

2015



Petroleum

GsBP™ GC Column Applications



General Separation Technologies, Inc.

GS-Tek, a USA GC column manufacturer located in Delaware USA, offers complete GsBP™ GC column product line to worldwide chromatographers. Rooted in the original developer experiences of a major brand GC column started in 1990, and greatly re-engineered GC column process, GsBP™ GC columns have similar and improved performance to the major brand GC columns. Even though GsBP™ GC column is a new comer to market, GsBP™ GC columns gain market recognition from its similar and improved separations for many old and new applications.

Main features of GsBP™ GC columns:

- Complete offers with robust, better quality and cost effectiveness, and confidence
- Similar performances and qualities to major brands
- Improved column selectivity and inertness for many challenging applications
- Quick turn-around customizations for method development

GS-Tek offers complete GsBP™ column selections for many petroleum and petrochemical applications, from pure gas, natural gas, petroleum oil to down stream chemicals and new fuels. GsBP™ columns have been widely used in petroleum and petrochemical industry to produce very good separations and quantitation results, as specified in ASTM, EN, UOP, GPA and other methods.

GS-Tek also offers the custom-made columns to meet your special separation requirements. GS-Tek will collaborate with you with quick deliver of the custom-made columns, many year experiences in column technology and GC instrumentation, to develop your method and to solve challenging analysis problems.

The followings demonstrate a few GsBP™ GC column applications. For more detailed application information, please contact our sales or customer support engineer or our world-wide distribution channel.

We always like to hear
from you, work with
you and satisfy you
with our products and
our expertise.

Fixed Gases

Popular columns for gas applications are molecular sieves and porous polymer phase type columns. GsBP™ columns can be custom-made with extended lengths to improve gas separations. Table I lists most popular columns. Contact GS-Tek sales for custom-made column length, ID and packing support meshes.

Columns for gas analysis

Catalog No.	Description	Applications At Above Ambient Temperature
8453-3025	GsBP-PLOT MS5A, 30m x 0.53mm x 25um	H2, O2, N2, CO, Methane, SF6, Ne, He, Xe, Ar, N2O, NO
8453-5050	GsBP-PLOT MS5A, 50m x 0.53mm x 50um	Argon/Oxygen separation
8653-3030	GsBP-PLOT Q, 30m x 0.53mm x 30um	Air, CO, CO2, C1, C2, Moisture, COS, H2S, SO2
8653-5030	GsBP-PLOT Q, 50m x 0.53mm x 30um	Improved resolution of CO from Air and C1
8532-3005	GsBP-GasPro, 30m x 0.32mm x 5um	H2S, COS, MeSH
9010-0102	Packed Column, 2m x 1/8 SS, MS 13X, 80/100mesh	O2, N2, CO, Methane
9010-0202	Packed Column, 2m x 1/8 SS, MS 5A, 80/100mesh	O2, N2, CO, Methane
9010-0302	Packed Column, 2m x 1/8SS, Porapak Q, 80/100mesh	Air, CO, CO2, H2O, Methane, H2S
9010-0402	Packed Column, 2m x 1/8SS Hayesep Q, 80/100mesh	Air, CO, CO2, H2O, Methane, H2S, COS
9010-0502	Packed Column, 2m x 1/8SS, Porapak N, 80/100mesh	Air, CO, CO2, H2O, Methane, H2S, COS
9010-0602	Packed column, 2m x 1/8SS, Hayesep T, 80/100mesh	Air, CO, CO2, H2O, Methane, H2S, COS
9010-1202	Packed Column, 2m x 1/8 Silostel, Porous Si-C, 80/100mesh	H2S, COS, MeSH,
9010-1402	Packed Column, 2m x 1/8 SS, ShimCarbon, 80/100mesh	H2, O2, N2, CO, CO2, Methane

Typical Chromatograms

1. Fixed gases

Column: 8453-3050, GsBP-PLOT MS5A, 30m x 0.53mm x 50um

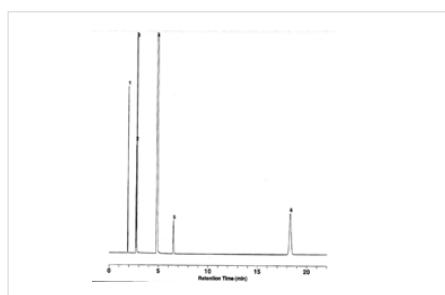
Oven: 35C

Detector: TCD, 150C

Injector: valve injection, 25ul loop, split flow 20:1

Carrier: Helium

Sample: Blend gas: 1. Neon, 2. Argon, 3. Oxygen,
4. Nitrogen, 5. Methane, 6. Carbon monoxide.



2. Helium/Neon Separation:

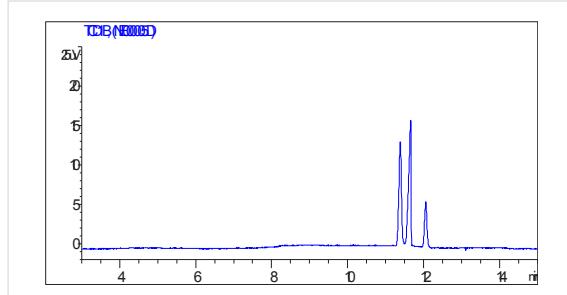
Column: 2x 8453-5050, GsBP-PLOT MS5A,
50m x 0.53mm x 50um

Oven: 35C

Carrier: Nitrogen

Detector: TCD

Sample: Neon, Helium, Hydrogen, % level

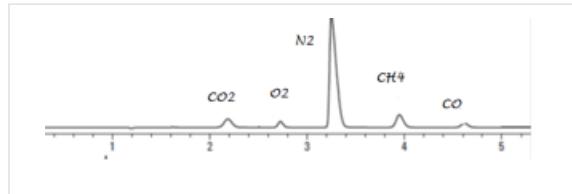


3.CO/CO2

Column: 2 valves, 3 columns, 2m x 1/8 SS,

Porapak Q (CO₂) and MS 5A,

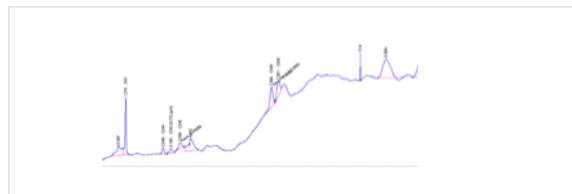
Sample: O₂, N₂, CO.



4.Trace level hydrocarbon impurities in Liquefied O₂

Column: 20ft x 1/8 SS,

Sebaconitrile on Chromsorb P-AW, 80/100mesh



Elution Orders of Permanent Gases

Molesieve 5A/13X	Porapak Q	Porapak T	CarbonSieve
SF6			
Ne	Ne		
H ₂	H ₂		H ₂
He	He		
Ar	O ₂		O ₂
O ₂	N ₂		N ₂
N ₂	Ar		
C ₁	CO		CO
CO	C ₁	C ₁	C ₁
C ₂	CO ₂	CO ₂	CO ₂
Ethylene	Acetylene	Ethylene	Acetylene
N ₂ O	Ethylene	Ethane	Ethylene
	Ethane	Acetylene	Ethane
	H ₂ S	H ₂ S	
	COS	COS	
	Propylene		
	Propane		

Suggestion

Application	Column 1	Column 2
inert gases	GsBP-PLOT MS5A, 50m x 0.53mm x 50um	GsBP-PLOT Q, 50m x 0.53mm x 20um
water gas	Packed column 2m x 1/8 SS MS 5A	Packed Column 2m x 1/8 SS Hayesep Q
Beverage,CO ₂ , benzene, H ₂ S, COS and other impurities a	GsBP-PONA, 100m x 0.25mm x 0.5um	GsBP-Inowax, 60m x 0.32mm x 0.5um
H ₂ , O ₂ , N ₂ , CO	GsBP-PLOT MS5A, 30m x 0.53mm x 25um	GsBP-PLOT Al ₂ O ₃ , 50m x 0.53mm x 15um
HCl, Cl	Packed Column 3m x 1/8 Silostel, GsBP-HCL	GsBP-Select HCL, 30m x 0.53mm
Green House Gases	GsBP-PLOT Q, 30m x 0.53mm x 30um	GsBP-PLOT MS5A, 30m x 0.53mm x 25um
Protection Gas for Insulated transformers, SF6	GsBP-PLOT MS5A, 30m x 0.53mm x 25um	Packed Column 2m x 1/8 SS MS 5A

Natural Gas, Refinery Gases and Butadiene

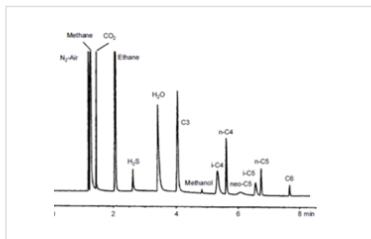
Natural gas, refinery gas and petroleum gas contain C1 to C6+ hydrocarbons with concentration ranges from percentage to ppm levels. These analyses are done by multiple valves switching sample to multiple columns. The core separation column is GsBP-PLOT Al₂O₃ column to generate C1 to C5 baseline separations.

