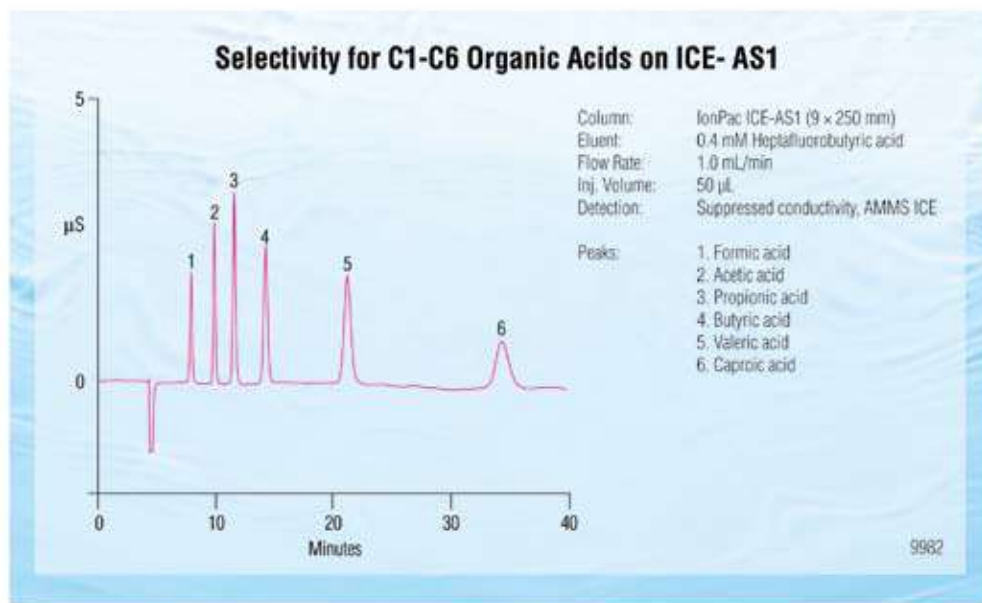


## IonPac® ICE-AS1 Ion-Exclusion Column



*The IonPac ICE-AS1 ion-exclusion column provides fast analysis of aliphatic organic acids and alcohols in complex- or high-ionic strength samples using a moderately hydrophilic resin functionalized with sulfonic acid groups. The column's polymeric structure allows the use of low pH eluents. HPLC solvents can be used to control hydrophobic retention, as well as for effective column cleanup.*

Now sold under the  
Thermo Scientific brand

**Thermo**  
SCIENTIFIC

The IonPac ICE-AS1 ion-exclusion column is designed for the determination of aliphatic organic acids and alcohols in complex- or high-ionic-strength samples, including food and beverage products, biological samples, fermentation processes, industrial process liquors, and wastewater.

#### Superior Chromatographic Performance

- Separates weakly ionized acids by differences in  $pK_a$ , size, and hydrophobicity.
- Elutes strong acid anions (e.g., chloride, oxalate, and sulfate) in the void.
- Achieves difficult separations, including formate, acetate, propionate, and butyrate, as well as cyanide, carbonate, and borate.
- Separates glycols, nitriles, and ketones
- Employs ion exclusion, the preferred method for determining ions in acidic or high-ionic-strength solutions.
- Compatible with a wide range of acid eluents and detection methods.
- Uses HPLC solvents to control hydrophobic retention of higher-molecular-weight acids or for effective column cleanup.



Passion. Power. Productivity.

## Unique Selectivity

The retention mechanisms operating in the IonPac ICE-AS1 include:

- Ion exclusion
- Steric exclusion
- Adsorption

The IonPac ICE-AS1 resin is functionalized with sulfonic acid groups. The ion-exclusion mechanism causes strong acid anions, such as chloride, nitrate, etc., to be eluted in the column void volume, as illustrated in Figure 1. For rapid analysis, the IonPac ICE-AS1 column can easily resolve the straight-chain organic acids—formic through caproic—by ion-exclusion retention, as shown in the figure on page one.

## Resist Fouling

The polymeric packing in the IonPac ICE-AS1 resists fouling and allows the analysis of a wide range of complex samples, as shown in Figure 2.

