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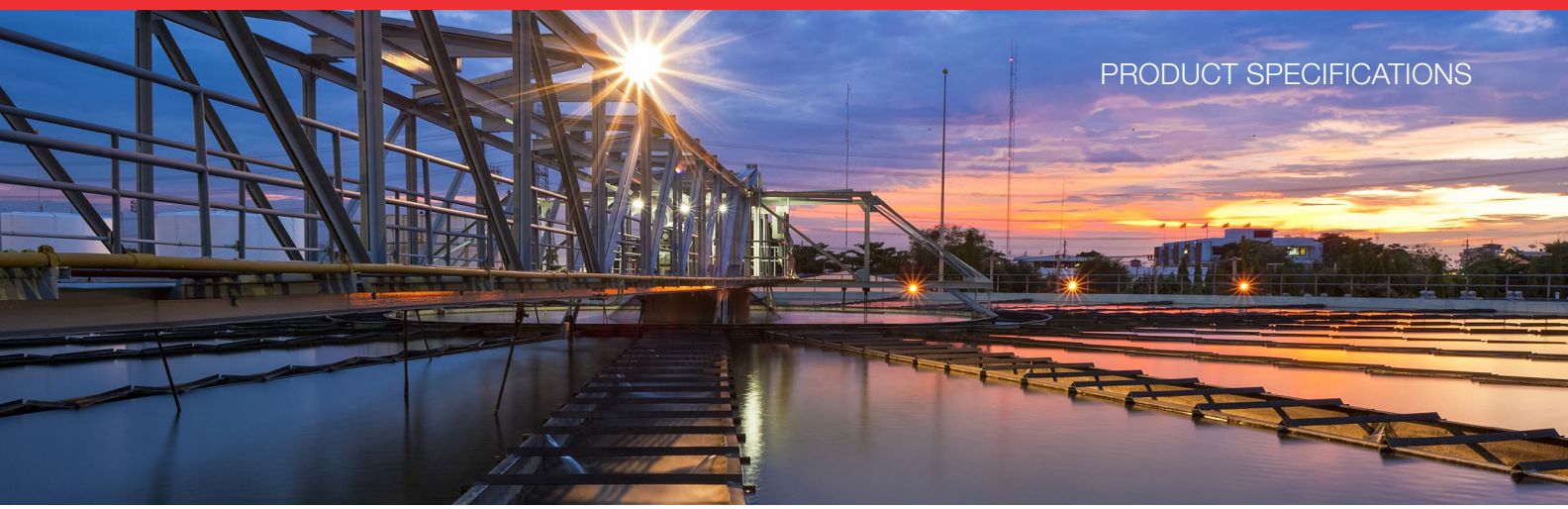

Thermo Scientific™ Dionex™ IonPac™ AS29-Fast-4µm anion-exchange column

Exceptional performance for high ionic strength matrices

Benefits

- Fast isocratic separation of common anions in less than 10 minutes
- Maintains excellent separation of analytes, even in high ionic strength samples
- Robust stationary phase tolerates acidic or basic samples without any sample treatment

Keywords
Anion-exchange chromatography, inorganic anions, carbonate eluent, high ionic strength, acidic, basic, extreme pH, drinking water, wastewater, chlorine dioxide disinfection

The Thermo Scientific™ Dionex™ IonPac™ AS29-Fast-4µm anion-exchange column is designed for fast determination of common inorganic anions in high ionic strength matrices using an isocratic carbonate/bicarbonate eluent and suppressed conductivity detection. The Dionex IonPac AS29-Fast-4µm column can easily separate common inorganic anions in less than 10 minutes and can tolerate samples with high or low pH without requiring any pretreatment. For added convenience and increased reproducibility, the column can be used in high-pressure ion chromatography (HPIC) systems equipped with Thermo Scientific™ Dionex™ Eluent Generators and the Thermo Scientific™ Dionex™ Electrolytic pH Modifier (EPM), which together automatically produce potassium carbonate/bicarbonate eluents from water.

