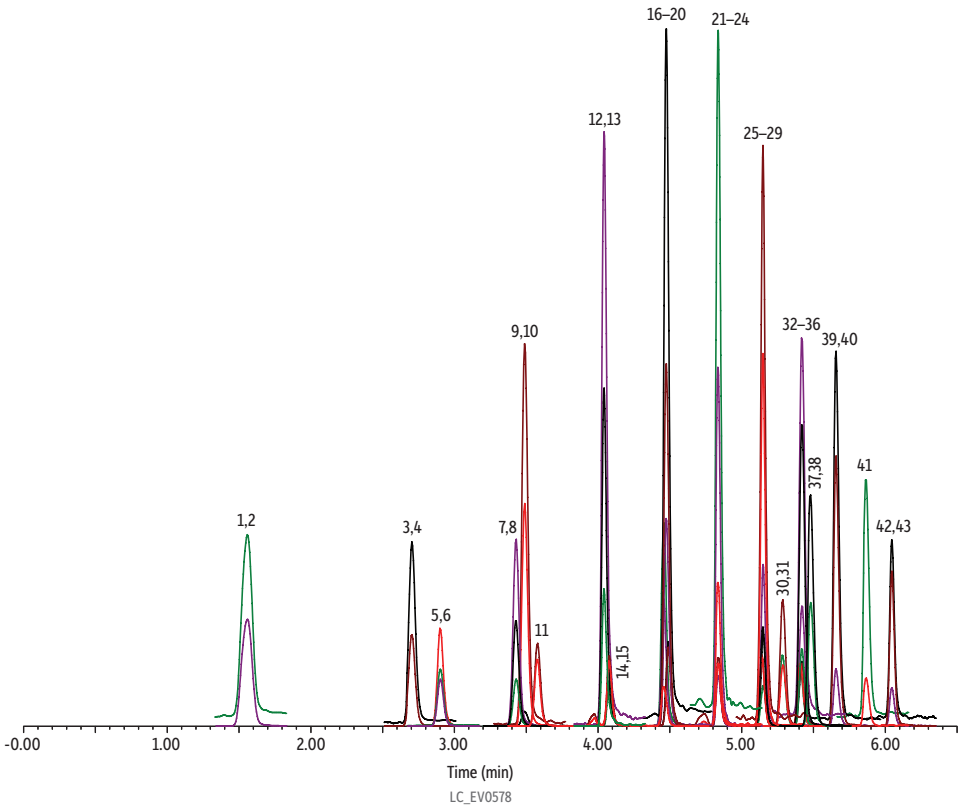
Featured Application: *PFAS in Non-Potable Water on Force C18*

Fast, 8-Minute Method for Direct Injection of PFAS in Non-Potable Water

- Analyze EPA Method 8327 PFAS 3x faster than method conditions.
- Direct injection means no time-consuming sample preparation steps.
- Force C18 FPP column provides extra retention and improved peak shape for PFBA.

While methods for analyzing per- and polyfluoroalkyl substances (PFAS) in drinking water typically use SPE sample preparation (styrene divinylbenzene or weak anion exchange), non-potable waters are most often analyzed using direct injection. EPA Method 8327, for example, is a validated test method used to measure a group of 24 PFAS compounds in groundwater, surface water, and wastewater samples using LC-MS/MS. Direct injection can be advantageous because time-consuming sample preparation and its associated costs and variability can be avoided, but the typical 21-minute analysis time limits sample throughput. To provide a faster approach for direct injection of PFAS, we have established a chromatographic method for the comprehensive analysis of the 24 target and 19 surrogate PFAS in EPA 8327 with a total cycle time of just 8 minutes. This method also provides proper detection sensitivity (10 ppt before dilution) for all analytes.

Using a 1:1 dilution with methanol (0.1% acetic acid) and the conditions shown below, all compounds were successfully analyzed on a Force C18 (50 mm x 2.1 mm, 3 µm) fully porous particle (FPP) column. The high surface area and carbon load of the FPP column provides increased chromatographic retention compared to a superficially porous particle (SPP) column, which can be advantageous when PFBA is a target analyte. As an early eluting compound, PFBA can be difficult to chromatograph, especially if there is a mismatch between the sample diluent and the initial mobile phase composition. When this occurs, PFBA peak shape can be very poor, and fronting or peak splitting may be observed. An effective way to address this is to increase the retention time of PFBA by using a Force C18 column. As shown below, labs running direct injection of PFAS can obtain excellent resolution of EPA Method 8327 compounds in a third of the time using a Force C18 column. In addition, labs dealing with poor retention and peak shape for PFBA on a superficially porous particle (SPP) column will benefit from using a Force C18 column under the conditions established here.