1. Natural gas C1 to C6 by Single column

Column: GsBP-PLOT Q, 30m x 0.53mm x 30um

Oven: 60C (2min) 30C/min to 240C (1min).

Detector: TCD

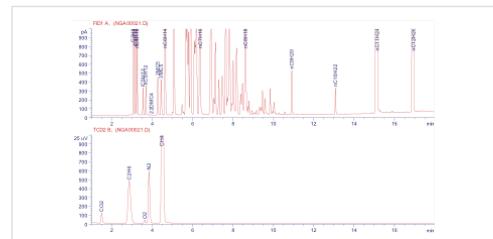


2. Extended Natural Gas C1 to C12

3 valves 4 Columns: GsBP-PONA column,

100m x 0.25mm x 0.5um (C3 to C12 separations).

Cat. No.: 9006-PONA



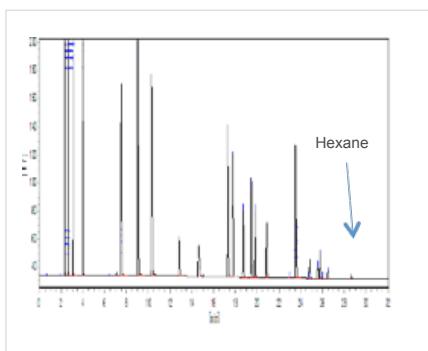
3. Refinery gas and liquefied petroleum gas

Column: GsBP-PLOT Al₂O₃, "S", 50m x 0.53mm x 15um

Cat. No.: 8253-5015

Oven: 60C 4min 7.5C/min to 180C Hold

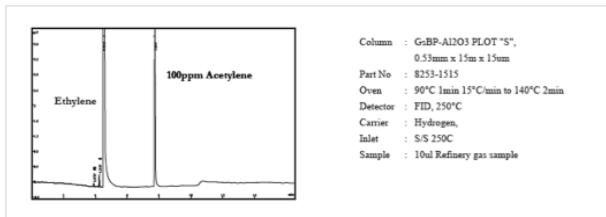
Sample: Refinery gas sample, C1 to C5s and C6



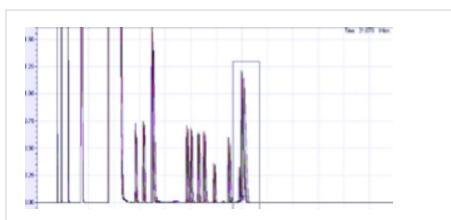
Peak No.	Compound	Peak No.	Compound
1	Methane	13	iso-Butylene
2	Ethane	14	cis-2-Butene
3	Ethylene	15	Iso-Pentane
4	Propane	16	n-Pentane
5	Cyclopropane	17	1,3-Butadiene
6	Propylene	18	Methylacetylene
7	iso-Butane	19	Trans-2-pentene
8	n-Butane	20	2-Methyl-2-butene
9	Propadiene	21	1-Pentene
10	Acetylene	22	cis-2-pentene
11	Trans-2-Butene	23	n-Hexane
12	1-Butene		

4. Olefins

Ethylene with 1000ppm acetylene

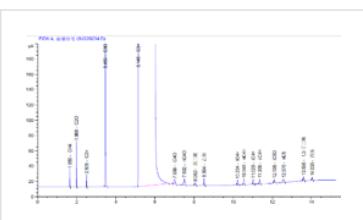


Propylene standard



High purity Propylene

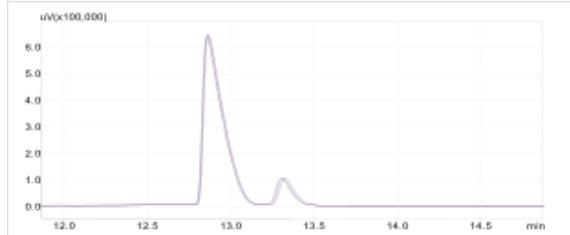
Column: GsBP-PLOT Al₂O₃ "S", 50m x 0.53mm x 15um



1, 3-Butadiene and methyl acetylene

Column: GsBP-PLOT Al₂O₃ "S", 50m x 0.53mm x 15um

Peak: 1,3 Butadiene, Methyl acetylene



5.C5s

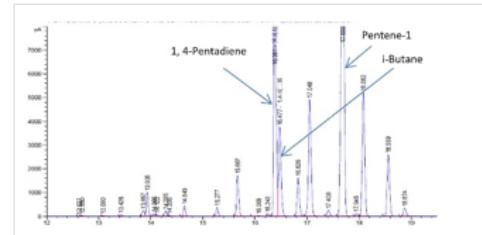
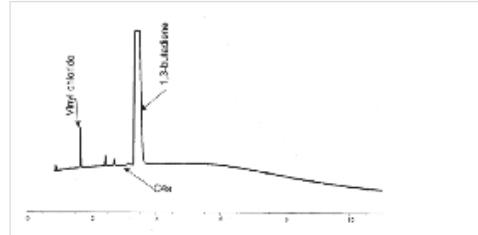
Column: GSBP-PONA, 100.0m×250.0um×0.50um

Oven: 35C (18min) 1C/min to 52C

Vinyl chloride in 1, 3-Butadiene

Column: GsBP-PLOT U, 30m x 0.53mm x 20um

Oven: 100C (5min) 10C/min to 150C (1min)



Acidic Gases

H₂S, SO₂, HCl, Cl₂, CO₂, PH₃, AsH₃ and other gases at ambient temperature are typical acidic gases presented as impurity in many petroleum gas streams, such as natural gas, ethylene/propylene, refinery gas, and liquefied petroleum gas. These applications demand both proper separations and column inertness for acidic analytes. In order to detect trace level impurity, it is necessary to develop proper instrumentation with gas sampling valve, valve switching and sulfur selective detector such as FPD, PFPD, and SCD. 0.53mm ID columns are first considered in order to increase sample size.

Column Selections for Acidic Gases

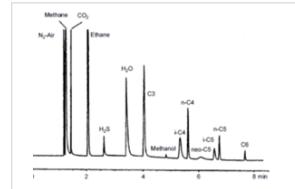
Applications	Column 1	Column 2	Column 3
H ₂ S/COS, MeSH, etc,	GsBP-GasPro, 60m x 0.32mm	Packed Column, Hastelloy Hayesep QS	GsBP-1, 105m x 0.53mm x 5um
HCl, Cl ₂	Packed Column, Hastelloy Hayesep QS	GsBP-GasPro, 60m x 0.32mm	GsBP-Select HCL, 60m x 0.32mm
PH ₃ , AsH ₃	GsBP-SelectPH3, 60m x 0.53mm	GsBP-GasPro, 60m x 0.32mm	GsBP-PLOT Q, 50m x 0.32mm
CO ₂	Packed Column, Hastelloy Hayesep QS		
H ₂ S, COS, and mercaptans in Ethylene/Propylene stream	GsBP-GasPro, 60m x 0.32mm	GsBP-1, 105m x 0.53mm x 5um	

1.Typical Sulfurs Chromatogram

Column: GsBP-GasPro, 30m x 0.32mm

Oven: 60C (2.5min) 10C/min to 250C

Detector: PFPD



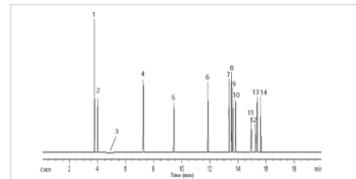
2.CO₂/H₂S

Column: GsBP-PLOT Q, 30m x 0.53m x 30um

Oven: 60C (2min) 30C/min to 240C (1min).

