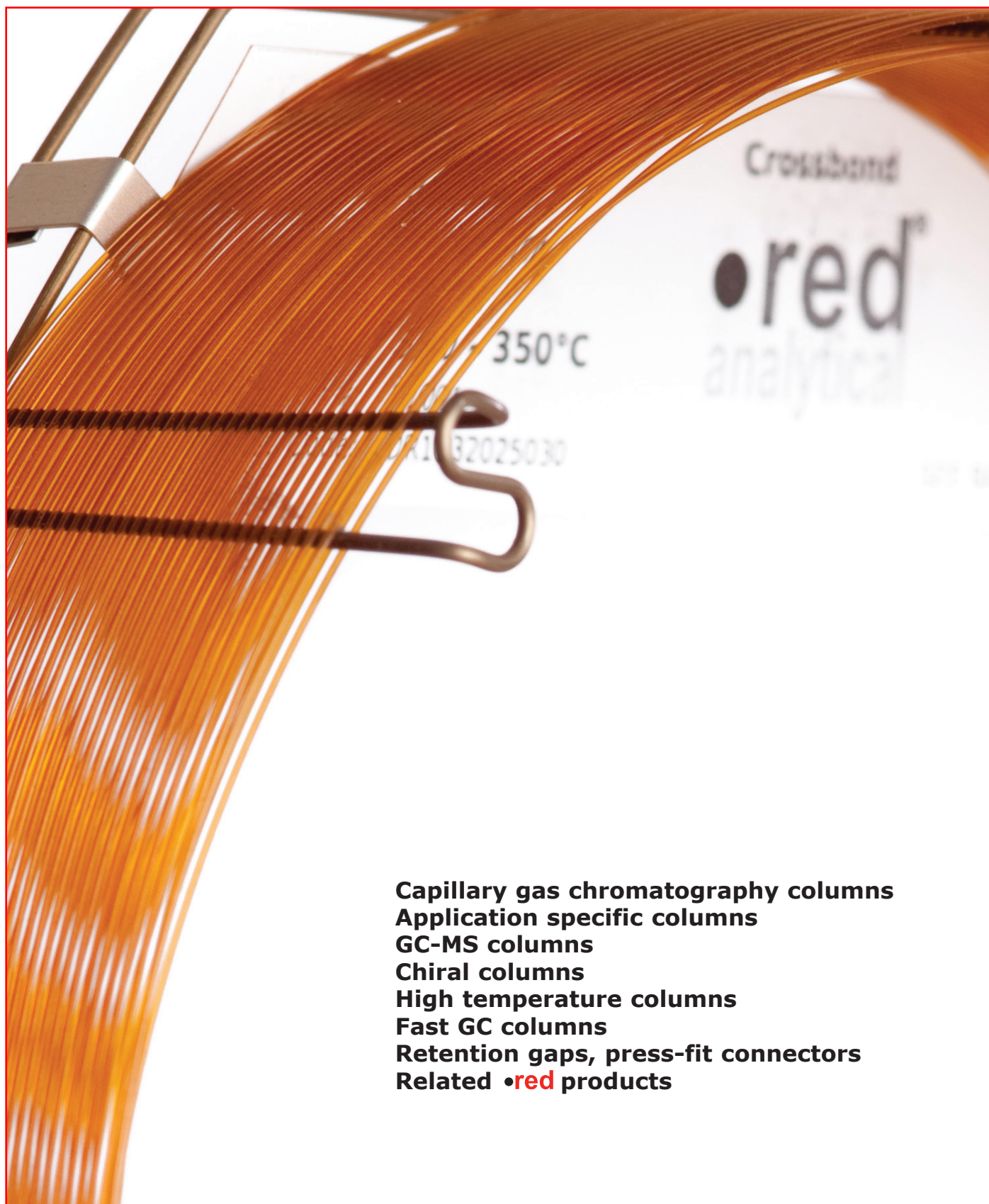


Gas chromatography columns and accessories



Capillary gas chromatography columns
Application specific columns
GC-MS columns
Chiral columns
High temperature columns
Fast GC columns
Retention gaps, press-fit connectors
Related •red products

Gas chromatography columns and accessories

Contents

GC columns: available dimensions	Page
Phase composition and equivalents; Phase polarity quick view	2
Phase composition, USP classification, EPA and other methods	3-5
Fast GC columns	6-8
High temperature GC columns; Applications and support	8
Column availability and ordering information	9
Column catalogue numbers	10
DR column availability tables	11-18
Chiral columns	19-20
Accessories: Intelligent retention gaps, retention gaps, press-fit connectors	21-22
Packed columns	23
Related •red products	24

GC columns: available dimensions

Fast	ID	0.05mm	0.10mm	0.15mm
	Length	from 2 to 5m	from 2 to 5m	from 2.5 to 30m
	Film thickness	0.05µm 0.10µm	0.05µm 0.10µm 0.20µm	from 0.05 to 0.50µm
Conventional	ID	0.12mm 0.18mm	0.25mm	0.32mm
	Length	from 10 to 60m	from 10 to 105m	from 10 to 105m
	Film thickness	from 0.05µm to 1.20µm	from 0.05µm to 3.0µm	from 0.05µm to 5.0µm
Wide-Bore	ID	0.53mm		
	Length	from 10 to 105m		
	Film thickness	up to 5.0µm		

Complete customisation to meet your product requirements is also possible; select the required combination of length, diameter, phase and phase thickness and we will let you know if column production is possible. We can also develop ad-hoc solutions for your specific analytical problem without any additional cost.

All our stationary phases are available for Fast, Conventional, Wide-Bore and Multi-dimensional GC.

A unique range of chiral phases is offered along with some essential accessory products such as press-fit connectors and retention gaps.

Gas chromatography columns and accessories

Phase composition and equivalents

• red phase	Phase Composition	Agilent (J&W)	Alltech	Phenomenex	Quadrex	Restek	SGE	Supelco	Varian
DR - 1	100% Methyl Polysiloxane	DB-1 / HP-1	AT-1	ZB-1	007-1	Rtx-1	BP-1	SPB-1	CP Sil 5 CB
DR - 1 MS	100% Methyl Polysiloxane (Low Bleeding)	DB-1 ms, HP-1 ms	AT-1	ZB-1 ms	007-1	Rtx-1 ms	BPX-1	SPB-1, Equity-1	CP Sil 5 CB, Low Bleed / ms
DR - 1 HT	100% Methyl Polysiloxane (High Temperature)	DB-1 ht			High temperature				
DR - 5	5% Phenyl, 95% Methyl Polysiloxane	DB-5 / HP-5	AT-5	ZB-5	007-5	Rtx-5	BP-5	SPB-5	CP Sil 8 CB
DR - 5 MS	5% Phenyl, 95% Methyl Polysiloxane (Low Bleeding)	DB-5 ms, Ultra-2 HP-5 ms	AT-5 ms	ZB-5 ms	007-5 ms	Rtx-5 ms	BPX-5	SPB-5, Equity-5	
DR - 5 HT	5% Phenyl - 95% Methyl Polysiloxane (High Temperature)	DB-5 ht			High temperature				
DR - Wax	Polyethylene Glycol (PEG)	DB-Wax, HP-Wax	AT-Wax	ZB-Wax	007-CW	Rtx-Wax	BP-20	OmegaWax	CP Wax 52 CB
DR - Wax MS	Polyethylene Glycol (PEG) (Low Bleeding)	DB-Wax, HP-Wax	AT-Wax ms	ZB-Wax	007-CW	Stabilwax	BP-20	OmegaWax	CP Wax 52 CB
DR - Wax HT	Polyethylene Glycol (PEG) (High Temperature)				High temperature; unique				
DR - 1701	7% Cyanopropyl, 7% Phenyl, 86% Methyl Polysiloxane	DB-1701, HP-1701	AT-1701	ZB-1701	007-1701	Rtx-1701	BP-10	SPB-1701	CP Sil 19 CB, VF-1701 ms
DR - 35	35% Phenyl, 65% Methyl Polysiloxane	DB-35, HP-35	AT-35	ZB-35	007-11	Rtx-35	BPX-35, BPX-608	SPB-35, SPB-608	
DR - 35 MS	35% Phenyl, 65% Methyl Polysiloxane (Low Bleeding)	DB-35 ms				Rtx-35 Sil ms			
DR - 17	50% Phenyl, 50% Methyl Polysiloxane	DB-17, HP-17	AT-50	ZB-50	007-17	Rtx-17	BPX-50	SPB-50	CP Sil 24 CB, VF-17 ms
DR - 17 MS	50% Phenyl, 50% Methyl Polysiloxane (Low Bleeding)				Unique column				
DR - FFAP	Polyethylene Glycol (PEG) Acid Modified	DB-FFAP	AT-1000		007-FFAP	Stabilwax-DA	BP-21	SPB-1000, Nukol	CP Wax 58 CB
DR - 10 FAMES	100% Cyanopropyl Polysiloxane	HP-88	AT-Silar			Rtx-2330	BPX-70	SP-2330, SP-2560, SP-2331, SP-2380	CP Sil 88
DR - 225	25% Cyanopropyl, 25% Phenyl, 50% Methyl Polysiloxane	DB-225, HP-225	AT-225		007-225	Rtx-225	BP-225		CP Sil 43 CB
DR - 225 MS	25% Cyanopropyl, 25% Phenyl, 50% Methyl Polysiloxane (Low Bleeding)				Unique column				

All trademarks acknowledged.

