

# VHG LABS

Certified Reference Materials & Supplies

Na



Y



Pb



2010–2012

Cl



# Our Commitment to Quality

VHG Labs' focus on quality begins with the starting materials for our solutions. We use the highest purity elements and compounds available (typically 99.999+%) as well as high purity acids and solvents. Metals are acid pre-cleaned and rinsed with high purity water, and salts are dried to a constant weight. Solutions are prepared gravimetrically, in an ultra clean environment. Acid digestions are performed in pre-cleaned, high density polyethylene (HDPE) or Teflon™ containers to avoid contamination from the reaction vessel. Balances and volumetric flasks are calibrated according to NIST procedures. All bottles are acid leached and then triple rinsed in deionized water prior to use. Petroleum standards are blended in pre-cleaned HDPE or glass reactors.

Each VHG calibration standard is subjected to rigorous QA checks prior to shipment. Raw materials are assayed and analyzed for trace impurities. Major constituents are generally verified both instrumentally, against the appropriate NIST SRM (when available), and through classical wet chemical methods (titrimetry or gravimetry). All VHG standards are accompanied by a comprehensive Certificate of Analysis (COA). Each COA is supported by an unbroken chain of comparisons with traceability to national or international standards of measurement.



## Certifications

VHG Labs maintains ISO 9001, ISO Guide 34, and ISO/IEC 17025 certifications as three aspects of our commitment to quality. In addition, we have the most demanding quality assurance protocols and tightest purity specifications in the business. All VHG standards undergo final QA checks, and are awarded a comprehensive Certificate of Analysis (COA) only when they have met or surpassed our stringent requirements.

VHG Labs is the only manufacturer to employ the National Institute of Standards and Technology (NIST) High Performance ICP-AES Protocol that provides the most accurate certified concentrations and uncertainties, both directly traceable to the appropriate NIST Standard Reference Material (SRM). See Page 38 for information on the NIST High Performance ICP-AES Protocol.



# Need Special Sizes, Concentrations, Blends or Solvents?

Not to worry! VHG's extensive experience in creating custom standards and our commitment to service have come together to create VHG LABS' "Custom Spec" Program - your guarantee of quality custom standards at reasonable prices.

Whether buying our catalog stock items or custom standards, VHG promises to provide the best products in the industry.

## Easy To Use Forms:

This catalog is packed with useful and informative charts, tables and tips—all designed to help in the technical decision-making process. Should your requirements call for custom standards, be assured that we will make ordering as simple as possible and we are pleased to assist with any technical questions you may have.

## Look for the "CS" symbol:

It's your assurance of quality and ease of Custom Standard ordering. Our specially-designed "Work Sheet and Quote Request" forms take all the guess work out of ordering. Each form can be copied, then mailed, faxed or emailed to us. Ordering Custom Standards has never been easier!

VHG LABS



CUSTOM SPEC

**CUSTOM AQUEOUS STANDARD**  
**WORK SHEET AND QUOTE REQUEST**  
*Please Fill Out One Element Table (Below) Per Standard Requested*

METAL	UNITS	CONC.	METAL	UNITS	CONC.	METAL	UNITS	CONC.
Aluminum Al	µg/mL		Lead Pb	µg/mL		Tellurium Te	µg/mL	
Antimony Sb	µg/mL		Lithium Li	µg/mL		Terbium Tb	µg/mL	
Arsenic As	µg/mL		Lutetium Lu	µg/mL		Thallium Tl	µg/mL	
Barium Ba	µg/mL		Magnesium Mg	µg/mL		Thorium Th	µg/mL	
			Manganese Mn	µg/mL		Thulium Tm	µg/mL	
			Mercury Hg	µg/mL		Tin Sn	µg/mL	
			Molybdenum Mo	µg/mL		Titanium Ti	µg/mL	
			Niobium Nb	µg/mL		Tungsten W	µg/mL	
			Nickel Ni	µg/mL		Uranium U	µg/mL	
			Niobium Nb	µg/mL		Vanadium V	µg/mL	
			Osmium Os	µg/mL		Ytterbium Yb	µg/mL	
			Palladium Pd	µg/mL		Yttrium Y	µg/mL	
			Phosphorus P	µg/mL		Zinc Zn	µg/mL	
			Rhodium Rh	µg/mL		Zirconium Zr	µg/mL	
			Rubidium Rb	µg/mL				
			Selenium Se	µg/mL				
			Silver Ag	µg/mL				
			Sodium Na	µg/mL				
			Strontium Sr	µg/mL				
			Sulfur S	µg/mL				
			Tantalum Ta	µg/mL				
			Thallium Tl	µg/mL				
			Thulium Tm	µg/mL				
			Tin Sn	µg/mL				
			Titanium Ti	µg/mL				
			Tungsten W	µg/mL				
			Uranium U	µg/mL				
			Vanadium V	µg/mL				
			Ytterbium Yb	µg/mL				
			Yttrium Y	µg/mL				
			Zinc Zn	µg/mL				
			Zirconium Zr	µg/mL				

**CUSTOM ION CHROMATOGRAPHY STANDARD**  
**WORK SHEET AND QUOTE REQUEST**

Let us prepare your ION CHROMATOGRAPHY stock standards to save you time and money, while removing a common source of day-to-day error. Our experienced team of chemists can promptly prepare and deliver reliable stock standards fully QC-checked in VHG's analytical testing laboratory.

- Custom standards are made from high purity raw materials and prepared with 18 Mohm DI water and made to the same NIST traceable quality requirements as our general product offerings.
- Each Custom Standard is shipped with a Certificate of Analysis sheet.

**CUSTOM METALLO-ORGANIC STANDARD**  
**WORK SHEET AND QUOTE REQUEST**  
*Please Fill Out One Element Table (Below) Per Standard Requested*

METAL	UNITS	CONC.	METAL	UNITS	CONC.	METAL	UNITS	CONC.
Aluminum Al	µg/g		Copper Cu	µg/g		Rhodium Rh	µg/g	
Antimony Sb	µg/g		Iodine I	µg/g		Selenium Se	µg/g	
Arsenic As	µg/g		Iron Fe	µg/g		Silicon Si	µg/g	
Barium Ba	µg/g		Lanthanum La	µg/g		Silver Ag	µg/g	
Beryllium Be	µg/g		Lead Pb	µg/g		Sodium Na	µg/g	
Bismuth Bi	µg/g		Lithium Li	µg/g		Strontium Sr	µg/g	
Boron B	µg/g		Magnesium Mg	µg/g		Sulfur S	µg/g	
Bromine Br	µg/g		Manganese Mn	µg/g		Thallium Tl	µg/g	
Cadmium Cd	µg/g		Mercury Hg	µg/g		Tin Sn	µg/g	
Calcium Ca	µg/g		Molybdenum Mo	µg/g		Titanium Ti	µg/g	
Cerium Ce	µg/g		Nickel Ni	µg/g		Vanadium V	µg/g	
Chlorine Cl	µg/g		Phosphorus P	µg/g		Yttrium Y	µg/g	
Chromium Cr	µg/g		Potassium K	µg/g		Zinc Zn	µg/g	
Cobalt Co	µg/g		Platinum Pt	µg/g		Zirconium Zr	µg/g	

Instrument used for analysis (please circle one):  
XRF    ICP    RDE    Other: \_\_\_\_\_

2-oz. Minimum. Units: w/w (µg/g) is assumed. YOU MUST SPECIFY IF OTHERWISE.

Typical solvent matrices include light hydrocarbon (mineral) oil, heavy hydrocarbon oil, xylene, kerosene. Call us to inquire about other solvents or elements not shown in above table. Some may not be available and/or will have special solvent requirements.

Solvent: \_\_\_\_\_ Volume (oz.): \_\_\_\_\_ Specify # bottles or special packaging reqs. \_\_\_\_\_

We will strive to quote within 24 hours (M-F). Please state anticipated product delivery requirements or if RUSH is needed.

Name: \_\_\_\_\_ End User? Yes  No   
Company: \_\_\_\_\_ Name End User: \_\_\_\_\_  
Address: \_\_\_\_\_ Date: \_\_\_\_\_  
Address: \_\_\_\_\_ Email: \_\_\_\_\_  
Phone Number: \_\_\_\_\_ Fax Number: \_\_\_\_\_

Fax number: (603) 622-5180    [custsvc@vhglabs.com](mailto:custsvc@vhglabs.com)  
Email, or phone us to discuss: (603) 622-7660 or (888) 622-7660    Return This Form To VHG Labs

To convert from oz. to mL, multiply by 29.6. To determine weight (grams), multiply this term by density (approx. 0.86 for xylene and 0.80 for hydrocarbon oils and kerosene.)

Please See Pages 107-109 for copies of VHG's custom quote forms.



043



# Certificate of Registration

This certificate has been awarded to  
**INTERLINK SCIENTIFIC SERVICES LTD**

12 Swan Business Park  
Sandpit Road  
Dartford  
Kent DA1 5ED

in recognition of the  
organization's Quality System which complies with

**ISO9001: 2008**

The scope of activities covered by this certificate is defined below

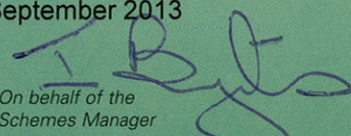
**THE SALE, MAINTENANCE AND CALIBRATION OF CHROMATOGRAPHY, MASS SPECTROMETRY, SPECTROSCOPY AND DISSOLUTION EQUIPMENT WITH ASSOCIATED SPARE PARTS.**

Certificate Number: 12206 Issue No. 6

Date of Issue: 01 October 2010 (28/09/2004)

Expiry Date: September 2013

Issued by:

  
On behalf of the  
Schemes Manager

URS is a member of Registrar of Standards (Holdings) Limited a UK registered company.



**INTERLINK  
SCIENTIFIC  
SERVICES**

[www.iss-gb.co.uk](http://www.iss-gb.co.uk)

Interlink Scientific Services Ltd  
12 Swan Business Park  
Sandpit Road,  
Dartford  
Kent DA1 5ED

Tel: +44 (0) 1322 285850



# About Interlink Scientific Services Ltd

Interlink Scientific Services Ltd has been steadily increasing over the last 14 years both in size and reputation in the UK market place. It started in 1996 and has built its success on the founder members personal commitment to "Service with Integrity". That commitment has remained unchanged as the company has grown.

No other company in this industry is better equipped to meet your analytical instrument and service needs. Our support of most major instrument manufacturers in the marketplace is un-surpassed, with our continued growth and success allowing us to support all of our customers in their service requirements.

## **Our commitment to service and support**

We are committed to helping laboratories become more efficient and profitable with our high quality, low cost alternative solution. We will provide you with the highest level of support for your laboratory and our goal is that you consider us to be an integral part of your company.

## **Where are we based?**

Our service organisation is based at our headquarters in Dartford and includes service workshop and stock holding facilities.

Our engineers are field based and located in geographically suitable areas to ensure a prompt service to our growing customer base.



[www.iss-gb.co.uk](http://www.iss-gb.co.uk)

Interlink Scientific Services Ltd  
12 Swan Business Park  
Sandpit Road,  
Dartford  
Kent DA1 5ED

Tel: +44 (0) 1322 285850



# What can Interlink Scientific Services Ltd offer you?

## **Service Support**

Our service team has the unique capability of offering you a high quality service and support package throughout many leading manufacturers product ranges. When I.S.S. becomes your service partner you will receive :-

Expertly trained, highly qualified field service engineers who are able to respond rapidly and professionally to your needs. They are fully equipped to enable efficient response to any situation that may arise.

'Off the shelf' or bespoke service contracts for a wide range of laboratory instruments.

Performance Qualification checks post service to guarantee the instruments performance.

Supply of spares and consumables for all major instrument manufacturers.

A range of laboratory instruments for sale with documented performance guarantees.

[www.iss-gb.co.uk](http://www.iss-gb.co.uk)



**Interlink Scientific Services Ltd  
12 Swan Business Park  
Sandpit Road,  
Dartford  
Kent DA1 5ED**

**Tel: +44 (0) 1322 285850**



# Laboratory Instrument Support

## **I.S.S. Instrument Support**

Our organisation has office based staff dedicated to supplying the instrument support and technical assistance you require.

When you place a request for support, you only need to make one call to our office and we will co-ordinate your enquiry to ensure you get the information you require and a prompt, efficient response.

We can also put you in direct contact via telephone or E:mail to the relevant person within I.S.S. to help you with any technical assistance you may require.

## Hardware and Software Assistance

### **Product support when you need it most**

When you require hardware or software support on your instruments, we recognise the importance of responding to your enquiry in the fastest time possible to ensure the minimum amount of downtime.

During the lifetime of your equipment, you have access to our technical support team and engineering staff to assist you with any enquiries you may have.

All calls for assistance are coordinated through our office, enabling your enquiries to be promptly answered.

We offer a wide range of hardware and software support to ensure compliance of your system with any future regulatory requirements.



[www.iss-gb.co.uk](http://www.iss-gb.co.uk)

**Interlink Scientific Services Ltd**  
12 Swan Business Park  
Sandpit Road,  
Dartford  
Kent DA1 5ED

**Tel: +44 (0) 1322 285850**





# Training courses to meet your requirements

## **The more you understand the instrument, the more productive it will become in your laboratory**

As a valued I.S.S. customer, we can offer you software and hardware training courses at regular intervals or on demand. Our exclusive training courses can be held at either your site or at our headquarters in Dartford.

We can offer courses dedicated to laboratory technicians who need instruction on basic operation and maintenance of your instruments and in addition, offer a range of customised courses that are specific to our customers who have their own internal technical service departments or specific training needs.

Further information on our training courses can be obtained by calling our office.

[www.iss-gb.co.uk](http://www.iss-gb.co.uk)

Interlink Scientific Services Ltd  
12 Swan Business Park  
Sandpit Road,  
Dartford  
Kent DA1 5ED

Tel: +44 (0) 1322 285850



# Instrument validation and certification

## **Do you work within an ISO, MCA or FDA regulated environment?**

Interlink Scientific Services Ltd can offer a wide range of products to assist you in meeting your compliance requirements.

We can offer your organisation off the shelf or bespoke Performance Qualification (PQ) protocols to aid you in your laboratory compliance needs.

Our team can also provide you with the validation certification required for all aspects of GLP/GMP and ISO regulated areas and we work in partnership with the UK's leading pharmaceutical companies to ensure that our protocols meet the high standards that are expected in a regulated laboratory environment.

## In House Repairs

### **Let us make your tired instruments spotless and operate like new!**

Our in-house repair facilities located in our head office are fully equipped to evaluate, refurbish and repair your instruments all the way down to component level.

We offer the following :-

- Discounted Hourly Service Rates.
- Equipment can be repaired at our offices eliminating travel charges.
- Identification of intermittent or chronic analytical problems.
- Loan instruments can be provided for a nominal charge.



[www.iss-gb.co.uk](http://www.iss-gb.co.uk)

**Interlink Scientific Services Ltd**  
12 Swan Business Park  
Sandpit Road,  
Dartford  
Kent DA1 5ED

**Tel: +44 (0) 1322 285850**



# Non contract repairs

## **Do you require repairs on the instrument but have no budget left for service contracts?**

We are happy to offer a non contract repair on instruments that you do not have service cover on. This is ideal for customers who have limited operating budgets but still require a high quality service on their instruments.

We offer the following :-

- On site repair or service at our current labour and travel rates.
- Equipment can be repaired at our offices eliminating travel charges.
- All parts needed for the repair will be invoiced at our current list prices.
- Loan instruments can be provided for a nominal charge.

## Why do you need an I.S.S. preventative maintenance contract?

### **How equipment cover benefits you**

Preventative Maintenance is required to minimise the occurrence of equipment failure as well as to extend the service life of your laboratory instruments. A correctly functioning instrument means less downtime and more productivity in your laboratory.

In order to obtain the highest performance of your laboratory instrumentation, the maintenance procedures include inspection, cleaning, configuration and verification of the instruments performance.

All measuring equipment used by I.S.S. engineers are regularly maintained and traceable to accredited UK standards suppliers.

All procedures are performed within the strict guidelines outlined by I.S.S. and are regularly reviewed.



[www.iss-gb.co.uk](http://www.iss-gb.co.uk)

**Interlink Scientific Services Ltd**  
12 Swan Business Park  
Sandpit Road,  
Dartford  
Kent DA1 5ED

**Tel: +44 (0) 1322 285850**



# Whose and what equipment can we service?

## **Which equipment in your laboratory can we service?**

The list is growing rapidly as we are currently working in partnership with some of the UK's largest pharmaceutical companies to bring new instruments on board. If your instrument type is not on the list then please do not assume we cannot work on it until you have spoken to us. We currently work on :-

HPLC, GC, GCMS, LCMS, Dissolution baths and a broad range of spectroscopy instruments.

# What are the financial benefits to you?

## **Are your laboratory equipment servicing budgets beginning to give you a headache!**

At Interlink Scientific Services, we charge considerably less for servicing your instrumentation and normally utilise spares from the same source as those supplied by the manufacturer.

If your laboratory contains a mixed assortment of instruments, we can offer considerable financial savings.

Think of how convenient it will be to have all your preventative service work handled by one company, saving you time and money as we can do all the scheduling if it is required.



[www.iss-gb.co.uk](http://www.iss-gb.co.uk)

Interlink Scientific Services Ltd  
12 Swan Business Park  
Sandpit Road,  
Dartford  
Kent DA1 5ED

Tel: +44 (0) 1322 285850



# What type of service contracts can we offer you?

**In short, whatever type is appropriate to you and your laboratory, 6 monthly performance checks or yearly preventative maintenance with full performance qualification after**

We offer many types of service contracts and can design bespoke ones to ensure all your needs are met.

When your equipment is covered by an I.S.S. service contract, you have the assurance that your equipment is being serviced by qualified engineers and that priority is given to callouts and service visits which have been requested by contract holding customers.

# What is included in a preventative maintenance contract?

## **Preventative Maintenance means minimised downtime**

The contract term is for 1 year.

- 1 or 2 preventative maintenance visits will be performed during the contract period at times specified by you.
- Work and travel hours are charged at a reduced rate.
- Consumable parts used are charged at a reduced rate.
- Priority is always given to contract customers when engineer time is scheduled.

Further information on preventative maintenance contracts can be obtained from our head-office.



[www.iss-gb.co.uk](http://www.iss-gb.co.uk)

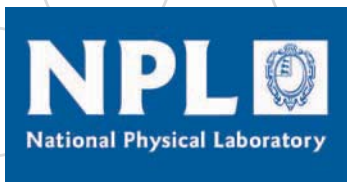
**Interlink Scientific Services Ltd**  
12 Swan Business Park  
Sandpit Road,  
Dartford  
Kent DA1 5ED

**Tel: +44 (0) 1322 285850**



# National Traceable Liquid Standards

**The traceability and confidence we can offer  
your company**



The key factor in our success of performing PQ's on all makes and models of analytical instrumentation is our use of qualification methods which are traceable to nationally recognised standards.

All of the standard manufacturers instrument modules can be covered by our independent PQ facility.

We can also supply you with NPL traceable standards for you to perform your own in-house checks on the instrumentation if necessary.

## Summary of Interlink Scientific Services

### **6 key points to remember about ISS**

We have :-

- The ability to PQ all manufacturers instruments.
- Full, proven and detailed operational procedures.
- Nationally traceable calibrators and standards.
- Formal certificates of successful performance qualification which are produced on site before we leave.
- Traceably trained performance qualification engineers.
- Independence of OEM's and user company.



[www.iss-gb.co.uk](http://www.iss-gb.co.uk)

Interlink Scientific Services Ltd  
12 Swan Business Park  
Sandpit Road,  
Dartford  
Kent DA1 5ED

**Tel: +44 (0) 1322 285850**



ISS Limited are UK Sales and Service Distributers for :-

# Waters

[www.waters.com](http://www.waters.com)

Waters creates business advantages for laboratory-dependent organizations to enable significant advancement in healthcare delivery, environmental management, food safety, and water quality.

- Ultra Performance Liquid Chromatography (UPLC)
- High Performance Liquid Chromatography (HPLC)
- Chromatography Columns & Chemistry Products
- Mass Spectrometry Systems
- Laboratory Informatics Solutions
- Comprehensive Service Programs

The new agreement with Waters will enabled ISS Limited to further expand its portfolio of high quality chromatography instruments. ISS Limited already offer a wide range of services including PM/PQ maintenance contracts, consumables and spare parts for the chromatography market and the addition of the Waters range of HPLC instrumentation will create new opportunities for both the Waters and ISS Limited sales/service engineers.



**Chromatography (HPLC, GC), Spectroscopy (UV/VIS),  
Mass Spectrometry and Dissolution Instruments**

**Sale of new and second user equipment  
Installation (IQ, OQ) Services**

**Preventative Maintenance (PM),  
Service Contracts with Performance Qualification (PQ)**

**Consumables and Instrument Spare Parts  
Client Training Courses**

To discuss your Service requirements in more detail  
please contact us:

12 Swan Business Park  
Sandpit Road, Dartford,  
Kent DA1 5ED  
United Kingdom

Tel: +44 (0)1322 285850  
Fax: +44 (0)1322 285851  
Email: [info@iss-gb.co.uk](mailto:info@iss-gb.co.uk)  
Web: [www.iss-gb.co.uk](http://www.iss-gb.co.uk)

We will be happy to arrange an on-site meeting to inspect  
all the equipment before issuing our proposals.



[www.iss-gb.co.uk](http://www.iss-gb.co.uk)

**Interlink Scientific Services Ltd  
12 Swan Business Park  
Sandpit Road,  
Dartford  
Kent DA1 5ED**

**Tel: +44 (0) 1322 285850**





# Table of Contents

<b>Section 1: Petroleum Standards</b>	<b>9</b>
<b>Standards for ICP and RDE</b>	<b>10</b>
Wear Metal Standards	10
Internal Standards	10
Metal Additives Standards	11
Matrix Oils and Solvents	11
V-Solv™	12
Stabilizer for Wear Metal Standards	12
Single-Element Metallo-Organic Standards	13
D-Series Multi-Element Wear Metal Standards	14
<b>Standards for Used Oil Analysis</b>	<b>15</b>
Acid Number and Base Number Standards	15
Fuel Dilution Standards	16
Coolant Standards	16
Soot Content Standards	16
Crackle Test Reference Standards	17
Karl Fischer Titration Certified Reference Standards	17
<b>Distillation Standards</b>	<b>17</b>
<b>Performance Testing Program</b>	<b>18-19</b>
<b>Standards for S, N, Cl, and Metals</b>	<b>20</b>
Single-Element, Sulfur-Free Metallo-Organic Standards	20
Metallo-Organic Concentrates	21
Wear Metal Standards for XRF	22
Sulfur and Metals in Oil Standards	22
Lube Oil Standards	23
Standards for Sulfur in Diesel Fuel Analysis	24
Sulfur in Kerosene Standards	24
Sulfur in Isooctane Standards	25
Sulfur in Crude and Residual Oil Standards	25
Matrix Oils and Solvents	25
Polysulfide Oil Standards	26
Sulfur in Petroleum Products (Ampoules)	27
Sulfur & Nitrogen Products (Ampoules)	28
Chlorine in Oil Standards	28
Standards for Lead in Gasoline	29
Internal Standards for XRF Analysis	29
<b>Petroleum Physical Test Standards</b>	<b>30</b>
Flash Point Reference Materials	30
Viscosity Reference Standards	30
Pour Point, Cloud Point, and Freezing Point Reference Materials	31
Cold Filter Plug Point Reference Materials	31
<b>Biodiesel</b>	<b>32</b>
Metals in Biodiesel Standards	32
Sulfur in Biodiesel Standards	32
Biodiesel/Diesel Fuel Blends	32
<b>Section 2: Aqueous Standards</b>	<b>33</b>
<b>Single-Element Standards</b>	<b>34</b>
A+ Single-Element Standards	34-37
NIST High Performance ICP-AES Protocol	38
Sample A+ Certificate of Analysis	39
Speciation Standards	40
Isotopic Standards	41
Atomic Absorption Standards	42
Matrix Modifiers, Ionization Buffers and Releasing Agents	43



**Section 2: Aqueous Standards (cont'd.)****33**

<b>Ion Chromatography and Wet Chemistry Standards</b> .....	<b>44</b>
Anions .....	44
Cations and Ammonia .....	45
Eluents and Multi-Ion Standards .....	46
Wet Chemistry Standards .....	47
QC Check Samples for Water Supply .....	48
QC Check Samples for Water Pollution .....	49
<b>Multi-Element Standards for ICP-AES and ICP-MS</b> .....	<b>50</b>
Multi-Element Standards .....	50-51
General Use Environmental Standards .....	52-53
Spiking Solutions .....	53
Water Pollution Standards .....	54
Synthetic Surface Water Certified Reference Material .....	54
QC Check Samples for Trace Metals .....	55
International Environmental Standards .....	56
EPA Method Standards Cross Reference Chart .....	57
Second Source Standards Pair-Matched .....	58-59
EPA Methods 200.7 & 6010A for ICP-AES .....	60-61
EPA Methods 6010 & CLP for ICP-AES .....	62-64
ICP-MS Tuning and Detector Optimization Solutions .....	65-66
ICP-MS Internal Standard Stock Solutions .....	66-67
EPA Method 200.8 for ICP-MS .....	68-69
EPA Methods 6020 & CLP for ICP-MS .....	70-71
Sample Multi-Element Certificate of Analysis .....	72

**Section 3: Solid Standards****73**

<b>XRF Standards for RoHS</b> .....	<b>74</b>
<b>XRF Solid Standards for S &amp; N</b> .....	<b>76</b>
<b>Binder and Briquetting Materials, Grinding Additives</b> .....	<b>77</b>
<b>Borate Fusion Fluxes</b> .....	<b>78</b>
<b>Soil Certified Reference Materials</b> .....	<b>80</b>

**Section 4: Instrumentation Consumables****83**

<b>Autosampler Cups and Tubes</b> .....	<b>84</b>
<b>ICP &amp; ICP-MS Consumables</b> .....	<b>85</b>
Tubing for Peristaltic Pumps .....	85-86
Flaring Tool for Peri-Pump Tubing .....	86
Mixing Tees for Sample Introduction .....	87
Nebulizers .....	88-89
Torches, Accessories & Spray-Chambers .....	90-93
ICP-MS Cones and Maintenance Kit .....	94-95
<b>AA &amp; GFAA Consumables</b> .....	<b>96</b>
GFAA Tubes & Parts .....	96-97
Hydride and Mercury Cold Vapor Quartzware .....	97
Hollow Cathode Lamps .....	98-99
<b>XRF Consumables</b> .....	<b>100</b>
XRF Sample Cups .....	100-101
Thin Films for XRF Sample Cups .....	102
Accessories & Tools for XRF .....	103
<b>Graphite Crucibles</b> .....	<b>104</b>

**Reference Documents****105**

<b>Conversion Tables for Reference</b> .....	<b>105</b>
<b>Wear Metal Set (WRMTLSET-17X50G) Addendum</b> .....	<b>106</b>
<b>Custom Standard Quote Request Forms</b> .....	<b>107-109</b>
<b>Product Index</b> .....	<b>110-111</b>
<b>ISO Scopes and Accreditations</b> .....	<b>112-114</b>

# Section 1 Petroleum Standards

Standards for ICP and RDE

Wear Metals and Metal Additives

Single Elements

D Series

Standards for Used Oil Analysis

AN and BN

Fuel Dilution

Coolant in Oil

Soot

Moisture

Distillation Standards

Performance Testing Program

Standards for S, N, Cl and Metals

Sulfur-Free Metallo-Organics

Metallo-Organic Concentrates

Sulfur and Metals for XRF

Sulfur

Nitrogen

Chlorine

Lead in Gas

Petroleum Physical Test Standards

Flash Point

Viscosity

Pour Point

Cloud Point

Freezing Point

Cold Filter Plug Point

Biodiesel Standards

**VHG Tips**

Metallo-organic standards should be kept away from moisture. Preferably store in a cool, dry location.

We welcome inquiries into custom metallo-organic standards. Please use the form at the end of the chapter.

## Wear Metal Standards For ICP, RDE and Other Techniques

- ◆ VHG manufactures the highest quality metallo-organic mixes in the industry in our ISO 9001 and ISO Guide 34 facility. Customers are assured of getting the best value and consistency available.
- ◆ Each product must pass rigorous Quality Control in our ISO/IEC 17025 laboratory.
- ◆ Each product is accompanied by a comprehensive Certificate of Analysis with actual (not nominal) concentrations.



<b>V21 Wear Metal Standards</b> Ag, Al, B, Ba, Ca, Cd, Cr, Cu, Fe, Mg, Mn, Mo, Na, Ni, P, Pb, Si, Sn, Ti, V, Zn combined in hydrocarbon oil		<b>V21+K Wear Metal Standards</b> All of the elements included in V21 plus K	<b>V23 Wear Metal Standards</b> All of the elements included in V21 plus K and Sb
Conc.* Size (µg/g) (grams)	Product No.	Product No.	Product No.
10	100	V21-10-100G	V23-10-100G
	200	V21-10-200G	V23-10-200G
30	100	V21-30-100G	V23-30-100G
	200	V21-30-200G	V23-30-200G
50	100	V21-50-100G	V23-50-100G
	200	V21-50-200G	V23-50-200G
100	100	V21-100-100G	V23-100-100G
	200	V21-100-200G	V23-100-200G
300	100	V21-300-100G	V23-300-100G
	200	V21-300-200G	V23-300-200G
500	100	V21-500-100G	V23-500-100G
	200	V21-500-200G	V23-500-200G
900	100	V21-900-100G	V23-900-100G
	200	V21-900-200G	V23-900-200G

\* For catalog purposes, nominal concentrations (µg/g) are provided.

## **NEW!** Internal Standards For Wear Metal Analysis by ICP

The use of an internal standard, such as Co or Y, can significantly improve the accuracy of your results by correcting for wide variations in the viscosity or oil composition of your samples. Internal standards are easy to use when added to the diluent prior to sample preparation.

Element	Matrix	Concentration	Size (grams)	Product No.
Cobalt (Co)	Mineral Spirits	6 wt. %	100	OCO-6%IS-100G
Cobalt (Co)	Mineral Spirits	6 wt.%	200	OCO-6%IS-200G
Cobalt (Co)	Mineral Spirits	6 wt. %	400	OCO-6%IS-400G
Cobalt (Co)	Hydrocarbon Oil	5000µg/g	200	OCODN-5000-200G
Cobalt (Co)	Hydrocarbon Oil	5000µg/g	800	OCODN-5000-800G
Yttrium (Y)	Hydrocarbon Oil	5000µg/g	400	OY-5000-400G

# Metal Additives Standards

For ICP, RDE and Other Techniques

## Metal Additives Standard MA3

Ca @ 5,000µg/g; P, Zn @ 1600µg/g  
combined in hydrocarbon oil\*

Size (grams)	Product No.
100	MA3-100G
200	MA3-200G

## Metal Additives Standard MA4

Ca @ 5,000µg/g; Mg, P, Zn @ 1600µg/g  
combined in hydrocarbon oil\*

Size (grams)	Product No.
100	MA4-100G
200	MA4-200G



## Metal Additives Standard MA5

Ba, Ca, Mg, P, Zn combined in hydrocarbon oil

Conc.* (µg/g)	Size (grams)	Product No.
900	100	MA5-900-100G
	200	MA5-900-200G
1000	100	MA5-1000-100G
	200	MA5-1000-200G
3000	100	MA5-3000-100G
	200	MA5-3000-200G
5000	100	MA5-5000-100G
	200	MA5-5000-200G

\* For catalog purposes, nominal concentrations (µg/g) are provided

**NEW!**

## Metal Additives Standard MA6

B, Ba, Ca, Mg, P, Zn combined in hydrocarbon oil

Conc.* (µg/g)	Size (grams)	Product No.
900	100	MA6-900-100G
	200	MA6-900-200G

\* For catalog purposes, nominal concentrations (µg/g) are provided

# Matrix Oils and Solvents

## Solvents for the Preparation of Working Standards for Hydrocarbon/Petrochemical Analysis

High-purity solvents supplied with a Certificate of Analysis that includes trace metal concentrations.

Item	Volume	Product No.
75 cSt Hydrocarbon Oil	500mL	OIL-75-500
	1Gal.	OIL-75-1GAL
20 cSt Hydrocarbon Oil	500mL	OIL-20-500
	1Gal.	OIL-20-1GAL
V-SOLV™ ICP Solvent	1 Gal.	V-SOLV-1GAL
	4 X 1 Gal.	V-SOLV-4GAL
Kerosene, low odor	500mL	KERO-500
	1 Gal.	KERO-1GAL

## ICP and RDE Standards

- ▶ Wear Metals
- ▶ Metal Additives
- V-Solv™
- Single Elements
- D Series

## Standards for Used Oils

### Distillation Standards

### Performance Testing Program

### Standards for S, N, Cl and Metals

### Petroleum Physical Test Standards

### Biodiesel

**VHG Tips**

The use of stabilizer is particularly important for long-term stability when diluting these standards in solvents.

**V-Solv™  
ICP Solvent**

V-Solv™ ICP Solvent is a proprietary solvent that is used for diluting oil and other organic liquids for analysis by ICP and ICP-MS. Use V-Solv™ as a matrix blank and as a diluent for your calibration standards and samples for outstanding nebulization characteristics. V-Solv™ ICP Solvent offers the following advantages over conventional low odor/odorless kerosene, xylene and other commercial solvents:



- ◆ Very high purity (essentially no trace metals or sulfur) - each bottle is accompanied by a COA that states the trace impurity levels of 36 metals and sulfur.
- ◆ Makes very stable dilutions of metallo-organic standards and oil samples.
- ◆ Extremely low odor (no kerosene or aromatic smell), which results in a comfortable work environment and is also VOC-exempt for consumer products applications (EPA Title 40, Volume 5, Parts 53-59).
- ◆ Extremely low toxicity compared with kerosene or xylene.
- ◆ Very competitively priced and non-hazardous to ship (flashpoint of 260°F).
- ◆ One gallon bottle size for ease of use and for shipment via common carrier.

**ICP Solvent for the Preparation of Working Standards for Hydrocarbon/Petrochemical Analysis**  
High-purity solvents supplied with a Certificate of Analysis that includes trace metal concentrations.

Item	Volume	Product No.
V-SOLV™ ICP Solvent	1 Gal.	V-SOLV-1GAL
	4 X 1 Gal.	V-SOLV-4GAL

**Stabilizer for Wear Metal Standards**

**Stabilizer to Improve Stability of Mixes or Dilutions**  
Solvent stabilizer can improve stability of mixes or dilutions of VHG's 1000µg/g and 5000µg/g stock metallo-organic standards, as well as multi-element mixes after dilution in solvent.

Product	Product Use	Product No.	Size (grams)
MO Stabilizer	VHG's wear metal standards. Add to solutions at 0.6wt%	STAB-50G	50

# Single-Element Metallo-Organic Standards

## For ICP, RDE and Other Techniques

- ◆ Metallo-organic compounds\* in hydrocarbon oil
- ◆ Accuracy ensured by Quality Testing with NIST Standard Reference Materials when available
- ◆ Certificate of Analysis supplied with each standard
- ◆ Certificate of Analysis includes trace metal concentrations confirmed with ICP-AES scans
- ◆ Stocked for prompt shipment

Single-Element in Hydrocarbon oil	Concentration (1,000µg/g)		Concentration (5,000µg/g)	
Element	Product No.	Size	Product No.	Size
Aluminum Al	OAL-1000-50G	50g	OAL-5000-	50g
Antimony Sb	OSB-1000-50G	50g	OSB-5000-50G	50g
Arsenic As	OAS-1000-50G	50g	N/A	
Barium Ba	OBA-1000-50G	50g	OBA-5000-50G	50g
Beryllium Be	OBE-1000-50G	50g	N/A	
Bismuth Bi	OBI-1000-50G	50g	N/A	
Boron B	OB-1000-50G	50g	OB-5000-50G	50g
Cadmium Cd	OCD-1000-50G	50g	OCD-5000-50G	50g
Calcium Ca	OCA-1000-50G	50g	OCA-5000-50G	50g
Chromium Cr	OCR-1000-50G	50g	OCR-5000-50G	50g
Cobalt Co	OCO-1000-50G	50g	OCO-5000-50G	50g
Copper Cu	OCU-1000-50G	50g	OCU-5000-50G	50g
Iron Fe	OFE-1000-50G	50g	OFE-5000-50G	50g
Lanthanum La	OLA-1000-50G	50g	N/A	
Lead Pb	OPB-1000-50G	50g	OPB-5000-50G	50g
Lithium Li	OLI-1000-50G	50g	OLI-5000-50G	50g
Magnesium Mg	OMG-1000-50G	50g	OMG-5000-50	50g
Manganese Mn	OMN-1000-50G	50g	OMN-5000-50	50g
Mercury Hg	OHG-1000-50G	50g	N/A	
Molybdenum Mo	OMO-1000-50G	50g	OMO-5000-50G	50g
Nickel Ni	ONI-1000-50G	50g	ONI-5000-50G	50g
Phosphorus P	OP-1000-50G	50g	OP-5000-50G	50g
Potassium K	OK-1000-50G	50g	OK-5000-50G	50g
Scandium Sc	OSC-1000-50G	50g	N/A	
Selenium Se	OSE-1000-50G	50g	N/A	
Silicon Si	OSI-1000-50G	50g	OSI-5000-50G	50g
Silver Ag	OAG-1000-50G	50g	OAG-5000-50G	50g
Sodium Na	ONA-1000-50G	50g	ONA-5000-50G	50g
Strontium Sr	OSR-1000-50G	50g	N/A	
Sulfur S	OS-1000-50G	50g	OS-5000-50G	50g
Thallium Tl	OTL-1000-50G	50g	N/A	
Tin Sn	OSN-1000-50G	50g	OSN-5000-50G	50g
Titanium Ti	OTI-1000-50G	50g	OTI-5000-50G	50g
Vanadium V	OV-1000-50G	50g	OV-5000-50G	50g
Yttrium Y	OY-1000-50G	50g	OY-5000-50G	50g
Zinc Zn	OZN-1000-50G	50g	OZN-5000-50G	50g
Zirconium Zr	OZR-1000-50G	50g	OZR-5000-50G	50g

\* Many of these compounds are sulfonate-based, and thus, contain high levels of sulfur. If absence of sulfur is important for your application, please use VHG's line of sulfur-free standards on Page 20.

## Section 1 Petroleum Standards

### ICP & RDE Standards

- Wear Metals
- Metal Additives
- ▶ V-Solv™
- ▶ Single Elements
- D Series

### Standards for Used Oils

### Distillation Standards

### Performance Testing Program

### Standards for S, N, Cl and Metals

### Petroleum Physical Test Standards

### Biodiesel

To order, call (+1) 888.622.7660 or fax (+1) 603.622.5180

## D-Series Multi-Element Wear Metal Standards For Military Applications Using RDE

- ◆ VHG Labs has supplied single-element concentrated standards to the Joint Oil Analysis Program - Technical Support Center (JOAP-TSC) for making D-Series standards (D3, D12, D19) for almost a decade. Now D-Series standards are available directly from VHG.
- ◆ VHG D-Series standards are made in our ISO 9001 and ISO Guide 34 facility.
- ◆ Each product must pass rigorous quality control in our ISO/IEC 17025 laboratory.
- ◆ All VHG standards are accompanied by a comprehensive Certificate of Analysis.
- ◆ VHG D-Series standards are supplied with a convenient squirt cap.

**NEW!**

### D3 Standards B, Mo, Zn in Aviation Reference Oil

Conc. (µg/g)	Size (grams)	Equivalent DOD NSN	VHG Product No.
0	200	9150-00-179-5137	D19-0-200G
100	200	9150-01-283-0249	D3-100-200G



### D12 Standards Ag, Al, Cr, Cu, Fe, Mg, Na, Ni, Pb, Si, Sn, Ti in Aviation Reference Oil

Conc. (µg/g)	Size (grams)	Equivalent DOD NSN	VHG Product No.
0	200	9150-00-179-5137	D19-0-200G
5	200	9150-01-307-3343	D12-5-200G
10	200	9150-00-179-5145	D12-10-200G
30	200	9150-00-179-5144	D12-30-200G
50	200	9150-00-179-5143	D12-50-200G
100	200	9150-00-179-5142	D12-100-200G
300	200	9150-00-179-5141	D12-300-200G
500	200		D12-500-200G
700	200		D12-700-200G
900	200		D12-900-200G

### D19 Standards Ag, Al, B, Ba, Cd, Cr, Cu, Fe, Mg, Mn, Mo, Na, Ni, Pb, Si, Sn, Ti, V, Zn in Aviation Reference Oil

Conc. (µg/g)	Size (grams)	Equivalent DOD NSN	VHG Product No.
0	100	9150-00-179-5137	D19-0-100G
5	100		D19-5-100G
10	100		D19-10-100G
30	100		D19-30-100G
50	100		D19-50-100G
100	100		D19-100-100G
300	100		D19-300-100G
500	100		D19-500-100G
700	100		D19-700-100G
900	100		D19-900-100G
Set*	16x100	9150-01-355-1178	D19-SET-16X100G

\* D19-SET includes 4xD19-0-100G, 1xD19-5-100G, 1xD19-10-100G, 1xD19-30-100G, 1xD19-50-100G, 3xD19-100-100G, 2xD19-300-100G, 1xD19-500-100G, 1xD19-700-100G, and 1xD19-900-100G.

