

## ICS-1000 Ion Chromatography System



*The preconfigured ICS-1000 integrated system performs isocratic ion chromatography (IC) separations using conductivity detection. When configured as a Reagent-Free™ IC system with Eluent Regeneration (RFIC-ER™ system), the ICS-1000 allows continuous operation for up to four weeks using a single eluent preparation.*

*Systems come equipped with a dual-piston pump and a thermally controlled conductivity cell. Coupled with an AutoSuppression® device, such as the SRS® 300 electrolytic suppressor, the ICS-1000 provides high performance with ease of use. Automation provides full control and digital data collection from a PC using USB high-speed communication protocol. Available options include eluent regeneration, column heating, and in-line vacuum degassing.*

### Versatile

- 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.
- Dual-piston pump design reduces pulsations, allowing high-sensitivity detection and excellent flow-rate accuracy and precision.
- Flexible flow rate supports 2, 3, 4, and 5 mm column formats.

### Simple and Precise Control

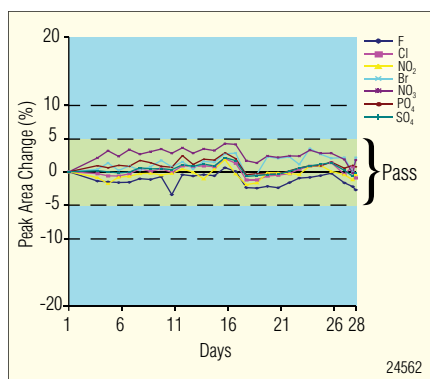
- Built-in control for SRS and Atlas® electrolytic suppressors. AutoSuppression with electrolytic suppression eliminates the need to hand-prepare acid or base regenerants. Electrolytic suppression reduces background conductivity and provides high signal-to-noise ratios.
- Full control and digital data collection available with Windows® based Chromeleon® SE Chromatography Workstation Software using USB high-speed communication protocol.
- Application templates preload all instrument parameters for fast and easy operation.
- Through Chromeleon software control, an electronic logbook provides monitoring of user-selectable operational parameters by creating virtual channels.



Passion. Power. Productivity.

## High Performance

- For improved reproducibility, the heated and thermostated high-performance conductivity detection cell permits measurements that are unaffected by temperature variation.
- Advanced single-range digital output with operating range to 15,000  $\mu\text{S}$  full scale. Alternate mode permits single-range analog signal output.
- Optional 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.



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.

## Convenient

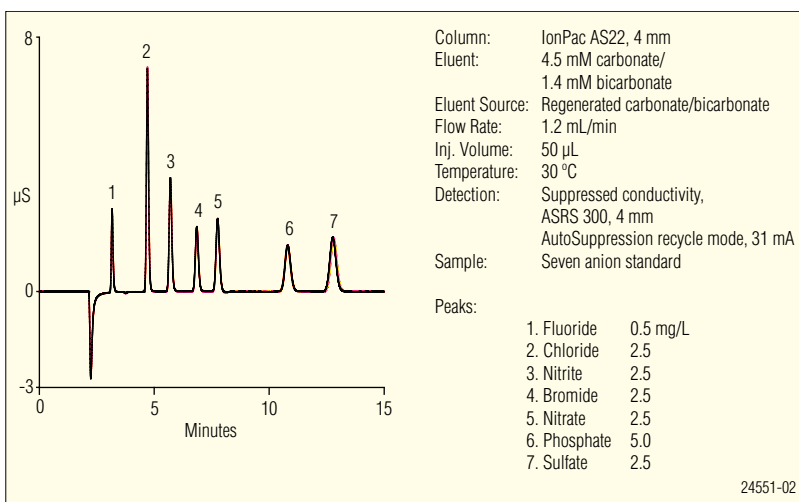
- Versatile eluent organizer tray accommodates 1, 2, or 4 liter eluent bottles.
- Electrically actuated six-port Rheodyne PEEK injection valve.
- Ergonomically placed injection port for easy manual sampling.
- Eluent valve provides positive shut-off of eluent flow prior to the pump for easy servicing.
- Easy-access door to 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.

