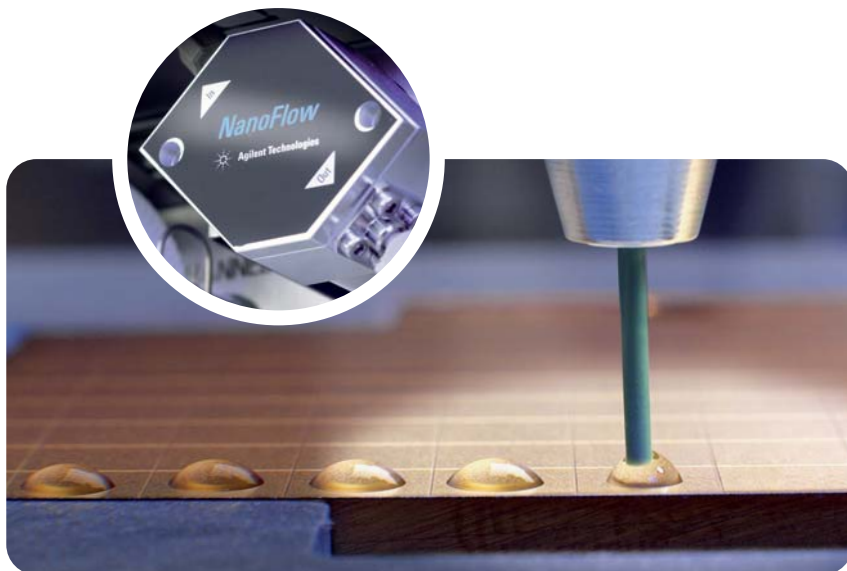


Low flow LC separation tools for highest sensitivity

Agilent 1200 Series Capillary LC System
Agilent 1200 Series Nanoflow LC System
Agilent 1200 Series Micro Collection/Spotting System

Low flow separation instrumentation solutions featuring high sensitivity and low sample consumption is now a proven state-of-the-art technology. These systems are frequently used for applications with limited sample amounts. It is also used where an optimized LC/MS combination is required or when an analysis of trace level components in complex mixtures is necessary.



All Agilent low flow LC systems are based on the industry-leading Agilent HPLC platform. Each system provides the following benefits:

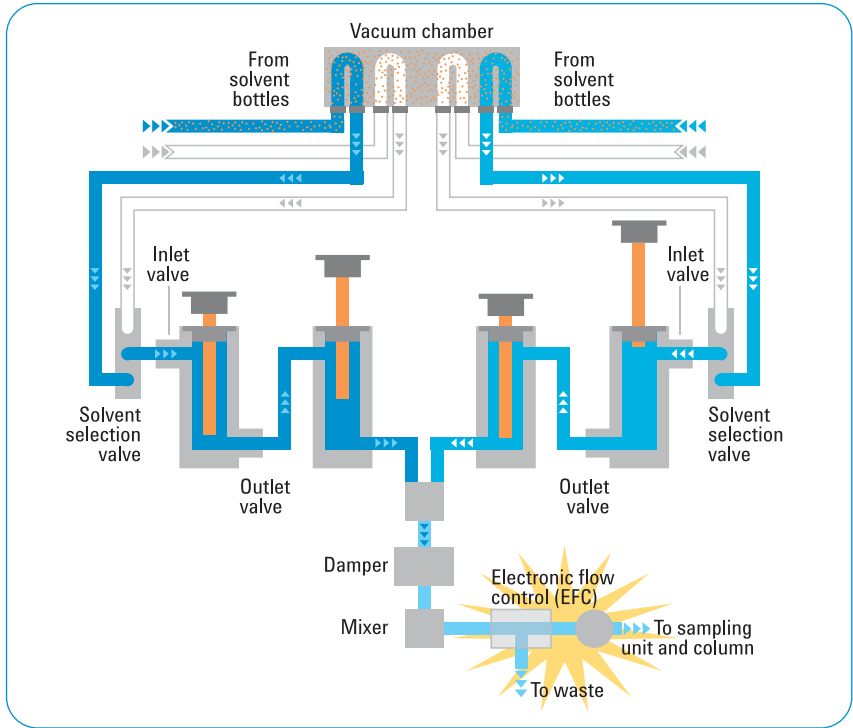
- Integrated and robust HPLC solution
 - Electronic Flow Control (EFC) with **real-time adjustment** of the flow rate for reliable and reproducible results, delivering unprecedented flow stability
 - Highest sensitivity with mass selective detection
 - Compatibility with various MS platforms
 - Optimum injection flexibility from various sample containers, such as different vials, well-plates and Eppendorf tubes
- Ability to expand all instruments to different solutions, i.e. multidimensional HPLC and Agilent 1200 Series HPLC Chip solution, makes system future-proof
 - Agilent ChemStation and Agilent 1200 Series instant pilot with intuitive graphical user interface simplifies method setup



