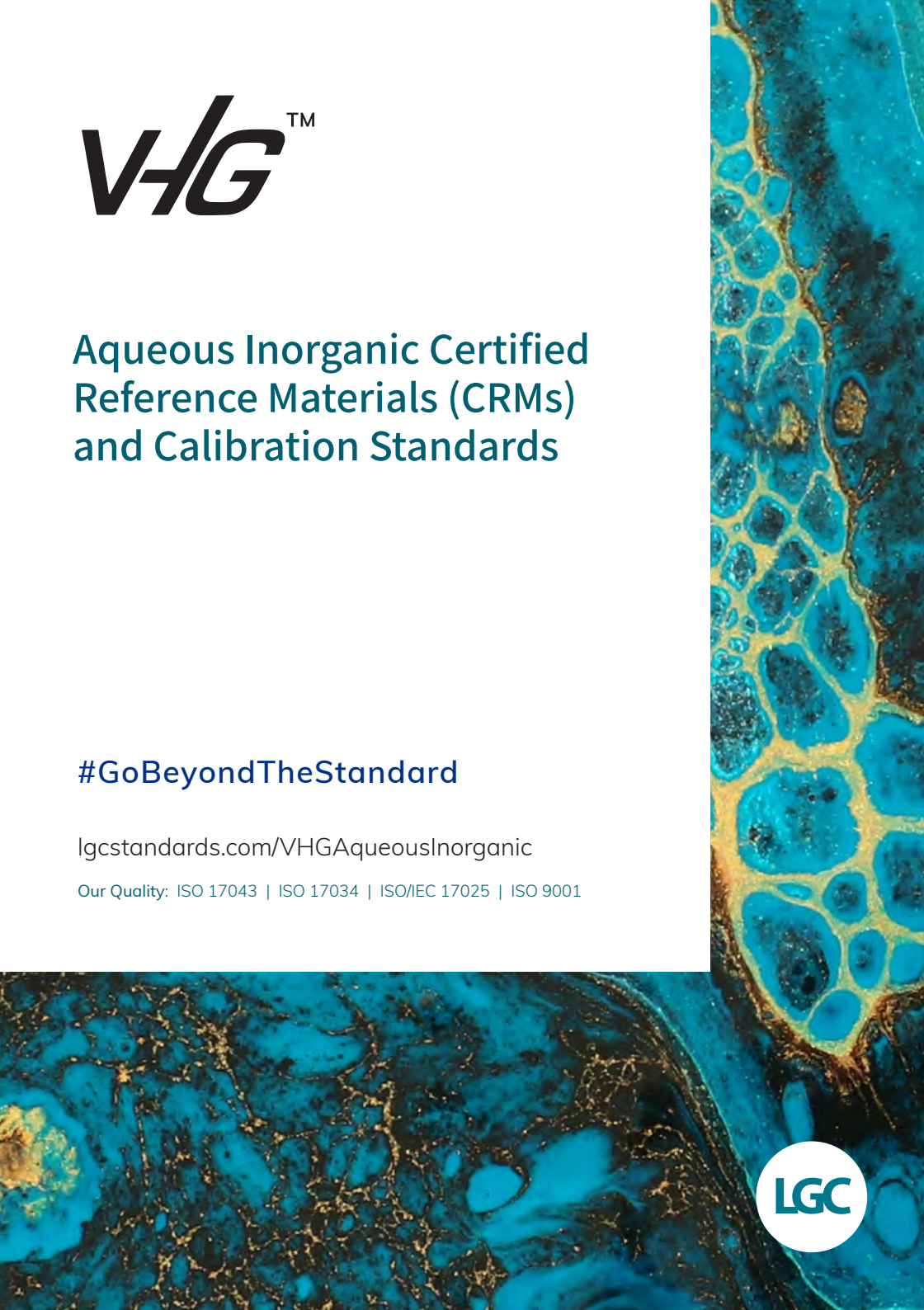
VHG™

Aqueous Inorganic Certified Reference Materials (CRMs) and Calibration Standards

#GoBeyondTheStandard

lgcstandards.com/VHGAqueousInorganic

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



VHG™ Catalog of Aqueous Inorganic Certified Reference Materials (CRMs) and Calibration Standards

Welcome to our full selection of VHG™ brand high-purity single and multi-element aqueous inorganic standards, CRMs, and instrument solutions for spectrochemical analysis, IC, wet chemistry techniques, and QC applications. With more than 30 years of expertise, we #GoBeyondTheStandard in quality, service and solutions.

Section 1: Inorganic Standards

A+ Single Element CRMs

You require the highest level of accuracy possible in your analysis. VHG™ A+ Single Element Standards™ deliver exactly that, so you can have absolute confidence when you need it most.

Multi-Element Standards

The VHG™ Multi-Element Aqueous Inorganic offerings are formulated from our A+ Single Element Standards™ and thus provide you the same high quality, traceability, and dependability.

VHG™ Multi-Element Standards are designed for use as calibration solutions, fortifying solutions, control checks, interference checks, and tuning solutions suitable for use with spectroscopic techniques. The portfolio also includes a suite of pre-configured environmental standards.

Additional Aqueous Inorganic Standards

For needs relating to a specific technique, turn to the VHG™ range of standards for ICP/ICP-MS, AA, IC, elemental speciation, and isotope analysis. You will also find our pH buffer reference materials in the VHG™ line of wet chemistry standards.

Custom Standards

Your requirements are unique. In VHG™ you have a partner who specializes in custom mixtures, and has the ISO accreditations that ensure the quality of the custom standards you receive.

Our experts are ready to discuss how we can meet your specific needs.

Section 2: Solid Standards

As a fully capable partner, we offer a wide variety of Solid Standards in addition to our Aqueous Inorganic Standards. From providing standards to test for metals in soil, plastic, or paint, to fusion fluxes, and binder & briquetting materials, we can deliver what you need.

Section 3: Instrument Consumables

Look no further for many of the consumables you may need for AA, GFAA, ICP, ICP-MS, and XRF instruments. We can be the single vendor to satisfy all of your spectroscopic needs.

Thank you to all of our customers. We look forward to supporting your continued success.

— The VHG™ Team

About LGC Standards

Headquartered in Teddington, Middlesex, UK, LGC Standards' network of dedicated sales offices extends across 20 countries on 5 continents.

Our unparalleled breadth of reference materials are the result of unmatched decades of expertise and experience, and are produced in facilities accredited to ISO 17034 in sites across the UK, the U.S., Germany and China.

In addition to our aqueous inorganic line, we manufacture CRMs and reference materials for the petroleum, pharmaceutical, forensic, clinical, food, beverage, cannabis, environmental, pesticide and contaminants sectors.

LGC Standards provides proficiency testing schemes in support of these sectors, as well as others, to more than 12,000 laboratories worldwide.

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:

Common Applications

VHG™ CRMs and reference materials are designed to meet the unique application needs of many industries.

Common applications include:

- Elemental Analysis
- Instrument Start Up & Calibration
- Materials Analysis
- Ore Testing
- Consumer Safety Analysis, including USP <232>
- Trace Impurity Analysis for Semiconductor Industry
- Ion Analysis
- QC Check Samples
- Inorganic Contaminant Analysis
- Water Quality Analysis
- Classical Wet Chemistry Analysis

Table of Contents

Table of Contents

Method & Application Index

Section 1: Inorganic Standards

Common EPA Methods

Environmental Sample Analysis

VHG™ Quality

Going beyond the standard

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.

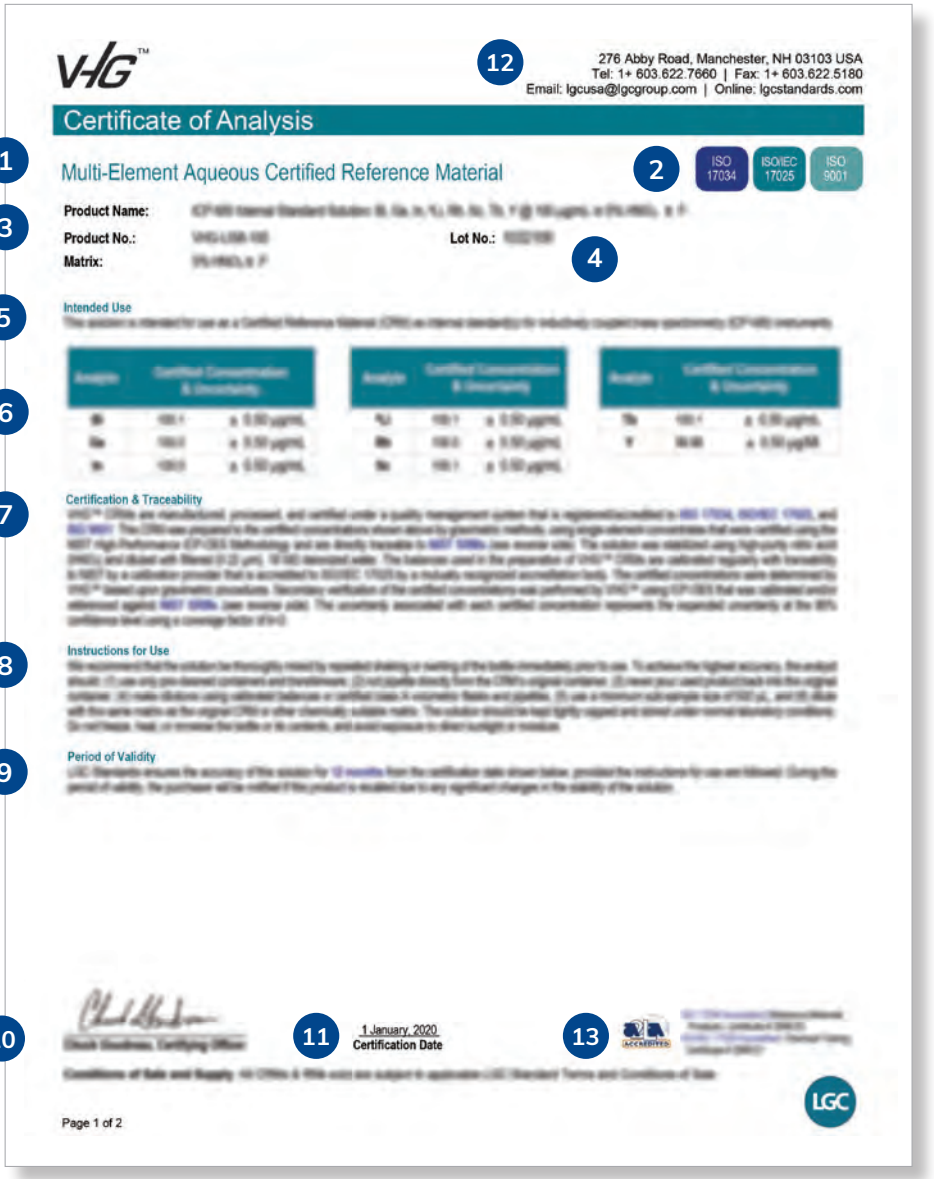
Expert customer support

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.

Sample CoA



VHG™

12 276 Abby Road, Manchester, NH 03103 USA
Tel: 1+ 603.622.7660 | Fax: 1+ 603.622.5180
Email: lgcusa@lgcgroup.com | Online: lgcstandards.com

Certificate of Analysis

1 Multi-Element Aqueous Certified Reference Material

2 ISO 17034 | ISO/IEC 17025 | ISO 9001

3 **Product Name:**
Product No.:
Matrix:
Lot No.:
4

5 Intended Use

6

Analyte	Certified Concentration & Uncertainty	Analyte	Certified Concentration & Uncertainty	Analyte	Certified Concentration & Uncertainty

7 Certification & Traceability

8 Instructions for Use

9 Period of Validity

10 Chuck Goodman, Certifying Officer

11 1 January, 2020
Certification Date

13

Conditions of Sale and Supply

Page 1 of 2

Explanation of CoA

1) Product Category
Document title and the type of Reference Material certified by the CoA

2) Accreditation / Quality Level
Accreditation and quality level of the product clearly defined

3) Product Details
Product name, number, and description of material

4) Lot Number
Unique identification number for a specific lot of the product

5) Intended Use
Description of the use for which the Reference Material has been produced

6) Elemental Analysis Information
Element, Certified Concentration, and Uncertainty

7) Certification Statement
Provides metrological traceability and measurement methods

8) Instructions for Use
Includes the minimum sample size, storage information, and instructions for handling and use

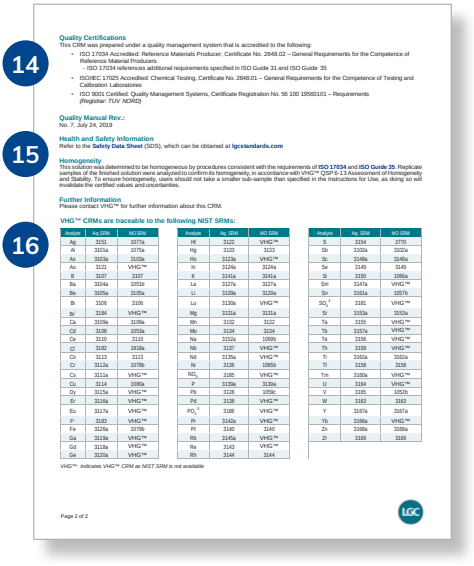
9) Period of Validity
Explains the period for which the Reference Material described in the COA is ensured to be accurate

10) Certified Signature
Signature of the Certifying Officer

11) Certification Date
Document version and the date of certification issuance

12) Company Contact Information

13) Accreditations
Accreditation information



14) Quality Certifications
Details of relevant quality certifications

15) Health & Safety Information
SDS may be found on our website

16) NIST SRM Cross Referral

NIST High-Performance ICP-OES Methodology

Delivering the accuracy you need to be confident in your results

The VHG™ brand is synonymous with unsurpassed quality, and we maintain a vigorous focus on delivering products with the highest level of accuracy to meet your needs.

As part of our long-term commitment to continuous improvement, the VHG™ team worked with NIST* on original research aimed at identifying a more accurate instrument-based technique for metals determinations.

The target was the development of a methodology to certify direct traceability of assay and associated uncertainty to NIST standard reference materials.

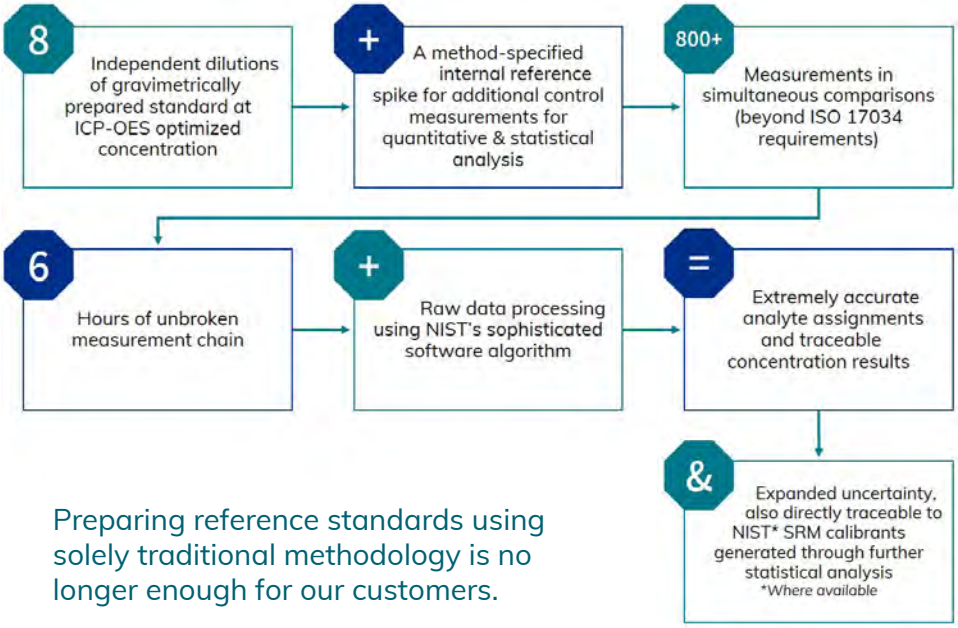
The result?

The NIST High-Performance ICP-OES Methodology

*The National Institute of Standards and Technology

The NIST High-Performance ICP-OES Methodology is the foundation for our A+ Single Element™ Certified Reference Standards

We #GoBeyondTheStandard in large part because we utilize this rigorous methodology to bring our reference standards to the next level.



Preparing reference standards using solely traditional methodology is no longer enough for our customers.

#GoBeyondTheStandard

VHG™

Section 1:

Inorganic Standards

#GoBeyondTheStandard

Contact us today: U.S. + Canada

Tel: +1 603.622.7660

Email: lgcusa@lgcgroup.com

*See page 179 for full list of LGC Country Sale Offices

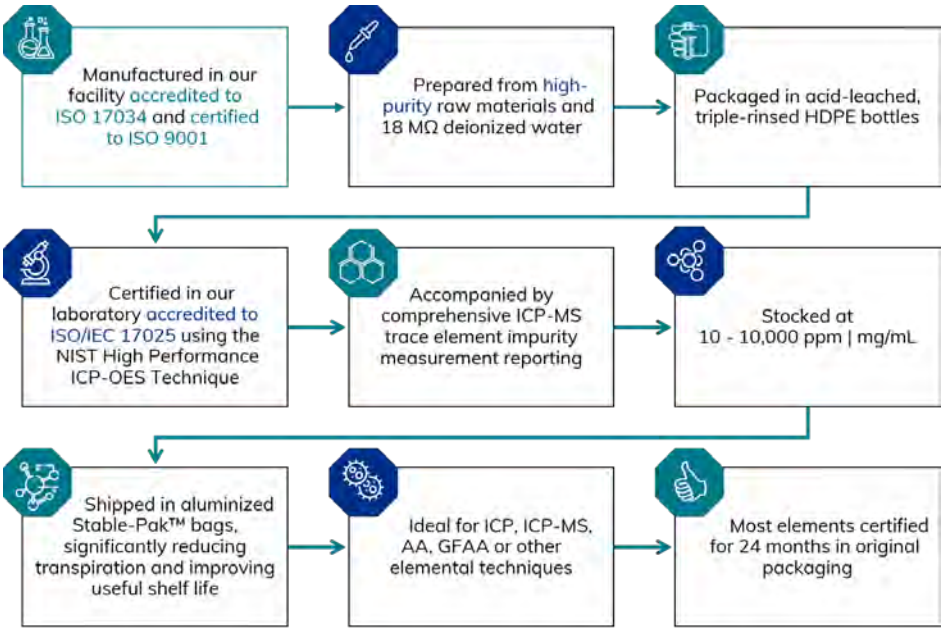
Single Elements — Overview

Sub-Section Contents:

A+ Single Element Certified Reference Materials

VHG™ is the only manufacturer of spectrochemical solution standards to routinely use the NIST High-Performance ICP-OES Methodology.

We #GoBeyondTheStandard with our A+ Single Element Certified Reference Materials (CRMs) to give you absolute confidence in your ICP, AA, and ICP-MS analysis, ensuring extremely accurate and consistent testing results from your laboratory instrumentation.



Developed to provide the highest levels of accuracy and traceability

A+ Single Element Standards™

VHG™ A+ Single Element Standards™ meet your lab's need for standards that are accurate, precise and traceably certified for concentration and uncertainty.

A+ Single Element Standards™ are analyzed according to the rigorous NIST High-Performance ICP-OES Methodology, utilizing NIST 3000-Series SRM calibrants; thus providing direct, NIST SRM traceable certification.

Please see pages 12-13 for more information on the NIST High-Performance ICP-OES Methodology.

Key product features:

- Ideal for ICP, ICP-MS, AA, GFAA, and many other elemental techniques
- Prepared from high-purity raw materials, acids, and 18 MΩ deionized water
- Certified using the NIST High-Performance ICP-OES Methodology, a method that assures the highest accuracy and direct traceability to NIST SRMs
- Accompanied by NIST-traceable Certificate of Analysis which includes ICP-MS trace element scans and low, statistically meaningful 'expanded uncertainty'
- Packaged in acid-leached, triple-rinsed HDPE bottles
- Shipped in Stable-Pak™ bags which reduce transpiration and improve useful shelf life

TIPS: A+ Single Element Standards™

"Trace HF" (tr. HF) refers to a small amount of HF added to stabilize some elements that require it. Concentrations are below 0.5%. When "F^-" is stated, the reference is to fluoride as part of a raw material compound. These have F^- at extremely low, dilute levels with no additional fluoride added.

Avoid using glass pipettes or transfer devices with standard solutions containing HF, as free HF reacts with glass and may elevate silicon levels.

A+ Single Element Standards™

Element	Matrix	mL	Conc. (10 µg/mL)	Conc. (1,000 µg/mL)	Conc. (10,000 µg/mL)
			Product No.	Product No.	Product No.
Aluminum (Al)	HCl	100	VHG-LALH-100	VHG-PALH-100	VHG-TALH-100
		250		VHG-PALH-250	VHG-TALH-250
		500		VHG-PALH-500	VHG-TALH-500
	HNO_3	100	VHG-LALN-100	VHG-PALN-100	VHG-TALN-100
		250		VHG-PALN-250	VHG-TALN-250
		500		VHG-PALN-500	VHG-TALN-500
Antimony (Sb)	HCl	100	VHG-LSBH-100	VHG-PSBH-100	VHG-TSBH-100
		250		VHG-PSBH-250	VHG-TSBH-250
		500		VHG-PSBH-500	VHG-TSBH-500
	HNO_3, Tartaric Acid	100	VHG-LSBWTN-100	VHG-PSBWTN-100	VHG-TSBWTN-100
		250		VHG-PSBWTN-250	VHG-TSBWTN-250
		500		VHG-PSBWTN-500	VHG-TSBWTN-500
Arsenic (As)	HNO_3	100	VHG-LASN-100	VHG-PASN-100	VHG-TASN-100
		250		VHG-PASN-250	VHG-TASN-250
		500	VHG-LASN-500	VHG-PASN-500	VHG-TASN-500
Barium (Ba)	HNO_3	100	VHG-LBAN-100	VHG-PBAN-100	VHG-TBAN-100
		250		VHG-PBAN-250	VHG-TBAN-250
		500		VHG-PBAN-500	VHG-TBAN-500
Beryllium (Be)	HNO_3	100	VHG-LBEN-100	VHG-PBEN-100	VHG-TBEN-100
		250		VHG-PBEN-250	VHG-TBEN-250
		500	VHG-LBEN-500	VHG-PBEN-500	VHG-TBEN-500
Bismuth (Bi)	HNO_3	100	VHG-LBIN-100	VHG-PBIN-100	VHG-TBIN-100
		250		VHG-PBIN-250	VHG-TBIN-250
		500		VHG-PBIN-500	VHG-TBIN-500
Boron (B)	NH_4OH	100	VHG-LBZ-100	VHG-PBZ-100	VHG-TBZ-100
		250		VHG-PBZ-250	VHG-TBZ-250
		500		VHG-PBZ-500	VHG-TBZ-500

Element continues on next page

A+ Single Element Standards™

Element continued from previous page

Element	Matrix	mL	Conc. (10 µg/mL)	Conc. (1,000 µg/mL)	Conc. (10,000 µg/mL)
			Product No.	Product No.	Product No.
Boron (B)	H_2O	100	VHG-LBW-100	VHG-PBW-100	
		250		VHG-PBW-250	
		500		VHG-PBW-500	
Cadmium (Cd)	HNO_3	100	VHG-LCDN-100	VHG-PCDN-100	VHG-TCDN-100
		250		VHG-PCDN-250	VHG-TCDN-250
		500	VHG-LCDN-500	VHG-PCDN-500	VHG-TCDN-500
Calcium (Ca)	HNO_3	100		VHG-PCAN-100	VHG-TCAN-100
		250		VHG-PCAN-250	VHG-TCAN-250
		500		VHG-PCAN-500	VHG-TCAN-500
Cerium (Ce)	HNO_3	100		VHG-PCEN-100	VHG-TCEN-100
		250		VHG-PCEN-250	VHG-TCEN-250
		500		VHG-PCEN-500	VHG-TCEN-500
Cesium (Cs)	HNO_3	100		VHG-PCSN-100	VHG-TCSN-100
		250		VHG-PCSN-250	VHG-TCSN-250
		500		VHG-PCSN-500	VHG-TCSN-500
Chromium (Cr)	HCl	100		VHG-PCRH-100	VHG-TCRH-100
		250		VHG-PCRH-250	VHG-TCRH-250
		500		VHG-PCRH-500	VHG-TCRH-500
	HNO_3	100	VHG-LCRN-100	VHG-PCRN-100	VHG-TCRN-100
		250		VHG-PCRN-250	VHG-TCRN-250
		500	VHG-LCRN-500	VHG-PCRN-500	VHG-TCRN-500
Cobalt (Co)	HNO_3	100	VHG-LCON-100	VHG-PCON-100	VHG-TCON-100
		250		VHG-PCON-250	VHG-TCON-250
		500		VHG-PCON-500	VHG-TCON-500
Copper (Cu)	HNO_3	100	VHG-LCUN-100	VHG-PCUN-100	VHG-TCUN-100
		250		VHG-PCUN-250	VHG-TCUN-250
		500		VHG-PCUN-500	VHG-TCUN-500

A+ Single Element Standards™

Element	Matrix	mL	Conc. (10 µg/mL)	Conc. (1,000 µg/mL)	Conc. (10,000 µg/mL)
			Product No.	Product No.	Product No.
Dysprosium (Dy)	HNO_3	100		VHG-PDYN-100	VHG-TDYN-100
		250		VHG-PDYN-250	VHG-TDYN-250
		500		VHG-PDYN-500	VHG-TDYN-500
Erbium (Er)	HNO_3	100		VHG-PERN-100	VHG-TERN-100
		250		VHG-PERN-250	VHG-TERN-250
		500		VHG-PERN-500	VHG-TERN-500
Europium (Eu)	HNO_3	100		VHG-PEUN-100	VHG-TEUN-100
		250		VHG-PEUN-250	VHG-TEUN-250
		500		VHG-PEUN-500	VHG-TEUN-500
Gadolinium (Gd)	HNO_3	100		VHG-PGDN-100	VHG-TGDN-100
		250		VHG-PGDN-250	VHG-TGDN-250
		500		VHG-PGDN-500	VHG-TGDN-500
Gallium (Ga)	HNO_3, tr. HCl	100		VHG-PGANH-100	VHG-TGANH-100
		250		VHG-PGANH-250	VHG-TGANH-250
		500		VHG-PGANH-500	VHG-TGANH-500
Germanium (Ge)	HNO_3, tr. HF	100	VHG-LGENF-100	VHG-PGENF-100	VHG-TGENF-100
		250		VHG-PGENF-250	VHG-TGENF-250
		500		VHG-PGENF-500	VHG-TGENF-500
	H_2O, tr. F^-	100	VHG-LGEW-100	VHG-PGEW-100	
		250		VHG-PGEW-250	
		500		VHG-PGEW-500	
Gold (Au)	HCl	100		VHG-PAUH-100	VHG-TAUH-100
		250		VHG-PAUH-250	VHG-TAUH-250
		500		VHG-PAUH-500	VHG-TAUH-500
Hafnium (Hf)	HCl	100		VHG-PHFH-100	VHG-THFH-100
		250		VHG-PHFH-250	VHG-THFH-250
		500		VHG-PHFH-500	VHG-THFH-500

