Since the introduction of Reagent-Free™ Ion Chromatography (RFIC™) products in 1995, we have continued to simplify IC while increasing the capabilities and power of ion analysis. RFIC systems with eluent generation (RFIC-EG systems) produce consistent, precisely controlled, high-purity eluents and regenerants electrolytically. Not only is the eluent preparation labor decreased, but reproducibility is increased. The Thermo Scientific™ Dionex™ ICS-2100, Thermo Scientific Dionex ICS-4000, Thermo Scientific Dionex ICS-5000+ systems are integrated RFIC-EG systems. The Thermo Scientific Dionex RFC-30 Reagent-Free Controller can be used to convert most other Dionex IC systems into RFIC-EG systems.

### Benefits of Eluent Generation
RFIC-EG systems generate high-purity hydroxide, carbonate, or methanesulfonic acid (MSA) eluents electrolytically using Thermo Scientific Dionex EGC Eluent Generation Cartridges. Chemists no longer need to spend time manually preparing eluents as traditionally done using conventional IC systems. The eluent is generated at the concentration required for your IC application. Eluents are purified on-line using Thermo Scientific Dionex Continuously Regenerated Trap Columns (Dionex CR-TC 500 column), and suppressed electrolytically before detection, without the need to prepare regenerants. The only requirement is a high-purity source of deionized water.

Key benefits:
- Achieves sensitive results with pure, uncontaminated eluent
- Eliminates errors and variability associated with manual eluent and regenerant preparation
- Achieves the power of hydroxide and MSA gradient separation with an isocratic pump
- Reduces operator exposure to hazardous chemicals
- Reduces pump maintenance because pump is exposed only to deionized (DI) water
- Supports capillary-scale flow rates to reduce eluent and EGC consumption.
- Supports up to 5,000 psi pressure (Dionex EGC 500 and Dionex EGC (Capillary) cartridges only) to allow operation with 4 µm columns.
Simplify Operation with RFIC-EG Systems

RFIC-EG systems are very easy to operate. Simply install the eluent generator, attach a source of deionized water to your pump, and begin collecting data. The schematic diagram (Figure 1) illustrates just how easy operation is with RFIC-EG systems. The compatibility chart to the right shows what eluent generator cartridges are supported on each system.

Reproducibility of Eluent Generation

Electrolytic eluent generation produces amazingly consistent run-to-run eluent concentrations by eliminating errors associated with manual eluent preparation. Eluent concentration accuracy and precision translates into highly reproducible retention times and peak areas. Figure 2 shows an overlay of 100 chromatograms, illustrating the unmatched reproducibility provided by eluent generation.

Make Your Methods Portable

With RFIC-EG systems, the ability to transfer methods from one lab to another is simplified. Whether the lab is next door or in another country, RFIC eluent generators ensure that your analytical results are consistent and can be seamlessly transferred. RFIC eluent generators are so precise that you can expect less than 1% deviation from lab to lab under most analytical conditions.

Achieve Sensitive Results

RFIC eluent generators make trace-level analysis routine. The ultrapure eluent produced by our full line of eluent generator cartridges, results in a stable baseline that makes peak integration more accurate and reliable. In addition to lower background, electrolytically generated gradients provide minimal baseline shifts compared to conventional gradients.

Accuracy of RFIC Eluent Generators

The eluent concentration generated by an RFIC-EG system is extremely accurate and reproducible. This patented eluent generation technology follows Faraday’s Law. The eluent concentration is, therefore, directly proportional to the applied current from the eluent generator and inversely proportional to the eluent flow rate. Because both of these parameters can be precisely controlled, the resulting eluent concentrations are more precise than manually prepared eluents. This consistency is true from run-to-run, system-to-system, and lab-to-lab.

Eluent generation is fully supported by Thermo Scientific™ OQ/PQ validation tools to ensure that your laboratory meets even the most rigorous regulatory requirements.
Compatible with High Pressure IC Systems

The new Dionex EGC 500 cartridge allows operation at pressures up to 5,000 psi (34.5 MPa) when installed on a high-pressure IC (HPIC) system such as the Dionex ICS-5000+ system. This enables compatibility with high flow rates and columns utilizing 4 µm beads, for high resolution and high throughput.

