

NEWS

Glass Expansion Newsletter | June 2013 | Issue 31

APPLICATION SPOTLIGHT

A NEBULIZER UPDATE

In June of 2008, Glass Expansion released a Newsletter article addressing ICP Nebulizer Selection and Maintenance. Since that time our line of nebulizers has expanded and designs have improved to better support the demands of the ICP-OES and ICP-MS analyst. This article will provide a summary of these additions and design changes, as well as addressing proper nebulizer maintenance and presenting an updated guide to nebulizer selection.

What Makes a Glass Expansion Nebulizer Unique?

Glass Expansion is most notably known for the unique VitriCone™ sample channel of the glass concentric line of nebulizers (MicroMist, SeaSpray, Conikal, and Slurry). The VitriCone sample channel is created by machining constant bore heavy stock glass tubing to create the desired aerodynamic exterior while maintaining a consistent internal diameter. Other manufacturers heat and draw a thin fragile capillary from glass tubing to create the internal capillary. This process is prone to a number of potential problems including inconsistent inner diameter, an increase in the porosity of the glass, and harmonic vibrations from the flow of argon, all of which degrade performance and lifetime. A diagram comparing a Glass Expansion nebulizer (A) to other brands (B) is shown in Figure 1.

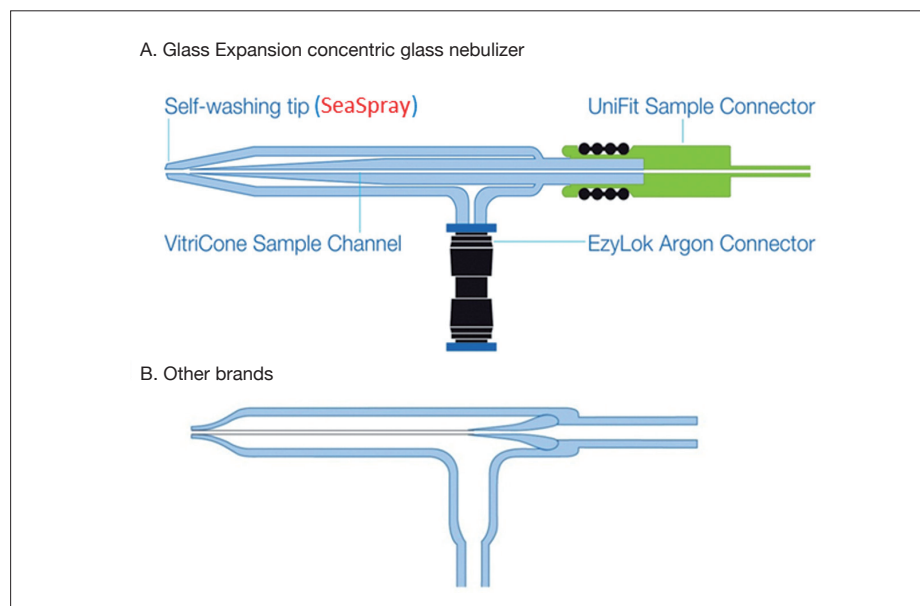


Figure 1: Glass Expansion VitriCone construction versus other brand glass concentric nebulizer.

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.

GE NEWS

59th ICASS

Glass Expansion will be exhibiting at the 59th ICASS (International Conference on Analytical Sciences and Spectroscopy) which is being held in conjunction with Spectr'Atom 2013 on June 25 to 28 at Mont-Tremblant, Quebec, Canada.

NYAAEL/PaAAEL 2013 Annual Convention & Exposition

The NY Association of Approved Environmental Laboratories (NYAAEL) and the PA Association of Accredited Environmental Laboratories (PaAAEL) will hold their 2013 Annual Convention and Exposition at Gettysburg, PA, USA on July 21 to 23. This year's meeting will have a focus on Automating Manual Techniques and Glass Expansion products will be on display.

JASIS 2013

A full range of Glass Expansion products will be on display at JASIS 2013, Tokyo, Japan, September 4 to 6 and Glass Expansion specialists will be on hand to assist you.



