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Thermo Scientific GC Columns and Accessories

The Thermo Scientific TRACE™ family of GC Columns offers high temperature stability and exhibits low bleed and long lifetimes. From general purpose non-polar to polar columns, TraceGOLD™, TRACE and TracePLOT™ columns provide excellent quality and performance, with guaranteed reproducibility. Our range of GC accessories includes all the consumables and tools necessary for today's gas chromatographer.

TraceGOLD GC Columns

Offering you a leap forward in column performance delivering low bleed and superior inertness.

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GC Equipment

Our new GFM Pro flowmeter and GLD Pro leak detector are essential tools for maintaining optimal performance of your GC instrument.

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TracePLOT GC Columns

The latest innovation in PLOT column technology, providing reproducible analyses of permanent gases, hydrocarbons and solvents.

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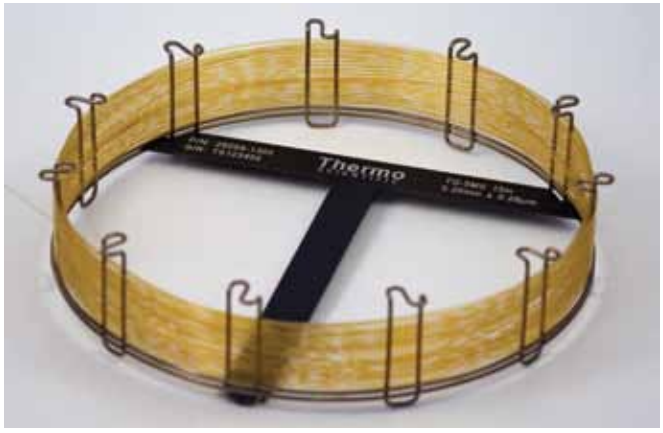
GC Column Selection



When selecting a GC column for your analysis, it can often be difficult to choose the most appropriate column because of the wide range of options. However, the choice can be simplified by considering a number of questions about the planned separation. This section provides useful information to help you determine the most suitable column for your analysis.

Column Selection for Existing or Regulated Methods

This section provides a number of tools to aid in selecting the most appropriate product from the TRACE family of GC Columns. The Thermo Scientific TRACE Phase table lists details for the wide array of phases offered in the TraceGOLD, TRACE and TracePLOT GC column ranges. The GC Column Selection by Manufacturer table provides a quick cross reference for TRACE columns to other GC columns. If you are following an ASTM, NIOSH or US EPA method, please refer to the Column Selection by Method tables for the best Thermo Scientific product.

Method Development Considerations

When first developing a method, you should consider these column characteristics to determine the best column for the separation.

A. Column Phase
B. Internal Diameter
C. Film Thickness
D. Column Length

A. Column Phase

In GC, the separation of two analytes occurs due to differences in their interaction with the stationary phase, therefore a phase must be chosen that matches the properties of the sample. For example, if the components have different boiling points (greater than 2 °C), a non-polar column such as the TG-1MS is recommended. If the products differ primarily in their polarities, then a polar column such as the TG-WAXMS will be ideal.

If you know the particular class of your sample, please refer to the column Selection by Application for a recommended phase (see page 208). Always select the least polar column which will perform the separation.

B. Internal Diameter

The selection of the internal diameter is often determined by the instrument or detection method. Most modern GC equipment will accommodate most column sizes. With a larger internal diameter, column sample capacity increases, but resolution and sensitivity decrease. Conversely, a smaller ID column can improve resolution and sensitivity, but with the drawback of reduced sample capacity and a greater need for sample preparation. It is a good idea to find a similar application which gives separation of the desired components and use this as a guide.

C. Film Thickness

Increasing the film thickness increases the sample capacity of the column and slows the elution of the peaks which can help when analyzing volatile compounds. A thicker film also reduces the potential of overloading the column, thus improving the resolution. However, a thicker film can be more sensitive to degradation. The same component will elute at a higher temperature on a thick film when compared to a thin film.

Compounds with high boiling points or those with a high molecular weight should be analyzed using a thin film to improve resolution and avoid unnecessarily long analysis times.

Another factor to consider is the phase ratio (b) which is calculated using both the internal diameter and film thickness in the following equation:

$$b = \frac{\text{Internal diameter (µm)}}{4 \times \text{Film thickness (µm)}}$$

The phase ratio can be used in two ways:

1. To categorize the best dimensions for an application:
   a. For volatile samples b < 100
   b. For general samples b ~ 250
   c. For high molecular weight samples b > 400
2. To transfer an analysis from a column of one ID to another without changing the method substantially, choose a column with a similar b value as this will have similar retention properties.

Internal Diameter (mm)	Film Thickness (µm) 0.1	0.25	0.5	1	1.8	3
0.1	250	100	50	25	14	8
0.25	625	250	125	63	35	21
0.32	800	320	160	80	44	27
0.53	1325	530	265	133	74	44

Phase ratio (β) of common column dimensions

D. Column Length

A longer column length will provide greater efficiency and resolution, but this is not a linear relationship. Resolution is proportional to the square root of column length, so doubling the column length will increase resolution by approximately 40%. However, increasing the column length will also increase the retention time. Double column length, twice the analysis time. Generally, it is recommended to use the shortest column which will perform the desired separation.

Additional Considerations

Several generalizations regarding GC columns exist that you might rely on when in doubt. First, 95% of all GC columns used are either TG-1MS, TG-5MS or TG-WAXMS type columns. A good starting column is a 30m x 0.25mm ID, 5% Phenyl column with a 0.25µm film thickness, such as the TG-5MS. (26098-1420; Page 221).

This is a non-polar column, which separates predominately on boiling point, but has some polar characteristics.

For further assistance in choosing the right column for your separation, please contact our technical support help desk.

Thermo Scientific TRACE GC Column Phase Information

Range	Column	Phase	Polarity	Maximum Operating Temperature
TraceGOLD	TG-1MS	100% Dimethyl Polysiloxane	Non-Polar	330°C / 350°C
TraceGOLD	TG-5MS	5% Phenyl Methylpolysiloxane	Non-Polar	330°C / 350°C
TraceGOLD	TG-SQC	Proprietary	Non-Polar	330°C / 350°C
TraceGOLD	TG-5MS AMINE	Base Optimised 5% Phenyl Methylpolysiloxane	Non-Polar	300°C / 315°C
TraceGOLD	TG-5SILMS	Similar to 5% Phenyl Methylpolysiloxane	Non-Polar	330°C / 350°C
TraceGOLD	TG-5HT	5% Phenyl Methylpolysiloxane	Non-Polar	380°C / 400°C
TraceGOLD	TG-35MS	35% Phenyl Methylpolysiloxane	Mid-Polarity	300°C / 320°C
TraceGOLD	TG-35MS AMINE	Base Optimised 35% Phenyl Methylpolysiloxane	Mid-Polarity	220°C
TraceGOLD	TG-17MS	50% Phenyl Polysiloxane	Mid-Polarity	300°C / 320°C
TraceGOLD	TG-1301MS	6% Cyanopropylphenyl Methylpolysiloxane	Mid-Polarity	260°C / 280°C
TraceGOLD	TG-624	6% Cyanopropylphenyl Methylpolysiloxane	Mid-Polarity	240°C
TraceGOLD	TG-1701MS	14% Cyanopropylphenyl Methylpolysiloxane	Mid-Polarity	260°C / 280°C
TraceGOLD	TG-225MS	50% Cyanopropylmethyl Phenylmethylpolysiloxane	Mid-Polarity	240°C
TraceGOLD	TG-200MS	Trifluoropropyl Methylpolysiloxane	Mid-Polarity	320°C / 340°C
TraceGOLD	TG-POLAR	90% Cyanopropyl Phenylcyanopropyl Polysiloxane	Polar	275°C
TraceGOLD	TG-WAXMS	Polyethylene Glycol (PEG)	Polar	260°C
TraceGOLD	TG-WAXMS A	Acid Optimised Polyethylene Glycol (PEG)	Polar	250°C
TraceGOLD	TG-WAXMS B	Base Optimised Polyethylene Glycol (PEG)	Polar	220°C
TRACE	TR-1	100% Dimethyl Polysiloxane	Non-Polar	340°C / 360°C for films ≤ 1.0µm 300°C / 320°C for films 1.5 to 3.0µm films 280°C / 300°C for films > 3.0µm
TRACE	TR-1MS	100% Dimethyl Polysiloxane	Non-Polar	370°C / 380°C
TRACE	TR-5	5% Phenyl Methylpolysiloxane	Non-Polar	340°C / 350°C for films ≤ 1.5µm 280°C / 300°C for films > 1.5µm
TRACE	TR-5MS	5% Phenyl Polysilphenylene-siloxane	Non-Polar	360°C / 370°C for films ≤ 1.5µm 350°C / 360°C for films > 1.5µm
TRACE	TR-5HT	5% Phenyl Polycarborane Siloxane	Non-Polar	380°C / 400°C
TRACE	TR-35MS	35% Phenyl Polysilphenylene-siloxane	Mid-Polarity	360°C / 370°C
TRACE	TR-50MS	50% Phenyl Polysilphenylene-siloxane	Mid-Polarity	360°C / 370°C
TRACE	TR-V1	6% Cyanopropylphenyl Polysiloxane	Mid-Polarity	280°C / 300°C
TRACE	TR-1701	14% Cyanopropylphenyl Polysiloxane	Mid-Polarity	280°C / 300°C
TRACE	TR-225	50% Cyanopropylphenyl Polysiloxane	Mid-Polarity	230°C / 250°C
TRACE	TR-FAME	70% Cyanopropyl Polysilphenylene-siloxane	Polar	250°C / 260°C
TRACE	TR-WAX	Polyethylene Glycol (PEG)	Polar	260°C / 280°C for films ≤ 1.0µm 240°C / 260°C for films > 1.0µm
TRACE	TR-WAXMS	Polyethylene Glycol (PEG)	Polar	280°C / 300°C
TRACE	TR-FFAP	TPA Modified Polyethylene Glygol (PEG)	Polar	240°C / 250°C
TRACE	TR-SIMDIST	100% Dimethyl Polysiloxane	Non-Polar	400°C for films ≤ 1.0µm 370°C for 2.65µm films
TRACE	TR-524	Cyanopropylpheyl Dimethyl Polysiloxane	Mid-Polarity	240°C / 260°C
TRACE	TR-525	Proprietary	Mid-Polarity	340°C / 360°C
TRACE	TR-527	5% Phenyl Polysilphenylene-siloxane	Non-Polar	330°C / 350°C
TRACE	TR-8095	8% Phenyl Polycarborane-siloxane	Mid-Polarity	360°C / 370°C
TRACE	TR-8270	5% Phenyl Polysilphenylene-siloxane	Non-Polar	330°C / 350°C
TRACE	TR-Pesticide	5% Phenyl Methylpolysiloxane	Non-Polar	330°C / 350°C
TRACE	TR-Pesticide II	Proprietary	Non-Polar	330°C / 350°C
TRACE	TR-Pesticide III	35% Phenyl Methylpolysiloxane	Mid-Polarity	300°C / 320°C
TRACE	TR-Pesticide IV	35% Phenyl Methylpolysiloxane	Mid-Polarity	300°C / 320°C
TRACE	TR-Biodiesel (M)	100% Dimethyl Polysiloxane	Non-Polar	300°C / 320°C
TRACE	TR-Biodiesel (F)	Polyethylene Glycol (PEG)	Polar	280°C / 300°C
TRACE	TR-Biodiesel (G)	5% Phenyl Polysilphenylene-siloxane	Non-Polar	380°C / 400°C
TRACE	TR-DoA5	5% Phenyl Methylpolysiloxane	Non-Polar	330°C / 350°C
TRACE	TR-DoA35	35% Phenyl Polysilphenylene-siloxane	Mid-Polarity	330°C / 350°C
TRACE	TR-Dioxin 5MS	5% Phenyl Polysilphenylene-siloxane	Non-Polar	330°C / 350°C
TRACE	TR-PCB 8MS	8% Phenyl Polysilphenylene-siloxane	Mid-Polarity	330°C / 350°C
TracePLOT	TR-Bond Alumina (Na_2SO_4)	Na_2SO_4 Deactivated Aluminium Oxide	Non-Polar	200°C
TracePLOT	TR-Bond Alumina (KCl)	KCl Deactivated Aluminium Oxide	Non-Polar	200°C
TracePLOT	TR-Bond Msieve 5A	Molecular Sieve (5A)	Non-Polar	300°C
TracePLOT	TR-Bond Q	100% divinylbenzene	Non-Polar	280°C / 300°C
TracePLOT	TR-Bond Q+	Porous divinyl benzene polymer	Mid-Polarity	250°C
TracePLOT	TR-Bond S	Divinylbenzene 4-vinylpyridine	Mid-Polarity	250°C
TracePLOT	TR-Bond U	Divinylbenzene ethylene glycol / dimethylacrylate	Polar	190°C

GC Column Selection by Manufacturer

Column	Phase	Manufacturer	Recommended Thermo Scientific Alternative	Page
Capillary	007-1(MS)	Quadrex	TG-1MS	220
Capillary	007-17(MPS-50)	Quadrex	TG-17MS	231
Capillary	007-1701	Quadrex	TG-1701MS	230
Capillary	007-2(MP-5)	Quadrex	TG-5MS	221
Capillary	007-2(MPS-5)	Quadrex	TG-5SilMS	224
Capillary	007-23	Quadrex	TR-FAME	259
Capillary	007-5MS	Quadrex	TG-5MS	221
Capillary	007-624	Quadrex	TG-624	229
Capillary	007-CW	Quadrex	TG-WAXMS	234
Capillary	AT-5	Alltech	TR-5	247
Capillary	AT50	Alltech	TG-17MS	231
Capillary	AT-5MS	Alltech	TG-5MS	221
Capillary	AT-624	Alltech	TG-624	229
Capillary	AT-Silar	Alltech	TR-FAME	259
Capillary	AT-Wax	Alltech	TR-WAXMS	255
Capillary	BP-1	SGE	TR-1	245
Capillary	BP10	SGE	TG-1701MS	230
Capillary	BP20	SGE	TG-WAXMS	234
Capillary	BP21	SGE	TG-WAXMS A / TR-FFAP	235/256
Capillary	BP225	SGE	TG-225MS	232
Capillary	BP5	SGE	TG-5MS	221
Capillary	BP624	SGE	TG-624	229
Capillary	BPX1	SGE	TG-1MS / TR-SimDist	220/257
Capillary	BPX1	SGE	TR-SimDist	257
Capillary	BPX1	SGE	TR-SimDist	257
Capillary	BPX5	SGE	TG-5MS	221
Capillary	BPX50	SGE	TG-17MS	231
Capillary	BPX608	SGE	TG-35MS	226
Capillary	BPX70	SGE	TR-FAME	259
Capillary	BPX90	SGE	TG-POLAR	237
Capillary	BPX-Volatiles	SGE	TG-624	229
Capillary	CARBOWAX	Agilent	TR-WAXMS	255
Capillary	CP-1301	Varian	TG-1301MS	228
Capillary	CP-FFAP CB	Varian	TG-WAXMS A / TR-FFAP	235/256
Capillary	CP-Select624CB	Varian	TG-624	229
Capillary	CP-Sil 19CB	Varian	TG-1701MS	230
Capillary	CP-Sil 5CB	Varian	TR-1	245
Capillary	CP-Sil 5CB MS	Varian	TG-1MS	220
Capillary	CP-Sil 88	Varian	TR-FAME	259
Capillary	CP-Sil 8CB	Varian	TG-5SilMS	224
Capillary	CP-SimDist	Varian	TR-SimDist	257
Capillary	CP-Wax 51 (Amines)	Varian	TG-WAXMS B	236
Capillary	CP-Wax 52CB	Varian	TG-WAXMS	234
Capillary	CP-Wax 58 CB (FFAP)	Varian	TG-WAXMS A / TR-FFAP	235/256
Capillary	DB-1	Agilent	TR-1	245
Capillary	DB-1301	Agilent	TG-1301MS	228
Capillary	DB-17	Agilent	TG-17MS	231
Capillary	DB-1701	Agilent	TG-1701MS	230
Capillary	DB-17ht	Agilent	TG-17MS	231
Capillary	DB-17ms	Agilent	TG-17MS	231
Capillary	DB-1ms	Agilent	TG-1MS	220
Capillary	DB-200	Agilent	TG-200MS	233
Capillary	DB-225	Agilent	TG-225MS	232

Column	Phase	Manufacturer	Recommended Thermo Scientific Alternative	Page
Capillary	DB-225ms	Agilent	TG-225MS	232
Capillary	DB-23	Agilent	TR-FAME	259
Capillary	DB-2887	Agilent	TR-SimDist	257
Capillary	DB-35	Agilent	TG-35MS	226
Capillary	DB-35ms	Agilent	TG-35MS	226
Capillary	DB-5	Agilent	TR-5	247
Capillary	DB-5.625	Agilent	TG-5MS	221
Capillary	DB-5ht	Agilent	TG-5HT	225
Capillary	DB-5ms	Agilent	TG-5MS	221
Capillary	DB-624	Agilent	TG-624	229
Capillary	DB-FFAP	Agilent	TG-WAXMS A / TR-FFAP	235/256
Capillary	DB-HT Sim Dis	Agilent	TR-SimDist	257
Capillary	DB-PETRO	Agilent	TG-1MS	220
Capillary	DB-WAX	Agilent	TG-WAXMS	234
Capillary	DB-WAXetr	Agilent	TR-WAXMS	255
Capillary	Elite-1	PerkinElmer	TR-1	245
Capillary	Elite-1301	PerkinElmer	TG-1301MS	228
Capillary	Elite-17	PerkinElmer	TG-17MS	231
Capillary	Elite-1701	PerkinElmer	TG-1701MS	230
Capillary	Elite-17ms	PerkinElmer	TG-17MS	231
Capillary	Elite-200	PerkinElmer	TG-200MS	233
Capillary	Elite-23	PerkinElmer	TR-FAME	259
Capillary	Elite-35ms	PerkinElmer	TG-35MS	226
Capillary	Elite-5	PerkinElmer	TR-5	247
Capillary	Elite-5ms	Perkin Elmer	TG-5MS	221
Capillary	Elite-5ht	PerkinElmer	TG-5HT	225
Capillary	Elite-624	PerkinElmer	TG-624	229
Capillary	Elite-FFAP	PerkinElmer	TG-WAXMS A / TR-FFAP	235/256
Capillary	Elite-WAX	PerkinElmer	TG-WAXMS	234
Capillary	Elite-WAX ETR	PerkinElmer	TG-WAXMS	234
Capillary	HP-1	Agilent	TR-1	245
Capillary	HP-17	Agilent	TG-17MS	231
Capillary	HP-1701	Agilent	TG-1701MS	230
Capillary	HP-1MS	Agilent	TG-1MS	220
Capillary	HP20M	Agilent	TG-WAXMS	234
Capillary	HP-23	Agilent	TR-FAME	259
Capillary	HP-35	Agilent	TG-35MS	226
Capillary	HP-35MS	Agilent	TG-35MS	226
Capillary	HP-5	Agilent	TR-5	247
Capillary	HP-50+	Agilent	TG-17MS	231
Capillary	HP-5MS	Agilent	TG-5MS	221
Capillary	HP5-TA	Agilent	TG-5MS	221
Capillary	HP-88	Agilent	TR-FAME	259
Capillary	HP-FFAP	Agilent	TG-WAXMS A / TR-FFAP	235/256
Capillary	HP-INNOWax	Agilent	TG-WAXMS	234
Capillary	HP-VOC	Agilent	TG-624	229
Capillary	HP-Wax	Agilent	TG-WAXMS	234
Capillary	HT5	SGE	TG-5HT	225
Capillary	HT8	SGE	TR-PCB 8MS	260
Capillary	MDN-35	Sigma Aldrich	TG-35MS	226
Capillary	MDN-5	Sigma Aldrich	TR-5	247
Capillary	MDN-5S	Sigma Aldrich	TG-5SilMS	224
Capillary	Nukol	Sigma Aldrich	TG-WAXMS	234

Column	Phase	Manufacturer	Recommended Thermo Scientific Alternative	Page
Capillary	OV-1	Ohio Valley	TR-1	245
Capillary	OV-17	Ohio Valley	TG-17MS	231
Capillary	OV-1701	Ohio Valley	TG-1701MS	230
Capillary	OV-5	Ohio Valley	TR-5	247
Capillary	OV-624	Ohio Valley	TG-624	229
Capillary	Petrocol 2887	Sigma Aldrich	TR-SimDist	257
Capillary	Petrocol DH	Sigma Aldrich	TG-1MS	220
Capillary	Petrocol EX2887	Sigma Aldrich	TR-SimDist	257
Capillary	Rtx-1	Restek	TR-1	245
Capillary	Rtx-1301	Restek	TG-1301MS	228
Capillary	Rtx-1701	Restek	TG-1701MS	230
Capillary	Rtx-1MS	Restek	TG-1MS	220
Capillary	Rtx-200	Restek	TG-200MS	233
Capillary	Rtx-200MS	Restek	TG-200MS	233
Capillary	Rtx-225	Restek	TG-225MS	232
Capillary	Rtx-2330	Restek	TG-POLAR	237
Capillary	Rtx-2560	Restek	TR-FAME	259
Capillary	Rtx-2887	Restek	TR-SimDist	257
Capillary	Rtx-35	Restek	TG-35MS	226
Capillary	Rtx-35 Amine	Restek	TG-35MS AMINE	227
Capillary	Rtx-35MS	Restek	TG-35MS	226
Capillary	Rtx-5	Restek	TR-5	247
Capillary	Rtx-5 Amine	Restek	TG-5MS AMINE	223
Capillary	Rtx-50	Restek	TG-17MS	231
Capillary	Rtx-5SilMS	Restek	TG-5SilMS	224
Capillary	Rtx-624	Restek	TG-624	229
Capillary	Rtx-Volatiles	Restek	TG-624	229
Capillary	Rtx-Wax	Restek	TG-WAXMS	234
Capillary	Rxi-17	Restek	TG-17MS	231
Capillary	Rxi-1ms	Restek	TG-1MS	220
Capillary	Rxi-5HT	Restek	TG-5HT	225
Capillary	Rxi-5MS	Restek	TG-5MS	221
Capillary	Rxi-5Sil MS	Restek	TG-5SilMS	224
Capillary	SE-30	Agilent	TG-1MS	220
Capillary	SE-52	Agilent	TG-5MS	221
Capillary	SE-54	Agilent	TG-5MS	221
Capillary	SolGel-Wax	SGE	TG-WAXMS	234
Capillary	SP-2100	Supelco	TG-1MS	220
Capillary	SP-2250	Supelco	TG-17MS	231
Capillary	SP-2330	Supelco	TR-FAME	259
Capillary	SP-2380	Supelco	TR-FAME	259
Capillary	SPB-1	Supelco	TR-1	245
Capillary	SPB-1 Sulfur	Supelco	TR-1	245
Capillary	SPB-17	Supelco	TG-17MS	231
Capillary	SPB-35	Supelco	TG-35MS	226
Capillary	SPB-5	Supelco	TR-5	247
Capillary	SPB-50	Supelco	TG-17MS	231
Capillary	Stabilwax	Restek	TG-WAXMS	234
Capillary	Stabilwax-DA	Restek	TG-WAXMS A / TR-FFAP	235/256
Capillary	Stabilwax-DB	Restek	TG-WAXMS B	236
Capillary	SUPELCOWAX-10	Supelco	TG-WAXMS	234
Capillary	VF-17ms	Varian	TG-17MS	231
Capillary	VF-1ms	Varian	TG-1MS	220
Capillary	VF-200ms	Varian	TG-200MS	233
Capillary	VF-23ms	Varian	TR-FAME	259
Capillary	VF-35ms	Varian	TG-35MS	226
Capillary	VF-5ht	Varian	TG-5HT	225
Capillary	VF-5ms	Varian	TG-5MS	221
Capillary	ZB-1	Phenomenex	TR-1	245
Capillary	ZB-1701	Phenomenex	TG-1701MS	230
Capillary	ZB-1701P	Phenomenex	TG-WAXMS	234
Capillary	ZB-1HT Inferno	Phenomenex	TR-SimDist	257
Capillary	ZB-1MS	Phenomenex	TG-1MS	220
Capillary	ZB-35	Phenomenex	TG-35MS	226
Capillary	ZB-5	Phenomenex	TR-5	247
Capillary	ZB-50	Phenomenex	TG-17MS	231
Capillary	ZB-5HT Inferno	Phenomenex	TG-5HT	225
Capillary	ZB-5MS	Phenomenex	TG-5MS	221
Capillary	ZB-5MS Si	Phenomenex	TG-5SilMS	224
Capillary	ZB-624	Phenomenex	TG-624	229
Capillary	ZB-FFAP	Phenomenex	TG-WAXMS A / TR-FFAP	235/256
Capillary	ZB-WAX	Phenomenex	TG-WAXMS	234
Capillary	ZB-WAXplus	Phenomenex	TR-WAXMS	255
PLOT	Alumina-PLOT	Supelco	TG-BOND Alumina (Na2SO4)	239
PLOT	AT-Alumina	Alltech	TG-BOND Alumina (Na2SO4)	239
PLOT	AT-Molsieve	Alltech	TG-BOND Msieve 5A	240
PLOT	AT-Q	Alltech	TG-BOND Q	241
PLOT	CP-Al2O3/KCl	Varian	TG-BOND Alumina (KCl)	239
PLOT	CP-Al2O3/Na2SO4	Varian	TG-BOND Alumina (Na2SO4)	239
PLOT	CP-Molsieve 5A	Varian	TG-BOND Msieve 5A	240
PLOT	CP-PoraPLOT Q	Varian	TG-BOND Q	241
PLOT	CP-PoraPLOT S	Varian	TG-BOND S	242
PLOT	CP-PoraPLOT U	Varian	TR-BOND U	242
PLOT	GS-Alumina	Agilent	TG-BOND Alumina (Na2SO4)	239
PLOT	GS-Alumina KCl	Agilent	TG-BOND Alumina (KCl)	239
PLOT	GS-Molsieve	Agilent	TG-BOND Msieve 5A	240
PLOT	GS-Q	Agilent	TG-BOND Q+	241
PLOT	HP PLOT M	Agilent	TG-BOND Alumina (Na2SO4)	239
PLOT	HP PLOT Molsieve	Agilent	TG-BOND Msieve 5A	240
PLOT	HP PLOT S	Agilent	TG-BOND Alumina (Na2SO4)	239
PLOT	HP-UPLOT	Agilent	TG-BOND U	242
PLOT	Molsieve 5A PLOT	Supelco	TG-BOND Msieve 5A	240
PLOT	PLT-5A	Quadrex	TG-BOND Msieve 5A	240
PLOT	PoraBond Q	Varian	TG-BOND Q	241
PLOT	PoraBond U	Varian	TG-BOND U	242
PLOT	Rt-Alumina Bond (KCl)	Restek	TG-BOND Alumina (KCl)	239
PLOT	Rt-Alumina Bond (Na2SO4)	Restek	TG-BOND Alumina (Na2SO4)	239
PLOT	Rt-Msieve 5A	Restek	TG-BOND Msieve 5A	240
PLOT	Rt-Q-BOND	Restek	TG-BOND Q	241
PLOT	Rt-QS-BOND	Restek	TG-BOND Q+	241
PLOT	Rt-S-BOND	Restek	TG-BOND S	242
PLOT	Rt-U-BOND	Restek	TG-BOND U	242
PLOT	Supel-Q-PLOT	Supelco	TG-BOND Q	241

GC Column Selection by Application

✔ Recommended
✔ Alternative

	TG-1MS	TR-1MS	TR-1	TG-5MS	TG-5SilMS	TG-5MS AMINE	TR-5MS	TR-5	TG-35MS	TG-35MS AMINE	TR-35MS	TG-17MS	TR-35MS	TG-1301MS	TG-1701MS	TR-1701	TG-WAXMS	TR-WAXMS	TR-WAX	TG-WAXMS A	TR-FFAP	TG-WAXMS B	TG-POLAR	TG-624	TR-V1	TG-200MS	TG-225MS	TR-FAME	TR-SIMDIST	TR-524	TR-525	TR-527	TG-5HT	TR-5HT	TR-8270	TR-DioX5	TR-DioX35	TR-Biodiesel (M)	TR-Biodiesel (F)	TR-Biodiesel (G)	TR-Dioxin 5MS	TR-Pesticide	TR-Pesticide II	TR-Pesticide III	TR-Pesticide IV	TR-PCB 8MS	R-901B5
Acids			✔	✔	✔	✔	✔								✔	✔	✔	✔	✔																												
Acid / Neutral Drugs			✔	✔	✔	✔	✔	✔	✔	✔																																				
Alcohols			✔	✔	✔	✔	✔					✔			✔	✔	✔	✔	✔	✔	✔	✔	✔	✔																								
Alcohols in Beverages												✔			✔	✔	✔	✔	✔	✔		✔	✔																								
Aldehydes															✔	✔	✔	✔	✔	✔	✔																										
Alditol Acatates (sugars)			✔	✔	✔	✔	✔								✔	✔	✔	✔	✔	✔				✔	✔																						
Amines - Aliphatic			✔	✔	✔	✔	✔	✔	✔	✔		✔			✔	✔	✔			✔		✔	✔																								
Amines - Aromatic			✔	✔	✔	✔	✔	✔	✔	✔		✔			✔	✔	✔			✔		✔	✔																								
Antidepressants			✔	✔	✔	✔	✔	✔	✔	✔																																				
Benzenes, substituted																														✔	✔																
Biodiesel - Methanol																																			✔											
Biodiesel - FAMEs																					✔															✔										
Biodiesel - Glycerine																																					✔									
Brominated Flame Retardants			✔	✔	✔	✔	✔																					✔																	
Butter Fat			✔	✔	✔	✔	✔																							✔	✔															
Carboxylic Acids																																														
Cigarette Lighter Fuel			✔	✔	✔	✔	✔					✔										✔	✔																								
Chlorinated Aromatics	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔			✔	✔										✔																		✔	✔	✔	✔		
Dioxins			✔	✔	✔	✔	✔			✔	✔																																			
Drugs of Abuse																																	✔													
Drugs of Abuse - THC							✔	✔	✔																									✔											
Essential Oils															✔	✔	✔	✔	✔	✔																										
Explosives																																													✔
FAMEs																					✔			✔	✔						✔	✔														
Glucose - Methylated																										✔																				
Herbicides			✔	✔	✔	✔	✔	✔	✔	✔	✔		✔	✔	✔	✔	✔	✔	✔	✔	✔			✔																		✔	✔	✔	✔		
Hydrocarbons																												✔				✔													
Ketones									✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔																				
Monomers												✔										✔	✔																								
Nitroaromatics			✔	✔	✔	✔	✔	✔	✔	✔	✔		✔	✔	✔	✔	✔	✔	✔	✔	✔																								
Organic acids																																														
Organochlorine Pesticides	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔		✔	✔										✔																		✔	✔	✔	✔		
Organophosphorous Pesticides	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔																														✔	✔	✔	✔		
PAHs	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔		✔	✔																✔	✔														
Paraffins	✔	✔	✔	✔	✔	✔	✔																																						
PCBs				✔	✔	✔	✔	✔																																						✔
Pesticides													✔	✔															✔														✔	✔	✔	✔		
Petroleum																										✔				✔	✔														
Phenols			✔	✔	✔	✔	✔	✔	✔	✔					✔	✔	✔	✔	✔	✔	✔			✔																						
Phthalates	✔	✔	✔	✔	✔	✔	✔																																						
Plant Sterols			✔	✔	✔	✔	✔	✔	✔	✔	✔																														✔	✔	✔	✔		
Polyethylene																														✔	✔															
Polymers	✔	✔	✔																																											
Polywax	✔	✔	✔	✔	✔	✔	✔																							✔	✔															
Pyrethroids	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔		✔	✔																												✔	✔	✔	✔		
Sedatives			✔	✔	✔	✔	✔	✔	✔	✔																																				
Semivolatiles	✔	✔	✔	✔	✔	✔	✔																					✔			✔															
Silicon Oil																														✔	✔															
Solvents												✔			✔	✔	✔	✔	✔	✔	✔	✔	✔																								
Terpenes			✔	✔	✔	✔	✔																																			✔	✔	✔	✔		
Triglycerides			✔	✔	✔	✔	✔																								✔	✔															
TRPH	✔	✔	✔	✔	✔	✔	✔																																						
Volatiles			✔	✔	✔	✔	✔					✔			✔	✔	✔	✔	✔	✔	✔	✔	✔				✔																				
Xylenes	✔	✔	✔	✔	✔	✔	✔								✔	✔	✔	✔	✔	✔						✔																				

GC Column Selection by U.S. Pharmacopeia Specifications

The USP specifications are listed below with the appropriate Thermo Scientific GC column offerings included for your convenience. In some cases, there is more than one phase that matches the phase description.

When in doubt, it is recommended that you consult the original complete method or contact our technical support team for additional information or help in choosing the correct column for your application.

USP Code	Description	Recommended Thermo Scientific Phase	Page
G1	Dimethylpolysiloxane oil	TG-1MS	220
		TR-1 MS	246
		TR-1	245
G2	Dimethylpolysiloxane gum	TG-1MS	220
		TR-1 MS	246
		TR-1	245
G3	50% Phenyl-50% methylpolysiloxane	TG-17MS	231
		TR-50MS	252
G5	3-Cyanopropylpolysiloxane	TR-FAME	259
G6	Trifluoropropyl Methylpolysiloxane	TG-200MS	233
G7	50% Cyanopropyl Phenylmethyl Polysiloxane	TG-225MS	232
G16	Polyethylene glycol compound (ave. mol. wt. ~15,000) with diepoxide linker	TG-WAXMS	234
		TR-WAX MS	255
		TR-WAX	254
G19	50% Cyanopropyl 50% Phenylmethyl Polysiloxane	TG-225MS	232
G20	Polyethylene glycol (ave. mol. wt. of 380 - 420)	TG-WAXMS	234
		TR-WAX MS	255
		TR-WAX	254
G27	5% Phenyl-95% methylpolysiloxane	TG-5MS	221
		TR-5MS	248
		TR-5	247
G36	1% Vinyl-5% phenylmethylpolysiloxane	TR-5MS	248
		TR-5	247
G38	Phase G1 containing a small percentage of tailing inhibitor	TG-1MS	220
		TR-1 MS	246
		TR-1	245
G42	35% Phenyl-65% dimethylpolysiloxane (percentages refer to molar substitution)	TG-35MS	226
		TR-35MS	250
G43	6% Cyanopropylphenyl-94% dimethylpolysiloxane (percentages refer to molar substitution)	TG-624	229
		TR-V1	258
G46	14% Cyanopropylphenol-86% methylpolysiloxane	TG-1701MS	230
		TR-1701	251
G48	90% biscyanopropyl 10% cyanopropyl phenyl polysiloxane	TG-POLAR	237

GC Column Selection by ASTM Method

Selected ASTM methods are listed below with the appropriate Thermo Scientific GC column offerings. In some cases, there is more than one phase or column dimension that can be used. When in doubt, it is recommended that you consult the original complete method or contact our technical support team for additional information or help in choosing the correct column for your application.

Method	Title	Recommended Thermo Scientific Phase	Part Number	Page
D1983	Fatty acid methyl ester composition	TG-WAXMS	26088-1420	234
D2245	Oils and oil acids in solvent-reducible paints	TR-FAME	260M154P	259
D2268	High-purity n-heptane and isooctane	TG-1MS	Inquire	220
D2306	C8 aromatic hydrocarbons	TG-WAXMS	26088-1540	234
D2360	Trace impurities in monocyclic aromatic hydrocarbons	TG-WAXMS	26088-1550	234
D2426	Butadiene dimer and styrene in butadiene concentrates	TR-1	260A470P	245
D2427	Determination of C2 through C5 hydrocarbons in gasoline	TR-1	260A470P	245
D2456	Polyhydric alcohols in alkyd resin	TG-WAXMS	26088-2980	234
D2580	Phenols in water	TG-5MS	26098-2230	221
D2753	Oil and oil acids	TR-FAME	260M154P	259
D2800	FAME analysis	TR-FAME	260M154P	259
D2804	Purity of methyl ethyl ketone	TG-WAXMS	26088-2980	234
D2887	Boiling range distribution of petroleum fractions	TR-SimDist	260S348P	257
		TR-SimDist	260S347S	257
D2998	Polyhydric alcohols in alkyd resin	TG-1MS	26099-2970	220
D2999	Monopentaerythritol in commercial pentaerythritol	TG-1MS	Inquire	220
D3009	Composition of turpentine	TG-WAXMS	26088-2240	234
D3054	Cyclohexane	TG-1MS	Inquire	220
D3168	Polymers in emulsion paints	TG-1MS	26099-2970	220
D3257	Aromatics in mineral spirits	TG-624	26085-3960	229
D3271	Solvent analysis in paints	TG-WAXMS	26088-2980	234
D3304	PCBs in environmental materials	TG-5MS	26098-1540	221
		TR-PCB 8MS	26AJ148P	260
D3328	Comparison of waterborne petroleum oils	TR-1	260A395P	245
D3329	Purity of methyl isobutyl ketone	TG-WAXMS	26088-2980	234
		TG-624	26085-3960	229
D3432	Unreacted toluene diisocyanates in urethane prepolymers and coating solutions	TG-1MS	26099-3090	220
D3447	Purity of halogentated organic solvents	TG-624	26085-3960	229
D3452	Identification of rubber	TG-1MS	26099-3090	220
D3457	FAME analysis	TR-FAME	260M154P	259
D3534	PCBs in water	TG-5MS	26098-336	221
		TR-PCB 8MS	26AJ148P	260
D3545	Alcohol content and purity of acetate esters	TG-624	26085-3960	229
D3687	Alcohol content and purity of acetate esters	TG-WAXMS	26088-2980	234
D3695	Volatile alcohols in water by direct aqueous-injection GC	TG-WAXMS	26088-2980	234
D3710	Boiling range distribution of gasoline and gasoline fractions	TR-SimDist	260S348P	257
		TR-SimDist	260S347S	257
D3725	Fatty acids in drying oils	TR-FAME	Inquire	259
D3760	Isopropylbenzene (cumene)	TG-WAXMS	26088-1550	234
		TG-1MS	Inquire	220
D3797	o-Xylene	TG-WAXMS	26088-2360	234
D3798	p-Xylene	TG-WAXMS	26088-2360	234
D3871	Purgeable organic compounds in water using headspace sampling	TG-624	26085-4080	229
D3893	Purity of methyl amyl ketone and methyl isoamyl ketone	TG-624	26085-3960	229
D3973	Low molecular weight halogenated hydrocarbons in water	TG-624	26085-3960	229
D4059	PCBs in insulating liquids	TG-5MS	26098-1540	221
		TR-PCB 8MS	26AJ148P	260
D4415	Dimer in acrylic acid	TG-WAXMS	26088-1430	234

Method	Title	Recommended Thermo Scientific Phase	Part Number	Page
D4443	Residual vinyl chloride monomer content in ppb range in homo- and co-polymers by headspace GC	TG-624	26085-3960	229
D4735	Trace thiophene in refined benzene	TG-WAXMS	26088-2250	234
D4773	Propylene gycol monomethyl ether, dipropylene glycol monomethyl ether, and propylene glycol monomethyl ether acetate	TR-5	260E470P	247
D4806	Denatured fuel ethanol for blending with gasoline for use as automotive spark-ignition engine fuel	TG-1MS	Inquire	220
D4815	MTBE, ETBE, TAME, DIPE, tert-Amyl Alcohol and C1 to C4 Alcohols in gasoline	TR-1	260A396P	245
D4864	Traces of methanol in propylene concentrates	TG-5MS	Inquire	221
D4947	Chlordane and heptachlor in indoor air	TG-5MS	26098-3360	221
D5060	Impurities in high-purity ethylbenzene	TG-WAXMS	26088-2360	234
D5075	Nicotine in indoor air	TG-5MS	26098-2970	221
D5134	Petroleum naphthas through n-nonane	TG-1MS	Inquire	220
D5135	Styrene	TG-WAXMS	26088-2360	234
D5399	Boiling point distribution of hydrocarbon solvents	TR-SimDist	260S348P	257
D5441	Methyl t-butyl ether	TG-1MS	Inquire	220
D5442	Petroleum waxes	TG-1MS	26099-1430	220
		TG-5MS	26098-1300	221
D5480	Motor oil volatility	TG-5MS	Inquire	221
D5501	Ethanol content of denatured fuel ethanol	TG-1MS	Inquire	220
D5580	Benzene, toluene, ethylbenzene, p/o/m-xylene, C9 and heavier aromatics in finished gasoline	TR-1	260A470P	245
D5599	Oxygenates in gasoline by oxygen selective FID	TG-1MS	26099-3080	220
D5623	Sulfur compounds in light petroleum liquids using sulfur selective detection	TG-1MS	Inquire	220
D5713	High purity benzene for cyclohexane feedstock	TG-1MS	Inquire	220
D5739	Oil spill source identification using positive ion electron impact low resolution MS	TG-5MS	26098-1420	221
D5769	Benzene, toluene and total aromatics in finished gasolines	TG-1MS	26099-3080	220
		TG-624	26085-3330	229
D5790	Purgeable organic compounds in water	TG-5MS	26098-1420	221
D5812	Organochlorine pesticides in water	TG-1701MS	26090-1420	230
		TG-17MS	26089-1420	231
		TG-WAXMS	26088-1550	234
D5917	Trace impurities in monocyclic aromatic hydrocarbons	TR-FAME	260M154P	259
D5974	Fatty androsin acids in tall oil fraction products	TG-1MS	Inquire	220
D5986	Oxygenates, benzene, toluene, C8-C12 aromatics and total aromatics in finished gasoline by GC/FTIR	TG-5MS	26098-1420	221
D6160	PCBs in waste materials	TR-SimDist	260S250P	257
D6352	Boiling range distribution of petroleum fractions	TG-1MS	Inquire	220
		TR-SimDist	260S250P	257
D6417	Engine oil volatility	TG-1MS	Inquire	220
D6584	Free and Total Glycerin in B-100 Biodiesel	TR-BioDiesel (G)	26AF024P	261
D6729	Individual components in spark ignition engine fuels	TG-1MS	Inquire	220
D6730	Individual components in spark ignition engine fuels using precolumn	TG-5MS	26098-2960	221
		TG-624	26085-4080	229
E202	Ethylene glycols and propylene glycols	TR-5	260E470P	247
E475	Di-tert-butyl peroxide	TG-1MS	Inquire	220
E1616	Acetic anhydride	TG-WAXMS	26088-3090	234
E1863	Acrylonitrile	TR-SimDist	260S250P	257

GC Column Selection by US EPA Drinking Water Test Method

Selected EPA Drinking Water methods are listed below with the appropriate Thermo Scientific GC column offerings. In some cases, there is more than one phase or column dimension that can be used. When in doubt, it is recommended that you consult the original complete method or contact our technical support team for additional information or help in choosing the correct column for your application.

Method	Title	Recommended Thermo Scientific Phase	Part Number	Page
501.3	Trihalomethanes	TG-624	26085-3960	229
502.1	Volatile halogenated compounds	TG-624 TR-5MS	26085-4080 260F396P	229 248
502.2	Volatile organic compounds	TG-624 TG-624	26085-4080 26085-3320	229 229
503.1	Volatile aromatic & unsaturated organics	TG-624 TR-5MS	26085-4080 260F396P	229 248
504	EDB and DBCP	TR-5MS TG-5MS	260F396P 26098-2240	248 221
504.1	EDB and DBCP	TR-5MS TG-5MS	260F396P 26098-2240	248 221
506	Phthalates and adipates	TG-1MS TG-5MS	26099-1430 26098-1430	220 221
507	Organonitrogen and organophosphorus pesticides	TG-5MS TG-17MS	26098-1420 26089-1420	221 231
509	Ethylene thiourea	TG-1701MS TG-WAXMS	26090-1420 26088-1300	230 234
513	Dioxin	TG-5MS	26098-1540	221
515.2	Chlorinated herbicides	TG-5MS TG-17MS	26098-1430 26089-1430	221 231
524.1	Volatile organic compounds	TR-524 TG-624 TG-624	26RV495P 26085-4080 26085-3320	260 229 229
524.2	Volatile organic compounds	TR-524 TG-624 TG-624	26RV495P 26085-4080 26085-3320	260 229 229
525.1	Semi-volatile organic compounds	TR-525 TG-5MS	26RX142P 26098-1420	260 221
525.2	Semi-volatile organic compounds	TR-525 TG-5MS	26RX142P 26098-1420	260 221
527	Selected pesticides and flame retardants	TR-527 TG-5MS	26RF142P 26098-1420	260 221
548.1	Endothall	TG-1MS TG-5MS	26099-1430 26098-1420	220 221
551	Chlorinated disinfection by-products/chlorinated solvents	TG-5MS TG-1701MS	26098-1420 26090-2240	221 230
552	Haloacetic acids	TG-1701MS TG-35MS	26090-1430 26094-1430	230 226
552.1	Haloacetic acids and dalapon	TG-1701MS TG-35MS	26090-1430 26094-1430	230 226

GC Column Selection by US EPA Waste Water Test Method

Selected EPA Waste Water methods are listed below with the appropriate Thermo Scientific GC column offerings. In some cases, there is more than one phase or column dimension that can be used. When in doubt, it is recommended that you consult the original complete method or contact our technical support team for additional information or help in choosing the correct column for your application.

Method	Title	Recommended Thermo Scientific Phase	Part Number	Page
601	Purgable halocarbons	TG-624 TG-624	26085-4080 26085-3320	229 229
602	Purgable aromatics	TG-624 TG-5MS	26085-4080 26098-2960	229 221
603	Acrolein and acrylonitrile	TG-624 TG-5MS	26085-4080 26098-2960	229 221
604	Phenols	TG-5MS TG-35MS	26098-1420 26094-1420	221 226
606	Phthalate ester	TG-5MS TG-35MS	26098-1420 26094-1420	221 226
607	Nitrosamines	TG-5MS TG-35MS	26098-1420 26094-1420	221 226
608.1	Organochlorine pesticides in industrial and municipal water	TG-5MS	26098-2240	221
608.2	Organochlorine pesticides in wastewater	TG-5MS	26098-2240	221
609	Nitroaromatics and isophorone	TG-5MS TG-35MS	26098-1430 26094-1430	221 226
610	Polynuclear aromatic hydrocarbons	TG-5MS	26098-1420	221
611	Haloethers	TG-5MS TG-35MS	26098-1430 26094-1430	221 226
612	Chlorinated hydrocarbons	TG-5MS TG-35MS	26098-1430 26094-1430	221 226
613	Dioxin	TG-5MS	26098-1540	221
614	Organophosphorous pesticides in industrial and municipal water	TG-5MS TG-17MS	26098-1420 26089-1420	221 231
614.1	Organophosphorous pesticides in wastewater	TG-5MS TG-17MS	26098-1420 26089-1420	221 231
615	Chlorinated herbicides in industrial and municipal water	TG-5MS TG-17MS	26098-1420 26089-1420	221 231
616	C, H, and O compounds	TG-1MS TG-5MS	26099-1420 26098-1420	220 221
617	Organohalide pesticides and PCBs in industrial and municipal water	TG-5MS	26098-1420	221
618	Volatile pesticides in industrial and municipal water	TG-1MS TG-5MS	26099-2240 26098-2240	220 221
619	Triazines, pesticides and PCBs in industrial and municipal water	TG-35MS	26094-1430	226
620	Diphenylamine in industrial and municipal water	TG-1MS TG-5MS	26099-1430 26098-1430	220 221
622	Organophosphorous pesticides in industrial and municipal water	TG-5MS TG-17MS	26098-1420 26089-1420	221 231
622.1	Thiophosphate pesticides	TG-5MS TG-35MS	26098-1420 26094-1420	221 226
624	Purgeables	TG-624 TG-624	26085-4080 26085-3320	229 229
625	Base/neutrals and acids	TG-5MS TG-5MS	26098-1420 26098-1430	221 221
627	Dinitroaniline pesticides in industrial and municipal water	TG-5MS TG-35MS	26098-1430 26094-1430	221 226
630.1	Dithiocarbamate pesticides as carbon disulfide	TG-5MS TG-5MS	26098-1420 26098-1430	221 221
633	Organonitrogen pesticides	TG-5MS TG-17MS	26098-1420 26089-1420	221 231
633.1	Neutral nitrogen-containing pesticides	TG-5MS TG-35MS	26098-1420 26094-1420	221 226
634	Thiocarbamate pesticides	TG-5MS TG-35MS	26098-1420 26094-1420	221 226
645	Amine pesticides and lethane in industrial and municipal water	TG-5MS TG-35MS	26098-1420 26094-1420	221 226
646	Dinitro aromatic pesticides	TG-5MS TG-35MS	26098-1420 26094-1420	221 226

GC Column Selection by US EPA Solid Waste Test Method

Selected EPA Solid Waste methods are listed below with the appropriate Thermo Scientific GC column offerings. In some cases, there is more than one phase or column dimension that can be used. When in doubt, it is recommended that you consult the original complete method or contact our technical support team for additional information or help in choosing the correct column for your application.

