

Analytical HPLC

LC-4000 Series



JASCO

Performance
Innovation
Reliability



The LC-4000 Series HPLC is the latest in a long history of innovative HPLC systems developed by JASCO reaching all the way back to the start of the commercial HPLC in the early 1970s.

The concept of the integrated LC-4000 series HPLC provides key separation platforms at 300bar, 700bar and 1300bar which correspond to conventional HPLC, the increasingly popular Rapid Analysis (RHPLC) and sub 2 μ m UHPLC, respectively. Each platform is supplied with a dedicated pump and autosampler matched to the operating pressure and all three platforms share common detectors optimized for high-speed 100 Hz acquisition and narrow peak shapes common to both RHPLC and UHPLC.

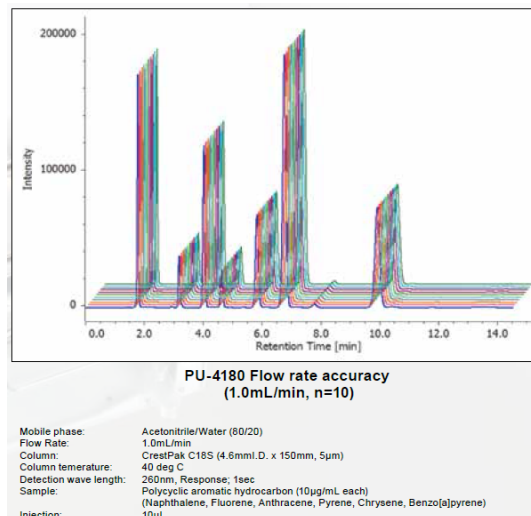
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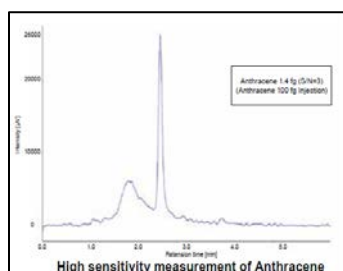
LC-4000 Advances

Flow Innovation

For over two decades JASCO analytical HPLC pumps have employed an asymmetric twin-piston delivery system SSQD (Slow Suction, Quick Delivery) providing significantly better flow and pressure profiles than conventional twin-piston reciprocating designs. The SSQD was redeveloped for the LC-4000 series to offer the highest stability in solvent delivery using ExReFT (Extremely Reliable Flow Technology).

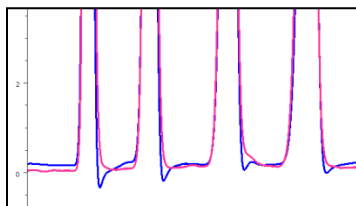


Retention Time	Naphthalene	Fluorene	Anthracene	Pyrene	Chrysene	Benzo[a]pyrene
% RSD	0.025	0.018	0.017	0.022	0.016	0.020



World's most sensitive FP detector.

Redesigned flow cells for excellent peak shape.



Pioneering Optical Design

As a pioneer in optical spectroscopy dating back over 60 years, JASCO has access to optical designs that few can match. Adapting designs from the most powerful spectrometers, we have developed a range of HPLC detectors with unrivalled performance like the new class leading FP-4020 fluorescence detector with S/N of over 2300:1 and the world's only circular dichroism detector for chiral chromatography. Dual simultaneous wavelength detection is offered as standard on the UV and FP detectors adding flexibility and versatility.

Compact and Easy to Use

Despite the extra power delivered by the LC-4000 series HPLC, the standard footprint is only 300mm wide requiring very little bench space. For those users that require front panel control, the LC-4000 series returns the popular keypad and display.

For easy user maintenance, all LC-4000 modules feature front access for replacing consumables such as check valves and seals in the pumps, sample needle and syringe parts in the autosamplers and lamps for the detectors.



Configurations

HPLC

Designed for routine HPLC research and teaching for 5 μ m columns and up to 60 samples per day.

Flow rate: 0.05 - 10.0 mL/min

Pressure: 300bar

Options:

- High Pressure Gradient
- Low Pressure Gradient
- Column Oven for various lengths
- UV, PDA, FP, RI, CD, MS



UHPLC

Designed for those requiring the highest sample throughput for use with sub-2 columns and up to 180 samples per day.