*Special sizes, concentrations, and blends available upon request.*



# Acid Number and Base Number Standards

**NEW!**

## Acid Number (AN) Reference Materials

VHG Labs' AN Reference materials are intended for use in the determination of Acid Number (AN) in petroleum products in accordance with ASTM D664/IP 177 (by potentiometric titration) or ASTM D974 (by color-indicator titration). Each standard is supplied with a full Certificate of Analysis (COA) which states the certified values and uncertainty by both ASTM D664 and D974.

Matrix	Nominal Value (mg KOH/g)*	Size (grams)	Product Number
Hydrocarbon Oil	0.1	100	AN-0.1-100G
Hydrocarbon Oil	0.5	100	AN-0.5-100G
Hydrocarbon Oil	1.0	100	AN-1-100G
Hydrocarbon Oil	1.5	100	AN-1.5-100G
Hydrocarbon Oil	2.0	50	AN-2-50G
Hydrocarbon Oil	3.0	50	AN-3-50G

\*Acid number is defined as the quantity of base, expressed as milligrams (mg) of potassium hydroxide (KOH) per gram of sample, required to titrate a sample in a specific solvent to a specified end point.

**NEW!**

## Base Number (BN) Reference Materials

VHG Labs' BN Reference Materials are intended for use in the determination of Base Number (BN) in petroleum products in accordance with ASTM D2896/IP 276 (by potentiometric perchloric acid titration) or ASTM D4739 (by potentiometric titration). Each standard is supplied with a full Certificate of Analysis (COA) which states the certified values and uncertainty by both ASTM D2896 and D4739.

Matrix	Nominal Value (mg KOH/g)*	Size (grams)	Product No.
Hydrocarbon Oil	6	50	BN-6-50G
Hydrocarbon Oil	10	50	BN-10-50G
Hydrocarbon Oil	15	50	BN-15-50G
Hydrocarbon Oil	30	50	BN-30-50G
Hydrocarbon Oil	40	50	BN-40-50G
Hydrocarbon Oil	70	50	BN-70-50G

\*Base number is defined as the quantity of acid, expressed as milligrams (mg) of potassium hydroxide (KOH) per gram of sample, required to titrate a sample in a specified solvent to a specified end point.



## Section 1 Petroleum Standards

### ICP & RDE Standards

- Wear Metals
- Metal Additives
- V-Solv™
- Single Elements

#### ► D Series

### Standards for Used Oils

#### ► AN & BN Standards

- Fuel Dilution
- Coolant in Oil
- Soot
- Crackle
- Karl Fischer

### Distillation Standards

### Performance Testing Program

### Standards for S, N, Cl and Metals

### Petroleum Physical Test Standards

### Biodiesel

*VHG Tip*

Fuels for the fuel dilution standards are devolatilized by removing 10% of the lights using a rotovap.

## NEW! Fuel Dilution Standards

### Fuel Dilution Standards

These standards are intended for use in the determination of fuel (diesel fuel or gasoline) in used engine oils by GC, IR, fuel dilution meter (fuel sniffer), or flash point analyzer. They are prepared gravimetrically from well-characterized fuels and hydrocarbon oils, and are verified by CG-FID in accordance with ASTM Method D3524 or D3525. **Volume: 100mL**

Description	Product No.
Blank for Diesel Fuel Dilution Standards	DSLFD-BLK-100
2% (v/v) Devolatilized Diesel Fuel in hydrocarbon oil	DSLFD-2%-100
5% (v/v) Devolatilized Diesel Fuel in hydrocarbon oil	DSLFD-5%-100
10% (v/v) Devolatilized Diesel Fuel in hydrocarbon oil	DSLFD-10%-100
Blank for Gas Fuel Dilution Standards	GASFD-BLK-100
2% (v/v) Devolatilized Gasoline in hydrocarbon oil	GASFD-2%-100
5% (v/v) Devolatilized Gasoline in hydrocarbon oil	GASFD-5%-100
10% (v/v) Devolatilized Gasoline in hydrocarbon oil	GASFD-10%-100



## NEW! Coolant Standards

### Engine Coolant in Oil Standards

VHG Labs' Engine Coolant in Oil Standards are intended for use in the determination of coolant (ethylene glycol or propylene glycol) in used motor oil by GC or IR. They are prepared from high purity glycols in high purity 20 cSt hydrocarbon oil and verified by GC-head space analyzer. **Volume: 100mL**

Analyte	Concentration (µg/g)	Product No.
Blank	0	GLY-BLK-100
Ethylene Glycol & Propylene Glycol	100 100	GLY-100-100
Ethylene Glycol & Propylene Glycol	500 500	GLY-500-100
Ethylene Glycol & Propylene Glycol	1000 1000	GLY-1000-100

## Soot Content Standards

Reference standards for use in the determination of soot content in 15W40 diesel motor oil by infrared spectroscopy or other techniques. All values certified by thermogravimetric analysis (TGA).

Nominal Soot Content Range (%)	Volume (mL)	Product No.
Blank	50	SOOT-BLK-50
0.5-2	50	SOOT-A-50
2-4	50	SOOT-B-50
4-6	50	SOOT-C-50
6-9	50	SOOT-D-50
9-12	50	SOOT-E-50
Set of all 6	6 x 50	SOOT-SET

# Crackle Test Reference Standards

“Crackle Test” reference standards for determining water in oil (all values nominal). The crackle test is a visual test performed by placing a small drop of oil onto a hot plate (usually around 300° F). The amount of water present in oil samples is estimated by comparison to these standards. All values certified by gravimetric preparation.

Nominal Water Concentration (%)	Volume (mL)	Product No.
Blank	100	CT-BLK-100
0.1	100	CT-0.1%-100
0.5	100	CT-0.5%-100
1.0	100	CT-1.0%-100

## Karl Fischer Titration Certified Reference Standards

Karl Fischer Titration certified reference standards for determining water in motor oil (all values certified by Karl Fischer Titration). This test determines the amount of water present in the oil and is the most commonly-used test for this type of determination, with a high degree of accuracy. For use with ASTM D6304.

Nominal Water Concentration (%)	Volume (mL)	Product No.
Blank	100	KF-BLK-100
0.1	100	KF-0.1%-100
0.5	100	KF-0.5%-100
1.0	100	KF-1.0%-100

## Distillation Standards

### ASTM D86 Group 1 & 2 Synthetic Distillation Standard

VHG Labs' Group 1 & 2 Distillation Standard is intended for use in accordance with ASTM Method D86 Distillation Groups 1 & 2 and ASTM D850, for distillation of petroleum products at atmospheric pressure. This standard is a synthetic blend of hydrocarbons that boil in the temperature range specified in ASTM D86 Distillation Groups 1 & 2. It covers the boiling range 129°F to 368°F (54°C to 187°C), and was verified by consensus analysis. **Volume: 500mL**

Description	Product No.
Synthetic Distillation Standard	D86-500

### ASTM D86 Group 4 Distillation Standard

VHG Labs' Group 4 Distillation Standard is intended for use in accordance with ASTM Method D86 Distillation Group 4 for distillation of petroleum products at atmospheric pressure. This standard is a diesel oil whose distillation range is specified in ASTM D86 Distillation Group 4. It covers the boiling range 379° F to 700° F (193° to 371° C) and was verified by consensus analysis. **Volume: 500mL**

Description	Product No.
Distillation Standard	D86-4-500

## Section 1 Petroleum Standards

### ICP & RDE Standards

#### Standards for Used Oils

- AN & BN Standards
- ▶ Fuel Dilution
- ▶ Coolant in Oil
- ▶ Soot
- ▶ Crackle
- ▶ Karl Fischer

### Distillation Standards

#### Performance Testing Program

#### Standards for S, N, Cl and Metals

#### Petroleum Physical Test Standards

#### Biodiesel

# Performance Testing Program

***The only program of its kind!***

*Provides an instant response to submitted values*

VHG Labs' Performance Testing Program (PTP) was specially designed to give analytical laboratories instant validation while measuring metals, sulfur, viscosity, and particle count in new or used oils. The PTP provides participating labs with a superior method of monitoring their analytical performance as measured against Certified Reference Materials (CRM's) in three quick and easy steps.

### **Web-based, Accurate, Immediate Results**

Don't be bogged down with out-dated "round-robin" programs that require months to return results. VHG Labs has taken Performance Testing to a new level by developing a world-class, interactive, web-

based product for checking the accuracy of your results immediately. It's the only testing program of its kind to provide an instantaneous response to submitted values. Due to its popularity among testing labs, our PTP program has recently been expanded to include the analysis of lead in isooctane, metals in lube oil or biodiesel, and sulfur in various matrices.

Performance Testing Program Results					
Symbol	Element	Analytical Results ug/g	Certified Values	Difference	% Diff
Al	aluminum	14.000	15	-1.00	6.67%
Ba	barium	-	1000	0.00	0.00%
B	boron	-	100	0.00	0.00%
Ca	calcium	3111.000	3000	111.00	3.70%
Cr	chromium	3.000	3	0.00	0.00%
Cu	copper	29.000	28	1.00	3.57%
Fe	iron	498.000	500	-2.00	0.40%
Pb	lead	11.500	10	1.00	15.00%
Mg	magnesium	264.000	250	14.00	5.60%
Mn	manganese	6	5	0.00	20.00%
Mo	molybdenum	29.000	30	-1.00	3.33%
Ni	nickel	5.000	5	0.00	0.00%
P	phosphorus	1048.000	1000	48.00	4.80%
K	potassium	26.000	25	1.00	4.00%
Si	silicon	28.000	30	-2.00	6.67%
Ag	silver	-	30	0.00	0.00%
Na	sodium	42.000	40	2.00	5.00%
Sn	tin	3.000	5	-2.00	40.00%
Ti	titanium	-	5	0.00	0.00%
V	vanadium	6	5	0.00	20.00%
Zn	zinc	1069.000	1000	69.00	6.90%
K	potassium	26.000	25	1.00	4.00%
V	vanadium	-	5	0.00	0.00%

## How Does It Work?

- 1) *Analyze the PTP Sample*
- 2) *Enter results on PTP Website*
- 3) *Check your accuracy*

**RECEIVE ACCURATE, IMMEDIATE RESULTS!**

# Performance Testing Program

## Section 1 Petroleum Standards

### VHG Performance Testing Program

Each sample includes a single use log-in code with a 90-day expiration.

Name	Description	Product No.
Sample for Elemental Analysis of Oils by ICP, RDE or other techniques	Elements: Ag, Al, B, Ba, Ca, Cd, Cr, Cu, Fe, K, Mg, Mn, Mo, Na, Ni, P, Pb, Sb, Si, Sn, Ti, V, Zn, 25g.	VPTPMO-25G
Sample for Viscosity Analysis	Viscosity Test Standard: 40°C and 100°C, 50mL.	VPTPVISC-50
Sample for Particle Count Analysis (For ISO 11171 only)	Particle Count Standard: 4µm, 6µm, 8µm, 14µm, 21µm, 38µm, 50µm and 70µm ranges, 125mL.	VPTPPC-125
Set: VPTPMO-25G, VPTPVISC-50, and VPTPPC-125	Elemental Analysis Test Standard: 25 grams, Viscosity Test Standard: 50mL and Particle Count Standard, 125mL.	VPTPSET1

### ICP & RDE Standards

### Standards for Used Oils

### Distillation Standards

### Performance Testing Program

### Standards for S, N, Cl and Metals

### Petroleum Physical Test Standards

### Biodiesel

**NEW!**

### Additions to the VHG Performance Testing Program

Each sample includes a single use log-in code with a 90-day expiration.

Name	Description	Product No.
Sample for Elemental Analysis of Lube Oil by XRF or other techniques	Elements: Ba, Ca, Cl, Mg, Mo, P, S, Si, Zn, 25mL.	PTPLUBEMO-25
Sample for Elemental Analysis of B100 Biodiesel	Elements: Ca, K, Mg, Na, P, 25g.	PTPB100M5-25G
Sample for Lead in Isooctane Analysis	Element: Pb, 25g	PTPPBISO-25G
Sample for Sulfur in #2 Diesel Fuel Analysis	Element: S, 25mL	PTPSDSL-25
Sample for Sulfur in 20 cSt Mineral Oil Analysis	Element: S, 25mL	PTPS20M-25
Sample for Sulfur in Isooctane Analysis	Element: S, 25mL	PTPSISO-25
Sample for Sulfur in B100 Biodiesel Analysis	Element: S, 25mL	PTPSB100-25
Sample for Sulfur in Crude Oil Analysis	Element: S, 25mL	PTPSCRD-25



To order, call (+1) 888.622.7660 or fax (+1) 603.622.5180

**VHG Tip**

Many commercial metallo-organic standards have matrices of sulfur-containing compounds. Use VHG's unique sulfur-free standards if the absence of S is important for your application. Alternatively, known amounts of S can be blended intentionally.

For multi-element XRF analysis, the element concentrations should be spread randomly across the suite of standards in order to best correct for inter-element effects.

# Single-Element, Sulfur-Free Metallo-Organic Standards

## For XRF and Other Techniques

- ◆ Sulfur-free metallo-organic compounds in hydrocarbon oil
- ◆ Certificate of Analysis supplied with each standard
- ◆ Accuracy ensured by Quality Testing with NIST Standard Reference Materials when available
- ◆ Certificate of Analysis includes trace metal concentrations

<b>Sulfur-Free Single Element in Oil</b>	<b>Concentration (1,000µg/g)</b>		<b>Concentration (5,000µg/g)</b>	
<b>Element</b>	<b>Product No.</b>	<b>Size</b>	<b>Product No.</b>	<b>Size</b>
Aluminum Al	OSF-AL-1000-50G	50g	OSF-AL-5000-50G	50g
Antimony Sb	OSF-SB-1000-50G	50g	OSF-SB-5000-50G	50g
Arsenic As	OSF-AS-1000-50G	50g	N/A	
Barium Ba	OSF-BA-1000-50G	50g	OSF-BA-5000-50G	50g
Beryllium Be	OSF-BE-1000-50G	50g	OSF-BE-5000-50G	50g
Bismuth Bi	OSF-BI-1000-50G	50g	OSF-BI-5000-50G	50g
Boron B	OSF-B-1000-50G	50g	OSF-B-5000-50G	50g
Cadmium Cd	OSF-CD-1000-50G	50g	OSF-CD-5000-50G	50g
Calcium Ca	OSF-CA-1000-50G	50g	OSF-CA-5000-50G	50g
Cerium Ce	OSF-CE-1000-50G	50g	OSF-CE-5000-50G	50g
Chromium Cr	OSF-CR-1000-50G	50g	OSF-CR-5000-50G	50g
Cobalt Co	OSF-CO-1000-50G	50g	OSF-CO-5000-50G	50g
Copper Cu	OSF-CU-1000-50G	50g	OSF-CU-5000-50G	50g
Gallium Ga	OSF-GA-1000-50G	50g	OSF-GA-5000-50G	50g
Gold Au	OSF-AU-1000-50G	50g	N/A	
Iron Fe	OSF-FE-1000-50G	50g	OSF-FE-5000-50G	50g
Lead Pb	OSF-PB-1000-50G	50g	OSF-PB-5000-50G	50g
Lithium Li	OSF-LI-1000-50G	50g	OSF-LI-5000-50G	50g
Magnesium Mg	OSF-MG-1000-50	50g	OSF-MG-5000-50G	50g
Manganese Mn	OSF-MN-1000-50G	50g	OSF-MN-5000-50G	50g
Mercury Hg	OSF-HG-1000-50G	50g	N/A	
Molybdenum Mo	OSF-MO-1000-50G	50g	OSF-MO-5000-50G	50g
Nickel Ni	OSF-NI-1000-50G	50g	OSF-NI-5000-50G	50g
Phosphorus P	OSF-P-1000-50G	50g	OSF-P-5000-50G	50g
Potassium K	OSF-K-1000-50G	50g	OSF-K-5000-50G	50g
Selenium Se	OSF-SE-1000-50G	50g	N/A	
Silicon Si	OSF-SI-1000-50G	50g	OSF-SI-5000-50G	50g
Silver Ag	OSF-AG-1000-50G	50g	OSF-AG-5000-50G	50g
Sodium Na	OSF-NA-1000-50G	50g	OSF-NA-5000-50G	50g
Strontium Sr	OSF-SR-1000-50G	50g	OSF-SR-5000-50G	50g
Thallium Tl	OSF-TL-1000-50G	50g	N/A	
Tin Sn	OSF-SN-1000-50G	50g	OSF-SN-5000-50G	50g
Titanium Ti	OSF-TI-1000-50G	50g	OSF-TI-5000-50G	50g
Vanadium V	OSF-V-1000-50G	50g	OSF-V-5000-50G	50g
Yttrium Y	OSF-Y-1000-50G	50g	N/A	
Zinc Zn	OSF-ZN-1000-50G	50g	OSF-ZN-5000-50G	50g
Zirconium Zr	OSF-ZR-1000-50G	50g	OSF-ZR-5000-50G	50g

# Metallo-Organic Concentrates

## Sulfur-Free Matrix: Excellent for XRF

### Metallo-Organic Concentrates - Single Element

These sulfur-free, metallo-organic concentrates are ideal for X-ray fluorescence (XRF). They can be used to prepare single or multi-element standards, individually or as a set. Sulfur can be added for the simultaneous analysis of sulfur and metals. Each product is accompanied by a Certificate of Analysis that documents the assayed concentration and any trace impurities.

Element	Nominal Conc.	Product No.	Size	Product No.	Size
Aluminum Al	3%	ROSFAL3-25G	25G	ROSFAL3-100	100g
Antimony Sb	2%	ROSFBS2-25G	25G	ROSFBS2-100G	100g
Barium Ba	7%	ROSFBA7-25G	25G	ROSFBA7-100G	100g
Bismuth Bi	28%	ROSFBI28-25G	25G	ROSFBI28-100G	100g
Boron B	3%	ROSF�3-25G	25G	ROSF�3-100G	100g
Cadmium Cd	10%	ROSFCD10-25G	25G	ROSFCD10-100G	100g
Calcium Ca	2%	ROSFCA2-25G	25G	ROSFCA2-100G	100g
Cerium Ce	12%	ROSFCE12-25G	25G	ROSFCE12-100G	100g
Chromium Cr	9%	ROSF CR9-25G	25G	ROSF CR9-100G	100g
Cobalt Co	8%	ROSF CO8-25G	25G	ROSF CO8-100G	100g
Copper Cu	3%	ROSF CU3-25G	25G	ROSF CU3-100G	100g
Iron Fe	6%	ROSF FE6-25G	25G	ROSF FE6-100G	100g
Lead Pb	10%	ROSF PB10-25G	25G	ROSF PB10-100G	100g
Lithium Li	2%	ROSF LI2-25G	25G	ROSF LI2-100G	100g
Magnesium Mg	2%	ROSF MG2-25G	25G	ROSF MG2-100G	100g
Manganese Mn	6%	ROSF MN6-25G	25G	ROSF MN6-100G	100g
Molybdenum Mo	15%	ROSF MO15-25G	25G	ROSF MO15-100G	100g
Nickel Ni	8%	ROSF NI8-25G	25G	ROSF NI8-100G	100g
Phosphorus P	11%	ROSF P11-25G	25G	ROSF P11-100G	100g
Potassium K	4%	ROSF K4-25G	25G	ROSF K4-100G	100g
Praseodymium Pr	3%	ROSF PR3-25G	25G	ROSF PR3-100G	100g
Silicon Si	18%	ROSF SI18-25G	25G	ROSF SI18-100G	100g
Silver Ag	1%	ROSF AG1-25G	25G	ROSF AG1-100G	100g
Sodium Na	3%	ROSF NA3-25G	25G	ROSF NA3-100G	100g
Strontium Sr	9%	ROSF SR9-25G	25G	ROSF SR9-100G	100g
Thallium Tl	3%	ROSF TL3-25G	25G	ROSF TL3-100G	100g
Tin Sn	18%	ROSF SN18-25G	25G	ROSF SN18-100G	100g
Titanium Ti	7%	ROSF TI7-25G	25G	ROSF TI7-100G	100g
Vanadium V	4%	ROSF V4-25G	25G	ROSF V4-100G	100g
Yttrium Y	2%	ROSF Y2-25G	25G	ROSF Y2-100G	100g
Zinc Zn	18%	ROSF ZN18-25G	25G	ROSF ZN18-100G	100g
Zirconium Zr	24%	ROSF ZR24-25G	25G	ROSF ZR24-100G	100g

### Stabilizer for Sulfur-Free Standard Preparation

Solvent stabilizer can improve stability of mixes or dilutions of VHG's 1000µg/g and 5000µg/g stock metallo-organic standards or concentrates, as well as multi-element mixes.

Product	Product Use	Product No.	Size (grams)
MOSF Stabilizer	VHG's sulfur-free metallo-organics. Add to solutions at 15-30% v/v	SF-STAB-100G	100

## Section 1 Petroleum Standards

### ICP & RDE Standards

#### Standards for Used Oils

#### Distillation Standards

#### Performance Testing Program

#### Standards for S, N, Cl and Metals

##### ► Sulfur-Free Metallo-Organics

##### ► Metallo-Organic Concentrates

Sulfur & Metals for XRF

Sulfur

Nitrogen

Chlorine

Lead in Gas

#### Petroleum Physical Test Standards

#### Biodiesel

**NEW!** Wear Metal Standards  
For XRF

**Wear Metal Calibration Set**

Set of 17 standards with concentrations randomly arranged across the set to correct for inter-element effects. See appendix on Page 106 for exact concentrations. Suitable for ASTM D4927.

Matrix: **Hydrocarbon Oil** Size: **50g each**

Element	Concentration Range (µg/g)
Ag	0-500
Al	0-500
Ba	0-2000
Ca	0-5000
Cd	0-500
Cr	0-500
Cu	0-500
Fe	0-500
K	0-500
Mg	0-3000
Mn	0-500
Mo	0-500
Na	0-500
Ni	0-500
P	0-2000
Pb	0-500
Sb	0-500
Si	0-500
Sn	0-500
Ti	0-500
V	0-500
Zn	0-2000

**Product No.** WRMTLSET-17X50G

*Elemental concentrations are randomly arranged across the set to correct for interelement effects. Standards in the set are not available for individual sale. See appendix on Page 106 for exact concentrations.*

**Sulfur and Metals in Oil Standards**

For XRF

**Sulfur and Metals in Oil**

Suitable for ASTM D5708

For S and metals in crude and residual oils

Matrix: **20cSt. Mineral Oil** Volume: **100mL**

**Elemental Concentrations**

Sulfur wt%	Iron µg/g	Nickel µg/g	Vanadium µg/g	Product No.
0.0	0	0	0	SMOIL1-100
2.5	400	100	250	SMOIL2-100
0.5	300	10	500	SMOIL3-100
1.0	0	80	350	SMOIL4-100
4.5	250	60	100	SMOIL5-100
4.0	350	30	200	SMOIL6-100
3.5	200	50	0	SMOIL7-100
5.5	50	40	400	SMOIL8-100
2.0	450	20	300	SMOIL9-100
1.5	500	5	150	SMOIL10-100
3.0	150	70	25	SMOIL11-100
5.0	100	0	50	SMOIL12-100

**Product No.** SMOILSET-12X100



# Lube Oil Standards

## For XRF

### Lubricating Oil Standards

Suitable for ASTM D4927, D6481, D6443

Matrix: Lubricating Oil Volume: 100mL

#### Elemental Concentrations

Sulfur wt%	Calcium wt%	Phosphorus wt%	Zinc wt%	Product No.
0.000	0.000	0.000	0.000	LOIL1-100
0.050	0.600	0.005	0.080	LOIL2-100
0.300	0.000	0.020	0.175	LOIL3-100
0.150	0.500	0.030	0.070	LOIL4-100
0.100	0.300	0.060	0.130	LOIL5-100
0.175	0.400	0.200	0.050	LOIL6-100
0.075	0.200	0.080	0.120	LOIL7-100
0.125	0.250	0.050	0.000	LOIL8-100
0.400	0.350	0.040	0.110	LOIL9-100
0.500	0.075	0.225	0.150	LOIL10-100
0.200	0.050	0.150	0.200	LOIL11-100
0.550	0.005	0.000	0.140	LOIL12-100
0.450	0.100	0.010	0.250	LOIL13-100
0.600	0.010	0.125	0.060	LOIL14-100
0.250	0.150	0.100	0.090	LOIL15-100
0.350	0.025	0.175	0.100	LOIL16-100

Product No. LOILSET-16X100

**NEW!**

### Lube Oil Calibration Set

Suitable for ASTM D4927

Matrix: Lubricating Oil Volume: 50mL

#### Elemental Concentrations (µg/g)

Ba	Ca	Cl	Mg	Mo	P	S	Si	Zn
10	10	1000	400	250	2000	5000	400	50
200	5000	0	350	100	1	10000	380	250
30	0	400	100	0	1750	0	25	750
0	4500	2000	0	200	1500	500	340	1250
50	0	200	300	250	20	1250	0	1750
30	0	1800	0	30	100	500	0	2250
100	3500	0	250	150	1	12500	300	10
140	20	10	800	0	1250	0	450	20
300	3000	60	120	500	3	0	210	0
0	2000	1600	20	300	1000	15000	400	50
0	2500	10	50	20	1750	22500	225	0
180	500	100	0	10	0	17500	220	100
400	2000	600	30	150	750	0	180	0
220	2	800	0	50	0	10000	140	2
340	1500	100	2	0	10	1250	100	1200
260	4000	4	700	0	500	0	250	120
0	1000	1800	0	350	50	20000	25	2500
380	500	2	400	5	250	0	10	2000
300	50	1000	0	400	2250	2500	0	1500
0	250	1000	500	0	1250	17500	0	1000
0	100	1200	600	0	2500	25000	0	500
340	1	1400	10	450	10	22500	0	125
0	0	0	0	0	0	0	0	0

Product No. LUBESET-23X50

Elemental concentrations are randomly arranged across the set to correct for interelement effects.

To order, call (+1) 888.622.7660 or fax (+1) 603.622.5180

## Section 1 Petroleum Standards

### ICP & RDE Standards

#### Standards for Used Oils

#### Distillation Standards

#### Performance Testing Program

#### Standards for S, N, Cl and Metals

- Sulfur-Free Metallo-Organics
- Metallo-Organic Concentrates

#### ► Sulfur & Metals for XRF

- Sulfur
- Nitrogen
- Chlorine
- Lead in Gas

#### Petroleum Physical Test Standards

#### Biodiesel

## Section 1 Petroleum Standards

### VHG Tips

Matrix oil blanks are necessary for most analytical techniques of petroleum products. VHG Labs provides a wide range of clean, pure blanks designed to get the most from your analysis.

## Sulfur Standards in Petroleum Products

- ◆ NEW! Wider range of products for product for ULSD analysis
- ◆ Standards are manufactured in accordance with applicable ASTM methods in VHG Labs' ISO 9001 and ISO Guide 34 facility
- ◆ Certificate of Analysis provided from our ISO/IEC 17025 laboratory showing NIST traceability of standard
- ◆ "Blank" standards include ppb-level sulfur concentration on Certificate of Analysis



## Standards for Sulfur in Diesel Fuel Analysis

**Full-range of Sulfur Standards for XRF. ASTM Methods D2622, D4294, D5453, D7039, D7212, D7220 and others.**

Matrix: See Below

Volume: 100mL

Concentration		Light Mineral Oil	Heavy Mineral Oil	#2 Diesel Fuel
(µg/g)	(wt%)	Product No.	Product No.	Product No.
Blank	Blank	S20MIN-BLK-100	SMIN-BLK-100	SDSL-BLK-100
5	0.0005	S20MIN-5-100	SMIN-5-100	SDSL-5-100
10	0.0010	S20MIN-10-100	SMIN-10-100	SDSL-10-100
15	0.0015	S20MIN-15-100	SMIN-15-100	SDSL-15-100
20	0.0020	S20MIN-20-100	SMIN-20-100	SDSL-20-100
25	0.0025	S20MIN-25-100	SMIN-25-100	SDSL-25-100
50	0.0050	S20MIN-50-100	SMIN-50-100	SDSL-50-100
75	0.0075	S20MIN-75-100	SMIN-75-100	SDSL-75-100
100	0.0100	S20MIN-100-100	SMIN-100-100	SDSL-100-100
200	0.0200	S20MIN-200-100	SMIN-200-100	SDSL-200-100
300	0.0300	S20MIN-300-100	SMIN-300-100	SDSL-300-100
400	0.0400	S20MIN-400-100	SMIN-400-100	SDSL-400-100
500	0.0500	S20MIN-500-100	SMIN-500-100	SDSL-500-100
750	0.0750	S20MIN-750-100	SMIN-750-100	SDSL-750-100
1000	0.100	S20MIN-1000-100	SMIN-1000-100	SDSL-1000-100
1500	0.150	S20MIN-1500-100	SMIN-1500-100	SDSL-1500-100
3000	0.300	S20MIN-3000-100	SMIN-3000-100	SDSL-3000-100
5000	0.500	S20MIN-5000-100	SMIN-5000-100	SDSL-5000-100
7500	0.750	S20MIN-7500-100	SMIN-7500-100	SDSL-7500-100
10,000	1.00	S20MIN-1%-100	SMIN-1%-100	SDSL-1%-100
20,000	2.00	S20MIN-2%-100	SMIN-2%-100	SDSL-2%-100
30,000	3.00	S20MIN-3%-100	SMIN-3%-100	SDSL-3%-100
40,000	4.00	S20MIN-4%-100	SMIN-4%-100	SDSL-4%-100
50,000	5.00	S20MIN-5%-100	SMIN-5%-100	SDSL-5%-100

## Sulfur in Kerosene Standards

VHG's Sulfur in Kerosene Standards are suitable for use with ASTM D2622, D3120, D4045, D4294, D5453, and others.

Volume: 100mL

Concentration		Product No.
(µg/g)	(wt%)	
Blank	Blank	SKERO-BLK-100
10	0.0010	SKERO-10-100
50	0.0050	SKERO-50-100
100	0.0100	SKERO-100-100
300	0.0300	SKERO-300-100
500	0.0500	SKERO-500-100
750	0.0750	SKERO-750-100
1000	0.100	SKERO-1000-100

# Sulfur in Isooctane Standards

VHG's Sulfur in Isooctane standards are ideal for use with the following ASTM methods: D2622, D3120, D3246, D4045, D4294, D5453, D6334, D6445, D7039, D7212, D7220, and others.

Volume: 100mL

Concentration		Product No.
(µg/g)	(wt%)	
Blank	Blank	SISO-BLK-100
5	0.0005	SISO-5-100
10	0.0010	SISO-10-100
15	0.0015	SISO-15-100
20	0.0020	SISO-20-100
25	0.0025	SISO-25-100
50	0.0050	SISO-50-100
75	0.0075	SISO-75-100
100	0.0100	SISO-100-100
200	0.0200	SISO-200-100
300	0.0300	SISO-300-100
400	0.0400	SISO-400-100
500	0.0500	SISO-500-100
750	0.0750	SISO-750-100
1000	0.100	SISO-1000-100
3000	0.300	SISO-3000-100

# Sulfur in Crude and Residual Oil Standards

VHG's Sulfur in Crude Oil and Sulfur in Residual Oil Standards are suitable for use with ASTM D2622, D4294, and others.

Matrix: See Below

Volume: 100mL

Concentration		Crude Oil Product No.	Residual Oil Product No.
(µg/g)	(wt%)		
Unspiked	Matrix Blank	CRUDE-100	
1000	0.100	SCRD-1000-100	
2500	0.250	SCRD-2500-100	SRES-2500-100
5000	0.500	SCRD-5000-100	SRES-5000-100
10,000	1.00	SCRD-1%-100	SRES-1%-100
20,000	2.00	SCRD-2%-100	SRES-2%-100
30,000	3.00	SCRD-3%-100	SRES-3%-100
40,000	4.00	SCRD-4%-100	SRES-4%-100
50,000	5.00	SCRD-5%-100	SRES-5%-100

# Matrix Oils and Solvents

High-purity Matrix Oils and Solvents (<1ppm Sulfur) for the preparation of working standards for petroleum analysis. Supplied with a Certificate of Analysis that includes trace sulfur and metal concentrations.

Matrix: See Below

Material	Volume	Product No.
20 cSt Mineral Oil	500mL	OIL-20MIN-500
20 cSt Mineral Oil	0.5 gal.	OIL-20MIN-1/2GAL
75 cSt Mineral Oil	500mL	OIL-MIN-500
75 cSt Mineral Oil	0.5 gal.	OIL-MIN-1/2GAL
#2 Diesel Fuel	500mL	ULSDSL-500
#2 Diesel Fuel	0.5 gal.	ULSDSL-1/2GAL
Isooctane	500mL	ISO-500
Isooctane	0.5 gal.	ISO-1/2GAL
Kerosene, low odor	500mL	KERO-500
Kerosene, low odor	0.5 gal.	KERO-1/2GAL

To order, call (+1) 888.622.7660 or fax (+1) 603.622.5180

## Section 1 Petroleum Standards

- ICP & RDE Standards
- Standards for Used Oils
- Distillation Standards
- Performance Testing Program
- Standards for S, N, Cl and Metals
  - Sulfur-Free Metallo-Organics
  - Metallo-Organic Concentrates
  - Sulfur & Metals for XRF
- Sulfur
  - Nitrogen
  - Chlorine
  - Lead in Gas
- Petroleum Physical Test Standards
- Biodiesel

## Polysulfide Oil Standards

### Sulfur QC Samples, Drift Monitors and Calibration Standards Made from Polysulfide Oil

VHG Labs' polysulfide oils have been formulated for long shelf life and optimal stability even when exposed to x-rays from modern high wattage XRF spectrometers. In addition, our polysulfide oil products offer high purity, low volatility, and minimal diffusion through sample films.



These standards are well suited to ultra low level sulfur analysis, quality control, drift correction, blank measurement and calibration standards for XRF and other sulfur analysis techniques. Our polysulfide oil standards are intended for use in accordance with ASTM D2622, D4294, D5453, D7039, D7212, D7220 and others.

Description	Product No.
<b>QC Samples</b>	
Sulfur @ 5µg/g, Polysulfide oil, 1L	X3SPS-5-1L
Sulfur @ 10µg/g, Polysulfide oil, 1L	X3SPS-10-1L
Sulfur @ 25µg/g, Polysulfide oil, 1L	X3SPS-25-1L
<b>Drift Monitors</b>	
Sulfur @ 100µg/g, Polysulfide oil, 1L	X3SPS-100-1L
Sulfur @ 500µg/g, Polysulfide oil, 1L	X3SPS-500-1L
Sulfur @ 1,000µg/g, Polysulfide oil, 1L	X3SPS-1000-1L
<b>Blank</b>	
Polysulfide Oil Blank	X3SPS-BLK-1L
<b>Calibration Sets</b>	
Sulfur Standard Set (low concentrations). Set of 13 Calibration Standards with Sulfur @ 0, 1, 2.5, 5, 10, 25, 50, 75, 100, 250, 500, 750, 1000µg/g, made from high-purity polysulfide oil, 50mL each	X3SPS-SET1-13X50
Sulfur Standard Set (high concentrations). Set of 12 Calibration Standards with Sulfur @ 0, 0.1, 0.5, 1, 1.5, 2, 2.5, 3, 3.5, 4, 4.5 and 5wt%, made from high-purity polysulfide oil, 50mL each	X3SPS-SET2-12X50
Sulfur Standard Set (low concentrations). Set of 6 Calibration Standards with Sulfur @ 0, 10, 25, 50, 100 and 250µg/g, made from high-purity polysulfide oil, 50mL each	X3SPS-SET3A-6X50
Ultra Low Sulfur EPA Qualification Set Set of 40 Calibration Standards with 10 Sulfur Standards @ 5 and 10µg/g each, and 20 @ 15µg/g, made from high-purity polysulfide oil, 20mL each	X3SPS-SET4-40X20
High Sulfur EPA Qualification Set Set of 40 Calibration Standards with 10 Sulfur Standards @ 100 and 500µg/g each, and 20 @ 300µg/g, made from high-purity polysulfide oil, 20mL each	X3SPS-SET5-40X20

# Sulfur in Petroleum Products (Ampoules)

## For Low-Level Sulfur Analytical Techniques

### Total Sulfur by UV Fluorescence

Calibration Set for ASTM Method D5453 - Total Sulfur in Liquid Petroleum Hydrocarbons by Ultraviolet Fluorescence. Composition: Sulfur in Isooctane. Offered only as a single set of 6 x 2mL ampoules. Sets also available in toluene upon request.

Concentration (ng/μL)	Matrix	Size	Product No.
0, 1.0, 2.5, 5, 7.5, 10	Isooctane	6x2mL	SUVF-SET1
0, 5, 25, 50, 100, 200	Isooctane	6x2mL	SUVF-SET2
0, 100, 250, 500, 750, 1000	Isooctane	6x2mL	SUVF-SET3

### Sulfur by Hydrogenolysis and Rateometric Colorimetry

Calibration Set for ASTM D4045 - Sulfur in Petroleum Products by Hydrogenolysis and Rateometric Colorimetry. Composition: Sulfur (from n-dibutyl sulfide) in isooctane. Offered only as a single set of 6 x 2mL ampoules.

Concentration (μg/g)	Matrix	Size	Product No.
0, 0.1, 0.5, 1.0, 2.5, 5.0, 10	Isooctane	7x2mL	SRC-SET1A

### Determination of Mercaptan Sulfur

Calibration Standards for UOP 163 and ASTM D3227 - Mercaptan Sulfur in Hydrocarbon Liquids by Potentiometric Titration. Composition: Sulfur (from tert-nonyl mercaptan) in isooctane/toluene. Offered only as a single set of 6 x 20mL ampoules.

Concentration (μg/g)	Matrix	Size	Product No.
30	80% Isooctane/ 20% Toluene	6x20mL	UOP163-30-6X20

### Sulfur Compounds by Selective Detection (100μg/g)

Calibration Standard for ASTM D5623 - Sulfur compounds in Light Hydrocarbon Liquids by Selective Detection. Composition: Multi-component mixture that contains fourteen (14) sulfur species in base fuel (40% LV isooctane/40% LV hexane/20% LV toluene). Sulfur species include: methanethiol, ethanethiol, dimethylsulfide, 2-propanethiol, t-butanethiol, 1-propanethiol, thiophene, diethylsulfide, 1-butanethiol, diethyl disulfide, thiophenol, benzothiophene, bromothiophene (as internal standard), and diphenyl sulfide. Offered as a single 2mL ampoule.

Concentration of Species	Matrix	Size	Product No.
100μg/g (as Sulfur)	Base Fuel	2mL	MSX14-2

### Sulfur Compounds by Selective Detection (50μg/g)

Calibration Standard for ASTM D5623 - Sulfur Compounds in Light Hydrocarbon Liquids by Selective Detection. Composition: Multi-component mixture containing twenty-two (22) sulfur species in base fuel (40% LV isooctane/40% LV hexane/20% LV toluene). Sulfur species include: 2-methyl-1-propanethiol, 2-methylthiophene, 3-methylthiophene, 1,2-ethane dithiol, 1-pentanethiol, 2-ethylthiophene, propylsulfide, t-butyl disulfide, 1,5-pentanedithiol, 1-nonanethiol, 1-decanethiol, propanethiol, t-butylsulfide, 1-heptanethiol, 1,4-butanedithiol, methyl ethylsulfide, propyl disulfide, 1-octanethiol, benzothiophene, 1-hexanethiol, carbon disulfide, and methyl sulfide. Offered as a single 2mL ampoule.

Concentration of Species	Matrix	Size	Product No.
50μg/g (as component)	Base Fuel	2mL	MSX22-2

- ICP & RDE Standards
- Standards for Used Oils
- Distillation Standards
- Performance Testing Program
- Standards for S, N, Cl and Metals
  - Sulfur-Free Metallo-Organics
  - Metallo-Organic Concentrates
  - Sulfur & Metals for XRF
- Sulfur
  - Nitrogen
  - Chlorine
  - Lead in Gas
- Petroleum Physical Test Standards
- Biodiesel

### VHG Tips

To convert lead in isooctane concentrations from g/gal to µg/g (ppm), multiply by 370 i.e., 0.1 g/gal=37µg/g.