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Design Improvements

U-Series

In 2009 Glass Expansion introduced the U-Series™ glass concentric nebulizer. The previous design used an EzyFit™ sample connector that slides into the sample arm port. Because the end of the EzyFit connector did not always exactly match the end of the port in the nebulizer arm, a small gap could result to varying degrees. The U-Series nebulizer features instead a UniFit connector that slides easily over the sample arm of the nebulizer creating an excellent seal and a zero dead volume connection. You can see in Figure 1 (A) that the VitriCone sample channel of the U-Series glass concentric nebulizers is uniform from entry point to the nebulizer tip. Since there is nowhere for the sample or particulates to be trapped, you get the fastest possible washout and highest sample throughput. A comparison of the EzyFit connector (A) and UniFit connector (B) is shown in Figure 2. All of the glass concentric nebulizers (MicroMist, SeaSpray, Conikal, and Slurry) are available in the U-Series style. The U-series nebulizer still includes the same EzyLok argon connector line for safe, easy, and effective connection to the argon supply line. The U-Series glass concentric nebulizers will deliver the same outstanding performance as the EzyFit style since the internal construction is unchanged, but provide all the benefits of the UniFit connector. Another modification implemented at the same time as the U-Series design was to specify all nebulizers at 40 psi (276kPa), which was the pressure found to give optimum performance. Since all nebulizers now have the same pressure specification, we changed the part number prefix from ARxx to ARG.

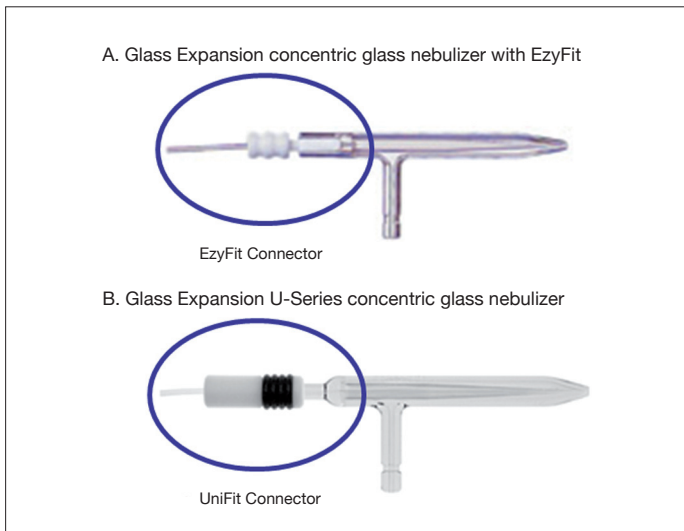


Figure 2: Glass Expansion EzyFit and UniFit sample connector.

The U-Series glass concentric nebulizer is a great improvement for all labs, but has an extra advantage for those that are conducting speciation measurements. With the Glass Expansion LC Fittings Kit (P/N FT-16-8), any glass concentric U-Series nebulizer can be quickly and easily connected to an LC, IC, or HPLC with a zero dead volume connection. The standard LC Fittings Kit is configured to connect typical eluent tubing (1.6mm or 1/16 inch OD) to the U-Series sample arm (3.2mm or 1/8 inch OD). A diagram of the kit connected to a U-Series nebulizer is pictured in Figure 3.



Figure 3: Glass Expansion LC Fittings Kit and U-Series glass concentric nebulizer (zero dead volume).

OpalMist and PolyCon

In 2011 the OpalMist and PolyCon nebulizers were re-designed. With the previous design, the sample tubing was connected using a screw-on cap and o’ring seal while the EzyLok argon connector was permanently connected to the side-arm. The new design is more user-friendly and accommodates the same UniFit sample tube connector as our U-Series glass concentric nebulizers. The EzyLok argon connector is attached by a screw-in fitting that is easily removable. The updated OpalMist and PolyCon nebulizers deliver the same outstanding performance as the previous design since the internal construction is unchanged. The updated OpalMist (A) is compared to the previous design (B) in Figure 4. The updated PolyCon has the same design.

