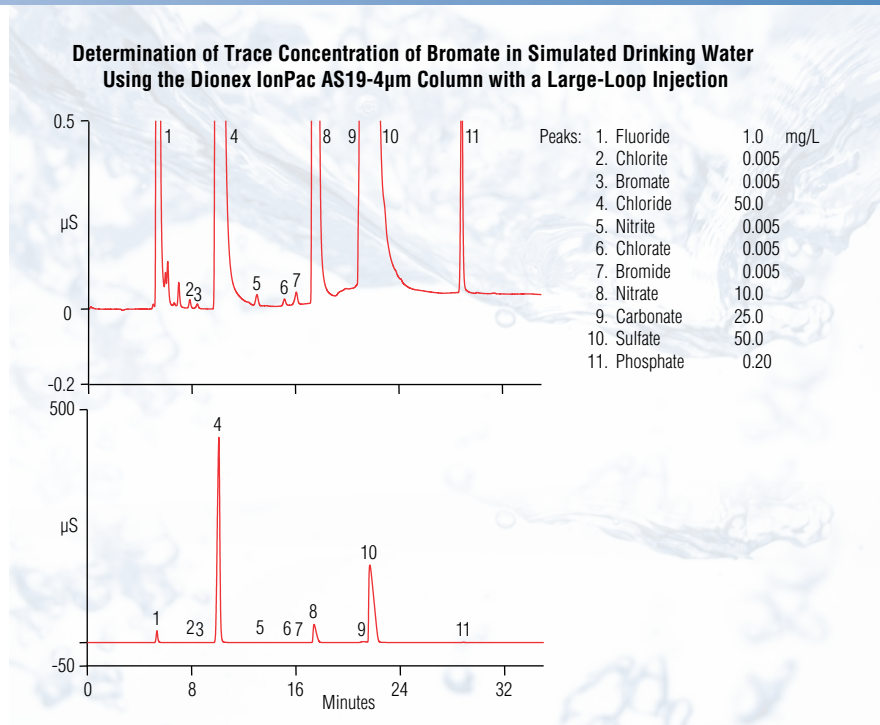


# Thermo Scientific Dionex IonPac AS19-4 $\mu$ m Anion-Exchange Column

The Thermo Scientific™ Dionex™ IonPac™ AS19-4 $\mu$ m high-capacity, hydroxide-selective, anion-exchange column is designed for the high resolution analysis of oxyhalides and common inorganic anions, including fluoride, chlorite, bromate, chloride, nitrite, chlorate, bromide, nitrate, sulfate, and phosphate in drinking water, groundwater, wastewater, and other diverse sample matrices.

The Dionex IonPac AS19-4 $\mu$ m column meets the performance requirements specified in U.S. EPA Methods 300.0 and 300.1 for the determination of oxyhalide byproducts from the disinfection of drinking water. The Dionex IonPac AS19-4 $\mu$ m column allows the analysis of most drinking water disinfected with ozone, without the use of sample pretreatment or preconcentration. Formats available range from 0.4 to 4 mm, allowing use of capillary to analytical flow rates, and supporting advanced IC  $\times$  IC applications.



## Superior Chromatographic Performance

- Same selectivity as the Dionex IonPac AS19 column, but uses smaller substrate particles, producing higher peak efficiencies and better resolution.
- Recommended column for trace bromate in drinking water matrices using a potassium hydroxide gradient with suppressed conductivity detection.
- Formats available include 0.4, 2, and 4 mm, supporting capillary to analytical flow rates.
- Capacity of 240  $\mu$ eq per column (4  $\times$  250 mm).
- Dionex IonPac AS19-4 $\mu$ m Capillary column offers reduced eluent consumption and reduced operating costs.
- Simplified Reagent-Free™ IC (RFIC™) operation provided by the eluent generator. Requires only a deionized water source to produce potassium hydroxide eluent.
- Eluent suppression using the Thermo Scientific™ Dionex™ AERS™ 500 Anion Electrolytically Regenerated Suppressor or the Thermo Scientific™ Dionex™ ACES™ 300 Anion Capillary Electrolytic Suppressor provides RFIC operation with low background and enhanced analyte sensitivity.