A+ Single Element Standards™

Element	Matrix	mL	Conc. (10 µg/mL)	Conc. (1,000 µg/mL)	Conc. (10,000 µg/mL)
			Product No.	Product No.	Product No.
Holmium (Ho)	HNO_3	100		VHG-PHON-100	VHG-THON-100
		250		VHG-PHON-250	VHG-THON-250
		500		VHG-PHON-500	VHG-THON-500
Indium (In)	HNO_3	100	VHG-LINN-100	VHG-PINN-100	VHG-TINN-100
		250		VHG-PINN-250	VHG-TINN-250
		500		VHG-PINN-500	VHG-TINN-500
Iridium (Ir)	HCl	100	VHG-LIRH-100	VHG-PIRH-100	VHG-TIRH-100
		250		VHG-PIRH-250	VHG-TIRH-250
		500		VHG-PIRH-500	VHG-TIRH-500
Iron (Fe)	HNO_3	100		VHG-PFEN-100	VHG-TFEN-100
		250		VHG-PFEN-250	VHG-TFEN-250
		500		VHG-PFEN-500	VHG-TFEN-500
Lanthanum (La)	HNO_3	100		VHG-PLAN-100	VHG-TLAN-100
		250		VHG-PLAN-250	VHG-TLAN-250
		500		VHG-PLAN-500	VHG-TLAN-500
Lead (Pb)	HNO_3	100	VHG-LPBN-100	VHG-PPBN-100	VHG-TPBN-100
		250		VHG-PPBN-250	VHG-TPBN-250
		500	VHG-LPBN-500	VHG-PPBN-500	VHG-TPBN-500
Lithium (Li)	HNO_3	100	VHG-LLIN-100	VHG-PLIN-100	VHG-TLIN-100
		250		VHG-PLIN-250	VHG-TLIN-250
		500		VHG-PLIN-500	VHG-TLIN-500
Lutetium (Lu)	HNO_3	100	VHG-LLUN-100	VHG-PLUN-100	VHG-TLUN-100
		250		VHG-PLUN-250	VHG-TLUN-250
		500		VHG-PLUN-500	VHG-TLUN-500
Magnesium (Mg)	HNO_3	100		VHG-PMGN-100	VHG-TMGN-100
		250		VHG-PMGN-250	VHG-TMGN-250
		500		VHG-PMGN-500	VHG-TMGN-500

A+ Single Element Standards™

Element	Matrix	mL	Conc. (10 µg/mL)	Conc. (1,000 µg/mL)	Conc. (10,000 µg/mL)
			Product No.	Product No.	Product No.
Manganese (Mn)	HNO_3	100	VHG-LMNN-100	VHG-PMNN-100	VHG-TMNN-100
		250		VHG-PMNN-250	VHG-TMNN-250
		500	VHG-LMNN-500	VHG-PMNN-500	VHG-TMNN-500
Mercury (Hg)	HNO_3	100	VHG-LHGN-100	VHG-PHGN-100	VHG-THGN-100
		250	VHG-LHGN-250	VHG-PHGN-250	VHG-THGN-250
		500	VHG-LHGN-500	VHG-PHGN-500	VHG-THGN-500
Molybdenum (Mo)	HNO_3, tr. HF	100	VHG-LMONF-100	VHG-PMONF-100	VHG-TMONF-100
		250		VHG-PMONF-250	VHG-TMONF-250
		500	VHG-LMONF-500	VHG-PMONF-500	VHG-TMONF-500
	NH_4OH	100		VHG-PMOZ-100	VHG-TMOZ-100
		250		VHG-PMOZ-250	VHG-TMOZ-250
		500		VHG-PMOZ-500	VHG-TMOZ-500
Neodymium (Nd)	HNO_3	100		VHG-PNDN-100	VHG-TNDN-100
		250		VHG-PNDN-250	VHG-TNDN-250
		500		VHG-PNDN-500	VHG-TNDN-500
Nickel (Ni)	HNO_3	100		VHG-PNIN-100	VHG-TNIN-100
		250		VHG-PNIN-250	VHG-TNIN-250
		500	VHG-LNIN-500	VHG-PNIN-500	VHG-TNIN-500
Niobium (Nb)	HF	100		VHG-PNBF-100	VHG-TNBF-100
		250		VHG-PNBF-250	VHG-TNBF-250
		500		VHG-PNBF-500	VHG-TNBF-500
Osmium (Os)	HCl	100	VHG-LOSH-100	VHG-POSH-100	
		250		VHG-POSH-500	
		500		VHG-POSH-250	
Palladium (Pd)	HCl	100		VHG-PPDH-100	VHG-TPDH-100
		250		VHG-PPDH-250	VHG-TPDH-250
		500		VHG-PPDH-500	VHG-TPDH-500

Element continues on next page

A+ Single Element Standards™

Element continued from previous page

Element	Matrix	mL	Conc. (10 µg/mL)	Conc. (1,000 µg/mL)	Conc. (10,000 µg/mL)
			Product No.	Product No.	Product No.
Palladium (Pd)	HNO_3	100		VHG-PPDN-100	VHG-TPDN-100
		250		VHG-PPDN-250	VHG-TPDN-250
		500		VHG-PPDN-500	VHG-TPDN-500
Phosphorus (P)	HNO_3	100		VHG-PPN-100	VHG-TPN-100
		250		VHG-PPN-250	VHG-TPN-250
		500		VHG-PPN-500	VHG-TPN-500
Platinum (Pt)	HCl	100	VHG-LPTH-100	VHG-PPTH-100	VHG-TPTH-100
		250		VHG-PPTH-250	VHG-TPTH-250
		500		VHG-PPTH-500	VHG-TPTH-500
Potassium (K)	HNO_3	100		VHG-PKN-100	VHG-TKN-100
		250		VHG-PKN-250	VHG-TKN-250
		500		VHG-PKN-500	VHG-TKN-500
Praseodymium (Pr)	HNO_3	100		VHG-PPRN-100	VHG-TPRN-100
		250		VHG-PPRN-250	VHG-TPRN-250
		500		VHG-PPRN-500	VHG-TPRN-500
Rhenium (Re)	HNO_3	100		VHG-PREN-100	VHG-TREN-100
		250		VHG-PREN-250	VHG-TREN-250
		500		VHG-PREN-500	VHG-TREN-500
Rhodium (Rh)	HCl	100	VHG-LRHH-100	VHG-PRHH-100	VHG-TRHH-100
		250	VHG-LRHH-250	VHG-PRHH-250	VHG-TRHH-250
		500		VHG-PRHH-500	VHG-TRHH-500
Rubidium (Rb)	HNO_3	100		VHG-PRBN-100	VHG-TRBN-100
		250		VHG-PRBN-250	VHG-TRBN-250
		500		VHG-PRBN-500	VHG-TRBN-500
Ruthenium (Ru)	HCl	100		VHG-PRUH-100	VHG-TRUH-100
		250		VHG-PRUH-250	VHG-TRUH-250
		500		VHG-PRUH-500	VHG-TRUH-500

A+ Single Element Standards™

Element	Matrix	mL	Conc. (10 µg/mL)	Conc. (1,000 µg/mL)	Conc. (10,000 µg/mL)
			Product No.	Product No.	Product No.
Samarium (Sm)	HNO_3	100		VHG-PSMN-100	VHG-TSMN-100
		250		VHG-PSMN-250	VHG-TSMN-250
		500		VHG-PSMN-500	VHG-TSMN-500
Scandium (Sc)	HNO_3	100	VHG-LSCN-100	VHG-PSCN-100	VHG-TSCN-100
		250		VHG-PSCN-250	VHG-TSCN-250
		500		VHG-PSCN-500	VHG-TSCN-500
Selenium (Se)	HNO_3	100	VHG-LSEN-100	VHG-PSEN-100	VHG-TSEN-100
		250		VHG-PSEN-250	VHG-TSEN-250
		500		VHG-PSEN-500	VHG-TSEN-500
Silicon (Si)	H_2O, tr. F^-	100		VHG-PSIW-100	VHG-TSIW-100
		250		VHG-PSIW-250	VHG-TSIW-250
		500		VHG-PSIW-500	VHG-TSIW-500
Silver (Ag)	HNO_3	100	VHG-LAGN-100	VHG-PAGN-100	VHG-TAGN-100
		250		VHG-PAGN-250	VHG-TAGN-250
		500	VHG-LAGN-500	VHG-PAGN-500	VHG-TAGN-500
Sodium (Na)	HNO_3	100		VHG-PNAN-100	VHG-TNAN-100
		250		VHG-PNAN-250	VHG-TNAN-250
		500		VHG-PNAN-500	VHG-TNAN-500
Strontium (Sr)	HNO_3	100	VHG-LSRN-100	VHG-PSRN-100	VHG-TSRN-100
		250		VHG-PSRN-250	VHG-TSRN-250
		500		VHG-PSRN-500	VHG-TSRN-500
Sulfur (S)	H_2O	100		VHG-PSW-100	VHG-TSW-100
		250		VHG-PSW-250	VHG-TSW-250
		500		VHG-PSW-500	VHG-TSW-500
Tantalum (Ta)	HF	100		VHG-PTAF-100	VHG-TTAF-100
		250		VHG-PTAF-250	VHG-TTAF-250
		500		VHG-PTAF-500	VHG-TTAF-500

A+ Single Element Standards™

Element	Matrix	mL	Conc. (10 µg/mL)	Conc. (1,000 µg/mL)	Conc. (10,000 µg/mL)
			Product No.	Product No.	Product No.
Tellurium (Te)	HCl	100		VHG-PTEH-100	VHG-TTEH-100
		250		VHG-PTEH-250	VHG-TTEH-250
		500		VHG-PTEH-500	VHG-TTEH-500
	HNO_3	100		VHG-PTEN-100	
		250		VHG-PTEN-250	
		500		VHG-PTEN-500	
Terbium (Tb)	HNO_3	100	VHG-LTBN-100	VHG-PTBN-100	VHG-TTBN-100
		250		VHG-PTBN-250	VHG-TTBN-250
		500		VHG-PTBN-500	VHG-TTBN-500
Thallium (Tl)	HNO_3	100		VHG-PTLN-100	VHG-TTLN-100
		250		VHG-PTLN-250	VHG-TTLN-250
		500		VHG-PTLN-500	VHG-TTLN-500
Thorium (Th)	HNO_3	100		VHG-PTHN-100	VHG-TTHN-100
		250		VHG-PTHN-250	VHG-TTHN-250
		500		VHG-PTHN-500	VHG-TTHN-500
Thulium (Tm)	HNO_3	100		VHG-PTMN-100	VHG-TTMN-100
		250		VHG-PTMN-250	VHG-TTMN-250
		500		VHG-PTMN-500	VHG-TTMN-500
Tin (Sn)	HCl	100	VHG-LSNH-100	VHG-PSNH-100	VHG-TSNH-100
		250		VHG-PSNH-250	VHG-TSNH-250
		500		VHG-PSNH-500	VHG-PSNH-500
	HNO_3, tr. HF	100	VHG-LSNNF-100	VHG-PSNNF-100	VHG-TSNNF-100
		250		VHG-PSNNF-250	VHG-TSNNF-250
		500		VHG-PSNNF-500	VHG-TSNNF-500
Titanium (Ti)	HNO_3, tr. HF	100	VHG-LTINF-100	VHG-PTINF-100	VHG-TTINF-100
		250		VHG-PTINF-250	VHG-TTINF-250
		500		VHG-PTINF-500	VHG-TTINF-500

Element continues on next page

A+ Single Element Standards™

Element continued from previous page

Element	Matrix	mL	Conc. (10 µg/mL)	Conc. (1,000 µg/mL)	Conc. (10,000 µg/mL)
			Product No.	Product No.	Product No.
Titanium (Ti)	H_2O, tr. F^-	100		VHG-PTIW-100	VHG-TTIW-100
		250		VHG-PTIW-250	VHG-TTIW-250
		500		VHG-PTIW-500	VHG-TTIW-500
Tungsten (W)	HNO_3, tr. HF	100		VHG-PWNF-100	VHG-TWNF-100
		250		VHG-PWNF-250	VHG-TWNF-250
		500		VHG-PWNF-500	VHG-TWNF-500
	H_2O	100		VHG-PWW-100	VHG-TWW-100
		250		VHG-PWW-250	VHG-TWW-250
		500		VHG-PWW-500	VHG-TWW-500
Uranium (U)	HNO_3	100	VHG-LUN-100	VHG-PUN-100	VHG-TUN-100
		250		VHG-PUN-250	VHG-TUN-250
		500		VHG-PUN-500	VHG-TUN-500
Vanadium (V)	HNO_3	100	VHG-LVN-100	VHG-PVN-100	VHG-TVN-100
		250		VHG-PVN-250	VHG-TVN-250
		500		VHG-PVN-500	VHG-TVN-500
Ytterbium (Yb)	HNO_3	100		VHG-PYBN-100	VHG-TYBN-100
		250		VHG-PYBN-250	VHG-TYBN-250
		500		VHG-PYBN-500	VHG-TYBN-500
Yttrium (Y)	HNO_3	100	VHG-LYN-100	VHG-PYN-100	VHG-TYN-100
		250	VHG-LYN-250	VHG-PYN-250	VHG-TYN-250
		500		VHG-PYN-500	VHG-TYN-500
Zinc (Zn)	HNO_3	100	VHG-LZNN-100	VHG-PZNN-100	VHG-TZNN-100
		250		VHG-PZNN-250	VHG-TZNN-250
		500	VHG-LZNN-500	VHG-PZNN-500	VHG-TZNN-500
Zirconium (Zr)	HCl	100		VHG-PZRH-100	VHG-TZRH-100
		250		VHG-PZRH-250	VHG-TZRH-250
		500		VHG-PZRH-500	VHG-TZRH-500
	HNO_3	100		VHG-PZRN-100	VHG-TZRN-100
		250		VHG-PZRN-250	VHG-TZRN-250
		500		VHG-PZRN-500	VHG-TZRN-500

Elemental Speciation Standards

In many fields, including environmental, biological, and food & beverage, performing solely elemental concentration analysis is no longer enough.

Identifying and quantifying the different species provides a more comprehensive understanding of the possible environmental or health impacts represented by a sample.

As a result, chromatographic separation of certain elements according to their chemical species followed by detection typically using ICP-MS is standard practice in many laboratories.

To help you meet this need, we offer a range of high-quality speciation standards.

Key product features:

- Ideal for detection by hyphenated systems
- Accompanied by a Certificate of Analysis

TIPS: Speciation Single Element Standards

USP <232> and ICH Guidelines outline the requirement for inorganic arsenic and mercury determination via speciation procedures.

Elemental Speciation Standards

Element	Analyte	Conc. (µg/mL)	Matrix	mL	Product No.
Arsenic	As^{+3}	100	2% HCl	50	VHG-SPAS3-50
				100	VHG-SPAS3-100
	As^{+5}	100	H_2O	50	VHG-SPAS5W-50
				100	VHG-SPAS5W-100
Chromium	Cr^{+3}	100	2% HNO_3	50	VHG-SPCR3-50
				100	VHG-SPCR3-100
	Cr^{+6}	100	H_2O	50	VHG-SPCR6-50
				100	VHG-SPCR6-100
	Cr^{+6}	1,000	H_2O	50	VHG-PCR6W-50
				100	VHG-PCR6W-100
Selenium	Se^{+4}	100	2% HNO_3	50	VHG-SPSE4-50
				100	VHG-SPSE4-100
	Se^{+6}	100	H_2O	50	VHG-SPSE6-50
				100	VHG-SPSE6-100

Element	Analyte	Conc. (µg/mL)	Matrix	mL	Product No.
Organic Mercury	$CH_3Hg(II)Cl$ Methyl Mercury Chloride	1,000	H_2O	25	VHG-MMC-25

Don't see what you need? We can prepare custom Methyl Mercury Chloride standards.

Isotopic Standards

The measurement of individual isotopes or isotope dilution methods are powerful techniques for research.

There are a selection of isotope reference materials available under the VHG™ brand. Please inquire with requests for isotopes not found here.

Key product features:

- Ideal for mass spectrometry techniques, including ICP-MS
- Non-radioactive, "stable" isotopes
- Can be handled like any aqueous metal standard
- Accompanied by a Certificate of Analysis that documents the certified isotopic abundances

TIPS: Isotopic Single Element Standards

Tip: ^{6}Li is a well-documented isotopic internal standard for ICP-MS. Other isotopic standards are typically used for isotope ratio or isotope dilution procedures.

Example: Try ^{61}Ni for the important transition metal range.

Isotopic Standards

Element	Symbol	Conc. (µg/mL)	Matrix	mL	Product No.
Boron 11	^{11}B	100	H_2O	50	VHG-LIS11B-50
Cadmium 106	^{106}Cd	10	2% HNO_3	50	VHG-LIS106CD-50
Chromium 50	^{50}Cr	10	2% HNO_3	50	VHG-LIS50CR-50
Copper 65	^{65}Cu	10	2% HNO_3	50	VHG-LIS65CU-50
Iron 57	^{57}Fe	10	2% HNO_3	50	VHG-LIS57FE-50
Lead, "Natural"	Pb	100	2% HNO_3	50	VHG-LISPB1-50
Lithium 6	^{6}Li	100	2% HNO_3	100	VHG-LIS6LIZ-100
Nickel 61	^{61}Ni	10	2% HNO_3	50	VHG-LIS61NI-50
Strontium, "Natural"	Sr	100	2% HNO_3	50	VHG-LISSR-50
Strontium 86	^{86}Sr	10	2% HNO_3	50	VHG-LIS86SR-50
Tin 122	^{122}Sn	10	2% HNO_3, tr. HF	50	VHG-LIS122SN-50
Thallium 203	^{203}Tl	10	2% HNO_3	50	VHG-LIS203TL-50
Zinc 68	^{68}Zn	10	2% HNO_3	50	VHG-LIS68ZN-50

Stable isotope standards are available for special mass spectrometric purposes. The items in the above table display the total abundance concentration and have the isotope of primary abundance listed within the Element name. For exact abundance information, please inquire regarding the reference values.

Inductively Coupled Plasma (ICP) Standards & Solutions — Overview

Inductively Coupled Plasma (ICP) Standards & Solutions — Introduction

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

Featured Products

Both ICP-OES and ICP-MS are comparative techniques. Each instrument requires numerous types of calibration to maximize accuracy, sensitivity, and signal stability.

VHG™ offers a line of high-quality Instrument Start Up Solutions that are essential when performing IQ/OQ/PQ as required under Good Laboratory Practices (GLP). This family of products is designed to meet ICP instrument manufacturers' specifications.

The portfolio includes:

- Wavelength Calibration Solutions
- Mass Calibration Solutions
- Instrument "Tuning" Solutions
- Detector Cross Calibration Solutions
- Internal Standard Solutions
- Calibration Blanks

Please visit pages 53-55 and 64-75 for the complete product lists.

VHG™ Quality

VHG™ manufactures our ICP / ICP-MS Start Up Solutions 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 Certified Reference Materials will consistently deliver reliable results.

Featured Products

Multi-Element Standards Calibration & QC Control

Our multi-element mixtures are produced using VHG™ A+ Single Element Standards™ and have elements conveniently grouped to provide comprehensive coverage of nearly the entire periodic table. In addition to their convenience, our extensive quality control makes these products a clear choice for value.

If you're also looking for Single Element Standards, please see page 19.

Key product features:

- Ideal for detection by ICP-OES and ICP-MS
- Accompanied by a Certificate of Analysis

TIPS: Multi-Element Calibration & QC Controls

Select multi-element mixtures that are associated with specific EPA or ASTM methods can be found starting on page 56 for ICP-OES and 76 for ICP-MS. And if you have a specific need not met by the products listed, please contact us to discuss a custom mixture.

Multi-Element Standards
Calibration & QC Control

Product	Elements	Conc. (µg/mL)	Matrix	mL	Product No.
Alkalis & Alkaline Earths	Ba, Be, Ca, Cs, K, Li, Mg, Na, Rb, Sr	100	5% HNO_3	100	VHG-SM10-100
				500	VHG-SM10-500
Refractory Elements	Al, B, Cr, Hf, Mo, Nb, Si, Ta, Ti, V, W, Zr	100	5% HCl, tr. HF	100	VHG-SM30A-100
				500	VHG-SM30A-500
Noble Metals	Au, Ir, Os, Pd, Pt, Re, Rh, Ru	100	20% HCl	100	VHG-SM40-100
				500	VHG-SM40-500
Metalloids / Hydride Elements	As, Bi, Ga, Ge, In, Pb, Sb, Se, Sn, Te, Tl	100	20% HCl, tr. HF	100	VHG-SM50B-100
				500	VHG-SM50B-500
Rare Earth and 'Geo' Elements	Ba, Ce, Dy, Er, Eu, Gd, Ho, La, Lu, Nd, Pr, Rb, Sc, Sm, Sr , Tb, Th, Tm, U, Y, Yb	100	5% HNO_3	100	VHG-SM60A-100
				500	VHG-SM60A-500
Non-Metals	As, B, P, S, Se, Si, Te	100	5% HCl, tr. HF	100	VHG-SM25A-100
				500	VHG-SM25A-500
Major Cations Mix	Al, Ca, Fe, K, Mg, Na	1,000	5% HNO_3	100	VHG-SM16-100
				500	VHG-SM16-500
Common Element Mix 1	Cd, Co, Cr, Cu, Fe, Mn, Ni, V, Zn	100	5% HNO_3	100	VHG-SM35A-100
				500	VHG-SM35A-500
Common Elements Mix 2	Ag, Al, B, Ca, Co, Cr, Cu, Fe, K, Mg, Mn, Na, Ni, P, Pb, Si, Sn, Ti, V, Zn	100	5% HNO_3, tr. HF	100	VHG-SM70B-100
				500	VHG-SM70B-500
Common & Transition – Multi Conc.	Ag, Al, As, Ba, Be, Bi, Cd, Cr, Co, Cu, Fe, Li, Mn, Mo, Ni, Pb, Sb, Se, Sr, Tl, V, Zn	100	5% HNO_3, 0.2% HF	100	VHG-SM75B-100
	Ca, K, Mg, Na	1,000		500	VHG-SM75B-500
Comprehensive Mix A	Ag, Al, As, Ba, Bi, Ca, Cd, Ce, Dy, Er, Eu, Ga, Gd, Ho, La, Lu, Mg, Na, Nd, P, Pb, Pr, Rb, Sc, Se, Sm, Sr, Tb, Th, Tl, Tm, U, Y, Yb	10	40% aqua regia	100	VHG-SM80C-100
				500	VHG-SM80C-500

Table continues on next page

Multi-Element Standards
Calibration & QC Control

Table continued from previous page

Product	Elements	Conc. (µg/mL)	Matrix	mL	Product No.
Comprehensive Mix B	Au, B, Be, Co, Cr, Cu, Fe, Ge, Hf, Ir, K, Li, Mn, Mo, Nb, Ni, Os, Pd, Pt, Re, Rh, Ru, Sb, Si, Sn, Ta, Te, Ti, V, W, Zn, Zr	10	40% aqua regia, tr. HF	100	VHG-SM90C-100
				500	VHG-SM90C-500
68 Element Multi Standard 1 (48 elements in Std. 1)	Al, As, B, Ba, Be, Bi, Ca, Cd, Ce, Co, Cr, Cs, Cu, Dy, Er, Eu, Fe, Ga, Gd, Ho, In, K, La, Li, Lu, Mg, Mn, Na, Nd, Ni, P, Pb, Pr, Rb, Re, Sc, Se, Sm, Sr, Tb, Th, Tl, Tm, U, V, Y, Yb, Zn	100	5% HNO_3	100	VHG-SM68-1-100
				500	VHG-SM68-1-500
68 Element Multi Standard 2 (12 elements in Std. 2)	Ag, Ge, Hf, Mo, Nb, Sb, Si, Sn, Ta, Ti, W, Zr	100	5% HNO_3, tr. HF	100	VHG-SM68-2-100
				500	VHG-SM68-2-500
68 Element Multi Standard 3 (8 elements in Std. 3)	Au, Ir, Os, Pd, Pt, Rh, Ru, Te	100	10% HCl	100	VHG-SM68-3-100
				500	VHG-SM68-3-500

VHG™

Custom Aqueous Inorganic Standards

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 under our **ISO 17034 Reference Material Producers accreditation** in our state of the art facility. Our experts are ready today to discuss how we can meet your lab's specific needs.

Manufactured in our facility accredited to ISO 17034 and certified to ISO 9001

Prepared from high-purity raw materials and 18 MΩ deionized water

Certified in our laboratory accredited to ISO/IEC 17025

Each shipment is accompanied by a Certificate of Analysis

Ideal for ICP, ICP-MS, AA, GFAA, IC and other elemental techniques

Contact us today to get started!

U.S. + Canada*

Tel: +1 603.622.7660

Email: lgcusa@lgcgroup.com

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

*See page 179 for full list of LGC Country Sale Offices


DANGER
WARNING

Multi-Element Standards
QC Check Samples

These products are designed for use in the analysis of drinking water, surface water, and ground water – clean or contaminated.

Key product features:

- Tested in compliance with appropriate U.S. EPA, NIST, NELAC, and ISO protocols
- Accompanied by a Certificate of Analysis
- Traceable to available NIST SRMs

TIPS: QC Check Samples

Use these products alongside U.S. EPA, NELAC or state accreditation PT samples or as part of your own internal quality control program.