Detector: TCD

Sample: 500ppm H₂S spike in natural gas standard

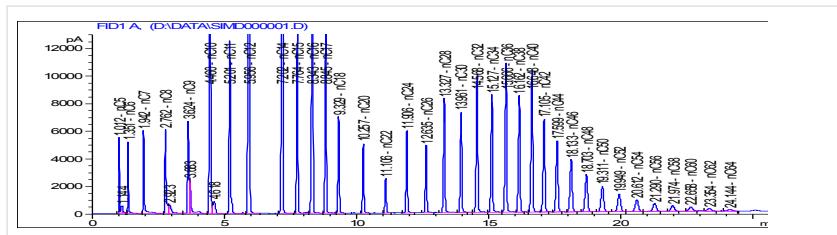


3.Sim-Dis

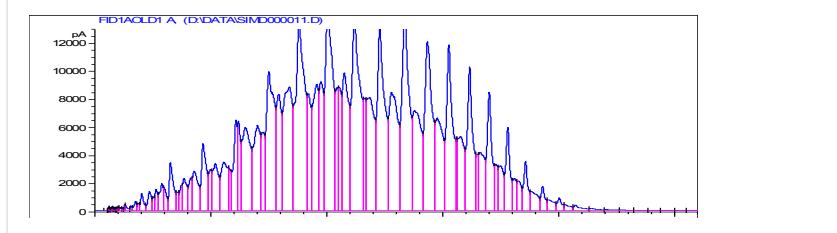
lists wide ranges of Sim-Dis columns from GS-Tek

Application	GsBP-Columns	Boiling Point/Carbon No
D2887	GsBP-SimDis-2887, 5m x 0.53mm x 2.65um	550C/Polywax 500
ED2887	GsBP-SimDis-2887-M, 10m x 0.53mm x 0.5um, metal	Polywax 550/C5 to C70
D2887-HT	GsBP-SimDisHT, 50m x 0.53mm x 0.15um	Polywax 650/ C6 to C110/C120
D2887	GsBP-SimDis, 10m x 0.53mm x 0.88um	Polywax 500
AC-SimDis Analyzer	GsBP-SimDis, 10m x 0.10mm x 0.20um	C5 to C60

D2887, C5 to C70 with 10m x 0.53mm x 0.5um

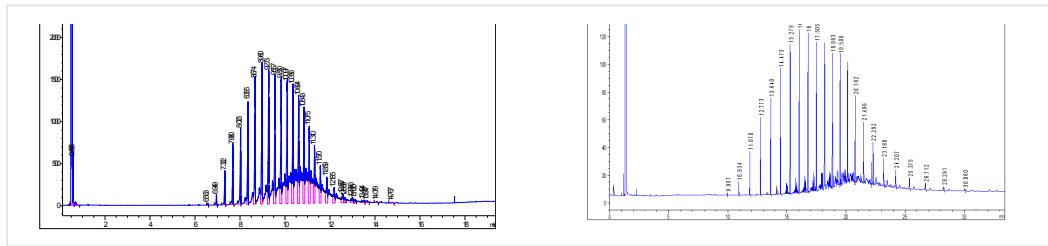


Polywax 550 Standard



Crude oil Sample

4. Petroleum Wax, Pearl, C5 to C60



by GsBP-1, 30m x 0.25mm x 0.25um

by GsBP-1, 10m x 0.10mm x 0.20um

5.DHA, PIONA, FCC and Diesel

GS-Tek offers complete solution for Detailed Hydrocarbon Analysis (DHA) as shown in Table 6.

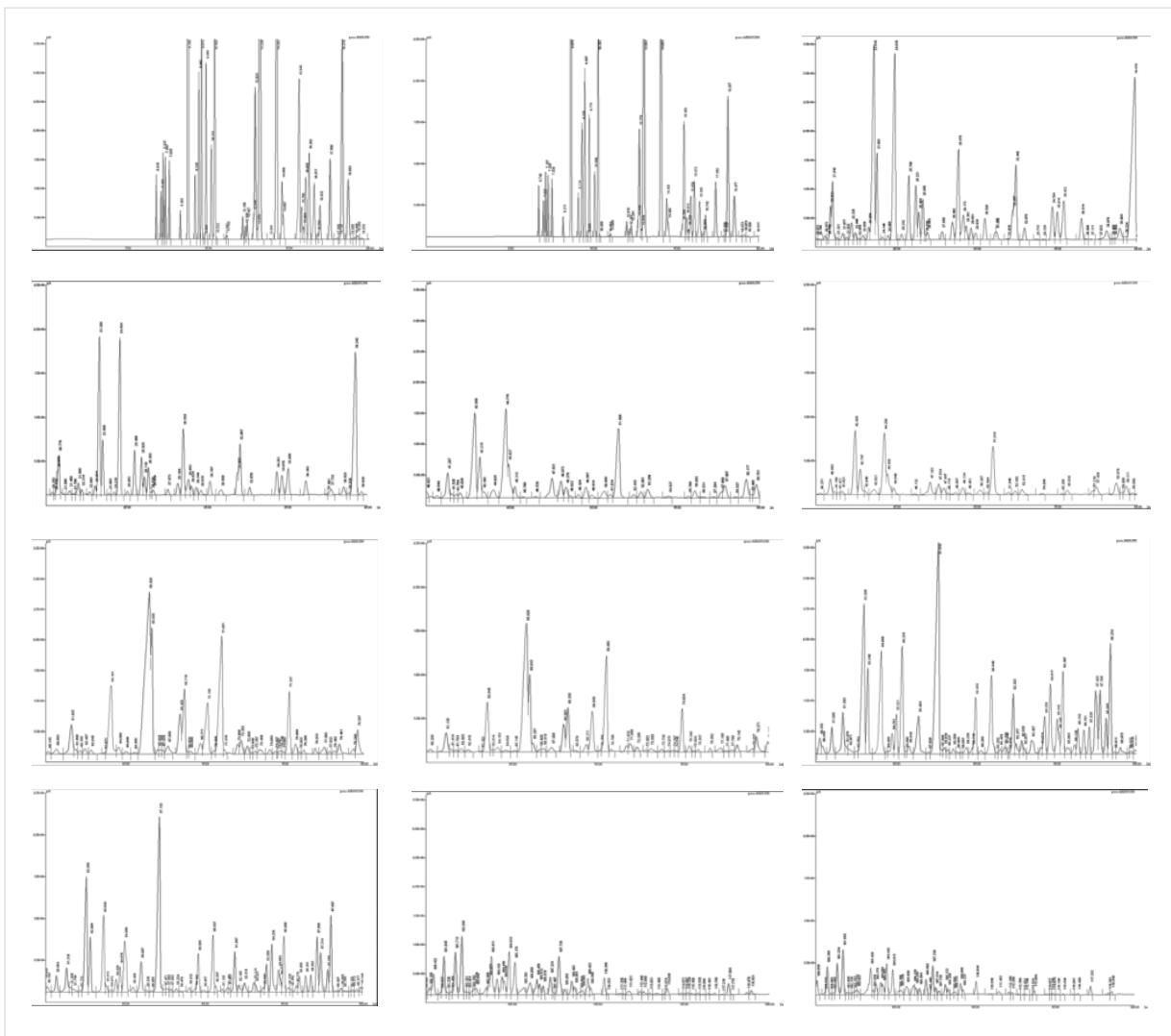
DHA/PIONA

Application	column	Similar to
PIONA	GsBP-PONA, 50m x 0.20mm x 0.5um	HP-PONA 19091S-001

