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Applicationsnote

RESTEK
GC Columns

Applicationsnote

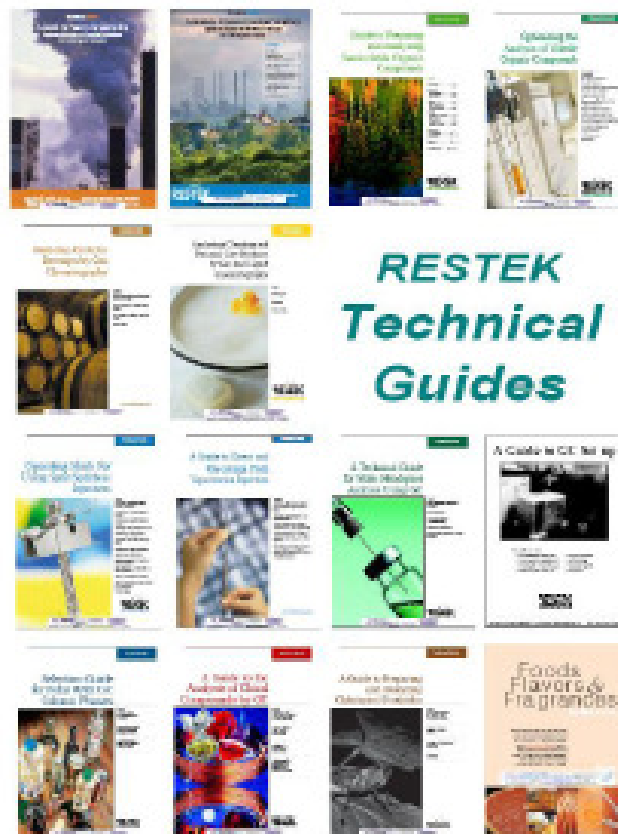
RESTEK
HPLC

Applicationsnote



Separation Science Application Note

GCxGC



**RESTEK
Technical
Guides**

CHROM Chromatography **ECH** Technology **net.au**
Website NEW : www.chromalytic.com.au E-mail : info@chromtech.net.au Tel: 03 9762 2034 . . . in AUSTRALIA

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What are Rtx®-1701/MXT®-1701 columns?

Rtx® and MXT®-1701 columns are fused silica and Silcosteel®-lined stainless steel (respectively) capillary GC columns coated with a 14% cyanopropylphenyl/86% dimethyl polysiloxane stationary phase. Rtx®/MXT®-1701 columns have an intermediate polarity.

Why use a 14% cyanopropylphenyl/86% dimethyl polysiloxane phase?

The cyano groups in Rtx®/MXT®-1701 columns impart a unique selectivity toward compounds that possess dipole moments and those that are proton donors or acceptors, such as alcohols and nitriles. Rtx®/MXT®-1701 columns are extremely versatile, exhibiting long column lifetime, low bleed, and thermal stability to 280°C.

Which applications work well using an Rtx®/MXT®-1701 column?

These columns are ideal for the analysis of nonpolar to polar compounds and acidic to basic species, all within a single analysis. They also are used for the analysis of alcohols, oxygenates, pesticides, and insecticides. The Rtx®/MXT®-1701 phase is equivalent to the G46 phase used in United States Pharmacopoeia (USP) Methods, and is frequently listed in US Environmental Protection Agency (EPA) Methods for pesticides and other pollutants.

Rtx®-1701/MXT®-1701 Capillary Columns

14% cyanopropylphenyl/86% dimethyl polysiloxane

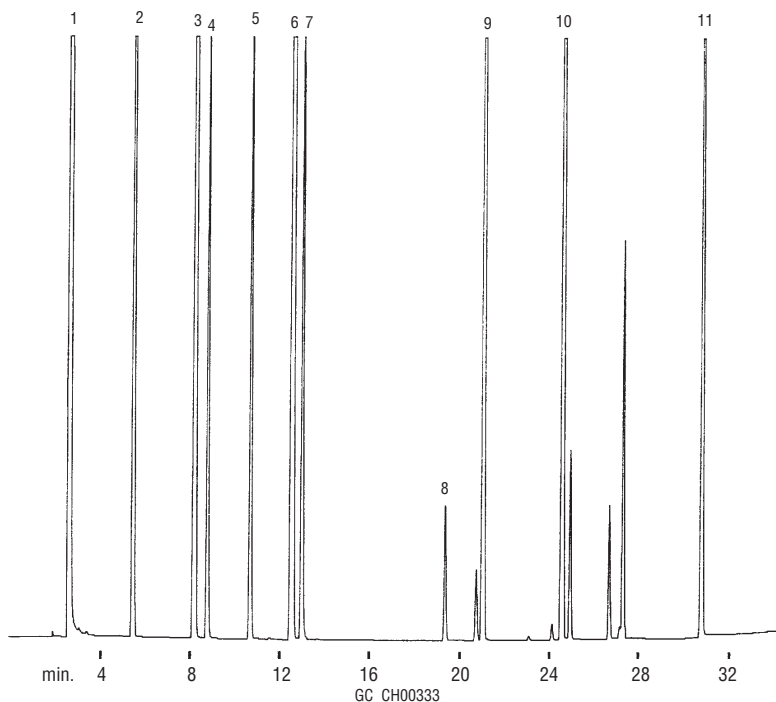
This highly versatile column can be used for a wide range of applications, such as pesticides, solvents, or drug compounds.

Substituted Pyridines on an Rtx®-1701 Column

- | | |
|-----------------|---------------------|
| 1. methanol | 7. β-picoline |
| 2. benzene | 8. 4-cyanopyridine |
| 3. toluene | 9. 3-cyanopyridine |
| 4. pyridine | 10. 2-cyanopyridine |
| 5. α-picoline | 11. picamide |
| 6. 2,6-lutidine | |

60m, 0.53mm ID, 3.0µm Rtx®-1701 (cat.# 12088)
0.1µL direct injection of a substituted pyridine standard
(0.5-5% per component), Uniliner® inlet liner

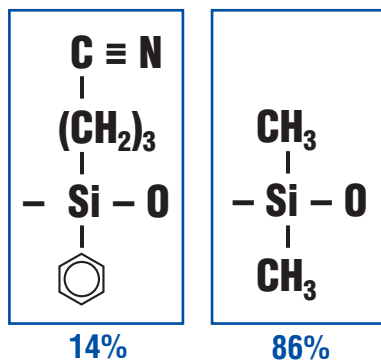
Oven temp.: 60°C to 225°C @ 5°C/min.
Inj. & det. temp.: 230°C
Carrier gas: hydrogen
Linear velocity: 40cm/sec. (flow rate: 5.1cc/min.)
FID sensitivity: 32 x 10⁻¹¹ AFS



See our chromatography products catalog or visit www.restekcorp.com for additional application chromatograms on Rtx®-1701/MXT®-1701 columns!

Features & Benefits

Feature	Benefit
Fused silica & MXT® tubing	Tubing material versatility—same price regardless of tubing.
Available in a variety of lengths, IDs and film thicknesses	Useful for a wide range of applications.
Low bleed	Increased detector sensitivity. Reduced system maintenance.
Integra-Guard™ columns	Protects column from non-volatile sample residue; longer column lifetime. Connectionless.

**FAST
FACTS**At-a-Glance
Product
Information
from Restek**Rtx[®]-1701/MXT[®]-1701****14% cyanopropylphenyl/
86% dimethyl polysiloxane****Similar Phases****J&W:**
DB[®]-1701**Supelco:**
SPB[™]-1701**Hewlett-Packard:**
HP-1701, HP-624**Alltech:**
AT[®]-1701**SGE:**
BP-10**Chrompack:**
CP-Sil[®] 19CB**Quadrex:**
007-1701**Ohio Valley:**
OV[®]-1701**PerkinElmer:**
Elite[®]-1701**USP Nomenclature:**
G46**Choosing the Best Phase for Your Sample**

When choosing a stationary phase for capillary GC separations, remember the saying “like dissolves like.” The stationary phase is a nonvolatile liquid coated on the inside of the column and acting as a solvent for the sample. The more soluble the solute (your analyte) is in the stationary phase, the more it is retained in the column.

Separations in GC are the result of the relative solubility and selective interactions of the sample solute and column stationary phase. Table I shows the four main forces responsible for solute-stationary phase interactions. The sum of all four serves as a measure of the **polarity** of the stationary phase. **Selectivity** is the ability of a phase to preferentially retain one compound over another based on specific solute-stationary phase interactions and is determined by the type and amount of substituted functional groups in the stationary phase.

Table I: Selective Solute-Stationary Phase Interactions

Dispersion forces arise from electric intermolecular fields, which result in the induction of in-phase dipoles. They are present in all stationary phases.

Orientation interactions occur between a stationary phase and a compound, both of which possess a permanent dipole.

Induction interactions occur between a stationary phase with a permanent dipole and a compound that forms a dipole as a result of the interaction with the stationary phase.

Hydrogen bonding occurs between a strong polar group (OH, NH) and a compound with strong electronegativity (F, O, N atoms). Hydrogen bonding is the strongest interaction force.

Retention indices (RI) are used to measure the overall stationary phase polarity. Retention indices on Rtx[®]/MXT[®]-1701 columns are listed in Table II. They are mathematical calculations used to indicate the elution point of a probe with respect to two straight-chain hydrocarbons. The probes used to measure RI are of different functionalities, each one designated to measure a specific solute-stationary phase interaction. As the RI for a probe on a given phase increases, the degree of specific interaction increases, relative to hydrocarbons.

**Table II: 14% Cyanopropylphenyl/86% Dimethyl Polysiloxane
Stationary Phase Retention Indices**

RI probe	RI	Measured interaction
benzene	721	Electron density for aromatic & olefinic hydrocarbons
<i>n</i> -butanol	778	Proton donor & acceptor capabilities (alcohols and nitriles)
2-pentanone	784	Proton acceptor interaction (ketones, ethers, esters, aldehydes)
nitropropane	881	Dipole interactions

Rtx[®]/MXT[®]-1701 columns are intermediate in polarity and are coated with a 14% cyanopropylphenyl/86% dimethyl polysiloxane stationary phase. The 14% cyano substitution imparts a dipole moment to this stationary phase. Solute-stationary phase interactions occurring in the Rtx[®]/MXT[®]-1701 column include a strong dispersion interaction, plus a selectivity toward aromatic compounds, proton donors or acceptors, and compounds possessing a dipole moment. Rtx[®]/MXT[®]-1701 columns can provide separations of alcohols, nitriles, and halogenated materials that a nonpolar phase cannot.

In summary, when selecting a stationary phase, choose a phase with functional groups similar to those present in your analyte. For a versatile, intermediate-polarity stationary phase, select an Rtx[®]/MXT[®]-1701 column. These columns are the best choice for pesticides, solvents or drug compounds.

? Commonly Asked Questions

What is the difference between an Rtx®-1701 and an MXT®-1701 column?

Rtx®-1701 columns are made with polyimide-coated, fused silica tubing and are deactivated with a nonpolar deactivation layer, resulting in the highest degree of tubing inertness. MXT®-1701 columns are made from unbreakable Silcosteel®-treated stainless steel. The Silcosteel® process bonds a thin, flexible layer to the stainless steel surface, which offers efficiency and inertness comparable to fused silica tubing, with increased durability. MXT® columns are caged in 4-inch diameter coils or smaller, and are ideal for compact, portable, or process GCs. Both columns possess a maximum operating temperature of 280°C.

How do I choose the right -1701 column for my application?

After you've decided whether you want an Rtx®-1701 column or an MXT®-1701 column, based on the answer to the question above, there are three main factors that should be considered when selecting a column: length, inside diameter (ID), and film thickness.

Column length affects the total plate count, which in turn, affects separation. Typical column lengths are 15, 30, 60, and 105 meters. Most separations can be achieved with 30-meter columns. However, if the sample contains very few compounds, a 15-meter column might offer sufficient separation. Alternatively, a 60- or 105-meter column might be required for samples containing large numbers of compounds.

Column ID affects both resolution and sample capacity. Typical column diameters range from 0.10mm ID to 0.53mm ID. Smaller ID columns offer better separation, but less sample capacity. 0.25mm and 0.32mm ID columns offer the best compromise between separation and capacity.

Select film thickness based on the volatility range of the compounds in the sample. As a general rule, use a film thickness of 1.0µm or greater for compounds with boiling points below 200°C. For compounds with boiling points higher than 200°C, use a film thickness of less than 1.0µm.

For answers to specific applications questions regarding Rtx®-1701 columns, contact Restek's Technical Service group, or your Restek representative.

What is an Integra-Guard™ column?

Guard columns are commonly used to trap nonvolatile residues, to protect and prolong the lifetime of the analytical column. However, for many analysts, the art of attaching a guard column to the analytical column is a mystery. Restek's chemists have discovered the solution to this mystery—the most reliable connection is no connection at all! An Integra-Guard™ column is a continuous length of fused silica tubing, containing both the guard column and the analytical column. The guard column is tied separately from the analytical column, using high-temperature string. Just imagine, guard columns WITHOUT connections - or leaks. Protecting your capillary column has never been easier!

Rtx®-1701/MXT®-1701 Columns

FAST FACTS

At-a-Glance
Product
Information
from Restek

Column Selection Made Easy

1

Contact **Restek's Technical Service** at **800-356-1688** or **814-353-1300, ext. 4**. We have more than 25 trained chemists with direct laboratory and applications experience, ready to assist you in choosing the best column.

2

Consult the applications section (hundreds of chromatograms) in **Restek's chromatography products catalog**, or on-line at **www.restekcorp.com**

3

ezGC™ software: Restek has Retention Index Libraries that contain more than 3000 compounds analyzed on the most commonly used stationary phases, in 10 different application areas including: petroleum hydrocarbons, solvents & chemicals, flavors & fragrances, FAMES, pesticides, PCBs, dioxins/ furans, semivolatiles, volatiles, and drugs of abuse. ezGC™ software is available from our chromatography products catalog.

(Crossbond® 14% cyanopropylphenyl/86% dimethyl polysiloxane)

ID	df (μm)	temp. limits*	15-Meter	30-Meter	60-Meter
0.25mm	0.25	-20 to 280°C	72020	72023	72026
	0.50	-20 to 280°C	72035	72038	72041
	1.00	-20 to 280°C	72050	72053	72056
0.28mm	0.25	-20 to 280°C	72021	72024	72027
	0.50	-20 to 270°C	72036	72039	72042
	1.00	-20 to 260°C	72051	72054	72057
0.53mm	1.50	-20 to 250°C	72066	72069	72072
	0.25	-20 to 280°C	72022	72025	72028
	0.50	-20 to 270°C	72037	72040	72043
	1.00	-20 to 260°C	72052	72055	72058
	1.50	-20 to 250°C	72067	72070	72073
	3.00	-20 to 240°C	72082	72085	72088
ID	df (μm)	temp. limits	10-Meter	20-Meter	40-Meter
0.18mm	0.20	-20 to 270/280°C	71871	71872	71873
	0.40	-20 to 270/280°C	71874	71875	71876

*Maximum temperatures listed are for 15- and 30-meter lengths.

Longer lengths may have a slightly reduced maximum temperature.

See our chromatography products catalog for additional product information, or visit www.restekcorp.com

FAST FACTS



www.restekcorp.com

Restek trademarks: ezGC, Rtx, MXT, Integra-Guard, ~~Ohio~~ trademarks: AT (Alltech Associates), CP-Sil (Chrompack), DB (J&W Scientific), OV (Ohio Valley Specialty Chemical Co.), Elite (PerkinElmer), SPB (Sigma-Aldrich Co.).

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Lit. Cat. #59016



Gas Mixes for Air Sampling

Analytical Reference Materials for Environmental Air Sampling Methods

did you know?

Spectra Gases manufactures our high-quality air monitoring gas mixes.

- ISO 9001:2000-approved gas manufacturer.
- Official EPA supplier of PAMS (ozone precursor) calibration gas.
- Only vendor of stable 62-component TO-15 gas mix.



Cylinder Design:
Aluminum construction.
Size: 8 x 24 cm.
Volume/Pressure:
104 liters @ 1800psig.
CGA-180 outlet fitting.
Weight: 1.5 lbs.

Restek Trademarks:
SilcoCan, Silcosteel, TO-Can,
Turning Visions into Reality,
Restek logo

Other Trademarks:
Freon (E.I. duPont de
Nemours & Co., Inc.)
Kel-F (3M Co.)

Restek is proud to offer Spectra Gases gas mixes to meet your environmental air sampling requirements. Rigorous quality control guarantees the reproducibility and stability of every mix.

Spectra Gases production and analytical procedures ensure that each calibration mix is of the highest accuracy. Calibration mixes are produced individually and gravimetrically, using NIST (National Institute of Science and Technology) traceable weights. All calibration mixes are individually analyzed against Spectra Gases master standards, directly traceable to NIST (TO-14 component) Primary Gas Standards and NIST traceable weights.

Spectra Gases uses a proprietary cylinder passivation process that ensures proven stability and lifetime, even for complex mixes. They are the only vendor capable of delivering a stable 62-component TO-15 gas mix. Restek and Spectra Gases offer many stock mixes for environmental air analysis. Mixes not already in stock are blended in master cylinders and are ready for final product packaging, so delivery of most products requires only a minimum leadtime.

TO-14A Calibration Mix (39 components)

benzene	ethyl chloride
bromomethane	hexachloro-1,3-butadiene
carbon tetrachloride	methylene chloride
chlorobenzene	styrene
chloroform	1,1,2,2-tetrachloroethane
chloromethane	tetrachloroethylene
1,2-dibromoethane	toluene
<i>m</i> -dichlorobenzene	1,2,4-trichlorobenzene
<i>o</i> -dichlorobenzene	1,1,1-trichloroethane
<i>p</i> -dichlorobenzene	1,1,2-trichloroethane
dichlorodifluoromethane	trichloroethene
1,1-dichloroethane	trichlorofluoromethane
1,2-dichloroethane	1,1,2-trichlorotrifluoroethane
1,1-dichloroethene	1,2,4-trimethylbenzene
<i>cis</i> -1,2-dichloroethene	1,3,5-trimethylbenzene
1,2-dichloropropane	vinyl chloride
<i>cis</i> -1,3-dichloropropene	<i>m</i> -xylene
<i>trans</i> -1,3-dichloropropene	<i>o</i> -xylene
dichlorotetrafluoroethane	<i>p</i> -xylene
ethyl benzene	

In nitrogen, 104 liters @ 1800psig

1ppm	cat. # 34400 (ea.)
100ppb	cat. # 34421 (ea.)

TO-14A Chlorinated Hydrocarbon Mix (19 components)

carbon tetrachloride	hexachloro-1,3-butadiene
chloroform	methyl chloride
1,1-dichloroethane	methylene chloride
1,2-dichloroethane	1,1,2,2-tetrachloroethane
1,1-dichloroethene	tetrachloroethylene
<i>cis</i> -1,2-dichloroethene	1,1,1-trichloroethane
1,2-dichloropropane	1,1,2-trichloroethane
<i>cis</i> -1,3-dichloropropene	trichloroethene
<i>trans</i> -1,3-dichloropropene	vinyl chloride
ethyl chloride	

In nitrogen, 104 liters @ 1800psig

1ppm	cat. # 34402 (ea.)
100ppb	cat. # 34422 (ea.)

TO-14A Aromatics Mix (14 components)

benzene	toluene
chlorobenzene	1,2,4-trichlorobenzene
<i>m</i> -dichlorobenzene	1,2,4-trimethylbenzene
<i>o</i> -dichlorobenzene	1,3,5-trimethylbenzene
<i>p</i> -dichlorobenzene	<i>m</i> -xylene
ethyl benzene	<i>o</i> -xylene
styrene	<i>p</i> -xylene

In nitrogen, 104 liters @ 1800psig

1ppm	cat. # 34404 (ea.)
100ppb	cat. # 34423 (ea.)

TO-14A 41 Component Mix (41 components)

acrylonitrile	ethyl benzene
benzene	ethyl chloride
bromomethane	hexachloro-1,3-butadiene
1,3-butadiene	methylene chloride
carbon tetrachloride	styrene
chlorobenzene	1,1,2,2-tetrachloroethane
chloroform	tetrachloroethylene
chloromethane	toluene
1,2-dibromoethane	1,2,4-trichlorobenzene
<i>m</i> -dichlorobenzene	1,1,1-trichloroethane
<i>o</i> -dichlorobenzene	1,1,2-trichloroethane
<i>p</i> -dichlorobenzene	trichloroethene
dichlorodifluoromethane	trichlorofluoromethane
1,1-dichloroethane	1,1,2-trichlorotrifluoroethane
1,2-dichloroethane	1,2,4-trimethylbenzene
1,1-dichloroethene	1,3,5-trimethylbenzene
<i>cis</i> -1,2-dichloroethene	vinyl chloride
1,2-dichloropropane	<i>m</i> -xylene
<i>cis</i> -1,3-dichloropropene	<i>o</i> -xylene
<i>trans</i> -1,3-dichloropropene	<i>p</i> -xylene
dichlorotetrafluoroethane	

In nitrogen, 104 liters @ 1800psig

1ppm	cat. # 34430 (ea.)
100ppb	cat. # 34431 (ea.)

TO-14A 43 Component Mix (43 components)

acrylonitrile	ethyl benzene
benzene	ethyl chloride
bromomethane	4-ethyltoluene
1,3-butadiene	hexachloro-1,3-butadiene
carbon tetrachloride	methylene chloride
chlorobenzene	styrene
chloroform	1,1,2,2-tetrachloroethane
chloromethane	tetrachloroethylene
3-chloropropene	toluene
1,2-dibromoethane	1,2,4-trichlorobenzene
<i>m</i> -dichlorobenzene	1,1,1-trichloroethane
<i>o</i> -dichlorobenzene	1,1,2-trichloroethane
<i>p</i> -dichlorobenzene	trichloroethene
dichlorodifluoromethane	trichlorofluoromethane
1,1-dichloroethane	1,1,2-trichlorotrifluoroethane
1,2-dichloroethane	1,2,4-trimethylbenzene
1,1-dichloroethene	1,3,5-trimethylbenzene
<i>cis</i> -1,2-dichloroethene	vinyl chloride
1,2-dichloropropane	<i>m</i> -xylene
<i>cis</i> -1,3-dichloropropene	<i>o</i> -xylene
<i>trans</i> -1,3-dichloropropene	<i>p</i> -xylene
dichlorotetrafluoroethane	

In nitrogen, 104 liters @ 1800psig

1ppm cat. # 34432 (ea.)**100ppb** cat. # 34433 (ea.)**Ozone Precursor Mixture/PAMS** (57 components)

acetylene	isopropylbenzene
benzene	methylcyclohexane
<i>n</i> -butane	methylcyclopentane
1-butene	2-methylheptane
<i>cis</i> -2-butene	3-methylheptane
<i>trans</i> -2-butene	2-methylhexane
cyclohexane	3-methylhexane
cyclopentane	2-methylpentane
<i>n</i> -decane	3-methylpentane
<i>m</i> -diethylbenzene	<i>n</i> -nonane
<i>p</i> -diethylbenzene	<i>n</i> -octane
2,2-dimethylbutane	<i>n</i> -pentane
2,3-dimethylbutane	1-pentene
2,3-dimethylpentane	<i>cis</i> -2-pentene
2,4-dimethylpentane	<i>trans</i> -2-pentene
<i>n</i> -dodecane	propane
ethane	<i>n</i> -propylbenzene
ethylbenzene	propylene
ethylene	styrene
<i>m</i> -ethyltoluene	toluene
<i>o</i> -ethyltoluene	1,2,3-trimethylbenzene
<i>p</i> -ethyltoluene	1,2,4-trimethylbenzene
<i>n</i> -heptane	1,3,5-trimethylbenzene
<i>n</i> -hexane	2,2,4-trimethylpentane
1-hexene	2,3,4-trimethylpentane
isobutane	<i>n</i> -undecane
isopentane	<i>o</i> -xylene
isoprene	<i>m/p</i> -xylene (combined)

In nitrogen, 104 liters @ 1800psig

1ppm cat. # 34420 (ea.)**100ppb** cat. # 34429 (ea.)**Spectra Gas 7621 High-Purity VOC Regulator**

- Single-stage, stainless steel.
- Two pressure gauges and CGA-180 fitting.
- 3000psig maximum inlet pressure.
- Stainless steel diaphragm and Kel-F® seat.
- 1/8-inch tube compression outlet.
- Small internal volume: 3.03cc.
- Accurate pressure control even at low flow rates.
- Individually tested for leaks and impurities.

Description	qty.	cat. #
0-30psig outlet pressure gauge	ea.	21572
0-100psig outlet pressure gauge	ea.	21572-R100

TO-14A CFC/HCFC Mix

trichlorofluoromethane (Freon® 11)
dichlorodifluoromethane (Freon® 12)
1,1,2-trichloro-1,2,2-trifluoroethane (Freon® 113)
1,2-dichlorotetrafluoroethane (Freon® 114)

In nitrogen, 104 liters @ 1800psig

1ppm cat. # 34410 (ea.)**100ppb** cat. # 34426 (ea.)**TO-14A Internal Standard Mix**

bromochloromethane 1,4-difluorobenzene
chlorobenzene-d5

In nitrogen, 104 liters @ 1800psig

1ppm cat. # 34412 (ea.)**100ppb** cat. # 34427 (ea.)**TO-14A GC/MS Tuning Mix**

4-bromofluorobenzene

In nitrogen, 104 liters @ 1800psig

100ppb cat. # 34424 (ea.)**2ppm** cat. # 34406 (ea.)**TO-14A Internal Standard/Tuning Mix**

bromochloromethane
1-bromo-4-fluorobenzene (4-bromofluorobenzene)
chlorobenzene-d5
1,4-difluorobenzene

In nitrogen, 104 liters @ 1800psig

1ppm cat. # 34408 (ea.)**100ppb** cat. # 34425 (ea.)**Ozone Precursor/PAMS Mix**

(57 components at EPA concentrations: ppb C)

acetylene	40	methylcyclohexane	30
benzene	30	methylcyclopentane	25
<i>n</i> -butane	40	2-methylheptane	25
1-butene	30	3-methylheptane	25
<i>cis</i> -2-butene	35	2-methylhexane	25
<i>trans</i> -2-butene	25	3-methylhexane	25
cyclohexane	40	2-methylpentane	20
cyclopentane	20	3-methylpentane	40
<i>n</i> -decane	30	<i>n</i> -nonane	25
<i>m</i> -diethylbenzene	40	<i>n</i> -octane	30
<i>p</i> -diethylbenzene	25	<i>n</i> -pentane	25
2,2-dimethylbutane	40	1-pentene	25
2,3-dimethylbutane	50	<i>cis</i> -2-pentene	35
2,3-dimethylpentane	50	<i>trans</i> -2-pentene	25
2,4-dimethylpentane	40	propane	40
<i>n</i> -dodecane	40	<i>n</i> -propylbenzene	30
ethane	25	propylene	25
ethylbenzene	25	styrene	40
ethylene	20	toluene	40
<i>m</i> -ethyltoluene	25	1,2,3-trimethylbenzene	25
<i>o</i> -ethyltoluene	30	1,2,4-trimethylbenzene	40
<i>p</i> -ethyltoluene	40	1,3,5-trimethylbenzene	25
<i>n</i> -heptane	25	2,2,4-trimethylpentane	30
<i>n</i> -hexane	30	2,3,4-trimethylpentane	25
1-hexene	60	<i>n</i> -undecane	30
isobutane	25	<i>o</i> -xylene	25
isopentane	40	<i>m/p</i> -xylene	
isoprene	40	(combined)	40
isopropylbenzene	40		

In nitrogen, 104 liters @ 1800psig

cat. # 34445 (ea.)



TO-15 62 Component Mix (62 components)

acetone	trichlorofluoromethane (Freon® 11)
benzene	dichlorodifluoromethane (Freon® 12)
benzyl chloride*	1,1,2-trichloro-1,2,2-trifluoroethane (Freon® 113)
bromodichloromethane	1,2-dichlorotetrafluoroethane (Freon® 114)
bromoform	heptane
bromomethane	hexachloro-1,3-butadiene
1,3-butadiene	hexane
2-butanone (MEK)	2-hexanone (MBK)
carbon disulfide*	4-methyl-2-pentanone (MIBK)
carbon tetrachloride	methylene chloride
chlorobenzene	methyl <i>tert</i> -butyl ether (MTBE)
chloroethane	2-propanol
chloroform	propylene
chloromethane	styrene
cyclohexane	1,1,2,2-tetrachloroethane
dibromochloromethane	tetrachloroethene
1,2-dichlorobenzene	tetrahydrofuran
1,3-dichlorobenzene	toluene
1,4-dichlorobenzene	1,2,4-trichlorobenzene
1,1-dichloroethane	1,1,1-trichloroethane
1,2-dichloroethane	1,1,2-trichloroethane
1,1-dichloroethene	trichloroethene
<i>cis</i> -1,2-dichloroethene	1,2,4-trimethylbenzene
<i>trans</i> -1,2-dichloroethene	1,3,5-trimethylbenzene
1,2-dichloropropane	vinyl acetate
<i>cis</i> -1,3-dichloropropene	vinyl chloride
<i>trans</i> -1,3-dichloropropene	<i>m</i> -xylene
1,4-dioxane	<i>o</i> -xylene
ethanol*	<i>p</i> -xylene
ethyl acetate	
ethyl benzene	
ethyl dibromide	
(1,1-dibromoethane)	
4-ethyltoluene	

In nitrogen, 104 liters @ 1800psig

1ppm cat. # 34436 (ea.)**100ppb** cat. # 34437 (ea.)

*Stability of this compound cannot be guaranteed.

TO-15 Subset 25 Component Mix (25 components)

acetone	4-ethyltoluene
allyl chloride	heptane
benzyl chloride*	hexane
bromodichloromethane	2-hexanone (MBK)
bromoform	4-methyl-2-pentanone (MIBK)
1,3-butadiene	methyl <i>tert</i> -butyl ether (MTBE)
2-butanone (MEK)	2-propanol
carbon disulfide*	propylene
cyclohexane	tetrahydrofuran
dibromochloromethane	2,2,4-trimethylpentane
<i>trans</i> -1,2-dichloroethene	vinyl acetate
1,4-dioxane	vinyl bromide
ethyl acetate	

In nitrogen, 104 liters @ 1800psig

1ppm cat. # 34434 (ea.)**100ppb** cat. # 34435 (ea.)

*Stability of this compound cannot be guaranteed.

BTEX Gas Mix

benzene	<i>m</i> -xylene
ethylbenzene	<i>o</i> -xylene
toluene	<i>p</i> -xylene

In nitrogen, 104 liters @ 1800psig

1ppm cat. # 34414 (ea.)**100ppb** cat. # 34428 (ea.)**Massachusetts APH Mix** (26 components)

benzene	<i>p</i> -isopropyltoluene
1,3-butadiene	methyl <i>tert</i> -butyl ether
butylcyclohexane	1-methyl-3-ethylbenzene
cyclohexane	<i>n</i> -nonane
<i>n</i> -decane	<i>n</i> -octane
2,3-dimethylheptane	toluene
2,3-dimethylpentane	toluene-d8 (IS)
<i>n</i> -dodecane	1,2,3-trimethylbenzene
ethylbenzene	1,3,5-trimethylbenzene
<i>n</i> -heptane	<i>n</i> -undecane
<i>n</i> -hexane	<i>m</i> - & <i>p</i> - xylene
isopentane	<i>o</i> -xylene
isopropylbenzene	

In nitrogen, 104 liters @ 1800psig

cat. # 34540 (ea.)

Japan Calibration Mix (9 components)

acrylonitrile	dichloromethane
benzene	tetrachloroethylene
1,3-butadiene	trichloroethylene
chloroform	vinyl chloride
1,2-dichloroethane	

In nitrogen, 104 liters @ 1800psig

1ppm cat. # 34418 (ea.)please **note**

Don't see the gas mixture you need? Contact Restek for a custom gas mixture that meets your requirements

for **more** info**Air Sampling & Analysis**

Our SilcoCan™ (Siltek®-treated) and TO-Can™ (electro polished) canisters are your best choice for collecting ambient air samples as specified in EPA TO-14/TO-15. In addition to the TO-listed compounds, inert SilcoCan™ canisters offer excellent stability for low ppb levels of sulfur compounds. Used in conjunction with a SilcoCan™ or TO-Can™ canister, our Passive Air Sampling Kit incorporates all of the hardware you'll need for air sample collection. Our miniature air sampling canisters are ideal for indoor air, personal, and emergency response sampling.

We also offer ultra-clean resin, fiber filters, sampling bags, thermal desorption tubes, and a range of gas reference standards to meet your environmental air sampling requirements.

To view our complete line of air sampling products, visit our website at www.restek.com/air.





Alternative

Vacuum/Pressure Gauges

The standard vacuum/pressure range on a SilcoCan™ or TO-Can™ canister fitted with a gauge is 30" Hg to 60psig. To order a different gauge for the canister, *add the appropriate suffix number to the canister catalog number*. There is no price difference for these substituted gauges.

Gauge	Suffix
30" Hg/15psi	-651
30" Hg/30psi	-652

SilcoCan™ Air Monitoring Canisters

Siltek® treated - ideal for low-level reactive sulfur compounds (1-20ppb)

- Unsurpassed inertness, even for sulfur-containing or brominated compounds.
- Sizes from 1 to 15 liters support a wide range of sampling needs.
- Optional vacuum/pressure gauge (other gauges available).
- For critical applications, order a Siltek® treated valve - add suffix "-650" to the catalog number of the canister.

For ultimate inertness, we treat SilcoCan™ air monitoring canisters with our unique Siltek® passivation technology. Even highly active components, at low parts-per-billion concentrations, can be readily sampled and stored without loss. The valve is a high quality, metal-to-metal seal, 2/3-turn valve with metal diaphragms. Both stainless steel and Siltek®-treated valves are available, in both the 2-port and 3-port configurations.

Description	qty.	cat.#
1L Volume		
SilcoCan™ Canister, 1/4" Valve	ea.	24180
SilcoCan™ Canister, Siltek®-Treated 1/4" Valve	ea.	24180-650
SilcoCan™ Canister with Gauge, 1/4" Valve	ea.	24140
SilcoCan™ Canister with Gauge, Siltek®-Treated 1/4" Valve	ea.	24140-650
3L Volume		
SilcoCan™ Canister, 1/4" Valve	ea.	24181
SilcoCan™ Canister, Siltek®-Treated 1/4" Valve	ea.	24181-650
SilcoCan™ Canister with Gauge, 1/4" Valve	ea.	24141
SilcoCan™ Canister with Gauge, Siltek®-Treated 1/4" Valve	ea.	24141-650
6L Volume		
SilcoCan™ Canister, 1/4" Valve	ea.	24182
SilcoCan™ Canister, Siltek®-Treated 1/4" Valve	ea.	24182-650
SilcoCan™ Canister with Gauge, 1/4" Valve	ea.	24142
SilcoCan™ Canister with Gauge, Siltek®-Treated 1/4" Valve	ea.	24142-650
15L Volume		
SilcoCan™ Canister, 1/4" Valve	ea.	24183
SilcoCan™ Canister, Siltek®-Treated 1/4" Valve	ea.	24183-650
SilcoCan™ Canister with Gauge, 1/4" Valve	ea.	24143
SilcoCan™ Canister with Gauge, Siltek®-Treated 1/4" Valve	ea.	24143-650

did you know?

All Restek canisters are equipped with high-quality Parker Hannifin diaphragm valves. Each valve is helium leak-tested to 4×10^{-9} cc/sec. The all-stainless steel construction eliminates contamination and the valve operates at temperatures from -100°C to 250°C. Compression outlet fitting, indicator plate to display open or closed position, 1/4" inlet and outlet.

We also ship our canisters cleaned, batch-tested per USEPA TO-14, and under 30psig pressure with dry nitrogen.

TO-Can™ Air Monitoring Canisters

Optimized for US EPA Methods TO-14 and TO-15

- High quality, metal-to-metal seal, 2/3-turn valve with metal diaphragms.
- Sizes from 1 to 15 liters.
- Optional 30" Hg/60psig vacuum/pressure gauge (other gauges available).

Description	qty.	cat.#
1L Volume		
TO-Can™ Canister, 1/4" Valve	ea.	24172
TO-Can™ Canister with Gauge, 1/4" Valve	ea.	24176
3L Volume		
TO-Can™ Canister, 1/4" Valve	ea.	24173
TO-Can™ Canister with Gauge, 1/4" Valve	ea.	24177
6L Volume		
TO-Can™ Canister, 1/4" Valve	ea.	24174
TO-Can™ Canister with Gauge, 1/4" Valve	ea.	24178
15L Volume		
TO-Can™ Canister, 1/4" Valve	ea.	24175
TO-Can™ Canister with Gauge, 1/4" Valve	ea.	24179



Lit. Cat.# 59276B

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CLP OLM 04.1 (04.2) Semivolatiles Reference Materials

Dear Customers:

The US Environmental Protection Agency (EPA) has recently awarded contracts for organic low medium (OLM) concentration samples within the Superfund program under the 04.2 revision Statement of Work. Restek has prepared calibration, internal standard, and surrogate solutions to meet these requirements.

During development of these products, one basic premise was understood—we would produce the fewest number of solutions possible while maintaining stability and maximum shelf life by avoiding chemical interactions. We carefully reviewed the 04.2 Statement of Work and determined that the identical products specified in 04.1 will also be required for the 04.2 revision. The products listed here are a result of this work.

To order, call our customer service team at 800-356-1688 or 814-353-1300, ext. 3, or your local Restek representative.

Sincerely,

Eric A. Steindl
Analytical Reference Materials
Product Line Manager
esteindl@restekcorp.com

Save money—built-in discounts!
5-packs, 10-packs and data packs
are available.



800-356-1688
814-353-1300

www.restekcorp.com

CLP Semivolatile Target Compounds

Feature	Benefit
SV Calibration Mixtures—Restek calibration mixtures are subdivided into two separate solutions. These are:	<i>Maximum shelf life and no chemical interactions combined with the fewest number of solutions possible.</i>
14 phenols @ 2,000ppm in CH ₂ Cl ₂ CLP 04.1 Phenols Calibration Mix (cat.# 31494)	<i>Contains all acidic target compounds required by method. Maximum shelf life*=36 months.</i>
51 compounds @ 1,000ppm in CH ₂ Cl ₂ CLP 04.1 B/N MegaMix™ (cat.# 31495)	<i>Contains all base/neutral compounds required by method. Maximum shelf life*=24 months.</i>
18 chlorinated pesticides @ 2,000ppm in hexane/toluene (cat.# 31012)	<i>Add pesticides to working solutions for confirmation only as needed.</i>
Data packs available for all listed quantitative environmental stock standards	<i>Complies with stringent audits.</i>

**Maximum shelf life based on unopened ampul.*

CLP Semivolatile Internal Standard Mixes

Feature	Benefit
Internal Standard Mixtures—two concentrations are available:	<i>Provides greatest versatility in preparing working solutions.</i>
SV Internal Standard Mix 4,000µg/mL in CH ₂ Cl ₂ (cat.# 31006)	<i>Highest concentration possible—always requires sonication before use.</i>
SV Internal Standard Mix 2,000µg/mL in CH ₂ Cl ₂ (cat.# 31206)	<i>Lower concentration—easier to handle, may require sonication before use.</i>
Data packs available for all listed quantitative environmental stock standards	<i>Complies with stringent audits.</i>

CLP Semivolatile Surrogate Mixes

Feature	Benefit
Surrogate Mixtures—two concentrations are available: 1mL or 5mL ampuls, BNA combined or separate Acid/BN mixes.	<i>Provides greatest versatility and maximum value in preparing working solutions.</i>
Acid Surrogate Mix 1,500µg/mL or 7,500µg/mL 1mL or 5mL ampuls	<i>Can prepare 10mL, 50mL, or 250mL of working solution from one ampul.</i>
B/N Surrogate Mix 1,000µg/mL or 5,000µg/mL 1mL or 5mL ampuls	<i>Can prepare 10mL, 50mL, or 250mL of working solution from one ampul.</i>
BNA Surrogate Mix 1,000µg/mL (B/N) and 1,500µg/mL (acids) 1mL ampuls	<i>Can prepare 10mL combined working solution from one ampul.</i>
Data packs available for all listed quantitative environmental stock standards	<i>Complies with stringent audits.</i>



At-a-Glance
Product
Information
from Restek

CLP OLM 04.1 (04.2) Semivolatiles Reference Materials

**Call 800-356-1688 or
814-353-1300, ext. 3,
to order.**

CLP Semivolatile Kits

Feature	Benefit
CLP SV Kits	Built-in discounts and convenient mixture groups frequently required.
Data packs available for all listed quantitative environmental standards	Complies with stringent audits.

Semivolatiles—Acid Surrogates (04.1, 04.2 and 3/90 SOW)

Acid Surrogate Standard Mix (3/90 SOW)

2-chlorophenol-d4 phenol-d6
2-fluorophenol 2,4,6-tribromophenol

1,500µg/mL ea. in methanol, 1mL/ampul

	Each	5-pk.	10-pk.
	31003	31003-510	
w/data pack	31003-500	31003-520	31103

7,500µg/mL ea. in methanol, 1mL/ampul

	Each	5-pk.	10-pk.
	31073	31073-510	
w/data pack	31073-500	31073-520	31173

7,500µg/mL ea. in methanol, 5mL/ampul

	Each	5-pk.	10-pk.
	31083	31083-510	
w/data pack	31083-500	31083-520	31183

Semivolatiles—B/N Surrogates (04.1, 04.2 and 3/90 SOW)

B/N Surrogate Standard Mix (3/90 SOW)

1,2-dichlorobenzene-d4 nitrobenzene-d5
2-fluorobiphenyl p-terphenyl-d14

1,000µg/mL ea. in CH₂Cl₂, 1mL/ampul

	Each	5-pk.	10-pk.
	31002	31002-510	
w/data pack	31002-500	31002-520	31102

5,000µg/mL ea. in CH₂Cl₂, 1mL/ampul

	Each	5-pk.	10-pk.
	31072	31072-510	
w/data pack	31072-500	31072-520	31172

5,000µg/mL ea. in CH₂Cl₂, 5mL/ampul

	Each	5-pk.	10-pk.
	31082	31082-510	
w/data pack	31082-500	31082-520	31182

Semivolatiles—Combined BNA Surrogates (04.1 and 04.2 SOW)

CLP 04.1 BNA Surrogate Mix (04.1 and 04.2 SOW)

2-chlorophenol-d4 1,500µg/mL
1,2-dichlorobenzene-d4 1,000
2-fluorobiphenyl 1,000
2-fluorophenol 1,500
nitrobenzene-d5 1,000
phenol-d6 1,500
p-terphenyl-d14 1,000
2,4,6-tribromophenol 1,500

In methylene chloride, 1mL/ampul

	Each	5-pk.	10-pk.
	31493	31493-510	
w/data pack	31493-500	31493-520	31593



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CLP OLM 04.1 (04.2) Semivolatiles Reference Materials

Semivolatiles—Matrix Spike Mixes (04.1 and 04.2 SOW)

Acid Matrix Spike Mix

4-chloro-3-methylphenol pentachlorophenol
2-chlorophenol phenol
4-nitrophenol

1,500µg/mL ea. in methanol, 1mL/ampul

	Each	5-pk.	10-pk.
	31005	31005-510	
w/data pack	31005-500	31005-520	31105

7,500µg/mL ea. in methanol, 1mL/ampul

	Each	5-pk.	10-pk.
	31075	31075-510	
w/data pack	31075-500	31075-520	31175

7,500µg/mL ea. in methanol, 5mL/ampul

	Each	5-pk.	10-pk.
	31085	31085-510	
w/data pack	31085-500	31085-520	31185

Semivolatiles—Matrix Spike Mixes (04.1 and 04.2 SOW)

CLP 04.1 and 04.2 B/N Matrix Spike Mix

acenaphthene N-nitroso-di-n-propylamine
2,4-dinitrotoluene pyrene

1,000µg/mL ea. in methanol, 1mL/ampul

	Each	5-pk.	10-pk.
	31492	31492-510	
w/data pack	31492-500	31492-520	31592

NEW

Semivolatiles—Internal Standards (04.1, 04.2, 4/89 and 3/90 SOW)

SV Internal Standard Mix*

acenaphthene-d10 naphthalene-d8
chrysene-d12 perylene-d12
1,4-dichlorobenzene-d4 phenanthrene-d10

4,000µg/mL ea. in CH₂Cl₂, 1mL/ampul

	Each	5-pk.	10-pk.
	31006	31006-510	
w/data pack	31006-500	31006-520	31106

*Requires special handling (warming and sonication) before use.

SV Internal Standard Mix**

acenaphthene-d10 naphthalene-d8
chrysene-d12 perylene-d12
1,4-dichlorobenzene-d4 phenanthrene-d10

2,000µg/mL ea. in CH₂Cl₂, 1mL/ampul

	Each	5-pk.	10-pk.
	31206	31206-510	
w/data pack	31206-500	31206-520	31306

**Easier to handle than 31006. May require sonication before use.

Tuning Mix

SV Tuning Compound

decafluorotriphenylphosphine

2,500µg/mL ea. in CH₂Cl₂, 1mL/ampul

	Each	5-pk.	10-pk.
	31001	31001-510	
w/data pack	31001-500	31001-520	31101

Screening Mix

SV Screening Mix

di-n-octyl phthalate
phenanthrene
phenol

2,500µg/mL ea. in CH₂Cl₂, 1mL/ampul

	Each	5-pk.	10-pk.
	31000	31000-510	
w/data pack	31000-500	31000-520	31100

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CLP OLM 04.1 (04.2) Semivolatiles Reference Materials

Semivolatiles—Calibration Mixtures (04.1 and 04.2 SOW)

CLP 04.1 and 04.2 Phenols Calibration Mix

4-chloro-3-methylphenol	4-methylphenol
2-chlorophenol	2-nitrophenol
2,4-dichlorophenol	4-nitrophenol
2,4-dimethylphenol	pentachlorophenol
2,4-dinitrophenol	phenol
2-methyl-4,6-dinitrophenol	2,4,5-trichlorophenol
2-methylphenol	2,4,6-trichlorophenol

2,000µg/mL ea. in methylene chloride, 1mL/ampul

	Each	5-pk.	10-pk.
	31494	31494-510	
w/data pack	31494-500	31494-520	31594

Semivolatiles—Calibration Mixtures (04.1 and 04.2 SOW)

CLP 04.1 and 04.2 B/N MegaMix™

acenaphthene	3,3'dichlorobenzidine
acenaphthylene	diethyl phthalate
acetophenone	dimethyl phthalate
anthracene	di- <i>n</i> -butyl phthalate
atrazine	2,4-dinitrotoluene
benzaldehyde	2,6-dinitrotoluene
benzo(a)anthracene	di- <i>n</i> -octyl phthalate
benzo(a)pyrene	fluoranthene
benzo(b)fluoranthene	fluorene
benzo(ghi)perylene	hexachlorobenzene
benzo(k)fluoranthene	hexachlorobutadiene
biphenyl	hexachlorocyclopentadiene
bis(2-chloroethoxy)methane	hexachloroethane
bis(2-chloroethyl)ether	indeno(1,2,3- <i>cd</i>)pyrene
bis-(2-chloroisopropyl) ether	isophorone
bis(2-ethylhexyl)phthalate	2-methylnaphthalene
butyl benzyl phthalate	naphthalene
4-bromophenyl phenyl ether	2-nitroaniline
caprolactam	3-nitroaniline
carbazole	4-nitroaniline
4-chloroaniline	nitrobenzene
2-chloronaphthalene	N-nitroso-di- <i>n</i> -propylamine
4-chlorophenyl phenyl ether	N-nitrosodiphenylamine
chrysene	phenanthrene
dibenz(a,h)anthracene	pyrene
dibenzofuran	

1,000µg/mL ea. in methylene chloride/benzene (3:1), 1mL/ampul

	Each	5-pk.	10-pk.
	31495	31495-510	
w/data pack	31495-500	31495-520	31595

Semivolatiles—Calibration Mixtures (04.1 and 04.2 SOW)

SV Calibration Mix #6

aldrin	endosulfan I
α-BHC	endosulfan II
β-BHC	endosulfan sulfate
δ-BHC	endrin
γ-BHC (lindane)	endrin aldehyde
4,4'-DDD	endrin ketone
4,4'-DDE	heptachlor
4,4'-DDT	heptachlor epoxide (B)
dieldrin	methoxychlor

2,000µg/mL ea. in toluene/hexane (1:1), 1mL/ampul

	Each	5-pk.	10-pk.
	31012	31012-510	
w/data pack	31012-500	31012-520	31112

To add chlorinated pesticides, use SV Calibration Mix #6.

Semivolatiles Kits (04.1 and 04.2 SOW)

KIT

CLP OLM 04.1 and 04.2 SV Kit #1

- 31000: SV Screening Mix
- 31001: SV Tuning Mix
- 31493: CLP 04.1 and 04.2 BNA Surrogate Mix
- 31492: CLP 04.1 and 04.2 B/N Matrix Spike Mix
- 31005: Acid Matrix Spike Mix
- 31006: SV Internal Standard Mix
- 31494: CLP 04.1 and 04.2 Phenols Calibration Mix
- 31495: CLP 04.1 and 04.2 B/N MegaMix™
- 31012: SV Calibration Mix #6 (pesticides)

Contains 1mL each of these mixtures

Kit	Kit w/Data Pack
31603	31603-500

KIT

CLP OLM 04.1 and 04.2 SV Kit #2

- 31494: CLP 04.1 and 04.2 Phenols Calibration Mix
- 31495: CLP 04.1 and 04.2 B/N MegaMix™
- 31012: SV Calibration Mix #6 (pesticides)

Contains 1mL each of these mixtures

Kit	Kit w/Data Pack
31604	31604-500

KIT

CLP OLM 04.1 and 04.2 SV Kit #3

- 31494: CLP 04.1 and 04.2 Phenols Calibration Mix
- 31495: CLP 04.1 and 04.2 B/N MegaMix™

Contains 1mL each of these mixtures

Kit	Kit w/Data Pack
31605	31605-500

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Name: _____ Date: _____

Company: _____

Address: _____

Phone #: _____ Fax #: _____ E-mail: _____

Solvent: _____ Volume per ampul: _____ # of ampuls: _____

Compound(s):	Concentration:	Documentation Required:
_____	_____	<input type="checkbox"/> Gravimetric records
_____	_____	<input type="checkbox"/> Full data pack
_____	_____	<input type="checkbox"/> Other: _____
_____	_____	_____
_____	_____	_____
_____	_____	Comments: _____
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Restek's Analytical Reference Materials Team



(standing left to right) Joe Moodler, Rick Parmely, Mary Ellen Wood, John Lidgett, Chris Cox, Diane Shaffer, Eric Steindl, Andrea Gill, Jason Martin, Scott Strohm, (seated at table) Denise Witherite, and Joe Tallon.

Restek's Customer Support—at your service!

Sales & Service

Our highly trained customer service team looks forward to working with you. We are here when you need to place an order, track a package, check the status of an open order, or request a price quote. We will suggest time- and money-saving options and are dedicated to getting your products to you *fast*. Because we know how busy you are, we will do whatever it takes to simplify your work. That's what having the best customer service in the business is all about!

Shipping

Same day shipments are the standard at Restek! Our shipping team is completely dedicated to getting your products from our warehouse to your lab as quickly as you need them. We'll do whatever it takes to make sure you are satisfied. Trips to the airport to get products to a customer are not unheard of at Restek. We truly mean...*whatever it takes*.

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CLP OLM 04.1 (04.2) Pesticides Reference Materials

The US Environmental Protection Agency (EPA) recently has awarded contracts for organic low medium (OLM) concentration samples within the Superfund program under the 04.2 Statement of Work. Restek has prepared calibration and surrogate solutions to meet these requirements.

During development of these products, one basic premise was understood—we would produce the fewest number of solutions possible while maintaining stability and maximum shelf life by avoiding chemical interactions. We carefully reviewed the 04.2 Statement of Work and determined that the identical products specified in 04.1 also will be required for the 04.2 revision. The products listed here are a result of this work. Call 800-356-1688 or 814-353-1300, ext. 3, to order your CLP OLM 04.1 (04.2) pesticides reference materials today.

5-packs, 10-packs, and data packs available on ALL products.

Complies with stringent audits and saves money—built-in discounts.

Pesticide Target Compounds

Feature	Benefit
Pesticide Calibration Mixtures—Restek calibration mixtures are offered in two different concentrations:	<i>Maximum value and ease of dilution.</i>
Pesticide Mix A (cat.# 32003) Pesticide Mix B (cat.# 32004) 8–16µg/mL	<i>Used to prepare working solutions at 16 x CRQL, 4 x CRQL, and CRQL by serial dilution.</i>
Pesticide Mix A (cat.# 32297) Pesticide Mix B (cat.# 32298) 5–10µg/mL	<i>Used to prepare working solutions at 20 x CRQL, 4 x CRQL, and CRQL by direct dilution.</i>
Pesticide Mix AB #2 (cat.# 32292) 8 and 16µg/mL	<i>Used to prepare single working solution containing all pesticides at 16 x CRQL, 4 x CRQL, and CRQL by serial dilution from a single ampul.</i>

CLP Pesticide Surrogate Mixes

Feature	Benefit
Combined surrogate and individual surrogate mixtures available.	<i>Provides greatest versatility in preparing working solutions.</i>
Pesticide Surrogate Mix DCB and TCMX at 200ppm (cat.# 32000)	<i>Highest concentration possible in acetone. Requires sonication before use.</i>
Individual surrogates at 200µg/mL 1mL and 5mL ampuls	<i>DCB and TCMX available as individual solutions to customize working solutions.</i>

CLP Aroclor®, Chlordane, and Toxaphene Mixes

Feature	Benefit
Two concentrations available: 1000ppm in hexane or 200ppm in isooctane	<i>High concentrations for maximum value and versatility.</i>
Aroclor® 1016/1260 1000ppm ea. (cat.# 32039)	<i>One mixture containing both materials—fewer ampules required.</i>
All other Aroclor® mixes	<i>Individual mixtures for correct identification and quantitation.</i>
Toxaphene: 1000ppm and 5000ppm	<i>Easily prepare high-concentration working solutions.</i>
Chlordane (technical): 1000ppm and 5000ppm	<i>Easily prepare high-concentration working solutions.</i>

Pesticide and PCB Kits

Feature	Benefit
CLP Pesticides and PCB kits	<i>Built-in discounts and convenient mixture groups that are frequently required—in one handy kit.</i>



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814-353-1300



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CLP OLM 04.1 (04.2) Pesticides Reference Materials

CLP Pesticide Mixtures—Individual Surrogates

04.1, 3/90, 4/89, and 2/88 SOW

2,4,5,6-Tetrachloro-m-xylene Mix

200µg/mL in acetone

1mL/ampul	Each	5-pk.	10-pk.
	32027	32027-510	
w/data pack	32027-500	32027-520	32127
5mL/ampul	Each	5-pk.	10-pk.
	32028	32028-510	
w/data pack	32028-500	32028-520	32128

Decachlorobiphenyl Mix

200µg/mL in acetone

1mL/ampul	Each	5-pk.	10-pk.
	32029	32029-510	
w/data pack	32029-500	32029-520	32129
5mL/ampul	Each	5-pk.	10-pk.
	32030	32030-510	
w/data pack	32030-500	32030-520	32130

Technical tips for working with solutions containing decachlorobiphenyl:

Decachlorobiphenyl has poor solubility in most organic solvents. The maximum concentration that can be prepared in acetone, hexane, or isooctane is 200µg/mL. Temperature will affect the solubility as well. Storing solutions at reduced temperatures will cause the decachlorobiphenyl to precipitate.

It's crucial that these products be sonicated for a minimum of 15 minutes prior to opening the ampul. Because each ultrasonic bath operates at different energy levels, the 15 minutes must be used as a guideline only. Longer sonication time will not affect the product quality.

It is important to remember this applies to working solutions prepared in your laboratory as well. The amount of compound that precipitates is dependent upon concentration AND temperature. If you store your standards at a temperature lower than 4°C (even dilute solutions), allow extra sonication time.

For best results, sonicate the ampul before each use.

CLP GPC Calibration Mix

Qualitative mixture useful for determining GPC dump/collect times. Data packs are not available. The compounds are dissolved in methylene chloride at the concentrations listed.

CLP GPC Calibration Mix

bis(2-ethylhexyl)phthalate	10mg/mL
corn oil	250
methoxychlor	2.0
perylene	0.2
sulfur	0.8

In methylene chloride

1mL/ampul	Each	5-pk.	10-pk.
	32019	32019-510	32119
5mL/ampul	Each	5-pk.	10-pk.
	32023	32023-510	32123

Revised GPC Calibration Mix

bis(2-ethylhexyl)phthalate	5mg/mL
corn oil	250
methoxychlor	1.0
perylene	0.2
sulfur	0.8

In methylene chloride

1mL/ampul	Each	5-pk.	10-pk.
	32041	32041-510	32141
5mL/ampul	Each	5-pk.	10-pk.
	32042	32042-510	32142

CLP OLM 04.1 (04.2) Pesticides Reference Materials

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CLP Pesticide Mixtures

04.1 and 3/90 SOW

Pesticide Surrogate Mix

decachlorobiphenyl 2,4,5,6-tetrachloro-*m*-xylene

200µg/mL ea. in acetone, 1mL/ampul

	Each	5-pk.	10-pk.
	32000	32000-510	
w/data pack	32000-500	32000-520	32100

Florisil® Cartridge Check Mix

2,4,5-trichlorophenol

1,000µg/mL in acetone, 1mL/ampul

	Each	5-pk.	10-pk.
	32017	32017-510	
w/data pack	32017-500	32017-520	32117

Pesticide Resolution Check Mix

γ-chlordane	1µg/mL	endosulfan sulfate	2µg/mL
4,4'-DDE	2	endrin ketone	2
dieldrin	2	methoxychlor	10
endosulfan I	1		

In hexane, 1mL/ampul

	Each	5-pk.	10-pk.
	32001	32001-510	
w/data pack	32001-500	32001-520	32101

Pesticide Resolution Check Mix w/Surrogates

γ-chlordane	1µg/mL	endosulfan sulfate	2µg/mL
4,4'-DDE	2	endrin ketone	2
decachlorobiphenyl	2	methoxychlor	10
dieldrin	2	2,4,5,6-tetrachloro- <i>m</i> -xylene	2
endosulfan I	1		

In hexane, 1mL/ampul

	Each	5-pk.	10-pk.
	32073	32073-510	
w/data pack	32073-500	32073-520	32173

Pesticide Performance Evaluation Mix

α-BHC	1µg/mL	4,4'-DDT	10µg/mL
β-BHC	1	endrin	5
γ-BHC (lindane)	1	methoxychlor	25

In hexane, 1mL/ampul

	Each	5-pk.	10-pk.
	32002	32002-510	
w/data pack	32002-500	32002-520	32102

Pesticide Performance Evaluation Mix w/Surrogates

α-BHC	1µg/mL	decachlorobiphenyl	2µg/mL
β-BHC	1	endrin	5
γ-BHC (lindane)	1	methoxychlor	25
4,4'-DDT	10	2,4,5,6-tetrachloro- <i>m</i> -xylene	2

In hexane, 1mL/ampul

	Each	5-pk.	10-pk.
	32074	32074-510	
w/data pack	32074-500	32074-520	32174

Pesticide Matrix Spike Mix

aldrin	25µg/mL	dieldrin	50µg/mL
γ-BHC (lindane)	25	endrin	50
4,4'-DDT	50	heptachlor	25

In acetone, 1mL/ampul

	Each	5-pk.	10-pk.
	32018	32018-510	
w/data pack	32018-500	32018-520	32118

Pesticide Calibration Mixtures

These products can be used to prepare calibration mixes at the Contract Required Quantitation Level (CRQL), 4 x CRQL, 16 x CRQL by serial dilution (includes surrogates).

Pesticide Standard Mix A

α-BHC	8µg/mL	endosulfan I	8µg/mL
γ-BHC (lindane)	8	endrin	16
4,4'-DDD	16	heptachlor	8
4,4'-DDT	16	methoxychlor	80
decachlorobiphenyl	16	2,4,5,6-tetrachloro- <i>m</i> -xylene	8
dieldrin	16		

In hexane, 1mL/ampul

	Each	5-pk.	10-pk.
	32003	32003-510	
w/data pack	32003-500	32003-520	32103

Pesticide Standard Mix B

aldrin	8µg/mL	endosulfan II	16µg/mL
β-BHC	8	endosulfan sulfate	16
δ-BHC	8	endrin aldehyde	16
α-chlordane	8	endrin ketone	16
γ-chlordane	8	heptachlor epoxide (B)	8
4,4'-DDE	16	2,4,5,6-tetrachloro- <i>m</i> -xylene	8
decachlorobiphenyl	16		

In hexane, 1mL/ampul

	Each	5-pk.	10-pk.
	32004	32004-510	
w/data pack	32004-500	32004-520	32104



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CLP OLM 04.1 (04.2) Pesticides Reference Materials

CLP Pesticide Mixtures (04.1 and 3/90 SOW)

These products can be used to prepare calibration mixes at the Contract Required Quantitation Level (CRQL), 4 x CRQL, 20 x CRQL by direct dilution (surrogates NOT included).

Pesticide Standard Mix A

α -BHC	5 μ g/mL	endosulfan I	5 μ g/mL
γ -BHC (lindane)	5	endrin	10
4,4'-DDD	10	heptachlor	5
4,4'-DDT	10	methoxychlor	50
dieldrin	10		

In hexane, 1mL/ampul

	Each	5-pk.	10-pk.
	32297	32297-510	
w/data pack	32297-500	32297-520	32397

Pesticide Standard Mix B

aldrin	5 μ g/mL	endosulfan II	10 μ g/mL
β -BHC	5	endosulfan sulfate	10
δ -BHC	5	endrin aldehyde	10
α -chlordane	5	endrin ketone	10
γ -chlordane	5	heptachlor epoxide (B)	5
4,4'-DDE	10		

In hexane, 1mL/ampul

	Each	5-pk.	10-pk.
	32298	32298-510	
w/data pack	32298-500	32298-520	32398

Restek's Rtx®-CLPesticides fused silica capillary column enables the analysis of all twenty organochlorine pesticides and their surrogates simultaneously. No longer are laboratories required to analyze these pesticides in two separate solutions. Call 800-356-1688 or 814-353-1300, ext. 4, for more information on column specifications and run conditions.

Organochlorine Pesticide Mix AB #1

aldrin	dieldrin
α -BHC	endosulfan I
β -BHC	endosulfan II
δ -BHC	endosulfan sulfate
γ -BHC (lindane)	endrin
α -chlordane	endrin aldehyde
γ -chlordane	endrin ketone
4,4'-DDD	heptachlor
4,4'-DDE	heptachlor epoxide (B)
4,4'-DDT	methoxychlor

200 μ g/mL ea. in hexane/toluene (1:1), 1mL/ampul

	Each	5-pk.	10-pk.
	32291	32291-510	
w/data pack	32291-500	32291-520	32391

Organochlorine Pesticide Mix AB #2

aldrin	8 μ g/mL	dieldrin	16 μ g/mL
α -BHC	8	endosulfan I	8
β -BHC	8	endosulfan II	16
δ -BHC	8	endosulfan sulfate	16
γ -BHC (lindane)	8	endrin	16
α -chlordane	8	endrin aldehyde	16
γ -chlordane	8	endrin ketone	16
4,4'-DDD	16	heptachlor	8
4,4'-DDE	16	heptachlor epoxide (B)	8
4,4'-DDT	16	methoxychlor	80

In hexane/toluene (1:1), 1mL/ampul

	Each	5-pk.	10-pk.
	32292	32292-510	
w/data pack	32292-500	32292-520	32392

Technical Chlordane, Toxaphene Solutions

Compound (1mL/ampul)	Solvent	μ g/mL	Individual	Individual w/data pack	5-pk.	5-pk. w/data pack	10-pk. w/data pack
chlordane (technical)	Hexane	1,000	32021	32021-500	32021-510	32021-520	32121
chlordane (technical)	Isooctane	5,000	32072	32072-500	32072-510	32072-520	32172
toxaphene	Hexane	1,000	32005	32005-500	32005-510	32005-520	32105
toxaphene	Isooctane	5,000	32071	32071-500	32071-510	32071-520	32171

CLP OLM 04.1 (04.2) Pesticides Reference Materials

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CLP Pesticides—Kits

KIT

Pesticide Kit #1

Complete for CLP 04.1 using Standard Mix A & B at 16 x CRQL with surrogates, Resolution Check Mix, & Performance Evaluation Mix with surrogates.

