

**Ion chromatography**


## Thermo Scientific Dionex eluent suppressors for ion chromatography

Suppression was introduced in 1975, thereby bringing ion chromatography (IC) to the forefront of modern analytical techniques for inorganic analysis.

Suppression greatly enhances signal-to-noise ratio by:

- Decreasing background eluent conductivity and noise
- Increasing analyte conductivity

We currently offer six suppressors for continuous suppression of the eluent in a broad range of IC applications. Suppressor choice depends on the eluent used, whether organic solvents are used, analyte and matrix concentration, and the type of chromatography being practiced:

- The Thermo Scientific™ Dionex™ DRS 600 Dynamically Regenerated Suppressor is used for electrolytically regenerated suppression in IC applications requiring high capacity, low noise, high backpressure resiliency, and fast startup. The Dionex DRS 600 suppressor is recommended for isocratic and gradient use with hydroxide, methanesulfonic acid, or sulfuric acid eluents in both the standard bore (4 mm) and microbore (2 mm) formats of operation.
- The Thermo Scientific™ Dionex™ ERS™ 500e Electrolytically Regenerated Suppressor for External Water Mode is used for electrolytically regenerated suppression in IC applications requiring operation in the external water mode. The Dionex ERS 500e suppressor is recommended for isocratic and gradient use with hydroxide, methanesulfonic acid, or sulfuric acid eluents in both the standard bore (4 mm) and microbore (2 mm) formats of operation.
- The Thermo Scientific™ Dionex™ AERS™ 500 Carbonate Electrolytically Regenerated Suppressor is used for electrolytically regenerated suppression in IC applications using carbonate eluent. The Dionex AERS 500 Carbonate suppressor is recommended for isocratic use with carbonate eluents in both the standard bore (4 mm) and microbore (2 mm) formats of operation.

- Thermo Scientific™ Dionex™ CES™ 300 Capillary Electrolytic Suppressor is used for electrolytically regenerated suppression in IC applications at a capillary scale (5–30  $\mu\text{L}/\text{min}$ ). The Dionex CES 300 suppressor is recommended for isocratic use with carbonate, hydroxide, or methanesulfonic acid eluents, as well as gradient use with hydroxide or methanesulfonic acid eluents, in the capillary (0.4 mm) format of operation.
- The Thermo Scientific™ Dionex™ CRS™ 500 Chemically Regenerated Suppressor is used for chemically regenerated suppression of IC eluents requiring high capacity, solvents, and/or very low noise. The Dionex CRS 500 suppressor is available in the standard bore (4 mm) and microbore (2 mm) formats of operation.
- The Thermo Scientific™ Dionex™ ACRS-ICE 500 Anion Chemically Regenerated Suppressor is used for chemically regenerated suppression in ion-exclusion and is available in both the standard bore (9 mm) and microbore (4 mm) formats of operation.

### IC separation technology

A typical ion chromatograph consists of several components as shown in Figure 1. The eluent, which is conductive, is delivered to the system using a high-pressure pump. The sample is introduced, then flows through the guard, and into the analytical ion-exchange column where the ion-exchange separation occurs. After separation, the suppressor reduces the conductivity of the eluent and typically increases the conductivity of the analytes so they are delivered to the conductivity cell in a form that increases response. A computer and software are used to control the system, acquire and process the data.

We have continuously worked to improve suppressor technology to provide better sensitivity and consistency for the analysis of a wide variety of compounds.

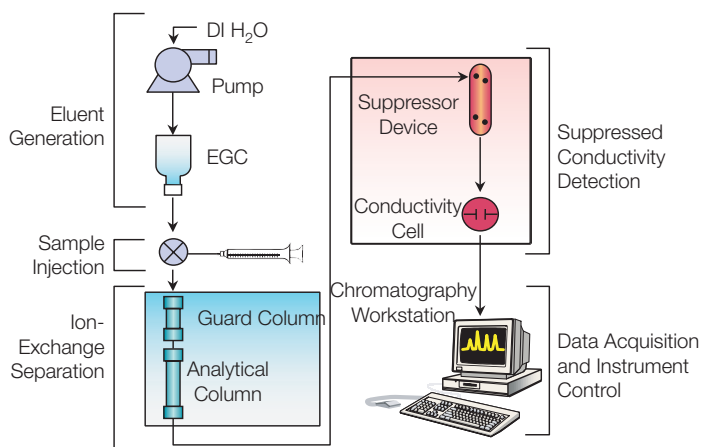


Figure 1. Ion chromatograph using suppressed conductivity detection

### The suppressor advantage

Figure 2 shows an example of suppression used for anion chromatography. The Dionex ADRS 600, Dionex AERS 500e, and Dionex ACES 300 suppressors remove potassium or sodium ions (and other sample cations) from the eluent and replace them with hydronium ions formed by electrolysis of the water regenerant. These hydronium ions combine with the hydroxyl or carbonate ions from the eluent to form water or carbonic acid, which have very low conductivity and associated noise compared with the hydroxide or carbonate eluent. Analyte conductivity is generally enhanced because the analyte anions associate with the highly conductive hydronium ions. Overall improved detection limits are feasible due to the net gain in signal-to-noise ratio using suppressed IC relative to non-suppressed IC.

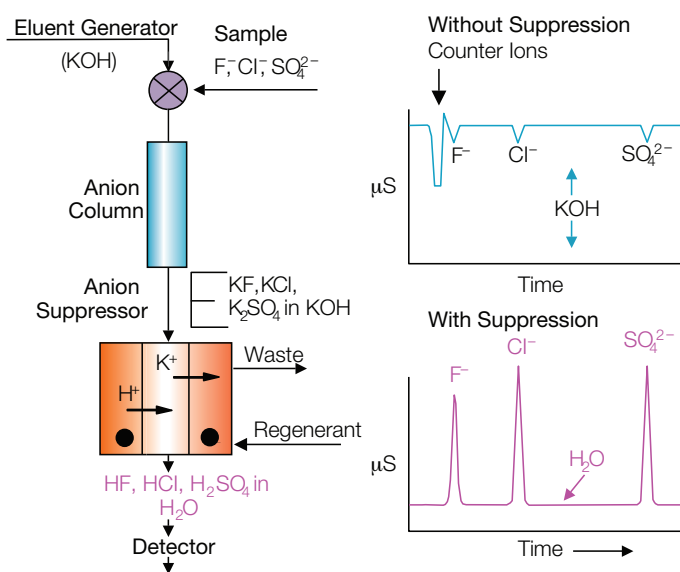


Figure 2. Diagram of eluent suppression for anion chromatography

### Performance comparison

The Dionex DRS 600, Dionex ERS 500e, and Dionex CRS 500 suppressors are high-capacity, continuously regenerated suppressors capable of suppressing eluents for all IC separations, including gradients in the standard bore and microbore scale of operation. The Dionex CES 300 suppressor is a capillary-scale suppressor capable of suppressing all eluents at a capillary-scale. The Dionex AERS 500 Carbonate suppressor is a moderate-capacity, continuously regenerated suppressor capable of suppressing carbonate eluents up to 30 mN.

Suppressor	Regeneration Requirements	Operational Requirements	Suppressor Capacity [mN] × [mL/min]	Benefits	Applications	
					Anions	Cations
<b>Dionex DRS 600 and Dionex ERS 500e Suppressors</b> 2 and 4 mm formats < 15 and < 50 µL void volume	Electrolytic	All existing systems, except Thermo Scientific™ Dionex™ ICS-600 systems (China only)	Anion (Dionex ADRS 600 and AERS 500e): 4 mm: 200 µeq/min 2 mm: 50 µeq/min  Cation (Dionex CDRS 600 and CERS 500e): 4 mm: 100 µeq/min 2 mm: 35 µeq/min	<ul style="list-style-type: none"> <li>High-capacity</li> <li>Versatility</li> <li>Ease-of-use</li> <li>High-pressure operation</li> <li>Low noise</li> <li>Electrolytic regeneration</li> </ul>	<ul style="list-style-type: none"> <li>Hydroxide and carbonate/bicarbonate eluents</li> <li>Borate eluents (Dionex ERS 500e suppressor)</li> <li>For low-level solvent applications use external water (Dionex AERS 500e suppressor)</li> <li>Columns: all anion-exchange columns</li> </ul>	<ul style="list-style-type: none"> <li>Methanesulfonic acid and sulfuric acid eluents</li> <li>For low-level solvent applications, external water (Dionex CERS 500e suppressor)</li> <li>For eluents containing chloride or nitrate use the Dionex CCRS 500 suppressor</li> <li>Columns: all cation-exchange columns except Thermo Scientific™ Dionex™ IonPac™ SCS 1</li> </ul>
<b>Dionex AERS 500 Carbonate Suppressor</b> 2 and 4 mm formats < 15 and < 50 µL void volume	Electrolytic	All existing systems, except Dionex ICS-600 systems (China only)	4 mm: 30 µeq/min, 2 mm: 7.5 µeq/min	<ul style="list-style-type: none"> <li>Optimized for carbonate eluents</li> <li>Lowest noise with carbonate eluents and electrolytic suppression</li> </ul>	Carbonate/bicarbonate eluents	
<b>Dionex CES 300 Suppressor</b> < 1.5 µL void volume	Electrolytic	Requires Capillary IC system (Thermo Scientific™ Dionex™ ICS-5000+ HPIC™ or Thermo Scientific™ Dionex™ ICS-4000 HPIC™ system)	Anion (Dionex ACES suppressor): 2 µeq/min  Cation (Dionex CCES suppressor): 1.5 µeq/min	<ul style="list-style-type: none"> <li>Compatible with capillary flow rates</li> <li>Versatility</li> <li>Ease-of-use</li> <li>Low noise</li> <li>Electrolytic regeneration</li> <li>Limited solvent compatibility</li> </ul>	<ul style="list-style-type: none"> <li>Hydroxide and carbonate/bicarbonate eluents</li> <li>For low-level solvent applications use external water or chemical regeneration</li> <li>All capillary anion-exchange columns</li> <li>Isoocratic and gradient eluents</li> </ul>	
<b>Dionex CRS 500 Suppressor</b> 2 and 4 mm formats < 15 and < 50 µL void volume	Chemical	All existing systems Required for the Dionex ICS-600 system (China only)	Anion (Dionex ACRS 500 suppressor): 4 mm: 150 µeq/min 2 mm: 75 µeq/min  Cation (Dionex CCRS 500 suppressor): 4 mm: 75 µeq/min 2 mm: 37.5 µeq/min	<ul style="list-style-type: none"> <li>Solvent compatibility</li> <li>Lowest noise</li> <li>Fastest startup</li> </ul>	<ul style="list-style-type: none"> <li>Carbonate/bicarbonate, borate and hydroxide eluents containing solvents</li> <li>Columns: all anion-exchange columns</li> </ul>	<ul style="list-style-type: none"> <li>Methanesulfonic acid and sulfuric acid eluents and eluents containing solvents, chloride, or nitrate</li> <li>Columns: all cation exchange columns except Dionex IonPac SCS 1</li> </ul>
<b>Dionex ACRS-ICE-500 Suppressor</b> 4 and 9 mm formats < 15 and < 50 µL void volume	Chemical	All existing systems		<ul style="list-style-type: none"> <li>Recommended for ion-exclusion chromatography</li> </ul>	<ul style="list-style-type: none"> <li>Any Dionex IonPac ICE column set with suppressed conductivity detection</li> <li>Useful for IC of weak acids</li> </ul>	