Method	Title	Recommended Thermo Scientific Phase	Part Number	Page
8010B	Halogenated volatile organics	TG-624 TG-624	26085-4080 26085-3320	229 229
8011	EDB and DBCP	TG-5MS	26098-1420	221
8015B	Nonhalogenated volatile organics	TG-624 TG-5MS	26085-4080 26098-2960	229 221
8020A	Aromatic volatile organics	TG-624 TG-5MS	26085-4080 26098-2960	229 221
8021A	Halogenated and aromatic volatile organics	TG-624 TG-5MS	26085-4080 26098-2960	229 221
8030A	Acrolein and acrylonitrile	TG-624	26085-4080	229
8031	Acrylonitrile	TG-624	26085-3390	229
8032	Acrylamide	TG-624	26085-3390	229
8040A	Phenols	TG-5MS TG-35MS	26098-1420 26094-1420	221 226
8060	Phthalate esters	TG-5MS	26098-1420	221
8061	Phthalate esters	TG-5MS	26098-1420	221
8070	Nitrosamines	TG-5MS	26098-1430	221
8081	Organochlorine pesticides and PCBs	TG-5MS TG-17MS	26098-2230 26089-1420	221 231
8090	Nitroaromatics and cyclic ketones	TG-5MS	26098-1430	221
8095	Explosives	TR-8095	260P123P	260
8100	Polynuclear aromatic hydrocarbons	TG-5MS	26098-1420	221
8110	Haloethers	TG-5MS	26098-1420	221
8120A	Chlorinated hydrocarbons	TG-5MS	26098-1430	221
8121	Chlorinated hydrocarbons	TG-5MS	26098-1430	221
8140	Organophosphorous pesticides	TG-5MS TG-17MS	26098-1420 26089-1420	221 231
8141A	Organophosphorous pesticides	TG-5MS TG-17MS	26098-1420 26089-1420	221 231
8150B	Chlorinated herbicides	TG-5MS TG-17MS	26098-1420 26089-1420	221 231
8151	Chlorinated herbicides	TG-5MS TG-17MS	26098-1420 26089-1420	221 231
8240B	Volatile organic compounds	TG-624 TG-624	26085-4080 26085-3320	229 229
8250A	Semi-volatile organic compounds	TG-5MS TG-5MS	26098-1420 26098-1430	221 221
8260A	Volatile organic compounds	TG-624 TG-624	26085-4080 26085-3320	229 229
8270B	Semi-volatile organic compounds	TG-5MS TG-5MS	26098-1420 26098-1430	221 221
8270C	Semi-volatile organic compounds	TR-8270	26RF296P	260
8280	Polychlorinated dioxins and furans	TG-5MS	26098-1540	221
8290	Polychlorinated dioxins and furans	TG-5MS	26098-1540	221

GC Column Selection by NIOSH Method

Selected NIOSH methods are listed below with the recommended Thermo Scientific GC column offerings included for your convenience. There may be more than one phase or column dimension that can be used. When in doubt, it is recommended that you consult the original complete method or contact our technical support team for additional information or help in choosing the correct column for your application.

Method	Title	Recommended Thermo Scientific Phase	Part Number	Page
801	Aerobic bacteria	TR-FAME	Inquire	259
1001	Methylene chloride	TG-1MS	26098-1430	220
1002	Chloroprene	TG-1MS	26098-2960	220
1003	Halogenated hydrocarbons	TG-624	26085-3390	229
1004	Dichloroethyl ether	TG-1MS	Inquire	220
1005	Methylene chloride	TG-WAXMS	26088-1430	234
1010	Epichlorohydrin	TG-WAXMS	Inquire	234
1011	Ethyl bromide	TG-WAXMS	26088-2240	234
1013	Propylene dichloride	TG-WAXMS	Inquire	234
1015	Vinylidene chloride	TG-624	Inquire	229
1016	1,1,2,2-Tetrachoro-2,2-difluoroethane and 1,1,2,2-tetrachoro-1,2-difluoroethane	TG-WAXMS	26088-2240	234
1018	Dichlorodifuoromethane, 1,2-dichlorotetrafluoroethane and chlorodifluoromethane	TG-1MS	26099-2970	220
1020	1,1,2-Trichloro-1,2,2-trifluoroethane	TG-WAXMS	26088-1430	234
1300	Ketones 1	TG-WAXMS	26088-2240	234
1301	Ketones 2	TG-WAXMS	26088-2240	234
1302	N-Methyl-2-pyrrolidinone	TG-5MS	26098-2970	221
1400	Alcohols 1	TG-WAXMS	26088-2240	234
1401	Alcohols 2	TG-WAXMS	26088-2240	234
1402	Alcohols 3	TG-WAXMS	26088-2240	234
1403	Alcohols 4	TG-WAXMS	26088-1430	234
1450	Esters 1	TG-WAXMS	26088-2240	234
1451	Methyl cellosolve acetate	TG-5MS	26098-2970	221
1453	Vinyl acetate	TG-5MS	26098-2970	221
1454	Isopropyl acetate	TG-1MS	26099-2970	220
1457	Ethyl acetate	TG-WAXMS	26088-2970	234
1458	Methyl acetate	TG-WAXMS	26088-2970	234
1500	Hydrocarbons (b.p. 36 -126 °C)	TR-1	260A395P	245
1501	Aromatic hydrocarbons	TG-WAXMS	26088-2970	234
1550	Naphthas	TG-1MS	26099-1540	220
1551	Turpentine	TG-1MS	26099-1540	220
1552	Terpenes	TG-WAXMS	26088-3100	234
1601	1,1-Dichloro-1-nitroethane	TG-1MS	Inquire	220
1602	Dioxane	TG-5MS	26098-2970	221
1604	Acrylonitrile	TG-WAXMS	26088-2240	234
1606	Acetonitrile	TG-WAXMS	26088-2970	234
1608	Glycidol	TG-WAXMS	Inquire	234
1609	Tetrahydrofuran	TG-WAXMS	26088-2240	234
1610	Ethyl ether	TG-1MS	26099-2970	220
1611	Methylal	TG-WAXMS	Inquire	234
1612	Propylene oxide	TG-5MS	26098-2970	221
1613	Pyridine	TG-5SilMS	26096-2970	221
1614	Ethylene oxide	TG-WAXMS	Inquire	234
1615	Methyl-tert-butyl ether	TG-1MS	26099-2240	220
1618	Isopropyl ether	TR-1	260A395P	245
2000	Methanol	TG-35MS	26094-2980	226
2004	Dimethlyacetamide and dimethylformamide	TG-WAXMS	26088-2240	234
2005	Nitroaromatics	TG-5MS	26098-2250	221
2007	Aminoethanol compounds 1	TG-5MS	Inquire	221
2010	Aliphatic amines	TG-5MS	26098-1420	221
2012	n-Butylamine	TG-5MS	26098-1420	221

GC Column Selection by NIOSH Method

Method	Title	Recommended Thermo Scientific Phase	Part Number	Page
2017	Aniline, o-toluidine and nitrobenzene	TG-5MS	26098-2970	221
2500	Methyl ethyl ketone	TG-1MS	26099-2970	220
2505	Furfuryl alcohol	TG-1MS	26099-1420	220
2520	Methyl bromide	TG-1MS	26099-2970	220
2529	Furfural	TG-5MS	26098-2960	221
2536	Valeraldehyde	TG-5MS	26098-1310	221
2537	Methyl methacrylate	TG-35MS	26094-2980	226
2541	Formaldehyde	TG-WAXMS	26088-2240	234
2542	Mercaptans	TG-1MS	26099-2960	220
2546	Cresols and phenol	TG-WAXMS	26088-1430	234
2549	Volatile organic CPDS (screening)	TG-1MS	26099-2960	220
2550	Benzothiazole in asphalt fume	TG-1MS	26099-2970	220
2551	Nicotine	TG-5MS	26098-2970	221
3511	Monomethylaniline	TG-5MS	26098-1420	221
3513	Tetranitromethane	TG-1MS	26099-1420	220
5020	Dibutyl phthalate and di(2-ethylhexyl) phthalate	TG-1MS	26099-1300	220
5515	Polynuclear aromatic hydrocarbons	TG-1MS	26099-3090	220
5519	Endrin	TG-1MS	26099-3090	220
5523	Glycols	TG-35MS	26094-2980	226
5600	Organophosphorus pesticides	TG-5MS	26098-2970	221
5602	Chlorinated organonitrogen herbicides (air sampling)	TG-17MS	26089-1420	231
5701	Resorcinol	TG-1MS	26099-1420	220
9200	Chlorinated organonitrogen herbicides (hand wash)	TG-17MS	26089-1420	231
9201	Chlorinated organonitrogen herbicides (dermal patch)	TG-17MS	26089-1420	231

Thermo Scientific TRACE GC Columns

The Thermo Scientific TRACE™ family of GC Columns offer high temperature stability and exhibit low bleed and long lifetimes. From general purpose non-polar to polar columns, TraceGOLD™, TRACE & TracePLOT™ columns provide excellent quality and performance, with guaranteed reproducibility.

TraceGOLD GC Columns

Offering you a leap forward in column performance delivering low bleed and superior inertness

Go to — PAGE 219

TracePLOT GC Columns

The latest innovation in PLOT column technology, providing reproducible analyses of permanent gases, hydrocarbons and solvents

Go to — PAGE 238

TRACE GC Columns

Offering excellent quality and reproducilbity for a wide range of GC applications

Go to — PAGE 244

Thermo Scientific TRACE GC Capillary Columns

A leap forward in column performance

- Low bleed even at elevated temperatures
- Outstanding robustness for difficult separations
- Reliable and reproducible performance
- Complete range of GC consumables for all instruments

The heart of any gas chromatograph is the column. We have used the knowledge gained more than 30 years of HPLC column production and 50 years in GC and GC/MS instrument manufacturing to offer a range of columns and consumables that are unsurpassed in the most important aspects of their performance.

Low Bleed

Bleeding phases cause problems including low sensitivity, detector contamination, lower temperature limits and short lifetimes. All manufacturers have at some time claimed their columns have the lowest bleed, but use supporting chromatograms that lack reproducible scale information or methodology. By quantifying the amount of phase bleeding from the column, we can show that the Thermo Scientific TRACE column range has less than half the bleed of other popular columns.

Robustness

Moisture and oxygen pose a danger to GC columns. Oxygen contamination can come from many sources, leading to shortened lifetimes, increased bleed and increased cost. TRACE GC columns have been manufactured with improved phase bonding to minimize the risk of damage due to contaminated carrier gas or difficult samples.

Reproducibility

As well as focusing on individual column performance, we work to improve column-to-column reproducibility, arising from major improvements in the production processes. A column bought today will have the same characteristics or better as one obtained a year or ten years from now.

Guaranteed Performance

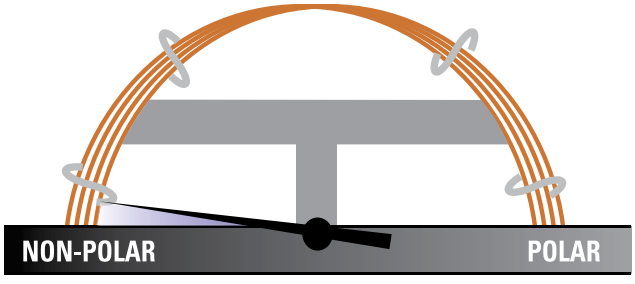
All TRACE columns have passed rigorous testing procedures to ensure the highest possible performance and are delivered with a serialized certificate to show their performance and assist with traceability. All Thermo Scientific columns come with a 100% guarantee. If for any reason the column does not perform up to our claims, we will replace it with one that does.

Technical Support

Our quality technical support will help you solve your problems quickly, via phone, our web resource center or the technical section of this catalog. Please refer to the GC Column Selection Guide on page 204 for information to help you select the appropriate column for your separation. If you are looking for a column for a NIOSH, ASTM or EPA method, Thermo Scientific column recommendations are given on pages 210-216. Should you need assistance with column selection or method development, please contact one of our technical support desks and our highly trained team of scientists will be able to help.

Quick Reference Icon

The reference graphic (below) on each column page gives easy access to the specifications of each phase type. It gives a relative measure of polarity, its chemistry and its maximum temperature limits as well as its USP classification.



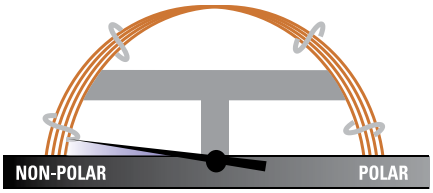
Phase:	100% Dimethyl Polysiloxane
Max. Temps.:	330°C/350°C
USP Listing:	G2

TraceGOLD GC Columns

TraceGOLD GC Columns offer you a leap forward in column performance delivering low bleed and superior inertness ideally suited to MS applications.

TraceGOLD TG-1MS GC Columns

Exceptionally low bleed for optimal signal-to-noise ratio, sensitivity and mass spec integrity



Phase:	100% Dimethyl Polysiloxane
Max. Temps.:	330°C/350°C
USP Listing:	G2

Applications:

- Hydrocarbons
- PCBs
- Drugs of abuse
- Gasoline range organics (GRO)
- Refinery gases
- Essential oils
- Pesticides

- **Non-polar, 100% dimethyl polysiloxane**
- **Equivalent to USP G2**

Similar to:

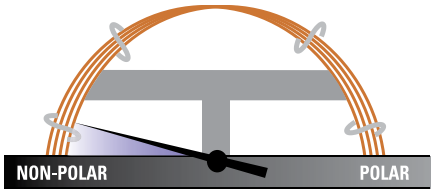
Rxi-1ms, DB-1, DB-1ms, HP-1, HP-1ms, Ultra-1, SPB-1, Equity-1, VF-1ms, CP-Sil 5 CB Low Bleed,/MS

TraceGOLD TG-1MS GC Columns

I.D.	Length	Film Thickness	Cat. No.	Quantity
0.1mm	10m	0.1µm	**26099-0200**	1 Each
0.25mm	15m	0.25µm	**26099-1300**	1 Each
0.25mm	15m	0.5µm	**26099-2110**	1 Each
0.25mm	15m	1µm	**26099-2840**	1 Each
0.25mm	30m	0.25µm	**26099-1420**	1 Each
0.25mm	30m	0.5µm	**26099-2230**	1 Each
0.25mm	30m	1µm	**26099-2960**	1 Each
0.25mm	60m	0.25µm	**26099-1540**	1 Each
0.25mm	60m	0.5µm	**26099-2350**	1 Each
0.25mm	60m	1µm	**26099-3080**	1 Each
0.32mm	15m	0.25µm	**26099-1310**	1 Each
0.32mm	15m	0.5µm	**26099-2120**	1 Each
0.32mm	15m	1µm	**26099-2850**	1 Each
0.32mm	30m	0.25µm	**26099-1430**	1 Each
0.32mm	30m	0.5µm	**26099-2240**	1 Each
0.32mm	30m	1µm	**26099-2970**	1 Each
0.32mm	60m	0.25µm	**26099-1550**	1 Each
0.32mm	60m	0.5µm	**26099-2360**	1 Each
0.32mm	60m	1µm	**26099-3090**	1 Each
0.53mm	15m	0.5µm	**26099-2130**	1 Each
0.53mm	15m	1µm	**26099-2860**	1 Each
0.53mm	15m	1.5µm	**26099-3340**	1 Each
0.53mm	30m	0.5µm	**26099-2250**	1 Each
0.53mm	30m	1µm	**26099-2980**	1 Each
0.53mm	30m	1.5µm	**26099-3360**	1 Each
0.53mm	60m	1.5µm	**26099-3370**	1 Each

TraceGOLD TG-5MS GC Columns

The most widely used MS phase in gas chromatography



Phase:	5% diphenyl / 95% dimethyl polysiloxane
Max. Temps.:	330°C/350°C
USP Listing:	G27, G36

Applications:

- Semivolatiles
- Phenols
- Amines
- Residual solvents and solvent impurities
- Drugs of abuse
- Pesticides
- PCB cogeners
- Aroclor mixes

- **Low polarity phase, 5% diphenyl/95% dimethyl polysiloxane**
- **Low bleed for excellent signal-to-noise ratio, sensitivity and mass spectral integrity**
- **Exceptional inertness ideal for analysis of active compounds**
- **Equivalent to USP G27 phase**

Similar to:

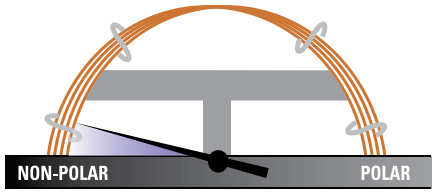
Rxi-5ms, DB-5, HP-5, HP-5ms, Ultra-2, SPB-5, Equity-5, CP-Sil 8

TraceGOLD TG-5MS GC Columns

I.D.	Length	Film Thickness	Cat. No.	Quantity
0.1mm	10m	0.1µm	**26098-0200**	1 Each
0.25mm	15m	0.25µm	**26098-1300**	1 Each
0.25mm	15m	0.5µm	**26098-2110**	1 Each
0.25mm	15m	1µm	**26098-2840**	1 Each
0.25mm	30m	0.25µm	**26098-1420**	1 Each
0.25mm	30m	0.5µm	**26098-2230**	1 Each
0.25mm	30m	1µm	**26098-2960**	1 Each
0.25mm	60m	0.25µm	**26098-1540**	1 Each
0.25mm	60m	0.5µm	**26098-2350**	1 Each
0.25mm	60m	1µm	**26098-3080**	1 Each
0.32mm	15m	0.25µm	**26098-1310**	1 Each
0.32mm	15m	0.5µm	**26098-2120**	1 Each
0.32mm	15m	1µm	**26098-2850**	1 Each
0.32mm	30m	0.25µm	**26098-1430**	1 Each
0.32mm	30m	0.5µm	**26098-2240**	1 Each
0.32mm	30m	1µm	**26098-2970**	1 Each
0.32mm	60m	0.25µm	**26098-1550**	1 Each
0.32mm	60m	0.5µm	**26098-2360**	1 Each
0.32mm	60m	1µm	**26098-3090**	1 Each
0.53mm	15m	0.25µm	**26098-1320**	1 Each
0.53mm	15m	0.5µm	**26098-2130**	1 Each
0.53mm	15m	1µm	**26098-2860**	1 Each
0.53mm	15m	1.5µm	**26098-3340**	1 Each
0.53mm	30m	0.25µm	**26098-1440**	1 Each
0.53mm	30m	0.5µm	**26098-2250**	1 Each
0.53mm	30m	1µm	**26098-2980**	1 Each
0.53mm	30m	1.5µm	**26098-3360**	1 Each

TraceGOLD TG-SQC GC Columns

Ensure the quality of a Thermo Scientific instrument when installed on site



Phase:	Proprietary
Max. Temps.:	330°C/350°C

Applications:

- System Qualification Tests (Thermo Scientific GCMS)

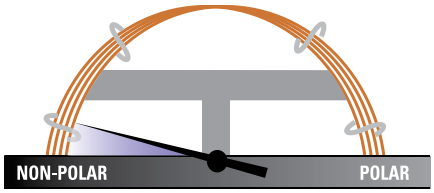
- **Optimized for system qualification tests for new GCMS installations or during service/maintenance of an existing instrument**
- **Thermo Scientific recommends reserving this column for benchmark testing only**

TraceGold TG-SQC GC Columns

I.D.	Length	Film Thickness	Cat. No.	Quantity
0.25mm	15m	0.25µm	**26070-1300**	1 Each
0.25mm	30m	0.25µm	**26070-1420**	1 Each

TraceGOLD TG-5MS AMINE GC Columns

Analysis of ppm levels of amines without column priming



Phase:	Modified 5% Phenyl Methylpolysiloxane for Basic Compounds
Max. Temps.:	305°C/315°C
USP Listing:	N/A

Applications:

- Amines and other basic compounds, including alkylamines, diamines, triamines, ethanolamines
- Nitrogen-containing heterocyclics

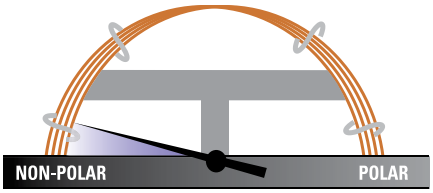
- **Low polarity phase, 5% diphenyl/95% dimethyl polysiloxane**
- **Tubing surface is chemically altered to reduce tailing of active basic compounds**
- **Also allows analysis of neutral or weakly acidic compounds (e.g., phenols) and compounds susceptible to hydrogen bonding**
- **Low bleed at maximum operating temperature**

TraceGOLD TG-5MS AMINE GC Columns

I.D.	Length	Film Thickness	Cat. No.	Quantity
0.25mm	15m	0.25µm	**26097-1300**	1 Each
0.25mm	15m	0.5µm	**26097-2110**	1 Each
0.25mm	15m	1µm	**26097-2840**	1 Each
0.25mm	30m	0.25µm	**26097-1420**	1 Each
0.25mm	30m	0.5µm	**26097-2230**	1 Each
0.25mm	30m	1µm	**26097-2960**	1 Each
0.32mm	15m	1µm	**26097-2850**	1 Each
0.32mm	30m	1µm	**26097-2970**	1 Each
0.53mm	15m	1µm	**26097-2860**	1 Each
0.53mm	15m	3µm	**26097-3840**	1 Each
0.53mm	30m	1µm	**26097-2980**	1 Each
0.53mm	30m	3µm	**26097-3960**	1 Each

TraceGOLD TG-5SilMS GC Columns

Incorporate phenyl groups in the polymer backbone for improved thermal stability, reduced bleed and reduced susceptibility to oxidation



Phase:	Similar to 5% Phenyl Methylpolysiloxane
Max. Temps.:	330°C/350°C
USP Listing:	G27, G36

Applications:

- GC/MS applications using ion-trap systems
- Polycyclic aromatics
- Hydrocarbons including chlorinated hydrocarbons
- Phthalates
- Phenols
- Amines
- Organophosphate

- **Low polarity, silarylene phase with selectivity comparable to 5 % diphenyl/95% dimethyl polysiloxane**
- **Designed for low bleed and outstanding inertness**

Similar to:

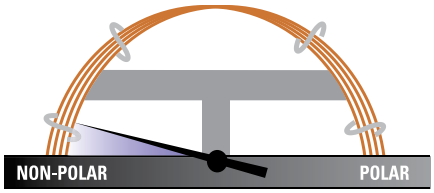
DB-5MS, VF-5ms, CP-Sil 8 Low-Bleed/MS, Rxi-5Sil MS, BPX5, ZB-5ms, Optima-5MS, SLB-5

TraceGOLD TG-5SilMS GC Columns

I.D.	Length	Film Thickness	Cat. No.	Quantity
0.1mm	10m	0.1µm	**26096-0200**	1 Each
0.25mm	15m	0.25µm	**26096-1300**	1 Each
0.25mm	15m	0.5µm	**26096-2110**	1 Each
0.25mm	15m	1µm	**26096-2840**	1 Each
0.25mm	30m	0.25µm	**26096-1420**	1 Each
0.25mm	30m	0.5µm	**26096-2230**	1 Each
0.25mm	30m	1µm	**26096-2960**	1 Each
0.25mm	60m	0.25µm	**26096-1540**	1 Each
0.25mm	60m	1µm	**26096-3080**	1 Each
0.32mm	15m	0.25µm	**26096-1310**	1 Each
0.32mm	30m	0.25µm	**26096-1430**	1 Each
0.32mm	30m	0.5µm	**26096-2240**	1 Each
0.32mm	30m	1µm	**26096-2970**	1 Each
0.53mm	30m	1.5µm	**26096-3360**	1 Each

TraceGOLD TG-5HT GC Columns

Offers extended operation up to 400°C, ideal for high temperature extended GC applications



Phase:	5% Phenyl Methylpolysiloxane
Max. Temps.:	380°C/400°C
USP Listing:	G27, G36

Applications:

- Phenols
- Residual solvents
- Solvents
- Semivolatiles
- Pesticides
- PCBs
- Solvent impurities

- **Low polarity, 5% diphenyl/95% dimethyl polysiloxane**
- **Lower bleed and better inertness than comparable high-temperature columns**
- **Special design of fused silica tubing extends column lifetime by up to 40%**

Similar to:

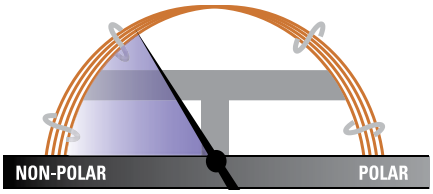
Rxi-5HT, BP-5HT, VF-5HT, ZB-5HT

TraceGOLD TG-5HT GC Columns

I.D.	Length	Film Thickness	Cat. No.	Quantity
0.25mm	15m	0.1µm	**26095-0350**	1 Each
0.25mm	30m	0.1µm	**26095-0470**	1 Each
0.25mm	30m	0.25µm	**26095-1420**	1 Each
0.32mm	15m	0.1µm	**26095-0360**	1 Each
0.32mm	30m	0.1µm	**26095-0480**	1 Each
0.32mm	30m	0.25µm	**26095-1430**	1 Each
0.53mm	30m	0.15µm	**26095-0620**	1 Each

TraceGOLD TG-35MS GC Columns

Higher phenyl content for useful elution order and retention time changes



Phase:	35% Phenyl Methylpolysiloxane
Max. Temps.:	300°C/320°C
USP Listing:	G42

Applications:

- Organochlorine pesticides and herbicides
- Pharmaceuticals
- PCB cogeners
- Aroclor mixes
- Sterols
- Rosin acids
- Phthalate esters

- **Mid-polarity phase, 35% diphenyl/65% dimethyl polysiloxane**
- **Equivalent to USP G42 phase**

Similar to:

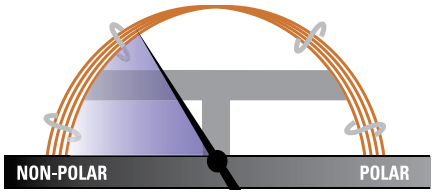
Rtx-35, BP-35, HP-35, SPB-35, SPB-608

TraceGOLD TG-35MS GC Columns

I.D.	Length	Film Thickness	Cat. No.	Quantity
0.25mm	15m	0.25µm	**26094-1300**	1 Each
0.25mm	15m	0.5µm	**26094-2110**	1 Each
0.25mm	15m	1µm	**26094-2840**	1 Each
0.25mm	30m	0.25µm	**26094-1420**	1 Each
0.25mm	30m	0.5µm	**26094-2230**	1 Each
0.25mm	30m	1µm	**26094-2960**	1 Each
0.32mm	15m	0.25µm	**26094-1310**	1 Each
0.32mm	15m	0.5µm	**26094-2120**	1 Each
0.32mm	15m	1µm	**26094-2850**	1 Each
0.32mm	30m	0.25µm	**26094-1430**	1 Each
0.32mm	30m	0.5µm	**26094-2240**	1 Each
0.32mm	30m	1µm	**26094-2970**	1 Each
0.53mm	15m	0.5µm	**26094-2130**	1 Each
0.53mm	15m	1µm	**26094-2860**	1 Each
0.53mm	15m	1.5µm	**26094-3340**	1 Each
0.53mm	15m	3µm	**26094-3840**	1 Each
0.53mm	30m	0.5µm	**26094-2250**	1 Each
0.53mm	30m	1µm	**26094-2980**	1 Each
0.53mm	30m	1.5µm	**26094-3360**	1 Each
0.53mm	30m	3µm	**26094-3960**	1 Each

TraceGOLD TG-35MS AMINE GC Columns

Chemically altered tubing surface reduces tailing and eliminates the need for column priming



Phase:	Modified 35% Phenyl Methylpolysiloxane for Basic Compounds
Max. Temps.:	200°C/220°C
USP Listing:	N/A

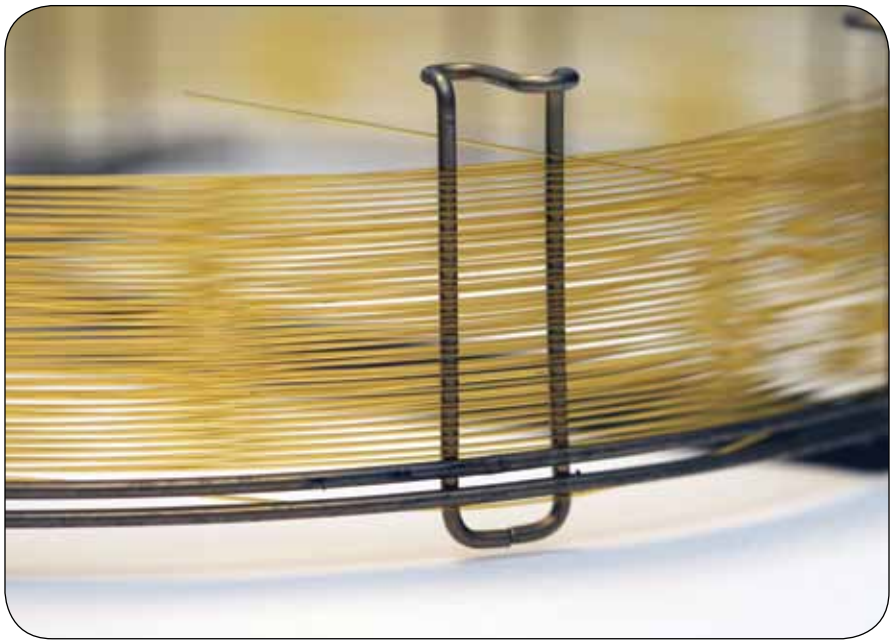
Applications:

- Amines including alkylamines, diamines, triamines and ethanolamines
- Nitrogen-containing heterocyclics

- **Midpolarity phase, 35% diphenyl/65% dimethyl polysiloxane**
- **Developed for analysis of active basic compounds without derivatization**
- **Also allows analysis of neutral compounds and adsorptive compounds with oxygen groups susceptible to hydrogen bonding**
- **Low bleed at maximum operating temperature**

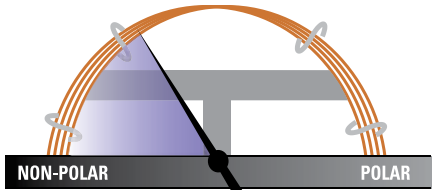
TraceGOLD TG-35MS AMINE GC Columns

I.D.	Length	Film Thickness	Cat. No.	Quantity
0.25mm	15m	0.5µm	**26092-2110**	1 Each
0.25mm	15m	1µm	**26092-2840**	1 Each
0.25mm	30m	0.5µm	**26092-2230**	1 Each
0.25mm	30m	1µm	**26092-2960**	1 Each
0.32mm	15m	1µm	**26092-2850**	1 Each
0.32mm	15m	1.5µm	**26092-0680**	1 Each
0.32mm	30m	1µm	**26092-2970**	1 Each
0.32mm	30m	1.5µm	**26092-3350**	1 Each
0.53mm	15m	1µm	**26092-2860**	1 Each
0.53mm	15m	3µm	**26092-3840**	1 Each
0.53mm	30m	1µm	**26092-2980**	1 Each
0.53mm	30m	3µm	**26092-3960**	1 Each



TraceGOLD TG-1301MS GC Columns

Low bleed, excellent reproducibility and column-to-column consistency even with sensitive detectors like ECDs and MS



Phase:	6% Cyanopropylphenyl Polysiloane
Max. Temps.:	260°C/280°C
USP Listing:	G43

Applications:

- Alcohols
- Volatile organics
- Oxygenates
- Residual solvents

- **Low to mid-polarity phase, 6% cyanopropylphenyl/94% dimethyl polysilo**
- **Long lifetime**
- **Excellent inertness**
- **Equivalent to USP G43 phase**

Similar to:

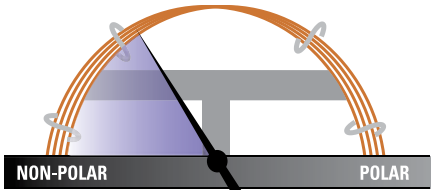
Rtx-1301, DB-1301, BP-624, HP-1301, HP-624, SPB-1301, SPB-624, VP-1301, BF-624ms, CP-1301, CP-Select 624 CB

TraceGOLD TG-1301MS GC Columns

I.D.	Length	Film Thickness	Cat. No.	Quantity
0.25mm	15m	0.25µm	**26091-1300**	1 Each
0.25mm	15m	0.5µm	**26091-2110**	1 Each
0.25mm	15m	1µm	**26091-2840**	1 Each
0.25mm	30m	0.25µm	**26091-1420**	1 Each
0.25mm	30m	0.5µm	**26091-2230**	1 Each
0.25mm	30m	1µm	**26091-2960**	1 Each
0.25mm	60m	0.25µm	**26091-1540**	1 Each
0.25mm	60m	0.5µm	**26091-2350**	1 Each
0.25mm	60m	1µm	**26091-3080**	1 Each
0.25mm	60m	1.4µm	**26091-3330**	1 Each
0.32mm	15m	0.25µm	**26091-1310**	1 Each
0.32mm	15m	0.5µm	**26091-2120**	1 Each
0.32mm	15m	1µm	**26091-2850**	1 Each
0.32mm	15m	1.5µm	**26091-0680**	1 Each
0.32mm	30m	0.25µm	**26091-1430**	1 Each
0.32mm	30m	0.5µm	**26091-2240**	1 Each
0.32mm	30m	1µm	**26091-2970**	1 Each
0.32mm	30m	1.5µm	**26091-3350**	1 Each
0.32mm	30m	1.8µm	**26091-3390**	1 Each
0.32mm	60m	0.25µm	**26091-1550**	1 Each
0.32mm	60m	0.5µm	**26091-2360**	1 Each
0.32mm	60m	1µm	**26091-3090**	1 Each
0.32mm	60m	1.8µm	**26091-3410**	1 Each
0.53mm	15m	0.25µm	**26091-1320**	1 Each
0.53mm	15m	0.5µm	**26091-2130**	1 Each
0.53mm	15m	1µm	**26091-2860**	1 Each
0.53mm	15m	1.5µm	**26091-3340**	1 Each
0.53mm	15m	3µm	**26091-3840**	1 Each
0.53mm	30m	0.25µm	**26091-1440**	1 Each
0.53mm	30m	0.5µm	**26091-2250**	1 Each
0.53mm	30m	1µm	**26091-2980**	1 Each
0.53mm	30m	1.5µm	**26091-3360**	1 Each
0.53mm	30m	3µm	**26091-3960**	1 Each
0.53mm	60m	0.25µm	**26091-1560**	1 Each
0.53mm	60m	0.5µm	**26091-2370**	1 Each
0.53mm	60m	1µm	**26091-3100**	1 Each
0.53mm	60m	1.5µm	**26091-3370**	1 Each
0.53mm	60m	3µm	**26091-4080**	1 Each
0.53mm	75m	3µm	**26091-4900**	1 Each
0.53mm	105m	3µm	**26091-4090**	1 Each

TraceGOLD TG-624 GC Columns

Offers 90+% resolution of the first six gases in EPA Method 8260 and EPA Method 524.2 for volatile organics analysis



Phase:	6% Cyanopropylphenyl Polysiloane
Max. Temps.:	220°C/240°C
USP Listing:	G43

Applications:

- Residual Solvents
- Volatile Organic Compounds
- Alcohols
- Oxygenates

- **Low to mid-polarity phase, 6% cyanopropylphenyl/94% dimethyl polysiloxane**
- **Ideal for EPA methods 624 and 608**
- **Allows resolution of 2-nitropropane from 1,1-dichloropropanone under EPA Method 524.2 revision IV**

Similar to:

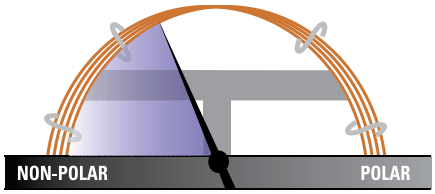
DB-1301, DB-624, HP-1301, HP-624, SPB-1301, SPB-624, VF-1301, VF-624ms, CP-1301, CP-Select 624 CB, Rtx-624, BP-624, ZB-624, Optima-1301, Optima-624, AT-624, 007-1301

TraceGOLD TG-624 GC Columns

I.D.	Length	Film Thickness	Cat. No.	Quantity
0.18mm	20m	1µm	**26085-4950**	1 Each
0.18mm	40m	1µm	**26085-4960**	1 Each
0.25mm	30m	1.4µm	**26085-3320**	1 Each
0.25mm	60m	1.4µm	**26085-3330**	1 Each
0.32mm	30m	1.8µm	**26085-3390**	1 Each
0.32mm	60m	1.8µm	**26085-3410**	1 Each
0.53mm	30m	3µm	**26085-3960**	1 Each
0.53mm	60m	3µm	**26085-4080**	1 Each
0.53mm	75m	3µm	**26085-4900**	1 Each
0.53mm	105m	3µm	**26085-4090**	1 Each

TraceGOLD TG-1701MS GC Columns

Feature a mix of cyano and phenyl groups for increased polarity and a different elution order relative to less polar columns



Phase:	14% Cyanopropylphenyl Polysiloxane
Max. Temps.:	260°C/280°C
USP Listing:	G46

Applications:

- Alcohols
- Pesticides
- Oxygenates
- PCB cogeners
- Aroclor mixes

- **Mid-polarity phase, 14% cyanopropylphenyl, 86% dimethyl polysiloxane**
- **Fully characterized for long-term reproducibility, column-to-column consistency and low bleed**
- **Optimal for confirmation analysis**
- **Equivalent to USP G46 phase**

Similar to:

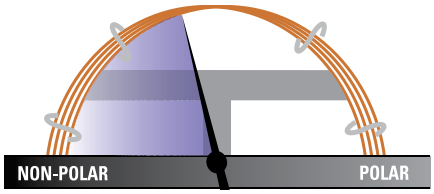
Rtx-1701, DB-1701, HP-1701, SPB-1701, VF-1701, CP-Sil 19 CB

TraceGOLD TG-1701MS GC Columns

I.D.	Length	Film Thickness	Cat. No.	Quantity
0.1mm	10m	0.1µm	**26090-0200**	1 Each
0.25mm	15m	0.25µm	**26090-1300**	1 Each
0.25mm	15m	0.5µm	**26090-2110**	1 Each
0.25mm	15m	1µm	**26090-2840**	1 Each
0.25mm	30m	0.25µm	**26090-1420**	1 Each
0.25mm	30m	0.5µm	**26090-2230**	1 Each
0.25mm	30m	1µm	**26090-2960**	1 Each
0.25mm	60m	0.25µm	**26090-1540**	1 Each
0.25mm	60m	0.5µm	**26090-2350**	1 Each
0.25mm	60m	1µm	**26090-3080**	1 Each
0.32mm	15m	0.25µm	**26090-1310**	1 Each
0.32mm	15m	0.5µm	**26090-2120**	1 Each
0.32mm	15m	1µm	**26090-2850**	1 Each
0.32mm	15m	1.5µm	**26090-0680**	1 Each
0.32mm	30m	0.25µm	**26090-1430**	1 Each
0.32mm	30m	0.5µm	**26090-2240**	1 Each
0.32mm	30m	1µm	**26090-2970**	1 Each
0.32mm	30m	1.5µm	**26090-3350**	1 Each
0.32mm	60m	0.25µm	**26090-1550**	1 Each
0.32mm	60m	0.5µm	**26090-2360**	1 Each
0.32mm	60m	1µm	**26090-3090**	1 Each
0.32mm	60m	1.5µm	**26090-0630**	1 Each
0.53mm	15m	0.25µm	**26090-1320**	1 Each
0.53mm	15m	0.5µm	**26090-2130**	1 Each
0.53mm	15m	1µm	**26090-2860**	1 Each
0.53mm	15m	1.5µm	**26090-3340**	1 Each
0.53mm	15m	3µm	**26090-3840**	1 Each
0.53mm	30m	0.25µm	**26090-1440**	1 Each
0.53mm	30m	0.5µm	**26090-2250**	1 Each
0.53mm	30m	1µm	**26090-2980**	1 Each
0.53mm	30m	1.5µm	**26090-3360**	1 Each
0.53mm	30m	3µm	**26090-3960**	1 Each
0.53mm	60m	0.25µm	**26090-1560**	1 Each
0.53mm	60m	0.5µm	**26090-2370**	1 Each
0.53mm	60m	1µm	**26090-3100**	1 Each
0.53mm	60m	1.5µm	**26090-3370**	1 Each
0.53mm	60m	3µm	**26090-4080**	1 Each

TraceGOLD TG-17MS GC Columns

Particularly suited to GCMS applications that require more polarity than a 5% Phenyl phase



Phase:	50% Phenyl Methylpolysiloxane
Max. Temps.:	300°C/320°C
USP Listing:	G43

Applications:

- Pesticides and herbicides
- Rosin acids
- Phthalate esters
- Triglycerides
- Sterols

- **Mid-polarity phase of 50% diphenyl/50% dimethyl polysiloxane**
- **Ideal for confirmational analysis**
- **Excellent inertness for active compounds such as pesticides**
- **Very low bleed ideal for analysis by GCMS**

Similar to:

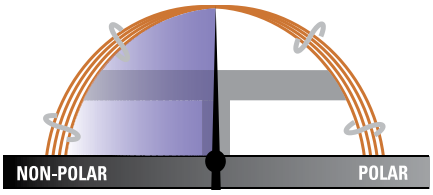
Rxi-17, DB-17, DB-608, VF-17ms, CP-Sil 24 CB

TraceGOLD TG-17MS GC Columns

I.D.	Length	Film Thickness	Cat. No.	Quantity
0.1mm	10m	0.1µm	**26089-0200**	1 Each
0.25mm	15m	0.25µm	**26089-1300**	1 Each
0.25mm	15m	0.5µm	**26089-2110**	1 Each
0.25mm	15m	1µm	**26089-2840**	1 Each
0.25mm	30m	0.25µm	**26089-1420**	1 Each
0.25mm	30m	0.5µm	**26089-2230**	1 Each
0.25mm	30m	1µm	**26089-2960**	1 Each
0.32mm	15m	0.25µm	**26089-1310**	1 Each
0.32mm	15m	0.5µm	**26089-2120**	1 Each
0.32mm	15m	1µm	**26089-2850**	1 Each
0.32mm	30m	0.25µm	**26089-1430**	1 Each
0.32mm	30m	0.5µm	**26089-2240**	1 Each
0.32mm	30m	1µm	**26089-2970**	1 Each
0.53mm	15m	0.25µm	**26089-1320**	1 Each
0.53mm	15m	0.5µm	**26089-2130**	1 Each
0.53mm	15m	1µm	**26089-2860**	1 Each
0.53mm	15m	1.5µm	**26089-3340**	1 Each
0.53mm	30m	0.25µm	**26089-1440**	1 Each
0.53mm	30m	0.5µm	**26089-2250**	1 Each
0.53mm	30m	1µm	**26089-2980**	1 Each
0.53mm	30m	1.5µm	**26089-3360**	1 Each

TraceGOLD TG-225MS GC Columns

Offers better thermal stability than comparable columns



Phase:	50% Cyanopropylphenyl Polysiloxane
Max. Temps.:	220°C/240°C
USP Listing:	G7, G19

Applications:

- FAMEs
- Carbohydrates
- Sterols
- Flavor compounds

- **Polar phase, 50% cyano propylmethyl/50% phenylmethyl polysiloxane**
- **Innovative deactivation process for siloxane reduces tailing and improves efficiency over comparable columns**
- **Equivalent to USP G7, G19 phases**

Similar to:

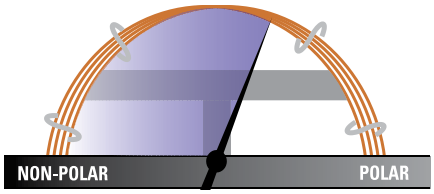
Rtx-225, DB-225, HP-225, SPB-225

TraceGOLD TG-225MS GC Columns

I.D.	Length	Film Thickness	Cat. No.	Quantity
0.25mm	15m	0.25µm	**26083-1300**	1 Each
0.25mm	15m	0.5µm	**26083-2110**	1 Each
0.25mm	30m	0.25µm	**26083-1420**	1 Each
0.25mm	30m	0.5µm	**26083-2230**	1 Each
0.25mm	60m	0.25µm	**26083-1540**	1 Each
0.25mm	60m	0.5µm	**26083-2350**	1 Each
0.32mm	15m	0.25µm	**26083-1310**	1 Each
0.32mm	15m	0.5µm	**26083-2120**	1 Each
0.32mm	15m	1µm	**26083-2850**	1 Each
0.32mm	30m	0.25µm	**26083-1430**	1 Each
0.32mm	30m	0.5µm	**26083-2240**	1 Each
0.32mm	30m	1µm	**26083-2970**	1 Each
0.32mm	60m	0.25µm	**26083-1550**	1 Each
0.32mm	60m	0.5µm	**26083-2360**	1 Each
0.32mm	60m	1µm	**26083-3090**	1 Each
0.53mm	15m	0.25µm	**26083-1320**	1 Each
0.53mm	15m	0.5µm	**26083-2130**	1 Each
0.53mm	15m	1µm	**26083-2860**	1 Each
0.53mm	30m	0.25µm	**26083-1440**	1 Each
0.53mm	30m	0.5µm	**26083-2250**	1 Each
0.53mm	30m	1µm	**26083-2980**	1 Each
0.53mm	60m	0.5µm	**26083-2370**	1 Each
0.53mm	60m	1µm	**26083-3100**	1 Each

TraceGOLD TG-200MS GC Columns

Exceptionally inert mid-polarity columns with selectivity and elution order optimized for difficult separations



Phase:	Trifluoropropylmethyl Polisiloxane
Max. Temps.:	320°C/340°C
USP Listing:	G6

Applications:

- Solvents
- Fluorocarbons
- Alcohols and letones
- Silanes
- Glycols

- **Polar phase, Trifluoropropylmethyl polysiloxane solid phase resolves compounds that phenyl and cyano phases cannot**
- **Outstanding thermal stability and low bleed**
- **Suitable for use with sensitive detectors including ECDs, NPDs and MS**
- **Equivalent to USP G6 phase**
- **Confirmation column in combination with another GC column**

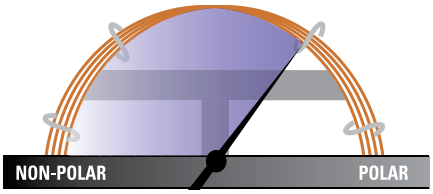
Similar to:
Rtx-200MS, DB-200, DB-210

TraceGOLD TG-200MS GC Columns

I.D.	Length	Film Thickness	Cat. No.	Quantity
0.25mm	30m	0.25µm	**26084-1420**	1 Each
0.25mm	30m	0.5µm	**26084-2230**	1 Each
0.25mm	30m	1µm	**26084-2960**	1 Each
0.32mm	30m	0.25µm	**26084-1430**	1 Each
0.32mm	30m	0.5µm	**26084-2240**	1 Each
0.32mm	30m	1µm	**26084-2970**	1 Each

TraceGOLD TG-WaxMS GC Columns

Manufactured for better column-to-column reproducibility



Phase:	Polyethylene Glycol (PEG)
Max. Temps.:	240/260°C
USP Listing:	G14, G15, G20, G39

Applications:

- FAMEs
- Flavor compounds and essential oils
- Solvents
- Xylene isomers
- EPA Method 603 for Acrolein/Acrylonitrile

- **Polar phase, polyethylene glycol**
- **Polar-deactivated surface tightly binds polymer for excellent thermal stability**
- **Resists oxidative damage, damage from strongly acidic or basic volatiles better than silicone solid phases**
- **Equivalent to USP G14, G15, G16, G20 and G39 phases**

Similar to:

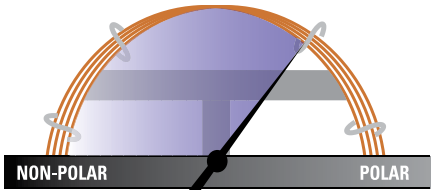
DB-WAX, DB-WAXetr, HP-Wax, HP-Innowax, Supelcowax 10, CP-Wax 52 CB, Stabilwax, Rtx-Wax, BP20, ZB-Wax, Optima Wax, AT-Wax

TraceGOLD TG-WaxMS GC Columns

I.D.	Length	Film Thickness	Cat. No.	Quantity
0.1mm	10m	0.1µm	**26088-0200**	1 Each
0.25mm	15m	0.25µm	**26088-1300**	1 Each
0.25mm	15m	0.5µm	**26088-2110**	1 Each
0.25mm	30m	0.25µm	**26088-1420**	1 Each
0.25mm	30m	0.5µm	**26088-2230**	1 Each
0.25mm	60m	0.25µm	**26088-1540**	1 Each
0.25mm	60m	0.5µm	**26088-2350**	1 Each
0.32mm	15m	0.25µm	**26088-1310**	1 Each
0.32mm	15m	0.5µm	**26088-2120**	1 Each
0.32mm	15m	1µm	**26088-2850**	1 Each
0.32mm	30m	0.25µm	**26088-1430**	1 Each
0.32mm	30m	0.5µm	**26088-2240**	1 Each
0.32mm	30m	1µm	**26088-2970**	1 Each
0.32mm	60m	0.25µm	**26088-1550**	1 Each
0.32mm	60m	0.5µm	**26088-2360**	1 Each
0.32mm	60m	1µm	**26088-3090**	1 Each
0.53mm	15m	0.25µm	**26088-1320**	1 Each
0.53mm	15m	0.5µm	**26088-2130**	1 Each
0.53mm	15m	1µm	**26088-2860**	1 Each
0.53mm	15m	1.5µm	**26088-3340**	1 Each
0.53mm	30m	0.25µm	**26088-1440**	1 Each
0.53mm	30m	0.5µm	**26088-2250**	1 Each
0.53mm	30m	1µm	**26088-2980**	1 Each
0.53mm	30m	1.5µm	**26088-3360**	1 Each
0.53mm	60m	0.25µm	**26088-1560**	1 Each
0.53mm	60m	0.5µm	**26088-2370**	1 Each
0.53mm	60m	1µm	**26088-3100**	1 Each
0.53mm	60m	1.5µm	**26088-3370**	1 Each

TraceGOLD TG-WaxMS A GC Columns

Acidic functionality in the polymer structure allows analysis of acidic compounds without derivatization



Phase:	Polyethylene Glycol (PEG)
Max. Temps.:	250°C
USP Listing:	G25, G35

Applications:

- Organic acids
- Free fatty acids
- Alcohols

- **Polar phase, acid-deactivated polyethylene glycol**
- **Resists oxidative damage and adsorption of acids**
- **Excellent peak shapes for high MW acids**
- **Equivalent to USP G25, G35 phases**

Similar to:

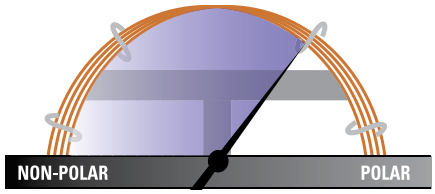
DB-FFAP, HP-FFAP, NUKOL, OV-351, CP-Wax 58 CB, FFAP, Stabilwax-DA, BP-21, Optima FFAP

TraceGOLD TG-WaxMS A GC Columns

I.D.	Length	Film Thickness	Cat. No.	Quantity
0.25mm	15m	0.25µm	**26087-1300**	1 Each
0.25mm	15m	0.5µm	**26087-2110**	1 Each
0.25mm	30m	0.25µm	**26087-1420**	1 Each
0.25mm	30m	0.5µm	**26087-2230**	1 Each
0.25mm	60m	0.25µm	**26087-1540**	1 Each
0.25mm	60m	0.5µm	**26087-2350**	1 Each
0.32mm	15m	0.25µm	**26087-1310**	1 Each
0.32mm	15m	0.5µm	**26087-2120**	1 Each
0.32mm	15m	1µm	**26087-2850**	1 Each
0.32mm	30m	0.25µm	**26087-1430**	1 Each
0.32mm	30m	0.5µm	**26087-2240**	1 Each
0.32mm	30m	1µm	**26087-2970**	1 Each
0.32mm	60m	0.25µm	**26087-1550**	1 Each
0.32mm	60m	0.5µm	**26087-2360**	1 Each
0.32mm	60m	1µm	**26087-3090**	1 Each
0.53mm	15m	0.25µm	**26087-1320**	1 Each
0.53mm	15m	0.5µm	**26087-2130**	1 Each
0.53mm	15m	1µm	**26087-2860**	1 Each
0.53mm	15m	1.5µm	**26087-3340**	1 Each
0.53mm	30m	0.25µm	**26087-1440**	1 Each
0.53mm	30m	0.5µm	**26087-2250**	1 Each
0.53mm	30m	1µm	**26087-2980**	1 Each
0.53mm	30m	1.5µm	**26087-3360**	1 Each
0.53mm	60m	0.25µm	**26087-1560**	1 Each
0.53mm	60m	0.5µm	**26087-2370**	1 Each
0.53mm	60m	1µm	**26087-3100**	1 Each
0.53mm	60m	1.5µm	**26087-3370**	1 Each

TraceGOLD TG-WaxMS B GC Columns

Base deactivation allows analysis of basic analytes without derivatization or column priming



Phase:	Modified Polyethylene Glycol (PEG) for Basic Compounds
Max. Temps.:	200°C/220°C
USP Listing:	N/A

Applications:

- Amines
- Alkylamines
- Diamines
- Other basic compounds

- **Polar phase, base deactivated polyethylene glycol phase**
- **Reduced absorption and improved responsiveness for basic compounds**
- **Not suitable for use with water or alcohols**

Similar to:

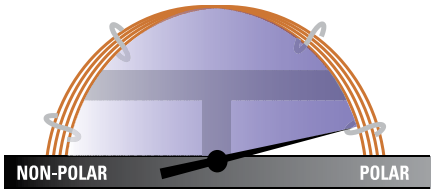
CAM, Carbowax Amine, CP Wax51, Stabilwax-DB

TraceGOLD TG-WaxMS B GC Columns

I.D.	Length	Film Thickness	Cat. No.	Quantity
0.25mm	15m	0.25µm	**26086-1300**	1 Each
0.25mm	30m	0.25µm	**26086-1420**	1 Each
0.25mm	30m	0.50µm	**26086-2230**	1 Each
0.32mm	15m	0.25µm	**26086-1310**	1 Each
0.32mm	30m	0.25µm	**26086-1430**	1 Each
0.32mm	30m	0.50µm	**26086-2240**	1 Each
0.32mm	15m	1µm	**26086-2850**	1 Each
0.32mm	30m	1µm	**26086-2970**	1 Each
0.32mm	60m	1µm	**26086-3090**	1 Each
0.53mm	30m	0.5µm	**26086-2250**	1 Each
0.53mm	15m	1µm	**26086-2860**	1 Each
0.53mm	30m	1µm	**26086-2980**	1 Each
0.53mm	60m	1µm	**26086-3100**	1 Each
0.53mm	30m	1.5µm	**26086-3360**	1 Each

TraceGOLD TG-POLAR GC Columns

Specifically designed polymer and surface treatment overcome traditional problems with high-polarity columns



Phase:	90% Cyanopropylphenyl Polysiloxane
Max. Temps.:	260°C/275°C
USP Listing:	G8, G48

Applications:

- Cis/Trans FAMES
- Dioxins

- **Highly polar phase, 90% biscyanopropyl/10% phenylcyanopropyl polysiloxane, not bonded**
- **Strong dipole moment and high selectivity for cis/trans compounds or compounds with conjugated double bonds**
- **Equivalent to USP G8 and G48**

Similar to:

DB-23, HP-23, Rtx-2330, SP-2330, SP-2380, SPB-2560, HP-88, Silar 10c, CP-Sil 88 FAME, CP-Sil 88, BPX 70, BPX 90

TraceGOLD TG-POLAR GC Columns

I.D.	Length	Film Thickness	Cat. No.	Quantity
0.25mm	30m	0.1µm	**26082-0470**	1 Each
0.25mm	30m	0.2µm	**26082-5010**	1 Each
0.25mm	60m	0.1µm	**26082-0590**	1 Each
0.25mm	60m	0.2µm	**26082-5020**	1 Each
0.25mm	105m	0.1µm	**26082-5000**	1 Each
0.25mm	105m	0.2µm	**26082-5030**	1 Each
0.32mm	30m	0.2µm	**26082-5040**	1 Each
0.32mm	60m	0.2µm	**26082-5050**	1 Each
0.32mm	105m	0.2µm	**26082-5060**	1 Each
0.53mm	30m	0.1µm	**26082-0490**	1 Each
0.53mm	30m	0.2µm	**26082-5070**	1 Each
0.53mm	60m	0.1µm	**26082-0610**	1 Each
0.53mm	60m	0.2µm	**26082-5080**	1 Each

TracePLOT GC Columns

Thermo Scientific TracePLOT GC Columns offer the latest innovation in PLOT column technology, providing reproducible analyses of permanent gases, hydrocarbons and solvents.