Gas chromatography columns and accessories

Phase composition and equivalents (cont.)

• red phase	Phase Composition	Agilent (J&W)	Alltech	Phenomenex	Quadrex	Restek	SGE	Supelco	Varian
DR - 624	3.5% Cyanopropyl, 3.5% Phenyl, 93% Methyl Polysiloxane	DB-624, DB-1301 HP-624, HP-1301	AT-624	ZB-624	007-624, 007-1301	Rtx-624, Vocol, Rtx-1301	BP-624	SPB-1301, Vocol SPB-624	CP 1301, VF-624 ms
DR - 13	13% Phenyl, 87% Methyl Polysiloxane								CP Sil 13 CB
DR - 20	20% Phenyl, 80% Methyl Polysiloxane		AT-20		007-7	Rtx-20		SPB-20	
DR - 50	50% Cyanopropyl, 50% Methyl Polysiloxane	DB-23							
DR - 200	100% Trifluoropropyl Me. Polysiloxane	DB-200, DB-210	AT-210		007-210	Rtx-200		SP-2401	VF-200 ms
DR - SE54	5% Phenyl, 1% Vinyl 94% Methyl Polysiloxane			New columns					
DR - ALC 1 & 2	Proprietary phase developed for alcohols testing	DB-ALC 1 & 2				Rtx-BAC 1 & 2			
DR - AMN	Proprietary unique phase for basic compounds separation (Amines)			Unique column					
DR - DIR	Proprietary unique phases developed for Direct Aqueous Injections			Unique column					
DR - LIP	Proprietary phase for the separation of triglycerides, sterols and lipids			Unique column					
DR - COP	Copolymer Polyethylene Glycol (PEG) + Methyl Polysiloxane			Unique column					
DR - HIP 1 & 2	Proprietary phases for pesticides, herbicides and insecticides			New columns					
DR - VOC	Proprietary phases for VOCs and Purge & Trap compounds analysis			New columns					
DR - SV 1 & 2	Proprietary unique phases for complex solvents mixtures separation			Unique column					
DR - Biodiesel	Proprietary phases for the separation of biodiesel FAME, glycerol and methanol			New columns					
DR - 1 PONA	100% Methyl Polysiloxane optimised for Detailed Hydrocarbons Analysis	DB-Petro, HP-Pona				Rtx-1 Pona		Petrocol	
DR - 101	100% Methyl Polysiloxane	HP-101						SP2100	
DR - PS255	1% Vinyl 99% Methyl Polysiloxane			Unique column					

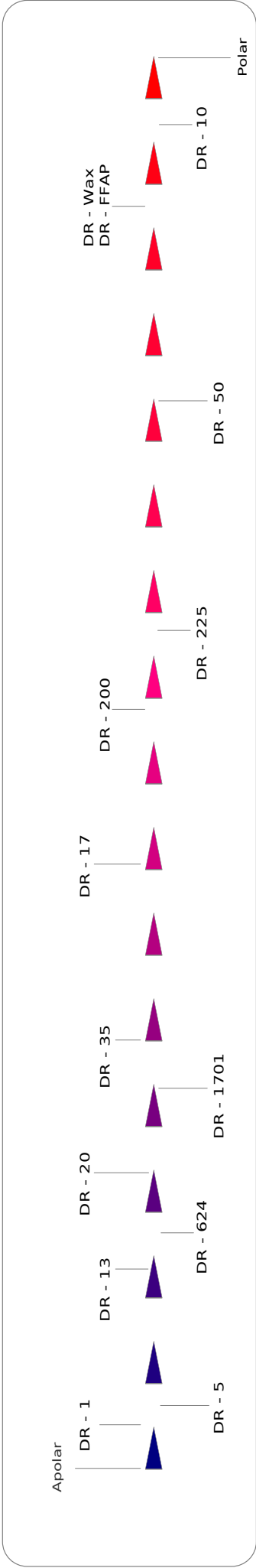
All trademarks acknowledged.

Gas chromatography columns and accessories

Phase Composition and Equivalents (cont.)

● red phase	Phase Composition	Agilent (J&W)	Alltech	Phenomenex	Quadrex	Restek	SGE	Supelco	Varian
DR - PS264	5.8% Phenyl, 0.2% Vinyl 94% Methyl Polysiloxane				Unique column				
DR - JXR	100% Methyl Polysiloxane				Unique column				
DR - SE30	100% Methyl Polysiloxane				New columns				
DR - PAH	Proprietary phase for the separation of polycyclic aromatic hydrocarbons				Unique column				

Phase Polarity Quick View



All trademarks mentioned in this document are acknowledged.

Gas chromatography columns and accessories

Phase composition, USP classification, EPA and other methods

• red phase	Phase Composition	Temperature Max *	USP Classification	EPA Methods, Normatives	Applications
DR - 1	100% Methyl Polysiloxane	350°C	G1, G2, G9, G38	EPA 504.1, 505, 606, 8141 A	General purpose column. Solvent impurities, PCB congeners (Aroclor mixes), simulated distillation, drugs of abuse, gases, natural gases, essential oils, semivolatiles, pesticides.
DR - 1 MS	100% Methyl Polysiloxane (Low Bleeding)	350°C	G1, G2, G9, G38	EPA 606	General purpose column (see DR-1) for GC-MS use.
DR - 1 HT	100% Methyl Polysiloxane (High Temperature)	380°C	G2		General purpose column (see DR-1) for high temperature use.
DR - 5	5% Phenyl - 95% Methyl Polysiloxane	350°C	G27, G36, G41	EPA 611/8110, 604, 606, 607, 608/8081, 609, 612, 613, 615, 619, 622, 8015B, 8041, 8061A, 8082, 8091, 8121, 8141A	General purpose column. Solvent impurities, PCB congeners (Aroclor mixes), hydrocarbons, essential oils, semivolatiles, pesticides etc.
DR - 5 MS	5% Phenyl - 95% Methyl Polysiloxane (Low Bleeding)	350°C	G27, G36, G41	EPA 513, 525, 552.2, 604, 606, 610, 613, 625, 1625, 1653, 8100, 8141A, 8270C, 8280A	General purpose column (see DR-5) for GC-MS use.
DR - 5 HT	5% Phenyl - 95% Methyl Polysiloxane (High Temperature)	380°C	G27, G36, G41		General purpose column (see DR-5) for high temperature use.
DR - Wax	Polyethylene Glycol (PEG)	250°C	G14, G15, G16, G20, G39, G47	EPA 602, 603, 619, 8121, USP 467 (OVIs)	General purpose column. FAMES, solvents, BTEX aromatics, flavour compounds, alcohols. Tune your WAX column polarity! Ask us for a custom PEG based column besides our well known standard MEGA-WAX. Contact us for more information!
DR - Wax MS	Polyethylene Glycol (PEG) (Low Bleeding)	250°C	G14, G15, G16, G20, G39, G47	EPA 602, 603, 619, USP 467 (OVIs)	General purpose column (see DR-WAX) for GC-MS use.
DR - Wax HT	Polyethylene Glycol (PEG) (High Temperature)	300°C			General purpose column (see DR-WAX) for high temperature use.
DR - 1701	7% Cyanopropyl, 7% Phenyl, 86% Methyl Polysiloxane	280°C	G46	EPA 513, 515.2, 552.2, 607, 619, 622, 8091, 8121, 8151A	General purpose column. Alcohols, oxygenates, PCB congeners (e.g. Aroclor mixes) etc. Ideal as confirmation column.
DR - 35	35% Phenyl, 65% Methyl Polysiloxane	340°C	G28, G32, G42	EPA 507, 508, 513, 551.1, 552.2 607, 611, 615, 622, 8082, 8141A	General purpose column. Substituted polar compounds, phenols, PCBs, pesticides etc. Ideal as confirmation column.
DR - 35 MS	35% Phenyl, 65% Methyl Polysiloxane (Low Bleeding)	340°C	G28, G42		General purpose column (see DR-35) for GC-MS use.
DR - 17	50% Phenyl, 50% Methyl Polysiloxane	340°C	G3, G17	EPA 604, 608, 619, 8060, 8081	General purpose column. Phthalate esters, rosin acids, herbicides, pharmaceuticals etc. Ideal as confirmation column.
DR - 17 MS	50% Phenyl, 50% Methyl Polysiloxane (Low Bleeding)	340°C	G3, G17		General purpose column (see DR-17) for GC-MS use.
DR - FFAP	Polyethylene Glycol (PEG) Acid Modified	250°C	G14, G15, G16, G25, G35, G39		General purpose column. Free acids, FAMES, solvents, BTEX aromatics, flavour compounds, alcohols, polar compounds.
DR - 10 FAMES	100% Cyanopropyl Polysiloxane	260°C	G5, G8, G48		High polarity column ideal for cis/trans FAMES and dioxins isomers.
DR - 225	25% Cyanopropyl, 25% Phenyl, 50% Methyl Polysiloxane	280°C	G7, G19		Mid to high polarity column for carbohydrate, sterols, flavour compounds.
DR - 225 MS	25% Cyanopropyl, 25% Phenyl, 50% Methyl Polysiloxane (Low Bleeding)	280°C	G7, G19		Mid to high polarity column (see DR-225) for GC-MS use.