Agilent Technologies

Agilent 1200 Series Capillary LC System

Capillary or standard LC – for maximum flexibility in your laboratory



Principle of operation:
 The Agilent 1200 Series binary pump, which is well known for its excellent performance, served as the basis for Agilent's capillary pump. The pump incorporates a unique Electronic Flow Control (EFC). This lets you measure and control the flow rate throughout an analysis.



Agilent Technologies' 1200 Series is the latest addition to Agilent's range of industry-leading, high performance liquid chromatography (HPLC) systems. Using a unique technology, this system is optimized for capillary LC. A wide range of flow rates expands laboratory flexibility, offering you unparalleled sensitivity and reproducibility.

A fully integrated system for highest sensitivity and reproducibility

Agilent provides everything you need for optimum HPLC performance. All Agilent 1200 Series modules are optimized to meet the special requirements of capillary LC.

Agilent 1200 Series capillary pump with micro vacuum degasser

- Reliable and reproducible results – Electronic Flow Control (EFC) provides real-time adjustment of the flow rate throughout the analysis, offering accurate flow rates even with solvent mixtures
- Highest flexibility – in capillary mode optimized flow rates from 1 $\mu\text{L}/\text{min}$ up to 100 $\mu\text{L}/\text{min}$ (in normal mode up to 2.5 mL/min with additional hardware changes)

- Maximum performance – retention time (RT) stability irrespective of column back pressure
- Enhanced flexibility of solvent selection – built-in solvent selection valve combines two out of four solvents for binary gradient formation, or selects a different solvent for flushing the column
- Reduced delay volume – provided by micro volume components
- Low detector baseline noise and long-term stability – regulated by micro vacuum degasser

Agilent 1200 Series micro well-plate autosampler

- Minimized dispersion due to Micro Rheodyne® valve and the optimized design of the needle seat, loop and seat capillaries
- Ten times better resolution in comparison to a standard autosampler enabled by a high-resolution metering device
- Minimal delay volumes for rapid gradients and fast equilibration when bypassing the autosampler after sample injection
- Increased sample injection speed for high sample throughput
- No sample waste (especially with limited sample volume) due to variable injection volume and flow-through design (compared to fixed loop approaches)
- Flexible and convenient sample handling with different types of sample containers, such as well-plates, vials and Eppendorf tubes. Using 384-well plates enables unattended processing of up to 768 samples.