TracePLOT TG-BOND Alumina GC Columns: Na_2SO_4 and KCl Deactivation

Optimized for linear and quantitative analysis of polar unsaturated hydrocarbons

Applications:

- C1-C5 hydrocarbons
- Unsaturated hydrocarbon isomers

- **Strong bonding to prevent particle generation suits these columns to valve-switching operations without damage to injection and detection systems from particle release**
- **Columns to which water has adsorbed may be regenerated to restore full efficiency and selectivity**
- **Each column has been tested to ensure proper film thickness (1,3-butadiene), selectivity (propadiene and methyl acetylene), resolution (trans-2-butene and 1-butene) and coating efficiency (1,3-butadiene)**

Similar to:

Alumina-PLOT, AT-Alumina, CP-Al2O3/KCl, CP-Al2O3/Na2SO4, GS-Alumina, GS-Alumina KCl, HP PLOT M, HP PLOT S, Rt-Alumina BOND (KCl),Rt-Alumina BOND (Na2SO4)

TracePLOT TG-BOND Alumina GC Columns, Na_2SO_4 and KCl Deactivation

I.D.	Length	Film Thickness	Cat. No.	Quantity
Na_2SO_4 Deactivation				
0.32mm	30m	5µm	**26001-6020**	1 Each
0.32mm	50m	5µm	**26001-6050**	1 Each
0.53mm	30m	10µm	**26001-6080**	1 Each
0.53mm	50m	10µm	**26001-6110**	1 Each
KCl Deactivation				
0.32mm	30m	5µm	**26002-6020**	1 Each
0.32mm	50m	5µm	**26002-6050**	1 Each
0.53mm	30m	10µm	**26002-6080**	1 Each
0.53mm	50m	10µm	**26002-6110**	1 Each

TracePLOT TG-BOND Msieve 5A GC Columns

Designed for separation of Ar/O_2 and other permanent gases

Applications:

- Permanent gases
- Refinery or natural gases

- **Specially designed coating and deactivation procedures for chromatographic efficiency and the integrity of the coating porous layer**
- **Deactivation process yields a sharp peak for CO elution rather than the tailing commonly seen in other columns**
- **High retention of molecular sieve permits separation of permanent gases at temperatures above ambient**
- **Uniform particles remain adherent to the tubing even following continuous valve-cycling**

Similar to:

GS-Msieve, HP PLOT Molsieve, CP-Molsieve 5A, Molsieve 5A, AT-Molsieve, PLT-5A, Rt-Msieve 5A

TracePLOT TG-BOND Msieve 5A GC Columns				
I.D.	**Length**	**Film Thickness**	**Cat. No.**	**Quantity**
0.32mm	15m	30µm	**26003-6010**	1 Each
0.32mm	30m	30µm	**26003-6040**	1 Each
0.53mm	15m	50µm	**26003-6070**	1 Each
0.53mm	30m	50µm	**26003-6100**	1 Each

TracePLOT TG-BOND Q GC Columns

Non-polar columns incorporating particles to the walls of the tubing for essentially no particle release

Applications:

- C1 to C3 isomers and alkanes up to C12
- Separation of CO_2, methane and $O_2/N_2/CO$
- Analysis of oxygenated compounds and solvents

- **Non-polar 100% divinyl benzene phase**
- **Particles incorporated to the walls of the tubing for essentially no particle release**

Similar to:
CP-PoraPLOT Q, Rt-Q-BOND, CP-PoraBond Q, Supel-Q-Plot, AT-Q

TracePLOT TG-BOND Q GC Columns

I.D.	Length	Film Thickness	Cat. No.	Quantity
0.32mm	15m	10µm	**26004-6000**	1 Each
0.32mm	30m	10µm	**26004-6030**	1 Each
0.53mm	15m	20µm	**26004-6060**	1 Each
0.53mm	30m	20µm	**26004-6090**	1 Each

TracePLOT TG-BOND Q+ GC Columns

Intermediate polarity columns incorporating particles to the walls of the tubing for essentially no particle release

Applications:

- Separation of ethane, ethylene and acetylene to baseline

- **Intermediate polarity, porous divinyl benzene homopolymer**
- **Particles incorporated to the walls of the tubing for essentially no particle release**

Similar to:
GS-Q, Rt-QS-BOND

TracePLOT TG-BOND Q+ GC Columns

I.D.	Length	Film Thickness	Cat. No.	Quantity
0.32mm	15m	10µm	**26005-6000**	1 Each
0.32mm	30m	10µm	**26005-6030**	1 Each
0.53mm	15m	20µm	**26005-6060**	1 Each
0.53mm	30m	20µm	**26005-6090**	1 Each

TracePLOT TG-BOND S GC Columns

Midpolarity columns incorporating particles to the walls of the tubing for essentially no particle release

Applications:

- Non-polar and polar compounds

- **Mid-polarity, Divinylbenzene 4-vinylpyridine solid phase**
- **Particles incorporated to the walls of the tubing for essentially no particle release**

Similar to:
CP-PoraPLOT S, Supel-G45, Rt-S-BOND

TracePLOT TG-BOND S GC Columns

I.D.	Length	Film Thickness	Cat. No.	Quantity
0.32mm	15m	10µm	**26006-6000**	1 Each
0.32mm	30m	10µm	**26006-6030**	1 Each
0.53mm	15m	20µm	**26006-6060**	1 Each
0.53mm	30m	20µm	**26006-6090**	1 Each

TracePLOT TG-BOND U GC Columns

Polar columns incorporating particles to the walls of the tubing for essentially no particle release

Applications:

- Analysis of polar and nonpolar compounds

- **Polar, Divinylbenzene ethylene glycol/dimethylacrylate phase**
- **Particles incorporated to the walls of the tubing for essentially no particle release**

Similar to:
HP-PLOT U, Rt-U-BOND, CP-PoraPLOT U, CP-PoraBOND U, Supel-N PLOT

TracePLOT TG-BOND U GC Columns

I.D.	Length	Film Thickness	Cat. No.	Quantity
0.32mm	15m	10µm	**26007-6000**	1 Each
0.32mm	30m	10µm	**26007-6030**	1 Each
0.53mm	15m	20µm	**26007-6060**	1 Each
0.53mm	30m	20µm	**26007-6090**	1 Each

TracePLOT Particle Traps for GC Instruments

Provides a safeguard from dislodged particles entering the detector

- **Provides a safeguard from dislodged particles entering the detector**

TracePLOT Particle Traps for GC Instruments

Description	I.D.	Cat. No.	Quantity
PLOT Particle Trap 2.5m x 0.32mm ID	0.32mm	**60180-860**	1 Each
PLOT Particle Trap 2.5m x 0.53mm ID	0.53mm	**60180-861**	1 Each

Notes

Our **interactive online version** features access to an expanded range of content to help guide you through any application, on any instrument:

- Find your application, method or part number using our **robust search tool**
- Method Development Guides
- Application Notebooks
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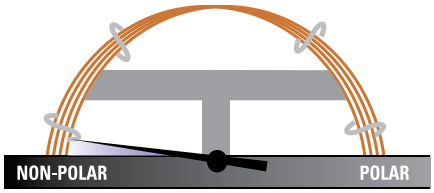
TRACE GC Columns

TRACE GC Columns offer high temperature stability and exhibit low bleed and long lifetimes. TRACE GC columns provide excellent quality and performance with guaranteed reproducibility.

TRACE TR-1 GC Columns

General-purpose nonpolar columns



Phase:	100% Dimethyl Polysiloxane
Max. Temps.:	340°C/360°C for films ≤1.0µm 300°C/320°C for 3.0µm films 280°C/300°C for films >3.0µm
USP Listing:	G1, G2, G38

Applications:

- Hydrocarbons
- PONA
- Esters
- Pesticides
- Drugs
- Amines

- **Non-polar phase, 100% dimethyl polysiloxane**
- **Low bleed for increased sensitivity, even at high temperatures**
- **Outstanding robustness for difficult separations**
- **Reliable and reproducible performance**

Similar to:

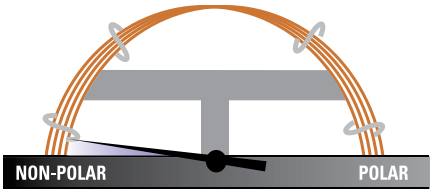
DB-1, DB-Petro, BP1, HP-1, HP-1MS, Rtx-1, Ultra-1, SPB-1, SPB-1 Sulfur, Petrocol DH, CP-Sil 5CB, RSL-150, RSL-160, ZB-1, CB-1, OV-1, PE-1, 007-1(MS), SP-2100, SE-30, RH-1, CC-1, CP-Sil 5CB MS, VF-1ms

TRACE TR-1 GC Columns

I.D.	Length	Film Thickness	Cat. No.	Quantity
0.10mm	10m	0.1µm	**260A020P**	1 Each
0.10mm	10m	0.5µm	**260A196P**	1 Each
0.15mm	50m	0.50µm	**260A227P**	1 Each
0.25mm	15m	0.1µm	**260A035P**	1 Each
0.25mm	15m	0.25µm	**260A130P**	1 Each
0.25mm	30m	0.1µm	**260A047P**	1 Each
0.25mm	30m	0.25µm	**260A142P**	1 Each
0.25mm	30m	0.5µm	**260A223P**	1 Each
0.25mm	30m	1µm	**260A296P**	1 Each
0.25mm	60m	0.25µm	**260A154P**	1 Each
0.25mm	60m	1µm	**260A308P**	1 Each
0.25mm	100m	0.5µm	**260A241P**	1 Each
0.25mm	100m	1µm	**260A314P**	1 Each
0.32mm	15m	0.1µm	**260A036P**	1 Each
0.32mm	15m	0.25µm	**260A131P**	1 Each
0.32mm	15m	0.5µm	**260A212P**	1 Each
0.32mm	30m	0.1µm	**260A048P**	1 Each
0.32mm	30m	0.25µm	**260A143P**	1 Each
0.32mm	30m	0.5µm	**260A224P**	1 Each
0.32mm	30m	1µm	**260A297P**	1 Each
0.32mm	30m	3µm	**260A395P**	1 Each
0.32mm	30m	5µm	**260A469P**	1 Each
0.32mm	60m	0.25µm	**260A155P**	1 Each
0.32mm	60m	1µm	**260A309P**	1 Each
0.32mm	60m	5.00µm	**260A481P**	1 Each
0.53mm	15m	0.5µm	**260A213P**	1 Each
0.53mm	30m	0.5µm	**260A225P**	1 Each
0.53mm	30m	1µm	**260A298P**	1 Each
0.53mm	30m	1.5µm	**260A336P**	1 Each
0.53mm	30m	3µm	**260A396P**	1 Each
0.53mm	30m	5µm	**260A470P**	1 Each

TRACE TR-1MS GC Columns

Extremely low-bleed nonpolar columns suitable for GC/MS applications



Phase:	100% Dimethyl Polysiloxane
Max. Temps.:	370°C/380°C
USP Listing:	G1, G2, G38

Applications:

- Chlorinated and nitroaromatic compounds
- GC/MS environmental analyses

- **Non-polar phase, 100% dimethyl polysiloxane**
- **High operating temperature**
- **Inert phase suited for environmental analyses**

Similar to:

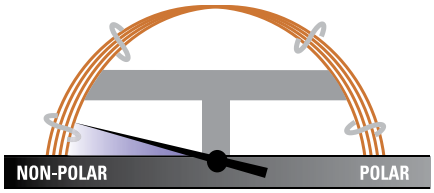
DB-1, DB-Petro, BP1, HP-1, HP-1MS, Rtx-1, Ultra-1, SPB-1, SPB-1 Sulfur, Petrocol DH, CP-Sil 5CB, RSL-150, RSL-160, ZB-1, CB-1, OV-1, PE-1, 007-1(MS), SP-2100, SE-30, RH-1, CC-1, CP-Sil 5CB MS, VF-1ms

TRACE TR-1MS GC Columns

ID	Length	Film Thickness	Cat. No.	Quantity
0.25mm	30m	0.10µm	**260B047P**	1 Each
0.25mm	15m	0.25µm	**260B130P**	1 Each
0.25mm	30m	0.25µm	**260B142P**	1 Each
0.25mm	60m	0.25µm	**260B154P**	1 Each
0.32mm	30m	0.25µm	**260B143P**	1 Each
0.32mm	60m	0.25µm	**260B155P**	1 Each
0.32mm	60m	1.00µm	**260B309P**	1 Each

TRACE TR-5 GC Columns

Excellent starting columns for method development, capable of performing most required separations



Phase:	5% Phenyl Methylpolysiloxane
Max. Temps.:	340°C/350°C for films ≤1.5µm 280°C/300°C for films >1.5µm
USP Listing:	G27, G36

Applications:

- Alcohols
- Free fatty acids
- Aromatics
- Flavors
- Low polarity pesticides

Non-polar phase, 5% Phenyl methyl polysiloxane

High operating temperature and extremely low bleed

Widely used in a variety of applications

Similar to:

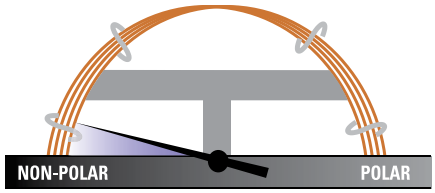
DB-5, BP5, Rtx-5, HP-5, Ultra-2, PTE-5, SPB5, MDN-5, CP-Sil 8CB, SPB-5, AT-5, ZB-5, 007-2(MPS-5), SE-52, SE-54

TRACE TR-5 GC Columns

I.D.	Length	Film Thickness	Cat. No.	Quantity
0.25mm	7m	0.25µm	**260E113P**	1 Each
0.25mm	15m	0.25µm	**260E130P**	1 Each
0.25mm	30m	0.25µm	**260E142P**	1 Each
0.25mm	30m	0.50µm	**260E223P**	1 Each
0.25mm	30m	1.00µm	**260E296P**	1 Each
0.25mm	60m	0.25µm	**260E154P**	1 Each
0.25mm	60m	1.00µm	**260E308P**	1 Each
0.32mm	15m	0.25µm	**260E131P**	1 Each
0.32mm	30m	0.25µm	**260E143P**	1 Each
0.32mm	30m	0.50µm	**260E224P**	1 Each
0.32mm	30m	1.00µm	**260E297P**	1 Each
0.32mm	60m	0.25µm	**260E155P**	1 Each
0.32mm	60m	1.00µm	**260E309P**	1 Each
0.32mm	100m	0.50µm	**260E242P**	1 Each
0.53mm	15m	1.00µm	**260E286P**	1 Each
0.53mm	15m	1.50µm	**260E334P**	1 Each
0.53mm	30m	0.50µm	**260E225P**	1 Each
0.53mm	30m	1.00µm	**260E298P**	1 Each
0.53mm	30m	1.50µm	**260E336P**	1 Each
0.53mm	30m	5.00µm	**260E470P**	1 Each

TRACE TR-5MS GC Columns

Feature a popular GCMS phase for many applications



Phase:	5% Phenyl Polysilphenylene-siloxane
Max. Temps.:	360°C/370°C for films ≤1.5µm 350°C/360°C for films >1.5µm
USP Listing:	G27, G36

Applications:

- Hydrocarbons
- Solvents
- Pesticides
- Herbicides
- Phenols
- Amines

- **Non-polar phase, 5% Phenyl polysilphenylene-siloxane**
- **Low bleed and high stability**
- **High signal-to-noise for increased sensitivity**
- **High robustness to oxygen and water contamination**

Similar to:

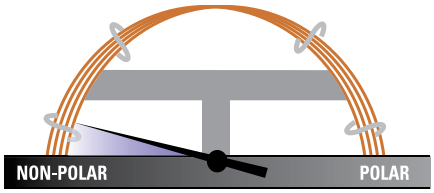
DB-5, DB-5MS, DB-5.625 XTI-5, BPX5, Rtx-5MS, Rtx- 5, SilMS, AT-5, AT-5MS, 007-5MS, SPB-5, CP-Sil 8CB, Ultra-2, HP-5, HP-5MS, HP5-TA, SPB-5, MDN-5S, VF-5ms, RSL-200, CB-5, OV-5, PE-5, 007-2(MP-5), SE-52, SE-54, PTE-5, CC-5, RH-5ms, ZB-5

TRACE TR-5MS GC Columns

I.D.	Length	Film Thickness	Cat. No.	Quantity
0.10mm	5m	0.1µm	**260F002P**	1 Each
0.10mm	10m	0.1µm	**260F020P**	1 Each
0.10mm	20m	0.10µm	**260F145P**	1 Each
0.15mm	25m	0.25µm	**260F134P**	1 Each
0.18mm	20m	0.18µm	**260F578P**	1 Each
0.25mm	15m	0.10µm	**260F035P**	1 Each
0.25mm	15m	0.25µm	**260F130P**	1 Each
0.25mm	15m	1.00µm	**260F284P**	1 Each
0.25mm	30m	0.10µm	**260F047P**	1 Each
0.25mm	30m	0.25µm	**260F142P**	1 Each
0.25mm	30m	0.25µm	**260F142J**	1 Each
0.25mm	30m	0.50µm	**260F223P**	1 Each
0.25mm	30m	1.00µm	**260F296P**	1 Each
0.25mm	60m	0.25µm	**260F154P**	1 Each
0.25mm	60m	1.00µm	**260F308P**	1 Each
0.32mm	10m	0.10µm	**260F024P**	1 Each
0.32mm	15m	0.25µm	**260F131P**	1 Each
0.32mm	15m	1.00µm	**260F285P**	1 Each
0.32mm	30m	0.25µm	**260F143P**	1 Each
0.32mm	30m	0.50µm	**260F224P**	1 Each
0.32mm	30m	1.00µm	**260F297P**	1 Each
0.32mm	60m	1.00µm	**260F309P**	1 Each
0.32mm	100m	0.50µm	**260F242P**	1 Each
0.53mm	15m	0.50µm	**260F213P**	1 Each
0.53mm	15m	3.00µm	**260F384P**	1 Each
0.53mm	30m	0.5µm	**260F225P**	1 Each
0.53mm	30m	1.00µm	**260F298P**	1 Each
0.53mm	30m	1.50µm	**260F336P**	1 Each
0.53mm	30m	3.0µm	**260F396P**	1 Each

TRACE TR-5HT GC Columns

Feature upper temperature limits as high as 400°C



Phase:	5% Phenyl Polycarborane Siloxane
Max. Temps.:	380°C/400°C
USP Listing:	G27, G36

Applications:

- Hydrocarbons
- Solvents
- Pesticides
- Herbicides
- Phenols
- Amines

- **Non-polar phase, 5% Phenyl polycarborane siloxane**
- **Allow the elution of higher-boiling hydrocarbons up to C_{100}**
- **Low bleed even at elevated temperatures**

Similar to:

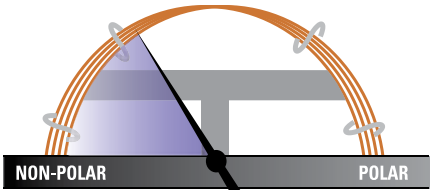
DB-5, BP5, Rtx-5, HP-5, Ultra-2, PTE-5, SPB5, MDN-5, CP-Sil 8CB, SPB-5, AT-5, ZB-5, 007-2(MPS-5), SE-52, SE-54

TRACE TR-5HT GC Columns

I.D.	Length	Film Thickness	Cat. No.	Quantity
0.25mm	15m	0.1µm	**260H035P**	1 Each
0.25mm	30m	0.1µm	**260H047P**	1 Each
0.25mm	30m	0.25µm	**260H142P**	1 Each
0.32mm	12m	0.1µm	**260H030P**	1 Each

TRACE TR-35MS GC Columns

Mid-polarity columns excellent for many applications



Phase:	35% Phenyl Polysilphenylene-siloxane
Max. Temps.:	360°C/370°C
USP Listing:	G42

Applications:

- Pesticides
- Herbicides
- Drugs of Abuse
- Poly Aromatic Hydrocarbons
- Pharmaceuticals

- **Mid-polarity phase, 35% Phenyl polysilphenylene-siloxane**
- **Exceptionally low surface activity**
- **Low bleed even at elevated temperatures**

Similar to:

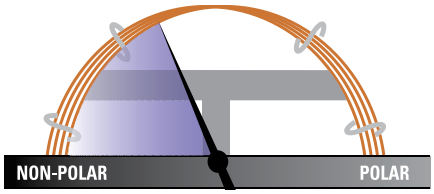
DB-35, DB-35MS, HP-35, HP-35MS,MDN-35, Rtx-35, SPB-35, BPX35

TRACE TR-35MS GC Columns

I.D.	Length	Film Thickness	Cat. No.	Quantity
0.20mm	15m	0.33µm	**260C497P**	1 Each
0.22mm	15m	0.25µm	**260C129P**	1 Each
0.22mm	25m	0.25µm	**260C135P**	1 Each
0.25mm	15m	0.25µm	**260C130P**	1 Each
0.25mm	30m	0.25µm	**260C142P**	1 Each
0.25mm	60m	0.25µm	**260C154P**	1 Each
0.25mm	30m	0.50µm	**260C223P**	1 Each
0.32mm	30m	0.50µm	**260C224P**	1 Each
0.32mm	30m	0.25µm	**260C143P**	1 Each
0.32mm	60m	0.25µm	**260C155P**	1 Each
0.53mm	30m	0.50µm	**260C225P**	1 Each
0.53mm	15m	1.00µm	**260C286P**	1 Each
0.53mm	30m	1.00µm	**260C298P**	1 Each

TRACE TR-1701 GC Columns

Mid-polarity column with alternative selectivity



Phase:	14% Cyanopropylphenyl Polysiloxane
Max. Temps.:	280°C/300°C
USP Listing:	G46

Applications:

- Pesticides
- PCB's
- PAH's
- Organic Acids
- Drugs
- Steroids
- EPA 608, 8081

- **Mid-polarity phase, 14% Cyanopropylphenyl polysiloxane**
- **Low bleed even at a high operating temperature**
- **Excellent starting point for method development**
- **Suitable for a wide variety of applications**

Similar to:

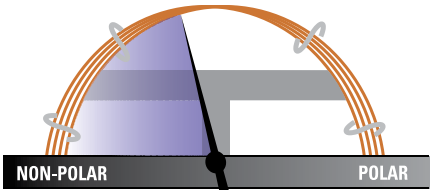
DB-1701, Rtx-1701, HP-1701, BP10, OV-1701, 007-1701, CP-Sil 19 CB

TRACE TR-1701 GC Columns

I.D.	Length	Film Thickness	Cat. No.	Quantity
0.25mm	15m	0.25µm	**260Q130P**	1 Each
0.25mm	30m	0.25µm	**260Q142P**	1 Each
0.25mm	60m	0.25µm	**260Q154P**	1 Each
0.32mm	15m	0.25µm	**260Q131P**	1 Each
0.32mm	30m	0.25µm	**260Q143P**	1 Each
0.32mm	60m	1.00µm	**260Q309P**	1 Each
0.32mm	30m	0.50µm	**260Q224P**	1 Each
0.53mm	30m	1.00µm	**260Q298P**	1 Each

TRACE TR-50MS GC Columns

Mid-polarity columns well-suited to GC/MS applications



Phase:	50% Phenyl Polysilphenylene-siloxane
Max. Temps.:	360°C/370°C
USP Listing:	G3

Applications:

- Herbicides
- Drugs of Abuse
- EPA 604, 608, 8060, 8081
- Pharmaceuticals

- **Mid-polarity phase, 50% Phenyl polysilphenylene-siloxane**
- **Low bleed decreases MS contamination**
- **Particularly useful for applications requiring a higher temperature and more polarity than a 5% phenyl column**
- **Column inertness results in minimal peak tailing and decreased breakdown of sensitive samples**

Similar to:

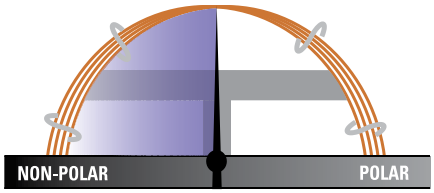
OV-17, SP-2250, DB-17, DB-17ms, DB-17ht, BPX50, Rtx-50, SPB-50, HP-50+, HP-17, AT50, RSL-300, PE-17, CC-17, 007-17 (MPS-50), SPB-17, ZB-50

TRACE TR-50MS GC Columns

I.D.	Length	Film Thickness	Cat. No.	Quantity
0.10mm	10m	0.10µm	**260R020P**	1 Each
0.25mm	30m	0.10µm	**260R047P**	1 Each
0.25mm	30m	0.15µm	**260R050P**	1 Each
0.25mm	15m	0.25µm	**260R130P**	1 Each
0.25mm	30m	0.25µm	**260R142P**	1 Each
0.25mm	60m	0.25µm	**260R154P**	1 Each
0.32mm	15m	0.25µm	**260R131P**	1 Each
0.32mm	30m	0.25µm	**260R143P**	1 Each
0.32mm	60m	0.25µm	**260R155P**	1 Each
0.53mm	15m	0.50µm	**260R213P**	1 Each
0.53mm	30m	0.50µm	**260R225P**	1 Each

TRACE TR-225 GC Columns

Reliable and reproducible performance



Phase:	50% Cyanopropylphenyl Polysiloxane
Max. Temps.:	230°C/260°C
USP Listing:	G7

Applications:

- Fatty Acid Methyl Esters (FAMEs)
- Carbohydrates
- Neutrol Sterols

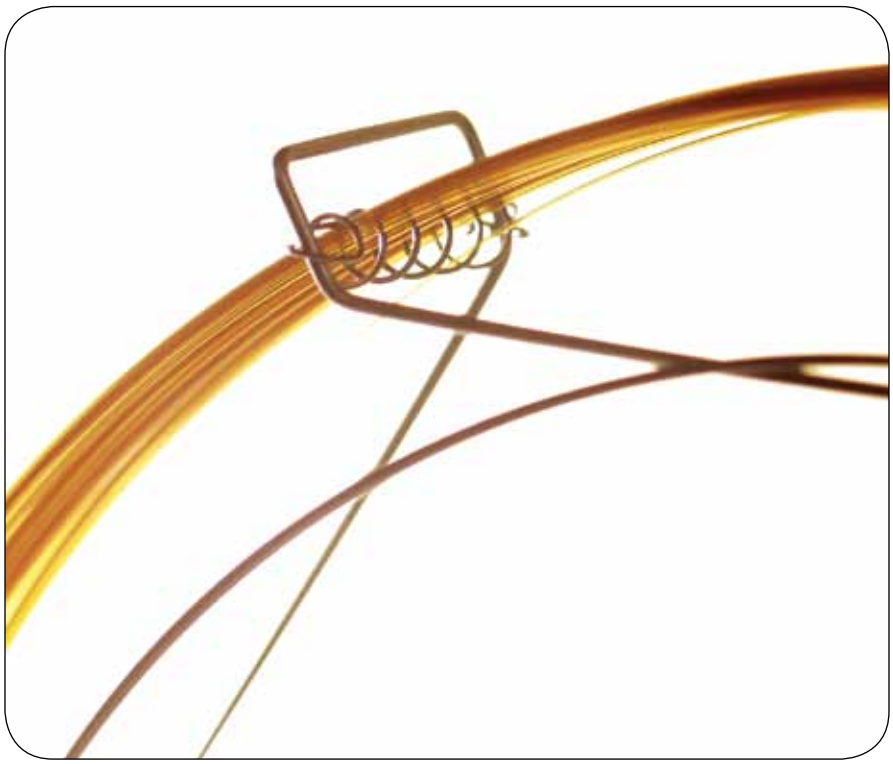
- **Mid-polarity phase, 50% Cyanopropylphenyl polysiloxane**
- **Low bleed even at elevated temperatures**
- **Outstanding robustness for difficult separations**
- **Manufactured to minimize risk of damage from contaminated carrier gas**

Similar to:

DB-225, HP-225, RTX-225, BP225

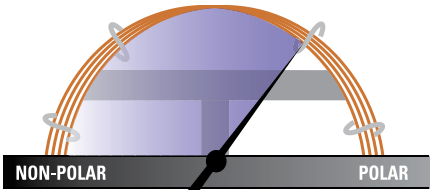
TRACE TR-225 GC Columns

I.D.	Length	Film Thickness	Cat. No.	Quantity
0.25mm	60m	0.25µm	**260Y154P**	1 Each
0.25mm	15m	0.25µm	**260Y130P**	1 Each
0.25mm	30m	0.25µm	**260Y142P**	1 Each
0.32mm	25m	0.25µm	**260Y137P**	1 Each



TRACE TR-WAX GC Columns

General-purpose, high polarity columns



Phase:	Polyethylene Glycol (PEG)
Max. Temps.:	260°C/280°C for films <1.0µm 240°C/260°C for 1.0µm films
USP Listing:	G16, G20

Applications:

- Esters
- Alcohols
- Ketones
- Glycols
- Aromatic isomers

- **Polar phase, Polyethylene glycol**
- **Highly crosslinked and fully deactivated**
- **Solvent washable**

Similar to:

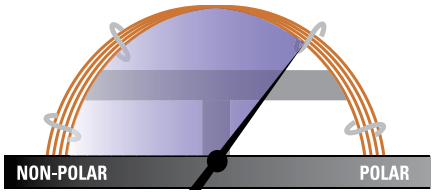
DB-Wax, BP20, Rtx-Wax, Stabilwax, HP20M, HP-Wax, HP-INNOWax, Supelcowax-10, AT-Wax, Nukol, CP Wax52CB, SUPEROX II, Carbowax, PE-WAX, ZBWAX

TRACE TR-WAX GC Columns

I.D.	Length	Film Thickness	Cat. No.	Quantity
0.10mm	10m	0.1µm	**260W020P**	1 Each
0.25mm	15m	0.25µm	**260W130P**	1 Each
0.25mm	30m	0.25µm	**260W142P**	1 Each
0.25mm	60m	0.25µm	**260W154P**	1 Each
0.25mm	30m	0.50µm	**260W223P**	1 Each
0.25mm	60m	0.50µm	**260W235P**	1 Each
0.25mm	30m	1.00µm	**260W296P**	1 Each
0.32mm	15m	0.25µm	**260W131P**	1 Each
0.32mm	30m	0.25µm	**260W143P**	1 Each
0.32mm	60m	0.25µm	**260W155P**	1 Each
0.32mm	30m	0.50µm	**260W224P**	1 Each
0.32mm	60m	0.50µm	**260W236P**	1 Each
0.32mm	30m	1.00µm	**260W297P**	1 Each
0.32mm	60m	1.00µm	**260W309P**	1 Each
0.53mm	30m	0.50µm	**260W225P**	1 Each
0.53mm	15m	1µm	**260W286P**	1 Each
0.53mm	30m	1.00µm	**260W298P**	1 Each
0.53mm	60m	1.00µm	**260W310P**	1 Each

TRACE TR-WaxMS GC Columns

Feature a high polarity phase designed for mass spectometry detectors



Phase:	Polyethylene Glycol (PEG)
Max. Temps.:	280°C/300°C
USP Listing:	G16

Applications:

- Aromatic hydrocarbons
- Food additives
- Essential oils
- Alcohols
- Esters
- Aldehydes
- Ketones

- **Polar phase, Polyethylene glycol**
- **Proprietary bonding method expands operating temperatures**
- **Extremely low bleed improves sensitivity and library matches**
- **High stability with oxygen and water**

Similar to:

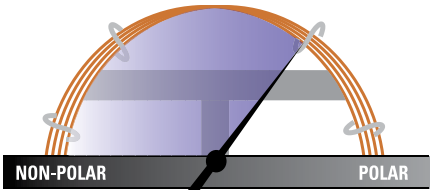
DB-Wax, Rtx-Wax, Stabilwax, HP20M, BP20, HP-Wax, HP-INNOWax, SUPELCOWAX 10, AT-Wax, Nukol, CP Wax 52CB, ZB-Wax

TRACE TR-WaxMS GC Columns

I.D.	Length	Film Thickness	Cat. No.	Quantity
0.10mm	20m	0.1µm	**260X145P**	1 Each
0.25mm	30m	0.5µm	**260X223P**	1 Each
0.25mm	30m	0.25µm	**260X142P**	1 Each
0.25mm	60m	0.25µm	**260X154P**	1 Each
0.25mm	30m	1.0µm	**260X296P**	1 Each
0.32mm	30m	0.25µm	**260X143P**	1 Each
0.32mm	30m	1.0µm	**260X297P**	1 Each
0.32mm	60m	0.25µm	**260X155P**	1 Each
0.32mm	30m	0.5µm	**260X224P**	1 Each
0.32mm	60m	1.0µm	**260X309P**	1 Each
0.53mm	30m	1.0µm	**260X298P**	1 Each

TRACE TR-FFAP GC Columns

High polarity phase optimized for FFAP analysis



Phase:	TPA Modified Polyethylene Glycol (PEG)
Max. Temps.:	240°C/250°C
USP Listing:	G25, G35

Applications:

- Organic acids
- Free fatty acids
- Alcohols

- **Polar phase, TPA modified Polyethylene glycol**
- **Bonded FFAP phase**
- **Quality tested for acidic compound analysis**

Similar to:

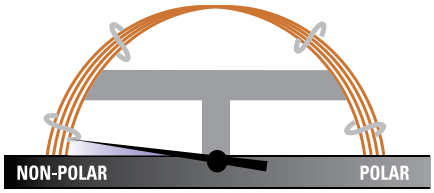
DB-FFAP, HP-FFAP, Stabilwax-DA, CPWax-58CB

TRACE TR-FFAP Capillary GC Columns

I.D.	Length	Film Thickness	Cat. No.	Quantity
0.25mm	15m	0.25µm	**260N130P**	1 Each
0.25mm	30m	0.25µm	**260N142P**	1 Each
0.25mm	60m	0.25µm	**260N154P**	1 Each
0.32mm	15m	0.25µm	**260N131P**	1 Each
0.32mm	30m	0.25µm	**260N143P**	1 Each
0.32mm	60m	0.25µm	**260N155P**	1 Each
0.32mm	50m	0.50µm	**260N230P**	1 Each
0.53mm	15m	0.50µm	**260N213P**	1 Each
0.53mm	30m	0.50µm	**260N225P**	1 Each
0.53mm	30m	1.00µm	**260N298P**	1 Each

TRACE TR-SimDist GC Columns

Feature a low polarity phase for high temperature analyses



Phase:	100% Dimethyl Polysiloxane
Max. Temps.:	400°C for films <1.0µm 370°C for 2.65µm films
USP Listing:	

Applications:

- High molecular weight hydrocarbons
- Simulated distillation
- ASTM D2887, D6532

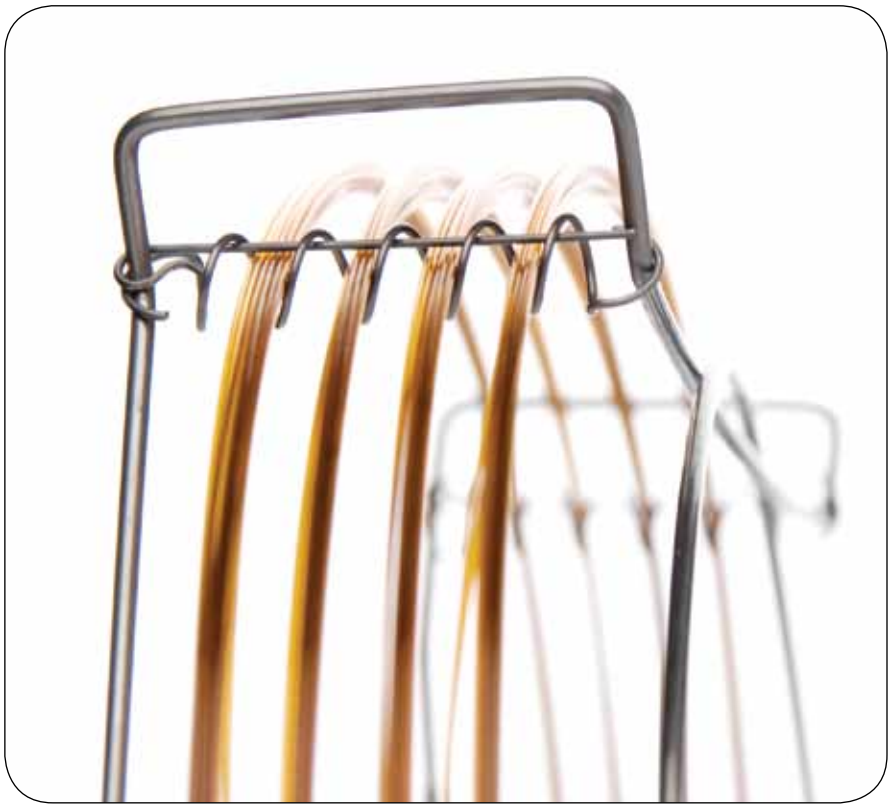
- **Non-polar phase, 100% Dimethyl polysiloxane**
- **Optimized for simulated distillation analysis**
- **High temperature limits**
- **Strongly cross-linked**

Similar to:

DB-HT Sim Dis, DB-2887, BPX1, Rtx-2887, HP-1, Petrocol 2887, Petrocol EX2887

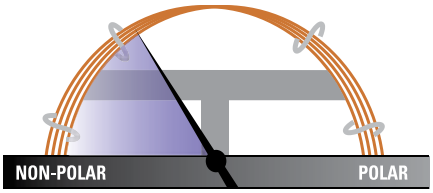
TRACE TR-SimDist GC Columns

I.D.	Length	Film Thickness	Cat. No.	Quantity
0.10mm	10m	0.10µm	**260S020P**	1 Each
0.53mm	6m	2.65µm	**260S347S**	1 Each
0.53mm	10m	0.10µm	**260S025P**	1 Each
0.53mm	10m	0.90µm	**260S250P**	1 Each
0.53mm	10m	2.65µm	**260S348P**	1 Each



TRACE TR-V1 GC Columns

Mid-polarity, thick-film columns



Phase:	6% Cyanopropylphenyl Polysiloane
Max. Temps.:	280°C/300°C
USP Listing:	G43

Applications:

- Volatile Organics
- Alcohols
- EPA 502.2, 608 & 624

- **Mid-polarity phase, 6% Cyanopropylphenyl Polysiloxane**
- **Thick films for the analysis of volatile analytes**
- **Low bleed suitable for MS detection**

Similar to:

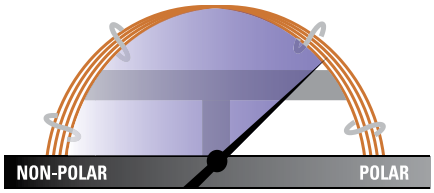
DB-624, BPX Volatiles, Rtx Volatiles, VOCOL 56, OV-624, AT-624, HP-VOC, CP-Select 624CB, 007-624, ZM-624

TRACE TR-V1 GC Columns

I.D.	Length	Film Thickness	Cat. No.	Quantity
0.18mm	20m	1.00µm	**260V495P**	1 Each
0.18mm	40m	1.00µm	**260V496P**	1 Each
0.25mm	30m	1.40µm	**260V332P**	1 Each
0.25mm	60m	1.40µm	**260V333P**	1 Each
0.32mm	30m	1.80µm	**260V339P**	1 Each
0.32mm	60m	1.80µm	**260V341P**	1 Each
0.53mm	30m	3.00µm	**260V396P**	1 Each
0.53mm	30m	5.00µm	**260V470P**	1 Each
0.53mm	60m	3.00µm	**260V408P**	1 Each
0.53mm	75m	3.00µm	**260V490P**	1 Each

TRACE TR-FAME GC Columns

High polarity phase optimized for FAME analysis



Phase:	70% Cyanopropyl Polysilphenylene-siloxane
Max. Temps.:	250°C/260°C
USP Listing:	N/A

Applications:

- Fatty Acid Methyl Esters (FAMEs)
- FAMEs Cis/Trans Isomers

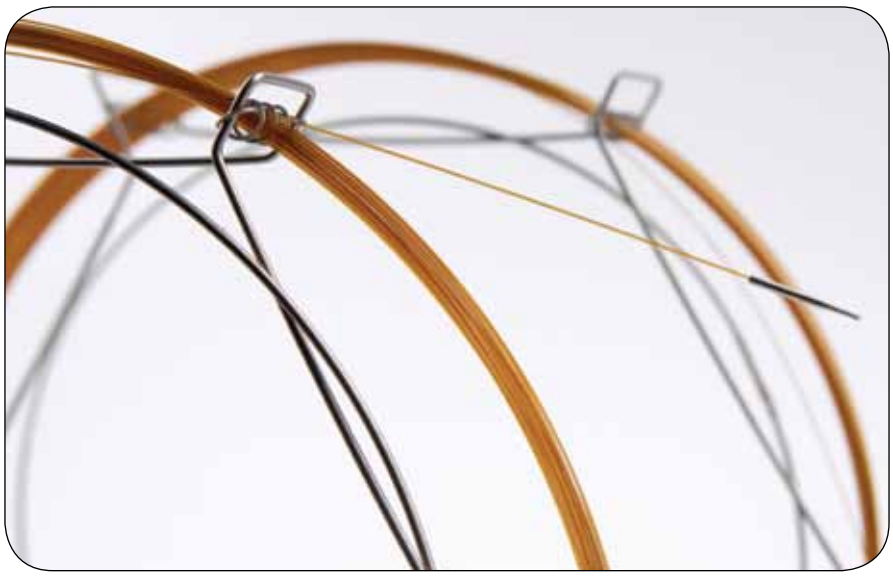
- **Polar phase, 70% Cyanopropyl Polysilphenylene-siloxane**
- **High operating temperature compared to competitor columns**
- **Low bleed for mass spectrometry use**

Similar to:

DB-23, BPX70, Rtx-2330, SP-2330, CP-Sil 88,SP-2380, HP-23, VF-23ms, 007-23, AT-Silar, PE-23

TRACE TR-FAME GC Columns

I.D.	Length	Film Thickness	Cat. No.	Quantity
0.10mm	10m	0.20µm	**260M096P**	1 Each
0.22mm	25m	0.25µm	**260M135P**	1 Each
0.22mm	30m	0.25µm	**260M141P**	1 Each
0.22mm	50m	0.25µm	**260M147P**	1 Each
0.22mm	60m	0.25µm	**260M153P**	1 Each
0.25mm	30m	0.25µm	**260M142P**	1 Each
0.25mm	60m	0.25µm	**260M154P**	1 Each
0.25mm	120m	0.25µm	**260M166L**	1 Each
0.32mm	25m	0.25µm	**260M137P**	1 Each
0.32mm	30m	0.25µm	**260M143P**	1 Each
0.32mm	50m	0.25µm	**260M149P**	1 Each
0.32mm	60m	0.25µm	**260M155P**	1 Each



TRACE GC Columns for Specific EPA Methods

Low bleed and temperature-stable performance tailored to specific EPA methodologies

Applications:

- Volatile Organic Compounds (VOC's)
- Pesticides
- Flame retardants
- Explosives

- **TRACE TR-524 and TRACE TR-525: US EPA Drinking Water Test Methods 524 or 525**
- **TRACE TR-527: US EPA Drinking Water Test Method 527, features the robust, low-bleed performance required for analysis of pesticides and flame retardants**
- **TRACE TR-8270: US EPA Solid Waste Test Method 8270**
- **TRACE TR-8095: US EPA Method 8095 for Explosives Testing featuring high max temperature and low surface activity**

TRACE GC Columns for Specific EPA Methods

Phase	I.D.	Length	Film Thickness	Cat. No.	Quantity
TR-524	0.18mm	20m	1.0µm	**26RV495P**	1 Each
TR-525	0.25mm	30m	0.25µm	**26RX142P**	1 Each
TR-527	0.25mm	30m	0.25µm	**26RF142P**	1 Each
TR-8095	0.32mm	12m	0.25µm	**260P123P**	1 Each
TR-8270	0.25mm	30m	0.5µm	**26RF223P**	1 Each
TR-8270	0.25mm	30m	1.0µm	**26RF296P**	1 Each

TRACE GC Columns for Dioxin and PCB Analysis

Designed to meet the requirements of high resolution GC/MS methods

Applications:

- Dioxins (PCDDs)
- Furans (PCDFs)
- PCB Congeners

- **TRACE TR-Dioxin 5MS; Specifically designed for Dioxin and Furan testing.**
- **Wide coverage of the 17 cogeners with the highest toxicological significance**
- **TRACE TR-PCB 8MS; meets the requirments for HR GCMS analysis of PCB's**
- **Low bleed**

TRACE GC Columns for Dioxin and PCB Analysis

Phase	I.D.	Length	Film Thickness	Cat. No.	Quantity
TR-PCB 8MS	0.25mm	50m	0.25µm	**26AJ148P**	1 Each
TR-Dioxin 5MS	0.25mm	60m	0.25µm	**26AF154P**	1 Each
TR-Dioxin 5MS	0.25mm	30m	0.1µm	**26AF047P**	1 Each
TR-Dioxin 5MS	0.25mm	60m	0.1µm	**26AF059P**	1 Each

TRACE GC Columns for Drugs of Abuse

Specifically designed for the analysis of common drugs of abuse

Applications:

- Amphetamines, codeine and morphine
- Carboxy-THC

- **TRACE TR-DoA 5MS; widely used for the analysis and determination of a range of toxicological target compounds including amphetamines, codeine and morphine**
- **TRACE TR-DoA 35MS; the recommended column for use in drug testing labs for the confirmation of THC**

TRACE GC Columns for Drugs of Abuse

Phase	I.D.	Film Thickness	Length	Cat. No.	Quantity
TR-DoA35	0.20mm	0.33µm	15m	**26AC497P**	1 Each
TR-DoA5	0.25mm	0.25µm	15m	**26AF130P**	1 Each

TRACE TR-BioDiesel GC Columns

Designed for use in carbon neutral fuels development applications

Applications:

