VHG™

Instrument Start Up Solutions
for ICP-OES and ICP-MS

Developed to provide the highest level of accuracy and traceability

#GoBeyondTheStandard

lgcstandards.com/VHG-StartUpSolutions

LGC Quality: ISO 17043 | ISO 17034 | ISO/IEC 17025 | ISO 9001

LGC

VHG™ Quality

#GoBeyondTheStandard

VHG™ is deeply committed to providing highly accurate Certified Reference Materials to our customers. We #GoBeyondTheStandard in our ISO 17034 accredited and ISO 9001 certified manufacturing processes, combined with our stringent quality control procedures which exceed the requirements of our ISO/IEC 17025 accreditation. VHG™ is one of the few reference material producers (along with NIST) to adopt the NIST High-Performance ICP-OES Methodology for the majority of our aqueous products, providing an unparalleled level of quality assurance.

Extensive, high-quality portfolio

VHG™ manufactures our comprehensive portfolio of high-purity elemental Certified Reference Materials under our ISO 17034 Reference Material Producers accreditation in our state of the art facility utilizing our certified cleanroom when appropriate. The starting materials are carefully selected with the highest level of purity in mind, along with the correct matrix for the application. Extensive long term stability evaluations, homogeneity verifications, and effects of transport conditions are performed, with all relevant analytical measurements conducted under our ISO/IEC 17025 scope of accreditation. Our validated manufacturing and packaging processes provide additional peace of mind that our materials will consistently deliver reliable results.

Understanding your analytical needs

VHG™ provides critical tools which protect the integrity of testing data for industries with highly sensitive safety and security concerns around the world. Committed to the belief that any defect in our products or services is unacceptable, we combine customer interactions with our scientific and regulatory expertise to constantly work to meet the requirements of our customers while continually improving our products and processess.

Expert customer support

At VHG™ we combine experience with continuous training to ensure that the latest knowledge and skills are provided by our customer service team, in your technical support, and in the production of your Certified Reference Materials. As part of the wider LGC Standards family, we are proud to offer our customers the extensive experience of scientific experts from across our global network, with dedicated local teams supporting the selection and implementation of reference materials for your analytical testing.

Our vision

VHG™ continues to build on our more than 30 years of expertise in planning, developing, producing, and reliably delivering high-quality reference materials to customers around the world. We hold ourselves to an incredibly high standard to ensure your trust in our product. Our passion for our work includes a commitment to achieving our quality objectives while meeting the requirements of all applicable international standards. We are continuously adding innovative products to our portfolio, and are dedicated to supporting you as a trusted partner for all of your analytical solutions.

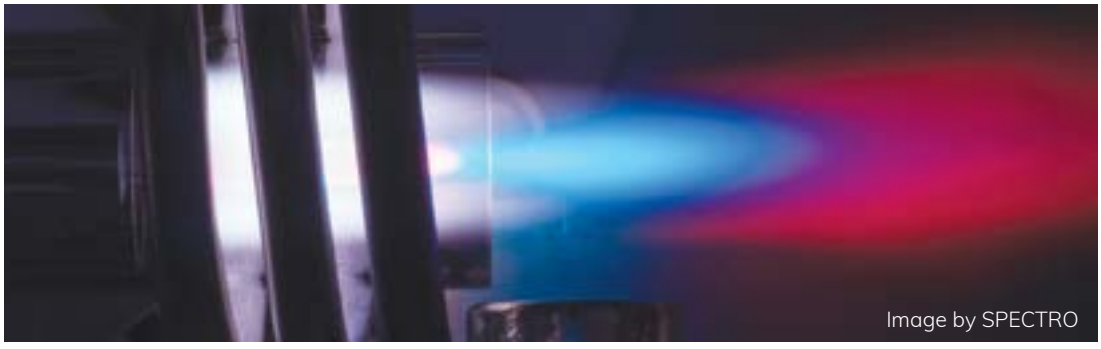


Image by SPECTRO

Industries Served

The VHG™ Aqueous Inorganic product portfolio serves many scientific industries. We strive to provide both standard products as well as custom mixtures to serve your lab's specific needs. Some of the key markets we operate in include:

#GoBeyondTheStandard

Inductively Coupled Plasma (ICP)

Technique Overview

ICP Emission

Also known as ICP-OES or ICP-AES

Primary Uses

Metals Analysis

Performs well with complex matrices:

