

Restek HPLC Columns



**Your preferred supplier of chromatography
instruments & consumables**



Strategies for the Analysis of EtG and EtS in Urine Resolving from Matrix Interferences

- Optimization of instrument setup—MS ion source
- Optimize sample prep—Protein precipitation followed by dilution
- Reducing formic acid in aqueous mobile phase



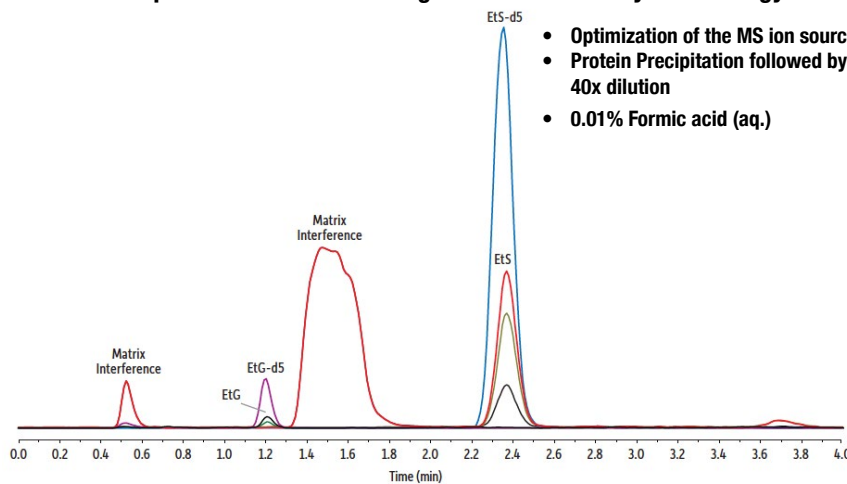
RAPTOR ETG/ETS PRODUCTS

PART NO	DESCRIPTION
RTK-9325A12	Raptor EtG/EtS, 2.7 μm, 2.1 x 100 mm, ea
RTK-25809	UltraShield UHPLC precolumn filter, 0.2 μm frit, ea



Good sensitivity and separation were achieved for the analysis of EtG and EtS in urine on a Raptor EtG/EtS column using the combined analytical strategy:

- Optimization of the MS ion source
- Protein Precipitation followed by 40x dilution
- 0.01% Formic acid (aq.)

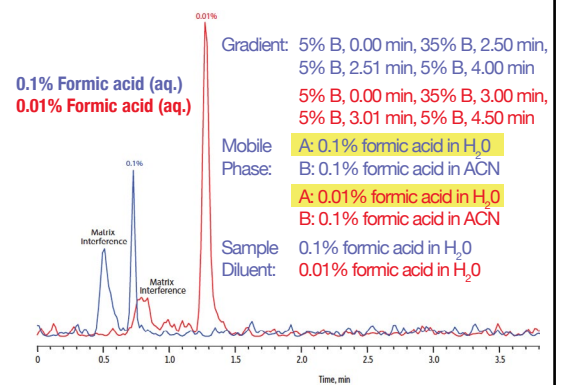


Optimization of MS Ion Source

It's important to recognize that optimized ionization source settings for highly organic mobile phases may not be optimal for the ionization of compounds that elute under high aqueous mobile phase conditions, as is the case with the analysis of EtG and EtS in urine.

While optimizing MS source parameters is something that will likely require experimental adjustments, higher source temperatures and a readjusted probe position may help provide incremental sensitivity boosts for any LC-MS/MS. In addition to method parameter adjustments, simply cleaning the instrument's ionization source can provide increased sensitivity.

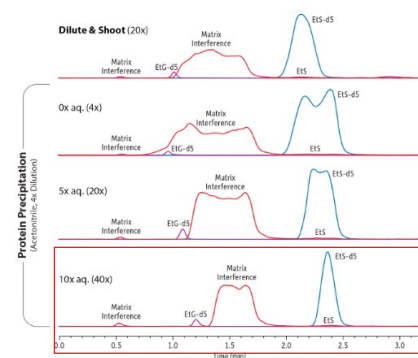
Improvement in EtG response by dropping the aqueous mobile phase concentration of formic acid from 0.1% to 0.01%



Mobile Phase Additive Concentration

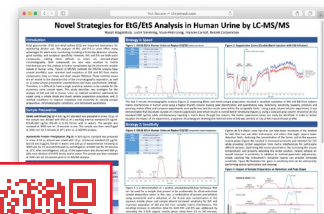
Reducing the formic acid concentration in the aqueous mobile phase from 0.1% to 0.01% resulted in an increase in EtG sensitivity. A couple of factors contributed to this effect. First, decreasing the formic acid concentration in the aqueous mobile phase increases EtG retention, and this may lead to further separation from matrix interferences for particularly difficult samples. Second, higher concentrations of formic acid in the mobile phase actually suppress the signal, so reducing the concentration increases sensitivity.

Impact of Sample Preparation on Retention and Peak Shape



Some urine samples have much more pronounced matrix components that can interfere with the analysis when using a simple dilute and shoot sample preparation, thus, protein precipitation followed by dilution can be useful.

Adding an aqueous dilution factor of 20x with 0.01% formic acid, and then ultimately 40x, significantly improved chromatographic performance, allowing for confident quantitation.



Scan to view the full scientific poster of this analysis.

RESTEK | Authorized Distributor

Restek Raptor Polar X Applications

Featured Application: Ultrashort-Chain (C2, C3), Alternative, and Legacy PFAS on Raptor Polar X

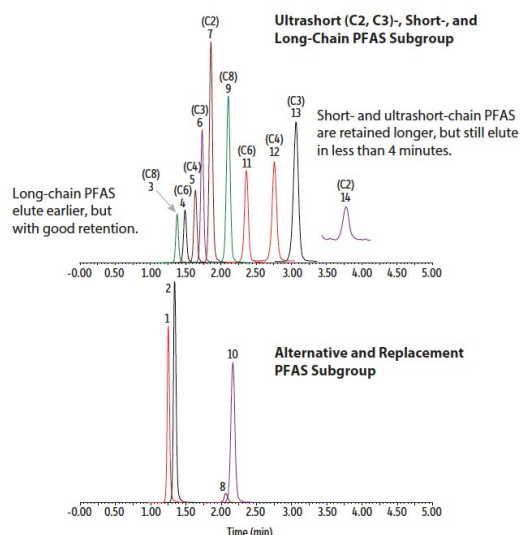
- Unique stationary phase provides proper chromatographic retention of small, polar ultrashort-chain PFAS as well as short- and long-chain PFAS
- Fast and simple isocratic LC-MS/MS method allows high-throughput PFAS analysis
- Consistent column performance ensures accurate results



RAPTOR POLAR X LC COLUMNS	
PART NO	DESCRIPTION
RTK-9311A2	Raptor Polar X, 2.7 μm, 2.1 x 30 mm, ea
RTK-9311A52	Raptor Polar X, 2.7 μm, 2.1 x 50 mm, ea
RTK-9311A12	Raptor Polar X, 2.7 μm, 2.1 x 100 mm, ea