Gas chromatography columns and accessories

Phase composition, USP classification, EPA and other methods (cont.)

• red phase	Phase Composition	Temperature Max *	USP Classification	EPA Methods, Normatives	Applications
DR - 624	3-5% Cyanopropyl, 3-5% Phenyl, 93% Methyl Polysiloxane	280°C	G43	EPA 501.3, 502.1, 502.2, 503.1, 504.1, 524.2, 601, 602, 603, 624, 1624, 8010B, 8021B, 8030A, 8260B, USP 467 (OVIs)	General purpose column ideal for volatile organic pollutants.
DR - 13	13% Phenyl, 87% Methyl Polysiloxane	340°C		EPA 601, 602, 624	General purpose column for halocarbons and ideal as confirmation column .
DR - 20	20% Phenyl, 80% Methyl Polysiloxane	340°C	G28, G32		General purpose column. Volatile compounds, flavour compounds, alcoholic beverages etc. ideal as confirmation column .
DR - 50	50% Cyanopropyl, 50% Methyl Polysiloxane	260°C	G5		General purpose column. Carbohydrates, sterols, flavour compounds, FAMES and confirmation column .
DR - 200	Trifluoropropyl Methyl Polysiloxane	300°C	G6		General purpose column. Freon fluorocarbons, alcohols, ketones. Unique selectivity .
DR - SE54	5% Phenyl, 1% Vinyl 94% Methyl Polysiloxane	350°C	G36		General purpose column (see DR-5).
DR - ALC 1 & 2	Proprietary phases	nd*			Application-specific columns for Blood Alcohols testing; equivalent to DB-ALC 1 & 2 and Rtx-BAC 1 & 2.
DR - AMN	Proprietary unique phase for basic compounds separation (Amines)	nd*			Application-specific column for basic compounds analysis (Amines).
DR - DIR 1 & 2	Proprietary unique phases developed for Direct Aqueous Injections	nd*			Application-specific columns for Direct Aqueous Injections without sample preparation.
DR - LIP	Proprietary unique phase developed for Lipid Analysis	370°C			Application-specific column for Lipids, Sterols and Triglycerides analysis.
DR - COP	Copolymer Polyethylenglycol (PEG) + Methyl Polysiloxane	nd*			General purpose. Tune the selectivity choosing between the unique DR-PLUS 10 (10% PEG, 90% PDMS), DR-PLUS 25 (25% PEG, 75% PDMS), DR-PLUS 75 (75% PEG, 25% PDMS) or ask for a completely custom DR-PLUS column!
DR - HIP 1 & 2	New proprietary phases	nd*			Application-specific columns developed for herbicides, insecticides and pesticides analysis.
DR - VOC 1 & 2	New proprietary phases	nd*	G43 (DR-VOC 1)		Application-specific columns developed for Volatile Organic Compounds (VOCs), solvents and purgeable compounds analysis.
DR - SV 1 & 2	Proprietary unique phases for complex solvents mixtures separation	nd*			Application-specific columns for complex solvents mixtures analysis.
DR - Biodiesel	Proprietary phases for the separation of biodiesel FAME, glycerol and Methanol	370°C (UNI EN ISO 14105)		UNI EN ISO 14105 (ASTM 6584), UNI EN ISO 14103	Application-specific columns developed for Biodiesel analysis. DR-BIODIESEL 105 for triglycerides in biodiesel (UNI EN ISO 14105, ASTM 6584) stable up to 370°C and DR-BIODIESEL 103 for FAMES in biodiesel (UNI EN ISO 14103).
DR - 1 PONA	100% Methyl Polysiloxane optimized for Hydrocarbon Analysis	350°C			Column optimized for DHA (Detailed Hydrocarbons Analysis); equivalent to DB-Petro, HP-Pona, Rtx-1 Pona, Petrocol.
DR - 101	100% Methyl Polysiloxane	350°C	G1, G2, G9, G38	EPA 504.1, 505, 606, 8141 A	General purpose column (see DR-1).
DR - PS255	1% Vinyl 99% Methyl Polysiloxane	350°C			General purpose column (see DR-1).

All trademarks acknowledged.

*: the temperature range may change depending on stationary phase film thickness.

*nd Not determined

Gas chromatography columns and accessories

Phase composition, USP classification, EPA and other methods (cont.)

• red phase	Phase Composition	Temperature Max *	USP Classification	EPA Methods, Normatives	Applications
DR - 264	5.8% Phenyl, 0.2% Vinyl 94% Methyl Polysiloxane	350°C	G27, G36, G41	EPA 611/8110, 604, 606, 607, 608/8081, 609, 612, 613, 615, 619, 622, 8015B, 8041, 8061A, 8082, 8091, 8121, 8141A	General purpose column. Solvent impurities, PCB congeners (Aroclor mixes), hydrocarbons, essential oils, semivolatiles, pesticides etc.
DR - JXR	100% Methyl Polysiloxane	350°C	G1, G2, G9, G38	EPA 504.1, 505, 606, 8141 A	General purpose column (see DR-1).
DR - SE30	100% Methyl Polysiloxane	350°C	G1, G2, G9, G38	EPA 504.1, 505, 606, 8141 A	General purpose column (see DR-1).
DR - PAH	Proprietary phase for the separation pf polycyclic aromatic hydrocarbons	nd			
DR - SE54	5% Phenyl, 1% Vinyl 94% Methyl Polysiloxane	350°C	G36		General purpose column (see DR-5).
DR - TNT 8095	Unique phase	nd		EPA 8095	Application-specific column developed for Explosives analysis (nitroaromatics, nitramines, nitrate esters).
DR - CDX Chiral Columns	DR-CDX DET Beta and Gamma DR-CDX DAC Beta and Gamma DR-CDX DMT Beta DR-CDX DMP Beta	230°C			Unique cyclodextrines based phases for chiral GC separations. Contact dot-red for details of our complete chiral columns range! We provide custom made DR-CDX stationary phases to solve your specific chiral analytical problem.

All trademarks acknowledged.

*: the temperature range may change depending on stationary phase film thickness.

*nd Not determined

Fast GC columns

Fast GC systems typically offer a ten-fold run time saving compared to a GC separation based around a conventional capillary GC. This allows a much higher sample throughput along with low operating costs and cheaper columns.

To accomplish FASTGC you will only need:

- A short column with a small internal diameter (a "narrow bore" column). A column of 10 m with an internal diameter of 0.10 mm is frequently used.
- A gas chromatograph that:
 - is able to carry out a fast and controlled temperature ramp rate of 25°C/min and more
 - is equipped with a high frequency data acquisition system
 - and is able to manage relatively high pressures at the head of the column.

Fast GC columns are available for the following phases and can be identified for ordering purposes by their diameter of 0.05 and 0.10mm on the following tables:

Non-polar	Low polarity	Intermediate polarity	Medium polarity	High polarity
DR-1 DR-101 DR-JXR DR-PS255 DR-SE30	DR-5 DR-SE54	DR-13 DR-20 DR-1701 DR-624 DR-PS264	DR-17 DR-225 DR-50 DR-COP	DR-10 DR-200 DR-FFAP DR-WAX

Gas chromatography columns and accessories

High temperature GC columns

Extended temperature range columns are available for the following phases: DR-1, DR-5, DR-SE54 and DR-Wax. Columns are produced using custom bonding/cross-linking technology giving an improved stability at significantly higher temperatures.

Applications and support

All columns are supported by a comprehensive applications database. Please visit www.dot-red.com.

We can also develop ad-hoc solutions for your specific analysis when not covered by an existing application note. Contact your local dealer or visit the [.red](http://www.dot-red.com) website.

All columns are supplied pretested with a suitable test mix which is included with the column when dispatched.

Organophosphorus Pesticides on DR-1

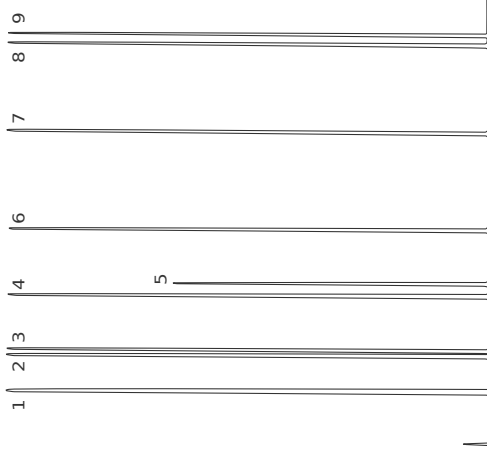
Column: **DR-1 25m x 0.25mm x 0.30µm**
Catalogue no.: DR1025025030

Conditions:

Injection: Split 250°C, 1.0µL, 1:20 Split Ratio.
Detector: FPD 160°C.
Oven Temp.: 160°C (1min), 5°C/min, 250°C.
Carrier Gas: Hydrogen, 60kPa.

