Thermo Scientific Concentrator and Trap Columns

Thermo Scientific™ Dionex™ IonPac™ and Thermo Scientific™ Dionex™ IonSwift™ concentrator columns for anion, cation, and chelation ion chromatography are used to concentrate analytes, allowing determinations at µg/L (ppb) and sub-µg/L levels.

Dionex IonPac trap columns for anion and cation determinations prevent eluent contaminants from causing interfering peaks during gradient ion chromatography (IC).

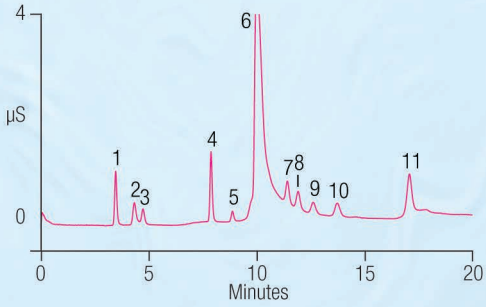
Concentrator Columns

Dionex IonPac Concentrator Columns are designed primarily for high-purity water analysis. The columns retain ions from a measured volume of aqueous sample matrix, thereby concentrating the analyte species and lowering detection limits. The advantage of using concentrator columns is the ability to perform routine analysis for ions at µg/L (ppb) to ng/L (ppt) levels.

Sample Preconcentration Using a 2 mm Dionex IonPac AS15 Column

Column:	Dionex IonPac AG15, AS15, 2 mm
Concentrator Column:	Dionex IonPac AC15 (2 × 50 mm)
Eluent:	Potassium hydroxide, 10 mM from 0 to 4 min, 10 mM to 40 mM from 4 min to 14 min, 40 mM to 60 mM from 14 to 18 min
Eluent Source:	Dionex EGC III KOH
Temperature:	30 °C
Flow Rate:	0.5 mL/min
Inj. Volume:	20 mL, preconcentrated
Detection:	Suppressed conductivity, Dionex ASRS ULTRA 2 mm, AutoSuppression recycle mode

Peaks:		
1.	Fluoride	0.1 µg/L (ppb)
2.	Acetate	0.1
3.	Formate	0.1
4.	Chloride	0.1
5.	Nitrite	0.1
6.	Carbonate	–
7.	Sulfate	0.1
8.	Oxalate	0.1
9.	Bromide	0.1
10.	Nitrate	0.1
11.	Phosphate	0.1



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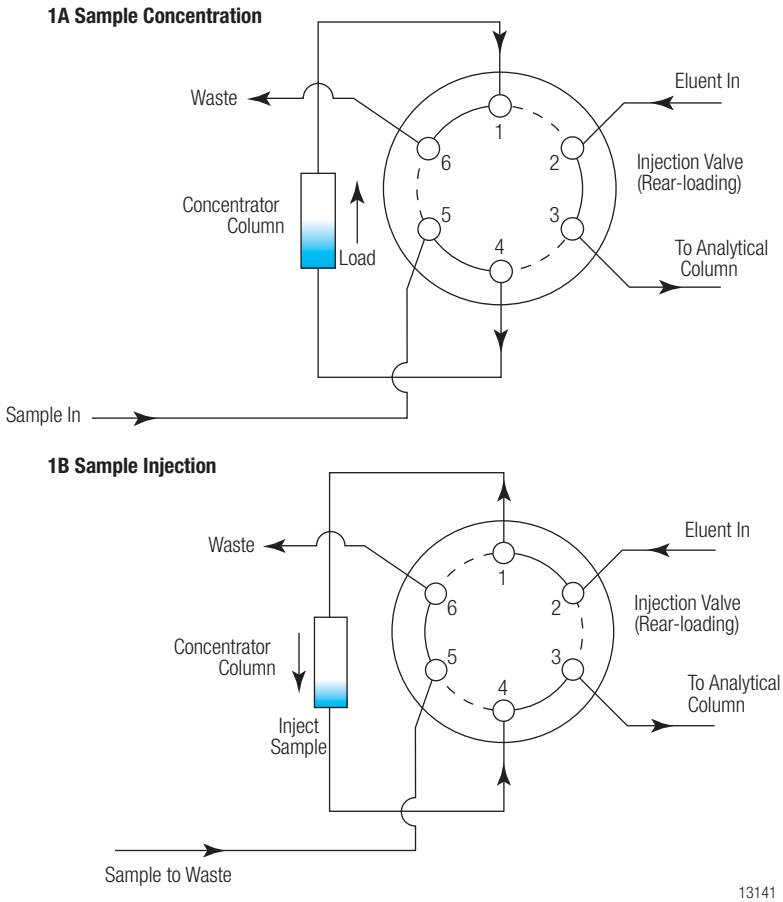


Figure 1. Process for ion chromatography trace enrichment: (A) sample concentration step and (B) sample injection step.

Figure 1 illustrates a typical IC trace-enrichment system configuration using a concentrator column. The sample is pumped across the concentrator column, as shown in Figure 1A. After the analytes from the sample are concentrated, the valve is switched. The concentrated analytes are then swept by the eluent from the concentrator column onto the analytical column, as shown in Figure 1B.

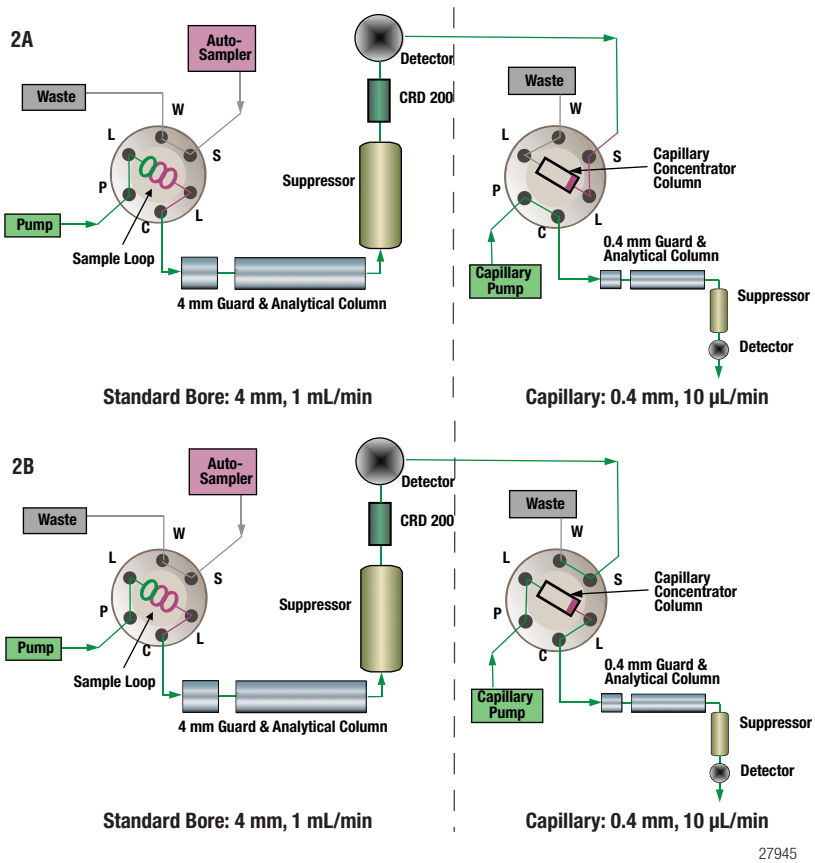


Figure 2. Configuration of a 2D-IC System using a capillary concentrator column.

Figure 2 illustrates the configuration of a 2D-IC System using a capillary concentrator column. The concentrator column is placed between the first and second dimension of the 2D System set-up; a cut volume then is focused on the capillary concentration column, then eluted onto a second dimension column.

Figures 3–12 illustrate the use of this system configuration for trace-level anion determinations. This concentrator system can also be used for the determination of trace cations and transition metals, as shown in Figures 13 and 14.

