Fox Scientific, Inc.

MilliporeSigma

PREPARED FOR PFAS TESTING

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The Millipore® portfolio of MilliporeSigma offers an ecosystem of industry-leading products and services, spanning preparation, separation, filtration and monitoring – all of which are deeply rooted in quality, reliability and timetested processes. Our proven products, regulatory and application expertise are a strong foundation you can rely on to consistently perform at the highest level.

Sigma-Aldrich®

Lab & Production Materials

The Sigma-Aldrich® portfolio of MilliporeSigma offers a strong and ever-expanding offering of lab and production materials. Through our technical support and scientific partnerships, we help connect our customers with a whole world of progress.

Contents

Introduction

Per- and polyfluoroalkyl substances (PFAS) have been in use since the 1940’s. Consisting of over 4700 different compounds, PFAS substances are used in almost every facet of modern life.

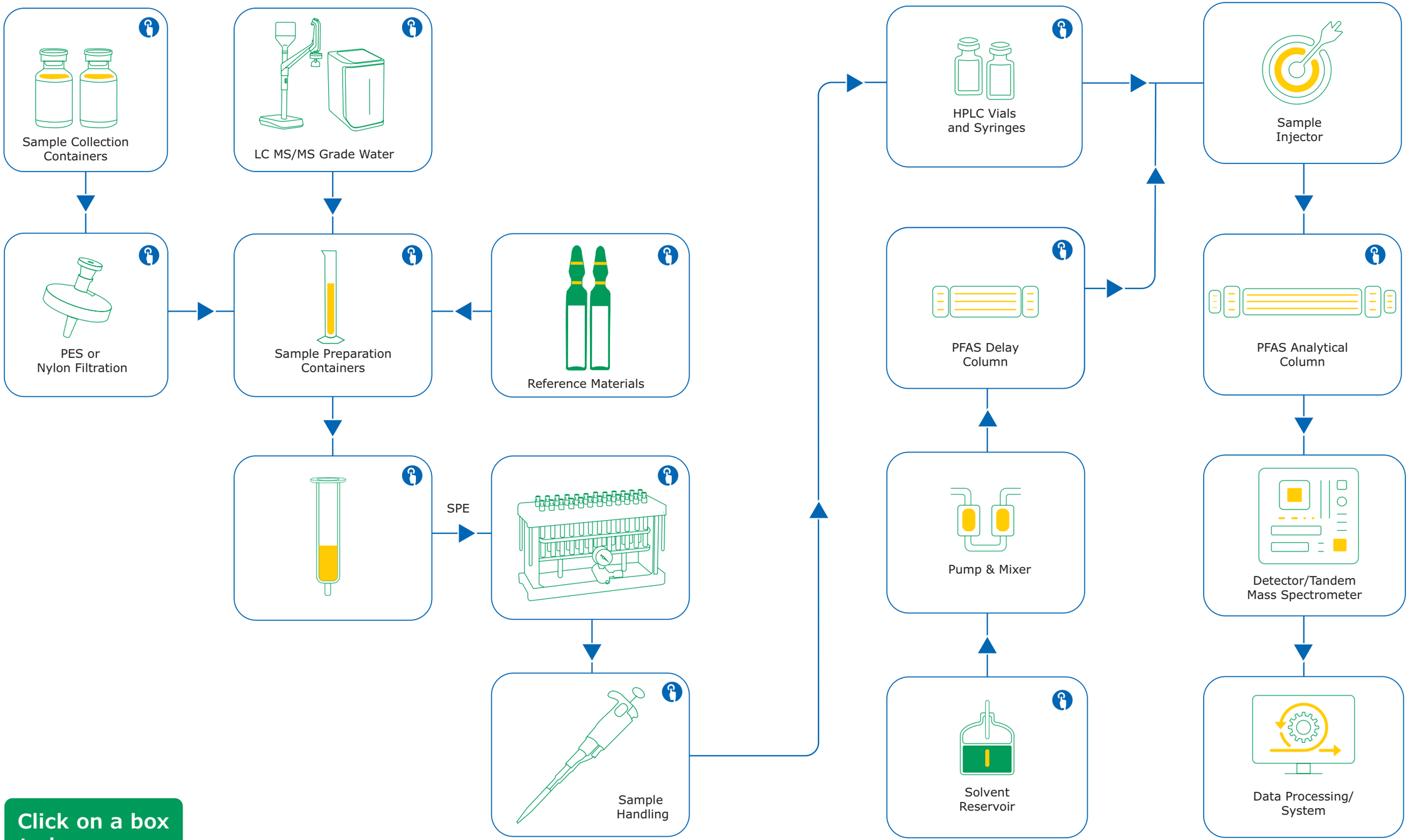
The utility of these compounds resulted in rapid adoption; and PFAS compounds can now be found in food packaging, cookware, cosmetics, stain repellants, firefighting foams, and are commonly used in many manufacturing processes. While incredibly useful, these compounds also carry a risk to health that we have only recently started to understand clearly.

PFAS compounds are also commonly known as “forever chemicals” which means they do not break down in the environment like other chemicals. This persistence can result in the concentration of these compounds growing to levels that are unsafe for human exposure and negative health effects such as: low infant birth weights, effects on the immune system, cancer, and thyroid hormone disruption.

As part of our commitment to making a positive difference by supporting the scientific community with our products; we have focused on the need to deliver quality products, and tools that can be used to more accurately quantify PFAS compounds. Our solutions empower researchers trying to better understanding the effects of PFAS, as well as regulators and labs focused on providing ongoing exposure testing services.

This brochure is intended to provide a comprehensive list of the products that are commonly used in PFAS analysis. This includes analysis of environmental samples such as water and soil, food and beverage samples as well as serum samples. Wherever PFAS compounds can be found, we are committed to helping scientists accurately quantify these compounds to advance our knowledge and understanding of their impact on society.

Products across the workflow



Click on a box to learn more

Products by Method

Chemicals & Columns

Sample Prep and Lab Equipment

Containers

The product categories above list ALL the products for the following methods:

- ASTM 7968
- ASTM 7979
- CDC 6304.09
- CEN TS 15968
- EPA 533
- EPA 537.1
- EPA 8327
- EPA 1633
- FDA C-010.01
- ISO 21675
- ISO 25101

Products for PFAS Analysis by Method

Have You Considered a Pricing Agreement with us?

Whether you are a researcher trying to develop new methods for the analysis of PFAS compounds or a contract testing lab performing thousands of tests a day; we are here to support you with quality products that ensure you achieve the best precision and accuracy possible.

In addition to delivering products of the highest quality, we also want to make sure the delivery of those products happens on time so that you don't have to worry about down time in your lab(s). The best way to avoid down time is by setting up a pricing agreement with your account manager.

Pricing Agreements provide the following benefits:

1. Better pricing across all products
2. Flexible delivery options for scheduled orders
3. Confidence in your supply chain
4. Online ordering profile(s) that automatically import your pricing; which simplifies placing orders.
5. Potential discounts on shipping

To set up a pricing agreement, please contact your account manager and they will work with you to get it in place.

Unique Applications

Are you working on a unique application not covered by the promulgated methods covered in this brochure?

Are you struggling with a difficult extraction, poor peak separation, or poor recovery?

We can help!

Our global team of experts is happy to work with you across the entire workflow of PFAS analysis. We are set up to help with both new method development as well as troubleshooting existing methods.

Our product specific specialists can help with:

- Membrane Filtration
- Sample Preparation
- Analytical U/HPLC and Delay Columns
- Solvents
- Water Purification Systems
- Reference Materials

For help with general issues we can connect you with our:

- Applications Lab
- Analytical Technology Specialists

To connect with one of our expert team members about your application, please contact us at **SigmaAldrich.com/pfas-contact** or contact your local account manager.

PFAS Compounds by Method

Do you have a particular PFAS compound of interest but are not sure what method you should be using for the analysis?

The table below can help point you toward which of the promulgated methods have been validated for the named compounds. For any compound not included in this table, please contact our experts at **SigmaAldrich.com/pfas-contact** and we can help you either adapt an existing method or develop a new method for your analysis.

Cat. No	Compound Name	Abbreviation	CASRN	EPA 533	EPA 537.1	EPA 8327	EPA 1633	OTM 45	ASTM D7968	ASTM D7979	ISO 21675	ISO 25101	CEN-TS-15968	CDC 6304.09	FDA-010.01	DIN 38414-14	DIN 38407-42	DIN 23702-1	DIN 17681-1 (Draft)	DIN 17681-2 (Draft)
43809	Perfluorohexanoic acid	PFHxA	307-24-4	x	x	x	x	x	x	x	x				x	x	x	x	x	x
43929	Perfluorodecanoic acid	PFDA	335-76-2	x	x	x	x	x	x	x	x				x	x	x	x	x	x
43996	Perfluoroheptanoic acid	PFHpA	375-85-9	x	x	x	x	x	x	x	x				x	x	x	x		
68542	Perfluoropentanoic acid	PFPeA	2706-90-3	x		x	x	x	x	x	x				x	x	x	x		
68706	Pentacosafluorotridecanoic acid		72629-94-8																x	x
68808	Perfluorobutanoic acid	PFBA	375-22-4	x		x	x	x	x	x	x				x	x	x	x		
80312	Perfluorotetradecanoic acid	PFTA	376-06-7		x		x	x			x							x	x	x
80444	Perfluoroundecanoic acid	PFUnA	2058-94-8	x	x	x	x	x	x	x	x			x				x	x	x
89374	Potassium heptadecafluoro-1-octanesulfonate		2795-39-3																x	x
91977	Perfluorononanoic acid	PFNA	375-95-1	x	x	x	x	x	x	x	x			x	x	x	x	x	x	x
92291	Perfluorododecanoic acid	PFDoA	307-55-1	x	x	x	x	x	x	x	x			x					x	x
33607	Perfluorooctanesulfonic acid	PFOS	1763-23-1	x	x	x	x	x	x	x	x	x	x		x	x	x	x	x	x
33824 & 33603	Perfluorooctanoic acid	PFOA	335-67-1	x	x	x	x	x	x	x	x	x			x	x	x	x	x	x
Coming H2 2022	Hexafluoropropylene oxide dimer acid	HFPO-DA	13252-13-6	x	x		x	x			x								x	x
Coming H2 2022	Perfluoro-n-octadecanoic acid	PFOcDA	16517-11- 6								x									
Coming H2 2022	1H, 1H, 2H, 2H-perfluorohexane sulfonic acid	4:2 FTS	757124-72-4	x		x	x	x												
Coming H2 2022	1H,1H, 2H, 2H-Perfluorodecane sulfonic acid	8:2FTS	39108-34-4	x			x													
Coming H2 2022	2,3,3,3-Tetrafluoro-2-(1,1,2,2,3,3,3-heptafluoropropoxy) propanoic acid	HFPO-DA	62037-80-3												x				x	x
Coming H2 2022	N-Ethyl-heptadecafluorooctane sulphonamidoethanol	N-Et-FOSE alcohol	1691-99-2				x	x					x						x	x
Coming H2 2022	Nonafluoro-3,6-dioxaheptanoic acid	NFDHA	151772-58-6	x			x	x												
Coming H2 2022	Perfluoro(2-ethoxyethane)sulfonic acid	PFEESA	113507-82-7	x			x	x												

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PFAS Compounds by Method (continued)