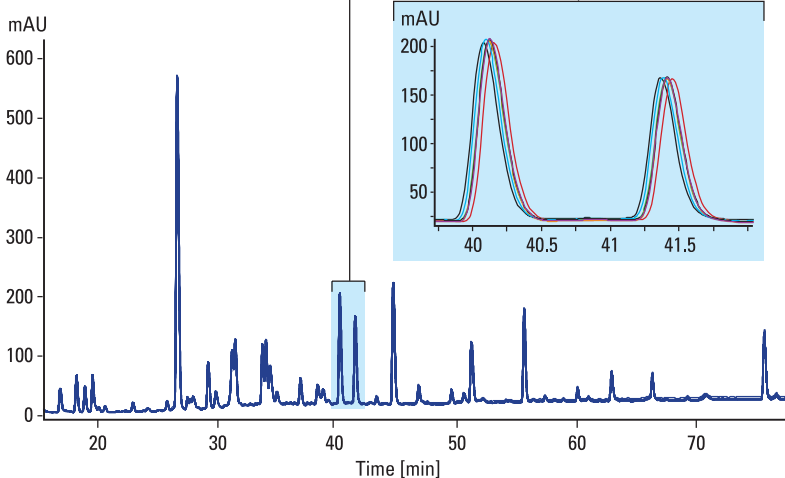


Agilent 1200 Series thermostatted column compartment

- Peltier temperature control allows fast cooling and heating from 10 °C below ambient up to 80 °C for maximum application flexibility and stability
- Two heat exchangers can be set independently for applications that require different temperature zones
- An optional Rheodyne® micro column switching valve for 2D-LC separations or column regeneration

Agilent 1200 Series diode array detector with 80 or 500 nL flow cell

- Optimized geometry and novel fitting design minimize dispersion
- Low RI sensitivity for flat baselines at low flow gradients enabled by optical reference wavelength
- High sensitivity due to long path length and high light throughput



Precise flow control at low flow rates provides highly reproducible analyses. RSD for retention time below 0.15% was achieved, using a gradient from 1 – 61% B in 120 minutes of degassed acetonitrile/water/TFA.

Column: 300 µm id, 25 cm length,
ZORBAX 300SB-C18, 5 µm
Flow rate: 5.5 µL/min

Application focus:

Capillary LC is frequently used for the analysis of drugs and their metabolites to gain sensitivity, especially when sample volume is limited. A robust and reliable instrument is important for low flow rate ranges. It provides a stable flow rate throughout the analysis, making Capillary LC as easy as standard LC.

Agilent 1200 Series LC micro collection/spotting system

Combining the benefits of chromatography with the power of MALDI mass spectrometry



The Agilent 1200 Series LC micro collection/spotting system offers researchers a complete software-controlled separation solution for proteomics. Seamless integration of each module in the system guarantees lowest delay volumes and assures highest separation performance and sensitivity.

Reliability and robustness based on the industry-leading LC system

The modularity of the system gives researchers the flexibility to configure a system that meets their separation needs. For optimized performance, users have the choice between different collection capillaries depending on the application.

Agilent 1200 Series LC micro collection/spotting system

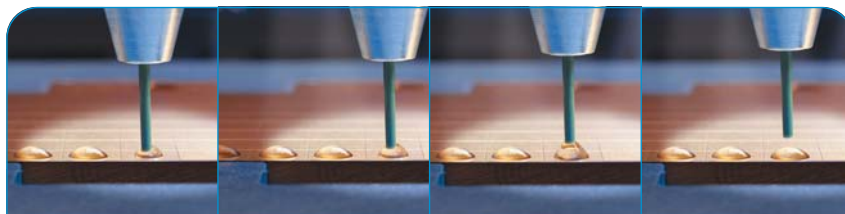
- Seamless integration of each module minimizes internal volumes, providing highest separation performance and sensitivity
- Exceptional flow stability with electronic flow control using the 1200 Series capillary/nanoflow pumps
- Flexible collection in various well-plates, Eppendorf tubes and on MALDI targets
- “Liquid contact control” for reproducible collection of microliter and nanoliter fractions
- Fraction cooling to prevent sample evaporation and thermal decomposition
- Thermostating of MALDI targets results in superior crystallization between matrix and analyte

Liquid contact control mode:



Liquid contact control for micro collection

Liquid contact control provides continuous contact between the needle tip and the liquid surface. This results in a sharp cut of the fraction droplets for the highly reproducible collection of small fraction volumes. It also inhibits the formation of air bubbles in small conical wells during the fraction collection process and prevents the cross contamination of fractions.