Flow rate: 0.05 - 2.0 mL/min

Pressure: 1300bar

Options:

- High Pressure Gradient
- Low Pressure Gradient
- Column Oven for various lengths
- UV, PDA, FP, RI, CD, MS

RHPLC

Designed for those requiring more sample throughput for use with 3 μ m and 5 μ m columns and up to 180 samples per day.

Flow rate: 0.05 - 10.0 mL/min

Pressure: 700bar

Options:

- High Pressure Gradient
- Low Pressure Gradient
- Column Oven for various lengths
- UV, PDA, FP, RI, CD, MS



LCMS



Prep LCMS

Detectors



UV-4070/4075

UV-visible detector

Both detectors offer simultaneous dual wavelength acquisition and spectra scanning.

Wavelength ranges:
UV 4070: 190-900nm
UV 4075: 190-600nm



MD-4010/4015/4017

PDA detector

When 2 wavelengths are not enough a PDA can provide the additional needed as well as spectral information and identification possibilities.

Wavelength ranges:
MD-4010: 190-900nm
MD-4015: 190-600nm
MD-4017: 190-400nm



CD-4095

Circular Dichroism detector

The world's only circular dichroism detector provides the most sensitive chiral detector available.

Wavelength range: 220-460nm



FP-4020/4025

Fluorescence detector

For the ultimate in sensitivity the FP-4020 provides S/N of 2300:1. The FP-4025 offers excellent sensitivity with S/N of 1400:1 and both offer simultaneous detection of 2 wavelength pairs.

Wavelength range: 200-900nm



CMS

Mass Spectrometer

When mass identification is needed the CMS offers ESI, APCI or ASAP with positive and negative switching.

CMS-S up to 1200 m/z
CMS-L up to 2000 m/z



OR-4090

Optical Rotation detector

The optical rotation detector provides chiral detection for optically active isomers and chiral compounds that have no absorption.

Wavelength ranges: 350-900nm



RI-4030/4035

Refractive Index detector

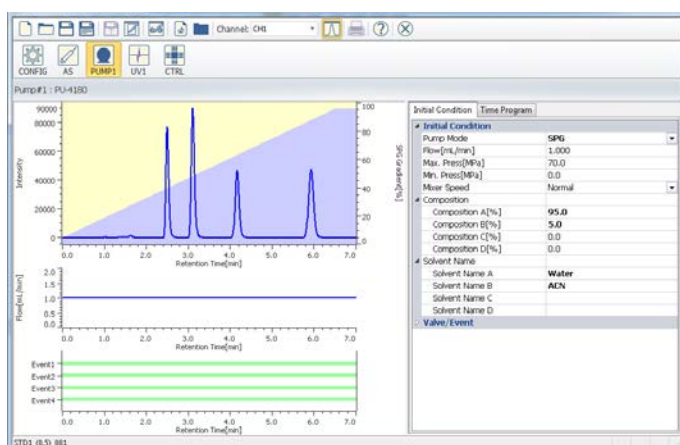
The refractive index detector is a universal detector for those compounds that cannot be seen on the UV or FP.

RI-4030 up to 120mL/min
RI-4035 for RHPLC/UHPLC

ChromNAV Software

ChromNAV 2.0 (and ChromNAV-CFR 2.0) are JASCO's next generation CDS developed from the powerful and easy-to-use ChromNAV 1.0 with a host of existing new features. With a customizable graphical-user-interface (GUI), the user can set-up the system to display only the functions necessary for their application. This latest intuitive GUI allows the user to quickly learn the operation and explore the extensive functionality of data processing.

ChromNAV 2.0 is a universal CDS which can be used with any type of separation – HPLC, RHPLC, UHPLC, Prep LC, Analytical SFC and Prep SFC. ChromNAV can also satisfy the demands of dedicated analyses or multi-purpose systems.