Cat. No	Compound Name	Abbreviation	CASRN	EPA 533	EPA 537.1	EPA 8327	EPA 1633	OTM 45	ASTM D7968	ASTM D7979	ISO 21675	ISO 25101	CEN-TS-15968	CDC 6304.09	FDA-010.01	DIN 38414-14	DIN 38407-42	DIN 23702-1	DIN 17681-1 (Draft)	DIN 17681-2 (Draft)
Coming 2023	8:2 Polyfluoroalkyl phosphate diester	8:2 diPAP	678-41-1								x									
Coming 2023	8:2 Fluorotelomer unsaturated carboxylic acid	8:2 FTUCA	70887-84-2					x			x									
Coming 2023	N-ethylperfluorooctanesulfo-namide	N-EtFOSA	4151-50-2				x	x			x		x						x	x
Coming 2023	Perfluoro-1-decanesulfonic acid	PFDS	335-77-3			x	x	x			x									
Coming 2023	2-perfluorodecyl ethanoic acid	FDEA	53826-13-4						x	x	x									
Coming 2023	Perfluoro-3-methoxypropanoic acid	PFMPA	377-73-1	x			x	x												
Coming 2023	Perfluoro-1-nonanesulfonic acid	PFNS	68259-12-1			x	x	x												
Coming 2023	Perfluoro-4-methoxybutanoic acid	PFMBA	863090-89-5				x	x												
Coming 2023	3-Perfluoroheptyl propanoic acid	7:3FTCA	812-70-4				x	x												
Coming 2023	Perfluoropentadecanoic acid		141074-63-7						x	x										
Coming 2023	Decafluoro-4-(pentafluoroethyl) cyclohexane sulfonic acid-K salt	PFecHS-K	335-24-0						x	x										
Coming 2023	2-Perfluorooctyl ethanoic acid	FOEA	27854-31-5						x	x										
Coming 2023	2H-Perfluoro-2-octenoic acid	FHUEA	2321-3-19						x	x										
Coming 2023	Potassium nonafluoro-1-butanesulfonate	PFBS-K	29420-49-3						x	x										
Coming 2023	Potassium tridecafluorohexanesulfonate	PFHxS-K	3871-99-6						x	x										
Coming 2023	Decafluoro-4-(pentafluoroethyl) cyclohexane sulfonate	PFecHS-K	67584-42-3						x	x										
N/A	Perfluorobutanesulfonic acid	PFBS	375-73-5	x	x	x	x	x	x	x	x				x	x	x	x	x	x
N/A	Perfluorohexanesulfonic acid	PFHxS	355-46-4	x	x	x	x	x	x	x	x			x	x	x	x	x	x	x
N/A	1H, 1H, 2H, 2H-perfluorooctane sulfonic acid	6:2 FTS	27619-97-2	x		x	x	x			x									
N/A	1H, 1H, 2H, 2H-perfluorodecane sulfonic acid	8:2 FTS	39108-34-4			x		x			x								x	x
N/A	1H,1H,2H,2H-perfluorododecane sulfonate (10:2)	10:2 FTS	120226-60-0					x												
N/A	9-Chlorohexade-cafluoro-3-oxanon-ane-1-sulfonic acid	9Cl-PF3ONS	73606-19-6								x				x					
N/A	4,8-Dioxa-3H-perfluorononanoic acid	ADONA	919005-14-4	x	x		x	x			x									
N/A	Perfluorooctanesulfo-namide	FOSA	754-91-6					x			x								x	x
N/A	N-ethylperfluorooctanesulfon-amidoacetic acid	N-EtFOSAA	2991-50-6		x		x	x			x									
N/A	N-methylperfluorooctanesulfo-namide	N-MeFOSA	31506-32-8				x				x		x						x	x
N/A	N-methylperfluorooctanesulfon-amidoacetic acid	N-MeFOSAA	2355-31-9		x		x	x			x									

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PFAS Compounds by Method (continued)

Cat. No	Compound Name	Abbreviation	CASRN	EPA 533	EPA 537.1	EPA 8327	EPA 1633	OTM 45	ASTM D7968	ASTM D7979	ISO 21675	ISO 25101	CEN-TS-15968	CDC 6304.09	FDA-010.01	DIN 38414-14	DIN 38407-42	DIN 23702-1	DIN 17681-1 (Draft)	DIN 17681-2 (Draft)
N/A	Perfluoroheptanesulfonic acid	PFHpS	375-92-8	x		x	x	x			x				x					
N/A	Perfluoro-n-hexadecanoic acid	PFHxDA	67905-19 -5					x			x									
N/A	Perfluorotridecanoic acid	PFTrDA	7269-94-8		x	x	x	x			x							x		
N/A	11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid	11Cl-PF3OUdS	763051-92-9	x	x		x	x							x					
N/A	Perfluoro-n-[13C8] octanoic acid	13C8 PFOA	864071-09-0				x								x					
N/A	9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acd	9Cl-PF3ONS	756426-58-1	x	x		x	x												
N/A	N-Methyl-heptadecafluorooctane sulphonamidoethanol	Me-FOSE alcohol	24448-09-7				x	x					x						x	x
N/A	Sodium dodecafluoro-3H-4, 8-dioxanonanoate	NaDONA	958445-44-8												x					
N/A	Perfluorooctane sulphonamide	PFOSA	754-91-6				x						x							
N/A	Perfluoropentanesulfonic acid	PFPeS	2706-91-4	x		x	x	x							x					
N/A	Perfluorododecanesulfonic acid	PFDoS	79780-39-5				x	x												
N/A	3-Perfluoropropyl propanoic acid	3:3FTCA	356-02-5				x	x												
N/A	2H,2H,3H,3H-Perfluorooctanoic acid	5:3FTCA	914637-49-3				x	x												
N/A	Ammonium perfluorocaprilate		3825-26-1																x	x
N/A	Sodium pentadecafluorooctanoate		335-95-5																x	x
N/A	potassium perfluorooctanoate		2395-00-8																x	x
N/A	pentadecafluoro-octanoic acid		335-93-3																x	x
N/A	METHYL PERFLUOROOCTANOATE		376-27-2																x	x
N/A	ethyl perfluorooctanoate		3108-24-5																x	x
N/A	2,2,3,4,4,5,5,6,6,7,8,8,8-tridecafluoro-3,7-bis(trifluoromethyl)octanoic acid	pc1214	172155-07-6																x	x
N/A	2-aminotoluene-5-sulfonic acid		34598-33-9																x	x
N/A	heptadecafluoro-1-octanesulfonic acid lithium salt		29457-72-5																x	x
N/A	Ammonium perfluorooctylsulfonate		29081-56-9																x	x
N/A	bis(2-hydroxyethyl)ammonium perfluorooctanesulfonate		70225-14-8																x	x
N/A	Heptadecafluorooctanesulfonic acid tetraethylammonium salt		56773-42-3																x	x
N/A	2-(Perfluorooctyl)ethanol		678-39-7																x	x
N/A	1H,1H,2H,2H-Heptadecafluorodecyl acrylate		27905-45-9																x	x
N/A	perfluorooctylsulfonylfluoride/Fc-8		307-35-7																x	x
N/A	2-(Perfluorooctyl)ethyl methacrylate		1996-88-9																x	x
N/A	potassium 2,3,3,3-tetrafluoro-2-(heptafluoropropoxy)propionate		67118-55-2																x	x

Supelco®
Analytical Products

Products by Promulgated Methods

If you are using a promulgated method, the chances are VERY high that we have everything you need for the analysis.

The following pages list all of the potential products needed for the promulgated methods listed below, sorted into 3 categories: Columns and Chemicals, Lab Equipment and Sample Prep supplies and Containers.

To find the products listed on **SigmaAldrich.com**, simply click on the catalogue number listed in the left column.

The methods covered in the tables are:

- ASTM 7968
- ASTM 7979
- CDC 6304.09
- CEN TS 15968
- EPA 533
- EPA 537.1
- EPA 8327
- EPA 1633
- FDA C-010.01
- ISO 21675
- ISO 25101

If you are using a promulgated method we have not listed here, please contact us so that we can add that method to the next version of this brochure.

Chemicals and Columns by Method

Cat. No	Part Description	ASTM 7968	ASTM 7979	CDC 6304.09	CEN-TS 15968-2010	EPA 533	EPA 537.1	EPA 8327 / SW-846	EPA 1633	FDA C-010.01	ISO 21675	ISO 215101
900667	Acetonitrile for UHPLC, suitable for mass spectrometry (MS)	8.12 & 11.1	7.1, 8.12 & 11.2	6.b.2				7.3.1		2019.4	6.3	
1.03725	Acetonitrile for UHPLC-MS LiChrosolv®	8.12 & 11.1	7.1, 8.12 & 11.2	6.b.2				7.3.1		2019.4	6.3	
900688	Methanol UHPLC, suitable for mass spectrometry (MS)	8.13, 11.1, 12.2 & 13.4	8.13 & 13.4	6.b.3 & 6.b.4	6.3.1, 6.4.5, 9.1 & 9.3	11.4	11.3 & 11.7	7.3.3, B7.3.1		2019.4	6.6	5.5
1.03726	Methanol for UHPLC-MS LiChrosolv®	8.13, 11.1, 12.2 & 13.4	8.13 & 13.4	6.b.3 & 6.b.4	6.3.1, 6.4.5, 9.1 & 9.3	11.4	11.3 & 11.7	7.3.3, B7.3.1		2019.4	6.6	5.5
AX1222	Ammonium acetate HPLC, meets ACS specifications	6.2.1 & B6.1	7.1 & 8.14		6.4.3	11.3	11.7			2019.4	6.5 & 6.10	5.4
5.43834	Ammonium acetate for HPLC LiChropur™	8.14 & 11.1	7.1 & 8.14		6.4.3	11.3	11.7			2019.4	6.5 & 6.10	5.4
73594	Ammonium acetate suitable for mass spectrometry (MS), LiChropur™	8.14 & 11.1	7.1 & 8.14		6.4.3	11.3	11.7	7.3.6		2019.4	6.5 & 6.10	5.4
5.33004	Ammonium acetate for LC-MS LiChropur™	8.14 & 11.1	7.1 & 8.14		6.4.3	11.3	11.7	7.3.6		2019.4	6.5 & 6.10	5.4
695092	Acetic acid glacial, ACS reagent, ≥99.7%	8.15, 11.1, 12.2 & 13.4	8.15 & 13.6			11.3						
33209	Acetic acid glacial, puriss. p.a., ACS reagent, reag. ISO, reag. Ph. Eur., ≥99.8%	8.15, 11.1, 12.2 & 13.4	8.15 & 13.6			11.3						
45754	Acetic acid solution suitable for HPLC	8.15, 11.1, 12.2 & 13.4	8.15 & 13.6	6.b.1		11.3		7.3.7, B7.3.2			6.2	5.2
5.43808	Acetic acid 100% for HPLC LiChropur™	8.15, 11.1, 12.2 & 13.4	8.15 & 13.6	6.b.1		11.3		7.3.7, B7.3.2			6.2	5.2
650447	2-Propanol HPLC Plus, for HPLC, GC, and residue analysis, 99.9%	8.16 & 11.2	8.16 & 11.2									
102781	2-Propanol hypergrade for LC-MS LiChrosolv®	8.16 & 11.2	8.16 & 11.2					7.3.4				
AX1303	Ammonium Hydroxide Meets ACS Specifications	8.17 & 13.4	8.17 & 13.5			11.4	7.2				6.4	5.3
AX1308	Ammonium Hydroxide OmniTrace® Ultra	8.17 & 13.4	8.17 & 13.5	6.b.1		11.4	7.2	7.3.5		2019.4	6.4	5.3
1.03728	Water for UHPLC-MS LiChrosolv®	11.1, 12.2 & 13.4	7.1	6.b.1 & 6.b.4			11.4	B7.2		2019.4	6.1	5.1
900682	Water for UHPLC, suitable for mass spectrometry (MS)	11.1, 12.2 & 13.4	7.1	6.b.1 & 6.b.4			11.4	B7.2		2019.4	6.1	5.1
1.99001	Buffer solution (potassium hydrogen phthalate), traceable to SRM from NIST and PTB pH 4.01 (25°C) Certipur®			6.b.1								
00940	Formic acid for LC-MS LiChropur™, 97.5-98.5% (T)			6.b.5	6.4.4					2019.4		
RDD007	Sodium phosphate monobasic anhydrous, free-flowing, Redi-Dri™, ≥99.0%					11.4						
795410	Sodium phosphate dibasic anhydrous, free-flowing, Redi-Dri™, ACS reagent, ≥99%					11.4						
T7193	Trizma® Pre-set crystals BioPerformance Certified, pH 7.0, average Mw 154.8						11.3					