Liquid contact control for MALDI spotting

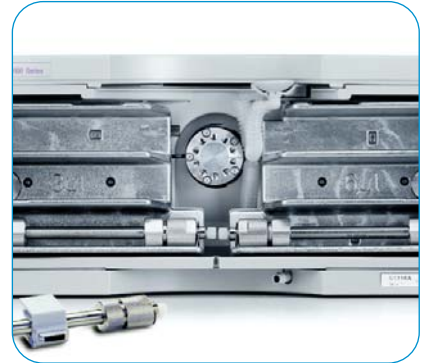
The upward movement of the needle during the spotting process prevents squeezing of the droplet by the needle tip. This avoids any liquid movement along the capillary for reliable and robust LC/MALDI spotting over a wide range of droplet volumes.

Agilent 1200 Series micro valves

The 1200 Series valve solutions extend the capabilities of the 1200 Series HPLC platform. The valve range includes a variety of valve types for various flow rates and application needs. Micro valves with small internal volumes for minimum peak broadening are ideal for low flow rates in the nL/min and $\mu\text{L}/\text{min}$ range.

1200 Series micro valves offer:

- Sample preparation (desalting, enrichment)
- High throughput (parallel sample clean-up)
- Multidimensional separation
- Smallest internal volumes for minimum peak broadening
- Column compartment integration for temperature control
- External micro valves for shortest capillary connections

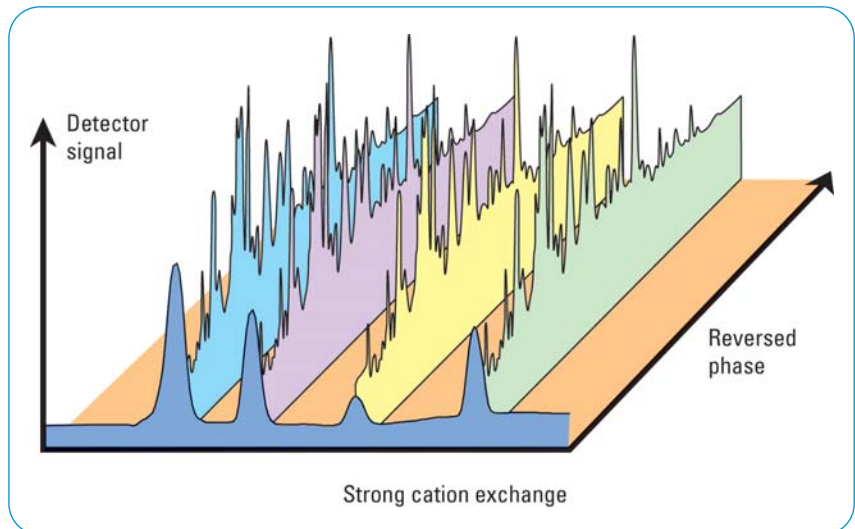


Application focus:

The Agilent 1200 Series LC micro collection/spotting system offers researchers the flexibility required for multidimensional chromatography:

- Online by means of column switching with the Agilent 1200 Series micro valves
- Offline by collecting the desired fractions for subsequent dimensions

The offline approach yields superior separation results for enhanced protein identification. It also allows researchers to perform enzymatic or chemical modifications of fractions between the separation runs.



