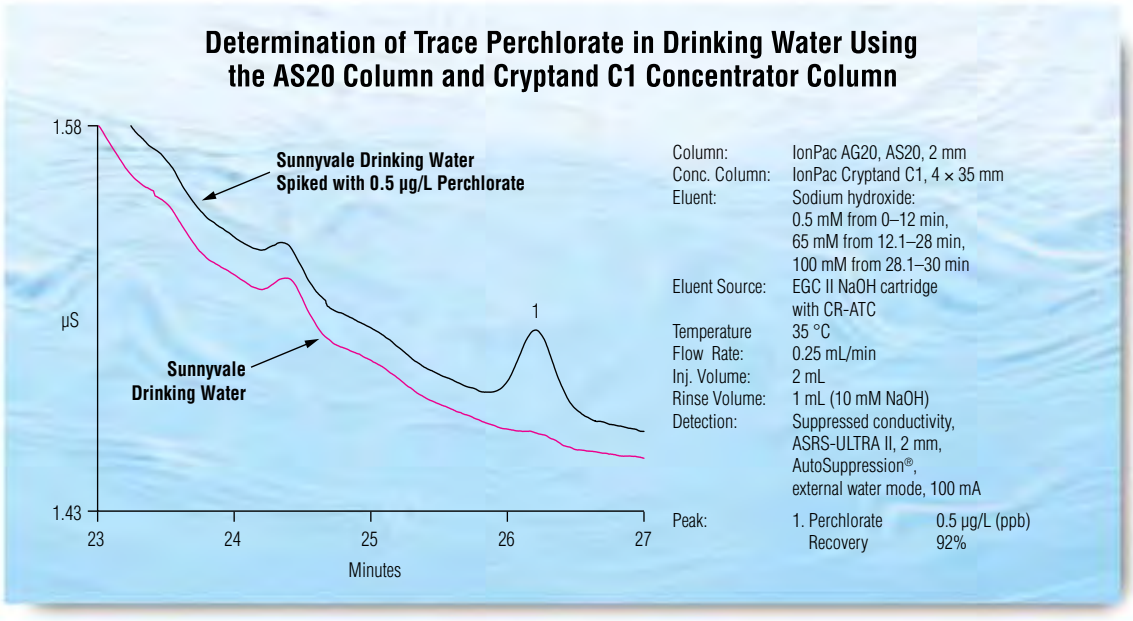
columns

# IonPac AS20 Anion-Exchange Column




*The IonPac® AS20 column is a high-capacity, hydroxide-selective, anion-exchange column designed for the determination of trace concentrations of perchlorate in drinking water, surface water, and groundwater matrices. The capacity and selectivity of the AS20 ensure that perchlorate can be quantified at sub-µg/L concentrations using suppressed conductivity detection, even in the presence of very high concentrations of chloride, sulfate, and carbonate. The AS20 column is the column specified in U.S. EPA Method 314.1 for the determination of trace perchlorate in drinking water. The Cryptand C1 Concentrator Column is the specified concentrator column for sample preconcentration in U.S. EPA Method 314.1. Formats available include 0.4 mm, 2 mm, 4 mm, allowing use of capillary to analytical flow rates, and supporting advanced IC × IC applications.*

Now sold under the Thermo Scientific brand

Thermo SCIENTIFIC

## Superior Chromatographic Performance

- Recommended hydroxide-selective, anion-exchange column for trace perchlorate in environmental water samples
- High capacity: 310 µeq per column (4 × 250 mm column)
- Increased mass sensitivity, reduced eluent consumption and reduced operating costs
- Specified column in U.S. EPA Method 314.1
- Use with the Cryptand C1 Concentrator Column for perchlorate preconcentration
- Use with eluent generator for simplified Reagent-Free™ Ion Chromatography (RFIC™) system operation. Requires only a deionized water source to produce sodium hydroxide eluent
- Eluent suppression using the ASRS® 300 or ACES 300 suppressor provides RFIC system operation with low background and enhanced analyte sensitivity
- Operate at ambient or elevated temperatures; column selectivity optimized for a 35 °C operating temperature 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