Supelco® Analytical Products

Sigma-Aldrich® Lab & Production Materials

Chemicals and Columns by Method (continued)

Cat. No	Part Description	ASTM 7968	ASTM 7979	CDC 6304.09	CEN-TS 15968-2010	EPA 533	EPA 537.1	EPA 8327 / SW-846	EPA 1633	FDA C-010.01	ISO 21675	ISO 215101
Z273228	Alconox® detergent 0.5 oz packs							B6.4				
242985	Alconox® detergent bulk packed							B6.4				
217247	Sodium thiosulfate pentahydrate ACS reagent, ≥99.5%											5.12
13479	Sodium thiosulfate pentahydrate puriss., meets analytical specification of Ph. Eur., BP, USP											5.12
31623	Silicon dioxide washed and calcined, analytical reagent	8.18 & 12.6										
53572-U	Ascentis® Express 90 Å PFAS Delay, 2.7 µm HPLC Column L × I.D. 5 cm × 3.0 mm	11.1	7.1	6.d.x	Annex A	6.12 & 11.6	11.7	6.1.2	6.10.3	2019.8	5.2 & 9.3	6.8, Annex B & Annex C
53573-U	Ascentis® Express 90 Å PFAS Delay, 2.7 µm HPLC Column L × I.D. 5 cm × 4.6 mm	11.1	7.1	6.d.x	Annex A	6.12 & 11.6	11.7	6.1.2	6.10.3	2019.8	5.2 & 9.3	6.8, Annex B & Annex C
53559-U	Ascentis® Express 90 Å PFAS, 2.7 µm HPLC Column L × I.D. 10 cm × 2.1 mm	11.1	7.1	6.d.x	Annex A	6.12 & 11.6	11.7	6.1.2	6.10.2	2019.8	5.2, 9.3 & Annex B	6.8, Annex B & Annex C
53560-U	Ascentis® Express 90 Å PFAS, 2.7 µm HPLC Column L × I.D. 15 cm × 2.1 mm	11.1	7.1	6.d.x	Annex A	6.12 & 11.6	11.7	6.1.2	6.10.2	2019.8	5.2, 9.3 & Annex B	6.8, Annex B & Annex C
53557-U	Ascentis® Express 90 Å PFAS, 2.7 µm HPLC Column L × I.D. 5 cm × 2.1 mm	11.1	7.1	6.d.x	Annex A	6.12 & 11.6	11.7	6.1.2	6.10.2	2019.8	5.2, 9.3 & Annex B	6.8, Annex B & Annex C
53562-U	Ascentis® Express 90 Å PFAS, 2.7 µm HPLC Column L × I.D. 25 cm × 2.1 mm	11.1	7.1	6.d.x	Annex A	6.12 & 11.6	11.7	6.1.2	6.10.2	2019.8	5.2, 9.3 & Annex B	6.8, Annex B & Annex C
53563-U	Ascentis® Express 90 Å PFAS, 2.7 µm HPLC Column L × I.D. 5 cm × 3.0 mm	11.1	7.1	6.d.x	Annex A	6.12 & 11.6	11.7	6.1.2	6.10.2	2019.8	5.2, 9.3 & Annex B	6.8, Annex B & Annex C
53564-U	Ascentis® Express 90 Å PFAS, 2.7 µm HPLC Column L × I.D. 10 cm × 3.0 mm	11.1	7.1	6.d.x	Annex A	6.12 & 11.6	11.7	6.1.2	6.10.2	2019.8	5.2, 9.3 & Annex B	6.8, Annex B & Annex C
53565-U	Ascentis® Express 90 Å PFAS, 2.7 µm HPLC Column L × I.D. 15 cm × 3.0 mm	11.1	7.1	6.d.x	Annex A	6.12 & 11.6	11.7	6.1.2	6.10.2	2019.8	5.2, 9.3 & Annex B	6.8, Annex B & Annex C
53570-U	Ascentis® Express 90 Å PFAS, 2.7 µm HPLC Column L × I.D. 25 cm × 3.0 mm	11.1	7.1	6.d.x	Annex A	6.12 & 11.6	11.7	6.1.2	6.10.2	2019.8	5.2, 9.3 & Annex B	6.8, Annex B & Annex C
1.52022	Chromolith® HighResolution RP-18 endcapped 100-4.6 HPLC column			6.d.2					6.10.2			
1.52025	Chromolith® HighResolution RP-18 endcapped 5-4.6 guard cartridges (3 pieces)			6.d.3					6.10.3			
1.52032	Chromolith® 5-4.6 guard cartridge holder			6.d.x								
1.52020	Chromolith® HighResolution RP-18 endcapped 25-4.6 HPLC column			6.d.4					6.10.2			
1.52321	Chromolith® HighResolution RP-18 endcapped L × I.D. 50 mm × 2 mm HPLC column			6.d.x					6.10.2			
1.52322	Chromolith® HighResolution RP-18 endcapped L × I.D. 100 mm × 2 mm HPLC column			6.d.x					6.10.2			
581300-U	Ascentis® C18 HPLC Column 3 µm particle size, L × I.D. 5 cm × 2.1 mm					6.12 & 11.6			6.10.2			
150651	Purospher® STAR RP-18 endcapped (3µm) Hibar® HR 50-2.1 suitable for UHPLC					6.12 & 11.6			6.10.2			
581304-U	Ascentis® C18 HPLC Column 5 µm particle size, L × I.D. 15 cm × 2.1 mm						11.7		6.10.2			
53569-U	Ascentis® Express F5, 2.7 µm HPLC Column 2.7 µm particle size, L × I.D. 10 cm × 2.1 mm								6.10.2		Annex E	

Equipment & Sample Prep by Method

Cat. No	Description	ASTM 7968	ASTM 7979	CDC 6304.09	CEN-TS 15968-2010	EPA 533	EPA 537.1	EPA 8327 / SW-846	EPA 1633	FDA C-010.01	ISO 21675	ISO 215101
109535	pH-indicator strips pH 0 - 14 Universal indicator. Accuracy: 1 pH unit, for use with MQuant® StripScan App	8.7 & 13.4	8.8						6.3.12		7.15	
SLPBDZ5	Millex®-PB Filter, 1.0 µm, Glass Fiber, 25 mm, nonsterile										Annex G.3.2	
SLGP033N	Millex®-GP Filter, 0.22 µm, PES, 33 mm, nonsterile	7.5 & 13.4	7.3 & 13.6					6.2.3.3, B6.3.1	6.4.2			
SLGN033	Millex®-GN Filter, 0.20 µm, Nylon, 33 mm, nonsterile								6.4.2	2019.8		
SLGNDZ5	Millex®-GN Filter, 0.20 µm, Nylon, 25 mm, nonsterile								6.4.2			
WHA10370019	Whatman® glass microfiber filters with inorganic binder, Grade GF 6 diam. 47 mm								6.4.3			
SLGNX13	Millex®-GN Filter, 0.20 µm, Nylon, 13 mm, nonsterile									2019.8		
WHAUN203NPENYL	Whatman® Mini-UniPrep® syringeless filters Nylon, 0.2 µm, 100/pk									2019.8		
57225-U	Supelclean™ENVI™-Chrom P SPE Tube bed wt. 250 mg, volume 6 mL, pk of 30				6.2 & 9.3						6.12 & 7.3	5.10 & Annex A
57226	Supelclean™ENVI™-Chrom P SPE Tube bed wt. 500 mg, volume 6 mL, pk of 30				6.2 & 9.3		11.4					5.10 & Annex A
54056-U	Supelclean™ ENVI-WAX SPE Cartridges, bed wt. 200 mg, volume 6 mL, pk of 30				6.2 & 9.3	6.8 & 11.4			6.7.1	2019.8	6.12 & 7.3	6.2 & Annex A
54057-U	Supelclean™ ENVI-WAX SPE Cartridges, bed wt. 500 mg, volume 6 mL, pk of 30				6.2 & 9.3	6.8 & 11.4				2019.8	6.12 & 7.3	6.2 & Annex A
57491-U	Supel™ Swift HLB SPE Tubes weight 200 mg (bed), volume 6 mL, pk of 30 ea				6.2 & 9.3							6.2 & Annex A
57143	Supelclean™ENVI™-Chrom P SPE Tube bed wt. 100 mg, volume 1 mL, pk of 108										6.12 & 7.3	
57062	Supelclean™ ENVI™-18 SPE Tube bed wt. 100 mg, volume 1 mL, pk of 108											6.2 & Annex A
57064	Supelclean™ ENVI™-18 SPE Tube bed wt. 500 mg, volume 6 mL, pkg of 30 ea											6.2 & Annex A
57224	Supelclean™ENVI™-Chrom P SPE Tube bed wt. 250 mg, volume 3 mL, pk of 54											5.10 & Annex A
54258-U	Large Volume SPE Reservoir polypropylene body, for use with 6 mL polypropylene SPE tubes, volume 25 mL, pk of 30										7.4	
57030-U	Visiprep™ SPE Vacuum Manifold standard, 12-port model					11.4	11.4		6.7.2		7.5	6.3
57250-U	Visiprep™ SPE Vacuum Manifold standard, 24-port model					11.4	11.4		6.7.2		7.5	6.3
55295-U	Supel™ QuE Non-Buffered Tube 2, pk of 50									2019.4		
55464-U	Supel™ QuE PSA/ENVI-Carb Tube 2, pk of 50, suitable for EN 15662:2008 per BS, centrifuge tube volume 15 mL , Shaker Compatible									2019.4		
Z135003	Transfer pipette, polyethylene, general purpose, standard, bulb draw 3.2 mL, non-sterile	6.6 & 8.11	8.11				11.5	6.2.3.3, B6.3.1				
Z740106	BRAND® pipette tips, racked, TipBox, volume 2-200 µL, non-sterile, pack of 480 ea (5 boxes of 96)	8.10	8.10					6.2.3.3, B6.3.1	6.6.2		7.2	
Z740030	BRAND® pipette tips, bulk, volume 2-200 µL, pack of 1000 ea (1 bag of 1000)	8.10	8.10						6.6.2		7.2	
CLS4863	Corning® universal fit racked pipet tips, 1-200 µL, natural, non-sterile, 10 racks/case, 960 tips/case		8.10								7.2	
CLS4844	Corning® universal fit bulk pipet tips, 1-200 µL, natural, non-sterile, 1000 tips/bag, 10,000 tips/case		8.10						6.6.2		7.2	

Equipment & Sample Prep by Method (continued)

