**Thermo Scientific Dionex
ICS-1100, ICS-1600, and ICS-2100 Systems**
Ion Chromatography

Simplicity and performance to meet your needs and budget

integrated ion chromatography systems

Thermo SCIENTIFIC

Dedicated system configurations

Dionex™ ICS-1100 Series

Standard Features	Options
• Dual-Piston Pump • Thermostated Digital Conductivity Cell • Electrolytic Suppression • LED Status Panel • Eluent Regeneration Controller • Standard bore and microbore column support	• Eluent Regeneration (RFIC-ER) • Column Heater • In-Line Vacuum Degas • Thermo Scientific Dionex Chromeleon SE Software • Full Chromeleon Chromatography Data System software • Auxiliary high pressure valve for sample preparation, 6-port or 10-port

Dionex ICS-1600 Series

Standard Features	Options
• Touchpad Front Panel Control • Dual-Piston Pump • Thermostated Digital Conductivity Cell • Electrolytic Suppression • Column Heater • Eluent Regeneration Controller • Standard bore and microbore column support	• Eluent Regeneration (RFIC-ER) • Chromeleon™ Chromatography Data System software • In-Line Vacuum Degas • Auxiliary high pressure valve for sample preparation, 6-port or 10-port

Dionex ICS-2100 Series

Standard Features	Options

• Touchpad Front Panel Control
• RFIC-EG System
  -Eluent Generation
  -Electrolytic Gradients
  -Electrolytic Suppression
  -CR-TC Trap Column Control
• Dual-Piston Pump
• Thermostated Digital Conductivity Cell
• Column Heater
• Standard bore and microbore column support
	• In-Line Vacuum Degas
	• Chromeleon Chromatography Data System software
	• Eluent Regeneration (RFIC-ER)
	• Auxiliary high pressure valve for sample preparation, 6-port or 10-port
	• Electrolytic Sample Preparation (RFIC-ESP)
	• Electrolytic Water Purifier

As an RFIC-EG system, just add water
to produce these eluents:
- K^+, Na^+, or Li^+ hydroxide
- MSA
- CO_3^-
- CO_3^-/HCO_3^-

The Dionex ICS-2100 System

Front Panel 1

The LCD touchpad front panel on the Dionex ICS-1600 and ICS-2100 systems provides precise control and monitoring at the instrument.

Eluent Generator 2

Eluent concentrations can be changed with the click of a mouse. Atmospheric carbonate contamination is virtually eliminated. Eluent generation also eliminates the variability of manually prepared eluents and improves day-to-day, operator-to-operator and lab-to-lab repeatibility.

Conductivity Cell 3

Low-volume, high-performance thermostated cell provides high sensitivity and stable operation. Autoranging allows both major and minor components to be detected in a single run.

Suppressor 4

All Dionex suppressor technologies for 2 and 4 mm i.d. columns are supported. Electrolytic suppression provides highest performance detection with less maintenance.

Column Heater 5

Temperature control promotes column stability and reproducibility in many applications. A low-dispersion heat exchanger provides eluent preheating prior to the column to maintain the column temperature set point. The column heater is standard on the Dionex ICS-1600 and ICS-2100 systems, and optional on the ICS-1100 system.

Leak Detector and Drip Tray 6

Provide fast response and shutdown for system leaks.

USB Communication 7

Plug-n-Play USB communication permits fast connectivity and reliability. Instantaneous recognition with auto-configuration provides simplicity when configuring systems.

Eluent Valve 8

Electronically controlled valve provides positive shutoff of eluent before to the pump for easy servicing.

Vacuum Degas (Optional) 9

Automatic in-line vacuum degassing of eluents ensures reproducibility and protection of eluents from contamination and decomposition.

Automated Sample Prep 10

Optional 6-port or 10-port valve provides a wide range of sample injection and preparation options, including matrix elimination, inline filtration, and concentration.

Auxiliary Power Supply 11

The auxiliary power supply supports electrolytic devices, such as a water purifier for trace analysis or CR-TC for sample preparation.

