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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



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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.

V21 Wear Metal Standards 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		V21+K Wear Metal Standards All of the elements included in V21 plus K		V23 Wear Metal Standards All of the elements included in V21 plus K and Sb	
Conc.* (µg/g)	Size (grams)	Product No.	Product No.	Product No.	Product No.
10	100	V21-10-100G	V21+K-10-100G	V23-10-100G	V23-10-200G
	200	V21-10-200G	V21+K-10-200G		
30	100	V21-30-100G	V21+K-30-100G	V23-30-100G	V23-30-200G
	200	V21-30-200G	V21+K-30-200G		
50	100	V21-50-100G	V21+K-50-100G	V23-50-100G	V23-50-200G
	200	V21-50-200G	V21+K-50-200G		
100	100	V21-100-100G	V21+K-100-100G	V23-100-100G	V23-100-200G
	200	V21-100-200G	V21+K-100-200G		
300	100	V21-300-100G	V21+K-300-100G	V23-300-100G	V23-300-200G
	200	V21-300-200G	V21+K-300-200G		
500	100	V21-500-100G	V21+K-500-100G	V23-500-100G	V23-500-200G
	200	V21-500-200G	V21+K-500-200G		
900	100	V21-900-100G	V21+K-900-100G	V23-900-100G	V23-900-200G
	200	V21-900-200G	V21+K-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



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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^a
 - 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



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

V-Solv^a ICP Solvent

V-Solv^a 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^a as a matrix blank and as a diluent for your calibration standards and samples for outstanding nebulization characteristics. V-Solv^a 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 ^a 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 VHГ'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	VHГ'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.	Product No.
Aluminum Al	OAL-1000-50G	OAL-5000-50G
Antimony Sb	OSB-1000-50G	OSB-5000-50G
Arsenic As	OAS-1000-50G	N/A
Barium Ba	OBA-1000-50G	OBA-5000-50G
Beryllium Be	OBE-1000-50G	N/A
Bismuth Bi	OBI-1000-50G	N/A
Boron B	OB-1000-50G	OB-5000-50G
Cadmium Cd	OCD-1000-50G	OCD-5000-50G
Calcium Ca	OCA-1000-50G	OCA-5000-50G
Chromium Cr	OCR-1000-50G	OCR-5000-50G
Cobalt Co	OCO-1000-50G	OCO-5000-50G
Copper Cu	OCU-1000-50G	OCU-5000-50G
Iron Fe	OFE-1000-50G	OFE-5000-50G
Lanthanum La	OLA-1000-50G	N/A
Lead Pb	OPB-1000-50G	OPB-5000-50G
Lithium Li	OLI-1000-50G	OLI-5000-50G
Magnesium Mg	OMG-1000-50G	OMG-5000-50G
Manganese Mn	OMN-1000-50G	OMN-5000-50G
Mercury Hg	OHG-1000-50G	N/A
Molybdenum Mo	OMO-1000-50G	OMO-5000-50G
Nickel Ni	ONI-1000-50G	ONI-5000-50G
Phosphorus P	OP-1000-50G	OP-5000-50G
Potassium K	OK-1000-50G	OK-5000-50G
Scandium Sc	OSC-1000-50G	N/A
Selenium Se	OSE-1000-50G	N/A
Silicon Si	OSI-1000-50G	OSI-5000-50G
Silver Ag	OAG-1000-50G	OAG-5000-50G
Sodium Na	ONA-1000-50G	ONA-5000-50G
Strontium Sr	OSR-1000-50G	N/A
Sulfur S	OS-1000-50G	OS-5000-50G
Thallium Tl	OTL-1000-50G	N/A
Tin Sn	OSN-1000-50G	OSN-5000-50G
Titanium Ti	OTI-1000-50G	OTI-5000-50G
Vanadium V	OV-1000-50G	OV-5000-50G
Yttrium Y	OY-1000-50G	OY-5000-50G
Zinc Zn	OZN-1000-50G	OZN-5000-50G
Zirconium Zr	OZR-1000-50G	OZR-5000-50G

* 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 VHГ's line of sulfur-free standards on Page 20.

Section 1 Petroleum Standards

ICP & RDE Standards

Wear Metals
Metal Additives

▶ V-Solv^a

▶ 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



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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	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	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	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.