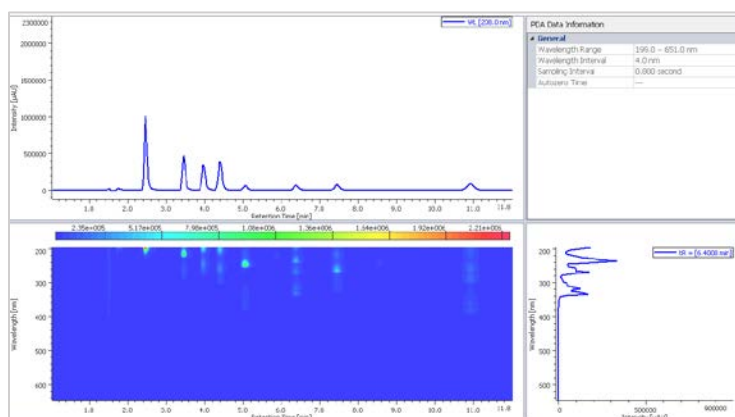


Control Method

The pump flow rate and gradient profile display is flexible and can be overlaid with a chromatogram for adjusting gradient conditions.

PDA Analysis

PDA data processing is included as standard. Data is displayed in a 2D contour plot and 3D with simultaneous overlay of spectra and chromatograms. Chromatograms can be extracted at single or multiple wavelengths for quantitation.



ChromNAV 2.0 offers powerful system control and data acquisition. During acquisition, the run-time can be extended to capture later eluting peaks. Previously acquired chromatograms can be overlaid for visual comparison with data currently being acquired.

Sample can be changed or added to the sequence while it is acquiring. Also the sequence can be setup to stop the pump, turn off the lamps, turn of the oven temperature and even turn off the power on the system at the end of the sequence.

ChromNAV 2.0 Standard Features

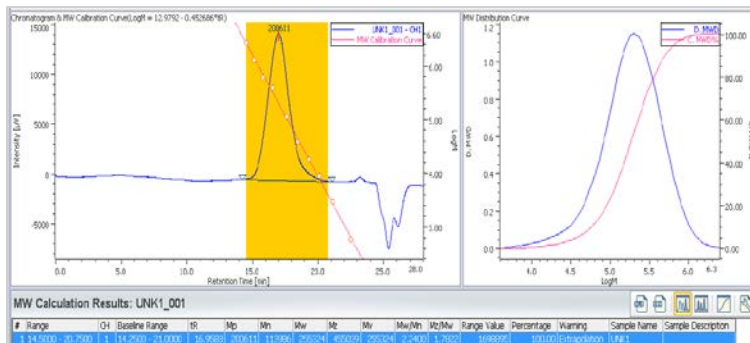
- Peak integration and peak identification
- Peak grouping
- Linear and non-linear quantitation
- 3D chromatogram analysis
- Spectral analysis for UV-visible, Fluorescence and PDA detectors
- Customizable report generator
- User formula calculations
- Automatic raw data export

All data is protected and saved; which can then be analyzed and re-analyzed, reported and saved with both raw data and with any data processing from the user's analysis.

A comprehensive audit trail records the acquisition method along with the history of the instrument performance in each data file. This provides the user with a snap-shot of the condition of the system during the run and can indicate warnings about requirements for impending maintenance.

ChromNAV 2.0 Optional Applications

- ChromNAV CFR for CFR Part 11 compliance and electronic registration of data
- ChromNAV GPC/SEC for molecular weight dispersion calculations and determinations
- ChromNAV Heparin for molecular weight dispersion of low molecular weight heparin
- ChromNAV FUMI for Function of Mutual Information (FUMI) for theoretical precision analysis
- ChromNAV FC for fraction collection (included as standard with a Prep LC)
- ChromNAV CMS for control of the CMS Mass Spectrometer (included as standard with CMS)
- ChromNAV Method Scouting for solvent and column screening in SFC and HPLC

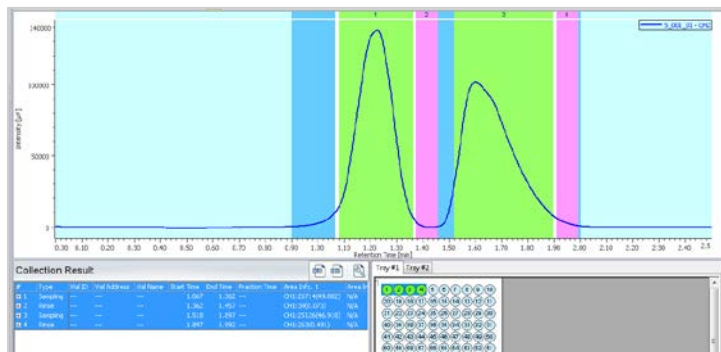


ChromNAV GPC/SEC

Molecular weight distribution program (Option) for GPC and SEC analysis.