Ultrashort (C2, C3)-, Short-, and Long-Chain PFAS Subgroup



- 11-Chloroeicosafluoro-3-oxanonane-1-sulfonate (11CL-PF3OUdS)
- 9-Chlorohexadecafluoro-3-oxanonane-1-sulfonate (9Cl-PF3ONS)
- Perfluorooctanesulfonic acid (PFOS)
- Perfluorohexanesulfonic acid (PFHxS)
- Perfluorobutanesulfonic acid (PFBS)
- Perfluoropropanesulfonic acid (PFPrS)
- Perfluoroethanesulfonic acid (PFETs)
- Hexafluoropropylene oxide dimer acid (HFPO-DA)
- Perfluorooctanoic acid (PFOA)
- Ammonium 4,8-dioxa-3H-perfluorononanoate (ADONA)
- Perfluorohexanoic acid (PFHxA)
- Perfluorobutanoic acid (PFBA)
- Perfluoropropionic acid (PFPrA)
- Trifluoroacetic acid (TFA)

Column: Raptor Polar X
RTK-9311A52
2.1 x 50 mm ID

Mobile Phase: A: Water, 10 mM ammonium formate, 0.05% formic acid
B: 60:40 Acetonitrile:methanol, 0.05% formic acid

Gradient: (%B): 0.00 min (85%B), 5.00 min (85% B)

Temperature: 40 °C

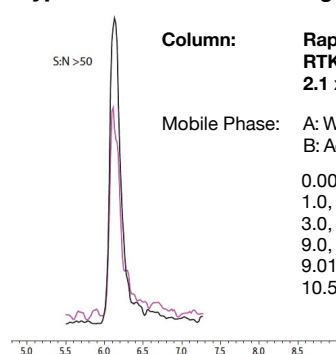
Flow: 0.5 mL/min

Detector: MS/MS, Ion Mode: ESI-, Mode: MRM

Instrument: UHPLC

Featured Application: Glyphosate on Raptor Polar X

Simple Large Volume Injection Method for Trace-Level Glyphosate in Bottled Drinking Water



Column: Raptor Polar X
RTK-9311A32
2.1 x 30 mm ID

Mobile Phase: A: Water, 0.5% formic acid
B: Acetonitrile, 0.5% formic acid

0.00, %A: 5, %B: 95
1.0, %A: 5, %B: 95
3.0, %A: 90, %B: 10
9.0, %A: 90, %B: 10
9.01, %A: 5, %B: 95
10.5, %A: 5, %B: 95

1. Glyphosate

Flow: 0.5 mL/min

Inj. Vol: 500 μL

Diluent: Direct injection of bottled drinking water fortified at 100 ppt with glyphosate

Temp: 30 °C

Detector: MS/MS, Ion Mode: ESI-

Instrument: UHPLC

- Analyze glyphosate without derivatization or ion pairing.
- Unique Raptor Polar X column provides good retention and efficient elution, resulting in better peak shape.
- Direct large volume injection makes it easy to increase sensitivity at ppt levels.

RESTEK Authorized Distributor

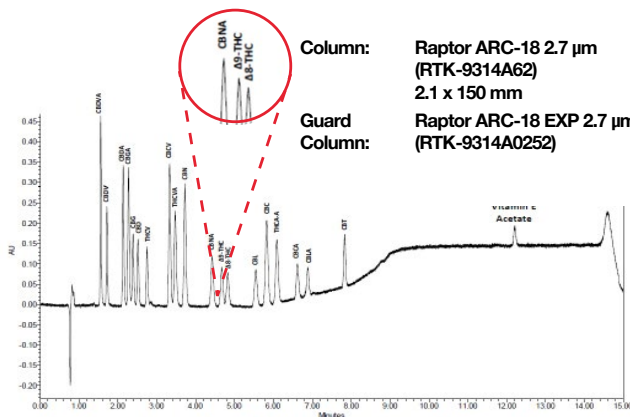
High-Throughput Analysis of Cannabinoids by LC-UV - Recently added Vitamin E Acetate

While it appears that Vitamin E Acetate is associated with EVALI (e-cigarette, or vaping, product use associated lung injuries), evidence is not yet sufficient to rule out contribution of other chemicals of concern to EVALI. Many different substances and product sources are still under investigation, and it may be that there is more than one cause of this outbreak.

Restek scientists recently revised their cannabinoid workflow by adding Vitamin E Acetate as part of a modified potency analysis. Restek is continuing to look at other methods for rapidly screening for Vitamin E Acetate as interest in this compound continues to develop.



Analysis of 16 Cannabinoids Using Modified Aqueous Mobile Phase - Recently added Vitamin E Acetate



Column: Raptor ARC-18 2.7 μm (RTK-9314A62)
2.1 x 150 mm
Guard Column: Raptor ARC-18 EXP 2.7 μm , (RTK-9314A0252)

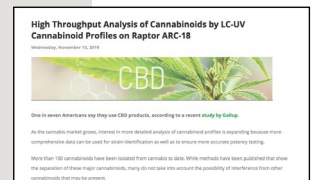
Mobile Phase: A: 5mM Ammonium Formate, 0.1% Formic Acid in H_2O
B: 0.1% Formic Acid in ACN
Column Temp: 30 $^\circ\text{C}$
Injection Vol: 2.0 μL
Sample: 50 ppm in 50:50 Methanol:ACN
Gradient: 75% B, 0.00 min; 0.4 mL/min
75% B, 4.00 min; 0.4 mL/min
98% B, 8.00 min; 0.4 mL/min
98% B, 8.01 min; 0.8 mL/min
98% B, 13.00 min; 0.8 mL/min
75% B, 13.01 min; 0.4 mL/min
75% B, 15.00 min; 0.4 mL/min

1. Cannabidivarinic acid (CBDVA)
2. Cannabidivarin (CBDV)
3. Cannabidiolic acid (CBDA)
4. Cannabigerolic acid (CBGA)
5. Cannabigerol (CBG)
6. Cannabidiol (CBD)
7. Tetrahydrocannavarin (THCV)
8. Tetrahydrocannabivarinic acid (THCVA)
9. Cannabinol (CBN)
10. Cannabinolic acid (CBNA)
11. Δ 9-Tetrahydrocannabinol (Δ 9-THC)
12. Δ 8-Tetrahydrocannabinol (Δ 8-THC)
13. Cannabicyclol (CBL)
14. Cannabichromene (CBC)
15. Tetrahydrocannabinolic acid A (THCA-A)
16. Cannabichromenic acid (CBCA)
17. Vitamin E Acetate

TECH TIP

Using popular mobile phases may lead to co-elution of cannabinolic acid and Δ 9-Tetrahydrocannabinol (Δ 9-THC). In order to resolve CBNA from Δ 9-THC without compromising established separations, ammonium formate was added to the aqueous mobile phase to a concentration of 5 mM in solution.

