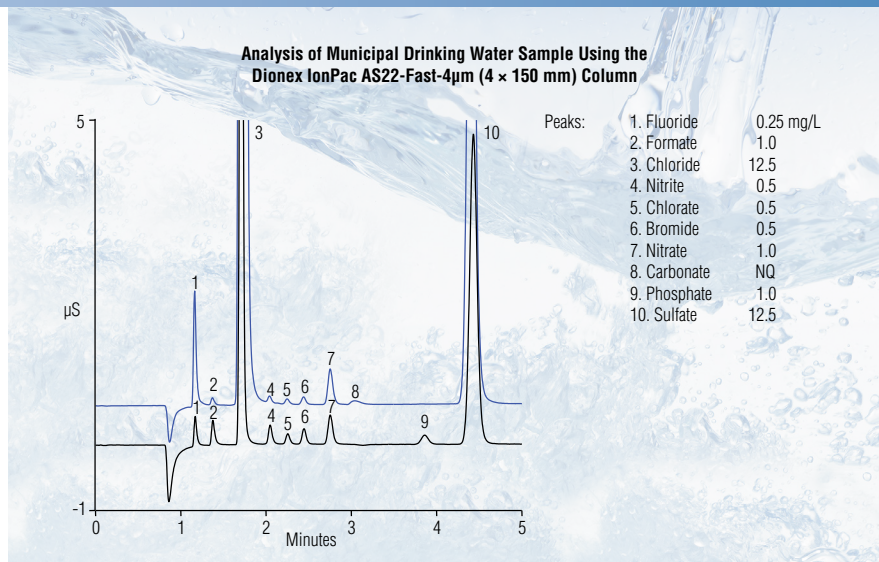


# Thermo Scientific Dionex IonPac AS22-Fast-4 $\mu$ m Anion-Exchange Column

The Thermo Scientific™ Dionex™ IonPac™ AS22-Fast-4 $\mu$ m column is a carbonate based anion-exchange column designed for the fast determination of inorganic anions and low-molecular-weight organic acids including fluoride, acetate, chloride, nitrite, bromide, nitrate, phosphate, and sulfate. The Dionex IonPac AS22-Fast-4 $\mu$ m column is used with isocratic carbonate/bicarbonate eluents and suppressed conductivity detection. The Dionex Eluent Generators and the Electrolytic pH Modifier (EPM) automatically produce potassium carbonate/bicarbonate eluents from water, which when combined with the Dionex IonPac AS22-Fast-4 $\mu$ m column, are ideal for fast IC separations.



## Column Performance

The Dionex IonPac AS22-Fast-4 $\mu$ m column uses the same ion-exchange chemistry as the Dionex IonPac AS22 column line, but with smaller substrate particles. Existing methods using the Dionex IonPac AS22-Fast column can be easily transferred to the Dionex IonPac AS22-Fast-4 $\mu$ m column with the benefit of increased peak efficiencies and better resolution. In addition, higher flow rates can be used resulting in faster runs and increased productivity without sacrificing performance. The Dionex IonPac AS22-Fast-4 $\mu$ m column meets the performance requirements specified in U.S. Environmental Protection Agency (EPA) Method 300.0 (A). The common inorganic anions are easily separated in a variety of sample matrices, including drinking water, wastewater, process streams, and scrubber solutions. The Dionex IonPac AS22-Fast-4 $\mu$ m column selectivity provides excellent retention of fluoride from the water dip and resolution of fluoride, acetate, and formate. Solvent compatibility permits easy column cleanup after the analysis of samples with hydrophobic components. The Dionex IonPac AS22-Fast-4 $\mu$ m column is available in 4 mm, 2 mm and 0.4 mm formats.

The Dionex IonPac AS22-Fast-4 $\mu$ m column is ideal for fast separations as it is designed to have sufficient capacity to maintain resolution even in a short column format and at higher flow rates. Fast separations are achieved on any Thermo Scientific Dionex HPLC system capable of operating at 5000 psi. In a short column format, backpressures produced at higher flow rates are reduced while allowing overall shorter run times. This combination of smaller particles and shorter columns allows for high resolution separations of anions in drinking, surface, groundwater, and wastewater matrices in under 5 min. Laboratories can achieve higher productivity and increased throughput using the Dionex IonPac AS22-Fast-4 $\mu$ m column.