ChromNAV FC

Fraction collection control for the CHF-122SC fraction collector triggered from time, threshold and/or slope.



Specifications

Pumps

Isocratic

Model	PU-4180 (HPLC)	PU-4185 (RHPLC)	PU-4285 (UHPLC)
Flow range	0.5 ~ 6.0 mL/min (70MPa) ~ 10.0 mL/min (35MPa)	0.05 ~ 3.0 mL/min (70MPa) ~ 4.0 mL/min (40MPa)	0.05 ~ 1.5 mL/min (130MPa) ~ 2.0 mL/min (100MPa)
Maximum Pressure	70 MPa (~6.0 mL/min) 35 MPa (~10.0mL/min)	70 MPa (~3.0 mL/min) 40 MPa (~4.0 mL/min)	130 MPa (~1.5 mL/min) 100 MPa (~2.0 mL/min)
Flow rate accuracy	±1% or ± 2µl/min	±1% or ± 2µl/min	±1% or ± 2µl/min
Flow rate precision	0.05% RSD or ±0.04min SD Measured by chromatogram	0.05% RSD or ±0.04min SD Measured by chromatogram	0.05% RSD or ±0.04min SD Measured by chromatogram
Dimensions, weight	300 (W) x 470 (D) x 150 (H) mm, 13kg	300 (W) x 470 (D) x 150 (H) mm, 13kg	300 (W) x 470 (D) x 150 (H) mm, 14.5kg
Power requirement	AC 100 ~ 240 V, 50/60 Hz, 80 VA	AC 100 ~ 240 V, 50/60 Hz, 80 VA	AC 100 ~ 240 V, 50/60 Hz, 60 VA

Low Pressure Gradient

Model	PU-4180 (HPLC)	PU-4185 (RHPLC)	PU-4285 (UHPLC)
Mixing accuracy	± 0.8% (5~95%, 0.5 ~ 5.0mL/min)	± 0.6% (5~95%, 0.2 ~ 1.0mL/min) ± 1.2% (5~95%, ~ 4.0mL/min)	± 0.6% (5~95%, 0.2 ~ 1.0mL/min) ± 1.2% (5~95%, ~ 2.0mL/min)
Mixing precision	0.25% RSD or ±0.02min SD Measured by chromatogram	0.15% RSD or ±0.01min SD Measured by chromatogram	0.15% RSD or ±0.01min SD Measured by chromatogram

Binary High Pressure Gradient

Model	PU-4180 (HPLC)	PU-4185 (RHPLC)	PU-4285 (UHPLC)
Mixing accuracy	-	± 0.6% (5~95%, 0.2 ~ 1.0mL/min) ± 1.2% (5~95%, ~ 4.0mL/min)	± 0.6% (5~95%, 0.2 ~ 1.0mL/min) ± 1.2% (5~95%, ~ 2.0mL/min)
Mixing precision	-	0.15% RSD or ±0.01min SD Measured by chromatogram	0.15% RSD or ±0.01min SD Measured by chromatogram
Dimensions, weight	-	300 (W) x 470 (D) x 150 (H) mm, 19.5kg	300 (W) x 470 (D) x 150 (H) mm, 22.5kg
Power requirement	-	AC 100 ~ 240 V, 50/60 Hz, 130 VA	AC 100 ~ 240 V, 50/60 Hz, 100 VA