Agilent 1200 Series Nanoflow LC System for MS

Unsurpassed low-flow performance and stability



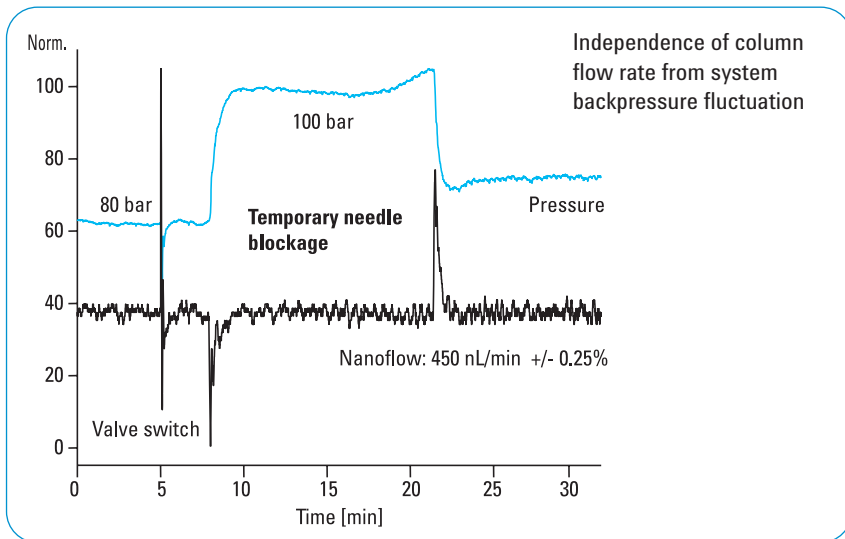
This LC system is used for mass spectrometry (MS)-based applications when an analysis of trace level components is required. It features an extremely stable, ultra-low flow control which provides a constant level of high sensitivity and reproducibility.

Superior separations

The nanoflow LC system is supplied with high-efficiency nanocolumns for sample cleanup, concentration, and separation. It can be configured for one-dimensional separation; one-dimensional separation with sample cleanup and concentration; or full two-dimensional separation,

as appropriate for your samples. The pump uses a unique solvent delivery technology which is optimized for nanoliter-per-minute flows and features EFC (Electronic Flow Control) with active feedback.

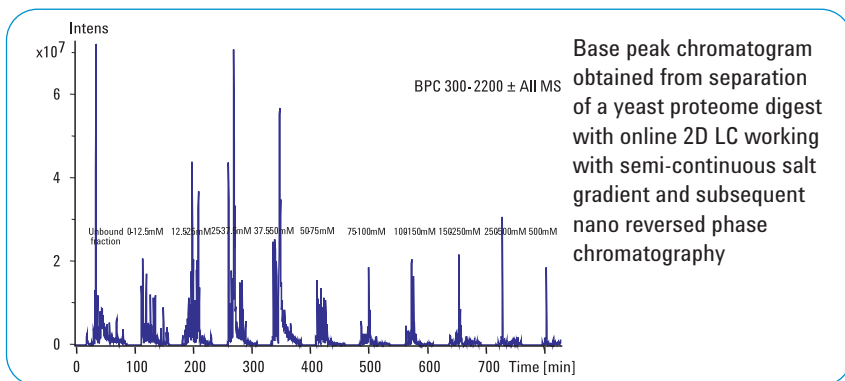
The EFC consists of an electromagnetic proportioning valve (EMPV) and nanoflow sensor which provides real-time adjustment of the column flow rate. The entire flow path has been designed to maximize and maintain separation efficiency. The injection valves, fittings, connectors, and PEEK-coated, fused silica tubing have all been carefully selected to minimize dead volumes.



The nano system can be configured using the whole range of low-flow LC modules described above. The nano pump is specific to the nano LC system.

1200 Series nanoflow pump

- The extremely stable and accurate flow provided by Electronic Flow Control (EFC) achieves greater MS sensitivity, resulting from stable ion generation
- 1200 Series micro degasser with very low internal volume per channel (1 mL) allows fast changeover of mobile phase and quick purge
- Second generation flow sensors ensure robustness and high instrument uptime



