2012-2013

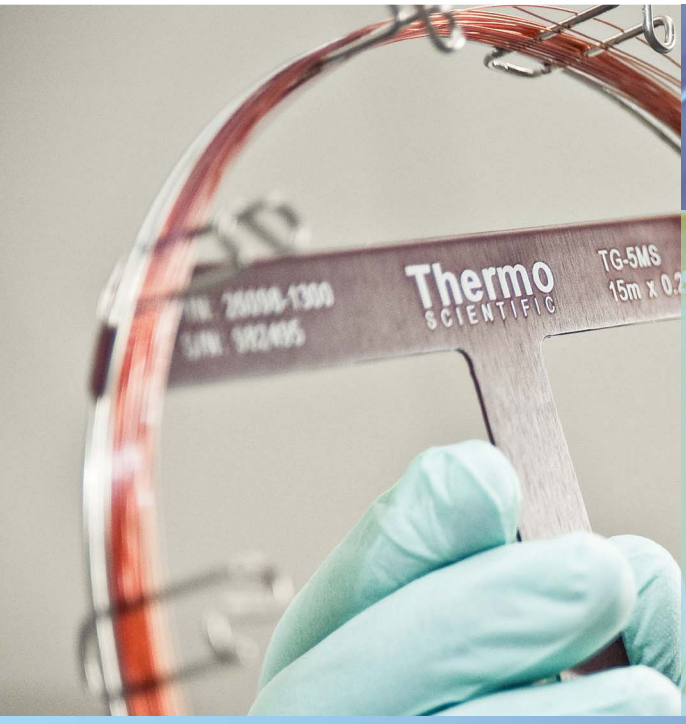
Thermo Scientific
Chromatography Columns
and Consumables

Trusted solutions

uncompromised analysis

Thermo
SCIENTIFIC

consistency



GC Columns and Accessories

Thermo Scientific GC Columns offer high temperature stability and exhibit 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.

Section Contents

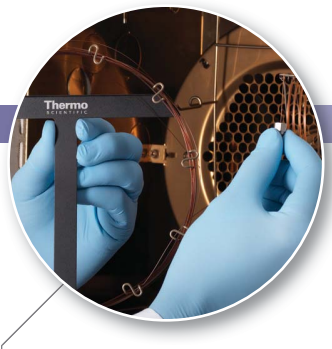
GC Column Selection 3-002
TraceGOLD GC Columns 3-022
TRACE GC Columns 3-053
TracePLOT GC Columns 3-075
Gas Management 3-080
Injection Port Septa 3-083
Injection Port Liners 3-084
Capillary Accessories 3-087
Tools 3-096
Syringes 3-099
GC Reagents 3-114
GC Sample Handling 3-133
GC Instrument Spare Parts 3-142
GC Technical Information 3-156

Featured Products

TraceGOLD GC Columns

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

PAGE 3-022



TracePLOT GC Columns

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

PAGE 3-075

GC Equipment

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

PAGE 3-098

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 Thermo Scientific GC Column. 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 Thermo Scientific columns to other GC column manufacturers. 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 3-010). 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 (β) which is calculated using both the internal diameter and film thickness in the following equation:

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

The phase ratio can be used in two ways:

1. To categorize the best dimensions for an application:
   a. For volatile samples $\beta < 100$
   b. For general samples $\beta \sim 250$
   c. For high molecular weight samples $\beta > 400$
2. To transfer an analysis from a column of one ID to another without changing the method substantially, choose a column with a similar β 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 3-025).

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.

GC Column Phase Information

Range	Column	Phase	Polarity	Maximum Operating Temperature
TraceGOLD	TG-1MS	100% Dimethyl Polysiloxane	Non-Polar	330°C / 350°C
	TG-XLBMS	Proprietary	Non-Polar	360°C
	TG-5MS	5% Phenyl Methylpolysiloxane	Non-Polar	330°C / 350°C
	TG-SQC	Proprietary	Non-Polar	330°C / 350°C
	TG-5MS AMINE	Base Optimised 5% Phenyl Methylpolysiloxane	Non-Polar	300°C / 315°C
	TG-5SILMS	Similar to 5% Phenyl Methylpolysiloxane	Non-Polar	330°C / 350°C
	TG-5HT	5% Phenyl Methylpolysiloxane	Non-Polar	380°C / 400°C
	TG-35MS	35% Phenyl Methylpolysiloxane	Mid-Polarity	300°C / 320°C
	TG-35MS AMINE	Base Optimised 35% Phenyl Methylpolysiloxane	Mid-Polarity	220°C
	TG-1301MS	6% Cyanopropylphenyl Methylpolysiloxane	Mid-Polarity	260°C / 280°C
	TG-624	6% Cyanopropylphenyl Methylpolysiloxane	Mid-Polarity	240°C
	TG-VRX	Proprietary		260°C
	TG-VMS	Proprietary		260°C
	TG-1701MS	14% Cyanopropylphenyl Methylpolysiloxane	Mid-Polarity	260°C / 280°C
	TG-17MS	50% Phenyl Polysiloxane	Mid-Polarity	300°C / 320°C
	TG-225MS	50% Cyanopropylmethyl Phenylmethylpolysiloxane	Mid-Polarity	220°C / 240°C
	TG-200MS	Trifluoropropyl Methylpolysiloxane	Mid-Polarity	320°C / 340°C
	TG-WaxMS	Polyethylene Glycol (PEG)	Polar	240°C / 260°C
	TG-WaxMS A	Acid Optimised Polyethylene Glycol (PEG)	Polar	240°C / 250°C
	TG-WaxMS B	Base Optimised Polyethylene Glycol (PEG)	Polar	200°C / 220°C
	TG-OCP I	Proprietary		340°C
	TG-OCP II	Proprietary		340°C
	TG-OPP I	Proprietary		330°C
	TG-OPP II	Proprietary		330°C
	TG-ALC I	Proprietary		260°C
	TG-ALC II	Proprietary		260°C
	TG-POLAR	90% Cyanopropyl Phenylcyanopropyl Polysiloxane	Polar	275°C
	TG-1MT	100% Dimethyl Polysiloxane	Non-Polar	430°C
	TG-5MT	5% Diphenyl Polysiloxane	Non-Polar	430°C
	TG-WaxMT	Polyethylene Glycol (PEG)	Polar	240°C / 260°C

GC Column Phase Information *continued*

Range	Column	Phase	Polarity	Maximum Operating Temperature
TRACE	TR-1MS	100% Dimethyl Polysiloxane	Non-Polar	370°C / 380°C
	TR-5	5% Phenyl Methylpolysiloxane	Non-Polar	340°C / 350°C for films ≤ 1.5µm 280°C / 300°C for films > 1.5µm
	TR-5MS	5% Phenyl Polysilphenylene-siloxane	Non-Polar	360°C / 370°C for films ≤ 1.5µm 350°C / 360°C for films > 1.5µm
	TR-5HT	5% Phenyl Polycarborane Siloxane	Non-Polar	380°C / 400°C
	TR-35MS	35% Phenyl Polysilphenylene-siloxane	Mid-Polarity	360°C / 370°C
	TR-1701	14% Cyanopropylphenyl Polysiloxane	Mid-Polarity	280°C / 300°C
	TR-50MS	50% Phenyl Polysilphenylene-siloxane	Mid-Polarity	360°C / 370°C
	TR-225	50% Cyanopropylphenyl Polysiloxane	Mid-Polarity	230°C / 250°C
	TR-Wax	Polyethylene Glycol (PEG)	Polar	260°C / 280°C for films ≤ 1.0µm 240°C / 260°C for films > 1.0µm
	TR-WaxMS	Polyethylene Glycol (PEG)	Polar	280°C / 300°C
	TR-FFAP	TPA Modified Polyethylene Glygol (PEG)	Polar	240°C / 250°C
	TR-SimDist	100% Dimethyl Polysiloxane	Non-Polar	400°C for films ≤ 1.0µm 370°C for 2.65µm films
	TR-V1	6% Cyanopropylphenyl Polysiloxane	Mid-Polarity	280°C / 300°C
	TR-FAME	70% Cyanopropyl Polysilphenylene-siloxane	Polar	250°C / 260°C
	TR-524	Cyanopropylpheyl Dimethyl Polysiloxane	Mid-Polarity	240°C / 260°C
	TR-525	Proprietary	Mid-Polarity	340°C / 360°C
	TR-527	5% Phenyl Polysilphenylene-siloxane	Non-Polar	330°C / 350°C
	TR-8095	8% Phenyl Polycarborane-siloxane	Mid-Polarity	360°C / 370°C
	TR-8270	5% Phenyl Polysilphenylene-siloxane	Non-Polar	330°C / 350°C
	TR-PCB 8MS	8% Phenyl Polysilphenylene-siloxane	Mid-Polarity	330°C / 350°C
	TR-Dioxin 5MS	5% Phenyl Polysilphenylene-siloxane	Non-Polar	330°C / 350°C
	TR-Biodiesel (M)	100% Dimethyl Polysiloxane	Non-Polar	300°C / 320°C
	TR-Biodiesel (F)	Polyethylene Glycol (PEG)	Polar	280°C / 300°C
	TR-Biodiesel (G)	5% Phenyl Polysilphenylene-siloxane	Non-Polar	380°C / 400°C
	TR-DoA5	5% Phenyl Methylpolysiloxane	Non-Polar	330°C / 350°C
	TR-DoA35	35% Phenyl Polysilphenylene-siloxane	Mid-Polarity	330°C / 350°C
	TR-Pesticide	5% Phenyl Methylpolysiloxane	Non-Polar	330°C / 350°C
	TR-Pesticide II	Proprietary	Non-Polar	330°C / 350°C
	TR-Pesticide III	35% Phenyl Methylpolysiloxane	Mid-Polarity	300°C / 320°C
	TR-Pesticide IV	35% Phenyl Methylpolysiloxane	Mid-Polarity	300°C / 320°C
TracePLOT	TR-Bond Alumina (Na_2SO_4)	Na_2SO_4 Deactivated Aluminium Oxide	Non-Polar	200°C
	TR-Bond Alumina (KCl)	KCl Deactivated Aluminium Oxide	Non-Polar	200°C
	TR-Bond Msieve 5A	Molecular Sieve (5A)	Non-Polar	300°C
	TR-Bond Q	100% Divinylbenzene	Non-Polar	280°C / 300°C
	TR-Bond Q+	Porous Divinylbenzene Polymer	Mid-Polarity	250°C
	TR-Bond S	Divinylbenzene 4-Vinylpyridine	Mid-Polarity	250°C
	TR-Bond U	Divinylbenzene Ethylene Glycol / Dimethylacrylate	Polar	190°C

Download a copy of our GC Column selector mobile app
www.thermoscientific.com/tracegold

GC Column Selection by Manufacturer

Column	Phase	Manufacturer	Recommended Thermo Scientific Alternative	Page
Capillary	007-1(MS)	Quadrex	TG-1MS	**3-023**
	007-17(MPS-50)	Quadrex	TG-17MS	**3-037**
	007-1701	Quadrex	TG-1701MS	**3-036**
	007-2(MP-5)	Quadrex	TG-5MS	**3-025**
	007-2(MPS-5)	Quadrex	TG-5SilMS	**3-028**
	007-23	Quadrex	TR-FAME	**3-066**
	007-5MS	Quadrex	TG-5MS	**3-025**
	007-624	Quadrex	TG-624	**3-033**
	007-CW	Quadrex	TG-WaxMS	**3-040**
	AT-5	Alltech	TR-5	**3-054**
	AT50	Alltech	TG-17MS	**3-037**
	AT-5MS	Alltech	TG-5MS	**3-025**
	AT-624	Alltech	TG-624	**3-033**
	AT-Silar	Alltech	TR-FAME	**3-066**
	AT-Wax	Alltech	TR-WaxMS	**3-062**
	BP10	SGE	TG-1701MS	**3-036**
	BP20	SGE	TG-WaxMS	**3-040**
	BP21	SGE	TG-WaxMS A TR-FFAP	**3-041** **3-063**
	BP225	SGE	TG-225MS	**3-038**
	BP5	SGE	TG-5MS	**3-025**
	BP624	SGE	TG-624	**3-033**
	BPX1	SGE	TG-1MS TR-SimDist	**3-023** **3-064**
	BPX1	SGE	TR-SimDist	**3-064**
	BPX1	SGE	TR-SimDist	**3-064**
	BPX5	SGE	TG-5MS	**3-025**
	BPX50	SGE	TG-17MS	**3-037**
	BPX608	SGE	TG-35MS	**3-030**
	BPX70	SGE	TR-FAME	**3-066**
	BPX90	SGE	TG-POLAR	**3-048**
	BPX-Volatiles	SGE	TG-624	**3-033**
	CARBOWAX	Agilent	TR-WaxMS	**3-062**
	CP-1301	Varian	TG-1301MS	**3-032**
	CP-FFAP CB	Varian	TG-WaxMS A TR-FFAP	**3-041** **3-063**
	CP-Select624CB	Varian	TG-624	**3-033**
	CP-Sil 19CB	Varian	TG-1701MS	**3-036**
	CP-Sil 5CB MS	Varian	TG-1MT	**3-050**
	CP-Sil 88	Varian	TG-5SilMS TG-5MT	**3-028** **3-051**
	CP-Sil 8CB	Varian	TG-5SilMS	**3-028**
	CP-SimDist	Varian	TR-SimDist	**3-064**
	CP-Wax 51 (Amines)	Varian	TG-WaxMS B	**3-042**
	CP-Wax 52CB	Varian	TG-WaxMS TG-WaxMT	**3-040** **3-052**
	CP-Wax 58 CB (FFAP)	Varian	TG-WaxMS A TR-FFAP	**3-041** **3-063**

GC Column Selection by Manufacturer *continued*

Column	Phase	Manufacturer	Recommended Thermo Scientific Alternative	Page
Capillary	DB-1	Agilent	TG-1MT	**3-050**
	DB-1301	Agilent	TG-1301MS	**3-032**
	DB-17	Agilent	TG-17MS	**3-037**
	DB-1701	Agilent	TG-1701MS	**3-036**
	DB-17ht	Agilent	TG-17MS	**3-037**
	DB-17ms	Agilent	TG-17MS	**3-037**
	DB-1ms	Agilent	TG-1MS TG-1MT	**3-023** **3-050**
	DB-200	Agilent	TG-200MS	**3-039**
	DB-225	Agilent	TG-225MS	**3-038**
	DB-225ms	Agilent	TG-225MS	**3-038**
	DB-23	Agilent	TR-FAME	**3-066**
	DB-2887	Agilent	TR-SimDist	**3-064**
	DB-35	Agilent	TG-35MS	**3-030**
	DB-35ms	Agilent	TG-35MS	**3-030**
	DB-5	Agilent	TR-5 TG-5MT	**3-054** **3-051**
	DB-5.625	Agilent	TG-5MS	**3-025**
	DB-5ht	Agilent	TG-5HT	**3-029**
	DB-5ms	Agilent	TG-5MS	**3-025**
	DB-624	Agilent	TG-624	**3-033**
	DB-ALC1	Agilent	TG-ALC I	**3-047**
	DB-ALC2	Agilent	TG-ALC II	**3-047**
	DB-FFAP	Agilent	TG-WaxMS A TR-FFAP	**3-041** **3-063**
	DB-HT Sim Dis	Agilent	TR-SimDist	**3-064**
	DB-PETRO	Agilent	TG-1MS	**3-023**
	DB-WAX	Agilent	TG-WaxMS TG-WaxMT	**3-040** **3-052**
	DB-WAXetr	Agilent	TR-WaxMS TG-WaxMT	**3-062** **3-052**
	DB-XLB	Agilent	TG-XLBMS	**3-024**
	Elite-1301	PerkinElmer	TG-1301MS	**3-032**
	Elite-17	PerkinElmer	TG-17MS	**3-037**
	Elite-1701	PerkinElmer	TG-1701MS	**3-036**
	Elite-17ms	PerkinElmer	TG-17MS	**3-037**
	Elite-200	PerkinElmer	TG-200MS	**3-039**
	Elite-23	PerkinElmer	TR-FAME	**3-066**
	Elite-35ms	PerkinElmer	TG-35MS	**3-030**
	Elite-5	PerkinElmer	TR-5	**3-054**
	Elite-5ms	Perkin Elmer	TG-5MS	**3-025**
	Elite-5ht	PerkinElmer	TG-5HT	**3-029**
	Elite-624	PerkinElmer	TG-624	**3-033**
	Elite-FFAP	PerkinElmer	TG-WaxMS A TR-FFAP	**3-041** **3-063**
	Elite-WAX	PerkinElmer	TG-WaxMS	**3-040**
	Elite-WAX ETR	PerkinElmer	TG-WaxMS	**3-040**

Column	Phase	Manufacturer	Recommended Thermo Scientific Alternative	Page
Capillary	HP-1	Agilent	TG-1MT	**3-050**
	HP-17	Agilent	TG-17MS	**3-037**
	HP-1701	Agilent	TG-1701MS	**3-036**
	HP-1MS	Agilent	TG-1MS TG-1MT	**3-023** **3-050**
	HP20M	Agilent	TG-WaxMS	**3-040**
	HP-23	Agilent	TR-FAME	**3-066**
	HP-35	Agilent	TG-35MS	**3-030**
	HP-35MS	Agilent	TG-35MS	**3-030**
	HP-5	Agilent	TR-5	**3-054**
	HP-50+	Agilent	TG-17MS	**3-037**
	HP-5MS	Agilent	TG-5MS TG-5MT	**3-025** **3-051**
	HP5-TA	Agilent	TG-5MS	**3-025**
	HP-88	Agilent	TR-FAME	**3-066**
	HP-FFAP	Agilent	TG-WaxMS A TR-FFAP	**3-041** **3-063**
	HP-INNOWax	Agilent	TG-WaxMS TG-WaxMT	**3-040** **3-052**
	HP-VOC	Agilent	TG-624	**3-033**
	HP-Wax	Agilent	TG-WaxMS TG-WaxMT	**3-040** **3-052**
	HT5	SGE	TG-5HT	**3-029**
	HT8	SGE	TR-PCB 8MS	**3-068**
	MDN-1	Sigma Aldrich	TG-1MT	**3-050**
	MDN-35	Sigma Aldrich	TG-35MS	**3-030**
	MDN-5	Sigma Aldrich	TR-5 TG-5MT	**3-054** **3-051**
	MDN-5S	Sigma Aldrich	TG-5SilMS	**3-028**
	Nukol	Sigma Aldrich	TG-WaxMS	**3-040**
	OV-17	Ohio Valley	TG-17MS	**3-037**
	OV-1701	Ohio Valley	TG-1701MS	**3-036**
	OV-5	Ohio Valley	TR-5	**3-054**
	OV-624	Ohio Valley	TG-624	**3-033**
	Petrocol 2887	Sigma Aldrich	TR-SimDist	**3-064**
	Petrocol DH	Sigma Aldrich	TG-1MS	**3-023**
	Petrocol EX2887	Sigma Aldrich	TR-SimDist	**3-064**
	MXT-1	Restek	TG-1MT	**3-050**
	MXT-5	Restek	TG-5MT	**3-051**
	MXT-WAX	Restek	TG-WaxMT	**3-052**
	Rtx-1301	Restek	TG-1301MS	**3-032**
	Rtx-1701	Restek	TG-1701MS	**3-036**
	Rtx-1MS	Restek	TG-1MS	**3-023**
	Rtx-200	Restek	TG-200MS	**3-039**
	Rtx-200MS	Restek	TG-200MS	**3-039**
	Rtx-225	Restek	TG-225MS	**3-038**
	Rtx-2330	Restek	TG-POLAR	**3-048**
	Rtx-2560	Restek	TR-FAME	**3-066**
	Rtx-2887	Restek	TR-SimDist	**3-064**
	Rtx-35	Restek	TG-35MS	**3-030**
	Rtx-35 Amine	Restek	TG-35MS AMINE	**3-031**

GC Column Selection by Manufacturer *continued*

Column	Phase	Manufacturer	Recommended Thermo Scientific Alternative	Page
Capillary	Rtx-35MS	Restek	TG-35MS	**3-030**
	Rtx-5	Restek	TR-5	**3-054**
	Rtx-5 Amine	Restek	TG-5MS AMINE	**3-027**
	Rtx-50	Restek	TG-17MS	**3-037**
	Rtx-5SilMS	Restek	TG-5SilMS	**3-028**
	Rtx-624	Restek	TG-624	**3-033**
	Rtx-CLPesticides	Restek	TG-OCP I	**3-045**
	Rtx-CLPesticides2	Restek	TG-OCP II	**3-045**
	Rtx-OPPesticides	Restek	TG-OPP I	**3-045**
	Rtx-OPPesticides2	Restek	TG-OPP II	**3-045**
	Rtx-VMS	Restek	TG-VMS	**3-035**
	Rtx-Volatiles	Restek	TG-624	**3-033**
	Rtx-VRX	Restek	TG-VRX	**3-034**
	Rtx-Wax	Restek	TG-WaxMS	**3-040**
	Rxi-17	Restek	TG-17MS	**3-037**
	Rxi-1ms	Restek	TG-1MS	**3-023**
	Rxi-5HT	Restek	TG-5HT	**3-029**
	Rxi-5MS	Restek	TG-5MS	**3-025**
	Rxi-5Sil MS	Restek	TG-5SilMS	**3-028**
	Rxi-XLB	Restek	TG-XLBMS	**3-024**
	SE-30	Agilent	TG-1MS	**3-0 23**
	SE-52	Agilent	TG-5MS	**3-0 25**
	SE-54	Agilent	TG-5MS	**3-0 25**
	SolGel-Wax	SGE	TG-WaxMS	**3-040**
	SP-2100	Supelco	TG-1MS	**3-023**
	SP-2250	Supelco	TG-17MS	**3-037**
	SP-2330	Supelco	TR-FAME	**3-066**
	SP-2380	Supelco	TR-FAME	**3-066**
	SPB-1	Supelco	TG-1MT	**3-050**
	SPB-17	Supelco	TG-17MS	**3-037**
	SPB-35	Supelco	TG-35MS	**3-030**
	SPB-5	Supelco	TR-5 / TG-5MT	**3-054 / 3-051**
	SPB-50	Supelco	TG-17MS	**3-037**
	SUPELCOWAX-10	Supelco	TG-WaxMS TG-WaxMT	**3-040** **3-052**
	Stabilwax	Restek	TG-WaxMS	**3-040**
	Stabilwax-DA	Restek	TG-WaxMS A TR-FFAP	**3-041** **3-063**
	Stabilwax-DB	Restek	TG-WaxMS B	**3-042**
	SUPELCOWAX-10	Supelco	TG-WaxMS	**3-040**
	VF-17ms	Varian	TG-17MS	**3-037**
	VF-1ms	Varian	TG-1MS TG-1MT	**3-023** **3-058**
	VF-200ms	Varian	TG-200MS	**3-039**
	VF-23ms	Varian	TR-FAME	**3-066**
	VF-35ms	Varian	TG-35MS	**3-030**
	VF-5ht	Varian	TG-5HT	**3-029**
	VF-5ms	Varian	TG-5MS	**3-025**
	VF-Xms	Varian	TG-XLBMS	**3-024**

Column	Phase	Manufacturer	Recommended Thermo Scientific Alternative	Page
Capillary	ZB-1701	Phenomenex	TG-1701MS	**3-036**
	ZB-1701P	Phenomenex	TG-WaxMS	**3-040**
	ZB-1HT Inferno	Phenomenex	TR-SimDist	**3-064**
	ZB-1MS	Phenomenex	TG-1MS	**3-023**
	ZB-35	Phenomenex	TG-35MS	**3-030**
	ZB-5	Phenomenex	TR-5	**3-054**
	ZB-50	Phenomenex	TG-17MS	**3-037**
	ZB-5HT Inferno	Phenomenex	TG-5HT	**3-029**
	ZB-5MS	Phenomenex	TG-5MS	**3-025**
	ZB-5MS Si	Phenomenex	TG-5SilMS	**3-028**
	ZB-624	Phenomenex	TG-624	**3-033**
	ZB-FFAP	Phenomenex	TG-WaxMS A TR-FFAP	**3-041** **3-063**
	ZB-WAX	Phenomenex	TG-WaxMS	**3-040**
	ZB-WAXplus	Phenomenex	TR-WaxMS	**3-062**
PLOT	Alumina-PLOT	Supelco	TG-BOND Alumina (Na_2SO_4)	**3-075**
	AT-Alumina	Alltech	TG-BOND Alumina (Na_2SO_4)	**3-075**
	AT-Molsieve	Alltech	TG-BOND Msieve 5A	**3-076**
	AT-Q	Alltech	TG-BOND Q	**3-077**
	CP-Al2O3/KCl	Varian	TG-BOND Alumina (KCl)	**3-075**
	CP-Al2O3/Na_2SO_4	Varian	TG-BOND Alumina (Na_2SO_4)	**3-075**
	CP-Molsieve 5A	Varian	TG-BOND Msieve 5A	**3-076**
	CP-PoraPLOT Q	Varian	TG-BOND Q	**3-077**
	CP-PoraPLOT S	Varian	TG-BOND S	**3-078**
	CP-PoraPLOT U	Varian	TR-BOND U	**3-078**
	GS-Alumina	Agilent	TG-BOND Alumina (Na_2SO_4)	**3-075**
	GS-Alumina KCl	Agilent	TG-BOND Alumina (KCl)	**3-075**
	GS-Molsieve	Agilent	TG-BOND Msieve 5A	**3-076**
	GS-Q	Agilent	TG-BOND Q+	**3-077**
	HP PLOT M	Agilent	TG-BOND Alumina (Na_2SO_4)	**3-075**
	HP PLOT Molsieve	Agilent	TG-BOND Msieve 5A	**3-076**
	HP PLOT S	Agilent	TG-BOND Alumina (Na_2SO_4)	**3-075**
	HP-UPLOT	Agilent	TG-BOND U	**3-078**
	Molsieve 5A PLOT	Supelco	TG-BOND Msieve 5A	**3-076**
	PLT-5A	Quadrex	TG-BOND Msieve 5A	**3-076**
	PoraBond Q	Varian	TG-BOND Q	**3-077**
	PoraBond U	Varian	TG-BOND U	**3-078**
	Rt-Alumina Bond (KCl)	Restek	TG-BOND Alumina (KCl)	**3-075**
	Rt-Alumina Bond (Na_2SO_4)	Restek	TG-BOND Alumina (Na_2SO_4)	**3-075**
	Rt-Msieve 5A	Restek	TG-BOND Msieve 5A	**3-076**
	Rt-Q-BOND	Restek	TG-BOND Q	**3-077**
	Rt-QS-BOND	Restek	TG-BOND Q+	**3-077**
	Rt-S-BOND	Restek	TG-BOND S	**3-078**
	Rt-U-BOND	Restek	TG-BOND U	**3-078**
	Supel-Q-PLOT	Supelco	TG-BOND Q	**3-077**

GC Column Selection by Application

● Recommended
● Alternative

	TG-1MS, TG-1MT, TR-1MS	TG-5MS, TG-5SilMS, TG-5MS AMINE, TG-5MT, TR-5, TR-5MS	TG-35MS, TG-35MS AMINE, TR-35MS	TG-17MS	TG-1301MS	TG-1701MS, TR-1701	TG-WaxMS, TG-WaxMT, TR-Wax, TR-WaxMS	TG-WaxMS A	TG-WaxMS B	TG-POLAR	TG-624	TG-200MS	TG-225MS	TG-5HT, TR-5HT	TG-XLBMS	TG-VRX, TG-VMS	TG-OCP I, TG-OCP II	TG-OPP I, TG-OPP II	TG-ALC I, TG-ALC II	TR-FFAP	TR-V1	TR-FAME	TR-Simdist	TR-524	TR-525	TR-527	TR-8270	TR-DoA5	TR-DoA35	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	TR-8095
Acids		○					○	●												●																				
Acid/Neutral Drugs		○	●																																					
Alcohols		○			○		○	○	○	○	○	○								○	○																			
Alcohols in Beverages					●		○	○	○		○									○	●																			
Aldehydes							○	○	○	○										○																				
Alditol Acetates (sugars)		○					○	○	○				●							○		●																		
Amines – Aliphatic		○	●		○		○		●		○										○																			
Amines – Aromatic		○	●		○		○		●		○										○																			
Antidepressants		○	●																																					
Benzenes, substituted														●																									
Biodiesel – Methanol																															●								
Biodiesel – FAMEs										○																						●							
Biodiesel – Glycerine																																	●						
Blood Alcohols										○									●																				
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	**3-023**
		TG-1MT	**3-050**
		TR-1MS	**3-053**
		TR-1MS	**3-053**
G2	Dimethylpolysiloxane gum	TG-1MS	**3-023**
		TG-1MT	**3-050**
		TR-1MS	**3-053**
		TR-1MS	**3-053**
G3	50% Phenyl-50% Methylpolysiloxane	TG-17MS	**3-037**
		TR-50MS	**3-059**
G5	3-Cyanopropylpolysiloxane	TR-FAME	**3-066**
G6	Trifluoropropyl Methylpolysiloxane	TG-200MS	**3-039**
G7	50% Cyanopropyl Phenylmethyl Polysiloxane	TG-225MS	**3-038**
G16	Polyethylene Glycol Compound (ave. mol. wt. ~15,000) with Diepoxide Linker	TG-WaxMS	**3-040**
		TG-WaxMT	**3-052**
		TR-WaxMS	**3-062**
		TR-Wax	**3-061**
G19	50% Cyanopropyl 50% Phenylmethyl Polysiloxane	TG-225MS	**3-038**
G20	Polyethylene Glycol (ave. mol. wt. of 380 – 420)	TG-WaxMS	**3-040**
		TG-WaxMT	**3-052**
		TR-WaxMS	**3-062**
		TR-Wax	**3-061**
G27	5% Phenyl-95% Methylpolysiloxane	TG-5MS	**3-025**
		TG-5MT	**3-051**
		TR-5MS	**3-055**
		TR-5MS	**3-055**
G36	1% Vinyl-5% Phenylmethylpolysiloxane	TR-5MS	**3-055**
		TR-5MS	**3-055**
G38	Phase G1 containing a small percentage of tailing inhibitor	TG-5MS	**3-025**
		TG-5MT	**3-051**
		TR-5MS	**3-055**
		TR-5MS	**3-055**
G42	35% Phenyl-65% Dimethylpolysiloxane (percentages refer to molar substitution)	TG-35MS	**3-030**
		TR-35MS	**3-057**
G43	6% Cyanopropylphenyl-94% Dimethylpolysiloxane (percentages refer to molar substitution)	TG-624	**3-053**
		TR-V1	**3-065**
G46	14% Cyanopropylphenol-86% Methylpolysiloxane	TG-1701MS	**3-036**
		TR-1701	**3-058**
G48	90% Biscyanopropyl 10% Cyanopropyl Phenyl Polysiloxane	TG-POLAR	**3-048**

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**	**3-040**
D2245	Oils and oil acids in solvent-reducible paints	TR-FAME	**260M154P**	**3-066**
D2268	High-purity n-heptane and isooctane	TG-1MS	**Inquire**	**3-023**
D2306	C8 aromatic hydrocarbons	TG-WaxMS	**26088-1540**	**3-040**
D2360	Trace impurities in monocyclic aromatic hydrocarbons	TG-WaxMS	**26088-1550**	**3-040**
D2456	Polyhydric alcohols in alkyd resin	TG-WaxMS	**26088-2980**	**3-040**
D2580	Phenols in water	TG-5MS	**26098-2230**	**3-025**
D2753	Oil and oil acids	TR-FAME	**260M154P**	**3-066**
D2800	FAME analysis	TR-FAME	**260M154P**	**3-066**
D2804	Purity of methyl ethyl ketone	TG-WaxMS	**26088-2980**	**3-040**
D2887	Boiling range distribution of petroleum fractions	TR-SimDist	**260S348P**	**3-064**
D2998	Polyhydric alcohols in alkyd resin	TG-1MS	**26099-2970**	**3-023**
D2999	Monopentaerythritol in commercial pentaerythritol	TG-1MS	**Inquire**	**3-023**
D3009	Composition of turpentine	TG-WaxMS	**26088-2240**	**3-040**
D3054	Cyclohexane	TG-1MS	**Inquire**	**3-023**
D3168	Polymers in emulsion paints	TG-1MS	**26099-2970**	**3-023**
D3257	Aromatics in mineral spirits	TG-624	**26085-3960**	**3-033**
D3271	Solvent analysis in paints	TG-WaxMS	**26088-2980**	**3-040**
D3304	PCBs in environmental materials	TG-5MS TR-PCB 8MS	**26098-1540** **26AJ148P**	**3-025** **3-068**
D3329	Purity of methyl isobutyl ketone	TG-WaxMS TG-624	**26088-2980** **26085-3960**	**3-040** **3-033**
D3432	Unreacted toluene diisocyanates in urethane prepolymers and coating solutions	TG-1MS	**26099-3090**	**3-023**
D3447	Purity of halogentated organic solvents	TG-624	**26085-3960**	**3-033**
D3452	Identification of rubber	TG-1MS	**26099-3090**	**3-023**
D3457	FAME analysis	TR-FAME	**260M154P**	**3-066**
D3534	PCBs in water	TG-5MS TR-PCB 8MS	**26098-3360** **26AJ148P**	**3-025** **3-068**
D3545	Alcohol content and purity of acetate esters	TG-624	**26085-3960**	**3-033**
D3687	Alcohol content and purity of acetate esters	TG-WaxMS	**26088-2980**	**3-040**
D3695	Volatile alcohols in water by direct aqueous-injection GC	TG-WaxMS	**26088-2980**	**3-040**
D3710	Boiling range distribution of gasoline and gasoline fractions	TR-SimDist	**260S348P**	**3-064**
D3725	Fatty acids in drying oils	TR-FAME	**Inquire**	**3-066**
D3760	Isopropylbenzene (cumene)	TG-WaxMS TG-1MS	**26088-1550** **Inquire**	**3-040** **3-023**
D3797	o-Xylene	TG-WaxMS	**26088-2360**	**3-040**
D3798	p-Xylene	TG-WaxMS	**26088-2360**	**3-040**
D3871	Purgeable organic compounds in water using headspace sampling	TG-624	**26085-4080**	**3-033**
D3893	Purity of methyl amyl ketone and methyl isoamyl ketone	TG-624	**26085-3960**	**3-033**
D3973	Low molecular weight halogenated hydrocarbons in water	TG-624	**26085-3960**	**3-033**
D4059	PCBs in insulating liquids	TG-5MS TR-PCB 8MS	**26098-1540** **26AJ148P**	**3-025** **3-068**
D4415	Dimer in acrylic acid	TG-WaxMS	**26088-1430**	**3-040**

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**	**3-033**
D4735	Trace thiophene in refined benzene	TG-WaxMS	**26088-2250**	**3-040**
D4773	Propylene gycol monomethyl ether, dipropylene glycol monomethyl ether, and propylene glycol monomethyl ether acetate	TR-5	**260E470P**	**3-054**
D4806	Denatured fuel ethanol for blending with gasoline for use as automotive spark-ignition engine fuel	TG-1MS	**Inquire**	**3-023**
D4864	Traces of methanol in propylene concentrates	TG-5MS	**Inquire**	**3-025**
D4947	Chlordane and heptachlor in indoor air	TG-5MS	**26098-3360**	**3-025**
D5060	Impurities in high-purity ethylbenzene	TG-WaxMS	**26088-2360**	**3-040**
D5075	Nicotine in indoor air	TG-5MS	**26098-2970**	**3-025**
D5134	Petroleum naphthas through n-nonane	TG-1MS	**Inquire**	**3-023**
D5135	Styrene	TG-WaxMS	**26088-2360**	**3-040**
D5399	Boiling point distribution of hydrocarbon solvents	TR-SimDist	**260S348P**	**3-064**
D5441	Methyl t-butyl ether	TG-1MS	**Inquire**	**3-023**
D5442	Petroleum waxes	TG-1MS TG-5MS	**26099-1430** **26098-1300**	**3-023** **3-025**
D5480	Motor oil volatility	TG-5MS	**Inquire**	**3-025**
D5501	Ethanol content of denatured fuel ethanol	TG-1MS	**Inquire**	**3-023**
D5599	Oxygenates in gasoline by oxygen selective FID	TG-1MS	**26099-3080**	**3-023**
D5623	Sulfur compounds in light petroleum liquids using sulfur selective detection	TG-1MS	**Inquire**	**3-023**
D5713	High purity benzene for cyclohexane feedstock	TG-1MS	**Inquire**	**3-023**
D5739	Oil spill source identification using positive ion electron impact low resolution MS	TG-5MS	**26098-1420**	**3-025**
D5769	Benzene, toluene and total aromatics in finished gasolines	TG-1MS TG-624	**26099-3080** **26085-3330**	**3-023** **3-033**
D5790	Purgeable organic compounds in water	TG-5MS	**26098-1420**	**3-025**
D5812	Organochlorine pesticides in water	TG-1701MS TG-17MS TG-WaxMS	**26090-1420** **26089-1420** **26088-1550**	**3-036** **3-037** **3-040**
D5917	Trace impurities in monocyclic aromatic hydrocarbons	TR-FAME	**260M154P**	**3-066**
D5974	Fatty androsin acids in tall oil fraction products	TG-1MS	**Inquire**	**3-023**
D5986	Oxygenates, benzene, toluene, C8-C12 aromatics and total aromatics in finished gasoline by GC/FTIR	TG-5MS	**26098-1420**	**3-025**
D6160	PCBs in waste materials	TR-SimDist	**260S250P**	**3-064**
D6352	Boiling range distribution of petroleum fractions	TG-1MS TR-SimDist	**Inquire** **260S250P**	**3-023** **3-064**
D6417	Engine oil volatility	TG-1MS	**Inquire**	**3-023**
D6584	Free and Total Glycerin in B-100 Biodiesel	TR-BioDiesel (G)	**26AF024P**	**3-069**
D6729	Individual components in spark ignition engine fuels	TG-1MS	**Inquire**	**3-023**
D6730	Individual components in spark ignition engine fuels using precolumn	TG-5MS TG-624	**26098-2960** **26085-4080**	**3-025** **3-033**
E202	Ethylene glycols and propylene glycols	TR-5	**260E470P**	**3-054**
E475	Di-tert-butyl peroxide	TG-1MS	**Inquire**	**3-023**
E1616	Acetic anhydride	TG-WaxMS	**26088-3090**	**3-040**
E1863	Acrylonitrile	TR-SimDist	**260S250P**	**3-064**

GC Column Selection by U.S. 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**	**3-033**
502.1	Volatile halogenated compounds	TG-624	**26085-4080**	**3-033**
		TR-5MS	**260F396P**	**3-055**
502.2	Volatile organic compounds	TG-624	**26085-4080**	**3-033**
		TG-624	**26085-3320**	**3-033**
503.1	Volatile aromatic and unsaturated organics	TG-624	**26085-4080**	**3-033**
		TR-5MS	**260F396P**	**3-055**
504	EDB and DBCP	TR-5MS	**260F396P**	**3-055**
		TG-5MS	**26098-2240**	**3-025**
504.1	EDB and DBCP	TR-5MS	**260F396P**	**3-055**
		TG-5MS	**26098-2240**	**3-025**
506	Phthalates and adipates	TG-1MS	**26099-1430**	**3-023**
		TG-5MS	**26098-1430**	**3-025**
507	Organonitrogen and organophosphorus pesticides	TG-5MS	**26098-1420**	**3-025**
		TG-5MT	**26M98-1420**	**3-051**
		TG-17MS	**26089-1420**	**3-037**
509	Ethylene thiourea	TG-1701MS	**26090-1420**	**3-036**
		TG-WaxMS	**26088-1300**	**3-040**
513	Dioxin	TG-5MS	**26098-1540**	**3-025**
		TG-5MT	**26M98-1540**	**3-051**
515.2	Chlorinated herbicides	TG-5MS	**26098-1430**	**3-025**
		TG-17MS	**26089-1430**	**3-051**
524.1	Volatile organic compounds	TR-524	**26RV495P**	**3-067**
		TG-624	**26085-4080**	**3-033**
		TG-624	**26085-3320**	**3-033**
524.2	Volatile organic compounds	TR-524	**26RV495P**	**3-067**
		TG-624	**26085-4080**	**3-033**
		TG-624	**26085-3320**	**3-033**
525.1	Semi-volatile organic compounds	TR-525	**26RX142P**	**3-067**
		TG-5MS	**26098-1420**	**3-025**
		TG-5MT	**26M98-1420**	**3-051**
525.2	Semi-volatile organic compounds	TR-525	**26RX142P**	**3-067**
		TG-5MS	**26098-1420**	**3-025**
		TG-5MT	**26M98-1420**	**3-051**
527	Selected pesticides and flame retardants	TR-527	**26RF142P**	**3-067**
		TG-5MS	**26098-1420**	**3-025**
		TG-5MT	**26M98-1420**	**3-051**
548.1	Endothall	TG-1MS	**26099-1430**	**3-023**
		TG-5MS	**26098-1420**	**3-025**
		TG-5MT	**26M98-1420**	**3-051**
551	Chlorinated disinfection by-products/chlorinated solvents	TG-5MS	**26098-1420**	**3-025**
		TG-5MT	**26M98-1420**	**3-051**
		TG-1701MS	**26090-2240**	**3-036**
552	Haloacetic acids	TG-1701MS	**26090-1430**	**3-036**
		TG-35MS	**26094-1430**	**3-030**
552.1	Haloacetic acids and dalapon	TG-1701MS	**26090-1430**	**3-036**
		TG-35MS	**26094-1430**	**3-030**

GC Column Selection by U.S. 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**	**3-033** **3-033**
602	Purgable aromatics	TG-624 TG-5MS TG-5MT	**26085-4080** **26098-2960** **26M98-2960**	**3-033** **3-025** **3-051**
603	Acrolein and acrylonitrile	TG-624 TG-5MS TG-5MT	**26085-4080** **26098-2960** **26M98-2960**	**3-033** **3-025** **3-051**
604	Phenols	TG-5MS TG-5MT TG-35MS	**26098-1420** **26M98-1420** **26094-1420**	**3-025** **3-051** **3-030**
606	Phthalate ester	TG-5MS TG-5MT TG-35MS	**26098-1420** **26M98-1420** **26094-1420**	**3-025** **3-051** **3-030**
607	Nitrosamines	TG-5MS TG-5MT TG-35MS	**26098-1420** **26M98-1420** **26094-1420**	**3-025** **3-051** **3-030**
608.1	Organochlorine pesticides in industrial and municipal water	TG-5MS	**26098-2240**	**3-025**
608.2	Organochlorine pesticides in wastewater	TG-5MS	**26098-2240**	**3-025**
609	Nitroaromatics and isophorone	TG-5MS TG-35MS	**26098-1430** **26094-1430**	**3-025** **3-030**
610	Polynuclear aromatic hydrocarbons	TG-5MS TG-5MT	**26098-1420** **26M98-1420**	**3-025** **3-051**
611	Haloethers	TG-5MS TG-35MS	**26098-1430** **26094-1430**	**3-025** **3-030**
612	Chlorinated hydrocarbons	TG-5MS TG-35MS	**26098-1430** **26094-1430**	**3-025** **3-030**
613	Dioxin	TG-5MS TG-5MT	**26098-1540** **26M98-1540**	**3-025** **3-051**
614	Organophosphorous pesticides in industrial and municipal water	TG-5MS TG-5MT TG-17MS	**26098-1420** **26M98-1420** **26089-1420**	**3-025** **3-051** **3-037**
614.1	Organophosphorous pesticides in wastewater	TG-5MS TG-5MT TG-17MS	**26098-1420** **26M98-1420** **26089-1420**	**3-025** **3-051** **3-037**
615	Chlorinated herbicides in industrial and municipal water	TG-5MS TG-5MT TG-17MS	**26098-1420** **26M98-1420** **26089-1420**	**3-025** **3-051** **3-037**
616	C, H, and O compounds	TG-1MS TG-5MS TG-5MT	**26099-1420** **26098-1420** **26M98-1420**	**3-023** **3-025** **3-051**
617	Organohalide pesticides and PCBs in industrial and municipal water	TG-5MS TG-5MT	**26098-1420** **26M98-1420**	**3-025** **3-051**
618	Volatile pesticides in industrial and municipal water	TG-1MS TG-5MS	**26099-2240** **26098-2240**	**3-023** **3-025**
619	Triazines, pesticides and PCBs in industrial and municipal water	TG-35MS	**26094-1430**	**3-030**
620	Diphenylamine in industrial and municipal water	TG-1MS TG-5MS	**26099-1430** **26098-1430**	**3-023** **3-025**
622	Organophosphorous pesticides in industrial and municipal water	TG-5MS TG-5MT TG-17MS	**26098-1420** **26M98-1420** **26089-1420**	**3-025** **3-051** **3-037**

