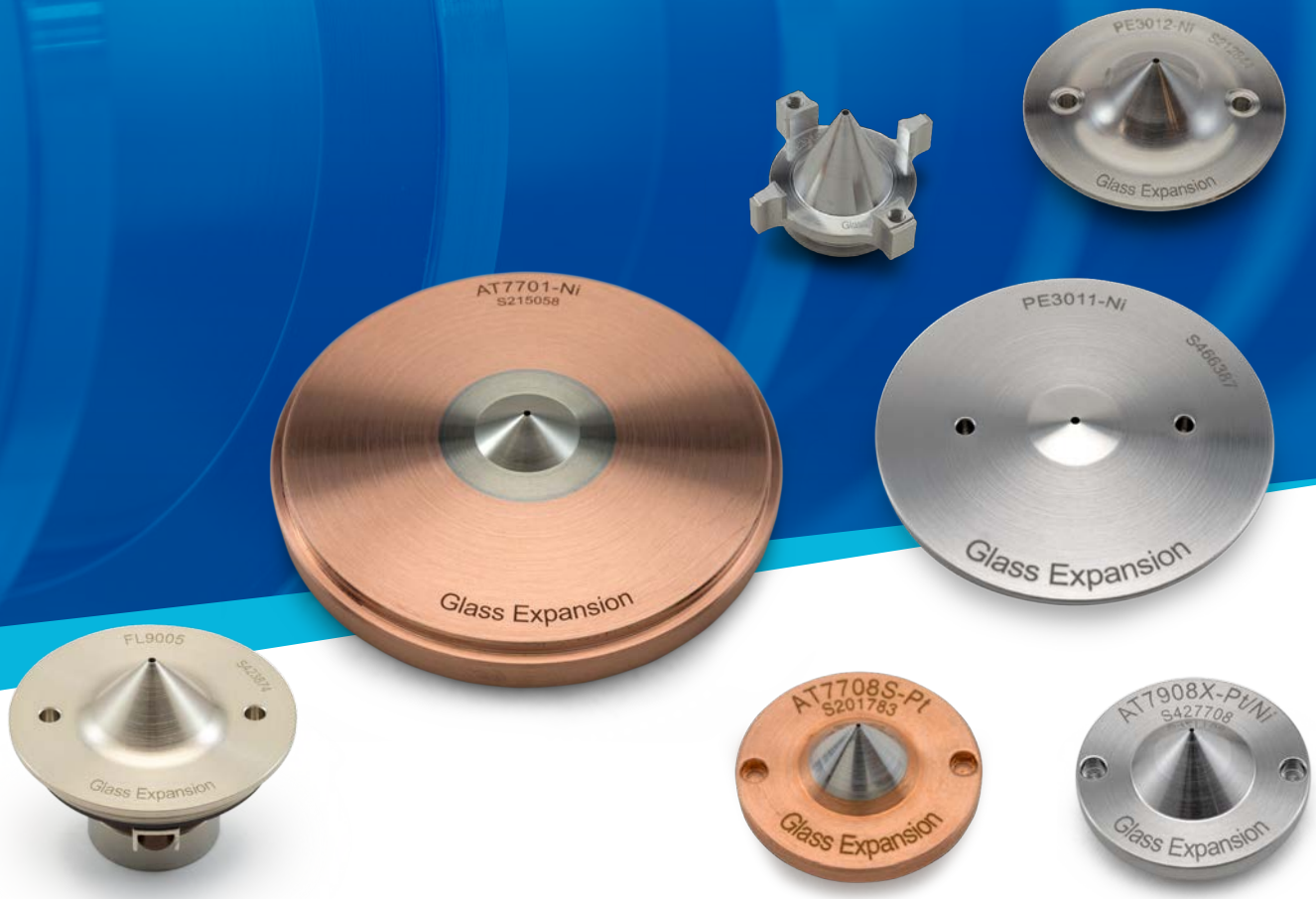
GLASS EXPANSION
Quality By Design

Glass Expansion ICP-MS Cone Resource Guide

Issue 1



Contents

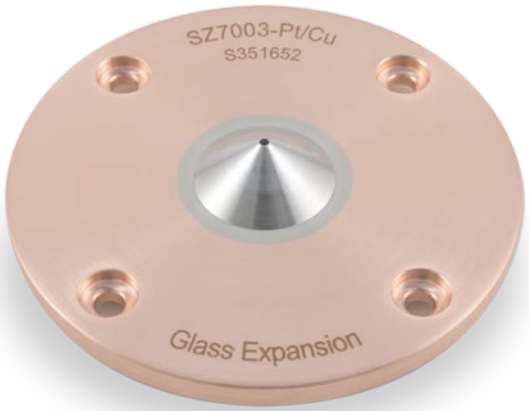
Learn about Glass Expansion Cones

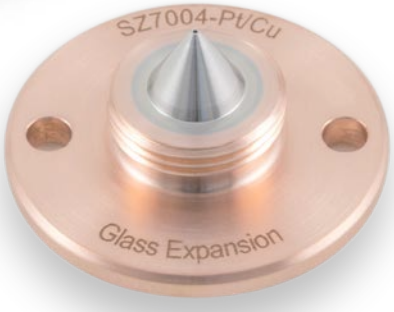
Cone by ICP Model

Cone Conditioning, Gasket & O-ring Replacement Guidelines

Cone Maintenance

Customer Comments





Best Equipped and Qualified Cone Machining Plant in the World

Glass Expansion has over 35 years of experience in manufacturing ICP-MS sample introduction components and has earned a world-wide reputation for quality and reliability. We manufacture ICP-MS cones to the same exacting standards as all of our products and they are guaranteed to perform to your satisfaction. Our manufacturing plant includes CNC machines, laser and electron beam welders allowing us to provide you with the tightest manufacturing specifications.

We supply cones for all of the popular ICP-MS instruments, including models from Agilent®, Nu Instruments, PerkinElmer®, Shimadzu®, Thermo Fisher Scientific® and Standard BioTools™. To make sure you get all the support you need, we have a staff of technical experts and a fully equipped ICP-MS laboratory for testing and evaluation.