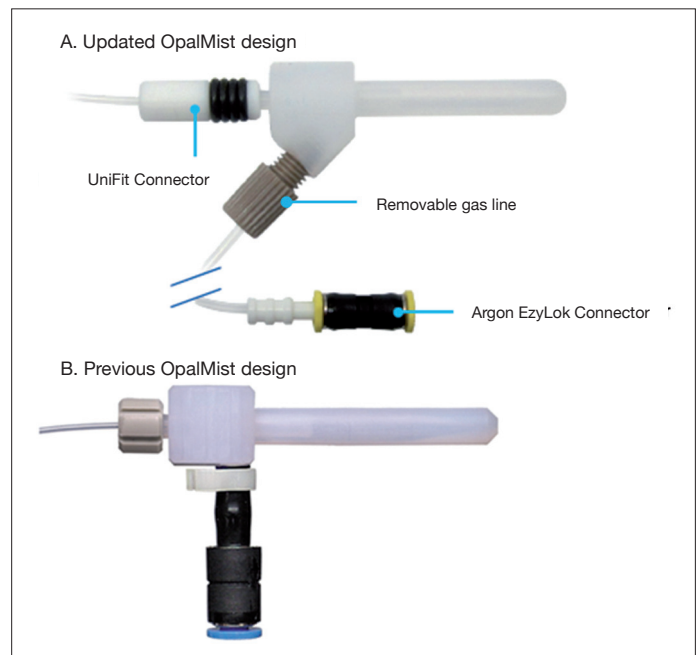


Figure 4: Updated nebulizer design for Glass Expansion HF resistant concentric nebulizers.

VeeSpray

The new Ceramic VeeSpray™ nebulizer design was also released in 2009. The focus of the VeeSpray re-design was to make it simpler, while maintaining its ability to handle the widest range of samples and largest particulates. The VeeSpray is now only available with a ceramic body, making it ideal for any sample matrix. It is also a fully serviceable nebulizer, allowing the ICP analyst to easily replace the sample tube, gas tube, even the ceramic body (Figure 5).

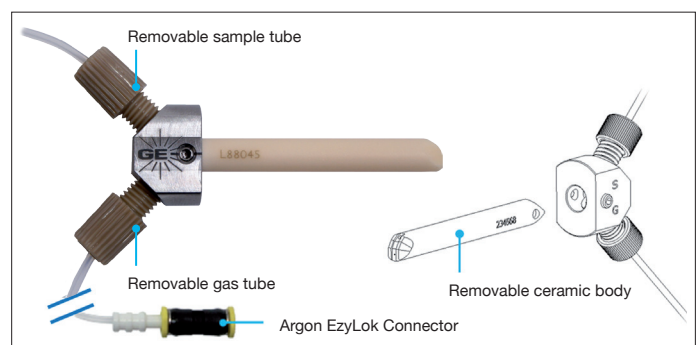


Figure 5: Updated nebulizer design for Glass Expansion Ceramic VeeSpray.

New DuraMist™ Inert Nebulizer

The **DuraMist nebulizer** was added to the product line in 2011. The DuraMist is a new model of HF-resistant nebulizer (up to 5% HF), providing excellent sensitivity and precision at an affordable price. It is a concentric, self-aspirating nebulizer and is compatible with all ICP models. Its ability to run samples with up to 30% total dissolved solids without blockage makes it an effective universal nebulizer. The strength and rigidity of the PEEK material allow the DuraMist to be manufactured to very tight tolerances, enabling it to approximate the performance of our SeaSpray nebulizer, the worldwide market-leading high performance glass nebulizer. The DuraMist is shown in Figure 6 and a detailed summary of its performance can be found in the October 2011 Newsletter.

