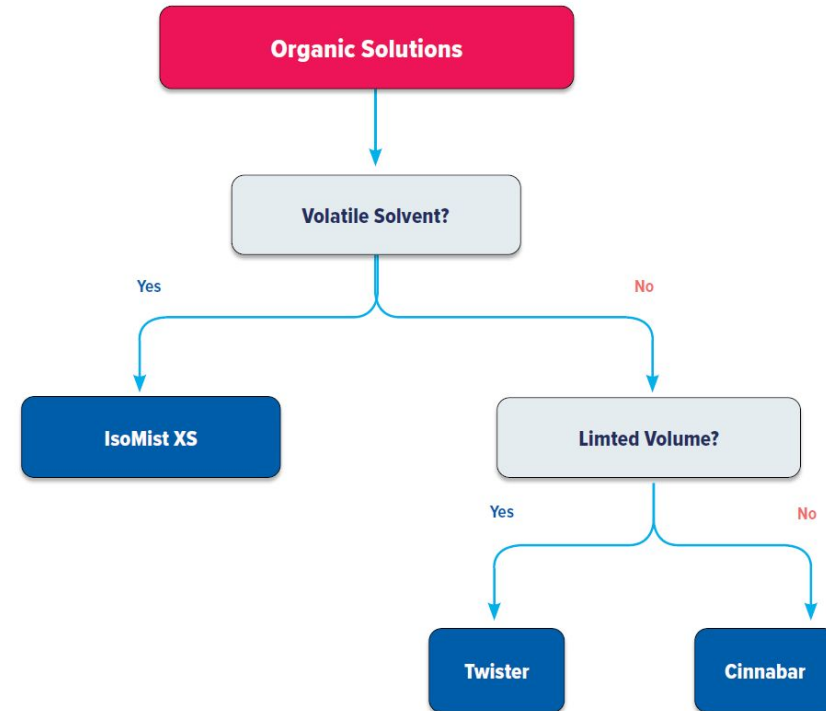
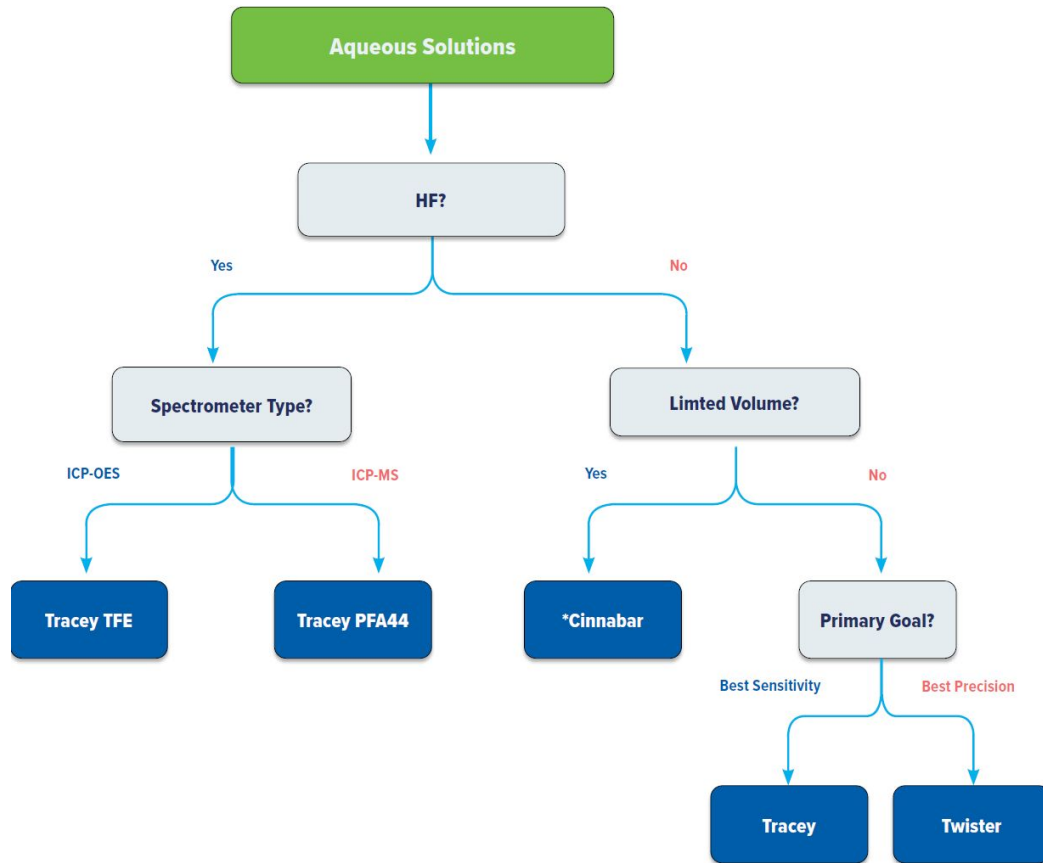


The size, shape, and design of the spray chamber has a substantial effect on sensitivity, precision, washout times, and carryover

Components of a Modern Spray Chamber



Spray Chamber Selection Criteria



Spray Chamber: Temperature Control

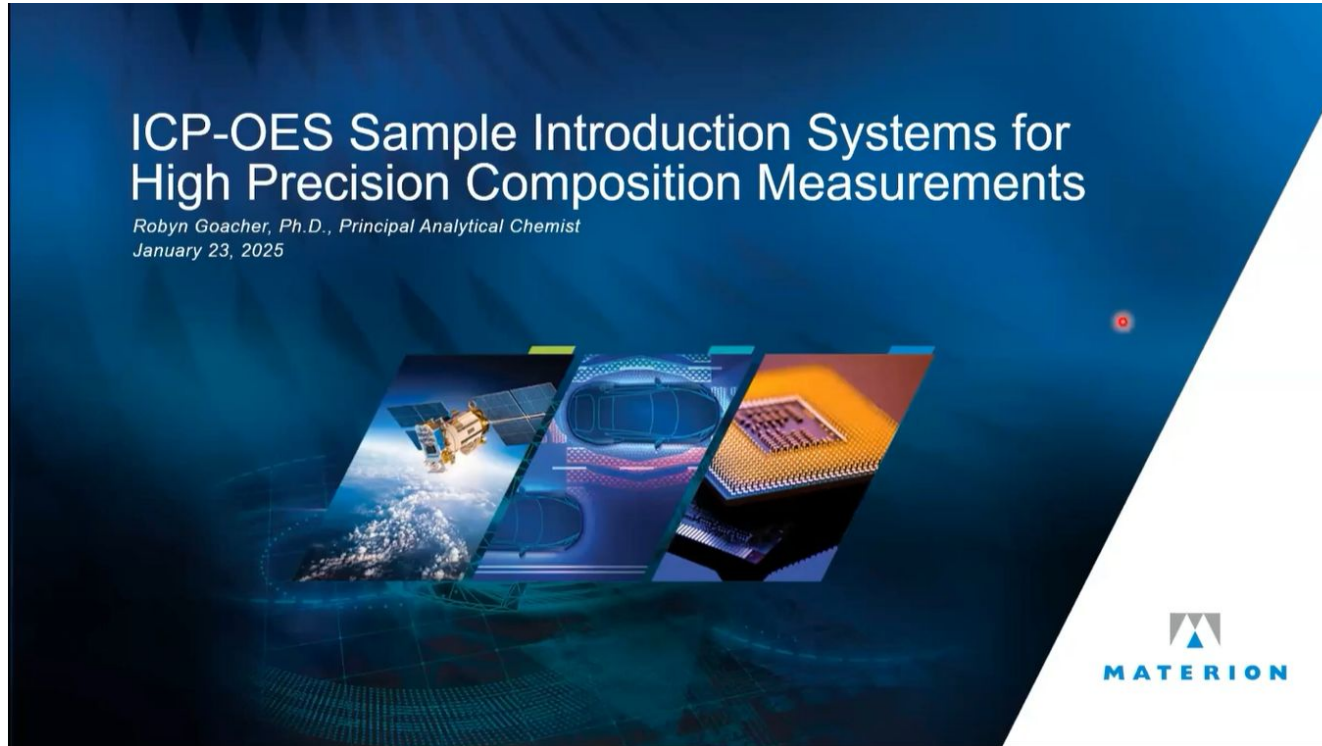
Why does temperature matter?

One consideration is that, as the room temperature changes, so does that of the spray chamber, and that affects the transport efficiency and hence the sensitivity, resulting in analyte drift.

Another concern is that specific sample matrices, particularly those which are very volatile, excessively load the plasma, resulting in instability and, in the worst case, extinguish the plasma.



IsoMist-XR: Real World Application



Webinar featuring a customer study is available for streaming

[Watch here](#)

Torch

The core function of the torch is to generate and sustain a high-temperature plasma (up to 10,000 K), which desolvates, vaporizes, atomizes, and finally ionizes the sample. It is the energy released in the form of light (ICP-OES) or the ions themselves (ICP-MS) that are detected by the instrument.



Since the torch is directly exposed to the extreme conditions of the plasma stand, the correct selection of both the torch and the injector is of utmost importance to both analytical precision and longevity.