- Analyze samples with high levels of carbonate without affecting the quantification of other analytes.
- Use with Thermo Scientific™ Dionex™ AS29 Eluent Concentrate for fast, simple, and accurate eluent preparation.
- Compatible with 100% organic solvents such as acetonitrile and methanol to enhance analyte solubility and allow effective column cleanup.
- Use for a variety of samples including drinking water, wastewater, process streams, brines, and scrubber solutions.

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High Efficiency Particle Structure

The Dionex IonPac AS29-Fast-4µm column was developed using a unique polymer bonding technology. 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 the same manner as other Thermo Scientific Dionex latex-coated anion-exchange columns. However, in this anion-exchange resin, alternating treatments of epoxy monomer and amines produce a coating which is grown directly off the substrate as illustrated in Figure 1. Resin capacity is controlled through the number of alternating coating cycles. The Dionex IonPac AS29-Fast-4µm column uses a high-capacity resin (126 µeq/4mm column) with optimized selectivity for common inorganic anions in diverse sample matrices. It is composed of a polymeric 4 µm substrate consisting of ethylvinylbenzene cross-linked with 55% divinylbenzene. The robust stationary phase can tolerate extremely acidic or basic samples with minimum loss of performance.

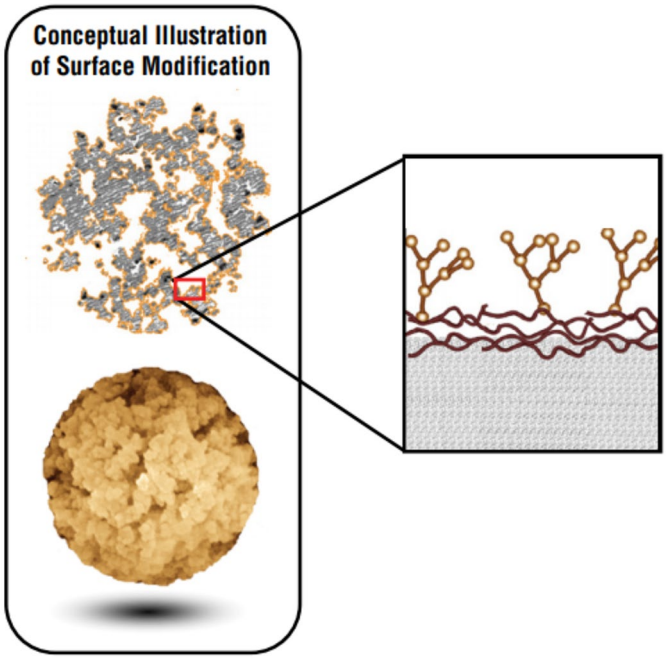

Figure 1. Structure of a Dionex IonPac AS29-Fast-4µm column resin particle

Fast Separation of Common Inorganic Anions

The Dionex IonPac AS29-Fast-4µm column provides excellent separation of fluoride, chloride, nitrite, bromide, nitrate, phosphate, and sulfate using an isocratic carbonate/bicarbonate eluent and suppressed conductivity detection. Common inorganic anions can be resolved in less than 10 minutes, as shown in Figure 2.

Column:	Thermo Scientific™ Dionex™ IonPac™ AG29-Fast-4µm and Dionex IonPac AS29-Fast-4µm (4 mm)
Eluent:	4.5 mM Na_2CO_3 / 2.0 mM $NaHCO_3$
Flow Rate:	1.0 mL/min
Inj. Volume:	10 µL
Temperature:	30 °C
Detection:	Suppressed Conductivity, Thermo Scientific™ Dionex™ AERS 500 Carbonate Anion Electrolytically Regenerated Suppressor (4 mm), AutoSuppression, recycle mode
Suppressor Current:	34 mA

