The preconfigured Thermo Scientific™ Dionex™ ICS-1100 and ICS-1600 are the first integrated Reagent-Free™ IC systems with Eluent Regeneration (RFIC™-ER systems). The Dionex ICS-1600 system is designed to perform isocratic ion chromatography (IC) separations using conductivity detection and standard bore (4 mm) and microbore (2 mm) columns. Multiple available valving configurations support many modes of automated sample preparation. When configured as an RFIC-ER system, the Dionex ICS-1600 allows continuous operation for up to four weeks using a single eluent preparation. Thermo Scientific™ Dionex™ Chromeleon™ Chromatography Data System provides full control and digital data collection from a PC using USB high-speed communication protocol. Available options include column heating, in-line vacuum degassing, and RFIC-ER installation kit.

**Versatility**

- Performs isocratic IC separations using conductivity detection.
- Integrated, preconfigured, factory plumbed, and tested for immediate productivity.
- Streamlined design with small footprint occupies minimal bench space.
- An LCD touch-pad front panel provides clear identification of key parameters, permitting at-instrument control and monitoring.
- Dual-piston pump design reduces pulsations, allowing high-sensitivity detection and excellent flow-rate accuracy and precision.

- Wide flow rate range supports 2, 3, 4, and 5 mm column formats.
- RFIC-ER system technology provides up to 28 days of chromatography results using only a single eluent preparation.
- Automated sample preparation capabilities enable techniques, such as on-line filtration, concentration, and matrix elimination.
Simple and Precise Control

- Built-in control for Thermo Scientific™ Dionex™ SRS™ Self-Regenerating Suppressor and Atlas™ electrolytic suppressors. Electrolytic suppression with an AutoSuppression™ device eliminates the need to manually prepare acid or base regenerants. Suppression reduces background conductivity and provides high signal-to-noise ratios.

- Full control and digital data collection available with Windows®-based Chromeleon Chromatography Data System software using USB high-speed communication protocol.

- Chromeleon eWorkflows preload all instrument parameters for fast and easy operation and data analysis.

- Chromeleon software control includes an electronic logbook for monitoring of nearly unlimited user-selectable operational parameters.

High Performance

- Eluent regeneration provides extremely stable baselines, day-to-day, for up to 28 days of continuous operation. Calibration curves remain valid over the entire period.

- For improved reproducibility, the thermostated high-performance conductivity detector permits measurements that are unaffected by temperature variation.

- Advanced single-range digital output with operating range to 15,000 µS full scale, with autoranging to provide accurate detection of major and minor constituents in a single run. Single-range analog signal output is also standard.

- Column heater provides day-to-day consistency, ensuring reproducibility and stability. Preheating of the eluent prior to the column maintains the column temperature set by the user. A transparent cover allows viewing of the column without temperature disruption.

- Optional built-in vacuum degas provides in-line degassing of eluents, ensuring reproducibility and protection of eluents from contamination and decomposition. Control of the degas operation can be automated to sense when degassing is required.

- Inert, nonmetallic PEEK™ components throughout the system ensure compatibility with corrosive eluents and provide metal-contamination-free chromatography.

Eluent Regeneration

- When configured as a Reagent-Free IC system with Eluent Regeneration (RFIC-ER system), the Dionex ICS-1600 allows the use of a single preparation of eluent for up to four weeks.

- The RFIC-ER system uses the Dionex SRS 300 Self-Regenerating electrolytic suppressor to simultaneously regenerate returning eluent as it suppresses eluent before detection.

- Trap and catalytic columns purify returning eluent, assuring consistent, high-quality eluent for separations.

- Because it is a closed loop, the always on, always ready RFIC-ER system remains equilibrated and calibrated between eluent changes; up to four weeks.

- Less frequent eluent preparation reduces unintentional variations in concentration, increasing reliability and reproducibility.

- RFIC-ER systems are designed for high throughput analyses of anions or cations in low- to moderate-concentration matrices, or in high-concentration matrices after matrix elimination.