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## Analyze for Inorganic Anions in Diverse Sample Matrices

- Source water and drinking water
- Municipal and industrial wastewater
- Industrial cooling water
- Foods and beverages
- Anionic counterions in pharmaceutical preparations and synthetic peptides
- Scrubber solutions

## Superior Chromatographic Performance

- Fast, high-resolution, isocratic separation of the common inorganic anions in simple sample matrices in 5 min.
- High-resolution isocratic separation of common inorganic anions in complex sample matrices in 8 min.
- Carbonate peak well resolved from common inorganic anions.
- Meets performance requirements specified in EPA Method 300.0 (A).
- Ideal alternative for Dionex IonPac AS4A-SC, AS12A, AS14, and AS14A inorganic anion applications.
- Simplified Reagent-Free™ ion chromatography (RFIC™) system operation provided by Dionex Eluent Generators and EPM, which require only a deionized water source to produce potassium carbonate/bicarbonate eluent.

- Ideal column for use with Eluent Regeneration, enabling simple, non-stop operation for up to 28 days.
- Simple, accurate eluent preparation with the Dionex IonPac AS22 Eluent Concentrate—just dilute in deionized water and start operation.
- Eluent suppression using the Dionex AERS 500 suppressor or Thermo Scientific™ Dionex™ ACES™ Anion Capillary Electrolytic Suppressor technology provides RFIC operation with low backgrounds and enhanced analyte sensitivity.
- High capacity: 126 µeq/column (4 × 150 mm column) allows the analysis of higher ionic strength matrices.
- Operate at ambient or elevated temperatures. Column selectivity is optimized for a 30 °C operating temperature to ensure reproducible retention times.
- Compatible with organic solvents to enhance analyte solubility, modify column selectivity, or for effective column cleanup.

## High Efficiency Particle Structure

The Dionex IonPac AS22-Fast-4µm column uses the same polymer bonding technology as the Dionex IonPac AS22 column but it is applied to a smaller particle. This delivers the same selectivity as the Dionex IonPac AS22-Fast column but with more efficient peaks and higher resolution separations as shown in Figure 1. The stationary phase consists of a novel hyper-branched anion-exchange condensation polymer, electrostatically attached to the surface of a wide-pore polymeric substrate. The substrate is surface-sulfonated in exactly the same manner as is common in Dionex latex coated anion-exchange materials. However, in this anion-exchange resin, alternating treatments of epoxy monomer and amines produce a coating which is grown directly off the substrate surface as illustrated in Figure 2. Resin capacity is controlled through the number of alternating coating cycles. The Dionex IonPac AS22-Fast-4µm column uses a high-capacity resin (126 µeq/4 mm column) with optimized selectivity for the common inorganic anions in a variety of sample matrices.

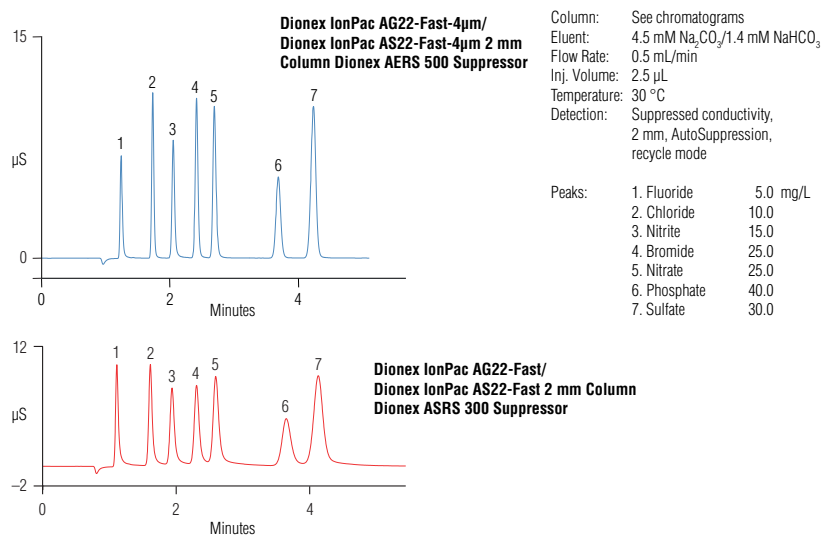


Figure 1. Comparison of Dionex IonPac AS22-Fast-4µm column to Dionex IonPac AS22-Fast column using a fast flow rate.