32000: Pesticide Surrogate Mix
32073: Resolution Check Mix w/surrogates
32074: Performance Evaluation Mix w/surrogates
32003: Pesticide Standard Mix A w/surrogates (16 x CRQL)
32004: Pesticide Standard Mix B w/surrogates (16 x CRQL)
32005: Toxaphene
32007: Aroclor® 1221
32008: Aroclor® 1232
32009: Aroclor® 1242
32010: Aroclor® 1248
32011: Aroclor® 1254
32039: Aroclor® 1016/1260
32017: Florisil® Cartridge Check Mix
32018: Pesticide Matrix Spike Mix

NEW

Kit

32402

Kit w/Data Pack

32402-500

KIT

Pesticide Kit #3

Calibration mixes only for CLP 04.1 using Standard Mix A & B at 16 x CRQL with surrogates.

32003: Pesticide Standard Mix A w/surrogates (16 x CRQL)
32004: Pesticide Standard Mix B w/surrogates (16 x CRQL)
32005: Toxaphene
32007: Aroclor® 1221
32008: Aroclor® 1232
32009: Aroclor® 1242
32010: Aroclor® 1248
32011: Aroclor® 1254
32039: Aroclor® 1016/1260

Kit

32404

Kit w/Data Pack

32404-500

KIT

Pesticide Kit #2

Complete for CLP 04.1 using Standard Mix A & B at 20 x CRQL without surrogates, Resolution Check Mix, & Performance Evaluation Mix without surrogates.

32000: Pesticide Surrogate Mix
32001: Resolution Check Mix
32002: Performance Evaluation Mix
32297: Pesticide Standard Mix A (20 x CRQL)
32298: Pesticide Standard Mix B (20 x CRQL)
32005: Toxaphene
32007: Aroclor® 1221
32008: Aroclor® 1232
32009: Aroclor® 1242
32010: Aroclor® 1248
32011: Aroclor® 1254
32039: Aroclor® 1016/1260
32017: Florisil® Cartridge Check Mix
32018: Pesticide Matrix Spike Mix

NEW

Kit

32403

Kit w/Data Pack

32403-500

KIT

Pesticide Kit #4

Calibration mixes only for CLP 04.1 using Standard Mix A & B at 20 x CRQL without surrogates.

32297: Pesticide Standard Mix A (20 x CRQL)
32298: Pesticide Standard Mix B (20 x CRQL)
32005: Toxaphene
32007: Aroclor® 1221
32008: Aroclor® 1232
32009: Aroclor® 1242
32010: Aroclor® 1248
32011: Aroclor® 1254
32039: Aroclor® 1016/1260

NEW

Kit

32405

Kit w/Data Pack

32405-500



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CLP OLM 04.1 (04.2) Pesticides Reference Materials

Aroclor® Solutions

Compound (1mL/ampul)	Solvent	µg/mL	Individual	Individual w/data pack	5-pk.	5-pk. w/data pack	10-pk. w/data pack
Aroclor® 1016	Hexane	1,000	32006	32006-500	32006-510	32006-520	32106
Aroclor® 1221	Hexane	1,000	32007	32007-500	32007-510	32007-520	32107
Aroclor® 1232	Hexane	1,000	32008	32008-500	32008-510	32008-520	32108
Aroclor® 1242	Hexane	1,000	32009	32009-500	32009-510	32009-520	32109
Aroclor® 1248	Hexane	1,000	32010	32010-500	32010-510	32010-520	32110
Aroclor® 1254	Hexane	1,000	32011	32011-500	32011-510	32011-520	32111
Aroclor® 1260	Hexane	1,000	32012	32012-500	32012-510	32012-520	32112
Aroclor® 1016/1260	Hexane	1,000	32039	32039-500	32039-510	32039-520	32139
Aroclor® 1016	Isooctane	200	32064	32064-500	32064-510	32064-520	32164
Aroclor® 1221	Isooctane	200	32065	32065-500	32065-510	32065-520	32165
Aroclor® 1232	Isooctane	200	32066	32066-500	32066-510	32066-520	32166
Aroclor® 1242	Isooctane	200	32067	32067-500	32067-510	32067-520	32167
Aroclor® 1248	Isooctane	200	32068	32068-500	32068-510	32068-520	32168
Aroclor® 1254	Isooctane	200	32069	32069-500	32069-510	32069-520	32169
Aroclor® 1260	Isooctane	200	32070	32070-500	32070-510	32070-520	32170
Aroclor® 1016/1260	Isooctane	200	32299	32299-500	32299-510	32299-520	32399

KIT

PCBs Kit #1

1,000µg/mL in hexane, 1mL/ampul. Includes one each of:

32006: Aroclor® 1016
32007: Aroclor® 1221
32008: Aroclor® 1232
32009: Aroclor® 1242
32010: Aroclor® 1248
32011: Aroclor® 1254
32012: Aroclor® 1260

Kit	Kit w/Data Pack
32089	32089-500

KIT

PCBs Kit #3

1,000µg/mL in hexane, 1mL/ampul. Includes one each of:

32007: Aroclor® 1221
32008: Aroclor® 1232
32009: Aroclor® 1242
32010: Aroclor® 1248
32011: Aroclor® 1254
32039: Aroclor® 1016/1260

NEW

Kit	Kit w/Data Pack
32400	32400-500

KIT

PCBs Kit #2

200µg/mL in isooctane, 1mL/ampul. Includes one each of:

32064: Aroclor® 1016
32065: Aroclor® 1221
32066: Aroclor® 1232
32067: Aroclor® 1242
32068: Aroclor® 1248
32069: Aroclor® 1254
32070: Aroclor® 1260

Kit	Kit w/Data Pack
32090	32090-500

KIT

PCBs Kit #4

200µg/mL in isooctane, 1mL/ampul. Includes one each of:

32065: Aroclor® 1221
32066: Aroclor® 1232
32067: Aroclor® 1242
32068: Aroclor® 1248
32069: Aroclor® 1254
32299: Aroclor® 1016/1260

NEW

Kit	Kit w/Data Pack
32401	32401-500

Can't locate the exact mixture you need?

**With over 3000 compounds in our inventory,
we can make any mixture to your specifications.**

Custom Reference Material Request Form

Copy, Complete, and Fax Back to:

the Analytical Reference Materials Department at 814-353-1309.

Name: _____ Date: _____

Company: _____

Address: _____

Phone #: _____ Fax #: _____ E-mail: _____

Solvent: _____ Volume per ampul: _____ # of ampuls: _____

Compound(s):	Concentration:	Documentation Required:
_____	_____	<input type="checkbox"/> Gravimetric records
_____	_____	<input type="checkbox"/> Full data pack
_____	_____	<input type="checkbox"/> Other: _____
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_____	_____	_____
_____	_____	Comments: _____
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Restek's Analytical Reference Materials Team



(standing left to right) Joe Moodler, Rick Parmely, Mary Ellen Wood, John Lidgett, Chris Cox, Diane Shaffer, Eric Steindl, Andrea Gill, Jason Martin, Scott Strohm, (seated at table) Denise Witherite, and Joe Tallon.

Restek's Customer Support—at your service!

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Our highly trained customer service team looks forward to working with you. We are here when you need to place an order, track a package, check the status of an open order, or request a price quote. We will suggest time- and money-saving options and are dedicated to getting your products to you **fast**. Because we know how busy you are, we will do whatever it takes to simplify your work. That's what having the best customer service in the business is all about!

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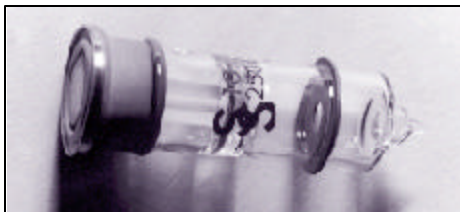
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Model 108-10.0/10.6



Model 108-BTEX

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Photoionization Detector (PID) Lamps

From the “Pioneers of PID”™

Restek offers Photoionization Lamps from the “Pioneers of PID,”™ Robert Gauthier and Scientific Services Co. The quality of these lamps are assured through testing of each lamp component during manufacturing, as well as testing of each assembled lamp’s performance prior to being shipped. In fact, these lamps are so good that the manufacturer supports their products with a “Guarantee of Three Months of Useful Life.”

Scientific Services Co. innovation continues with the introduction of the Model 108-BTEX lamp—the first new design since the introduction of the Model 108-10.0/10.6 in 1979. The BTEX lamp produces on average 33% more output than the workhorse Model 108-10.0/10.6.

Features & Benefits

Feature	Benefit
Longer life.	Get more for your money with each lamp.
More powerful 108-BTEX lamp.	Model 108-BTEX has 33% more output than older models.
Lamps individually tested.	Confidence that your lamp will work, right out of the box.
Variety of models available.	Best lamps available for most instrumentation.

Commonly Asked Questions

Will the new Model 108-BTEX fit as a replacement to my old Model 108-10.0/10.6?

Yes. The lamps are fully interchangeable. The Model 108-BTEX has identical dimensions as the Model 108-10.0/10.6.

What instruments can use PID lamps as general replacements?

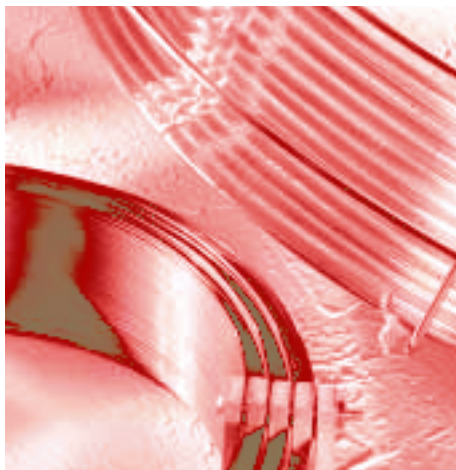
For Tracor, OI, and Baseline instruments, a lamp with a 0.781" diameter base must be used, such as Model 108-10.0/10.6 and Model 108-BTEX. For HNU and SRI detectors, a lamp with a 1.375" diameter base must be used, such as Model 103 C. Other PID lamps are available that offer different ionization potentials.

Should I clean my PID lamp?

Yes, cleaning the lamp is necessary because the window may become contaminated from stationary phase bleed and non-volatile residues. Cleaning the PID window enhances sensitivity by increasing the amount of ionization energy passing through the window to the sample. PID lamp windows must be cleaned by polishing with an aluminum oxide slurry.

Description	Cat. #
PID Lamp, Model 103 C (1.375" base)	20676
PID Lamp, Model 108-10.0/10.6 (0.781" base)	20675
PID Lamp, Model 108-BTEX (0.781" base)	23020
PID Lamp, Model 108-9.6 (0.781" base)	23021
PID Lamp, Model 107-8.4 (0.781" base)	23022
PID Lamp, Model 109-11.8 (0.781" base)	23023
PID Lamp Polishing Kit	20674

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What is the Rtx®/MXT®-5?

The nonpolar Rtx® and MXT®-5 columns are fused silica and Silcosteel®-lined stainless steel (respectively) capillary columns coated with a 5% diphenyl/95% dimethyl polysiloxane stationary phase.

Why use a 5% diphenyl/95% dimethyl polysiloxane phase?

The Rtx®/MXT®-5 column is the most popular and versatile capillary stationary phase available. The diphenyl groups impart a selectivity towards aromatic compounds. Rtx®/MXT®-5 columns are extremely rugged, exhibiting long column lifetime, low bleed, and high maximum operating temperatures.

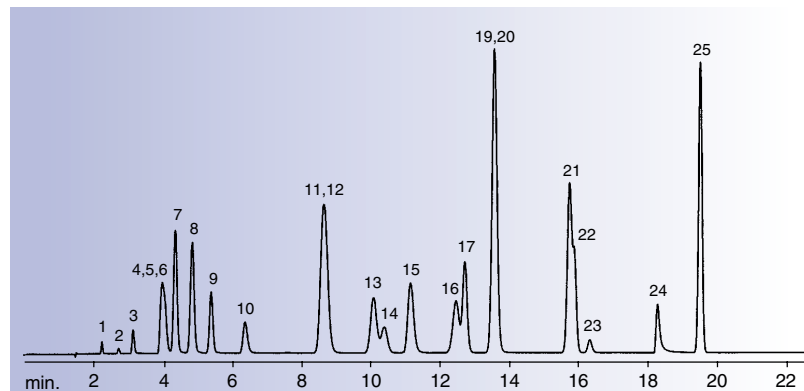
Which applications work well using an Rtx®/MXT®-5 column?

A 5% diphenyl phase is extremely versatile, permitting the analysis of nonpolar to polar compounds, and acidic to basic species, all in a single analysis. An Rtx®/MXT®-5 column is ideal for environmental analyses, such as semivolatile pollutants, phenols, polynuclear aromatic hydrocarbons, pesticides, herbicides, and diesel range organics (DRO). The Rtx®/MXT®-5 column exhibits excellent inertness towards highly reactive, trace environmental compounds and has low column bleed to improve detection limits and instrument sensitivity. The phase also is ideal for drugs of abuse and flavor analyses.

Rtx®-5/MXT®-5 Capillary Columns

5% diphenyl/95% dimethyl polysiloxane

The Rtx®-5 phase is extremely versatile and can be used for a wide range of applications, such as organic volatile impurities in residual solvents.



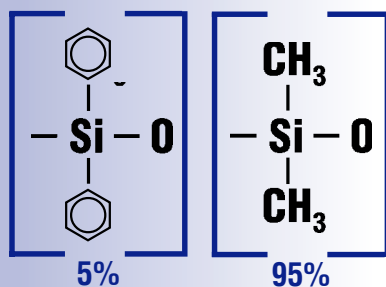
30m, 0.53mm ID, 5.0µm Rtx®-5 (cat.# 10279). 1mL headspace injection of 24 common residual solvents for pharmaceutical processing. Prepared to equal about 500ppm in the bulk pharmaceutical. Samples shaken and heated at 90°C for 15 minutes. **Oven temp.:** 35°C (hold 10 min.) to 100°C @ 5°C/min., to 240°C @ 25°C/min. (hold 5 min.); **Inj./det. temp.:** 220°C/240°C; **FID sensitivity:** 1.05 x 10⁻¹¹ AFS; **Carrier gas:** helium, 35cm/sec. set @ 35°C; **Split ratio:** 2:1.

- | | | | |
|-------------------|-------------------------|---------------------------|--------------------------|
| 1. methanol | 7. diethyl ether | 13. ethyl acetate | 19. carbon tetrachloride |
| 2. ethylene oxide | 8. 1,1-dichloroethene | 14. chloroform | 20. n-butanol |
| 3. ethanol | 9. methylene chloride | 15. tetrahydrofuran | 21. heptane |
| 4. acetonitrile | 10. n-propanol | 16. 1,1,1-trichloroethane | 22. trichloroethylene |
| 5. acetone | 11. methyl ethyl ketone | 17. 1,2-dichloroethane | 23. 1,4-dioxane |
| 6. isopropanol | 12. n-hexane | 18. benzene | 24. pyridine |
| | | | 25. toluene |

See our *Chromatography Products* catalog or visit www.restekcorp.com to see additional application chromatograms on the Rtx®/MXT®-5 columns!

Features & Benefits

Feature	Benefit
Fused silica & MXT® tubing	Tubing material versatility—same price regardless of tubing.
Low-bleed	Increased detector sensitivity, reduced system maintenance.
Application Specific Columns Rtx®-5MS	Low-bleed to improve GC/MS detection limits and reduce interference with trace analyte identification and detection.
Rtx®-5Sil MS	Optimized low-bleed GC/MS column for semivolatile pollutants.
Rtx®-5 Amine	Basic deactivation layer provides highest degree of inertness for primary amines and basic compounds.
Integra-Guard™ columns	Leak-free connection, protects column from non-volatile sample residue, longer column lifetime.

**FAST
FACTS**At-a-Glance
Product
Information
from Restek**Rtx[®]-5/MXT[®]-5**
5% diphenyl/95% dimethyl
polysiloxane**Similar Phases****J&W:**DB-5, DB-5.625, DB-5ht,
DB-5ms, SE-54**Supelco:**SPB-5, SAC-5, PTE-5
PTE-5 QTM, SE-54**Hewlett-Packard:**

HP-5, PAS-5, HP-5ms

Alltech:

AT-5, SE-54

SGE: BP-5, BPX-5**Chrompack:**

CP-Sil8CB, CP-Sil8CB MS

Quadrex: 007-2**Ohio Valley:** OV-5**Perkin-Elmer:** PE-2**USP Nomenclature:** G27, G36**Choosing the Best Phase for Your Sample**

When choosing a stationary phase for capillary GC separations, remember the saying “like dissolves like.” The stationary phase is a nonvolatile liquid coated on the inside walls of the column and acts as a solvent for the sample. The more soluble the solute or your analyte is in the stationary phase, the more retention it has in the column.

Separations in GC are the result of the relative solubility and selective interactions of the sample solute and column stationary phase. Table I shows the four main forces responsible for solute-stationary phase interactions. The sum of all four forces serves as a measure of the **polarity** of the stationary phase. **Selectivity** is the ability of a phase to preferentially retain one compound over another based on specific solute-stationary phase interactions and is determined by the type and amount of substituted functional groups in the stationary phase.

Table I: Selective Solute-Stationary Phase Interactions

Dispersion forces arise from electric intermolecular fields, which result in the induction of in-phase dipoles. They are present in all phases.

Orientation interactions occur between a stationary phase and a compound, both of which possess a permanent dipole.

Induction interactions occur between a stationary phase with a permanent dipole and a compound, which forms a dipole as a result of the interaction with the stationary phase.

Hydrogen bonding occurs between hydrogen contained in a compound and a stationary phase with a strong electronegative center (F, O, N).

Retention indices (RI) are used to measure the overall stationary phase polarity. (Retention indices on Rtx[®]/MXT[®]-5 columns are listed in Table II.) They are mathematical calculations used to indicate the elution point of a probe with respect to two hydrocarbons. The probes used to measure RI are of different functionalities, each one designated to measure a specific solute-stationary phase interaction. As the difference in RI for a probe on a given phase increases, the degree of specific interaction increases.

**Table II: 5% Diphenyl/95% Dimethyl Polysiloxane
Stationary Phase Retention Indices**

RI probe	RI	Measured interaction
benzene	667	Electron density for aromatic & olefinic hydrocarbons
<i>n</i> -butanol	667	Proton donor & acceptor capabilities (alcohols and nitriles)
2-pentanone	689	Proton acceptor interaction (ketones, ethers, esters, aldehydes)
nitropropane	743	Dipole interactions

Rtx[®]/MXT[®]-5 columns are nonpolar and coated with a 5% diphenyl/95% dimethyl polysiloxane stationary phase. The small percentage of phenyl groups impart an aromatic nature to this phase. Solute-stationary phase interactions occurring within the Rtx[®]/MXT[®]-5 column includes a strong dispersion interaction, plus a selectivity towards aromatic compounds. The Rtx[®]/MXT[®]-5 column can provide separations of aromatic compounds, such as aromatic hydrocarbons, flavor volatiles, and benzene/toluene/*o*-, *m*-, *p*-xylenes, that a 100% dimethyl polysiloxane stationary phase cannot.

In summary, when selecting a stationary phase, choose a phase with similar functional groups as those present in your analyte. For the most versatile, chemically inert, thermally stable stationary phase, select an Rtx[®]/MXT[®]-5 column. An Rtx[®]/MXT[®]-5 column is the column of choice for environmental, drugs of abuse and fragrance analyses.



Commonly Asked Questions

How do I know that an Rtx®-5/MXT®-5 phase will resolve my compounds of interest?

A 5% diphenyl/ 95% dimethyl polysiloxane stationary phase possesses a stronger dispersion interaction between the solute and stationary phase than a 100% dimethyl polysiloxane phase. Additionally, the 5% diphenyl substitution increases the selectivity towards aromatic compounds. If you cannot separate your compounds of interest on a methyl silicone column and they differ in functionality or boiling point by 5°C, the Rtx®/MXT®-5 column should provide separation.

What is the difference between an Rtx®-5 and an MXT®-5 column?

Rtx®-5 columns are made with polyimide-coated, fused silica tubing and deactivated with a nonpolar deactivation layer, resulting in the highest degree of tubing inertness. These columns possess a maximum operating temperature of 350°C. MXT®-5 columns are made from unbreakable Silcosteel®-treated stainless steel. The Silcosteel® process bonds a thin, flexible layer to the stainless steel surface, which offers comparable efficiency and inertness to fused silica tubing, with increased durability. MXT® columns are caged in 4-inch diameter coils or smaller, and are ideal for compact, portable, or process GCs.

Which type of Rtx®-5 column should I use for my analysis?

The Rtx®-5 is an all-purpose column for use with non-trace-level analyses (ppm levels and above) on FIDs, PIDs, ELCDs, and TCDs. It is recommended to use the Rtx®-5 for FID environmental work (TPH, DRO, screening column, etc.), for solvent and chemical analysis, flavor and fragrance analysis, and residual solvents in pharmaceutical products (USP <467>). Every Rtx®-5 column is tested with the temperature-programmed Grob test mixture to guarantee low bleed and a high degree of inertness, efficiency, and versatility.

The Rtx®-5MS is an all-purpose column designed for trace-level analyses (ppb to ppt concentrations) on sensitive GC detectors such as MSDs, ECDs, NPDs, SCDs, and FPDs, where it is important to maximize detector sensitivity. When a capillary column is connected to a sensitive detector, column bleed can cause a number of problems, such as misidentification of analytes, loss of detector sensitivity, and inaccurate quantitation. The combination of our MS column chemistry and rigorous QA testing ensures that each MS column exceeds the requirements of the most sensitive GC detectors. The Rtx®-5MS column is ideal for the analysis of drugs of abuse, clinical and forensic samples, arson analysis, and low-level purity analysis.

The XTI®-5 is an all-purpose 5% diphenyl/ 95% dimethyl polysiloxane environmental capillary column. It is tested for special bleed specifications at high temperature to ensure good environmental analyses of active components. It can be used with all common GC detectors.

The Rtx®-5Sil MS column is ideal for semivolatile pollutant analysis for EPA Methods 8270, 1625, 625, and 525. It offers superior inertness towards reactive phenols, such as pentachloro- and dinitrophenols, providing more accurate quantitation at low concentration levels. It also provides low GC/MS bleed and improved resolution of semivolatile pollutants.

The Rtx®-5Amine column is a nonpolar 5% diphenyl polysiloxane with a basic deactivation layer that reduces adsorption and improves response of basic compounds. Analyses of active basic compounds that previously required derivatization or another analytical technique can be performed on the Rtx®-5Amine. This column is ideal for analyzing a wide variety of basic compounds such as alkylamines, diamines, triamines, ethanolamines, and nitrogen containing heterocycles.

What is an Integra-Guard™ column?

An Integra-Guard™ column is a continuous length of fused silica tubing, containing both the guard column and the analytical column. No guard tubing is more leak-free than an Integra-Guard™ column! The guard column is tied separately from the analytical column using high-temperature string. The transition area between the columns is the point where the guard column ends and the analytical column begins. Just imagine, guard columns WITHOUT press-tight connections. Protecting your capillary column has never been easier!

Rtx®-5/MXT®-5 Columns

FAST FACTS

At-a-Glance
Product
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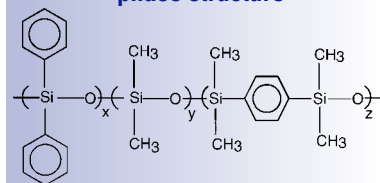
Column Selection Made Easy

1 Contact **Restek's Technical Service** at **800-356-1688** or **814-353-1300, ext. 4**. We have over 25 trained chemists with direct laboratory and applications experience, ready to assist you in choosing the best column.

2 Consult the applications section (over 135 pages of applications chromatograms) in **Restek's Chromatography Products Catalog**.

3 **ezGC™ software**: Restek has Retention Index Libraries that contain more than 3000 compounds analyzed on the most commonly used stationary phases, in 10 different application areas including: petroleum hydrocarbons, solvents & chemicals, flavors & fragrances, FAMES, pesticides, PCBs, dioxins/ furans, semivolatile, volatile, and drugs of abuse.

Rtx®-5Sil MS phase structure



Rtx®-5/MXT®-5 Columns**FAST
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Product
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from Restek

Rtx®-5 Columns
are available with
Integra-Guard™
built-in guard
columns.

Integra-Guard™ Columns

ID (mm)	Length (m)	Suffix #
0.25	5	-124
0.25	10	-127
0.32	5	-125
0.32	10	-128
0.53	5	-126
0.53	10	-129

See Restek's Chromatography
Products catalog for additional
product information, or visit
www.restekcorp.com.

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Lit. Cat. #59310**Product Listing****Rtx®-5 (fused silica) Crossbond® 5% diphenyl/95% dimethyl polysiloxane**

ID	df (μm)	temp. limits	15-Meter	30-Meter	60-Meter	105-Meter
0.25mm	0.10	-60 to 330/350°C	10205	10208	10211	10214
	0.25	-60 to 330/350°C	10220	10223	10226	10229
	0.50	-60 to 330/350°C	10235	10238	10241	10244
	1.00	-60 to 320/340°C	10250	10253	10256	10259
0.32mm	0.10	-60 to 330/350°C	10206	10209	10212	10215
	0.25	-60 to 330/350°C	10221	10224	10227	10230
	0.50	-60 to 330/350°C	10236	10239	10242	10245
	1.00	-60 to 330/350°C	10251	10254	10257	10260
	1.50	-60 to 310/330°C	10266	10269	10272	10275
0.53mm	3.00	-60 to 280/300°C	10281	10284	10287	10290
	0.10	-60 to 320/340°C	10207	10210	10213	
	0.25	-60 to 320/340°C	10222	10225	10228	
	0.50	-60 to 310/330°C	10237	10240	10243	
	1.00	-60 to 310/330°C	10252	10255	10258	
0.53mm	1.50	-60 to 310/330°C	10267	10270	10273	
	3.00	-60 to 270/290°C	10282	10285	10288	
	5.00	-60 to 270/290°C	10277	10279	10283	



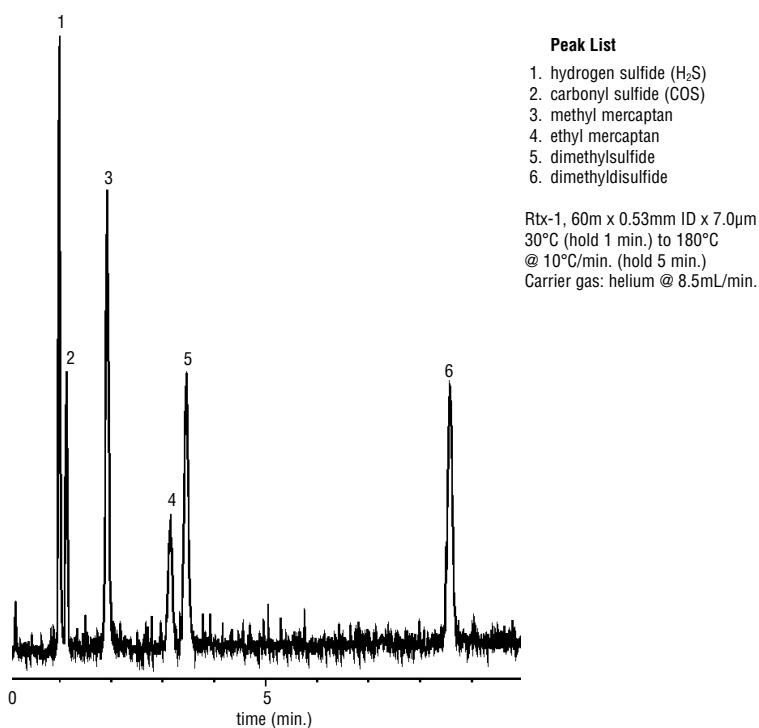
SilcoCan™ Canisters

Increases accurate sampling and analysis for low-level sulfur compounds!



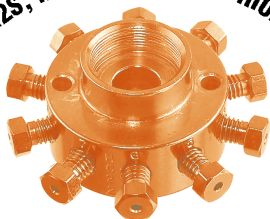
The SilcoCan™ air sampling canister is Restek's premier sampling container for the air sampling of sulfur-containing compounds. The SilcoCan™ canister has been optimized for holding samples with low ppb-levels of organo-sulfur species (**Figure 1**).

Figure 1—The SilcoCan™ canister demonstrates amazing stability for 10ppbv sulfur mix.



Compounds with low stability in the SilcoCan™ canister are bromoform and select brominated compounds. We recommend using our TO-Can™ air sampling canisters for these compounds. Request lit. cat. #59312 for more information on TO-Can™ canisters.

H₂S, MERCAPTANS, & THIOLS



SULFURS

Commonly Asked Questions

• Can I reuse the canister?

Yes. The high temperature limit of the SilcoCan™ canister and high-purity valve ensures that even heavily contaminated samples can be removed from your canister, leaving you ready for the next sample.

• Can the canister be reconditioned?

Yes. Call our customer service department at 814-353-1300 or 800-356-1688, ext. 3, or your local Restek representative to get approval and a return authorization number. Our qualified technicians will then thoroughly inspect your canister before quoting, and assess what level of service is needed to get your canister back into the field and performing at an optimum level.

(cont.)

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SilcoCan™ Canisters



At-a-Glance
Product
Information
from Restek

For More Information

- TO-Can™ Canisters Fast Facts (lit. cat.# 59312)
 - Silcosteel® Technology Applications (lit. cat. #59654)
 - Silcosteel® Information and Applications packet (lit. cat. #59616)
- Silcosteel®-Treated Tubing & Fittings Fast Facts (lit. cat. #59725)
- Silcosteel® Treatment for Sulfur Analysis Fast Facts (lit. cat. #59719)
- Sulfinert™ Coatings brochure (lit. cat.# 59203)

Restek is your free technical literature source!

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- Fax 800-353-1309
- Online at www.restekcorp.com

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• What is the full temperature range of the canister?

The SilcoCan™ air sampling canister can be used or cleaned in a temperature range of -100°C to 250°C.

• Where can I find Silcosteel®-coated air sampling kits for use with the SilcoCan™ canister?

Ask for information about our complete list of air sampling kits and their accessories including flow controllers, in-line filters, and passive tubing. See the Air Monitoring section of Restek's Product Guide.

Features & Benefits

Feature	Benefit
High purity, 2/3-turn valve with stainless steel valve diaphragms	No sample adsorption for more accurate results, easy to use.
Vacuum/pressure gauge optional	Readily indicates internal conditions.
Variety of sizes available	Meet a variety of sampling needs.
Temperature stability to 250°C	Can be cleaned at higher temperature, producing a cleaner can.
Silcosteel®-coated valve available	A complete, passive sample pathway ensures sample stability.
Silcosteel®-coated canisters	Inert surface is ideal for low-level sulfur sampling.

Product Listing

SilcoCan™ Air Sampling Canisters	
Description	Cat.#
1-liter	24112
3-liter	24113
6-liter	24114
15-liter	24115
1-liter, with gauge	24116
3-liter, with gauge	24117
6-liter, with gauge	24118
15-liter, with gauge	24119

Lit. Cat. #59311



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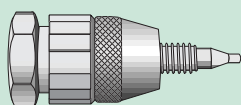
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Trident™ Direct Guard Column System

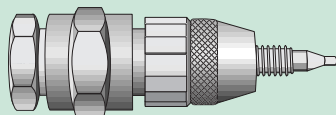
*Easy to Use, Low Dead Volume—
The Ultimate Combination of
Convenience and Column Protection*

**Trident™ Direct
provides three levels
of protection**



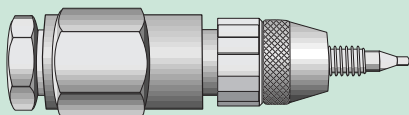
**Trident™ Direct high-pressure filter
cat. #25082**

Protection against particulate matter.



**Trident™ Direct 1cm guard
cartridge holder with filter
cat.#25084**

Protection against particulate matter
and sample impurities.



**Trident™ Direct 2cm
guard cartridge holder with filter
cat.#25086**

Protection against particulate matter
and heavily contaminated samples.

Unlike other “one size fits all” guard systems the **Trident™ Direct** system gives you the power to select the right level of protection for your analysis. The system offers three levels of protection and guard cartridges that are available in four dimensions with a variety of bonded phases to match your analytical column. The economical leak-free cartridge design provides an unprecedented combination of convenience, economy, and reliability.

Features & Benefits

Feature	Benefit
Direct connection	Easy installation that eliminates connection tubing and extra dead volume.
Three levels of protection	Provides the right protection for your needs.
Leak-free design	Smooth, reliable operation saves lab time.
Cartridge column design	Eliminates waste and saves money.

The foundation of the **Trident™ Direct** system is a reusable direct connect holder that easily attaches to any HPLC column using CPI- or Waters®-style end fittings.* The system is available in the following configurations to match different protection level needs: in-line filter, in-line filter with holder for 1cm guard cartridge, and in-line filter with holder for 2cm guard cartridge. The guard cartridges are available in both 2.1 and 4.0mm ID's and are interchangeable with the appropriate length holder.

*The standard PEEK® tip that comes with the **Trident™ Direct** systems is compatible with Parker®, Swagelok®, Upchurch®, Valco®, and other CPI-style fittings. To use the **Trident™ Direct** systems with Waters®-style end fittings, the tip must be replaced with cat.# 25088.

Commonly Asked Questions

• What level of protection do I need for my application?

For protection against particulate matter only, use the Trident™ Direct in-line filter. For protection against particulate matter and sample impurities, use the Trident Direct 1cm holder and 1cm guard cartridges. This is the most popular configuration and is well suited for most applications. For protection against particulate matter and heavily contaminated samples, use the Trident Direct 2cm holder and 2cm guard cartridges.

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Trident™ Direct

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Application notes:

- (#59511) Improved HPLC Analysis of Analgesics
- (#59512) The Ultra IBD Column Allows HPLC Separation of Polar and Non-Polar Analytes from the Same Sample
- (#59510) HPLC Stationary Phase Selection for the Analysis of Steroids
- (#59118) Allure™ PFP Propyl HPLC Column Provides Improved LC/MS Analyses of Basic Compounds

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• What internal diameter guard cartridge should I use?

If the ID of your analytical column is greater than 3.2 and less than 6mm, use a 4.0mm ID guard cartridge. If the ID of your analytical column is between 2.0 and 3.2mm, use a 2.1mm ID guard cartridge.

• Do I need a different size holder depending on the guard cartridge ID?

No, because all Trident™ guard cartridges have the same outer diameter, the holders will function with either 2.1 or 4.0 mm ID guard cartridges. The holder needed is dependent only on the length of the guard cartridge.

• Which guard cartridge should I use?

After you decide what level of protection and diameter guard cartridge is right for your application, you should choose the cartridge with a bonded phase that is the same or similar to your analytical column. The Allure™ and Ultra bonded phases are base-deactivated and compatible with virtually all silica-based analytical columns.

Trident™ Direct	cat.#
High-pressure filter	25082
1cm guard cartridge holder with filter	25084
2cm guard cartridge holder with filter	25086
Connection tip for Waters®-style end fittings	25088

Replacement Frits for the Trident™ Filter	qty.	cat.#
Cap Frits 4mm, 2.0µm:	5pk.	25022
Cap Frits 2mm, 2.0µm:	5pk.	25057

Guard Column Cartridges	(10 x 2.1mm) 3-pack	(10 x 4.0mm) 3-pack	(20 x 2.1mm) 2-pack	(20 x 4.0mm) 2-pack
Allure™ Acidix	916250212	916250210	916250222	916250220
Allure™ Basix	916150212	916150210	916150222	916150220
Allure™ C18	916450212	916450210	916450222	916450220
Allure™ PFP Propyl	916950212	916950210	916950222	916950220
Allure™ Silica	916050212	916050210	916050222	916050220
Ultra Amino	910750212	910750210	910750222	910750220
Ultra Aqueous C18	917850212	917850210	917850222	917850220
Ultra C1	910150212	910150210	910150222	910150220
Ultra C4	910250212	910250210	910250222	910250220
Ultra C8	910350212	910350210	910350222	910350220
Ultra C18	917450212	917450210	917450222	917450220
Ultra Cyano	910650212	910650210	910650222	910650220
Ultra IBD	917550212	917550210	917550222	917550220
Ultra PFP	917650212	917650210	917650222	917650220
Ultra Phenyl	910550212	910550210	910550222	910550220
Ultra Silica	910050212	910050210	910050222	910050220

Lit. Cat. # 59314

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Always use Sulfinert™-coated components when peak performance is required for your sulfur analyses.

What is Sulfinert™ Treatment?

The Sulfinert™ coating is the leading passivation technique for the storage and transfer of low-level, organo-sulfur-containing samples.

The Sulfinert™ coating is ideal for use in environmental, petrochemical, polymeric, high- and low-pressure environments. The Sulfinert™ layer is stable in a wide variety of pH ranges. Unlike fused silica coatings which can dissolve in a caustic environment, the Sulfinert™ coating is stable when sampling caustic amines as well as acidic sulfur compounds.

RESTEK 800-356-1688
814-353-1300
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Lit. Cat. # 59318A

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Sulfinert™ Coatings

For Sampling, Transfer, and Analysis of Sulfur Compounds to less than 20ppb

Restek is proud to offer Sulfinert™ coatings—the next generation of metal passivation coatings for low-level sulfur storage and transfer. Restek has been a pioneer in the development and the application of passive coatings since 1987, beginning with the introduction of our Silcosteel® treatment. Recently, new sulfur regulations and low detection limits have created a demand for an even more inert surface, so we created Sulfinert™ coatings.

Features & Benefits

Feature	Benefit
Inert	No adsorption of sulfur compounds.
Durable and flexible	Will not crack or flake.
Stable in a wide pH range	Sample amines and sulfur compounds without compromising compound stability.
Thermally stable	Usable to 600°C.
Non-polymeric	No memory effects as seen with Teflon®-coated parts.
Readily available	Treated tubing and fittings are in stock for immediate delivery.

Commonly Asked Questions

How is Sulfinert™ coating different from Silcosteel® coating?

Sulfinert™ coating has been proven to hold organo-sulfur compounds at lower concentrations than Silcosteel® coating under static sampling conditions. Sulfinert™ coating was developed specifically to sample or transfer organo-sulfur compounds at concentrations to less than 20ppb.

Why does Sulfinert™ coating work so well for sulfur compounds?

The Sulfinert™ layer is applied to the stainless steel surface and is completely inert to organo-sulfur compounds. Typically stainless steel will adsorb or react with sulfur compounds such as hydrogen sulfide and mercaptans. The Sulfinert™ layer will prevent sulfur compounds from contacting the reactive stainless surface.

Why use Sulfinert™ coatings instead of fused silica linings?

The Sulfinert™ coating can be used in a wide variety of pH ranges. Fused silica linings will become active when amines or other basic compounds are sampled because of a chemical reaction with the Si-O bond.

Is custom coating service available?

Restek offers custom service for parts in your sulfur analysis systems such as manifolds and valves. Combining this service with the stock Sulfinert™-treated parts offered by Restek will permit your entire sulfur system to be inert. Contact our technical service department at 800-356-1688 or 814-353-1300, ext. 4, to inquire about our custom Sulfinert™ service.

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for more Information...

For more information on Sulfinert™ coating,
request the following literature:

Sulfinert™ brochure (lit. cat.# 59203)

**Restek is your free
technical literature source!**

Call 800-356-1688 or 814-353-1300, ext. 5,
Fax 814-353-1309
Online at www.restekcorp.com

visit us online at 
www.restekcorp.com

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Sulfinert™ Sample Cylinders, Valves, and Rupture Discs

Sulfinert™ Sample Cylinders

Size	qty.	cat.#
75cc	ea.	24130
150cc	ea.	24131
300cc	ea.	24132
500cc	ea.	24133
1000cc	ea.	24134
2250cc	ea.	21394

Sulfinert™ Sample Cylinder Valves

Description	qty.	cat.#
1/4" NPT Exit, Kel-F Stem Tip	ea.	24127
1/4" Compression Exit, Kel-F Stem Tip	ea.	24128
1/4" Female NPT Outlet (built-in rupture disc)	ea.	21395

Sulfinert™ Rupture Disc Tee

Description (1/4" NPT connections)	qty.	cat.#
Sulfinert™ Rupture Disc Tee	ea.	21396
Replacement Rupture Disc (not coated)	ea.	24298

Sulfinert™ Gas Sampling Valves and Sample Loops

Sulfinert™ Gas Sampling Valves, 1/16" fittings, 0.40mm port diameter; "W Type" valve

Description	qty.	cat.#
Sulfinert™ Gas Sampling Valve; 4-Port	ea.	20584
Sulfinert™ Gas Sampling Valve; 6-Port	ea.	20585
Sulfinert™ Gas Sampling Valve; 10-Port	ea.	20586

Replacement Rotors

Description	qty.	cat.#
For 4-Port Sulfinert™ Gas Sampling Valve	ea.	20587
For 6-Port Sulfinert™ Gas Sampling Valve	ea.	20588
For 10-Port Sulfinert™ Gas Sampling Valve	ea.	20589

Sulfinert™ Gas Sample Loops, 1/16" fittings, for "W Type" valves

Sizes	qty.	cat.#
5µL	ea.	22840
10µL	ea.	22841
20µL	ea.	22842
25µL	ea.	22843
50µL	ea.	22844
100µL	ea.	22845
250µL	ea.	22846
500µL	ea.	22847
1cc	ea.	22848
2cc	ea.	22849
5cc	ea.	22850

Coiled Sulfinert™ Tubing Price-per-foot by length

Sulfinert™ Welded 304 Grade Stainless Steel Tubing

ID	OD	cat.#
0.011" (0.28mm)	0.022" (0.56mm)	22500
0.021" (0.53mm)	0.029" (0.74mm)	22501
0.010" (0.25mm)	1/16" (1.59mm)	22502
0.020" (0.51mm)	1/16" (1.59mm)	22503
0.030" (0.76mm)	1/16" (1.59mm)	22504
0.040" (1.02mm)	1/16" (1.59mm)	22505
0.085" (2.16mm)	1/8" (3.18mm)*	22506
0.210" (5.33mm)	1/4" (6.35mm)*	22507

Sulfinert™ Seamless 316 Grade Stainless Steel Tubing

ID	OD	cat.#
0.055" (5.33mm)	1/8" (3.18mm)**	22508
0.180" (4.57mm)	1/4" (6.35mm)**	22509

0.020" Wall Thickness

**0.035" Wall Thickness



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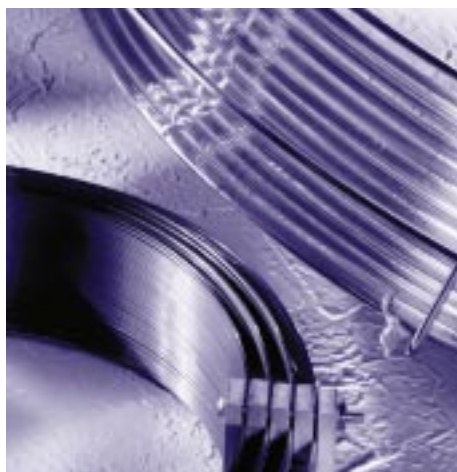
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For a complete
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air monitoring
product listing,
call and request a
copy of the **Restek**
chromatography
products catalog.





Rtx[®]-CLPesticides Capillary Columns



Why use an Rtx[®]-CLPesticides column?

The Rtx[®]-CLPesticides columns overcome the coelution and component breakdown problems that commonly occur in chlorinated pesticide analysis. These columns provide baseline resolution of target analytes, yielding more accurate qualitative data without GC/MS detection. An analysis time of under 25 minutes can increase sample throughput by 15% compared to other columns. The Rtx[®]-CLPesticides columns do not have the problems associated with cyanopropyl phases, such as on-column breakdown of methoxychlor and DDT, and low maximum operating temperatures. They have a high maximum operating temperature (330°C), which allows bake-out of high-boiling contaminants, and extends column lifetime, minimizes baseline instability, and reduces instrument maintenance.

Which applications work well using Rtx[®]-CLPesticides columns?

These stationary phases are highly selective for compounds that contain electronegative substituents (halogenated compounds). The Rtx[®]-CLPesticides columns not only work well for chlorinated pesticides, but also for chlorophenoxy herbicides, triazine herbicides, haloacetic acids, and Aroclor[®] mixtures.

What are the Rtx[®]-CLPesticides/Rtx[®]-CLPesticides2 columns?

The Rtx[®]-CLPesticides/Rtx[®]-CLPesticides2 columns are fused silica capillary columns coated with a unique stationary phase specifically designed to provide the best separation of chlorinated pesticides. The Rtx[®]-CLPesticides/Rtx[®]-CLPesticides2 columns are used in parallel for simultaneous quantitation and confirmation by gas chromatography/electron capture detection (GC/ECD). The Rtx[®]-CLPesticides/Rtx[®]-CLPesticides2 columns are intermediate polarity columns.

Features & Benefits

Feature	Benefit
Unique phase	<i>Baseline resolution of pesticides in fast analysis time; better resolution than other available phases; improved qualitative and quantitative reliability.</i>
Exceptional inertness	<i>No on-column breakdown of sensitive pesticides; reduces GC and column maintenance.</i>
High thermal stability	<i>Permits column bake-out to remove high-boiling contaminants; reduces contaminant interferences with target analytes; decreases ECD bleed; reduces system maintenance.</i>

Optimizing the analysis of pesticides using the Rtx[®]-CLPesticides column pair

In the environmental industry, analytical methods for chlorinated pesticides often are the most challenging to perform. Analysts struggle with linearity, breakdown, and lengthy calibrations; as well as column bleed, column reactivity, and poor separation. Not only do the labs keep track of resolution requirements and breakdown performance criteria, but they also analyze extracts that usually contain high-boiling contaminants. While these contaminants do not always appear in the GC/ECD chromatogram, they can cause shifts in retention time, elevated baselines, and target compound breakdown.

Pesticide methods generally are analyzed using two columns of different polarity to provide confirmation and increase confidence in reporting the presence of target analytes. To reduce analysis times, many labs prefer to run both columns simultaneously using the same run conditions. However, this can be difficult because the run conditions for one column may not be optimum for the second, confirmation column.

Although dual-column analyses can be set up several different ways, Restek recommends a dual-column system where the sample is injected into a single injection port via direct injection, vaporized in a hot injection port liner, transferred onto a 5m Siltek[™] guard column, and split onto the two columns using a glass "Y" splitter. Siltek[™] deactivation provides the best inertness for chlorinated pesticide analysis, minimizes endrin breakdown, and the 5m length allows enough of a retention gap so that the sample is split evenly between the two columns. In a conventional direct injection port using a Uniliner[®] glass sleeve, the guard column is connected with a press-tight seal at the bottom of the liner. This type of injection port set-up eliminates contact of the analytes with the active metal sur-



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Compound	Retention Time (min.)
1. 2,4,5,6-tetrachloro- <i>m</i> -xylene	9.34
2. -BHC	10.93
3. -BHC	11.78
4. -BHC	12.02
5. -BHC	12.47
6. heptachlor	13.01
7. aldrin	13.74
8. heptachlor epoxide	15.16
9. -chlordane	15.45
10. -chlordane	15.75
11. 4,4'-DDE	15.92
12. endosulfan I	16.05
13. dieldrin	16.59
14. endrin	17.09
15. 4,4'-DDD	17.22
16. endosulfan II	17.59
17. 4,4'-DDT	17.83
18. endrin aldehyde	18.48
19. methoxychlor	18.87
20. endosulfan sulfate	19.42
21. endrin ketone	20.03
22. decachlorobiphenyl	22.19

On-column concentration: 16-160pg
Organochlorine Pesticide Mix AB#2 (cat.# 32292)
Oven program: 120°C (hold 1 min.) to 300°C @ 9°C/min. (hold 10 min.)
Inj. port: Direct injection using a Uniliner® sleeve (cat.# 20335) at 200°C
Detector: ECD at 300°C with Anode Purge
Dead time: 1.9 minutes
Head pressure: 8.7psi (constant)
Flow rate: He @ 1.3mL/min. @ 120°C

Compound	Retention Time (min.)
1. 2,4,5,6-tetrachloro- <i>m</i> -xylene	9.75
2. -BHC	11.53
3. -BHC	12.48
4. -BHC	12.70
5. -BHC	13.44
6. heptachlor	13.59
7. aldrin	14.37
8. heptachlor epoxide	15.72
9. -chlordane	16.15
10. -chlordane	16.48
11. 4,4'-DDE	16.85
12. endosulfan I	16.61
13. dieldrin	17.22
14. endrin	17.90
15. 4,4'-DDD	18.11
16. endosulfan II	18.36
17. 4,4'-DDT	18.79
18. endrin aldehyde	19.09
19. methoxychlor	20.25
20. endosulfan sulfate	19.69
21. endrin ketone	20.87
22. decachlorobiphenyl	23.84

On-column concentration: 16-160pg
Organochlorine Pesticide Mix AB#2 (cat.# 32292)
Oven program: 120°C (hold 1 min.) to 300°C @ 9°C/min. (hold 10 min.)
Inj. port: Direct injection using a Uniliner® sleeve (cat.# 20335) at 200°C
Detector: ECD at 300°C with Anode Purge
Dead time: 1.9 minutes
Head pressure: 8.7psi (constant)
Flow rate: He @ 1.3mL/min. @ 120°C

faces below the bottom of the liner. Although a splitless injection also can be made, the direct injection method provides the best reproducibility, while achieving the required detection limits and minimizing instrument maintenance.

The most common phases used for dual-column pesticide analysis are cyanopropyl stationary phases (1701 columns) and phenyl/methyl phases (5, 35, 50 columns). 1701 columns resolve the pesticides well, but have several limitations: they are prone to on-column breakdown of DDT and methoxychlor as a result of degradation of the stationary phase, and have relatively low maximum operating temperatures (275°C).

Various phenyl/methyl phases also can be used for dual-column pesticide analysis, such as a 5% phenyl/phenyl primary column and a 35% or a 50% phenyl/methyl confirmational column. While each of these phases has a higher maximum operating temperature and is less reactive than the cyano phases, they all have target compounds that coelute to some extent.

Figure 1: The Rtx®-CLPesticides column (30m, 0.32mm ID, 0.50µm) provides baseline resolution of 22 chlorinated pesticides in EPA Method 8081 in less than 23 minutes.

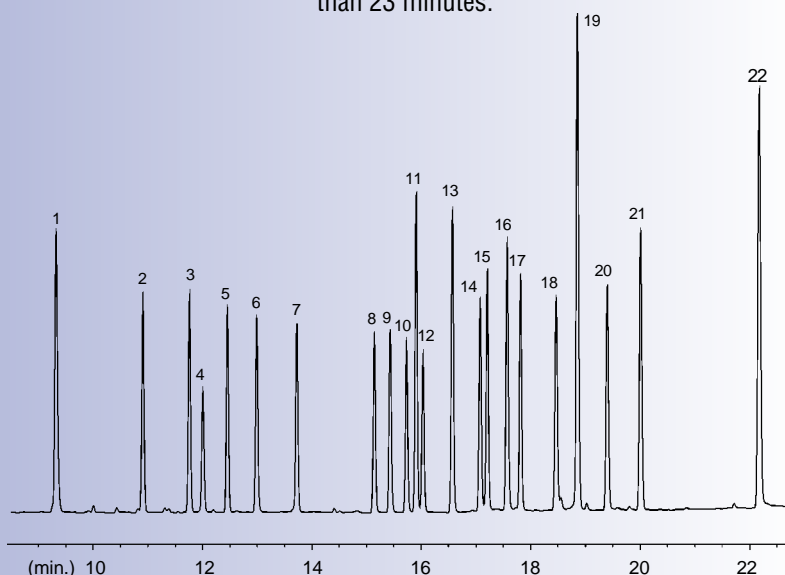
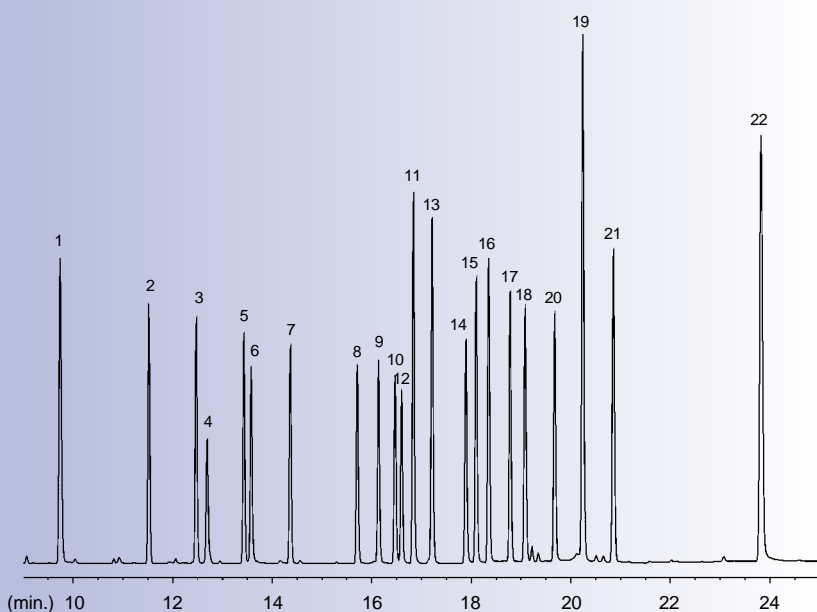


Figure 2: The Rtx®-CLPesticides2 column offers 4 elution order changes, making it the ideal confirmational column.



Rtx®-CLPesticides columns simplify pesticide analyses

The introduction of the Rtx®-CLPesticides and the Rtx®-CLPesticides2 columns has simplified the choice of phase for pesticide analysis. Both columns achieve baseline resolution under identical run conditions for the 22 common chlorinated pesticides as listed in US Environmental Protection Agency (EPA) Methods 8081, CLP, and 608, thus permitting simultaneous dual-column confirmation (Figures 1 and 2). In addition to their separating ability, the Rtx®-CLPesticides columns have a maximum operating temperature of 330°C and feature low column bleed after conditioning. Also, when using cyanopropyl-phase or phenyl-phase columns, laboratories typically must calibrate using 5-point curves, injecting mix A and mix B compounds separately because the target compounds coelute. Because no coelution problems occur with the Rtx®-CLPesticides column pair, the mixes can be combined. This eliminates the need for at least five injections during the calibration of the instrument, which may free a minimum of 2.5 hours a day to analyze more samples.

Although the Rtx®-CLPesticides columns are available in all three common ID dimensions, Restek recommends the 0.32mm ID column. This column ID provides the best combination of sample capacity and efficiency. If your sample extracts are particularly contaminated, you may find that the 0.53mm ID columns allow for longer duration of calibration because of the higher capacity. Columns of 0.25mm ID provide better resolution, but have less capacity for contaminated or large samples.



Commonly Asked Questions

How can I minimize endrin and DDT breakdown on my pesticides system?

The major source of analytical problems in pesticide analyses occur in the injection port—it is important to maintain the cleanliness and inertness of this area. Two compounds used to check injection port inertness are 4,4'-DDT and endrin. 4,4'-DDT breakdown is generally indicative of an injection port contaminated by oily or dirty sample extracts. Replacing the liner and cutting off 6 to 12 inches of the guard column usually is required to restore system inertness. Use GPC or carbon column cleanup to remove hydrocarbon contamination. Endrin breakdown is indicative of a chemical reaction taking place in the injection port. Endrin breakdown can be caused by impurities in the carrier gas, active metal surfaces, an improperly deactivated inlet liner, or septum particles. Proper and frequent injection port maintenance will help keep endrin breakdown to a minimum. Endrin breakdown also can be significantly reduced by using Siltek™ guard tubing and inlet liners in the injection port. Siltek™ deactivation provides the highest degree of inertness towards pesticides and typically shows a <1% breakdown of endrin.

What other analyses can I run on the Rtx®-CLPesticides and Rtx®-CLPesticides2 columns?

The Rtx®-CLPesticides columns also can be used for US EPA Method 508 pesticides, 8151 chlorophenoxy herbicides, 619 triazine herbicides, 552 haloacetic acids, and PCBs (Aroclors or congeners) which typically are analyzed using the same instrument as that used for chlorinated pesticides. The optimized phases of the Rtx®-CLPesticides and Rtx®-CLPesticides2 columns allow one column pair and the same instrument for several different environmental analyses, thereby increasing the versatility and usability of your pesticide GC.

What is the proper way to condition the Rtx®-CLPesticides column pair for the lowest ECD bleed?

Although the Rtx®-CLPesticides columns are pre-conditioned at Restek, we recommend re-conditioning the columns before analyzing samples. To properly condition a new Rtx®-CLPesticides or Rtx®-CLPesticides2 column, install the column into the injection port, cap off the ECD, set the appropriate column flow rate (1.3mL/min. for helium carrier gas), temperature program the GC from 40°C to 330°C @ 15°C/min., and condition the columns out of the detector overnight. After conditioning, cool the oven, install the columns into the ECDs and re-condition in the detectors at 310°C for one hour.

Rtx®-CLPesticides Columns

FAST FACTS

At-a-Glance
Product
Information
from Restek

Column Selection Made Easy

1 Contact **Restek's Technical Service** at 800-356-1688 or 814-353-1300, ext. 4, or contact your local Restek representative. We have over 25 trained chemists with direct laboratory and applications experience, ready to assist you in choosing the best column.

2 Consult the applications section (over 135 pages of applications chromatograms) in **Restek's Chromatography Products Catalog**.

3 **ezGC™ software:** Restek has Retention Index Libraries that contain more than 3000 compounds analyzed on the most commonly used stationary phases, in ten different application areas including:

- Petroleum hydrocarbons
- Solvents and chemicals
- Flavors and fragrances
- FAMES
- Pesticides
- PCBs
- Dioxins/Furans
- Semivolatile
- Volatile
- Drugs of abuse

See Restek's Chromatography Products catalog for additional product information, or visit www.restekcorp.com.



At-a-Glance
Product
Information
from Restek

**For more detailed information
on pesticide analysis,
Request this Restek literature:**

- *Guide to Preparing and Analyzing Chlorinated Pesticides* (#59892)
- *GC Analysis of US EPA Method 619 Triazine Herbicides Using the Rtx[®]-CLP Columns* (#59101)
- *Rtx[®]-CLPesticides Columns: The Ideal Confirmational Pair for Analyzing Polychlorinated Biphenyls (PCBs)* (#59120)
- *Environmental SPE Graphitized Carbon Using Black SPE Tubes* (#59543)
- *CarboPrep[™] SPE Cleanup of Method 8081A Chlorinated Pesticides* (#59110)
- *CarboPrep[™] Cleanup of Chlorinated Pesticides in Hazardous Wastes* (#59103)
- *Siltek[™] Brochure* (#59803)

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Lit. Cat. #59320

I have been using one of the traditional phases for my pesticide analysis. What are some of the troublesome pesticide separations on these phases and how does the Rtx[®]-CLPesticides column pair overcome these?

Rtx[®]-CLPesticides and Rtx[®]-CLPesticides2 columns: Both columns provide baseline separation of the 22 chlorinated pesticides listed in EPA Method 8081 within 24 minutes. Maximum operating temperature is 330°C.

5% phenyl phase: Difficult separation of -BHC/ -BHC, endosulfan I/ -chlordane, and 4,4'-DDE/dieldrin. Analysis time is 32 minutes. Maximum operating temperature is 330°C.

35% phenyl phase: Difficult separation of -BHC/aldrin and -chlordane/endosulfan I. Analysis time is 26 minutes. Maximum operating temperature is 310°C.

1701 cyanopropyl phase: Baseline resolution of 22 pesticides in US EPA Method 8081. Analysis time is 28 minutes. Maximum operating temperature is 280°C. May see on-column breakdown of DDT and methoxychlor as a result of degradation of the stationary phase.

50% phenyl phase: Difficult separation of -chlordane/endosulfan I. Analysis time is 25 minutes. Maximum operating temperature is 310°C.

Product Listing

Rtx [®] -CLPesticides (fused silica)						
ID	df (µm)	Temp. Limits	10-Meter	15-Meter	20-Meter	30-Meter
0.18mm	0.18	-60 to 310/330°C	42101	—	42102	—
0.25mm	0.25	-60 to 310/330°C	—	11120	—	11123
0.32mm	0.50	-60 to 310/330°C	—	11136	—	11139
0.53mm	0.50	-60 to 310/330°C	—	11137	—	11140

Rtx [®] -CLPesticides2 (fused silica)						
ID	df (µm)	Temp. Limits	10-Meter	15-Meter	20-Meter	30-Meter
0.18mm	0.14	-60 to 310/330°C	42301	—	42302	—
0.25mm	0.20	-60 to 310/330°C	—	11320	—	11323
0.32mm	0.25	-60 to 310/330°C	—	11321	—	11324
0.53mm	0.42	-60 to 310/330°C	—	11337	—	11340

Rtx[®]-CLPesticides Kits (Note: columns are not preconnected in these kits)

0.53mm ID Rtx [®] -CLPesticides Kit		cat.# 11197
<i>Includes:</i>		
30m, 0.53mm ID, 0.50µm Rtx [®] -CLPesticides Column		cat.# 11140
30m, 0.53mm ID, 0.42µm Rtx [®] -CLPesticides2 Column		cat.# 11340
Siltek [™] Universal Angled 'Y' Press-Tight [®] Connector		cat.# 20487
5m, 0.53mm ID Siltek [™] Guard Column		cat.# 10028
0.32mm ID Rtx [®] -CLPesticides Kit		cat.# 11198
<i>Includes:</i>		
30m, 0.32mm ID, 0.50µm Rtx [®] -CLPesticides Column		cat.# 11139
30m, 0.32mm ID, 0.25µm Rtx [®] -CLPesticides2 Column		cat.# 11324
Siltek [™] Universal Angled 'Y' Press-Tight [®] Connector		cat.# 20487
5m, 0.32mm ID Siltek [™] Guard Column		cat.# 10027
0.25mm ID Rtx [®] -CLPesticides Kit		cat.# 11199
<i>Includes:</i>		
30m, 0.25mm ID, 0.25µm Rtx [®] -CLPesticides Column		cat.# 11123
30m, 0.25mm ID, 0.20µm Rtx [®] -CLPesticides2 Column		cat.# 11323
Siltek [™] Universal Angled 'Y' Press-Tight [®] Connector		cat.# 20487
5m, 0.25mm ID Siltek [™] Guard Column		cat.# 10026



GC Column Connectors

Leak-free seals for reliable connections



**Press-Tight® Connectors are available with Siltek™ deactivation, which features high temperature stability, extreme durability, and low bleed. Ask us about Siltek™ deactivation when you order.*



Vu-Union® **Helping Hand**

The Helping Hand is included with all Vu-Union® connectors and makes assembly very easy!



Connecting two pieces of fused silica tubing is a necessary task for gas chromatographers. This includes connecting a guard column to an analytical column, or connecting a column to a mass spectrometer (MS) transfer line. No matter what the connection, the ultimate goal is to ensure a leak-free seal without causing dead volume. Restek connectors can help accomplish this goal easily.

Press-Tight® Connectors*

- One connector fits all standard Restek tubing outer diameters.
- Taper sealing mechanism means no dead volume, leak-free seal.
- Quick to install; saves time.
- Many configurations available.
- Stable to 325°C.

To order, call 800-356-1688 or 814-353-1300, ext. 3, or your local Restek representative.

The Press-Tight® connector is one of the most commonly used products for joining two pieces of fused silica tubing. When used correctly, the Press-Tight® connector creates a leak-free seal between fused silica tubing without dead volume. Press-Tight® connectors are available in a straight configuration, which traditionally is used for connecting a guard column to an analytical column; a 'Y' configuration for connecting a guard column to two analytical columns; and an 'X' configuration for special connection needs. The straight connector and 'Y' connector also are available in an angled configuration to lessen the strain on the fused silica tubing.

Vu-Union® Connectors



- Taper sealing mechanism means no dead volume, leak-free seal.
- Added benefit of a mechanical seal so the connection won't separate.
- Vacuum model available for MS applications.
- 'Y' configuration also available.