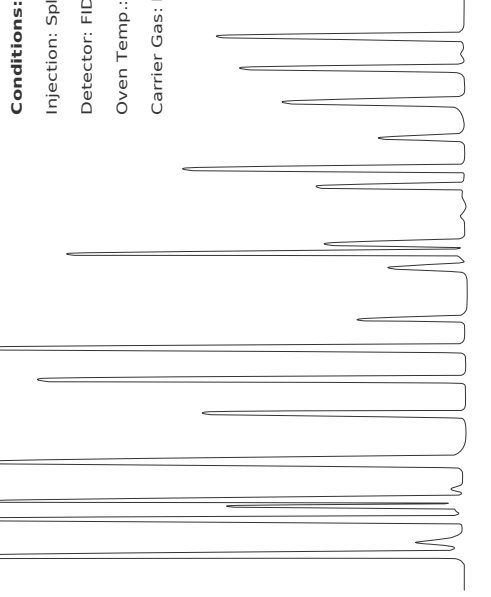
Peaks:

1. Diazinone
2. Parathion methyl
3. Chlorpyrifos methyl
4. Malathion
5. Chlorpyrifos
6. Methidathion
7. Ethion
8. Azinphos methyl
9. Phosalone



Flavor & Fragrance Compounds

Column: **DR-FFAP 25m x 0.25mm x 0.25µm**
Catalogue no.: DRFFAP025025025



Conditions:

Injection: Split 250°C.
Detector: FID 250°C.
Oven Temp.: 75°C, 2°C/min, 140°C.
Carrier Gas: Helium, 1.5mL/min.

Peaks:

1. Isoamyl Acetate
2. Alpha-Phellandrene
3. Cumene
4. 1-pentanol
5. 6-methyl - 5-hepten - 2-one
6. 2-nonanone
7. Ethyl Octanoate
8. Furfural
9. Benzaldehyde
10. Linalool
11. Isobutyric Acid
12. n-Butyric Acid
13. Ethyl Decanoate
14. Furfuryl Alcohol
15. Alpha + Beta-Terpineol
16. Carvone
17. Methyl Salicylate

Gas chromatography columns and accessories

Column availability and ordering information

Column catalogue numbers

Column catalogue numbers are created using the following system.

Simply join the Phase Code + Length + Internal Diameter + Film thickness using the following coding system. The internal diameter of a column can be found on the following tables (pages 10-18).

Phase	Phase code	Phase (cont.)	Phase code (cont.)	Phase (cont.)	Phase code (cont.)	Phase (cont.)	Phase code (cont.)
DR-1	DR1	DR-35 MS	DR35M	DR-200	DR200	DR-SV 1	DRSV1
DR-1 MS	DR1MS	DR-17	DR17	DR-SE54	DRSE54	DR-SV 2	DRSV2
DR-1 HT	DR1HT	DR-17 MS	DR17M	DR-ALC 1	DRALC1	DR-Biodiesel	DRBD0/3/5
DR-5	DR5	DR-FFAP	DRFFAP	DR-ALC 2	DRALC2	DR-1 PONA	DR1PN
DR-5 MS	DR5MS	DR-10FAME	DR10F	DR-AMN	DRAMN	DR-101	DR101
DR-5 HT	DR5HT	DR-225	DR225	DR-DIR	DRDIR	DR-TNT8095	DRTT
DR-Wax	DRWX	DR-225 MS	DR225M	DR-LIP	DRLIP	DR-PS255	DR255
DR-Wax MS	DRWXM	DR-624	DR624	DR-PLUS	DRPS	DR-PS264	DR264
DR-Wax HT	DRWHT	DR-13	DR13	DR-HIP 1	DRHP1	DR-JXR	DRJX
DR-1701	DR1701	DR-20	DR20	DR-HIP 2	DRHP2	DR-SE30	DRSE30
DR-35	DR35	DR-50	DR50	DR-VOC	DRVC1	DR-PAH	DRPAH

Coding for column length, internal diameter and film thickness are shown below.

Phase	Phase code	+	Length (m)	Length code	+	ID (mm)	ID code	+	Film thickness (µm)	Film thickness code
			5	005		0.05	005		0.05	005
			10	010		0.10	010		0.10	010
			15	015		0.15	015		0.15	015
			20	020		0.20	020		0.20	020
			25	025		0.25	025		0.25	025
			30	030		0.32	032		0.32	032
			50	050		0.53	053		0.45	045
			60	060					1.00	100
			100	100					1.50	150
									3.00	300
									5.00	500

Check the column length, ID and film thickness against the following column availability tables.

Example

A 30m DR-5 column having an internal diameter of 0.32mm and a 1.00µm film has the code DR5030032100 (from DR5+030+032+100).

Note

Contact your dealer for details of DR- high temperature phases columns. These are available for the following phases: DR-1, DR-5, DR-SE54 and DR-Wax.

Gas chromatography columns and accessories

GC column availability tables

DR-1 columns (including standard/conventional, fast, wide bore and GC-MS)

Shaded cells are standard internal diameter columns offered. Items in **bold** indicate GCMS columns.

Film, μm Length, m	0.05	0.10	0.15	0.20	0.25	0.32	0.45	1.00	1.50	3.00	5.00
5	0.05	0.05									
10		0.10		0.10							
15			0.25, 0.32, 0.53		0.25, 0.32, 0.53	0.32	0.25, 0.32, 0.53	0.25, 0.32, 0.53	0.25, 0.32, 0.53	0.25, 0.32, 0.53	0.32, 0.53
25			0.25, 0.32, 0.53		0.25, 0.32, 0.53	0.32	0.25, 0.32, 0.53	0.25, 0.32, 0.53	0.25, 0.32, 0.53	0.25, 0.32, 0.53	0.32, 0.53
30			0.25, 0.32, 0.53		0.25, 0.32, 0.53	0.32	0.25, 0.32, 0.53	0.25, 0.32, 0.53	0.25, 0.32, 0.53	0.25, 0.32, 0.53	0.32, 0.53
50			0.25, 0.32, 0.53		0.25, 0.32, 0.53	0.32	0.25, 0.32, 0.53	0.25, 0.32, 0.53	0.25, 0.32, 0.53	0.25, 0.32, 0.53	0.32, 0.53
60			0.25, 0.32, 0.53		0.25, 0.32, 0.53	0.32	0.25, 0.32, 0.53	0.25, 0.32, 0.53	0.25, 0.32, 0.53	0.25, 0.32, 0.53	0.32, 0.53

Example: 60m x 0.25mm DR-1, 1.5 μm film = DR1060025150

DR-5 columns (including standard/conventional, fast, wide bore and GC-MS)

Film, μm Length, m	0.05	0.10	0.15	0.20	0.25	0.32	0.45	1.00	1.50	3.00	5.00
5	0.05	0.05									
10		0.10		0.10							
15			0.25, 0.32, 0.53		0.25, 0.32, 0.53		0.25, 0.32, 0.53	0.25, 0.32, 0.53	0.25, 0.32, 0.53	0.32, 0.53	0.32, 0.53
25			0.25, 0.32, 0.53		0.25, 0.32, 0.53		0.25, 0.32, 0.53	0.25, 0.32, 0.53	0.25, 0.32, 0.53	0.32, 0.53	0.32, 0.53
30			0.25, 0.32, 0.53		0.25, 0.32, 0.53		0.25, 0.32, 0.53	0.25, 0.32, 0.53	0.25, 0.32, 0.53	0.32, 0.53	0.32, 0.53
50			0.25, 0.32, 0.53		0.25, 0.32, 0.53		0.25, 0.32, 0.53	0.25, 0.32, 0.53	0.25, 0.32, 0.53	0.32, 0.53	0.32, 0.53
60			0.25, 0.32, 0.53		0.25, 0.32, 0.53		0.25, 0.32, 0.53	0.25, 0.32, 0.53	0.25, 0.32, 0.53	0.32, 0.53	0.32, 0.53

DR-Wax columns (including standard/conventional, fast, wide bore and GC-MS)

Film, μm Length, m	0.05	0.10	0.15	0.20	0.25	0.325	0.45	1.00	1.50	3.00	5.00
5	0.05	0.05									
10		0.10		0.10							
15			0.25, 0.32, 0.53		0.25, 0.32, 0.53		0.25, 0.32, 0.53	0.25, 0.32, 0.53			
25			0.25, 0.32, 0.53		0.25, 0.32, 0.53		0.25, 0.32, 0.53	0.25, 0.32, 0.53			
30			0.25, 0.32, 0.53		0.25, 0.32, 0.53		0.25, 0.32, 0.53	0.25, 0.32, 0.53			
50			0.25, 0.32, 0.53		0.25, 0.32, 0.53		0.25, 0.32, 0.53	0.25, 0.32, 0.53			
60			0.25, 0.32, 0.53		0.25, 0.32, 0.53		0.25, 0.32, 0.53	0.25, 0.32, 0.53			

Gas chromatography columns and accessories

DR-1701 columns (including standard/conventional, fast and wide bore)

Shaded cells are standard internal diameter columns offered. Items in **bold** indicate GCMS columns.