Use the IonPac ICE-AS1 for diverse sample matrices, including:

- Brines
- Mineral acids
- Wastewater
- Power plant water
- Foods and beverages
- Kraft liquors
- Soil extracts

## Increased Sensitivity with Suppressed Conductivity Detection

The IonPac ICE-AS1 is designed to be used with a wide range of detectors, including conductivity, UV, refractive index, and amperometry. For conductivity detection, the IonPac ICE-AS1 is used with the AMMS<sup>®</sup>-ICE 300, which is a low-void volume, high-capacity eluent suppressor. The AMMS-ICE 300 suppressor reduces the background conductivity of the eluent, while increasing the conductivity of the analytes, thereby providing a stable baseline and high signal-to-noise ratio.

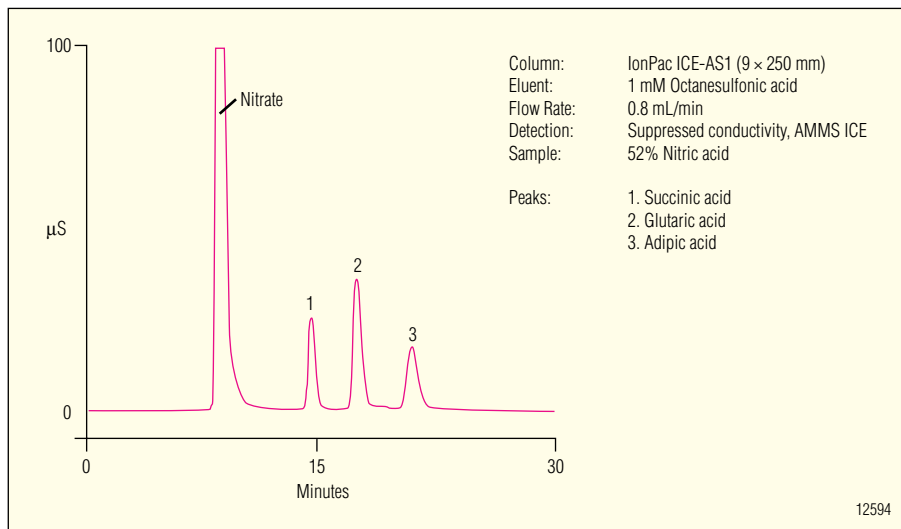


Figure 1. Ion exclusion allows the determination of organic acids in nitric acid and eliminates nitrate interference. The nitrate ion elutes in the void volume.

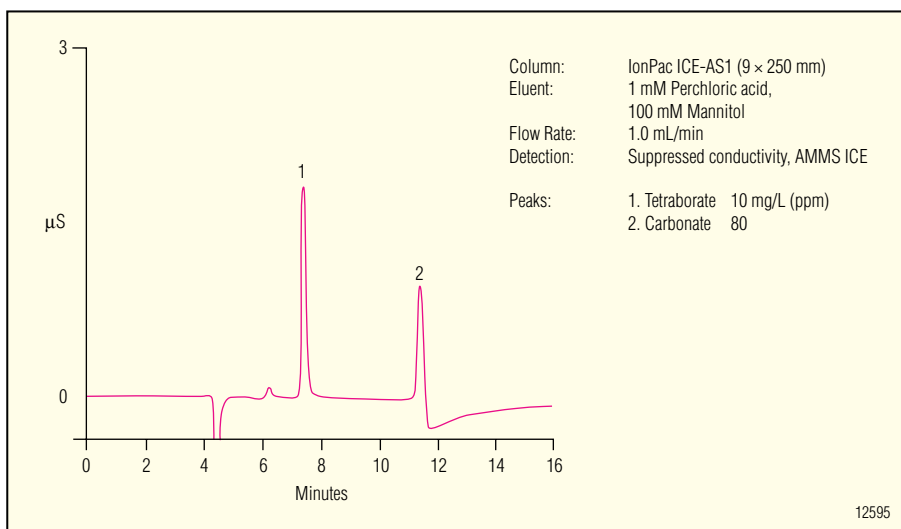


Figure 2. Determination of carbonate and tetraborate in a plating bath.