GC Column Selection by U.S. EPA Waste Water Test Method *continued*

Method	Title	Recommended Thermo Scientific Phase	Part Number	Page
622.1	Thiophosphate pesticides	TG-5MS TG-5MT TG-35MS	**26098-1420** **26M98-1420** **26094-1420**	**3-025** **3-051** **3-030**
624	Purgeables	TG-624 TG-624	**26085-4080** **26085-3320**	**3-033** **3-033**
625	Base/neutrals and acids	TG-5MS TG-5MT TG-5MS	**26098-1420** **26M98-1420** **26098-1430**	**3-025** **3-051** **3-025**
627	Dinitroaniline pesticides in industrial and municipal water	TG-5MS TG-35MS	**26098-1430** **26094-1430**	**3-025** **3-030**
630.1	Dithiocarbamate pesticides as carbon disulfide	TG-5MS TG-5MS TG-5MT	**26098-1420** **26098-1430** **26M98-1420**	**3-025** **3-025** **3-051**
633	Organonitrogen pesticides	TG-5MS TG-5MT TG-17MS	**26098-1420** **26M98-1420** **26089-1420**	**3-025** **3-051** **3-037**
633.1	Neutral nitrogen-containing pesticides	TG-5MS TG-5MT TG-35MS	**26098-1420** **26M98-1420** **26094-1420**	**3-025** **3-051** **3-030**
634	Thiocarbamate pesticides	TG-5MS TG-5MT TG-35MS	**26098-1420** **26M98-1420** **26094-1420**	**3-025** **3-051** **3-030**
645	Amine pesticides and lethane in industrial and municipal water	TG-5MS TG-5MT TG-35MS	**26098-1420** **26M98-1420** **26094-1420**	**3-025** **3-051** **3-030**
646	Dinitro aromatic pesticides	TG-5MS TG-5MT TG-35MS	**26098-1420** **26M98-1420** **26094-1420**	**3-025** **3-051** **3-030**

GC Column Selection by U.S. 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**	**3-033** **3-033**
8011	EDB and DBCP	TG-5MS TG-5MT	**26098-1420** **26M98-1420**	**3-025** **3-051**
8015B	Nonhalogenated volatile organics	TG-624 TG-5MS TG-5MT	**26085-4080** **26098-2960** **26M98-2960**	**3-033** **3-025** **3-051**
8020A	Aromatic volatile organics	TG-624 TG-5MS TG-5MT	**26085-4080** **26098-2960** **26M98-2960**	**3-033** **3-025** **3-051**
8021A	Halogenated and aromatic volatile organics	TG-624 TG-5MS TG-5MT	**26085-4080** **26098-2960** **26M98-2960**	**3-033** **3-025** **3-051**
8030A	Acrolein and acrylonitrile	TG-624	**26085-4080**	**3-033**
8031	Acrylonitrile	TG-624	**26085-3390**	**3-033**
8032	Acrylamide	TG-624	**26085-3390**	**3-033**

Method	Title	Recommended Thermo Scientific Phase	Part Number	Page
8040A	Phenols	TG-5MS TG-5MT TG-35MS	**26098-1420** **26M98-1420** **26094-1420**	**3-025** **3-051** **3-030**
8060	Phthalate esters	TG-5MS TG-5MT	**26098-1420** **26M98-1420**	**3-025** **3-051**
8061	Phthalate esters	TG-5MS TG-5MT	**26098-1420** **26M98-1420**	**3-025** **3-051**
8070	Nitrosamines	TG-5MS	**26098-1430**	**3-025**
8081	Organochlorine pesticides and PCBs	TG-5MS TG-5MT TG-17MS	**26098-2230** **26M98-2230** **26089-1420**	**3-025** **3-051** **3-037**
8090	Nitroaromatics and cyclic ketones	TG-5MS	**26098-1430**	**3-025**
8095	Explosives	TR-8095	**260P123P**	**3-067**
8100	Polynuclear aromatic hydrocarbons	TG-5MS TG-5MT	**26098-1420** **26M98-1420**	**3-025** **3-051**
8110	Haloethers	TG-5MS TG-5MT	**26098-1420** **26M98-1420**	**3-025** **3-051**
8120A	Chlorinated hydrocarbons	TG-5MS	**26098-1430**	**3-025**
8121	Chlorinated hydrocarbons	TG-5MS	**26098-1430**	**3-025**
8140	Organophosphorous pesticides	TG-5MS TG-5MT TG-17MS	**26098-1420** **26M98-1420** **26089-1420**	**3-025** **3-051** **3-037**
8141A	Organophosphorous pesticides	TG-5MS TG-5MT TG-17MS	**26098-1420** **26M98-1420** **26089-1420**	**3-025** **3-051** **3-037**
8150B	Chlorinated herbicides	TG-5MS TG-5MT TG-17MS	**26098-1420** **26M98-1420** **26089-1420**	**3-025** **3-051** **3-037**
8151	Chlorinated herbicides	TG-5MS TG-5MT TG-17MS	**26098-1420** **26M98-1420** **26089-1420**	**3-025** **3-051** **3-037**
8240B	Volatile organic compounds	TG-624 TG-624	**26085-4080** **26085-3320**	**3-033** **3-033**
8250A	Semi-volatile organic compounds	TG-5MS TG-5MS TG-5MT	**26098-1420** **26098-1430** **26M98-1420**	**3-025** **3-025** **3-051**
8260A	Volatile organic compounds	TG-624 TG-624	**26085-4080** **26085-3320**	**3-033** **3-033**
8270B	Semi-volatile organic compounds	TG-5MS TG-5MS TG-5MT	**26098-1420** **26098-1430** **26M98-1420**	**3-025** **3-025** **3-051**
8270C	Semi-volatile organic compounds	TR-8270	**26RF296P**	**3-067**
8280	Polychlorinated dioxins and furans	TG-5MS TG-5MT	**26098-1540** **26M98-1540**	**3-025** **3-051**
8290	Polychlorinated dioxins and furans	TG-5MS TG-5MT	**26098-1540** **26M98-1540**	**3-025** **3-051**

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**	**3-066**
1001	Methylene chloride	TG-1MS	**26099-1430**	**3-023**
1002	Chloroprene	TG-1MS TG-1MT	**26099-2960** **26M99-2960**	**3-023** **3-050**
1003	Halogenated hydrocarbons	TG-624	**26085-3390**	**3-033**
1004	Dichloroethyl ether	TG-1MS	**Inquire**	**3-023**
1005	Methylene chloride	TG-WaxMS	**26088-1430**	**3-040**
1010	Epichlorohydrin	TG-WaxMS	**Inquire**	**3-040**
1011	Ethyl bromide	TG-WaxMS	**26088-2240**	**3-040**
1013	Propylene dichloride	TG-WaxMS	**Inquire**	**3-040**
1015	Vinylidene chloride	TG-624	**Inquire**	**3-033**
1016	1,1,2,2-Tetrachoro-2,2-difluoroethane and 1,1,2,2-tetrachoro-1,2-difluoroethane	TG-WaxMS	**26088-2240**	**3-040**
1018	Dichlorodifuoromethane, 1,2-dichlorotetrafluoroethane and chlorodifluoromethane	TG-1MS	**26099-2970**	**3-023**
1020	1,1,2-Trichloro-1,2,2-trifluoroethane	TG-WaxMS	**26088-1430**	**3-040**
1300	Ketones 1	TG-WaxMS	**26088-2240**	**3-040**
1301	Ketones 2	TG-WaxMS	**26088-2240**	**3-040**
1302	N-Methyl-2-pyrrolidinone	TG-5MS	**26098-2970**	**3-025**
1400	Alcohols 1	TG-WaxMS	**26088-2240**	**3-040**
1401	Alcohols 2	TG-WaxMS	**26088-2240**	**3-040**
1402	Alcohols 3	TG-WaxMS	**26088-2240**	**3-040**
1403	Alcohols 4	TG-WaxMS	**26088-1430**	**3-040**
1450	Esters 1	TG-WaxMS	**26088-2240**	**3-040**
1451	Methyl cellosolve acetate	TG-5MS	**26098-2970**	**3-025**
1453	Vinyl acetate	TG-5MS	**26098-2970**	**3-025**
1454	Isopropyl acetate	TG-1MS	**26099-2970**	**3-023**
1457	Ethyl acetate	TG-WaxMS	**26088-2970**	**3-040**
1458	Methyl acetate	TG-WaxMS	**26088-2970**	**3-040**
1501	Aromatic hydrocarbons	TG-WaxMS	**26088-2970**	**3-040**
1550	Naphthas	TG-1MS TG-1MT	**26099-1540** **26M99-1540**	**3-023** **3-050**
1551	Turpentine	TG-1MS TG-1MT	**26099-1540** **26M99-1540**	**3-023** **3-050**
1552	Terpenes	TG-WaxMS	**26088-3100**	**3-040**
1601	1,1-Dichloro-1-nitroethane	TG-1MS	**Inquire**	**3-023**
1602	Dioxane	TG-5MS	**26098-2970**	**3-025**
1604	Acrylonitrile	TG-WaxMS	**26088-2240**	**3-040**
1606	Acetonitrile	TG-WaxMS	**26088-2970**	**3-040**
1608	Glycidol	TG-WaxMS	**Inquire**	**3-040**
1609	Tetrahydrofuran	TG-WaxMS	**26088-2240**	**3-040**
1610	Ethyl ether	TG-1MS	**26099-2970**	**3-023**
1611	Methylal	TG-WaxMS	**Inquire**	**3-040**
1612	Propylene oxide	TG-5MS	**26098-2970**	**3-025**
1613	Pyridine	TG-5SilMS	**26096-2970**	**3-028**
1614	Ethylene oxide	TG-WaxMS	**Inquire**	**3-040**
1615	Methyl-tert-butyl ether	TG-1MS	**26099-2240**	**3-023**
2000	Methanol	TG-35MS	**26094-2980**	**3-030**
2004	Dimethlyacetamide and dimethylformamide	TG-WaxMS	**26088-2240**	**3-040**

Method	Title	Recommended Thermo Scientific Phase	Part Number	Page
2005	Nitroaromatics	TG-5MS TG-5MT	**26098-2250** **26M98-2250**	**3-025** **3-051**
2007	Aminoethanol compounds 1	TG-5MS	**Inquire**	**3-025**
2010	Aliphatic amines	TG-5MS TG-5MT	**26098-1420** **26M98-1420**	**3-025** **3-051**
2012	n-Butylamine	TG-5MS TG-5MT	**26098-1420** **26M98-1420**	**3-025** **3-051**
2017	Aniline, o-toluidine and nitrobenzene	TG-5MS	**26098-2970**	**3-025**
2500	Methyl ethyl ketone	TG-1MS	**26099-2970**	**3-023**
2505	Furfuryl alcohol	TG-1MS TG-1MT	**26099-1420** **26M99-1420**	**3-023** **3-050**
2520	Methyl bromide	TG-1MS	**26099-2970**	**3-023**
2529	Furfural	TG-5MS TG-5MT	**26098-2960** **26M98-2960**	**3-025** **3-051**
2536	Valeraldehyde	TG-5MS	**26098-1310**	**3-025**
2537	Methyl methacrylate	TG-35MS	**26094-2980**	**3-030**
2541	Formaldehyde	TG-WaxMS	**26088-2240**	**3-040**
2542	Mercaptans	TG-1MS TG-1MT	**26099-2960** **26M99-2960**	**3-023** **3-050**
2546	Cresols and phenol	TG-WaxMS	**26088-1430**	**3-040**
2549	Volatile organic CPDS (screening)	TG-1MS TG-1MT	**26099-2960** **26M99-2960**	**3-023** **3-050**
2550	Benzothiazole in asphalt fume	TG-1MS	**26099-2970**	**3-023**
2551	Nicotine	TG-5MS	**26098-2970**	**3-025**
3511	Monomethylaniline	TG-5MS TG-5MT	**26098-1420** **26M98-1420**	**3-025** **3-051**
3513	Tetranitromethane	TG-1MS TG-1MT	**26099-1420** **26M99-1420**	**3-023** **3-050**
5020	Dibutyl phthalate and di(2-ethylhexyl) phthalate	TG-1MS TG-1MT	**26099-1300** **26M99-1300**	**3-023** **3-050**
5515	Polynuclear aromatic hydrocarbons	TG-1MS	**26099-3090**	**3-023**
5519	Endrin	TG-1MS	**26099-3090**	**3-023**
5523	Glycols	TG-35MS	**26094-2980**	**3-030**
5600	Organophosphorus pesticides	TG-5MS	**26098-2970**	**3-025**
5602	Chlorinated organonitrogen herbicides (air sampling)	TG-17MS	**26089-1420**	**3-037**
5701	Resorcinol	TG-1MS TG-1MT	**26099-1420** **26M99-1420**	**3-023** **3-050**
9200	Chlorinated organonitrogen herbicides (hand wash)	TG-17MS	**26089-1420**	**3-037**
9201	Chlorinated organonitrogen herbicides (dermal patch)	TG-17MS	**26089-1420**	**3-037**

Thermo Scientific GC Columns

Thermo Scientific GC Columns offer high temperature stability and exhibit 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.

TraceGOLD GC Columns

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

PAGE 3-022

TRACE GC Columns

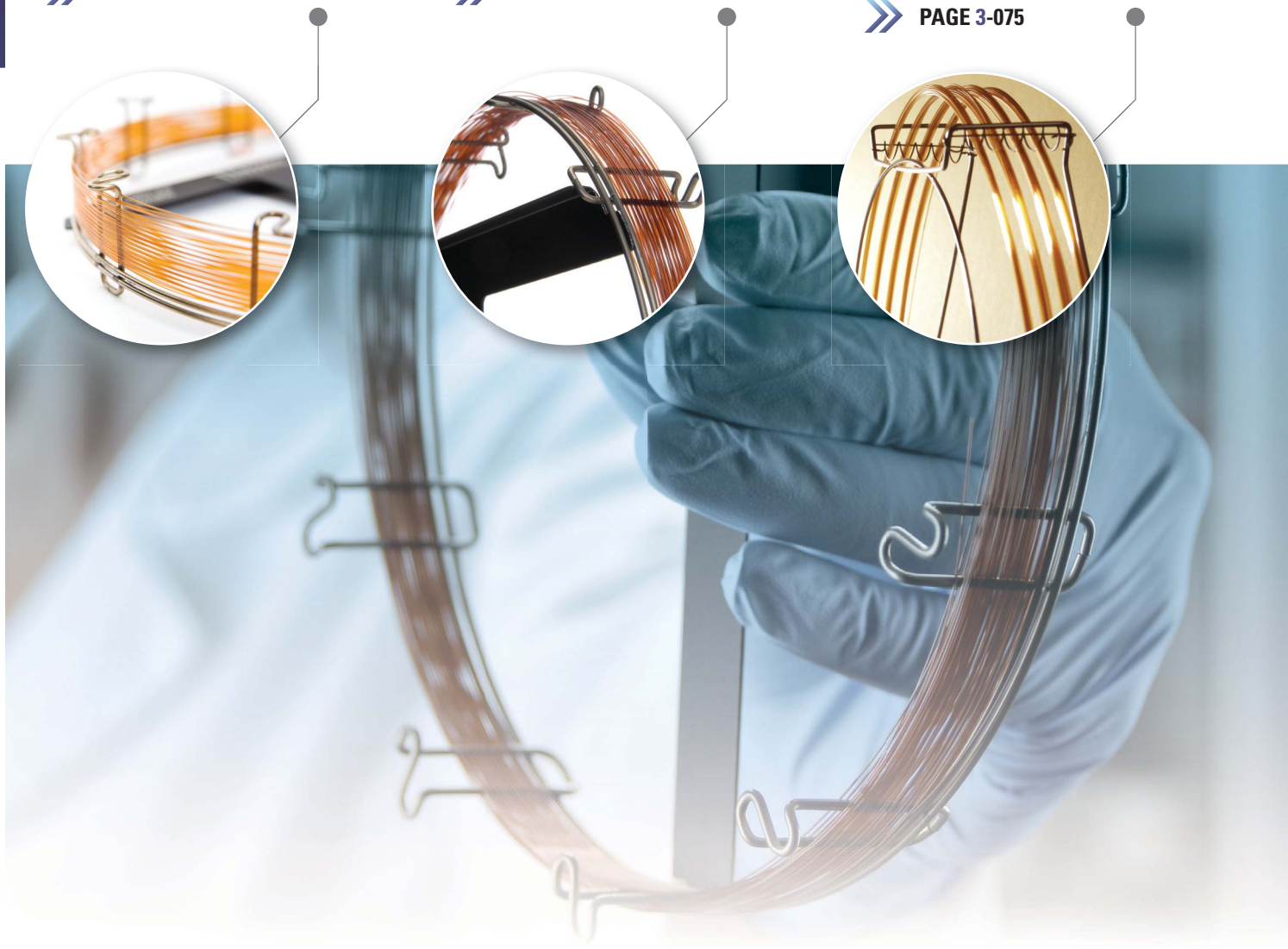
Offering excellent quality and reproducilbity for a wide range of GC applications

PAGE 3-053

TracePLOT GC Columns

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

PAGE 3-075



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 from 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. Thermo Scientific 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.

Guaranteed Performance

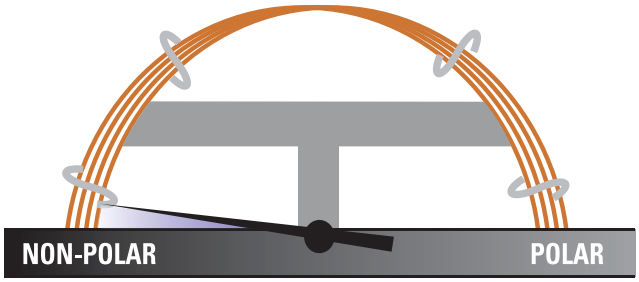
All Thermo Scientific columns have passed rigorous testing procedures to ensure the highest possible performance and are delivered with a serialized certificate to show their performance and assist with traceability. All Thermo Scientific columns come with a 100% guarantee. If for any reason the column 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 3-002 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 3-012 to 3-019. 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

Thermo Scientific 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.

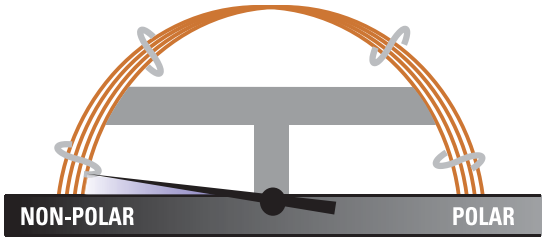
Quick Reference

TG-1MS **3-023**
TG-XLBMS **3-024**
TG-5MS **3-025**
TG-SQC **3-026**
TG-5MS AMINE **3-027**
TG-5SilMS **3-028**
TG-5HT **3-029**
TG-35MS **3-030**
TG-35MS AMINE **3-031**
TG-1301MS **3-032**
TG-624 . . . . . **3-033**
TG-VRX **3-034**
TG-VMS **3-035**
TG-1701MS **3-036**
TG-17MS **3-037**
TG-225MS **3-038**
TG-200MS **3-039**
TG-WaxMS **3-040**
TG-WaxMS A **3-041**
TG-WaxMS B **3-042**
SafeGuard **3-043**
TG-OCP I / TG OCP II **3-045**
TG-OPP I / TG-OPP II **3-046**
TG-ALC I / ALC II **3-047**
TG-POLAR **3-048**
TG-1MT Metal **3-050**
TG-5MT Metal **3-051**
TG-WaxMT Metal **3-052**

TraceGOLD TG-1MS GC Columns

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

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



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

TraceGOLD TG-1MS GC Columns

ID (mm)	Length (m)	Film Thickness (µm)	Cat. No.	Quantity
0.1	10	0.1	**26099-0200**	1 Each
0.25	15	0.25	**26099-1300**	1 Each
		0.5	**26099-2110**	1 Each
		1.0	**26099-2840**	1 Each
	30	0.25	**26099-1420**	1 Each
		0.5	**26099-2230**	1 Each
		1.0	**26099-2960**	1 Each
	60	0.25	**26099-1540**	1 Each
		0.5	**26099-2350**	1 Each
		1.0	**26099-3080**	1 Each
0.32	15	0.25	**26099-1310**	1 Each
		0.5	**26099-2120**	1 Each
		1.0	**26099-2850**	1 Each
	30	0.25	**26099-1430**	1 Each
		0.5	**26099-2240**	1 Each
		1.0	**26099-2970**	1 Each
	60	0.25	**26099-1550**	1 Each
		0.5	**26099-2360**	1 Each
		1.0	**26099-3090**	1 Each
0.53	15	0.5	**26099-2130**	1 Each
		1.0	**26099-2860**	1 Each
		1.5	**26099-3340**	1 Each
	30	0.5	**26099-2250**	1 Each
		1.0	**26099-2980**	1 Each
		1.5	**26099-3360**	1 Each
	60	1.5	**26099-3370**	1 Each

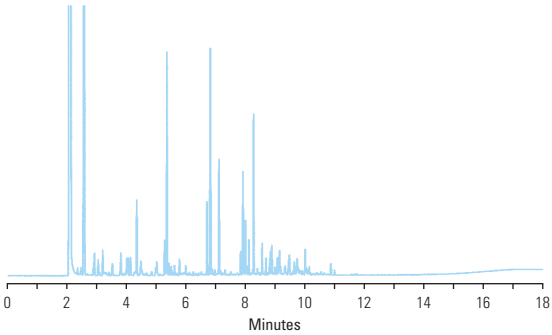
Applications:

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

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

Unleaded Gasoline



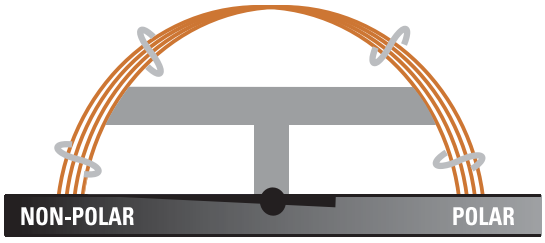
Column: TG-1MS 30m x 0.25mm x 0.25µm

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

TraceGOLD TG-XLBMS GC Columns

General purpose columns exhibiting extremely low bleed

- Low polarity phase, proprietary
- Low bleed for excellent signal-to-noise ratio, sensitivity and mass spectral integrity
- Ideal for analysis of active, high molecular weight compounds with sensitive GC/MS systems



Phase:	Proprietary
Max. Temps.:	360°C
USP Listing:	N/A

TraceGOLD TG-XLBMS GC Columns

ID (mm)	Length (m)	Film Thickness (µm)	Cat. No.	Quantity
0.10	10	0.1	**26079-0200**	1 Each
0.18	20	0.18	**26079-5780**	1 Each
0.25	15	0.1	**26079-0350**	1 Each
		0.25	**26079-1300**	1 Each
		1.0	**26079-2840**	1 Each
	30	0.1	**26079-0470**	1 Each
		0.25	**26079-1420**	1 Each
		0.5	**26079-2230**	1 Each
		1.0	**26079-2960**	1 Each
	60	0.25	**26079-1540**	1 Each
0.32	15	0.25	**26079-1310**	1 Each
	30	0.1	**26079-0480**	1 Each
		0.25	**26079-1430**	1 Each
		0.5	**26079-2240**	1 Each
		1.0	**26079-2970**	1 Each
	60	0.25	**26079-1550**	1 Each
0.53	15	1.5	**26079-3340**	1 Each
	30	0.5	**26079-2250**	1 Each
		1.5	**26079-3360**	1 Each

Applications

- Pesticides
- PCB congeners
- PAHs
- Aroclor mixes

Similar to:

- Rxi-XLB
- DB-XLB
- VF-Xms

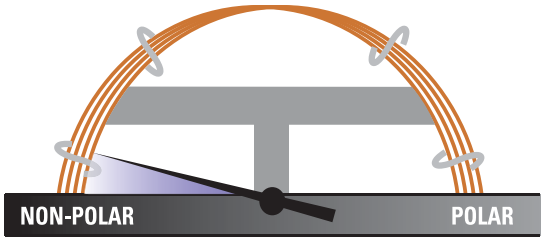
Semi-Volatile Drinking Water Application Kit

Description	Cat. No.	Quantity
Semivolatile Drinking Water Application Kit	**60181-736**	1 Each
Containing the following:		
TraceGOLD TG-XLBMS GC Column 30m x 0.25mm x 0.25µm	**26079-1420**	1 Each
BTO Septa 17mm Diameter	**31303211**	50 Pack
S/SL Injector – Split/Splitless Liner, 5mm ID x 8mm OD x 105mm Length	**45350033**	5 Pack
S/SL Injector – Silver Seals	**29033629**	10 Pack
S/SL Injector – Graphite Liner Seals	**29033406**	10 Pack
S/SL Injector – Graphite Ferrules for 0.25mm ID Column	**29053488**	10 Pack
MS Interface – Graphite/Vespel Ferrules for 0.25mm ID Column	**29033496**	10 Pack
2mL Screw Top Vials, Amber Glass	**60180-567**	100 Pack
Blue Caps With PTFE/Red Rubber Seals	**60180-569**	100 Pack
5µL Fixed Needle Syringe, 50mm Length, 26 Gauge, Cone Needle	**36500505**	1 Each

TraceGOLD TG-5MS GC Columns

The most widely used MS phase in gas chromatography

- 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



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

TraceGOLD TG-5MS GC Columns

ID (mm)	Length (m)	Film Thickness (µm)	Cat. No.	Quantity
0.1	10	0.1	**26098-0200**	1 Each
0.18	20	0.18	**26098-5780**	1 Each
0.25	10	0.25	**26098-1180**	1 Each
	15	0.25	**26098-1300**	1 Each
		0.5	**26098-2110**	1 Each
		1.0	**26098-2840**	1 Each
	30	0.25	**26098-1420**	1 Each
		0.5	**26098-2230**	1 Each
		1.0	**26098-2960**	1 Each
	60	0.25	**26098-1540**	1 Each
		0.5	**26098-2350**	1 Each
		1.0	**26098-3080**	1 Each
0.32	15	0.25	**26098-1310**	1 Each
		0.5	**26098-2120**	1 Each
		1.0	**26098-2850**	1 Each
	30	0.25	**26098-1430**	1 Each
		0.5	**26098-2240**	1 Each
		1.0	**26098-2970**	1 Each
	60	0.25	**26098-1550**	1 Each
		0.5	**26098-2360**	1 Each
		1.0	**26098-3090**	1 Each
0.53	15	0.25	**26098-1320**	1 Each
		0.5	**26098-2130**	1 Each
		1.0	**26098-2860**	1 Each
		1.5	**26098-3340**	1 Each
	30	0.25	**26098-1440**	1 Each
		0.5	**26098-2250**	1 Each
		1.0	**26098-2980**	1 Each
		1.5	**26098-3360**	1 Each

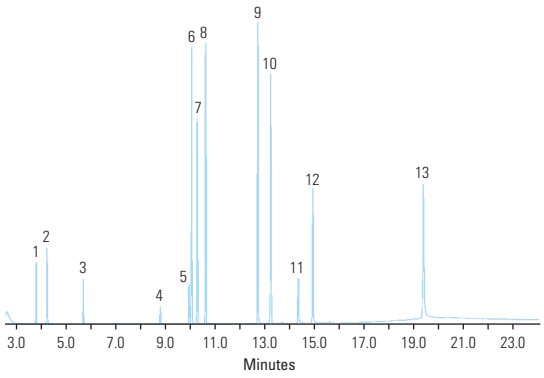
Applications:

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

Similar to:

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

Basic Drugs



Column: TG-5MS 30m x 0.25mm x 0.25µm

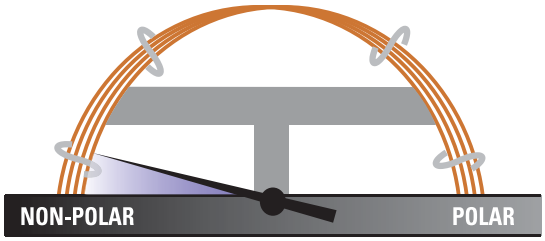
Part Number:	26098-1420
Temperature:	100°C to 220°C at 15°C/minute to 330°C at 10°C/minute (5 minute hold)
Detector Type:	MS
Carrier Gas:	He
Flow Rate:	30cm/sec
Injection Volume:	1.0µL
Injection Mode:	Split 50:1, 250°C

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

TraceGOLD TG-SQC GC Columns

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

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



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

TraceGold TG-SQC GC Columns

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

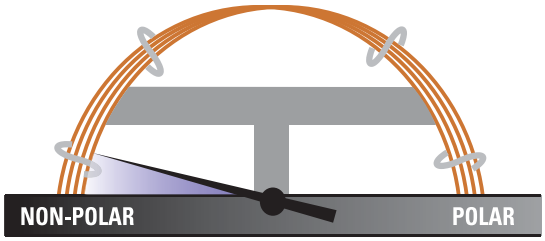
Applications:

- System Qualification Tests (Thermo Scientific GCMS)

TraceGOLD TG-5MS AMINE GC Columns

Analysis of ppm levels of amines without column priming

- 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



Phase:	Modified 5% Phenyl Methylpolysiloxane for Basic Compounds
Max. Temps.:	300°C / 315°C
USP Listing:	N/A

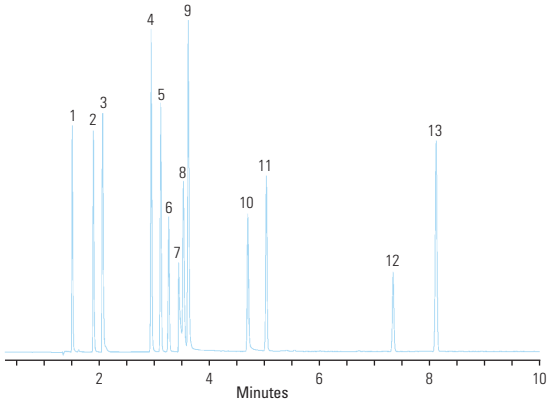
TraceGOLD TG-5MS AMINE GC Columns

ID (mm)	Length (m)	Film Thickness (µm)	Cat. No.	Quantity
0.25	15	0.25	**26097-1300**	1 Each
		0.5	**26097-2110**	1 Each
		1.0	**26097-2840**	1 Each
	30	0.25	**26097-1420**	1 Each
		0.5	**26097-2230**	1 Each
		1.0	**26097-2960**	1 Each
0.32	15	1.0	**26097-2850**	1 Each
	30	1.0	**26097-2970**	1 Each
0.53	15	1.0	**26097-2860**	1 Each
		3.0	**26097-3840**	1 Each
	30	1.0	**26097-2980**	1 Each
		3.0	**26097-3960**	1 Each

Applications:

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

Amines and Phenols



Column: TG-5MS Amine 30m x 0.32mm x 1.0µm

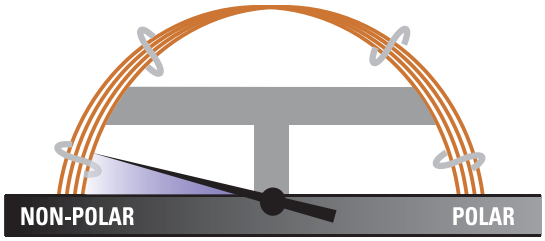
Part Number:	26097-2970
Temperature:	120°C to 220°C at 10°C/minute
Detector Type:	FID
Carrier Gas:	Hydrogen
Flow Rate:	40cm/min
Injection Volume:	1.0µL
Injection Mode:	Split 25:1, 300°C

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

TraceGOLD TG-5SilMS GC Columns

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

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



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

TraceGOLD TG-5SilMS GC Columns

ID (mm)	Length (m)	Film Thickness (µm)	Cat. No.	Quantity
0.1	10	0.1	**26096-0200**	1 Each
0.25	15	0.25	**26096-1300**	1 Each
		0.5	**26096-2110**	1 Each
		1.0	**26096-2840**	1 Each
	30	0.25	**26096-1420**	1 Each
		0.5	**26096-2230**	1 Each
		1.0	**26096-2960**	1 Each
	60	0.25	**26096-1540**	1 Each
		1.0	**26096-3080**	1 Each
0.32	15	0.25	**26096-1310**	1 Each
	30	0.25	**26096-1430**	1 Each
		0.5	**26096-2240**	1 Each
		1.0	**26096-2970**	1 Each
0.53	30	1.5	**26096-3360**	1 Each

Semivolatile Waste / Wastewater Application Kit

Description	Cat. No.	Quantity
Semivolatile Waste / Wastewater Application Kit	**60181-735**	1 Each
Containing the following:		
TraceGOLD TG-5SilMS GC Column 30m x 0.25mm x 0.50µm	**26096-2230**	1 Each
BTO Septa 17mm Diameter	**31303211**	50 Pack
S/SL Injector – Split/Splitless Liner, 5mm ID x 8mm OD x 105mm Length	**45350033**	5 Pack
S/SL Injector – Silver Seals	**29033629**	10 Pack
S/SL Injector – Graphite Liner Seals	**29033406**	10 Pack
S/SL Injector – Graphite Ferrules for 0.25mm ID Column	**29053488**	10 Pack
MS Interface – Graphite/Vespel Ferrules for 0.25mm ID Column	**29033496**	10 Pack
2mL Screw Top Vials, Amber Glass	**60180-567**	100 Pack
Blue Caps With PTFE/Red Rubber Seals	**60180-569**	100 Pack
5µL Fixed Needle Syringe, 50mm Length, 26 Gauge, Cone Needle	**36500505**	1 Each

Applications:

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

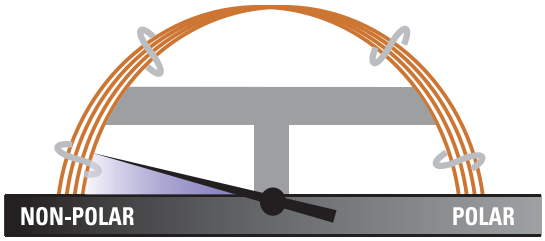
Similar to:

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

TraceGOLD TG-5HT GC Columns

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

- 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%



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

TraceGOLD TG-5HT GC Columns

ID (mm)	Length (m)	Film Thickness (µm)	Cat. No.	Quantity
0.25	15	0.1	**26095-0350**	1 Each
		0.25	**26095-1300**	1 Each
	30	0.1	**26095-0470**	1 Each
		0.25	**26095-1420**	1 Each
0.32	15	0.1	**26095-0360**	1 Each
	30	0.1	**26095-0480**	1 Each
		0.25	**26095-1430**	1 Each
0.53	10	0.15	**26095-1640**	1 Each
	30	0.15	**26095-0620**	1 Each

Applications:

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

Similar to:

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

PBDE (Environmental) Applications Kit

Description	Cat. No.	Quantity
PBDE (Environmental) Applications Kit	**60181-737**	1 Each
Containing the following:		
TraceGOLD TG-5HT GC Column 15m x 0.25mm x 0.10µm	**26095-0350**	1 Each
BTO Septa 12.7mm Diameter	**31303228**	50 Pack
PTV Injector – Deactivated Glass Baffle Liner, 2mm ID x 2.75mm OD x 120mm Length	**453T1001**	5 Pack
PTV Injector – Graphite Liner Seals	**29013417**	2 Pack
S/SL Injector – Graphite Ferrules for 0.25mm ID Column	**29053488**	10 Pack
MS Interface – Graphite/Vespel Ferrules for 0.25mm ID Column	**29033496**	10 Pack
2mL Screw Top Vials, Amber Glass	**60180-567**	100 Pack
Blue Caps With PTFE/Red Rubber Seals	**60180-569**	100 Pack
100uL Removable Needle Gas Tight Syringe, 50mm Length, 23 Gauge, Side Hole	**36520050**	1 Each

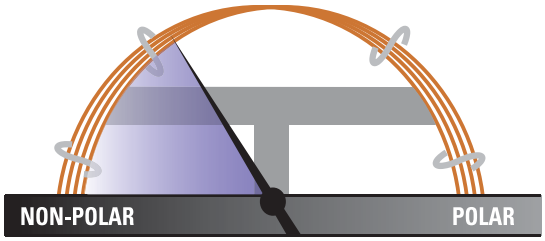
PBDE (ROSH) Application Kit

Description	Cat. No.	Quantity
PBDE (ROSH) Applications Kit	**60181-738**	1 Each
Containing the following:		
TraceGOLD TG-5HT GC Column 15m x 0.25mm x 0.10µm	**26095-0350**	1 Each
S/SL Injector – BTO Septa 17mm Diameter	**31303211**	50 Pack
S/SL Injector – Split/Splitless Liner, 5mm ID x 8mm OD x 105mm Length	**45350033**	5 Pack
S/SL Injector – Silver Seals	**29033629**	10 Pack
S/SL Injector – Graphite Liner Seals	**29033406**	10 Pack
S/SL Injector – Graphite Ferrules for 0.25mm ID Column	**29053488**	10 Pack
MS Interface – Graphite/Vespel Ferrules for 0.25mm ID Column	**29033496**	10 Pack
2mL Screw Top Vials, Amber Glass	**60180-567**	100 Pack
Blue Caps With PTFE/Red Rubber Seals	**60180-569**	100 Pack
10µL Fixed Needle Syringe, 50mm Length, 25 Gauge, Cone Needle	**36500525**	1 Each

TraceGOLD TG-35MS GC Columns

Higher phenyl content for useful elution order and retention time changes

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



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

TraceGOLD TG-35MS GC Columns

ID (mm)	Length (m)	Film Thickness (µm)	Cat. No.	Quantity
0.25	15	0.25	**26094-1300**	1 Each
		0.5	**26094-2110**	1 Each
		1.0	**26094-2840**	1 Each
	30	0.25	**26094-1420**	1 Each
		0.5	**26094-2230**	1 Each
		1.0	**26094-2960**	1 Each
0.32	15	0.25	**26094-1310**	1 Each
		0.5	**26094-2120**	1 Each
		1.0	**26094-2850**	1 Each
	30	0.25	**26094-1430**	1 Each
		0.5	**26094-2240**	1 Each
		1.0	**26094-2970**	1 Each
0.53	15	0.5	**26094-2130**	1 Each
		1.0	**26094-2860**	1 Each
		1.5	**26094-3340**	1 Each
		3.0	**26094-3840**	1 Each
	30	0.5	**26094-2250**	1 Each
		1.0	**26094-2980**	1 Each
		1.5	**26094-3360**	1 Each
		3.0	**26094-3960**	1 Each

Applications:

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

Similar to:

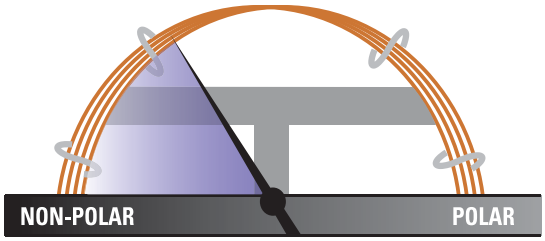
- Rtx-35
- BP-35
- HP-35
- SPB-35
- SPB-608

Thermo Scientific high-performance chromatography refrigerators offer close temperature control, instrumentation access and easy set-up.
www.thermoscientific.com/cold

TraceGOLD TG-35MS AMINE GC Columns

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

- Mid-polarity 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



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

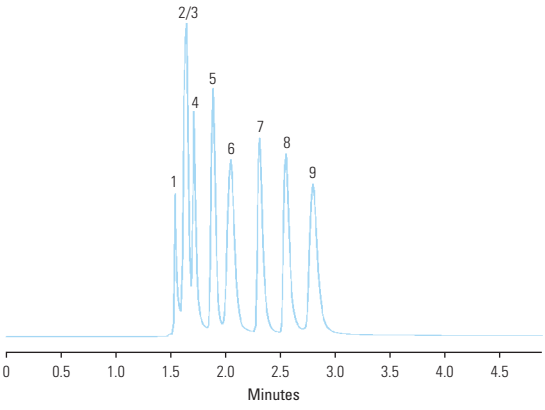
TraceGOLD TG-35MS AMINE GC Columns

ID (mm)	Length (m)	Film Thickness (µm)	Cat. No.	Quantity
0.25	15	0.5	**26092-2110**	1 Each
		1.0	**26092-2840**	1 Each
	30	0.5	**26092-2230**	1 Each
		1.0	**26092-2960**	1 Each
0.32	15	1.0	**26092-2850**	1 Each
		1.5	**26092-0680**	1 Each
	30	1.0	**26092-2970**	1 Each
		1.5	**26092-3350**	1 Each
0.53	15	1.0	**26092-2860**	1 Each
		3.0	**26092-3840**	1 Each
	30	1.0	**26092-2980**	1 Each
		3.0	**26092-3960**	1 Each

Applications:

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

Primary Amines



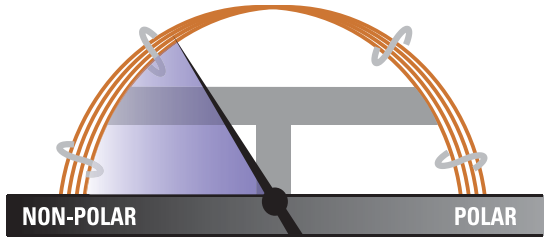
Column: TG-35MS Amine 30m x 0.53mm x 1.0µm

Part Number:	26092-2980
Temperature:	35°C (5 minute hold) Isothemal
Detector Type:	FID
Carrier Gas:	He
Flow Rate:	35cm/sec
Injection Volume:	1.0µL
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

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 Polysiloxane
Max. Temps.:	260°C/280°C
USP Listing:	G43

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

TraceGOLD TG-1301MS GC Columns

ID (mm)	Length (m)	Film Thickness (µm)	Cat. No.	Quantity
0.25	15	0.25	**26091-1300**	1 Each
		0.5	**26091-2110**	1 Each
		1.0	**26091-2840**	1 Each
	30	0.25	**26091-1420**	1 Each
		0.5	**26091-2230**	1 Each
		1.0	**26091-2960**	1 Each
	60	0.25	**26091-1540**	1 Each
		0.5	**26091-2350**	1 Each
		1.0	**26091-3080**	1 Each
		1.4	**26091-3330**	1 Each
0.32	15	0.25	**26091-1310**	1 Each
		0.5	**26091-2120**	1 Each
		1.0	**26091-2850**	1 Each
		1.5	**26091-0680**	1 Each
	30	0.25	**26091-1430**	1 Each
		0.5	**26091-2240**	1 Each
		1.0	**26091-2970**	1 Each
		1.5	**26091-3350**	1 Each
		1.8	**26091-3390**	1 Each
	60	0.25	**26091-1550**	1 Each
		0.5	**26091-2360**	1 Each
		1.0	**26091-3090**	1 Each
		1.8	**26091-3410**	1 Each
0.53	15	0.25	**26091-1320**	1 Each
		0.5	**26091-2130**	1 Each
		1.0	**26091-2860**	1 Each
		1.5	**26091-3340**	1 Each
		3.0	**26091-3840**	1 Each
	30	0.25	**26091-1440**	1 Each
		0.5	**26091-2250**	1 Each
		1.0	**26091-2980**	1 Each
		1.5	**26091-3360**	1 Each
		3.0	**26091-3960**	1 Each
	60	0.25	**26091-1560**	1 Each
		0.5	**26091-2370**	1 Each
		1.0	**26091-3100**	1 Each
		1.5	**26091-3370**	1 Each
		3.0	**26091-4080**	1 Each
	75	3.0	**26091-4900**	1 Each
	105	3.0	**26091-4090**	1 Each

Applications:

- Alcohols
- Volatile organics
- Oxygenates
- Residual solvents

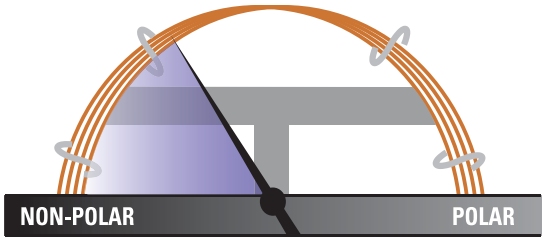
Similar to:

- 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-624 GC Columns

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

- 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

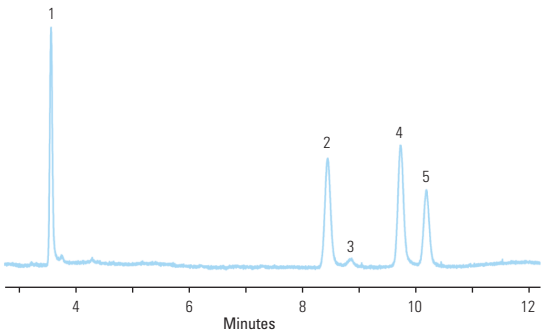


Phase:	6% Cyanopropylphenyl Polysiloxane
Max. Temps.:	240°C
USP Listing:	G43

TraceGOLD TG-624 GC Columns

ID (mm)	Length (m)	Film Thickness (µm)	Cat. No.	Quantity
0.18	20	1.0	**26085-4950**	1 Each
	40	1.0	**26085-4960**	1 Each
0.25	30	1.4	**26085-3320**	1 Each
	60	1.4	**26085-3330**	1 Each
0.32	30	1.8	**26085-3390**	1 Each
	60	1.8	**26085-3410**	1 Each
0.53	30	3.0	**26085-3960**	1 Each
	60	3.0	**26085-4080**	1 Each
	75	3.0	**26085-4900**	1 Each
	105	3.0	**26085-4090**	1 Each

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:	2.15mL/min
Injection Volume:	1.0µL
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

Applications:

