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ACQUITY UPLC H-Class System

The Waters® ACQUITY UPLC® H-Class System delivers the flexibility of quaternary solvent blending with the advanced performance of UPLC® separations. The system's holistic design is targeted for routine analysis and method development use and is perfectly suited for running both HPLC and UPLC applications while still realizing the improved resolution and sensitivity of UPLC separations. The system is comprised of a Quaternary Solvent Manager (QSM), a Sample Manager with Flow-Through Needle (SM-FTN) design, and offers a choice of column compartment products. For specific test conditions, see the ACQUITY UPLC H-Class and H-Class Bio System Specifications Guide.

ACQUITY UPLC H-CLASS SYSTEM FEATURES

Dwell volume (total system)	<400 µL (includes standard 100 µL mixer)
Integrated leak management	Leak sensors, as standard, and safe leak handling
Quantum synchronization	Injection synchronization between pump and sample manager enhances retention time reproducibility
Settable flow rate range	0.010 to 2.000 mL/min, in 0.001 mL increments (firmware version 1.5x and earlier) 0.010 to 2.200 mL/min, in 0.001 mL increments (firmware version 1.60) 0.001 to 2.200 mL/min in 0.001 mL increments (firmware version 1.65 and later)
Maximum operating pressure	15,000 psi up to 1.0 mL/min, 9000 psi up to 2.0 mL/min (firmware version 1.5x and earlier) 15,000 psi up to 1.0 mL/min, 7800 psi up to 2.2 mL/min (firmware version 1.6x and later)
pH range	2 to 12
Unattended operation	Leak sensors and safe leak handling, full 96-hour diagnostic data display through console software
Cycle time	<30 s inject-to-inject

QUATERNARY SOLVENT MANAGER (QSM)

Number of solvents	Blend up to four solvents in any combination (standard) Expanded solvent choices with optional six-port solvent select valve
Solvent degassing	Integrated vacuum degassing, four chambers One additional chamber for the SM-FTN purge solvent
Solvent blending	Automated, on-line pH, ionic strength, and organic modifier blending from pure solvents with Auto•Blend Plus™ Technology
Gradient formation	Low-pressure mixing, quaternary gradient
Gradient profiles	11 gradient curves [including linear, step (2), concave (4), and convex (4)]
Primary check valve	Intelligent Intake Valve (i^2Valve), standard Passive check valve (optional)
Flow accuracy	±1.0% at 0.5 to 2.0 mL/min using 100% A (with i^2Valve) Back pressure 600 to 1000 psi with degassed H_2O

Flow precision	0.075% RSD or ±0.020 min SD, whichever is greater, based on six replicates (with *i*^{2} Valve) 60:40 H_2O/MeOH via Auto•Blend Plus Technology, 0.5 mL/min, alkylphenone mix (5.0 µL injection volume), ACQUITY UPLC BEH C_{18}, 1.7 µm, 2.1 x 50 mm, 35 °C ± 0.3 °C, UV @ 254 nm
Composition ripple (baseline noise)	<1.0 mAu (<0.1 mAU with optional 250.0 µL mixer) (with *i*^{2} Valve) A: H_2O + 0.1% TFA, B: ACN + 0.1% TFA, 0.5 mL/min, ACQUITY UPLC BEH C_{18}, 1.7 µm, 2.1 x 50 mm UV @ 214 nm, 10 mm analytical flow cell
Composition accuracy	±0.5% absolute (full scale) from 5% to 90% from 0.5 to 2.0 mL/min (with *i*^{2} Valve) Degassed ACN/H_2O (90:10), ACN/H_2O (90:10) with caffeine at 12 mg/L concentration, back pressure 2000 psi, step gradient method, UV at 273 nm
Composition precision	<0.15% RSD or ±0.04 min SD, whichever is greater, based on six replicate injections (with *i*^{2} Valve) 60:40 H_2O/MeOH via Auto•Blend Plus Technology, 0.5 mL/min, alkylphenone mix (5.0 µL injection volume), ACQUITY UPLC BEH C_{18}, 1.7 µm, 2.1 x 50 mm, 35 °C ± 0.3 °C, UV @ 254 nm
Compressibility compensation	Automatic and continuous
Priming	Wet priming can run at flow rates up to 4 mL/min
Pump seal wash	Equipped with an automated wash system to flush the rear of the high pressure seal and the plunger
Flow ramping	Range: 0.01 to 30.00 min to reach 2.0 mL/min Default: 0.45 min to reach 2.0 mL/min
Primary wetted materials	316L stainless steel, PPS, fluoropolymer, fluoroelastomer, UHMWPE blend, sapphire, ruby, zirconia, Nitronic 60, DLC, PEEK and PEEK blend, titanium alloy

SAMPLE MANAGER-FTN (SM-FTN)

Injection volume range	0.1 to 10.0 µL as standard in 0.1 µL increments Up to 1000.0 µL with optional extension loops
Accuracy (aspiration)	±0.2 µL, measured by fluid weight removed from vial with 10.0 µL injections averaged over 20 injections using standard 100 µL syringe
Linearity	>0.999 (standard needle) caffeine 0.030 mg/mL, ACN/H_2O (10:90), isocratic 0.6 mL/min, 0.2 to 10.0 µL, 1 to 70% needle volume
Precision	<1% RSD 0.2 to 1.9 µL <0.5% RSD 2.0 to 10.0 µL
Number of sample plates	Any two of the following: • 96 and 384 microtiter plates • 48 position 2.00-mL vial plates • 48 position 0.65-mL micro-centrifuge tube plates • 24 position 1.50-mL micro-centrifuge tube plates