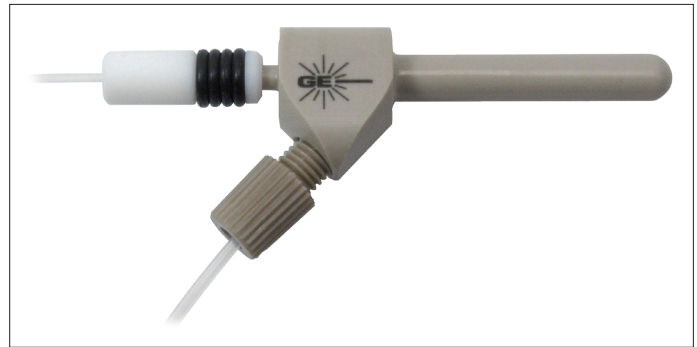


Figure 6: DuraMist inert nebulizer

Nebulizer Selection

This section will briefly summarize the characteristics of each Glass Expansion nebulizer. When selecting a nebulizer for a specific application, you should consider a number of characteristics as follows:

- Tolerance to total dissolved solids (TDS)
- Tolerance to particulates
- Tolerance to hydrofluoric acid (HF)
- Precision
- Purity
- Robustness
- Material

Table I compares all Glass Expansion nebulizers with respect to these characteristics.

Nebulizer	TDS (%)	Particulates (µm)	HF	Precision	Purity	Robustness	Material
Conikal	5	75	No	High	Good	Good	Glass
SeaSpray	20	75	No	High	Good	Good	Glass
MicroMist	15	40*	No	High	Good	Good	Glass
Slurry	1	150	No	High	Good	Good	Glass
OpalMist	15	75*	Yes	High	Excellent	Good	PFA
PolyCon	5	75*	Yes	High	Good	Good	Polyimide
DuraMist	30	75*	Yes	High	Good	Good	PEEK
Ceramic VeeSpray	30	300	Yes	Moderate	Good	Excellent	Ceramic

* Varies with nebulizer uptake

Table 1: Comparison of Glass Expansion nebulizers.

All of these characteristics were considered when designing our helpful (and popular) Nebulizer Selection Guide (Figure 7). Following this flow chart will help the ICP analyst choose the most suitable nebulizer for a specific application. We also now have an interactive selection guide, compatible with your iPhone, iPad and Android devices, which can be downloaded for free from the Apple App Store or Google Play. Like the flow chart, this application will select the nebulizer (and spray chamber) that will provide the best performance, but it will also provide you with a photo and P/N of the nebulizer suitable for your model ICP-OES or ICP-MS.