Pump 12

Dual-piston pump design provides low drift and pulsation-free eluent delivery for stable baselines and low detection limits. The PEEK™ polymeric flow path eliminates metal contamination and corrosion.
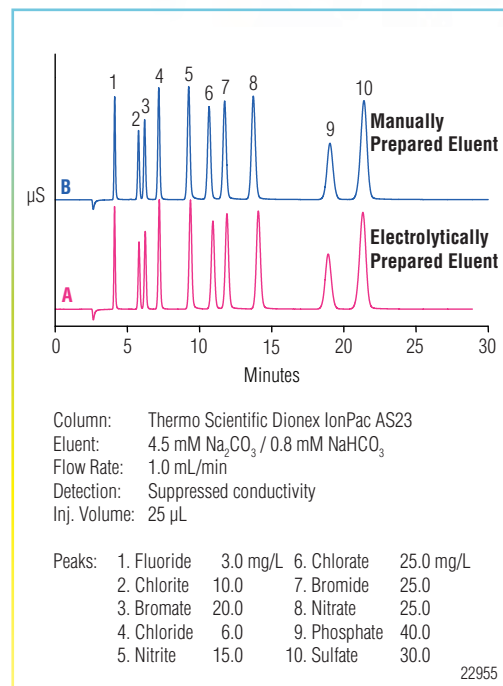
Injector 13

Highly precise, valve provides reliability and consistency from injection to injection.

Integrated ion chromatographs

The Dionex ICS-1100, ICS-1600, and ICS-2100 high-performance integrated Reagent-Free™ ion chromatography (RFIC™) systems provide the ultimate in productivity for low cost per analysis while maintaining high-sensitivity results. The systems combine the power of on-line sample preparation with all the capabilities of modern IC systems, including eluent generation (EG), eluent regeneration (ER), and electrolytic sample preparation (ESP). All three RFIC systems feature a dual-piston pump and optional eluent degasser, a conductivity detector with heated cell, and a chromatography compartment for columns, suppressors, and automated sample preparation. The Dionex ICS-2100 is the first totally integrated RFIC system with Electrolytic Sample Preparation (RFIC-ESP system) for automated on-line sample preparation combined with eluent generation. The Dionex ICS-1100 and ICS-1600 are the first integrated RFIC systems with built-in ER control (RFIC-ER systems), allowing continuous operation for up to four weeks. The ICS series is compatible with all Dionex suppressor technologies and all Dionex 2 mm to 5 mm columns.

Column:	Thermo Scientific Dionex IonPac AS23
Eluent:	4.5 mM Na_2CO_3 / 0.8 mM $NaHCO_3$
Flow Rate:	1.0 mL/min
Detection:	Suppressed conductivity
Inj. Volume:	25 µL

Peaks:	1. Fluoride	3.0 mg/L	6. Chlorate	25.0 mg/L
	2. Chlorite	10.0	7. Bromide	25.0
	3. Bromate	20.0	8. Nitrate	25.0
	4. Chloride	6.0	9. Phosphate	40.0
	5. Nitrite	15.0	10. Sulfate	30.0

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Identical separation of anions and oxyhalides using manually or electrolytically prepared eluent.
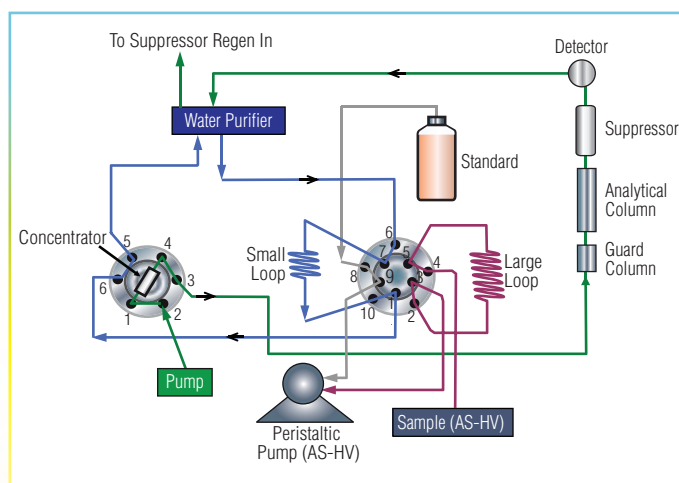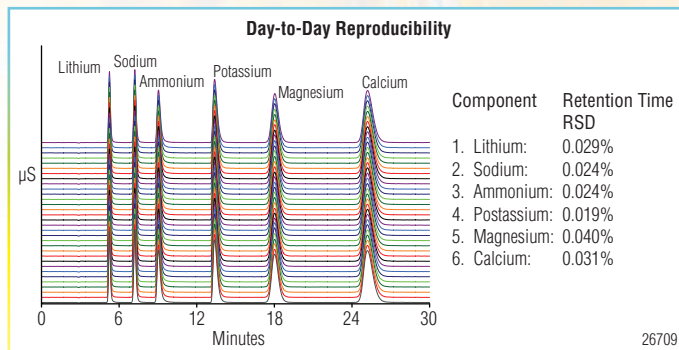

