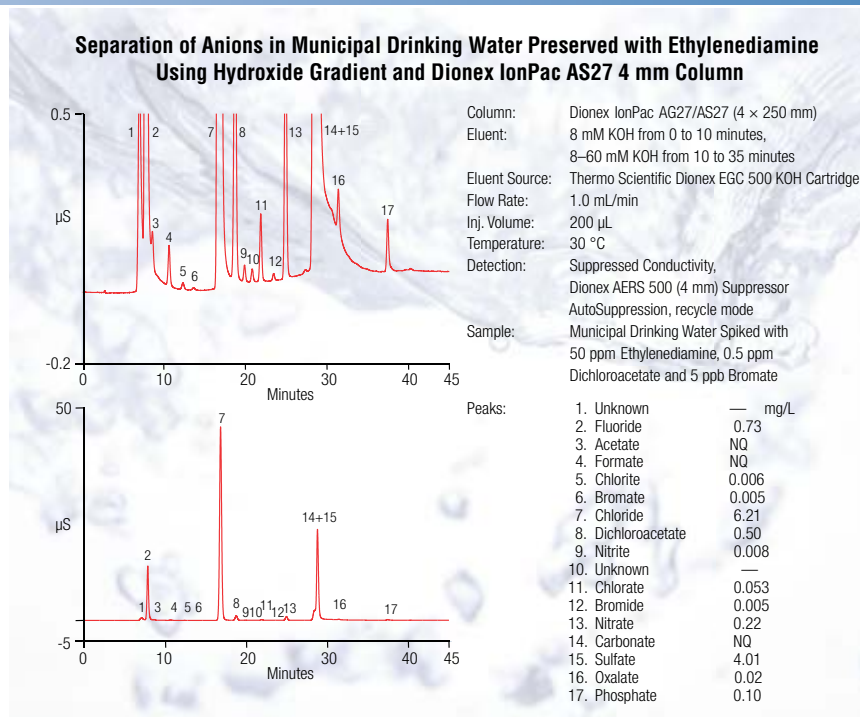


# Thermo Scientific Dionex IonPac AS27 Anion-Exchange Column

The Thermo Scientific™ Dionex™ IonPac™ AS27 high-capacity, hydroxide-selective, anion-exchange column is designed for trace level analysis of bromate in the presence of ppm levels of ethylenediamine (EDA) which is used as a preservative in some drinking water samples and can interfere with early eluting peaks.

The Dionex IonPac AS27 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 AS27 column allows the analysis of most drinking water disinfected with ozone, without the use of sample pretreatment or preconcentration. The selectivity of the Dionex IonPac AS27 column delivers high resolution separation 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. Column diameters available range from 0.4 to 4 mm, allowing use of capillary to analytical flow rates, and supporting advanced 2D-IC applications.



## Superior Chromatographic Performance

- Recommended column for trace bromate in drinking water matrices preserved with EDA using a potassium hydroxide gradient with suppressed conductivity detection.
- Similar selectivity and capacity as the Dionex IonPac AS19 column allows for easy method transfer.
- Column diameters available include 0.4, 2, and 4 mm, supporting capillary to analytical flow rates.
- Capacity of 220 µeq per column (4 × 250 mm).
- Dionex IonPac AS27 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 AS27 column ensures that bromate, a toxic byproduct in ozone disinfection, can be quantified at low- $\mu\text{g/L}$  concentrations using suppressed conductivity detection, even in the presence of 50 ppm ethylenediamine.
- 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 AS27 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.

### Economical Capillary Format

The Dionex IonPac AS27 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 24 environmental anions using the Dionex IonPac AS27 capillary column. Excellent retention time reproducibility can be achieved with the capillary format.

