



# **Biodiesel** Analysis Toolkit

## **Sample Preparation, Methods and Analysis**



AUSTRALIA & PACIFIC REGION

EUROPE

JAPAN

USA

# Introduction

Biodiesel is taking its place as one of the new cleaner and greener solutions required to meet the world's growing energy needs. New feedstocks, production techniques and applications are continuing to drive the production capabilities of Biodiesel to meet consumer demand, and this is therefore increasing the analysis required by Biodiesel producers.

SGE is pleased to take our part in supporting the drive towards a sustainable future and we are available to assist you achieve your analytical requirements.

This guide has been created as a resource for Biodiesel analysis. Inside you will find method information, products and solutions designed to ensure you can effectively and reliably complete fuels testing according to either ASTM International or European National (EN) methods. The latest information about our products and applications can always be found at our website [www.sge.com](http://www.sge.com).

## About SGE

SGE Analytical Science began manufacturing syringes over 50 years ago and now manufactures a vast array of products for chromatography and mass spectrometry. SGE is an ISO accredited company and is proud that all major analytical science instrument manufacturers rely on and incorporate SGE manufactured components in their systems. SGE is heavily committed to ongoing research and development that will allow the company to continue to bring innovative technologies and solutions to analytical science.



*SGE locations worldwide*

## Technical Support

This guide provides a comprehensive level of information. Should you require further support please don't hesitate to contact your local SGE office or email [techsupport@sge.com](mailto:techsupport@sge.com)

# Introduction to Biodiesel Analysis

The rising price of oil is driving fuel prices to new highs causing substantial global economic impacts. This economic situation combined with the desire for cleaner and greener energy solutions has created the demand for new fuels. Companies and consumers are looking for alternative ways of deriving fuel from available sources.

One alternative fuel achieving both the environmental and economic requirements is Biodiesel. Biodiesel is diesel derived from vegetable oils, animal fats and waste food by-products, usually cooking oil. Major investment is currently being made into the development of algae and other specifically bred plant crops that will increase yield and enable biodiesel to become a major component of our energy infrastructure.

## Product Process

The most widely accepted form of biodiesel production is trans-esterification, where typically oil is mixed with a solvent, usually methanol, and catalyzed by sodium methoxide, which causes the oil to be split into biodiesel and glycerine by-products. The biodiesel will then be processed for use in vehicles and the waste products split-off and sold separately. Glycerols, the major waste components, need to be minimized to trace levels within the fuel to prevent engine malfunction. Both the ASTM International and European National (EN) standards for biodiesel fuel certification require the fuel to be tested for total glycerol content before it can be released for sale. The European biodiesel standard mandates the completion of additional tests such as methanol and FAMES.

## Toolkit Contents

- **Sample Preparation**
- **BPX-BIOD GC Capillary Columns**
- **Method Library:**
  - **ASTM 6584 / EN14105**  
Free Glycerine, Mono-glycerides, Di-glycerides, Tri-glycerides
  - **EN14103** Determination of ester and linolenic acid methyl ester contents
  - **EN14110** Determination of methanol content
- **Optimized chromatography supplies for Biodiesel Analysis**
- **Information Resources**



Biodiesel requires quantitative measurement of the composition of the sample. Consequently liquid handling accuracy and precision are critical to the success of the final application.

eVol<sup>®</sup>, the world's first digitally controlled analytical syringe and 2010 R&D100 award winner, provides the accuracy and precision required in Biodiesel analytical laboratories.

### eVol<sup>®</sup> XR makes Everyone an expert

- Speed up and simplify laboratory workflow
- Improve accuracy and reproducibility
- Standardize results independent of operator skill

**eVol<sup>®</sup> is the coupling of two precision devices: a digitally controlled electronic drive and an XCHANGE<sup>®</sup> enabled analytical syringe.**

- XCHANGE<sup>®</sup> syringes are easily and quickly changed allowing them to be dedicated to individual liquids or methods to prevent possible cross-contamination of reagents.
- eVol<sup>®</sup> is ergonomic, comfortable and easy to use.
- eVol<sup>®</sup> is easily calibrated and calibration factors saved for each syringe, enabling laboratories to comply with stringent global laboratory standards
- eVol<sup>®</sup> is suitable for use with volatile samples.
- eVol<sup>®</sup> is programmable to store a laboratory workflow (up to 98 steps).
- eVol<sup>®</sup> is suitable for direct injection onto a chromatography column with a consistent flow rate.
- eVol<sup>®</sup>'s stainless steel needle enables direct injection through septa.



#### Now available! eVol<sup>®</sup> XR 1 mL syringe

- Password protection options enabling standardization of work processes
- Slow aspirate and dispense for titrations and reaction rate control.
- New 1 mL syringe provides more flexibility to improve workflows.
- Up to 20 syringes, methods and custom programs can now be saved.

#### eVol<sup>®</sup> Electronic Syringe Starter Kit contains:

Description	Part No.
eVol <sup>®</sup> XR	2910200
3 eVol <sup>®</sup> Syringes – 5 $\mu$ L, 100 $\mu$ L and 1 mL	-
Stand	-
Universal Charger	-
Comprehensive Instruction Manual	-
Disc with Manual in Multiple Languages	-
eVol <sup>®</sup> only	2910205

# BPX-BIOD GC Capillary Columns

SGE has evaluated each ASTM and EN biodiesel method to demonstrate the suitability of BPX-BIOD GC columns to achieve optimal separation.

Each BPX-BIOD GC column is tested at the maximum operating temperature for the column, and specific tests are undertaken to ensure the column meets inertness specifications and separation performance. This means you can be confident of a reliable separation, column after column.

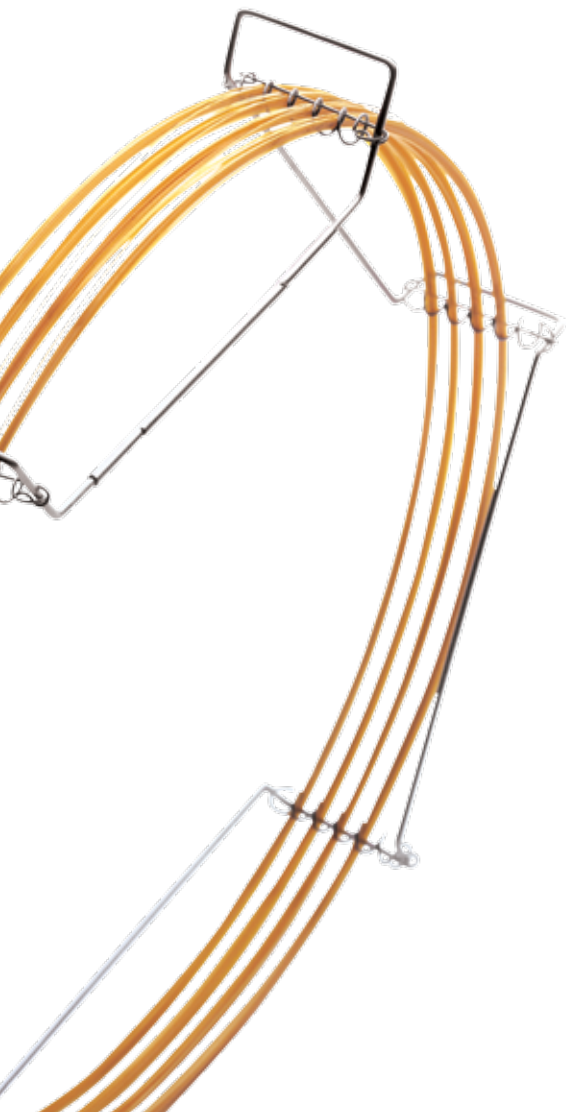
Please refer to the table below and method library on the following pages (6-14) to find the best high temperature column for your biodiesel analysis.

Method	Description	Column ID	Length (m)	Film Thickness ( $\mu\text{m}$ )	Part Number
ASTM D6584*¥	BPX – BIOD6584	0.32	10	0.1	0541180SG53
ASTM D6584*¥	BPX – BIOD6584	0.32	15	0.1	0541181SG53
EN14103*	BPX – BIOD20	0.32	30	0.25	0544331
EN14105*¥	BPX – BIOD5	0.32	10	0.1	05411801SG53
EN14110*	BPX – BIOD1	0.32	30	3	0540731
EN14110**	BPX - BIOD Wax	0.32	30	0.25	0544332
EN14110**	BPX - BIOD Wax	0.32	30	1	0544441