Column: Thermo Scientific™ Dionex™ IonPac™ AS22, 4 mm
Eluent: 4.5 mM carbonate/1.4 mM bicarbonate
Eluent Source: Regenerated carbonate/bicarbonate
Flow Rate: 1.2 mL/min
Inj. Volume: 50 µL
Temperature: 30 °C
Detection: Suppressed conductivity, Thermo Scientific™ Dionex™ ASRS 300 Anion Self-Regenerating Suppressor™, 4 mm AutoSuppression recycle mode, 31 mA
Sample: Seven anion standard

Figure 1. Overlay of chromatograms from a representative week of the seven anion calibration check standard runs on an RFIC-ER system using a single 4 L preparation of eluent. The peak retention times demonstrate high reproducibility.

Figure 2. Graph of peak area changes for a seven-anion calibration check standard run daily for 28 days on an RFIC-ER system using a single 4 L preparation of eluent. The system passed for the entire four weeks without reequilibration or recalibration.
Convenience
- RFIC-ER system technology reduces eluent preparation to once every 28 days.
- An LCD touch-pad front panel provides clear identification of key parameters and permits at-instrument control and monitoring.
- Versatile eluent organizer tray accommodates 1, 2, or 4 liter eluent bottles.
- Electrically activated 6-port Rheodyne PEEK injection valve for precise sampling.
- Ergonomically placed injection port for easy manual sampling.
- Eluent valve provides positive shut-off of eluent flow prior to the pump for easy servicing.
- Easy-access door provides front access to all main chromatography components.
- Leak detection and management allow fast response to system leaks.
- TTL controls for external pump, injection valve, range selection, and signal offset for stand-alone operation

Automated Sample Preparation
- Optional 6- or 10-port valves support automated sample preparation.
- The 6-port valve supports techniques such as matrix elimination, sample concentration, and on-line filtration.
- The 10-port valve supports Auto-Dilution using a small loop and large loop to reinject out-of-range samples.
- 6- or 10-port valves can be used for matrix diversion prior to MS detection.

Key Features
- LCD front panel control
- Eluent regeneration functionality built in
- Dual-piston pump
- Column heater
- Electrolytic suppression
- Digital conductivity detection
- Vacuum degas (option)
- USB connectivity, plug-n-play
- Optical leak detector
- Electronic logbook and trending
- Optional 6- or 10-port valve for automated sample preparation

Figure 3: Optional 6- or 10-port valves support automated, on-line sample preparation techniques, such as sample concentration and matrix elimination, or AutoDilution using large and small injection loops with a 10-port valve, shown above.
## Dionex iCS-1600 IC System Specifications

### Analytical Pump and Fluidics

<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Type</strong></td>
<td>Serial dual-reciprocating pistons, microprocessor-controlled constant stroke, variable speed</td>
</tr>
<tr>
<td><strong>Construction</strong></td>
<td>Chemically inert, metal-free PEEK pump heads and flow paths compatible with aqueous eluents of pH 0–14 and reversed-phase solvents</td>
</tr>
<tr>
<td><strong>Pump Operating Pressure</strong></td>
<td>0–35 MPa (0–5000 psi)</td>
</tr>
<tr>
<td><strong>Flow Rate Range</strong></td>
<td>0.00–5.00 mL/min without changing pump heads</td>
</tr>
<tr>
<td><strong>Flow Precision</strong></td>
<td>&lt;0.1%, typically</td>
</tr>
<tr>
<td><strong>Flow Accuracy</strong></td>
<td>&lt;0.1%, typically</td>
</tr>
<tr>
<td><strong>Pressure Ripple</strong></td>
<td>&lt;1% at 13.8 MPa (2000 psi) and 1.0 mL/min</td>
</tr>
<tr>
<td><strong>Eluent On-Off Valve</strong></td>
<td>Standard</td>
</tr>
<tr>
<td><strong>Piston Seal Wash</strong></td>
<td>Dual-valve, wash can be continuous when connected to rinse solution supply</td>
</tr>
<tr>
<td><strong>Pressure Alarm Limits</strong></td>
<td>Upper limit 0–35 MPa or 0–5000 psi in one unit (MPa or psi) increments; lower limit can be set up to one unit lower than upper limit</td>
</tr>
<tr>
<td><strong>Vacuum Degas</strong></td>
<td>Yes, optional, automatic control</td>
</tr>
<tr>
<td><strong>Eluent Bottles</strong></td>
<td>Polypropylene, up to 4 L volume</td>
</tr>
<tr>
<td><strong>Eluent Bottle Pressure</strong></td>
<td>Not required</td>
</tr>
<tr>
<td><strong>Injection Valve</strong></td>
<td>6-port, 2-position Rheodyne valve, electrically activated</td>
</tr>
<tr>
<td><strong>Columns Supported</strong></td>
<td>2, 3, 4, and 5 mm i.d.; maximum length 250 mm analytical column with 50 mm guard column</td>
</tr>
</tbody>
</table>