## Chemical Specifications

Suppressor	Temperature Range <sup>1</sup>	Recommended Backpressure	Maximum Eluent Flow Rate	Eluent Solvent Restrictions <sup>2</sup>	Maximum Regenerant EWM <sup>3</sup> Flow Rate	Modes of Operation Supported	Maximum Current
Dionex ADRS 600	15–50 °C	30–100 psi	3 mL/min (4 mm), 1 mL/min (2 mm)	Not Recommended <sup>7</sup>	5 mL/min (4 mm) 2 mL/min (2 mm)	Recycle, EWM <sup>3,7</sup>	500 mA for 4 mm (recommended for use with Chromeleon CDS) 150 mA for 2 mm
Dionex CDRS 600	15–50 °C	30–100 psi	3 mL/min (4 mm), 0.75 mL/min (2 mm)	Not Recommended <sup>7</sup>	5 mL/min (4 mm) 2 mL/min (2 mm)	Recycle, EWM <sup>3,7</sup>	300 mA for 4 mm, (recommended for use with Chromeleon CDS) 110 mA for 2 mm
Dionex AERS 500 Carbonate	15–40 °C	40–100 psi	3 mL/min (4 mm), 1 mL/min (2 mm)	< 40% oxidizable	5 mL/min (4 mm) 2 mL/min (2 mm)	Recycle, EWM <sup>3</sup>	125 mA for 4 mm, 30 mA for 2 mm
Dionex AERS 500e	15–40 °C	30–100 psi	3 mL/min (4 mm), 1 mL/min (2 mm)	< 40% oxidizable solvents in EWM <sup>3</sup>	5 mL/min (4 mm) 2 mL/min (2 mm)	Recycle, EWM <sup>3</sup>	500 mA for 4 mm, 150 mA for 2 mm
Dionex CERS 500e	15–40 °C	30–100 psi	3 mL/min (4 mm), 0.75 mL/min (2 mm)	< 40% oxidizable solvents in EWM <sup>3</sup>	5 mL/min (4 mm), 2 mL/min (2 mm)	Recycle, EWM <sup>3</sup>	300 mA for 4 mm, 110 mA for 2 mm
Dionex ACES 300	15 °C	20–100 psi	0.30 mL/min	< 40% solvent in EWM <sup>3</sup>	0.100 mL/min	Recycle, EWM <sup>3</sup>	20 mA
Dionex CCES 300	15 °C	20–100 psi	0.30 mL/min	< 40% solvent in EWM <sup>3</sup>	0.100 mL/min	Recycle, EWM <sup>3</sup> (recycle recommended)	20 mA
Dionex CCRS 500	15–40 °C	30–60 psi	3 mL/min (4 mm), 0.75 mL/min (2 mm)	100% solvent compatible	10 mL/min (4 mm) 5 mL/min 2 mm	Chemical, DCR mode	na
Dionex ACRS 500	15–40 °C	30–60 psi	3 mL/min (4 mm), 0.75 mL/min (2 mm)	100% solvent compatible	10 mL/min (4 mm) 5 mL/min 2 mm	Chemical, DCR mode	na
ACRS-ICE 500	15–40 °C	40 psi	3 mL/min	90% solvent	10 mL/min compatible	Chemical, DCR mode	na

<sup>1</sup> When installed outside the heated column enclosure, all suppressors excluding Dionex CES 300 suppressor can support applications up to 60 °C.

<sup>2</sup> Solvents for anion eluents include methanol. Solvents for cation eluents include acetonitrile and dioxane.

<sup>3</sup> EWM = external water mode; for eluents containing > 40% solvent, use the chemical regeneration mode.

<sup>4</sup> Recycle recommended for aqueous applications without solvent.

<sup>5</sup> Do not use THF solvent in the eluent.

<sup>6</sup> Dionex ACES 300 and Dionex CCES 300 suppressors require 15 °C for recycled eluent mode of operation.

<sup>7</sup> Dionex ADRS 600 can be used in External Water Mode, however the Dionex AERS 500e is recommended if borate eluent or eluents containing oxidizable solvents such as methanol are used.

The Dionex CRS 500 suppressor is recommended for the best long-term performance when using solvent in the eluent. The DRS 600 Dynamically Regenerated Suppressor replaces the Thermo Scientific™ Dionex™ ERS™ 500 Electrolytically Regenerated Suppressor. The Thermo Scientific™ Dionex™ ERS™ 500e Electrolytically Regenerated Suppressor is recommended for external water applications and Thermo Scientific™ Dionex™ AERS 500 Carbonate Anion Electrolytically Regenerated Suppressor is recommended for carbonate Eluents.

The Dionex DRS 600 family of suppressors and Dionex CRS 500 suppressors are available in two formats, 4 mm and 2 mm. The 4 mm suppressors are used with 5 and 4 mm columns. The 2 mm suppressors are used with 3 and 2 mm columns. The Dionex ACRS-ICE 500 suppressors are available in two formats, 9 mm and 4 mm. The 9 mm suppressor is used with 9 mm Thermo Scientific™ Dionex IonPac ICE columns. The 4 mm suppressor is used with 4 mm Dionex IonPac ICE columns.

The internal void volume of the suppressor can affect the efficiency of a separation. To maintain maximum peak efficiencies when using 1, 2, or 3 mm columns, the 2 mm Dionex DRS 600 or 2 mm Dionex CRS 500 suppressors should be used.

### Noise comparison

The Dionex DRS 600 suppressor offers very low noise for hydroxide, and MSA eluents, whereas the Dionex AERS 500 Carbonate suppressor provide the lowest noise for carbonate eluent suppression. The Dionex CRS 500 suppressor produces the lowest overall noise because it uses non-electrolytic chemical regeneration and therefore does not add any noise to the system. The Dionex ERS 500 Carbonate suppressor provides very low noise for carbonate eluents when used in conjunction with the Thermo Scientific™ Dionex™ CRD 300 Carbonate Removal Device. Low noise levels translate into lower method detection limits.

### Dynamically regenerated suppressor (Dionex DRS 600) for IC analysis

The Dionex DRS 600 family of suppressors enhances analyte conductivity while suppressing eluent conductivity. The Thermo Scientific™ Dionex™ AutoSuppression™ devices provides significant improvement in analyte detection limits. The ions required for eluent suppression are generated by the continuous electrolysis of water. Therefore, the Dionex DRS 600 suppressor family of suppressors deliver low backgrounds and low noise levels without the need for manually prepared regenerant solutions or off-line regeneration of the suppressor.