- Residual Solvents
- Volatile Organic Compounds
- Alcohols
- Oxygenates

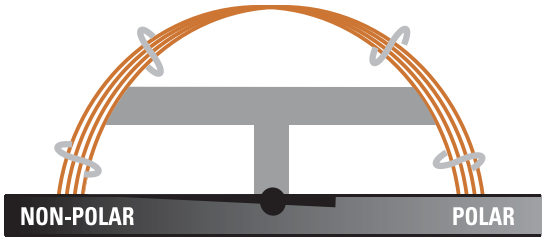
Similar to:

- 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-VRX GC Columns

Application specific column for volatile organic pollutants

- Highly stable polymer phase
- Low bleed for excellent signal-to-noise ratio, sensitivity and mass spectral integrity
- Excellent resolution for analysis of volatile compounds
- Fast analysis times for volatile compounds



Phase:	Proprietary
Max. Temps.:	260°C
USP Listing:	N/A

TraceGOLD TG-XLBMS GC Columns

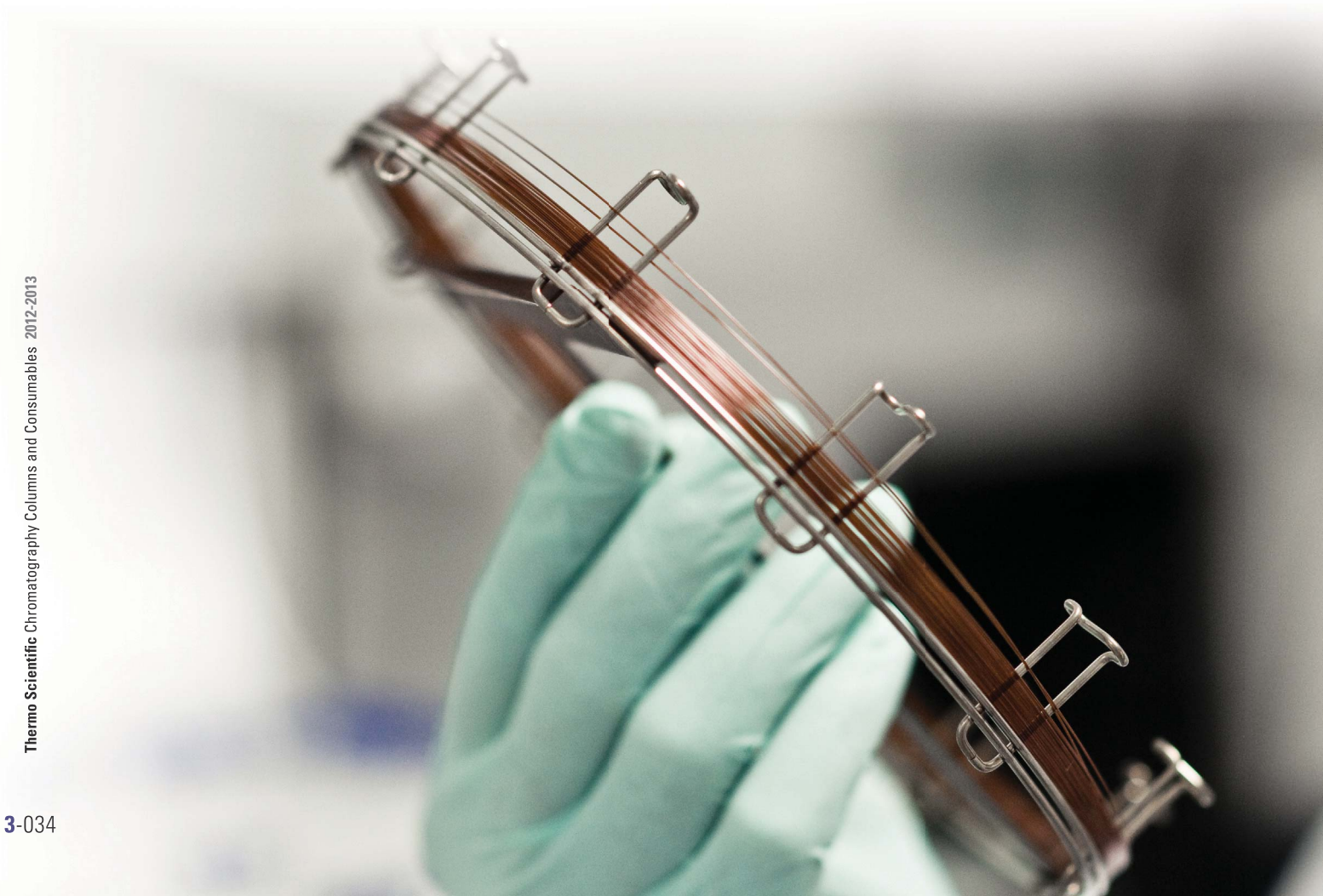
ID (mm)	Length (m)	Film Thickness (µm)	Cat. No.	Quantity
0.18	20	1.0	**26081-4950**	1 Each
	40	1.0	**26081-4960**	1 Each
0.25	30	1.4	**26081-3320**	1 Each
	60	1.4	**26081-3330**	1 Each
0.32	30	1.8	**26081-3390**	1 Each
	60	1.8	**26081-3410**	1 Each
0.53	30	3.0	**26081-3960**	1 Each
	60	3.0	**26081-4080**	1 Each
	75	3.0	**26081-4900**	1 Each
	105	3.0	**26081-4090**	1 Each

Applications:

- Volatile organic pollutants
- US EPA Method 8021 compounds

Similar to:

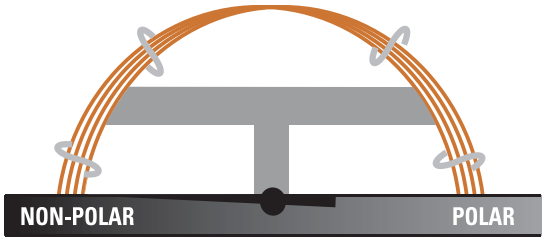
- Rtx-VRX
- DB-VRX



TraceGOLD TG-VMS GC Columns

Application specific column for volatile organic pollutants

- Highly stable polymer phase
- Low bleed for excellent signal-to-noise ratio, sensitivity and mass spectral integrity
- Excellent resolution for analysis of volatile compounds
- Fast analysis times for volatile compounds



Phase:	Proprietary
Max. Temps.:	260°C
USP Listing:	N/A

TraceGOLD TG-VMS GC Columns

ID (mm)	Length (m)	Film Thickness (µm)	Cat. No.	Quantity
0.18	20	1.0	**26080-4950**	1 Each
	40	1.0	**26080-4960**	1 Each
0.25	30	1.4	**26080-3320**	1 Each
	60	1.4	**26080-3330**	1 Each
0.32	30	1.8	**26080-3390**	1 Each
	60	1.8	**26080-3410**	1 Each
0.53	30	3.0	**26080-3960**	1 Each
	60	3.0	**26080-4080**	1 Each
	75	3.0	**26080-4900**	1 Each

Applications:

- Volatile organic pollutants
- US EPA Method 8260B compounds

Similar to:

- Rtx-VMS

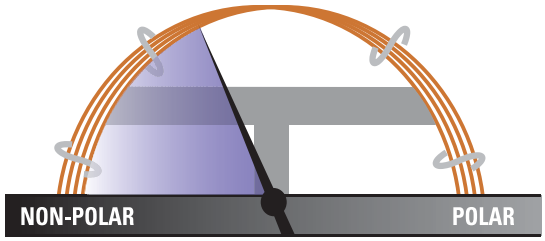
Volatile Organic Compound (VOC) Application Kit

Description	Cat. No.	Quantity
Volatile Organic Compound (VOC) Application Kit	**60181-734**	1 Each
Containing the following:		
TraceGOLD TG-VMS GC Column 20m x 0.18mm x 1.00µm	**26080-4950**	1 Each
S/SL Injector – BTO Septa 9mm Diameter	**31303240**	50 Pack
S/SL Injector – Silver Seals	**29033629**	10 Pack
S/SL Injector – Graphite Liner Seals	**29033406**	10 Pack
S/SL Injector – Graphite Ferrules for 0.25mm ID Column	**29053488**	10 Pack
MS Interface – Graphite/Vespel Ferrules for 0.25mm ID Column	**29033496**	10 Pack
2mL Screw Top Vials, Amber Glass	**60180-567**	100 Pack
Blue Caps with PTFE/Red Rubber Seals	**60180-569**	100 Pack
40mL VOA Sample Vials with Caps and Seals	**60180-573**	72 Pack

Search thousands of applications
in our chromatography resource center
www.thermoscientific.com/crc

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

- 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

TraceGOLD TG-1701MS GC Columns

ID (mm)	Length (m)	Film Thickness (µm)	Cat. No.	Quantity
0.1	10	0.1	**26090-0200**	1 Each
0.25	15	0.25	**26090-1300**	1 Each
		0.5	**26090-2110**	1 Each
		1.0	**26090-2840**	1 Each
	30	0.25	**26090-1420**	1 Each
		0.5	**26090-2230**	1 Each
		1.0	**26090-2960**	1 Each
	60	0.25	**26090-1540**	1 Each
		0.5	**26090-2350**	1 Each
		1.0	**26090-3080**	1 Each
0.32	15	0.25	**26090-1310**	1 Each
		0.5	**26090-2120**	1 Each
		1.0	**26090-2850**	1 Each
		1.5	**26090-0680**	1 Each
	30	0.25	**26090-1430**	1 Each
		0.5	**26090-2240**	1 Each
		1.0	**26090-2970**	1 Each
		1.5	**26090-3350**	1 Each
	60	0.25	**26090-1550**	1 Each
		0.5	**26090-2360**	1 Each
		1.0	**26090-3090**	1 Each
		1.5	**26090-0630**	1 Each
0.53	15	0.25	**26090-1320**	1 Each
		0.5	**26090-2130**	1 Each
		1.0	**26090-2860**	1 Each
		1.5	**26090-3340**	1 Each
		3.0	**26090-3840**	1 Each
	30	0.25	**26090-1440**	1 Each
		0.5	**26090-2250**	1 Each
		1.0	**26090-2980**	1 Each
		1.5	**26090-3360**	1 Each
		3.0	**26090-3960**	1 Each
	60	0.25	**26090-1560**	1 Each
		0.5	**26090-2370**	1 Each
		1.0	**26090-3100**	1 Each
		1.5	**26090-3370**	1 Each
		3.0	**26090-4080**	1 Each

Applications:

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

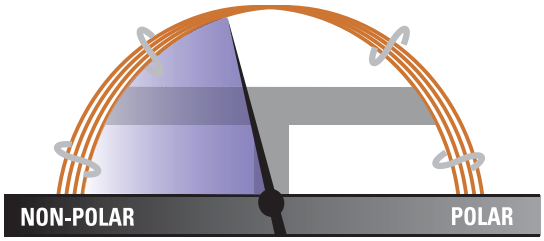
Similar to:

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

TraceGOLD TG-17MS GC Columns

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

- 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



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

TraceGOLD TG-17MS GC Columns

ID (mm)	Length (m)	Film Thickness (µm)	Cat. No.	Quantity
0.1	10	0.1	**26089-0200**	1 Each
0.25	15	0.25	**26089-1300**	1 Each
		0.5	**26089-2110**	1 Each
		1.0	**26089-2840**	1 Each
	30	0.25	**26089-1420**	1 Each
		0.5	**26089-2230**	1 Each
		1.0	**26089-2960**	1 Each
	60	0.25	**26089-1540**	1 Each
0.32	15	0.25	**26089-1310**	1 Each
		0.5	**26089-2120**	1 Each
		1.0	**26089-2850**	1 Each
	30	0.25	**26089-1430**	1 Each
		0.5	**26089-2240**	1 Each
		1.0	**26089-2970**	1 Each
0.53	15	0.25	**26089-1320**	1 Each
		0.5	**26089-2130**	1 Each
		1.0	**26089-2860**	1 Each
		1.5	**26089-3340**	1 Each
	30	0.25	**26089-1440**	1 Each
		0.5	**26089-2250**	1 Each
		1.0	**26089-2980**	1 Each
		1.5	**26089-3360**	1 Each

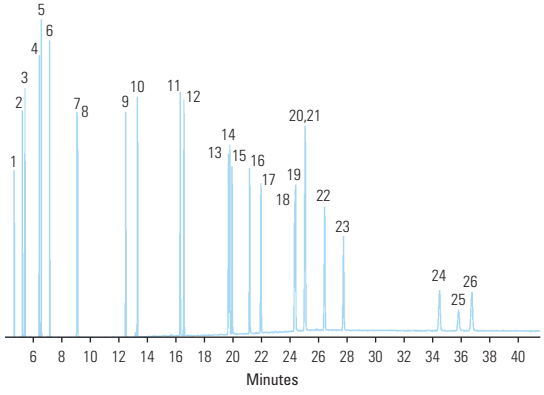
Applications:

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

Similar to:

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

Polycyclic Aromatic Hydrocarbons



Column: TG-17MS 30m x 0.25mm x 0.25µm

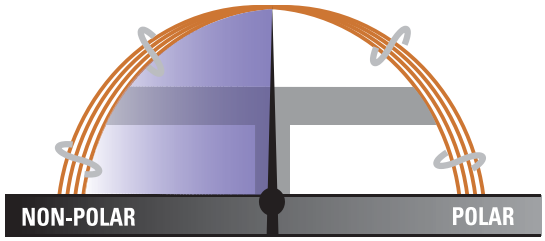
Part Number:	26089-1420
Temperature:	90°C (1.0 minute hold) to 215°C at 25°C/minute (0.5 minute hold) to 235°C at 4°C/minute to 280°C at 15°C/minute to 320°C at 4°C/minute (20 minute hold)
Detector Type:	MS
Carrier Gas:	He
Flow Rate:	1.2mL/min
Injection Volume:	1.0µL
Injection Mode:	Splitless, 300°C

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

TraceGOLD TG-225MS GC Columns

Offers better thermal stability than comparable columns

- 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



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

TraceGOLD TG-225MS GC Columns

ID (mm)	Length (m)	Film Thickness (µm)	Cat. No.	Quantity
0.25	15	0.25	**26083-1300**	1 Each
		0.5	**26083-2110**	1 Each
	30	0.25	**26083-1420**	1 Each
		0.5	**26083-2230**	1 Each
	60	0.25	**26083-1540**	1 Each
		0.5	**26083-2350**	1 Each
0.32	15	0.25	**26083-1310**	1 Each
		0.5	**26083-2120**	1 Each
		1.0	**26083-2850**	1 Each
	30	0.25	**26083-1430**	1 Each
		0.5	**26083-2240**	1 Each
		1.0	**26083-2970**	1 Each
	60	0.25	**26083-1550**	1 Each
		0.5	**26083-2360**	1 Each
		1.0	**26083-3090**	1 Each
0.53	15	0.25	**26083-1320**	1 Each
		0.5	**26083-2130**	1 Each
		1.0	**26083-2860**	1 Each
	30	0.25	**26083-1440**	1 Each
		0.5	**26083-2250**	1 Each
		1.0	**26083-2980**	1 Each
	60	0.5	**26083-2370**	1 Each
		1.0	**26083-3100**	1 Each

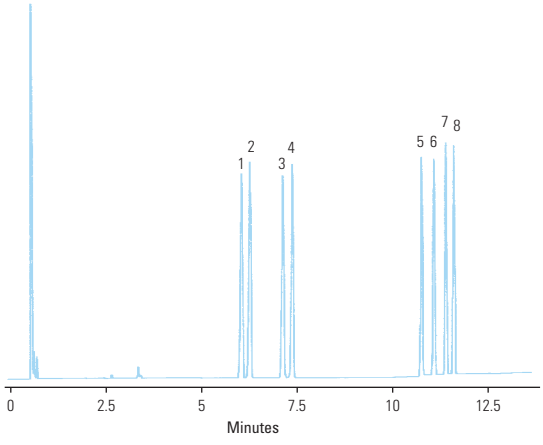
Applications:

- FAMEs
- Carbohydrates
- Sterols
- Flavor compounds

Similar to:

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

Sugars



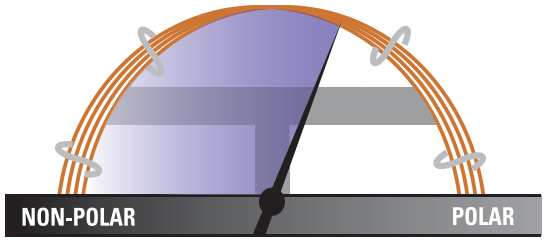
Column: TG-225MS 15m x 0.25mm x 0.25µm

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:	45cm/sec
Injection Volume:	0.5µL
Injection Mode:	Split (35:1), 260°C

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

TraceGOLD TG-200MS GC Columns

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



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

- 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

TraceGOLD TG-200MS GC Columns

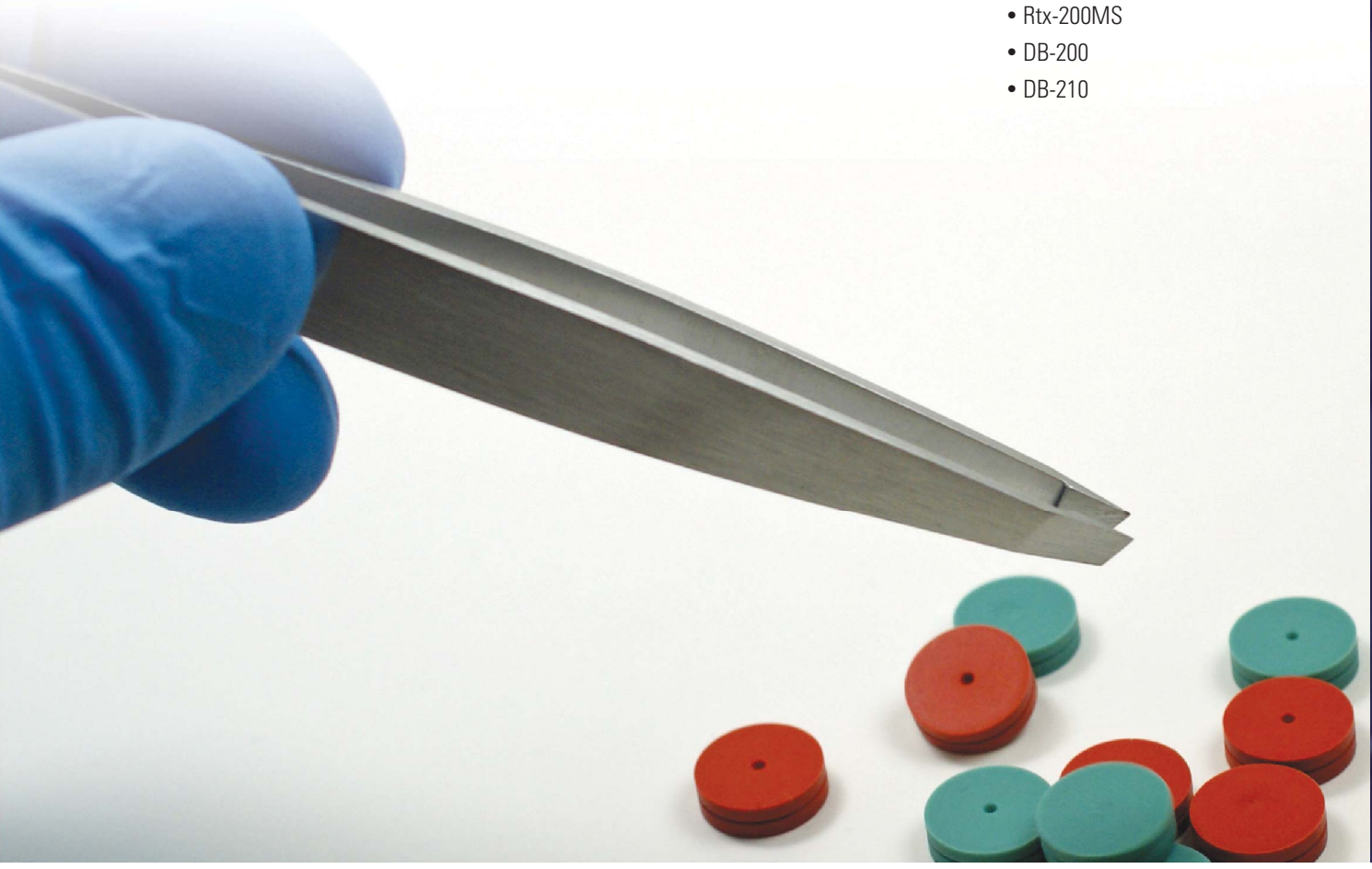
ID (mm)	Length (m)	Film Thickness (µm)	Cat. No.	Quantity
0.25	30	0.25	**26084-1420**	1 Each
		0.5	**26084-2230**	1 Each
		1.0	**26084-2960**	1 Each
0.32	30	0.25	**26084-1430**	1 Each
		0.5	**26084-2240**	1 Each
		1.0	**26084-2970**	1 Each

Applications:

- Solvents
- Fluorocarbons
- Alcohols and ketones
- Silanes
- Glycols

Similar to:

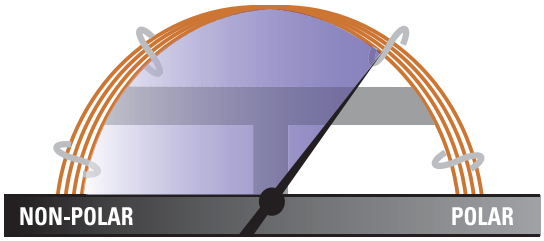
- Rtx-200MS
- DB-200
- DB-210



TraceGOLD TG-WaxMS GC Columns

Manufactured for better column-to-column reproducibility

- 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



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

TraceGOLD TG-WaxMS GC Columns

ID (mm)	Length (m)	Film Thickness (µm)	Cat. No.	Quantity
0.1	10	0.1	**26088-0200**	1 Each
0.25	15	0.25	**26088-1300**	1 Each
		0.5	**26088-2110**	1 Each
	30	0.25	**26088-1420**	1 Each
		0.5	**26088-2230**	1 Each
	60	0.25	**26088-1540**	1 Each
		0.5	**26088-2350**	1 Each
0.32	15	0.25	**26088-1310**	1 Each
		0.5	**26088-2120**	1 Each
		1.0	**26088-2850**	1 Each
	30	0.25	**26088-1430**	1 Each
		0.5	**26088-2240**	1 Each
		1.0	**26088-2970**	1 Each
	60	0.25	**26088-1550**	1 Each
		0.5	**26088-2360**	1 Each
		1.0	**26088-3090**	1 Each
0.53	15	0.25	**26088-1320**	1 Each
		0.5	**26088-2130**	1 Each
		1.0	**26088-2860**	1 Each
		1.5	**26088-3340**	1 Each
	30	0.25	**26088-1440**	1 Each
		0.5	**26088-2250**	1 Each
		1.0	**26088-2980**	1 Each
		1.5	**26088-3360**	1 Each
	60	0.25	**26088-1560**	1 Each
		0.5	**26088-2370**	1 Each
		1.0	**26088-3100**	1 Each
		1.5	**26088-3370**	1 Each

Applications:

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

Similar to:

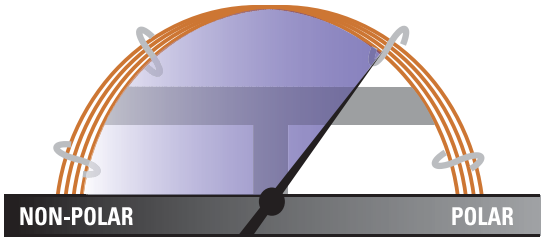
- DB-WAX
- DB-WAXetr
- HP-Wax
- HP-Innowax
- Supelcowax 10
- CP-Wax 52 CB
- Stabilwax
- Rtx-Wax
- BP20
- ZB-Wax
- Optima Wax
- AT-Wax

Search thousands of applications in our chromatography resource center
www.thermoscientific.com/crc

TraceGOLD TG-WaxMS A GC Columns

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

- 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



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

TraceGOLD TG-WaxMS A GC Columns

ID (mm)	Length (m)	Film Thickness (µm)	Cat. No.	Quantity
0.25	15	0.25	**26087-1300**	1 Each
		0.5	**26087-2110**	1 Each
	30	0.25	**26087-1420**	1 Each
		0.5	**26087-2230**	1 Each
	60	0.25	**26087-1540**	1 Each
		0.5	**26087-2350**	1 Each
0.32	15	0.25	**26087-1310**	1 Each
		0.5	**26087-2120**	1 Each
		1.0	**26087-2850**	1 Each
	30	0.25	**26087-1430**	1 Each
		0.5	**26087-2240**	1 Each
		1.0	**26087-2970**	1 Each
	60	0.25	**26087-1550**	1 Each
		0.5	**26087-2360**	1 Each
		1.0	**26087-3090**	1 Each
0.53	15	0.25	**26087-1320**	1 Each
		0.5	**26087-2130**	1 Each
		1.0	**26087-2860**	1 Each
		1.5	**26087-3340**	1 Each
	30	0.25	**26087-1440**	1 Each
		0.5	**26087-2250**	1 Each
		1.0	**26087-2980**	1 Each
		1.5	**26087-3360**	1 Each
	60	0.25	**26087-1560**	1 Each
		0.5	**26087-2370**	1 Each
		1.0	**26087-3100**	1 Each
		1.5	**26087-3370**	1 Each

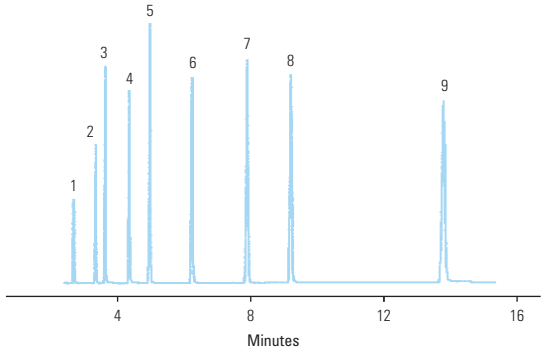
Applications:

- Organic acids
- Free fatty acids
- Alcohols

Similar to:

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

Free Fatty Acids



Column: TG-WaxMS A 30m x 0.25mm x 0.25µm

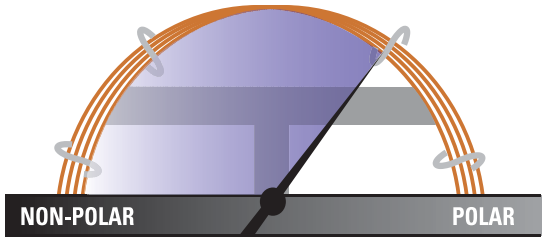
Part Number:	26087-1420
Temperature:	145°C Isothermal
Detector Type:	FID
Carrier Gas:	Hydrogen
Flow Rate:	40cm/sec
Injection Volume:	1.0µL
Injection Mode:	Split (50:1), 250°C

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

TraceGOLD TG-WaxMS B GC Columns

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

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



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

TraceGOLD TG-WaxMS B GC Columns

ID (mm)	Length (m)	Film Thickness (µm)	Cat. No.	Quantity
0.25	15	0.25	**26086-1300**	1 Each
	30	0.25	**26086-1420**	1 Each
		0.5	**26086-2230**	1 Each
0.32	15	0.25	**26086-1310**	1 Each
		1.0	**26086-2850**	1 Each
	30	0.25	**26086-1430**	1 Each
		0.5	**26086-2240**	1 Each
		1.0	**26086-2970**	1 Each
	60	1.0	**26086-3090**	1 Each
0.53	15	1.0	**26086-2860**	1 Each
	30	0.5	**26086-2250**	1 Each
		1.0	**26086-2980**	1 Each
		1.5	**26086-3360**	1 Each
	60	1.0	**26086-3100**	1 Each

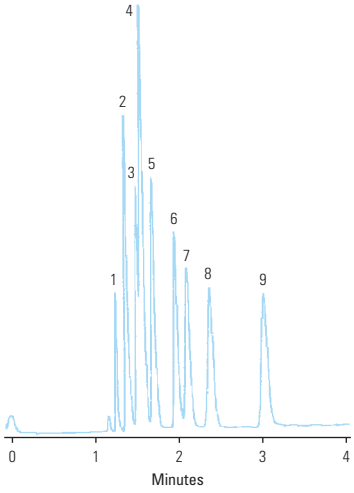
Applications:

- Amines
- Alkylamines
- Diamines
- Other basic compounds

Similar to:

- CAM
- Carbowax Amine
- CP Wax51
- Stabilwax-DB

Amines



Column: TG-WaxMS B 30m x 0.53mm x 1.0µm

Part Number:	26086-2980
Temperature:	45°C Isothermal
Detector Type:	FID
Carrier Gas:	Hydrogen
Flow Rate:	40cm/sec
Injection Volume:	1µL
Injection Mode:	Direct Injection, 250°C

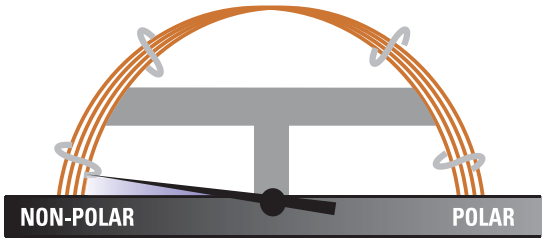
1. trimethylamine
2. dimethylamine
3. ethylamine
4. methylamine
5. isopropylamine
6. n-propylamine
7. tert-butylamine
8. diethylamine
9. sec-butylamine

TraceGOLD GC Columns with SafeGuard

Extend your column lifetime without compromising performance

- Prolong the lifetime of an analytical GC column
- No impact upon performance when cutting column during routine maintenance
- Available in a range of phases to meet many application needs

TraceGOLD TG-1MS GC Columns with SafeGuard

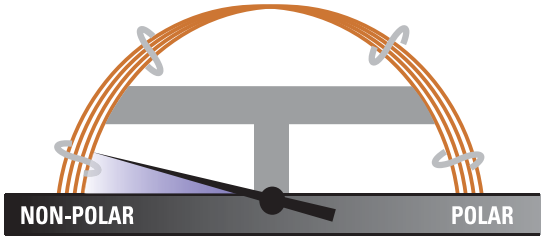


Phase:	100% Dimethyl Polysiloxane
Max. Temps.:	330°C/350°C
USP Listing:	G2

TraceGOLD TG-1MS GC Columns with SafeGuard

ID (mm)	Length (m)	Film Thickness (µm)	SafeGuard Length (m)	Cat. No.	Quantity
0.25	30	0.25	5	**26099-1425**	1 Each
0.53	30	1.0	5	**26099-2985**	1 Each
		5.0	5	**26099-4705**	1 Each

TraceGOLD TG-5MS GC Columns with SafeGuard



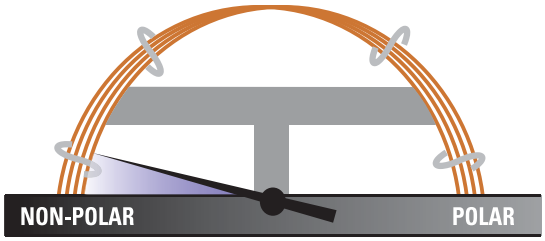
Phase:	5% diphenyl / 95% dimethyl polysiloxane
Max. Temps.:	330°C/350°C
USP Listing:	G27, G36

TraceGOLD TG-5MS GC Columns with SafeGuard

ID (mm)	Length (m)	Film Thickness (µm)	SafeGuard Length (m)	Cat. No.	Quantity
0.18	20	0.18	5	**26098-5785**	1 Each
0.25	15	0.25	5	**26098-1305**	1 Each
	30	0.1	5	**26098-0475**	1 Each
		0.25	5	**26098-1425**	1 Each
		0.5	5	**26098-2235**	1 Each
0.32	30	0.25	5	**26098-1435**	1 Each

TraceGOLD TG-5SILMS GC Columns with SafeGuard

SafeGuard is an integrated guard on the GC Column



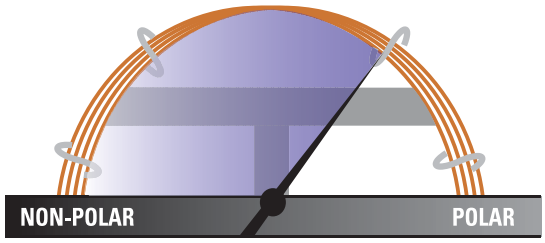
Phase:	Similar to 5% Phenyl Methylpolysiloxane
Max. Temps.:	330°C/350°C
USP Listing:	G27, G36

TraceGOLD TG-5SILMS GC Columns with SafeGuard

ID (mm)	Length (m)	Film Thickness (µm)	SafeGuard Length (m)	Cat. No.	Quantity
0.25	15	0.25	10	**26096-1301**	1 Each
	30	0.25	5	**26096-1425**	1 Each
		0.25	10	**26096-1421**	1 Each
		0.5	5	**26096-2235**	1 Each
0.32	30	0.5	5	**26096-2245**	1 Each

TraceGOLD TG-WaxMS GC Columns with SafeGuard

SafeGuard is an integrated guard on the GC Column



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

TraceGOLD TG-WaxMS GC Columns with SafeGuard

ID (mm)	Length (m)	Film Thickness (µm)	SafeGuard Length (m)	Cat. No.	Quantity
0.25	15	0.25	5	**26088-1305**	1 Each
	30	0.25	10	**26088-1421**	1 Each
0.32	30	0.25	5	**26088-1435**	1 Each

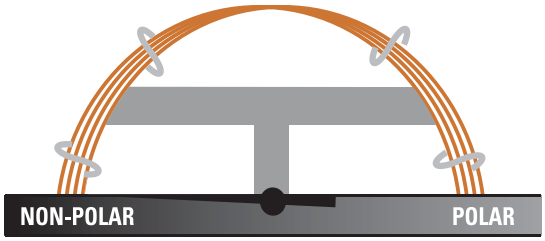
Trying to find the right column for your separation?
Use our column selection guides

PAGE 3-005

TraceGOLD TG-OCP I / TG-OCP II GC Columns

Application-specific columns for organochlorine pesticides and herbicides

- Low bleed for excellent signal-to-noise ratio, sensitivity and mass spectral integrity
- Fast analysis time giving full separation of chlorinated pesticides
- Ideal for US EPA methods 8081, 608 and CLP



Phase:	Proprietary
Max. Temps.:	340°C
USP Listing:	N/A

TraceGOLD TG-OCP I GC Columns

ID (mm)	Length (m)	Film Thickness (µm)	Cat. No.	Quantity
0.10	10	0.1	**26078-0200**	1 Each
0.18	10	0.18	**26078-1510**	1 Each
	20	0.18	**26078-5780**	1 Each
0.25	15	0.25	**26078-1300**	1 Each
	30	0.25	**26078-1420**	1 Each
	60	0.25	**26078-1540**	1 Each
0.32	15	0.5	**26078-2120**	1 Each
	30	0.32	**26078-5760**	1 Each
		0.5	**26078-2240**	1 Each
0.53	15	0.5	**26078-2130**	1 Each
	30	0.5	**26078-2250**	1 Each

Applications:

- Organochlorine pesticides
- Herbicides

Similar to:

- Rtx-CLPesticides/ Rtx-CLPesticides2

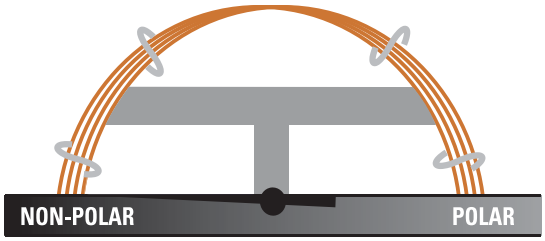
TraceGOLD TG-OCP II GC Columns

ID (mm)	Length (m)	Film Thickness (µm)	Cat. No.	Quantity
0.10	10	0.1	**26077-0200**	1 Each
	20	0.1	**26077-1450**	1 Each
0.18	10	0.14	**26077-5700**	1 Each
	20	0.14	**26077-5690**	1 Each
0.25	15	0.2	**26077-5730**	1 Each
	30	0.2	**26077-5720**	1 Each
	60	0.2	**26077-5710**	1 Each
0.32	15	0.25	**26077-1310**	1 Each
	30	0.25	**26077-1430**	1 Each
		0.5	**26077-2240**	1 Each
0.53	15	0.42	**26077-5750**	1 Each
	30	0.42	**26077-5740**	1 Each

TraceGOLD TG-OPP I / TG-OPP II GC Columns

Application-specific columns for organophosphorus pesticides

- Low bleed for excellent signal-to-noise ratio, sensitivity and mass spectral integrity
- Fast analysis time giving full separation of organophosphorus pesticides
- Ideal for US EPA methods 8141A



Phase:	Proprietary
Max. Temps.:	330°C
USP Listing:	N/A

TraceGOLD TG-OPP I GC Columns

ID (mm)	Length (m)	Film Thickness (µm)	Cat. No.	Quantity
0.25	30	0.25	**26076-1420**	1 Each
0.32	30	0.5	**26076-2240**	1 Each
0.53	30	0.83	**26076-0690**	1 Each

TraceGOLD TG-OPP II GC Columns

ID (mm)	Length (m)	Film Thickness (µm)	Cat. No.	Quantity
0.18	20	0.2	**26076-1580**	1 Each
0.25	30	0.25	**26075-1420**	1 Each
0.32	30	0.32	**26075-5760**	1 Each
0.53	30	0.5	**26075-2250**	1 Each

Applications:

- Organophosphorus pesticides

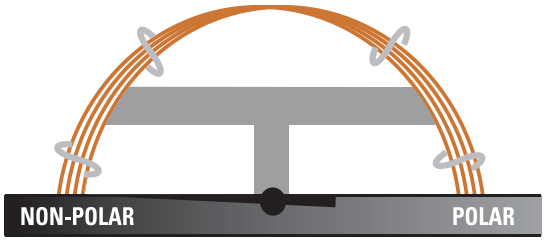
Similar to:

- Rtx-OPPesticides/ Rtx-OPPesticides2

TraceGOLD TG-ALC I / ALC II GC Columns

Application-specific columns for blood alcohol analysis

- Low bleed for excellent signal-to-noise ratio, sensitivity and mass spectral integrity
- Fast analysis time giving full separation of blood alcohols



Phase:	Proprietary
Max. Temps.:	260°C
USP Listing:	N/A

TraceGOLD TG-ALC I GC Columns

ID (mm)	Length (m)	Film Thickness (µm)	Cat. No.	Quantity
0.32	30	1.8	**26074-3390**	1 Each
0.53	30	3.0	**26074-3960**	1 Each

TraceGOLD TG-ALC II GC Columns

ID (mm)	Length (m)	Film Thickness (µm)	Cat. No.	Quantity
0.32	30	1.20	**26073-2260**	1 Each
0.53	30	2.00	**26073-2200**	1 Each

Applications:

- Blood alcohol analysis
- Abused inhalent anesthetics
- γ-hydroxybutyrate (GHB)
- γ-butyrolactone (GBL)
- Glycols
- Common industrial solvents

Similar to:

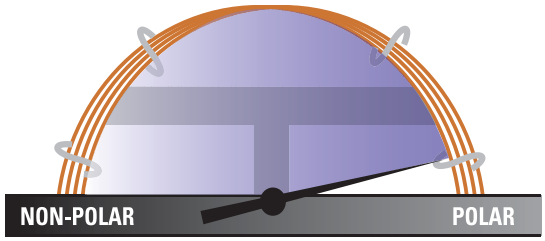
- Rtx-BAC1/RTX-BAC2

Search thousands of applications
in our chromatography resource center
www.thermoscientific.com/crc

TraceGOLD TG-POLAR GC Columns

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

- 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



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

TraceGOLD TG-POLAR GC Columns

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

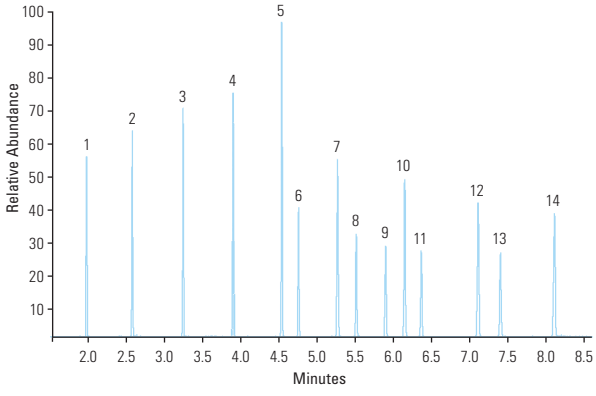
Applications:

- Cis/Trans FAMES
- Dioxins

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

FAMES C8-C24



Column: TG-POLAR 30m x 0.25mm x 0.25µm

Part Number:	26082-1420
Temperature:	100°C (0.5 minute hold) to 195°C at 25°C/minute (1 minute hold) to 250°C at 10°C/minute (3 minute hold)
Detector Type:	MS
Carrier Gas:	He
Flow Rate:	1.2mL/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

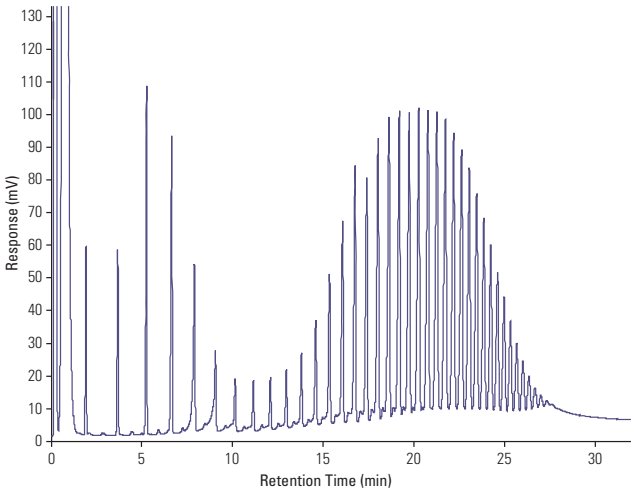
TraceGOLD Metal Columns – Technical Information

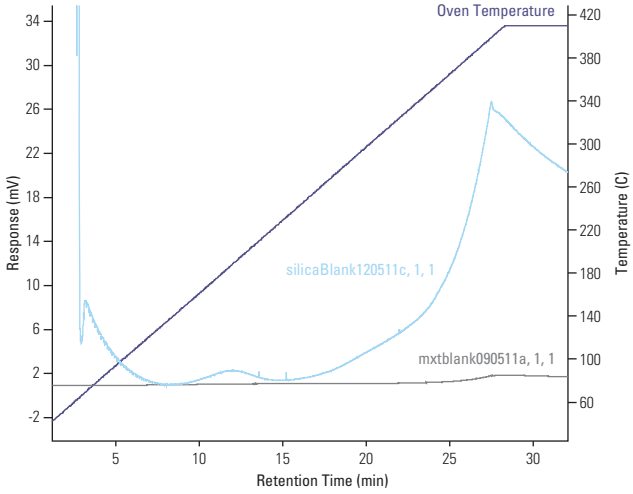
Push the limits of your analyses

Your analysis is critical, so your tools are critical. Thermo Scientific TraceGOLD GC Metal Columns are proven to withstand the stress of elevated temperatures and highly active compounds, without any breakdown or column bleed.

Thermo Scientific TraceGOLD Metal Columns enable the user to work at higher temperatures with no compromise on performance. The columns also withstand added stress and perform to the high standard expected from a TraceGOLD Column when analysing highly active and aggressive compounds.

TraceGOLD Metal Column	Temperature Range (°C)
TG-1MT	-60 to 430
TG-5MT	-60 to 430
TG-WaxMT	+40 to 260





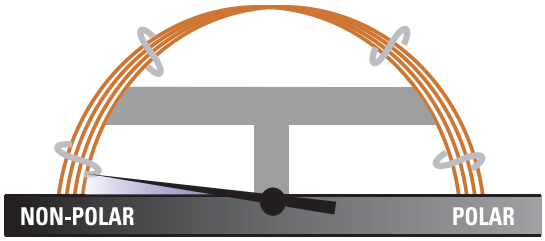
Left: A simulated distillation chromatogram shows carbon range C12-C90 using a TG-1MT metal GC column.

Right: This chromatogram shows the relative amounts of column bleed using a TG-1MT GC column against a TR-SimDist GC column when running a blank. As can be seen, the TG-1MT shows significantly lower bleed levels once the temperature rises above 300°C.