Film, μm Length, m	0.05	0.10	0.15	0.20	0.25	0.32	0.45	1.00	1.50	3.00	5.00
5	0.05	0.05									
10		0.10		0.10							
15			0.25, 0.32, 0.53		0.25, 0.32, 0.53		0.25, 0.32, 0.53	0.25, 0.32, 0.53	0.25, 0.32, 0.53		
25			0.25, 0.32, 0.53		0.25, 0.32, 0.53		0.25, 0.32, 0.53	0.25, 0.32, 0.53	0.25, 0.32, 0.53		
30			0.25, 0.32, 0.53		0.25, 0.32, 0.53		0.25, 0.32, 0.53	0.25, 0.32, 0.53	0.25, 0.32, 0.53		
50			0.25, 0.32, 0.53		0.25, 0.32, 0.53		0.25, 0.32, 0.53	0.25, 0.32, 0.53	0.25, 0.32, 0.53		
60			0.25, 0.32, 0.53		0.25, 0.32, 0.53		0.25, 0.32, 0.53	0.25, 0.32, 0.53	0.25, 0.32, 0.53		

DR-35 columns (including standard/conventional, wide bore and GC-MS)

Film, μm Length, m	0.05	0.10	0.15	0.20	0.25	0.32	0.45	1.00	1.50	3.00	5.00
5	0.05	0.05									
10		0.10		0.10							
15			0.25, 0.32, 0.53		0.25, 0.32, 0.53		0.25, 0.32, 0.53	0.25, 0.32, 0.53	0.25, 0.32, 0.53		
25			0.25 , 0.32, 0.53		0.25 , 0.32, 0.53		0.25, 0.32, 0.53	0.25, 0.32, 0.53	0.25, 0.32, 0.53		
30			0.25 , 0.32, 0.53		0.25 , 0.32, 0.53		0.25, 0.32, 0.53	0.25, 0.32, 0.53	0.25, 0.32, 0.53		
50			0.25, 0.32, 0.53		0.25, 0.32, 0.53		0.25, 0.32, 0.53	0.25, 0.32, 0.53	0.25, 0.32, 0.53		
60			0.25, 0.32, 0.53		0.25, 0.32, 0.53		0.25, 0.32, 0.53	0.25, 0.32, 0.53	0.25, 0.32, 0.53		

DR-17 columns (including standard/conventional, fast, wide bore and GC-MS)

Film, μm Length, m	0.05	0.10	0.15	0.20	0.25	0.32	0.45	1.00	1.50	3.00	5.00
5	0.05	0.05									
10		0.10		0.10							
15			0.25, 0.32, 0.53		0.25, 0.32, 0.53	0.32	0.25, 0.32, 0.53	0.25, 0.32, 0.53	0.53		
25			0.25 , 0.32, 0.53		0.25 , 0.32, 0.53	0.32	0.25, 0.32, 0.53	0.25, 0.32, 0.53	0.53		
30			0.25 , 0.32, 0.53		0.25 , 0.32, 0.53	0.32	0.25, 0.32, 0.53	0.25, 0.32, 0.53	0.53		
50			0.25, 0.32, 0.53		0.25, 0.32, 0.53	0.32	0.25, 0.32, 0.53	0.25, 0.32, 0.53	0.53		
60			0.25, 0.32, 0.53		0.25, 0.32, 0.53	0.32	0.25, 0.32, 0.53	0.25, 0.32, 0.53	0.53		

Example: 30m x 0.15mm DR-17 MS, 0.15 μm film = DR17M030015015

Gas chromatography columns and accessories

DR-FFAP columns (including standard/conventional, fast and wide bore)

Shaded cells are standard internal diameter columns offered. Items in **bold** indicate GCMS columns.

Film, μm Length, m	0.05	0.10	0.15	0.20	0.25	0.32	0.45	1.00	1.50	3.00	5.00
5	0.05	0.05									
10		0.10		0.10							
15			0.25, 0.32, 0.53		0.25, 0.32, 0.53		0.25, 0.32, 0.53	0.25, 0.32, 0.53			
25			0.25, 0.32, 0.53		0.25, 0.32, 0.53		0.25, 0.32, 0.53	0.25, 0.32, 0.53			
30			0.25, 0.32, 0.53		0.25, 0.32, 0.53		0.25, 0.32, 0.53	0.25, 0.32, 0.53			
50			0.25, 0.32, 0.53		0.25, 0.32, 0.53		0.25, 0.32, 0.53	0.25, 0.32, 0.53			
60			0.25, 0.32, 0.53		0.25, 0.32, 0.53		0.25, 0.32, 0.53	0.25, 0.32, 0.53			

DR-10 FAME columns (including standard/conventional, fast and wide bore)

Film, μm Length, m	0.05	0.10	0.15	0.20	0.25	0.32	0.45	1.00	1.50	3.00	5.00
15			0.15		0.25, 0.32, 0.53						
25					0.25, 0.32, 0.53						
30				0.20	0.25, 0.32, 0.53						
50					0.25, 0.32, 0.53						
60					0.25, 0.32, 0.53						

DR-225 columns (including standard/conventional, fast, wide bore and GC-MS)

Film, μm Length, m	0.05	0.10	0.15	0.20	0.25	0.32	0.45	1.00	1.50	3.00	5.00
5	0.05	0.05									
10		0.10		0.10							
15			0.25, 0.32, 0.53		0.25, 0.32, 0.53	0.32	0.25, 0.32, 0.53	0.25, 0.32, 0.53	0.25, 0.32, 0.53		
25			0.25 , 0.32, 0.53		0.25 , 0.32, 0.53	0.32	0.25, 0.32, 0.53	0.25, 0.32, 0.53	0.25, 0.32, 0.53		
30			0.25, 0.32, 0.53		0.25, 0.32, 0.53	0.32	0.25, 0.32, 0.53	0.25, 0.32, 0.53	0.25, 0.32, 0.53		
50			0.25, 0.32, 0.53		0.25, 0.32, 0.53	0.32	0.25, 0.32, 0.53	0.25, 0.32, 0.53	0.25, 0.32, 0.53		
60			0.25, 0.32, 0.53		0.25, 0.32, 0.53	0.32	0.25, 0.32, 0.53	0.25, 0.32, 0.53	0.25, 0.32, 0.53		

Example: 5m x 0.05mm DR-225, 0.05 μm film = DR225005005005
 30m x 0.53mm DR-225, 0.45 μm film = DR225030053045

Gas chromatography columns and accessories

DR-624 columns (including standard/conventional, fast and wide bore)

Shaded cells are standard internal diameter columns offered.

Film, μm Length, m	0.05	0.10	0.15	0.20	0.25	0.32	0.45	1.00	1.50	3.00	5.00
15			0.25, 0.32, 0.53		0.25, 0.32, 0.53	0.32	0.25, 0.32, 0.53	0.25, 0.32, 0.53	0.25, 0.32, 0.53	0.32, 0.53	
25			0.25, 0.32, 0.53		0.25, 0.32, 0.53	0.32	0.25, 0.32, 0.53	0.25, 0.32, 0.53	0.25, 0.32, 0.53	0.32, 0.53	
30			0.25, 0.32, 0.53		0.25, 0.32, 0.53	0.32	0.25, 0.32, 0.53	0.25, 0.32, 0.53	0.25, 0.32, 0.53	0.32, 0.53	
50			0.25, 0.32, 0.53		0.25, 0.32, 0.53	0.32	0.25, 0.32, 0.53	0.25, 0.32, 0.53	0.25, 0.32, 0.53	0.32, 0.53	
60			0.25, 0.32, 0.53		0.25, 0.32, 0.53	0.32	0.25, 0.32, 0.53	0.25, 0.32, 0.53	0.25, 0.32, 0.53	0.32, 0.53	

DR-13 columns (including standard/conventional, fast and wide bore)

Film, μm Length, m	0.05	0.10	0.15	0.20	0.25	0.32	0.45	1.00	1.50	3.00	5.00
5	0.05	0.05									
10		0.10		0.10							
15			0.25, 0.32, 0.53		0.25, 0.32, 0.53	0.32	0.25, 0.32, 0.53	0.25, 0.32, 0.53			
25			0.25, 0.32, 0.53		0.25, 0.32, 0.53	0.32	0.25, 0.32, 0.53	0.25, 0.32, 0.53			
30			0.25, 0.32, 0.53		0.25, 0.32, 0.53	0.32	0.25, 0.32, 0.53	0.25, 0.32, 0.53			
50			0.25, 0.32, 0.53		0.25, 0.32, 0.53	0.32	0.25, 0.32, 0.53	0.25, 0.32, 0.53			
60			0.25, 0.32, 0.53		0.25, 0.32, 0.53	0.32	0.25, 0.32, 0.53	0.25, 0.32, 0.53			

DR-20 columns (including standard/conventional, fast and wide bore)

Film, μm Length, m	0.05	0.10	0.15	0.20	0.25	0.32	0.45	1.00	1.50	3.00	5.00
5	0.05	0.05									
10		0.10		0.10							
15			0.25, 0.32, 0.53		0.25, 0.32, 0.53	0.32	0.25, 0.32, 0.53	0.25, 0.32, 0.53	0.32, 0.53	0.32, 0.53	
25			0.25, 0.32, 0.53		0.25, 0.32, 0.53	0.32	0.25, 0.32, 0.53	0.25, 0.32, 0.53	0.32, 0.53	0.32, 0.53	
30			0.25, 0.32, 0.53		0.25, 0.32, 0.53	0.32	0.25, 0.32, 0.53	0.25, 0.32, 0.53	0.32, 0.53	0.32, 0.53	
50			0.25, 0.32, 0.53		0.25, 0.32, 0.53	0.32	0.25, 0.32, 0.53	0.25, 0.32, 0.53	0.32, 0.53	0.32, 0.53	
60			0.25, 0.32, 0.53		0.25, 0.32, 0.53	0.32	0.25, 0.32, 0.53	0.25, 0.32, 0.53	0.32, 0.53	0.32, 0.53	

Contact your local dealer for details of other column combinations and prices.