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## High-Efficiency Particle Structure

The IonPac AS20 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 exactly the same manner as 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 substrate surface. Resin capacity is controlled through the number of alternating coating cycles. The resulting polymer is extremely hydrophilic and therefore has excellent selectivity for hydroxide eluents, allowing the use of lower eluent concentrations. The AS20 uses a high-capacity resin (310 µeq/column) with optimized selectivity for trace perchlorate in environmental water matrices.

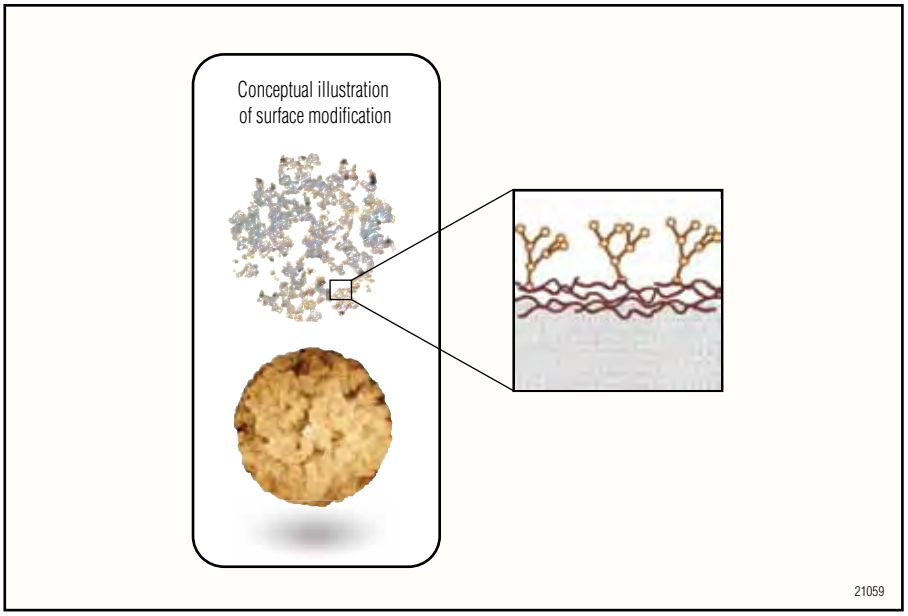



*Figure 1. Structure of an IonPac AS20 packing particle.*

## AS20 Capillary Format

The AS20 Capillary column (0.4 × 250 mm) is packed with the same material as the equivalent analytical scale version, thus producing the same performance as a 4 mm column, but requires only 1/100th the eluent flow rate. The capillary format offers the advantage of less eluent consumption providing reduced operating costs. Figure 2 illustrates the separation of anions using the AS20 Capillary Column. Excellent retention time reproducibility can be achieved with the capillary format.

