

Stationary Phase: **Biphenyl**

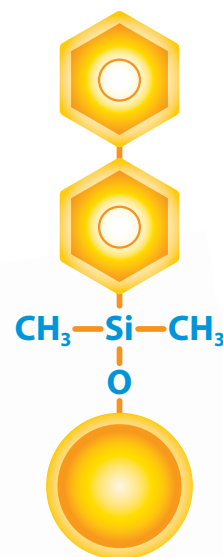
# Raptor

LC Columns

*Selectivity Accelerated*

## Fast, Rugged Raptor Columns with Time-Tested Selectivity

The industry-leading Biphenyl, first introduced by Restek in 2005, is our most popular LC stationary phase because it is particularly adept at separating compounds that are hard to resolve or that elute early on C18 and other phenyl chemistries. As a result, the rugged Raptor Biphenyl column is extremely useful for fast separations in bioanalytical testing applications such as drug and metabolite analyses, especially those that require a mass spectrometer (MS).



**RESTEK**

Pure Chromatography

[www.restek.com/raptor](http://www.restek.com/raptor)

# Raptor Biphenyl Columns

- Ideal for bioanalytical testing applications such as drug and metabolite analyses.
- Heightened selectivity and retention for compounds that are hard to resolve or elute early on C18 and other phenyl chemistries.
- Limits ionization suppression and allows simple, MS-friendly mobile phases.

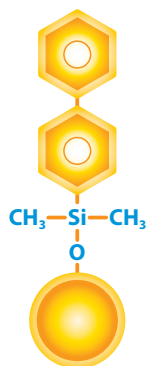
Increasing retention of early-eluting compounds can limit ionization suppression, and the heightened selectivity helps eliminate the need for complex mobile phases that are not well suited for MS detection. Restek was the first to bring you the benefits of the Biphenyl ligand, and we have the experience to maximize SPP performance of this premier phenyl chemistry for today's challenging workflows.

Part of Restek's Raptor LC column line featuring 1.8, 2.7, and 5  $\mu\text{m}$  SPP core-shell silica:

- Higher efficiencies and resolution for drastically faster analysis times, especially for traditional HPLC instruments.
- Faster analyses mean increased sample throughput.
- Long-lasting ruggedness for dependable reproducibility.

Learn why the Biphenyl is Restek's most popular LC phase at [www.restek.com/raptor](http://www.restek.com/raptor)

## Column Description:



**Stationary Phase Category:**  
Phenyl (L11)

**Ligand Type:**  
Biphenyl

**Particle:**  
1.8  $\mu\text{m}$ , 2.7  $\mu\text{m}$ , or 5  $\mu\text{m}$  superficially porous silica (SPP or "core-shell")

**Pore Size:**  
90  $\text{\AA}$

**Surface Area:**  
125  $\text{m}^2/\text{g}$  (1.8  $\mu\text{m}$ ), 130  $\text{m}^2/\text{g}$  (2.7  $\mu\text{m}$ ), or 100  $\text{m}^2/\text{g}$  (5  $\mu\text{m}$ )

## Recommended Usage:

pH Range: 1.5–8.0

Maximum Temperature: 80  $^{\circ}\text{C}$

Maximum Pressure: 1,034 bar/15,000 psi\* (1.8  $\mu\text{m}$ ), 600 bar/8,700 psi (2.7  $\mu\text{m}$ ); 400 bar/5,800 psi (5  $\mu\text{m}$ )

\* For maximum lifetime, recommended maximum pressure for 1.8  $\mu\text{m}$  particles is 830 bar/12,000 psi.

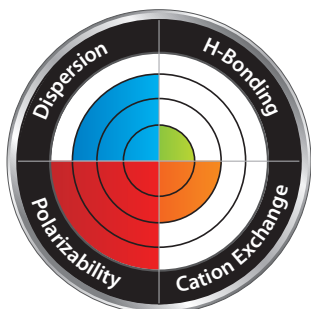
## Properties:

- Increased retention for dipolar, unsaturated, or conjugated solutes.
- Enhanced selectivity when used with methanolic mobile phase.
- Ideal for increasing sensitivity and selectivity in LC-MS analyses.

## Switch to a Biphenyl when:

- You observe limited selectivity on a C18.
- You need to increase retention of hydrophilic aromatics.