- High levels of dissolved solids
- Oil / solvent matrix materials

Coverage & Detection Limits

- Wide elemental coverage
- ppb detection limits

Common Applications

- Environmental
- Wear metals
- Metal & metal alloys
- Chemical & petrochemical
- Paints & pigments
- Geological exploration
- Engine coolant analysis

ICP Mass Spectrometry

Also known as ICP-MS

Primary Uses

Metals Analysis

Couples well with range of "front end" sample introduction devices such as:

- Liquid Chromatography
- Gas Chromatography

Coverage & Detection Limits

- Wide elemental coverage
- Sub-ppt detection limits

Common Applications

- Environmental
- Semiconductor
- Earth & planetary science research
- Clinical
- Pharmaceutical
- Nuclear

ICP-OES

Wavelength Calibration Solutions

Common applications: Wave calibration | Performance set up and validation | Wavecal

Accurate indexing of emission wavelengths is critical to sensitivity (d.l.) and signal stability (RSD). The VHG™ line of high-quality ICP-OES Wavelength Calibration Solutions are designed to meet ICP instrument manufacturers' specifications and are the ideal solutions for calibrating your instrument to which pixels of its array detector correspond to each emission wavelength. If you have a specific need not met by the products listed, please contact us to discuss a custom mixture.

Wavelength Calibration and Related Solutions for ICP-OES

Description	Composition	Product No.	mL	Suitable for use with
Low UV Wave Cal Solution	Al, P, S @ 10 µg/mL in 2% HNO_3	VHG-ISUPE-LOW-250	250	PerkinElmer® ICP-OES
VIS Wave Cal Solution	K @ 50 µg/mL; La, Li, Mn, Na, Sr @ 10 µg/mL; Ba, Ca @ 1 µg/mL in 2% HNO_3	VHG-ISUPEVIS-250	250	PerkinElmer® ICP-OES: Optima® / Avio®
UV Wave Cal Solution	K, P, S @ 100 µg/mL; As, La, Li, Mn, Mo, Na, Ni, Sc @ 20 µg/mL; Ca @ 1 µg/mL in 5% HCl	VHG-ISUPEUVW-500	500	PerkinElmer® ICP-OES: Optima® / Avio®
Multi-Element Setup Standard	As, K @ 50 µg/mL; La, Li, Mn, Ni, Sr, Zn @ 10 µg/mL; Ba, Mg @ 1 µg/mL in 2% HNO_3	VHG-ISUPEOPTME-500	500	PerkinElmer® ICP-OES: Optima®
Instrument Check Standard 3	K, P, S @ 100 µg/mL; As, La, Li, Mn, Mo, Na, Ni, Sc @ 20 µg/mL in 5% HCl	VHG-ISUPECHKSTD3-250	250	PerkinElmer® ICP-OES
Instrument Calibration Standard 4	As, Tl @ 100 µg/mL; Cd, Pb, Se @ 50 µg/mL in 5% HNO_3	VHG-ISUPECAL4-100	100	PerkinElmer® ICP-OES: Optima® / Avio®
ICAL Solution	S @ 50 µg/mL; Ce, Cu, Eu, Fe, In, K, Ni, P, Si, Ti, V, Y, Zr @ 10 µg/mL; Mn, Mo, Na, Sc @ 5 µg/mL; Be, Li, Sr @ 2 µg/mL; Ca @ 1 µg/mL in 2% HNO_3, 2% HCl	VHG-ISUSPCTICAL-250	250	SPECTGRO ICP-OES: Genesis®, ARCOS®, Blue®

Blank Solutions

VHG™ Blank Solutions are produced in our dedicated aqueous production laboratory with a certified cleanroom, and are accompanied by a COA containing a trace impurity scan. You can be confident using our Blank Solutions for ICP-OES references and clean rinses.

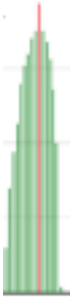
Blank Solutions for ICP-OES

Description	Composition	Product No.	mL
Nitric Acid Blank	5% HNO_3	VHG-HNO3-BLK-500	500
Hydrochloric Acid Blank	5% HCl	VHG-HCL-BLK-500	500
Hydrochloric/Nitric Blank	5% HCl, 1% HNO_3	VHG-ICB/CCB-500	500
ICP-OES Blank	2% HNO_3	VHG-L2HNO3BLK-500	500
Wash Water Blank	18 MΩ DI water	VHG-LDIWASH-250	250

ICP-MS

Tuning and Mass Calibration Solutions

Common applications: Tuning | Tune check | Peak calibration | Mass calibration | Resolution/Axis



Tuning of an ICP-MS is universally acknowledged as being a frequent (usually daily) task for optimal ICP-MS operation.