Understanding Torch Design: Gas Flows



Plasma (Coolant) Gas flows through the outer channel and acts a heat barrier between the inner and outer tubes. It also entrains the plasma, ensuring the sample is introduced into the right area for optimal atomization and ionization

Auxiliary Gas flows through the inner channel and controls the “lift” of the plasma off the bottom of the injector. It helps regulate the plasma temperature and energy distribution, as well as assisting in positioning the sample within the plasma to ensure optimal atomization and ionization

Carrier Gas flows through the nebulizer to the injector to both transport the sample and, at the tip of the injector, punch a hole through the plasma

Components of a Modern Torch

In recent years, many analysts and manufacturers have switched to a demountable platform, such as the D-Torch™, owing to its versatility and cost-effectiveness



- Replaceable quartz outer tube
- Optional ceramic outer tube

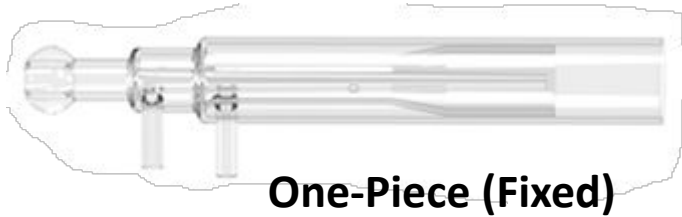
- High-purity alumina inner tube fused to base
 - *Allows for replacement of outer tube only*

- Replaceable / interchangeable injector
 - *Allows for easy swapping between methods*
- Multiple adapter options for use with different spray chambers



Basic Guidelines for Torch Selection

Torches generally fall into one of three categories: one-piece (fixed), semi-demountable, and fully-demountable.



One-Piece (Fixed)

- Fully-integrated quartz body with injector
- Simple, low upfront cost
- Routine, low-matrix aqueous samples
- Entire torch must be replaced – cost can add up quickly



Semi-Demountable

- Outer tube set with replaceable injector
- Injector can be replaced instead of entire torch if damaged/clogged
- Injector can be easily swapped for different methods
- Excellent option in between one-piece and fully-demountable



Fully-Demountable (D-Torch)

- Completely modular: separate outer tube, alumina inner tube, injector
- Only the quartz outer tube needs to be replaced as a matter of routine maintenance
- Injector can be easily replaced or swapped for different methods
- Ceramic outer tube option for organics or high-matrix samples
- Most economical over the lifetime of the instrument

Basic Guidelines for Injector Selection



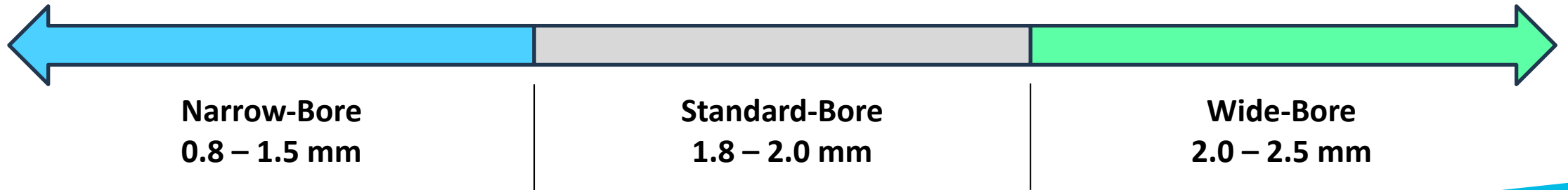
- Clean, low-TDS aqueous
- Organics
- Often max sensitivity for clean samples (higher analyte density)



- Often the standard size
- General purpose
- Moderate matrices



- High-TDS
- High particulates
- Slurries
- Max robustness



Cones

The core function of the cones (sampler, skimmer, and hyper skimmer on some instruments) is to act as the critical interface that extracts and transmits ions between the high-temperature, atmospheric pressure plasma region into the high-vacuum spectrometer region.



The most important consideration when selecting cones is to match the application and sample matrix to the appropriate cone material (*e.g.*, brass, nickel, platinum, etc.)

Basic Guidelines on Cone Selection

Copper

- Solid copper is often the lowest-cost option.
- Runs “colder”—since copper has the most efficient heat transfer compared to other cone materials, this also makes copper the most-susceptible to matrix effects, corrosion, and sample deposition, resulting in shorter lifetime, more frequent cone orifice clogging/blockage, and increased background from sample deposits.
- Often needs more frequent cleaning.
- Can be used for low-level Al, Ni or Pt measurements.



Basic Guidelines on Cone Selection

Nickel

- Often the “standard” configuration due to the balance between cost and performance.
- Options can include a solid nickel tip with copper base, solid nickel tip with a nickel-plated copper base (see below), or a solid nickel tip and base.
- Suitable for the most common applications (routine aqueous environmental samples, <5% acid matrix, non-HF, non-organic).
- Good thermal and chemical resistance – solid nickel and nickel-plated cones (see below) are more resistant to matrix effects, corrosion, and sample deposition compared to copper.
- Runs “hotter” than copper—since nickel is less efficient at heat transfer compared to copper, nickel cones will usually stay cleaner longer than solid Cu cones, providing longer operating times between cleaning, and provide more stable signals with less background.



Basic Guidelines on Cone Selection

Nickel Plated

- Often times a nickel-plated base is chosen when samples have an acid concentration >5%.
- The nickel plating improves the chemical resistance of the bare copper while maintaining the heat transfer properties of the copper base. Some instruments require a cone with copper base to maintain a lower temperature, or an optional skimmer base can be used.
- If a cone runs too hot, it can degrade rapidly, especially at the orifice, which is responsible for sensitivity and good signal stability.
- Glass Expansion's proprietary electrodeless nickel-plating process allows us to maintain the highest level of precision, quality and reliability standards for these popular nickel-plated cones.



Basic Guidelines on Cone Selection

Platinum

- Typically, the most durable and longest-lasting option, but also the highest cost.
- Options include a platinum tip with a copper base, platinum tip with a nickel-plated copper base, and platinum tip with a solid nickel base. These multiple options are to offer choices with balancing heat transfer and chemical resistance.
- When using platinum cones in certain Agilent ICP-MS model systems, instead of using a stainless-steel skimmer base, a brass skimmer base is necessary to assist with the transfer of heat in the cone-interface region.
- Excellent chemical resistance - greatest resistance to matrix effects, corrosion, and sample deposition.



Basic Guidelines on Cone Selection

Platinum

- Example of applications include: high-matrix samples (high TDS), aggressive acids or high concentration of acids (>5%), volatile organic solvents, and when the lowest detection limits are required.
- A sampler cone with a larger diameter platinum tip can increase the cone lifetime. For some ICP-MS models a sampler is available with a 10, 15 or 18mm platinum tip. For example, a customer reported that 15mm and 18mm platinum tips would last for upwards of 18-24 months compared to 6-8 months with the standard 10mm tip.
- Least efficient heat transfer compared to copper and nickel, this means the platinum tip “runs hotter” than both copper and nickel.
- The advantage to the hotter platinum tip is that it will usually stay cleaner longer than Nickel tipped cones.
- If well maintained, platinum cones can usually be refurbished 2-3 times, thereby greatly extending their useful operating lifetime, compared to all other cone options.
- Once platinum cones are no longer refurbishable, they can be recycled for platinum reclaim value, and this credit can then be used to buy any other sample introduction consumables from Glass Expansion.

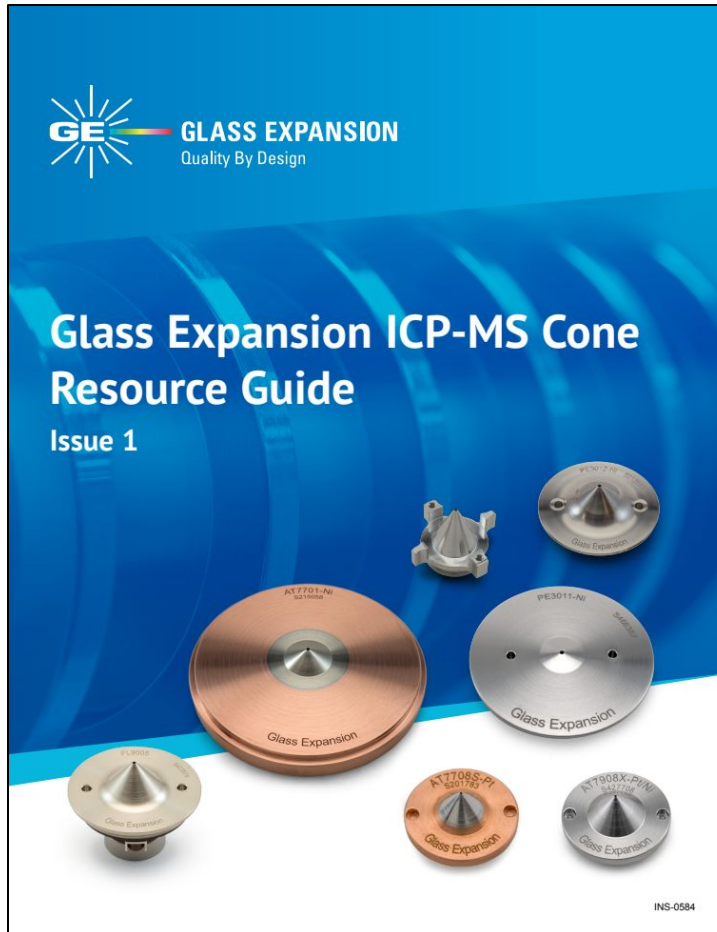
Basic Guidelines on Cone Selection

Aluminum

- Similar cost to copper.
- Like copper, also susceptible to matrix effects, corrosion, and sample deposition.
- Great option if a low-level detection limit for copper, nickel, and/or platinum is required.
- Commonly used in Laser Ablation ICP-MS (LA-ICP-MS).



