



Ion Chromatography

ICS-5000 System



Now sold under the
Thermo Scientific brand

Thermo
SCIENTIFIC



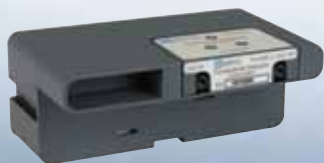
Speed · Simplicity · Solutions

The New Standard in Ion Chroma

The ICS-5000: The World's First Capillary Reagent-Free Ion Chromatography System

Developed for flexibility, modularity, and ease-of-use, the ICS-5000 combines the highest sensitivity with convenience. Capillary, microbore, and standard bore flow rates (or a combination of any two using the dual system) are available, providing flexibility to choose highest throughput or highest sensitivity in a modular system that makes upgrades easy and economical. From an entry-level system with a single pump, detector, and injection valve, all the way to a high-end dual Reagent-Free™ IC (RFIC™) system with Eluent Generator (EG) which utilizes capillary, microbore or standard bore formats for IC × IC (2D-IC), the ICS-5000 will meet and adapt to your laboratory's changing needs.

Application Range for the ICS-5000 System			
Format	Capillary	Microbore	Standard Bore
Flow Rate Range	0.001–3.000 mL/min in 0.001 mL/min increments Typical range: 5–20 µL/min	0.001–4 mL/min in 0.001 mL/min increments Typical range: 0.2–0.5 mL/min	0.001–10.000 mL/min in 0.001 mL/min increments Typical range: 1–2 mL/min
Column i.d. Supported	0.2–0.6 mm	1–3 mm	3–7 mm
Yearly Eluent Usage	5.25 L	131 L	525 L



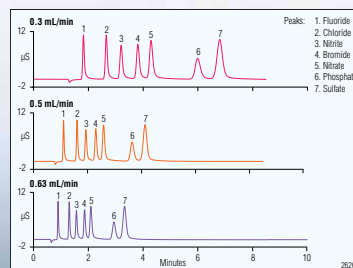
Flexible Detection Options

- Conductivity
- Electrochemical:
 - ⇒ DC amperometry
 - ⇒ Integrated amperometry
- UV-vis Absorbance:
 - ⇒ Variable wavelength
 - ⇒ Photodiode array
- Mass spectrometry
- Improved ESI-MS/MS sensitivity with capillary formats



Advanced Applications

- Able to combine capillary and analytical flows for trace detection (low ng/L levels) and matrix elimination
- Micro and standard flow rates for existing methods and regulatory compliance
- Capillary flows of 10 µL/min for reduced eluent usage and waste



Fast IC Capabilities

- Shorter columns optimized for high flow rates and pressures
- Run times under 4 min for common anion separations; up to four times faster
- No loss of resolution when properly configured
- All ICS-5000 systems capable of using Fast IC



Easy Configuration

- IC Cube™ module for convenient plumbing of capillary columns, suppressor, degasser, and injection valve
- Convenient cartridge-based consumables
- Precut, preformed tubing
- Color-coded connections for ease of plumbing

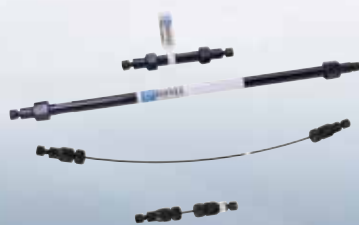
System Highlights

- Increased sensitivity with IC × IC (2D-IC) and suppressed conductivity detection
- Able to combine a first-dimension standard bore column with a second-dimension capillary column for detection limits in the low ng/L range
- 100-fold increase in mass sensitivity using capillary columns compared to standard bore columns
- Unmatched sensitivity with direct-injection IC-MS/MS
- Always ready, decreasing calibration and equilibration time
- Consumes just 5.25 L of water per year at capillary flow rates, thereby reducing eluent disposal costs
- EG cartridge lasts for 18 months of continuous operation at capillary flow rates under typical conditions
- Easy configuration with IC Cube consumable cartridges
- Up to four times faster IC separations using Fast IC columns
- Capillary and micro/standard bore flow rates and columns for application flexibility
- Excellent ease-of-use with fewer connections and precut, preformed tubing
- Reduced sample sizes for low-volume sampling, as low as 0.4 µL
- Reduced cost-of-ownership—system's time-saving features free up lab staff to perform other important tasks and increase productivity.