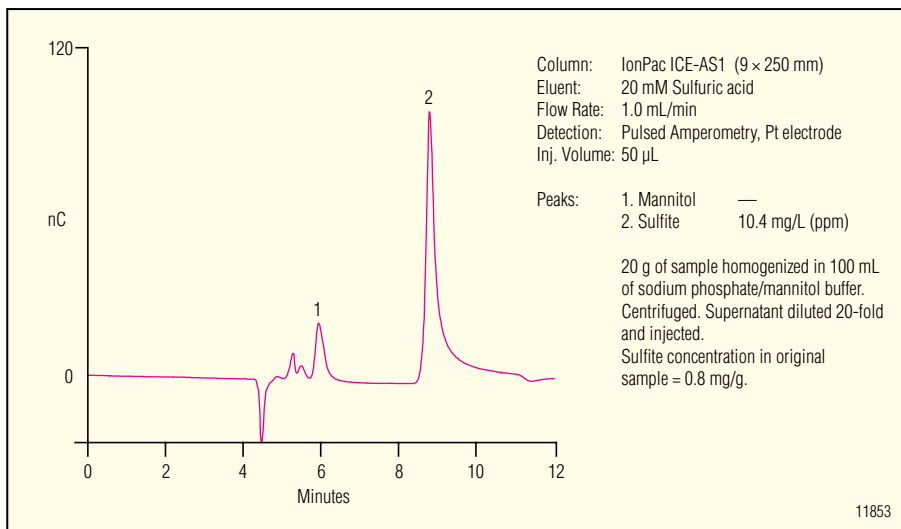


Figure 3. Determination of sulfite in dried apricots using pulsed amperometric detection.

## Use IonPac ICE-AS1 with a Wide Range of Acid Eluents and Detectors

The IonPac ICE-AS1 column can also be used with amperometric detection to determine electroactive ions, such as cyanide and sulfite, in a wide range of complex samples (see Figures 3 and 4). Figures 5, 6, and 7 show the determination of glycols, nitriles, and ketones using amperometric detection and a disposable platinum electrode.

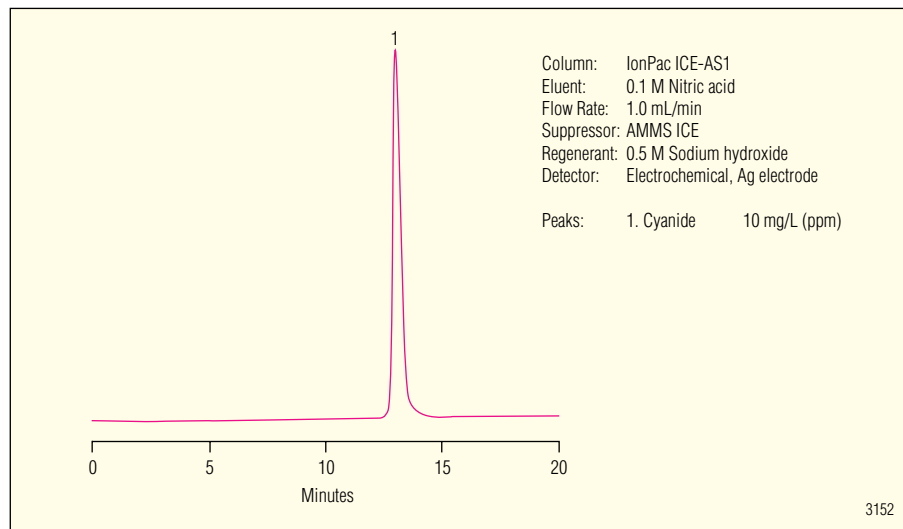


Figure 4. Determination of cyanide using the IonPac ICE-AS1. The AMMS ICE suppressor is used to adjust the postcolumn eluent pH for optimum detection.