Gas chromatography columns and accessories

DR-50 columns (including standard/conventional, fast and wide bore)

Shaded cells are standard internal diameter columns offered.

Film, μm Length, m	0.05	0.10	0.15	0.20	0.25	0.32	0.45	1.00	1.50	3.00	5.00
5	0.05	0.05									
10		0.10		0.10							
15					0.25, 0.32, 0.53						
25					0.25, 0.32, 0.53						
30					0.25, 0.32, 0.53						
50					0.25, 0.32, 0.53						
60					0.25, 0.32, 0.53						

DR-200 columns (including standard/conventional, fast and wide bore)

Film, μm Length, m	0.05	0.10	0.15	0.20	0.25	0.32	0.45	1.00	1.50	3.00	5.00
5	0.05	0.05									
10		0.10		0.10							
15			0.25, 0.32, 0.53		0.25, 0.32, 0.53	0.32	0.25, 0.32, 0.53	0.25, 0.32, 0.53	0.32, 0.53	0.53	
25			0.25, 0.32, 0.53		0.25, 0.32, 0.53	0.32	0.25, 0.32, 0.53	0.25, 0.32, 0.53	0.32, 0.53	0.53	
30			0.25, 0.32, 0.53		0.25, 0.32, 0.53	0.32	0.25, 0.32, 0.53	0.25, 0.32, 0.53	0.32, 0.53	0.53	
50			0.25, 0.32, 0.53		0.25, 0.32, 0.53	0.32	0.25, 0.32, 0.53	0.25, 0.32, 0.53	0.32, 0.53	0.53	
60			0.25, 0.32, 0.53		0.25, 0.32, 0.53	0.32	0.25, 0.32, 0.53	0.25, 0.32, 0.53	0.32, 0.53	0.53	

DR-SE54 columns (including standard/conventional, fast and wide bore)

Film, μm Length, m	0.05	0.10	0.15	0.20	0.25	0.32	0.45	1.00	1.50	3.00	5.00
15			0.25, 0.32, 0.53		0.25, 0.32, 0.53	0.32	0.25, 0.32, 0.53	0.25, 0.32, 0.53	0.25, 0.32, 0.53	0.32, 0.53	0.32, 0.53
25			0.25, 0.32, 0.53		0.25, 0.32, 0.53	0.32	0.25, 0.32, 0.53	0.25, 0.32, 0.53	0.25, 0.32, 0.53	0.32, 0.53	0.32, 0.53
30			0.25, 0.32, 0.53		0.25, 0.32, 0.53	0.32	0.25, 0.32, 0.53	0.25, 0.32, 0.53	0.25, 0.32, 0.53	0.32, 0.53	0.32, 0.53
50			0.25, 0.32, 0.53		0.25, 0.32, 0.53	0.32	0.25, 0.32, 0.53	0.25, 0.32, 0.53	0.25, 0.32, 0.53	0.32, 0.53	0.32, 0.53
60			0.25, 0.32, 0.53		0.25, 0.32, 0.53	0.32	0.25, 0.32, 0.53	0.25, 0.32, 0.53	0.25, 0.32, 0.53	0.32, 0.53	0.32, 0.53

Example: 25m x 0.32mm DR-SE54, 5.00 μm film = DRSE54025032500

Gas chromatography columns and accessories

DR-ALC1 & ALC-2 columns

Shaded cells are standard internal diameter columns offered.

Film, μm Length, m	0.05	0.10	0.15	0.20	0.25	0.32	0.45	1.00	1.50	3.00	5.00
30								ALC-2 0.32	ALC-1 0.32		

DR-AMN column

Film, μm Length, m	0.05	0.10	0.15	0.20	0.25	0.32	0.45	1.00	1.50	3.00	5.00
25					0.32						

DR-DIR column

Film, μm Length, m	0.05	0.10	0.15	0.20	0.25	0.32	0.45	1.00	1.50	3.00	5.00
30											0.32

DR-LIP column

Film, μm Length, m	0.05	0.10	0.15	0.20	0.25	0.32	0.45	1.00	1.50	3.00	5.00
25		0.32									

DR-PLUS column

Film, μm Length, m	0.05	0.10	0.15	0.20	0.25	0.32	0.45	1.00	1.50	3.00	5.00
5	0.05	0.05									
10		0.10		0.10							
15			0.25, 0.32, 0.53		0.25, 0.32, 0.53	0.32	0.25, 0.32, 0.53	0.25, 0.32, 0.53			
25			0.25, 0.32, 0.53		0.25, 0.32, 0.53	0.32	0.25, 0.32, 0.53	0.25, 0.32, 0.53			
30			0.25, 0.32, 0.53		0.25, 0.32, 0.53	0.32	0.25, 0.32, 0.53	0.25, 0.32, 0.53			
50			0.25, 0.32, 0.53		0.25, 0.32, 0.53	0.32	0.25, 0.32, 0.53	0.25, 0.32, 0.53			
60			0.25, 0.32, 0.53		0.25, 0.32, 0.53	0.32	0.25, 0.32, 0.53	0.25, 0.32, 0.53			

DR-HIP column

Film, μm Length, m	0.05	0.10	0.15	0.20	0.25	0.32	0.45	1.00	1.50	3.00	5.00
25					0.32						

Contact your local dealer for details of other column combinations and prices.

Gas chromatography columns and accessories

DR-VOC column

Shaded cells are standard internal diameter columns offered.

Film, μm Length, m	0.05	0.10	0.15	0.20	0.25	0.32	0.45	1.00	1.50	3.00	5.00
30									0.25		

DR-SV1 and SV-2 columns

Film, μm Length, m	0.05	0.10	0.15	0.20	0.25	0.32	0.45	1.00	1.50	3.00	5.00
50					0.32 (SV1) 0.32 (SV2)						

DR-BD for Biodiesel columns

Film, μm Length, m	0.05	0.10	0.15	0.20	0.25	0.32	0.45	1.00	1.50	3.00	5.00
15		0.32 (BD5)									
30					0.32 (BD3)			0.32 (BD0)			

DR-1 PONA for Hydrocarbons analysis column

Film, μm Length, m	0.05	0.10	0.15	0.20	0.25	0.32	0.5	1.00	1.50	3.00	5.00
100							0.25				

DR-101 columns (including standard/conventional, fast and wide bore)

Film, μm Length, m	0.05	0.10	0.15	0.20	0.25	0.32	0.45	1.00	1.50	3.00	5.00
5	0.05	0.05									
10		0.10		0.10							
15			0.25, 0.32, 0.53		0.25, 0.32, 0.53	0.32	0.25, 0.32, 0.53	0.25, 0.32, 0.53	0.32, 0.53		
25			0.25, 0.32, 0.53		0.25, 0.32, 0.53	0.32	0.25, 0.32, 0.53	0.25, 0.32, 0.53	0.32, 0.53		
30			0.25, 0.32, 0.53		0.25, 0.32, 0.53	0.32	0.25, 0.32, 0.53	0.25, 0.32, 0.53	0.32, 0.53		
50			0.25, 0.32, 0.53		0.25, 0.32, 0.53	0.32	0.25, 0.32, 0.53	0.25, 0.32, 0.53	0.32, 0.53		
60			0.25, 0.32, 0.53		0.25, 0.32, 0.53	0.32	0.25, 0.32, 0.53	0.25, 0.32, 0.53	0.32, 0.53		

DR-TNT 8095 column - details on application

Gas chromatography columns and accessories

DR-PS255 columns (including standard/conventional, fast and wide bore)

Shaded cells are standard internal diameter columns offered.