TraceGOLD TG-1MT Metal GC Columns

Metal columns for elevated temperature use

- Non-polar, 100% dimethyl polysiloxane
- Low bleed for excellent signal-to-noise ratio, sensitivity and mass spectral integrity
- Equivalent to USP G1, G2, G38 phases



Phase:	100% Dimethyl Polysiloxane
Max. Temps.:	430°C
USP Listing:	G2

TraceGOLD TG-1MT Metal GC Columns

ID (mm)	Length (m)	Film Thickness (µm)	Cat. No.	Quantity
0.25	15	0.25	**26M99-1300**	1 Each
	30	0.25	**26M99-1420**	1 Each
		0.5	**26M99-2230**	1 Each
		1.0	**26M99-2960**	1 Each
	60	0.25	**26M99-1540**	1 Each
0.53	6	0.15	**26M99-4100**	1 Each
	15	0.5	**26M99-2130**	1 Each
		1.0	**26M99-2860**	1 Each
	30	0.25	**26M99-1440**	1 Each
		0.5	**26M99-2250**	1 Each
		1.0	**26M99-2980**	1 Each
		1.5	**26M99-3360**	1 Each
		3.0	**26M99-3960**	1 Each

Applications:

- Hydrocarbons
- Solvent impurities
- PCB congeners
- Aroclor mixes
- Simulated distillation
- Drugs of abuse
- Natural gas odorants
- Essential oils
- Pesticides

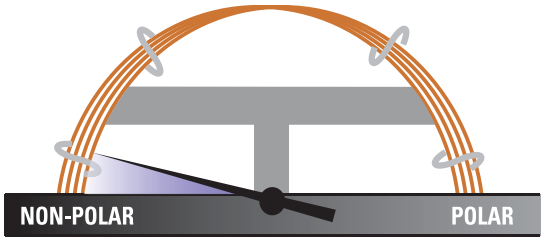
Similar to:

- MXT-1
- DB-1
- DB-1MS
- HP-1
- HP-1MS
- Ultra-1
- SPB-1
- Equity-1
- MDN-1
- CP-Sil 5 CB
- VF-1ms
- ZB-1HT

TraceGOLD TG-5MT Metal GC Columns

The most widely used MS phase in gas chromatography

- 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



Phase:	5% Diphenyl / 95% Dimethyl Polysiloxane
Max. Temps.:	430°C
USP Listing:	G27, G36

TraceGOLD TG-5MT Metal GC Columns

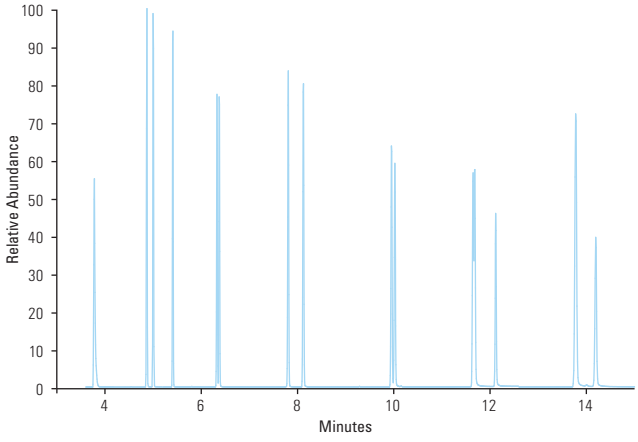
ID (mm)	Length (m)	Film Thickness (µm)	Cat. No.	Quantity
0.25	15	0.1	**26M98-0350**	1 Each
		0.25	**26M98-1300**	1 Each
	30	0.25	**26M98-1420**	1 Each
		0.5	**26M98-2230**	1 Each
		1.0	**26M98-2960**	1 Each
	60	0.25	**26M98-1540**	1 Each
0.53	15	1.0	**26M98-2860**	1 Each
	30	0.25	**26M98-1440**	1 Each
		0.5	**26M98-2250**	1 Each
		1.0	**26M98-2980**	1 Each
		1.5	**26M98-3360**	1 Each
		3.0	**26M98-3960**	1 Each

Applications:

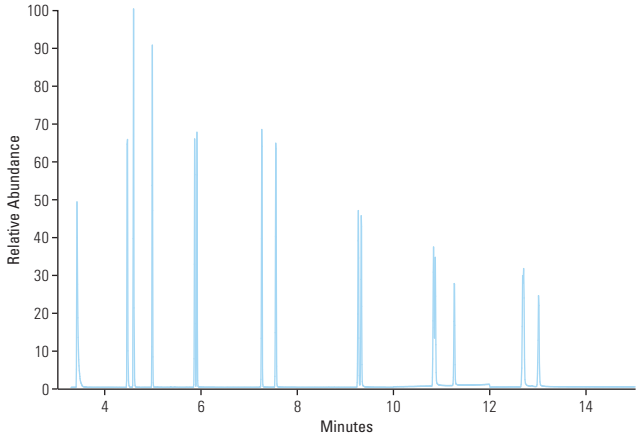
- Drugs
- Solvent impurities
- Pesticides
- Hydrocarbons
- PCB congeners
- Essential oils
- Semivolatiles

Similar to:

- MXT-5
- DB-5
- HP-5
- HP-5MS
- Ultra-2
- SPB-5
- Equity-5
- MDN-5
- CP-Sil 8 CB
- ZB-5HT



Sample TIC chromatogram of 16 PAHs analyzed on a TG-5MT metal GC column.



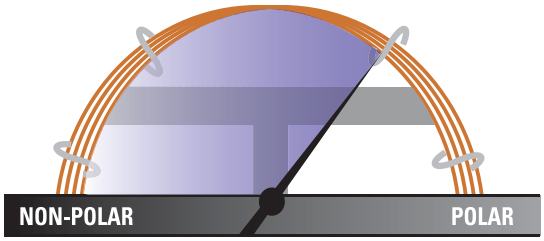
Sample TIC chromatogram of 16 PAHs analyzed on a TG-5MS GC column.

Only 15 peaks shown as Indeno(1,2,3-cd)pyrene and Dibenzo(a,h)anthracene coelute (seperatable using MS). These chromatograms illustrate that the chromatography is not adversely affected by using a metal column over a silica column.

TraceGOLD TG-WaxMT Metal GC Columns

Manufactured for better column-to-column reproducibility

- 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



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

TraceGOLD TG-WaxMT Metal GC Columns

ID (mm)	Length (m)	Film Thickness (µm)	Cat. No.	Quantity
0.25	15	0.1	**26M88-0350**	1 Each
		0.25	**26M88-1300**	1 Each
	30	0.25	**26M88-1420**	1 Each
		0.5	**26M88-2230**	1 Each
	60	0.25	**26M88-1540**	1 Each
0.53	15	0.5	**26M88-2130**	1 Each
		1.0	**26M88-2860**	1 Each
	30	0.25	**26M88-1440**	1 Each
		0.5	**26M88-2250**	1 Each
		1.0	**26M88-2880**	1 Each
		1.5	**26M88-3360**	1 Each

Applications:

- FAMEs
- Flavor compounds
- Essential oils
- Amines
- Solvents
- Xylene isomers
- EPA Method 603 for Acrolein/ Acrylonnitrile

Similar to:

- MXT-WAX
- DB-WAX
- DB-WAXetr
- HP-Wax
- HP-Innowax
- Supelcowax 10
- CP-Wax 52 CB

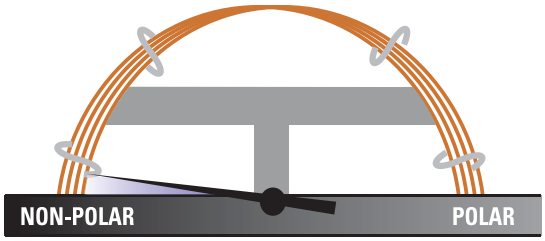
We have vials for any instrument and any application, visit

PAGE 1-001

TRACE TR-1MS GC Columns

Extremely low-bleed non-polar columns suitable for GC/MS applications

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



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

TRACE TR-1MS GC Columns

ID (mm)	Length (m)	Film Thickness (µm)	Cat. No.	Quantity
0.25	30	0.1	**260B047P**	1 Each
		0.25	**260B142P**	1 Each
	60	0.25	**260B154P**	1 Each
0.32	30	0.25	**260B143P**	1 Each
	60	0.25	**260B155P**	1 Each
		1.0	**260B309P**	1 Each

Applications:

- Chlorinated and nitroaromatic compounds
- GC/MS environmental analyses

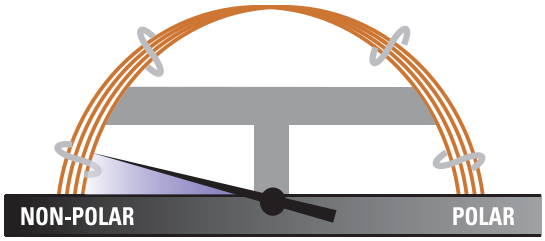
Similar to:

- 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-5 GC Columns

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

- Non-polar phase, 5% phenyl methyl polysiloxane
- High operating temperature and extremely low bleed
- Widely used in a variety of applications



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

TRACE TR-5 GC Columns

ID (mm)	Length (m)	Film Thickness (µm)	Cat. No.	Quantity
0.25	7	0.25	**260E113P**	1 Each
	15	0.25	**260E130P**	1 Each
	30	0.25	**260E142P**	1 Each
		0.5	**260E223P**	1 Each
	60	0.25	**260E154P**	1 Each
0.32	15	0.25	**260E131P**	1 Each
	30	0.25	**260E143P**	1 Each
		0.5	**260E224P**	1 Each
		1.0	**260E297P**	1 Each
	60	0.25	**260E155P**	1 Each
		1.0	**260E309P**	1 Each
	100	0.5	**260E242P**	1 Each
0.53	15	1.0	**260E286P**	1 Each
	30	0.5	**260E225P**	1 Each
		1.0	**260E298P**	1 Each
		1.5	**260E336P**	1 Each
		5.0	**260E470P**	1 Each

Applications:

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

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

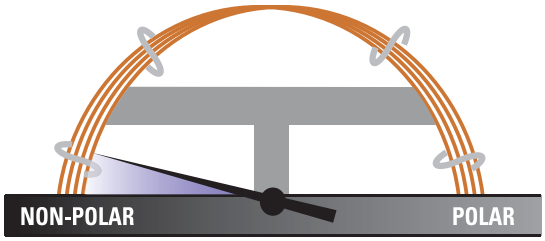
Thermo Scientific SOLA SPE Columns are revolutionizing sample preparation, visit

PAGE 2-007

TRACE TR-5MS GC Columns

Feature a popular GCMS phase for many applications

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



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

TRACE TR-5MS GC Columns

ID (mm)	Length (m)	Film Thickness (µm)	Cat. No.	Quantity
0.10	10	0.1	**260F020P**	1 Each
0.15	25	0.25	**260F134P**	1 Each
0.18	20	0.18	**260F578P**	1 Each
0.25	15	0.1	**260F035P**	1 Each
		0.25	**260F130P**	1 Each
		1.0	**260F284P**	1 Each
	30	0.1	**260F047P**	1 Each
		0.25	**260F142P**	1 Each
		0.25	**260F142J**	1 Each
		0.5	**260F223P**	1 Each
		1.0	**260F296P**	1 Each
	60	0.25	**260F154P**	1 Each
		1.0	**260F308P**	1 Each
0.32	10	0.1	**260F024P**	1 Each
	15	1.0	**260F285P**	1 Each
	30	0.25	**260F143P**	1 Each
		0.5	**260F224P**	1 Each
		1.0	**260F297P**	1 Each
	60	1.0	**260F309P**	1 Each
		0.25	**260F155P**	1 Each
	100	0.5	**260F242P**	1 Each
0.53	15	0.5	**260F213P**	1 Each
		3.0	**260F384P**	1 Each
	30	0.5	**260F225P**	1 Each
		1.0	**260F298P**	1 Each
		1.5	**260F336P**	1 Each
		3.0	**260F396P**	1 Each

Applications:

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

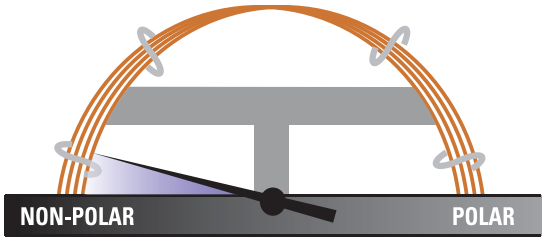
Similar to:

- 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-5HT GC Columns

Feature upper temperature limits as high as 400°C

- Non-polar phase, 5% phenyl polycarborane siloxane
- Allow the elution of higher-boiling hydrocarbons up to C100
- Low bleed even at elevated temperatures



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

TRACE TR-5HT GC Columns

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

Applications:

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

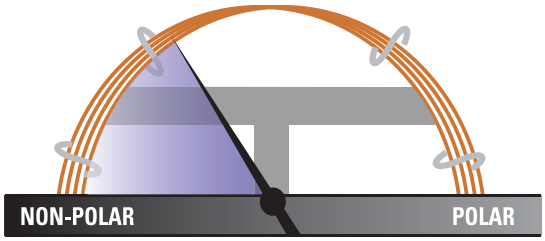
Similar to:

- 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-35MS GC Columns

Mid-polarity columns excellent for many applications

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



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

TRACE TR-35MS GC Columns

ID (mm)	Length (m)	Film Thickness (µm)	Cat. No.	Quantity
0.22	15	0.25	**260C129P**	1 Each
	25	0.25	**260C135P**	1 Each
0.25	15	0.25	**260C130P**	1 Each
	30	0.25	**260C142P**	1 Each
		0.5	**260C223P**	1 Each
	60	0.25	**260C154P**	1 Each
0.32	15	0.25	**260C131P**	1 Each
	30	0.25	**260C143P**	1 Each
		0.5	**260C224P**	1 Each
0.53	15	1.0	**260C286P**	1 Each
	30	1.0	**260C298P**	1 Each

Applications:

- Pesticides
- Herbicides
- Drugs of abuse
- Poly aromatic hydrocarbons
- Pharmaceuticals

Similar to:

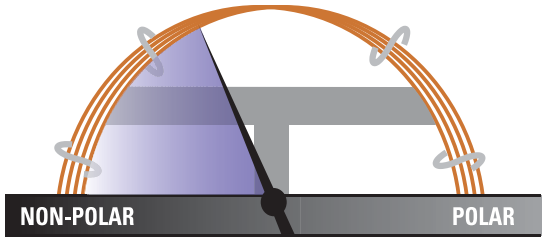
- DB-35
- DB-35MS
- HP-35
- HP-35MS
- MDN-35
- Rtx-35
- SPB-35
- BPX35

Search thousands of applications
in our chromatography resource center
www.thermoscientific.com/crc

TRACE TR-1701 GC Columns

Mid-polarity column with alternative selectivity

- 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



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

TRACE TR-1701 GC Columns

ID (mm)	Length (m)	Film Thickness (µm)	Cat. No.	Quantity
0.25	30	0.25	**260Q142P**	1 Each
	60	0.25	**260Q154P**	1 Each
0.32	15	0.25	**260Q131P**	1 Each
	30	0.25	**260Q143P**	1 Each
	60	1.0	**260Q309P**	1 Each
		0.25	**260Q155P**	1 Each
0.53	30	1.0	**260Q298P**	1 Each

Applications:

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

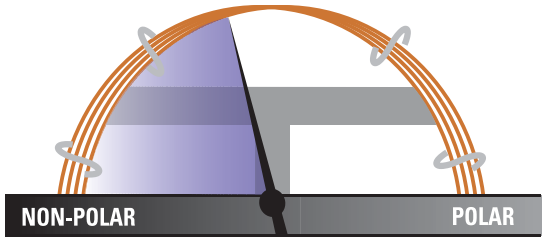
Similar to:

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

TRACE TR-50MS GC Columns

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

- 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



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

TRACE TR-50MS GC Columns

ID (mm)	Length (m)	Film Thickness (µm)	Cat. No.	Quantity
0.10	10	0.1	**260R020P**	1 Each
0.25	15	0.25	**260R130P**	1 Each
	30	0.1	**260R047P**	1 Each
		0.15	**260R050P**	1 Each
		0.25	**260R142P**	1 Each
	60	0.25	**260R154P**	1 Each
0.32	30	0.25	**260R143P**	1 Each
0.53	15	0.5	**260R213P**	1 Each
	30	0.5	**260R225P**	1 Each

Applications:

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

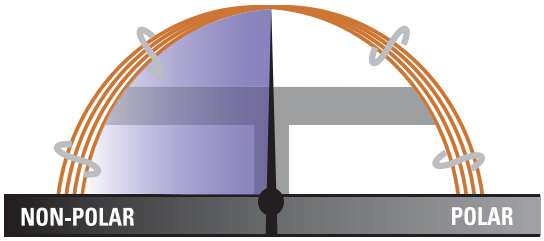
Similar to:

- 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-225 GC Columns

Reliable and reproducible performance

- 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



Phase:	50% Cyanopropylphenyl Polysiloxane
Max. Temps.:	230°C / 250°C
USP Listing:	G7

TRACE TR-225 GC Columns

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

Applications:

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

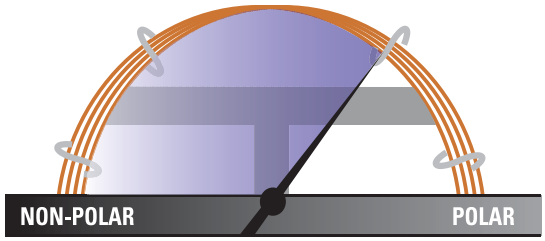
Similar to:

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

TRACE TR-Wax GC Columns

General-purpose, high-polarity columns

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



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

TRACE TR-Wax GC Columns

ID (mm)	Length (m)	Film Thickness (µm)	Cat. No.	Quantity
0.10	10	0.1	**260W020P**	1 Each
0.25	15	0.25	**260W130P**	1 Each
	30	0.25	**260W142P**	1 Each
		0.5	**260W223P**	1 Each
		1.0	**260W296P**	1 Each
	60	0.25	**260W154P**	1 Each
0.32	15	0.25	**260W131P**	1 Each
	30	0.25	**260W143P**	1 Each
		0.5	**260W224P**	1 Each
		1.0	**260W297P**	1 Each
	60	0.25	**260W155P**	1 Each
		0.5	**260W236P**	1 Each
		1.0	**260W309P**	1 Each
0.53	15	1.0	**260W286P**	1 Each
	30	0.5	**260W225P**	1 Each
		1.0	**260W298P**	1 Each
	60	1.0	**260W310P**	1 Each

Applications:

- Esters
- Alcohols
- Ketones
- Glycols
- Aromatic isomers

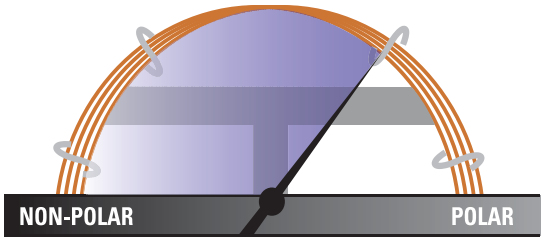
Similar to:

- 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-WaxMS GC Columns

Feature a high-polarity phase designed for mass spectometry detectors

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



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

TRACE TR-WaxMS GC Columns

ID (mm)	Length (m)	Film Thickness (µm)	Cat. No.	Quantity
0.10	20	0.1	**260X145P**	1 Each
0.25	30	0.25	**260X142P**	1 Each
		0.5	**260X223P**	1 Each
		1.0	**260X296P**	1 Each
	60	0.25	**260X154P**	1 Each
		0.5	**260X235P**	1 Each
0.32	30	0.25	**260X143P**	1 Each
		0.5	**260X224P**	1 Each
	60	0.25	**260X155P**	1 Each
		1.0	**260X309P**	1 Each
0.53	30	1.0	**260X298P**	1 Each

Applications:

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

Similar to:

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

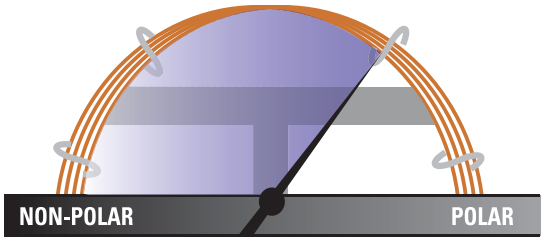
A full portfolio of GC accessories can be found on

PAGE 3-080

TRACE TR-FFAP GC Columns

High-polarity phase optimized for FFAP analysis

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



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

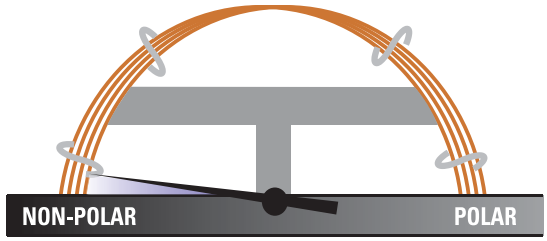
TRACE TR-FFAP Capillary GC Columns

ID (mm)	Length (m)	Film Thickness (µm)	Cat. No.	Quantity
0.25	15	0.25	**260N130P**	1 Each
	30	0.25	**260N142P**	1 Each
	60	0.25	**260N154P**	1 Each
0.32	15	0.25	**260N131P**	1 Each
	30	0.25	**260N143P**	1 Each
	50	0.5	**260N230P**	1 Each
0.53	15	0.5	**260N213P**	1 Each
	30	0.5	**260N225P**	1 Each
		1.0	**260N298P**	1 Each

TRACE TR-SimDist GC Columns

Feature a low-polarity phase for high temperature analyses

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



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

TRACE TR-SimDist GC Columns

ID (mm)	Length (m)	Film Thickness (µm)	Cat. No.	Quantity
0.53	10	0.1	**260S025P**	1 Each
		0.9	**260S250P**	1 Each
		2.65	**260S348P**	1 Each

Applications:

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

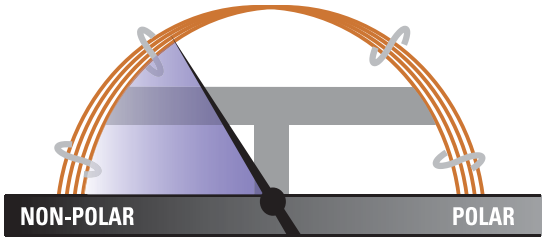
Similar to:

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

TRACE TR-V1 GC Columns

Mid-polarity, thick-film columns

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



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

TRACE TR-V1 GC Columns

ID (mm)	Length (m)	Film Thickness (µm)	Cat. No.	Quantity
0.18	20	1.0	**260V495P**	1 Each
0.25	30	1.4	**260V332P**	1 Each
	60	1.4	**260V333P**	1 Each
0.32	30	1.8	**260V339P**	1 Each
	60	1.8	**260V341P**	1 Each
0.53	30	3.0	**260V396P**	1 Each
		5.0	**260V470P**	1 Each

Applications:

- Volatile organics
- Alcohols
- EPA 502.2, 608 and 624

Similar to:

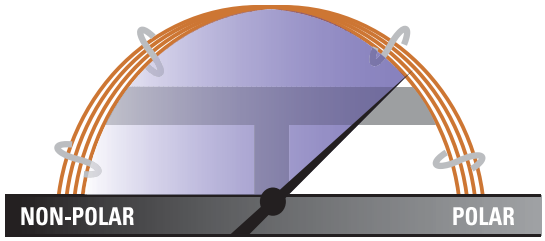
- DB-624
- BPX volatiles
- Rtx volatiles
- VOCOL 56
- OV-624
- AT-624
- HP-VOC
- CP-Select 624CB
- 007-624
- ZM-624

Search thousands of applications
in our chromatography resource center
www.thermoscientific.com/crc

TRACE TR-FAME GC Columns

High-polarity phase optimized for FAME analysis

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



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

TRACE TR-FAME GC Columns

ID (mm)	Length (m)	Film Thickness (µm)	Cat. No.	Quantity
0.10	10	0.2	**260M096P**	1 Each
0.22	25	0.25	**260M135P**	1 Each
	30	0.25	**260M141P**	1 Each
	50	0.25	**260M147P**	1 Each
	60	0.25	**260M153P**	1 Each
0.25	30	0.25	**260M142P**	1 Each
	60	0.25	**260M154P**	1 Each
	120	0.25	**260M166L**	1 Each
0.32	25	0.25	**260M137P**	1 Each
	30	0.25	**260M143P**	1 Each
	50	0.25	**260M149P**	1 Each
	60	0.25	**260M155P**	1 Each

Applications:

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

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 GC Columns for Specific EPA Methods

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

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

Applications:

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

TRACE GC Columns for Dioxin and PCB Analysis

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

- 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 requirements for HR GCMS analysis of PCB's
- Low bleed

TRACE GC Columns for Specific EPA Methods

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

Applications:

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

Application Kits for Screening and Conformation of Persistant Organic Pollutants (POP)

Persistant Organic Pollutants (POP) Screening Kit

Description	Cat. No.	Quantity
Persistant Organic Pollutants (POP) Screening Kit	**TS-MKITG501**	1 Each
Containing the following:		
TRACE TR-Dioxin 5MS GC Column 30m x 0.25mm x 0.10µm	**26AF047P**	1 Each
S/SL Injector – BTO Septa 17mm Diameter	**31303211**	50 Pack
S/SL Injector – Split/Splitless Liner, 5mm ID x 8mm OD x 105mm Length	**45350033**	5 Pack
S/SL Injector – Silver Seals	**29033629**	10 Pack
S/SL Injector – Graphite Liner Seals	**29033406**	10 Pack
S/SL Injector – Graphite Ferrules for 0.25mm ID Column	**29053488**	10 Pack
MS Interface – Graphite/Vespel Ferrules for 0.25mm ID Column	**29033496**	10 Pack
1.1mL Screw Top Tapered Vial, Clear Gold Grade Glass	**1.1-STVG**	500 Pack
8mm Screw Caps with Pre-fitted Silicone/PTFE Seal	**8-SC-ST15**	500 Pack
10µL Fixed Needle Syringe, 50mm Length, 25 Gauge, Cone Needle	**36500525**	1 Each

Persistant Organic Pollutants (POP) Conformation Kit

Description	Cat. No.	Quantity
Persistant Organic Pollutants (POP) Conformation Kit	**TS-MKITG502**	1 Each
Containing the following:		
TRACE TR-Dioxin 5MS GC Column 60m x 0.25mm x 0.25µm	**26AF154P**	1 Each
S/SL Injector – BTO Septa 17mm Diameter	**31303211**	50 Pack
S/SL Injector – Split/Splitless Liner, 5mm ID x 8mm OD x 105mm Length	**45350033**	5 Pack
S/SL Injector – Silver Seals	**29033629**	10 Pack
S/SL Injector – Graphite Liner Seals	**29033406**	10 Pack
S/SL Injector – Graphite Ferrules for 0.25mm ID Column	**29053488**	10 Pack
MS Interface – Graphite/Vespel Ferrules for 0.25mm ID Column	**29033496**	10 Pack
1.1mL Screw Top Tapered Vial, Clear Gold Grade Glass	**1.1-STVG**	500 Pack
8mm Screw Caps with Pre-fitted Silicone/PTFE Seal	**8-SC-ST15**	500 Pack
10µL Fixed Needle Syringe, 50mm Length, 25 Gauge, Cone Needle	**36500525**	1 Each

TRACE TR-BioDiesel GC Columns

Designed for use in carbon neutral fuels development applications

- 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

Applications:

- Biodiesel
- ASTM D-6751
- EN14214

TRACE TR-BioDiesel GC Columns

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

TRACE GC Columns for Drugs of Abuse

Specifically designed for the analysis of common drugs of abuse

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

Application Kit for Drugs of Abuse / Toxicology Screening

Description	**Cat. No.**	Quantity
Drugs of Abuse / Toxicology Application Kit	**60181-741**	1 Each
Containing the following:		
TRACE TR-DoA 5MS GC Column 15m x 0.25mm x 0.25µm	**26AF130P**	1 Each
TRACE TR-DoA 35MS GC Column 15m x 0.20mm x 0.33µm	**26AC497P**	1 Each
S/SL Injector – BTO Septa 17mm Diameter	**31303211**	50 Pack
S/SL Injector – Split/Splitless Liner, 5mm ID x 8mm OD x 105mm Length	**45350033**	5 Pack
S/SL Injector – Graphite Ferrules for 0.25mm ID Column	**29053488**	10 Pack
MS Interface – Graphite/Vespel Ferrules for 0.25mm ID Column	**29033496**	10 Pack
S/SL Injector – Deactivated Glass Wool 10g	**60180-785**	1 Each
2mL Screw Top Vials, Amber with PTFE/Red Rubber Seal	**60180-565**	100 Pack
250µL Glass Inserts with Rubber Polyspring	**60180-566**	100 Pack
10µL Gas Tight Syringe, Fixed Needle, 50mm Length, 23 Gauge, Cone Needle	**365D3741**	1 Each
HyperSep Verify-CX SPE Columns 200mg 10mL	**60108-742**	50 Pack

Applications:

- Amphetamines, codeine and morphine
- Carboxy-THC

TRACE GC Columns for Pesticides

Specifically designed and tested for analysis of pesticides

- 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

Applications:

- Organophosphate pesticides
- Organochlorine pesticides
- Pyrethroid pesticides
- Herbicides

TRACE GC Columns for Pesticides

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

QuEChERS solutions offer efficient pesticide sample preparation options. Discover our portfolio of HyperSep Dispersive SPE products on

PAGE 1-056

Applications Kits for Pesticide Analysis

Pesticide (S/SL Installation) Application Kit

Description	Cat. No.	Quantity
Pesticide (S/SL Installation) Application Kit	**60181-730**	1 Each
Containing the following:		
TRACE TR-Pesticide II GC Column 30m x 0.25mm x 0.25µm + 5m Guard Column	**26RD142F**	1 Each
Deactivated Silica Guard Column 0.53mm ID x 2m Length	**26060375**	1 Each
SilTite Column Connector (0.1-0.25mm to 0.1-0.53mm)	**290MU498**	1 Each
SilTite Ferrules 0.53mm Column ID	**290MF231**	10 Pack
S/SL Injector – Split/Splitless Deactivated Liner 3mm ID x 8mm OD x 105mm Length	**453T2121**	5 Pack

Pesticide (S/SL Consumables) Application Kit

Description	Cat. No.	Quantity
Pesticide (S/SL Consumables) Application Kit	**60181-732**	1 Each
Containing the following:		
TRACE TR-Pesticide II GC Column 30m x 0.25mm x 0.25µm + 5m Guard Column	**26RD142F**	2 Pack
Deactivated Silica Guard Column 0.53mm ID x 2m Length	**26060375**	10 Pack
SilTite Column Connector (0.1-0.25mm to 0.1-0.53mm)	**290MU498**	2 Pack
SilTite Ferrules 0.53mm Column ID	**290MF231**	30 Pack
SilTite Ferrules 0.25mm Column ID	**290MF229**	30 Pack
S/SL Injector – Split/Splitless Deactivated Liner 3mm ID x 8mm OD x 105mm Length	**453T2121**	25 Pack

Pesticide (PTV Installation) Application Kit

Description	Cat. No.	Quantity
Pesticide (PTV Installation) Application Kit	**60181-731**	1 Each
Containing the following:		
TRACE TR-Pesticide II GC Column 30m x 0.25mm x 0.25µm + 5m Guard Column	**26RD142F**	1 Each
Deactivated Silica Guard Column 0.53mm ID x 2m Length	**26060375**	1 Each
SilTite Column Connector (0.1-0.25mm to 0.1-0.53mm)	**290MU498**	2 Pack
SilTite Ferrules 0.53mm Column ID	**290MF231**	10 Pack
PTV Injector – Deactivated Baffle Liner 2mm ID x 2.75mm OD x 120mm Length	**453T2120**	5 Pack

Pesticide (PTV Consumables) Application Kit

Description	Cat. No.	Quantity
Pesticide (PTV Consumables) Application Kit	**60181-733**	1 Each
Containing the following:		
TRACE TR-Pesticide II GC Column 30m x 0.25mm x 0.25µm + 5m Guard Column	**26RD142F**	2 Pack
Deactivated Silica Guard Column 0.53mm ID x 2m Length	**26060375**	10 Pack
SilTite Column Connector (0.1-0.25mm to 0.1-0.53mm)	**290MU498**	2 Pack
SilTite Ferrules 0.53mm Column ID	**290MF231**	30 Pack
SilTite Ferrules 0.25mm Column ID	**290MF229**	30 Pack
PTV Injector – Deactivated Baffle Liner 2mm ID x 2.75mm OD x 120mm Length	**453T2120**	25 Pack

UltraFast GC Columns – Technical Information

The huge demand of samples to be analyzed every day by labs in industries such as environmental and petrochemical requires an increased speed of analysis

A significant gain in analysis speed compared to conventional GC procedures is obtained through UltraFast Gas Chromatography. UltraFast GC utilises short (2-10m) narrow bore capillaries and temperature programming conditions usually faster than 2°C/s. This leads to peak widths in the 50-200ms range. The analysis times are in the range of 1 minute or even less.

Benefits of UltraFast GC Columns

- Dramatically shorter analysis times – typically a minute or less
- Ideal for applications in petrochem and environmental markets
- Long column lifetimes

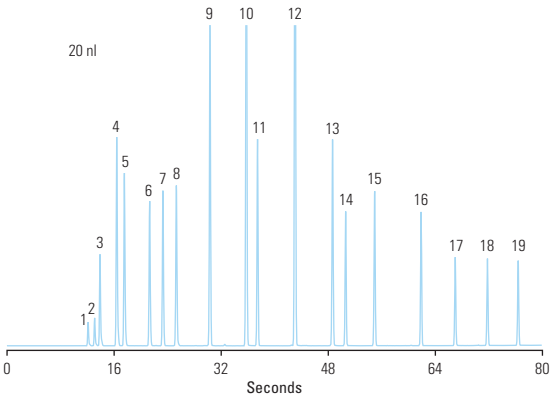
Application – UltraFast Analysis of Pure Petroleum Products through Nanovolumes Injection

The analyses were performed in the UltraFast GC mode using a TRACE GC Ultra System equipped with a Split/Splitless injector (SSL) and a Digital Pressure and Flow Controller, as well as a FAST FID detector. The GC System was also equipped with an UltraFast Module (UFM).

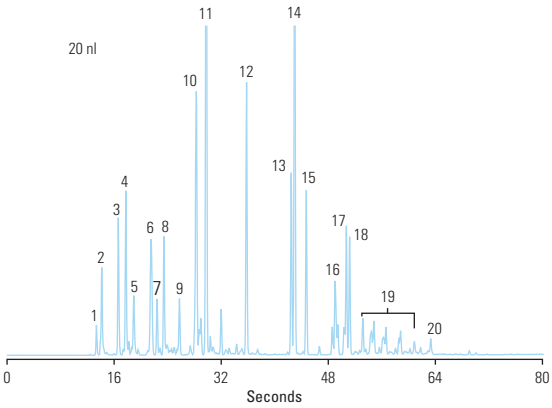
Split injections were performed with a AS3000 Autosampler using a 0.5µL plunger-in-needle syringe p/n 36504045). A minimum penetration depth in the injector (cold needle mode) was set, and 0.3µL of air was automatically withdrawn after the sample to ensure that the part of the needle inserted into the injector was empty. A 3mm ID upper-tapered empty liner with an 8mm long and 1mm wide restriction at the top was installed. The SSL injector was set to 225°C and the FID to 320°C.

Column: UFC-1 10m x 0.32mm x 3um

Part Number:	UFMC00002070414
Temperature:	40°C (6 sec hold) to 300°C (6 sec hold) at 180°C/min
Detector Type:	FID
Carrier Gas:	Helium
Flow Rate:	0.5mL/min
Injection Mode:	Split/Splitless



1. propane
2. methyl-propane
3. butane
4. methyl-butane
5. pentane
6. methyl-pentane
7. hexane
8. dimethyl-pentane
9. heptane
10. toluene
11. octane
12. p-xylene
13. propyl-benzene
14. n-decane
15. butyl-benzene
16. n-dodecane
17. n-tridecane
18. n-tetradecane
19. n-pentadecane



1. methyl-propane
2. butane
3. 2-methyl-butane
4. pentane
5. ter-butyl alcohol
6. methyl-pentane
7. 3-methyl-pentane
8. hexane
9. dimethyl-pentane
10. cyclohexane
11. dimethyl-hexane
12. toluene
13. ethyl-benzene
14. p-xylene
15. m-xylene
16. propyl-benzene
17. tetramethyl-octane
18. 1,2,4-trimethyl-benzene
19. tri/tetramethyl-benzene isomers
20. naphtalene

UltraFast GC Columns

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

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

Applications:

- Chemical
- Petrochemical
- Environmental
- Flavors and fragrances

UltraFast GC Columns

Phase	ID (mm)	Length (m)	Film Thickness (µm)	Uses	Cat. No.	Quantity
UFC-1	0.10	5	0.1	General	**UFMC00001010401**	1 Each
	0.32	2.5	0.1	ASTM D-2887	**UFMC00000070401**	1 Each
		5	0.1	ASTM D-2887	**UFMC00001070401**	1 Each
		5	0.25	ISO 9377-2	**UFMC00001070404**	1 Each
		5	0.5	General	**UFMC00001070907**	1 Each
		10	3.0	ASTM D-3710	**UFMC00002070414**	1 Each
UFC-5	0.10	2.5	0.4	General	**UFMC00100000000**	1 Each
		5	0.4	General	**UFMC00200000000**	1 Each
		5	0.4	General	**UFMC00501010006**	1 Each
		5	0.1	General	**UFMC00300000000**	1 Each
		10	0.1	General	**UFMC00002010601**	1 Each
		10	0.4	General	**UFMC00002010006**	1 Each
		10	0.4	General	**UFMC00502010006**	1 Each
UFC-1701	0.10	5	0.1	General	**UFMC00400000000**	1 Each
UFC-WAX	0.10	5	0.1	FAMES, Essential Oils	**UFMC00001010501**	1 Each
		5	0.2	General	**UFMC00001010503**	1 Each
UFC-200	0.18	10	0.4	Alcohols, Ketones	**UFMC00002030306**	1 Each
UFC-264	0.10	10	0.5	Volatiles	**UFMC00002010207**	1 Each
UFC-23	0.15	10	0.15	FAMEs	**UFMC00002020802**	1 Each
	0.18	10	0.2	FAMEs	**UFMC00002030603**	1 Each
UFC-BioDiesel	0.32	5	0.5	BioDiesel	**UFMC00001070600**	1 Each
UFC-M1	0.10	2.5	0.1	General	**UFMC00000010906**	1 Each
	0.32	5	0.25	General	**UFMC00001070904**	1 Each
UFC-FFAP	0.25	10	0.25	FFAP	**UFMC00091025250**	1 Each
UFC-POR Q					**UFMC00002060614**	1 Each

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

Optimized for linear and quantitative analysis of polar unsaturated hydrocarbons

- 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)

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

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

Applications:

- C1-C5 hydrocarbons
- Unsaturated hydrocarbon isomers

Similar to:

- Alumina-PLOT
- AT-Alumina
- CP-Al2O3/KCl
- CP-Al2O3/Na_2SO_4
- GS-Alumina
- GS-Alumina KCl
- HP PLOT M
- HP PLOT S
- Rt-Alumina BOND (KCl)
- Rt-Alumina BOND (Na_2SO_4)

TracePLOT TG-BOND Msieve 5A GC Columns

Designed for separation of Ar/O_2 and other permanent 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

TracePLOT TG-BOND Msieve 5A GC Columns

ID (mm)	Length (m)	Film Thickness (µm)	Cat. No.	Quantity
0.32	15	30	**26003-6010**	1 Each
	30	30	**26003-6040**	1 Each
0.53	15	50	**26003-6070**	1 Each
	30	50	**26003-6100**	1 Each
	50	50	**26003-1630**	1 Each

Applications:

- Permanent gases
- Refinery or natural gases

Similar to:

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

TracePLOT TG-BOND Q GC Columns

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

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

TracePLOT TG-BOND Q GC Columns

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

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

Similar to:

- CP-PoraPLOT Q
- Rt-Q-BOND
- CP-PoraBond Q
- Supel-Q-Plot
- AT-Q

TracePLOT TG-BOND Q+ GC Columns

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

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

TracePLOT TG-BOND Q+ GC Columns

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

Applications:

- Separation of ethane, ethylene and acetylene to baseline

Similar to:

- GS-Q
- Rt-QS-BOND

TracePLOT TG-BOND S GC Columns

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

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

TracePLOT TG-BOND S GC Columns

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

Applications:

- Non-polar and polar compounds

Similar to:

- CP-PoraPLOT S
- Supel-G45
- Rt-S-BOND

TracePLOT TG-BOND U GC Columns

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

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

TracePLOT TG-BOND U GC Columns

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

Applications:

- Analysis of polar and non-polar compounds

Similar to:

- HP-PLOT U
- Rt-U-BOND
- CP-PoraPLOT U
- CP-PoraBOND U
- Supel-N PLOT

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

Notes

GC Accessories

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	Filter Capacity
Moisture	Inert carrier, He, H_2, N_2, AR, Air		21g H_2O
Oxygen	Inert carrier, He, H_2, N_2, AR		3L O_2
Hydrocarbon	Inert carrier, He, H_2, N_2, AR, Air		36g (as n-butane)
Combi – Moisture, Oxygen	Inert carrier, He, H_2, N_2, AR		10g H_2O, 1.5L O_2
Combi – Moisture, Hydrocarbons	Inert carrier, He, H_2, N_2, AR, Air		10g H_2O, 18g HCs (as n-butane)
Triple – Moisture, Oxygen, Hydrocarbons	Inert carrier, He, H_2, N_2, AR		6g H_2O, 1L O_2, 12g HCs (as n-butane)
Triple– Moisture, Oxygen, Hydrocarbons – He preconditioned for GC/MS	He		6g H_2O, 1L O_2, 12g HCs (as n-butane)
Indicating Triple – Moisture, Oxygen, Hydrocarbons – He preconditioned for GC/MS	He	Red to White Purple to Green	0.1g H_2O, 100mL O2, 0.07HCs (as n-butane)

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 – Moisture, Oxygen	**60180-804**	1 Each
Combi – Moisture, Hydrocarbons	**60180-843**	1 Each
Triple – Moisture, Oxygen, Hydrocarbons	**60180-805**	1 Each
Triple – Moisture, Oxygen, Hydrocarbons – He preconditioned for GC/MS	**60180-806**	1 Each
Indicating Triple – Moisture, Oxygen, Hydrocarbons – He preconditioned for GC/MS	**60180-808**	1 Each

Connectors and Accessories

Description	Cat No.	Quantity
Brass End Fitting, 0.125in.	**60180-809**	2 Pack
Steel End Fitting, 0.125in.	**60180-810**	2 Pack
Brass End Fitting, 0.25in.	**60180-811**	2 Pack
Steel End Fitting, 0.25in.	**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.

Super Clean Cartridge Filter	For Gas Type	Indicator Change	Filter Capacity
Moisture	Inert carrier, He, H_2, N_2, AR, Air	Gray to White	7.2g H_2O
Oxygen	Inert carrier, He, H_2, N_2, AR	Green to Gray	1L O_2
Hydrocarbon	Inert carrier, He, H_2, N_2, AR, Air		24g HCs (as n-butane)
Combi	Inert carrier, He, H_2, N_2, AR, Air	Purple to Green	3.5g H_2O, 12g HCs (as n-butane)
Triple	Inert carrier, He, H_2, N_2, AR	Orange to Gray Purple to Green	1.8g H_2O, 500mL O_2, 7g HCs (as n-butane)

Super Clean Cartridge Filters

Type	Base Included	Cat. No.	Quantity
Indicating Moisture Cartridge Filter	No	**60180-819**	1 Each
Indicating Oxygen Cartridge Filter	No	**60180-820**	1 Each
Hydrocarbon Cartridge Filter	No	**60180-821**	1 Each
Indicating Combi Filter – Moisture, Hydrocarbons	No	**60180-826**	1 Each
Indicating Triple Filter – Moisture, Oxygen, Hydrocarbons	No	**60180-824**	1 Each
Indicating Triple Filter – Moisture, Oxygen, Hydrocarbons – He preconditioned for GC/MS	No	**60180-825**	1 Each
Triple Filter – Moisture, Oxygen, Hydrocarbons – He preconditioned for GC/MS	Yes	**60180-830**	1 Each
Indicating Triple Filter – Moisture, Oxygen, Hydrocarbons – He preconditioned for GC/MS	Yes	**60180-829**	1 Each
3 Cartridge Pack – contains 1 x Triple Filter and 2 x Combi Filter (Moisture, Hydrocarbons)	No	**60180-822**	1 Each
4 Cartridge Pack – contains 1 x Moisture Filter, 1 x O_2 Filter and 2 x Hydrocarbon Filter	No	**60180-823**	1 Each
4 Cartridge Pack – contains 1 x Moisture Filter, 1 x O_2 Filter and 2 x Hydrocarbon Filter	Yes	**60180-827**	1 Each
3 Cartridge Pack – contains 1 x Triple Filter and 2 x Combi Filter (Moisture, Hydrocarbons)	Yes	**60180-828**	1 Each
Twin Hydrocarbon Filters for High Flow Base Plate for LC/MS – no Indicator	No	**60180-831**	1 Each
Twin Moisture Filters for High Flow (Air Generators)	No	**60180-832**	1 Each
High Flow Pack of 2 x Hydrocarbon Filters for LC/MS – no Indicator	No	**60180-839**	1 Each
High Flow Pack of 2 x Hydrocarbon Filters for LC/MS – with Indicator	No	**60180-840**	1 Each
High Flow Pack of 2 x Moisture Filters for LC/MS – with Indicator	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

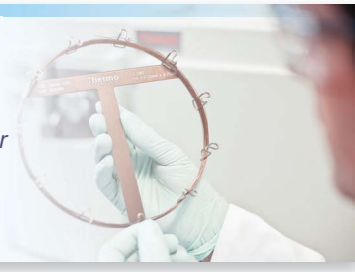
Filters are not included.