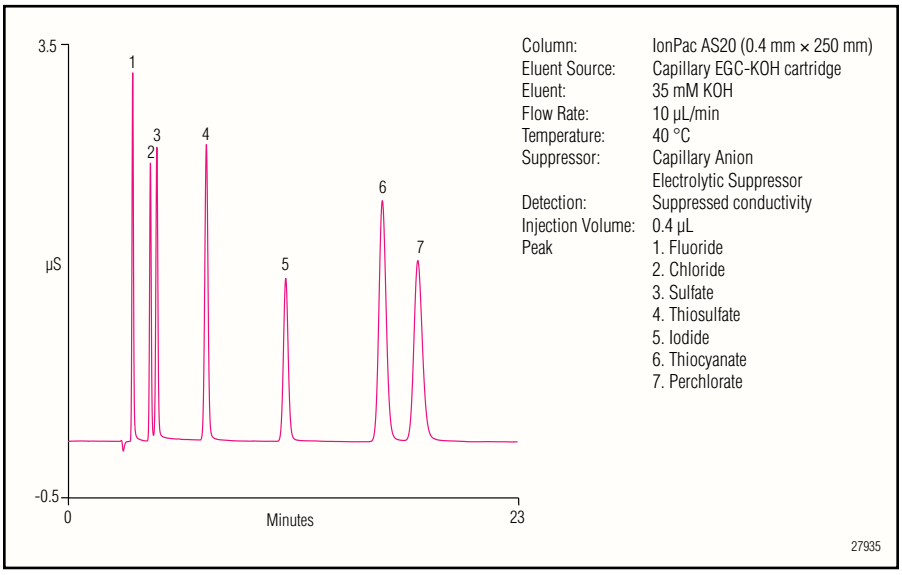



*Figure 2: Separation of anions on an IonPac AS20 capillary column.*

## Determination of Trace Perchlorate in Drinking Water Matrices

Perchlorate (initially as ammonium perchlorate), which is widely used in the manufacture of rocket propellants, munitions, fireworks, and road flares, has been found in drinking water in areas where aerospace materials and munitions have been manufactured and tested. Perchlorate is a potential health concern because it may interfere with the production of thyroid hormones. The IonPac AS20 column was designed to determine trace perchlorate in groundwater and drinking water matrices. Figure 3 shows the determination of trace perchlorate in a drinking water sample using sample preconcentration with the Cryptand C1 Concentrator Column and a sodium hydroxide eluent coupled with suppressed conductivity detection. The Cryptand C1 Concentrator Column is used with a sodium hydroxide eluent for optimum concentrator capacity control. At high sodium concentrations, the Cryptand C1 has high capacity, but at lower concentrations the capacity decreases and the analytes can be eluted. Figure 4 illustrates the system flow path for the determination of trace perchlorate according to U.S. EPA Method 314.1.

Low- to sub-µg/L levels of perchlorate can easily be quantified using the AS20 column and a 2-mL sample preconcentration, as shown in Figure 3. The AS20 column can be operated using either sodium or potassium hydroxide eluents with comparable results. However, sodium hydroxide is required when using the Cryptand C1 Concentrator Column.

