

UltiMate™ 3000—Intelligent Systems for Nano, Capillary, and Micro LC



The UltiMate 3000 is the most versatile and powerful nano, capillary and micro LC separation system. It features innovative new technologies and ease of operation with its modular design and reliable system components. The UltiMate 3000 system uses high-flow gradient formation for ultrafast gradient delivery. With active flow splitting using the UltiFlow™ control system, the UltiMate 3000 delivers maximum reproducibility and versatility down to a flow rate of 50 nL/min. The UltiMate 3000 system is ideally suited for coupling to mass spectrometry, regardless of ionization technique. The UltiMate 3000 system offers the highest reliability to bioanalytical researchers, independent of sample size, concentration or matrix complexity. The system is user-friendly and allows easy setup and performance qualification.

Features

- Optimized design for high-resolution, low-flow separations
- Nano, capillary, and micro flows
- Dual-gradient flow delivery
- Patented, electronically-controlled split flow
- Unparalleled separation versatility
- Biocompatible system versions
- Patented, efficient sample cooling
- Excellent flow accuracy and reproducibility
- Control from major MS software
- Micro fraction collection option
- Reproducible injections to 10 nL

- Small footprint
- Automated qualification procedures
- Life cycle monitoring of wear parts

Typical Applications

- Front-end separation for MS proteomics
- On-line multidimensional separations for complex samples
- Fractionation and reinjection on a single system
- Two-dimensional LC complementary to 2-D gels
- On-line LC/MALDI target prep via Probot™ Microfraction Collector
- Microliter pickup injections for analysis of minute samples



Passion. Power. Productivity.

Unsurpassed Nanogradient Accuracy and Reproducibility

The UltiMate 3000 system brings scientists the essentials: accuracy and reproducibility. Optimized system design, thermostatted microswitching valves, select tubings and connections, and nano and capillary columns achieve the lowest possible dead volumes. This not only maximizes separation efficiency but also preserves it for each consecutive run.

Using its unique active splitting, the UltiMate 3000 system presents unmatched accuracy, independent of solvent composition and column backpressure. Even if partial clogging occurs, the system will maintain flow rate accurately, for high separation efficiency and retention time reproducibility. With the industry-leading nano and capillary columns, including Acclaim® PepMap™ and PepSwift™ Monolithic columns, the system performs highly efficient protein and peptide separations, for easy MS coupling.

Its modular setup makes the UltiMate 3000 system configurable for a variety of separations, such as single-dimension LC, multidimensional LC, sample cleanup, sample pre-concentration, or combinations thereof.

Innovative Active Flow Splitting

The patented active splitting system provides reliable generation of nano and capillary gradients. Dionex's innovative technology significantly improves flow accuracy and reproducibility of nano and capillary gradients, compared to passive split approaches. Mixing of up to three solvents at higher flow rates achieves the best homogeneity, for accurate resolution, for example, when mixing ion-pair reagents such as TFA or formic acid with the mobile phase. In addition, Dionex technology is designed to minimize gradient delays.

This design also provides the most separation flexibility, with a broad flow range. The active split

supports separations on nano (50- μ m, 75- μ m, and 100- μ m i.d.), capillary (300- μ m i.d.), and micro LC (up to 1.0-mm i.d.) columns.

SRD-3000 Solvent Racks

- Highly efficient solvent degassing
- No helium degassing required
- Low-volume degassing channels for fast solvent exchange
- Easy installation

DGP-3600 Micro Pumps

Low-pressure dual-gradient micropumping system:

- Two independent ternary gradients
- One microgradient (from 50 μ L/min to 2.5 mL/min) and one nanogradient (down to 50 nL/min) delivery
- Accurate gradient delivery, using high-flow mixing and SmartFlow

WPS-3000 Nano/Cap/Micro Pulled-Loop Samplers

Well Plate Sampler:

- High sample throughput, using three well plate capacity
- Flexible multiple-tray carrier for a variety of sample carrier formats
- Sample thermostating from 4 °C to 45 °C, at least 22 °C below ambient, avoids sample degradation
- Dual-needle principle for sealed sample carriers
- Pulled-loop injections for best injection reproducibility and accuracy
- Microliter pickup injections for zero sample loss and minute samples
- Large-injection volume range: 20 nL to 125 μ L
- Micro Fraction Collection option for greatest flexibility in multidimensional separations

