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ACQUITY UPLC I-Class PLUS System (SM-FL)

The Waters™ ACQUITY™ UPLC™ I-Class PLUS System's holistic design is targeted for investigative analysis where maximized peak capacity, throughput, and sensitivity are critical and is perfectly suited for running any MS-based application. The system is comprised of a Binary Solvent Manager (BSM) and a Sample Manager with Fixed-Loop (SM-FL); this design offers lowest dispersion performance and is suitable for running 1.0 mm columns.

ACQUITY UPLC I-CLASS PLUS SYSTEM FEATURES (WITH SM-FL)

Total system bandspread, 5σ	≤7 µL, default configuration
Dwell volume (total system)†	≤95 µL, default configuration
Gradient delay volume†	≤75 µL
Integrated leak management	Leak sensors, as standard, and safe leak handling
System synchronization	Injection synchronization between both pumps and the sample manager enhances retention time reproducibility
Operating flow rate range	0.001 to 2.000 mL/min, in 0.001 mL increments (firmware version 1.71 and later)
Maximum operating pressure	18,000 psi up to 1 mL/min 12,000 psi up to 2 mL/min
pH range†	1 to 12.5
Unattended operation	Leak sensors, full 96-hour diagnostic data display through console software
Cycle time	≤15 s inject to inject, with load ahead enabled

BINARY SOLVENT MANAGER

Number of solvents	Up to four, in combination of two, A1 or A2 and B1 or B2
Solvent conditioning	Integrated vacuum degassing, five lines with one allocated for purge solvent
Gradient formation	High pressure mixing, binary gradient
Gradient profiles	11 gradient curves (including linear, step [2], concave [4], and convex [4])
Primary check valves	Intelligent Intake Valves (i^2Valve)
Flow accuracy†	±1.0% of set flow rate at 0.500 mL/min as per SystemsQT™
Flow precision†	≤0.075% RSD or ± 0.01 min SD, (0.2 to 2.0 mL/min), whichever is greater using premixed solvent
Composition ripple† (baseline noise)	≤1.0 mAu
Composition precision†	≤0.15% or ±0.01 min SD, whichever is greater (from 0.2 to 2.0 mL/min)
Pump compositional accuracy†	±0.5% absolute from 5% to 95%, 0.2 to 2.0 mL/min

Pressure pulsation†	≤0.4% or 25 psi whichever is greater
Compressibility compensation	Automatic, no user intervention required
Priming	Wet priming runs at a flow rate of 4 mL/min
Pump seal wash	Equipped with a programmable active wash system to flush the rear of the high pressure seals and the plungers
Flow ramping	Automatic
Primary wetted materials	316L stainless steel, UHMWPE blend, MP35N, titanium alloy, gold, sapphire, ruby, zirconia, Nitronic 60, DLC, fluoropolymer PEEK, and PEEK blend
Mixing options	Standard: 50 µL Optional: 100 µL and 380 µL

SAMPLE MANAGER – FIXED LOOP (SM-FL)

Injection volume range	0.1 µL to 250.0 µL, in 0.1-µL increments 10 µL loop standard with 1, 2, 5, 20, 50, 100, and 250 µL optional loops
Linearity†	≥0.999, (default needle) from 20% to 75% of loop, Partial Loop Uses Needle Overfill mode, (PLUNO), per SystemsQT protocol
Injection mode	Three – Full Loop mode, for optimal quantitation and dispersion, Partial Loop mode for fastest cycle time, and Partial Loop Uses Needle Overfill mode, default mode, for optimal quantitation using partial loop injection volumes
Precision†	<1% area RSD, 0.2 to 1.9 µL injection <0.5% area RSD, 2 to 10 µL injection ≤0.25% area RSD, 5 to 50 µL injection
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, plus four additional positions for dilution functions
Sample compartment temperature range	4.0 to 40.0 °C, settable in 0.1 °C increments; maintains 19 °C below ambient with a tolerance range between -2 and +4 °C
Temperature accuracy	±0.5 °C at sensor
Temperature stability	±1.0 °C at sensor
Sample manager heat time	≤30 min ambient-40 °C
Sample manager cool time	≤60 min ambient-4 °C
Injection needle wash	Integrated, active, programmable, dual wash
Minimum sample required	3 µL residual, using Waters' Total Recovery 2-mL Vials (zero offset)

Sample carryover†	≤0.001% caffeine (UV) ≤0.001% sulphadimethoxine (MS)
Advanced sample manager capabilities	Load Ahead and Loop Offline mode, valve cycle timed event
Primary wetted materials	316L stainless steel, UHMWPE blend, MP35N, DLC, titanium alloy, gold, sapphire, ruby, zirconia, Nitronic 60, fluoropolymer, PEEK and PEEK blend, fluoroelastomer

COLUMN HEATERS (CH-A)

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 Mounting extends out for use with MS-based detector
Fittings	18,000 psi, low dispersion, with reusable column inlet fittings
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
Column compartment heat time	≤15 min ambient-60 °C
Solvent conditioning	Active pre-heating as standard; passive pre-heating (for legacy method support)
Column tracking	eCord™ Technology column information management tracks and archives column usage history

COLUMN MANAGEMENT (CM-A)

Column capacity	CM-A: Two columns, as standard (maximum length of 150 mm with filter or guard column) up to 4.6 mm internal diameter (I.D.)
Switching valves	Two nine-port, eight-position valves (CM-A only); provides programmable 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
Column compartment(s) temperature accuracy	±0.5 °C at sensor
Column compartment(s) temperature stability	±0.3 °C at sensor
Column compartment heat time	≤15 min ambient-60 °C
Column compartment cool time	≤15 min 60–20 °C
Solvent conditioning	Active pre-heating as standard; passive pre-heating (for legacy method support)

Fittings	18,000 psi, low dispersion, with reusable column inlet fittings
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 temperature range	4.0 to 40.0 °C, settable in 0.1 °C increments with a tolerance range between -2 and +4 °C
Temperature accuracy	±1 °C at the sensor
Temperature stability	±1 °C at the sensor

INSTRUMENTAL CONTROL

External control	Empower™ Software, MassLynx™ Software, UNIFI™ Scientific Information System, 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

ENVIRONMENTAL SPECIFICATIONS

Acoustic noise	≤62 dBA, system
Humidity – Operating	20% to 80%, non-condensing
Operating temperature range	4 to 40 °C

ELECTRICAL SPECIFICATIONS

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

PHYSICAL SPECIFICATIONS

ACQUITY UPLC I-Class PLUS System: BSM, SM-FL, and CH-A	Width: 34.3 cm (13.5 in.) Height: 71.1 cm (28.0 in.) Depth: 71.2 cm (28.0 in.)
ACQUITY UPLC I-Class PLUS System: BSM, SM-FL, and CM-A	Width: 34.3 cm (13.5 in.) Height: 79.6 cm (31.4 in.) Depth: 71.2 cm (28.0 in.)
Sample Organizer	Width: 25.4 cm (10.0 in.) Height: 96.5 cm (38.0 in.) Depth: 71.1 cm (28.0 in.)

[†] *For specific test conditions, contact your Waters sales representative.*

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