### Column Heater (Optional)

<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Operating Temperature Range</strong></td>
<td>30 to 60 °C (86 to 140 °F); minimum 5 °C above ambient; Settable range is equal to working range</td>
</tr>
<tr>
<td><strong>Temperature Accuracy</strong></td>
<td>±0.5 °C at sensor, at 40 °C</td>
</tr>
</tbody>
</table>

### Auxiliary Valve (Optional)

<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Available Valves</strong></td>
<td>2-position, 6- or 10-port high-pressure Rheodyne valve, fully inert PEEK construction, electrically activated</td>
</tr>
</tbody>
</table>

### Eluent Generation

<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Optional</strong></td>
<td>Thermo Scientific Dionex RFC-30 Reagent-Free Controller</td>
</tr>
</tbody>
</table>

### Eluent Regeneration

<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Eluent Regeneration Support</strong></td>
<td>Yes, with optional RFIC-ER kit</td>
</tr>
<tr>
<td><strong>Eluents</strong></td>
<td>Carbonate and carbonate/bicarbonate up to 20 mM MSA up to 34 mM</td>
</tr>
<tr>
<td><strong>Flow Rates</strong></td>
<td>0.01–2.00 mL/min</td>
</tr>
<tr>
<td><strong>Continuous Operation (4 L of Eluent)</strong></td>
<td>Up to 28 days or 2000 samples, typically</td>
</tr>
<tr>
<td><strong>Always On, Always Ready Capable</strong></td>
<td>Yes, standard feature</td>
</tr>
<tr>
<td><strong>Remains Fully Calibrated for Extended Periods (&lt;28 days)</strong></td>
<td>Yes, standard feature. Results are traceable to a single calibration</td>
</tr>
<tr>
<td><strong>System Wellness</strong></td>
<td>Consumables usage monitoring for predictive maintenance</td>
</tr>
<tr>
<td><strong>Maximum Operating Pressure</strong></td>
<td>21 MPa (3000 psi)</td>
</tr>
<tr>
<td><strong>Operating Temperature Range</strong></td>
<td>4–40 °C</td>
</tr>
</tbody>
</table>
### Suppressors and Control

<table>
<thead>
<tr>
<th></th>
<th>2 mm and 4 mm anion and cation, membrane suppression bed types</th>
</tr>
</thead>
<tbody>
<tr>
<td>Displacement Chemical Regeneration:</td>
<td>2 mm and 4 mm anion and cation membrane suppression bed types</td>
</tr>
<tr>
<td>Electrolytic Suppression—Self-Regenerating:</td>
<td>2 mm and 4 mm anion and cation; both membrane and MonoDisk™ suppression bed types available</td>
</tr>
<tr>
<td>Electrolytic Suppression—Self-Regenerating with External Water Mode:</td>
<td>2 mm and 4 mm anion and cation; both membrane and MonoDisk™ suppression bed types available</td>
</tr>
</tbody>
</table>