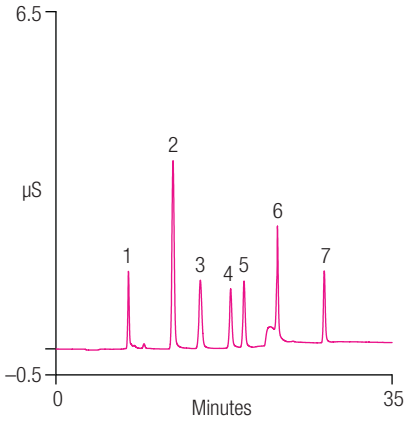
Ordering Information

Monolith Anion Concentrator (Dionex IonSwift MAC-1000
(0.5 × 80 mm)…….....P/N 074702

The Dionex IonSwift MAC-100 Monolith Anion Concentrator Column is designed primarily for high-purity water analysis. The Dionex IonSwift MAC-100 is a general purpose, ultra-low pressure anion concentrator designed for use with Dionex IonPac anion capillary columns and Dionex IonSwift anion columns. The Dionex IonSwift MAC-100 strips ions from a measured volume of aqueous sample, concentrating the analyte species and thereby lowering detection limits. This concentrator column is available in a 0.5 × 80 mm format for ultra-low pressure applications using a pressurized bottle, syringes, Thermo Scientific™ Dionex™ AS-AP Autosampler and a single piston sample delivery pump (Thermo Scientific™ Dionex™ AXP Auxiliary Pump) for sample loading. The Dionex IonSwift MAC-100 has a capacity of 0.17 µeq/column and a void volume of approximately 10 µL.

Monolith Anion Concentrator (Dionex IonSwift MAC-200)
(0.75 × 80 mm)…….....P/N 075461

The Dionex IonSwift MAC-200 Monolith Anion Concentrator Column is designed primarily for 2D-IC capillary applications including trace bromate or perchlorate in drinking water matrices. This concentrator column can also be used to preconcentrate trace anions in high purity water matrices. The Dionex IonSwift MAC-200 is available in a 0.75 × 80 mm format designed specifically for concentrating trace anions such as bromate or perchlorate. It is placed between the first and second dimension of the 2D-IC System set-up and a cut volume is focused on the concentrator, then eluted onto a second dimension column such as a Dionex IonPac AS19 or AS20 capillary column. The Dionex IonSwift MAC-200 has a capacity of 0.24 µeq/column and a void volume of approximately 23 µL.



Column:	Dionex IonPac AS19 capillary column (0.4 × 250 mm)
Conc. Column:	Dionex IonSwift MAC-100 Concentrator (0.5 mm × 80 mm)
Eluent Source:	Dionex EGC-KOH (Capillary) Cartridge
Eluent:	10 mM KOH (0 to 10 min), 10 to 50 mM KOH (10 to 25 min), 50 mM KOH (25 to 30 min), 10 mM (30 to 35 min)
Flow Rate:	10 µL/min
Temperature:	30 °C
Detection:	Suppressed conductivity, Thermo Scientific™ Dionex™ ACES™ 300
Inj. Volume:	200 µL

Peaks:		Concentration (µg/L)
	1. Fluoride	1.0
	2. Chloride	5.0
	3. Nitrite	5.0
	4. Bromide	5.0
	5. Nitrate	5.0
	6. Sulfate	10.0
	7. Phosphate	5.0

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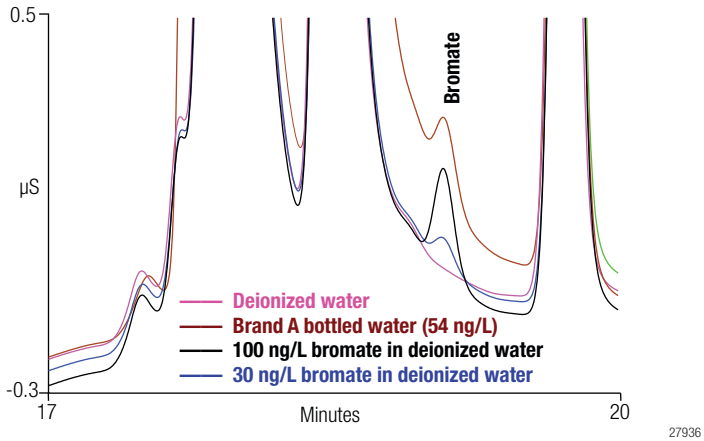
Figure 3. Separation of inorganic anions at trace concentrations using a Dionex IonPac AS19 capillary column with 200 µL injection.

A. First-Dimension Conditions

Column:	Dionex IonPac AG19, AS19, 4 mm
Flow Rate:	1.0 mL/min
Eluent Source:	Dionex EGC III KOH Cartridge
Eluent:	10 mM KOH (0 to 12 min), 65 mM KOH (12 to 35 min), and 10 mM KOH (35 to 40 min)
Detection:	Suppressed conductivity, Dionex ASRS 300 4 mm
Inj. Volume:	1000 µL
Temperature:	30 °C

B. Second-Dimension Conditions

Column:	Dionex IonPac AS20 (0.4 mm × 250 mm)
Flow Rate:	10 µL/min
Eluent Source:	Dionex EGC-KOH (Capillary) Cartridge
Eluent:	8 mM KOH (0 to 12 min), 8 to 65 mM KOH (12 to 35 min), and 8 mM KOH (35 to 40 min)
Detection:	Suppressed conductivity, Dionex ACES 300 anion capillary electrolytic suppressor
Temperature:	30 °C
Concentrator Column:	Dionex IonSwift MAC-200 capillary concentrator, (0.75 × 80 mm) 2500 µL of 1st dimension suppressed effluent (7.5 to 10 min)



27936

Figure 4. Determination of trace concentrations of bromate using the Dionex IonPac AS20 column with 2D-IC.

Anion Concentrators

Anion Microconcentrator (Dionex IonPac AMC-1)

(2 × 15 mm).....P/N 051760

The Dionex IonPac AMC-1 is a low void volume microconcentrator column designed for the concentration of inorganic and low-molecular-weight organic anions from ultrapure water. The novel solvent compatible resin technology ensures a low sulfate background during the concentration step. The Dionex IonPac AMC-1 can be loaded with either a loop or sample loading pump. The low column void volume (approximately 15 µL) allows improved determination of early-eluting anions such as fluoride, glycolate, acetate, and formate. This low void volume is ideal for 2 mm concentration methods, reduces the "system dip", and improves anion determinations for trace anion determinations in the power generation and semiconductor industries. The Dionex IonPac AMC-1 has a capacity of 3.0 µeq/column and can be used in 2 mm or 4 mm i.d. anion-exchange systems with carbonate/bicarbonate or borate eluents.

Trace Anion Concentrator (Dionex IonPac TAC-LP1)

(4 × 35 mm).....P/N 046026

The Dionex IonPac TAC-LP1 Low-Pressure Trace Anion Concentrator Column is designed primarily for high-purity water analysis. The Dionex IonPac TAC-LP1 strips ions from a measured volume of aqueous sample matrix, concentrating the analyte species and thereby lowering detection limits. The Dionex IonPac TAC-LP1 is a general purpose, low-pressure concentrator for use with syringe or autosampler loading (Dionex AS-DV Autosampler). It can be used in anion-exchange systems using hydroxide, carbonate/bicarbonate, or borate eluent systems. This concentrator column has a capacity of 25.0 µeq/column and a void volume of approximately 145 µL.

Ultra-Low-Pressure Trace Anion Concentrator (Dionex IonPac TAC-ULP1)

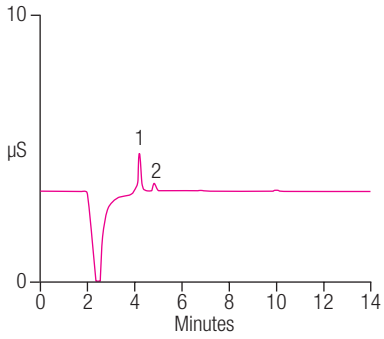
(5 × 23 mm).....P/N 061400

The Dionex IonPac TAC-ULP1 Ultra-Low-Pressure Trace Anion Concentrator Column is designed primarily for high-purity water analysis. The Dionex IonPac TAC-ULP1 strips ions from a measured volume of aqueous sample matrix, concentrating the analyte species and thereby lowering detection limits. The Dionex IonPac TAC-ULP1 is a general purpose, ultra-low-pressure concentrator for use with syringe or autosampler loading (Dionex AS-DV and AS Autosamplers). The Dionex IonPac TAC-ULP1 (5 × 23 mm) can be used with single-piston sample delivery pumps, including the Dionex AXP Auxiliary Pump. It can be used with carbonate/bicarbonate, borate, or hydroxide eluents. This concentrator column has a capacity of 25.0 µeq/column and a void volume of approximately 145 µL.