Cat. No	Description	ASTM 7968	ASTM 7979	CDC 6304.09	CEN-TS 15968-2010	EPA 533	EPA 537.1	EPA 8327 / SW-846	EPA 1633	FDA C-010.01	ISO 21675	ISO 215101
Z709972	Sartorius pipette tips, volume range 10-1000 µL, standard, refill, non-sterile		8.10								7.2	
CLS4867	Corning® universal fit racket pipet tips, 100-1000 µL, blue, non-sterile, 10 racks/case, 1000 tips/case		8.10								7.2	
CLS4868	Corning® universal fit bulk pipet tips, 100-1000 µL, blue, non-sterile, 1000 tips/bag, 1000 tips/case		8.10						6.6.2		7.2	
Z741648	Sartorius pipette tips, volume range 100-5000 µL, Standard, rack, non-sterile		8.10						6.6.2		7.2	
Z741650	Sartorius pipette tips, volume range 100-5000 µL, Standard, bulk, non-sterile		8.10						6.6.2		7.2	
Z740447	Eppendorf® Reference® 2 Variable Volume Pipettor, 0.1–2.5 µL, 0.5–10 µL, 10–100 µL, 100–1,000 µL, pack of 4 ea			6.d.6				6.2.1, B6.1	6.6.2, 6.6.4			
CLS4071	Corning® Lambda® plus single channel pipettor, volume 0.5-10 µL			6.d.6				6.2.1, B6.1	6.6.2, 6.6.4			
CLS4072	Corning® Lambda® plus single channel pipettor, volume 2-20 µL			6.d.6				6.2.1, B6.1	6.6.2, 6.6.4			
CLS4073	Corning® Lambda® plus single channel pipettor, volume 10-100 µL			6.d.6				6.2.1, B6.1	6.6.2, 6.6.4			
CLS4074	Corning® Lambda® plus single channel pipettor, volume 20-200 µL			6.d.6				6.2.1, B6.1	6.6.2, 6.6.4			
CLS4075	Corning® Lambda® plus single channel pipettor, volume 100-1000 µL			6.d.6				6.2.1, B6.1	6.6.2, 6.6.4			
Z740099	BRAND® pipette tips, racked, TipBox, volume 0.1-20 µL, non-sterile, pack of 480 ea (5 boxes of 96)			6.d.6				6.2.3.3, B6.3.1	6.6.2			
Z740108	BRAND® pipette tips, racked, TipBox, volume 50-1000 µL, non-sterile, pack of 480 ea (5 boxes of 96)			6.d.6				6.2.3.3, B6.3.1	6.6.2			
AXYAP5000ALT	Corning® Axygen® Axypet® Single Channel Pipetor, volume (1-5 mL), ISO17025, Calibration 3x4								6.6.2, 6.6.4			
Z627992	Pasteur pipettes, short capillary tip, approx 2 mL withdraw volume, soda-lime glass								6.6.3			
CLS7095B5X	Corning® Pasteur pipettes, non-sterile, L 5 3/4 in. (146 mm), standard tip, soda lime								6.6.3			
Z683620	Syringe PP/PE without needle, luer lock tip, centered, capacity 20 mL, graduated, 1 mL, non-sterile							6.2.3.3, B6.3.1				
Z760293	Ohaus® MB-23 and MB-25 moisture analyzers, model MB23, AC/DC input 110 V AC								6.3.6.1			
Z743924	Ohaus® Explorer® semi-micro analytical balance, model EX125D, weighing capacity 51 or 120 g, Precision 0.01 0.1 mg, AC/DC input 110 V, US 3-pin plug								6.3.7.1			
Z760420	Ohaus® Explorer® analytical balance, model EX124, weighing capacity 120 g, precision: 0.1 mg, AC/DC input 110 V AC								6.3.7.2			
Z185159	Aluminum foil W × L 18 in. × 500 ft, thickness 0.001 in.								6.3.8			
Z561762	Disposable smartSpatula®, L 140 mm, white, anti-static, micro								6.3.9			
Z560057	Disposable smartSpatula®, L 310 mm, green, macro								6.3.9			
Z742705	BenchMixer™ XLQ QuEChERs Shaker/Vortexer, AC/DC input 115 V AC, US 2-pin plug								6.3.13			
Z742300	RotoBot™ Programmable Rotator, AC/DC input 115 V AC (US plug)								6.3.16			
20411	Glass Wool, Silanized, pkg of 50 g								6.4.1			
Z683582	Syringe PP/PE without needle, luer lock tip, centered, capacity 5 mL, graduated, 0.2 mL, non-sterile								6.6.1	2019.8		

Equipment & Sample Prep by Method (continued)

Cat. No	Description	ASTM 7968	ASTM 7979	CDC 6304.09	CEN-TS 15968-2010	EPA 533	EPA 537.1	EPA 8327 / SW-846	EPA 1633	FDA C-010.01	ISO 21675	ISO 215101
22971	Six Port Mini-Vap Evaporator/Concentrator, Mini-Vap L × W 7 1/2 in. (19 cm) × 1 1/2 in. (4 cm), for use with 1-250 mL containers, pkg of 1 ea								6.8.1		7.9	6.6
23029-U	Replacement needles for 6 port Mini-Vap, stainless steel, pkg of 6 ea								6.8.1		7.9	6.6
Z765503	Benchmixer™ XL multi-tube vortexer, AC/DC input 115 V AC									2019.8		
57100-U	Visidry™ Drying Attachment for use with Visiprep 12-port model										7.9	
57124	Visidry™ Drying Attachment for use with Visiprep 24-port model										7.9	

Containers by Method

Cat. No	Description	ASTM 7968	ASTM 7979	CDC 6304.09	CEN-TS 15968-2010	EPA 533	EPA 537.1	EPA 8327 / SW-846	EPA 1633	FDA C-010.01	ISO 21675	ISO 215101
29654-U	Certified Vial Kit, Low Adsorption (LA), 2 mL, pk of 100, volume 2 mL, amber glass vial (with marking spot), natural PTFE/silicone septa (with slit), thread for 9 mm	8.4, 12.2 & 13.4	8.4									
B9532	Nalgene® bottles, style 2105, capacity 30 mL	10.1	4.2 & 10.1									
Z376795	Disposable culture tubes, polypropylene tube								6.3.15			
T2318	Greiner centrifuge tubes, 50 mL, 30 x 115 mm, conical (V) bottom, w/ graduations, I.D. field	8.8	8.7					6.2.3.3, B6.3.1	6.5.2	2019.8		
CLS430829	Corning® 50 mL centrifuge tubes, polypropylene, conical bottom w/ CentriStar cap, bulk packed, sterile, natural, 500/cs	8.8	8					6.2.3.3, B6.3.1	6.5.2	2019.8		
T1943	Greiner centrifuge tubes, 15 mL, 17x120 mm, conical (V) bottom, w/ graduation, I.D. field	8.8, 12.6 & 13.3	8.7 & 13.3			11.4	11.5	6.2.3.3, B6.3.1		2019.8	7.6	
CLS430791	Corning® 15 mL centrifuge tubes, polypropylene, conical bottom w/ CentriStar cap, sterile, natural, 500/cs	8.8, 12.6 & 13.3	8.7 & 13.3			11.4	11.5	6.2.3.3, B6.3.1		2019.8	7.6	
Z511501	Kimax® heavy-duty wide-mouth, large numbers volumetric flasks - CLASS A, capacity 10 mL	8.9	8.9									
CLS563110	Pyrex® certified and serialized micro volumetric flask, with Pyrex® stopper, capacity 10 mL	8.9	8.9									
B9532	Nalgene® bottles, style 2105, capacity 30 mL	10.1	4.2 & 10.1									
CLS56405	Pyrex® volumetric flask, class A with Pyrex® ST stopper, capacity 5 mL		8.9									
CLS564010	Pyrex® volumetric flask, class A with Pyrex® ST stopper, capacity 10 mL		8.9									
DWK92812G-5	KIMBLE® KIMAX® Heavy duty volumetric wide-mouth flask with glass stopper, glass flask, flask capacity (5 mL), class A		8.9									
CLS5641P10	Corning® reusable volumetric flask, Class B, polypropylene, size 10 mL, with 10/19 tapered PP stopper				6.2						7.7	6.4
CLS5641P50	Corning® reusable volumetric flask, Class B, polypropylene, size 50 mL, with 12/21 tapered PP stopper				6.2						7.7	6.4
CLS5641P100	Corning® reusable volumetric flask, Class B, polypropylene, size 100 mL, with 14/23 tapered PP stopper				6.2						7.7	6.4
CLS5641P500	Corning® reusable volumetric flask, Class B, polypropylene, size 500 mL, with 19/26 tapered PP stopper				6.2						7.7	6.4
B9907	Nalgene® bottles, style 2105, capacity 250 mL					11.1	11.3					
B0158	Nalgene® bottles, style 2105, capacity 500 mL					11.1	11.3					
B0283	Nalgene® bottles, style 2105, capacity 1,000 mL					11.1	11.3					
Z327549	BRAND® graduated cylinder, PP, with blue printed scale or embossed scale, volume 25 mL, blue graduations						11.3					

Containers by Method (continued)

Cat. No	Description	ASTM 7968	ASTM 7979	CDC 6304.09	CEN-TS 15968-2010	EPA 533	EPA 537.1	EPA 8327 / SW-846	EPA 1633	FDA C-010.01	ISO 21675	ISO 215101
Z327565	BRAND® graduated cylinder, PP, with blue printed scale or embossed scale, volume 50 mL, blue graduations						11.3					
Z327581	BRAND® graduated cylinder, PP, with blue printed scale or embossed scale, volume 100 mL, blue graduations						11.3					
Z327670	BRAND® graduated cylinder, PP, with blue printed scale or embossed scale, volume 1,000 mL, blue graduations						11.3					
TMO312006-9125	Nalgene® diagnostic bottle, natural polypropylene copolymer, volume 4 mL, case of 2000 ea						11.4					
B7657	Nalgene® bottles, style 2002, capacity 125 mL								6.1.1.1			
B6660	Nalgene® bottles, style 2114, capacity 500 mL								6.1.1.1 & 6.1.1.2			
B6535	Nalgene® bottles, style 2114, capacity 250 mL								6.1.1.1			
B9282	Nalgene® bottles, style 2104, capacity 500 mL								6.1.1.2			
B9032	Nalgene® bottles, style 2104, capacity 125 mL								6.1.1.3			
Z261076	Nalgene® PassPort™ IP2 bottles, Narrow-mouth, capacity 60 mL								6.3.11			
B6285	Nalgene® bottles, style 2114, capacity 60 mL								6.3.11			
CLS568010	Pyrex® volumetric flask, certified and serialized, with Pyrex® ST stopper, capacity 10 mL								6.3.14			
CLS568025	Pyrex® volumetric flask, certified and serialized, with Pyrex® ST stopper, capacity 25 mL								6.3.14			
CLS568050	Pyrex® volumetric flask, certified and serialized, with Pyrex® ST stopper, capacity 50 mL								6.3.14			
CLS5680100	Pyrex® volumetric flask, certified and serialized, with Pyrex® ST stopper, capacity 100 mL								6.3.14			
CLS5680200	Pyrex® volumetric flask, certified and serialized, with Pyrex® ST stopper, capacity 200 mL								6.3.14			
Z376795	Disposable culture tubes, polypropylene tube								6.3.15			
B8157	Nalgene® bottles, style 2006, capacity 60 mL										7.1	
B8282	Nalgene® bottles, style 2006, capacity 125 mL										7.1	
B8407	Nalgene® bottles, style 2006, capacity 250 mL										7.1	
B8532	Nalgene® bottles, style 2006, capacity 500 mL										7.1	
B8657	Nalgene® bottles, style 2006, capacity 1,000 mL										7.1	
CLS3022P50	Corning® reusable graduated cylinder, single metric scale with funnel top, polypropylene, "to contain", size 50 mL										7.8	
Z327557	BRAND® graduated cylinder, PP, with blue printed scale or embossed scale, volume 50 mL										7.8	
CLS3022P100	Corning® reusable graduated cylinder, single metric scale with funnel top, polypropylene, "to contain", size 100 mL										7.8	
Z327573	BRAND® graduated cylinder, PP, with blue printed scale or embossed scale, volume 100 mL										7.8	
CLS3022P500	Corning® reusable graduated cylinder, single metric scale with funnel top, polypropylene, "to contain", size 500 mL										7.8	6.5
Z327638	BRAND® graduated cylinder, PP, with blue printed scale or embossed scale, volume 500 mL										7.8	6.5
CLS1500P1L	Corning® narrow mouth reagent bottle, reusable, capacity 1 L, polypropylene, with GL-63 PP screw cap											6.1

Notable Products for PFAS Testing

The following pages provide technical information on the products that have been specifically evaluated for use in PFAS testing.