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

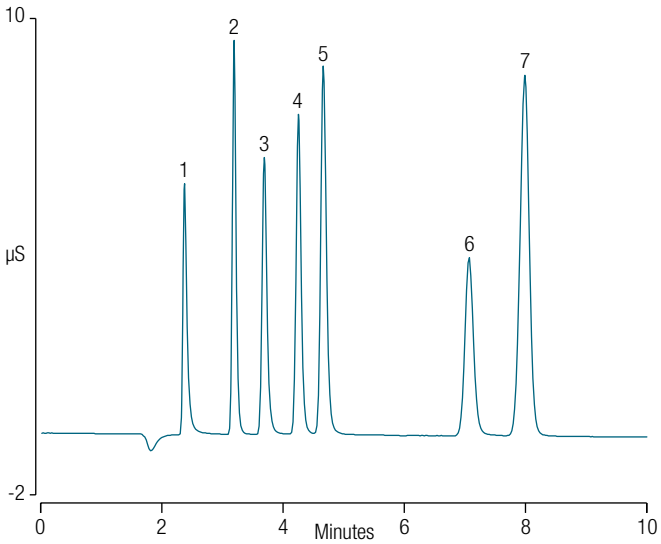

Figure 2. Isocratic separation of common inorganic anions using the Dionex IonPac AS29-Fast-4µm column (4 × 150 mm)

Monitor Inorganic Anions in Drinking Water

The Dionex IonPac AS29-Fast-4µm column meets or exceeds the performance requirements of U.S. EPA Method 300.0 (A) and is ideal for compliance monitoring of drinking water and wastewater. Figure 3 illustrates the separation of common inorganic anions in a simulated municipal drinking water sample spiked with surrogate anions. Note the excellent separation of malonate and succinate from sulfate.

		Peaks:	mg/L
Column:	Dionex IonPac AG29-Fast-4µm and Dionex IonPac AS29-Fast-4µm, 2 mm	1. Fluoride	0.1
Eluent:	4.5 mM Na_2CO_3 / 2.0 mM $NaHCO_3$	2. Chloride	20.0
Flow Rate:	0.25 mL/min	3. Nitrite	0.3
Inj. Volume:	2.5 µL	4. Bromide	0.5
Temperature:	30 °C	5. Nitrate	0.5
Detection:	Suppressed Conductivity, Dionex AERS 500 Carbonate Suppressor (2 mm), AutoSuppression, recycle mode	6. Phosphate	0.8
		7. Sulfate	20.0
		8. Malonate	2.0
Suppressor Current:	8 mA	9. Succinate	2.0

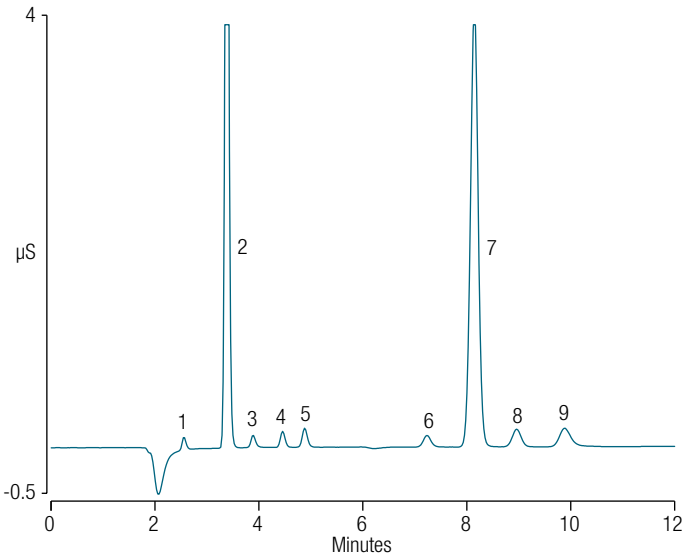

Figure 3. Simulated municipal drinking water spiked with surrogate anions separated on the Dionex IonPac AS29-Fast-4µm column (2 × 150 mm)

Chlorite and chlorate can be present in municipal drinking water as disinfection byproducts from chlorine dioxide treatment, a faster and more effective alternative to conventional chlorine disinfection. Figure 4 shows the separation of common inorganic anions, chlorite, and chlorate in a matrix containing 1000 mg/L chloride and 400 mg/L sulfate on the Dionex IonPac AS29-Fast-4µm column.

