systems

# ICS-3000 Ion Chromatography System

*The ICS-3000 Ion Chromatography System provides an impressive combination of increased productivity, expanded capabilities, and improved performance. Innovations in all modules provide up to an order of magnitude improvement in performance—the foundation of the system. Modular versatility, functional integration, and superior performance culminate in the most advanced ion chromatography system on the market.*

- Modular design allows versatility in configuring a wide variety of applications
- Flow rate accuracy, eluent generator electronics stability, and conductivity cell temperature control deliver high retention time reproducibility, baseline stability, and sensitivity
- Hydroxide, carbonate, and MSA consumables for Reagent-Free™ Ion Chromatography systems with Eluent Generation (RFIC-EG™ systems) offer high purity and unparalleled control and reproducibility for isocratic and gradient elutions
- When configured as a RFIC system with Eluent Regeneration (RFIC-ER™ system), the ICS-3000 allows the use of a single preparation of eluent for up to four weeks
- Dual-system capability (within the same footprint) maximizes throughput
- VWD Variable Wavelength Detector, PDA Photodiode Array, and MSQ Plus™ Mass Spectrometer Detector expand the range of applications and provide additional detail for every sample
- Integrated DC Detector/Chromatography module with precisely controlled temperature zones maintains baseline stability and increases application flexibility
- AM Automation Manager simplifies and automates complex applications including sample preparation, preconcentration, matrix elimination, and postcolumn reagent addition
- Innovative ED Electrochemical Detector capabilities improve and expand applications: multiwaveforms in a single run and post-run 3-D data processing
- Chromeleon® Chromatography Management software unifies and simplifies system control, operation, data collection, and reporting

DIONEX

**Passion. Power. Productivity.**

## Modular Capabilities and Performance

The modular ICS-3000 meets a wide and ever-increasing range of application needs. From entry-level IC for routine, dedicated analysis to the high-throughput, dual RFIC system, the ICS-3000 is truly designed for versatility and productivity. The system can be upgraded to a dual system configuration—without taking up more valuable laboratory bench space.

### Performance Enhancements

Significant performance enhancements make the ICS-3000 the most reproducible, stable, and sensitive ion chromatography system available today. State of the art flow rate accuracy, eluent generator electronics, and conductivity cell temperature control increase baseline stability and improve sensitivity.

### Unique System Control

Instead of individual module front panels, the ICS-3000 gives you one convenient control system. Chromeleon Chromatography Management software provides a centralized panel so that all module control parameters, status, calibration, and diagnostics are easily available. A convenient home screen shows overall system status while individual module tabs provide quick access to module functions and detailed status and diagnostics. Wizards take the uncertainty out of setting up customized analyses. System Wellness features alert you to potential system issues before they become problems.

### DP Dual and SP Single Pump

The DP Dual Pump and SP Single Pump are each available in multiple configurations based on application requirements. Both formats can be configured for gradient or isocratic eluent delivery. The SP pump-based system can be field-upgraded to a DP pump, depending on need. Pump assemblies slide out for easy access and serviceability. The pumps feature a variable-speed, serial-piston design to deliver consistent flow rates and quiet detector baselines. The pump offers a tenfold improvement in flow rate accuracy and precision over previous systems. The pumps are designed to support flow rates from 0.001 to 10.000 mL/min.

### EG Eluent Generator

The EG Eluent Generator module provides the benefits of an RFIC system with Eluent Generation (RFIC-EG™ system) in a dual-system format. Robust electronics provide an extremely stable baseline and precise gradient generation. You can generate high-purity eluents on-line, and run gradient separations as easily as isocratic. RFIC-EG systems combine "Just Add Water" eluent generation, eluent purification, and electrolytic suppression technologies. RFIC-EG systems eliminate variability and potential contamination compared to systems with manually prepared eluents, and provide superior performance, higher sensitivity, improved resolution, and excellent reproducibility. The EG can be configured for a single system or for dual-system support, along with an expanded set of eluent chemistry options for carbonate and hydroxide applications for anion analysis. RFIC-EG systems are only available from Dionex.

### Eluent Regeneration Option

With the eluent regeneration option, a single preparation of eluent can be used for up to four weeks. The RFIC-ER system 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.

### DC Detector/Chromatography

The DC Detector/Chromatography module houses and organizes chromatography components such as valves and columns, as well as conductivity and electrochemical detectors and cells. The module keeps plumbing organized and minimizes connection lengths to reduce delay volumes and improve peak efficiencies. The DC is separated into three sections for automation, detection, and separation. The DC offers up to five separate temperature zones that can be maintained simultaneously (separation section, detection section, two conductivity detector cells, and postcolumn reaction coils). This flexible and precise temperature control improves stability and enhances sensitivity. Improvements in conductivity detector temperature control and column temperature control further improve sensitivity.

### TC Thermal Compartment

The TC Thermal Compartment is for UV-Vis or IC-MS applications which do not require an ED or CD detector. It provides precise temperature control over a wide temperature range with fast heat up and cool down times. The single zone oven design minimizes tubing connection lengths and reduces delay volumes, yet allows single and dual valve configurations.

### CD Conductivity and ED Electrochemical Detectors

The CD and ED detectors are installed inside the DC compartment, minimizing tubing lengths and providing optimum thermal stability. The detectors are easy to install snap-in devices and can be configured in series for dual detection or as separate detectors for a dual system—all in the same enclosure.

The ED features a new cell design with an improved reference electrode. The cell is also more rugged due to an improved handle design that provides uniform torque on the working electrode. Multiple waveforms optimize detection conditions for individual analytes and signal measurements can be collected as a complete three-dimensional data set for post-run analysis and characterization of different compound classes.

**Optical Detectors**

The ICS-3000 can be configured with any of the optical detectors available from Dionex; the VWD, the PDA, and the RF2000, covering the visible ultraviolet, and fluorescent range of wavelengths. The ICS-Series Variable Wavelength Detector can be configured to monitor single or multiple wavelengths — up to four simultaneously. The PDA can monitor single or multiple wavelengths in addition to performing full 3-D scanning during each run. Each optical detector is configured as a separate module.

**AM Automation Manager**

The AM Automation Manager option can be configured in the upper compartment of the DC module. The AM includes options for two high pressure rotary valves and two low pressure solenoid valves for automated sample preparation, preconcentration, matrix elimination, and postcolumn reagent addition. Components are recognized, configured, and controlled through Chromeleon, providing complete automation for even the most complex applications.

**AS Autosampler**

The AS Autosampler can be configured for simultaneous or sequential sample delivery. In simultaneous delivery mode, sample is delivered through a splitter to two injection valves for dual full-loop injections. With this configuration you can perform two separate analyses on one sample (e.g., anions and cations).

For sequential delivery, valves are configured to divert the sample stream to the appropriate injection valve for loading. The AS also provides sample preparation options and variable sample size loading for preconcentration on various trap columns.