- Selectivity of the Dionex IonPac AS19-4 $\mu$ m column ensures that bromate, a toxic byproduct in ozone disinfection, can be quantified at low- $\mu$ g/L concentrations using suppressed conductivity detection, even in the presence of very high concentrations of chloride, sulfate, and carbonate.
- Operates at ambient or elevated temperatures. Column selectivity is optimized for operation at 30 °C to ensure reproducible retention times in all environmental conditions.
- Compatible with organic solvents to enhance analyte solubility, modify column selectivity, or allow effective column cleanup.

### High-Efficiency Particle Structure

The Dionex IonPac AS19-4 $\mu$ m column uses Thermo Scientific Dionex polymer bonding technology and a high-capacity resin with optimized selectivity for bromate and bromide. The stationary phase consists of a novel hyperbranched 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 Thermo Scientific Dionex latex-coated anion-exchange materials; however, in this anion-exchange resin, alternating treatments of epoxy monomer and amines produce a coating that grows directly off the surface of the substrate, as illustrated in Figure 1. The number of alternating coating cycles controls the capacity of the resin. The resulting polymer is extremely hydrophilic and therefore has excellent selectivity for hydroxide eluents, allowing the use of lower eluent concentrations. The Dionex IonPac AS19-4 $\mu$ m column has the same selectivity as the Dionex IonPac AS19 column, but uses smaller substrate particles, producing higher peak efficiencies and better resolution. Improved resolution makes peak integration easier and more reliable, leading to more accurate results.

### Economical Capillary Format

The Dionex IonPac AS19-4 $\mu$ m Capillary column (0.4  $\times$  250 mm) is packed with the same material as the equivalent standard bore version (producing the same performance as a 4 mm column), but requires only 1/100<sup>th</sup> the eluent flow rate. The capillary format offers the advantage of less eluent consumption providing reduced operating costs. Figure 2 illustrates the separation of 22 environmental anions using the Dionex IonPac AS19-4 $\mu$ m capillary column. Excellent retention time reproducibility can be achieved with the capillary format.

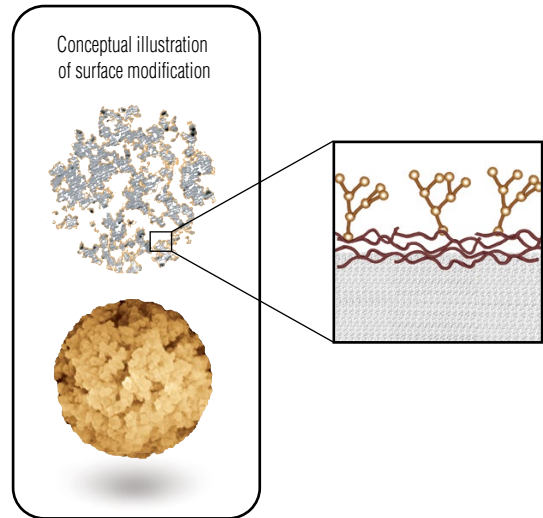


Figure 1. Preparation and anatomy of Dionex IonPac AS19-4 $\mu$ m resin.