## Key Features

- Dual-piston pump
- Electrolytic suppression
- Digital conductivity detection
- USB connectivity, plug-n-play
- Optical leak detector
- Electronic logbook and trending through virtual channels

## Eluent Regeneration Option

- When configured as a Reagent-Free IC system with Eluent Regeneration (RFIC-ER system), the ICS-1000 allows the use of a single preparation of eluent for up to four weeks.
- The RFIC-ER option uses the SRS 300 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.



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.

## ICS-1000 IC SYSTEM SPECIFICATIONS

### Analytical Pump and Fluidics

**Type:**

Serial dual-reciprocating pistons, microprocessor-controlled constant stroke, variable speed

**Construction:**

Chemically inert, metal-free PEEK pump heads and flow paths compatible with aqueous eluents of pH 0–14 and reversed-phase solvents

**Pump Operating Pressure**

0–35 MPa (0–5000 psi)

**Flow Rate Range:**

0.00–5.00 mL/min in 0.01 mL/min increments without changing pump heads

**Flow Precision:**

<0.1%

**Flow Accuracy:**

<0.1%

**Pressure Ripple:**

<1%

**Eluent On-Off Valve:**

Standard

**Piston Seal Wash:**

Dual-pump head, wash can be continuous when connected to rinse solution supply

**Pressure Alarm Limits:**

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

**Vacuum Degas:**

Yes, optional, automatic control

**Eluent Bottles:**

Polypropylene

**Eluent Bottle Pressure:**

Not required

**Injection Valve:**

6-port, 2-position Rheodyne valve, electrically activated

**Maximum Column Lengths:**

250 mm analytical column with 50 mm guard column

**Column Heater (Optional)**

**Operating Temperature Range:**

30 to 60 °C (86 to 140 °F); minimum 5 °C above ambient. Settable range is equal to working range

**Temperature Stability:**

±0.5 °C at sensor

**Temperature Accuracy:**

±0.5 °C at sensor, at 40 °C

**Eluent Generation**

Optional with RFC-30

**Eluent Regeneration**

**Eluent Regeneration Support:**

Yes, with optional RFIC-ER controller

**Eluents:**

Carbonate and carbonate/bicarbonate up to 20 mM  
MSA up to 34 mM

**Flow Rates:**

0.01–2.00 mL/min

**Continuous Operation (4 L of Eluent):**

Up to 28 days or 2000 samples, typically

**Always On, Always Ready Capable:**

Yes, standard feature

**Remains Fully Calibrated for Extended Periods (≤28 days):**

Yes, standard feature. results are traceable to a single calibration

**System Wellness:**

Consumables usage monitoring for predictive maintenance

**Maximum Operating Pressure:**

21 MPa (3000 psi)

**Operating Temperature Range:**

4–40 °C

**Suppressors and Control**

**Chemical Suppression:**

2 mm and 4 mm anion and cation, membrane suppression bed types

**Displacement Chemical Regeneration:**

2 mm and 4 mm anion and cation, membrane suppression bed types

**Electrolytic Suppression—Self-Regenerating:**

2 mm and 4 mm anion and cation. Both membrane and MonoDisc suppression bed types available

**Electrolytic Suppression—Self-Regenerating with External Water Mode:**

2 mm and 4 mm anion and cation. Both membrane and MonoDisc suppression bed types available

**Current Control Range:**

**SRS:**

4 mm, 0–300 mA in 1 mA increments  
2 mm, 0–100 mA in 1 mA increments  
AES<sup>®</sup>: 0–150 mA in 1 mA increments  
CMD: 0–500 mA in 1 mA increments  
SRN: 0–500 mA in 1 mA increments

**Salt Converter:**

Available in 2 and 4 mm versions

**AMMS-ICE:**

Available in 2 and 4 mm versions

**Carbonic Acid Removal for Anions:**

ASRS<sup>®</sup> 300 with CRD 200 for hydroxide eluents  
ASRS 300 with CRD 300 for carbonate eluents

