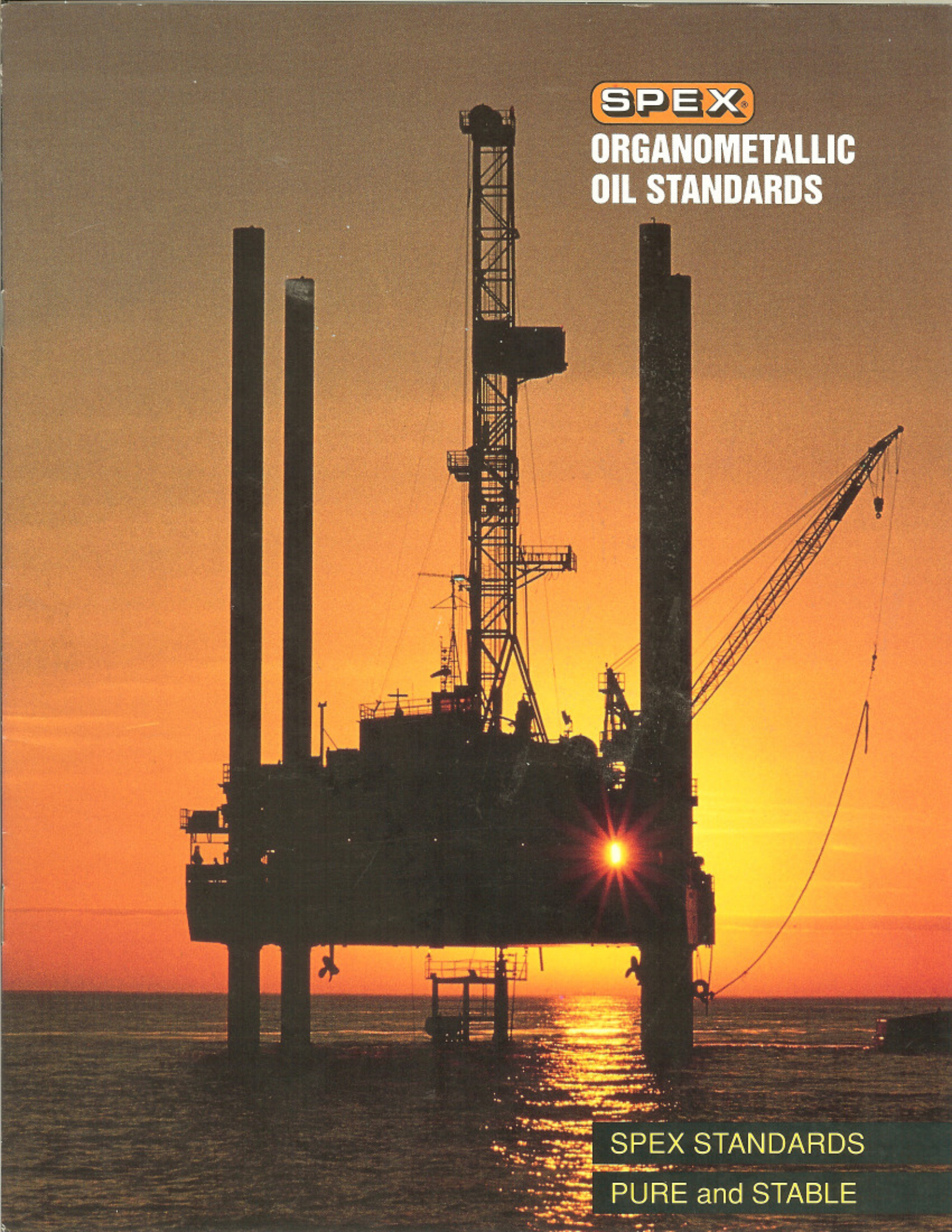

SPEX
ORGANOMETALLIC
OIL STANDARDS
SPEX STANDARDS
PURE and STABLE

QUALITY, RELIABILITY AND CONVENIENCE

For over 35 years, SPEX Industries, Inc. has been your source for specialty inorganic standards: liquid or solid, aqueous or organic base. No matter which type of instrument used ICP, DCP, AA, DC ARC, XRF . . . your results are only as accurate as the standard you are using. SPEX has the standard to meet your needs! We have made Spectroscopy our business and our reputation . . . with **Quality, Reliability,** and **Convenience.** We know you have come to expect nothing less from us.