Filters

Higher particulate samples, such as wastewater, may require a filtration step before analysis. Millipore EXPRESS Polyethersulfone (PES) membranes, in either a Millex® syringe filter or cut disc format, can enable testing of these more complex matrices. Three lots of nonsterile PES Millex syringe filters were tested for PFAS extractables (**Table 1**). For all compounds tested, PFAS extractables were not detected (**Table 2**). The analytes tested include all analytes in EPA 537.1 and SW-846 Method 8327 and the majority of analytes in ASTM D7979-19 and ISO 21675.

Table 1. Nonsterile PES Millex syringe filters included in PFAS extractable analysis. Note, larger pack sizes are available.

Cat. No.	Diameter	Pore Size	# Lots Analyzed
SLGP033NS	33mm	0.22 µm	3
SLHP033NS	33mm	0.45 µm	3

Table 2. PFAS Compounds Analyzed in Nonsterile PES Millex syringe filter extractable study. All compounds were below the minimum detection limit (MDL) of the study.

Compound	Abbreviation	MDL (ppb)	EPA 537.1	ASTM D7979-19	SW-846 Method 8327	ISO 21675
Perfluoro-n-butanoic acid	PFBA	0.0020		x	x	x
Perfluoro-n-pentanoic acid	PFPeA	0.0010		x	x	x
Perfluoro-n-hexanoic acid	PFHxA	0.0010	x	x	x	x
Perfluoro-n-heptanoic acid	PFHpA	0.0010	x	x	x	x
Perfluoro-n-octanoic acid	PFOA	0.0010	x	x	x	x
Perfluoro-n-nonanoic acid	PFNA	0.0010	x	x	x	x
Perfluoro-n-decanoic acid	PFDA	0.0010	x	x	x	x
Perfluoro-n-undecanoic acid	PFUnDA	0.0010	x	x	x	x
Perfluoro-n-dodecanoic acid	PFDoDA	0.0010	x	x	x	x
Perfluoro-n-tridecanoic acid	PFTrDA	0.0010	x	x	x	x
Perfluoro-n-tetradecanoic acid	PFTeDA	0.0010	x	x	x	x
Perfluoro-n-butanesulfonic acid	PFBS	0.0020	x	x	x	x
Perfluoro-n-pentanesulfonic acid	PFPeS	0.0020			x	
Perfluoro-n-hexanesulfonic acid	PFHxS	0.0020	x	x	x	x
Perfluoro-n-heptanesulfonic acid	PFHpS	0.0020			x	x
Perfluoro-n-octanesulfonic acid	PFOS	0.0020	x	x	x	x
Perfluoro-n-nonanesulfonic acid	PFNS	0.0020			x	
Perfluoro-n-decanesulfonic acid	PFDS	0.0020			x	x
4:2 Fluorotelomer sulfonic acid	4:2 FTS / 4:2 FTSA	0.0020		x		
6:2 Fluorotelomer sulfonic acid	6:2 FTS / 6:2 FTSA	0.0020		x	x	
8:2 Fluorotelomer sulfonic acid	8:2 FTS / 8:2 FTSA	0.0020				
Perfluorooctanesulfonamide	PFOSA/FOSA	0.0020			x	x
N-methyl Perfluorooctanesulfonamidoacetic acid	N-MeFOSAA	0.0040			x	x
N-ethyl Perfluorooctanesulfonamidoacetic acid	N-EtFOSAA	0.0040			x	x
Hexafluoropropylene oxide dimer acid	Gen-X / HFPO-DA	0.0020			x	
4,8-Dioxa-3H-perfluorononanoic acid	ADONA / DONA	0.0020			x	
9-Chlorohexadecafluoro-3-oxanone-1-sulfonic acid	9Cl-PF3ONS / F-53B Major	0.0020			x	
11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid	11Cl-PF3OUdS / F-53B Minor	0.0020				

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Preparation, Separation,
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Read the full application note here

Sample Preparation Products

Optimized sample cleanup and concentration is vital to achieve accurate and precise results. We offer vacuum manifolds, solid phase extraction (SPE) cartridges, and large volume samplers manufactured to high quality specifications to support your PFAS sample preparation needs (**Figure 1**).

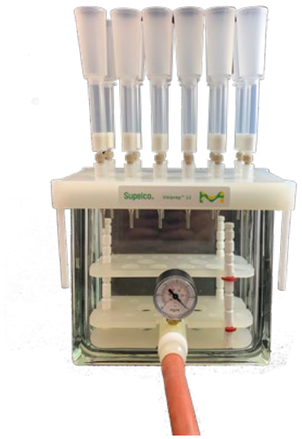


Figure 1. Visiprep™ large volume samplers, Supelclean™ SPE cartridges, and Visiprep™ vacuum manifolds provide a complete sample preparation solution for PFAS analysis.

Supelclean™ SPE Cartridges

Cat. No	Description
57226	Supelclean™ ENVI™ Chrom P SPE Cartridges, 500 mg
57239-U	Supelclean™ ENVI™ Chrom P SPE Cartridges, 500 mg for use with Gerstel® MPS
54057-U	Supelclean™ ENVI™ WAX™ SPE Cartridges, 500 mg
54056-U	Supelclean™ ENVI™ WAX™ SPE Cartridges, 200 mg

Visiprep™ Vacuum Manifolds

Cat. No	Description
57030-U	Standard, 12-port model
57250-U	Standard, 24-port model

Large Volume SPE Reservoir

Cat. No	Description
54258-U	Large Volume SPE Reservoir, polypropylene body, for use with 6 mL polypropylene SPE tubes, volume 25 mL, pk of 30

Visiprep™ Vacuum Manifolds

The Visiprep™ system contains a patented valve system that allows for precise flow control through each SPE tube via rotating, independent, screw-type valves situated in each port within the manifold cover. Visiprep™ vacuum manifolds allow you to process up to 12 (12-port version) or 24 (24-port version) PFAS samples simultaneously.

Supelclean™ SPE Cartridges

Multiple regulatory methods, such as EPA 537 and 533, detail the extraction of PFAS analytes from drinking water using SPE cartridges followed by analysis by LC/TQ. Most commonly, weak anion exchange (WAX) cartridges, such as Supelclean™ ENVI-WAX SPE cartridges, are used due to their ability to extract both short and long-chain PFAS analytes with good recoveries as seen in EPA 533 and ISO methods. EPA 537 uses a polystyrene divinylbenzene (PS-DVB) cartridge, such as a Supelclean™ ENVI™-Chrom P SPE cartridge, which offers high recoveries for medium and long-chain PFAS analytes.

Large Volume SPE Reservoirs

Large volume SPE reservoirs are designed to increase the headspace volume of standard polypropylene SPE tubes. Because these reservoirs are designed to connect directly to the mouth of the SPE tube, they are ideal for gravity applications where increased headspace volume is required.

The reservoirs are designed for use with 6 mL polypropylene SPE tubes and add an additional headspace volume of 25 mL.

Supelco®
Analytical Products

Columns

The HPLC column of choice for PFAS analysis by LC-MS/(MS) is a C18 column based on fully porous silica particles (FPP) such as Ascentis® C18 and Purospher™ STAR RP-18 endcapped, monolithic Chromolith® columns for every matrix-rich samples, or on superficially porous silica particles (SPP) such as Ascentis® Express.

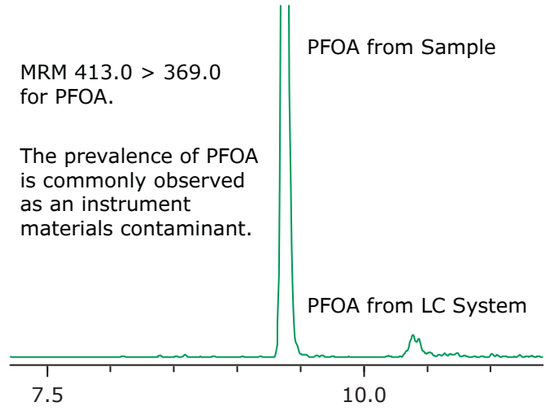
In contrast to ordinary FPP C18 columns Ascentis® Express PFAS columns are tested using a PFAS compound mixture. This ensures the full suitability of the column for PFAS analysis.

The contamination of PFAS compounds from the HPLC system and materials used in analytics is a concern. Therefore, it is recommended to use a delay column, which is placed before injection in the system set-up

The highly retentive endcapped silane of the Ascentis® Express PFAS Delay column provides high retention of PFAS compounds across various mobile phase conditions and is used to delay background instrument PFAS contamination from interference with analyzed samples. For this reason, the Ascentis® Express PFAS Delay column is placed upstream of the sample injector and after the mixer.

The new Ascentis® Express PFAS HPLC column is designed for the separation of novel and legacy short chain and long chain PFAS compounds containing branched and linear isomers, whilst adhering to EPA methodology requirements. The Ascentis® Express PFAS HPLC column, with its Fused-Core® technology and a particle size of 2.7 µm, delivers fast and high-resolution separations with excellent selectivity, peak shape, and necessary retention to perform in EPA methods 537.1, 533 and 8327.

Furthermore, a specific PFAS delay column prevents background PFAS contamination from interfering with the sample results in quantitative LC-MS methods.



Cat. No	Description	Cat. No	Description
Analytical Column		**Corresponding Delay Column**	
Ascentis® Express 90 Å PFAS, 2.7 µm HPLC Column		**Ascentis® Express 90 Å PFAS Delay, 2.7 µm HPLC Column**	
53557-U	L × I.D. 5 cm × 2.1 mm	**53572-U**	L × I.D. 5 cm × 3.0 mm
53559-U	L × I.D. 10 cm × 2.1 mm	**53572-U**	L × I.D. 5 cm × 3.0 mm
53560-U	L × I.D. 15 cm × 2.1 mm	**53572-U**	L × I.D. 5 cm × 3.0 mm
53562-U	L × I.D. 25 cm × 2.1 mm	**53572-U**	L × I.D. 5 cm × 3.0 mm
53563-U	L × I.D. 5 cm × 3.0 mm	**53573-U**	L × I.D. 5 cm × 4.6 mm
53564-U	L × I.D. 10 cm × 3.0 mm	**53573-U**	L × I.D. 5 cm × 4.6 mm
53565-U	L × I.D. 15 cm × 3.0 mm	**53573-U**	L × I.D. 5 cm × 4.6 mm
53570-U	L × I.D. 25 cm × 3.0 mm	**53573-U**	L × I.D. 5 cm × 4.6 mm

Read the related application note

Supelco® Analytical Products
Sigma-Aldrich® Lab & Production Materials

Solvents

We are committed to providing our customers with the widest selection of high purity solvents, specifically designed to deliver the ultimate performance for UHPLC-MS, LC-MS, and HPLC Analysis. For solvents that are ready to be used for PFAS analysis; we have products available from both the Supelco® and Sigma-Aldrich® product lines.

Our advanced UHPLC-MS LiChrosolv® solvents have been designed to meet the highest requirements of UHPLC-MS in quality control for environmental, clinical, food or industrial testing applications.

Our Sigma-Aldrich® solvents were designed originally for academic and research applications but maintain an excellent level of quality control and in both internal as well as 3rd party testing have been found to have very low levels of background PFAS.

Regardless of which brand you choose from; our solvents enable the highest sensitivity and reliable results due to the low baseline noise and clean mass spectra. Both brands have been tested and shown to contain less than 4ppt PFAS when analyzed using EPA methods 533 and 537.1.

Cat. No	Description
900688	methanol (LC-MS grade, verified)
1.03726	methanol (LC-MS grade, verified)
45754	acetic acid (HPLC grade)
5.43808	acetic acid (HPLC grade)
AX1308	ammonium hydroxide (OmniTrace Ultra)
5.43834	ammonium acetate, solid (HPLC grade)
900667	acetonitrile (LC-MS grade, verified)
1.03725	acetonitrile (LC-MS grade, verified)
AX1222	ammonium acetate, solid (HPLC & ACS grades)
650447	isopropyl alcohol (HPLC+ grade)
900682	water (LC-MS grade, verified)
1.03728	water (LC-MS grade, verified)

Water Purification Systems

Purified water is an important solvent in the laboratory, and is used for sample and standard preparation, as blank and in LC-MS mobile phase. To achieve and maintain good chromatographic performance, it is recommended to use freshly produced ultrapure water at each step of the PFAS testing process.