In RFIC-ESP systems, the optional electrolytic water purifier replaces the sample loading pump and provides a highly purified source of transfer water facilitating preconcentration or matrix elimination applications.
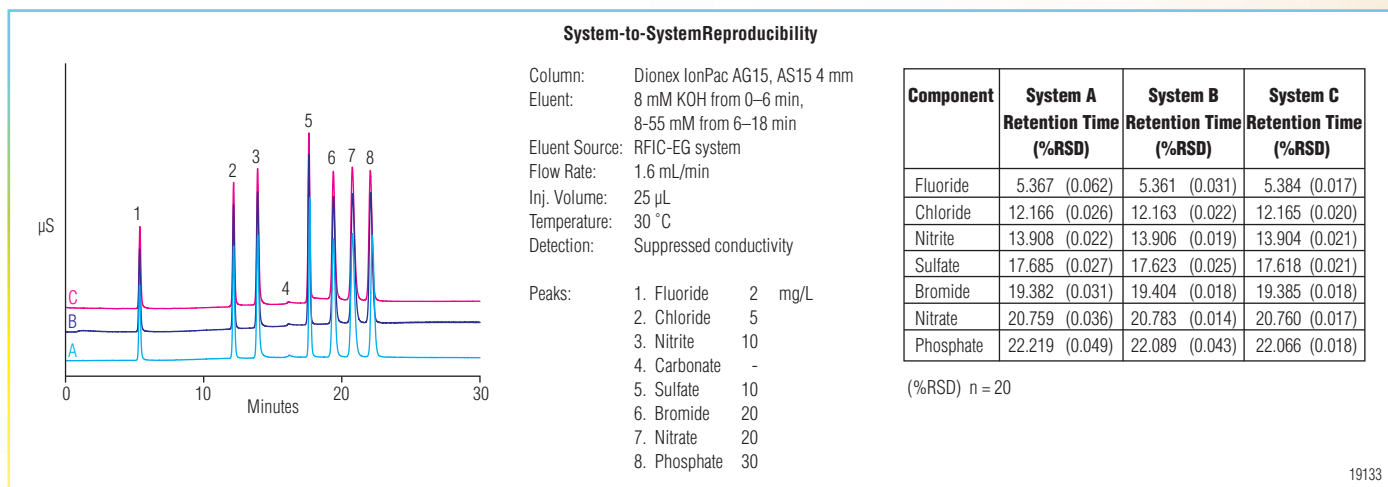
Powerful RFIC Solutions

The Dionex ICS-1100 RFIC-ER system integrates an advanced set of features into a single instrument, including RFIC-ER control and plumbing for simple setup of eluent regeneration. A dual-piston pumping system with active feedback control provides extremely low pressure-ripple baselines, enabling the low flow rates required for microbore columns. Advanced detector cell design and precision temperature control provide drift-free baselines for precise integration and quantification at very low analyte concentrations. Valve options facilitate a variety of automated sample handling and preparation techniques.

The Dionex ICS-1600 RFIC-ER system has the same features as the Dionex ICS-1100—including the powerful sample preparation capabilities—with the addition of an LCD touch-panel display and integrated column heater.