Multi-Element Standards
QC Check Samples

Water Supply (WS) Check Samples				
Product	**Concentration Range**	**Yields**	**Vial Size**	**Product No.**
WS Cyanide	Total Cyanide: 0.1-0.5 mg/L	2 L	15 mL	VHG-QWSCN-15
WS Inorganics	Alkalinity as $CaCO_3$: 25-200 mg/L	N/A	500 mL	VHG-QWSIN-500
	Chloride: 20-160 mg/L			
	Fluoride: 1-8 mg/L			
	Nitrate as N: 3-10 mg/L			
	Nitrate + Nitrite, as N: 3-10 mg/L			
	Potassium: 10-40 mg/L			
	Sodium: 10-400 mg/L			
	Specific Conductance at 25°C: 130-1,300 µmhos/cm			
	Sulfate: 25-250 mg/L			
	Total Dissolved Solids (TDS) at 180°C: 100-1,000 mg/L			
WS Hardness	Calcium: 30-90 mg/L	N/A	250 mL	VHG-QWSHRD-250
	Calcium Hardness as $CaCO_3$: 75-225 mg/L			
	Total Hardness as $CaCO_3$: 83-307 mg/L			
	Magnesium: 2-20 mg/L			
	Sodium: 12-50 mg/L			
WS o-Phosphate Nutrients	ortho-Phosphate as P: 0.5-5.5 mg/L	2 L	15 mL	VHG-QWSONUT-15
WS Nitrite	Nitrite as N: 0.4-2 mg/L	2 L	15 mL	VHG-QWSNO2-15
WS pH	pH: 5-10 units	N/A	250 mL	VHG-QCPH-250

Table continues on next page

Multi-Element Standards QC Check Samples

Table continued from previous page

Water Supply (WS) Check Samples				
Product	**Concentration Range**	**Yields**	**Vial Size**	**Product No.**
WS Residual Chlorine	Total Residual Chlorine: 0.5-3 mg/L	2 L	2 mL	VHG-QWSRCL-2
	Free Residual Chlorine: 0.5-3 mg/L			
WS Solids	Total Dissolved Solids (TDS) at 180°C: 100-1,000 mg/L	1 L	23 mL	VHG-QWSSOL-23
	Total Solids at 105° C: 123-110 mg/L			
	Total Suspended Solids (TSS) at 105°C: 23-100 mg/L			
WS Organic Carbon	Total Organic Carbon (TOC): 1.3-139 mg/L	1 L	15 mL	VHG-QWSOC-15
	Dissolved Organic Carbon (DOC): 1.3-13 mg/L			
WS Turbidity	Turbidity: 0.5-8 NTU	1 L	15 mL	VHG-QWSTURB-15

Water Pollution (WP) Check Samples				
Product	**Concentration Range**	**Yields**	**Vial Size**	**Product No.**
WP Cyanide	Total Cyanide: 0.1-1 mg/L	2 L	15 mL	VHG-QWPCN-15
WP Demand	5-day BOD: 18-2,230 mg/L	2 L	15 mL	VHG-QWPDEM-15
	Carbonaceous BOD: 18-230 mg/L			
	COD: 30-250 mg/L			
	TOC: 6-100 mg/L			
WP Hexavalent Chromium	Cr^{+6}: 90-900 µg/L	2 L	15 mL	VHG-QWPCR6-15

Table continues on next page

Multi-Element Standards
QC Check Samples

Table continued from previous page

Water Pollution (WP) Check Samples				
Product	**Concentration Range**	**Yields**	**Vial Size**	**Product No.**
WP Minerals	Total Alkalinity as $CaCO_3$: 25-400 mg/L	N/A	500 mL	VHG-QWPMIN-500
	Chloride: 35-275 mg/L			
	Fluoride: 0.4-4 mg/L			
	Potassium: 4-40 mg/L			
	Sodium: 10-100 mg/L			
	Specific Conductance at 25°C: 200-1200 µmhos/cm			
	Sulfate: 5-125 mg/L			
	Total Dissolved Solids (TDS) at 180°C: 140-800 mg/L			
	Total Solids at 105°C: 140-800 mg/L			
WP Hardness	Calcium: 10-100 mg/L	N/A	500 mL	VHG-QWPHRD-500
	Calcium Hardness as $CaCO_3$: 25-250 mg/L			
	Total Hardness as $CaCO_3$: 40-415 mg/L			
	Magnesium: 4-40 mg/L			
	Total Suspended Solids (TSS): 20-100 mg/L			
WP Simple Nutrients	Ammonia as N: 1-20 mg/L	2 L	15 mL	VHG-QWPSNUT-15
	Nitrate as N: 2-25 mg/L			
	Nitrate + Nitrite, as N: 0.25-25 mg/L			
	ortho-Phosphate as P: 0.5-5.5 mg/L			

Table continues on next page

Multi-Element Standards QC Check Samples

Table continued from previous page

Water Pollution (WP) Check Samples				
Product	**Concentration Range**	**Yields**	**Vial Size**	**Product No.**
WP pH	pH: 5-10 units	N/A	250 mL	VHG-QCPH-250
WP Complex Nutrients	Total Kjeldahl Nitrogen as N: 3-35 mg/L	2 L	15 mL	VHG-QWPCNUT-15
	Total Phosphorus as P: 0.5-10 mg/L			
WP Oil and Grease Concentrate	Oil and Grease: 20-200 mg/L	2 L	23 mL	VHG-QWPOG-23
WP Total Phenolics	Total Phenolics by 4-AAP: 0.5-5 mg/L	2 L	2 mL	VHG-QWPPHEN-2
WP Total Residual Chlorine	Total Residual Chlorine: 0.5-3 mg/L	2 L	2 mL	VHG-QWPRCL-2
WP Solids Concentrate	Total Solids at 105°C: 140-800 mg/L	1 L	23 mL	VHG-QWPSOL-23
	Total Dissolved Solids (TDC) at 180°C: 140-800 mg/L			
	Total Suspended Solids Residue (TSS): 20-100 mg/L			

Trace Metals					
Product	**Elements**	**Concentration Range**	**Yields**	**Vial Size**	**Product No.**
WS Trace Metals	Aluminum (Al)	130-1,000 µg/L	2 L	15 mL	VHG-QWSTM-15
	Antimony (Sb)	6-50 µg/L			
	Arsenic (As)	5-50 µg/L			
	Barium (Ba)	500-3,000 µg/L			
	Beryllium (Be)	2-10 µg/L			
	Boron (B)	800-2,000 µg/L			
	Cadmium (Cd)	2-50 µg/L			

Product continues on next page

Multi-Element Standards
QC Check Samples

Product continued from previous page

Trace Metals					
Product	**Elements**	**Concentration Range**	**Yields**	**Vial Size**	**Product No.**
WS Trace Metals	Chromium (Cr)	10-200 µg/L	2 L	15 mL	VHG-QWSTM-15
	Copper (Cu)	50-2,000 µg/L			
	Iron (Fe)	100-1,800 µg/L			
	Lead (Pb)	5-100 µg/L			
	Manganese (Mn)	40-900 µg/L			
	Molybdenum (Mo)	15-130 µg/L			
	Nickel (Ni)	10-500 µg/L			
	Selenium (Se)	10-100 µg/L			
	Silver (Ag)	20-300 µg/L			
	Thallium (Tl)	2-10 µg/L			
	Vanadium (V)	50-1,000 µg/L			
	Zinc (Zn)	200-2,000 µg/L			
WS Mercury	Total Mercury (Hg)	0.5-10 µg/L	1 L	15 mL	VHG-QWSHG-15
WP Trace Metals	Aluminum (Al)	200-4,000 µg/L	1 L	15 mL	VHG-QWPTM-15
	Antimony (Sb)	90-900 µg/L			
	Arsenic (As)	90-900 µg/L			
	Barium (Ba)	100-2,500 µg/L			
	Beryllium (Be)	50-500 µg/L			
	Boron (Be)	800-2,000 µg/L			
	Cadmium (Cd)	100-1,000 µg/L			
	Chromium (Cr)	100-1,000 µg/L			
	Cobalt (Co)	100-1,000 µg/L			
	Copper (Cu)	100-1,000 µg/L			
	Iron (Fe)	200-4,000 µg/L			
	Lead (Pb)	100-1,500 µg/L			
	Manganese (Mn)	200-2,000 µg/L			

Product continues on next page

Multi-Element Standards
QC Check Samples

Product continued from previous page

Trace Metals					
Product	**Elements**	**Concentration Range**	**Yields**	**Vial Size**	**Product No.**
WP Trace Metals	Molybdenum (Mo)	60-600 µg/L	1 L	15 mL	VHG-QWPTM-15
	Nickel (Ni)	200-2,000 µg/L			
	Selenium (Se)	100-1,000 µg/L			
	Silver (Ag)	100-1,000 µg/L			
	Strontium (Sr)	50-500 µg/L			
	Thallium (Tl)	80-800 µg/L			
	Vanadium (V)	55-2,000 µg/L			
	Zinc (Zn)	300-2,000 µg/L			
WP Mercury	Total Mercury (Hg)	3-30 µg/L	1 L	15 mL	VHG-QWPHG-15
WP Tin & Titanium	Tin (Sn)	200-2,000 µg/L	1 L	15 mL	VHG-QWPSNTI-15
	Titanium (Ti)	60-300 µg/L			

Industry Highlight — Environmental

General Use Environmental Standards

VHG™ manufactures accurate, NIST-traceable standards for the analysis of environmental waters, soils, sludges, and other samples by ICP-OES, ICP-MS, AA, and other spectroscopic techniques.

We offer a range of pre-configured environmental standards that can be used for calibration, fortifying solutions, control checks, and interference checks. While these standards may meet all of your requirements, VHG™ also specializes in NIST-traceable custom mixtures. Please inquire.

Industry Highlight — Environmental

General Use Environmental Standards					
Product	**Elements**	**Conc. (µg/mL)**	**Matrix**	**mL**	**Product No.**
U.S. EPA 23 Metals	Ag, Al, As, Ba, Be, Ca, Cd, Co, Cr, Cu, Fe, K, Mg, Mn, Mo, Na, Ni, Pb, Sb, Se, Tl, V, Zn	100	5% HNO_3, tr. Tartaric Acid, tr. HF	100	VHG-SM23-100
				500	VHG-SM23-500
U.S. EPA RCRA 8 Elements	Ag, As, Ba, Cd, Cr, Hg, Pb, Se	100	5% HNO_3	100	VHG-SM45-100
				500	VHG-SM45-500
QC Standard '7'	Ag, Al, B, Ba, Na	100	5% HNO_3, tr. F^-	100	VHG-QC7-100
	K	1,000		500	VHG-QC7-500
	Si	50			
QC Standard '7A'	Al, B, Ba, Na	100	5% HNO_3, tr. F^-	100	VHG-QC7A-100
	Ag	50		500	VHG-QC7A-500
	K	1,000			
QC Standard '19'	As, Be, Ca, Cd, Co, Cr, Cu, Fe, Mg, Mn, Mo, Ni, Pb, Sb, Se, Ti, Tl, V, Zn	100	5% HNO_3, tr. F^-, tr. Tartaric Acid	100	VHG-QC19-100
				500	VHG-QC19-500
QC Standard '20'	Ag, Al, As, Ba, Be, Cd, Co, Cr, Cu, Mn, Mo, Ni, Pb, Sb, Se, Th, Tl, U, V, Zn	10	5% HNO_3, tr. F^-, tr. Tartaric Acid	100	VHG-ISQC20-100
				500	VHG-ISQC20-500
TCLP Standard 1	Ag, As, Cr, Pb	25	2% HNO_3	100	VHG-TCLP1-100
	Cd, Se	5		500	VHG-TCLP1-500
	Ba	500			
Environmental Sample Interferents	Al, Ca, Fe, K, Mg, Na, P, S	1,000	2% HNO_3	500	VHG-LMCS1Z-500
	C, Cl	5,000			

Table continues on next page

ISO 17034 & NELAC

Our ISO 17034 Certified Reference Materials meet or exceed NELAC requirements. See the NELAC Institute TNI Module 2 for more information.

Industry Highlight — Environmental

Table continued from previous page

General Use Environmental Standards					
Product	**Elements**	**Conc. (µg/mL)**	**Matrix**	**mL**	**Product No.**
Spiking Solution EG1 *Dilute as needed; configured for use with Environmental Water samples*	*Components listed below*		5% HNO_3, tr. F^-, tr. Tartaric Acid	100	VHG-SSEG1-100
	Ag, Be, Cd	5		500	VHG-SSEG1-500
	Co	20			
	Cr, Cu, Mn, Mo, Ni, Pb, Sb, Tl, V	40			
	Al, Fe, Se, Zn	100			
	As, Ba, SiO_2	200			
Spiking Solution EG2 *Dilute as needed; configured for use with Environmental Soil samples*	*Components listed below*		5% HNO_3, tr. F^-, tr. Tartaric Acid	100	VHG-SSEG2-100
	Ag, Be, Cd	25		500	VHG-SSEG2-500
	Co	100			
	Cr, Cu, Mn, Mo, Ni, Pb, Sb, Tl, V	200			
	Zn	500			
	As, Ba, Se	1,000			
	Al, Fe	2,000			
Spiking Solution EG3 *Dilute as needed; configured for use with Environmental Water samples*	*Components listed below*		5% HNO_3	100	VHG-SSEG3-100
	B, Li, P, Sr	1,000		500	VHG-SSEG3-500
	Ca, K, Mg, Na	10,000			
Mercury Standard 20	Hg	20	5% HNO_3	10	VHG-LHGN-100

Industry Highlight — Environmental

Water Pollution Standard					
Product	**Elements**	**Conc. (µg/mL)**	**Matrix**	**mL**	**Product No.**
Water Pollution Standard 1	*Components listed below*		5% HNO_3	100	VHG-WPS1-100
	Hg	5		500	VHG-WPS1-500
	Cd, Se	25			
	As, Be, Co, Cr, Cu, Fe, Mn, Ni, Pb, Zn	100			
	V	250			
	Al	500			
Water Pollution Standard 3	*Components listed below*		2% HNO_3	100	VHG-WPS3-100
	K, Mg	100		500	VHG-WPS3-500
	Ba, Ca, Mo, Na	500			
Water Pollution Standard 5	*Components listed below*		2% HNO_3	100	VHG-WPS5-100
	K, Mg	100		500	VHG-WPS5-500
	Ca, Na	500			

Surface Water Certified Reference Material					
Product	**Elements**	**Conc. (µg/mL)**	**Matrix**	**mL**	**Product No.**
Natural Water Matrix Reference	*Components listed below*		1% HNO_3, 1% HCl, tr. HF	100	VHG-NWMR-100
	Ag, As, Be, Cd, Co, Cr, Mn, Mo, Ni, Pb, Rb, Se, Sn, Ti, Tl, U, V	0.005-0.05		500	VHG-NWMR-500
	Al, Ba, Cu, Fe, Sr, Zn	0.05-0.25			
	K	0.5-3			
	Ca, Na	10-25			
	Mg	1-10			

ICP-OES Standards
Wavelength Calibration & Related Solutions

ICP-OES Standards
Wavelength Calibration & Related Solutions

The VHG™ line of high-quality ICP-OES Wavelength Calibration Solutions are Certified Reference Materials designed to meet ICP instrument manufacturers' specifications, making them the ideal solutions for calibrating your instrument.

Our 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 ICP-OES calibration solutions, and if you have a specific need not met by the products listed, please contact us to discuss a custom mixture.

Key product features:

- Produced from high-purity raw materials
- Accompanied by a Certificate of Analysis

TIPS: Wavelength Calibration

Accurate indexing of emission wavelengths is critical to sensitivity (d.l.) and signal stability (RSD). Wavelength Calibration, also referred to as WaveCal, is commonly used during performance set up and validation activities.

ICP-OES Standards
Wavelength Calibration & Related Solutions

Wavelength Calibration & Related Solutions						
Description	**Elements**	**Conc. (µg/mL)**	**Size (mL)**	**Matrix**	**Product No.**	**Suitable for**
Low UV Wave Cal Solution	Al, P, S	10	250	2% HNO_3	VHG-ISUPE-LOW-250	PerkinElmer® ICP-OES
VIS Wave Cal Solution	Ba, Ca	1	250	2% HNO_3	VHG-ISUPEVIS-250	PerkinElmer® ICP-OES: Optima® / Avio®
	La, Li, Mn, Na, Sr	10				
	K	50				
UV Wave Cal Solution	Ca	1	500	5% HCl	VHG-ISUPEUVW-500	PerkinElmer® ICP-OES: Optima® / Avio®
	As, La, Li, Mn, Mo, Na, Ni, Sc	20				
	K, P, S	100				
Multi-Element Setup Standard	Ba, Mg	1	500	2% HNO_3	VHG-ISUPEOPTME-500	PerkinElmer® ICP-OES: Optima®
	La, Li, Mn, Ni, Sr, Zn	10				
	As, K	50				
Instrument Check Standard 3	As, La, Li, Mn, Mo, Na, Ni, Sc	20	250	5% HCl	VHG-ISUPECHKSTD3-250	PerkinElmer® ICP-OES
	K, P, S	100				
Instrument Calibration Standard 4	Cd, Pb, Se	50	100	5% HNO_3	VHG-ISUPECAL4-100	PerkinElmer® ICP-OES: Optima® / Avio®
	As, Tl	100				

ICP-OES Standards
Wavelength Calibration & Related Solutions

Wavelength Calibration & Related Solutions						
Description	**Elements**	**Conc. (µg/mL)**	**Size (mL)**	**Matrix**	**Product No.**	**Suitable for**
ICAL Solution	Ca	1	250	2% HNO_3, 2% HCl	VHG-ISUSPCTICAL-250	Spectro ICP-OES: Genesis®, ARCOS®, Blue®
	Be, Li, Sr	2				
	Mn, Mo, Na, Sc	5				
	Ce, Cu, Eu, Fe, In, K, Ni, P, Si, Ti, V, Y, Zr	10				
	S	50				

Genesis®, ARCOS® and Blue® are Registered trademarks of SPECTRO Analytical Instruments, and appear solely for the purpose of product comparison.

Blank Water & Acid Matrices

Blank Water & Acid Matrices			
Product	**Matrix**	**mL**	**Product No.**
ICP-OES Blank	2% HNO_3	500	VHG-L2HNO3BLK-500
Nitric Acid Blank	5% HNO_3	500	VHG-HNO3-BLK-500
Hydrochloric Acid Blank	5% HCl	500	VHG-HCL-BLK-500
Hydrochloric/Nitric Blank	5% HCl, 1% HNO_3	500	VHG-ICB/CCB-500

ICP-OES Standards
Common Methods & Applications

Today, many standard methods, including EPA Methods 6010 and 200.7, and those in use under the EPA Contract Laboratory Program (CLP), call for the use of ICP-OES for trace analysis.

EPA Methods 6010 and 200.7 were developed for different purposes, and each requires a particular set of standards and solutions.

Method 6010 was developed for RCRA regulations and covers the detection of a range of elements.

Method 200.7 is utilized for regulatory compliance for drinking water analysis.

Pages 57-63 include the VHG™ products designed for use with these Methods.

If there are additional mixtures you need, please contact us to discuss a custom quote.

Key product features:

- Produced from high-purity raw materials
- Accompanied by a Certificate of Analysis

TIPS: Common Methods

EPA Method 200.7 can also be used for the analysis of other matrices including wastewater and groundwater.

ICP-OES Standards
Common Methods & Applications

CLP and EPA Methods 6010, 6010A & 200.7

CLP Instrument Calibration Standards - ICAL					
Product	**Elements**	**Conc. (µg/mL)**	**Matrix**	**mL**	**Product No.**
Instrument Calibration Standard 1	Ag	200	5% HNO_3	100	VHG-ICL1-100
	Be	400			
	Cd	500		500	VHG-ICL1-500
	Ba, Co, Cu, Fe, Pb, Mn, Ni, Tl, Zn	1,000			
Instrument Calibration Standard 2	Al, As, Cr, Sb, Se, V	1,000	20% HCl	100	VHG-ICL2-100
	Ca, K, Mg, Na	10,000		500	VHG-ICL2-500

CLP Initial Calibration Verification Standards - ICV (Second Source)					
Product	**Elements**	**Conc. (µg/mL)**	**Matrix**	**mL**	**Product No.**
Initial Calibration Verification Standard 1	Ag	20	5% HNO_3	100	VHG-ICV1-100
	Be	40			
	Cd	50		500	VHG-ICV1-500
	Ba, Co, Cu, Fe, Pb, Mn, Ni, Tl, Zn	100			
Initial Calibration Verification Standard 2	Al, As, Cr, Sb, Se, V	100	20% HCl	100	VHG-ICV2-100
	Ca, K, Mg, Na	1,000		500	VHG-ICV2-500

Mercury Standards					
Product	**Elements**	**Conc. (µg/mL)**	**Matrix**	**mL**	**Product No.**
Mercury Standard 10	Hg	10	5% HNO_3	100	VHG-LHGN-100
Mercury ICV Standard 10	Hg	10	5% HNO_3	100	VHG-ISHG-100

ICP-OES Standards
Common Methods & Applications

CLP Continuing Calibration Verification - CCV					
Product	**Elements**	**Conc. (µg/mL)**	**Matrix**	**mL**	**Product No.**
Continuing Calibration Verification Std. 1	Ag	100	5% HNO_3	100	VHG-CCV1-100
	Be	200		500	VHG-CCV1-500
	Cd	250			
	Ba, Co, Cu, Fe, Pb, Mn, Ni, Tl, Zn	500			
Continuing Calibration Verification Std. 2	Al, Sb, As, Cr, Se, V	500	20% HCl	100	VHG-CCV2-100
	Ca, Mg, K, Na	5,000		500	VHG-CCV2-500

CLP Spiking Solutions					
Product	**Elements**	**Conc. (µg/mL)**	**Matrix**	**mL**	**Product No.**
CLP Spiking Solution 1	Be, Cd, Ag	5	5% HNO_3	100	VHG-W1-100
	Cu	25		500	VHG-W1-500
	Co, Pb, Mn, Ni, Zn	50			
	Fe	100			
	Tl	200			
CLP Spiking Solution 2	Cr	20	20% HCl	100	VHG-W2-100
	Sb, V	50		500	VHG-W2-500
	Al, As, Ba, Se	200			

ICP-OES Standards
Common Methods & Applications

CLP Interference Checks - ICS					
Product	**Elements**	**Conc. (µg/mL)**	**Matrix**	**mL**	**Product No.**
ICS Interferants A	Fe	2,000	20% HCl	500	VHG-ICSA-500
	Al, Ca, Mg	5,000			
ICS Analytes B	Pb, Se	5	5% HNO_3, tr. Tartaric Acid	100	VHG-4ICSAB-100
	As, Tl	10			
	Ag	20			
	Ba, Be, Cr, Co, Cu, Mn, V	50			
	Sb	60			
	Cd, Ni, Zn	100			

CLP ILM05.2 Contract Required Quantitation Limit for Water and Soil					
Product	**Elements**	**Conc. (µg/mL)**	**Matrix**	**mL**	**Product No.**
ICP-OES CRQL Solution 1	Be, Cd	5	5% HNO_3, tr. Tartaric Acid	100	VHG-CRQL1AES-100
	Cr, Pb, Ag	10			
	As, Mn	15			
	Cu, Tl	25			
	Se	35			
	Ni	40			
	Co, V	50			
	Sb, Zn	60			
	Fe	100			
	Al, Ba	200			
ICP-OES CRQL Solution 2	Ca, K, Mg, Na	5,000	5% HNO_3	100	VHG-CRQL2AES-100
				500	VHG-CRQL2AES-500

ICP-OES Standards
Common Methods & Applications

CLP Contract Required Detection Limit – CRDL					
Product	**Elements**	**Conc. (µg/mL)**	**Matrix**	**mL**	**Product No.**
CRDL Solution 1	Pb	6	5% HNO_3, tr. Tartaric Acid	100	VHG-CRDL-100
	Be, Cd, Se	10			
	As, Cr, Ag, Tl	20			
	Mn	30			
	Zn	40			
	Cu	50			
	Ni	80			
	Co, V	100			
	Sb	120			

Tuning / Optimization					
Product	**Elements**	**Conc. (µg/mL)**	**Matrix**	**mL**	**Product No.**
U.S. EPA Method 200.7 ICP Tuning	Cu, Pb	10	5% HNO_3	100	VHG-TNG-100
				500	VHG-TNG-500
U.S. EPA Method 200.7 ICP Plasma Solution	As, Pb, Se, Tl	10	5% HNO_3	100	VHG-PLS-100
				500	VHG-PLS-500

Mixed Calibration Standards 200.7 Rev. 3.3, 6010A					
Product	**Elements**	**Conc. (µg/mL)**	**Matrix**	**mL**	**Product No.**
Mixed Calibration Standard 1	Be	50	2% HNO_3	100	VHG-MCS1-100
	Mn	100			
	Cd, Zn	150			

Product continues on next page

ICP-OES Standards
Common Methods & Applications

Product continued from previous page

Mixed Calibration Standards 200.7 Rev. 3.3, 6010A

Product	Elements	Conc. (µg/mL)	Matrix	mL	Product No.
Mixed Calibration Standard 1	Be	50	2% HNO_3	100	VHG-MCS1-100
	Mn	100			
	Cd, Zn	150			
Mixed Calibration Standard 1	Se	200	2% HNO_3	100	VHG-MCS1-100
	Pb	500			
Mixed Calibration Standard 2	Ba, Co, Cu, V	100	5% HNO_3	100	VHG-MCS2-100
	Fe	10,000			
Mixed Calibration Standard 3	Mo, Si	100	2% HNO_3, tr. F^-	100	VHG-MCS3-100
	As	500			
Mixed Calibration Standard 4	Cr, Ni	20	5% HNO_3	100	VHG-MCS4-100
	Al, Na	200			
	K	400			
	Ca	1,000			
Mixed Calibration Standard 5	Ag	50	5% HNO_3, tr. Tartaric Acid	100	VHG-MCS5-100
	B	100			
	Sb, Tl	200			
	Mg	1,000			

Mixed Calibration Standards 200.7 Rev. 4.4

Product	Elements	Conc. (µg/mL)	Matrix	mL	Product No.
Calibration Standard 1	Ag	50	5% HNO_3	100	VHG-44CS1Y-100
	B, Ba, Be, Cd, Ce, Co, Cr, Cu, Mn, Ni, Pb, Sr, V	200		500	VHG-44CS1Y-500
	As, Se, Tl, Zn	500			
	Ca, K, Mg, P	1,000			

Table continues on next page

ICP-OES Standards
Common Methods & Applications

Product continued from previous page

Mixed Calibration Standards 200.7 Rev. 4.4					
Product	**Elements**	**Conc. (µg/mL)**	**Matrix**	**mL**	**Product No.**
Calibration Standard 2	Sn	200	20% HCl, tr. HF	100	VHG-44CS2Z-100
	Sb, Li	500		500	VHG-44CS2Z-500
	Al, Fe, Mo, Na, Ti, SiO_2	1,000			

Instrument Performance Checks					
Product	**Elements**	**Conc. (µg/mL)**	**Matrix**	**mL**	**Product No.**
IPC Solution 1	Ag	20	5% HNO_3	100	VHG-IPC1Y-100
	As, Ba, Be, B, Cd, Ca, Ce, Cr, Co, Cu, Pb, Mg, Mn, Ni, Se, Sr, Tl, V, Zn	100		500	VHG-IPC1Y-500
	P, K	500			
IPC Solution 2	Al, Sb, Fe, Li, Hg, Mo, Na, Sn, Ti	100	20% HCl, tr. HF	100	VHG-IPC2Y-100
	SiO_2	500		500	VHG-IPC2Y-500

Quality Control					
Product	**Elements**	**Conc. (µg/mL)**	**Matrix**	**mL**	**Product No.**
QCS Solution 1	Ag	50	5% HNO_3	100	VHG-44QCS1Z-100
	As, Ba, Be, B, Cd, Ca, Ce, Cr, Co, Cu, Pb, Mg, Mn, Hg, Ni, P, Se, Sr, Tl, V, Zn	100		500	VHG-44QCS1Z-500
QCS Solution 2	Al, Sb, Fe, Li, Mo, K, Na, Sn, Ti, SiO_2	100	20% HCl, tr. HF	100	VHG-44QCS2Z-100
				500	VHG-44QCS2Z-500

ICP-OES Standards
Common Methods & Applications

Interference Checks					
Product	**Elements**	**Conc. (µg/mL)**	**Matrix**	**mL**	**Product No.**
Interference Check Solution 1	Hg	50	5% HNO_3	100	VHG-INT1-100
	Be	100		500	VHG-INT1-500
	Mn	200			
	Ag, Ba, Cd, Cr, Co, Cu, Ni, V, Zn	300			
	Se	500			
	As, Pb, Tl	1,000			
	K	20,000			
Interference Check Solution 2	Si	230	2% HNO_3, tr. HF	100	VHG-INT2-100
	Mo	300		500	VHG-INT2-500
	Be	500			
	Ti	1,000			
Interference Check Solution 3	Sb	1,000	H_2O, Tartaric Acid, tr. HNO_3	100	VHG-INT3-100
				500	VHG-INT3-500
Interference Check Solution 4	Na	1,000	5% HNO_3	100	VHG-INT4-100
	Al	1,200		500	VHG-INT4-500
	Mg	3,000			
	Fe	5,000			
	Ca	6,000			

ICP-MS Standards
Tuning & Mass Calibration Solutions

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 & 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.

Key product features:

- Produced from high-purity raw materials
- Accompanied by a Certificate of Analysis

TIPS: Tuning & Mass Calibration

These standards are used for tuning, tune checks, peak calibration, mass calibration, and Resolution/Axis activities.

ICP-MS Standards
Tuning & Mass Calibration Solutions

Suitable for use with all ICP-MS					
Product	**Elements**	**Conc. (µg/mL)**	**Matrix**	**mL**	**Product No.**
Tuning/ Mass Calibration Multi-Element Mix 1 (concentrate)	^{7}Li, Y, Ce, Tl	10	5% HNO_3	500	VHG-LMSTNG1-500
Tuning/ Mass Calibration Multi-Element Mix 1A (concentrate)	^{7}Li, Co, Y, Ce, Tl	10	1% HNO_3, 0.5% HCl	500	VHG-LMSTNG5CONC-500
Tuning/ Mass Calibration Multi-Element Mix 2 (concentrate)	Be, Mg, Co, In, Ce, Pb	10	1% HNO_3	500	VHG-LMSTNG2Z-500
Tuning/ Mass Calibration Multi-Element Mix 3 (concentrate)	^{7}Li, Be, Mg, Co, Y, In, Ba, Ce, Tb, Pb, U	10	5% HNO_3	500	VHG-LMSTNG3Z-500

Suitable for use with Agilent® ICP-MS						
Product	**Elements**	**Conc. (µg/mL)**	**Matrix**	**mL**	**Product No.**	**Suitable for**
Tuning Solution *(see composition)*	Ce, Co, Li, Tl, Y	10	2% HNO_3	100	VHG-LAGTSTK1-100	7500, 7700, 7800, 7900, 8800, 8900
Tuning Solution 2	Ce, Co, Li, Mg, Tl, Y	10	2% HNO_3	100	VHG-LAGTSTK2-100	7500, 7700, 7800, 7900, 8800, 8900
Tuning Solution *(see composition)*	Ce, Co, Li, Mg, Tl, Y	1	2% HNO_3	500	VHG-LMSTNG101-500	7500, 7700, 7800, 7900, 8800, 8900
Tuning Solution *(see composition)*	^{7}Li, Co, Y, Ce, Tl	10	2% HNO_3	500	VHG-LMSTNG5DIL-500	All

Agilent® is a trademark of Agilent Technologies, Inc. and appears solely for the purpose of product comparison.