The ICS-3000 can also be configured with all other Dionex autosamplers and is compatible with many third party autosamplers.

## Module Features

**DP Dual and SP Single Pump**

The Dionex DP and SP Pumps are each available in isocratic or gradient configurations. The pumps support standard-bore and microbore applications. Gradient configurations provide low-pressure mixing of up to four mobile phases per pump at precisely controlled proportions and flow rates.

**DP and SP Features**

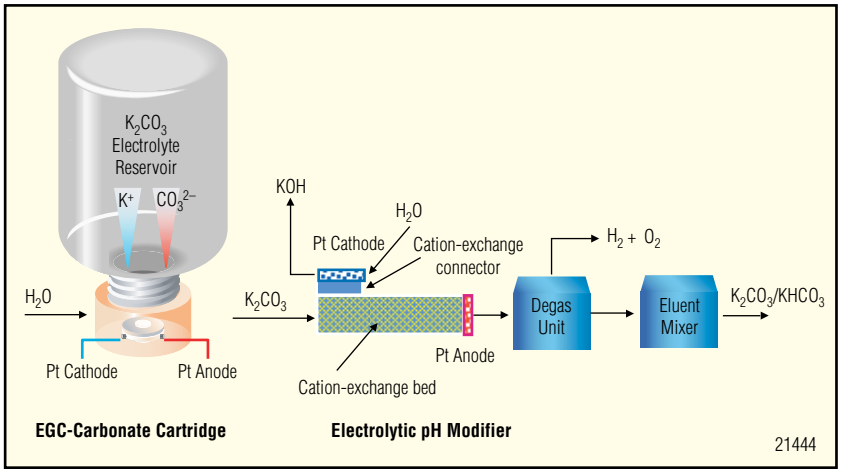
- Variable-speed, serial dual-piston design delivers consistent flow rates and quiet detector baselines
- Pump flow components are chemically inert, made with high-quality PEEK heads and fittings, inert polymer seals, and sapphire pistons
- Quaternary proportioning and a low-volume mixer deliver reproducible eluent mixtures
- Linear, concave, and/or convex gradients are possible
- Vacuum degas provides sealed, in-line degassing for flow reproducibility and protection of eluent from contamination and degradation
- Automated integral piston seal wash prolongs seal lifetime by preventing eluent crystallization on the seal surfaces
- The pump assemblies slide out for easy access and serviceability
- User-selectable pressure limits automatically stop pump flow in the event of leaks, flow restrictions, or depleted eluent reservoirs
- User-configurable alarm features in Chromeleon allow additional responses to status or alarm conditions
- Front panel indicates the status of power, pump flow, priming, connectivity (Chromeleon Control), and alarms

*DP Dual Pump module*

**Benefits of Dual Pump Configurations**

Dual configurations provide independent pumping capabilities in the same module and same space-saving footprint. Configure a DP-based system according to one of the following scenarios:

- Configure the system for dual applications, either running simultaneously or independently:
  - Anion and cation separations
  - Two different anion or two different cation separations
- Use the second pump for:
  - Sample preconcentration or matrix elimination
  - Postcolumn reagent delivery for postcolumn reaction (PCR) applications
  - External water and chemical regenerant delivery
  - A backup pump for the primary application
  - Consumables cleanup or start-up preparation; preventing primary system downtime for reconfiguration




*Electrolytic generation of $K_2CO_3/KHCO_3$ eluents using an EGC II $K_2CO_3$ cartridge and an EPM Electrolytic pH Modifier.*

*EG Eluent Generator module*

## EG Eluent Generator Module

The EG Eluent Generator module provides the benefits of an RFIC-EG system in a dual system format. The EG continues Dionex's technology leadership, allowing the user to generate high-purity eluents on-line and run gradient separations as easily as isocratic applications. Reagent-Free IC is the powerful combination of Dionex "Just Add Water" electrolytic eluent generation, purification, and suppression technologies. The EG can be configured for a single system or for dual system support.

### EG Features

- Eluents are generated from deionized water using an EG cartridge and then polished of contaminants using one of the Continuously Regenerating Trap Columns (CR-TCs)
- Now you can enjoy the RFIC system carbonate-based eluent generation using a carbonate cartridge and EPM Electrolytic pH Modifier
- In addition to KOH for anion separations, NaOH and LiOH cartridges are available for specialized applications
- The EG delivers eluent concentrations from 0.1 – 100 mM
- Control, status, and diagnostics are provided with Chromeleon software
- Improved EG electronics provide smoother eluent delivery with minimal noise for improved peak detection in both gradient and isocratic modes
- A slide-out tray provides easy access to the EG cartridges and CR-TCs for maintenance
- Using on-line eluent generation actually extends the lifetime of pump pistons and seals because the pumps only deliver water
- Front panel displays the status of module power, CR-TC power, and leak functions

### Benefits of an RFIC-EG System

- Minimizes baseline drift
- Improves retention time stability and resolution
- Provides excellent run-to-run reproducibility
- Supports both gradient and isocratic applications
- Minimizes labor and operating costs

## RFIC-ER Option

RFIC-ER systems can regenerate eluent for isocratic IC separations using carbonate, carbonate/bicarbonate, or methanesulfonic acid. These always on, always ready systems are ideal for the analysis of drinking, ground-, and surface waters, and are intended for use as systems dedicated to these analyses.

### Benefits of Eluent Regeneration

- A single preparation of eluent can be used for up to four weeks, reducing labor and waste.
- Trap, purification, and catalytic columns purify returning eluent, assuring consistent, high quality eluent for separations.
- Consistent eluent concentration generates reproducible results.
- 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, increasing the amount of operator and system time available for analysis.

## DC Detector/Chromatography Module

The DC Detector/Chromatography module houses and organizes chromatography components such as valves and columns. The DC module contains three sections: (1) separation, (2) detection, and (3) automation. The lower separation compartment holds injection valves, guard, and analytical columns, and is under independent temperature control. The conductivity and electrochemical detectors are housed above the separation columns. An Automation Manager option can be configured in the upper compartment to support switching valves and other hardware required for advanced applications.