View Restek's original cannabinoids method for a fast and easy method of the 16 cannabinoids. No re-equilibration time required with the isocratic method. <https://chromtech.com/blog>



RAPTOR COLUMNS & ACCESSORIES

PART NO	DESCRIPTION
RTK-9314A62	Raptor ARC-18, 2.7 μm , 2.1 x 150 mm, ea
RTK-9314A0252	Raptor ARC-18, 2.7 μm , EXP Guard cartridge, 2.1 x 5 mm, 3/pk*
RTK-25808	EXP Guard cartridge holder, includes fitting & ferrules
FV-3020EX	Filter vial, 0.2 μm EX-PVDF, slit cap, 100/pk

*Requires holder sold separately: RTK-25808

CANNABIS STANDARDS (1,000 $\mu\text{g}/\text{mL}$, Volume is 1 mL/ampul)

PART NO	DESCRIPTION	PART NO	DESCRIPTION
RTK-34123	Cannabidivarin (CBDV)	RTK-34010	Cannabinol (CBN)
RTK-34094	Cannabidiolic Acid (CBDA)	RTK-34067	Δ 9-Tetrahydrocannabinol (Δ 9-THC)
RTK-34112	Cannabigerolic Acid (CBGA)	RTK-34090	Δ 8-Tetrahydrocannabinol (Δ 8-THC)
RTK-34091	Cannabigerol (CBG)	RTK-34092	Cannabichromene (CBC)
RTK-34011	Cannabidiol (CBD)	RTK-34093	Tetrahydrocannabinolic acid A (THCA-A)
RTK-34100	Tetrahydrocannavarin		

Certified reference materials (CRMs) manufactured and QC-tested in ISO-accredited labs satisfy your ISO requirements.



RTK-25808



FV-3020EX



LC-MS/MS Analysis of 58 Antipsychotics and Antidepressants in Human Urine

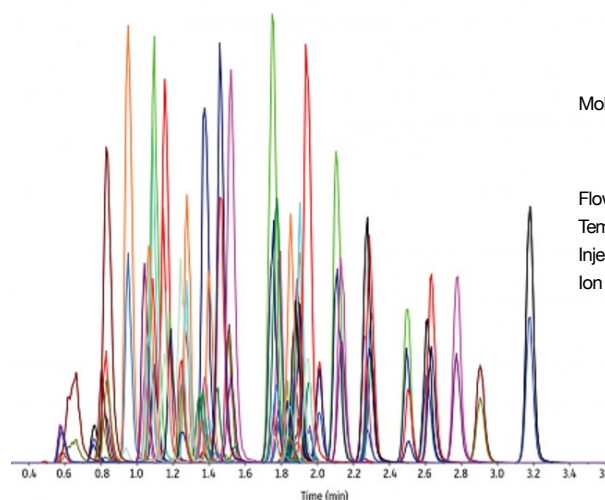
- Fast analysis, 5.5-min total LC cycle time
- Good chromatographic separation of isobaric compounds
- Optimized method suitable for quantitative analysis

RAPTOR BIPHENYL PRODUCTS

PART NO	DESCRIPTION
RTK-9309A5E	Raptor Biphenyl, 2.7 μ m, 3.0 x 50 mm, ea
RTK-9309A0253	2.7 μ m, EXP Guard, 3.0 x 5 mm, 3/pk



Analysis of 58 Antipsychotics and Antidepressants in Fortified Human Urine (2,500 ng/mL)



Column: Raptor Biphenyl 2.7 μ m, (RTK-9309A5E) 50 mm x 3.0 mm

Guard Column: Raptor Biphenyl 2.7 μ m, (RTK-9309A0253) 5 mm x 3.0 mm

Gradient: 60% B, 0.00 min; 60% B, 0.20 min; 100% B, 3.50 min; 60% B, 3.51 min; 60% B, 5.50 min

Mobile Phase: A: Water, 0.1% formic acid + 5mM ammonium formate
B: Methanol, 0.1% formic acid + 5mM ammonium formate

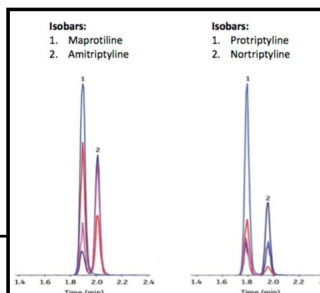
Flow Rate: 0.6 mL/min

Temp: 30 $^{\circ}$ C

Injection Vol: 2 μ L

Ion Mode: Scheduled MRM in positive ESI

- Desmethyloanzapine
- Phenelzine sulfate
- Olanzapine
- Lamotragine
- Molindone
- (+/-)-Hydroxybupropion
- 7-Hydroxyquetiapine
- Bupropion-D9 (IS)
- Bupropion
- Venlafaxine
- Reduced haloperidol
- Milnacipran
- N-desmethylnortriptyline
- 9-Hydroxyrisperidone
- Mirtazapine
- N-desmethylozapine
- Droperidol
- Cozapine
- Didesmethyl citalopram
- N-desmethylopram
- Escitalopram
- Fluvoxamine
- Maprotiline
- Haloperidol
- Norfluoxetine
- Isocarboxazid
- Fluoxetine
- Desmethyldoxepin
- Doxepin
- Trazodone
- Oxcarbazepine
- Risperidone
- Quetiapine
- Asenapine
- Ziprasidone
- Protriptyline
- Desipramine
- Paroxetine
- Iloperidone
- Duloxetine
- Amoxapine
- Carbamazepine
- Maprotiline
- Imipramine
- Nortriptyline
- Loxapine
- Amitriptyline
- Trimipramine
- Pimozide
- Chlorpromazine
- Dehydro aripiprazole
- Clomipramine
- Sertraline
- Fluphenazine
- Aripiprazole
- Perphenazine
- Trifluoperazine
- Prochlorperazine
- Thiothixene
- Thioridazine

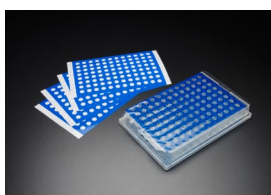


It was demonstrated that simultaneous measurement of 58 antipsychotic and antidepressant drugs and their metabolites in urine can be achieved with a fast 5.5-minute LC-MS/MS analysis using the Raptor Biphenyl column. The established method provides high-throughput and accurate determination for a variety of available mental health drugs.

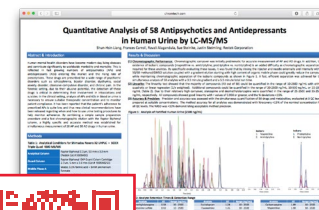
CHROM TECH RELATED PRODUCTS



96-0001T
No need to adjust your needle height. Our TrueTaper plates maintain the same 45 mm overall height as our standard 1 mL collection plates.



BST-9790
PTFE sealing film has an adhesive free area around each well so plastic pipette tips and metal probes stay clean.



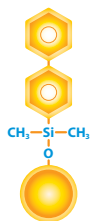
Scan to view the full scientific poster of this analysis.