ICP-MS Standards
Tuning & Mass Calibration Solutions

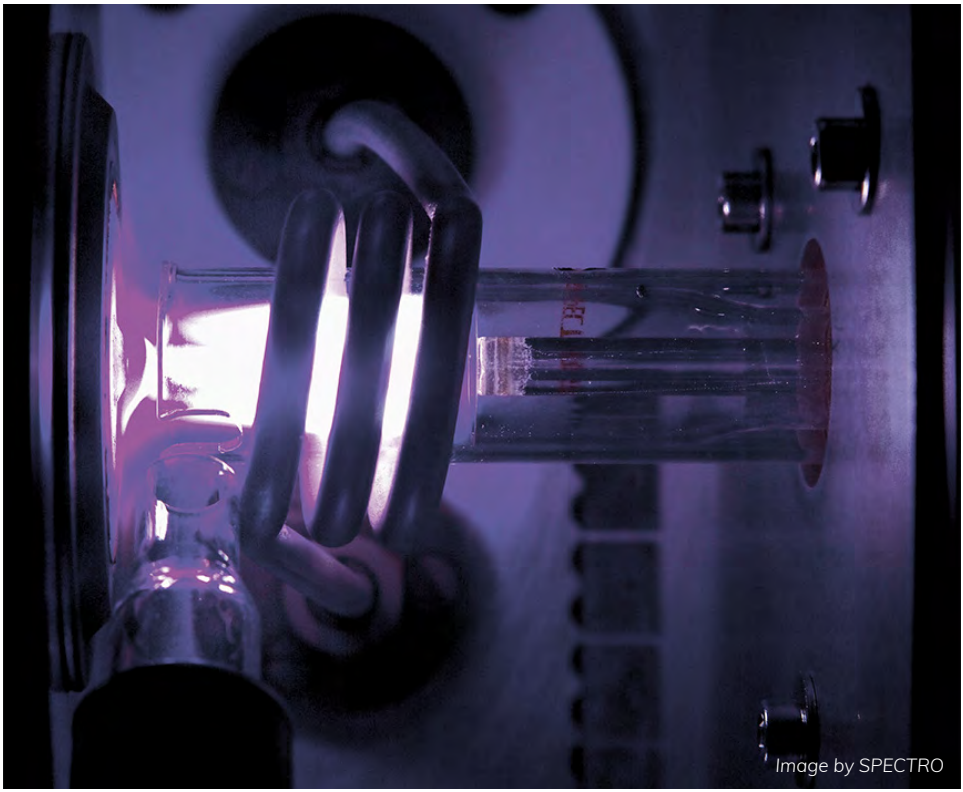
Suitable for use with PerkinElmer® ICP-MS						
Product	**Elements**	**Conc. (µg/mL)**	**Matrix**	**mL**	**Product No.**	**Suitable for**
Tuning Solution *(see composition)*	Be, Mg, Fe, Co, In, Ce, Pb, Th, U	1	2% HNO_3	500	VHG-LMSTNG8-500	DRC, DRCII
	Ba	10				
Setup / Stability / Masscal Solution	Al, Cd, Ce, Cr, Cu, In, Mg, Mn, Pb, Rh, Th	1	0.5% HCl	500	VHG-LPEMCAL-500	E6100DRC, DRCII
	Ba	10				
Tuning Solution I	Ba, Be, Ce, Co, In, Li, Mg, Pb, Rh, Tl, U, Y	10	2% HNO_3, 5% HCl	100	VHG-LPETSOL1-100	DRC, DRCII, NexION™
Product	**Elements**	**Conc. (µg/L)**	**Matrix**	**mL**	**Product No.**	**Suitable for**
Setup Solution	Be, Ce, Fe, In, Li, Mg, Pb, U	1	1% HNO_3	500	VHG-LPENXSUSDIL-500	NexION™
KED Setup Solution	Ce	1	1% HNO_3	250	VHG-LPENXKED-SUS-250	NexION™
	Co	10				
Setup Solution	Be, Ce, Fe, In, Li, Mg, Pb, U	10	1% HNO_3	500	VHG-LPENXSUS-500	NexION™

Suitable for use with Thermo Scientific™ ICP-MS						
Product	**Elements**	**Conc. (µg/mL)**	**Matrix**	**mL**	**Product No.**	**Suitable for**
Tuning Solution	^{7}Li, Be, Mg, Co, In, Ba, Ce, Pb, Bi, U	10	2% HNO_3	100	VHG-LMSTNG6-100	X-Series

ICP-MS Standards
Tuning & Mass Calibration Solutions

Suitable for use with Varian™ ICP-MS						
Product	**Elements**	**Conc. (µg/mL)**	**Matrix**	**mL**	**Product No.**	**Suitable for**
Tuning Solution	Be, Mg, Co, In, Ba, Ce, Tl, Pb, Th	250	2% HNO_3	500	VHG-LMSTNG9-500	All models

Varian™ is a trademark of Agilent Technologies, Inc. and appears solely for the purpose of product comparison.



ICP-MS Standards
Stability Solutions & Detector Calibration

Accurate “cross calibration” is a requirement for establishing linearity of the detector. We offer a range of solutions suitable for this activity. If you find you need a custom mixture, please contact us to discuss.

Key product features:

- Produced from high-purity raw materials
- Accompanied by a Certificate of Analysis

TIPS: Detector Calibration

Use of VHG™ ICP-MS Detector Calibration Standards can ensure consistent day-to-day and month-to-month detector linearity and optimal dynamic range.

ICP-MS Standards
Stability Solutions & Detector Calibration

Stability Solutions

Product	Elements	Conc. (µg/mL)	Matrix	mL	Product No.	Suitable for
Stability Solution	Cd, Cu, Mg, Pb	1	1% HNO_3	500	VHG-LPENXSTB-500	Non-Cell ICP-MS: NexION™
Stability Solution	Cd, Cr, Fe, Mg, Pb	1	1% HNO_3	500	VHG-LPENXCELL-500	Cell ICP-MS: NexION™
	Co, Cu, In, Se	10				

Detector Calibration

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

ICP-MS Standards
Blank Water & Acid Matrices

VHG™ Blank Solutions are backed by our commitment to quality and produced to be ultra-clean and pure. You can be confident using our Blank Solutions to support your ICP-MS analysis.

Key product features:

- Produced with 18 MΩ water and Trace Metal Grade acids
- Packaged in HDPE bottles that are acid leached and rinsed with DI water
- Accompanied by a Certificate of Analysis

Suitable for use with all ICP-MS			
Product	**Matrix**	**mL**	**Product No.**
Nitric Acid Blank	5% HNO_3	500	VHG-HNO3-BLK-500
Hydrochloric Acid Blank	5% HCl	500	VHG-HCL-BLK-500
Hydrochloric/Nitric Blank	5% HCl, 1% HNO_3	500	VHG-ICB/CCB-500
ICP-MS Wash Solution	1% HNO_3 Blank	250	VHG-LPENXWASH-250
ICP-MS Wash Water Blank	18 MΩ DI Water	250	VHG-LDIWASH-250
ICP-MS Blank	5% HNO_3 in ASTM Type I Water	250	VHG-LNITWASH5-250

ICP-MS Standards
Internal Standard Stock Solutions

These standards serve as a reference that can be used to correct for any variability between calibration standards and your sample, significantly improving the accuracy of your data.

Key product features:

- Produced with high-purity materials
- Accompanied by a Certificate of Analysis

TIPS: Internal Standards

Select an Internal Standard as close as possible in mass number to that of the analyte of interest to obtain optimal precision and accuracy.

ICP-MS Standards
Internal Standard Stock Solutions

Single Element Internal Standards for ICP-MS					
Element	**Symbol**	**Conc.** (µg/mL)	**Matrix**	**mL**	**Product No.**
Lithium-6	^{6}Li	100	2% HNO_3	100	VHG-LISC6LI-100
Lithium-6	^{6}Li	10	2% HNO_3	100	VHG-LISA6LI-100
Bismuth	Bi	100	2% HNO_3	100	VHG-LISBI100-100
Bismuth	Bi	10	2% HNO_3	100	VHG-LISABI-100
Cobalt	Co	10	2% HNO_3	100	VHG-LISACO-100
Germanium	Ge	100	2% HNO_3	100	VHG-LISGE100-100
Germanium	Ge	10	2% HNO_3, tr. F^-	100	VHG-LISAGE-100
Indium	In	100	2% HNO_3	100	VHG-LISIN100-100
Indium	In	10	2% HNO_3	100	VHG-LISAIN-100
Iridium	Ir	10	2% HCl	100	VHG-LISAIR-100
Lutetium	Lu	10	2% HNO_3	100	VHG-LISALU-100
Platnium	Pt	10	5% HCl	100	VHG-LISAPT-100
Rhodium	Rh	10	2% HCl	100	VHG-LISARH-100
Scandium	Sc	100	2% HNO_3	100	VHG-LISSC100-100
Scandium	Sc	10	2% HNO_3	100	VHG-LISASC-100
Terbium	Tb	100	2% HNO_3	100	VHG-LISTB100-100
Terbium	Tb	10	2% HNO_3	100	VHG-LISATB-100
Yttrium	Y	100	2% HNO_3	100	VHG-LISY100-100
Yttrium	Y	10	2% HNO_3	100	VHG-LISAY-100

See our A+ Single Element Standards™

Our A+ Single Element Standards™ product listing can be found in Section 1 starting on page 19. See

ICP-MS Standards
Internal Standard Stock Solutions

Multi-Element Internal Standards for ICP-MS					
Product	**Elements**	**Conc.** (µg/L)	**Matrix**	**mL**	**Product No.**
Internal Standard Multi-Element Mix 1	^{6}Li, Bi, Ga, In, Sc, Tb, Y	100	5% HNO_3	100	VHG-LIS1-100
Internal Standard Multi-Element Mix 2	Bi, Ga, In, Tb, Y	20	2% HNO_3	100	VHG-LIS2-100
	^{6}Li, Sc	100			
Internal Standard Multi-Element Mix 3	^{6}Li, Bi, Ge, In, Lu, Sc, Tb	100	5% HNO_3, tr. F^-	100	VHG-LIS3-100
Internal Standard Multi-Element Mix 4	Bi, In, Tb	10	5% HNO_3, tr. F^-	100	VHG-LIS4-100
	Ge, Te	25			
	^{6}Li, Sc	50			
Product	**Elements**	**Conc.** (µg/mL)	**Matrix**	**mL**	**Product No.**
ICP-MS Internal Standard Solution	Bi, Ge, In, ^{6}Li, Rh, Sc, Tb, Y	100	5% HNO_3, tr. F^-	100	VHG-LIS8-100
ICP-MS Internal Standard 7 Element Mix	Bi, Ge, ^{6}Li, In, Sc, Tb, Y	10	2% HNO_3	100	VHG-LAGISTDMIX-100
ICP-MS Pharma & USP <232> Internal Standard Solution	Bi, Ga, In	100	5% HNO_3	100	VHG-LIS9-100

ICP-MS Standards
Internal Standard Stock Solutions

ICP-MS Standards
Common Methods & Applications

Many standard methods, including EPA Methods 200.8 and 6020, and those in use under the EPA Contract Laboratory Program (CLP), call for the use of ICP-MS.

These Methods are deployed for the determination of trace elements and require a range of solutions and standards to ensure accurate analysis.

VHG™ offers a range of products to support the performance of these Methods. Please contact us to discuss a custom mixture should the products listed not fill your lab's specific need.

Key product features:

- Produced from high-purity materials
- Accompanied by a Certificate of Analysis

TIPS: Common Methods

Method 200.8 has become popular due to the need for lower limits of detection to comply with increasingly rigorous drinking water standards.

For calibration standard and laboratory field blank requirements, see Sections 7.4 and 7.9 of Method 200.8.

ICP-MS Standards
Common Methods & Applications

CLP and EPA Methods 200.8 & 6020

Internal Standard					
Product	**Elements**	**Conc.** (µg/L)	**Matrix**	**mL**	**Product No.**
Internal Standard Stock Solution for Methods 200.8 & CLP ILM05.2	^{6}Li, Sc, Y, In, Tb, Lu, Bi	10	5% HNO_3	100	VHG-LIS2008Z-100

Tuning Solution					
Product	**Elements**	**Conc.** (µg/L)	**Matrix**	**mL**	**Product No.**
Tune & Resolution Solution 1 for Method 200.8 & ILM05.2	Be, Mg, Co, In, Pb	10	5% HNO_3	100	VHG-LTS2008D-100

Calibration Standards					
Product	**Elements**	**Conc.** (µg/L)	**Matrix**	**mL**	**Product No.**
Standard A1	Al, As, Be, Cd, Co, Cr, Cu, Mn, Mo, Ni, Pb, Sb, Se, Th, Tl, U, V, Zn	10	5% HNO_3, tr. Tartaric Acid	100	VHG-L53SSA1-100
Standard A2	Al, As, Be, Cd, Co, Cr, Cu, Mn, Mo, Ni, Pb, Sb, Th, Tl, U, V, Zn	10	5% HNO_3, tr. Tartaric Acid	100	VHG-L54SSA2-100
	Se	50			
Standard B	Ag, Ba	10	1% HNO_3	100	VHG-LSSB-100
200.8 Stock Calibration Standard CS1	Al, As, Be, Cd, Co, Cr, Mn, Mo, Ni, Pb, Sb, Se, Th, Tl, U, V,	10	5% HNO_3, tr. Tartaric Acid	100	VHG-L2008CS1-100
200.8 Stock Calibration Standard CS2	Ag, Ba	10	2% HNO_3	100	VHG-L2008CS2-100
	Ba, Cu, Fe, Sn	100			

Table continues on next page

ICP-MS Standards
Common Methods & Applications

Table continued from previous page

Calibration Standards

Product	Elements	Conc. (µg/L)	Matrix	mL	Product No.
200.8 Stock Calibration Standard CS3	K, Mg	1,000	2% HNO_3	100	VHG-L2008CS3-100
	Ca, Na	10,000			
Mercury Standard 10	Hg	10	5% HNO_3	100	VHG-LHGN-100
Gold *Stabilizer for Hg (Single Element)*	Au	100	5% HCl	100	VHG-LSAU-100

Standards for USP EPA 6020 & 200.8, ILM05.2 and CLP

Product	Elements	Conc. (µg/L)	Matrix	mL	Product No.
U.S. EPA 6020 Internal Standard Stock Solution	^{6}Li, Sc, Y, In, Tb, Ho, Bi	10	5% HNO_3	100	VHG-LIS6020-100
U.S. EPA 6020 Tune & Resolution Solution (for Method 200.8 & ILM05.2)	Li, Co, In, Ti	10	5% HNO_3	100	VHG-LTS6020D-100
Major Elements Standard	Ca, Fe, Mg, K, Na	2,000	5% HNO_3	100	VHG-LMES-100
				500	VHG-LMES-500
CLP ILM05.2 for ICP-MS Spiking Solution *Dilute as prescribed by the Method for both waters and soils*	*Components listed below*		5% HNO_3, tr. Tartaric Acid	100	VHG-52SS3Z-100
	Se	10		500	VHG-52SS3Z-500
	Pb	20			
	As	40			
	Ag, Be, Cd, Tl	50			
	Sb	100			
	Cr	200			
	Cu	250			
	Co, Mn, Ni, V, Zn	500			
	Al, Ba	2,000			

ICP-MS Standards
Common Methods & Applications

Interference Checks					
Product	**Elements**	**Conc.** (µg/L)	**Matrix**	**mL**	**Product No.**
U.S. EPA ICP-MS ICS A Mix 1	*Components listed below*		5% HNO_3, 1.5% HCl	500	VHG-LICSA1Z-500
	Al, Ca, Fe, K, Mg, Na, P, S	500			
	C	1,000			
	Cl	5,000			
U.S. EPA ICP-MS ICS Interferents A Mix 2	Mo, Ti	10	5% HNO_3, 1.5% HCl	500	VHG-LICSA2-500
6020A ICS Interferents A *To be diluted by 1:10 to achieve prescribed concentrations*	*Components listed below*		2% HNO_3, 6.5% HCl, tr. HF	500	VHG-LINTA6020A-500
	Mo, Ti	20			
	Al, K, Mg, P, S	1,000			
	C	2,000			
	Fe, Na	2,500			
	Ca	3,000			
	Cl	20,000			
Method 6020 ICS Analytes B	Al, As, Cd, Cr, Co, Cu, Mn, Ni, Se, V, Zn, Ag	10	5% HNO_3	100	VHG-LICSB1-100
6020A & CLP-M ICS Analytes B *To be diluted by 1:1,000 to achieve prescribed concentrations*	*Components listed below*		5% HNO_3	100	VHG-LINTB6020-100
	Ag	5			
	As, Cd, Se, Zn	10			
	Cr, Co, Cu, Mn, Ni,	20			
ICS Target Analytes B	Sb, Al, As, Ba, Be, Cd, Cr, Co, Cu, Pb, Mn, Ni, Se, Ag, Tl, V, Zn	10	5% HNO_3, tr. Tartaric Acid	100	VHG-LICSB2Z-100

ICP-MS Standards
Common Methods & Applications

General Memory & Interference Check Sample Mix					
Product	**Elements**	**Conc.** (µg/L)	**Matrix**	**mL**	**Product No.**
Environmental Sample Interferents	Al, Ca, Fe, K, Mg, Na, P, S	1,000	2% HNO_3	500	VHG-LMCS1Z-500
	C, Cl	5,000			

CLP ILM05.2 Contract Required Quantitation Limit for Water					
Product	**Elements**	**Conc.** (µg/L)	**Matrix**	**mL**	**Product No.**
ICP-MS CRQL Solution 1	*Components listed below*		5% HNO_3, tr. Tartaric Acid	100	VHG-CRQL1MS-100
	Co, Mn	5			
	As, Be, Cd, Pb, Ni, Ag, Tl, V, Zn	10			
	Sb, Cr, Cu	20			
	Se	50			
	Ba	100			
	Al	300			
ICP-MS CRQL Solution 2	*Components listed below*		5% HNO_3, tr. Tartaric Acid	100	VHG-CRQL2MS-100
	Ag, As, Be, Cd, Co, Mn, Ni, Pb, Tl, V	10			
	Cr, Cu, Sb, Zn	20			
	Se	50			
	Ba	100			
	Cu	250			
	Co, Mn, Ni, V, Zn	500			
	Al, Ba	2,000			

ICP-MS Standards
Common Methods & Applications

Metal Standards for Cannabis Testing

Single & multi-element standards for cannabis metal impurity testing.

VHG™ A+ Single Element Standards™ meet your lab's need for standards that are accurate, precise and traceably certified for concentration and uncertainty. These standards are prepared from high-purity raw materials in our facility accredited to ISO 17034 and certified to ISO 9001, and then are certified in our testing laboratory accredited to ISO/IEC 17025. They are analyzed according to the rigorous NIST High-Performance ICP-OES Methodology, utilizing NIST 3000-Series SRM calibrants; thus providing direct, NIST SRM traceable certification.

Our multi-element mixes are produced using VHG™ A+ Single Element Standards™ and have elements conveniently grouped to provide comprehensive coverage of all of the required metals for most U.S. states and Canada. In addition to their convenience, our extensive quality control makes these products a clear choice for value.

If you have a need not met by the products listed, please contact us to discuss a custom mixture.

A+ Single Element Standards™ for Cannabis Testing

Element	Matrix	mL	Conc. (10 µg/mL)	Conc. (1,000 µg/mL)	Conc. (10,000 µg/mL)
			Product No.	Product No.	Product No.
Antimony (Sb)	HCl	100	VHG-LSBH-100	VHG-PSBH-100	VHG-TSBH-100
		250		VHG-PSBH-250	VHG-TSBH-250
		500		VHG-PSBH-500	VHG-TSBH-500
	HNO_3, Tartaric Acid	100	VHG-LSBWTN-100	VHG-PSBWTN-100	VHG-TSBWTN-100
		250		VHG-PSBWTN-250	VHG-TSBWTN-250
		500		VHG-PSBWTN-500	VHG-TSBWTN-500
Arsenic (As)	HNO_3	100	VHG-LASN-100	VHG-PASN-100	VHG-TASN-100
		250		VHG-PASN-250	VHG-TASN-250
		500	VHG-LASN-500	VHG-PASN-500	VHG-TASN-500

Table continues on next page

ICP-MS Standards
Common Methods & Applications

Table continued from previous page

A+ Single Element Standards™ for Cannabis Testing					
Element	**Matrix**	**mL**	**Conc.** (10 µg/mL)	**Conc.** (1,000 µg/mL)	**Conc.** (10,000 µg/mL)
			Product No.	**Product No.**	**Product No.**
Barium (Ba)	HNO_3	100	VHG-LBAN-100	VHG-PBAN-100	VHG-TBAN-100
		250		VHG-PBAN-250	VHG-TBAN-250
		500		VHG-PBAN-500	VHG-TBAN-500
Cadmium (Cd)	HNO_3	100	VHG-LCDN-100	VHG-PCDN-100	VHG-TCDN-100
		250		VHG-PCDN-250	VHG-TCDN-250
		500	VHG-LCDN-500	VHG-PCDN-500	VHG-TCDN-500
Calcium (Ca)	HNO_3	100		VHG-PCAN-100	VHG-TCAN-100
		250		VHG-PCAN-250	VHG-TCAN-250
		500		VHG-PCAN-500	VHG-TCAN-500
Chromium (Cr)	HCl	100		VHG-PCRH-100	VHG-TCRH-100
		250		VHG-PCRH-250	VHG-TCRH-250
		500		VHG-PCRH-500	VHG-TCRH-500
	HNO_3	100	VHG-LCRN-100	VHG-PCRN-100	VHG-TCRN-100
		250		VHG-PCRN-250	VHG-TCRN-250
		500	VHG-LCRN-500	VHG-PCRN-500	VHG-TCRN-500
Cobalt (Co)	HNO_3	100	VHG-LCON-100	VHG-PCON-100	VHG-TCON-100
		250		VHG-PCON-250	VHG-TCON-250
		500		VHG-PCON-500	VHG-TCON-500
Copper (Cu)	HNO_3	100	VHG-LCUN-100	VHG-PCUN-100	VHG-TCUN-100
		250		VHG-PCUN-250	VHG-TCUN-250
		500		VHG-PCUN-500	VHG-TCUN-500
Gold* (Au) **Stabilizer for Hg*	HCl	100		VHG-PAUH-100	VHG-TAUH-100
		250		VHG-PAUH-250	VHG-TAUH-250
		500		VHG-PAUH-500	VHG-TAUH-500

Table continues on next page

ICP-MS Standards
Common Methods & Applications

A+ Single Element Standards™ for Cannabis Testing					
Element	**Matrix**	**mL**	**Conc.** (10 µg/mL)	**Conc.** (1,000 µg/mL)	**Conc.** (10,000 µg/mL)
			Product No.	**Product No.**	**Product No.**
Lead (Pb)	HNO_3	100	VHG-LPBN-100	VHG-PPBN-100	VHG-TPBN-100
		250		VHG-PPBN-250	VHG-TPBN-250
		500	VHG-LPBN-500	VHG-PPBN-500	VHG-TPBN-500
Lithium (Li)	HNO_3	100	VHG-LLIN-100	VHG-PLIN-100	VHG-TLIN-100
		250		VHG-PLIN-250	VHG-TLIN-250
		500		VHG-PLIN-500	VHG-TLIN-500
Mercury* (Hg) *Au stabilizer for Hg recommended	HNO_3	100	VHG-LHGN-100	VHG-PHGN-100	VHG-THGN-100
		250	VHG-LHGN-250	VHG-PHGN-250	VHG-THGN-250
		500	VHG-LHGN-500	VHG-PHGN-500	VHG-THGN-500

ICP-MS Standards
Common Methods & Applications

Table continued from previous page

A+ Single Element Standards™ for Cannabis Testing					
Element	**Matrix**	**mL**	**Conc.** (10 µg/mL)	**Conc.** (1,000 µg/mL)	**Conc.** (10,000 µg/mL)
			Product No.	**Product No.**	**Product No.**
Molybdenum (Mo)	HNO_3, tr. HF	100	VHG-LMONF-100	VHG-PMONF-100	VHG-TMONF-100
		250		VHG-PMONF-250	VHG-TMONF-250
		500	VHG-LMONF-500	VHG-PMONF-500	VHG-TMONF-500
	NH_4OH	100		VHG-PMOZ-100	VHG-TMOZ-100
		250		VHG-PMOZ-250	VHG-TMOZ-250
		500		VHG-PMOZ-500	VHG-TMOZ-500
Nickel (Ni)	HNO_3	100		VHG-PNIN-100	VHG-TNIN-100
		250		VHG-PNIN-250	VHG-TNIN-250
		500	VHG-LNIN-500	VHG-PNIN-500	VHG-TNIN-500
Selenium (Se)	HNO_3	100	VHG-LSEN-100	VHG-PSEN-100	VHG-TSEN-100
		250		VHG-PSEN-250	VHG-TSEN-250
		500		VHG-PSEN-500	VHG-TSEN-500
Silver (Ag)	HNO_3	100	VHG-LAGN-100	VHG-PAGN-100	VHG-TAGN-100
		250		VHG-PAGN-250	VHG-TAGN-250
		500	VHG-LAGN-500	VHG-PAGN-500	VHG-TAGN-500
Thallium (Tl)	HNO_3	100		VHG-PTLN-100	VHG-TTLN-100
		250		VHG-PTLN-250	VHG-TTLN-250
		500		VHG-PTLN-500	VHG-TTLN-500
Tin (Sn)	HNO_3, tr. HF	100	VHG-LSNNF-100	VHG-PSNNF-100	VHG-TSNNF-100
		250		VHG-PSNNF-250	VHG-TSNNF-250
		500		VHG-PSNNF-500	VHG-TSNNF-500
Zinc (Zn)	HNO_3	100	VHG-LZNN-100	VHG-PZNN-100	VHG-TZNN-100
		250		VHG-PZNN-250	VHG-TZNN-250
		500	VHG-LZNN-500	VHG-PZNN-500	VHG-TZNN-500

ICP-MS Standards Common Methods & Applications

Cannabis Standards					
Product	**Elements**	**Conc.** (µg/mL)	**Matrix**	**mL**	**Product No.**
Cannabis Target Elements-A	Hg	1	5% HNO_3	100	VHG-CANNA-TELH-100
	As, Cd	2			
	Pb	5			
	Au*	100			
Pharma Internal Standard	Bi, Ge, In, Lu	5	5% HNO_3	100	VHG-PHARM-IS1-100
	Sc	10			
	Te	25			
Cannabis 8 Element Heavy Metals Kit	Ag, As, Ba, Cd, Cr, Hg, Pb, Se	100	5% HNO_3	100	VHG-CANNA-8-KIT
	Au*	100			

**Stabilizer for Mercury (5% HCl)*

ICP-MS Standards
Common Methods & Applications

USP <232> / ICH Q3D refer to four main elements – Hg, Cd, Pb, and As. However, a number of other elements are also included, depending on the product and route of intake. See our USP <232> related products below.