## Column Interaction Profile:



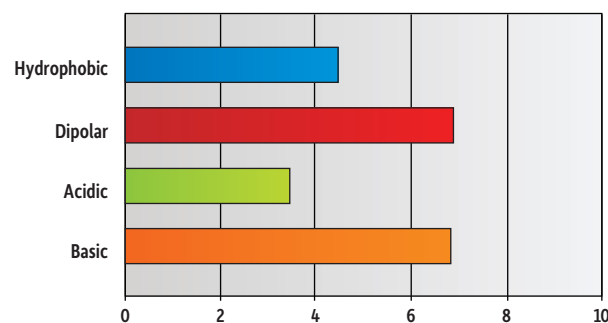
### Defining Solute Interactions:

- Polarizability
- Dispersion

### Complementary Solute Interaction:

- Cation exchange

## Solute Retention Profile:



### Target Analyte Structures:

- Aromatic
- Dipolar

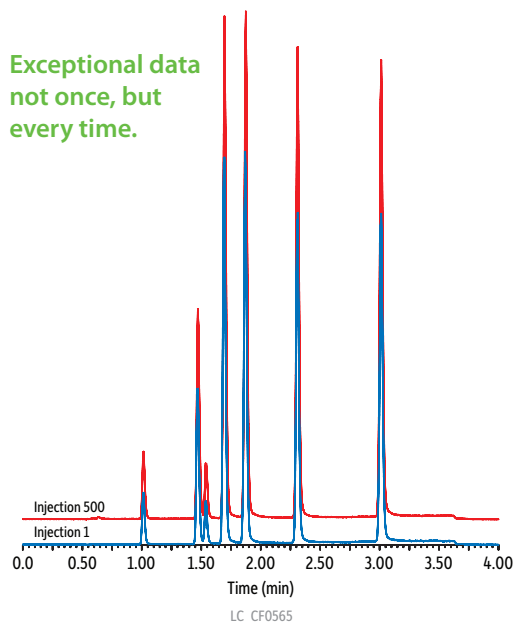
### Target Analyte Functionalities:

- Hydrophilic aromatics
- Strong dipoles
- Lewis acids
- Dipolar, unsaturated, or conjugated compounds
- Fused-ring compounds with electron withdrawing groups

# Raptor Biphenyl: Clinically Proven to Optimize Your Bioanalytical Workflows

**Figure 1:** Even after hundreds of injections, a Raptor Biphenyl column will provide consistent, reliable data.

Exceptional data not once, but every time.



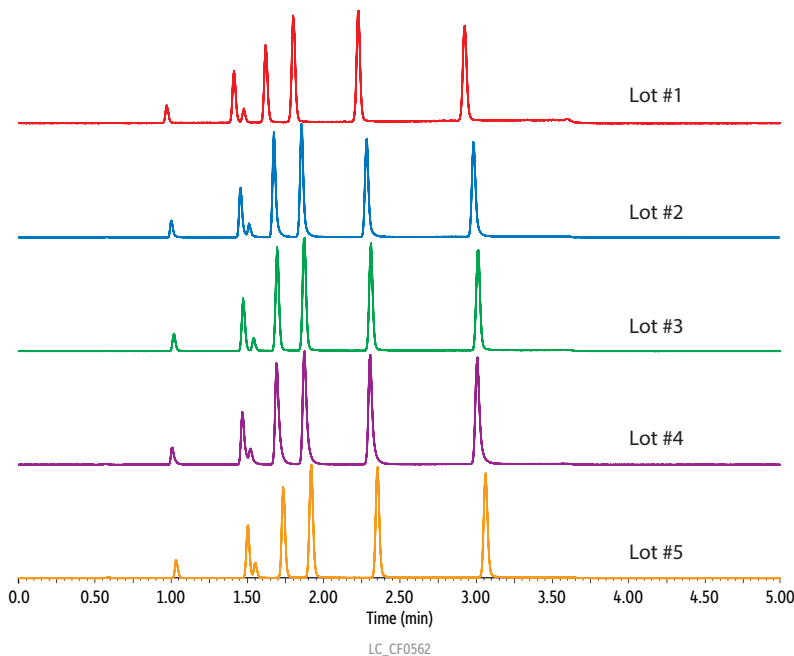
**Peaks**

1. Cortisol
2. 11-Deoxycortisol
3. Estradiol
4. Boldenone
5. Testosterone
6. Androstenedione
7. Progesterone

**Column:** Raptor Biphenyl (cat.# 9309A1E); Dimensions: 100 mm x 3.0 mm ID; Particle Size: 2.7 µm; Pore Size: 90 Å; Temp.: 30 °C; **Sample:** Diluent: initial mobile phase; Conc.: 50 ng/mL; Inj. Vol.: 5 µL **Mobile Phase:** A: 0.1% formic acid in water, B: 0.1% formic acid in acetonitrile; **Gradient (%B):** 0.00 min (40%), 3.00 min (80%), 3.01 min (40%), 5.00 min (40%); **Flow:** 0.700 mL/min; **Detector:** Waters Xevo TQ-S; Ion Mode: ESI+; **Instrument:** Waters.