Other than the backpressure rating, the Dionex EGC 500 cartridge has identical operational parameters as the Dionex EGC III cartridge, making it fully compatible with existing methods. The Dionex EGC 500 KOH and Dionex EGC 500 MSA cartridges are only compatible with HPIC systems such as the Dionex ICS-5000+ system. The Dionex EGC 500 K₂CO₃ cartridge is compatible with both HPIC systems as well as standard RFIC systems, but is limited to 3,000 psi when coupled with a standard RFIC system.

Labor Savings

Labor savings alone justify the purchase of a Dionex EGC cartridge. Manual eluent preparation typically consists of a long list of tasks that can include weighing or pipetting chemicals, diluting, filtering, mixing stock solutions, transferring, dispensing, priming, degassing, filling bottles, etc. This list does not take into consideration potential errors associated with eluent makeup or time required for system equilibration. Eluent generation simplifies IC by making the eluent for you. Simply add water to the system and begin collecting data. In addition, with an RFIC-EG system, no additional chemicals or reagents are needed for the suppressor, which saves even more time. Table 1 illustrates the potential labor savings of RFIC eluent generators.

RFIC EGC Lifetime

The life expectancy of an analytical Dionex EGC cartridge is a function of a number of user-selectable parameters. Based on eluent concentration and flow rate, the number of expected operating hours for the cartridge can be determined. Table 2 shows some examples of calculations of Dionex EGC III KOH, Dionex EGC 500 K₂CO₃, and Dionex EGC III MSA cartridge lifetimes based on different column applications. The Dionex EGC 500 cartridge has identical operational lifetime than the Dionex EGC III cartridge. But with higher flow rates, HPIC systems typically can run more samples in the same period of time. This gives the Dionex EGC 500 cartridge a cost of ownership advantage over the Dionex EGC III cartridge. Under most conditions, the Dionex EGC cartridge (Capillary) will last 18 months regardless of use, allowing Always on operation without concern for accelerated consumption of the Dionex EGC cartridge.

<table>
<thead>
<tr>
<th>Table 1. Labor savings.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cost of Manual Preparation</strong></td>
</tr>
<tr>
<td>Hourly Labor Rate</td>
</tr>
<tr>
<td>Hours spent per 5-day week preparing eluent. Calculations based on 50 weeks</td>
</tr>
<tr>
<td>$15.00</td>
</tr>
<tr>
<td>$25.00</td>
</tr>
<tr>
<td>$35.00</td>
</tr>
<tr>
<td>$45.00</td>
</tr>
</tbody>
</table>

*Quality Assurance Report conditions

<table>
<thead>
<tr>
<th>Table 2. Cartridge life.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Dionex IonPac Column</strong></td>
</tr>
<tr>
<td>AS23 (4 mm)</td>
</tr>
<tr>
<td>AS23 (2 mm)</td>
</tr>
<tr>
<td>AS22 (4 mm)</td>
</tr>
<tr>
<td>AS22 (2 mm)</td>
</tr>
<tr>
<td>AS19 (0.4 mm)</td>
</tr>
<tr>
<td>AS18 (4 mm)</td>
</tr>
<tr>
<td>AS18 (2 mm)</td>
</tr>
<tr>
<td>AS18-Fast (0.4 mm)</td>
</tr>
<tr>
<td>AS15 (3 mm)</td>
</tr>
<tr>
<td>AS14 (4 mm)</td>
</tr>
<tr>
<td>AS9-HC (4 mm)</td>
</tr>
<tr>
<td>CS12A (4 mm)</td>
</tr>
<tr>
<td>CS12A (0.4 mm)</td>
</tr>
<tr>
<td>CS16 (4 mm)</td>
</tr>
<tr>
<td>CS17 (2 mm)</td>
</tr>
</tbody>
</table>

*Quality Assurance Report conditions
¹Non-stop operation
The Reagent-Free Controller (Dionex RFC-30 controller) is an economical way to upgrade an existing Dionex DX-120, DX-320, DX-500, DX-600, or ICS-2500 IC system to an RFIC-EG system. The Dionex RFC-30 controller is a stand-alone eluent generation system that does not require software. This controller coupled with a Dionex EGC cartridge can deliver isocratic or simple gradient eluents. The Dionex RFC-30 controller includes an eluent generator, an electrolytic suppressor controller for Thermo Scientific™ Dionex™ AES™ Atlas™ Electrolytic Suppressor and Thermo Scientific™ Dionex™ ERS™ 500 Electrolytically Regenerated Suppressor, and control for the Dionex Continuously Regenerated Trap Columns (Dionex CR-TC 500 column).