USP Elemental Standards

USP <232> / ICH Q3D					
Name	**Elements**	**Conc. (µg/L)**	**Matrix**	**mL**	**Product No.**
ICH-USP Target Elements-A	Cd, Pb	5	2% HNO_3	100	VHG-ICH-USP-TELA-100
	As	15			
	Hg	30			
ICH-USP Oral Target Elements-B	Co	5	2% HNO_3	100	VHG-ICH-USP-TELB-100
	Tl	8			
	V	100			
	Se	150			
	Ni	200			
ICH-USP Oral Target Elements-C	Au, Ir, Os, Pd, Pt, Rh, Ru	100	5% HCl	100	VHG-ICH-USP-TELC-100
ICH-USP Oral Target Elements-D	Li	550	5% HNO_3, tr. HF	100	VHG-ICH-USP-TELD-100
	Sb	1,200			
	Ba	1,400			
	Cu, Mo	3,000			
	Sn	6,000			
	Cr	11,000			

Table continues on next page

ICP-MS Standards
Common Methods & Applications

Table continued from previous page

USP <232> / ICH Q3D					
Name	**Elements**	**Conc. (µg/L)**	**Matrix**	**mL**	**Product No.**
ICH/USP Class 1&2A Parenteral Target Elements	Cd	2	2% HNO_3	100	VHG-ICH-USP-TELE-100
	Hg	3			
	Co, Pb	5			
	V	10			
	As	15			
	Ni	20			
ICH/USP Parenteral Combined-1 Target Elements	Tl	8	5% HNO_3, tr. HF	100	VHG-ICH-USP-TELF-100
	Ag	10			
	Se	80			
	Sb	90			
	Li	250			
	Cu	300			
	Sn	600			
	Ba	700			
	Cr	1,100			
	Mo	1,500			
ICH/USP Parenteral Combined-2 Target Elements	Ir, Os, Pd, Pt, Rh, Ru	10	15% HCl	100	VHG-ICH-USP-TELG-100
	Au	100			
Pharma Internal Standard Stock	Bi, Ge, In, Lu	5	2% HNO_3, tr. HF	100	VHG-PHARM-IS1-100
	Sc	10			
	Te	25			

Ion Chromatography (IC) — Overview

Sub-Section Contents:

Ion Chromatography (IC) — Introduction

Technique Overview

Ion Chromatography
Also known as IC

Primary Uses

Anion & cation quantification (can measure multiple ions at a time)

Coverage & Detection Limits

- Minimal technician time compared to titrations
- ppb detection limits
- Capable of high accuracy
- Minimal sample volume required

Common Applications

- Chemical & Industrial
- Environmental
- Water Analysis
- Food & Beverage
- Metal Mining
- Petrochemical Refineries
- Pharmaceutical
- Semiconductor

Featured Products

Featured Products

IC is the preferred analysis method across a number of ASTM, EPA Standard Methods, and USP Methods. Often, these methods call for analyte identification based on retention times that are compared to those of known standards.

VHG™ high-quality Ion Chromatography (IC) Standards are accompanied by a NIST-traceable Certificate of Analysis, making them ideal for use when performing standard methods.

VHG™ offers anion and cation standards that align with the requirements of many standard methods. Contact us to discuss single ion standards or mixtures customized for your specific needs.

Ion	Product No.	EPA				ASTM	ISO
		9056A	300.0	300.1	326.0	D4327	11206
Bromate	VHG-IBRO3-500		X	X	X		X
Bromide	VHG-IBR-500		X	X	X	X	
Chlorate	VHG-ICLO3-500	X	X	X			
Chloride	VHG-ICL1K-500		X	X	X	X	
Fluoride	VHG-IF1K-500	X	X	X		X	
Nitrate	VHG-INO3-500	X	X			X	
Nitrite	VHG-INO2-500	X	X			X	
Perchlorate	VHG-ICLO4-500		X				
Sulfate	VHG-ISO41K-500	X	X	X		X	

Ion	Product No.	EPA	ASTM	ISO
		300.7	D6919	14911
Ammonium	VHG-INH41K-500	X	X	X
Calcium	VHG-ICAW1K-500	X	X	X
Lithium	VHG-ILIW1K-500		X	X
Magnesium	VHG-IMGW1K-500	X	X	X
Potassium	VHG-IKW1K-500	X	X	X
Sodium	VHG-INAW1K-500	X	X	X

For more concentrations and sizes, see pages 93-95

Single Ion Standards

Regulations dictate increasingly stringent contaminant limits for a range of analytes. For the many industries impacted, accurate sample analysis is paramount.

VHG™ offers a comprehensive range of anion and cation standards to support your IC analysis.

Anions: In addition to the sizes shown here, standards are available in 50 mL and 250 mL sizes.

Key product features:

- Prepared from high-purity raw materials and 18 MΩ deionized water
- Accompanied by NIST-traceable Certificate of Analysis

TIPS: Gravimetric Factors for IC Standards

1,000 µg/mL NO_3^- = 226 mg/L N
1,000 µg/mL NO_2^- = 305 mg/L N
1,000 µg/mL PO_4^{-3} = 326 mg/L P
1,000 µg/mL SO_4^{-2} = 334 mg/L S

Single Ion Standards

Single Anion Standards					
Ion	Matrix	mL	Conc. (10 µg/mL)	Conc. (1,000 µg/mL)	Conc. (10,000 µg/mL)
			Product No.	Product No.	Product No.
Acetate $CH_3CO_2^-$	H_2O	100		VHG-IACET-100	
		500		VHG-IACET-500	VHG-I1PACET-500
Bromate BrO_3^-	H_2O	100		VHG-IBRO3-100	
		500		VHG-IBRO3-500	
Bromide Br^- (Raw material: $NaBrO_3$)	H_2O	100		VHG-IBR-100	VHG-I1PBR-100
		500		VHG-IBR-500	VHG-I1PBR-500
Bromide Br^- (Raw Material: KBr)	H_2O	100			VHG-I1PABR-100
		500			VHG-I1PABR-500
Chlorate ClO_3^-	H_2O	100		VHG-ICLO3-100	
		500		VHG-ICLO3-500	
Chloride Cl^- (Raw material: KCl)	H_2O	100		VHG-ICL1K-100	
		500		VHG-ICL1K-500	VHG-I1PCL-500
Chloride Cl^- (Raw material: H_4Cl)	H_2O	100			VHG-I1PACL-100
		500			VHG-I1PACL-500
Chlorite ClO_2^-	H_2O	100		VHG-ICLO2-100	
		500		VHG-ICLO2-500	
Chromate CrO_4^{-2}	H_2O	100		VHG-ICRO-100	VHG-I1PCRO-100
		500		VHG-ICRO-500	VHG-I1PCRO-500
Dichromate $Cr_2O_7^{-2}$	H_2O	100		VHG-IDCRO-100	VHG-I1PDCRO-100
		500		VHG-IDCRO-500	VHG-I1PDCRO-500
Fluoride F^-	H_2O	100	VHG-IF100-100	VHG-IF1K-100	
		500		VHG-IF1K-500	VHG-I1PF-500
Formate HCO_2^-	H_2O	100		VHG-IFORM-100	
		500		VHG-IFORM-500	

Table continues on next page

Single Ion Standards

Table continued from previous page

Single Anion Standards					
Ion	Matrix	mL	Conc. (10 µg/mL)	Conc. (1,000 µg/mL)	Conc. (10,000 µg/mL)
			Product No.	Product No.	Product No.
Glycolate $C_2H_3O^-$	H_2O	100		VHG-IGLY-100	
		500		VHG-IGLY-500	
Iodide I^- (Raw material: NaI)	H_2O	100		VHG-II-100	
		500		VHG-II-500	VHG-I1PI-500
Iodide I^- (Raw material: NH_4I)	H_2O	100			VHG-I1PAI-100
		500			VHG-I1PAI-500
Nitrate NO_3^-	H_2O	100		VHG-INO3-100	VHG-I1PNO3-100
		500		VHG-INO3-500	VHG-I1PNO3-500
Nitrate as N NO_3^-	H_2O	100		VHG-INO3N-100	VHG-I1PNO3N-100
		500		VHG-INO3N-500	VHG-I1PNO3N-500
Nitrite NO_2^-	H_2O	100		VHG-INO2-100	VHG-I1PNO2-100
		500		VHG-INO2-500	VHG-I1PNO2-500
Nitrite as N NO_2^-	H_2O	100		VHG-INO2N-100	VHG-I1PNO2N-100
		500		VHG-INO2N-500	VHG-I1PNO2N-500
Oxalate $C_2O_4^{-2}$	H_2O	100		VHG-IOXAL-100	VHG-I1POXAL-100
		500		VHG-IOXAL-500	VHG-I1POXAL-500
Perchlorate ClO_4^-	H_2O	100		VHG-ICLO4-100	
		500		VHG-ICLO4-500	VHG-I1PCLO4-500
Phosphate PO_4^{-3}	H_2O	100		VHG-IPO4-100	VHG-I1PPO4-100
		500		VHG-IPO4-500	VHG-I1PPO4-500
Phosphate as P PO_4^{-3}	H_2O	100		VHG-IPO4P-100	
		500		VHG-IPO4P-500	VHG-I1PPO4P-500
Silica SiO_2	H_2O	100	VHG-ISIO2100-100	VHG-ISIO21K-100	
		500	VHG-ISIO2100-500	VHG-ISIO21K-500	
Sulfate SO_4^{-2}	H_2O	100	VHG-ISO4100-100	VHG-ISO41K-100	VHG-I1PSO4-100
		500		VHG-ISO41K-500	

Single Ion Standards

Single Cation Standards					
Ion	Matrix	mL	Conc. (10 µg/mL)	Conc. (1,000 µg/mL)	Conc. (10,000 µg/mL)
			Product No.	Product No.	Product No.
Ammonium NH^+	H_2O	100	VHG-INH4100-100	VHG-INH41K-100	VHG-I1PNH4-100
		500	VHG-INH4100-500	VHG-INH41K-500	VHG-I1PNH4-500
Barium Ba^{+2}	H_2O	100		VHG-IBAW1K-100	
		500		VHG-IBAW1K-500	
Calcium Ca^{+2}	H_2O	100		VHG-ICAW1K-100	
		500		VHG-ICAW1K-500	
Ethanolamine C_2H_7NO	H_2O	100		VHG-IETA1K-100	
		500		VHG-IETA1K-500	
Lithium Li^+	H_2O	100	VHG-ILI100-500	VHG-ILIW1K-100	
		500		VHG-ILIW1K-500	
Magnesium Mg^{+2}	H_2O	100		VHG-IMGW1K-100	
		500		VHG-IMGW1K-500	
Potassium K^+	H_2O	100		VHG-IKW1K-100	
		500		VHG-IKW1K-500	
Sodium Na^+	H_2O	100	VHG-INAW100-500	VHG-INAW1K-100	
		500		VHG-INAW1K-500	

Single Ion Ammonia Standards*				
Ion	Raw Material	Conc. (µg/mL)	mL	Product No.
Ammonia NH_3	H_2O	1	100	VHG-INH3-1-100
		10	100	VHG-INH3-10-100
		100	100	VHG-INH3-100-100
		1,000	100	VHG-INH3-1K-100
		10,000	100	VHG-INH3-1P-100

**Also available in 500 mL size*

Multi-Ion Standards & Eluent Concentrates

Our Multi-Ion Standards combine the high quality of our Single Ion Standards with the convenience of a prepared mixture.

TIPS: Multi-Ion Standards

Use only glass containers for IC multi-element standards containing nitrite ion in order to maximize shelf life

Key product features:

- Our Eluent Concentrates are ready to dilute by 100 for most applications
- Our Multi-Ion Standards are prepared from high-purity raw materials and 18 MΩ deionized water
- Accompanied by a NIST-traceable Certificate of Analysis

Eluent Concentrates			
Product	**Description**	**Size**	**Product No.**
Eluent 1	0.18M Na_2CO^3 and 0.17M $NaHCO_3$	500 mL	VHG-IELUENT1-500
Eluent 3	0.5M Na_2CO^3	500 mL	VHG-IELUENT3-500
Eluent 4	0.5M $NaHCO_3$	500 mL	VHG-IELUENT4-500
Methanesulfonic Acid	CH_3SO_3H	500 g	VHG-JMSA-500G

Multi-Ion Standards & Eluent Concentrates

Multi-Anion Standards					
Product	**Ions**	**Conc. (µg/mL)**	**Matrix**	**mL**	**Product No.**
Multi-Anion Standard 1	F^-, Cl^-, Br^-, NO_3^-, PO_4^{-3}, SO_4^{-2}	100	H_2O	100	VHG-ICM1-100
Multi-Anion Standard 2	F^-, Cl^-, SO_4^{-2}	100	H_2O	100	VHG-ICM2-100
Multi-Anion Standard 3	F^-	20	H_2O	100	VHG-ICM3-100
	Cl^-	30			
	NO_3^-	100			
	PO_4^{-3}, SO_4^{-2}	150			
Multi-Anion Standard 4	F^-	100	H_2O	100	VHG-ICM4-100
	Cl^-	200			
	Br^-, NO_3^-, SO_4^{-2}	400			
	PO_4^{-3}	600			
Multi-Anion Standard 7A	F^-, Cl^-, Br^-, NO_3^- as N, PO_4^{-3} as P, SO_4^{-2}	1,000	H_2O	100	VHG-ICM7A-100
Multi-Anion Standard 8	F^-, Cl^-, NO_3^-, SO_4^{-2}	1,000	H_2O	100	VHG-ICM8-100

Multi-Cation Standards					
Product	**Ions**	**Conc. (µg/mL)**	**Matrix**	**mL**	**Product No.**
Multi-Cation Standard 1	Ca^{+2}	500	dil. HNO_3	100	VHG-ICM5A-100
	K^+	500			
	Li^+	50			
	Mg^{+2}	250			
	Na^+	500			
	NH_4^+	250			

Industry Highlight — Nuclear & Power

Nuclear Power Generation:

Plant Cooling System Water: Common Testing Standards

Water is used in the nuclear power industry in numerous ways, including critical cooling functions. Knowing and controlling the chemistry of the coolant water is essential for reactor control and for maintaining the integrity of the cooling systems. VHG™ manufactures testing standards designed to meet the needs of labs performing water analysis.

Check out our A+ Single Element Standards™ on pages 19-27 for single element standards including Al, Ca, Co, Cr, Cu, Fe, Mg, Mn, Ni, Na, Pb, and Zn.

Industry Highlight — Nuclear & Power

Common Ion Testing Standards				
Ion	**Conc.** (µg/mL)	**Matrix**	**mL**	**Product No.**
Chloride Cl^-	1,000	H_2O	100	VHG-ICL1K-100
			500	VHG-ICL1K-500
Ethanolamine C_2H_7NO	1,000	H_2O	100	VHG-IETA1K-100
			500	VHG-IETA1K-500
Fluoride F^-	1,000	H_2O	100	VHG-IF1K-100
			500	VHG-IF1K-500
Glycolate $C_2H_3O^-$	1,000	H_2O	100	VHG-IGLY-100
			500	VHG-IGLY-500
Hydrazine N_2H_4	100	1% Acetic Acid	100	VHG-IHYD100-100
			500	VHG-IHYD100-500
Molybdate MoO_4^{-2}	1,000	H_2O	100	VHG-IMOLB-100
			500	VHG-IMOLB-500
Nitrate NO_3^-	1,000	H_2O	100	VHG-INO3-100
			500	VHG-INO3-500
Nitrite NO_2^-	1,000	H_2O	100	VHG-INO2-100
			500	VHG-INO2-500
Phosphate PO_4^{-3}	1,000	H_2O	100	VHG-IPO4-100
			500	VHG-IPO4-500
Silica SiO_2	1,000	H_2O	100	VHG-ISIO21K-100
			500	VHG-ISIO21K-500
Sulfate SO_4^{-2}	1,000	H_2O	100	VHG-ISO41K-100
			500	VHG-ISO41K-500

Common Analyte Testing Standards				
Analyte	**Conc.** (µg/mL)	**Matrix**	**mL**	**Product No.**
Boron Titration Standard	1,000	H_2O	500	VHG-B1K-500

Atomic Absorption (AA) — Overview

Sub-Section Contents:

Atomic Absorption (AA) — Introduction

Technique Overview

Flame Atomic Absorption

Also known as Flame AA

Primary Uses

Rapid single element analysis

Good for high TDS samples

Coverage & Detection Limits

- Moderate elemental coverage
- ppm detection limits

Common Applications

- Chemical & Industrial
- Environmental
- Food & Beverage
- Metal mining
- Petrochemical refineries
- Agricultural

Graphite Furnace Atomic Absorption

Also known as GFAA

Primary Uses

Single to several element analysis

Limited sample throughput

Measurement range on par with ICP-MS

Coverage & Detection Limits

- Limited elemental coverage
- ppb detection limits

Common Applications

- Chemical & Industrial
- Environmental
- Food & Beverage
- Petrochemical refineries
- Pharmaceutical
- Semiconductor

Featured Products

Featured Products

Matrix Modifiers are used to modify volatility of the analyte or matrix to improve instrument signal.

Magnesium and palladium are some of the most commonly cited compounds for matrix modification.

In addition to the Matrix Modifiers highlighted here, VHG™ offers pre-mixed modifiers.

See page 109 for the full list of matrix modifiers.

GFAA Matrix Modifiers			
Modifer	**Matrix**	**mL**	**Product No.**
Ammonium Phosphate	10% $NH_4H_2PO_4$, 2% HNO_3	100	VHG-MAP10P-100
Magnesium Nitrate	1% $Mg(NO_3)_2$, 2% HNO_3	100	VHG-MMGN1P-100
Nickel Nitrate	1% $Ni(NO_3)_2$, 2% HNO_3	100	VHG-MNIN1P-100
Palladium Nitrate	0.1% Pd, 5% HNO_3	100	VHG-MPDN1K-100
	1% Pd, 5% HNO_3	100	VHG-MPDN1P-100

AA Single Element Standards

We offer more than 30 stock AA Single Element Standards. If you don't see the standard you need, contact our team to discuss a custom order.

Key product features:

- Prepared from high-purity raw materials, acids, and 18 MΩ deionized water
- Accompanied by a Certificate of Analysis

TIPS: Single Element Standards

Don't see the concentration you need? Our A+ Single Element Standards™ can also be used with Atomic Absorption and are kept in stock! See pages 19-27 for the full list of available elements.

AA Single Element Standards

Element	Symbol	Conc. (µg/mL)	Matrix	mL	Product No.
Aluminum	Al	1,000	HCl	100	VHG-AAALH-100
				500	VHG-AAALH-500
Antimony	Sb	1,000	HCl	100	VHG-AASBH-100
				500	VHG-AASBH-500
Arsenic	As	1,000	HNO_3	100	VHG-AAASN-100
				500	VHG-AAASN-500
Barium	Ba	1,000	HNO_3	100	VHG-AABAN-100
				500	VHG-AABAN-500
Beryllium	Be	1,000	HNO_3	100	VHG-AABEN-100
				500	VHG-AABEN-500
Bismuth	Bi	1,000	HNO_3	100	VHG-AABIN-100
				500	VHG-AABIN-500
Boron	B	1,000	H_2O	100	VHG-AABW-100
				500	VHG-AABW-500
Cadmium	Cd	1,000	HNO_3	100	VHG-AACDN-100
				500	VHG-AACDN-500
Calcium	Ca	1,000	HNO_3	100	VHG-AACAN-100
				500	VHG-AACAN-500
Chromium	Cr	1,000	HCl	100	VHG-AACRH-100
				500	VHG-AACRH-500
Cobalt	Co	1,000	HNO_3	100	VHG-AACON-100
				500	VHG-AACON-500
Copper	Cu	1,000	HNO_3	100	VHG-AACUN-100
				500	VHG-AACUN-500
Gold	Au	1,000	HCl	100	VHG-AAAUH-100
				500	VHG-AAAUH-500
Iron	Fe	1,000	HNO_3	100	VHG-AAFEN-100
				500	VHG-AAFEN-500
Lead	Pb	1,000	HNO_3	100	VHG-AAPBN-100
				500	VHG-AAPBN-500

Table continues on next page

AA Single Element Standards

Table continued from previous page

Element	Symbol	Conc. (µg/mL)	Matrix	mL	Product No.
Lithium	Li	1,000	HNO_3	100	VHG-AALIN-100
				500	VHG-AALIN-500
Magnesium	Mg	1,000	HNO_3	100	VHG-AAMGN-100
				500	VHG-AAMGN-500
Manganese	Mn	1,000	HNO_3	100	VHG-AAMNN-100
				500	VHG-AAMNN-500
Mercury	Hg	1,000	HNO_3	100	VHG-AAHGN-100
				500	VHG-AAHGN-500
Molybdenum	Mo	1,000	HNO_3, tr. HF	100	VHG-AAMONF-100
				500	VHG-AAMONF-500
Nickel	Ni	1,000	HNO_3	100	VHG-AANIN-100
				500	VHG-AANIN-500
Palladium	Pd	1,000	HCl	100	VHG-AAPDH-100
				500	VHG-AAPDH-500
Platinum	Pt	1,000	HCl	100	VHG-AAPTH-100
				500	VHG-AAPTH-500
Potassium	K	1,000	HNO_3	100	VHG-AAKN-100
				500	VHG-AAKN-500
Selenium	Se	1,000	HNO_3	100	VHG-AASEN-100
				500	VHG-AASEN-500
Silicon	Si	1,000	H_2O, tr. F^-	100	VHG-AASIW-100
				500	VHG-AASIW-500
Silver	Ag	1,000	HNO_3	100	VHG-AAAGN-100
				500	VHG-AAAGN-500
Sodium	Na	1,000	HNO_3	100	VHG-AANAN-100
				500	VHG-AANAN-500
Strontium	Sr	1,000	HNO_3	100	VHG-AASRN-100
				500	VHG-AASRN-500
Thallium	Tl	1,000	HNO_3	100	VHG-AATLN-100
				500	VHG-AATLN-500

Table continues on next page

AA Single Element Standards

Table continued from previous page

Element	Symbol	Conc. (µg/mL)	Matrix	mL	Product No.
Tin	Sn	1,000	HCl	100	VHG-AASNH-100
				500	VHG-AASNH-500
Titanium	Ti	1,000	HNO_3, tr. HF	100	VHG-AATINF-100
				500	VHG-AATINF-500
Vanadium	V	1,000	HNO_3	100	VHG-AAVN-100
				500	VHG-AAVN-500
Zinc	Zn	1,000	HNO_3	100	VHG-AAZNN-100
				500	VHG-AAZNN-500

Matrix Modifiers, Ionization Buffers & Releasing Agents

To help you optimize your instrument performance, we provide a range of Matrix Modifiers, Ionization Buffers, and Releasing Agents.

Key product features:

- GFAA Matrix Modifier purity checked for over 70 elements
- All products accompanied by a Certificate of Analysis

TIPS: Matrix Modifiers

See Section 3 for Instrument Consumables for your Flame AA and GFAA.

Matrix Modifiers, Ionization Buffers & Releasing Agents

GFAA Matrix Modifiers			
Modifer	**Matrix**	**mL**	**Product No.**
Ammonium Phosphate	10% $NH_4H_2PO_4$, 2% HNO_3	100	VHG-MAP10P-100
Magnesium Nitrate	1% $Mg(NO_3)_2$, 2% HNO_3	100	VHG-MMGN1P-100
Nickel Nitrate	1% $Ni(NO_3)_2$, 2% HNO_3	100	VHG-MNIN1P-100
Palladium Nitrate	0.1% Pd, 5% HNO_3	100	VHG-MPDN1K-100
	1% Pd, 5% HNO_3	100	VHG-MPDN1P-100

Pre-Mixed GFAA Matrix Modifiers			
Modifer	**Matrix**	**mL**	**Product No.**
Palladium + Magnesium	750 µg/mL Pd & 500 µg/mL $Mg(NO_3)_2$, 2% HNO_3	250	VHG-MPM1-250
Palladium + Magnesium	1,000 µg/mL Pd & 600 µg/mL $Mg(NO_3)_2$, 2% HNO_3	250	VHG-MPM2-250
Ammonium Phosphate + Magnesium	10 mg/mL $NH_4H_2PO_4$ & 600 µg/mL $Mg(NO_3)_2$, 2% HNO_3	250	VHG-MPM3-250

Ionization Buffers			
Modifer	**Matrix**	**mL**	**Product No.**
Lithium Nitrate	1% Li (from carbonate), 5% HNO_3	100	VHG-MLIN1P-100
Cesium Nitrate	1% Cs (from carbonate), 5% HNO_3	100	VHG-MCSN1P-100

Lanthanum Releasing Agents			
Modifer	**Matrix**	**mL**	**Product No.**
Lanthanum Chloride	1% La (from oxide), 2% HCl	100	VHG-MLAH1P-100
Lanthanum Nitrate	1% La (from oxide), 5% HNO_3	100	VHG-MLAN1P-100

Industry Highlight — Mining

Analysis in the Metals & Mining Industry

Atomic Absorption (AA) is a primary technique utilized in the metals and mining industry to analyze samples to determine the concentration of metals in the ground. The technique is cost-effective, rapid, and accurate, particularly when it is supported by robust standards and instrument solutions.

VHG™ offers a range of high-quality AA Standards, including precious metals, ideal for this purpose. Please see pages 105-107 for a full list of available elements and sizes.

Industry Highlight — Mining

Select Precious Metal AA Standards					
Element	**Symbol**	**Conc.** (µg/mL)	**Matrix**	**mL**	**Product No.**
Copper	Cu	1,000	HNO_3	100	VHG-AACUN-100
				500	VHG-AACUN-500
Gold	Au	1,000	HCl	100	VHG-AAAUH-100
				500	VHG-AAAUH-500
Palladium	Pd	1,000	HCl	100	VHG-AAPDH-100
				500	VHG-AAPDH-500
Platinum	Pt	1,000	HCl	100	VHG-AAPTH-100
				500	VHG-AAPTH-500
Silver	Ag	1,000	HNO_3	100	VHG-AAAGN-100
				500	VHG-AAAGN-500

Wet Chemistry — Overview

Sub-Section Contents:

pH Standards				
Analyte	**Color**	**Matrix**	**Size** (mL)	**Product No.**
pH 4.01 Buffer Standard	Red	H_2O	500	VHG-WPH4-500
pH 7.00 Buffer Standard	Yellow	H_2O	500	VHG-WPH7-500
pH 10.01 Buffer Standard	Blue	H_2O	500	VHG-WPH10-500

Wet Chemistry — Introduction

Standards for Water Analysis				
Analyte	**Conc.** (µg/mL)	**Matrix**	**Size**	**Product No.**
Biochemical Oxygen Demand (BOD)	200 mg/L	H_2O, tr. HCl	100 mL	VHG-BOD200A-100
Biochemical Oxygen Demand (BOD) Seeds	N/A	N/A	50 Capsules, 100 mg each	VHG-BODSEED-50
Boron Titration Standard	1,000 mg/L	H_2O	500 mL	VHG-B1K-500
Chemical Oxygen Demand (COD)	1,000 mg/L	H_2O, 0.5% H_2SO_4	100 mL	VHG-COD1K-100
Conductivity (from NaCl)	100 µmho/cm	H_2O	1 L	VHG-CONDNA100-1L
	1,000 µmho/cm			VHG-CONDNA1K-1L
	10,000 µmho/cm			VHG-CONDNA10K-1L
Cyanide, CN^- (from KCN)	1,000 mg/L	0.1% NaOH	100 mL	VHG-CN-100
			500 mL	VHG-CN-500
Hydrazine, N_2H_4 (from N_2H_4•2HCl)	100 mg/L	1% Acetic Acid	100 mL	VHG-IHYD100-100
			500 mL	VHG-IHYD100-500
	1,000 mg/L		100 mL	VHG-IHYD1K-100
			500 mL	VHG-IHYD1K-500
Methylene Blue Active Substance (MBAS)	1,000 mg/L	H_2O, 0.5% H_2SO_4	100 mL	VHG-MBAS-100
Silica, SiO_2 (from Na_2SiO_3)	100 mg/L	H_2O	500 mL	VHG-ISIO2100-500
	1,000 mg/L		100 mL	VHG-ISIO21K-100
			500 mL	VHG-ISIO21K-500
Total Kjeldahl Nitrogen - TKN (from glycine)	1,000 mg/L	1% HCl	100 mL	VHG-TOTKJN1K-100
			500 mL	VHG-TOTKJN1K-500
Total Organic Carbon - TOC (from $KHC_8H_4O_4$)	100 mg/L	H_2O	500 mL	VHG-TOC100-500
	1,000 mg/L		100 mL	VHG-TOC1K-100
			500 mL	VHG-TOC1K-500

ISO Certification

What is ISO and why is it so important?