*DC Detector/Chromatography module*

### DC Features

- Three distinct sections keep plumbing organized while minimizing connection lengths, reducing delay volumes, and improving peak efficiencies
- Two options for overall thermal control offer application and budgetary flexibility
  - Dual temperature zone configuration controls the injection valve and column compartment separately from the upper compartments
  - A single temperature zone configuration controls the temperature of both compartments at one set temperature
- With either configuration, the CD cells feature temperature control independent of the other sections
- In the dual temperature zone configuration, up to five separate temperatures can be maintained simultaneously (separation section, detection section, two detector cells, and reaction coil) providing maximum application flexibility
- Independent compartment doors allow independent access to the separation or detector section without disturbing the other thermal section (with dual temperature zone configuration)
- Automatic detection of valves, CD/ED cells, and suppressor devices by software
- Manual loading of sample is possible
- Column compartment can be configured with two independent injection valves
- Column/injection valve panel slides forward for easy access
- Optional analog output board provides analog detection signals to data recorders
- Optional analog board also includes eight user-assignable TTL inputs that are provided for basic valve and detector operation
- Front panel displays the status of module power, injection valve position, and alarms

### Expand Your Capabilities with Dual Detection Configurations

- Easily install the CD and ED detectors as plug-in devices and have a dual system in a single system footprint
  - Run anion/cation analyses simultaneously from one injection
  - Run confirmatory separations in parallel to verify components
  - Inject different sample loop sizes; eliminate reanalysis of samples at different dilutions
- Implement innovative detection schemes by pairing conductivity and electrochemical detection techniques in series on the same system
  - Determine classic anions with conductivity along with sensitive and selective ED detection of electroactive species such as iodide, sulfide, cyanide, and phenols
  - Analyze cations and electroactive amines, amino acids, organic acids, and carbohydrates from a single separation

### AM Automation Manager

Simplify complex applications with the AM Automation Manager option. This option, which fits in the upper section of the DC module, organizes and controls high-pressure rotary valves, low-pressure solenoid valves, the RCH Reaction Coil Heater, and a variety of reaction coils.

- Configure up to two 6- or 10-port high-pressure rotary valves for automated sample preparation, preconcentration, matrix elimination, or flow-diversion applications
- Configure up to two low-pressure 2-port shut-off or 3-port switching valves for selection of reagents for postcolumn reagent addition, rinse solutions, or regenerants
- Install the optional RCH for heated reactions, or simply mount non-heated reaction coils to support ambient reagent addition
- Installed components are automatically recognized through Chromeleon
- All valves and positions are recognized with Chromeleon
- Preconcentrate samples during a run to increase throughput

*AM Automation Manager*

*CD Detector cell with suppressor*

### CD Conductivity and ED Electrochemical Detectors

The CD and ED detectors are installed inside the DC compartment as snap-in devices. They can be configured in series for dual detection, or as separate detectors for a dual system.

#### CD Features

- Microprocessor-controlled digital signal processing detects high and low concentrations of analytes in the same run
- Supports all IC and RFIC system applications with maximum range up to 15,000 µS
- Control through Chromeleon software or locally through TTL inputs
- Mount inside the DC compartment in either of two locations
- No tools are required
- Minimizes noise and maximizes thermal stability
- Electronics are integrated between cell and detector for greater stability
- Heats CD cell independently from other chromatography components
- Innovative built-in electronics allow for easy calibration and diagnostics

*ED Electrochemical Detector and cell*

#### ED Features

- New one-piece reference electrode provides consistency and reliability
- New handle design provides consistent torque to cell electrode for consistent installation and mounting of working electrode
- Uses microprocessor-controlled digital signal processing
- Supports DC amperometry, pulsed amperometry, or integrated amperometry detection modes
- New detection capabilities include use of multiple waveforms and multiple integration times to optimize detection conditions for individual analytes
- Three-dimensional display of the raw integrated amperometry data set similar to PDA data display, with cross-hairs on an isoamperometric plot used to select "slices" of the plot along the applied voltage axis (to render a chromatogram) and along the time axis (to render a voltammogram)
- Three-dimensional wireframe rendering, printing, color selection, display of apex, and other spectra on peaks in chromatograms are echoed in the integrated amperometry implementation
- The integrated amperometry mode provides complete freedom to change the waveform profile's number of segments, duration of each segment, and voltage applied at each segment
- Control through Chromeleon software or locally through TTL inputs
- Mounts within the DC compartment in either of two locations
- No tools are required for installation
- Cell and detector electronics integrated to minimize noise, maximize electrical isolation and shielding, and maximize thermal stability
- Innovative, built-in electronics for easy calibrations and diagnostics
- Can be used in dual-detection configuration (detectors in series or systems in parallel)

*PDA Photodiode Array detector*

## Optical Detectors

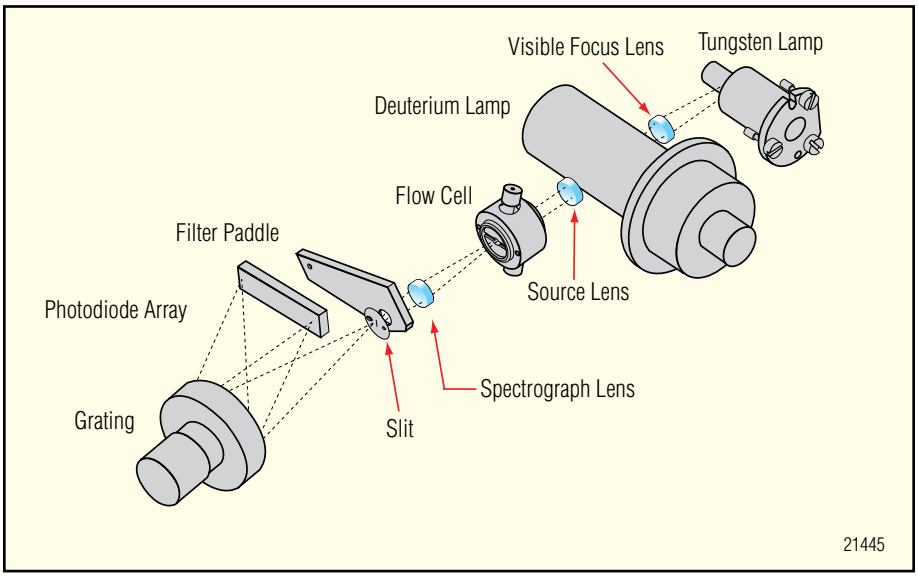
The ICS-3000 can be configured with any of several optical IC detectors available from Dionex.

### ICS Series PDA Photodiode Array Detector

The PDA is a high-resolution, 1024-element photodiode array detector with low noise and drift. Two light sources, a deuterium lamp and a tungsten lamp, provide a broad spectral range. The PDA is operated using Chromeleon software with a 3-D data processing option.

Achieve the benefits of performance and versatility of the PDA Photodiode Array detector through the following unique features:

- Photodiode array (1024-element) provides optimum wavelength resolution
- Low noise and high light intensity over the full spectral range via deuterium and tungsten lamps
- Full control and data collection through Chromeleon software with 3-D option
- USB-based digital data collection for simple installation
- Four analog outputs support alternate data collection
- Built-in holmium oxide filter provides verification of wavelength accuracy
- Low baseline drift for excellent reliability and reproducibility
- Front access to prealigned cells and lamps for easy maintenance
- Five front-panel LEDs that clearly indicate detector status




*ICS Series PDA optical schematic*

*TC Thermal Compartment*

## TC Thermal Compartment

The TC Thermal Compartment houses and organizes the chromatography columns and valves. The TC can be configured with up to two valves. The TC can be configured on a single timebase or shared between two timebases for sequential analysis.