Film, μm Length, m	0.05	0.10	0.15	0.20	0.25	0.32	0.45	1.00	1.50	3.00	5.00
5	0.05	0.05									
10		0.10		0.10							
15			0.25, 0.32, 0.53		0.25, 0.32, 0.53	0.32	0.25, 0.32, 0.53	0.25, 0.32, 0.53	0.25, 0.32, 0.53	0.32, 0.53	0.53
25			0.25, 0.32, 0.53		0.25, 0.32, 0.53	0.32	0.25, 0.32, 0.53	0.25, 0.32, 0.53	0.25, 0.32, 0.53	0.32, 0.53	0.53
30			0.25, 0.32, 0.53		0.25, 0.32, 0.53	0.32	0.25, 0.32, 0.53	0.25, 0.32, 0.53	0.25, 0.32, 0.53	0.32, 0.53	0.53
50			0.25, 0.32, 0.53		0.25, 0.32, 0.53	0.32	0.25, 0.32, 0.53	0.25, 0.32, 0.53	0.25, 0.32, 0.53	0.32, 0.53	0.53
60			0.25, 0.32, 0.53		0.25, 0.32, 0.53	0.32	0.25, 0.32, 0.53	0.25, 0.32, 0.53	0.25, 0.32, 0.53	0.32, 0.53	0.53

DR-PS264 columns (including standard/conventional, fast and wide bore)

Film, μm Length, m	0.05	0.10	0.15	0.20	0.25	0.32	0.45	1.00	1.50	3.00	5.00
5	0.05	0.05									
10		0.10		0.10							
15			0.25, 0.32, 0.53		0.25, 0.32, 0.53	0.32	0.25, 0.32, 0.53	0.25, 0.32, 0.53	0.25, 0.32, 0.53	0.32, 0.53	0.32, 0.53
25			0.25, 0.32, 0.53		0.25, 0.32, 0.53	0.32	0.25, 0.32, 0.53	0.25, 0.32, 0.53	0.25, 0.32, 0.53	0.32, 0.53	0.32, 0.53
30			0.25, 0.32, 0.53		0.25, 0.32, 0.53	0.32	0.25, 0.32, 0.53	0.25, 0.32, 0.53	0.25, 0.32, 0.53	0.32, 0.53	0.32, 0.53
50			0.25, 0.32, 0.53		0.25, 0.32, 0.53	0.32	0.25, 0.32, 0.53	0.25, 0.32, 0.53	0.25, 0.32, 0.53	0.32, 0.53	0.32, 0.53
60			0.25, 0.32, 0.53		0.25, 0.32, 0.53	0.32	0.25, 0.32, 0.53	0.25, 0.32, 0.53	0.25, 0.32, 0.53	0.32, 0.53	0.32, 0.53

DR-JXR and DR-SE30 columns (including standard/conventional, fast and wide bore)

Film, μm Length, m	0.05	0.10	0.15	0.20	0.25	0.32	0.45	1.00	1.50	3.00	5.00
5	0.05	0.05									
10		0.10		0.10							
15			0.25, 0.32, 0.53		0.25, 0.32, 0.53	0.32	0.25, 0.32, 0.53	0.25, 0.32, 0.53	0.25, 0.32, 0.53	0.32, 0.53	0.32, 0.53
25			0.25, 0.32, 0.53		0.25, 0.32, 0.53	0.32	0.25, 0.32, 0.53	0.25, 0.32, 0.53	0.25, 0.32, 0.53	0.32, 0.53	0.32, 0.53
30			0.25, 0.32, 0.53		0.25, 0.32, 0.53	0.32	0.25, 0.32, 0.53	0.25, 0.32, 0.53	0.25, 0.32, 0.53	0.32, 0.53	0.32, 0.53
50			0.25, 0.32, 0.53		0.25, 0.32, 0.53	0.32	0.25, 0.32, 0.53	0.25, 0.32, 0.53	0.25, 0.32, 0.53	0.32, 0.53	0.32, 0.53
60			0.25, 0.32, 0.53		0.25, 0.32, 0.53	0.32	0.25, 0.32, 0.53	0.25, 0.32, 0.53	0.25, 0.32, 0.53	0.32, 0.53	0.32, 0.53

DR-PAH columns - please contact your local dealer for details of these and other column combinations and prices.

Gas chromatography columns and accessories

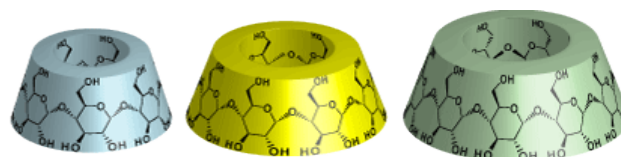
Chiral columns

Cyclodextrin

Cyclodextrins are oligosaccharides formed from the bonding of six to twelve glucopyranose (sugar) units into a cyclic, cone shaped structure. The number of sugar units varies from 6 to 12. Three sizes are commonly used in the manufacture of commercially available GC phases: alpha, beta & gamma corresponding to 6, 7 and 8 glucopyranose units respectively.

The cyclodextrin molecule forms a truncated conical cavity, the diameter of which depends on the number of glucopyranose units. For chiral resolution to occur, a portion of the molecule must enter the cyclodextrin cone cavity.

The selectivity of a cyclodextrin phase is dependent on the size of the analyte. Alpha-cyclodextrin will include single phenyl groups or naphthyl groups end-on. Beta-cyclodextrin will accept naphthyl groups and heavily substituted phenyl groups. Gamma-cyclodextrin is useful for bulky steroid-type molecules. Overall, the beta form has been found to have the widest application.



	alpha-CD	beta-CD	gamma-CD
No. glucose units	6	7	8
Cavity diameter (mm)	0.47	0.60	0.75
Height of torus (nm)	0.79	0.79	0.79

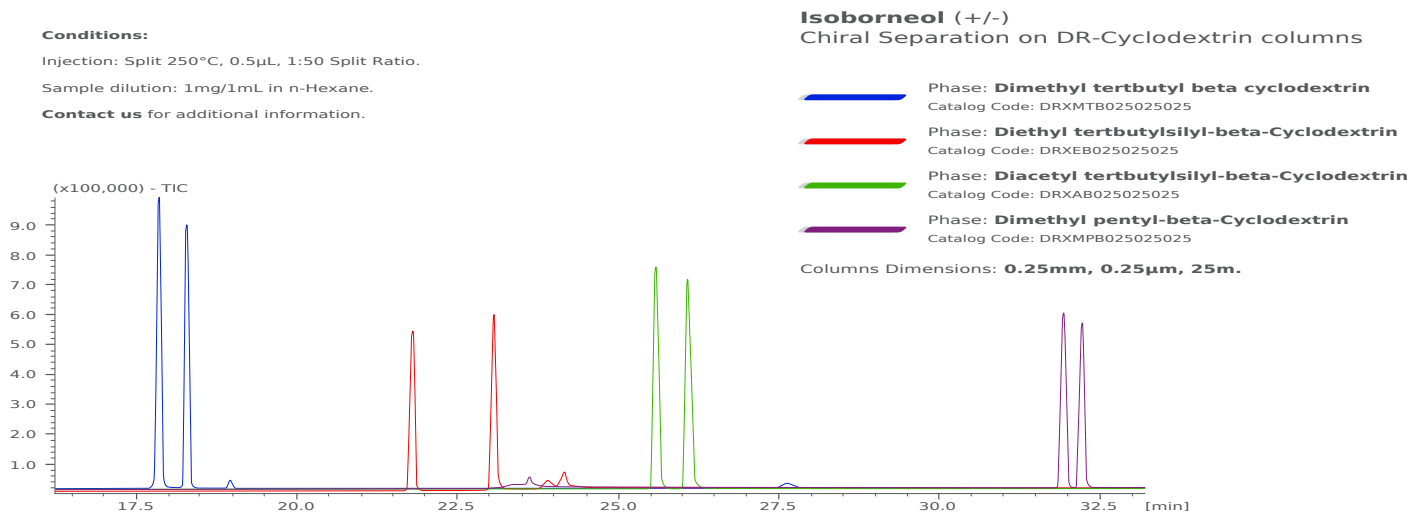
Courtesy Harada Lab., Dept Macromolecular Science, Osaka University

DR-Cyclodextrin columns: Phase composition

Extensive substitution of the cyclodextrin backbone has yielded many different commercially available phases. •red cyclodextrin columns are based on substituted beta- and gamma- cyclodextrin.

Phase composition	Phase code
Diacetyl tertbutylsilyl-BETA-Cyclodextrin	DRXAB
Diacetyl tertbutylsilyl-GAMMA-Cyclodextrin	DRXAG
Diethyl tertbutylsilyl-BETA-Cyclodextrin	DRXETB
Diethyl tertbutylsilyl-GAMMA-Cyclodextrin	DRXETG
Dimethyl pentyl-BETA-Cyclodextrin	DRXMPB
Dimethyl tertbutylsilyl-BETA-Cyclodextrin	DRXMTB

Resulting columns offer useful differences in efficiency, sample capacity and, most importantly, enantiomeric selectivity.



Gas chromatography columns and accessories

Availability and ordering information

•red chiral catalogue numbers are created using the same system as described for non-chiral GC columns above. They are given in full in the table below. Note all columns are 0.25mm internal diameter.