The Vu-Union® connector uses a glass taper seal identical to that of the Press-Tight® connector, thus achieving a leak-free seal without dead volume. It also provides a mechanical seal that prevents the column from moving or separating, thus giving extra reliability for critical applications such as MS.

The Vu-Union® connector is available in two configurations:

- **Standard**—joins tubing using graphite ferrules.
- **Vacuum**—for applications like MS; uses a Vespel®/graphite ferrule.

There is a standard, straight Vu-Union® connector for joining a guard column to an analytical column, and a 'Y' Vu-Union® connector for joining a guard column to two analytical columns.



800-356-1688
814-353-1300

0.33/0.74mm Vu-Union® Connector:

cat.# 20418 (ea.)

Replacement Inserts:

'Y' Vu-Union® Connector:

cat.# 20432 (ea.)

Replacement Inserts:

(ea.); cat.# 20434 (3-pk.)



GC Column Connectors

**FAST
FACTS**

At-a-Glance
Product
Information
from Restek

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literature source!*

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- Online at www.restekcorp.com

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MXT® Low Dead Volume Connectors

- Stainless steel construction means no more breakage.
- Silcosteel®-treated for inertness, causes no peak tailing.
- Low dead volume minimizes peak tailing.
- Connects metal capillary tubing or fused silica capillary tubing.



Restek has applied the Silcosteel® metals passivation coating to the surface of a low dead volume connector to provide an inert, durable connection for metal and fused silica tubing. The MXT® low dead volume connector features a 1/32" union that uses

metal ferrules for metal tubing and Valcon® polyimide ferrules for fused silica tubing. The MXT® low dead volume connector is also available from Restek in a 'Y' configuration.

MXT® Low Dead Volume Connector:

for 0.28mm ID MXT® columns: cat.# 20397 (ea.)

for 0.53mm ID MXT® columns: cat.# 20394 (ea.)

MXT® Low Dead Volume 'Y' Connector:

for 0.28mm ID MXT® columns: cat.# 20396 (ea.)

for 0.53mm ID MXT® columns: cat.# 20395 (ea.)

Ferrules for Connecting Fused Silica Capillaries:

1/32" Adaptor, 5-pk.			
Tubing OD (mm)	Tubing ID (mm)	Valco® #	Valcon® Polyimide
0.25-0.4	0.25	FS.4-5	20137, (5-pk.)
0.4-0.5	0.32	FS.5-5	20140, (5-pk.)
0.5-0.8mm	0.53	FS.5V-5	20141, (5-pk.)

1/32" Stainless Steel Replacement Ferrules for MXT® Connectors

Ferrule ID (mm)	Fits Column ID (mm)	cat.#
0.59	0.28	20398, (10-pk.)
0.79	0.53	20399, (10-pk.)

The Gerstel GRAPHPACK® Connectors

- Metal jacket graphite ferrule is ideal for connecting metal or fused silica tubing.
- Advanced technology creates a leak-free, low dead volume connection.
- Quick and reliable connections decrease down-time.



The central component of this connector is a metal-jacketed graphite ferrule. The Gerstel GRAPHPACK® connector can be used for connecting metal capillary columns to fused silica capillary columns.

GRAPHPACK® 3D/2 Connector**

(0.25mm to 0.32mm):

cat.# 20272 (ea.)

GRAPHPACK® 3D/2 Connector**

(0.7mm to 0.45mm):

cat.# 20273 (ea.)

**Use only with GRAPHPACK® 3D/2 ferrules.

Lit. Cat. #59325

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FAST FACTS

At-a-Glance
Product
Information
from Restek

US Environmental Protection Agency (EPA) Method 8270D outlines the analysis of semi-volatile organic pollutants in solid waste, soil, water, and air matrices using gas chromatography/mass spectrometry (GC/MS). Update IVA of the third edition of SW-846—Test Methods for Evaluating Solid Waste, Physical/Chemical Methods—includes EPA Method 8270D, in which there were no major revisions from EPA Method 8270C.

Restek chemists have carefully reviewed EPA methods 8270C and 8270D, and prepare analytical reference materials to include all of the most commonly calibrated compounds. The compounds have been grouped to provide flexibility, convenience, and maximum stability. Restek also offers all the required surrogate, internal standard, calibration check, matrix spike, and tuning mixtures required for these methods.

For more information,
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or
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Semivolatile Organic Reference Materials

US EPA Methods 8270D/Appendix IX Target Compounds

Feature	Benefit
<ul style="list-style-type: none"> Carefully researched formulations. Data packs available. Calibration mixes available in two independent lots. 	<ul style="list-style-type: none"> Fewest solutions compatible with maximum shelf life and no chemical interactions. Complies with stringent audits. Assured agreement, ordering convenience.
8270C calibration mixtures are subdivided into separate solutions. These are:	
8270 MegaMix™ 76 components @ 1000µg/mL in methylene chloride:benzene (75:25), 3- & 4-methylphenol @ 500µg/mL, 1mL/ampul cat.# 31686	Calibrate for all components in one analysis – 3- & 4-methylphenol included at 1/2 concentration of other components. 18-month shelf life.*
8270 Matrix Spike Mix 76 components @ 200µg/mL in methanol:methylene chloride:benzene (80:15:5), 3- & 4-methylphenol @ 100µg/mL, 5mL/ampul cat.# 31687	Calibrate for all components in one analysis – 3- & 4-methylphenol included at 1/2 concentration of other components. 18-month shelf life.*
8270 Benzidines Mix 3 components @ 2000µg/mL in methanol, 1mL/ampul cat.# 31688	Contains commonly analyzed 8270C benzidine compounds. 37-month shelf life.*
605 Benzidines Calibration Mix 2 components @ 2000µg/mL in methanol, 1mL/ampul cat.# 31030	Contains commonly analyzed 8270C benzidine compounds. 36-month shelf life.*
Appendix IX Mix #1 18 basic compounds @ 2000µg/mL in methylene chloride, 1mL/ampul cat.# 31625	Most commonly analyzed Appendix IX basic compounds; add only as needed. 24-month shelf life.*
Appendix IX Mix #2 32 components @ 2000µg/mL in benzene:methylene chloride (75:25), 1mL/ampul cat.# 31806	Most commonly analyzed Appendix IX compounds; add only as needed. 12-month shelf life.*
Organophosphorous Pesticide Mix, 8270/Appendix IX 9 organophosphorous pesticides @ 2000µg/mL in methylene chloride, 1mL/ampul cat.# 32419	Most commonly analyzed 8270C/Appendix IX organophosphorous compounds; add only as needed. 36-month shelf life.*
Organochlorine Pesticide Mix AB #3 20 organochlorine pesticides @ 2000µg/mL in hexane:toluene (1:1), 1mL/ampul cat.# 32415	Most commonly analyzed 8270C/Appendix IX organochlorine pesticides; add only as needed. 37-month shelf life.*
Organochlorine Pesticide Mix AB #1 20 organochlorine pesticides @ 200µg/mL in hexane:toluene (1:1), 1mL/ampul cat.# 32291	Most commonly analyzed 8270C/Appendix IX organochlorine pesticides; add only as needed. 37-month shelf life.*
Organochlorine Pesticide Mix AB #2 20 organochlorine pesticides @ 8-80µg/mL in hexane:toluene (1:1), 1mL/ampul cat.# 32292	Most commonly analyzed 8270C/Appendix IX organochlorine pesticides; add only as needed. 37-month shelf life.*

*Shelf life is based on an unopened ampul stored at the recommended temperature.

Semivolatile Organic Reference Materials

8270 MegaMix™ (76 components)

acenaphthene	2,4-dinitrophenol
acenaphthylene	2,4-dinitrotoluene
aniline	2,6-dinitrotoluene
anthracene	di- <i>n</i> -butyl phthalate
azobenzene ¹	di- <i>n</i> -octyl phthalate
benzo(a)anthracene	diphenylamine ²
benzo(a)pyrene	fluorene
benzo(b)fluoroanthene	fluoroanthene
benzo(ghi)perylene	hexachlorobenzene
benzo(k)fluoroanthene	hexachlorobutadiene
benzyl alcohol	hexachlorocyclopentadiene
benzyl butyl phthalate	hexachloroethane
bis 2-ethylhexyl adipate	indeno(1,2,3-cd)pyrene
bis(2-chloroethoxy)methane	isophorone
bis(2-chloroethyl)ether	1-methylnaphthalene
bis(2-chloroisopropyl)ether	2-methylnaphthalene
bis(2-ethylhexyl)phthalate	2-methylphenol
4-bromophenyl phenyl ether	3-methylphenol*
carbazole	4-methylphenol*
4-chloroaniline	naphthalene
4-chloro-3-methylphenol	2-nitroaniline
2-chloronaphthalene	3-nitroaniline
2-chlorophenol	4-nitroaniline
4-chlorophenyl phenyl ether	nitrobenzene
chrysene	2-nitrophenol
dibenz(a,h)anthracene	4-nitrophenol
dibenzofuran	N-nitrosodimethylamine
1,2-dichlorobenzene	N-nitroso-di- <i>n</i> -propylamine
1,3-dichlorobenzene	pentachlorophenol
1,4-dichlorobenzene	phenanthrene
2,4-dichlorophenol	phenol
diethyl phthalate	pyrene
dimethyl phthalate	pyridine
2,4-dimethylphenol	2,3,4,6-tetrachlorophenol
1,2-dinitrobenzene	2,3,5,6-tetrachlorophenol
1,3-dinitrobenzene	1,2,4-trichlorobenzene
1,4-dinitrobenzene	2,4,5-trichlorophenol
4,6-dinitro-2-methylphenol	2,4,6-trichlorophenol

1,000µg/mL each (except where noted) in methylene chloride:benzene (75:25), 1mL/ampul

Each	5-pk.	10-pk.
31686	31686-510	—
w/data pack		
31686-500	31686-520	31786

*Concentration is 500µg/mL.

¹1,2-diphenylhydrazine (8270-listed analyte) decomposes to azobenzene (mix component).

²N-nitrosodiphenylamine (8270-listed analyte) decomposes to diphenylamine (mix component).

8270 Matrix Spike Mix (76 components)

Same 76 components as listed above in the 8270 MegaMix™.

200µg/mL each in methanol:methylene chloride:benzene (80:15:5), 5mL/ampul**

Each	5-pk.	10-pk.
31687	31687-510	—
w/data pack		
31687-500	31687-520	31787

**3-methylphenol and 4-methylphenol concentration is 100µg/mL.

8270 Benzidines Mix

benzidine
3,3'-dichlorobenzidine
3,3'-dimethylbenzidine
2,000µg/mL each in methanol, 1mL/ampul

Each	5-pk.	10-pk.
31688	31688-510	—
w/data pack		
31688-500	31688-520	31788

605 Benzidines Calibration Mix

benzidine
3,3'-dichlorobenzidine
2,000µg/mL each in methanol, 1mL/ampul

Each	5-pk.	10-pk.
31030	31030-510	—
w/data pack		
31030-500	31030-520	31130

Appendix IX Mix #1 (18 components)

2-acetylaminofluorene N-nitrosodibutylamine
4-aminobiphenyl N-nitrosodiethylamine
p-dimethylaminoazobenzene N-nitrosomethylethylamine
3,3'-dimethylbenzidine N-nitrosomorpholine
 α,α' -dimethylphenethylamine N-nitrosopiperidine
(free base) N-nitrosopyrrolidine
methapyriline (free base) 1,4-phenylenediamine
1-naphthylamine 2-picoline
2-naphthylamine *o*-toluidine
5-nitro-*o*-toluidine
2,000µg/mL each in methylene chloride, 1mL/ampul

Each	5-pk.	10-pk.
31625	31625-510	—
w/data pack		
31625-500	31625-520	31725

Appendix IX Mix #2 (32 components)

acetophenone hexachloropropene
aramite isodrin
atrazine isosafrole (*cis* & *trans*)
benzaldehyde kepone
biphenyl 3-methylcholanthrene
caprolactam (epsilon) methyl methanesulfonate
chlorobenzilate 1,4-naphthoquinone
1-chloronaphthalene 4-nitroquinoline-N-oxide
diallate pentachlorobenzene
dibenz(a,j)acridine pentachloroethane
2,6-dichlorophenol pentachloronitrobenzene
7,12-dimethylbenz phenacetin
(a)anthracene pronamide
1,4-dioxane safrole
diphenyl ether 1,2,4,5-tetrachlorobenzene
ethyl methacrylate 1,3,5-trinitrobenzene
ethyl methanesulfonate
1,000µg/mL each in methylene chloride, 1mL/ampul

Each	5-pk.	10-pk.
31806	31806-510	—
w/data pack		
31806-500	31806-520	31906

Organophosphorous Pesticide

Mix, 8270/Appendix IX (9 components)

dimethoate parathion (ethyl parathion)
disulfoton phorate
famphur sulfotepp
methyl parathion zinophos (thionazine)
O,O,O-triethylphosphorothioate
2,000µg/mL in methylene chloride, 1mL/ampul

Each	5-pk.	10-pk.
32419	32419-510	—
w/data pack		
32419-500	32419-520	32519

Organochlorine Pesticide

Mix AB # 3 (20 components)

aldrin dieldrin
 α -BHC endosulfan I
 β -BHC endosulfan II
 δ -BHC endosulfan sulfate
 γ -BHC (lindane) endrin
 α -chlordane endrin aldehyde
 γ -chlordane endrin ketone
4,4'-DDD heptachlor
4,4'-DDE heptachlor epoxide (isomer B)
4,4'-DDT methoxychlor
2,000µg/mL each in hexane:toluene (1:1), 1mL/ampul

Each	5-pk.	10-pk.
32415	32415-510	—
w/data pack		
32415-500	32415-520	32515

200µg/mL each in hexane:toluene (1:1), 1mL/ampul

Each	5-pk.	10-pk.
32291	32291-510	—
w/data pack		
32291-500	32291-520	32391

Organochlorine

Pesticide Mix AB #2 (20 components)

aldrin 8µg/mL dieldrin 16
 α -BHC 8 endosulfan I 8
 β -BHC 8 endosulfan II 16
 δ -BHC 8 endosulfan sulfate 16
 γ -BHC (lindane) 8 endrin 16
 α -chlordane 8 endrin aldehyde 16
 γ -chlordane 8 endrin ketone 16
4,4'-DDD 16 heptachlor 8
4,4'-DDE 16 heptachlor epoxide (B) 8
4,4'-DDT 16 methoxychlor 80

In hexane:toluene (1:1), 1mL/ampul

Each	5-pk.	10-pk.
32292	32292-510	—
w/data pack		
32292-500	32292-520	32392

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Semivolatile Organic Reference Materials

SV Internal Standard Mix

acenaphthene-d10 naphthalene-d8
chrysene-d12 perylene-d12
1,4-dichlorobenzene-d4 phenanthrene-d10
4,000µg/mL each in methylene chloride, 1mL/ampul

Each	5-pk.	10-pk.
31006	31006-510	—
w/data pack		
31006-500	31006-520	31106

2,000µg/mL each in methylene chloride, 1mL/ampul

Each	5-pk.	10-pk.
31206	31206-510	—
w/data pack		
31206-500	31206-520	31306

B/N Surrogate Mix (4/89 SOW)

2-fluorobiphenyl p-terphenyl-d14
nitrobenzene-d5
1,000µg/mL each in methylene chloride, 1mL/ampul

Each	5-pk.	10-pk.
31024	31024-510	—
w/data pack		
31024-500	31024-520	31124

5,000µg/mL each in methylene chloride, 1mL/ampul

Each	5-pk.	10-pk.
31062	31062-510	—
w/data pack		
31062-500	31062-520	31162

5,000µg/mL each in methylene chloride, 5mL/ampul

Each	5-pk.	10-pk.
31086	31086-510	—
w/data pack		
31086-500	31086-520	31186

Acid Surrogate Mix (4/89 SOW)

2-fluorophenol 2,4,6-tribromophenol
phenol-d6
2,000µg/mL each in methanol, 1mL/ampul

Each	5-pk.	10-pk.
31025	31025-510	—
w/data pack		
31025-500	31025-520	31125

10,000µg/mL each in methanol, 1mL/ampul

Each	5-pk.	10-pk.
31063	31063-510	—
w/data pack		
31063-500	31063-520	31163

10,000µg/mL each in methanol, 5mL/ampul

Each	5-pk.	10-pk.
31087	31087-510	—
w/data pack		
31087-500	31087-520	31187

B/N Matrix Spike Mix

acenaphthene N-nitroso-di-n-propylamine
1,4-dichlorobenzene pyrene
2,4-dinitrotoluene 1,2,4-trichlorobenzene
1,000µg/mL each in methanol, 1mL/ampul

Each	5-pk.	10-pk.
31004	31004-510	—
w/data pack		
31004-500	31004-520	31104

5,000µg/mL each in methanol, 1mL/ampul

Each	5-pk.	10-pk.
31074	31074-510	—
w/data pack		
31074-500	31074-520	31174

5,000µg/mL each in methanol, 5mL/ampul

Each	5-pk.	10-pk.
31084	31084-510	—
w/data pack		
31084-500	31084-520	31184

Acid Matrix Spike Mix

4-chloro-3-methylphenol pentachlorophenol
2-chlorophenol phenol
4-nitrophenol
2,000µg/mL each in methanol, 1mL/ampul

Each	5-pk.	10-pk.
31014	31014-510	—
w/data pack		
31014-500	31014-520	31114

10,000µg/mL each in methanol, 1mL/ampul

Each	5-pk.	10-pk.
31061	31061-510	—
w/data pack		
31061-500	31061-520	31161

10,000µg/mL each in methanol, 5mL/ampul

Each	5-pk.	10-pk.
31071	31071-510	—
w/data pack		
31071-500	31071-520	31171

SV System Performance Check Mix (SPCC) (4 components)

2,4-dinitrophenol 4-nitrophenol
hexachlorocyclopentadiene N-nitroso-di-n-propylamine
2,000µg/mL each in methylene chloride, 1mL/ampul

Each	5-pk.	10-pk.
31689	31689-510	—
w/data pack		
31689-500	31689-520	31789

8270 B/N Calibration Check Mix

(7 components)

acenaphthene diphenylamine
benzo(a)pyrene fluoranthene
1,4-dichlorobenzene hexachlorobutadiene
di-n-octyl phthalate
2,000µg/mL each in methylene chloride, 1mL/ampul

Each	5-pk.	10-pk.
31616	31616-510	—
w/data pack		
31616-500	31616-520	31716

8270 Acid Calibration Check Mix

4-chloro-3-methylphenol pentachlorophenol
2,4-dichlorophenol phenol
2-nitrophenol 2,4,6-trichlorophenol
2,000µg/mL each in methylene chloride, 1mL/ampul

Each	5-pk.	10-pk.
31617	31617-510	—
w/data pack		
31617-500	31617-520	31717

SV Tuning Compound

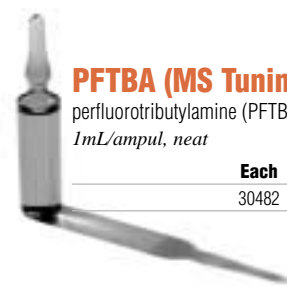
decafluorotriphenylphosphine (DFTPP)
2,500µg/mL in methylene chloride, 1mL/ampul

Each	5-pk.	10-pk.
31001	31001-510	—
w/data pack		
31001-500	31001-520	31101

GC/MS Tuning Mixture

benzidine DFTPP
4,4'-DDT pentachlorophenol
1,000µg/mL each in methylene chloride, 1mL/ampul

Each	5-pk.	10-pk.
31615	31615-510	—
w/data pack		
31615-500	31615-520	31715



PFTBA (MS Tuning Compound)

perfluorotributylamine (PFTBA)
1mL/ampul, neat

Each
30482

8270/Appendix IX MegaMix™ Kit

- 128 compounds in 4 stable mixes.
- Includes Benzidines Calibration Mix
- Includes all commonly analyzed Appendix IX compounds.



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Semivolatile Organic Reference Materials

8270 Calibration Mix #1 (19 components)

benzoic acid	3-methylphenol
4-chloro-3-methylphenol	4-methylphenol
2-chlorophenol	2-nitrophenol
2,4-dichlorophenol	4-nitrophenol
2,6-dichlorophenol	pentachlorophenol
2,4-dimethylphenol	phenol
4,6-dinitro-2-methylphenol	2,3,4,6-tetrachlorophenol
2,4-dinitrophenol	2,4,5-trichlorophenol
dinoseb	2,4,6-trichlorophenol
2-methylphenol	

2,000µg/mL each in methylene chloride, 1mL/ampul

Each	5-pk.	10-pk.
31618	31618-510	—
w/data pack		
31618-500	31618-520	31718

8270 Calibration Mix #2 (11 components)

aniline	3-nitroaniline
benzidine	4-nitroaniline
4-chloroaniline	N-nitrosodimethylamine
3,3'-dichlorobenzidine	N-nitrosodi-n-propylamine
diphenylamine*	pyridine
2-nitroaniline	

2,000µg/mL each in methylene chloride:methanol (85:15), 1mL/ampul

Each	5-pk.	10-pk.
31619	31619-510	—
w/data pack		
31619-500	31619-520	31719

*N-nitrosodiphenylamine (listed compound) decomposes to diphenylamine (mix component) in the injector.

8270 Calibration Mix #3 (23 components)

aramite	hexachlorobenzene
bis(2-chloroethyl)ether	hexachlorobutadiene
bis(2-chloroethoxy)methane	hexachlorocyclopentadiene
bis(2-chloroisopropyl)ether	hexachloroethane
4-bromophenyl phenyl ether	hexachloropropene
chlorobenzilate	isodrin
2-chloronaphthalene	kepone
4-chlorophenyl phenyl ether	pentachlorobenzene
1,2-dichlorobenzene	pentachloronitrobenzene
1,3-dichlorobenzene	1,2,4,5-tetrachlorobenzene
1,4-dichlorobenzene	1,2,4-trichlorobenzene
1,3-dinitrobenzene	

2,000µg/mL each in methylene chloride, 1mL/ampul

Each	5-pk.	10-pk.
31620	31620-510	—
w/data pack		
31620-500	31620-520	31720

Aramite Mix

Aramite
2,000µg/mL in hexane, 1mL/ampul

Each	5-pk.	10-pk.
31624	31624-510	—
w/data pack		
31624-500	31624-520	31724

8270 Calibration Mix #5 (19 components)

acenaphthene	fluoranthene
acenaphthylene	fluorene
anthracene	ideno(1,2,3-cd)pyrene
benzo(a)anthracene	3-methylcholanthrene
benzo(a)pyrene	1-methylnaphthalene
benzo(b)fluoranthene	2-methylnaphthalene
benzo(ghi)perylene	naphthalene
benzo(k)fluoranthene	phenanthrene
chrysene	pyrene
dibenz(a,h)anthracene	

2,000µg/mL each in methylene chloride, 1mL/ampul

Each	5-pk.	10-pk.
31622	31622-510	—
w/data pack		
31622-500	31622-520	31722

8270 Calibration Mix #4 (23 components)

acetophenone	2,6-dinitrotoluene
azobenzene*	ethyl methanesulfonate
benzyl alcohol	isophorone
bis(2-ethylhexyl)phthalate	isoflural (cis & trans)
butyl benzyl phthalate	methyl methanesulfonate
dibenzofuran	1,4-naphthoquinone
diethyl phthalate	nitrobenzene
dimethyl phthalate	4-nitroquinoline-1-oxide
di-n-butyl phthalate	phenacetin
di-n-octyl phthalate	safrole
2,4-dinitrotoluene	1,3,5-trinitrobenzene

2,000µg/mL each in methylene chloride, 1mL/ampul

Each	5-pk.	10-pk.
31621	31621-510	—
w/data pack		
31621-500	31621-520	31721

*1,2-diphenylhydrazine (listed compound) decomposes to azobenzene (mix component) in the injector.

Kits

8270 Calibration Kit

31618: 8270 Calibration Mix #1
31619: 8270 Calibration Mix #2
31620: 8270 Calibration Mix #3
31621: 8270 Calibration Mix #4
31622: 8270 Calibration Mix #5

Contains 1mL each of these mixtures.

Kit	Kit w/Data Pack
31626	31626-500

8270/Appendix IX Kit

31686: 8270 MegaMix™
31030: Benzidine Mix, EPA 605
31625: Appendix IX Mix #1
31806: Appendix IX Mix #2

Contains 1mL each of these mixtures.

Kit	Kit w/Data Pack
31815	31815-500



Rtx®-5Sil MS Columns for Semivolatiles Analyses

- Silarylene stationary phase designed to provide low GC/MS bleed.
- Optimized for US EPA Method 8270 semivolatiles.
- Improved separation of benzo(b)- and benzo(k)fluoranthene.
- Available in 0.28mm ID for optimal semivolatiles analysis.
- Similar to DB-5MS, HP-5TH, BPX-5, MDN-5S columns.
- Available with Integra-Guard™ built-in guard column.

(Similar selectivity to Crossbond® 5% diphenyl/95% dimethyl polysiloxane)

ID	df (µm)	temp. limits	15-Meter	30-Meter
0.25mm	0.10	-60 to 330/350°C	12705	12708
	0.25	-60 to 330/350°C	12720	12723
	0.50	-60 to 330/350°C	12735	12738
	1.00	-60 to 325/350°C	12750	12753
0.28mm	0.25	-60 to 330/350°C	12790	12793
	0.50	-60 to 330/350°C	12791	12794
	1.00	-60 to 325/350°C	12792	12795
0.32mm	0.10	-60 to 330/350°C	12706	12709
	0.25	-60 to 330/350°C	12721	12724
	0.50	-60 to 330/350°C	12736	12739
0.53mm	1.00	-60 to 325/350°C	12751	12754
	0.50	-60 to 320/340°C	12737	12740
	1.00	-60 to 320/340°C	12752	12755
	1.50	-60 to 310/330°C	12767	12770



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Custom Reference Material Request Form

Domestic Customers

FAX#: (814) 355-2895

email: standards@restekcorp.com

International Customers

**Contact Your Local
Restek Representative.**

Name:

Date:

Company/Location:

Phone #:

FAX #:

E-mail:

Take these eight steps to create the right solution:

1. Mixture Description:

2. Solvent:

3. No. of components:

4. Volume (select): 1mL, 2mL, 5mL, 10mL, or other mL

5. Quantity: No. of units

6. Select testing and documentation that best meets your requirements:

- ☐ Gravimetric Documentation: Lot Sheet detailing exact amount of each raw material used, purity of each material used, total volume prepared, calculated concentration and a unique lot number. Balance printout attached.
- ☐ Qualitative Documentation: Certificate of Composition, Chromatogram elution order, and Gravimetric Documentation.
- ☐ Quantitative Documentation: Certificate of Analysis and Data Pack.

7. Compound(s): (list or attach sheet)	Concentration:	8. Concentration Units
1.		<input type="radio"/> mg/mL
2.		<input type="radio"/> µg/mL
3.		<input type="radio"/> ng/mL
4.		<input type="radio"/> vol./vol.%
5.		<input type="radio"/> wt./wt.%
6.		<input type="radio"/> other _____
7.		
8.		
9.		
10.		
11.		
12.		

ALL mixtures are produced in accordance with our ISO 9001 registration. Analytical balances are calibrated daily at seven mass levels using NIST-traceable weights. ALL raw materials used are a minimum of 97% pure unless otherwise specified.

on-line: <http://www.restekcorp.com/stdreq.htm>

Can't locate the exact mixture you need?

With **thousands** of compounds in our inventory,
we can make any mixture
to your specifications.

*To order, use the convenient custom
reference material request form inside.*

visit us online at
www.restekcorp.com

For more information,
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EPA Method 8260B

US Environmental Protection Agency (EPA) Method 8260B outlines the analysis of volatile organic pollutants in solid waste and water samples using purge and trap concentration or direct injection with high resolution capillary gas chromatography/mass spectrometry detection (GC/MS). Method 8260B supersedes EPA Methods 8240 and 8260A. The compound lists are similar, however, this new method introduces several compounds that we have included in the 8260B mix.

Restek has carefully reviewed Method 8260B and has prepared a comprehensive product listing to meet most laboratories' needs. Our new standards for Method 8260B include the most commonly analyzed compounds. If your list contains any compounds not in our comprehensive listing, we would be happy to provide custom mixtures to meet your specific compound list.

We continue to offer our original 8260 and 8240 calibration mixtures to laboratories calibrating for the 8260B short lists. Restek also offers all the required surrogate, internal standard, calibration check, matrix spike, and tuning mixtures required for this method; and can provide custom mixtures for specific needs.



Reference Materials for Volatile Organic Compounds

US EPA Method 8260B

- ✓ Fewest mixtures needed for calibration
- ✓ Mixtures formulated for maximum stability
- ✓ Contains the most commonly run compounds

8260B Calibration Mixtures

Feature	Benefit
These eight 8260B calibration mixtures include the most commonly calibrated 8260B target compounds	Maximum shelf life and no chemical interactions, with the smallest number of solutions possible.
76+1-Component mixture @ 2000µg/mL each in P&T methanol. 8260B MegaMix™ Calibration Mix cat.# 30475	Contains most commonly analyzed 8260B target compounds. Maximum shelf life* = 24 months. 2-chloroethyl vinyl ether is provided in a separate ampul.
6-Component gas mixture @ 2000µg/mL each in P&T methanol. 502.2 Calibration Mix #1 cat.# 30042	Contains six room-temperature gases in a separate ampul for ease in preparing working standards. Maximum shelf life* = 36 months.
4-Component ketone mix @ 5000µg/mL each in P&T methanol water (90:10). VOA Calibration Mix #1 cat.# 30006	Contains four ketones in a separate ampul for maximum shelf life. Maximum shelf life* = 36 months.
5-Component acetate mix @ 2000µg/mL each in P&T methanol. 8260B Acetate Mix cat.# 30477	Contains five acetates in a separate ampul for maximum shelf life. Maximum shelf life* = 24 months.
5 Oxygenated compounds in P&T methanol. California Oxygenates Mix cat.# 30465	Contains five of the most commonly analyzed oxygenated compounds in a separate ampul for maximum calibration flexibility. Maximum shelf life* = 36 months.
Ethanol at 10,000µg/mL in water. Ethanol cat.# 30466	A high-concentration ethanol mix suitable for direct injection or P&T. Maximum shelf life* = 36 months.
Acrolein at 10,000µg/mL in P&T methanol.* Acrolein cat.# 30499	An individual, high-concentration acrolein standard for maximum stability and calibration flexibility. Maximum shelf life* = 6 months.
1,2-Dichlorotetrafluoroethane @ 2000µg/mL in P&T methanol 1,2-Dichlorotetrafluoroethane cat.# 30476	An individual Freon® 114 mixture for calibration flexibility. Maximum shelf life* = 36 months.

*Also available in water (cat# 30478).

*Shelf life is based on an unopened ampul stored at the recommended temperature.

8260B Calibration Mixes

76+1-Component 8260B MegaMix™ Calibration Mix

Ampul 1: 8260B Calibration Mix #1 A

acetonitrile	1,4-dichlorobenzene	methylene chloride
acrylonitrile	<i>cis</i> -1,4-dichloro-2-butene	naphthalene
allyl chloride	<i>trans</i> -1,4-dichloro-2-butene	nitrobenzene
benzene	1,1-dichloroethane	2-nitropropane
bromobenzene	1,2-dichloroethane	pentachloroethane
bromochloromethane	1,1-dichloroethene	propionitrile
bromodichloromethane	<i>cis</i> -1,2-dichloroethene	<i>n</i> -propylbenzene
bromoform	<i>trans</i> -1,2-dichloroethene	styrene
<i>n</i> -butylbenzene	1,2-dichloropropane	1,1,1,2-tetrachloroethane
<i>sec</i> -butylbenzene	1,3-dichloropropane	1,1,2,2-tetrachloroethane
<i>tert</i> -butylbenzene	2,2-dichloropropane	tetrachloroethene
carbon disulfide	1,1-dichloropropene	tetrahydrofuran
carbon tetrachloride	<i>cis</i> -1,3-dichloropropene	toluene
chlorobenzene	<i>trans</i> -1,3-dichloropropene	1,2,3-trichlorobenzene
2-chloroethanol	diethyl ether	1,2,4-trichlorobenzene
chloroform	1,4-dioxane	1,1,1-trichloroethane
chloroprene	ethyl methacrylate	1,1,2-trichloroethane
2-chlorotoluene	ethylbenzene	trichloroethene
4-chlorotoluene	hexachlorobutadiene	1,2,3-trichloropropene
dibromochloromethane	iodomethane	1,1,2-trichlorotrifluoroethane (Freon® 113)
1,2-dibromo-3-chloropropane	isobutyl alcohol	1,2,4-trimethylbenzene
1,2-dibromoethane	isopropylbenzene	1,3,5-trimethylbenzene
dibromomethane	<i>p</i> -isopropyltoluene	<i>m</i> -xylene
1,2-dichlorobenzene	methacrylonitrile	<i>p</i> -xylene
1,3-dichlorobenzene	methyl acrylate	<i>o</i> -xylene
	methyl methacrylate	

2000µg/mL each in P&T methanol 1mL per ampul

Ampul 2: 8260B Calibration Mix #1 B

2-chloroethyl vinyl ether

2000µg/mL in P&T methanol 1mL per ampul

Ea.	5-pk.	10-pk.
30475	30475-510	—
	with data pack	
30475-500	30475-520	30575

54-Component 502.2 MegaMix™ Mixtures

benzene	1,4-dichlorobenzene	styrene
bromobenzene	1,1-dichloroethane	1,1,1,2-tetrachloroethane
bromochloromethane	1,2-dichloroethane	1,1,2,2-tetrachloroethane
bromodichloromethane	1,1-dichloroethene	tetrachloroethene
bromoform	<i>cis</i> -1,2-dichloroethene	toluene
<i>n</i> -butylbenzene	<i>trans</i> -1,2-dichloroethene	1,2,3-trichlorobenzene
<i>sec</i> -butylbenzene	1,2-dichloropropane	1,2,4-trichlorobenzene
<i>tert</i> -butylbenzene	1,3-dichloropropane	1,1,1-trichloroethane
carbon tetrachloride	2,2-dichloropropane	1,1,2-trichloroethane
chlorobenzene	1,1-dichloropropene	trichloroethene
chloroform	<i>cis</i> -1,3-dichloropropene	1,2,3-trichloropropene
2-chlorotoluene	<i>trans</i> -1,3-dichloropropene	1,2,4-trimethylbenzene
4-chlorotoluene	dichloropropene	1,3,5-trimethylbenzene
dibromochloromethane	ethylbenzene	<i>m</i> -xylene
1,2-dibromo-3-chloropropane	hexachlorobutadiene	<i>o</i> -xylene
1,2-dibromoethane	isopropylbenzene	<i>p</i> -xylene
dibromomethane	<i>p</i> -isopropyltoluene	
1,2-dichlorobenzene	methylene chloride	
1,3-dichlorobenzene	naphthalene	
	<i>n</i> -propylbenzene	

2,000µg/mL each in P&T methanol, 1mL/ampul

Ea.	5-pk.	10-pk.
30431	30431-510	—
	with data pack	
30431-500	30431-520	30531

200µg/mL in P&T methanol, 1mL per ampul

Ea.	5-pk.	10-pk.
30432	30432-510	—
	with data pack	
30432-500	30432-520	30532

502.2 Calibration Mix # 1 (gases)

bromomethane chloromethane trichlorofluoromethane
chloroethane dichlorodifluoromethane vinyl chloride

2000µg/mL each in P&T methanol, 1mL per ampul

Ea.	5-pk.	10-pk.
30042	30042-510	—
	with data pack	
30042-500	30042-520	30142

VOA Calibration Mix # 1 (ketones)

acetone 2-hexanone
2-butanone 4-methyl-2-pentanone

5,000µg/mL each in P&T methanol/water (90:10), 1mL per ampul

Ea.	5-pk.	10-pk.
30006	30006-510	—
	with data pack	
30006-500	30006-520	30106

California Oxygenates Mix

tert-amyl methyl ether 2,000µg/mL ethyl-*tert*-butyl ether 2,000µg/mL
tert-butyl alcohol 10,000µg/mL methyl-*tert*-butyl ether 2,000µg/mL
diisopropyl ether 2,000µg/mL

in P&T methanol, 1mL per ampul

Ea.	5-pk.	10-pk.
30465	30465-510	—
	with data pack	
30465-500	30465-520	30565

1,2-Dichlorotetrafluoroethane (Freon® 114)

2000ppm in P&T methanol, 1mL per ampul

Ea.	5-pk.	10-pk.
30476	30476-510	—
	with data pack	
30476-500	30476-520	30576

Ethanol

10,000µg/mL in deionized water, 1mL per ampul

Ea.	5-pk.	10-pk.
30466	30466-510	—
	with data pack	
30466-500	30466-520	30566

Methanol

10,000µg/mL in deionized water, 1mL per ampul

Ea.	5-pk.	10-pk.
30467	30467-510	—
	with data pack	
30467-500	30467-520	30567

8260B Acetate Mix

n-butyl acetate *n*-propyl acetate
ethyl acetate vinyl acetate

isopropyl acetate
2000µg/mL each in P&T methanol, 1mL per ampul

Ea.	5-pk.	10-pk.
30477	30477-510	—
	with data pack	
30477-500	30477-520	30577

8260B Acetate Mix (Revised)

n-amyl acetate isopropyl acetate vinyl acetate
butyl acetate methyl acetate
ethyl acetate propyl acetate

2,000µg/mL each in P&T methanol, 1mL/ampul

Ea.	5-pk.	10-pk.
30489	30489-510	—
	with data pack	
30489-500	30489-520	30589

Acrolein

10,000µg/mL in P&T methanol, 1mL per ampul

Ea.	5-pk.	10-pk.
30499	30499-510	—
	with data pack	
30499-500	30499-520	30599

Acrolein

10,000µg/mL in deionized water, 1mL per ampul

Ea.	5-pk.	10-pk.
30478	30478-510	—
	with data pack	
30478-500	30478-520	30578

8260B Recommended Internal Standards and Surrogates

8260A/B Internal Standard Mix

chlorobenzene-d5

1,4-dichlorobenzene-d4

fluorobenzene

2500µg/mL each in P&T methanol, 1mL per ampul

Ea.	5-pk.	10-pk.
30241	30241-510	—
	with data pack	
30241-500	30241-520	30341

8260A/B Surrogate Mix

4-bromofluorobenzene

1,2-dichloroethane-d4

dibromofluoromethane

toluene-d8

2500µg/mL each in P&T methanol, 1mL per ampul

Ea.	5-pk.	10-pk.
30240	30240-510	—
	with data pack	
30240-500	30240-520	30340

4-Bromofluorobenzene (Tuning Mix)

2500µg/mL in P&T methanol, 1mL per ampul

Ea.	5-pk.	10-pk.
30067	30067-510	—
	with data pack	
30067-500	30067-520	30167

8260B Matrix Spike Mix

benzene

trichloroethylene

chlorobenzene

toluene

1,1-dichloroethene

2500µg/mL each in P&T methanol, 1mL per ampul

Ea.	5-pk.	10-pk.
30479	30479-510	—
	with data pack	
30479-500	30479-520	30579

8000 Series—Solid Waste—Volatiles

Xylene-Free, Highly-Purified Chloroprene Standard

The R&D chemists at Restek developed a novel procedure that produces a pure, quantitative chloroprene solution specially stabilized in purge & trap-grade methanol. The entire procedure is performed under carefully monitored conditions to prevent any contamination or polymerization of the highly reactive, neat chloroprene. The final solution is specially stabilized, allowing analysts to make dilutions for working standards in unmodified purge & trap-grade methanol.

The working level dilution of this product, combined with all other 8240 compounds (8240 VOA Kit, cat.# 30232), has been tested using purge & trap GC/MS. Thorough evaluation of the resultant data indicates that working level solutions may be prepared weekly, by mixing all of the 8240 calibration mixtures with the chloroprene mixture, and diluting to volume with purge & trap-grade methanol. No special care, other than the use of clean glassware and pure purge & trap-grade methanol, is required for the preparation of stable solutions. A detailed instruction sheet is included for persons analyzing modified 8240 target compound lists.

Chloroprene

5,000µg/mL in P&T methanol, 1mL/ampul

Ea.	5-pk.	10-pk.
30238	30238-510	—
	w/data pack	
30238-500	30238-520	30338

Alternative 8260B Optional Internal Standard Mixtures

8260 Surrogate Mix

4-bromofluorobenzene

toluene-d8

dibromofluoromethane

2,500µg/mL each in P&T methanol, 1mL/ampul

Ea.	5-pk.	10-pk.
30073	30073-510	—
	w/data pack	
30073-500	30073-520	30173

8260 Internal Standard Mix

chlorobenzene-d5

1,4-difluorobenzene

1,4-dichlorobenzene-d4

pentafluorobenzene

2,500µg/mL each in P&T methanol, 1mL/ampul

Each	5-pk.	10-pk.
30074	30074-510	—
	w/data pack	
30074-500	30074-520	30174

8240/8260 System Performance Check Mix

bromoform

1,1-dichloroethane

chlorobenzene

1,1,2,2-tetrachloroethane

chloromethane

2,000µg/mL each in P&T methanol, 1mL/ampul

Ea.	5-pk.	10-pk.
30075	30075-510	—
	w/data pack	
30075-500	30075-520	30175

8240/8260 Calibration Check Mix

chloroform

ethylbenzene

1,1-dichloroethene

toluene

1,2-dichloropropane

vinyl chloride

2,000µg/mL each in P&T methanol, 1mL/ampul

Ea.	5-pk.	10-pk.
30427	30427-510	—
	w/data pack	
30427-500	30427-520	30527

Antifoam Agent for Purge & Trap Samples

Foam generated as purge gas passes through a sample can enter the analytical trap, and possibly into the GC column. Our silica-containing antifoam agent will be of great help to analysts performing VOC analysis. It's effective over a wide pH range, and will not conflict with chromatography of target analytes.

Neat, 1mL/ampul

Each	5-pk.
31822	31822-510

for more info

See the Custom Reference Materials Request Form inside.

Note: Because chloroprene is analyzed by few laboratories, it is not included in our 8240 VOA Kits. Purchase this product separately if needed.

8260B Short list Calibration Mixtures

BTEX Standard

benzene *m*-xylene
ethylbenzene *o*-xylene
toluene *p*-xylene

2,000µg/mL each in P&T methanol, 1mL/ampul

Each	5-pk.	10-pk.
30213	30213-510	—
with data pack		
30213-500	30213-520	30313

502.2 Calibration Mix #1 (gases)

bromomethane dichlorodifluoromethane
chloroethane trichlorofluoromethane
chloromethane vinyl chloride

2,000µg/mL each in P&T methanol, 1mL/ampul

Each	5-pk.	10-pk.
30042	30042-510	—
w/data pack		
30042-500	30042-520	30142

VOA Purgeable Halocarbon Mix #1

bromodichloromethane 1,1-dichloroethane
bromoform *trans*-1,2-dichloroethene
carbon tetrachloride 1,2-dichloropropane
chlorobenzene *cis*-1,3-dichloropropene
2-chloroethyl vinyl ether *trans*-1,3-dichloropropene
chloroform methylene chloride
dibromochloromethane 1,1,2,2-tetrachloroethane
1,2-dichlorobenzene tetrachloroethene
1,3-dichlorobenzene 1,1,1-trichloroethane
1,4-dichlorobenzene 1,1,2-trichloroethane
1,1-dichloroethane trichloroethene
1,2-dichloroethane

2,000µg/mL each in P&T methanol, 1mL/ampul

Each	5-pk.	10-pk.
30212	30212-510	—
w/data pack		
30212-500	30212-520	30312

8240 Alcohols Mix

allyl alcohol isobutyl alcohol
2-chloroethanol propargyl alcohol
ethanol

2,000µg/mL each in P&T methanol, 1mL/ampul

Each	5-pk.	10-pk.
30214	30214-510	—
w/data pack		
30214-500	30214-520	30314

Vinyl Acetate

2,000µg/mL in P&T methanol, 1mL/ampul

Each	5-pk.	10-pk.
30216	30216-510	—
w/data pack		
30216-500	30216-520	30316

VOA Calibration Mix #1 (ketones)

acetone 2-hexanone
2-butanone 4-methyl-2-pentanone

5,000µg/mL each in P&T methanol water (90:10), 1mL/ampul

Each	5-pk.	10-pk.
30006	30006-510	—
w/data pack		
30006-500	30006-520	30106

8240 Volatiles Mix #1A

allyl chloride *trans*-1,4-dichloro-2-butene
benzyl chloride 1,4-dioxane
1,2-dibromo-3-chloropropane iodomethane
1,2-dibromoethane pentachloroethane
dibromomethane 1,1,1,2-tetrachloroethane
cis-1,4-dichloro-2-butene 1,2,3-trichloropropane

2,000µg/mL each in P&T methanol, 1mL/ampul

Each	5-pk.	10-pk.
30217	30217-510	—
w/data pack		
30217-500	30217-520	30317

8240 Volatiles Mix #2A

carbon disulfide 2-picoline pyridine

2,000µg/mL each in P&T methanol, 1mL/ampul

Each	5-pk.	10-pk.
30218	30218-510	—
w/data pack		
30218-500	30218-520	30318

8240 Nitriles Mix

acrylonitrile methyl methacrylate
ethyl methacrylate propionitrile
malononitrile styrene
methacrylonitrile

2,000µg/mL each in P&T methanol, 1mL/ampul

Each	5-pk.	10-pk.
30215	30215-510	—
w/data pack		
30215-500	30215-520	30315

Rtx®-VMS (Fused Silica)

Stable to 260°C



ID (mm)	df (µm)	temp. limits (°C)	20-Meter	40-Meter	30-Meter	60-Meter	75-Meter	105-Meter
0.18	1.00	-40 to 240/260	49914	49915				
0.25	1.40	-40 to 240/260			19915	19916		
0.32	1.80	-40 to 240/260			19919	19920		
0.45	2.55	-40 to 240/260			19908	19909		
0.53	3.00	-40 to 240/260			19985	19988	19974	

Rtx®-502.2 (Fused Silica)

(EPA Volatiles in Methods 502.2, 524.2) Stable to 270°C

ID (mm)	df (µm)	temp. limits (°C)	20-Meter	40-Meter	30-Meter	60-Meter	75-Meter	105-Meter
0.18	1.00	-20 to 250/270	40914	40915				
0.25	1.40	-20 to 250/270			10915	10916		
0.32	1.80	-20 to 250/270			10919	10920		10921
0.45	2.55	-20 to 250/270					10986	
0.53	3.00	-20 to 250/270			10908	10909		10910

gc columns



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Custom Reference Materials Request Form

Take these **eight** steps to create the right solution:

1. Mixture Description: _____
2. Solvent: _____
3. Number of Components: _____
4. Volume per ampul (select): 1mL, 2mL, 5mL, 10mL or other _____mL
5. Quantity of ampuls: _____
6. Testing and documentation that best meets your requirements:
 - ☐ Gravimetric Documentation: Lot Sheet with balance printout attached.
 - ☐ Qualitative Documentation: Certificate of Composition, Chromatogram, and Gravimetric Documentation.
 - ☐ Quantitative Documentation: Certificate of Analysis and Data Pack.

7. Compound(s): (list or attach sheet; include CAS number)

Compound 01: _____	Concentration: _____
Compound 02: _____	Concentration: _____
Compound 03: _____	Concentration: _____
Compound 04: _____	Concentration: _____
Compound 05: _____	Concentration: _____
Compound 06: _____	Concentration: _____
Compound 07: _____	Concentration: _____
Compound 08: _____	Concentration: _____
Compound 09: _____	Concentration: _____
Compound 10: _____	Concentration: _____
Compound 11: _____	Concentration: _____
Compound 12: _____	Concentration: _____
Compound 13: _____	Concentration: _____
Compound 14: _____	Concentration: _____
Compound 15: _____	Concentration: _____
Compound 16: _____	Concentration: _____
Compound 17: _____	Concentration: _____
Compound 18: _____	Concentration: _____
Compound 19: _____	Concentration: _____
Compound 20: _____	Concentration: _____

8. Concentration Units

☐ mg/mL ☐ µg/mL _____ ☐ ng/mL ☐ vol./wt. % _____ ☐ wt./wt. % ☐ other

Contact Information:

Name: _____ Date: _____

Company/Location: _____

Phone #: _____ FAX #: _____

E-mail: _____

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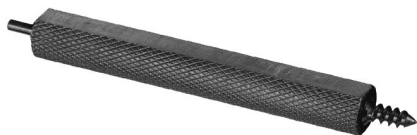
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Restek's Innovative Piston Seal Removal and Insertion tool

Do you have to search for a paper clip or screw to remove those old, worn seals from your HPLC pump? Then, once you get the old seal out, do you struggle to correctly seat and insert the new seal? Now Restek has one tool that can help. Use one end to remove your old seal, then simply slip your new seal on the other end and push the new seal flush into position. The material used in this tool will not mar the surrounding metal surface of your pump housing.

Description	qty.	cat.#
Piston Seal Insertion Tool	ea.	21356



Broken PEEK® nut removal tool

Have you ever lost an expensive analytical column because the PEEK end-fitting snapped off? Restek has created an easy-to-use tool to remove the broken PEEK Tip and save your analytical column.

Description	qty.	cat.#
PEEK Nut Removal Tool	ea.	25325

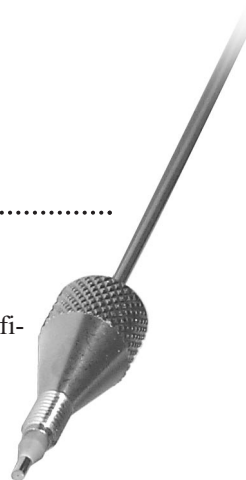
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HPLC Accessories

Secure-Fit Column Connectors

Making a good connection between HPLC components is necessary for accurate quantification. The new Secure-Fit connectors from Restek and Selerity Technologies ensure a consistent, leak-free seal and eliminate voids! An internal spring mechanism holds the capillary tube at the proper depth in the female fitting. This seal is maintained while finger-tightening the nut. This product can be purchased in stainless steel or in PEEK and comes in a variety of tubing lengths and internal diameters (ID).



Stainless Steel Secure Fit Fittings - Single End

Length	0.005" ID	0.007" ID	0.010" ID
6cm	25181	25185	25190
10cm	25182	25186	25191
20cm	25183	25187	25192
30cm	25184	25188	25193

Stainless Steel Secure Fit Fittings - Double Ended

Length	0.005" ID	0.007" ID	0.010" ID
10cm	25208	25211	25214
20cm	25209	25212	25215
30cm	25210	25213	25216

PEEK® Secure Fit Fittings - Single End

Length	0.005" ID	0.007" ID	0.010" ID
6cm	25230	25234	25217
10cm	25231	25235	25218
20cm	25232	25236	25219
30cm	25233	25237	25220

PEEK® Secure Fit Fittings - Double Ended

Length	0.005" ID	0.007" ID	0.010" ID
10cm	25221	25224	25227
20cm	25222	25225	25228
30cm	25223	25226	25229

Piston Seals

Over time the piston seal in every HPLC system becomes worn and must be replaced. We offer a line of Teflon® piston seals for Agilent HPLC systems. The Teflon® seals have an additive that reduce their tendency to "cold flow" and improve their wear characteristics.



Agilent Pump Piston Seals

Description	Material	qty.	cat.#
Agilent 1050 & 1100	Teflon®	ea.	25175
Agilent 1050 & 1100	Teflon®	10-pk.	25176

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Degasys In-Line Mobile Phase Degasser

Dissolved oxygen has an adverse affect on HPLC analyses: Flow rate instability and increased baseline noise can result. Also, it has a quenching affect on fluorescence detection and increases the background of UV detectors. Dissolved gases can out-gas in the HPLC system, causing bubbles in check valves, at connections, or in detector flow cells.

In-line vacuum degassing has been shown to be more effective at removing dissolved gas from mobile phases than sonication or helium sparging. In-line degassers work by withdrawing gas from a semi-permeable membrane encased in a sealed chamber. Traditionally, the membrane was made of PTFE tubing, but the Degasys Ultimate Degasser uses tubing composed of an amorphous fluoropolymer. This material is 200 to 300 times more gas permeable than PTFE. This translates into the ability to use shorter tubing for the removal of dissolved gas. This new material also provides better tubular burst strength than PTFE. In addition to using this new tubing material, each channel on this Degasys unit is individually encased within its own vacuum chamber to prevent any cross-contamination.

Specifications:

Residual Oxygen ¹	Pressure Loss ¹	Internal Volume	Wetted Parts	Max. Flow Rate
0.9ppm	0.24psi	500uL	Teflon® AF	7mL/min./channel
			PTFE	
			ETFE	
			PPS	

¹ Ratings at a flow rate of 1mL/min.

Description	cat.#
Mobile Phase Degasser (4 Channel, 7mL/min./channel)	25189

LC/MS Generator

The Parker N2-15 generator incorporates an oil-less air compressor and membrane nitrogen generator assembled as a package specifically to feed LC/MS systems. The N2-15 produces 15 liters-per-minute at 99% purity. The N2-15 generator is an ideal, safe, and less expensive long-term alternative than nitrogen cylinders or bulky dewars.

The N2-15 generator is a convenient, inexpensive solution to high-volume nitrogen generation. Previously a compressor and generator would have to be purchased separately. Often the end-users were responsible for installing and interfacing the compressor and generator. The cost of a reasonable system was well in excess of \$20,000. Now the N2-15 generator solves the installation and set-up difficulties at a very attractive price.

Model #	qty.	cat.#
N2-15	ea.	22037



Parker N2-15
LC/MS generator



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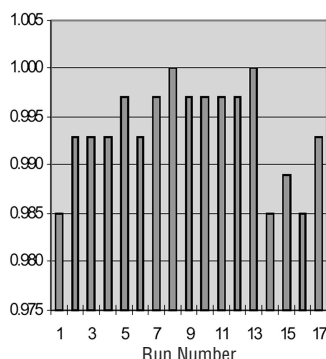
Check Valves

Restek offers Analytical Science Instruments (ASI) check valves and piston seals for Agilent and Waters mobile phase pumps. ASI specializes in HPLC system components, and parts that often exceed the original equipment manufacturers' requirements.

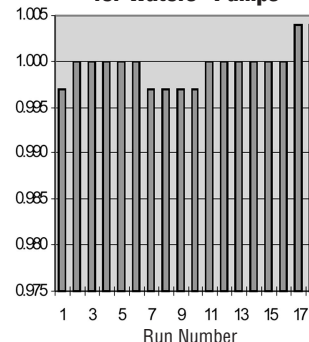
ASI subjects each valve to a rigorous series of tests. Each valve is tested for its self-priming capability, which means you won't need a syringe or draw-off valves to prime your pump. Simply open the pump outlet and start the pump, the valve will prime itself—even if the transfer lines are completely dry! Next, the valve goes through both a high-pressure and a low-pressure test. The high-pressure test ensures that the valve will not leak, even at pressures up to 12,000psi. The low-pressure test verifies that the valve closes properly, even without the presence of a high backpressure force. The cartridge design allows easy replacement of worn or damaged valves.

Figure 1: Achieve more consistent flow rates with ASI valves.

Flowrates of Waters™ Valves



**Flowrates of ASI Valves
for Waters™ Pumps**



Check Valves for Agilent 1050 & 1100

Description	material	qty.	cat.#
Outlet check valve (cartridge and housing)	sapphire & ruby ball & seat	ea.	25170
Outlet check valve (cartridge and housing)	ceramic ball & seat	ea.	25173
Outlet cartridges	sapphire & ruby ball & seat	ea.	25171
Outlet cartridges	ceramic ball & seat	ea.	25174
Outlet housing	—	ea.	25172

Check Valves for Waters Alliance Model 2690

Description	material	qty.	cat.#
Outlet cartridges	sapphire & ruby ball & seat	ea.	25161
Outlet cartridges	ceramic ball & seat	ea.	25163
Inlet cartridges	sapphire & ruby ball & seat	ea.	25160
Inlet cartridges	ceramic ball & seat	ea.	25162

Check Valves for Waters 616 SS

Description	material	qty.	cat.#
Outlet check valve (cartridge and housing)	sapphire & ruby ball & seat	ea.	25167
Outlet check valve (cartridge and housing)	ceramic ball & seat	ea.	25179
Inlet check valve (cartridge and housing)	sapphire & ruby ball & seat	ea.	25164
Inlet check valve (cartridge and housing)	ceramic ball & seat	ea.	25177
Outlet cartridges	sapphire & ruby ball & seat	ea.	25168
Outlet cartridges	ceramic ball & seat	ea.	25180
Inlet cartridges	sapphire & ruby ball & seat	ea.	25165
Inlet cartridges	ceramic ball & seat	ea.	25178
Inlet housing	—	ea.	25166
Outlet housing	—	ea.	25169

HPLC Accessories

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Lit. Cat. #59362

LO-Pulse® Pulse Damper (type 316 SS)

The LO-Pulse® Pulse Damper is a patented, wide-dynamic-range device that smooths pulsations and maintains constant flow at system pressures up to 6,000psi.

The flow path volume is only 0.9mL and the path is designed to ensure that it is completely swept, eliminating solvent memory effects when changing mobile phases.

The pulse damper also is available in a space-saving, economical kit. The kit includes attachment hardware for mounting the pulse damper on a bracket, or for installing feet on it for bench-top use.

Description	qty.	cat.#
Model LP-21 LO-Pulse®	ea.	25012
Economical Kit Version	kit	25013

*LO-Pulse®
Pulse Damper kit*



HPLC Column Test Mixes

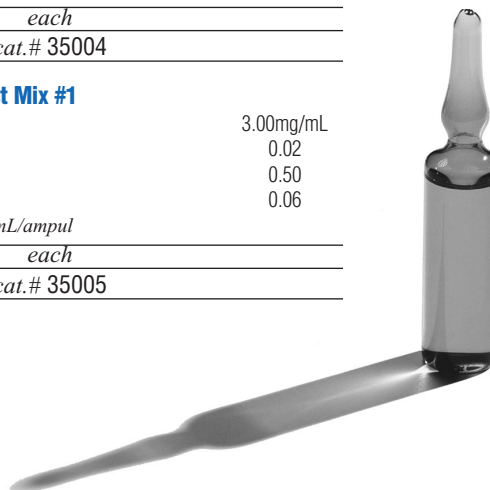
These test mixes are suitable for monitoring HPLC column performance. Routine analysis using these products can assist in determining the need to perform column and/or system maintenance.

HPLC Normal Phase Test Mix #1

benzene	1.00mg/mL
benzaldehyde	0.04
benzyl alcohol	3.00
4-methoxybenzyl alcohol	2.00
In hexane, 1mL/ampul	
each	
cat.# 35004	

HPLC Reversed Phase Test Mix #1

benzene	3.00mg/mL
uracil	0.02
naphthalene	0.50
biphenyl	0.06
In methanol:water (75:25), 1mL/ampul	
each	
cat.# 35005	



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Ultra Aqueous C18 HPLC Columns

Achieve Stable Retention in 100% Aqueous Mobile Phase

Figure 1

The Ultra Aqueous C18 phase provides a hydrophilic environment that prevents chain folding.

Peak List:	Conc. (mg/mL)	Column:	Ultra Aqueous C18
1. glycolic acid	5.4	Catalog#:	9178565
2. malonic acid	4.2	Dimensions:	150x4.6mm
3. acetic acid	7.8	Particle Size:	5µm
4. maleic acid	0.06	Pore Size:	100Å

Sample:

Sample dissolved in mobile phase.

Conditions:

Mobile Phase: 50mM potassium phosphate, pH 2.5
Flow Rate: 1.0mL/min.
Temp.: 25°C
Det.: UV@210nm
Inj.: 10µL

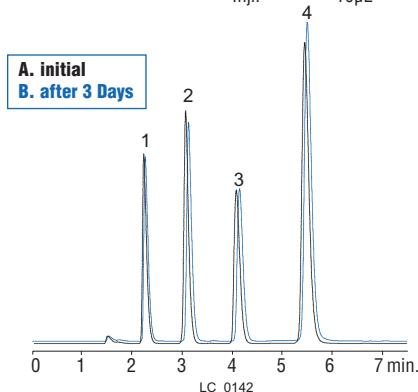
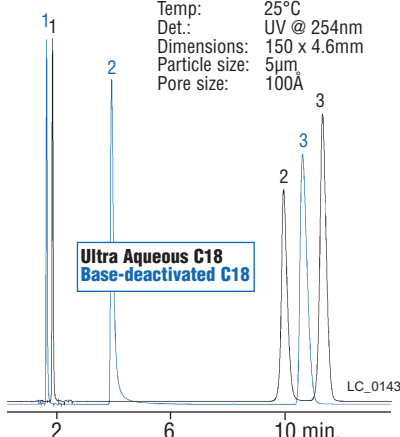


Figure 2

The Ultra Aqueous C18 column has enhanced retention and unique selectivity for polar and basic compounds.

Peak List:	Conditions:
1. uracil	Mobile phase: 20mM potassium phosphate, pH 7.0; acetonitrile (80:20)
2. pyridine	Flow: 1.0mL/min.
3. phenol	Temp: 25°C
	Det.: UV @ 254nm
	Dimensions: 150 x 4.6mm
	Particle size: 5µm
	Pore size: 100Å



The Ultra Aqueous C18 HPLC column provides reproducible retention times and can be used with highly aqueous mobile phases, which may eliminate the need for sample derivitization or ion pairing reagents. This column features a true C18 alkyl bonded phase, meeting the requirements of a US Pharmacopoeia (USP) L1 stationary phase.

Many traditional C18 alkyl stationary phases exhibit a loss in retention over time when exposed to highly aqueous mobile phases. This retention time loss is even more pronounced if the mobile phase flow is stopped and restarted. One theory explaining this loss in retention is "chain folding," where extremely hydrophobic alkyl chains of a traditional C18 phase fold down upon the surface of the silica to avoid the hydrophilic aqueous mobile phase environment. In turn, the folded C18 chains diminish the amount of hydrophobic interaction that occurs between sample analytes and the stationary phase, resulting in a loss of analyte retention.

Restek scientists however, use a novel bonding chemistry for the Ultra Aqueous C18 column that results in polar groups at the silica surface. These surface polar groups keep the alkyl stationary phase extended, and thus wetted by the mobile phase—even when using up to 100% aqueous mobile phases (Figure 1). Additionally, although the Ultra Aqueous C18 column behaves similarly to a traditional base-deactivated C18 column when analyzing neutral hydrophobic compounds, it has enhanced retention and unique selectivity for polar and basic compounds (Figure 2).

Features & Benefits

Feature	Benefit
Analyzes polar compounds by reversed phase.	Retains compounds such as amino acids and water soluble vitamins using simple mobile phases and without derivitization.
Analyzes polar, hydrophilic materials without retention time loss. Stable retention in 100% aqueous mobile phases.	Can analyze compounds that are sparingly soluble in organic solvents.
True C18 alkyl bonded phase.	Meets requirements of USP L1.
High-density C18 ligand coverage.	Similar selectivity as traditional C18 phases for neutral hydrophobic compounds.
Unique secondary polar characteristics.	End-capping diminishes peak tailing observed from exposed silanol sites on the silica surface.

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Ultra Aqueous C18

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Application Notes:

(#59177) Analyze Polar Compounds by
Reversed Phase HPLC Using Ultra Aqueous
C18 Column

(#59314) Trident™ Direct Guard Cartridge
System Fast Facts

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- **Online** www.restekcorp.com

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Lit. Cat. # 59371

Commonly Asked Questions

• How is the Ultra Aqueous C18 column different from traditional C18 columns?

The Ultra Aqueous C18 column has a true C18 alkyl linkage to a high-surface-area Type B silica support. This is different from traditional C18 phases because Restek uses a novel bonding process that results in a polar group attached to the silica surface. It is this secondary process with the polar functional groups that makes the Ultra Aqueous C18 column unique and allows it to be used in highly aqueous mobile phases.

• How is Restek's Ultra Aqueous C18 column different from other brands of highly aqueous stationary phases?

There are several approaches to designing aqueous stationary phases. Some of the older types of highly aqueous stationary phases used a low-density bonding of the C18 ligand, unintentionally leaving exposed silanol sites. These silanol sites helped to create a hydrophilic surface that kept the alkyl chains suspended. However, the very reactive silanol sites could cause severe peak tailing of basic analytes. Another avenue manufacturers have taken is to cross-link the C18 chains, creating a physical hindrance that would prevent the alkyl chains from collapse. This process has been successful, but creates problems in trying to perform a secondary end-capping procedure, so many reactive silanol sites may remain. The Restek process successfully achieves secondary polar end-capping that provides a hydrophilic environment that prevents the hydrophobic alkyl chain from folding.