The VHG™ line of ICP-MS mass calibration and tuning solutions are designed to meet a wide-range of instrument manufacturers' specifications. We offer an array of Concentrates and Ready-to-use solutions, but if you have a specific need not met by the products listed here, please contact us to discuss a custom mixture.

Application Tip:

These solutions are essential when performing IQ/OQ/PQ as required under good laboratory practices (GLP)

Tuning and Mass Calibration Solutions for ICP-MS

Description	Composition	Product No.	mL	Suitable for use with
Tuning / Mass Calibration Multi-Element Mix 1 *(concentrate)*	^{7}Li, Y, Ce, Tl @ 10 µg/mL in 5% HNO_3	VHG-LMSTNG1-500	500	All models
Tuning / Mass Calibration Multi-Element Mix 1A *(concentrate)*	^{7}Li, Co, Y, Ce, Tl @ 10 µg/mL in 1% HNO_3, 0.5% HCl	VHG-LMSTNG5CONC-500	500	All models
Tuning / Mass Calibration Multi-Element Mix 2 *(concentrate)*	Be, Mg, Co, In, Ce, Pb @ 10 µg/mL in 1% HNO_3	VHG-LMSTNG2Z-500	500	All models
Tuning / Mass Calibration Multi-Element Mix 3 *(concentrate)*	^{7}Li, Be, Mg, Co, Y, In, Ba, Ce, Tb, Pb, U @ 10 µg/mL in 5% HNO_3	VHG-LMSTNG3Z-500	500	All models
Tuning Solution *(see composition)*	Ce, Co, Li, Tl, Y @ 10 µg/mL in 2% HNO_3	VHG-LAGTSTK1-100	100	Agilent® ICP-MS: 7500, 7700, 7800, 7900, 8800, 8900
Tuning Solution 2	Ce, Co, Li, Mg, Tl, Y @ 10 µg/mL in 2% HNO_3	VHG-LAGTSTK2-100	100	Agilent® ICP-MS: 7500, 7700, 7800, 7900, 8800, 8900
Tuning Solution *(see composition)*	Ce, Co, Li, Mg, Tl, Y @ 1 µg/L in 2% HNO_3	VHG-LMSTNG101-500	500	Agilent® ICP-MS: 7500, 7700, 7800, 7900, 8800, 8900
Tuning Solution *(see composition)*	^{7}Li, Co, Y, Ce, Tl @ 10 µg/L in 2% HNO_3	VHG-LMSTNG5DIL-500	500	Agilent® ICP-MS: Various Models
Tuning Solution *(see composition)*	Be, Mg, Fe, Co, In, Ce, Pb, Th, U @ 1 µg/L; Ba @ 10 µg/L in 2% HNO_3	VHG-LMSTNG8-500	500	PerkinElmer ® ICP-MS: DRC, DRCII