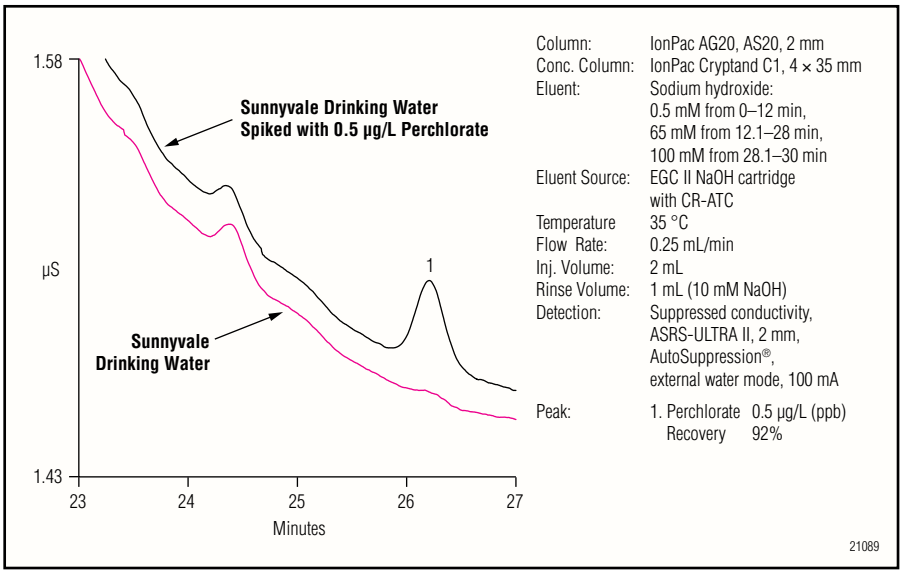
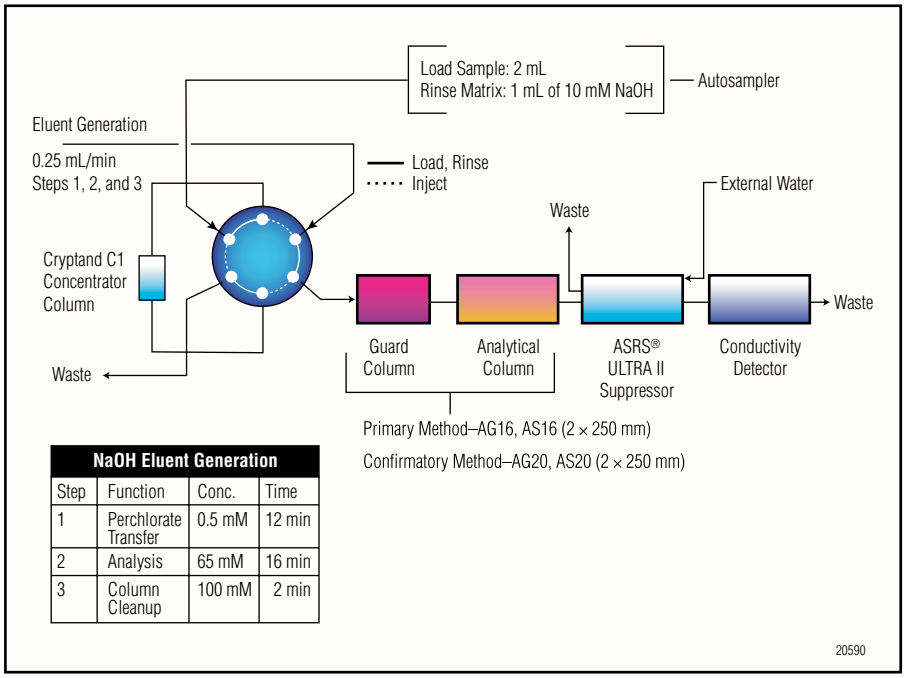



*Figure 3. Determination of trace perchlorate in drinking water using the AS20 column following concentration on a Cryptand C1 Concentrator column.*




**NaOH Eluent Generation**

| Step | Function | Conc. | Time |
|---|---|---|---|
| 1 | Perchlorate Transfer | 0.5 mM | 12 min |
| 2 | Analysis | 65 mM | 16 min |
| 3 | Column Cleanup | 100 mM | 2 min |

*Figure 4. System flow path for trace perchlorate in drinking water.*

### Determination of Trace Bromate using Two-Dimensional Ion Chromatography

The AS20 Capillary column can be used with suppressed conductivity detection to determine trace perchlorate or bromate. Using a two-dimensional ion chromatography system, trace concentrations of bromate can be determined in drinking water samples as shown in Figure 5.

### Gradient Separations as Simple as Isocratic Runs with RFIC Systems

The IonPac AS20 column is recommended for use with RFIC systems. The EGC-NaOH Eluent Generator electrolytically produces high-purity sodium hydroxide eluent from water, eliminating the need for eluent preparation. The CR-ATC is used to continuously purify the eluent. The sodium hydroxide eluent is free of carbonate contamination. Carbonate-free hydroxide eluents minimize baseline shifts during hydroxide gradients, yielding lower background conductivities and lower detection limits for target analytes.

Figure 6 shows the gradient separation of a variety of environmental anions using an eluent-generator-produced potassium hydroxide gradient. A CR-ATC Continuously Regenerated Anion Trap Column was used to remove carbonate from the source water to minimize the baseline shift during the gradient.

### Unique Selectivity Resolves Potential Interference from Perchlorate

Aromatic sulfonates such as 4-chlorobenzene sulfonate, which can be found in leachates from some hazardous waste sites, can potentially interfere with perchlorate determination using the IonPac AS16 column. For example, the presence of the 4-chlorobenzene sulfonate in an environmental sample may result in false positives for perchlorate.