Ultra Trace Anion Concentrator Low Pressure (Dionex IonPac UTAC-LP1)

(4 × 35 mm).....P/N 063079

The Dionex IonPac UTAC-LP1 (4 × 35 mm) Ultra Trace Anion Concentrator Column is designed primarily for high purity water analysis. The Dionex IonPac UTAC-LP1 is an ultraclean (low sulfate) concentrator column. The Dionex IonPac UTAC-LP1 strips ions from a measured volume of aqueous sample matrix, concentrating the analyte species thereby lowering detection limits. The Dionex IonPac UTAC-LP1 is a general purpose, low-pressure anion concentrator column for use with syringe or autosampler loading (Dionex AS-DV Autosampler). The Dionex IonPac UTAC-LP1 can be used with carbonate/bicarbonate, borate, or hydroxide eluents. The This concentrator column has a capacity of 25.0 µeq/column and a void volume of approximately 145 µL.

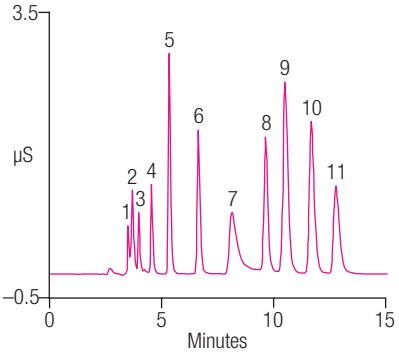


Column: Concentrator	Dionex IonPac AG14, AS14, 4 mm
Column:	Dionex IonPac TAC-LP1 (4 × 35 mm)
Eluent:	3.5 mM Sodium carbonate/ 1.0 mM Sodium bicarbonate
Flow Rate:	1.5 mL/min
Inj. Volume:	5 mL
Detection:	Suppressed conductivity
Peaks:	1. Chloride 9.7 µg/L (ppb)
	2. Unidentified -

ISO calibration data unavailable

13934

Figure 5. Determination of trace-level chloride using a Dionex IonPac TAC-LP1 concentrator column.



Column:	Dionex IonPac AG18, AS18, 4 mm
Conc. Column:	Dionex IonPac TAC-ULP1 (5 × 23 mm)
Eluent:	23 mM Potassium hydroxide
Source:	Dionex EGC-KOH (Capillary) Cartridge
Temperature:	30 °C
Flow Rate:	1.0 mL/min
Inj. Volume:	1 mL
Detection:	Suppressed conductivity, Dionex ASRS ULTRA, 4 mm, AutoSuppression recycle mode

Peaks:		
1.	Fluoride	0.01 µg/L (ppm)
2.	Acetate	0.05
3.	Formate	0.02
4.	Chlorite	0.10
5.	Chloride	0.06
6.	Nitrite	0.10
7.	Carbonate	0.40
8.	Bromide	0.20
9.	Sulfate	0.20
10.	Nitrate	0.20
11.	Chlorate	0.20

19324

Figure 6. Determination of trace anions using a Dionex IonPac TAC-ULP1 concentrator column.

Ultra Trace Anion Concentrator Low Pressure 2 (Dionex IonPac UTAC-LP2)
(4 × 35 mm).....P/N 079917

The Dionex IonPac UTAC-LP2 (4 × 35 mm) Ultra Trace Anion Concentrator Column is designed primarily for high-purity water analysis. The Dionex IonPac UTAC-LP2 is a general purpose, low-pressure anion concentrator column with similar features to the Dionex IonPac UTAC-LP1, but backpressure resilience has been improved to eliminate the need for a pulse damper on the loading pump, and matrix resilience has been improved to allow direct injection of samples containing polyacrylic acid additives used in the power industry. This concentrator column is available in a 4 × 35 mm format for low-pressure applications including loading pump, syringe or Dionex AS-DV Autosampler loading. The Dionex IonPac UTAC-LP2 has a capacity of 25.0 µeq/column and a void volume of approximately 145 µL.

Ultra Trace Anion Concentrator-Ultra Low Pressure (Dionex IonPac UTAC-ULP1)
(5 × 23 mm).....P/N 063475

The Dionex IonPac UTAC-ULP1 (5 × 23 mm) Ultra Trace Anion Concentrator Column is designed primarily for high purity water analysis. The Dionex IonPac UTAC-ULP1 is an ultra clean (low sulfate) concentrator column. The Dionex IonPac UTAC-ULP1 strips ions from a measured volume of aqueous sample matrix, concentrating the analyte species thereby lowering detection limits. This concentrator column is a general purpose, ultra low-pressure concentrator for use with syringe or autosampler loading (Dionex AS-DV and AS Autosamplers). The Dionex IonPac UTAC-ULP1 can be used with single piston sample delivery pumps including the Dionex AXP Auxiliary Pump. It can also be used with carbonate/bicarbonate, borate, or hydroxide eluents. The Dionex IonPac UTAC-ULP1 has a capacity of 25.0 µeq/column and a void volume of approximately 145 µL.

Ultra Trace Anion Concentrator Ultra-Low-Pressure 2 (Dionex IonPac UTAC-LP2)
(5 × 23 mm).....P/N 079918

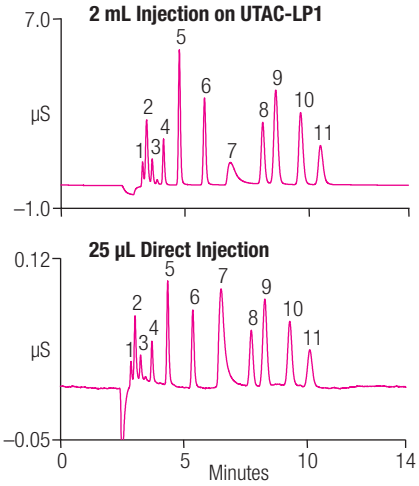
The Dionex IonPac UTAC-ULP2 (5 × 23 mm) Ultra Trace Anion Concentrator Column is designed primarily for high-purity water analysis. The Dionex IonPac UTAC-ULP2 is a general purpose, ultra-low pressure anion concentrator column with similar features to the Dionex IonPac UTAC-ULP1, but backpressure resilience has been improved to eliminate the need for a pulse damper on the loading pump, and matrix resilience has been improved to allow direct injection of samples containing polyacrylic acid additives. This concentrator column is available in a 5 × 23 mm formnat for ultra-low pressure applications including loading pump, syringe, and a Dionex AS-DV or AS Autosampler loading. The Dionex IonPac UTAC-ULP2 has a capacity of 25.0 µeq/column and a void volume of approximately 145 µL.

Ultra Trace Anion Concentrator, Extremely Low-Pressure (Dionex IonPac UTAC-XLP1)
(6 × 16 mm).....P/N 063459

The Dionex IonPac UTAC-XLP1 (6 × 16 mm) Ultra Trace Anion Concentrator Column is designed primarily for high purity water analysis. The Dionex IonPac UTAC-XLP1 is an ultraclean (low sulfate) concentrator column. The Dionex IonPac UTAC-XLP1 strips ions from a measured volume of aqueous sample matrix, concentrating the analyte species thereby lowering detection limits. This concentrator column is a general purpose, extremely low-pressure concentrator for use with syringe or autosampler loading (Dionex AS-DV and AS Autosamplers). The Dionex IonPac UTAC-XLP1 can be used with single piston sample delivery pumps including the Dionex AXP Auxiliary Pump. It can be used with carbonate/bicarbonate, borate, or hydroxide eluents. The Dionex IonPac UTAC-XLP1 has a capacity of 25.0 µeq/column and a void volume of approximately 145µL.