SPEX Organometallic Standards in oil are used for a variety of different applications such as wear metal analysis, environmental monitoring, petrochemical testing, food processing and quality control of organic solvents.

The determination of wear metals in oils can be applied to many different types of engines such as those in automobiles, aircraft, heavy equipment, trucks, military vehicles . . . the examples are endless. By tracking specific metals suspended in the used oil, engineers and mechanics can determine the breakdown of specific engine parts. Specific elements present in the used oils have been found to be directly related to specific engine problems (see table). Engine failures as well as expensive repairs can be avoided if oils from the same engine are analyzed on a periodic trend basis for the different wear metals.

Quality
We provide our customers with QUALITY oil standards for ICP, DCP, AA, XRF, rotrode, DC ARC or atomic fluorescence. SPEX oil standards are clear, transparent solutions made directly from SPEX manufactured high-pure organometallic salts. The organometallic starting materials and base oils used are very critical. SPEX uses only the highest quality starting materials available, and we analyze and report trace metal impurities as well as the concentration of the major element for your assurance.

Reliability
All SPEX oil standards are triple-checked and accompanied by a Certificate of Analysis. On every certificate you'll receive a trace metal impurity analysis of the solid starting material and the base oil via DC ARC, a titrametric or gravimetric assay for the major element in the starting material, sulfur content, viscosity, ICP check of the final solution, and traceability information to United States National Institute of Standards and Technology SRM's (Standard Reference Materials) where available. No other manufacturer provides you with this type of RELIABLE certification for both single and multi-element oil standards.

Convenience
SPEX makes it CONVENIENT! Save time, money, man hours and headaches. Why prepare your own standards when you can obtain certified, high-pure, reliable oil standards from SPEX. We offer several different lines of quality oil standards to meet your particular needs. Products range from 1,000 and 5,000 ug/g (ppm) single-element to off-the-shelf multi-element standards to custom multi-element standards to oil concentrates. In addition, SPEX provides SPEX Base Oil 20, SPEX Base Oil 75, and STA-SOL, Stabilizer/Solubilizer.

Our order department and chemical sales staff are waiting to assist you. Let us put over 35 years of knowledge to work for your laboratory. If you have a standardization or purity problem, call us for advice, recommendations, and reliable SPEX products to solve that problem.

Engine Wear as Indicated by Specific Elements Found in Engine Oil

Element	Indicated Engine Wear
Aluminum (Al)	Pistons, bearings, spacers, shims and washers
Boron (B)	Coolant leaks using borate inhibitors or airborn dust
Chromium (Cr)	Rings, valves, or coolant leaks using chromate inhibitors
Copper (Cu)	Bearings and bushings, valve guides, injector shields, connecting rods and piston pins or coolant from copper radiators
Iron (Fe)	Engine shafts (camshaft or crankshaft), cylinder walls, engine block, rings, wrist pins and oil pump
Lead (Pb)	Lead additive in gear oil, seals, solder, paint, bearing metal and fuel blowby is suspected. In diesels, bearing wear
Magnesium (Mg)	Gear box housing and oil pump
Molybdenum (Mo)	Oil coolers and bearing alloys
Nickel (Ni)	Bearings, turbo blades, shafts and gears
Silicon (Si)	Dirt and/or dust in air cleaner system, casting sand in new engines, grinding compound
Silver (Ag)	Puddle pumps, piping with silver solder joints, bearing cages
Sodium (Na)	Coolant leak (antifreeze leakage) or oil additive
Tin (Sn)	Rod and piston coatings, bushing thrust metal and bearings
Titanium (Ti)	Turbine blades, compressor discs and bearing hub wear
Ba, B, Ca, Cr, Mo, P and Na often indicate coolant leakage as these elements are frequently used for coolants as rust or corrosion inhibitors.	