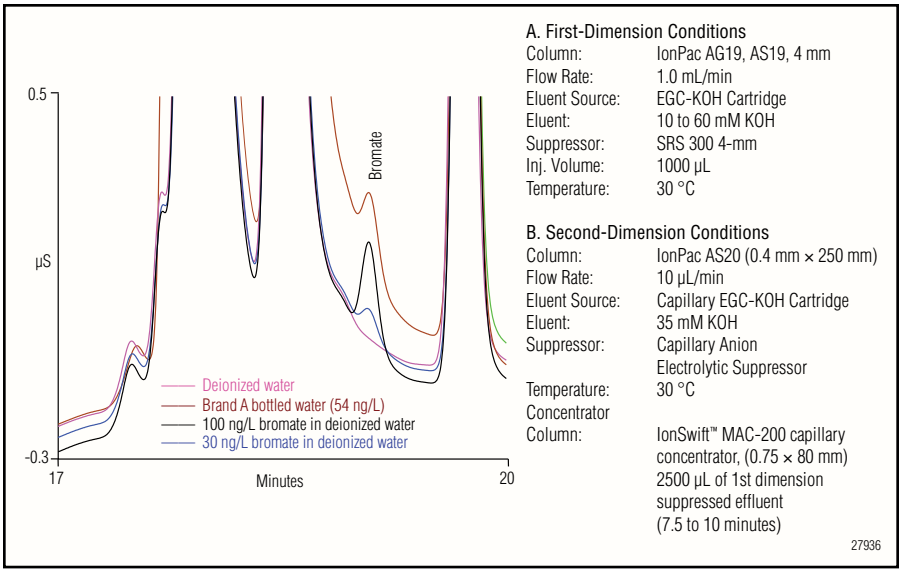



*Figure 5: Determination of trace concentrations of bromate using the IonPac AS20 with two-dimensional ion chromatography*