\*Recommended column in method

\*\*Alternative column recommended in method

¥ Includes guard column

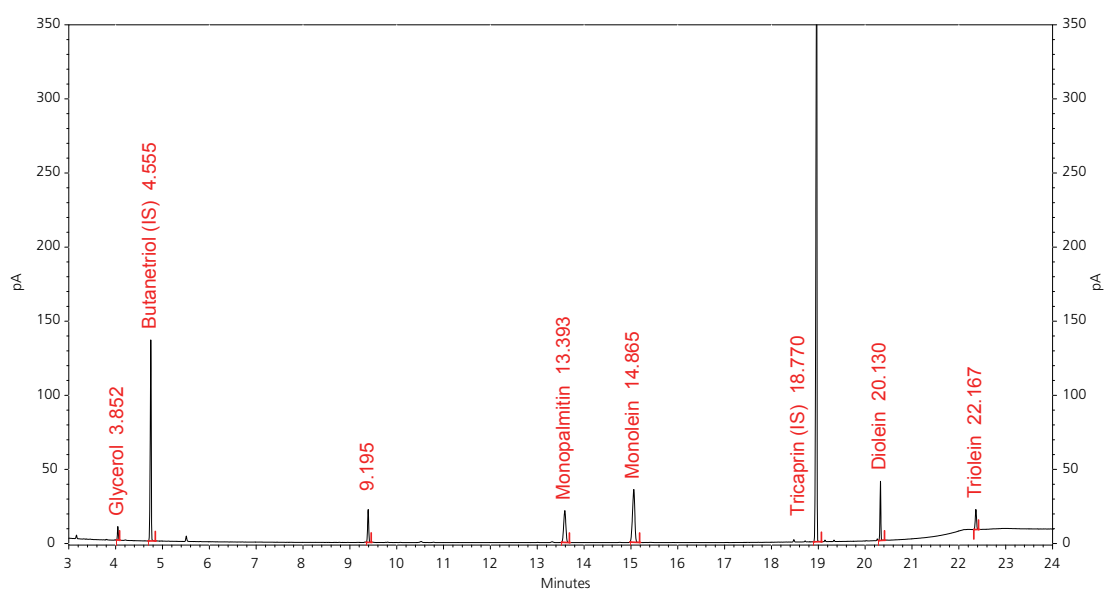


# ASTM D6584 / EN 14105 Free and total Glycerine

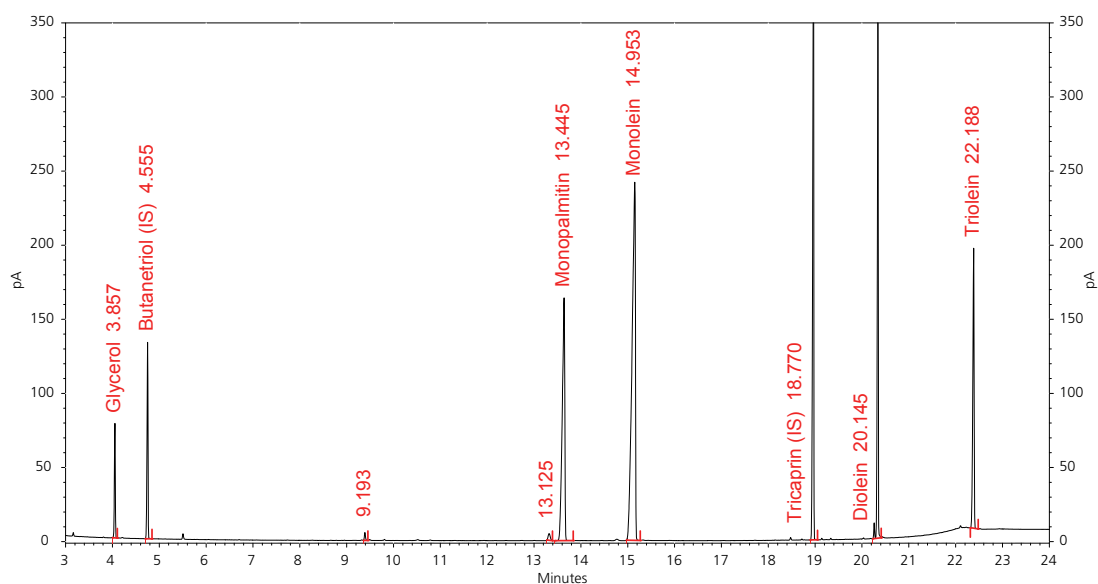
Column:	BIOD-BPX6584 or BPX-BIOD5 10 M X 0.32 mm ID X 0.10 µm film w / 2 m 0.53 guard column. Part Number: 05411805G53
Inlet Liner:	Baffle liner if using PTV injection
Septum:	HT
Condition column at 390 °C for 1.0 hours with 3 mL/min flow of helium	
Injection:	PTV Inlet 60 °C for 0.05 minute to 400 °C at 14.5 °C/ sec hold 22 minutes – Splitless for 1.0 minutes (A PTV injection system was used as an equivalent technique to 'on- column injection')

<b>GC Conditions:</b>	
Oven:	50 °C for 1 minute to 180 °C at 15 °C/min hold 0 minutes to 230 °C at 7 °C/min hold 0 minutes to 380 °C hold 4.2 minutes (26.01)
Flow:	He 3.0/min constant flow, split 20:1
Detector (FID):	400 °C

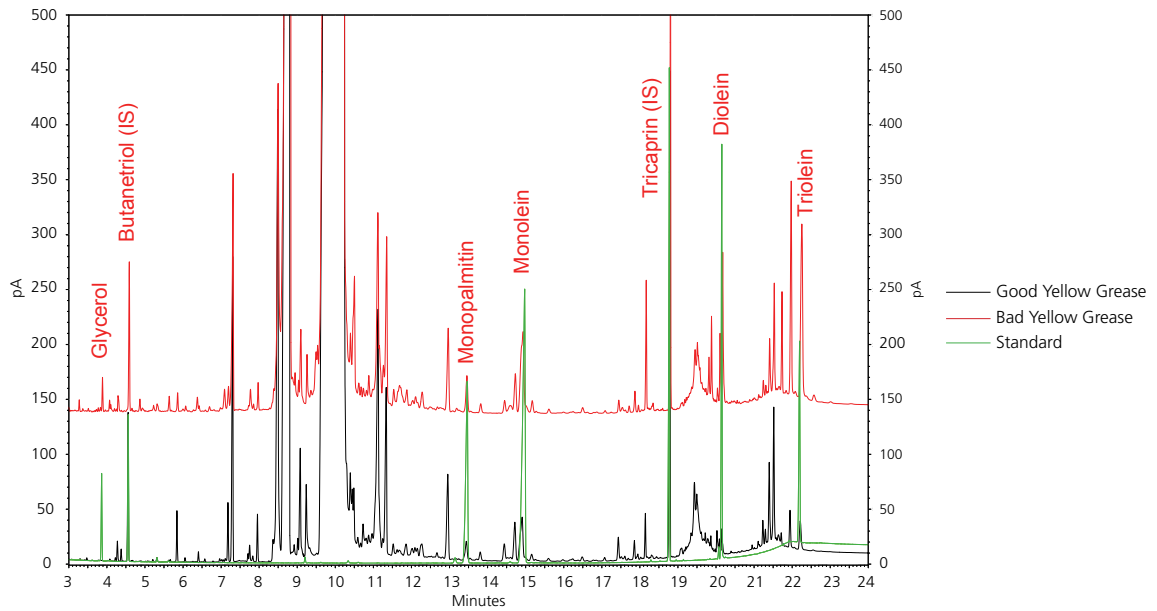
## Low Level ASTMD6584 / EN14105 Standard



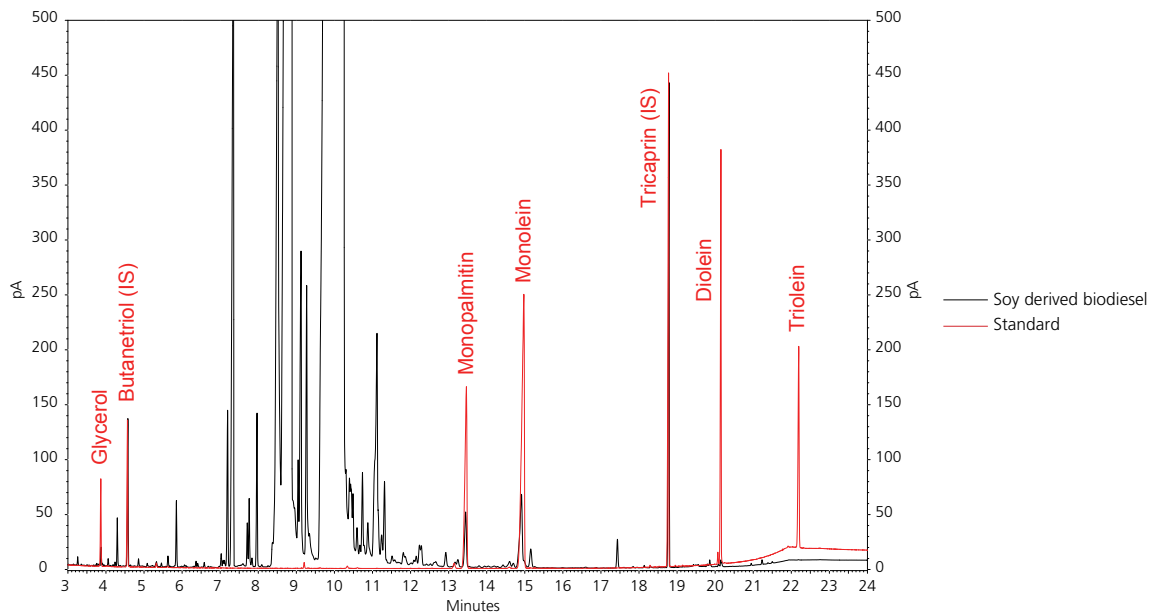
## High Level ASTMD6584 / EN14105 Standard