Table continued on next page

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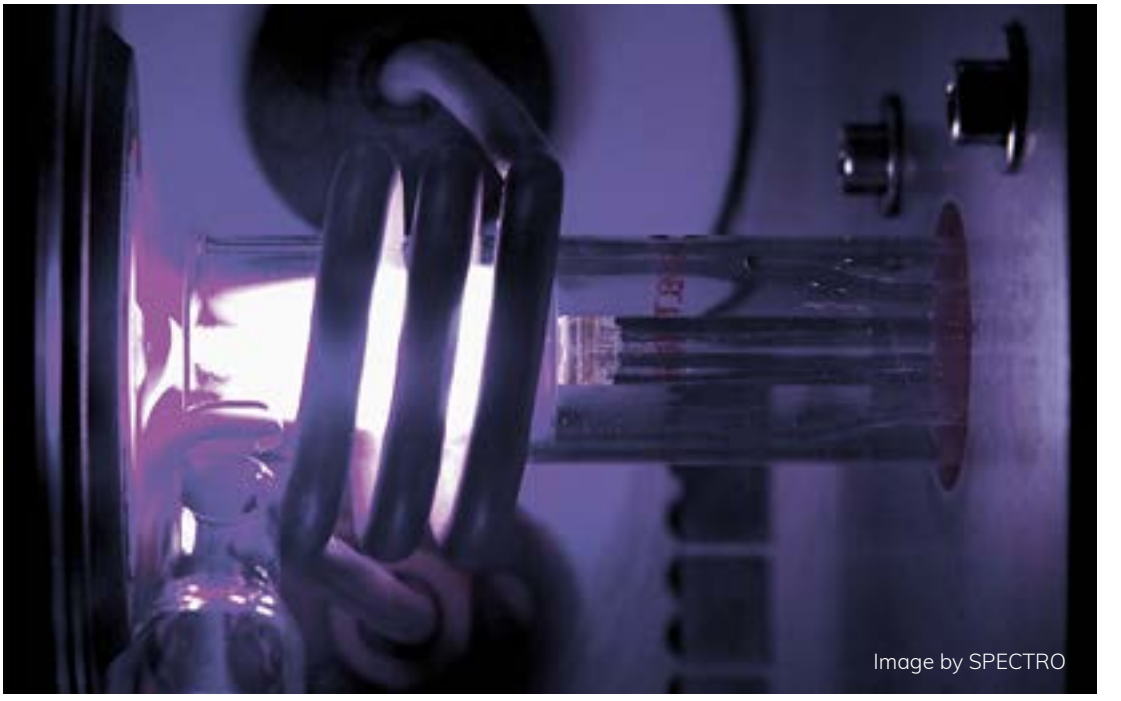
Tuning and Mass Calibration Solutions for ICP-MS				
Description	Composition	Product No.	mL	Suitable for use with
Setup / Stability / Masscal Solution	Ba @ 10 µg/L; Al, Cd, Ce, Cr, Cu, In, Mg, Mn, Pb, Rh, Th @ 1 µg/L in 0.5% HCl	VHG-LPEMCAL-500	500	PerkinElmer® ICP-MS: E6100DRC, DRCII
Setup Solution *(see composition)*	Be, Ce, Fe, In, Li, Mg, Pb, U @ 1 µg/L in 1% HNO_3	VHG-LPENXSUSDIL-500	500	PerkinElmer® ICP-MS: NexION™
KED Setup Solution	Co @ 10 µg/L; Ce @ 1 µg/L in 1% HNO_3	VHG-LPENXKED-SUS-250	250	PerkinElmer® ICP-MS: NexION™
Setup Solution *(see composition)*	Be, Ce, Fe, In, Li, Mg, Pb, U @ 10 µg/L in 1% HNO_3	VHG-LPENXSUS-500	500	PerkinElmer® Instruments: NexION™
Tuning Solution 1	Ba, Be, Ce, Co, In, Li, Mg, Pb, Rh, Tl, U, Y @ 10 µg/mL in 2% HNO_3, 5% HCl	VHG-LPETSOL1-100	100	PerkinElmer® ICP-MS: DRC, DRCII, NexION™
Tuning Solution *(see composition)*	^{7}Li, Be, Mg, Co, In, Ba, Ce, Pb, Bi, U @10 ug/L in 2% HNO_3	VHG-LMSTNG6-100	100	Thermo Scientific™ ICP-MS: X-Series
Tuning Solution *(see composition)*	Be, Mg, Co, In, Ba, Ce, Tl, Pb, Th @ 250 µg/L in 2% HNO_3	VHG-LMSTNG9-500	500	Varian™ ICP-MS: Various models