SINGLE-ELEMENT ORGANOMETALLIC OIL STANDARDS

- **Choice of 34 Elements**
- **1,000ug/g (ppm), Matrix-Base Oil 20**
- **5,000ug/g (ppm), Matrix-Base Oil 75**
- **Sold in 100g Quantities**
- **Certificate of Analysis with Every Solution**
- **Additional Elements upon Request**

SPEX Single-Element Organometallic Standards are specifically designed to meet the accuracy and purity requirements for all end user needs. The starting materials are high-pure organometallic salts manufactured by SPEX with purities ranging from 99.99% to 99.9999%. Preparing the standard from the solid salt results in elimination of unwanted starting materials, by-products and impurities. All SPEX oil standards are made with Base Oil 20, which is low in sulfur, or Base Oil 75, which has a higher sulfur content.

SPEX single-element oil standards are certified by our unique Triple-Checked Quality Assurance Program: (1) DC ARC for trace metal impurities in solid starting materials and Base Oils; (2) classical "wet" assay of the solid starting material; (3) ICP check for major element. All of these results are then reported directly on the corresponding Certificate of Analysis. Also listed are the viscosity and sulfur content. SPEX standards are certified against United States National Institute of Standards and Technology SRM's (where available). The actual found values are right on the certificate . . . your assurance of the highest quality standards available.

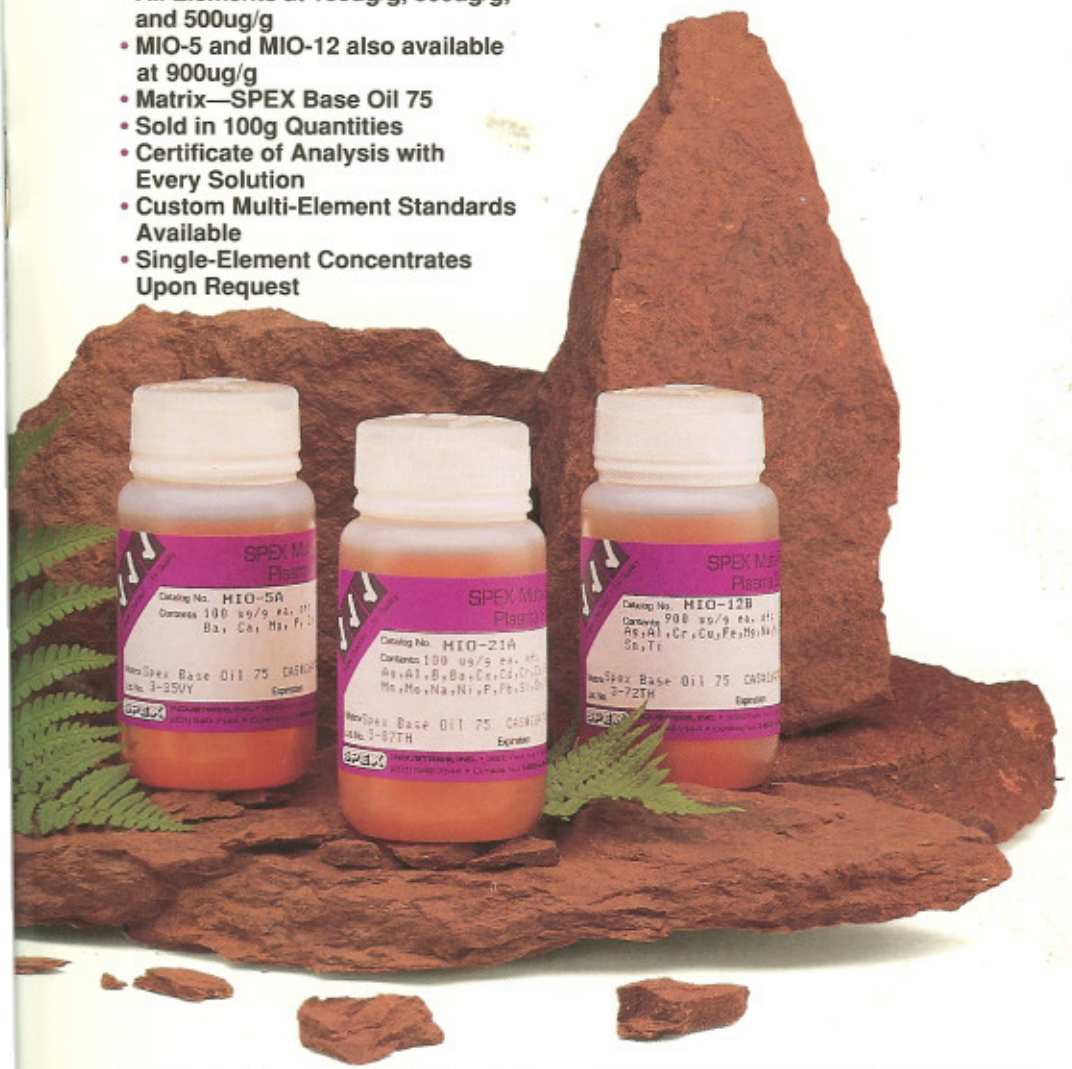
Single-element oil standards are available in concentrations of 1,000 and 5,000ug/g (ppm), in matrices of Base Oil 20 and Base Oil 75, respectively.