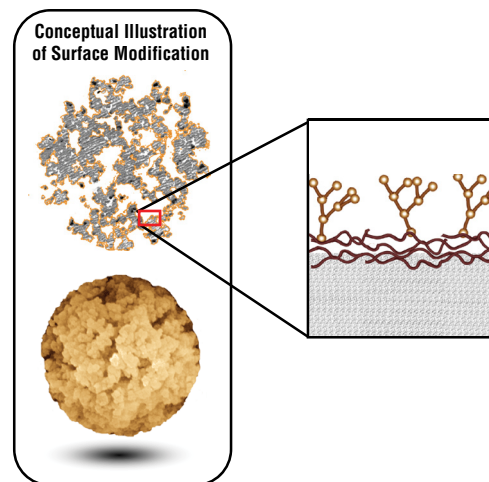


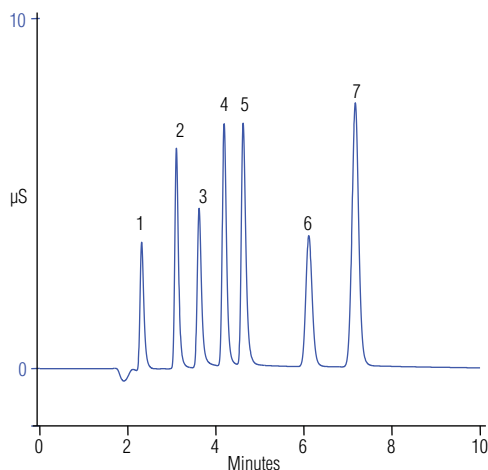
Figure 2. Structure of a Dionex IonPac AS22-Fast-4µm column particle.

### Economical Capillary Operation

The Dionex IonPac AS22-Fast-4 $\mu$ m column is available in 0.4 mm i.d. for capillary operation offering the advantage of reduced operating costs.

- Ideal for limited sample volumes due to higher mass sensitivity.
- One hundred fold reduction in eluent consumption and waste disposal.
- 4 mm applications can be directly transferred to the 0.4 mm format by reducing flow rate by one hundred fold.

Figure 3 is an example of the separation of inorganic anions using the Dionex IonPac AG22-Fast-4 $\mu$ m/AS22-Fast-4 $\mu$ m capillary column.



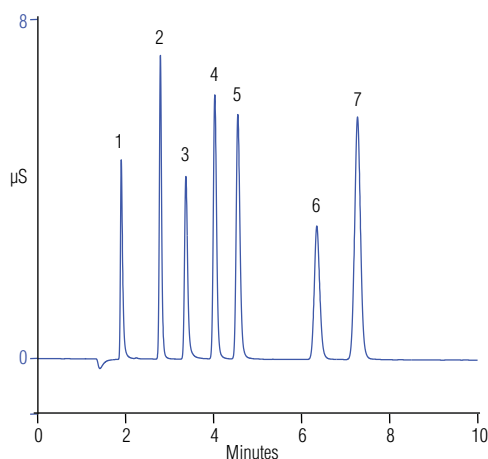
Column: Dionex IonPac AG22-Fast-4 $\mu$ m (0.4  $\times$  35 mm)/AS22-Fast-4 $\mu$ m (0.4  $\times$  150 mm)  
 Eluent: 4.5 mM Na<sub>2</sub>CO<sub>3</sub>/1.4 mM NaHCO<sub>3</sub>  
 Flow Rate: 12  $\mu$ L/min  
 Inj. Volume: 0.4  $\mu$ L  
 Temperature: 30 °C  
 Detection: Suppressed Conductivity, Dionex ACES 300 Suppressor, AutoSuppression, recycle mode

Peaks:		
1.	Fluoride	1.3 mg/L
2.	Chloride	2.5
3.	Nitrite	3.8
4.	Bromide	6.3
5.	Nitrate	6.3
6.	Phosphate	10.0
7.	Sulfate	7.5

Figure 3. Separation of inorganic anions using the Dionex IonPac AG22-Fast-4 $\mu$ m/AS22-Fast-4 $\mu$ m capillary column.

### Isocratic Separation of Common Inorganic Anions

The Dionex IonPac AS22-Fast-4 $\mu$ m column provides excellent separation of fluoride, chloride, nitrite, bromide, nitrate, phosphate and sulfate using an isocratic carbonate/bicarbonate eluent and suppressed conductivity detection. Using a 4.5 mM carbonate/1.4 mM bicarbonate eluent, the common inorganic anions can be resolved in less than 8 min as shown in Figure 4.