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**	20 Pack
Flush Cap	**60180-838**	2 Pack

Search thousands of applications
in our chromatography resource center
www.thermoscientific.com/crc



GC Installation Kit

Includes:

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

GC Installation Kit

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

Septa

A wide range to cover most applications

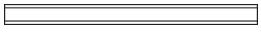
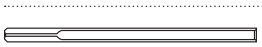
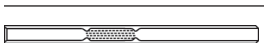
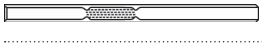
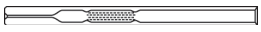
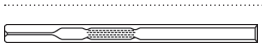
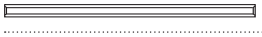
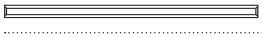
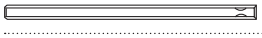
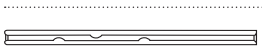
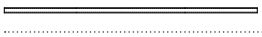
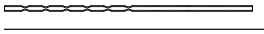
- Variety of materials and temperature limits for all applications
- For use in Thermo Scientific TRACE and Thermo Scientific FOCUS GCs and instruments from other manufacturers
- Contaminant-free in individual blister packs
- Temperature limit: 400°C

Septa

Brand	Material	ID (mm)	Cat. No.	Quantity
BTO	Low Bleed Silicone	9	**31303240**	50 Pack
BTO	Low Bleed Silicone	11	**31303233**	50 Pack
BTO	Low Bleed Silicone	11.5	**31303230**	50 Pack
BTO	Low Bleed Silicone	12.7	**31303228**	50 Pack
BTO	Low Bleed Silicone	17	**31303211**	50 Pack
TR-Green	Low Coring Silicone	9	**313G3240**	50 Pack
TR-Green	Low Coring Silicone	11	**313G3230**	50 Pack
TR-Green	Low Coring Silicone	12.7	**313G3228**	50 Pack
TR-Green	Low Coring Silicone	17	**313G3211**	50 Pack

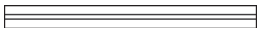
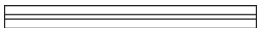
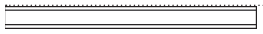
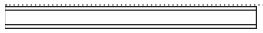
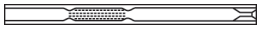
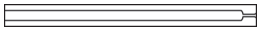
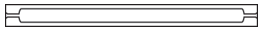
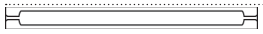
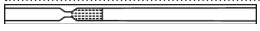
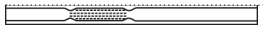
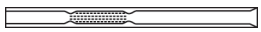
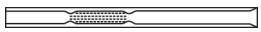
Injection Port Liners for Thermo Scientific Instruments

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

	Injection Type	ID x OD (mm)	Length (mm)	Packing	Cat. No.	Quantity	Liner Sealing Ring Cat No.	Quantity
Liners for TRACE and FOCUS SSL Instruments								
	Split Straight Liner	5 x 8	105	No	**45350030**	5 Pack	**29033406**	10 Pack
	Split Straight Liner	5 x 8	105	No	**45354030**	25 Pack	**29033406**	10 Pack
	Split Straight Liner	3 x 8	105	No	**45350031**	5 Pack	**29033406**	10 Pack
	Split Straight Liner	3 x 8	105	No	**45354031**	25 Pack	**29033406**	10 Pack
	Split Straight Liner	5 x 8	105	CarboFrit	**453T2131**	5 Pack	**29033406**	10 Pack
	Splitless Straight Liner	3 x 8	105	No	**45350032**	5 Pack	**29033406**	10 Pack
	Splitless Straight Liner	3 x 8	105	No	**45354032**	25 Pack	**29033406**	10 Pack
	Splitless Straight Liner	5 x 8	105	No	**45350033**	5 Pack	**29033406**	10 Pack
	Splitless Straight Liner	5 x 8	105	No	**45354033**	25 Pack	**29033406**	10 Pack
	Splitless Straight Liner	5 x 8	105	CarboFrit	**453T2130**	5 Pack	**29033406**	10 Pack
	Splitless Straight Liner (Siltek)	3 x 8	105	No	**453T2121**	5 Pack	**29033406**	10 Pack
	Split FocusLiner for 50mm Needle	5 x 8	105	Quartz Wool	**453T1905**	5 Pack	**29033406**	10 Pack
	Split FocusLiner for 50mm Needle	5 x 8	105	Quartz Wool	**453T4905**	25 Pack	**29033406**	10 Pack
	Splitless FocusLiner for 70mm Needle	5 x 8	105	Quartz Wool	**453T2895**	5 Pack	**29033406**	10 Pack
	Splitless FocusLiner for 70mm Needle	5 x 8	105	Quartz Wool	**453T4895**	25 Pack	**29033406**	10 Pack
	Splitless FocusLiner for 50mm Needle	5 x 8	105	Quartz Wool	**453T2999**	5 Pack	**29033406**	10 Pack
	Splitless FocusLiner for 50mm Needle	5 x 8	105	Quartz Wool	**453T4999**	25 Pack	**29033406**	10 Pack
	Baffle Liner	2 x 8	105	No	**453T1001**	5 Pack	**29033406**	10 Pack
Liners for TRACE PTV Instruments								
	PTV Straight Liner	0.75 x 2.75	105	No	**45352083**	5 Pack		
	PTV Straight Liner	1 x 2.75	120	No	**45352054**	5 Pack		
	PTV Straight Liner	1 x 2.75	120	No	**45354054**	25 Pack		
	PTV Straight Liner	2 x 2.75	120	No	**45352057**	5 Pack		
	PTV Straight Liner	2 x 2.75	120	No	**45354057**	25 Pack		
	PTV Liner with Sintered Lining	1 x 2.75	120	No	**45352060**	5 Pack		
	PTV Liner with Three Baffles	1 x 2.75	120	No	**45352062**	5 Pack		
	PTV Liner with Three Baffles	1 x 2.75	120	No	**45354062**	25 Pack		
	PTV Siltek Metal Liner	2 x 2.75	120	No	**45322044**	2 Pack		
	PTV Siltek Metal Liner	1 x 2.75	120	No	**45322046**	2 Pack		
	PTV Baffle Liner (Siltek)	2 x 2.75	120	No	**453T2120**	5 Pack		
	PTV Silcosteel Liner for OC	1 x 2.75	120	No	**45322052**	2 Pack	**29013417**	2 Pack

	Injection Type	ID x OD (mm)	Length (mm)	Packing	Cat. No.	Quantity	Liner Sealing Ring Cat No.	Quantity
Liners for Mega 4000, 5000 and 6000								
	Split Straight Liner	2 × 5	79.5	No	**45350300**	5 Pack		
	Split Straight Liner	3 × 5	79.5	No	**45350400**	5 Pack		
	Split/Splitless Liner with Recessed Gooseneck	3 x 5	79.5	Quartz Wool	**453T2955**	5 Pack		

Injection Port Liners for Agilent Instruments

	Injection Type	ID x OD (mm)	Length (mm)	Packing	Cat. No.	Quantity	Liner Sealing Ring Cat No.	Quantity
Injection Port Liners for Agilent Instruments								
	Direct Straight Liner	1.2 x 6.3	78.5	No	**453A1335**	5 Pack	**290GA242 (Graphite) 290OA241 (Viton)**	10 Pack
	Direct Straight Liner	1.2 x 6.3	78.5	No	**453A2332**	25 Pack		
	Split Straight Liner	4 x 6.3	78.5	Quartz Wool	**453A2265**	5 Pack	**290GA243 (Graphite) 290OA241 (Viton)**	10 Pack
	Split Straight Liner	4 x 6.3	78.5	Quartz Wool	**453A1262**	25 Pack		
	Split Straight Liner	4 x 6.3	78.5	No	**453A1295**	5 Pack		
	Split Straight Liner	4 x 6.3	78.5	No	**453A2292**	25 Pack		
	Split/Splitless FocusLiner	4 x 6.3	78.5	Quartz Wool	**453A1255**	5 Pack	**290GA243 (Graphite) 290OA241 (Viton)**	10 Pack
	Split/Splitless FocusLiner	4 x 6.3	78.5	Quartz Wool	**453A1252**	25 Pack		
	Split/Splitless FocusLiner with Single Taper	4 x 6.3	78.5	No	**453A1315**	5 Pack	**290GA243 (Graphite) 290OA241 (Viton)**	10 Pack
	Split/Splitless FocusLiner with Single Taper	4 x 6.3	78.5	No	**453A1312**	25 Pack		
	Split/Splitless Liner with Single Taper	4 x 6.3	78.5	No	**453A1345**	5 Pack	**290GA243 (Graphite) 290OA241 (Viton)**	10 Pack
	Split/Splitless Liner with Single Taper	4 x 6.3	78.5	No	**453A2342**	25 Pack		
	Split/Splitless Liner with Double Taper	4 x 6.3	78.5	No	**453A1355**	5 Pack	**290GA242 (Graphite) 290OA241 (Viton)**	10 Pack
	Split/Splitless Liner with Double Taper	4 x 6.3	78.5	No	**453A2352**	25 Pack		
	Split/Splitless Liner w/Recessed Gooseneck	4 x 6.3	78.5	Quartz Wool	**453A1305**	5 Pack	**290GA243 (Graphite) 290OA241 (Viton)**	10 Pack
	Split/Splitless Liner w/Recessed Gooseneck	4 x 6.3	78.5	Quartz Wool	**453A2302**	25 Pack		
	Split/Splitless FAST FocusLiner	2.3 x 6.3	78.5	Quartz Wool	**453A1285**	5 Pack	**290GA243 (Graphite) 290OA241 (Viton)**	10 Pack
	Split/Splitless FAST FocusLiner	2.3 x 6.3	78.5	Quartz Wool	**453A2282**	25 Pack		
	Split/Splitless FAST FocusLiner with Single Taper	2.3 x 6.3	78.5	Quartz Wool	**453A2375**	5 Pack	**290GA243 (Graphite) 290OA241 (Viton)**	10 Pack
	Split/Splitless FAST FocusLiner with Single Taper	2.3 x 6.3	78.5	Quartz Wool	**453A1372**	25 Pack		

Injection Port Liners for Agilent Instruments *continued*

	Injection Type	ID x OD (mm)	Length (mm)	Packing	**Cat. No.**	Quantity	**Liner Sealing Ring Cat No.**	Quantity
	Splitless Liner with Single Taper	4 x 6.3	78.5	Quartz Wool	**453A1925**	5 Pack		
	Splitless Straight Liner	2.0 x 6.1	78.5	Quartz Wool	**453A2275**	5 Pack	**290GA244 (Graphite)**	10 Pack
	Splitless Liner with Recessed Gooseneck	2.0 x 6.3	78.5	No	**453A2325**	5 Pack	**290OA241 (Viton)**	10 Pack
	Cyclo/Single Gooseneck (Deactivated Metal)	5.2 x6.3	78.5	No	**453A2000**	5 Pack		
	Single Gooseneck (Deactivated Metal)	5.2 x 6.3	78.5	No	**453A2001**	5 Pack		
	Cyclosplitter Liner (Deactivated Metal)	5.2 x 6.3	78.5	No	**453A2002**	5 Pack		
	Split/Splitless Liner with Wool (Deactivated Metal)	5.2 x 6.3	78.5	Quartz Wool	**453A2003**	5 Pack		
	Split/Splitless Mixed Liner Sample Pack	Mixed	Mixed	No	**453AG001**	5 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

Gold Inlet Base Seals for Agilent GCs

For Use With	ID (mm)	Cat. No.	Quantity
Single column installation	0.8	**290GA081**	10 Pack
Single column installation	0.8	**290GA082**	2 Pack
Dual column installation	1.2	**290GA121**	10 Pack
Dual column installation	1.2	**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

- 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

ID (mm)	Cat. No.	Quantity
0.8	**290GA084**	10 Pack
0.8	**290GA083**	2 Pack

We offer a comprehensive range of user changeable instrument parts for your GC – visit

PAGE 3-142

Siltek Inlet Base Seals for Agilent GCs

Siltek coating 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 pesticides, PCB's, phenols, etc.)
- High grade stainless steel providing reproducible seal

Siltek-Treated Inlet Base Seals for Agilent GC Instruments

ID (mm)	Cat. No.	Quantity
0.8	**290GA091**	10 Pack
0.8	**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

ID (mm)	Cat. No.	Quantity
0.8	**290GA094**	10 Pack
0.8	**290GA093**	2 Pack

Finger Tite Connectors

Easier fit, reliability 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 and FID Starter Kit	**290ST132**	1 Each

Finger Tite Connectors for Agilent Instruments

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

Finger Tite Ferrules

ID (mm)	For Use With	Cat. No.	Quantity
0.4	0.1-0.25mm ID columns	**290S1132**	10 Pack
0.5	0.32mm ID columns	**290S1131**	10 Pack

QCC (Quick Column Change)

Leak free column installation

- Leak free column installation to injector and detector
- Tool-free installation of analytical GC column
- Graphite ferrules
- Available for Thermo Scientific and Agilent GC instruments

Complete QCC Kits:

Includes:

- Injector adaptor
- Detector adaptor
- Tight nut
- Ferrules (1 each 0.25mm, 0.32mm, 0.53mm)
- Ceramic column cutter

Thermo Scientific QCC (Quick Column Change) for Thermo Scientific Instruments

Description	Cat. No.	Quantity
QCC Kit for GC/FID	**60180-879**	1 Each
QCC Kit for GC/TCD	**60180-883**	1 Each
S/SL Injector Adaptor	**60180-880**	1 Each
FID Detector Adaptor	**60180-881**	1 Each
TCD Detector Adaptor	**60180-884**	1 Each
Silver Seals	**60180-882**	10 Pack
Tight Nut	**60180-873**	1 Each
Graphite Ferrules 0.25mm	**29053488**	10 Pack
Graphite Ferrules 0.32mm	**29053487**	10 Pack
Graphite Ferrules 0.53mm	**29053486**	10 Pack

Thermo Scientific QCC (Quick Column Change) for Agilent Instruments

Description	Cat. No.	Quantity
QCC Kit for GC/FID	**60180-870**	1 Each
QCC Kit for GC/TCD	**60180-871**	1 Each
S/SL Injector Adaptor	**60180-872**	1 Each
FID Detector Adaptor	**60180-877**	1 Each
TCD Detector Adaptor	**60180-878**	1 Each
Tight Nut	**60180-873**	1 Each
Ferrules 0.25mm	**60180-874**	10 Pack
Ferrules 0.32mm	**60180-875**	10 Pack
Ferrules 0.53mm	**60180-876**	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 3-099.

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.

Ferrules for Thermo Scientific Instruments

For Use With	Ferrule Size (Column ID) (mm)	Cat. No.	Quantity
100% Graphite Ferrules			
TRACE and FOCUS Injectors and Detectors (not GC/MS Interface)	0.1-0.25	**29053488**	10 Pack
	0.32	**29053487**	10 Pack
	0.53	**29053486**	10 Pack
15% Graphite/85% Vespel Ferrules			
TRACE Cold On-Column Injectors	0.1-0.25	**29033461**	10 Pack
	0.32	**29033460**	10 Pack
	0.53	**29033471**	10 Pack
	Packed Column 1/8" OD	**290VT168**	10 Pack
	Packed Column 1/4" OD	**290VT165**	10 Pack
Injectors and Detectors	0.1-0.25	**290VT186**	10 Pack*
	0.32	**290VT187**	10 Pack*
	0.53	**290VT188**	10 Pack*
Brass Nut		**290BT239**	2 Pack
GC/MS Interface	0.1-0.25	**29033496**	10 Pack
	0.32	**29033497**	10 Pack
SilTite Kit			
GC/MS Interface	0.1-0.25	**290MT229**	1 Each**
	0.32	**290MT230**	1 Each**
	0.53	**290MT231**	1 Each**
Replacement SilTite Ferrules			
SilTite Kit	0.1-0.25	**290MT221**	10 Pack
	0.32	**290MT222**	10 Pack
	0.53	**290MT223**	10 Pack
	Replacement SilTite Nuts	**290MT211**	5 Pack

* Must be used in conjunction with brass nut part number 290BT239
** Kit contains 2 SilTite nuts and 10 ferrules

Ferrules for Agilent 5890, 6890 and 6850 Instruments

For Use With	Ferrule Size (Column ID) (mm)	Cat. No.	Quantity
100% Graphite Ferrules			
Injectors and Detectors at atmospheric pressure (not GC/MS interface)	0.1-0.32	**290GA139**	10 Pack
	0.45-0.53	**290GA140**	10 Pack
	Packed Column 1/8" OD	**290GA108**	10 Pack
	Packed Column 1/4" OD	**290GA107**	10 Pack
15% Graphite/85% Vespel Ferrules			
Injectors and Detectors	0.1-0.25	**290VA191**	10 Pack
	0.32	**290VA192**	10 Pack
	0.53	**290VA193**	10 Pack
	Packed Column 1/8" OD	**290VT168**	10 Pack
	Packed Column 1/4" OD	**290VT165**	10 Pack
GC/MS Interface	0.1-0.25	**29033496**	10 Pack
	0.32	**29033497**	10 Pack
	0.53	**290VP144**	10 Pack
SilTite Kits			
GC/MS Interface	0.1-0.25	**290MA194**	1*
	0.32	**290MA195**	1*
	0.53	**290MA196**	1*
Split Splitless Injectors	0.1-0.25	**290MA215**	1**
	0.32	**290MA216**	1**
	0.53	**290MA217**	1**
Replacement SilTite Ferrules			
All SilTite Connectors	0.1-0.25	**290MA201**	10 Pack
	0.32	**290MA202**	10 Pack
	0.53	**290MA203**	10 Pack
SilTite Nuts			
GC/MS Interface		**290MA205**	10 Pack
Split Splitless Injectors		**290MA207**	5
Replacement Baseplate Seals		**290MA227**	10 Pack
		290MA228	10

*Kit contains 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
- Kit contains one union and five ferrules

Retention Gap Kits

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

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 GuardGOLD Columns

ID (mm)	Length (m)	Cat. No.	Quantity
0.25	2	**26050-0225**	1 Each
0.32	2	**26050-0232**	1 Each
0.53	2	**26050-0253**	1 Each
0.25	5	**26050-0525**	1 Each
0.32	5	**26050-0532**	1 Each
0.53	5	**26050-0553**	1 Each
0.25	10	**26050-1025**	1 Each
0.32	10	**26050-1032**	1 Each
0.53	10	**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 ID (mm)	2nd Column ID (mm)	Pack Contents	Cat. No.	Quantity
0.1 – 0.25	0.1 – 0.53	1 Connector, 2 Nuts and 5 Ferrules (0.1 – 0.25mm ID)	**290MU498**	1 Each
0.32	0.32 – 0.53	1 Connector, 2 Nuts and 5 Ferrules (0.32mm ID)	**290MU499**	1 Each
0.45 – 0.53	0.45 – 0.53	1 Connector, 2 Nuts and 5 Ferrules (0.45 – 0.53mm ID)	**290MU500**	1 Each
Replacement SilTite Connector Nuts†		5 Nuts	**290MN211**	1 Each

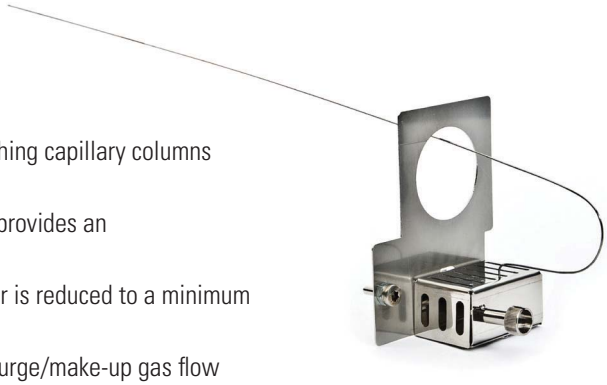
† SilTite nuts must be used with Siltite ferrules

SilTite Ferrules

Column ID (mm)	Cat. No.	Quantity
0.25	**290MF229**	10 Pack
0.32	**290MF230**	10 Pack
0.53	**290MF231**	10 Pack

SWAP-IT GC MS Interface System

Easy to install for quick column changeovers

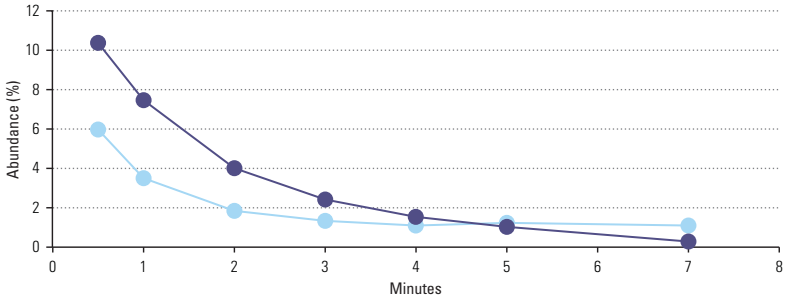


The SWAP-IT GCMS Interface provides a powerful tool for switching capillary columns without the need to vent the MS.

- 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 GC MS Interface System

Description	Cat. No.	Quantity
For Thermo Scientific Instruments (DSQ, DSQ II, 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



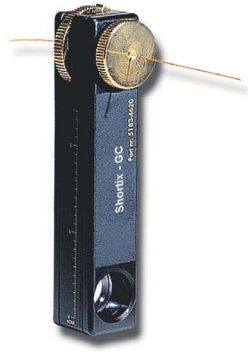
Removal of water and nitrogen to levels less than 2% is obtained within 3-4 minutes after column replacement

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
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

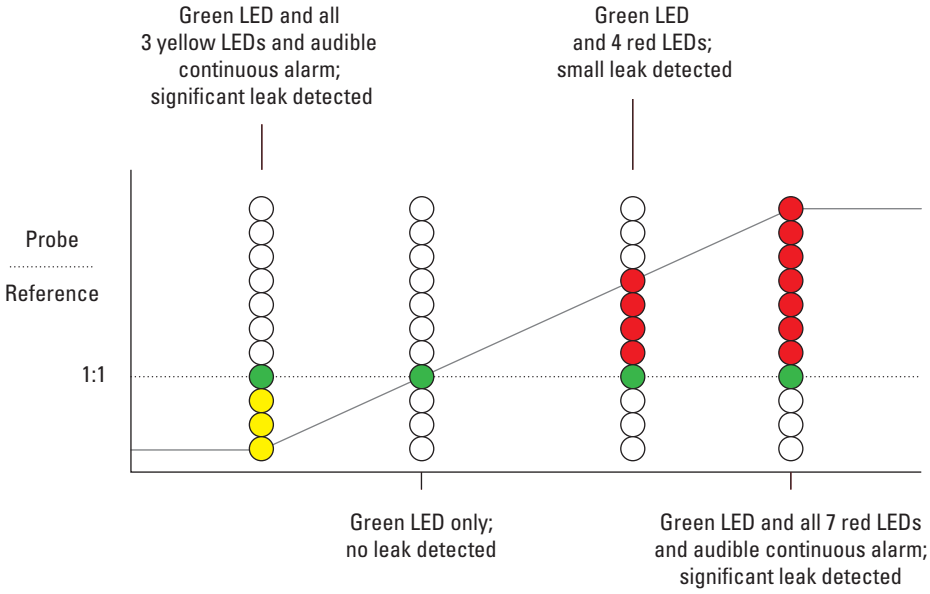
Aids in quickly locating and identifying gas leaks

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

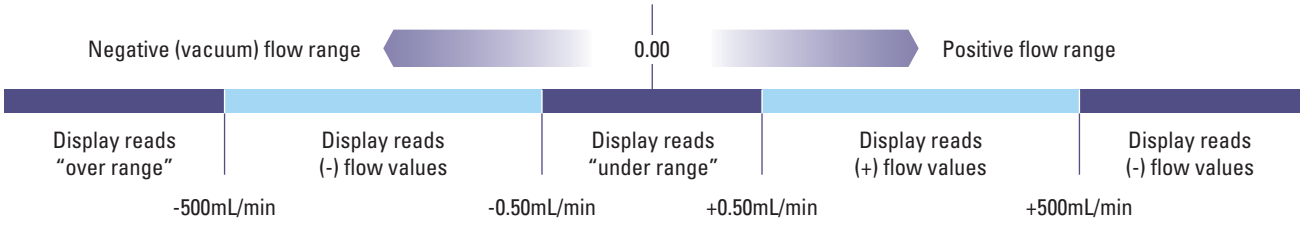
Measure and monitor flow quickly and efficiently

The GFM Pro Flowmeter is specifically designed for use with gas chromatography 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 0.5-500mL/min (both positive and negative flow)
- Accuracy of +/- 2% of flow or +/- 0.05mL/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



GC Syringes for Thermo Scientific Instruments

Removable Needle, Gas Tight Syringes

Volume (µL)	Length (mm)	Gauge	Tip Style	Type	**Cat No.**	Quantity	**Replacement Needle Cat. No.**	Quantity	Instrument Compatibility
10	75	31	Cone	Manual OC	**36500520**	1 Each	**36550046**	2 Pack	
50	50	25	Bevel		**365G2161**	1 Each	**365RN225**	5 Pack	AS200/AS800
100	50	23	Side hole	See Note	**36520050**	1 Each	**36550040**	2 Pack	TriPlus, AS200/ AS800
100	50	25	Bevel		**365H2381**	1 Each	**365RN225**	5 Pack	AS200/AS800
100	50	23	Cone	LV Splitless	**36500495**	1 Each	**36566485**	5 Pack	TriPlus, AS2000, AS200/AS800
250	50	25	Bevel		**365I2611**	1 Each	**365RN225**	5 Pack	AS200/AS800
250	80	26	Cone	LVOC	**36500490**	1 Each	**36566480**	5 Pack	TriPlus, AS2000
250	50	23	Side hole	See Note	**36520051**	1 Each	**36550040**	2 Pack	TriPlus, AS2000, AS200/AS800
1000	50	23	Bevel		**365K3041**	1 Each	**365RN235**	5 Pack	AS200/AS800

Removable Needle Syringes

Volume (µL)	Length (mm)	Gauge	Tip Style	Type	**Cat No.**	Quantity	**Replacement Needle Cat. No.**	Quantity	Instrument Compatibility
5	75	31	Cone	Manual OC	**36500510**	1 Each	**36550045**	2 Pack	
10	42	23	Cone		**365D1611**	6 Pack	**365RN252**	2 Pack	AS200/AS800
10	50	26	Cone		**365D1841**	1 Each	**365RN362**	2 Pack	AS3000, AS2000
10	50	23	Cone		**365D3731**	1 Each	**365RN372**	2 Pack	AS3000, AS2000, AS200/ AS800
50	50	23	Cone	LV Splitless	**36503015**	1 Each	**36566485**	5 Pack	AS2000
100	50	25	Bevel		**365H2301**	1 Each	**365RN225**	5 Pack	AS200/AS800

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.

Fixed Needle, Gas Tight Syringes

Volume (µL)	Length (mm)	Gauge	Tip Style	Type	**Cat No.**	Quantity	Instrument Compatibility
10	50	23	Cone		**365D3741**	1 Each	AS2000
250	50	25	Bevel		**365I2561**	1 Each	AS200/AS800

Fixed Needle Syringes

Volume (µL)	Length (mm)	Gauge	Tip Style	Type	**Cat No.**	Quantity	Instrument Compatibility
5	50	26	Cone	Split/PTV	**36504047**	1 Each	TriPlus
5	50	23	Cone		**365C3701**	1 Each	AS3000, AS2000, AS200/AS800
5	50	26	Cone	Split/PTV	**36500505**	1 Each	AS3000, AS2000
5	80	26	Cone	Splitless and OC	**36502025**	1 Each	TriPlus
10	50	26	Cone		**365D3711**	1 Each	AS3000, AS200, AS200/AS800
10	50	26	Cone		**365D1856**	6 Pack	AS300, AS2000, AS200/AS800
10	50	25	Cone	Split/PTV	**36500525**	1 Each	TriPlus, AS3000, AS2000, AS200/AS800
10	50	23	Cone	PTV/SSL Split	**36520060**	1 Each	TriPlus, AS300, AS2000, AS200/AS800
10	80	23	Cone	Merlin Valve SSL Splitless	**36520061**	1 Each	TriPlus, AS2000
10	50	23-26	Cone	OC in PTV Merlin Valve	**36500580**	1 Each	TriPlus, AS2000
10	80	26	Cone	OC and Splitless	**36502019**	1 Each	TriPlus, AS2000

Plunger-in-Needle Syringes

Volume (µL)	Length (mm)	Gauge	Tip Style	Type	**Cat No.**	Quantity	Instrument Compatibility
0.5	50	23	Cone	Split/PTV	**36504045**	1 Each	TriPlus, AS3000
0.5	75	31	Cone	Manual OC	**36500500**	1 Each	
0.5	80	26	Cone	Splitless and OC	**36504046**	1 Each	TriPlus

GC Syringes for Thermo Scientific TriPlus RSH Autosampler

Removable Needle Syringes

Volume (µL)	Length (mm)	Gauge	Tip Style	Type	Cat. No.	Quantity
0.5	57	23	Cone	Split	**365A0241**	1 Each
1	57	23	Cone	Split	**365B0251**	1 Each

Fixed Needle Syringes

Volume (µL)	Length (mm)	Gauge	Tip Style	Type	Cat. No.	Quantity
5	85	23s	Cone	Merlin Valve SSL Injector: Splitless	**365C0221**	1 Each
	57	23s	Cone	Merlin Valve Injector: PTV and split	**365C0231**	1 Each
	85	26s	Cone	Splitless and OC	**365C0241**	1 Each
	57	26s	Cone	Split and PTV	**365C0251**	1 Each
10	85	23s	Cone	Merlin Valve SSL Injector: Splitless	**365D0261**	1 Each
	57	23s	Cone	Merlin Valve Injector: PTV and split	**365D0271**	1 Each
	85	26s	Cone	Splitless and OC	**365D0281**	1 Each
	57	26s	Cone	Split and PTV	**365D0291**	1 Each

Fixed Needle, Gas Tight Syringes

Volume (µL)	Length (mm)	Gauge	Tip Style	Type	Cat. No.	Quantity
10	85	23s	Cone	Merlin Valve SSL Injector: Splitless	**365D0301**	1 Each
	57	23s	Cone	Merlin Valve Injector: PTV and split	**365D0311**	1 Each
	85	26s	Cone	Splitless and OC	**365D0321**	1 Each
	57	26s	Cone	Split and PTV	**365D0331**	1 Each
25	85	23s	Cone	Merlin Valve SSL Injector: Splitless	**365F2431**	1 Each
	57	23s	Cone	Merlin Valve Injector: PTV and split	**365F2441**	1 Each
	85	26s	Cone	Splitless and OC	**365F2451**	1 Each
	57	26s	Cone	Split and PTV	**365F2461**	1 Each
50	57	23s	Cone	Merlin Valve SSL Injector: LV Splitless	**365G2311**	1 Each
	85	26s	Cone	LV OC	**365G2321**	1 Each
	57	26s	Cone	LV Splitless	**365G2331**	1 Each
100	57	23s	Cone	Merlin Valve SSL Injector: LV Splitless	**365H2141**	1 Each
	85	26s	Cone	LV OC	**365H2151**	1 Each
	57	26s	Cone	LV Splitless	**365H2161**	1 Each
	85	23	Side Hole	Variable depth LV PTV (w & w/o Merlin)	**365H2171**	1 Each
	57	23	Side Hole	LV PTV (with or without Merlin valve)	**365H2181**	1 Each
250	85	26	Cone	LV OC	**365I2321**	1 Each
	57	26	Cone	LV Splitless	**365I2331**	1 Each
	85	23	Side Hole	Variable depth LV PTV (w & w/o Merlin)	**365I2341**	1 Each
	57	23	Side Hole	LV PTV (with or without Merlin valve)	**365I2351**	1 Each
500	85	26	Cone	LV OC	**365J2411**	1 Each
	57	26	Cone	Sample Dilution	**365J2421**	1 Each
	85	23	Side Hole	Variable depth LV PTV (w & w/o Merlin)	**365J2431**	1 Each
	57	23	Side Hole	LV PTV (with or without Merlin valve)	**365J2441**	1 Each
1000	65	23	Side Hole	Headspace	**365Q2121**	1 Each
	57	22	LC	Sample Dilution	**365K2811**	1 Each
2500	65	23	Side Hole	Headspace	**365Q2131**	1 Each
5000	65	22	Side Hole	Headspace	**365Q2141**	1 Each
10000	57	19	LC	Sample Dilution	**365N2721**	1 Each

GC Syringes for Agilent Instruments

Removable Needle Syringes

Volume (µL)	Length (mm)	Gauge	Tip Style	**Cat No.**	Quantity	**Replacement Needle Cat. No.**	Quantity
0.5	42	26	Cone	**365A0411**	1 Each	**365RK541**	1 Each
		23	Cone	**365A0421**	1 Each	**365RK241**	1 Each
		23-26	Cone	**365A0431**	1 Each	**365RK261**	1 Each
10	42	23	Cone	**365D1611**	6 Pack	**365RN252**	2 Pack
		26	Cone	**365D1771**	1 Each	**365RN272**	2 Pack

Fixed Needle Syringes

Volume (µL)	Length (mm)	Gauge	Tip Style	**Cat No.**	Quantity
5	42	23	Cone	**365C0951**	1 Each
		23	Cone	**365C0956**	6 Pack
		23-26	Cone	**365C0971**	1 Each
		23-26	Cone	**365C0976**	6 Pack
10	42	26	Cone	**365D1521**	1 Each
		26	Cone	**365D1526**	6 Pack
		23-26	Cone	**365D1561**	1 Each
		23	Cone	**365D1571**	1 Each
		23	Cone	**365D1576**	1 Each
		23-26	Cone	**365D1621**	1 Each
		23-26	Cone	**365D1636**	6 Pack

GC Syringes for CTC Instruments

Removable Needle, Gas Tight Syringes

Volume (µL)	Length (mm)	Gauge	Tip Style	**Cat No.**	Quantity	**Replacement Needle Cat. No.**	Quantity	**Replacement Plunger Cat. No.**	Quantity
10	50	23	Cone	**365D2985**	1 Each	**365RN362**	2 Pack	**365RP121**	1 Each
25	50	26	Side Hole	**365F3988**	1 Each	**365RN749**	2 Pack	**365RP816**	1 Each
100	50	26	Cone	**365H5333**	1 Each	**365RN732**	2 Pack	**365RP826**	1 Each

Removable Needle Syringes

Volume (µL)	Length (mm)	Gauge	Tip Style	**Cat No.**	Quantity	**Replacement Needle Cat. No.**	Quantity
0.5	50	26	Cone	**365A0490**	1 Each	**365RK770**	1 Pack
10	50	23	Cone	**365D3731**	1 Each	**365RN732**	2 Pack
10	50	26	Cone	**365D1841**	1 Each	**365RN363**	3 Pack

Fixed Needle, Gas Tight Syringes

Volume (µL)	Length (mm)	Gauge	Tip Style	**Cat No.**	Quantity	**Replacement Plunger Cat No.**	Quantity
10	50	23	Cone	**365D2972**	6 Pack	**365RP532**	1 Each
10	50	26	Cone	**365D2976**	6 Pack	**365RP532**	1 Each
10	50	26	Cone	**365D2977**	1 Each	**365RP532**	1 Each
10	50	23	Cone	**365D3741**	1 Each	**365RP532**	1 Each
25	50	26	Cone	**365F3700**	1 Each	**365RP922**	1 Each
25	50	23	Cone	**365F3761**	1 Each	**365RP431**	1 Each
100	50	23	Cone	**365H3771**	1 Each	**365RP471**	1 Each
100	50	26	Cone	**365H5700**	1 Each	**365RP471**	1 Each
250	50	26	Cone	**365H6700**	1 Each	**365RP926**	1 Each
500	50	26	Cone	**365J7700**	1 Each	**365RP928**	1 Each
1000	50	23	Side Hole	**365K8130**	1 Each	**365RP844**	1 Each
1000	50	26	Side Hole	**365K8135**	1 Each	**365RP844**	1 Each
2500	50	23	Side Hole	**365L8630**	1 Each	**365RP845**	1 Each
2500	50	26	Side Hole	**365L8635**	1 Each	**365RP845**	1 Each

Fixed Needle Syringes

Volume (µL)	Length (mm)	Gauge	Tip Style	**Cat No.**	Quantity
5	50	23	Cone	**365C3701**	1 Each
5	50	26	Cone	**36500505**	1 Each
10	50	26	Cone	**365D3711**	1 Each
10	50	23	Cone	**36520060**	1 Each
10	50	26	Cone	**365D1856**	6 Pack
10	50	26	Bevel	**365D2705**	1 Each
10	50	23	Cone	**365D2971**	6 Pack
25	50	26	Cone	**365F3980**	1 Each

Repair Kits for Thermo Scientific Plunger-in-Needle Syringes

Extend the life and performance of syringes

Repair Kits for Thermo Scientific Plunger-in-Needle Syringes

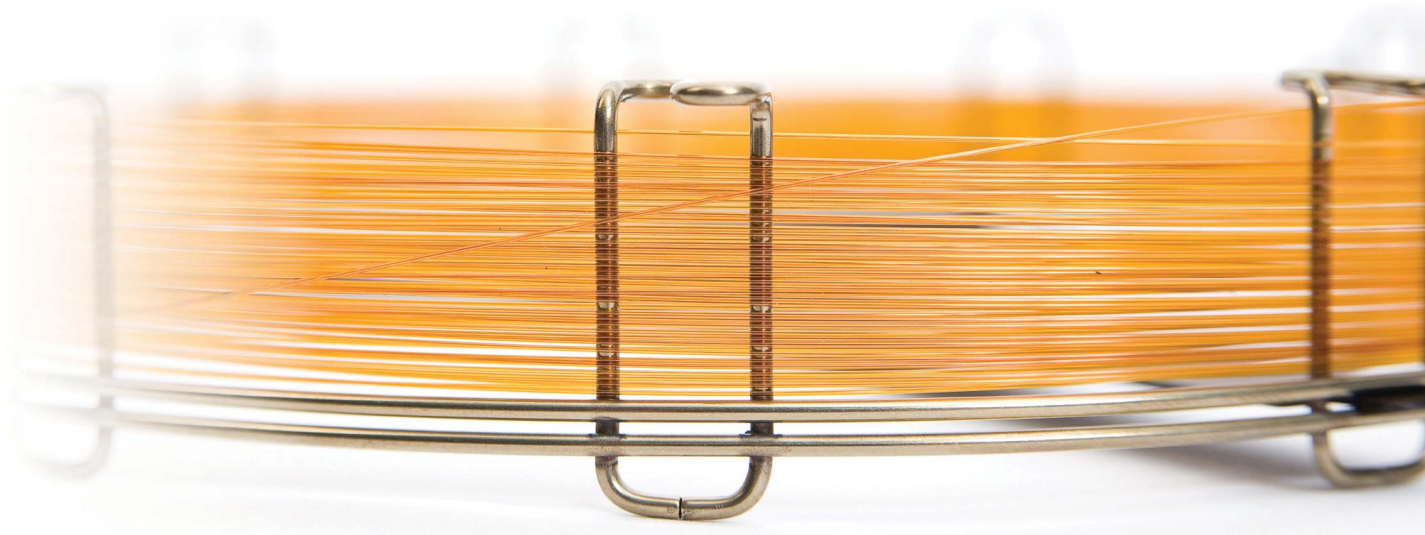
For Repair of Syringe Cat. No.	Cat. No.	Quantity
365A0411	**365RK541**	1 Each
365A0421	**365RK241**	1 Each
365A0431	**365RK261**	1 Each
365A0471	**365RK291**	1 Each
365A0481	**365RK331**	1 Each
365A0331	**365RK321**	1 Each
365B0511	**365RK311**	1 Each
365B0531	**365RK341**	1 Each
365A0490	**365RK770**	1 Each

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

Replacement Seals for Thermo Scientific 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



Manual GC Syringes

Removable Needle, Gas Tight Syringes

Volume (µL)	Length (mm)	Gauge	Tip Style	**Cat No.**	Quantity	**Replacement Needle Cat. No.**	Quantity	**Replacement Plunger Cat No.**	Quantity
25	70	25	Bevel	**365F1931**	1 Each	**365RN225**	5 Pack	**365RP421**	1 Each
50	50	25	Bevel	**365G2161**	1 Each	**365RN225**	5 Pack	**365RP451**	1 Each
100	50	25	Bevel	**365H2381**	1 Each	**365RN225**	5 Pack	**365RP461**	1 Each
250	50	25	Bevel	**365I2611**	1 Each	**365RN225**	5 Pack	**365RP481**	1 Each
500	50	25	Bevel	**365J2881**	1 Each	**365RN225**	5 Pack	**365RP491**	1 Each
1000	50	23	Bevel	**365K3041**	1 Each	**365RN235**	5 Pack	**365RP511**	1 Each

Removable Needle Syringes

Volume (µL)	Length (mm)	Gauge	Tip Style	**Cat No.**	Quantity	**Replacement Needle Cat. No.**	Quantity
5	50	26	Bevel	**365C0761**	1 Each	**365RN555**	5 Pack
10	50	26	Bevel	**365D1171**	1 Each	**365RN215**	5 Pack
25	50	25	Bevel	**365F1901**	1 Each	**365RN225**	5 Pack
50	50	25	Bevel	**365G2091**	1 Each	**365RN225**	5 Pack
100	50	25	Bevel	**365H2301**	1 Each	**365RN225**	5 Pack

Fixed Needle, Gas Tight Syringes

Volume (µL)	Length (mm)	Gauge	Tip Style	**Cat No.**	Quantity	**Replacement Plunger Cat No.**	Quantity
25	50	25	Bevel	**365F1921**	1 Each	**365RP421**	1 Each
50	50	25	Bevel	**365G2111**	1 Each	**365RP451**	1 Each
100	50	25	Bevel	**365H2321**	1 Each	**365RP461**	1 Each
250	50	25	Bevel	**365I2561**	1 Each	**365RP481**	1 Each
250	50	25	Bevel	**365J2831**	1 Each	**365RP491**	1 Each
1000	50	22	Bevel	**365K3051**	1 Each	**365RP511**	1 Each

Fixed Needle Syringes

Volume (µL)	Length (mm)	Gauge	Tip Style	**Cat No.**	Quantity
5	50	26	Bevel	**365C0741**	1 Each
10	50	26	Bevel	**365D1091**	1 Each
10	50	26	Bevel	**365D1096**	6 Pack
25	50	25	Bevel	**365F1891**	1 Each
50	50	25	Bevel	**365G2081**	1 Each
100	50	25	Bevel	**365H2291**	1 Each
250	50	25	Bevel	**365I2541**	1 Each

National Target Precision GC Syringes

Syringes for Agilent Technologies Instruments

Removable Needle, Gas Tight Syringes

Volume (µL)	Length (mm)	Gauge	Tip Style	Agilent No.	**Cat No.**	Quantity	**Replacement Needle Cat. No.**	Quantity
5	42	23-26s	Cone	5181-3356	**NS604408**	1 Each		

Removable Needle Syringes

Volume (µL)	Length (mm)	Gauge	Tip Style	Agilent No.	**Cat No.**	Quantity	**Replacement Needle Cat. No.**	Quantity
5	42	23-26s	Cone	5182-0835	**NS104308**	1 Each	**NS834308**	3 Pack
10	42	23-26s	Cone	5181-3321	**NS104408**	1 Each	**NS834408**	3 Pack

Fixed Needle, Gas Tight Syringes

Volume (µL)	Length (mm)	Gauge	Tip Style	Agilent No.	**Cat No.**	Quantity
5	42	23	Cone		**NS604305**	1 Each
	42	23	Cone		**NS604315**	6 Pack
	42	26	Cone		**NS604303**	1 Each
	42	26	Cone		**NS604313**	6 Pack
	42	23-26s	Cone		**NS604304**	1 Each
	42	23-26s	Cone		**NS604314**	6 Pack
10	42	23	Cone	5181-8809	**NS604405**	1 Each
	42	23	Cone	5181-4730	**NS604415**	6 Pack
	42	26	Cone		**NS604403**	1 Each
	42	26	Cone		**NS604413**	6 Pack
	42	23-26s	Cone	5181-3354	**NS604404**	1 Each
	42	23-26s	Cone	5181-3361	**NS604414**	6 Pack

Fixed Needle Syringes

Volume (µL)	Length (mm)	Gauge	Tip Style	Agilent No.	**Cat No.**	Quantity
5	42	23	Cone	9301-0892	**NS104305**	1 Each
5	42	23	Cone	5182-0875	**NS104315**	6 Pack
5	42	26	Cone	9301-0891	**NS104303**	1 Each
5	42	26	Cone	5183-4728	**NS104313**	6 Pack
5	42	23-26s	Cone	5181-1273	**NS104304**	1 Each
5	42	23-26s	Cone	5181-8810	**NS104314**	6 Pack
10	42	23	Cone	9301-0713	**NS104405**	1 Each
10	42	23	Cone	9301-0725	**NS104415**	6 Pack
10	42	26	Cone	9301-0714	**NS104403**	1 Each
10	42	26	Cone	5181-4729	**NS104413**	6 Pack
10	42	23-26s	Cone	5181-1267	**NS104404**	1 Each
10	42	23-26s	Cone	5181-3360	**NS104414**	6 Pack