ISO stands for the International Organization for Standardization. This organization creates documents that provide requirements, specifications, guidelines, or characteristics to ensure that materials, products, processes, and services are fit for their purpose.

The creation and promotion of ISO Standards means that...

> ***"Consumers can have confidence that their products are safe, reliable, and of good quality."***
>
> **— International Organization for Standardization**

By following ISO guidelines we are living up to our promise to produce Science for a Safer World.

Contact us today to get started!

Our experts are ready to discuss your specific needs and get you started down the road to more accurate testing data.

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

VHG™ ISO Accreditation

ISO/IEC 17025

General requirements for the competence of testing and calibration laboratories

Specifies the general requirements for the competence, impartiality and consistent operation of laboratories.

Applicable to all organizations performing laboratory activities.

Laboratory customers, organizations, regulatory authorities, and schemes using peer-assessment, accreditation bodies, and others use this for confirming or recognizing laboratory competence.

ISO 17034

General requirements for the competence of reference material producers

Specifies general requirements for the competence and consistent operation of reference material producers.

Intended to be used as part of the general quality assurance procedures of the reference material producer, it sets out the requirements in accordance with which reference materials are produced.

Covers all reference materials production, including certified reference materials.

ISO 17043

General requirements for proficiency testing

Specifies general requirements for the competence of proficiency testing scheme providers, and for the development and operation of proficiency testing schemes.

These requirements are intended to be general for all types of proficiency testing schemes. They can be used as a basis for specific technical requirements for particular fields of application.

ISO 9001

Quality management systems

Specifies requirements for a quality management system:

a) Demonstrates ability to consistently provide products and services that meet customer and applicable statutory and regulatory requirements.

b) Aims to enhance custome satisfaction through effective application of the system, including processes for improvement and the assurance of conformity to customer and applicable statutory and regulatory requirements.

VHG™

Section 2:

Solid Standards

#GoBeyondTheStandard

Contact us today: U.S. + Canada

Tel: +1 603.622.7660

Email: lgcusa@lgcgroup.com

*See page 179 for full list of LGC Country Sale Offices

Solid Standards — Overview

Section Contents:

RoHS Calibration Standards (PE Powder) for ICP or XRF

QC Check Samples for PE (Polyethylene) Analysis

RoHS compliant polymer samples in powder form for the determination of hazardous materials in PE. Available in 3 standard set.

Description				Product No.	
Set of 3 QC Check Samples in PE Powder (25 g each)				VHG-ROHS-PE-SET1P	
Standard No.	**Br (wt %)**	**Cd (wt %)**	**Cr (wt %)**	**Hg (wt %)**	**Pb (wt %)**
Standard 1	0.000	0.000	0.000	0.000	0.000
Standard 2	0.025	0.005	0.050	0.050	0.050
Standard 3	0.050	0.010	0.100	0.100	0.100

XRF Standard for PE (Polyethylene) Analysis

RoHS compliant polymer standards in powder form for the determination of hazardous materials in PE. Available in 9 standard set, plus 1 QC Check Sample.

Description				Product No.	
Set of 9 Standards + 1 QC Check Sample in PE powder (25 g each)				VHG-ROHS-PE-SET2P	
Standard No.	**Br (wt %)**	**Cd (wt %)**	**Cr (wt %)**	**Hg (wt %)**	**Pb (wt %)**
Standard 1	0. 0000	0. 0000	0. 0000	0. 0000	0. 0000
Standard 2	0.0025	0.0025	0.0050	0.0100	0.1000
Standard 3	0.0400	0.0100	0.0750	0.0075	0.0250
Standard 4	0.0100	0.0125	0.1250	0.0500	0.0050
Standard 5	0.0250	0.0075	0.1000	0.0250	0.1250
Standard 6	0.0500	0.0010	0.0650	0.0800	0.0750
Standard 7	0.0200	0.0005	0.0250	0.1000	0.0100
Standard 8	0.0300	0.0050	0.0500	0.0030	0.0500
Standard 9	0.0050	0.0150	0.0100	0.1200	0.0350
QC Sample	0.0250	0.0050	0.0500	0.0500	0.0500

Binder & Briquetting Materials, Grinding Additives for XRF

Direct analysis of solids by XRF and other techniques such as Laser Ablation ICP-MS often utilize dry sample preparation materials. VHG™ provides a range of special high-quality products for these purposes.

Boric Acid

Powder used as binding agent, and tablets as grinding aid that withstands elevated temperatures. Moderately self-binding.

Form	Package	Product No.
Powder	500 g bottle	VHG-BAX1-500G
0.5 g Tablets	1,500 / bottle	VHG-BAX50-1500T

Cellulose Binder

Good binder choice for samples with moderately soft characteristics, e.g. cement, limestone, etc. Available in powder form.

Form	Package	Product No.
Microcrystalline Powder	500 g bottle	VHG-CBXM-500G

Paraffin Binder

Binding aid, excellent for use with geological, ore, slag, and other hard or abrasive samples. Low moisture, <20 µm powder that can be blended with sample at 10-20% by weight for pressing.

Form	Package	Product No.
Powder	450 g bottle	VHG-PBX1-450G

Binder & Briquetting Materials, Grinding Additives for XRF

Pellet Mix

Wax-based blend, self-binding. For use with cement, alumina, ceramics, limestone, and miscellaneous refractories. Powder (approximately 30 µm) that can be blended with sample at 10% by weight.

Form	Package	Product No.
Powder	500 g bottle	VHG-PMX1-500G
0.25 g Tablets	500 / bottle	VHG-PMX25-500T
0.5 g Tablets	500 / bottle	VHG-PMX50-500T

PTFE (Teflon™)

Often the binder of choice for laser ablation where low blanks are needed. 6-10 µm particle size. Use at up to 1:1 sample to binder.

Form	Package	Product No.
Powder	100 g bottle	VHG-PTFE12-100

Teflon™ is a trademark of The Chemours Company

Soil Certified Reference Materials for multiple techniques

Our Soil Certified Reference Materials are interlaboratory certified and include instrumentally determined concentrations. They come with a comprehensive Certificate of Analysis that includes analysis statistics. These products are suitable with U.S. EPA Methods and other related procedures.

Metals in Soil Certified Reference Materials

Description:	Metals in Sandy Loam Soil	Metals in Sewage Amended Soil
Size:	100 g	50 g
Product No.:	VHG-DS1-100G	VHG-SSD1A-50G
Element	**Nominal Conc.** (mg/kg)	**Nominal Conc.** (mg/kg)
Aluminum	2,730	15,300
Antimony	4,950	N/A
Arsenic	24.8	6.9
Barium	586	853
Beryllium	N/A	0.6
Cadmium	1.2	13.7
Calcium	5,430	119,000
Chromium, total	10.7	41.3
Cobalt	(2.7)	6.2
Copper	4,790	465
Iron	6,480	12,700
Lead	(144,742)	89
Magnesium	(2,367)	6,710
Manganese	174	172
Mercury	4.7	3.2
Molybdenum	N/A	14.2
Nickel	12.6	26

Table continues on next page

Soil Certified Reference Materials for multiple techniques

Table continued from previous page

Description:	Metals in Sandy Loam Soil	Metals in Sewage Amended Soil
Size:	100 g	50 g
Product No.:	VHG-DS1-100G	VHG-SSD1A-50G
Element	**Nominal Conc.** (mg/kg)	**Nominal Conc.** (mg/kg)
Phosphorus, total	N/A	(10,071)
Potassium	1,010	6,230
Selenium	N/A	19.9
Silver	6.5	36.3
Sodium	380	2,490
Tin	(304.1)	N/A
Vanadium	8.7	109
Zinc	546	625

Values in parentheses are not certified and are given for information only.

Metals in Sewage Sludge Certified Reference Materials

Description:	Metals in Sewage Sludge (amended)	Metals in Sewage Sludge (amended)
Size:	50 g	40 g
Product No:	VHG-SL1-50G	VHG-SL2-40G
Element	**Nominal Conc.** (mg/kg)	**Nominal Conc.** (mg/kg)
Aluminum	12,300	18,957
Antimony	3.1	195.6
Arsenic	32.9	170.6
Barium	1,020	1,288
Beryllium	4.4	70.2

Table continues on next page

Soil Certified Reference Materials for multiple techniques

Table continued from previous page

Description:	Metals in Sewage Sludge (amended)	Metals in Sewage Sludge (amended)
Size:	50 g	40 g
Product No:	VHG-SL1-50G	VHG-SL2-40G
Element	**Nominal Conc.** (mg/kg)	**Nominal Conc.** (mg/kg)
Boron	156	91
Cadmium	497	76
Calcium	48,000	44,759
Chromium, total	346	192
Cobalt	5.7	83.4
Copper	1,130	670
Iron	19,700	23,572
Lead	303	284
Magnesium	8,470	7,563
Manganese	379	408
Mercury	6.9	9.1
Molybdenum	18	69
Nickel	159	279
Phosphorus, total	2.2 wt%	2.01 wt%
Potassium	3170	4492
Selenium	27.3	307.6
Silicon	590	N/A
Silver	44	72
Sodium	1,630	1,717
Strontium	658	677
Thallium	N/A	111
Tin	N/A	218
Vanadium	40.5	297
Zinc	1,390	1,304

Soil Certified Reference Materials for multiple techniques

Metals in Clean Soil Reference Materials

Description:	Blank (Clean) Clay Loam Soil	Blank (Clean) Sandy Loam Soil
Size:	100 g	100 g
Product No.:	VHG-BLKSOIL1-100G	VHG-BLKSOIL2-100G
Element	**Nominal Conc.** (mg/kg except *)	**Nominal Conc.** (mg/kg except *)
Aluminum	3,540	11,033
Antimony	<1	<1
Arsenic	2	2
Barium	50	204
Beryllium	<0.2	0.7
Cadmium	<0.3	0.5
Calcium, soluble	20* (meq/L)	11* (meq/L)
Chromium	<1	9
Cobalt	<1	9
Copper	<1	10
Iron	3163	27,000
Lead	<2	17
Magnesium	228* (meq/L)	3* (meq/L)
Manganese	97	577
Mercury	0.03	0.3
Nickel	<1	8
Phosphorus, total	0.02* (%)	0.09* (%)
Potassium, soluble	5.7* (meq/L)	0.9* (meq/L)
Selenium	0.4	0.3
Silver	<0.5	<0.5
Sodium, soluble	39* (meq/L)	0.5* (meq/L)

Table continues on next page

Soil Certified Reference Materials for multiple techniques

Table continued from previous page

Description:	Blank (Clean) Clay Loam Soil	Blank (Clean) Sandy Loam Soil
Size:	100 g	100 g
Product No.:	VHG-BLKSOIL1-100G	VHG-BLKSOIL2-100G
Element	**Nominal Conc.** (mg/kg except *)	**Nominal Conc.** (mg/kg except *)
Thallium	<1	<1
Vanadium	16	17
Zinc	21	112

V-Flux™ High Purity Borate Fusion Fluxes for multiple techniques

Borate fusion is an effective method of preparing samples that either 1) due to inhomogeneity of particle size, density or composition are difficult to press as a homogeneous pellet for analysis by XRF, or 2) are difficult to dissolve in acid, for analysis by techniques such as AA.

Virtually all fusions are performed with borate compounds. Samples are mixed with a flux, and the mixture is heated until the flux disintegrates or solubilizes the sample, yielding a melt that is homogeneous at the atomic level and can be cast as a glass disc for analysis by XRF or dissolved in HNO3 or HCl for AA analysis

Key product features:

- High purity – 99.99+% (trace impurities certified on CoA)
- Homogeneous, free-flowing, dust-free, easy to handle
- Controlled high-density particle size – no crucible overflows
- Anhydrous, non-hygroscopic – faster weighing times
- Low loss on fusion – avoids correction, pre-firings
- Pre-fused fluxes feature uniform individual particle composition

Please inquire about additional products beyond the selection shown here.

TIP: Borate Fusion

Borate fusion is a useful preparation technique for samples such as cement, ceramics, glass, ores, oxides, refractories and rocks.

V-Flux™ High Purity Borate Fusion Fluxes for multiple techniques

Lithium Metaborate Fluxes (m.p. 845°C)

A basic flux recommended for acidic samples; soluble in water. Often used in testing of ceramics and steel. Will not dissolve highly basic refractories. Samples must be fully oxidized. For use with AA and ICP instrumentation.

Description	Product No.
100% Lithium metaborate	VHG-VFLUX-210-1KG

Lithium Metaborate : Lithium Tetraborate Blends (m.p. 840°C)

Intermediate acidity. Will dissolve entire aluminosilicate range. Often used in testing of ceramics and glass. Samples must be fully oxidized.

Description	Product No.
80% Lithium metaborate	VHG-VFLUX-20-80-G-1KG
20% Lithium tetraborate	
64.7% Lithium metaborate	VHG-VFLUX-35.3-64.7-G-1KG
35.3% Lithium tetraborate	

Lithium Tetraborate Fluxes (m.p. 920°C)

General purpose acidic fluxes for fusing aluminosilicates, basic oxides, carbonates, ceramics, cement, glass, rare earth oxides, refractories, soils, and steel. Not suitable for highly acidic samples. Samples must be fully oxidized.

Description	Product No.
100% Lithium tetraborate	VHG-VFLUX-LIT-G-1KG

Lithium Tetraborate : Lithium Carbonate : Lanthanum Oxide (m.p. 700°C)

A basic oxidizing flux. Suitable for sulfate, phosphate, and other acidic minerals. Will oxidize traces of reduced species. (Note: contains Lanthanum as a heavy absorber).
Please inquire for specific products.

V-Flux™ High Purity Borate Fusion Fluxes for multiple techniques

Lithium Tetraborate : Lithium Metaborate Fluxes (m.p. 875°C)

Intermediate activity flux. Suitable for aluminosilicates and calcareous refractories. Often used in testing of cement and steel. Samples must be fully oxidized. VFLUX-315 is suitable for glass samples and chrome ore bearing samples up to 50% by weight.

Description	Product No.
66% Lithium tetraborate	VHG-VFLUX-66-34-G-1KG
34% Lithium metaborate	
50% Lithium tetraborate	VHG-VFLUX-50-50-G-1KG
50% Lithium metaborate	

Lithium Tetraborate : Lanthanum Oxide Fluxes (m.p. 900°C)

Non-oxidizing, intermediate activity flux with Lanthanum as a heavy absorber. Often used in testing of steel and cement. Samples must be fully oxidized.

Description	Product No.
85% Lithium tetraborate	VHG-VFLUX-316-1KG
15% Lanthanum oxide	

Lithium Tetraborate : Lithium Fluoride Fluxes (m.p. 780°C)

A low viscosity, low melting, acidic flux. Suitable for fusion on gas burners. Often used in testing of petroleum samples. Samples must be fully oxidized.

Description	Product No.
90% Lithium tetraborate	VHG-VFLUX-318-1KG
10% Lithium fluoride	
80% Lithium tetraborate	VHG-VFLUX-319-1KG
20% Lithium fluoride	

Lead Paint Reference Materials for ICP-MS, AA & other techniques

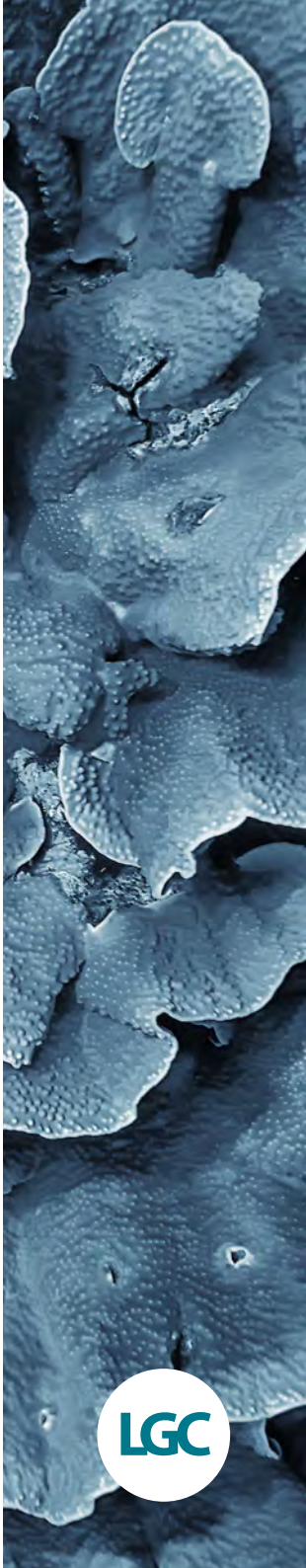
Environmental Lead

Description	Nominal Conc. Pb	Size	Product No.
Lead-Free Paint (Powdered)	<0.01 µg/g	20 g	VHG-PBFP-20G
Lead-Free Soil	<4 µg/g	50 g	VHG-PBFS-50G
Lead in Paint Chips	643 µg/g	50 g	VHG-PBPC-50G
Lead Paint in Soil	484 µg/g	50 g	VHG-PBPS-50G

VHG™

Section 3:

Instrument Consumables



#GoBeyondTheStandard

Contact us today: U.S. + Canada

Tel: +1 603.622.7660

Email: lgcusa@lgcgroup.com

*See page 179 for full list of LGC Country Sale Offices

LGC

Instrument Consumables — Overview

Section Contents:

Autosampler Cups & Tubes for AA, GFAA, ICP, ICP-MS, Viscometers

VHG™ autosampler tubes and vials are standard sizes and fit many manufacturers' autosamplers, including Cetac and Gilson as well as systems by PerkinElmer®, Agilent, Varian™, Unicam, TJA/Thermo Fisher Scientific® & others.

TIPS: Sample Tubes

You can cover sample tubes for trace metals with common polyolefin (kitchen) wrap instead of waxy stretch film that is sold as laboratory wrap. Common plastic wrap is generally cleaner and laboratory tissues may introduce contamination when used for wiping ICP-MS sipper probes.

Small Volume Sample Cups for AA, ICP and ICP-MS Autosamplers

Size	Material	Bottom	Product No.
9.1 x 23.6 mm (1.2 mL)	Clarified Polypropylene	Cylindrical	VHG-FAASC4-MP
13 x 25 mm (1.5 - 2.0 mL)	Clarified Polypropylene	Conical	VHG-FAASC3-MP

Sample Tubes for ICP, ICP-MS Autosamplers

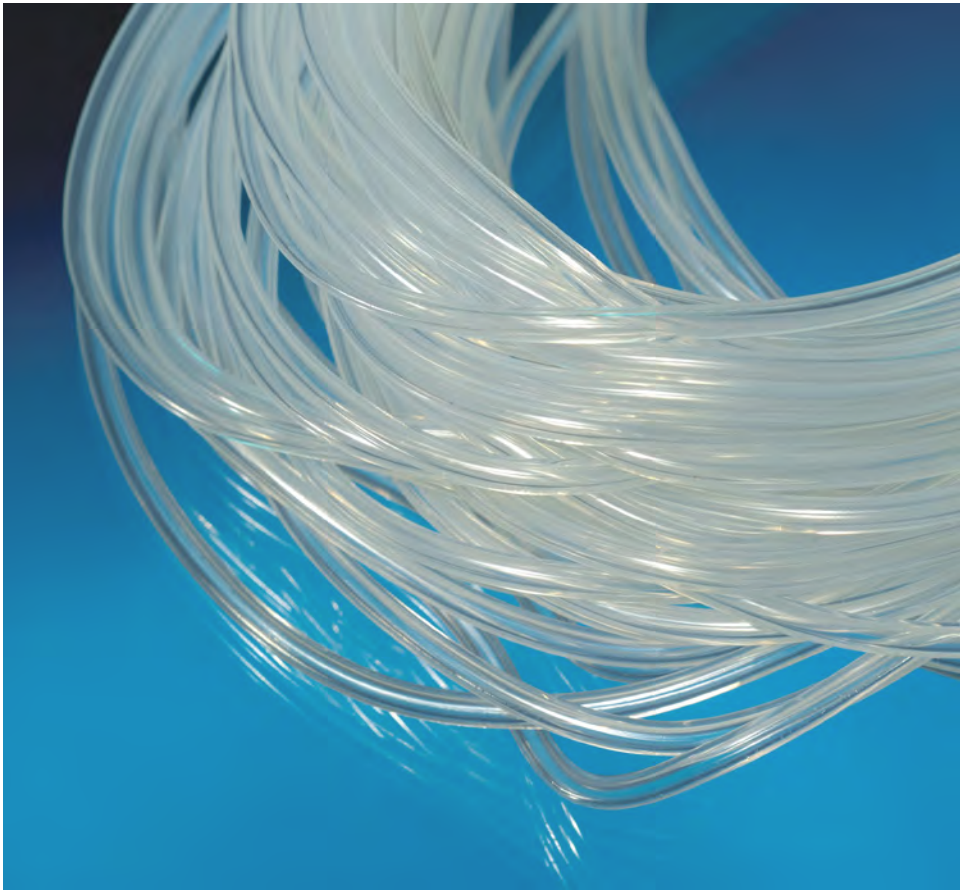
Size	Material	Bottom	Product No.
13 x 100 mm (~8 mL)	Polypropylene	Round	VHG-FPSC4-MP
17 x 100 mm (~15 mL)	Polypropylene	Round	VHG-FPSC1-MP
Plug for FPSC1-MP	Polyethylene	Round	VHG-FPSC1-MP-PLUG

Sample Tubes for Viscometer Autosamplers

Size	Material	Bottom	Product No.
2.3 x 6 cm (15 mL)	Polypropylene	Cylindrical	VHG-FVISC-MPA

Autosampler Cups & Tubes
for AA, GFAA, ICP, ICP-MS, Viscometers

Digestion Vials with Cap			
Size	**Material**	**Bottom**	**Product No.**
30 x 110 mm (50 mL) w/ cap	Polypropylene	Flat	VHG-FDIG1-MP



ICP & ICP-MS Consumables
Tubing for Peristaltic Pumps

Peri-Pump Tubing materials
Flexible PVC - Clear and economical, used in most ICP & ICP-MS work. Excellent chemical resistance, medical grade, FDA approved DMF 2458, meets U.S. Pharmacopoeia Class VI
Solvent Flex - Translucent yellow, used for most oil or organic solvent samples. Resistant to cracking, swelling, and hardening.
Silicone - Clear, peroxide-cured, suitable for high-purity applications. Contains no plasticizer, food grade, FDA approved, meets U.S. Pharmacopoeia Class VI
Viton™ - Black synthetic rubber, resistant to strong acids, bases and solvents.
Santoprene™ - Opaque beige to protect light-sensitive fluids. Very robust, long-lasting tubing, high chemical resistance, medical grade, FDA approved, meets U.S. Pharmacopoeia Class VI

Flaring Tool for Peri-Pump Tubing	
Description	**Product No.**
The ends of peristaltic pump tubing almost always need to be stretched to get a secure connection. Our flaring tool will work for all sizes, is rugged, and won't contaminate or corrode.	VHG-D180AWLP

For flared tubing, please inquire

"1 Bridge" Pump Tubing for Leeman Labs® ICP Spectrometers				
Description	**Material**	ID mm (in)	Leeman Product No.	Product No.
Sample Uptake	PVC	0.51 (0.020")	309-3551	VHG-D180217
Sample Uptake	Solvent Flex	0.51 (0.020")	309-3550	VHG-D180229
Sample Drain	PVC	1.14 (0.045")	309-3538	VHG-D180220
Sample Drain	Solvent Flex	1.14 (0.045")	309-3536	VHG-D180231

ICP & ICP-MS Consumables
Tubing for Peristaltic Pumps

"2 Bridge" Peri-Pump Tubing					
	Flexible PVC	Solvent Flex	Silicone	Viton™	Santoprene™
Quantity Per Pack	12	12	6	6	6
Length (in.)	17.9	17.9	17.9	6.9	15.7
No. of Bridges	2	2	2	2	2
Bridge Interval (in.)	5.9	5.5	5.5	5	5.9

Table continues on next page

ICP & ICP-MS Consumables
Tubing for Peristaltic Pumps

Table continued from previous page

"2 Bridge" Peri-Pump Tubing					
I.D. mm (in.) **Color**	Product No.	Product No.	Product No.	Product No.	Product No.
0.19 (.007") oran/red	VHG-D180241				
0.25 (.010") oran/blue	VHG-D180253		VHG-D180247		
0.38 (.015") oran/grn	VHG-D180261				
0.51 (.02") oran/yell	VHG-D180213	VHG-D180228		VHG-D180235	VHG-D180256
0.64 (.025") oran/white	VHG-D180222	VHG-D180230	VHG-D180263	VHG-D180239	
0.76 (.03") blk/blk	VHG-D180203	VHG-D180209	VHG-D180238	VHG-D180212	VHG-D180268
0.89 (.035") oran/oran	VHG-D180202	VHG-D180208	VHG-D180255	VHG-D180211	
1.02 (.04") white/white	VHG-D180219	VHG-D180232	VHG-D180267	VHG-D180236	
1.14 (.045") red/red	VHG-D180201	VHG-D180207	VHG-D180250	VHG-D180210	VHG-D180259
1.30 (.051") gray/gray	VHG-D180216	VHG-D180240	VHG-D180265	VHG-D180237	
1.52 (.06") yell/blue	VHG-D180258		VHG-D180248		
1.65 (.065") blue/blue	VHG-D180245				
3.18 (.125") blk/white	VHG-D180276				

ICP & ICP-MS Consumables
Tubing for Peristaltic Pumps

"3 Bridge" Peri-Pump Tubing					
	Flexible PVC	Solvent Flex	Silicone	Viton™	Santoprene™
Quantity Per Pack	12	12	6	6	6
Length (in.)	17.9	17	15.7	15.7	15.7
No. of Bridges	3	3	3	3	3
Bridge Interval (in.)	2.8	3.2	2.6	3.2	2.8
I.D. mm (in.) Color	Product No.	Product No.	Product No.	Product No.	Product No.
0.19 (0.007") oran/red	VHG-D180215				
0.38 (0.015") oran/grn	VHG-D180244				
0.64 (0.025") oran/white	VHG-D180254		VHG-D180264	VHG-D180266	
0.76 (0.03") blk/blk	VHG-D180218	VHG-D180279			VHG-D180270
0.89 (0.035") oran/oran	VHG-D180206	VHG-D180280	VHG-D180225	VHG-D180234	VHG-D180249
1.02 (0.04") white/white	VHG-D180214		VHG-D180257		VHG-D180271
1.14 (0.045") red/red	VHG-D180204	VHG-D180278	VHG-D180227	VHG-D180223	VHG-D180269
1.52 (0.06") yell/blue	VHG-D180221				VHG-D180242
3.18 (0.125") blk/white	VHG-D180277				

ICP & ICP-MS Consumables
Mixing Tees for Sample Introduction

The use of a mixing tee to automatically combine two liquid streams, such as the sample and the internal standard, is gaining widespread popularity.

VHG™ carries two types of tees: a simple plastic barbed tee, and a 100% PTFE system. Both feature inert materials and low dead volume. If you have been considering an expensive auto-dilutor for your ICP or ICP-MS, try a simple mixing tee first – you may find that you don't need the expense or hassle.