### RFIC-EG COMPONENT SPECIFICATIONS

**Dionex EGC 500 Cartridge Specifications**
- **Cartridge Dimensions (h × diam.):** 25.4 × 10.8 cm (10 × 4.25 in)
- **Cartridge Weight:** 1.4 kg (3.0 lb)
- **Concentration Range:** 0.1–100 mM
- **Flow Rate:** 0.10–3.00 mL/min.
- **Max. Operating Pressure:** 34.5 MPa (5000 psi)
- **Max. Solvent Concentration:** Dionex EGC 500 KOH–25% methanol
  - Dionex EGC 500 MSA–no solvents
  - Dionex EGC 500 K₂CO₃–no solvents
  - Dionex EPM 500–no solvents

**Dionex EGC III Cartridge Specifications**
- **Cartridge Dimensions (h × w × d):** 23 × 7 × 10 cm (9 × 2.75 × 4 in)
- **Cartridge Weight:** 1.6 kg (3.5 lb)
- **Concentration Range:** 0.1–100 mM (0.1–80 mM Dionex EGC-LiOH)
- **Flow Rate:** 0.10–3.00 mL/min.
- **Max. Operating Pressure:** 21 MPa (3000 psi)
- **Max. Solvent Concentration:** Dionex EGC III KOH–25% methanol
  - Dionex EGC III MSA–no solvents

**Dionex EGC Cartridge (Capillary) Specifications**
- **Cartridge Dimensions (h × diam.):** 15 cm × 6.4 cm (6 in × 2.5 in)
- **Cartridge Weight:** 0.375 kg (0.83 lb)
- **Concentration Range:** 0.1–200 mM
- **Flow Rate:** 1–30 µL/min (0.001–0.030 mL/min)
- **Max. Operating Pressure:** 34.5 MPa (5,000 psi)
- **Max. Solvent Concentration:** Dionex EGC KOH (Capillary)–25% Methanol
  - Dionex EGC MSA (Capillary)–no solvents

**RFIC Dionex CR-ATC 500 and Dionex CR-CTC 500 Column Specifications**
- **Dimensions (h × w × l):** 5.1 cm × 5.5 cm × 8.4 cm (2.0 in × 2.15 in × 3.3 in)
- **Weight:** 60 g (0.13 lb)
- **Current Output (Analytical):** < 125 mA
- **Void Volume (Analytical):** < 100 µL
- **Constant Voltage (Analytical):** 24 V dc
- **Current Output (Capillary):** 1 mA
- **Void Volume (Capillary):** <2 µL
- **Constant Voltage (Capillary):** 12 V dc

Dionex EGC Cartridge specifications are available in the document.
## RFIC Suppressor Specifications

**Thermo Scientific™ Dionex™ AERS™ 500 Anion Electrolytically Regenerated Suppressor and Thermo Scientific™ Dionex™ CERS™ 500 Cation Electrolytically Regenerated Suppressor**

<table>
<thead>
<tr>
<th>Dimensions</th>
<th>12.1 × 4.5 × 4.8 cm (4.25 × 1.8 × 1.9 in)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Void Volume</td>
<td>4 mm: &lt; 50 µL, 2 mm: &lt; 15 µL</td>
</tr>
<tr>
<td>Weight</td>
<td>295 g (0.65 lb)</td>
</tr>
<tr>
<td>Current Range</td>
<td>0–500 mA for 4 mm, 0–100 mA for 2 mm</td>
</tr>
</tbody>
</table>

**Thermo Scientific™ Dionex™ AAES™ Anion Atlas Electrolytic Suppressor and Thermo Scientific™ Dionex™ CAES™ Cation Atlas Electrolytic Suppressor**

<table>
<thead>
<tr>
<th>Dimensions</th>
<th>4.9 × 4.4 × 10.2 cm (1.9 × 1.8 × 4.0 in)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Void Volume</td>
<td>&lt; 35 µL</td>
</tr>
<tr>
<td>Weight</td>
<td>120 g (0.3 lb)</td>
</tr>
</tbody>
</table>

**Thermo Scientific™ Dionex™ ACES™ 300 Anion Capillary Electrolytic Suppressor and Thermo Scientific™ Dionex™ CCES™ 300 Cation Capillary Electrolytic Suppressor**