## Sulfur and Nitrogen Products (Ampoules) For Low-Level Analytical Techniques



### Sulfur and Nitrogen Combined

Calibration Set for instruments designed for simultaneous determination of sulfur and nitrogen. Composition: Sulfur and Nitrogen in isooctane. Offered only as a single set of 6 x 2mL ampoules. Also available in toluene upon request.

Concentration (ng/µL)	Matrix	Size	Product No.
S @ 0, 1, 5, 10, 15, 20; N @ 0, 1, 5, 20, 35, 50	Isooctane	6x2mL	SN-SET1

### Trace Nitrogen by Chemiluminescence

Calibration Set for ASTM Method D4629 - Trace Nitrogen in Liquid Petroleum Hydrocarbons by Chemiluminescence Detection. Composition: N (from pyridine) in isooctane. Offered only as a single set of 9 x 2mL ampoules. Also available in toluene upon request.

Concentration (ng/µL)	Matrix	Size	Product No.
0, 1, 2, 10, 20, 50, 100, 200, 500, 1000	Isooctane	10x2mL	NCH-SET1

### Trace Nitrogen by Oxidative Combustion and Electrochemical Detection

Calibration Set for ASTM D6366 - Total Trace Nitrogen and its Derivatives in Liquid Aromatic Hydrocarbons by Oxidative Combustion and Electrochemical Detection. Composition: N (from pyridine) in p-xylene [Set 1] or isooctane [Set 2]. Offered only as single sets of 2mL ampoules. Set also available in toluene upon request (with N from carbazole).

Concentration (ng/µL)	Matrix	Size	Product No.
0.1, 0.5, 1.0, 2.5, 5.0, 10	p-xylene	6x2mL	NCED-SET1B
10, 25, 50, 75, 100	Isooctane	5x2mL	NCED-SET2

## Chlorine in Oil Standards For XRF, ICP and Other Techniques

### Chlorine Standards in Oil (ASTM D4929 or D5384)

Matrix: Heavy Mineral Oil

Volume: 100mL

Concentration		Oil Product No
(µg/g)	(wt%)	
Blank	Blank	CLOIL-BLK-100
10	0.001	CLOIL-10-100
100	0.010	CLOIL-100-100
500	0.050	CLOIL-500-100
1,000	0.10	CLOIL-1000-100
10,000	1.00	CLOIL-1%-100
50,000	5.00	CLOIL-5%-100

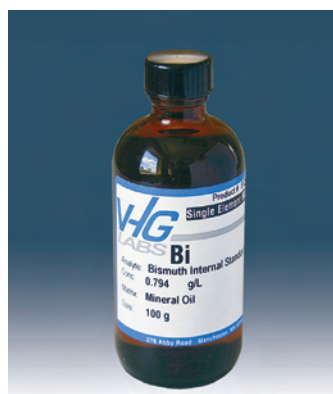
# Standards for Lead in Gasoline

## Section 1 Petroleum Standards

Lead In Isooctane Standards for XRF (ASTM D5059)		
Matrix: Isooctane	Volume: 100 Grams	
Method	Conc. (g/gal)*	Product No.
ASTM D5059 Pt. A	0.0	PBISO-BLK-100G
"	0.1	PBISO-0.1-100G
"	1.0	PBISO-1-100G
"	2.0	PBISO-2-100G
"	3.0	PBISO-3-100G
"	4.0	PBISO-4-100G
"	5.0	PBISO-5-100G
ASTM D5059 Pt. A	Set	PBISOSETA-7X100G
ASTM D5059 Pt. C	0.000	PBISO-BLK-100G
"	0.001	PBISO-0.001-100G
"	0.005	PBISO-0.005-100G
"	0.010	PBISO-0.010-100G
"	0.050	PBISO-0.050-100G
"	0.100	PBISO-0.100-100G
"	0.300	PBISO-0.300-100G
ASTM D5059 Pt. C	Set	PBISOSETC-7X100G

\*Note: For approximate conversion from g/gal to µg/g (ppm), multiply by 380 i.e., 0.1 g/gal=38µg/g

Bismuth Internal Standard for ASTM D5059			
Matrix: Mineral Oil			
Method	Conc. Bi	Size (grams)	Product No.
ASTM D5059 Pt. A and C	0.793g/L	100	BIIS-100G
	0.793g/L	400	BIIS-400G



- ICP & RDE Standards
- Standards for Used Oils
- Distillation Standards
- Performance Testing Program
- Standards for S, N, Cl and Metals
  - Sulfur-Free Metallo-Organics
  - Metallo-Organic Concentrates
  - Sulfur & Metals for XRF
  - Sulfur
- ▶ Nitrogen
- ▶ Chlorine
- ▶ Lead in Gas
- Petroleum Physical Test Standards
- Biodiesel

## Internal Standards for XRF Analysis Sulfur-Free Raw Material in Oil

Internal Standards for XRF Analysis				
Element	Method	Concentration	Product No.	Product No.
Bismuth	ASTM D5059 Pb Analysis	0.793g/L	BIIS-100G	BIIS-400G
Manganese	ISO/CD 14596 Ni and V Analysis	0.05%	MNIS-100G	MNIS-400G
Zirconium	ISO/CD 14597 Low Sulfur Analysis	1%	ZRIS1%-100G	ZRIS1%-400G
Zirconium	ISO/CD 14597 High Sulfur Analysis	16%	ZRIS16%-100G	ZRIS16%-400G

To order, call (+1) 888.622.7660 or fax (+1) 603.622.5180

## Petroleum Physical Test Standards

### Flash Point Reference Materials

VHG Labs' Flash Point Reference materials are intended for use with and certified by the appropriate ASTM Methods [ASTM D56, D92, D93]. Each standard is verified by consensus analysis, and is supplied with a full Certificate of Analysis (COA) that states the certified value. **Volume: 250mL**

Specification	Apparatus	Typical Flash Point Range (°C)	Product No.
ASTM D93 (Flash Point)	Pensky-Martens Closed-Cup Tester	25-35	FP27-250
		55-65	FPPM60-250
		70-80	FP75-250
		90-100	FP93-250
ASTM D92 (Flash and Fire Point)	Cleveland Open Cup Tester	190-215	FP200-250
		220-240	FP230-250
ASTM D56 (Flash Point)	Tag Closed Cup Tester	40-50	FP40-250
		50-60	FP55-250
		55-65	FPTC60-250

### Flash Point Certified Reference Materials

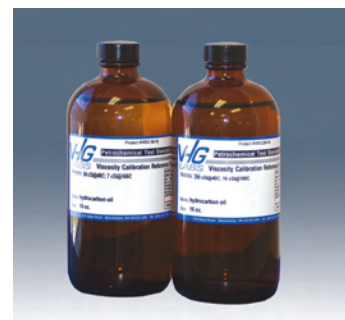
VHG Labs' Flash Point Certified Reference Materials are intended for use in accordance with the specified ASTM Methods [ASTM D56, D92, D93]. They consist of stable, pure hydrocarbons with a method-specific flash point determined by an inter-laboratory study. Each standard is supplied with a full Certificate of Analysis (COA) that states the certified value. **Volume: 250mL**

ASTM Method	Hydrocarbon	Typical Flash Point Range °C	Product No.
D93 Flash Point Pensky-Martens Closed Cup Tester	n-Decane	45-55	FP53-250
	n-Undecane	65-75	FP70-250
	n-Tetradecane	110-120	FP114-250
	n-Hexadecane	130-145	FP134-250
D92 Flash & Fire Point Cleveland Open Cup Tester	n-Tetradecane	110-120	FP115-250
	n-Hexadecane	135-150	FP138-250
D56 Flash Point Tag Closed Cup Tester	n-Decane	45-55	FP51-250
	n-Undecane	60-70	FP67-250

### Viscosity Reference Standards

VHG Labs provides viscosity reference standards, intended for use in accordance with standard methods [e.g. ASTM D445]. Each standard is manufactured in our ISO 9001 and ISO Guide 34 facility and certified in our ISO/IEC 17025 laboratory. **Volume: 500mL**

Nominal Viscosity @ 40°C (cSt)	Nominal Viscosity @ 100°C (cSt)	Product No.
4.5	1.6	VISC5-500
9.5	2.8	VISC10-500
30	5.3	VISC30-500
54	7.3	VISC60-500
102	15.3	VISC100-500
110	16.8	VISC110-500
130	20	VISC130-500
300	47	VISC300-500
520	57	VISC500-500
920	84	VISC900-500





# Petroleum Physical Test Standards

## Section 1 Petroleum Standards



- ◆ The following physical test standards are not intended for use with Phase Instruments. Please contact us for Phase-compatible standards.

### ASTM D97 Pour Point Reference Materials

VHG Labs' Pour Point Reference Materials are intended for use in accordance with ASTM D97 **only**, for determination of the pour point of petroleum products. Each standard is verified by consensus analysis, and is supplied with a full Certificate of Analysis (COA) that states the certified value.

**Volume: 250mL**

#### Typical Pour Point Range (°C)

#### Product No.

-7 to -3	P5-250
-12 to -8	P10-250
-17 to -13	P15-250
-22 to -18	P20-250
-42 to -36	P40-250
-53 to -47	P50-250

### ASTM D2500 Cloud Point Reference Materials

VHG Labs' Cloud Point Reference Materials are intended for use in accordance with ASTM D2500 for the determination of the cloud point of petroleum products. The cloud point of a petroleum product is an index of the lowest temperature of their utility for certain applications. Each standard is verified by consensus analysis, and is supplied with a full Certificate of Analysis (COA) that states the certified value.

**Volume: 250mL**

#### Typical Cloud Point Range (°C)

#### Product No.

+3 to +9	C5-250
-4 to 0	C2-250
-12 to -8	C10-250
-17 to -13	C15-250
-22 to -18	C20-250

### ASTM D2386 Freezing Point Reference Materials

VHG Labs' Freezing Point Reference Materials are intended for use in accordance with ASTM Method D2386 for determination of the freezing point of aviation fuels. Each standard is verified by consensus analysis, and is supplied with a full Certificate of Analysis (COA) that states the certified value.

**Volume: 250mL**

#### Typical Freezing Point Range (°C):

#### Product No.

-47 to -42	F45-250
-52 to -48	F50-250

**NEW!**

### ASTM D6371 Cold Filter Plug Point Reference Materials

VHG Labs' Cold Filter Plug Point Standards are intended for use in accordance with ASTM Method D6371/IP309 for determination of the cold filter plug point of diesel and heating fuels. Each standard is verified by consensus analysis, and is supplied with a full Certificate of Analysis (COA) that states the certified value.

**Volume: 250mL**

#### Typical Plug Point Range (°C)

#### Product No.

-20 to -17	CFP1-250
------------	----------

ICP & RDE Standards  
Standards for Used Oils  
Distillation Standards  
Performance Testing Program  
Standards for S, N, Cl and Metals

### Petroleum Physical Test Standards

- ▶ Flash Point
- ▶ Viscosity
- ▶ Pour Point
- ▶ Cloud Point
- ▶ Freezing Point
- ▶ Cold Filter Plug Point

### Biodiesel

To order, call (+1) 888.622.7660 or fax (+1) 603.622.5180

## Biodiesel Standards

As the demand for biofuels continues to rise, the need to reliably analyze these products has become a necessity for the petroleum industry.

Most biodiesel fuels are comprised of a blend of traditional refined diesel combined with biodiesel fuel. The percentage of biodiesel in the blend is generally 5%, 10% or 15%, and is labeled B5, B10, or B15 respectively. Pure biodiesel (100%) is labeled B100. All of the biodiesel standards manufactured by VHGLabs have a matrix of 100% biodiesel. This is important in the analysis of materials by ICP and other methods because the analysis can often be encumbered by the variance of matrices from standards to samples.

Our biodiesel standards have been formulated specifically for the analysis of metals and sulfur in biodiesel fuel. Our B100 is made from soybean oil and is an excellent matrix match for almost all biodiesel fuel analysis.

**NEW!**



### Metals in Biodiesel Standards

These standards have been formulated specifically for the analysis of metals in biodiesel fuel in accordance with ASTM D6751, EN 14107, EN 14108, EN 14109, EN 14214, or EN 14538.

Description	Product No.
Ca, K, Mg, Na, P @ 5µg/g, B100 Biodiesel, 100g	B100M5-5-100G
Ca, K, Mg, Na, P @ 10µg/g, B100 Biodiesel, 100g	B100M5-10-100G
Ca, K, Mg, Na, P @ 15µg/g, B100 Biodiesel, 100g	B100M5-15-100G
Ca, K, Mg, Na, P @ 20µg/g, B100 Biodiesel, 100g	B100M5-20-100G

### Sulfur in Biodiesel Standards

These standards have been formulated specifically for the analysis of sulfur in biodiesel fuel in accordance with ASTM D2622, D4294, or D5453.

Description	Product No.
Sulfur @ 5µg/g, B100 Biodiesel, 100mL	SB100-5-100
Sulfur @ 10µg/g, B100 Biodiesel, 100mL	SB100-10-100
Sulfur @ 15µg/g, B100 Biodiesel, 100mL	SB100-15-100
Sulfur @ 20µg/g, B100 Biodiesel, 100mL	SB100-20-100
Sulfur @ 25µg/g, B100 Biodiesel, 100mL	SB100-25-100
Sulfur @ 50µg/g, B100 Biodiesel, 100mL	SB100-50-100
Sulfur @ 100µg/g, B100 Biodiesel, 100mL	SB100-100-100
Sulfur @ 500µg/g, B100 Biodiesel, 100mL	SB100-500-100

### Biodiesel Blanks

These solutions are intended for use as calibration blanks for analysis of metals or sulfur in biodiesel. Each is supplied with a Certificate of Analysis (COA) that includes relevant trace metal and sulfur concentrations.

Description	Product No.
B100 Biodiesel Blank, 100mL	B100-BLK-100
B100 Biodiesel Blank, 500mL	B100-BLK-500

### Biodiesel/Diesel Fuel Blends

These standards are intended for use as calibration or reference standards for the determination of fatty acid methyl esters (FAME) biodiesel content in diesel fuel by infrared (IR) spectroscopy. They are formulated specifically for use with ASTM Method D7371 or EN 14078.

Description	Product No.
100% #2 Diesel Fuel, 20mL	BDBLEND-BLK-20
2% (v/v) Biodiesel in #2 Diesel Fuel, 20mL	BDBLEND-2%-20
5% (v/v) Biodiesel in #2 Diesel Fuel, 20mL	BDBLEND-5%-20
10% (v/v) Biodiesel in #2 Diesel Fuel, 20mL	BDBLEND-10%-20
15% (v/v) Biodiesel in #2 Diesel Fuel, 20mL	BDBLEND-15%-20
20% (v/v) Biodiesel in #2 Diesel Fuel, 20mL	BDBLEND-20%-20
100% (v/v) Biodiesel, 20mL	BDBLEND-100%-20

## Section 2 Aqueous Standards

### Single-Element Standards

- A+ Single-Element

- Speciation

- Isotopic

- AA Standards

### Ion Chromatography and Wet Chemistry Standards

- IC Standards

- Wet Chemistry

- QC Check Samples for Water

### Multi-Element Standards for ICP-AES and ICP-MS

- Multi-Element

- Environmental

- Trace Elements CRMs

- QC Check Samples for Water

- EPA 200.7, 6010, CLP

- ICP-MS Standards

- EPA 200.8, 6020, CLP



# Single-Element Standards

No analytical instrument can undo the costs created by poor accuracy of the stock standards. VHGLabs' line of A+ standards are manufactured to leave nothing to chance. They are tested and certified according to a protocol created by the US National Institute of Standards and Technology (NIST) that provides for accurate, precise and traceable certified concentration and uncertainty.

### VHG Tips

Always pour a small amount from the standard solution to a suitable container for the purpose of volumetric pipette solution transfer. Do not add the removed sample back to the original standard solution container.

Avoid using glass pipettes or transfer devices with standard solutions containing HF. Free HF attacks glass.

When preparing solutions, don't underestimate the importance of good mixing. A simple swirl is not adequate. Invert and shake the container several times.

When making mixes of single-element standards, chemists should understand inter-element and matrix compatibility issues.

Fortunately, most elements are soluble and stable in dilute nitric acid. Have any questions related to this? Call VHGLabs and ask for Technical Support.

Try using HCl rather than HNO<sub>3</sub> as the matrix acid for Hg measurements using

ICP or ICP-MS. Stability of low level solutions is improved and washout times are faster.

### Features of VHGLabs A+ Standards:

- ◆ Ideal for ICP, ICP-MS, AA, GFAA or other elemental techniques
- ◆ Prepared from high purity raw materials, acids and 18Mohm DI water
- ◆ Manufactured in our ISO 9001, ISO Guide 34 facility, and certified in our ISO/IEC 17025 laboratory
- ◆ Assayed by NIST HP-ICP-AES method (see page 38)
- ◆ Purity confirmed by ICP-MS
- ◆ Accompanied by NIST-traceable COA
- ◆ Packaged in acid-leached, triple-rinsed HDPE bottles
- ◆ Shipped in poly-sealed bags
- ◆ Most elements certified for 18 months shelf life

A+ High Purity Single Element Aqueous Calibration Standards			Concentration (10µg/mL)	Concentration (1,000µg/mL)	Concentration (10,000µg/mL)
Element	Starting Material, Matrix	Vol. (mL)	Product No.	Product No.	Product No.
Aluminum	Al, HCl	100	LALH-100	PALH-100	TALH-100
		50		PALH-500	TALH-500
	Al(NO <sub>3</sub> ) <sub>3</sub> , HNO <sub>3</sub>	100	LALN-100	PALN-100	TALN-100
		50		PALN-500	TALN-500
Antimony	Sb, HCl	100	LSBH-100	PSBH-100	TSBH-100
		50		PSBH-500	TSBH-500
	Sb, HNO <sub>3</sub> , Tartaric Acid	100	LSBWTN-100	PSBWTN-100	TSBWTN-100
		50		PSBWTN-500	TSBWTN-500
Arsenic	As, HNO <sub>3</sub>	100	LASN-100	PASN-100	TASN-100
		50		PASN-500	TASN-500
		<b>More Info. (p. 40)</b> As+3, As+5			
Barium	Ba(NO <sub>3</sub> ) <sub>2</sub> , HNO <sub>3</sub>	100	LBAN-100	PBAN-100	TBAN-100
		50		PBAN-500	TBAN-500
Beryllium	Be <sub>4</sub> O(C <sub>2</sub> H <sub>3</sub> O <sub>2</sub> ) <sub>6</sub> , HNO <sub>3</sub>	100	LBEN-100	PBEN-100	TBEN-100
		50		PBEN-500	TBEN-500
Bismuth	Bi, HNO <sub>3</sub>	100	LBIN-100	PBIN-100	TBIN-100
		50		PBIN-500	TBIN-500
Boron	H <sub>3</sub> BO <sub>3</sub> , NH <sub>4</sub> OH	100	LBZ-100	PBZ-100	TBZ-100
		50		PBZ-500	TBZ-500
	H <sub>3</sub> BO <sub>3</sub> , H <sub>2</sub> O	100	LBW-100	PBW-100	N/A
		50		PBW-500	N/A
Cadmium	Cd, HNO <sub>3</sub>	100	LCDN-100	PCDN-100	TCDN-100
		50		PCDN-500	TCDN-500
Calcium	CaCO <sub>3</sub> , HNO <sub>3</sub>	10		PCAN-100	TCAN-100
		50		PCAN-500	TCAN-500
Carbon	CH <sub>3</sub> CO <sub>2</sub> H, H <sub>2</sub> O	10		PCW-100	TCW-100
		50		PCW-500	TCW-500
Cerium	Ce, HNO <sub>3</sub>	10		PCEN-100	TCEN-100
		50		PCEN-500	TCEN-500
Cesium	Cs <sub>2</sub> CO <sub>3</sub> , HNO <sub>3</sub>	10		PCSN-100	TCSN-100
		50		PCSN-500	TCSN-500
Chromium	Cr, HCl	10		PCRH-100	TCRH-100
		50		PCRH-500	TCRH-500
	Cr(NO <sub>3</sub> ) <sub>3</sub> , HNO <sub>3</sub>	100	LCRN-100	PCRN-100	TCRN-100
		50		PCRN-500	TCRN-500
Cobalt	Co, HNO <sub>3</sub>	100	LCON-100	PCON-100	TCON-100
		50		PCON-500	TCON-500

**More Info. (p. 40)** Cr<sup>+3</sup>, Cr<sup>+6</sup>

**A-PLUS CERTIFIED** Single-Element Standards

A+ High Purity Single Element Aqueous Calibration Standards			Concentration (10µg/mL)	Concentration (1,000µg/mL)	Concentration (10,000µg/mL)
Element	Starting Material, Matrix	Vol. (mL)	Product No.	Product No.	Product No.
Copper	Cu, HNO <sub>3</sub>	100	LCUN-100	PCUN-100	TCUN-100
		500		PCUN-500	TCUN-500
Dysprosium	Dy <sub>2</sub> O <sub>3</sub> , HNO <sub>3</sub>	100		PDYN-100	TDYN-100
		500		PDYN-500	TDYN-500
Erbium	Er <sub>2</sub> O <sub>3</sub> , HNO <sub>3</sub>	100		PERN-100	TERN-100
		500		PERN-500	TERN-500
Europium	Eu <sub>2</sub> O <sub>3</sub> , HNO <sub>3</sub>	100		PEUN-100	TEUN-100
		500		PEUN-500	TEUN-500
Gadolinium	Gd <sub>2</sub> O <sub>3</sub> , HNO <sub>3</sub>	100		PGDN-100	TGDN-100
		500		PGDN-500	TGDN-500
Gallium	Ga, HNO <sub>3</sub> , tr. HCl	100		PGANH-100	TGANH-100
		500		PGANH-500	TGANH-500
Germanium	Ge, HNO <sub>3</sub> , tr. HF	100	LGENF-100	PGENF-100	TGENF-100
		500		PGENF-500	TGENF-500
	(NH <sub>4</sub> ) <sub>2</sub> GeF <sub>6</sub> , H <sub>2</sub> O, tr. F-	100		PGEW-100	N/A
		500		PGEW-500	N/A
Gold	Au, HCl	100		PAUH-100	TAUH-100
		500		PAUH-500	TAUH-500
Hafnium	HfCl <sub>2</sub> O, HCl	100		PHFH-100	THFH-100
		500		PHFH-500	THFH-500
Holmium	Ho <sub>2</sub> O <sub>3</sub> , HNO <sub>3</sub>	100		PHON-100	THON-100
		500		PHON-500	THON-500
Indium	In, HNO <sub>3</sub>	100	LINN-100	PINN-100	TINN-1000
		500		PINN-500	TINN-500
Iridium	IrCl <sub>3</sub> , HCl	100	LIRH-100	PIRH-100	TIRH-100
		500		PIRH-500	TIRH-500
Iron	Fe, HNO <sub>3</sub>	100		PFEN-100	TFEN-100
		500		PFEN-500	TFEN-500
Lanthanum	La <sub>2</sub> O <sub>3</sub> , HNO <sub>3</sub>	100		PLAN-100	TLAN-100
		500		PLAN-500	TLAN-500
Lead	Pb, HNO <sub>3</sub>	100	LPBN-100	PPBN-100	TPBN-100
		500		PPBN-500	TPBN-500
Lithium	Li <sub>2</sub> CO <sub>3</sub> , HNO <sub>3</sub>	100	LLIN-100	PLIN-100	TLIN-100
		500		PLIN-500	TLIN-500
<b>More Info. (p.41)</b> <sup>6</sup> Li					
Lutetium	Lu <sub>2</sub> O <sub>3</sub> , HNO <sub>3</sub>	100	LLUN-100	PLUN-100	TLUN-100
		500		PLUN-500	TLUN-500
Magnesium	Mg, HNO <sub>3</sub>	100		PMGN-100	TMGN-100
		500		PMGN-500	TMGN-500
Manganese	Mn, HNO <sub>3</sub>	100	LMNN-100	PMNN-100	TMNN-100
		500		PMNN-500	TMNN-500
Mercury	Hg, HNO <sub>3</sub>	100	LHGN-100	PHGN-100	THGN-100
		500		PHGN-500	THGN-500
Methyl Mercury Chloride	CH <sub>3</sub> HgCl				
	<b>More Info. (p. 40)</b>				
Molybdenum	Mo, HNO <sub>3</sub> , tr. HF	100	LMONF-100	PMONF-100	TMONF-100
		500		PMONF-500	TMONF-500
	(NH <sub>4</sub> ) <sub>2</sub> MoO <sub>4</sub> , NH <sub>4</sub> OH	100		PMOZ-100	TMOZ-100
		500		PMOZ-500	TMOZ-500

**Section 2  
Aqueous  
Standards**

**Single-Element Standards**

- ▶ A+ Single-Element Speciation
- Isotopic
- Atomic Absorption

**Ion Chromatography and Wet Chemistry Standards**

**Multi-Element Standards for ICP-AES and ICP-MS**

## Section 2 Aqueous Standards



## Single-Element Standards

A+ High Purity Single Element Aqueous Calibration Standards		Concentration (10µg/mL)		Concentration (1,000µg/mL)		Concentration (10,000µg/mL)	
Element	Starting Material, Matrix	Vol. (mL)	Product No.	Product No.	Product No.	Product No.	Product No.
Neodymium	Nd <sub>2</sub> O <sub>3</sub> , HNO <sub>3</sub>	100		PNDN-100		TNDN-100	
		500		PNDN-500		TNDN-500	
Nickel	Ni, HNO <sub>3</sub>	100	LNIN-100	PNIN-100		TNIN-100	
		500		PNIN-500		TNIN-500	
Niobium	NbCl <sub>5</sub> , HF	100		PNBF-100		TNBF-100	
		500		PNBF-500		TNBF-500	
		100		PNBW-100		TNBW-100	
Osmium	(NH <sub>4</sub> ) <sub>2</sub> OsCl <sub>6</sub> , HCl	100		POSH-100		N/A	
		500		POSH-500		N/A	
Palladium	Pd, HCl	100		PPDH-100		TPDH-100	
		500		PPDH-500		TPDH-500	
	Pd, HNO <sub>3</sub>	100	PPDN-100	TPDN-100			
Phosphorus	H <sub>3</sub> PO <sub>4</sub> , H <sub>2</sub> O	100		PPW-100		TPW-100	
		500		PPW-500		TPW-500	
Platinum	Pt, HCl	100	LPTH-100	PPTH-100		TPTH-100	
		500		PPTH-500		TPTH-500	
Potassium	KNO <sub>3</sub> , HNO <sub>3</sub>	100		PKN-100		TKN-100	
		500		PKN-500		TKN-500	
Praseodymium	Pr <sub>6</sub> O <sub>11</sub> , HNO <sub>3</sub>	100		PPRN-100		TPRN-100	
		500		PPRN-500		TPRN-500	
Rhenium	Re, HNO <sub>3</sub>	100		PREN-100		TREN-100	
		500		PREN-500		TREN-500	
Rhodium	RhCl <sub>3</sub> , HCl	100	LRHH-100	PRHH-100		TRHH-100	
		500		PRHH-500		TRHH-500	
Rubidium	Rb <sub>2</sub> CO <sub>3</sub> , HNO <sub>3</sub>	100		PRBN-100		TRBN-100	
		500		PRBN-500		TRBN-500	
Ruthenium	RuCl <sub>3</sub> , HCl	100		PRUH-100		TRUH-100	
		500		PRUH-500		TRUH-500	
Samarium	Sm <sub>2</sub> O <sub>3</sub> , HNO <sub>3</sub>	100		PSMN-100		TSMN-100	
		500		PSMN-500		TSMN-500	
Scandium	Sc <sub>2</sub> O <sub>3</sub> , HNO <sub>3</sub>	100	LSCN-100	PSCN-100		TSCN-100	
		500		PSCN-500		TSCN-500	
Selenium	Se, HNO <sub>3</sub>	100	LSEN-100	PSEN-100		TSEN-100	
		500		PSEN-500		TSEN-500	
Silica							
Silicon	Si, HNO <sub>3</sub> , tr. HF	100		PSINF-100		TSINF-100	
		500		PSINF-500		TSINF-500	
		100		PSIW-100		TSIW-100	
		500		PSIW-500		TSIW-500	
Silver	Ag, HNO <sub>3</sub>	100	LAGN-100	PAGN-100		TAGN-100	
		500		PAGN-500		TAGN-500	
Sodium	Na <sub>2</sub> CO <sub>3</sub> , HNO <sub>3</sub>	100		PNAN-100		TNAN-100	
		500		PNAN-500		TNAN-500	
Strontium	Sr(NO <sub>3</sub> ) <sub>2</sub> , HNO <sub>3</sub>	100	LSRN-100	PSRN-100		TSRN-100	
		500		PSRN-500		TSRN-500	
Sulfur	(NH <sub>4</sub> ) <sub>2</sub> SO <sub>4</sub> , H <sub>2</sub> O	100		PSW-100		TSW-100	
		500		PSW-500		TSW-500	
Tantalum	TaCl <sub>5</sub> , HF	100		PTAF-100		TTAF-100	
		500		PTAF-500		TTAF-500	

### VHG Tips

Try doing dilutions on a wt./wt. basis; the uncertainty of a balance is much lower than a pipette.

“Trace 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 similarly low, dilute levels with no additional fluoride added.

“Matrix-matching” of major sample components can be of great benefit with many spectrometric techniques. Our 1% (10,000µg/mL) standards work well as stock materials for these purposes.

When working with osmium, only mix the standard with water and HCl. Do not use nitric acid. Nitric acid will slowly oxidize the Os to OsO<sub>4</sub>, which is volatile and very toxic.

“Fall-out” or precipitation of an analyte will ruin your analysis.

Be especially aware of any mixing of Ag and Cl-, Ba and SO<sub>4</sub><sup>2-</sup>, and Mg, Sc (and other lanthanides/actinides) with F-.

As a rule of thumb, the total concentration of all elements (metals) in a multi-element mixture should be kept below 20,000µg/mL (2%).

Silver is stable in HCl up to 100ppm. Add Ag concentrate to concentrated HCl to effect complexation, then bring to volume with dilute HCl.

**More Info. (p.40)** → Se+4, Se+6

**More Info. (p.47)**



# Single-Element Standards

## Section 2 Aqueous Standards

A+ High Purity Single Element Aqueous Calibration Standards			Concentration (10µg/mL)	Concentration (1,000µg/mL)	Concentration (10,000µg/mL)
Element	Starting Material, Matrix	Vol. (mL)	Product No.	Product No.	Product No.
Tellurium	Te, HCl	100		PTEH-100	TTEH-100
		500		PTEH-500	TTEH-500
	Te, HNO <sub>3</sub>	100		PTEN-100	N/A
		500		PTEN-500	N/A
Terbium	Tb <sub>4</sub> O <sub>7</sub> , HNO <sub>3</sub>	100	LTBN-100	PTBN-100	TTBN-100
		500		PTBN-500	TTBN-500
Thallium	Tl, HNO <sub>3</sub>	100		PTLN-100	TTLN-100
		500		PTLN-500	TTLN-500
Thorium	Th(NO <sub>3</sub> ) <sub>4</sub> , HNO <sub>3</sub>	100		PTHN-100	TTHN-100
		500		PTHN-500	TTHN-500
Thulium	Tm <sub>2</sub> O <sub>3</sub> , HNO <sub>3</sub>	100		PTMN-100	TTMN-100
		500		PTMN-500	TTMN-500
Tin	Sn, HCl	100	LSNH-100	PSNH-100	TSNH-100
		500		PSNH-500	TSNH-500
	Sn, HNO <sub>3</sub> , tr. HF	100	LSNNF-100	PSNNF-100	TSNNF-100
		500		PSNNF-500	TSNNF-500
Titanium	Ti, HNO <sub>3</sub> , tr. HF	100	LTINF-100	PTINF-100	TTINF-100
		500		PTINF-500	TTINF-500
	(NH <sub>4</sub> ) <sub>2</sub> TiF <sub>6</sub> , H <sub>2</sub> O, tr. F -	100		PTIW-100	TTIW-100
		500		PTIW-500	TTIW-500
Tungsten	W, HNO <sub>3</sub> , tr. HF	100		PWNF-100	TWNF-100
		500		PWNF-500	TWNF-500
	(NH <sub>4</sub> ) <sub>2</sub> WO <sub>4</sub> , H <sub>2</sub> O	100		PWW-100	TWW-100
		500		PWW-500	TWW-500
Uranium	U <sub>3</sub> O <sub>8</sub> , HNO <sub>3</sub>	100	LUN-100	PUN-100	TUN-100
		500		PUN-500	TUN-500
Vanadium	V <sub>2</sub> O <sub>5</sub> , HNO <sub>3</sub>	100	LVN-100	PVN-100	TVN-100
		500		PVN-500	TVN-500
Ytterbium	Yb <sub>2</sub> O <sub>3</sub> , HNO <sub>3</sub>	100		PYBN-100	TYBN-100
		500		PYBN-500	TYBN-500
Yttrium	Y <sub>2</sub> O <sub>3</sub> , HNO <sub>3</sub>	100	LYN-100	PYN-100	TYN-100
		500		PYN-500	TYN-500
Zinc	Zn, HNO <sub>3</sub>	100	LZNN-100	PZNN-100	TZNN-100
		500		PZNN-500	TZNN-500
Zirconium	ZrCl <sub>2</sub> O, HCl	100		PZRH-100	TZRH-100
		500		PZRH-500	TZRH-500

### Single-Element Standards

- ▶ A+ Single-Element Speciation
- Isotopic
- Atomic Absorption

### Ion Chromatography and Wet Chemistry Standards

### Multi-Element Standards for ICP-AES and ICP-MS



To order, call (+1) 888.622.7660 or fax (+1) 603.622.5180

## NIST High Performance ICP-AES Protocol

VHG Labs' A+ Standards are certified to provide the highest possible confidence.

As part of our long-term commitment to continuous improvement, VHG participated in original research conducted by the National Institute of Standards and Technology (NIST) in 1999. The primary goal of this research was to provide a more accurate instrument-based methodology for metals determinations. An additional goal of the NIST method was to have a complete and unbroken chain of traceability to standard reference materials. The result of this work is the **NIST High Performance ICP-AES method<sup>(1)</sup>**.



### The NIST High Performance Method is the Core of VHG's A+ Single Element Standard Product Line

It is widely accepted that standards prepared gravimetrically in the classical manner provide reasonable concentration accuracy. Many commercial vendors stop there. At VHG Labs, we go several steps further — the NIST protocol prescribes that four independent dilutions of the gravimetric standard are made at a concentration optimized for the ICP-AES system. At the same time, four additional, independent preparations of a reference standard are made. We utilize NIST 300-Series SRM calibrants; thus providing direct, NIST SRM traceable certification. The eight (total) samples also have a method-specified internal reference spike added to provide additional control measurements for quantitative and statistical analysis. Once rigorous criteria are met for the array-based ICP-AES instrument, over 800 measurements are obtained on these samples. The raw data is processed with a program created by NIST and provides extremely accurate, traceable concentration results, as well as a meaningful expanded uncertainty that is also directly traceable to the NIST SRM. For additional technical information, please visit our website.

#### A+ Standards feature:

- ◆ Rigorous quality control
- ◆ Highest purity with minimal traces
- ◆ Complete traceability to NIST SRM
- ◆ Low, statistically meaningful, 'expanded uncertainty' provided on COA
- ◆ Superior packaging in pre-cleaned containers



**Your analysis ultimately depends on the standard chosen to calibrate your instrument. Compromising on quality should not be an option.**

1. M. Salit, G. Turk et. Al, *Anal. Chem.*, 2001, 73, 4821-4829.





# CERTIFICATE OF ANALYSIS

Single-Element Aqueous CRM

**Silver (Ag) – 1000 µg/mL**

Matrix: 5% HNO<sub>3</sub>

Lot #: Sample

Product #: PAGN-XXX

Expires: January 2012

Element	Certified Concentration & Uncertainty
Ag	1,001 ± 3 µg/mL (w/v)
	985 ± 3 µg/g (w/w)

**Intended Use:** This solution is intended for use as a certified reference material or calibration standard for inductively coupled plasma optical emission spectroscopy (ICP-OES), inductively coupled plasma mass spectrometry (ICP-MS), flame or furnace atomic absorption spectroscopy (AA or GFAA), x-ray fluorescence spectroscopy (XRF), and other techniques for elemental analysis.

**Certification & Traceability:** VHG CRMs are manufactured and certified under a quality management system that is registered to ISO 9001, ISO Guide 34 and ISO/IEC 17025. This CRM was prepared to a nominal concentration of 1000µg/mL by gravimetric methods using 99.9999% pure silver (Ag) metal dissolved in high purity nitric acid (HNO<sub>3</sub>) and diluted with filtered (0.22µm), 18 M-ohm deionized water. The balances used in the preparation of VHG CRMs are calibrated regularly with traceability to NIST. All volumetric dilutions are performed in Class A calibrated glassware. The certified concentration and uncertainty were determined by VHG Labs using the “High Performance ICP-OES” protocol developed by NIST (visit [www.vhglabs.com](http://www.vhglabs.com) for further information) and both the certified concentration and uncertainty values are traceable to NIST SRM 3151, lot #992212. The uncertainty associated with the certified concentration represents the expanded uncertainty at the 95% confidence level using a coverage factor of k=2.

**Uncertified Values:** ICP-MS was used to determine trace metal concentrations for this product (nd = not determined).

### Trace Concentrations (µg/L)

Ag	MAJOR	Ce	<0.2	Gd	<0.2	Lu	<0.2	Pb	<1	Se	<2	Tl	<0.5
Al	<2	Co	<1	Ge	<0.5	Mg	<5	Pd	<0.5	Si	<100	Tm	<0.2
As	<2	Cs	<0.5	Hf	<0.2	Mn	<1	Pr	<0.2	Sm	<0.2	U	<0.5
Au	<0.5	Cr	<0.5	Hg	<0.5	Mo	<0.5	Pt	<0.5	Sn	<0.5	V	<1
B	<5	Cu	<1	Ho	<0.2	Na	<25	Rb	<0.5	Sr	<1	W	<0.5
Ba	<1	Dy	<0.2	In	nd	Nb	<0.5	Re	<0.2	Ta	<0.5	Y	<0.5
Be	<0.5	Er	<0.2	Ir	<0.2	Nd	<0.2	Rh	<0.5	Tb	<0.5	Yb	<0.2
Bi	<0.2	Eu	<0.2	K	<25	Ni	<2	Ru	<0.5	Te	<1	Zn	<2
Ca	<20	Fe	<10	La	<0.5	Os	<0.5	Sb	<1	Th	<0.5	Zr	<0.5
Cd	<0.5	Ga	<0.5	Li	<2	P	<100	Sc	<5	Ti	<2		

**Instructions for Use:** We recommend that the solution be thoroughly mixed by repeated shaking or swirling of the bottle immediately prior to use. To achieve the highest accuracy the analyst should: (1) use only pre-cleaned containers and transferware, (2) not pipette directly from the CRM’s original container, (3) use a minimum sub-sample size of 500µL, (4) make dilutions using calibrated balances or certified volumetric class A flasks and pipettes, (5) dilute with the same matrix as the original CRM, and (6) never pour used product back into the original container. The solution should be kept tightly capped and stored under normal laboratory conditions. Do not freeze, heat, or expose to direct sunlight. Minimize exposure to moisture or high humidity.

**Period of Validity:** VHG ensures the accuracy of this solution until the expiration date shown above, provided the instructions for use are followed. During the period of validity, the purchaser will be notified if this product is recalled due to any significant changes in the stability of the solution.

VHG Labs, Inc.

Susan Evans Norris, Certifying Officer

7/1/2010

Certification Date



REFERENCE MATERIALS  
PRODUCER CERT #2848.02  
CHEMICAL TESTING  
CERT #2848.01



VHG Labs, Inc. waives all responsibility for any damages resulting from the usage and/or implementation of the products/data described herein.

**VHG Tips**

<sup>6</sup>Li is a well documented internal standard for ICP-MS. But did you know that other isotopic materials can be used as effective internal standards? Example: Try <sup>61</sup>Ni for the important transition metal range.

Feel free to call VHG's Technical Services Division with questions about speciation or isotopic analysis.

# Speciation Standards

Is elemental concentration measurement enough? Analysis of environmental, biological and food-stuff samples now often involves chromatographic separation of certain elements according to their chemical species followed by detection using AA, ICP-AES or ICP-MS. In some cases, simple low pressure chromatography is adequate, while others require full HPLC separations followed by elemental detection.