Take Advantage of the Glass Expansion Warranty

- Meet or exceed OEM specifications
- Available for all common ICP-MS models
- Satisfaction guaranteed

Cone Availability

ICP-MS	Ni	Al	Pt	Pt - Boron Free	Cu
Agilent®	✓	✓	✓	✓	✓
Nu Instruments	✓		✓		
PerkinElmer®	✓	✓	✓	✓	
Shimadzu®	✓		✓		✓
Standard BioTools™	✓				
Thermo®	✓	✓	✓	✓	

Refurbishment and Reclaim Service for Platinum Cones

- Fast turnaround
- Simple return processing

Refurbishment

Extend the life of your platinum cones with our refurbishment service. Platinum cones have a much longer life than nickel cones but they do deteriorate over time. In many cases, a platinum cone can be refurbished multiple times and its lifetime greatly extended. As a customer service, Glass Expansion offers refurbishment of the platinum cones that we sell for the life of the cone.

To take advantage of this program, simply contact us and request a Product Return form for a platinum cone refurbishment service. We will also need to know your instrument model along with the number of platinum sampler and platinum skimmer cones that you would like to be evaluated for refurbishing.

Platinum Reclaim

If your platinum cone cannot be refurbished, we will provide a credit to the value of platinum in the cone which can be used on the purchase of any Glass Expansion products including new cones.

ConeGuard Thread Protector

When cleaning cones which have a screw thread, it is important that the thread is not contacted by any corrosive solution. If the thread gets corroded, the cone may not seal correctly or it may bond to the base and be difficult to remove. With platinum cones, the thread is likely to wear out before the platinum insert.

- Extend the life of your ICP-MS cones.
- Seals the thread and protects it from corrosion during the cleaning process.
- Keeps the thread in good condition to prevent the possibility of cross-threading and potential damage to the instrument housing.

General Guidelines on Cone Material

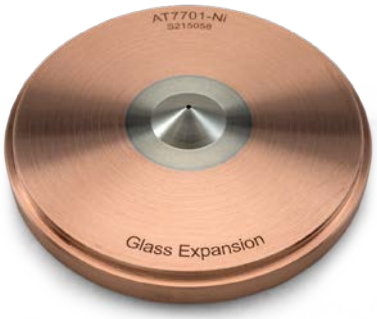
For most ICP-MS instruments you may have several interface cone options to choose from. Below we have summarized the general characteristics of each interface cone material to use as guidelines to help you make a decision based on your application and analysis goals.

As you review Glass Expansion's cone resource guide, you will find that as a cone designer and manufacturer, Glass Expansion has the expertise to manufacture specialty cones, in addition to the OEM design. These specialty cones may not be available from the instrument manufacturer, but are designed to provide improved performance for specific applications.

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.

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.

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.

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.
- 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.

Platinum - Boron-Free

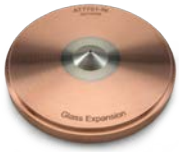
- All the benefits of a standard platinum cone, but boron-free cones go through a Glass Expansion proprietary treatment to remove boron, resulting in the lowest boron background possible.
- PerkinElmer NexION customer (PE3013-Pt-BF & PE3014-Pt-BF):
  “Great news, ran your set right out of the box and got 20 counts for boron 11.”

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).

Sampler Cones for Agilent® 7700/7800/7850/7900/8800/8900 ICP-MS

Description	Part Number	OEM P/N	Comments
Nickel Sampler	AT7701-Ni	G3280-67040	Standard with x-lens.
Nickel Sampler with Nickel plated base	AT7701-Ni/Ni	G3280-67061	For samples with > 0.5% HCl or when using maximum HMI dilution.
Aluminium Sampler	AT7701-Al	N/A	For lowest nickel background and Laser Ablation applications.
Platinum Sampler	AT7706-Pt	G3280-67036	Standard with s-lens.
Platinum Sampler (18 mm insert)	AT7706A-Pt	G3280-67056	For use with high viscosity or high boiling point acids. Best LOD in high matrix.
Platinum Sampler with Nickel plated base	AT7706-Pt/NiP	G3280-67142	For aggressive acid matrices (HCl, HF, $HClO_4$) and high matrix samples.
Platinum Sampler with Nickel base	AT7706-Pt/Ni	N/A	For when cone deposition is rapid due to high TDS.
Platinum Sampler (15mm insert) with Nickel base	AT7706B-Pt/Ni	N/A	For when cone deposition is rapid due to high TDS.
Platinum Sampler with Nickel plated base (Extended Life)	AT7706L-Pt/NiP	N/A	For when cone deposition is rapid due to high TDS and more durability is required.



AT7701-Ni

AT7701-Ni/Ni

AT7706-Pt/NiP

Skimmer cones for Agilent® 8900 ICP-MS

Description	Part Number	OEM P/N	Comments
Nickel Skimmer for x-lens	AT7902X-Ni	G8400-67200	Standard with x-lens.
Nickel Skimmer for s-lens	AT8902S-Ni	G3666-67421	For routine samples.
Copper Skimmer for s-lens	AT8902S-Cu	G3666-67067	For Semiconductor applications.
Aluminium Skimmer for x-lens	AT7902X-Al	N/A	For lowest nickel background and Laser Ablation applications.
Platinum Skimmer with Copper Base for x-lens	AT7908X-Pt	G8400-67201	For aggressive acid digests, including HF. Best LOD in high matrix. Must be mounted on the brass skimmer adaptor base.
Platinum Skimmer with Nickel Base for x-lens	AT7908X-Pt/Ni	G8400-67202	Recommended for organic analysis. Must be mounted on the brass skimmer adaptor base.
Platinum Skimmer with Copper Base for s-lens	AT8908S-Pt/Cu	G3666-67401	Standard with s-lens. For use with sample digests that contain aggressive acids and HF acid.
Platinum Skimmer with Nickel Base for s-lens	AT8908S-Pt/Ni	G3666-67411	For use with organic solvents and added oxygen.
Platinum Skimmer with Nickel Base for m-lens	AT8908M-Pt/Ni	G3666-67501	For use with high matrix samples.