GsBP™ is not just another quality column brand

PIONA	GsBP-PONA, 100m x 0.25mm x 0.5um	CP-PONA, DB-Petro
DHA	GsBP-DHA, 100m x 0.25mm x 0.5um+5m x 0.25mm	Improved Benzene resolution
Diesel	GsBP-1MS, 30m x 0.25mm x 0.25um	
Software	GS-Tek PONA software	
Standards	FCC, Naphtha	

FCC Gasoline

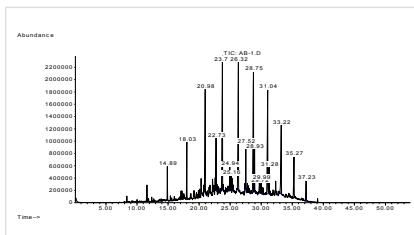


Reports

Column	GSBP-PONA	HP-PONA
No. of Peaks	300	301
RON	87.26	87.15
MON	78.18	78.07
C:H	7.33	7.34
Density	0.8064	0.8062

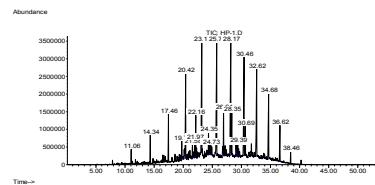
PIONA	Wt%	Wt%
P	3.29	3.28
I	25.81	25.69
O	9.34	9.40
N	15.74	15.72
A	46.02	45.91

Diesel



Peak & retention time, GsBP

C17: 28.75min Pristane: 28.93min
C18: 31.04min Phytane: 31.28min

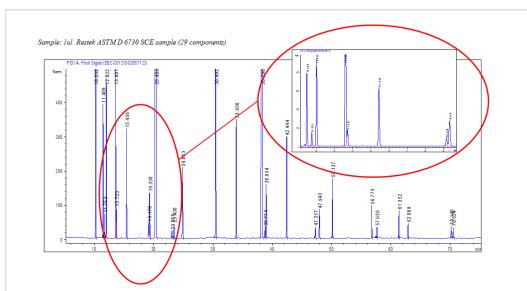


Peak & Retention time, HP

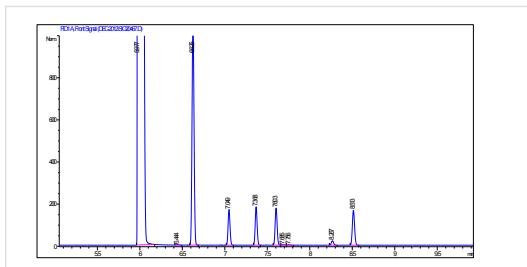
C17: 28.17min Pristane: 28.35min
C18: 30.46min Phytane: 30.69min

DHA ASTMD6730 Samples, 29 components

Column: GsBP-DHA5, 100m x 0.25mm x 0.5um + 5m x 0.25mm



Alcohol, Ether and Benzene



Peak	Component	RetTime
1	Methanol	5.977
2	Tert-butyl alcohol	6.444
3	Methyl tert-butyl ether(MTBE)	7.049
4	Ethyl tert-butyl ether (ETBE)	7.368
5	Tertiary amyl methyl ether(TAME)	7.603
6	Benzene	8.267
7	Diisopropyl ether	8.513

Column: GsBP-DHA5, 100m x 0.25mm x 0.5um + 5m x 0.25mm

6.Aromatics

GS-Tek offers very good columns for petrochemical aromatics applications with improved separations to other brand products. Table 7 lists popular GsBP™ columns.

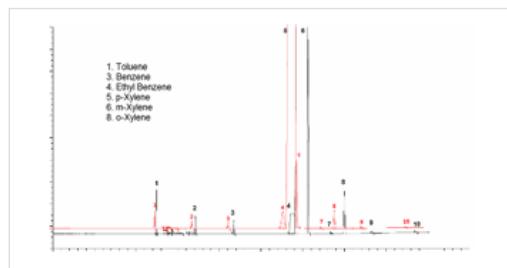
Aromatics columns

Applications	Column	Similar to Agilent Column
Xylene	GsBP-Inowax, 60m x 0.32mm x 0.5um	HP-Innowax, 19091N-216
Toluene, Benzene, ethyl benzene	GsBP-Inowax, 60m x 0.32mm x 0.5um, or GsBP-Inowax, 60m x 0.32mm x 0.25um	HP-Innowax, 19091N-216 HP-Innowax, 19091N-116
Aromatics	GsBP-Inowax, 60m x 0.25mm x 0.25um or GsBP-Inowax, 60m x 0.25mm x 0.5um	H P-Innowax, 19091N-136 HP-Innowax, 19091N-236
Butylbenzene	GsBP-SelectBuBenzene, 60m x 0.24mm x 0.2um	

Chromatogram, p-Xylene

Column: GsBP-Inowax, 60m x 0.32mm x 0.5um

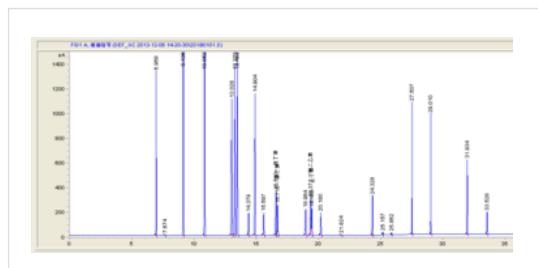
Oven: 90C (16min) 10C/min to 136C (2min)



Butyl benzene

Column: GsBP-Bubenzene, 60m x 0.24mm x 0.2um

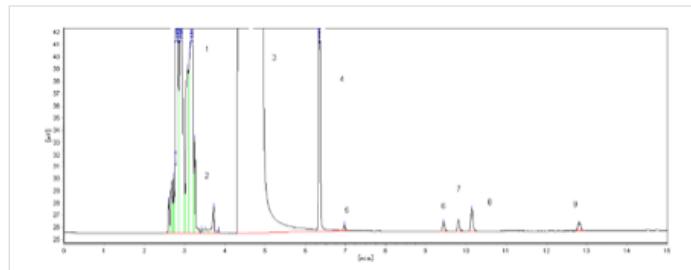
Oven: 80C (5min) 3.5C/min to 132C 10C/min to 200C (10min)



High purity Benzene

Column: GsBP-Inowax, 60m x 0.32mm x 0.25um

Oven: 50C (5min) 10C/min to 200C (2min)



7. Acrylates, nitrile, ethylene and propylene oxides

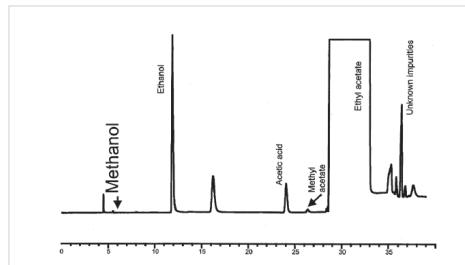
The separations of interesting impurities in acrylates or alkane oxides are always challenging, for example, aldehydes, ketones, acids and esters, and alcohols in propylene oxides. Also, column inertness should be closely matched as much as possible to the interesting analysts. One example is acetonitrile, the impurity of acrylate acid requires column close to acidic, but acetonitrile that exhibits slight basic demands column close to basic.

GsBP™ columns can meet these difficult requirements. The following demonstrate GsBP™ columns performance for these applications.