Restek Raptor™ Superficially Porous Core-Shell LC Columns

RESTEK RAPTOR SPECIFICATIONS						
	BIPHENYL	ARC-18	C18	POLAR X	FLUOROPHENYL	HILIC-SI
Phase	Phenyl (L11)	C18, octadecylsilane (L1)	C18, octadecylsilane (L1)	Polar X	Pentafluorophenyl propyl (L43)	Bare Silica (L3)
Ligand type	Biphenyl	Sterically protected C18	End-capped C18	Proprietary	Fluorophenyl	None
Pore size	90 Å	90 Å	90 Å	90 Å	90 Å	90 Å
Max temp	80° C	80° C	80° C	60° C	80° C	80° C
pH range	1.5 – 8.0	1.0 – 8.0	2.0 – 8.0	2.0 – 8.0	2.0 – 8.0	2.0 – 8.0
Particle	2.7 µm or 5 µm superficially porous silica (SPP or "core-shell")	2.7 µm or 5 µm superficially porous silica (SPP or "core-shell")	2.7 µm or 5 µm superficially porous silica (SPP or "core-shell")	2.7 µm superficially porous silica (SPP or "core-shell")	2.7 µm or 5 µm superficially porous silica (SPP or "core-shell")	2.7 µm superficially porous silica (SPP or "core-shell")
Surface area	150 m2/g (2.7 µm) 100 m2/g (5 µm)	150 m2/g (2.7 µm) 100 m2/g (5 µm)	150 m2/g (2.7 µm) 100 m2/g (5 µm)	130 m2/g	125 m2/g (1.8 µm) 130 m2/g (2.7 µm) 100 m2/g (5 µm)	130 m2/g
Max pressure	600 bar / 8,700 PSI (2.7 µm) 400 bar / 5,800 PSI (5 µm)	600 bar / 8,700 PSI (2.7 µm) 400 bar / 5,800 PSI (5 µm)	600 bar / 8,700 PSI (2.7 µm) 400 bar / 5,800 PSI (5 µm)	600 bar / 8,700 PSI	1,034 bar/15,000 PSI (1.8 µm) 600 bar/8,700 PSI (2.7 µm) 400 bar/5,800 PSI (5 µm)	600 bar / 8,700 PSI

Biphenyl (USP L11)

- Ideal for bioanalytical applications like 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; allows MS-friendly mobile phases



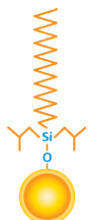
Polar X

- Unique stationary phase provides proper chromatographic retention of short- and long-chain PFAS.
- Analyze glyphosate without derivatization or ion pairing
- Consistent column performance ensures accurate results.
- Direct large volume injection makes it easy to increase sensitivity at ppt levels



ARC-18

- Ideal for high-throughput LC-MS/MS applications with minimal sample prep
- Well-balanced retention profile for better detection and integration of large, multiclass analyte lists
- Sterically protected to endure low-pH mobile phases without sacrificing retention or peak quality
- Part of Restek's Raptor™ LC column line featuring 2.7 and 5 µm SPP core-shell silica



Fluorophenyl

- Capable of both reversed-phase and HILIC separations.
- Ideal for increasing sensitivity and selectivity in LC-MS analyses.
- Offers increased retention for charged bases.



C18 (USP L1)

- Compatible with moderately acidic to neutral mobile phases (pH 2 – 8)
- Excellent data quality in food, environmental, bioanalytical, and other applications
- General purpose column for reversed phase chromatography
- Increased retention of hydrophobic compounds



Hilic-Si

- HILIC silica column designed for increased retention of polar compounds without ion-pairing reagents.
- Ideal for increasing sensitivity and selectivity in LC-MS analyses.
- Fully compatible with HPLC and UHPLC when using low back-pressure HILIC mobile phases.



EtG/EtS

- Capable of both reversed-phase and HILIC separations.
- Ideal for increasing sensitivity and selectivity in LC-MS analyses.
- Offers increased retention for charged bases.



Restek Raptor™ Superficially Porous Core-Shell LC Columns (cont.)

SIZE (mm)	PARTICLE SIZE (µm)	BIPHENYL	ARC-18	C18	POLAR X	FLUOROPHENYL	Hilic-Si	EtG/EtS
4.6 x 250	5	RTK-9309575	RTK-9314575	RTK-9304575	—	RTK-9319575	—	—
4.6 x 150	5	RTK-9309565	RTK-9314565	RTK-9304565	—	RTK-9319565	—	—
4.6 x 100	5	RTK-9309515	RTK-9314515	RTK-9304515	—	RTK-9319515	—	—
4.6 x 50	5	RTK-9309555	RTK-9314555	RTK-9304555	—	RTK-9319555	—	—
4.6 x 5 Guard, 3/pk		RTK-930950250	RTK-931450250	RTK-930450250	—	RTK-931950250	—	—
3.0 x 150	5	RTK-930956E	RTK-931456E	RTK-930456E	—	RTK-931956E	—	—
3.0 x 100	5	RTK-930951E	RTK-931451E	RTK-930451E	—	RTK-931951E	—	—
3.0 x 50	5	RTK-930955E	RTK-931455E	RTK-930455E	—	RTK-931955E	—	—
3.0 x 30	5	RTK-930953E	RTK-931453E	RTK-930453E	—	RTK-931953E	—	—
3.0 x 5 Guard, 3/pk		RTK-930950253	RTK-931450253	RTK-930450253	—	RTK-931950253	—	—
2.1 x 150	5	RTK-9309562	RTK-9314562	RTK-9304562	—	RTK-9319562	—	—
2.1 x 100	5	RTK-9309512	RTK-9314512	RTK-9304512	—	RTK-9319512	—	—
2.1 x 50	5	RTK-9309552	RTK-9314552	RTK-9304552	—	RTK-9319552	—	—
2.1 x 5 Guard, 3/pk		RTK-930950252	RTK-931450252	RTK-930450252	—	RTK-931950252	—	—
4.6 x 150	2.7	RTK-9309A65	RTK-9314A65	RTK-9304A65	—	RTK-9319A65	RTK-9310A65	—
4.6 x 100	2.7	RTK-9309A15	RTK-9314A15	RTK-9304A15	—	RTK-9319A15	RTK-9310A15	—
4.6 x 50	2.7	RTK-9309A55	RTK-9314A55	RTK-9304A55	—	RTK-9319A55	RTK-9310A55	—
4.6 x 30	2.7	RTK-9309A35	RTK-9314A35	RTK-9304A35	—	RTK-9319A35	—	—
4.6 x 5 Guard, 3/pk		RTK-9309A0250	RTK-9314A0250	RTK-9304A0250	—	RTK-9319A0252	RTK-9310A0250	—
3.0 x 150	2.7	RTK-9309A6E	RTK-9314A6E	RTK-9304A6E	—	RTK-9319A6E	RTK-9310A6E	—
3.0 x 100	2.7	RTK-9309A1E	RTK-9314A1E	RTK-9304A1E	—	RTK-9319A1E	RTK-9310A1E	—
3.0 x 50	2.7	RTK-9309A5E	RTK-9314A5E	RTK-9304A5E	—	RTK-9319A5E	RTK-9310A5E	—
3.0 x 30	2.7	RTK-9309A3E	RTK-9314A3E	RTK-9304A3E	—	RTK-9319A3E	—	—
3.0 x 5 Guard, 3/pk		RTK-9309A0253	RTK-9314A0253	RTK-9304A0253	—	RTK-9319A0253	RTK-9310A0253	—
2.1 x 150	2.7	RTK-9309A62	RTK-9314A62	RTK-9304A62	—	RTK-9319A62	RTK-9310A62	—
2.1 x 100	2.7	RTK-9309A12	RTK-9314A12	RTK-9304A12	RTK-9311A12	RTK-9319A12	RTK-9310A12	RTK-9325A12
2.1 x 50	2.7	RTK-9309A52	RTK-9314A52	RTK-9304A52	RTK-9311A52	RTK-9319A52	RTK-9310A52	—
2.1 x 30	2.7	RTK-9309A32	RTK-9314A32	RTK-9304A32	RTK-9311A32	RTK-9319A32	RTK-9310A32	—
2.1 x 5 Guard, 3/pk		RTK-9309A0252	RTK-9314A0252	RTK-9304A0252	—	RTK-9319A0252	RTK-9310A0252	—



CHROM TECH RELATED PRODUCTS

15-24-03832
EXP Repl Ferrule



15-20-03930
EXP Nut & Ferrule
Hand-tight to 8,700 PSI
Wrench-tight to 20,000 PSI

Raptor™ EXP® Guard Column Cartridges

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.