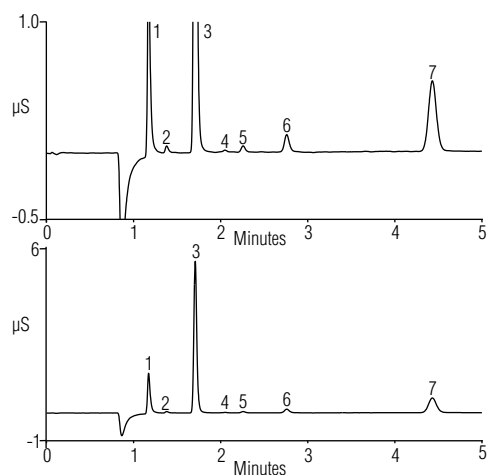
Column: Dionex IonPac AG22-Fast-4 $\mu$ m (4  $\times$  30 mm)/AS22-Fast-4 $\mu$ m (4  $\times$  150 mm)  
 Eluent: 4.5 mM Na<sub>2</sub>CO<sub>3</sub>/1.4 mM NaHCO<sub>3</sub>  
 Flow Rate: 1.2 mL/min  
 Inj. Volume: 10  $\mu$ L  
 Temperature: 30 °C  
 Detection: Suppressed Conductivity, Dionex AERS 500 Suppressor, 4 mm AutoSuppression, recycle mode

Peaks:		
1.	Fluoride	5.0 mg/L
2.	Chloride	10.0
3.	Nitrite	15.0
4.	Bromide	25.0
5.	Nitrate	25.0
6.	Phosphate	40.0
7.	Sulfate	30.0

Figure 4. Separation of common inorganic anions using the Dionex IonPac AS22-Fast-4 $\mu$ m column with a 4.5 mM carbonate/1.4 mM bicarbonate eluent.

### Inorganic Anions in Drinking Water

The Dionex IonPac AS22-Fast-4 $\mu$ m column is ideal for compliance monitoring of drinking water and wastewater. The column meets or exceeds the performance requirements of U.S. EPA Method 300.0 (A). Common inorganic anions in drinking water are separated in approximately 5 min when using an elevated flow rate as shown in Figure 5.



Column: Dionex IonPac AG22-Fast-4 $\mu$ m (4  $\times$  30 mm)/AS22-Fast-4 $\mu$ m (4  $\times$  150 mm)  
 Eluent: 4.5 mM Na<sub>2</sub>CO<sub>3</sub>/1.4 mM NaHCO<sub>3</sub>  
 Flow Rate: 2.0 mL/min  
 Inj. Volume: 40  $\mu$ L  
 Temperature: 30 °C  
 Detection: Suppressed conductivity, Dionex AERS 500 Suppressor, 4 mm, AutoSuppression, recycle mode  
 Sample: Municipal Drinking Water

Peaks:		
1.	Fluoride	0.81 mg/L
2.	Formate	NQ
3.	Chloride	3.14
4.	Nitrite	0.02
5.	Chlorate	0.15
6.	Nitrate	0.31
7.	Sulfate	1.42

Figure 5. Determination of inorganic anions in a municipal drinking water sample using the Dionex IonPac AS22-Fast-4 $\mu$ m column.

### Fast IC

The Dionex IonPac AS22-Fast-4 $\mu$ m column is suitable for separations requiring higher flow rates for the fast determination of inorganic anions in simple sample matrices as shown in Figure 6. The Dionex IonPac AS22-Fast-4 $\mu$ m column (2  $\times$  150 mm) was operated with the same eluent at 0.30 and 0.50 mL/min. Using a higher flow rate in a shorter column format, the overall run time was reduced to 4.5 min with optimal resolution of the common inorganic anions.

Figure 7 illustrates the analysis of a municipal drinking water sample using the Dionex IonPac AS22-Fast-4 $\mu$ m (4  $\times$  150 mm) column. At 2.0 mL/min, the anions can be separated in less than 5 min. The bottom trace shows the separation of an anion standard for comparison. The anions are well resolved in the drinking water sample, even at an elevated flow rate, providing high throughout analysis.