Cone Resource Guide



The **Cone Resource Guide** covers everything you need to know about cones, including:

- Information about design and construction
- The different cones manufactured by Glass Expansion
- Selection guide
- Accessories
- Maintenance procedures

Accessories to Consider

Elegra™ Argon Humidifier



A carrier gas humidifier, such as the **Elegra Argon Humidifier** from Glass Expansion, is recommended for samples containing high amounts of total dissolved solids (TDS), as there is an increased likelihood of salt deposits forming at the tip of the nebulizer and injector which can result in significant analytical drift in or even an extinguished plasma.

Guardian™ In-Line Particle Filter

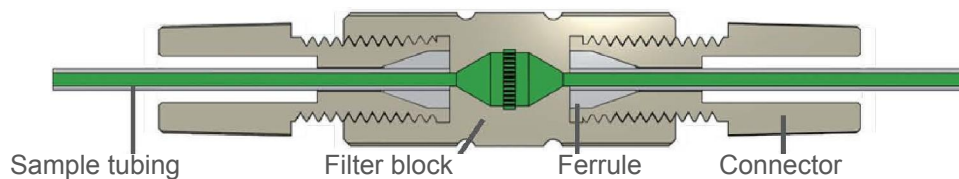
The **Guardian In-Line Sample Filter** installs directly onto the sample uptake or probe tubing. It contains a 120 µm PEEK filter that is designed to trap any large particulates that are taken up into the sample stream before they have a chance to reach and subsequently block or damage the nebulizer. The filter is reusable and can be backflushed with the **Eluo** and appropriate adapter.



Eluo P/N: 70-ELUO



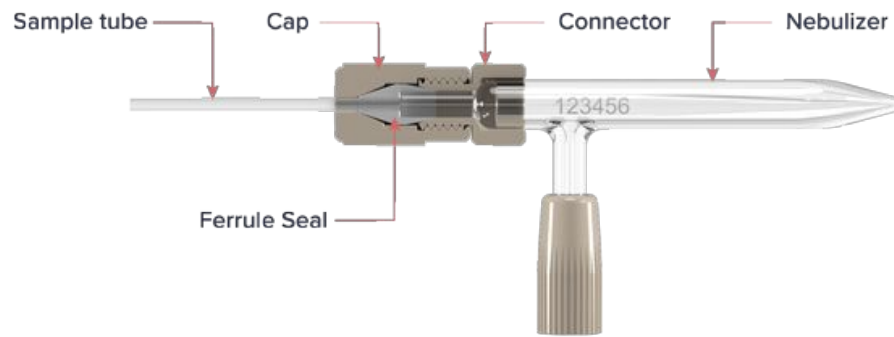
Adaptor
P/N: 70-803-1160



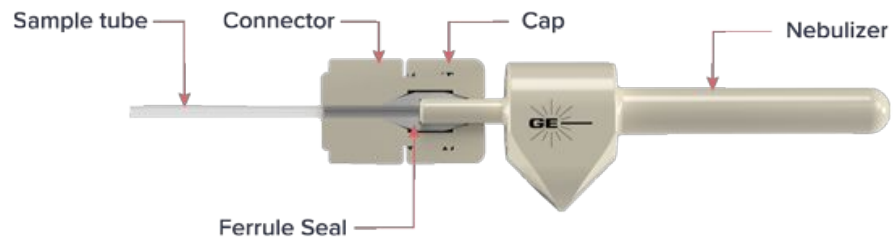
Nexus™ Universal Nebulizer Connection Kit

The Nexus™ Universal Connection Kit is a one-size-fits-all nebulizer connection kit which enables you to use any of Glass Expansion's industry-leading concentric nebulizers* with the sample introduction configuration of your choice, including switching valves, chromatographs (LC, HPLC, IC, etc.), and other high-performance accessories

P/N FT-16-8



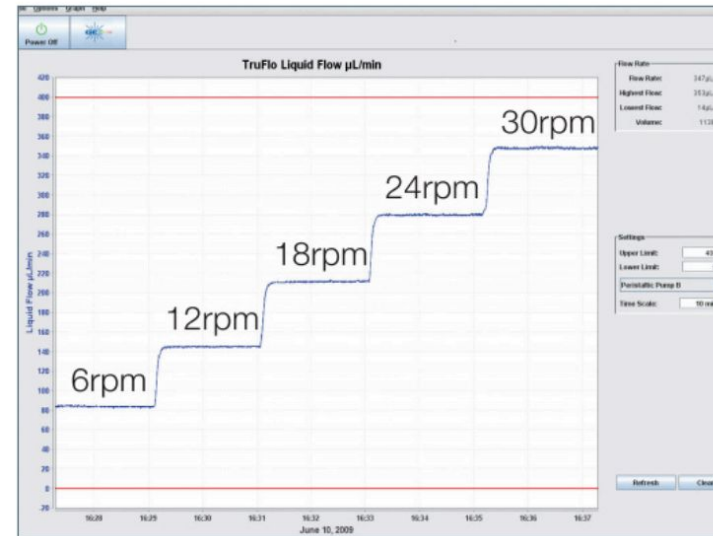
P/N FT-16-8-X



- **Switching Valves:** Simple and reliable custom-length connections to all high-throughput valve or syringe-drive systems.
- **Speciation Analysis:** Zero-dead-volume and secure, high-pressure connection for hyphenated techniques, such as LC-ICP-MS, HPLC-ICP-MS, IC-ICP-MS, and FFF-ICP-MS.
- **High-Efficiency Sample Introduction System (HE-SIS):** Connect to Glass Expansion's HE-SIS, which provides up to 95% transport efficiency for a variety of applications.
- **High-Precision Analysis:** Create a high-pressure seal when performing self-aspiration for the most stable sample uptake and delivery.

TruFlo™ Sample Monitor

For precise analyses and complete diagnostic control, the **TruFlo Sample Monitor** actively monitors sample uptake rate, as well as enabling you to set optimal pump tension, allowing you to always know the actual rate of sample uptake to your nebulizer. It provides continuous, real-time flow measurement and will sound an alarm if the uptake rate falls outside of the pre-determined range.

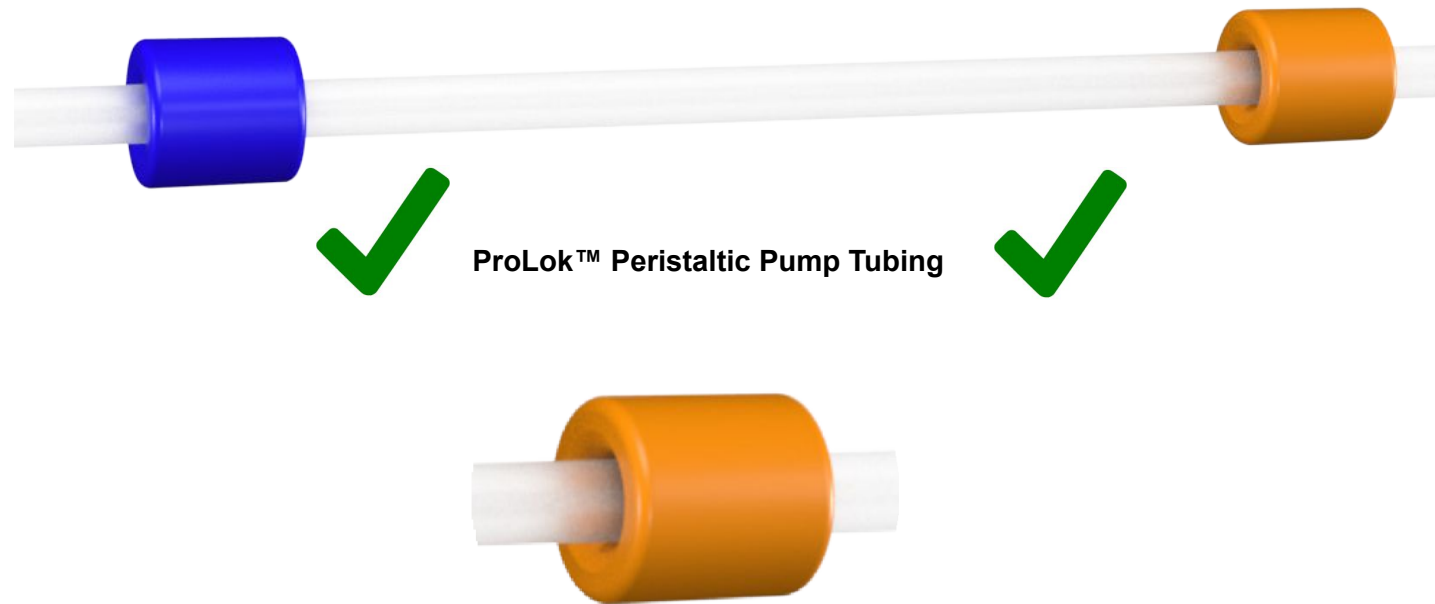


New Product Highlights

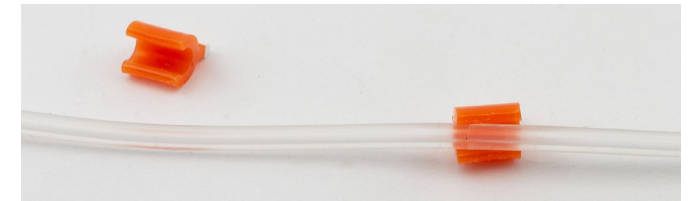
“Innovation, not imitation”

ProLok™ Peristaltic Pump Tubing

The New ProLok peristaltic pump tubing from Glass Expansion is designed to eliminate the problems of premature tag failure and tubing slippage/displacement associated with the traditional style of pump tubing. The ProLok, full-collar tabs result in 2x the surface bonding area.



