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ACQUITY APC p-QSM System

The Waters™ ACQUITY™ Advanced Polymer Chromatography™ (APC™) System with Polymer Quaternary Solvent Manager (p-QSM) delivers the flexibility of quaternary solvent blending with the advanced performance of UPLC™ separation. The system is designed for superior solvent compatibility and broad ranges of applications. The holistic design is targeted for routine analysis as well as method development use and is perfectly suited for running both HPLC and UPLC applications.

For polymer applications, combining low-dispersion system fluidics with rigid, small particle columns of a wide-range of pore sizes, the system defines the ultimate in polymer peak resolution, particularly for low molecular weight oligomers. Getting more information about your polymers in less time means better characterization, better asset utilization, and ultimately a better solution for achieving your scientific, business, and sustainability goals.

ACQUITY APC p-QSM SYSTEM FEATURES

Dwell volume (total system)	≤400 µL (includes standard 100 µL mixer)
Gradient delay volume	≤300 µL (includes standard 100 µL mixer)
Integrated leak management	Leak sensors, as standard equipment, compatible with the supported solvents and safe leak handling; drip trays direct all leaks to the front of the instrument and into the waste line
Maximum operating pressure	0 to 1.0 mL/min: 15,000 psi 1.0 to 2.2 mL/min: 15,000–7,800 psi (linear)
Super synchronization	Synchronization between the solvent manager pistons enhances retention time reproducibility
Operating flow range	0.010 to 2.20 mL/min in 0.001 mL increments
pH range	2 to 12
Unattended operation	Full 96-hour diagnostic data displayed through the instrument console software

ACQUITY APC QUATERNARY SOLVENT MANAGER (P-QSM)

Number of solvents	Blend up to four solvents in any miscible 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^2 Valve)
Flow accuracy	±1.0% at 0.5 to 2.0 mL/min using 100% A Backpressure 1,000 psi ±200 psi with degassed H_2O
Flow precision	<0.075% RSD or 0.020 min SD, whichever is greater, based on six replicates 60:40

	H_2O/MeOH via premix, 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 ±0.1 °C, UV @ 254 nm
Composition ripple (baseline noise)	<1.0 mAu (<0.1 mAU with optional 250.0 µL mixer) 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, 5 mm analytical flow cell
Composition accuracy	±0.5% absolute (full scale) from 5% to 90% from 0.2 to 2.0 mL/min Degassed ACN/ACN 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 ± 0.1 °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	316 SS, NITRONIC® 60, titanium alloy, fluoropolymer, UHMWPE blend, fluoroelastomer, PPS, zirconia, ruby, sapphire, DLC, gold, MP35N, PEEK blend, polyimide
Solvent selection	Programable up to six solvents (optional)

ACQUITY APC SAMPLE MANAGER WITH FLOW-THROUGH NEEDLE

Injection volume range	0.5 to 50.0 µL as standard 0.1 to 250.0 µL with optional extension loop
Injection needle wash	Integral, active, programmable
Number of sample plates	Two
Maximum sample capacity	96 in 2-mL vial holders. For more information see Waters Sample Vials and Accessories brochure
Injection accuracy (aspiration)	±0.2 µL, measured by water weight removed from vial with 10.0-µL injections over 20 injections using standard 100-µL syringe
Injection linearity	>0.999 based from 0.5-µL to 50-µL injections of a polystyrene standard, 0.5 mL/min, 100% THF, ACQUITY APC XT 200 Å, 2.5 µm 4.6 x 150 mm, column at 40 °C, RI detection
Injection precision	<0.5% RSD 2.0 to 50.0 µL based six replicates at each injection volume of a polystyrene standard, 0.5 mL/min, 100% THF, ACQUITY APC XT 200 Å, 2.5 µm 4.6 x 150 mm, column at 40 °C, RI detection
Sample compartment temperature range	4.0 °C to 40.0 °C, settable in 0.1 °C increments with a tolerance range between -2 °C and +4 °C
Temperature accuracy	±0.5 °C at the sample compartment temperature sensor

Temperature stability	±1.0 °C at the sample compartment temperature sensor
Sample carryover	<0.005% caffeine (UV) based on carryover after 4 mg/mL standard, 5-µL injection volume, 90/10 water/acetonitrile (for eluent, wash solvents, and diluent/blank), 0.6 mL/min, ACQUITY UPLC BEH C_{18} 1.7 µm 2.1 x 50 mm, column at 40°C, UV detection at 273 nm
Primary wetted materials	316 SS, PPS, polyimide, fluoropolymer

ACQUITY APC SINGLE ZONE COLUMN MANAGER

Column capacity	One bank of columns connected in series: - Maximum of four 30- to 75-mm columns - Maximum of three 150-mm columns Two modules configurable per APC System
Valves	Optional valves for column switching, column bypass, waste, or solvent recycling
Solvent conditioning	Active pre-heating as standard
Column tracking	Individual eCord™ connectors for all columns in the bank
Temperature range	Controlled 4.0 °C to 90.0 °C settable in 0.1 °C increments
Time to temperature ready	12 min after door open 30 s, at internal temperature sensor after 1-hour thermal equilibrium at set point
Temperature accuracy	±0.5 °C measured at sensor on trough
Temperature precision	±0.1 °C measured at sensor on trough
Temperature stability	±0.3 °C measured at sensor on trough
Primary wetted materials (including optional valves)	PEEK, 316 SS, polyimide, fluoropolymer
Column switching with optional valves	- Up to 2 APC column banks (one bank per CM-S module) - Up to 2 GPC column banks (two banks in CM-30S)

ACQUITY APC 30CM SINGLE ZONE COLUMN MANAGER (OPTIONAL)

Column capacity	Support for one or two banks of up to four columns per bank: - Maximum column length 300 mm, plus 50-mm guard column - Maximum column I.D. 8 mm
Solvent conditioning	Passive pre-heating (standard)
Column tracking	Optional eCord connectors with support for up to four columns per bank
Temperature range	Settable 20 °C to 90 °C in 0.1 °C increments Controllable (ambient +5 °C) to 90 °C
Time to temperature ready	12 min after door open 30 s, at internal temperature sensor after 1-hour thermal equilibration at 60 °C temperature set point, 25 °C ambient temperature.
Temperature accuracy	±0.5 °C measured at sensor
Temperature precision	±0.1 °C measured at sensor

Temperature stability	±0.3 °C measured at sensor
Primary wetted materials (including optional valves)	316 SS, DLC

ACQUITY APC p-QSM INSTRUMENT CONTROL

External control	Empower™ 3 FR2 or later
External communication	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 faster problem resolution

ACQUITY APC PHYSICAL/ENVIRONMENTAL SPECIFICATIONS*

Acoustic noise	<62 dBA, system
Operating temperature range	15 °C to 40 °C (59 °F to 104 °F)
Operating humidity range	20% to 80%, non-condensing
Dimensions	Width: 34.3 cm (13.5 in.) Height: 70.6 cm (27.8 in.) Depth: 71.2 cm (28.0 in.)
Weight	74.9 kg (165.0 lbs.)

**Core system with single CM-S only.*

ACQUITY APC ELECTRICAL SPECIFICATIONS

Power requirements	100–240 VAC
Line frequency	50 Hz–60 Hz
Power consumption*	1,000 VA

**Core system with single CM-S only.*

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