Designed for High Ionic Strength Samples

The unique chemistry of the Dionex IonPac AS29-Fast-4µm column has been intelligently designed to handle high ionic strength matrices without compromising the separation of other analytes. Figure 5 illustrates the separation of common inorganic anions in the presence of 400 mg/L chloride and 400 mg/L sulfate. Figure 6 shows the separation in the presence of 400 mg/L phosphate. Note how the column provides excellent separation of the analytes in both examples.

		Peaks:	mg/L
Column:	Dionex IonPac AS29-Fast-4µm, 2 mm	1. Fluoride	5.0
Eluent:	4.5 mM Na_2CO_3 / 2.0 mM $NaHCO_3$	2. Chlorite	10.0
Flow Rate:	0.25 mL/min	3. Chloride	1000.0
Inj. Volume:	2.5 µL	4. Nitrite	15.0
Temperature:	30 °C	5. Chlorate	10.0
Detection:	Suppressed Conductivity, Dionex AERS 500 Carbonate Suppressor (2 mm), AutoSuppression, recycle mode	6. Bromide	25.0
		7. Nitrate	25.0
Suppressor Current:	8 mA	8. Phosphate	40.0
		9. Sulfate	400.0

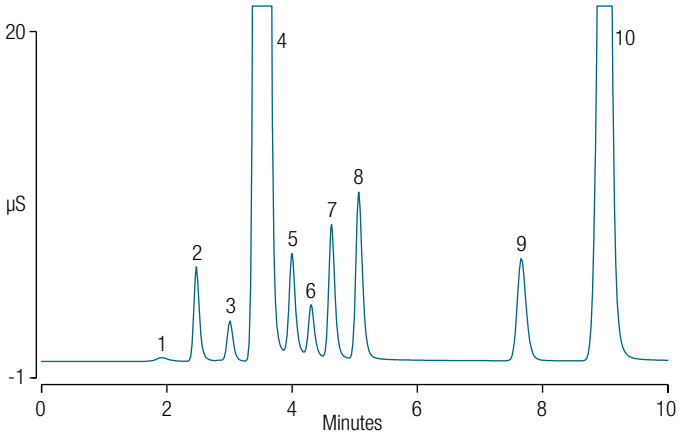

Figure 4. Determination of common inorganic anions, chlorite, and chlorate in a matrix containing high amounts of chloride and sulfate on the Dionex IonPac AS29-Fast-4µm column (2 × 150 mm)

		Peaks (QAR):	mg/L
Column:	Dionex IonPac AG29-Fast-4µm and Dionex IonPac AS29-Fast-4µm, 4 mm	1. Fluoride	5.0
Eluent:	4.5 mM Na_2CO_3 / 2.0 mM $NaHCO_3$	2. Chloride	10.0
Flow Rate:	1.0 mL/min	3. Nitrite	15.0
Inj. Volume:	10 µL	4. Bromide	25.0
Temperature:	30 °C	5. Nitrate	25.0
Detection:	Suppressed Conductivity, Dionex AERS 500 Carbonate Suppressor (4 mm), AutoSuppression, recycle mode	6. Phosphate	40.0
		7. Sulfate	30.0
Suppressor Current:	34 mA		