ProLok™ Peristaltic Pump Tubing



Traditional Pump Tubing

Guardian™ Autosampler Probe

Key Features:

- Proprietary mechanical finish to improve wetting characteristics and prevent the beading of droplets.
- **Robust tip design** prevents crushed or damaged tips from misalignment.
- **Drip-resistant** 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.
- **Interchangeable UniFit sample lines** (3000mm in length) to accommodate various IDs (e.g. 0.3, 0.50, 0.75 & 1.0mm)

Available for all common
autosampler models



Guardian Probe for SPS3, SPS4, AIMS, 0.75mm
P/N 70-803-1957

E-Torch™ for ICP-OES

Benefits

- Made from PEEK, PTFE & Quartz
- Interchangeable injectors (Quartz, Ceramic, Sapphire)
- Compatible with any ball joint spray chamber
- Performance equivalent to the D-Torch
- Ceramic tube set available on request for HF and high TDS applications
- **Low cost Inner and Outer tube assembly which simplifies deposit removal maintenance and allows for oven cleaning of Carbon deposits**



P/N 30-808-4388
E-Torch for Thermo® PRO Duo



P/N 30-808-4466
E-Torch Agilent 5000 Series
SVDV, VDV

E-Torch for Thermo® PRO Series ICP-OES

- Shipped with P/N [31-808-2836](#), Capillary Quartz Injector 2.0mm (EMT)

Comparison of Quartz Tube set to Ceramic Outer tube set		
Element	% Increase in Sensitivity	%RSD
Zn (213) λ	17%	0.36
Ni (231) λ	19%	0.57
Mn (257) λ	14%	0.52



P/N 30-808-4388
E-Torch for Thermo® PRO Duo

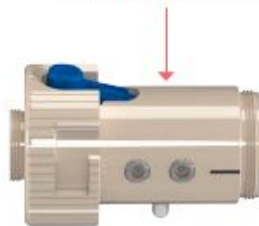
Torch Ball Joint Adaptor & Ferrule for E-Torch
P/N 31-808-4582



Quartz Injector 2.0mm
P/N 31-808-2836



E-Torch Body
P/N 31-808-4425



Ceramic Torch Tube Set
P/N 31-808-4502

Quartz Torch Tube Set
P/N 31-808-4390



E-Torch Retainer and Ferrule
P/N 31-808-4498



E-Torch options for Thermo[®] PRO Series ICP-OES

Tapered Injector Options

Part Number	Description
31-808-3511	Quartz Injector 0.75mm
31-808-2833	Quartz Injector 1.0mm
31-808-2834	Quartz Injector 1.5mm



Tapered Quartz Injector 1.0mm
P/N 31-808-2833

Capillary Injector Options

Part Number	Description
31-808-3510	Quartz Injector 1.0mm
31-808-2836	Quartz Injector 2.0mm
31-808-3246	Quartz Injector 2.5mm
31-808-3247	Quartz Injector 3.0mm
31-808-3279	Alumina Injector 1.0mm
31-808-2835	Alumina Injector 2.0mm
31-808-2977	Sapphire Injector 2.0mm



Quartz



Alumina



Sapphire

Outer Tube Sets:



Quartz Outer Tube Set
P/N 31-808-4390



Ceramic Outer Tube Set
P/N 31-808-4502

E-Torch for Agilent® 5000 Series ICP-OES

- Shipped with P/N [31-808-3576](#), Tapered Quartz Injector 1.8mm
- P/N 31-808-4560, E-Torch Agilent 5000 Series RV is available on request.



P/N 30-808-4466
E-Torch Agilent 5000 Series SVDV, VDV

Torch Ball Joint Adaptor &
Ferrule for E-Torch
P/N 31-808-4565



E-Torch Body
P/N 31-808-4487



Quartz Injector 1.8mm
P/N 31-808-3576



Ceramic Torch Tube Set
P/N 31-808-4503

Quartz Outer Tube
P/N 31-808-4471



E-Torch Retainer and Ferrule
P/N 31-808-4589



E-Torch options for Agilent® 5000 Series ICP-OES

Tapered Injector Options

Part Number	Description
31-808-3738	Quartz Injector 0.8mm
31-808-3583	Quartz Injector 1.4mm
31-808-3576	Quartz Injector 1.8mm
31-808-3584	Quartz Injector 2.4mm
31-808-3725	Alumina Injector 1.5mm
31-808-3585	Alumina Injector 1.8mm
31-808-3722	Alumina Injector 2.4mm



Outer Tube Sets for SVDV & VDV



Quartz Outer Tube Set
P/N 31-808-4471



Ceramic Outer Tube Set
P/N 31-808-4503

*Quartz & Ceramic Outer Tube Sets for Agilent 5000 Series RV is available on request.

Agilent® FDT Injectors

Glass Expansion now offers a full suit of injectors compatible with the Agilent fully-demountable torch

Torch Retainer P/N 31-808-3563



Quartz Tube Set
P/N 31-808-3557 for SVDV, VDV
P/N 31-808-3556 for RV

Torch Base



NEW LamiFlow™ Alumina Injector

Agilent® FDT Injectors: LamiFlow™

New LamiFlow™ alumina injectors are designed to meet and exceed industry standards

Part Number	Description
31-808-4530	NEW LamiFlow™ Alumina Injector 0.8mm for Agilent Fully Demountable
31-808-4532	NEW LamiFlow™ Alumina Injector 1.4mm for Agilent Fully Demountable
31-808-4358	NEW LamiFlow™ Alumina Injector 1.8mm for Agilent Fully Demountable
31-808-4534	NEW LamiFlow™ Alumina Injector 2.4mm for Agilent Fully Demountable
31-808-4357	Tapered Quartz Injector 0.8mm for Agilent Fully Demountable
31-808-4354	Tapered Quartz Injector 1.4mm for Agilent Fully Demountable
31-808-4355	Tapered Quartz Injector 1.8mm for Agilent Fully Demountable
31-808-4356	Tapered Quartz Injector 2.4mm for Agilent Fully Demountable



NEW LamiFlow™ Alumina Injector

- GE Tapered Design
- Robust
- Designed to meet and exceed industry standards

RotaValve for Agilent® ICP-OES

Key Features:

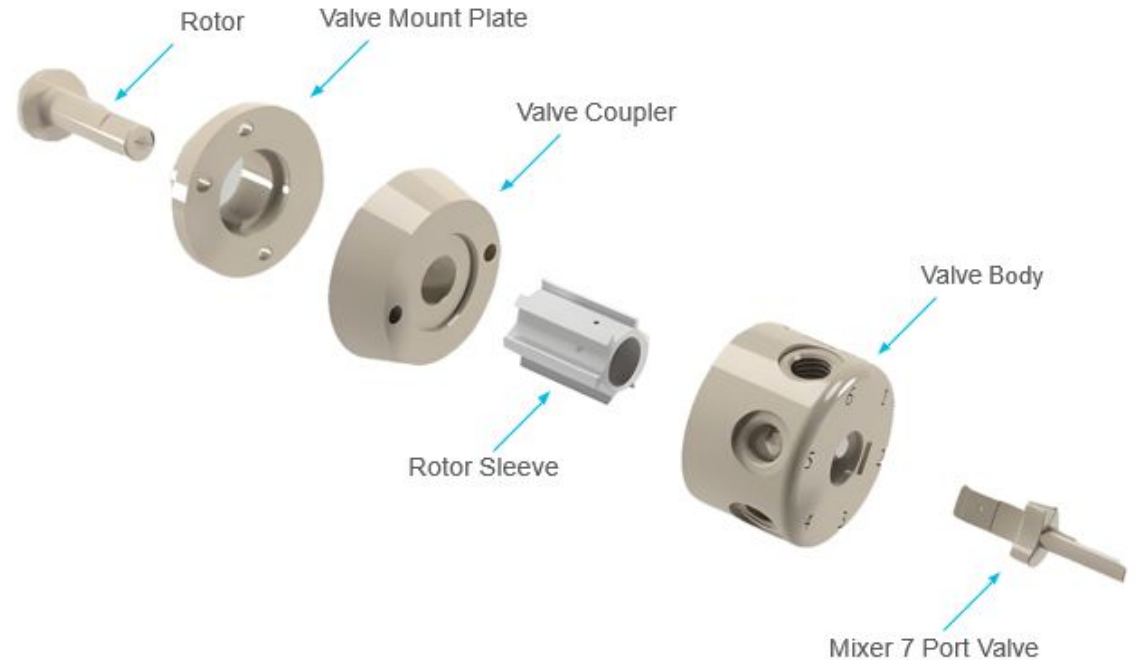
- Utilizing **Flow Injection technology**, the RotaValve reduces analysis time, environmental impact, and operating costs. Ideal for labs looking to extend system life and cut maintenance without sacrificing performance.
- **Optimized for ICP:** Purpose-built with low dead volume for precise sample injection and minimal carryover.
- **Compact, Efficient Design:** Integrated mixing chamber ensures complete blending of sample and reagent for reliable results.
- **Dual Configuration Flexibility:** Easily switch between 6-port and 7-port setups using a removable Tee, no valve change required.
- **Rugged & Field-Serviceable:** Durable rotor/stator design resists chemicals and wear; only replace worn parts, not the entire valve.
- **Reliable, Leak-Free Sealing:** ¼-28 ratchet fittings provide consistent torque and easy, tool-free sealing, no overtightening guesswork.
- **Seamless Compatibility:** Plug-and-play with Agilent 5000 Series ICP-OES; no software modifications needed.