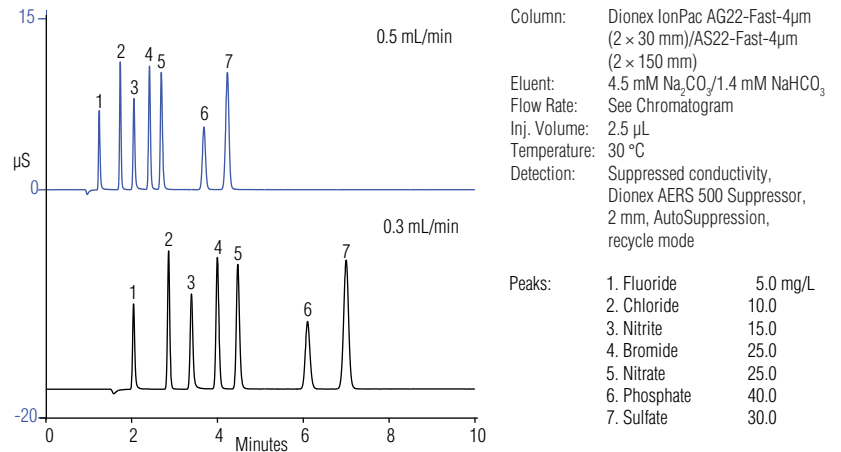


Figure 6. Separation of common inorganic anions using the Dionex IonPac AS22-Fast-4 $\mu$ m (2  $\times$  150 mm) column.

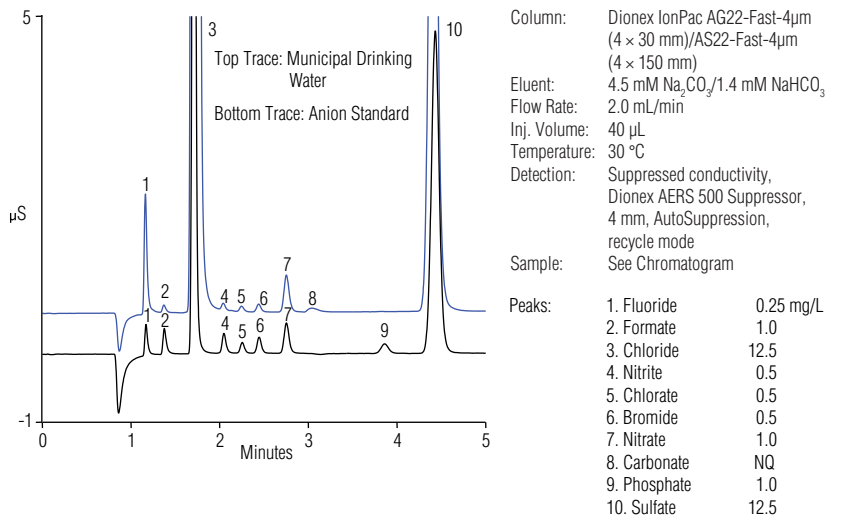


Figure 7. Analysis of municipal drinking water sample using the Dionex IonPac AS22-Fast-4 $\mu$ m (4  $\times$  150 mm) column.

## System Requirements

The Dionex IonPac AS22-Fast-4 $\mu$ m Capillary Column is recommended for use with the Thermo Scientific™ Dionex™ ICS-5000+ or Thermo Scientific™ Dionex™ ICS-4000 Capillary Reagent-Free™ HPIC™ system. The Dionex IonPac AS22-Fast-4 $\mu$ m Analytical Columns are recommended for use with Dionex ICS-5000+ RFIC system equipped with an eluent generator and EPM. The eluent generator is used to automatically produce carbonate and bicarbonate eluents from deionized water.

## Suppressor Recommendation

For optimum ease-of-use and economy, the Dionex IonPac AS22-Fast-4 $\mu$ m columns should be used with the Dionex AERS 500 suppressor or the Dionex ACES 300 suppressor.

## Concentrator Columns

For concentrator work with a 2 mm or 4 mm Dionex IonPac AS22-Fast-4 $\mu$ m column, use the: Dionex IonPac AG22-Fast-4 $\mu$ m guard column; Ultratrace Anion Concentrator Columns (Dionex IonPac UTAC-ULP1, UTAC-XLP1, UTAC-ULP2, or UTAC-XLP2) or Trace Anion Concentrator Column (Dionex IonPac TAC-ULP1) when a single piston pump such as the Thermo Scientific Dionex AXP Auxiliary Pump (pulse damper required) is used for sample delivery. In addition to the concentrator columns listed above, use the Dionex IonPac UTAC-LP1, UTAC-LP2 or TAC-LP1 when the sample is delivered using a syringe or a low-pressure AutoSampler, e.g., the Thermo Scientific Dionex AS-DV AutoSampler.

For concentrator work with a 0.4 mm capillary column, use the Dionex IonPac AG22-Fast-4 $\mu$ m Capillary Guard Column or the Thermo Scientific™ Dionex™ IonSwift™ MAC-100 concentrator column.