Plastic Barbed Mixing Tee (TJA Type)

The plastic barbed mixing tee is ideal for many ICP and ICP-MS applications. Flexible PVC uptake tubing is used for each leg. A zero dead-space connector combines the liquid streams and a PTFE tube mixes and then delivers the combined solutions to the nebulizer.

Product No.	VHG-D180243
TJA Type	**Color Code**	**PTFE Exit**
"Leg" 1	orange/orange	0.56mm
"Leg" 2	orange/green	0.38mm

ICP & ICP-MS Consumables
Mixing Tees for Sample Introduction

PTFE Mixing Tee System

Suggested Use #1: Adding an internal standard: When an internal standard is teed into the sample stream, the analyst is spared the labor of having to add it to each sample. In addition, dilution takes place (see *table below*). This is an advantage as many samples require a set, consistent dilution.

Suggested Use #2: Online dilution: If you use a standard nebulizer with an approximate 1 mL/min liquid flow, you can create a 1:1 dilution by using two orange/orange legs. Greater or lesser dilutions can be achieved as desired (see *chart below*). The VHG™ 100% PTFE mixing tee system is made from the best components, is completely configurable, has color-coded ends, and is designed to last for years. Examples shown below, call us to configure your set.

Product No. (PTFE Tee Only)*					VHG-D180TEE
	Sample diln. achieved	**Nebulizer liquid flow**	**Peri Tube Leg #1**	**Peri Tube Leg #2**	**PTFE Tube Leg #3**
1	Large dilution (1:20)	0.7 - 1.0	orange/red diluted about 1:20 (95%)	orange/orange diluted about 5%	(0.7 mm ID) combined solutions
2	0.045138889	0.7 - 1.0	orange/orange diluted about 20%	orange/green diluted about 80%	(0.7 mm ID) combined solutions
3	0.042361111	0.7 - 1.0	black/black diluted about 50%	black/black diluted about 50%	(0.7 mm ID) combined solutions

**Pump tubing must be ordered separately*

ICP & ICP-MS Consumables
Nebulizers

All nebulizers are available with sample and argon quick connection. Please inquire.

Quartz replacement nebulizers are available upon request.

Key product features:

- Extensive line of high-quality nebulizers
- Designed to meet or exceed original specifications
- Direct replacement items and upgrade potential

TIPS: Nebulizers

We do not recommend ultrasonic cleaning of nebulizers.

ICP & ICP-MS Consumables
Nebulizers

Replacement Nebulizers

Concentric Type Glass Nebulizers			
Description	**Liquid flow** (mL/min)	**Argon back pressure** (psi)	**Product No.**
A-Type, 1.0 Lpm Ar	1	30	VHG-GNB-75
A-Type, 1.0 Lpm Ar	2	30	VHG-GNB-76
A-Type, 1.0 Lpm Ar	3	30	VHG-GNB-77
C-Type, 1.0 Lpm Ar	1	30	VHG-GNB-70
C-Type, 1.0 Lpm Ar	2	30	VHG-GNB-71
C-Type, 1.0 Lpm Ar	3	30	VHG-GNB-72
K-Type, 0.7 Lpm Ar	3	30	VHG-GNB-80
K-Type, 0.7 Lpm Ar	2	30	VHG-GNB-82
Aerosalt - High Solids, 0.7 Lpm Ar Quick Disconnect, Argon Connect	2	30	VHG-GNB-65QDAC

All nebulizers are available with sample and argon quick connection - please inquire.
Quartz replacement nebulizers are available upon request

Cross-Flow (CF) or V-Groove Nebulizers		
Description	**Specifications**	**Product No.**
Fixed CF	High Flow (Agilent®/HP)	VHG-GNB-94
Fixed CF	Fits 34 mm Spray Chamber	VHG-GNB-92S
Fixed CF	Fits 35 mm Spray Chamber	VHG-GNB-92
Fixed CF	High Solids (Agilent®/HP)	VHG-GNB-93
V-Groove	Noordermeer MDSN, Quick Disconnect, Argon Connect	VHG-GNB-10QDAC

ICP & ICP-MS Consumables
Nebulizers

Burgener Enhanced Parallel Path Nebulizers

All Burgener Nebulizers have excellent stability and sensitivity, and fit standard spray chambers as direct replacements of glass concentrics. Burgener Nebulizers have no natural aspiration and must have the sample pumped to the nebulizer.

Name	Compare to Mfg. No.	Nebulizer Description	VHG Part No.
T2100	T2100	High solids, inert wide bore (750 µm) Teflon™ nebulizer. Designed to replace T2002 and BTN. Ideal for samples with large undissolved particulates - virtually unpluggable. Liquid flow 0.5 mL/min to 3.0 mL/min. Operates on standard pressures of 30-45 psi.	VHG-T2100
PEEK Mira Mist®	PMM4000	Standard flow, inert *PEEK® nebulizer. Teflon™ sample and gas capillaries, *PEEK® body. Suitable for most samples, excluding concentrated acids, strong bases or some organic solvents. Tolerates high salts and undissolved particulates. Liquid flow 0.2 mL/min to 2.5 mL/min. pressure of 45 psi. Operates on standard gas.	VHG-PMM4000
Teflon™ Mira Mist	TMM3500	Standard flow, inert Teflon™ nebulizer. Teflon™ capillaries and body. Best choice for aggressive samples such as concentrated acids. Tolerates high salts and undissolved particulates. Liquid flow 0.2 mL/min to 2.5 mL/min. Operates on standard gas pressures of 35-45 psi.	VHG-TMM3500
Ari Mist	AM5000	Low flow, inert *PEEK® nebulizer. Teflon™ sample and gas capillaries. Designed for particulate-free samples. Black *PEEK® body. Liquid flow 0.050 mL/min to 1.0 mL/min. Operates at standard gas pressures of 40-50 psi.	VHG-AM5000
Ari Mist HP	AMHP5500	Ultra-low flow, inert *PEEK® nebulizer. Teflon™ sample and gas capillaries. Brown *PEEK® body designed for particulate-free samples. Liquid flow 0.005 mL/min to 1.0 mL/min. Operates at higher gas pressure (80 psi). Excellent for LC/ICP/ICP-MS.	VHG-AMHP5500

**PEEK® Polymer: Polyether Ether Ketone. Please supply the name and model number of the instrument, so that the nebulizer will be supplied with correct fittings for the instrument's gas line.*

ICP & ICP-MS Consumables
Torches, Accessories & Spray-Chambers

To avoid downtime, it is good to keep spare items of all instrument glassware. Even though intact, torches with white, metallic-looking or brownish surface discolorations may ignite with greater difficulty.

PerkinElmer® ICP-OES Supplies

Suitable for Optima® 3000 Series Radial		
ICP Torch and Torch Accessories	**Compare to Mfg. No.**	**Product No.**
Torch Body, Optima®, Radial	N069-0568	VHG-GPE1-04
Torch Bonnet, Flat Edge (Optima® post 9/94)	N069-5456	VHG-GPE1-13
Quartz Injector, 1.2 mm	N068-1631	VHG-GPE2-33
Spray Chambers		
Cyclonic Spray Chamber, Optima®		VHG-GPE0-19
Spray Chambers		
Cyclonic Spray Chamber, Optima®		VHG-GPE0-19

Suitable for Optima® 3000XL & SC(X)		
ICP Torch and Torch Accessories	**Compare to Mfg. No.**	**Product No.**
Torch Body, Optima XL	N069-5379	VHG-GPE1-11
Quartz Injector, 2.0 mm	N069-5442	VHG-GPE2-41
Alumina Injector, 2.0 mm	N069-5362	VHG-GPE2-50
Torch Bonnet	N069-1664	VHG-GPE1-15

ICP & ICP-MS Consumables
Torches, Accessories & Spray-Chambers

Suitable for Optima® 3000 Series DV		
ICP Torch and Torch Accessories	**Compare to Mfg. No.**	**Product No.**
Torch Body, Optima® DV, 1 Slot	N069-1662	VHG-GPE1-14
Torch Bonnet	N069-1664	VHG-GPE1-15
Purge Tube Window, Radial, Short	N069-0672	VHG-GPE2-73
Quartz Injector, 2.0 mm	N069-5442	VHG-GPE2-41
Alumina Injector, 2.0 mm	N069-5362	VHG-GPE2-50
Spray Chambers and Nebulizers		
Cyclonic Spray Chamber	N812-2188	VHG-GPE0-18DV
C-Type Concentric Nebulizer, 1 Lpm Ar, 50 psi, 1 mL/min	0047-2022	VHG-GNB-70P
K-Type Concentric Nebulizer, 0.7 Lpm Ar, 30 psi, 3 mL/min	N068-1574	VHG-GNB-80

Suitable for Optima® 3000 Series DV		
ICP Torch and Torch Accessories	**Compare to Mfg. No.**	**Product No.**
Torch Body, Optima® 2000/4000/5000/7000DV, 1 Slot	N077-0338	VHG-GPE1-16
Torch Body, Optima® 4300V/5300V	N077-1500	VHG-GPE1-17A
Torch Body, Optima® 4300V/5300V/7300V, Wear Metals, 3 Slot	N077-1561	VHG-GPE1-17W
Glass Expansion Demountable Ceramic Torch, Optima® 4300V/5300V/7300V	N077-7052	VHG-31-808-2815
Torch Bonnet	N077-5289	VHG-GPE1-25
Alumina Injector, 2.0 mm	N077-5177	VHG-GPE1-42
Alumina Injector, 1.2 mm, Optima® 4300V/5300V	N077-1531	VHG-GPE2-54
Quartz Injector, 1.2 mm	N077-5226	VHG-GPE2-77
Axial Purge Window, Optima® 2000DV	0999-2731	VHG-GPE2-65
Axial Purge Window, Optima® 4000/5000/7000DV	N077-1116	VHG-GPE2-67
Radial Purge Window, Optima® 4000/5000/7000DV	N077-0322	VHG-GPE2-80

Table continues on next page

ICP & ICP-MS Consumables
Torches, Accessories & Spray-Chambers

Table continued from previous page

Suitable for Optima® 3000 Series DV		
ICP Torch and Torch Accessories	**Compare to Mfg. No.**	**Product No.**
Purge Tube Window, Radial, Short, Optima® 2000DV	N069-0672	VHG-GPE2-73
Quartz Injector, 2.0 mm	N077-5014	VHG-GPE2-74
Spray Chambers and Nebulizers		
Cyclonic Spray Chamber, no Baffle, with Neb Adapter	N077-6052	VHG-GPE0-29
Cyclonic Spray Chamber, Baffled, with Neb Adapter	N077-6053	VHG-GPE0-30
C-Type Concentric Nebulizer, 1 Lpm Ar, 50 psi, 1 mL/min	0047-2022	VHG-GNB-70P
K-Type Concentric Nebulizer, 0.7 Lpm Ar, 30 psi, 3 mL/min	N068-1574	VHG-GNB-80

Thermo Fisher Scientific (TJA) ICP-OES Supplies

Suitable for 61E, Iris Advantage, Intrepid Radial, 61E Trace, Iris AP, Intrepid		
ICP Torch and Torch Accessories	**Compare to Mfg. No.**	**Product No.**
Ceramic Base Torch, High Flow w/ 1.5 mm Injector	126432-01	VHG-GTJA5-07
Ceramic Base Torch, Trace, with 1.5 mm Injector	126432-03	VHG-GTJA5-10
Ceramic Base Torch, DV, with 1.5 mm Injector		VHG-GTJA5-10DV
Duo Torch Sleeve and Seal Kit	138563-00	VHG-GTJA0-26
Quartz Injector, 1.5 mm	125407-00	VHG-GTJA0-41
Spray Chambers and Nebulizers		
Cyclonic Spray Chamber, Axial, Pump	139662-00	VHG-GTJA5-13
Cyclonic Spray Chamber, Radial, Pump	139663-00	VHG-GTJA5-14
V-Groove Nebulizer, Noordermeer MDSN, Quick Disconnect, Argon Connect	N/A	VHG-GNB-10QDAC
Meinhard K-Type Glass Concentric Nebulizer, 30 psi, 2 mL/min	139600-00	VHG-TR-30-K2
Glass Expansion Conikal Nebulizer, 0.7 Lpm Ar, 30 psi, 2 mL/min	139184-00	VHG-AR30-07-FC2E

ICP & ICP-MS Consumables
Torches, Accessories & Spray-Chambers

Spectro® ICP-OES Supplies

Suitable for Spectroflame and Ciros		
ICP Torch and Torch Accessories	**Compare to Mfg. No.**	**Product No.**
EOP Flared End Torch, with 2.5 mm injector	48105052	VHG-GSP-40
Demountable EOP Torch	48206007	VHG-GSP-42
Torch, Fixed, Spectroflame, 1.8 mm, Standard		VHG-GSP-05
Torch, Fixed, Spectroflame, 1.8 mm, Standard with Fittings	75060596	VHG-GSP-05F
Demountable Torch, Spectroflame	48206002	VHG-GSP-06
Spray Chambers and Nebulizers		
Cyclonic Spray Chamber for Modified Lichte	48105061	VHG-GSP-27
Modified Lichte MDSN Nebulizer, 1 Lpm Ar	48205036	VHG-GNB-20S
C-Type Concentric Nebulizer, 1 Lpm Ar, 30 psi, 1 mL/min	76060510	VHG-GNB-70
Meinhard C-Type Glass Concentric Nebulizer, 30 psi, 1 mL/min	76060510	VHG-TR-30-C1

HORIBA Jobin Yvon ICP-OES Supplies

Suitable for HORIBA Jorbin Yvon		
ICP Torch and Torch Accessories	**Compare to Mfg. No.**	**Product No.**
Demountable Torch Assembly, Complete	21.356.110	VHG-GISA-40
Outer Quartz Tube, 71 mm, Radial	31.023.722	VHG-GISA-50
Outer Quartz Tube, Axial	31.031.099	VHG-GISA-70
Inner Quartz Tube	31.023.723	VHG-GISA-52
PTFE Centering Ring	31.023.724	VHG-GISA-53
PTFE Insert	31.021.730	VHG-GISA-55

Table continues on next page

ICP & ICP-MS Consumables
Torches, Accessories & Spray-Chambers

Table continued from previous page

Suitable for HORIBA Jorbin Yvon		
ICP Torch and Torch Accessories	**Compare to Mfg. No.**	**Product No.**
Alumina Injector	31.021.589	VHG-GISA-58
Alumina Injector and Teflon Insert	21.356.130	VHG-GISA-61
Spray Chambers and Nebulizers		
Cyclonic Spray Chamber, 4 mm Drain	31.031.279	VHG-GISA-15
C-Type Concentric Nebulizer, 1 Lpm Ar, 50 psi, 1 mL/min	47.929.001	VHG-GNB-70P
Meinhard C-Type Concentric Glass Nebulizer, 50 psi, 1 mL/min	47.929.001	VHG-TR-50-C1
Meinhard K-Type Concentric Glass Nebulizer, 30 psi, 3 mL/min	47.929.005	VHG-TR-30-K3

Leeman Labs ICP-OES Supplies

Suitable for Leeman Labs ICP-OES		
ICP Torch and Torch Accessories	**Compare to Mfg. No.**	**Product No.**
1 Piece Torch with Ball Joint, Aqueous	120-3748	VHG-GLMN-20
1 Piece Torch with Ball Joint, Organics	120-3749	VHG-GLMN-22
Demountable Torch	318-0001	VHG-GLMN-43
Spray Chambers and Nebulizers		
Spray Chamber, Scott, Radial	120-3751	VHG-GLMN-25
C-Type Concentric Nebulizer, 1 Lpm Ar, 30 psi, 3 mL/min	N/A	VHG-GNB-72
Glass Expansion Conikal Nebulizer with EzyFit & EzyLok 30 psi, 2 mL/min	318-00078	VHG-AR30-1-FC2E

ICP & ICP-MS Consumables
Torches, Accessories & Spray-Chambers

Varian™ ICP-OES Supplies

Suitable for 700-ES Series, Liberty Radial, Vista Axial		
ICP Torch and Torch Accessories	**Compare to Mfg. No.**	**Product No.**
Low Flow Torch, One Piece, Radial	20-100696-90	VHG-GVA-05
Torch Bonnet	20-100707-00	VHG-GVA-25
Low Flow Torch, One Piece, Axial, 90° Bend	20-100904-00	VHG-GVA-12
Spray Chambers and Nebulizers		
Cyclonic Spray Chamber, 8 mm Top, 4 mm Drain	20-100817-00	VHG-GVA-21
Noordermeer V-Groove MDSN Nebulizer		VHG-GNB-10
Aerosalt - High Solids Nebulizer, 0.7 Lpm Ar, 30 psi, 2 mL/min, Quick Disconnect, Argon Connect	20-100964-00	VHG-GNB-65QDAC
C-Type Concentric Nebulizer, 1 Lpm Ar, 30 psi, 1 mL/min	20-100765-00	VHG-GNB-70
K-Type, High Flow Concentric Nebulizer	20-100816-00	VHG-GNB-85
Meinhard C-Type Glass Concentric Nebulizer, 30 psi, 2 mL/min	20-100765-00	VHG-TR-30-C2
Glass Expansion Conikal Nebulizer, 0.7 Lpm Ar, 30 psi, 3 mL/min	N/A	VHG-AR30-07-FC3E

ICP & ICP-MS Consumables
Torches, Accessories & Spray-Chambers

The injector tip of the ICP-MS torch can be a source of "background," especially in Na, K, Li, and B. In some cases, operating with higher nebulizer and/or auxiliary argon flow can reduce this.

Agilent® (Hewlett Packard) ICP-MS Supplies for 4500, 7500 & 7700

Suitable for 4500, 7500 & 7700		
ICP-MS Torch and Torch Accessories	**Compare to Mfg. No.**	**Product No.**
Standard Torch, 2.5 mm Injector (Agilent® 7500), 2 Projections, HMI Compatible	G3270-80043	VHG-GHP-01
Quartz Bonnet (Agilent® 7500)	G1833-65421	VHG-GHP-25
One Piece Torch, 2.5 mm Injector (Agilent® 7700)	G3280-80001	VHG-GHP-51
One Piece Torch, 1.5 mm Injector (Agilent® 7700)	G3280-80004	VHG-GHP-54
One Piece Torch, 1.0 mm Injector (Agilent® 7700)	G3280-80005	VHG-GHP-55
Spray Chambers and Nebulizers		
Scott Chamber, Inner/Outer Tube Flush, Drain & Exit 90°, Quartz (HP 4500, Agilent® 7500)	G1820-65337	VHG-GHP-13
C-Type Concentric Nebulizer, 1 Lpm Ar, 30 psi, 1 mL/min	N/A	VHG-GNB-70
Meinhard A-Type Concentric Quartz Nebulizer, 30 psi, 2 mL/min	G1820-65138	VHG-TQ-30-A2
Glass Expansion MicroMist Nebulizer, 1 Lpm Ar 35 psi, 0.4 mL/min	N/A	VHG-AR35-1-FM04EX

ICP & ICP-MS Consumables
Torches, Accessories & Spray-Chambers

Varian™ ICP-MS Supplies

Suitable for 800-MS Series		
ICP-MS Torch and Torch Accessories	**Compare to Mfg. No.**	**Product No.**
Torch with Placement Posts	20-101007-00	VHG-GVA-34
Sheath Bypass	20-101008-00	VHG-GVA-31
Sheath Gas Port	20-101009-00	VHG-GVA-32
Spray Chambers and Nebulizers		
ICP-MS Spray Chamber	20-101010-00	VHG-GVA-33
C-Type Concentric Nebulizer, 1 Lpm Ar, 30 psi, 1 mL/min	20-100765-00	VHG-GNB-70
Glass Expansion Conikal Nebulizer with EzyFit & EzyLock, 1 Lpm Ar, 30 psi, 2 mL/min	N/A	VHG-AR30-1-FC2E

PerkinElmer SCIEX™ ICP-MS Supplies

Suitable for Elan 5000/6X00/9000/DRC II		
ICP-MS Torch and Torch Accessories	**Compare to Mfg. No.**	**Product No.**
Torch Body, Elan	N812-2006	VHG-GSC4-10
Quartz Injector, 2.0 mm	N812-5029	VHG-GSC2-35
Quartz Injector, 2.0 mm, 6100 DRC & DRC II	WE02-3948	VHG-GSC4-30
Spray Chambers and Nebulizers		
Cyclonic Spray Chamber	N812-0150	VHG-GSC3-19MS
Cyclonic Spray Chamber, 6100 DRC, Quartz	WE02-5221	VHG-GSC4-20
Meinhard A-Type Quartz Concentric Nebulizer, 30 psi, 3 mL/min	WE02-4371	VHG-TQ-30-A3

ICP & ICP-MS Consumables
Torches, Accessories & Spray-Chambers

Thermo Fisher Scientific® (VG) ICP-MS Supplies

Suitable for Axiom, PlasmaQuad 1,2,3 & PQ ExCell		
ICP-MS Torch and Torch Accessories	**Compare to Mfg. No.**	**Product No.**
Torch, 1.5 mm	3201192	VHG-GVG-05
Torch Bonnet	N/A	VHG-GVG-25
Torch Bonnet Cap	1200274	VHG-GVG-26
Torch Bonnet, 72 mm	3204703	VHG-GVG-28
Spray Chambers and Nebulizers		
Conical Spray Chamber w/ Impact Bead, Quartz	3600170	VHG-GVG-13
Scott Spray Chamber, Water-Cooled, Quartz	3200841	VHG-GVG-16
C-Type Concentric Nebulizer, 1 Lpm Ar, 30 psi, 1 mL/min	1040894	VHG-GNB-70
Glass Expansion Conikal Nebulizer, 1 Lpm Ar, 35 psi, 1 mL/min	1201318	VHG-AR35-1-FC1ET
Glass Expansion MicroMist Nebulizer, 1 Lpm Ar, 35 psi, 0.4 mL/min	1201831	VHG-AR35-1-FM04E

ICP & ICP-MS Consumables
ICP-MS Cones

SPECTRON cones are the world's best quality, most precisely engineered ICP-MS cones and we are proud to be a supplier. These cones are either identical to OEM cones, or else meet and exceed OEM specifications.

PerkinElmer® SCIEX™ ICP-MS Cones & Accessories

Suitable For 5000, 6000, 6100, 9000, DRC Series Instruments		
Cone	**Compare to Mfg. No.**	**Product No.**
Nickel Sampler (6000, 6100, 9000)	WE02-1140	VHG-CSC2011-NI
Platinum Sampler (6000, 6100, 9000)	WE02-7802	VHG-CSC2013-PT
eSPEC Platinum Sampler (6000, 6100, 9000)	WE02-7802	VHG-CSC2013-Pte
Nickel Skimmer (6000, 6100, 9000)	WE02-1137	VHG-CSC2012-NI
Platinum Skimmer (6000, 6100, 9000)	WE02-7803	VHG-CSC2014-PT
eSPEC Platinum Skimmer (6000, 6100, 9000)	WE02-7803	VHG-CSC2014-PTe

Thermo Fisher Scientific (VG, Finnigan) ICP-MS Cones & Accessories

Suitable For VG X-Series, PlasmaQuad, Axiom, PQ ExCell, Genesis® and Finnigan Element, Element 2, Neptune Series Instruments		
Cone	**Compare to Mfg. No.**	**Product No.**
Nickel Sampler, 100% Ni (VG X-Series)	3600812	VHG-CVG1021-NI
Nickel Sampler, Cu Core (VG X-Series)	3600812	VHG-CVG1021-NI/CU
Nickel Sampler (all VG models except X-Series)	3004661	VHG-CVG1001-NI
Platinum (15.2 mm Pt insert) Sampler (all VG models except X-Series)	3601289	VHG-CVG1006A-PT
Nickel Skimmer (VG X-Series)	3600811	VHG-CVG1022-NI
Nickel Micro-Skimmer (all VG models except X-Series)	3200860	VHG-CVG1004-NI

Table continues on next page

ICP & ICP-MS Consumables
ICP-MS Cones

Table continued from previous page

Suitable For VG X-Series, PlasmaQuad, Axiom, PQ ExCell, Genesis® and Finnigan Element, Element 2, Neptune Series Instruments		
Cone	**Compare to Mfg. No.**	**Product No.**
Platinum diameter is stated Platinum Skimmer	N/A	VHG-CVG1028-PT
Nickel Sampler, Cu Core (Element, Element 2, Neptune)	1044520	VHG-CT1001-NI/CU
eSPEC Platinum (7.62 mm Pt insert) Sampler (Element, Element 2, Neptune)	1067500	VHG-CT1006-PTe
Nickel Skimmer (Element, Element 2, Neptune)	1067600	VHG-CT1002A-NI
Platinum Skimmer, Ni base (Element, Element 2, Neptune)	1047510	VHG-CT1007-PT
Platinum Guard Electrode (Element, Element 2, Neptune)	1126640	VHG-CT5004

VHG™ ICP-MS Maintenance Kit

The VHG™ Maintenance Kit is designed to provide the ICP-MS analyst with the essential tools for cleaning and restoring cones to their “as-new” performance.

Our maintenance kit is suitable for any brand or type of ICP-MS cone.

Kit Components	Product No.
Diamond abrasive paste compound, diamond abrasive lapping paper, alumina abrasive powder, “cleanroom” quality polyester cloths, polyester polishing felt, wood-stick cotton swabs, pointed-tip plastic foam swabs, magnifier lens	VHG-CVHG-MNTKIT1

AA & GFAA Consumables
Tubes & Parts

All tubes are pyrolytic graphite-coated unless otherwise stated. For other GFAA tubes and parts, please inquire.

GBC	Description	Compare to Mfg. No.	Product No.
Graphite Tube	Pre-Inserted Omega Platform	N/A	VHG-FGBC25
Graphite Tube	Non-Platform	99-0059-00	VHG-FGBC59
Platform	Solid Pyro Graphite (for FGBC59)	99-0060-00	VHG-FGBC60
Graphite Shroud	GF 3000	45-0004-00	VHG-FGBC04

Hitachi	Description	Compare to Mfg. No.	Product No.
Graphite Cuvette	Pre-Inserted Forked Platform	N/A	VHG-FHIT55
Contact Rings	Set of 2, AD 20 mm	180-7401	VHG-FHIT01

PerkinElmer®	Description	Compare to Mfg. No.	Product No.
Graphite Tube	Pre-Inserted Platform	B011-2660	VHG-FPE93
Graphite Tube	Pre-Inserted Forked Platform	B050-5057	VHG-FPE57
Graphite Tube	Std Tube for L'Vov Platform	B012-1092, B010-9322	VHG-FPE92
L'Vov Platform	Solid Pyro Graphite (for FPE92)	B012-1091, B010-9324	VHG-FPE91
Graphite Tube	Non-Platform	B013-5653, B009-1504	VHG-FPE53
Graphite Tube	Non-Platform, Uncoated	B007-0699	VHG-FPE99
Zeeman Contact Set	Set of 2	B011-6823	VHG-FPE61
HGA Contact Set	Set of 2, with Sensor Hole	B012-8490	VHG-FPE63

AA & GFAA Consumables
Tubes & Parts

Thermo Fisher Scientific Unicam/ATI	Description	Compare to Mfg. No.	Product No.
Graphite Cuvette	ELC Type	9423 393 95041	VHG-FATI41
Graphite Cuvette	Omega Platform	9423 490 20101	VHG-FATI20101
Graphite Cuvette	Ridged	9423 393 95071	VHG-FATI71
Graphite Cuvette	Ridged, Uncoated	9423 393 95031	VHG-FATI31
Graphite Cuvette	Standard, Unridged	9423 393 95091	VHG-FATI95091

Varian™	Description	Compare to Mfg. No.	Product No.
Graphite Tube	Pre-Inserted Omega Platform	N/A	VHG-FVAR37
Graphite Tube	Partitioned Type	63-100012-00	VHG-FVAR12
Graphite Tube	Plateau Type	63-100011-00	VHG-FVAR11
Bone Platform	Solid Pyro Graphite	63-100013-00	VHG-FVAR13
Zeeman Electrodes	Set of 2	63-100017-00	VHG-FVAR17

AA & GFAA Consumables
Hydride & Mercury Cold Vapor Quartzware

VHG™ provides quartz components for commercial hydride generators that are guaranteed to meet your application. These are direct match components.