RotaValve for Agilent® ICP-OES

Valve Connections:

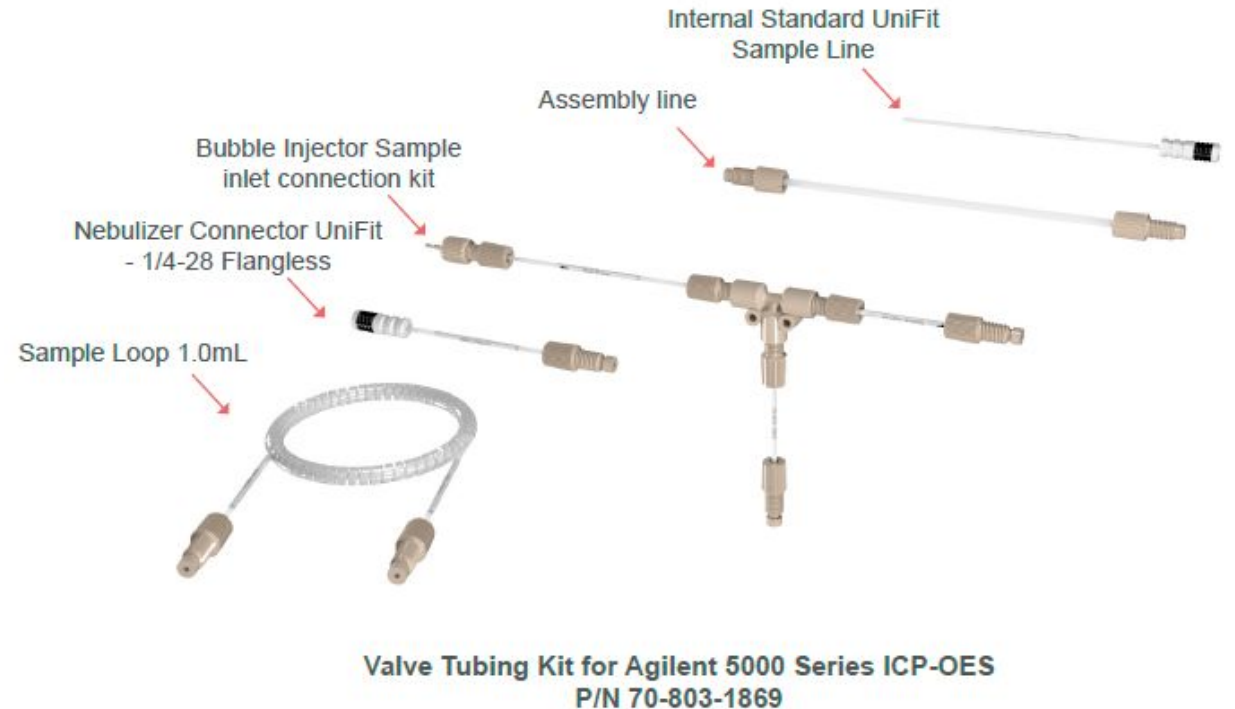
- The 6/7 Port Valve has been designed specifically for use in ICP analysis requiring the addition of an Internal Standard or Dilution of the sample. A major advantage is the incorporation of the Tee piece into the Valve design which reduces the number of components required.
- The Valve is made up of one 6 Port Valve and is switched between two positions with a removable Tee piece creating the 7th Port for the Valve.
- All ports on the 6/7 Port Valve have been numbered to allow easy connection to the Valve tubing kit.
- Various Sample Loop sizes available on request
- **Requires Valve Tubing Kit P/N 70-803-1869**



RotaValve for Agilent® ICP-OES

Valve Connections:

- The 6/7 Port Valve has been designed specifically for use in ICP analysis requiring the addition of an Internal Standard or Dilution of the sample. A major advantage is the incorporation of the Tee piece into the Valve design which reduces the number of components required.
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Tracey BC™ High-Efficiency Spray Chamber

Features & Benefits:

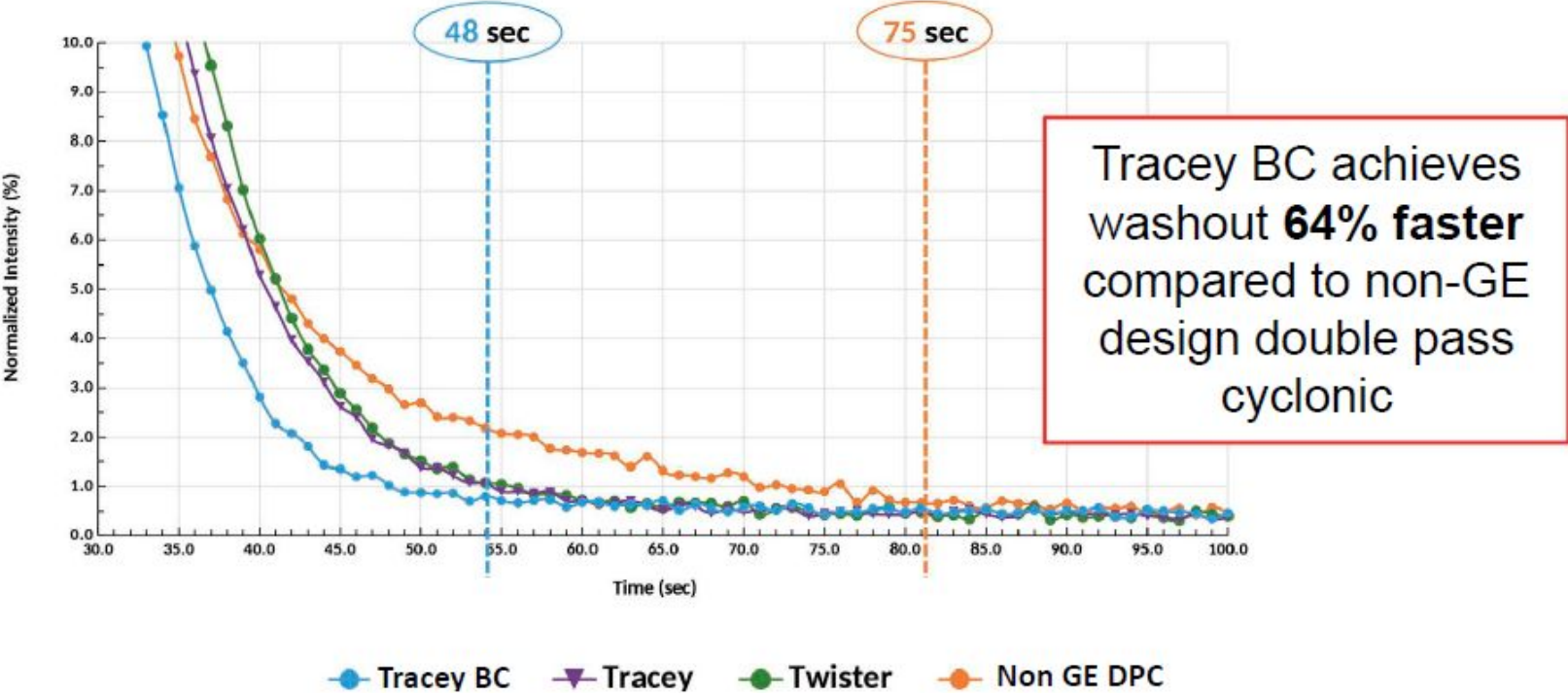
- 1. No O-Rings:** Reduces washout times and eliminates frequent replacements due to wear.
- 2. Efficient Washout:** 30mL low-volume cyclonic chamber with Helix CT technology.
- 3. Cost-Effective:** More affordable than traditional glass spray chambers.
- 4. Wide Compatibility:** Fits most common ICP-OES models with E-Torch, D-Torch, and SDT/ FDT. Tracey BC spray chamber design is available in Glass and PEEK.



Tracey™ BC Spray Chamber

Tracey BC™ High-Efficiency Spray Chamber

Washout Profiles for 1 ppm Hg:



Tracey BC™ PEEK Spray Chamber

- **HF Resistance:** With resistance up to 5%
- **Superior Wetting:** PEEK material maintains excellent wetting properties with routine laboratory cleaning.
- **Compact Design:** Lightweight and compact, eliminating the need for additional spray chamber brackets.
- **No Internal Surface Treatment:** Unlike TFE or PFA, this spray chamber requires no internal surface treatment while maintaining excellent precision.
- **Cost-Effective:** More affordable compared to other HF spray chamber designs.



Tracey DC™ High-Efficiency Spray Chamber

Tracey DC Spray Chamber:

- **Inert DC (“Direct Connect”) Connection:** PEEK construction ensures durability and chemical resistance. No ball joint clamps that corrode over time.
- **IsoMist Compatibility:** Tracey DC spray chamber is compatible with IsoMist MS temperature-controlled spray chambers.
- **Consistent Alignment:** Provides precise alignment for enhanced accuracy and efficiency.
- **Contamination-Free:** DC fitting removes the need for metal clamps, reducing contamination risk.



Tracey DC™ PEEK Spray Chamber

- **Inert DC Connection:** PEEK construction ensures durability and chemical resistance. No ball joint clamps that corrode over time.
- **IsoMist Compatibility:** Tracey DC spray chamber is compatible with IsoMist MS temperature-controlled spray chambers.
- **Consistent Alignment:** Provides precise alignment for enhanced accuracy and efficiency.
- **Contamination-Free:** DC fitting removes the need for metal clamps, reducing contamination risk.