Discover the Milli-Q® IQ 7003/7005/7010/7015 ultrapure and pure water system, designed to improve your productivity, reduce environmental impact, and provide unparalleled convenience and versatility in the lab.

- **Tailor water quality to your needs**

  An optimized combination of purification technologies reliably delivers pure and ultrapure water, ascertained by highly accurate, continuous water quality monitoring. The LC-Pak® polisher, when connected to the Q-POD® dispenser, delivers the optimal water quality for sensitive LC-MS analyses.

- **Work more efficiently**

  Intuitive and easy to use touch screens enable rapid and precise dispensing.

- **Save bench space**

  Only the POD is needed for daily use. The system can be conveniently placed under the bench or wall-mounted.

- **Reach your sustainability targets**

  Look for the Greener Alternative Product label on some of our Milli-Q® systems, as they are certified to consume less water and electricity, decrease plastic waste and eliminate mercury waste handling.

Cat. No	Description
ZIQ7005T0C	Milli-Q® IQ 7003/05/10/15 pure and ultrapure water purification systems
ZIQ7000T0C	Milli-Q® IQ 7000 ultrapure water purification system
LCPAK00A1	LC-Pak® Polisher for trace and ultra-trace organic analyses

Milli-Q®
Lab Water Solutions

Reference Materials

Reference materials are a critical component of the analytical testing workflow.

Our reference material portfolio comprises neat material and solutions in analytical grade standard quality as well as certified reference materials. Our analytical standard grade products come with a certificate of analysis including a purity and identity as well as a chromatogram and the expiration date. These materials can be used for identity/screening analysis and content/assay determination if the product is qualified.

The certified reference materials are produced and certified according to ISO/IEC 17025 and ISO 17034 and provide the highest level of confidence to get accurate results. They come with a certificate including the certified content plus the expanded combined uncertainty having contributions from the certification process itself, stability and homogeneity studies and all requirements according to the ISO Guide 31.

Cat. No.	Description	Format	Concentration / matrix	Quality grade	Pack Size
68808	Perfluorobutanoic acid	neat		Analytical standard	25 mg
68542	Perfluoropentanoic acid	neat		Analytical standard	25 mg
43809	Perfluorohexanoic acid	neat		Analytical standard	25 mg
93899	Perfluorohexanoic acid	neat		CRM	25 mg
43996	Perfluoroheptanoic acid	neat		Analytical standard	25 mg
93983	Perfluoroheptanoic acid	neat		CRM	25 mg
33824	Perfluorooctanoic acid	neat		Analytical standard	100 mg
91977	Perfluorononanoic acid	neat		Analytical standard	50 mg
05167	Perfluorononanoic acid	neat		CRM	25 mg
43929	Perfluorodecanoic acid	neat		Analytical standard	25 mg
91367	Perfluorodecanoic acid	neat		CRM	10 mg
89988	Perfluoroundecanoic acid	neat		CRM	10 mg
92291	Perfluorododecanoic acid	neat		Analytical standard	50 mg
76705	Perfluorotridecanoic acid	neat		CRM	10 mg
80312	Perfluorotetradecanoic acid	neat		Analytical standard	50 mg
38400	Perfluorotetradecanoic acid	neat		CRM	10 mg
76467	Tricosafluorododecanoic acid	neat		CRM	10 mg
93973	Pentadecafluorooctanoic acid	neat		CRM	25 mg
33603	Pentadecafluorooctanoic acid	solution	100 µg/mL in methanol	Analytical standard	1 mL
33607	Heptadecafluorooctanoic acid	solution	100 µg/mL in methanol	Analytical standard	1 mL
33829	Perfluorooctane sulfonic acid	neat		Analytical standard	10 mg
80444	Perfluoroundecanoic acid	neat		Analytical standard	50 mg
89374	Heptadecafluorooctanesulfonic acid potassium salt	neat		Analytical standard	100 mg
93899	Heptadecafluorooctanesulfonic acid potassium salt	neat		CRM	25 mg

Supelco®
Analytical Products

Application Notes

For access to all of the latest application notes, visit **SigmaAldrich.com/pfas-testing**

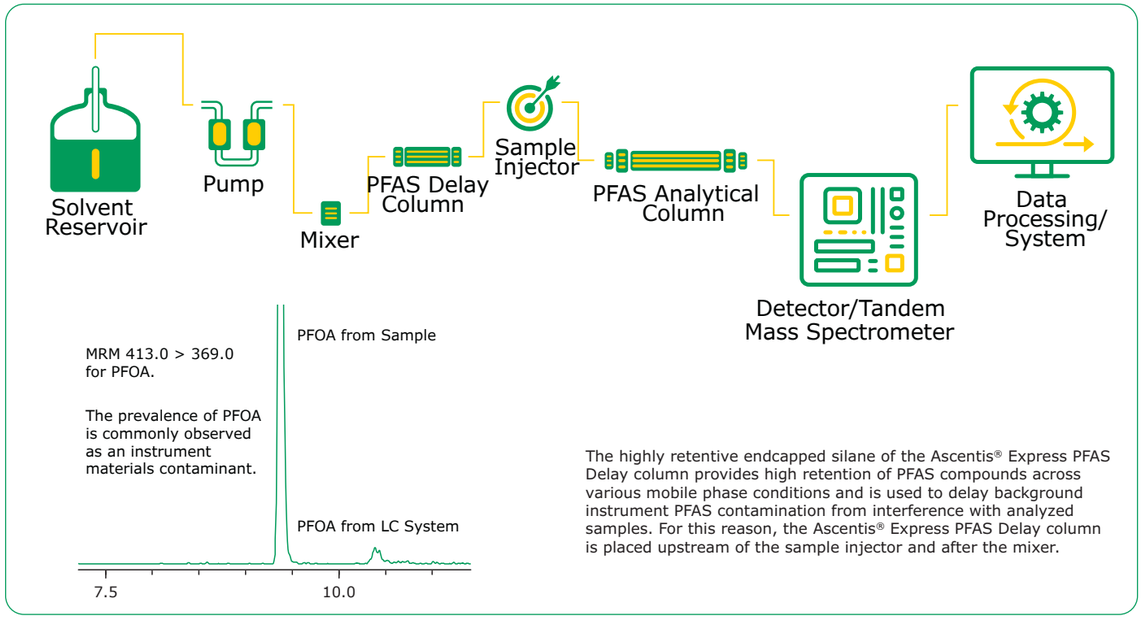
Ascentis® Express PFAS HPLC Columns LC-MS Analysis of PFAS Compounds in EPA Methods 537.1, 533 and 8327

PFAS (Per- and poly-fluoroalkyl substances) are persistent, man-made organic compounds, widely found in the environment. Recent awareness has brought attention to the toxicity of these substances. The U.S. Food and Drug Administration (FDA) and the U.S. Environmental Protection Agency (EPA) have initiated actions against PFAS. For determination of PFASs, liquid chromatography–mass spectrometry (LC-MS) is a commonly used technique.

EPA has developed, validated, and published three methods to support the analysis of 29 PFAS in drinking water, Method 533, 537 and 537.1. EPA 8327 covers the analysis of selected per- and polyfluoroalkyl substances (PFAS) in prepared extracts of various matrices (e.g., waters and solids) by liquid chromatography/tandem mass spectrometry (LC/MS/MS) analysis.

The Ascentis® Express PFAS HPLC column is designed for the separation of novel and legacy short chain and long chain PFAS compounds containing branched and linear isomers, whilst adhering to EPA methodology requirements. Furthermore, a specific PFAS delay column prevents background PFAS contamination from interfering with the sample results in quantitative LC-MS methods.

Sample Preparation | **Reference Standards** | **LC-MS Analysis**



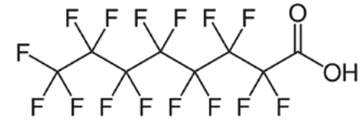
The highly retentive endcapped silane of the Ascentis® Express PFAS Delay column provides high retention of PFAS compounds across various mobile phase conditions and is used to delay background instrument PFAS contamination from interference with analyzed samples. For this reason, the Ascentis® Express PFAS Delay column is placed upstream of the sample injector and after the mixer.

Supelco®
Analytical Products

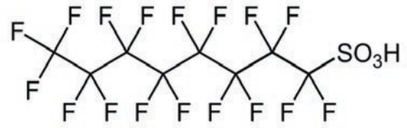
EPA Method 537.1

LC Conditions:	
Analytical Column:	Ascentis® Express PFAS, 2.7 µm, 10 cm x 2.1 mm, 90 Å (**53559-U**)
Delay Column:	Ascentis® Express PFAS Delay, 2.7 µm, 5 cm x 3 mm (**53572-U**)
Gradient:	Time / %B: 0.0 / 33.0; 18.0 / 98.0; 18.1 / 100.0; 21.0 / 100.0; 21.1 / 33.0; 26.0 / End
Mobile Phase A:	10 mM Ammonium Acetate
Mobile Phase B:	Methanol
Flow Rate:	0.4 mL/min
Pressure:	485 bar
Temperature:	35 °C
Injection Volume:	2.0 µL
Sample Solvent:	Methanol (96%) Water (4%)

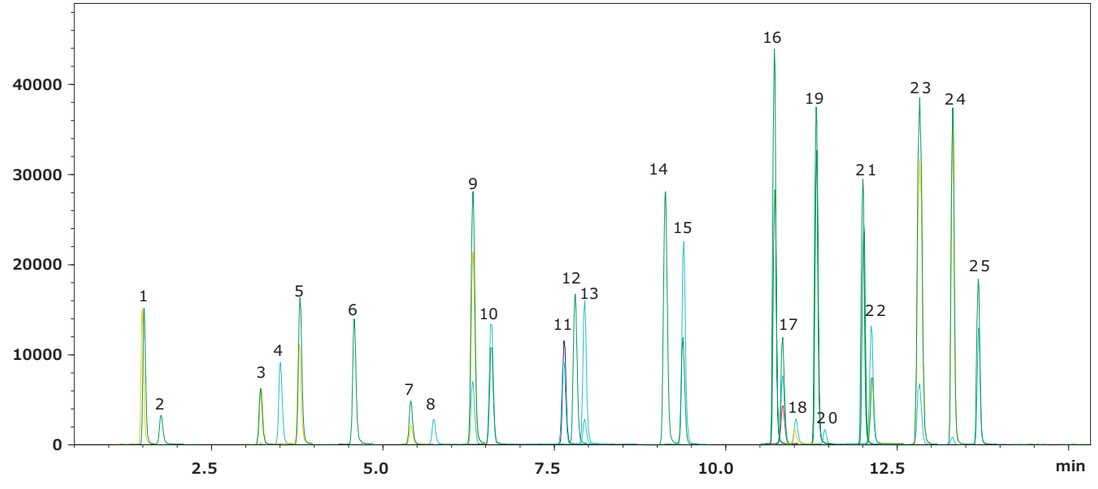
MS Conditions:	
Detection:	-ESI MS/MS
LC System:	Shimadzu Nexera X2
ESI LCMS system:	Shimadzu LCMS-8040
Spray Voltage:	-2.0 kV
Nebulizing gas:	2 L/min
Drying gas:	15 L/min
DL temp:	250 °C
Heat Block:	400 °C



PFOA



PFOS



Peak #	Compound	Transition	tR (min)
1	PFBS	299.0000>80.0000	3.789
2	PFHxA	313.0000>269.0000	5.639
3	HFPO-DA	285.0000>169.0000	6.307
4	PFHpA	363.0000>319.0000	7.723
5	PFHxS	399.0000>80.0000	7.936
6	ADONA	377.0000>250.9000	7.978
7	PFOA	413.0000>369.0000	9.368
8	PFNA	463.0000>419.0000	10.715
9	PFOS	499.0000>80.0000	10.762