Fixed Needle, Super-Elastic Plunger Syringes

Volume (µL)	Length (mm)	Gauge	Tip Style	Agilent No.	**Cat No.**	Quantity
5	42	23-26s	Cone		**NS164304**	1 Each
10	42	23-26s	Cone		**NS164404**	1 Each

GC Syringes for PerkinElmer Instruments

Fixed Needle, Gas Tight Syringes

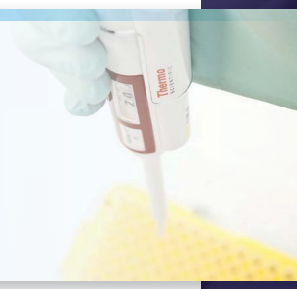
Volume (µL)	Length (mm)	Gauge	Tip Style	PerkinElmer No.	**Cat No.**	Quantity
5	70	26s	Cone	N6101390	**NS608302**	1 Each
5	70	23s	Cone	N6101380	**NS608303**	1 Each
5	70	26s	Cone		**NS108302**	1 Each

GC Syringes for Shimadzu Instruments

Fixed Needle Syringes

Volume (µL)	Length (mm)	Gauge	Tip Style	Shimadzu No.	**Cat No.**	Quantity
5	42	26s	Cone		**NS105303**	1 Each
5	42	23s	Cone		**NS105304**	1 Each
10	42	26s	Cone		**NS105403**	1 Each
10	42	23s	Cone	221-34618-00	**NS105404**	1 Each

Thermo Scientific liquid transfer solutions – the power to handle anything
www.thermoscientific.com/liquidtransfer



GC Syringes for CTC/Leap Technologies Instruments

Removable Needle, Gas Tight Syringes

Volume (µL)	Length (mm)	Gauge	Tip Style	**Cat No.**	Quantity
10	51	26s	Bevel	**NS606405**	1 Each

Fixed Needle, Gas Tight Syringes

Volume (µL)	Length (mm)	Gauge	Tip Style	**Cat No.**	Quantity
25	51	26s	Bevel	**NS620506**	1 Each
100	51	26s	Bevel	**NS620706**	1 Each
100	51	23s	Cone	**NS620703**	1 Each
500	51	26s	Bevel	**NS620903**	1 Each

Fixed Needle Syringes

Volume (µL)	Length (mm)	Gauge	Tip Style	**Cat No.**	Quantity
10	51	26s	Bevel	**NS100401**	1 Each

Fixed Needle, Headspace, Gas Tight Syringes

Volume (µL)	Length (mm)	Gauge	Tip Style	**Cat No.**	Quantity
10	51	26s	Bevel	**NS606401**	1 Each
1000	56	22s	Side Hole	**NS620013**	1 Each
2500	56	22s	Side Hole	**NS620023**	1 Each
5000	56	22s	Side Hole	**NS620049**	1 Each

GC Syringes for Manual, On-Column and Septum Injection

Series N Removable Needle Syringes

Volume (µL)	Length (mm)	Gauge	Tip Style	**Cat No.**	Quantity	**Replacement Needle Cat. No.**	Quantity
5	51	26s	Bevel	**NS100305**	1 Each	**NS832301**	3 Pack
10	51	26s	Bevel	**NS100405**	1 Each	**NS832401**	3 Pack
25	51	22s	Bevel	**NS100505**	1 Each	**NS832501**	3 Pack
50	51	22s	Bevel	**NS100605**	1 Each	**NS832501**	3 Pack
100	51	22s	Bevel	**NS100705**	1 Each	**NS832501**	3 Pack
250	51	22s	Bevel	**NS100805**	1 Each	**NS832601**	3 Pack
500	51	22s	Bevel	**NS100905**	1 Each	**NS832601**	3 Pack

Series N Fixed Needle Syringes

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

Series N Fixed Needle 90° Syringe

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

Thermo Scientific centrifuges, rotors and accessories deliver outstanding performance and reliability in the lab.
www.thermoscientific.com/centrifuge

GC Syringes for Accurate Dosing of Liquids

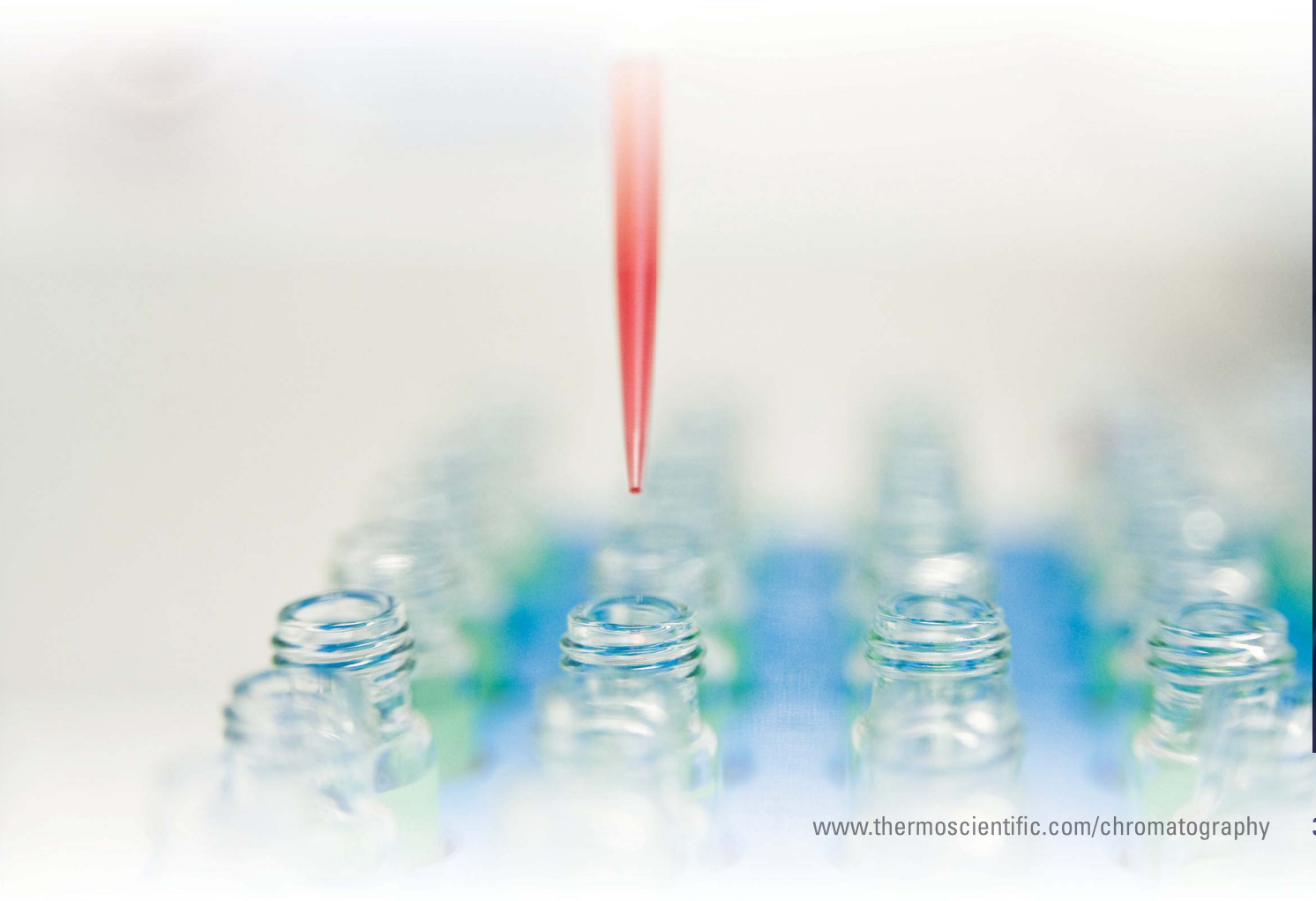
- Suitable for liquid or gas samples
- 26s and 22s Gauge needles
- PTFE-tipped stainless-steel plunger eliminates frozen plungers

Removable Needle, Gas Tight Syringes

Volume (µL)	Length (mm)	Gauge	Tip Style	**Cat No.**	Quantity	**Replacement Needle Cat. No.**	Quantity
5	51	26s	Bevel	**NS600305**	1 Each	**NS832301**	3 Pack
10	51	26s	Bevel	**NS600405**	1 Each	**NS832401**	3 Pack
25	51	22s	Bevel	**NS600505**	1 Each	**NS831013**	3 Pack
50	51	22s	Bevel	**NS600605**	1 Each	**NS831013**	3 Pack
100	51	22s	Bevel	**NS600705**	1 Each	**NS831013**	3 Pack
250	51	26s	Bevel	**NS600805**	1 Each	**NS841013**	3 Pack
500	51	22s	Bevel	**NS600905**	1 Each	**NS841013**	3 Pack
1000	51	22s	Bevel	**NS600005**	1 Each	**NS841013**	3 Pack
5000	51	22s	Bevel	**NS600045**	1 Each	**NS841013**	3 Pack
10000	51	22s	Bevel	**NS600065**	1 Each	**NS841013**	3 Pack
5	51	26s	Blunt End	**NS600306**	1 Each	**NS834307**	3 Pack
10	51	26s	Blunt End	**NS600406**	1 Each	**NS834407**	3 Pack
25	51	22s	Blunt End	**NS600506**	1 Each	**NS831014**	3 Pack
50	51	22s	Blunt End	**NS600606**	1 Each	**NS831014**	3 Pack
100	51	22s	Blunt End	**NS600706**	1 Each	**NS831014**	3 Pack
500	51	22s	Blunt End	**NS600906**	1 Each	**NS841014**	3 Pack
1000	51	22s	Blunt End	**NS600006**	1 Each	**NS841014**	3 Pack
5000	51	22s	Blunt End	**NS600046**	1 Each	**NS841014**	3 Pack
10000	51	22s	Blunt End	**NS600066**	1 Each	**NS841014**	3 Pack
500	51	22s	Side Hole	**NS600908**	1 Each	**NS841015**	2 Pack
1000	51	22s	Side Hole	**NS600007**	1 Each	**NS841015**	2 Pack
5000	51	22s	Side Hole	**NS600047**	1 Each	**NS841015**	2 Pack

Fixed Needle, Gas Tight Syringes

Volume (µL)	Length (mm)	Gauge	Tip Style	Cat No.	Quantity
5	51	26s	Bevel	**NS600301**	1 Each
10	51	26s	Bevel	**NS600401**	1 Each
25	51	22s	Bevel	**NS600501**	1 Each
50	51	26s	Bevel	**NS100601**	1 Each
100	51	22s	Bevel	**NS600701**	1 Each
250	51	26s	Bevel	**NS100801**	1 Each
500	51	22s	Bevel	**NS600901**	1 Each
500	51	26s	Bevel	**NS100901**	1 Each
1000	51	22s	Bevel	**NS600000**	1 Each
5000	51	22s	Bevel	**NS600040**	1 Each
10000	51	22s	Bevel	**NS600060**	1 Each
5	51	26s	Blunt End	**NS600302**	1 Each
10	51	26s	Blunt End	**NS600402**	1 Each
25	51	22s	Blunt End	**NS600502**	1 Each
50	51	22s	Blunt End	**NS600602**	1 Each
100	51	22s	Blunt End	**NS600702**	1 Each
500	51	22s	Blunt End	**NS600902**	1 Each
1000	51	22s	Blunt End	**NS600001**	1 Each
5000	51	22s	Blunt End	**NS600041**	1 Each
10000	51	22s	Blunt End	**NS600061**	1 Each
250	51	22s	Side Hole	**NS600804**	1 Each
500	51	22s	Side Hole	**NS600904**	1 Each
1000	51	22s	Side Hole	**NS600002**	1 Each
5000	51	22s	Side Hole	**NS600042**	1 Each
10000	51	22s	Side Hole	**NS600062**	1 Each



GC Syringes for Accurate Dosing of Liquids *continued*

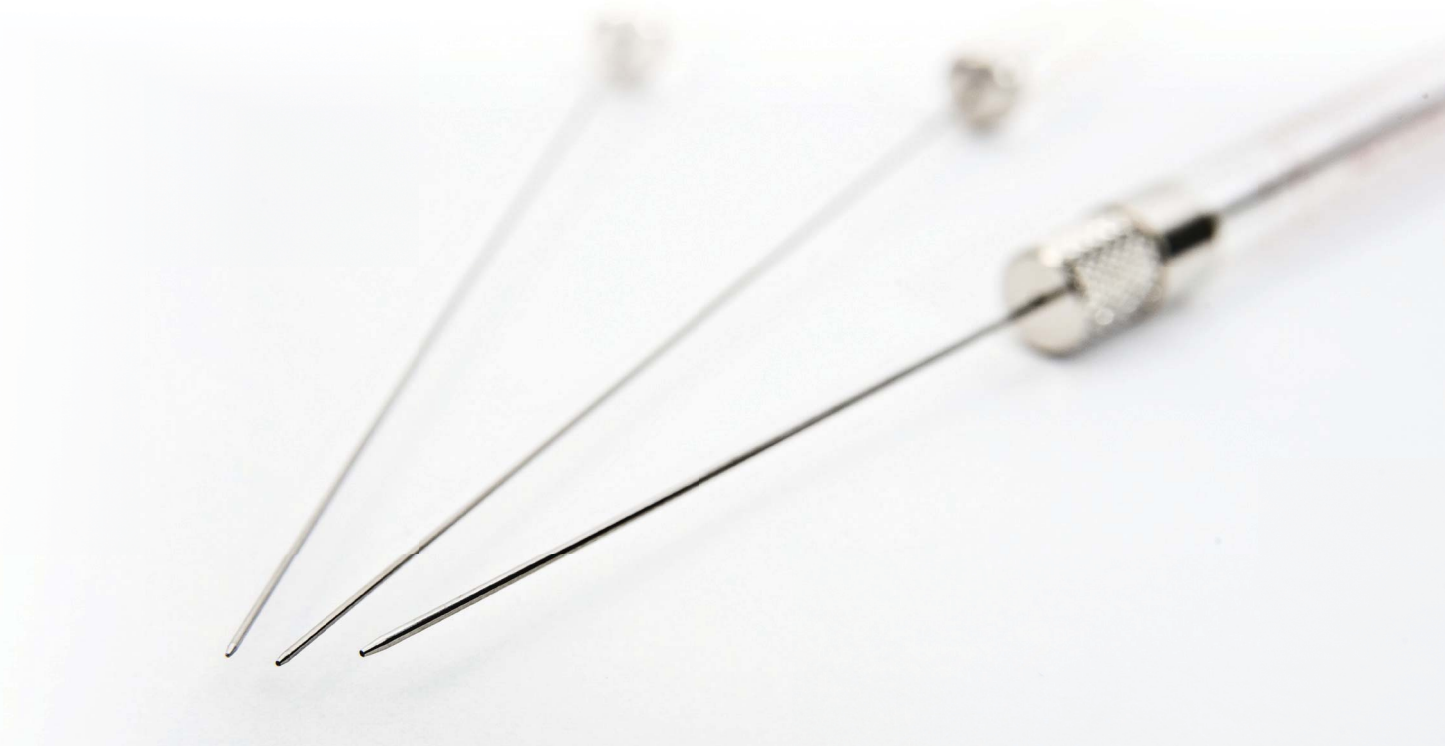
- Suitable for liquid or gas
- PTFE-tipped plunger eliminates frozen plungers

PTFE Luer-Lok, Gas Tight Syringes

Volume (µL)	Cat No.	Quantity
5	**NS600309**	1 Each
10	**NS600409**	1 Each
25	**NS600509**	1 Each
50	**NS600609**	1 Each
100	**NS600709**	1 Each
250	**NS600809**	1 Each
500	**NS600909**	1 Each
1000	**NS607011**	1 Each
2500	**NS607031**	1 Each
5000	**NS607051**	1 Each
10000	**NS607071**	1 Each
25000	**NS607091**	1 Each

Luer Tip, Gas Tight Syringes

Volume (µL)	Cat No.	Quantity
25	**NS600511**	1 Each
50	**NS600611**	1 Each
100	**NS600711**	1 Each
250	**NS600811**	1 Each
500	**NS600911**	1 Each
1000	**NS600013**	1 Each
2500	**NS600033**	1 Each
5000	**NS600053**	1 Each
10000	**NS600073**	1 Each



Metal Luer Screw Replacement Needles

Feature a precision-machined PTFE-tipped plunger

Metal Luer Screw Replacement Needles

Length (mm)	Gauge	Tip Style	Cat. No.	Quantity
51	26s	90°	**NS842047**	3 Pack
		Bevel	**NS840047**	3 Pack
	22s	90°	**NS842070**	3 Pack
		Bevel	**NS840070**	3 Pack

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

- With PTFE-tipped stainless-steel plungers

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

Volume (µL)	Length (mm)	Gauge	Tip Style	Cat No.	Quantity
5	51	26s	Side Hole	**NS600304**	1 Each
10	51	26s	Side Hole	**NS600404**	1 Each
250	51	22s	Side Hole	**NS600804**	1 Each
1000	51	22s	Side Hole	**NS600002**	1 Each
2500	51	22s	Side Hole	**NS600022**	1 Each
5000	51	22s	Side Hole	**NS600042**	1 Each

GC Syringes for On-Column Fused Silica, Removable Needle Syringes

- Stainless-steel plungers

GC Syringes for On-Column Fused Silica, Removable Needle Syringes

Volume (µL)	Length (mm)	OD (mm)	Cat No.	Quantity	Replacement Needle Cat. No.	Quantity
5	100	0.23	**NS142304**	1 Each	**NS822031**	3 Pack
10	100	0.23	**NS142404**	1 Each	**NS822042**	3 Pack

Gas Chromatography Reagents

Derivatization

The chemical literature contains an abundance of data on derivatization, most of which is relevant to particular compounds, classes of compounds and derivatization reagents. Two books are recognized as standards in the field of analytical derivatization. The first book, Handbook of Analytical Derivatization Reactions by Daniel R. Knapp[1], provides a general collection of analytical derivatization methods for chromatography and mass spectroscopy (MS) that involves formation of covalent derivatives prior to analysis. The second book, Silylation of Organic Compounds by Alan F. Pierce,[2]" was a significant factor in the transfer of silylation reactions from the relatively esoteric field of organosilicon chemistry to the status of perhaps the most widely practiced of derivatization methods."[3]

Compounds or compound mixtures are derivatized before analysis for the following reasons:

1. To make a compound that otherwise could not be analyzed by a particular method suitable for analysis.[4]
2. To improve the analytical efficiency of the compound.[5,6]
3. To improve the detectability of the compound.[7]

Suitability

Often compounds cannot be analyzed because they are not in a form that is suitable for the particular analytical technique. Examples include nonvolatile compounds for GC analysis,[8,9,10] insoluble compounds for HPLC analysis and materials that are not stable using the conditions of the technique.[11] The derivatization procedure modifies the chemical structure of the compounds, allowing analysis by a desired technique.[12]

Efficiency

Direct analysis can be difficult when compounds interact with each other or with the column. These interactions can lead to poor peak resolution and/or asymmetrical peaks that make proper peak integration difficult or impractical. This interference can be reduced with conversion to derivatized products.[13,14] Compounds that exhibit co-elution can often be separated by using the appropriate derivatization methods.

Detectability

As demand increases for the analysis of increasingly smaller amounts of materials, it becomes important to extend the detectability range of the materials in question. This increased sensitivity can be accomplished by improved detector design that is directed toward specific atoms or functional groups.

Another popular approach to increase detectability is the use of derivatization. Enhanced detectability can be achieved by increasing the bulk of the compound, or by introducing atoms or functional groups that strongly interact with the detector.[16,17] This technique is performed in gas chromatographic applications, with the addition of halogen atoms for electron capture detectors,[18,19] and with the formation of TMS derivatives to produce readily identifiable fragmentation patterns and mass ions.[20]

Types of Derivatization

Compounds containing functional groups with active hydrogens (-COOH, -OH, -NH and -SH) are usually derivatized prior to analysis by gas chromatography. These functional groups have a tendency to form intermolecular hydrogen bonds that affect the volatility, their tendency to interact deleteriously with column packing materials and their thermal stability. Silylation, acylation and alkylation are derivatization techniques used to alter these functional groups to improve their thermal and chromatographic character.

The ideal derivatization procedure will:

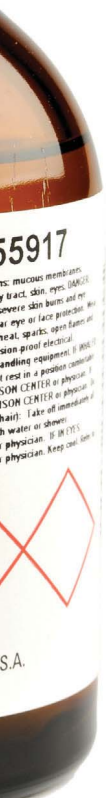
1. Accomplish the desired modification.
2. Proceed quantitatively, or at least reproducibly.
3. Produce products that are readily distinguishable and separable from the starting materials.
4. Proceed rapidly with simple and straight-forward laboratory techniques that will be both selective and applicable to a number of similar compounds.
5. Involve reagents and reactions that present no unusual hazards.

Thermo Scientific Silylation Reagents

Silyl derivatives are the most widely used derivatives for gas chromatographic applications. Usually they are formed by the replacement of the active hydrogens from acids, alcohols, thiols, amines, amides and enolizable ketones and aldehydes with the trimethylsilyl group. A variety of reagents is available for the introduction of the trimethylsilyl group. These reagents differ in their reactivity, selectivity and side reactions and the character of the reaction products from the silylation reagent itself. Considerable literature is available to assist you in the selection of the most suitable silylation reagent for your particular compounds or systems.[1,2]

Silylation reagents and trimethylsilyl derivatives are hydrolytically unstable and must be protected from moisture. However, the rate of hydrolysis for various reagents and derivatives is different, and sometimes it is possible to prepare derivatives in the presence of small amounts of moisture,[21] or to isolate and purify derivatives by extraction in an organic solvent, followed by washing with aqueous solutions.[22] Reagents that introduce a t-butyldimethylsilyl group instead of the trimethylsilyl group were developed for greater hydrolytic stability.[23] These derivatives provide improved stability against hydrolysis and provide distinctive fragmentation patterns, making them useful in GC/MS applications.[24]

Most trimethylsilyl and t-butyldimethylsilyl derivatives offer excellent thermal stability and are suitable for a wide range of injector and column conditions. However, as the silylation reagents will derivatize nearly all active hydrogens, it is important that they are not injected onto any column in which the stationary phase contains these functional groups. Examples of packings that are not compatible with silylating reagents are polyethylene glycols (TG-WaxMS) and free fatty acid phases (TG-WaxMS A).



References

1. Knapp D.R. (1979). *Handbook of Analytical Derivatization Reactions,* John Wiley & Sons: New York.
2. Pierce, A.E. (1968). *Silylation of Organic Compounds,* Pierce Chemical: Rockford, IL.
3. Pierce, A.E. (1968). *Silylation of Organic Compounds,* Pierce Chemical: Rockford, IL. p. 2.
4. Sweeley, C.C., *et al.* (1963). Gas-liquid chromatography of trimethylsilyl derivatives of sugars and related substances. *J. Am. Chem. Soc.* **85**, 2495-2507.
5. Khalifa, S. and Mumma. R.O. (1972). *J. Agric. Food Chem.* **20**, 632.
6. Sinsheimer, J.E. and Smith, R.V. (1967). Methods for the qualitative and quantitative analysis of some hydroxystilbenes. *J. Pharm. Sci.* **56**, 1280.
7. Poole. C.F. (1976). *Chem. Ind. (London),* 479.
8. Brittain, G.D. and Schewe, L. (1971). In *Recent Advances in Gas Chromatography,* Domsky, I.I. and Perry, J.A., Eds., Marcel Decker: New York, NY.
9. Sakauchi, N. and Horning, E.C. (1971). *Anal. Lett.* **4**, 41-42.
10. Sullivan, J.E. and Schewe, L.R. (1977). Preparation and gas chromatography of highly volatile trifluoroacetylated carbohydrates using *N*-Methylbis (trifluoroacetamide). *J. Chromatogr. Sci.* **15**, 196-197.
11. Hallgren, B. and Larsson, S. (1962). *J. Lipid Res.* **3**, 31.
12. Samuelsson, K. and Samuelsson, B. (1969). Gas-liquid chromatography-mass spectroscopy of cerebrosides as trimethylsilyl ether derivatives. *Biochem. Biophys. Res. Commun,* **37(1)**, 15-21.
13. Langer, M., *et al.* (1960). *Chem. Ind. (London),* **378**.
14. Neeman, M., *et al.* (1959). *Tetrahedron,* **6**, 36.
15. Marfey, P. (1984). Determination of D-amino acids. II. Use of a bifunctional reagent, 1,5-Difluoro-2,4-Dinitrobenzene. *Carlsberg Res. Commun.* **49**, 591-596.
16. Ehrsson, H., *et al.* (1971). *Acta. Pharm. Suecica.* **8**, 319.
17. Koshy, K.T., *et al.* (1975). *O*-(2,3,4,5,6-Pentafluorobenzyl) hydroxylamine hydrochloride as a sensitive derivatizing agent for the electron capture gas liquid chromatographic analysis of keto steroids. *J. Chromatogr. Sci.* **13(Feb)**, 97-103.
18. Walle, T. and Ehrsson, H. (1970). *Acta. Pharm. Suecica.* **7**, 389-406.
19. Benington, F., *et al.* (1975). Identification and separation of indolealkylamines by gas liquid chromatographic analysis of their heptafluorobutyryl derivatives. *J. Chromatogr.* **106**, 435-439.
20. Kelly, R.W. and Taylor, P.L. (1976). *tert*-Butyldimethylsilyl ethers as derivatives for qualitative analysis of steroids and prostaglandins by gas phase methods. *Anal. Chem.* **48(3)**, 465.
21. Lau, H.L. (1966). *J. Gas Chromatogr.* **4**, 136.
22. Tallent, W.H. and Kleinman, R. (1968). *J. Lipid Res.* **9**, 146.
23. Mawhinney, T.P. and Madson, M.A. (1982). *N*-Methyl-*N*-(*tert*-butyldimethylsilyl) trifluoroacetamide and related *N*-*tert*-butyldimethylsilyl amides as protective silyl donors. *J. Org. Chem.* **47**, 3336-3339.
24. Bazan, A.C. and Knapp, D.R. (1982). Improved derivative of 6-keto-prostaglandin F_{1a} for gas chromatographic-mass spectrometric analysis. *J. Chromatogr.* **236**, 201-207.

Thermo Scientific Acylation Reagents

Acylation is the conversion of compounds (through the action of a carboxylic acid or a carboxylic acid derivative) that contain active hydrogens such as -OH, -SH and -NH esters; thioesters; and amides.[1] In chromatographic applications, the acylation reaction is used primarily for converting the above classes of compounds into derivatives that are better suited for chromatography[2] or that give a greater response to the chromatographic detection system than the parent compound.[3]

An important example of this application is the insertion of perfluoroacyl groups into a molecule to enhance the detectability of the substance by electron capture. The presence of a carbonyl group adjacent to the halogenated carbons enhances the electron capture detector (ECD) response.

Acyl derivatives are also useful in MS applications in which they influence the fragmentation patterns of the compounds to be studied.[4]

References

1. Donike, M. (1973). Acylation with bis (acylamides). *N*-Methyl-bis (trifluoroacetamide), two new reagents for trifluoroacetylation. *J. Chromatogr.* **78**, 273-279.
2. Sullivan, J.E. and Schewe, L.R. (1977). Preparation and gas chromatography of highly volatile trifluoroacetylated carbohydrates using *N*-Methyl-bis (trifluoroacetamide). *J. Chromatogr. Sci.* **15**, 196-197.
3. Benington, F., *et al.* (1975). Identification and separation of indolealkylamines by gas liquid chromatographic analysis of their heptafluorobutyryl derivatives. *J. Chromatogr.* **106**, 435-439.
4. Borga, 0., *et al.* (1971). Quantitative determination of nortriptyline and desmethylnortriptyline in human plasma by combined gas chromatography-mass spectrometry. *J. Chromatogr.* **4(12)**, 837-849.

Thermo Scientific Alkylation Reagents

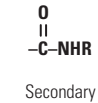
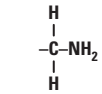
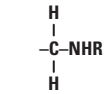
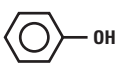
When used in derivatization for gas chromatography, alkylation represents the substitution of an active hydrogen by an aliphatic or aliphatic-aromatic[1] (benzyl) group. This technique is used to modify those compounds containing acidic hydrogens, such as carboxylic acids and phenols. The principal chromatographic use of this reaction is the conversion of organic adds into esters, which produce better chromatograms than the free acids.

In addition, alkylation reactions can be used to prepare ethers, thioethers and thioesters; N-alkylamines; and amides.[2] As the acidity of the active hydrogen decreases, the strength of the alkylating reagent must be increased. As the reagents and conditions become harsher, the selectivity and applicability of the methods become more limited.

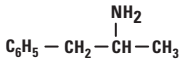
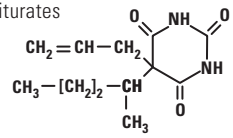
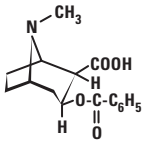
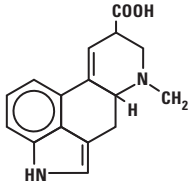
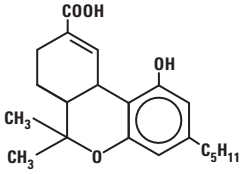
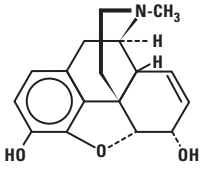
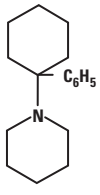
References

1. Kawahara, F.K. (1968). Microdetermination of derivatives of phenols and mercaptans by means of electron capture gas chromatography. *Anal. Chem.* **40(6)**, 1009.
2. Kananen, G., *et al.* (1972). Barbiturate analysis – a current assessment. *J. Chrom. Sci.* **10**, 283-287.

Derivatization Reagents for Specific Functional Groups

Functional Group	Procedure	Reagent	Derivative	Notes
Amides Primary  Secondary	Silylation	BSA	TMS Amides	Difficult to form due to steric hindrance
		BSTFA	TMS Amides	
		BSTFA+TMCS	TMS Amides	TMCS used as a catalyst
		MSTFA	TMS Amides	Reaction byproducts more volatile
		MSTFA+TMCS	TMS Amides	
		Tri-Sil Reagents	TMS Amides	
		MTBSTFA	TBDMCS Amides	Difficult to form; very stable
		MTBSTFA+TBDMCS	TBDMCS Amides	TBDMCS aids derivatization
	Acylation	MBTFA	Trifluoroacetamides	
		TFAA	Trifluoroacetamides	
		PFAA	Pentafluoropropionamides	Good for ECD detection
		HFBA	Heptafluorobutyamides	
	Alkylation	MethElute Reagent (TMPAH)	Methyl Amides	On-column derivatization especially for drugs
Amines  Primary  Secondary	Silylation	BSA	TMS	
		BSTFA	TMS	
		BSTFA+TMCS	TMS	TMCS aids derivatization
		MSTFA	TMS	
		MSTFA+TMCS	TMS	TMCS aids derivatization
		Tri-Sil® Reagents	TMS	
	Silylation	MTBSTFA	TBDMCS	Difficult to form, but more stable
		MTBSTFA+TBDMCS	TBDMCS	TBDMCS aids derivatization
	Acylation	MBTFA	Trifluoroacetamides	Good for trace analysis with ECD
		TFAA	Trifluoroacetamides	Good for trace analysis with ECD
		TFAI	Trifluoroacetamides	Good for trace analysis with ECD
		PFAA	Pentafluoropropionamides	
		PFPI	Pentafluoropropionamides	
		HFAA	Heptafluorobutyamides	
		HFBI	Heptafluorobutyamides	
	Alkylation	MethElute Reagent (TMPAH)	Methyl Amides	On-column derivatization for specific drugs
Carbohydrates $(CH_2OH)_n$	Silylation	MSTFA	TMS	
		TMSI	TMS	Can be used with some syrups
		Tri-Sil Reagents	TMS	
	Acylation	MBTFA	Trifluoroacetates	Volatile derivatives of mono-, di- and trisaccharides
		TFAI	Trifluoroacetates	
Carboxyl	Silylation	BSA	TMS	Easily formed, generally not stable, analyze quickly
		BSTFA	TMS	
		BSTFA+TMCS	TMS	
		MSTFA	TMS	
		TMCS	TMS	Can be used with some salts
		TMSI	TMS	
		Tri-Sil Reagents	TMS	
		MTBSTFA	TBDMCS	More stable than TMS derivatives
		MTBSTFA+TBDMCS	TBDMCS	TBDMCS aids derivatization
	Alkylation	PFBBr	Pentafluorobenzyl Esters	Used in EC detection and UV, MS
		BF_3-Methanol	Methyl Esters	Best for large samples of fatty acids
		Methylate Reagent (DMFDMA)	Methyl Esters	Fatty acids and amino acids
		MethElute Reagent (TMPAH)	Methyl Esters	On-column derivatization
		PFAA+Pentafluoropropanol	Pentafluoropropyl Ester	Drug analysis
Hydroxyl-OH **R–OH** Alcohols  Phenols	Silylation	BSA	TMS	Most often used derivatives
		BSTFA	TMS	Good thermal stability
		BSTFA+TMCS	TMS	Poor hydrolytic stability
		HMDS	TMS	Weak donor usually used with TMCS
		MSTFA	TMS	
		MSTFA+TMCS	TMS	
		TMCS	TMS	Weak donor usually used with HMDS; can be used with salts
		TMSI	TMS	Can be used with syrups
		Tri-Sil Reagents	TMS	
		MTBSTFA	TBDMCS	More stable than TMS, good MS fragmentation patterns
		MTBSTFA+TBDMCS	TBDMCS	TBDMCS aids derivatization
	Acylation	MBTFA	Trifluoroacetates	Good for trace analysis with EDC
		TFAA	Trifluoroacetates	Good for trace analysis with EDC
		TFAI	Trifluoroacetates	Good for trace analysis with EDC
		PFAA	Pentafluoropropionates	Good for trace analysis with EDC
		HFBI	Heptafluorobutrates	Good for trace analysis with EDC
		HFAA	Heptafluorobutrates	Good for trace analysis with EDC
	Alkylation	PFBBr	Pentafluorobenzyl Ethers	With alkoxides only

Derivatization Reagents for Drugs of Abuse

Drug	Form	Reagent	Reference
Amphetamines 	Amphetamines	BSTFA	1
	Amphetamines	HFAA	2-5
	Amphetamines	HFAA/PFAA	6
	Amphetamines	MSTFA with TMCS	7
	Amphetamines	TFAA	7,8
	Methamphetamine	TFAA	9,10
Barbiturates 		BSTFA	1
		MethElute Reagent (TMPAH)	11-13
		Methylate Reagent (DMFDMA)	14,15
		PFBBr	16
Cocaine 	Benzoylecgonine	BSTFA/Butyl Iodine/TMAH	17
		BSTFA	1,18
		MTBSTFA	19
		PFAA/PFPOH	9,20
LSD 		BSA	21
		BSTFA	22
		MSTFA	21
		TFAI	23
Marijuana 	THC metabolites	BSA	24
		BSTFA/BSTFA+1% TMCS	24-27
		BSTFA/TMCS/TMSI	24
		MSTFA	9
		MSTFA/MSTFA+1% TMCS	27
		MTBSTFA	28
		PFBBr	29
		PFAA/HFIOH	30
		PFAA/PFPOH	31
		TFAA and BF3/MeOH	32
		MethElute Reagent (TMPAH)	9
		TMSI	24
Opiates 	Morphine	BSTFA+1% TMCS	33
		MBTFA	34
		PFAA	35
		TFAA	36
	Morphine/Codeine	BSTFA	1,37
		BSTFA+1% TMCS	38,39
		BSTFA/TFAI	40
		HFBA	38
		MBTFA	38
		PFAA	38,41
		PFAA/HFAA	37
		PFAA/PFPOH	9
		TFAA	42
		Trimethylsilyl	43
PCP 	PPC/PCHP/PCP	BSTFA+1% TMCS	44
		HFAA	45

See references on following page.

† Reagent names correspond to product names as listed in this catalog, except PFPOH (pentafluoropropanol).

HFIOH (heptafluoro-isopropanol) is not offered by Thermo Fisher Scientific. PFAA (PentaFluoropropionic Acid Anhydride) and HFAA (HeptaFluorobutyric Acid Anhydride) are sometimes incorrectly referred to as PFAA and HFBA (respectively), which are the appropriate abbreviations for the free acid.

References

1. Dutt, M.C. (1982). *J. Chromatogr.* **248**, 115-124.
2. Wu, A.H.B., et al. (1992). *J. Anal. Toxicol.* **16**, 137-141.
3. Thurman, E.M., et al. (1992). *J. Anal. Toxicol.* **16**, 19-27.
4. Reimer, M.L., et al. (1993). *Biol. Mass Spectrom.* **22**, 235-242.
5. Yamamoto, T., et al. (1989). *J. Anal. Toxicol.* **13**, 117-119.
6. Wu, A.H.B., et al. (1992). *Biol. Mass Spectrom.* **21**, 278-284.
7. Rood, H.D. and Knitter, J.A. (1991). Capillary Chromatography. W.G. Jennings, ed., pp. 115-130.
8. DePace, A., et al. (1990). *J. Forensic Sci.* **35(6)**, 1431-1435.
9. Mulé, S.J. and Casella, G.A. (1998). *J. Anal. Toxicol.* **12**, 102-107.
10. Suzuki, S., et al. (1983). *J. Chromatogr.* **267**, 381-387.
11. Kananen, G., et al. (1972). *J. Chromatogr. Sci.* **10**, 283-287.
12. Skinner, R., et al. (1973). *Anal. Chem.* **45(3)**, 574-576.
13. Mulé, S.J. and Casella, G.A. (1989). *J. Anal. Toxicol.* **13**, 13-16.
14. Christophersen, A.S. and Rasmussen, K.E. (1980). *J. Chromatogr.* **192**, 363-374.
15. Venturella, V.S., et al. (1973). *J. Pharm. Sci.* **62(4)**, 662-668.
16. Walle, T. (1975). *J. Chromatogr.* **114**, 345-350.
17. Ellerbe, P., et al. (1992). *J. Anal. Toxicol.* **16**, 158-162.
18. Graffeo, A.P., et al. (1976). *J. Chromatogr.* **126**, 712-717.
19. Harkey, M.R., et al. (1991). *J. Anal. Toxicol.* **15**, 260-265.
20. Bodor, G., et al. (1990). *Clin. Chem.* **36**, 742-747.
21. Jane, I. and Wheals, B.B. (1973). *J. Chromatogr.* **84**, 181-186.
22. Nelson, C.C. and Foltz, R.L. (1992). *Anal. Chem.* **64**, 1578-1585.
23. Lim, H.K., et al. (1988). *Anal. Chem.* **60**, 1420-1425.
24. Harvey, D.J. (1981). *Biomed. Mass.* Spec. 8(8).
25. Parry, R.C., et al. (1990). *J. Anal Toxicol.* **14**, 39-43.
26. Clatworthy, A.J. (1990). *Forensic Sci. Int.* **46**, 219-230.
27. Baker, T.S., et al. (1984). *J. Anal Toxicol.* **8**, 255-259.
28. Clouette, R., et al. (1993). *J. Anal Toxicol.* **17**, 1-4.
29. Rosenfeld, J.M., et al. (1986). *Anal. Chem.* **58**, 716-721.
30. McBurney, L.J., et al. (1986). *J. Anal Toxicol.* **10**, 56-64.
31. Karlsson, L., et al. (1983). *J. Anal Toxicol.* **7**, 198-202.
32. Foltz, R.L. (1984). Advances in Analytical Toxicology, I. R.C. Baselt, ed. Foster City, CA: Biomedical Publications.
33. Wilkinson, G.R., et al. (1969). *Biochem. Pharmacol.* **18**, 1435-1439.
34. Weitz, C.J., et al. (1986). *Proc. Nat. Acad. Sci.* **83**, 9784-9788.
35. Fehn, J. and Megges, G. (1985). *J. Anal. Toxicol.* **9**, 134-138.
36. Wasels, R., et al. (1989). *J. Chromatogr.* **489**, 411-418.
37. Christopherson, A.S., et al. (1987). *J. Chromatogr.* **422**, 117-124.
38. Chen, B.H., et al. (1990). *J. Anal. Toxicol.* **14**, 12-17.
39. Bowie, L. and Kirkpatrick, P.B. (1989). *J. Anal. Toxicol.* **13**, 326-329.
40. Nelson, C.C. and Foltz, R.L. (1992). *Anal. Chem.* **64**, 1578-1585.
41. Grinstead, G.F. (1991). *J. Anal. Toxicol.* **15**, 293-298.
42. Fuller, D.C. and Anderson, W.H. (1992). *J. Anal. Toxicol.* **16**, 315-318.
43. Lee, H.M. and Lee, C.W. (1991). *J. Anal. Toxicol.* **15**, 182-187.
44. Woodworth, J.R., et al. (1984). *J. Anal. Toxicol.* **8**, 2-6.
45. Cone, E., et al. (1981). *J. Chromatogr.* **223**, 331-339.

Drugs of Abuse Derivatization Applications

Cocaine Metabolites

Cardenas, S., *et al.* (1996). *Rapid Commun. Mass Spectrom.* **10**, 631-636.
Crouch, D.J., *et al.* (1995). *J. Anal. Toxicol.* **19**, 352-358.
Smimow, D., *et al.* (1995). Presented at the Society of Forensic Toxicolologists, Baltimore, MD, 72.
Okeke, C.C., *et al.* (1994). *Chromatographia* **38**, 52-56.
Cone, E.J., *et al.* (1994). *Clin. Chem.* **40**, 1299-1305.
Peterson, K.L., *et al.* (1994). Presented at the 46th Annual Meeting of the American Academy of Forensic Sciences, San Antonio, TX, 197.
Moore, J.M., *et al.* (1993). *J. Forensic. Sci.* **38**, 1305-1325.
Aderjan, R.E., *et al.* (1993). *J. Anal. Toxicol.* **17**, 51-55.
Taylor, R.W., *et al.* (1991). *Adv. Lab Autom. Rob.* **7**, 567-582.
Ortuno, J., *et al.* (1990). *J. Pharmaceut. Biomed. Anal.* **8**, 911-914.
Verebey, K., *et al.* (1989). *J. Forensic Sci.* **34**, 46-52.
Vasiliades, J. (1989). *J. Anal. Toxicol.* **13**, 127.
Isenschmid, D.S., *et al.* (1988). *J. Anal. Toxicol.* **12**, 242-245.
Mule, S.J., *et al.* (1988). *J. Anal. Toxicol.* **12**, 153-155.

Derivatization of Cannabinoids

Prest, H. Advantages of positive chemical ionization mass spectroscopy. Application Note. Hewlett Packard Co.
Lisi, A.M., *et al.* (1993). *J. Chromatogr.* **617**, 265-270.
Wu, A.H.B., *et al.* (1993). *J. Anal. Toxicol.* **17**, 215-217.
Clouette, R., *et al.* (1993). *J. Anal. Toxicol.* **17**, 1-4.
Fysh, R.R. (1989). Presented at the 26th International Meeting of the International Association of Forensic Toxicologists, Glasgow, Scotland, 67.
Rosenfeld, J.M., *et al.* (1989). *Anal. Chem.* **61**, 925-928.
Baker, T.S., *et al.* (1984). *J. Anal. Toxicol.* **8**, 255-259.
Karlsson, L., *et al.* (1983). *J. Anal. Toxicol.* **7**, 198-202.
Borys, H.K., *et al.* (1981). *J. Chromatogr.* **205**, 303-323.

Derivatization of Amphetamines

Kuroda, N., *et al.* (1998). *J. Chromatogr. A.* **798**, 325-334.
Dasgupta, A., *et al.* (1998). *Amer. J. Clin. Pathol.* **109**, 527-532.
Cheung, S., *et al.* (1997). *J. Chromatogr. B.* **690**, 77-87.
Sadeghipour, F., *et al.* (1997). *J. Chromatogr. A.* **761**, 71-78.
Hara, K., *et al.* (1997). *J. Anal. Toxicol.* **21**, 54-58.
Shin, H.-S., *et al.* (1996). *Anal. Chem.* **68**, 3015-3020.
Meatherall, R.C. (1994). Presented at the 1994 TIAFT-SOFT Program, Tampa, FL, 66.
Thompson, W.C., *et al.* (1994). *Clin. Chem.* **40**, 1703-1706.
Sievert, H.J.P. (1994). *Chirality* **6**, 295-301.
Melgar, R., *et al.* (1993). *J. Anal. Toxicol.* **17**, 399-402.
Jones. J.B., *et al.* (1993). *J. Anal. Toxicol.* **17**, 447.
Gjerde, H., *et al.* (1993). *J. Anal. Toxicol.* **17**, 65-68.
Cody, J.T., *et al.* (1992). *J. Chromatogr.* **580**, 77-95.
Hughes, R.O., *et al.* (1991). *J. Anal. Toxicol.* **15**, 256-259.
Gan, B.K., *et al.* (1991). *J. Forensic Sci.* **36**, 1331-1341.
Lillsunde, P., *et al.* (1991). *Forensic Sci. Int.* **49**, 205-213.
Rasmussen, S., *et al.* (1989). *J. Anal. Toxicol.* **13**, 263-267.
Czarny. R.J., *et al.* (1989). *J. Anal. Toxicol.* **13**, 257-262.
Hornbeck, C.L., *et al.* (1989). *J. Anal. Toxicol.* **13**, 144-149.