Column	Force C18 (cat.# 9634352)
Dimensions:	50 mm x 2.1 mm ID
Particle Size:	3 µm
Pore Size:	100 Å
Temp.:	40 °C
Standard/Sample	
Diluent:	50:50 Water:methanol, 0.1% acetic acid
Conc.:	80 ppt (40 ppt for surrogate or isotopically-labelled PFAS)
Inj. Vol.:	10 µL
Mobile Phase	
A:	Water, 5 mM ammonium acetate
B:	Methanol

Time (min)	Flow (mL/min)	%A	%B
0.00	0.4	80	20
6.00	0.4	5	95
6.50	0.4	5	95
6.51	0.4	80	20
8.50	0.4	80	20

Detector	MS/MS
Ion Mode:	ESI-
Mode:	MRM
Instrument	UHPLC
Notes	A PFAS delay column (cat.# 27854) was installed before the injector.

	Peaks	t_R (min)	Conc. (ng/L)	Precursor Ion	Product Ion	Product Ion
1.	Perfluorobutanoic acid (PFBA)	1.56	80	231.1	169.1	-
2.	Perfluoro-*n*-[$^{13}C_4$]butanoic acid (M4PFBA)	1.56	40	217.0	172.0	-
3.	Perfluoropentanoic acid (PFPeA)	2.70	80	263.0	219.0	-
4.	Perfluoro-*n*-[$^{13}C_5$]pentanoic acid (M5PFPeA)	2.70	40	268.0	223.0	-
5.	Perfluorobutane sulfonic acid (PFBS)	2.90	80	299.1	80.0	99.0
6.	Perfluoro-1-[2,3,4-$^{13}C_3$]butyl sulfonic acid (M3PFBS)	2.90	40	302.0	80.0	-
7.	1H, 1H, 2H, 2H-perfluorohexane sulfonic acid (4:2 FTS)	3.43	80	327.1	307.1	80.8
8.	1H, 1H, 2H, 2H-perfluoro-1-[1,2-$^{13}C_2$]hexyl sulfonic acid (M2-4:2 FTS)	3.43	40	329.0	309.0	-
9.	Perfluorohexanoic acid (PFHxA)	3.49	80	313.1	269.1	119.1
10.	Perfluoro-*n*-[1,2,3,4,6-$^{13}C_5$]hexanoic acid (M5PFHxA)	3.49	40	318.0	273.0	-
11.	Perfluoropentane sulfonic acid (PFPeS)	3.58	80	349.1	80.0	99.0
12.	Perfluoroheptanoic acid (PFHpA)	4.04	80	363.2	319.1	169.1
13.	Perfluoro-*n*-[1,2,3,4-$^{13}C_4$]heptanoic acid (M4PFHpA)	4.04	40	367.0	322.0	-
14.	Perfluorohexane sulfonic acid (PFHxS)	4.07	80	399.1	80.0	99.0
15.	Perfluoro-1-[1,2,3-$^{13}C_3$]hexyl sulfonic acid (M3PFHxS)	4.07	40	402.0	80.0	-
16.	1H, 1H, 2H, 2H-perfluorooctane sulfonic acid (6:2 FTS)	4.46	80	427.2	407.2	80.7
17.	1H, 1H, 2H, 2H-perfluoro-1-[1,2-$^{13}C_2$]octyl sulfonic acid (M2-6:2 FTS)	4.46	40	429.0	409.0	-
18.	Perfluorooctanoic acid (PFOA)	4.48	80	412.9	369.0	169.0
19.	Perfluoro-*n*-[$^{13}C_8$]octanoic acid (M8PFOA)	4.48	40	421.0	376.0	-
20.	Perfluoroheptane sulfonic acid (PFHpS)	4.49	80	449.2	80.0	99.0
21.	Perfluorononanoic acid (PFNA)	4.84	80	463.2	419.2	219.1
22.	Perfluoro-*n*-[$^{13}C_9$]nonanoic acid (M9PFNA)	4.84	40	472.0	427.0	-
23.	Perfluorooctane sulfonic acid (PFOS)	4.84	80	499.2	80.0	99.0
24.	Perfluoro-1-[$^{13}C_8$]octyl sulfonic acid (M8PFOS)	4.84	40	506.8	80.0	-
25.	Perfluorononane sulfonic acid (PFNS)	5.14	80	549.2	80.0	99.0
26.	1H, 1H, 2H, 2H-perfluorodecane sulfonic acid (8:2 FTS)	5.15	80	527.2	507.2	80.8
27.	1H, 1H, 2H, 2H-perfluoro-1-[1,2-$^{13}C_2$]decyl sulfonic acid (M2-8:2 FTS)	5.15	40	529.0	509.0	-
28.	Perfluorodecanoic acid (PFDA)	5.15	80	513.2	469.2	219.1
29.	Perfluoro-*n*-[1,2,3,4,5,6-$^{13}C_6$]decanoic acid (M6PFDA)	5.15	40	518.9	473.9	-
30.	N-methylperfluoro-1-octanesulfonamidoacetic acid (N-MeFOSAA)	5.28	80	570.2	419.2	483.2
31.	N-methyl-d3-perfluoro-1-octanesulfonamidoacetic acid (d3-N-MeFOSAA)	5.28	40	572.9	418.9	-
32.	Perfluorodecane sulfonic acid (PFDS)	5.40	80	599.2	80.0	99.0
33.	N-ethylperfluoro-1-octanesulfonamidoacetic acid (N-EtFOSAA)	5.42	80	584.2	419.2	483.1
34.	N-ethyl-d5-perfluoro-1-catanesulfonamidoacetic acid (d5-N-EtFOSAA)	5.42	40	589.0	419.0	-
35.	Perfluoroundecanoic acid (PFUnA)	5.42	80	563.2	519.2	269.1
36.	Perfluoro-*n*-[1,2,3,4,5,6,7-$^{13}C_7$]undecanoic acid (M7PFUnA)	5.42	40	569.9	524.9	-
37.	Perfluorooctane sulfonic acid (FOSA)	5.49	80	498.2	78.0	-
38.	Perfluoro-1-[$^{13}C_8$]octanesulfonamide (M8FOSA)	5.49	40	505.9	78.0	-
39.	Perfluorododecanoic acid (PFDoA)	5.65	80	613.2	569.2	169.1
40.	Perfluoro-*n*-[1,2,-$^{13}C_2$]dodecanoic acid (M2PFDoA)	5.65	40	614.8	569.9	-
41.	Perfluorotridecanoic acid (PFTriA)	5.86	80	663.2	619.2	169.1
42.	Perfluorotetradecanoic acid (PFTreA)	6.05	80	713.2	669.2	169.1
43.	Perfluoro-*n*-[1,2-$^{13}C_2$]tetradecanoic acid (M2PFTreA)	6.05	40	714.8	669.7	-