- Biodiesel
- ASTM D-6751
- EN14214

- **TRACE TR-BioDiesel (M); For determination of residual methanol content in Biodiesel according to EN method 14110**
- **TRACE TR-BioDiesel (G); For the analysis of total glyceride content according to EN method 14105**
- **TRACE TR-BioDiesel (F); For the analysis of FAME content in biodiesel according to EN method 14103**
- **TRACE TR-BioDiesel (G) ASTM; For the analysis of total glyceride content according to ASTM method D-6751**
- **Specific columns developed for the determination of methanol, FAMEs or glycerides**

TRACE TR-BioDiesel GC Columns

Phase	I.D.	Length	Film Thickness	Cat. No.	Quantity
TR-BioDiesel (M)	0.32mm	30m	3.0µm	**26AA395P**	1 Each
TR-BioDiesel (G)	0.32mm	10m	0.1µm	**26AF024P**	1 Each
TR-BioDiesel (F)	0.25mm	30m	0.25µm	**26AX142P**	1 Each
TR-BioDiesel (G) ASTM	0.32mm	10m	0.1µm	**26RF024P**	1 Each

TRACE GC Columns for Pesticides

Specifically designed and tested for analysis of pesticides

Applications:

- Organophosphate pesticides
- Organochlorine pesticides
- Pyrethroid pesticides
- Herbicides

- **Low bleed decreases MS contamination**
- **Particularly useful for applications requiring a higher temperature**
- **Column inertness results in minimal peak tailing and decreased breakdown of sensitive samples**

TRACE GC Columns for Pesticides

Phase	I.D.	Length	Film Thickness	Guard	Cat. No.	Quantity
TR-Pesticide	0.25mm	30m	0.25µm	5m guard column attached	**26RF142F**	1 Each
TR-Pesiticide II	0.25mm	30m	0.25µm	5m guard column attached	**26RD142F**	1 Each
TR-Pesticide III	0.25mm	30m	0.25µm	5m guard column attached	**26RC142F**	1 Each
TR-Pesticide IV	0.25mm	30m	0.25µm	--	**26RC142P**	1 Each

Ultrafast GC Columns

Short, narrow-bore columns for use with the Thermo Scientific TRACE GC UltraFast instrument

Applications:

- Chemical
- Petrochemical
- Environmental
- Flavors and fragrances

- **Dramatically shorter analysis times**
- **Increase sample throughput by a factor of 20**
- **Lengthen column lifetimes**

Ultrafast Packed GC Columns

Phase	I.D.	Length	Film Thickness	Uses	Cat. No.	Quantity
UFC-1	0.1mm	5m	0.1µm	General	**UFMC00001010401**	1 Each
UFC-1	0.32mm	2.5m	0.1µm	ASTM D-2887	**UFMC00000070401**	1 Each
UFC-1	0.32mm	5m	0.1µm	ASTM D-2887	**UFMC00001070401**	1 Each
UFC-1	0.32mm	5m	0.25µm	ISO 9377-2	**UFMC00001070404**	1 Each
UFC-1	0.32mm	5m	3.0µm	ASTM D-3710	**UFMC00002070414**	1 Each
UFC-1	0.32mm	10m	0.5µm	General	**UFMC00001070907**	1 Each
UFC-5	0.1mm	2.5m	0.4µm	General	**UFMC00002010006**	1 Each
UFC-5	0.1mm	5m	0.4µm	General	**UFMC00100000000**	1 Each
UFC-5	0.1mm	5m	0.4µm	General	**UFMC00200000000**	1 Each
UFC-5	0.1mm	10m	0.1µm	General	**UFMC00300000000**	1 Each
UFC-1701	0.1mm	10m	0.1µm	General	**UFMC00400000000**	1 Each
UFC-WAX	0.1mm	10m	0.1µm	FAMES, Essential Oils	**UFMC00001010501**	1 Each
UFC-WAX	0.1mm	10m	0.2µm	General	**UFMC00001010503**	1 Each
UFC-200	0.18mm	5m	0.4µm	Alcohols, Ketones	**UFMC00002030306**	1 Each
UFC-264	0.1mm	5m	0.5µm	Volatiles	**UFMC00002010207**	1 Each
UFC-23	0.18mm	5m	0.2µm	FAMEs	**UFMC00002030603**	1 Each
UFC-BioDiesel	0.32mm	5m	0.5µm	BioDiesel	**UFMC00001070600**	1 Each
UFC-M1	0.32mm	5m	0.25µm	General	**UFMC00001070904**	1 Each

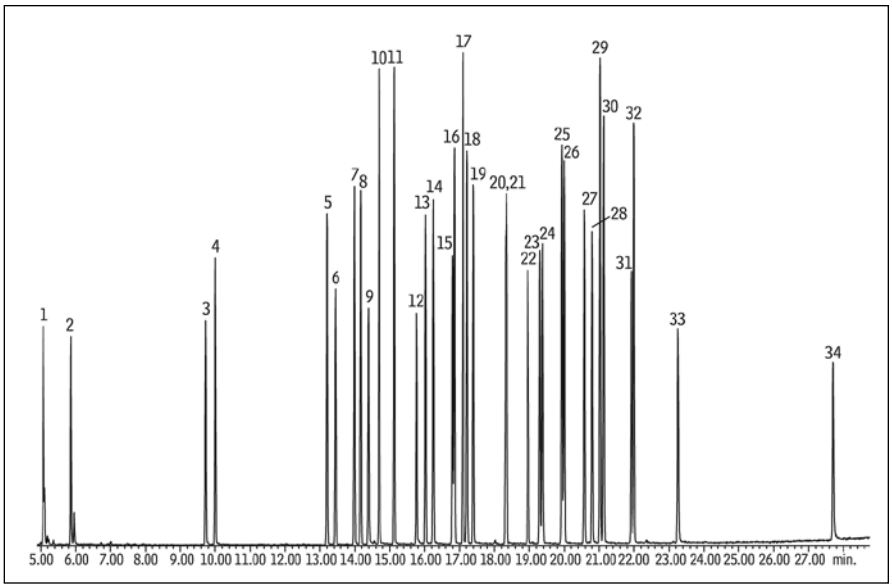
GC and GCMS Applications

Compiled from our years of experience in chromatography, the Application Compendium contains GC and GCMS applications to help you find the solution you need. For your convenience, the applications are sorted by industry;

Organochlorine and Organophosphorus Pesticides

Column:	TG-5MS 30m x 0.25mm x 0.25µm
Part Number:	26098-1420
Temperature:	100°C (0.5 minute hold) to 300°C at 7°C/minute (1 minute hold)
Detector Type:	MS
Carrier Gas:	He
Flow Rate:	1.2 mL/min
Injection Volume:	1.0 µL
Injection Mode:	Split 10:1, 290°C

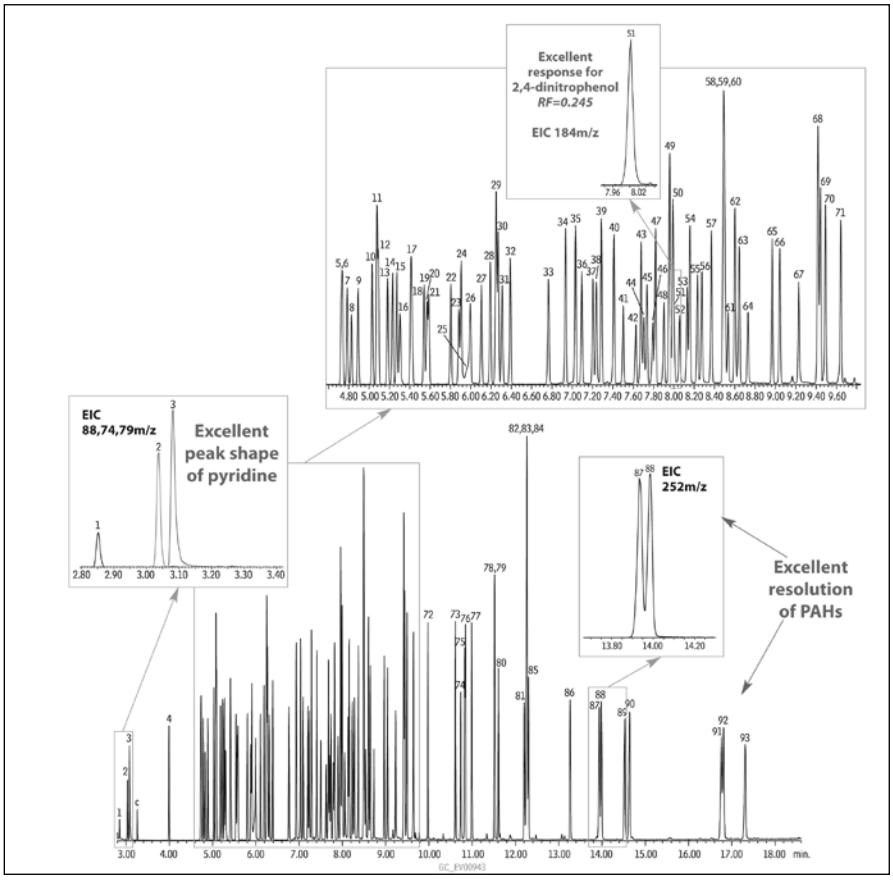
1. naphthalene-d8
2. dichlorvos
3. acenaphthene-d10
4. methacrifos
5. α-BHC
6. hexachlorobenzene
7. γ-BHC (lindane)
8. β-BHC
9. phenanthrene-d10
10. diazinon
11. etrimphos
12. phosphamidon
13. chlorpyrifos-methyl
14. heptachlor
15. fenitrothion
16. pirimiphos methyl
17. malathion
18. aldrin
19. chlorpyrifos
20. heptachlor epoxide
21. oxychlordane
22. trans-chlordane
23. endosulfan I
24. cis-chlordane
25. 2,4'-DDT
26. dieldrin
27. endrin
28. endosulfan II
29. 4,4'-DDE
30. 4,4'-DDD
31. endosulfan sulfate
32. 4,4'-DDT
33. chrysene-d12
34. perylene-d12



EPA 8270 Semivolatile Organics

Column:	TG-5SilMS 30m x 0.25mm x 0.25µm
Part Number:	26096-1420
Temperature:	40°C (1.0 minute hold) to 280°C at 25°C/minute to 320°C at 5°C/minute (1.0 minute hold)
Detector Type:	MS
Carrier Gas:	He
Flow Rate:	1.2 mL/min
Injection Volume:	1.0 µL
Injection Mode:	Splitless, 250°C

1. 1,4-dioxane
2. n-nitrosodimethylamine
3. pyridine
c. toluene
4. 2-fluorophenol (SS)
5. phenol-d6 (SS)
6. phenol
7. aniline
8. bis(2-chloroethyl) ether
9. 2-chlorophenol
10. 1,3-dichlorobenzene
11. 1,4-dichlorobenzene-d4 (IS)
12. 1,4-dichlorobenzene
13. benzyl alcohol
14. 1,2-dichlorobenzene
15. 2-methylphenol
16. bis(2-chloroisopropyl) ether
17. 4-methylphenol/3-methylphenol
18. n-nitroso-di-n-propylamine
19. hexachloroethane
20. nitrobenzene-d5 (SS)
21. nitrobenzene
22. isophorone
23. 2-nitrophenol
24. 2,4-dimethylphenol
25. benzoic acid
26. bis(2-chloroethoxy)methane
27. 2,4-dichlorophenol
28. 1,2,4-trichlorobenzene
29. naphthalene-d8 (IS)
30. naphthalene
31. 4-chloroaniline
32. hexachlorobutadiene
33. 4-chloro-3-methylphenol
34. 2-methylnaphthalene
35. 1-methylnaphthalene
36. hexachlorocyclopentadiene
37. 2,4,6-trichlorophenol
38. 2,4,5-trichlorophenol
39. 2-fluorobiphenyl (SS)
40. 2-chloronaphthalene
41. 2-nitroaniline
42. 1,4-dinitrobenzene
43. dimethyl phthalate
44. 1,3-dinitrobenzene
45. 2,6-dinitrotoluene
46. 1,2-dinitrobenzene
47. acenaphthylene
48. 3-nitroaniline
49. acenaphthene-d10 (IS)
50. acenaphthene
51. 2,4-dinitrophenol
52. 4-nitrophenol
53. 2,4-dinitrotoluene
54. dibenzofuran
55. 2,3,5,6-tetrachlorophenol
56. 2,3,4,6-tetrachlorophenol
57. diethyl phthalate
58. 4-chlorophenyl phenyl ether
59. fluorene
60. 4-nitroanaline

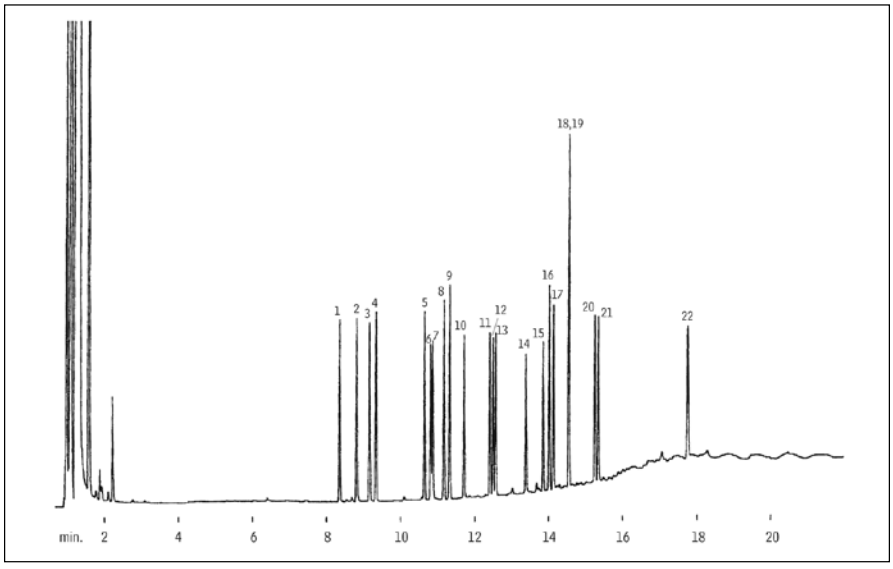


61. 4,6-dinitro-2-methylphenol
62. n-nitrosodiphenylamine (diphenylamine)
63. 1,2-diphenylhydrazine (as azobenzene)
64. 2,4,6-tribromophenol (SS)
65. 4-bromophenyl phenyl ether
66. hexachlorobenzene
67. pentachlorophenol
68. phenanthrene-d10 (IS)
69. phenanthrene
70. anthracene
71. carbazole
72. di-n-butyl phthalate
73. fluoranthene
74. benzidine
75. pyrene-d10 (SS)
76. pyrene
77. p-terphenyl-d14 (SS)
78. 3,3'-dimethylbenzidine
79. butyl benzyl phthalate
80. bis(2-ethylhexyl) adipate
81. 3,3'-dichlorobenzidine
82. benzo(a)anthracene
83. bis(2-ethylhexyl) phthalate
84. chrysene-d12 (IS)
85. chrysene
86. di-n-octyl phthalate
87. benzo(b)fluoranthene
88. benzo(k)fluoranthene
89. benzo(a)pyrene
90. perylene-d12 (IS)
91. indeno(1,2,3-cd)pyrene
92. dibenzo(a,h)anthracene
93. benzo(ghi)perylene
c = contaminant

Nitrogen Herbicides

Column:	TG-35MS 30m x 0.53mm x 0.50µm
Part Number:	26094-2250
Temperature:	60°C (1.0 minute hold) to 290°C at 15°C/minute (5.0 minute hold)
Detector Type:	FID
Carrier Gas:	He
Flow Rate:	2.5 mL/min
Injection Volume:	0.2 µL
Injection Mode:	Direct, 290°C

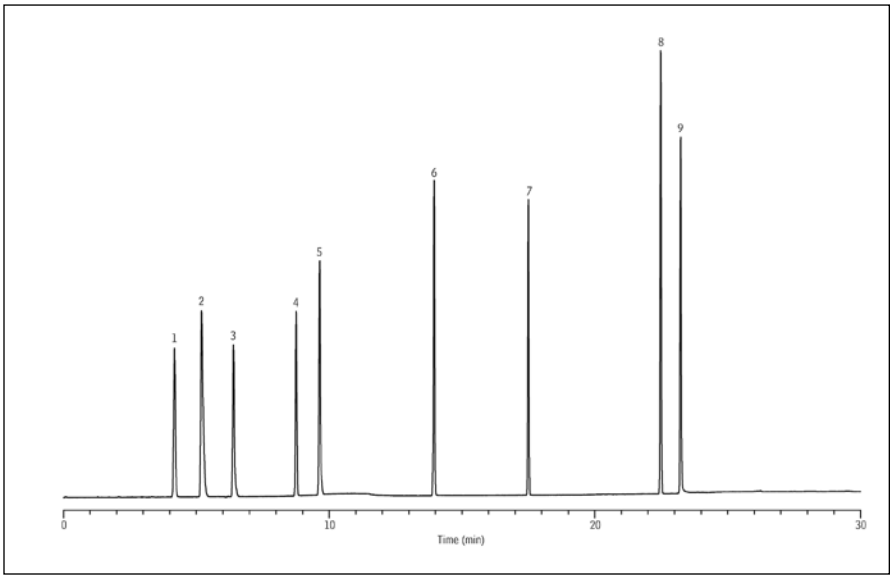
1. Eptam®
2. Sutan®
3. Vernam®
4. Tillam®
5. Ordram®
6. Treflan®
7. Balan®
8. Ro-Neet®
9. propachlor
10. Tolban®
11. propazine
12. atrazine
13. simazine
14. terbacil
15. Sencor®
16. Dua®
17. Paarlan®
18. Prowl®
19. bromacil
20. oxadiazon
21. GOAL®
22. hexazinone



EPA 1671 Volatile Organic Compounds

Column:	TG-WAXMS 30m x 0.32mm x 1.0µm
Part Number:	26088-2970
Temperature:	40°C (5.0 minute hold) to 180°C at 7°C/minute (5.0 minute hold)
Detector Type:	FID
Carrier Gas:	He
Flow Rate:	2.5 mL/min
Injection Volume:	1.0 µL
Injection Mode:	Split (12:1), 200°C

1. tetrahydrofuran (IS)
2. methanol
3. ethanol
4. acetonitrile
5. n-propanol
6. Methyl Cellosolve®
7. formamide
8. dimethyl sulfoxide
9. ethylene glycol

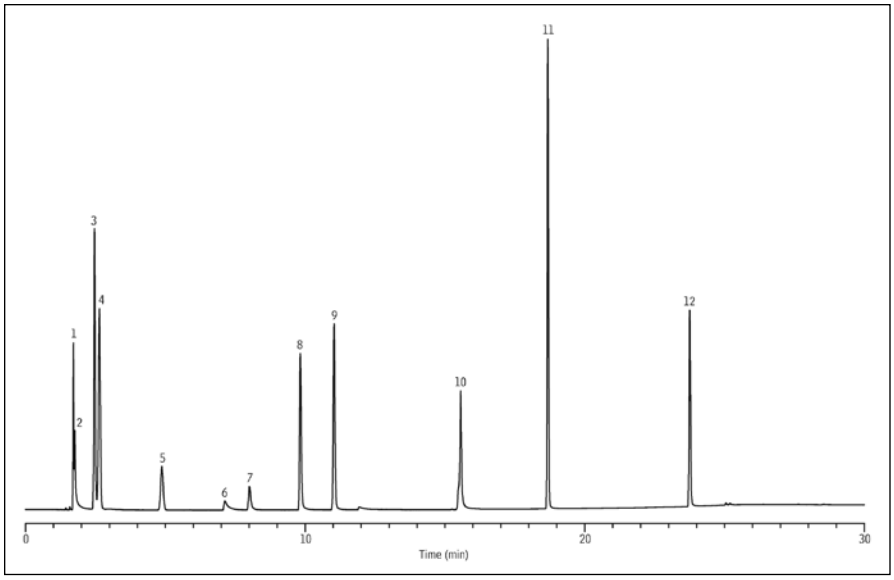


EPA 1671 Volatile Organic Compounds

Column:	TG-WAXMS B 30m x 0.32mm x 1.0µm
Part Number:	26086-2970
Temperature:	40°C (5.0 minute hold) to 180°C at 7°C/ minute (5.0 minute hold)
Detector Type:	FID
Carrier Gas:	He
Flow Rate:	2.5 mL/min
Injection Volume:	1.0 µL
Injection Mode:	Split (12:1), 200°C

1. dimethylamine
2. methylamine
3. diethylamine
4. triethylamine
5. tetrahydrofuran (IS)
6. methanol
7. ethanol
8. acetonitrile
9. n-propanol
10. Methyl Cellosolve®
11. formamide
12. dimethyl sulfoxide
    ethylene glycol no elution*

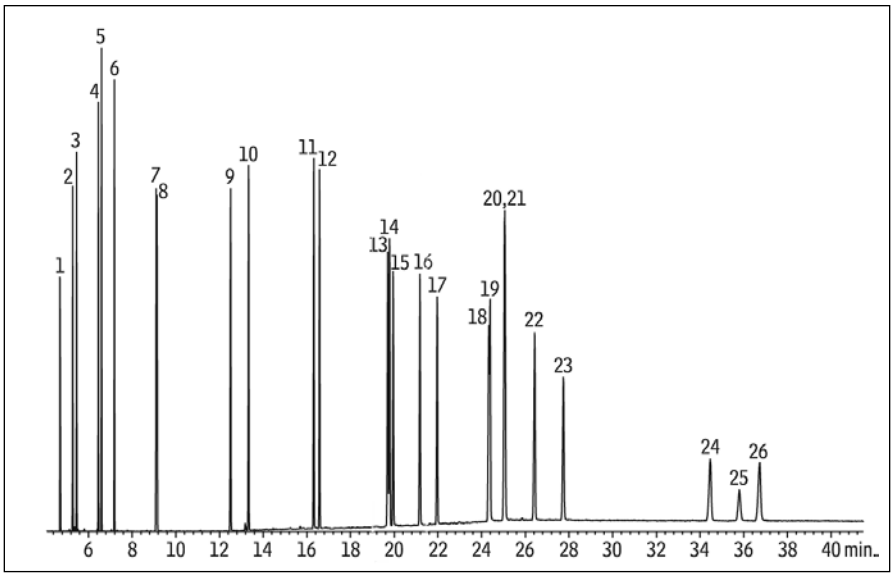
** Included in sample, but does not elute due to base deactivation in the TG-WAXMS B phase.*



Polycyclic Aromatic Hydrocarbons

Column:	TG-17MS 30m x 0.25mm x 0.25µm
Part Number:	26089-1420
Temperature:	90ºC (1.0 minute hold) to 215ºC at 25ºC/minute (0.5 minute hold) to 235ºC at 4ºC/minute to 280°C at 15°C/minute to 320°C at 4°C/minute (20 minute hold)
Detector Type:	MS
Carrier Gas:	He
Flow Rate:	1.2 mL/min
Injection Volume:	1.0 µL
Injection Mode:	Splitless, 300°C

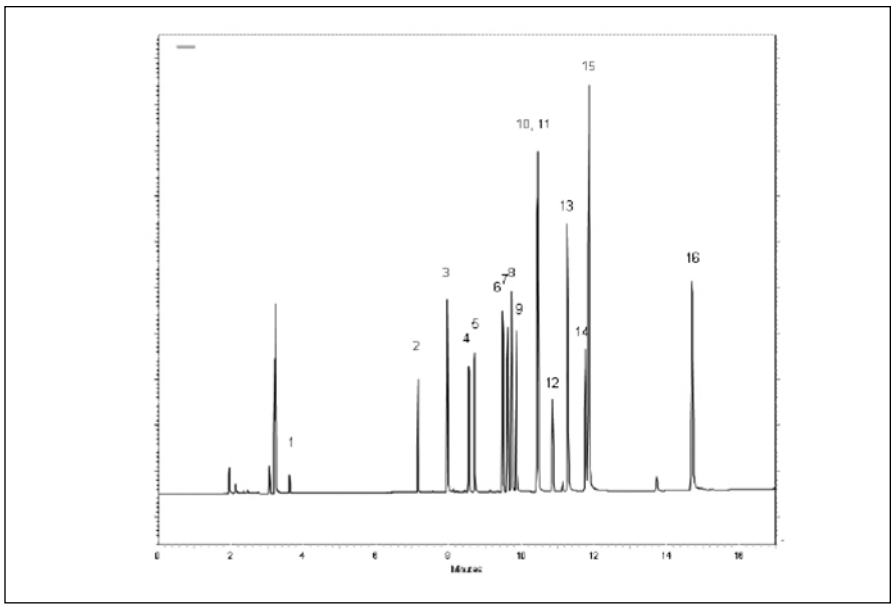
1. naphthalene
2. 1-methylnaphthalene
3. 2-methylnapthalene
4. acenaphthylene
5. acenaphthene
6. fluorene
7. phenanthrene
8. anthracene
9. fluoranthene
10. pyrene
11. benzo(a)anthracene
12. chrysene
13. benzo(b)fluoranthene
14. benzo(k)fluoranthene
15. benzo(j)fluoranthene
16. benzo(a)pyrene
17. 3-methylcholanthrene
18. dibenzo(a,h)acridine
19. dibenzo(a,j)acridine
20. indeno(1,2,3-cd)pyrene
21. dibenzo(a,h)anthracene
22. benzo(ghi)perylene
23. 7H-dibenzo(c,g)carbazole
24. dibenzo(a,e)pyrene
25. dibenzo(a,i)pyrene
26. dibenzo(a,h)pyrene



EPA 515.4 Methylated Chlorinated Acid Herbicides

Column:	TG-5SilMS 30m x 0.25mm x 0.25µm
Part Number:	26096-1420
Temperature:	70ºC (1 minute hold) to 210ºC at 20ºC/minute (1 minute hold) to 250ºC at 5ºC/minute
Detector Type:	ECD at 310ºC, base at 300ºC
Carrier Gas:	He
Flow Rate:	1.0 mL/min
Injection Volume:	0.5µL
Injection Mode:	Split 75:1, 230°C

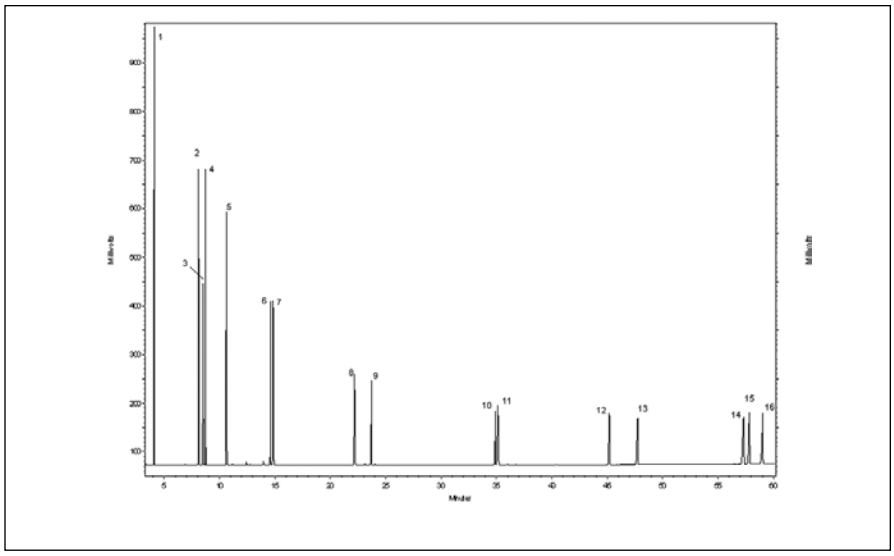
1. Dalapon methyl ester
2. 3,5-dichlorobenzoic acid methyl ester
3. Dicamba methyl ester
4. Dichlorprop methyl ester
5. 2,4-D methyl ester
6. Pentachloroanisole
7. 2,4,5-TP (Silvex) methyl ester
8. Chloramben methyl ester
9. 2,4,5-T methyl ester
10. 2,4-DB methyl ester
11. Dinoseb methyl ether
12. Bentazon methyl ester
13. Picloram methyl ester
14. Quinclorac methyl ester
15. DCPA (Dacthal)
16. Acifluorfen methyl ester



QTM PAH Mix

Column:	TG-1MS 30m x 0.25mm x 0.25µm
Part Number:	26099-1420
Temperature:	100°C to 160°C at 5°C/minute to 260°C at 2°C/minute (1.0 minute hold)
Detector Type:	MS
Carrier Gas:	He
Flow Rate:	1.2 mL/min
Injection Volume:	1.0µL
Injection Mode:	Split (50:1), 250°C

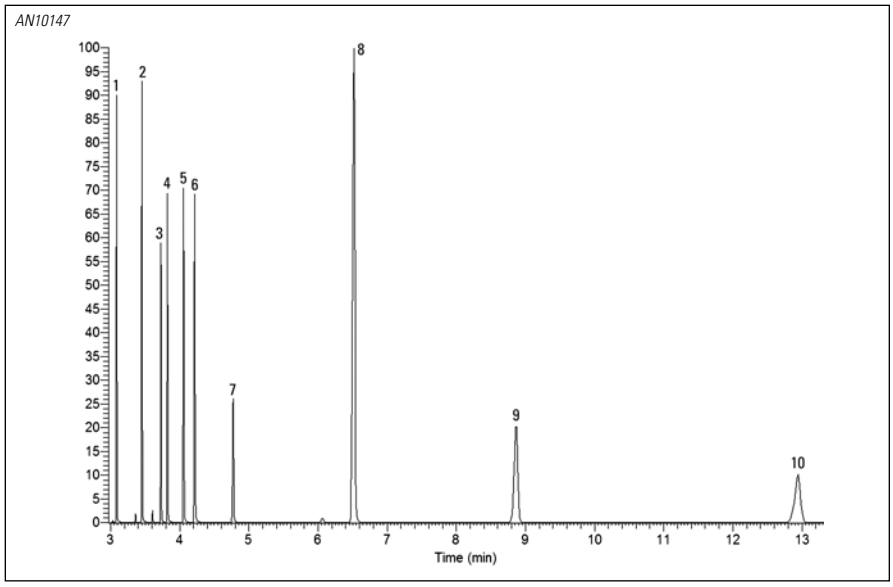
1. Naphthalene
2. Acenaphthylene
3. 2-Bromonaphthylene
4. Acenaphthene
5. Fluorene
6. Anthracene
7. Phenanthrene
8. Fluoranthene
9. Pyrene
10. Benzo(a)anthracene
11. Chrysene
12. Benzo(b)fluoranthene
13. Benzo(a)pyrene
14. Indeno(1,2,3-c,d)pyrene
15. Dibenzo(a,h)anthracene
16. Benzo(g,h,i)perylene



Polybrominated Diphenyl Ethers (PBDE) in Environmental Samples

Column:	TR-5MS,15m x 0.25 mm x 0.1 µm
Part Number:	260F035P
Temperature:	Initial Temp. 80°C 0.1 min 1°C/sec to 300°C. hold 10 min.
Detector Type:	MS DSQ™
Carrier Gas:	He
Injection Mode:	PTV injection

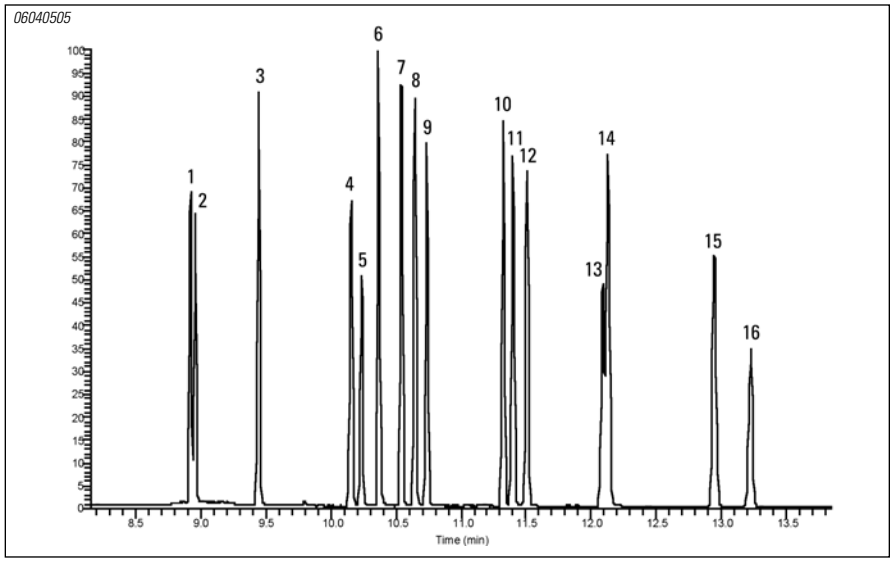
1. Tri-BDE (28)
2. Tetra-BDE (47)
3. Penta-BDE (99)
4. Penta-BDE (100)
5. Hexa-BDE (153)
6. Hexa-BDE (154)
7. Hepta-BDE (183)
8. Octa-BDE (205)
9. Nona-BDE (206)
10. Deca-BDE (209)



Minnesota Ag List Pesticides Mix A

Column:	TR-35MS, 30 m x 0.25 mm x 0.25 µm
Part Number:	260C142P
Initial Temp:	100 °C, 1 min
Rate 1:	15 °C/min to 250 °C,
Final Temp:	250 °C, 5 min
Detector Type:	MS
Detection Conditions:	TRACE DSQ MS, source 225 °C, 50-650 *m/z*, EI @ 70 eV
Carrier Gas:	He
Flow Rate:	1 mL/min
Injection Mode:	PTV, Split at 250 °C
Split Ratio:	20:1

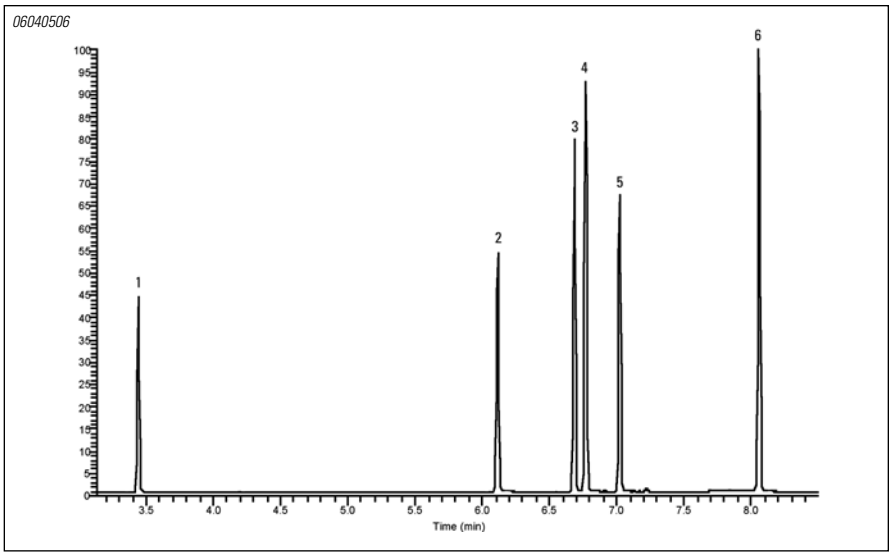
1. Ethalfluralin
2. Tifluralin
3. Propachlor
4. Atrazine-desethyl
5. Atrazine-desisopropyl
6. Prometon
7. Propazine
8. Atrazine
9. Simazine
10. Acetochlor
11. Dimethenamid
12. Alachlor
13. Metribuzin
14. Metolachlor
15. Pendimethalin
16. Cyanazine



Minnesota Ag List Pesticides Mix B

Column:	TR-5MS, 15 m x 0.25 mm x 0.25 µm
Part Number:	260F130P
Initial Temp:	100 °C, 1 min
Rate 1:	15 °C/min to 250 °C
Final Temp:	250 °C, 5 min
Detector Type:	MS
Detection Conditions:	Polaris*Q*™, source 225 °C, 35-500 *m/z*, EI @ 70 eV
Carrier Gas:	He
Flow Rate:	1 mL/min
Injection Mode:	PTV split, 20 °C
Split Ratio:	90:1

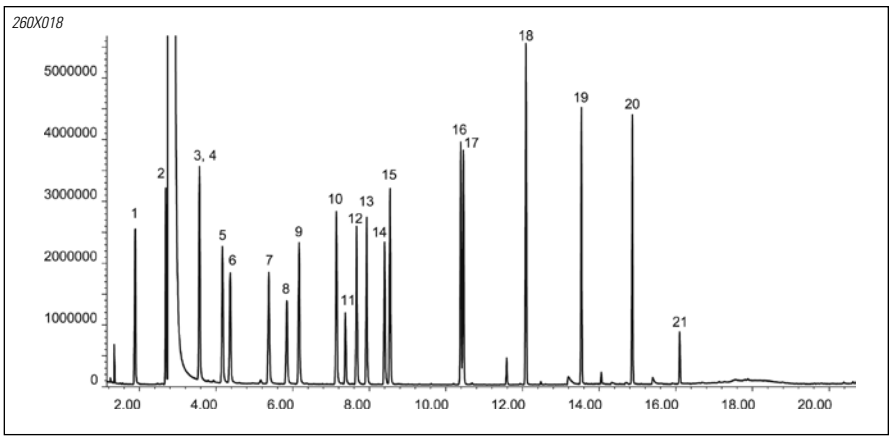
1. EPTC
2. Phorate
3. Terbufos
4. Fonofos
5. Triallate
6. Chlorpyrifos



Ketones

Column:	TR-WaxMS, 30 m x 0.25 mm x 0.25 µm
Part Number:	260X142P
Temperature:	40 °C 5 min, 10 °C/min to 190 °C
Detector Type:	MS
Carrrier Gas:	He 25 psi
Flow Rate:	1.6 mL/min
Injection Volume:	0.5 µL
Injection Mode:	Split 80:1, 250 °C

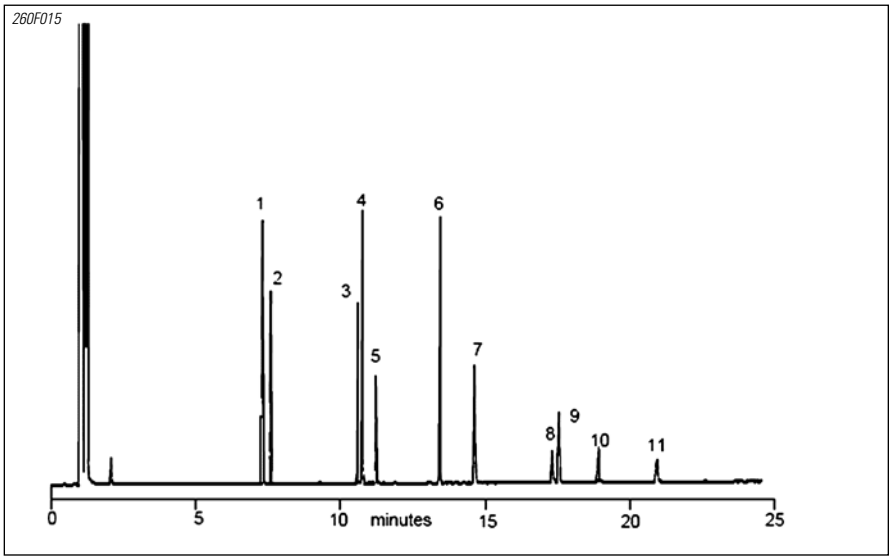
1. Acetone
2. 2-Butanone
3. 2-Pentanone
4. 3-Pentanone
5. 4-Methyl-2-pentanone
6. 3-Methyl-2-pentanone
7. 3-Hexanone
8. 2-Methyl-3-hexanone
9. 2-Hexanone
10. 4-Methyl-2-hexanone
11. Mesityl oxide
12. 5-Methyl-2-hexanone
13. 3-Heptanone
14. Cyclopentanone
15. 2-Heptanone
16. Cyclohexanone
17. Octanone
18. 2-Nonanone
19. 2-Decanone
20. 2-Undecanone
21. 2-Dodecanone



EPA 625 Phenols (5 ng)

Column:	TR-5MS, 30 m x 0.25 mm x 0.25 µm
Part Number:	260F142P
Temperature:	40 °C 1 min, 8 °C/min to 360 °C
Detector Type:	FID
Carrrier Gas:	H_2, 12 psi
Injection Mode:	Split, 380 °C

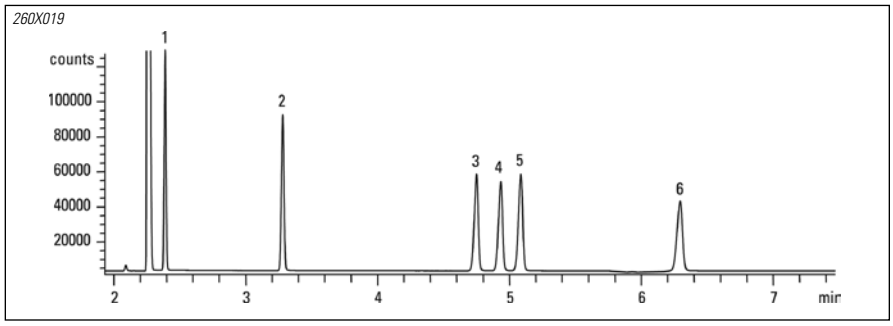
1. Phenol
2. 2-Chlorophenol
3. 2-Nitrophenol
4. 2,4-Dimethylphenol
5. 2,4-Dichlorophenol
6. 4-Chloro-3-methylphenol
7. 2,4,6-Trichlorophenol
8. 2,4-Dinitrophenol
9. 4-Nitrophenol
10. 2-Methyl-4,6-dinitrophenol
11. Pentachlorophenol



Aromatic Pollutants

Column:	TR-WaxMS, 30 m x 0.25 mm x 0.25 µm
Part Number:	260X142P
Temperature:	60 °C Isothermal 10 min
Detector Type:	FID
Carrrier Gas:	He 17.3 psi
Flow Rate:	1.5 mL/min
Injection Volume:	0.2 µL
Injection Mode:	Split 100:1, 250 °C

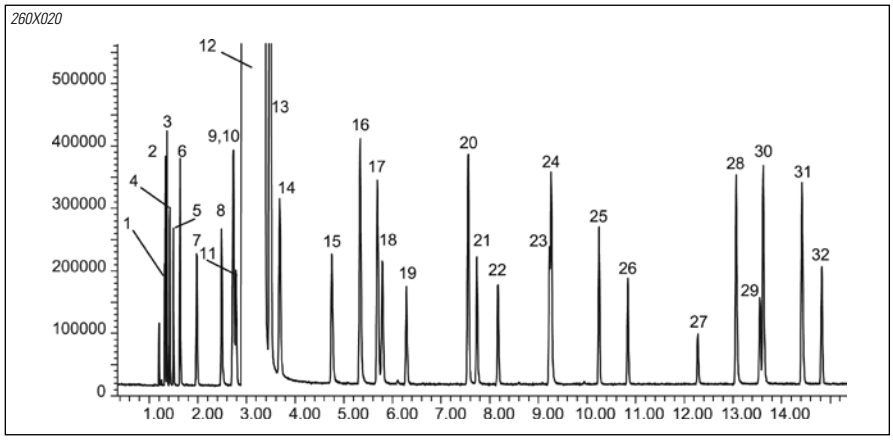
1. Benzene
2. Toluene
3. Ethyl benzene
4. p-Xylene
5. m-Xylene
6. o-Xylene



EPA 624 Purgeables

Column:	TR-WaxMS 30 m x 0.25 mm x 0.25 µm
Part Number:	260X142P
Temperature:	32 °C 3 min, 8 °C/min to 90 °C, 6 °C/min to 200 °C, hold 5 min
Detector Type:	MS
Carrrier Gas:	He 27.2 psi, 35cm/s
Flow Rate:	1.8 mL/min
Injection Volume:	0.5 µL
Injection Mode:	Split 40:1, 250 °C

1. Chloromethane
2. Vinyl chloride
3. Trichlorofluoromethane
4. Chloroethane
5. Bromomethane
6. 1,1-Dichloroethene
7. Unknown
8. *trans*-1,2-Dichloroethene
9. Carbon tetrachloride
10. 1,1,1-Trichloroethane
11. 1,1,-Dichloroethane
12. Chloroform under methanol
13. Dichloromethane
14. Benzene
15. Trichloroethene
16. Tetrachloroethene
17. Toluene
18. 1,2-Dichloropropane
19. 1,2-Dichloroethane
20. Ethylbenzene
21. 1,3-Dichloropropene (Z)
22. Bromodichloromethane
23. 1,3-Dichloropropene (E)
24. Chlorobenzene
25. 1,1,2-Trichloroethane
26. Dibromochloromethane

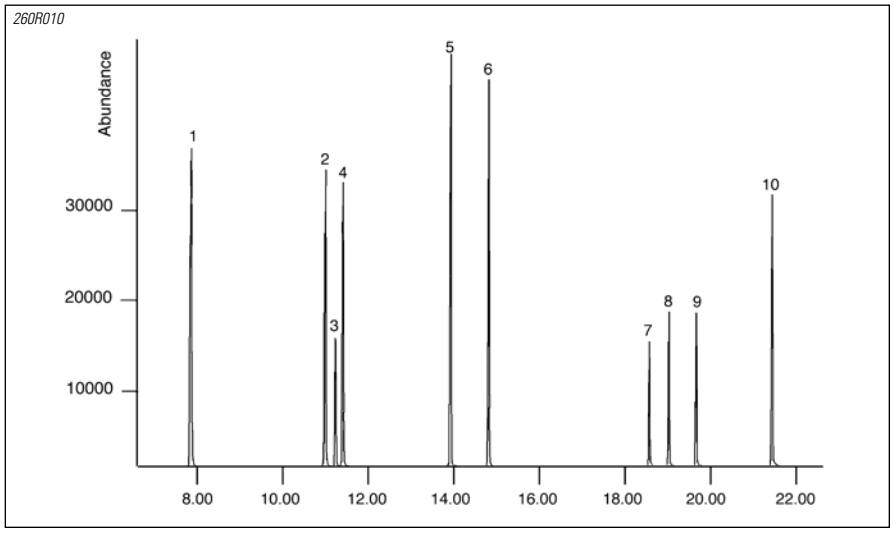


27. 2-Chloroethylvinyl ether
28. 1,3-Dichlorobenzene
29. Tribromomethane
30. 1,4-Dichlorobenzene
31. 1,2-Dichlorobenzene
32. 1,1,2,2-Tetrachloroethane

EPA 625 Chloro/Nitro Phenols

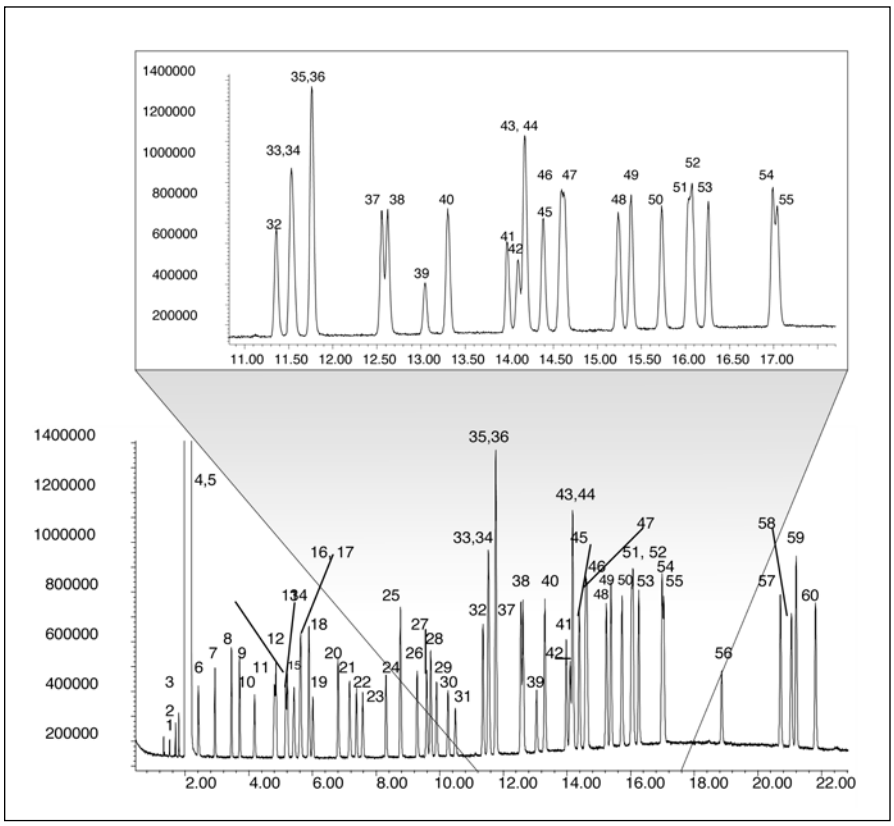
Column:	TR-50MS 30 m x 0.25 mm x 0.25 µm
Part Number:	260R142P
Temperature:	50 °C 1 min, 8 °C/min to 300 °C, hold 10 min
Detector Type:	MS
Injection Mode:	Split 40:1

1. 2-Chlorophenol
2. 2-Nitrophenol
3. 2, 4-Dimethylphenol
4. 2, 4-Dichlorophenol
5. 4-Chloro-3-methylphenol
6. 2, 4, 6-Trichlorophenol
7. 2, 4- Dinitrophenol
8. 4-Nitrophenol
9. 2-Methyl-4, 6-dinitrophenol
10. Pentachlorophenol



EPA 502.2 Volatile Organic Compounds

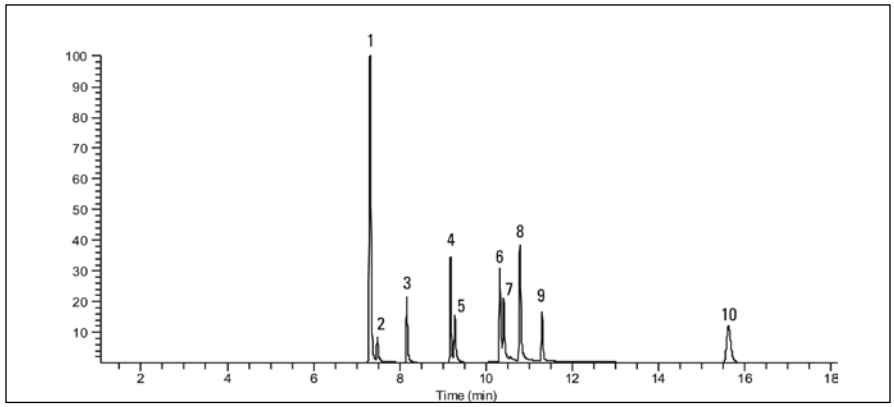
Column:	TR-V1, 30 m x 0.25 mm x 1.4 µm
Part Number:	260V332P
USEPA 502.2 mix:	200 ppm in Methanol
Injection Mode:	Split
Split Ratio:	50:1
Injection Volume:	1 µL
Initial Temp:	40 °C, 1 min
Injection Temp:	250 °C
Rate 1:	6 °C/min to 210 °C
Rate 2:	15°/min to 240 °C
Liner Type:	4 mm ID Single Taper Liner
Final Temp:	240 °C, 5 min
Carrier Gas:	Helium, 22.8 psi
Carrier Gas Flow:	1.3 mL/min
Average Linear Velocity:	35 cm/sec at 40 °C
Detector Type:	Mass Spectrometer
Full scan:	45 - 450