Autosamplers

Model	AS-4050 (HPLC)	AS-4150 (HPLC/RHPLC)	AS-4250 (UHPLC)
Sample injection method	Full or partial fill loop injection	Full or partial fill loop injection	Full or partial fill loop injection
Number of samples	60 (2 mL vials)	180 (2 mL vials)	180 (2 mL vials)
Injection volume	0.1~ 100 μ L Large volume option (1~1000 μ L)	0.1~ 100 μ L Large volume option (1~1000 μ L)	0.1~ 100 μ L Large volume option (1~1000 μ L)
Injection accuracy	\pm 0.1% or less	\pm 0.1% or less	\pm 0.1% or less
Injection precision	0.03% RSD or less	0.025% RSD or less	0.025% RSD or less
Carry over	0.01% or less	0.01% or less 0.005% or less with multiple solvent flushing	0.01% or less 0.005% or less with multiple solvent flushing
Maximum pressure	30 MPa	70 MPa	130 MPa
Sample cooling/heating	Option: 4 ~ 40C	Option: 4 ~ 40C	Option: 4 ~ 40C
Pre-column derivatization	-	Yes, up to 2 reagents, dilution, other user programs	Yes, up to 2 reagents, dilution, other user programs
Dimensions, weight	300 (W) x 470 (D) x 300 (H) mm, 21kg	300 (W) x 470 (D) x 385.5 (H) mm, 25kg	300 (W) x 470 (D) x 385.5 (H) mm, 25kg
Power requirement	AC 100 ~ 240 V, 50/60 Hz, 60 VA	AC 100 ~ 240 V, 50/60 Hz, 75 VA	AC 100 ~ 240 V, 50/60 Hz, 75 VA

Column Ovens

Model	CO-4061	CO-4062	CO-4060	CO-4065	CO-4060
Temperature Range	Ambient -15°C ~ 100°C	Ambient -15°C ~ 100°C	Ambient -15°C ~ 80°C	Ambient -15°C ~ 90°C	Ambient+10°C ~ 200°C
Column compartment dimensions	270(W) x 23(D) x 60(H) mm Option 370 (W) mm	260(W) x 25(D) x 105(H) mm	110(W) x 105(D) x 410(H) mm	260(W) x 120(D) x 410(H) mm	43(W) x 350(D) x 75(H) mm
Safety Features	Heating/cooling power shut off when unusually high temperatures or solvent leaks are detected				
Dimensions, weight	300 (W) x 470 (D) x 150 (H) mm, 10kg	300 (W) x 470 (D) x 150 (H) mm, 10kg	150 (W) x 470 (D) x 475 (H) mm, 16kg	300 (W) x 470 (D) x 475 (H) mm, 25kg	300 (W) x 470 (D) x 150 (H) mm, 12kg
Power requirement	AC 100 ~ 240 V, 50/60 Hz, 160 VA	AC 100 ~ 240 V, 50/60 Hz, 200 VA	AC 100 ~ 240 V, 50/60 Hz, 350 VA	AC 100 ~ 240 V, 50/60 Hz, 530 VA	AC 100 ~ 240 V, 50/60 Hz, 325 VA

Detectors

UV-Vis and Circular Dichroism

Model	UV-4075	UV-4070	CD-4095
Light Source	D2 lamp	D2 lamp + WI lamp	150W Hg-Xe lamp
Wavelength range	190 ~ 600 nm	190 ~ 900 nm	220 ~ 460 nm
Noise level	$\pm 0.2 \times 10^{-5}$ AU (230 nm, 1.5sec)	$\pm 0.2 \times 10^{-5}$ AU (230 nm, 1.5sec)	0.04 mdeg (at specified conditions)
Drift	$\pm 1 \times 10^{-4}$ AU/h (250 nm) At constant room temperature	$\pm 1 \times 10^{-4}$ AU/h (250 nm) At constant room temperature	0.1 mdeg/h (at specified conditions) At constant room temperature
Data Output	100 Hz	100 Hz	100 Hz
Flow cell	Temperature controlled, tapered, path length 10 mm	Temperature controlled, tapered, path length 10 mm	Tapered cell, path length 25 mm
Spectrum measurement	200 ~ 600 nm	200 ~ 900 nm	200 ~ 460 nm
Dimensions, weight	300 (W) x 470 (D) x 150 (H) mm, 10g	300 (W) x 470 (D) x 150 (H) mm, 10kg	300 (W) x 470 (D) x 230 (H) mm, 21g
Power requirement	AC 100 ~ 240 V, 50/60 Hz, 110 VA	AC 100 ~ 240 V, 50/60 Hz, 175 VA	AC 100 ~ 240 V, 50/60 Hz, 210 VA