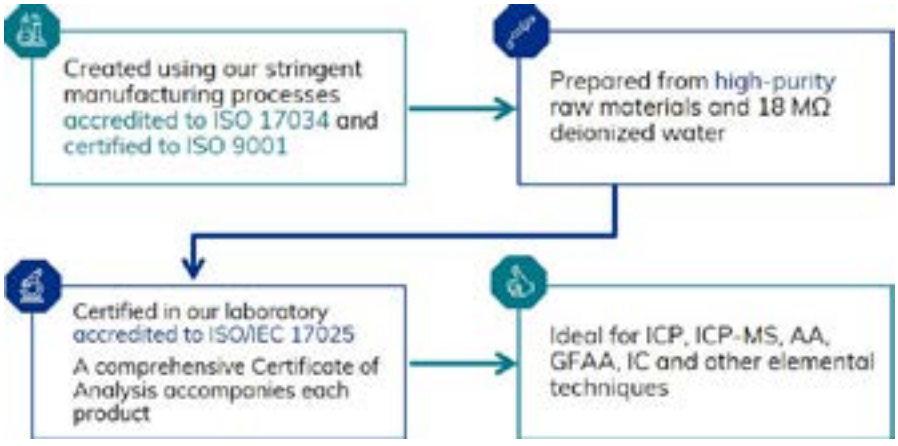


Custom Aqueous Inorganic Mixtures for Elemental Analysis

for use with ICP, ICP-MS, AA, GFAA, Ion Chromatography & other techniques

No two laboratories process exactly the same samples, or have precisely the same requirements. There is a seemingly endless list of variables your analysts must account for, while producing accurate data every test. You need a partner who specializes in custom mixtures, with the ISO accreditations that ensure the quality of the standards you receive.

When you work with VHG™, you get a partner who specializes in manufacturing custom mixtures in our state of the art facility under our ISO 17034 Reference Material Producers accreditation. Whether you need a single element or multiple elements in a specific matrix, our experts are ready to work with you to meet your lab's specific needs.



Contact us today to get started!

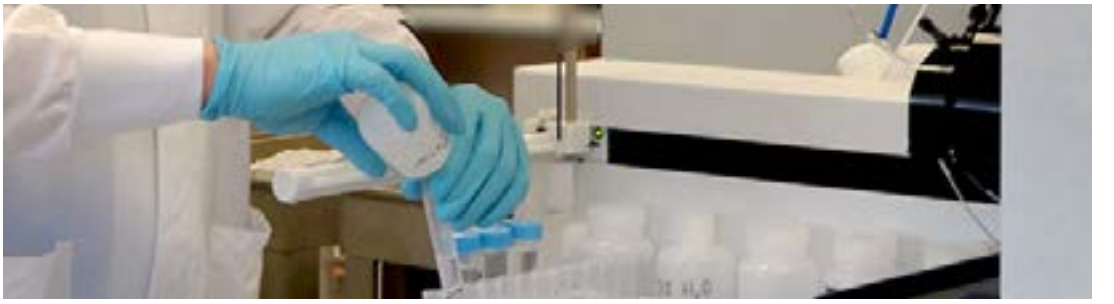
Tel: +1 603.622.7660
Email: lgcusa@lgcgroup.com

LGC Quality: ISO 17043 | ISO 17034 | ISO/IEC 17025 | ISO 9001

ICP-MS

IQ/OQ/PQ Solutions

Stability Solutions for ICP-MS				
Description	Composition	Product No.	mL	Suitable for use with
Stability Solution *(see composition)*	Cd, Cu, Mg, Pb @ 1 µg/L in 1% HNO_3	VHG-LPENXSTB-500	500	PerkinElmer® Non-Cell ICP-MS: NexION™
Stability Solution *(see composition)*	Co, Cu, In, Se @ 10 µg/L; Cd, Cr, Fe, Mg, Pb @ 1 µg/L in 1% HNO_3	VHG-LPENXCELL-500	500	PerkinElmer® Cell ICP-MS: NexION™



Detector Calibration Solutions

Common applications: Detector calibration | Detector cross calibration | P/A | XCal

Accurate "cross calibration" is a requirement for establishing the linearity of the detector across pulse and analog. We offer a range of solutions suitable for this activity. If you find that you have a specific need not met by the products listed below, please contact us to discuss a custom mixture.

Detector Calibration Solutions for ICP-MS				
Description	Composition	Product No.	mL	Suitable for use with
Dual Detector Solution	Al, Ba, Ce, Co, Cu, In, Li, Mg, Mn, Ni, Pb, Tb, U, Zn @ 200 µg/L in 2% HNO_3	VHG-LSUSPENXDD-250	250	PerkinElmer® Cell ICP-MS: NexION™
P/A Tuning Mix 1 *(concentrate)*	Y, Tb @ 2.5 µg/mL; ^{6}Li, Na, Al, Sc, Ti, V, Cr, Mn, Co, Cu, Sr, In, Ba, Lu, Ir, Bi, Tl, Th, U @ 5 µg/mL; Mg, Ni, Ge, Mo, Ru, Pd, Sn, Sb, Pb @ 10 µg/mL; Be, Zn, As, Cd @ 20 µg/mL in 20% HCl, tr. HF	VHG-LDPA1-100	100	Agilent® models: 7500, 7700, 7800, 7900, 8800, 8900
P/A Tuning Solution 1 *(concentrate)*	As, Be, Cd, Zn @ 20 µg/mL; Mg, Ni, Pb @ 10 µg/mL; Al, Ba, Bi, Co, Cr, Cu, In, ^{6}Li, Lu, Mn, Na, Sc, Sr, Th, Tl, U, V @ 5 µg/mL; Y, Yb @ 2.5 µg/mL in 2% HNO_3	VHG-LAGPATSOL1-100	100	
P/A Tuning Solution 2 *(concentrate)*	Ge, Mo, Pd, Ru, Sb, Sn @ 10 µg/mL; Ir, Ti @ 5 µg/mL in 10% HCl, 1% HNO_3, tr. HF	VHG-LAGPATSOL2-100	100	