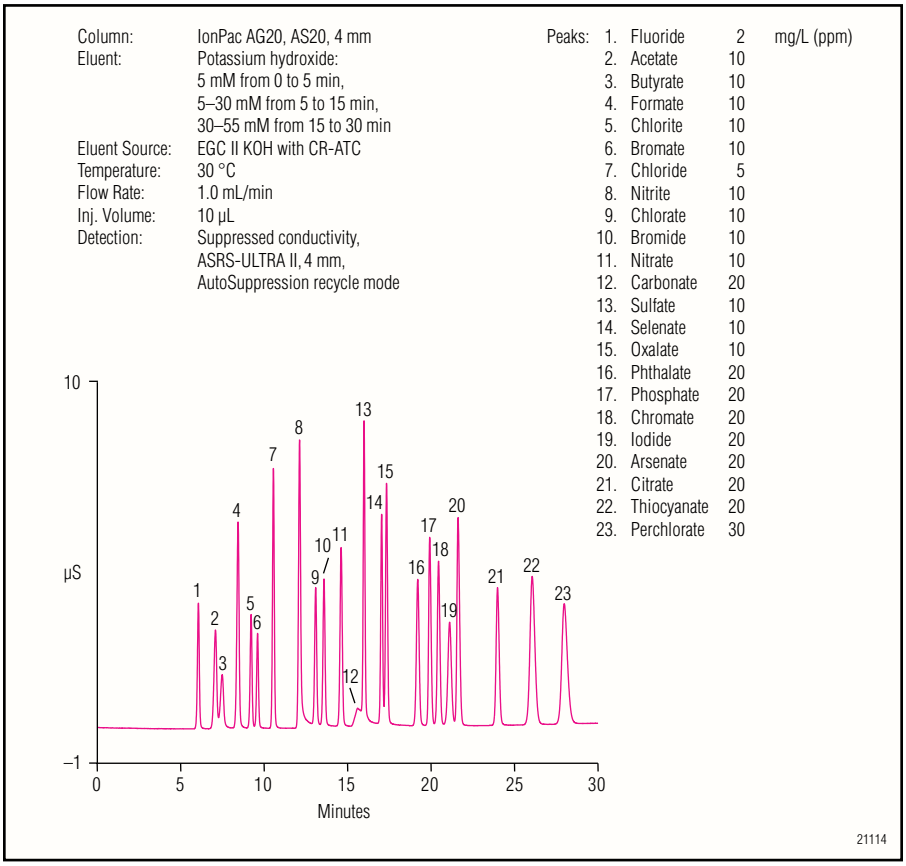



*Figure 6. Gradient separation of a variety of environmental anions using the AS20 column.*

The IonPac AS20 has unique selectivity in that its substrate coating (aliphatic backbone) is different from the AS16 (aromatic backbone) and can resolve potential interferences from perchlorate.

Figure 7 shows a comparison of the separation of common anions, hydrophobic anions, and 4-chlorobenzene sulfonate on the AS16 and AS20 columns. In Figure 7A, the 4-chlorobenzene sulfonate peak is not resolved from the perchlorate peak on the AS16 column. However, in Figure 7B, the unique selectivity of the AS20 resolves this potential interference from the perchlorate peak.

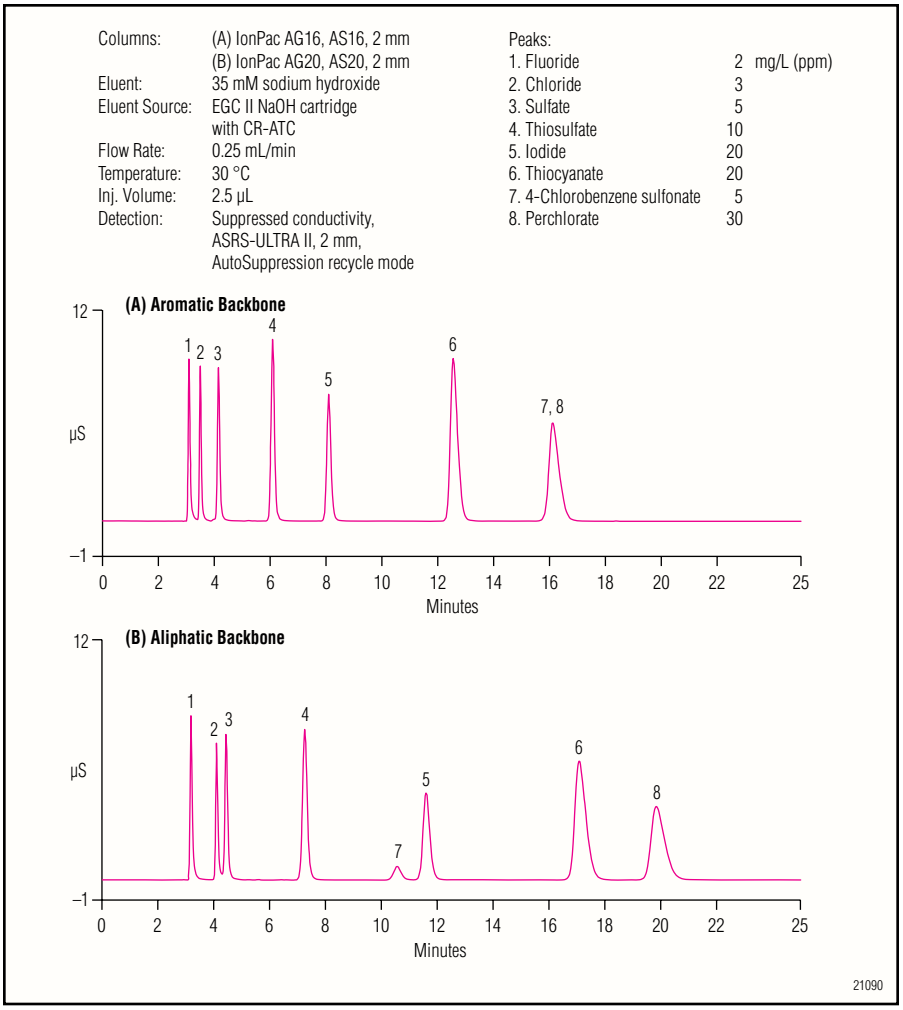



*Figure 7. Comparison of the AS16 and AS20 columns for the separation of common anions, hydrophobic anions, and 4-chlorobenzene sulfonate.*