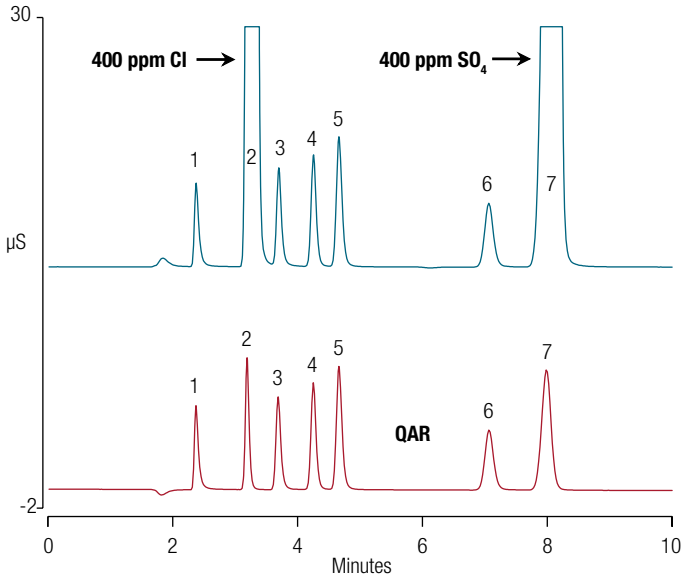

Figure 5. Determination of common inorganic anions in the presence of 400 mg/L chloride and sulfate using the Dionex IonPac AS29-Fast-4µm column (4 × 150 mm)

		Peaks (QAR):	mg/L
Column:	Dionex IonPac AG29-Fast-4µm and Dionex IonPac AS29-Fast-4µm, 4 mm	1. Fluoride	5.0
Eluent:	4.5 mM Na_2CO_3 / 2.0 mM $NaHCO_3$	2. Chloride	10.0
Flow Rate:	1.0 mL/min	3. Nitrite	15.0
Inj. Volume:	10 µL	4. Bromide	25.0
Temperature:	30 °C	5. Nitrate	25.0
Detection:	Suppressed Conductivity, Dionex AERS 500 Carbonate Suppressor (4 mm), AutoSuppression, recycle mode	6. Phosphate	40.0
		7. Sulfate	30.0
Suppressor Current:	34 mA		

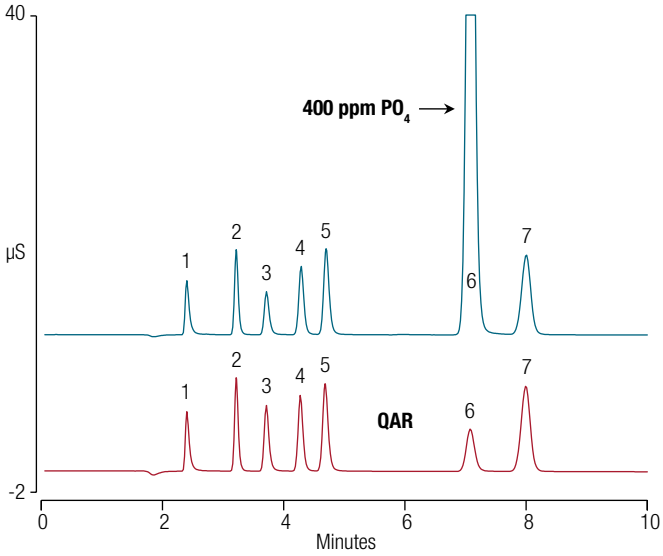

Figure 6. Separation of common inorganic anions in the presence of 400 mg/L phosphate using the Dionex IonPac AS29-Fast-4µm column (4 × 150 mm)

Analyze Acidic or Basic Samples with Ease

The Dionex IonPac AS29-Fast-4µm column features a robust stationary phase designed to tolerate acidic or basic samples without the need for additional sample pretreatment. Figure 7 illustrates the separation of common inorganic anions in two low pH industrial samples in a sulfuric acid matrix. Figure 8 shows the separation of common inorganic anions in a high pH industrial sample from a matrix of sodium hydroxide.