• What are the particle and pore sizes of the silica used for the Ultra Aqueous C18 column?

The Ultra Aqueous C18 is available in 3µm or 5µm spherical, Type B silica with a 100Å pore size.

• What are the temperature and pH ranges of the Ultra Aqueous C18 column?

Temp. limits: Up to 80°C pH limits: 2.5 -7.5

• Are guard cartridges available for the Ultra Aqueous C18 column?

Yes. The Ultra Aqueous C18 column is available as part of the Restek **Integral Trident™ guard system**, which is one of the most efficient guard systems on the market. Or it is available as part of our **Trident™ Direct guard system**, Restek's efficient, universal guard cartridge and holder system.

Also available in 3µm.
Call for details.

■ Ultra Aqueous C18 5µm Columns

Column Length	1.0mm ID cat.#	2.1mm ID cat.#	3.2mm ID cat.#	4.6mm ID cat.#
30mm	9178531	9178532	9178533	9178535
50mm	9178551	9178552	9178553	9178555
100mm	9178511	9178512	9178513	9178515
150mm	9178561	9178562	9178563	9178565
200mm	9178521	9178522	9178523	9178525
250mm	9178571	9178572	9178573	9178575

■ Ultra Aqueous C18 5µm Columns with Trident™ Inlet Fitting

Column Length	2.1mm ID cat.#	3.2mm ID cat.#	4.6mm ID cat.#
30mm	9178532-700	9178533-700	9178535-700
50mm	9178552-700	9178553-700	9178555-700
100mm	9178512-700	9178513-700	9178515-700
150mm	9178562-700	9178563-700	9178565-700
200mm	9178522-700	9178523-700	9178525-700
250mm	9178572-700	9178573-700	9178575-700

■ Ultra Aqueous C18 Guard Cartridges

Dimensions	cat.#	qty.
10 x 2.1mm	917850212	3
10 x 4.0mm	917850210	3
20 x 4.0mm	917850220	2

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Restek analytical reference materials for explosives are formulated to support nitroaromatic, nitroamine, and nitroester analyses. These materials can be analyzed using high performance liquid chromatography (HPLC-UV) according to US EPA Method 8330¹ or using gas chromatography (GC-ECD) according to Method 8095², developed by the US Army Cold Regions Research and Engineering Laboratory.³

EPA Method 8095 includes all the Method 8330 target compounds, plus 3,5-dinitroaniline, nitroglycerin, and pentaerythritol tetranitrate (PETN). Our Method 8095 calibration mixtures contain the additional components at the concentration ratios appropriate for ECD.

Compounds listed are explosives, intermediates that are used in the manufacture of explosives, or degradation products of explosive compounds.

References

1. US Environmental Protection Agency. *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods*. SW-846 Update III, Office of Solid Waste, Washington, DC, 1997.
2. US Environmental Protection Agency. *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods*. SW-846, Proposed Draft Update IVB, Office of Solid Waste, Washington, DC, 1999.
3. M. E. Walsh, T. Ranney. *Determination of Nitroaromatic, Nitramine, and Nitrate Ester Explosives in Water Using Solid-Phase Extraction and Gas Chromatography-Electron Capture Detection: Comparison with High-Performance Liquid Chromatography*. J. Chromatogr. Sci., Vol. 36, pp. 406-416, August 1998.

Try our Pinnacle II™ C18 and Cyano Columns when analyzing explosive compounds!

Pinnacle II™ C18 5µm Column

Cat.#: 9214575

Dimensions: 250 x 4.6mm



Pinnacle II™ Cyano 5µm Column

Cat.#: 9216575

Dimensions: 250 x 4.6mm

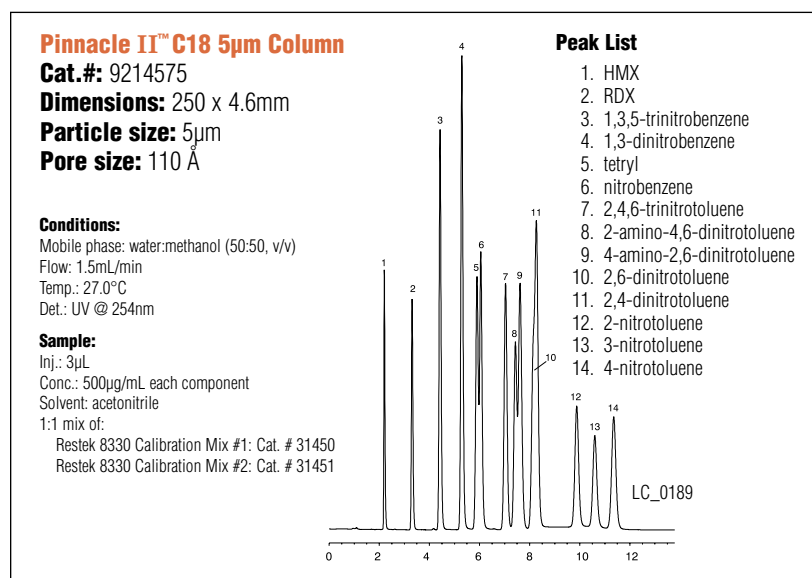


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Reference Standards for Explosives Analysis

- 20 single-component certified solutions or retention time markers.
- Support the US Department of Defense base closures and remediation.
- Mixtures supporting HPLC Method 8330.
- Mixtures supporting GC-ECD Method 8095.
- Internal standards and surrogates to support both methods.



Single-Component Explosives Solutions

Packaged 1mL/ampul				Individual	5-pk. w/	10-pk. w/
Compound	Solvent	µg/mL	Individual	w/data pack	5-pk.	data pack
2-amino-4,6-dinitrotoluene	ACN	1,000	31670	31670-500	31670-510	31670-520
4-amino-2,6-dinitrotoluene	ACN	1,000	31671	31671-500	31671-510	31671-520
3,5-dinitroaniline	ACN	1,000	31661	31661-500	31661-510	31661-520
1,3-dinitrobenzene	ACN	1,000	31662	31662-500	31662-510	31662-520
2,4-dinitrotoluene	ACN	1,000	31663	31663-500	31663-510	31663-520
2,6-dinitrotoluene	ACN	1,000	31664	31664-500	31664-510	31664-520
EGDN	M	1,000	31601	31601-500	31601-510	31601-520
HMX	ACN	1,000	31665	31665-500	31665-510	31665-520
nitrobenzene	ACN	1,000	31657	31657-500	31657-510	31657-520
nitroglycerin	M	1,000	31498	31498-500	31498-510	31498-520
nitroguanidine	M	1,000	31602	31602-500	31602-510	31602-520
2-nitrotoluene	ACN	1,000	31659	31659-500	31659-510	31659-520
3-nitrotoluene	ACN	1,000	31660	31660-500	31660-510	31660-520
4-nitrotoluene	ACN	1,000	31658	31658-500	31658-510	31658-520
PETN	M	1,000	31600	31600-500	31600-510	31600-520
picric acid	M	1,000	31499	31499-500	31499-510	31499-520
RDX	ACN	1,000	31666	31666-500	31666-510	31666-520
tetryl	ACN	1,000	31667	31667-500	31667-510	31667-520
1,3,5-trinitrobenzene	ACN	1,000	31668	31668-500	31668-510	31668-520
2,4,6-trinitrotoluene	ACN	1,000	31669	31669-500	31669-510	31669-520

A = acetone; ACN=acetonitrile; M = methanol

Reference Standards for Explosives Analysis

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technical literature source!**

Application Note:

(#59177) Analyze Polar Compounds by Reversed
Phase HPLC Using Ultra Aqueous C18 Column

Fast Facts:

(#59314) Trident™ Direct Guard
Cartridge System

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restekeurope@aol.com

Thames Restek U.K., Ltd.:

01494-563377
fax: 01494-564990
Sales@Thamesrestek.co.uk

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Lit. Cat. # 59381A

Method 8095

8095 Calibration Mix A

2-amino-4,6-dinitrotoluene HMX
4-amino-2,6-dinitrotoluene RDX
1,3-dinitrobenzene tetryl
2,4-dinitrotoluene 1,3,5-trinitrobenzene
2,6-dinitrotoluene 2,4,6-trinitrotoluene
1,000µg/mL each in acetonitrile, 1mL/ampul

Each	5-pk.	10-pk.
31607	31607-510	—
w/data pack		
31607-500	31607-520	31707

8095 Calibration Mix B

3,5-dinitroaniline 1,000µg/mL
nitrobenzene 5,000
nitroglycerine 5,000
2-nitrotoluene 5,000
3-nitrotoluene 5,000
4-nitrotoluene 5,000
PETN 5,000

Prepared in acetonitrile, 1mL/ampul

Each	5-pk.	10-pk.
31608	31608-510	—
w/data pack		
31608-500	31608-520	31708

8095 Matrix Spike Mix A

2-amino-4,6-dinitrotoluene 200µg/mL
4-amino-2,6-dinitrotoluene 200
1,3-dinitrobenzene 200
2,4-dinitrotoluene 200
2,6-dinitrotoluene 200
HMX 2,000
RDX 200
tetryl 200
1,3,5-trinitrobenzene 200
2,4,6-trinitrotoluene 200

Prepared in acetonitrile, 1mL/ampul

Each	5-pk.	10-pk.
31609	31609-510	—
w/data pack		
31609-500	31609-520	31709

8095 Matrix Spike Mix B

3,5-dinitroaniline 200µg/mL
nitrobenzene 1,000
nitroglycerine 1,000
2-nitrotoluene 1,000
3-nitrotoluene 1,000
4-nitrotoluene 1,000
PETN 1,000

Prepared in acetonitrile, 1mL/ampul

Each	5-pk.	10-pk.
31610	31610-510	—
w/data pack		
31610-500	31610-520	31710

8095 Surrogate

2-methyl-4-nitroaniline
1,000µg/mL in methanol, 1mL/ampul

Each	5-pk.	10-pk.
31612	31612-510	—
w/data pack		
31612-500	31612-520	31712

Method 8330

8330 Calibration Mix #1

1,3-dinitrobenzene RDX
2,4-dinitrotoluene 1,3,5-trinitrobenzene
HMX 2,4,6-trinitrotoluene
nitrobenzene

1,000µg/mL each in acetonitrile, 1mL/ampul

Each	5-pk.	10-pk.
31450	31450-510	—
w/data pack		
31450-500	31450-520	31550

8330 Calibration Mix #2

2-amino-4,6-dinitrotoluene 3-nitrotoluene
4-amino-2,6-dinitrotoluene 4-nitrotoluene
2,6-dinitrotoluene tetryl
2-nitrotoluene

1,000µg/mL each in acetonitrile, 1mL/ampul

Each	5-pk.	10-pk.
31451	31451-510	—
w/data pack		
31451-500	31451-520	31551

8330 Internal Standard*

3,4-dinitrotoluene
1,000µg/mL in methanol, 1mL/ampul

Each	5-pk.	10-pk.
31452	31452-510	—
w/data pack		
31452-500	31452-520	31552

8330 Surrogate

1,2-dinitrobenzene
1,000µg/mL in methanol, 1mL/ampul

Each	5-pk.	10-pk.
31453	31453-510	—
w/data pack		
31453-500	31453-520	31553

8330 Nitroaromatics Kit

31450: 8330 Calibration Mix #1
31451: 8330 Calibration Mix #2
31452: 8330 Internal Standard Mix*
31453: 8330 Surrogate Mix

Contains 1mL each of these mixtures.

Kit	Kit w/Data Pack
31454	31454-500

* Cat.# 31452 also can be used as a surrogate
standard for Method 8095.

Rtx®-TNT/Rtx®-TNT2 Capillary GC Columns

- Better resolution of Method 8095
analytes, in 20 minutes
- Eight elution order differences

Rtx®-TNT

Cat.#: 12998

Three 6-meter columns

Rtx®-TNT2

Cat.#: 12999

Three 6-meter columns



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Capillary GC Columns

Rtx®-BAC1 (fused silica)

ID	df (µm)	30-Meter
0.32mm	1.80	18003
0.53mm	3.00	18001

Rtx®-BAC2 (fused silica)

ID	df (µm)	30-Meter
0.32mm	1.20	18002
0.53mm	2.00	18000

MXT®-BAC1 (Silcosteel®-treated stainless)

ID	df (µm)	30-Meter
0.53mm	3.00	78001

MXT®-BAC2 (Silcosteel®-treated stainless)

ID	df (µm)	30-Meter
0.53mm	2.00	78000



Ethanol Analytical Reference Standards for Blood Alcohol Testing

- NIST-traceable ethanol calibration standards from 0.015g/dL to 0.4g/dL in water.
- Eight-component resolution control standard with NIST-certified ethanol concentration.
- Datapack and Certificate of Analysis provided with each standard.

Legal limits for blood alcohol in the United States are set at either 0.080 or 0.100g/dL. We offer high- and low-concentration standards so that laboratories can construct calibration curves that bracket either legal limit concentration. In addition, we offer 0.015g/dL and 0.025g/dL concentrations, which are important in "zero-tolerance" cases involving minors or convicted DUI offenders.

These standards are National Institute of Standards and Technology (NIST)-traceable and are shipped with a complete data pack that includes a Certificate of Analysis, copies of all raw material testing results, statistical QA results, analytical balance printout, and a lot sheet showing gravimetric weight of each analyte.

Use our Resolution Control Standard mix to verify the retention time for each compound normally detected in a blood alcohol test, and to verify that the compounds are resolved from and do not interfere with each other. Each compound in this resolution mix is 0.100g/dL. The ethanol concentration is an NIST-traceable certified value.

We also offer Rtx®-BAC1 and Rtx®-BAC2 columns, which can resolve a blood alcohol sample in less than 3 minutes. If you have any questions about blood alcohol methods, or these products, please contact our Technical Service Team at support@restekcorp.com or via phone at 800-356-1688 or 814-353-1300, ext. 4. To order call ext. 3.

Note: Ethanol Standards

Expiration date for each solution is 36 months from the date of manufacture.

Custom Resolution Control Standard

Expiration date is 18 months from the date of manufacture.



Forensic Ethanol Solutions w/data pack

Forensic ethanol solutions w/data pack	5-pk. 1mL/ampul	10-pk. 1mL/ampul	ea. 5mL/ampul	ea. 20mL/ampul
0.015g/dL forensic ethanol solution	36232	36332	36240	36248
0.02g/dL forensic ethanol solution	36233	36333	36241	36249
0.025g/dL forensic ethanol solution	36234	36334	36242	36250
0.04g/dL forensic ethanol solution	36235	36335	36243	36251
0.05g/dL forensic ethanol solution	36257	36259	36258	36260
0.08g/dL forensic ethanol solution	36262	36264	36263	36265
0.1g/dL forensic ethanol solution	36236	36336	36244	36252
0.15g/dL forensic ethanol solution	36237	36337	36245	36253
0.2g/dL forensic ethanol solution	36238	36338	36246	36254
0.3g/dL forensic ethanol solution	36239	36339	36247	36255
0.4g/dL forensic ethanol solution	36266	36268	36267	36269

Blood Alcohol Mix Resolution Control Standard (8 components)

acetaldehyde ethanol (NIST certified value) methanol
acetone ethyl acetate methyl ethyl ketone
acetonitrile isopropanol

0.100g/dL each in water; 1mL/ampul

Each w/data pack

36256

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**Ethanol Analytical Reference Standards
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Name: _____

Date: _____

Company/Location: _____

Phone #: _____

FAX #: _____

E-mail: _____

Take these eight steps to create the right solution:

1. Mixture Description: _____

2. Solvent: _____

3. Number of components: _____

4. Volume (select): 1mL, 2mL, 5mL, 10mL, or other mL _____

5. Quantity: Number of units _____

6. Select testing and documentation that best meets your requirements:

- ☐ Gravimetric Documentation: Lot Sheet with balance printout attached.
☐ Qualitative Documentation: Certificate of Composition,
Chromatogram, and Gravimetric Documentation.
☐ Quantitative Documentation: Certificate of Analysis and Data Pack.

7. Compound(s)

Compound(s): (list or attach sheet)	Concentration:
1.	
2.	
3.	
4.	
5.	
6.	
7.	
8.	
9.	
10.	
11.	
12.	

8. Concentration Units

☐ mg/mL ☐ µg/mL ☐ ng/mL ☐ vol./vol.% ☐ wt./wt.% ☐ other _____

ALL mixtures are produced in accordance with our ISO 9001 registration. Analytical balances are calibrated daily at seven mass levels using NIST-traceable weights. ALL raw materials used are a minimum of 97% pure unless otherwise specified.

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Calibration Standards for ASTM Method D2887-01, Boiling Range Distribution of Petroleum Products



Ken Herwehe
Analytical Reference Materials
Product Marketing Manager
814-353-1300, ext. 2127



Joe Moodler
Analytical Reference Materials
Custom Standards Group Leader
814-353-1300, ext. 2148

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Components of ASTM D2887-01 Hydrocarbon Mixtures

<i>n</i> -pentane (C5)	<i>n</i> -hexadecane (C16)
<i>n</i> -hexane (C6)	<i>n</i> -heptadecane (C17)
<i>n</i> -heptane (C7)	<i>n</i> -octadecane (C18)
<i>n</i> -octane (C8)	<i>n</i> -eicosane (C20)
<i>n</i> -nonane (C9)	<i>n</i> -tetracosane (C24)
<i>n</i> -decane (C10)	<i>n</i> -octacosane (C28)
<i>n</i> -undecane (C11)	<i>n</i> -dotriacontane (C32)
<i>n</i> -dodecane (C12)	<i>n</i> -hexatriacontane (C36)
<i>n</i> -tetradecane (C14)	<i>n</i> -tetracosane (C40)
<i>n</i> -pentadecane (C15)	<i>n</i> -tetratetracontane (C44)

- ✓ Meet requirements for the 2001 revision of ASTM 2887-01.
- ✓ Pentane added.
- ✓ Equal weight/weight concentrations of all components.
- ✓ Designed for both calibration and resolution tests—
one sample for both test criteria.



American Society for Testing and Materials (ASTM International) Method D2887-01, *Standard Test Method for Boiling Range Distribution of Petroleum Fractions by Gas Chromatography*, describes the determination of the boiling range distribution of petroleum products. This test method is applicable to petroleum products and fractions having a final boiling point of 538°C (1000°F) or lower; and is limited to samples having a boiling range greater than 55°C (100°F) and having a vapor pressure sufficiently low to permit sampling at ambient temperature.

To facilitate the ASTM International guideline and help petroleum analytical laboratories in determining petroleum product boiling range applications, Restek has introduced two chemical standards designed specifically for ASTM Method D2887-01. The first mixture is prepared at 1% w/w in carbon disulfide for convenient laboratory use. This standard may only be shipped by ground shipment within the US. The second mixture is a blend of neat hydrocarbons to allow overnight shipments in the US and shipments to our international customers.

This method is not to be used for the analysis of gasoline samples or gasoline range petroleum products. These types of samples must be analyzed by ASTM Method D3710-95. Restek offers a calibration mixture for ASTM D-3710-95. (cat.# 31223, single ampul, and cat.# 31323, 10-pack with data pack)

In addition, Restek offers chemical standards for other ASTM Methods: D6352-98 (Polywax®); E1387-95 and E1618-97 (fire debris); and D-4059-96 (PCBs in transformer oil). Restek also makes custom chemical standard solutions for a wide variety of ASTM Methods — see the reverse side of this *Fast Facts* for information.

ASTM D2887-01 Hydrocarbon Mixture in Carbon Disulfide

1% w/w each component in carbon disulfide, 1mL/ampul

	cat.#/Each	5-pk.	10-pk.
	31674	31674-510	—
w/data pack	31674-500	31674-520	31774

Solvent-Free ASTM D2887-01 Hydrocarbon Mixture

5% w/w each component*, 1g/5mL ampul

	cat.#/Each	5-pk.	10-pk.
	31675	31675-510	—
w/data pack	31675-500	31675-520	31775

*This mixture may be diluted by the analyst with 4g carbon disulfide to achieve a concentration of 1% w/w.



Separating Restek from
the rest through
12 critical steps.

1. Review method requirements
2. Verify compatibility and stability
3. Test starting materials
4. Certify balance and weights
5. Deactivate glassware and ampuls
6. Prepare two independent lots
7. Assay to assure quality
8. Assign real-time expiration date
9. Use customer friendly packaging (includes extra vial and label)
10. Include Restek documentation
11. Comply with ISO 9001 registration
12. Offer custom reference materials program

Capillary GC Columns for ASTM D-2887-01

Rtx®-2887 10m x 0.53mm x 2.65µm (cat.# 10199)

MXT®-2887 10m x 0.53mm x 2.65µm (cat.# 70199)

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Name: _____

Date: _____

Company/Location: _____

Phone #: _____

FAX #: _____

E-mail: _____

Take these eight steps to create the right solution:

1. Mixture Description: _____

2. Solvent: _____

3. No. of Components: _____

4. Volume (select): 1mL, 2mL, 5mL, 10mL, or other mL _____

5. Quantity: No. of units _____

6. Select testing and documentation that best meets your requirements:

- ☐ Gravimetric Documentation: Lot Sheet with balance printout attached.
- ☐ Qualitative Documentation: Certificate of Composition, Chromatogram, and Gravimetric Documentation.
- ☐ Quantitative Documentation: Certificate of Analysis and Data Pack.

7. Compound(s): (list or attach sheet)

Concentration:

1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		
11.		
12.		

8. Concentration Units

☐ mg/mL ☐ µg/mL ☐ ng/mL ☐ vol./vol.% ☐ wt./wt.% ☐ other _____

ALL mixtures are produced in accordance with our ISO 9001 registration.
Analytical balances are calibrated daily at seven mass levels using NIST-traceable weights.
ALL raw materials used are a minimum of 97% pure unless otherwise specified.

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Certified PAHs in Composite Diesel Fuel #2

PAH Typical Certified Conc. * (ppm)

acenaphthene	20
acenaphthylene	10
fluorene	30
1-methylnaphthalene	250
2-methylnaphthalene	170
naphthalene	80
phenanthrene	40

50,000µg/mL diesel fuel #2 in methylene chloride, 1mL/ampul

	cat.#/Each	5-pk.	10-pk.
	31673	31673-510	
w/data pack	31673-500	31673-520	31773

Certified Aromatics in Composite Gasoline

Certified for:*

benzene	MTBE	toluene
ethylbenzene	naphthalene	m-xylene
m-ethyltoluene	n-propylbenzene	o-xylene
o-ethyltoluene	1,2,3-trimethylbenzene	p-xylene
p-ethyltoluene	1,2,4-trimethylbenzene	
isopropylbenzene	1,3,5-trimethylbenzene	

5500µg/mL unleaded gasoline in P&T methanol, 1mL/ampul

	cat.#/Each	5-pk.	10-pk.
	30485	30485-510	
w/data pack	30485-500	30485-520	30585

Certified BTEX in Composite Unleaded Gas

Certified for:*

benzene	total xylenes	naphthalene
ethylbenzene	MTBE	toluene
isopropyl benzene		

5500µg/mL unleaded gasoline in P&T methanol, 1 mL/ampul

	cat.#/Each	5-pk.	10-pk.
	30237	30237-510	
w/data pack	30237-500	30237-520	30337

* Concentrations differ from lot to lot. See Certificate of Analysis for certified concentrations.

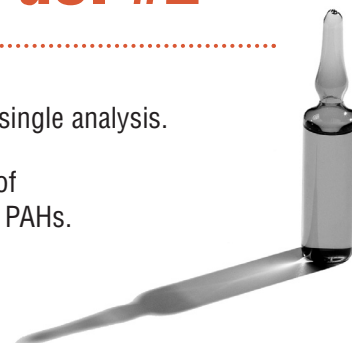
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Certified PAHs in Composite Diesel Fuel #2

Lit. Cat. #59384B

- ✓ Confirm diesel #2 TPH and priority PAHs in a single analysis.
- ✓ Certificate of Analysis includes concentration of TPH and certified concentrations of individual PAHs.
- ✓ Complete data pack available.



There is great concern about environmental pollution caused by polynuclear aromatic hydrocarbons (PAHs) from diesel fuel: diesel internal combustion engines produce exhaust emissions that pollute the air; diesel fuel that leaks while in storage or spills during transportation will pollute soil and water systems. To address the latter issue, the US Environmental Protection Agency (EPA) Underground Storage Tank (UST) program has been enforcing the federal rules in monitoring and assessing diesel fuel contamination in soil and water systems. In addition, the American Society for Testing and Materials (ASTM International) has developed analytical methods and procedures for priority PAHs in fuels.

To help analytical laboratories accurately quantify and characterize PAHs in diesel fuel, Restek offers a reference material—Certified PAHs in Composite Diesel Fuel #2. Prepared from diesel #2 composite, this standard is suitable for checking both diesel #2 total petroleum hydrocarbons (TPH) and PAH calibrations in one analysis. After preparation and packaging, the concentration of each priority PAH compound is certified by GC/MS analysis. The complete data pack includes all gravimetric, QC, and calibration data.

Also available:

Certified Aromatics/BTEX in Unleaded Gasoline

- ✓ Confirm unleaded gasoline TPH, BTEX, and aromatics in a single analysis.
- ✓ Certificate of Analysis includes concentration of TPH and certified concentrations of BTEX and individual aromatics.
- ✓ Complete data pack available.

Certified BTEX in Composite Unleaded Gasoline and Certified Aromatics in Composite Gasoline are prepared from unleaded gasoline composites. After preparation and packaging, the concentration of each aromatic compound is certified by GC/MS analysis. The complete data pack includes all gravimetric, QC, and calibration data.

Recommended Rtx®-5 Capillary GC Columns for Diesel #2 Analysis

Catalog #: 10238
Dimensions: 30m x 0.25mm x 0.5µm

Catalog #: 10239
Dimensions: 30m x 0.32mm x 0.5µm

Catalog #: 10270
Dimensions: 30m x 0.53mm x 1.5µm

Recommended Rtx®-1 Capillary GC Columns for Gasoline Analysis

Catalog #: 10156
Dimensions: 60m x 0.25mm x 1.0µm

Catalog #: 10157
Dimensions: 60m x 0.32mm x 1.0µm

Catalog #: 10173
Dimensions: 60m x 0.53mm x 1.5µm

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Custom Reference Materials Request Form

Take these **eight** steps to create the right solution:

1. Mixture Description: _____
2. Solvent: _____
3. Number of Components: _____
4. Volume per ampul (select): 1mL, 2mL, 5mL, 10mL or other _____mL
5. Quantity of ampuls: _____
6. Testing and documentation that best meets your requirements:
 - ☐ Gravimetric Documentation: Lot Sheet with balance printout attached.
 - ☐ Qualitative Documentation: Certificate of Composition, Chromatogram, and Gravimetric Documentation.
 - ☐ Quantitative Documentation: Certificate of Analysis and Data Pack.

7. Compound(s): (list or attach sheet; include CAS number)

Compound 01: _____	Concentration: _____
Compound 02: _____	Concentration: _____
Compound 03: _____	Concentration: _____
Compound 04: _____	Concentration: _____
Compound 05: _____	Concentration: _____
Compound 06: _____	Concentration: _____
Compound 07: _____	Concentration: _____
Compound 08: _____	Concentration: _____
Compound 09: _____	Concentration: _____
Compound 10: _____	Concentration: _____
Compound 11: _____	Concentration: _____
Compound 12: _____	Concentration: _____
Compound 13: _____	Concentration: _____
Compound 14: _____	Concentration: _____
Compound 15: _____	Concentration: _____
Compound 16: _____	Concentration: _____
Compound 17: _____	Concentration: _____
Compound 18: _____	Concentration: _____
Compound 19: _____	Concentration: _____
Compound 20: _____	Concentration: _____

8. Concentration Units

☐ mg/mL ☐ µg/mL ☐ ng/mL ☐ vol./wt. % ☐ wt./wt. % ☐ other

Contact Information:

Name: _____

Date: _____

Company/Location: _____

Phone #: _____ FAX #: _____

E-mail: _____

Domestic Customers

FAX#: (814) 355-2895

email: standards@restekcorp.com

International Customers

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Restek Representative.

Order custom reference materials quickly and easily online at www.restekcorp.com

ALL mixtures are produced in accordance with our ISO 9001 registration.
Analytical balances are calibrated daily at seven mass levels using NIST traceable weights.
ALL raw materials used are a minimum of 97% pure unless otherwise specified.

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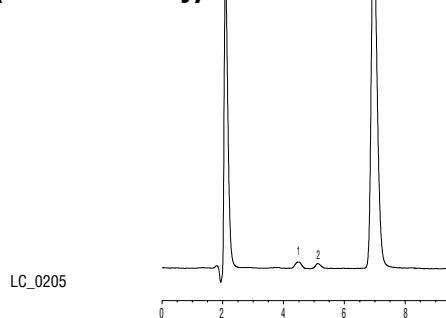
FAST FACTS

At-a-Glance
Product
Information
from Restek

Sugar analysis is important in the generation of nutrition panels, as both the sugar content and the total carbohydrate content must be included. Simple sugars include mono- and disaccharides such as fructose, glucose, sucrose, maltose, and lactose. In foods and beverages, they provide sweetness, texture, and color development. The perceived sweetness of each sugar is different in terms of character, intensity, and duration. Therefore, the ability to profile the individual mono- and disaccharides is important to the food chemist. Methods exist for the quantification of individual sugar species, as well as for the determination of total sugar content. The new Pinnacle II™ Amino column is ideal for these sugar analyses. HPLC analysis using an amino-based stationary phase is the most popular technique for the routine analyses of simple sugars. This analysis uses isocratic elution (e.g., water:acetonitrile, 25:75) and a refractive index detector (RI). Review Figures 1 through 3 to see how the new Pinnacle II™ Amino column can achieve good resolution of common sugars.

Another sugar, lactulose, is a common laxative ingredient. The test method for this compound is prescribed in the United States Pharmacopoeia (USP 25). The assay calls for an analytical column with an L8 (propylamino) stationary phase bonded to 3µm particle silica, and use of refractive index detection. The new Pinnacle II™ Amino column allows excellent quantification and peak shape for lactulose. Observe the lactulose chromatogram analyzed per the USP monograph in Figure 4.

Pure Maple Syrup on Pinnacle II™ Amino (low sensitivity)



Pinnacle II™ Amino HPLC Columns

*Newest phase available in our line of
Pinnacle II™ HPLC Silica*

Features & Benefits

Feature	Benefit
Supported by experienced HPLC technical service.	Free method development assistance.
Product of strictly controlled in-house manufacturing	Column-to-column reproducibility; fast order fulfillment.
Economical.	Same peak shape as higher-priced columns, but at a better value.

Figure 1 5-Sugar Standard on Pinnacle II™ Amino

Peak List:
1. fructose
2. glucose
3. sucrose
4. maltose
5. lactose

Sample:
Inj.: 5.0µL
Conc.: 15mg/mL each
Solvent: methanol:water
(10:90, v/v)

Column: Pinnacle II™ Amino
Catalog #: 9217565
Dimensions: 150 x 4.6mm
Particle Size: 5µm
Pore Size: 110Å

Conditions:
Mobile Phase: water:acetonitrile
(25:75, v/v)
Flow: 1.0mL/min
Temp.: 35°C
Det.: RI

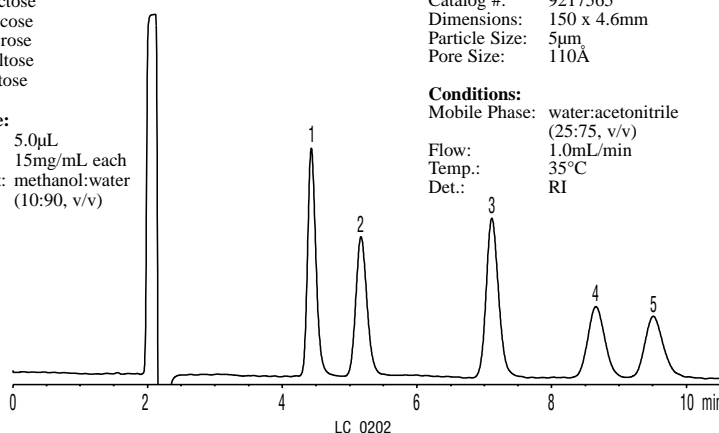


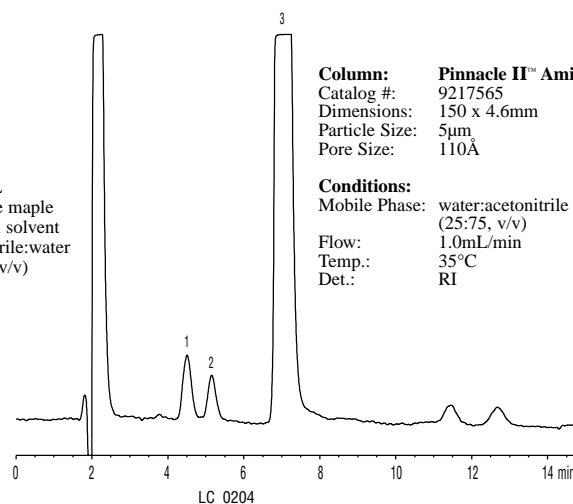
Figure 2 Pure Maple Syrup on Pinnacle II™ Amino (high sensitivity)

Peak List:
1. fructose
2. glucose
3. sucrose

Sample:
Inj.: 100.0µL
Conc.: 1% pure maple
syrup in solvent
Solvent: acetonitrile:water
(70:30, v/v)

Column: Pinnacle II™ Amino
Catalog #: 9217565
Dimensions: 150 x 4.6mm
Particle Size: 5µm
Pore Size: 110Å

Conditions:
Mobile Phase: water:acetonitrile
(25:75, v/v)
Flow: 1.0mL/min
Temp.: 35°C
Det.: RI



RESTEK 800-356-1688
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Pinnacle II™ Amino

FAST FACTS

At-a-Glance
Product
Information
from Restek

*Restek is your free
technical literature source!*

Application Notes:

(#59177) Analyze Polar Compounds by
Reversed Phase HPLC Using Ultra Aqueous
C18 Column

Fast Facts:

(#59314) Trident™ Direct Guard
Cartridge System

For literature:

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800-356-1688, ext. 5

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• **Online** www.restekcorp.com

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fax: 44-28-9081-4576
restekeurope@aol.com

Thames Restek U.K., Ltd.:

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fax: 01753-624666
Sales@Thamesrestek.co.uk

www.restekcorp.com

RESTEK

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Lit. Cat. # 59385A

Figure 3: Cola on Pinnacle II™ Amino

Peak List:

1. fructose
2. glucose

Sample:

Inj.: 10.0µL
Conc.: 10% cola in solvent
Solvent: acetonitrile:water
(70:30, v/v)

Column: Pinnacle II™ Amino
Catalog #: 9217565
Dimensions: 150 x 4.6mm
Particle Size: 5µm
Pore Size: 110Å

Conditions:

Mobile Phase: water:acetonitrile
(25:75, v/v)
Flow: 1.0mL/min
Temp.: 35°C
Det.: RI

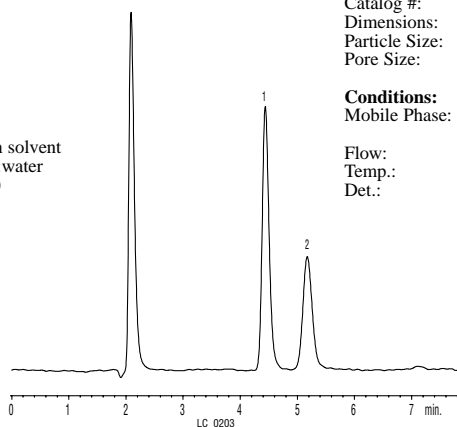


Figure 4: Lactulose Concentrate by USP 25: Resolution Solution on Pinnacle II™ Amino

Peak List:	Conc. (mg/mL)	Ret. Time (min.)	RRT	Res.	Inj. %RSD(n=5)
1. fructose	0.4	4.6	0.44	—	—
2. galactose	6.4	6.1	0.58	—	—
3. epi-lactose	unknown	10.0	0.95	—	—
4. lactulose	40	10.5	1.00	1.1	0.3%
5. lactose	4.8	12.7	1.21	2.9	—

Sample:

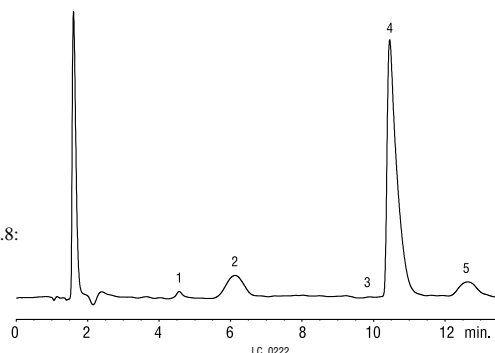
Inj.: 20µL
Sample: resolution standard
Solvent: acetonitrile:water (50:50)

Column:

Pinnacle II™ Amino
Catalog #: 9217365
Dimensions: 150 x 4.6mm
Particle size: 3µm
Pore size: 110Å

Conditions:

Mobile phase: 10mM sodium phosphate
monobasic in water, pH 4.8:
acetonitrile (22:78, v/v)
Flow: 1.3mL/min.
Temp.: 40°C
Det.: refractive index @ 40°C



Pinnacle II™ Amino 3µm Columns

	1.0mm ID	2.1mm ID	3.2mm ID	4.6mm ID
Length	cat.#	cat.#	cat.#	cat.#
30mm	9217331	9217332	9217333	9217335
50mm	9217351	9217352	9217353	9217355
100mm	9217311	9217312	9217313	9217315
150mm	9217361	9217362	9217363	9217365
200mm	9217321	9217322	9217323	9217325

Pinnacle II™ Amino 5µm Columns

	1.0mm ID	2.1mm ID	3.2mm ID	4.6mm ID
Length	cat.#	cat.#	cat.#	cat.#
30mm	9217531	9217532	9217533	9217535
50mm	9217551	9217552	9217553	9217555
100mm	9217511	9217512	9217513	9217515
150mm	9217561	9217562	9217563	9217565
200mm	9217521	9217522	9217523	9217525
250mm	9217571	9217572	9217573	9217575

Pinnacle II™ Amino Guard Cartridges

Dimensions	cat.#	qty.
10 x 2.1mm	921750212	3-pk.
10 x 4.0mm	921750210	3-pk.
20 x 2.1mm	921750222	2-pk.
20 x 4.0mm	921750220	2-pk.

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State of Massachusetts UST Monitoring

To help laboratories comply with and use these analytical procedures, Restek has been active in following the state guidance. Based on our good knowledge of the methods, our experienced chemists have developed a list of the appropriate technical service tools and analytical products to achieve success with these methods. We offer quality chromatographic columns, analytical reference materials, and sample preparation products.

In this comprehensive product listing, you will find everything you need to quickly set up or reorder consumables for these methods. Please refer to our latest product catalog or call 800-356-1688 or 814-353-1300, ext. 3, for more information. Also, we will be happy to provide a quote on any custom consumable you may need!

Regulatory and Analytical Methodology Contact Information

UST CONTACT

**Massachusetts Dept. of Public Safety
Department of Fire Safety**
Underground Storage Tank Program
One Ashburton Place, Room 1310
Boston, MA 02108
Phone: 617-727-3200
Fax: 617-727-4390

LUST CONTACT

**Massachusetts Dept. of
Environmental Protection**
One Winter Street
Boston, MA 02108
Phone: 617-292-5851
Fax: 617-727-7467

Massachusetts' UST program maintains a web site at
http://www.dor.state.ma.us/ust/ust_home.htm

Massachusetts' LUST program maintains a web site at
<http://www.magnet.state.ma.us/dep/bwsc/bwschome.htm>

- ✓ Comprehensive products listing for the latest UST methods used by the State of Massachusetts.
- ✓ Products conveniently organized by method number.
- ✓ Easy method set-up and reorder of consumables, including:
 - Gas chromatography columns and accessories,
 - Analytical reference materials,
 - Sample preparation supplies,
 - Technical service.

To comply with federal Underground Storage Tank (UST) rules, the Massachusetts Department of Environmental Protection (MADEP) proposed a new toxicological approach to characterize petroleum-contaminated media in August 1994. Under this approach, the toxicity of petroleum-contaminated media is defined by (a) the individual concentrations of targeted petroleum constituents, such as BTEX and PAH compounds, and (b) the collective concentrations of (remaining) aliphatic and aromatic hydrocarbons, within defined carbon ranges.

To provide data to support and complement this new toxicological approach, MADEP issued two draft analytical methods in August 1995. The two methods were needed to cover the range of hydrocarbons of concern; volatile petroleum hydrocarbons (VPH) and extractable petroleum hydrocarbons (EPH). In January 1998 MADEP published the final VPH and EPH methods for environmental analytical laboratories.

The VPH test method is a purge-and-trap GC procedure that detects hydrocarbons in the C5-C12 range. It can be used to separate the gasoline range organics (GRO) into three sub-fractions, C5-C8 aliphatic hydrocarbons, C9-C12 aliphatic hydrocarbons and C9-C10 aromatic hydrocarbons and 8 target compounds (BTEX, MTBE, and naphthalene).

The EPH method quantitates hydrocarbons heavier than nonane (C9). It separates the total petroleum hydrocarbons (THP) into three sub-fractions: C9-C18 aliphatic hydrocarbons, C19-C36 aliphatic hydrocarbons, and C11-C22 aromatic hydrocarbons and 17 polynuclear aromatic hydrocarbons (PAHs).

In addition, MADEP has been developing a new method for airborne petroleum hydrocarbons (APH) and is in the process of collecting public comments. We will offer appropriate analytical product and service for MADEP APH as soon as it is finalized.



Ken Herwehe
Analytical Reference Materials
Product Marketing Manager
814-353-1300, ext. 2127



Joe Moodler
Analytical Reference Materials
Custom Standards Group Leader
814-353-1300, ext. 2148

Massachusetts

Gas Chromatography Columns & Accessories

For these items, see Restek's
Chromatography Products Catalog:

- Syringes
- Autosampler Vials
- Guard Columns
- Ferrules, Septa



Recommended Gas Chromatography Columns

Rtx®-5, 30m x 0.25mm

Film Thickness	temp. limits	Cat. #
0.25µm	-60 to 330/350°C	10223
0.50µm	-60 to 330/350°C	10238
1.00µm	-60 to 320/340°C	10253

Integra-Guard™ Columns

Guard and analytical column in one connectionless length.

*Add the appropriate suffix number to analytical column catalog number.

ID	Length	Suffix #*
0.25mm	5m	-124
	10m	-127

Syringes

Standard Micro-Liter Syringes for Agilent 7673 and 7683 Autosamplers

Size	Needle Gauge	6-pk.
10µL	23s	24384
10µL	23s-26s	24600

Autosampler Vials

Crimp Top Vial Snap Seal™ Style (12 x 32mm, 11mm Crimp)

Description*	1,000-pk.
2.0mL Clear Glass Vial w/White Graduated Marking Spot	24384
2.0mL Amber Glass Vial w/White Graduated Marking Spot	24386

*Marking spots are available on request in blue, green, rust or yellow.

Aluminum Crimp Seals w/Septa

Description	1,000-pk.
Silver Seal, PTFE/Natural Rubber Septa	21175
Silver Seal, PTFE/Silicone Septa*	24360

*PTFE/Silicone/PTFE available on request.

Thermolite® Septa

Size	temp. limits	25-pk.	50-pk.	100-pk.
11mm (7/16")	to 340°C	20363	20364	20365

Replacement Inlet Seals

Stainless Steel Inlet Seal for Single-Column Installation*

Size	2-pk.	10-pk.
0.8mm ID	21315	21316

*Equivalent to Agilent Part# 18740-20880.

Inlet Liners

For Agilent GCs

Description	ID/OD & Length (mm)	ea.	5-pk.
Uniliner®*	4.0 ID, 6.3 OD x 78.5	20335	20336
Drilled Uniliner®	4.0 ID, 6.3 OD x 78.5	21054	21055
1mm Split**	1.0 ID, 6.3 OD x 78.5	20972	20973

*Restek design improves performance over the original Agilent Liner.

**Use this liner for increased sensitivity.

Low Volume Injector for Agilent GCs

Description	kit.
Low-Volume Injector for Agilent Split/Splitless GC Inlets	21692

Analytical Reference Materials:

MA VPH (Jan. 1998)

To measure the collective concentrations of volatile aliphatic and aromatic petroleum hydrocarbons in water and soil. The method is based on a purge and trap, gas chromatography procedure with PID/FID in series for detection.

Calibration Mixtures

MA Volatile Petroleum Hydrocarbon (VPH) Standard

<i>n</i> -pentane (C5)	1,000µg/mL	naphthalene	1,000
<i>n</i> -nonane (C9)	1,000	toluene	1,500
benzene	500	1,2,4-trimethylbenzene	1,000
ethylbenzene	500	<i>m</i> -xylene	1,000
isooctane	1,500	<i>o</i> -xylene	1,000
2-methylpentane	1,500	<i>p</i> -xylene	1,000
methyl <i>tert</i> -butyl ether	1,500		

In P&T methanol, 1mL/ampul

	Each	5-pk.	10-pk.
	30434	30434-510	
w/data pack	30434-500	30434-520	30534

MA VPH Standard with Surrogate

<i>n</i> -pentane (C5)	1,000µg/mL	methyl <i>tert</i> -butyl ether	1,500
<i>n</i> -nonane (C9)	1,000	naphthalene	1,000
benzene	500	toluene	1,500
2,5-dibromotoluene (surrogate)	1,000	1,2,4-trimethylbenzene	1,000
ethylbenzene	500	<i>m</i> -xylene	1,000
isooctane	1,500	<i>o</i> -xylene	1,000
2-methylpentane	1,500	<i>p</i> -xylene	1,000

In P&T methanol, 1mL/ampul

	Each	5-pk.	10-pk.
	30452	30452-510	
w/data pack	30452-500	30452-520	30552

Surrogate Mixtures

MA VPH Surrogate Standard

2,5-dibromotoluene

1,000µg/mL in P&T methanol, 1mL/ampul

	Each	5-pk.	10-pk.
	30435	30435-510	
w/data pack	30435-500	30435-520	30535

10,000µg/mL in P&T methanol, 1mL/ampul

	Each	5-pk.	10-pk.
	30453	30453-510	
w/data pack	30453-500	30453-520	30553

Matrix Spike Mixtures

MA VPH Matrix Spike Mix with Surrogate

<i>n</i> -pentane (C5)	ethylbenzene	toluene
<i>n</i> -nonane (C9)	isooctane	1,2,4-trimethylbenzene
benzene	2-methylpentane	<i>m</i> -xylene
2,5-dibromotoluene	methyl <i>tert</i> -butyl ether	<i>o</i> -xylene
(surrogate)	naphthalene	<i>p</i> -xylene

2,500µg/mL each in P&T methanol, 1mL/ampul

	Each	5-pk.	10-pk.
	30454	30454-510	
w/data pack	30454-500	30454-520	30554

Petroleum Reference Mixtures Pattern Recognition Mixtures

Unleaded Gasoline Composite Standard

2,500µg/mL in P&T methanol, 1mL/ampul

	Each	5-pk.	10-pk.
	30081	30081-510	
w/data pack	30081-500	30081-520	30181

50,000µg/mL in P&T methanol, 1mL/ampul

	Each	5-pk.	10-pk.
	30205	30205-510	
w/data pack	30205-500	30205-520	30305

50,000µg/mL in P&T methanol, 5mL/ampul

	Each	5-pk.	10-pk.
	30206	30206-510	
w/data pack	30206-500	30206-520	30306

Analytical Reference Materials:

MA EPH (Jan. 1998)

To measure the collective concentrations of volatile aliphatic and aromatic petroleum hydrocarbons in water and soil. The method is based on a solvent extraction, silica gel solid-phase extraction/fractionation (SPE), gas chromatography procedure with FID detection.

Calibration Mixtures

MA EPH Aromatic Hydrocarbon Standard

acenaphthene	dibenzo(a,h)anthracene
acenaphthylene	fluoranthene
anthracene	fluorene
benzo(a)anthracene	indeno(1,2,3-cd)pyrene
benzo(a)pyrene	2-methylnaphthalene
benzo(b)fluoranthene	naphthalene
benzo(k)fluoranthene	phenanthrene
benzo(ghi)perylene	pyrene
chrysene	

1,000µg/mL each in methylene chloride, 1mL/ampul

	Each	5-pk.	10-pk.
	31458	31458-510	
w/data pack	31458-500	31458-520	31558

MA EPH Aliphatic Hydrocarbon Standard

<i>n</i> -nonane (C9)	<i>n</i> -eicosane (C20)
<i>n</i> -decane (C10)	<i>n</i> -docosane (C22)
<i>n</i> -dodecane (C12)	<i>n</i> -tetracosane (C24)
<i>n</i> -tetradecane (C14)	<i>n</i> -hexacosane (C26)
<i>n</i> -hexadecane (C16)	<i>n</i> -octacosane (C28)
<i>n</i> -octadecane (C18)	<i>n</i> -triacontane (C30)
<i>n</i> -nonadecane (C19)	<i>n</i> -hexatriacontane (C36)

1,000µg/mL each in hexane, 1mL/ampul

	Each	5-pk.	10-pk.
	31459	31459-510	
w/data pack	31459-500	31459-520	31559

Analytical Reference Materials:

MA EPH (cont.)

Surrogate Spike Mixtures

MA EPH Surrogate Spike Mix

1-chlorooctadecane *o*-terphenyl

4,000µg/mL each in acetone, 1mL/ampul

	Each	5-pk.	10-pk.
	31479	31479-510	
w/data pack	31479-500	31479-520	31579

MA Fractionation Surrogate Spike Mix

2-bromonaphthalene 2-fluorobiphenyl

4,000µg/mL each in hexane, 1mL/ampul

	Each	5-pk.	10-pk.
	31480	31480-510	
w/data pack	31480-500	31480-520	31580

Internal Standards

5- α -androstane

2,000µg/mL in methylene chloride, 1mL/ampul

	Each	5-pk.	10-pk.
	31065	31065-510	
w/data pack	31065-500	31065-520	31165

Matrix Spike Mixtures

MA EPH Matrix Spike Mix

<i>n</i> -nonane (C9)	acenaphthene
<i>n</i> -tetradecane (C14)	anthracene
<i>n</i> -nonadecane (C19)	chrysene
<i>n</i> -eicosane (C20)	naphthalene
<i>n</i> -octacosane (C28)	pyrene

250µg/mL each in acetone, 1mL/ampul

	Each	5-pk.	10-pk.
	31460	31460-510	
w/data pack	31460-500	31460-520	31560

Fractionation Check Mixtures

MA Fractionation Check Mix

PAHs:	naphthalene	Hydrocarbons:
acenaphthene	phenanthrene	<i>n</i> -nonane (C9)
acenaphthylene	pyrene	<i>n</i> -decane (C10)
anthracene		<i>n</i> -dodecane (C12)
benzo(a)anthracene		<i>n</i> -tetradecane (C14)
benzo(a)pyrene		<i>n</i> -hexadecane (C16)
benzo(b)fluoranthene		<i>n</i> -octadecane (C18)
benzo(k)fluoranthene		<i>n</i> -nonadecane (C19)
benzo(ghi)perylene		<i>n</i> -eicosane (C20)
chrysene		<i>n</i> -docosane (C22)
dibenzo(a,h)anthracene		<i>n</i> -tetracosane (C24)
fluoranthene		<i>n</i> -hexacosane (C26)
fluorene		<i>n</i> -octacosane (C28)
indeno(1,2,3-cd)pyrene		<i>n</i> -triacontane (C30)
2-methylnaphthalene		<i>n</i> -hexatriacontane (C36)

25µg/mL each in hexane, 1mL/ampul

	Each	5-pk.	10-pk.
	31481	31481-510	
w/data pack	31481-500	31481-520	31581

Petroleum Reference Mixtures Pattern Recognition Mixtures

Diesel Fuel #2 Composite Standard

5,000µg/mL in methylene chloride, 1mL/ampul

	Each	5-pk.	10-pk.
	31093	31093-510	
w/data pack	31093-500	31093-520	31193

50,000µg/mL in methylene chloride, 1mL/ampul

	Each	5-pk.	10-pk.
	31258	31258-510	
w/data pack	31258-500	31258-520	31358

50,000µg/mL in methylene chloride, 5mL/ampul

	Each	5-pk.	10-pk.
	31259	31259-510	
w/data pack	31259-500	31259-520	31359

Other Certified Fuel Standards

Save time—use these standards to perform calibration checks for TPH and aromatics in a single analysis.

Certified BTEX in Unleaded Gas Composite Standard

Certified for:	
benzene	toluene
ethylbenzene	m-xylene
isopropyl benzene	o-xylene
methyl tert-butyl ether	p-xylene
naphthalene	

5,500ppm gasoline in P&T methanol, certified components listed, 1mL/ampul

	Each	5-pk.	10-pk.
	30237	30237-510	
w/data pack	30237-500	30237-520	30337

Certified Aromatics in Gasoline

Certified for:	
benzene	n-propylbenzene
ethylbenzene	toluene
m-ethyltoluene	1,2,3-trimethylbenzene
o-ethyltoluene	1,2,4-trimethylbenzene
p-ethyltoluene	1,3,5-trimethylbenzene
isopropylbenzene	m-xylene
methyl tert-butyl ether	o-xylene
naphthalene	p-xylene

5,500ppm gasoline in P&T methanol, certified components listed, 1mL/ampul

	Each	5-pk.	10-pk.
	30485	30485-510	
w/data pack	30485-500	30485-520	30585

Certified PAHs in Diesel #2

Certified PAHs and Typical Certified Conc. (ppm)

acenaphthene	7	1-methylnaphthalene	110
acenaphthylene	1	2-methylnaphthalene	60
anthracene	13	naphthalene	30
fluorene	6	phenanthrene	13

50,000ppm diesel #2 in methylene chloride,
PAH concentrations listed above, 1mL/ampul

	Each	5-pk.	10-pk.
	31673	31673-510	
w/data pack	31673-500	31673-520	31773

EPA Methods

for Massachusetts UST Applications

To complement the MA-EPH and MA-VPH methods, analyses for individual target compounds, such as benzene, toluene, naphthalene, and other aromatics, are included in EPA Methods 8021, 8260 or 8270. Please request our EPA UST *Fast Facts* (Lit. Cat. #59397) for complete product listings.

Fuel and Certified Fuel Standards

We offer a wide variety of composite and single-source fuel standards to meet your needs. Please see our general chromatography product catalog for detailed listings of the following:

Aviation Gasoline	JP-4 Military Fuel
Jet Fuel A	JP-5 Military Fuel
Fuel Oil #4	JP-8 Military Fuel
Fuel Oil #5	Mineral Spirits
Fuel Oil #6	

Certified PAHs in Motor Oil

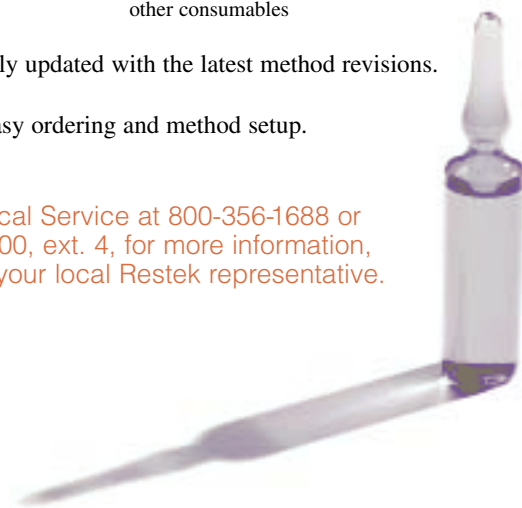
coming soon!

50 State UST Methods

Latest Revisions for All 50 States Available Soon!

- ✓ Detailed product listings for each state in convenient *Fast Facts* format:
 - analytical columns
 - reference materials
 - sample preparation materials
 - other consumables
- ✓ Completely updated with the latest method revisions.
- ✓ Allows easy ordering and method setup.

Call Technical Service at 800-356-1688 or 814-353-1300, ext. 4, for more information, or contact your local Restek representative.





Custom Reference Material Request Form

Domestic Customers**FAX#:** (814) 355-2895**email:** standards@restekcorp.com**International Customers****Contact Your Local
Restek Representative.****Name:****Date:****Company/Location:****Phone #:****FAX #:****E-mail:****Take these eight steps to create the right solution:****1.** Mixture Description:**2.** Solvent:**3.** No. of components:**4.** Volume (select): 1mL, 2mL, 5mL, 10mL, or other mL**5.** Quantity: No. of units**6. Select testing and documentation that best meets your requirements:**

- ☐ Gravimetric Documentation: Lot Sheet with balance printout attached.
- ☐ Qualitative Documentation: Certificate of Composition, Chromatogram, and Gravimetric Documentation.
- ☐ Quantitative Documentation: Certificate of Analysis and Data Pack.

	7. Compound(s): (list or attach sheet)	Concentration:	8. Concentration Units
1.			<input type="radio"/> mg/mL
2.			<input type="radio"/> µg/mL
3.			<input type="radio"/> ng/mL
4.			<input type="radio"/> vol./vol.%
5.			<input type="radio"/> wt./wt.%
6.			<input type="radio"/> other _____
7.			
8.			
9.			
10.			
11.			
12.			

ALL mixtures are produced in accordance with our ISO 9001 registration. Analytical balances are calibrated daily at seven mass levels using NIST-traceable weights. ALL raw materials used are a minimum of 97% pure unless otherwise specified.

on-line: <http://www.restekcorp.com/stdreq.htm>

Can't locate the exact mixture you need?

With **thousands** of compounds in our inventory,
we can make any mixture
to your specifications.

*To order, use the convenient custom
reference material request form inside.*

visit us online at
www.restekcorp.com

For more information,
Call 800-356-1688 or 814-353-1300 or
Contact Your Local Restek Representative

USA: 110 Benner Circle, Bellefonte, PA 16823 • phone: (800) 356-1688 • fax: (814) 353-1309

Germany: Schaberweg 23, 61348 Bad Homburg • phone: (49) 06172 2797 0 • fax: (49) 06172 2797 77

France: 1, rue Montespan, 91024 Evry • phone: 01 60 78 32 10 • fax: 01 60 78 70 90

Ireland: 8 Baronscourt Lane, Belfast, BT8 8RR, Northern Ireland • phone: (44) 28 9081 4576 • fax: (44) 28 9081 4576

Thames Restek UK Ltd.: Fairacres Industrial Centre, Dedworth Road, Windsor, Berkshire • SL4 4LE
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To help laboratories comply with and use these analytical procedures, Restek has been active in following the state guidance. Based on our good knowledge of the methods, our experienced chemists have developed a list of the appropriate technical service tools and analytical products to achieve success with these methods. We offer quality chromatographic columns, analytical reference materials, and sample preparation products.

In this comprehensive product listing, you will find everything you need to quickly set up or reorder consumables for these methods. Please refer to our latest product catalog or call 800-356-1688 or 814-353-1300, ext. 3, for more information. Also, we will be happy to provide a quote on any custom consumable you may need!

Regulatory and Analytical Methodology Contact Information

UST CONTACT

**Wisconsin Department of
Commerce, Environmental &
Regulatory Services Division**
P.O. Box 7837
Madison, WI 53707-7837
Phone: 608-266-0956
Fax: 608-261-7725

LUST CONTACT

**Wisconsin Department of
Natural Resources**
P.O. Box 7921
Madison, WI 53707-7921
Phone: 608-267-7560
Fax: 608-261-7725

Wisconsin's UST program maintains a web site at
<http://www.commerce.state.wi.us/ER/ER-BST-HomePage.html>

Wisconsin's LUST program maintains a web site at
http://www.dnr.state.wi.us/org/aw/rr/cleanup/ust_lust.html

State of Wisconsin UST Monitoring

- ✓ Comprehensive products listing for the latest UST methods used by the State of Wisconsin.
- ✓ Products conveniently organized by method number.
- ✓ Easy method set-up and reorder of consumables, including:
 - Gas chromatography columns and accessories,
 - Analytical reference materials,
 - Sample preparation supplies,
 - Technical service.

In 1992 the Wisconsin Department of Natural Resources (WDNR) published its technical guidance in assessing and closing underground storage tanks (UST). In accordance with Wisconsin state law and applicable US Environmental Protection Agency (EPA) UST site assessment requirements, WDNR requires site assessment to determine if a release has occurred from a UST System. In the technical guidance, WDNR released the first versions of modified gasoline range organic (GRO) and diesel range organic (DRO) methods. In September 1995, WDNR approved the modified GRO and DRO methods. These two methods, known as Wisconsin GRO and DRO, have been used in various laboratories since 1996; they are popular analytical procedures, not only in the State of Wisconsin but also in many other states.

The GRO method is based on purge and trap GC/FID/PID analysis and is designed to measure the concentration of GROs (C6-C10) and petroleum volatile organic compounds (PVOCs) in water or soil. The DRO method is based on solvent extraction GC/FID and is designed to measure the concentration of diesel range organics (C10-C28) in water, soil, or waste. DRO also can be used to measure kerosene, motor oil, or lubricant oil.



Ken Herwehe
Analytical Reference Materials
Product Marketing Manager
814-353-1300, ext. 2127



Joe Moodler
Analytical Reference Materials
Custom Standards Group Leader
814-353-1300, ext. 2148

Wisconsin

Gas Chromatography Columns & Accessories

For these items, see Restek's
Chromatography Products Catalog:

- Syringes
- Autosampler Vials
- Guard Columns
- Ferrules, Septa



Recommended Gas Chromatography Columns

Rtx®-5, 30m x 0.25mm

Film Thickness	temp. limits	Cat. #
0.25µm	-60 to 330/350°C	10223
0.50µm	-60 to 330/350°C	10238
1.00µm	-60 to 320/340°C	10253

Integra-Guard Columns

Guard and analytical column in one connectionless length.

*Add the appropriate suffix number to analytical column catalog number.

ID	Length	Suffix #*
0.25mm	5m	-124
	10m	-127

Syringes

Standard Micro-Liter Syringes for Agilent 7673 and 7683 Autosamplers

Size	Needle Gauge	6-pk.
10µL	23s	20169
10µL	23s-26s	24600

Autosampler Vials

Crimp Top Vial Snap Seal™ Style (12 x 32mm, 11mm Crimp)

Description*	1,000-pk.
2.0mL Clear Glass Vial w/White Graduated Marking Spot	24384
2.0mL Amber Glass Vial w/White Graduated Marking Spot	24386

*Marking spots are available on request in blue, green, rust or yellow.

Aluminum Crimp Seals w/Septa

Description	1,000-pk.
Silver Seal, PTFE/Natural Rubber Septa	21175
Silver Seal, PTFE/Silicone Septa*	24360

*PTFE/Silicone/PTFE available on request.

Thermolite® Septa

Size	temp. limits	25-pk.	50-pk.	100-pk.
11mm (7/16")	to 340°C	20363	20364	20365

Replacement Inlet Seals

Stainless Steel Inlet Seal for Single-Column Installation*

Size	2-pk.	10-pk.
0.8mm ID	21315	21316

*Equivalent to Agilent Part# 18740-20880.

Inlet Liners

For Agilent GCs

Description	ID /OD & Length (mm)	ea.	5-pk.
Uniliner®*	4.0 ID, 6.3 OD x 78.5	20335	20336
Drilled Uniliner®	4.0 ID, 6.3 OD x 78.5	21054	21055
1mm Split**	1.0 ID, 6.3 OD x 78.5	20972	20973

*Restek design improves performance over the original Agilent Liner.

**Use this liner for increased sensitivity.

Low Volume Injector for Agilent GCs

Description	kit.
Low-Volume Injector for Agilent Split/Splitless GC Inlets	21692

Analytical Reference Materials:

WI GRO (Sept. 1995)

The method is designed to measure concentrations of gasoline range organics (GRO) (C6-C10) in water or soil. Petroleum volatile organic compounds (PVOCs) can be determined concurrently by this method. It is based on purge and trap, GC/FID procedure. FID/PID in series is used for GRO/PVOCs concurrently.