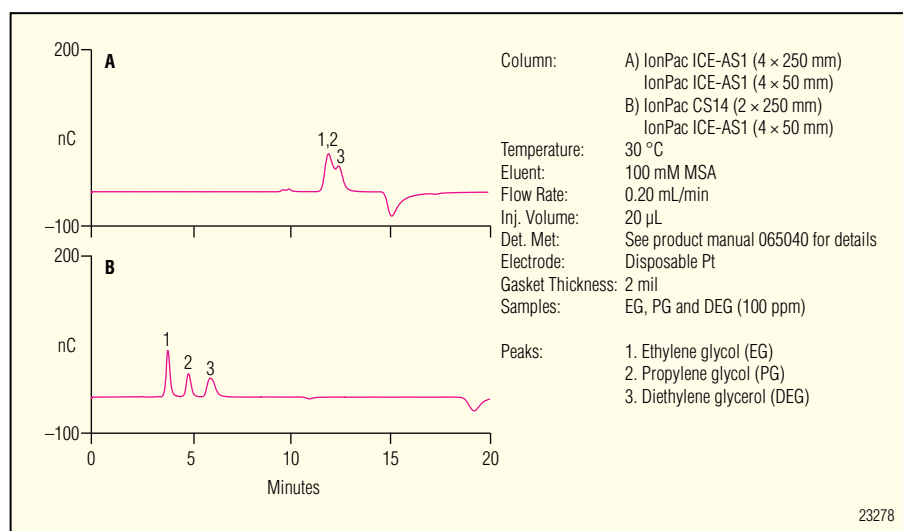


Figure 5. Determination of glycols using pulsed amperometric detection and a disposable platinum electrode.

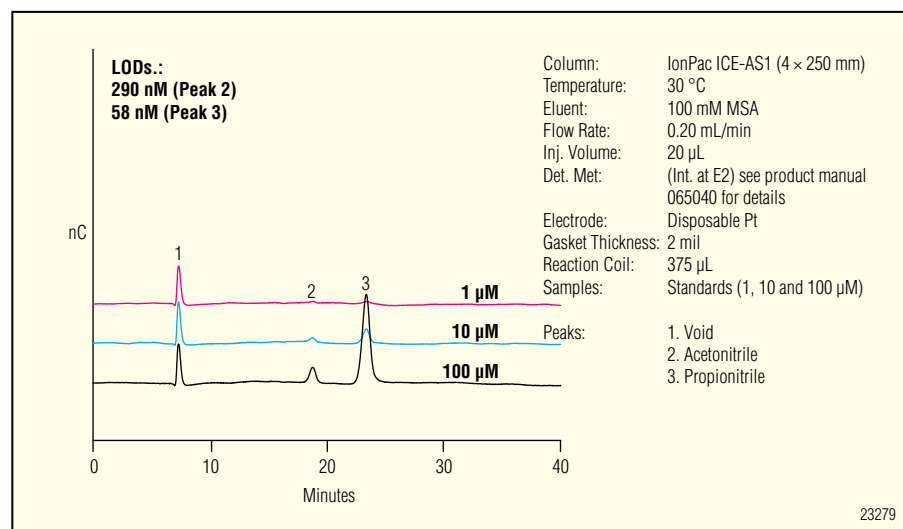


Figure 6. Determination of nitriles using the ICE-AS1 4-mm with pulsed amperometric detection and a disposable platinum electrode.

The IonPac ICE-AS1 can be used with any typical strong acid eluent. A high acid eluent concentration is used to retain and separate organic acids with low  $pK_a$ 's such as tartaric, quinic, formic, and succinic acids, as illustrated in Figure 8. A wide range of eluents can be used with UV or refractive index detection. Figure 9 illustrates the selectivity achieved for aliphatic alcohols when ion-exclusion chromatography using the IonPac ICE-AS1 is coupled with pulsed amperometric detection. The IonPac ICE-AS1 is coupled with pulsed amperometric detection.

### Solvent Compatible Packing

The IonPac ICE-AS1 column is compatible with eluents containing up to 50% HPLC solvents, including methanol, isopropanol, and MeCN. Organic solvents can be used to decrease the hydrophobic retention of strongly retained organic acids, as illustrated in Figure 10. For columns fouled with hydrophobic matrix components, up to 50% organic solvents can be used for effective column cleanup.