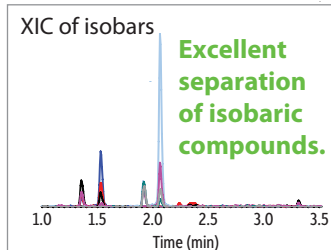
**Figure 2:** From one lot to the next, every Raptor Biphenyl column you purchase will perform the same.

Strict QC specs guarantee retention time stability for worry-free MRM analyses.



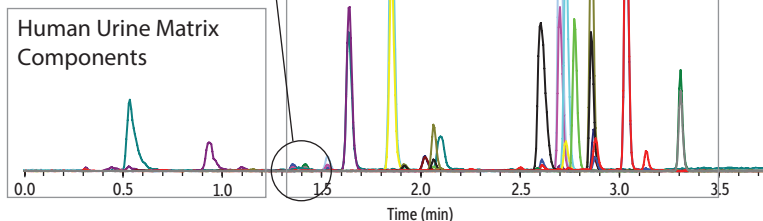
See Figure 1 for compound list and conditions.

**Figure 3:** Raptor Biphenyl columns offer pain panel analyses with complete isobaric resolution in under 5 minutes!



Excellent separation of isobaric compounds.

Analytes separated from early-eluting matrix.



Peaks	ts (min)	Precursor ion	Production ion 1	Production ion 2
1. Morphine*	1.34	286.2	152.3	165.3
2. Oxymorphone	1.40	302.1	227.3	198.2
3. Hydromorphone*	1.52	286.1	185.3	128.2
4. Amphetamine	1.62	136.0	91.3	119.2
5. Methamphetamine	1.84	150.0	91.2	119.3
6. Codeine*	1.91	300.2	165.4	153.2
7. Oxycodone	2.02	316.1	241.3	256.4
8. Hydrocodone*	2.06	300.1	199.3	128.3
9. Norbuprenorphine	2.59	414.1	83.4	101.0
10. Meprobamate	2.61	219.0	158.4	97.2
11. Fentanyl	2.70	337.2	188.4	105.2
12. Buprenorphine	2.70	468.3	396.4	414.5
13. Flurazepam	2.73	388.2	315.2	288.3
14. Sufentanil	2.77	387.2	238.5	111.3
15. Methadone	2.86	310.2	265.3	105.3
16. Carisoprodol	2.87	261.2	176.3	158.1
17. Lorazepam	3.03	321.0	275.4	303.1
18. Diazepam	3.31	285.1	193.2	153.9

\*An extracted ion chromatogram (XIC) of the isobars is presented in the inset.

**Column:** Raptor Biphenyl (cat.# 9309A5E); Dimensions: 50 mm x 3.0 mm ID; Particle Size: 2.7 µm; Pore Size: 90 Å; Temp.: 30 °C; **Sample:** Diluent: urine; mobile phase A: mobile phase B (17:76:7); Conc.: 10-100 ng/mL; Inj. Vol.: 10 µL **Mobile Phase:** A: 0.1% formic acid in water, B: 0.1% formic acid in methanol; **Gradient (%B):** 0.00 min (10%), 1.50 min (45%), 2.50 min (100%), 3.70 min (100%), 3.71 min (10%) 5.00 min (10%); **Flow:** 0.6 mL/min; **Detector:** AB SCIEX API 4000 MS/MS; Ion Source: TurbolonSpray; Ion Mode: ESI+; **Instrument:** API LC-MS/MS; **Notes:** Lorazepam was prepared at 100 ng/mL; all other analytes are 10 ng/mL.