Glass Expansion IsoMist MS™

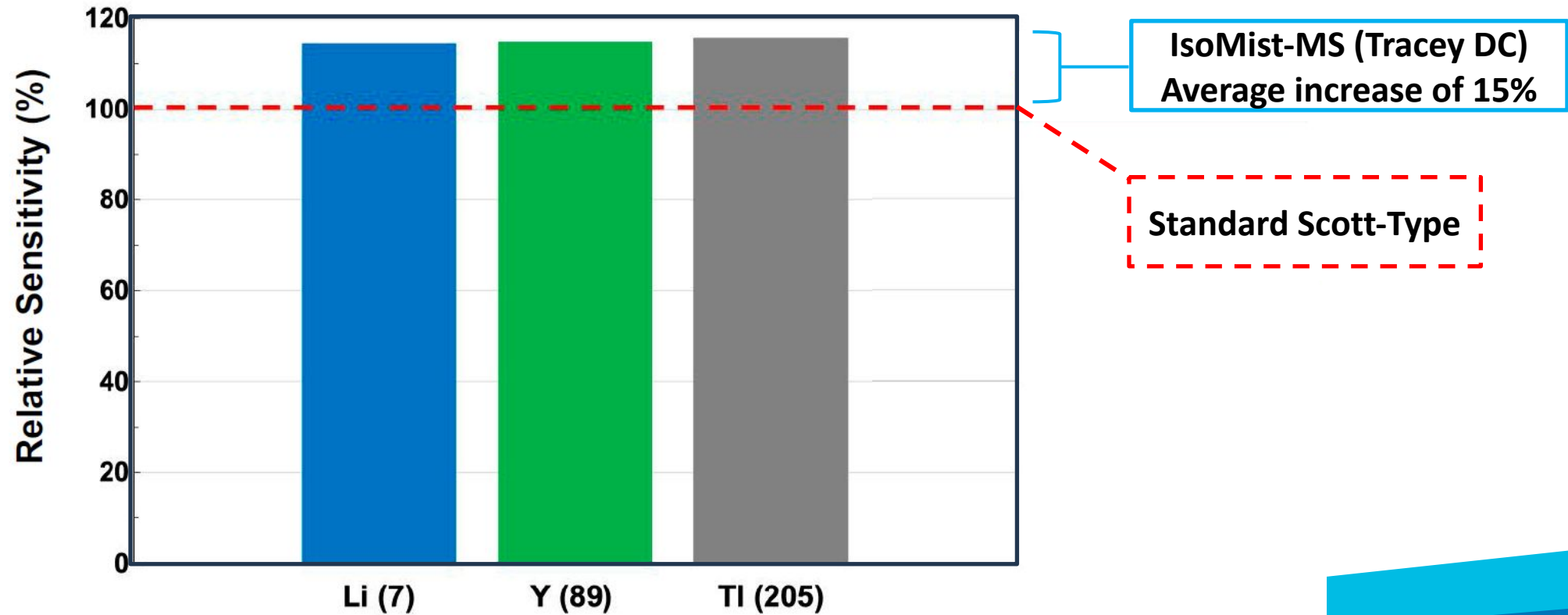
Features:

- Next Generation IsoMist-Compact
- DC (Direct Connection) Spray chamber
- Low volume (30mL) cyclonic spray chamber for faster washout with Helix CT technology
- Interchangeable Tracey™ DC spray chambers (Glass, PEEK, PFA & Quartz)
- Compatible with existing auxiliary gas option(s)
- Light weight design
- Improved transport efficiency with reduced sample path length
- Interchangeable DC Transfer tubes, Glass, Quartz, PEEK



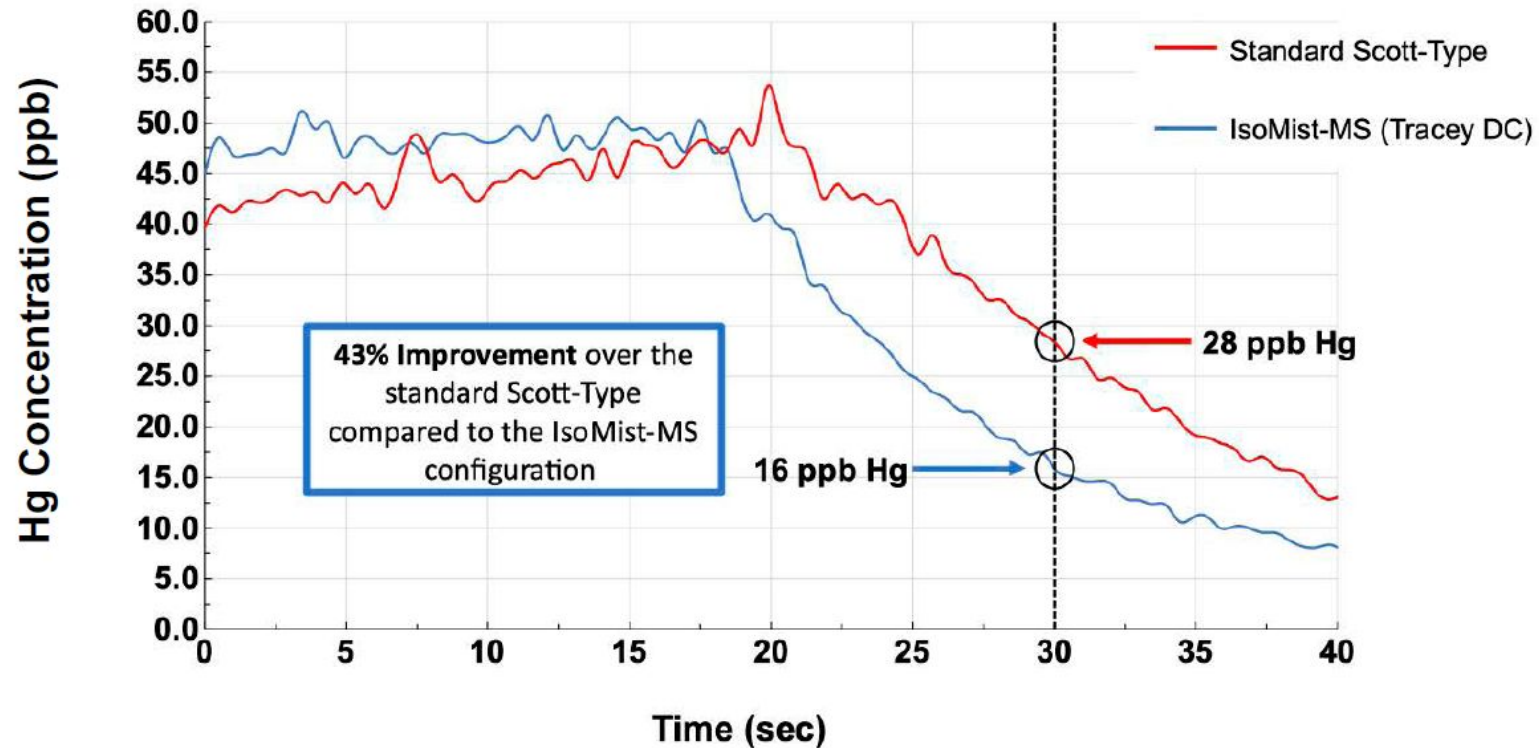
IsoMist-MS™ Sensitivity Comparison

Sensitivity Comparison



IsoMist-MS™ Washout Performance

Washout Performance (50 ppb Hg)



Jet Vortex Interface (JVI™): Innovative Aerosol Filtration

JVI provides precise control of the aerosol droplet size transported to the plasma, which, for high matrix samples, results in extended lifetimes of the torch, injector, and cones by a reduction in sample deposition, which also serves to prevent signal drift, in addition to reduced matrix effects in general.

Introducing the Jet Vortex Interface (JVI)

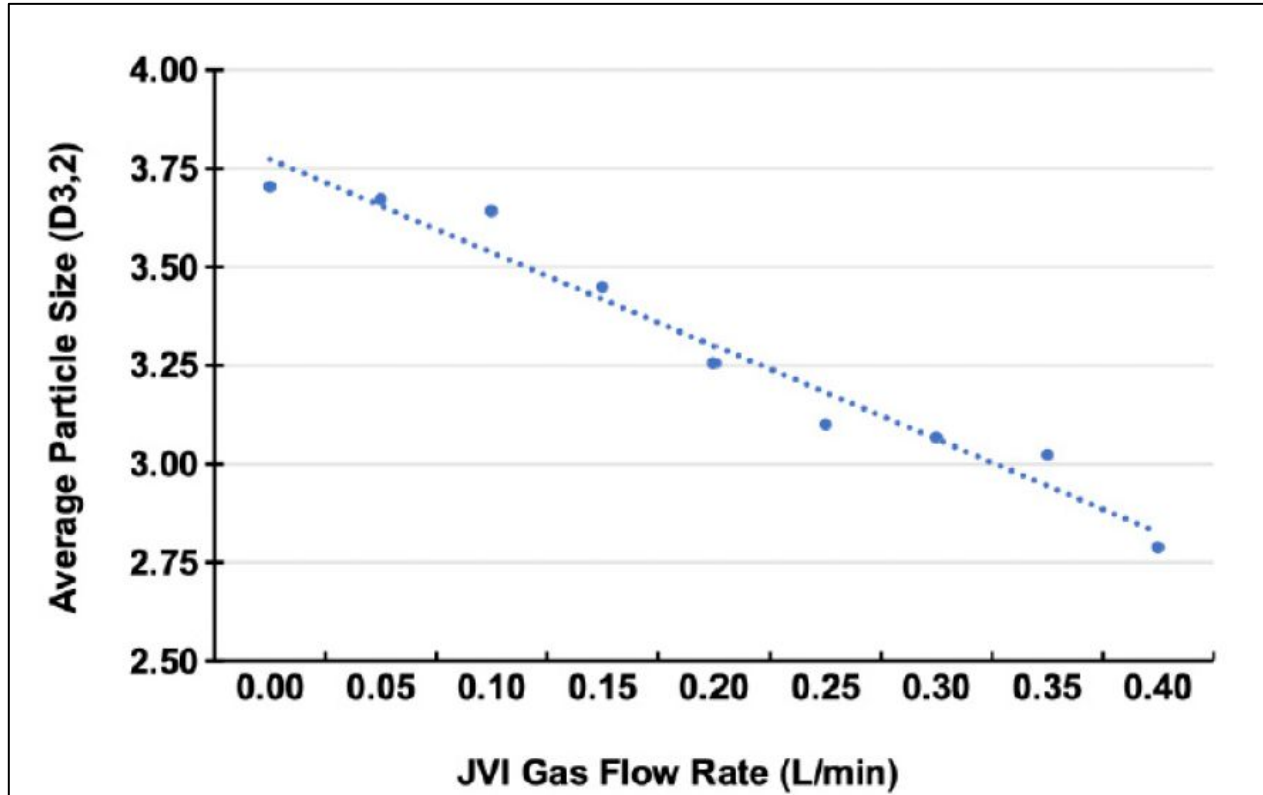
- **Novel Design (Patent Pending):** Highly efficient aerosol filtration.
- **Easy Installation:** Works with existing “Make-Up” or “Dilution/Auxillary” gas options.
- **Compatibility:** Fits any GE DC spray chamber; suitable for ICP-OES and ICP-MS applications.