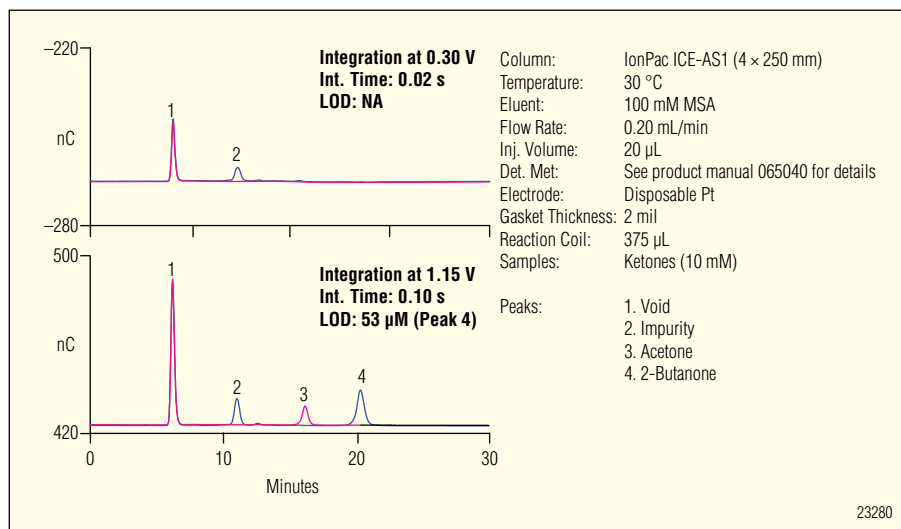


Figure 7. Determination of ketones using pulsed amperometric detection and a disposable platinum electrode.

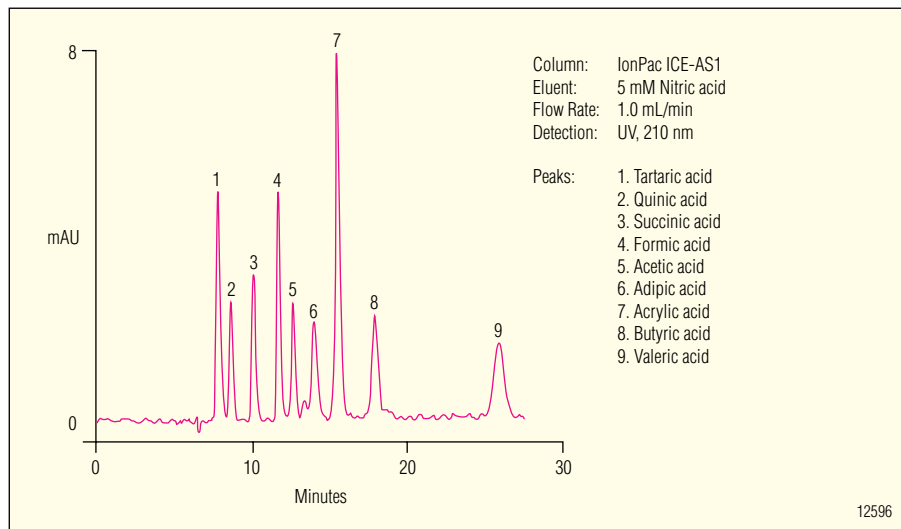


Figure 8. Determination of weakly ionized organic acids using UV detection.

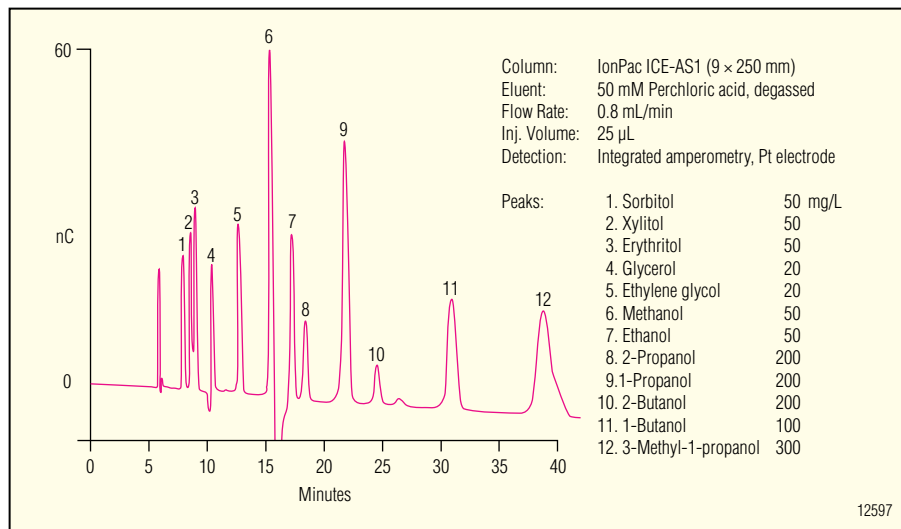


Figure 9. Determination of aliphatic alcohols using UV detection.