CT-0205
EXP Direct Connect Holder for EXP Guard Cartridges (includes hex-head fitting & 2 ferrules) Maximum holder pressure: 20,000 PSI (1,400 bar)

Restek Raptor Chromatograms

Get Complete Isobaric Resolution and Sub-5-minute Pain Panel Runs

Column: Raptor™ Biphenyl
RTK-9309A5E
3.0 x 50 mm, 2.7 µm

Instrumentation: API LC-MS/MS

Detector: AB SCIEX API4000™ MS/MS; ESI+

Mobile Phase: A: 0.1% formic acid in H₂O
B: 0.1% formic acid in methanol

Gradient: 10% B, 0.00 min; 45% B, 1.50 min;
100% B, 2.50 min; 100% B, 3.70 min;
10% B, 3.71 min; 10% B, 5.00 min

Temp: 30 °C

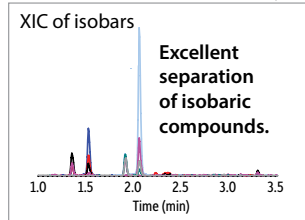
Flow Rate: 0.6 mL/min

Sample: Diluent: urine:mobile phase A:
mobile phase B (17:76:7)

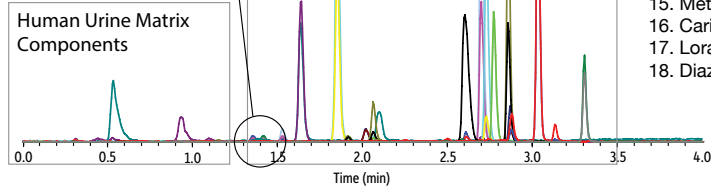
Injection: 10 µL

Concentration: 10 – 100 ng/mL

Lorazepam was prepared at 100 ng/mL;
all other analytes are 10 ng/mL



Analytes separated from early-eluting matrix.



1. Morphine
2. Oxycodone
3. Hydromorphone
4. Amphetamine
5. Methamphetamine
6. Codeine
7. Oxycodone
8. Hydrocodone
9. Norbuprenorphine
10. Meprobamate
11. Fentanyl
12. Buprenorphine
13. Flurazepam
14. Sufentanil
15. Methadone
16. Carisoprodol
17. Lorazepam
18. Diazepam

Analysis of Vitamin D and Metabolites with Raptor ARC-18

Column: Raptor™ ARC-18
RTK-9314A12
2.1 x 100 mm, 2.7 µm

Instrumentation: Shimadzu UFLCXR

Detector: ABSCIEX API4000™; Ion Source: TurbolonSpray®; Ion Mode: ESI+

Mobile Phase: A: 0.1% formic acid + FmM ammonium formate in water
B: 0.1% formic acid + 5 mM ammonium formate in methanol

Gradient (%B): 0.00 min (90%), 4.00 min (100%),
4.01 min (90%), 6.00 min (90%)

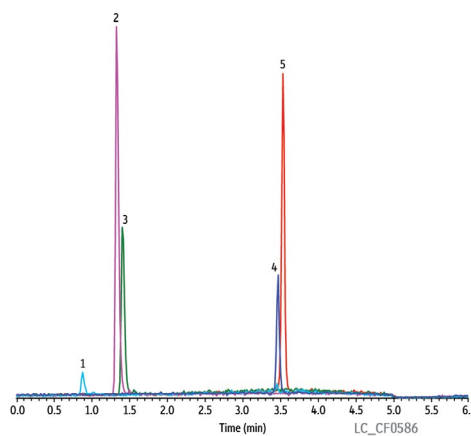
Temp: 40 °C

Flow Rate: 0.5 mL/min

Sample: Diluent: Methanol

Injection: 5 µL

Concentration: 200 ng/mL



1. 1,25-Dihydroxyvitamin D3
2. 25-Hydroxyvitamin D3
3. 25-Hydroxyvitamin D2
4. Vitamin D2
5. Vitamin D3

Separating fat-soluble vitamins by LC can be time consuming. The Raptor ARC-18 column, however, can analyze these difficult compounds using reversed-phase chromatography (RPC) in less time than traditional columns to increase productivity. Plus in the bioanalytical arena, the ARC-18 can quantitate the metabolites of vitamin D using the same column and mobile phases.

Restek Raptor Chromatograms

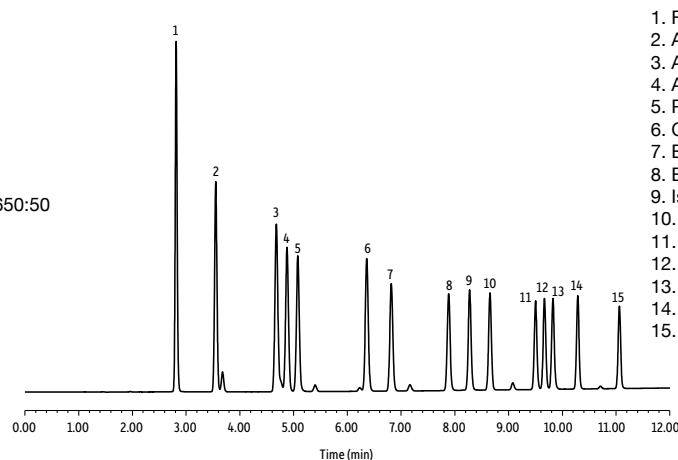
Aldehyde-Ketone-DNPH TO-A Calibration Mix on Raptor C18

Column A: Raptor C18
RTK-9304A65
150 mm x 4.6 mm ID

Mobile Phase: A: Water
B: Methanol: acetonitrile (650:50)

Temperature: 30 °C

Detector: UV/Vis @ 365, 4.8 nm



1. Formaldehyde
2. Acetaldehyde
3. Acrolein
4. Acetone
5. Propionaldehyde
6. Crotonaldehyde
7. Butyraldehyde
8. Benzaldehyde
9. Isovaleraldehyde
10. Valeraldehyde
11. *o*-Tolualdehyde
12. *m*-Tolualdehyde
13. *p*-Tolualdehyde
14. Hexanal
15. 2,5-Dimethylbenzaldehyde