AT8902S-Ni

AT7708S-Pt

AT7908X-Pt/Ni

Skimmer cones for Agilent® 7900 ICP-MS

Description	Part Number	OEM P/N	Comments
Nickel Skimmer for x-lens	AT7902X-Ni	G8400-67200	Standard with x-lens.
Nickel Skimmer for s-lens	AT7702S-Ni	G3280-67066	For use with routine sample digests.
Copper Skimmer for s-lens	AT7702S-Cu	G3280-67067	For Semiconductor applications.
Aluminium Skimmer for x-lens	AT7902X-Al	N/A	For lowest nickel background and Laser Ablation applications.
Platinum Skimmer for x-lens	AT7908X-Pt	G8400-67201	For aggressive acid digests, including HF. Best LOD in high matrix. Must be mounted on the brass skimmer adaptor base P/N AT7905X-BR.
Platinum Skimmer for s-lens	AT7708S-Pt	G3280-67064	Standard with s-lens. Must be mounted on the brass skimmer adaptor base.
Platinum Skimmer with Nickel Base for x-lens	AT7908X-Pt/Ni	G8400-67202	Recommended for organic analysis. Must be mounted on the brass skimmer adaptor base P/N AT7905X-BR.
Platinum Skimmer with Nickel Base for s-lens	AT7708S-Pt/Ni	G3280-67065	Recommended for organic analysis. Must be mounted on the brass skimmer adaptor base.
Platinum Skimmer with Nickel Base for m-lens	AT8908M-Pt/Ni	G3666-67501	For use with high matrix samples. Must be mounted on the brass skimmer adaptor base.

AT7902X-Ni

AT7908X-Pt

AT8908M-Pt/Ni

Skimmer cones for Agilent® 7800/7850 ICP-MS

Description	Part Number	OEM P/N	Comments
Nickel Skimmer for x-lens	AT7702X-Ni	G3280-67041	Standard.
Aluminium Skimmer for x-lens	AT7702X-Al	N/A	For lowest nickel background and Laser Ablation applications.
Platinum Skimmer with Copper Base for x-lens	AT7708X-Pt	G3280-67060	Must be mounted on the brass skimmer adaptor base.
Platinum Skimmer with Nickel Base for x-lens	AT7708X-Pt/Ni	G3280-67063	Recommended for organic analysis. Must be mounted on the brass skimmer adaptor base.

AT7702X-Ni

Skimmer cones for Agilent® 7700/8800 ICP-MS

Description	Part Number	OEM P/N	Comments
Nickel Skimmer for x-lens	AT7702X-Ni	G3280-67041	Standard with x-lens.
Nickel Skimmer for s-lens	AT7702S-Ni	G3280-67066	For use with routine sample digests.
Aluminium Skimmer for x-lens	AT7702X-Al	N/A	For lowest nickel background and Laser Ablation applications.
Platinum Skimmer with Copper Base for x-lens	AT7708X-Pt	G3280-67060	Must be mounted on the brass skimmer adaptor base.
Platinum Skimmer with Nickel Base for x-lens	AT7708X-Pt/Ni	G3280-67063	Recommended for organic analysis. Must be mounted on the brass skimmer adaptor base.
Platinum Skimmer with Copper Base for s-lens	AT7708S-Pt	G3280-67064	Recommended for organic analysis. Standard with s-lens. Must be mounted on the brass skimmer adaptor base.
Platinum Skimmer with Nickel Base for s-lens	AT7708S-Pt/Ni	G3280-67065	Recommended for organic analysis. Must be mounted on the brass skimmer adaptor base.

AT7708X-Pt

AT7708X-Pt/Ni

Cone Options for Agilent® ICP-MS

Description	Part Number	OEM P/N	Comments
Skimmer ConeGuard	70-803-1004	N/A	For 7700s/7900. To protect cone threads during cleaning.
Skimmer ConeGuard	70-803-1008	N/A	For 7700x/7800/7850/8800/8900. To protect cone threads during cleaning.
Retaining Ring	AT7704	G3280-20504	For 7700/7800/7850/7900/8800/8900 Sampler Cone.
Graphite Gasket (PKT 3)	AT7703	G3280-67009	For 7700/7800/7850/7900/8800/8900 Sampler Cone.
Long Life Shield Plate	AT5004	G1833-65419	For 7700/7800/7850/7900/8800/8900.
Magnifier Inspection Tool	70-803-1923	5190-9614	10x magnification loupe with LED illumination. Used to inspect condition of cone orifice.


70-803-1004


AT5004

Sampler Cones for Nu Instruments Vitesse TOF-ICP-MS

Description	Part Number	OEM P/N	Comments
Nickel Sampler, Wet Plasma	NU1011A-Ni	319-645	Standard applications.
Nickel Sampler, Dry Plasma	NU1011B-Ni	319-646	Laser Ablation applications.

NU1001B-Ni

Skimmer Cones for Nu Instruments Vitesse TOF-ICP-MS

Description	Part Number	OEM P/N	Comments
Nickel Skimmer, Wet Plasma	NU1004A-Ni	319-497	Standard applications.
Nickel Skimmer, Dry Plasma	NU1014B-Ni	325-294	Laser Ablation applications.

NU1004A-Ni

Sampler Cones for Nu Instruments Plasma2, Plasma3 & Attom ES

Description	Part Number	OEM P/N	Comments
Nickel Sampler, Version A, Wet Plasma	NU1001A-Ni	319-285	Standard applications.
Nickel Sampler, Version B, Dry Plasma	NU1001B-Ni	319-541	Laser Ablation applications.
Nickel Sampler, Dry Plasma	NU1011B-Ni	319-646	Laser Ablation applications.
Nickel Sampler, Wet Plasma	NU1011A-Ni	319-645	Standard applications.
Platinum Sampler, Wet Plasma	NU1006A-Pt	319-593	Standard applications.

NU1001A-Ni

Skimmer Cones for Nu Instruments Plasma2, Plasma3 & Attom ES

Description	Part Number	OEM P/N	Comments
Nickel Skimmer, Version A, Wet Plasma	NU1004A-Ni	319-497	Standard applications.
Nickel Skimmer, Version B, Dry Plasma	NU1004B-Ni	319-540	Laser Ablation applications.
Nickel Skimmer, Wet Plasma	NU1005A-Ni	319-595	Standard applications.
Nickel Skimmer, Dry Plasma	NU1014B-Ni	325-294	Laser Ablation applications.
Platinum Skimmer, Wet Plasma	NU1008A-Pt	319-594	Standard applications.