ICP-MS

Internal Standards

Common applications: IC-MS calibration and analyis of samples

VHG™ Internal Standards are manufactured to be free of impurities. Utilized continuously throughout the run, they help the analyst monitor recovery and normalize the noise of the instrument. We offer convenient concentrations for simple dilution into working solutions, or as a stock blend for automated inline addition of the internal standard.

Single Element Internal Standards for ICP-MS		
Composition	Product No.	mL
^{6}Li @100 µg/mL in 2% HNO_3	VHG-LISC6LI-100	100
^{6}Li @10 µg/mL in 2% HNO_3	VHG-LISA6LI-100	100
Bi @ 100 ug/mL in 2% HNO_3	VHG-LISBI100-100	100
Bi @10 µg/mL in 2% HNO_3	VHG-LISABI-100	100
Co @10 µg/mL in 2% HNO_3	VHG-LISACO-100	100
Ge @ 100 ug/mL in 2% HNO_3	VHG-LISGE100-100	100
Ge @10 µg/mL in 2% HNO_3, tr. F^-	VHG-LISAGE-100	100
In @ 100 ug/mL in 2% HNO_3	VHG-LISIN100-100	100
In @10 µg/mL in 2% HNO_3	VHG-LISAIN-100	100
Ir @10 µg/mL in 2% HCl	VHG-LISAIR-100	100
Lu @10 µg/mL in 2% HNO_3	VHG-LISALU-100	100
Pt @10 µg/mL in 5% HCl	VHG-LISAPT-100	100
Rh @10 µg/mL in 2% HCl	VHG-LISARH-100	100
Sc @ 100 ug/mL in 2% HNO_3	VHG-LISSC100-100	100
Sc @10 µg/mL in 2% HNO_3	VHG-LISASC-100	100
Tb @ 100 ug/mL in 2% HNO_3	VHG-LISTB100-100	100
Tb @10 µg/mL in 2% HNO_3	VHG-LISATB-100	100
Y @ 100 ug/mL in 2% HNO_3	VHG-LISY100-100	100
Y @10 µg/mL in 2% HNO_3	VHG-LISAY-100	100

ICP-MS

Internal Standard Mixtures

Multi-Element Internal Standard Mixtures for ICP-MS				
Description	Composition	Product No.	mL	Suitable for use with
ICP-MS Pharma & USP <232> Internal Standard Solution	Bi, Ga, In @ 100 µg/mL in 5% HNO_3	VHG-LIS9-100	100	Thermo Scientific™ ICP-MS: iCAP™-Q, X-series
ICP-MS Internal Standard 7 Element Mix	Bi, Ge, ^{6}Li, In, Sc, Tb, Y @ 10 µg/mL in 2% HNO_3	VHG-LAGISTDMIX-100	100	Agilent® ICP-MS: 7500, 7700, 7800, 7900, 8800, 8900
ICP-MS Internal Standard Solution	Bi, Ge, In, ^{6}Li, Rh, Sc, Tb, Y @ 10 µg/mL in 5% HNO_3, tr. F-	VHG-LIS8-100	100	Thermo Scientific™ ICP-MS: X-Series
Internal Standard Multi-Element Mix 1	^{6}Li, Bi, Ga, In, Sc, Tb, Y @ 100 µg/L in 5% HNO_3	VHG-LIS1-100	100	All models
Internal Standard Multi-Element Mix 2	Bi, Ga, In, Tb, Y @ 20 µg/L; ^{6}Li, Sc @ 100 µg/L in 2% HNO_3	VHG-LIS2-100	100	All models
Internal Standard Multi-Element Mix 3	^{6}Li, Bi, Ge, In, Lu, Sc, Tb @ 100 µg/L in 5% HNO_3, tr. F^-	VHG-LIS3-100	100	All models
Internal Standard Multi-Element Mix 4	Bi, In, Tb @10 µg/L; Ge, Te @ 25 µg/L; ^{6}Li, Sc @ 50 µg/L in 5% HNO_3, tr. F^-	VHG-LIS4-100	100	All models