Calibration Mixtures

PVOC/GRO Mix (Wisconsin)

benzene	1,2,4-trimethylbenzene
ethylbenzene	1,3,5-trimethylbenzene
methyl <i>tert</i> -butyl ether	<i>m</i> -xylene
naphthalene	<i>o</i> -xylene
toluene	<i>p</i> -xylene

1,000µg/mL each in P&T methanol, 1mL/ampul

	Each	5-pk.	10-pk.
	30095	30095-510	
w/data pack	30095-500	30095-520	30195

Surrogate Mixtures

4-bromofluorobenzene

2,500µg/mL in P&T methanol, 1mL/ampul

	Each	5-pk.	10-pk.
	30067	30067-510	
w/data pack	30067-500	30067-520	30167

10,000µg/mL in P&T methanol, 1mL/ampul

	Each	5-pk.	10-pk.
	30082	30082-510	
w/data pack	30082-500	30082-520	30182

α,α,α-trifluorotoluene

2,500µg/mL in P&T methanol, 1mL/ampul

	Each	5-pk.	10-pk.
	30068	30068-510	
w/data pack	30068-500	30068-520	30168

10,000µg/mL in P&T methanol, 1mL/ampul

	Each	5-pk.	10-pk.
	30083	30083-510	
w/data pack	30083-500	30083-520	30183

fluorobenzene

2,000µg/mL in P&T methanol, 1mL/ampul

	Each	5-pk.	10-pk.
	30030	30030-510	
w/data pack	30030-500	30030-520	30130

Analytical Reference Materials:

WI DRO (Sept. 1995)

The method is designed to measure concentrations of diesel range organics (DRO) in the C10-C28 range in water, soil, or waste. It also can be used to measure kerosene, motor oil, or lubricant oil. It is based on a solvent extraction, GC/FID procedure.

Calibration Mixtures

DRO Mix (EPA/Wisconsin)

n-decane (C10) *n*-eicosane (C20)
n-dodecane (C12) *n*-docosane (C22)
n-tetradecane (C14) *n*-tetracosane (C24)
n-hexadecane (C16) *n*-hexacosane (C26)
n-octadecane (C18) *n*-octacosane (C28)

2,000µg/mL each in methylene chloride, 1mL/ampul

	Each	5-pk.	10-pk.
	31064	31064-510	
w/data pack	31064-500	31064-520	31164

Standard Mixture of *n*-alkanes for System Performance Test

n-decane (C10) *n*-hexacosane (C26)
n-dodecane (C12) *n*-octacosane (C28)
n-tetradecane (C14) *n*-triacontane (C30)
n-hexadecane (C16) *n*-dotriacontane (C32)
n-octadecane (C18) *n*-tetraatriacontane (C34)
n-eicosane (C20) *n*-hexatriacontane (C36)
n-docosane (C22) *n*-octatriacontane (C38)
n-tetracosane (C24) *n*-tetracontane (C40)

50µg/mL each in cyclohexane, 1mL/ampul

	Each	5-pk.	10-pk.
	31633	31633-510	
w/data pack	31633-500	31633-520	31733

Surrogate Mixtures

p-terphenyl

10,000µg/mL in methylene chloride, 1mL/ampul

	Each	5-pk.	10-pk.
	31095	31095-510	
w/data pack	31095-500	31095-520	31195

2-fluorobiphenyl

2,500µg/mL each in P&T methanol, 1mL/ampul

	Each	5-pk.	10-pk.
	31096	31096-510	
w/data pack	31096-500	31096-520	31196

o-terphenyl

10,000µg/mL in methylene chloride, 1mL/ampul

	Each	5-pk.	10-pk.
	31097 Default	31097-510 Default	
w/data pack	31097-500 Default	31097-520 Default	31197 Default

Analytical Reference Materials:

WI DRO (cont.)

Petroleum Reference Mixtures Pattern Recognition Mixtures

Kerosene Fuel Composite Standard

5,000µg/mL in methylene chloride, 1mL/ampul

	Each	5-pk.	10-pk.
	31094	31094-510	
w/data pack	31094-500	31094-520	31194

50,000µg/mL in methylene chloride, 1mL/ampul

	Each	5-pk.	10-pk.
	31256	31256-510	
w/data pack	31256-500	31256-520	31356

50,000µg/mL in methylene chloride, 5mL/ampul

	Each	5-pk.	10-pk.
	31257	31257-510	
w/data pack	31257-500	31257-520	31357

Diesel Fuel #2 Composite Standard

5,000µg/mL in methylene chloride, 1mL/ampul

	Each	5-pk.	10-pk.
	31093	31093-510	
w/data pack	31093-500	31093-520	31193

50,000µg/mL in methylene chloride, 1mL/ampul

	Each	5-pk.	10-pk.
	31258	31258-510	
w/data pack	31258-500	31258-520	31358

50,000µg/mL in methylene chloride, 5mL/ampul

	Each	5-pk.	10-pk.
	31259	31259-510	
w/data pack	31259-500	31259-520	31359

Motor Oil Composite Standard

This composite solution is prepared from an equal volume blend of the following types of motor oil: 5W30, 10W30, 10W40, and 20W50. After blending, a precisely weighed amount of the composite is added to a volumetric flask to produce a mixture at 50,000µg/mL in methylene chloride, 1mL/ampul.

	Each	5-pk.	10-pk.
	31464	31464-510	
w/data pack	31464-500	31464-520	31564

Used Motor Oil Composite Standard

This composite solution is prepared from an equal volume blend from five gasoline powered vehicles (belonging to Restek employees). After blending, a precisely weighed amount of the composite is added to a volumetric flask to produce a mixture at 50,000µg/mL in methylene chloride, 1mL/ampul.

	Each	5-pk.	10-pk.
	31465	31465-510	
w/data pack	31465-500	31465-520	31565

Other Certified Fuel Standards

Save time—use these standards to perform calibration checks for TPH and aromatics in a single analysis.

Certified BTEX in Unleaded Gas Composite Standard

Certified for: toluene
benzene *m*-xylene
ethylbenzene *o*-xylene
isopropyl benzene *p*-xylene
methyl *tert*-butyl ether
naphthalene
5,500ppm gasoline in P&T methanol, certified components listed, 1mL/ampul

	Each	5-pk.	10-pk.
	30237	30237-510	
w/data pack	30237-500	30237-520	30337

Certified Aromatics in Gasoline

Certified for: *n*-propylbenzene
benzene toluene
ethylbenzene 1,2,3-trimethylbenzene
m-ethyltoluene 1,2,4-trimethylbenzene
o-ethyltoluene 1,3,5-trimethylbenzene
p-ethyltoluene *m*-xylene
isopropylbenzene *o*-xylene
methyl *tert*-butyl ether *p*-xylene
naphthalene
5,500ppm gasoline in P&T methanol, certified components listed, 1mL/ampul

	Each	5-pk.	10-pk.
	30485	30485-510	
w/data pack	30485-500	30485-520	30585

Certified PAHs in Diesel #2

Certified PAHs	Typical Certified Conc.* (ppm)
acenaphthene	7
acenaphthylene	1
anthracene	13
fluorene	6
1-methylnaphthalene	110
2-methylnaphthalene	60
naphthalene	30
phenanthrene	13

50,000ppm diesel #2 in methylene chloride, PAH concentrations listed above, 1mL/ampul

	Each	5-pk.	10-pk.
	31673	31673-510	
w/data pack	31673-500	31673-520	31773

Certified PAHs in Motor Oil

coming soon!

EPA Methods

for Wisconsin UST Applications

To complement the WI GRO and WI DRO methods, analyses of individual target compounds, such as benzene, toluene, naphthalene, and other aromatics are included in EPA Methods 8021, 8260 or 8270. Please request our EPA UST *Fast Facts* (Lit. Cat. #59397) for complete product listings.

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Fuel Oil #6	

50 State UST Methods

Latest Revisions for
All 50 States
Available Soon!

- ✓ Detailed product listings for each state in convenient *Fast Facts* format:

analytical columns
reference materials
sample preparation materials
other consumables

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- ☐ Gravimetric Documentation: Lot Sheet with balance printout attached.
- ☐ Qualitative Documentation: Certificate of Composition, Chromatogram, and Gravimetric Documentation.
- ☐ Quantitative Documentation: Certificate of Analysis and Data Pack.

	7. Compound(s): (list or attach sheet)	Concentration:	8. Concentration Units
1.			<input type="radio"/> mg/mL
2.			<input type="radio"/> µg/mL
3.			<input type="radio"/> ng/mL
4.			<input type="radio"/> vol./vol. %
5.			<input type="radio"/> wt./wt. %
6.			<input type="radio"/> other _____
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11.			
12.			

ALL mixtures are produced in accordance with our ISO 9001 registration. Analytical balances are calibrated daily at seven mass levels using NIST-traceable weights. ALL raw materials used are a minimum of 97% pure unless otherwise specified. Select the testing and documentation option that best meets your requirements. **on-line:** <http://www.restekcorp.com/stdreq.htm>

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Germany: Schaberweg 23, 61348 Bad Homburg • phone: (49) 06172 2797 0 • fax: (49) 06172 2797 77

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Ireland: 8 Baronscourt Lane, Belfast, BT8 8RR, Northern Ireland • phone: (44) 28 9081 4576 • fax: (44) 28 9081 4576

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FAST FACTS

At-a-Glance
Product
Information
from Restek

To help laboratories comply with and use these analytical procedures, Restek has been active in following the state guidance. Based on our assembled knowledge of the methods, our experienced chemists have a list of the appropriate technical service tools and analytical products to achieve success with these methods. We offer quality chromatographic columns, analytical reference materials, and sample preparation products.

This comprehensive product listing contains all the information you will need to quickly set-up or reorder consumables for these methods. Please reference our latest product catalog or call 800-356-1688 or 814-353-1300, ext. 3, for more information. Also, we would be happy to provide a quote on any custom consumable you may need!

Regulatory and Analytical Methodology Contact Information

Texas Natural Resources Conservation Commission

Petroleum Storage Tank Division

MC: 133

P.O. Box 13087

12100 Park 35 Circle, 78753

Austin, TX 78711-3087

Phone: (512) 239-2106

Fax: (512) 239-2177

Texas UST program maintains a web site at:

http://www.tnrcc.state.tx.us/permitting/r_e/pssta/

Texas LUST program maintains a web site at:

<http://www.tnrcc.state.tx.us/permitting/remed/rpr/index.html>



State of Texas UST Monitoring

- ✓ The latest TNRCC 1005/1006 UST methods used by Texas.
- ✓ Comprehensive product listing conveniently organized by method number.
- ✓ Easy method set-up and reorder of consumables, including:
 - Gas chromatography columns and accessories,
 - Analytical reference materials,
 - Sample preparation supplies,
 - Technical service.

Texas Natural Resource Conservation Commission (TNRCC) enforces the state and EPA rules in assessment, monitoring, and closure of Underground Storage Tanks (UST). In the early 1990s TNRCC published the TNRCC Method 1005, Revision 01 analytical method for UST applications. Then, in 1996 they modified the method and released Revision 02; then modified it again in 1998 and Revision 03 was finalized in June 2001.

TNRCC Method 1005, Revision 03 determines the total petroleum hydrocarbons (TPH) (C6-C35) in solid and aqueous matrices. The GC method is used to separate the TPH into two ranges (C6-C12, and C12-C28), and a third range (C28-C35) when applicable, based on the boiling points of the hydrocarbons. It is based on liquid/liquid or liquid/solid extraction and GC/FID analysis, and may be used in lieu of US EPA Method 418.1 for the analysis of TPHs. Compared with earlier versions, this final version now includes heavier hydrocarbons in the range of C28 to C35. Data produced using Revision 03 should be reported to C35, unless the environmental medium of concern or suspected source of TPH does not contain hydrocarbons greater than C28. Results from analyses using earlier versions of Method 1005 may not include data for C28 to C35.

TNRCC Method 1006, draft version, was published in May 2000 to guide the separation and quantitation of aliphatic and aromatic fractions in petroleum contaminated soil or water samples. This method uses silica gel fractionation to separate the aliphatic and aromatic fractions. The method is applicable to hydrocarbons in the gasoline, diesel, motor oil range, and commonly is used in conjunction with TNRCC Method 1005 for the determination of total petroleum hydrocarbons. TNRCC 1006 method is not intended for the quantitation of individual target analytes, such as benzene, toluene, naphthalene, or other aromatics. Those target analytes are best determined using EPA Methods 8021, 8260 or 8270.



Ken Herwehe

Analytical Reference Materials
Product Marketing Manager
(814) 353-1300, ext. 2127



Joe Moodler

Analytical Reference Materials
Custom Standards Group Leader
(814) 353-1300, ext. 2148

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www.chromtech.net.au

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Gas Chromatography Columns & Accessories

For the below items, see Restek's Chromatography Products Catalog

- Syringes
- Autosampler Vials
- Guard Columns
- Ferrules, Septa



Recommended Gas Chromatography Columns

Rtx®-5, 30m x 0.25mm

Film Thickness	temp. limits	Cat. #
0.25µm	-60 to 330/350°C	10223
0.50µm	-60 to 330/350°C	10238
1.00µm	-60 to 320/340°C	10253

Integra-Guard™ Columns

*Add the appropriate suffix number to analytical column catalog number.

ID	Length	Suffix #*
0.25mm	5m	-124
	10m	-127

Syringes

Standard Micro-Liter Syringes for Agilent 7673 and 7683 Autosamplers

Size	Needle Gauge	6-pk.
10µL	23s	20169
10µL	23s-26s	24600

Autosampler Vial

Crimp Top Vial Snap Seal™ Style (12 x 32mm, 11mm Crimp)

Description*	1,000-pk.
2.0mL Clear Glass Vial w/White Graduated Marking Spot	24384
2.0mL Amber Glass Vial w/White Graduated Marking Spot	24386

*Marking spots are available on request in blue, green, rust or yellow.

Aluminum Crimp Seals w/Septa

Description	1,000-pk.
Silver Seal, PTFE/Natural Rubber Septa	21175
Silver Seal, PTFE/Silicone Septa*	24360

*PTFE/Silicone/PTFE available on request.

Thermolite® Septa

Size	temp. limits	25-pk.	50-pk.	100-pk.
11mm (7/16")	to 340°C	20363	20364	20365

Replacement Inlet Seals

Stainless Steel Inlet Seal for Single-Column Installation*

Size	2-pk.	10-pk.
0.8mm ID	21315	21316

*Our stainless steel inlet seal is equivalent to Agilent Part# 18740-20880.

Inlet Liners

For Agilent GCs

Description	ID / OD & Length (mm)	ea.	5-pk.
Uniliner®*	4.0 ID, 6.3 OD x 78.5	20335	20336
Drilled Uniliner®	4.0 ID, 6.3 OD x 78.5	21054	21055
1mm Split**	1.0 ID, 6.3 OD x 78.5	20972	20973

*Restek design changes improve performance over the original Agilent Liner.

**Use this liner for increased sensitivity.

Low Volume Injector for Agilent GCs

Description	kit
Low-Volume Injector for Agilent Split/Splitless GC Inlets	21692

TNRCC Method 1005, Revision 3, (6-1-2001)

To determine the total concentrations of petroleum hydrocarbons (TPH) (C6-C35) in solid and aqueous matrices. It is based on solvent/solid extraction and GC/FID.

Analytical Reference Materials

Calibration Mixtures

TX TPH Calibration Mix

diesel fuel #2 composite
unleaded gasoline composite
each in pentane, 1mL/ampul

	Each	5-pk.	10-pk.
	31483	31483-510	—
w/data pack	31483-500	31483-520	31583

Retention Time Calibration Mixtures

Alternate Boiling Point/Carbon Number Distribution Marker Stock Standard

hexane (C6) heneicosane (C21)
octane (C8) octacosane (C28)
decane (C10) pentatriacontane (C35)
dodecane (C12) hexatriacontane (C36)
hexadecane (C16)

200µg/mL each in pentane, 1mL/ampul

	Each	5-pk.	10-pk.
	31639	31639-510	—
w/data pack	31639-500	31639-520	31739

Note: Restek includes both C35 and C36 as the method allows the laboratory to use C36, if the laboratory is unable to locate the C35 reference standard (TNRCC 1005 & 1006, paragraph 2.0).

TX TPH Locator Mix

hexane (C6) octacosane (C28)
decane (C10)

200µg/mL each in pentane, 1mL/ampul

	Each	5-pk.	10-pk.
	31482	31482-510	—
w/data pack	31482-500	31482-520	31582

Matrix Spike Mixtures

TX TPH Matrix Spike Mix

diesel fuel #2 composite
unleaded gasoline composite
10,000µg/mL each in P&T methanol, 1mL/ampul

	Each	5-pk.	10-pk.
	31484	31484-510	—
w/data pack	31484-500	31484-520	31584

TNRCC Method 1005 (cont.)

Surrogate Mixtures

2-Fluorobiphenyl Standard

10,000µg/mL in methylene chloride, 1mL/ampul

	Each	5-pk.	10-pk.
	31096	31096-510	
w/data pack	31096-500	31096-520	31196

o-Terphenyl Standard

10,000µg/mL in methylene chloride, 1mL/ampul

	Each	5-pk.	10-pk.
	31097	31097-510	
w/data pack	31097-500	31097-520	31197

Draft TNRCC Method 1006

To separate and quantify the aliphatic and aromatic fractions (C6-C35) of petroleum hydrocarbons extracted from soil and water samples. It is used in conjunction with TNRCC 1005 for selected samples to determine the aliphatic and aromatic fractions of the TPH. It is based on extraction, fractionation and GC/FID.

Analytical Reference Materials

Calibration Mixtures

TX TPH Calibration Mix

diesel fuel #2 composite

unleaded gasoline composite

10,000µg/mL each in pentane, 1mL/ampul

	Each	5-pk.	10-pk.
	31483	31483-510	—
w/data pack	31483-500	31483-520	31583

Calibration Check Mixtures

BTEX Standard

benzene
ethylbenzene
toluene

m-xylene
o-xylene
p-xylene

200µg/mL each in P&T methanol, 1mL/ampul

	Each	5-pk.	10-pk.
	30051	30051-510	—
w/data pack	30051-500	30051-520	30151

2,000µg/mL each in P&T methanol, 1mL/ampul

	Each	5-pk.	10-pk.
	30213	30213-510	—
w/data pack	30213-500	30213-520	30313

Draft TNRCC Method 1006 (cont.)

WA EPH Aromatic Hydrocarbon Standard

acenaphthene
acenaphthylene
anthracene
benzo(a)anthracene
benzo(a)pyrene
benzo(b)fluoranthene
benzo(k)fluoranthene
benzo(ghi)perylene
chrysene

dibenzo(a,h)anthracene
fluoranthene
fluorene
indeno(1,2,3-cd)pyrene
2-methylnaphthalene
naphthalene
pyrene
1,2,3-trimethylbenzene

1,000µg/mL each in methylene chloride, 1mL/ampul

	Each	5-pk.	10-pk.
	31469	31469-510	—
w/data pack	31469-500	31469-520	31569

Retention Time Calibration Mixtures

Alternate Boiling Point/Carbon Number Distribution Marker Stock Standard

hexane (C6)
octane (C8)
decane (C10)
dodecane (C12)
hexadecane (C16)

heneicosane (C21)
octacosane (C28)
pentatriacontane (C35)
hexatriacontane (C36)

200µg/mL each in pentane, 1mL/ampul

	Each	5-pk.	10-pk.
	31639	31639-510	—
w/data pack	31639-500	31639-520	31739

Note: Restek includes both C35 and C36 as the method allows the laboratory to use C36, if the laboratory is unable to locate the C35 reference standard (TNRCC 1005 & 1006, paragraph 2.0).

Matrix Spike Mixtures

TX TPH Matrix Spike Mix

diesel fuel #2 composite

unleaded gasoline composite

10,000µg/mL each in P&T methanol, 1mL/ampul

	Each	5-pk.	10-pk.
	31484	31484-510	—
w/data pack	31484-500	31484-520	31584

Petroleum Reference Mixtures Pattern Recognition Mixtures

Unleaded Gasoline Composite Standard

2,500µg/mL in P&T methanol, 1mL/ampul

	Each	5-pk.	10-pk.
	30081	30081-510	—
w/data pack	30081-500	30081-520	30181

50,000µg/mL in P&T methanol, 1mL/ampul

	Each	5-pk.	10-pk.
	30205	30205-510	—
w/data pack	30205-500	30205-520	30305

Petroleum Reference Mixtures Pattern Recognition Mixtures (cont.)

Unleaded Gasoline Composite Standard

50,000µg/mL in P&T methanol, 5mL/ampul

	Each	5-pk.	10-pk.
	30206	30206-510	—
w/data pack	30206-500	30206-520	30306

Kerosene Fuel Composite Standard

5,000µg/mL in methylene chloride, 1mL/ampul

	Each	5-pk.	10-pk.
	31094	31094-510	—
w/data pack	31094-500	31094-520	31194

50,000µg/mL in methylene chloride, 1mL/ampul

	Each	5-pk.	10-pk.
	31256	31256-510	—
w/data pack	31256-500	31256-520	31356

50,000µg/mL in methylene chloride, 5mL/ampul

	Each	5-pk.	10-pk.
	31257	31257-510	—
w/data pack	31257-500	31257-520	31357

Diesel Fuel #2 Composite Standard

5,000µg/mL in methylene chloride, 1mL/ampul

	Each	5-pk.	10-pk.
	31093	31093-510	—
w/data pack	31093-500	31093-520	31193

50,000µg/mL in methylene chloride, 1mL/ampul

	Each	5-pk.	10-pk.
	31258	31258-510	—
w/data pack	31258-500	31258-520	31358

50,000µg/mL in methylene chloride, 5mL/ampul

	Each	5-pk.	10-pk.
	31259	31259-510	—
w/data pack	31259-500	31259-520	31359

Motor Oil Composite Standard

This composite solution is prepared from an equal volume blend of the following types of motor oil: 5w30, 10w30, 10w40, and 20w50. After blending, a precisely weighed amount of the composite is added to a volumetric flask to produce a mixture at 50,000µg/mL in methylene chloride, 1mL/ampul.

	Each	5-pk.	10-pk.
	31464	31464-510	—
w/data pack	31464-500	31464-520	31564

Used Motor Oil Composite Standard

This composite solution is prepared from an equal volume blend from five different gasoline-powered vehicles. After blending, a precisely weighed amount of the composite is added to a volumetric flask to produce a mixture at 50,000µg/mL in methylene chloride, 1mL/ampul.

	Each	5-pk.	10-pk.
	31465	31465-510	—
w/data pack	31465-500	31465-520	31565

EPA Methods for Texas UST Applications

To complement the TNRCC 1005 and TNRCC 1006 methods, TNRCC has recommended standard EPA methods for Texas UST analysis of individual target compounds, such as benzene, toluene, naphthalene, and other aromatics. The recommended methods include EPA Methods 8021, 8260 or 8270. Please request the EPA UST Fast Facts (Lit. Cat. #59397) for complete product listings.

Fuel and Certified Fuel Standards

We offer a wide variety of composite fuel standards and single-source fuels to meet your needs. Please see our general chromatography product catalog for detailed listings of the following:

Certified BTEX in Unleaded Gas Composite Standard
Certified Aromatics in Unleaded Gasoline
Certified PAHs in Diesel Fuel #2
Certified PAHs in Motor Oil (coming soon)

Single Source Fuel Standards

Aviation Gasoline
Jet Fuel A
Fuel Oil #4
Fuel Oil #5
Fuel Oil #6
JP-4 Military Fuel
JP-5 Military Fuel
JP-8 Military Fuel
Mineral Spirits

50 State UST Methods

Latest Revisions for All 50 States Available Soon!

- ✓ Detailed product listing available for all 50 states in convenient Fast Facts format.
- ✓ Completely updated with the latest method revisions.
- ✓ Allows easy ordering and method setup.
- ✓ Convenient listing of analytical column, sample preparation, reference material, and other consumables needed for all methods.

Call Technical Service at 800-356-1688 or 814-353-1300, ext. 4, for more information, or contact your local Restek representative.





Custom Reference Material Request Form

Domestic Customers**FAX#:** (814) 353-1309**email:** standards@restekcorp.com**International Customers****Contact Your Local
Restek Representative.****Name:****Date:****Company/Location:****Phone #:****FAX #:****E-mail:****Take these eight steps to create the right solution:****1. Mixture Description:****2. Solvent:****3. No. of components:****4. Volume (select):** 1mL, 2mL, 5mL, 10mL, or other mL**5. Quantity:** No. of units**6. Select testing and documentation that best meets your requirements:**

- ☐ Gravimetric Documentation: Lot Sheet with balance printout attached.
- ☐ Qualitative Documentation: Certificate of Composition, Chromatogram, and Gravimetric Documentation.
- ☐ Quantitative Documentation: Certificate of Analysis and Data Pack.

	7. Compound(s): (list or attach sheet)	Concentration:	8. Concentration Units
1.			<input type="radio"/> mg/mL
2.			<input type="radio"/> µg/mL
3.			<input type="radio"/> ng/mL
4.			<input type="radio"/> vol./vol. %
5.			<input type="radio"/> wt./wt. %
6.			<input type="radio"/> other _____
7.			
8.			
9.			
10.			
11.			
12.			

ALL mixtures are produced in accordance with our ISO 9001 registration. Analytical balances are calibrated daily at seven mass levels using NIST-traceable weights. ALL raw materials used are a minimum of 97% pure unless otherwise specified. Select the testing and documentation option that best meets your requirements. **on-line:** <http://www.restekcorp.com/stdreq.htm>

Can't locate the exact mixture you need?

With **thousands** of compounds in our inventory,
we can make any mixture
to your specifications.

*To order, use the convenient custom
reference material request form inside.*

visit us online at
www.restekcorp.com

For more information,
Call 800-356-1688 or 814-353-1300 or
Contact Your Local Restek Representative

USA: 110 Benner Circle, Bellefonte, PA 16823 • phone: (800) 356-1688 • fax: (814) 353-1309

Germany: Schaberweg 23, 61348 Bad Homburg • phone: (49) 06172 2797 0 • fax: (49) 06172 2797 77

France: 1, rue Montespan, 91024 Evry • phone: 01 60 78 32 10 • fax: 01 60 78 70 90

Ireland: 8 Baronscourt Lane, Belfast, BT8 8RR, Northern Ireland • phone: (44) 28 9081 4576 • fax: (44) 28 9081 4576

Thames Restek UK Ltd.: Fairacres Industrial Centre, Dedworth Road, Windsor, Berkshire • SL4 4LE
phone: 01753 624111 • fax: 01753 624666

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FAST FACTS

At-a-Glance
Product
Information
from Restek

To help laboratories comply with and use these analytical procedures, Restek has been active in following the state guidance. Based on our good knowledge of the methods, our experienced chemists have developed a list of the appropriate technical service tools and analytical products to achieve success with these methods. We offer quality chromatographic columns, analytical reference materials, and sample preparation products.

In this comprehensive product listing, you will find everything you need to quickly set up or reorder consumables for these methods. Please refer to our latest product catalog or call 800-356-1688 or 814-353-1300, ext. 3, for more information. Also, we will be happy to provide a quote on any custom consumable you may need!

Regulatory and Analytical Methodology Contact Information

Florida Dept. of Environmental Regulation
Tank Section
Twin Towers Office Building, Room 403
2600 Blair Stone Road
Tallahassee, FL 32399-2400
Phone: 904-488-3935
Fax: 904-922-4939

Florida's UST & LUST program maintains a web site at
<http://www.dep.state.fl.us/labs/sop/index.htm>



State of Florida UST Monitoring

- ✓ Comprehensive products listing for the latest UST methods used by the State of Florida.
- ✓ Products conveniently organized by method number.
- ✓ Easy method set-up and reorder of consumables, including:
 - Gas chromatography columns and accessories,
 - Analytical reference materials,
 - Sample preparation supplies,
 - Technical service.

The Florida storage tank program is part of the Bureau of Petroleum Storage Systems in the Department of Environmental Protection (FDEP) Division of Waste Management. In 1983 Florida was one of the first states to pass legislation, adopt rules, and develop a program for the regulation of underground and aboveground storage tank systems. To comply with the US Environmental Protection Agency (EPA) UST rules, FDEP developed specific analytical requirements in the early 1990s for the assessment of petroleum contaminations from storage tank systems.

In November 1995, FDEP released the first Florida Petroleum Residual Organic (FL-PRO) method to regulate the procedure for analyzing petroleum hydrocarbons. The method is based on solvent extraction and GC/FID to measure the Total Recoverable Petroleum Hydrocarbons (TRPH) in water and soil in the alkane range of C8-C40. In April 1996 FDEP published the FL-PRO supplement in its Petroleum Cleanup Guidance Document #7.

FDEP also mandates that each sample be analyzed for volatile organic aromatics (VOAs), methyl-tert-butylether (MTBE), and polycyclic aromatic hydrocarbons (PAHs). FDEP references Massachusetts EPH and VPH Protocols and standard EPA Methods 8015, 8021, 8260, 8270 and 8310.



Ken Herwehe
Analytical Reference Materials
Product Marketing Manager
814-353-1300, ext. 2127



Joe Moodler
Analytical Reference Materials
Custom Standards Group Leader
814-353-1300, ext. 2148

RESTEK
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www.restekcorp.com

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Website NEW : www.chromalytic.com.au E-mail : info@chromtech.net.au Tel: 03 9762 2034 . . . in AUSTRALIA

Florida Gas Chromatography Columns & Accessories

For these items, see Restek's

Chromatography Products Catalog:

- Syringes
- Autosampler Vials
- Guard Columns
- Ferrules, Septa



Recommended Gas Chromatography Columns

Rtx®-5, 30m x 0.25mm

Film Thickness	temp. limits	Cat. #
0.25µm	-60 to 330/350°C	10223
0.50µm	-60 to 330/350°C	10238
1.00µm	-60 to 320/340°C	10253

Integra-Guard™ Columns

Guard and analytical column in one connectionless length.

*Add the appropriate suffix number to analytical column catalog number.

ID	Length	Suffix #*
0.25mm	5m	-124
	10m	-127

Syringes

Standard Micro-Liter Syringes for Agilent 7673 and 7683 Autosamplers

Size	Needle Gauge	6-pk.
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10µL	23s-26s	24600

Autosampler Vials

Crimp Top Vial Snap Seal™ Style (12 x 32mm, 11mm Crimp)

Description*	1,000-pk.
2.0mL Clear Glass Vial w/White Graduated Marking Spot	24384
2.0mL Amber Glass Vial w/White Graduated Marking Spot	24386

*Marking spots are available on request in blue, green, rust or yellow.

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Description	1,000-pk.
Silver Seal, PTFE/Natural Rubber Septa	21175
Silver Seal, PTFE/Silicone Septa*	24360

*PTFE/Silicone/PTFE available on request.

Thermolite® Septa

Size	temp. limits	25-pk.	50-pk.	100-pk.
11mm (7/16")	to 340°C	20363	20364	20365

Replacement Inlet Seals

Stainless Steel Inlet Seal for Single-Column Installation*

Size	2-pk.	10-pk.
0.8mm ID	21315	21316

*Equivalent to Agilent Part# 18740-20880.

Inlet Liners

For Agilent GCs

Description	ID / OD & Length (mm)	ea.	5-pk.
Unliner®*	4.0 ID, 6.3 OD x 78.5	20335	20336
Drilled Unliner®	4.0 ID, 6.3 OD x 78.5	21054	21055
1mm Split**	1.0 ID, 6.3 OD x 78.5	20972	20973

*Restek design improves performance over the original Agilent Liner.

**Use this liner for increased sensitivity.

Low Volume Injector for Agilent GCs

Description	kit.
Low-Volume Injector for Agilent Split/Splitless GC Inlets	21692

Analytical Reference Materials: FL-PRO, Revision 1 (11-1-1995)

Recommended Surrogate

nonatriacontane (C39), 3000 µg/mL in carbon disulfide, working solution 300µg/mL in acetone.

Florida TRPH Surrogate Mix

n-nonatriacontane (C39)

3,000µg/mL in carbon disulfide, 1mL/ampul*

	Each	5-pk.	10-pk.
	31456	31456-510	
w/data pack	31456-500	31456-520	31556

*Ground transportation shipments only.

o-Terphenyl Standard

10,000µg/mL in methylene chloride, 1mL/ampul

	Each	5-pk.	10-pk.
	31097	31097-510	
w/data pack	31097-500	31097-520	31197

2,000µg/mL in acetone, 1mL/ampul

	Each	5-pk.	10-pk.
	31066	31066-510	
w/data pack	31066-500	31066-520	31166

Petroleum Hydrocarbon Standard

Florida TRPH Standard

<i>n</i> -octane (C8)	<i>n</i> -eicosane (C20)	<i>n</i> -dotriacontane (C32)
<i>n</i> -decane (C10)	<i>n</i> -docosane (C22)	<i>n</i> -tetraatriacontane (C34)
<i>n</i> -dodecane (C12)	<i>n</i> -tricosane (C24)	<i>n</i> -hexatriacontane (C36)
<i>n</i> -tetradecane (C14)	<i>n</i> -hexacosane (C26)	<i>n</i> -octatriacontane (C38)
<i>n</i> -hexadecane (C16)	<i>n</i> -octacosane (C28)	<i>n</i> -tetracontane (C40)
<i>n</i> -octadecane (C18)	<i>n</i> -triacontane (C30)	

500µg/mL each in hexane, 1mL/ampul

	Each	5-pk.	10-pk.
	31266	31266-510	
w/data pack	31266-500	31266-520	31366

Retention Time Marker

n-hexane (C6) *n*-decane (C10) *n*-dodecane (C12)

1,000µg/mL each in P&T methanol, 1mL/ampul

	Each	5-pk.	10-pk.
	30483	30483-510	
w/data pack	30483-500	30483-520	30583

Pattern Recognition Standards (Optional)

Used to identify petroleum product type.

Unleaded Gasoline Composite Standard

2,500µg/mL in P&T methanol, 1mL/ampul

	Each	5-pk.	10-pk.
	30081	30081-510	
w/data pack	30081-500	30081-520	30181

50,000µg/mL in P&T methanol, 1mL/ampul

	Each	5-pk.	10-pk.
	30205	30205-510	
w/data pack	30205-500	30205-520	30305

50,000µg/mL in P&T methanol, 5mL/ampul

	Each	5-pk.	10-pk.
	30206	30206-510	
w/data pack	30206-500	30206-520	30306

Diesel Fuel #2 Composite Standard

5,000µg/mL in methylene chloride, 1mL/ampul

	Each	5-pk.	10-pk.
	31093	31093-510	
w/data pack	31093-500	31093-520	31193

50,000µg/mL in methylene chloride, 1mL/ampul

	Each	5-pk.	10-pk.
	31258	31258-510	
w/data pack	31258-500	31258-520	31358

50,000µg/mL in methylene chloride, 5mL/ampul

	Each	5-pk.	10-pk.
	31259	31259-510	
w/data pack	31259-500	31259-520	31359

Kerosene Fuel Composite Standard

5,000µg/mL in methylene chloride, 1mL/ampul

	Each	5-pk.	10-pk.
	31094	31094-510	
w/data pack	31094-500	31094-520	31194

50,000µg/mL in methylene chloride, 1mL/ampul

	Each	5-pk.	10-pk.
	31256	31256-510	
w/data pack	31256-500	31256-520	31356

50,000µg/mL in methylene chloride, 5mL/ampul

	Each	5-pk.	10-pk.
	31257	31257-510	
w/data pack	31257-500	31257-520	31357

Motor Oil Composite Standard

This composite solution is prepared from an equal volume blend of the following types of motor oil: 5w30, 10w30, 10w40, and 20w50. After blending, a precisely weighed amount of the composite is added to a volumetric flask to produce a mixture of 50,000µg/mL in methylene chloride, 1mL/ampul.

	Each	5-pk.	10-pk.
	31464	31464-510	
w/data pack	31464-500	31464-520	31564

Used Motor Oil Composite Standard

This composite solution is prepared from an equal volume blend from five different gasoline powered vehicles (belonging to Restek employees). After blending, a precisely weighed amount of the composite is added to a volumetric flask to produce a mixture of 50,000µg/mL in methylene chloride, 1mL/ampul.

	Each	5-pk.	10-pk.
	31465	31465-510	
w/data pack	31465-500	31465-520	31565

Extractable Petroleum Hydrocarbons:

MA EPH (Jan. 1998)

Internal/surrogate

p-Terphenyl Standard

10,000µg/mL in methylene chloride, 1mL/ampul

	Each	5-pk.	10-pk.
	31095	31095-510	
w/data pack	31095-500	31095-520	31195

o-Terphenyl Standard

See FL-PRO, Rev. 1(11-1-1995) for description

5-α-androstane

2,000µg/mL in methylene chloride, 1mL/ampul

	Each	5-pk.	10-pk.
	31065	31065-510	
w/data pack	31065-500	31065-520	31165

MA EPH Surrogate Spike Mix

1-chlorooctadecane o-terphenyl

4,000µg/mL each in acetone, 1mL/ampul

	Each	5-pk.	10-pk.
	31479	31479-510	
w/data pack	31479-500	31479-520	31579

MA Fractionation Surrogate Spike Mix

2-bromonaphthalene 2-fluorobiphenyl

4,000µg/mL each in hexane, 1mL/ampul

	Each	5-pk.	10-pk.
	31480	31480-510	
w/data pack	31480-500	31480-520	31580

Matrix Spike Mixtures

MA EPH Matrix Spike Mix

n-nonane (C9) n-octacosane (C28) naphthalene
n-tetradecane (C14) acenaphthene pyrene
n-nonadecane (C19) anthracene
n-eicosane (C20) chrysene

250µg/mL each in acetone, 1mL/ampul

	Each	5-pk.	10-pk.
	31460	31460-510	
w/data pack	31460-500	31460-520	31560

Calibration Mixtures

MA EPH Aromatic Hydrocarbon Standard

acenaphthene benzo(k)fluoranthene indeno(1,2,3-cd)pyrene
acenaphthylene benzo(ghi)perylene 2-methylnaphthalene
anthracene chrysene naphthalene
benzo(a)anthracene dibenzo(a,h)anthracene phenanthrene
benzo(a)pyrene fluoranthene pyrene
benzo(b)fluoranthene fluorene

1,000µg/mL each in methylene chloride, 1mL/ampul

	Each	5-pk.	10-pk.
	31458	31458-510	
w/data pack	31458-500	31458-520	31558

MA EPH Aliphatic Hydrocarbon Standard

n-nonane (C9) n-octadecane (C18) n-hexacosane (C26)
n-decane (C10) n-nonadecane (C19) n-octacosane (C28)
n-dodecane (C12) n-eicosane (C20) n-triacontane (C30)
n-tetradecane (C14) n-docosane (C22) n-hexatriacontane (C36)
n-hexadecane (C16) n-tetracosane (C24)

1,000µg/mL each in hexane, 1mL/ampul

	Each	5-pk.	10-pk.
	31459	31459-510	
w/data pack	31459-500	31459-520	31559

Fractionation Check Mixtures

MA Fractionation Check Mix

PAHs:	fluorene	<i>n</i> -hexadecane (C16)
acenaphthene	indeno(1,2,3-cd)pyrene	<i>n</i> -octadecane (C18)
acenaphthylene	2-methylnaphthalene	<i>n</i> -nonadecane (C19)
anthracene	naphthalene	<i>n</i> -eicosane (C20)
benzo(a)anthracene	phenanthrene	<i>n</i> -docosane (C22)
benzo(a)pyrene	pyrene	<i>n</i> -tetracosane (C24)
benzo(b)fluoranthene		<i>n</i> -hexacosane (C26)
benzo(k)fluoranthene	Hydrocarbons:	<i>n</i> -octacosane (C28)
benzo(ghi)perylene	<i>n</i> -nonane (C9)	<i>n</i> -triacontane (C30)
chrysene	<i>n</i> -decane (C10)	<i>n</i> -hexatriacontane (C36)
dibenzo(a,h)anthracene	<i>n</i> -dodecane (C12)	
fluoranthene	<i>n</i> -tetradecane (C14)	

25µg/mL each in hexane, 1mL/ampul

	Each	5-pk.	10-pk.
	31481	31481-510	
w/data pack	31481-500	31481-520	31581

Aliphatic and Aromatic Fractions:

EPA Method 8021B and 8260B

Internal/surrogate

MA VPH Surrogate Standard

2,5-dibromotoluene

1,000µg/mL in P&T methanol, 1mL/ampul

	Each	5-pk.	10-pk.
	30435	30435-510	
w/data pack	30435-500	30435-520	30535

10,000µg/mL in P&T methanol, 1mL/ampul

	Each	5-pk.	10-pk.
	30453	30453-510	
w/data pack	30453-500	30453-520	30553

Matrix Spike Mixtures

MA VPH Matrix Spike Mix with Surrogate

<i>n</i> -pentane (C5)	methyl <i>tert</i> -butyl ether
<i>n</i> -nonane (C9)	naphthalene
benzene	toluene
2,5-dibromotoluene (surrogate)	1,2,4-trimethylbenzene
ethylbenzene	<i>m</i> -xylene
isooctane	<i>o</i> -xylene
2-methylpentane	<i>p</i> -xylene

2,500µg/mL each in P&T methanol, 1mL/ampul

	Each	5-pk.	10-pk.
	30454	30454-510	
w/data pack	30454-500	30454-520	30554

Calibration Mixtures

California Oxygenates Mix

diisopropyl ether	2,000µg/mL	<i>tert</i> -butyl alcohol	10,000
ethyl- <i>tert</i> -butyl ether	2,000	methyl <i>tert</i> -butyl ether	2,000
<i>tert</i> -amyl methyl ether	2,000		

In P&T methanol, 1mL/ampul

	Each	5-pk.	10-pk.
	30465	30465-510	
w/data pack	30465-500	30465-520	30565

BTEX Standards

benzene	toluene	<i>o</i> -xylene
ethylbenzene	<i>m</i> -xylene	<i>p</i> -xylene

200µg/mL each in P&T methanol, 1mL/ampul

	Each	5-pk.	10-pk.
	30051	30051-510	
w/data pack	30051-500	30051-520	30151

2,000µg/mL each in P&T methanol, 1mL/ampul

	Each	5-pk.	10-pk.
	30213	30213-510	
w/data pack	30213-500	30213-520	30313

2,000µg/mL each in P&T methanol, 1,000µg/mL *m*-xylene & *p*-xylene, 1mL/ampul

	Each	5-pk.	10-pk.
	30488	30488-510	
w/data pack	30488-500	30488-520	30588

MA Volatile Petroleum Hydrocarbon (VPH) Standard

<i>n</i> -pentane (C5)	1,000µg/mL	naphthalene	1,000
<i>n</i> -nonane (C9)	1,000	toluene	1,500
benzene	500	1,2,4-trimethylbenzene	1,000
ethylbenzene	500	<i>m</i> -xylene	1,000
isooctane	1,500	<i>o</i> -xylene	1,000
2-methylpentane	1,500	<i>p</i> -xylene	1,000
methyl <i>tert</i> -butyl ether	1,500		

In P&T methanol, 1mL/ampul

	Each	5-pk.	10-pk.
	30434	30434-510	
w/data pack	30434-500	30434-520	30534

Other Certified Fuel Standards

Perform calibration checks for TPH & aromatics in one analysis.

Certified BTEX in Unleaded Gas Composite Standard

Certified for:

benzene	methyl <i>tert</i> -butyl ether	<i>m</i> -xylene
ethylbenzene	naphthalene	<i>o</i> -xylene
isopropyl benzene	toluene	<i>p</i> -xylene

5,500ppm gasoline in P&T methanol, 1mL/ampul

	Each	5-pk.	10-pk.
	30237	30237-510	
w/data pack	30237-500	30237-520	30337

Certified Aromatics in Gasoline

Certified for:

benzene	isopropylbenzene	1,2,4-trimethylbenzene
ethylbenzene	methyl <i>tert</i> -butyl ether	1,3,5-trimethylbenzene
<i>m</i> -ethyltoluene	naphthalene	<i>m</i> -xylene
<i>o</i> -ethyltoluene	<i>n</i> -propylbenzene	<i>o</i> -xylene
<i>p</i> -ethyltoluene	toluene	<i>p</i> -xylene
	1,2,3-trimethylbenzene	

5,500ppm gasoline in P&T methanol, 1mL/ampul

	Each	5-pk.	10-pk.
	30485	30485-510	
w/data pack	30485-500	30485-520	30585

Certified PAHs in Diesel

Certified PAHs & Typical Certified Conc.* (ppm)

acenaphthene	20	2-methylnaphthalene	180
acenaphthylene	14	naphthalene	90
fluorene d6	32	phenanthrene	47
1-methylnaphthalene	269		

50,000ppm diesel #2 in methylene chloride, PAH conc. listed above, 1mL/ampul

	Each	5-pk.	10-pk.
	31673	31673-510	
w/data pack	31673-500	31673-520	31773

*Varies lot to lot. See Certificate of Analysis for certified concentrations.



Custom Reference Material Request Form

Domestic Customers**FAX#:** (814) 355-2895**email:** standards@restekcorp.com**International Customers****Contact Your Local
Restek Representative.****Name:** _____ **Date:** _____**Company/Location:** _____**Phone #:** _____ **FAX #:** _____**E-mail:** _____**Take these eight steps to create the right solution:**

1. Mixture Description: _____
2. Solvent: _____
3. No. of components: _____
4. Volume (select): 1mL, 2mL, 5mL, 10mL, or other mL _____
5. Quantity: No. of units _____

6. Select testing and documentation that best meets your requirements:

- ☐ Gravimetric Documentation: Lot Sheet with balance printout attached.
- ☐ Qualitative Documentation: Certificate of Composition, Chromatogram, and Gravimetric Documentation.
- ☐ Quantitative Documentation: Certificate of Analysis and Data Pack.

7. Compound(s): (list or attach sheet)	Concentration:	8. Concentration Units
1.		<input type="radio"/> mg/mL
2.		<input type="radio"/> µg/mL
3.		<input type="radio"/> ng/mL
4.		<input type="radio"/> vol./vol. %
5.		<input type="radio"/> wt./wt. %
6.		<input type="radio"/> other _____
7.		
8.		
9.		
10.		
11.		
12.		

ALL mixtures are produced in accordance with our ISO 9001 registration. Analytical balances are calibrated daily at seven mass levels using NIST-traceable weights. ALL raw materials used are a minimum of 97% pure unless otherwise specified.

on-line: <http://www.restekcorp.com/stdreq.htm>

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Contact Your Local Restek Representative

USA: 110 Benner Circle, Bellefonte, PA 16823 • phone: (800) 356-1688 • fax: (814) 353-1309

Germany: Schaberweg 23, 61348 Bad Homburg • phone: (49) 06172 2797 0 • fax: (49) 06172 2797 77

France: 1, rue Montespan, 91024 Evry • phone: 01 60 78 32 10 • fax: 01 60 78 70 90

Ireland: 8 Baronscourt Lane, Belfast, BT8 8RR, Northern Ireland • phone: (44) 28 9081 4576 • fax: (44) 28 9081 4576

Thames Restek UK Ltd.: Units 8-16, Ministry Wharf, Wycombe Road, Saunderton, Buckinghamshire • HP14 4HW
phone: 01494 563377 • fax: 01494 564990



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To help laboratories comply with and use these analytical procedures, Restek has been active in following the state guidelines. Based on our good knowledge of the methods, our experienced chemists have developed a list of the appropriate technical service tools and analytical products to achieve success with these methods. We offer quality chromatographic columns, analytical reference materials, and sample preparation products.

In this comprehensive product listing, you will find everything you need to quickly set up or reorder consumables for these methods. Please refer to our latest product catalog (lit. cat. #59662) or call 800-356-1688 or 814-353-1300, ext. 3, for more information. Also, we will be happy to provide a quote on any custom consumable you may need!

Regulatory and Analytical Methodology Contact Information

UST & LUST CONTACT

Washington Department of Ecology

Toxics Cleanup Program

P.O. Box 47600

Olympia, WA 98504-7600

Phone: 360-407-7170

Fax: 360-407-7154

**Washington's UST & LUST program
maintains a web site at**

<http://www.ecy.wa.gov/programs/tcp/ust-lust/tanks.html>

UST & LUST CONTACT

Oregon Department of

Environmental Quality

UST Program, 811 SW Sixth Avenue, 9th Floor
Portland, OR 97204

Phone: 503-229-5733 or 1-800-742-7878

Fax: 503-229-6954

**Oregon's UST & LUST program
maintains a web site at**

<http://www.deq.state.or.us/wmc/tank/ust-lust.htm>

Northwest Regional UST Monitoring

- ✓ Comprehensive product listing for the latest UST methods used by the States of Oregon and Washington.
- ✓ Products conveniently organized by method number.
- ✓ Easy method set-up and reorder of consumables, including:
 - Gas chromatography columns and accessories,
 - Analytical reference materials,
 - Sample preparation supplies,
 - Technical service.

Washington State Department of Ecology (WSDE) has been using analytical methods for the analysis of total petroleum hydrocarbons (TPH) since 1991. These analytical methods, known as WTPH methods, have been extensively used in underground storage tank (UST) applications. In 1997 these methods were updated to provide additional detail, to provide for extended analysis and to incorporate an identification (ID) method for water samples. These updated methods are now called NWTPH ("NW" = "Northwest" to reflect their use in Oregon as well as Washington). Under NWTPH, there are three methods: NWTPH-HCID for hydrocarbon identification; NWTPH-Gx for volatile petroleum products; and NWTPH-Dx for semivolatile petroleum products.

In 1998 WSDE completed a "working draft" of the amendment to the state cleanup law: The Interim TPH Policy describes a new approach for petroleum: Separation into carbon-range fractions and use of surrogates or derived values to represent those fractions. Two analytical methods were adopted from Massachusetts' Department of Environmental Protection: VPH for volatile aliphatic and aromatic petroleum hydrocarbons, and EPH for extractable aliphatic and aromatic petroleum hydrocarbons.

NWTPH-HCID is a qualitative and semi-quantitative screen to determine the presence and type of petroleum products that may exist in water or soil. This method should be used if the type of petroleum contamination is unknown, and should be performed on contaminated soil or water that is representative of the site. The results will determine what fully quantitative method(s), if any, are needed for compliance with the matrix criteria. Should the value of the analysis for gasoline, diesel or heavy oils (or any other identified petroleum product) exceed the reporting limits, the specific analytical method for that product must be employed.

NWTPH-Gx is the qualitative and quantitative extended method for volatile (e.g., gasoline) petroleum products in soil and water. Petroleum products applicable for this method include aviation and automotive gasoline, mineral spirits, Stoddard solvent, and naphtha.

NWTPH-Dx is the qualitative and quantitative extended method for semivolatile (e.g., diesel) petroleum products in soil and water. Petroleum products applicable for this include jet fuels, kerosene, diesel oils, hydraulic fluids, mineral oils, lubricating oils and fuel oils.

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Northwest Regional Gas Chromatography Columns & Accessories

For these items, see Restek's
Chromatography Products Catalog:

- Syringes
- Autosampler Vials
- Guard Columns
- Ferrules, Septa



Recommended Gas Chromatography Columns

Rtx®-5, 30m x 0.25mm

Film Thickness	temp. limits	Cat. #
0.25µm	-60 to 330/350°C	10223
0.50µm	-60 to 330/350°C	10238
1.00µm	-60 to 320/340°C	10253

Integra-Guard™ Columns

Guard and analytical column in one connectionless length.

*Add the appropriate suffix number to analytical column catalog number.

ID	Length	Suffix #*
0.25mm	5m	-124
	10m	-127

Syringes

Standard Micro-Liter Syringes for Agilent 7673 and 7683 Autosamplers

Size	Needle Gauge	6-pk.
10µL	23s	24384
10µL	23s-26s	24600

Autosampler Vials

Crimp Top Vial Snap Seal™ Style (12 x 32mm, 11mm Crimp)

Description*	1,000-pk.
2.0mL Clear Glass Vial w/White Graduated Marking Spot	24384
2.0mL Amber Glass Vial w/White Graduated Marking Spot	24386

*Marking spots are available on request in blue, green, rust or yellow.

Aluminum Crimp Seals w/Septa

Description	1,000-pk.
Silver Seal, PTFE/Natural Rubber Septa	21175
Silver Seal, PTFE/Silicone Septa*	24360

*PTFE/Silicone/PTFE available on request.

Thermolite® Septa

Size	temp. limits	25-pk.	50-pk.	100-pk.
11mm (7/16")	to 340°C	20363	20364	20365

Replacement Inlet Seals

Stainless Steel Inlet Seal for Single-Column Installation*

Size	2-pk.	10-pk.
0.8mm ID	21315	21316

*Equivalent to Agilent Part# 18740-20880.

Inlet Liners

For Agilent GCs

Description	ID/OD & Length (mm)	ea.	5-pk.
Uniliner®*	4.0 ID, 6.3 OD x 78.5	20335	20336
Drilled Uniliner®	4.0 ID, 6.3 OD x 78.5	21054	21055
1mm Split**	1.0 ID, 6.3 OD x 78.5	20972	20973

*Restek design improves performance over the original Agilent Liner.

**Use this liner for increased sensitivity.

Low Volume Injector for Agilent GCs

Description	kit.
Low-Volume Injector for Agilent Split/Splitless GC Inlets	21692

Analytical Reference Materials: WA VPH (June 1997)

The method is designed to measure the collective concentrations of volatile aliphatic and aromatic petroleum hydrocarbons in water and soil. The method is based on a purge and trap, gas chromatography procedure with PID/FID in series for detection.

Calibration Mixtures

WA VPH Standard

<i>n</i> -pentane (C5)	benzene	toluene
<i>n</i> -hexane (C6)	ethylbenzene	1,2,3-trimethylbenzene
<i>n</i> -octane (C8)	1-methylnaphthalene	<i>m</i> -xylene
<i>n</i> -decane (C10)	methyl <i>tert</i> -butyl ether	<i>o</i> -xylene
<i>n</i> -dodecane (C12)	naphthalene	<i>p</i> -xylene

1,000µg/mL each in P&T methanol, 1mL/ampul

	Each	5-pk.	10-pk.
	30451	30451-510	
w/data pack	30451-500	30451-520	30551

Surrogate Mixtures

MA VPH Surrogate Standard

2,5-dibromotoluene

1,000µg/mL in P&T methanol, 1mL/ampul

	Each	5-pk.	10-pk.
	30435	30435-510	
w/data pack	30435-500	30435-520	30535

10,000µg/mL in P&T methanol, 1mL/ampul

	Each	5-pk.	10-pk.
	30453	30453-510	
w/data pack	30453-500	30453-520	30553

Matrix Spike Mixtures

PVOC Mix (California)

benzene	toluene	<i>p</i> -xylene
ethylbenzene	<i>m</i> -xylene	
methyl <i>tert</i> -butyl ether	<i>o</i> -xylene	

1,000µg/mL each in P&T methanol, 1mL/ampul

	Each	5-pk.	10-pk.
	30231	30231-510	
w/data pack	30231-500	30231-520	30331

Petroleum Reference Mixtures Pattern Recognition Mixtures

Unleaded Gasoline Composite Standard

2,500µg/mL in P&T methanol, 1mL/ampul

	Each	5-pk.	10-pk.
	30081	30081-510	
w/data pack	30081-500	30081-520	30181

50,000µg/mL in P&T methanol, 1mL/ampul

	Each	5-pk.	10-pk.
	30205	30205-510	
w/data pack	30205-500	30205-520	30305

50,000µg/mL in P&T methanol, 5mL/ampul

	Each	5-pk.	10-pk.
	30206	30206-510	
w/data pack	30206-500	30206-520	30306

Analytical Reference Materials: WA EPH (June 1997)

The method is designed to measure concentrations of diesel range organics (DRO) in the C10-C28 range in water, soil, or waste. It also can be used to measure kerosene, motor oil, or lubricant oil. It is based on a solvent extraction, GC/FID procedure.

Calibration Mixtures

WA EPH Aromatic Hydrocarbon Mix

acenaphthene naphthalene toluene
benzo(ghi)perylene pyrene 1,2,3-trimethylbenzene

1,000µg/mL each in methylene chloride, 1mL/ampul

	Each	5-pk.	10-pk.
	31488	31488-510	
w/data pack	31488-500	31488-520	31588

WA EPH Aliphatic Hydrocarbon Mix

n-octane (C8) *n*-dodecane (C12) *n*-heneicosane (C21)
n-decane (C10) *n*-hexadecane (C16) *n*-tetratriacontane (C34)

1,000µg/mL each in hexane, 1mL/ampul

	Each	5-pk.	10-pk.
	31489	31489-510	
w/data pack	31489-500	31489-520	31589

Surrogate Mixtures

MA EPH Surrogate Spike Mix

1-chlorooctadecane *o*-terphenyl

4,000µg/mL each in acetone, 1mL/ampul

	Each	5-pk.	10-pk.
	31479	31479-510	
w/data pack	31479-500	31479-520	31579

Internal Standard Mixtures

5- α -androstane

2,000µg/mL in methylene chloride, 1mL/ampul

	Each	5-pk.	10-pk.
	31065	31065-510	
w/data pack	31065-500	31065-520	31165

Matrix Spike Mixtures

WA EPH Matrix Spike Mix

n-decane (C10) *n*-heneicosane (C21) benzo(a)pyrene pyrene
n-dodecane (C12) acenaphthene benzo(ghi)perylene
n-hexadecane (C16) anthracene naphthalene

250µg/mL each in acetone, 1mL/ampul

	Each	5-pk.	10-pk.
	31490	31490-510	
w/data pack	31490-500	31490-520	31590

Fractionation Mixtures

WA EPH Fractionation Check Mix

<i>n</i> -octane (C8)	anthracene	fluoranthene
<i>n</i> -decane (C10)	benzo(a)anthracene	fluorene
<i>n</i> -dodecane (C12)	benzo(a)pyrene	indeno(1,2,3-cd)pyrene
<i>n</i> -hexadecane (C16)	benzo(b)fluoranthene	naphthalene
<i>n</i> -heneicosane (C21)	benzo(k)fluoranthene	phenanthrene
<i>n</i> -tetratriacontane (C34)	benzo(ghi)perylene	pyrene
acenaphthene	chrysene	
acenaphthylene	dibenzo(a,h)anthracene	

25µg/mL each in hexane, 1mL/ampul

	Each	5-pk.	10-pk.
	31491	31491-510	
w/data pack	31491-500	31491-520	31591

Analytical Reference Materials:

NWTPH-HCID (June 1997)

The method is designed to identify petroleum products in the C7-C30 range, by "fingerprint" pattern matching, in water, soil or waste. The extraction can be used to quantitatively measure DRO range petroleum products, kerosene, motor oil, or lubricant oil. It is based on a solvent extraction GC/FID procedure.

Surrogate Mixtures

NW TPH-HCID Surrogate Mix

n-pentacosane (C25) 4-bromofluorobenzene
5,000µg/mL each in methylene chloride, 1mL/ampul

	Each	5-pk.	10-pk.
	31486	31486-510	
w/data pack	31486-500	31486-520	31586

Retention Time Mixtures

NW TPH-HCID Retention Time Mix

n-dodecane (C12) *n*-tetracosane (C24) toluene
2,500µg/mL each in methylene chloride, 1mL/ampul

	Each	5-pk.	10-pk.
	31485	31485-510	
w/data pack	31485-500	31485-520	31585

Petroleum Reference Mixtures Pattern Recognition Mixtures

Mineral Spirits Standard

50,000µg/mL in methylene chloride, 1mL/ampul

	Each	5-pk.	10-pk.
	31260	31260-510	
w/data pack	31260-500	31260-520	31360

50,000µg/mL in methylene chloride, 5mL/ampul

	Each	5-pk.	10-pk.
	31261	31261-510	
w/data pack	31261-500	31261-520	31361

Unleaded Gasoline Composite Standard

2,500µg/mL in P&T methanol, 1mL/ampul

	Each	5-pk.	10-pk.
	30081	30081-510	
w/data pack	30081-500	30081-520	30181

50,000µg/mL in P&T methanol, 1mL/ampul

	Each	5-pk.	10-pk.
	30205	30205-510	
w/data pack	30205-500	30205-520	30305

50,000µg/mL in P&T methanol, 5mL/ampul

	Each	5-pk.	10-pk.
	30206	30206-510	
w/data pack	30206-500	30206-520	30306

Kerosene Fuel Composite Standard

5,000µg/mL in methylene chloride, 1mL/ampul

	Each	5-pk.	10-pk.
	31094	31094-510	
w/data pack	31094-500	31094-520	31194

50,000µg/mL in methylene chloride, 1mL/ampul

	Each	5-pk.	10-pk.
	31256	31256-510	
w/data pack	31256-500	31256-520	31356

50,000µg/mL in methylene chloride, 5mL/ampul

	Each	5-pk.	10-pk.
	31257	31257-510	
w/data pack	31257-500	31257-520	31357

Diesel Fuel #2 Composite Standard

5,000µg/mL in methylene chloride, 1mL/ampul

	Each	5-pk.	10-pk.
	31093	31093-510	
w/data pack	31093-500	31093-520	31193

50,000µg/mL in methylene chloride, 1mL/ampul

	Each	5-pk.	10-pk.
	31258	31258-510	
w/data pack	31258-500	31258-520	31358

50,000µg/mL in methylene chloride, 5mL/ampul

	Each	5-pk.	10-pk.
	31259	31259-510	
w/data pack	31259-500	31259-520	31359

Motor Oil Composite Standard

Prepared from an equal volume blend of these motor oils: 5W30, 10W30, 10W40, 20W50. A precisely weighed amount of the composite is diluted to 50,000µg/mL in methylene chloride. 1mL/ampul.

	Each	5-pk.	10-pk.
	31464	31464-510	
w/data pack	31464-500	31464-520	31564

Used Motor Oil Composite Standard

Prepared from an equal volume blend from five gasoline powered vehicles. A precisely weighed amount of the composite is diluted to 50,000µg/mL in methylene chloride. 1mL/ampul.

	Each	5-pk.	10-pk.
	31465	31465-510	
w/data pack	31465-500	31465-520	31565

Analytical Reference Materials: NWT PH-Gx (June 1997)

This method is designed to measure concentrations of volatile petroleum products. BTEX may be determined simultaneously with gasoline, if requirements of methods 8020/8021 (use of PID) or 8260 (use of MS) are met.

NW TPH-Gx Surrogate Mix

4-bromofluorobenzene 1,4-difluorobenzene

2,500µg/mL each in P&T methanol, 1mL/ampul

	Each	5-pk.	10-pk.
	30455	30455-510	
w/data pack	30455-500	30455-520	30555

Petroleum Reference Mixtures Pattern Recognition Mixtures

Unleaded Gasoline Composite Standard

2,500µg/mL and 50,000µg/mL mixtures; described in column at left.

Analytical Reference Materials: NWT PH-Dx (June 1997)

The method is designed to measure concentrations of diesel range organics (DRO) in the C10-C28 range in water, soil, or waste. It also can be used to measure kerosene, motor oil, or lubricant oil. It is based on a solvent extraction, GC/FID procedure.

NW TPH-Dx Surrogate Mixes

Pentacosane Standard

10,000µg/mL in methylene chloride, 1mL/ampul

	Each	5-pk.	10-pk.
	31487	31487-510	
w/data pack	31487-500	31487-520	31587

p-terphenyl

10,000µg/mL in methylene chloride, 1mL/ampul

	Each	5-pk.	10-pk.
	31095	31095-510	
w/data pack	31095-500	31095-520	31195

2-fluorobiphenyl

10,000µg/mL in methylene chloride, 1mL/ampul

	Each	5-pk.	10-pk.
	31096	31096-510	
w/data pack	31096-500	31096-520	31196

o-terphenyl

10,000µg/mL in methylene chloride, 1mL/ampul

	Each	5-pk.	10-pk.
	31097	31097-510	
w/data pack	31097-500	31097-520	31197

Petroleum Reference Mixtures Pattern Recognition Mixtures

Diesel Fuel #2 Composite Standard

5,000µg/mL and 50,000µg/mL mixtures; described in column at left.

Kerosene Fuel Composite Standard

5,000µg/mL and 50,000µg/mL mixtures; described in column at left.