- Ideal for UV/VIS applications which do not require an ED or CD detector
- Single zone oven designed to minimize tubing connection lengths, reduce delay volumes, and improve peak efficiencies
- Valve configurations include no valves, one 6-port injection valve, two 6-port injection valves or one injection valve and and 10-port chemistry switching valve.
- Column ID chip system for monitoring column properties and use (automatically logged to audit trail)
- Front panel displays power up status, injection valve position, and alarm status
- Wide temperature range; 5° to 85° C
- Precise temperature control
- Fast heat up and cool down times
- Optional heat exchangers for optimal eluent temperature and improved reproducibility

*VWD UV-Vis detector*

### VWD Absorbance Detector

Get the benefits of performance and versatility of the VWD through the following features:

- Deuterium and tungsten lamps that provide operation over the entire wavelength range of 190–900 nm
- Compact design for optimal plumbing of liquid flow path and minimal use of bench space
- Built-in holmium oxide filter for automated wavelength verification
- High signal-to-noise ratio for maximum sensitivity
- Data collection rate up to 100 Hz allows detection of even the sharpest peaks
- Low baseline drift for reliable results
- Excellent resolution that yields high linearity
- Integrated flow cell heat exchanger for thermal stability
- Lamp lifetime monitor to prevent downtime
- Front access to prealigned lamps and flow cell to simplify detector maintenance
- Identification chips integrated into lamps and flow cells (automatically logged to audit trail)
- Multiple wavelength monitoring; up to 4 different wavelengths simultaneously

## Autosamplers

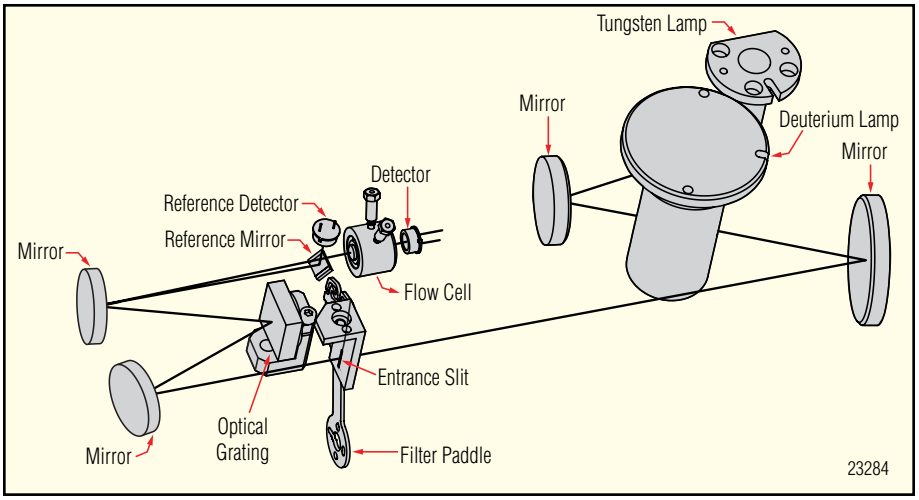
### AS Autosampler

The AS Autosampler delivers precision, reliability, ruggedness, and ease of use. Options include sample preparation, temperature control, and chemistry switching.

Configure the sampler for simultaneous injection and perform concurrent injections of a sample or standard onto two analytical systems running unique or similar applications. Improve efficiency by controlling dual ICS-3000 systems with one autosampler through sequential injections. This setup allows different applications to be run, or doubles the throughput in one application. With simultaneous and sequential injection, you can increase sample throughput, and eliminate errors associated with multiple operators and sampling locations.

New features include reagent prime, reagent flush, and concentrate. These capabilities offer additional flexibility that range from matrix elimination to concentration. Sequences can also be run in "overlap" with the previous sample to minimize overall cycle time.

- Free up your schedule and lab time with automated sample handling for your IC




*ICS Series VWD optical schematic*

*AS Autosampler*

  - Simultaneous injection
  - Sequential injection
  - Preconcentration
  - Matrix elimination
  - Automated dilutions
- Eliminate complex laboratory procedures with automated standard preparation

### Key AS Autosampler Features Provide Performance and Versatility

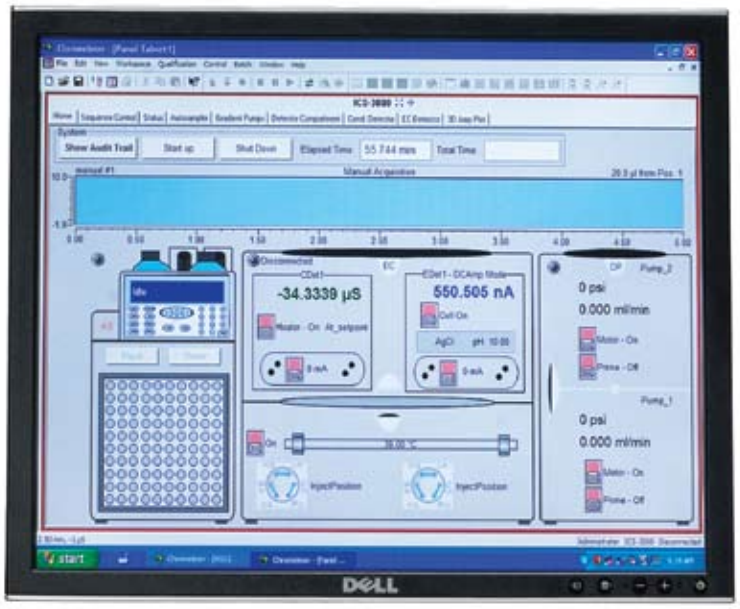
- Consistent operation at RSDs of less than 0.3% provide reproducible, accurate results
- Specially designed 10 mL polystyrene sample vials with wide openings that are easy to fill, easy to handle, and permit large-volume injections
- Optional well plates facilitate processing large numbers of samples
- All-PEEK flow path – including the sample needle – ensures compatibility with aqueous and reversed-phase eluents and protects sensitive samples from metallic contamination
- Control through Chromeleon or module front panel
- Moving-needle design to guarantee reliable sampling from a variety of vial sizes
- Sample preparative option that saves time and labor by automating your sample and standard preparations
- Sample tray temperature control option for thermally sensitive samples that offers precise, reliable control over a temperature range of 4–60 °C

## ICS-3000 System Control

To operate most modular systems, you have to learn the front panels of various modules, then try to coordinate them through your chromatograply software. The ICS-3000 is different. Powerful Chromeleon software integrates system control and data handling into your instrument, providing a convenient command center. Run with direct control, or set up a sequence of samples and methods for your system to run automatically overnight. It's easy and convenient.