		Peaks (Standard):	mg/L
Column:	Dionex IonPac AG29-Fast-4µm and Dionex IonPac AS29-Fast-4µm, 2 mm	1. Fluoride	5.0
Eluent:	4.5 mM Na_2CO_3 / 2.0 mM $NaHCO_3$	2. Chloride	10.0
Flow Rate:	0.25 mL/min	3. Nitrite	15.0
Inj. Volume:	2.5 µL	4. Bromide	25.0
Temperature:	30 °C	5. Nitrate	25.0
Detection:	Suppressed Conductivity, Dionex AERS 500 Carbonate Suppressor (2 mm), AutoSuppression, recycle mode	6. Phosphate	40.0
		7. Sulfate	30.0
Suppressor Current:	8 mA		

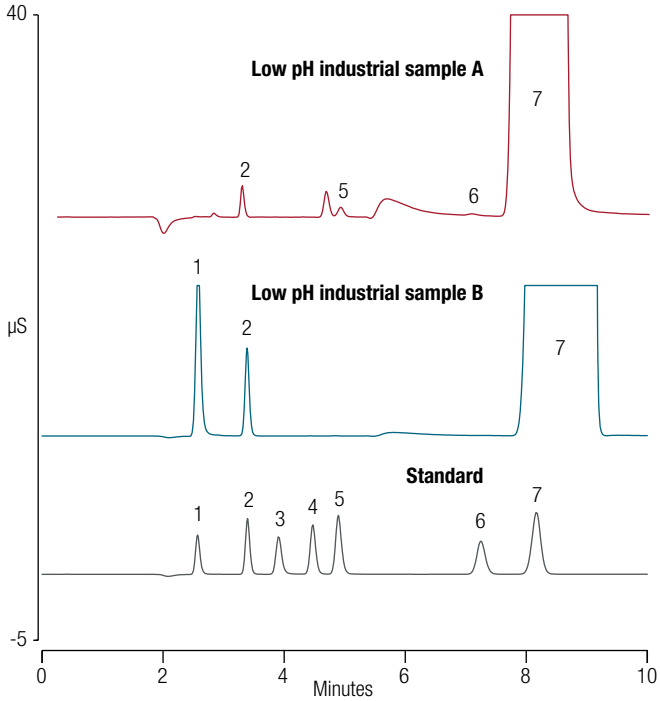

Figure 7. Separation of common inorganic anions in a sulfuric acid matrix using the Dionex IonPac AS29-Fast-4µm column (2 × 150 mm)

Column:	Dionex IonPac AG29-Fast-4µm and Dionex IonPac AS29-Fast-4µm, 2 mm	Peaks (Standard):	mg/L
Eluent:	4.5 mM Na_2CO_3 / 2.0 mM $NaHCO_3$	1. Fluoride	5.0
Flow Rate:	0.25 mL/min	2. Chloride	10.0
Inj. Volume:	2.5 µL	3. Nitrite	15.0
Temperature:	30 °C	4. Bromide	25.0
Detection:	Suppressed Conductivity, Dionex AERS 500 Carbonate Suppressor (2 mm), AutoSuppression, recycle mode	5. Nitrate	25.0
		6. Phosphate	40.0
		7. Sulfate	30.0
Suppressor Current:	8 mA		