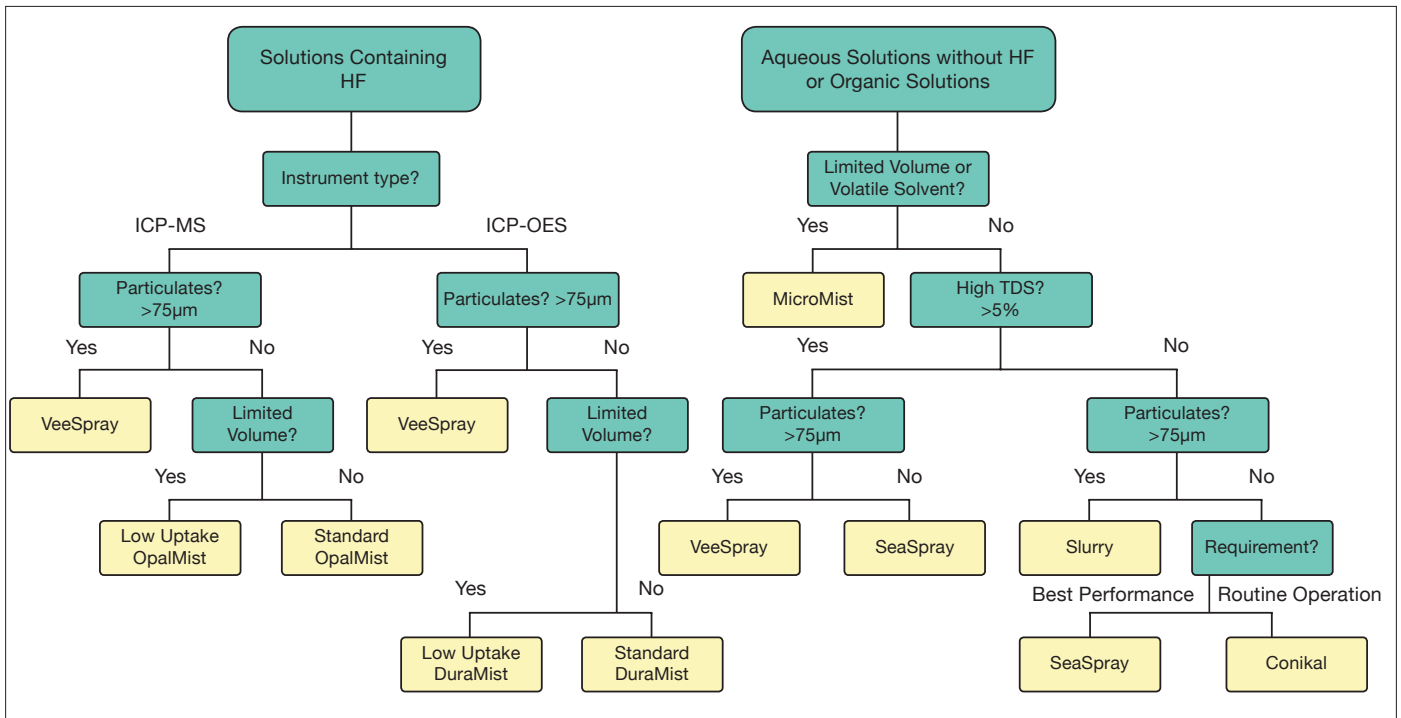


Figure 7: Glass Expansion nebulizer selection guide.

As shown in Figure 7, sample uptake rate is a factor in the selection of the proper nebulizer. Our [online pump speed and sample uptake calculator](#) provides a quick and accurate estimate of your sample uptake rate. If you prefer a real-time continuous measurement of your sample uptake, consider adding the [TruFlo Sample Monitor](#) to your ICP laboratory. The TruFlo provides a 24-hour record of performance and reduces the need to repeat measurements due to a blocked nebulizer, worn pump tubing or incorrect clamping of the pump tube. If you require the measurement of trace levels of boron, you might consider using a high purity PFA nebulizer like the OpalMist. We also offer a Quartz Concentric U-Series nebulizer that would be suitable for boron measurements. The performance of the Quartz Concentric U-Series nebulizer is comparable to that of the Conikal nebulizer.

Nebulizer Maintenance

The lifetime of a nebulizer can be prolonged by proper maintenance. Here are some practices that should be avoided to prevent damage.

- Do not insert anything through the orifice of the nebulizer. This is most likely to damage the nebulizer beyond repair.
- Do not use any concentration of HF to clean a glass or quartz nebulizer. Even dilute HF can alter the orifice of the internal capillary and deteriorate the performance of the nebulizer.
- Do not place a glass nebulizer in an ultrasonic bath as it may dislodge the internal capillary.
- Do not use hot liquid to flush the sample capillary of an inert nebulizer. The temperature can potentially deform the capillary and affect nebulizer performance.

At the end of each day, it is always best to aspirate dilute acid for 15 minutes followed by deionized water (DIW). This ensures that sample deposits or crystals do not form on the inside of a nebulizer when the solvent dries, which can deteriorate performance and shorten the lifetime. For regular analysis of samples with high TDS we recommend aspirating a 2.5% Fluka RBS-25 (P/N [FLUKA25](#)) solution for 15 minutes at the end of each day or analysis run followed by DIW. This will also clean your spray chamber. (For tips on analyzing high TDS samples, see the [June 2010 newsletter](#).)

If your nebulizer's sample capillary becomes blocked, we recommend using the Eluo nebulizer cleaning tool to safely back-flush and unblock your nebulizer (Figure 8). For concentric glass nebulizers, use the standard Eluo nebulizer cleaner, P/N [70-ELUO](#); for the OpalMist, PolyCon, and DuraMist use P/N [70-ELUO-OPD](#); and for the old design OpalMist and PolyCon use P/N [70-ELUO-OP](#). If there are salt deposits that cannot be removed with the Eluo, we recommend removing all of the fittings and soaking the nebulizer for 24hrs in a beaker of 25% Fluka solution and then flushing with warm water using the Eluo. After a few flushes with warm water it can then be flushed with methanol so that it will dry faster. Use the Eluo regularly to maintain nebulizer performance and prolong life.