For data analysis, Chromeleon software gives you all the power and versatility of the worlds most complete chromatography management system. If your lab requires third party software for data analysis, Chromeleon Xpress provides complete ICS-3000 system control, and affords an easy upgrade path to the full version of Chromeleon.

- **Analyze**
  Set up and start running your routine analyses in seconds
- **Develop**
  Customize your methods for advanced analysis
- **Control**
  Take complete control of your chromatography instruments
- **Acquire**
  Get accurate results for peaks of all sizes with autoranging digital data acquisition
- **Diagnose**
  Maintain high confidence in your results with System Wellness
- **Interpret**
  Process your data quickly and accurately for dependable results
- **Organize**
  Find the data you need quickly and easily with powerful queries
- **Report**
  Produce the reports you need with an easy-to-use spreadsheet
- **Compliant**
  All with full 21 CFR Part 11 compliance




## EO Eluent Organizer

The EO Eluent Organizer holds eluent containers in a liner for spill and leak containment. The EO holds and organizes eluent tubing and air lines. The EO is designed for placement on top of or adjacent to ICS-3000 modules

A pressure regulator is available to provide an inert blanket of helium over the mobile phase.

### EO Features

- The flexible design of the EO Eluent Organizer accommodates:
  - Four 1 or 2 L plastic containers
  - Two 4 L plastic containers
- Up to two EO eluent organizers stack on top of the DC or TC module.
- Translucent liner contains spills and allows view of liquid levels
- Constructed of corrosion-proof polypropylene and epoxy resin
- Pressure regulator option available

## Eluent Containers

### Features

- Available in 1, 2, and 4 L sizes constructed from polypropylene
- Non-twist stopper with separate retaining ring prevents tubing from tangling
- Graduations marked on containers in 100 mL increments
- Includes custom-molded polyethylene end-line filters with 5 µm pores

## ICS-3000 SP SINGLE AND DP DUAL PUMPS SPECIFICATIONS

**Pump**

*Type:*
Dual-piston (in series), microprocessor controlled, constant stroke, variable speed, patented Isokinetic Eluent Precompression, without a pulse damper

*Construction:*
Chemically inert, metal-free PEEK pump heads and flow path; compatible with aqueous eluents from pH 0–14 and reversed-phase solvents

*Pressure Range:*
0–35 MPa (0–5000 psi)

*Flow Rate Range:*
0.000–10.000 mL/min with settable flow increments at 0.001 mL/min, without changing pump heads

*Flow Rate Precision:*
<0.1%

*Flow Rate Accuracy:*
<0.1%

*Pressure Ripple:*
<1%

*Eluent Bottle Pressure:*
None required

*Vacuum Degasser:*
Integrated, optional 1 channel for isocratic pump or 4 channel for quaternary pump

*Piston Seal Wash:*
Standard, automatic operation

*Gradient Formation:*
Quaternary low pressure or electrolytic eluent generation at high pressure and with pH modification, optional

*Gradient Profiles:*
Any combination of an unlimited number of linear, convex, and concave positive and negative gradient profiles

*Gradient Proportioning Accuracy and Precision:*
±0.5% at 2 mL/min

*Gradient Mixing:*
Passive mixers for 2 mm and 4 mm id columns, optional

*Eluent Generation:*
Optional eluent generation (RFIC-EG) and eluent regeneration (RFIC-ER)

*Eluent On/Off Valve:*
Electrically actuated, standard

*Leak Sensor:*
Optical, standard

**System Software**

*Software:*
Chromeleon Chromatography Management Software, supports Microsoft Windows® 2000, XP, or Vista

*Automated Procedure Wizards:*
Yes, standard feature

*System Smart Startup and Shutdown:*
Yes, standard feature

*System Wellness and Predictive Performance:*
Yes, standard feature

*Application Templates:*
Yes, standard feature

*Multivendor Automation Support of 3rd Party:*
Yes, fully controls over 200 different instruments from more than 25 manufacturers, including GC, HPLC, and MS.

*Customizable System Control Panels:*
Yes, standard feature

*Signal Channels:*
Pump pressure

*Data Trending Plots:*
Device numerical parameters plotted

*System Status Virtual Channels:*
Yes, standard feature

*Power Failure Protection:*
Yes, standard feature

*System Trigger Commands and Conditionals:*
Yes, standard feature

*Daily Audit Trail:*
Yes, standard feature

*Sample Audit Trail:*
Yes, standard feature

*System Calibration Storage:*
Yes, factory, present, and previous; completely user selectable

*Customized Reporting:*
Yes, standard feature with unlimited report workbooks

*GLP Compliance:*
Yes, optional

**Physical Specifications**

*Power Requirements:*
90–265 V ac, 47–63 Hz

*Dimensions (h x w x d):*
36 × 21 × 48 cm
(14 × 8.25 × 19 in.)

*Weight:*
SP: 20.4 kg (45 lb)
DP: 24.1 kg (55 lb)

*Flow Path:*
All polymeric (PEEK), anion or cation configurations

## ICS-3000 EG ELUENT GENERATOR SPECIFICATIONS

*Minimum and Maximum Eluent Concentrations:*
0.01–100 mM

*Flow Rates:*
0.100–3.000 mL/min

*Eluent Types:*
KOH, LiOH, NaOH; Carbonate; Carbonate/ Bicarbonate; Carbonate with pH modifier; MSA

*Maximum Operating Pressure:*
21 MPa (3000 psi)

*Maximum Solvent Concentration:*
Cations: None
Anions: 25% methanol

*Gradient Profiles:*
Standard - any combination of an unlimited number of linear, convex and concave positive and negative gradient profiles

*Number of Cartridges Supported:*
Two–dual cartridge support

**System Software**

*Software:*
Chromeleon Chromatography Management Software, supports Microsoft Windows® 2000, XP, and Vista

*Automated Procedure Wizards:*
Yes, standard feature

*System Smart Startup and Shutdown:*
Yes, standard feature

*System Wellness and Predictive Performance:*
Yes, standard feature

*Application Templates:*
Yes, standard feature

*Multivendor Automation Support of 3rd Party:*
Yes, fully controls over 200 different instruments including GC, HPLC, and MS from more than 30 manufacturers.

*Customizable System Control Panels:*
Yes, standard feature

*Signal Channels:*
Eluent concentration

*Data Trending Plots:*
Device numerical parameters plotted

*System Status Virtual Channels:*
Yes, standard feature

*Power Failure Protection:*
Yes, standard feature

*System Trigger Commands and Conditionals:*
Yes, standard feature

*Daily Audit Trail:*
Yes, standard feature

*Sample Audit Trail:*
Yes, standard feature

*Eluent Cartridge Information Storage:*
Yes, serial number, remaining life (ion count), remaining lifetime (%) and expiration date

*Customized Reporting:*
Yes, standard feature with unlimited report workbooks

*GLP Compliance:*
Yes, optional package provides security system, modification history, and electronic signatures

**Physical Specifications**

*Dimensions (h × w × d):*
41 × 23 × 56 cm
(16 × 8.75 × 21.5 in.)