## Speciation Single-Element Standards

Element	Analyte	Matrix	Concentration (µg/mL)	Vol. (mL)	Product
Arsenic	As <sup>+3</sup> (from As <sub>2</sub> O <sub>3</sub> )	2% HCl	100	50 100	SPAS3-50 SPAS3-100
	As <sup>+5</sup> (from As <sub>2</sub> O <sub>5</sub> )	H <sub>2</sub> O	100	50 100	SPAS5W-50 SPAS5W-100
Chromium	Cr <sup>+3</sup> (from Cr(NO <sub>3</sub> ) <sub>3</sub> )	2% HNO <sub>3</sub>	100	50 100	SPCR3-50 SPCR3-100
	Cr <sup>+6</sup> (from Na <sub>2</sub> CrO <sub>4</sub> )	H <sub>2</sub> O	100	50 100	SPCR6-50 SPCR6-100
	Cr <sup>+6</sup> (from Na <sub>2</sub> CrO <sub>4</sub> )	H <sub>2</sub> O	1000	100 500	PCR6W-100 PCR6W-500
Selenium	Se <sup>+4</sup> (from H <sub>2</sub> SeO <sub>3</sub> )	2% HNO <sub>3</sub>	100	50 100	SPSE4-50 SPSE4-100
	Se <sup>+6</sup> (from H <sub>2</sub> SeO <sub>4</sub> )	H <sub>2</sub> O	100	50 100	SPSE6-50 SPSE6-100



## Organic Mercury Standard

Element	Analyte	Matrix	Concentration	Vol. (mL)	Product
Organic Mercury	CH <sub>3</sub> Hg(II)Cl Methyl Mercury Chloride	H <sub>2</sub> O	1000µg/mL	25	MMC-25

*We can prepare custom standards of Methyl Mercury Chloride for your convenience.*

# Isotopic Standards

Mass spectrometry, in particular ICP-MS, is a powerful technique to measure elemental isotopes. The measurement of individual isotopes can reveal important information about the origin of the element in the sample. Isotope Dilution Mass Spectrometry (IDMS) is often touted as being the most accurate mode of sample 'unknown' analysis.

VHG offers a selection of isotope reference materials. These are non-radioactive, "stable" isotopes and can be handled like any aqueous metal standard. Each standard comes with a Certificate of Analysis (COA) that documents the certified isotopic abundances. Please inquire with requests for isotopes not found here.

## Isotopic Single-Element Standards

Element	Matrix	Total Elemental Concentration (µg/mL)	Size (mL)	Product No.
Boron 10, <sup>10</sup> B	2% HNO <sub>3</sub>	100	50mL	LIS10BN-50
Boron 11, <sup>11</sup> B	H <sub>2</sub> O	100	50mL	LIS11B-50
Cadmium 106, <sup>106</sup> Cd	2% HNO <sub>3</sub>	10	50mL	LIS106CD-50
Chromium 50, <sup>50</sup> Cr	2% HNO <sub>3</sub>	10	50mL	LIS50CR-50
Copper 65, <sup>65</sup> Cu	2% HNO <sub>3</sub>	10	50mL	LIS65CU-50
Iron 57, <sup>57</sup> Fe	2% HNO <sub>3</sub>	10	50mL	LIS57FE-50
Lead, "Natural" Pb	2% HNO <sub>3</sub>	100	50mL	LISPB1-50
Lithium 6, <sup>6</sup> Li	2% HNO <sub>3</sub>	100	100mL	LIS6LIZ-100
Neodymium, Natural Nd	2% HNO <sub>3</sub>	10	50mL	LISND-50
Nickel 61, <sup>61</sup> Ni	2% HNO <sub>3</sub>	10	50mL	LIS61NI-50
Selenium 78, <sup>78</sup> Se	2% HNO <sub>3</sub>	10	50mL	LIS78SE-50
Selenium 82, <sup>82</sup> Se	2% HNO <sub>3</sub>	10	50mL	LIS82SE-50
Strontium, Natural Sr	2% HNO <sub>3</sub>	100	50mL	LISSR-50
Strontium 86, <sup>86</sup> Sr	2% HNO <sub>3</sub>	10	50mL	LIS86SR-50
Tin 122, <sup>122</sup> Sn	2% HNO <sub>3</sub> , tr. HF	10	50mL	LIS122SN-50
Thallium 203, <sup>203</sup> Tl	2% HNO <sub>3</sub>	10	50mL	LIS203TL-50
Zinc 68, <sup>68</sup> Zn	2% HNO <sub>3</sub>	10	50mL	LIS68ZN-50



VHG Labs can supply other elements and/or other isotopes of the elements listed above. Call to inquire.

To order, call (+1) 888.622.7660 or fax (+1) 603.622.5180

## Section 2 Aqueous Standards

### Single Element Standards

- A+ Single-Element
- Speciation
- Isotopic
- Atomic Absorption

### Ion Chromatography and Wet Chemistry Standards

### Multi-Element Standards for ICP-AES and ICP-MS

## Section 2 Aqueous Standards

### VHG Tips

To determine the mass of matrix modifier added to the furnace, multiply the concentration of the modifier by 0.005 for 5 $\mu$ L aliquots or 0.02 for 20 $\mu$ L aliquots.

## Atomic Absorption Standards

- ◆ Suitable for all spectrometric techniques
- ◆ Manufactured from high purity raw materials
- ◆ Higher accuracy and lower uncertainty than competitive standards
- ◆ Certificate of Analysis provided with each standard
- ◆ Stocked for prompt shipment



AA Aqueous Calibration Standards Concentration: (1,000 $\mu$ g/mL)				AA Aqueous Calibration Standards Concentration: (1,000 $\mu$ g/mL)			
Element	Matrix	Vol. (mL)	Product No.	Element	Matrix	Vol. (mL)	Product No.
Aluminum Al	HCl	100	AALH-100	Manganese Mn	HNO <sub>3</sub>	100	AMNN-100
		500	AALH-500			500	AMNN-500
Antimony Sb	HCl	100	ASBH-100	Mercury Hg	HNO <sub>3</sub>	100	AHGN-100
		500	ASBH-500			500	AHGN-500
Arsenic As	HNO <sub>3</sub>	100	AASN-100	Molybdenum Mo	HNO <sub>3</sub> , tr. HF	100	AMONF-100
		500	AASN-500			500	AMONF-500
Barium Ba	HNO <sub>3</sub>	100	ABAN-100	Nickel Ni	HNO <sub>3</sub>	100	ANIN-100
		500	ABAN-500			500	ANIN-500
Beryllium Be	HNO <sub>3</sub>	100	ABEN-100	Palladium Pd	HCl	100	APDH-100
		500	ABEN-500			500	APDH-500
Bismuth Bi	HNO <sub>3</sub>	100	ABIN-100	Platinum Pt	HCl	100	APTH-100
		500	ABIN-500			500	APTH-500
Boron B	H <sub>2</sub> O	100	ABW-100	Potassium K	HNO <sub>3</sub>	100	AKN-100
		500	ABW-500			500	AKN-500
Cadmium Cd	HNO <sub>3</sub>	100	ACDN-100	Selenium Se	HNO <sub>3</sub>	100	ASEN-100
		500	ACDN-500			500	ASEN-500
Calcium Ca	HNO <sub>3</sub>	100	ACAN-100	Silicon Si	HNO <sub>3</sub> , tr. HF	100	ASINF-100
		500	ACAN-500			500	ASINF-500
Chromium Cr	HCl	100	ACRH-100	Silver Ag	HNO <sub>3</sub>	100	AAGN-100
		500	ACRH-500			500	AAGN-500
Cobalt Co	HNO <sub>3</sub>	100	ACON-100	Sodium Na	HNO <sub>3</sub>	100	ANAN-100
		500	ACON-500			500	ANAN-500
Copper Cu	HNO <sub>3</sub>	100	ACUN-100	Strontium Sr	HNO <sub>3</sub>	100	ASRN-100
		500	ACUN-500			500	ASRN-500
Gold Au	HCl	100	AAUH-100	Thallium Tl	HNO <sub>3</sub>	100	ATLN-100
		500	AAUH-500			500	ATLN-500
Iron Fe	HNO <sub>3</sub>	100	AFEN-100	Tin Sn	HCl	100	ASNH-100
		500	AFEN-500			500	ASNH-500
Lead Pb	HNO <sub>3</sub>	100	APBN-100	Titanium Ti	HNO <sub>3</sub> , tr. HF	100	ATINF-100
		500	APBN-500			500	ATINF-500
Lithium Li	HNO <sub>3</sub>	100	ALIN-100	Vanadium V	HNO <sub>3</sub>	100	AVN-100
		500	ALIN-500			500	AVN-500
Magnesium Mg	HNO <sub>3</sub>	100	AMGN-100	Zinc Zn	HNO <sub>3</sub>	100	AZNN-100
		500	AMGN-500			500	AZNN-500

# Matrix Modifiers, Ionization Buffers and Releasing Agents

- ◆ Rigorous quality control of AA products
- ◆ Certificate of analysis supplied with each
- ◆ Matrix Modifier purity checked for over 70 elements



## Section 2 Aqueous Standards

### Single-Element Standards

A+ Single-Element  
Speciation  
Isotopic

### ▶ Atomic Absorption

Ion Chromatography and  
Wet Chemistry Standards

Multi-Element Standards for  
ICP-AES and ICP-MS

### GFAA Matrix Modifiers

Modifier	Matrix	Volume (mL)	Product No.
Ammonium Phosphate	10% NH <sub>4</sub> H <sub>2</sub> PO <sub>4</sub> , 2% HNO <sub>3</sub>	100	MAP10%-100
Magnesium Nitrate	1% Mg(NO <sub>3</sub> ) <sub>2</sub> , 2% HNO <sub>3</sub>	100	MMGN1%-100
Nickel Nitrate	1% Ni(NO <sub>3</sub> ) <sub>2</sub> , 2% HNO <sub>3</sub>	100	MNIN1%-100
Palladium Nitrate	0.1% Pd, 10% HNO <sub>3</sub>	100	MPDN1K-100
	1% Pd, 10% HNO <sub>3</sub>	100	MPDN1%-100

### Pre-Mixed GFAA Matrix Modifiers

Modifier	Matrix	Volume (mL)	Product No.
Pd + Mg	750µg/mL Pd & 500µg/mL Mg(NO <sub>3</sub> ) <sub>2</sub> , 2% HNO <sub>3</sub>	250	MPM1-250
Pd + Mg	1000µg/mL Pd & 600µg/mL Mg(NO <sub>3</sub> ) <sub>2</sub> , 2% HNO <sub>3</sub>	250	MPM2-250
Amm. Phos + Mg	10mg/mL NH <sub>4</sub> H <sub>2</sub> PO <sub>4</sub> & 600µg/mL Mg(NO <sub>3</sub> ) <sub>2</sub> , 2% HNO <sub>3</sub>	250	MPM3-250

### Ionization Buffers

Material	Matrix	Volume (mL)	Product No.
Lithium Nitrate	1% Li (from carbonate), 5% HNO <sub>3</sub>	100	MLIN1%-100
Cesium Nitrate	1% Cs (from carbonate), 5% HNO <sub>3</sub>	100	MCSN1%-100

### Lanthanum Releasing Agents

Material	Matrix	Volume (mL)	Product No.
Lanthanum Chloride	1% La (from oxide), 2% HCl	100	MLAH1%-100
Lanthanum Nitrate	1% La (from oxide), 5% HNO <sub>3</sub>	100	MLAN1%-100

See Page 97 for Hydride and Cold Vapor AA Supplies.

## Section 2 Aqueous Standards

### VHG Tips

We also prepare custom IC standards to your specifications. Call VHG Labs' Customer Service to submit a request.

#### Gravimetric Factors for IC Standards:

1,000µg/mL NO<sub>3</sub><sup>-</sup>=226mg/L N  
 1,000µg/mL NO<sub>2</sub><sup>-</sup>=305mg/L N  
 1,000µg/mL PO<sub>4</sub><sup>-3</sup>=326mg/L P  
 1,000µg/mL SO<sub>4</sub><sup>-2</sup>=334mg/L S

## Ion Chromatography Standards

- ◆ Prepared from high purity raw materials and 18Mohm DI water
- ◆ Manufactured in our ISO 9001 facility
- ◆ Accompanied by NIST-traceable COA

Anio		Concentration (100µg/mL)		Concentration (1,000µg/mL)		Concentration (10,000µg/mL)	
Ion	Raw Material, Matrix	Vol. (mL)	Product No.	Product No.	Product No.	Product No.	Product No.
Acetate CH <sub>3</sub> CO <sub>2</sub> <sup>-</sup>	CH <sub>3</sub> CO <sub>2</sub> Na, H <sub>2</sub> O	100		IACET-100			
		500		IACET-500		11%ACET-500	
Bromate BrO <sub>3</sub> <sup>-</sup>	NaBrO <sub>3</sub> , H <sub>2</sub> O	100		IBRO3-100			
		500		IBRO3-500			
Bromide Br <sup>-</sup>	KBr, H <sub>2</sub> O	100		IBR-100			
		500		IBR-500		11%BR-500	
		500				11%ABR-100	
	NH <sub>4</sub> Br, H <sub>2</sub> O	100					11%ABR-500
		500					
		500					
Chlorate ClO <sub>3</sub> <sup>-</sup>	NaClO <sub>3</sub> , H <sub>2</sub> O	100		ICLO3-100			
		500		ICLO3-500			
Chloride Cl <sup>-</sup>	KCl, H <sub>2</sub> O	100		ICL1K-100			11%CL-100
		500	ICL100-500	ICL1K-500		11%CL-500	
		100				11%ACL-100	
	NH <sub>4</sub> Cl, H <sub>2</sub> O	100					11%ACL-500
		500					
		500					
Chlorite ClO <sub>2</sub> <sup>-</sup>	NaClO <sub>2</sub> , H <sub>2</sub> O	100		ICLO2-100			1%CLO2-100
		500		ICLO2-500			11%CLO2-500
Chromate CrO <sub>4</sub> <sup>-2</sup>	K <sub>2</sub> CrO <sub>4</sub> , H <sub>2</sub> O	100		ICRO-100			11%CRO-100
		500		ICRO-500			11%CRO-500
Dichromate Cr <sub>2</sub> O <sub>7</sub> <sup>-2</sup>	Na <sub>2</sub> Cr <sub>2</sub> O <sub>7</sub> , H <sub>2</sub> O	100		IDCRO-100			11%DCRO-100
		500		IDCRO-500			11%DCRO-500
Fluoride F <sup>-</sup>	NaF, H <sub>2</sub> O	100		IF1K-100			
		500	IF100-500	IF1K-500		11%F-500	
Formate HCO <sub>2</sub> <sup>-</sup>	HCO <sub>2</sub> Na, H <sub>2</sub> O	100		IFORM-100			
		500		IFORM-500			
Glycolate C <sub>2</sub> H <sub>3</sub> O <sub>3</sub> <sup>-</sup>	NaC <sub>2</sub> H <sub>3</sub> O <sub>3</sub> , H <sub>2</sub> O	100		IGLY-100			
		500		IGLY-500			
Iodide I <sup>-</sup>	NaI, H <sub>2</sub> O	100		II-100			
		500		II-500		11%I-500	
		100				11%AI-100	
	NH <sub>4</sub> I, H <sub>2</sub> O	100					11%AI-500
		500					
		500					
Molybdate MoO <sub>4</sub> <sup>-2</sup>	Na <sub>2</sub> MoO <sub>4</sub> , H <sub>2</sub> O	100		IMOLB-100			
		500	IMOLB100-500	IMOLB-500			
Nitrate NO <sub>3</sub> <sup>-</sup>	NaNO <sub>3</sub> , H <sub>2</sub> O	100		INO3-100			11%NO3-100
		500		INO3-500			11%NO3-500
Nitrate as N NO <sub>3</sub> <sup>-</sup>	NaNO <sub>3</sub> , H <sub>2</sub> O	100		INO3N-100			11%NO3N-100
		500		INO3N-500			11%NO3N-500
Nitrite NO <sub>2</sub> <sup>-</sup>	NaNO <sub>2</sub> , H <sub>2</sub> O	100		INO2-100			11%NO2-100
		500		INO2-500			11%NO2-500
Nitrite as N NO <sub>2</sub> <sup>-</sup>	NaNO <sub>2</sub> , H <sub>2</sub> O	100		INO2N-100			11%NO2N-100
		500		INO2N-500			11%NO2N-500
Oxalate C <sub>2</sub> O <sub>4</sub> <sup>-2</sup>	Na <sub>2</sub> C <sub>2</sub> O <sub>4</sub> , H <sub>2</sub> O	100		IOXAL-100			
		500		IOXAL-500			11%OXAL-500
Perchlorate ClO <sub>4</sub> <sup>-</sup>	NaClO <sub>4</sub> , H <sub>2</sub> O	100		ICLO4-100			
		500		ICLO4-500			11%CLO4-500
Phosphate PO <sub>4</sub> <sup>-3</sup>	KH <sub>2</sub> PO <sub>4</sub> , H <sub>2</sub> O	100		IPO4-100			
		500		IPO4-500			11%PO4-500
Phosphate as P, PO <sub>4</sub> <sup>-3</sup>	KH <sub>2</sub> PO <sub>4</sub> , H <sub>2</sub> O	100		IPO4P-100			
		500		IPO4P-500			11%PO4P-500
Silica SiO <sub>2</sub>	Na <sub>2</sub> SiO <sub>3</sub> , H <sub>2</sub> O	100		ISIO21K-100			
		500	ISIO2100-500	ISIO21K-500			
Sulfate SO <sub>4</sub> <sup>-2</sup>	K <sub>2</sub> SO <sub>4</sub> , H <sub>2</sub> O	100		ISO41K-100			11%SO4-100
		500	ISO4100-500	ISO41K-500			11%SO4-500

# Ion Chromatography Standards

## Section 2 Aqueous Standards

Cations		Concentration (100µg/mL)		Concentration (1,000µg/mL)	Concentration (10,000µg/mL)
Ion	Raw Material, Matrix	Vol. (mL)	Product No.	Product No.	Product No.
Ammonium NH <sub>4</sub> <sup>+</sup>	(NH <sub>4</sub> ) <sub>2</sub> SO <sub>4</sub> , H <sub>2</sub> O	100		INH41K-100	I1%NH4-100
		500	INH4100-500	INH41K-500	IHN1%NH4-500
Barium Ba <sup>+2</sup>	Ba(NO <sub>3</sub> ) <sub>2</sub> , dil. HNO <sub>3</sub>	100		IBA-100	
		500		IBA-500	
Calcium Ca <sup>+2</sup>	CaCO <sub>3</sub> , dil. HNO <sub>3</sub>	100		ICA-100	
		500		ICA-500	
Ethanolamine	HOCH <sub>2</sub> CH <sub>2</sub> NH <sub>2</sub> , H <sub>2</sub> O	100		IETA1K-100	
		500		IETA1K-500	IETA1%-500
Lithium Li <sup>+</sup>	Li <sub>2</sub> CO <sub>3</sub> , dil. HNO <sub>3</sub>	100		ILI1K-100	
		500	ILI100-500	ILI1K-500	
Magnesium Mg <sup>+2</sup>	Mg, dil. HNO <sub>3</sub>	100		IMG-100	
		500		IMG-500	
Potassium K <sup>+</sup>	KNO <sub>3</sub> , dil. HNO <sub>3</sub>	100		IK-100	
		500		IK-500	
Sodium Na <sup>+</sup>	Na <sub>2</sub> CO <sub>3</sub> , dil. HNO <sub>3</sub> NaCl, H <sub>2</sub> O	100		INAN-100	
		500		INAN-500	
		100		INAW1K-100	
		500	INAW100-500	INAW1K-500	

### Ammonia

Ion	Raw Material, Matrix	Conc. (µg/mL)	Volume (mL)	Product No.
Ammonia NH <sub>3</sub>	(NH <sub>4</sub> ) <sub>2</sub> SO <sub>4</sub> , H <sub>2</sub> O	1	100	INH3-1-100
			500	INH3-1-500
Ammonia NH <sub>3</sub>	(NH <sub>4</sub> ) <sub>2</sub> SO <sub>4</sub> , H <sub>2</sub> O	10	100	INH3-10-100
			500	INH3-10-500
Ammonia NH <sub>3</sub>	(NH <sub>4</sub> ) <sub>2</sub> SO <sub>4</sub> , H <sub>2</sub> O	100	100	INH3-100-100
			500	INH3-100-500
Ammonia NH <sub>3</sub>	(NH <sub>4</sub> ) <sub>2</sub> SO <sub>4</sub> , H <sub>2</sub> O	1000	100	INH3-1K-100
			500	INH3-1K-500
Ammonia NH <sub>3</sub>	(NH <sub>4</sub> ) <sub>2</sub> SO <sub>4</sub> , H <sub>2</sub> O	10,000	100	INH3-1P-100
			500	INH3-1P-500

For other anion and cation single-element standards at 100µg/mL or 1%, please inquire.



To order, call (+1) 888.622.7660 or fax (+1) 603.622.5180

### Single-Element Standards

#### Ion Chromatography and Wet Chemistry Standards

- ▶ Ion Chromatography
- Wet Chemistry
- QC Checks for Water

#### Multi-Element Standards for ICP-AES and ICP-MS

## Section 2 Aqueous Standards

### VHG Tips

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

Call us if you'd like "ready-to-go" cubitainers of eluent solutions.

## Eluents

### Eluent Concentrates (ready to dilute by 100 for most applications)

Product	Description	Size	Product No.
Eluent 1	0.18M Na <sub>2</sub> CO <sub>3</sub> and 0.17M NaHCO <sub>3</sub>	500mL	IELUENT1-500
Eluent 3	0.5M Na <sub>2</sub> CO <sub>3</sub>	500mL	IELUENT3-500
Eluent 4	0.5M NaHCO <sub>3</sub>	500mL	IELUENT4-500
Methanesulfonic Acid	CH <sub>3</sub> SO <sub>3</sub> H	500g	JMSA-500G

## Multi-Ion Standards

### For Ion Chromatography

#### Multi-Anion Standards

Ions	Conc. (µg/mL)	Matrix	Product No.
<b>Multi-Anion Standard 1 - Volume 100mL</b>	100	H <sub>2</sub> O	ICM1-100
F <sup>-</sup> , Cl <sup>-</sup> , Br <sup>-</sup> , NO <sub>3</sub> <sup>-</sup> , PO <sub>4</sub> <sup>-3</sup> , SO <sub>4</sub> <sup>-2</sup>			
<b>Multi-Anion Standard 2 - Volume 100mL</b>	100	H <sub>2</sub> O	ICM2-100
F <sup>-</sup> , Cl <sup>-</sup> , SO <sub>4</sub> <sup>-2</sup>			
<b>Multi-Anion Standard 3 - Volume 100mL</b>		H <sub>2</sub> O	ICM3-100
F <sup>-</sup>	20		
Cl <sup>-</sup>	30		
NO <sub>3</sub> <sup>-</sup>	100		
PO <sub>4</sub> <sup>-3</sup> , SO <sub>4</sub> <sup>-2</sup>	150		
<b>Multi-Anion Standard 4 - Volume 100mL</b>		H <sub>2</sub> O	ICM4-100
F <sup>-</sup>	100		
Cl <sup>-</sup>	200		
Br <sup>-</sup> , NO <sub>3</sub> <sup>-</sup> , SO <sub>4</sub> <sup>-2</sup>	400		
PO <sub>4</sub> <sup>-3</sup>	600		
<b>Multi-Anion Standard 7A - Volume 100mL</b>	1000	H <sub>2</sub> O	ICM7A-100
F <sup>-</sup> , Cl <sup>-</sup> , NO <sub>3</sub> <sup>-</sup> as N, Br <sup>-</sup> , SO <sub>4</sub> <sup>-2</sup> , PO <sub>4</sub> <sup>-3</sup> as P			
<b>Multi-Anion Standard 8 - Volume 100mL</b>	1000	H <sub>2</sub> O	ICM8-100
Cl <sup>-</sup> , F <sup>-</sup> , NO <sub>3</sub> <sup>-</sup> , SO <sub>4</sub> <sup>-2</sup>			

#### Multi-Cation Standards

Ions	Conc. (µg/mL)	Matrix	Product No.
<b>Multi-Cation Standard 1 - Volume 100mL</b>		dil. HNO <sub>3</sub>	ICM5A-100
Ca <sup>+2</sup>	500		
K <sup>+</sup>	500		
Li <sup>+</sup>	50		
Mg <sup>+2</sup>	250		
Na <sup>+</sup>	200		
NH <sub>4</sub> <sup>+</sup>	250		



# Wet Chemistry Standards

## For Water Analysis

## Section 2 Aqueous Standards

**NEW!**

### Standard Tests for Waters

Analyte	Concentration	Matrix	Size	Product No.
Biochemical Oxygen Demand (BOD)*	200mg/L	H <sub>2</sub> O, tr. HCl	100mL	BOD200-100
Biochemical Oxygen Demand (BOD) Seeds	N/A	N/A	50 Capsules, 100mg each	BODSEED-50
Boron Titration Standard	1000mg/L	H <sub>2</sub> O	500mL	B1K-500
Chemical Oxygen Demand (COD)	1000mg/L	H <sub>2</sub> O, 0.5% H <sub>2</sub> SO <sub>4</sub>	100mL	COD1K-100
Conductivity (from NaCl)	100µmho/cm	H <sub>2</sub> O	1 Liter	CONDNA100-1L
	1000µmho/cm			CONDNA1K-1L
	10,000µmho/cm			CONDNA10K-1L
Cyanide, CN <sup>-</sup> (from KCN)	1000mg/L	0.1% NaOH	100mL	CN-100
			500mL	CN-500
Hydrazine, N <sub>2</sub> H <sub>4</sub> (from N <sub>2</sub> H <sub>4</sub> ·2HCl)	100mg/L	1% Acetic Acid	100mL	IHYD100-100
			500mL	IHYD100-500
	1000mg/L	100mL	IHYD1K-100	
		500mL	IHYD1K-500	
Methylene Blue Active Substance (MBAS)	1000mg/L	H <sub>2</sub> O, tr.H <sub>2</sub> SO <sub>4</sub>	100mL	MBAS-100
Silica, SiO <sub>2</sub> (from Na <sub>2</sub> SiO <sub>3</sub> )	100mg/L	H <sub>2</sub> O	500mL	ISIO2100-500
	1000mg/L		100mL	ISIO21K-100
			500mL	ISIO21K-500
Total Kjeldahl Nitrogen - TKN (from glycine)	1000mg/L	1% HCl	100mL	TOTKJN1K-100
			500mL	TOTKJN1K-500
Total Organic Carbon - TOC (from KHC <sub>8</sub> H <sub>4</sub> O <sub>4</sub> )	100mg/L	H <sub>2</sub> O	500mL	TOC100-500
	1000mg/L		100mL	TOC1K-100
			500mL	TOC1K-500

\* CBOD value is also included on the Certificate of Analysis for BOD200-100

### Single-Element Standards

#### Ion Chromatography and Wet Chemistry Standards

- ▶ Ion Chromatography
- ▶ Wet Chemistry
- QC Checks for Water

#### Multi-Element Standards for ICP-AES and ICP-MS



To order, call (+1) 888.622.7660 or fax (+1) 603.622.5180

**VHG Tips**

VHG Labs QC Check Samples are NIST-traceable and verified by an interlaboratory program. Laboratories using these products as part of their internal quality program can monitor their performance against both EPA acceptance criteria and results from other well-respected laboratories.

QC Reference Standards are useful as controls and/or to represent your real-world samples for method development.

WS and WP certified reference standards offer great values too! Many ship as concentrates in screw-topped vials, which can then be diluted to yield a liter or more. Exact directions are included on the Certificate of Analysis.

# QC Check Samples for Water Supply

- ◆ Designed for analyses of drinking water, ground water, and clean surface water
- ◆ Tested in compliance with appropriate US EPA, NIST, NELAC, and ISO protocols
- ◆ Certificate of Analysis includes two sets of acceptance limits to evaluate your performance
- ◆ Traceable to NIST SRMs (whenever available)
- ◆ For use in analyzing alongside US EPA, NELAC or state accreditation PT samples or as part of your own internal quality control program

## Water Supply (WS) Check Samples

Product & Range	Vial Size	Yields	Product No.
<b>WS Cyanide</b> Total Cyanide: 0.1-0.5 mg/L	15mL	2 L	QWSCN-15
<b>WS Inorganics</b> Alkalinity as CaCO <sub>3</sub> : 25-200mg/L Chloride: 5-100mg/L Fluoride: 1-8mg/L Nitrate as N: 3-10mg/L Nitrate + Nitrite, as N: 3.5-9mg/L Potassium: 10-40mg/L Specific Conductance at 25°C: 250-2500µmhos/cm Sulfate: 5-500mg/L Total Filterable Residue (TDS) at 180°C: 200-450mg/L	500mL	N/A	QWSIN-500
<b>WS Hardness</b> Calcium: 30-90mg/L Calcium Hardness as CaCO <sub>3</sub> : 75-375mg/L Total Hardness as CaCO <sub>3</sub> : 83-307mg/L Magnesium: 2-20mg/L Sodium: 12-24mg/L	250mL	N/A	QWSHRD-250
<b>WS o-Phosphate Nutrients</b> ortho-Phosphate as P: 0.5-5.5mg/L	15mL	2 L	QWSONUT-15
<b>WS Nitrite</b> Nitrite as N: 0.4-2mg/L	15mL	2 L	QWSNO2-15
<b>WS pH</b> pH: 5-10 units	250mL	N/A	QCPH-250
<b>WS Residual Chlorine</b> Total Residual Chlorine: 0.5-3mg/L Free Residual Chlorine: 0.5-3mg/L	2mL	2 L	QWSRCL-2
<b>WS Solids</b> Total Filterable Residue (TDS) at 180°C: 200-450mg/L Total Solids: 223-550mg/L Non-Filterable Residue (TSS) at 105°C: 23-100mg/L	23mL	1 L	QWSSOL-23
<b>WS Organic Carbon</b> Total Organic Carbon (TOC): 1.2-4.9mg/L Dissolved Organic Carbon (DOC): 1.2-4.9mg/L	15mL	1 L	QWSOC-15
<b>WS Turbidity</b> Turbidity: 0.5-8 NTU	15mL	1 L	QWSTURB-15

**For Trace Metals Check Samples, see Page 55.**

# QC Check Samples for Water Pollution

- ◆ Designed for analyses of waste water, surface water, and contaminated ground water
- ◆ Tested in compliance with appropriate US EPA, NIST, NELAC, and ISO protocols
- ◆ Certificate of Analysis includes two sets of acceptance limits to evaluate your performance
- ◆ Traceable to NIST SRMs (whenever available)
- ◆ For use in analyzing alongside US EPA, NELAC or state accreditation PT samples or as part of your own internal quality control program

## Water Pollution (WP) Check Samples

Product & Range	Vial Size	Yields	Product No.
<b>WP Cyanide</b> Total Cyanide: 0.1-1mg/L	15mL	2 L	QWPCN-15
<b>WP Demand</b> 5-day BOD: 15-250mg/L Carbonaceous BOD: 15-250mg/L COD: 30-250mg/L TOC: 6-100mg/L	15mL	2 L	QWPDEM-15
<b>WP Hexavalent Chromium</b> Cr <sup>+6</sup> : 45-880µg/L	15mL	2 L	QWPCR6-15
<b>WP Minerals</b> Total Alkalinity as CaCO <sub>3</sub> : 10-120mg/L Chloride: 35-275mg/L Fluoride: 0.3-4mg/L Potassium: 4-40mg/L Sodium: 6-100mg/L Specific Conductance at 25°C: 200-930µmhos/cm Sulfate: 5-125mg/L Total Dissolved Solids at 180°C: 140-650mg/L Total Solids at 105°C: 140-675mg/L	500mL	N/A	QWPMIN-500
<b>WP Hardness</b> Calcium: 3.5-110mg/L Calcium Hardness as CaCO <sub>3</sub> : 8.7-275mg/L Total Hardness as CaCO <sub>3</sub> : 17-440mg/L Magnesium: 2-40mg/L Non-Filterable Residue (TSS): 23-100mg/L	500mL	N/A	QWPHRD-500
<b>WP Simple Nutrients</b> Ammonia as N: 0.65-19mg/L Nitrate as N: 0.25-40mg/L Nitrate + Nitrite, as N: 0.25-40mg/L ortho-Phosphate as P: 0.5-5.5mg/L	15mL	2 L	QWPSNUT-15
<b>WP Complex Nutrients</b> Total Kjeldahl Nitrogen as N: 1.5-35mg/L Total Phosphorus as P: 0.5-10mg/L	15mL	2 L	QWPCNUT-15
<b>WP Oil and Grease Concentrate</b> Oil and Grease: 20-100 mg/L	23mL	2 L	QWPOG-23
<b>WP pH</b> pH: 5-10 units	250mL	N/A	QCPH-250
<b>WP Total Phenolics</b> Total Phenolics by 4-AAP: 0.06-5mg/L	2mL	2 L	QWPPHEN-2
<b>WP Total Residual Chlorine</b> Total Residual Chlorine: 0.5-3mg/L	2mL	2 L	QWPRCL-2
<b>WP Solids Concentrate</b> Total Solids at 105°C: 140-675mg/L Total Dissolved Solids at 180°C: 140-650mg/L Non-Filterable Residue (TSS): 23-100mg/L	23mL	1 L	QWPSOL-23

For Trace Metals Check Samples, see Page 55.

## Section 2 Aqueous Standards

### Single-Element Standards

#### Ion Chromatography and Wet Chemistry Standards

Ion Chromatography

Wet Chemistry

#### ► QC Checks for Water

#### Multi-Element Standards for ICP-AES and ICP-MS

## Section 2 Aqueous Standards

### VHG Tips

Ever encounter difficult samples or analysis that you can't perform? Consider using VHG's Analytical Services or Consultation Services Divisions. We're the only leading manufacturer of spectroscopic samples and supplies that also operates a commercial testing laboratory: Call 888.622.7660.

VHG multi-element standards are made from our A+ certified single-element standards which are certified by the NIST HP-ICP-AES Protocol (see Page 38).

ICP-MS user note: Comprehensive Mix A and B can be combined for semi-quantitative analysis or as a control. Indium and <sup>6</sup>Li can be added as internal standards (see Page 66).



# Multi-Element Standards

## For Calibration or QC Controls of ICP-AES or ICP-MS

VHG's certified NIST-traceable multi-element mixes have elements conveniently grouped to provide nearly comprehensive coverage of the entire periodic table.

Multi-Element mixes that are associated with a method, such as EPA or ASTM, can be found later in this section. Our extensive quality control makes them the clear choice for value.

### Alkalis & Alkaline Earths

Ba, Be, Ca, Cs, K, Li, Mg, Na, Rb, Sr @ 100µg/mL  
Matrix: 5% HNO<sub>3</sub>

Volume	Product No.
100mL	SM10-100
500mL	SM10-500

H																	He
Li	Be											B	C	N	O	F	Ne
Na	Mg											Al	Si	P	S	Cl	Ar
K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr
Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe
Cs	Ba	La	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi			

Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu
Th	Pa	U											

### Refractory Elements

Al, B, Cr, Hf, Mo, Nb, Si, Ta, Ti, V, W, Zr @ 100µg/mL  
Matrix: 5% HCl, tr. HF

Volume	Product No.
100mL	SM30A-100
500mL	SM30A-500

H																	He
Li	Be											B	C	N	O	F	Ne
Na	Mg											Al	Si	P	S	Cl	Ar
K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr
Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe
Cs	Ba	La	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi			

Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu
Th	Pa	U											

### Noble Metals

Au, Ir, Os, Pd, Pt, Re, Rh, Ru @ 100µg/mL  
Matrix: 20% HCl

Volume	Product No.
100mL	SM40-100
500mL	SM40-500

H																	He
Li	Be											B	C	N	O	F	Ne
Na	Mg											Al	Si	P	S	Cl	Ar
K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr
Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe
Cs	Ba	La	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi			

Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu
Th	Pa	U											

### Metalloids/Hydride Elements

As, Bi, Ga, Ge, In, Pb, Sb, Se, Sn, Te, Tl @ 100µg/mL

Matrix: 20% HCl, tr. HF

Volume	Product No.
100mL	SM50B-100
500mL	SM50B-500

H																	He
Li	Be											B	C	N	O	F	Ne
Na	Mg											Al	Si	P	S	Cl	Ar
K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr
Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe
Cs	Ba	La	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi			

Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu
Th	Pa	U											

### 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 @ 100µg/mL  
Matrix: 5% HNO<sub>3</sub>

Volume	Product No.
100mL	SM60A-100
500mL	SM60A-500

H																	He
Li	Be											B	C	N	O	F	Ne
Na	Mg											Al	Si	P	S	Cl	Ar
K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr
Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe
Cs	Ba	La	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi			

Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu
Th	Pa	U											

### Non-Metals

As, B, P, S, Se, Si, Te @ 100µg/mL  
Matrix: 5% HCl, tr. HF

Volume	Product No.
100mL	SM25A-100
500mL	SM25A-500

H																	He
Li	Be											B	C	N	O	F	Ne
Na	Mg											Al	Si	P	S	Cl	Ar
K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr
Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe
Cs	Ba	La	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi			

Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu
Th	Pa	U											



## Section 2 Aqueous Standards

### VHG Tips

VHG's multi-element standards undergo extensive QC and are traceable to NIST SRMs. Not all suppliers make this important investment in quality.

Spikes of environmental samples with silver (Ag) are prone to poor recoveries due to AgCl precipitation. Free Cl<sup>-</sup> can come from a nearby beaker of HCl or other volatile chlorides.

Remember to keep spiking levels within the calibration range. For "unknowns", the use of two spikes (estimated and of different concentration) may actually be the simplest way to hit a good target spike concentration.

# General Use Environmental Standards

## For Calibration, QC Controls or Spiking

VHG labs manufactures accurate, NIST-traceable standards for the analysis of environmental waters, soils, sludges and other samples by ICP-AES, 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 blends. Please inquire.

### US EPA 23 Metals

Ag, Al, As, Ba, Be, Ca, Cd, Co, Cr, Cu, Fe, K, Mg, Mn, Mo, Na, Ni, Pb, Sb, Se, Ti, V, Zn @ 100µg/mL  
Matrix: 5%HNO<sub>3</sub>, tr. Tartaric Acid, tr. HF

Volume (mL)	Product No.
100	SM23-100
500	SM23-500

### QC Standard '7'

Matrix: 5% HNO<sub>3</sub>, tr. F<sup>-</sup>

Volume (mL)	Product No.
100	QC7-100
500	QC7-500

Element	Conc. (µg/mL)	Element	Conc. (µg/mL)
Ag	100	K	1000
Al	100	Na	100
B	100	Si	50
Ba	100		

### QC Standard '19'

Matrix: 5% HNO<sub>3</sub>, tr. F<sup>-</sup>, tr. Tartaric Acid

Volume (mL)	Product No.
100	QC19-100
500	QC19-500

Element	Conc. (µg/mL)	Element	Conc. (µg/mL)
As	100	Mo	100
Be	100	Ni	100
Ca	100	Pb	100
Cd	100	Sb	100
Co	100	Se	100
Cr	100	Ti	100
Cu	100	Tl	100
Fe	100	V	100
Mg	100	Zn	100
Mn	100		

### US EPA RCRA Elements

Ag, As, Ba, Cd, Cr, Hg, Pb, Se @ 100µg/mL  
Matrix: 5%HNO<sub>3</sub>

Volume (mL)	Product No.
100	SM45-100
500	SM45-500

### QC Standard '7A'

Matrix: 5% HNO<sub>3</sub>, tr. F<sup>-</sup>

Volume (mL)	Product No.
100	QC7A-100
500	QC7A-500

Element	Conc. (µg/mL)	Element	Conc. (µg/mL)
Ag	50	K	1000
Al	100	Na	100
B	100	Si	500
Ba	100		

### QC Standard '20'

Matrix: 5% HNO<sub>3</sub>, tr. F<sup>-</sup>, tr. Tartaric Acid

Volume (mL)	Product No.
100	ISQC20-100
500	ISQC20-500

Element	Conc. (µg/mL)	Element	Conc. (µg/mL)
Ag	10	Mo	10
Al	10	Ni	10
As	10	Pb	10
Ba	10	Sb	10
Be	10	Se	10
Cd	10	Th	10
Co	10	Tl	10
Cr	10	U	10
Cu	10	V	10
Mn	10	Zn	10

**Second Source:** QC Standard '20' is prepared from independent raw materials relative to any VHG single element or multi-element standard except those designated as second source standards.