When cleaning your nebulizer always take special care of the nebulizer tip. Any deposit of body oils can have a detrimental effect on the performance of the nebulizer, so handle only with gloves. Once a nebulizer tip has been damaged, the nebulizer's performance cannot be restored. All Glass Expansion nebulizers are supplied in specially designed plastic boxes. The nebulizer should be kept in this box when it is being stored. This prevents damage to the nebulizer tip, and small particles from lodging in the nebulizer bore and causing blockages.

The VeeSpray nebulizer is quite rugged and usually only requires minimal maintenance. However, it is still advisable to run dilute acid or DIW at the end of each analysis run. The ceramic body can be isolated and soaked in 25% Fluka if necessary.

As easy as 1, 2, 3

1. Fill with solvent



2. Insert nebulizer



3. Clean nebulizer



Figure 8: Eluo Nebulizer Cleaning Tool.

If you find that RSD's are getting worse, but the spray chamber doesn't seem to be at fault, remember to check the argon connection to your nebulizer. PVC or other polymer tubes can sometimes harden over time and lose their flexible gas-tight grip. Even a 1% loss of argon can produce changes of several percent in many ICP analytical lines.

Most of the ICP-OES and ICP-MS instrument models monitor the nebulizer back-pressure. It is good practice to record or take note of the nebulizer back-pressure after your instrument has warmed up. This way you will know if the back-pressure is abnormally low or high and can check for leaks or a clogged nebulizer tip, respectively. Glass Expansion U-Series concentric nebulizers run optimally at approximately 40 psi.

Summary

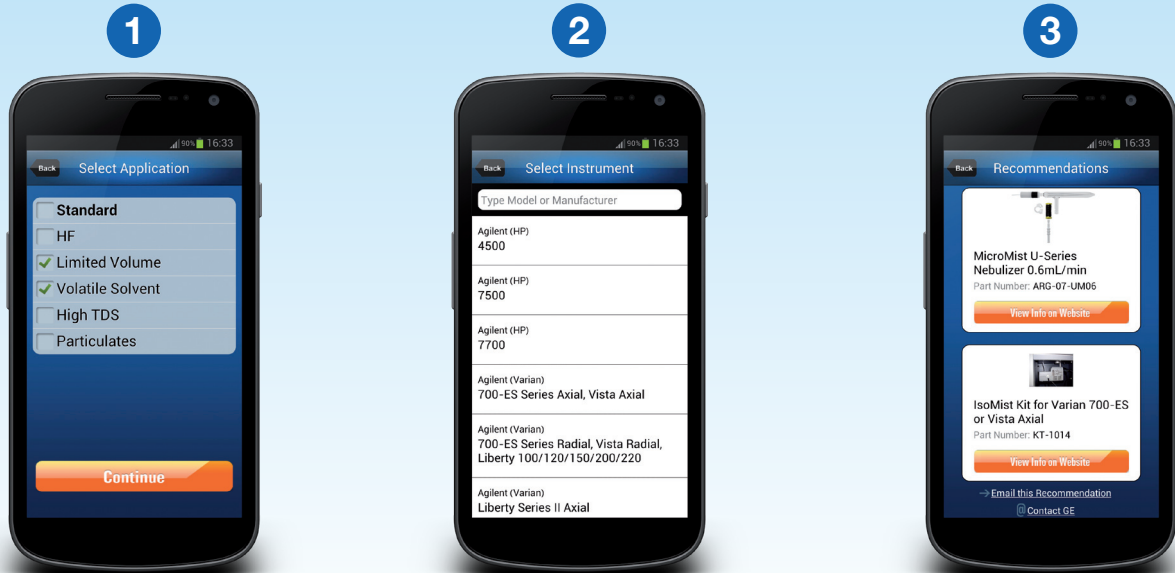
We hope that this nebulizer update has provided you with a helpful guide to selecting the appropriate nebulizer for your application in addition to addressing all of the design improvements and new additions to our line of nebulizers. The reproducibility of analytical results in ICP analyses is of paramount importance. In an environment where a small change or inconsistency in a product or variable can result in a dramatic change in analytical results, design quality and reliability are essential. Glass Expansion has developed unique and proprietary manufacturing methods, which enable the production of components with the high mechanical strength and micron-level dimensional accuracy to satisfy the most stringent analytical requirements, each and every time. This is why Glass Expansion nebulizers are recognized worldwide for their excellent precision, cost effectiveness and reproducibility of results.