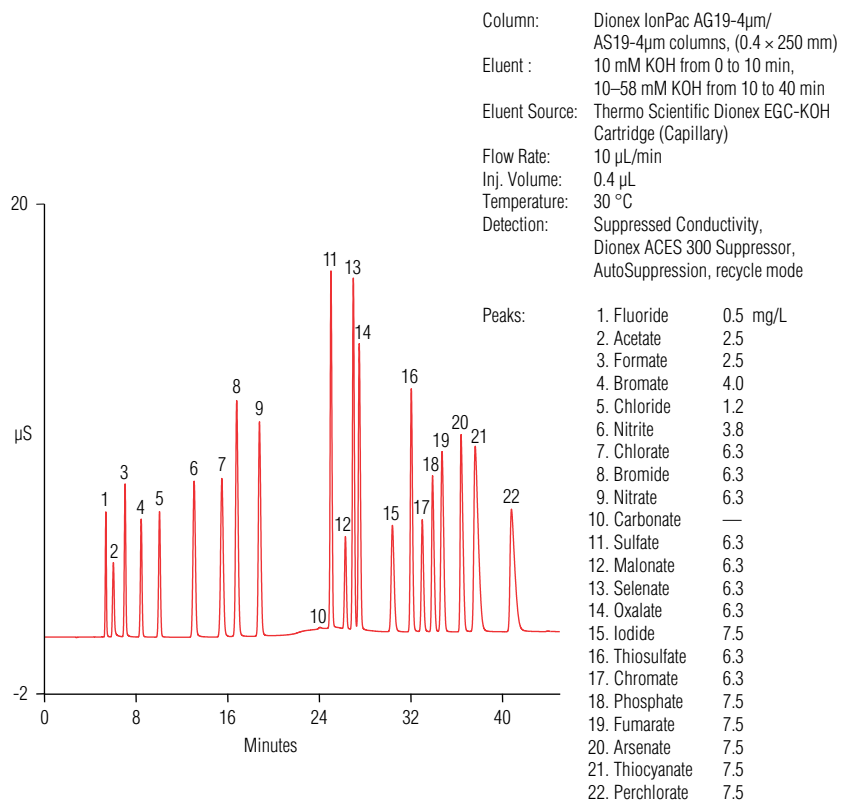


Figure 2. Separation of 22 anions using the Dionex IonPac AS19-4 $\mu$ m capillary column.

## Determination of Trace Bromate in Drinking Water Matrices

The high-capacity Dionex IonPac AS19-4 $\mu$ m column can be used to determine bromate at low- $\mu$ g/L concentrations in drinking water matrices. Bromate, a byproduct of the ozonation disinfection process for drinking water, has been cited by the EPA and the World Health Organization as a potential carcinogen, even at low- $\mu$ g/L concentrations. Treatment plants that use ozone for disinfection are required to monitor bromate, at an MCL of 10  $\mu$ g/L, in addition to the common inorganic anions. The high-resolution, high-capacity Dionex IonPac AS19-4 $\mu$ m column does not require sample pretreatment or preconcentration. This method uses a large-loop injection with a potassium hydroxide gradient coupled with suppressed conductivity detection, as illustrated in Figures 3 and 4.

## Gradient Separations as Simple as Isocratic Runs with the Eluent Generator and RFIC

The Dionex IonPac AS19-4 $\mu$ m column is recommended for use with eluent generation and Thermo Scientific™ Dionex™ RFIC-EG™ systems. The eluent generator (EG) electrolytically produces high-purity potassium hydroxide eluent from water, eliminating the need for eluent preparation. The potassium hydroxide eluent is free of carbonate contamination. Carbonate-free hydroxide eluents minimize baseline shifts during hydroxide gradients, which provides greater retention time reproducibility, lower background conductivity, and lower detection limits for target analytes.

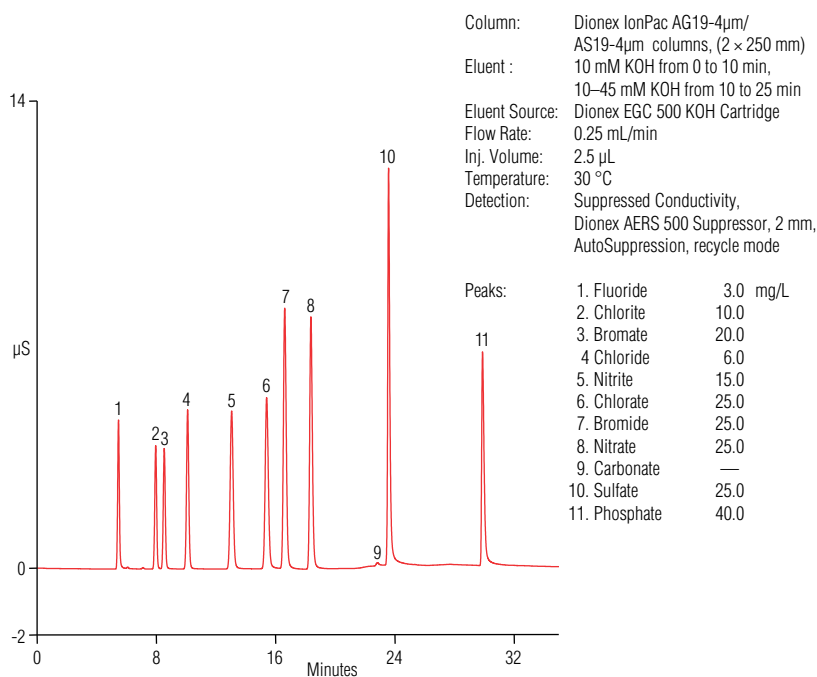


Figure 3. Determination of oxyhalides and common inorganic anions using the Dionex IonPac AS19-4 $\mu$ m column.