1.Acrylates

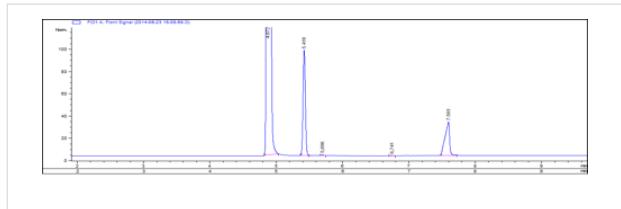
Column: GsBP-PLOT U, 30m x 0.53mm x 20um

Oven: 100C (15min) 10C/min to 190C (5min)



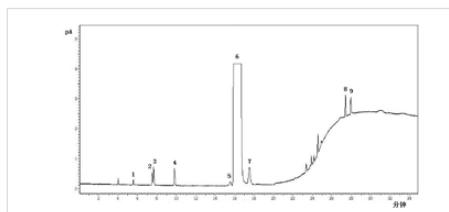
Acrylic acid

Column: GsBP-5, 60m x 0.32mm x 1.0um
 Oven: 50C (4min) 10C/min to 200C (hold)
 Peak: 1. Methanol, 2. Acetonitrile, 3. Acrolein,
 4. Acrylonitrile, 5. Acrylic acid



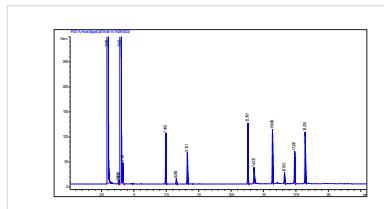
Propylene oxides

Column: GsBP-PrOxides, 60m x 0.32mm
 Oven: 30C (20min) 25C/min to 150C (10min)
 Peak ID: 1. Propylene, 2. Acetaldehyde, 3. Methanol,
 4. Ethylene oxide, 5. Acrolein, 6. Propylene oxides,
 7. Furan, 8. 1,2-dichloropropane, 9. 1,2- propylene glycol.



Volatile Amines:

Column: GsBP-Amine, 30m x 0.32mm
 Oven: 100C 4min 8C/min to 200C (1min)
 Peak: 1. Pyridine, 2. 1,2-Butanediol, 3. Decane,
 4. Nonanol, 5. Diethylenetriamine, 6. Dodecane,
 7. Diethanolamine, 8. 2,6-Dimethylaniline

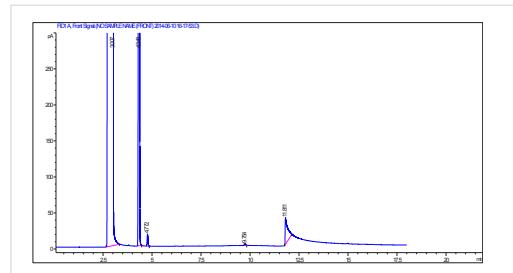


Columns for acrylates, oxides, and esters

Applications	Column 1	Column 2
Acrylic acids	GsBP-FFAP, 30m x 0.53mm x 1.0um	GsBP-1, 30m x 0.32mm x 1.0um
Acrylate impurities	GsBP-624, 30m x 0.53mm x 3.0um	GsBP-1701, 30m x 0.32mm x 1.0um
Ester	GsBP-1, 30m x 0.53mm x 3.0um	GsBP-624, 30m x 0.53mm x 3.0um
Ethylene oxide	GsBP-Inowax, 30m x 0.53mm x 1.0um	GsBP-1, 30m x 0.53mm x 1.0um
Oxides residues	GsBP-1, 30m x 0.32mm x 3um	

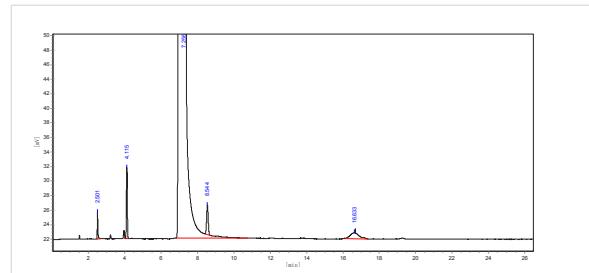
8.Solvents

Impurities in Acetonitrile



Column: GsBP-624, 30m x 0.25mm x 1.4um
 Oven: 40C (4min) 10C/min to 200C
 Peak: 1. Methanol, 2. Acetonitrile, 3.
 4. Acrylonitrile, 5. Acrylic acid

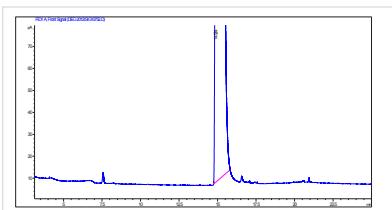
Isopropyl Alcohol



Column: GsBP-624, 30m x 0.32mm x 1.8um
 Oven: 40C
 Peak: 1. Methanol, 2. Acetone, 3. Isopropyl Alcohol,
 4. Ethyl acetate 5. Butyl acetate

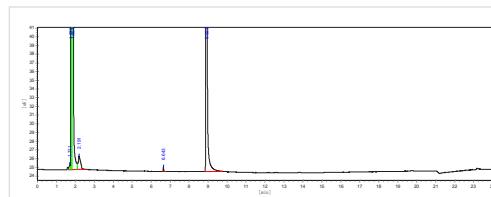
Acetic acid

Column: GsBP-FFAP, 30m x 0.53mm x 1.0um
Oven: 40C (4min) 10C/min to 200C (5min)



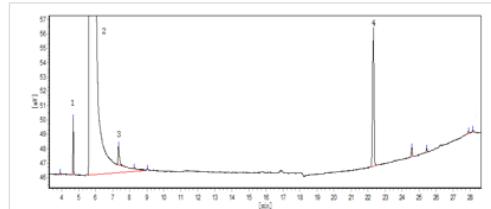
Ethylene Glycol in water/Ethanol

Column: GsBP-Inowax, 30m x 0.53mm x 1.0um
Oven: 80C (1min) 10C/min to 250C (1min)



Low level ethanol in Methanol

Column: GsBP-Methanol, 100m x 0.32mm
Oven: 50C (10min) 10C/min to 200C
Peak ID: 2. Methanol, 3. ethanol



Conclusion:

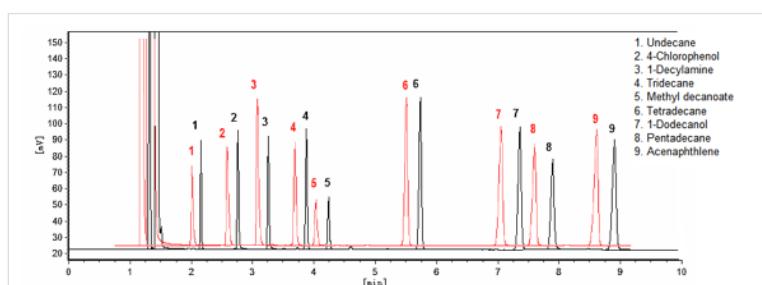
Above applications have demonstrated that GsBP™ GC columns have produced very good separations for most petroleum and petrochemical applications and help you to provide quality products to your customers.
GS-Tek hope you will soon experience Quality and Performance of GsBP™ column for your applications.

GsBP™ GC Column Quality Practices

Each GsBP™ column is gone extensive quality and performance tests to ensure high quality and performances with internal specifications. The following are comparisons of GsBP standard test to JW columns.

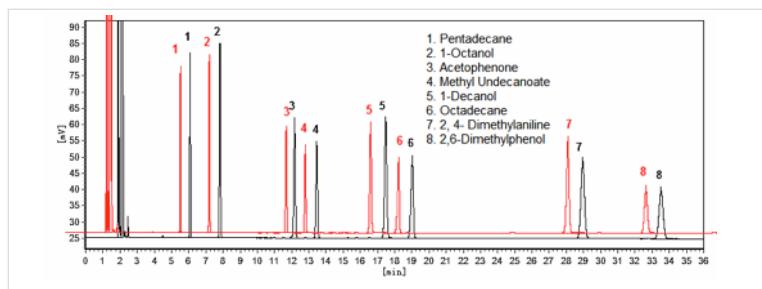
GsBP-5 Columns

Columns: GsBP-5, 30m x 0.25mm x 0.25um (0532-3002) (Red) vs HP-5, 30m x 0.25mm x 0.25um (19091J-433) (Black)



GsBP-Inowax Columns

Columns: GsBP-Inowax (Red) 30m x 0.25mm x 0.25um (2025-3002) vs HP-INNowax (Black), 30m x 0.25mm x 0.25um (19091N-113)



Acknowledgement:

GS-Tek special thanks the following customers for their evaluation feedbacks:

Huixing Wang, Senior Engineer of Quality Inspection Center, Sinopec Zhenhai Refining & Chemical Company, Zhejiang, China