Peak #	Compound	Transition	tR (min)
10	9Cl-PF3ONS	530.9000>351.0000	11.439
11	PFDA	513.0000>469.0000	11.857
12	N-MeFOSAA	570.0000>419.0000	12.336
13	PFUnA	563.0000>519.0000	12.822
14	N-EtFOSAA	584.0000>419.0000	12.827
15	11Cl-PF3OUdS	630.7000>451.0000	13.311
16	PFDoA	613.0000>569.0000	13.690
17	PFTrDA	663.0000>619.0000	14.435
18	PFTeDA	713.0000>669.0000	15.083

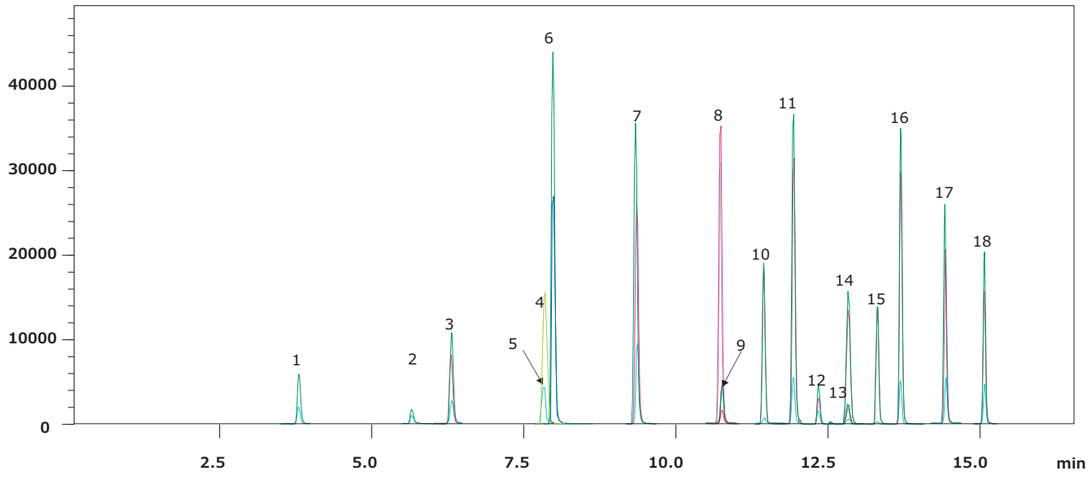
EPA Method 533

LC Conditions:	
Analytical Column:	Ascentis® Express PFAS, 2.7 µm, 10 cm x 2.1 mm, 90 Å (**53559-U**)
Delay Column:	Ascentis® Express PFAS Delay, 2.7 µm, 5 cm x 3 mm (**53572-U**)
Gradient:	

Time	%B
0.0	33.0
18.0	98.0
18.1	100.0
21.0	100.0
21.1	33.0
26.0	End

Mobile Phase A:	10 mM Ammonium Acetate
Mobile Phase B:	Methanol
Flow Rate:	0.4 mL/min
Pressure:	485 bar
Temperature:	35 °C
Injection Volume:	2.0 µL
Sample Solvent:	Methanol (96%) Water (4%)

MS Conditions:	
Detection:	-ESI MS/MS
LC System:	Shimadzu Nexera X2
ESI LCMS system:	Shimadzu LCMS-8040
Spray Voltage:	-2.0 kV
Nebulizing gas:	2 L/min
Drying gas:	15 L/min
DL temp:	250 °C
Heat Block:	400 °C



Peak #	Compound	Transition	tR (min)
1	PFBA	213.0000>169.0000	1.358
2	4:2FTS	229.0000>85.0000	1.890
3	PFPeA	263.0000>219.0000	3.219
4	PFBS	299.0000>80.0000	3.810
5	PFHpS	279.0000>85.0000	3.967
6	PFPeS	315.0000>135.0000	4.791
7	PFMPA	327.0000>307.0000	5.431
8	PFHxA	313.0000>269.0000	5.684
9	PFEESA	349.0000>80.0000	6.099
10	HFPO-DA	285.0000>169.0000	6.335
11	PFHpA	363.0000>319.0000	7.763
12	PFHxS	399.0000>80.0000	7.985
13	ADONA	377.0000>250.9000	8.012

Peak #	Compound	Transition	tR (min)
14	PFOA	413.0000>369.0000	9.398
15	PFMBA	449.0000>80.0000	9.512
16	PFNA	463.0000>419.0000	10.751
17	PFOS	499.0000>80.0000	10.793
18	9Cl-PF3ONS	530.9000>351.0000	11.459
19	PFDA	513.0000>469.0000	11.885
20	8:2FTS	549.0000>80.0000	11.897
21	6:2FTS	498.0000>78.0000	12.680
22	NFDHA	599.0000>80.0000	12.847
23	PFUnA	563.0000>519.0000	12.862
24	11Cl-PF3OUdS	630.7000>451.0000	13.329
25	PFDoA	613.0000>569.0000	13.708

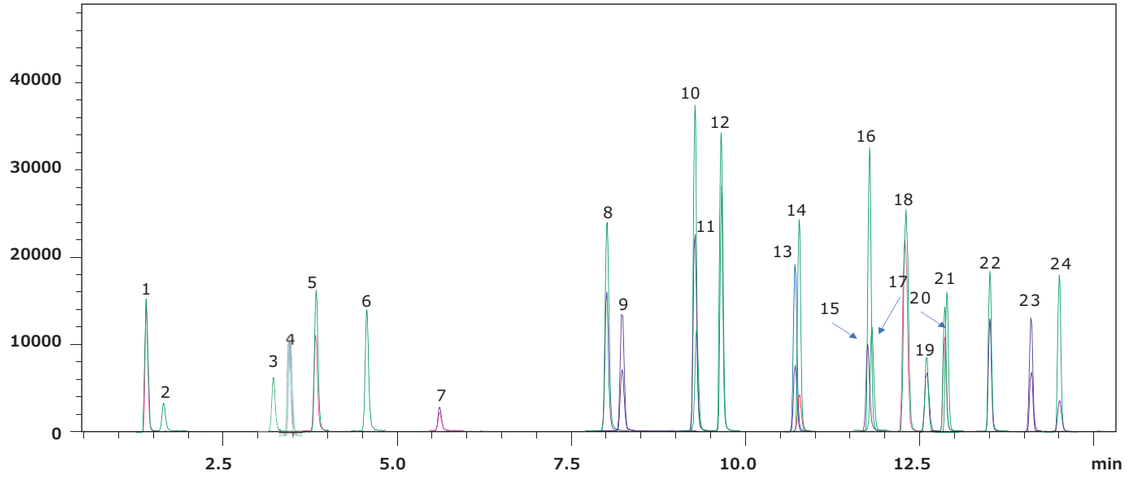
EPA Method 8327

LC Conditions:	
Analytical Column:	Ascentis® Express PFAS, 2.7 µm, 10 cm x 2.1 mm, 90 Å (**53559-U**)
Delay Column:	Ascentis® Express PFAS Delay, 2.7 µm, 5 cm x 3 mm (**53572-U**)
Gradient:	

Time	%B
0.0	33.0
18.0	98.0
18.1	100.0
21.0	100.0
21.1	33.0
26.0	End

Mobile Phase A:	10 mM Ammonium Acetate
Mobile Phase B:	Methanol
Flow Rate:	0.4 mL/min
Pressure:	485 bar
Temperature:	35 °C
Injection Volume:	2.0 µL
Sample Solvent:	Methanol (96%) Water (4%)

MS Conditions:	
Detection:	-ESI MS/MS
LC System:	Shimadzu Nexera X2
ESI LCMS system:	Shimadzu LCMS-8040
Spray Voltage:	-2.0 kV
Nebulizing gas:	2 L/min
Drying gas:	15 L/min
DL temp:	250 °C
Heat Block:	400 °C



Peak #	Compound	Transition	tR (min)
1	PFBA	213.0000>169.0000	1.358
2	4:2FTS	229.0000>85.0000	1.890
3	PFPeA	263.0000>219.0000	3.219
4	PFBS	299.0000>80.0000	3.810
5	PFHpS	279.0000>85.0000	3.967
6	PFPeS	315.0000>135.0000	4.791
7	PFHxA	313.0000>269.0000	5.684
8	PFHpA	363.0000>319.0000	7.763
9	PFHxS	399.0000>80.0000	7.985
10	FOSA	427.0000>407.0000	9.304
11	PFOA	413.0000>369.0000	9.398
12	PFDS	295.0000>201.0000	9.695

Peak #	Compound	Transition	tR (min)
13	PFNA	463.0000>419.0000	10.751
14	PFOS	499.0000>80.0000	10.793
15	PFNS	527.0000>507.0000	11.843
16	PFDA	513.0000>469.0000	11.885
17	8:2FTS	549.0000>80.0000	11.897
18	N-MeFOSAA	570.0000>419.0000	12.366
19	6:2FTS	498.0000>78.0000	12.680
20	PFUnA	563.0000>519.0000	12.862
21	N-EtFOSAA	584.0000>419.0000	12.865
22	PFDoA	613.0000>569.0000	13.708
23	PFTrDA	663.0000>619.0000	14.446
24	PFTeDA	713.0000>669.0000	15.103

Product list	Cat. No.
Ascentis® Express PFAS, 2.7 µm, 10 cm x 2.1 mm, 90 Å	**53559-U**
Ascentis® Express PFAS Delay, 2.7 µm, 5 cm x 3 mm	**53572-U**
Methanol for chromatography (LC-MS grade) LiChrosolv®	**1.06035**
Water for chromatography (LC-MS grade) LiChrosolv® or Ultrapure water from a Milli-Q® IQ 7 series water purification system	**1.15333** **or** **ZIQ7005T0C**
Ammonium acetate suitable for mass spectrometry (MS), LiChropur™, eluent additive for LC-MS	**73594**

Ascentis® Express PFAS HPLC Columns
LC-MS Analysis of 33 PFAS Compounds in 5 minutes

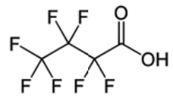
Introduction

The EPA has developed, validated, and published three methods to support the analysis of 29 PFAS in drinking water, Method 533, 537 and 537.1. EPA 8327 covers the analysis of selected PFAS compounds in prepared extracts of various matrices (e.g., waters and solids) by liquid chromatography/ tandem mass spectrometry (LC/MS/MS) analysis.

As technological advancements continue to progress, mass spectrometers will continue to be improved regarding their level of sensitivity, mass resolution, and scanning speed. This will impact future developments in PFAS analysis, and column performance must be able to handle these advancements. With this in mind, we developed a method for separation at maximum speed to test the suitability of the columns for use in these advanced conditions. The higher scanning speed of the MS instruments will lead to faster analysis time. However, an increase in the speed of analysis will lead to a decrease in the resolution therefore causing coelutions. The rapid separation of 33 PFAS compounds found in EPA 537.1, EPA 533, and EPA 8327 was completed in 5 minutes in this application note.

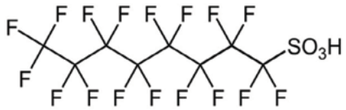
The HPLC column of choice for PFAS analysis by LC-MS/(MS) is a C18 column based on fully porous silica particles (FPP) or on superficially porous silica particles (SPP). In contrast to ordinary C18 columns, Ascentis® Express PFAS columns are tested using a PFAS compound mixture. This ensures the full suitability of the column for PFAS analysis.

The contamination of PFAS compounds from the HPLC system and materials used in analytics is a concern. Therefore, it is recommended to use a delay column, which is placed before injection in the system set-up.