1. Dichlorodifluoromethane
2. Chloromethane
3. Vinyl chloride
4. Bromomethane
5. Chloroethane
6. Trichlorofluoromethane
7. 1,1-Dichloroethene
8. Dichloromethane
9. trans-1,2-Dichloroethene
10. 1,1-Dichloroethane
11. 2,2-Dichloropropane
12. *cis*-1,2-Dichloroethene
13. Bromochloromethane
14. Chloroform
15. 1,1,1-Trichloroethane
16. 1,1-Dichloropropene
17. Carbon tetrachloride
18. Benzene
19. 1,2-Dichloroethane
20. Trichloroethene
21. 1,2-Dichloropropane
22. Dibromomethane
23. Bromodichloromethane
24. *cis*-1,3-Dichloropropene
25. Toluene
26. trans-1,3-Dichloropropene
27. 1,1,2-Trichloroethane
28. Tetrachloroethene
29. 1,3-Dichloropropane
30. Dibromochloromethane
31. 1,2-Dibromoethane
32. Chlorobenzene
33. Ethylbenzene
34. 1,1,1,2-Tetrachloroethane
35. m-Xylene
36. p-Xylene
37. o-Xylene
38. Styrene
39. Bromoform
40. Isopropylbenzene
41. Bromobenzene
42. 1,1,2,2-Tetrachloroethane
43. 1,2,3-Trichloropropane
44. n-Propyl benzene
45. 2-Chlorotoluene
46. 1,3,5-Trimethylbenzene
47. 4-Chlorotoluene
48. tert-Butylbenzene
49. 1,2,4-Trimethylbenzene
50. sec-Butylbenzene
51. 1,3-Dichlorobenzene
52. p-Isopropyltoluene
53. 1,2-Dichlorobenzene
54. n-Butylbenzene
55. 1,4-Dichlorobenzene
56. 1,2-Dibromo-3-chloropropan
57. 1,2,4-Trichlorobenzene
58. Hexachlorobutadiene
59. Naphthalene
60. 1,2,3-Trichlorobenzene

EPA 8095 Explosives

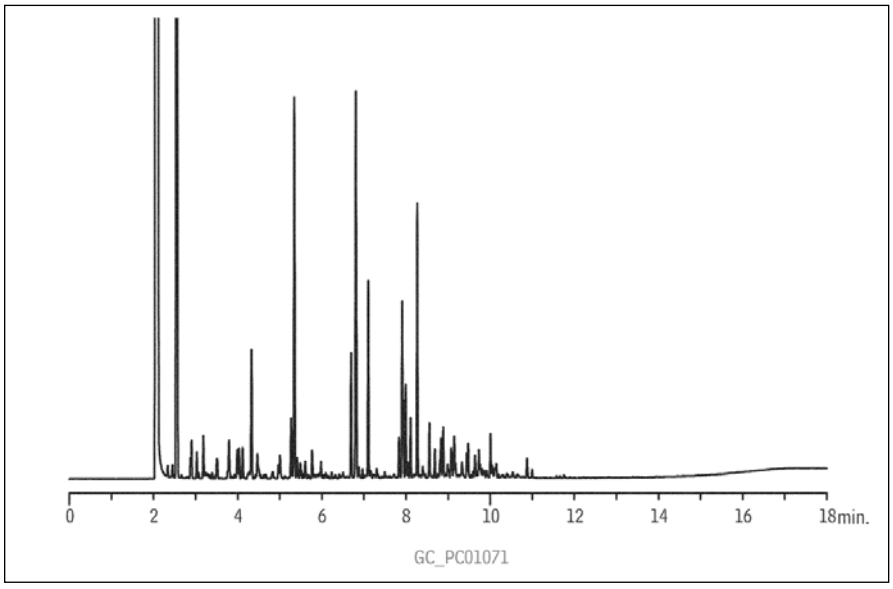
Column:	TR-8095 12 m x 0.32 mm x 0.25 µm
Part Number:	260P123P
Sample:	200 pg/µL (HMX: 2,000 pg/µL)
Initial Temperature:	80 °C, 5 min.
Rate #1:	20.0 °C/min to 225 °C
Final Temperature #1:	225 °C
Detector Type:	Mass Spec
Reagent Gas Type:	Methane
Reagent Gas Flow, all segments:	2.5 mL/min
Carrier Gas:	Helium
Carrier Gas Flow:	5.0 mL/min
Left Carrier Method Mode:	Constant Flow
Injection mode:	Basic
Sample volume (µL):	1.0



1. Nitrobenzene
2. 2-Nitrotoluene
3. 3-Nitrotoluene
4. 4-Nitrotoluene
5. Nitroglycerin
6. 2,6-Dinitrotoluene-D3 (ISTD)
7. 2,6-Dinitrotoluene
8. 1,3-Dinitrobenzene
9. 2,4-Dinitrotoluene
10. 2,4,6-Trinitrotoluene
11. 1,3,5-Trinitrobenzene
12. PETN
13. 4-Amino-2,6-dinitrotoluene
14. RDX
15. 3,5-Dinitroaniline
16. 2-Amino-4,6-dinitrotoluene
17. Tetryl
18. HMX

Unleaded Gasoline

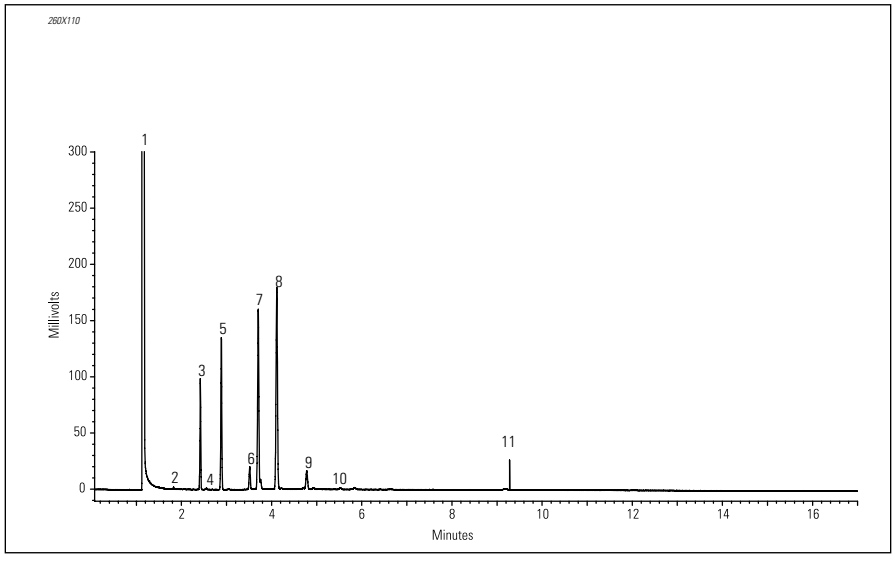
Column:	TG-1MS 30m x 0.25mm x 0.25µm
Part Number:	26099-1420
Temperature:	50ºC (2.0 minute hold) to 75ºC at 10ºC/minute to 300ºC at 20ºC/minute (5 minute hold)
Detector Type:	FID
Carrier Gas:	He
Flow Rate:	1.0 mL/min
Injection Volume:	1.0 µL
Injection Mode:	Split (20:1), 250°C



Biodiesel

Column:	TR-Biodiesel F 30 m x 0.25 mm x 0.25 µm
Part Number:	26AX142P
Temp:	200 °C isothermal
Inlet Temp:	250 °C
Detector Type:	FID
Detector Temp:	250 °C
Carrier Gas:	Helium
Flow Rate:	1.6 mL/minute
Split Ratio:	50:1
Injection Volume:	1.0 µL

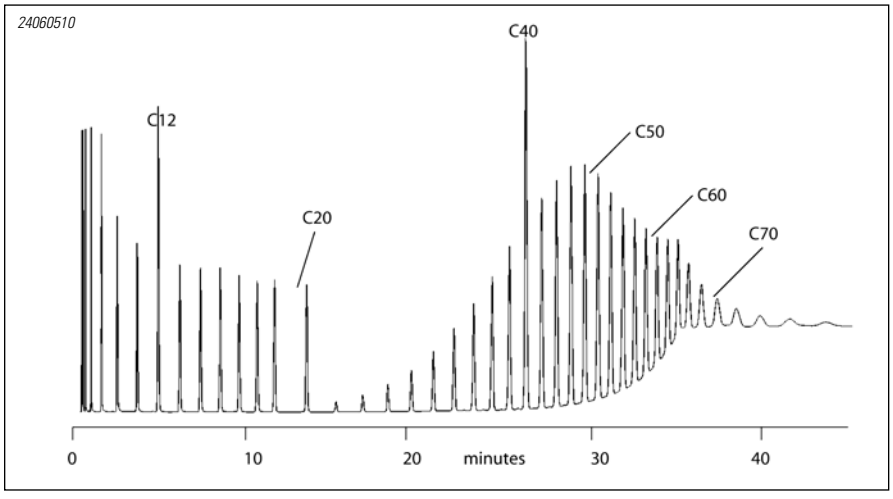
1. C12:0
2. C14:0
3. C16:0
4. C16:1
5. C17:0 (Internal standard)
6. C18:0
7. C18:1n9cis
8. C18:2n6cis
9. C18:3n3
10. C20:0
11. C24:0



Hydrocarbon Standard (SimDist)

Column:	TR-SimDist 10 m x 0.53 mm x 0.9 µm
Part Number:	260S250P
Temperature:	40 °C, 10 °C/min to 39 0 °C, hold 10 min
Detector Type:	FID
Detection Conditions:	400 °C
Carrier Gas:	He
Flow Rate:	20 mL/min

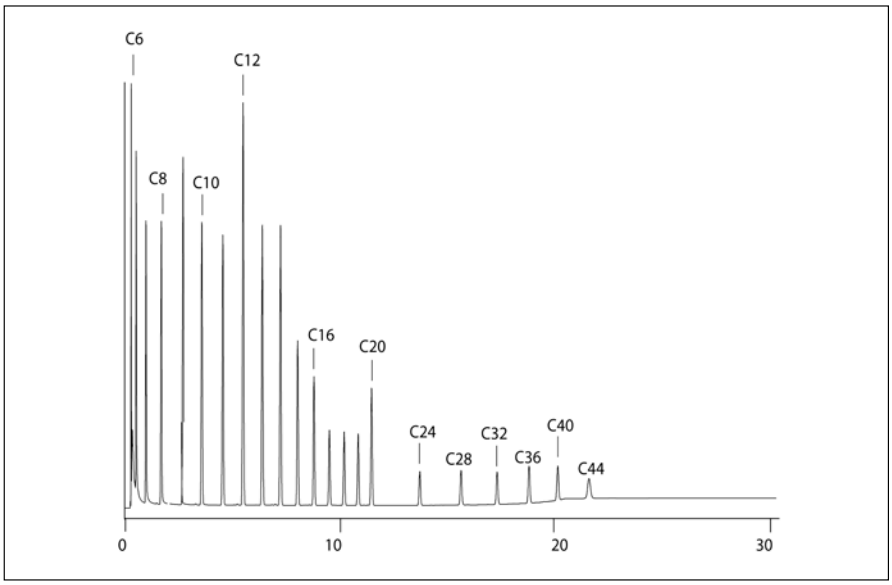
Hydrocarbon Standard Mix



ASTM D2887

Column:	TR-SimDist 10 m x 0.53 mm x 2.65 µm
Part Number:	260S348P
Initial Temp:	40 °C
Rate:	15 °C/min
Final Temp:	350 °C, 10 min
Detector Temp:	400 °C
Carrier Gas:	Helium, 20 mL/min
Initial Temp:	80 °C
Rate:	15 °C/min
Final Temp:	350 °C, 10 min

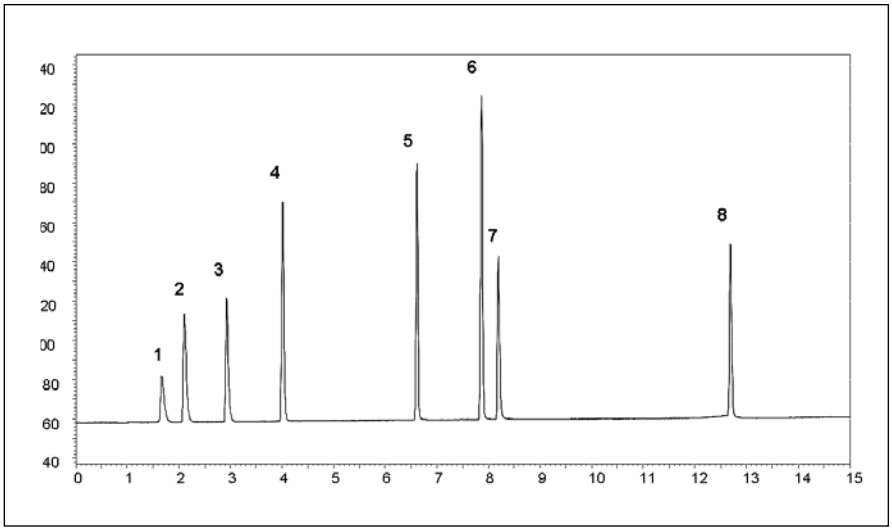
Hydrocarbon Standard Mix



Hydrocarbons (C1-C4)

Column:	TG-BOND Alumina (Na2SO4) 30m x 0.53mm x 10µm
Part Number:	26001-6080
Temperature:	40ºC (1.0 minute hold) to 200ºC at 10ºC/minute (10 minute hold)
Detector Type:	FID
Carrier Gas:	He
Flow Rate:	40.0 mL/min
Injection Volume:	100 µL
Injection Mode:	Splitless, 180°C

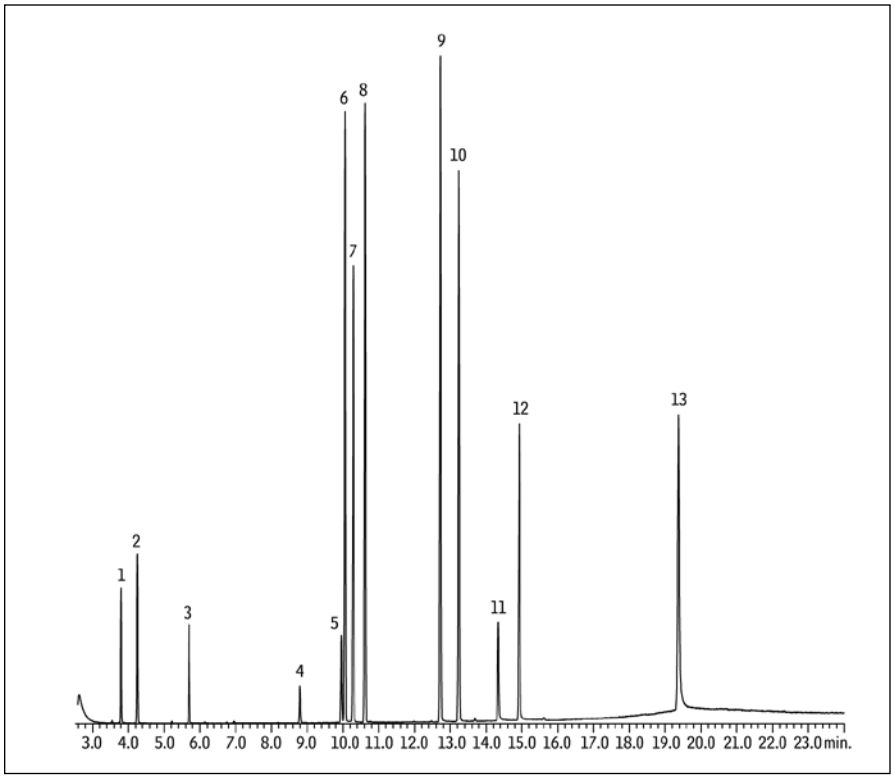
1. Methane
2. Ethane
3. Ethylene
4. Propane
5. Propylene
6. n-Butane
7. Acetylene
8. Propyne



Basic Drugs

Column:	TG-5MS 30m x 0.25mm x 0.25µm
Part Number:	26098-1420
Temperature:	100°C to 220°C at 15°C/minute to 330°C at 10°C/minute (5 minute hold)
Detector Type:	MS
Carrier Gas:	He
Flow Rate:	30cm/sec
Injection Volume:	1.0 µL
Injection Mode:	Split 50:1, 250°C

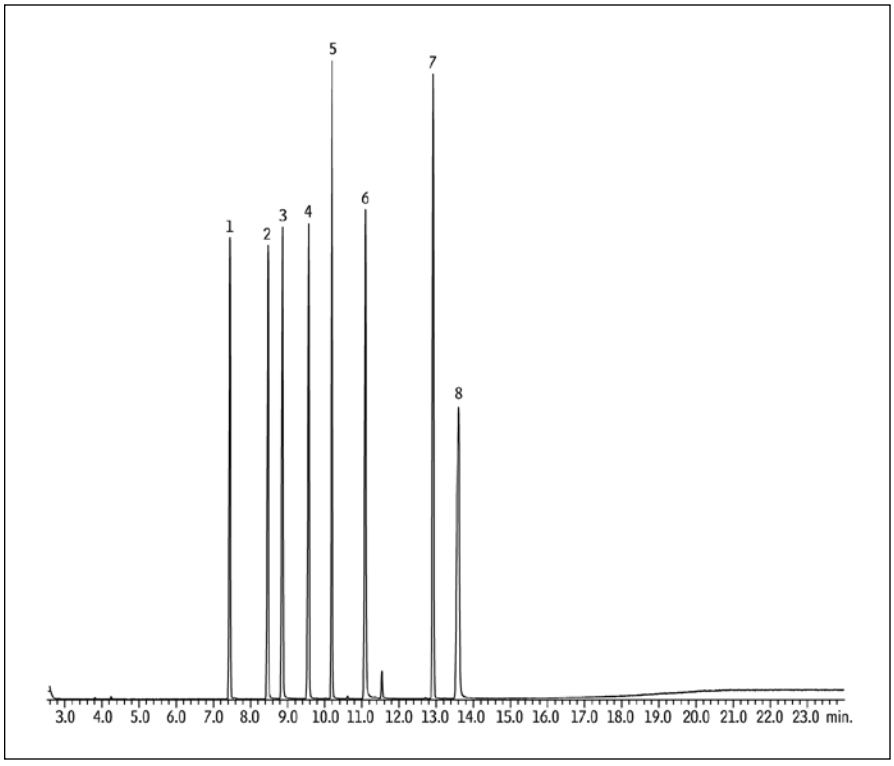
1. amphetamine
2. methamphetamine
3. nicotine
4. cotinine
5. caffeine
6. benzphetamine
7. ketamine
8. phencyclidine
9. methadone
10. cocaine
11. codeine
12. scopolamine
13. alprazolam



Neutral and Acidic Drugs

Column:	TG-5MS 30m x 0.25mm x 0.25µm
Part Number:	26098-1420
Temperature:	100°C to 220°C at 15°C/minute to 330°C at 10°C/minute (5 minute hold)
Detector Type:	MS
Carrier Gas:	He
Flow Rate:	30cm/sec
Injection Volume:	1.0 µL
Injection Mode:	Split 50:1, 250°C

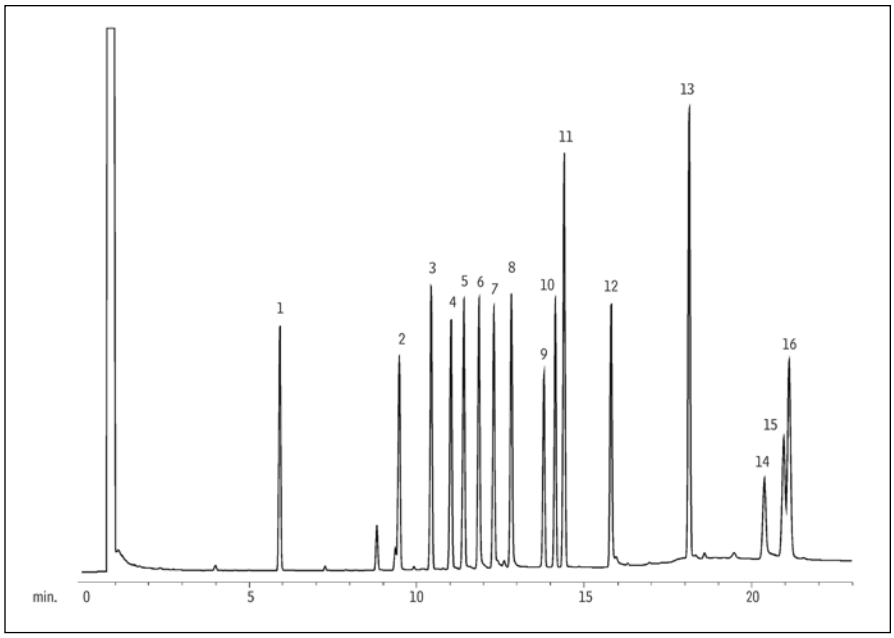
1. methprylon
2. butalbital
3. amobarbital
4. meprobamate
5. glutethimide
6. phenobarbital
7. methaqualone
8. primidone



Underivatized Barbituates

Column:	TG-35MS 30m x 0.53mm x 1.0µm
Part Number:	26094-2980
Temperature:	100°C to 280°C at 10°C/minute (10 minute hold)
Detector Type:	FID
Carrier Gas:	He
Flow Rate:	40cm/sec
Injection Volume:	1.0 µL
Injection Mode:	Splitless, 250°C

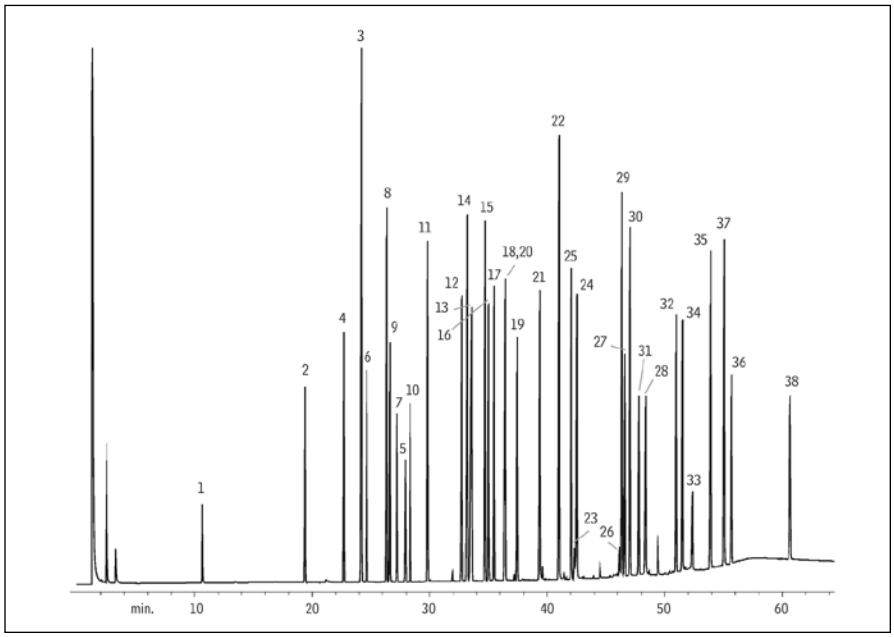
1. ethosuximide
2. barbital
3. methyprylon
4. aprobarbital
5. butalbital
6. amobarbital
7. pentobarbital
8. secobarbital
9. meprobamate
10. carisoprodal
11. glutethimide
12. phenobarbital
13. methaqualone
14. primidone
15. carbamazepine
16. diphenylhydantoin



Underivatized Mixed Basic Drugs

Column:	TG-35MS 30m x 0.25mm x 0.25µm
Part Number:	26094-1420
Temperature:	100°C to 325°C at 4°C/minute (10 minute hold)
Detector Type:	FID
Carrier Gas:	He
Flow Rate:	30cm/sec
Injection Volume:	1.0 µL
Injection Mode:	Split (50:1), 250°C

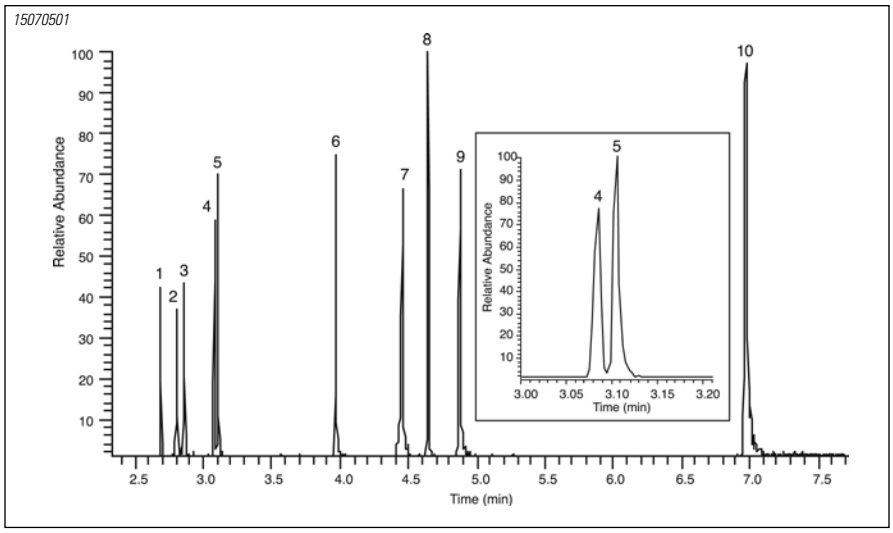
1. nicotine
2. benzocaine
3. cotinine
4. meperidine
5. caffeine
6. benzphetamine
7. ketamine
8. diphenhydramine
9. lidocaine
10. phenyltoloxamine
11. tripelennamine
12. phenothiazine
13. dextromethorphan
14. methadone
15. amitriptyline
16. trimipramine
17. tetracaine
18. pyrilamine
19. medazepam
20. bupivacaine
21. scopolamine
22. codeine
23. morphine
24. diazepam
25. chlorpromazine
26. temazepam
27. flunitrazepam
28. bromazepam
29. prazepam
30. acetopromazine
31. flurazepam
32. papaverine
33. clonazepam
34. haloperidol
35. alprazolam
36. triazolam
37. thioridazine
38. trazodone



Performance Enhancing Drugs in Racehorses

Column:	TR-5MS 15 m x 0.15 mm x 0.25 µm
Part Number:	260F128P
Temperature:	45 °C, 200 °C/min to 200 °C, 30 °C/min to 350 °C
Detector Type:	MS
Carrrier Gas:	He
Flow Rate:	0.8 mL/min
Injection Volume:	1 µL
Injection Mode:	260 °C, splitless 0.8 min,

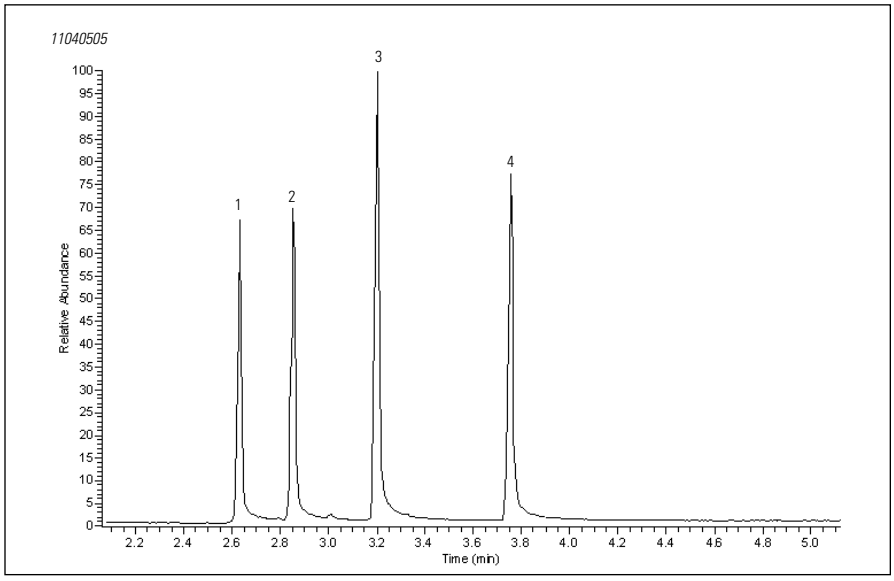
1. Metronidazole
2. Amylobarbitone
3. Pentobarbitone
4. Caffeine
5. Diphenhydramine
6. Trimipramine
7. Phenytoin
8. Diazepam
9. Nordiazepam
10. Diphenoxylate



Barbiturates

Column:	TR-5MS 15 m x 0.25 mm x 0.25 µm
Part Number:	260F130P
Initial Temp:	150 °C, 0.2 min
Rate 1:	20 °C/min to 300 °C
Final Temp:	300 °C, 0.5 min
Detector Type:	MS
Detection Conditions:	Polaris*Q* source 225 °C, 35-400 *m/z*, EI @ 70 eV
Carrier Gas:	He
Flow Rate:	1.5 mL/min
Injection Temp:	250 °C
Injection Mode:	Split
Split Ratio:	20:1

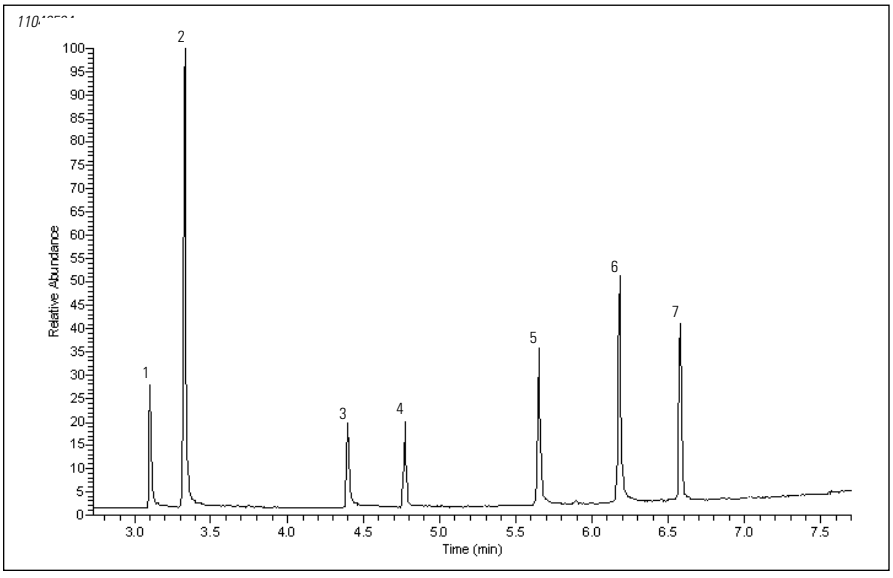
1. Pentabarbital
2. Secobarbital
3. Hexabarbital
4. Phenobarbital



Drugs of Abuse

Column:	TR-DoA 5MS 15 m x 0.25 mm x 0.25 µm
Part Number:	26AF130P
Initial Temp:	150 °C, 0.2 min
Rate 1:	20 °C/min to 300 °C
Final Temp:	300 °C, 0.5 min
Detector Type:	MS
Detection Conditions:	Polaris*Q*™ source 225 °C, 35-400 *m/z*, EI @ 70 eV
Carrier Gas:	He
Flow Rate:	1.5 mL/min
Injection Temp:	250 °C
Injection Details:	Split
Split Ratio:	50:1

1. Caffeine
2. Phencyclidine
3. Methadone
4. Cocaine
5. Codeine
6. 6-acetylmorphine
7. Heroin

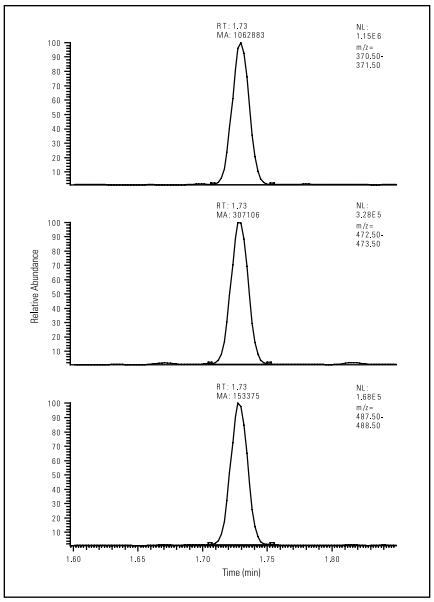


Drugs of Abuse

Column:	TR-DoA 35MS 30m x 0.25mm x 0.25µm
Part Number:	26AC497P
Temperature:	230ºC (0.1 minute hold) to 320ºC at 60ºC/minute (1.8 minute hold)
Detector Type:	MS
Carrier Gas:	He
Flow Rate:	2.5 mL/min
Injection Volume:	2.0 µL
Injection Mode:	Split 10:1, 270°C

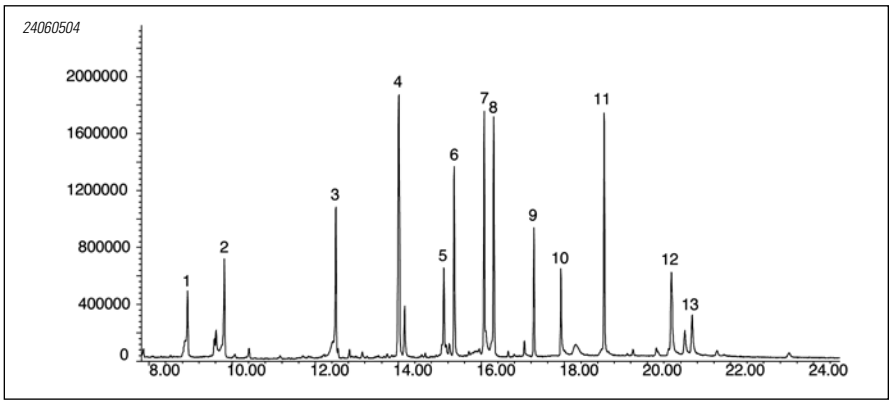
High-Throughput Confirmation and Quantitation of a THC Metabolite in Urine using the DSQ II GC/MS.

For the sample preparation procedure and conditions used for the GC/MS analysis please request Application Note TN10161



Antidepressant and Anticonvulsant Drugs

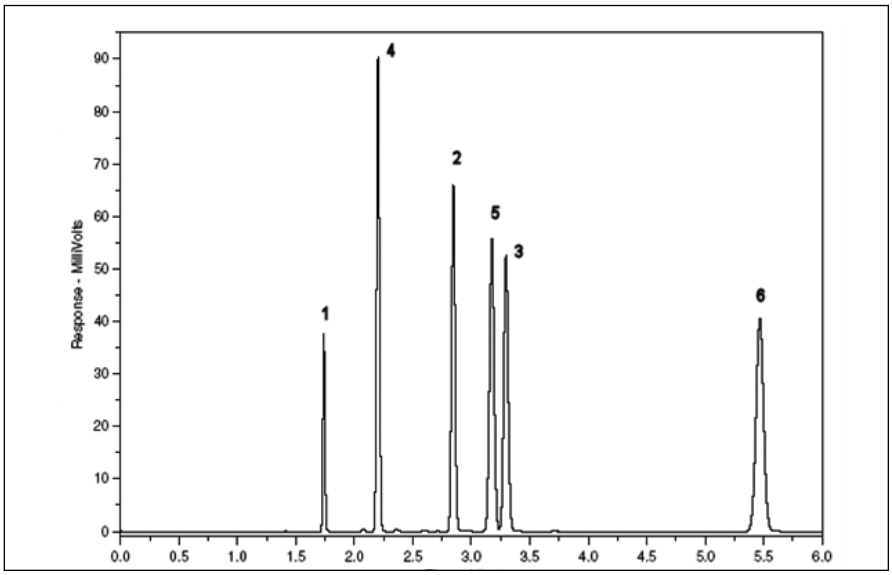
Column:	TR-50MS 30 m x 0.25 mm x 0.25 µm
Part Number:	260R142P
Temperature:	150 °C 0.5 min, 10 °C/min to 180 °C, 1.5 °C/min to 220 °C, 30 °C/min to 260 °C, hold 5 min
Detector Type:	MS
Carrier Gas:	He 25.7 psi
Flow Rate:	1.8
Injection Volume:	1.0 µL
Injection Details:	Splitless 0.5 min,



Blood Alchohols

Column:	TR-WAX 30m x 0.53mm x 1.0µm
Part Number:	260W298P
Temperature:	55°C Isothermal
Detector Type:	FID
Carrier Gas:	He
Flow Rate:	4 mL/min
Injection Volume:	1.0 µL
Injection Mode:	Split 20:1, 200°C

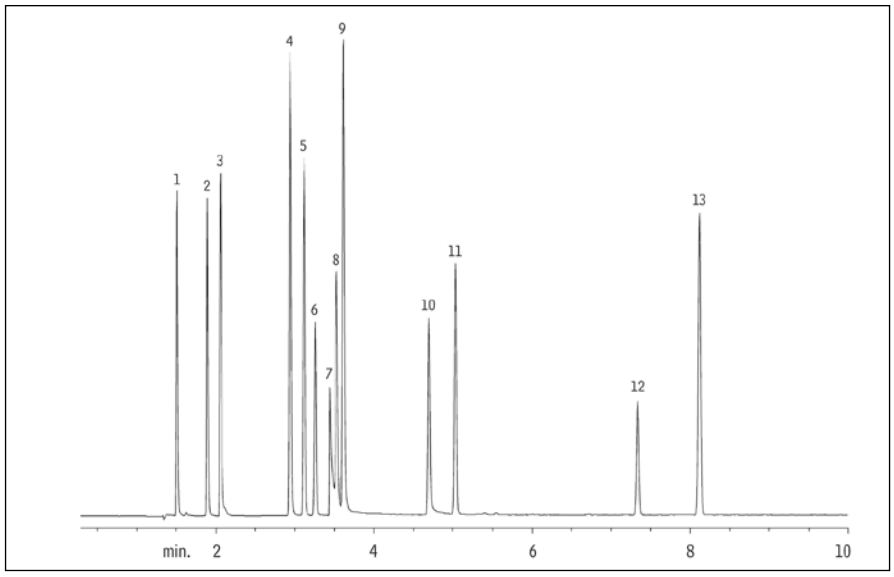
1. Acetaldehyde
2. Methanol
3. Ethanol
4. Acetone
5. Isopropanol (propan-2-ol)
6. n-Propanol



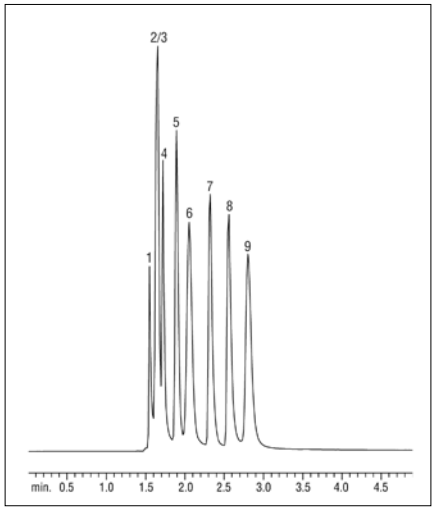
Amines and Phenols

Column:	TG-5MS Amine 30m x 0.32mm x 1.0µm
Part Number:	26097-2970
Temperature:	120ºC to 220ºC at 10ºC/minute
Detector Type:	FID
Carrier Gas:	Hydrogen
Flow Rate:	40 cm/min
Injection Volume:	1.0 µL
Injection Mode:	Split 25:1, 300°C

1. diethylamine
2. pyridine
3. morpholine
4. phenol
5. aniline
6. 2-chlorophenol
7. diethylenetriamine
8. octylamine
9. 1-methyl-2-pyrrolidinone
10. 2-nitrophenol
11. 2,6-dimethylaniline
12. nicotine
13. 2-nitroaniline



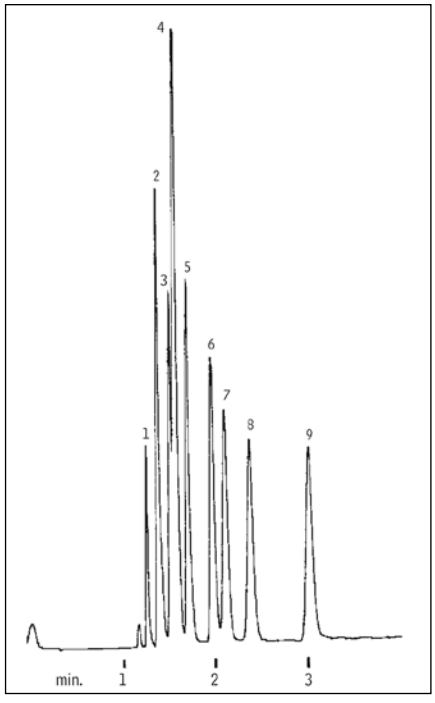
Primary Amines



Column:	TG-35MS Amine 30m x 0.53mm x 1.0µm
Part Number:	26092-2980
Temperature:	35ºC (5 minute hold) Isothemal
Detector Type:	FID
Carrier Gas:	He
Flow Rate:	35 cm/sec
Injection Volume:	1.0 µL
Injection Mode:	Split (10:1), 250°C

1. methylamine
2. dimethylamine
3. trimethylamine
4. ethylamine
5. isopropylamine
6. tert-butylamine
7. n-propylamine
8. diethylamine
9. sec-butylamine

Amines



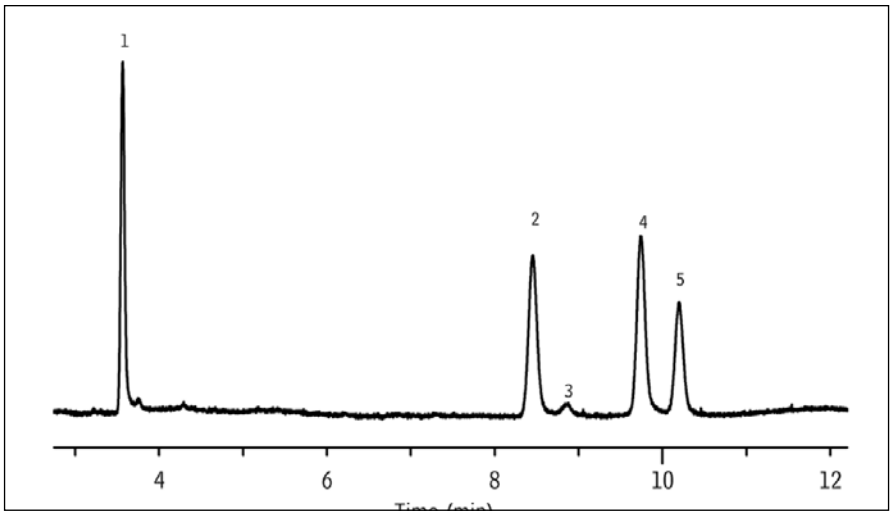
Column:	TG-WAXMS B 30m x 0.53mm x 1.0µm
Part Number:	26086-2980
Temperature:	45ºC Isothermal
Detector Type:	FID
Carrier Gas:	Hydrogen
Flow Rate:	40 cm/sec
Injection Volume:	1.0 µL
Injection Mode:	Direct Injection, 250°C

1. trimethylamine
2. dimethylamine
3. ethylamine
4. methylamine
5. isopropylamine
6. n-propylamine
7. tert-butylamine
8. diethylamine
9. sec-butylamine

Residual Solvents Class 1

Column:	TG-624 30m x 0.32mm x 1.80µm
Part Number:	26085-3390
Temperature:	40°C (20 minute hold) to 240°C at 10°C/min (20 minute hold)
Detector Type:	FID
Carrier Gas:	He
Flow Rate:	2.15 mL/min
Injection Volume:	1.0 µL
Injection Mode:	Headspace, Split (1:5), 140°C

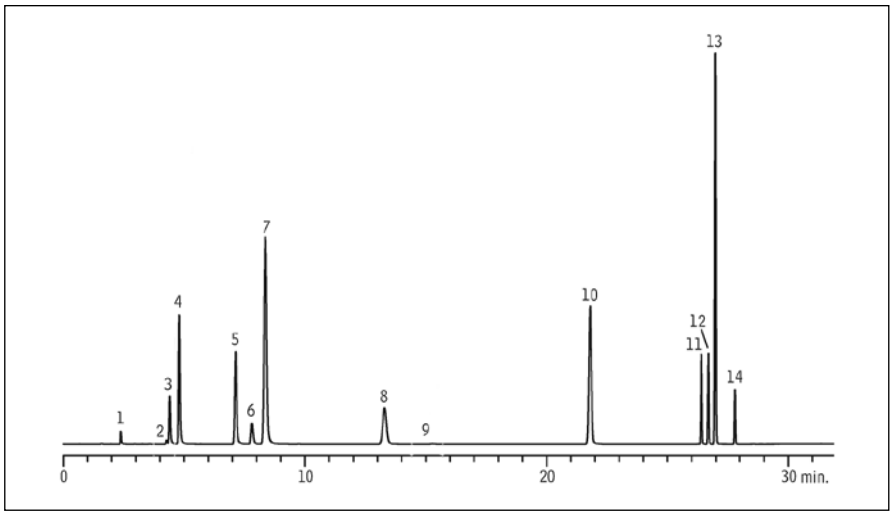
1. 1,1-dichloroethene
2. 1,1,1-trichloroethane
3. carbon tetrachloride
4. benzene
5. 1,2-dichloroethane



Residual Solvents Class 2 Mix A

Column:	TG-624 30m x 0.32mm x 1.80µm
Part Number:	26085-3390
Temperature:	40°C (20 minute hold) to 240°C at 10°C/min (20 minute hold)
Detector Type:	FID
Carrier Gas:	He
Flow Rate:	2.15 mL/min
Injection Volume:	1.0 µL
Injection Mode:	Headspace, Split (1:5), 140°C

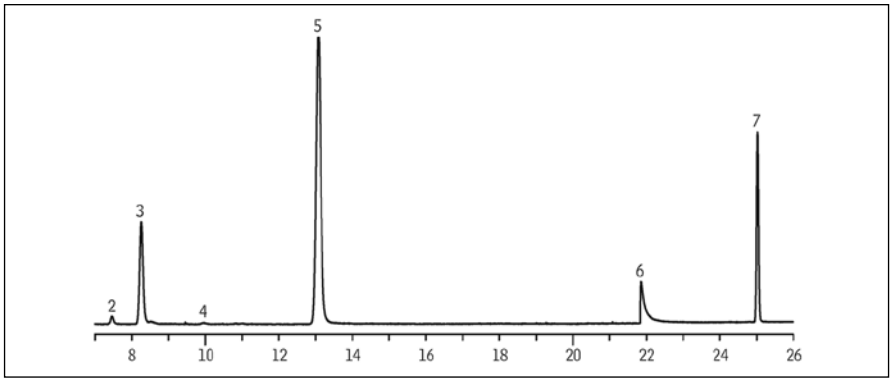
1. methanol
2. acetonitrile (resolution=1.35)
3. dichloromethane
4. trans-1,2-dichloroethene
5. cis-1,2-dichloroethene
6. tetrahydrofuran
7. cyclohexane
8. methylcyclohexane
9. 1,4-dioxane
10. toluene
11. chlorobenzene
12. ethyl benzene
13. m-xylene/p-xylene
14. o-xylene



Residual Solvents Class 2 Mix B

Column:	TG-624 30m x 0.32mm x 1.8µm
Part Number:	26085-3390
Temperature:	40°C (20 minute hold) to 240°C at 10°C/minute (20 minute hold)
Detector Type:	FID
Carrier Gas:	He
Flow Rate:	2 mL/min
Injection Volume:	1.0 µL
Injection Mode:	Headspace, Split 1:5, 140°C

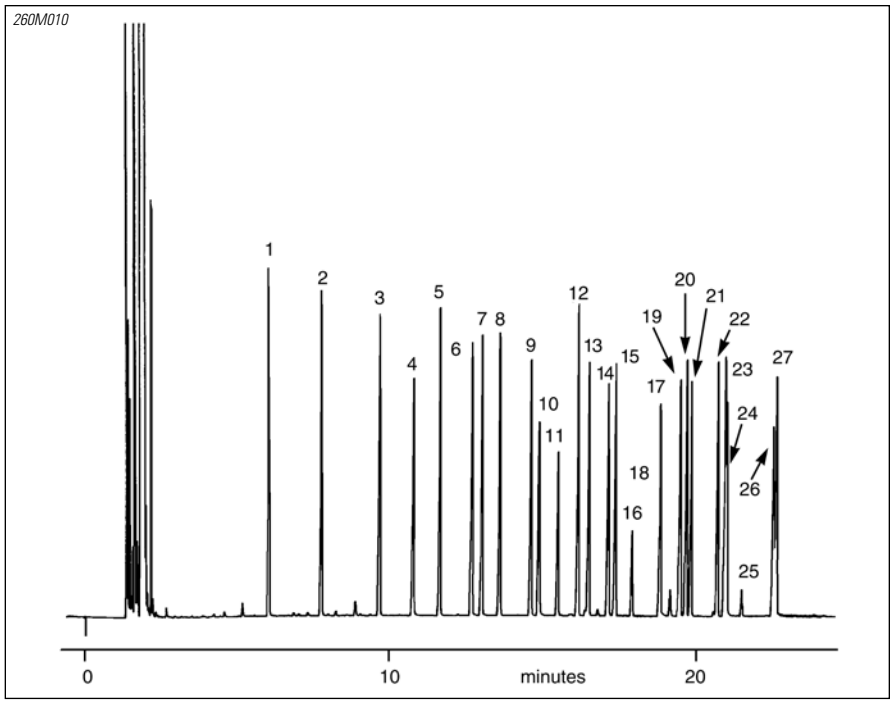
1. hexane
2. nitromethane
3. chloroform
4. 1,2-dimethoxyethane
5. trichloroethylene
6. pyridine
7. 2-hexanone
8. tetralin



Bacterial Acid Methyl Esters

Column:	TR-FAME 30 m x 0.25 mm x 0.25 µm
Part Number:	260M142P
Temperature:	100 °C 1 min, 5 °C/min to 220 °C
Detector Type:	FID
Injection Mode:	Split

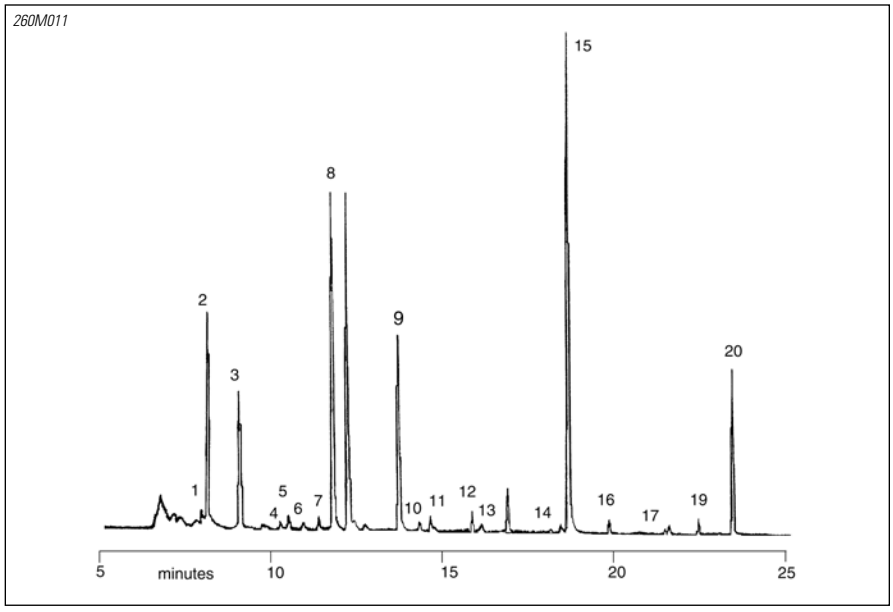
1. C11:0
2. C12:0
3. C13:0
4. C10:0 2-OH
5. C14:0
6. C15:0-i
7. C15:0-a
8. C15:0
9. C12:0 2-OH
10. C16:0-i
11. C16:0
12. C15.1n7-*cis*
13. C12:0 3-OH
14. C17:0-a
15. C17:0
16. C9,10-methylene 16:0
17. C14:0-2-OH
18. C18:0
19. C18:1n9-trans
20. C18.1n9-*cis*
21. C18.1n7-*cis*
22. C18.2n6-*cis*
23. C19:0
24. C16:0 2-OH
25. C9,10-methylene 18:0
26. C20:0
27. C18:0 2-OH



Partially Methylated Glucose

Column:	TR-FAME 25 m x 0.22 mm x 0.25 µm
Part Number:	260M135P
Temperature:	185 °C 1 min, 3 °C/min to 260 °C, hold 10 min
Detector Type:	MS
Detection:	70 eV, 100-350 *m/z*
Carrrier Gas:	He, 50 kPa
Injection Volume:	1 µL
Injection Mode:	Split

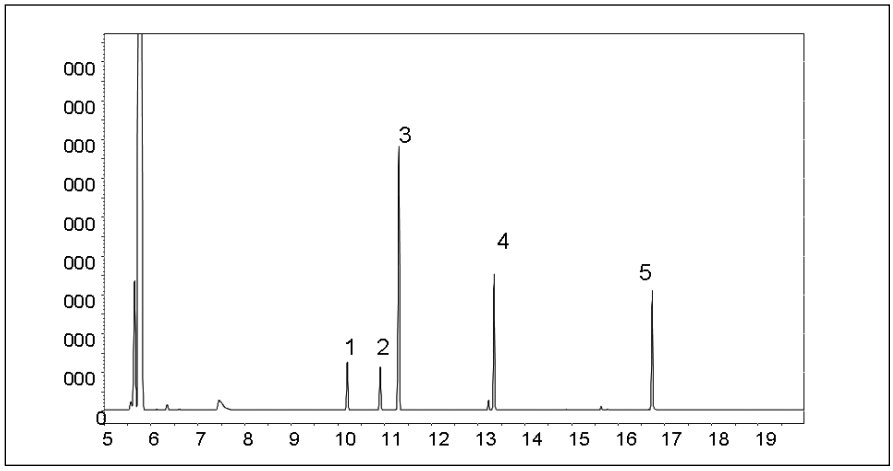
1. 2,3,4-O-methyl rhamnitol
2. 2,3,5-O- methyl arabinitol (f)
3. 2,3,4-O-methyl arabinitol (p)
4. 3,5-O-methyl arabinitol
5. 2,3,4,6-O-methyl glucitol
6. 2,5-O-methyl arabinitol
7. 2,3,4,6-O-methyl galactitol
8. 2,3-O-methyl arabinitol
9. 2,4,6-O-methyl galactitol
10. 2-O-methyl arabinitol
11. 2,3,6-O-methyl glucitol
12. 2,3,4-O-methyl galactitol
13. arabinitol hexa-acetate
14. xylitol hexa-acetate
15. 2,3,4,6-O-methyl galactitol
16. 2-O-methyl galactitol
17. 4-O-methyl galactitol
18. Galactitol hexa-acetate
19. Glucitol hexa-acetate
20. Myo-inositol hexa-acetate



Derivatized Cholrinated Acetic Acids (Alkylated)

Column:	TR-5 30m x 0.25mm x 0.25µm
Part Number:	260E142P
Temperature:	40ºC (1 minute hold) to 300°C at 10°C/min (5 minute hold)
Detector Type:	FID
Carrier Gas:	He
Flow Rate:	1.2 mL/min
Injection Volume:	1.0 µL
Injection Mode:	Split (50:1), 240°C

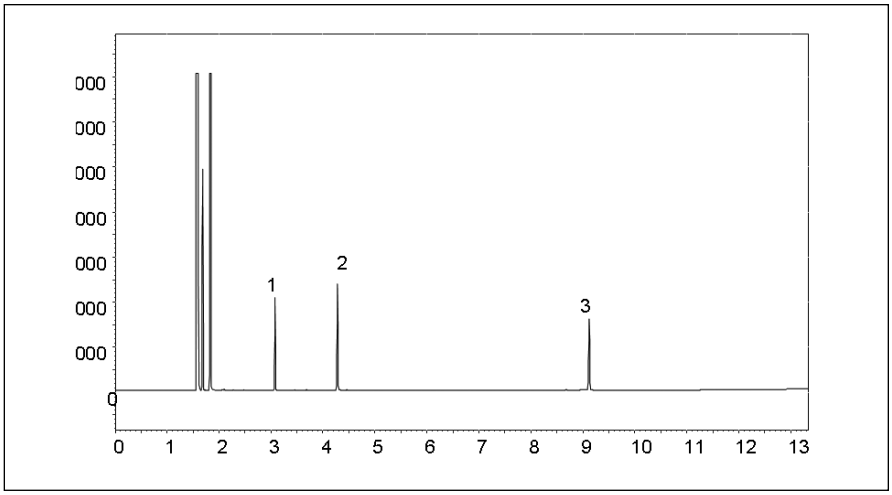
1. Derivatised TCA
2. Derivatised TCA
3. PFB-byproduct
4. Derivatised CA
5. Derivatised (DCA).