NU1005A-Ni

Cone Options for Nu Instruments

Description	Part Number	OEM P/N	Comments
Magnifier Inspection Tool	70-803-1923	N/A	10x magnification loupe with LED illumination. Used to inspect condition of cone orifice.

70-803-1923

Sampler Cones for PerkinElmer® NexION 5000

Description	Part Number	OEM P/N	Comments
Nickel Sampler	PE3011-Ni	W1033612	Standard.
Platinum Sampler	PE3013-Pt	W1033614	For corrosive samples.
Platinum Sampler (18mm)	PE3013A-Pt	N8145028	For sulfur based acids and solvents.
Platinum Sampler, Boron Free	PE3013-Pt-BF	N/A	For lowest boron background.

PE3011-Ni

Skimmer Cones for PerkinElmer® NexION 5000

Description	Part Number	OEM P/N	Comments
Nickel Skimmer	PE4012-Ni	N/A	Economic alternative to Pt.
Nickel Hyper Skimmer	PE4015-Ni	N8160120	Standard.
Platinum Skimmer	PE4014-Pt	N8161041	Standard.

PE4012-Ni

PE4015-Ni

Cone Options for PerkinElmer® NexION 5000

Description	Part Number	OEM P/N	Comments
O-ring for NexION Hyper Skimmer Cone (PKT 5)	PE5125	09211389	Replace if brittle or cracked.
Gasket for Sampler Cone (PKT 5)	PE5111	W1040148	Use a new gasket each time the cone is re-installed, even if it is the same cone.
Sampler ConeGuard	70-803-1024	N8145319	To protect cone threads during cleaning.
Magnifier Inspection Tool	70-803-1923	N/A	10x magnification loupe with LED illumination. Used to inspect condition of cone orifice.


PE5125


70-803-1024

Sampler Cones for PerkinElmer® NexION 1000/2000

Description	Part Number	OEM P/N	Comments
Nickel Sampler	PE3011-Ni	W1033612	Standard.
Aluminium Sampler	PE3011-Al	N/A	For lowest Ni background and Laser Ablation applications.
Platinum Sampler	PE3013-Pt	W1033614	For corrosive samples.
Platinum Sampler (18mm)	PE3013A-Pt	N8145028	For sulfur based acids and solvents.
Platinum Sampler, Boron Free	PE3013-Pt-BF	N/A	For lowest boron background.

PE3011-Ni

Skimmer Cones for PerkinElmer® NexION 1000/2000

Description	Part Number	OEM P/N	Comments
Nickel Skimmer	PE3012-Ni	W1026356	Standard.
Aluminium Skimmer	PE3012-Al	N/A	For lowest Ni background and Laser Ablation applications.
Aluminum Hyper Skimmer	PE3015-Al	W1033995	Standard.
Platinum Skimmer	PE3014-Pt	W1026907	For corrosive samples.
Platinum Skimmer, Boron Free	PE3014-Pt-BF	N/A	For lowest boron background.
Platinum/Nickel Hyper Skimmer	PE3015-Pt/Ni	N/A	For corrosive samples.

PE3012-Ni


PE3012-Al

Cone Options for PerkinElmer® NexION 1000/2000

Description	Part Number	OEM P/N	Comments
O-ring for NexION Hyper Skimmer Cone (PKT 5)	PE5115	9902123	Replace if brittle or cracked.
Stainless Steel screw for NexION Hyper Skimmer Cone (PKT 2)	PE5116	WE027484	Replace if corroded or worn.
Gasket for Sampler Cone	PE5111	W1040148	Use a new gasket each time the cone is re-installed, even if it is the same cone.
Sampler ConeGuard For NexION 1000/2000	70-803-1024	N8145319	To protect cone threads during cleaning.
Skimmer ConeGuard For NexION 1000/2000	70-803-1026	N8145320	To protect cone threads during cleaning.
Magnifier Inspection Tool	70-803-1923	N/A	10x magnification loupe with LED illumination. Used to inspect condition of cone orifice.


PE5115


70-803-1024

Sampler Cones for PerkinElmer® NexION 300/350

Description	Part Number	OEM P/N	Comments
Nickel Sampler	PE3011-Ni	W1033612	Standard.
Aluminium Sampler	PE3011-Al	N/A	For lowest Ni background and Laser Ablation applications.
Platinum Sampler	PE3013-Pt	W1033614	For corrosive samples.
Platinum Sampler, Boron Free	PE3013-Pt-BF	N/A	For lowest boron background.

PE3013-Pt

Skimmer Cones for PerkinElmer® NexION 300/350

Description	Part Number	OEM P/N	Comments
Nickel Skimmer	PE3012-Ni	W1026356	Standard.
Aluminium Skimmer	PE3012-Al	N/A	For lowest Ni background and Laser Ablation applications.
Aluminum Hyper Skimmer	PE3015-Al	W1033995	Standard.
Platinum Skimmer	PE3014-Pt	W1026907	For corrosive samples.
Platinum Skimmer, Boron Free	PE3014-Pt-BF	N/A	For lowest boron background.
Platinum/Nickel Hyper Skimmer	PE3015-Pt/Ni	N/A	For corrosive samples.

PE3014-Pt


PE3015-Pt/Ni

Cone Options for PerkinElmer® NexION 300/350

Description	Part Number	OEM P/N	Comments
O-ring for NexION Hyper Skimmer Cone (PKT 5)	PE5115	9902123	Replace if brittle or cracked.
Stainless Steel screw for NexION Hyper Skimmer Cone (PKT 2)	PE5116	WE027484	Replace if corroded or worn.
Gasket for Sampler Cone	PE5111	W1040148	Use a new gasket each time the cone is re-installed, even if it is the same cone.
Sampler ConeGuard For NexION 300/350	70-803-1024	N8145319	To protect cone threads during cleaning.
Skimmer ConeGuard For NexION 300/350	70-803-1026	N8145320	To protect cone threads during cleaning.
Magnifier Inspection Tool	70-803-1923	N/A	10x magnification loupe with LED illumination. Used to inspect condition of cone orifice.