*Weight:*
25 kg (40 lb)

*Power requirements:*
90–265 V ac, 47–63 Hz

*Flow Path:*
All polymeric (PEEK), anion or cation configurations

## ICS-3000 ER ELUENT REGENERATION SPECIFICATIONS

*Eluents:*
Carbonate and carbonate/bicarbonate combinations up to 20 mM MSA up to 34 mM

*Flow Rates:*
0.01–2.00 mL/min

*Continuous Operation with 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 of Time (≤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

## ICS-3000 DC DETECTOR/CHROMATOGRAPHY COMPARTMENT SPECIFICATIONS

*DC Models:*
Single or Dual Temperature Zone Models

*Single Temperature Zone Model or Dual Temperature Zone Model:*
Thermoelectric cooling/heating
Temperature Range:
15 °C – 40 °C
(minimum temperature: ambient -15 °C)
(maximum temperature: ambient +20 °C)
Temperature Accuracy: ±0.5 °C
Temperature Stability: ±0.2 °C
Temperature Precision: ±0.2 °C

*Dual Temperature Zone Model: Independent Temperature Control of Each Zone:*
Upper Zone Temp. Range:
15–40 °C
(minimum temperature: ambient -15 °C)
(maximum temperature: ambient +20 °C)
Lower Zone Temp. Range:
10–70 °C
(minimum temperature: ambient -15 °C)
(maximum temperature: ambient +50 °C)
Temperature Accuracy: ±0.5 °C
Temperature Stability: ±0.2 °C
Temperature Precision: ±0.2 °C

*Lower Compartment: (Applies to Both Single and Dual Temperature Zone Models):*
Injection Valves:
1 or 2 ea., 6 or 10 port (upgradable, field installable)
Up to two column sets
1–9 mm diameter
Maximum Column Length:
250 mm plus
50 mm guard column
Precolumn Heat Exchangers:
2 (2 mm or 4 mm column id version)

*Automation Manager: (Optional):*
Injection Valves:
Up to 2 high pressure valves, either 6 or 10 port, 2 position
Low Pressure Valves:
Up to 2 inert, 2- or 3-way
Reaction Coil Heater (RCH):
Holds two reaction coils
RCH Temperature Range:
5 °C above upper zone, 80 °C maximum
AutoPrep Kit:
Dual loop with sample pre-concentration
All valves and heater upgradable and field installable

*Flow Path:*
Plumbing configurations for 4 mm and 2 mm columns, fully inert, PEEK

*Detectors:*
Any combination of two conductivity or electrochemical detectors, upgradeable and field installable. Dual detectors can be operated simultaneously or independently. Optional remote operation up to 3 m from instrument.

*Analog Signal Output:*
Two analog output channels, two 24 V relays, 2 TTL Out and 8 TTL In lines, upgradable and field installable, optional

*Leak Detection:*
Optical leak sensor standard

*Application Control Automation:*
Yes, standard. All DC modules come equipped with two switched AC controllers built-in to automate external devices and the ability to control up to 6 low pressure 2-way or 3-way valves for fluidic automation.

**Suppression**

*Non-suppressed conductivity:*
Yes, supported

*Suppressor wear parts:*
None. No valves, pumps, peristaltic pump tubing or inline filters required

*Chemical Suppression:*
2 mm and 4 mm anion and cation membrane suppression bed types available

*Displacement Chemical Suppression:*
2 mm and 4 mm anion and cation membrane suppression bed types available

*Electrolytic Suppression, Self-Regenerating:*
2 mm and 4 mm anion and cation. Membrane and MonoDisc suppression bed types available

*Electrolytic Suppression, Self-Regenerating, External Water Mode:*
2 mm and 4 mm anion and cation. Membrane and MonoDisc suppression bed types available

*Salt Converter:*
Available in 2 and 4 mm versions

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

*Carbonic Acid Removal for Anions:*
ASRS and AMMS plus CRD 300 for 2 and 4 mm versions

## ICS-3000 DC DETECTOR/CHROMATOGRAPHY COMPARTMENT SPECIFICATIONS (CONTINUED)

*Suppression Capacities:*
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 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
AMMS-ICE: N/A

*Suppressor 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
AES (Anion or Cation): <35 µL

**System Software**

*Software:*
Chromeleon Chromatography Management Software, supports Microsoft Windows® 2000, XP, and Vista

*Automated Procedure Wizards:*
Yes, standard feature

*System Smart Startup and Shutdown:*
Yes, standard feature

*System Wellness and Predictive Performance:*
Yes, standard feature

*Application Templates:*
Yes, standard feature

*Multivendor Automation Support of 3rd Party:*
Yes, fully controls over 200 different instruments from more than 25 manufacturers, including GC, HPLC, and MS.

*Customizable System Control Panels:*
Yes, standard feature

*Signal Channels:*
Detector signals, detector background signals, temperatures

*Data Trending Plots:*
Device numerical parameters plotted

*System Status Virtual Channels:*
Yes, standard feature

*Power Failure Protection:*
Yes, standard feature

*System Trigger Commands and Conditionals:*
Yes, standard feature

*Daily Audit Trail:*
Yes, standard feature

*Sample Audit Trail:*
Yes, standard feature

*System Calibration Storage:*
Yes, factory, current, and previous. Completely user selectable

*Customized Reporting:*
Yes, standard feature with unlimited report workbooks

*GLP Compliance:*
Yes, optional

**Physical Specifications**

*Power Requirements:*
90–265 V ac, 47–63 Hz; (auto-sensing power supply; no manual voltage or frequency adjustment required)

*Dimensions (h × w × d):*
44.5 × 42 × 57 cm (17.5 × 16.5 × 22.5 in)

*Weight:*
38 kg (84 lb)

*Flow Path:*
All polymeric (PEEK), anion or cation configurations

## ICS-3000 CD CONDUCTIVITY DETECTOR SPECIFICATIONS

*Electronics Type:*
Microprocessor controlled digital signal processing, autoranging

*Cell Drive:*
8 kHz square wave

*Linearity:*
1%

*Resolution:*
0.00238 nS/cm

*Output Range:*
Digital Signal Range:
0–15,000 µS/cm,
Analog Signal Range:
0–15,000 µS/cm

*Noise, Wet:*
<0.2 nS at 23 µS/cm background
<0.1 nS at 1 µS/cm background

*Filter:*
Rise times 0 to 10 s, programmable

*Sampling Rate:*
1 to 100 Hz, user settable or automatic

*Cell Temperature:*
5 °C above DC upper zone temperature to 60 °C maximum. User settable, working range is identical to settable range.