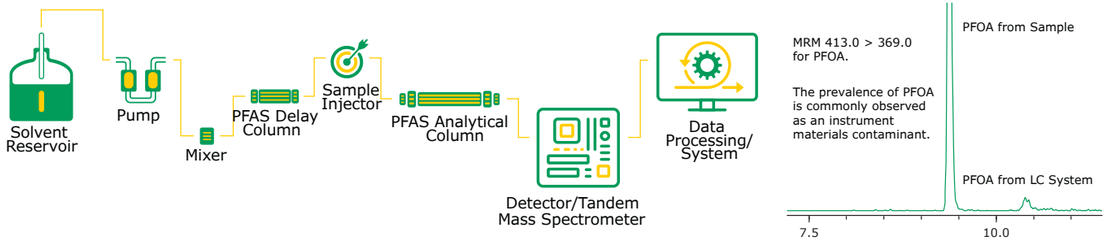


PFBA

PFOA



PFOS

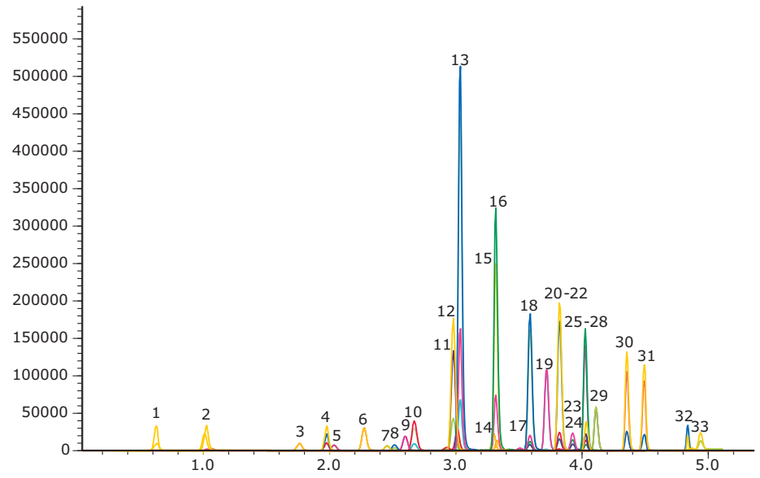


The highly retentive endcapped silane of the Ascentis® Express PFAS Delay column provides high retention of PFAS compounds across various mobile phase conditions and is used to delay background instrument PFAS contamination from interference with analyzed samples. For this reason, the Ascentis® Express PFAS Delay column is placed upstream of the sample injector and after the mixer.

LC Conditions:	
Analytical Column:	Ascentis® Express PFAS, 2.7 µm, 10 cm x 2.1 mm, 90 Å (**53559-U**)
Delay Column:	Ascentis® Express PFAS Delay, 2.7 µm, 5 cm x 3 mm (**53572-U**)
Gradient:	**Time** / **%B**: 0.0 / 33.0; 4.0 / 98.0; 4.1 / 100.0; 6.0 / 100.0; 6.1 / 33.0; 7.5 / End
Mobile Phase A:	10 mM Ammonium Acetate
Mobile Phase B:	Methanol
Flow Rate:	0.4 mL/min
Pressure:	485 bar
Temperature:	35 °C
Injection Volume:	2.0 µL
Sample Solvent:	Methanol (96%) Water (4%)

MS Conditions:	
Detection:	-ESI MS/MS
LC System:	Shimadzu Nexera X2
ESI LCMS system:	Shimadzu LCMS-8040
Spray Voltage:	-2.0 kV
Nebulizing gas:	2 L/min
Drying gas:	15 L/min
DL temp:	250 °C
Heat Block:	400 °C

Analysis of 33 PFAS Compounds in Under 5 Minutes



Peak #	Compound	Transition	tR (min)
1	PFBA	213.0000>169.0000	0.755
2	4:2FTS	229.0000>85.0000	1.031
3	PFPeA	263.0000>219.0000	1.762
4	PFBS	299.0000>80.0000	1.979
5	PFHpS	279.0000>85.0000	2.035
6	PFPeS	315.0000>135.0000	2.273
7	PFMPA	327.0000>307.0000	2.454
8	PFHxA	313.0000>269.0000	2.514
9	PFEESA	349.0000>80.0000	2.599
10	HFPO-DA	285.0000>169.0000	2.670
11	PFHxS	399.0000>80.0000	3.013
12	NaDONA	377.0000>251.0000	3.033
13	ADONA	377.0000>250.9000	3.034
14	FOSA	427.0000>407.0000	3.299
15	PFOA	413.0000>369.0000	3.316
16	PFMBA	449.0000>80.0000	3.328
17	PFHpA	363.0000>319.0000	3.388
18	PFOS	499.0000>80.0000	3.588
19	9Cl-PF3ONS	530.9000>351.0000	3.719
20	8:2FTS	549.0000>80.0000	3.816
21	PFNS	527.0000>507.0000	3.820
22	PFDA	513.0000>469.0000	3.822
23	N-MeFOSAA	570.0000>419.0000	3.925
24	PFNA	463.0000>419.0000	3.942
25	NFDHA	599.0000>80.0000	4.015
26	PFUnA	563.0000>519.0000	4.025
27	N-EtFOSAA	584.0000>419.0000	4.029
28	6:2FTS	498.0000>78.0000	4.033
29	11Cl-PF3OUdS	630.7000>451.0000	4.110
30	PFTrDA	663.0000>619.0000	4.355
31	PFDoA	613.0000>569.0000	4.496
32	PFTeDA	713.0000>669.0000	4.745
33	PFDS	295.0000>201.0000	4.921

Conclusion

The new Ascentis® Express PFAS HPLC column allows the highly efficient separation of 33 PFAS compounds in 5 minutes, and it is equally adept at delaying PFAS contamination originating from the instrument by using the Ascentis® Express PFAS Delay column.

This application note demonstrates that the Fused-Core® technology of Ascentis® Express PFAS HPLC columns benefits PFAS analysis for fast, efficient, and rugged separations which are paramount to environmental analysis.

Product list	Cat. No
Ascentis® Express PFAS, 2.7 µm, 10 cm x 2.1 mm, 90 Å	**53559-U**
Ascentis® Express PFAS Delay, 2.7 µm, 5 cm x 3 mm	**53572-U**
Methanol for chromatography (LC-MS grade) LiChrosolv®	**1.06035**
Water for chromatography (LC-MS grade) LiChrosolv® or ultrapure water from a Milli-Q® IQ 7 series water purification system	**1.15333 or ZIQ7005T0C**
Ammonium acetate suitable for mass spectrometry (MS), LiChropur™, eluent additive for LC-MS	**73594**

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LC-MS/MS Analysis of PFAS Extractables in Polyethersulfone (PES) Syringe Filters Using EPA 537.1

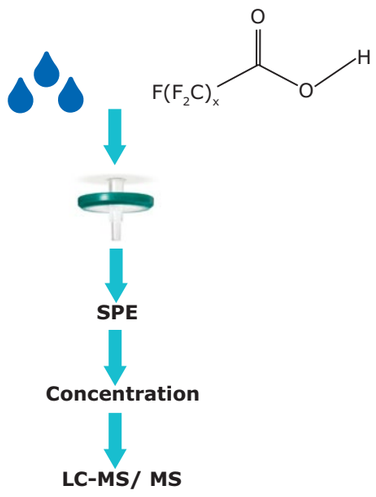
Introduction

A key consideration for any PFAS method is to avoid contamination that can impact the accuracy of data, including those coming from sample preparation techniques such as filtration. Currently, most of the analytical methods are for “clean” matrices, such as drinking water, and often do not require filtration as a part of sample preparation. However, methods such as SW-846 Method 8327, ASTM D7968, ASTM D797 and ISO 21675 involve matrices that could have a higher degree of particulates, such as wastewater. Particulates in solution must be removed prior to LC/MS/MS, as they can be detrimental to sample analysis, column longevity and overall instrument function. These methods identify the need for filtration using membranes in a syringe filter format.

In this application note, EPA Method 537.1 was used to demonstrate that the Millex® syringe filters with PES (polyethersulfone) Millipore Express®membranes did not give any detectable levels of PFAS contamination. **Figure 1** is the schematic of the experimental procedure.

Results

No PFAS contaminants were detected even with the very low reporting limits (RL) of the method (**Table 1**). These results suggest that nonsterile Millex® syringe filters with PES membranes are reliable and appropriate to utilize in the filtration of samples for the analysis of PFAS compounds in environmental matrices that require filtration prior to further clean-up, by solid phase extraction for example, and/or LC-MS/MS analysis.



- 250-mL water sample + surrogates
- QC blank internal standard spike = 0.08 ppb
- Filtration with 0.22µm or 0.4Sµm Millex syringe filter
- SDVB SPE cartridge extraction (Methanol)
- Concentrate samples to 1 mL in 96:4% v/v Methanol:Water
- LC/MS/MS, C18 column
- Analysis by internal standards

Figure 1. Schematic outline for testing Millex® syringe filters for PFAS contamination

Table 1 Detection of PFAS after filtration with nonsterile Millex® filters with PES membranes using LC/MS/MS according to EPA 537.1

				Millex® PES					
				0.22mm			0.45mm		
Compound	Abbre-viation	RL (ppb)	MDL (ppb)	Lot1	Lot2	Lot3	Lot1	Lot2	Lot3
Perfluoroalkylcarboxylic Acids									
Perfluorobutanoic acid	PFBA	0.0040	0.0020						
Perfluoropentanoic acid	PFPeA	0.0020	0.0010						
Perfluorohexanoic acid	PFHxA	0.0020	0.0010						
Perfluoroheptanoic acid	PFHpA	0.0020	0.0010						
Perfluorooctanoic acid	PFOA	0.0020	0.0010						
Perfluorononanoic acid	PFNA	0.0020	0.0010			Not detected			
Perfluorodecanoic acid	PFDA	0.0020	0.0010						
Perfluoroundecanoic acid	PFUnDA	0.0020	0.0010						
Perfluorododecanoic acid	PFDoDA	0.0020	0.0010						
Perfluorotridecanoic acid	PFTrDA	0.0020	0.0010						
Perfluorotetradecanoic acid	PFTeDA	0.0020	0.0010						
Perfluoroalkylsulfonic Acids, Perfluorooctanesulfonamides, and Perfluorooctanesulfonamidoacetic Acids									
Perfluorobutanesulfonic acid	PFBS	0.0020	0.0010						
Perfluoropentanesulfonic acid	PFPeS	0.0020	0.0010						
Perfluorohexanesulfonic acid	PFHxS	0.0020	0.0010						
Perfluoroheptanesulfonic acid	PFHpS	0.0020	0.0010						
Perfluorooctanesulfonic acid	PFOS	0.0020	0.0010			Not detected			
Perfluorononanesulfonic acid	PFNS	0.0020	0.0010						
Perfluorodecanesulfonic acid	PFDS	0.0020	0.0010						
PFOSA	PFOSA	0.0040	0.0020						
N-MeFOSAA	MeFOSAA	0.0040	0.0020						
N-EtFOSAA	EtFOSAA	0.0040	0.0020						
Fluorotelomer Sulfonates and Next Generation PFAS Analytes									
4:2 Fluorotelomer sulfonate	8:2 FTS	0.0080	0.0020						
6:2 Fluorotelomer sulfonate	6:2 FTS	0.0080	0.0020						
8:2 Fluorotelomer sulfonate	8:2 FTS	0.0080	0.0020						
HFPO-DA	GenX	0.0040	0.0020			Not detected			
ADONA	ADONA	0.0080	0.0020						
9Cl-PF3ONS (F-53B Major)	--	0.0080	0.0020						
11Cl-PF3OUdS (F-53B Minor)	--	0.0080	0.0020						

Abbreviations: RL = reporting limit (ppb); MDL = minimum detection limit (ppb).

Product list	Cat. No.
Syringe Filters	
Millex-GP Syringe Filter, PES 0.22µm	**SLGP033NS**
	SLGP033NB
	SLGP033NK
Millex-GP Syringe Filter, PES 0.45µm	**SLHP033NS**
	SLHP033NB
	SLHP033NK

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