Element Cat. #	Matrix	Concentration (ug/g)
Aluminum		
SPAL8-2Y	Al in Base Oil 20	1,000ug/g
SPAL8-4Y	Al in Base Oil 75	5,000ug/g
Arsenic		
SPAS8-2Y	As in Base Oil 20	1,000ug/g
SPAS8-4Y	As in Base Oil 75	5,000ug/g
Barium		
SPBA8-2Y	Ba in Base Oil 20	1,000ug/g
SPBA8-4Y	Ba in Base Oil 75	5,000ug/g
Beryllium		
SPBE8-2Y	Be in Base Oil 20	1,000ug/g
SPBE8-4Y	Be in Base Oil 75	5,000ug/g
Bismuth		
SPBI8-2Y	Bi in Base Oil 20	1,000ug/g
SPBI8-4Y	Bi in Base Oil 75	5,000ug/g
Boron		
SPB8-2Y	B in Base Oil 20	1,000ug/g
SPB8-4Y	B in Base Oil 75	5,000ug/g
Cadmium		
SPCD8-2Y	Cd in Base Oil 20	1,000ug/g
SPCD8-4Y	Cd in Base Oil 75	5,000ug/g
Calcium		
SPCA8-2Y	Ca in Base Oil 20	1,000ug/g
SPCA8-4Y	Ca in Base Oil 75	5,000ug/g
Chromium		
SPCR8-2Y	Cr in Base Oil 20	1,000ug/g
SPCR8-4Y	Cr in Base Oil 75	5,000ug/g
Cobalt		
SPCO8-2Y	Co in Base Oil 20	1,000ug/g
SPCO8-4Y	Co in Base Oil 75	5,000ug/g
Copper		
SPCU8-2Y	Cu in Base Oil 20	1,000ug/g
SPCU8-4Y	Cu in Base Oil 75	5,000ug/g
Iron		
SPFE8-2Y	Fe in Base Oil 20	1,000ug/g
SPFE8-4Y	Fe in Base Oil 75	5,000ug/g
Lanthanum		
SPLA8-2Y	La in Base Oil 20	1,000ug/g
Lead		
SPPB8-2Y	Pb in Base Oil 20	1,000ug/g
SPPB8-4Y	Pb in Base Oil 75	5,000ug/g
Lithium		
SPLI8-2Y	Li in Base Oil 20	1,000ug/g
SPLI8-4Y	Li in Base Oil 75	5,000ug/g
Magnesium		
SPMG8-2Y	Mg in Base Oil 20	1,000ug/g
SPMG8-4Y	Mg in Base Oil 75	5,000ug/g
Manganese		
SPMN8-2Y	Mn in Base Oil 20	1,000ug/g
SPMN8-4Y	Mn in Base Oil 75	5,000ug/g