Derivatized Amino Acids (Silylated)

Column:	TR-5 30m x 0.25mm x 0.25µm
Part Number:	260E142P
Temperature:	100ºC to 300°C at 15°C/min
Detector Type:	FID
Carrier Gas:	He
Flow Rate:	1.2 mL/min
Injection Volume:	1.0 µL
Injection Mode:	Split (90:1), 240°C

1. Derivatised L-Alanine
2. Derivatised L-Leucine
3. Derivatised L-Lysine

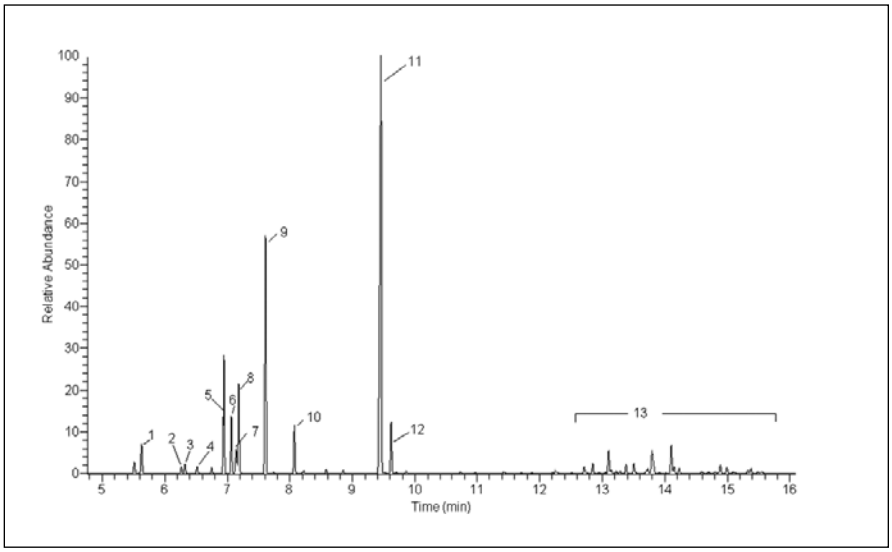


INDUSTRIAL

Analysis of Tea Tree Oil

Column:	TG-5MS 30m x 0.25mm x 0.25µm
Part Number:	26098-1420
Temperature:	40ºC (1 minute hold) to 200°C at 10ºC/min to 250ºC at 30ºC/min
Detector Type:	MS
Carrier Gas:	He
Flow Rate:	1.1 mL/min
Injection Volume:	1.0 µL
Injection Mode:	Split (30:1), 250°C

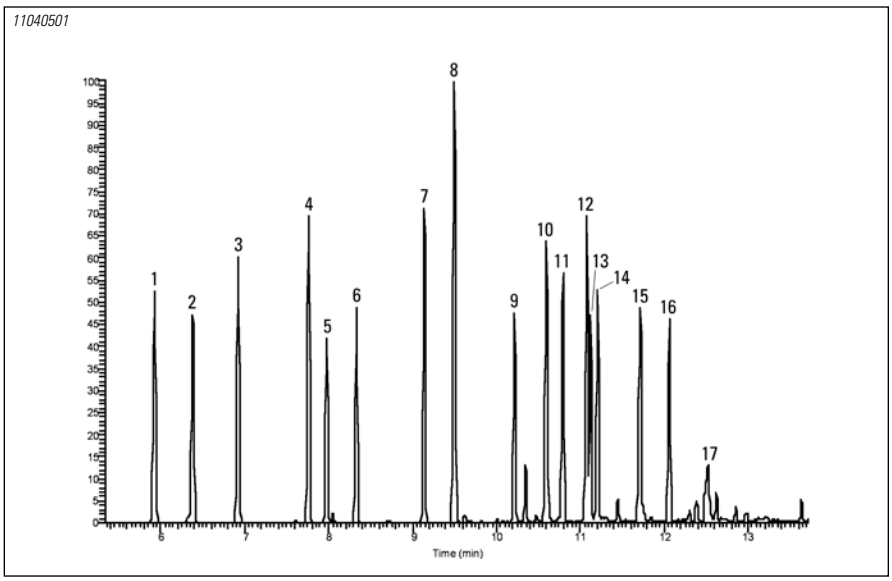
1. alpha-Pinene
2. beta-Phellandrene
3. beta-Pinene
4. beta-Myrcene
5. alpha-Terpinene
6. Cymene
7. Limonene
8. Cineole
9. gamma-Terpinene
10. Terpinoline
11. Terpinen-4-ol
12. alpha-Terpineol
13. Sesquiterpine



Terpenes

Column:	TR-35MS, 30 m x 0.25 mm x 0.25 µm
Part Number:	260C142P
Initial Temp:	40 °C, 0.5 min
Rate 1:	10 °C/min to 200 °C
Final Temp:	200 °C, 1 min
Detector Type:	MS
Detection Conditions:	TRACE DSQ MS, source 225 °C, 35-500 *m/z*, EI @ 70 eV
Carrier Gas:	He
Flow Rate:	1 mL/min
Injection Temp:	200 °C
Injection Mode:	Split
Split Ratio:	50:1

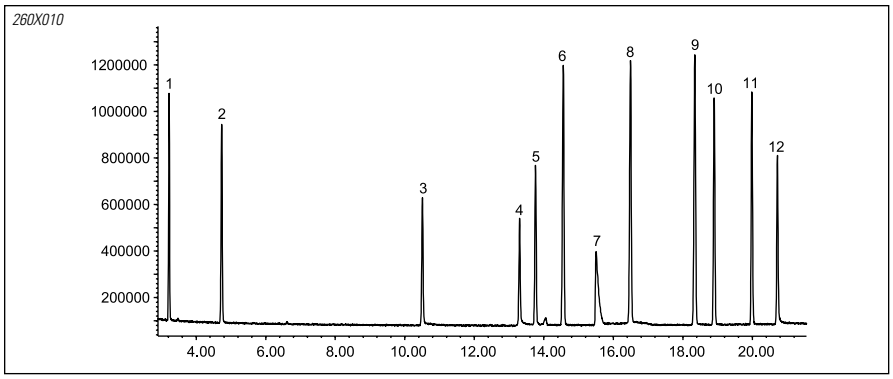
1. α-pinene
2. Camphene
3. β-pinene
4. d-limonene
5. p-cymene
6. α-terpinene
7. Linalool
8. Fenchone
9. l-isopulegol
10. dl-menthol
11. Borneol
12. l-α-terpineol
13. Dihydrocarveol
14. Citronellol
15. Geraniol
16. Pulegone
17. 2-piperidone



Grob Test

Column:	TR-WaxMS 30 m x 0.25 mm x 0.25 µm
Part Number:	260X142P
Temperature:	40 °C 1 min, 6 °C/min to 160 °C, hold 5 min
Detector Type:	MS
Carrrier Gas:	He 25.7 psi, 35cm/s
Flow Rate:	1.8 mL/min
Injection Volume:	1 µL
Injection Mode:	Split 50:1, 250 °C

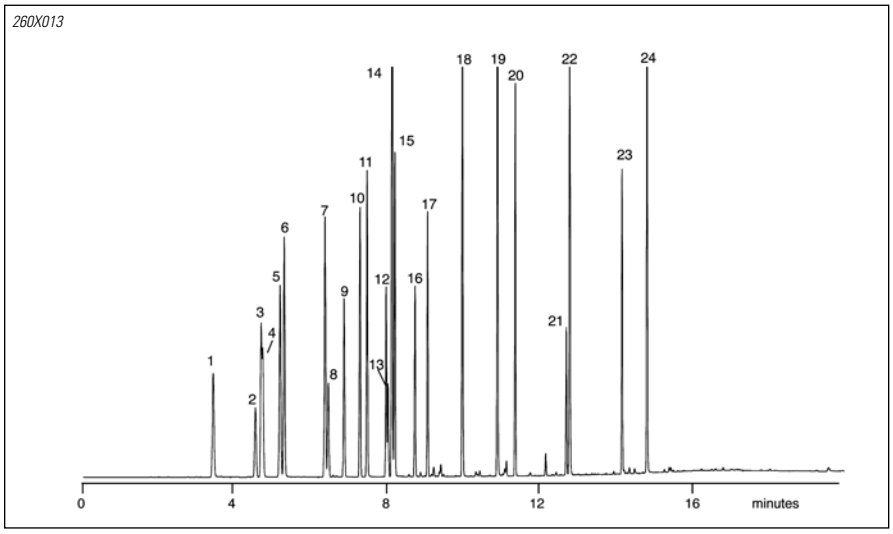
1. n-Decane
2. n-Undecane
3. 1-Nonanal
4. 2,3-Butanediol
5. 1-Octanol
6. Methyl decanoate
7. Dicyclohexylamine
8. Methyl undecanoate
9. Methyl dodecanoate
10. 2,6-Dimethylaniline
11. 2,6-Dimethylphenol
12. 2-Ethylhexanoic acid



Industrial Solents

Column:	TR-WaxMS, 30 m x 0.32 mm x 0.5 µm
Part Number:	260X224P
Temperature:	35 °C 3 min, 15 °C/min to 230 °C, hold 4 min
Detector Type:	FID
Detection:	270 °C
Carrrier Gas:	He 8.4 psi, 30cm/s
Flow Rate:	1.84 mL/min
Injection Volume:	0.1 µL
Injection Mode:	Split 83:1, purge on vent 150 mL/min

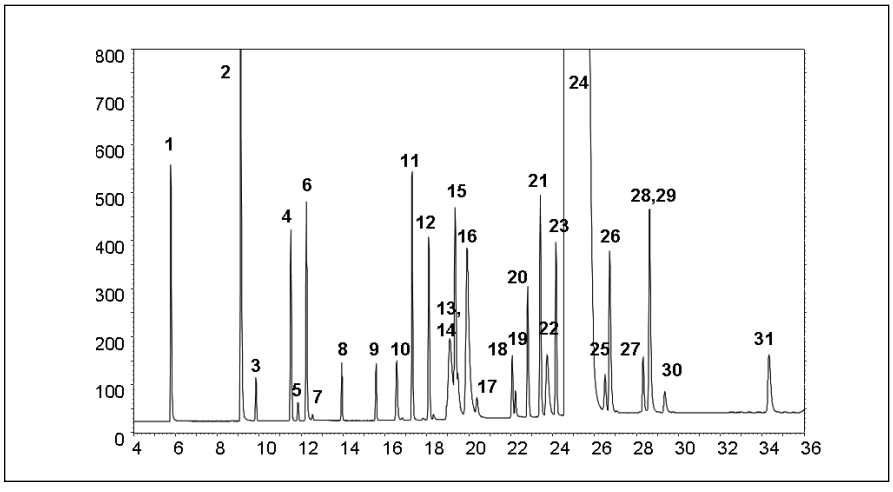
1. Acetone
2. Ethyl acetate
3. Methyl ethyl ketone
4. Contaminant
5. iso-Propanol
6. Ethanol
7. Methyl isobutyl ketone
8. Toluene
9. Butyl acetate
10. iso-Butanol
11. Propylene glycol Monomethyl ether
12. n-Butanol
13. Ethyl benzene
14. p-Xylene
15. m-Xylene
16. o-Xylene
17. Butyl Cellosolve acetate
18. Cyclohexanone
19. Butyl Cellosolve
20. Butyl glycol acetate
22. Isophorone
23. Butyl Carbitol
24. Benzyl alcohol



Solvent Mixture

Column:	TG-BOND Q 30m x 0.32mm x 10µm
Part Number:	26004-6030
Temperature:	100°C to 240°C at 5°C/minute (10 minute hold)
Detector Type:	FID
Carrier Gas:	He
Flow Rate:	1.5 mL/min
Injection Volume:	1.0 µL
Injection Mode:	Split, 220°C

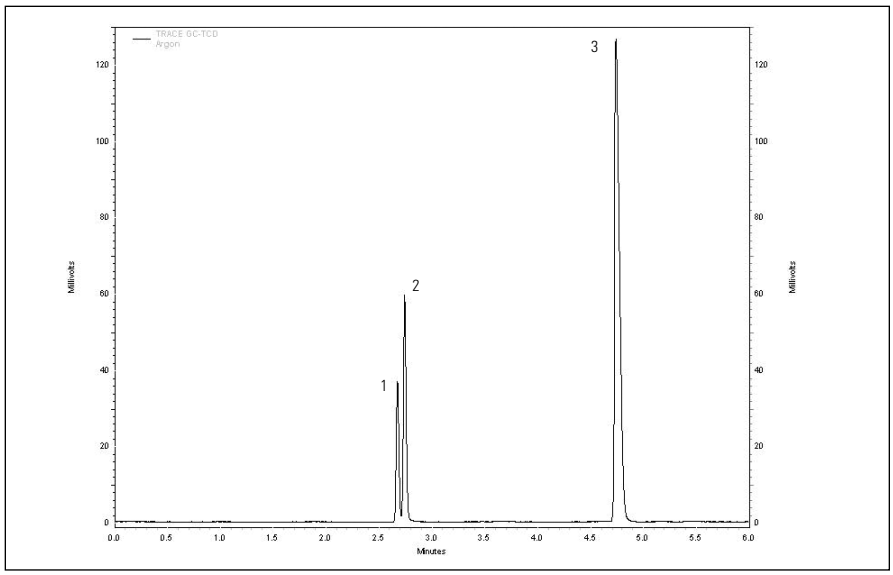
1. Methanol
2. Ethanol
3. Acetonitrile
4. Acetone
5. Dichloromethane
6. 1,1,1-Trichloroethene
7. Nitromethane
8. Trans-1,2-Dichloroethene
9. Cis-1,2-Dichloroethene
10. Tetrahydrofuran
11. Ethyl acetate
12. 1,2-Dichloroethane
13. n-Hexane
14. 1,1,1-trichloroethane
15. Benzene
16. Trichloroethylene
17. 1,4-Dioxane
18. 2-Hexanone
19. Pyridine
20. N,N-Dimethylformamide
21. n-Heptane
22. Methycyclohexane
23. Toluene
24. DMSO
25. Chlorobenzene
26. N,N-Dimethylacetamide
27. Ethylbenzene
28. m-Xylene
29. p-Xylene
30. o-Xylene
31. Ethylene glycol 34.21min.



Separation of Argon/ Oxygen in Air

Column:	TG-BOND MSieve 5A 30m x 0.53mm x 50µm
Part Number:	26003-6100
Temperature:	27°C Isothermal
Detector Type:	TCD
Carrier Gas:	He
Flow Rate:	4.0 mL/min
Injection Volume:	1.0 µL
Injection Mode:	Split (15:1), 100°C

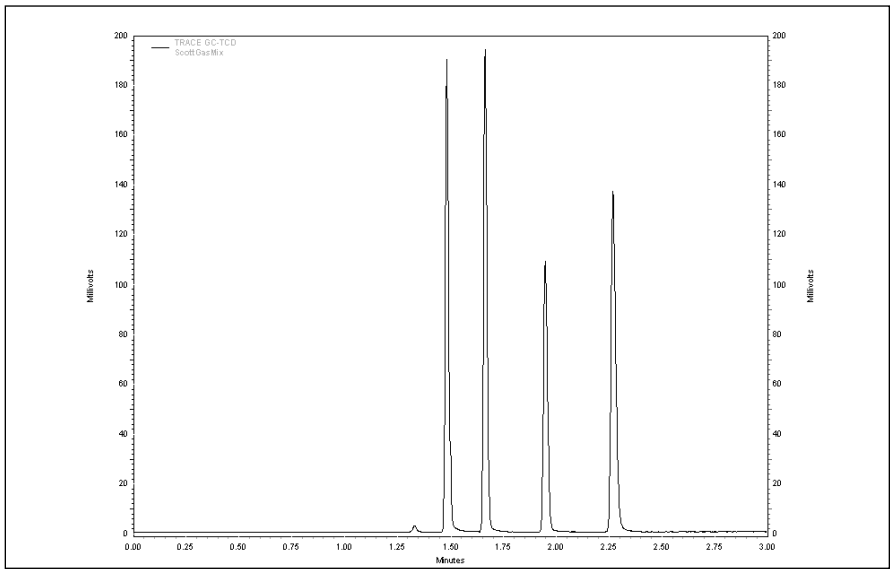
1. Argon
2. Oxygen
3. Nitrogen



Standard Gas Mix (H2, O2, N2, CH4, CO)

Column:	TG-BOND MSieve 5A 30m x 0.53mm x 50µm
Part Number:	26003-6100
Temperature:	120°C Isothermal
Detector Type:	TCD
Carrier Gas:	He
Flow Rate:	5.0 mL/min
Injection Volume:	1.0 µL
Injection Mode:	Split (12:1), 150°C

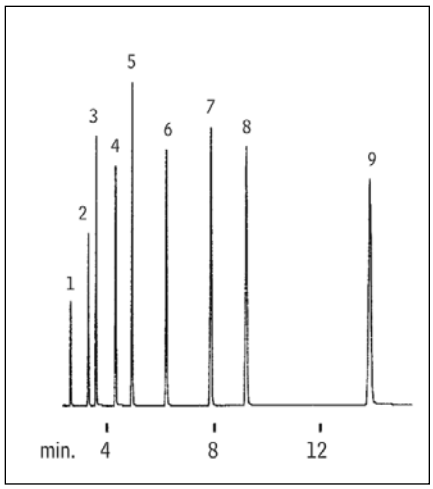
1. Hydrogen
2. Oxygen
3. Nitrogen
4. Methane
5. Carbon Monoxide



Free Fatty Acids

Column:	TG-WAXMS A 30m x 0.25mm x 0.25µm
Part Number:	26087-1420
Temperature:	145°C Isothermal
Detector Type:	FID
Carrier Gas:	Hydrogen
Flow Rate:	40 cm/sec
Injection Volume:	1.0 µL
Injection Mode:	Split (50:1), 250°C

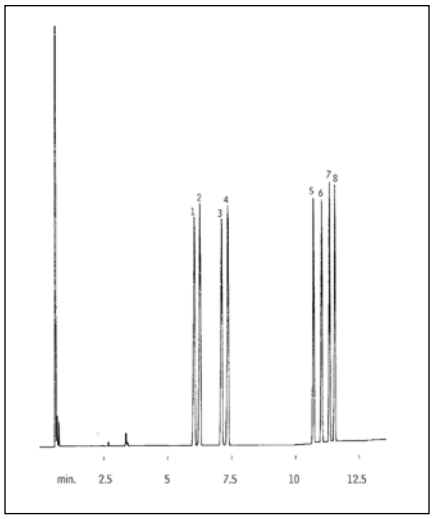
1. acetic acid
2. propionic acid
3. isobutyric acid
4. n-butyric acid
5. isovaleric acid
6. n-valeric acid
7. isocaproic acid
8. caproic acid
9. heptanoic acid



Sugars

Column:	TG-225MS 15m x 0.25mm x 0.25µm
Part Number:	26083-1300
Temperature:	190°C (5 minute hold) to 250°C at 8°C/min (5 minute hold)
Detector Type:	FID
Carrier Gas:	Hydrogen
Flow Rate:	45 cm/sec
Injection Volume:	0.5 µL
Injection Mode:	Split (35:1), 260°C

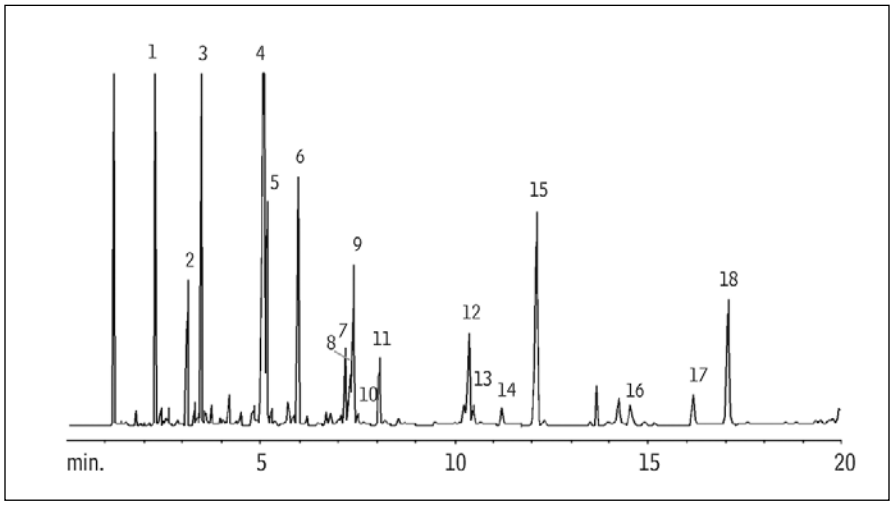
1. rhamnitol
2. fucitol
3. ribitol
4. arabinitol
5. mannitol
6. galactitol
7. glucitol
8. inositol



FAMES (PUFA)

Column:	TG-POLAR 30m x 0.25mm x 0.20µm
Part Number:	26082-5010
Temperature:	160°C to 225°C at 2°C/min
Detector Type:	FID
Carrier Gas:	Hydrogen
Flow Rate:	45 cm/sec
Injection Volume:	0.5 µL
Injection Mode:	Split (35:1), 225°C

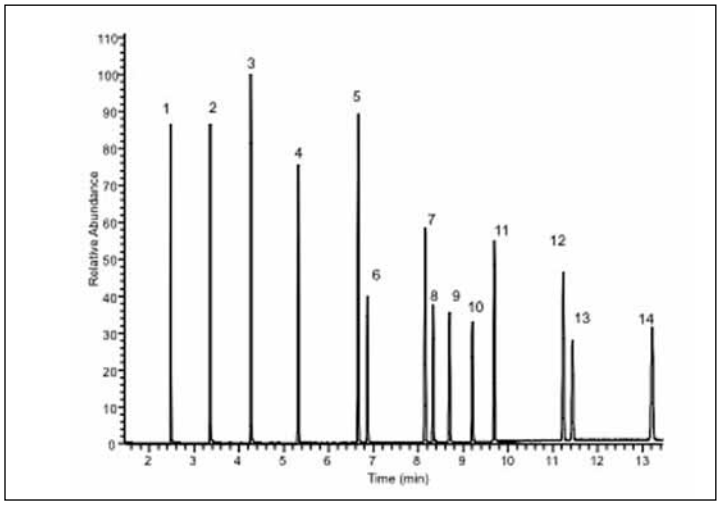
1. C14:0
2. C16:0
3. C16:1n7
4. C18:1n9
5. C18:1n7
6. C18:2n6
7. C18:3n3
8. C20:1n11
9. C20:1n9
10. C20:1n7
11. C18:4n3
12. C22:1n11
13. C22:1n9
14. C20:4n3
15. C20:5n3
16. C21:5n3
17. C22:5n3
18. C22:6n3



FAMES C8-C24

Column:	TG-WAXMS 30m x 0.25mm x 0.25µm
Part Number:	26088-1420
Temperature:	100°C (0.5 minute hold) to 220°C at 5°C/minute to 250°C at 10°C/minute (3 minute hold)
Detector Type:	MS
Carrier Gas:	He
Flow Rate:	1.2 mL/min
Injection Volume:	0.1µL
Injection Mode:	Split (100:1), 250°C

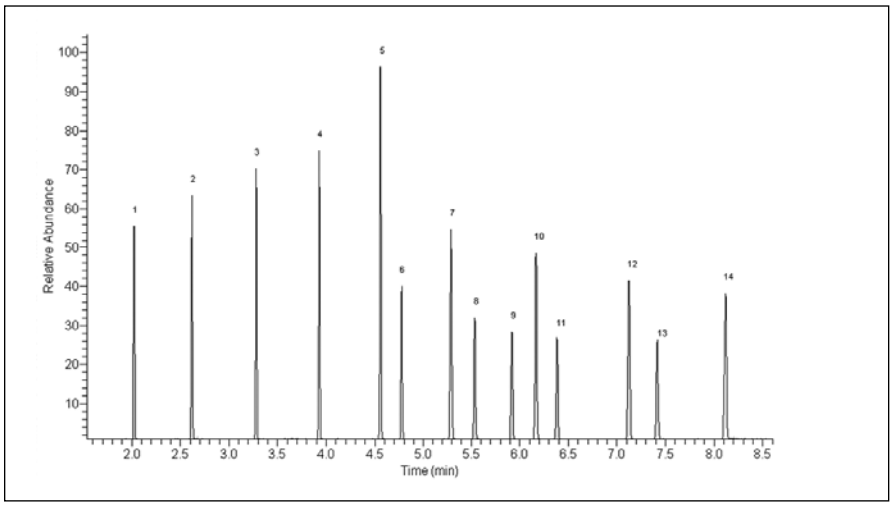
1. Methyl octanoate
2. Methyl decanoate
3. Methyl decanoate
4. Methyl myristate
5. Methyl palmitate
6. Methyl palmitoleate
7. Methyl stearate
8. Methyl oleate
9. Methyl linoleate
10. Methyl linolenate
11. Methyl arachidate
12. Methyl behenate
13. Methyl cis-13-docosenoate
14. Methyl tetracosanoate



FAMES C8-C24

Column:	TG-POLAR 30m x 0.25mm x 0.25µm
Part Number:	26082-1420
Temperature:	100ºC (0.5 minute hold) to 195ºC at 25ºC/minute (1 minute hold) to 250ºC at 10ºC/minute (3 minute hold)
Detector Type:	MS
Carrier Gas:	He
Flow Rate:	1.2 mL/min
Injection Volume:	0.1µL
Injection Mode:	Split (100:1), 250°C

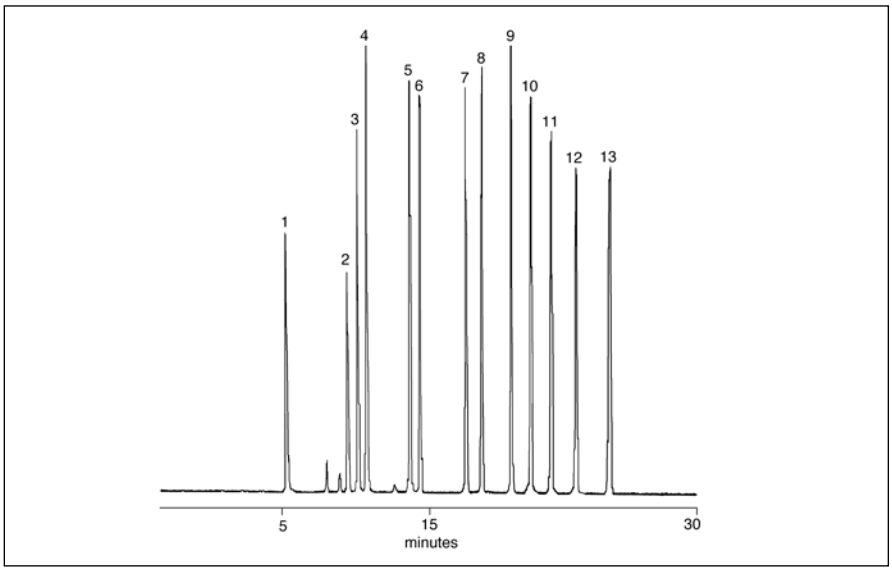
1. Methyl octanoate
2. Methyl decanoate
3. Methyl decanoate
4. Methyl myristate
5. Methyl palmitate
6. Methyl palmitoleate
7. Methyl stearate
8. Methyl oleate
9. Methyl linoleate
10. Methyl linolenate
11. Methyl arachidate
12. Methyl behenate
13. Methyl cis-13-docosenoate
14. Methyl tetracosanoate



Alditol Acetate Mixture

Column:	TR-FAME 30 m x 0.25 mm x 0.25 µm
Part Number:	260M142P
Initial Temp:	190 °C, 1 min
Program Rate:	3 °C/min
Final Temp:	260 °C, 10 min
Carrier Gas:	He, 50 kPa
Detector:	MS (Electron Impact Ionization, Ionization Potential 70eV) Scan 100 *m/z* to 350 *m/z* in 0.3s
Injection Mode:	Split 50:1

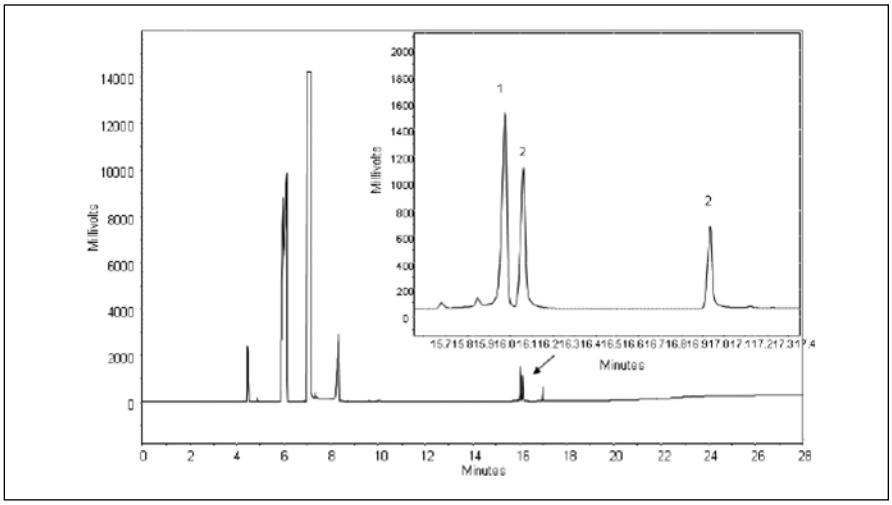
1. Erythritol
2. 2-Deoxy-ribitol
3. Rhamnitol
4. Fucitol
5. Ribitol
6. Arabinitol
7. Xylitol
8. 2-Deoxy-glucitol
9. Allitol
10. Mannitol
11. Galacitol
12. Glucitol
13. Myo-inositol



Derivatized Sugars (Acylated)

Column:	TR-1701 30m x 0.25mm x 0.25µm
Part Number:	260Q142P
Temperature:	40°C (1.0 minute hold) to 260ºC at 10°C/min (5 minute hold)
Detector Type:	FID
Carrier Gas:	He
Flow Rate:	1.2 mL/min
Injection Volume:	1.0 µL
Injection Mode:	Split (50:1), 250°C

1. Derivatized Fructose
2. Derivatized Glucose isomer
3. Derivatized Glucose isomer



GC Accessories and Equipment

Choose Thermo Scientific accessories to enhance and optimize the performance of your GC and GCMS instruments. We offer a wide array of products including fittings, septa, gas filters, liners, syringes and equipment.

Click-On Inline Filters

Easy-to-use format eliminates contamination

- **Pure gas output 99.9999% or 6.0 grade**
- **No carrier gas line contamination during filter change**
- **Easy and fast replacement without the need for tools**
- **No risk of overtightening fittings**
- **Reuseable end fittings reduce cost of clean gas: remain installed during filter replacement**
- **TUEV approved**
- **Maximum pressure 11 bar (160 psi)**
- **Maximum flow 25L/min.**
- **Combi filter removes oxygen and moisture, or moisture and hydrocarbons**
- **Triple filter removes oxygen, moisture and hydrocarbons**

Click-On Inline Filters	For Gas	Indicator Change	Capacity
Moisture	Inert Carrier, Air, H_2		21g H_2O
Oxygen	Inert Carrier		3L O_2
Hydrocarbon	Inert Carrier, Air, H_2		36g n-butane
Indicating Triple	Inert Carrier	Red to White Purple to Green	3g H_2O, 400mL O_2, 5g HCs
Triple	Inert Carrier		6g H_2O, 1L O_2, 12g HCs
Combi	Inert Carrier		10g H_2O, 18g HCs

Click-On Inline Filters

Type	Cat No.	Quantity
Moisture Filter	**60180-801**	1 Each
Oxygen Filter	**60180-802**	1 Each
Hydrocarbon Filter	**60180-803**	1 Each
Combi (O2, H2O)	**60180-804**	1 Each
Triple (H2O, O2, HCs)	**60180-805**	1 Each
Triple (H2O, O2, HCs), He Preconditioned for GCMS	**60180-806**	1 Each
Indicating Triple (O2, H2O, HCs), He Preconditioned for GCMS	**60180-808**	1 Each
Combi (Moisture and Hydrocarbons)	**60180-843**	1 Each
End fitting, Brass, 0.125 in.	**60180-809**	2 Pack
End fitting, Steel, 0.125 in.	**60180-810**	2 Pack
End fitting, Brass, 0.25 in.	**60180-811**	2 Pack
End fitting, Steel, 0.25 in.	**60180-812**	2 Pack
Double-ended Connector to Connect Filter to Indicator	**60180-813**	1 Each
Replacement-O-rings	**60180-833**	1 Each
Wall mounting clamp	**60180-834**	4 Pack

Super Clean Cartridge Filters

Replace easily without tools

- **99.9999% pure gas (or 6.0 grade) output**
- **No carrier gas line contamination during cartridge change**
- **Cost effective**
- **TUEV approved**
- **Max. pressure 11 bar (160 psi)**
- **Max. flow 7L/min.**

Cartridge Type	For Gas	Indicator Change	Capacity
Moisture	Inert Carrier, Air, H_2	Gray to White	7.2g H_2O
Oxygen	Inert Carrier	Green to Gray	1L O_2
Hydrocarbon	Inert Carrier, Air, H_2		12g n-butane
Combi	Inert Carrier	Purple to Green	1.8g H_2O, 6g HCs
Triple	Inert Carrier	Orange to Gray Purple to Green	1.8g H_2O, 500mL O_2, 4g HCs

Super Clean Cartridge Filters

Description	Base Included	Cat. No.	Quantity
Moisture Cartridge Filter with Indicator	No	**60180-819**	1 Each
Oxygen Cartridge Filter with Indicator	No	**60180-820**	1 Each
Hydrocarbon Cartridge Filter	No	**60180-821**	1 Each
3 Cartridge Pack (1 x Triple + 2 x HC/$H_2$0 Combi Filters)	No	**60180-822**	1 Each
4 Cartridge Pack (1 x O_2, 1 x $H_2$0 + 2 x HC Filters)	No	**60180-823**	1 Each
Indicating Triple ($H_2$0, O_2, HCs)	No	**60180-824**	1 Each
Indicating Triple (H_2O, O_2, HCs), He Preconditioned for GCMS	No	**60180-825**	1 Each
Indicating Combi (HC/H_2O)	No	**60180-826**	1 Each
4 Cartridge Kit (1 x O_2, 1 x $H_2$0 + 2 x HC Filters)	Yes	**60180-827**	1 Each
3 Cartridge Kit (1 x Triple + 2 x HC/$H_2$0 Combi Filters)	Yes	**60180-828**	1 Each
1 Cartridge Kit (1 x Indicating Triple), He Preconditioned for GCMS	Yes	**60180-829**	1 Each
1 Cartridge Kit (1 x Triple), He Preconditioned for GCMS	Yes	**60180-830**	1 Each
Twin HC Filters For High-Flow Base Plate (LC/MS); No Indicator	No	**60180-831**	1 Each
High Flow Twin $H_2$0 Filters (Air Generators)	No	**60180-832**	1 Each
High Flow Cartridge Pack (2 x HC), No indicator, for LCMS	No	**60180-839**	1 Each
High Flow Cartridge Pack (2 x HC), with indicator, for LCMS	No	**60180-840**	1 Each
High Flow Cartridge Pack (2 x H_2O), with indicator, for LCMS	No	**60180-841**	1 Each

Super Clean Cartridge Filter Baseplates

One-time installation procedure

- **Can be configured to the individual user requirements**
- **Needle valves ensure gas line is not contaminated during cartridge change**

Filters are not included.

Type	For Use with	For Gas
Single Base	Triple Filter	Carrier Gas Only
Dual Base	2 x Combi Filter	Air and Fuel Gas
Triple Base	Triple and 2 x Combi Filter	Carrier, Make-Up, and Fuel Gas
Four-position Base	Moisture, Oxygen, 2 x Hydrocarbon	High capacity carrier, fuel, make up
Two-position, High-flow Base	N_2 in LC/MS, H_2O in H_2/air generators	Carrier, make up and fuel

Super Clean Cartridge Filter Baseplates/Manifolds

Type	Cat. No.	Quantity
Single Base	**60180-814**	1 Each
Dual Base	**60180-815**	1 Each
Triple Base	**60180-817**	1 Each
Two-position, High-flow Base	**60180-816**	1 Each
Four-position Base	**60180-818**	1 Each
O-rings for base plates	**60180-837**	1 Each
Flush Cap	**60180-838**	1 Each

High Purity Single Stage Brass Gas Regulators

- **For non-corrosive analytical and process applications**
- **Includes a built-in Smart Purifier Base and Cartridge ensuring 99.99999% gas purity**
- **Specially designed, convoluted, stainless steel diaphragm provides good regulating performance and maximum purity integrity without the need for a soft seal**
- **Capable of withstanding an internal vacuum**
- **All regulators supplied with 1/8 in. stainless steel output adaptor**
- **Built in check valve allows for cylinder change without contaminating the gas line**

High Purity Single Stage Brass Gas Regulators			
Inlet	**Filter**	**Cat. No.**	**Quantity**
CGA 580	Triple Filter	**60180-901**	1 Each
DIN 6	Triple Filter	**60180-903**	1 Each
CGA 350	Triple Filter	**60180-905**	1 Each
DIN 1	Triple Filter	**60180-907**	1 Each
CGA 320	Triple Filter	**60180-909**	1 Each
CGA 580	Combi Filter	**60180-915**	1 Each
DIN 6	Combi Filter	**60180-917**	1 Each
CGA 350	Combi Filter	**60180-919**	1 Each
DIN 1	Combi Filter	**60180-921**	1 Each
CGA 320	Combi Filter	**60180-923**	1 Each
CGA 590	Combi Filter	**60180-925**	1 Each
DIN 13	Combi Filter	**60180-927**	1 Each

Specifications	
Maximum Rated Inlet Pressure	3,500 psig
Outlet Pressure Ranges	0 to 100
Flow Capacity	Cv=0.095
Ambient Operating Temperature	-40°F to +165°F
Designed Leak Rate	2 x10^{8}ccs (helium)
Weight	4.6 lbs
Ports (5)	1/4" FNPT
Inlet	1/4" FNPT
Outlet	1/4" Compression
Decay Inlet Characteristic	0.78/100 psi
Materials	
Body	Nickel-Plated Brass
Bonnet	Nickel-Plated Brass
Seat	PCTFE
Diaphragm	316 Stainless Steel
Gauges	2 1/2" Nickel-Plated Brass
Filter	316 Stainless Steel
Outlet Valve	Nickel-Plated Brass
Trim	Nickel-Plated Brass

High Purity Two Stage Brass Gas Regulators

- **For non-corrosive analytical and process applications**
- **Includes a built-in Smart Purifier Base and Cartridge ensuring 99.99999% gas purity**
- **Specially designed, convoluted, stainless steel diaphragm provides good-regulating performance and maximum purity integrity without the needfor a soft seal**
- **Capable of withstanding an internal vacuum**
- **All regulators supplied with $^1/_8$ in. stainless steel output adaptor**
- **Built in check valve allows for cylinder change without contaminating the gas line**

High Purity Two Stage Brass Gas Regulators

Inlet	Filter	Cat. No.	Quantity
CGA 580	Triple Filter	**60180-902**	1 Each
DIN 6	Triple Filter	**60180-904**	1 Each
CGA 350	Triple Filter	**60180-906**	1 Each
DIN 1	Triple Filter	**60180-908**	1 Each
CGA 320	Triple Filter	**60180-910**	1 Each
CGA 580	Combi Filter	**60180-916**	1 Each
DIN 6	Combi Filter	**60180-918**	1 Each
CGA 350	Combi Filter	**60180-920**	1 Each
DIN 1	Combi Filter	**60180-922**	1 Each
CGA 320	Combi Filter	**60180-924**	1 Each
CGA 590	Combi Filter	**60180-926**	1 Each
DIN 13	Combi Filter	**60180-928**	1 Each

Specifications	
Maximum Rated Inlet Pressure	3,500 psig
Outlet Pressure Ranges	0 to 100
Flow Capacity	Cv=0.05
Ambient Operating Temperature	-40°F to +165°F
Designed Leak Rate	2 x10^{8}ccs (helium)
Weight	5.6 lbs
Ports (5)	$^1/_4$" FNPT
Inlet	$^1/_4$" FNPT
Outlet	$^1/_4$" Compression
Decay Inlet Characteristic	0.02/100 psi
Materials	
Body	Nickel-Plated Brass
Bonnet	Nickel-Plated Brass
Seat	PCTFE
Diaphragm	316 Stainless Steel
Gauges	2$^1/_2$" Nickel-Plated Brass
Filter	316 Stainless Steel
Outlet Valve	Nickel-Plated Brass
Trim	Nickel-Plated Brass

Replacement Indicating Cartridge Filters

Indicating cartridge filters for inert carrier gases

Replacement Indicating Cartridge Filters For High Purity Regulators

Description	Indicator Change	Cat. No.	Quantity
Combi Indicating Filter (H2O, HC)	Purple to Green	**60180-941**	1 Each
Triple Indicating Filter (H_2O, O_2, HCs)	Orange to Gray	**60180-940**	1 Each
	Purple to Green		

Valve with SMART Indicating Purifier (VIP)

Provide either flow control or positive shut off while maintaining gas purity for gasses 99.9999% pure or better

- **Provides a visual indication of contaminants in the gas stream while it is removing them, ensuring consistent performance of analytical processes**
- **Safeguards the gas stream and process**
- **Specially cleaned for all analytical applications and will not generate contaminates that consume the purifier**
- **Patented Quick-Change Base to allow for easy change out of spent purifiers**
- **Available in both a multiturn and quarter turn models**
- **All valves supplied with a $^1/_8$ in. stainless steel output adaptor**

VIP Valves with SMART Filter

Description	Filter	Cat. No.	Quantity
Multi Turn	Triple Filter	**60180-950**	1 Each
Multi Turn	Combi Filter	**60180-951**	1 Each
Quarter Turn	Triple Filter	**60180-952**	1 Each
Quarter Turn	Combi Filter	**60180-953**	1 Each

Specifications	
Weight	1 lb.
Maximum Rated Inlet Pressure	165 PSIG
Flow Capacity	12 L/min.
Ambient Operating Temperature	-40°F to +165°F
Inlet	$^1/_4$" FNPT
Outlet	$^1/_4$" FNPT
Designed Leak Rate	2 x 10^{-8}ccs (helium)
Valve Materials	
Body	Nickel-Plated Brass
Seat	PCTFE
Diaphragm	316 Stainless Steel

Replacement Indicating Cartridge Filters for VIP Valves

Indicating cartridge filters to be used with VIP Valves

Replacement Indicating Cartridge Filters for VIP Valves

Description	Indicator Change	Cat. No.	Quantity
Triple Indicating Filter (H_2O, O_2, HCs)	Orange to Gray; Purple to Green	**60180-942**	1 Each
Combi Indicating Filter(H_2O, HC)	Purple to Green	**60180-943**	1 Each

GC Installation Kit

- **Includes: Tubing cutter; 1/8 x 1/4 in. reamer; 7/16 in. wrench; 1/2 in. wrench; 1/8 in. brass tees, 4; 1/8 in. brass nuts, 10; Brass front and back ferrules, 10; 15.2m instrument-grade, cleaned 1/8-in. copper tubing**

GC Installation Kit

Description	Cat. No.	Quantity
GC Installation Kit	**60180-888**	1 Each

Septa

A wide range to cover most applications

Variety of materials and temperature limits for all applications

For use in Thermo Scientific TRACE and Thermo Scientific FOCUS GCs and instruments from other manufacturers