## Good yellow grease biodiesel and bad yellow grease biodiesel compared with ASTM D6584 / EN14105 Standard



## Soy derived biodiesel sample compared to ASTM D6584 / EN14105 Standard

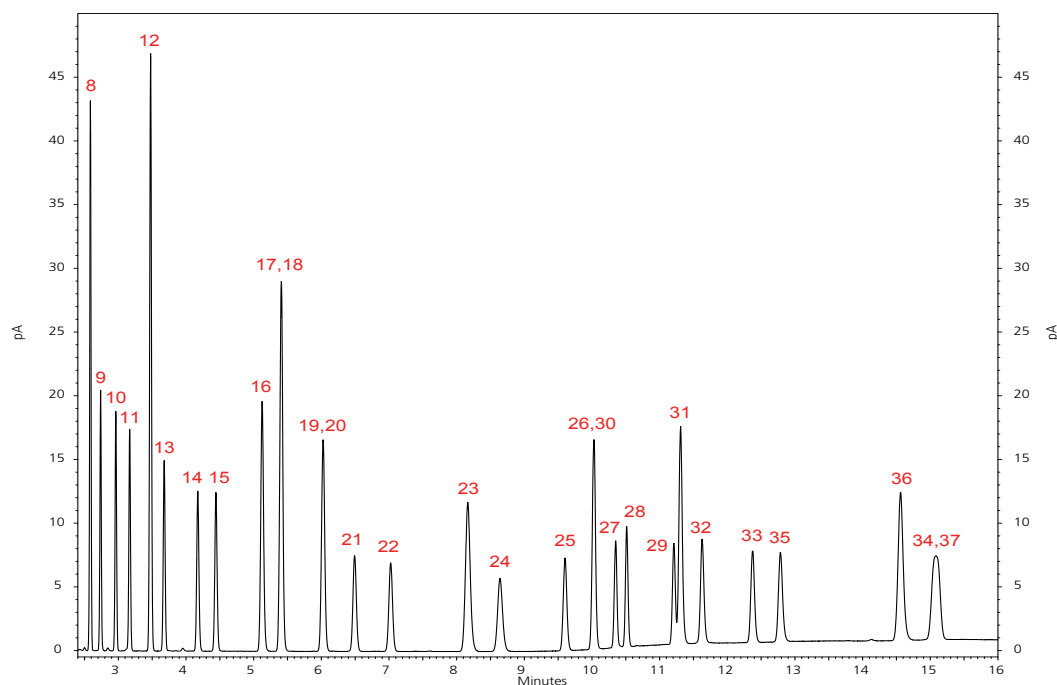


# EN14103 Determination of ester and linolenic acid methyl ester contents

Column:	BPX-BIOD20 – 30M X 0.32mm ID X 0.25 um film: Part Number: 0544331
Inlet Liner:	FocusLiner Split
Septum:	HT
Condition column at 260 °C for 1.5 hours	
Ferrule:	SilTite™ Ferrule Kit
Autosampler Syringe:	10 µL
Injection type:	split 50:1
Injector Temp:	250 °C
Detector Temp:	280 °C

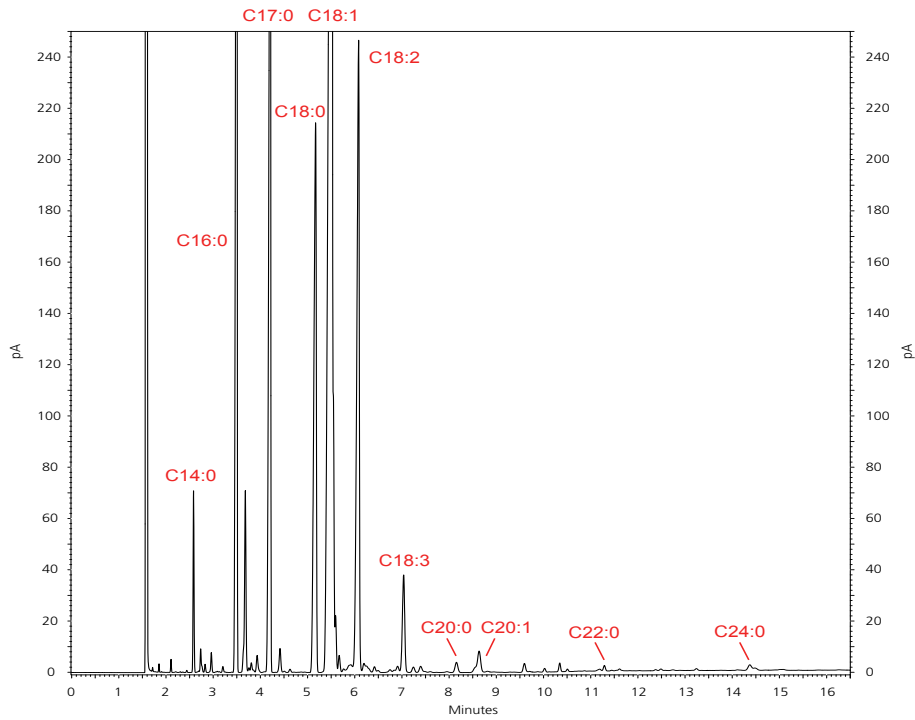
<b>GC Conditions:</b>	
Carrier Gas:	He
Constant flow:	on
Column Flow:	1.5 ml/min
Oven:	210 °C for 9 minutes to 240 °C at 20 °C/min hold 6 minutes (16.5 minutes)
Injection volume:	1 µL via Autosampler

## 37 FAME Reference Standard

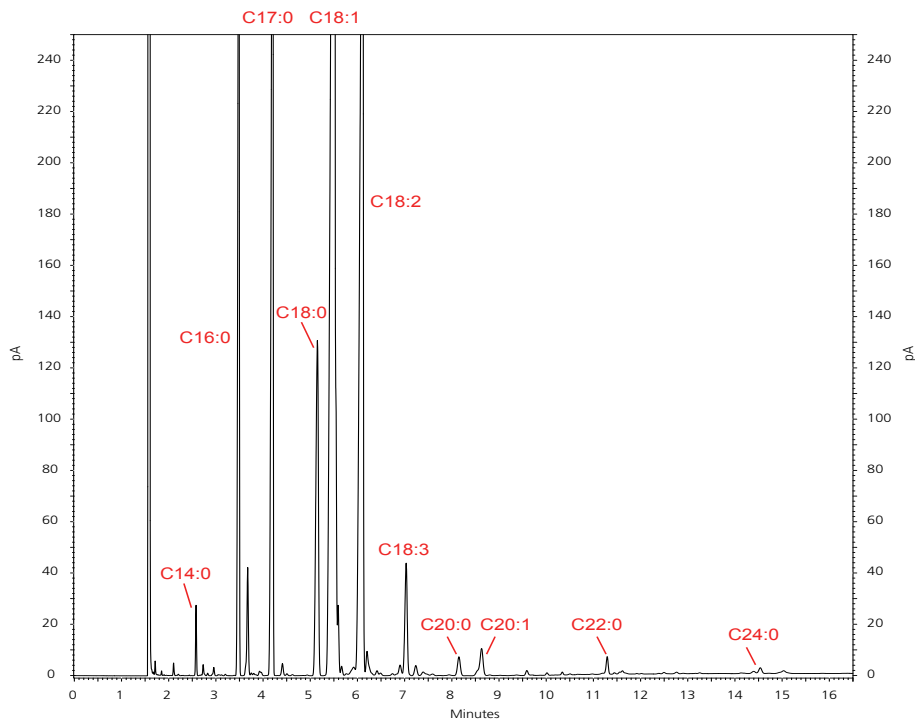


RT	#	Component	Wt%	RT	#	Component	Wt%
2.58	8	C14:0 (Myristic)	4	8.16	23	C20:0 (Arachidic)	4
2.74	9	C14:1 (Myristoleic)	2	8.64	24	C20:1n9 (cis-11-Eicosenoic)	2
2.96	10	C15:0 (Pentadecanoic)	2	9.60	25	C20:2 (cis-11,14-Eicosadienoic)	2
3.17	11	C15:1 (cis-10-Pentadecenoic)	2	10.03	26	C20:3n6 (cis-8,11,14-Eicosatrienoic)	2
3.48	12	C16:0 (Palmitic)	6	10.03	30	C21:0 (Henicosanoic)	2
3.68	13	C16:1 (Palmitoleic)	2	10.35	27	C20:3n3 (cis-11,14,17-Eicosatrienoic)	2
4.17	14	C17:0 (Heptadecanoic)	2	10.51	28	C20:4n6 (Arachidonic)	2
4.44	15	C17:1 (cis-10-Heptadecenoic)	2	11.21	29	C20:5n3 (cis-5,8,11,14,17-Eicosapentaenoic)	2
5.12	16	C18:0 (Stearic)	4	11.31	31	C22:0 (Behenic)	4
5.41	17	C18:1n9c (Oleic)	4	11.63	32	C22:1n9 (Erucic)	2
5.41	18	C18:1n9t (Elaidic)	2	12.38	33	C22:2 (cis-13,16-Docosadienoic)	2
6.02	19	C18:2n6c (Linoleic)	2	12.78	35	C23:0 (Tricosanoic)	2
6.02	20	C18:2n6t (Linolelaidic)	2	14.56	36	C24:0 (Lignoceric)	4
6.49	21	C18:3n6 (γ-Linolenic)	2	15.08	34	C22:6n3 (cis-4,7,10,13,16,19-Docosahexaenoic)	2
7.02	22	C18:3n3 (α-Linolenic)	2	15.08	37	C24:1n9 (Nervonic)	2