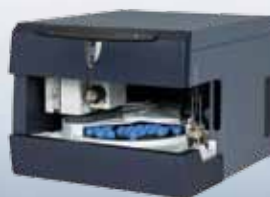
Reagent-Free IC

- Saves time and labor—no eluents or regenerants to prepare
- Precise, computer-controlled eluent concentrations up to 200 mM
- Gradients as easy as isocratic
- Hydroxide, MSA, and carbonate/bicarbonate (analytical only) eluents
- Electrolytic suppression for low noise and trace-level detection



High-Performance Consumables

- Wide range of capillary, microbore, and standard bore columns, suppressors, and accessories:
 - ⇒ Anion, cation, organic acid, carbohydrate, and amino acid columns
 - ⇒ Trap columns for matrix elimination and concentration
 - ⇒ Electrolytic suppressors
 - ⇒ Carbonate and contaminant removal



Reliable Sample Handling

- AS-AP
 - ⇒ PEEK™ injection needle
 - ⇒ Simultaneous and sequential injections for high throughput
- AS-DV Autosampler:
 - ⇒ Random access and multiple injections
 - ⇒ Optional 6 or 10-port valve
- AutoDilution for automatic reanalysis of out-of-range samples



Intelligent Software

- Chromeleon® software panels for intuitive instrument control
- eWorkflows for simplified operation
- System diagnostics for wellness monitoring and increased uptime

Advanced Detection Technology

Precision, Sensitivity, and Superior Response

Innovative, self-contained conductivity and electrochemical detectors are easily configured into the ICS-5000 detector module. Dionex has always been the pioneer in suppressed conductivity detection, and the ICS-5000 continues this trend. With industry-leading suppressor technology now in 0.4 mm formats, the ICS-5000 can handle all of your matrices and do so at flow rates from many milliliters per minute all the way down to low microliters per minute.

The new electrochemical detector uses an innovative palladium hydrogen (PdH) reference electrode with vastly superior reproducibility compared to traditional technology, and a substantially increased lifetime.



New capillary conductivity detector

New electrochemical detector and cell



Advanced Application Capabilities

Sensitivity and Format Versatility to Fit Your Application Needs

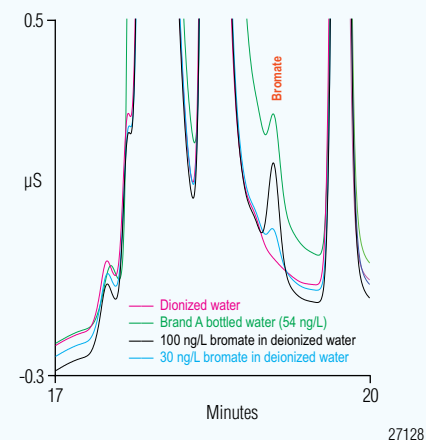
The ICS-5000 system can be configured with two standard/microbore channels, two capillary channels, or as a hybrid analytical/capillary system. This gives you the flexibility to run two different analyses simultaneously on a single sample, analyze two different samples concurrently, or perform advanced IC × IC (2D-IC) techniques such as matrix elimination. Using a standard bore or microbore column in the first dimension to separate analytes from the matrix, followed by a capillary column in the second dimension to resolve the analytes, provides sensitivity and detection limits comparable to MS detection.