Element Cat. #	Matrix	Concentration (ug/g)
Mercury		
SPHG8-2Y	Hg in Base Oil 20	1,000ug/g
Molybdenum		
SPMO8-2Y	Mo in Base Oil 20	1,000ug/g
SPMO8-4Y	Mo in Base Oil 75	5,000ug/g
Nickel		
SPNI8-2Y	Ni in Base Oil 20	1,000ug/g
SPNI8-4Y	Ni in Base Oil 75	5,000ug/g
Phosphorus		
SPP8-2Y	P in Base Oil 20	1,000ug/g
SPP8-4Y	P in Base Oil 75	5,000ug/g
Potassium		
SPK8-2Y	K in Base Oil 20	1,000ug/g
SPK8-4Y	K in Base Oil 75	5,000ug/g
Scandium		
SPSC8-2Y	Sc in Base Oil 20	1,000ug/g
Selenium		
SPSE8-2Y	Se in Base Oil 20	1,000ug/g
Silicon		
SPSI8-2Y	Si in Base Oil 20	1,000ug/g
SPSI8-4Y	Si in Base Oil 75	5,000ug/g
Silver		
SPAG8-2Y	Ag in Base Oil 20	1,000ug/g
SPAG8-4Y	Ag in Base Oil 75	5,000ug/g
Sodium		
SPNA8-2Y	Na in Base Oil 20	1,000ug/g
SPNA8-4Y	Na in Base Oil 75	5,000ug/g
Strontium		
SPSR8-2Y	Sr in Base Oil 20	1,000ug/g
Sulfur		
SPS8-1AY	S in Base Oil 20	500ug/g
SPS8-2Y	S in Base Oil 20	1,000ug/g
SPS8-4Y	S in Base Oil 20	5,000ug/g
Tin		
SPSN8-2Y	Sn in Base Oil 20	1,000ug/g
SPSN8-4Y	Sn in Base Oil 75	5,000ug/g
Titanium		
SPTI8-2Y	Ti in Base Oil 20	1,000ug/g
SPTI8-4Y	Ti in Base Oil 75	5,000ug/g
Vanadium		
SPV8-2Y	V in Base Oil 20	1,000ug/g
SPV8-4Y	V in Base Oil 75	5,000ug/g
Yttrium		
SPY8-2Y	Y in Base Oil 20	1,000ug/g
SPY8-4Y	Y in Base Oil 75	5,000ug/g
Zinc		
SPZN8-2Y	Zn in Base Oil 20	1,000ug/g
SPZN8-4Y	Zn in Base Oil 75	5,000ug/g

STOCK MULTI-ELEMENT ORGANOMETALLIC OIL STANDARDS

- **21, 12, 5, Element Combinations**
- **All Elements at 100ug/g, 300ug/g, and 500ug/g**
- **MIO-5 and MIO-12 also available at 900ug/g**
- **Matrix—SPEX Base Oil 75**
- **Sold in 100g Quantities**
- **Certificate of Analysis with Every Solution**
- **Custom Multi-Element Standards Available**
- **Single-Element Concentrates Upon Request**



SPEX Industries provides off-the-shelf, mixed multi-element oil standards formulated with combinations of elements and concentrations for the most common applications. The stock organometallic multi-element standards are designed with each element at 100, 300, 500 or 900ug/g (ppm) concentrations. All are prepared in Base Oil 75. Off-the-shelf multi-element standards decrease the time spent preparing multies from single-element standards and at the same time eliminate dilution and mixing errors.