Following the maintenance guidelines described in this article will allow you to protect your investment and maintain optimum nebulizer performance. If you have any questions about nebulizer selection or maintenance please contact us; we are happy to help.

GE NEWS

Smartphone App - ICP Nebulizer and Spray Chamber Selection Guide

The new Glass Expansion Smartphone App shows you the best nebulizer and spray chamber for your specific application and your specific ICP model.



Select your sample type.

Select your ICP model.

The App will show you which nebulizer and spray chamber will give you the best performance.

Compatible with iPhone, iPad and Android devices

Download from App Store or Google play:



Upgraded online shop

Getting your ICP-OES and ICP-MS supplies and consumables is now even easier with the upgraded Glass Expansion online shop.

You now have the option of creating a 'login' account. If you choose to create a 'login' account, you will be able to view your 'order history', greatly simplifying the re-ordering of any item purchased previously. And your contact details will be automatically entered into your order. If you choose not to create a 'login' account, you can still place new orders, but you will not be able to view previous orders.

We hold a full range of ICP-OES and ICP-MS supplies in stock ready for immediate dispatch, and delivery to most countries takes 2-4 days. And we also provide FREE DELIVERY anywhere in the world for orders placed through our online shop with a value above the specified minimum.

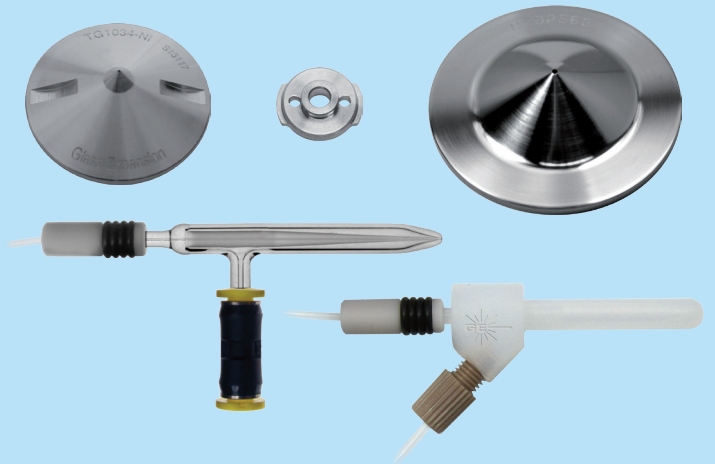
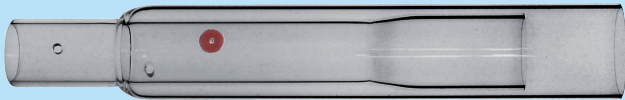
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Date	O/No	Part	Description	Qty	
28 May 2013	201305137	KT-1116	PCC Spray Chamber for Agilent 7700/8800	1	add
		70-803-0643	TruFlo Sample Monitor	1	add
21 May 2013	201305121	ARG-1-USS04X	SeaSpray U-Series Nebulizer 0.4mL/min	2	add
		30-808-3305	D-Torch for Agilent 7700/8800 (without injector)	1	add
		31-808-3302	Tapered Quartz Injector 2.5mm for D-Torch	1	add
		AT7701-Ni	Nickel Sampler Cone for Agilent 7700	2	add
		AT7702X-Ni	Nickel Skimmer Cone for Agilent 7700x	2	add
		0.19-OR3B-E	Contour Flared End PVC Pump Tube 3tag 0.19mm ID Orange/Red (PKT 6)	3	add
		1.02-WHT3B-E	Contour Flared End PVC Pump Tube 3tag 1.02mm ID White/White (PKT 6)	3	add

NEW PRODUCTS

Consumables for Thermo iCAP Q ICP-MS

The Thermo iCAP Q ICP-MS was released in 2012. We can now supply a range of consumables for this model, including nebulizers, torches and cones. You can see these products on our website at www.geicp.com. Click [here](#) to find products to suit your application or [here](#) to see the full range.