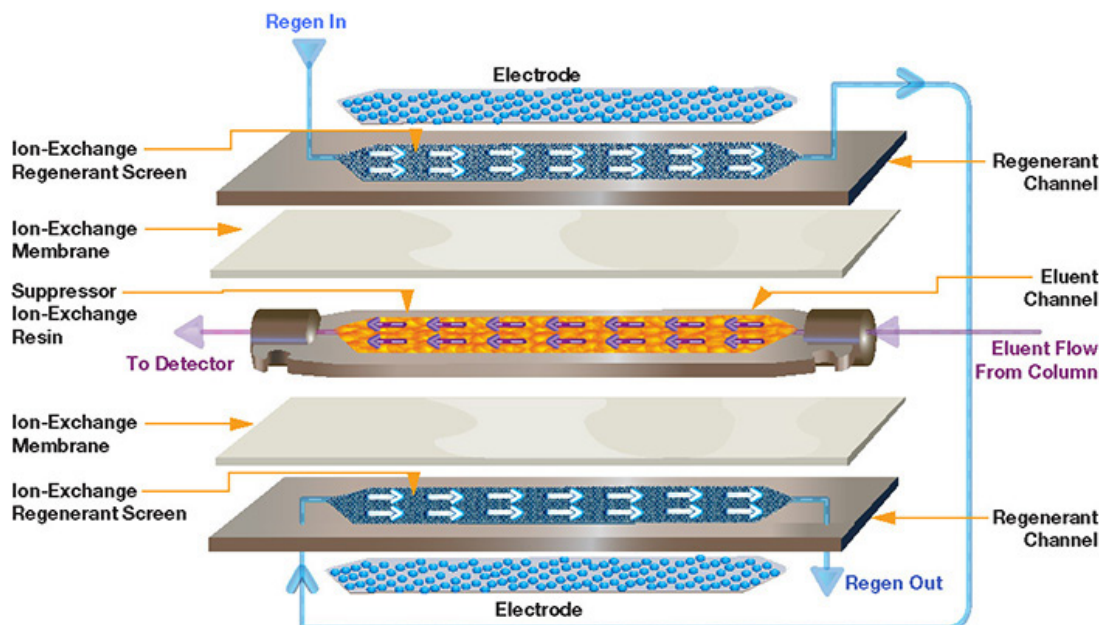
Physical Specifications			
Suppressor	Dimensions	Void Volume	Weight
Dionex DRS 600	12.1 × 4.5 × 4.8 cm	4 mm: < 50 µL	295 g (0.65 lb)
Dionex ERS 500 Carbonate	(4.25 × 1.8 × 1.9 in)	2 mm: < 15 µL	
Dionex ERS 500e			
Dionex CRS 500	14.0 × 4.5 × 4.8 cm	4 mm: < 50 µL 2 mm: < 15 µL	370 g (0.82 lb)
Dionex ACRS-ICE 500	14.0 × 4.5 × 4.8 cm (5.5 × 1.8 × 1.9 in.)	9 mm: < 50 µL 4 mm: < 15 µL	370 g (0.82 lb)
Dionex CES 300	10.3 × 3.1 × 10.3 cm (5.5 × 1.8 × 1.9 in.)	< 1.5 µL	150 g (0.3 lb)

Table 1. Dionex DRS 600 suppressor modes of operation

Mode	Benefit	Application
Recycle	Easy-to-use	Aqueous eluents, limited solvents
Gas-Assisted Recycle*	Easy-to-use, low noise	Aqueous eluents, limited solvents, low level analysis
External Water	Low noise, solvent compatible	Eluents containing < 40% solvent trace-level analysis, interface with MS and postcolumn reactions
Gas-Assisted External Water*	Low noise, solvent compatible, reduces water requirement	Eluents containing < 40% solvent, trace-level analysis
Thermo Scientific™ Dionex™ MPIC™ Mobile Phase IC	Low noise	Anion ion-pairing and ion suppression Cation ion-pairing and ion suppression

\*Requires P/N 056886.





**Figure 3. Internal construction of the Dionex DRS 600 suppressor.** The Dionex ERS 500e and Dionex ERS 500 Carbonate have a similar construction. The Dionex ERS 500e uses a pair of tees to direct the regenerant flow to the regenerant channels in parallel, similar to the Dionex CRS 500, see Figure 10. The Dionex ERS 500 Carbonate also uses a parallel regenerant flow configuration as well as using a divided electrode as the anode.

### System requirements

The Dionex DRS 600 suppressor is designed to be a direct replacement for the Dionex ERS 500 suppressor, as well as all Dionex SRS series suppressors (Dionex SRS I, Dionex SRS II, Dionex SRS ULTRA, Dionex SRS ULTRA II and Dionex SRS 300). The Dionex DRS 600 suppressor can be used in place of any of these suppressors where recycled eluent mode or external water mode is employed.

The Dionex ERS 500e is designed for applications where difficult sample matrices or zwitterionic species are being analyzed. The ion-exchange screen in the Dionex ERS 500e reduces the static capacity of the suppressor, thus improving compatibility with samples and matrices that have an affinity for the ion exchange resin found in the Dionex DRS 600 suppressor.

The Dionex AERS 500 Carbonate suppressor is designed for operation with carbonate and carbonate/bicarbonate eluents. The Dionex AERS 500 Carbonate suppressor features a hardware design that significantly improves noise performance with carbonate eluents without sacrificing performance or ease-of-use. The unique hardware design delivers the lowest noise level of any electrolytic suppressor for carbonate eluents.

The Dionex DRS 600, Dionex ERS 500e and Dionex AERS 500 Carbonate suppressors are not designed to be direct replacements for the Dionex SRS series of suppressors where these suppressors are being used in Chemical Suppression

Mode. If Chemical Suppression Mode is being used, the Thermo Scientific™ Dionex™ CRS 500 Chemically Regenerated Suppressor, or equivalent, is recommended. The Dionex ERS 500e and Dionex AERS 500 Carbonate suppressors can be used in the Chemical Suppression Mode, however, the total suppression capacity is reduced compared to a chemically regenerated suppressor.

The Dionex DRS 600 suppressor is also designed to be a direct replacement for the Thermo Scientific™ Dionex™ SRN™ series of neutralizers, such as the Dionex SRN 300, Dionex SRN-II and Dionex SRN products.

The Dionex DRS 600, Dionex ERS 500e and Dionex AERS 500 Carbonate suppressors are designed to be run on any Dionex ion chromatography system equipped with an analytical anion- or cation-exchange column set and an electrolytic suppressor controller, such as the Thermo Scientific™ Dionex™ ICS-6000 HPIC system, Thermo Scientific™ Dionex™ Integrion™ HPIC™ system, or Thermo Scientific™ Dionex™ Aquion™ IC system. They are not designed to be run on a capillary ion chromatography system, such as the Thermo Scientific™ Dionex™ ICS-4000 HPIC system, or on ion chromatography systems that do not have an electrolytic suppressor controller, such as the Thermo Scientific™ Dionex™ ICS-90, Dionex ICS-600, or Dionex ICS-900. **Some legacy systems require a standalone controller for installation of the Dionex DRS 600, Dionex ERS**

**500e or Dionex AERS 500 Carbonate suppressors. See, “Electrolytically Regenerated Suppressor Requirements for Selected IC Modules.”**

The Dionex DRS and Dionex ERS suppressor control is provided by power supplies that can deliver power in 1 mA increments up to 500 mA. Discrete (50, 100, 300, and 500

mA) power supplies are integrated into older systems, such as the CDM-3 and PED-2 of the Dionex DX-300, the Dionex DX-100 (Model 1-03), Dionex DX-120, Dionex DX-320 (IC20 and IC25 models), Dionex DX-500 (CD20 and ED40 detectors), and Dionex DX-600 systems (CD25 and ED50 detectors). **The use of discrete power supplies is no longer supported on Thermo Scientific products.**

Table 2. Eluent Composition and Suppression Mode Compatibility

Eluent Composition	Recycled Eluent Mode	External Water Mode	Chemical Regeneration Mode <sup>(1)</sup>	MPIC Suppression
Aqueous Eluents (excluding Borate, Carbonate)	DRS 600 ERS 500e	DRS 600 ERS 500e	DRS 600 ERS 500e CRS 500	No
Aqueous Borate Eluents	No	DRS 600 ERS 500e	DRS 600 ERS 500e CRS 500	No
Aqueous Carbonate Eluents	DRS 600 ERS 500e AERS 500 Carbonate	DRS 600 ERS 500e AERS 500 Carbonate	DRS 600 ERS 500e AERS 500 Carbonate CRS 500	No
Aqueous Eluents containing solvents up to 40%	No	DRS 600 ERS 500e	DRS 600 ERS 500e CRS 500	DRS 600 ERS 500e
Eluents containing solvents up to 100%	No	No	DRS 600 ERS 500e CRS 500	DRS 600 ERS 500e
Eluents containing non-oxidizable solvents (such as IPA)	DRS 600 ERS 500e	DRS 600 ERS 500e	DRS 600 ERS 500e CRS 500	DRS 600 ERS 500e
Eluent containing Ion Pair Reagents	No	No	No	DRS 600 ERS 500e
Simple Aqueous Samples	DRS 600 ERS 500e AERS 500 Carbonate	DRS 600 ERS 500e AERS 500 Carbonate	DRS 600 ERS 500e AERS 500 Carbonate CRS 500	DRS 600 ERS 500e
Complex Aqueous Samples	No	DRS 600 ERS 500e AERS 500 Carbonate	DRS 600 ERS 500e AERS 500 Carbonate CRS 500	DRS 600 ERS 500e
Samples Containing Solvents	No	DRS 600 ERS 500e AERS 500 Carbonate	DRS 600 ERS 500e AERS 500 Carbonate CRS 500	DRS 600 ERS 500e

## Dionex DRS 600 suppressor for maximum flexibility

The Dionex DRS 600 family of suppressors is designed for maximum flexibility. The Dionex DRS 600 suppressors do not restrict the user to one or two columns and eluents. These suppressors are compatible with the full range of ion-exchange columns and isocratic or gradient eluents.

The Dionex DRS 600 and Dionex ERS 500 suppressor design is composed of three channels defined by two ion-exchange membranes. The central channel is the eluent channel and the two side channels are regenerant channels. Two PEEK plates form the outer wall of the regenerant channels and have ¼-24 ports for bringing the regenerant liquid into and out of the device. The eluent channel is physically defined by a PEEK plate that seals against the ion exchange membrane and a thin elastomeric O-ring installed in the regenerant channel. The eluent in and out ports are independent ports that define the fluidic pathway, similar to a column. The regenerant flow is arranged to be counter-current to the eluent flow. This orientation ensures complete regeneration of the device. The only difference between the Dionex DRS 600 and Dionex ERS 500 suppressors is the functionality of the resin in the eluent channel.