Composition	Phase code	Length m	Film, df µm	Max. temp. °C	Catalogue no.
Diacetyl tertbutylsilyl-BETA-Cyclodextrin	DRXAB	15	0.15	230	DRXAB015025015
		25	0.15	230	DRXAB025025015
		15	0.25	230	DRXAB015025025
		25	0.25	230	DRXAB025025025
Diacetyl tertbutylsilyl-GAMMA-Cyclodextrin	DRXAG	15	0.15	230	DRXAG015025015
		25	0.15	230	DRXAG025025015
		15	0.25	230	DRXAG015025025
		25	0.25	230	DRXAG025025025
Diethyl tertbutylsilyl-BETA-Cyclodextrin	DRXETB	15	0.15	230	DRXEB015025015
		25	0.15	230	DRXEB025025015
		15	0.25	230	DRXEB015025025
		25	0.25	230	DRXEB025025025
Diethyl tertbutylsilyl-GAMMA-Cyclodextrin	DRXETG	15	0.15	230	DRXEG015025015
		25	0.15	230	DRXEG025025015
		15	0.25	230	DRXEG015025025
		25	0.25	230	DRXEG025025025
Dimethyl pentyl-BETA-Cyclodextrin	DRXMPB	15	0.15	230	DRXPB015025015
		25	0.15	230	DRXPB025025015
		15	0.25	230	DRXPB015025025
		25	0.25	230	DRXPB025025025
Dimethyl tertbutylsilyl-BETA-Cyclodextrin	DRXMTB	15	0.15	230	DRXMB015025015
		25	0.15	230	DRXMB025025015
		15	0.25	230	DRXMB015025025
		25	0.25	230	DRXMB025025025

Gas chromatography columns and accessories

Accessories

Intelligent retention gaps

•red columns can be supplied with an 'intelligent' retention gap for use at the injector end of the column. These are an extension of the analytical column tubing with no union required between the deactivated and analytical column sections.

In addition, columns can be produced having the deactivated section at the detector end either as well as, or instead of, the injector end. This can be of value especially for GC-MS users. •red retention gaps eliminate problems of unnecessary handling, cold spots and leakage commonly associated with press fit and/or ferrule type retention gaps.

Contact your local •red dealer for catalogue number and pricing information.

Retention gaps

Conventional retention gaps offer a wider range of applications than Intelligent Retention Gaps™. Typical uses are automated on-column injection, direct injection of large volumes and/or dirty samples.

Conventional retention gaps are lengths of fused silica tubing internally deactivated for

- General purpose applications
- Apolar solvents
- Polar solvents

Retention gaps are supplied without press-fit or ferrule type connectors which are available separately. Lengths from 1m and above are available.



Press-fit connector - column to column (2-way)

Complimenting the retention gaps are a range of simple to use press-fit unions recommended to connect most column diameters. Note these are not universal unions - column ID need specifying.

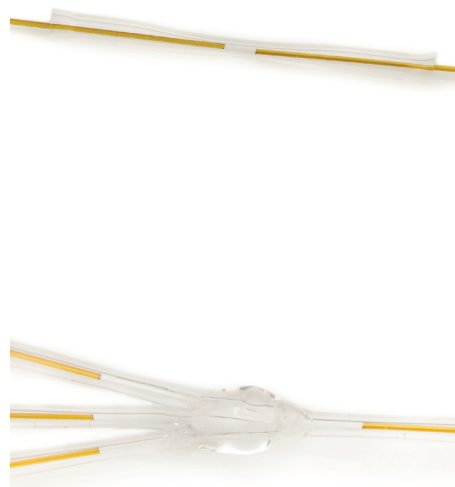
Connect this ID column	To this ID column
0.05, 0.10, 0.25, 0.32, 0.53mm	0.05, 0.10, 0.25, 0.32, 0.53mm

Most press fit connectors are sold in packs of 5, 10 or 20.

Press-fit connector - column to columns (3-, 4- and 5-way)

3-way press-fit connectors allow even greater application flexibility. 3-way connectors are offered across the range allowing a vast number of connection possibilities.

For 4- and 5-way press-fit connectors, customers are requested to contact •red with details of the column diameters requiring connection along with the orientation of the connections.



Gas chromatography columns and accessories

Availability and ordering information

The following table can be used as a guide to construct required catalogue numbers. The system adopted for length and internal diameter (ID) is similar to that already used. For example, fused silica tubing of 0.05mm ID is coded '005'. 0.53mm tubing is '053'. Lengths are in multiples of 1m and are represented as '001', '005' etc.

Contact your local •red dealer for further assistance and pricing.

Product	Option 1	Option 2	Option 3	Catalogue no.
Intelligent Retention Gaps™				Contact dealer
Retention gaps	General purpose	Length (in multiples of 001m)	ID (025, 032 etc.)	DRRGG + length + ID
	Apolar	As above	As above	DRRGA + length + ID
	Polar	As above	As above	DRRGP + length + ID
Press-fit connectors Universal type	Universal 2-way. Fits 0.05 to 0.53mm ID columns	-	-	DRPF2U
Press-fit connectors 2-way very low volume type	ID#1 (025, 032 etc.)	ID#2 (025, 032 etc.)	-	DRPF2 + ID#1 + ID#2
Press-fit connectors 3-way very low volume type	ID#1 (025, 032 etc.)	ID#2 (025, 032 etc.)	ID#3 (025, 032 etc.)	DRPF3 + ID#1 + ID#2 + ID#3
Press-fit connectors 4-way very low volume type	-	-	-	Use generic catalogue number DRPF4 and give full description
Press-fit connectors 5-way very low volume type	-	-	-	Use generic catalogue number DRPF5 and give full description

Gas chromatography columns and accessories

Packed columns

Column composition

Despite low efficiency compared to capillary columns, the highly selective nature of packed columns can often be used successfully to separate mixtures. The robust nature of packed columns is also useful in certain environments (eg within petrochemical refineries and offshore labs).

Common application areas include permanent gases, low molecular weight (gaseous) hydrocarbons and simple alcohol content testing.

Column ordering

Unlike capillary GC columns, packed columns can be ordered using the following generic catalogue numbers: 100100 for glass columns or 100101 for stainless steel columns. These generic catalogue numbers require a full product description to correctly calculate the column price and configure the column:

1. Outer material: glass or stainless steel*
2. Length (in m or ft)
3. Outer diameter (typically 6mm (1/4") for glass and either 3mm (1/8") or 6mm (1/4") for stainless steel)
4. Inner diameter or bore (in mm, typically 2, 3 or 4mm)

plus either

5. Liquid coating (eg Carbowax 400)

and

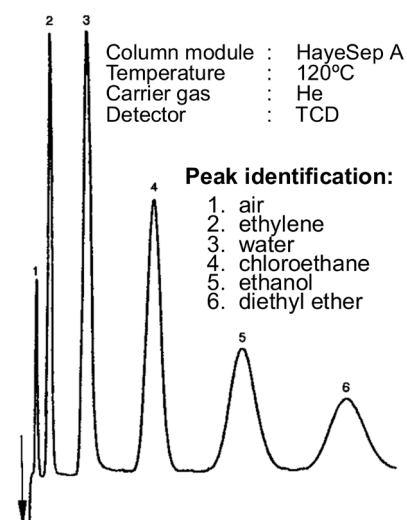
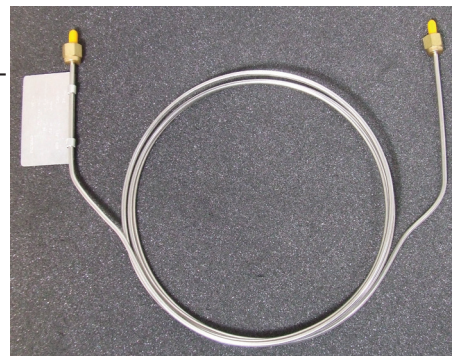
6. Support with mesh or μm size (eg Chromosorb W-AW, 80/100 mesh)

or instead of 5 & 6

7. Solid phase (eg Porapak Q) with mesh size
8. For 1/4" and other large diameter stainless steel and some smaller diameter stainless steel and **ALL** glass columns, the shape/bend is required. ie which instrument is the column for, and what injector/detector configuration
9. Special items/requirements (eg column preconditioning)

* For other materials (eg PTFE), contact your •red dealer.

For further details please refer to the www.dot-red.com website or contact your local •red dealer.



Applications and support

All •red columns are supported by a comprehensive applications database. Please visit www.dot-red.com for further details.

We can also develop ad-hoc solutions for your specific analysis when not covered by an existing application note. Contact your local dealer or visit the •red website.

All columns are supplied pretested with a suitable test mix. Both the test mix and test report are supplied with the column when dispatched.

Gas chromatography columns and accessories

Related •red products

Calibration standards

- Suitable for various analytical techniques and important application areas including organic standards, European Pharmacopoeia solutions and standards, ion chromatography standards, analytical solutions, ICP and AAS spectroscopy standards.

Chromatography vials

- Suitable for use with most manufacturers' instrumentation

Laboratory gas generators

- Provide a safe, secure and cost effective alternative to high pressure gas cylinders in the laboratory

Deuterium lamps for HPLC and UV-Vis detectors

- Available for most leading makes of detector including Agilent, Shimadzu, Perkin Elmer, Thermo and others

HPLC columns

- Packed with a wide range of phases from equivalents to traditional HPLC materials to newer ultra-pure silicas

Hollow cathode lamps

- Suitable for all major atomic absorption instruments

Order from

ORGANIC SINGLE-ELEMENT

Metabolite: Azinphos-ethyl

Ref.: DRS01250 CAS: 2642-71-9

Concentration: 10 ug/ml

Solvent: Cyclohexane

Volume: 10 ml Ampoule(s)