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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^a
- 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



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 300¼ 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 129¼F to 368¼F (54¼C to 187¼C), 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 379¼ F to 700¼ F (193¼ C to 371¼ C) and was verified by consensus analysis. Volume: 500mL

Description	Product No.
Distillation Standard	D86-4-500

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.	VTPMO-25G
Sample for Viscosity Analysis	Viscosity Test Standard: 40°C and 100°C, 50mL.	VTPVISC-50
Sample for Particle Count Analysis (For ISO 11171 only)	Particle Count Standard: 4µm, 6µm, 8µm, 14µm, 21µm, 38µm, 50µm and 70µm ranges, 125mL.	VTPPC-125
Set: VTPMO-25G, VTPVISC-50, and VTPPC-125	Elemental Analysis Test Standard: 25 grams, Viscosity Test Standard: 50mL and Particle Count Standard, 125mL.	VTPSET1

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	PTPBISO-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

XRF

ICP

RDE



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

Many commercial metallo-organic standards have matrices of sulfur-containing compounds. Use VHGOs 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.

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



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.	Product No.
Aluminum Al	3%	ROSFAL3-25G	ROSFAL3-100G
Antimony Sb	2%	ROSFBS2-25G	ROSFBS2-100G
Barium Ba	7%	ROSFBA7-25G	ROSFBA7-100G
Bismuth Bi	28%	ROSFBI28-25G	ROSFBI28-100G
Boron B	3%	ROSF�3-25G	ROSF�3-100G
Cadmium Cd	10%	ROSFCD10-25G	ROSFCD10-100G
Calcium Ca	2%	ROSFCA2-25G	ROSFCA2-100G
Cerium Ce	12%	ROSFCE12-25G	ROSFCE12-100G
Chromium Cr	9%	ROSFCR9-25G	ROSFCR9-100G
Cobalt Co	8%	ROSFCO8-25G	ROSFCO8-100G
Copper Cu	3%	ROSFUC3-25G	ROSFUC3-100G
Iron Fe	6%	ROSFIE6-25G	ROSFIE6-100G
Lead Pb	10%	ROSFPB10-25G	ROSFPB10-100G
Lithium Li	2%	ROSFLL2-25G	ROSFLL2-100G
Magnesium Mg	2%	ROSFMG2-25G	ROSFMG2-100G
Manganese Mn	6%	ROSFMN6-25G	ROSFMN6-100G
Molybdenum Mo	15%	ROSFMO15-25G	ROSFMO15-100G
Nickel Ni	8%	ROSFNI8-25G	ROSFNI8-100G
Phosphorus P	11%	ROSFPP11-25G	ROSFPP11-100G
Potassium K	4%	ROSFK4-25G	ROSFK4-100G
Praseodymium Pr	3%	ROSFPR3-25G	ROSFPR3-100G
Silicon Si	18%	ROSFSL18-25G	ROSFSL18-100G
Silver Ag	1%	ROSFAG1-25G	ROSFAG1-100G
Sodium Na	3%	ROSFNA3-25G	ROSFNA3-100G
Strontium Sr	9%	ROSFSR9-25G	ROSFSR9-100G
Thallium Tl	3%	ROSFTL3-25G	ROSFTL3-100G
Tin Sn	18%	ROSFSL18-25G	ROSFSL18-100G
Titanium Ti	7%	ROSFTE7-25G	ROSFTE7-100G
Vanadium V	4%	ROSFV4-25G	ROSFV4-100G
Yttrium Y	2%	ROSFY2-25G	ROSFY2-100G
Zinc Zn	18%	ROSFZN18-25G	ROSFZN18-100G
Zirconium Zr	24%	ROSFZR24-25G	ROSFZR24-100G

Stabilizer for Sulfur-Free Standard Preparation

Solvent stabilizer can improve stability of mixes or dilutions of VHГ'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	VHГ'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

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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.

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and Metals

Sulfur-Free Metallo-
Organics
Metallo-Organic
Concentrates

► Sulfur & Metals for XRF

Sulfur

Nitrogen

Chlorine

Lead in Gas

Petroleum Physical Test
Standards

Biodiesel



ДАНС ФАРМА

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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 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® 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.

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

Matrix: See Below

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

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► 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.
QC Samples	
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
Drift Monitors	
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
Blank	
Polysulfide Oil Blank	X3SPS-BLK-1L
Calibration Sets	
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

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Metallo-Organic

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► Sulfur

Nitrogen

Chlorine

Lead in Gas

Petroleum Physical Test
Standards

Biodiesel



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

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 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)		
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



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	190-215 220-240	FP200-250 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



- ◆ 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, 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



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 VHG Labs 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