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Naizhong Zou, Beijing Chrom Institute, PIONA Analysis, Beijing, China

Zhihong Lin, Application Manager of Fuli Analytical Instrument Co.,Ltd, Zhejiang, China

GC column Specified in ASTM Methods for Most Petroleum and Petrochemical Analyses

Method	Sample	Column	Description
D1945	Natural Gas	8453-1550	GsBP-PLOT MS5A, 15m X 0.53mm X 50um
		8653-1530	GsBP-PLOT Q, 15m X 0.53mm X 30um
D1946	Reformed Gas	8453-1550	GsBP-PLOT MS5A, 15m X 0.53mm X 50um
		8653-1530	GsBP-PLOT Q, 15m X 0.53mm X 30um
D2163	Liquefied Petroleum Gas And Propene Concentrates	8153-3015	GsBP-PLOT Al2O3, KCL, 30m X 0.53mm X15um
		8253-3015	GsBP-PLOT Al2O3,"S", 30m X 0.53mm X15um
D2306	C8 Aromatics	2032-6002	GsBP-Inowax, 60m X 0.32mm X 0.25um
D2360	Trace Impurities In Monocyclic Aromatic Hydrocarbons And Total Aromatic Determination	2032-6002	GsBP-Inowax, 60m X 0.32mm X 0.25um
D2426	Butadiene Dimer And Styrene In Butadiene Concentrates	0153-3015	GsBP-1, 30m X 0.53mm X 1.5um
D2427	Determination Of C2 Through C5 Hydrocarbons In Gasoline	8153-3015	GsBP-PLOT Al2O3, KCL, 30m X 0.53mm X15um
		8253-3015	GsBP-PLOT Al2O3,"S", 30m X 0.53mm X15um
D2504	Noncondensable Gases In C2 And Lighter Hydrocarbons	8453-3050	GsBP-PLOT MS5A, 30m X 0.53mm X 50um
D2505	Other Hydrocarbons, And Carbon Dioxide In High-Purity Ethylene	8353-5015	GsBP-PLOT Al2O3,"M", 50m X 0.53mm X15um
		0153-3050	GsBP-1, 30m X 0.53mm X 5.0um
D2593	Butadiene Purity And Hydrocarbon Impurities	8253-5015	GsBP-PLOT Al2O3,"S", 50m X 0.53mm X15um
D2712	Hydrocarbon Traces In Propylene Conetrates	8253-5015	GsBP-PLOT Al2O3,"S", 50m X 0.53mm X15um
D2804	Purity Of Methyl Ethyl Ketone (MEK)	2053-3010	GsBP-Inowax, 30m X 0.53mm X 1.0um
D2887	Boiling Range Distribution Of Petroleum	0153-1026	GsBP-1, 10m X 0.53mm X 2.65um
	Extended Boiling Range Distribution Of Petroleum	0153-0508	GsBP-1, 5m X 0.53mm X 0.88um
D3054	Impurities In Cyclohexane	0132-5005	GsBP-1, 50m X 0.32mm X 0.52um
D3329	Purity Of Methyl Isobutyl Ketone	2053-6010	GsBP-Inowax, 60m X 0.53mm X 1.0um
D3524	Diesel Fuel Diluent Used In Diesel Engine Oil	0153-1008	GsBP-1, 10m X 0.53mm X 0.88um
D3710	Boiling Range Distribution Of Gasoline And Gasoline Fractions	0153-0750	GsBP-1, 7.5m X 0.53mm X 5.0um
D3760	Analysis Of Isopropylbenzene (Cumene)	2032-6002	GsBP-Inowax, 60m X 0.32mm X 0.25um
		0132-6005	GsBP-1, 50m X 0.32mm X 0.5um
D3797	Analysis Of O-Xylene	2032-6005	GsBP-Inowax, 60m X 0.32mm X 0.5um
D3798	Analysis Of P-Xylene	2032-6005	GsBP-Inowax, 60m X 0.32mm X 0.5um
D4415	Determination Of Dimer In Acrylic Acid	2132-3002	GsBP-FFAP, 30m X 0.32mm X 0.25um
D4424	Butylene Analysis	8253-5015	GsBP-PLOT Al2O3,"S", 50m X 0.53mm X15um

D4492	Analysis Of Benzene	2032-6002	GsBP-Inowax, 60m X 0.32mm X 0.25um
D4735	Trace Thiophene In Refined Benzene	2153-3010	GsBP-FFAP, 30m X 0.53mm X 1.0um
D4815	MTBE, ETBE, TAME, DIPE, Tert- Amyl Alcohol, C1-C4 Alcohols In Gasoline	0153-3050-	GsBP-1, 30m X 0.53mm X 5.0um
		D4815-2	Packed Column, 2m X 1/8 SS, 25% TCEP On Chromsorb P-AW 80/100mesh
D4864	Traces Of Methanol In Propylene	0553-1515	GsBP-5, 15m X 0.53mm X 1.5um
D5008	Ethyl Methyl Pentanol Content And Purity Of 2-Ethylhexanol	0153-1050	GsBP-1, 10m X 0.53mm X 5.0um
		2032-3002	GsBP-Inowax, 30m X 0.32mm X 0.25um
D5060	Impurities In High-Purity Ethylbenzene	2032-6005	GsBP-Inowax, 60m X 0.32mm X 0.5um
D5134	Impurities In High-Purity Ethylbenzene	9002-PONA	GsBP-PONA, 50m X 0.20mm X 0.5um
D5135	Styrene Analysis	2032-6005	GsBP-Inowax, 60m X 0.32mm X 0.5um
D5274	1,3-Butadiene Analysis	8253-5015	GsBP-PLOT Al2O3,"S", 50m X 0.53mm X15um
D5310	Tar Acid Composition	6620-2502	GsBP-5, 25m X 0.20mm X 0.20um
D5399	Boiling Point Distribution Of Hydrocarbon Solvents	0153-1030	GsBP-5, 10m X 0.53mm X 3.0um
D5441	Analysis Of Methyl T-Butyl Ether (MTBE)	9006-PONA	GsBP-PONA, 100m X 0.25mm X 0.5um
		9002-PONA	GsBP-PONA, 50m X 0.20mm X 0.5um
D5442	Analysis Of Petroleum Waxes	1125-3002	GsBP-1MS, 30m X 0.25mm X 0.25um
		0525-1502	GsBP-5, 15m X 0.25mm X 0.25um
D5480	Engine Oil Volatility By GC	0153-6050	GsBP-1, 60m X 0.53mm X 5.0um
D5501	Ethanol Content Of Denatured Fuel Ethanol	9006-PONA	GsBP-PONA, 100m X 0.25mm X 0.5um
D5599	Oxygenates In Gasoline By GC And Oxygen Selective Flame Ionization Detector	0125-6010	GsBP-1, 60m X 0.25mm X 1.0um
D5623	Sulfur Compounds In Light Petroleum Liquids By GC And Sulfur Selective Detection	0132-3040	GsBP-1, 30m X 0.32mm X 4um
D5713	Analysis Of High-Purity Benzene For Cyclohexane Feedstock By Capillary GC	9002-PONA	GsBP-PONA, 50m X 0.20mm X 0.5um
D5769	Determination Of Benzene, Toluene And Total Aromatics In Finished Gasoline By GC/MS	1125-6010	GsBP-1MS, 60m X 0.25mm X 1.0um
		0132-6050	GsBP-1, 60m X 0.32mm X 5.0um
D5917	Trace Impurities In Monocyclic Aromatic Hydrocarbons By GC And External Calibration	2032-6002	GsBP-Inowax, 60m X 0.32mm X 0.25um
D6144	Alpha-Methylstyrene By Capillary GC	1125-6010	GsBP-1MS, 60m X 0.25mm X 1.0um
D6159	Hydrocarbon Impurities In Ethylene	8353-5015	GsBP-PLOT Al2O3,"M", 50m X 0.53mm X15um
		0153-3050	GsBP-1, 30m X 0.53mm X 5.0um