Derivatization of Opiates

Brendler, J.P., *et al.* (1998). Presented at the AAFS, San Francisco, CA.
Balikova, M., *et al.* (1998). *Forensic Sci. Int.* **94**, 201-209.
Emara, S. (1998). *Biomed. Chromatogr.* **12**, 15-20.
Hyotylainen, T., *et al.* (1997). *J. Chromatogr. A.* **771**, 360-365.
Guillot, J.G., *et al.* (1997). *J. Anal. Toxicol.* **21**, 127-133.
Dietzen, D.J., *et al.* (1995). *J. Anal. Toxicol.* **19**, 299-303.
Hendrickson, T.L., *et al.* (1994). *J. Chromatogr. B.* **653**, 147-154.
Nakahara, Y., *et al.* (1992). *Arch. Toxicol.* **66**, 669-674.
Chari, G., *et al.* (1991). *J. Chromatogr.* **571**, 263-270.
Lee, H.-M., *et al.* (1991). *J. Anal. Toxicol.* **15**, 182-187.
Chen, B.H., *et al.* (1990). *J. Anal. Toxicol.* **14**, 12-17.
McLean, C.F., *et al.* (1990). *J. Pharm. Pharmacol.* **42**, 669-671.
Wasels, R., *et al.* (1989). *J. Chromatogr.* **489**, 411-418.
Battah, A.-K., *et al.* (1989). Presented at the 26th Annual International Meeting of the International Association of Forensic Toxicologists, Glasglow, Scotland, 16.
Derks, H.J.G.M., *et al.* (1986). *J. Chromatogr.* **370**, 173-178.
Moore, J.M., *et al.* (1984). *Anal. Chem.* **56**, 642-646.

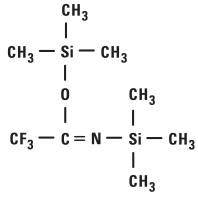
Silylation Reagents

BSTFA + TMCS

For excellent chromatographic separations and difficult-to-silylate compounds

BSTFA is a powerful trimethylsilyl donor, with donor strength that is comparable to its unfluorinated analog BSA [N,O-Bis(trimethylsilyl)acetamide]. BSTFA reacts to replace labile hydrogens on a wide range of polar compounds with a -Si$(CH_3)_3$ group. This physical characteristic is particularly useful in the gas chromatography of some lower boiling TMS-amino acids and TMS Krebs cycle acids.

- Increased volatility of reaction byproducts mono (trimethylsilyl) trifluoroacetamide and trifluoroacetamide over corresponding nonfluorinated compounds from BSA
- Increased volatility makes it possible to derivatize smaller molecules with which the TMS derivatives elute with the byproducts from BSA
- Excellent for derivatizing fatty acid amides, slightly hindered hydroxyls and other compounds
- Catalyzed formulation is stronger than BSTFA alone



BSTFA
MW 257.4
bp 40°C/12 mm
d_4^{20} 0.961

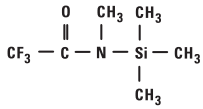
BSTFA

Description	Quantity	Cat. No.	Quantity
BSTFA	10 × 1mL ampules	**TS-38830**	1 Pack
	25g	**TS-38828**	1 Each
	100g	**TS-38829**	1 Each
BSTFA +1% TMCS	10 × 1mL ampules	**TS-38831**	1 Pack
	10g	**TS-38832**	1 Each
	25g	**TS-38833**	1 Each
	100g	**TS-38834**	1 Each
BSTFA +10% TMCS	10 × 1mL ampules	**TS-38840**	1 Pack

MSTFA and MSTFA+1% TMCS

Offers maximum volatility

- Trimethylsilyl donor strength comparable to BSA and BSTFA
- Reacts to replace labile hydrogens on a wide range of polar compounds with a $Si(CH_3)_3$ group
- Used to prepare volatile and thermally stable derivatives for GC and MS
- Volatile byproduct, N-methyltrifluoroacetamide, has an even lower retention time than MSTFA
- Often TMS derivatives of small molecules can be analyzed when derivatized with MSTFA because the byproducts and the reagent itself usually elute with the solvent front
- Addition of Thermo Scientific TMCS aids derivatization of amides, secondary amines and hindered hydroxyls not derivatized by MSTFA alone



MSTFA
MW 199.1
bp 70°C/75 mm
d_4^{20} 1.11

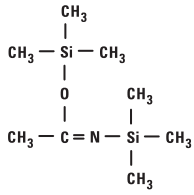
MSTFA and MSTFA 1% TMCS

Description	Quantity	Cat. No.	Quantity
MSTFA	10 × 1mL ampules	**TS-48910**	1 Pack
	10g	**TS-48911**	1 Each
	25mL	**TS-48913**	1 Each
	100mL	**TS-48914**	1 Each
MSTFA +1% TMCS	10 × 1mL ampules	**TS-48915**	1 Pack

BSA

The perfect reagent for rapid silylation reactions

- Highly reactive trimethylsilyl donor that reacts quantitatively to form volatile, stable TMS derivatives
- Reacts quickly and quantitatively under mild conditions with a variety of compounds
- Derivatizes alcohols, amines, amides, carboxylic acids, phenols, steroids, biogenic amines and alkaloids



BSA
MW 203.4
bp 71-73°C/35 mm
d_4^{20} 0.832

BSA

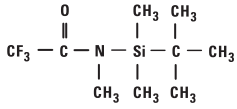
Description	Quantity	Cat. No.	Quantity
BSA	10 x 1mL	**TS-38836**	1 Pack
	25g	**TS-38838**	1 Each
	100g	**TS-38839**	1 Each

Silylation Reagents

MTBSTFA and MTBSTFA+1% TBDMCS

Offers stable TBDMS (tert-butyldimethylsilyl) derivatization

- Derivatizes hydroxyl, carboxyl, thiol and primary and secondary amines
- Typical yields are >96%
- Provides TBDMCS ethers that are 104 times more stable to hydrolysis than TMS ethers
- Reaction byproducts are neutral and volatile
- Derivatives have a high molecular concentration at M-57
- Silylating potential increased by adding 1% TBDMCS



MTBSTFA
MW 241.3
bp 168-170°C
d_4^{20} 1.121

MTBSTFA and MTBSTFA+1% TBDMCS

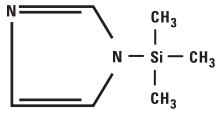
Description	Quantity		Cat. No.	Quantity
MTBSTFA	5mL ampules	X	**TS-48920**	1 Each
MTBSTFA +1% TBDMCS	10 × 1mL	X	**TS-48927**	1 Pack

X in the ordering table indicates that hazardous shipping charges apply.

TMSI (*N*-Trimethylsilylimidazole)

The strongest silylator available for carbohydrates and steroids

- Reacts quickly and smoothly with hydroxyls and carboxylic acids but not with amines
- Especially useful in multiderivatization schemes for compounds containing both hydroxyl and amine groups
- Used in the derivatization of alcohols, phenols, organic acids, steroids, hormones, glycols, nucleotides and narcotics
- Excellent for C1 through C5 fatty acids in serum and urine



TMSI
MW 140.26
bp 99°C/14 mm Hg
d_4^{20} 0.957

TMSI

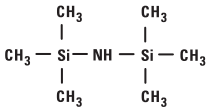
Description	Quantity		Cat. No.	Quantity
TMSI (*N*-Trimethylsilylimidazole)	10 × 1mL ampules	X	**TS-88623**	1 Pack
TMSI	25g	X	**TS-88625**	1 Each
	100g	X	**TS-88626**	1 Each

X in the ordering table indicates that hazardous shipping charges apply.

HMDS (Hexamethyldisilazane)

The popular choice for silylation of sugars and related substances

- Greatly extends the practical range of GC, improving chromatographic results
- Suitable for deactivating and coating chromatographic supports
- Monofunctional, making polymerization not possible and eliminating surface moisture



HMDS
MW 161.4
bp 125°C
n_d^{20} 1.4071

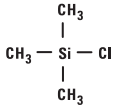
HMDS

Description	Quantity (g)		Cat. No.	Quantity
HMDS (Hexamethyldisilazane)	25	X	**TS-84770**	1 Each
HMDS	100	X	**TS-84769**	1 Each

X in the ordering table indicates that hazardous shipping charges apply.

TMCS (Trimethylchlorosilane)

An excellent catalyst for difficult-to-silylate compounds



TMCS
MW 108.7
bp 57.6°C
d_4^{20} 0.858

- Excellent adjunct for forming trimethylsilyl ethers for GC determinations
- Used to prepare TMS derivatives of organic acids

TMCS

Description	Quantity (g)		Cat. No.	Quantity
TMCS	25	X	**TS-88530**	1 Each

X in the ordering table indicates that hazardous shipping charges apply.

MOX (Methoxamine) Reagent

Useful for preparing oximes of steroids and ketoacids prior to silylation

- 2% methoxyamine HCl (M.W. 83.51) in pyridine
- Prevents formation of multiple derivatives when enols are present during silylation
- Supplied in amber Thermo Scientific Hypo-Vial Sample Storage Vial with septum and crimp top

MOX

Description	Quantity (mL)		Cat. No.	Quantity
MOX (Methoxamine) Reagent (2% methoxyamine•HCl in pyridine)	10	X	**TS-45950**	1 Each

X in the ordering table indicates that hazardous shipping charges apply.

Silylation Reagents

Tri-Sil HTP (HDMS:TMCS:Pyridine) Reagent

Reagent-catalyst mixture for one-step derivatization

- Derivatizes carbohydrates, phenols, steroids, sterols, organic acids, alcohols and some amines
- Useful for rapid production of TMS derivatives of polar compounds for gas chromatographic determination and biochemical synthesis
- The versatility, speed and ease of use of Tri-Sil HTP Reagent has made it the most widely used silylation formulation available

Tri-Sil HTP

Description	Quantity		Cat. No.	Quantity
Tri-Sil HTP Reagent HDMS:TMCS:Pyridine (2:1:10)	10 × 1mL ampules	X	**TS-48999**	1 Pack
Tri-Sil HTP Reagent HDMS:TMCS:Pyridine (2:1:10)	50mL	X	**TS-49001**	1 Each

1. Ng, L., et al. (1993). J. Chromatogr. ***637***, 104-108.

X in the ordering table indicates that hazardous shipping charges apply.

Tri-Sil BP (BSA:Pyridine) Reagent

Derivatizes alcohols, phenols, organic acids, aromatic amides and amines

Tri-Sil BP Reagent reacts with:

- Alcohols, phenols, some enols and other hydroxyl and polyhydroxyl compounds to from trimethylsilyl esters
- Organic acids to form trimethylsilyl esters
- Aromatic amides to form N-trimethylsilyl derivatives
- Amino acids to form both N- and O-trimethylsilyl derivatives
- Amines to form N-trimethylsilyl derivatives
- In addition, Tri-Sil BP is excellent for unhindered steroids, but it is not recommended for carbohydrates

Tri-Sil BP

Description	Quantity (mL)		Cat. No.	Quantity
Tri-Sil BP Reagent (2.5mEq/mL BSA in pyridine)	25	X	**TS-49012**	1 Each

X in the ordering table indicates that hazardous shipping charges apply.

Tri-Sil TBT (TMSI:BSA:TMCS) Reagent

A catalyzed silylation reagent formulation containing three parts TMSI, three parts BSA and two parts TMCS

- Converts all classes of hydroxyl groups to TMS ethers
- Under usual conditions, the reaction is complete in a short period of time at 60 to 80°C, although very hindered hydroxyls may require several hours

Tri-Sil TBT

Description	Quantity		Cat. No.	Quantity
Tri-Sil TBT Reagent TMSI:BSA:TMCS (3:3:2)	10 × 1mL ampules	X	**TS-49016**	1 Pack

1. Seidel, V., et al. (1993). Chromatographia ***37***, 191-201.

X in the ordering table indicates that hazardous shipping charges apply.

Tri-Sil TP Reagent (TMSI:Pyridine)

Derivatizes hydroxyl compounds, particularly carbohydrates

- Silylates alcohols and phenols, organic acids, hydroxylamines, amino acids, carbohydrates, flavonoids, glycols and polyglycols, nucleotides, steroids, hydroxyl acids, barbituates, narcotics, indoles and vitamins
- Does not react with amines
- May be used with water as long as there is enough reagent present to react with both the water and the sample

Tri-Sil TP

Description	Quantity		Cat. No.	Quantity
Tri-Sil TP Reagent TMSI: Pyridine (1:4)	10 × 1mL ampules	X	**TS-49230**	1 Pack
Tri-Sil TP Reagent TMSI: Pyridine (1:4)	25mL	X	**TS-49231**	1 Each

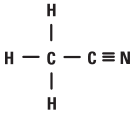
X in the ordering table indicates that hazardous shipping charges apply.

Silylation Reagents

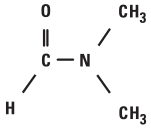
Silylation Grade Solvents

Manufactured to meet your exacting silylation needs

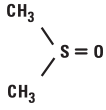
- Purified, dried and packaged under nitrogen in convenient 50mL Hypo-Vial Sample Storage Vials
- Supplied with elastomer septa, allowing immediate access to the sample without exposure to moisture and oxygen
- Use polar solvents (acetonitrile, dimethylformamide, dimethylsulfoxide, pyridine, tetrahyrdrofuran) to facilitate reactions; nonpolar organic solvents may be used, but they will not accelerate the rate of reaction



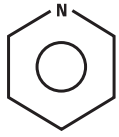
Acetonitrile
MW 41.05
bp 81.6°C



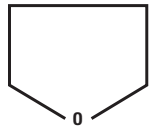
Dimethylformamide
MW 73.09
bp 153°C



Dimethylsulfoxide
MW 78.13
bp 189°C



Pyridine
MW 79.10
bp 115.2°C



Tetrahydrofuran
MW 72.10
bp 66°C

Silylation Grade Solvents

Description	Quantity (mL)		Cat. No.	Quantity
Acetonitrile	50	X	**TS-20062**	1 Each
Dimethylformamide (DMF)	50	X	**TS-20672**	1 Each
Dimethylsulfoxide (DMSO)	50		**TS-20684**	1 Each
Pyridine	50	X	**TS-27530**	1 Each
Tetrahydrofuran (THF)	50	X	**TS-27860**	1 Each

X in the ordering table indicates that hazardous shipping charges apply.

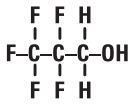
For HPLC Grade Solvents, see page 4-193.

Acylation Reagents

Pentafluoropropanol

Purified for GC/MS applications

- Addition of fluorine atoms into compounds greatly enhances the sensitivity of certain detectors for all those materials
- Carboxylic acids can be derivatized using a two-step reaction involving reaction with anhydride, followed by a fluorinated alcohol



Pentafluoropropanol
MW 150.05
bp 80.6°C
d_4^{20} 1.2880

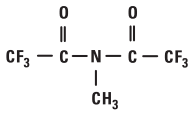
Pentafluoropropanol

Description	Quantity	Cat. No.	Quantity
Pentafluoropropanol	10 x 1mL ampules	**TS-65195**	1 Pack

MBTFA

For trifluoroacylating primary and secondary amines, hydroxyl and thiol groups and carbohydrates

- Reacts under nonacidic conditions
- Principle byproduct from the derivatization reaction is N-methyltrifluoroacetamine, which is stable, volatile and does not present problems in subsequent GC
- Produces very volatile derivatives of carbohydrates
- Can be used to selectively acylate amines in the presence of hydroxyl and carboxyl groups that have been protected by silylation



MBTFA
MW 223.08
bp 123-124°C
d_4^{20} 1.55

MBTFA

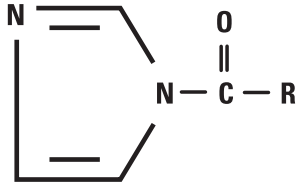
Description	Quantity		Cat. No.	Quantity
MBTFA [N-Methyl-bis(trifluoroacetamide)	10 × 1mL ampules	X	**TS-49700**	1 Pack
MBTFA	25mL	X	**TS-49703**	1 Each
	100mL	X	**TS-49704**	1 Each
	5g	X	**TS-49701**	1 Each

X in the ordering table indicates that hazardous shipping charges apply.

Perfluoroacylimidazoles (HFBI and TFAI)

Offer effective acylation of hydroxyl groups and primary and secondary amines

- Reactions are smooth, quantitative and produce no acid byproducts
- Principal byproduct, imidazole, is relatively inert
- Excellent for FID and ECD techniques
- Derivatives are volatile, despite size of group
- Closely bound fluorines contribute to stability



R	Name	M.W.	Boiling Point
C_3F_7	HFBI	264.10	57 to 58°C/10mm
CF_3	TFAI	164.08	38 to 40°C/14mm

Perfluoroacylimidazoles (HFBI and TFAI)

Description	Quantity		Cat. No.	Quantity
HFBI	5g		**TS-44211**	1 Each
TFAI	10 x 1mL ampules	X	**TS-48882**	1 Pack

X in the ordering table indicates that hazardous shipping charges apply.

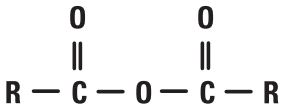
Thermo Scientific high-performance chromatography refrigerators offer close temperature control, instrumentation access and easy set-up.
www.thermoscientific.com/cold

Acylation Reagents

Perfluoro Acid Anhydrides (TFAA, PFAA and HFAA)

Highly purified for optimal preparation of fluoracyl derivatives

- Used to prepare fluoracyl derivatives for GC/MS
- Produce stable volatile derivatives for FID and ECD techniques



Perfluoro Acid Anhydrides

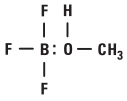
Description	Quantity		Cat. No.	Quantity
TFAA (Trifluoroacetic Acid Anhydride)	100g	X	**TS-67363**	1 Each
PFAA (Pentafluoropropionic Acid Anhydride)	10 × 1mL ampules	X	**TS-65193**	1 Pack
PFAA	25g	X	**TS-65192**	1 Each
PFAA	100g	X	**TS-65191**	1 Each
HFAA (Heptafluorobutyric Acid Anhydride)	10 × 1mL ampules	X	**TS-63164**	1 Pack
HFAA	25g	X	**TS-63163**	1 Each
HFAA	100g	X	**TS-63162**	1 Each

X in the ordering table indicates that hazardous shipping charges apply.

Alkylation Reagents

BF_3-Methanol

Provides convenient, fast and quantitative esterification of fatty acids



BF_3-Methanol
14% BF_3 MW 67.82
86% CH_3OH MW 32.04

- Supplied in septum-sealed Thermo Scientific Hypo-Vial Sample Storage Vial for convenient syringe removal
- Consists of 14% BF_3, MW 67.82, and 86% CH_3OH, MW 32.04

BF_3-Methanol

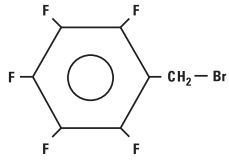
Description	Quantity (mL)		Cat. No.	Quantity
BF_3-Methanol	100	X	**TS-49370**	1 Each

X in the ordering table indicates that hazardous shipping charges apply.

Pentafluorobenzyl Bromide (PFBBr)

For electron capture GC analysis of carboxyl acids, phenols and sulfonamides

- Fast reaction times for extraction alkylation technique: ~20 minutes
- Derivatives are highly EC-sensitive, making them useful in low-level determinations of fatty acids
- Analysis of trace organics in asphalt



PFBBr
MW 260.9
bp 174-175°C
d_4^{20} 1.86

Pentafluorobenzyl Bromide

Description	Quantity (g)		Cat. No.	Quantity
PFBBr (Pentafluorobenzyl Bromide)	5	X	**TS-58220**	1 Each

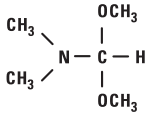
X in the ordering table indicates that hazardous shipping charges apply.

Methylate Reagent (DMFDMA)

For easy, effective preparation of methyl esters from fatty acids and amino acids

Advantages for preparation of methyl esters for gas chromatography:

- Speed: the reaction is complete upon dissolution (except long chain solid acids)
- No water washing, extraction or concentration of derivatives required
- No water formed
- Quantitation: quantitative yields are obtained when the reagent and sample are injected without prior mixing
- Convenient: ready-to-use reagent contains 2mEq/mL pyridine



Methylate Reagent
MW 119.17
bp 102-104°C
d_4^{20} 0.897

Methylate Reagent

Description	Quantity (mL)	Cat. No.	Quantity
Methylate Reagent (N, N-Dimethylformamide dimethyl acetal)	25	**TS-49350**	1 Each

Packaged in Hypo-Vial Sample Storage Vial.

Alkylation Reagents

MethElute Reagent (TMPAH)

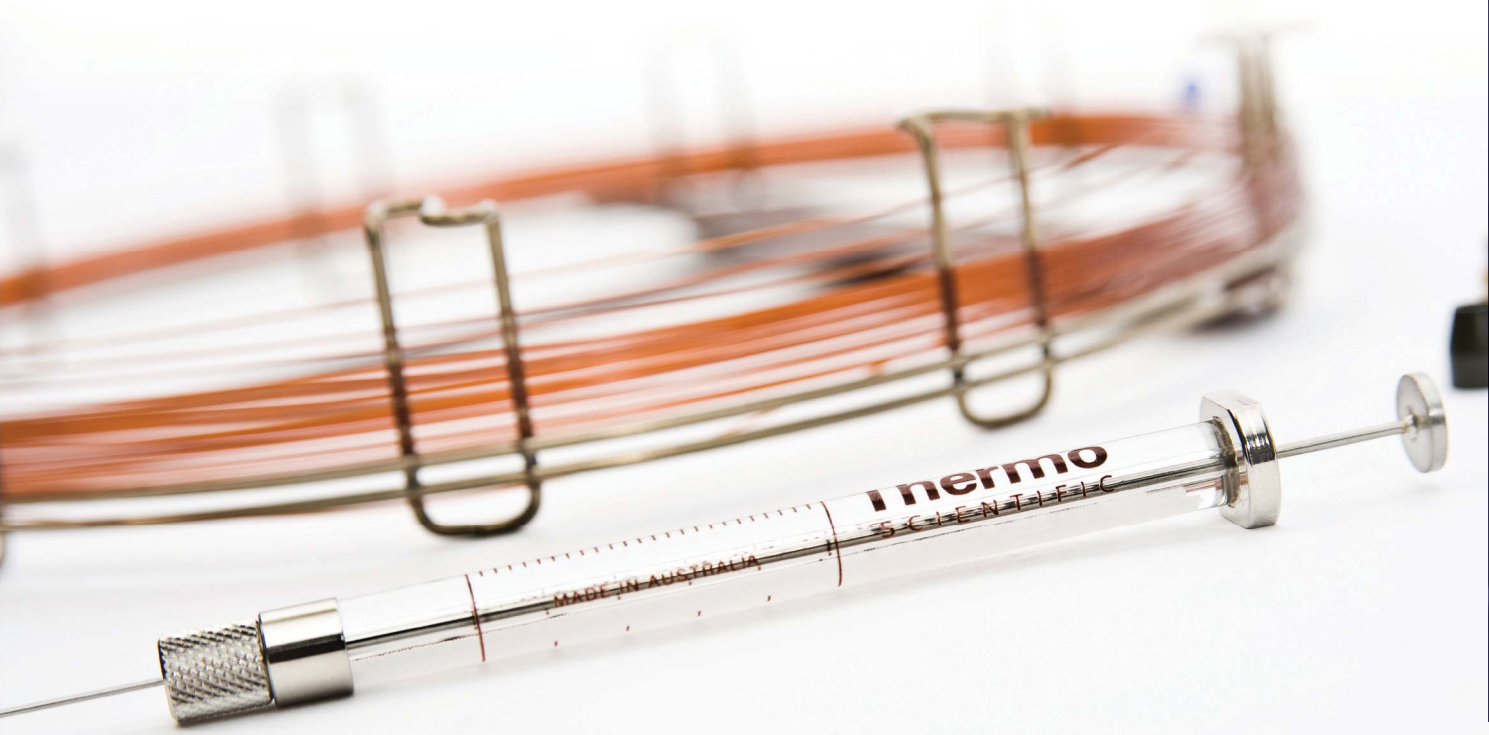
Provides accurate sensitive on-column methylation

- 0.2M trimethylanilinium hydroxide (TMPAH) in methanol solution
- For quantitative methylation and detection of barbituates, sedatives, xanthine bases, phenolic alkaloids and phenytoin by gas chromatography
- Single quantitative peak for each substance
- When reagent is heated with drug-containing extracts, serum or urine, those drugs containing reactive amino, hydroxyl and carboxyl functions will be methylated at the reactive sites
- Comparable to or better than UV/TLC method (when phenobarbitol and phenytoin are present, GC is superior to UV/TLC)
- Coefficient of variation is 5% or less
- Detects barbituates to 0.2mg/dL

MethElute Reagent

Description	Quantity (mL)		Cat. No.	Quantity
MethElute Reagent (TMPAH)	10	X	**TS-49300**	1 Each
MethElute Reagent (TMPAH)	12 × 1	X	**TS-49301**	1 Pack

X in the ordering table indicates that hazardous shipping charges apply.



Siliconizing Fluids

Water-Soluble Siliconizing Fluid

Attaches the silane polymer, octadecyltrialkosilane, to make the surface inert or polymerizes to create an inert film

- Easy-to-use silane monomer solution that is supplied as a 20% solid solution in a mixture of diacetone alcohol and tertiary butyl alcohol
- Greater resistance to base hydrolysis than other surface treatments
- Can be used on plastic surfaces

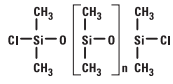
Water-Soluble Siliconizing Fluid

Description	Quantity (mL)		Cat. No.	Quantity
Siliconizing Fluid-Water Soluble	120	X	**TS-42799**	1 Each

X in the ordering table indicates that hazardous shipping charges apply.

Hydrocarbon-Soluble Siliconizing Fluid

Attaches a short-chain silane polymer to make the surface inert or polymerizes to create an inert film



Siliconizing Fluid – Hydrocarbon Soluble

When applied to glass, quartz or similar materials, the unhydrolyzed chlorines present on the chain react with surface silanols to form a neutral, hydrophobic and tightly bonded film over the entire surface.

- Soluble in organic solvents
- Excellent for modifying metals, glass, ceramics and fiber optics
- Can be used for certain plastic surfaces
- Well-suited for treatment of GC injection port liners

Hydrocarbon-Soluble Siliconizing Fluid

Description	Quantity (mL)		Cat. No.	Quantity
Siliconizing Fluid-Hydrocarbon Soluble	120	X	**TS-42800**	1 Each
Siliconizing Fluid-Hydrocarbon Soluble	480	X	**TS-42801**	1 Each
Siliconizing Fluid-Hydrocarbon Soluble	5 x 10	X	**TS-42855**	1 Pack

X in the ordering table indicates that hazardous shipping charges apply.

Sample Handling Products

To complete our offering for gas and liquid chromatography, we offer a wide range of heating and stirring systems, vials, closures and other accessories. All Thermo Scientific sample handling products are manufactured under strict conditions, providing the quality you need for reliable derivatization reactions.

Reacti-Therm Sample Derivatization System

This unique product combines heating, stirring and evaporation with unmatched convenience and versatility. The system comprises of a Reacti-Therm heating/stirring module (uniform dry heat to the sample) coupled with the Reacti-Vap evaporator (simultaneous or separate delivery of pressurized gas) to provide a complete solution for derivatization or other small scale reactions. To complete the system we offer a range of accessories including; Reacti-Vial Small Reaction Vials, Reacti-Blocks and Reacti-Vial Magnetic Stirrers.

Reacti-Therm Heating and Stirring Modules

Reliable and easy-to-use for constant temperatures

- Uniform, stable heating: steady temperature incubation between ambient plus 10°C to 200°C
- LED display: match digital display to in-block thermometer to calibrate temperature set-point
- Modular design: switch aluminum blocks and vials; attach compatible evaporator manifold
- Dual-voltage flexibility: compatible with 120V and 240V power; country-specific power cord supplied
- Four models: single-block and triple-block sizes with either heat-only or heat-and-stir capability
- In-block temperature control option by Remote Temperature Probe, an optional accessory to allow temperature regulation from block wells or actual sample vials

Reacti-Therm Heating Modules

Type	Size of Unit	Cat. No.	Quantity
Heating Function	Single-block	**TS-18822**	1 Each
Model with Heating Function	Triple-block	**TS-18824**	1 Each
Remote Temperature Probe		**TS-18820**	1 Each

Reacti-Therm Heating and Stirring Modules

Type	Size of Unit	Cat. No.	Quantity
Heating and Stirring Function	Single block	**TS-18821**	1 Each
Model with Heating and Stirring Function	Triple-block	**TS-18823**	1 Each

Applications:

- General sample incubation and evaporation in a variety of tube and vial sizes
- Silylation, alkylation and acylation derivatization reactions for GC sample preparation
- Protein hydrolysis and vacuum hydrolysis reactions for amino acid analysis by HPLC

We offer a full range of Reacti-Thermo accessories

Notes

Reacti-Therm Thermometers

NIST-traceable thermometers specially designed for use in dry block heaters

- Mercury-free: alcohol-filled for greater safety
- PTFE coating ensures that glass is impervious to corrosive materials
- Certified and calibrated
- Shock-resistant glass and coatings
- Standard laboratory size: 225mm length x 8mm diameter with 35mm immersion length
- Compatible for use in Reacti-Therm Heating Modules and other laboratory equipment

Reacti-Therm Thermometers

Min. Temperature (°C)	Max. Temperature (°C)	Cat. No.	Quantity
0	100	**TS-18914**	1 Each
0	200	**TS-18915**	1 Each

Reacti-Block Aluminum Blocks

Optimal thermal conductivity

- Constructed of an aluminum alloy for optimal thermal conductivity
- Each Reacti-Block Aluminum Block contains a thermometer well
- Block dimensions are 9.4 L x 7.5 W x 5.1cm H for all blocks except for F, G, J and M which have a depth of 7.6cm
- For use with Reacti-Therm Modules only

Reacti-Block Aluminum Blocks

Description	For Use With	No. of Tubes per Block	Cat. No.	Quantity
Reacti-Block A-1	0.3 or 1mL Reacti-Vial Small Reaction Vials	13 holes	**TS-18801**	1 Each
Reacti-Block B-1	3 to 5mL Reaction Vials	9 holes	**TS-18802**	1 Each
Reacti-Block C-1	3.5mL Screw Cap Septum VialsReacti-Block F	13 holes	**TS-18803**	1 Each
Reacti-Block F	5 or 8mL Vacuum Reaction Tubes	8 holes	**TS-18806**	1 Each
Reacti-Block K	Custom Drilling	None	**TS-18810**	1 Each
Reacti-Block M-1	27.5mL Tubes	6 holes	**TS-18811**	1 Each
Reacti-Block L	0.1mL Reacti-Vial Small Reaction VialsReacti-Block S-1	16 holes	**TS-18812**	1 Each
Reacti-Block Q-1	10mL Reacti-Vial Small Reaction Vials	8 holes	**TS-18814**	1 Each
Reacti-Block S-1	13mm Test Tubes	13 holes	**TS-18816**	1 Each
Reacti-Block T-1	16mm Test Tubes	9 holes	**TS-18817**	1 Each
Reacti-Block U-1	20mm Test Tubes	8 holes	**TS-18818**	1 Each
Reacti-Block V-1	Microfuge Test Tubes	17 holes	**TS-18819**	1 Each
Reacti-Block G	20mL Vacuum Reaction Tube	4 holes	**TS-18807**	1 Each
Reacti-Block J	Custom Drilling	None	**TS-18809**	1 Each

Reacti-Vial Magnetic Stirrers

Triangular stir bars for faster reaction times and smooth mixing of small samples in conical-bottom vials

- PTFE-coated for chemical resistance and inertness
- Provide for simultaneous stirring of samples in multiple vials when used with a Reacti-Therm Heating/Stirring Module equipped with appropriate Reacti-Block Aluminum Blocks
- Allow increased speed of surface reactions by keeping insoluble reactants in suspension

Reacti-Vial Magnetic Stirrers

Fits	Cat. No.	Quantity
3.0, 5.0 and 10.0mL Reacti-Vials	**TS-16000**	6 Pack
0.3 and 1mL Small Reacti-Vials	**TS-16010**	6 Pack

Search thousands of applications
in our chromatography resource center
www.thermoscientific.com/crc

Reacti-Vap Evaporators

Manifolds for easy sample evaporation

- Integrated pressure-relief valve protects against excessive gas-flow and dangerous pressure build up
- Easy set-up: attach to corresponding Reacti-Therm Module, attach tubing from gas supply, and lower into position over samples and start gas flow
- Choose 9-port or 27-port model for compatibility with single-block and triple-block Reacti-Therm Modules, respectively

Reacti-Vap Evaporators

No. of Ports	For Use With	Cat. No.	Quantity
9	Single-block Reacti-Therm Heating Module	**TS-18825**	1 Each
27	Triple-block Reacti-Therm Heating Module	**TS-18826**	1 Each

Applications:

- General sample incubation and evaporation in a variety of tube and vial sizes
- Silylation, alkylation and acylation derivatization reactions for GC sample preparation

Reacti-Vap Evaporator Replacement Parts

Extend the lifetime of Reacti-Vap evaporators

Reacti-Vap Evaporator Replacement Parts

Needle Length (mm)	Needle Gauge	Cat. No.	Quantity
64 (2.5in.)	16	**TS-18782**	9 Pack

Reacti-Vap PTFE-Coated Needles

Support the operation of Reacti-Vap evaporators

Reacti-Vap PTFE-Coated Needles

Needle Length (mm)	Needle Gauge	Cat. No.	Quantity
102 (4in.)	19	**TS-18784**	9 Pack
152 (6in.)	19	**TS-18786**	9 Pack

Reacti-Vial Small Reaction Vials

An internal cone makes small sample handling easy and convenient

- Extra thick glass wall magnifies the sample, making these vials ideal for observing chemical reactions
- Amber vials available for light-sensitive compounds
- Supplied complete with Open-Top Screw Caps and PTFE/Rubber Discs

Reacti-Vial Small Reaction Vials

Capacity	Cat. No.	Quantity
Amber		
1mL	**TS-13097**	12 Pack
5mL	**TS-13099**	12 Pack
Clear		
100µL	**TS-13100**	12 Pack
300µL	**TS-13220**	12 Pack
1mL	**TS-13221**	12 Pack
3mL	**TS-13222**	12 Pack
5mL	**TS-13223**	12 Pack
10mL	**TS-13225**	12 Pack

Applications:

- Residue isolation, derivative preparation, maximum sample retrieval, moisture protection, sample storage,precipitations, centrifugations, solvent evaporation

Thermo Scientific Tuf-Bond PTFE/Silicone Discs

Discs that combine the inertness of PTFE with the resealability of silicone

- Structurally bonded PTFE to silicone; no cement to leak out of your sample after needle penetration
- Reseals instantly, puncture after puncture
- Autoclavable
- Compresses to maintain a tight seal forcing the PTFE to conform to the sealing surface
- Standard syringe and GC needles penetrate the entire disc with ease

Thermo Scientific Tuf-Bond PTFE/Silicone Discs

Diameter (mm)	Fits	Cat. No.	Quantity
8	100µL Reacti-Vial Small Reaction Vials, 1.5mL Screw Cap Septum Vials	**TS-12708**	72 Pack
12	0.3 and 1mL Reacti-Vial Small Reaction Vials, 3.5mL Screw Cap Septum Vials	**TS-12712**	72 Pack
13	7mL Screw Cap Septum Vials	**TS-12713**	72 Pack
16	14mL Screw Cap Septum Vials; 15mL (0.5 oz.) Screw Cap Bottles	**TS-12716**	72 Pack
18	3 and 5mL Reacti-Vial Small Reaction Vials	**TS-12718**	72 Pack
22	25 and 40mL Screw Cap Septum Vials, 240mL (8 oz.) Screw Cap Bottles, 10mL Reacti-Vial	**TS-12722**	72 Pack

PTFE/Rubber Laminated Discs

Provides a highly inert and unreactive seal

- Constructed of white pharmaceutical rubber with PTFE bonded to one side
- Discs are autoclavable with no loss of integrity after heating above 100°C for 5 hours

PTFE/Rubber Laminated Discs

Diameter (mm)	Fits	Cat. No.	Quantity
12	0.3 and 1mL Reacti-Vial Small Reaction Vials, 2 and 3.5mL Screw Cap Septum Vial	**TS-12412**	72 Pack
18	3 and 5mL Reacti-Vial Small Reaction Vials; 10 and 25mL Reacti-Flask	**TS-12418**	72 Pack
22	25 and 40mL Screw Cap Septum Vials	**TS-12422**	72 Pack

Open-Top Screw Caps

Provide inert, air-tight seal and direct puncture-access to sample with a syringe needle

- Fits into Reacti-Vial Small reaction vials
- Used with PTFE/Rubber laminated discs

Open-Top Screw Caps

Fits	Cat. No.	Quantity
1.5mL Screw Cap Septum Vials, 100µL Reacti-Vials	**TS-13208**	72 Pack
3 and 5mL Reacti-Vials, 40mL Screw Cap Septum Vials	**TS-13218**	72 Pack
0.3 and 1.0mL Reacti-Vials, 3.5mL Screw Cap Septum Vial	**TS-13215**	72 Pack
7mL Screw Cap Septum Vials	**TS-13216**	72 Pack
10mL Reacti-Vials	**TS-13219**	72 Pack
14mL Screw Cap Septum Vials	**TS-13217**	72 Pack

Screw Cap Septum Vials

Economy, convenience and versatility in a vial and closure system

- Flat bottom vials
- Heavy-duty flip-top divider box provides easy access to vials, caps and septa and offers a convenient sample storage center
- Storage of reagents and standards under complete seal with instant syringe access

Screw Cap Septum Vials

Capacity (mL)	Cat. No.	Quantity
Amber		
1.5	**TS-13080**	72 Pack
Clear		
3.5	**TS-13019**	72 Pack
7	**TS-13028**	72 Pack
14	**TS-13043**	72 Pack
40	**TS-13075**	72 Pack

Vari-Clean Precleaned Vials

Versatile choice for sampling, analytical and general laboratory needs

Vials

- Allow instant syringe access to reagents and standards through the open top screw caps
- Long-term sample storage of biological media and volatile solutions
- Meticulously cleaned and ready to use, with no residue from the manufacturing process

TFE/Silicone Discs

- Autoclavable and resealable
- 90mm silicone body and 10mm TFE face not cemented into place: no cement leaching or baking out
- TFE provides an inert barrier between sample and screw cap

Vari-Clean Precleaned Vials

Capacity (mL)	Cat. No.	Quantity
Clear		
3.5	**TS-13504**	72 Pack
40	**TS-13510**	72 Pack

Mininert Valves

Excellent closures for chemicals that deteriorate or evaporate through conventional vial caps and seals

Thermo Scientific Mininert Valves are screw caps that have integrated resealable valves to allow repeated and unlimited syringe-needle access to samples. Slide the valve one way to open the needle-port. Slide the valve back to close and completely seal the close.

- Available in two sizes – 20mm (thread size 20/400) and 27mm (thread size 24/400) to fit 3 and 5mL Reacti-Vial Small Reaction Vials and 40mL Screw Cap Septum Vials, respectively
- Precision crafted from PTFE plastic for repeated use and chemical resistance
- Valve design eliminates the septum-boring that occurs with repeated puncture of traditional septa

Mininert Valves

Size (mm)	Fits	Cat. No.	Quantity
20	Fits 40mL Screw Cap Septum Vials	**TS-10130**	12 Pack
27	Fits 3 and 5mL Reacti-Vial Small Reaction Vials	**TS-10135**	12 Pack

Thermo Scientific GC Instrument Spare Parts

Our HPLC and GC chromatography and mass spectrometry instruments offer solutions to life science, laboratory, and industrial customers to advance scientific knowledge, enable drug discovery, improve manufacturing processes, and protect people and the environment. When your instrument is tuned for peak performance with parts, you can expect the best results and highest level of productivity to keep your research or processes moving smoothly.

TRACE GC Ultra Gas Chromatograph

- Innovative advances for unprecedented performance and reliability
- UltraFast GC to boost lab productivity
- Utmost sensitivity through Large Volume Injection techniques

Incorporating a large variety of high quality solutions in injector and detector technology, the Thermo Scientific TRACE GC Ultra gas chromatograph delivers excellence and innovation in full a range of application fields. This versatile GC is designed to be easily configured with up to two injectors and three detectors for utmost flexibility. Unique UltraFast GC technology delivers tremendous productivity without compromising precision and reliability. A full range of Large Volume Injection (LVI) techniques helps you overcome the sensitivity boundaries of conventional GC.

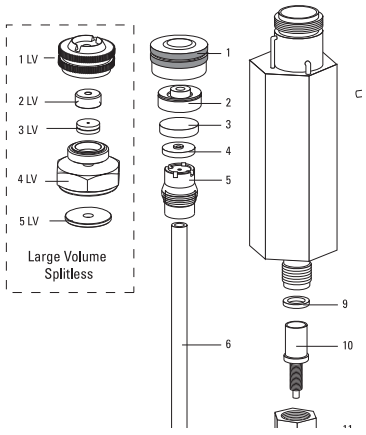
FOCUS GC

- Compact and productive
- Ease of use and reliability
- High quality QA/QC routine analyses

Compact in size and very affordable, the Thermo Scientific FOCUS GC is the ideal solution for every budget-conscious laboratory looking for an instantly productive GC environment. Designed for routine quality control and high throughput laboratories, the FOCUS GC is the benchmark for precision and accuracy of results as well as the standard for ruggedness. Even though it takes up less bench space, the FOCUS GC has a wide front-opening oven, which offers easy access for installation of capillary columns mounted on standard diameter cages.