*Cell Temperature Stability:*
<0.001 °C

*Cell Temperature Compensation:*
Default 1.7% per °C ; programmable from 0–3% per °C

*Flow Cell Maximum Pressure:*
10 MPa (1500 psi)

*Flow Cell Volume:*
0.7 µL

*Cell Electrodes:*
Passivated 316 stainless steel. Compatible with MSA

*Cell Body:*
Chemically inert polymeric material

*Heat Exchanger:*
Inert, tortuous-path for low axial dispersion

**System Software**

*Software:*
Chromeleon Chromatography Management Software, supports Microsoft Windows® 2000, XP, or Vista

*Automated Procedure Wizards:*
Yes, standard feature

*System Smart Startup and Shutdown:*
Yes, standard feature

*System Wellness and Predictive Performance:*
Yes, standard feature

*Application Templates:*
Yes, standard feature

*Multivendor Automation Support of 3rd Party:*
Yes, fully controls over 200 different instruments from more than 25 manufacturers, including GC, HPLC, and MS

*Customizable System Control Panels:*
Yes, standard feature

*Signal Channels:*
Conductivity, Total Conductivity

*Data Trending Plots:*
Detector numerical parameters plotted

*System Status Virtual Channels:*
Yes, standard feature

*Power Failure Protection:*
Yes, standard feature

*System Trigger Commands and Conditionals:*
Yes, standard feature

*Daily Audit Trail:*
Yes, standard feature

*Sample Audit Trail:*
Yes, standard feature

*System Calibration Storage:*
Yes, factory, present, and previous. Completely user selectable

*Customized Reporting:*
Yes, standard feature with unlimited report workbooks

*GLP Compliance:*
Yes, optional

**Physical Specifications**

*Dimensions (h x w x d):*
6.9 × 16.7 × 9.9 cm
(2.7 × 6.5 × 3.9 in)

*Weight:*
400 g (1.6 lb.)

## ICS-3000 ED ELECTROCHEMICAL DETECTOR SPECIFICATIONS

*Electronics Type:*
Microprocessor controlled digital signal processing

*Electronic Noise:*
IPAD <80 pC
DC Amperometry <5 pA

*Potential Range:*
-2.0 to 2.0 V in 0.001 V increments

*Signal Range: Digital and Analog:*
Integrated Amperometry: 50 pC to 200 µC
DC Amperometry: 5 pA to 74 µA

*Filter:*
0–10 s response time, user settable

*Control Mode:*
Local or remote control using relay closures or TTL, or control using Chromeleon via DC module

*Cell Body:*
Titanium body and inlet tubing. Compatible with 2 mm to 4 mm id columns

*Working Electrodes:*
Conventional: gold, glassy carbon, platinum, and silver
Disposable: gold, carbon, platinum, and silver

*Reference Electrode:*
pH-Ag/AgCl combination, one piece design

*Autoranging:*
Yes

*Analog Output:*
User selectable full scale of 10, 100, or 1000 mV

*Working Volume:*
<0.5 µL

*Maximum Cell Operating Pressure:*
0.7 MPa (100 psi)

**System Software and Control**

*Software:*
Chromeleon Chromatography Management Software, supports Microsoft Windows® 2000, XP, or Vista

*Detection Modes:*
DC amperometry, pulsed amperometry, integrated amperometry, and cyclic voltammetry.
Detection modes include use of multiple waveforms and multiple integration times to optimize detection conditions for individual analytes
Integrated amperometry mode—unlimited changes to the waveform profile's number of segments, duration of each segment, and voltage applied at each segment

*3-D Amperometry:*
Three-dimensional display of the raw integrated amperometry data set, with crosshairs on an isoamperometric plot used to select "slices" of the plot along the applied voltage axis (to render a chromatogram) and along the time axis (to render a voltammogram)
Three-dimensional wireframe rendering, printing, color selection, display of apex, and other voltammograms

*Automated Procedure Wizards:*
Yes, standard feature

*System Smart Startup and Shutdown:*
Yes, standard feature

*System Wellness and Predictive Performance:*
Yes, standard feature

*Application Templates:*
Yes, standard feature

*Multivendor Automation Support of 3rd Party:*
Yes, fully controls over 200 different instruments from more than 30 manufacturers, including GC, HPLC, and MS.

*Customizable System Control Panels:*
Yes, standard feature

*Signal Channels:*
Electrochemical and total electrochemical signals

*Data Trending Plots:*
Detector numerical parameters plotted

*System Status Virtual Channels:*
Yes, standard feature

*Power Failure Protection:*
Yes, standard feature

*System Trigger Commands and Conditionals:*
Yes, standard feature

*Daily Audit Trail:*
Yes, standard feature

*Sample Audit Trail:*
Yes, standard feature

*System Calibration Storage:*
Yes, factory, present, and previous. Completely user selectable

*Customized Reporting:*
Yes, standard feature with unlimited report workbooks

*GLP Compliance:*
Yes, optional

**Physical Specifications**

*Dimensions (h x w x d):*
6.9 × 16.7 × 9.9 cm
(2.7 × 6.5 × 3.9 in)

*Weight:*
400 g (1.6 lb.)

## ICS-SERIES PDA PHOTODIODE ARRAY DETECTOR SPECIFICATIONS

**Optics**

*Photodiode Array:*
1024 element

*Pixel Resolution:*
0.7 nm

*Lamps:*
Tungsten and deuterium

*Optical Resolution:*
1.0 nm

*Wavelength Range:*
190–800 nm

**Electronics**

*Analog Outputs:*
Four, 0–3 AU, 1000 mV range

**Flow Cell**

*Standard:*
PEEK or SST, 13 µL, 10 mm path length

*Semi-Prep:*
PEEK, 0.7 µL, 0.4 mm path length

*Maximum Flow Operating Pressure:*
300 psi (<2 MPa) PEEK
500 psi (<3 MPa) SST

**Performance**

*Noise:*
±10 µAU at 254 nm (flowing water, 2-s rise time)

±15 µAU at 520 nm (flowing water, 2-s rise time)

*Drift:*
<500 µAU/h

*Wavelength Accuracy:*
±1 nm, self-calibration with deuterium lines, verification with built-in holmium oxide filter

*Linearity:*
>2 AU

**Physical Specifications**

*Power Requirements:*
90–265 V ac, 47–63 Hz

*Operating Temperature Range:*
4–40 °C (40–104 °F)

*Operating Humidity Range:*
5–95% relative, noncondensing

*Dimensions (h × w × d):*
17.4 × 44.4 × 50.3 cm
6.8 × 17.5 × 19.8 in.