### System Requirements for EGC-NaOH Eluent Generation

The AS20 Column is recommended for use with the Dionex ICS-2100 or ICS-5000 RFIC systems equipped with an EG. The eluent generator is used to automatically produce sodium hydroxide gradients from deionized water. The EGC-NaOH cartridge can only be controlled using Chromeleon® 6.7 and subsequent Chromeleon releases.

### System Requirements for EGC-KOH Eluent Generation

The AS20 Column is recommended for use with the Dionex ICS-2100 or ICS-5000 RFIC systems equipped with an EG. The AS20 can also be used with older Dionex IC Systems equipped with an EG or an RFC-30 Reagent-Free Controller. The EG is used to automatically produce potassium hydroxide gradients from deionized water.

### Suppressor Recommendations

For optimum ease of use and economy, the IonPac AS20 column should be used with the Anion Self-Regenerating Suppressor, ASRS 300 or the ACES 300. Operate the IonPac AS20 column at an elevated temperature (30 °C) to ensure reproducible retention times.

### Anion Trap Columns

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

Alternatively, when performing sodium hydroxide gradient anion-exchange applications on the AS20 using hand-prepared bottled eluents, the 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 trace-perchlorate concentrator work, use the Cryptand C1 Concentrator Column when the sample is delivered with a syringe or autosampler. For concentrator work with a 2 mm or 4 mm AS20 column, use the IonPac AG20 guard column, UTAC-LP1, UTAC-ULP1, UTAC –XLP1, UTAC-LP2, UTAC-ULP2, or UTAC-XLP2 Ultra Trace Anion Concentrator Columns, TAC-ULP1 Trace Anion Concentrator Column, or TAC-2 Trace Anion Concentrator Column, when a single piston pump such as the AXP pump (pulse damper required) is used for sample delivery. Use the UTAC-LP1, UTAC-LP2 or TAC-LP1 Trace Anion Concentrator Column when the sample is delivered with a syringe or with a low pressure autosampler such as the AS-DV. For concentrator work with a 0.4 mm capillary column, use the AG20 capillary guard column or the IonSwift MAC-100 concentrator column. For two-dimensional Ion Chromatography methods to determine trace bromate or perchlorate, use the IonSwift MAC-200 concentrator column.

## SPECIFICATIONS

*Dimensions:*

IonPac AS20 Capillary Column: 0.4 × 250 mm
IonPac AG20 Capillary Guard Column: 0.4 × 50 mm
IonPac AS20 Analytical Column: 4 × 250 mm
IonPac AG20 Guard Column: 4 × 50 mm
IonPac AS20 Analytical Column: 2 × 250 mm
IonPac AG20 Guard Column: 2 × 50 mm

*Maximum Operating Pressure:*

4000 psi (standard or microbore)
5000 psi (capillary)

*Mobile Phase Compatibility:*

pH 0–14; 0–100% HPLC solvents

*Substrate Characteristics, Analytical Column:*

Supermacroporous resin
Bead Diameter (µm): 7.5
Pore Size: 2000 Å
Cross-Linking (%DVB): 55%

*Substrate Characteristics, Guard Column:*

Microporous resin
Bead Diameter (µm): 11
Pore Size: <1 Å
Cross-Linking (%DVB): 55%

*Ion-Exchange Group:*

Functional Group: Alkanol quaternary ammonium ion

*Functional Group Characteristics:*

Hydrophobicity: Ultralow

*Capacity:*

3.1 µeq (0.4 × 250 mm column)
0.06 µeq (0.4 × 50 mm column)
77.5 µeq (2 × 250 mm column)
1.5 µeq (2 × 50 mm column)
310 µeq (4 × 250 mm column)
6 µeq (4 × 50 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., call 1-800-346-6390, or contact the Dionex Regional Office nearest you. Outside the U.S., order through your local Dionex office or distributor. Refer to the following part numbers.