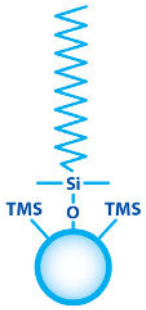
Featured Products

Analytical Column	Maintenance & Accessories
	
• **Force C18 LC Column** (cat.# 9634352) • **PFAS Delay Column** (cat.# 27854)	• **Limited-Volume 2.0 mL, 9 mm Screw-Thread Polypropylene Vials** • **2.0 mL, 9 mm Solid-Top Polyethylene Caps**

Force C18 LC Columns (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.

ID	Length	qty.	cat.#
1.8 µm Particles			
2.1 mm	30 mm	ea.	9634232
	50 mm	ea.	9634252
	100 mm	ea.	9634212
3.0 mm	50 mm	ea.	963425E
	100 mm	ea.	963421E
3 µm Particles			
2.1 mm	30 mm	ea.	9634332
	50 mm	ea.	9634352
	100 mm	ea.	9634312
	150 mm	ea.	9634362
3.0 mm	50 mm	ea.	963435E
	100 mm	ea.	963431E
	150 mm	ea.	963436E
4.6 mm	100 mm	ea.	9634315
	150 mm	ea.	9634365
5 µm Particles			
2.1 mm	50 mm	ea.	9634552
	100 mm	ea.	9634512
	150 mm	ea.	9634562
3.0 mm	50 mm	ea.	963455E
	100 mm	ea.	963451E
	150 mm	ea.	963456E
4.6 mm	100 mm	ea.	9634515
	150 mm	ea.	9634565
	250 mm	ea.	9634575



ordering notes

Certificates of analysis for new Restek LC columns are now provided electronically. To view and download, visit www.restek.com/documentation then enter your cat.# and serial #.

PFAS Delay Column

- Traps system-related PFAS, preventing interference and ensuring accurate trace-level analysis of PFAS in samples.
- Universal compatibility; works with
  - any HPLC or UHPLC up to 15,000 psi (1034 bar),
  - both FPP and SPP analytical columns, and
  - all stationary phases.
- Highly retentive of system-related PFAS; no breakthrough even with extended equilibration times.
- Easy installation with standard fittings.

27854

ID	Length	qty.	cat.#
2.1 mm	50 mm	ea.	27854

23242

Limited-Volume 2.0 mL, 9 mm Screw-Thread Polypropylene Vials

NEW!

- Available in 1.5 mL or 700 µL volumes.
- Limited-volume design fits all 2.0 mL, 12 x 32 mm, vial-based autosamplers.
- Compatible with all 9 mm screw-thread caps.
- PTFE-free—ideal for PFAS analysis (e.g., EPA 537) and other PFAS-sensitive methods.