First Dimension Conditions

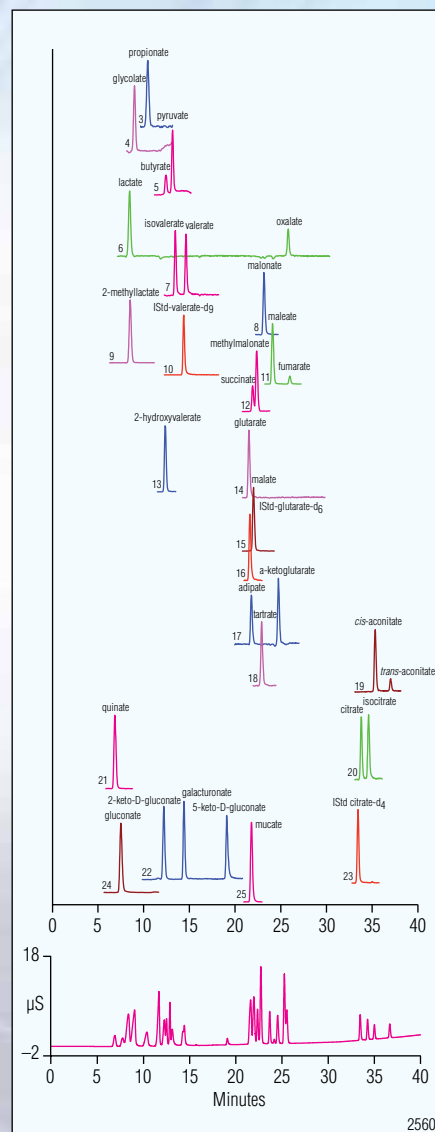
Column: IonPac® AG19, AS19, 4 mm
Eluent: 10–60 mM KOH (EGC II KOH)
Flow Rate: 1.0 mL/min
Inj. Volume: 1000 µL
Temperature: 30 °C
Detection: Suppressed conductivity, ASRS® 300, 4 mm

Second Dimension Conditions

Column: IonPac AS20, 0.4 × 250 mm
Eluent: 35 mM KOH (Capillary EGC)
Flow Rate: 10 µL/min
Temperature: 30 °C
Concentration: Capillary concentrator, 2500 µL of suppressed effluent from first dimension (from 7.5 to 10 min)
Detection: Suppressed conductivity, ACES™ 300



Easily detect trace levels of analytes in concentrated matrices with two-dimensional separation using a high-capacity standard bore column in the first dimension, and a high-sensitivity capillary column in the second.

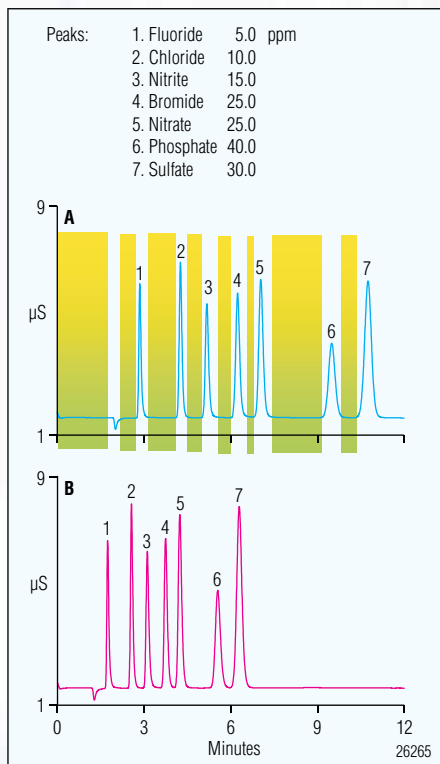


Accurately identify coeluting species with direct injection IC-MS, as in this low-molecular-weight organic acid example.