INSTRUMENT NEWS

From SPECTRO – Mass Spectrometry Provides New Ways to Extract Platinum Metals

The natural occurrence of platinum group metals, ruthenium, rhodium, and palladium as well as osmium, iridium and platinum, is very rare; making them extremely valuable. Even a tiny difference in the already very-low platinum metal concentrations in a raw material can determine whether or not extraction is worthwhile. This is true for all forms of production, be it mining for metal ores, as a byproduct during nickel refining, recycling of electronic scrap or material recovery in spoil piles leftover from earlier platinum ore mining. The SPECTRO MS inductively coupled plasma mass spectrometer (ICP-MS) can establish the contents of platinum metals with a high precision and sensitivity. Even determination in the range of a few micrograms per kilogram is possible.

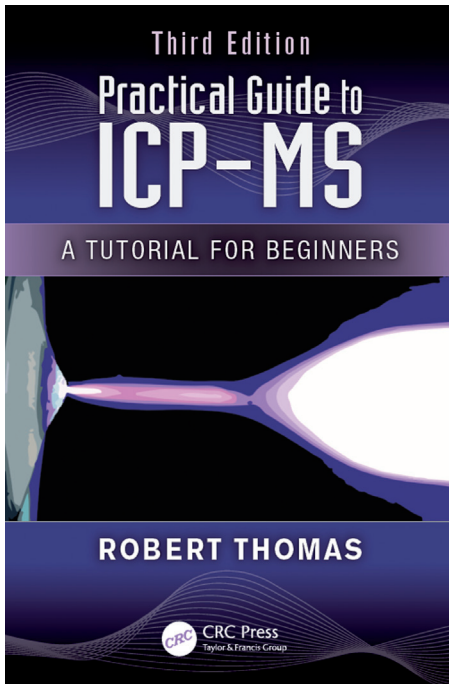
The high sensitivity and precision have been made possible by internal standardization of the instrument. With the conventional method for the solid material analysis of platinum metals, the sample is first mixed with nickel sulfate. The mixture is then processed to form a fused bead, whereby the platinum metals accumulate in the nickel sulfate, and the rest of the sample can be removed as slag. In the next step, the bead is subjected to a laser impulse. Using this laser ablation, a portion of the material at the sample surface is transformed into a plasma that can be evaluated with an analytical instrument.

“The problem is that the amount of sample that passes into the plasma is strongly dependent on the sample matrix,” explains Willi Barger, specialist for ICP mass spectrometry at SPECTRO. “If a large portion of the sample substance passes into the plasma, then the instrument measures high concentrations. But if only a small amount is removed, then the contents are low. To minimize the resulting fuzziness, the SPECTRO MS uses nickel, the main component in the bead, as an internal calibration standard.”

Because the SPECTRO MS is the first and only ICP mass spectrometer to offer fully simultaneous measurement of the complete relevant mass range from ${}^6\text{Li}$ to ${}^{238}\text{U}$ over a very wide dynamic range, the instrument is able to determine nickel at extremely high concentrations. At the same time, the instrument is able to detect the platinum metals group elements at trace levels.



INSTRUMENT NEWS



From CRC Press – Practical Guide to ICP-MS: A Tutorial for Beginners, Third Edition

Author: Robert Thomas, *Scientific Solutions, Gaithersburg, Maryland, USA*

Order information: <http://www.crcpress.com/product/isbn/9781466555433>

Presenting an in-depth discussion of the fundamental principles, analytical advantages, and practical capabilities of ICP-MS, this volume offers key concepts in a reader-friendly format suitable for those with limited knowledge of the technique. Written by an insider with more than 20 years experience in product development, customer support, and technical marketing for an ICP-MS instrument vendor, the book highlights this powerful ultra trace-element technique as a practical solution to real-world problems. The new edition has been updated and revised to cover new developments and updates to existing applications, including nanomaterials, pharmaceuticals, geological, semiconductor and environmental. The book also covers the brand new technology introduced by vendors since the second edition published.