Benefits of JVI:

- **Particle Size Reduction:** Decreases average particle size by 3-4% for every 0.005 L/min flow.
- **Material:** Chemically inert construction from Ceramic & PEEK.
- **Reduced Build-Up:** Minimizes deposits on injector and interface cones.
- **Improved Plasma Conditions**

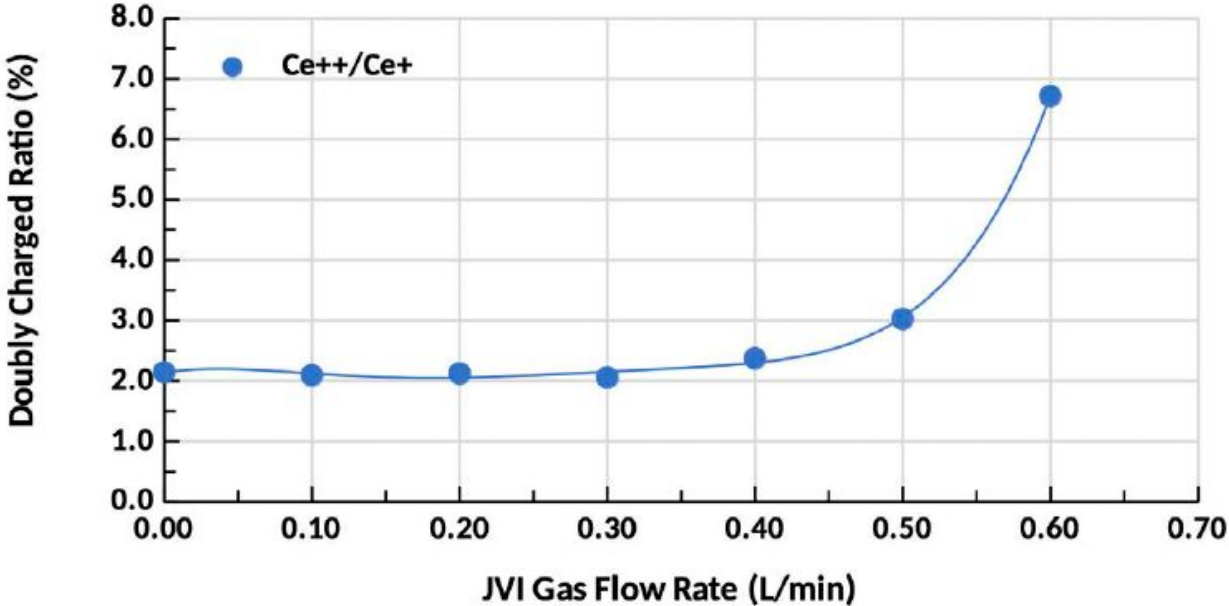
Jet Vortex Interface: Performance (ICP-MS)



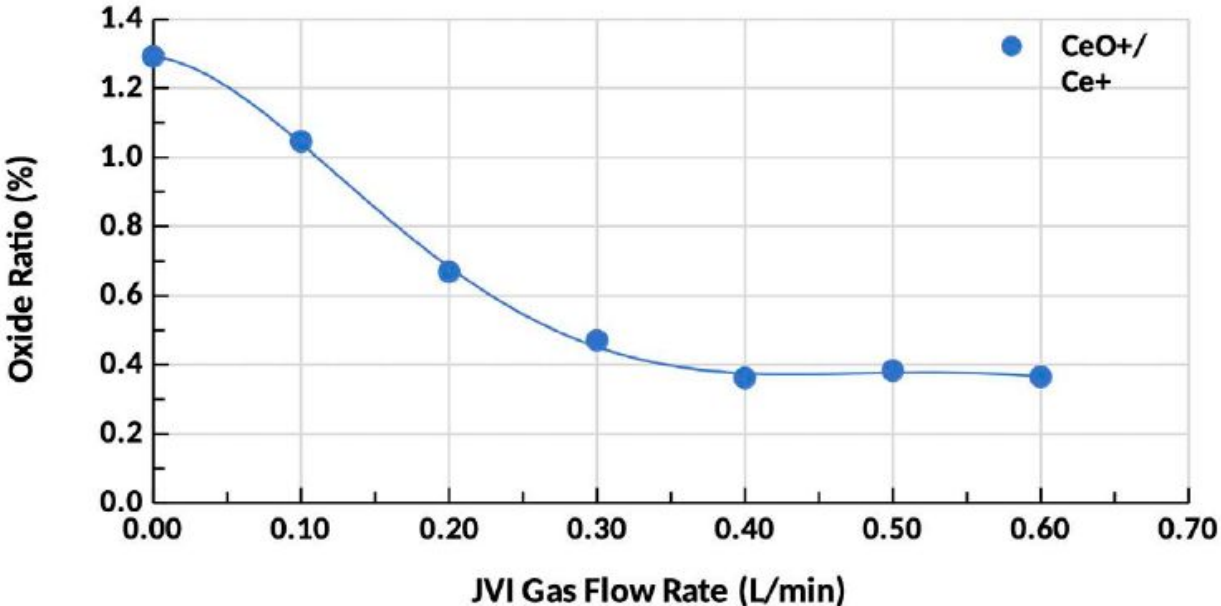
- Reduces aerosol particle size by 3-4% per 0.05 L/min, extending the life of the torch, injector, and cones (ICP-MS), while preventing sample deposition to minimize signal drift.
- Improves transport efficiency and signal intensity by adjusting the flow rate for high matrix samples.

Jet Vortex Interface: Performance (ICP-MS)

Doubly Charged Ratio - Ce⁺⁺/Ce⁺



Oxide Ratio - CeO⁺/Ce⁺

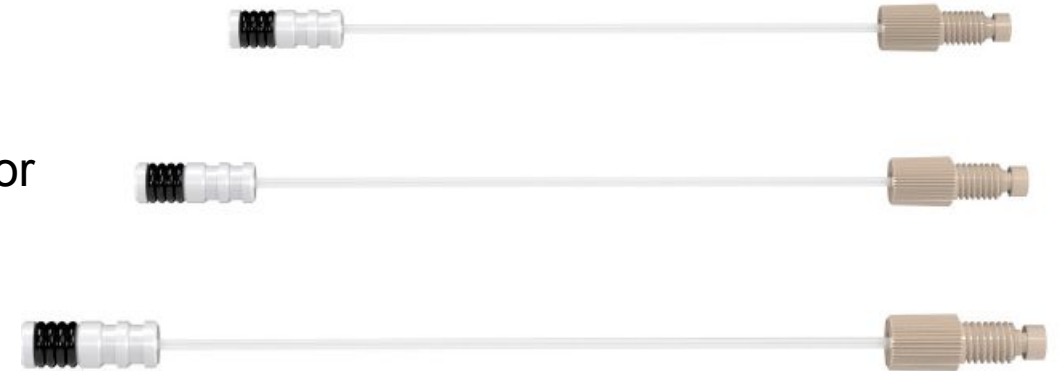


UniFit™ Flangeless Connectors

These UniFit-Flangeless Connectors are designed to connect the SeaSpray™, MicroMist™, DuraMist™, OpalMist™, Slurry™ and Conikal™ nebulizers to high throughput switch valve systems.

Benefits of UniFit-Flangeless Connectors:

- Completely inert (metal-free) assembly
- Secure UniFit connection to the nebulizer sample inlet.
- Ratchet style fitting to high throughput switch valve systems for torque-controlled seal
- Optimized length to minimize sample path and uptake time
- Internal Diameter available 0.25mm, 0.5mm & 0.75mm ID
- Industry Standard OD size 1.6mm (1/16")



Thank You!