# General Use Environmental Standards

For Calibration, QC Controls or Spiking

## Section 2 Aqueous Standards

### TCLP

TCLP Standard 1			
Matrix: 2% HNO <sub>3</sub>			
Volume (mL)		Product No.	
100		TCLP1-100	
500		TCLP1-500	
Element	Conc. (µg/mL)	Element	Conc. (µg/mL)
Ag	25	Cr	25
As	25	Pb	25
Ba	500	Se	5
Cd	5		

See Mercury Standard 20 listed below

### General Memory & Interference Check Sample

Environmental Sample Interferents			
Matrix: 2% HNO <sub>3</sub>			
Volume (mL)		Product No.	
500		LMCS1Z-500	
Element	Conc. (µg/mL)	Element	Conc. (µg/mL)
Al	1000	K	1000
C	5000	Mg	1000
Ca	1000	Na	1000
Cl	5000	P	1000
Fe	1000	S	1000

## Spiking Solutions

### Waters - Trace Elements

Spiking Solution EG1			
Dilute as needed; configured for use with Environmental Waters			
Matrix: 5% HNO <sub>3</sub> , tr. HF, tr. Tartaric Acid			
Volume (mL)		Product No.	
100		SSEG1-100	
500		SSEG1-500	
Element	Conc. (µg/mL)	Element	Conc. (µg/mL)
Ag	5	Mn	40
Al	100	Mo	40
As	200	Ni	40
Ba	200	Pb	40
Be	5	Sb	40
Cd	5	Se	100
Co	20	SiO <sub>2</sub>	200
Cr	40	Tl	40
Cu	40	V	40
Fe	100	Zn	100

### Soils

Spiking Solution EG2			
Dilute as needed; configured for use with Environmental Soils			
Matrix: 5% HNO <sub>3</sub> , tr. HF, tr. Tartaric Acid			
Volume (mL)		Product No.	
100		SSEG2-100	
500		SSEG2-500	
Element	Conc. (µg/mL)	Element	Conc. (µg/mL)
Ag	25	Mn	200
Al	2000	Mo	200
As	1000	Ni	200
Ba	1000	Pb	200
Be	25	Sb	200
Cd	25	Se	1000
Co	100	Tl	200
Cr	200	V	200
Cu	200	Zn	500
Fe	2000		

See Page 64 for additional Spiking Standards for EPA Methods

### Waters - Major Elements

Spiking Solution EG3			
Dilute as needed; configured for use with Environmental Waters			
Matrix: 5% HNO <sub>3</sub>			
Volume (mL)		Product No.	
100		SSEG3-100	
500		SSEG3-500	
Element	Conc. (µg/mL)	Element	Conc. (µg/mL)
B	1000	Mg	10,000
Ca	10,000	Na	10,000
K	10,000	P	1000
Li	1000	Sr	1000

Mercury Standard 20	
Matrix: 5% HNO <sub>3</sub>	
Volume (mL)	Product No.
100	HG20-100
Element	Conc. (µg/mL)
Hg	20

Single-Element Standards  
Ion Chromatography and  
Wet Chemistry Standards

Multi-Element Standards for  
ICP-AES and ICP-MS

- Multi-Element
- ▶ General Environmental
- ▶ Spiking Solutions
- Water Pollution Standards
- QC Check Samples for Water
- QC Checks for Trace Metals
- International Environmental Standards
- EPA Method Ref Chart
- Second Source (pair-matched) Standards
- EPA 200.7, 6010, CLP
- ICP-MS Standards
- EPA 200.8, 6020 CLP

## Section 2 Aqueous Standards

### VHG Tips

See Pages 48-49 for QC Check Samples for Wet Chemistry Methods such as Water Supply Hardness and Water Pollution Minerals.

VHG Labs QC Check Samples are NIST traceable and verified by an interlaboratory program. Laboratories using these products as part of their internal quality program can monitor their performance against both EPA acceptance criteria and results from other well-respected laboratories.

QC Reference Standards are useful as controls and/or to represent your real-world samples for method development.

## Water Pollution Standards US EPA Standards for Clean Water Act

### Water Pollution Standard 1

Matrix: 5% HNO<sub>3</sub>

Volume (mL)		Product No.	
100		WPS1-100	
500		WPS1-500	
Element	Conc. (µg/mL)	Element	Conc. (µg/mL)
Al	500	Hg	5
As	100	Mn	100
Be	100	Ni	100
Cd	25	Pb	100
Co	100	Se	25
Cr	100	V	250
Cu	100	Zn	100
Fe	100		

### Water Pollution Standard 3

Matrix: 2% HNO<sub>3</sub>

Volume (mL)		Product No.	
100		WPS3-100	
500		WPS3-500	
Element	Conc. (µg/mL)	Element	Conc. (µg/mL)
Ba	500	Mg	100
Ca	500	Mo	500
K	100	Na	500

### Water Pollution Standard 5

Matrix: 2% HNO<sub>3</sub>

Volume (mL)		Product No.	
100		WPS5-100	
500		WPS5-500	
Element	Conc. (µg/mL)	Element	Conc. (µg/mL)
Ca	500	Mg	100
Na	500	K	100

**NEW!**

## Synthetic Surface Water Certified Reference Material

- ◆ Metals in water matrix representative of typical natural water sample
- ◆ Certified by an inter-laboratory study
- ◆ Excellent control sample for environmental testing

### Natural Water Matrix Reference

Matrix: 1% HNO<sub>3</sub>, 1% HCl, tr HF, tr Tartaric Acid

Volume (mL)		Product No.	
100		NWMR-100	
500		NWMR-500	
Element	Conc. Range (µg/mL)	Element	Conc. Range (µg/mL)
Ag	0.005-0.05	Mo	0.005-0.05
Al	0.05-0.25	Na	10-25
As	0.005-0.05	Ni	0.005-0.05
Ba	0.05-0.25	Pb	0.005-0.05
Be	0.005-0.05	Rb	0.005-0.05
Ca	10-25	Sb	0.005-0.05
Cd	0.005-0.05	Se	0.005-0.05
Co	0.005-0.05	Sn	0.005-0.05
Cr	0.005-0.05	Sr	0.05-0.25
Cu	0.05-0.25	Ti	0.005-0.05
Fe	0.05-0.25	Tl	0.005-0.05
K	0.5-3	U	0.005-0.05
Mg	1-10	V	0.005-0.05
Mn	0.005-0.05	Zn	0.05-0.25





# QC Check Samples for Trace Metals

## WS and WP Concentrates

- ◆ Designed for analyses of water supply and water pollution samples
- ◆ Tested in compliance with appropriate US EPA, NIST, NELAC, and ISO protocols
- ◆ Certificate of Analysis includes two sets of acceptance limits to evaluate your performance
- ◆ Traceable to NIST SRMs (whenever available)
- ◆ For use in analyzing alongside US EPA, NELAC or state accreditation PT samples or as part of your own internal quality control program

### Water Supply (WS) Samples

Product & Range	Vial Size	Yields	Product No.
<b>WS Trace Metals</b> Aluminum Al: 130-2500µg/L Antimony Sb: 6-50µg/L Arsenic As: 5-50µg/L Barium Ba: 500-3000µg/L Beryllium Be: 1-10µg/L Boron B: 800-2000µg/L Cadmium Cd: 2-50µg/L Chromium Cr: 10-200µg/L Copper Cu: 50-2000µg/L Iron Fe: 100-1800µg/L Lead Pb: 5-100µg/L Manganese Mn: 40-900µg/L Molybdenum Mo: 15-130µg/L Nickel Ni: 10-500µg/L Selenium Se: 10-100µg/L Silver Ag: 20-300µg/L Thallium Tl: 2-10µg/L Vanadium V: 315-2500µg/L Zinc Zn: 400-2500µg/L	15mL	2 L	QWSTM-15
<b>WS Mercury</b> Total Mercury: 0.5-10µg/L	15mL	1 L	QWSHG-15

### Water Pollution (WP) Samples

Product & Range	Vial Size	Yields	Product No.
<b>WP Trace Metals</b> Aluminum Al: 200-4000µg/L Antimony Sb: 95-900µg/L Arsenic As: 70-900µg/L Barium Ba: 100-2500µg/L Beryllium Be: 8-900µg/L Boron B: 800-2000µg/L Cadmium Cd: 8-750 µg/L Chromium Cr: 17-1000µg/L Cobalt Co: 28-1000µg/L Copper Cu: 40-900µg/L Iron Fe: 200-4000µg/L Lead Pb: 70-3000µg/L Manganese Mn: 70-4000µg/L Molybdenum Mo: 60-600µg/L Nickel Ni: 80-3000µg/L Selenium Se: 90-2000µg/L Silver Ag: 26-600µg/L Strontium Sr: 30-300µg/L Thallium Tl: 60-900µg/L Vanadium V: 55-2000µg/L Zinc Zn: 100-2000µg/L	15mL	1 L	QWPMTM-15
<b>WP Mercury</b> Total Mercury: 2-30µg/L	15mL	1 L	QWPHG-15
<b>WP Tin &amp; Titanium</b> Tin Sn: 1000-5000µg/L Titanium Ti: 80-300µg/L	15mL	1 L	QWPSNTI-15

## Section 2 Aqueous Standards

### Single-Element Standards Ion Chromatography and Wet Chemistry Standards

### Multi-Element Standards for ICP-AES and ICP-MS

Multi-Element

General Environmental  
Spiking Solutions

▶ Water Pollution Standards

▶ QC Check Samples for  
Water

▶ QC Checks for Trace Metals  
International Environmental  
Standards

EPA Method Ref Chart

Second Source (pair-

matched) Standards  
EPA 200.7, 6010, CLP

ICP-MS Standards

EPA 200.8, 6020 CLP

# International Environmental Standards

## Canadian Regulated Inorganics

### Regmet Standard 1

Matrix: 5% HNO<sub>3</sub>

Volume (mL)		Product No.	
100		RMS1Z-100	
Element	Conc. (µg/mL)	Element	Conc. (µg/mL)
Ag	100	Mn	100
As	100	Ni	100
B	100	P	100
Ba	100	Pb	100
Be	100	Rb	100
Ca	100	Se	100
Cd	100	Sr	100
Co	100	Th	100
Cr	100	Tl	100
Cu	100	V	100
Mg	100	Zn	100

### Regmet Standard 2

Matrix: 20% HCl, tr. HF

Volume (mL)		Product No.	
100		RMS2Z-100	
Element	Conc. (µg/mL)	Element	Conc. (µg/mL)
Al	100	Si	100
Fe	100	Sn	100
K	100	Ti	100
Mo	100	U	100
Na	100	Zr	100
Sb	100		

### Mercury Standard 10

Matrix: 5% HNO<sub>3</sub>

Volume (mL)		Product No.	
100		LHGN-100	
Element	Conc. (µg/mL)		
Hg	10		

U. S. Environmental Protection Agency (EPA) methods and guidelines have widespread application both inside and outside the U.S. Other governmental organizations have also established guidelines, each with unique listings of monitored elements and quality control criteria.

### Europe

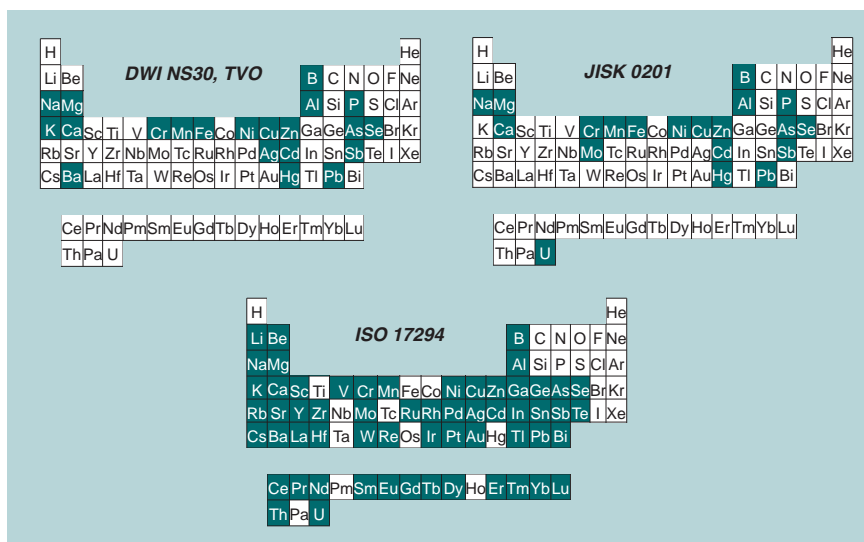
UK "DWI NS30" program standards prevail and these are similar to German "TVO" standards. They establish a "Prescribed Concentration Value" for regulated metals in the environment.

Also, a central European standard in the International Organization of Standards (ISO), has ICP-MS specified for the monitoring of over 60 metals.

### Japan & Asia

The "JISK0102" method has been created for environmental metal monitoring.

VHG has numerous standards that are useful calibration standards for these analyses. Try our "Common & Transition Elements" that contain the DWI, TVO and JISK element listings (see Page 51). For more comprehensive multi-element mixes, VHG's "Comprehensive Mix A" and "Comprehensive Mix B" will meet the need.



The shaded periodic tables show regulated metals under some of these guidelines.

# EPA Method Standards Cross Reference Chart

Also Good for General Sample Sequencing

## Section 2 Aqueous Standards

Description: Purpose	Number	Sample Acronym	Name	200.7 ICP-AES	200.8 ICP-MS	CLP6010 (ILM 05.2)	CLP6020 (ILM 05.2)	AA, Hg, Cr VI use same general CLP Seq.	
optimization block	1	Set-up Sample	Tuning, mass cal., detector cal., wave- length cal.	For listings of these standards and mixes, refer to pgs. 60, 65-66, 67- 68					
calibration block	2	Calib. Blank	Blank	<i>Remember: internal standards need to be included in blanks (See pgs. 62, 68)</i>					
calibration block	3	Calib. Grp A Std 1	Quant Std	See VHGs Extensive list of EPA calibration standards or our Single & Multi-Element Standards					
calibration block	4	Calib. Grp A Std "n"	Quant Std	See VHGs Extensive list of EPA calibration standards or our Single & Multi-Element Standards					
calibration block	5	(optnl.-Calib. "Grp B" Stds)	Quant Std	<i>(Use if elements isolated in separate solutions. May be useful for stability or convenience reasons.)</i>					
calibration check	7	Initial Calib. Verif. Grp A (ICV, IPC)	QC	Refer to Catalog pgs. 58-59, 61-62, 69 or VHGs Extensive List of Single- Element or Multi-Element Standards.					
calibration check	8	(optnl. ICV for "Grp B")	QC	<i>(If elements isolated in separate solutions. May be useful for stability or convenience reasons.)</i>					
calibration check	9	ICB	QC	<i>Remember: Blank preparation should match those for standards</i>					
interference check	10	ICS-A (SIC)	QC	ICS solns (see p. 61)		ICSA (see p. 63)	ICSA (see p. 71)		
interference check	11	ICS-AB (SIC)	QC			ICSAB (see p. 63)	ICSAB (see p. 71)		
interference mem. check	12	Memory Check, MEM	QC	Refer to Method			Refer to Meth (see p. 71)		
detn. limit test	13	(CRQL,CRI, MDL, CRDL)	QC	Refer to Method	Refer to Method	(See p. 64)	Refer to Meth (see p. 70)	Refer to Method.	
blank background	14	Reagent Blk (LRB)	QC	<i>Remember: Blank preparation should match those for standards</i>					
spike recovery in Blank	15	Reagent Blk Spk (LFB)	QC	Refer to pgs. 53, 64, 70 or VHGs Extensive List of Single Element or Multi-Element Standards.					
accuracy	16	(QCS, LCS)	QC	Use VHGs Quality Control Reference Standards, pgs. 52, 54-55, 61					
begin sample block	17	Sample 1	Sample Unknown	Measurement Data					
spike recovery in Blank	18	Sample 1 SPK (LFM)	QC	For Spiking Standards refer to pgs. 53, 64, 70 or VHG's Multi-Element Standards.					
calibration verification	19	CCV Grp A-1	QC	See VHGs Extensive list of EPA calibration standards or our Single & Multi-Element Standards					
calibration verification	20	(opt.-CCV Grp B-1)	QC	See #8 Above					
blank verification	21	CCB-1	QC	See #2 Above					
continue sample block	22	Sample 2	Sample Unknown	Measurement Data. (Sample 2 -> n may possibly be prior to first CCV/CCB block)					
continue sample block	23	Sample 2 Duplicate	QC	Refer to Method					
continue sample block	24	Sample 2 Dilution	QC	Refer to Method					
continue sample block	25->	Samples...n	Sample Unknowns	Measurement Data					
calibration verification	x	CCV Grp A-2	QC	See #19 Above					
calibration verification	x	(optnl.-CCV Grp B-2)	QC	See #8 Above					
blank verification	x	CCB-2	QC	See #2 Above					
POST RUN QC	x	see method	QC	Refer to Method					

\*Refer to method documentation for elaboration of sample sequence requirements. Grey block signifies that this test block may not exist in method

Aqueous Standards

## Section 2 Aqueous Standards

### VHG Tips

We recommend you use a QC Check Sample or other laboratory control standard with each analytical run.

## Second Source Standards Pair-Matched

The following VHG's Standards are pair-matched (by element) with one being 100% independent of the other. These are designed for CAL and ICV or LCS checks. All VHG second source standards are prepared from independent raw materials relative to any VHG single element or multi-element standard except those designated as second source standards.

### Primary Standards

**QC Standard '21'**  
Matrix: 5% HNO<sub>3</sub>, tr. F<sup>-</sup>, tr. Tartaric Acid

Volume (mL)		Product No.	
100		QC21-100	
500		QC21-500	
Element	Conc. (µg/mL)	Element	Conc. (µg/mL)
As	100	Mo	100
Be	100	Ni	100
Ca	100	Pb	100
Cd	100	Sb	100
Co	100	Se	100
Cr	100	Sr	100
Cu	100	Ti	100
Fe	100	Tl	100
Li	100	V	100
Mg	100	Zn	100
Mn	100		

### Second Source Standards

**ISQC Standard '21'**  
Matrix: 5% HNO<sub>3</sub>, tr. F<sup>-</sup>, tr. Tartaric Acid

Volume (mL)		Product No.	
100		ISQC21-100	
500		ISQC21-500	
Element	Conc. (µg/mL)	Element	Conc. (µg/mL)
As	100	Mo	100
Be	100	Ni	100
Ca	100	Pb	100
Cd	100	Sb	100
Co	100	Se	100
Cr	100	Sr	100
Cu	100	Ti	100
Fe	100	Tl	100
Li	100	V	100
Mg	100	Zn	100
Mn	100		

### Major Elements Standards

Matrix: 5% HNO<sub>3</sub>

Volume (mL)		Product No.	
100		LMES-100	
500		LMES-500	
Element	Conc. (µg/mL)	Element	Conc. (µg/mL)
Ca	2000	Mg	2000
Fe	2000	Na	2000
K	2000		

### 6020 SS-High Level Element ICV Stock

Matrix: 5% HNO<sub>3</sub>

Volume (mL)		Product No.	
100		LICVMES-100	
500		LICVMES-500	
Element	Conc. (µg/mL)	Element	Conc. (µg/mL)
Ca	2000	Mg	2000
Fe	2000	Na	2000
K	2000		

### Mercury Standard 10

Matrix: 5% HNO<sub>3</sub>

Volume (mL)		Product No.	
100		LHGN-100	
Element	Conc. (µg/mL)		
Hg	10		

### Mercury ICV Standard

Matrix: 5% HNO<sub>3</sub>

Volume (mL)		Product No.	
100		ISHG-100	
Element	Conc. (µg/mL)		
Hg	10		



VHG Labs carries the most extensive line of "second source" (independent) standards. If we don't already have the mixture you need, call us and we will prepare a custom-spec standard from an independent lot.

# Second Source Standards Pair-Matched

## Section 2 Aqueous Standards

### Primary Standards

### Second Source Standards

#### Environmental Calibration Standard A

Matrix: 5% HNO<sub>3</sub>, tr. Tartaric Acid, tr. HF

←1 | 2→

#### Environmental ICV Standard A

Matrix: 5% HNO<sub>3</sub>, tr. Tartaric Acid, tr. HF

Volume (mL)		Product No.	
100		LCAL1A-100	
Element	Conc. (µg/mL)	Element	Conc. (µg/mL)
Ag	10	Mn	10
Al	10	Mo	10
As	10	Na	1000
Ba	10	Ni	10
Be	10	Pb	10
Ca	1000	Sb	10
Cd	10	Se	10
Co	10	Sr	10
Cr	10	Ti	10
Cu	10	Tl	10
Fe	1000	U	10
K	1000	V	10
Mg	1000	Zn	10

Volume (mL)		Product No.	
100		LICV1A-100	
Element	Conc. (µg/mL)	Element	Conc. (µg/mL)
Ag	10	Mn	10
Al	10	Mo	10
As	10	Na	1000
Ba	10	Ni	10
Be	10	Pb	10
Ca	1000	Sb	10
Cd	10	Se	10
Co	10	Sr	10
Cr	10	Ti	10
Cu	10	Tl	10
Fe	1000	U	10
K	1000	V	10
Mg	1000	Zn	10

#### 200.8 Stock Calibration Standard CS1

Matrix: 5% HNO<sub>3</sub>, tr. Tartaric Acid

←1 | 2→

#### 200.8 Stock Calibration Standard SQC1

Matrix: 5% HNO<sub>3</sub>, tr. Tartaric Acid

Volume (mL)		Product No.	
100		L2008CS1-100	
Element	Conc. (µg/mL)	Element	Conc. (µg/mL)
Al	10	Ni	10
As	10	Pb	10
Be	10	Sb	10
Cd	10	Se	10
Co	10	Tl	10
Cr	10	Th	10
Mn	10	U	10
Mo	10	V	10

Volume (mL)		Product No.	
100		L2008SQC1-100	
Element	Conc. (µg/mL)	Element	Conc. (µg/mL)
Al	10	Ni	10
As	10	Pb	10
Be	10	Sb	10
Cd	10	Se	10
Co	10	Tl	10
Cr	10	Th	10
Mn	10	U	10
Mo	10	V	10

#### 200.8 Stock Calibration Standard CS2

Matrix: 2% HNO<sub>3</sub>

←1 | 2→

#### 200.8 Stock Calibration Standard SQC2

Matrix: 2% HNO<sub>3</sub>

Volume (mL)		Product No.	
100		L2008CS2-100	
Element	Conc. (µg/mL)	Element	Conc. (µg/mL)
Ag	10	Fe	100
Ba	100	Zn	100
Cu	100		

Volume (mL)		Product No.	
100		L2008SQC2-100	
Element	Conc. (µg/mL)	Element	Conc. (µg/mL)
Ag	10	Fe	100
Ba	100	Zn	100
Cu	100		

#### 200.8 Stock Calibration Standard CS3

Matrix: 2% HNO<sub>3</sub>

←1 | 2→

#### 200.8 Stock Calibration Standard SQC3

Matrix: 2% HNO<sub>3</sub>

Volume (mL)		Product No.	
100		L2008CS3-100	
Element	Conc. (µg/mL)	Element	Conc. (µg/mL)
Ca	10,000	Mg	1000
K	1000	Na	10,000

Volume (mL)		Product No.	
100		L2008SQC3-100	
Element	Conc. (µg/mL)	Element	Conc. (µg/mL)
Ca	10,000	Mg	1000
K	1000	Na	10,000

### Single-Element Standards Ion Chromatography and Wet Chemistry Standards

### Multi-Element Standards for ICP-AES and ICP-MS

- Multi-Element
- General Environmental Spiking Solutions
- Water Pollution Standards
- QC Check Samples for Water
- QC Checks for Trace Metals
- International Environmental Standards
- EPA Method Ref Chart
- Second Source (pair-matched) Standards
- EPA 200.7, 6010, CLP
- ICP-MS Standards
- EPA 200.8, 6020 CLP

# EPA Methods 200.7 & 6010A for ICP-AES

## Tuning/Optimization

### US EPA Method 200.7 ICP Tuning

Matrix: 5% HNO<sub>3</sub>

Volume (mL)		Product No.	
100		TNG-100	
500		TNG-500	
Element	Conc. (µg/mL)	Element	Conc. (µg/mL)
Cu	10	Pb	10

### US EPA Method 200.7 ICP Plasma Solution

Matrix: 5% HNO<sub>3</sub>

Volume (mL)		Product No.	
100		PLS-100	
500		PLS-500	
Element	Conc. (µg/mL)	Element	Conc. (µg/mL)
As	10	Se	10
Pb	10	Tl	10

## Mixed Calibration Standards 200.7 Rev. 4.4

### Calibration Standard 1

Matrix: 5% HNO<sub>3</sub>

Volume (mL)		Product No.	
100		44CS1Y-100	
500		44CS1Y-500	
Element	Conc. (µg/mL)	Element	Conc. (µg/mL)
Ag	50	K	1000
As	500	Mg	1000
B	200	Mn	200
Ba	200	Ni	200
Be	200	P	1000
Ca	1000	Pb	200
Cd	200	Se	500
Ce	200	Sr	200
Co	200	Tl	500
Cr	200	V	200
Cu	200	Zn	500

### Calibration Standard 2

Matrix: 20% HCl, tr. HF

Volume (mL)		Product No.	
100		44CS2Z-100	
500		44CS2Z-500	
Element	Conc. (µg/mL)	Element	Conc. (µg/mL)
Al	1000	Sb	500
Fe	1000	SiO <sub>2</sub>	1000
Li	500	Sn	200
Mo	1000	Ti	1000
Na	1000		

## Mixed Calibration Standards 200.7 Rev. 3.3, 6010A

### Mixed Calibration Standard 1

Matrix: 2% HNO<sub>3</sub>

Volume (mL)		Product No.	
100		MCS1-100	
Element	Conc. (µg/mL)	Element	Conc. (µg/mL)
Be	50	Pb	500
Cd	150	Se	200
Mn	100	Zn	150

### Mixed Calibration Standard 2

Matrix: 5% HNO<sub>3</sub>

Volume (mL)		Product No.	
100		MCS2-100	
Element	Conc. (µg/mL)	Element	Conc. (µg/mL)
Ba	100	Fe	10,000
Co	100	V	100
Cu	100		

### Mixed Calibration Standard 3

Matrix: 2% HNO<sub>3</sub>, tr. F<sup>-</sup>

Volume (mL)		Product No.	
100		MCS3-100	
Element	Conc. (µg/mL)	Element	Conc. (µg/mL)
As	500	Si	100
Mo	100		

### Mixed Calibration Standard 4

Matrix: 5% HNO<sub>3</sub>

Volume (mL)		Product No.	
100		MCS4-100	
Element	Conc. (µg/mL)	Element	Conc. (µg/mL)
Al	200	K	400
Ca	1000	Na	200
Cr	20	Ni	20

### Mixed Calibration Standard 5

Matrix: 5% HNO<sub>3</sub>, tr. Tartaric Acid

Volume (mL)		Product No.	
100		MCS5-100	
Element	Conc. (µg/mL)	Element	Conc. (µg/mL)
Ag	50	Sb	200
B	100	Tl	200
Mg	1000		

# EPA Methods 200.7 & 6010 for ICP-AES

## Section 2 Aqueous Standards

### Interference Checks

#### Interference Check Solution 1

Matrix: 5% HNO<sub>3</sub>

Volume (mL)	Product No.
100	INT1-100
500	INT1-500

Element	Conc. (µg/mL)	Element	Conc. (µg/mL)
Ag	300	K	20,000
As	1000	Mn	200
Ba	300	Ni	300
Be	100	Pb	1000
Cd	300	Se	500
Co	300	Tl	1000
Cr	300	V	300
Cu	300	Zn	300
Hg	50		

#### Interference Check Solution 2

Matrix: 2% HNO<sub>3</sub>, tr. HF

Volume (mL)	Product No.
100	INT2-100
500	INT2-500

Element	Conc. (µg/mL)	Element	Conc. (µg/mL)
B	500	Si	230
Mo	300	Ti	1000

#### Interference Check Solution 3

Matrix: H<sub>2</sub>O, Tartaric Acid, tr. HNO<sub>3</sub>

Volume (mL)	Product No.
100	INT3-100
500	INT3-500

Element	Conc. (µg/mL)
Sb	1000

#### Interference Check Solution 4

Matrix: 5% HNO<sub>3</sub>

Volume (mL)	Product No.
100	INT4-100
500	INT4-500

Element	Conc. (µg/mL)	Element	Conc. (µg/mL)
Al	1200	Mg	3000
Ca	6000	Na	1000
Fe	5000		

#### QCS Solution 2

Matrix: 20% HCl, tr. HF

Volume (mL)	Product No.
100	44QCS2Z-100
500	44QCS2Z-500

Element	Conc. (µg/mL)	Element	Conc. (µg/mL)
Al	100	Na	100
Fe	100	Sb	100
K	100	SiO <sub>2</sub>	100
Li	100	Sn	100
Mo	100	Ti	100

### Instrument Performance Checks

#### IPC Solution 1

Matrix: 5% HNO<sub>3</sub>

Volume (mL)	Product No.
100	IPC1Y-100
500	IPC1Y-500

Element	Conc. (µg/mL)	Element	Conc. (µg/mL)
Ag	20	K	500
As	100	Mg	100
B	100	Mn	100
Ba	100	Ni	100
Be	100	P	500
Ca	100	Pb	100
Cd	100	Se	100
Ce	100	Sr	100
Co	100	Tl	100
Cr	100	V	100
Cu	100	Zn	100

#### IPC Solution 2

Matrix: 20% HCl, tr. HF

Volume (mL)	Product No.
100	IPC2Y-100
500	IPC2Y-500

Element	Conc. (µg/mL)	Element	Conc. (µg/mL)
Al	100	Na	100
Fe	100	Sb	100
Hg	100	SiO <sub>2</sub>	500
Li	100	Sn	100
Mo	100	Ti	100

### Quality Control

#### QCS Solution 1

Matrix: 5% HNO<sub>3</sub>

Volume (mL)	Product No.
100	44QCS1Z-100
500	44QCS1Z-500

Element	Conc. (µg/mL)	Element	Conc. (µg/mL)
Ag	50	Hg	100
As	100	Mg	100
B	100	Mn	100
Ba	100	Ni	100
Be	100	P	100
Ca	100	Pb	100
Cd	100	Se	100
Ce	100	Sr	100
Co	100	Tl	100
Cr	100	V	100
Cu	100	Zn	100

#### Single-Element Standards

#### Ion Chromatography and Wet Chemistry Standards

#### Multi-Element Standards for ICP-AES and ICP-MS

##### Multi-Element

General Environmental

Spiking Solutions

Water Pollution Standards

QC Check Samples for

Water

QC Checks for Trace Metals

International Environmental

Standards

EPA Method Ref Chart

Second Source (pair-

matched) Standards

► EPA 200.7, 6010, CLP

ICP-MS Standards

EPA 200.8, 6020 CLP

## Section 2 Aqueous Standards

### VHG Tips

US EPA CLP standards ICL1 & ICL2, ICV1 & ICV2, and CCV1 & CCV2 are generally mixed and diluted as follows: To a 100mL volumetric flask containing 5mL concentrated HCl and 1mL concentrated HNO<sub>3</sub>, aliquot 1mL each of Solutions 1 & 2. Swirl to effect complexation and dilute to 100mL with D.I. water. Hg can be added as required.

## EPA Methods 6010 & CLP for ICP-AES

- ◆ VHG Labs has manufactured reliable standards for US EPA Methods since 1984.
- ◆ Full coverage of method-specified standards, controls and spikes.
- ◆ Standards are manufactured in our ISO 9001 and ISO Guide 34 facility.
- ◆ Certificate of Analysis from our ISO/IEC 17025 laboratory provided, showing NIST traceability.

### US EPA Methods: Acid Matrix/Blank Solutions

#### Blank Water and Acid Matrices

ASTM Type I water and Trace Metal Grade acids used. HDPE bottles are acid leached and rinsed with DI water.  
Volume: 500 mL

Name	Matrix	Product No.
Nitric Acid Blank	5% HNO <sub>3</sub>	HNO3-BLK-500
Hydrochloric Acid Blank	5% HCl	HCL-BLK-500
Hydrochloric/Nitric Blank	5% HCl, 1% HNO <sub>3</sub>	ICB/CCB-500

### CLP Instrument Calibration Standards - ICAL

#### Instrument Calibration Standard 1

Matrix: 5% HNO<sub>3</sub>

Volume (mL)		Product No.	
100		ICL1-100	
500		ICL1-500	
Element	Conc. (µg/mL)	Element	Conc. (µg/mL)
Ag	200	Fe	1000
Ba	1000	Mn	1000
Be	400	Ni	1000
Cd	500	Pb	1000
Co	1000	Tl	1000
Cu	1000	Zn	1000

#### Instrument Calibration Standard 2

Matrix: 20% HCl

Volume (mL)		Product No.	
100		ICL2-100	
500		ICL2-500	
Element	Conc. (µg/mL)	Element	Conc. (µg/mL)
Al	1000	Mg	10,000
As	1000	Na	10,000
Ca	10,000	Sb	1000
Cr	1000	Se	1000
K	10,000	V	1000

#### Mercury Standard 10

Matrix: 5% HNO<sub>3</sub>

Volume (mL)		Product No.	
100		LHGN-100	
Element	Conc. (µg/mL)		
Hg	10		

### CLP Initial Calibration Verification Standards - ICV (Second Source)

#### Initial Calibration Verification Standard 1

Matrix: 5% HNO<sub>3</sub>

Volume (mL)		Product No.	
100		ICV1-100	
500		ICV1-500	
Element	Conc. (µg/mL)	Element	Conc. (µg/mL)
Ag	20	Fe	100
Ba	100	Mn	100
Be	40	Ni	100
Cd	50	Pb	100
Co	100	Tl	100
Cu	100	Zn	100

#### Initial Calibration Verification Standard 2

Matrix: 20% HCl

Volume (mL)		Product No.	
100		ICV2-100	
500		ICV2-500	
Element	Conc. (µg/mL)	Element	Conc. (µg/mL)
Al	100	Mg	1000
As	100	Na	1000
Ca	1000	Sb	100
Cr	100	Se	100
K	1000	V	100

#### Mercury ICV Standard 10

Matrix: 5% HNO<sub>3</sub>

Volume (mL)		Product No.	
100		ISHG-100	
Element	Conc. (µg/mL)		
Hg	10		

**Second Source:** ICV1 & ICV2 and ISHG are prepared from independent raw materials relative to any VHG single element or multi-element standard except those designated as second source standards.



# EPA Methods 6010 & CLP for ICP-AES

## CLP Interference Checks - ICS

### ICS Interference A

Matrix: 20% HCl

Volume (mL)		Product No.	
500		ICSA-500	
Element	Conc. (µg/mL)	Element	Conc. (µg/mL)
Al	5000	Fe	2000
Ca	5000	Mg	5000

### ICS Analytes B

Matrix: 5% HNO<sub>3</sub>, tr. Tartaric Acid

Volume (mL)		Product No.	
100		4ICSAB-100	
Element	Conc. (µg/mL)	Element	Conc. (µg/mL)
Ag	20	Mn	50
As	10	Ni	100
Ba	50	Pb	5
Be	50	Sb	60
Cd	100	Se	5
Co	50	Tl	10
Cr	50	V	50
Cu	50	Zn	100

### ICS Analytes Sub-B1

Matrix: 5% HNO<sub>3</sub>

Volume (mL)		Product No.	
100		ICSAB1-100	
500		ICSAB1-500	
Element	Conc. (µg/mL)	Element	Conc. (µg/mL)
Ag	100	Mn	50
Be	50	Ni	100
Cd	100	Pb	100
Co	50	Zn	100
Cu	50		

### ICS Analytes Sub-B2

For ICP-AES CLP

Matrix: 20% HCl

Volume (mL)		Product No.	
100		ICSAB2-100	
500		ICSAB2-500	
Element	Conc. (µg/mL)	Element	Conc. (µg/mL)
Ba	50	V	50
Cr	50		

## CLP Continuing Calibration Verification - CCV

### Continuing Calibration Verification Std. 1

Matrix: 5% HNO<sub>3</sub>

Volume (mL)		Product No.	
100		CCV1-100	
500		CCV1-500	
Element	Conc. (µg/mL)	Element	Conc. (µg/mL)
Ag	100	Fe	500
Ba	500	Mn	500
Be	200	Ni	500
Cd	250	Pb	500
Co	500	Tl	500
Cu	500	Zn	500

### Continuing Calibration Verification Std. 2

Matrix: 20% HCl

Volume (mL)		Product No.	
100		CCV2-100	
500		CCV2-500	
Element	Conc. (µg/mL)	Element	Conc. (µg/mL)
Al	500	Mg	5000
As	500	Na	5000
Ca	5000	Sb	500
Cr	500	Se	500
K	5000	V	500



## Section 2 Aqueous Standards

### Single-Element Standards Ion Chromatography and Wet Chemistry Standards

### Multi-Element Standards for ICP-AES and ICP-MS

- Multi-Element
- General Environmental Spiking Solutions
- Water Pollution Standards
- QC Check Samples for Water
- QC Checks for Trace Metals
- International Environmental Standards
- EPA Method Ref Chart
- Second Source (pair-matched) Standards
- EPA 200.7, 6010, CLP
- ICP-MS Standards
- EPA 200.8, 6020 CLP

## EPA Methods 6010 & CLP for ICP-AES



### CLP Contract Required Detection Limit – CRDL

#### CRDL Solution 1

Matrix: 5% HNO<sub>3</sub>, tr. tartaric acid

Volume (mL)		Product No.	
100		CRDL-100	
Element	Conc. (µg/mL)	Element	Conc. (µg/mL)
Ag	20	Ni	80
As	20	Pb	6
Be	10	Sb	120
Cd	10	Se	10
Co	100	Tl	20
Cr	20	V	100
Cu	50	Zn	40
Mn	30		

### CLP ILM05.2 Contract Required Quantitation Limit for Water and Soil

#### ICP-AES CRQL Solution 1

Matrix: 5% HNO<sub>3</sub>, tr. tartaric acid

Volume (mL)		Product No.	
100		CRQL1AES-100	
Element	Conc. (µg/mL)	Element	Conc. (µg/mL)
Ag	10	Fe	100
Al	200	Mn	15
As	15	Ni	40
Ba	200	Pb	10
Be	5	Sb	60
Cd	5	Se	35
Co	50	Tl	25
Cr	10	V	50
Cu	25	Zn	60

#### ICP-AES CRQL Solution 2

Matrix: 5% HNO<sub>3</sub>

Volume (mL)		Product No.	
100		CRQL2AES-100	
500		CRQL2AES-500	
Element	Conc. (µg/mL)	Element	Conc. (µg/mL)
Ca	5000	Mg	5000
K	5000	Na	5000

#### Mercury Standard 20

Matrix: 5% HNO<sub>3</sub>

Volume (mL)		Product No.	
100		HG20-100	
Element	Conc. (µg/mL)		
Hg	20		

### CLP Spiking Solutions

#### CLP Spiking Solution 1

Matrix: 5% HNO<sub>3</sub>

Volume (mL)		Product No.	
100		W1-100	
500		W1-500	
Element	Conc. (µg/mL)	Element	Conc. (µg/mL)
Ag	5	Mn	50
Be	5	Ni	50
Cd	5	Pb	50
Co	50	Tl	200
Cu	25	Zn	50
Fe	100		

#### CLP Spiking Solution 2

Matrix: 20% HCl

Volume (mL)		Product No.	
100		W2-100	
500		W2-500	
Element	Conc. (µg/mL)	Element	Conc. (µg/mL)
Al	200	Sb	50
As	200	Se	200
Ba	200	V	50
Cr	20		

# ICP-MS Tuning Solutions

**NEW!**

◆ Tuning solutions are designed to meet ICP-MS manufacturers' specifications

## Read to Use Solutions

### Tuning Solution for Agilent Instruments

Matrix: 2% HNO<sub>3</sub>, Volume: 500mL

Elements	Conc. (µg/L)	Product No.
<sup>7</sup> Li, Co, Y, Ce, Tl	10	LMSTNG5DIL-500

### Tuning Solution for PerkinElmer Instruments

Matrix: 2% HNO<sub>3</sub>, Volume: 500mL

Elements	Conc. (µg/L)	Product No.
<sup>7</sup> Li, Be, Mg, Co, Y, In, Ba, Ce, Tl, Pb, U	10	LMSTNG7-500

### Tuning Solution for PerkinElmer DRC Instruments

Matrix: 2% HNO<sub>3</sub>, Volume: 500mL

Elements	Conc. (µg/L)	Product No.
Ba	10	LMSTNG8-500
Be, Mg, Fe, Co, In, Ce, Pb, Th, U	1	

### Tuning Solution for Thermo Instruments

Matrix: 2% HNO<sub>3</sub>, Volume: 500mL

Elements	Conc. (µg/L)	Product No.
<sup>7</sup> Li, Be, Mg, Co, In, Ba, Ce, Pb, Bi, U	10	LMSTNG6-500

### Tuning Solution for Varian Instruments

Matrix: 2% HNO<sub>3</sub>, Volume: 500mL

Elements	Conc. (µg/L)	Product No.
Be, Mg, Co, In, Ba, Ce, Tl, Pb, Th	250	LMSTNG9-500

### Cobalt in HCl Tuning Solution for Agilent Instruments

Matrix: 2% Ultrapure HCl, Volume: 500mL

Elements	Conc. (µg/L)	Product No.
Co	1	LMSTNG4-500

## Concentrates - Ready to Dilute

### Tuning/Mass Calibration Multi-Element Mix 1

Matrix: 5% HNO<sub>3</sub>, Volume: 100mL or 500mL

Elements	Conc. (µg/mL)	Product No.
<sup>7</sup> Li, Y, Ce, Tl	10	LMSTNG1-100 LMSTNG1-500

*Item suitable for use with Agilent instruments as well as others*

### Tuning/Mass Calibration Multi-Element Mix 1A

Matrix: 1% HNO<sub>3</sub>, 0.5% HCl, Volume: 100mL or 500mL

Elements	Conc. (µg/mL)	Product No.
<sup>7</sup> Li, Co, Y, Ce, Tl	10	LMSTNG5-100 LMSTNG5-500

### Tuning/Mass Calibration Multi-Element Mix 2

Matrix: 1% HNO<sub>3</sub>, Volume: 100mL or 500mL

Elements	Conc. (µg/mL)	Product No.
Be, Mg, Co, In, Ce, Pb	10	LMSTNG2Z-100 LMSTNG2Z-500

*Item suitable for use with Thermo instruments as well as others*

### Tuning/Mass Calibration Multi-Element Mix 3

Matrix: 5% HNO<sub>3</sub>, Volume: 100mL or 500mL

Elements	Conc. (µg/mL)	Product No.
<sup>7</sup> Li, Be, Mg, Co, Y, In, Ba, Ce, Tl, Pb, U	10	LMSTNG3Z-100 LMSTNG3Z-500

*Item suitable for use with Thermo instruments as well as others*



## Section 2 Aqueous Standards

### Single-Element Standards

Ion Chromatography and Wet Chemistry Standards

### Multi-Element Standards for ICP-AES and ICP-MS

- Multi-Element General Environmental Spiking Solutions
- Water Pollution Standards
- QC Check Samples for Water
- QC Checks for Trace Metals
- International Environmental Standards
- EPA Method Ref Chart Second Source (pair-matched) Standards
- ▶ EPA 200.7, 6010, CLP
- ▶ ICP-MS Standards
- EPA 200.8, 6020 CLP

To order, call (+1) 888.622.7660 or fax (+1) 603.622.5180

# ICP-MS Tuning and Detector Optimization Solutions

◆ Tuning solutions are designed to meet ICP-MS manufacturers' specifications

## VHG Tips

Instrument manufacturers often suggest special instrument tuning and optimization solutions. VHG Labs can provide custom solutions for this purpose. Please submit a request.