Custom Reference Material Request Form

Domestic Customers**FAX#:** (814) 355-2895**email:** standards@restekcorp.com**International Customers****Contact Your Local
Restek Representative.****Name:****Date:****Company/Location:****Phone #:****FAX #:****E-mail:****Take these eight steps to create the right solution:****1.** Mixture Description:**2.** Solvent:**3.** No. of components:**4.** Volume (select): 1mL, 2mL, 5mL, 10mL, or other mL**5.** Quantity: No. of units**6. Select testing and documentation that best meets your requirements:**

- ☐ Gravimetric Documentation: Lot Sheet with balance printout attached.
- ☐ Qualitative Documentation: Certificate of Composition, Chromatogram, and Gravimetric Documentation.
- ☐ Quantitative Documentation: Certificate of Analysis and Data Pack.

7. Compound(s): (list or attach sheet)		Concentration:	8. Concentration Units
1.			<input type="radio"/> mg/mL
2.			<input type="radio"/> µg/mL
3.			<input type="radio"/> ng/mL
4.			<input type="radio"/> vol./vol. %
5.			<input type="radio"/> wt./wt. %
6.			<input type="radio"/> other _____
7.			
8.			
9.			
10.			
11.			
12.			

ALL mixtures are produced in accordance with our ISO 9001 registration. Analytical balances are calibrated daily at seven mass levels using NIST-traceable weights. ALL raw materials used are a minimum of 97% pure unless otherwise specified.

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To help laboratories comply with and use these analytical procedures, Restek has been active in following federal guidance. Based on our good knowledge of the methods, our experienced chemists have developed a list of the appropriate technical service tools and analytical products to achieve success with these methods. We offer quality chromatographic columns, analytical reference materials, and sample preparation products.

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Regulatory and Analytical Methodology Contact Information

U.S. EPA/OSWER/OUST

1200 Pennsylvania Avenue, N.W.
Mailcode: 5401G
Washington, DC 20460
Phone: 703-603-9900
Fax: 703-603-0175 or 703-603-9163

U.S. EPA/OSWER/OUST maintains a web site at
<http://www.epa.gov/swerust1>

EPA Office Of Underground Storage Tanks (OUST) Recommended Methods

- ✓ Comprehensive products listing for the latest EPA methods for UST applications.
- ✓ Products conveniently organized by method number.
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 - Chromatography columns and accessories
 - Analytical reference materials
 - Sample preparation supplies

In the late 1980s the US Environmental Protection Agency (EPA) established the Office of Underground Storage Tanks (OUST) to enforce federal laws on environmental petroleum contamination. Underground storage tank (UST) systems installed before December 22, 1988 had no protection against spills and overfills, or were likely to corrode and leak. OUST mandated that all UST systems must not be contaminating nearby groundwater and soil by December 22, 1998. Existing UST systems must be either protected from spills, overfills, and corrosion or replaced with new systems that have spill, overfill, and corrosion protection.

The 1998 deadline has passed and many of the unprotected USTs have been properly treated. However, the need for monitoring USTs persists. OUST has been actively enforcing the federal UST regulations.

OUST has recommended specific EPA methods for UST applications (Table 1). Although many states have developed state-specific methods for UST analysis over the years, a majority of the states still use these EPA methods.

Table 1. OUST-recommended EPA Methods for UST applications.

EPA Method	Chemical of Concern	Technique
EPA 8015B	Aliphatic and aromatic hydrocarbons GRO (C6-C10) and DRO (C10-C28)	GRO: purge and trap GC/FID; DRO: solvent extraction GC/FID
EPA 8021B	Aromatic VOCs	Purge and trap GC/PID/HECD
EPA 8310	PAHs	Solvent extraction HPLC/UV
EPA 8100	PAHs	Solvent extraction GC/FID
EPA 8260B	VOCs	Purge and trap GC/MS
EPA 8270C†	SVOCs	Solvent extraction GC/MS
EPA 418.1/413.1†	TRPH in sediment, soil and sludge	IR
EPA 1664†	TPH	Solvent extraction IR

†Reference materials not listed here; please inquire.

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EPA 8015B

revision 2, (Dec. 1996)

Petroleum Reference/Pattern Recognition Mixtures

Unleaded Gasoline Composite Standard

2,500µg/mL in P&T methanol, 1mL/ampul

	Each	5-pk.	10-pk.
	30081	30081-510	—
w/data pack	30081-500	30081-520	30181

50,000µg/mL in P&T methanol, 1mL/ampul

	Each	5-pk.	10-pk.
	30205	30205-510	—
w/data pack	30205-500	30205-520	30305

50,000µg/mL in P&T methanol, 5mL/ampul

	Each	5-pk.	10-pk.
	30206	30206-510	—
w/data pack	30206-500	30206-520	30306

Diesel Fuel #2 Composite Standard

5,000µg/mL in methylene chloride, 1mL/ampul

	Each	5-pk.	10-pk.
	31093	31093-510	—
w/data pack	31093-500	31093-520	31193

50,000µg/mL in methylene chloride, 1mL/ampul

	Each	5-pk.	10-pk.
	31258	31258-510	—
w/data pack	31258-500	31258-520	31358

50,000µg/mL in methylene chloride, 5mL/ampul

	Each	5-pk.	10-pk.
	31259	31259-510	—
w/data pack	31259-500	31259-520	31359

Connecticut ETPH Calibration Mixture (15 components)

<i>n</i> -nonane (C9)	<i>n</i> -octadecane (C18)	<i>n</i> -octacosane (C28)
<i>n</i> -decane (C10)	<i>n</i> -eicosane (C20)	<i>n</i> -triacontane (C30)
<i>n</i> -dodecane (C12)	<i>n</i> -docosane (C22)	<i>n</i> -dotriacontane (C32)
<i>n</i> -tetradecane (C14)	<i>n</i> -tetracosane (C24)	<i>n</i> -tetraatriacontane (C34)
<i>n</i> -hexadecane (C16)	<i>n</i> -hexacosane (C26)	<i>n</i> -hexatriacontane (C36)

1,000µg/mL each in methylene chloride, 1mL/ampul

	Each	5-pk.	10-pk.
	31614	31614-510	—
w/data pack	31614-500	31614-520	31714

Florida TRPH Standard (17 components)

<i>n</i> -octane (C8)	<i>n</i> -eicosane (C20)	<i>n</i> -dotriacontane (C32)
<i>n</i> -decane (C10)	<i>n</i> -docosane (C22)	<i>n</i> -tetraatriacontane (C34)
<i>n</i> -dodecane (C12)	<i>n</i> -tetracosane (C24)	<i>n</i> -hexatriacontane (C36)
<i>n</i> -tetradecane (C14)	<i>n</i> -hexacosane (C26)	<i>n</i> -octatriacontane (C38)
<i>n</i> -hexadecane (C16)	<i>n</i> -octacosane (C28)	<i>n</i> -tetracontane (C40)
<i>n</i> -octadecane (C18)	<i>n</i> -triacontane (C30)	

500µg/mL each in hexane, 1mL/ampul

	Each	5-pk.	10-pk.
	31266	31266-510	—
w/data pack	31266-500	31266-520	31366

Retention Time Marker

n-hexane (C6) *n*-decane (C10) *n*-dodecane (C12)
1,000µg/mL each in P&T methanol, 1mL/ampul

	Each	5-pk.	10-pk.
	30483	30483-510	—
w/data pack	30483-500	30483-520	30583

Internal/Surrogate Standards

See reverse side for descriptions.

α,α,α -Androstane	31065
α -Terphenyl	31066, 31097

EPA 8021B

revision 2, (Dec. 1996)

Calibration Mixtures

Gasoline Component Standard (10 components)

benzene	500µg/mL	1,2,4-trimethylbenzene	1000
ethylbenzene	500	2,2,4-trimethylpentane	1500
<i>n</i> -heptane (C7)	500	<i>m</i> -xylene	1000
2-methylpentane	1500	<i>o</i> -xylene	1000
toluene	1500	<i>p</i> -xylene	1000

10,000µg/mL total in P&T methanol, 1mL/ampul

	Each	5-pk.	10-pk.
	30486	30486-510	—
w/data pack	30486-500	30486-520	30586

Michigan GRO Mix (14 components)

benzene	2-methylnaphthalene	1,3,5-trimethylbenzene
1,2-dibromoethane	methyl <i>tert</i> -butyl-ether	<i>m</i> -xylene
1,2-dichloroethane	naphthalene	<i>o</i> -xylene
ethylbenzene	toluene	<i>p</i> -xylene
isopropylbenzene	1,2,4-trimethylbenzene	

2,000µg/mL each in P&T methanol, 1mL/ampul

	Each	5-pk.	10-pk.
	30468	30468-510	—
w/data pack	30468-500	30468-520	30568

MA Volatile Petroleum Hydrocarbons (VPH)

(13 components)

benzene	500µg/mL	<i>n</i> -pentane (C5)	1,000
ethylbenzene	500	toluene	1,500
isooctane	1,500	1,2,4-trimethylbenzene	1,000
2-methylpentane	1,500	<i>m</i> -xylene	1,000
methyl <i>tert</i> -butyl ether	1,500	<i>o</i> -xylene	1,000
naphthalene	1,000	<i>p</i> -xylene	1,000
<i>n</i> -nonane (C9)	1,000		

In P&T methanol, 1mL/ampul

	Each	5-pk.	10-pk.
	30434	30434-510	—
w/data pack	30434-500	30434-520	30534

Certified Aromatics in Gasoline (16 components)

Certified for:

benzene	methyl <i>tert</i> -butyl ether	1,3,5-trimethylbenzene
ethylbenzene	naphthalene	<i>m</i> -xylene
<i>m</i> -ethyltoluene	<i>n</i> -propylbenzene	<i>o</i> -xylene
<i>o</i> -ethyltoluene	toluene	<i>p</i> -xylene
<i>p</i> -ethyltoluene	1,2,3-trimethylbenzene	
isopropylbenzene	1,2,4-trimethylbenzene	

5,500ppm gasoline in P&T methanol, 1mL/ampul

	Each	5-pk.	10-pk.
	30485	30485-510	—
w/data pack	30485-500	30485-520	30585

BTEX Standard

benzene	toluene	<i>o</i> -xylene
ethylbenzene	<i>m</i> -xylene	<i>p</i> -xylene

200µg/mL each in P&T methanol, 1mL/ampul

	Each	5-pk.	10-pk.
	30051	30051-510	—
w/data pack	30051-500	30051-520	30151

2,000µg/mL each in P&T methanol, 1mL/ampul

	Each	5-pk.	10-pk.
	30213	30213-510	—
w/data pack	30213-500	30213-520	30313

2,000µg/mL each in P&T methanol, *1,000µg/mL, 1mL/ampul

benzene	toluene	<i>o</i> -xylene
ethylbenzene	<i>m</i> -xylene*	<i>p</i> -xylene*

	Each	5-pk.	10-pk.
	30488	30488-510	—
w/data pack	30488-500	30488-520	30588

PMOC Mix (California) (7 components)

benzene	toluene	<i>p</i> -xylene
ethylbenzene	<i>m</i> -xylene	
methyl <i>tert</i> -butyl ether	<i>o</i> -xylene	

1,000µg/mL each in P&T methanol, 1mL/ampul

	Each	5-pk.	10-pk.
	30231	30231-510	—
w/data pack	30231-500	30231-520	30331

CA WIP VOA Standard (11 components)

benzene	1,4-dichlorobenzene	<i>m</i> -xylene
chlorobenzene	ethylbenzene	<i>o</i> -xylene
1,2-dichlorobenzene	methyl <i>tert</i> -butyl ether	<i>p</i> -xylene
1,3-dichlorobenzene	toluene	

2,000µg/mL each in P&T methanol, 1mL/ampul

	Each	5-pk.	10-pk.
	30236	30236-510	—
w/data pack	30236-500	30236-520	30336

Unleaded Gasoline Composite Standard

See EPA 8015B for description. 30081 30205 30206

Retention Time Marker

See EPA 8015B for description. 30483

Certified BTEX in Unleaded Gas Composite Standard

Certified for:

benzene	methyl <i>tert</i> -butyl ether	<i>m</i> -xylene
ethylbenzene	naphthalene	<i>o</i> -xylene
isopropylbenzene	toluene	<i>p</i> -xylene

5,500ppm gasoline in P&T methanol, 1mL/ampul

	Each	5-pk.	10-pk.
	30237	30237-510	—
w/data pack	30237-500	30237-520	30337

Internal/Surrogate Standards

See reverse side for descriptions.

1-Chloro-4-fluorobenzene	30066
4-Bromofluorobenzene	30067, 30082
α,α,α-Trifluorotoluene	30068, 30083
1-Chlorooctane	30084

EPA 8310

revision 0, (Sept. 1986)

Calibration Mixtures

SV Calibration Mix #5 (16 components)

acenaphthene	benzo(k)fluoranthene	indeno(1,2,3-cd)pyrene
acenaphthylene	benzo(ghi)perylene	naphthalene
anthracene	chrysene	phenanthrene
benzo(a)anthracene	dibenzo(a,h)anthracene	pyrene
benzo(a)pyrene	fluoranthene	
benzo(b)fluoranthene	fluorene	

2,000µg/mL each in methylene chloride, 1mL/ampul

	Each	5-pk.	10-pk.
	31011	31011-510	—
w/data pack	31011-500	31011-520	31111

610 PAH Calibration Mixes (16 components)

	MIX A	MIX B		MIX A	MIX B
acenaphthene	1000µg/mL	1000	chrysene	500	100
acenaphthylene	1000	2000	dibenzo(a,h)anthracene	500	200
anthracene	1000	100	fluoranthene	500	200
benzo(a)anthracene	500	100	fluorene	1000	200
benzo(a)pyrene	500	100	indeno(1,2,3-cd)pyrene	500	100
benzo(b)fluoranthene	500	200	naphthalene	1000	1000
benzo(k)fluoranthene	500	100	phenanthrene	500	100
benzo(ghi)perylene	500	200	pyrene	500	100

A- In methylene chloride, 1mL/ampul

B- In methylene chloride:methanol (1:1), 1mL/ampul

Mix A	Each	5-pk.	10-pk.
	31264	31264-510	—
w/data pack	31264-500	31264-520	31364

Mix B	Each	5-pk.	10-pk.
	31455	31455-510	—
w/data pack	31455-500	31455-520	31555

Internal/Surrogate Standards

See reverse side for description.

Decafluorobiphenyl	31041
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EPA 8100

Calibration Mixtures

8270 Calibration Mix #5 (19 components)

acenaphthene	benzo(ghi)perylene	1-methylnaphthalene
acenaphthylene	chrysene	2-methylnaphthalene
anthracene	dibenzo(a,h)anthracene	naphthalene
benzo(a)anthracene	fluoranthene	phenanthrene
benzo(a)pyrene	fluorene	pyrene
benzo(b)fluoranthene	ideno(1,2,3-cd)pyrene	
benzo(k)fluoranthene	3-methylcholanthrene	

2,000µg/mL each in methylene chloride, 1mL/ampul

	Each	5-pk.	10-pk.
	31622	31622-510	—
w/data pack	31622-500	31622-520	31722

SV Calibration Mix #5 (16 components)

See EPA 8310 for description. 31011

Internal/Surrogate Standards

See reverse side for description.

2-Fluorobiphenyl 31091

1-Fluoronaphthalene 31092

EPA 8260B

revision 2, (Dec. 1996)

Calibration Mixtures

California Oxygenates Mix

diisopropyl ether	2,000µg/mL	tert-butyl alcohol	10,000
ethyl-tert-butyl ether	2,000	methyl tert-butyl ether	2,000
tert-amyl methyl ether	2,000		

In P&T methanol, 1mL/ampul

	Each	5-pk.	10-pk.
	30465	30465-510	—
w/data pack	30465-500	30465-520	30565

Ethanol Mix

10,000µg/mL in DI water, 1mL/ampul

	Each	5-pk.	10-pk.
	30466	30466-510	—
w/data pack	30466-500	30466-520	30566

BTEX Standard

See EPA 8021B for description. 30051 30213

Certified BTEX in Unleaded Gas Composite Standard

See EPA 8021B for description. 30237

Certified Aromatics in Gasoline

See EPA 8021B for description. 30485

PVOC Mix (California)

See EPA 8021B for description. 30231

CA WIP VOA Standard (11 components)

See EPA 8021B for description. 30236

MA Volatile Petroleum Hydrocarbon (VPH)

See EPA 8021B for description. 30434

PA DEP UST Standard (11 components)

benzene	isopropyl benzene	m-xylene
1,2-dibromoethane	methyl tert-butyl ether	o-xylene
1,2-dichloroethane	naphthalene	p-xylene
ethylbenzene	toluene	

2,000µg/mL each in P&T methanol, 1mL/ampul

	Each	5-pk.	10-pk.
	30433	30433-510	—
w/data pack	30433-500	30433-520	30533

WA VPH Standard (15 components)

benzene	1-methylnaphthalene	toluene
n-decane (C10)	methyl tert-butyl ether	1,2,3-trimethylbenzene
n-dodecane (C12)	naphthalene	m-xylene
ethylbenzene	n-octane (C8)	o-xylene
n-hexane (C6)	n-pentane (C5)	p-xylene

1,000µg/mL each in P&T methanol, 1mL/ampul

	Each	5-pk.	10-pk.
	30451	30451-510	—
w/data pack	30451-500	30451-520	30551

PVOC/GRO Mix (Wisconsin) (10 components)

benzene	toluene	o-xylene
ethylbenzene	1,2,4-trimethylbenzene	p-xylene
methyl tert-butyl ether	1,3,5-trimethylbenzene	
naphthalene	m-xylene	

1,000µg/mL each in P&T methanol, 1mL/ampul

	Each	5-pk.	10-pk.
	30095	30095-510	—
w/data pack	30095-500	30095-520	30195

Gasoline Component Standard (10 components)

See EPA 8021B for description. 30486

Internal/Surrogate Standards

See reverse side for descriptions.

1-Chloro-4-fluorobenzene 30066

4-Bromofluorobenzene 30067, 30082

α,α,α-Trifluorotoluene 30068, 30083

1-Chlorooctane 30084

Internal / Surrogate Standards

5- α -Androstane

2,000 μ g/mL in methylene chloride, 1mL/ampul

	Each	5-pk.	10-pk.
	31065	31065-510	—
w/data pack	31065-500	31065-520	31165

4-Bromofluorobenzene

2,500 μ g/mL in P&T methanol, 1mL/ampul

	Each	5-pk.	10-pk.
	30067	30067-510	—
w/data pack	30067-500	30067-520	30167

10,000 μ g/mL in P&T methanol, 1mL/ampul

	Each	5-pk.	10-pk.
	30082	30082-510	—
w/data pack	30082-500	30082-520	30182

1-Chloro-4-fluorobenzene

2,500 μ g/mL in P&T methanol, 1mL/ampul

	Each	5-pk.	10-pk.
	30066	30066-510	—
w/data pack	30066-500	30066-520	30166

1-Chlorooctadecane

10,000 μ g/mL in methylene chloride, 1mL/ampul

	Each	5-pk.	10-pk.
	31098	31098-510	—
w/data pack	31098-500	31098-520	31198

1-Chlorooctane

10,000 μ g/mL in P&T methanol, 1mL/ampul

	Each	5-pk.	10-pk.
	30084	30084-510	—
w/data pack	30084-500	30084-520	30184

Decafluorobiphenyl

2,000 μ g/mL in methylene chloride, 1mL/ampul

	Each	5-pk.	10-pk.
	31041	31041-510	—
w/data pack	31041-500	31041-520	31141

Fluorobenzene

2,000 μ g/mL in P&T methanol, 1mL/ampul

	Each	5-pk.	10-pk.
	30030	30030-510	—
w/data pack	30030-500	30030-520	30130

2-Fluorobiphenyl

10,000 μ g/mL in methylene chloride, 1mL/ampul

	Each	5-pk.	10-pk.
	31096	31096-510	—
w/data pack	31096-500	31096-520	31196

1-Fluoronaphthalene

2,000 μ g/mL in methylene chloride, 1mL/ampul

	Each	5-pk.	10-pk.
	31092	31092-510	—
w/data pack	31092-500	31092-520	31192

o-Terphenyl

2,000 μ g/mL in acetone, 1mL/ampul

	Each	5-pk.	10-pk.
	31066	31066-510	—
w/data pack	31066-500	31066-520	31166

10,000 μ g/mL in methylene chloride, 1mL/ampul

	Each	5-pk.	10-pk.
	31097	31097-510	—
w/data pack	31097-500	31097-520	31197

p-Terphenyl

10,000 μ g/mL in methylene chloride, 1mL/ampul

	Each	5-pk.	10-pk.
	31095	31095-510	—
w/data pack	31095-500	31095-520	31195

α,α,α -Trifluorotoluene

2,500 μ g/mL in P&T methanol, 1mL/ampul

	Each	5-pk.	10-pk.
	30068	30068-510	—
w/data pack	30068-500	30068-520	30168

10,000 μ g/mL in P&T methanol, 1mL/ampul

	Each	5-pk.	10-pk.
	30083	30083-510	—
w/data pack	30083-500	30083-520	30183

request a custom quote at

800-356-1688 or
complete our custom request order form online at
www.restekcorp.com



Can't locate the
exact mixture
you need?

With **thousands** of compounds in our inventory,
we can make any mixture to your specifications.

Chromatography Columns & Accessories

Recommended Gas Chromatography Columns

Rtx®-5, 30m x 0.25mm

Film Thickness	temp. limits	Cat. #
0.25µm	-60 to 330/350°C	10223
0.50µm	-60 to 330/350°C	10238
1.00µm	-60 to 320/340°C	10253

Integra-Guard Columns

Guard and analytical column in one connectionless length.

*Add the appropriate suffix number to analytical column catalog number.

5m: add -124; 10m: add -127.

Recommended HPLC Column

Description	Size	Cat. #
Pinnacle™ PAH	250 x 4.6mm	9170575

Syringes

Standard Micro-Liter Syringes for Agilent 7673 and 7683 Autosamplers

Size	Needle Gauge	6-pk.
10µL	23s	20169
10µL	23s-26s	24600

Autosampler Vials

Crimp Top Vial Snap Seal™ Style (12 x 32mm, 11mm Crimp)

Description*	1,000-pk.
2.0mL Clear Glass Vial w/White Graduated Marking Spot	24384
2.0mL Amber Glass Vial w/White Graduated Marking Spot	24386

*Marking spots are available on request in blue, green, rust or yellow.

Aluminum Crimp Seals w/Septa

Description	1,000-pk.
Silver Seal, PTFE/Natural Rubber Septa	21175
Silver Seal, PTFE/Silicone Septa*	24360

*PTFE/Silicone/PTFE available on request.

Thermolite® Septa

Size	temp. limits	25-pk.	50-pk.	100-pk.
11mm (7/16")	to 340°C	20363	20364	20365

Replacement Inlet Seals, Inlet Liners Low Volume Injectors for Agilent GCs, Ferrules, Septa...

For a complete listing of these items, other columns, and accessories request our chromatography catalog.



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France: 1, rue Montespan, 91024 Evry • phone: 01 60 78 32 10 • fax: 01 60 78 70 90

Ireland: 8 Baronscourt Lane, Belfast, BT8 8RR, Northern Ireland • phone: (44) 28 9081 4576 • fax: (44) 28 9081 4576

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phone: 01494 563377 • fax: 01494 564990

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FAST FACTS

At-a-Glance
Product
Information
from Restek

To help laboratories comply with and use these analytical procedures, Restek has been active in following the state guidance. Based on our good knowledge of the methods, our experienced chemists have developed a list of the appropriate technical service tools and analytical products to achieve success with these methods. We offer quality chromatographic columns, analytical reference materials, and sample preparation products. In this comprehensive product listing, you will find everything you need to quickly set up or reorder consumables for these methods. Please refer to our latest product catalog, or call 800-356-1688 or 814-353-1300, ext. 3, for more information. Also, we will be happy to provide a quote on any custom consumable you may need!

Regulatory and Analytical Methodology Contact Information

California State Water Resources Control Board

Division of Clean Water Programs
P.O. Box 944212
Sacramento, CA 94244-2120
Phone: (916) 227-4313
Fax: (916) 227-4349

**The California State Water Resources
Control Board web site is located at**
<http://www.swrcb.ca.gov/cwphome/ust/>



Ken Herwehe
Analytical Reference Materials
Product Marketing Manager
814-353-1300, ext. 2127



Joe Moodler
Analytical Reference Materials
Custom Standards Group Leader
814-353-1300, ext. 2148

RESTEK
www.restekcorp.com

800-356-1688
814-353-1300

Underground Storage Tank Monitoring State Of California

- ✓ Comprehensive products listing for the latest UST methods used by the State of California.
- ✓ Conveniently organized by method number.
- ✓ Easy method set-up and reorder of consumables, including:
 - Gas chromatography columns and accessories,
 - Analytical reference materials,
 - Sample preparation supplies,
 - Technical service.

In 1985, the California Department of Health Services and the State Water Resource Control Board (SWRCB) formed the Leaking Underground Fuel Tank (LUFT) task force to establish procedures for determining if an underground storage fuel tank site is clean and safe. In 1989 the task force published a LUFT field manual setting up guidelines for site assessment, cleanup, and underground storage tank closure. Within the field manual, the task force mandated a DHS analytical method for petroleum storage tank applications, known as LUFT method.

In 1993, SWRCB released the Underground Storage Tank (UST) Closure Guideline to comply with the US Environmental Protection Agency (EPA) UST 1998 deadline. SWRCB approved standard EPA methods for California UST analysis are listed in Table I. EPA 8015B is for gasoline and gasoline range organics (GRO) by GC/FID/purge and trap, with optional BTEX by PID; this is known as the California GRO method. EPA 8015B is for diesel range organics (DRO) and motor oil range organics (MORO) by GC/FID; this is known as the California DRO method.

While SWRCB is the head agency for California's UST program, and regulates the analytical procedures, each of the eight regional UST offices requires specific analyses of its target list of petroleum contaminants. The California UST program is diversified, in terms of contaminant lists that must be analyzed in different regions, but is unified under the guidelines of SWRCB. For example, Los Angeles region requires TPHG (gasoline range), BTEX, and MTBE. The central valley region, however, requires TPH and a list of oxygenates, methanol, ethanol, tertiary butyl alcohol (TBA), methyl *tert*-butyl ether (MTBE), diisopropyl ether (DIPE), ethyl tertiary butyl ether (ETBE) and tertiary amyl methyl ether (TAME).

Table I. California Guide for the Analysis of Petroleum Hydrocarbon Residues

	Soil, solids, sludge	Water
Gasoline	8015B	8015B
BTEX	8021B	8021B 8260B
	(with PID in series)	(with PID in series)
MTBE & Oxygenates	8021B	8021B, 8260B
Diesel	8015B	8015B
PAHs	8270D	8270D
Kerosene	8015B	8015B
Motor oil	8015B	8015B

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California

Gas Chromatography Columns & Accessories

For these items, see Restek's Chromatography Products Catalog:

- Syringes
- Autosampler Vials
- Guard Columns
- Ferrules, Septa

Recommended Gas Chromatography Columns

Rtx®-5, 30m x 0.25mm

Film Thickness	temp. limits	Cat. #
0.25µm	-60 to 330/350°C	10223
0.50µm	-60 to 330/350°C	10238
1.00µm	-60 to 320/340°C	10253

Integra-Guard™ Columns

Guard and analytical column in one connectionless length.

*Add the appropriate suffix number to analytical column catalog number.

ID	Length	Suffix#*
0.25mm	5m	-124
	10m	-127

Syringes

Standard Micro-Liter Syringes for Agilent 7673 and 7683 Autosamplers

Size	Needle Gauge	6-pk.
10µL	23s	20169
10µL	23s-26s	24600

Autosampler Vials

Crimp Top Vial Snap Seal™ Style (12 x 32mm, 11mm Crimp)

Description*	1,000-pk.
2.0mL Clear Glass Vial w/White Graduated Marking Spot	24384
2.0mL Amber Glass Vial w/White Graduated Marking Spot	24386

*Marking spots are available on request in blue, green, rust or yellow.

Aluminum Crimp Seals w/Septa

Description	1,000-pk.
Silver Seal, PTFE/Natural Rubber Septa	21175
Silver Seal, PTFE/Silicone Septa*	24360

*PTFE/Silicone/PTFE available on request.

Thermolite® Septa

Size	temp. limits	25-pk.	50-pk.	100-pk.
11mm (7/16")	to 340°C	20363	20364	20365

Replacement Inlet Seals

Stainless Steel Inlet Seal for Single-Column Installation*

Size	2-pk.	10-pk.
0.8mm ID	21315	21316

*Equivalent to Agilent Part# 18740-20880.

Inlet Liners

For Agilent GCs

Description	ID / OD & Length (mm)	ea.	5-pk.
Uniliner**	4.0 ID, 6.3 OD x 78.5	20335	20336
Drilled Uniliner®	4.0 ID, 6.3 OD x 78.5	21054	21055
1mm Split**	1.0 ID, 6.3 OD x 78.5	20972	20973

*Restek design improves performance over the original Agilent liner.

**Use this liner for increased sensitivity.

Low Volume Injector for Agilent GCs

Description	kit.
Low-Volume Injector for Agilent Split/Splitless GC Inlets	21692

Analytical Reference Materials

EPA 8015B, 8021B, and 8260B

To determine gasoline and GRO in water, wastewater, soil and solid waste based on solvent extraction, purge and trap, GC/FID with optional PID in series for BTEX and GC/MS.

California Gasoline Range Organics (GRO)

8015B

Retention Time Marker

n-hexane (C6) *n*-decane (C10) *n*-dodecane (C12)

1,000µg/mL each in P&T methanol, 1mL/ampul

Each	5-pk.	10-pk.
30483	30483-510	—
	w/data pack	
30483-500	30483-520	30583

Unleaded Gasoline Composite Standard

2,500µg/mL in P&T methanol, 1mL/ampul

Each	5-pk.	10-pk.
30081	30081-510	—
	w/data pack	
30081-500	30081-520	30181

50,000µg/mL in P&T methanol, 1mL/ampul

Each	5-pk.	10-pk.
30205	30205-510	—
	w/data pack	
30205-500	30205-520	30305

50,000µg/mL in P&T methanol, 5mL/ampul

Each	5-pk.	10-pk.
30206	30206-510	—
	w/data pack	
30206-500	30206-520	30306

Certified BTEX in Unleaded Gas Composite Standard

Certified for:

benzene*	methyl <i>tert</i> -butyl ether*	<i>m</i> -xylene*
ethylbenzene*	naphthalene*	<i>o</i> -xylene*
isopropyl benzene*	toluene*	<i>p</i> -xylene*

5,500ppm gasoline in P&T methanol, 1mL/ampul

Each	5-pk.	10-pk.
30237	30237-510	—
	w/data pack	
30237-500	30237-520	30337

*Concentration varies lot to lot. See Certificate of Analysis for certified concentrations. See <http://www.restekcorp.com> for current Certificate of Analysis.

Certified Aromatics in Gasoline (16 components)

Certified for:

benzene*	methyl <i>tert</i> -butyl ether*	1,3,5-trimethylbenzene*
ethylbenzene*	naphthalene*	<i>m</i> -xylene*
<i>m</i> -ethyltoluene*	<i>n</i> -propylbenzene*	<i>o</i> -xylene*
<i>o</i> -ethyltoluene*	toluene*	<i>p</i> -xylene*
<i>p</i> -ethyltoluene*	1,2,3-trimethylbenzene*	
isopropylbenzene*	1,2,4-trimethylbenzene*	

5,500ppm gasoline in P&T methanol, 1mL/ampul

Each	5-pk.	10-pk.
30485	30485-510	—
	w/data pack	
30485-500	30485-520	30585

*Concentration varies lot to lot. See Certificate of Analysis for certified concentrations. See <http://www.restekcorp.com> for current Certificate of Analysis.

8021B

BTEX Standard

benzene
ethylbenzene

toluene
m-xylene

o-xylene
p-xylene

200µg/mL each in P&T methanol, 1mL/ampul

Each	5-pk.	10-pk.
30051	30051-510	—
w/data pack		
30051-500	30051-520	30151

2,000µg/mL each in P&T methanol, 1mL/ampul

Each	5-pk.	10-pk.
30213	30213-510	—
w/data pack		
30213-500	30213-520	30313

2,000µg/mL each in P&T methanol, except *m*-xylene and *p*-xylene at 1,000µg/mL, 1mL/ampul

Each	5-pk.	10-pk.
30488	30488-510	—
w/data pack		
30488-500	30488-520	30588

PVOC Mix (California) (7 components)

benzene
ethylbenzene
methyl *tert*-butyl ether

toluene
m-xylene
o-xylene

p-xylene

1,000µg/mL each in P&T methanol, 1mL/ampul

Each	5-pk.	10-pk.
30231	30231-510	—
w/data pack		
30231-500	30231-520	30331

CA WIP VOA Standard (11 components)

benzene
chlorobenzene
1,2-dichlorobenzene
1,3-dichlorobenzene

1,4-dichlorobenzene
ethylbenzene
methyl *tert*-butyl ether
toluene

m-xylene
o-xylene
p-xylene

2,000µg/mL each in P&T methanol, 1mL/ampul

Each	5-pk.	10-pk.
30236	30236-510	—
w/data pack		
30236-500	30236-520	30336

Surrogate and Internal Standards

1-Chloro-4-fluorobenzene Mix

2,500µg/mL in P&T methanol, 1mL/ampul

Each	5-pk.	10-pk.
30066	30066-510	—
w/data pack		
30066-500	30066-520	30166

α,α,α-Trifluorotoluene Mix

2,500µg/mL in P&T methanol, 1mL/ampul

Each	5-pk.	10-pk.
30068	30068-510	—
w/data pack		
30068-500	30068-520	30168

10,000µg/mL in P&T methanol, 1mL/ampul

Each	5-pk.	10-pk.
30083	30083-510	—
w/data pack		
30083-500	30083-520	30183

1-Chlorooctane Mix

10,000µg/mL in P&T methanol, 1mL/ampul

Each	5-pk.	10-pk.
30084	30084-510	—
w/data pack		
30084-500	30084-520	30184

4-Bromofluorobenzene Mix

2,500µg/mL in P&T methanol, 1mL/ampul

Each	5-pk.	10-pk.
30067	30067-510	—
w/data pack		
30067-500	30067-520	30167

10,000µg/mL in P&T methanol, 1mL/ampul

Each	5-pk.	10-pk.
30082	30082-510	—
w/data pack		
30082-500	30082-520	30182

8260B (VOA)

California Oxygenates Mix

diisopropyl ether 2,000µg/mL
ethyl-*tert*-butyl ether 2,000
tert-amyl methyl ether 2,000
tert-butyl alcohol 10,000
methyl *tert*-butyl ether 2,000

In P&T methanol, 1mL/ampul

Each	5-pk.	10-pk.
30465	30465-510	—
w/data pack		
30465-500	30465-520	30565

8260B MegaMix™ Calibration Mix (76 + 1 components)

Note: This product is provided as a two ampul set:

Ampule 1

acetonitrile	<i>cis</i> -1,4-dichloro-2-butene	naphthalene
acrylonitrile	<i>trans</i> -1,4-dichloro-2-butene	nitrobenzene
allyl chloride	1,1-dichloroethane	2-nitropropane
benzene	1,2-dichloroethane	pentachloroethane
bromobenzene	1,1-dichloroethene	propionitrile
bromochloromethane	<i>cis</i> -1,2-dichloroethene	<i>n</i> -propylbenzene
bromodichloromethane	<i>trans</i> -1,2-dichloroethene	styrene
bromoform	1,2-dichloropropane	1,1,1,2-tetrachloroethane
<i>n</i> -butylbenzene	1,3-dichloropropane	1,1,2,2-tetrachloroethane
<i>sec</i> -butylbenzene	2,2-dichloropropane	tetrachloroethene
<i>tert</i> -butylbenzene	1,1-dichloropropene	tetrahydrofuran
carbon disulfide	<i>cis</i> -1,3-dichloropropene	toluene
carbon tetrachloride	<i>trans</i> -1,3-dichloropropene	1,2,3-trichlorobenzene
chlorobenzene	diethyl ether	1,2,4-trichlorobenzene
2-chloroethanol	1,4-dioxane	1,1,1-trichloroethane
chloroform	ethylbenzene	1,1,2-trichloroethane
chloroprene	ethyl methacrylate	trichloroethene
2-chlorotoluene	hexachlorobutadiene	1,2,3-trichloropropane
4-chlorotoluene	iodomethane	1,1,2-trichlorotrifluoroethane
dibromochloromethane	isobutyl alcohol	(Freon® 113)
1,2-dibromo-3-chloropropane	isopropylbenzene	1,2,4-trimethylbenzene
1,2-dibromoethane	<i>p</i> -isopropyltoluene	1,3,5-trimethylbenzene
dibromomethane	methacrylonitrile	<i>m</i> -xylene
1,2-dichlorobenzene	methyl acrylate	<i>o</i> -xylene
1,3-dichlorobenzene	methyl methacrylate	<i>p</i> -xylene
1,4-dichlorobenzene	methylene chloride	

2,000µg/mL each in P&T methanol, 1mL/ampul

Ampule 2

2-chloroethyl vinyl ether

2,000µg/mL in P&T methanol, 1mL/ampul

Each	5-pk.	10-pk.
30475	30475-510	—
w/data pack		
30475-500	30475-520	30575

Request a quote on customer ready-to-use solutions. Use the convenient Custom Reference Materials Request Form on-line at www.restekcorp.com/stdreq.htm

Methanol Mix

10,000µg/mL in DI water, 1mL/ampul

Each	5-pk.	10-pk.
30467	30467-510	—
w/data pack		
30467-500	30467-520	30567

Ethanol Mix

10,000µg/mL in DI water, 1mL/ampul

Each	5-pk.	10-pk.
30466	30466-510	—
w/data pack		
30466-500	30466-520	30566

Surrogate and Internal Standards

8260A/B Internal Standard Mix

chlorobenzene-d5 1,4-dichlorobenzene-d4 fluorobenzene
2,500µg/mL each in P&T methanol, 1mL/ampul

Each	5-pk.	10-pk.
30241	30241-510	—
w/data pack		
30241-500	30241-520	30341

8260A/B Surrogate Mix

4-bromofluorobenzene 1,2-dichloroethane-d4
dibromofluoromethane toluene-d8
2,500µg/mL each in P&T methanol, 1mL/ampul

Each	5-pk.	10-pk.
30240	30240-510	—
w/data pack		
30240-500	30240-520	30340

California Diesel Range Organics/Motor Oil Range Organics 8015B

Diesel Fuel #2 Composite Standard

5,000µg/mL in methylene chloride, 1mL/ampul

Each	5-pk.	10-pk.
31093	31093-510	—
w/data pack		
31093-500	31093-520	31193

50,000µg/mL in methylene chloride, 1mL/ampul

Each	5-pk.	10-pk.
31258	31258-510	—
w/data pack		
31258-500	31258-520	31358

50,000µg/mL in methylene chloride, 5mL/ampul

Each	5-pk.	10-pk.
31259	31259-510	—
w/data pack		
31259-500	31259-520	31359

Motor Oil Composite Standard

50,000µg/mL in methylene chloride, 1mL/ampul

Each	5-pk.	10-pk.
31464	31464-510	—
w/data pack		
31464-500	31464-520	31564

Alternate Boiling Point/Carbon Number

Distribution Marker Stock Standard (9 components)

n-hexane (C6) n-dodecane (C12) n-octacosane (C28)
n-octane (C8) n-hexadecane (C16) n-pentatriacontane (C35)
n-decane (C10) n-heneicosane (C21) n-hexatriacontane (C36)

200µg/mL each in pentane, 1mL/ampul

Each	5-pk.	10-pk.
31639	31639-510	—
w/data pack		
31639-500	31639-520	31739

Connecticut ETPH Calibration Mixture (15 components)

n-nonane (C9) n-octadecane (C18) n-octacosane (C28)
n-decane (C10) n-eicosane (C20) n-triacontane (C30)
n-dodecane (C12) n-docosane (C22) n-dotriacontane (C32)
n-tetradecane (C14) n-tetracosane (C24) n-tetracontane (C34)
n-hexadecane (C16) n-hexacosane (C26) n-hexatriacontane (C36)

1,000µg/mL each in methylene chloride, 1mL/ampul

Each	5-pk.	10-pk.
31614	31614-510	—
w/data pack		
31614-500	31614-520	31714

WA EPH Aliphatic Hydrocarbon Mix

n-octane (C8) n-dodecane (C12) n-heneicosane (C21)
n-decane (C10) n-hexadecane (C16) n-tetracontane (C34)

1,000µg/mL each in hexane, 1mL/ampul

Each	5-pk.	10-pk.
31489	31489-510	—
w/data pack		
31489-500	31489-520	31589

Certified PAHs in Diesel (7 components)

Certified PAHs	Typical Certified Conc. (ppm)		
acenaphthene	20*	2-methylnaphthalene	180*
acenaphthylene	14*	naphthalene	90*
fluorene	32*	phenanthrene	47*
1-methylnaphthalene	269*		

50,000ppm diesel #2 in methylene chloride, typical PAH concentrations listed above, 1mL/ampul

Each	5-pk.	10-pk.
31673	31673-510	—
w/data pack		
31673-500	31673-520	31773

*Concentration varies lot to lot. See Certificate of Analysis for certified concentrations. See <http://www.restekcorp.com> for current Certificate of Analysis.

Surrogate and Internal Standards

p-Terphenyl Standard

10,000µg/mL in methylene chloride, 1mL/ampul

Each	5-pk.	10-pk.
31095	31095-510	—
w/data pack		
31095-500	31095-520	31195

o-Terphenyl Standard

10,000µg/mL in methylene chloride, 1mL/ampul

Each	5-pk.	10-pk.
31097	31097-510	—
w/data pack		
31097-500	31097-520	31197

5-α-Androstane

2,000µg/mL in methylene chloride, 1mL/ampul

Each	5-pk.	10-pk.
31065	31065-510	—
w/data pack		
31065-500	31065-520	31165

8270 (SV)

8270 MegaMix™ (76 components)

acenaphthene	dibenzofuran	1-methylnaphthalene
acenaphthylene	1,2-dichlorobenzene	2-methylnaphthalene
aniline	1,3-dichlorobenzene	2-methylphenol
anthracene	1,4-dichlorobenzene	3-methylphenol*
azobenzene ¹	2,4-dichlorophenol	4-methylphenol*
benzo(a)anthracene	diethyl phthalate	naphthalene
benzo(a)pyrene	dimethyl phthalate	2-nitroaniline
benzo(b)fluoranthene	2,4-dimethylphenol	3-nitroaniline
benzo(ghi)perylene	1,2-dinitrobenzene	4-nitroaniline
benzo(k)fluoranthene	1,3-dinitrobenzene	nitrobenzene
benzyl alcohol	1,4-dinitrobenzene	2-nitrophenol
benzyl butyl phthalate	4,6-dinitro-2-methylphenol	4-nitrophenol
bis 2-ethylhexyl adipate	2,4-dinitrophenol	N-nitrosodimethylamine
bis(2-chloroethoxy)methane	2,4-dinitrotoluene	N-nitroso-di-n-propylamine
bis(2-chloroethyl)ether	2,6-dinitrotoluene	pentachlorophenol
bis(2-chloroisopropyl)ether	di-n-butyl phthalate	phenanthrene
bis(2-ethylhexyl)phthalate	di-n-octyl phthalate	phenol
4-bromophenyl phenyl ether	diphenylamine ²	pyrene
carbazole	fluorene	pyridine
4-chloroaniline	fluoranthene	2,3,4,6-tetrachlorophenol
4-chloro-3-methylphenol	hexachlorobenzene	2,3,5,6-tetrachlorophenol
2-chloronaphthalene	hexachlorobutadiene	1,2,4-trichlorobenzene
2-chlorophenol	hexachlorocyclopentadiene	2,4,5-trichlorophenol
4-chlorophenyl phenyl ether	hexachloroethane	2,4,6-trichlorophenol
chrysene	indeno(1,2,3-cd)pyrene	
dibenz(a,h)anthracene	isophorone	

1,000µg/mL each (except where noted) in methylene chloride:benzene (75:25), 1mL/ampul

Each	5-pk.	10-pk.
31686	31686-510	—
w/data pack		
31686-500	31686-520	31786

*3-methylphenol and 4-methylphenol concentration is 500µg/mL each.

¹1,2-diphenylhydrazine (8270-listed analyte) decomposes to azobenzene (mix component).

²N-nitrosodiphenylamine (8270-listed analyte) decomposes to diphenylamine (mix component).

8270 Calibration Mix #5 (19 components)

acenaphthene	benzo(k)fluoranthene	1-methylnaphthalene
acenaphthylene	chrysene	2-methylnaphthalene
anthracene	dibenz(a,h)anthracene	naphthalene
benzo(a)anthracene	fluoranthene	phenanthrene
benzo(a)pyrene	fluorene	pyrene
benzo(b)fluoranthene	ideno(1,2,3-cd)pyrene	
benzo(ghi)perylene	3-methylcholanthrene	

2,000µg/mL each in methylene chloride, 1mL/ampul

Each	5-pk.	10-pk.
31622	31622-510	—
w/data pack		
31622-500	31622-520	31722

Surrogate and Internal Standards

SV Internal Standard Mix

acenaphthene-d10	1,4-dichlorobenzene-d4	perylene-d12
chrysene-d12	naphthalene-d8	phenanthrene-d10

2,000µg/mL each in methylene chloride, 1mL/ampul

Each	5-pk.	10-pk.
31206	31206-510	—
w/data pack		
31206-500	31206-520	31306

4,000µg/mL each in methylene chloride, 1mL/ampul**

Each	5-pk.	10-pk.
31006	31006-510	—
w/data pack		
31006-500	31006-520	31106

** Requires special handling (warming and sonication) before use.

Acid Surrogate Mix (4/89 SOW)

2-fluorophenol phenol-d6 2,4,6-tribromophenol
2,000µg/mL each in methanol, 1mL/ampul

Each	5-pk.	10-pk.
31025	31025-510	—
w/data pack		
31025-500	31025-520	31125

10,000µg/mL each in methanol, 1mL/ampul

Each	5-pk.	10-pk.
31063	31063-510	—
w/data pack		
31063-500	31063-520	31163

10,000µg/mL each in methanol, 5mL/ampul

Each	5-pk.	10-pk.
31087	31087-510	—
w/data pack		
31087-500	31087-520	31187

B/N Surrogate Mix (4/89 SOW)

2-fluorobiphenyl nitrobenzene-d5 p-terphenyl-d14
1,000µg/mL each in methylene chloride, 1mL/ampul

Each	5-pk.	10-pk.
31024	31024-510	—
w/data pack		
31024-500	31024-520	31124

5,000µg/mL each in methylene chloride, 1mL/ampul**

Each	5-pk.	10-pk.
31062	31062-510	—
w/data pack		
31062-500	31062-520	31162

5,000µg/mL each in methylene chloride, 5mL/ampul**

Each	5-pk.	10-pk.
31086	31086-510	—
w/data pack		
31086-500	31086-520	31186

**Requires special handling (warming and sonication) before use.

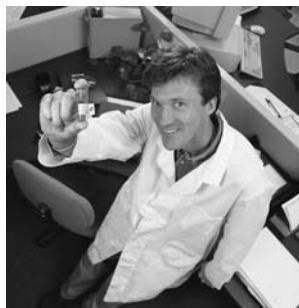
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Pesticides
Fused Silica Columns
Chromatography Accessories



Pesticide	CAS No.	qty.	cat.#
abamectin	71751-41-2	100mg	PS-2068
Abate™	3383-96-8	100mg	PS-665
acephate	30560-19-1	1g	PS-738
acetochlor	34256-82-1	100mg	PS-2040
alachlor	15972-60-8	1g	PS-357
aldicarb	116-06-3	1g	PS-734
Aldrin™	309-00-2	100mg	PS-69
aminomethyl phosphonic acid		100mg	MET-1051A
atrazine	1912-24-9	1g	PS-380
atrazine desethyl		50mg	MET-380B
atrazine desisopropyl		50mg	MET-58A
atrazine-2-hydroxy		50mg	MET-380F
azinphos-methyl oxon (100µg/mL in toluene)		5mL	MET-666A
azoxystrobin	131860-33-8	250mg	PS-2141
benomyl	17804-35-2	100mg	PS-222
bentazon	25057-89-0	1g	PS-1011
bifenthrin	82657-04-3	100mg	PS-2003
carbaryl	63-25-2	1g	PS-84
carbendazim	10605-21-7	100mg	PS-1077
carbofuran	1563-66-2	1g	PS-754
carbophenothion methyl (100µg/mL in methanol)		5mL	MET-88A
chlorimuron ethyl	90982-32-4	100mg	PS-1081
chlorothalonil	1897-45-6	1g	PS-1020
chlorpyrifos	2921-88-2	1g	PS-674
chlorpyrifos oxon		500mg	MET-674B
chlorsulfuron	64902-72-3	100mg	PS-1065
alpha-chlordane	5103-71-9	10mg	PS-75-1
trans-chlordane	5103-74-2	10mg	PS-75-2
coumaphos-O-analog		100mg	MET-656D
cycloheximide	66-81-9	100mg	PS-1002
cyfluthrin	68359-37-5	100mg	PS-1090
lambda-cyhalothrin	91465-08-6	50mg	PS-2018
cypermethrin	52315-07-8	100mg	PS-1068
2,4-D	94-75-7	1g	PS-41
o,p'-DDE	3424-82-6	50mg	PS-695
p,p'-DDE	72-55-9	100mg	PS-696

Pesticide	CAS No.	qty.	cat.#
o,p'-DDT	789-02-6	50mg	PS-698
deltamethrin	52918-63-5	100mg	PS-2071
demeton S	126-75-0	100mg	PS-662
diazinon	333-41-5	1g	PS-90
diazinon-O-analog		100mg	MET-90A
dicamba	1918-00-9	1g	PS-346
dichlorvos	62-73-7	1g	PS-89
o,p'-dicofol (100µg/mL in acetonitrile)		5mL	MET-82A
dieldrin	60-57-1	250mg	PS-76
diethyl phosphate		100mg	MET-90C
dimethoate	60-51-5	100mg	PS-659
diuron	330-54-1	1g	PS-60
Dyfonate™	944-22-9	100mg	PS-664
endrin	72-20-8	1g	PS-77
ethion	563-12-2	1g	PS-92
fenamiphos sulfone		100mg	MET-612B
fenamiphos sulfoxide		50mg	MET-612A
fenarimol	60168-88-9	100mg	PS-1073
fenchlorphos	299-84-3	100mg	PS-657
fenitrothion	122-14-5	1g	PS-678
fenitrothion-O-analog (100µg/mL in hexane)		5mL	MET-678A
fenthion	55-38-9	1g	PS-655
fipronil	120068-37-3	1g	PS-2136
glyphosate	1071-83-6	1g	PS-1051
Guthion™	86-50-0	1g	PS-666
heptachlor	76-44-8	100mg	PS-78
heptachlor epoxide (isomer B)	1024-57-3	50mg	PS-700
imazethapyr	81335-77-5	100mg	PS-2039
imidacloprid	138261-41-3	500mg	PS-2086
Imidan™	732-11-6	1g	PS-653
Kelthane™	115-32-2	100mg	PS-82
lindane	58-89-9	1g	PS-71
linuron	330-55-2	1g	PS-372
malathion	121-75-5	1g	PS-86
malathion-O-analog		100mg	MET-86C
mecoprop	7085-19-0	100mg	PS-324

*Orders in by 3pm Eastern time are shipped the same day, subject to product availability.

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Pesticide	CAS No.	qty.	cat.#
metalaxyl	57837-19-1	100mg	PS-1099
methamidophos	10265-92-6	100mg	PS-676
methane arsonate sesquihydrate (monosodium acid)		1g	PS-429
methidathion	950-37-8	1g	PS-679
methiocarb sulfoxide (100µg/mL in toluene)		5mL	MET-543B
methoxychlor	72-43-5	1g	PS-83
methyl isothiocyanate		1g	MET-221A
3-methyl-4-nitrophenol		1g	MET-678B
methyl parathion	298-00-0	1g	PS-94
metolachlor	51218-45-2	1g	PS-403
metsulfuron methyl	74223-64-6	100mg	PS-1078
molinate	2212-67-1	100mg	PS-501
N-1-naphthylphthalamic acid	132-66-1	1g	PS-343
trans-nonachlor		25mg	MET-75C
omethoate	1113-02-6	100mg	PS-2017
oxychlorodane (100µg/mL in methanol)		5mL	MET-75A
oxydemeton-methyl	301-12-2	100mg	PS-641
paraoxon	311-45-5	100mg	PS-610
paraquat CL tetrahydrate	1910-42-5	1g	PS-366
Parathion™	56-38-2	1g	PS-95
pentachloroaniline		100mg	MET-150A
permethrin	52645-53-1	100mg	PS-758

Pesticide	CAS No.	qty.	cat.#
phorate	298-02-2	1g	PS-654
phorate sulfone (100µg/mL in hexane)		5mL	MET-654B
picloram	1918-02-1	100mg	PS-274
Pinnacle™	79277-27-3	100mg	PS-2011
piperonyl butoxide	51-03-6	100mg	PS-100
pirimiphos-methyl	29232-93-7	1g	PS-644
Prowl™	40487-42-1	1g	PS-401
propoxur	114-26-1	1g	PS-551
pyrethrum	8003-34-7	100mg	PS-97
S, S, S,-tributylphosphorothioate	78-48-8	1g	PS-562
sanmarlon	51630-58-1	250mg	PS-1032
simazine	122-34-9	100mg	PS-58
STB	132827-25-9	500mg	MET-222B
sulfometuron methyl	74222-97-2	100mg	PS-1074
sulfotep	3689-24-5	50mg	PS-2024
tetradifon	116-29-0	1g	PS-80
Tilt™	60207-90-1	100mg	PS-1075
triadimefon	43121-43-3	1g	PS-1013
3,5,6-trichloro-2-pyridinol		50mg	MET-674A
trifluralin	1582-09-8	1g	PS-393
vinclozolin	50471-44-8	1g	PS-1049

pesticide columns & chromatography accessories

Fused Silica Columns (Columns listed are 30 meters in length)

Rtx®-CLPesticides:

ID	df (µm)	temp.limits	Cat. #
0.25mm	0.25	-60 to 320/340°C	11123
0.32mm	0.50	-60 to 320/340°C	11139
0.53mm	0.50	-60 to 320/320°C	11140

Stx®-CLPesticides:

0.25mm	0.25	-60 to 310/330°C	11543
0.32mm	0.50	-60 to 310/330°C	11544
0.53mm	0.50	-60 to 310/330°C	11545

Rtx®-CLPesticides2:

ID	df (µm)	temp.limits	Cat. #
0.25mm	0.20	-60 to 320/340°C	11323
0.32mm	0.25	-60 to 320/340°C	11324
0.53mm	0.42	-60 to 300/320°C	11340

Stx®-CLPesticides2:

0.25mm	0.20	-60 to 310/330°C	11443
0.32mm	0.25	-60 to 310/330°C	11444
0.53mm	0.42	-60 to 310/330°C	11445

Rtx®-OPPesticides:

ID	df (µm)	temp.limits	Cat. #
0.32mm	0.50	-20 to 310/330°C	11239
0.53mm	0.83	-20 to 310/330°C	11240

Rtx®-OPPesticides2:

ID	df (µm)	temp.limits	Cat. #
0.25mm	0.25	-20 to 310/330°C	11243
0.32mm	0.32	-20 to 310/330°C	11241
0.53mm	0.50	-20 to 310/330°C	11242

Chromatography Accessories

Syringes:

Standard Micro-Liter Syringes for Agilent 7673 and 7683 Autosamplers

10µl, 23s needle: 6-pack:	20169
10µl, 23s-26s needle: 6-pack:	24600

Autosampler Vials (11mm crimp top, 2mL, 12 x 32mm):

1,000 pack clear w/graduated marking spot:	24384
1,000 pack amber w/graduated marking spot:	24386

Aluminum Crimp Seals w/Septa (11mm):

Silver seal, PTFE/natural rubber: 1,000pk:	21175
Silver seal, PTFE/Silicone: 1,000pk:	24360

High Temperature Septa (use to 340°C inlet temp.):

Thermolite® 11mm: 25pk:	20363
50pk:	20364
100pk:	20365

Vespe® Ring Inlet Seal:

Gold-plated, 0.8mm ID: 2pk:	21562
10pk:	21563

Inlet Liners for Agilent/Finnigan GCs:

Splitless:

4mm straight 5pk:	20773
4mm straight w/wool 5pk:	22401
4mm single gooseneck 5pk:	20799
4mm single gooseneck w/wool 5pk:	22406

Split:

4mm split w/ wool 5pk:	20782
4mm split Precision 5pk:	21023

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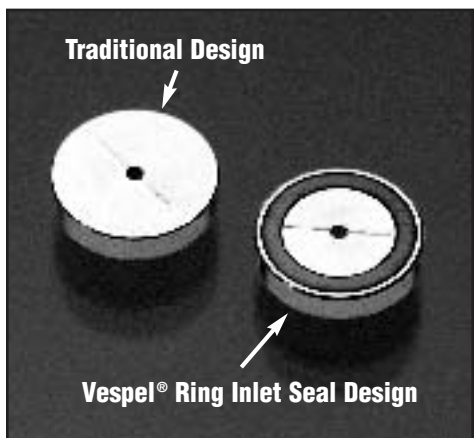


Vespel® Ring Inlet Seals

Leak-tight inlet seals for Agilent GCs!

Figure 1.

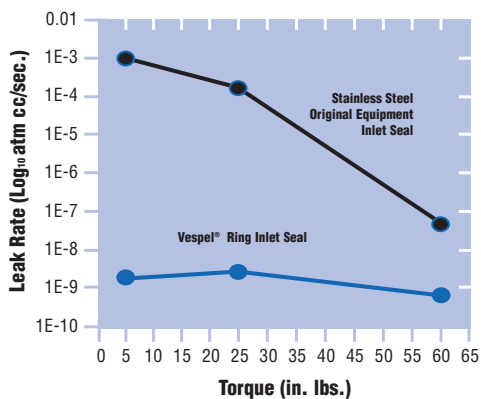
The soft ring in a Vespel® Ring Inlet Seal will not harm the critical seal or contaminate your sample, and you'll get a leak-tight seal every time!



the
Vespel®
advantage

Figure 2.

A Vespel® Ring Inlet Seal achieves leak-tight seals even at low torque, reducing the chance of leaks.



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Features & Benefits

Feature	Benefit
Exclusive Vespel® ring seals first time, every time.	Leak-tight connections: no oxygen leaks into your carrier gas.
Lower leak rate than OEM metal seals.	Greater sensitivity (less detector noise) and longer column life (no phase oxidation).
Low torque, soft seal, patent pending design.	Reduces wear, prevents damage at critical seal: no unexpected downtime.

In Agilent split/splitless injection ports, it can be difficult to make and maintain a good seal with a conventional metal inlet disk. The metal-to-metal seal dictates that the analyst apply considerable torque to the reducing nut, and, based on our testing, this does not ensure a leak-tight seal. Over the course of oven temperature cycling, metal seals are prone to leaks, which ultimately can degrade the capillary column, and cause other analytical difficulties.

Restek designed the Vespel® Ring Inlet Seal to greatly improve injection port performance. The Vespel® Ring Inlet Seal is made from high-quality stainless steel and features a Vespel® ring embedded into its face (Figure 1). This soft Vespel® ring will not harm the critical seal on the bottom of the injector body, and is outside the sample flow path, for worry-free chromatography.

The Vespel® Ring Inlet Seal is designed to seal even after repeated temperature cycles and without retightening the reducing nut! To determine the variances between traditional seals and the Vespel® Ring Inlet Seal, we compared the leak rate for each type of seal at increasing torque (Figure 2), using a high sensitivity leak detector. Notice how well the Vespel® Ring Inlet Seal performs at all levels; it seals equally effectively at torques of 5lb. or 60lb. (Figure 2). Why trust a metal-to-metal seal when you can get leak-tight seals quickly, easily, and more reliably with a Restek Vespel® Ring Inlet Seal?

Vespel® Ring Inlet Seals are available in stainless steel, gold-plated, or with a Silcosteel® coating. Use the stainless steel seals for analyses of unreactive compounds. To reduce breakdown and adsorption of active compounds, use gold-plated or Silcosteel®-treated seals. The gold surface offers better inertness than standard stainless steel; Silcosteel® treatment provides inertness similar to that of fused silica capillary columns.

Vespel® Ring Inlet Seals

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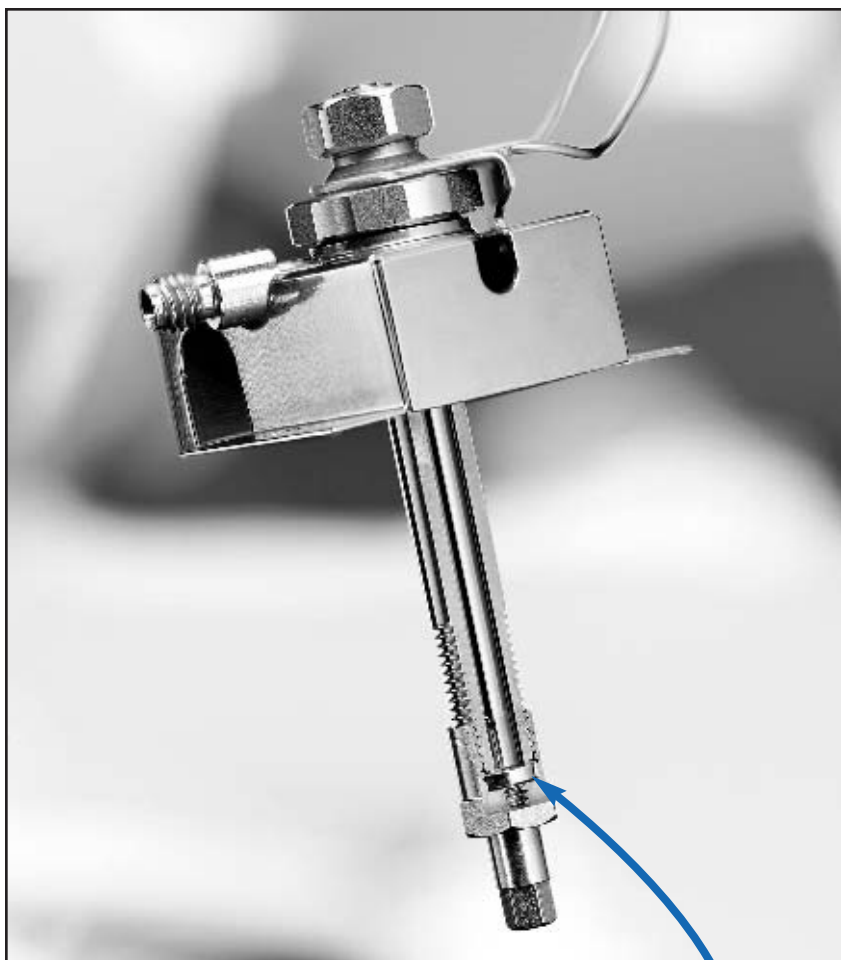
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for Agilent 5890/6890 and 6850 GCs!

Vespel® Ring Inlet Seals

0.8mm ID Vespel® Ring Inlet Seal

	2-pk.	10-pk.
Gold-Plated	21562	21563
Silcosteel®	21564	21565
Stainless Steel	21560	21561

1.2mm ID Vespel® Ring Inlet Seal*

	2-pk.	10-pk.
Gold-Plated	21568	21569
Silcosteel®	21570	21571
Stainless Steel	21566	21567

Note: All seals include washers.

*For dual-column installations (0.25 or 0.32mm ID fused silica columns)

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1. AK101, AK102, AK103 revised April 8, 2002.
2. Aromatic/aliphatic methods are under review by the state at the time of publication (July, 2003).



State of Alaska UST Monitoring

Alaska Department of Environmental Conservation (ADEC) has established guidelines defining gasoline range organics (GRO), diesel range organics (DRO), and residual range organics (RRO) from gross organic measurements by gas chromatography. ADEC regulations indicate which aromatic and aliphatic products and indicator compounds are to be tested for each petroleum range. The analyst must use Alaska Series Methods AK 101, AK 102, AK103¹, AK101AA, AK102AA, and AK103AA² and, for the various indicator compounds, methods from US EPA *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846*. The Alaska UST procedural manual indicates which products are to be tested for each petroleum range (see http://www.state.ak.us/dec/dspar/csites/guidance_cs.htm).