Day-to-Day Reproducibility

Component	Retention Time RSD
1. Lithium:	0.029%
2. Sodium:	0.024%
3. Ammonium:	0.024%
4. Postassium:	0.019%
5. Magnesium:	0.040%
6. Calcium:	0.031%

RFIC-EG systems provide excellent reproducibility. Outstanding column temperature control and pump performance are demonstrated in this example showing a Dionex IonPac™ CS16 column and replicates of cation standards.

The Dionex ICS-2100 is the first system with integrated eluent generation (EG) and electrolytic sample preparation (ESP) capabilities. The RFIC-EG/ESP system combines the sensitivity and precision of eluent generation with a variety of automated sample preparation techniques. An auxiliary power supply is available to drive electrolytic devices, such as a water purifier for ultratrace-level anion and cation analyses.

System-to-System Reproducibility

Column: Dionex IonPac AG15, AS15 4 mm
Eluent: 8 mM KOH from 0–6 min, 8-55 mM from 6–18 min
Eluent Source: RFIC-EG system
Flow Rate: 1.6 mL/min
Inj. Volume: 25 µL
Temperature: 30 °C
Detection: Suppressed conductivity

Peaks: 1. Fluoride 2 mg/L; 2. Chloride 5; 3. Nitrite 10; 4. Carbonate -; 5. Sulfate 10; 6. Bromide 20; 7. Nitrate 20; 8. Phosphate 30

Component	System A Retention Time (%RSD)	System B Retention Time (%RSD)	System C Retention Time (%RSD)
Fluoride	5.367 (0.062)	5.361 (0.031)	5.384 (0.017)
Chloride	12.166 (0.026)	12.163 (0.022)	12.165 (0.020)
Nitrite	13.908 (0.022)	13.906 (0.019)	13.904 (0.021)
Sulfate	17.685 (0.027)	17.623 (0.025)	17.618 (0.021)
Bromide	19.382 (0.031)	19.404 (0.018)	19.385 (0.018)
Nitrate	20.759 (0.036)	20.783 (0.014)	20.760 (0.017)
Phosphate	22.219 (0.049)	22.089 (0.043)	22.066 (0.018)

(%RSD) n = 20

RFIC-EG systems produce consistent results. The table shows excellent reproducibility when transferring applications from system to system.

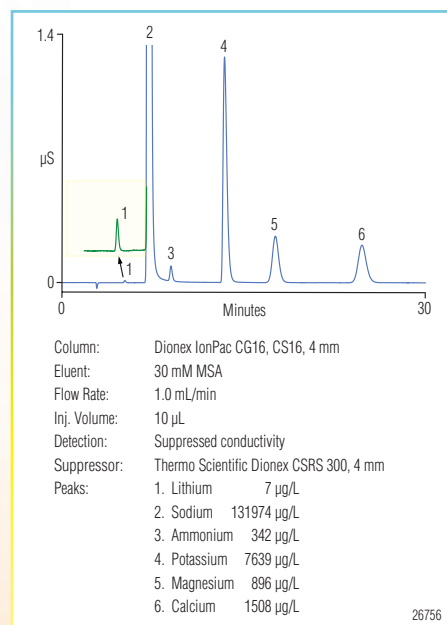# A powerful combination of chemistry and software
Integrated, upgradable modules for all your application needs