As with all SPEX organometallic oil standards, every multi-element standard is prepared under the unique SPEX Triple-Checked Quality Assurance Program. This program guarantees the purity and concentration of your standard. Only SPEX organometallic standards are checked three ways: (1) DC ARC trace metal analysis of starting materials and Base Oil; (2) Classical "wet" assay of solid starting material; (3) Final ICP check for major element.

Every SPEX multi-element organometallic standard comes with a Certificate of Analysis that provides the end user with the actual found values as well as the labeled values. All standards are certified against United States Institute of Standards and Technology SRM's (where available). SRM's are listed directly on the Certificate of Analysis.

Multi-Standard 5A
MIO-5A.....100g
Matrix: SPEX Base Oil 75
100ug/g each: Ba, Ca, Mg, P, Zn

Multi-Standard 5B
MIO-5B.....100g
Matrix: SPEX Base Oil 75
900ug/g each: Ba, Ca, Mg, P, Zn

Multi-Standard 5C
MIO-5C.....100g
Matrix: SPEX Base Oil 75
500ug/g each: Ba, Ca, Mg, P, Zn

Multi-Standard 5D
MIO-5D.....100g
Matrix: SPEX Base Oil 75
300ug/g each: Ba, Ca, Mg, P, Zn

Multi-Standard 12A
MIO-12A.....100g
Matrix: SPEX Base Oil 75
100ug/g each: Al, Cr, Cu, Fe, Pb, Mg, Ni, Si, Ag, Na, Sn, Ti

Multi-Standard 12B
MIO-12B.....100g
Matrix: SPEX Base Oil 75
900ug/g each: Al, Cr, Cu, Fe, Pb, Mg, Ni, Si, Ag, Na, Sn, Ti

Multi-Standard 12C
MIO-12C.....100g
Matrix: SPEX Base Oil 75
500ug/g each: Al, Cr, Cu, Fe, Pb, Mg, Ni, Si, Ag, Na, Sn, Ti

Multi-Standard 12D
MIO-12D.....100g
Matrix: SPEX Base Oil 75
300ug/g each: Al, Cr, Cu, Fe, Pb, Mg, Ni, Si, Ag, Na, Sn, Ti

Multi-Standard 21A
MIO-21A.....100g
Matrix: SPEX Base Oil 75
100ug/g each: Al, Ba, B, Cd, Ca, Cr, Cu, Fe, Pb, Mg, Mn, Mo, Ni, P, Si, Ag, Na, Sn, Ti, V, Zn

Multi-Standard 21C
MIO-21C.....100g
Matrix: SPEX Base Oil 75
500ug/g each: Al, Ba, B, Cd, Ca, Cr, Cu, Fe, Pb, Mg, Mn, Mo, Ni, P, Si, Ag, Na, Sn, Ti, V, Zn

Multi-Standard 21D
MIO-21D.....100g
Matrix: SPEX Base Oil 75
300ug/g each: Al, Ba, B, Cd, Ca, Cr, Cu, Fe, Pb, Mg, Mn, Mo, Ni, P, Si, Ag, Na, Sn, Ti, V, Zn

SPEX BASE OILS AND STA-SOL

SPEX Base Oils

SPEX Base Oil 20 and 75 are the same certified base oils that are used in our single and multi-element blends. The Certificate of Analysis included with each bottle reports the inorganic impurities found by DC ARC, actual lot assay of sulfur content, and viscosity. SPEX Base Oil 20 is low in sulfur, while SPEX Base Oil 75 is higher in sulfur content.

BASE20	SPEX Base Oil 20.....500ml
BASE 20-G	SPEX Base Oil 20.....3.78 l
BASE75	SPEX Base Oil 75.....500ml
BASE75-G	SPEX Base Oil 75.....3.78 l

STA-SOL Stabilizer/Solubilizer

This unique blend of organic solubilizing agents and metal-ion stabilizers is a universal stabilizer/solubilizer which enables preparation of stable organometallic standards in your own laboratory.