Experience *Selectivity Accelerated*. Order the Raptor Biphenyl today at [www.restek.com/raptor](http://www.restek.com/raptor)

# Accelerated Performance and Time-Tested Biphenyl Selectivity for Clinical Diagnostic, Pain, Pharma, and Environmental Labs

## Raptor Biphenyl LC Columns



Length	2.1 mm cat.#	3.0 mm cat.#	4.6 mm cat.#
<b>1.8 µm Columns</b>			
30 mm	9309232	—	—
50 mm	9309252	930925E	—
100 mm	9309212	930921E	—
150 mm	9309262	—	—
<b>2.7 µm Columns</b>			
30 mm	9309A32	9309A3E	9309A35
50 mm	9309A52	9309A5E	9309A55
100 mm	9309A12	9309A1E	9309A15
150 mm	9309A62	9309A6E	9309A65
<b>5 µm Columns</b>			
30 mm	—	930953E	—
50 mm	9309552	930955E	9309555
100 mm	9309512	930951E	9309515
150 mm	9309562	930956E	9309565
250 mm	—	—	9309575

## EXP Reusable Fittings for HPLC & UHPLC for 10-32 fittings and 1/16" tubing

Effortlessly achieve 8,700+ psi HPLC seals by hand! (Wrench tighten to 20,000+ psi.) Hybrid titanium/PEEK seal can be installed repeatedly without compromising your seal.

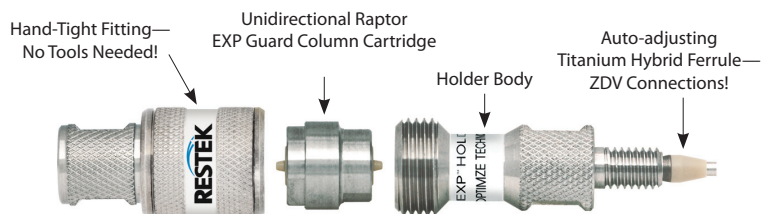


Description	qty.	cat.#
EXP Hand-Tight Fitting (Nut w/Ferrule)	ea.	25937
EXP Hand-Tight Fitting (Nut w/Ferrule)	10-pk.	25938
EXP Hand-Tight Nut (w/o Ferrule)	ea.	25939

Hybrid Ferrule U.S. Patent No. 8201854, EXP Holders U.S. Patent No. 8696902, EXP2 Wrench U.S. Patent No. D766055. Other U.S. and Foreign Patents Pending. The EXP, Free-Turn, and the Opti- prefix are registered trademarks of Optimize Technologies, Inc.

Experience *Selectivity Accelerated*.  
Order the Raptor Biphenyl today at  
[www.restek.com/raptor](http://www.restek.com/raptor)

## Raptor EXP Guard Cartridges—for All Raptor Columns



Protect your investment, extend the life of our already-rugged LC columns, and change guard column cartridges by hand without breaking fluid connections—no tools needed! Great with any Raptor column to get ultimate protection from particulates and matrix contamination, especially when using dilute-and-shoot or other minimal sample preparation techniques.

### EXP Direct Connect Holder

Description	qty.	cat.#
EXP Direct Connect Holder for EXP Guard Cartridges (includes hex-head fitting & 2 ferrules)	ea.	25808

Maximum holder pressure: 20,000 psi (1,400 bar)

### Raptor EXP Guard Column Cartridges

Description	Particle Size	qty.	5 x 2.1 mm cat.#	5 x 3.0 mm cat.#	5 x 4.6 mm cat.#
Raptor Biphenyl EXP Guard Column Cartridge	UHPLC	3-pk.	9309U0252	9309U0253	—
Raptor Biphenyl EXP Guard Column Cartridge	2.7 µm	3-pk.	9309A0252	9309A0253	9309A0250
Raptor Biphenyl EXP Guard Column Cartridge	5 µm	3-pk.	930950252	930950253	930950250

1,034 bar/15,000 psi\* (UHPLC), 600 bar/8,700 psi (2.7 µm); 400 bar/5,800 psi (5 µm).

\* For maximum lifetime, recommended maximum pressure for 1.8 µm particles is 830 bar/12,000 psi.

Raptor SPP LC columns combine the speed of SPP with the resolution of USLC technology. Learn more at [www.restek.com/raptor](http://www.restek.com/raptor)

### UltraShield UHPLC PreColumn Filter—for 1.8 µm Raptor Columns

Pair 1.8 µm Raptor columns with an UltraShield filter instead of a guard cartridge to protect against particulates, minimize extra column volume, and maximize UHPLC sample throughput when using SPE, SLE, or other extensive sample preparations.

Description	Filter Porosity	qty.	cat.#
UltraShield UHPLC PreColumn Filter	0.2 µm frit	ea.	25809
		5-pk.	25810
		10-pk.	25811



**RESTEK**  
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Lit. Cat.# GNSS2250B-UNV