*Weight:*
18.1 kg, 40 lb

## TC THERMAL COMPARTMENT MODULE SPECIFICATIONS

**TC Models:**

*Temperature Range:*
5–85 °C (max 18 °C below ambient) in 0.1 °C increments

*Temperature Performance:*
Accuracy: ±0.5 °C
Stability: ±0.1 °C
Precision: ±0.1 °C

*Heat up / Cool down Time:*
Typically 15 minutes 20 °C to 50 °C and 50 °C to 20 °C

*High-Pressure Valve Types:*
Six-port/two position
Rheodyne PEEK (injection) valve
Ten-port/two position
Rheodyne PEEK (switching) valve

*Column Capacity:*
Three column sets, 1– 9 mm

*Maximum Column Length:*
300 mm + 50 mm guard column

*Precolumn Heat Exchangers (optional):*
Two low delay volume exchangers

**General Specifications**

*Control:*
Chromeleon/ Chromeleon Xpress

*Computer Connection:*
USB

*Leak Detection:*
Humidity and vapor sensors

*TTL and Relay inputs and outputs:*
Two digital inputs/ outputs, two relay outputs

**Physical Specifications**

*Power Requirements:*
90–265 V ac, 47–63 Hz

*Operating Temperature Range:*
10–35 °C (50–95 °F)

*Operating Humidity Range:*
5–80% relative, noncondensing

*Dimensions (h × w × d):*
17.4 × 44.4 × 50.3 cm
6.8 × 17.5 × 19.8 in.

*Weight:*
15.4 kg, 34 lb

## ICS-SERIES VARIABLE WAVELENGTH DETECTOR SPECIFICATIONS

**Optics**

*Optical System:*
Dual beam forward optics design (monochromator) single or multiple (4-channel) wavelength UV/VIS detector options

*Light Source:*
Deuterium lamp for UV range; tungsten lamp for visible range

*Wavelength Range:*
190 to 900 nm in 1-nm increments

**Electronics**

*Analog Output Ranges (optional):*
0.001–3.0 AU

*Rise Time:*
0.00–4.55 s

*Full-Scale Recorder Output:*
1V or 10V

*Data Collection rate up to 100 Hz Digital Output:*
Full dynamic autoranging digital absorbance signal output to Chromeleon

*Control Modes:*
Software remote control through Chromeleon/ Chromeleon Xpress

**Flow Cell**

*Cell:*
PEEK

*Cell Path Length:*
10 mm

*Cell Volume:*
11 µL PEEK

*Heat Exchanger Volume:*
8.8 µL

*Maximum Flow Cell Operating Pressure:*
725 psi (5 MPa)

**Performance**

*Wavelength Accuracy:*
±1 nm

*Bandwidth:*
6 nm at 254 nm

*Linearity:*
Up to 2.5 AU

*Noise:*
Typically <±2.5 × µAU at 254 nm

*Drift:*
<0.1 mAU/h at 254 nm

**Physical Specifications**

*Power Requirements:*
85–265 V ac, 47–63 Hz

*Operating Temperature Range:*
10–35 °C (50–95 °F)

*Operating Humidity Range:*
5–80% relative, noncondensing

*Dimensions (h × w × d):*
15.2 × 44.4 × 50.3 cm
6.0 × 17.5 × 19.8 in.

*Weight:*
15.4 kg, 34 lb

## AS AUTOSAMPLER SPECIFICATIONS

*Sample Capacity:*
10 mL vials: 49
1.5 mL vials: 100
Well Plates: 192 (two standard or deep well 96 well plates)

*Injections per Vial:*
1–99

*Minimum Sample Volume:*
10 µL can be sampled from a 300 µL microvial;

20 µL can be sampled from a 500 µL microvial

*Maximum Injection Volume:*
8200 µL

*Variable Volume Range:*
1–100 µL in 0.1 µL increments;

100–8200 µL in 1 µL increments

*Injection Cycle Time (including sample prep such as dilution):*
15 seconds, with sample overlap function

*Injection Modes:*
Full Loop
Partial Loop
Limited Sample

*Injection Precision:*
Fixed Loop: <0.3% RSD at 20 µL;

Partial Loop: <0.5% RSD at 20 µL

*Dilution:*
1:1 to 1:1000

*Autodilution:*
With post run functionality and Chromeleon Purification License

*Dilution Precision:*
<1.0% RSD for a 1:100 dilution

*Dispensing Precision:*
<0.2% RSD (by weight)

*Carryover:*
<0.01% with 500 µL flush volume

*Sample Tray Thermostatting:*
4 °C to 60 °C, optional

*Dual Instrument Support:*
Sequential (asynchronous) and Simultaneous modes, field upgradeable, optional

*Sample Degassing:*
CRD 200/300, upgradeable, user installable

*Injection Valves:*
One or two two-position six-port

*Diverter Valve:*
One two-position six-port

*Sample Preparation:*
Dilution, addition of internal standards, concentration/ matrix elimination, derivatization, etc. optional

*Inline Sample Filtration:*
Dual filter, backflush, optional

**System Software**

*Software:*
Chromeleon Chromatography Management Software, supports Microsoft Windows® 2000, XP, or Vista

*Automated Procedure Wizards:*
Yes, standard feature

*System Smart Startup and Shutdown:*
Yes, standard feature

*System Wellness and Predictive Performance:*
Yes, standard feature

*Application Templates:*
Yes, standard feature

*Multivendor Automation Support of 3rd Party:*
Yes, fully controls over 200 different instruments from more than 25 manufacturers, including GC, HPLC, and MS.

*Customizable System Control Panels:*
Yes, standard feature

*Data Trending Plots:*
Yes, all device numerical parameters

*System Status Virtual Channels:*
Yes, standard feature

*Power Failure Protection:*
Yes, standard feature

*System Trigger Commands and Conditionals:*
Yes, standard feature

*Daily Audit Trail:*
Yes, standard feature

*Sample Audit Trail:*
Yes, standard feature

*System Calibration Storage:*
Yes, factory, current and previous. Completely user selectable

*Customized Reporting:*
Yes, standard feature with unlimited report workbooks

*GLP Compliance:*
Yes, Optional

## AS AUTOSAMPLER SPECIFICATIONS (CONTINUED)

### Physical Specifications

*Dimensions:*
58 x 30 x 46 cm
(23 in x 12 in x 19 in.)
65 x 30 x 46 cm
(27.5 in x 12 in x 19 in)
with sample temperature control

*Weight:*
<30 kg (<65 lb)
<38 kg (<81 lb) with sample temperature control

*Power:*
90–265 V ac, 47–63 Hz

*Flow Path:*
All polymeric (PEEK), anion or cation configurations

### Validation Services

Dionex offers a full range of validation services and kits for the ICS-3000 product line. Validation procedures include Installation Qualification (IQ) and Operational Qualification (OQ)/Performance Qualification (PQ) for the ICS-3000 system modules.

All validation kits include detailed procedures for performing the validation. Also included are calibration tools, data worksheets, methods, and validation certificates.

### Ordering Information

Part numbers for ICS-3000 systems and modules are available from your local Dionex office or distributor. Please consult your Dionex representative for the system configuration and modules best suited to your needs.



**Passion. Power. Productivity.**

DIONEX

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