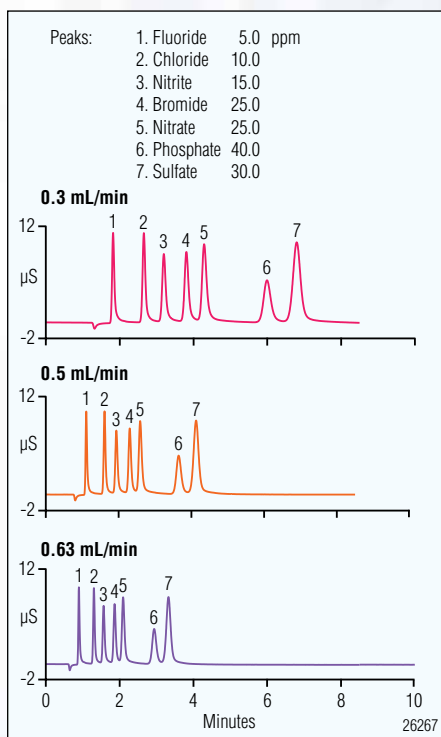
Fast IC

Optimized Separations for Faster Throughput

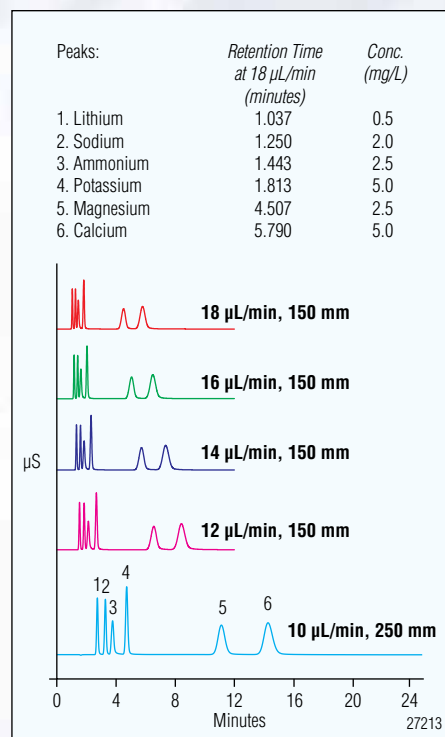
Many chromatographic separations have far more resolution than necessary to separate and integrate analytes of interest. Optimizing column dimensions and increasing flow rate can dramatically decrease run times while maintaining sufficient resolution. Dionex has developed a new line of Fast IC columns with decreased lengths and higher pressure tolerances to facilitate separations up to 4× faster than conventional columns. All ICS-5000 systems are designed to be compatible with Fast IC columns, which are available in standard bore, microbore, and capillary formats.



Common anions separated on A) an IonPac AS22 4 mm i.d. × 250 mm column and B) an IonPac AS22-Fast 4 mm i.d. × 150 mm column at a flow rate of 1.2 mL/min. The excess resolution of the 250 mm column is marked in green.



Common anions separated on an IonPac AS22-Fast 2 mm i.d. × 150 mm column at flow rates from 0.3–0.63 mL/min. The smaller column i.d. allows 3× faster separations than with the 4 mm column at half the flow rate.



Cation separations on A) a 0.4 mm i.d. × 250 mm IonPac CS12A-8 μm capillary column and B–E) a 0.4 mm i.d. × 150 mm IonPac CS12A-5 μm fast capillary column at increasing flow rates. The six common cations can be separated more than 3× faster.


Easy Configuration

Innovative Solutions for System Setup

At the heart of the ICS-5000 system is the innovative IC Cube module, a revolutionary way to add, configure, and use capillary consumables. All consumables are contained in one convenient, easily-accessed cube, including the guard and separation columns, suppressor, degasser, and injection valve. Color-coded connections and precut, preformed tubing makes plumbing simple. The close proximity of the consumables reduces dead volume, thus improving performance. The reduced number of fittings further improves performance and ease-of-use.

The Detector/Chromatography module of the ICS-5000 has room for two IC Cubes, providing dual-channel capabilities. Separate temperature zones (10 to 40 °C) for each IC Cube support two different, simultaneous or sequential applications. IC Cubes can be switched easily for rapid reconfiguration.

The IC Cube makes plumbing columns and suppressors easy with color-coded connections and precut, preformed tubing.



The IC Cube slides easily into the chromatography compartment for rapid reconfiguration.