## FAME profile of IQAEP B214 Yellow Grease



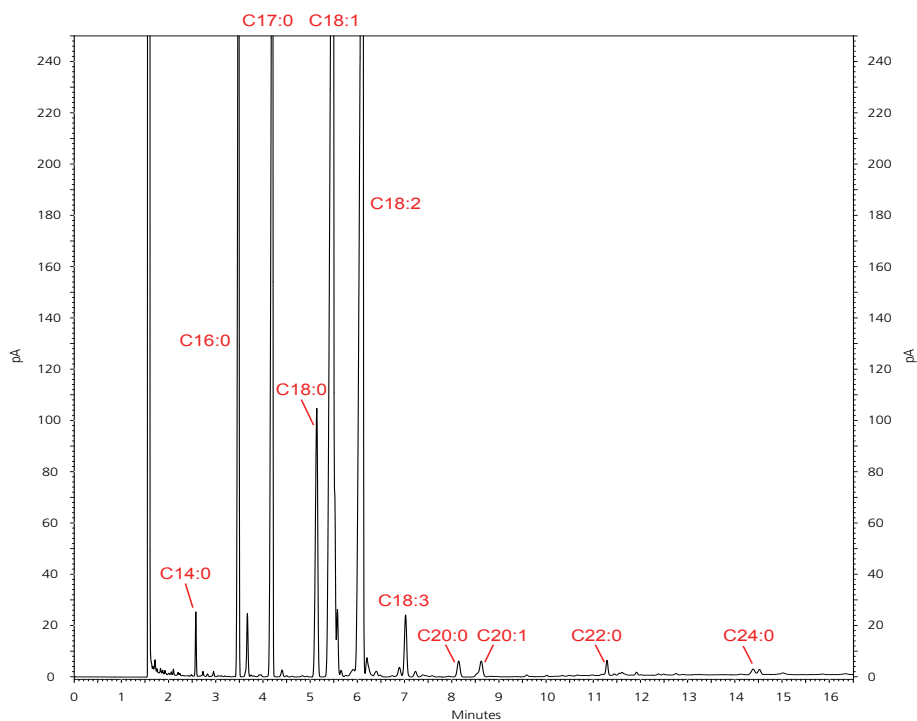
## FAME profile of Good Yellow Grease



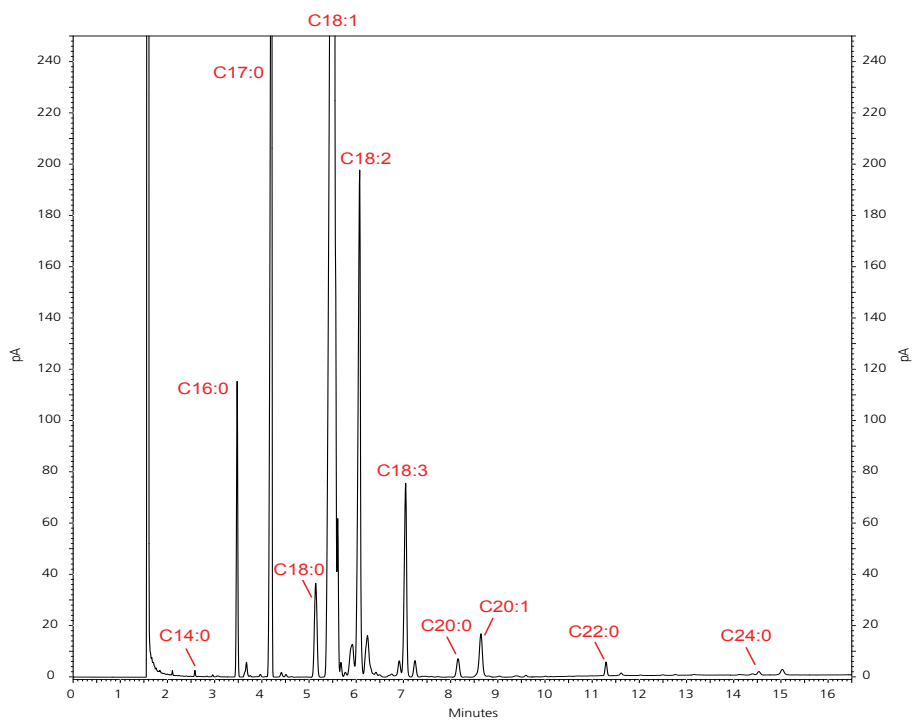
SGE recommends HT septa and SilTite™ ferrules for leak free performance in high temperature applications



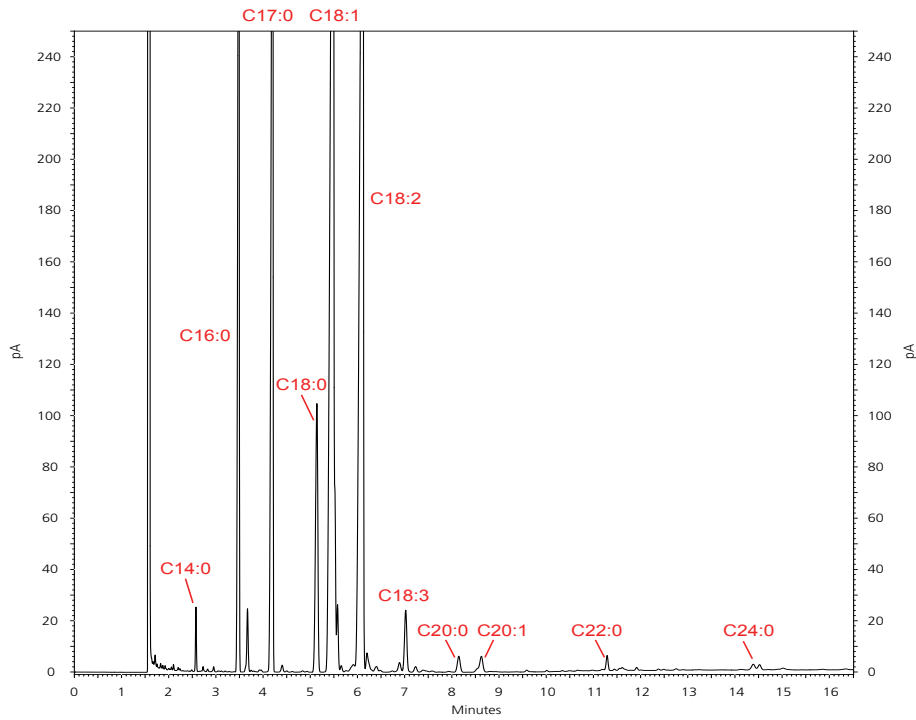
### FAME profile of Bad Yellow grease



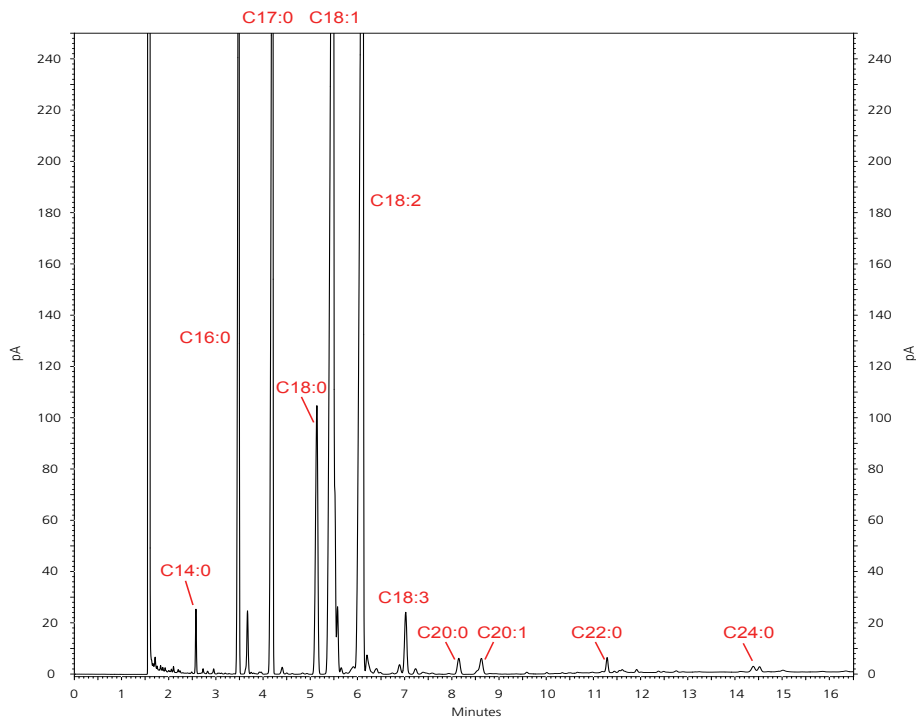
### FAME profile of Canola



## FAME profile of Sunflower



## FAME profile of Soy / Tallow



SGE recommends HT septa and SilTite™ ferrules for leak free performance in high temperature applications



# EN14110 Methanol Content in Biodiesel

Column: BPX-BIOD1 – 30 M X 0.32 mm ID X 3.0 µm film.  
Part Number: 0540731

The analysis can also be accomplished on BPX-BIOD 30 M x 0.32 mm ID x 0.25 and 1.0 µm Film, conditions are available on request

Inlet Liner: FocusLiner™ Split

Septum: HT

Ferrule: SilTite™ Ferrule Kit

Inlet Temp: 150 °C

Detector Temp: 250 °C

## GC Conditions:

Carrier Gas: He

Constant Flow: On

Flow: Helium 1.5 ml/min, split 50:1

Helium 1.0 ml/min, split 50:1

Oven: 210 °C for 9 minutes to 240 °C at 20 °C/min hold 6 minutes (16.5 minutes)

## Manual Injections

### Standard set up:

Initial sample: 10 mL sample with 56.8 µL methanol (0.5%) -  
**Calibration Solution A**

1st dilution: 2 mL initial sample + 8 mL BD (0.1%) -  
**Calibration Solution B**

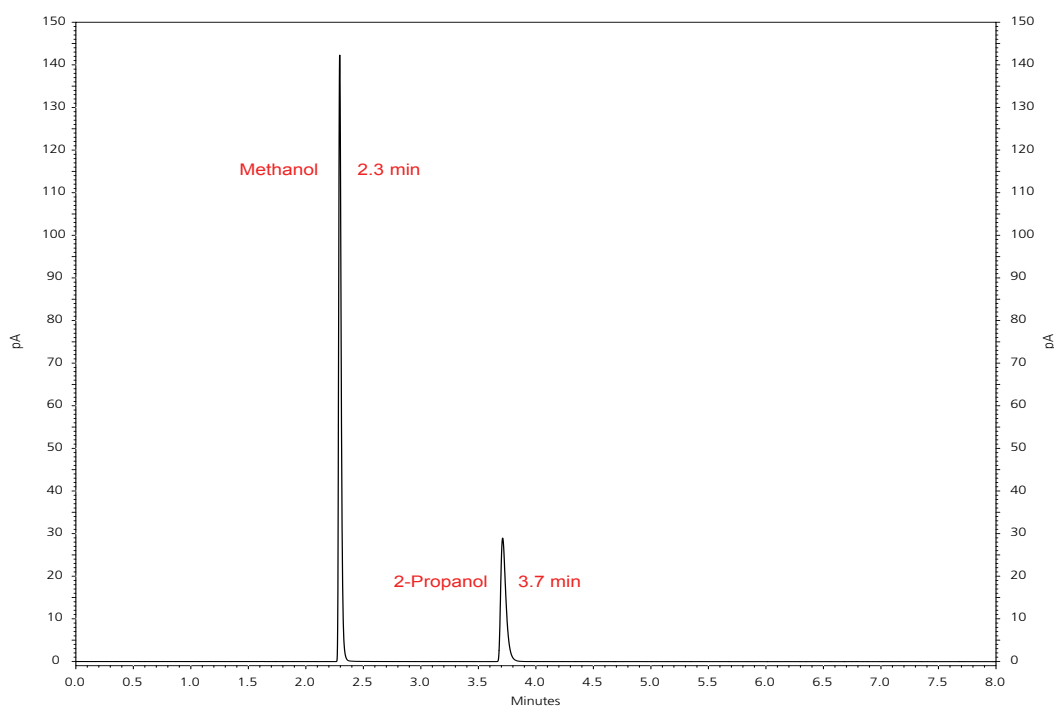
2nd dilution: 2 mL of 1st dilution + 9 mL of BD (0.01%) -  
**Calibration Solution C**

5 gm of each Calibration Solution were placed in 20 mL headspace vials and

5 µL of isopropanol (IPA) was added to each vial and crimp sealed. The samples were placed in an 80 °C oven 15 minutes apart for 45 minutes. The 250 µL syringe was placed in a 60 °C oven during this period and between injections.