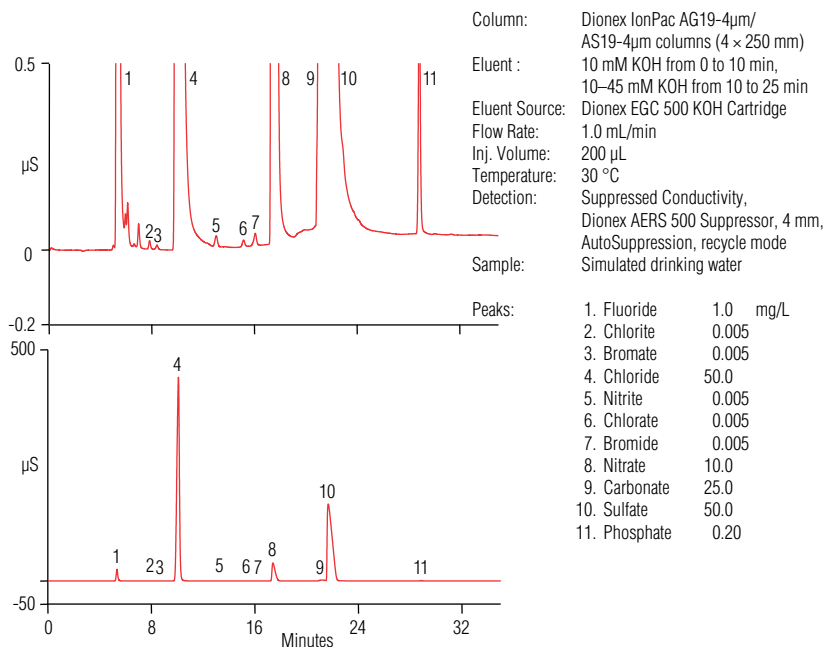


Figure 4. Determination of trace concentration of bromate in simulated drinking water using the Dionex IonPac AS19-4 $\mu$ m column with a large-loop injection.

The Dionex IonPac AS19-4 $\mu$ m column provides excellent separation of a variety of environmental anions including inorganic anions, oxyhalides, oxyanions, and organic acids using a potassium hydroxide gradient generated with an RFIC-EG system as demonstrated in Figure 5. A Thermo Scientific Dionex CR-ATC Continuously Regenerated Anion-Trap Column was used to remove carbonate from the source water to minimize the baseline shift during the gradient.

### System Requirements

The Dionex IonPac AS19-4 $\mu$ m Capillary Column is recommended for use with the Thermo Scientific™ Dionex™ ICS-5000+ Reagent Free HPIC™ or Thermo Scientific Dionex ICS-4000 Capillary HPIC system. The Dionex IonPac AS19-4 $\mu$ m Analytical Column is recommended for use with the Dionex ICS-5000+ HPIC system capable of operating up to 5000 psi. The smaller particles used in the Dionex IonPac AS19-4 $\mu$ m column generate higher back pressure under standard operating conditions and therefore cannot be used with older Dionex IC systems.

### Suppressor Recommendations

For optimum ease-of-use and performance, the Dionex IonPac AS19-4 $\mu$ m column should be used with Dionex ERS 500 Electrolytically Regenerated Suppressors or Dionex ACES 300 Anion Capillary Electrolytic Suppressor.

### Anion Trap Columns

When using the eluent generator for eluent delivery, a Dionex CR-ATC Continuously Regenerated Anion Trap Column should be installed between the eluent generator cartridge (EGC) and the degas module. As an alternative for 4 mm and 2 mm systems, a Dionex IonPac ATC-HC column can be installed between the pump outlet and the EGC inlet. Alternatively, when using a