PE5115


70-803-1026

Sampler Cones for PerkinElmer® Elan 6000/9000/DRC II/ DRC-E

Description	Part Number	OEM P/N	Comments
Nickel Sampler	PE2011-Ni	WE021140	Standard.
Platinum Sampler	PE2013-Pt	WE027802	For corrosive samples.

PE2011-Ni

Skimmer Cones for PerkinElmer® Elan 6000/9000/DRC II/ DRC-E

Description	Part Number	OEM P/N	Comments
Nickel Skimmer	PE2012-Ni	WE021137	Standard.
Platinum Skimmer	PE2014-Pt	WE027803	For corrosive samples.

PE2012-Ni

Cone Options for PerkinElmer® Elan 6000/9000/DRC II/ DRC-E

Description	Part Number	OEM P/N	Comments
Sampler Cone O-ring (PKT 5)	PE5011	N8120511	Replace if brittle or cracked.
Skimmer Cone O-ring (PKT 5)	PE5012	N8120512	Replace if brittle or cracked.
Skimmer ConeGuard	70-803-1022	N8121086	To protect cone threads during cleaning.
Magnifier Inspection Tool	70-803-1923	N/A	10x magnification loupe with LED illumination. Used to inspect condition of cone orifice.


PE5011


70-803-1022

Sampler Cones for Shimadzu® ICP-MS 2030

Description	Part Number	OEM P/N	Comments
Nickel Sampler	SZ7001-Ni	211-90190-42 220-95356-84	Recommended option for routine samples.
Nickel Sampler with Copper Base	SZ7001-Ni/Cu	N/A	For routine samples. Cu base provides better heat transfer if required.
Copper Sampler	SZ7001-Cu	211-90190-41 220-95356-82	Standard low-cost option.
Platinum Sampler (10mm)	SZ7003-Pt/Cu	220-95356-80 211-90110	For corrosive samples.
Platinum Sampler (15mm)	SZ7003A-Pt/Cu	N/A	For corrosive samples. Larger insert for extended life.

SZ7001-Ni

SZ7003-Pt/Cu

Skimmer Cones for Shimadzu® ICP-MS 2030

Description	Part Number	OEM P/N	Comments
Nickel Skimmer	SZ7002-Ni	211-90200-42 220-95356-85	Recommended option for routine samples.
Nickel Skimmer with Copper Base	SZ7002-Cu	N/A	For routine samples. Cu base provides better heat transfer if required.
Copper Skimmer	SZ7002-Cu	211-90200-41 220-95356-83	Standard low-cost option.
Platinum Skimmer	SZ7004-Pt/Cu	220-95356-81 211-90194-02	For corrosive samples.

SZ7002-Cu

SZ7002-Ni

Cone Options for Shimadzu® ICP-MS 2030

Description	Part Number	OEM P/N	Comments
Graphite Gasket (PKT 3)	SZ5001	211-90174-41	Use a new gasket each time the cone is re-installed, even if it is the same cone.
Screw Kit for Skimmer Cone (PKT 2)	SZ5002	022-27002-00	Replace if corroded or worn.
Screw Kit for Sampler Cone (PKT 4)	SZ5004	022-27001-00	Replace if corroded or worn.
O-ring Kit	70-803-1908	N/A	Replacement O-ring kit for the cone interface.
Cone Extraction Tool	70-803-1573	211-92103-00	For skimmer removal & installation.
Magnifier Inspection Tool	70-803-1923	220-95356-75	10x magnification loupe with LED illumination. Used to inspect condition of cone orifice.

70-803-1923

Cones for Standard BioTools™ Mass Cytometers

Description	Part Number	OEM P/N	Comments
Nickel Sampler	FL9001-Ni	105197	Standard for CyTOF2 & Helios. Not for use with C5 upgrade.
Nickel Skimmer-Reducer Assembly	FL9005	101802	Standard for Helios.

FL9001-Ni

Cone Options for Standard BioTools™ Mass Cytometers

Description	Part Number	OEM P/N	Comments
O-ring for Reducer Cone (PKT 5)	70-803-1564	101815	Compatible with CyTOF2, CyTOF XT, & Helios.
O-ring for Sampler Cone (PKT 5)	70-803-1565	105704	Compatible with CyTOF 2 & Helios. Not for use with C5 upgrade.
Magnifier Inspection Tool	70-803-1923	N/A	10x magnification loupe with LED illumination. Used to inspect condition of cone orifice.

FL9005

Sampler Cones for Thermo® ICP-MS Q/RQ/TQ

Description	Part Number	OEM P/N	Comments
Nickel Sampler with Copper Core	TG1021-Ni/Cu	3600812	Standard.
Aluminium Sampler	TG1021-Al	N/A	For lowest Ni background and Laser Ablation applications.
Platinum Sampler with Copper Core	TG1026A-Pt/Cu	3601289	For corrosive samples.


TG1021-Al

Skimmer Cones for Thermo® ICP-MS Q/RQ/TQ

Description	Part Number	OEM P/N	Comments
Nickel Skimmer Hot and Cold Plasma	TG1035-Ni	1341420	For use with Cold Plasma Lens Kit.
Nickel Skimmer (High Matrix)	TG1044-Ni	1311870 & 1318480	Eliminates need for insert. (Details below)
Nickel Skimmer (Robust Plasma)	TG1045-Ni	1311870 & BRE0006591	Eliminates need for insert. (Details below)
Platinum Skimmer Hot and Cold Plasma	TG1039-Pt	1341430	For use with Cold Plasma Lens Kit.
Platinum Skimmer (High Matrix)	TG1048-Pt	1324540 & 1318480	Eliminates need for insert. (Details below)

TG1044-Ni

TG1048-Pt

Cone Options for Thermo® ICP-MS Q/RQ/TQ

Description	Part Number	OEM P/N	Comments
Graphite Sampler Cone Gasket	TG5001	3004382	Use a new gasket each time the cone is re-installed, even if it is the same cone.
Skimmer ConeGuard for Thermo Q, RQ, TQ	70-803-1028	N/A	To protect cone threads during cleaning.
Skimmer Cone Extraction Tool	70-803-2050	3200918	For skimmer removal & installation.
Magnifier Inspection Tool	70-803-1923	N/A	10x magnification loupe with LED illumination. Used to inspect condition of cone orifice.