Consumables for most Petroleum and Petrochemical Applications

Ferrule

Cat. No.	Description	Cross-Reference P/N
C0211164	0.4 Mm ID Graphite Ferrule For Agilent GC Inlet (10pk)	5181-3322
C0211165	0.5 Mm ID Graphite Ferrule For Agilent GC Inlet (10pk)	5080-8853
C0211168	0.8 Mm ID Graphite Ferrule For Agilent GC Inlet (10pk)	500-2118
C0211104	1/16" To 0.4 Mm Graphite Ferrule (10pk)	
C0211105	1/16" To 0.5 Mm Graphite Ferrule (10pk)	
C0211108	1/16" To 0.8 Mm Graphite Ferrule (10pk)	
C0213104	1/16" To 0.4 Mm V/G Ferrule (10pk)	5062-3508
C0213105	1/16" To 0.5 Mm V/G Ferrule (10pk)	5062-3506
C02131XX	1/16" Blank V/G Ferrule (10pk)	5181-3308
CSG073220	SILTITE FERRULE 0.25 COL PK10	5188-5361
CSG073221	SILTITE FERRULE 0.32 COL PK10	5188-5362
CSG073222	SILTITE FERRULE 0.53 COL PK10	5188-5363
CSG073223	SILTITE FERRULE 1/16" PK10	

9010-0020	Column Nut 2/PK	5181-8830
9010-0030	Column Nut For MS Interface	05988-20066
9010-0040	Column Wrench 2/Pk 1/4 And 5/16	8710-0510
9010-0050	Column Cage, 2/Pk, 150mm Diameter	
9010-0060	Column Cutter 5/Pk	

Inlet Septa

Cat. No.	Description	Cross-Reference P/N
C0298718	Septa BTO 11 Mm (7/16") Centerguide (100pk)	5183-4547-100
C0246228	Septa Ag3 11 Mm (7/16") Centerguide (100pk)	5183-4759-100
C0298787	Septa BTO 5 Mm Centerguide (50pk)	5183-4758

Inlet Liner

Cat. No.	Description	Cross-Reference P/N
CSG092001	LINER Agilent 4mm ID QW PKT5	5190-3164
CSG092002	LINER Agilent 4mm ID FOCUS PKT5	210-4004-5
CSG092003	LINER Agilent 4mm ID TAPFOCUS PKT5	210-4022-5
CSG092004	LINER Agilent QTZ 2mm ID STRGT PKT5	5183-4707
CSG092005	LINER Agilent 2.3mm ID FOCUS PKT5	
CSG092007	LINER Agilent 4mm ID STRGT PKT5	5183-4691
CSG092010	LINER Agilent 4mm ID GN QW PKT5	
CSG092011	LINER Agilent 4mm ID TAPFOCUS PKT25	
CSG092013	LINER Agilent 2mm ID GN PKT5	
CSG092016	LINER Agilent 1.2mm ID STRGT PKT5	5183-4709
CSG092017	LINER Agilent 4mm ID TAPER PKT5	5183-4701
CSG092018	LINER Agilent 4mm ID DBLTAP PKT5	5183-4705
CSG092019	LINER Agilent 4mm ID TAPER QW PKT 5	5183-4693
CSG092111	LINER Agilent 2.3mm IDFOCUS PKT5	210-4022-5
CSG092234	Agilent LINER PACKED COL PKT5	5183-4691
CSG092246	LINER AGILENT PTV STRGT PKT 5	5183-2037
CSG092243	LINER GE LVI PKT5	5190-1426
CSG092210	LINER AC PTV INJ PKT5 (UNTRD)	
CSG0726005	GRAPHITE O-RING 6.35MM PKT10	5180-4173
C0216973	Viton O-Rings for Agilent Capillary Inj. Liners (12pk)	5188-5365
C0486310	Glass Wool Inserter	
C0486313	Glass Wool Puller	
C0486315	Glass Wool (50 g)	

Inlet gold plate seal

Cat. No.	Description	Cross-Reference P/N
COV4300	0.8mm Inlet Seal, Gold-plated, For Agilent Systems, Splitless, w/GP Washers, 2/pk	5188-5367
COV4300-10	0.8mm Inlet Seal, Gold-plated, For Agilent Systems, Splitless, w/GP Washers, 10/pk	5190-2209
COV4400	0.8mm Inlet Seal, Gold-plated, For Agilent, Split Double Groove w/GP Washers, 2/pk	5182-9652
COV4400-10	0.8mm Inlet Seal, Gold-plated, For Agilent, Split Double Groove w/GP Washers, 10/pk	
COV4850	Replacement Stainless Steel Washers for Inlet Seal, 12/pk	18740-20880

Jet

Cat. No.	Description	For
g1531-80560	Jet, Capillary Optimized, 0.29mm ID	6890/7890
19244-80560	Jet, Adaptable, capillary, 0.29mm ID	6890/7890
g1531-80620	Jet, Cap Optimized, high temp, 0.47mm ID	SimDIs
19244-80620	Jet, Adapt, high temp capillary, 0.47mm ID	SimDIs

Gas Purifier

Cat. No.	Description	Cross-Reference P/N
C0202232-B	Zpure Hc Purifier, 1/8" Brass Fittings	Ht-200-2
C0202232xl-B	Zpure XI Hc Purifier - 1/8"	Bht-2
C0202230-B	Zpure H2o Purifier, 1/8" Brass Fittings	Mt200-2
C0202230xl-B	Zpure XI H2o Purifier - 1/8"	Bmt-2
C0202234-B	Zpure Glass Moisture Trap, 1/8", Brass	Mt200-2-S
C0202256-B	Zpure Glass H2o/Hc Purifier 1/8"	Hmt200-2
C0202216-B	Zpure O2 Purifier, 1/8" Brass Fittings	Bot-2
C0202236-B	Zpure Glass Indicating Oxygen Trap, 1/8" Brass	lot-2-Hp
C0202206-B	Zpure Dual Purifier, 1/8" Brass Fittings	Ot3-2

Vial

Cat. No.	Description	Volume
CAG5182-0553	Screw cap and clear vial kit 100/PK	2ml
CAG5182-0558	AsmKit AmbWrt Vial GrnCap PTFE/Si 100/pk	2ml
C0123135	1.8 mL Amber Screw Top Combo Pack w/ Preassem Caps (100pk)	2ml
C0123225	1.8 mL Clear Screw Top Std. Mouth Vial Combo Pack (100pk)	2ml
C05A11C0	6.4V Electronic Crimper Tool 11mm	2ml
C05A11D0	6.4V Electronic Decapper Tool 11mm	2ml

Syringes for Agilent Auto sampler

Cat. No.	Description	Volume	Cross-Reference P/N
CSG000400	0.5BR-AG-0.47 0.5UL SYRINGE	0.5ul	
CSG000410	0.5BR-AG-0.63 0.5UL SYRINGE	0.5ul	G4513-80229
CSG000415	0.5BR-AG-0.63/0.47 0.5UL SYRINGE	0.5ul	
CSG000610	1BR-AG-0.63 1UL SYRINGE	1ul	
CSG001804	SK-5F-AG-0.47 5UL 6PK SYRINGE	5ul	9301-0891
CSG001814	SK-5F-AG-0.63 5UL 6PK SYRINGE	5ul	9301-0892
CSG001822	SK-5F-AG-63/47 5UL 6PK SYRINGE	5ul	5181-8810
CSG002804	SK-10F-AG-47 10UL 6PK SYRINGE	10ul	G4513-80211
CSG002814	SK-10F-AG-63 10UL 6PK SYRINGE	10ul	9301-0725
CSG002822	SK-10F-AG6347 10UL 6PK SYRINGE	10ul	5181-3360
CSG002827	SK-10F-AG-GT-63/47 6PK SYRINGE	10ul	5181-3354
CSG003668	25F-AG-GT-0.63/0.47 25UL SYRINGE	25ul	G4513-80241
CSG004668	50F-AG-GT-0.63/0.47 50UL SYRINGE	50ul	G4513-80244
CSG005668	100F-AG-GT-0.63/0.47 100UL SYRINGE	100ul	G4513-80243