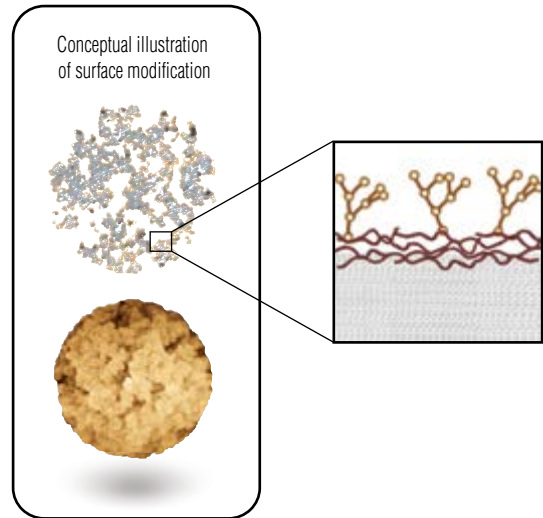


Figure 1. Preparation and anatomy of Dionex IonPac AS27 column resin.

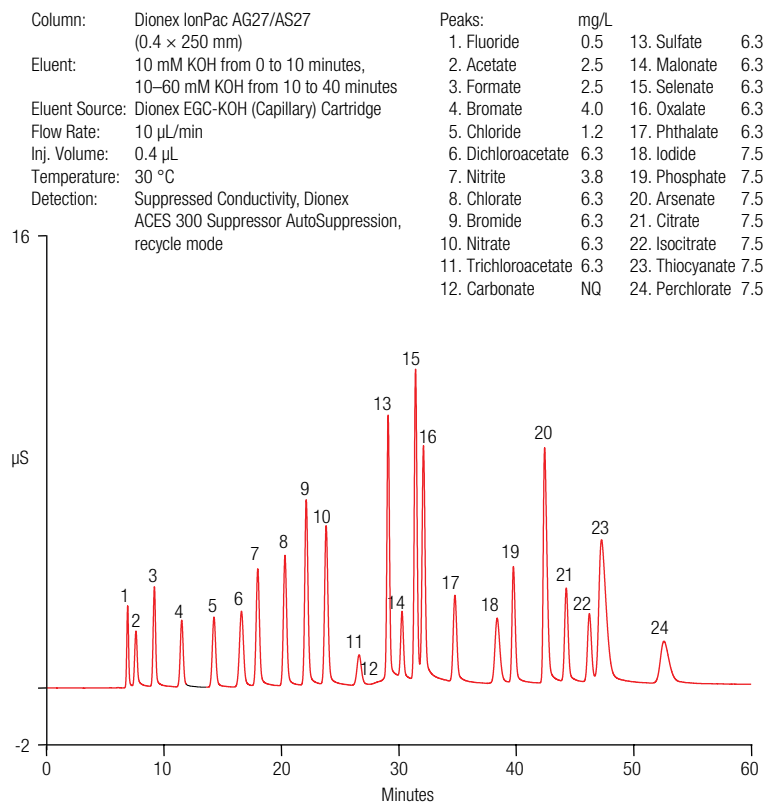


Figure 2. Separation of 24 anions using the Dionex IonPac AS27 capillary column.

## Determination of Trace Bromate in Drinking Water Matrices

The high-capacity Dionex IonPac AS27 column can be used to determine bromate at low- $\mu\text{g/L}$  concentrations in drinking water matrices that have been preserved with 50 ppm ethylenediamine (EDA). 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- $\mu\text{g/L}$  concentrations. Treatment plants that use ozone for disinfection are required to monitor bromate, at an MCL of 10  $\mu\text{g/L}$ , in addition to the common inorganic anions. EDA is sometimes added to the drinking water sample as a preservative and can react with carbonate to produce artifacts that interfere with early eluting peaks, including bromate. The high-resolution, high-capacity Dionex IonPac AS27 column minimizes this interference by increasing the separation between artifacts and bromate and allowing better integration of the bromate peak without 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. The EDA artifacts are present as peak 1, Unknown, in Figure 4.

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

The Dionex IonPac AS27 column is recommended for use with eluent generation and 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.