Maximum sample capacity	768 in two 384-well plates or, 96 in 2-mL vial holders Four additional positions for dilution functions
Sample compartment	4.0 to 40.0 °C, settable in 0.1 °C increments
Temperature accuracy	±0.5 °C at sensor
Temperature stability	±1.0 °C at sensor
Injection needle wash	Integral, active, programmable
Minimum sample required	3 µL residual, using total recovery 2-mL vials (zero offset)
Sample carryover	<0.004% caffeine (UV) <0.005% sulphadimethoxine (MS)
Advanced Sample Manager capabilities	Auto-dilution, auto-addition, and load-ahead
Primary wetted materials	316L stainless steel, gold plated stainless steel, Vespel SCP, PEEK blend, DLC

COLUMN HEATER (CH-A AND CH-30A)

Column capacity	CH-A: Single column, up to 4.6 mm internal diameter (I.D.), up to 150 mm in length with filter or guard column CH-30A: Single column, up to 4.6 mm internal diameter (I.D.), up to 300 mm length with filter or guard column
Column compartment temperature range	20.0 to 90.0 °C, settable in 0.1 °C increments
Column compartment temperature accuracy	±0.5 °C at sensor
Column compartment temperature stability	±0.3 °C at sensor
Solvent conditioning	Active pre-heating as standard Passive pre-heating (optional in CH-A only)
Column tracking	eCord™ Technology column information management tracks and archives column usage history

COLUMN MANAGEMENT (CM-A AND CM-AUX)

Column capacity	CM-A: Two columns, as standard (maximum length of 150 mm with filter or guard column) or four columns (maximum length of 50 mm) can be supported with optional tubing kit, up to 4.6 mm internal diameter (I.D.) CM-Aux: Two columns (maximum length of 150 mm, with filter or guard column) – up to two CM-Aux units can be configured with one CM-A for support of up to six columns
Switching valves	Two nine-port, eight-position valves (CM-A only); provides programmable, automatic, random access switching, waste and bypass positions for rapid solvent changeover
Column compartment(s) temperature range	4.0 to 90.0 °C, settable in 0.1 °C increments Two independent heat/cool zones per module, up to six zones in stacked configuration
Column compartment(s) temperature accuracy	±0.5 °C
Column compartment(s) temperature stability	±0.3 °C
Solvent conditioning	Active pre-heating as standard
Column tracking	eCord Technology column information management tracks and archives column usage history
2D support	Optional

SAMPLE ORGANIZER

Sample plate capacity	Sample plate capacity is configured based on the types and combinations of plates being used: • Maximum of 19 standard microtiter plates, up to 15.5 mm high, or, • Maximum of 9 intermediate height plates (or 2-mL vial holders), up to 40.0 mm high, or, • Maximum of 6 deep well plates (or 4-mL vial holders), up to 47.0 mm high
Maximum sample capacity	Maximum of 7296 samples in nineteen 384-well plates
Sample compartment	4.0 to 40.0 °C, settable in 0.1 °C increments
Temperature accuracy	+/- 1.0 °C at the sensor
Temperature stability	+/- 1.0 °C at the sensor

INSTRUMENTAL CONTROL

External control	Empower® Software, MassLynx® Software, UNIFI,® or standalone through console software
External communications	Ethernet interfacing via RJ45 connection to host PC
Event inputs/outputs	Rear panel contact closure and/or TTL inputs/outputs
Connections INSIGHT®	Provides real-time monitoring and automatic notification of instrument performance and diagnostic information allowing for quicker problem resolution
Local control	ACQUITY UPLC Local Console Controller (LCC)

ENVIRONMENTAL SPECIFICATIONS

Acoustic noise	<65 dBA, system
Operating temperature range	4.0 to 40.0 °C (39.2 to 104.0 °F)
Operating humidity range	20% to 80%, non-condensing

ELECTRICAL SPECIFICATIONS

Power requirements	100 to 240 VAC
Line frequency	50 to 60 Hz
Power consumption	QSM: 360VAC SM-FTN: 400VAC CM-A: 400VAC

PHYSICAL SPECIFICATIONS

ACQUITY UPLC H-Class System: Quaternary Solvent Manager, Sample Manager-FTN, Column Heater, and Solvents Tray	Width: Height: Depth:	34.3 cm (13.5 in.) 71.1 cm (28.0 in.) 71.2 cm (28.0 in.)
ACQUITY UPLC H-Class System: Quaternary Solvent Manager, Sample Manager-FTN, Column Manager, and Solvents Tray	Width: Height: Depth:	34.3 cm (13.5 in.) 79.6 cm (31.4 in.) 71.2 cm (28.0 in.)
Sample Organizer	Width: Height: Depth:	25.4 cm (10 in.) 96.5 cm (38.0 in.) 71.1 cm (28.0 in.)

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