Electrodes are placed along the length of the regenerant channels to completely cover the regenerant channel. In operation, when a DC voltage is applied across the electrodes and the voltage exceeds the standard potential for the electrolysis of water (approximately 1.5 V), water is electrolytically split to form electrolysis ions.

**At the anode**  $\text{H}_2\text{O} \rightarrow 2\text{H}^+ + 1/2\text{O}_2 + 2\text{e}^-$

**At the cathode**  $2\text{H}_2\text{O} + 2\text{e}^- \rightarrow 2\text{OH}^- + \text{H}_2$

Eluents or samples containing up to 40% oxidizable organic solvent can be suppressed using the AutoSuppression external water mode. In external water mode, the water for electrolysis is supplied from an external source (see Figure 5). This mode also can be enhanced with the use of the gas-assisted mode, which reduces the regenerant consumption and lowers noise. Although all Dionex DRS 600 suppressors can be operated in external water mode, the Dionex ERS 500e suppressor has been specifically optimized for this mode and the preferred solution. When using eluents containing solvent (up to 40%) or borate, the Dionex ERS 500e suppressor gives longer lifetime and lower noise.

Installation kits are available for each of these modes of operation, see the Ordering Information section.

The Dionex ERS 500e suppressor can also be used to suppress eluents for Dionex MPIC Mobile Phase IC when the organic solvent content of the eluent remains below 40%.

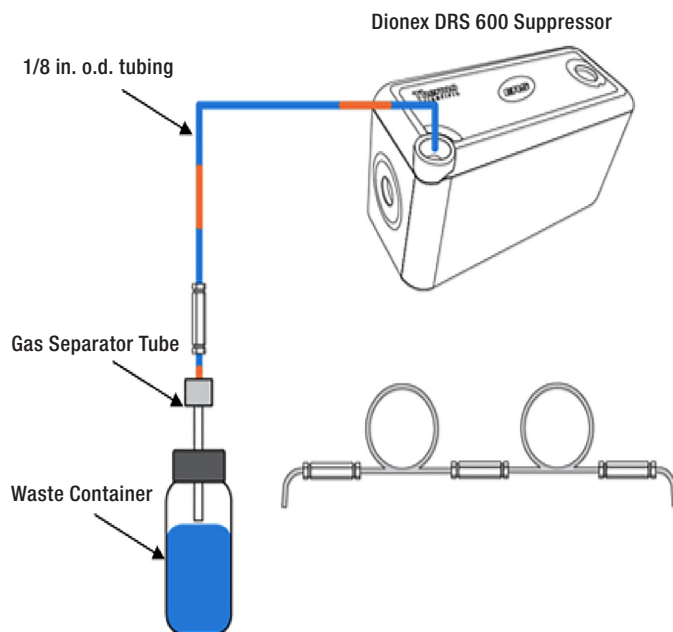


Figure 4. The Dynamically Regenerated Suppressor and Accessories.

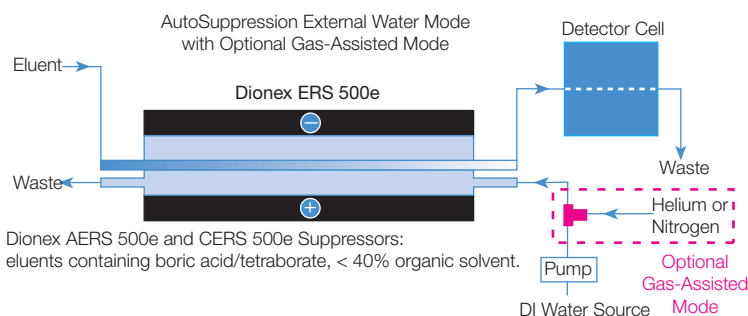


Figure 5. Eluent flow in the AutoSuppression external water mode with optional gas-assisted mode. The deionized water used for the electrolysis process is supplied from a constant pressure source or pump. This mode is ideal for operation with eluents and samples containing up to 40% organic solvent. With the optional gas-assisted mode, gas is added to the external water, which is pumped through the Dionex ERS 500e suppressor at a consistent flow rate between 1–2 mL/min. This mode decreases the amount of water required for the external water mode.

Finally, the Dionex AERS 500 Carbonate suppressor is designed for optimal performance when using carbonate or carbonate/bicarbonate eluents. The design of the Dionex AERS 500 Carbonate suppressor results in significantly lower noise levels when used with carbonate or carbonate/bicarbonate eluents. For routine analysis, the peak response and efficiencies are equivalent to the performance of a Dionex DRS 600 suppressor, but with lower noise.



## Dionex ADRS 600 suppressor for anion-exchange Chromatography

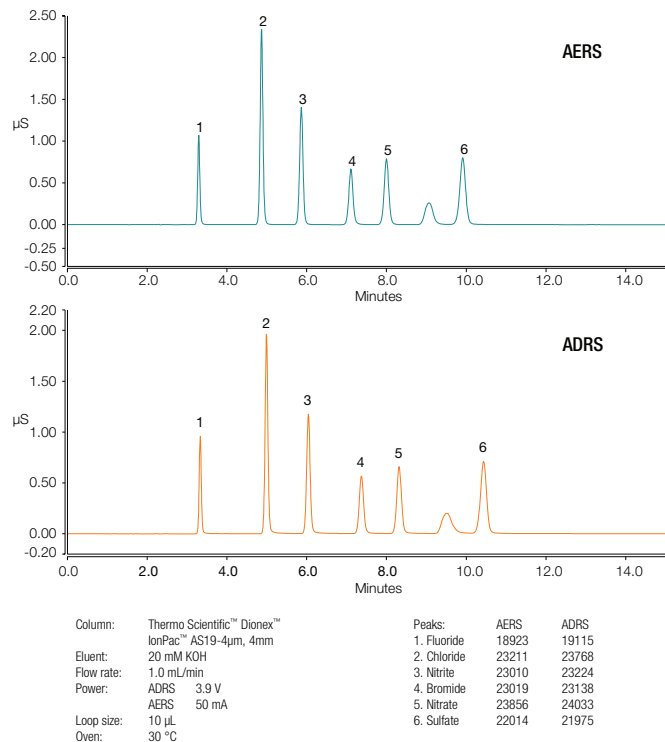


Figure 6. Comparison of the Dionex ADRS 600 suppressor to the Dionex AERS 500 suppressor using an anion standard. The Dionex ADRS 600 suppressor outperforms the Dionex AERS 500 suppressor, as shown by the peak efficiencies.

## Dionex ADRS 600 suppressor for anion-exchange chromatography

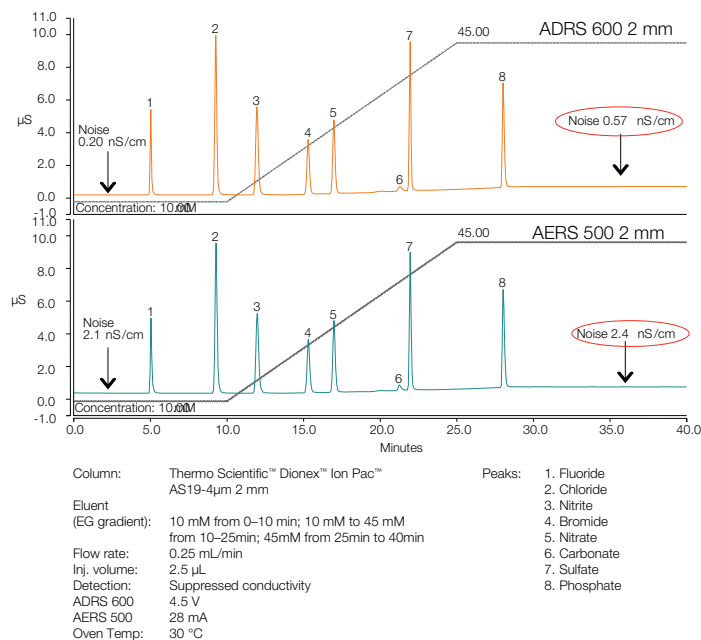


Figure 7. Comparison of the Dionex ADRS 600 suppressor to the Dionex AERS 500 suppressor under gradient conditions. The Dionex ADRS 600 suppressor outperforms the Dionex AERS 500 suppressor, as shown by the noise values.

## Dionex ERS 500e suppressor for mobile phase ion chromatography

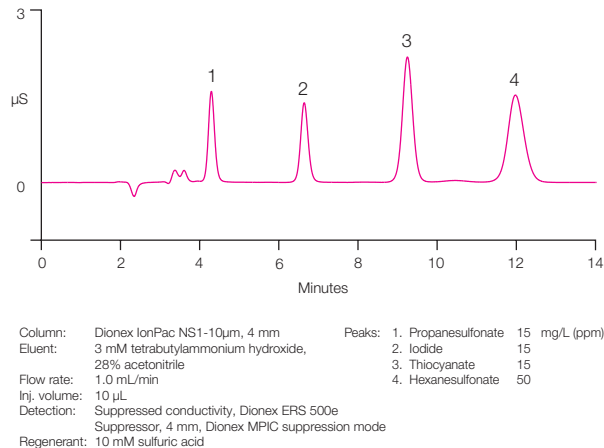


Figure 8. The Dionex AERS 500e or Dionex CERS 500e suppressors can suppress eluents used for Dionex MPIC Mobile Phase IC. In this example, the anion Dionex MPIC Mobile Phase IC suppression mode uses electrolysis augmented by sulfuric acid regenerant to supply the hydronium ions for suppression. Similarly, the Dionex CSRS or Dionex CERS 500e suppressor can be used for cation Dionex MPIC Mobile Phase IC ion-pairing separations.