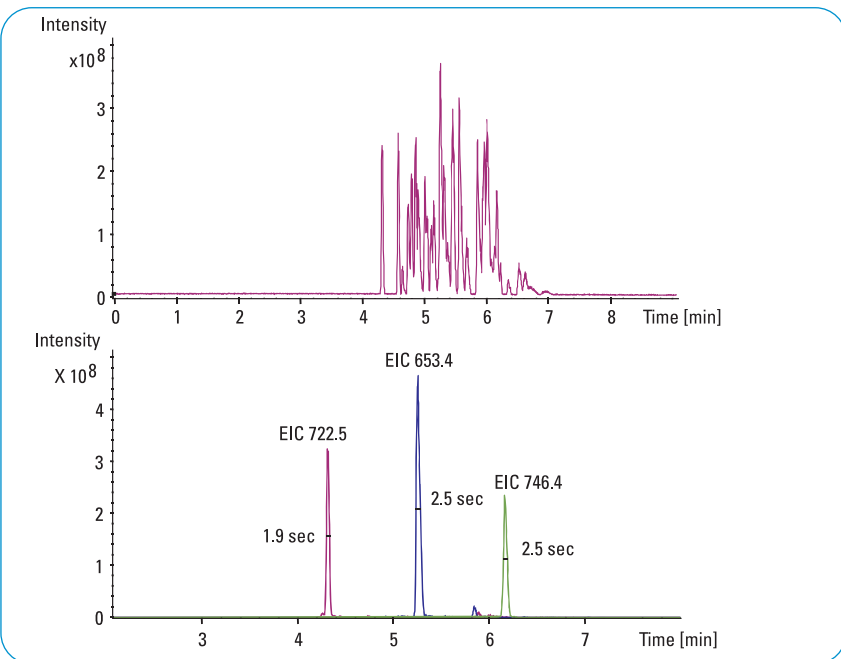
Application focus:

Proteomics is a typical application area for the nanoflow pump. The nanoflow LC system is used for multidimensional chromatography and LC/MS/MS for protein identification (online and offline 2D LC).

Get "Chip ready"!



Take advantage of the HPLC-Chip/MS system and make nanoflow LC/MS the workhorse for your high sensitivity LC/MS analysis needs. Combining the Agilent HPLC-Chip/MS with the Agilent 1200 Series nanoflow LC and LC/MSD Trap XCT Ultra or LC/MSD TOF mass spectrometers will offer you the best possible performance for nanospray applications where sensitivity, reproducibility, reliability, robustness and ease of use are essential.



Performance of the Protein ID chip using a rapid gradient at 600 nL/min for the analysis of a BSA tryptic digest. Separation was achieved with a solvent gradient from 3% Acetonitrile (ACN), 0.1% Formic acid (FA) to 80% ACN, 0.1% FA in 7 min.

Specifications at a glance

System specifications

(The system includes a capillary pump, micro well-plate autosampler, column compartment and diode array detector)