SPECIFICATIONS	
<b>Dimension</b>	Dionex IonPac AS22-Fast-4 $\mu$ m Capillary Column (0.4 × 150 mm) Dionex IonPac AS22-Fast-4 $\mu$ m Analytical Column (2 × 150 mm), (4 × 150 mm) Dionex IonPac AG22-Fast-4 $\mu$ m Capillary Guard Column (0.4 × 35 mm) Dionex IonPac AG22-Fast-4 $\mu$ m Guard Column (2 × 30 mm), (4 × 30 mm)
<b>Maximum Operating Pressure</b>	5000 psi
<b>Mobile Phase Compatibility</b>	pH 0–14; 0–100% HPLC solvents
<b>Substrate Characteristics</b>	
<b>Analytical Column</b>	Supermacroporous resin
Bead Diameter ( $\mu$ m)	4.0
Pore Size Å	2000
Cross-Linking (%DVB)	55
<b>Guard Column</b>	Microporous resin
Bead Diameter ( $\mu$ m)	11
Pore Size Å	<10
Cross-Linking (%DVB)	55
<b>Ion-Exchange Functional Group</b>	Alkanol quaternary ammonium ion
<b>Functional Group Characteristics</b>	Hydrophobicity Ultralow
<b>Capacity</b>	
1.26 $\mu$ eq	(0.4 × 150 mm capillary column)
0.04 $\mu$ eq	(0.4 × 35 mm capillary guard column)
126 $\mu$ eq	(4 × 150 mm analytical column)
4.0 $\mu$ eq	(4 × 30 mm guard column)
31.5 $\mu$ eq	(2 × 150 mm analytical column)
1.0 $\mu$ eq	(2 × 30 mm guard column)
<b>Column Construction</b>	PEEK with 10–32 threaded ferrule style end fittings. All components are nonmetallic.

## Ordering Information

For more information or to place an order, contact the Thermo Scientific Dionex Products office nearest you or your local distributor. Phone numbers and addresses for worldwide subsidiaries can be found in the About Us section of [www.thermoscientific.com](http://www.thermoscientific.com).

Analytical, Capillary, and Guard Columns	Part Number
Dionex IonPac AS22-Fast-4 $\mu$ m Capillary Column (0.4 $\times$ 150 mm)	088490
Dionex IonPac AG22-Fast-4 $\mu$ m Capillary Guard Column (0.4 $\times$ 35 mm)	088491
Dionex IonPac AS22-Fast-4 $\mu$ m Analytical Column (4 $\times$ 150 mm)	088486
Dionex IonPac AG22-Fast-4 $\mu$ m Guard Column (4 $\times$ 30 mm)	088487
Dionex IonPac AS22-Fast-4 $\mu$ m Analytical Column (2 $\times$ 150 mm)	088488
Dionex IonPac AG22-Fast-4 $\mu$ m Guard Column (2 $\times$ 30 mm)	088489
Trace Anion Concentrator Columns	Part Number
Dionex IonPac AMC-1 Anion MicroConcentrator (2 $\times$ 15 mm)	051760
Dionex IonPac TAC-2 Trace Anion Concentrator (3 $\times$ 35 mm)	043101
Dionex IonPac TAC-LP1 Low Pressure Trace Anion Concentrator (4 $\times$ 35 mm)	046026
Dionex IonPac TAC-ULP1 Ultra Low Pressure Trace Anion Concentrator (5 $\times$ 23 mm)	061400
Dionex IonPac UTAC-LP1 Ultra Trace Anion Concentrator – Low Pressure (4 $\times$ 35 mm)	063079
Dionex IonPac UTAC-ULP1 Ultra Trace Anion Concentrator – Ultra Low Pressure (5 $\times$ 23 mm)	063475
Dionex IonPac UTAC-XLP1 Ultra Trace Anion Concentrator – Extremely Low Pressure (6 $\times$ 16 mm)	063459
Dionex IonPac UTAC-LP2 Ultra Trace Anion Concentrator – Low Pressure (4 $\times$ 35 mm)	079917
Dionex IonPac UTAC-ULP2 Ultra Trace Anion Concentrator – Ultra Low Pressure (5 $\times$ 23 mm)	079918
Dionex IonPac UTAC-XLP2 Ultra Trace Anion Concentrator – Extremely Low Pressure (6 $\times$ 16 mm)	072781
Eluent Concentrate	Part Number
Dionex IonPac AS22 Sodium Carbonate/Bicarbonate Eluent Concentrate (250 mL of 100 $\times$ concentrate)	063965

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