## Dionex CRS 500 chemically regenerated suppressor for chemically regenerated eluent suppression

The Dionex CRS 500 suppressor uses continuous chemical suppression to enhance analyte conductivities while decreasing eluent conductivity. While using continuous chemical regeneration, the Dionex CRS 500 suppressor enables direct conductivity detection with ion-exchange applications using isocratic or gradient elution over wide concentration ranges (Figure 9).

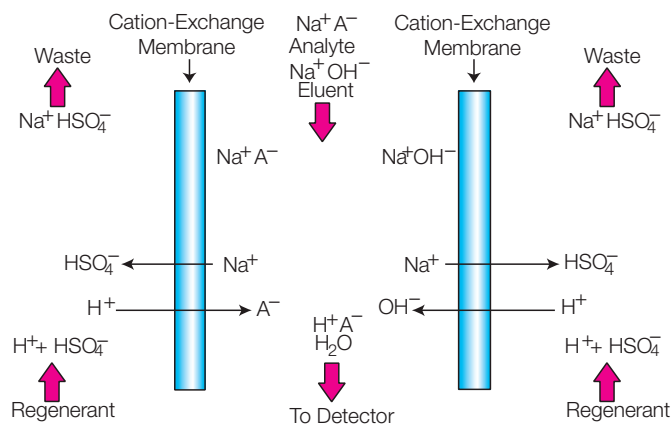


Figure 9. The Dionex CRS 500 suppressor enables direct conductivity detection with ion-exchange applications using isocratic or gradient elution over wide concentration ranges

The Dionex CRS 500 has a new hardware design that allows the suppressor to be more pressure tolerant than previous generation suppressor devices. The suppressor flow pathway has been redesigned to optimize band dispersion, improve the flow and sealing properties. The Dionex CRS 500 continues to use the same cleaned ion exchange components (screens and membranes) as the Dionex MMS 300 suppressor devices; however, the Dionex CRS 500 eluent channel uses an ion exchange screen as opposed to a gasketed screen. Figure 10 illustrates the internal design of the Dionex CRS 500 suppressor.

### Dionex CRS 500 suppressor for sensitive ion-exchange chromatography

When compared to non-suppressed IC, chemical suppression increases the linear working range of analytes by several orders of magnitude and improves detection limits for analytes 20–100 times. The Dionex CRS 500 suppressor is designed with minimal internal dead volume to provide high suppression capacity with minimal peak dispersion. The net result of chemical suppression is a dramatic improvement in signal-to-noise compared to non-suppressed applications.

### Dionex CRS 500 operational modes

The Dionex CRS 500 suppressor can be used in the conventional pressurized bottle mode, the displacement chemical regeneration (DCR) mode, or the peristaltic pump mode. Convenient concentrated regenerant solutions are available for each mode of operation.

The DCR mode is a convenient and economical mode of operation for chemical suppressors in which the regenerant is displaced by using conductivity cell effluent, delivering regenerant to the suppressor at a flow rate equal to the eluent flow rate (Figure 11). In this mode, the regenerant bottle is completely filled with regenerant upon start-up. As the cell effluent is pumped into the regenerant bottle, the regenerant is forced out into the suppressor regen chambers. No additional pump or pressure is required. Eluent and regenerant bottles are of equivalent volumes and new regenerant is prepared when new eluent is installed. The low regenerant flow rate minimizes waste and allows unattended operation, offering an economical option to the AutoRegen or pressurized bottle mode.

The conventional pressurized bottle mode uses a pressurized reservoir to deliver the chemical regenerant to the Dionex CRS 500 suppressor (Figure 12). The pressure is set at 3–10 psi, which delivers the regenerant to the Dionex CRS 500 suppressor at approximately 5–10 mL/min for 4 mm (3–8 mL/min for 2 mm). The spent regenerant is then diverted to waste. This mode offers the lowest possible noise levels as it eliminates pump pulsation from the regenerant delivery system.

The new peristaltic pump mode uses a peristaltic pump to deliver the regenerant to the Dionex CRS 500 suppressor at a controlled flow rate. A two-channel pump is available, and can be used to deliver Dionex CRS 500 regenerant and Thermo Scientific Dionex CRD 300 Carbonate Removal Device regenerant simultaneously.

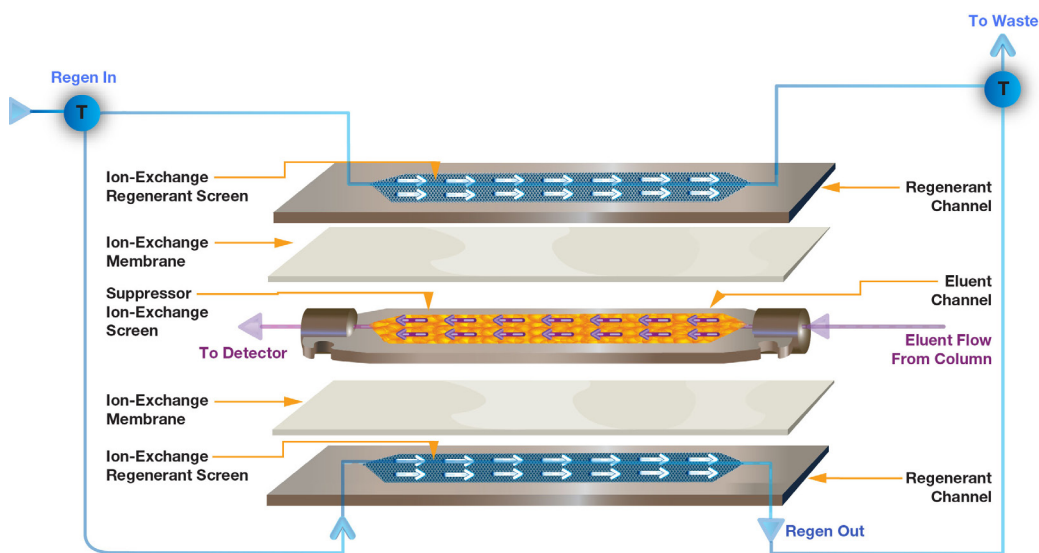


Figure 10. Internal construction of the Dionex CRS 500 suppressor. The Dionex CRS 500 suppressor is a high-capacity suppressor. The Dionex ERS 500e and Dionex DRS 600 suppressor use a similar regenerant flow design, but share the ERS 500 suppressor electrode configuration.

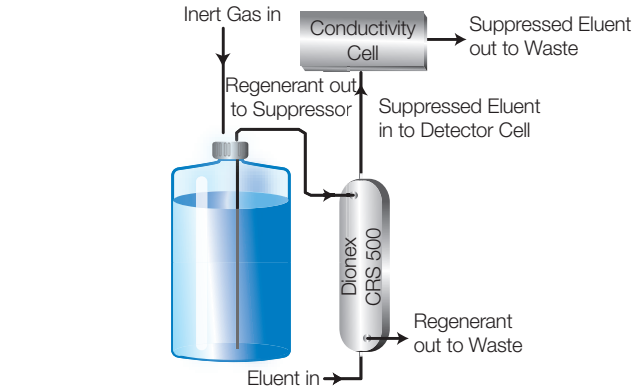
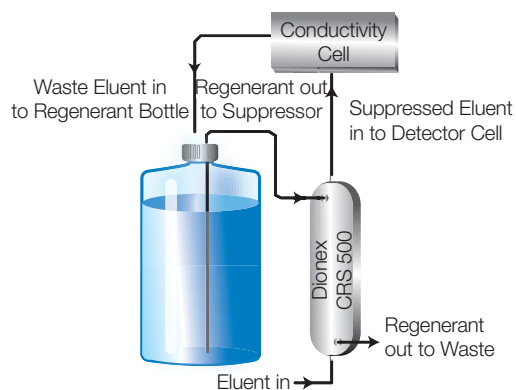


Figure 11. In the DCR mode, the regenerant is displaced by the eluent flow into the regenerant bottle. The regenerant flow is directed to the suppressor's Regen In port. This mode of operation is convenient and economical because the regenerant flow rate is reduced to and controlled by the eluent flow rate.

Figure 12. In pressurized bottle mode, the regenerant reservoir is pressurized to deliver the regenerant to the suppressor. The spent regenerant is then collected as waste.

Table 3. Dionex CRS 500 suppressor modes of operation

Mode	Benefit	Application
Displacement chemical regeneration (DCR)	Low noise and ease-of-use with extended unattended operation	Chemical regeneration with Displacement Chemical Regeneration Kit
Pressurized bottle	Lowest noise	Chemical regeneration with External Regeneration Kit
Peristaltic Pump	Low noise and ease-of-use	Peristaltic Pump Kit

Table 4. Dionex CRS 500 suppressor

Anions	Cations
Use with carbonate/bicarbonate and hydroxide eluents and for eluents containing solvents	Use with methanesulfonic acid and sulfuric acid eluents and eluents containing solvents, chloride, or nitrate
Columns: All anion-exchange columns	Columns: All cation-exchange columns except for the Dionex IonPac SCS-1 column

## High efficiency

The Dionex CRS 500 suppressor is available in both standard bore (5 and 4 mm) and microbore (2 and 3 mm) formats. The standard bore suppressors have a low void volume of less than 50  $\mu\text{L}$  to maintain the efficiency of ion-exchange separations using 4 or 5 mm columns. The microbore Dionex CRS 500 suppressor format is optimized to maintain the efficiency of ion-exchange separations when using either 2 or 3 mm columns (Figures 14 and 15).