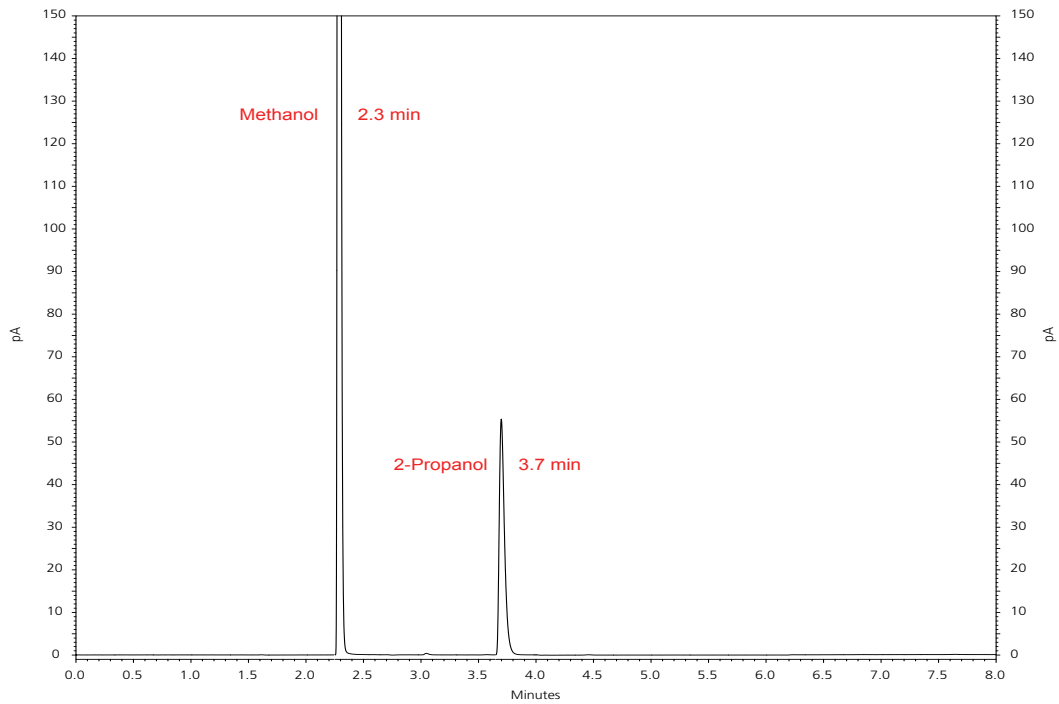
## Methanol content using EN14110 recommended column

### 2.0 mL/min flow - 50°C - 20 µL injection

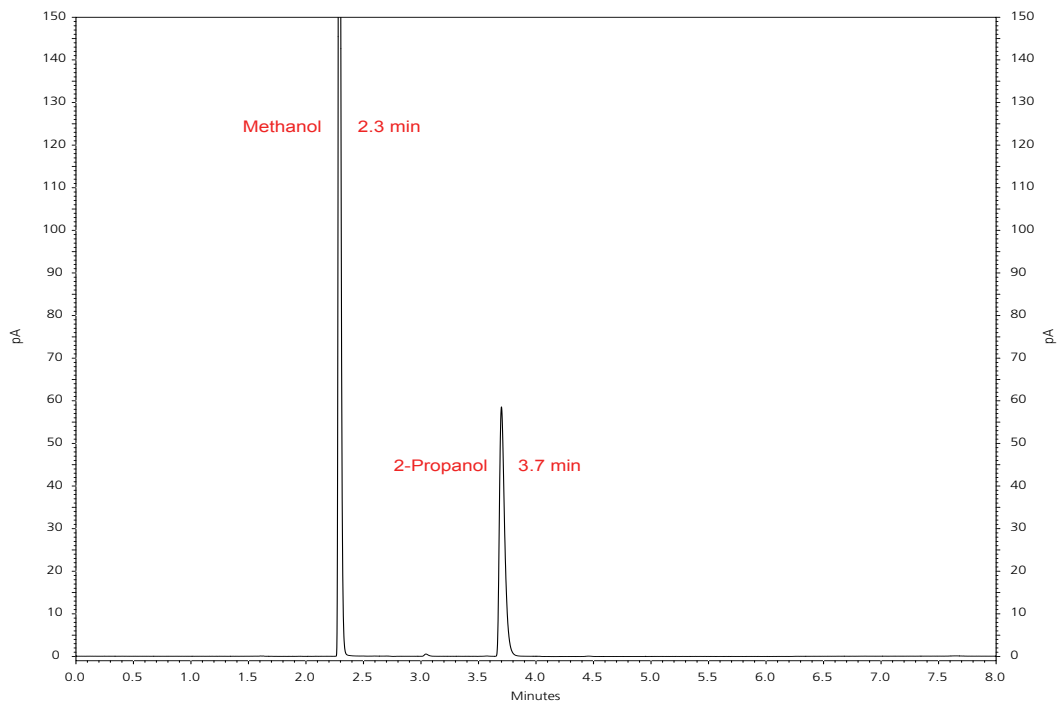


SGE recommends HT septa and SilTite™ ferrules for leak free performance in high temperature applications

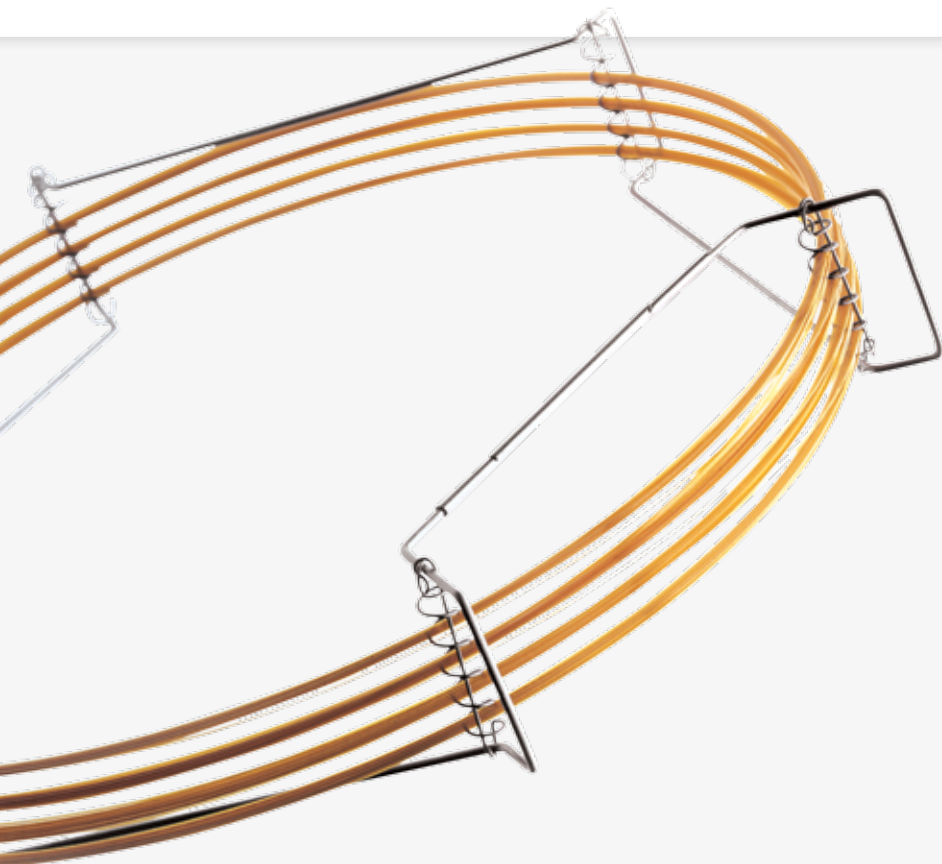
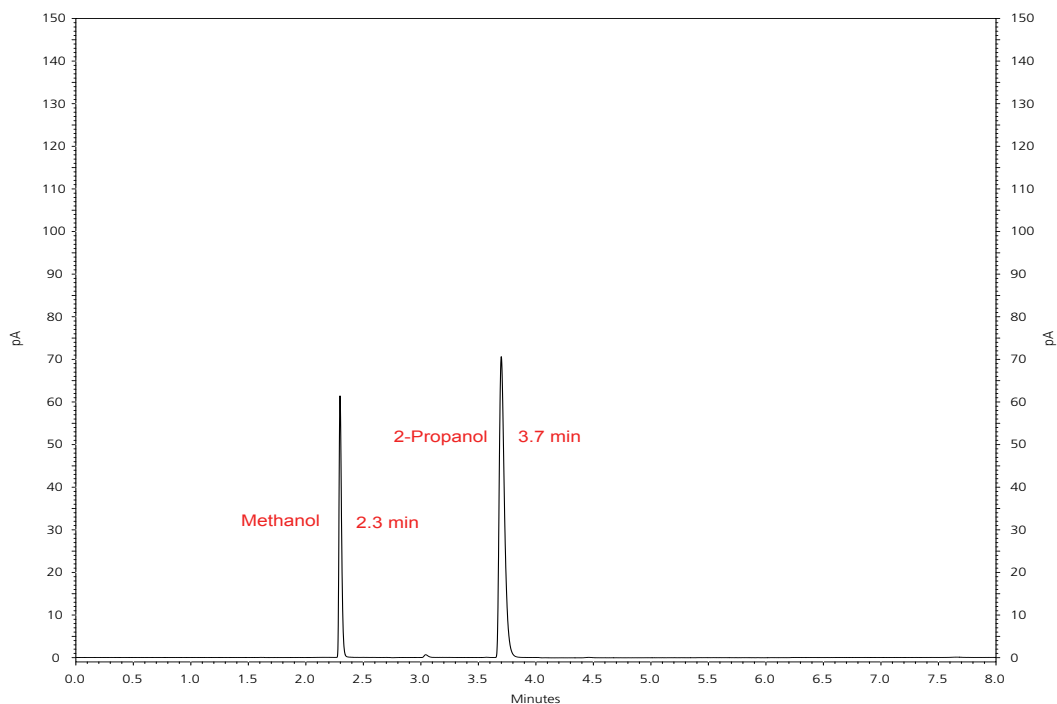
**Calibration Solution A - 250  $\mu$ L of 0.5% standard on BP1 column with 5  $\mu$ L of IPA / 5 gms of sample**