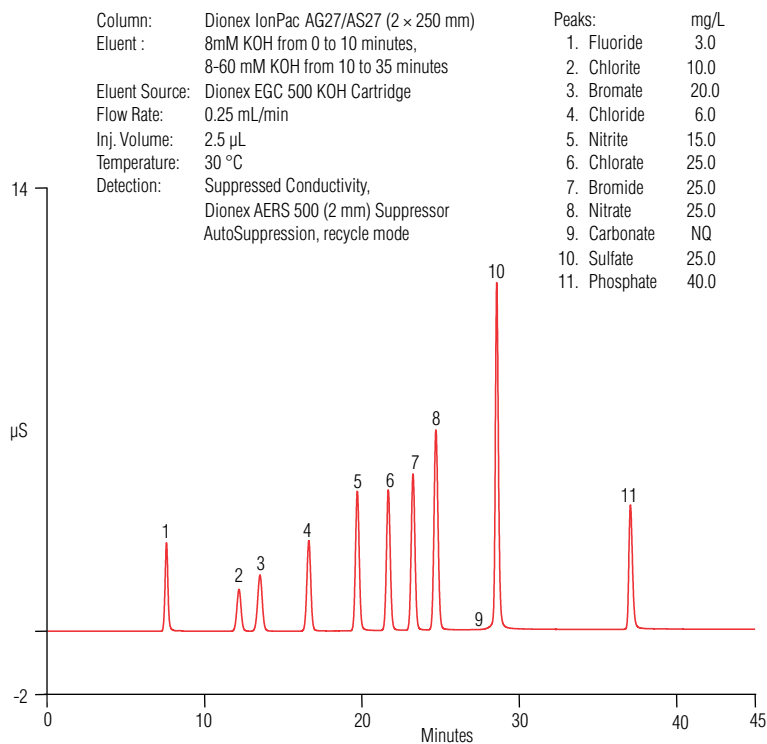


Figure 3. Determination of oxyhalides and common inorganic anions using the Dionex IonPac AS27 column.

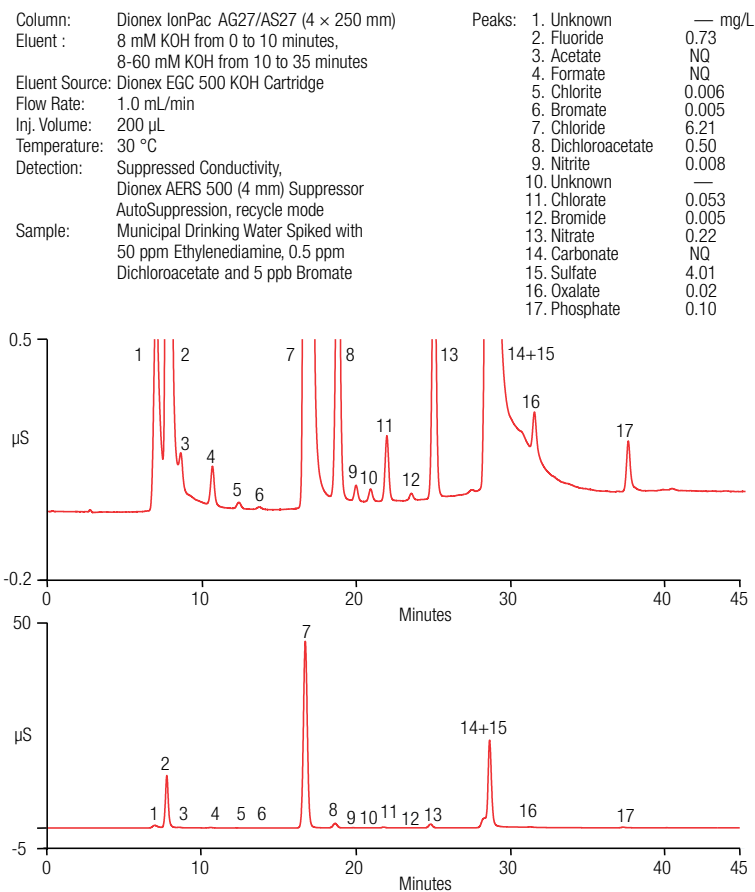


Figure 4. Determination of trace concentration of bromate in municipal drinking water spiked with 50 ppm ethylenediamine using the Dionex IonPac AS27 column with a large-loop injection.