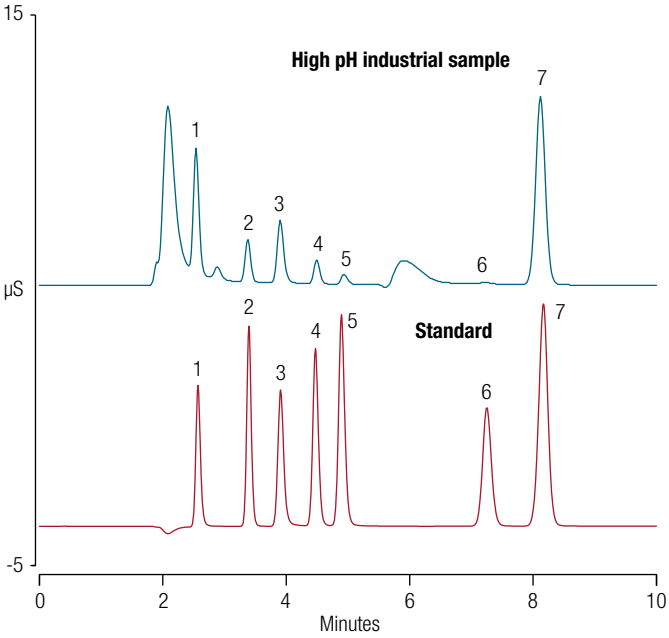

Figure 8. Determination of common inorganic anions in a sodium hydroxide matrix using the Dionex IonPac AS29-Fast-4µm column (2 × 150 mm)

Fast, Simple, and Accurate Eluent Preparation

Dionex AS29 Eluent Concentrate (Figure 9) has been formulated for use with Dionex IonPac AS29-Fast-4µm columns and arrives ready to use. Just dilute with deionized water and begin operation. Each 250 mL bottle of 100× concentrate is made with only high purity reagent-grade chemicals and water, and contains verified concentrations of 0.45 M carbonate and 0.20 M bicarbonate.

Figure 9. Save time and reduce eluent preparation errors with ready-to-dilute Dionex AS29 Eluent Concentrate.

System Requirements

The Dionex IonPac AS29-Fast-4µm column is recommended for use with the Thermo Scientific™ Dionex™ ICS-6000 HPIC™, Thermo Scientific™ Dionex™ ICS-5000⁺ HPIC™, or Thermo Scientific™ Dionex™ Integrion™ HPIC™ systems equipped with an eluent generator and electrolytic pH modifier (EPM). These HPIC systems can operate continuously at up to 5000 psi to support the backpressure generated by the Dionex IonPac AS29-Fast-4µm column under standard operating conditions. The eluent generator and EPM automatically produce potassium carbonate/bicarbonate eluent from deionized water. For all systems, the use of Thermo Scientific™ Dionex™ IC PEEK Viper™ fittings (Figure 10) is recommended to achieve consistent low dead volume connections and ensure optimum chromatographic performance.

Figure 10. For best chromatographic performance, Dionex IC PEEK Viper fittings are recommended for use with Dionex IonPac AS29-Fast-4µm columns.

Suppressor Recommendations

For optimum ease of use and performance, Dionex IonPac AS29-Fast-4µm analytical columns should be used with a Thermo Scientific™ Dionex™ AERS 500 Carbonate Anion Electrolytically Regenerated Suppressor for Carbonate Eluents (Figure 11). Compared to the standard Thermo Scientific™ Dionex™ AERS 500 Anion Electrolyically Regenerated suppressors, Dionex AERS 500 Carbonate suppressors may reduce baseline noise by up to 80% in systems that use carbonate/bicarbonate eluents. Additionally, use of a Thermo Scientific™ Dionex™ CRD 300 Carbonate Removal Device may provide lower limits of detection, wider calibration linearity ranges, and further reduction in baseline noise.

Figure 11. The Dionex AERS 500 Carbonate Anion Electrolytically Regenerated Suppressor offers improved baseline noise performance for carbonate eluents and is recommended for use with Dionex IonPac AS29-Fast-4µm columns.

Specifications	
Dionex IonPac AS29-Fast-4µm, Analytical Column Dimensions	2 × 150 mm 4 × 150 mm
Dionex IonPac AG29-Fast-4µm, Guard Column Dimensions	2 × 30 mm 4 × 30 mm
Maximum Operating Pressure	5000 psi
Mobile Phase Compatibility	pH 0–14, 100% HPLC solvents (e.g., acetonitrile, methanol, and 2-propanol)
Substrate Characteristics	
Analytical Columns	Supermacroporous resin Particle Diameter: 4 µm Pore Size: 2000 Å Crosslinking (%DVB): 55%
Guard Columns	Microporous resin Particle Diameter: 10 µm Pore Size: < 10 Å Crosslinking (%DVB): 55%
Functional Group	Alkanol quaternary ammonium
Hydrophobicity	Ultralow
Capacity	126 µeq (4 × 150 mm column) 4.0 µeq (4 × 30 mm column) 31.5 µeq (2 × 150 mm column) 1.0 µeq (2 × 30 mm column)
Column Construction	PEEK with 10-32 threaded ferrule-style end fittings. All components are nonmetallic.