For pricing on quartz cells not listed here, please inquire.

PerkinElmer® Quartz Components

Description	Material	Compare to Mfg. No.	Product No.
Cell for MHS-10™ (no rings or sleeves incl.)	Pure Quartz	B009-4415	VHG-GPEQC55
Cell for MHS-20™ (with UV windows)	Pure Quartz	B009-7693	VHG-GPEQC65

Varian™ Quartz Components

Description	Material	Compare to Mfg. No.	Product No.
Mercury Flow Through Cell (VGA-76/77™)	Pure Quartz	99-100407-00	VHG-GVARQC30
Hydride Absorption Cell (VGA-76/77™)	Pure Quartz	99-100400-00	VHG-GVARQC35
Gas/Liquid Separator (VGA-76™)	Pure Quartz	99-100402-00	VHG-GVARQC40
Gas/Liquid Separator (VGA-77™)	Pure Quartz	99-100711-00	VHG-GVARQC65
Atom Concentrator Tube (ACT-80™)	Pure Quartz	99-100544-00	VHG-GVARQC60

AA & GFAA Consumables
Hollow Cathode Lamps

These hollow cathode lamps offer the most advanced, pure cathode materials and inert fill gas. Featuring fast warm-up times, high output, good stability, low noise, and a five-year shelf life, this line provides the highest available quality.

Single Element Hollow Cathode Lamps

	1.5" Diam., 2-pin, Non-Coded (GBC, Hitachi, Shimadzu, Thermo, Varian™)	2.0" Diam., 9-pin, Non-Coded (older PerkinElmer® instrumentation)	2.0" Diam., 4-pin, Cableless (PerkinElmer® AAnalyst* – timer excluded)
Element	**Product. No.**	**Product. No.**	**Product. No.**
Aluminum	VHG-LAL	VHG-LPEAL	VHG-LPE4AL
Antimony	VHG-LSB	VHG-LPESB	VHG-LPE4SB
Arsenic	VHG-LAS	VHG-LPEAS	VHG-LPE4AS
Barium	VHG-LBA	VHG-LPEBA	VHG-LPE4BA
Beryllium	VHG-LBE	VHG-LPEBE	VHG-LPE4BE
Bismuth	VHG-LBI	VHG-LPEBI	VHG-LPE4BI
Boron	VHG-LB	VHG-LPEB	VHG-LPE4B
Cadmium	VHG-LCD	VHG-LPECD	VHG-LPE4CD
Calcium	VHG-LCA	VHG-LPECA	VHG-LPE4CA
Chromium	VHG-LCR	VHG-LPECR	VHG-LPE4CR
Cobalt	VHG-LCO	VHG-LPECO	VHG-LPE4CO
Copper	VHG-LCU	VHG-LPECU	VHG-LPE4CU
Gold	VHG-LAU	VHG-LPEAU	VHG-LPE4AU
Iron	VHG-LFE	VHG-LPEFE	VHG-LPE4FE
Lead	VHG-LPB	VHG-LPEPB	VHG-LPE4PB
Lithium	VHG-LLI	VHG-LPELI	VHG-LPE4LI
Magnesium	VHG-LMG	VHG-LPEMG	VHG-LPE4MG
Manganese	VHG-LMN	VHG-LPEMN	VHG-LPE4MN
Mercury	VHG-LHG	VHG-LPEHG	VHG-LPE4HG

Table continues on next page

AA & GFAA Consumables
Hollow Cathode Lamps

Table continued from previous page

	1.5" Diam., 2-pin, Non-Coded (GBC, Hitachi, Shimadzu, Thermo, Varian™)	2.0" Diam., 9-pin, Non-Coded (older PerkinElmer® instrumentation)	2.0" Diam., 4-pin, Cableless (PerkinElmer® AAnalyst* – timer excluded)
Element	**Product. No.**	**Product. No.**	**Product. No.**
Molybdenum	VHG-LMO	VHG-LPEMO	VHG-LPE4MO
Nickel	VHG-LNI	VHG-LPENI	VHG-LPE4NI
Palladium	VHG-LPD	VHG-LPEPD	VHG-LPE4PD
Platinum	VHG-LPT	VHG-LPEPT	VHG-LPE4PT
Potassium	VHG-LK	VHG-LPEK	VHG-LPE4K
Selenium	VHG-LSE	VHG-LPESE	VHG-LPE4SE
Silicon	VHG-LSI	VHG-LPESI	VHG-LPE4SI
Silver	VHG-LAG	VHG-LPEAG	VHG-LPE4AG
Sodium	VHG-LNA	VHG-LPENA	VHG-LPE4NA
Strontium	VHG-LSR	VHG-LPESR	VHG-LPE4SR
Thallium	VHG-LTL	VHG-LPETL	VHG-LPE4TL
Tin	VHG-LSN	VHG-LPESN	VHG-LPE4SN
Titanium	VHG-LTI	VHG-LEPTI	VHG-LPE4TI
Vanadium	VHG-LV	VHG-LPEV	VHG-LPE4V
Zinc	VHG-LZN	VHG-LPEZN	VHG-LPE4ZN

**Timers are no longer supplied with PerkinElmer® 4-pin lamps. If you require timers, please order LTIMER with each lamp.*

Timer for 2.0" Diameter, 4-pin, Cableless Lamp for PerkinElmer® AAnalyst		
Description	**Instrument**	**Product No.**
10,000 mA/hour Timer	LPE4xx Series Lamps	VHG-LTIMER

AA & GFAA Consumables
Hollow Cathode Lamps

Multi-Element Hollow Cathode Lamps*

Type of Lamp & Instr. Fitted:	1.5" Diam., 2-pin, Non-Coded (GBC, Varian™, Thermo, Shimadzu, Hitachi)	1.5" Diam. 4-pin, Coded (GBC, Varian™)	2.0" Diam.,9-pin, Non-Coded (older PerkinElmer instrumentation)	2.0" Diam., 12-pin, Coded (PerkinElmer)
Elements*	**Product No.**	**Product No.**	**Product No.**	**Product No.**
Al/Ca/Mg	VHG-L506		VHG-L606	
Al/Si	VHG-L503		VHG-L603	
As/Pb	VHG-L539			
Ca/Cu/Mg/Zn	VHG-L507		VHG-L607	
Ca/Mg	VHG-L870	VHG-L870C	VHG-L970	VHG-L970C
Co/Cr/Cu/Fe/Mn/Ni	VHG-L873	VHG-L873C	VHG-L973	VHG-L973C
Cr/Fe/Ni	VHG-L516		VHG-L616	
Cu/Fe/Mn/Zn	VHG-L524		VHG-L624	
Cu/Mn/Zn	VHG-L526		VHG-L626	
Cu/Zn	VHG-L872		VHG-L972	
Fe/Mn	VHG-L530		VHG-L630	
K/Na	VHG-L871	VHG-L871C	VHG-L971	VHG-L971C
K/Na/Ni	VHG-L537		VHG-L637	

**For other multi-element lamp choices, please inquire.*

AA & GFAA Consumables
Hollow Cathode Lamps

Deuterium Background Correction Lamps*

Deuterium background correction lamps provide accurate and fast correction over the widest possible absorbance range and typically last in excess of 1,100 hours.

Description	Instrument	Product No.
Deuterium Arc Lamp 10 Volt	GBC UV Cintra & UV-VIS 914/916, 918/920	VHG-P702
Deuterium Arc Lamp 10 Volt	Hitachi Instruments (most)	VHG-P703
Deuterium Arc Lamp 3 Volt	PerkinElmer® AAS & AAnalyst 600, 700, 800	VHG-P735
Deuterium Arc Lamp 10 Volt	Varian™ 75 Series, AA, DMS 100, Spectra, UV Superscan	VHG-P706

**For other Deuterium lamp choices, please inquire*

Image courtesy of images-of-elements.com/deuterium.php

XRF Consumables
Thin Films for Sample Cups

VHG™ provides a range of special high-quality films for X-Ray Fluorescence. For selection of the ideal film, consider the material's transmission (especially important for "light elements"), purity, and physical strength.

Kapton® (Polyimide)

Features high-strength, high-purity, chemical robustness, and withstands prolonged X-Ray irradiation.

Thickness	Film Size & Shape	Product No.
7.6 Micron	3" x 50' Roll	VHG-FKP30-R15
12.7 Micron	3" x 50' Roll	VHG-FKP50-R15

Also available in pre-cut circles or squares

Mylar®

Mylar (polyethylene-terephthalate) film is economical, strong and offers good chemical resistance. It is well suited for light elements analysis. (Note: may contain Ca, Fe, P, Sb, Zn)

Thickness	Film Size & Shape	Product No.
2.5 Micron	3" x 300' Roll	VHG-FMY10-R3
3.6 Micron	3" x 300' Roll	VHG-FMY15-R3
6 Micron	3" x 300' Roll	VHG-FMY25-R3
6 Micron	3" x 3" Squares	VHG-FMY25-33
6 Micron	2.5" Diameter Circles	VHG-FMY25-C64

Also available in 1.5 & 12.7 micron thickness

Optilene-XF™

Highest grade, proprietary film featuring optimal transmission, purity, strength, chemical resistance, and thermal stability. Good for full range of XRF analytes, including light elements.

Thickness	Film Size & Shape	Product No.
4 Micron	3" x 300' Roll	VHG-FOL04-R3

Table continues on next page

XRF Consumables
Thin Films for Sample Cups

Table continued from previous page

Thickness	Film Size & Shape	Product No.
4 Micron	3" x 3" Squares	VHG-FOL04-33
4 Micron	2.5" Dia. Circles	VHG-FOL04-S64
6 Micron	3" x 300' Roll	VHG-FOL06-R3
6 Micron	3" x 3" Squares	VHG-FOL06-33

Also available in 1.5, 3.6 & 12.7 micron thickness

Teflon™ Microporous

Gas permeable Microporous Teflon™ allows pressure or gas equalization between the sample cell and instrument.

Film Size & Shape	Product No.
2.5" x 200'	VHG-FPTFE-R64

Polycarbonate

Features excellent X-Ray transmission characteristics and good chemical resistance.

Thickness	Film Size & Shape	Product No.
2 Micron	3" x 300' Roll	VHG-FPC02-R3

Also available in pre-cut circles or squares

Polypropylene

General purpose film with good transmission and chemical resistance (Note: may contain Al, Ca, Cu, Fe, P, Ti, Zn, Zr).

Thickness	Film Size & Shape	Product No.
5 Micron	2.5" Dia. Circles	VHG-FPP20-C64
6 Micron	3" x 300' Roll	VHG-FPP25-R3

Also available in pre-cut squares

XRF Consumables
Sample Cups

VHG™ offers XRF Cups which feature a unique Tri-Lock Taut Film™ design that ensures a wrinkle-free, leak-resistant and taut window film.

Double Open End Cups

VHG™ double open end cups come with open or vented caps with a proprietary lift tab feature that enables more reliable sample handling of full sample cups. Samples are top loaded for maximum ease and are self-nesting. These cups support thin film and microporous sheets for sealing.

Double Open End Cup with Open Cap (consists of 3 parts)				
O.D. (mm)	**I.D.** (mm)	**Height** (mm)	**Vol.** (cc)	**Product No.**
25	17	24	4.6	VHG-CUP11-25S
31	25	24	8.4	VHG-CUP11-31S
40	31	24	14	VHG-CUP11-40S
40	31	34	22	VHG-CUP11-40T

Double Open End Cup with Vented Cap (consists of 3 parts)				
O.D. (mm)	**I.D.** (mm)	**Height** (mm)	**Vol.** (cc)	**Product No.**
25	17	24	4.6	VHG-CUP22-25S
31	25	24	8.4	VHG-CUP22-31S
40	31	24	14	VHG-CUP22-40S
45	39	34	36.7	VHG-CUP22-45T

Double Open End Cup with Baffle Plus™ Cap (consists of 4 parts)				
O.D. (mm)	**I.D.** (mm)	**Height** (mm)	**Vol.** (cc)	**Product No.**
31	25	29	6.8	VHG-CUP69-31S
40	31	29	11.3	VHG-CUP69-40S
45	39	39	31	VHG-CUP69-45T

XRF Consumables
Sample Cups

Double Open End Cup for Oxford				
O.D. (mm)	**I.D.** (mm)	**Height** (mm)	**Vol.** (cc)	**Product No.**
32	28	36	20	VHG-CUPOX-35

Standard replacement cup; fits directly into aluminum sample sleeve (supplied with instrument) to form a taut-film sample support with respect to the integrated o-ring. Each cup supplied with vented cap

Closed End Cups

Bottom loaded to handle liquids, slurries, powders, and many volatiles or foaming liquids, where user wishes immediate back pressure of closed cell conditions. Ventable for pressure equalization.

Standard Closed End Cups (consists of 2 parts)				
O.D. (mm)	**I.D.** (mm)	**Height** (mm)	**Vol.** (cc)	**Product No.**
25	17	24	4.6	VHG-CUP77-25S
31	25	24	8.1	VHG-CUP77-31S
40	31	24	14.7	VHG-CUP77-40S
45	39	34	29	VHG-CUP77-45T

HORIBA Analyzers (consists of 2 parts)				
O.D. (mm)	**I.D.** (mm)	**Height** (mm)	**Vol.** (cc)	**Product No.**
43	47	18.4	17	VHG-CUPH-43

Designed for special needs of Horiba Instruments and applications requiring low-profile cups. Feature Taut Film Ring™ and Lift Tab™

XRF Consumables
Sample Cups

Pellet Caps for XRF Analysis of Powders

Straight wall cap design is generally recommended for briquetting materials of uniform size distribution.

Pellet Caps – Straight Wall	
Briquette Size (mm)	**Product No.**
32	VHG-CAP30
40	VHG-CAP38

Straight wall cap design is generally recommended for briquetting materials of uniform size distribution

Pellet Caps – Tapered Wall	
Briquette Size (mm)	**Product No.**
32	VHG-CAP32
40	VHG-CAP40

Tapered wall cap design helps overcome briquetting difficulties and spill over for materials that resist briquetting or are of non-uniform chemistry or size

XRF Consumables Accessories & Tools

Cup Press Plates (2 parts)

Easy to use, 3" diameter tool made of polyethylene that simplifies the task of XRF Sample Cup assembly and setting Tri-Lock taut thin film sample support windows. Two parts – the assembly base and top plate.

Cup Size (mm)	Product No.
25	VHG-CPP25
31	VHG-CPP31
40	VHG-CPP40
43/45	VHG-CPP45

Cup Positioning Guide

Convenient and re-usable guides that achieve secured and centered positioning of smaller sample cups in larger sample holders.

Cup Size (mm)	Product No.
25	VHG-CPG25
31	VHG-CPG31
40	VHG-CPG40
45	VHG-CPG45

Sample Cup Trays

Chemical resistant polyethylene trays for holding, transporting or storing XRF sample cups/caps. Made to protect Thin-Film windows from damage or contamination in either single or stacked mode.

Cup Size (mm) to hold	No. Cups Per Tray	Product No.
25	15	VHG-CT25
31	15	VHG-CT31
40	15	VHG-CT40
43	8	VHG-CT43
45	8	VHG-CT45
50/52	6	VHG-CT50

Graphite Crucibles for Gas Determination Analyzers

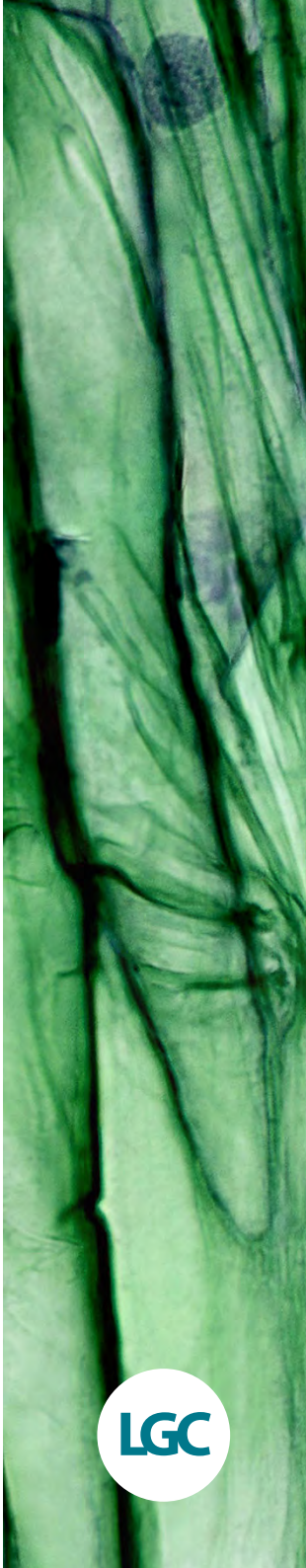
Made from special, high-purity graphite with proper electrical characteristics, these graphite crucibles are machined to exact dimensions to ensure good contact with electrode and proper thermal characteristics. They undergo final purification and degassing; and are then cooled under vacuum or nitrogen to provide maximum purity. Finally, they are ultrasonically cleaned to remove machining dust and then dried.

LECO Models EF-100, TC-136 to 436, TN-114 to 414, RO-116 to 416			
Item / Specifications	**Product No.** (10/pack)	**Product No.** (100/pack)	**Product No.** (1,000/pack)
Crucible: designed for typical nitrogen/ oxygen analysis *Compare to Mgf. No.: 776-247*		VHG-F776247-100	VHG-F776247-1000
Crucible: designed for high temp. alloys and refractories *Compare to Mgf. No.: 782-719/720*		VHG-F782720-100	VHG-F782720-1000
Inner Crucible–uniform temp.: for use with F775433 *Compare to Mgf. No.: 775-431/892*		VHG-F775431-100	VHG-F775431-1000
Outer Crucible–uniform temp.: for use with F775431 *Compare to Mgf. No.: 775-433*	VHG-F775433-10	VHG-F775433-100	

LECO Models EF-10, RH-1, 1E&EN, RH2/3, RH-402&404EN, TN-14/15, RO-16/17, TC30/36			
Item / Specifications	**Product No.** (10/pack)	**Product No.** (100/pack)	**Product No.** (1,000/pack)
Short Crucible, degassed: for LECO RH-2, RH-402 *Compare to Mgf. No.: 769-520*	VHG-F769520-10	VHG-F769520-100	
Tall Crucible, degassed: for LECO RH-3, RH-402 *Compare to Mgf. No.: 769-761*	VHG-F769761-10	VHG-F769761-100	
Crucible: for LECO TN-15, TC-36, RO-17, RO-18, EF-10 *Compare to Mgf. No.: 767-277*		VHG-F767277-100	VHG-F767277-1000

VHG™

Reference Information



#GoBeyondTheStandard

Contact us today: U.S. + Canada

Tel: +1 603.622.7660

Email: lgcusa@lgcgroup.com

*See page 179 for full list of LGC Country Sale Offices

LGC

Periodic Table of Elements

References

1000 ppm Standard						
		Volumetric Size (mL)				
Desired Content:		10	25	50	100	250
100 ppm	Aliquot Volume	1.0 mL	2.5 mL	5.0 mL	10.0 mL	25.0 mL
10 ppm		100 µL	250 µL	500 µL	1 mL	2.5 mL
1 ppm		(10 µL)	25 µL	50 µL	100 µL	250 µL
100 ppb		*	(2.5 µL)	(5 µL)	(10 µL)	25 µL
10 ppb		*	*	*	*	(2.5 µL)
1 ppb		*	*	*	*	*

*Those shown with * or ( ) not recommended due to overly ambitious dilution factor and small aliquot.*

Tubing I.D. & Volumes			
I.D. (in)	**I.D.** (mm)	**Vol.** (µL/in)	**Vol.** (µL/cm)
0.001	0.0254	0.0129	0.005
0.01	0.254	1.287	0.507
0.02	0.508	5.148	2.027
0.04	1.016	20.59	8.107
0.06	1.524	46.33	18.24
0.08	2.032	82.37	32.43
0.1	2.54	128.7	50.67

Volume Conversion				
CC (cm^3)	mL	Liter	Fl. Oz.	Gallon
1	1	0.001	0.0338	0.000264
10	10	0.01	0.338	0.00264
29.57	29.57	0.0296	1	0.00781
3785	3785	3.785	128	1

References

Viscosity Conversion		
Centipoise (cP)*	**Centistokes** (cSt)	**Examples**
1	1	water
16.5	20.635	lotion
40	43.2	vegetable oil
88	110	latex paint
176	220	maple syrup
352	440	SAE 30 oil

*cp = cSt x (density in g/mL)

Weight Conversion			
Pound (lb)	**Ounce** (oz)	**Gram** (g)	**Kilogram** (kg)
0.0022	0.0352	1	0.001
0.0625	1	28.38	0.0284
1	16	454	0.454
2.203	35.24	1000	1

Flow Rate Conversion			
L/min.	**L/sec.**	**Gal./min.** (gpm)	**Gal./sec** (gps)
3.785	0.0631	1	0.0167
227.1	3.785	60	1
1	0.0167	0.264	0.0044
60	1	15.85	0.264

References

Dimension Conversion		
U.S. Fractional Inches	Metric	U.S. Decimal Inches
1/32	0.794 mm	0.0313
n/a	1.00 mm	0.0394
1/16	1.59 mm	0.0625
1/8	3.18 mm	0.125
1/4	6.35 mm	0.25
5/16	7.94 mm	0.313
3/8	9.53 mm	0.375
n/a	10 mm (1 cm)	0.394
7/16	1.11 cm	0.438
1/2	1.27 cm	0.5
9/16	1.43 cm	0.563
5/8	1.59 cm	0.625
11/16	1.75 cm	0.688
3/4	1.91 cm	0.75
13/16	2.06 cm	0.813
7/8	2.22 cm	0.875
15/16	2.38 cm	0.938
1	2.54 cm	1
2	5.08 cm	2
n/a	10.0 cm	3.94
5	12.7 cm	5
n/a	50.0 cm	19.7
n/a	100 cm (1 m)	39.4

References

Pressure Conversion				
psi	bar	Pa (N/m^2)	Torr	atm
0.000145	0.00001	1	0.0075	0.00000987
0.0145	0.001	100	0.75	0.000987
0.0193	0.00133	133	1	0.00132
1	0.0689	6894	51.72	0.068
10	0.689	68940	517	0.68
14.7	1.013	101,325	760	1
25	1.724	172,350	1293	1.701
50	3.447	344,700	2586	3.402
100	6.894	689,400	5172	6.805

Stable-Pak™

#GoBeyondTheStandard with VHG™ A+ Single Element Certified Reference Materials.

What are Stable-Pak™ bags?

They are aluminized, heat-sealed bags that conform to the MIL-PRF-131K, Class 1 specification. Aluminized bags have been shown to significantly impede transpiration, thus increasing the storage life of your products from 18 to 24 months*. By reducing transpiration between the inside of the Stable-Pak™ bag and the outside environment, equilibrium is established quickly after the bag is sealed, creating a stable environment that resists the effects of temperature and humidity.

Why is transpiration an issue?

Transpiration, the diffusion of water vapor through the container, is responsible for a surprising amount of moisture loss through the wall and cap of the bottle as it sits on your shelf. Over time, this causes the concentration of analytes in the solution to increase. Reducing transpiration increases shelf life and extends expiration dates. The certified values for VHG™ standards shipped and stored in sealed Stable-Pak™ bags are guaranteed for up to 2 years.

**Products packaged in Stable-Pak™ bags will expire as per the Expiry contained in the COA, or twelve months from the date the Stable-Pak™ bag is opened, whichever comes first.*

Download now!

Catalog of Petroleum Certified Reference Materials (CRMs) & Standards

Our extensive portfolio of Petroleum CRMs and GC Hydrocarbon Standards includes analytical reference standards for both new and in-service oil applications, for analysis by ICP, ICP-MS, XRF, RDE, UVF, physical testing instruments and other oil analysis instruments.

Our products are applicable for use with multiple methods such as ASTM, DIN, IP, ISO, JIS and ANFOR methods, including EPA Tier 3 methods.

Download the catalog to shop our full product listing:

lgcstandards.com/VHG

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

The ultimate online source for reference materials

100,000 reference materials

+

your search criteria

=

your reference standards

Contact Us

Tel: +1 603.622.7660

Email: lgcusa@lgcgroup.com

*See page 179 for full list of LGC Country Sale Offices

Offering the most comprehensive online source of reference materials.

lgcstandards.com

Order online today!

Science for a safer world

Buy online at lgcstandards.com/VHGAqueousInorganic or contact your local sales office.

Brazil
+55 12 3302 5880
bz@lgcgroup.com

Bulgaria
+359 (0)2 971 4955
bg@lgcgroup.com

China
+86 400 9216156
info.china@lgcgroup.com

France
+33 (0)3 88 04 82 82
fr@lgcgroup.com

Germany
+49 (0)281 9887 0
de@lgcgroup.com

Hungary
+49 (0)281 9887 0
de@lgcgroup.com

India
+91 (0)90 8297 4025
india@lgcgroup.com

Ireland
+44 (0) 208 943 8480
uksales@lgcgroup.com

Italy
+39 02 22476412
it@lgcgroup.com

Middle East
+49 (0)281 9887 0
global.sales@lgcgroup.com

Netherlands
+49 (0)281 9887 0
nl@lgcgroup.com

Nordic Countries
+49 (0)281 9887 0
de@lgcgroup.com

Poland
+48 22 751 31 40
pl@lgcgroup.com

Romania
+40 364 116890
ro@lgcgroup.com

Russia
+7 812 777 04 88
ru@lgcgroup.com

South Africa
+27 (0)11 466 4321
sales.za@lgcgroup.com

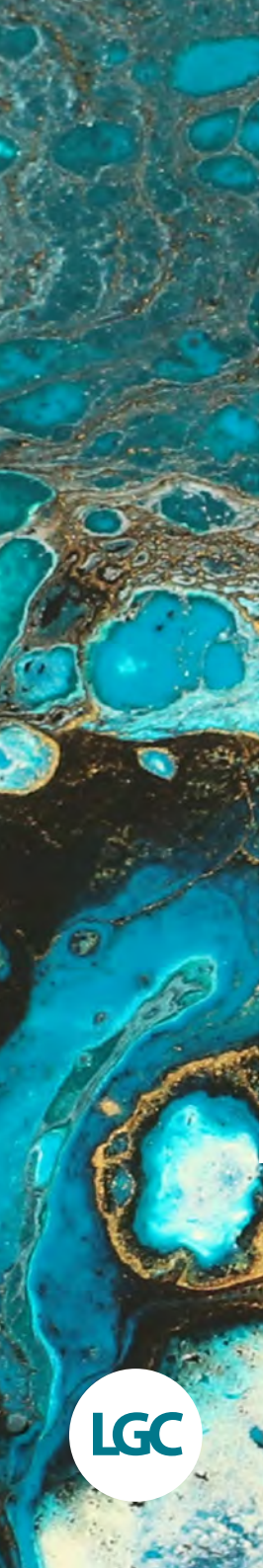
Spain
+34 (0)93 308 4181
es@lgcgroup.com

UK Reference Materials
+44 (0)208 943 8480
uksales@lgcgroup.com

USA + Canada
+1 603 622 7660
lgcusa@lgcgroup.com

Export Queries
+49 (0)281 9887 0
global.sales@lgcgroup.com

Proficiency Testing
+44 (0)161 762 2,500
ptcustomerservices@lgcgroup.com



VHG™

U.S. + Canada

Tel: +1 603.622.7660

Email: lgcusa@lgcgroup.com

*See page 179 for full list of LGC Country Sale Offices

Order online:
lgcstandards.com/ VHGAqueousInorganic

LGC