The Dionex IonPac AS27 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. The gradient was optimized (Eluent B) to resolve iodide, a monovalent ion, from phosphate, a trivalent buffer, as large differences in hydrophobicity and valency can have a significant affect on peak resolution. 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 AS27 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 AS27 analytical column is recommended for use with any Dionex IC system equipped with suppressed conductivity detection.

### Suppressor Recommendations

For optimum ease-of-use and performance, the Dionex IonPac AS27 column should be used with Dionex ERS 500 or Dionex ACES 300 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 manually prepared sodium hydroxide eluents with the Dionex IonPac AS27 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.

Column:	Dionex IonPac AG27/AS27 (4 × 250 mm)	Peaks:	mg/L		
Eluent A:	10 mM KOH from 0 to 10 minutes, 10–60 mM KOH from 10 to 40 minutes	1. Fluoride	2.0	13. Sulfate	25.0
Eluent B:	10 mM KOH from 0 to 10 minutes, 10–60 mM KOH from 10 to 42 minutes	2. Acetate	10.0	14. Malonate	25.0
Eluent Source:	Dionex EGC 500 KOH Cartridge	3. Formate	10.0	15. Selenate	25.0
Flow Rate:	1.0 mL/min	4. Bromate	20.0	16. Oxalate	25.0
Inj. Volume:	10 µL	5. Chloride	6.0	17. Phthalate	25.0
Temperature:	30 °C	6. Dichloroacetate	25.0	18. Iodide	30.0
Detection:	Suppressed Conductivity, Dionex AERS 500 (4 mm) Suppressor, AutoSuppression, recycle mode	7. Nitrite	15.0	19. Phosphate	30.0
		8. Chlorate	25.0	20. Arsenate	30.0
		9. Bromide	25.0	21. Citrate	30.0
		10. Nitrate	25.0	22. Isocitrate	30.0
		11. Trichloroacetate	25.0	23. Thiocyanate	30.0
		12. Carbonate	NQ	24. Perchlorate	30.0

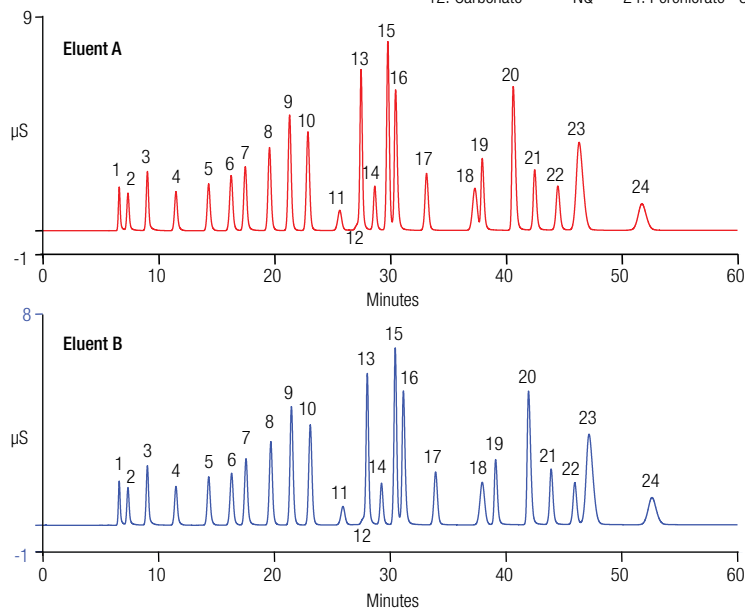


Figure 5. Determination of inorganic anions, oxyhalides, organic acids, and oxyanions using the Dionex IonPac AS27 column using a potassium hydroxide gradient delivered by an eluent generator.