**Non-Suppressed:**

Yes, supported

**Suppressor Wear Parts:**

None; peristaltic pump and inline filters not required

**Suppression Capacity:**

Anion SRS 300 (4 mm): 200 µeq/min  
Cation SRS 300 (4 mm): 110 µeq/min  
Anion SRS 300 (2 mm): 50 µeq/min  
Cation SRS 300 (2 mm): 37.5 µeq/min  
Anion MMS<sup>™</sup> 300 (4 mm): 150 µeq/min  
Cation MMS 300 (4 mm): 150 µeq/min  
Anion MMS 300 (2 mm): 37.5 µeq/min  
Cation MMS 300 (2 mm): 37.5 µeq/min  
Anion AES: 25 µeq/min  
Cation AES: 25 µeq/min

**Void Volumes:**

SRS 300 (4 mm): <50 µL  
SRS 300 (2 mm): <15 µL  
MMS 300 (4 mm): <50 µL  
MMS 300 (2 mm): <15 µL  
AMMS-ICE 300 (4 mm): <50 µL  
AMMS-ICE 300 (2 mm): <15 µL  
Anion AES: <35 µL  
Cation AES: <35 µL

**Conductivity Detector Electronics and Flow Cell**

**Type:**

Microprocessor-controlled digital signal processor

**Cell Drive:**

8 kHz square wave

**Linearity:**

1%

**Resolution:**

0.00238 nS/cm

## ICS-1000 IC SYSTEM SPECIFICATIONS (CONT'D)

**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

**Temperature Stability:**

<0.01 °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:**

Dionex AS40, AS, AS-HV, or third-party autosamplers

**Sequential/Simultaneous Injection**

Yes, depending on autosampler capabilities

**Automated Dilution:**

Yes, available with AS Autosampler

**Dilution Factor, AS Autosampler:**

1:1 to 1:1000

**Dilution Time, AS Autosampler:**

15 seconds with sample overlap

**Inline Sample Degassing:**

Yes, optional with CRD 300/200

**Inline Filtration:**

Yes, AS40 Autosampler or inline filter

**Automation Flexibility:**

High, conditionals using Chromeleon and post run features

**System Software**

Chromeleon Chromatography Management Software, supports Windows 2000, XP, or Vista

- Automated Procedure Wizards
- System Smart Startup and Shutdown
- 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 3<sup>rd</sup> Party (fully controls over 300 instruments from more than 30 manufacturers, including GC, HPLC, and MS)
- 3-D Software for PDA, MS, and ED (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 Dionex office nearest you. Outside the U.S., order through your local Dionex office or distributor. Refer to the following part numbers.

### **ICS-1000 Ion Chromatography System with Software and PC**

An ICS-1000/Chromeleon SE/Windows Workstation bundled package includes: an ICS-1000 with isocratic dual-piston pump, injection valve, heated conductivity cell, USB cable, Chromeleon SE, computer (with Windows XP), and USB dongle. Chromeleon SE comes with one SE timebase controlling one ICS-1000 system. The ICS-1000 is supplied without a front control panel, and must be controlled through Chromeleon software. Consumables must be ordered separately.

ICS-1000 Ion Chromatography System with Chromeleon SE .....061076 and Windows XP Workstation, without Degas
ICS-1000 Ion Chromatography System with Chromeleon SE, .....061077 Windows XP Workstation, and Degas
ICS-1000 Ion Chromatography System with Chromeleon SE, .....061079 without Windows XP Workstation, or Degas
ICS-1000 Ion Chromatography System with Chromeleon SE .....061078 and Degas, without Windows XP Workstation
Optional Column Heater .....061301
RFIC-ER Anion Startup Kit .....067797 Includes anion installation kit and anion consumables.
RFIC-ER Cation Startup Kit .....067798 Includes cation installation kit and cation consumables.

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