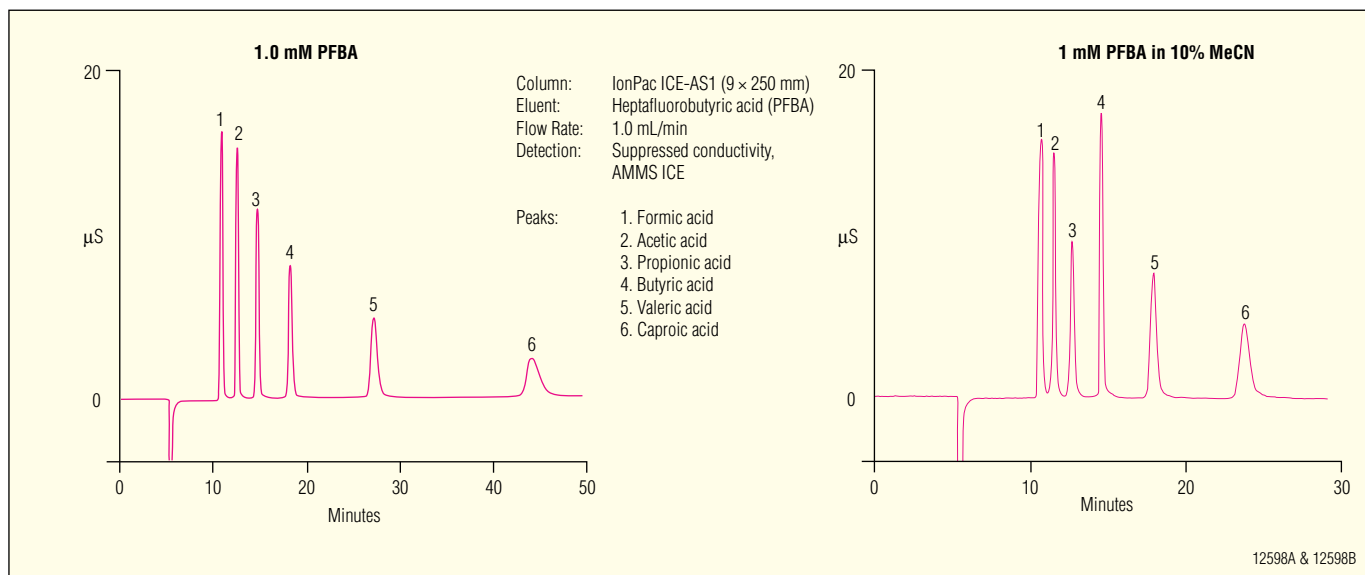


Figure 10. Effect of organic solvent on selectivity for organic acids using the IonPac ICE-AS1 column.

## Ordering Information

For optimum ease-of-use and economy, the IonPac ICE-AS1 column should be used with AMMS-ICE 300 MicroMembrane™ Suppressor (for suppressed conductivity detection).

To order in the U.S., call (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.

## PART NUMBERS

| Description                                         | Part Number |
|-----------------------------------------------------|-------------|
| IonPac ICE-AS1 Analytical Column (9 × 250 mm).....  | 043197      |
| IonPac ICE-AS1 Analytical Column (4 × 250 mm) ..... | 064198      |
| IonPac ICE-AS1 Guard Column (4 × 50 mm).....        | 067842      |
| AMMS ICE 300 MicroMembrane Suppressor .....         | 067527      |

## SPECIFICATIONS

### Dimensions:

Analytical: 9 × 250 mm, 4 × 250 mm; Guard: 4 × 50

### Maximum Operating Pressure:

9.65 MPa (1400 psi)

### Eluent Compatibility:

pH 0–7

Use eluents containing only hydronium ion as the cation.

Avoid eluents containing sodium, potassium, etc.

0–50% HPLC Solvents

### Column Construction:

PEEK (Polyetheretherketone) with 10–32 threaded ferrule-style end fittings.

All components are nonmetallic.

### Substrate Characteristics:

Bead Diameter: 7.5 µm

Bead Type: Microporous

Cross-linking (%DVB): 8%

### Functional Group Characteristics:

Capacity (meq/column): 27 meq (9 × 250 mm)

5.3 meq (4 × 250 mm)

### Ion-Exchange Group:

Sulfonic acid

### Surface Characteristics:

Hydrophilic

AMMS and IonPac are registered trademarks and  
MicroMembrane is a trademark of Dionex Corporation.

**Passion. Power. Productivity.**



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