Electrolytic Suppression

The Dionex ICS-1100, ICS-1600, and ICS-2100 systems support all types of Dionex suppressor technologies for standard bore and microbore and column formats, including Thermo Scientific Dionex MMS, and the SRS and AES electrolytic suppressors, which free the operator from manual regenerant preparation.
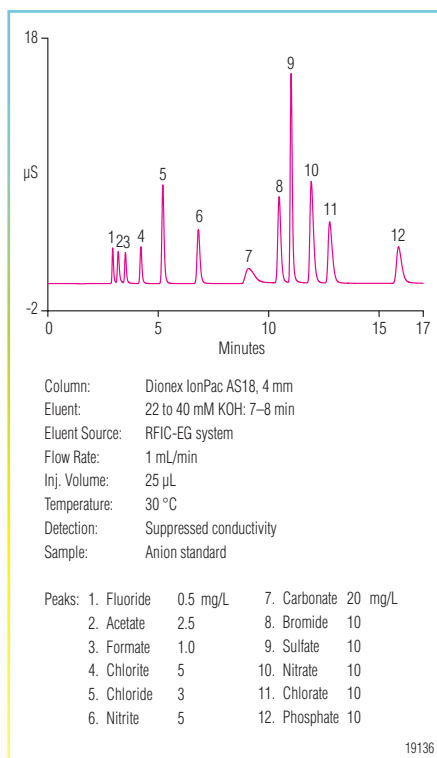
The advantages of electrolytic suppression include:

• Enhanced day-to-day consistency with low noise and drift

• Reduced background conductivity and lower detection limits

• Fast startup times

• Superior sensitivity for analysis of cations or anions

Conductivity Detection

The Dionex ICS-1100, ICS-1600, and ICS-2100 systems are designed and optimized for all types of IC separations and applications using conductivity detection. The temperature-controlled high-performance conductivity cell is unaffected by ambient temperature variations. Digital control offers a wide dynamic range for detecting analytes with large concentration variations within the same sample.

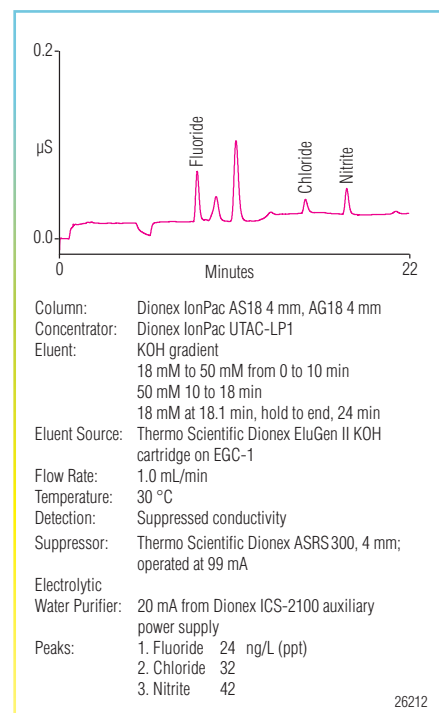| Column:	Dionex IonPac CG16, CS16, 4 mm
Eluent:	30 mM MSA
Flow Rate:	1.0 mL/min
Inj. Volume:	10 μL
Detection:	Suppressed conductivity
Suppressor:	Thermo Scientific Dionex CSRS 300, 4 mm
Peaks:	1. Lithium 7 μg/L
	2. Sodium 131974 μg/L
	3. Ammonium 342 μg/L
	4. Potassium 7639 μg/L
	5. Magnesium 896 μg/L
	6. Calcium 1508 μg/L

26756

RFIC-EG systems and electrolytic suppression provide excellent peak resolution and sensitivity. This drinking water sample displays a lithium well resolved from a 20,000-fold excess of sodium.

Column:	Dionex IonPac AS18, 4 mm
Eluent:	22 to 40 mM KOH: 7–8 min
Eluent Source:	RFIC-EG system
Flow Rate:	1 mL/min
Inj. Volume:	25 μL
Temperature:	30 °C
Detection:	Suppressed conductivity
Sample:	Anion standard

Peaks:	1. Fluoride	0.5 mg/L	7. Carbonate	20 mg/L
	2. Acetate	2.5	8. Bromide	10
	3. Formate	1.0	9. Sulfate	10
	4. Chlorite	5	10. Nitrate	10
	5. Chloride	3	11. Chlorate	10
	6. Nitrite	5	12. Phosphate	10

19136

The Dionex ICS-2100 system and the Dionex IonPac AS18 column provide excellent separation and increased sensitivity in this anion application. RFIC-EG systems meet the requirements of U.S. EPA methods 300.0 and 300.1.