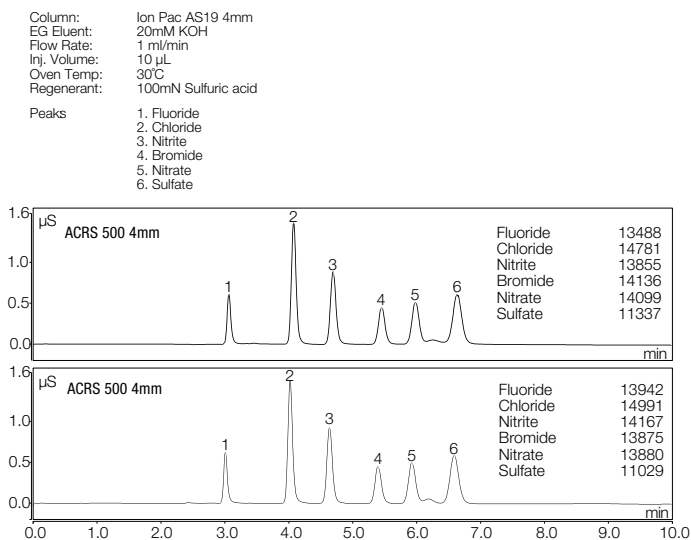


Figure 14. Comparison of Dionex ACRS 500 suppressor with Dionex ACRS 500 suppressor using the RFIC generated hydroxide eluent. The Dionex ACRS 500 suppressor outperforms the ACRS 500 suppressor as shown by the peak efficiency.

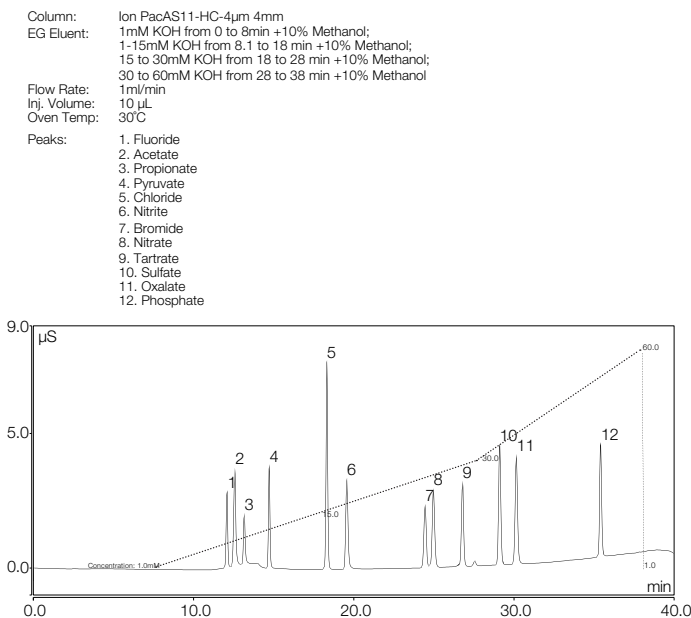


Figure 15. Anion gradient application containing solvent using the Dionex IonPac AS11-HC 4  $\mu\text{m}$  (4 mm) column and the Dionex ACRS 500 (4 mm) suppressor.

## High suppression capacity

The Dionex CRS 500 suppressor is a direct replacement for the CRS 500 suppressor as well as older chemical suppressor devices, including the Dionex MMS 300, Dionex MMS III, Dionex MMS II, Dionex MMS I, and packed-bed suppressors. The Dionex CRS 500 suppressor accommodates both isocratic elution and rapidly increasing gradients to high eluent concentrations (above 100 mM hydroxide for the Dionex ACRS 500 4 mm suppressor) while maintaining low background conductance.

## Compatible with HPLC solvents

The Dionex CRS 500 suppressor is compatible with typical HPLC solvents and are recommended for both anion and cation separations when solvents are used in the eluents (Figures 16 and 17). Solvent compatibility allows flexibility when optimizing eluent conditions for more demanding separations.

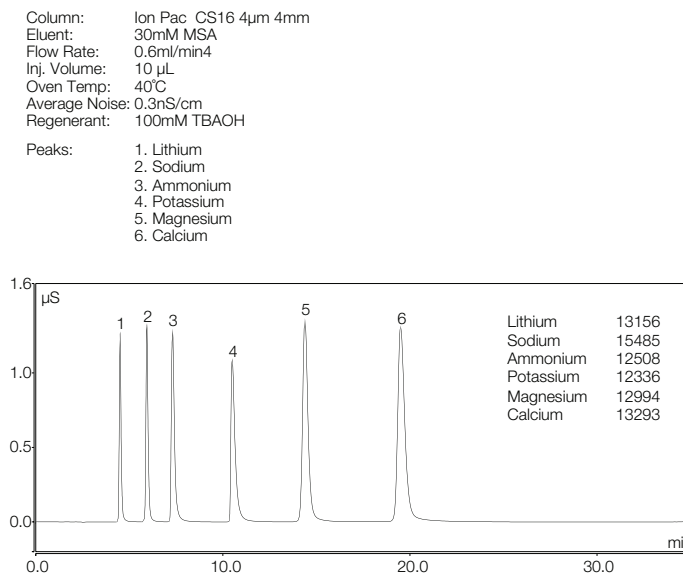


Figure 16. Cation separation using the Dionex IonPac CS16 4  $\mu\text{m}$  (4 mm) column and the Dionex CCRS 500 (4 mm) suppressor in the pressurized bottle mode

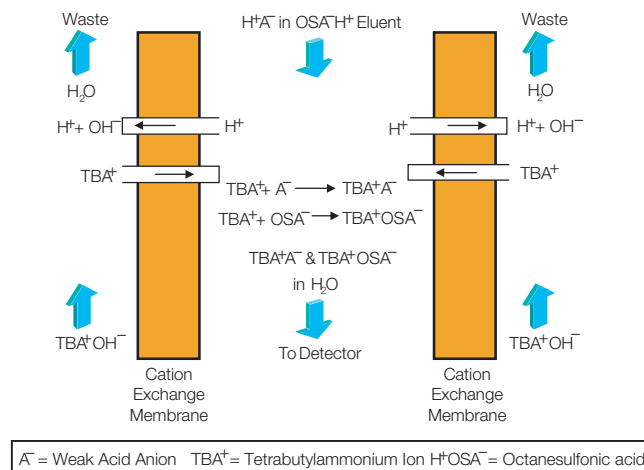


Figure 17. Dionex ACRS-ICE 500 suppressor suppression process for ion-exclusion chromatography.

## Dionex ACRS-ICE 500 chemically regenerated suppressor for chemically regenerated eluent suppression of ICE eluents

The Dionex ACRS-ICE 500 is a high-capacity, low-void volume, membrane-based eluent suppressor designed for use with the ion-exclusion and ion-suppression separation modes of IC. The Dionex ACRS-ICE 500 uses chemical suppression to increase analyte ionization and therefore conductivity while decreasing eluent conductivity. The result is a significant improvement in analyte detection limits.

### Increased sensitivity with suppressed conductivity detection

The Dionex ACRS-ICE 500 suppressor is used in chemical suppression mode with a tetrabutylammonium hydroxide (TBAOH) regenerant. The Dionex ACRS-ICE 500 suppressor decreases background eluent conductivity by displacing the highly conductive hydronium ions from the eluent into the regenerant chambers, followed by a neutralization step in the regenerant chambers. The resulting TBA<sup>+</sup> OSA<sup>-</sup> pair has low conductance. Figure 18 illustrates the suppression process for the Dionex ACRS-ICE 500 suppressor.

The cation-exchange membrane in the Dionex ACRS-ICE 500 suppressor allows the hydronium ions from the eluent to pass into the regenerant chambers where they are neutralized by hydroxide ions from the TBAOH regenerant.

Analyte conductivity is increased by forming the TBA salt of the weak acid analyte, which is more conductive than the partially ionized acid form of the analyte.

### Optimized for ion-exclusion chromatography and ion-suppression chromatography

The Dionex ACRS-ICE 500 suppressor has been improved to allow use at temperatures up to 40 °C with eluents containing HPLC solvents. Elevated temperatures or solvents can be used to increase peak efficiency or alter column selectivity in ion-exclusion and ion-suppression separations. The suppressor can be placed outside a chromatography oven for operation at elevated temperatures above 40 °C.

The Dionex ACRS-ICE 500 suppressor is designed for use with either the ion-exclusion or ion-suppression separation modes of IC. Both modes use dilute eluents containing acids with low pKa values. Ion-exclusion chromatography uses a cation-exchange phase, typically in the hydronium form, to selectively exclude weak acids on the basis of differences in pKa (see Figures 19 and 20). In contrast, ion-suppression chromatography uses an acidic eluent that suppresses ionization of analytes, thus allowing the separation of weak acids using a hydrophobic reversed-phase column such as the Dionex IonPac NS1 column.

Column: Dionex IonPac ICE-AS1, see chromatogram  
Eluent: 10 mM heptafluorobutyric acid  
Flow Rate: 0.8 mL/min, 9 mm  
0.16 mL/min, 4 mm  
Inj. Volume: 50 µL  
Detection: Suppressed conductivity, Dionex ACRS-ICE 500 Suppressor, see chromatogram  
Sample: 0.25% sulfuric acid

Peaks:	1. Nitrate	50.0 mg/L (ppm)
	2. Malate	20.0
	3. Glycolate	40.0
	4. Formate	20.0
	5. Acetate	40.0
	6. Propionate	60.0

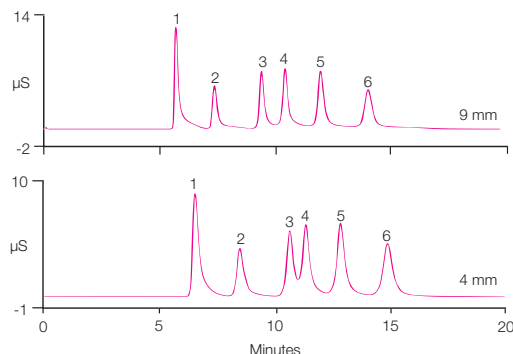


Figure 18. Comparison of Dionex ACRS-ICE 500 (9 mm) and (4 mm) on a Dionex IonPac ICE-AS1 columns. The Dionex ACRS-ICE 500 column (4 mm) gives similar suppression results to the Dionex ACRS-ICE 500 column (9 mm), but with 1/4 eluent consumption.