### Current Control Range:

- **Dionex SRS**: 4 mm, 0–300 mA in 1 mA increments
- **Dionex SRS**: 2 mm, 0–100 mA in 1 mA increments
- **Thermo Scientific™ Dionex™ AES™ Atlas™ Electrolytic Suppressor**: 0–150 mA in 1 mA increments
- **Thermo Scientific™ Dionex™ CMD™ Carbohydrate Membrane Desalter**: 0–500 mA in 1 mA increments
- **Thermo Scientific™ Dionex™ SRN™ Self-Regenerating Neutralizer**: 0–500 mA in 1 mA increments

### Salt Converter:

- **Thermo Scientific Dionex AMMS-ICE**: Available in 2 and 4 mm versions

### Carbonic Acid Removal for Anions:

- **Dionex ASRS 300 with Thermo Scientific Dionex CRD 200 Carbonate Removal Device for hydroxide eluents**
- **Dionex ASRS 300 with Dionex CRD 300 for carbonate eluents**

### Non-Suppressed Chromatography:

- Yes, supported

### Suppressor Wear Parts:

- None; peristaltic pump and inline filters not required

### Suppression Capacity:

- **Dionex SRS 300**
  - Anions: (4 mm): 200 μeq/min  
  - (2 mm): 50 μeq/min
  - Cations: (4 mm) 150 μeq/min  
  - (2 mm) 37.5 μeq/min
- **Thermo Scientific™ Dionex™ MMS 300 MicroMembrane™ Suppressor**
  - Anion: (4 mm): 150 μeq/min  
  - (2 mm): 37.5 μeq/min
  - Cations: (4 mm) 150 μeq/min  
  - (2 mm) 37.5 μeq/min
- **Dionex AES**
  - Anion: 25 μeq/min
  - Cations: 25 μeq/min

### Void Volumes:

- **Dionex SRS 300 (4 mm)**: <50 μL
- **Dionex SRS 300 (2 mm)**: <15 μL
- **Dionex MMS 300 (4 mm)**: <50 μL
- **Dionex MMS 300 (2 mm)**: <15 μL
- **Dionex AMMS-ICE 300 (4 mm)**: <50 μL
- **Dionex AMMS-ICE 300 (2 mm)**: <15 μL
- **Dionex AAES**: <35 μL
- **Dionex CAES**: <35 μL

### Conductivity Detector Electronics and Flow Cell

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Microprocessor-controlled digital signal processor</td>
</tr>
<tr>
<td>Cell Drive</td>
<td>8 kHz square wave</td>
</tr>
<tr>
<td>Linearity</td>
<td>1% up to 1 mS</td>
</tr>
<tr>
<td>Resolution</td>
<td>0.00238 nS/cm</td>
</tr>
</tbody>
</table>
| Full-Scale Output Ranges: | Digital signal range 0–15000 μS  
  Analog signal range 0–15000 μS |
| Electronic Noise: | ±0.1 nS when background conductivity is 0–150 μS/cm  
  ±2 nS when background conductivity is 151–3200 μS |
| Filter: | Rise times from 0 to 10 s, user selectable |
| Temperature Compensation: | Fixed at 1.7% per 1 °C at cell temperature |
| Temperature Range: | Ambient +7 °C, 30 to 55 °C |
| Cell Electrodes: | Passivated 316 stainless steel. Compatible with MSA |
| Cell Body: | Chemically inert polymeric material |
| Cell Volume: | <1 μL |
| Heat Exchanger: | Inert, tortuous path for low axial dispersion |
| Maximum Cell Operating Pressure: | 10 MPa (1500 psi) |
Autosampler

Automation Using Autosampler: Thermo Scientific Dionex AS-DV, AS-AP, AS-HV, or third-party autosamplers