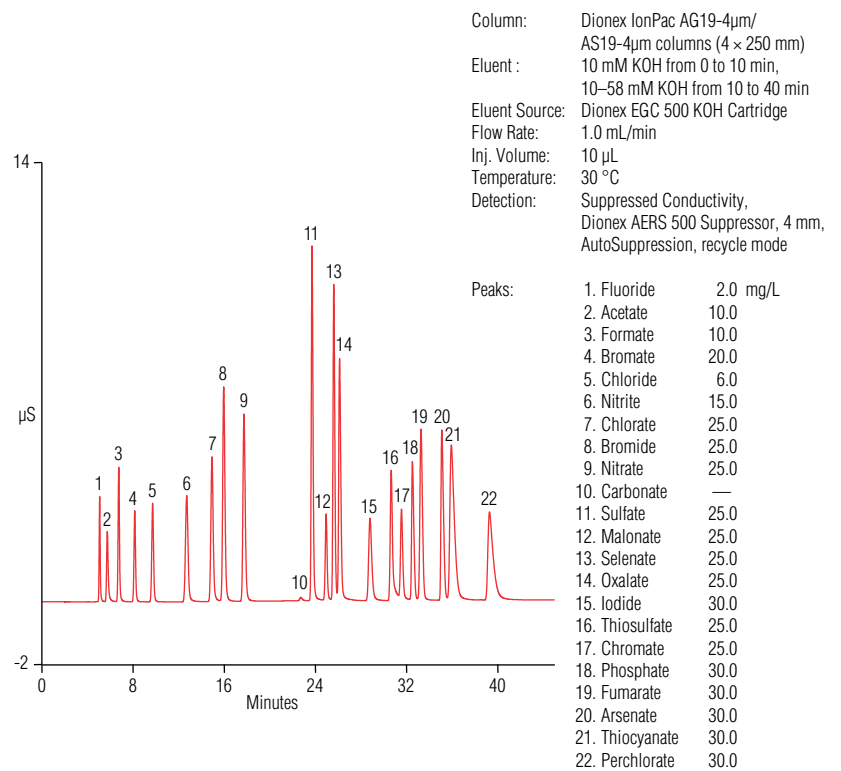


Figure 5. Determination of inorganic anions, oxyhalides, organic acids, and oxyanions using the Dionex IonPac AS19-4 $\mu$ m column using a potassium hydroxide gradient delivered by an eluent generator.

manually prepared sodium hydroxide gradient with the Dionex IonPac AS19-4 $\mu$ m column, the Dionex IonPac ATC-3 Anion Trap Column should be installed between the gradient pump and the injection valve to remove anionic contaminants from the eluent.

### Concentrator Columns

For concentrator work with a 2 mm or 4 mm Dionex IonPac AS19-4 $\mu$ m column, use the Dionex IonPac AG19-4 $\mu$ m Guard Column; Thermo Scientific Dionex IonPac Ultra Trace Anion Concentrator Columns (Dionex IonPac UTAC-UPL1, UTAC-XLP1, UTAC-UPL2, or UTAC-XLP2 ) or Thermo Scientific Dionex IonPac Trace Anion Concentrator Column (Dionex IonPac TAC-UPL1) 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., Thermo Scientific Dionex AS-DV Autosampler). For concentrator work with a 0.4 mm capillary column, use Dionex IonPac AG19-4 $\mu$ m Capillary Guard Column or the Thermo Scientific™ Dionex™ IonSwift™ MAC-100 Concentrator Column.

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**SPECIFICATIONS**


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<b>Dimensions</b>	Dionex IonPac AS19-4 $\mu$ m Analytical Column: 2 $\times$ 250 mm, 4 $\times$ 250 mm Dionex IonPac AS19-4 $\mu$ m Capillary Column: 0.4 $\times$ 250 mm Dionex IonPac AG19-4 $\mu$ m Guard Column: 2 $\times$ 50 mm, 4 $\times$ 50 mm Dionex IonPac AG19-4 $\mu$ m Capillary Guard Column: 0.4 $\times$ 50 mm
<b>Maximum Operating Pressure</b>	5000 psi
<b>Mobile Phase Compatibility</b>	pH 0–14; 0–100% HPLC solvents
<b>Substrate Characteristics</b>	2 $\times$ 250 mm, 4 $\times$ 250 mm, 0.4 $\times$ 250 mm Supermacroporous Resin Particle Diameter: 4 $\mu$ m Pore Size: 2000 Å Crosslinking (%DVB): 55%  2 $\times$ 50 mm, 4 $\times$ 50 mm, 0.4 $\times$ 50 mm Microporous Resin Particle Diameter: 11 $\mu$ m Pore Size: < 1 Å Crosslinking (%DVB): 55%
<b>Ion-Exchange Group</b>	Functional Group: Alkanol quaternary ammonium ion
<b>Functional Group Characteristics</b>	Hydrophobicity: Ultralow
<b>Capacity</b>	2.4 $\mu$ eq (0.4 $\times$ 250 mm column) 0.06 $\mu$ eq (0.4 $\times$ 50 mm column) 60 $\mu$ eq (2 $\times$ 250 mm column) 1.5 $\mu$ eq (2 $\times$ 50 mm column) 240 $\mu$ eq (4 $\times$ 250 mm column) 6 $\mu$ eq (4 $\times$ 50 mm column)
<b>Column Construction</b>	PEEK with 10–32 threaded ferrule-style end fittings. All components are nonmetallic.