Ultra Trace Anion Concentrator, Extremely Low-Pressure 2 (Dionex IonPac UTAC-LP2)
(6 × 16 mm).....P/N 072781

The Dionex IonPac UTAC-XLP2 (6 × 16 mm) Ultra Trace Anion Concentrator Column is designed primarily for high purity water analysis. It is a general purpose, extremely low-pressure anion concentrator column with similar features to the Dionex IonPac UTAC-XLP1, but backpressure resilience has been improved to eliminate the need for a pulse damper on the loading pump, and matrix resilience has been improved to allow direct injection of samples containing polyacrylic acid additives used in the power industry. This concentrator column is available in a 6 × 16 mm format for extremely low-pressure applications including Dionex AS-DV and AS Autosampler loading. The Dionex IonPac UTAC-ULP2 has a capacity of 25.0 µeq/column and a void volume of approximately 145 µL.

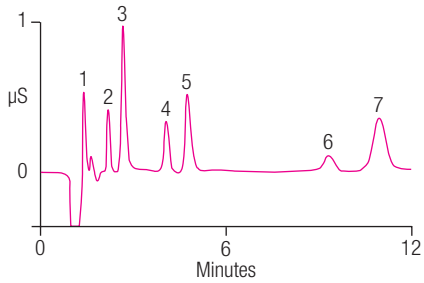


Column:	Dionex IonPac AG18, AS18, 4 mm
Conc. Column:	Dionex IonPac UTAC-LP1 (4 × 35 mm)
Eluent:	23 mM Potassium hydroxide
Eluent Source:	Dionex EGC II KOH (Capillary) Cartridge with Thermo Scientific™ Dionex™ CR-ATC Column
Flow Rate:	1.0 mL/min
Inj. Volume:	See chromatogram
Temperature:	30 °C
Detection:	Suppressed conductivity, Dionex ASRS ULTRA II 4 mm, AutoSuppression recycle mode

Peaks:		
1.	Fluoride	0.05 mg/L (ppm)
2.	Acetate	0.25
3.	Formate	0.01
4.	Chlorite	0.05
5.	Chloride	0.03
6.	Nitrite	0.05
7.	Carbonate	0.20
8.	Bromide	0.10
9.	Sulfate	0.10
10.	Nitrate	0.10
11.	Chlorate	0.10

21572

Figure 7. Comparison of direct injection and preconcentration using the Dionex IonPac UTAC-LP1 concentrator column for the determination of trace anions.



Column: Dionex IonPac AG4A, AS4A, 4 mm
Conc. Column: Dionex IonPac TAC-2 (3 × 35 mm)
Eluent: 1.75 mM Sodium bicarbonate/ 2.5 mM Sodium carbonate
Flow Rate: 1.0 mL/min
Inj. Volume: 80 mL, preconcentrated
Detection: Suppressed conductivity, Dionex ASRS ULTRA 4 mm, AutoSuppression external water mode

Peaks:		
1. Fluoride	0.1	µg/L (ppb)
2. Chloride	0.1	
3. Nitrite	0.5	
4. Bromide	0.5	
5. Nitrate	0.5	
6. Phosphate	0.5	
7. Sulfate	0.5	

10826

Figure 8. Trace-level anion determination using a Dionex IonPac TAC-2 concentrator column.

Column: Dionex IonPac AG15, AS15, 2 mm
Concentrator Column: Dionex IonPac AC15 (2 × 50 mm)
Eluent: Potassium hydroxide, 10 mM from 0 to 4 min, 10 mM to 40 mM from 4 min to 14 min, 40 mM to 60 mM from 14 to 18 min
Eluent Source: Dionex EGC III KOH
Temperature: 30 °C
Flow Rate: 0.5 mL/min
Inj. Volume: 20 mL, preconcentrated
Detection: Suppressed conductivity, Dionex ASRS ULTRA 2 mm, AutoSuppression recycle mode

Peaks:		
1. Fluoride	0.1	µg/L (ppb)
2. Acetate	0.1	
3. Formate	0.1	
4. Chloride	0.1	
5. Nitrite	0.1	
6. Carbonate	–	
7. Sulfate	0.1	
8. Oxalate	0.1	
9. Bromide	0.1	
10. Nitrate	0.1	
11. Phosphate	0.1	

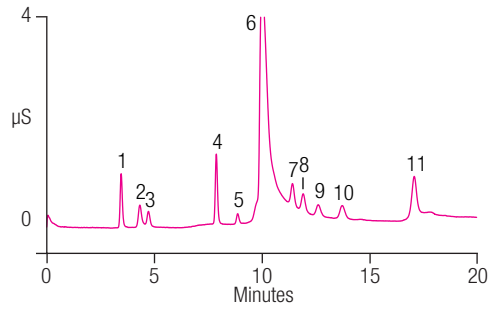


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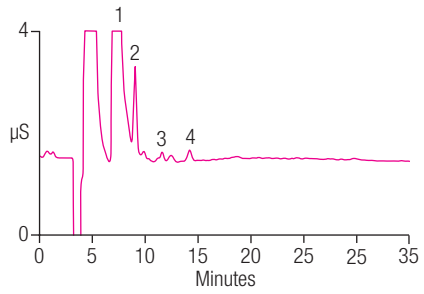
Figure 9. Determination of inorganic anions and low molecular weight organic acids with sample preconcentration using a 2 mm Dionex IonPac AC15 column.



Column: Dionex IonPac AS10, 4 mm
Eluent: 100 mM Sodium hydroxide
Flow Rate: 1.0 mL/min
Sample: 5 mL concentrated on Dionex IonPac AC10 column, rinsed with DI water at 2.0 mL/min for 10 min
Detection: Suppressed conductivity, Dionex ASRS ULTRA 4 mm, AutoSuppression external water mode

Peaks:		
1. Carbonate	–	µg/L (ppb)
2. Chloride	3.0	
3. Sulfate	< 0.5	
4. Unknown	–	

10854

Figure 10. Determination of anions in semiconductor-grade isopropyl alcohol using a Dionex IonPac AC10 concentrator column.

Trace Anion Concentrator (Dionex IonPac TAC-2)
(3 × 35 mm) .....P/N 043101
(pkg. of 4).....P/N 043102

The Dionex IonPac TAC-2 Trace Anion Concentrator Column is a pellicular anion-exchange concentrator column with a capacity of 3.4 µeq/column and a moderately low void volume (approximately 50 µL). This concentrator column can be used in anion-exchange systems using carbonate/bicarbonate or borate eluent systems. Note that the Dionex IonPac TAC-2 should not be used with solvents.

Dionex IonPac AC10 Anion Concentrator
(4 × 35 mm).....P/N 043133

For use with Dionex IonPac AS10 4 mm Hydroxide-Selective Anion-Exchange Columns. The Dionex IonPac AC10 Anion Concentrator Column has a void volume of approximately 207 µL and a capacity of approximately 4 µeq/column.

Dionex IonPac AC10 Anion Concentrator
(2 × 35 mm).....P/N 043134

For use with Dionex IonPac AS10 2 mm Hydroxide-Selective Anion-Exchange Columns; the capacity is approximately 0.8 µeq/column. The void volume is approximately 52 µL.

Dionex IonPac AC15 Anion Concentrator
(4 × 50 mm).....P/N 079970

For use with Dionex IonPac AS15 4 mm Hydroxide-Selective Anion-Exchange Columns; the capacity is approximately 9 µeq/column. The void volume is approximately 210 µL.

Dionex IonPac AC15 Anion Concentrator
(2 × 50 mm).....P/N 055695

For use with Dionex IonPac AS15 2 mm and 3 mm Hydroxide-Selective Anion-Exchange Columns; the capacity is approximately 2.2 µeq/column. The void volume is approximately 53 µL.