**Calibration Solution B - 250  $\mu$ L of 0.1% standard on BP1 column with 5  $\mu$ L of IPA / 5 gms of sample**



Calibration Solution C - 250  $\mu$ L of 0.01% standard on BP1 column with 5  $\mu$ L of IPA / 5 gms of sample



## Syringes



### 1 - 5 µL NanoVolume

SPECIFICATIONS	
Accuracy and Reproducibility	± 2 % (dispensed volume)
Borosilicate Glass Barrel Outer Diameter (OD)	6.5 mm and 8 mm
Scale Length	0.5 µL (6.5 mm OD barrel) = 27.05 mm, 0.5 µL (8 mm OD barrel) = 63.7 mm, 1 µL = 54.1 mm, 63.7 mm, 5 µL = 48.7 mm
International Standards Traceability	

Syringe Volume	Needle Length (mm)	Needle Gauge	Needle OD (mm)	Needle ID (mm)	Needle Tip	Syringe Code	Replacement Needle and Plunger Part No.	Syringe Part No.
<b>8.0 mm Outer Diameter (OD) Barrel</b>								
1 µL	50	23	0.63	0.155	Cone	1BR-5	034055	000500
1 µL	50	23	0.63	0.155	Bevel	1BR-5BV	034056	000501
1 µL	70	23	0.63	0.155	Cone	1BR-7	034057	000505
1 µL	70	23	0.63	0.155	Bevel	1BR-7BV	034060	000506
1 µL	115	23	0.63	0.155	Cone	1BR-11.5	034059	000510
1 µL	70	26	0.47	0.155	Cone	1BR-7/0.47	034610	000570
5 µL	50	23	0.63	0.365	Cone	5BR-5	035055	000800
5 µL	50	23	0.63	0.365	Bevel	5BR-5BV	035056	000801
5 µL	70	23	0.63	0.365	Cone	5BR-7	035057	000802
5 µL	70	23	0.63	0.365	Bevel	5BR-7BV	035058	000803
5 µL	115	23	0.63	0.365	Cone	5BR-11.5	035059	000804
5 µL	70	23	0.63	0.365	Nozzle	5BR-7N	035060	000805

### Syringes Fitted with Repeating Adaptor

The SGE Repeating Adaptor (RAX) is attached to a syringe to ensure reproducibility of sample volumes.



Syringe Volume	Needle Length (mm)	Needle Gauge	Needle OD (mm)	Needle ID (mm)	Needle Tip	Syringe Code	Replacement Needle and Plunger Part No.	Syringe Part No.
<b>8.0 mm Outer Diameter (OD) Barrel</b>								
1 µL	50	23	0.63	0.155	Cone	1BR-5-RAX	034055	000550
1 µL	70	23	0.63	0.155	Cone	1BR-7-RAX	034057	000553



## Manual and On Column Syringes

### 10 - 500 µL PTFE Tipped Plunger

SPECIFICATIONS	
Accuracy and Reproducibility	± 1 % (dispensed volume)
Borosilicate Glass Barrel Outer Diameter (OD)	10 µL = 6.5 mm, 25 – 500 µL = 8 mm
Scale Length	10 µL = 54.1 mm, 25 –500 µL = 60 mm
International Standards Traceability	

Syringe Volume	PTFE Tipped Plunger	Needle Length (mm)	Needle Gauge	Needle OD (mm)	Needle ID (mm)	Needle Tip	Syringe Code	Replacement Needle Part No.	Replacement Plunger Part No.	6 Pack Syringe Part No.	Syringe Part No.
<b>Fixed Needle</b>											
10 µL	✓	50	26	0.47	0.11	Bevel	10F-GT	-	031810	002202	002200
10 µL	✓	70	26	0.47	0.11	Bevel	10F-GT-7	-	031810	-	002208
25 µL	✓	50	25	0.50	0.20	Bevel	25F-GT	-	031815	-	003200
50 µL	✓	50	25	0.50	0.20	Bevel	50F-GT	-	031820	-	004200
100 µL	✓	50	25	0.50	0.20	Bevel	100F-GT	-	031825	-	005200
250 µL	✓	50	25	0.50	0.20	Bevel	250F-GT	-	031830	-	006200
500 µL	✓	50	25	0.50	0.20	Bevel	500F-GT	-	031835	-	007200
<b>Removable Needle</b>											
10 µL	✓	50	26	0.47	0.11	Bevel	10R-GT	037110	031811	002252	002250
25 µL	✓	50	25	0.50	0.20	Bevel	25R-GT	038110	031815	-	003250
50 µL	✓	50	25	0.50	0.20	Bevel	50R-GT	038110	031820	-	004250
100 µL	✓	50	25	0.50	0.20	Bevel	100R-GT	038110	031825	-	005250
250 µL	✓	50	25	0.50	0.20	Bevel	250R-GT	038110	031830	-	006250
500 µL	✓	50	25	0.50	0.20	Bevel	500R-GT	038110	031835	-	007250
<b>Guided Plunger</b>											
10 µL	✓	50	26	0.47	0.11	Bevel	10R-GP-GT	037110	031805	-	002455
<b>On-Column</b>											
10 µL	✓	75	-	0.17	0.11	On-Column	10R-GT-OC-CE	037675	031811	-	002500



# GC Supplies for PerkinElmer

## Autosampler Syringes

All needles are 70 mm long with a cone point style.

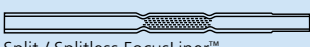
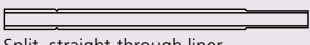
### For PerkinElmer AutoSystem

Volume	Needle Gauge (OD mm)	Syringe Code	Syringe Part No.	Pack Size	Spare Plunger Part No.	Pack Size
<b>Fixed Needle</b>						
5 µL	26 (0.47)	5F-PE-0.47C	001953	1	–	–
5 µL	23 (0.63)	5F-PE-0.63C	001954	1	–	–
5 µL <i>Gas Tight</i>	26 (0.47)	5F-PE-GT-0.47C	001955	1	031807	2
5 µL <i>Gas Tight</i>	23 (0.63)	5F-PE-GT-0.63C	001957	1	031807	2
50 µL	23 (0.63)	50F-PE-0.63C	004670	1	–	–

## Septa

Instrument	Diameter	Septum Type	Pack Size	Part No.
<b>PerkinElmer</b>				
Sigma, 900, 990, 8000series, AutoSystem & Clarus	11	HT	25	041898
	11	EC	25	041902

## Inlet Liners

Description and Geometry Sketch	OD (mm)	ID (mm)	Length (mm)	Pack Size	Part No.
<b>For AutoSystem™ &amp; Clarus 500, 600</b>					
 Split / Splitless FocusLiner™	6.2	4	92	1	09209201
				5	092092
				25	09209225
 Split, straight-through liner	6.2	4	92	1	09210001
				5	092100
				25	09210025



SGE's new enhanced inlet liner range is colour coded by geometry to simplify selection:

- FocusLiner™
- Straight

## Ferrules

Instrument	Column ID	Size of Nut	Ferrule ID	Pack Size	Part No.
<b>15% Graphite / 85% Vespel® Ferrules</b>					
For Injectors & Detectors at atmospheric pressure e.g. FID	0.1-0.25 mm	1/16"	0.4 mm	10	072663
	0.1-0.25 mm	1/8"	0.4 mm	10	0726703
	0.32 mm	1/16"	0.5 mm	10	072654
	0.32 mm	1/8"	0.5 mm	10	0726702
	0.45-0.53 mm	1/16"	0.8 mm	10	072655
	0.45-0.53 mm	1/8"	0.8 mm	10	072671
	1/8" OD Packed Columns	1/8"	1/8"	10	072669
	1/4" OD Packed Columns	1/4"	1/4"	10	072667
<b>SilTite™ Metal Ferrules</b>					
For GC-MS Interface Connection (Starter Kit)	0.1-0.25 mm	–	0.4 mm	10*	073200
	0.32 mm	–	0.5 mm	10*	073201
	0.53 mm	–	0.8 mm	10*	073202
<b>Replacement SilTite™ Ferrules</b>					
For GC-MS Interface Connection	0.1-0.25 mm	–	0.4 mm	10	073220
	0.32 mm	–	0.5 mm	10	073221
	0.53 mm	–	0.8 mm	10	073222
	1/32"	–	0.81 mm	10	073219
Replacement SilTite™ Nuts	–	–	5	–	073224

\*Includes 10 ferrules, 2 SilTite™ nuts.