Column: Dionex IonPac ICE-AS6, 9 mm  
Eluent: 1 mM heptafluorobutyric acid  
Flow Rate: 0.8 mL/min  
Inj. Volume: 50 µL  
Detection: Suppressed conductivity, Dionex ACRS-ICE 500 Suppressor, 9 mm  
Sample: 0.25% sulfuric acid

Peaks:	1. Nitrate	5.0 mg/L (ppm)
	2. Malate	10.0
	3. Glycolate	15.0
	4. Formate	20.0
	5. Acetate	10.0
	6. Propionate	10.0

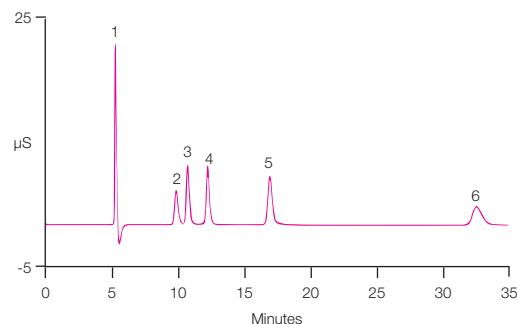


Figure 19. Determination of aliphatic acids in an acidic matrix using ion-exclusion.

### Dionex ACRS-ICE 500 suppressor applications

The Dionex ACRS-ICE 500 suppressor is ideally suited to ion-exclusion chromatography of:

- Organic acids and alcohols in complex or high-ionic-strength samples, including food and beverage products, biological samples, fermentation processes, industrial process liquors, and treated wastewaters.
- Organic acids in high-ionic-strength matrices.



## Capillary Electrolytic Suppressor for capillary IC analysis

The Dionex CES 300 suppressors are optimized for eluent flow rates typically seen in capillary systems (5–30  $\mu\text{L}/\text{min}$ ). When used for anion analysis, the Dionex ACES 300 suppressor converts highly conductive hydroxide-based eluents into pure water, thus reducing the baseline on a conductivity detector. While suppressing the eluent, the Dionex ACES 300 suppressor also converts the analytes into their more conductive hydronium (acid) form, thus increasing their sensitivity under conductivity detection. Likewise, when used for cation analysis, the Dionex CCES 300 suppressor converts highly conductive methanesulfonic acid (MSA) eluents into pure water; simultaneously, the analytes are converted to their more conductive hydroxide form, increasing their sensitivity.

## Dionex CES suppressor technology

The Dionex CES 300 suppressor uses a three-chamber design to minimize dead volume while maximizing suppression capacity and reducing noise.

The eluent chamber is comprised of an ion-exchange capillary membrane that facilitates the efficient exchange of the eluent counterions for regenerant ions.

The regenerant chambers are divided into the ion-exchange chamber and the electrode chambers. The regenerant first passes through the ion-exchange chamber, which is filled with a bed of ion-exchange resin; the ion-exchange capillary membrane is coiled in this bed. The regenerant bed is anion-exchange resin in the opposite form as the eluent. It is this bed of resin that provides the regenerant ions for the capillary membrane eluent chamber.

There are two electrode chambers that are separated from the ion-exchange chamber by a pair of ion-exchange membranes. The regenerant, after passing through the ion-exchange chamber, passes through the cathode and anode chambers serially. When current is passed through the electrodes, the regenerant ions are generated in the first electrode chamber; these ions are pushed into the ion-exchange chamber via an electric field, maintaining the ion-exchange chamber in the regenerant form. After co-ions exchange from the eluent ion-exchange capillary membrane, the co-ions are pushed out of the ion-exchange chamber via the electric field into the second electrode chamber. Finally, these co-ions are neutralized by the ions generated in the second electrode chamber.

## Dionex CES 300 suppressor system control

The unique design of the Dionex CES 300 suppressor simplifies software and hardware control options. For most applications, the Dionex CES 300 suppressor can be set to a single current setting of 10 mA. For applications requiring very high eluent concentrations, the Dionex CES 300 suppressor must be set to 20 mA. The Dionex ICS-5000+ system includes software and hardware to control the Dionex CES 300 suppressor. Chromeleon CDS software, version 6.8 or 7.0 is required.

## Key applications using a Dionex CES 300 suppressor

Column:	Dionex IonPac CS12A (0.4 × 250 mm)	Peaks:	1. Lithium 0.5 mg/L
Eluent:	20 mM Methanesulfonic acid		2. Sodium 2.0
Eluent Source:	Thermo Scientific Dionex EGC-MSA (Capillary) Cartridge		3. Ammonium 2.5
Temperature:	30 °C		4. Potassium 5.0
Flow Rate:	10 $\mu\text{L}/\text{min}$		5. Magnesium 2.5
Inj. Volume:	0.4 $\mu\text{L}$		6. Calcium 5.0
Detection:	Suppressed conductivity, Dionex CCES 300 Suppressor, Dionex AutoSuppression device, recycle mode		

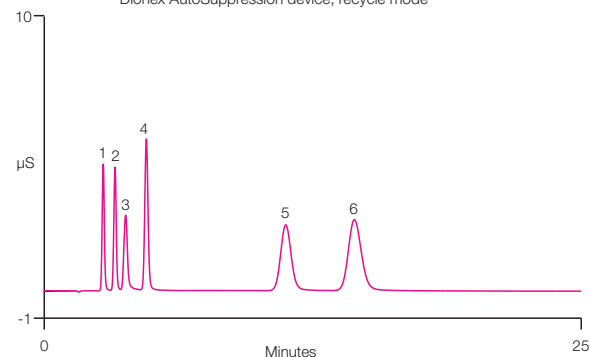


Figure 21. Separation of six common cations using a Dionex IonPac CS12A capillary column.

Column:	Dionex IonPac AS19 (0.4 mm × 250 mm)	Peaks:	1. Fluoride	12. Malonate
Eluent:	10 mM KOH (0 to 10 min), 10 to 52 mM KOH (10 to 42 min), 52 to 70 mM (42 to 45 min), 10 mM (45 to 50 min)		2. Acetate	13. Selenate
Eluent Source:	Dionex EGC-KOH (Capillary) Cartridge		3. Formate	14. Oxalate
Temperature:	30 °C		4. Chlorite	15. Iodide
Flow Rate:	10 $\mu\text{L}/\text{min}$		5. Bromate	16. Thiosulfate
Inj. Volume:	0.4 $\mu\text{L}$		6. Chloride	17. Chromate
Detection:	Suppressed conductivity, Dionex ACES 300 Suppressor recycle mode		7. Nitrite	18. Chromate
			8. Chlorate	19. Fumarate
			9. Bromide	20. Arsenate
			10. Nitrate	21. Thiocyanate
			11. Sulfate	22. Perchlorate

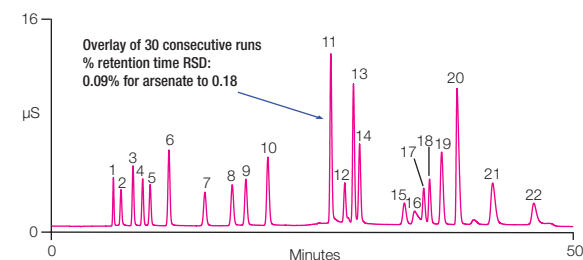


Figure 22. Separation of 22 anions on a Dionex IonPac AS19 capillary column.

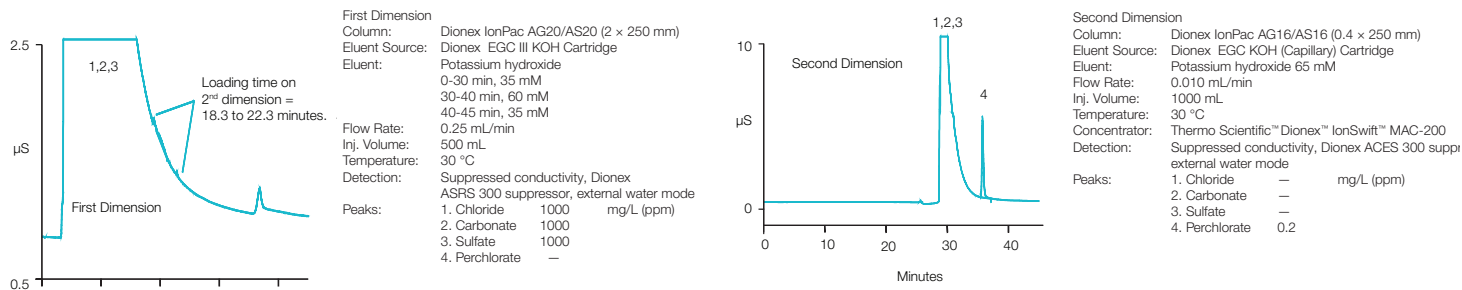


Figure 23. 2D-IC Analysis of Trace Perchlorate Using the Dionex IonPac AS20 microbore column and the Dionex IonPac AS16 capillary column.