<table>
<thead>
<tr>
<th>Dimensions</th>
<th>9.4 × 3.1 × 10.3 cm (3.7 × 1.2 × 4.1 in)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Void Volume</td>
<td>&lt; 1.5 µL</td>
</tr>
<tr>
<td>Weight</td>
<td>150 g (0.33 lb)</td>
</tr>
<tr>
<td>Current Range</td>
<td>0–25 mA</td>
</tr>
</tbody>
</table>

## DIONEX RFC-30 REAGENT-FREE CONTROLLER SPECIFICATIONS

<table>
<thead>
<tr>
<th>TTL Inputs</th>
<th>Two independent 0–5 V, 0V = On, 5V = Off; ac control</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dimensions (h × w × d):</td>
<td>12.4 × 16.2 × 28.8 cm (4.9 × 6.4 × 11.3 in)</td>
</tr>
<tr>
<td>Weight</td>
<td>2.5 kg (5.5 lb)</td>
</tr>
<tr>
<td>Power Requirements:</td>
<td>Consumption, 500 VA max.; voltage, 100–240 V ac; frequency, 50/60 Hz</td>
</tr>
<tr>
<td>Operating Temperature Range:</td>
<td>4–40 °C</td>
</tr>
<tr>
<td>Operating Humidity Range:</td>
<td>5–95% relative, noncondensing</td>
</tr>
</tbody>
</table>
### 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.

#### Dionex EGC Cartridges
- Dionex EGC III KOH Cartridge: 074532
- Dionex EGC III MSA Cartridge: 074535
- Dionex EGC 500 K₂CO₃ Cartridge: 088453
- Dionex EPM 500 Electrolytic pH Modifier (needed to generate K₂CO₃/KHCO₃ eluent): 088471
- Dionex EGC 500 Carbonate Mixer Kit (2 mm): 088467
- Dionex EGC 500 Carbonate Mixer Kit (4 mm): 088468
- Dionex EGC III NaOH Cartridge: 074533
- Dionex EGC III LiOH Cartridge: 074534
- Splitter/Mixer (used to operate Dionex EGC III NaOH and Dionex EGC III LiOH cartridges in dual-mode for Dionex IonPac Cryptand A1 column chemistry): 063049
- Dionex EGC-KOH (Capillary) Cartridge: 072076
- Dionex EGC-MSA (Capillary) Cartridge: 072077
- Dionex EGC 500 KOH Cartridge: 075778
- Dionex EGC 500 MSA Cartridge: 075779

#### Electrolytic Suppressors
- Dionex AERS 500 (4 mm) Anion Electrolytically Regenerated Suppressor: 082540
- Dionex AERS 500 (2 mm) Anion Electrolytically Regenerated Suppressor: 082541
- Dionex CERS 500 (4 mm) Cation Electrolytically Regenerated Suppressor: 082542
- Dionex CERS 500 (2 mm) Cation Electrolytically Regenerated Suppressor: 082543
- Dionex AAES Anion Atlas Electrolytic Suppressor: 056116
- Dionex CAES Cation Atlas Electrolytic Suppressor: 056118
- Dionex ACES 300 Anion Capillary Electrolytic Suppressor: 072052
- Dionex CCES 300 Cation Capillary Electrolytic Suppressor: 072053

#### Eluent Purification
- Dionex CR-ATC 500 Continuously Regenerated Anion Trap Column: 075550
- Dionex CR-CTC 500 Continuously Regenerated Cation Trap Column: 075551
- Dionex CR-ATC (Capillary) Continuously Regenerated Anion Trap Column: 072078
- Dionex CR-CTC (Capillary) Continuously Regenerated Cation Trap Column: 072079

#### Sample Purifications
- For Hydroxide Eluents:
  - Dionex CRD 200 (4 mm) Carbonate Removal Device: 062983
  - Dionex CRD 200 (2 mm) Carbonate Removal Device: 062986
  - Dionex CRD 200 (Capillary) Carbonate Removal Device: 072054
- For Carbonate Eluents:
  - Dionex CRD 300 (4 mm) Carbonate Removal Device: 064637
  - Dionex CRD 300 (2 mm) Carbonate Removal Device: 064638

#### Reagent-Free Controller
- Dionex RFC-30 Reagent-Free Controller (Dionex EGC III KOH, Dionex CR-ATC 500): 060667
- Dionex RFC-30 (Dionex MSA, Dionex CR-CTC 500, CTS-10) for Dionex DX-120 Only: 060668
- Dionex RFC-30 (Dionex KOH, Dionex CR-ATC 500, CTS-10) for Dionex DX-120 Only: 061413

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