Performance specifications		flow rates up to 2.5 mL/min; mixer delay volume 420 µL 1.0 to 8.5 recommended	Specifications for nanoflow pump
Baseline noise:	± 3 × 10 ⁻⁵ AU, at 254 nm at flow rates < 100 µL/min	pH range:	Settable flow range: 0.01 – 4 µL/min, 1 – 2500 µL/min (with EFC bypassed)
Maintenance and system test:	• Front access to all maintenance parts • Maintenance instructions on a multimedia CD-ROM • Time for full system test (OQ/PV) < 5 h	Agilent 1200 Series micro vacuum degasser	Recommended flow range: 0.1 – 1 µL/min, 200 – 2500 µL/min (with EFC bypassed)
Benchspace:	System delay volume: 5 µL from EFC to column (typical) head, for flow rates up to 20 µL/min (default setup); 14 µL from EFC to column head, for flow rates up to 100 µL/min (default setup)	Max. flow rate: 5 mL/min per channel No. of channels: 4 Internal volume: Typically 1 mL per channel Materials in contact with solvent: PTFE, FEP, PEEK	Flow precision: < 0.7% RSD (typically < 0.4% RSD) at 600 nL/min (BSA digest)
Required benchspace:	< 36 cm	Agilent 1200 Series micro well-plate autosampler and thermostatted version	Delay volume: Typically 300 nL from EFC to pump outlet for flow rates up to 4 µL/min
System control:	Through local computer software, LAN or local handheld control module	Sample capacity: 108 x 2-mL vials plus 10 additional 2-mL vials, 54 Eppendorf tubes (0.5, 1.5 and 2.0 mL), 2 well-plates (96 and 384)* plus 10 additional 2-mL vials	Specifications for the Micro Collector/Spotter
GLP features:	Early Maintenance Feedback – EMF (tracks lamp burn time, usage, number of injections with limits and feedback messages)	Settable injection volume: 0.01 – 8 µL with small loop capillary; 0.01 – 40 µL with extended loop capillary	Fraction vessel capacities and trays • 4 well-plates full tray (MTP) with: 384 or 96 well-plates (standard and conical shape) or 4 x 27 Eppendorf tubes (0.5, 1.5, 2.0 mL), MALDI target plates • 2 x well-plates std. tray (MTP) + 10 x 2 mL vials (+ 1 half tray) with: 384 or 96 well-plates (standard and conical shape) or 2 x 27 Eppendorf tubes (0.5, 1.5, 2.0 mL)
Agilent 1200 Series capillary pump		Precision: Typically: < 0.5% RSD from 5 – 40 µL, < 1% RSD from 1 – 5 µL, < 3% RSD from 0.2 – 1 µL	MALDI Plate Capacity • 4 (3 for Bruker Anchor Chip 1536), variety of preconfigured plates available
Hydraulic system:	Two dual pistons in series, with proprietary servo-controlled variable stroke drive, floating pistons and active inlet valve, solvent selection valve and electronic flow control (EFC) for flow rates up to 100 µL/min	Carry-over: Typically: < 0.05% using the following conditions: Column: 150 x 0.5 mm, Hypersil ODS, 3 µm Mobile Phase: water/acetonitrile = 85/15 Column flow rate: 13 µL/min Inj. volume: 1 µL caffeine (= 25 ng caffeine) 1 µL water to test carry-over Outside wash of needle: 20 s with water using flush port	Minimum fraction volume • Typically 2 µL (depending on the fraction collection container)
Settable column flow range:	0.01 – 20 µL/min 0.01 – 100 µL/min (with extended flow range kit) 0.001 – 2.5 mL/min (electronic flow control bypassed)	Temperature range: Settable from 4 – 40 °C in 1 degree increments	MALDI spot size • 100 – 5000 nL (depending on the MALDI plate)
Recommended column flow range:	1 – 20 µL/min 10 – 100 µL/min (with extended flow range kit)	pH-range: 1.0 to 8.5 recommended	Maximum spotting rate • 20 spots/min (1 spot/3 s)
Column flow precision:	< 0.7% RSD or 0.03 SD, whatever is greater (typically < 0.4% RSD or 0.02 SD), at 10 µL/min and 50 µL/min column flow (based on RT, default settings)	Agilent 1200 Series column compartment	Maximum flow rate • 100 µL/min
Composition precision:	< 0.2% SD at 10 µL/min, 50 µL/min (with extended flow range kit) and 1 mL/min (default settings)	Temperature range: 10 degrees below ambient to 80 °C Temperature stability: ± 0.15 °C Column capacity: Three 30-cm columns	Specifications for 2-position/6-port micro valve
Pressure range:	up to 400 bar system pressure	Agilent 1200 Series diode array detector (G1315B)	Volume in flow passages: 70 nL port to port Max. pressure: 41 MPa (408 bar, 6000 psi) Recommended flow range: 0.1 – 100 µL
Delay volume:	Typically 3 µL from EFC to pump outlet for flow rates up to 20 µL/min; 12 µL from EFC to pump outlet for flow rates up to 100 µL/min; 180 – 480 µL (system pressure dependant) without mixer for	Short-term noise: ± 1 × 10 ⁻⁵ AU, at 254 nm ± 1 × 10 ⁻⁵ AU, at 750 nm Wavelength range: 190 – 950 nm Slit width: Programmable: 1, 2, 4, 8, 16 nm Diode width: < 1 nm Light source: Deuterium and tungsten lamps	Specifications for 2-position/10-port micro valve

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