VHG's "Internal Standard Multi-Element Mix 2" is recommended for ICP-MS environmental sample analysis. It contains common, method suggested elements and has the additional advantage of a higher concentration for <sup>6</sup>Li and <sup>45</sup>Sc--this aids in reducing error in results due to slight interferences or contamination evident at masses 6 and 45.

### Detector Calibration Multi-Element Mix

Matrix	Volume (mL)	Product No.	
5% HNO <sub>3</sub>	100	LDCAL-100	
Element	Conc. (µg/mL)	Element	Conc. (µg/mL)
<sup>7</sup> Li	50	In	10
Be	100	Ce	10
Mg	25	Tb	5
Sc	25	Tl	10
Co	20	U	5
Y	10		

*Item is suitable for use with Thermo instruments as well as others.*

### Oxide & Doubly Charged Ion Test Mix

Matrix: 2% HNO<sub>3</sub>, Volume: 100 mL

Elements	Conc. (µg/mL)	Product No.
Ba, Ce	1	LOD-100

*See Page 34 for single-element Barium and Cerium standards.*

### P/A Tuning Multi-Element Mix 1

Matrix	Volume (mL)	Product No.	
20% HCl, tr. HF	100	LDPA1-100	
Element	Conc. (µg/mL)	Element	Conc. (µg/mL)
<sup>6</sup> Li	5	Y	2.5
Be	20	Mo	10
Na	5	Ru	10
Mg	10	Pd	10
Al	5	Cd	20
Sc	5	In	5
Ti	5	Sn	10
V	5	Sb	10
Cr	5	Ba	5
Mn	5	Tb	2.5
Co	5	Lu	5
Ni	10	Ir	5
Cu	5	Pb	10
Zn	20	Bi	5
Ge	10	Tl	5
As	20	Th	5
Sr	5	U	5

*Item is suitable for use with Agilent instruments as well as others.*



## ICP-MS Internal Standard Stock Solutions

- ◆ Single and Multi-element internal standard stock solutions are manufactured to be free of impurities.
- ◆ These solutions are shipped with a comprehensive Certificate of Analysis.

### Single-Element Stock Standards

Volume: 100mL

Element	Matrix	Conc. (µg/mL)	Product No.
<sup>6</sup> Li	2% HNO <sub>3</sub>	100	LISC6LI-100
<sup>6</sup> Li	2% HNO <sub>3</sub>	10	LISA6LI-100
Sc	2% HNO <sub>3</sub>	10	LISASC-100
Co	2% HNO <sub>3</sub>	10	LISACO-100
Ge	2% HNO <sub>3</sub> , tr. HF	10	LISAGE-100
Y	2% HNO <sub>3</sub>	10	LISAY-100
Rh	2% HCl	10	LISARH-100
In	2% HNO <sub>3</sub>	10	LISAIN-100
Tb	2% HNO <sub>3</sub>	10	LISATB-100
Lu	2% HNO <sub>3</sub>	10	LISALU-100
Ir	2% HCl	10	LISAIR-100
Pt	5% HCl	10	LISAPT-100
Bi	2% HNO <sub>3</sub>	10	LISABI-100

# ICP-MS Internal Standard Stock Solutions

- ◆ Made of pure materials and free of contaminating elements
- ◆ Blends include the most common and effective elements for ICP-MS
- ◆ Sold in convenient concentrations for sample diluting into working solutions or as the stock blend for automated addition of internal standards

## Internal Standard Multi-Element Mix 1

Matrix	Volume (mL)	Product No.	
5% HNO <sub>3</sub>	100	LIS1-100	
Element	Conc. (µg/mL)	Element	Conc. (µg/mL)
<sup>6</sup> Li	100	In	100
Sc	100	Tb	100
Ga	100	Bi	100
Y	100		

## Internal Standard Multi-Element Mix 2

Matrix	Volume (mL)	Product No.	
2% HNO <sub>3</sub>	100	LIS2-100	
Element	Conc. (µg/mL)	Element	Conc. (µg/mL)
<sup>6</sup> Li	100	In	20
Sc	100	Tb	20
Ga	20	Bi	20
Y	20		

## Internal Standard Multi-Element Mix 3

Matrix	Volume (mL)	Product No.	
5% HNO <sub>3</sub> , tr. HF	100	LIS3-100	
Element	Conc. (µg/mL)	Element	Conc. (µg/mL)
<sup>6</sup> Li	100	Tb	100
Sc	100	Lu	100
Ge	100	Bi	100
In	100		

## Internal Standard Multi-Element Mix 4

Matrix	Volume (mL)	Product No.	
5% HNO <sub>3</sub> , tr. HF	100	LIS4-100	
Element	Conc. (µg/mL)	Element	Conc. (µg/mL)
<sup>6</sup> Li	50	In	10
Sc	50	Tb	10
Ge	25	Bi	10
Te	25		

Internal standards for EPA Methods can be found on Pages 68 and 70



## CCT/DRC/ORS Multi-Element Mix 1

Matrix	Volume (mL)	Product No.	
2% HNO <sub>3</sub>	100	LCELL-100	
Element	Conc. (µg/mL)	Element	Conc. (µg/mL)
Cr	100	As	100
Fe	100	Se	100

## Gold Stabilizer for Hg (Single Element)

Matrix: 5% HCl		Conc: 100µg/mL
Element	Volume (mL)	Product No.
Au	100	LSAU-100

### VHG's Mixing Tees

ICP and ICP-MS users can save both time and money by using an inexpensive mixing tee to introduce internal standards to their solutions. See Page 87 for additional information.

## Section 2 Aqueous Standards

### Single-Element Standards Ion Chromatography and Wet Chemistry Standards

### Multi-Element Standards for ICP-AES and ICP-MS

- Multi-Element
- General Environmental Spiking Solutions
- Water Pollution Standards
- QC Check Samples for Water
- QC Checks for Trace Metals
- International Environmental Standards
- EPA Method Ref Chart
- Second Source (pair-matched) Standards
- EPA 200.7, 6010, CLP
- ▶ ICP-MS Standards
- EPA 200.8, 6020 CLP

## Section 2 Aqueous Standards

### VHG Tips

VHG offers gold stabilizer in solution form for Hg analysis. EPA Method 200.8 for ICP-MS explains the use of gold stabilizer. We recommend an aqueous matrix including HCl and HNO<sub>3</sub>. Note that our Au stabilizer includes Cl<sup>-</sup>.

# EPA Method 200.8 for ICP-MS

◆ Standards designed for US EPA published methods

## Acid Matrix/Blank Solutions

### Blank Water and Acid Matrices

ASTM Type I water and Trace Metal Grade acids used. HDPE bottles are acid leached and rinsed with DI water.  
Volume: 500mL

Name	Matrix	Product No.
Nitric Acid Blank	5% HNO <sub>3</sub>	HNO3-BLK-500
Hydrochloric Acid Blank	5% HCl	HCL-BLK-500
Hydrochloric/Nitric Blank	5% HCl, 1% HNO <sub>3</sub>	ICB/CCB-500

## Internal Standard

### Internal Standard Stock Solution for Methods 200.8 & CLP ILM05.2

Matrix: 5% HNO<sub>3</sub>

Volume (mL)		Product No.	
100		LIS2008Z-100	
Element	Conc. (µg/mL)	Element	Conc. (µg/mL)
<sup>6</sup> Li	10	Tb	10
Sc	10	Lu	10
Y	10	Bi	10
In	10		

## Tuning Solution

### Tune & Resolution Solution 1 for Method 200.8 & ILM05.2

Matrix: 5% HNO<sub>3</sub>

Volume (mL)		Product No.	
100		LTS2008D-100	
Element	Conc. (µg/mL)	Element	Conc. (µg/mL)
Be	10	In	10
Mg	10	Pb	10
Co	10		

## Calibration Standards - See 200.8 Section 7.4 (Cal) & 7.9 (LFB)

### Standard A1

Matrix: 5% HNO<sub>3</sub>, tr. Tartaric Acid

Volume (mL)		Product No.	
100		L53SSA1-100	
Element	Conc. (µg/mL)	Element	Conc. (µg/mL)
Al	10	Ni	10
As	10	Pb	10
Be	10	Sb	10
Cd	10	Se	10
Co	10	Th	10
Cr	10	Tl	10
Cu	10	U	10
Mn	10	V	10
Mo	10	Zn	10

### Standard A2

Matrix: 5% HNO<sub>3</sub>, tr. Tartaric Acid

Volume (mL)		Product No.	
100		L54SSA2-100	
Element	Conc. (µg/mL)	Element	Conc. (µg/mL)
Al	10	Ni	10
As	10	Pb	10
Be	10	Sb	10
Cd	10	Se	50
Co	10	Th	10
Cr	10	Tl	10
Cu	10	U	10
Mn	10	V	10
Mo	10	Zn	10

\* NOTE L54SSA2 is the same as L53SSA1 but with Se at 50µg/mL

### Standard B

Matrix: 1% HNO<sub>3</sub>

Volume (mL)		Product No.	
100		LSSB-100	
Element	Conc. (µg/mL)	Element	Conc. (µg/mL)
Ag	10	Ba	10

# EPA Method 200.8 for ICP-MS

## Calibration Standards

### 200.8 Stock Calibration Standard CS1

Matrix: 5% HNO<sub>3</sub>, tr. Tartaric Acid

Volume (mL)		Product No.	
100		L2008CS1-100	
Element	Conc. (µg/mL)	Element	Conc. (µg/mL)
Al	10	Ni	10
As	10	Pb	10
Be	10	Sb	10
Cd	10	Se	10
Co	10	Th	10
Cr	10	Tl	10
Mn	10	U	10
Mo	10	V	10

### 200.8 Stock Calibration Standard CS2

Matrix: 2% HNO<sub>3</sub>

Volume (mL)		Product No.	
100		L2008CS2-100	
Element	Conc. (µg/mL)	Element	Conc. (µg/mL)
Ag	10	Fe	100
Ba	100	Zn	100
Cu	100		

### 200.8 Stock Calibration Standard CS3

Matrix: 2% HNO<sub>3</sub>

Volume (mL)		Product No.	
100		L2008CS3-100	
Element	Conc. (µg/mL)	Element	Conc. (µg/mL)
Ca	10,000	Mg	1000
K	1000	Na	10,000

For second source standards, see Page 59

## Primary Standard

### Environmental Calibration Standard A

Matrix: 5% HNO<sub>3</sub>, tr. Tartaric Acid, tr. HF

Volume (mL)		Product No.	
100		LCAL1A-100	
Element	Conc. (µg/mL)	Element	Conc. (µg/mL)
Ag	10	Mn	10
Al	10	Mo	10
As	10	Na	1000
Ba	10	Ni	10
Be	10	Pb	10
Ca	1000	Sb	10
Cd	10	Se	10
Co	10	Sr	10
Cr	10	Ti	10
Cu	10	Tl	10
Fe	1000	U	10
K	1000	V	10
Mg	1000	Zn	10

## Second Source Standard

### Environmental ICV Standard A

Matrix: 5% HNO<sub>3</sub>, tr. Tartaric Acid, tr. HF

←1 | 2→

Volume (mL)		Product No.	
100		LICV1A-100	
Element	Conc. (µg/mL)	Element	Conc. (µg/mL)
Ag	10	Mn	10
Al	10	Mo	10
As	10	Na	1000
Ba	10	Ni	10
Be	10	Pb	10
Ca	1000	Sb	10
Cd	10	Se	10
Co	10	Sr	10
Cr	10	Ti	10
Cu	10	Tl	10
Fe	1000	U	10
K	1000	V	10
Mg	1000	Zn	10

### Mercury Standard 10

Matrix: 5% HNO<sub>3</sub>

Volume (mL)		Product No.	
100		LHGN-100	
Element	Conc. (µg/mL)		
Hg	10		

### Gold Stabilizer for Hg (Single Element)

Matrix: 5% HCl

Volume (mL)		Product No.	
100		LSAU-100	
Element	Conc. (µg/mL)		
Au	100		

## Section 2 Aqueous Standards

### Single-Element Standards Ion Chromatography and Wet Chemistry Standards

### Multi-Element Standards for ICP-AES and ICP-MS

- Multi-Element
- General Environmental Spiking Solutions
- QC Check Samples for Water
- Water Pollution Standards
- QC Checks for Trace Metals
- International Environmental Standards
- EPA Method Ref Chart
- Second Source (pair-matched) Standards
- EPA 200.7, 6010, CLP
- ICP-MS Standards
- ▶ EPA 200.8, 6020 CLP

## Section 2 Aqueous Standards

### VHG Tips

With ICP-MS, an internal standard should not be in the unknown or in a spike mix.

Some commercial spiking standards have indium, lithium or bismuth added. VHG Labs has a range of multi-element solutions absent these elements or others commonly used as ICP-MS internal standards.

VHG offers gold stabilizer in solution form for Hg analysis. EPA Method 200.8 for ICP-MS explains the use of gold stabilizer. We recommend an aqueous matrix including HCl and HNO<sub>3</sub>. Note that our Au stabilizer includes Cl<sup>-</sup>.

# EPA Methods 6020 & CLP for ICP-MS

◆ Standards designed for US EPA published methods

### US EPA 6020 Internal Standard Stock Solution

Matrix: 5% HNO<sub>3</sub>

Volume (mL)		Product No.	
100		LIS6020-100	
Element	Conc. (µg/mL)	Element	Conc. (µg/mL)
<sup>6</sup> Li	10	Tb	10
Sc	10	Ho	10
Y	10	Bi	10
In	10		

### Calibration Standard For 6020 CLP-M

Matrix: 2% HNO<sub>3</sub>, tr. Tartaric Acid

Volume (mL)		Product No.	
100		LCAL6020-100	
Element	Conc. (µg/mL)	Element	Conc. (µg/mL)
Ag	10	K	10
Al	10	Mg	10
As	10	Mn	10
Ba	10	Na	10
Be	10	Ni	10
Ca	10	Pb	10
Cd	10	Sb	10
Co	10	Se	10
Cr	10	Tl	10
Cu	10	V	10
Fe	10	Zn	10

### US EPA 6020 Tune & Resolution Solution

For method 200.8 & ILM05.2

Matrix: 5% HNO<sub>3</sub>

Volume (mL)		Product No.	
100		LTS6020D-100	
Element	Conc. (µg/mL)	Element	Conc. (µg/mL)
Li	10	In	10
Co	10	Tl	10

### Major Elements Standard

Matrix: 5% HNO<sub>3</sub>

Volume (mL)		Product No.	
100		LMES-100	
500		LMES-500	
Element	Conc. (µg/mL)	Element	Conc. (µg/mL)
Ca	2000	Mg	2000
Fe	2000	Na	2000
K	2000		

For second source standard, see LICVMES on Page 58

### CLP ILM05.2 for ICP-MS Spiking Solution

Matrix: 5% HNO<sub>3</sub>, tr. Tartaric Acid

Dilute as prescribed by the method for both waters and soils

Volume (mL)		Product No.	
100		52SS3Z-100	
500		52SS3Z-500	
Element	Conc. (µg/mL)	Element	Conc. (µg/mL)
Ag	50	Mn	500
Al	2000	Ni	500
As	40	Pb	20
Ba	2000	Sb	100
Be	50	Se	10
Cd	50	Tl	50
Co	500	V	500
Cr	200	Zn	500
Cu	250		

## CLP ILM05.2 Contract Required Quantitation Limit For Water

### ICP-MS CRQL Solution 1

Matrix: 5% HNO<sub>3</sub>, tr. Tartaric Acid

Volume (mL)		Product No.	
100		CRQL1MS-100	
Element	Conc. (µg/mL)	Element	Conc. (µg/mL)
Ag	10	Mn	5
Al	300	Ni	10
As	10	Pb	10
Ba	100	Sb	20
Be	10	Se	50
Cd	10	Tl	10
Co	5	V	10
Cr	20	Zn	10
Cu	20		

### ICP-MS CRQL Solution 2

Matrix: 5% HNO<sub>3</sub>, tr. Tartaric Acid

Volume (mL)		Product No.	
100		CRQL2MS-100	
Element	Conc. (µg/mL)	Element	Conc. (µg/mL)
Ag	10	Mn	10
As	10	Ni	10
Ba	100	Pb	10
Be	10	Sb	20
Cd	10	Se	50
Co	10	Tl	10
Cr	20	V	10
Cu	20	Zn	20



# EPA Methods 6020 & CLP for ICP-MS

## Section 2 Aqueous Standards

### Interference Checks

#### US EPA ICP-MS ICS A Mix 1

For method 6020, ILM05.2 and ILM05.3  
Matrix: 5% HNO<sub>3</sub>, 0.5% HCl

Volume (mL)		Product No.	
500		LICSA1Z-500	
Element	Conc. (µg/mL)	Element	Conc. (µg/mL)
Al	500	K	500
C	1000	Mg	500
Ca	500	Na	500
Cl	5000	P	500
Fe	500	S	500

#### US EPA ICP-MS ICS Interferents A Mix 2

For method 6020, ILM05.2 and ILM05.3  
Matrix: H<sub>2</sub>O, tr. HF

Volume (mL)		Product No.	
500		LICSA2-500	
Element	Conc. (µg/mL)	Element	Conc. (µg/mL)
Mo	10	Ti	10

#### Method 6020 ICS: Analytes B

Matrix: 5% HNO<sub>3</sub>

Volume (mL)		Product No.	
100		LICSB1-100	
Element	Conc. (µg/mL)	Element	Conc. (µg/mL)
Ag	10	Cu	10
Al	10	Mn	10
As	10	Ni	10
Cd	10	Se	10
Co	10	V	10
Cr	10	Zn	10

Method 6020 ICS-A mixes are to be diluted 1:5 and ICS-B by 1:500 in order to achieve prescribed concentrations.

#### ICS Target Analytes B

For ILM 05.2 & ILM 05.3  
Matrix: 5% HNO<sub>3</sub>, tr. Tartaric Acid

Volume (mL)		Product No.	
100		LICSB2Z-100	
Element	Conc. (µg/mL)	Element	Conc. (µg/mL)
Ag	10	Mn	10
Al	10	Ni	10
As	10	Pb	10
Ba	10	Sb	10
Be	10	Se	10
Cd	10	Tl	10
Co	10	V	10
Cr	10	Zn	10
Cu	10		

#### 6020A ICS Interferents A

Matrix: 2% HNO<sub>3</sub>, tr. HF  
To be diluted by 1:10 to achieve prescribed concentrations

Volume (mL)		Product No.	
500		LINTA6020A-500	
Element	Conc. (µg/mL)	Element	Conc. (µg/mL)
Al	1000	Mg	1000
C	2000	Mo	20
Ca	3000	Na	2500
Cl	20,000	P	1000
Fe	2500	S	1000
K	1000	Ti	20

#### 6020A & CLP-M ICS Analytes B

Matrix: 5% HNO<sub>3</sub>  
To be diluted by 1:1000 to achieve prescribed concentrations

Volume (mL)		Product No.	
100		LINTB6020-100	
Element	Conc. (µg/mL)	Element	Conc. (µg/mL)
Ag	5	Mn	20
As	10	Ni	20
Cd	10	Se	10
Co	20	V	20
Cr	20	Zn	10
Cu	20		

### General Memory & Interference Check Sample Mix

#### Environmental Sample Interferents

Matrix: 2% HNO<sub>3</sub>

Volume (mL)		Product No.	
500		LMCS1Z-500	
Element	Conc. (µg/mL)	Element	Conc. (µg/mL)
Al	1000	K	1000
C	5000	Mg	1000
Ca	1000	Na	1000
Cl	5000	P	1000
Fe	1000	S	1000

### Single-Element Standards Ion Chromatography and Wet Chemistry Standards

### Multi-Element Standards for ICP-AES and ICP-MS

- Multi-Element
- General Environmental
- Spiking Solutions
- Water Pollution Standards
- QC Checks for Trace Metals
- International Environmental Standards
- EPA Method Ref Chart
- Second Source (pair-matched) Standards
- EPA 200.7, 6010, CLP
- ICP-MS Standards
- ▶ EPA 200.8, 6020 CLP



# CERTIFICATE OF ANALYSIS

Multi-Element Aqueous CRM

## Internal Standard Multi-Element Mix 1

Matrix: 5% HNO<sub>3</sub>

Product #: LIS1-XXX

Lot #: Sample

Expires: July 2011

Element	Certified Concentration & Uncertainty	Element	Certified Concentration & Uncertainty	Element	Certified Concentration & Uncertainty
Bi	100 ± 0.5 µg/mL	<sup>6</sup> Li	100 ± 0.5 µg/mL	Y	100 ± 0.5 µg/mL
Ga	100 ± 0.5 µg/mL	Sc	100 ± 0.5 µg/mL		
In	100 ± 0.5 µg/mL	Tb	100 ± 0.5 µg/mL		

**Intended Use:** This certified reference material is intended for use as an internal standard for inductively coupled plasma mass spectrometry (ICP-MS).

**Certification & Traceability:** VHG CRMs are manufactured and certified under a quality management system that is registered to ISO 9001, ISO Guide 34 and ISO/IEC 17025. This CRM was prepared to the certified concentrations shown above by gravimetric methods using single-element concentrates that were certified using the "High Performance ICP-OES" protocol developed by NIST and are directly traceable to the NIST SRMs listed below. This solution was stabilized using high purity nitric acid (HNO<sub>3</sub>) and diluted with filtered (0.22µm), 18 M-ohm deionized water. The balances used in the preparation of VHG CRMs are calibrated regularly with traceability to NIST. All volumetric dilutions are performed in Class A calibrated glassware. The certified concentrations were determined by VHG Labs based upon gravimetric procedures. Secondary verification of the certified concentrations was performed by VHG Labs using ICP-OES that was calibrated and/or referenced against NIST SRMs: 3106, 3119a, 3124a, 3129a, 3148a, 3157a and 3167a. The uncertainty associated with each certified concentration represents the expanded uncertainty at the 95% confidence level using a coverage factor of k=2.

**Uncertified Values:** ICP-MS was used to determine trace metal concentrations for this product (nd = not determined).

**Trace Concentrations (µg/L)**

Ag <0.5	Ce <0.2	Gd <0.2	Lu <0.2	Pb <1	Se <2	Tl <0.5
Al <2	Co <1	Ge <0.5	Mg <5	Pd <0.5	Si <100	Tm <0.2
As <2	Cs <0.5	Hf <0.2	Mn <1	Pr <0.2	Sm <0.2	U <0.5
Au <0.5	Cr <0.5	Hg <0.5	Mo <0.5	Pt <0.5	Sn <0.5	V <1
B <5	Cu <1	Ho <0.2	Na <25	Rb <0.5	Sr <1	W <0.5
Ba <1	Dy <0.2	In MAJOR	Nb <0.5	Re <0.2	Ta <0.5	Y MAJOR
Be <0.5	Er <0.2	Ir <0.2	Nd <0.2	Rh <0.5	Tb MAJOR	Yb <0.2
Bi MAJOR	Eu <0.2	K <25	Ni <2	Ru <0.5	Te <1	Zn <2
Ca <20	Fe <10	La <0.5	Os <0.5	Sb <1	Th <0.5	Zr <0.5
Cd <0.5	Ga MAJOR	Li MAJOR	P <100	Sc MAJOR	Ti <2	

**Instructions for Use:** We recommend that the solution be thoroughly mixed by repeated shaking or swirling of the bottle immediately prior to use. To achieve the highest accuracy the analyst should: (1) use only pre-cleaned containers and transferware, (2) not pipette directly from the CRM's original container, (3) use a minimum sub-sample size of 500µL, (4) make dilutions using calibrated balances or certified volumetric class A flasks and pipettes, (5) dilute with the same matrix as the original CRM, and (6) never pour used product back into the original container. The solution should be kept tightly capped and stored under normal laboratory conditions. Do not freeze, heat, or expose to direct sunlight. Minimize exposure to moisture or high humidity.

**Period of Validity:** VHG ensures the accuracy of this solution until the expiration date shown above, provided the instructions for use are followed. During the period of validity, the purchaser will be notified if this product is recalled due to any significant changes in the stability of the solution.

VHG Labs, Inc.

Susan Evans Norris, Certifying Officer

7/1/2010

Certification Date



REFERENCE MATERIALS  
PRODUCER CERT #2848.02  
CHEMICAL TESTING  
CERT #2848.01



VHG Labs, Inc. waives all responsibility for any damages resulting from the usage and/or implementation of the products/data described herein.

276 Abby Road    Manchester, NH 03103  
(603) 622-7660    Fax: (603) 622-5180    www.vhglabs.com

A scientist wearing a white lab coat and safety glasses is working at a computer in a laboratory. The background shows various pieces of laboratory equipment, including a tray of small metal cups and a large piece of machinery. The entire image has a red tint.

XRF Standards for RoHS

Standards for PE Analysis

Standards for PVC Analysis

XRF Solid Standards

Sulfur QC Check Monitors

Nitrogen in Solid Polymer

Binder and Briquetting Materials, Grinding Additives

Boric Acid

Cellulose Binder

Paraffin Blend

Pellet Mix

PTFE (Teflon®)

Borate Fusion Fluxes

Soil Certified Reference Materials

Metals in Soil

Metals in Sewage Sludge

Metals in Clean Soil

Lead in Paint

## RoHS Calibration Standards (PE Discs) For XRF

**NEW!**



VHG Labs' set of ten polyethylene discs are intended for use in the analysis of polyolefins, such as polyethylene (PE) or polypropylene (PP), by XRF, for compliance with the RoHS directive. They are intended for use with ASTM F2617-08. The discs contain the elements regulated by RoHS: bromine (Br), cadmium (Cd), chromium (Cr), lead (Pb) and mercury (Hg).

Our PE standards can also be used for the analysis of additives and catalyst residues in polyolefins. Six additional elements commonly present in polyolefins as additives or fillers have also been incorporated into the discs: antimony (Sb), arsenic (As), chlorine (Cl), sulfur (S), tin (Sn) and zinc (Zn).

The raw materials used to manufacture these reference materials were mixed, extruded and granulated to achieve a high degree of homogeneity and then pressed into discs. Each set is accompanied by a COA that states the actual certified elemental concentrations and uncertainties as determined by ICP-MS, NAA, ICP-AES, and CV-AAS. This set of PE discs offers excellent homogeneity, accuracy, and precision over a wide range of concentrations.

### Calibration Standard Discs for PE (Polyethylene) Analysis

RoHS compliant polyethylene discs for analysis of metals in polyolefins. Elemental concentrations (mg/kg) are approximate and may vary from batch to batch.

Standard No.	As	Br	Cd	Cl	Cr	Hg	Pb	S	Sb	Sn	Zn
Standard 1	0	0	0	0	0	0	0	0	0	0	0
Standard 2	145	1000	13	1075	104	483	53	107	34	19	50
Standard 3	8	51	25	70	973	25	99	63	345	178	98
Standard 4	60	383	252	430	259	188	1033	591	18	41	976
Standard 5	15	101	100	120	459	49	406	234	136	85	384
<b>Standard Set</b>						<b>Product No.</b>					
Each set consists of 10 discs (40mm each) (2 each of Standards 1-5)						ROHS-PE-SET5					

# 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.

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	0.0250	0.0050	0.0500	0.0500	0.0500
Standard 3	0.0500	0.0100	0.1000	0.1000	0.1000

### Standard Sets

Set of 3 QC Check Samples in PE Powder (25 grams each)

### Product No.

ROHS-PE-SET1P

## 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.

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

### Standard Sets

Set of 9 Standards plus one QC Check Sample in PE powder (25 grams each)

### Product No.

ROHS-PE-SET2P

## XRF Standards for RoHS

► Standards for PE Analysis  
Standards for PVC Analysis

## XRF Solid Standards

Binder and Briquetting Materials, Grinding Additives

Borate Fusion Fluxes

Soil CRMs



To order, call (+1) 888.622.7660 or fax (+1) 603.622.5180

## RoHS Calibration Standards (PVC Discs or Powder)

For ICP or XRF

### QC Check Samples for PVC (Polyvinylchloride) Analysis

RoHS compliant polymer samples in powder or disc form for the determination of hazardous materials in PVC. PVC samples also include some Ca and Cl in each sample. Available in 3 standard set only.

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	0.0250	0.0500	0.0500	0.0500	0.0500
Standard 3	0.0500	0.1000	0.1000	0.1000	0.1000

Standard Sets	Product No.
Set of 3 QC Check Samples in PVC powder (25 grams each)	ROHS-PVC-SET3P
Set of 3 QC Check Samples, PVC discs (40mm each)	ROHS-PVC-SET3D

For 31mm discs, please inquire.

### XRF Standard Sets for PVC (Polyvinylchloride) Analysis

RoHS compliant polymer samples in powder or disc form for the determination of hazardous materials in PVC. PVC samples also include some Ca and Cl in each sample. Available in 9 standard set plus 1 QC Check Sample.

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

Standard Sets	Product No.
Set of 9 Standards plus 1 QC Check Sample in PVC powder (25 grams each)	ROHS-PVC-SET4P
Set of 9 Standards plus 1 QC Check Sample PVC discs (40mm each)	ROHS-PVC-SET4D

For 31mm discs, please inquire.

## Sulfur QC Check Monitor

For XRF

### Sulfur QC Check Monitors

Monitor Samples for XRF-Silicate Glasses. Optically polished on the analytical surface; sizes 30-40mm in diameter and 5mm in height.

Sulfur Standards	
Description	Product No.
High level of Sulfur approx. 0.70wt%	SGL-HI
Low level of Sulfur approx. 0.005wt%	SGL-LO
Mid level of Sulfur approx. 0.050wt%	SGL-MD

For other QC check monitors, please inquire.

# Nitrogen in Solid Polymer

## For XRF

### Nitrogen in Solid Polymer

Finely divided synthetic polymer standard that contains a certified amount of nitrogen. Used for calibrating instruments for the analysis of nitrogen in all types of polymers and other solids that are completely combustible.

#### Description

#### Product No.

Concentration Range: NP-XX-10G  
1ppm - 3.0 wt% Nitrogen (10 grams)

*Please specify concentration. Please inquire for other sizes.*

## Binder and Briquetting Materials, Grinding Additives

Direct analysis of solids by XRF and other techniques such as Laser Ablation ICP-MS often utilize dry sample preparation materials. VHG Labs 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 temperature. Moderately self-binding.

Form	Package	Product No.
Powder	500g bottle	BAX1-500G
0.5g Tablets	1500/bottle	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.
Ashless Powder	500g bottle	CBXA-500G
Microcrystalline Powder	500g bottle	CBXM-500G

### Paraffin Binder

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

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

### Pellet Mix

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

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

### PTFE (Teflon®)

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

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

## Section 3 Solid Standards

### XRF Standards for RoHS

Standards for PE Analysis

- ▶ Standards for PVC Analysis

### XRF Solid Standards

- ▶ Sulfur QC Check Monitors
- ▶ Nitrogen in Solid Polymer

### Binder and Briquetting Materials, Grinding Additives

- ▶ Boric Acid
- ▶ Cellulose Binder
- ▶ Paraffin Blend
- ▶ Pellet Mix
- ▶ PTFE (Teflon®)

### Borate Fusion Fluxes

### Soil CRMs

## V-Flux™ High Purity Borate Fusion Fluxes

**NEW!**

- ◆ High Purity - 99.998+% (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



Borate fusion is an effective method of preparing samples, like cement, ceramics, glass, ores, oxides, refractories and rocks 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 OES or 2) are difficult to dissolve in acid, for analysis by AA or ICP.

Virtually all fusions are performed with borate compounds. Samples are mixed with a flux, typically lithium tetraborate ( $\text{Li}_2\text{B}_4\text{O}_7$ , m.p.  $920^\circ\text{C}$ ), lithium metaborate ( $\text{LiBO}_2$ , m.p.  $845^\circ\text{C}$ ) or mixtures of the two. The sample/flux 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 OES or dissolved in  $\text{HNO}_3$  or  $\text{HCl}$  for AA or ICP analysis.

Lithium tetraborate is better suited for dissolution of basic oxides while lithium metaborate is more suitable for acidic oxides. Between the two, you can dissolve almost anything with bonded oxygen. The addition of a high absorption diluent like lanthanum oxide has particular applications to geological and other similar types of samples exhibiting absorption-enhancement effects. The addition of non-wetting agents like fluorides can be added in small quantities so the molten flux will not stick to the crucible.

### Lithium Metaborate Fluxes

#### Lithium Metaborate Fluxes (m.p. $845^\circ\text{C}$ )

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	VFLUX-210-1KG

#### Lithium Metaborate:Lithium Tetraborate Blends (m.p. $840^\circ\text{C}$ )

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 20% Lithium tetraborate	VFLUX-211-1KG
80% Lithium metaborate 20% Lithium tetraborate, pre-fused	VFLUX-211PF-1KG
64.7% Lithium metaborate 35.3% Lithium tetraborate	VFLUX-212-1KG
64.7% Lithium metaborate 35.3% Lithium tetraborate, pre-fused	VFLUX-212PF-1KG
61.5% Lithium metaborate 33% Lithium tetraborate 5.5% Sodium nitrate	VFLUX-213-1KG



# V-Flux™ High Purity Borate Fusion Fluxes

## Section 3 Solid Standards

### Lithium Tetraborate Fluxes

#### 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. VFLUX-312PF is typically used for cements. VFLUX-313 is typically used for ceramics.

Description	Product No.
100% Lithium tetraborate	VFLUX-310-1KG
100% Lithium tetraborate (100-500 micron), prefused	VFLUX-311PF-1KG
100% Lithium tetraborate (<800 micron), pre-fused	VFLUX-312PF-1KG
100% Lithium tetraborate (phosphorus <20ppm)	VFLUX-313-1KG

#### 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.
66.5% Lithium tetraborate 33.5% Lithium metaborate	VFLUX-314-1KG
66.5% Lithium tetraborate 33.5% Lithium metaborate, pre-fused	VFLUX-314PF-1KG
50% Lithium tetraborate 50% Lithium metaborate	VFLUX-315-1KG
50% Lithium tetraborate 50% Lithium metaborate, pre-fused	VFLUX-315PF-1KG

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

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

Description	Product No.
85% Lithium tetraborate 15% Lanthanum oxide	VFLUX-316-1KG
81.8% Lithium tetraborate 18.2% Lanthanum oxide	VFLUX-317-1KG

#### 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 10% Lithium fluoride	VFLUX-318-1KG
80% Lithium tetraborate 20% Lithium fluoride	VFLUX-319-1KG

#### 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 La as a heavy absorber.

Description	Product No.
47% Lithium tetraborate 37% Lanthanum oxide 16% Lanthanum carbonate	VFLUX-320-1KG

XRF Standards for RoHS  
XRF Solid Standards  
Binder and Briquetting Materials, Grinding Additives  
Borate Fusion Fluxes  
Soil CRMs

## Soil Certified Reference Materials

- ◆ Interlaboratory certified
- ◆ Full certificate of analysis supplied
- ◆ Analysis statistics supplied
- ◆ Instrumentally determined concentrations
- ◆ Suitable for use with US EPA Methods and other related procedures

### Metals in Soil Certified Reference Materials

Description	Metals in Sandy Loam Soil	Metals in Sewage Amended Soil
<b>Product No.</b>	DS1-100G	SSD1-50G
<b>Size</b>	100g	50g
Element	Nominal Conc. (mg/kg)	Nominal conc. (mg/kg)
Aluminum Al	2730	15,300
Antimony Sb	4950	n/a
Arsenic As	24.8	6.9
Barium Ba	586	853
Beryllium Be	n/a	0.6
Cadmium Cd	1.2	13.7
Calcium Ca	5430	119,000
Chromium Cr, total	10.7	41.3
Cobalt Co	(2.7)	6.2
Copper Cu	4790	465
Iron Fe	6480	12,700
Lead Pb	(144,742)	89
Magnesium Mg	(2367)	6710
Manganese Mn	174	172
Mercury Hg	4.7	3.2
Molybdenum Mo	n/a	14.2
Nickel Ni	12.6	26
Phosphorus P, total	n/a	(10,071)
Potassium K	1010	6230
Selenium Se	n/a	19.9
Silver Ag	6.5	36.3
Sodium Na	380	2490
Tin Sn	(304.1)	n/a
Vanadium V	8.7	109
Zinc Zn	546	625

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

# Soil Certified Reference Materials

- ◆ Interlaboratory certified
- ◆ Full certificate of analysis supplied
- ◆ Analysis statistics supplied
- ◆ Instrumentally determined concentrations
- ◆ Suitable for use with US EPA Methods and other related procedures

## Metals in Sewage Sludge Certified Reference Materials

Description	Metals in Sewage Sludge (Amended)	Metals in Sewage Sludge (Amended)
<b>Product No.</b>	SL1-50G	SL2-40G
<b>Size</b>	50g	40g
Element	Nominal Conc. (mg/kg)	Nominal conc. (mg/kg)
Aluminum Al	12,300	18,957
Antimony Sb	3.1	195.6
Arsenic As	32.9	170.6
Barium Ba	1020	1288
Beryllium Be	4.4	70.2
Boron B	156	91
Cadmium Cd	497	76
Calcium Ca	48,000	44,759
Chromium Cr, total	346	192
Cobalt Co	5.7	83.4
Copper Cu	1130	670
Iron Fe	19,700	23,572
Lead Pb	303	284
Magnesium Mg	8470	7563
Manganese Mn	379	408
Mercury Hg	6.9	9.1
Molybdenum Mo	18	69
Nickel Ni	159	279
Phosphorus P, total	2.2 wt %	2.01 wt%
Potassium K	3170	4492
Selenium Se	27.3	307.6
Silicon Si	590	n/a
Silver Ag	44	72
Sodium Na	1630	1717
Strontium Sr	658	677
Thallium Tl	n/a	111
Tin Sn	n/a	218
Vanadium V	40.5	297
Zinc Zn	1390	1304

## Section 3 Solid Standards

### XRF Standards for RoHS

### XRF Solid Standards

### Binder and Briquetting Materials, Grinding Additives

### Borate Fusion Fluxes

### Soil CRMs

- ▶ Metals in Soil
- ▶ Metals in Sewage Sludge
- Metals in Clean Soil
- Lead in Paint

To order, call (+1) 888.622.7660 or fax (+1) 603.622.5180

## Soil Reference Materials

### Metals in Clean Soil Reference Materials

<b>Description</b>	Blank (Clean) Clay Loam Soil	Blank (Clean) Sandy Loam Soil
<b>Product No.</b>	BLKSOIL1-100G	BLKSOIL2-100G
<b>Size</b>	100g	100g

<b>Element</b>	<b>Nominal Conc. (mg/kg except *)</b>	<b>Nominal Conc. (mg/kg except *)</b>
Aluminum Al	3540	11,033
Antimony Sb	<1	<1
Arsenic As	2	2
Barium Ba	50	204
Beryllium Be	<0.2	0.7
Cadmium Cd	<0.3	0.5
Calcium Ca, soluble	20* (meq/L)	11*(meq/L)
Chromium Cr	<1	9
Cobalt Co	<1	9
Copper Cu	<1	10
Iron Fe	3163	27,000
Lead Pb	<2	17
Magnesium Mg	228* (meq/L)	3* (meq/L)
Manganese Mn	97	577
Mercury Hg	0.03	0.3
Nickel Ni	<1	8
Phosphorus P, total	0.02* (%)	0.09* (%)
Potassium K, soluble	5.7* (meq/L)	0.9* (meq/L)
Selenium Se	0.4	0.3
Silver Ag	<0.5	<0.5
Sodium Na, soluble	39* (meq/L)	0.5* (meq/L)
Thallium Tl	<1	<1
Vanadium V	16	17
Zinc Zn	21	112

## Lead Paint Reference Materials

### Environmental Lead

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



## Autosampler Cups & Tubes

For AA, GFAA, ICP, ICP-MS, Viscometers

VHG Labs autosampler tubes and vials are standard sizes and fit many manufacturers' autosamplers, including Cetac and Gilson as well as systems by Perkin Elmer, Varian, Unicam, TJA/Thermo Fisher Scientific and others.