Note: Polypropylene vials and caps prevent sample contamination from PTFE-coated septa. However, since polypropylene caps do not reseal, evaporation occurs after injection. Multiple injections from the same vial are therefore not possible.

Description	Type	Volume	Color	Size	qty.	Similar to Part #	cat.#
Limited-Volume 2.0 mL, 9 mm Screw-Thread Polypropylene Vials,	9 mm Screw-Thread	1.5 mL	Clear	12 x 32 mm	100-pk.	Thermo Fisher Scientific C4000-14	23242
	9 mm Screw-Thread	1.5 mL	Clear	12 x 32 mm	1000-pk.	Thermo Fisher Scientific C4000-14	23245
	9 mm Screw-Thread	700 µL	Clear	12 x 32 mm	100-pk.	Waters 186005230	23243
	9 mm Screw-Thread	700 µL	Clear	12 x 32 mm	1000-pk.	Waters 186005230	23246

23244

2.0 mL, 9 mm Solid-Top Polyethylene Caps

NEW!

- Compatible with all 9 mm screw-thread vials.
- Molded, 10 mil, solid, pierceable cap.
- PTFE-free—ideal for PFAS analysis (e.g., EPA 537) and other PFAS-sensitive methods.

Note: Polypropylene vials and caps prevent sample contamination from PTFE-coated septa. However, since polypropylene caps do not reseal, evaporation occurs after injection. Multiple injections from the same vial are therefore not possible.

Description	Type	Cap Size	Color	qty.	Similar to Part #	cat.#
2.0 mL, 9 mm Solid-Top Polyethylene Caps,	Screw-Thread	9 mm	Clear	100-pk.	Waters 186004169	23244
	Screw-Thread	9 mm	Clear	1000-pk.	Waters 186004169	23247

Related Products

Low-Pressure Slip-On Inlet Filter for Mobile Phase Reservoir

A 316 stainless-steel tip with a Tefzel collar seals to a corrosion-resistant 316 stainless-steel filter element. The slip-on filter easily attaches to the pump inlet line without the use of wrenches. The universal 1/8" OD tip accommodates standard PTFE tubing inner diameters. The cylindrical filter is standard 10 µm porosity. Fits Altex, ISCO, LDC, Varian, Waters, PerkinElmer, and other pumps.

25008

Description	qty.	cat.#
Slip-On Inlet Filter	ea.	25008

Survival Kit for HPLC, Stainless Steel

For start-up and maintenance in all HPLC systems.

The stainless-steel survival kit contains a wide range of tubing, fittings, and tools necessary to set up and maintain your HPLC system: a selection of lengths and IDs of 1/16" tubing, nuts, ferrules, a ValvTool wrench, and a zero-dead-volume union.

25097

Kit includes:

- HPLC Capillary Tubing, SS, 1/16" x 0.005" x 5 cm, 3-pk.
- HPLC Capillary Tubing, SS, 1/16" x 0.005" x 10 cm, 3-pk.
- HPLC Capillary Tubing, SS, 1/16" x 0.005" x 20 cm, 3-pk.
- HPLC Capillary Tubing, SS, 1/16" x 0.005" x 30 cm, 3-pk.
- HPLC Capillary Tubing, SS, 1/16" x 0.007" x 5 cm, 3-pk.
- HPLC Capillary Tubing, SS, 1/16" x 0.007" x 10 cm, 3-pk.
- HPLC Capillary Tubing, SS, 1/16" x 0.007" x 20 cm, 3-pk.
- HPLC Capillary Tubing, SS, 1/16" x 0.007" x 30 cm, 3-pk.
- HPLC Capillary Tubing, SS, 1/16" x 0.010" x 5 cm, 3-pk.
- HPLC Capillary Tubing, SS, 1/16" x 0.010" x 10 cm, 3-pk.
- HPLC Capillary Tubing, SS, 1/16" x 0.010" x 20 cm, 3-pk.
- HPLC Capillary Tubing, SS, 1/16" x 0.010" x 30 cm, 3-pk.
- HPLC Capillary Tubing, SS, 1/16" x 0.020" x 5 cm, 3-pk.
- HPLC Capillary Tubing, SS, 1/16" x 0.020" x 10 cm, 3-pk.
- HPLC Capillary Tubing, SS, 1/16" x 0.020" x 20 cm, 3-pk.
- HPLC Capillary Tubing, SS, 1/16" x 0.020" x 30 cm, 3-pk.
- 1/16" Rheodyne Style Nut, 10-pk.
- 1/16" Rheodyne Style Ferrule, 10-pk.
- ValvTool Wrench, 1 ea.
- Ferrules, 1/16" Stainless Steel, 10-pk.
- Nuts, 1/16" Stainless Steel, 10-pk.
- Zero-Dead-Volume Internal Union, 1 ea.

Description	qty.	cat.#
Survival Kit for HPLC	kit	25097

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