Ordering Information

To order in the U.S., visit thermofisher.com, call (800) 532-4752, or contact the nearest Thermo Fisher Scientific office. Outside the U.S., order through your local Thermo Fisher Scientific office or distributor. Refer to the part numbers in the following table.

Analytical and Guard Columns	
Dionex IonPac AS29-Fast-4µm Analytical Column (4 × 150 mm)	302833
Dionex IonPac AG29-Fast-4µm Guard Column (4 × 30 mm)	302834
Dionex IonPac AS29-Fast-4µm Analytical Column (2 × 150 mm)	302835
Dionex IonPac AG29-Fast-4µm Guard Column (2 × 30 mm)	302836
Eluent Concentrate	
Dionex AS29 Eluent Concentrate (100×), 250 mL	302952
Anion Standards	
Thermo Scientific™ Dionex™ Seven Anion Retention Time Standard, 50 mL (2 ppm F, 24 ppm Cl, 16 ppm NO_2, 36 ppm Br, 36 ppm NO_3, 26 ppm PO_4, 40 ppm SO_4)	088957
Thermo Scientific™ Dionex™ Seven Anion Retention Time Standard Concentrate, 50 mL (100 ppm F, 1200 ppm Cl, 800 ppm NO_2, 1800 ppm Br, 1800 ppm NO_3, 1300 ppm PO_4, 2000 ppm SO_4)	302511
Thermo Scientific™ Dionex™ Combined Seven Anion Standard I, 50 mL (20 ppm F, 30 ppm Cl, 100 ppm NO_2, 100 ppm Br, 100 ppm NO_3, 150 ppm PO_4, 150 ppm SO_4)	056933
Thermo Scientific™ Dionex™ Combined Seven Anion Standard II, 100 mL (20 ppm F, 100 ppm Cl, 100 ppm NO_2, 100 ppm Br, 100 ppm NO_3, 200 ppm PO_4, 200 ppm SO_4)	057590
Thermo Scientific™ Dionex™ Combined Five Anion Standard, 100 mL (20 ppm F, 30 ppm Cl, 100 ppm NO_3, 150 ppm PO_4, 150 ppm SO_4)	037157
Eluent Generator Accessories	
Thermo Scientific™ Dionex™ EGC 500 K_2CO_3 Eluent Generator Cartridge	088453
Thermo Scientific™ Dionex™ EPM 500 Electrolytic pH Modifier (required to generate bicarbonate eluents)	088471
Thermo Scientific™ Dionex™ EGC 500 Carbonate Mixer (2 mm)	088467
Thermo Scientific™ Dionex™ EGC 500 Carbonate Mixer (4 mm)	088468
Dionex IC PEEK Viper Fittings Kits	
Dionex IC PEEK Viper Fittings Kit for Dionex Integrion HPIC systems with conductivity detectors	088798
Dionex IC PEEK Viper Fittings Kit for Dionex ICS-6000 HPIC and Dionex ICS-5000⁺ HPIC systems with conductivity detectors	088803
Suppressors	
Dionex AERS 500 Carbonate (2 mm) Anion Electrolytically Regenerated Suppressor for Carbonate Eluents	085028
Dionex AERS 500 Carbonate (4 mm) Anion Electrolytically Regenerated Suppressor for Carbonate Eluents	085029
Carbonate Removal Devices	
Dionex CRD 300 (2 mm) Carbonate Removal Device	064638
Dionex CRD 300 (4 mm) Carbonate Removal Device	064637

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