## Ordering Information

In the U.S., call (800) 346-6390 or contact the Thermo Fisher Scientific Regional Office nearest you. Outside the U.S., order through your local Thermo Fisher Scientific office or distributor. Refer to the following part numbers.

Analytical, Capillary, and Guard Columns	Part Number
Dionex IonPac AS19-4 $\mu$ m Analytical Column (4 $\times$ 250 mm)	083217
Dionex IonPac AG19-4 $\mu$ m Guard Column (4 $\times$ 50 mm)	083221
Dionex IonPac AS19-4 $\mu$ m Analytical Column (2 $\times$ 250 mm)	083223
Dionex IonPac AG19-4 $\mu$ m Guard Column (2 $\times$ 50 mm)	083225
Dionex IonPac AS19-4 $\mu$ m Capillary Column (0.4 $\times$ 250 mm)	083230
Dionex IonPac AG19-4 $\mu$ m Capillary Guard Column (0.4 $\times$ 50 mm)	083233
Anion Trap Columns	Part Number
Dionex CR-ATC 500 Continuously Regenerated Anion Trap Column (for use with systems equipped with an eluent generator or Dionex RFC-30 Reagent-Free Controller)	075550
Dionex CR-ATC Continuously Regenerated Anion Trap Column (Capillary) (for use with Capillary Anion Columns)	072078
Dionex IonPac ATC-3 Anion Trap Column (9 $\times$ 24 mm) (for use with 4 mm columns)	059660
Dionex IonPac ATC-3 Anion Trap Column (4 $\times$ 35 mm) (for use with 2 mm columns)	079932
Dionex IonPac ATC-HC Anion Trap Column (9 $\times$ 75 mm) (for use with the Thermo Scientific Dionex EG40 Eluent Generator)	059604
Trace Anion Concentrator Columns	Part Number
Dionex IonPac TAC-2 Trace Anion Concentrator Column (3 $\times$ 35 mm)	043101
Dionex IonPac TAC-LP1 Trace Anion Concentrator Column (4 $\times$ 35 mm)	046026
Dionex IonSwift MAC-100 Monolith Anion Concentrator Column (0.5 $\times$ 80 mm) (for use with Capillary IC)	074702
Dionex IonPac TAC-LP1 Trace Anion Concentrator Column (4 $\times$ 35 mm)	046026
Dionex IonPac TAC-ULP1 Trace Anion Concentrator Column (5 $\times$ 23 mm)	061400
Dionex IonPac UTAC-LP1 Ultra Trace Anion Concentrator Low Pressure Column (4 $\times$ 35 mm)	063079
Dionex IonPac UTAC-ULP1 Ultra Trace Anion Concentrator Ultra Low Pressure Column (5 $\times$ 23 mm)	063475
Dionex IonPac UTAC-XLP1 Ultra Trace Anion Concentrator Extremely Low Pressure Column (6 $\times$ 16 mm)	063459
Dionex IonPac UTAC-LP2 Ultra Trace Anion Concentrator Low Pressure Column (4 $\times$ 35 mm)	079917
Dionex IonPac UTAC-ULP2 Ultra Trace Anion Concentrator Ultra Low Pressure Column (5 $\times$ 23 mm)	079918
Dionex IonPac UTAC-XLP2 Ultra Trace Anion Concentrator Extremely Low Pressure Column (6 $\times$ 16 mm)	072781

[www.thermoscientific.com/dionex](http://www.thermoscientific.com/dionex)

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