Anion Concentrator for Eluent Regeneration (Dionex IonPac AC-ER)

(4 × 16 mm).....P/N 072778

The Dionex IonPac AC-ER (4 × 16 mm) Anion Concentrator Column is a general purpose, low dead volume, extremely low-pressure anion concentrator column with similar features to the Dionex IonPac UTAC 2 Ultra Trace Anion Concentrators, but with reduced dead volume and capacity. The Dionex IonPac AC-ER is available in a 4 × 16 mm format for very low-dead volume to maximize the number of injections that can be made on an RFIC™ system with eluent regeneration (ER) between eluent exchanges. It has a capacity of 12.0 µeq/column and a void volume of approximately 70 µL.

With a Dionex IonPac AC-ER Anion Concentrator Column installed in an RFIC-ER system, each injection only adds 75 µL of sample matrix into the eluent regardless of the sample volume (70 µL + 5 µL for connecting tubing). Therefore, approximately 266 injections can be performed before the eluent needs to be replaced, regardless of the actual amount of sample loaded onto the concentrator. By using a matrix elimination step with the Dionex IonPac AC-ER in place, solvents can be directly injected onto the Dionex IonPac AC-ER then flushed off before injection into the RFIC-ER system. The new Dionex IonPac AC-ER concentrator brings a host of new applications within range of RFIC-ER systems, including analysis of bromate to 5 ppb in drinking water, and analysis of common anions in ethanol.

Cation Concentrators

Monolith Cation Concentrator (Dionex IonSwift MCC-100)

(0.5 × 80 mm)…….....P/N 075462

The Dionex IonSwift MCC-100 Monolith Cation Concentrator Column is designed primarily for high-purity water analysis. This concentrator column is a general purpose, ultra-low-pressure cation concentrator designed for use with Dionex IonPac cation capillary columns. The Dionex IonSwift MCC-100 strips ions from a measured volume of aqueous sample, concentrating the analyte species and thereby lowering detection limits. It is available in a 0.5 × 80 mm format for ultra-low-pressure applications using a pressurized bottle, syringes, Dionex AS Autosampler and a single piston sample delivery pump (Dionex AXP Auxiliary Pump) for sample loading. The Dionex IonSwift MCC-100 has a capacity of 0.72 µeq/column and a void volume of approximately 10 µL.

Monolith Cation Concentrator (Dionex IonSwift MCC-200)

(0.75 × 80 mm)…….....P/N 075463

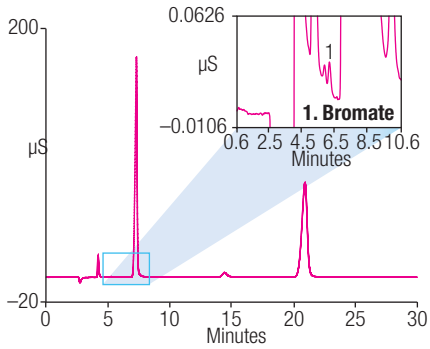
The Dionex IonSwift MAC-200 Monolith Cation Concentrator Column is designed primarily for 2D-IC capillary applications including trace ammonium and amines in high salt matrices. This concentrator column can also be used to preconcentrate trace cations in high purity water matrices. The Dionex IonSwift Dionex IonSwift MCC-200 is available in a 0.75 × 80 mm format designed specifically for concentrating trace cations such as ammonium or amines. The Dionex IonSwift MCC-200 is placed between the first and second dimension of the 2D-IC System set-up and a cut volume is focused on it, then eluted onto a second dimension column such as the Dionex IonPac CS16 or CS17 capillary column. It has a capacity of 1.57 µeq/column and a void volume of approximately 23 µL.

Low-Pressure Trace Cation Concentrator (Dionex IonPac TCC-LP1)

(4 × 35 mm).....P/N 046027

The Dionex IonPac TCC-LP1 (4 × 35 mm) Low-Pressure Trace Cation Concentrator Column is designed primarily for high purity water analysis. The Dionex IonPac TCC-LP1 strips ions from a measured volume of aqueous sample matrix, concentrating the analyte species thereby lowering detection limits.

This concentrator column is a general purpose, low-pressure concentrator for use with syringe or autosampler loading (Dionex AS-DV Autosampler). It is designed for use with carboxylated cation-exchange systems such as the Dionex IonPac CS12, CS12A, CS14, CS15, CS16, CS17 or CS18 with monovalent eluents (sulfuric acid, methanesulfonic acid, or hydrochloric acid). The Dionex IonPac TCC-LPI has a capacity of 260 µeq/column and a void volume of approximately 145 µL.

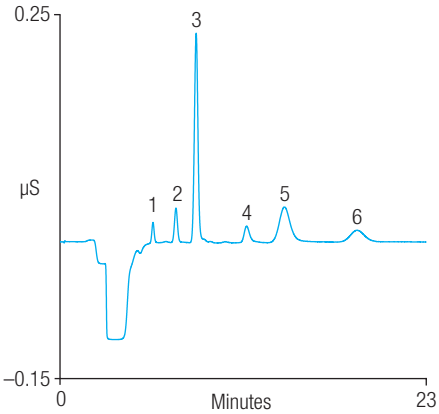


Column:	Dionex IonPac AG23, AS23, 4 mm
Conc. Column:	Dionex IonPac AC-ER (4 × 16 mm)
Eluent:	4.5 mM Sodium carbonate/ 0.8 mM Sodium bicarbonate
Flow Rate:	1 mL/min
Inj. Volume:	500 µL, preconcentrated
Detection:	Suppressed conductivity, Dionex ASRS 300, 4 mm, AutoSuppression recycle mode
Peaks:	1. Bromate

26696

Figure 11. Determination of bromate in a municipal water sample using a Thermo Scientific™ Dionex™ Reagent-Free™ IC System with eluent regeneration and a Dionex IonPac AC-ER concentrator column.

Column:	Dionex IonPac CS16 (0.5 mm × 250 mm)
Eluent Source:	Dionex EGC-MSA (Capillary) Cartridge
Eluent:	30 mM MSA



Flow Rate:	10 µL/min		
Temperature:	40 °C		
Suppressor:	Thermo Scientific™ Dionex™ CCES™ 300 Cation Capillary Electrolytic Suppressor		
Detection:	Suppressed conductivity		
Concentrator:	Dionex IonSwift MCC-100 Concentrator (0.5 mm × 80 mm)		
Inj. Volume:	100 µL		
Sample	Deionized water spiked with six cations		
Peaks:	1. Lithium	0.017	µg/L
	2. Sodium	0.067	
	3. Ammonium	0.083	
	4. Potassium	0.17	
	5. Magnesium	0.067	
	6. Calcium	0.17	

28022

Figure 12. Separation of inorganic cations at trace concentrations using a Dionex IonPac CS16 capillary column and Dionex IonSwift MCC-100 concentrator column with 100 µL injection.

Ultralow Pressure Trace Cation Concentrator (Dionex IonPac TCC-ULP1)

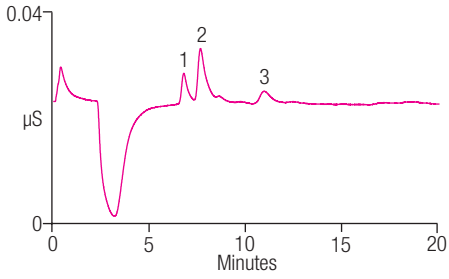
(5 × 23 mm).....P/N 063783

The Dionex IonPac TCC-ULP1 (5 × 23 mm) Ultralow Pressure Trace Cation Concentrator Column is designed primarily for high purity water analysis. The Dionex IonPac TCC-ULP1 strips ions from a measured volume of aqueous sample matrix, concentrating the analyte species thereby lowering detection limits. This concentrator column is a general purpose, ultra-low-pressure concentrator for use with syringe or autosampler loading (Dionex AS-DV or AS Autosamplers). The Dionex IonPac TCC-ULP1 can also be used with single-piston sample delivery pumps including the Dionex AXP Auxiliary Pump. It is recommended for use with carboxylated columns such as the Dionex IonPac CS12, CS12A, CS14, CS15, CS16, CS17 and CS18 columns. The Dionex IonPac TCC-ULP1 can be used with sulfuric acid, methanesulfonic acid, and hydrochloric acid eluents. It has a capacity of 260 µeq/column and a void volume of approximately 145 µL.