70-803-1028

Glass Expansion Insert-Free Skimmer Cone Features:

- Design eliminates the need for the removable insert.
- TG1044-Ni & TG1048-Pt skimmer cone provides both high matrix tolerance and high sensitivity.
- TG1045-Ni provides robust plasma.
- Available in Nickel and Platinum.
- Compatible with Q, RQ, TQ ICP-MS.

Sampler Cones for Thermo® X Series

Description	Part Number	OEM P/N	Comments
Nickel Sampler	TG1021-Ni	3004661	For lowest Cu background.
Nickel Sampler with Copper Core	TG1021-Ni/Cu	3600812	Optional, used for more efficient heat transfer.
Aluminum Sampler	TG1021-Al	N/A	For lowest Ni background and Laser Ablation applications.
Platinum Sampler with Copper Core	TG1026A-Pt/Cu	3601289	For corrosive samples, HF and semi-conductor.

TG1021-Ni/Cu


TG1021-Al

Skimmer Cones for Thermo® X Series

Description	Part Number	OEM P/N	Comments
Nickel Micro-Skimmer, Xs, Copper Core	TG1004-Ni	3200860	For Xs, High Performance & Sensitivity.
Nickel Skimmer, Xi, Xt, Copper Core	TG1022-Ni	3600811	For Xi/Xt, High Matrix Tolerance.
Platinum Micro-Skimmer, Xs, Copper Core	TG1008-Pt	3201101	For Xs, Corrosive samples, HF and semiconductor.

TG1022-Ni

Cone Options for Thermo® X Series

Description	Part Number	OEM P/N	Comments
Skimmer Cone Interface, X Series	TG1023-Cu	3600813	Standard for X series.
Skimmer Cone Interface, X Series II	TG1023-Ni	3601320	Standard for X Series II.
Graphite Sampler Cone Gasket	TG5001	3004382	Use a new gasket each time the cone is re-installed, even if it is the same cone.
Screws for Skimmer Interface TG1023-Ni or TG1023-Cu (PKT 4)	TG5002	N/A	Replace if corroded or worn.
Skimmer ConeGuard for Thermo X-Series	70-803-1028	N/A	To protect cone threads during cleaning.
Magnifier Inspection Tool	70-803-1923	5190-9614	10x magnification loupe with LED illumination. Used to inspect condition of cone orifice.


TG1023-Cu

70-803-1028

Sampler Cones for Thermo® Neoma MC-ICP-MS

Description	Part Number	OEM P/N	Comments
Nickel Jet Sampler	TF1005-Ni	1260630	For high sensitivity applications for low matrix containing samples.
Nickel Sampler with Copper Core	TF1001-Ni/Cu	1044530	Standard.
Platinum Sampler with Copper Core (boron-free)	TF1006-Pt/Cu	1067500	For lowest boron background and semiconductor applications.

TF1005-Ni

Skimmer Cones for Thermo® Neoma MC-ICP-MS

Description	Part Number	OEM P/N	Comments
Nickel Skimmer	TF1002A-Ni	1067600	For lowest Cu background.
Nickel X-Skimmer, Copper Core	TF1002X-Ni	1142160	For high sensitivity applications.
Platinum Skimmer (H, boron-free)	TF1008-Pt	1047460	For lowest boron background and semiconductor applications.


TF1002A-Ni


TF1008-Pt

Cone Options for Thermo® Neoma MC-ICP-MS

Description	Part Number	OEM P/N	Comments
Graphite Sampler Cone Gasket	TF5001	1042620	Use a new gasket each time the cone is re-installed, even if it is the same cone.
Magnifier Inspection Tool	70-803-1923	N/A	10x magnification loupe with LED illumination. Used to inspect condition of cone orifice.


70-803-1923

Sampler Cones for Thermo® Element 1 & 2/ Neptune

Description	Part Number	OEM P/N	Comments
Nickel Sampler	TF1001-Ni	N/A	For lowest Cu background.
Nickel Jet Sampler	TF1005-Ni	1260630	For high sensitivity applications for low matrix containing samples.
Nickel Sampler with Copper Core	TF1001-Ni/Cu	1044530	Standard.
Aluminum Sampler	TF1001-Al	1184050	For lowest Ni background and Laser Ablation applications.
Platinum Jet Sampler	TF1009-Pt	1313360 BRE0010792	For high sensitivity applications for low matrix containing samples.
Platinum Sampler with Copper Core	TF1006A-Pt/Cu	1067501	For corrosive samples.
Platinum Sampler with Copper Core (boron-free)	TF1006-Pt/Cu	1067500	For lowest boron background and semiconductor applications.

TF1005-Ni

Skimmer Cones for Thermo® Element 1 & 2/ Neptune

Description	Part Number	OEM P/N	Comments
Nickel Skimmer	TF1002A-Ni	1067600	For lowest Cu background.
Nickel X-Skimmer, Copper Core	TF1002X-Ni	1142160	For high sensitivity applications.
Aluminium Skimmer	TF1002A-Al	1184060	For lowest Ni background and Laser Ablation applications.
Platinum Skimmer (N)	TF1007-Pt	1067510	
Platinum X-Skimmer (boron-free)	TF1007X-Pt	1142150	For lowest boron background and semiconductor applications.
Platinum Skimmer (H, boron-free)	TF1008-Pt	1047460	For lowest boron background and semiconductor applications.
Platinum Skimmer (H)	TF1010-Pt	1047461	Semiconductor applications.

TF1002A-Al

TF1007X-Pt

Cone Options for Thermo® Element 1 & 2/ Neptune

Description	Part Number	OEM P/N	Comments
Graphite Sampler Cone Gasket	TF5001	1042620	Use a new gasket each time the cone is re-installed, even if it is the same cone.
Magnifier Inspection Tool	70-803-1923	N/A	10x magnification loupe with LED illumination. Used to inspect condition of cone orifice.


70-803-1923

Cone Conditioning

To ensure the lowest background levels of copper and nickel, **conditioning before use is recommended.** A conditioned cone with a uniform coating will also lead to improved long-term stability.