### VHG Tips

You can cover sample tubes for trace metals with common poly-olefin (kitchen) wrap instead of waxy stretch film that is sold as laboratory wrap.

Common plastic wrap is generally much cleaner. Also, 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.	
13 x 25mm (1.5 - 2.0mL)	Clarified Polypropylene	Conical	FAASC3-MP	Pack of 1000

#### Sample Tubes for ICP, ICP-MS Autosamplers

Size	Material	Bottom	Product No.	
13 x 100mm (~8mL)	Polypropylene	Round	FPSC4-MP	Pack of 1200
17 x 100mm (~15mL)	Polypropylene	Round	FPSC1-MP	Pack of 1200
Plug for FPSC1-MP	Polyethylene	Round	FPSC1-MP-PLUG	Pack of 1200
30 x 115mm (~50mL) w/cap	Polypropylene	Conical	FPSC2A	Pack of 500
30 x 115mm (~50mL) w/cap	Polypropylene	Conical Freestanding	FPSC5	Pack of 500

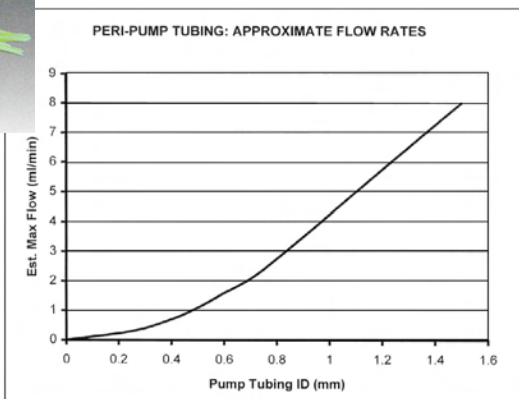
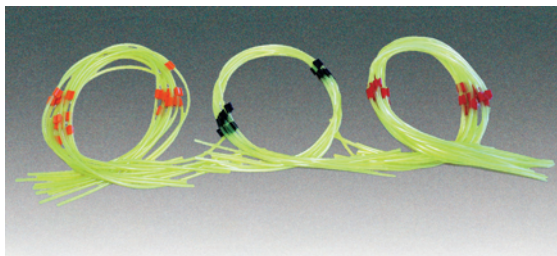
#### Sample Tubes for Viscometer Autosamplers

Size	Material	Bottom	Product No.	
2.3 x 6cm (15mL)	Polypropylene	Cylindrical	FVISC-MPA	Pack of 1000



# Tubing for Peristaltic Pumps

For ICP & ICP-MS



## Peri-Pump Tubing is available in five different materials:

### Flexible PVC

Clear and economical, used in most ICP & ICP-MS work. Has 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

## "2 Bridge" Peri-Pump Tubing

	Flexible PVC	Solvent Flex	Silicone	Viton™	Santoprene™
<b>Quantity Per Pack</b>	12	12	6	6	6
<b>Length (in.)</b>	17.9	17.9	17.9	6.9	15.7
<b>No. of Bridges</b>	2	2	2	2	2
<b>Bridge Interval (in.)</b>	5.9	5.5	5.5	5	5.9
<b>I.D. mm (in.) /Color</b>	<b>Product No.</b>	<b>Product No.</b>	<b>Product No.</b>	<b>Product No.</b>	<b>Product No.</b>
0.19 (.007")-oran/red	D180241				
0.25 (.010")-oran/blue	D180253		D180247		
0.38 (.015")-oran/grn	D180261				
0.51 (.02")-oran/yell	D180213	D180228		D180235	D180256
0.64 (.025")-oran/white	D180222	D180230	D180263	D180239	
0.76 (.03")-blk/blk	D180203	D180209	D180238	D180212	D180268
0.89 (.035")-oran/oran	D180202	D180208	D180255	D180211	
1.02 (.04")-white/white	D180219	D180232	D180267	D180236	
1.14 (.045")-red/red	D180201	D180207	D180250	D180210	D180259
1.30 (.051")-gray/gray	D180216	D180240	D180265	D180237	
1.52 (.06")-yell/blue	D180258		D180248		
1.65 (.065")-blue/blue	D180245				
3.18 (.125")-blk/white	D180276				

To order, call (+1) 888.622.7660 or fax (+1) 603.622.5180

## Section 4 Consumables

### Autosampler Cups & Tubes

### ICP & ICP-MS Consumables

- ▶ Peristaltic Pump Tubing
- Mixing Tees
- Nebulizers
- Torches & Spray-Chambers
- Cones

### AA & GFAA Consumables

### XRF Consumables

### Graphite Crucibles

## Tubing for Peristaltic Pumps

### For ICP & ICP-MS

#### VHG Tips

We agree with many instrument manufacturers in recommending Santoprene tubing for drain lines or for cases where highest purity is critical. Santoprene has a much greater lifetime in most applications. While irrelevant for drain lines, it may add modest contamination for Zn and Sn if used for sample uptake.

#### "3 Bridge" Peri-Pump Tubing

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

#### "1 Bridge" Pump Tubing for Leeman Labs® ICP Spectrometers

Description	Material	ID mm (in)	Leeman Product No.	Product No.	
Sample Uptake	PVC	0.51mm (0.020")	309-3551	D180217	Pack of 12
Sample Uptake	Solvent Flex	0.51mm (0.020")	309-3550	D180229	Pack of 12
Sample Drain	PVC	1.14mm (0.045")	309-3538	D180220	Pack of 12
Sample Drain	Solvent Flex	1.14mm (0.045")	309-3536	D180231	Pack of 12

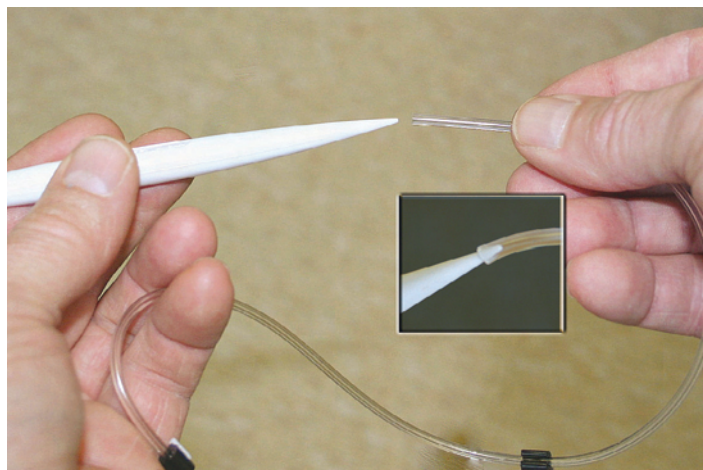
## Flaring Tool for Peri-Pump Tubing

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.

#### Product No.

D180AWLP

For flared tubing, please inquire.





# Mixing Tees for Sample Introduction

## For ICP & ICP-MS

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.



TJA Type	Color Code	PTFE Exit Line
"Leg" 1	oran/oran	0.56mm
"Leg" 2	oran/green	0.38mm

Product No. D180243

### 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 since many samples require a set, consistent dilution.

#### Suggested Use #2: Online dilution

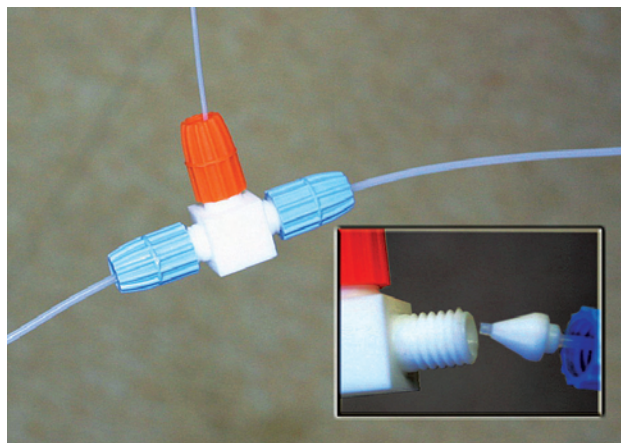
If you use a standard nebulizer with an approximate 1 mL/min liquid flow, you can create a 1:1 dilution by using two orange/orange legs. Greater or lesser dilutions can be achieved as desired (see chart below). VHG's new 100% PTFE mixing tee system is made from the best components, is completely configurable, has color-coded ends, and will likely last for years. Call us to configure your set.

Examples (call for others)	Sample diln. achieved	Nebulizer liquid flow	Peri tubing leg #1	Peri tubing 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%	(0.7mm ID) combined solutions
2	1:5	0.7 - 1.0	orange/orange diluted about 20%	orange/green diluted about 80%	(0.7mm ID) combined solutions
3	1:1	0.7 - 1.0	black/black diluted about 50%	black/black diluted about 50%	(0.7mm ID) combined solutions

Product No. (PTFE Tee Only)\*

D180TEE

\* Pump tubing must be ordered separately



#### Autosampler Cups & Tubes

#### ICP & ICP-MS Consumables

- ▶ Peristaltic Pump Tubing
- ▶ Mixing Tees
  - Nebulizers
  - Torches & Spray-Chambers
  - Cones

#### AA & GFAA Consumables

#### XRF Consumables

#### Graphite Crucibles

### VHG Tips

Concentric Nebulizer types:

“A” types have the nozzle and inner capillary flush with each other and the end tip is flat.

“C” and “K” types have a recessed capillary that handles high dissolved salts.

Quartz is pure SiO<sub>2</sub> and will offer lower backgrounds (ICP-MS) for some elements, such as B, Na & K. The benefit will only be apparent if the other sample introduction components of the instrument correspond.

## Nebulizers

### For ICP & ICP-MS

- ◆ Extensive Line of High Quality Nebulizers
- ◆ Designed to Meet or Exceed Original Specifications
- ◆ Direct Replacement Items and Upgrade Potential!

### Replacement Nebulizers

#### Concentric Type Glass Nebulizers

Description	Liquid flow (mL/min)	Argon back pressure (psi)	Product No.
A-Type, 1.0 Lpm Ar	1.0	30	GNB-75
A-Type, 1.0 Lpm Ar	2.0	30	GNB-76
A-Type, 1.0 Lpm Ar	3.0	30	GNB-77
C-Type, 1.0 Lpm Ar	1.0	30	GNB-70
C-Type, 1.0 Lpm Ar	2.0	30	GNB-71
C-Type, 1.0 Lpm Ar	3.0	30	GNB-72
K-Type, 0.7 Lpm Ar	3.0	30	GNB-80
K-Type, 0.7 Lpm Ar Quick Disconnect	3.0	30	GNB-80QD
K-Type, 0.7 Lpm Ar	2.0	30	GNB-82
Aerosalt - High Solids, 0.7 Lpm Ar Quick Disconnect, Argon Connect	2.0	30	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

	Specifications	Product No.
Fixed CF	High Flow (Agilent/HP)	GNB-94
Fixed CF	Fits 34mm Spray Chamber	GNB-92S
Fixed CF	Fits 35mm Spray Chamber	GNB-92
Fixed CF	High Solids (Agilent/HP)	GNB-93
V-Groove	Noordermeer MDSN, Quick Disconnect, Argon Connect	GNB-10QDAC
Modified Lichte	MDSN Nebulizer, 1 Lpm Ar	GNB-20S

## MEINHARD®

#### Concentric Type Nebulizers

Description	Liquid flow (mL/min)	Argon back pressure (psi)	Product No.
A-Type-Quartz	0.5	30	TQ-30-A0.5
A-Type-Quartz	0.5	50	TQ-50-A0.5
A-Type-Quartz	3.0	30	TQ-30-A3
A-Type-Glass	2.0	30	TR-30-A2
A-Type-Glass	3.0	30	TR-30-A3
C-Type-Glass	2.0	30	TR-30-C2
C-Type-Glass	3.0	30	TR-30-C3
C-Type-Glass	0.5	50	TR-50-C0.5
C-Type-Glass	1.0	50	TR-50-C1
K-Type-Glass	2.0	30	TR-30-K2
K-Type-Glass	3.0	30	TR-30-K3

*We Do Not Recommend Ultrasonic Cleaning Of Nebulizers.*

# Nebulizers

For ICP & ICP-MS

VHG Labs is an Authorized Distributor of Glass Expansion Products.



For information on Glass Expansion nebulizers or other sample introduction components, please inquire.

## 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	Mfg. No.	Nebulizer Description	VHG Part No.
T2100	T2100	High solids, inert wide bore (750um) Teflon® nebulizer. Designed to replace T2002 and BTN. Ideal for samples with large undissolved particulates - virtually unpluggable. Liquid flow 0.5mL/min to 3.0mL/min. Operates on standard pressures of 30-45psi.	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 0.2mL/min to 2.5mL/min. Operates on standard gas pressure of 45psi.	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 0.2mL/min to 2.5mL/min. Operates on standard gas pressures of 35-45psi.	TMM3500
Ari Mist	AM5000	Low flow, inert *Peek® nebulizer. Teflon® sample and gas capillaries. Designed for particulate-free samples. Black *PEEK™ body. Liquid flow 0.050mL/min to 1.0mL/min. Operates at standard gas pressures of 40-50psi.	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 0.005mL/min to 1.0mL/min. Operates at higher gas pressure (80psi). Excellent for LC/ICP/ICP-MS.	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.

**To order, call (+1) 888.622.7660 or fax (+1) 603.622.5180**

- Autosampler Cups & Tubes
- ICP & ICP-MS Consumables
  - Peristaltic Pump Tubing
  - Mixing Tees
  - ▶ Nebulizers
  - Torches & Spray-Chambers
  - Cones
- AA & GFAA Consumables
- XRF Consumables
- Graphite Crucibles

# Torches, Accessories & Spray-Chambers

For ICP & ICP-MS

**NEW!**

## VHG Tips

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.

The injector tip of the ICP-MS torch can be a source of "background," especially for 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

ICP-MS Torch and Torch Accessories	Mfg. No.	Product No.
Standard Torch, 2.5mm Injector (Agilent 7500), 2 Projections, HMI Compatible	G3270-67002	GHP-01
Quartz Bonnet (Agilent 7500)	G1833-65421	GHP-25
One Piece Torch, 2.5mm Injector (Agilent 7700)	G3280-80001	GHP-51
One Piece Torch, 1.5mm Injector (Agilent 7700)	G3280-80004	GHP-54
One Piece Torch, 1.0mm Injector (Agilent 7700)	G3280-80005	GHP-55

### Spray Chambers and Nebulizers

Scott Chamber, Inner/Outer Tube Flush, Drain & Exit 90°, Quartz (HP 4500, Agilent 7500)	G1820-65337	GHP-13
C-Type Concentric Nebulizer, 1 Lpm Ar, 30psi, 1mL/min		GNB-70
Meinhard A-Type Concentric Quartz Nebulizer, 30psi, 2mL/min	G1820-65138	TQ-30-A2
Glass Expansion MicroMist Nebulizer, 1 Lpm Ar 35psi, 0.4mL/min		AR35-1-FM04EX

### Platinum Torch Shields

Long Life Platinum Shield (4500)	G1820-65357	CHP5003
Long Life Platinum Shield (7500)	G1833-65419	CHP5004

### HORIBA Jobin Yvon ICP-AES Supplies

ICP Torch and Torch Accessories	Mfg. No.	Product No.
Demountable Torch Assembly, Complete	21.356.110	GISA-40
Outer Quartz Tube, 71mm, Radial	31.023.722	GISA-50
Outer Quartz Tube, Axial	31.031.099	GISA-70
Inner Quartz Tube	31.023.723	GISA-52
PTFE Centering Ring	31.023.724	GISA-53
PTFE Insert	31.021.730	GISA-55
Alumina Injector	31.021.589	GISA-58
Alumina Injector and Teflon Insert	21.356.130	GISA-61

### Spray Chambers and Nebulizers

Cyclonic Spray Chamber, 4mm Drain	31.031.279	GISA-15
C-Type Concentric Nebulizer, 1 Lpm Ar, 50psi, 1mL/min	47.929.001	GNB-70P
Meinhard C-Type Concentric Glass Nebulizer, 50psi, 1mL/min	47.929.001	TR-50-C1
Meinhard K-Type Concentric Glass Nebulizer, 30psi, 3mL/min	47.929.005	TR-30-K3

### Leeman Labs ICP-AES Supplies

ICP Torch and Torch Accessories	Mfg. No.	Product No.
1 Piece Torch with Ball Joint, Aqueous	120-3748	GLMN-20
1 Piece Torch with Ball Joint, Organics	120-3749	GLMN-22
Demountable Torch	318-0001	GLMN-43

### Spray Chambers and Nebulizers

Spray Chamber, Scott, Radial	120-3751	GLMN-25
C-Type Concentric Nebulizer, 1 Lpm Ar, 30psi, 3mL/min		GNB-72
Glass Expansion Conikal Nebulizer, 1 Lpm Ar, 30psi, 3mL/min	318-00078	AR30-1-FC3E

# Torches, Accessories & Spray-Chambers

For ICP & ICP-MS

Section 4  
Consumables

## PerkinElmer ICP-AES Supplies

### Optima 3000 Series Radial

ICP Torch and Torch Accessories	Mfg. No.	Product No.
Torch Body, Optima, Radial	N069-0568	GPE1-04
Torch Bonnet, Flat Edge (Optima post 9/94)	N069-5456	GPE1-13
Quartz Injector, 1.2mm	N068-1631	GPE2-33

### Spray Chambers

Cyclonic Spray Chamber, Optima		GPE0-19
--------------------------------	--	---------

### Optima 3000XL & SC(X)

ICP Torch and Torch Accessories	Mfg. No.	Product No.
Torch Body, Optima XL	N069-5379	GPE1-11
Quartz Injector, 2.0mm	N069-5442	GPE2-41
Alumina Injector, 2.0mm	N069-5362	GPE2-50
Torch Bonnet	N069-1664	GPE1-15

### Optima 3000 Series DV

ICP Torch and Torch Accessories	Mfg. No.	Product No.
Torch Body, Optima DV, 1 Slot	N069-1662	GPE1-14
Torch Bonnet	N069-1664	GPE1-15
Purge Tube Window, Radial, Short	N069-0672	GPE2-73
Quartz Injector, 2.0mm	N069-5442	GPE2-41
Alumina Injector, 2.0mm	N069-5362	GPE2-50

### Spray Chambers and Nebulizers

Cyclonic Spray Chamber	N812-2188	GPE0-18DV
C-Type Concentric Nebulizer, 1 Lpm Ar, 50psi, 1mL/min	0047-2022	GNB-70P
K-Type Concentric Nebulizer, 0.7Lpm Ar, 30psi, 3mL/min	N068-1574	GNB-80

### Optima 2000/4000/5000/7000DV & 4000/5000V

ICP Torch and Torch Accessories	Mfg. No.	Product No.
Torch Body, Optima 2000/4000/5000/7000DV, 1 Slot	N077-0338	GPE1-16
Torch Body, Optima 4300V/5300V	N077-1500	GPE1-17A
Torch Body, Optima 4300V/5300V/7300V, Wear Metals		GPE1-17W
Glass Expansion Demountable Ceramic Torch, Optima 4300V/5300V/7300V	N077-7052	31-808-2815
Torch Bonnet	N077-5289	GPE1-25
Alumina Injector, 2.0mm	N077-5177	GPE1-42
Alumina Injector, 1.2mm, Optima 4300V/5300V	N077-1531	GPE2-54
Quartz Injector, 1.2mm	N077-5226	GPE2-77
Axial Purge Window, Optima 2000DV	0999-2731	GPE2-65
Axial Purge Window, Optima 4000/5000/7000DV	N077-1116	GPE2-67
Radial Purge Window, Optima 4000/5000/7000DV	N077-0322	GPE2-80
Purge Tube Window, Radial, Short, Optima 2000DV	N069-0672	GPE2-73
Quartz Injector, 2.0mm	N077-5014	GPE2-74

### Spray Chambers and Nebulizers

Cyclonic Spray Chamber, no Baffle, with Neb Adapter	N077-6052	GPE0-29
Cyclonic Spray Chamber, Baffled, with Neb Adapter	N077-6053	GPE0-30
C-Type Concentric Nebulizer, 1 Lpm Ar, 50psi, 1mL/min	0047-2022	GNB-70P
K-Type Concentric Nebulizer, 0.7 Lpm Ar, 30psi, 3mL/min	N068-1574	GNB-80

## Autosampler Cups & Tubes

### ICP & ICP-MS Consumables

Peristaltic Pump Tubing  
Mixing Tees  
Nebulizers

► Torches & Spray-Chambers  
Cones

### AA & GFAA Consumables

### XRF Consumables

### Graphite Crucibles

To order, call (+1) 888.622.7660 or fax (+1) 603.622.5180

# Torches, Accessories & Spray-Chambers

## For ICP & ICP-MS

### VHG Tips

The tip of the torch injector (central tube) ought to be regularly inspected for build-up of sample residue.

Even small amounts of material can disrupt the even flow of sample aerosol.

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 Sciex ICP-MS Supplies

#### Elan 5000/6X00/9000/DRC II

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

### Spectro ICP-AES Supplies

#### Spectroflame and Ciros

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

### Thermo Fisher Scientific (VG) ICP-MS Supplies

#### Axiom, PlasmaQuad 1,2,3 & PQ ExCell

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

# Torches, Accessories & Spray-Chambers

For ICP & ICP-MS

## Thermo Fisher Scientific (TJA) ICP-AES Supplies

61E, Iris Advantage, Intrepid Radial, 61E Trace, Iris AP, Intrepid

ICP Torch and Torch Accessories	Mfg. No.	Product No.
Ceramic Base Torch, High Flow w/ 1.5mm Injector	126432-01	GTJA5-07
Ceramic Base Torch, Trace, with 1.5mm Injector	126432-03	GTJA5-10
Ceramic Base Torch, DV, with 1.5mm Injector		GTJA5-10DV
Duo Torch Sleeve and Seal Kit	138563-00	GTJA0-26
Quartz Injector, 1.5mm	125407-00	GTJA0-41
Spray Chambers and Nebulizers		
Cyclonic Spray Chamber, Axial, Pump	139662-00	GTJA5-13
Cyclonic Spray Chamber, Radial, Pump	139663-00	GTJA5-14
V-Groove Nebulizer, Noordermeer MDSN, Quick Disconnect, Argon Connect		GNB-10QDAC
K-Type Concentric Nebulizer, 0.7Lpm Ar, 30psi, 3mL/min, Quick Disconnect, Argon Connect		GNB-80QDAC
Meinhard K-Type Glass Concentric Nebulizer, 30psi, 2mL/min	139600-00	TR-30-K2
Glass Expansion Conikal Nebulizer, 0.7 Lpm Ar, 30psi, 2mL/min	139184-00	AR30-07-FC2E

## Varian ICP-AES Supplies

700-ES Series, Liberty Radial, Vista Axial

ICP Torch and Torch Accessories	Mfg. No.	Product No.
Low Flow Torch, One Piece, Radial	20-100696-90	GVA-05
Torch Bonnet	20-100707-00	GVA-25
Low Flow Torch, One Piece, Axial, 90° Bend	20-100904-00	GVA-12
Spray Chambers and Nebulizers		
Cyclonic Spray Chamber, 8mm Top, 4mm Drain	20-100817-00	GVA-21
Noordermeer V-Groove MDSN Nebulizer		GNB-10
Aerosalt - High Solids Nebulizer, 0.7 Lpm Ar, 30psi, 2mL/min, Quick Disconnect, Argon Connect	20-100964-00	GNB-65QDAC
C-Type Concentric Nebulizer, 1 Lpm Ar, 30psi, 1mL/min	20-100765-00	GNB-70
K-Type Concentric Nebulizer, 0.7 Lpm Ar, 30psi, 3mL/min, Quick Disconnect, Argon Connect	20-101068-00	GNB-80QDAC
K-Type, High Flow Concentric Nebulizer	20-100816-00	GNB-85
Meinhard C-Type Glass Concentric Nebulizer, 30psi, 2mL/min	20-100765-00	TR-30-C2
Glass Expansion Conikal Nebulizer, 0.7 Lpm Ar, 30psi, 3mL/min		AR30-07-FC3E

## Varian ICP-MS Supplies

800-MS Series

ICP-MS Torch and Torch Accessories	Mfg. No.	Product No.
Torch with Placement Posts	20-101007-00	GVA-34
Sheath Bypass	20-101008-00	GVA-31
Sheath Gas Port	20-101009-00	GVA-32
Spray Chambers and Nebulizers		
ICP-MS Spray Chamber	20-101010-00	GVA-33
C-Type Concentric Nebulizer, 1 Lpm Ar, 30psi, 1 mL/min	20-100765-00	GNB-70
Glass Expansion Conikal Nebulizer, 1 Lpm Ar, 30psi, 3mL/min		AR30-1-FC3E

### Autosampler Cups & Tubes

### ICP & ICP-MS Consumables

Peristaltic Pump Tubing  
Mixing Tees  
Nebulizers

► Torches & Spray-Chambers  
Cones

### AA & GFAA Consumables

### XRF Consumables

### Graphite Crucibles

To order, call (+1) 888.622.7660 or fax (+1) 603.622.5180

## ICP-MS Cones

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



### VHG Tips

Nickel cones work well for many ICP-MS applications. Pt-tipped cones offer greater life-time and usually require less day-to-day maintenance attention. Aggressive matrices (high in oxidizing conditions) may require Pt-tipped cones.

Platinum diameter is stated with respect to a platinum insert piece. It is the outer dimension of the insert.

**NEW!**

#### Agilent (HP) ICP-MS Cones & Accessories

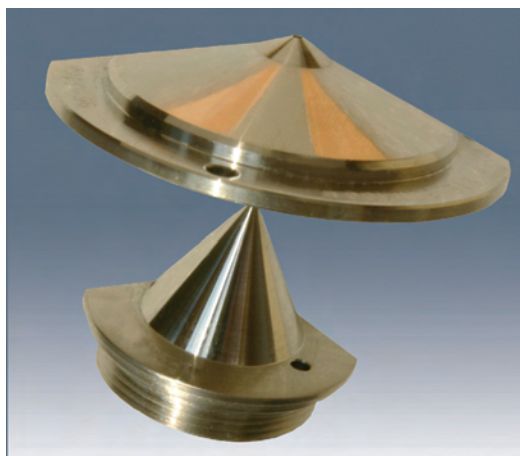
For 4500, 7500, 7700 Series Instruments

Cone	Mfg. No.	Product No.
Nickel Sampler (25mm Ni insert)	G1820-65238	CHP1001-Ni
Nickel Sampler (7700)	G3280-67040	CHP2001-Ni
Platinum (10mm Pt insert) Sampler (4500, 7500)	G1820-65239	CHP1006-Pt
Platinum (10mm Pt insert) Sampler (7700)	G3280-67036	CHP2006-Pt
Nickel Skimmer (7500ce)	G3270-65024	CHP1002CE-Ni
Nickel "S" Skimmer (7700)	G3280-67066	CHP2002S-Ni
Nickel "X" Skimmer (7700)	G3280-67041	CHP2002X-Ni
Platinum Skimmer (7500ce, 7500cs)	G1833-65132	CHP1008CS-Pt
Platinum "X" Skimmer in Copper Base (7700)	G3280-67060	CHP2008X-Pt/Cu
Platinum "S" Skimmer in Copper Base (7700)	G3280-67064	CHP2008S-Pt/Cu
eSPEC Platinum Shield Plate (7500)	G1833-65419	CHP5004e

#### PerkinElmer Sciex ICP-MS Cones & Accessories

For 5000, 6000, 6100, 9000, DRC Series Instruments

Cone	Mfg. No.	Product No.
Nickel Sampler (6000, 6100, 9000)	WE02-1140	CSC2011-Ni
Platinum Sampler (6000, 6100, 9000)	WE02-7802	CSC2013-Pt
eSPEC Platinum Sampler (6000, 6100, 9000)	WE02-7802	CSC2013-Pte
Nickel Skimmer (6000, 6100, 9000)	WE02-1137	CSC2012-Ni
Platinum Skimmer (6000, 6100, 9000)	WE02-7803	CSC2014-Pt
eSPEC Platinum Skimmer (6000, 6100, 9000)	WE02-7803	CSC2014-Pte



#### Cone Refurbishment Program offered by VHG Labs:

Platinum parts are refurbished at no charge for the life of the part. Non-Spectron cones may also be refurbished at a nominal charge (please call). This applies to cones where their condition is suitable for refurbishment and not those chemically or mechanically degraded to a point where the metal is compromised.

#### e•SPEC™ Cones Now Available.

Unprecedented value is offered with Spectron's new line of enhanced performance ICP-MS cones. Call us or visit our website for details. Platinum cones at 1990's prices!



**NEW!**

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

For VG X-Series, PlasmaQuad, Axiom, PQ ExCell, Genesis and Finnigan Element, Element 2, Neptune Series Instruments

Cone	Mfg. No.	Product No.
Nickel Sampler, 100% Ni (VG X-Series)	3600812	CVG1021-Ni
Nickel Sampler, Cu Core (VG X-Series)	3600812	CVG1021-Ni/Cu
Nickel Sampler (all VG models except X-Series)	3004661	CVG1001-Ni
Platinum (15.2mm Pt insert) Sampler (all VG models except X-Series)	3601289	CVG1006A-Pt
Nickel Skimmer (VG X-Series)	3600811	CVG1022-Ni
Nickel Micro-Skimmer (all VG models except X-Series)	3200860	CVG1004-Ni
Platinum Skimmer (all VG models except X-Series)	N/A	CVG1028-Pt
Nickel Sampler, Cu Core (Element, Element 2, Neptune)	1044520	CT1001-Ni/Cu
eSPEC Platinum (7.62mm Pt insert) Sampler (Element, Element 2, Neptune)	1067500	CT1006-Pte
Nickel Skimmer (Element, Element 2, Neptune)	1067600	CT1002A-Ni
Platinum Skimmer, Ni base (Element, Element 2, Neptune)	1047510	CT1007-Pt
Platinum Guard Electrode (Element, Element 2, Neptune)	1126640	CT5004

## VHG Labs' ICP-MS Maintenance Kit

VHG Labs has assembled an ICP-MS Maintenance Kit designed to provide the ICP-MS analyst with the right tools for the job of cleaning and restoring cones to their "as-new" performance. Cone maintenance and cone restoration improve analytical performance, reduce the time needed to tune and optimize, reduce interference, and can save substantial money!

ICP-MS cones take the brunt of all sample by-products and also experience high temperature which leads to build-up of residue on the cone and reduced performance. Ion lenses also experience issues with build-up of residue. We are certain that the items in this kit will result in better and quicker cone cleaning. If you have never used proper polishing felt or cloth, the right swab, or diamond paste, then you will be in for a pleasant experience. Our Maintenance Kit is designed for any brand or type of ICP-MS cone.

### Our ICP-MS Cone and Lens Maintenance Kit Includes:

- ◆ Diamond abrasive paste compound
- ◆ Diamond abrasive lapping paper: coarse and fine
- ◆ Alumina abrasive powder: coarse and fine
- ◆ Lint-free, "clean-room" quality polyester cloths
- ◆ Polyester polishing felt (3/8")
- ◆ Wood-stick cotton swabs
- ◆ Pointed-tip plastic foam swabs
- ◆ Magnifier lens
- ◆ Instruction guide



Description	Product No.
ICP-MS Maintenance Kit	CVHG-MNTKIT1

**To order, call (+1) 888.622.7660 or fax (+1) 603.622.5180**

### Autosampler Cups & Tubes

### ICP & ICP-MS Consumables

- Peristaltic Pump Tubing
- Mixing Tees
- Nebulizers
- Torches & Spray-Chambers

### ► Cones

### AA & GFAA Consumables

### XRF Consumables

### Graphite Crucibles

## GFAA Tubes & Parts

All tubes are pyrolytic graphite-coated unless otherwise stated

### VHG Tips

We guarantee the quality of our graphite consumables!

We supply only top quality, pure, high-density graphite and pyrolytic graphite-coated parts.

Tubes are pyrolytic graphite-coated unless otherwise stated.

GBC	Description	Mfg. No.	Product No.
Graphite Tube	Pre-Inserted Omega Platform	N/A	FGBC25
Graphite Tube	Non-Platform	99-0059-00	FGBC59
Platform	Solid Pyro Graphite (for FGBC59)	99-0060-00	FGBC60
Electrode Set	Set of 2	45-0006-00	FGBC06
Graphite Shroud	GF 3000	45-0004-00	FGBC04

Hitachi	Description	Mfg No.	Product No.
Graphite Cuvette	Pre-Inserted Forked Platform	190(ANO)-0028	FHIT55
Contact Rings	Set of 2, AD 20mm	180-7401	FHIT01

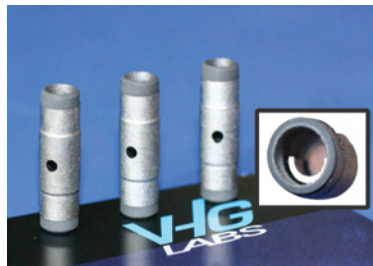
PerkinElmer	Description	Mfg. No.	Product No.
Graphite Tube	Pre-Inserted Platform	B011-2660	FPE930
Graphite Tube	Pre-Inserted Forked Platform	B050-5057	FPE57
Graphite Tube	Std Tube for L'Vov Platform	B012-1092, B010-9322	FPE92
L'Vov Platform	Solid Pyro Graphite (for FPE92)	B012-1091, B010-9324	FPE91
Graphite Tube	Non-Platform	B013-5653, B009-1504	FPE53
Graphite Tube	Non-Platform, Uncoated	B007-0699	FPE99
Zeeman Contact Set	Set of 2	B011-6823	FPE61
HGA Contact Set	Set of 2, with Sensor Hole	B012-8490	FPE63

For other GFAA tubes and parts, please inquire.



# GFAA Tubes & Parts

All tubes are pyrolytic graphite-coated unless otherwise stated



## Section 4 Consumables

### Autosampler Cups & Tubes ICP & ICP-MS Consumables

#### AA & GFAA Consumables

- ▶ GFAA Tubes & Parts
- ▶ Hydride Quartzware
- Hollow Cathode Lamps

### XRF Consumables

#### Graphite Crucibles

Thermo Fisher Scientific Unicam/ATI	Description	Mfg. No.	Product No.
-------------------------------------	-------------	----------	-------------

Graphite Cuvette	ELC Type	9423 393 95041	FATI41
Graphite Cuvette	Omega Platform	9423 490 20101	FATI20101
Graphite Cuvette	Ridged	9423 393 95071	FATI71
Graphite Cuvette	Ridged, Uncoated	9423 393 95031	FATI31
Graphite Cuvette	Standard, Unridged	9423 393 95091	FATI95091

Varian	Description	Mfg. No.	Product No.
--------	-------------	----------	-------------

Graphite Tube	Pre-Inserted Omega Platform	N/A	FVAR37
Graphite Tube	Partitioned Type	63-100012-00	FVAR12
Graphite Tube	Plateau Type	63-100011-00	FVAR11
Bone Platform	Solid Pyro Graphite (for FVAR11)	63-100013-00	FVAR13
Zeeman Electrodes	Set of 2	63-100017-00	FVAR17

For other GFAA tubes and parts, please inquire.

## Hydride and Mercury Cold Vapor Quartzware

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

### PerkinElmer Quartz Components

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

### Varian Quartz Components

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

For pricing on other quartz cells, please inquire.

To order, call (+1) 888.622.7660 or fax (+1) 603.622.5180

### VHG Tips

Coded lamps are recognized by the instrument hardware automatically. Performance is identical for coded and non-coded lamps.

Expand the range of your AA! Multi-Element hollow cathode lamps offer a convenient option to expand the range of your AA.

We guarantee our lamps. VHG lamps are equal to or better than those supplied by the AA manufacturers' parts departments.

Lamps have a finite shelf life. Consider replacing your old lamps to enhance results.

## Hollow Cathode Lamps

### For AA & GFAA

- ◆ Highest available quality line sources for Atomic Absorption
- ◆ Most advanced, pure cathode materials and inert fill gas
- ◆ Fast warm-up times
- ◆ High output, stable and with low noise
- ◆ Long operating life with a five-year shelf life



### Single-Element Hollow Cathode Lamps

Type of Lamp and the Instrument Fitted:	1.5" Diam., 2-pin, Non-Coded for GBC, Hitachi, Shimadzu, Thermo, Varian	2.0" Diam., 9-pin, Non-Coded for Older PerkinElmer Instrumentation	2.0" Diam., 4-pin, Cableless for Perkin-Elmer AAnalyst* (timer excluded)
Element	Product. No.	Product. No.	Product. No.
Aluminum Al	LAL	LPEAL	LPE4AL
Antimony Sb	LSB	LPESB	LPE4SB
Arsenic As	LAS	LPEAS	LPE4AS
Barium Ba	LBA	LPEBA	LPE4BA
Beryllium Be	LBE	LPEBE	LPE4BE
Bismuth Bi	LBI	LPEBI	LPE4BI
Boron B	LB	LPEB	LPE4B
Cadmium Cd	LCD	LPECD	LPE4CD
Calcium Ca	LCA	LPECA	LPE4CA
Chromium Cr	LCR	LPECR	LPE4CR
Cobalt Co	LCO	LPECO	LPE4CO
Copper Cu	LCU	LPECU	LPE4CU
Gold Au	LAU	LPEAU	LPE4AU
Iron Fe	LFE	LPEFE	LPE4FE
Lead Pb	LPB	LPEPB	LPE4PB
Lithium Li	LLI	LPELI	LPE4LI
Magnesium Mg	LMG	LPEMG	LPE4MG
Manganese Mn	LMN	LPEMN	LPE4MN
Mercury Hg	LHG	LPEHG	LPE4HG
Molybdenum Mo	LMO	LPEMO	LPE4MO
Nickel Ni	LNI	LPENI	LPE4NI
Palladium Pd	LPD	LPEPD	LPE4PD
Platinum Pt	LPT	LPEPT	LPE4PT
Potassium K	LK	LPEK	LPE4K
Selenium Se	LSE	LPESE	LPE4SE
Silicon Si	LSI	LPESI	LPE4SI
Silver Ag	LAG	LPEAG	LPE4AG
Sodium Na	LNA	LPENA	LPE4NA
Strontium Sr	LSR	LPESR	LPE4SR
Thallium Tl	LTL	LPETL	LPE4TL
Tin Sn	LSN	LPESN	LPE4SN
Titanium Ti	LTI	LEPTI	LPE4TI
Vanadium V	LV	LPEV	LPE4V
Zinc Zn	LZN	LPEZN	LPE4ZN

\* Timers are no longer supplied with Perkin Elmer 4-pin lamps. If you require timers, please order LTIMER with each lamp. See Page 99.

# Hollow Cathode Lamps

For AA & GFAA

## Timer for 2.0" Diameter, 4-pin, Cableless Lamp for PerkinElmer AAnalyst

Description	Instrument	Product No.
10,000 mA/hour Timer	LPE4xx Series Lamps	LTIMER

## Multi-Element Hollow Cathode Lamps

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

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



## 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 1100 hours.

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

\*For other Deuterium lamp choices, please inquire.

Autosampler Cups & Tubes  
ICP & ICP-MS Consumables

AA & GFAA Consumables

GFAA Tubes & Parts

Hydride Quartzware

► Hollow Cathode Lamps

XRF Consumables

Graphite Crucibles

To order, call (+1) 888.622.7660 or fax (+1) 603.622.5180

## Section 4 Consumables

### VHG Tips

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

Only a limited sample available?

When sample is limited, smaller sample cups can be used with accurate centering over the aperture made possible with a VHG Cup Positioning Guide. See Page 103.

Analyzing powders or non-volatile liquids in vacuum?