Column:	Dionex IonPac AS18 4 mm, AG18 4 mm
Concentrator:	Dionex IonPac UTAC-LP1
Eluent:	KOH gradient
	18 mM to 50 mM from 0 to 10 min
	50 mM 10 to 18 min
	18 mM at 18.1 min, hold to end, 24 min
Eluent Source:	Thermo Scientific Dionex EluGen II KOH cartridge on EGC-1
Flow Rate:	1.0 mL/min
Temperature:	30 °C
Detection:	Suppressed conductivity
Suppressor:	Thermo Scientific Dionex ASRS 300, 4 mm; operated at 99 mA
Electrolytic Water Purifier:	20 mA from Dionex ICS-2100 auxiliary power supply
Peaks:	1. Fluoride 24 ng/L (ppt)
	2. Chloride 32
	3. Nitrite 42

26212

The RFIC-ESP system is especially well-suited for trace-level analysis.

Eluent Generation

Eluent generation, integrated into the Dionex ICS-2100 system requires only a source of DI water; isocratic or gradient eluent concentrations are programmed with the click of a mouse for unprecedented simplicity and error-free operation. RFIC-EG provides precise eluent concentration delivery, run-to-run, instrument-to-instrument, and lab-to-lab.

Electrolytically generated hydroxide eluents have very low background conductivity, resulting in the lowest detection limits available for ion chromatography.

Eluent Regeneration

The Dionex ICS-1100 and ICS-1600 systems are the first fully integrated RFIC-ER systems. Eluent regeneration (ER) technology is designed for systems dedicated to routine isocratic analyses. Eluent lasts up to four weeks, increasing reproducibility while reducing eluent preparation time and waste disposal. Always on and always ready, the system does not require re-equilibration or recalibration between eluent preparations.

Automated Sample Preparation

The sample preparation capabilities available with the Dionex ICS-1100, -1600, and -2100 systems provide a wide variety of automated labor-saving techniques, described below:

Electrolytic Sample Preparation

The auxiliary power supply on the Dionex ICS-2100 system allows control of electrolytic sample preparation devices, such as Self-Regenerating™ Neutralizers for neutralization of acidic or basic samples. An optional electrolytic water purifier can be added to to reduce ion backgrounds in sample transfer water for ultratrace-level determinations.

Automated Large Loop/Small Loop Sample Injection

Automatically reinject different volumes of sample when a specified analyte concentration is out of range. Two injection loops with a large volume differential makes reanalysis of disparate sample concentrations easy.

On-Line Filtration

Simple, inexpensive and reliable, on-line filtration reduces costs and improves confidence.

On-Line Matrix Elimination

Organic materials easily can foul and damage analytical columns. Trap columns can remove these materials, but trap column lifetime is limited. Automated column wash or backflush significantly extends organic trap column lifetime, prevents carryover, and eliminates sample contamination.

Sample Preconcentration

Automated on-line sample preconcentration makes trace analysis easy, while an optional integrated auxiliary valve facilitates automated sample preconcentration. The optional electrolytic water purifier reduces analyte background noise and eliminates the need for an external pump for loading the concentrator column.

Chromatography management solutions
Chromeleon Chromatography Data System Software

Chromeleon software provides the most powerful control and data processing software available for ion chromatography. Chromeleon features make system control and setup fast and easy. Overall system and method consistency is accomplished with minimal effort with easy-to-follow screens and setup wizards.

Wellness Trending

The built-in Electronic Log Book monitors and plots the trend of the condition of your system over time to ensure high performance and accurate diagnosis of potential service issues.

eWorkflows

eWorkflows automatically generate the injection list, load the correct instrument conditions, and apply the correct processing parameters. Chromatograms are immediately processed and results are instantly calculated.

Application Templates

Select the column type and the Chromeleon software sets the eluent conditions and flow rate, guaranteeing system consistency and application conditions proven to meet your laboratory requirements.

Calibration Wizard

Enter the component and concentration levels through a wizard-based program for fast and easy method development and quantification.

To discover more ways Chromeleon data system software can benefit your laboratory, contact your local Dionex Sales Representative or visit www.thermoscientific.com/dionex.

ISO 9001 REGISTERED

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