Contaminant-free in individual blister packs

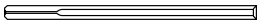
Temperature limit: 400°C

Septa

Brand	Material	I.D.	Cat. No.	Quantity
BTO	Low Bleed Silicone	9mm	**31303240**	50 Pack
BTO	Low Bleed Silicone	11mm	**31303230**	50 Pack
BTO	Low Bleed Silicone	12.7mm	**31303228**	50 Pack
BTO	Low Bleed Silicone	17mm	**31303211**	50 Pack
TR-Green	Low Coring Silicone	9mm	**313G3240**	50 Pack
TR-Green	Low Coring Silicone	11mm	**313G3230**	50 Pack
TR-Green	Low Coring Silicone	12.7mm	**313G3228**	50 Pack
TR-Green	Low Coring Silicone	17mm	**313G3211**	50 Pack

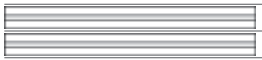
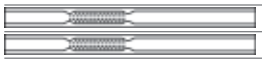
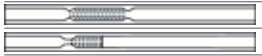
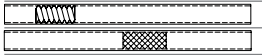
Injection Port Liners for Thermo Scientific Instruments

Highly deactivated and produced to exacting tolerances to ensure a high degree of reproducibility

	Injection Type	I.D. x O.D.	Length	Packing	Cat. No.	Quantity
TRACE and FOCUS SSL						
	Splitless Straight Liner (Siltek)	3 x 8mm	105mm	No	**453T2121**	5 Pack
	Baffle Liner	5 x 8mm	105mm	No	**453T1001**	5 Pack
	Split Straight Liner	5 × 8mm	105mm	No	**45350030**	5 Pack
	Split Straight Liner	5 × 8mm	105mm	No	**45354030**	25 Pack
	Split Straight Liner	3 × 8mm	105mm	No	**45350031**	5 Pack
	Split Straight Liner	3 × 8mm	105mm	No	**45354031**	25 Pack
	Splitless Straight Liner	3 × 8mm	105mm	No	**45350032**	5 Pack
	Splitless Straight Liner	3 × 8mm	105mm	No	**45354032**	25 Pack
	Splitless Straight Liner	5 × 8mm	105mm	No	**45350033**	5 Pack
	Splitless Straight Liner	5 × 8mm	105mm	No	**45354033**	25 Pack
	Split FocusLiner for 50mm Needle	5 × 8mm	105mm	Quartz Wool	**453T1905**	5 Pack
	Split FocusLiner for 50mm Needle	5 x 8mm	105mm	Quartz Wool	**453T4905**	25 Pack
	Splitless FocusLiner for 70mm Needle	5 × 8mm	105mm	Quartz Wool	**453T2895**	5 Pack
	Splitless FocusLiner for 70mm Needle	5 × 8mm	105mm	Quartz Wool	**453T4895**	2 Pack
	Splitless FocusLiner for 50mm Needle	5 × 8mm	105mm	Quartz Wool	**453T2999**	5 Pack
	Splitless FocusLiner for 50mm Needle	5 × 8mm	105mm	Quartz Wool	**453T4999**	25 Pack
	Mixed Liner Split/Splitless Sample Pack	Mixed	Mixed	Mixed	**453TH001**	5 Pack
	Splitless Straight Liner	5 x 8mm	105mm	CarboFrit	**453T2130**	5 Pack
	Split Straight Liner	5 x 8mm	105mm	CarboFrit	**453T2131**	5 Pack
TRACE PTV						
	PTV Silcosteel Liner for OC	1 × 2.75mm	120mm	No	**45322052**	2 Pack
	PTV Siltek Metal Liner	2 × 2.75mm	120mm	No	**45322056**	2 Pack
	PTV Straight Liner	0.75 x 2.75mm	105mm	No	**45352083**	5 Pack
	PTV Straight Liner	1 × 2.75mm	125mm	No	**45352054**	5 Pack
	PTV Straight Liner	1 × 2.75mm	125mm	No	**45354054**	25 Pack
	PTV Straight Liner	2 × 2.75mm	120mm	No	**45352057**	5 Pack
	PTV Straight Liner	2 × 2.75mm	120mm	No	**45354057**	25 Pack
	PTV Liner with Sintered Lining	2 × 2.75mm	120mm	No	**45352060**	5 Pack
	PTV Liner with Three Baffles	1 × 2.75mm	120mm	No	**45352062**	5 Pack
	PTV Liner with Three Baffles	1 × 2.75mm	120mm	No	**45354062**	25 Pack
	PTV Siltek Metal Liner	2 × 2.75mm	120mm	No	**45322044**	2 Pack
	PTV Siltek Metal Liner	1 × 2.75mm	120mm	No	**45322046**	2 Pack
	PTV Baffle Liner (Siltek)	2 × 2.75mm	120mm	No	**453T2120**	5 Pack

Mega 4000, 5000, and 6000						
	Split Straight Liner	2 × 5mm	79.5mm	No	**45350300**	5 Pack
	Split Straight Liner	3 × 5mm	79.5mm	No	**45350400**	5 Pack
	Split/Splitless Liner With Recessed Gooseneck	5 × 5mm	79.5mm	Quartz Wool	**453T2955**	5 Pack

Injection Port Liners for Agilent Instruments

Injection Port Liners for Agilent Instruments						
	Injection Type	**I.D. x O.D.**	**Length**	**Packing**	**Cat. No.**	**Quantity**
	Direct Straight Liner	1.2 × 6.3mm	78.5mm	None	**453A1335**	5 Pack
	Direct Straight Liner	1.2 × 6.3mm	78.5mm	None	**453A2332**	25 Pack
	Split/Splitless FocusLiner	4 × 6.3mm	78.5mm	Quartz Wool	**453A1255**	5 Pack
	Split/Splitless FocusLiner	4 × 6.3mm	78.5mm	Quartz Wool	**453A1252**	25 Pack
	Split/Splitless Fast FocusLiner	2.3 × 6.3mm	78.5mm	Quartz Wool	**453A1285**	5 Pack
	Split/Splitless FAST FocusLiner	2.3 × 6.3mm	78.5mm	Quartz Wool	**453A2282**	25 Pack
	Split/Splitless Liner w/Recessed Gooseneck	4 × 6.3mm	78.5mm	Quartz Wool	**453A1305**	5 Pack
	Split/Splitless Liner w/Recessed Gooseneck	4 × 6.3mm	78.5mm	Quartz Wool	**453A2302**	25 Pack
	Split Straight Liner	4 × 6.3mm	78.5mm	Quartz Wool	**453A2265**	5 Pack
	Split Straight Liner	4 × 6.3mm	78.5mm	Quartz Wool	**453A1262**	25 Pack
	Split/Splitless FocusLiner with Single Taper	4 × 6.3mm	78.5mm	None	**453A1315**	5 Pack
	Split/Splitless FocusLiner with Single Taper	4 × 6.3mm	78.5mm	None	**453A1312**	25 Pack
	Splitless Liner with Single Taper	4 × 6.3mm	78.5mm	Quartz Wool	**453A1925**	5 Pack
	Splitless Straight Liner	2.0 × 6.1mm	78.5mm	Quartz Wool	**453A2275**	5 Pack
	Splitless Liner with Recessed Gooseneck	2.0 × 6.3mm	78.5mm	None	**453A2325**	5 Pack
	Split Straight Liner	4 × 6.3mm	78.5mm	None	**453A1295**	5 Pack
	Split Straight Liner	4 × 6.3mm	78.5mm	None	**453A2292**	25 Pack
	Split/Splitless Liner with Single Taper	4 × 6.3mm	78.5mm	None	**453A1345**	5 Pack
	Split/Splitless Liner with Single Taper	4 × 6.3mm	78.5mm	None	**453A2342**	25 Pack
	Cyclo/Single Gooseneck (Deactivated Metal)	5.2 × 6.3mm	78.5mm	None	**453A2000**	5 Pack
	Split/Splitless Liner with Double Taper	4 × 6.3mm	78.5mm	None	**453A1355**	5 Pack
	Split/Splitless Liner with Double Taper	4 × 6.3mm	78.5mm	None	**453A2352**	25 Pack
	Split/Splitless FAST FocusLiner with Single Taper	2.3 × 7.3mm	78.5mm	Quartz Wool	**453A2375**	5 Pack
	Split/Splitless FAST FocusLiner with Single Taper	2.3 × 6.3mm	78.5mm	Quartz Wool	**453A1372**	25 Pack
	Single Gooseneck (Deactivated Metal)	5.2 × 6.3mm	78.5mm	None	**453A2001**	5 Pack
	Split/Splitless Mixed Liner Sample Pack	Mixed	Mixed	None	**453AG001**	5 Pack
	Cyclosplitter Liner (Deactivated Metal)	5.2 × 6.3mm	78.5mm	None	**453A2002**	5 Pack
	Split/Splitless Liner with Wool (Deactivated Metal)	5.2 × 6.3mm	78.5mm	Quartz Wool	**453A2003**	5 Pack

Liner Sealing Rings

Suited for use with injection liners in instruments from a variety of manufacturers

Liner Sealing Rings				
For Use with	**For Liner Type**	**Material**	**Cat. No.**	**Quantity**
Thermo Scientific Instruments	8mm O.D. Liners	Graphite	**29033406**	10 Pack
Thermo Scientific TRACE	45322052 Liner	Graphite	**29013417**	2 Pack
Agilent Instruments	453A1335, 453A1355, 453A2332, 453A2352 Liners	Graphite	**290GA242**	10 Pack
Agilent Instruments	453A2265, 453A1255, 453A1315, 453A1285, 453A1295, 453A2282, 453A1305, 453A1312, 453A2325, 453A1345, 453A2375, 453A1372, 453A1252, 453A1262, 453A2292, 453A2302, 453A2342 Liners	Graphite	**290GA243**	10 Pack
Agilent Instruments	453A2275 Liners	Graphite	**290GA244**	10 Pack
Agilent Instruments	453A1335, 453A1355, 453A2332, 453A2352, 453A2265, 453A1255, 453A1315, 453A1285, 453A1295, 453A2282, 453A1305, 453A1312, 453A2325, 453A1345, 453A2375, 453A1372, 453A1252, 453A1262, 453A2292, 453A2302, 453A2342, 453A2275 Liners	Viton	**290OA241**	10 Pack

Gold Inlet Base Seals for Agilent GCs

Gold plating provides a surface with exceptional inertness suitable for analysis of highly active compounds

- **Precision machined to provide exceptional sealing properties**
- **Reduces activity (especially useful for analysis of pesticide, PCBs, phenols etc)**
- **High grade stainless steel providing reproducible seal**
- **Direct equivalent to Agilent original part**
- **All Agilent GC 5890/6890/7890 split/splitless injection ports**

Thermo Scientific Gold Inlet Base Seals for Agilent GCs			
For Use with	**I.D.**	**Cat. No.**	**Quantity**
Single column installation	0.8mm	**290GA081**	10 Pack
Single column installation	0.8mm	**290GA082**	2 Pack
Dual column installation	1.2mm	**290GA121**	10 Pack
Dual column installation	1.2mm	**290GA122**	2 Pack

Gold Cross Inlet Base Seals for Agilent GCs

Gold plating provides a surface with exceptional inertness suitable for analysis of highly active compounds

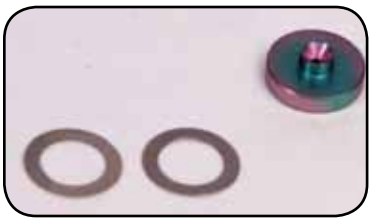
S99164

- **Precision machined to provide exceptional sealing properties**
- **Reduces activity (especially useful for analysis of pesticide, PCBs, phenols etc)**
- **High grade stainless steel providing reproducible seal**
- **Direct equivalent to Agilent original part**
- **Compatible with all Agilent GC 5890/6890/7890 split/splitless injection ports**

Gold Cross Inlet Base Seals for Agilent GC Instruments		
I.D.	**Cat. No.**	**Quantity**
0.8mm	**290GA084**	10 Pack
0.8mm	**290GA083**	2 Pack

Siltek Inlet Base Seals for Agilent GCs

Siltek coating provides a surface with exceptional inertness suitable for the analysis of highly active compounds.



- **Precision machined tp provide exceptional sealing properties**
- **Reduces activity (especially useful for analysis of pesticides, PCB's, phenols, etc.)**
- **High grade stainless steel providing reproducible seal**

Siltek-Treated Inlet Base Seals for Agilent GC Instruments

I.D.	Cat. No.	Quantity
0.8mm	**290GA091**	10 Pack
0.8mm	**290GA092**	2 Pack

Siltek Cross Inlet Base Seals for Agilent GCs

Siltek coating provides a surface with exceptional inertness suitable for analysis of highly active compounds

- **Ideal for high-flow split applications on Agilent GCs**
- **Precision machined to provide exceptional sealing properties**
- **Reduces activity (especially useful for analysis of pesticides, PCB's, phenols, etc.)**
- **High grade stainless steel providing reproducible seal**

Siltek-Treated Cross Inlet Base Seals for Agilent GC Instruments

I.D.	Cat. No.	Quantity
0.8mm	**290GA094**	10 Pack
0.8mm	**290GA093**	2 Pack

Finger Tite Connectors

Easier fit, reliabililty and leak-free connections

- **Advantages over conventional graphite/polymer ferrules:**
- **Perfect metal-to-metal seal eliminates contamination and gives lower air/water background**
- **No need to retighten ferrules, as they expand and contract with the fitting over GC operating temperatures**
- **Easy to handle with the nut touchable even with a hot injector/detector**
- **No tools required**
- **Available for Thermo Scientific and Agilent GC instruments**

Finger Tite Connectors for Thermo Scientific Instruments

Description	Cat. No.	Quantity
Female Nut	**290ST130**	5 Pack
Split/Splitess and MS Starter Kit	**290ST131**	1 Each
Split/Splitless & FID Starter Kit	**290ST132**	1 Each

Finger Tite Connectors for Agilent Instruments

Description	Cat. No.	Quantity
Male Nut	**290SA130**	5 Pack
Split/Splitless & MS Starter Kit	**290SA131**	1 Each
Split/Splitless & FID Starter Kit	**290SA132**	1 Each
Split/Splitless Injector Base Seal	**290SA133**	2 Pack

Finger Tite Ferrules

I.D.	For Use with	Cat. No.	Quantity
0.4mm	0.1-0.25mm I.D. columns	**290S1132**	10 Pack
0.5mm	0.32mm I.D. columns	**290S1131**	10 Pack

Ferrules

Wide range of choices for a wide range of instruments and applications

Thermo Scientific ferrules are available in three different materials and various dimensions to match the instrument and capillary column ID. The choice of material is dependent upon the use; guidelines are given in the table

.

Material Type	Suitable for GC/MS	Temp Limit (°C)	Re-usable
Graphite	No	450	Yes
Graphite/Vespel	Yes	350	No
Stainless Steel (SilTite)	Yes	500	No

100% Graphite Ferrules

Thermo Scientific 100% graphite ferrules are a soft material that is porous to oxygen, making them suitable for most applications except GC/MS interface connections. These easy-to-use ferrules form a soft grip with the column and provide a stable seal.

15% Graphite/85% Vespel Ferrules

The mechanically robust 15% Graphite / 85% Vespel ferrules have a long lifetime and are compatible with GC/MS. These ferrules form a strong grip with the column and cannot be reused as they form a permanent seal with the column. They have a temperature limit of 350 °C, but must be re-tightened after initial temperature cycles.

SilTite™ Metal Ferrules

SilTite™ metal ferrules and nuts are made from the same material and have the same thermal expansion coefficient. The SilTite ferrule forms a strong, permanent, airtight seal around the capillary column, eliminating leaks. The base of the ferrule is flat and forms a perfect seal with the MS interface. The ferrule's temperature tolerance is well above the limit of the injector, MS interface or GC oven. Unlike other ferrules, SilTite Ferrules do not need re-tightening after installation.

Please also see syringes on page 00.

All varieties of ferrules are supplied in contaminant-free, individual blister packs, allowing removal of an individual item without risk of contamination to the other supplied items.

Ordering Information

Thermo Scientific Instruments

Description	Uses	Ferrule Size (Column ID)	Quantity	Part Number
100% Graphite Ferrules	TRACE and FOCUS Injectors and Detectors (not GC/MS interface)	0.1 – 0.25 mm	10	29053488†
		0.32 mm	10	29053487†
		0.53 mm	10	29053486†
15% Graphite/85% Vespel Ferrules	TRACE Cold On-Column Injectors	0.1 – 0.25 mm	10	29033461
		0.32 mm	10	29033460
		0.53 mm	10	29033471
		Packed Column 1/8" OD	10	290VT168
		Packed Column 1/4" OD	10	290VT165
	Injectors and Detectors	0.1 – 0.25 mm	10*	290VT186
		0.32 mm	10*	290VT187
		0.53 mm	10*	290VT188
	Brass Nut		2	290BT239
	GC/MS Interface	0.1 – 0.25 mm	10	29033496
		0.32 mm	10	29033497
SilTite Kit	GC/MS Interface	0.1 – 0.25 mm	1**	290MT229
		0.32 mm	1**	290MT230
		0.53 mm	1**	290MT231
Replacement SilTite Ferrules		0.1 – 0.25 mm	10	290MT221
		0.32 mm	10	290MT222
		0.53 mm	10	290MT223
		Replacement SilTite Nuts	5	290MT211

** Must be used in conjunction with brass nut PN 290BT239*

*** Kit contains 2 SilTite nuts and 10 ferrules*

† Equivalent to PN 29013488, 29013487 & 29013486 previously sold in quantities of two

Agilent 5890, 6890 and 6850 Instruments

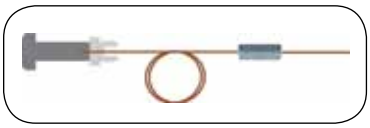
Description	Uses	Ferrule Size (Column ID)	Quantity	Part Number
15% Graphite/85% Vespel Ferrules	Injectors and Detectors	0.1 – 0.25 mm	10	290VA191
		0.32 mm	10	290VA192
		0.53 mm	10	290VA193
		Packed Column 1/8" OD	10	290VT168
		Packed Column 1/4" OD	10	290VT165
	GC/MS Interface	0.1 – 0.25 mm	10	29033496
		0.32 mm	10	29033497
		0.53 mm	10	290VP144
100% Graphite Ferrules	Injectors and Detectors at Atmospheric Pressure (Not for GC/MS)	0.1 – 0.32 mm	10	290GA139
		0.45 – 0.53 mm	10	290GA140
		Packed Column 1/8" OD	10	290GA108
		Packed Column 1/4" OD	10	290GA107
SilTite Kits	GC/MS Interface	0.1 – 0.25 mm	1*	290MA194
		0.32 mm	1*	290MA195
		0.53 mm	1*	290MA196
	Split Splitless Injectors	0.1 – 0.25 mm	1**	290MA215
		0.32 mm	1**	290MA216
		0.53 mm	1**	290MA217
Replacement SilTite Ferrules	For all SilTite Connectors	0.1 – 0.25 mm	10	290MA201
		0.32 mm	10	290MA202
		0.53 mm	10	290MA203
SilTite Nuts	GC/MS Interface		5	290MA205
	Split Splitless Injectors		5	290MA207
	Replacement Baseplate Seals		2	290MA227
			10	290MA228

** Kits contain 2 nuts and 10 ferrules*

*** Contains 2 nuts, 10 ferrules and 2 base seals*

Retention Gap Kits

Support Thermo Scientific gas chromatography consumables



- **Length of deactivated fused silica tubing**
- **Mini-union**
- **5 Ferrules**

Retention Gap Kits

Description	Cat. No.	Quantity
Retention gap kit, I.D. 0.22 - 0.32mm, 2m (includes connectors)	**260RG497**	1 Each
Retention gap kit, I.D. 0.53mm, 2m (includes connectors)	**260RG499**	1 Each
Retention gap kit, I.D. 0.53mm, 5m (includes connectors)	**260RG500**	1 Each
Deactivated silica tubing; 0.32mm I.D.; 2m Length	**260G498P**	1 Each
Deactivated silica tubing; 0.53mm I.D.; 2m Length	**260G499P**	1 Each
Deactivated silica tubing, I.D. 0.25mm, 5m	**260G495P**	1 Each
Deactivated silica tubing, I.D. 0.32mm, 5m	**260G496P**	1 Each
Deactivated silica tubing ID 0.53mm, 5m	**260G500P**	1 Each
Deactivated silica tubing ID 0.53mm, 1m (Siltek)	**260G401P**	1 Each

- **Kit contains one union and five ferrules**

Mini Capillary Unions

For Use with	Cat. No.	Quantity
0.32mm ID capillary GC column	**290GU498**	1 Each
0.53mm ID capillary GC column	**290GU499**	10 Pack

Capillary Column End Caps

Feature a universal fit to all GC capillary columns

- **Eliminate column contamination caused by leaving a column unsealed or sealed with a septum**
- **Color-coordinated fittings ensure that the column is reinstalled the same way it came out**
- **Reusable**

Capillary Column End Caps

Description	Cat No.	Quantity
Capillary Column End Caps, Paired	**260EC111**	10 Pack

Capillary GuardGOLD Columns

Providing protection to the analytical column

- **Protects against column contamination caused by non-volatile materials, extending the column lifetime**
- **Focuses target analytes at the head of the analytical column, leading to better chromatographic peak shape**
- **Highly deactivated to provide superior inertness, essential for analysis of active compounds.**
- **High maximum operating temperature of 360°C**

Capillary Guard Columns			
I.D.	**Length**	**Cat. No.**	**Quantity**
GuardGOLD Columns			
0.25mm	2m	**26050-0225**	1 Each
0.32mm	2m	**26050-0232**	1 Each
0.53mm	2m	**26050-0253**	1 Each
0.25mm	5m	**26050-0525**	1 Each
0.32mm	5m	**26050-0532**	1 Each
0.53mm	5m	**26050-0553**	1 Each
0.25mm	10m	**26050-1025**	1 Each
0.32mm	10m	**26050-1032**	1 Each
0.53mm	10m	**26050-1053**	1 Each

SilTite Capillary Column Connectors

For use with capillary GC columns

- **For fused silica capillary columns**
- **Glass lined for inertness**
- **Low thermal mass**

SilTite Capillary Column Connectors				
Column I.D.	**2nd Column I.D.**	**Pack Contents**	**Cat. No.**	**Quantity**
0.1 - 0.25mm	0.1 - 0.53mm	1 Connector, 2 Nuts and 5 Ferrules (0.1 - 0.25mm I.D.)	**290MU498**	1 Each
0.32mm	0.32 - 0.53mm	1 Connector, 2 Nuts and 5 Ferrules (0.32mm I.D.)	**290MU499**	1 Each
0.45 - 0.53	0.45 - 0.53mm	1 Connector, 2 Nuts and 5 Ferrules (0.45 - 0.53mm I.D.)	**290MU500**	1 Each
Replacement SilTite Connector Nuts†		5 Nuts	**290MN211**	1 Each

† *SilTite nuts must be used with Siltite ferrules*

SilTite Ferrules		
Column I.D.	**Cat. No.**	**Quantity**
0.25mm	**290MF229**	10 Pack
0.32mm	**290MF230**	10 Pack
0.53mm	**290MF231**	10 Pack

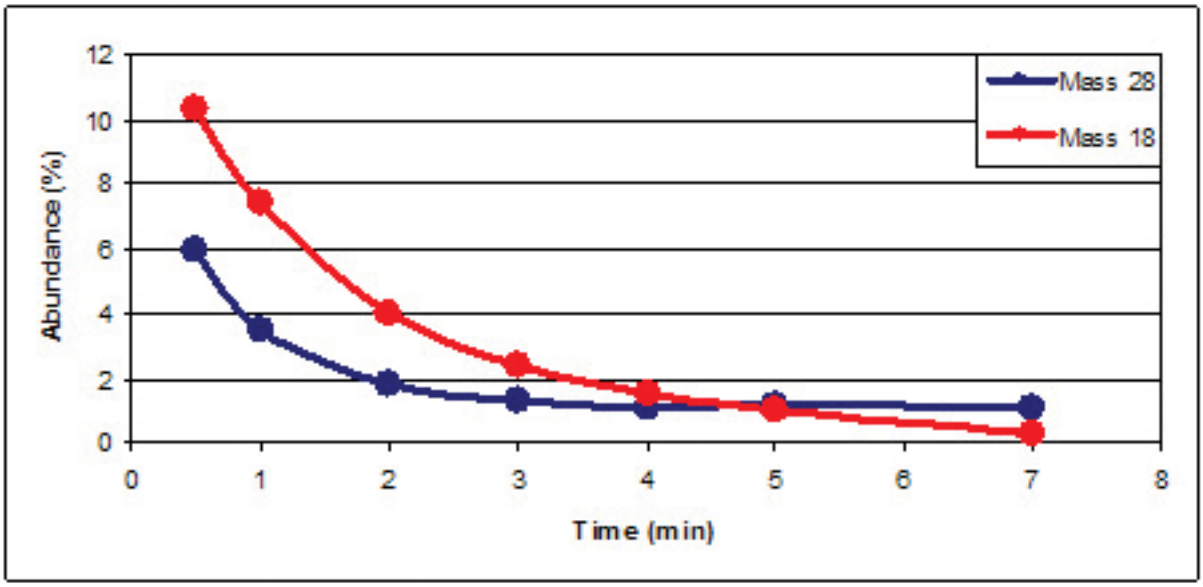
SWAP-IT GC MS Interface System

Easy to install for quick column changeovers

The SWAP-IT GCMS Interface provides a powerful tool for switching capillary columns without the need to vent the MS.

- **Specially deactivated , robust stainless steel transfer capillary provides an interface between the analytical column and the MS detector**
- **Small ID of transfer capillary ensures exposure to air and water is reduced to a minimum during disconnection of the analytical column**
- **The system works without the requirement for additional He-purge/make-up gas flow**
- **Finger-tight connections make exchanging the analytical column quick and easy without the need for tools**

SWAP-IT No Vent System		
Description	**Cat. No.**	**Quantity**
For Thermo Scientific Instruments (DSQ, DSQII, Polaris Q, ITQ only)		
SWAP-IT GCMS Interface Kit: SWAP-IT GCMS Interface, Nuts, Ferrules, Accessories	**60180-790**	1 Each
SWAP-IT GCMS Interface, SWAP-IT only	**60180-792**	1 Each
Transfer Line Nut	**290SG001**	1 Each
Graphite/Vespel Ferrule for Transfer Line	**290SG020**	10 Pack
For Agilent Instruments		
SWAP-IT GCMS Interface Kit: SWAP-IT GCMS Interface, Nuts, Ferrules, Accessories	**60180-794**	1 Each
SWAP-IT GCMS Interface, SWAP-IT Only	**60180-796**	1 Each
Transfer Line Nut	**290SG004**	1 Each
Graphite/Vespel Ferrule for Transfer Line	**290SG021**	10 Pack
SWAP-Tight Nut and Adaptor for S/SL Injector	**290SG003**	1 Each
Accessories		
SWAP-Tight Nut	**290SG002**	1 Each
SWAP-Tight Ferrules, Blank	**290SG000**	10 Pack
SWAP-Tight Ferrules, 0.1-0.25mm	**290SG025**	10 Pack
SWAP-Tight Ferrules, 0.32mm	**290SG032**	10 Pack



General Gas Chromatography Tools

Support GC applications

General Gas Chromatography Tools		
Description	**Cat. No.**	**Quantity**
Straight-Tipped Forceps	**60180-770**	1 Each
Angle-Tipped Forceps	**60180-771**	1 Each
Pin Vice	**60180-772**	1 Each
Magnifying Glass	**60180-773**	1 Each
Probes	**60180-774**	1 Each
Inspection Mirror	**60180-775**	1 Each
Pick-Up Tool	**60180-777**	1 Each
0.35mm Drill Bit	**60180-779**	1 Each
0.45mm Drill Bit	**60180-780**	1 Each
0.70mm Drill Bit	**60180-781**	1 Each
Adjustable Spanner	**60180-782**	1 Each
Tri-Scale Ruler	**60180-783**	1 Each
Shortix Capillary Column Cutter	**60180-835**	1 Each
Shortix Capillary Column Cutter Repair Kit	**60180-836**	1 Each
Ceramic Column Cutter	**60201-318**	1 Each

GC Tool Kit for Thermo Scientific Instruments

GC Tool Kit for Thermo Scientific Instruments		
Description	**Cat. No.**	**Quantity**
Capillary Tool Kit for Thermo Scientific GCs	**60180-784**	1 Each

GC Tool Kit for Agilent Instruments

GC Tool Kit for Agilent Instruments		
Description	**Cat. No.**	**Quantity**
Capillary Tool Kit for Agilent GCs	**60180-786**	1 Each

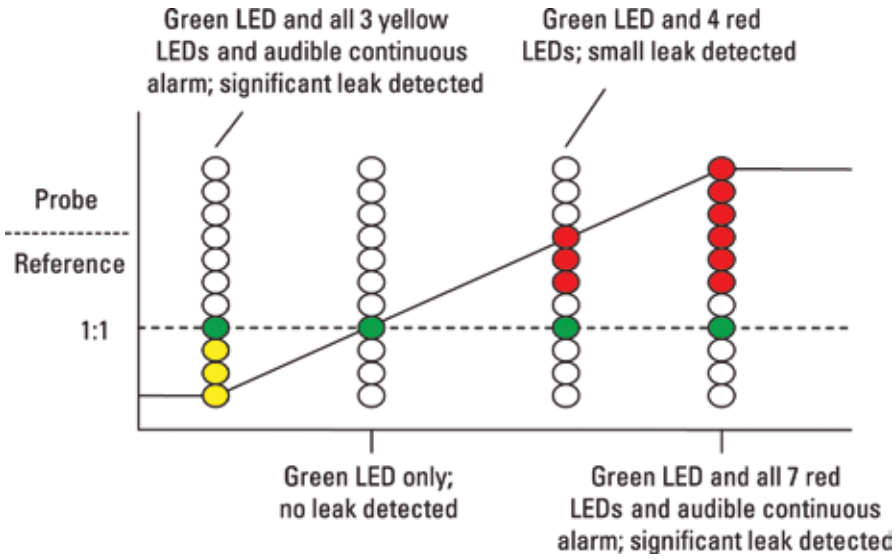
GLD Pro Gas Leak Detector

Aids in quickly locating and identifying gas leaks

The GLD Pro Gas Leak Detector is specifically designed for use with gas chromatography instruments. Detection of leaks allows the user to reduce detector noise, provide a stable baseline, reduce carrier gas by minimizing waste, and maximize the lifetime of the analytical column by minimizing the presence of oxygen and other impurities in the carrier gas.

- **Suitable for detection of a wide range of laboratory gases**
- **Push button on/off switch**
- **Push button zero function**
- **Automatic shutoff (5 minutes)**
- **LED light indicator for intensity of leak**
- **Rechargable battery (up to 6 hrs operation)**
- **Durable storage case**
- **Probe holder**
- **One year warranty**

GLD Pro Gas Leak Detector		
Description	**Cat. No.**	**Quantity**
GLD Pro Leak Detector	**66002-001**	1 Each
Small Probe Adaptor	**66002-003**	1 Each
Soft-sided Carry Case (Leak Detector not included)	**66002-002**	1 Each



GFM Pro Electronic Flowmeter

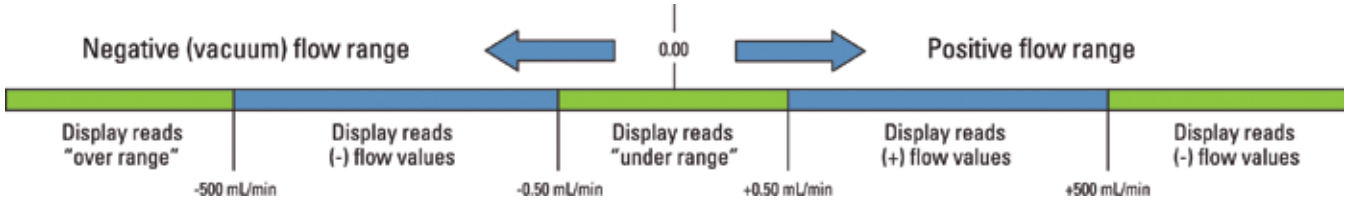
Measure and monitor flow quickly and efficiently

The GFM Pro Flowmeter is specifically designed for use with gas chromatography (GC) instruments. This versatile product is an electronic device capable of measuring bidirectional, volumetric flow for all types of gases. Real-time measurements can be made for various types of flow paths including continually changing gas types. The unit is portable so it can be hand-held or it also has an optional stand for bench-top convenience.

- **Compact ergonomic design features side grips for added durability**
- **Easy-to-use interface features over-range warning indicator and auto-shutoff**
- **Measurement range of 0.5-500 mL/min (both positive & negative flow)**
- **Accuracy of +/- 2% of flow or +/- 0.05 mL/min, whichever is greater**
- **Data output via USB port**
- **Calibration: traceable to NIST primary standards**
- **Explosion-proof rating for flammable and explosive gases**
- **CE certified**
- **Uses 2-AA batteries**
- **Re-calibration service available**

GFM Pro Electronic Flowmeter

Description	Cat. No.	Quantity
GFM Pro Flowmeter	**66002-010**	1 Each
Soft-sided Carry Case (Flowmeter not included)	**66002-002**	1 Each



Thermo Scientific GC Syringes

Autosampler Syringes for Thermo Scientific Instruments

Autosampler Syringes for Thermo Scientific Instruments

Volume	Needle Type	Length	Gauge	Tip Style	TriPlus	AS3000	AS2000	AS200/ AS800	Type	Cat. No.	Quantity
0.5µL	Plunger-in-Needle	50mm	23	Cone	X	X			Split/PTV	**36504045**	1 Each
0.5µL	Plunger-in-Needle	75mm	31	Cone					Manual OC	**36500500**	1 Each
0.5µL	Plunger-in-Needle	80mm	26	Cone	X				Splitless and OC	**36504046**	1 Each
5µL	Fixed	50mm	26	Cone	X				Split/PTV	**36504047**	1 Each
5µL	Fixed	50mm	23	Cone		X	X	X		**365C3701**	1 Each
5µL	Fixed	50mm	26	Cone		X	X		Split/PTV	**36500505**	1 Each
5µL	Removable	75mm	31	Cone					Manual OC	**36500510**	1 Each
5µL	Fixed	80mm	26	Cone	X				Splitless and OC	**36502025**	1 Each
10µL	Removable	42mm	23	Cone				X		**365D1611**	6 Pack
10µL	Fixed	50mm	26	Cone		X	X	X		**365D3711**	1 Each
10µL	Fixed	50mm	26	Cone		X	X	X		**365D1856**	6 Pack
10µL	Fixed	50mm	25	Cone	X	X	X	X	Split/PTV	**36500525**	1 Each
10µL	Fixed	50mm	23	Cone	X	X	X	X	PTV/SSL Split	**36520060**	1 Each
10µL	Removable	50mm	26	Cone		X	X			**365D1841**	1 Each
10µL	Removable	50mm	23	Cone		X	X	X		**365D3731**	1 Each
10µL	Fixed	80mm	23	Cone	X		X		Merlin Valve SSL Splitless	**36520061**	1 Each
10µL	Fixed	50mm	23-26	Cone	X		X		OC in PTV Merlin Valve	**36500580**	1 Each
10µL	Fixed, Gas Tight	50mm	23	Cone			X			**365D3741**	1 Each
10µL	Fixed	80mm	26	Cone	X		X		OC and Splitless	**36502019**	1 Each
10µL	Removable, Gas Tight	75mm	31	Cone					Manual OC	**36500520**	1 Each
50µL	Removable, Gas Tight	50mm	25	Bevel				X		**365G2161**	1 Each
50µL	Removable	50mm	23	Cone			X		LV Splitless	**36503015**	1 Each
100µL	Removable	50mm	25	Bevel				X		**365H2301**	1 Each
100µL	Removable, Gas Tight	50mm	23	Side hole	X		X		See Note	**36520050**	1 Each
100µL	Removable, Gas Tight	50mm	25	Bevel				X		**365H2381**	1 Each
100µL	Removable, Gas Tight	50mm	23	Cone	X		X	X	LV Splitless	**36500495**	1 Each
250µL	Fixed, Gas Tight	50mm	25	Bevel				X		**365I2561**	1 Each
250µL	Removable, Gas Tight	50mm	25	Bevel				X		**365I2611**	1 Each
250µL	Removable, Gas Tight	80mm	26	Cone	X		X		LVOC	**36500490**	1 Each
250µL	Removable, Gas Tight	50mm	23	Side hole	X		X	X	See Note	**36520051**	1 Each
1.0mL	Removable, Gas Tight	50mm	23	Bevel				X		**365K3041**	1 Each

Syringe 36520051 is to be used when performing PTV/LVI injections with a dedicated liner for thermo labile compounds (liner 45352060). Compatible with Merlin Microseal device installed on BEST PTV and with AS2000 and TriPlus autosamplers for liquids.

Autosampler Syringes for Agilent Instruments

Autosampler Syringes for Agilent Technologies						
Volume	**Needle Type**	**Length**	**Gauge**	**Needle Point**	**Cat. No.**	**Quantity**
0.5µL	Removable	42mm	26	Cone	**365A0411**	1 Each
0.5µL	Removable	42mm	23	Cone	**365A0421**	1 Each
0.5µL	Removable	42mm	23 to 26	Cone	**365A0431**	1 Each
5µL	Fixed	42mm	26	Cone	**365C0921**	1 Each
5µL	Fixed	42mm	26	Cone	**365C0926**	6 Pack
5µL	Fixed	42mm	23	Cone	**365C0951**	1 Each
5µL	Fixed	42mm	23	Cone	**365C0956**	6 Pack
5µL	Fixed	42mm	23 to 26	Cone	**365C0971**	1 Each
5µL	Fixed	42mm	23 to 26	Cone	**365C0976**	6 Pack
10µL	Fixed	42mm	26	Cone	**365D1521**	1 Each
10µL	Fixed	42mm	26	Cone	**365D1526**	6 Pack
10µL	Fixed	42mm	23 to 26	Cone	**365D1561**	1 Each
10µL	Fixed	42mm	23	Cone	**365D1571**	1 Each
10µL	Fixed	42mm	23	Cone	**365D1576**	1 Each
10µL	Removable	42mm	23	Cone	**365D1611**	6 Pack
10µL	Fixed	42mm	23-26	Cone	**365D1621**	1 Each
10µL	Fixed	42mm	23-26	Cone	**365D1636**	6 Pack

Autosampler Syringes for CTC

Autosampler Syringes for CTC						
Volume	**Needle Type**	**Length**	**Gauge**	**Needle Point**	**Cat. No.**	**Quantity**
0.5µL	Plunger-in-Needle	50mm	23	Cone	**36504045**	1 Each
5µL	Fixed	50mm	23	Cone	**365C3701**	1 Each
5µL	Fixed	50mm	26	Cone	**36500505**	1 Each
0.5µL	Removable	50mm	26	Cone	**365A0490**	1 Each
10µL	Fixed	50mm	26	Cone	**365D3711**	1 Each
10µL	Fixed	50mm	23	Cone	**36520060**	1 Each
10µL	Removable	50mm	23	Cone	**365D3731**	1 Each
10µL	Fixed	50mm	26	Cone	**365D1856**	6 Pack
10µL	Removable	50mm	26	Cone	**365D1840**	1 Each
10µL	Fixed	50mm	26	Bevel	**365D2705**	1 Each
10µL	Fixed	50mm	23	Cone	**365D2971**	6 Pack
10µL	Fixed†	50mm	23	Cone	**365D2972**	6 Pack
10µL	Fixed†	50mm	26	Cone	**365D2976**	6 Pack
10µL	Fixed†	50mm	26	Cone	**365D2977**	1 Each
10µL	Removable†	50mm	23	Cone	**365D2985**	1 Each
10µL	Fixed†	50mm	23	Cone	**365D3741**	1 Each
25µL	Fixed†	50mm	26	Cone	**365F3700**	1 Each
25µL	Fixed†	50mm	23	Cone	**365F3761**	1 Each
25µL	Fixed	50mm	26	Cone	**365F3980**	1 Each
25µL	Removable†	50mm	26	Side hole	**365F3988**	1 Each
100µL	Fixed†	50mm	23	Cone	**365H3771**	1 Each
100µL	Removable†	50mm	26	Cone	**365H5333**	1 Each
100µL	Fixed†	50mm	26	Cone	**365H5700**	1 Each
250µL	Fixed†	50mm	26	Cone	**365H6700**	1 Each
500µL	Fixed†	50mm	26	Cone	**365J7700**	1 Each
1mL	Fixed†	50mm	23	Side hole	**365K8130**	1 Each
1mL	Removable†	50mm	26	Side hole	**365K8135**	1 Each
2.5mL	Removable†	50mm	23	Side hole	**365L8630**	1 Each
2.5mL	Removable†	50mm	26	Side hole	**365L8635**	1 Each

†Gas Tight

Manual Syringes

Manual Syringes

Volume	Needle Type	Length	Gauge	Needle Point	Cat. No.	Quantity
0.5µL	Plunger-in-Needle	50mm	23	Cone	**365A0331**	1 Each
1.0µL	Plunger-in-Needle	50mm	23	Cone	**365B0511**	1 Each
1.0µL	Plunger-in-Needle	70mm	23	Cone	**365B0531**	1 Each
5.0µL	Fixed	50mm	26	Bevel	**365C0741**	1 Each
5.0µL	Removable	50mm	26	Bevel	**365C0761**	1 Each
10µL	Fixed	50mm	26	Bevel	**365D1091**	1 Each
10µL	Fixed	50mm	26	Bevel	**365D1096**	6 Each
10µL	Removable	50mm	26	Bevel	**365D1171**	1 Each
25µL	Fixed	50mm	25	Bevel	**365F1891**	1 Each
25µL	Removable	50mm	25	Bevel	**365F1901**	1 Each
25µL	Fixed, Gas Tight	50mm	25	Bevel	**365F1921**	1 Each
25µL	Removable, Gas Tight	70mm	25	Bevel	**365F1931**	1 Each
50µL	Fixed	50mm	25	Bevel	**365G2081**	1 Each
50µL	Removable	50mm	25	Bevel	**365G2091**	1 Each
50µL	Fixed, Gas Tight	50mm	25	Bevel	**365G2111**	1 Each
50µL	Removable, Gas Tight	50mm	25	Bevel	**365G2161**	1 Each
100µL	Fixed	50mm	25	Bevel	**365H2291**	1 Each
100µL	Removable	50mm	25	Bevel	**365H2301**	1 Each
100µL	Fixed, Gas Tight	50mm	25	Bevel	**365H2321**	1 Each
100µL	Removable, Gas Tight	50mm	25	Bevel	**365H2381**	1 Each
250µL	Fixed	50mm	25	Bevel	**365I2541**	1 Each
250µL	Fixed, Gas Tight	50mm	25	Bevel	**365I2561**	1 Each
250µL	Removable, Gas Tight	50mm	25	Bevel	**365I2611**	1 Each
250µL	Fixed, Gas Tight	50mm	25	Bevel	**365J2831**	1 Each
500µL	Removable, Gas Tight	50mm	25	Bevel	**365J2881**	1 Each
1.0mL	Removable, Gas Tight	50mm	23	Bevel	**365K3041**	1 Each
1.0mL	Fixed, Gas Tight	50mm	22	Bevel	**365K3051**	1 Each

Replacement Needles for GC Syringes

Replacement Needles for GC Syringes

For Syringe Models	Cat. No.	Quantity
365D1611	**365RN252**	2 Pack
365D1841	**365RN362**	2 Pack
365D1771	**365RN272**	2 Pack
365D3731	**365RN372**	2 Pack
365H2301, 365F1931, 365G2161, 365H2381, 365I2611, 365F1901, 365G2091, 365J2881	**365RN225**	5 Pack
365K3041	**365RN235**	5 Pack
36500495, 36503015	**36566485**	5 Pack
36500490	**36566480**	5 Pack
36520050, 36520051, 36520055	**36550040**	2 Pack
365D1811	**365RN351**	1 Pack
365C0761	**365RN555**	5 Pack
365D1171	**365RN215**	5 Pack
365D1781, 365D1791	**365RN282**	2 Pack
36500510	**36550045**	1 Pack
36500520	**36550046**	1 Pack
365H5333	**365RN732**	2 Pack
365F3988	**365RN749**	2 Pack

Replacement Plungers for Syringes

Replacement Plungers for Syringes		
For Use with	**Cat. No.**	**Quantity**
365F1921 or 365F1931	**365RP421**	1 Each
365G2111 or 365G2161	**365RP451**	1 Each
365H2321 or 365H2381	**365RP461**	1 Each
365I2561 or 365I2611	**365RP481**	1 Each
365J2831 or 365J2881	**365RP491**	1 Each
365K3041 or 365K3051	**365RP511**	1 Each
365D1811	**365RP441**	1 Each
365D1561	**365RP392**	2 Pack
365C1041	**365RP382**	2 Pack
365D1791	**365RP522**	2 Pack
365D3741	**365RP532**	2 Pack
365D1611	**365RP412**	2 Pack
365H3771	**365RP471**	1 Each
365D1611	**365RK351**	1 Each
365D2985	**365RP121**	1 Each
365F3761	**365RP431**	1 Each
365F3988	**365RP816**	1 Each
365H5333	**365RP826**	1 Each
365L8630, 365L8635	**365RP845**	1 Each
365F3700	**365RP922**	1 Each
365H6700	**365RP926**	1 Each
365J7700	**365RP928**	1 Each
365K8130, 365K8135	**365RP844**	2 Each

Repair Kits for Thermo Scientific Plunger-in-Needle Syringes

Extend the life and performance and reduce cost per use of syringes

Repair Kits for Thermo Scientific Plunger-in-Needle Syringes		
For Repair of Syringe Cat. No.	**Cat. No.**	**Quantity**
365A0411	**365RK541**	1 Each
365A0421	**365RK241**	1 Each
365A0431	**365RK261**	1 Each
365A0471	**365RK291**	1 Each
365A0481	**365RK331**	1 Each
365A0331	**365RK321**	1 Each
365B0511	**365RK311**	1 Each
365B0531	**365RK341**	1 Each
365A0490	**365RK770**	1 Each

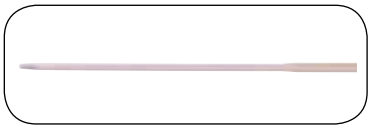
Repair kits for plunger in needle syringes contain both the plunger and needle, which must be changed together

Replacement Seals for Syringes

Replacement Seals for Thermo Scientific Syringes		
For Use with	**Cat. No.**	**Quantity**
0.5µL Syringes	**365RK561**	2 Pack
1.0µL Syringes	**365RK563**	2 Pack

National Scientific Target Precision Syringes

Syringes for Agilent Technologies, Fixed Needle, 23-26s

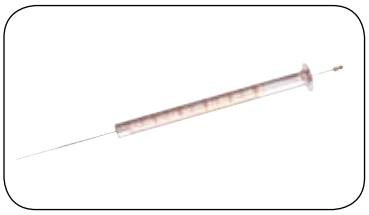


- 23-26s Tapered needle
- Use with 7673 Series, 7683 Series, 6850 ALS
- Feature HP-style dual-gauge, cone-shaped blunt tip
- Tapered design combines strength of larger diameter 23s with narrow 26s gauge piercing for minimized evaporation and easy on-column injection

National Scientific Target Precision GC Syringes for Agilent Technologies, Fixed Needle, 23-26s

Volume	Length	Agilent No.	Cat. No.	Quantity
5µL	42mm	5181-1273	**NS104304**	1 Each
10µL	42mm	5181-1267	**NS104404**	1 Each
5µL	42mm	5181-8810	**NS104314**	6 Pack
10µL	42mm	5181-3360	**NS104414**	6 Pack

Syringes for Agilent Technologies, Fixed Needle, PTFE Tip Plunger, 23-26s

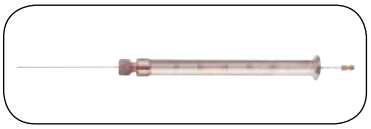


- 23-26s Gauge, tapered needle; PTFE-tipped plunger
- Use with 7673 Series, 7683 Series, 6850 ALS
- Feature HP-style dual gauge, cone-shaped blunt tip
- Tapered design combines strength of larger diameter 23s with narrow 26s gauge piercing for minimized evaporation and easy on-column injection

National Scientific Target Precision GC Syringes for Agilent Technologies, Fixed Needle, PTFE Tip Plunger, 23-26s

Volume	Length	Agilent No.	Cat. No.	Quantity
5µL	42mm	N/A	**NS604304**	1 Each
10µL	42mm	5181-3354	**NS604404**	1 Each
5µL	42mm	N/A	**NS604314**	6 Pack
10µL	42mm	5181-3361	**NS604414**	6 Pack

Syringes for Agilent Technologies, Removable Needle, 23-26s



- 23-26s Tapered needle
- Use with 7673 Series, 7683 Series, 6850 ALS
- Feature HP-style dual gauge, cone-shaped blunt tip
- Tapered design combines strength of larger diameter 23s with narrow 26s gauge piercing for minimized evaporation and easy on-column injection

National Scientific Target Precision GC Syringes for Agilent Technologies, Removable Needle, 23-26s

Volume	Length	Agilent No.	Cat. No.	Quantity
5µL	42mm	5182-0835	**NS104308**	1 Each
10µL	42mm	5181-3321	**NS104408**	1 Each

Syringes for Agilent Technologies, Removable Needle, PTFE Tip Plunger, 23-26s

- 23-26s Tapered needle; PTFE-tipped plunger
- Use with 7673 Series, 7683 Series, 6850 ALS
- Feature HP-style dual gauge, cone-shaped blunt tip
- Tapered design combines strength of larger diameter 23s with narrow 26s gauge piercing for minimized evaporation and easy on-column injection

National Scientific Target Precision GC Syringes for Agilent Technologies, Removable Needle, PTFE Tip Plunger, 23-26s

Volume	Length	Agilent No.	Cat. No.	Quantity
5µL	42mm	5181-3356	**NS604408**	1 Each

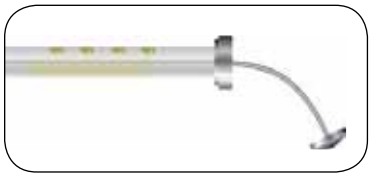
Syringes for Agilent Technologies, Replacement Needles, 23-26s

- 23-26s Tapered needle

National Scientific Target Precision GC Syringes for Agilent Technologies, Replacement Needles, 23-26s

Volume	Length	Agilent No.	Cat. No.	Quantity
5µL	42mm	5182-0832	**NS834308**	3 Pack
10µL	42mm	5181-3319	**NS834408**	3 Pack