## GC Supplies for Agilent Technologies

### Autosampler Syringes

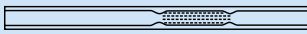

For Agilent 7673, 7683 & 6850 ALS Instruments

Volume	Needle Gauge (OD mm)	Syringe Code	Syringe Part No.	Pack Size	Spare Needle Part No.	Pack Size	Spare Plunger Part No.	Pack Size
<b>Fixed Tapered Needle</b>								
5 µL	23-26s (0.63/0.47)	5F-AG-0.63/0.47C	001821	1	-	-	-	-
10 µL	23-26s (0.63/0.47)	10F-AG-0.63/0.47C	002821	1	-	-	-	-
10 µL Gas Tight	23-26s (0.63/0.47)	10F-AG-GT-0.63/0.47C	002826	1	-	-	031808	2
<b>Fixed Straight Needle</b>								
5 µL(M)	23 (0.63)	5F-AG-0.63C	001810	1	-	-	-	-
10 µL(M)	23 (0.63)	10F-AG-0.63C	002810	1	-	-	-	-
<b>Removable Tapered Needle</b>								
5 µL	23-26s (0.63/0.47)	5R-AG-0.63/0.47C	001825	1	036730	2	-	-
10 µL	23-26s (0.63/0.47)	10R-AG-0.63/0.47C	002825	1	037730	2	-	-
<b>Removable Straight Needle</b>								
1 µL	23 (0.63)	1BR-AG-0.63C	000610	1	034715	1**	-	-

### Septa

Instrument	Diameter	Septum Type	Pack Size	Part No.
<b>Agilent Technologies</b>				
7890, 6890, 5890, 5880, 4890 & 6850	11	HT	25	041898
	11	EC	25	041902
5700, 5800 & 5900	9.5	HT	25	041897
	9.5	EC	25	041901
5750, 710, 720, 810 & 7610	12.5	HT Pre-drilled	25	0418992
	12.5	EC	25	041906
7620, 5790, 5880 & 5890	5	HT Pre-drilled	25	0418991

### Inlet Liners

Description and Geometry Sketch	OD (mm)	ID (mm)	Length (mm)	Pack Size	Part No.
<b>For Agilent 5890, 6850, 6890, 7890 and HP4890</b>					
 Split / Splitless FocusLiner™	6.3	4	78.5	1	09200201
				5	092002
				25	092219
 Split, Straight-through Liner	6.3	4	78.5	1	09200701
				5	092007
				25	092222



SGE's new enhanced inlet liner range is colour coded by geometry to simplify selection:

- FocusLiner™
- Straight

## Ferrules

Instrument	Column ID	Ferrule ID	Pack Size	Part No.
<b>15% Graphite / 85% Vespel® Ferrules</b>				
For Injectors & Detectors at atmospheric pressure e.g. FID	0.1-0.25 mm	0.4 mm	10	073109
	0.32 mm	0.5 mm	10	073111
	0.53 mm	0.8 mm	10	073113
	for 1/8" OD Packed Columns	1/8"	10	072669
	for 1/4" OD Packed Columns	1/4"	10	072667
For GC-MS Interface Connection	0.1-0.25 mm	0.4 mm	10	072663
	0.32 mm	0.5 mm	10	072654
	0.53 mm	0.8 mm	10	072655
<b>SilTite™ Metal Ferrules</b>				
For GC-MS Interface Connection (Starter Kit)	0.1-0.25 mm	0.4 mm	10	*073200
	0.32 mm	0.5 mm	10	*073201
	0.53 mm	0.8 mm	10	*073202
For Split / Splitless Injectors (Starter Kit)	0.1-0.25 mm	0.4 mm	10	#073270
	0.32 mm	0.5 mm	10	#073271
	0.45-0.53 mm	0.8 mm	10	#073272
	1/32"	0.81 mm	10	#073273
<b>Replacement SilTite™ Metal Ferrules</b>				
For All Connections	0.1-0.25 mm	0.4 mm	10	073220
	0.32 mm	0.5 mm	10	073221
	0.53 mm	0.8 mm	10	073222
	1/32"	0.81 mm	10	073219
<b>Replacement SilTite™ Nuts</b>				
For GC-MS Interface Connection	–	–	5	073224
For Split / Splitless Injector	–	–	5	073226
<b>Replacement SilTite™ Base Seals</b>				
For Split / Splitless Injector	–	–	2	073400
	–	–	10	073401

\* Includes 10 ferrules, 2 SilTite™ nuts. # Includes 10 ferrules, 2 SilTite™ nuts and 2 SilTite™ Inlet Base Seals.

## GC Supplies for Shimadzu

### Autosampler Syringes

All needles are 42 mm long with a cone point style.

#### Shimadzu AOC14, AOC17 and AOC20




Volume	Needle Gauge (OD mm)	Syringe Code	Syringe Part No.	Pack Size	Spare Needle Part No.	Pack Size	Spare Plunger Part No.	Pack Size
<b>Fixed Needle</b>								
5 µL	26 (0.47)	5F-S-0.47C	001987	1	–	–	–	–
5 µL	23 (0.63)	5F-S-0.63C	001988	1	–	–	–	–
250 µL <i>Gas Tight</i>	23 (0.63)	250F-S-GT-0.63C	006682	1	–	–	031828	1
<b>Removable Needle</b>								
10 µL	26 (0.47)	10R-S-0.47C	002897	1	037745	2	–	–
10 µL	23 (0.63)	10R-S-0.63C	002898	1	037747	2	–	–
10 µL <i>Gas Tight</i>	23 (0.63)	10R-S-GT-0.63C	002902	1	037747	2	031798	2

### Septa

Instrument	Septum Type	Pack Size	Part No.
9A, 14, 15A, 16, 17A, 2010 & 2014	HT	50	041895
	EC	50	041905

## GC Supplies for Shimadzu continued

### Inlet Liners

Description and Geometry Sketch	OD (mm)	ID (mm)	Length (mm)	Pack Size	Part No.
<b>For GC-2010 (SPL-2010 Injector), GC-2014 (SPL-2014 Injector) and GC-17A (SPL-17 Injector)</b>					
 Split / Splitless FocusLiner™ *	5	3.4	95	1	09205901
				5	092059
				25	09205925
 Split / Splitless FocusLiner™	5	3.4	95	1	09206201
				5	092062
 Split, straight-through liner	5	3.4	95	1	09206401
				5	092064

\* When using a standard 42 mm needle for autosamplers, the sample will be injected on top of the wool for this liner.



### O-rings and Sealing Rings

Description	Usage	Pack Size	Part No.
Graphite Sealing Ring	Can be used at temperatures up to 450 °C. For 14, 15A & 16 (SPL-14 injector)	10	0726001
Graphite Sealing Ring	Can be used at temperatures up to 450 °C. For 17A (SPL-17 injector)	10	0726007
Viton O-Ring	Can be used at temperatures up to 300 °C. For 2010 & 2014 (SPL-2010 Injector & SPL-2014 Injector)	10	0726533

SGE's new enhanced inlet liner range is colour coded by geometry to simplify selection:

● FocusLiner™

● Straight

### Ferrules

Column ID	Description	Pack Size	Part No.
<b>GC14A, GC17A, GC2010 and GC2014 Detector / Injectors (Not for MS interfaces or QP2010 Injector)</b>			
0.10-0.25 mm ID columns	SilTite™ Metal - Initial Installation	10*	073350
0.10-0.25 mm ID columns	SilTite™ Ferrules	10	073227
0.32 mm ID columns	SilTite™ Metal - Initial Installation	10*	073351
0.32 mm ID columns	SilTite™ Ferrules	10	073228
0.45-0.53 mm ID columns	SilTite™ Metal - Initial Installation	10*	073352
0.53 mm ID columns	SilTite™ Ferrules	10	073229
n/a	SilTite™ Metal Nuts - Slotted	5	073232
<b>QP5000/5050 Standard MS Interface</b>			
QP5000-I 0.10-0.25 mm ID columns	15% Graphite/ 85% Vespel® Ferrules	10	0726563
QP5000-I 0.32 mm ID columns	15% Graphite/ 85% Vespel® Ferrules	10	0726564
QP5000-II & QP5050 0.10-0.25 mm ID columns	15% Graphite/ 85% Vespel® Ferrules	10	0726561
QP5000-II & QP5050 0.32 mm ID columns	15% Graphite/ 85% Vespel® Ferrules	10	0726562
0.10-0.25 mm ID columns	SilTite™ Metal - Initial Installation	10*	073204
0.10-0.25 mm ID columns	SilTite™ Ferrules	10	073227
0.32 mm ID columns	SilTite™ Metal - Initial Installation	10*	073205
0.32 mm ID columns	SilTite™ Ferrules	10	073228
0.53 mm ID columns	SilTite™ Metal - Initial Installation	10*	073206
0.53 mm ID columns	SilTite™ Ferrules	10	073229
<b>QP5000/5050 Wide Bore MS Interface, QP2010 Injector and QP2010 Standard MS Interface</b>			
0.10-0.25 mm ID columns	15% Graphite/ 85% Vespel® Ferrules	10	072663
0.32 mm ID columns	15% Graphite/ 85% Vespel® Ferrules	10	072654
0.45-0.53 mm ID columns	15% Graphite/ 85% Vespel® Ferrules	10	072655
0.10-0.25 mm ID columns	SilTite™ Metal - Initial Installation	10*	073200
0.10-0.25 mm ID columns	SilTite™ Ferrules	10	073220
0.32 mm ID columns	SilTite™ Metal - Initial Installation	10*	073201
0.32 mm ID columns	SilTite™ Ferrules	10	073221
0.45-0.53 mm ID columns	SilTite™ Metal - Initial Installation	10*	073202
0.45-0.53 mm ID columns	SilTite™ Ferrules	10	073222
n/a	SilTite™ Metal Nuts	5	073224

\* Includes 10 ferrules, 2 SilTite™ nuts.