1079-10	STA-SOL.....10ml
1079-50	STA-SOL.....50ml
1079-100	STA-SOL.....100ml
1079-500	STA-SOL.....500ml

SPEX HAS THE "TOOLS OF THE TRADE" FOR INORGANIC SPECTROSCOPY

SPEX Certified Aqueous Standards and Compounds

Whatever your Spectroscopy needs are, SPEX has the standards for you! In addition to our oil standards, SPEX supplies certified, high-purity inorganic plasma-grade standards in aqueous matrices. These standards are assayed for their metal content by wet chemical analysis. Semi-micro analytical balances and Class A volumetric labware are used exclusively. Our ASTM Type I, filtered water minimizes cations, anions, and colloids; resistivity is maintained in the 18 megohm range. SPEX uses only the highest purity acids available, and all plastic bottles are subjected to a leaching /cleaning process.

As with all SPEX Organometallic Oil standards, every plasma-grade standard is prepared under the unique SPEX Triple-Checked Quality Assurance Program.

- DC ARC trace metal analysis of starting materials
- Classical "wet" assay for major element
- ICP check of the final solution

All of these results are then reported directly on the corresponding Certificate of Analysis.

SPEX also offers high-purity inorganic compounds, mixes and kits. These materials have found applications ranging from analytical standards to electrolytes to semiconductors to vacuum coatings.

- Single and Multi-element plasma-grade standards for AA, ICP, and DCP analysis
- Custom Standards
- Standards for EPA Wastewater and Drinking Water Analysis
- Standards for the Contract Laboratory Program, CLP
- TCLP Standards
- ICP-MS Standards
- Calibration Standards
- Matrix Modifiers
- Standards for Ion Chromatography
- High-Purity Compounds, SPEX-Mixes, Element Kits and Pellements

Inorganic Quality Control Samples

SPEX Industries, Inc. has entered into a Cooperative Research and Development Agreement (CRADA) with the United States Environmental Protection Agency (US EPA) for the development, production, certification and distribution of Inorganic Quality Control (QC) Samples.

Previously, US EPA QC Samples and calibration standards were available only through the US EPA to labs throughout the world. Recently, the US EPA in conjunction with private industry has created five CRADA agreements to supply these samples. SPEX Industries has been chosen to supply the Inorganic QC samples. QC samples are used as a means to check the individual analyst's accuracy and precision related to various EPA methods for the analysis of wastewater, drinking water and groundwater.

Samples are certified for:

- ACCURACY
- HOMOGENEITY
- STABILITY

All QC samples manufactured by SPEX are certified by both SPEX and the US EPA prior to distribution. This dual certification assures you the highest degree of confidence when using QC samples to assess the performance of your laboratory.

- Trace Metal—AA
- Trace Metal—ICP
- Trace Metal— Water Supply
- Cyanide
- Demand
- Minerals
- Nutrients
- Oil & Grease
- Phenolics
- Residues
- Residual Chlorine
- Corrosivity/Sodium
- Nitrate/Fluoride
- Turbidity

ORDERING INFORMATION

Chemical orders may be phoned in from 8:00 a.m. - 5:30 p.m. EST, or faxed 24 hours a day. For technical information and custom orders, please call between 8:30 a.m. - 5:00 p.m. EST

Telephone: 1-908-549-7144

Toll Free: **1-800-LAB-SPEX**
(1-800-522-7739)

FAX: 1-908-603-9647

Address: SPEX Industries, Inc.
Chemical Sales Department
3880 Park Avenue
Edison, NJ 08820
USA

Precautions:
SPEX products are not for any cosmetic, drug or household application. Our acceptance of a purchase order is with the assumption that only qualified individuals, trained and familiar with procedures suitable to the products ordered, will handle them. On our clients must rest the entire burden of safe storage, handling, and application of all products ordered from this catalog.

Printed on recycled paper

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