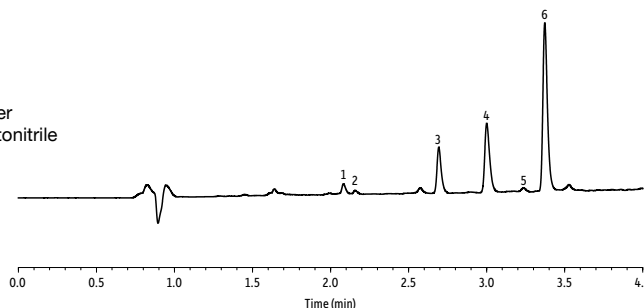
Cannabis Potency by LC--Cannabis Sample 71 on Raptor ARC-18

Column A: Raptor ARC-18
RTK-9314A65
150 mm x 4.6 mm ID

Mobile Phase: 0.1% Formic acid in water
0.1% Formic acid in acetonitrile

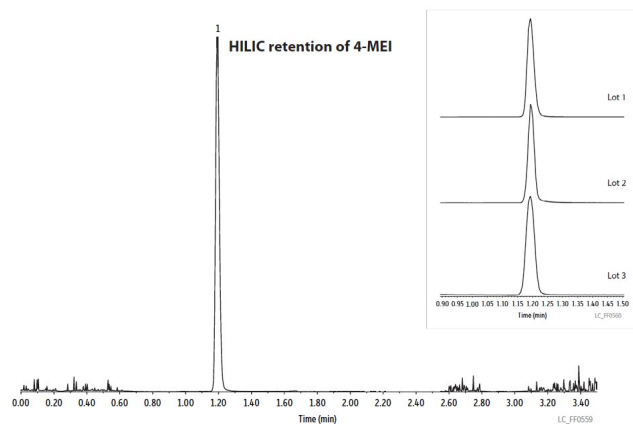
Temperature: 50 °C

Detector: UV @ 220 nm



1. Cannabidiolic acid
2. Cannabigerol
3. Cannabinol
4. delta-9-Tetrahydrocannabinol
5. Cannabichromene
6. delta-9-Tetrahydrocannabinolic acid A

Raptor FluoroPhenyl columns give you the flexibility to work in both reversed-phase and HILIC modes



1. 4-Methylimidazole (4-MEI)

Column A: Raptor FluoroPhenyl
RTK-9319A52
2.1 x 50 mm ID

Mobile Phase: A: 0.1% Formic acid in water
B: 0.1% Formic acid in acetonitrile

Gradient (%B): 0.00 min (95% B), 2.00 (30% B)
2.01 (95% B), 3.50 (95% B)

Temperature: 35 °C

Sample: Diluent: Acetonitrile,
Conc.: 100 ng/mL, Inj. Vol. 5 µL

Flow: 0.6 mL/min

Detector: MS/MS, Ion Mode: ESI+, Mode: MRM

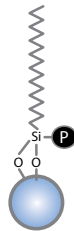
Instrument: UHPLC

Restek Ultra HPLC Columns

RESTEK LC ANALYTICAL COLUMN SPECIFICATIONS					
	ULTRA AQUEOUS C18	ULTRA IBD	ULTRA BIPHENYL	ULTRA PFP PROPYL	ULTRA C18
Particle size:	3 µm or 5 µm, spherical	3 µm or 5 µm, spherical	3 µm or 5 µm, spherical	3 µm or 5 µm, spherical	3 µm or 5 µm, spherical
Pore size:	100 Å	100 Å	100 Å	100 Å	100 Å
Carbon load:	15%	12%	15%	11%	20%
End-cap:	no	no	yes	yes	yes
pH range:	2.5 to 8	2.5 to 8	2.5 to 8	2.5 to 8	2.5 to 8
Temperature limit:	80 °C	80 °C	80 °C	80 °C	80 °C
USP phase code:	L1	L68	L11	L43	L1
Phase category:	modified C18	polar-embedded alkyl	phenyl	fluorophenyl propyl	C18, octadecylsilane
Ligand type:	proprietary polar modified and functionally bonded C18	proprietary polar functional embedded alkyl	unique Biphenyl	pentafluorophenyl propyl	monomeric C18

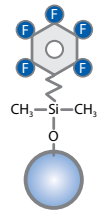
Ultra Aqueous C18 (USP L1)

The Restek® Aqueous C18 is a rugged, reversed-phase column with a well-balanced retention profile. It can effectively retain more types of solutes than a conventional C18 and is ideal for multicomponent LC-MS analyses. The general-purpose Aqueous C18 boasts high reproducibility and compatibility with many mobile phase conditions—even 100% aqueous. And when used with a gradient, it eliminates the all-too-common issue of multiple compounds eluting near the column void time.



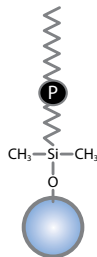
Ultra PFP Propyl (USP L43)

The Restek® PFP Propyl is a great choice for the retention and selectivity of charged bases, electronegative compounds, and amine-containing compounds. Unlike a conventional cyano column, the Restek® PFP Propyl is much more amenable to LC-MS because it is more reliable and efficient with acidic mobile phases. This versatile column is also compatible with highly aqueous mobile phases and HILIC separations.



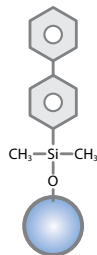
Ultra IBD (USP L68)

The Restek® IBD is a polar-embedded column that acts as a strong hydrogen bond donor and may be the most versatile column available today. With a unique polar group, this column is very retentive and selective for acids. It also provides symmetrical peak shape for strong bases. Restek's IBD is compatible with 100% aqueous mobile phases and can be used under reversed-phase or HILIC conditions to retain very polar, ionic compounds in highly organic mobile phases.



Ultra Biphenyl (USP L11)

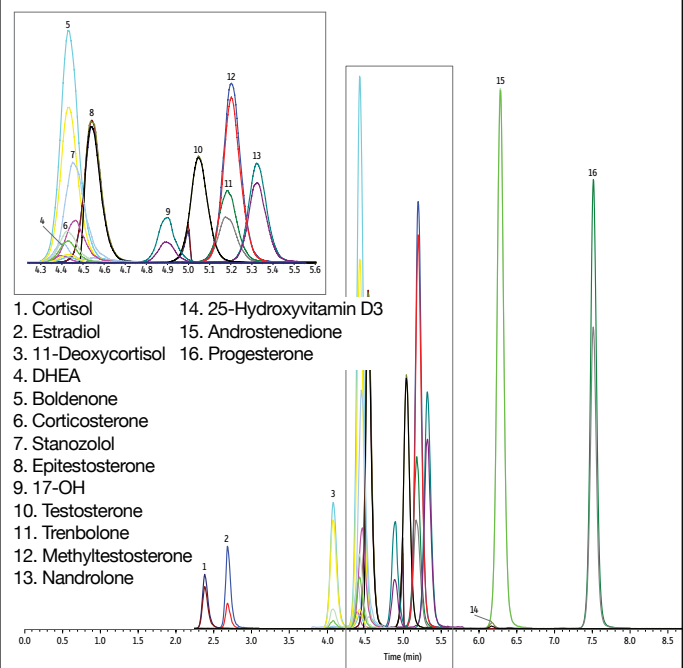
Since 2005, the Restek® Biphenyl has offered a greater degree of dispersion than conventional phenyls and a greater degree of polarizability than phenyl hexyls, creating higher selectivity and a greater range of usability. Because of these heightened interactions, this column shows substantial increases in retention—especially for dipolar, unsaturated, or conjugated solutes—and enhanced orthogonal selectivity when using methanol mobile phases. It is ideal for increasing sensitivity and selectivity in LC-MS analyses.