WARNING: Always use safety glasses and protective gloves. Be careful when handling the cone – the tip is very easily damaged. Hold the cone by its edge and only use light pressure with your hand when cleaning the tip. Never use tools for cleaning cones.

To condition your nickel cones, prepare the following conditioning solutions:

- 1% nitric acid blank
- 50 ppm calcium in 1% nitric acid

Install the new skimmer cone into the instrument. Turn on the plasma and establish robust plasma conditions.

- Aspirate the 50 ppm calcium solution for 10 minutes
- Change to 1 % Nitric acid blank solution and aspirate for a further 10 minutes

Gaskets and O-rings

With the sampler cone, the gasket should be replaced every time that the sampler cone is removed, either for cleaning or replacement.

There always is a level of uneven flatness between the sampler cone and instrument interface. These surfaces are also exposed to extremely high temperatures that result in some deformation. Once the cone is removed it can very slightly deform due to relief of the stresses. The purpose of the gasket is to fill-in these irregularities and make a proper seal. However, once the gasket has been compressed or used for a period of time it loses it's flexural properties to compensate for those irregularities. **Therefore, always replace the gasket to ensure a long sampler cone life.**

Similarly, interface cones that require an O-ring to achieve a proper seal should be inspected regularly for cracks and elasticity. Exposure to the high temperature will change the physical properties of the O-ring material, over time the O-ring will become brittle and crack, effecting the ability to make a proper seal. The O-ring should always be removed prior to cleaning.

The gasket and O-ring are both low-cost consumables that should be inspected and replaced often to ensure optimum performance and long-life of your valuable interface cones.

When to Clean

The frequency at which the cones are cleaned depends very much on the application and the workload of the instrument. If the samples are clean and the usage is low, the cones may only need cleaning monthly. But if the instrument is in continuous use and/or the samples contain high levels of dissolved solids or are highly corrosive, the cones may need cleaning daily.

Our Magnifier Inspection Tool (P/N 70-803-1923) is ideal for inspection and measurement of the ICP-MS sampler and skimmer cone orifice. Cones should be cleaned if there are visible deposits near the orifice or if the orifice is blocked or distorted. Deterioration in the performance of the ICP-MS can also indicate that the cones may need cleaning. In particular, watch for increased background signal, memory effects, loss of sensitivity or distorted peak shapes. A change in the instrument vacuum reading can also indicate cone problems. If the orifice gets blocked, the vacuum will increase (pressure decrease), although there will usually be a deterioration in performance before this point. If the vacuum decreases (pressure increases), this could indicate that the orifice is worn and has increased in size. If this happens the cone needs to be replaced.

As the sampler cone is more exposed to the plasma, it will usually need cleaning more frequently than the skimmer cone. If the performance of the instrument does not recover when the cones are cleaned, they may need to be replaced or refurbished.

What to Use

The method of cleaning will also depend on the application. If the samples are relatively clean, a gentle cleaning process will be sufficient. But, if the samples contain high levels of dissolved solids or are highly corrosive, a more aggressive cleaning procedure will be required. A Citranox solution is a gentle and effective cleaning agent and we recommend that it be tried first.

If Citranox is not effective, it may be necessary to use a more aggressive cleaning agent such as nitric acid. However, we recommend that nitric acid not be used unless it is necessary. Nitric acid is more corrosive than Citranox and prolonged use will reduce the lifetime of the cones. Note that even Citranox will attack copper cones so the cones should not be exposed to high concentrations of Citranox or exposed for long periods.

When cleaning cones which have a screw thread, be particularly careful that the thread is not contacted by nitric acid. Pre-soaking the cones in a detergent such as Fluka RBS-25 prior to cleaning with Citranox or nitric acid will help the cleaning process. Citranox is manufactured by Alconox Inc. (www.alconox.com) and Fluka RBS-25 by Sigma-Aldrich. Fluka is available for purchase through Glass Expansion, P/N FLUKA25.

How to Clean

WARNING: Always use safety glasses and protective gloves. Be careful when handling the cone - the tip is very easily damaged. Hold the cone by its edge and only use light pressure with your hand when cleaning the tip. Never use tools for cleaning cones.

The cleaning process does not necessarily need to reproduce the original as-new polished appearance. Sample deposits need to be removed, but it is not usually a problem if the cone is discolored. This may actually result in a more stable signal.

There are three common methods of cleaning cones. From the simplest and gentlest to the most thorough and aggressive.

The recommended concentrations of the Citranox and nitric acid, and the wash times, should be used as a guide only. Given the wide range of ICP-MS applications and sample types, you may need to experiment a little to find the best cleaning procedure for your application. We recommend that you do not use nitric acid any more than is necessary since it will attack the cone materials. If nitric acid is used excessively, the size of the cone orifice may be increased. If this happens, or if the tip is damaged or deformed, then the cone needs to be replaced.

Cleaning Methods

Method A - Soak in Citranox - daily or weekly, depending on application:

1. Soak the cone overnight in a 25% solution (4x dilution) of Fluka RBS-25.
2. Rinse with deionized water.
3. Place the cone in a 2% Citranox solution and soak for about 10 minutes.
4. Wipe with a soft cloth or Kimwipe dipped in the Citranox solution.
5. Wash thoroughly with deionized water.
6. Place the cones in deionized water and soak for 2 minutes to remove any residual Citranox.
7. Replace the deionized water and repeat Step 6 at least twice, e.g. the cones should be washed at least 3 times, using fresh deionized water each time.
8. Rinse with deionized water and allow to dry or blow-dry with clean argon or nitrogen. Make sure the cones are completely dry. It may help to heat them in a laboratory oven at about 60°C.