FLM-3000 Flow Managers

Thermostatted Flow Manager and column compartment:

- Active flow splitting for constant flow delivery
- Electronically controlled split flow independent of solvent composition and column pressure
- Flow sensor for continuous and accurate flow control
- Thermostatted flow split
- Thermostatted column compartment, from 5 to 70 °C
- Up to two thermostatted 10-port low-dispersion switching valves for more advanced applications and sample preparation steps
- Column and splitter identification system

VWD-3000 UV-Vis Detector

- High sensitivity UV data using dedicated nano and capillary flow cells
- Low-volume flow cells, to 3 nL
- No chromatographic dispersion, ideal for monitoring separation prior to MS, or for MDLC
- Data collection rate up to 100 Hz (VWD-3400)
- Automated tracking of lamps and flow cells

Software Control

- Chromeleon® Data Management Software for full control
- Automatic instrument qualification (AutoQ™) and System Wellness in Chromeleon
- All system parameters recorded in Chromeleon audit trail
- MS interfacing via single-point control from MS software. DCMS^{Link} supports ABI Analyst®, Bruker HyStar™, and Thermo Xcalibur™

SPECIFICATIONS

UltiMate 3000 System Specifications

Column Flow Range:

50 nL/min to 2.5 mL/min using pre-defined splitter cartridges and active flow control

Flow Control:

Electronically controlled and actively balanced flow splitter, independent of solvent composition and column backpressure

Gradient Delay Time:

Typically less than 1.5 min to splitter outlet at 200 nL/min

Optional Sample Thermostatting:

From 4 to 45 °C

Column Compartment Thermostatting:

From 5 to 70 °C

UV Detection:

Dedicated flow cells for nano, capillary, and micro LC with 10-mm path lengths

Display:

Large LCDs, programmable to show system parameters

System Control:

All functions and parameters are software controlled through USB 1.1

Manual Operation:

Soft keys for operation during installation and maintenance

GLP Features:

System wellness monitoring and recording of all system parameters in audit trail by Chromeleon software
Tracking system for columns, splitters, lamps, and flow cells
Automated instrument qualification (AutoQ) with qualification period monitoring

Predictive Performance:

Life cycle monitoring of wear parts and automatic diagnostic routines for maximum uptime

SRD-3000 Solvent Racks

Eluent Bottle Capacity:

Up to six bottles (1 L)

Degasser Channels:

Up to six, low-volume vacuum degassing channels

Degassing Channel Tubing:

Teflon® AF

Channel Volume:

670 µL

Optimal Flow Rate/Channel:

300 µL/min

Wetted Parts:

Teflon AF, PEEK, PPS and Tefzel

Safety Features:

Leak detection, Vacuum-level monitoring

Dimensions (h × w × d):

10 × 42 × 51 cm; 3.9 × 16.5 × 20 in.

Weight:

4.8 kg (10.6 lb) maximum

DGP-3600 Dual-Gradient Micropump

Flow Accuracy and Rreproducibility:

± 0.5% at 200 µL/min

Flow Rate Range:

10–2500 µL/min

Gradient Formation:

2× low-pressure ternary gradient

Composition Precision:

Typically <0.5% at 200 µL/min

Pump Pressure Range:

0.1–50 MPa (1–7250 psi)

Compressibility Compensation:

Automatic and solvent independent
SmartFlow Technology

I/O Interfaces:

Three digital inputs, four programmable relays

Analog Output:

One for pressure monitoring

Safety Features:

Leak sensor, active rear-seal washing, and leak monitoring system

Wetted Parts:

Stainless steel (1.4571), Sapphire, Ruby, UHMW polyethylene, PCTFE, PTFE, PEEK, Zirconium oxide (ZrO₂), Aluminum oxide (Al₂O₃)

Dimensions (h × w × d):

19 × 42 × 51 cm (7.5 × 16.5 × 20 in)

Weight:

21.5 kg (47.3 lb)

VWD-3000 UV-VIS Detectors

Noise (single wavelength):

<±3.5 µAU (typically <±2.5 µAU) at 254 nm and dry analytical flow cell: time constant (according to ASTM) 1 s, only deuterium lamp turned on

Drift:

<0.1 mAU/h at 254 nm and dry analytical flow cell: only deuterium lamp turned on, constant ambient conditions

Wavelengths:

Up to four simultaneously, user-selectable (VWD-3400)

Wavelength Range and Accuracy:

190–900 nm, ±1 nm

Optical Bandwidth:

6 nm at 254 nm

Lamps:

Deuterium and tungsten

Flow Cell Volumes:

3 nL for Nano LC
45 nL for Capillary LC
180 nL for Micro LC

Maximum Flow Cell Pressure:

400 bar (6000 psi)

Data Collection Rate:

Up to 100 Hz (VWD-3400 in single wavelength mode)

SPECIFICATIONS

Inferfaces:

USB
Four digital inputs, four digital outputs
Two analog outputs (optional) via DAC plug-in module

Dimensions (h × w × d):

16 × 42 × 51 cm (6.3 × 16.3 × 20 in.)

Weight:

15 kg (33 lb)

FLM-3000 Thermostatted Flow Managers and Column Compartments

Temperature Range:

5–70 °C (max 15 °C below ambient)

Temperature Accuracy:

±0.5 °C

Temperature Stability and Precision:

±0.1 °C

Heatup/Cooldown Time:

From 20 °C to 50 °C in less than 25 min
From 50 °C to 20 °C in less than 35 min

Switching Valves:

Up to two, 10-port low-dispersion microvalves

Column Capacity:

3 columns, max. 30-cm length

Column Recognition:

Electronic identification system for three columns

Max. Column Pressure:

35 MPa (4900 psi)

Flow Control:

Nano, capillary, or micro thermostatted splitter cartridge with electronic splitter identification system

Flow Range Selection:

50 nL/min to 1000 nL/min (using nano LC splitter)

0.5 µL/min to 10 µL/min (using capillary LC splitter)

10 µL/min to 200 µL/min (using micro LC splitter)

Wetted Parts:

Fused silica, stainless steel (1.4571, 316 L), PEEK; Waste line: PTFE, aluminum oxide (Al₂O₃)

Safety Features:

Humidity sensor, gas sensor, and leak sensor

Dimensions (h × w × d):

19 × 42 × 51 cm (6.7 × 16.5 × 20 in.)

Weight:

17 kg (37.4 lb)

WPS-3000 Pulled-Loop Samplers

Sample Capacity:

3× well plate (128 × 86 mm);
15× 10-mL vials for reagents, diluents, and transport liquids

Sample Format:

96 well plate, 96 deep well plate, 384 well plate, 40 standard autosampler vials 1.8 mL (sealed or open), 72 mini vials 1.2 mL (sealed or open)

Injection Volume:

20 nL to 25 µL with 25-µL syringe
0.1–100 µL with 100-µL syringe
0.25–250 µL with 250-µL syringe

Injection Methods:

Full-loop, partial-loop low-dispersion injections, microliter pickup, and user-defined injection procedures

Injection Technique:

Needle in needle, with programmable needle wash

Injection Precision:

RSD <0.4% for 1 µL full-loop injections; RSD <1% for 200 nL partial-loop injections

Linearity:

Corr. Coeff. >0.9995, from 100 nL to 500 nL partial-loop injections

Carryover:

<0.02% with needle wash

Injection Cycle Time:

<30 s for 1-µL full-loop injection

Optional Sample Thermostating:

4–45 °C, at least 22 °C below ambient

Fraction Collection:

Micro Fraction Collection option

Wetted Parts:

PEEK, stainless steel, PCTFE, fused silica

Dimensions (h × w × d):

40 × 42 × 51 cm (16 × 16.5 × 20 in.)

Weight:

23.8 kg (52 lb); 31.4 kg (69 lb) including cooling

Software Control

Chromeleon Chromatography Management System:

Full control and traceability for all components, including System Wellness and Qualification monitoring, and automated diagnostic tests

DCMS^{Link}:

Single-point control from the following MS software packages:

Analyst (Applied Biosystems/MDS Sciex)

HyStar (Bruker Daltonics)

Xcalibur (Thermo Scientific)

Analyst is a registered trademark of Applied Biosystems.

HyStar is a trademark of Bruker Daltonics.

Teflon and Tefzel are registered trademarks of E.I. du Pont de Nemours.

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