Where to Find More Information

www.geicp.com

Product Care

- [Care of Nebulizers](#)
- [Care of Spray Chambers](#)
- [Care of Torches](#)
- [Care of ICP-MS Cones](#)

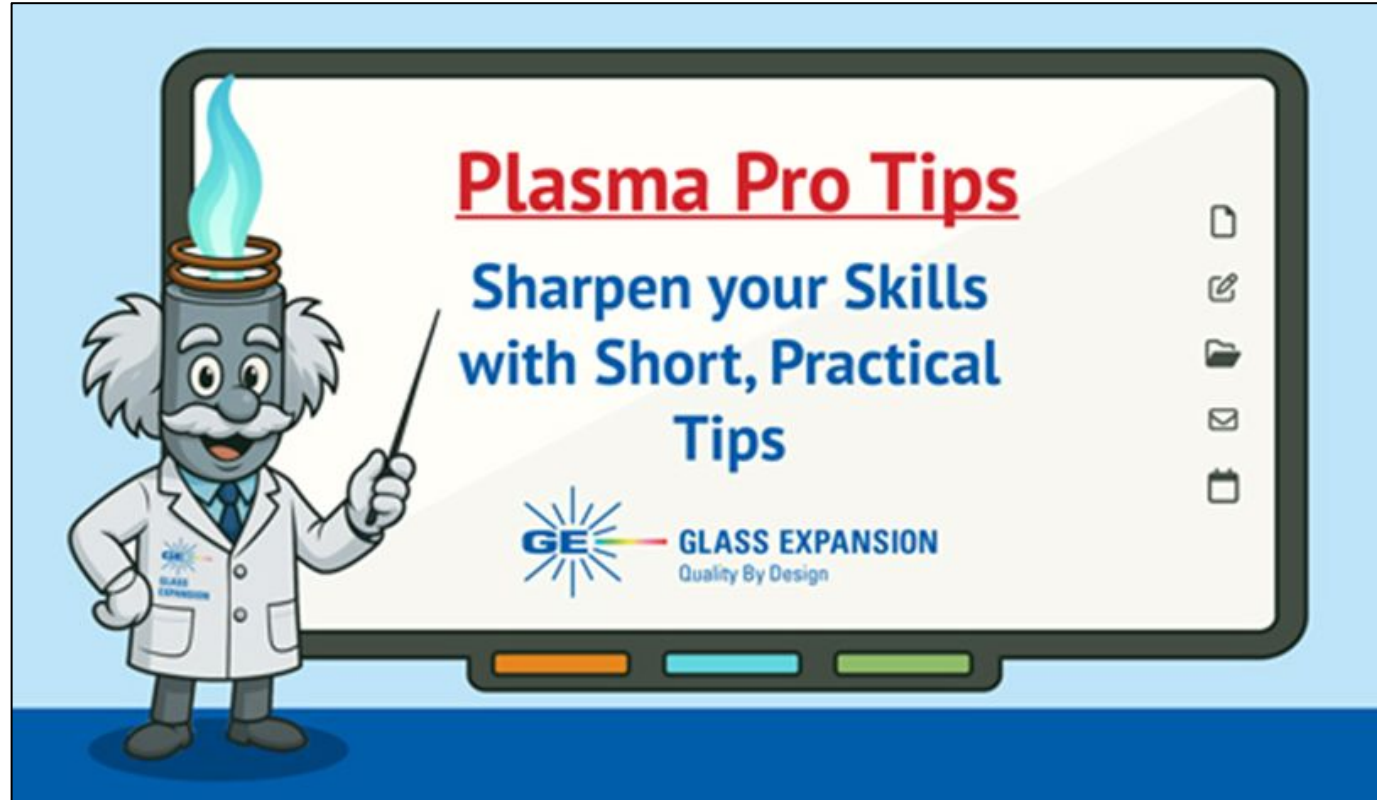
- [Chemical Resistance of High Performance Polymers](#)

- [Instructions for nebulizers and nebulizer accessories](#)
- [Instructions for spray chambers and spray chamber accessories](#)
- [Instructions for torches and torch accessories](#)
- [Instructions for accessories](#)
- [Instructional videos for IsoMist](#)
- [DC Nebulizer Video Installation Guide](#)
- [ICP-MS Semi-Demountable Torch and PCC Kit Video Installation Guide](#)
- [D-Torch Video Installation Guide](#)
- [Warranty Statement and Returns Procedure](#)

News

- [Important Dates and Events](#)
- [ICP Industry Newsletter](#)
- [Glass Expansion E-News](#)
- [New Products](#)
- [References](#)
- [Exhibitions and Conferences](#)
- [Product Flyers](#)
- [Application Notes](#)
- [Videos](#)
- [Webinars](#)

Where to Find More Information



Where to Find More Information

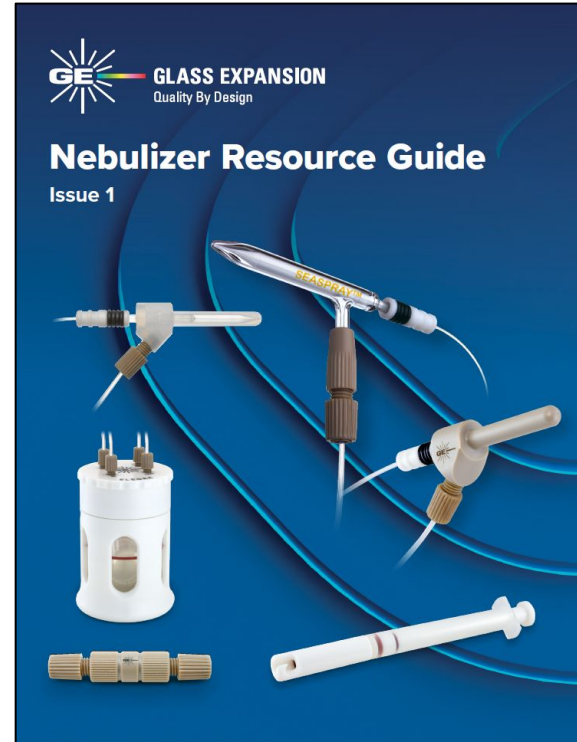


GE GLASS EXPANSION
Quality By Design

Supplies and Accessories Catalogue | Issue 11 2024

Providing High Quality ICP-OES & ICP-MS Sample Introduction Solutions for Over 40 Years.

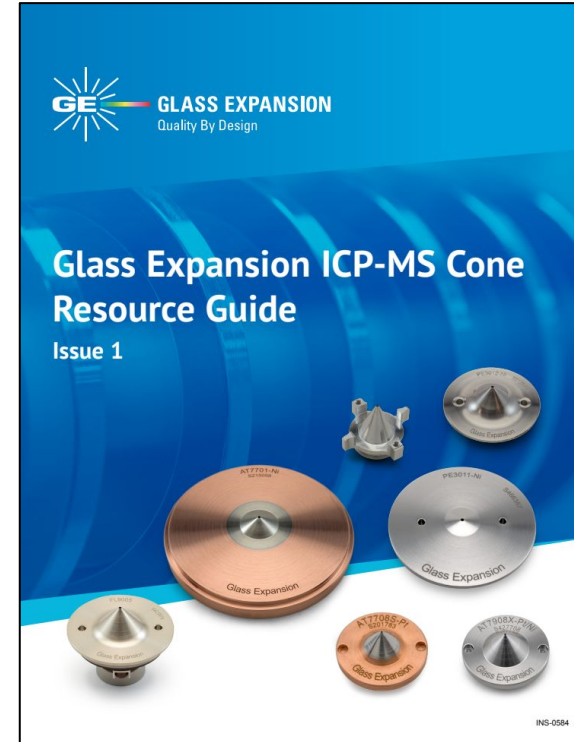
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Nebulizer Resource Guide
Issue 1

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Glass Expansion ICP-MS Cone Resource Guide
Issue 1

INS-0584

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ICP INDUSTRY NEWS
GLASS EXPANSION | JULY 2025 | VOLUME 1

Welcome to Our Quarterly Newsletter

We are excited to launch the first edition of ICP Industry News, a quarterly newsletter designed to keep Glass Expansion subscribers updated on our events, collaborations, and the latest advancements in the Inductively Coupled Plasma (ICP) community. This issue recaps our busy Spring, highlights new resources, and introduces tools to enhance your ICP workflows.

Events Recap

Our technical team had a productive spring, and we extend our gratitude to everyone who joined us at our events! A highlight was the debut of **ICP Alley** at Pitcon 2025 in Boston, MA, in collaboration with industry leaders CEM, GFS Chemicals, and Inorganic Ventures. This educational hub provided tailored technical support and practical solutions for ICP specialists. The enthusiastic turnout and engaging discussions were truly rewarding.

Missed Pitcon? Join us at **Analytica USA**, September 10 to 12, in Columbus, OH. [Register here](#) for the same enriching ICP Alley experience. We all hope to see you there! We will also exhibit our products at **JASIS 2025**, in Makuhari Messe, Japan, September 3 to 5. [Register here](#).

CEM invited Glass Expansion, Agilent® Technologies, GFS Chemicals, and Inorganic Ventures to their **"Mastering Trace Metals Analysis: Tips & Tricks from the Metals Experts"** seminar tour, with stops in Texas, Oklahoma, Kansas, Colorado, Louisiana, Pennsylvania, and New Jersey from April to June. Stay tuned for the upcoming Fall Seminar tour on our [Event Calendar](#).

Glass Expansion was also honored to speak at Thermo Fisher Scientific's **"Ignite Your Productivity: ICP-MS and ICP-OES Insights and Innovations"** seminar series in Maryland, Massachusetts, Tennessee, and Kentucky.

Our presentation, **"Top 5 Mass-ive Problems with Element-ary Solutions,"** resonated strongly with attendees at both seminar tours. Download the [PDF here](#).

The "Top 5" Mass-ive Problems with Element-ary Solutions

Dr. Ryan Brennan
Inorganic
Glass Expansion, Inc.

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Q&A / Live Discussion