Syringes for Agilent Technologies, Fixed Needle, Super-Elastic Plunger, 23-26s



- 23-26s Tapered needle; super-elastic plunger
- Use with 7673 Series, 7683 Series, 6850 ALS
- Feature cone-shaped 90° blunt tip
- Tapered design combines strength of larger diameter 23s with narrow 26s gauge piercing for minimized evaporation and easy on-column injection

National Scientific Target Precision GC Syringes for Agilent Technologies, Fixed Needle, Super-Elastic Plunger, 23-26s

Volume	Length	Agilent No.	Cat. No.	Quantity
5µL	42mm	N/A	**NS164304**	1 Each
10µL	42mm	N/A	**NS164404**	1 Each

Syringes for Agilent Technologies, Fixed Needle, 23 Gauge

- **23s Gauge needle**
- **Use with 7673 Series, 7683 Series, 6850 ALS**
- **Feature cone-shaped 90° blunt tip**

National Scientific Target Precision GC Syringes for Agilent Technologies, Fixed Needle, 23 Gauge

Volume	Length	Agilent No.	Cat. No.	Quantity
5µL	42mm	9301-0892	**NS104305**	1 Each
10µL	42mm	9301-0713	**NS104405**	1 Each
5µL	42mm	5182-0875	**NS104315**	6 Pack
10µL	42mm	9301-0725	**NS104415**	6 Pack

Syringes for Agilent Technologies, Fixed Needle, PTFE Tip Plunger, 23 Gauge

- **Use with 7673 Series, 7683 Series, 6850 ALS**
- **23s Gauge needle; PTFE-tipped plunger**
- **Feature cone-shaped 90° blunt tip**

National Scientific Target Precision GC Syringes for Agilent Technologies, Fixed Needle, PTFE Tip Plunger, 23 Gauge

Volume	Length	Agilent No.	Cat. No.	Quantity
5µL	42mm	----	**NS604305**	1 Each
10µL	42mm	5181-8809	**NS604405**	1 Each
5µL	42mm	----	**NS604315**	6 Pack
10µL	42mm	5181-4730	**NS604415**	6 Pack

Syringes for Agilent Technologies, Fixed Needle, 26 Gauge

- **26s Gauge needle**
- **Use with 7673 Series, 7683 Series, 6850 ALS**
- **Feature cone-shaped 90° blunt tip**

National Scientific Target Precision GC Syringes for Agilent Technologies, Fixed Needle, 26 Gauge

Volume	Length	Agilent No.	Cat. No.	Quantity
5µL	42mm	9301-0891	**NS104303**	1 Each
10µL	42mm	9301-0714	**NS104403**	1 Each
5µL	42mm	5183-4728	**NS104313**	6 Pack
10µL	42mm	5181-4729	**NS104413**	6 Pack

Syringes for Agilent Technologies, Fixed Needle, PTFE Tip Plunger, 26 Gauge

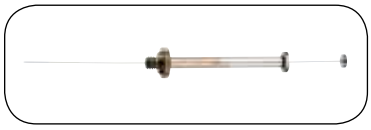
Use with 7673 Series, 7683 Series, 6850 ALS

- **26s Gauge needle; PTFE-tipped plunger**
- **Use with 7673 Series, 7683 Series, 6850 ALS**
- **Feature cone-shaped 90° blunt tip**

National Scientific Target Precision GC Syringes for Agilent Technologies, Fixed Needle, PTFE Tip Plunger, 26 Gauge

Volume	Length	Cat. No.	Quantity
5µL	42mm	**NS604303**	1 Each
10µL	42mm	**NS604403**	1 Each
5µL	42mm	**NS604313**	6 Pack
10µL	42mm	**NS604413**	6 Pack

Syringes for PerkinElmer, Fixed Needle, PTFE Tip Plunger, Gas

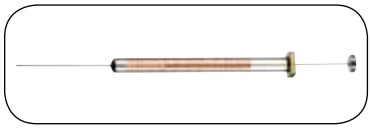


- **23s and 26s Gauge needle; PTFE-tipped plunger, gastight**
- **Use with AS100/200, AS3000, Autosystem**
- **Feature cone-shaped 90° blunt tip**

National Scientific Target Precision GC Syringes for PerkinElmer, Fixed Needle, Gas Tight

Volume	Length	Needle Gauge	PerkinElmer No.	Cat. No.	Quantity
5µL	70mm	26s	N6101390	**NS608302**	1 Each
5µL	70mm	23s	N6101380	**NS608303**	1 Each
5µL	70mm	26s	---	**NS108302**	1 Each

Syringes for Shimadzu, Fixed Needle



- **23s and 26s gauge needle**
- **Use with AOC-14, AOC-17, AOC-20**
- **Feature cone-shaped 90° blunt tip**

National Scientific Target Precision GC Syringes for Shimadzu, Fixed Needle

Volume	Length	Needle Gauge	For Use with	Cat. No.	Quantity
5µL	42mm	26s	----	**NS105303**	1 Each
5µL	42mm	23s	----	**NS105304**	1 Each
10µL	42mm	26s	----	**NS105403**	1 Each
10µL	42mm	23s	221-34618-00	**NS105404**	1 Each

Syringes for CTC/Leap Technologies, Fixed Needle

- **26s Gauge needle**
- **Use with A200s, GC Pal, LC Pal, HTS Combi-Pal**

National Scientific Target Precision GC Syringes for CTC/Leap Technologies, Fixed Needle

Volume	Length	Gauge	Needle Point	Cat. No.	Quantity
10µL	51mm	26s	Bevel	**NS100401**	1 Each

Syringes for CTC/Leap Technologies, Fixed Needle, PTFE Tip Plunger, Gas Tight

- **26s Gauge needle**
- **PTFE-tipped plunger, gastight**
- **Use with A200s, GC Pal, LC Pal, HTS Combi-Pal**

National Scientific Target Precision GC Syringes for CTC/Leap Technologies, Fixed Needle, PTFE Tip Plunger

Volume	Length	Gauge	Needle Point	Cat. No.	Quantity
25µL	51mm	26s	Bevel	**NS620506**	1 Each
100µL	51mm	26s	Bevel	**NS620706**	1 Each
100µL	50mm	23s	Cone	**NS620703**	1 Each
500µL	51mm	26s	Bevel	**NS620903**	1 Each

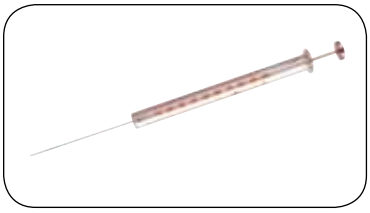
Syringes for CTC/Leap Technologies, Removable Needle, PTFE Tip Plunger, Gas Tight

- **Use with A200s, GC Pal, LC Pal, HTS Combi-Pal**
- **26s Gauge needle**
- **PTFE-tipped plunger, gastight**

National Scientific Target Precision GC Syringes for CTC/Leap Technologies, Removable Needle, PTFE Tip Plunger, Gas Tight

Volume	Length	Gauge	Needle Point	Cat. No.	Quantity
10µL	51mm	26s	Bevel	**NS606405**	1 Each

Syringes for Manual, On-Column and Septum Injection, Series N Fixed Needle, Bevel



- **26s and 22s Gauge needle**
- **Use with JADE or Merlin septumless injectors, split and splitless mode**

National Scientific Target Precision GC Syringes for Manual, On-Column and Septum Injection, Series N Fixed Needle, Bevel

Volume	Length	Needle Gauge	Needle Point	Cat. No.	Quantity
5µL	51mm	26s	Bevel	**NS100301**	1 Each
10µL	51mm	26s	Bevel	**NS100401**	1 Each
25µL	51mm	22s	Bevel	**NS100501**	1 Each
100µL	51mm	22s	Bevel	**NS100701**	1 Each
5µL	51mm	26s	Bevel	**NS100311**	6 Pack
10µL	51mm	26s	Bevel	**NS100411**	6 Pack

Syringes for Manual, On-Column and Septum Injection, Series N Fixed Needle, 90°

- **22s Gauge needle**
- **Use with JADE or Merlin septumless injectors, split and splitless mode**

National Scientific Target Precision Syringes for Manual, On-Column and Septum Injection, Series N Fixed Needle, 90°

Volume	Length	Needle Gauge	Needle Point	Cat. No.	Quantity
25µL	51mm	22s	90°	**NS101502**	1 Each
50µL	51mm	22s	90°	**NS101602**	1 Each
100µL	51mm	22s	90°	**NS101702**	1 Each
250µL	51mm	22s	90°	**NS101802**	1 Each

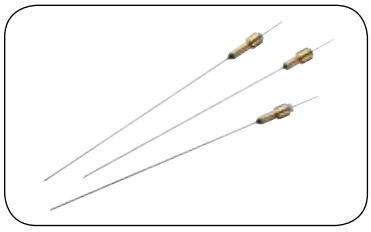
Syringes for Manual, On-Column and Septum Injection, Series N Removable Needle, Bevel

- **Use with JADE or Merlin septumless injectors, split and splitless mode**
- **26s and 22s Gauge needle**

National Scientific Target Precision Syringes for Manual, On-Column and Septum Injection, Series N Removable Needle, Bevel

Volume	Length	Gauge	Needle Point	Cat. No.	Quantity
5µL	51mm	26s	Bevel	**NS100305**	1 Each
10µL	51mm	26s	Bevel	**NS100405**	1 Each
25µL	51mm	22s	Bevel	**NS100505**	1 Each
50µL	51mm	22s	Bevel	**NS100605**	1 Each
100µL	51mm	22s	Bevel	**NS100705**	1 Each
250µL	51mm	22s	Bevel	**NS100805**	1 Each
500µL	51mm	22s	Bevel	**NS100905**	1 Each

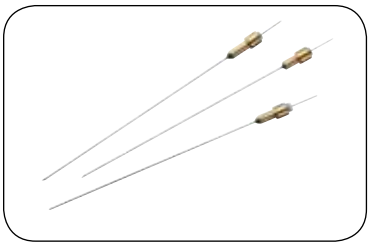
Syringes for Manual, On-Column and Septum Injection, Replacement Needles, Bevel



National Scientific Target Precision Syringes for Manual, On-Column and Septum Injection, Replacement Needles, Bevel

Volume	Length	Gauge	Needle Type	Cat. No.	Quantity
5µL	51mm	26s	Bevel	**NS832301**	3 Pack
10µL	51mm	26s	Bevel	**NS832401**	3 Pack
25-100µL	2"/51mm	22s	Bevel	**NS832401**	3 Pack
250-500µL	2"/51mm	22s	Bevel	**NS832601**	3 Pack

Syringes for Manual, On-Column and Septum Injection, Replacement Needles, Blunt



National Scientific Target Precision Syringes for Manual, On-Column and Septum Injection, Replacement Needles, Blunt					
Volume	**Length**	**Gauge**	**Needle Point**	**Cat. No.**	**Quantity**
5µL	2"/51mm	26s	90° blunt end	**NS832302**	3 Pack
10µL	2"/51mm	26s	90° blunt end	**NS832402**	3 Pack
25-100µL	2"/51mm	22s	90° blunt end	**NS832502**	3 Pack
250-500µL	51mm	22s	90° blunt end	**NS832602**	3 Pack

Syringes for Accurate Dosing of Liquids, Fixed Needle, Side Hole, Gas Tight

- **Suitable for liquid or gas samples**
- **26s and 22s Gauge needles**
- **PTFE-tipped stainless-steel plunger eliminates frozen plungers**

National Scientific Syringes for Accurate Dosing of Liquids, Fixed Needle, Side Hole, Gas Tight					
Volume	**Length**	**Gauge**	**Needle Point**	**Cat. No.**	**Quantity**
5µL	51mm	26s	Bevel	**NS600301**	1 Each
5µL	51mm	26s	Blunt End	**NS600302**	1 Each
10µL	51mm	26s	Bevel	**NS600401**	1 Each
10µL	51mm	26s	Blunt End	**NS600402**	1 Each
25µL	51mm	22s	Bevel	**NS600501**	1 Each
25µL	51mm	22s	Blunt End	**NS600502**	1 Each
50µL	51mm	26s	Bevel	**NS100601**	1 Each
50µL	51mm	22s	Blunt End	**NS600602**	1 Each
100µL	51mm	22s	Bevel	**NS600701**	1 Each
100µL	51mm	22s	Blunt End	**NS600702**	1 Each
250µL	51mm	26s	Bevel	**NS100801**	1 Each
250µL	51mm	22	Side Hole	**NS600804**	1 Each
500µL	51mm	22s	Bevel	**NS600901**	1 Each
500µL	51mm	22s	Blunt End	**NS600902**	1 Each
500µL	51mm	22s	Side Hole	**NS600904**	1 Each
1mL	51mm	22s	Bevel	**NS600000**	1 Each
1mL	51mm	22s	Blunt End	**NS600001**	1 Each
1mL	51mm	22s	Side Hole	**NS600002**	1 Each
5mL	51mm	22s	Bevel	**NS600040**	1 Each
5mL	51mm	22s	Blunt End	**NS600041**	1 Each
5mL	51mm	22s	Side Hole	**NS600042**	1 Each
10mL	51mm	22s	Bevel	**NS600060**	1 Each
10mL	51mm	22s	Blunt End	**NS600061**	1 Each
10mL	51mm	22s	Side Hole	**NS600062**	1 Each

Syringes for Accurate Dosing of Liquids, Fixed Needle, Gas Tight

22s Gauge bevel type fixed needles

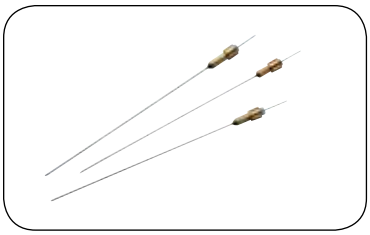
National Scientific Target Precision Glass Syringes, Liquid Dosing, FN					
Volume	**Length**	**Gauge**	**Needle Point**	**Cat. No.**	**Quantity**
50µL	51mm	26s	Bevel	**NS100601**	1 Each
250µL	51mm	26s	Bevel	**NS100801**	1 Each
500µL	51mm	26s	Bevel	**NS100901**	1 Each

Syringes for Accurate Dosing of Liquids, Removable Needle, Gas Tight

- **Suitable for liquid or gas samples**
- **PTFE-tipped stainless-steel plunger eliminates frozen plungers**

National Scientific Target Precision Syringes for Accurate Dosing of Liquids, Removable Needle, Gas Tight					
Volume	**Length**	**Gauge**	**Needle Type**	**Cat. No.**	**Quantity**
5µL	51mm	26s	Bevel point	**NS600305**	1 Each
5µL	51mm	26s	Blunt end	**NS600306**	1 Each
10µL	51mm	26s	Bevel point	**NS600405**	1 Each
10µL	51mm	26s	Blunt end	**NS600406**	1 Each
25µL	51mm	22s	Bevel point	**NS600505**	1 Each
25µL	51mm	22s	Blunt end	**NS600506**	1 Each
50µL	51mm	22s	Bevel point	**NS600605**	1 Each
50µL	51mm	22s	Blunt end	**NS600606**	1 Each
100µL	51mm	22s	Bevel point	**NS600705**	1 Each
100µL	51mm	22s	Blunt end	**NS600706**	1 Each
250µL	51mm	26s	Bevel point	**NS600805**	1 Each
500µL	51mm	22s	Bevel point	**NS600905**	1 Each
500µL	51mm	22s	Blunt end	**NS600906**	1 Each
500µL	51mm	22s	Side hole	**NS600908**	1 Each
1.0mL	51mm	22s	Bevel point	**NS600005**	1 Each
1.0mL	51mm	22s	Blunt end	**NS600006**	1 Each
1.0mL	51mm	22s	Side hole	**NS600007**	1 Each
5.0mL	51mm	22s	Bevel point	**NS600045**	1 Each
5.0mL	51mm	22s	Blunt end	**NS600046**	1 Each
5.0mL	51mm	22s	Side hole	**NS600047**	1 Each
10.0mL	51mm	22s	Bevel point	**NS600065**	1 Each
10.0mL	51mm	22s	Blunt end	**NS600066**	1 Each

Syringes for Accurate Dosing of Liquids, Replacement Needles

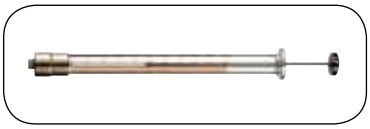


- **Suitable for liquid or gas samples**

National Scientific Target Precision Syringes for Accurate Dosing of Liquids, Replacement Needles

Volume	Length	Gauge	Needle Type	Cat. No.	Quantity
5µL	42mm	26s	90° Blunt End	**NS834307**	3 Pack
10µL	42mm	26s	90° Blunt End	**NS834407**	3 Pack
5µL	51mm	26s	Bevel	**NS832301**	3 Pack
5µL	51mm	26s	Side Hole	**NS832304**	2 Pack
10µL	51mm	26s	Bevel	**NS832401**	3 Pack
10µL	51mm	26s	Side Hole	**NS832404**	2 Pack
25 to 100µL	51mm	22s	90° Blunt End	**NS831014**	3 Pack
25 to 100µL	51mm	22s	Side Hole	**NS831015**	3 Pack
25 to 100µL	51mm	22s	Side Hole	**NS832504**	2 Pack
25 to 100µL	51mm	22s	Bevel	**NS831013**	3 Pack
250µL to 10mL	51mm	22s	90° Blunt End	**NS841014**	3 Pack
250µL to 10mL	51mm	22s	Side Hole	**NS841015**	2 Pack
250µL to 10mL	51mm	22s	Side hole	**NS832604**	2 Pack
250µL to 10mL	51mm	22s	Bevel	**NS841013**	3 Pack

Syringes for Accurate Dosing of Liquids, PTFE Luer-Lok, Gas Tight



Suitable for liquid or gas

PTFE-tipped plunger eliminates frozen plungers

National Scientific Target Precision Syringes for Accurate Dosing of Liquids, PTFE Luer-Lok, Gas Tight

Volume	Cat. No.	Quantity
5µL	**NS600309**	1 Each
10µL	**NS600409**	1 Each
25µL	**NS600509**	1 Each
50µL	**NS600609**	1 Each
100µL	**NS600709**	1 Each
250µL	**NS600809**	1 Each
500µL	**NS600909**	1 Each
1mL	**NS607011**	1 Each
2.5mL	**NS607031**	1 Each
5mL	**NS607051**	1 Each
10mL	**NS607071**	1 Each
25mL	**NS607091**	1 Each

Metal Luer-screw Replacement Needles

Feature a precision-machined PTFE-tipped plunger

National Scientific Target Precision Metal Luer-screw Replacement Needles				
Needle Length	**Gauge**	**Needle Type**	**Cat. No.**	**Quantity**
51mm	26s	90° Blunt End	**NS842047**	3 Pack
51mm	26s	Bevel	**NS840047**	3 Pack
51mm	22s	90° Blunt End	**NS842070**	3 Pack
51mm	22s	Bevel	**NS840070**	3 Pack

Syringes for Accurate Dosing of Liquids, Luer Tip, Gas Tight

Glass Luer-slip tip is compatible with standard Luer profile needles and fittings

Sold without needle

National Scientific Target Precision Syringes for Accurate Dosing of Liquids, Luer Tip, Gas Tight		
Volume	**Cat. No.**	**Quantity**
25µL	**NS600511**	1 Each
50µL	**NS600611**	1 Each
100µL	**NS600711**	1 Each
250µL	**NS600811**	1 Each
500µL	**NS600911**	1 Each
1mL	**NS600013**	1 Each
2.5mL	**NS600033**	1 Each
5mL	**NS600053**	1 Each
10mL	**NS600073**	1 Each

Syringes for Headspace/Soil Gas Sampling, Fixed Needle, Gas Tight

With PTFE-tipped stainless-steel plungers

- **With PTFE-tipped stainless-steel plungers**

National Scientific Target Precision Syringes for Headspace/Soil Gas Sampling, Fixed Needle, Gas Tight					
Volume	**Needle Length**	**Gauge**	**Needle Point**	**Cat. No.**	**Quantity**
5µL	51mm	26s	Side hole	**NS600304**	1 Each
10µL	51mm	26s	Side hole	**NS600404**	1 Each
250µL	51mm	22s	Side hole	**NS600804**	1 Each
1mL	51mm	22s	Side hole	**NS600002**	1 Each
2.5mL	51mm	22s	Side hole	**NS600022**	1 Each
5mL	51mm	22s	Side hole	**NS600042**	1 Each

Syringes for CTC/Leap Technology, Headspace, Fixed Needle, Gas Tight

- **For Combi-Pal Headspace Autosampler**
- **PTFE-tipped stainless-steel plunger**

National Scientific Target Precision Syringes for CTC/Leap Technology, Headspace, Fixed Needle, Gas Tight

Volume	Needle Length	Gauge	Needle Type	Cat. No.	Quantity
10µL	51mm	26s	Bevel	**NS606401**	1 Each
1.0mL	56mm	22s	Side hole	**NS620013**	1 Each
2.5mL	56mm	22s	Side hole	**NS620023**	1 Each
5.0mL	56mm	22s	Side hole	**NS620049**	1 Each

Syringes for On-Column, Fused Silica, Removable Needle

- **Stainless-steel plunger**

National Scientific Target Precision Syringes for On-Column, Fused Silica, Removable Needle

Volume	Needle Length	O.D.	Cat. No.	Quantity
5µL	100mm	0.23mm	**NS142304**	1 Each
10µL	100mm	0.23mm	**NS142404**	1 Each

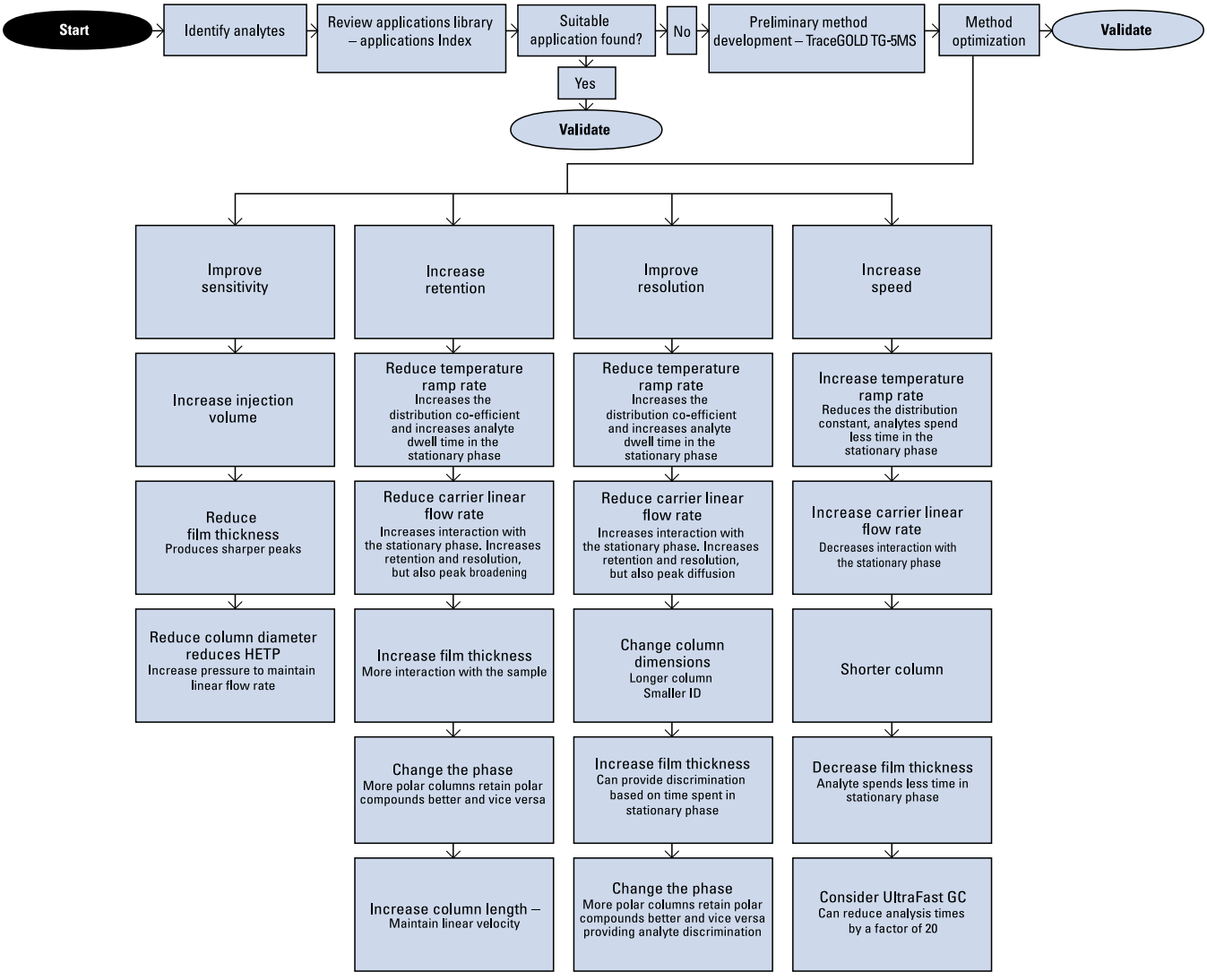
Syringes for On-Column, Fused Silica, Replacement Needle

National Scientific Target Precision Syringes for On-Column, Fused Silica, Replacement Needle

Volume	Needle Length	O.D.	Cat. No.	Quantity
5µL	100mm	0.23mm	**NS822031**	3 Pack
10µL	100mm	0.23mm	**NS822042**	3 Pack

GC Method Selection and Optimization

The following flow chart briefly describes the common steps in GC method development and optimization.



GC Troubleshooting

Before you start any troubleshooting, it is essential to observe safe laboratory practices. Know the chemical and physical properties of any solvents used and have the appropriate Material Safety Data Sheets (MSDSs) readily available. All electrically powered instruments should be shut down and unplugged before starting. Eye protection should also be worn.

The following table lists common GC problems encountered, the possible causes and solutions for your quick reference.

Symptom	Cause	Recommended Solutions
Baseline Related Problems		
Baseline Drifting	Accumulation of stationary phase.	Remove the end section of the column.
	Carrier gas cylinder pressure too low to allow control.	Replace the carrier gas cylinder. Increase the pressure.
	Drifting carrier gas or combustion gas flows.	Check the gas controllers.
	Accumulation of impurities in the column.	Check impurity levels in the gas source. Use correct gas purity. Replace or install appropriate Gas Filters (see page 287)
Baseline Falling	Carrier gas leak in the system.	Perform a leak test. Check the tightness of the connections on the carrier gas line.
	Column is baking out.	Allow enough time for the column to stabilize.
Baseline Falling Away Slowly After a High Initial Value	Purge valve left closed during acquisition.	Alter the GC program. See your GC user manual for details.
	Inadequate purge flow rate.	Increase the purge flow rate.
	Purge valve left closed for too long.	Shorten the purge time.
	Solvent tail peak.	Increase the solvent delay. Shorten the purge time.
	Pre-filters are dirty. (when using a quadrupole MS detector)	Contact your service representative.
Baseline Rising	Accumulation of impurities in the column.	Check impurity levels in the gas source. Use correct gas purity. Replace or install appropriate Gas Filters (see page 287)
	Contaminated detector.	Check the detector and clean it.
	There is bleeding from the GC column.	Condition column. Change the column.
	Air is leaking into the system.	Trace and repair the leak.
Baseline Rising Under Temperature Program Control	Column contaminated.	Recondition the column.
Baseline High Standing Current	Carrier gas flow rate too high.	Reduce the carrier gas flow.
	Column contaminated.	Recondition the column.
	Contaminated gases.	Replace gas cylinders. Replace the gas filters.
	Excessive column stationary phase bleeding.	Check the oven temperature, ensuring that it doesn't exceed the column upper limit. Recondition the column. Replace the column.
	Loose connections.	Ensure that all interconnections and screw connections are tight.
Baseline Irregular Shape: Dip After Solvent Peak	Detector contaminated.	Bake out the detector. Clean the detector.
Baseline Irregular Shape: S-shaped	Excessive column bleed during column temperature programming.	Reduce the upper column temperature. Bake out the column. Install a high temperature column.
	Oxygen contamination is decomposing the stationary phase.	Install oxygen filters in the carrier gas line. Check the pneumatic and inlet systems for leaks. Use correct gas purity with low oxygen content.
Baseline High Frequency Noise	Contaminated detector.	Isolate the detector from the electronics. If noise disappears, clean the collector.
	Combustion gas flow too low or too high.	Check the detector gas flows.
	Column contaminated.	Condition the column.
	Contaminated detector gas supply.	Check the gas purity and install appropriate filters.
	Detector temperature higher than column maximum temperature.	Reduce the detector temperature to the column temperature upper limit.
	Loose column fittings.	Tighten fittings accordingly.
Baseline Spiking	Column too close to flame. (when using an FID)	Lower the column to the correct position (2 - 3mm below the tip of the jet).
	Dirty jet or detector.	Isolate the detector from the electronics. If the spiking disappears, clean the jet and the collector.
	FID temperature too low. (when using an FID)	Increase the FID temperature to at least 150°C.
Peak-Related Problems		
Peaks Broadening	Column flow too high.	Reduce the flow to slightly above optimum.
	Column flow too low.	Increase the flow to slightly above optimum.
	Split flow too low in split injection.	Increase the flow to 40 - 50mL/min.
	Column performances degraded.	Test the column at the optimum flow rate.
	Dirty injector.	Clean or replace the liner.
	Stationary phase accumulated in the outlet.	Remove the last two coils from the column.
	Detector base body temperature too low.	Increase the temperature to 5°C below the column maximum.
	The sample is overloading the column.	Reduce the amount and/or concentration of the sample.

If you need more assistance or information on specific detection systems, please contact us and request our Troubleshooting Guide.

Symptom	Cause	Recommended Solutions
Peak-Related Problems		
Double Peaks	Injection speed too low.	Inject more rapidly in a smooth motion.
	Wrong autosampler injection speed or mode.	Use a higher speed.
Peak Fronting	Column or detector overloaded.	Decrease the injected amount. Decrease the analyte concentrations. Increase the split ratio.
	Column temperature too low.	Increase the temperature.
	Stationary phase too thin.	Use a thicker-film column.
	Poor injection technique.	Repeat, with better injection technique.
Ghost Peaks	Contaminated carrier gas.	Replace the cylinder. Replace the filter (see page 287-289).
	Contamination from laboratory glassware.	Ensure the glassware is clean and contamination-free.
	Decomposition of injected sample.	Decrease the injection port temperature. Use the on-column injection technique.
	Dirty injection solution.	Carry out adequate clean-up of sample prior to injection.
Broad Ghost Peaks	Contaminated inlet or pneumatics.	Remove the column and bake out the inlet. Use a high-quality septum. Replace the split vent filter. Install an in-line filter between the pneumatics and the inlet.
	Incomplete elution of previous sample.	Increase the final oven program temperature or total run time. Increase the column flow rate.
Irregular, Chair-shaped Peaks	Solvent flooding of column.	Increase the initial oven temperature. Reduce the injection volume (On-column). Install a retention gap (On-column).
No Peaks After Solvent Peak	Carrier gas flow too high.	Reduce the carrier gas flow rate.
	Combustion gas flow incorrect.	Check the combustion gas flow.
	Detector contaminated.	Bake out or clean the detector.
	FID flame extinguished by solvent peak.	Check the detector temperature and that flame is lit.
	Too much sample injected.	Inject less sample.
	Incorrect column position in S/SL injector (too high).	Check the column position.
No Peaks at All	Clogged syringe needle.	Replace or repair the syringe.
	Column broken or disconnected.	Check the column and connections.
	Defective electrometer or amplifier.	Check electrometer or amplifier and associated connections. Replace if required.
	Defective recording device.	Replace the recording device.
	FID flame is out.	Clean FID jet, check detector gas flows and re-light flame.
	Incorrect column position in S/SL injector (too high).	Check the column position.
Sample Peak Tailing	Column degradation causing activity.	Inject a test mixture and evaluate the column.
	Column/oven temperature too low.	Increase the column/oven temperature. Do not exceed the recommended maximum temperature for the stationary phase.
	Column contaminated at inlet.	Trim first 10-20cm from column and re-install in injector.
	Glass wool or inlet liner causing activity.	Replace with fresh silanized wool and a clean inlet liner.
	Inlet temperature too low.	Increase the inlet temperature.
	Poor or obstructed column connections.	Remake the column inlet connection.
	Wrong stationary phase.	Replace the column according to the column manufacturer's literature.
Solvent Peak Tailing	Incorrect column position in inlet.	Reinstall the column.
	Initial oven temperature too high (On Column).	Reduce the initial oven temperature.
	Septum purge flow too low and/or split/splitless vent flow too low.	Check and adjust the septum purge and vent flows.
	Too large injection size.	Reduce the injection size.
Unresolved Peaks	Carrier gas flow rate too high.	Reduce the carrier gas flow rate.
	Column deteriorated.	Replace the column.
	Column temperature too high.	Lower the column oven temperature.
	Column too short.	Use a longer column.
	Incorrect column choice.	Install a suitable column.
	Injection technique is not adequate.	Choose a correct injection technique.
Discrete High-intensity Contaminant Peaks	Bleed from the GC column.	Condition or change the column.
	Bleed from the septum.	Replace the septum.
	Sample vial septa are contaminating the sample.	Discard sample. Store samples upright, in a refrigerator. Use Teflon™ faced septa, with the Teflon facing downwards (i.e. towards the sample).

If you need more assistance or information on specific detection systems, please contact us and request our Troubleshooting Guide.

Symptom	Cause	Recommended Solutions
Results-Related Problems		
Low Reproducibility of Peak Area	Concentration not compatible with the dynamic range of the detection system.	Ensure that the sample concentration is suitable for the detection system.
	Inappropriate injection technique.	Try a different injection technique.
	Injection parameters inappropriate.	Check the injection temperature. Check the flow rates.
	Non reproducible sample injection technique.	Evaluate the sample preparation sequences. Compare the results with a series of standard injections.
	Leaking syringe or septum.	Check and replace the syringe at regular intervals. Check and replace septum at regular intervals.
	Leaks at the injection.	Check the column connections. Run a leak check.
	Poor injection technique.	Carefully meter the injected amount. Use a clean, good-quality syringe.
	Poor split flow or ratio control.	Monitor the flow. Replace the in-line filter.
Poor Sensitivity with Increased Retention Time	Carrier gas flow rate too low.	Increase the carrier gas flow rate. Locate and remove possible obstructions in the carrier gas line. Check the injector/column ferrules.
Poor Sensitivity with Normal Retention Time	Oven or injector parameters are not optimized.	Adjust the oven parameters. Adjust the injector parameters.
	Leaks in the GC carrier gas line.	Run a leak test and correct leaks.
	Syringe leaks during injection.	Replace syringe or piston seals, if applicable.
	Split injection temperature too low.	Increase the temperature of the injector.
	Column is in poor condition, or wrong column type used.	Condition the columns. Change the column.
Retention Times Decreasing	Stationary phase deteriorated by oxygen and/or water.	Use a carrier gas free of oxygen and water. Replace or install appropriate gas filters (see page287-289).
	Stationary phase loss due to column bleeding.	Reduce the column temperature.
Retention Times Increasing	Increasing carrier leakage.	Check the septum and column connections.
	Carrier gas supply running out.	Replace the bottle.
Low Reproducibility of Retention Times	Drifting or unstable pneumatic controller.	Monitor the column pressure or flow. Check and replace the controller if necessary.
	Poor injection technique.	Start the run at consistent time after injection.
	Sample size is too large.	Reduce the injected amount and/or volume.
	Unstable column temperature.	Check the main oven door and cooling flap. Monitor the column temperature.
Retention Times are Inconsistent	GC column is in poor condition.	Condition the column. Change the column.
	Insufficient equilibration time set on GC.	Increase equilibration time.
	Poor injection.	Repeat with better injection technique.
	Oven temperature programmed to rise too quickly.	Reduce oven temperature ramp rate.
	Air is leaking into the system at the injector seal or the carrier gas manifold.	Trace and repair the leak.

If you need more assistance or information on specific detection systems, please contact us and request our Troubleshooting Guide.

GC Equations

Adjusted Retention Time (t_R')

An analyte's retention time (t_R) minus the elution time of an unretained peak (t_m).

$$t_R' = t_R - t_m$$

Adjusted retention time is also equivalent to the time the analyte spends in the stationary phase.

Capacity Factor (k)

Expression that measures the degree of retention of an analyte relative to an unretained peak, where t_R is the retention time for the sample peak and t_m is the retention time for an unretained peak. A measurement of capacity will help determine whether retention shifts are due to the column (capacity factor is changing with retention time changes) or the system (capacity factor remains constant with retention time changes).

$$k = \frac{t_R - t_m}{t_m}$$

Thus, the higher the capacity factor, the longer the retention time.

Effective Theoretical Plates (N_{eff})

A measure of a column performance that accounts for the effects of unretained elution time, where t_R' is the adjusted retention time and σ is the standard deviation of the peak.

$$N_{eff} = \left(\frac{t_R'}{\sigma}\right)^2$$

This value also remains constant as retention gaps and guards are used. Depending on the method of peak width calculation, different efficiencies can be reported. This leads to two popular measures:

$$N_{eff} = 16\left(\frac{t_R'}{W}\right)^2$$

Where W is the tangential peak width (13.4% peak height).

$$N_{eff} = 5.54\left(\frac{t_R'}{W}\right)^2$$

Where W is the width measured at half height (50% peak height).

HEEP (H_{eff})

Height Equivalent to an Effective Plate.

$$H_{eff} = L/N_{eff}$$

Where L is the column length. The smaller the N_{eff}, the more efficient the column's performance.

HETP (H)

Height Equivalent to a Theoretical Plate is a measure of column efficiency where L is the column length and N is the number of theoretical plates.

$$H = L/N$$

HETP is based on actual (t_R) rather than adjusted retention times (t_R').

Linear Velocity (u)

Mobile phase flow rate expressed in cm/s and is expressed as

$$u = L/t_m$$

Where L is the column length and t_m is the breakthrough time of an unretained peak

Phase Ratio (β)

The ratio of the volume of mobile phase to the stationary phase. An important value when changing the column dimensions in a method.

$$\beta = \frac{\text{column ID (µm)}}{4 \times \text{film thickness (µm)}}$$

Resolution

A measure of the separation of two peaks taking into account both the difference in elution time and the peak widths.

$$R_s = \frac{(t_2 - t_1)}{0.5\,(W_1 + W_2)}$$

Where t_2 and t_1 are the two retention times, and W_1 and W_2 are baseline peak widths.

Selectivity (α)

The relative retention of two adjacent peaks. Selectivity can be calculated using capacity factor.

$$\alpha = \frac{k_2}{k_1}$$

Trennzahl Number

A value to describe a separation. The Trennzahl number is calculated from the resolution between two consecutive homologous hydrocarbons. The Trennzahl number represents the number of peaks that can be included between the two hydrocarbon peaks.

$$T_z = \left(\frac{t_{R2} - t_{R1}}{(W_h)_1 + (W_h)_2}\right) - 1$$

Where t_R equals analyte retention time and W_h equals peak width at half height.

van Deemter Equation

This is a relationship that considers the effect of linear velocity on the HETP or H, where A accounts for eddy diffusion, B describes the molecular diffusion of the vapor in the direction of the column axis, C refers to the resistance to transfer from the stationary to mobile phase and u is the linear velocity of the mobile phase.

$$H = A + \frac{B}{u} + Cu$$

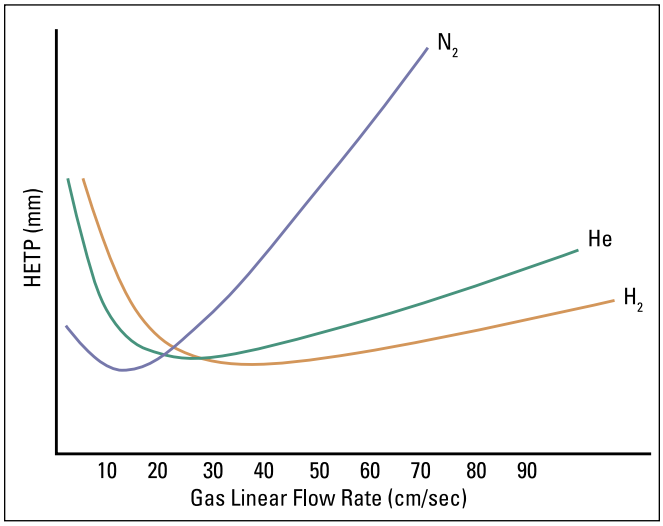
Carrier Gas Choice

The choice of carrier gas is a compromise between a number of considerations, among them, efficiency and speed as well as availability, safety and cost. The three most common carrier gases used are nitrogen, helium and hydrogen.

Nitrogen shows the lowest HETP, making it the most efficient of the gases. High quality nitrogen is readily available and inexpensive compared to other options. However, the optimum flow rate to achieve nitrogen's very low HETP leads to long analysis times (see figure).

Helium has a slightly lower efficiency than nitrogen, but the optimum flow rate is higher. Also small changes in flow rate of helium around the optimum will not affect efficiency as greatly as with nitrogen.

For many, hydrogen is the carrier gas of choice. It shows higher efficiency than helium and at a higher flow rate. The variation in HETP with changes in flow rate is also far lower, making it more forgiving and reproducible. There is, however, a slight risk of an explosive atmospheric build-up in the oven.



A van Deemter plot of efficiency against linear flow rate for three carrier gases.

Recommended Flow Rates and Velocities for Capillary Columns

Carrier Gas	0.25 mm ID		0.32 mm ID		0.53 mm ID	
	mL/min	cm/min	mL/min	cm/min	mL/min	cm/min
He	1	35	1.7	35	6	35
H_2	1.6	50	2.6	50	7.5	50
N_2	0.4	14	0.5	11	0.9	7

Recommended Detector Gas Flow Rates

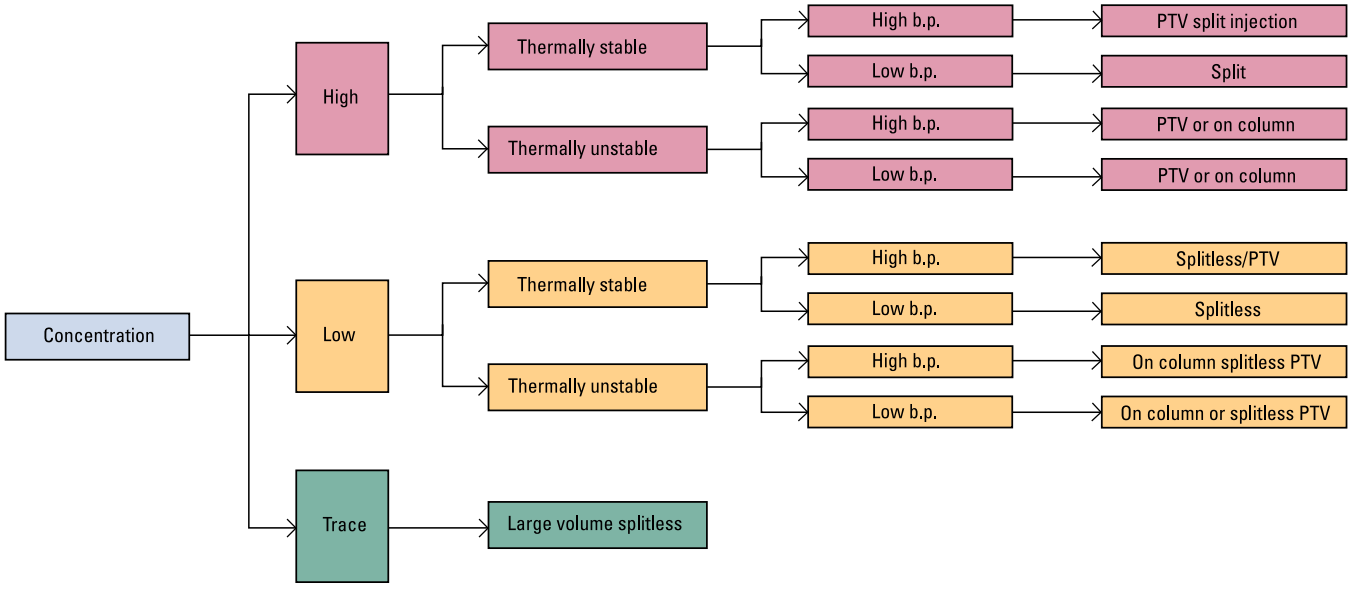
Detector	Air (mL/min)	H_2 (mL/min)	Make Up (mL/min)
ECD	–	–	35 - 40
FID	350	35	30
NPD	60	2.5	15
FPD	100	75	30

Unretained Compounds

Detector	Analyte
FID	Methane
ECD	Methylene Chloride
NPD	Acetonitrile
TCD, MS	Methane, Butane
PID, ELCD	Vinyl Chloride

Selection of Injection Method

The identification of the most appropriate injection method relies on the sample type and the boiling point to be used in the separation. The diagram below summarizes this selection process



Column Conditioning (All Columns Except TRACE TR-1MS & TR-WaxMS)

It is recommended that before the column is subjected to any thermal gradients, all oxygen has been removed because the presence of oxygen in the system can shorten the column lifetime. Removal of oxygen can be achieved by purging the columns with oxygen-free carrier gas for a minimum of 20 minutes at 40°C using an approximate head pressure of 100kPa.

Although all Thermo Scientific columns have been pre-conditioned, we recommend that they are conditioned after installation by following these steps:

1. Heat the column from 50°C to the maximum operating temperature at 5°C/min. and hold for one hour. The maximum operating temperatures for all TRACE™ GC columns are provided below. It is important to stay within the maximum temperature range for the column.
2. Monitor the detector signal during conditioning until a stable baseline is reached. Due to the factory pre-conditioning of the column, this should be achieved in approximately one hour. This duration may be longer in the case of thick films and polar phases.

Maximum Operating Temperatures for TraceGOLD and TRACE GC Columns

Column	Maximum Operating Temperature
TG-1MS	330°C / 350°C
TG-5MS	330°C / 350°C
TG-SQC	330°C / 350°C
TG-5MS AMINE	300°C / 315°C
TG-5SILMS	330°C / 350°C
TG-5HT	380°C / 400°C
TG-35MS	300°C / 320°C
TG-35MS AMINE	220°C
TG-17MS	300°C / 320°C
TG-1301MS	260°C / 280°C
TG-624	240°C
TG-1701MS	260°C / 280°C
TG-225MS	240°C
TG-200MS	320°C / 340°C
TG-POLAR	275°C
TG-WAXMS	260°C
TG-WAXMS A	250°C
TG-WAXMS B	220°C

Column	Maximum Operating Temperature
TR-1	340°C / 360°C for films ≤ 1.0µm 300°C / 320°C for films 1.5 to 3.0µm
films	280°C / 300°C for films > 3.0µm
TR-1MS	370°C / 380°C
TR-5	340°C / 350°C for films ≤ 1.5µm 280°C / 300°C for films > 1.5µm
TR-5HT	380°C / 400°C
TR-5MS	360°C / 370°C for films ≤ 1.5µm 350°C / 360°C for films > 1.5µm
TR-35MS	360°C / 370°C
TR-50MS	360°C / 370°C
TR-V1	280°C / 300°C
TR-1701	280°C / 300°C
TR-225	230°C / 250°C
TR-FAME	250°C / 260°C
TR-WAX	260°C / 280°C for films ≤ 1.0µm 240°C / 260°C for films > 1.0µm
TR-WAXMS	280°C / 300°C
TR-FFAP	240°C / 250°C

Column	Maximum Operating Temperature
TR-SIMDIST	400°C for films ≤ 1.0µm 370°C for 2.65µm films
TR-524	240°C / 260°C
TR-525	340°C / 360°C
TR-527	330°C / 350°C
TR-8095	360°C / 370°C
TR-8270	330°C / 350°C
TR-Pesticide	330°C / 350°C
TR-Pesticide II	330°C / 350°C
TR-Pesticide III	300°C / 320°C
TR-Pesticide IV	300°C / 320°C
TR-Biodiesel (M)	300°C / 320°C
TR-Biodiesel (F)	280°C / 300°C
TR-Biodiesel (G)	380°C / 400°C
TR-DoA5	330°C / 350°C
TR-DoA35	330°C / 350°C
TR-Dioxin 5MS	330°C / 350°C
TR-PCB 8MS	330°C / 350°C

Column Conditioning for the TRACE TR-WaxMS and TR-1MS Columns

This procedure will ensure an ultra low bleed for the columns entire lifetime and is only required once. Once performed, future installation of the column need only be followed by a 30 minute hold at the maximum temperature limit, follow the procedure below.

After installing the column according to the instrument manufactures instructions.

Steps	TR-WaxMS	TR-1MS
1	Equilibrate the column at 40°C with carrier gas flow for 20 minutes, purging air content.	Equilibrate the column at 40°C with carrier gas flow for 20 minutes, purging air content.
2	Raise the temperature to 100°C at 5°C/min.	Raise the temperature to 100°C at 5°C/min.
3	Hold for 30 minutes.	Hold for 30 minutes.
4	Raise to 150°C at 5°C/min.	Raise to 150°C at 5°C/min.
5	Hold for 30 minutes.	Hold for 30 minutes.
6	Raise to 200 °C at 5 °C.	Raise to 250°C at 5°C.
7	Hold for 40 minutes.	Hold for 40 minutes.
8	Raise to 250°C at 5°C/min.	Raise to 300°C at 5°C/min.
9	Hold for 40 minutes.	Hold for 40 minutes.
10	Raise to 280°C at 5°C/min.	Raise to 360°C at 5°C/min.
11	Hold for 30 minutes.	Hold for 30 minutes.

Although quite a long procedure, it will result in longer lifetimes and lower bleed for your column.

Performance Recovery

The performance of the column may exhibit signs of deterioration over time as a result of many different causes. Some of these, such as contamination by high boiling or strongly retained compounds, can be cleared by repeating the column-conditioning until a stable baseline is achieved.

Other contamination such as non-volatile compounds, pieces of septa or ferrule metal can result in poor peak shape due to band broadening at the injection step. This can be cured by the removal of a section from the front end of the column. The amount removed is dependent on the degree of contamination, the size of injection and the ID of the column, but generally 50cm should be sufficient. As the efficiency of the column is proportional to the square root of its length, the removal of the front end will not lower the separation effectiveness by the same ratio as 50cm/column length. A last resort in column regeneration is column washing. Column washing uses a pressurized vessel to force solvent through the column in a reverse direction. The selection of the solvent is dependent on the nature of the samples that have been analyzed and therefore the contamination. It is also dependent on the stationary phase. Generally, 2mL of pentane is suitable for non-polar contamination with methanol used for more polar samples.