Extremely Low-Pressure Trace Cation Concentrator (Dionex IonPac TCC-XLP1)

(6 × 16 mm).....P/N 063889

The Dionex IonPac TCC-XLP1 (6 × 16 mm) Extremely Low-Pressure Trace Cation Concentrator Column is designed primarily for high purity water analysis. The Dionex IonPac TCC-XLP1 strips ions from a measured volume of aqueous sample matrix, concentrating the analyte species thereby lowering detection limits. This concentrator column is a general purpose, extremely low-pressure concentrator for use with syringe or autosampler loading (Dionex AS-DV or AS Autosamplers). The Dionex IonPac TCC-XLP1 can also be used with single-piston sample delivery pumps including the Dionex AXP Auxiliary Pump. It is recommended for use with carboxylated columns such as the Dionex IonPac CS12, CS12A, CS14, CS15, CS16, CS17 and CS18 columns. The Dionex IonPac TCC-XLP1 can be used with sulfuric acid, methanesulfonic acid, and hydrochloric acid eluents. It has a capacity of 260 µeq/column and a void volume of approximately 145 µL.



Column: Dionex IonPac CS12A, 2 mm
Eluent: 20 mN Sulfuric acid
Flow Rate: 0.25 mL/min
Inj. Volume: 40 mL, preconcentrated
Detection: Suppressed conductivity, Thermo Scientific™ Dionex™ CSRS™ ULTRA 2 mm, AutoSuppression external water mode

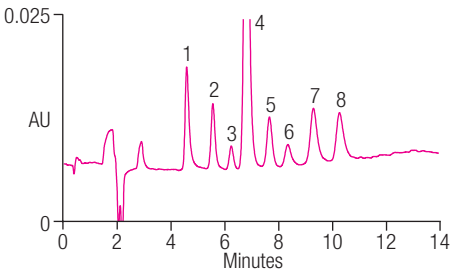
Peaks:		
1. Sodium	<10	ng/L (ppt)
2. Ammonium	<10	
3. Trimethylamine	–	

ISO calibration data unavailable.

13863

Figure 13. Determination of trace cations using sample preconcentration.

Column: Dionex IonPac CG5A, CS5A, 2 mm
Concentrator Column: Dionex IonPac TCC-2
Eluent: Dionex MetPac PDCA Eluent Concentrate
Flow Rate: 0.3 mL/min



Postcolumn Reagent: Dionex MetPac PAR Postcolumn Reagent Diluent
PCR Flow Rate: 0.15 mL/min
Detection: 530 nm, 10 mm cell
Column Temp: 30 °C
Inj. Volume: 4.0 mL, preconcentrated

Peaks:		
1. Iron	500	ng/L(ppt)
2. Copper	250	
3. Nickel	500	
4. Zinc	>500	
5. Cobalt	250	
6. Cadmium	1250	
7. Manganese	750	
8. Iron	500	

Note: Zn contamination present

13774

Figure 14. Determination of trace transition metals using sample preconcentration.

Trace Cation Concentrator (Dionex IonPac TCC-2)

(3 × 35 mm).....P/N 043103
(pkg. of 4).....P/N 043104

The Dionex IonPac TCC-2 Trace Cation Concentrator Column is a surface-sulfonated cation-exchange concentrator column with a capacity of approximately 10 µeq/column and a low void volume of approximately 50 µL. It is ideal for use with sulfonated cation-exchange columns such as the Dionex IonPac CS3, CS10, and CS11. The Dionex IonPac TCC-2 can also be used as concentrator column for transition metals.

Chelation Ion Chromatography Concentrators

Thermo Scientific™ Dionex™ MetPac™ CC-1 Chelating Column

(4 × 50 mm) (pkg. of 2).....P/N 042156

A chelating column is ideal for concentration of cationic transition metals from high ionic strength matrices. The capacity is 0.4 meq/column.

Trace Metal Concentrator (Dionex IonPac TMC-1)

(3 × 25 mm).....P/N 049000

A high-capacity cation concentration column used for coupling the Dionex MetPac CC-1 to the Dionex IonPac CS5 or CS5A analytical columns when performing chelation IC. The capacity is 0.3 meq/column.

Trap Columns

Dionex IonPac Trap Columns contain high-capacity, low-efficiency, ion-exchange resin. The column strips trace contaminants from the eluent, preventing concentration on the guard and analytical columns. The trap column is installed in the eluent line prior to the injection valve to prevent spurious peaks during gradient chromatography.

Metal-Free Trap Columns

(Dionex IonPac MFC-1)
(3 × 27 mm).....P/N 037017
(Dionex IonPac MFC 500)
(3 x 27 mm) ..... P/N 079017

The Dionex IonPac MFC-1 is packed with a special chelating resin and is used in the eluent line prior to the injection valve to remove transition metals from high-pH eluents. The Dionex IonPac MFC 500 is identical to the Dionex IonPac MFC-1 but is packed in a column body that is compatible with non-stop operation up to 5,000 psi. The capacity is 170 µeq/column.

Continuously Regenerated Trap Columns (Dionex CR-TC 500)

Thermo Scientific™ Dionex™ CR-TC 500 trap columns are high-pressure, electrolytically regenerated devices that remove ionic contaminants from the eluent without the need for off-line chemical regeneration. The product is available in two versions, the Thermo Scientific™ Dionex™ CR-ATC 500 Continuously Regenerated Anion Trap Column for anion applications and Dionex CR-CTC 500 for cation applications. The Dionex CR-TC 500 is compatible with all Dionex Eluent Generators including the Thermo Scientific™ Dionex™ RFC-30 Reagent Free Controller, Thermo Scientific™ Dionex™ ICS-2100 and Thermo Scientific™ Dionex™ ICS-5000 + EG. Dionex EGC III KOH cartridge customers must first order the Dionex CR-TC Add-on Kit (P/N 060476). A single format is used with 2, 3, 4, and 5 mm i.d. separator column applications, while a second format is available for capillary column applications.

Dionex CR-ATC 500 Continuously-Regenerated Anion Trap Column .....P/N 075550
Dionex CR-ATC Continuously-Regenerated Anion Trap Column (Capillary).....P/N 072078

When plumbed after the EGC cartridge, the Dionex CR-ATC 500 removes all anionic contaminants, for example carbonate, from the deionized feed water and provides low drift during gradient operations.

The Dionex CR-ATC 500 is identical to the Dionex CR-ATC but packed in a column body that is compatible with non-stop operation up to 5,000 psi.

Dionex CR-CTC 500 Continuously Regenerated Cation Trap Column .....P/N 075551
Dionex CR-CTC (Capillary) .....P/N 072079

When plumbed after the EGC cartridge, the Thermo Scientific™ Dionex™ CR-CTC 500 removes cationic contaminants, for example ammonium and sodium, from deionized feed water and provides low drift during gradient operations. The Dionex CR-CTC 500 is identical to the Dionex CR-CTC II, but contains a small layer of sulfonated resin to aid in monovalent removal, and is packed in a column body that is compatible with non-stop operation up to 5,000 psi.

Anion Trap Columns (Dionex IonPac ATC)

The Dionex IonPac Anion Trap Columns are high-capacity, low-efficiency, anion-exchange columns used to remove trace anion contamination from eluents.

Dionex ATC-3
(9 × 24 mm).....P/N 059660
For use with 4 mm anion-exchange columns.

Dionex ATC-3
(4 × 35 mm).....P/N 079932
For use with 2 mm and 3 mm anion-exchange columns.

Dionex ATC 500
(9 x 24 mm) ... .P/N 075976
Identical to the Dionex ATC-3 but packed in a column body that is compatible with non-stop operation up to 5000 psi.

Dionex ATC 500
(4 × 35 mm) ..... P/N 079018
Identical to the Dionex ATC-3 but packed in a column body that is compatible with non-stop operation up to 5,000 psi.