Reagent-Free IC Consumables

Precise, Reliable, Automatic Isocratic and Gradient Elution

Enjoy the benefits of precise, reproducible eluent production without handling hazardous chemicals. With an RFIC-EG system, your eluent is generated from deionized water consistently and conveniently. The system uses only 15 mL of water per day with continuous operation in the capillary format. Gradient elution is as easy as isocratic elution, all precisely computer-controlled, allowing you to save time and money by accelerating your separations. The capillary eluent cartridge will last up to 18 months of continuous operation under typical conditions. The capillary format also increases maximum generated eluent concentration to 200 mM, further accelerating difficult separations.



Easy to install and use, the capillary eluent generator cartridge provides eluent for up to 18 months of continuous operation under typical conditions.



The EG tray slides out for quick and easy cartridge replacement.

Separation Challenges Resolved

Chemistries for Challenging Separations

Dionex has a long history of supplying world class columns for anion, cation, organic acids, amine, carbohydrate, and amino acid separations, offering multiple chemistries for different application needs. Our suppressors, Continuously Regenerated Trap Columns (CR-TC), and carbonate removal devices (CRD) reduce noise and improve detection limits, ensuring the best results obtainable for a wide range of applications.

Capillary-Based IonPac Anion and Cation-Exchange Columns

Each IonPac Capillary column (0.4 mm) is packed with the same material as the equivalent analytical scale version, thus producing the same separation performance as a 4 mm column, while requiring only 1/100th the eluent flow rate. Mass sensitivity is greatly improved due to the smaller cross-sectional area, while the low eluent usage and waste production reduces operating costs.

Capillary Electrolytic Suppressor: CES 300

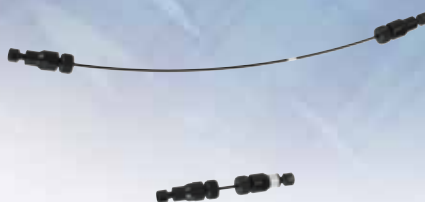
The CES 300 Suppressor electrolytically generates the ions necessary for eluent suppression through the electrolysis of water. Highly conductive hydroxide (anion analysis) or methanesulfonic acid (cation analysis) eluents are converted into pure water, thus reducing the baseline on a conductivity detector while improving the sensitivity and accuracy. The CES 300 suppressors are optimized for eluent flow rates typically used in capillary systems (5–30 $\mu\text{L}/\text{min}$).

Capillary Carbonate Removal Devices: CRD 200 (Capillary)

Carbonate contamination from samples can decrease sensitivity and accuracy for analytes like sulfate that elute close to the carbonate peak. The CRD 200 (Capillary) uses the same carbonate-permeable membrane as the standard and microbore CRDs, with dead volumes optimized for capillary flow rates.

Capillary Continuously Regenerated Trap Columns

CR-TCs are high-pressure, electrolytically-regenerated devices designed for use with hydroxide and MSA eluent generators exclusively. These trap columns operate continuously to remove trace levels of contaminants introduced by the feed water without the need for off-line chemical regeneration. CR-TCs allow operation with very low baseline drift during gradient operation and improve day-to-day and lab-to-lab reproducibility.



Reliable Sample Delivery

Versatile Automation Solutions

Dionex autosamplers integrate seamlessly with the ICS-5000, providing effortless automation and advanced sample preparation capabilities. All wetted surfaces are nonmetallic and chemically inert, protecting columns and sensitive samples from contamination. Control through Chromeleon software ensures reproducible results, clear audit trails, and easy automation of calibration, sample preparation, and automated dilution and resampling of out-of-range samples.

AS-DV

- Affordable automation
- Precise mechanics for high reproducibility
- Sample filters integrated into vial caps
- Optional high-pressure valve for automated sample preparation
- Random access and sample overlap capabilities



AS-AP

- Fraction collection and reinjection capabilities
- Flexible formats—10 mL vials to 0.45 mL well plates
- Full-loop, partial-loop, and limited-sample injections
- Automated sample preparation (dilution, concentration, matrix elimination, precolumn derivatization)
- AutoDilution for resampling out-of-range samples
- Simultaneous or sequential injections for dual system
- Temperature control for thermally labile samples
- Fast injection cycle time, <30 s per 5 μ L