AK101 is used to measure concentrations of gasoline range organics (GRO) in water and soil. GROs correspond to an alkane range from n-hexane (C6) to the beginning of integration of the n-decane (C10) peak, and a boiling point range of 60°C to 170°C. The analytical method is GC/FID/PID, as specified in EPA Method 602 (water) or 8021B (solids). AK101AA is used for extracting, fractionating, and quantifying aromatic and aliphatic compounds in the gasoline range. The method is GC/FID/PID, as specified in EPA SW-846 methods 8015 and 8020B. Compounds are to be quantified as total area, as in Method AK101. BTEX indicator compounds are measured by GC/PID, because aromatic hydrocarbons must be individually identified and quantified. The method quantifies C6, C7, C8, and C9 alkyl benzenes as aromatics.

AK 102 is used to measure concentrations of diesel range organics (DRO) in water and soil. DROs correspond to an alkane range from n-decane (C10) to the beginning of integration of the n-pentacosane (C25) peak, and a boiling point range of 170°C to 400°C. This range includes kerosene, several types of jet fuel, several types of diesel fuel, and several light heating oils. The analytical method is GC/FID, as specified in EPA Method 8000 in SW-8461, American Petroleum Institute (API) consensus method Method for the Determination of Diesel Range Organics revision 2, 2/5/95, and Iowa Method OA-2.4. Quantification is based on direct comparison of resolved and unresolved peaks from C10 to the beginning of C25 against a C10-C25 calibration standard. PAH indicator compounds are assayed and quantified by Method 8100 in SW-846.

AK 103 is used to measure concentrations of residual range organics (RRO) in soil. RROs correspond to an alkane range from n-pentacosane (C25) to the beginning of integration of the n-hexatriacontane (C36) peak, and a boiling point range of 400°C to 500°C. This range includes asphalt, mid-range boiling point products such as diesel fuels, and Bunker C. The analytical method is GC/FID as specified in methods 8000 and 8100 in SW-846, American Petroleum Institute (API) consensus method Method for the Determination of Petroleum Hydrocarbons 2/3/92, Washington Hydrocarbon Identification Method WTPH-HCID, Iowa Method OA-2, and Wisconsin Department of Natural Resources Modified DRO - Method for Determining Diesel Range Organics.



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Gas Chromatography Columns & Accessories

For these items, see Restek's
Chromatography Products Catalog:

- Syringes
- Autosampler Vials
- Guard Columns
- Ferrules, Septa



Recommended Gas Chromatography Columns

Rtx®-5, 30m x 0.25mm

Film Thickness	temp. limits	Cat. #
0.25µm	-60 to 330/350°C	10223
0.50µm	-60 to 330/350°C	10238
1.00µm	-60 to 320/340°C	10253

Integra-Guard™ Columns

Guard and analytical column in one continuous length.

*Add the appropriate suffix number to analytical column catalog number.

ID	Length	Suffix #
0.25mm	5m	-124
	10m	-127

Syringes

Standard Micro-Liter Syringes for Agilent 7673 and 7683 Autosamplers

Size	Needle Gauge	6-pk.
10µL	23s	20169
10µL	23s-26s	24600

Autosampler Vials

Crimp Top Vial Snap Seal™ Style (12 x 32mm, 11mm Crimp)

Description*	1,000-pk.
2.0mL Clear Glass Vial w/White Graduated Marking Spot	24384
2.0mL Amber Glass Vial w/White Graduated Marking Spot	24386

*Marking spots are available on request in blue, green, rust or yellow.

Aluminum Crimp Seals w/Septa

Description	1,000-pk.
Silver Seal, PTFE/Natural Rubber Septa	21175
Silver Seal, PTFE/Silicone Septa*	24360

*PTFE/Silicone/PTFE available on request.

Thermolite® Septa

Size	temp. limits	25-pk.	50-pk.	100-pk.
11mm (7/16")	to 340°C	20363	20364	20365

Replacement Inlet Seals

Stainless Steel Inlet Seal for Single-Column Installation*

Size	2-pk.	10-pk.
0.8mm ID	21315	21316

*Equivalent to Agilent Part# 18740-20880.

Inlet Liners

For Agilent GCs

Description	ID / OD & Length (mm)	ea.	5-pk.
Uniliner®*	4.0 ID, 6.3 OD x 78.5	20335	20336
Drilled Uniliner®	4.0 ID, 6.3 OD x 78.5	21054	21055
1mm Split**	1.0 ID, 6.3 OD x 78.5	20972	20973

*Restek design improves performance over the original Agilent Liner.

**Use this liner for increased sensitivity.

Low Volume Injector for Agilent GCs

Description	kit.
Low-Volume Injector for Agilent Split/Splitless GC Inlets	21692

AK101/AK101AA

Method for Determination of Aromatic and Aliphatic
Hydrocarbons in Gasoline Range Organics (GRO)

Calibration Mixes/Composite Standards

Retention Time Marker Standard

n-hexane (C6) *n*-pentacosane (C25)
n-decane (C10) *n*-hexatriacontane (C36)

new!

1,000µg/mL in methylene chloride, 1mL/ampul

Each	5-pk.	10-pk.
31819	31819-510	—
w/data pack		
31819-500	31819-520	31919

Alternate Boiling Point/Carbon Number

Distribution Marker Stock Standard (9 components)

n-hexane (C6) *n*-dodecane (C12) *n*-octacosane (C28)
n-octane (C8) *n*-hexadecane (C16) *n*-pentatriacontane (C35)
n-decane (C10) *n*-heneicosane (C21) *n*-hexatriacontane (C36)

200µg/mL each in pentane, 1mL/ampul

Each	5-pk.	10-pk.
31639	31639-510	—
w/data pack		
31639-500	31639-520	31739

WA VPH Marker Standard (9 components)

n-pentane (C5) *n*-decane (C10) naphthalene
n-hexane (C6) *n*-dodecane (C12) toluene
n-octane (C8) 1-methylnaphthalene 1,2,3-trimethylbenzene

1,000µg/mL each in P&T methanol, 1mL/ampul

Each	5-pk.	10-pk.
30450	30450-510	—
w/data pack		
30450-500	30450-520	30550

Alaska UST Method AK101AA, Ver. 3-1-99 (14 components)

benzene isopropylbenzene 1,3,5-trimethylbenzene
ethylbenzene *n*-propylbenzene *m*-xylene
1-ethyl-2-methylbenzene toluene *o*-xylene
1-ethyl-3-methylbenzene 1,2,3-trimethylbenzene *p*-xylene
1-ethyl-4-methylbenzene 1,2,4-trimethylbenzene

1,000µg/mL each in P&T methanol, 1mL/ampul

Each	5-pk.	10-pk.
30461	30461-510	—
w/data pack		
30461-500	30461-520	30561

Certified BTEX in Unleaded Gas Composite Standard

benzene* methyl *tert*-butyl ether* *m*-xylene*
ethylbenzene* naphthalene* *o*-xylene*
isopropyl benzene* toluene* *p*-xylene*

5,500ppm gasoline in P&T methanol, 1mL/ampul

Each	5-pk.	10-pk.
30237	30237-510	—
w/data pack		
30237-500	30237-520	30337

*Concentration varies lot to lot. See Certificate of Analysis for certified concentrations.
See <http://www.restekcorp.com> for current certificate of analysis.

Certified Aromatics in Gasoline (16 components)

benzene*	methyl <i>tert</i> -butyl ether*	1,3,5-trimethylbenzene*
ethylbenzene*	naphthalene*	<i>m</i> -xylene*
<i>m</i> -ethyltoluene*	<i>n</i> -propylbenzene*	<i>o</i> -xylene*
<i>o</i> -ethyltoluene*	toluene*	<i>p</i> -xylene*
<i>p</i> -ethyltoluene*	1,2,3-trimethylbenzene*	
isopropylbenzene*	1,2,4-trimethylbenzene*	

5,500ppm gasoline in P&T methanol, 1mL/ampul

Each	5-pk.	10-pk.
30485	30485-510	—
w/data pack		
30485-500	30485-520	30585

*Concentration varies lot to lot. See Certificate of Analysis for certified concentrations. See <http://www.restekcorp.com> for current certificate of analysis.

Unleaded Gasoline Composite Standard

2,500µg/mL in P&T methanol, 1mL/ampul

Each	5-pk.	10-pk.
30081	30081-510	—
w/data pack		
30081-500	30081-520	30181

50,000µg/mL in P&T methanol, 1mL/ampul

Each	5-pk.	10-pk.
30205	30205-510	—
w/data pack		
30205-500	30205-520	30305

50,000µg/mL in P&T methanol, 5mL/ampul

Each	5-pk.	10-pk.
30206	30206-510	—
w/data pack		
30206-500	30206-520	30306

Surrogates and Internal Standards

1-Chloro-4-fluorobenzene Mix

2,500µg/mL in P&T methanol, 1mL/ampul

Each	5-pk.	10-pk.
30066	30066-510	—
w/data pack		
30066-500	30066-520	30166

4-Bromofluorobenzene Mix

2,000µg/mL in P&T methanol, 1mL/ampul

Each	5-pk.	10-pk.
30026	30026-510	—
w/data pack		
30026-500	30026-520	30126

α,α,α-Trifluorotoluene

2,000µg/mL in P&T methanol, 1mL/ampul

Each	5-pk.	10-pk.
30048	30048-510	—
w/data pack		
30048-500	30048-520	30148

2,500µg/mL in P&T methanol, 1mL/ampul

Each	5-pk.	10-pk.
30068	30068-510	—
w/data pack		
30068-500	30068-520	30168

10,000µg/mL in P&T methanol, 1mL/ampul

Each	5-pk.	10-pk.
30083	30083-510	—
w/data pack		
30083-500	30083-520	30183

AK102/AK102AA

Method for Determination of Aromatic and Aliphatic Hydrocarbons in Diesel Range Organics (DRO)

Calibration Mixes/Composite Standards

Retention Time Marker Standard (cat.# 31819)

Alternate Boiling Point/Carbon Number

Distribution Marker Stock Standard (cat.# 31639)

See page 2.

Certified PAHs in Diesel (7 components)

Certified PAHs	Typical Certified Conc. (ppm)	
acenaphthene	20*	*Concentration varies lot to lot. See Certificate of Analysis for certified concentrations. See http://www.restekcorp.com for current certificate of analysis.
acenaphthylene	14*	
fluorene	32*	
1-methylnaphthalene	269*	
2-methylnaphthalene	180*	
naphthalene	90*	
phenanthrene	47*	

50,000ppm diesel #2 in methylene chloride, typical PAH concentrations listed above, 1mL/ampul

Each	5-pk.	10-pk.
31673	31673-510	—
w/data pack		
31673-500	31673-520	31773

DRO Mix (Tennessee/Mississippi) (16 components)

<i>n</i> -decane (C10)	<i>n</i> -hexadecane (C16)	<i>n</i> -docosane (C22)
<i>n</i> -undecane (C11)	<i>n</i> -heptadecane (C17)	<i>n</i> -tricosane (C23)
<i>n</i> -dodecane (C12)	<i>n</i> -octadecane (C18)	<i>n</i> -tetracosane (C24)
<i>n</i> -tridecane (C13)	<i>n</i> -nonadecane (C19)	<i>n</i> -pentacosane (C25)
<i>n</i> -tetradecane (C14)	<i>n</i> -eicosane (C20)	
<i>n</i> -pentadecane (C15)	<i>n</i> -heneicosane (C21)	

1,000µg/mL each in methylene chloride, 1mL/ampul

Each	5-pk.	10-pk.
31214	31214-510	—
w/data pack		
31214-500	31214-520	31314

WA EPH Aromatic Hydrocarbon Standard (18 components)

acenaphthene	benzo(k)fluoranthene	indeno(1,2,3-cd)pyrene
acenaphthylene	benzo(ghi)perylene	2-methylnaphthalene
anthracene	chrysene	naphthalene
benzo(a)anthracene	dibenzo(a,h)anthracene	phenanthrene
benzo(a)pyrene	fluoranthene	pyrene
benzo(b)fluoranthene	fluorene	1,2,3-trimethylbenzene

1,000µg/mL each in methylene chloride, 1mL/ampul

Each	5-pk.	10-pk.
31469	31469-510	—
w/data pack		
31469-500	31469-520	31569

WA EPH Matrix Spike Mix (10 components)

<i>n</i> -decane (C10)	acenaphthene	naphthalene
<i>n</i> -dodecane (C12)	anthracene	pyrene
<i>n</i> -hexadecane (C16)	benzo(a)pyrene	
<i>n</i> -heneicosane (C21)	benzo(ghi)perylene	

250µg/mL each in acetone, 1mL/ampul

Each	5-pk.	10-pk.
31490	31490-510	—
w/data pack		
31490-500	31490-520	31590

Diesel Range Calibration Standard (DCS)

diesel #1-diesel #2 (1:1)

50,000µg/mL in methylene chloride, 1mL/ampul

Each	5-pk.	10-pk.
31820	31820-510	—
w/data pack		
31820-500	31820-520	31920

new!

Diesel Fuel #2 Composite Standard

5,000µg/mL in methylene chloride, 1mL/ampul

Each	5-pk.	10-pk.
31093	31093-510	—
w/data pack		
31093-500	31093-520	31193

50,000µg/mL in methylene chloride, 1mL/ampul

Each	5-pk.	10-pk.
31258	31258-510	—
w/data pack		
31258-500	31258-520	31358

50,000µg/mL in methylene chloride, 5mL/ampul

Each	5-pk.	10-pk.
31259	31259-510	—
w/data pack		
31259-500	31259-520	31359

Kerosene Fuel Composite Standard

5,000µg/mL in methylene chloride, 1mL/ampul

Each	5-pk.	10-pk.
31094	31094-510	—
w/data pack		
31094-500	31094-520	31194

50,000µg/mL in methylene chloride, 1mL/ampul

Each	5-pk.	10-pk.
31256	31256-510	—
w/data pack		
31256-500	31256-520	31356

50,000µg/mL in methylene chloride, 5mL/ampul

Each	5-pk.	10-pk.
31257	31257-510	—
w/data pack		
31257-500	31257-520	31357

Aviation Gas Standard

100-octane low-lead fuel currently used in piston-type aircraft.

2,500µg/mL in P&T methanol, 1mL/ampul

Each	5-pk.	10-pk.
30094	30094-510	—
w/data pack		
30094-500	30094-520	30194

50,000µg/mL in P&T methanol, 1mL/ampul

Each	5-pk.	10-pk.
30207	30207-510	—
w/data pack		
30207-500	30207-520	30307

50,000µg/mL in P&T methanol, 5mL/ampul

Each	5-pk.	10-pk.
30208	30208-510	—
w/data pack		
30208-500	30208-520	30308

Jet Fuel A Standard

commercial jet fuel A

5,000µg/mL in methylene chloride, 1mL/ampul

Each	5-pk.	10-pk.
31215	31215-510	—
w/data pack		
31215-500	31215-520	31315

50,000µg/mL in methylene chloride, 1mL/ampul

Each	5-pk.	10-pk.
31242	31242-510	—
w/data pack		
31242-500	31242-520	31342

50,000µg/mL in methylene chloride, 5mL/ampul

Each	5-pk.	10-pk.
31243	31243-510	—
w/data pack		
31243-500	31243-520	31343

JP-4 Military Fuel Standard

5,000µg/mL in methylene chloride, 1mL/ampul

Each	5-pk.	10-pk.
31219	31219-510	—
w/data pack		
31219-500	31219-520	31319

50,000µg/mL in methylene chloride, 1mL/ampul

Each	5-pk.	10-pk.
31250	31250-510	—
w/data pack		
31250-500	31250-520	31350

50,000µg/mL in methylene chloride, 5mL/ampul

Each	5-pk.	10-pk.
31251	31251-510	—
w/data pack		
31251-500	31251-520	31351

JP-5 Military Fuel Standard

5,000µg/mL in methylene chloride, 1mL/ampul

Each	5-pk.	10-pk.
31220	31220-510	—
w/data pack		
31220-500	31220-520	31320

50,000µg/mL in methylene chloride, 1mL/ampul

Each	5-pk.	10-pk.
31252	31252-510	—
w/data pack		
31252-500	31252-520	31352

50,000µg/mL in methylene chloride, 5mL/ampul

Each	5-pk.	10-pk.
31253	31253-510	—
w/data pack		
31253-500	31253-520	31353

JP-8 Military Fuel Standard

5,000µg/mL in methylene chloride, 1mL/ampul

Each	5-pk.	10-pk.
31262	31262-510	—
w/data pack		
31262-500	31262-520	31362

50,000µg/mL in methylene chloride, 1mL/ampul

Each	5-pk.	10-pk.
31254	31254-510	—
w/data pack		
31254-500	31254-520	31354

Surrogates and Internal Standards

o-Terphenyl Standard

10,000µg/mL in methylene chloride, 1mL/ampul

Each	5-pk.	10-pk.
31097	31097-510	—
w/data pack		
31097-500	31097-520	31197

Surrogate Standard Mixture

squalane o-terphenyl tetrahydronaphthol
1,000µg/mL each in methylene chloride, 1mL/ampul

Each	5-pk.	10-pk.
31638	31638-510	—
w/data pack		
31638-500	31638-520	31738

5-α-androstane

2,000µg/mL in methylene chloride, 1mL/ampul

Each	5-pk.	10-pk.
31065	31065-510	—
w/data pack		
31065-500	31065-520	31165

AK103/AK103AA

Method for Determination of Aromatic and Aliphatic Hydrocarbons in Residual Range Organics (RRO)

Calibration Mixes/Composite Standards

Retention Time Marker Standard (cat.# 31819)

Alternate Boiling Point/Carbon Number

Distribution Marker Stock Standard (cat.# 31639)

See page 2.

Residual Range Calibration Standard (RCS)

SAE30-SAE40(1:1)

50,000µg/mL in methylene chloride, 1mL/ampul

new!

Each	5-pk.	10-pk.
31817	31817-510	—
w/data pack		
31817-500	31817-520	31917

Residual Range Calibration Verification Standard (CVS)

SAE30-SAE40(1:1)

25,000µg/mL in methylene chloride, 1mL/ampul

new!

Each	5-pk.	10-pk.
31818	31818-510	—
w/data pack		
31818-500	31818-520	31918

Motor Oil Composite Standard

This composite solution is prepared from an equal volume blend of the following types of motor oil: 5W30, 10W30, 10W40, and 20W50. After blending, a precisely weighed amount of the composite is added to a volumetric flask to produce the standard.

50,000µg/mL in methylene chloride, 1mL/ampul

Each	5-pk.	10-pk.
31464	31464-510	—
w/data pack		
31464-500	31464-520	31564

Fuel Oil #4 Standard

Fuel Oil #4 is typically used in limited applications in which the fuel cannot be preheated prior to burning. The fuel is a blend of distillate (Fuel Oil #2) and residual (Fuel Oil #6) to meet ASTM viscosity specifications. Fuel Oil #4 used to prepare this mixture has a kinematic viscosity of 21.9 at 38°C (100°F), measured using ASTM D-445.

5,000µg/mL in methylene chloride, 1mL/ampul

Each	5-pk.	10-pk.
31216	31216-510	—
w/data pack		
31216-500	31216-520	31316

50,000µg/mL in methylene chloride, 1mL/ampul

Each	5-pk.	10-pk.
31244	31244-510	—
w/data pack		
31244-500	31244-520	31344

Fuel Oil #5 Standard

Fuel Oil #5 is typically used in applications in which there is little or no preheating of the fuel prior to burning. A blend of distillate (Fuel Oil #2) and residual (Fuel Oil #6), the Fuel Oil #5 used to prepare this mixture has a kinematic viscosity of 106.5 at 38°C (100°F), measured using ASTM D-445.

5,000µg/mL in methylene chloride, 1mL/ampul

Each	5-pk.	10-pk.
31217	31217-510	—
w/data pack		
31217-500	31217-520	31317

50,000µg/mL in methylene chloride, 1mL/ampul

Each	5-pk.	10-pk.
31246	31246-510	—
w/data pack		
31246-500	31246-520	31346

Fuel Oil #6 Standard

This oil, sometimes called Bunker C or residual, is a black viscous fuel. Applications in which it may be used require the ability to preheat the fuel prior to pumping and burning.

5,000µg/mL in methylene chloride, 1mL/ampul

Each	5-pk.	10-pk.
31218	31218-510	—
w/data pack		
31218-500	31218-520	31318

50,000µg/mL in methylene chloride, 1mL/ampul

Each	5-pk.	10-pk.
31248	31248-510	—
w/data pack		
31248-500	31248-520	31348

50,000µg/mL in methylene chloride, 5mL/ampul

Each	5-pk.	10-pk.
31249	31249-510	—
w/data pack		
31249-500	31249-520	31349

Surrogates and Internal Standards

n-Triacontane-d62

new!

500µg/mL in methylene chloride, 1mL/ampul

Each	5-pk.	10-pk.
31816	31816-510	—
w/data pack		
31816-500	31816-520	31916

Surrogate Standard Mixture

squalane o-terphenyl tetrahydronaphthol

1,000µg/mL each in methylene chloride, 1mL/ampul

Each	5-pk.	10-pk.
31638	31638-510	—
w/data pack		
31638-500	31638-520	31738

5-α-androstane

2,000µg/mL in methylene chloride, 1mL/ampul

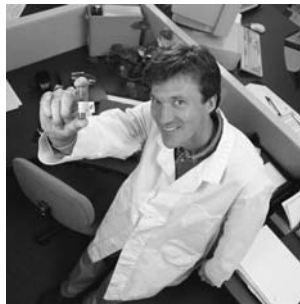
Each	5-pk.	10-pk.
31065	31065-510	—
w/data pack		
31065-500	31065-520	31165

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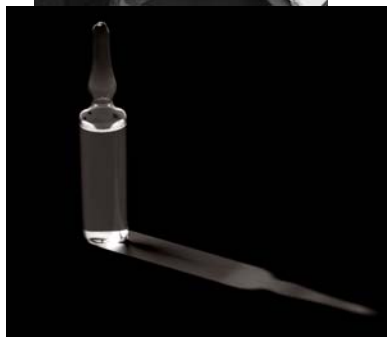


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FAST FACTS

At-a-Glance
Product
Information
from Restek

Contact Information

Iowa Department of Natural Resources

UST Section
Wallace State Office Building
900 East Grand
Des Moines, IA 50319
Phone: (515) 281-8135
Fax: (515) 281-7212

The Iowa Department of Natural Resources,
Environmental Protection Division, maintains
a UST/LUST website at:
<http://www.state.ia.us/dnr/organiza/wmad/lqbu-reau/ust/index.html>

State of Iowa UST Monitoring

The State of Iowa pools the UST parameters into one group for the purpose of certification. Iowa Administrative Code 567-135.16(455B) requires use of the following methodologies: Method OA-1, Method for Determination of Volatile Petroleum Hydrocarbons (Gasoline) revision 7/27/93 and Method OA-2 Method for Determination of Extractable Petroleum Products (And Related Low Volatility Organic Compounds) revision 7/27/93; EPA methods 525.2, 550, 550.1 for polynuclear aromatic hydrocarbons (PAHs) in drinking water; EPA methods 525.2, 550, 550.1, 610, 8100, 8270, 8310 for PAHs in water; EPA methods 8100, 8270, 8310 for PAHs in soil; and NIOSH 1501 for BTEX in soil gas.

Method OA-1 is a modification of EPA Method 8015 and is used to determine concentrations of volatile petroleum hydrocarbons and other individual components, including benzene, toluene, ethyl benzene, and xylenes, in water and soil/solids. Samples are analyzed using purge-and-trap sample concentration. Detection is achieved by GC/FID alone, by FID/PID in series, or by mass spectrometer (GC/MS). Identification and quantification are based on detector response to an external standard of commercial product.

Method OA-2 is a modification of EPA Method 8100, for determining diesel fuel, fuel oil, motor oil, kerosene, mineral spirits, or hydraulic fluid in a liquid or solid matrix. Laboratories use Method OA-2 to provide surrogate analysis of the PAHs based on default concentrations of the PAHs in certain petroleum-derived materials. This method covers the determination of low volatility petroleum products and organic compounds that are soluble in moderate to low polarity organic solvents. A capillary GC/FID method is used to quantify the compounds or mixtures of interest. GC/MS also may be used. Identification and quantification of various petroleum products is performed by comparing the chromatograms of samples and commercial products, preferably using computer data system overlay.



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Gas Chromatography Columns & Accessories

For these items, see Restek's

Chromatography Products Catalog:

- Syringes
- Autosampler Vials
- Guard Columns
- Ferrules, Septa



Recommended Gas Chromatography Columns

Rtx®-5, 30m x 0.25mm

Film Thickness	temp. limits	Cat. #
0.25µm	-60 to 330/350°C	10223
0.50µm	-60 to 330/350°C	10238
1.00µm	-60 to 320/340°C	10253

Integra-Guard™ Columns

Guard and analytical column in one continuous length.

*Add the appropriate suffix number to analytical column catalog number.

ID	Length	Suffix #
0.25mm	5m	-124
	10m	-127

Syringes

Standard Micro-Liter Syringes for Agilent 7673 and 7683 Autosamplers

Size	Needle Gauge	6-pk.
10µL	23s	20169
10µL	23s-26s	24600

Autosampler Vials

Crimp Top Vial Snap Seal™ Style (12 x 32mm, 11mm Crimp)

Description*	1,000-pk.
2.0mL Clear Glass Vial w/White Graduated Marking Spot	24384
2.0mL Amber Glass Vial w/White Graduated Marking Spot	24386

*Marking spots are available on request in blue, green, rust or yellow.

Aluminum Crimp Seals w/Septa

Description	1,000-pk.
Silver Seal, 11mm, PTFE/Natural Rubber Septa	21175
Silver Seal, 11mm, PTFE/Silicone Septa*	24360

*PTFE/Silicone/PTFE available on request.

Thermolite® Septa

Size	temp. limits	25-pk.	50-pk.	100-pk.
11mm (7/16")	to 340°C	20363	20364	20365

Replacement Inlet Seals

Stainless Steel Inlet Seal for Single-Column Installation*

Size	2-pk.	10-pk.
0.8mm ID	21315	21316

*Equivalent to Agilent Part# 18740-20880.

Inlet Liners

For Agilent GCs

Description	ID / OD & Length (mm)	ea.	5-pk.
Uniliner®*	4.0 ID, 6.3 OD x 78.5	20335	20336
Drilled Uniliner®	4.0 ID, 6.3 OD x 78.5	21054	21055
1mm Split**	1.0 ID, 6.3 OD x 78.5	20972	20973

*Restek design improves performance over the original Agilent Liner.

**Use this liner for increased sensitivity.

Low Volume Injector for Agilent GCs

Description	kit.
Low-Volume Injector for Agilent Split/Splitless GC Inlets	21692

OA-1, Revision 7/27/93

Calibration Mixtures/Composite Standards

Retention Time Marker

n-hexane (C6)

n-decane (C10)

n-dodecane (C12)

1,000µg/mL each in P&T methanol, 1mL/ampul

Each	5-pk.	10-pk.
30483	30483-510	—
	w/data pack	
30483-500	30483-520	30583

Unleaded Gasoline Composite Standard

2,500µg/mL in P&T methanol, 1mL/ampul

Each	5-pk.	10-pk.
30081	30081-510	—
	w/data pack	
30081-500	30081-520	30181

50,000µg/mL in P&T methanol, 1mL/ampul

Each	5-pk.	10-pk.
30205	30205-510	—
	w/data pack	
30205-500	30205-520	30305

50,000µg/mL in P&T methanol, 5mL/ampul

Each	5-pk.	10-pk.
30206	30206-510	—
	w/data pack	
30206-500	30206-520	30306

Certified BTEX in Unleaded Gas Composite Standard

benzene*

methyl tert-butyl ether*

m-xylene*

ethylbenzene*

naphthalene*

o-xylene*

isopropyl benzene*

toluene*

p-xylene*

5,500ppm gasoline in P&T methanol, 1mL/ampul

Each	5-pk.	10-pk.
30237	30237-510	—
	w/data pack	
30237-500	30237-520	30337

*Concentration varies lot to lot. See Certificate of Analysis for certified concentrations. See <http://www.restekcorp.com> for current certificate of analysis.

Certified Aromatics in Gasoline (16 components)

benzene*

n-propylbenzene*

ethylbenzene*

toluene*

m-ethyltoluene*

1,2,3-trimethylbenzene*

o-ethyltoluene*

1,2,4-trimethylbenzene*

p-ethyltoluene*

1,3,5-trimethylbenzene*

isopropylbenzene*

m-xylene*

methyl tert-butyl ether*

o-xylene*

naphthalene*

p-xylene*

5,500ppm gasoline in P&T methanol, 1mL/ampul

Each	5-pk.	10-pk.
30485	30485-510	—
	w/data pack	
30485-500	30485-520	30585

*Concentration varies lot to lot. See Certificate of Analysis for certified concentrations. See <http://www.restekcorp.com> for current certificate of analysis.

PVOC Mix (California) (7 components)

benzene

toluene

p-xylene

ethylbenzene

m-xylene

methyl tert-butyl ether

o-xylene

1,000µg/mL each in P&T methanol, 1mL/ampul

Each	5-pk.	10-pk.
30231	30231-510	—
	w/data pack	
30231-500	30231-520	30331

BTEX Standard

benzene
ethylbenzene

toluene
m-xylene

o-xylene
p-xylene

200µg/mL each in P&T methanol, 1mL/ampul

Each	5-pk.	10-pk.
30051	30051-510	—
w/data pack		
30051-500	30051-520	30151

2,000µg/mL each in P&T methanol, 1mL/ampul

Each	5-pk.	10-pk.
30213	30213-510	—
w/data pack		
30213-500	30213-520	30313

2,000µg/mL each in P&T methanol, except *m*-xylene and *p*-xylene at 1,000µg/mL, 1mL/ampul

Each	5-pk.	10-pk.
30488	30488-510	—
w/data pack		
30488-500	30488-520	30588

Internal Standard Mixtures

4-Bromofluorobenzene Mix

2,500µg/mL in P&T methanol, 1mL/ampul

Each	5-pk.	10-pk.
30067	30067-510	—
w/data pack		
30067-500	30067-520	30167

10,000µg/mL in P&T methanol, 1mL/ampul

Each	5-pk.	10-pk.
30082	30082-510	—
w/data pack		
30082-500	30082-520	30182

α,α,α-Trifluorotoluene Mix

2,000µg/mL in P&T methanol, 1mL/ampul

Each	5-pk.	10-pk.
30048	30048-510	—
w/data pack		
30048-500	30048-520	30148

2,500µg/mL in P&T methanol, 1mL/ampul

Each	5-pk.	10-pk.
30068	30068-510	—
w/data pack		
30068-500	30068-520	30168

10,000µg/mL in P&T methanol, 1mL/ampul

Each	5-pk.	10-pk.
30083	30083-510	—
w/data pack		
30083-500	30083-520	30183

Chlorobenzene Mix

2,000µg/mL in P&T methanol, 1mL/ampul

Each	5-pk.	10-pk.
30261	30261-510	—
w/data pack		
30261-500	30261-520	30361

Surrogate Mixtures

Surrogate Standard

1,4-bromofluorobenzene

α,α,α-trifluorotoluene

2,500µg/mL each in P&T methanol, 1mL/ampul

Each	5-pk.	10-pk.
30484	30484-510	—
w/data pack		
30484-500	30484-520	30584

OA-2, Revision 7/27/93

Calibration Mixtures/Composite Standards

Retention Time Marker Standard

n-decane (C10)

n-hexatriacontane (C36)

n-pentacosane (C25)

1,000µg/mL each in hexane, 1mL/ampul

Each	5-pk.	10-pk.
31637	31637-510	—
w/data pack		
31637-500	31637-520	31737

Diesel Fuel #2 Composite Standard

5,000µg/mL in methylene chloride, 1mL/ampul

Each	5-pk.	10-pk.
31093	31093-510	—
w/data pack		
31093-500	31093-520	31193

50,000µg/mL in methylene chloride, 1mL/ampul

Each	5-pk.	10-pk.
31258	31258-510	—
w/data pack		
31258-500	31258-520	31358

50,000µg/mL in methylene chloride, 5mL/ampul

Each	5-pk.	10-pk.
31259	31259-510	—
w/data pack		
31259-500	31259-520	31359

Motor Oil Composite Standard

This composite solution is prepared from an equal volume blend of the following types of motor oil: 5W30, 10W30, 10W40, and 20W50.

50,000µg/mL in methylene chloride, 1mL/ampul

Each	5-pk.	10-pk.
31464	31464-510	—
w/data pack		
31464-500	31464-520	31564

Used Motor Oil Composite Standard

This composite solution is prepared from an equal volume blend from five gasoline powered vehicles.

50,000µg/mL in methylene chloride, 1mL/ampul

Each	5-pk.	10-pk.
31465	31465-510	—
w/data pack		
31465-500	31465-520	31565

Kerosene Fuel Composite Standard

5,000µg/mL in methylene chloride, 1mL/ampul

Each	5-pk.	10-pk.
31094	31094-510	—
w/data pack		
31094-500	31094-520	31194

50,000µg/mL in methylene chloride, 1mL/ampul

Each	5-pk.	10-pk.
31256	31256-510	—
w/data pack		
31256-500	31256-520	31356

50,000µg/mL in methylene chloride, 5mL/ampul

Each	5-pk.	10-pk.
31257	31257-510	—
w/data pack		
31257-500	31257-520	31357

Fuel Oil #6 Standard

This oil, sometimes called Bunker C or residual, is a black viscous fuel. Applications in which it may be used require the ability to preheat the fuel prior to pumping and burning.

5,000µg/mL in methylene chloride, 1mL/ampul

Each	5-pk.	10-pk.
31218	31218-510	—
w/data pack		
31218-500	31218-520	31318

50,000µg/mL in methylene chloride, 1mL/ampul

Each	5-pk.	10-pk.
31248	31248-510	—
w/data pack		
31248-500	31248-520	31348

50,000µg/mL in methylene chloride, 5mL/ampul

Each	5-pk.	10-pk.
31249	31249-510	—
w/data pack		
31249-500	31249-520	31349

Fuel Oil #4 Standard

Fuel Oil #4 is typically used in limited applications in which the fuel cannot be preheated prior to burning. The fuel is a blend of distillate (Fuel Oil #2) and residual (Fuel Oil #6) to meet ASTM viscosity specifications. Fuel Oil #4 used to prepare this mixture has a kinematic viscosity of 21.9 at 38°C (100°F), measured using ASTM D-445.

5,000µg/mL in methylene chloride, 1mL/ampul

Each	5-pk.	10-pk.
31216	31216-510	—
w/data pack		
31216-500	31216-520	31316

50,000µg/mL in methylene chloride, 1mL/ampul

Each	5-pk.	10-pk.
31244	31244-510	—
w/data pack		
31244-500	31244-520	31344

Fuel Oil #5 Standard

Fuel Oil #5 is typically used in applications in which there is little or no preheating of the fuel prior to burning. A blend of distillate (Fuel Oil #2) and residual (Fuel Oil #6), the Fuel Oil #5 used to prepare this mixture has a kinematic viscosity of 106.5 at 38°C (100°F), measured using ASTM D-445.

5,000µg/mL in methylene chloride, 1mL/ampul

Each	5-pk.	10-pk.
31217	31217-510	—
w/data pack		
31217-500	31217-520	31317

50,000µg/mL in methylene chloride, 1mL/ampul

Each	5-pk.	10-pk.
31246	31246-510	—
w/data pack		
31246-500	31246-520	31346

WA EPH Aromatic Hydrocarbon Standard (18 components)

acenaphthene	dibenzo(a,h)anthracene
acenaphthylene	fluoranthene
anthracene	fluorene
benzo(a)anthracene	indeno(1,2,3-cd)pyrene
benzo(a)pyrene	2-methylnaphthalene
benzo(b)fluoranthene	naphthalene
benzo(k)fluoranthene	phenanthrene
benzo(ghi)perylene	pyrene
chrysene	1,2,3-trimethylbenzene

1,000µg/mL each in methylene chloride, 1mL/ampul

Each	5-pk.	10-pk.
31469	31469-510	—
w/data pack		
31469-500	31469-520	31569

Certified PAHs in Diesel (7 components)

Certified PAHs **Typical Certified Conc. (ppm)**

acenaphthene	20*
acenaphthylene	14*
fluorene	32*
1-methylnaphthalene	269*
2-methylnaphthalene	180*
naphthalene	90*
phenanthrene	47*

50,000ppm diesel #2 in methylene chloride, typical PAH concentrations listed above, 1mL/ampul

Each	5-pk.	10-pk.
31673	31673-510	—
w/data pack		
31673-500	31673-520	31773

*Concentration varies lot to lot. See Certificate of Analysis for certified concentrations. See <http://www.restekcorp.com> for current certificate of analysis.

Mineral Spirits Standard: Unweathered

There are four general types of mineral spirits, classified according to boiling point range (BPR):

- Type I (Stoddard solvent) BPR 149–182°C
- Type II (high flash point) BPR 177–196°C
- Type III (odorless) BPR 149–196°C
- Type IV (low dry point) BPR 149–174°C

The mixtures listed below were prepared from an equal volume blend of Type I, II, and III mineral spirits.

5,000µg/mL in methylene chloride, 1mL/ampul

Each	5-pk.	10-pk.
31225	31225-510	—
w/data pack		
31225-500	31225-520	31325

50,000µg/mL in methylene chloride, 1mL/ampul

Each	5-pk.	10-pk.
31260	31260-510	—
w/data pack		
31260-500	31260-520	31360

50,000µg/mL in methylene chloride, 5mL/ampul

Each	5-pk.	10-pk.
31261	31261-510	—
w/data pack		
31261-500	31261-520	31361

Internal Standard Mixtures

5-α-androstane

2,000µg/mL in methylene chloride, 1mL/ampul

Each	5-pk.	10-pk.
31065	31065-510	—
w/data pack		
31065-500	31065-520	31165

Surrogate Mixtures

o-Terphenyl Standard

10,000µg/mL in methylene chloride, 1mL/ampul

Each	5-pk.	10-pk.
31097	31097-510	—
w/data pack		
31097-500	31097-520	31197



Custom Reference Material Request Form

FAX#: (814) 355-2895
email: standards@restekcorp.com

You also can complete this form online at <http://www.restekcorp.com/stdreq.htm>

Name: _____ **Date:** _____

Company/Location: _____

Phone #: _____ **FAX #:** _____

E-mail: _____

Take these eight steps to create the right solution:

1. Mixture Description: _____
2. Solvent: _____
3. No. of components: _____
4. Volume (select): 1mL, 2mL, 5mL, 10mL, or other mL: _____
5. Quantity: No. of units _____

6. Select testing and documentation that best meets your requirements:

- ☐ Gravimetric Documentation: Lot Sheet with balance printout attached.
- ☐ Qualitative Documentation: Certificate of Composition, Chromatogram, and Gravimetric Documentation.
- ☐ Quantitative Documentation: Certificate of Analysis and Data Pack.

7. Compound(s): (list or attach sheet)	Concentration:	8. Concentration Units
1.		<input type="radio"/> mg/mL
2.		<input type="radio"/> µg/mL
3.		<input type="radio"/> ng/mL
4.		<input type="radio"/> vol./vol. %
5.		<input type="radio"/> wt./wt. %
6.		<input type="radio"/> other _____
7.		
8.		
9.		
10.		
11.		
12.		

ALL mixtures are produced in accordance with our ISO 9001:2000 registration. Analytical balances are calibrated daily at seven mass levels using NIST-traceable weights. ALL raw materials used are a minimum of 97% pure unless otherwise specified.

Can't locate the exact mixture you need?

With **thousands** of compounds in our inventory,
we can make any mixture
to your specifications.

*To order, use the convenient custom
reference material request form inside, or*

visit us online at
www.restekcorp.com 

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France: 1, rue Montespan, 91024 Evry Cedex • phone: 01 60 78 32 10 • fax: 01 60 78 70 90

Ireland: 8 Baronscourt Lane, Belfast, BT8 8RR, Northern Ireland • phone: (44) 28 9081 4576 • fax: (44) 28 9081 4576

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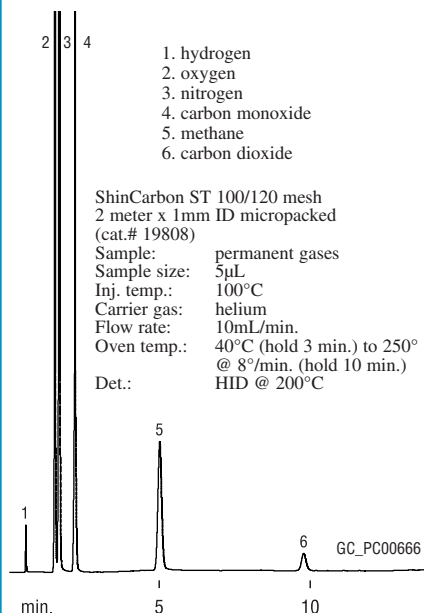
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ShinCarbon ST Micropacked GC Columns

Above-Ambient Analyses of Permanent Gases and Light Hydrocarbons

Figure 1

Separate permanent gases in 10 minutes,
without cryogenic cooling.



- Separate permanent gases, including CO/CO₂, in 10 minutes, without cryogenic cooling.
- Rapid separations of permanent gas / light hydrocarbon mixtures.
- Excellent compatibility with most GC detectors—minimal bleed, minimal baseline rise.
- Pre-conditioned, less than 30 minutes to stabilize.

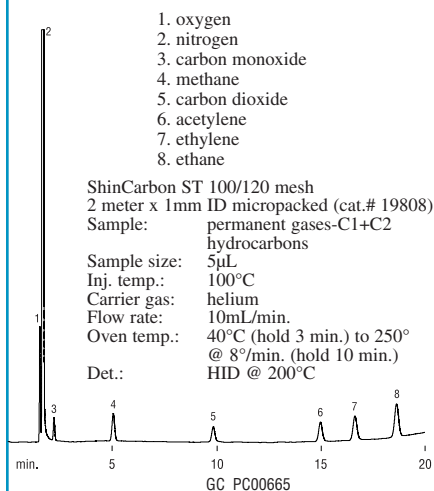
Analyzing the permanent gases oxygen, nitrogen, methane, carbon monoxide, and carbon dioxide has been virtually impossible for a single gas chromatography (GC) or gas-solid chromatography (GSC) column, without sub-ambient temperatures.

Now, Restek's new ShinCarbon ST material, a high surface area carbon molecular sieve (~1500 m²/g), is the ideal medium for separating gases and highly volatile compounds by GSC. A 2-meter by 1mm ID micropacked column containing ShinCarbon ST separates the permanent gases in 10 minutes, without cryogenic cooling (Figure 1).

In addition to providing a breakthrough in analyses of permanent gases, ShinCarbon ST columns can separate light hydrocarbon / permanent gas mixtures. Figure 2 shows an analysis of permanent gases plus acetylene, ethylene, and ethane, completed in less than 20 minutes. Natural gas components (70% methane) also are cleanly separated (Figure 3). Other potential applications for ShinCarbon ST include analyses of sulfur dioxide (Figure 4) and Freon® fluorocarbons (Figure 5).*

Figure 2

Rapidly analyze light hydrocarbon/
permanent gas mixtures.



*For analysis of other low molecular weight sulfur compounds, we recommend Rt-XLSulfur™ micropacked and packed columns or Rt-1 capillary columns.

Figure 3

Separate components in natural gas.

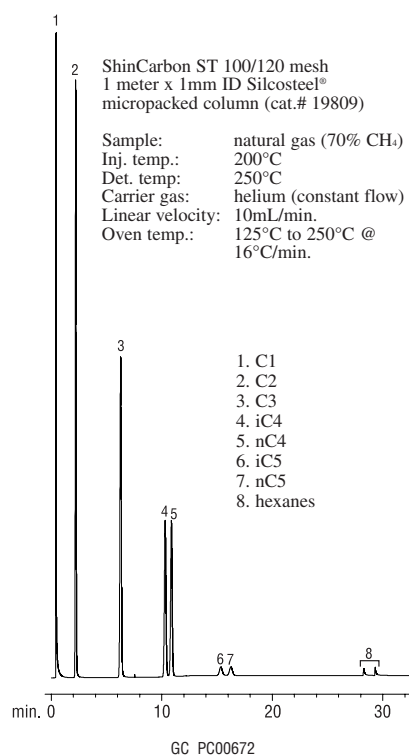


Figure 4

Sharp peak for ppm level sulfur dioxide.

ShinCarbon ST 100/120 mesh
2 meter x 1mm ID Silcosteel® micropacked
column (cat.# 19808)
Sample: 100ppm sulfur dioxide in helium
Inj.: 10µL
Inj. temp.: 100°C
Carrier gas: helium
Flow rate: 10mL/min.
Oven temp.: 150°C, isothermal
Det.: HID @ 200°C

1. sulfur dioxide

GC_PC00674

FAST FACTS

At-a-Glance
Product
Information
from Restek

online
ordering
available!
for U.S. customers only
www.restekcorp.com

ShinCarbon ST is a highly stable material. Its 330°C upper temperature limit minimizes bleed and baseline rise during temperature programming, making the material compatible with most detection systems used for gas analysis, including TCD or HID. All ShinCarbon ST columns are fully conditioned in an oxygen/moisture free environment to prevent contamination. This minimizes stabilization time (less than 30 minutes) when installing a new column which, in turn, minimizes downtime.

The unique properties of ShinCarbon ST make it an ideal packing material for analyses of gases and highly volatile compounds, including permanent gases, low molecular weight hydrocarbons, and Freon® gases. The rapid, above-ambient analyses these columns provide will be a great convenience. Excellent thermal stability of the high surface area carbon, combined with careful conditioning during column manufacture, ensures low-bleed operation and rapid stabilization when installing a new column. Custom-made ShinCarbon ST columns are available on request.

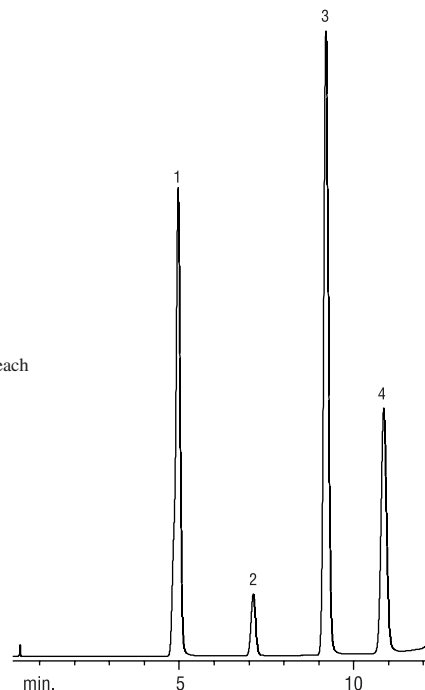
Figure 5

Fluorocarbon analysis completed in 11 minutes on ShinCarbon ST column.

Peak	Ret. Time (min.)
1. Freon® 134a/22	4.95
2. Freon® 12	7.11
3. Freon® 133a	9.19
4. Freon® 114	10.85

ShinCarbon ST 100/120 mesh
1 meter x 1mm ID Silcosteel® micropacked column
(cat.# 19809)
Sample: fluorocarbon blend, 5µL ~1-3% each
Inj. temp.: 200°C
Det. temp.: 250°C
Carrier gas: helium
Linear velocity: 10mL/min.
Oven temp.: 125°C to 320°C @ 16°C/min.

GC_PC00673



Refer to our catalog or
website for
Scott gas standards for
permanent gases and
light hydrocarbons

Ordering Information | Installation Kits

	for 0.75mm ID col.	for 1mm ID col.
For valve applications	21062	21065
For split applications	21063	—
For all Agilent GCs	21064	—
For direct injections	—	21066

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RESTEK

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Lit. Cat. # 59519A

Ordering Information | ShinCarbon ST 100/120 Micropacked Columns

OD	ID	1-Meter	2-Meter
1/16"	1.0mm	19809	19808
0.95mm	0.75mm	19810	—

Ordering Information | ShinCarbon ST 80/100 Packed Columns

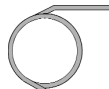
OD	ID	2-Meter
1/8" SilcoSmooth™	2.0mm	80486-xxx

Column Configurations

Add the appropriate
suffix to the catalog
number when ordering
packed columns.
Contact us for custom
configurations.



General
Configuration:
Suffix -800



Agilent 5880,
5890, 5987, 6890:
Suffix -810



Varian 3700, Vista
Series, FID:
Suffix -820



PE 900-3920
Sigma 1,2,3:
Suffix -830



PE Auto System
8300, 8400, 8700
(Not On-Column):
Suffix -840

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Sales@Thamesrestek.co.uk

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Aldehyde-Ketone-DNPH TO-11A Calibration Mix (15 components)

acetaldehyde-DNPH	hexaldehyde-DNPH
acetone-DNPH	isovaleraldehyde-DNPH
acrolein-DNPH	propionaldehyde-DNPH
benzaldehyde-DNPH	<i>m</i> -tolualdehyde-DNPH
<i>n</i> -butyraldehyde-DNPH	<i>o</i> -tolualdehyde-DNPH
crotonaldehyde-DNPH	<i>p</i> -tolualdehyde-DNPH
2,5-dimethylbenzaldehyde-DNPH	valeraldehyde-DNPH
formaldehyde-DNPH	

15µg/mL* each in acetonitrile, 1mL/ampul

Each
31808

Formaldehyde-DNPH Mix

formaldehyde-DNPH
500µg/mL in acetonitrile, 1mL/ampul

Each	5-pk.
31837	31837-510

HPLC Columns

Ultra C18 5µm Column
cat.#: 9174565
150 x 4.6mm



For a complete listing of Restek HPLC columns, packings, and accessories, request the 2004 Restek Chromatography Products catalog (lit. cat.# 59854).

This catalog details our extensive product line and includes hundreds of chromatograms.

Additional Information

Formaldehyde and Other Aldehydes
Committee on Aldehydes, Board of Toxicology and Environmental Hazards, National Research Council, National Academy Press, Washington, DC, 1981.

RESTEK 800-356-1688
814-353-1300
www.restekcorp.com

Aldehydes/Ketones DNPH Standard

For US EPA Methods TO-11A and 8315

- Convenient 15µg/mL concentration as aldehyde/ketone, similar to the concentration of interest in most ambient air work.
- Certificate of Analysis lists both aldehyde/ketone and -DNPH derivative concentrations.
- Fast analysis using a Restek Ultra C18 HPLC column.

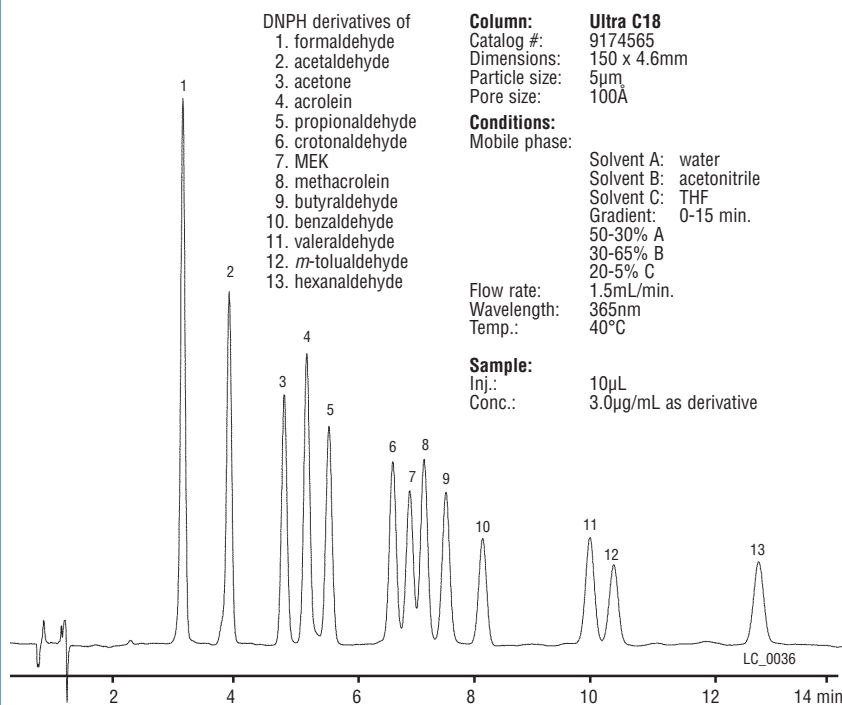
Carbonyl compounds, including low molecular weight aldehydes and ketones, are receiving increased attention by the regulatory community.

Formaldehyde is the target compound for US EPA Compendium Method TO-11A and Method 8315, but at least 14 other carbonyl compounds also can be detected and quantified. Method TO-11A modifies the sampling procedures outlined in earlier Method TO-5; the newer method is based on the specific reaction between carbonyl compounds and the 2,4-dinitrophenylhydrazine (DNPH) coating on a silica gel adsorbent (packed in cartridges), in the presence of a strong acid catalyst. The reaction produces stable, colored hydrazone derivatives.

To meet the needs of analysts monitoring these compounds, Restek offers a new 15-component aldehyde standard for US EPA Compendium Method TO-11A and Method 8315. The concentration of the mix components, 15µg/mL each, is similar to the concentration of interest in most ambient air work. For convenience, our Certificate of Analysis lists concentrations for both the aldehydes/ketones and the DNPH derivatives.

A 150 x 4.6 mm Ultra C18 HPLC column (cat.# 9174565) is optimal for fast, reliable analyses of the derivatives of formaldehyde, other aldehydes, and ketones.

Fast, reliable analyses of aldehydes and ketones on Restek's Ultra C18 HPLC column.



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Aldehydes/Ketones DNPH Standard

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*Restek is your free
technical literature source!*



lit. cat.# 59741

For literature:

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Custom Reference Materials Request Form

Domestic Customers

FAX#: (814) 355-2895
email: standards@restekcorp.com

International Customers

**Contact Your Local
Restek Representative.**

Name: _____

Date: _____

Company/Location: _____

Phone #: _____

FAX #: _____

E-mail: _____

Take these eight steps to create the right solution:

1. Mixture Description: _____

2. Solvent: _____

3. Number of Components: _____

4. Volume (select): 1mL, 2mL, 5mL, 10mL or other _____ mL

5. Quantity: Number of Units _____

6. Select testing and documentation that best meets your requirements:

- ☐ Gravimetric Documentation: Lot Sheet with balance printout attached.
☐ Qualitative Documentation: Certificate of Composition, Chromatogram, and Gravimetric Documentation.
☐ Quantitative Documentation: Certificate of Analysis and Data Pack.

7. Compound(s): (list or attach sheet; include CAS number)

Concentration:

1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		
11.		
12.		

8. Concentration Units

☐ mg/mL ☐ µg/mL ☐ ng/mL ☐ vol./vol.% ☐ wt./wt.% ☐ Other _____

ALL mixtures are produced in accordance with our ISO 9001 registration.
Analytical balances are calibrated daily at seven mass levels using NIST traceable weights.
ALL raw materials used are a minimum of 97% pure unless otherwise specified.

Restek trademarks: the Restek logo. Other trademarks: Pittcon (The Pittsburgh Conference).

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Silcosteel®-UHV

Patent pending.

Dramatically Reduce Outgassing in UHV Systems



RESTEK
Exclusive!



Silcosteel®-UHV surface treatment has been recognized by a panel of independent judges and editors of *R&D Magazine*

as one of the 100 most technologically significant products introduced in 2003

from the
Restek Performance Coatings Division

RESTEK

www.restekcorp.com

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Reduce outgassing, reduce pump-down time

- Silcosteel®-UHV layer can reduce outgassing by more than an order of magnitude, relative to heat treatment, in UHV environments.
- Reduced outgassing allows faster system pump-down.

Rugged, durable layer, for long-term reliable performance

- Silcosteel®-UHV layer will not delaminate.
- Stable to 600°C.
- Will not interfere with or be damaged by knife edge of Conflat® sealing flange.
- Reduces galling.

Custom service

- Apply Silcosteel®-UHV layer to a broad range of components.
- Treat complicated geometries and fine structures.

Ultra-high vacuum (UHV) environments of 10^{-7} torr or lower are critical for many instruments and systems used to analyze and manipulate the properties of materials, surfaces, or atomic structure. Under these vacuum conditions, steel components outgas large quantities of water, CO₂, CO, and other contaminant molecules. Until now, large pumping systems and extensive bake-out treatments have been required to remove these materials from the UHV environment.

A Silcosteel®-UHV layer significantly reduces outgassing by steel components in UHV systems. Applied to and incorporated into the steel surface, the Silcosteel®-UHV layer acts as a barrier, isolating any materials trapped on or in the steel and preventing them from entering the UHV environment, without liberating any contamination of its own. Figure 1 demonstrates the dramatic improvement attained by using Silcosteel®-UHV-treated components in a UHV assembly, relative to heat-cleaned components. After 10 hours under vacuum at 61°C, the Silcosteel®-UHV coated part demonstrated a 14-fold lower outgassing rate than the heat-cleaned part* (note circled area in Figure 1b). Clearly, Silcosteel®-UHV-treated parts make it possible to achieve and maintain a UHV environment with less pumping capacity and conservative bake-out requirements.

Figure 1a

Silcosteel®-UHV-treated vacuum system components show significantly less outgassing, compared to heat-cleaned* components.

Pressure Increase with Heat After 1 hr Under Vacuum

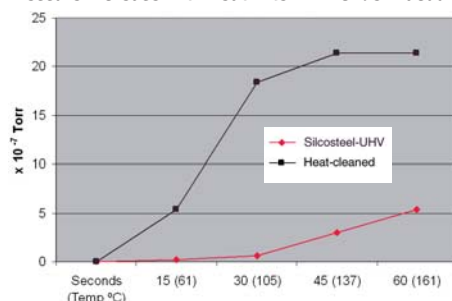
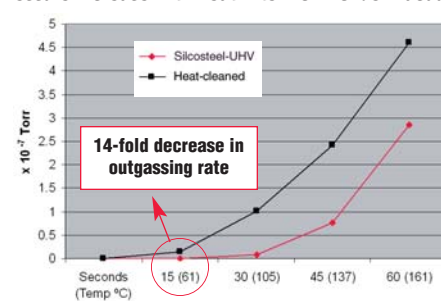


Figure 1b

After 10hr under vacuum, Silcosteel®-UHV-treated component continues to show significantly less outgassing. Note change in y-axis scale compared to Figure 1a.

Pressure Increase with Heat After 10 hr Under Vacuum



System: standard turbomolecular pump, 360L/sec;
all metal seals

Test pieces: independently heated, isolated closed end
thimbles; 4.5" x 1.5" OD

Base pressures: 4.6×10^{-7} Torr at 1hr
 7.5×10^{-8} Torr at 10hr

*Heat cleaned—test piece cleaned ultrasonically in an aqueous caustic bath, followed by 400°C under vacuum.

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Silcosteel®-UHV

Patent pending.

Dramatically Reduce Outgassing in UHV Systems

Figure 2

The durable Silcosteel®-UHV layer will withstand the sealing requirements of UHV, maintaining knife edge integrity.



The Silcosteel®-UHV layer is rugged and durable enough to stand up to the sealing requirements needed to attain a UHV environment. Figure 2 shows the knife-edge of a Silcosteel®-UHV-treated Conflat® sealing surface. The knife-edge penetrates and seals in the copper O-ring seated within the Conflat® surface. Even after multiple executions of this sealing process, the Silcosteel®-UHV layer remains intact.

Initial work with applying a Silcosteel®-UHV layer to Conflat® fitting bolts—without using anti-seize material—has demonstrated a decrease in galling. After sealing and thermal cycling, the bolts were easily removed from the Conflat® flange without galling.

Silcosteel®-UHV treatment is a custom service, available exclusively from Restek Corporation. For information on treating system components with Silcosteel®-UHV passivation, contact Restek, or your Restek representative.

About Us

Restek's involvement in coatings began in 1987. The focus of our initial work was to produce a coating on stainless steel that was inert to low-level reactive organic compounds, such as explosives and volatile organic compounds (VOCs). The end product from this work was the Silcosteel® coating for stainless steel tubing. Silcosteel® coated tubing currently is used for construction of analytical testing equipment by all major manufacturers of gas chromatography sampling and testing equipment.



Restek's headquarters are in Bellefonte, Pennsylvania, USA, with distributors and representatives in over 60 countries.

Since this initial project, Restek's coatings experts have developed a family of coatings to address other specific needs and thereby enhance the performance of system components. In brief, these coatings are:

- **Silcosteel®**—A general purpose passivation layer for steel and stainless steel.
- **Silcosteel®-CR**—A corrosion resistant layer that increases the lifetime of system components in acidic environments containing hydrochloric, nitric, or sulfuric acid. Patent pending.
- **Silcosteel®-UHV**—Used to reduce outgassing by components of ultra-high vacuum systems. Patent pending.
- **Silcosteel®-AC**—Dramatically reduces carbon buildup on stainless steel components. Patented.
- **Siltek™**—Provides the ultimate passivation of coated components, from glass to high nickel alloys of steel. Patented.
- **Sulfinert™**—A required coating on metal components when analyzing for parts-per-billion levels of organo-sulfur compounds. Patented.

Restek coatings are now used in many applications, spanning multiple industries and market areas. Restek coated components increase the lifetime of stack monitoring equipment exposed to sulfuric acid. Coated injector nozzles have longer service life because coking is inhibited. Sulfinert™-coated sampling equipment increases the reliability of process measurements in refineries and petrochemical plants. A mass spectrometer manufacturer demands Silcosteel®-coated parts to increase instrument sensitivity for analyzing pesticides. Restek coated air sampling equipment is used to sample diverse environments, from city air to submarine cabins. Let us solve *your* surface activity problems. Contact Dave Smith at 800-356-1688 or 814-353-1300, x 2154, or by email at daves@restekcorp.com.

Restek trademarks: Silcosteel, Siltek, Sulfinert, and the Restek logo. Other trademarks: Conflat (Varian Associates, Inc.)

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Allure™ C18 high carbon load phase is ideal for LC/MS applications

The sensitivity of LC/MS analyses is strongly affected by the percentage of organic content in the mobile phase. High organic content can greatly increase LC/MS signal-to-noise ratio. However, most commercial C18 phases contain only 10 to 15% carbon load so that less organic must be used in the mobile phase to retain solutes. The Allure™ C18 phase has a 27% carbon load, which results in increased retention and increased LC/MS sensitivity, even with high organic mobile phases. In the LC/MS analysis of steroids, the Allure™ C18 column shows a 26 % increase in sensitivity when compared to a conventional C18 phase (Figure 2).

Figure 2

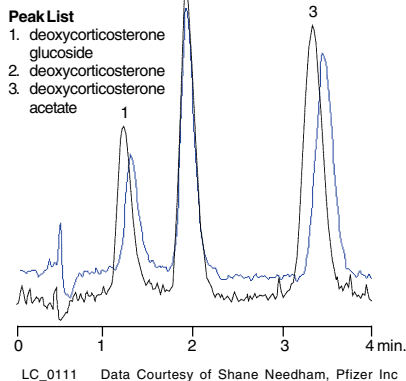
Allure™ C18 Columns Show a 26% Increase in LC/MS Sensitivity for Slightly Polar Steroids Compared to Conventional C18

Column:
Catalog #: 9164552
Dimensions: 50 x 2.1mm
Particle size: 5µm
Pore size: 60Å

Conditions:
Scan range: 320-520amu
Flow rate: 0.4mL/min.
LC/MS Interface: Positive ion ESI-TOF
Voltage: 3800V
Nozzle temp.: 160V
Nozzle volt.: 190V

Allure™ C18
H₂O:MeOH (33:67)
4191.1cps

Conventional C18
H₂O:MeOH (40:60)
3324.0cps



Allure™ C18 HPLC Columns

Maximum Retention and Peak Symmetry

Restek's Allure™ C18 column is designed using a simple yet unique bonding chemistry that offers improved resistance to hydrolysis and superior batch-to-batch reproducibility. The high carbon load phase exhibits maximum retention characteristics, making it ideal for liquid chromatography/mass spectrometry (LC/MS) applications. The phase is bonded onto a highly base-deactivated Type B silica, resulting in improved peak symmetry, even for basic analytes. The Allure™ C18 column can be used to analyze a wide range of compounds, from steroids and antibiotics to explosives (Figure 1).

Features & Benefits

Feature	Benefit
Highly base-deactivated silica.	Excellent peak symmetry for basic compounds.
Unique bonding technology resists hydrolysis of bonded phase.	More consistent retention times and longer column lifetime.
Excellent batch-to-batch consistency.	Reproducible analyses.
High carbon load phase.	Improved LC/MS sensitivity and HPLC resolution.