Sequential/Simultaneous Injection: Yes, depending on autosampler capabilities

Automated Dilution: Yes, available with Dionex AS-AP Autosampler

Dilution Factor, Dionex AS-AP Autosampler: 1:1 to 1:1000

Dilution Time, Dionex AS-AP Autosampler: 15 seconds with sample overlap

Inline Sample Degassing: Yes, optional with Dionex CRD 300/200

Inline Filtration: Yes, Dionex AS-DV Autosampler or inline filter

High Automation Flexibility: Conditionals using Chromeleon and post run features

System Software

Chromeleon Chromatography Management Software, supports Windows XP or Vista:

- Automated Procedure Wizards
- System Wellness and Predictive Performance
- Data trending plots (numerical device parameters)
- Virtual Column Simulator (evaluation mode standard, isocratic and gradient optional)
- Application templates
- Multivendor automation support of 3rd party instruments (fully controls over 300 instruments from more than 30 manufacturers, including GC, HPLC, and MS)
- 3-D Software for photodiode array, mass spectrometer, and electrochemical detectors (optional)
- Customizable System Control Panels
- System Status Virtual Channels
- Power Failure Protection
- Sequential Injection
- System Trigger Commands and Conditionals
- Daily Audit Trail
- Sample Audit Trail
- Multiple Network Control and Network Failure Protection (optional)
- System Calibration Storage (factory, present, and previous; completely user selectable)
- Customized Reporting (unlimited report workbooks)
- Automated System Qualification (detailed, comprehensive qualification reports)

Physical Specifications

Power Requirements: 100–240 V ac, 50-60 Hz autoranging

Operating Temperature: 4–40 °C (40–104 °F); cold-room-compatible (4 °C) as long as system power remains on

Operating Humidity Range: 5–95% relative, noncondensing

Control Modes: Full control through Chromeleon software; alternative control through TTL or relay closures; two relay outputs, two TTL outputs, four programmable inputs

USB Communication Protocol: One USB input; one built-in two-output USB hub

Leak Detection: Built-in, optical sensor

Dimensions (h × w × d): 56.1 cm × 22.4 cm × 53.3 cm (22.1 in × 8.8 in × 21 in)

Weight: 24.5 kg (54 lb)
### Ordering Information

To order in the U.S., call (800) 346-6390 or contact the Thermo Scientific office nearest you. Outside the U.S., order through your local Thermo Scientific office or distributor. Refer to the following part numbers.

<table>
<thead>
<tr>
<th>Product Specifications</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dionex ICS-1600 Ion Chromatography System with Chromeleon and Windows XP Workstation, without Degas:</td>
<td>069652</td>
</tr>
<tr>
<td>Dionex ICS-1600 Ion Chromatography System with Chromeleon, Windows XP Workstation, and Degas:</td>
<td>069653</td>
</tr>
<tr>
<td>Dionex ICS-1600 Ion Chromatography System with Chromeleon, without Windows XP Workstation, or Degas:</td>
<td>069654</td>
</tr>
<tr>
<td>Dionex ICS-1600 Ion Chromatography System with Chromeleon and Degas, without Windows XP Workstation:</td>
<td>069655</td>
</tr>
<tr>
<td>RFIC-ER Anion Startup Kit. Includes anion installation kit and anion consumables:</td>
<td>069570</td>
</tr>
<tr>
<td>RFIC-ER Cation Startup Kit. Includes cation installation kit and cation consumables:</td>
<td>069569</td>
</tr>
</tbody>
</table>

Dionex ICS-1600/Chromeleon/Windows Workstation bundled package includes: an Dionex ICS-1600 with isocratic dual-piston pump, injection valve, column heater, heated conductivity cell, LCD touch-pad front panel, USB cable, Chromeleon Chromatography Data Management System software, Computer (with Windows XP), and USB dongle. Comes with one Class 1 Timebase controlling one Dionex IC system. Consumables must be ordered separately.