Try Spectro Cup II with Baffle Plus™ Cap. Superior, vented baffle system features efficient pressure equalization, vapor recirculation, particle entrapment, and greater sample stability.

Why buy VHG's pellet caps?

- Firm support of samples & less susceptible to damage
- Easy & convenient storage
- Accommodated by all XRF spectrometers

VHG's pellet caps are made of thin wall aluminum with either straight side-walls or tapered side-walls. They support and reinforce samples in cup presses and are useful for holding, transporting and storing powder samples. They have a painted exterior and eject simply from the mold assembly.

## XRF Sample Cups

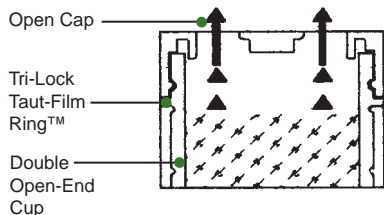
VHG's XRF Cups feature a unique Tri-Lock Taut Film™ design that ensures a wrinkle-free, leak-resistant and taut window film.

### Double Open-End Cups

VHG's 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.
Open Cap					
Tri-Lock Taut-Film Ring™	25	17	24	4.6	CUP11-25S
	31	25	24	8.4	CUP11-31S
	40	31	24	14.0	CUP11-40S
Double Open-End Cup	40	31	34	22.0	CUP11-40T



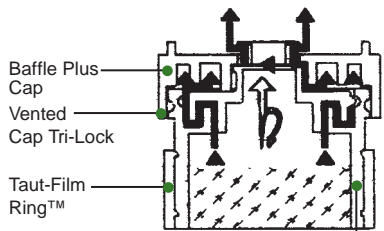
#### Double Open-End Cup with Vented Cap (consists of 3 parts)



	O.D. (mm)	I.D. (mm)	Height (mm)	Vol. (cc)	Product No.
	25	17	24	4.6	CUP22-25S
	31	25	24	8.4	CUP22-31S
	40	31	24	14.0	CUP22-40S
	45	39	34	36.7	CUP22-45T

#### Spectro Cup II® with Baffle Plus™ Cap (consists of 4 parts)

	O.D. (mm)	I.D. (mm)	Height (mm)	Vol. (cc)	Product No.
Baffle Plus Cap	31	25	29	6.8	CUP69-31S
Vented Cap Tri-Lock	40	31	29	11.3	CUP69-40S
Taut-Film Ring™	45	39	39	31.0	CUP69-45T
Baffle Vented Body					



#### Oxford Analyzers (consists of 2 parts)



#### Double Open-End Cup for Oxford

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.

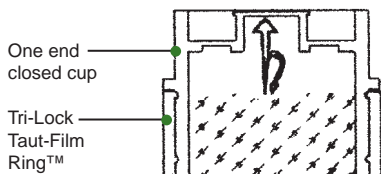
O.D. (mm)	I.D. (mm)	Height (mm)	Vol. (cc)	Product No.
32	28	36	20	CUPOX-35

# XRF Sample Cups

## Closed End Cups

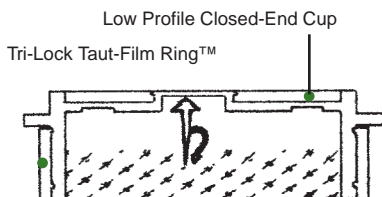
Bottom loaded to handle liquids, slurries, powders, and many volatiles or foaming liquids, where user wishes immediate back pressure of closed cell conditions. Cups are ventable for pressure equalization.

### 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	CUP77-25S
31	25	24	8.1	CUP77-31S
40	31	24	14.7	CUP77-40S
45	39	34	29.0	CUP77-45T

### HORIBA Analyzers (consists of 2 parts)



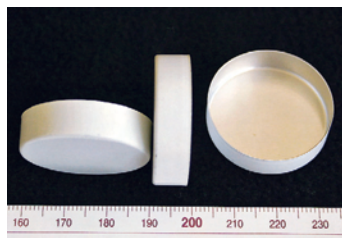
#### Closed-End Cups for HORIBA

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

O.D. (mm)	I.D. (mm)	Height (mm)	Vol. (cc)	Product No.
43	47	18.4	17	CUPH-43

## Pellet Caps For XRF Analysis of Powders

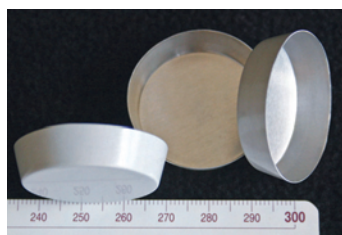
### Pellet Caps - Straight Wall



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

Briquette Size (mm)	Product No.
32	CAP30
40	CAP38

### Pellet Caps -Tapered Wall



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

Briquette Size (mm)	Product No.
32	CAP32
40	CAP40

Autosampler Cups & Tubes  
ICP & ICP-MS Consumables  
AA & GFAA Consumables  
**XRF Consumables**  
▶ XRF Sample Cups  
Thin Films  
XRF Accessories  
**Graphite Crucibles**

## Thin Films for XRF Sample Cups

XRF sample cup films allow liquids, powders and slurries to be analyzed by X-Ray Fluorescence. VHG Labs provides a range of special films of highest quality. For selection of the ideal film, consider the material's transmission (especially important for "light elements"), purity, and physical strength.

Kapton® (Polyimide)	Thickness (microns)	Film Size & Shape	Product No.
Features high strength, high purity, chemical robustness, and withstands prolonged X-Ray irradiation.	7.6 Micron	3" x 50' Roll	FKP30-R15
	12.7 Micron	3" x 50' Roll	FKP50-R15

*Also available in pre-cut circles or squares*

Mylar®	Thickness (microns)	Film Size & Shape	Product No.
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).	2.5 Micron	3" x 300' Roll	FMY10-R3
	3.6 Micron	3" x 300' Roll	FMY15-R3
	6 Micron	3" x 300' Roll	FMY25-R3
	6 Micron	3" x 3" Squares	FMY25-33
	6 Micron	2.5" Dia. Circles	FMY25-C64

*Also available in 1.5 & 12.7 micron thickness*

Optilene-XF™	Thickness (microns)	Film Size & Shape	Product No.
Highest grade, proprietary film featuring optimal transmission, purity, strength, chemical resistance, and thermal stability. Good for full range of XRF analytes, including light elements.	4 Micron	3" x 300' Roll	FOL04-R3
	4 Micron	3" x 3" Squares	FOL04-33
	4 Micron	2.5" Dia. Circles	FOL04-S64
	6 Micron	3" x 300' Roll	FOL06-R3
	6 Micron	3" x 3" Squares	FOL06-33

*Also available in 1.5, 3.6 & 12.7 micron thickness*

Polycarbonate	Thickness (microns)	Film Size & Shape	Product No.
Features excellent X-Ray transmission characteristics and good chemical resistance.	2 Micron	3" x 300' Roll	FPC02-R3
	5 Micron	3" x 300' Roll	FPC05-R3

*Also available in pre-cut circles or squares*

Polypropylene	Thickness (microns)	Film Size & Shape	Product No.
General purpose film with good transmission and chemical resistance (Note: may contain Al, Ca, Cu, Fe, P, Ti, Zn, Zr).	4 Micron	3" x 300' Roll	FPP16-R3
	5 Micron	2.5" Dia. Circles	FPP20-C64
	6 Micron	3" x 300' Roll	FPP25-R3

*Also available in pre-cut squares*

Teflon® Microporous	Film Size & Shape	Product No.
Gas permeable Microporous Teflon® allows pressure or gas equalization between the sample cell and instrument.	2.5" x 200'	FPTFE-R64



# Accessories & Tools for XRF

## Section 4 Consumables

### Cup Press Plates (consists of 2 parts)



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

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

**Autosampler Cups & Tubes**  
**ICP & ICP-MS Consumables**  
**AA & GFAA Consumables**

**XRF Consumables**  
XRF Sample Cups  
▶ Thin Films  
▶ XRF Accessories

**Graphite Crucibles**

### Cup Positioning Guides



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	CPG25
31	CPG31
40	CPG40
45	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	CT25
31	15	CT31
40	15	CT40
43	8	CT43
45	8	CT45
50/52	6	CT50

To order, call (+1) 888.622.7660 or fax (+1) 603.622.5180

**VHG Tips**

VHG Labs' crucibles are made using a unique high temperature and vacuum purification process. This eliminates gas impurities and ensures optimal analytical results.

# Graphite Crucibles

## For Gas Determination Analyzers

- ◆ Made from special, high-purity graphite with proper electrical characteristics
- ◆ Machined to exact dimensions to ensure good contact with electrode and proper thermal characteristics
- ◆ Ultrasonically cleaned to remove machining dust; then dried
- ◆ Undergo final purification and degassing; then cooled under vacuum or nitrogen to provide maximum purity



**LECO Models EF-100, TC-136 to 436, TN-114 to 414, RO-116 to 416**

Item/Specifications	Mfg. No.	VHG Product No.
Crucible: designed for typical nitrogen/oxygen analysis	776-247	F776247
Crucible: designed for high temp. alloys and refractories	782-719/720	F782720
Inner Crucible—uniform temp.; for use with F775433	775-431/892	F775431
Outer Crucible—uniform temp.; for use with F775431	775-433	F775433

**LECO Models EF-10, RH-1, 1E&EN, RH2/3, RH-402&404EN, TN-14/15, RO-16/17, TC30/36**

Item/Specifications	Mfg. No.	VHG Product No.
Short Crucible, degassed (for LECO RH-2, RH-402)	769-520	F769520
Tall Crucible, degassed (for LECO RH-3, RH-402)	769-761	F769761
Cover for F769520 & F769761	769-569	F769569
Crucible (for LECO TN-15, TC-36, RO-17, RO-18, EF-10)	767-277	F767277

# Conversion Tables For Reference

Use these tables to find the information you need

- ◆ Dilution
- ◆ Dimension
- ◆ Flow Rate
- ◆ Pressure
- ◆ Tubing I.D. & Volumes
- ◆ Viscosity
- ◆ Volume
- ◆ Weight

## 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	2.540	128.7	50.67

## Viscosity Conversion

Centipoise (cp)*	Centistokes (cSt)	Examples
1	1	water
16.5	20.635	lotion
40	43.2	veg. oil
88	110	latex paint
176	220	maple syrup
352	440	SAE 30 oil

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

## Volume Conversion

CC (cm <sup>3</sup> )	mL	Liter	Fl. Oz.	Gallon
1.0	1.0	0.001	0.0338	2.64E-04
10	10	0.01	0.338	0.00264
29.57	29.57	0.0296	1.0	0.00781
3785	3785	3.785	128	1.0

## Weight Conversion

Pound (lb)	Ounce (oz)	Gram (g)	Kilogram (kg)
0.00220	0.0352	1.0	0.001
0.0625	1.0	28.38	0.0284
1.0	16	454	0.454
2.203	35.24	1000	1.0

## Flow Rate Conversion

L/min.	L/sec.	Gal./min. (gpm)	Gal./sec (gps)
3.785	0.0631	1.0	0.0167
227.1	3.785	60	1.0
1.0	0.0167	0.264	0.00440
60	1.0	15.85	0.264

## 1000 ppm standard Dilution Table

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

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

## Dimension Conversion

U.S.A. Fractional Inches	Metric	U.S.A. Decimal Inches
1/32	0.794mm	0.0313
n/a	1.00mm	0.0394
1/16	1.59mm	0.0625
1/8	3.18mm	0.125
1/4	6.35mm	0.250
5/16	7.94mm	0.313
3/8	9.53mm	0.375
n/a	10mm(1cm)	0.394
7/16	1.11cm	0.438
1/2	1.27cm	0.500
9/16	1.43cm	0.563
5/8	1.59cm	0.625
11/16	1.75cm	0.688
3/4	1.91cm	0.750
13/16	2.06cm	0.813
7/8	2.22cm	0.875
15/16	2.38cm	0.938
1	2.54cm	1.00
2	5.08cm	2.00
n/a	10.0cm	3.94
5	12.7cm	5.00
n/a	50.0cm	19.7
n/a	100cm(1m)	39.4

## Pressure Conversion

psi	bar	Pa (N/m <sup>2</sup> )	Torr	atm
1.45E-04	1.00E-05	1.0	0.00750	9.87E-06
0.0145	0.001	100	0.750	9.87E-04
0.0193	0.00133	133	1.0	0.00132
1.0	0.0689	6894	51.72	0.0680
10.0	0.689	68940	517	0.680
14.7	1.013	101,325	760	1.0
25.0	1.724	172,350	1293	1.701
50.0	3.447	344,700	2586	3.402
100	6.894	689,400	5172	6.805

### Wear Metals Set for XRF (Part No: WRMTLSET-17X50G)

	Ag	Al	Ba	Ca	Cd	Cr	Cu	Fe	K	Mg	Mn	Mo	Na	Ni	P	Pb	Sb	Si	Sn	Ti	V	Zn
Standard 1	0	0	0	5000	0	0	300	20	0	50	0	0	40	10	0	200	100	400	50	500	30	500
Standard 2	0	300	0	500	30	500	0	0	0	10	0	0	100	40	1000	10	0	50	20	400	0	700
Standard 3	0	0	300	3000	0	0	40	500	0	0	10	0	0	100	0	20	400	300	30	200	50	10
Standard 4	0	500	30	50	0	0	0	400	50	500	50	30	0	20	700	40	200	0	300	0	100	100
Standard 5	10	100	500	0	200	0	20	0	0	30	0	0	0	300	10	30	50	500	0	40	0	300
Standard 6	20	10	1500	1000	0	50	0	200	40	0	300	50	30	500	100	0	0	100	400	0	0	1250
Standard 7	200	0	1000	10	50	300	10	0	30	1250	100	0	400	0	1500	500	0	0	0	20	40	50
Standard 8	300	20	50	100	100	400	400	30	10	2000	500	40	0	0	0	50	40	20	0	0	200	0
Standard 9	50	0	1250	2000	300	20	0	100	0	1500	400	10	200	0	50	300	30	40	0	0	500	0
Standard 10	100	50	0	700	20	200	500	0	300	100	0	400	0	30	2000	0	10	0	10	50	0	0
Standard 11	30	0	2000	30	10	100	0	300	500	0	40	200	0	0	300	0	20	0	100	10	0	1000
Standard 12	40	200	10	300	40	0	0	0	200	700	20	500	10	400	1250	100	300	0	200	30	400	2000
Standard 13	400	30	700	0	400	40	200	10	100	3000	30	300	500	50	0	0	0	0	0	0	20	1500
Standard 14	500	0	0	1500	0	30	50	40	0	300	0	100	20	0	0	400	500	200	0	300	10	30
Standard 15	0	400	100	4000	500	10	100	50	20	0	0	0	300	200	500	0	0	30	40	0	0	0
Standard 16	0	40	0	0	0	0	30	0	400	1000	200	20	50	0	30	0	0	10	500	100	300	0
Standard 17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Standards not available for individual sale. See set information on Page 22.

# CUSTOM METALLO-ORGANIC STANDARD

## WORK SHEET AND QUOTE REQUEST

Please Fill Out One Element Table (Below)  
Per Standard Requested



METAL	UNITS	CONC.	METAL	UNITS	CONC.	METAL	UNITS	CONC.
Aluminum Al	µg/g		Copper Cu	µg/g		Rhodium Rh	µg/g	
Antimony Sb	µg/g		Iodine I	µg/g		Selenium Se	µg/g	
Arsenic As	µg/g		Iron Fe	µg/g		Silicon Si	µg/g	
Barium Ba	µg/g		Lanthanum La	µg/g		Silver Ag	µg/g	
Beryllium Be	µg/g		Lead Pb	µg/g		Sodium Na	µg/g	
Bismuth Bi	µg/g		Lithium Li	µg/g		Strontium Sr	µg/g	
Boron B	µg/g		Magnesium Mg	µg/g		Sulfur S	µg/g	
Bromine Br	µg/g		Manganese Mn	µg/g		Thallium Tl	µg/g	
Cadmium Cd	µg/g		Mercury Hg	µg/g		Tin Sn	µg/g	
Calcium Ca	µg/g		Molybdenum Mo	µg/g		Titanium Ti	µg/g	
Cerium Ce	µg/g		Nickel Ni	µg/g		Vanadium V	µg/g	
Chlorine Cl	µg/g		Phosphorus P	µg/g		Yttrium Y	µg/g	
Chromium Cr	µg/g		Potassium K	µg/g		Zinc Zn	µg/g	
Cobalt Co	µg/g		Platinum Pt	µg/g		Zirconium Zr	µg/g	

Instrument used for analysis (please circle one):

XRF

ICP

RDE

Other: \_\_\_\_\_

2-oz. Minimum. Units: w/w (µg/g) is assumed. YOU MUST SPECIFY IF OTHERWISE.

Typical solvent matrices include **light hydrocarbon (mineral) oil, heavy hydrocarbon oil, xylene, kerosene.** Call us to inquire about other solvents or elements not shown in above table. **Some may not be available and/or will have special solvent requirements.**

Solvent: \_\_\_\_\_ Volume (oz.): \_\_\_\_\_ Specify # bottles or special packaging reqs. \_\_\_\_\_

We will strive to quote within 24 hours (M-F).  
Please state anticipated product delivery requirements or if RUSH is needed.

Name: \_\_\_\_\_

End User? Yes  No

Company: \_\_\_\_\_

Name End User: \_\_\_\_\_

Address: \_\_\_\_\_

Date \_\_\_\_\_

Address: \_\_\_\_\_

Email: \_\_\_\_\_

Phone Number: \_\_\_\_\_

Fax Number: \_\_\_\_\_

Fax number: (603) 622-5180

[custsvc@vhglabs.com](mailto:custsvc@vhglabs.com)

Email, or phone us to discuss:

(603) 622-7660 or (888) 622-7660

Return This Form To VHG Labs

# CUSTOM AQUEOUS STANDARD

## WORK SHEET AND QUOTE REQUEST

Please Fill Out One Element Table (Below)

Per Standard Requested



METAL	UNITS	CONC.	METAL	UNITS	CONC.	METAL	UNITS	CONC.
Aluminum Al	µg/mL		Lead Pb	µg/mL		Tellurium Te	µg/mL	
Antimony Sb	µg/mL		Lithium Li	µg/mL		Terbium Tb	µg/mL	
Arsenic As	µg/mL		Lutetium Lu	µg/mL		Thallium Tl	µg/mL	
Barium Ba	µg/mL		Magnesium Mg	µg/mL		Thorium Th	µg/mL	
Beryllium Be	µg/mL		Manganese Mn	µg/mL		Thulium Tm	µg/mL	
Bismuth Bi	µg/mL		Mercury Hg	µg/mL		Tin Sn	µg/mL	
Boron B	ug/mL		Molybdenum Mo	µg/mL		Titanium Ti	µg/mL	
Cadmium Cd	µg/mL		Neodymium Nd	µg/mL		Tungsten W	µg/mL	
Calcium Ca	µg/mL		Nickel Ni	µg/mL		Uranium U	µg/mL	
Cerium Ce	µg/mL		Niobium Nb	µg/mL		Vanadium V	µg/mL	
Cesium Cs	µg/mL		Osmium Os	µg/mL		Ytterbium Yb	µg/mL	
Chromium Cr	µg/mL		Palladium Pd	µg/mL		Yttrium Y	µg/mL	
Cobalt Co	µg/mL		Phosphorus P	µg/mL		Zinc Zn	µg/mL	
Copper Cu	µg/mL		Platinum Pt	µg/mL		Zirconium Zr	µg/mL	
Dysprosium Dy	µg/mL		Potassium K	µg/mL		<b>NON-METALS</b>		
Erbium Er	µg/mL		Praseodymium Pr	µg/mL		Bromine Br	µg/mL	
Europium Eu	µg/mL		Rhenium Re	µg/mL		Carbon C	µg/mL	
Gadolinium Gd	µg/mL		Rhodium Rh	µg/mL		Chlorine Cl	µg/mL	
Gallium Ga	µg/mL		Rubidium Rb	µg/mL		Iodine I	µg/mL	
Germanium Ge	µg/mL		Ruthenium Ru	µg/mL		Silicon Si	µg/mL	
Gold Au	µg/mL		Samarium Sm	µg/mL		Sulfur S	µg/mL	
Hafnium Hf	µg/mL		Scandium Sc	µg/mL		<b>ISOTOPICS &amp; SPECIATION</b>		
Holmium Ho	µg/mL		Selenium Se	µg/mL		Call us to discuss		
Indium In	µg/mL		Silver Ag	µg/mL				
Iridium Ir	µg/mL		Sodium Na	µg/mL				
Iron Fe	µg/mL		Strontium Sr	µg/mL				
Lanthanum La	µg/mL		Tantalum Ta	µg/mL				

Instrument used for analysis (please circle one):

ICP-AES

ICP-MS

AA

GFAA

Other: \_\_\_\_\_

100 mL minimum. Matrix: Water/dil. acid Units: w/v (mg/L) is assumed. YOU MUST SPECIFY IF OTHERWISE.

Specify preferred acid \_\_\_\_\_ Specify # bottles or special packaging reqs. \_\_\_\_\_

We will strive to quote within 24 hours (M-F). Please state anticipated product delivery requirements or if RUSH is needed.
--

Name: \_\_\_\_\_ End User? Yes  No

Company: \_\_\_\_\_ Name End User: \_\_\_\_\_

Address: \_\_\_\_\_ Date \_\_\_\_\_

Address: \_\_\_\_\_ Email: \_\_\_\_\_

Phone Number: \_\_\_\_\_ Fax Number: \_\_\_\_\_

Fax number: (603) 622-5180, email  
or phone us to discuss:  
(603) 622-7660 or (888) 622-7660

[custsvc@vhglabs.com](mailto:custsvc@vhglabs.com)

Return This Form To VHGLabs

# CUSTOM ION CHROMATOGRAPHY STANDARD

## WORK SHEET AND QUOTE REQUEST



Let us prepare your ION CHROMATOGRAPHY stock standards to save you time and money, while removing a common source of day-to-day error. Our experienced team of chemists can promptly prepare and deliver reliable stock standards fully QC-checked in VHG's analytical testing laboratory.

- ❖ Custom standards are made from high purity raw materials and prepared with 18 Mohm DI water and made to the same NIST traceable quality requirements as our general product offerings.
- ❖ Each Custom Standard is shipped with a Certificate of Analysis sheet.



**Please Fill Out One Element Table (Below) Per Standard Requested**

IC ANALYTE	UNITS	CONC.	IC ANALYTE	UNITS	CONC.
Acetate	mg/L		Oxalate	mg/L	
Bromate	mg/L		Perchlorate	mg/L	
Bromide	mg/L		Phosphate	mg/L	
Chlorate	mg/L		Sulfate	mg/L	
Chloride	mg/L				
Chlorite	mg/L		Ammonium	mg/L	
Chromate	mg/L		Barium	mg/L	
Dichromate	mg/L		Calcium	mg/L	
Fluoride	mg/L		Lithium	mg/L	
Formate	mg/L		Magnesium	mg/L	
Glycolate	mg/L		Potassium	mg/L	
Iodide	mg/L		Sodium	mg/L	
Nitrate	mg/L				
Nitrite	mg/L		Ammonia	mg/L	

### NOTES:

**100 mL Minimum. Matrix: Water Units: w/v (mg/L) is assumed. YOU MUST SPECIFY IF OTHERWISE.**

Specify # bottles or special packaging reqs. \_\_\_\_\_

We will strive to quote within 24 hours (M-F).  
Please state anticipated product delivery requirements or if RUSH is needed.

Name: \_\_\_\_\_

End User? Yes  No

Company: \_\_\_\_\_

Name End User: \_\_\_\_\_

Address: \_\_\_\_\_

Date: \_\_\_\_\_

Address: \_\_\_\_\_

Email: \_\_\_\_\_

Phone Number: \_\_\_\_\_

Fax Number: \_\_\_\_\_

Fax number: (603) 622-5180  
Email, or phone us to discuss:  
(603) 622-7660 or (888)622-7660

[custsvc@vhglabs.com](mailto:custsvc@vhglabs.com)

Return This Form To VHG Labs

## ALPHA PRODUCT INDEX

A+ Single Element Standards.....	34-37	Lead in Gasoline Standards.....	29
AA Ionization Buffers .....	43	Lead in Paint or Soil .....	82
AA Standards.....	42-43	Lubricating Oil Standards.....	23
AA Supplies .....	84, 96-99	Matrix Modifiers.....	43
Ammonia Standards for IC.....	45	Matrix Oils and Solvents .....	11-12, 25
AN (Acid Number) Reference Materials.....	15	Mercury Standards .....	13, 20, 35, 40, 42, 53, 55-56, 58, 62, 64, 69
Anion Standards for IC.....	44, 46	Metal Additive Standards .....	11
Aqueous Standards .....	34-71	Metallo-Organic Stds. & Concentrates .....	10-11, 13-14, 20-23, 29, 32
ASTM Petrochemical Test Standards .....	15-17, 22-32	MBAS (Methylene Blue Active Substance) .....	47
Atomic Absorption Standards .....	42-43	Mixing Tees .....	87
Autosampler Cups & Tubes.....	84	Multi-Ion Standards for Ion Chromatography.....	46
Binder & Briquetting Materials, Grinding Additives.....	77	Multi-Element Aqueous Standards .....	43, 46, 48-71
Biodiesel Standards .....	32	Multi-Element Metallo-Organic Standards .....	10-11, 14, 22-23, 28, 32
Bismuth Internal Standards.....	29	Multi-Element Wear Metal Standards.....	10, 14, 22
Blanks .....	11-12, 25, 62, 68	Multi-Element Standards for USEPA .....	60-64, 68-71
BN (Base Number) Reference Materials .....	15	Nebulizers for ICP and ICP-MS .....	88-93
BOD (Biochemical Oxygen Demand).....	47, 49	Nitrogen Standards .....	28, 47, 77
Cation Standards for IC .....	45-46	Peri-Pump Tubing Flaring Tool .....	86
Chlorine Standards .....	28, 48-49	Peristaltic Pump Tubing.....	85-86
Cloud Point Standards .....	31	Petroleum Standards .....	10-32
CLP Standards .....	62-64, 68, 70-71	Physical Test Standards (Petroleum) .....	30-31
Conductivity Standards .....	47-49	Polysulfide Oil Standards .....	26
Cones for ICP-MS.....	94-95	Pour Point Standards .....	31
Consumables for AA and GFAA.....	84, 96-99	PTP (Performance Testing Program).....	18-19
Consumables for Gas Analysis.....	104	QC Check Standards.....	26, 48-53, 55, 58, 61
Consumables for ICP-AES and ICP-MS.....	84-95	Quartzware for ICP and ICP-MS .....	88-93
Consumables for XRF.....	100-103	Reference Information .....	38-39, 57, 105-106
Conversion Tables for Reference .....	105	Releasing Agents .....	43
Coolant Standards .....	16	RoHS Standards for XRF.....	74-76
Crackle Test Reference Standards.....	17	Second Source Standards for ICP & ICP-MS.....	52, 58-59, 62, 69
Crucibles, Graphite for Gas Analyzers.....	104	Single-Element Aqueous Standards.....	34-37, 42-45
Cups and Caps for XRF.....	100-101	Single-Element Metallo-Organic Standards.....	13, 20-21, 24-29
Custom Aqueous Standard Request Form .....	108	Silica Test Standard .....	44, 47
Custom Ion Chromatography Standard Request Form.....	109	Soil and Sludge Reference Materials.....	80-82
Custom Metallo-Organic Standard Request Form .....	107	Solids and Powders for XRF Analysis.....	74-79
Cyanide Standards .....	47-49	Solvents and Matrix Oils .....	11-12, 25
Distillation Standards .....	17	Soot Content Standards.....	16
Drinking Water Standards.....	48, 55	Speciation Standards .....	40
Eluent Concentrates for IC.....	46	Spiking Solutions .....	52-53, 64, 70
Environmental Standards .....	47-49, 52-64, 68-71	Spray Chambers for ICP and ICP-MS .....	90-93
EPA Methods Standards .....	60-64, 68-71	Stabilizer for Metallo-Organic Standards.....	12, 21
Flaring Tool for Peri-Pump Tubing .....	86	Stock Multi-Element Aqueous Standards .....	50-51, 65-67
Flash Point Standards .....	30	Stock Multi-Element Environmental Standards .....	52-64, 68-71
Fluoride .....	44, 46, 48-49	Sulfur, Low-Level Analysis Standards .....	27-28
Flux .....	78-79	Sulfur and Metals in Oil Standards for XRF .....	22-23
Freezing Point Standards .....	31	Sulfur Compounds by Selective Detection .....	27
Fuel Dilution Standards.....	16	Sulfur in Petroleum Product Standards.....	24-28
GFAA Consumables .....	84, 96-99	Sulfur-Free, Metallo-Organic Standards.....	20-21
Glassware for ICP, ICP-MS .....	88-93	Synthetic Distillation Standards.....	17
Graphite Tubes for GFAA .....	96-97	TCLP Standard.....	53
Graphite Crucibles .....	104	Thin Film for XRF Sample Cups .....	102
Halogen Standards .....	28, 44	TOC (Total Organic Carbon) Standard.....	47
Hollow Cathode Lamps.....	98-99	Torches for ICP and ICP-MS.....	90-93
Hydride & Hg Cold Vapor Supplies .....	97	Tubing for Peristaltic Pumps.....	85-86
ICP, ICP-MS Stds ...	10-11, 13, 26, 28, 32, 34-37, 40-41, 50-71, 80-82	Tuning, Optimization Standards.....	60, 65-66, 68, 70
ICP, ICP-MS Torches and Supplies .....	90-93	USEPA Method 200.7 Standards.....	60-61
ICP-MS Cones .....	94-95	USEPA Method 200.8 Standards.....	59, 68-70
ICP-MS Cone and Lens Maintenance Kit .....	95	USEPA Method Standards 6010 & CLP .....	60-64
Interference Check Samples for ICP-AES .....	53, 61, 63	USEPA Method Standards 6020 & CLP .....	58, 70-71
Interference Check Samples for ICP-MS .....	53, 71	USEPA Method Standards Cross Reference Chart .....	57
Internal Standards for ICP-MS Analysis .....	66-68, 70	V21, V21+K, V23 .....	10
Internal Standards for Wear Metal Analysis.....	10	V-Solv™ .....	12
Internal Standards for XRF Analysis.....	29	Viscosity Standards.....	30
International Environmental Standards .....	56	Water Pollution Standards .....	49, 54-55
Ion Chromatography Standards.....	44-46	Water Supply Standards .....	48, 55
Ionization Buffers .....	43	Waters, Standard Tests.....	47-49, 53-55, 64, 70
Isotopic Standards .....	41	Wear Metal Standards .....	10-11, 14, 22
Kjeldahl Standard.....	47, 49	Wet Chemistry Standards .....	47
Karl Fischer Titration Certified Reference Standards .....	17	XRF Standards .....	20-26, 28-29, 74-77
		XRF Supplies.....	100-103



## ALPHA INDEX BY PRODUCT NUMBER

44CS.....	60	GSP.....	92	OCO.....	10, 13
44QCS.....	61	GTJA.....	93	OIL.....	11, 25
4ICSAB.....	63	GVA.....	93	OSF.....	20
52SS.....	70	GVARQC.....	97	OY.....	10, 13
A_ (atomic abs. singles).....	42	GVG.....	92	P_ (pour pt).....	31
AM.....	89	HCL.....	62, 68	P_ (single aq).....	34-37
AN.....	15	HG20.....	53, 64	P7.....	99
AR.....	90, 92-93	HNO3.....	62, 68	PBF.....	82
B_ (biodiesel).....	32	I_ (anions, cations).....	44-46	PBISO.....	29
B1K.....	47	ICB.....	62, 68	PBP.....	82
BAX.....	77	ICL.....	44, 62	PBX.....	77
BIIS.....	29	ICM.....	46	PCR6W.....	40
BLKSOIL.....	82	ICSA.....	63	PLS.....	60
BN.....	15	ICV.....	62	PMM.....	89
BOD.....	47	IELUENT.....	46	PMX.....	77
C_ (cloud pt).....	31	IHYD.....	47	PTFE.....	77
CAP.....	101	INH3.....	45	PTP.....	19
CBX.....	77	INT.....	61	QC.....	48-49, 52, 58
CCV.....	63	IPC.....	61	QW.....	48-49, 55
CFP.....	31	ISHG.....	58, 62	RMS.....	56
CHP.....	90, 94	ISIO2.....	44, 47	ROHS.....	74-76
CLOIL.....	28	ISO.....	25	ROSF.....	21
COD.....	47	ISQC.....	52, 58	S20MIN.....	24
COND.....	47	JMSA.....	46	SB100.....	32
CN.....	47	KERO.....	11, 25	SCRD.....	25
CPG.....	103	KF.....	17	SDSL.....	24
CPP.....	103	L_ (single aq).....	34-37	SF-STAB.....	21
CRDL.....	64	L_ (lamp).....	98-99	SGL.....	76
CRQL.....	64, 70	L2008.....	59, 69	SISO.....	25
CRUDE.....	25	L53SSA.....	68	SKERO.....	24
CSC.....	94	L54SSA.....	68	SL.....	81
CT(cones).....	95	LCAL.....	59, 69, 70	SM.....	50-52
CT (crackle test ref.).....	17	LCELL.....	67	SMIN.....	24
CT (cup tray).....	103	LDCAL.....	66	SMOIL.....	22
CUP.....	100-101	LDPA.....	66	SN.....	28
CVG.....	95	LHGN.....	35, 56, 58, 62, 69	SOOT.....	16
CVHG.....	95	LICS.....	71	SP_ (speciation).....	40
D180.....	85-87	LICV1.....	59, 69	SRC.....	27
D86.....	17	LICVMES.....	58	SRES.....	25
D Series (wear metals).....	14	LINT.....	71	SSD1.....	80
DS1.....	80	LIS (internal std.).....	66-67	SSEG.....	53
DSLFD.....	16	LIS_ (isotopic).....	41	STAB.....	12
F_ (freeze pt).....	31	LIS2008.....	68	SUVF.....	27
F7.....	104	LIS6020.....	70	T_ (single aq).....	34-37
FAASC.....	84	LMCS.....	53, 71	T2100.....	89
FATI.....	97	LMES.....	58, 70	TCLP.....	53
FGBC.....	96	LMSTNG.....	65	TMM.....	89
FHIT.....	96	LOD.....	66	TNG.....	60
FKP.....	102	LOIL.....	23	TOC.....	47
FMY.....	102	LPE.....	98	TOTKJN.....	47
FOL0.....	102	LSAU.....	67, 69	TQ.....	88, 90, 92
FP (flash pt.).....	30	LSS.....	68	TR.....	88, 90, 92-93
FPC.....	102	LTIMER.....	99	ULSDSL.....	25
FPE.....	96	LTS2008.....	68	UOP163.....	27
FPP.....	30, 102	LTS6020.....	70	V21.....	10
FPSC.....	84	LUBESET.....	23	V21+K.....	10
FPTFE.....	102	M_ (matrix modifiers).....	43	V23.....	10
FVAR.....	97	MA.....	11	V-FLUX.....	78-79
FVISC.....	84	MBAS.....	47	V-SOLV.....	11-12
GASFD.....	16	MCS.....	43, 60	VISC.....	30
GHP.....	90	MMC.....	40	VPTP.....	19
GISA.....	90	MNIS.....	29	W1.....	64
GLMN.....	90	MSX.....	27	W2.....	64
GLY.....	16	NC.....	28	WPS.....	54
GNB.....	88, 90-93	NP.....	77	WRMTLSET.....	22, 106
GPE.....	91	NWMMR.....	54	X3SPS.....	26
GPEQC.....	97	O_ (single wear metal).....	13	ZRIS.....	29
GSC.....	92				

SCOPE OF ACCREDITATION TO ISO GUIDE 34:2009

VHG LABS  
276 Abby Road  
Manchester, NH 03103  
Ms. Susan J. Evans Norris Phone: 603 622 7660  
E-mail: sue@vhglabs.com

REFERENCE MATERIAL PRODUCER

Valid to: May 31, 2011

Certificate Number: 2848.02

In recognition of the successful completion of the A2LA evaluation process, accreditation is granted to this Reference Material Producer for the production of certified reference materials of the following category:

Category	Concentration Ranges	Uncertainty	Method	Analytical Technique
<b>Certified Reference Materials</b>				
<b>A1.6 High Purity Metals – Spectrochemical Solutions</b>				
Single Element Standards	1 to 50,000 µg/mL	Relative < 0.5%	NIST High Performance ICP-OES	ICP-OES, ICP-MS
Multi Element Standards	1 to 50,000 µg/mL	+/-0.5% Relative	ICP-OES Aqueous QD, ICP-MS-Aqueous QD	ICP-OES, ICP-MS
<b>A3.4 Petroleum Products – Fuel and Lubricants</b>				
Acid Number	0.1 To 3.0 mg KOH/g	2 - 30% Relative	ASTM D974	Titrimetry
Chlorine (Cl)	1 to 50,000 µg/mL	+/-1% Relative	ICP-OES-Aqueous QD	ICP-OES
Lead (Pb)	0.001 to 5.0 g/gal	+/-1% Relative	ICP-OES-Aqueous QD	ICP-OES
Moisture (H <sub>2</sub> O)	0.1 to 1.0%	5% Relative	ASTM D6304	Karl Fischer, Titrimetry
Sulfur (S)	1 to 50,000 µg/g	+/-1% Relative	ASTM D4294	XRF
Single Element Standards	1 to 300,000 µg/g	1% Relative	ASTM D5185	ICP-OES
Multi Element Standards	1 to 50,000 µg/g	1% Relative	ASTM D5185	ICP-OES
<b>A6.2 Wear Metals in Oils</b>				
Single Element Standards	1 to 300,000 µg/g	1% Relative	ASTM D5185	ICP-OES
Multi-Element Standards in Petroleum Products	1 to 50,000 µg/g	+/-1% Relative	ASTM D5185	ICP-OES
C6.2 Viscosity	0-1000 cSt	0.32% Relative	ASTM D445	Viscometry



SCOPE OF ACCREDITATION TO ISO/IEC 17025:2005

ANALYTICAL SERVICES DIVISION, VHGLABS  
 276 Abby Road  
 Manchester, NH 03103  
 Ms. Susan J. Evans Norris Phone: 603 622 7660  
 E-mail: sue@vhglabs.com

CHEMICAL

Valid to: May 31, 2011

Certificate Number: 2848.01

In recognition of the successful completion of the A2LA evaluation process, accreditation is granted to this laboratory to perform the following tests on aqueous and organic reference materials, cosmetics, paints and other surface coatings, plastics and polymers, consumer and children's products, wood, petroleum (oil, lubricants), chemicals, and metals:

<u>Tests</u>	<u>Test Methods</u>
Spectroscopy	
ICP-OES Elemental Analysis	EN 71-3; Aqueous Quantitative & Semi-Quantitative Determinations; CPSC-CH-E1001-08; CPSC-CH-E1002-08, CPSC-CH-E1003-09 ASTM D5185 (Modified); ASTM F963; NIST High Performance ICP-OES
ICP-MS Elemental Analysis	EN 71-3; Aqueous Quantitative & Semi-Quantitative Determinations; CPSC-CH-E1001-08; CPSC-CH-E1002-08, CPSC-CH-1003-09; ASTM F963
Flame AA	EN 71-3; CPSC-CH-E1001-08; CPSC-CH-E1002-08, CPSC-CH-E1003-09; ASTM F963
XRF Elemental Analysis	ASTM D4294 (Modified); ASTM D7220
GC-MS	CPSC-CHC1001-09.2
Physical Property Viscosity	ASTM D445
Wet Chemistry Titration	ASTM D974, ASTM D6304



Page 1 of 1

# United Registrar Services, LLC.

*hereby certifies that*

**VHG Labs Inc.  
276 Abby Road  
Manchester, NH 03103**

*has established and applies a quality system for*

**Production, manufacturing, and  
distribution of spectrochemical  
solution standards and supplies**

An on-site audit was performed and documented.  
Proof has been furnished that the requirements according to

**ISO 9001: 2008**

are fulfilled.

Further clarification regarding the scope of this certificate and the applicability of *ISO 9001:2008* requirements may be obtained by contacting the United Registrar Services, LLC.

**Certificate Registration No. 10-1045**

The certificate is valid from

**May 21, 2010**

The certificate is valid until

**May 20, 2013**



TGA -ZM-04-06-00

Date of issue: May 26, 2010

*Michael Hopkins*

Quality Systems Division

[www.unitedregistrars.com](http://www.unitedregistrars.com)





Quality. Traceability. Dependability.  
Worldwide

AA

IC

ICP-MS

XRF

ICP

**VHG Labs** 276 Abby Road • Manchester, NH 03103  
603.622.7660 • 888.622.7660 • [www.vhglabs.com](http://www.vhglabs.com)



ISO 9001  
ISO Guide 34  
ISO/IEC 17025