## 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 DRS 600 and ERS 500 Suppressors	
Dionex Electrolytically Regenerated and Dynamically Regenerated Suppressors	Part Number
Dionex ADRS 600 (2 mm) Anion Dynamically Regenerated Suppressor For use with 2 and 3 mm microbore anion-exchange columns. Replaces the Dionex AERS 500 (P/N 082541), Dionex ASRS 300 (P/N SP6948), ASRS ULTRA II (P/N 061562), ASRS ULTRA (P/N 053947), ASRS I (P/N 043187), and the ASRS II (P/N 046078) suppressors.	088667
Dionex ADRS 600 (4 mm) Anion Dynamically Regenerated Suppressor For use with 4 and 5 mm anion-exchange columns. Replaces the Dionex AERS 500 (P/N 082540), Dionex ASRS 300 (P/N SP6949), ASRS ULTRA II (P/N 061561), ASRS (P/N 053946), ASRS I (P/N 043189), and the ASRS II (P/N 046081) suppressors.	088666
Dionex CDRS 600 (2 mm) Cation Dynamically Regenerated Suppressor For use with 2 and 3 mm microbore cation-exchange columns. Replaces the Dionex CERS 500 (P/N 082543), Dionex CSRS 300 (P/N SP6950), CSRS ULTRA II (P/N 061564), CSRS ULTRA (P/N 053949), CSRS I (P/N 043188), and the CSRS II (P/N 046080) suppressors.	088670
Dionex CDRS 600 (4 mm) Cation Dynamically Regenerated Suppressor For use with 4 mm cation-exchange columns. Replaces the Dionex CSRS 300 (P/N SP6951), CSRS ULTRA II (P/N 061563), CSRS ULTRA (P/N 053948), CSRS I (P/N 043190), and the CSRS II (P/N 046079) suppressors.	088668
Dionex AERS 500 Carbonate (4 mm) Anion Electrolytically Regenerated Suppressor for Carbonate Eluents For use with 4 and 5 mm anion-exchange columns and carbonate or carbonate/bicarbonate eluents.	085029
Dionex AERS 500 Carbonate (2 mm) Anion Electrolytically Regenerated Suppressor for Carbonate Eluents For use with 2 and 3 mm anion-exchange columns and carbonate or carbonate/bicarbonate eluents.	085028
Dionex AERS 500e (4 mm) Anion Electrolytically Regenerated Suppressor for External Water Mode For use with 4 and 5 mm anion-exchange columns when external water mode is used.	302661
Dionex AERS 500e (2 mm) Anion Electrolytically Regenerated Suppressor for External Water Mode For use with 2 and 3 mm anion-exchange columns when external water mode is used.	302662
Dionex CERS 500e (4 mm) Cation Electrolytically Regenerated Suppressor for External Water Mode For use with 4 and 5 mm cation-exchange columns when external water mode is used.	302663
Dionex AERS 500e (2 mm) Cation Electrolytically Regenerated Suppressor for External Water Mode For use with 2 and 3 mm cation-exchange columns when external water mode is used.	302664

Optional kits	Part Number
External Regenerant Installation Kit For Dionex DRS 600 suppressor operation in the external water mode, chemical regeneration mode, and MPIC chemical regeneration mode. Kit contains a 4 L bottle, one pressure regulator (0–30 psi/0–210 kPa), and appropriate tubing and fittings for installation of one Dionex DRS 600 suppressor with pneumatic delivery of regenerant.	038018
Dionex ERS Gas-Assisted Regeneration Kit Required for the initial installation of the gas-assisted recycle mode or the gas-assisted external water mode. Contains one pressure regulator (0–30 psi/0–210 kPa), 1/4-28 mixing tee, one check valve, and all tubing and fittings required to install the Dionex DRS 600 suppressor for operation in these modes.	056886
Dionex SRD-10 Suppressor Regenerant Detector The Dionex SRD-10 is a stand-alone device that monitors liquid flow to a suppressor's regenerant chambers and automatically disables the eluent pump if flow is disrupted.	074395

## Dionex CRS 500 Suppressors

Dionex CRS 500 Chemically Regenerated Suppressors	Part Number
Dionex ACRS 500 (2 mm) Anion Chemically Regenerated Suppressor For use with 2 and 3 mm anion-exchange columns. Replaces the AMMS 300 (P/N 064559), and the AMMS III (P/N 056751) suppressors.	085091
Dionex ACRS 500 (4 mm) Anion Chemically Regenerated Suppressor For use with 4 and 5 mm anion-exchange columns. Replaces the AMMS 300 (P/N 064558), and the AMMS III (P/N 056750) suppressors.	085090
Dionex CCRS 500 (2 mm) Cation Chemically Regenerated Suppressor For use with 2 and 3 mm cation-exchange columns. Replaces the Dionex CMMS 300 (P/N 064561), and the CMMS III (P/N 056753) suppressors.	085093
Dionex CCRS 500 (4 mm) Cation Chemically Regenerated Suppressor For use with 4 and 5 mm cation-exchange columns. Replaces the Dionex CMMS (P/N 064560), and the CMMS III (P/N 056752) suppressors.	085092

## Chemical regeneration Dionex CRS 500 kits for displacement

Chemical regeneration Dionex CRS 500 kits for displacement	Part Number
Installation Kit for Displacement Chemical Regeneration Operation	056882
2 L DCR Kit	056884
4 L DCR Kit	
Includes one regenerant reservoir, cap, and all tubing and fittings to install the Dionex CRS 500 in the DCR mode.	
2 L Eluent Bottle	044129
4 L Eluent Bottle	039164
Anion Regenerant Concentrate (75 mL of 2.0 N H <sub>2</sub> SO <sub>4</sub> )	057559
Anion Regenerant Concentrate, 4-pack (Four each of P/N 057559)	057555
Cation Regenerant Concentrate (100 mL of 2.06 M TBAOH)	057561
Cation Regenerant Concentrate, 4-pack (Four each of P/N 057561)	057556

## Chemical regenerant kits and regenerant concentrates

Chemical regenerant kits and regenerant concentrates	Part Number
External Regenerant Installation Kit For Dionex CRS 500 operation in the chemical suppression mode. Includes one 4 L pressurizable regenerant reservoir, one pressure regulator (0–30 psi/0–210 kPa), and all tubing and fittings required to install the Dionex CRS 500 for operation in this mode.	038018
Anion Regenerant Concentrate (50 mL of 0.25 N H <sub>2</sub> SO <sub>4</sub> )	039601
Cation Regenerant Concentrate (500 mL of 0.10 N TBAOH)	039602

## Dionex CRS 500 Suppressor spare parts

Dionex CRS 500 Suppressor spare parts	Part Number
Backpressure loop, 1 each For 4 and 5 mm system For 2 and 3 mm systems	045877 045878
Syringe, 1.0 mL, disposable For flushing the Dionex CRS 500 suppressor at startup.	016388
Syringe Adapter, female Luer lock, 1/4-28 threads	024305

<b>Dionex CES 300 Suppressors</b>	
<b>Dionex CES 300 Capillary Electrolytic Suppressors</b>	<b>Part Number</b>
Dionex ACES 300 Anion Capillary Electrolytic Suppressor For use with anion-exchange capillary columns.	072052
Dionex CCES 300 Cation Capillary Electrolytic Suppressor For use with cation-exchange capillary columns.	072053
<b>Optional kits</b>	<b>Part Number</b>
Cation Regenerant Concentrate (100 mL of 2.06 M TBAOH)	057561
Cation Regenerant Concentrate, 4-pack (Four each of P/N 057561)	057556
<b>Chemical regenerant kits and regenerant concentrates</b>	<b>Part Number</b>
External Regenerant Installation Kit For Dionex CES 300 suppressor operation in the external water mode. Kit contains a 4 L bottle, one pressure regulator (0–30 psi/0–210 kPa), and appropriate tubing and fittings for installation of one Dionex CES 300 suppressor with pneumatic delivery of external water.	038018
<b>Chemical regenerant kits and regenerant concentrates</b>	<b>Part Number</b>
External Regenerant Installation Kit For Dionex CRS 500 operation in the chemical suppression mode. Includes one 4 L pressurizable regenerant reservoir, one pressure regulator (0–30 psi/0–210 kPa), and all tubing and fittings required to install the Dionex CRS 500 for operation in this mode.	038018
<b>Dionex ACRS-ICE 500 Suppressor</b>	
<b>Dionex ACRS-ICE 500 Suppressor</b>	<b>Part Number</b>
ACRS-ICE 500 (9 mm) Anion Chemically Regenerated Suppressor for ICE Eluents. Replaces the Dionex AMMS-ICE 300 (P/N 067527) suppressor.	084715
ACRS-ICE 500 (4 mm) Anion Chemically Regenerated Suppressor for ICE Eluents	084714
<b>Regenerant kits and reagent</b>	<b>Part Number</b>
External Regenerant Installation Kit Required for first time installation. Includes one 4 L pressurizable regenerant reservoir, one pressure regulator (0–30 psi/0–210 kPa), and all tubing and fittings required to install regenerant delivery to the Dionex AMMS-ICE 300 suppressor.	038018
Dionex ACRS-ICE 500 Cation Regenerant Solution 500 mL of 0.1 M tetrabutylammonium hydroxide (TBAOH)	039602
<b>Dionex ACRS-ICE 500 Suppressor spare parts</b>	<b>Part Number</b>
Backpressure loop, 1 each for 4 mm system	045877
Syringe, 1.0 mL, disposable For flushing the Dionex ACRS-ICE 500 suppressor at startup.	016388

 Learn more at [thermofisher.com/suppressor](https://thermofisher.com/suppressor)