Simply Intelligent Software

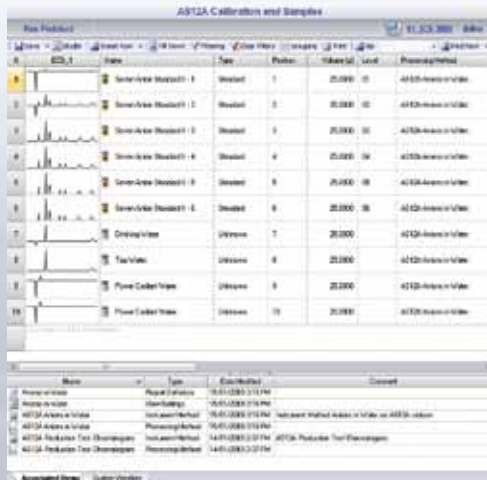
Powerful Capabilities and Outstanding Usability

The natural complement to your IC system is Chromeleon 7, the world's leading chromatography data system: With its inviting user interface and time-saving innovations, Chromeleon 7 software streamlines your path from samples to results. You'll find all the tools you need to tackle your toughest challenges without getting distracted from your goals. Chromeleon 7 software delivers both rich functionality and outstanding usability. It is Simply Intelligent™ software.

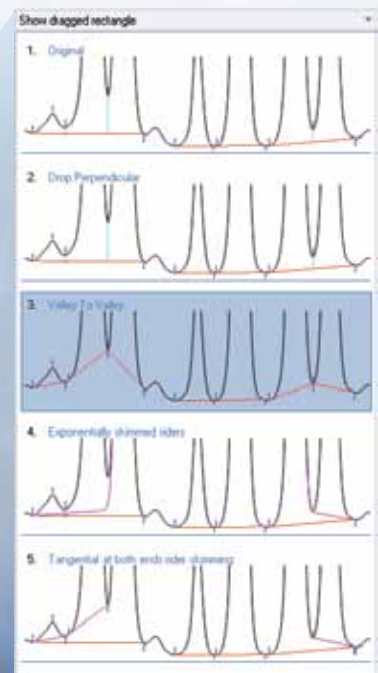
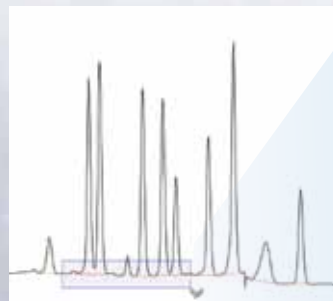


Use *eWorkflows*[†] to perform complete analyses perfectly, from sequence setup to final report, with just a few mouse clicks.

Gain an instant and intuitive understanding of your data at a glance with the Chromeleon 7 software's unique *MiniPlots*[†].



Get the peak treatments you want in seconds with the *SmartPeaks*[™] Integration Assistant[†].



[†]Patent Pending.

Discover the ICS-5000 and Capillary IC

The ICS-5000 system is the next generation of high-end ion chromatography systems, offering the ability to use 4 mm, 2 mm, or the newly announced 0.4 mm diameter column sets. With the new capillary IC Cube, Dionex has redefined ease-of-use by color-coding fittings and reducing the number of connections in the system; all with an array of detectors and options that add up to a very flexible system. Finally, the reduced eluent flow rate reduces eluent consumption and produces less waste, making the ICS-5000 system a green technology.

For more information or to place an order, contact the Dionex office nearest you or your local distributor. Phone numbers and addresses for worldwide subsidiaries can be found in the About Dionex section of www.dionex.com.

Enjoy Industry-Leading Support

Dionex Customer Support Centers are located in the Americas, Europe, and Asia. State-of-the-art laboratories are equipped with the full line of Dionex LC instrumentation and software capabilities. Support Centers provide accessible locations for advanced training and enhanced application development capabilities. Users can attend these laboratories to learn new skills in addressing challenging applications, receive training and support, and discover new, innovative LC and sample preparation solutions.

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www.dionex.com



Dionex products are designed, developed, and manufactured under an ISO 9001 Quality System.

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