Dionex ATC-HC
(9 × 75 mm).....P/N 059604
For use with the Dionex EGC-KOH (Capillary), EGC-NaOH, EGC III LiOH or EGC-K2CO3 cartridges in the Dionex EGC III KOH or EG50 Eluent Generator.

Dionex ATC-HC 500
(9 × 75 mm) ..... P/N 075978
Identical to the Dionex ATC-HC but packed in a column body that is compatible with non-stop operation up to 5,000 psi.

Dionex ATC-HC Borate Form
(9 × 75 mm).....P/N 064755
For use with the EG generated borate eluents or with manually prepared borate eluents.

Dionex ATC-HC 500 Borate Form
(9 × 75 mm) ..... P/N 075979
Identical to the Dionex ATC-HC Borate Form but packed in a column body that is compatible with non-stop operation up to 5,000 psi.

Cation Trap Columns (CTC)

The Dionex IonPac CTC is a high-capacity cation-exchange column packed with sulfonated resin. The Dionex IonPac CTC is used to remove trace cation contamination from the eluent.

Dionex IonPac CTC-1
(9 × 24 mm).....P/N 040192
For use with 4 mm and 5 mm cation-exchange columns.

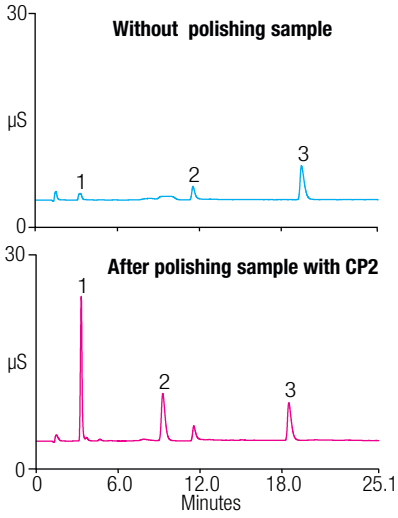
Dionex IonPac CTC 500
(9 × 24 mm) .....P/N 075977
Identical to the Dionex IonPac CTC-1 but packed in a column body that is compatible with non-stop operation up to 5,000 psi.

Dionex IonPac CTC (2 mm)
(4 × 35 mm).....P/N 043132
For use with 2 mm and 3 mm cation-exchange columns.

Dionex IonPac CTC 500
(4 × 35 mm) ..... P/N 079019
Identical to the Dionex IonPac CTC (2 mm) but packed in a column body that is compatible with non-stop operation up to 5,000 psi.

Cation Polisher Columns

Dionex IonPac Cation Polisher CP1 and CP2 columns are designed for removal of metallic contaminants and other cations such as calcium and magnesium from the sample stream while performing anion analysis. The columns improve the performance of IC systems, particularly with phosphate analysis in the presence of metallic contaminants. Samples that contain high levels of metals or cations can be deposited on the guard/analytical columns or the suppressor, which can lead to performance issues such as



Column: Dionex IonPac AG4A, AS4A, 4 mm
Flow Rate: 1.5 mL/min
Eluent: EG Gradient with 100 mM Boric acid

Time (min)	Concentration (KOH, mM)
0	5.0
10	5.0
10.1	65
25	65

Suppressor: Dionex ASRS ULTRA II, 4 mm 300 mA
Concentration
Column: Dionex IonPac AG4A
Volume: 40 mL
Sample:

	Concentration (µg/L)
1. Fluoride	10
Carbonate	–
2. Chloride	10
3. Sulfate	10
Boron	1500 mg/L
Li	3.5

23323

Figure 15. This example compares a simulated borated water sample consisting of trace anions and lithium. The polishing step ensured complete recovery of both response and peak shapes for all ions. A Dionex IonPac CP2 Cation Polisher is placed between the sampling pump and the injection valve.

poor peak shapes or poor recoveries for some anions such as phosphate. These contaminants can adversely affect the operation of the guard/analytical columns or suppressor. Dionex IonPac Cation Polisher columns address the potential precipitation issue of these contaminants and aid in extending the column and suppressor lifetimes when pursuing anion analysis and when the matrix ions contain multivalent cations.

In some cases the Dionex IonPac Cation Polisher columns aid removal of matrix cations when pursuing anion analysis with sample preconcentration. The matrix cations can elute species of interest from the concentrator column and lead to poor peak shapes and recovery. Removing the matrix cations using the Dionex IonPac Cation Polisher columns helps ensure good chromatographic performance.

The Dionex IonPac CP1 (6 × 16 mm) column is a cation-exchange column in the sodium form and packed in a low pressure format and is specifically designed for autosampler operation. The void volume of this column is approximately 250 µL. The Dionex IonPac CP2 (9 × 24 mm) column is a higher capacity version in the hydronium form and has a void volume of approximately 825 µL. The Dionex IonPac CP2 Cation Polisher column is recommended for large volume sample preconcentration applications using an external pump. Both columns can be regenerated off-line approximately every 2–3 months (depending on the level of contamination and usage).

Dionex IonPac Cation Polisher CP1 Na^+ Form (6 × 16 mm).....P/N 064930

Dionex IonPac Cation Polisher CP2 H^+ Form (9 × 24 mm).....P/N 064931

Anion concentrator column selection table.

Anion Columns	Capacity (µeq/ column)	Void Volume (µL)	Recommended Applications	Recommended Sample Delivery Method
MAC-100	0.17	10	Hydroxide, carbonate/ bicarbonate and borate eluents	Pressurized bottle, syringes, Dionex AS Autosampler, and single piston sample delivery pump (Dionex AXP Auxiliary Pump)
MAC-200	0.24	23	Hydroxide, carbonate/ bicarbonate and borate eluents	Pressurized bottle, syringes, Dionex AS Autosampler, and single piston sample delivery pump (Dionex AXP Auxiliary Pump)
AMC-1	3.0	15.0	Carbonate/bicarbonate and borate eluents	Dionex AXP Auxiliary Pump*
TAC-LP1	25.0	145.0	Hydroxide, carbonate/ bicarbonate and borate eluents	Pressurized bottles, syringes, low-pressure autosamplers (Dionex AS-DV Autosampler), SP10 AutoNeutralization™ module
TAC-ULP1	25.0	145.0	Hydroxide, carbonate/ bicarbonateand borate eluents	Pressurized bottles, syringes autosamplers (Dionex AS-DV and AS) single-piston sample delivery pumps (Dionex AXP Auxiliary Pump).
UTAC-LP1	25.0	145.0	Hydroxide, carbonate/ bicarbonate	Pressurized bottles, syringes, low-pressure autosamplers (Dionex AS-DV and AS-HV Autosamplers)
UTAC-LP2	25.0	145.0	Hydroxide, carbonate/ bicarbonate and borate eluents	Pressurized bottles, syringes, autosamplers (Dionex AS-DV, AS, and, AS-HV Autosamplers), single-piston sample delivery pumps (Dionex AXP Auxiliary Pump)
UTAC-ULP1	25.0	145.0	Hydroxide, carbonate/ bicarbonate and borate eluents	Pressurized bottles, syringes, autosamplers (Dionex AS-DV, AS and, AS-HV Autosamplers), single-piston sample delivery pumps (Dionex AXP Auxiliary Pump)
UTAC-ULP2	25.0	145.0	Hydroxide, carbonate/ bicarbonate and borate eluents	Pressurized bottles, syringes, autosamplers (Dionex AS-DV, AS and, AS-HV Autosamplers), single-piston sample delivery pumps (Dionex AXP Auxiliary Pump)
UTAC-XLP1	25.0	145.0	Hydroxide, carbonate/ bicarbonate and borate eluents	Pressurized bottles, syringes, low-pressure autosamplers (Dionex AS-DV, AS and, AS-HV Autosamplers), single-piston sample delivery pumps (Dionex AXP Auxiliary Pump)
UTAC-XLP2	25.0	145.0	Hydroxide, carbonate/ bicarbonate and borate eluents	Pressurized bottles, syringes, low-pressure autosamplers (Dionex AS-DV, AS, and, AS-HV Autosamplers), single-piston sample delivery pumps (Dionex AXP Auxiliary Pump)
TAC-2	3.4	50.0	Carbonate/bicarbonate and	Dionex AXP Auxiliary Pump*
AC10 (4 mm)	4.0	207.0	Hydroxide and borate eluents	Dionex AXP Auxiliary Pump*
AC10 (2 mm)	0.8	52.0	Hydroxide and borate eluents	Dionex AXP Auxiliary Pump*
AC15 (4 mm)	9.0	210.0	Hydroxide and borate eluents	Dionex AXP Auxiliary Pump*
AC15 (2 mm)	2.2	53.0	Hydroxide and borate eluents	Dionex AXP Auxiliary Pump*
AC-ER	12.0	70	Carbonate/bicarbonate eluent with RFIC-ER systems	Syringes, low-pressure autosamplers (Dionex AS-DV and AS Autosamplers)

* Dionex AXP Auxiliary Pumps should use a pressurized sample source.