Syringes for CTC Auto sampler

Cat. No.	Description	Volume
CSG000490	0.5BNR-C/T-5/0.47C 0.5UL SYRINGE	0.5ul
CSG000492	0.5BNR-C/T-5/0.63C 0.5UL SYRINGE	0.5ul
CSG002986	SK-10F-C/T-5/0.47C 6PK SYRINGE	10ul
CSG003770	25R-CTC-GT-MS1 25UL DIAMOND MS SYRINGE	25ul
CSG003987	25F-C/T-GT-0.63C 25UL SYRINGE	25ul
CSG003988	25R-C/T-GT-0.47H 25UL SYRINGE	25ul
CSG004770	50R-CTC-GT-MS1 50UL DIAMOND MS SYRINGE	50ul
CSG005770	100R-CTC-GT-MS1 100UL DIAMOND MS SYRINGE	100ul
CSG005335	100F-C/T-GT-0.63C 100UL SYRINGE	100ul

Manual syringes

Cat. No.	Description	Volume
CSG000300	0.5BNR-5 0.5UL SYRINGE	0.5ul
CSG000310	0.5BR-7 0.5UL SYRINGE	0.5ul
CSG000500	1BR-5 1UL SYRINGE	1ul
CSG000501	1BR-5BV 1UL SYRINGE	1ul
CSG000505	1BR-7 1UL SYRINGE	1ul
CSG000506	1BR-7BV 1UL SYRINGE	1ul
CSG000800	5BR-5 5UL SYRINGE	5ul
CSG000801	5BR-5BV 5UL SYRINGE	5ul
CSG000802	5BR-7 5UL SYRINGE	5ul
CSG000803	5BR-7BV 5UL SYRINGE	5ul
CSG002030	SK-10F 10UL 6PK SYRINGE	10ul
CSG002202	SK-10F-GT 10UL 6PK SYRINGE	10ul
CSG003000	25F 25UL SYRINGE	25ul
CSG003050	25R 25UL SYRINGE	25ul
CSG003200	25F-GT 25UL SYRINGE	25ul
CSG003250	25R-GT 25UL SYRINGE	25ul
CSG004000	50F 50UL SYRINGE	50ul
CSG004050	50R 50UL SYRINGE	50ul
CSG004200	50F-GT 50UL SYRINGE	50ul
CSG004250	50R-GT 50UL SYRINGE	50ul
CSG005000	100F 100UL SYRINGE	100ul
CSG005050	100R 100UL SYRINGE	100ul
CSG005055	100R-7 100UL SYRINGE	100ul
CSG005200	100F-GT 100UL SYRINGE	100ul
CSG005250	100R-GT 100UL SYRINGE	100ul
CSG006000	250F 250UL SYRINGE	250ul
CSG006050	250R 250UL SYRINGE	250ul
CSG006200	250F-GT 250UL SYRINGE	250ul
CSG006250	250R-GT 250UL SYRINGE	250ul
CSG007000	500F 500UL SYRINGE	500ul
CSG007050	500R 500UL SYRINGE	500ul
CSG007200	500F-GT 500UL SYRINGE	500ul
CSG007250	500R-GT 500UL SYRINGE	500ul
CSG008020	1MF-LT-GT 1ML SYRINGE	1ml

CSG008100	1MR-GT 1ML SYRINGE	1ml
CSG008420	2.5MDF-LT-GT 2.5ML SYRINGE	2.5ml
CSG008425	2.5MDF-LL-GT 2.5ML SYRINGE	2.5ml
CSG008500	2.5MDR-GT 2.5ML SYRINGE	2.5ml
CSG008502	2.5MDF-GT 2.5ML SYRINGE	2.5ml
CSG008700	5MDR-GT 5ML SYRINGE	5ml
CSG008760	5MDR-LL-GT 5ML SYRINGE	5ml
CSG008762	5MDF-LL-GT 5ML SYRINGE	5ml
CSG008900	10MDR-GT 10ML SYRINGE	10ml
CSG008960	10MDR-LL-GT 10ML SYRINGE	10ml
CSG008962	10MDF-LL-GT 10ML SYRINGE	10ml
CSG009462	25MDR-LL-GT 25ML SYRINGE	25ml
CSG009463	25MDF-LL-GT 25ML SYRINGE	25ml

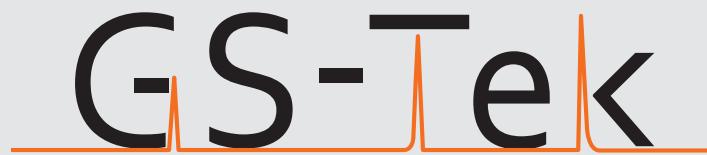
Swagelok Fitting

Cat. No.	Description
SS-100-6	1/16" Stainless Steel Union 2/pk
SS-100-3	1/16" Stainless Steel Tee, 2/pk
SS-100-4	SS Swagelok Tube Fitting, Union Cross, 1/16 in. Tube OD 2/pk
SS-100-set-10	SS Ferrule Set (1 Front Ferrule/1 Back Ferrule) for 1/16 in. Swagelok Tube Fitting, 10/set
SS-200-6	1/8" Stainless Steel Union, 10/pk
SS-200-6-1	1/8" X 1/16" Stainless Steel Reducing Union, 5/pk
SS-200-R-4	1/8" X 1/4" Stainless Steel Tube Reducer, 5/pk
SS-200-P	1/8" Stainless Steel Plug, 10/pk
SS-200-3	1/8" Stainless Steel Tee, 2/pk
SS-200-4	SS Swagelok Tube Fitting, Union Cross, 1/8 in. Tube OD, 2/pk
SS-400-6	1/4" Stainless Steel Union, 10/pk
SS-400-6-1	1/4" X 1/16" Stainless Steel Reducing Union, 5/pk
SS-400-6-2	1/4" X 1/8" Stainless Steel Reducing Union, 5/pk
SS-400-P	1/4" Stainless Steel Plug, 10/pk
SS-400-3	1/4" Stainless Steel Tee, 2/pk
SS-400-4	SS Swagelok Tube Fitting, Union Cross, 1/4 in. Tube OD 2/pk

Valco Sampling Valves

Cat. No.	Description
4C4UWE	Valco Gas Sampling Valve, 4 port 2-pos valve, manual/4"so 1/16*.75mm, 225C/400psi gas, N60/E
4C6UWE	Valco Gas Sampling Valve, 6 port 2-pos valve, manual/4"so 1/16*.75mm, 225C/400psi gas, N60/E
4C8UWE	Valco Gas Sampling Valve, 8 port 2-pos valve, manual/4"so 1/16*.75mm, 225C/400psi gas, N60/E
4C10UWE	Valco Gas Sampling Valve, 10 port 2-pos valve, manual/4"so 1/16*.75mm, 225C/400psi gas, N60/E
A44UWE	Valco Gas Sampling Valve4 port 2-pos valve, air actuated/4"so, 1/8*.75mm, 225C/400psi gas, N60/E
A46UWE	Valco Gas Sampling Valve6 port 2-pos valve, air actuated/4"so, 1/8*.75mm, 225C/400psi gas, N60/E
A48UWE	Valco Gas Sampling Valve8 port 2-pos valve, air actuated/4"so, 1/8*.75mm, 225C/400psi gas, N60/E
A4C10UWE	Valco Gas Sampling Valve10 port 2-pos valve, air actuated/4"so, 1/16*.75mm, 225C/400psi gas, N60/E
2I4UWE.2	Liquid Sampling Valve, 4 port 2-pos int vol valve, manual/2"so 1/8*.75mm, 175C/1000psi liq, .2ul, N60/E
2I4UWE.5	Liquid Sampling Valve, 4 port 2-pos int vol valve, manual/2"so 1/8*.75mm, 175C/1000psi liq, .5ul, N60/E
2I4UWE1	Liquid Sampling Valve, 4 port 2-pos int vol valve, manual/2"so 1/8*.75mm, 175C/1000psi liq, 1ul, N60/E
2I4UWE2	Liquid Sampling Valve, 4 port 2-pos int vol valve, manual/2"so 1/8*.75mm, 175C/1000psi liq, 2ul, N60/E

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