Method B - Sonicate in Citranox, daily or weekly, depending on application:

1. Soak the cone overnight in a 25% solution (4x dilution) of Fluka RBS-25.
2. Rinse with deionized water.
3. Be very careful to avoid damaging the cone tip. The cone should not be placed in the ultrasonic bath without being supported or contained. One way to avoid damage is to place the cone in a ziplock plastic bag half filled with a 2%Citranox solution and float the bag in the ultrasonic bath. Ensure that the bag is floating so that the cone is not resting on the bottom or touching the walls of the bath. This also minimizes the volume of Citranox used since the bath can be filled with water.
4. Sonicate for 5 minutes.
5. Wipe with a soft cloth or Kimwipe dipped in the Citranox solution.
6. Wash thoroughly with deionized water.
7. Replace the Citranox with deionized water and sonicate for 2 minutes to remove any residual Citranox.
8. Replace the deionized water and repeat Step 6 at least twice, e.g. the cones should be washed in the ultrasonic bath at least 3 times, using fresh deionized water each time.
9. Rinse with deionized water and allow to dry or blow-dry with clean argon or nitrogen. Make sure the cones are completely dry. It may help to heat them in a laboratory oven at about 60°C.

Method C - Sonicate in Nitric acid, weekly or monthly, depending on application:

1. Soak the cone overnight in a 25% solution (4x dilution) of Fluka RBS-25.
2. Rinse with deionized water.
3. Be very careful to avoid damaging the cone tip. The cone should not be placed in the ultrasonic bath without being supported or contained. One way to avoid damage is to place the cone in a ziplock plastic bag half filled with 5% nitric acid and float the bag in the ultrasonic bath. Ensure that the bag is floating so that the cone is not resting on the bottom or touching the walls of the bath. This also minimizes the volume of nitric acid used since the bath can be filled with water.
4. Sonicate for 5 minutes.
5. Wipe with a soft cloth.
6. Wash thoroughly with deionized water.
7. Replace the nitric acid with deionized water and sonicate for 2 minutes to remove any residual nitric acid.
8. Replace the deionized water and repeat Step 6 at least twice, e.g. the cones should be washed in the ultrasonic bath at least 3 times, using fresh deionized water each time.
9. Rinse with deionized water and allow to dry or blow-dry with clean argon or nitrogen. Make sure the cones are completely dry. It may help to heat them in a laboratory oven at about 60°C.

ICP-MS Cone Condition

The condition of your ICP-MS interface cones are critical to analytical performance. Simply use the Mangifier Inspection Tool (P/N 70-803-1923) to check the cone orifice for pitting, matrix build-up or an enlargement at the tip which can lead to elevated background and poor sensitivity. It's also a great way to confirm whether your cleaning/maintenance procedures have been successful before reinstalling the interface cones into your ICP-MS.

ConeGuard

When cleaning cones which have a screw thread, it is important that the thread is not contacted by any corrosive solution. If the thread gets corroded, the cone may not seal correctly or it may bond to the base and be difficult to remove. And with platinum cones, the thread is likely to wear out before the platinum insert. The ConeGuard Thread Protector seals the thread and protects it from corrosion during the cleaning process.

Platinum Cone Care

The cleaning procedures outlined above can be used for platinum cones as well as nickel cones. Since platinum is more chemically resistant than nickel, platinum cones can usually be used for longer before they need cleaning. Platinum cones consist of a platinum insert in a nickel or copper base, so aggressive cleaning solutions still need to be avoided as they may attack the base. Platinum cones also run hotter, which helps slow deposition. The lifetime of a platinum cone is typically much longer than that of a nickel cone, and can be further extended by refurbishment.

We offer refurbishment on the platinum cones that we sell for the life of the cone. Note that, if the orifice is worn to the extent that the diameter is outside specification, or if the tip is badly damaged, the cone may not be able to be refurbished. In this case, we will give a credit for the value of the platinum.

Please contact enquiries@geicp.com if you have any questions regarding the care of your ICP-MS cones.

Customer comments

The following are some of the comments made by our customers and we would like to thank all those customers who have taken the time to review our ICP-MS cones.

- (In response to NexION 5000 cones) We have been able to test the cones and so far, have been able to determine a performance that corresponds to the original cones, especially in terms of oxide rate, sensitivity, etc.
  University laboratory – Austria

- (In response to GE P/N TG1045-Ni) We've seen no negative issues. It's very durable. We've been running it now for over 2 months. We have the plasma lit for 12-18hrs per day nearly 7 days a week. This would definitely be a piece of hardware we'd look to use as a substitute for our skimmer+insert cones.
  Environmental Lab - USA

- We use tons of GE stuff in our lab. I am very satisfied with everything, especially the ICP-MS cones we recently purchased. Keep up the great work!
  Environmental Lab - USA

- Thank you so much for repairing our 2 skimmer cones. I was so happy when I received those two repaired skimmers, shiny like brand new. Thank you!! Everyone in the lab actually impressed by the work and this service. We all think this service deserve a star, and a thanks card.
  Clinical laboratory - Australia

- We've tested the GE sampler cone on all three of our Helios™ instruments and it worked great, showing highly comparable performance to our current Standard BioTools™ (Fluidigm) cone using both QC beads and biological cell samples. The QC bead CVs were actually slightly higher than with our Standard BioTools™ cones, but this could admittedly just be because it was a brand new cone and our current cones have likely been used for a while.
  Cytometry Laboratory – USA

- I tried the new cone on our Helios™ (Helios™ A) which usually has a Tb that doesn't get much above 1.0 million and with this cone I got a Tb of 1.48 million!
  Cytometry Laboratory – USA

- (In reference to P/N FL9005) it worked really well.
  Cytometry Laboratory – USA

- We have been running your sampler cone in our brand new Helios™ instrument. The initial comparison I sent previously showed they were nearly identical in terms of performance for an n=1, (both cones were new).
  Cytometry Laboratory – Canada

- Skimmer reducer cone test went well.
  Cytometry Laboratory – Canada

- Tested out your GE sampler cone, looks good! Primarily we look at the Tb mean duals in the tuning solution and polystyrene eq beads.
  Cytometry Laboratory – Canada

GLASS EXPANSION
Quality By Design

Asia Pacific

6 Central Boulevard
Port Melbourne
Vic 3207, Australia

Telephone: +61 3 9320 1111
Email: enquiries@geicp.com

Europe

Friedenbachstrasse 9
35781 Weilburg
Germany

Telephone: +49 6471 3778517
Email: gegmbh@geicp.com

Americas

31 Jonathan Bourne Drive, Unit 7
Pocasset, MA 02559, USA

Toll Free Phone: 800 208 0097
Telephone: 508 563 1800
Facsimile: 508 563 1802
Email: geusa@geicp.com

March 2023