Cation Columns	Capacity (µeq/ column)	Void Volume (µL)	Recommended Applications	Recommended Sample Delivery Method
MCC-100	0.72	10	Use with carboxylated columns; MSA and sulfuric acid eluents	Pressurized bottle, syringes, Dionex AS Autosampler, and single-piston sample delivery pump (Dionex AXP Auxiliary Pump)
MCC-200	1.57	23	Use with carboxylated columns; MSA and sulfuric acid eluents	Pressurized bottle, syringes, Dionex AS Autosampler, and single-piston sample delivery pump (Dionex AXP Auxiliary Pump)
TCC-LP1	260.0	145.0	Use with carboxylated columns;	Pressurized bottles, syringes, low-pressure autosamplers, (Dionex AS-DV Autosampler) SP10 AutoNeutralization module
TCC-ULP1	260.0	145.0	Use with carboxylated columns; MSA and sulfuric acid eluents	Pressurized bottles, syringes, autosamplers (Dionex AS-DV, and AS Autosamplers), single-piston sample delivery pump (Dionex AXP Auxiliary Pump)
TCC-XLP1	260.0	145.0	Use with carboxylated columns; MSA and sulfuric acid eluents	Pressurized bottles, syringes, autosamplers (Dionex AS-DV and AS Autosamplers), single-piston sample delivery pump Dionex AXP Auxiliary Pump)
TCC-2	10.0	50.0	Use with sulfonated columns; HCl/DAP•HCl eluents	Dionex AXP Auxiliary Pump*

* Dionex AXP Auxiliary Pumps should use a pressurized sample source.

Concentrator Column Specifications

Column	Particle Diameter	Substrate X-linking	Latex Diameter	Latex X-linking	Capacity (per column)	Functional Group	Hydrophobicity
Concentrator							
MAC-100	Monolithic backbone	55%	85 nm	6%	0.17 µeq	Alkanol quaternary ammonium	Very low
MAC-200	Monolithic backbone	55%	85 nm	6%	0.24 µeq	Alkanol quaternary ammonium	Very low
AMC-1	10 µm	55%	None[a]	NA	3.0 µeq	Alkyl quaternary ammonium	Medium
TAC-LP1	18 µm	55%	85 nm	6%	25.0 µeq	Alkanol quaternary ammonium	Very low
TAC-ULP1	18 µm	55%	85 nm	6%	25.0 µeq	Alkanol quaternary ammonium	Very low
UTAC-LP1	17 µm	55%	85 nm	6%	25 µeq	Alkanol quaternary ammonium	Very low
UTAC-LP2	20 µm	55%	N/A	N/A	25 µeq	Alkanol quaternary ammonium	Very low
UTAC-ULP1	17 µm	55%	85 nm	6%	25 µeq	Alkanol quaternary ammonium	Very low
UTAC-ULP2	20 µm	55%	N/A	N/A	25 µeq	Alkanol quaternary ammonium	Very low
UTAC-XLP1	17 µm	55%	85 nm	6%	25 µeq	Alkanol quaternary ammonium	Very low
UTAC-XLP2	20 µm	55%	N/A	N/A	25 µeq	Alkanol quaternary ammonium	Very low
TAC-2	30 µm	2%	250 nm	5%	3.4 µeq	Alkyl quaternary ammonium	Medium
AC10 (4 mm)	13 µm	55%	160 nm	5%	4.0 µeq	Alkanol quaternary ammonium	Low
AC10 (2 mm)	13 µm	55%	160 nm	5%	0.8 µeq	Alkanol quaternary ammonium	Low
AC15 (4 mm)	13 µm	55%	85 nm	6%	9.0 µeq	Alkanol quaternary ammonium	Very low
AC15 (2 mm)	13 µm	55%	85 nm	6%	2.2 µeq	Alkanol quaternary ammonium	Very low
AC-ER	20 µm	55%	N/A	N/A	12 µeq	Alkanol quaternary ammonium	Very low
MCC-100	Monolithic backbone	55%	85 nm	6%	0.17 µeq	Fully functionalized with carboxylic acid	Very low
MCC-200	Monolithic backbone	55%	85 nm	6%	0.24 µeq	Fully functionalized with carboxylic acid	Very low
TCC-LP1	20 µm	55%	None[a]	NA	260.0 µeq	Fully functionalized with carboxylic acid	Very low
TCC-ULP1	20 µm	55%	None[a]	NA	260.0 µeq	Fully functionalized with carboxylic acid	Very low
TCC-XLP1	20 µm	55%	None[a]	NA	260.0 µeq	Fully functionalized with carboxylic acid	Very Low
TCC-2	30 µm	2%	None[a]	NA	10.0 µeq	Sulfonic acid	High

[a]Surface-functionalized resin.

Trap Column Specifications

Column	Particle Diameter	Substrate X-linking	Latex Diameter	Latex X-linking	Capacity (per column)	Functional Group	Hydrophobicity
Trap							
ATC-3 (4 mm)	55 µm	8%	None[b]	NA	1.5 meq	Quaternary ammonium	Low
ATC 500 (4 mm)	55 µm	8%	None[b]	NA	1.5 meq	Quaternary ammonium	Low
ATC-3 (2 mm)	55 µm	8%	None[b]	NA	0.35 meq	Quaternary ammonium	Low
ATC 500 (2 mm)	55 µm	8%	None[b]	NA	0.35 meq	Quaternary ammonium	Low
ATC-HC (9 × 75 mm)	750 µm	8%	None[b]	NA	4.0 meq	Quaternary ammonium	Low
ATC-HC 500 (9 × 75 mm)	750 µm	8%	None[b]	NA	4.0 meq	Quaternary ammonium	Low
ATC-HC Borate Form (9 × 75 mm)	750 µm	8%	None[b]	NA	4.0 meq	Quaternary ammonium	Low
ATC-HC 500 Borate Form (9 × 75 mm)	750 µm	8%	None[b]	NA	4.0 meq	Quaternary ammonium	Low
CTC (4 mm)	500 µm	8%	None[b]	NA	3.0 meq	Sulfonic acid	Low
CTC 500 (4 mm)	500 µm	8%	None[b]	NA	3.0 meq	Sulfonic acid	Low
CTC (2 mm)	500 µm	8%	None[b]	NA	0.8 meq	Sulfonic acid	Low
CTC 500 (2 mm)	500 µm	8%	None[b]	NA	0.8 meq	Sulfonic acid	Low
MFC-1	200 µm	20%	None[b]	NA	170.0 µeq	Iminodiacetate	Medium
MFC 500	200 µm	20%	None[b]	NA	170.0 µeq	Iminodiacetate	Medium
Transition Metal							
MetPac CC-1	18 µm	20%	None[b]	NA	0.4 meq	Iminodiacetate	Medium
TMC-1	17 µm	8%	None[b]	NA	0.3 meq	Sulfonic acid	Medium
Cation Polisher							
CP1 Na^+ Form (6 × 16 mm)	20 µm	55%	None[b]	NA	170.0 meq	Carboxylic acid	Very low
CP2 H^+ Form (19 × 24 mm)	20 µm	55%	None[b]	NA	575.0 meq	Carboxylic acid	Very low

[b]Fully-functionalized resin.

www.thermoscientific.com/dionex

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PS70526_E 01/13S