## Replacement Parts

Material	Pack Size	Part No.
Replacement SilTite™ Nuts		
For 2010 GC-MS System	5	073224
For 2010 GC-MS System with QP5000 series MS	5	073224
For 2010/2014 GC Injectors and atmospheric detectors	5	073224
QP5000 Jet Separator MS Interface	5	073224
QP5000 Direct MS Interface	5	073233
For All Injectors Jet Separator (Starter Kit), except 2010/2014	5	073232

## GC Supplies for Thermo Scientific

### Autosampler Syringes

All needles have a cone point style.

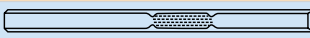
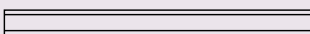
For Thermo Scientific / CE Instruments / Fisons

AUTOSAMPLER				NEEDLE SPECIFICATIONS						
TriPlus	AS3000	AS2000	AS200/800	Volume	Length (mm)	Gauge	Syringe Code	Syringe Part No.	Needle Part No.	Pack Size
<b>Fixed Needle</b>										
•				5 µL	50	26 (0.47)	5FX-5C	001105	–	–
•		•		10 µL	80	23 (0.63)	10F-C/T-8/0.63C	002989	–	–
•		•		10 µL	80	26 (0.47)	10F-C/T-8/0.47C	002992	–	–
•	•	•	•	10 µL	50	25 (0.50)	10F-C/T-5/0.50C	019050	–	–
<b>Removable Needle</b>										
•	•	•	•	10 µL	50	23 (0.63)	10R-C/T-5/0.63C	002984	037787	2
•		•	•	10 µL	80	26 (0.47)	10R-C/T-8/0.47C	002993	031535	3

### Septa

Instrument	Diameter (mm)	Septum Type	Pack Size	Part No.
8000 Series, FOCUS, Trace/ULTRA GC™	17	HT	25	0418990
	17	EC	25	041903

### Inlet Liners

Description and Geometry Sketch	OD (mm)	ID (mm)	Length (mm)	Pack Size	Part no.
<b>For TRACE™ and Focus™</b>					
 Split FocusLiner™ (for use with 50 mm Needle)	8	5	105	1	09204801
				5	092048
 Split, Straight-through Liner	8	5	105	1	0921501
				5	092150
				25	09215025

### Sealing Rings

Description	Usage	Pack Size	Part No.
Graphite Sealing Ring	8 mm ID. For 8000 & TRACE GCs.	10	0726004

## GC Supplies for Thermo Scientific continued

### Ferrules

Instrument	Column ID	Ferrule ID	Pack Size	Part No.
<b>15% Graphite / 85% Vespel® Ferrules</b>				
For All Injectors & Detectors (Not for 8000 Series, Focus, Trace/Ultra GC)	0.1-0.25 mm	0.4 mm	10	0726549
	0.32 mm	0.5 mm	10	0726557
	0.53 mm	0.8 mm	10	0726548
	1/8" OD Packed Columns	1/8"	10	072669
	1/4" OD Packed Columns	1/4"	10	072667
For All Focus, Trace/Ultra Injectors & Detectors at atmospheric pressure e.g. FID (Not for GC-MS)	0.1-0.25 mm	0.4 mm	10#	072696
	0.32 mm	0.5 mm	10#	072697
	0.53 mm	0.8 mm	10#	072698
Brass Nut for Focus, Trace/Ultra GC Injectors & Non-MS Detectors			2	1034085
<b>SilTite™ Metal Ferrules</b>				
For GC-MS Interface Connections (Starter Kit)	0.1-0.25 mm	0.4 mm	10*	073450
	0.32 mm	0.5 mm	10*	073451
	0.53 mm	0.8 mm	10*	073452
	1/32"	0.81 mm	10*	073453
<b>Replacement SilTite™ Metal Ferrules</b>				
For All GC-MS Interface Connections	0.1-0.25 mm	0.4 mm	10	073330
	0.32 mm	0.5 mm	10	073331
	0.53 mm	0.8 mm	10	073332
	1/32"	0.81 mm	10	073333
<b>Replacement SilTite™ Nuts</b>				
			5	073230

# To be used in combination with brass nut (Part No. 1034085) \* Includes 10 ferrules, 2 SilTite™ nuts.

## GC Supplies for Varian / Bruker

### Autosampler Syringes

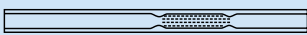
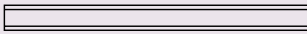


Volume	Length	Needle Gauge (OD mm)	Tip Style	Syringe Code	Syringe Part No.	Pack Size	Needle Part No.	Pack Size	Plunger Part No.	Pack Size
<b>Varian/Bruker 8035, 8100 and 8200</b>										
<b>Fixed Needle</b>										
10 µL Gas Tight	53	25 (0.5)	S/Hole	10F-GT-VA8X-II	002923	1	-	-	031218	1
<b>Removable Needle</b>										
1 µL*	51	26 (0.47)	Cone	1BR-VA8X	000655	1	034720	1**	-	-
10 µL Gas Tight	53	25 (0.5)	S/Hole	10R-GT-VA8X-II	002924	1	037777	1	031218	1
<b>Needle Alternatives for P/N 002924</b>										
	50	25 (0.5)	Bevel	N10-VA8035-II	-	1	037776	2	-	-
	105	-	OC	N10-VA8035-0.17-II	-	1	037778	2	-	-
	53	23 (0.63)	S/Hole	N10-VA8X00H-0-.63-II	-	1	037779	2	-	-
	53	25 (0.5)	S/Hole	N10-VA800H-II(0.2)	-	1	037780	1	-	-
<b>Varian/Bruker CP-8400/8410, CP-9010/9050</b>										
<b>Fixed Needle</b>										
10 µL	50	26 (0.47)	Bevel	10F-VA8400-5/0.47	002950	1	-	-	-	-
10 µL	50	23 (0.63)	Cone	10F-C/T-5/0.63C	002981	1	-	-	-	-
<b>Removable Needle</b>										
10 µL	50	26 (0.47)	Cone	10R-C/T-5/0.47C	002982	1	037785	2	-	-

\*Not suitable for 8200 autosampler. \*\*Denotes Plunger and Needle Kit.

## Septa

Instrument	Diameter	Septum Type	Pack Size	Part No.
<b>Varian/Bruker</b>				
1177 Injector	9	HT	25	041897
	9	EC	25	041900
1040, 1041, 1060 & 1061 Injectors	9.5	HT	25	041897
	9.5	EC	25	041901

## Inlet Liners

Description and Geometry Sketch	OD (mm)	ID (mm)	Length (mm)	Pack Size	Part no.
<b>For 1177 Injector</b>					
 Split / Splitless FocusLiner™	6.3	4	78.5	1	09200201
				5	092002
				25	092219
 Split, straight-through liner	6.3	4	78.5	1	09200701
				5	092007
				25	092222
 Split FocusLiner™	6.3	4	72	1	09202201
				5	092022
 Straight-through Liner	5	0.5	54	1	09203101
				5	092031



SGE's new enhanced inlet liner range is colour coded by geometry to simplify selection:

- FocusLiner™
- Straight

## O-rings and Sealing Rings

Description	Usage	Pack Size	Part No.
Viton O-Ring for 1177 Injector	Can be used at temperatures up to 300 °C.	10	0726532
Graphite Sealing Ring for 1075 & 1077 Injectors		10	072601
Graphite Sealing Ring for 1078 & 1079 Injectors		10	0726217

## Ferrules

Instrument	Column ID	Ferrule ID	Pack Size	Part No.
<b>15% Graphite / 85% Vespel® Ferrules</b>				
For GC-MS & Detectors at atmospheric pressure e.g. FID	0.1-0.25 mm	0.4 mm	10	072663
	0.32 mm	0.5 mm	10	072654
	0.53 mm	0.8 mm	10	072655
<b>SilTite™ Metal Ferrules</b>				
For GC-MS Interface Connections (Starter Kit)	0.1-0.25 mm	0.4 mm	10*	073300
	0.32 mm	0.5 mm	10*	073301
	0.53 mm	0.8 mm	10*	073302
	1/32"	0.81 mm	10*	073303
<b>Replacement SilTite™ Ferrules</b>				
For GC-MS Interface Connections	0.1-0.25 mm	0.4 mm	10	073220
	0.32 mm	0.5 mm	10	073221
	0.53 mm	0.8 mm	10	073222
	1/32"	0.81 mm	10	073219
<b>Replacement SilTite™ Nuts</b>				
			5	073231

\* Includes 10 ferrules, 2 SilTite™ nuts.

# Information Resources

## For Official Methodology

### ASTM International

ASTM International, formerly known as the American Society for Testing and Materials (ASTM), is a globally recognized leader in the development and delivery of international voluntary consensus standards.

[www.astm.org/Standards/D6584.htm](http://www.astm.org/Standards/D6584.htm)

### DIN – Deutsches Institut für Normung

A range of international standards and reference for EN methods.

[www.din.de](http://www.din.de)

## Industry resources

### National Biodiesel Board

Body responsible for the development of the US biodiesel industry.

[www.biodiesel.org](http://www.biodiesel.org)

## Journals

### BioDiesel Magazine

Biodiesel industry journal for news on commercial and technical developments

[www.biodieselmagazine.com](http://www.biodieselmagazine.com)

### BioFuels Magazine

Industry journal for biofuels that features biodiesel related news.

[www.biofuels-news.com](http://www.biofuels-news.com)



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