Ultra C18 (USP L1)

The general-purpose Restek® C18 is a conventional monomeric octadecylsilane column suitable for analyses of a wide range of compounds from acidic through slightly basic.

Steroid Panel Analysis on the Ultra Biphenyl



Restek Ultra HPLC Columns (cont.)

SIZE (mm)	PARTICLE SIZE (µm)	ULTRA AQUEOUS C18	ULTRA IBD	ULTRA BIPHENYL	ULTRA PFP PROPYL	ULTRA C18
4.6 x 250	5	RTK-9178575	RTK-9175575	RTK-9109575	RTK-9179575	RTK-9174575
4.6 x 150	5	RTK-9178565	RTK-9175565	RTK-9109565	RTK-9179565	RTK-9174565
4.6 x 100	5	RTK-9178515	RTK-9175515	RTK-9109515	RTK-9179515	RTK-9174515
4.6 x 50	5	RTK-9178555	RTK-9175555	RTK-9109555	RTK-9179555	RTK-9174555
4.6 x 30	5	RTK-9178535	RTK-9175535	RTK-9109535	RTK-9179535	RTK-9174535
3.0 x 250	5	RTK-917857E	RTK-917557E	RTK-910957E	RTK-917957E	RTK-917457E
3.0 x 150	5	RTK-917856E	RTK-917556E	RTK-910956E	RTK-917956E	RTK-917456E
3.0 x 100	5	RTK-917851E	RTK-917551E	RTK-910951E	RTK-917951E	RTK-917451E
3.0 x 50	5	RTK-917855E	RTK-917555E	RTK-910955E	RTK-917955E	RTK-917455E
3.0 x 30	5	RTK-917853E	RTK-917553E	RTK-910953E	RTK-917953E	RTK-917453E
2.1 x 250	5	RTK-9178572	RTK-9175572	RTK-9109572	RTK-9179572	RTK-9174572
2.1 x 150	5	RTK-9178562	RTK-9175562	RTK-9109562	RTK-9179562	RTK-9174562
2.1 x 100	5	RTK-9178512	RTK-9175512	RTK-9109512	RTK-9179512	RTK-9174512
2.1 x 50	5	RTK-9178552	RTK-9175552	RTK-9109552	RTK-9179552	RTK-9174552
2.1 x 30	5	RTK-9178532	RTK-9175532	RTK-9109532	RTK-9179532	RTK-9174532
1.0 x 250	5	RTK-9178571	RTK-9175571	RTK-9109571	RTK-9179571	RTK-9174571
1.0 x 150	5	RTK-9178561	RTK-9175561	RTK-9109561	RTK-9179561	RTK-9174561
1.0 x 100	5	RTK-9178511	RTK-9175511	RTK-9109511	RTK-9179511	RTK-9174511
1.0 x 50	5	RTK-9178551	RTK-9175551	RTK-9109551	RTK-9179551	RTK-9174551
1.0 x 30	5	RTK-9178531	RTK-9175531	RTK-9109531	RTK-9179531	RTK-9174531
4.6 x 150	3	RTK-9178365	RTK-9175365	RTK-9109365	RTK-9179365	RTK-9174365
4.6 x 100	3	RTK-9178315	RTK-9175315	RTK-9109315	RTK-9179315	RTK-9174315
4.6 x 50	3	RTK-9178355	RTK-9175355	RTK-9109355	RTK-9179355	RTK-9174355
4.6 x 30	3	RTK-9178335	RTK-9175335	RTK-9109335	RTK-9179335	RTK-9174335
3.0 x 150	3	RTK-917836E	RTK-917536E	RTK-910936E	RTK-917936E	RTK-917436E
3.0 x 100	3	RTK-917831E	RTK-917531E	RTK-910931E	RTK-917931E	RTK-917431E
3.0 x 50	3	RTK-917835E	RTK-917535E	RTK-910935E	RTK-917935E	RTK-917435E
3.0 x 30	3	RTK-917833E	RTK-917533E	RTK-910933E	RTK-917933E	RTK-917433E
2.1 x 150	3	RTK-9178362	RTK-9175362	RTK-9109362	RTK-9179362	RTK-9174362
2.1 x 100	3	RTK-9178312	RTK-9175312	RTK-9109312	RTK-9179312	RTK-9174312
2.1 x 50	3	RTK-9178352	RTK-9175352	RTK-9109352	RTK-9179352	RTK-9174352
2.1 x 30	3	RTK-9178332	RTK-9175332	RTK-9109332	RTK-9179332	RTK-9174332
1.0 x 150	3	RTK-9178361	RTK-9175361	RTK-9109361	RTK-9179361	RTK-9174361
1.0 x 100	3	RTK-9178311	RTK-9175311	RTK-9109311	RTK-9179311	RTK-9174311
1.0 x 50	3	RTK-9178351	RTK-9175351	RTK-9109351	RTK-9179351	RTK-9174351
1.0 x 30	3	RTK-9178331	RTK-9175331	RTK-9109331	RTK-9179331	RTK-9174331
2.1 x 10 mm Guard Cartridge, 3/pk	5	RTK-917850212	RTK-917550212	RTK-910950212	RTK-917950212	RTK-917450212
4.0 x 10 mm Guard Cartridge, 3/pk	5	RTK-917850210	RTK-917550210	RTK-910950210	RTK-917950210	RTK-917450210



CHROM TECH RELATED PRODUCTS

15-24-03832
EXP Repl Ferrule



15-20-03930
EXP Nut & Ferrule
Hand-tight to 8,700 PSI
Wrench-tight to 20,000 PSI



RTK-24995
UltraShield UHPLC
precolumn filter, 0.5 µm



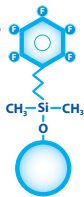
Trident Guard Cartridge Holder
*Required for ALL Ultra Guard Cartridges
Protection against irreversibly adsorbed compounds

PART NO	DESCRIPTION
RTK-27472	Trident Guard Cartridge Holder, ea
RTK-27473	Trident Guard Cartridge Holder, 4/pk

Restek Force HPLC Columns

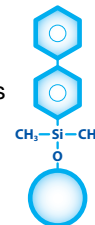
Force FluoroPhenyl (USP L43)

- Capable of both reversed-phase and HILIC separations
- Ideal for increasing sensitivity and selectivity in LC-MS analyses
- Offers increased retention for charged bases



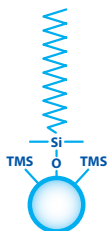
Force Biphenyl (USP L11)

- Ideal for bioanalytical testing applications like 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
- Restek's most popular LC stationary phase



Force C18 (USP L1)