### Concentrator Columns

For concentrator work with a 2 mm or 4 mm Dionex IonPac AS27 column, use the Dionex IonPac AG27 Guard Column; Dionex IonPac Ultra Trace Anion Concentrator Columns (Dionex IonPac UTAC-UPL1, Dionex IonPac UTAC-XLP1, Dionex IonPac UTAC-UPL2, or Dionex IonPac UTAC-XLP2) or 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, Dionex IonPac UTAC-LP2 or Dionex IonPac TAC-LP1 columns 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 AG27 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 AS27 Analytical Column: 2 × 250 mm, 4 × 250 mm Dionex IonPac AS27 Capillary Column: 0.4 × 250 mm Dionex IonPac AG27 Guard Column: 2 × 50 mm, 4 × 50 mm Dionex IonPac AG27 Capillary Guard Column: 0.4 × 50 mm
<b>Maximum Operating Pressure</b>	3000 psi
<b>Mobile Phase Compatibility</b>	pH 0–14; 0–100% HPLC solvents
<b>Substrate Characteristics</b>	2 × 250 mm, 4 × 250 mm, 0.4 × 250 mm Supermacroporous Resin Particle Diameter: 6.5 μm Pore Size: 2000 Å Crosslinking (%DVB): 55%  2 × 50 mm, 4 × 50 mm, 0.4 × 50 mm Microporous Resin Particle Diameter: 10 μm 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>	2.2 μeq (0.4 × 250 mm column) 0.05 μeq (0.4 × 50 mm column) 55 μeq (2 × 250 mm column) 1.25 μeq (2 × 50 mm column) 220 μeq (4 × 250 mm column) 5 μeq (4 × 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 AS27 Analytical Column (4 × 250 mm)	088437
Dionex IonPac AG27 Guard Column (4 × 50 mm)	088438
Dionex IonPac AS27 Analytical Column (2 × 250 mm)	088439
Dionex IonPac AG27 Guard Column (2 × 50 mm)	088440
Dionex IonPac AS27 Capillary Column (0.4 × 250 mm)	088441
Dionex IonPac AG27 Capillary Guard Column (0.4 × 50 mm)	088442
Anion Trap Columns	Part Number
Dionex CR-ATC 500 Continuously Regenerated Anion Trap Column (for use with systems equipped with an eluent generator or Thermo Scientific 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 × 24 mm) (for use with 4 mm columns and manually prepared eluents)	059660
Dionex IonPac ATC-3 Anion Trap Column (4 × 35 mm) (for use with 2 mm columns and manually prepared eluents)	079932
Dionex IonPac ATC-HC Anion Trap Column (9 × 75 mm) (for use with systems equipped with an eluent generator)	059604
Trace Anion Concentrator Columns	Part Number
Dionex IonPac TAC-2 Trace Anion Concentrator Column (3 × 35 mm)	043101
Dionex IonPac TAC-LP1 Trace Anion Concentrator Column (4 × 35 mm)	046026
Dionex IonSwift MAC-100 Monolith Anion Concentrator Column (0.5 × 80 mm) (for use with Capillary IC)	074702
Dionex IonPac TAC-LP1 Trace Anion Concentrator Column (4 × 35 mm)	046026
Dionex IonPac TAC-ULP1 Trace Anion Concentrator Column (5 × 23 mm)	061400
Dionex IonPac UTAC-LP1 Ultra Trace Anion Concentrator Low Pressure Column (4 × 35 mm)	063079
Dionex IonPac UTAC-ULP1 Ultra Trace Anion Concentrator Ultra Low Pressure Column (5 × 23 mm)	063475
Dionex IonPac UTAC-XLP1 Ultra Trace Anion Concentrator Extremely Low Pressure Column (6 × 16 mm)	063459
Dionex IonPac UTAC-LP2 Ultra Trace Anion Concentrator Low Pressure Column (4 × 35 mm)	079917
Dionex IonPac UTAC-ULP2 Ultra Trace Anion Concentrator Ultra Low Pressure Column (5 × 23 mm)	079918
Dionex IonPac UTAC-XLP2 Ultra Trace Anion Concentrator Extremely Low Pressure Column (6 × 16 mm)	072781

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