**IonPac AS20 Columns**

IonPac AS20 Capillary Column (0.4 × 250 mm)..... P/N 075399
IonPac AG20 Capillary Guard Column (0.4 × 50 mm)..... P/N 075400
IonPac AS20 Analytical Column (2 × 250 mm)..... P/N 063065
IonPac AG20 Guard Column (2 × 50 mm)..... P/N 063066
IonPac AS20 Analytical Column (4 × 250 mm)..... P/N 063148
IonPac AG20 Guard Column (4 × 50 mm)..... P/N 063154

**Trap Columns**

CR-ATC Continuously Regenerated Anion Trap Column..... P/N 060477
(For use with the EG50 with built-in CR-TC control, the EG40 with EG40 CR-TC Add-on Kit or the RFC-30 Reagent-Free Controller)
CR-ATC Continuously Regenerated Anion Trap Column (Capillary)..... P/N 072078
(For use with Capillary Anion Columns)
ATC-3 Anion Trap Column (9 × 24 mm)..... P/N 059660
(for use with 4 mm columns)
ATC-3 Anion Trap Column (4 × 35 mm)..... P/N 079932
(for use with 2 mm columns)
ATC-HC Anion Trap Column..... P/N 059604
(for use with the EG40 or EG50)

**Anion Concentrator Columns**

Cryptand C1 Concentrator Column (4 × 35 mm)..... P/N 062893
TAC-LP1 Trace Anion Concentrator (4 × 35 mm)..... P/N 046026
TAC-ULP1 Trace Anion Concentrator (5 × 23 mm)..... P/N 061400
UTAC-LP1 Ultra Trace Anion Concentrator- Low Pressure (4 × 35 mm)..... P/N 063079
UTAC-ULP1 Ultra Trace Anion Concentrator- Ultra Low Pressure (5 × 23 mm)..... P/N 063475
UTAC-XLP1 Ultra Trace Anion Concentrator- Extremely Low Pressure (6 × 16 mm)..... P/N 063459
UTAC-LP2 Ultra Trace Anion Concentrator- Low Pressure (4 × 35 mm)..... P/N 079917
UTAC-ULP2 Ultra Trace Anion Concentrator- Ultra Low Pressure (5 × 23 mm)..... P/N 079918
UTAC-XLP2 Ultra Trace Anion Concentrator- Extremely Low Pressure (6 × 16 mm)..... P/N 072781
MAC-100 Monolith Anion Concentrator Column (0.5 × 80 mm)..... P/N 074702
MAC-200 Monolith Anion Concentrator Column (0.75 × 80 mm)..... P/N 075461

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**Dionex Corporation**
1228 Titan Way
P.O. Box 3603
Sunnyvale, CA
94088-3603
(408) 737-0700

**North America**
U.S. (847) 295-7500
Canada (905) 844-9650

**South America**
Brazil (55) 11 3731 5140

**Europe**
Austria (43) 1 616 51 25 Belgium (32) 3 353 4294 Denmark (45) 36 36 90 90
France (33) 1 39 30 01 10 Germany (49) 6126 991 0 Italy (39) 02 51 62 1267
The Netherlands (31) 20 683 9768 Switzerland (41) 62 205 9966
U.K. and Ireland (44) 1276 691722

**Asia Pacific**
Australia (61) 2 9420 5233 China (852) 2428 3282 India (91) 22 28475235
Japan (81) 6 6885 1213 Korea (82) 2 2653 2580 Singapore (65) 6289 1190

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