Split/Splitless (S/SL) Injector, TRACE GC Ultra and FOCUS GC

Item	Description	Cat. No.	Quantity
1	Septum cap	**35001050**	1
1 LV	Septum cap for LVSL	**35001055**	1
2	Septum holder	**23303015**	1
2 LV	Septum holder for LVSL	**23303020**	1
3/3 LV	Septum (standard = 17mm, LV = 9mm)	**See page 3-083**	
4	Septum support	**35005433**	1
4 LV	LVSL adapter	**34709346**	1
5	Liner cap	**29004290**	1
5 LV	LVSL adapter Vespel seal	**35603450**	1
6	Liner	**See page 3-084**	
7	Liner seal	**See page 3-087**	
8	Liner cap removing tool	**20507010**	1
9	Silver seal	**29033629**	10
10	Terminal fitting for capillary columns	**34705451**	1
11	Nut for terminal fitting	**35022125**	2
12	Graphite ferrule	**See page 3-091**	
13	Fixing nut for column	**35032423**	5

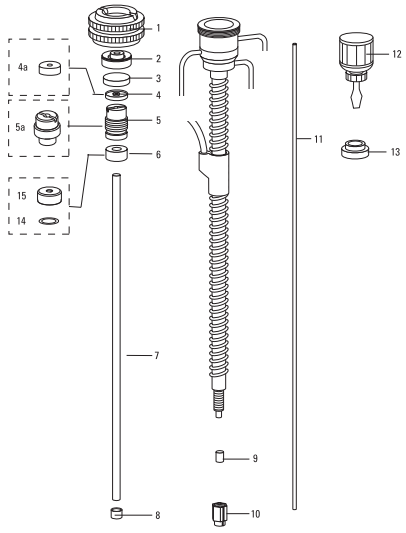


Split/Splitless (S/SL) Injector, TRACE GC Ultra and FOCUS GC

Programmed Temperature Vaporizing (PTV) Injector, TRACE GC Ultra

Item	Description	Cat. No.	Quantity
1	Septum cap	**35001047**	1
1	Septum cap for TriPlus HS and HS 2000 autosamplers	**35001048**	1
1	Merlin septum cap	**35001055**	1
2	Septum holder	**23303018**	1
3	Septum	**See page 3-083**	
4	Septum support* (replaced by item 4A)	**35005435**	1
4A	Septum support	**35005436**	1
5	Liner cap* (replaced by item 5A)	**29004277**	1
5A	Liner cap for PTV 816 RP-2004	**29004279**	1
6	Liner seal graphite	**29013417**	2
7	Liner	**See page 3-084**	
8	Spacer	**29014278**	2
9	Graphite ferrule	**See page 3-091**	
10	Fixing nut for column	**35032423**	5
11	Liner removing tool	**39801404**	1
12	Screwdriver	**20502603**	1
13	Ceramic washer	**34401100**	1
14	Viton® O-ring for sintered liner	**29031305**	10
14	Kalrez® O-ring for sintered liner	**29013702**	2
15	Sealing cup for PTV glass liner. To be used with PN 29031305 or PN 29013702	**29003420**	1

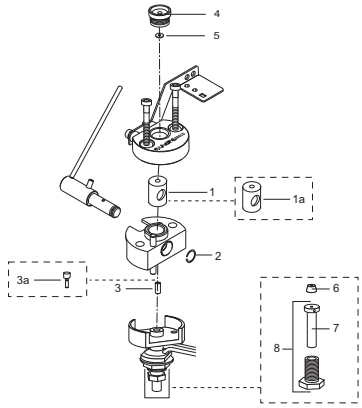
** Parts for PTV manufactured prior to 2004*



Programmed Temperature Vaporizing (PTV) Injector, TRACE GC Ultra

Cold On-Column Injector for TriPlus Autosampler and TRACE GC Ultra

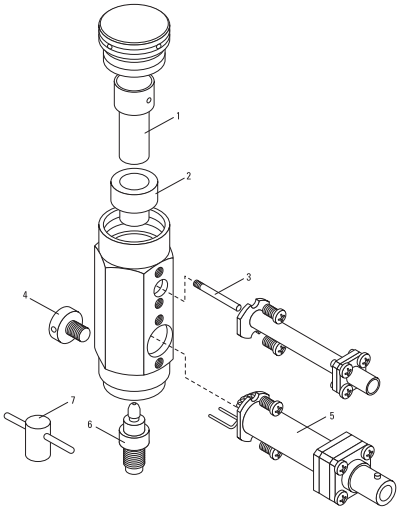
Item	Description	Cat. No.	Quantity
1	Seal, PTFE	**29007001**	1
1A	Direct on-column PFTE seal	**29007106**	1
2	Clip	**426003 57**	1
3	Needle guide	**45322036**	2
3A	Direct on-column needle guide	**45322063**	2
4	Seal holder (not used with direct on-column head)	**35001471**	1
5	O-ring (not used with direct on-column head)	**29011302**	2
6	Vespel® ferrule	**See page 3-091**	
7	Backwasher/cooling sleeve for OC	**45200001**	1
8	Column retaining nut and backwasher for OC	**45210001**	1



Cold On-Column Injector for TriPlus Autosampler and TRACE GC Ultra

Flame Ionization Detector (FID), TRACE GC Ultra and FOCUS GC

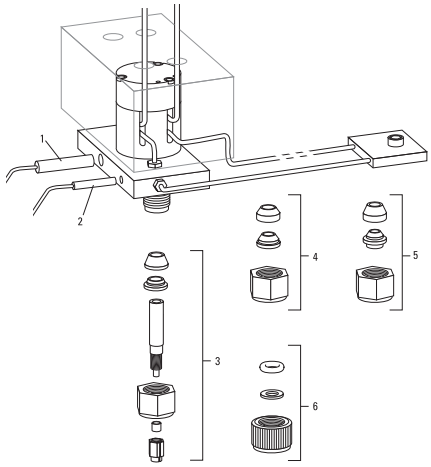
Item	Description	Cat. No.	Quantity
1	FID collecting electrode	**25901115**	1
2	Ceramic insulator	**30202310**	1
3	Collecting electrode pin	**20601602**	1
4	Retaining screw	**31106008**	1
5	FID jet	**40404301**	1
6	Jet removing tool	**20501900**	1



Flame Ionization Detector (FID), TRACE GC Ultra and FOCUS GC

Thermal Conductivity Detector (TCD), TRACE GC Ultra and FOCUS GC

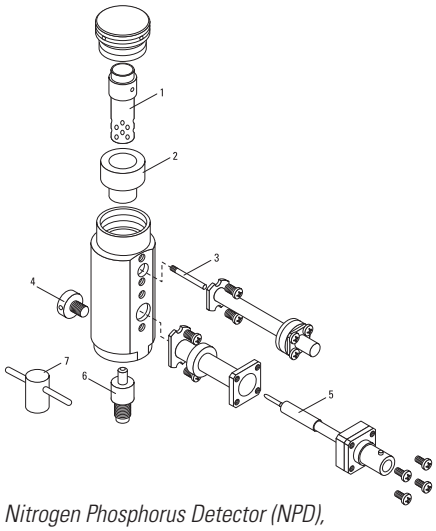
Item	Description	Cat. No.	Quantity
1	Adapter for capillary column (Kit)	**34709542**	1
2	Retaining nut for 6mm OD metal column and ferrule	**35020117**	1
3	Brass front/back ferrule for 1/8in. OD metal column	**29004666**	1
4	Retaining nut for 1/8in. OD column and ferrule	**35003062**	1



Thermal Conductivity Detector (TCD), TRACE GC Ultra and FOCUS GC

Nitrogen Phosphorus Detector (NPD), TRACE GC Ultra

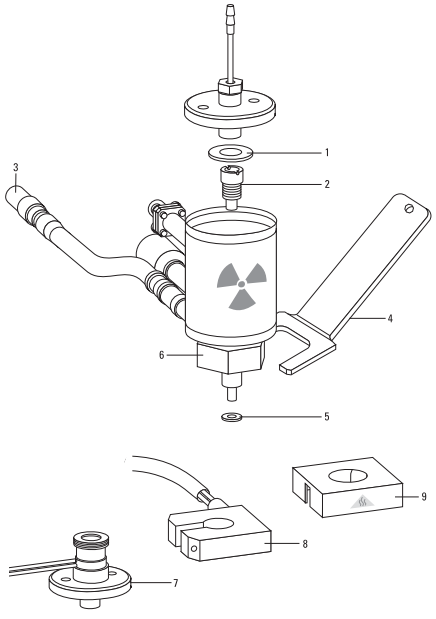
Item	Description	Cat. No.	Quantity
1	NPD collecting electrode	**25901110**	1
2	Ceramic insulator	**30202310**	1
3	Collecting electrode pin	**20601602**	1
4	Retaining screw	**31106008**	1
5	TS-2 source (standard)	**46500255**	1
5	TS-1 source for ENS mode	**46500250**	1
6	NPD jet	**40404302**	1
6	NPD (deactivated silcosteel) jet	**40404303**	1
7	Jet removing tool	**20501900**	1



Nitrogen Phosphorus Detector (NPD), TRACE GC Ultra

Electron Capture Detector (ECD), TRACE GC Ultra

Item	Description	Cat. No.	Quantity
1	Upper seal, aluminum	**29032608**	10
2	ECD collecting electrode	**27700350**	1
3	ECD fixing tool	**20502150**	1
4	Lower seal, silver	**29015058**	2
5	ECD blocking nut	**35001120**	1
6	Adapter for stack configuration	**34709007**	1
7	Heating block for stacked configuration (including heater and RTD)	**35425064**	1
8	Cover for heating block	**24104449**	1

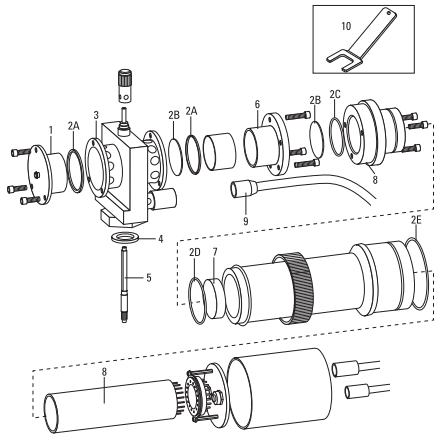


Electron Capture Detector (ECD), TRACE GC Ultra

Flame Photometric Detector (FPD), TRACE GC Ultra

Item	Description	Cat. No.	Quantity
1	Mirror plug	**35005350**	1
2A	Graphite seal	**19004589 (*)**	2
2B	Heat shield	**19004589 (*)**	2
2C	Viton® O-ring	**19004589 (*)**	1
2D	Viton® O-ring	**19004589 (*)**	1
2E	Viton® O-ring	**19004589 (*)**	1
3	Detector body	**19050111**	1
4	Aluminium O-ring	**29032630**	10
5	FPD jet	**40404511**	1
5	FPD (deactivated Silcosteel) jet	**40404512**	1
6	Flange and relevant Viton® O-ring	**36814235**	1
7	Interferential filter for sulphur	**28107000**	1
7	Interferential filter for tin	**28107001**	1
7	Interferential filter for phosphorus	**28107100**	1
8	Photomultiplier	**28600450**	1
9	Heater/sensor/coil cable	**23043479**	1
10	FPD fixing tool	**20502150**	1
11	FPD blocking nut	**35001125**	1

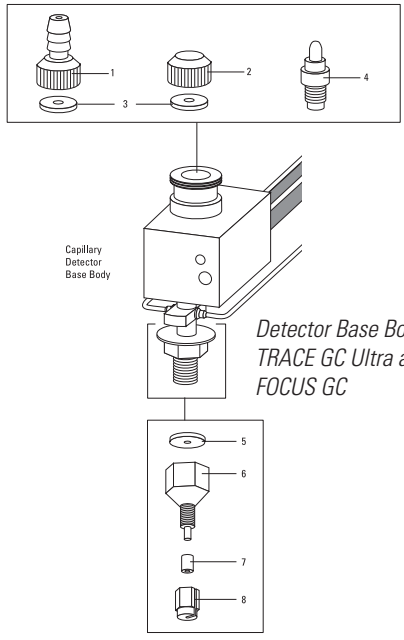
** Maintenance kit for FPD*



Flame Photometric Detector (FPD), TRACE GC Ultra

Detector Base Body, TRACE GC Ultra and FOCUS GC

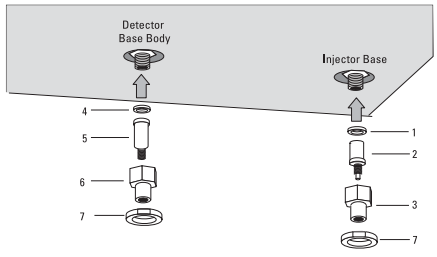
Item	Description	Cat. No.	Quantity
1	Adapter for flow measurement	**35004107**	1
2	Brass blind cap	**35006101**	1
3	Silicon seal	**29033037**	10
4	Blind jet	**40401900**	2
5	Seal, silver	**29037100**	10
6	Adapter for capillary column	**34725436**	2
7	Graphite ferrule	**See page 3-091**	
8	Fixing nut for column	**35032423**	5



Detector Base Body, TRACE GC Ultra and FOCUS GC

UltraFast Module Option – UFM S/SL-FID Configuration, TRACE GC Ultra

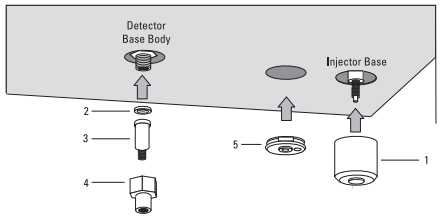
Item	Description	Cat. No.	Quantity
1	Silver seal for injector base	**29033629**	10
2	Terminal fitting for capillary column	**34705458**	1
3	1/4in. retaining nut for injector base	**35002132**	1
4	Silver seal for detector base	**29037100**	10
5	Terminal fitting for detector base	**34705456**	1
6	M8 x 1 retaining nut for detector base	**35002134**	1
7	Threaded locking ring	**35001468**	1



UltraFast Module Option – UFM S/SL-FID Configuration, TRACE GC Ultra

UltraFast Module Option – UFM PTV-FID Configuration, TRACE GC Ultra

Item	Description	Cat. No.	Quantity
1	Injector guide	**24104482**	1
2	Silver seal for detector base	**29037100**	10
3	Terminal fitting for detector base	**34705457**	1
4	M8 x 1 PTV retaining nut for detector base	**35002130**	1
5	Supporting disk	**36812760**	1



UltraFast Module Option – UFM PTV-FID Configuration, TRACE GC Ultra

TriPlus GC Autosampler

- Flexible sampling solutions for liquid, headspace and SPME
- Quick installation for easy start-up
- Double productivity with simultaneous operation of two different Thermo Scientific GC or GC/MS systems

The Thermo Scientific TriPlus autosampler is the evolution of autosamplers based on three dimensional (XYZ) space movements of the syringe holder. Besides conventional injection of liquid or headspace, this platform delivers unique "pluses" conceived to increase your lab's efficiency and productivity:

- Snap-on interchangeability of liquid, headspace and SPME™* configurations
- Quick mechanical installation of mainframe and accessories
- Self-alignment procedure and self-recognition of all installed accessories
- Simultaneous automation of independent sampling methods on two GC/GC-MS units
- Rugged SPME automation

**Sold under license from Supelco®*

Syringe Holders

Description	Cat. No.	Quantity
Syringe holder for 50mm needles (5, 10, 100, 250µL syringes)	**25401010**	1
Syringe holder for 50mm needles (0.5, 10, 100, 500µL syringes)	**25401015**	1
Syringe holder for 80mm syringe needles (5, 10, 100, 250µL syringes)	**25401020**	1
Syringe holder for 80mm syringe needles (0.5, 10, 100, 500µL syringes)	**25401025**	1
Syringe holder for TriPlus headspace	**36503008**	1
Syringe holder for SPME fiber	**25401080**	1

Syringe Holders

Sample Trays

Description	Cat. No.	Quantity
Ambient tray holder, configurable in field as primary or secondary	**36812755**	1
Primary ambient tray, positions 1 – 150, for 1, 2, 2.5mL vials	**24010150**	1
Primary ambient tray, positions 1 – 54, for 10, 20mL vials	**24010160**	1
Secondary ambient tray, positions 151 – 300, for 1, 2, 2.5mL vials	**24010155**	1
Secondary ambient tray, positions 55 – 108, for 10, 20mL vials	**24010165**	1
Cooled/Heated tray holder, configurable in field as primary or secondary	**24010190**	1
Primary cooled/heated tray, positions 1 – 96, for 1, 2, 2.5mL vials	**24010195**	1
Primary cooled/heated tray, positions 1 – 33, for 10mL vials	**24010200**	1
Secondary cooled/heated tray, positions 97 – 192, for 1, 2, 2.5mL vials	**24010215**	1
Secondary cooled/heated tray, positions 34 – 66, for 10mL vials	**24010220**	1

Sample Trays

Washing Stations

Description	Cat. No.	Quantity
Standard 5 x 10mL washing station	**19050390**	1
2 x 100mL washing station	**19050400**	1
Fast washing station	**19050401**	1

Washing Stations

Turrets and Oven

Description	Cat. No.	Quantity
Turret AS	**25401050**	1
Turret HS	**25401060**	1
HS incubation oven/agitator	**35408070**	1

SPME

Description	Cat. No.	Quantity
SPME fiber holder kit (only for TriPlus with turret s/n above 20066157)	**19050434**	1
SPME fiber conditioning station (only for TriPlus s/n above 20066529)	**19050502**	1

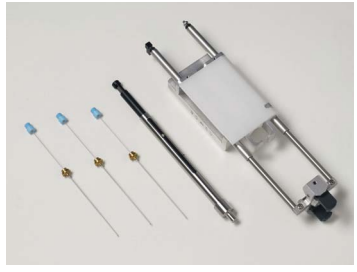
Septum Caps

Description	Cat. No.	Quantity
Septum cap for SSL suitable for HS and SPME	**34750004**	1
Septum cap for PTV suitable for HS and SPME	**35001048**	1
Septum cap for Merlin Valve SSL-PTV	**35001056**	1

Bar Code Reader

Description	Cat. No.	Quantity
Bar code reader	**19050490**	1
Magnetic 9mm caps for bar code reader	**38606095**	100
Labels for bar code reader	**38706782**	1000

SPME Fiber Conditioning Station



SPME Fiber Holder Kit

Bar Code Reader

AI/AS 3000 and AI/AS 3000 Series II Autosamplers

- Automated sampling systems for all Thermo Scientific GC and GC/MS systems
- Performance and simplicity in liquid sampling
- "Tool-Free" upgradability from 8 to 105 vial positions

Engineered to meet the highest level requirements of ruggedness and ease of use, the 3000 Series II automatic sampling system is ideal for high throughput and QA/QC control on the Thermo Scientific GC and GC/MS product portfolio. Utmost precision and ease-of-use of the plug and inject concept are combined in two available configurations: 8-position single module system for small batches of samples; 105-position tray system for high sample throughput. Boost productivity further with the Gemini configuration, which allows two autosamplers to be mounted on the same GC, serving two injection ports simultaneously.

AS 3000 II 8-vial Autoinjector

AS 3000 II 105-vial Autosampler

AI/AS 3000 and AI/AS 3000 Series II Autosamplers

Description	Cat. No.	Quantity
Waste bottle complete with septum and cap (Set of 5)	**19004646**	1
Tray 8-position holder	**24010140**	1
Tray 105-position assembly	**25117445**	1
Centering Plate for Merlin Adapter on S/SL injector	**36812734**	1
Centering plate for PTV injector and Merlin Adapter on PTV injector	**36812736**	1
Centering plate for S/SL injector	**36812738**	1

ISQ Innovative Single Quadrupole GC-MS

- Unique Full Source Removal™ capability delivers maximum uptime and unstoppable productivity
- ExtractaBrite™ solid, inert ion source provides robust operations and low detection limits
- Versatile and flexible for a broad range of applications

Re-think the way your lab operates with the Thermo Scientific ISQ single quadrupole GC-MS system. The ISQ™ GC-MS incorporates an innovative source design that keeps the ISQ cleaner, longer. With heat throughout the ion optics, the ISQ can analyze more samples per day, with maximum uptime. Easy to learn, easy to use, and easy to maintain, the ISQ was developed to meet the needs of the modern analytical laboratory.

Ion Source Components

Description	Cat. No.	Quantity
EI Ion Source Cartridge Kit	**120404-4100**	1
Ion Cartridge	**1R120404-1105**	1
EI Ion Volume	**1R120404-4111**	1
Ion Volume-Repeller Insulator	**1R120404-1114**	1
Repeller (Low Activity)	**1R120404-1161**	1
Ion Volume Locking Ring	**1R120404-1118**	1
Repeller Spring (pkg of 5)	**1R76485-1000K**	5
Repeller Nut	**1R120404-1120**	1
Lens 1	**1R120404-1130**	1
Lens 2	**1R120404-1140**	1
Lens 3/RF Lens	**120404-1150**	1
Ion Volume, CI	**1R120404-4112**	1
Ion Volume, EI/CI Combo	**1R120404-4113**	1
CI Ion Source Cartridge Kit	**120404-4400**	1
Dual Filament	**1R120404-1900**	1

Column Components

Description	Cat. No.	Quantity
Graphite Vespel ferrule for 0.25mm columns	**1R76458-2016**	10
Graphite Vespel ferrule for 0.32mm columns	**1R76458-2019**	10
Graphite Vespel ferrule for 0.53mm columns	**1R76458-2020**	10
2-hole graphite Vespel ferrule for <0.32mm column	**1R76458-2018**	10
No-hole graphite Vespel ferrule	**1R76458-2009**	10
SilTite ferrule for 0.10-0.25mm ID column	**1R76458-2000**	10
SilTite ferrule for 0.32mm columns	**1R76458-2024**	10
SilTite ferrule for 0.53mm columns	**1R76458-2026**	10
Nut for SilTite ferrules	**1R76458-2001**	5
Nickel-coated nut for graphite Vespel ferrule	**1R76256-0060**	5

Mechanical (rotary-vane) Pump

Description	Cat. No.	Quantity
Oil, rotary-vane pump	**A0301-15101**	1

Accessories

Description	Cat. No.	Quantity
Aluminum oxide	**32000-60340**	1
Calibration Compound (perfluorotributylamine)	**50010-30059**	1
Forceps	**1R76360-0008**	1
ISQ Tool Kit (Does not include exchange tool)	**1R120467-0001**	1
Source Exchange Tool	**1R120406-2000**	1
Column Measuring Tool	**1R120461-0010**	1
Manifold o-ring	**1R3815-360**	1
Vent valve o-ring	**1R3814-111**	1
Oil mist filter	**1R76505-0036**	1
Electron Multiplier	**1R76022-14633**	1
T10 Torxhead Key	**1R3812-5T10**	1
T20 Torxhead Key	**1R3812-5T20**	1
T30 Torxhead Key	**1R3812-5T30**	1
Test mix, octofluoronapthalene, benzophenone	**1R120151-TEST**	1

DSQ Series Single Quadrupole GC-MS Systems

- Sensitivity and large dynamic range for demanding analyses
- Proven performance for difficult samples
- Analytical flexibility for applications from research to routine

The Thermo Scientific DSQ Series of single quadrupole GC-MS systems includes the DSQ and DSQ II mass spectrometers. The DSQ Series mass spectrometers are available with either the TRACE GC Ultra gas chromatograph, or the compact FOCUS GC. Featuring an innovative curved prefilter for reduction of neutral noise, resulting in excellent sensitivity and lower detection limits, the DSQ Series of single quadrupole GC-MS products are suitable for a wide variety of applications.

DSQ II Spare Parts

Description	Cat. No.	Quantity
Magnet yoke	**119850-0710**	1
Magnet	**1R70001-98195**	1
Ion volume holder, Standard	**70001-20532**	1
Ion volume, EI	**119650-0220**	1
Ion volume, CI	**119650-0230**	1
Ion volume, EI/CI Combo	**119650-0240**	1
Ion volume kit, CEI w/holder	**119650-0221-KIT**	1
Ion volume holder, CEI Only	**70001-20532-T**	1
Ion volume, CEI	**119650-0221-T**	1
Lens heater ring	**120320-0020**	1
Lens assembly, Complete	**119650-0151**	1
Lens holder	**119650-0420**	1
Lens 1	**119650-0414**	1
Lens 2	**119650-0416**	1
Lens 3	**119650-0423**	1
Lens spacer	**119650-0426**	1
Lens retainer clip	**119650-0428**	1
Prefilter lens spacer	**119800-0475**	1
Prefilter lens	**119800-0535**	1
Prefilter lens retainer clip	**120173-0002**	1
Source alignment studs	**119650-0215**	1
Ion source heater assembly	**120309-0001**	1
Source block assembly	**120320-0101**	1
Lens retainer clip	**120320-0040B**	1
Lens retainer stud	**120320-0041**	1
Ion volume index screw	**120320-0042**	1
Filament	**120320-0030**	1
Filament insulator/spacer	**119650-0235**	1
Filament retainer clip	**120320-0050**	1
Lens alignment tool	**120271-0001**	1

DSQ Spare Parts

Description	Cat. No.	Quantity
Ion source assembly (complete)	**119850-0250**	1
Lens alignment tool	**120271-0001**	1
Magnet	**1R70001-98195**	1
Magnet support	**119850-0710**	1
Source spacer assembly	**119800-0475**	1
Spring	**76485-0032**	1
Thumbscrew	**119825-0100**	1
Filament	**119701-60287**	1
Filament spacer/insulator	**119650-0235**	1
Ion source PCB	**96000-60087**	1
Ion volume, CI	**119650-0230**	1
Ion volume, EI	**119650-0220**	1
Ion volume, EI/CI combo	**119650-0240**	1
Ion volume holder	**70001-20532**	1

DSQ and DSQ II Accessories and Spares

Inlet Valve (Upgrade Option)

Description	Cat. No.	Quantity
Ball valve seal replacement kit	**76461-2002**	1
Inlet valve seal replacement kit	**119265-0003**	1

Accessories

Description	Cat. No.	Quantity
Allen wrench kit, metric	**3812-0100**	1
Aluminum oxide	**32000-60340**	1
Back ferrule, 1/8in, brass	**A0101-02500**	1
Calibration compound (perfluorotributylamine)	**50010-30059**	1
Column measuring tool	**119640-0550**	1
Forceps	**76360-0400**	1
Front ferrule, 1/8in, brass	**A0101-08500**	1
Test mix, octafluoronaphthalene, benzophenone	**120150-TEST**	1
Transfer line ferrule, 1/16in to 0.4mm, graphite/vespel	**A0101-18100**	1

Mechanical (rotary-vane) Pump

Description	Cat. No.	Quantity
Oil, rotary-vane pump	**A0301-15101**	1

ITQ Series External Ionization GC-Ion Trap MS

- Excellent sensitivity in full-scan operation
- Advance to the power of MS^n for incredible selectivity in the dirtiest of matrices
- External ionization source for maximum productivity, reliability, and classical, library searchable spectra

The Thermo Scientific ITQ Series is designed with the ability to upgrade in mind, protecting your investment by adapting to your lab's changing work-flows and needs over time. If your needs change, upgrade your instrument to gain access to new features, greater flexibility, more power. Better yet, regardless of your choice, you will have the most sensitive GC-ion trap mass spectrometer available, giving you lower detection limits, even in matrix.

The ITQ Series offers a range of operating modes, from full-scan MS and MS/MS (MS^n), to positive and negative chemical ionization. Dual modes for sequential full scan and MS/MS or positive ion/negative ion chemical ionization (PPINICI) allow you to acquire both types of data in a single injection. Variable damping gas, an option available exclusively on the ITQ Series, further improves GC/MS sensitivity up to 5X or more across a broad range of real-world samples. Data Dependent™ scanning allows you to quickly collect data, confirm the identity of compounds, and further reduce sample cleanup costs.

Ion Source Spare Parts

Description	Cat. No.	Quantity
Magnet support thumbscrew	**76483-0125**	1
Compression spring	**76485-0032**	1
Set screws	**76905-0405**	1
Magnet support yoke	**119650-0710**	1
Magnet	**1R70001-98195**	1
Ion volume holder, standard	**70001-20532**	1
Ion volume, EI	**119650-0220**	1
Ion volume, CI	**119650-0230**	1
Ion volume, EI/CI combo	**119650-0240**	1
Ion volume, closed exit (CEI)	**119650-0221-T**	1
Ion volume holder, CEI only	**70001-20532-T**	1
Lens heater ring	**119650-0422**	1
Lens assembly, complete	**119650-0150**	1
Lens holder	**119650-0420**	1
Lens 1	**119650-0414**	1
Lens 2	**119650-0416**	1
Lens 3	**119650-0418**	1
Lens spacer	**119650-0426**	1
Lens retainer clip	**119650-0428**	1
Filament	**120320-0030**	1
Filament spacer/insulator	**119650-0235**	1
Filament retainer clip	**120320-0050**	1
Ion source PCB	**96000-60087**	1
Ion source block	**119650-0205**	1
Ion volume key thumbscrew	**119650-0206**	1
Heater RTD Spring	**96000-20176**	1
Heater RTD spring thumbscrew	**119650-0208**	1

Ion Trap Spare Parts

Description	Cat. No.	Quantity
Endcap electrode	**119650-0520**	1
Spacer	**119650-0540**	1
Ring electrode	**119650-0525**	1
Exit lens	**119650-0530**	1
Exit lens spacer	**119650-0515**	1
Helium inlet	**119650-0532**	1

Inlet Valve (Upgrade Option)

Description	Cat. No.	Quantity
Ball valve seal replacement kit	**76461-2002**	1
Inlet valve seal replacement kit	**119265-0003**	1

Mechanical (Rotary-vane) Pump

Description	Cat. No.	Quantity
Oil, rotary-vane pump, 1L	**A0301-15101**	1

Accessories

Description	Cat. No.	Quantity
Allen wrench kit, metric	**3812-0100**	1
Aluminum oxide	**32000-60340**	1
Calibration compound (perfluorotributylamine)	**50010-30059**	1
Back ferrule, 1/8in., brass	**A0101-02500**	1
Column measuring tool	**119640-0550**	1
Ion volume tool	**119270-0001**	1
Front ferrule, 1/8in., brass	**A0101-08500**	1
Test mix, octafluoronapthalene and decafluorobenzophenone (DFBZ)	**120420-TEST**	1
Transfer line ferrule, 1/16in to 0.4mm, graphite/vespel	**A0101-18100**	1

Polaris*Q* External Ionization Ion Trap GC/MS

- Stop matrix interference with the power of MS^n
- Outstanding sensitivity in full scan mode
- Reliability, robustness, and library-searchable data from external ionization source

The Thermo Scientific Polaris*Q* is a high quality benchtop ion trap GC/MS system with EI, CI, Negative CI, MS/MS and direct sample probe capability. Proprietary Pulsed Positive Ion/Negative Ion Chemical Ionization (PPINICI) and variable buffer gas options enhance ppb sensitivity and performance in the toughest sample matrices. External ionization ensures data integrity, while providing robust, reliable performance.

Ion Source

Description	Cat. No.	Quantity
CI ion volume	**119650-0230**	1
EI ion volume	**119650-0220**	1
EI/CI combo ion volume	**119650-0240**	1
Filament	**119701-60287**	1
Filament spacer	**119650-0235**	1
Ion source PCB	**96000-60087**	1
Ion volume holder	**70001-20532**	1

Mechanical (Rotary-Vane) Pump

Description	Cat. No.	Quantity
Oil, rotary-vane pump, 1L	**A0301-15101**	1

Inlet Valve (Upgrade Option)

Description	Cat. No.	Quantity
Ball valve seal replacement kit	**76461-2002**	1
Inlet valve seal replacement kit	**119265-0003**	1

Accessories

Description	Cat. No.	Quantity
Allen wrench kit, metric	**3812-0100**	1
Aluminum oxide	**32000-60340**	1
Back ferrule, 1/8in., brass	**A0101-02500**	1
Calibration compound	**50010-30059**	1
Filament	**119701-60287**	1
Front ferrule, 1/8in., brass	**A0101-08500**	1
Test mix, 100ng/µL decafluorobenzophenone, benzophenone, methyl stearate	**A0301-23057**	1
Test mix, 100pg/µL, 10pg/µL, and 1pg/µL decafluorobenzophenone	**96000-98044**	1
Transfer line ferrule, 1/16in. to 0.4mm, graphite/Vespel	**A0101-18100**	1

TSQ Quantum GC and TSQ Quantum GC XLS Triple Quadrupole GC-MS/MS

- Higher compound sensitivity
- More matrix selectivity
- More productivity

The Thermo Scientific TSQ Quantum GC is the latest evolution in triple quadrupole GC-MS/MS-. The TSQ Quantum GC provides unprecedented sensitivity for target compound analysis in complex samples. Timed selected reaction monitoring (t-SRM), unique to the TSQ Quantum GC, detects compounds at the expected elution time, with optimum sensitivity, independent of the total number of compounds, a feature no other GC-triple quadrupole MS can provide.

Ion Source

Description	Cat. No.	Quantity
Ion source assembly, complete	**119850-0250**	1
Magnet, TSQ Quantum GC XLS	**1R70001-98195**	1
Magnet	**70001-98195**	1
Magnet support	**1R119850-0710**	1
Source spacer assembly	**119800-0475**	1
Spring	**76485-0032**	1
Lens 1, TSQ Quantum GC	**119650-0414**	1
Lens 2, TSQ Quantum GC	**119650-0416**	1
Lens 3, TSQ Quantum GC	**119650-0423**	1
Lens housing	**119650-0420**	1
Lens insulator	**119650-0426**	1
Ion volume, EI, stainless steel	**70111-22036**	1
Ion volume, CI	**70111-22037**	1
Ion volume, closed exit (CEI), stainless steel	**70111-22038**	1
Ion volume holder, stainless steel	**70001-20532**	1
Ion volume, closed exit (CEI), inert, "P"-type	**70111-22202**	1
Ion volume, closed exit (CEI), inert	**70111-22147**	1
Ion volume holder, inert	**70001-20532-T**	1
Lens 1, TSQ Quantum GC XLS	**1R119650-3414**	1
Lens 2, TSQ Quantum GC XLS	**1R119650-3416**	1
Lens 3, TSQ Quantum GC XLS	**1RR119650-3423**	1
GC-source/Q00 Heather, XLS-TSQ	**70111-60840**	1
Ball Plunger, 5/40 modified	**70111-22062**	1
Assy, Lens 1,2,3, GC Source, Heated, XLS-TSQ	**70111-60842**	1
Lens Circlip Ion Trap/DSQ	**119650-0428**	1
Lens, 1,2,3 Holder, Source, XLS-TSQ	**70111-22197**	1
Quad Spacer Ceramic, Heated, Q0, XLS-TSQ	**70111-22200**	1
Orientation Spacer, Q0, XLS-TSQ	**70111-22201**	1
Ceramic Heather PCB Assy, XLS-TSQ	**70111-60848**	1

Ion Source Block

Description	Cat. No.	Quantity
Filament	**120320-0030**	1
Filament spacer	**70111-22061**	1
Filament retainer clip	**70111-22071**	1
Ion source heater board	**70111-60780**	1
Source block	**70111-60791**	1
Source alignment studs	**70111-22056**	1
Lens retainer clip	**70111-22070**	1
Lens retainer screw	**70111-22060**	1

Inlet Valve

Description	Cat. No.	Quantity
Ball valve seal replacement kit	**76461-2002**	1
Inlet valve seal replacement kit	**119265-0003**	1

Mechanical (Rotary-Vane) Pump

Description	Cat. No.	Quantity
Oil, rotary-vane pump, 1L	**A0301-15101**	1

Accessories

Description	Cat. No.	Quantity
Allen wrench kit, metric	**3812-0100**	1
Aluminum oxide	**32000-60340**	1
Back ferrule, 1/8in., brass	**A0101-02500**	1
Front ferrule, 1/8in., brass	**A0101-08500**	1
Forceps	**76360-0400**	1
Calibration compound (FC-43)	**50010-30059**	1
Transfer line ferrule, 1/16in. to 0.4mm, graphite/Vespel	**A0101-18100**	1
Electron multiplier, with flange	**70001-98175**	1
Kit, calibration compound vial	**120433-0001**	1

DFS High Resolution GC/MS

- Ultra high sensitivity analysis of dioxins, BFRs and other POPs
- Highest sample throughput at lowest LOQs
- Highest reliability of analytical results

The Thermo Scientific DFS is the highest performance, highest resolution GC/MS ever built for target compound analysis and structural elucidation, and the first completely new instrument of its class in more than 15 years. It delivers unprecedented flexibility and productivity for large sample series and can optionally be equipped with two TRACE GC Ultra™ units, simultaneously installed at the same ion source. The DFS is designed for unattended operation, with highest sample capacity and ultimate sampling flexibility.

MAT95 Double Focusing Sector Field Mass Spectrometer

- Proven performance for target compound confirmation in environmental, food safety and forensic, sports doping analysis
- Versatile for structure elucidation using multiple inlet systems

The Thermo Scientific MAT95 XP has been the high-end workhorse in the analysis of polychlorinated dioxins and furans for many years. It combines unprecedented sensitivity with the ruggedness of a benchtop instrument. It is highly versatile and can be equipped with various ionization methods, such as EI, CI, FAB, ESI and APCI.

High Resolution MS General Spares, DFS, MAT95/900

Description	Cat. No.	Quantity
Filament, EI Operation, Tungsten, for DFS/MAT95/900	**1062950**	1
Filament, CI Operation, Rhenium, for DFS/MAT95/900	**1062960**	1
Ion volume for exchange, EI operation	**1082100**	1
Ion volume for exchange, CI operation	**1082200**	1
Ion volume for exchange, ACE operation	**1082250**	1
Ion volume for exchange, FAB operation	**1082240**	1
SEV Unit, electron multiplier for DFS/MAT95/900	**1090010**	1
DIP aluminum crucibles for solid samples	**0568761**	200
Septum 12.5 PTFE coated	**0553371**	1
Source heater	**0491940**	1
Ferrule Vespel 1/16" transfer line	**0492490**	1

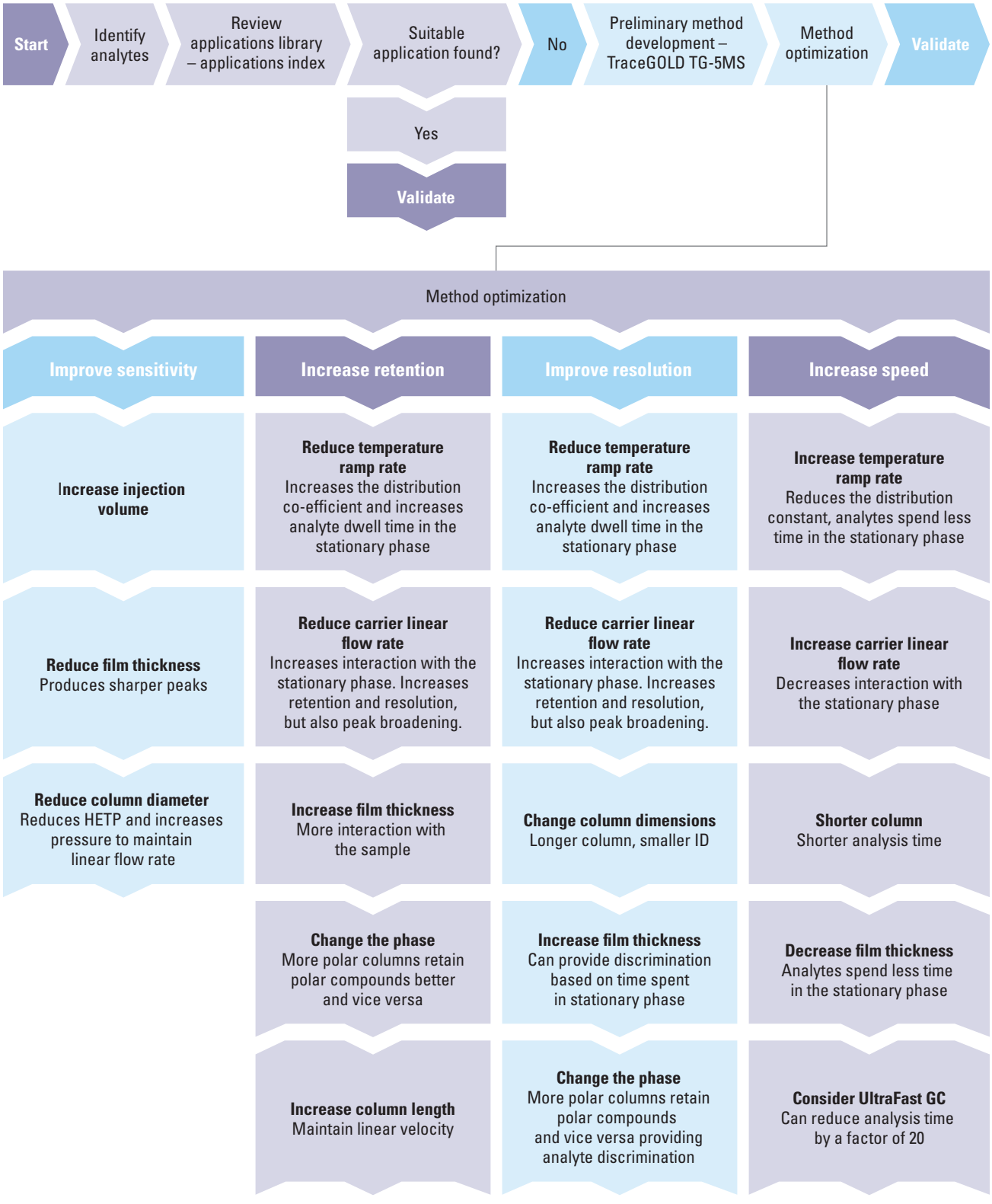
High Resolution MS General Spares, DFS, MAT95/900

Description	Cat. No.	Quantity
DIP aluminum crucibles for liquid samples	**0568770**	200
DIP aluminum crucibles for liquid samples, caps	**568780**	200
DIP gold crucibles	**0574200**	1
DIP-HT quartz crucibles	**1006070**	10
Crucible holder	**0568770**	
DCI wire units	**0744860**	1

GC Technical Information

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 3-080).
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 3-080).
	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.

GC Troubleshooting *continued*

Symptom	Cause	Recommended Solutions
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.
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 3-080).
	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.

Symptom	Cause	Recommended Solutions
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).
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 Increased Retention Time	Carrier gas flow rate too low.	Increase the carrier gas flow rate. Locate and remove possible with 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 page 3-080 to 3-082).
	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.

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

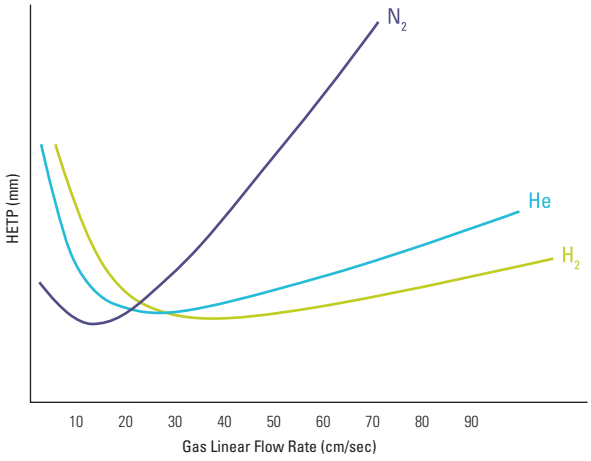
Carrier Gas Choice

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	0.25mm ID		0.32mm ID		0.53mm 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

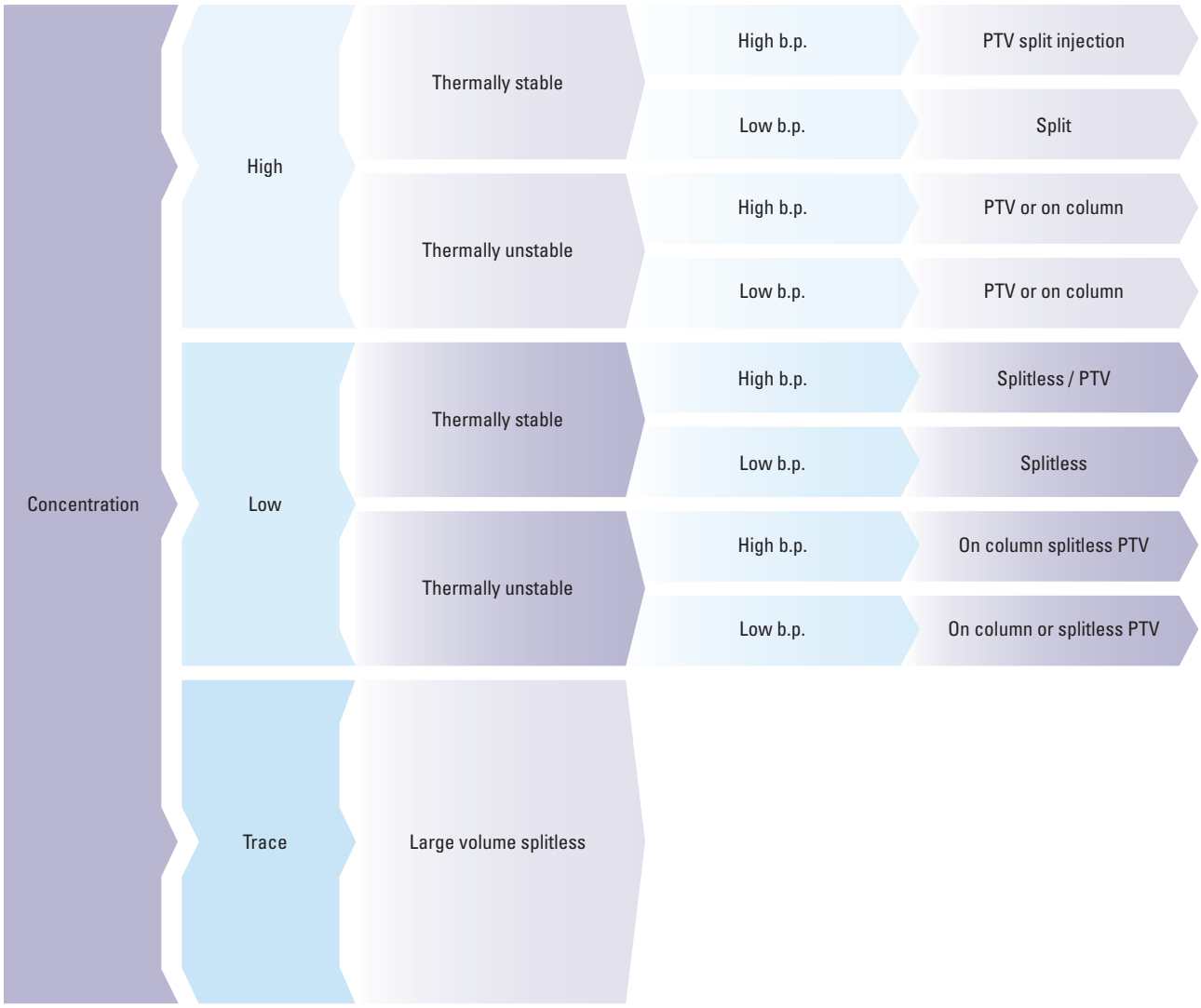
Detector	Air (mL/min)	H_2 (mL/min)	Make Up (mL/min)
ECD	–	–	35-40
FID	350	35	30
NPD	60	2.5	15
FPD	100	75	30

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 and 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-XLBMS	360°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-VRX	260°C
TG-VMS	260°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
TG-OCP I / TG-OCP II	340°C
TG-OPP I / TG-OPP II	330°C
TG-ALC I / TG-ALC II	260°C
TG-1MT	430°C
TG-5MT	430°C
TG-WaxMT	260°C

Column	Maximum Operating Temperature
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-5MS	360°C / 370°C for films ≤ 1.5µm 350°C / 360°C for films > 1.5µm
TR-5HT	380°C / 400°C
TR-35MS	360°C / 370°C
TR-1701	280°C / 300°C
TR-50MS	360°C / 370°C
TR-225	230°C / 250°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
TR-SimDist	400°C for films ≤ 1.0µm 370°C for 2.65µm films
TR-V1	280°C / 300°C
TR-FAME	250°C / 260°C
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-PCB 8MS	330°C / 350°C
TR-Dioxin 5MS	330°C / 350°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-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

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

This procedure will ensure an ultra low bleed for the column's 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.

After installing the column according to the instrument manufacturer's instructions, follow the procedure below.

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.