- A traditional end-capped C18 ideal for general-purpose use in reversed-phase chromatography
- Wide pH range (2–8) provides excellent data quality for many applications, matrices, and compounds
- Offers high hydrophobic retention



SIZE (mm)	PARTICLE SIZE (µm)	BIPHENYL	C18	FLUOROPHENYL
4.6 x 250	5	RTK-9629575	—	—
4.6 x 150	5	RTK-9629565	RTK-9634565	RTK-9639565
4.6 x 100	5	RTK-9629515	RTK-9634515	RTK-9639515
4.6 x 50	5	—	RTK-9634575	RTK-9639575
3 x 150	5	RTK-962956E	RTK-963456E	RTK-963956E
3 x 100	5	RTK-962951E	RTK-963451E	RTK-963951E
3 x 50	5	RTK-962955E	RTK-963455E	RTK-963955E
2.1 x 150	5	RTK-9629562	RTK-9634562	RTK-9639562
2.1 x 100	5	RTK-9629512	RTK-9634512	RTK-9639512
2.1 x 50	5	RTK-9629552	RTK-9634552	RTK-9639552
4.6 x 150	3	RTK-9629365	RTK-9634365	RTK-9639365
4.6 x 100	3	RTK-9629315	RTK-9634315	RTK-9639315
4.6 x 5 Guard, 3/pk		RTK-962950250	RTK-963450250	RTK-963950250
3 x 150	3	RTK-962936E	RTK-963436E	RTK-963936E
3 x 100	3	RTK-962931E	RTK-963431E	RTK-963931E
3 x 50	3	RTK-962935E	RTK-963435E	RTK-963935E
3 x 5 Guard, 3/pk		RTK-962950253	RTK-963450253	RTK-963950253
2.1 x 150	3	RTK-9629362	RTK-9634362	RTK-9639362
2.1 x 100	3	RTK-9629312	RTK-9634312	RTK-9639312
2.1 x 50	3	RTK-9629352	RTK-9634352	RTK-9639352
2.1 x 30	3	RTK-9629332	RTK-9634332	RTK-9639332
2.1 x 5 Guard, 3/pk		RTK-962950252	RTK-963450252	RTK-963950252
3 x 100	1.8	RTK-962921E	RTK-963421E	RTK-963921E
3 x 50	1.8	RTK-962925E	RTK-963425E	RTK-963925E
2.1 x 100	1.8	RTK-9629212	RTK-9634212	RTK-9639212
2.1 x 50	1.8	RTK-9629252	RTK-9634252	RTK-9639252
2.1 x 30	1.8	RTK-9629232	RTK-9634232	RTK-9639232



RTK-24995

ULTRASHIELD UHPLC PRECOLUMN FILTERS		
PART NO	PORE SIZE	QTY
RTK-24995	0.5 µm	ea
RTK-24996	0.5 µm	5/pk
RTK-24997	0.5 µm	10/pk
RTK-25809	0.2 µm	ea
RTK-25810	0.2 µm	5/pk
RTK-25811	0.2 µm	10/pk

Raptor™ EXP® Guard Column Cartridges



CT-0205
EXP Direct Connect Holder for EXP Guard Cartridges (includes hex-head fitting & 2 ferrules) Maximum holder pressure: 20,000 PSI (1,400 bar)

CHROM TECH RELATED PRODUCTS



15-24-03832
EXP Repl Ferrule

15-20-03930
EXP Nut & Ferrule
Hand-tight to 8,700 PSI
Wrench-tight to 20,000 PSI

Restek Roc® HPLC Columns

- Conventional HPLC column built to be the cornerstone for your lab; pressure rated for any 400 bar HPLC system
- Solid and reliable—delivers the peak shape, reproducibility, ruggedness, and performance you demand
- Exceptional value for routine analyses and large-volume workflows—high-purity, fully porous silica backed by quality manufacturing features a variety of phases to fit most HPLC methods
- Ideal for a wide range of applications from food to pharma

Solid, reliable Roc HPLC columns are pressure rated for any 400 bar HPLC system and deliver the peak shape, reproducibility, ruggedness, and performance you demand for all of your conventional HPLC applications, especially USP and other compendial methods. An exceptional value for routine analyses and large-volume workflows, Roc columns are made from high-purity, fully porous silica backed by quality manufacturing and are available in a variety of phases. Just 5 phases cover 98% of USP methods. Newly designed minimal packaging offers compact storage with serial #-specific certificates of analysis available upon request.



	C18	C8	PHENYL-HEXYL	CYANO	SILICA
USP Phase Code	L1	L7	L11	L10	L3
Stationary Phase Category	C18, octadecylsilane	C8, octylsilane	phenyl	cyano	bare silica
Ligand Type	monomeric C18	monomeric C8	phenyl-hexyl	cyanopropyl	n/a
Particle Size	3 µm or 5 µm, spherical	3 µm or 5 µm, spherical	3 µm or 5 µm, spherical	3 µm or 5 µm, spherical	3 µm or 5 µm, spherical
Pore Size	100 Å	100 Å	100 Å	100 Å	100 Å
Surface Area	300 m ² /g	300 m ² /g	300 m ² /g	300 m ² /g	300 m ² /g
Carbon Load	20%	12%	15%	8%	n/a
End-Cap	yes	yes	yes	yes	n/a
pH Range	2.5 to 8.0	2.5 to 8.0	2.0 to 8.0	2.5 to 8.0	2.5 to 8.0
Max Temperature	80 °C	80 °C	80 °C	80 °C	80 °C

SIZE (mm)	PARTICLE SIZE (µm)	ROC C18	ROC C8	ROC PHENYL HEXYL	ROC CN	ROC SILICA
4.6 x 250	5	RTK-9534575	RTK-9533575	RTK-9535575	RTK-9536575	RTK-9530575
4.6 x 150	5	RTK-9534565	RTK-9533565	RTK-9535565	RTK-9536565	RTK-9530565
4.6 x 100	5	RTK-9534515	RTK-9533515	RTK-9535515	RTK-9536515	RTK-9530515
3.0 x 250	5	RTK-953457E	RTK-953357E	RTK-953557E	RTK-953657E	RTK-953057E
3.0 x 150	5	RTK-953456E	RTK-953356E	RTK-953556E	RTK-953656E	RTK-953056E
3.0 x 100	5	RTK-953451E	RTK-953351E	RTK-953551E	RTK-953651E	RTK-953051E
4.6 x 150	3	RTK-9534365	RTK-9533365	RTK-9535365	RTK-9536365	RTK-9530365
4.6 x 100	3	RTK-9534315	RTK-9533315	RTK-9535315	RTK-9536315	RTK-9530315
3.0 x 150	3	RTK-953436E	RTK-953336E	RTK-953536E	RTK-953636E	RTK-953036E
3.0 x 100	3	RTK-953431E	RTK-953331E	RTK-953531E	RTK-953631E	RTK-953031E
Guard Cartridge, 3/pk		RTK-953450210	RTK-953350210	RTK-953550210	RTK-953650210	RTK-953050210
Guard Holder		RTK-25812	RTK-25812	RTK-25812	RTK-25812	RTK-25812

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