ICP-MS

Blank Solutions

VHG™ Blank Solutions are produced in our dedicated aqueous production laboratory with a certified cleanroom, and are accompanied by a COA containing a trace impurity scan. You can be confident using our Blank Solutions for ICP-MS references and clean rinses.

Blank Solutions for ICP-MS				
Description	Composition	Product No.	mL	Suitable for use with
ICP-MS Wash Solution	1% HNO_3	VHG-LPENXWASH-250	250	PerkinElmer® ICP-MS: NexION™, DRC, DRCII
ICP-MS Wash Water Blank	18 MΩ DI Water	VHG-LDIWASH-250	250	All models
ICP-MS Blank	5% HNO_3 in ASTM Type 1 Water	VHG-LNITWASH5-250	250	All models
Nitric Acid Blank	5% HNO_3	VHG-HNO3-BLK-500	500	All models
Hydrochloric Acid Blank	5% HCl	VHG-HCL-BLK-500	500	All models
Hydrochloric/Nitric Blank	5% HCl, 1% HNO_3	VHG-ICB/CCB-500	500	All models

Instrument Consumables

We offer a range of instrument consumables for ICP-OES and ICP-MS including nebulizers, torches, accessories and spray chambers. Please visit our website for more information!

VHG™

Download our full catalog of

Aqueous Inorganic Certified Reference Materials (CRMs) & Calibration Standards

Our Aqueous Inorganic Portfolio includes high-purity single and multi-element standards, CRMs, and instrument solutions for spectrochemical analysis, IC, wet chemistry techniques, and QC applications.

Download our catalog to shop our full product listing or shop online today at:

lgcstandards.com/VHGAqueousInorganic

LGC Quality: ISO 17043 | ISO 17034 | ISO/IEC 17025 | ISO 9001

LGC

The ultimate online source for reference materials

100,000 reference materials

+

your search criteria

=

your reference standards

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Instrument Start Up Solutions

FAQ's for Laboratories

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lgcstandards.com/VHG-StartUpSolutions

LGC Quality: ISO 17043 | ISO 17034 | ISO/IEC 17025 | ISO 9001

Instrument Start Up Solution FAQ's

Q: Are VHG™ products for wavelength calibration and tuning equivalent to those from the company that manufactured my ICP or ICP-MS instrument?

A: VHG™ product composition is designed to be a direct equivalent; simply match the VHG™ item to the manufacturer's part for the given use. Our products are manufactured in our facility accredited to ISO 17034 and certified to ISO 9001, making them products possibly superior for the intended use.

Q: My ICP set up is for petroleum materials and solvent matrices. How do I use an aqueous-based wavelength calibration standard?

A: You would have to switch your ICP sample introduction over to water-based samples; you can also request to have us configure a wavelength calibration standard in an oil/solvent-based matrix. We have over 40 metals available for blending in an organic solvent matrix.

Q: I have a mixing tee for my ICP-MS internal standard. How do I configure this for tuning the instrument?

A: You may leave the mixing tee connected. If your internal standard elements do not include or do not interfere with the elements present in the tuning solution, you may leave the internal standard uptake tube in the internal standard while you tune. Conversely, if your internal standard includes any of the elements in the tuning solution, then we advise the internal standard uptake tube be put into a dilute acid matrix (e.g. 2% HNO_3) prior to tuning.

Q: If a standard is designed for use for one instrument model, can it be used for different brands or models?

A: VHG™ Start Up Solutions are fully certified single or multi-element reference materials (CRMs). All elements present in the material and their certified concentrations are listed on the Certificate of Analysis (COA). VHG™ standards are analyzed for trace contaminants, which are listed on the COA. If the product contains the element blend and concentrations you need, then it is suitable for use.

Q: Why do ICP wavelength calibration standards commonly have concentration differences between elements?

A: The range of elements and concentrations relates to the intensity of the common analytical wavelengths. The distribution is aimed at making the measured intensities more equivalent between the elements present.

Have questions? Our experts are here to help!

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