Figure 1

Allure™ C18 separates all US EPA Method 8330 explosives in under 10 minutes.

Peak List:

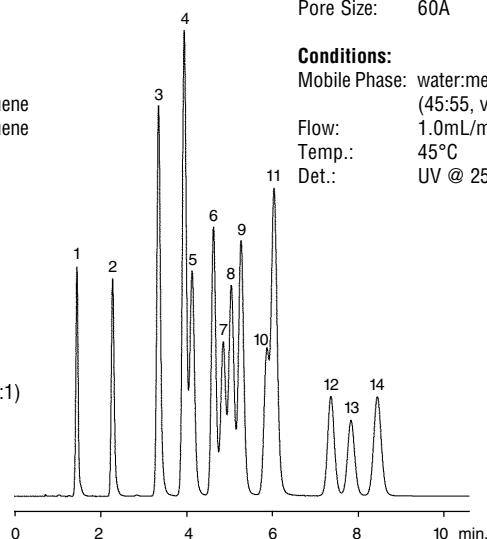
1. HMX
2. RDX
3. 1,3,5-trinitrobenzene
4. 1,3-dinitrobenzene
5. tetral
6. nitrobenzene
7. 4-amino-2,6-dinitrotoluene
8. 2-amino-4,6-dinitrotoluene
9. trinitrotoluene
10. 2,6-dinitrotoluene
11. 2,4-dinitrotoluene
12. 2-nitrotoluene
13. 4-nitrotoluene
14. 3-nitrotoluene

Sample:

Inj.: 5µL
Conc.: 50µg/mL
Solvent: water:methanol (1:1)

Column: Allure™C18
Dimensions: 150 x 4.0mm
Particle Size: 5µm
Pore Size: 60Å

Conditions:
Mobile Phase: water:methanol (45:55, v/v)
Flow: 1.0mL/min.
Temp.: 45°C
Det.: UV @ 254nm





At-a-Glance
Product
Information
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Application Notes:

(#59511A) Improved HPLC
Analysis of Analgesics

(#59512) The Ultra IBD Column Allows
HPLC Separation of Polar and Non-Polar
Analytes from the Same Sample

(#59510) HPLC Stationary Phase Selection
for the Analysis of Steroids

(#59118A) Allure™ PFP Propyl HPLC
Column Provides Improved LC/MS
Analyses of Basic Compounds

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Lit. Cat. # 59613B

Commonly Asked Questions

• **How is the Allure™ C18 column different from other C18 columns?**

The Allure™ C18 column has a much higher carbon load, which increases retention of non-polar compounds and improves LC/MS sensitivity. The unique bonding chemistry produces a high ligand density, which resists hydrolysis. These design benefits result in more consistent retention times and longer lifetimes.

• **What are the particle and pore sizes of the silica used for the Allure™ C18 phase?**

The Allure™ C18 is made from a 5µm, spherical Type B silica with a 60 Angstrom pore size.

• **What are the pH and temperature limits for the Allure™ C18 phase?**

The Allure™ C18 phase can be used from pH 2.5 to pH 7.5, and at temperatures up to 80°C.

• **How does Restek ensure phase reproducibility and column quality?**

A minimum of three lots of material are produced and verified for consistency using several analytical techniques. In addition, each lot of material must meet stringent chromatographic reproducibility requirements before release, and each column is individually tested before shipment.

• **Are guard cartridges available for the Allure™ C18 columns?**

Restek's unique Trident™ guard cartridge system is available for the Allure™ C18 column. The integral leak-free design of the Trident™ system contains a cap frit that can be replaced easily without disturbing the packed bed. The guard cartridge, packed with the Allure™ C18 phase can be replaced easily. A stand-alone guard column is also available.

■ Allure™ C18 5µm Columns

Column Length	1.0mm ID cat.#	2.1mm ID cat.#	3.2mm ID cat.#	4.6mm ID cat.#
30mm	9164531	9164532	9164533	9164535
50mm	9164551	9164552	9164553	9164555
100mm	9164511	9164512	9164513	9164515
150mm	9164561	9164562	9164563	9164565
200mm	9164521	9164522	9164523	9164525
250mm	9164571	9164572	9164573	9164575

■ Allure™ C18 5µm Columns with Trident™ Inlet

Column Length	2.1mm ID cat.#	3.2mm ID cat.#	4.6mm ID cat.#
30mm	9164532-700	9164533-700	9164535-700
50mm	9164552-700	9164553-700	9164555-700
100mm	9164512-700	9164513-700	9164515-700
150mm	9164562-700	9164563-700	9164565-700
200mm	9164522-700	9164523-700	9164525-700
250mm	9164572-700	9164573-700	9164575-700

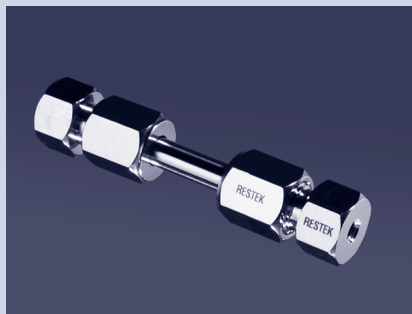
■ Allure™ C18 Guard Cartridges

Dimensions	cat.#	qty.
10 x 2.1mm	916450212	3
10 x 4.0mm	916450210	3
20 x 4.0mm	916450220	2



Ultra IBD HPLC Columns

Excellent Peak Shape for Acids and Bases



Restek's Ultra IBD column

The Ultra IBD can operate under both reverse and normal phase conditions and retains compounds across a wide range of mobile phase compositions. Request a copy of Restek's Applications Note cat. #59512, *The Ultra IBD Column Allows HPLC Separation of Polar and Non-Polar Analytes from the Same Sample*, for more detailed information.

Visit our website

at www.restekcorp.com and see our growing compilation of HPLC application chromatograms:

- LC_0129** Adenine, Adenosine, ATP, ADP, and AMP on Ultra IBD
- LC_0130** Cytosine, Cytidine, CTP, CDP, and CMP on Ultra IBD
- LC_0131** Guanine, Guanosine, GTP, GDP, and GMP on Ultra IBD
- LC_0132** Thymine, Thymidine, TTP, TDP, and TMP on Ultra IBD
- LC_0130** Uracil, Uridine, UTP, UDP, and UMP on Ultra IBD

Restek's Ultra IBD (intrinsically based deactivated) phase exhibits excellent peak shape and selectivity for acids, bases, zwitterions, and polar compounds. In contrast to conventional C18 columns, the Ultra IBD phase contains a polar functional group within the hydrocarbon bonded chain. This allows the column to retain solutes not only by hydrophobic interactions, but also by polar attraction forces between the stationary phase and the analyte.

Features & Benefits

Feature	Benefit
Separates acids, bases, zwitterions, and neutral compounds.	One column can analyze a wide range of compounds simultaneously.
Can be used with a wide range of mobile phase polarity and pH.	More flexibility with method development.
Excellent batch-to-batch consistency.	Reproducible analyses.
Highly retentive phase.	Improved LC/MS sensitivity and HPLC resolution.

Figure 1a

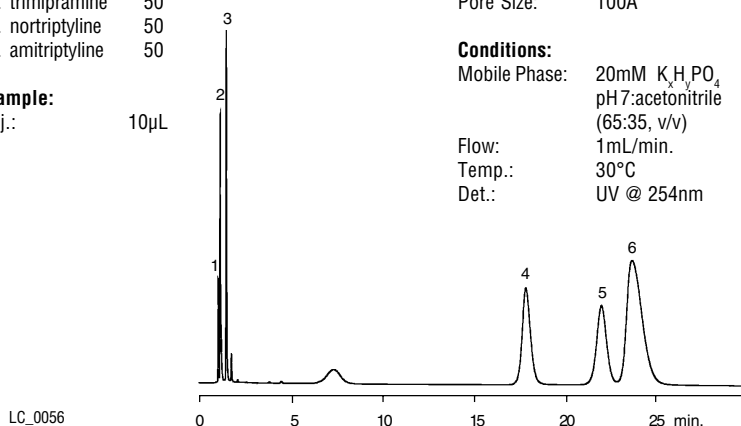
Restek's Ultra IBD column exhibits excellent peak shape for acidic and basic compounds at a neutral pH.

Peak List:	Conc. (µg/mL)
1. uracil	5
2. benzoic acid	50
3. maleate	5
4. trimipramine	50
5. nortriptyline	50
6. amitriptyline	50

Sample:
Inj.: 10 µL

Column: Ultra IBD
Catalog #: 9175565
Dimensions: 150 x 4.6mm
Particle Size: 5 µm
Pore Size: 100 Å

Conditions:
Mobile Phase: 20mM $K_2H_2PO_4$
pH 7: acetonitrile (65:35, v/v)
Flow: 1 mL/min.
Temp.: 30°C
Det.: UV @ 254nm



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Peak shape of basic compounds on bonded phase silica can be improved by lowering the pH to protonate active silanols. However, doing so can cause problems with some samples that are labile at acidic pH conditions. The Ultra IBD column performs well even under neutral pH mobile phase conditions. Figures 1a and 1b show the separation of acidic and basic compounds under neutral and acidic mobile phase conditions. The two elution order reversals between Figures 1a and 1b demonstrate how selection of pH can be used to alter selectivity.

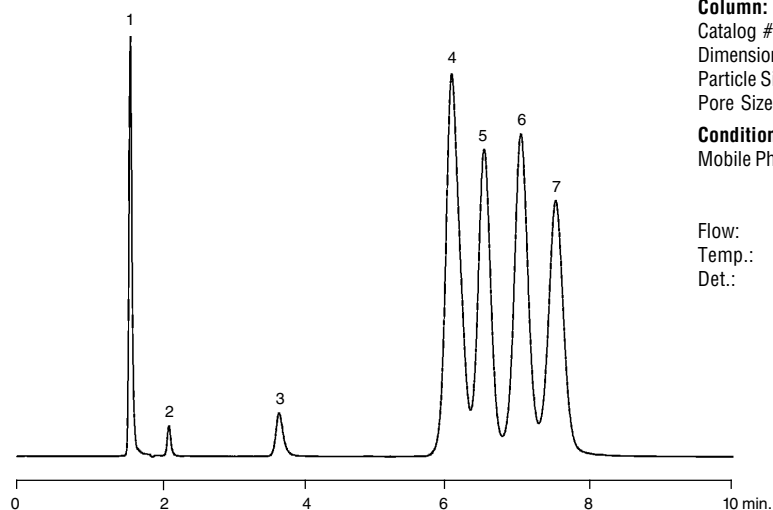
Figure 1b

Restek's Ultra IBD column exhibits excellent peak shape for acidic and basic compounds at an acidic range of pH.

Peak List:	Conc. (µg/mL)
1. uracil	5
2. unknown	
3. maleate	5
4. benzoic acid	50
5. nortriptyline	50
6. amitriptyline	50
7. trimipramine	50

Sample:
Inj.: 10µL
Solvent: mobile phase

Column: Ultra IBD
Catalog #: 9175565
Dimensions: 150 x 4.6mm
Particle Size: 5µm
Pore Size: 100Å
Conditions:
Mobile Phase: 20mM KH₂PO₄
pH3:acetonitrile
(70:30, v/v)
Flow: 1mL/min.
Temp.: 30°C
Det.: UV @ 254nm



LC_0057

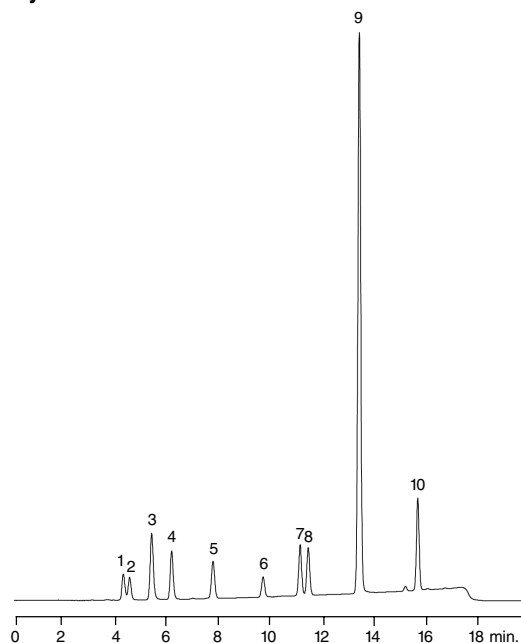
Figure 2

Ultra IBD shows great selectivity for Carbamates.

Peak List:	
1. aldicarb sulfoxide	
2. aldicarb sulfone	
3. oxamyl	
4. methomyl	
5. 3-hydroxycarbofuran	
6. aldicarb	
7. propoxur	
8. carbofuran	
9. carbaryl	
10. methiocarb	

Sample:
Inj.: 5µL
Solvent: methanol
Conc.: 1mg/mL each
component

Column: Ultra IBD
Catalog #: 9175565
Dimensions: 150 x 4.6mm
Particle Size: 5µm
Pore Size: 100Å
Conditions:
Mobile Phase: water:methanol
(80:20 to 20:80
in 15 minutes)
Flow: 1mL/min.
Temp.: ambient
Det.: UV @ 220nm



LC_0134

Commonly Asked Questions

- ***Why is the Ultra IBD different from other HPLC columns?***

The Ultra IBD phase incorporates a polar functional group within the hydrocarbon chain, resulting in a column that exhibits excellent peak shape for acids, bases, zwitterions, and neutral compounds. The unique chemistry of this phase allows compounds to be retained by both hydrophobic and polar interactions.

- ***What advantage does the Ultra IBD offer for LC/MS analyses?***

Mobile phases with high aqueous content are required to obtain adequate retention of polar analytes with most conventional reverse phase packings. However, mobile phases with high aqueous content can cause sensitivity loss in LC/MS analyses. The polar interaction of the Ultra IBD phase provides excellent retention with higher organic content mobile phases, and also greatly reduces or eliminates the need for mobile phase modifiers that are often required to obtain symmetrical peaks and/or sufficient retention when analyzing highly polar compounds with other columns. This makes the Ultra IBD much more compatible with MS detection than traditional straight chain alkyl stationary phases.

- ***What are the particle and pore sizes of the silica used for the Ultra IBD phase?***

The Ultra IBD is offered in both 3 and 5µm, spherical Type B silica with a 100 Angstrom pore size.

- ***What are the pH and temperature limits for the Ultra IBD phase?***

The Ultra IBD phase can be used from pH 2 to pH 8 and at temperatures up to 80°C.

- ***Are guard columns available for the Ultra IBD columns?***

Restek's unique Trident™ guard column system is available for the Ultra IBD column. The integral leak-free design of the Trident™ system contains a cap frit that can be replaced easily without disturbing the packed bed. The guard cartridge, packed with the Ultra IBD phase also can be replaced easily as needed.

Ultra IBD

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***Restek is your free
technical literature source!***

Application Notes:

(#59511) Improved HPLC
Analysis of Analgesics

(#59512) The Ultra IBD Column Allows
HPLC Separation of Polar and Non-Polar
Analytes from the Same Sample

(#59510) HPLC Stationary Phase Selection
for the Analysis of Steroids

(#59118) Allure™ PFP Propyl HPLC Column
Provides Improved LC/MS Analyses of
Basic Compounds

(#59141) Analyze Nucleotides,
Nucleosides, Purine, and Pyrimidine Bases
Simultaneously with the Ultra IBD Column

(#59398) Analysis of Preservatives
Using HPLC

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- **Online** www.restekcorp.com

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Ultra IBD

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■ Ultra IBD 3µm Columns

Column Length	1.0mm ID cat.#	2.1mm ID cat.#	3.2mm ID cat.#	4.6mm ID cat.#
30mm	9175331	9175332	9175333	9175335
50mm	9175351	9175352	9175353	9175355
100mm	9175311	9175312	9175313	9175315
150mm	9175361	9175362	9175363	9175365

■ Ultra IBD 3µm Columns with Trident™ Inlet

Column Length	2.1mm ID cat.#	3.2mm ID cat.#	4.6mm ID cat.#
30mm	9175332-700	9175333-700	9175335-700
50mm	9175352-700	9175353-700	9175355-700
100mm	9175312-700	9175313-700	9175315-700
150mm	9175362-700	9175363-700	9175365-700

■ Ultra IBD 5µm Columns

Column Length	1.0mm ID cat.#	2.1mm ID cat.#	3.2mm ID cat.#	4.6mm ID cat.#
30mm	9175531	9175532	9175533	9175535
50mm	9175551	9175552	9175553	9175555
100mm	9175511	9175512	9175513	9175515
150mm	9175561	9175562	9175563	9175565
200mm	9175521	9175522	9175523	9175525
250mm	9175571	9175572	9175573	9175575

■ Ultra IBD 5µm Columns with Trident™ Inlet

Column Length	2.1mm ID cat.#	3.2mm ID cat.#	4.6mm ID cat.#
30mm	9175532-700	9175533-700	9175535-700
50mm	9175552-700	9175553-700	9175555-700
100mm	9175512-700	9175513-700	9175515-700
150mm	9175562-700	9175563-700	9175565-700
200mm	9175522-700	9175523-700	9175525-700
250mm	9175572-700	9175573-700	9175575-700

■ Ultra IBD Guard Cartridges

Dimensions	cat.#	qty.
10 x 2.1mm	917550212	3
10 x 4.0mm	917550210	3
20 x 4.0mm	917550220	2

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Minimize Adsorption of Active Analytes, Using a Drilled Uniliner® GC Inlet Liner

Two Configurations, to Match Chromatographic Conditions

In sample injections into a hot splitless injection port liner, a typical 1 μ L sample expands to a volume of hundreds of microliters.¹ The sample solvent vapor, and the analytes, fill the entire injector system. During sample expansion, analyte molecules come in contact with hot, active surfaces outside the injection port liner, and occupy the dead volume at the bottom of the injection port, below the inlet end of the column (Figure 1). In splitless injection mode, there is very little carrier gas flow in this area to carry the analytes back up to the column inlet. This situation is most noticeable with active compounds that degrade when they come in contact with active surfaces; recoveries can be significantly reduced. In addition, late-eluting compounds that do not readily vaporize are affected by injection port discrimination.

The innovative geometry of a Drilled Uniliner® inlet liner minimizes active sites in the sample pathway, and reduces injection port discrimination. The analytical column connects to the bottom of a Drilled Uniliner® inlet liner via a Press-Tight® seal (Figure 1), eliminating sample contact with any part of the injector below the column inlet. Recoveries of active analytes are significantly improved.² Additionally, the hole in the side of the liner allows the injector to be operated in traditional split/splitless mode.

Restek offers Drilled Uniliner® inlet liners in two configurations (Figure 2). The liner to use depends on the analysis, and how closely the early-eluting compounds elute to the solvent peak.

In flash on-column injections, all of the solvent is transferred from the injector to the column, producing a substantial solvent peak tail. Splitless injection eliminates the solvent tail, because the injector goes into the split mode after the compounds of interest are transferred to the column, and all solvent remaining in the injection port is flushed out through the purge vent. The solvent peak ends abruptly, as shown in Figure 3a. Elimination of the solvent peak tail is an advantage to using the splitless injection technique when analyzing compounds that elute close to the solvent.

A Drilled Uniliner® inlet liner produces a distinctly different solvent peak shape than the single gooseneck splitless liner, as shown in Figure 3. The most noticeable difference is the peak width; the peak is considerably narrower than the peak from the single gooseneck liner. The position of the hole in the Drilled Uniliner® also affects solvent peak shape. A Drilled Uniliner® with the hole near the bottom produces a sharply ending solvent peak, similar to that from a single gooseneck liner (Figure 3b). This liner is a direct replacement for a splitless liner, and should be used when analytes elute closely behind the solvent.

Figure 1 — Inlet liner geometry affects analyte recovery.

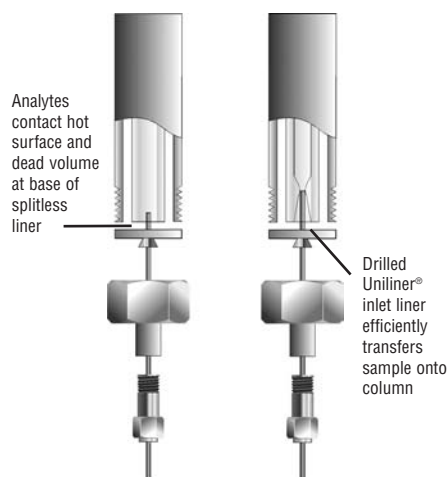
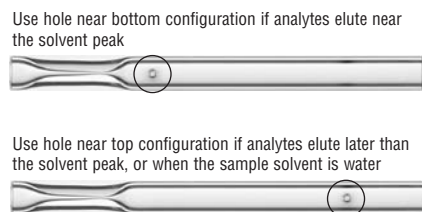


Figure 2 — Drilled Uniliner® inlet liners are available in two configurations. The hole allows the injector to be operated in split/splitless mode.



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Under the same conditions, a Drilled Uniliner® with the hole near the top produces a solvent peak with a small tail (Figure 3c). This is because solvent remaining in the liner, between the hole and the column entrance, is not swept out of the injection port when the injector goes into the split mode. Consequently, we recommend this liner for analyses in which the analytes would not be affected by a solvent tail, such as chlorinated pesticide analysis. A Drilled Uniliner® with the hole near the top will provide the best transfer of analytes to the column, and is recommended when transfer of analytes to the column is paramount. A Drilled Uniliner® with the hole near the top also exhibits excellent reproducibility for analysis of glycols in water³.

For accurate, reproducible, problem-free split/splitless injections, we recommend you use a Drilled Uniliner® inlet liner—and connect it to a Restek capillary GC column.

References

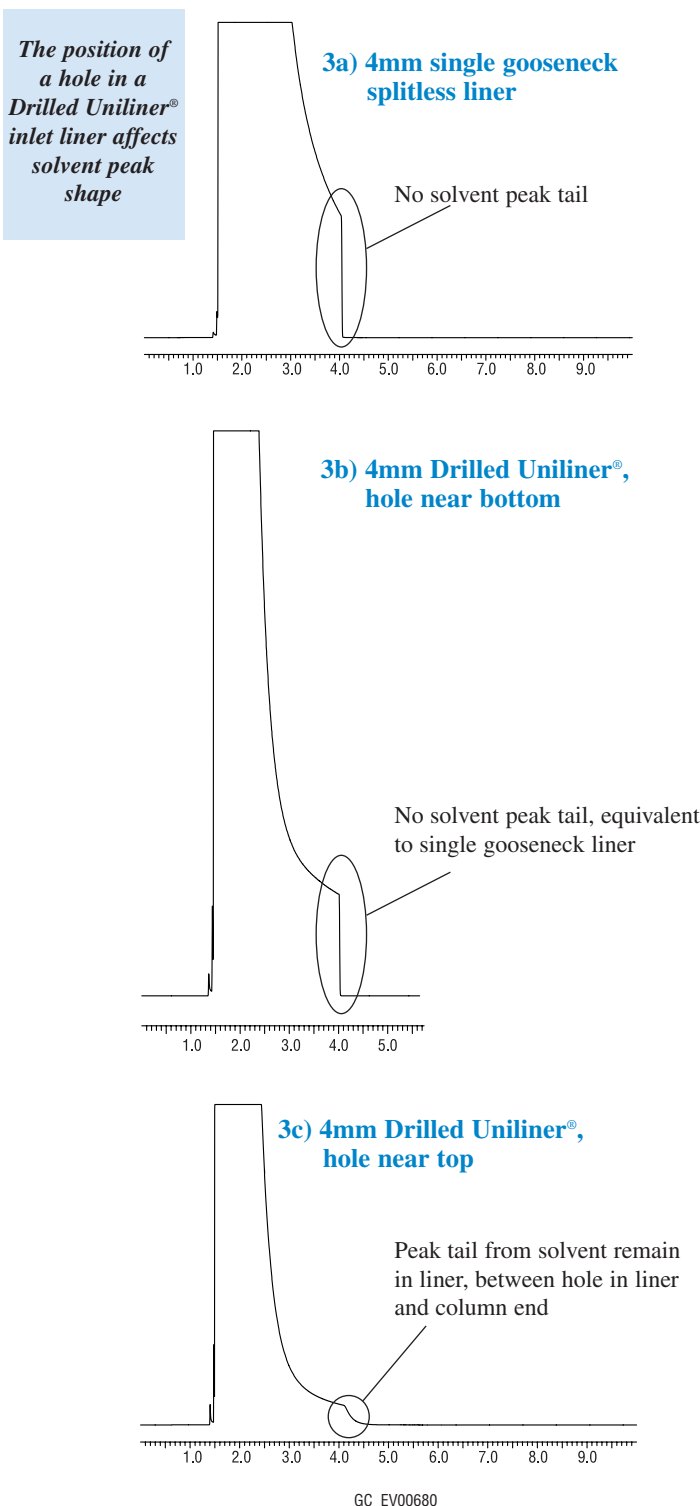
1. *Operating Hints for Using Split/Splitless Injectors* Restek Corporation, Bellefonte, PA, 36pp, 2002. (Reference free on request: cat.# 59880A)
2. *Higher Responses for Chlorinated Pesticides, Using a Drilled Uniliner® GC Inlet Liner and Rtx®-CLPesticides Columns* Restek Corporation, Bellefonte, PA, 4pp, 2003. (Reference free on request: cat.# 59487.)
3. *Techniques to Optimizing GC Analysis of Ethylene glycol in Water* Restek Corporation, Bellefonte, PA, 4pp, 2001. (Reference free on request: cat.# 59187.)

HOT Tech! Tip!

Drilled Uniliner®

The Drilled Uniliner® with the hole near the bottom is recommended for analysis in which compounds of interest could be affected by a tailing solvent peak. The Drilled Uniliner® with the hole near the top is recommended for aqueous injections, as well as analysis in which the compounds of interest elute away from the solvent peak.

Figure 3 – Solvent peak profiles from Drilled Uniliner® inlet liners and a splitless liner



Rtx®- 5Sil MS 30m, 0.25 ID, 0.25µm (cat.# 12723)
Sample: methylene chloride, PR grade
Inj.: 0.5µL, splitless (hold 2.5 min.)
4mm single gooseneck inlet liner (cat.# 20799)
4mm Drilled Uniliner® inlet liner (cat.# 21055)
4mm Drilled Uniliner® inlet liner (cat.# 20756)

Inj. temp.: 260°C
Carrier gas: helium, constant pressure
Linear velocity: 17cm/sec. @ 50°C
Oven temp.: 50°C, isothermal
Det.: FID @ 330°C

all liners are
100%
deactivated

All liners are shipped intermediate polarity (IP) deactivated unless otherwise requested.

Drilled Uniliner® GC Inlet Liners

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**Hole makes direct injection possible
with EPC-equipped Agilent 6890 GCs!**

Direct Injection Liners for Agilent 5890 & 6890 GCs (For 0.25/0.32/0.53mm ID Columns)

	Benefits/Uses	ID*/OD & Length (mm)	Similar to Agilent part #	ea.	cat.# 5-pk.	25-pk.
Drilled Uniliner® (hole on top)	trace, active samples, high recovery & linearity	4.0 ID 6.3 OD x 78.5	—	21054	21055	20998
Siltek™ Drilled Uniliner® (hole on top)	trace, active samples, high recovery & linearity	4.0 ID 6.3 OD x 78.5	—	21054-214.1	21055-214.5	20998-214.25
Drilled Uniliner® (hole on bottom)	trace, active samples, high recovery & linearity	4.0 ID 6.3 OD x 78.5	G1544-80730	20756	20771	—
Double Gooseneck Drilled Uniliner® (hole on top)	trace, active samples, high recovery & linearity	4.0 ID 6.3 OD x 78.5	—	20508	20509	—
Double Gooseneck Drilled Uniliner® (hole on bottom)	trace, active samples, high recovery & linearity	4.0 ID 6.3 OD x 78.5	G1544-80700	20954	20989	—
Siltek™ 1mm Drilled Uniliner® (hole on top)	trace, active samples, high recovery & linearity	1.0 ID 6.3 OD x 78.5	—	21390-214.1	21391-214.5	—

Direct Injection Liners for Varian 1177 GCs (For 0.25/0.32/0.53mm ID Columns)

	Benefits/Uses	ID*/OD & Length (mm)	Similar to Varian part #	cat.# ea.	cat.# 5-pk.	cat.# 25-pk.
Drilled Uniliner® (hole on top)	trace, active samples, high recovery & linearity	4.0 ID 6.3 OD x 78.5	—	21470	21471	—
Drilled Uniliner® (hole on bottom)	trace, active samples, high recovery & linearity	4.0 ID 6.3 OD x 78.5	—	21468	21469	—

Direct Injection Liners for Shimadzu GCs (For 0.32/0.53mm ID Columns)

	Benefits/Uses	ID*/OD & Length (mm)	Similar to Shimadzu part #	ea.	cat.# 5-pk.	25-pk.
Open-top Drilled Uniliner® (hole on top)	trace, active samples, high recovery & linearity	3.5 ID 5.0 OD x 95	—	21285	21286	—
Open-top Drilled Uniliner® (hole on bottom)	trace, active samples, high recovery & linearity	3.5 ID 5.0 OD x 95	—	21287	21288	—
Gooseneck Drilled Uniliner® (hole on top)	trace, active samples, high recovery & linearity	3.5 ID 5.0 OD x 95	—	21289	21290	—
Gooseneck Drilled Uniliner® (hole on bottom)	trace, active samples, high recovery & linearity	3.5 ID 5.0 OD x 95	—	21291	21292	—

Direct Injection Liners for PerkinElmer GCs (For 0.32/0.53mm ID Columns)

	Benefits/Uses	ID*/OD & Length (mm)	Similar to PE part #	ea.	cat.# 5-pk.	25-pk.
Auto SYS Drilled Uniliner® (hole on top)	trace, active samples, high recovery & linearity	4.0 ID 6.2 OD x 92.1	—	20819	20822	—
Auto SYS Drilled Uniliner® (hole on bottom)	trace, active samples, high recovery & linearity	4.0 ID 6.2 OD x 92.1	—	21293	21294	—
Auto SYS Gooseneck Drilled Uniliner® (hole on top)	trace, active samples, high recovery & linearity	4.0 ID 5.0 OD x 92.1	—	21295	21296	—
Auto SYS Gooseneck Drilled Uniliner® (hole on bottom)	trace, active samples, high recovery & linearity	4.0 ID 6.2 OD x 92.1	—	21297	21298	—

Direct Injection Liners for Thermo Finnigan 8000 & TRACE™ Series GCs (0.32 & 0.53mm ID columns)

	Benefits/Uses	ID*/OD & Length (mm)	Similar to TF part #	ea.	cat.# 5-pk.	25-pk.
Drilled Uniliner® (hole on top)	trace, active samples, high recovery, & linearity	5.0 ID 8.0 OD x 105	—	22411	22412	—
Drilled Uniliner® (hole on bottom)	trace, active samples, high recovery, & linearity	5.0 ID 8.0 OD x 105	—	22413	22414	—

*Nominal ID at syringe needle expulsion point.

Drilled Uniliner® GC Inlet Liners

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- For details about Siltek™ performance, request **FREE** publications **59803A** and **59111** – or view them on our website.
- Many Siltek™ treated accessories are listed in **Genuine Restek Replacement Parts for Agilent GCs** (59627D), also **FREE** on request.

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Liner Deactivations

Intermediate Polarity (IP) Deactivation

- Phenylmethyl-deactivated surface for better recovery of polar and nonpolar compounds.
- Compatible with most common solvents.
- Our standard deactivation—every Restek liner is IP deactivated unless otherwise requested.

Siltek™ Deactivation

- Revolutionary deactivation for difficult matrices and reactive compounds.
- Inertness retained over a wide sample pH range.
- Minimal bleed.
- Ideal for chlorinated pesticide analysis; lowers endrin breakdown to less than 1%.
- Recommended for use with Rtx®-CLPesticides, Stx™-CLPesticides, Stx™-IHT, and Rtx®-TNT columns.

Base Deactivation

- Excellent inertness for basic compounds.
- Recommended for use with Rtx®-5 Amine, Rtx®-35 Amine, and Stabilwax®-DB columns.

Siltek™ Deactivation—The Next Generation

- Maximizes the inertness of the sample pathway.
- Minimizes breakdown.
- Low bleed.
- Thermally stable.
- “Clean and green”—manufactured without the use of harmful organic solvents.



Restek offers the next generation of deactivation. The Siltek™ deactivation process (US Patent 6,444,326) produces a highly inert glass surface, that features high temperature stability, extreme durability, and low bleed. Try Siltek™ liners, guard columns, wool, and connectors for better recovery of sample analytes.

Add the corresponding suffix number to the liner catalog number. (Additional cost.)

qty.	Siltek™	Siltek™ with Siltek™ wool	Siltek™ with CarboFrit™
each	-214.1	-213.1	-216.1
5-pk.	-214.5	-213.5	-216.5
25-pk.	-214.25	-213.25	-216.25

A Good Word

“I installed Siltek™ liners on one of our GCs to replace standard quartz liners that required deactivating daily. I found the results to be excellent, saving many hours of instrument time with no detrimental effects on the analysis.”

Matthew Turner, Laboratory Manager—food contaminants, Global Analysis (UK)

Base-Deactivated Inlet Liners for Agilent GCs

Add the corresponding suffix number to the liner catalog number.
(Additional cost.)

qty.	Base-Deactivated	Base-Deactivated w/ Base-Deactivated Wool
each	-210.1	-211.1
5-pk.	-210.5	-211.5
25-pk.	-210.25	-211.25

*Ideal for amines
and basic compounds!*

Lit. Cat. # 59877

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Cool Tools!

for GC and HPLC

Restek Innovation Saves
You Time and Money

Ceramic Scoring Wafers

- Four straight scoring edges for cutting fused silica tubing and four serrated edges for cutting MXT[®] metal capillary columns.
- Sure-grip handle included.

**Make clean,
square cuts**



Hold the scoring wafer at a 45° angle to the tubing. Use gentle pressure and a smooth, perpendicular stroke.



Check the cut against the white of the scoring wafer. Look for a clean, square cut.

Description	qty.	cat.#
Ceramic Scoring Wafers	5-pk.	20116

Scoring Wafer with Handle

- Unique, ergonomic handle is made of soft, comfortable rubber.
- Ceramic wafer is serrated on one side and straight-edged on the other to cut both fused silica and metal tubing cleanly.

**Great scoring,
comfortable
grip**



Hold tubing firmly in one hand, allowing about two inches to extend freely. Hold the scoring wafer at a 45° angle to the tubing. Exert slight pressure—just



enough to put a slight arc in the tubing. Pull perpendicularly across the tubing. The tubing should fall off on its own, or it should easily break at the score with a slight tap of the wafer. Check the cut against the white of the scoring wafer. Look for a clean, square cut.

enough to put a slight arc in the tubing. Pull perpendicularly across the tubing.

Description	qty.	cat.#
Scoring Wafer with Handle	2-pk.	23015

Sapphire Scribe

- Cuts fused silica tubing.
- Produces a clean, square cut.

**Clips in shirt or lab coat
pocket**



One quick stroke...



...and tap leaves a clean, square end.

Description	qty.	cat.#
Sapphire Scribe	ea.	20182

Septum Puller



- Keep several on hand in your laboratory—can be used in many different ways.
- Use hooked end for removing septa and O-rings; pointed end works well for removing stuck ferrule fragments.



Dislodge a stuck ferrule quickly and easily—with-out scoring the fitting.



Remove septa without damaging an expensive weldment.

Description	qty.	cat.#
Septum Puller	ea.	20117

Inlet Liner Removal Tool

- Easily remove liner from injector.
- Made from high-temperature silicone.
- Won't chip or crack the liner.

**No more
burned
fingers!**



Gently push the liner removal tool onto the liner in the injection port, with a slight circular motion.



Slowly pull the liner out of the injection port in a straight vertical motion.



Use the liner removal tool to place a new liner into the injection port, avoiding hot metal surfaces.

Description	qty.	cat.#
Inlet Liner Removal Tool	3-pk.	20181

Mini Wool Puller/Inserter

Insert and remove wool plugs easily.* Order a spare pack so you'll always have one available.



Place a 1cm plug of loosely bound wool in the liner. Adjust its position with the puller/inserter tool.



Use the hooked end to retrieve a wool plug.

Description	qty.	cat.#
Mini Wool Puller/Inserter	2-pk.	20114

*Not recommended for use with double gooseneck liners.



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Inlet Liner Packing Tool



Eliminate user variation!

- Position wool reproducibly every time.
- Accurate placement to a specific, measured depth, up to 100mm.

Recommended for inlet liners with an ID ≥ 2 mm.



Loosen the nut on the side of the tool and adjust the gauge to the manufacturer's recommended depth.



Place a one-centimeter plug of loosely bound wool at the top of the inlet liner.



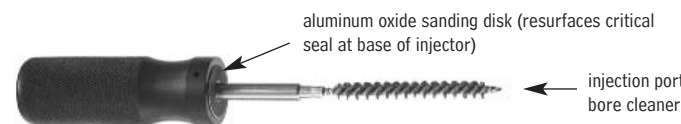
Insert the liner packing tool into the liner until the tool bottoms out. The wool is now positioned correctly in the liner and the liner is ready for use.

Description	qty.	cat.#
Inlet Liner Packing Tool	ea.	20339

Injection Port Repair Tool

- Resurfaces critical inlet seal areas.
- For Agilent split/splitless injection ports.

Remove contaminants, achieve a better seal!



The critical seal at the base of a split/splitless injector allows a seal to form between the injection port and the inlet liner. This critical seal wears over time and may become scratched or pitted, which compromises the sealing ability of the injector. Use the Restek injection port repair tool to easily resurface the inlet seal and remove contaminants; it saves time and money by preventing leaks.

Description	qty.	cat.#
Injection Port Repair Tool	ea.	21393
Replacement Sanding Disks (5 fine & 5 medium)	10-pk.	22689

GC Accessories Organizer for Agilent 5890/6890 and Varian GCs

- Ideal for keeping GC accessories and supplies organized and easy to find.
- Built-in syringe and vial holders.
- Mounts on the GC for easy access.
- Includes all mounting hardware.



GC accessories and supplies not included.

Description	qty.	cat.#
GC Accessories Organizer for Agilent 5890/6890 and Varian GCs	ea.	22681

Injector Wrench for Agilent 5890/6890/6850 GCs

- Use to remove the septum nut and weldments during GC maintenance.
- High-quality stainless steel construction.
- Meets original equipment performance.



Use the smaller end to remove the septum nut.



Use the larger end to tighten the split/splitless weldment nut.

Description	Similar to Agilent part #	qty.	cat.#
Injector Wrench for Agilent 5890/6890/6850 GCs	19251-00100	ea.	22065

Capillary Installation Gauge for Agilent 5973 MS

- Pre-seats ferrule onto column for consistent installations.
- Made from high-quality stainless steel.



Install the nut and ferrule onto the column, then insert the column through the installation tool, exposing several centimeters at the exit end. Tighten the nut.



Score and remove the exposed end of the column, then loosen the nut.



The ferrule will be properly seated and should remain in place when light force is applied. Install the column into the GC/MS interface.

Description	Similar to Agilent part #	qty.	cat.#
Capillary Installation Gauge for Agilent 5973 MS	G1099-20039	ea.	21894

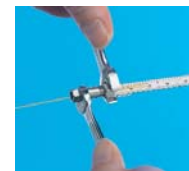
Easily pre-seat ferrules for consistent installations!

Capillary Installation Gauge

- Pre-seats graphite* ferrule onto column for consistent installations.
- Prevents crushed column ends.
- Made from high-quality stainless steel.



Install the column nut and ferrule onto the capillary column. Cut the column end squarely. Slide the column into the installation gauge to the recommended insertion distance. Finger-tighten the column nut.



Tighten the assembly with moderate force to ensure a properly seated ferrule. Loosen the assembly and remove the column and column nut with seated ferrule.



The ferrule will be properly seated in the column nut, and should remain in place when light force is applied. If it slides loosely on the column, repeat procedure.

Description	qty.	cat.#
Capillary Installation Gauge for Agilent-style fittings (compact ferrules)	ea.	21034
Capillary Installation Gauge for 1/16" fittings (1/16" ferrules)	ea.	21399

*Recommended for use with graphite ferrules.



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Rethreading Tool

- Repair worn or damaged threads.
- Multiple uses (fittings, injectors, detectors, etc.)
- Built-in guide to prevent cross-threading.



Due to constant installation, removal, and exposure to extreme temperature changes, threads on GC parts become worn and damaged. This can cause a poor seal, and oxygen can enter the system, compromising analytical results and possibly destroying expensive analytical columns.



Screw the rethreading tool completely onto the injection port in a clockwise direction. Depending on the severity of thread damage, this may require some force.



Description	qty.	cat.#
Rethreading Tool for 1/16" compression fitting	ea.	23016
Rethreading Tool for 1/8" compression fitting	ea.	23017
Rethreading Tool for 1/4" compression fitting (Agilent split/splitless injection ports)	ea.	23018
Rethreading Tool for 7/16" compression fitting (Varian injection ports)	ea.	23019
Rethreading Tool for 1/4" Varian-style capillary column fittings	ea.	21893

MLE Capillary Tool Kit

Make life easier! The MLE Tool Kit conveniently provides tools necessary for installing and maintaining capillary columns.

The MLE Tool Kit includes:

- Rubber-tipped slide-lock tweezers.
- 15cm compact steel ruler.
- Three ceramic scoring wafers with handles.
- Pocket magnifier.
- Four-inch tapered needle file.
- Six stainless steel jet reamers (0.25–0.65mm OD).
- Septum puller.
- Three nylon brushes (1/8", 3/16", and 1/4-inch OD).
- Pipe cleaner (one-foot length).
- 1/4" x 3/16-inch wrench.
- 3/8" x 7/16-inch, 7/16" x 1/2-inch, and 1/2" x 3/16-inch wrench.
- One-meter length of high-temperature string (400°C).
- Stainless steel surface brush.
- Mini wool puller/insertor tool.
- Inlet liner removal tool.
- Three stainless steel tube brushes (3/16", 1/4", and 3/8-inch OD).
- 25-pack cotton swabs.
- Flashlight.
- Column installation gauge for Agilent-style nuts.
- Mini hand drill set.



Description	qty.	cat.#
MLE Capillary Tool Kit	kit	20180

Free Literature!



Chromatography Columns and Supplies Catalog
(lit. cat.# 59854)
Designed by chromatographers, for chromatographers.

The 2004 Restek catalog features unique new GC and HPLC columns, problem-solving chromatography tools and accessories, high-value instrument parts, sample collection and sample preparation products, many new reference chemical mixes, proprietary surface treatments for sample pathways, new chromatograms, and more.

Inlet and FID Maintenance Kits for Agilent GCs

- Include the most common consumable supplies.
- All parts meet or exceed performance of instrument manufacturer's parts.
- Parts list makes reordering easy.

The Inlet Maintenance Kit includes these tools and many others.



Dislodge ferrules or remove silica deposits with the Jet Reamer/Ferrule Remover.



The Capillary Installation Gauge makes seating the ferrule and installing the column consistent and easy.



The Inlet Liner Removal Tool safely removes an inlet liner from a hot injection port without cracking the liner.



Inlet kit includes:

- 0.4, 0.5, and 0.8mm ID graphite ferrules.
- Viton® O-rings.
- Capillary nuts.
- Inlet seals.
- Reducing nut.
- Scoring wafer.
- 11mm Thermolite® septa.
- 4.0mm single gooseneck liner.
- 4.0mm split liner with wool.
- Capillary column caps.
- 1/4" x 3/16-inch wrench.
- Septum puller.
- Installation gauge.
- Wire cleaning brush.
- Jet reamers/ferrule removers.
- Inlet liner removal tool.

The FID Maintenance Kit includes these tools and many others.



FID maintenance made easy with tools and replacement components specifically matched to your instrument.



The FID ignitor meets original equipment specifications.



The high-performance Siltek™ FID jet will stay clean longer—even when exposed to highly active compounds.



FID kits include:

- 1/4-inch, 0.4, 0.5, and 0.8mm ID graphite ferrules.
- FID/NPD capillary adaptor.
- Capillary nuts.
- Jet reamers/ferrule removers.
- 1/4-inch nut.
- Scoring wafer.
- Capillary column caps.
- Ignitor for Agilent 5890 or 6890/6850 GCs.
- FID flow measuring adaptor.
- 1/4" x 3/16-inch wrench.
- Installation gauge.
- Wire cleaning brush.
- High-performance Siltek™-treated FID jet for Agilent 5890 or 6890/6850 GCs.
- 1/4-inch nut driver for jet removal.

Description	qty.	cat.#
Inlet Maintenance Kit for Agilent 5890/6890/6850 GCs	kit	21069
FID Maintenance Kit for Agilent 5890 GCs	kit	21070
FID Maintenance Kit for Agilent 6890/6850 GCs	kit	21071



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PEEK® Fitting Extractor

Drill into the broken fitting, then screw the extractor into the fitting and remove it easily.



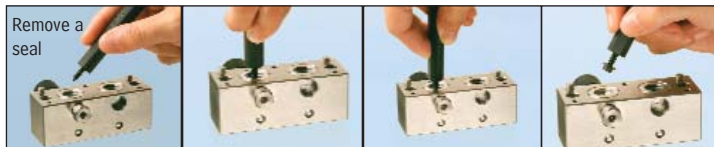
Description	qty.	cat.#
PEEK® Fitting Extractor	ea.	25325

HPLC Piston Seal Insertion Tool

- Simplify pump maintenance.
- One end removes old piston seal, other end easily and securely installs new seal.



Do you have to search for a paper clip or screw to remove worn seals from your HPLC pump? Then, once you get the old seal out, do you struggle to correctly seat the new seal? Now Restek has a tool that can help. Use one end to remove your old seal, then simply slip your new seal on the other end and push it flush into position. The tool cannot mar the surrounding metal surface of the pump housing.



Description	qty.	cat.#
HPLC Piston Seal Insertion Tool	ea.	21356

Visit www.restekcorp.com for a complete listing of HPLC replacement parts for Agilent, Waters, Perkin Elmer, Shimadzu, Hitachi, and Beckman systems.

Free
Literature!



HPLC Columns and Accessories

(lit. cat. # 59241A)

In addition to general-purpose and special-purpose HPLC columns and guard columns, this 114-page catalog contains instrument parts, innovative tools, and other accessories, and many example chromatograms from analyses on Restek columns. Columns are prepared from four distinct lines of silica with characteristics tailored to meet specific analytical requirements.



Lit. Cat. # 59879-INT

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Trident™ Integral HPLC Guard Column System

Offers Maximum Protection Against Contaminants and Particulate Matter

Hot Tech Tip!

High backpressure is one of the most common problems encountered when performing HPLC analysis. Normal column backpressure is observed after a new column has been installed and equilibrated with the mobile phase. Unfortunately, this pressure will often increase with use because of particulates collecting on the column inlet frit.

The source of these particles can be from sample impurities, mobile phase contaminants, and the injector or autosampler rotor seal. The presence of particles can result in increased backpressure, split peaks, tailing, and eventually over-pressure shut-down. In some circumstances, these problems can be corrected by back-flushing the column. However, in many cases it results in an unusable column.

To reduce backpressure problems, all samples and mobile phase solvents must be filtered before use; and rotor seals should be changed on a routine basis. Along with these preventative measures, it is advisable to use column prefilters such as the Trident™ column protection system. When using a prefilter, particles build up on its inexpensive, replaceable frit, instead of the permanent frit at the head of the column.

Trident™ Guard Column Protection Systems save you time and money!

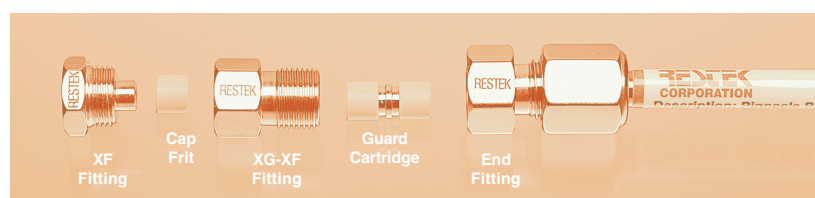
Features & Benefits

Feature	Benefit
Protection against both contaminants and particulates	Extends column life and saves money
Integral leak-free design	Eliminates connecting tubing and extra dead volume
Multiple configuration	Provides the appropriate level of protection
Easy to install	Convenient, time-saving installation
Replaceable external frit	Protects column and guard from particulates

The system's foundation consists of the analytical column configured with our exclusive Trident™ end fitting and XF fitting. This configuration contains the standard internal frit as well as a replaceable cap frit, which can be easily changed without disturbing the packed bed. Changing the external frit can reverse the effects of accumulated particles, such as high backpressure or peak distortion. To obtain this basic configuration, simply order any Restek HPLC column that has a (-700) suffix catalog number.



For maximum protection against contaminants and particulate matter, the system can be configured with both an integral guard cartridge and a replaceable external frit. To obtain this configuration, simply order any Restek HPLC column that has a (-700) suffix catalog number, the XG-XF male fitting (cat.# 25026), and the appropriate pack of guard cartridges (see back).



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Trident™ Guard Column System



At-a-Glance
Product
Information
from Restek

*Restek is your free technical
literature source!*

- **Call** 800-356-1688, ext. 5
- **Fax** 814-353-1309
- **Online** www.restekcorp.com

Commonly Asked Questions

- *Can the Trident™ Integral Guard system be used with other manufacturers columns?*

Due to the Trident's integral design, the inlet end fitting is specifically machined to accept the XF or XG-XF male fitting. Therefore the Trident™ Integral Guard system can only be used with columns manufactured by Restek.*

- *How do I know which Trident™ Guard system is right for me?*

The standard Trident™ XF system provides protection against particulate matter while the high-performance XG-XF system protects against particulates as well as chemical contaminants or sample impurities.

- *How do I order the XG-XF system?*

Simply order any Restek HPLC column that has a (-700) suffix catalog number, an XG-XF fitting (cat.#25026), and the appropriate pack of guard cartridges (see below).

- * A stand alone version of the Trident system is available which can be used with other manufacturers columns. Please call for more information.

Product Listing

Trident™ HPLC Guard Column Fittings and Frits

Description	cat.#
XG-XF Fitting for 1cm Guard Cartridge	25026
Replacement XF Filter Fitting	25024
Replacement Cap Frits, 2µm	25022
Replacement Cap Frits, 0.5µm	25023

Trident™ HPLC Guard Column Cartridges

	(10 x 2.1mm)	(10 x 4.0mm)
Guard Cartridge	cat.#	cat.#
Allure Acidix	916250212	916250210
Allure Basix	916150212	916150210
Allure C18	916450212	916450210
Allure Silica	916050212	916050210
Ultra Amino	910750212	910750210
Ultra C1	910150212	910150210
Ultra C4	910250212	910250210
Ultra C8	910350212	910350210
Ultra C18	917450212	917450210
Ultra Cyano	910650212	910650210
Ultra IBD	917550212	917550210
Ultra Phenyl	910550212	910550210
Ultra Silica	910050212	910050210

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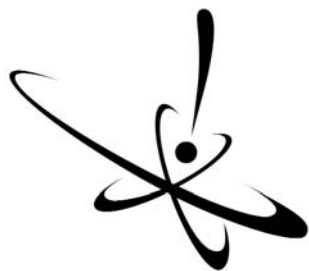
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Silcosteel®-CR Patent pending.

Achieve specialty alloy performance using austenitic stainless steels!

Restek
Exclusive!



Restek
Performance
Coatings



Enhance the corrosion resistance of steel and stainless steel, using Silcosteel®-CR treatment:

- Prolong component lifetimes.
- Reduce the need for preventive maintenance.
- Reduce contamination caused by corrosion.
- Save money, relative to using super alloys.

In acidic environments it is critical to engineer solutions to account for the depreciation of equipment caused by corrosion. Current commercial solutions that address corrosion are specialized alloys (e.g., Inconel®, Monel®, Hastelloy®)—or coatings.

Coatings often are employed as acid-resistant barriers between the corrosive environment and the equipment. Silcosteel®-CR surface treatment offers major advantages over traditional coatings: our chemical vapor deposition process incorporates the coating into the stainless steel lattice, eliminating delamination and blistering, common problems with traditional overlay coatings which rely primarily on primers or surface tension to remain in contact.

We developed the Silcosteel®-CR treatment specifically to protect equipment exposed to hydrochloric acid, nitric acid, sulfuric acid, or marine environments. A Silcosteel®-CR treatment upgrades the corrosion resistance of 300-grade stainless steels by greater than an order of magnitude.

A Silcosteel®-CR treatment is both durable and flexible. The coating builds from many starting points on the steel surface. Repeated overlaying as the coating grows on the surface creates a dense, chemically inert layer. The layering process also creates flexibility—coated components can be worked into place without cracking, chipping, or otherwise damaging the coating.

Figure 1 shows a cross-section optical micrograph of a Silcosteel®-CR treated coupon having a surface roughness average of 16 micro inches. The dense, well-bonded layer will afford reliable protection from acidic media. Several standardized corrosion testing protocols have been performed on the Silcosteel®-CR treatment. Below are the results of some of these tests.

Pitting and Crevice Corrosion Testing of Silcosteel®-CR Treated 316L Stainless Steel Coupons and Bare Coupons, by ASTM G 48, Method B

Each sample was weighed to the nearest 0.0001 gram, then a rubber gasket was wrapped around the center to simulate a crevice. Each sample was immersed in 6% by weight ferric chloride solution for 72 hours, per the ASTM test method. After 72 hours, the sample was recovered, the rubber gasket was removed, the sample was rinsed with deionized water, then with acetone, then was dried. The dried samples were reweighed to the nearest 0.0001 gram, to determine weight loss.



Figure 1 The Silcosteel®-CR coating is a well-bonded, dense layer designed to protect the substrate from attack by acids.

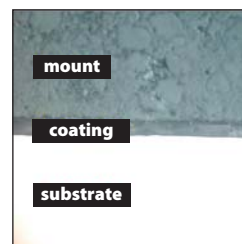




Table 1 summarizes the results of this experiment. Silcosteel®-CR treated 316L stainless steel samples exhibited an order of magnitude less corrosion, compared to bare samples. As seen in Figures 2 and 3, Silcosteel®-CR treated coupons exhibited no crevice corrosion, while untreated coupons exhibited severe crevice corrosion. Silcosteel®-CR treated coupons experienced only slight pitting corrosion during this aggressive test.

Figure 2 Silcosteel®-CR treated 316L stainless steel coupons show no crevice corrosion and only slight pitting corrosion.



Table 1 Silcosteel®-CR treated coupons show little weight loss after exposure to 6% w/w ferric chloride solution.

Sample	Weight Loss (g/m²)
Silcosteel®-CR sample 17	19
Silcosteel®-CR sample 28	25
Silcosteel®-CR sample 47	25
Bare Steel sample 27	231
Bare Steel sample 34	209
Bare Steel sample 37	228

Figure 3 Bare 316L stainless steel coupons exhibit severe crevice corrosion.



Cyclic Polarization Electrochemical Corrosion Testing of Silcosteel®-CR Treated 316L Stainless Steel Coupons and Bare 316L and Bare 304 Stainless Steel Coupons, by ASTM G 61

Samples were tested in accordance with ASTM G 61 in acidic and neutral aqueous solutions, at 23°C, at three chloride ion (Cl⁻) levels. Tables 2 and 3 summarize the test results: Silcosteel®-CR treated 316L stainless steel coupons outperformed bare 316L stainless steel by a factor of approximately 50 in neutral chloride solutions, and by approximately 10 in acidic chloride solutions. At a chloride concentration of 3000ppm, Silcosteel®-CR treated 316L stainless steel coupons outperformed 304 stainless steel coupons by a factor of approximately 65 in neutral solutions and by approximately 20 in acidic solutions. Table 4 summarizes the test results for Silcosteel®-CR treated 316L stainless steel and bare 304 stainless steel. Table 5 summarizes the corrosion potential, E_c, for Silcosteel®-CR treated 316L stainless steel.

Table 2 Silcosteel®-CR treatment greatly reduces corrosion rates in chloride solutions. (Corrosion rate in mpy (mil per year) determined by electrochemical testing.)

	Silcosteel®-CR	Bare Steel (316L)	Improvement
Neutral Solution			
100ppm chloride	0.0006	0.03	49X
3000ppm chloride	0.0009	0.03	32X
5000ppm chloride	0.001	0.03	29X
Acidic Solution (1N H₂SO₄)			
100ppm chloride	0.05	0.45	8X
3000ppm chloride	0.05	0.83	16X
5000ppm chloride	0.07	0.84	11X

Table 4 Corrosion of Silcosteel®-CR treated 316L stainless steel versus bare 304 stainless steel at 3000ppm Cl⁻ concentration.

	Silcosteel®-CR	Bare Steel (304)	Improvement
Neutral Solution			
Corrosion Rate, mpy	0.0009	0.06	66X
Breakdown Potential, E _b	1460	361	
Acidic Solution (1N H₂SO₄)			
Corrosion Rate, mpy	0.05	1.14	22X
Breakdown Potential, E _b	927	587	

Table 3 Breakdown or pitting potential, E_b, in millivolts, determined by electrochemical testing.

	Silcosteel®-CR	Bare Steel (316L)
Neutral Solution		
100ppm chloride	> 3000	674
3000ppm chloride	1460	370
5000ppm chloride	1590	285
Acidic Solution (1N H₂SO₄)		
100ppm chloride	1128	580
3000ppm chloride	927	370
5000ppm chloride	983	563

Table 5 Corrosion potential, E_c, in millivolts, for Silcosteel®-CR treated 316L stainless steel.

	E _c
Neutral Solution	
100ppm chloride	-188mV
3000ppm chloride	-418mV
5000ppm chloride	-420mV
Acidic Solution (1N H₂SO₄)	
100ppm chloride	-782mV
3000ppm chloride	-843mV
5000ppm chloride	-863mV

1000 Hour Salt Spray Testing (ASTM B 117) and Condensing Humidity Testing (ASTM D 4585) of Silcosteel®-CR Treated 316L Stainless Steel Coupons and Bare Coupons

ASTM B 117 (*Practice of Operating Salt Spray (Fog) Apparatus*) was run for a total of 1000 hours. Three Silcosteel®-CR treated 316L stainless steel coupons and 3 bare coupons were tested side by side. The Silcosteel®-CR treated coupons showed no signs of bleeding, rusting or pitting corrosion. The bare samples exhibited light surface rusting but no signs of pitting. Figure 4 shows a Silcosteel®-CR treated sample and a bare steel sample after salt spray testing.

ASTM D 4585 (*Practice for Testing the Water Resistance of Coatings, Using Controlled Condensation*) was run for a total of 1000 hours. Three Silcosteel®-CR treated 316L stainless steel coupons and 3 bare coupons were tested side by side. The Silcosteel®-CR treated coupons showed no signs of bleeding, rusting, or pitting corrosion. The bare samples exhibited a very light surface oxide film as a result of exposure. Figure 5 is a photograph of a Silcosteel®-CR treated sample and a bare steel sample after testing.

Figure 4 Silcosteel®-CR treated 316L stainless steel coupons show no corrosion as a result of salt spray testing; bare coupons show light rusting at aperture.*



Silcosteel®-CR treated



bare stainless steel

Figure 5 Silcosteel®-CR treated 316L stainless steel coupons show no impact of water exposure; bare coupons exhibit a light oxide layer.



Silcosteel®-CR treated



bare stainless steel

*Color at the tip of the Silcosteel®-CR treated coupon is due to light refraction by the treatment layer.

What advantages are gained by applying Silcosteel®-CR treatment to steel and stainless steel components in contact with corrosive environments? Silcosteel®-CR treatment will ensure longer lifetimes for these components. Maintenance schedules can be prolonged. Reduced corrosion will mean less contamination in process streams in contact with corroding steel substrates. Finally, Silcosteel®-CR treated components will greatly reduce system cost, relative to super alloy components (e.g., Hastelloy® or Inconel®).

Silcosteel®-CR Treated Fittings

A broad line of 1/16", 1/8" and 1/4" fittings is available with Silcosteel®-CR treatment. Because of expanding applications for these coatings, we have received many requests for a broader product offering. If you do not see everything you need, contact us for information on additional stock items, or for custom coating services.

Description	Size	qty.	cat.#
Union	1/16"	ea.	22863
	1/8"	ea.	22864
	1/4"	ea.	22865
Tee	1/16"	ea.	22866
	1/8"	ea.	22867
	1/4"	ea.	22868
Reducer	1/8" to 1/16"	ea.	22869
	1/4" to 1/16"	ea.	22870
	1/4" to 1/8"	ea.	22871
Elbow	1/16"	ea.	22874
	1/8"	ea.	22875
	1/4"	ea.	22876
Plug	1/16"	ea.	22877
	1/8"	ea.	22878
	1/4"	ea.	22879
Cross	1/8"	ea.	22872
	1/4"	ea.	22873

Description	Size	qty.	cat.#
Tube End Reducer	1/8" tube to 1/16"	ea.	22880
	1/4" tube to 1/16"	ea.	22881
	1/8" tube to 1/4"	ea.	22882
	1/4" tube to 1/8"	ea.	22883
Port Connector	1/8"	ea.	22884
	1/4"	ea.	22885
	1/8" to 1/4"	ea.	22886
Male NPT Union	1/8" to 1/8"	ea.	22887
	1/4" to 1/4"	ea.	22888
	1/16" to 1/8"	ea.	22889
	1/8" to 1/4"	ea.	22890
Female NPT Union	1/4" to 1/8"	ea.	22891
	1/8" to 1/8"	ea.	22892
	1/4" to 1/4"	ea.	22893
	1/4" to 1/8"	ea.	22894
	1/8" to 1/4"	ea.	22895



Silcosteel®-CR



These fittings are manufactured by Parker Hannifin. Swagelok® fittings also are available—see our website.



See page 4 for Silcosteel®-CR treated tubing.

RESTEK
www.restekcorp.com

800-356-1688 ★ 814-353-1300



See page 3
for Silcosteel®-CR treated
fittings.



The Silcosteel®
layer is a general
purpose passiva-
tion layer for
metals.



Siltek™ provides
the ultimate
passivation for
many surfaces,
from glass to high
nickel alloys of
steel.



Sulfinert™ coating
on metal compo-
nents is required
when analyzing for
parts-per-billion
levels of organo-
sulfur compounds.

Coiled Silcosteel®-CR Treated Seamless 316L Stainless Steel Tubing

ID	OD	cat.#
0.055" (1.40mm)	1/8" (3.18mm)*	22896
0.180" (4.57mm)	1/4" (6.35mm)*	22897

*0.035" wall thickness

*Priced by the foot;
lengths to >400 feet.*

Ordering note

An extra charge is applied for cutting Sulfinert™ or Silcosteel® tubing. The charge is calculated from the total number of pieces produced from cutting, for each line item.

About Us

Restek's involvement in coatings began in 1987. The focus of our initial work was to produce a coating on stainless steel that was inert to low-level reactive organic compounds, such as explosives and volatile organic compounds (VOCs). The end product from this work was the Silcosteel® coating for stainless steel tubing.

Silcosteel® coated tubing currently is used for construction of analytical testing equipment by all major manufacturers of gas chromatography sampling and testing equipment.

Since this initial project, Restek's coatings experts have developed a family of coatings to address other specific needs and thereby enhance the performance of system components. In brief, these coatings are:

- **Silcosteel®**—A general purpose passivation layer for steel and stainless steel. U.S. Patent 6,511,760.
- **Silcosteel®-CR**—A corrosion resistant layer that increases the lifetime of system components in acidic environments containing hydrochloric, nitric, or sulfuric acid. Patent pending.
- **Silcosteel®-UHV**—Used to reduce outgassing by components of ultra-high vacuum systems. Patent pending.
- **Silcosteel®-AC**—Dramatically reduces carbon buildup on stainless steel components. U.S. Patent 6,444,326.
- **Siltek™**—Provides the ultimate passivation of coated components, from glass to high nickel alloys of steel. U.S. Patent 6,444,326.
- **Sulfinert™**—A required coating on metal components when analyzing for parts-per-billion levels of organo-sulfur compounds. U.S. Patent 6,444,326.



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Restek coatings are used in many applications, spanning multiple industries and market areas. Let us solve *your* surface activity problems. Contact Dave Smith at 800-356-1688 or 814-353-1300, x 2154, or by email at daves@restekcorp.com.



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