Photo Diode Array

Model	MD-4010	MD-4015	MD-4017
Light Source	D2 lamp + WI lamp	D2 lamp	D2 lamp
Wavelength range	190 ~ 900 nm	200 ~ 600 nm	200 ~ 400 nm
PDA elements	1024 ch	512 ch	512 ch
Slit width	1, 4, 8 nm	4 nm	4 nm
Noise level	$\pm 3.0 \times 10^{-6}$ AU (specified condition)	$\pm 3.0 \times 10^{-6}$ AU (specified condition)	$\pm 7.0 \times 10^{-6}$ AU (specified condition)
Drift	$<0.5 \times 10^{-6}$ AU/h (specified condition)	$<0.5 \times 10^{-6}$ AU/h (specified condition)	$<1.0 \times 10^{-6}$ AU/h (specified condition)
Linearity	2.0 AU or more (specified condition)	2.0 AU or more (specified condition)	2.0 AU or more (specified condition)
Data acquisition rate	100 spectra/sec	100 spectra/sec	20 spectra/sec
Flow cell	Path length 10 mm	Path length 10 mm	Path length 10 mm
PC communication	USB	USB	USB
Dimensions, weight	300 (W) x 470 (D) x 150 (H) mm, 14.5g	300 (W) x 470 (D) x 150 (H) mm, 13.5kg	300 (W) x 470 (D) x 150 (H) mm, 13.5g
Power requirement	AC 100 ~ 240 V, 50/60 Hz, 180 VA	AC 100 ~ 240 V, 50/60 Hz, 150 VA	AC 100 ~ 240 V, 50/60 Hz, 120 VA

Fluorescence

Model	FP-4025	FP-4020
Light Source	Xenon short arc lamp	
Wavelength range	220 ~ 700 nm Option up to 900nm	
Spectral bandwidth	EX: 20nm, EM: 20 or 40nm	
Sensitivity	Raman peak of water S/N > 1400	Raman peak of water S/N > 2300
Data Output	100 Hz	
Flow cell	Front loading cassette cell	
Temperature control	-	OFF, ambient -10°C ~ 40°C
Spectrum measurement	Excitation and emission spectrum measurement	
Two-wavelength monitoring	Two sets of Ex/Em wavelength setting. Maximum wavelength difference 200nm or shorter.	
Dimensions, weight	300 (W) x 470 (D) x 225 (H) mm, 25g	
Power requirement	AC 100 ~ 240 V, 50/60 Hz, 230 VA	AC 100 ~ 240 V, 50/60 Hz, 270 VA

Refractive Index

Model	RI-4030	RI-4035
Measurement system	Deflection type	
Refractive index range	5.0 x 10 ⁻⁵ RIU (HIGH) 5.0 x 10 ⁻⁴ RIU (STD) 5.0 x 10 ⁻³ RIU (LOW)(H ₂ O)	5.0 x 10 ⁻⁵ RIU (HIGH) 5.0 x 10 ⁻⁴ RIU (STD)(H ₂ O)
Noise level	0.20 x 10 ⁻⁸ RIU or less (HIGH, STD)	0.50 x 10 ⁻⁸ RIU or less (HIGH, STD)
Cell capacity	10 µL	2.7 µL
Maximum flow range	10 mL/min (Low flow tubing) 120 mL/min (High flow tubing)	1.2 mL/min (H ₂ O)
Maximum pressure	0.1 MPa (Low flow tubing) 0.3 MPa (High flow tubing)	0.1 MPa
Temperature control	Ambient + 10°C ~ ambient + 25°C	
Dimensions, weight	300 (W) x 470 (D) x 150 (H) mm, 14g	
Power requirement	AC 100 ~ 240 V, 50/60 Hz, 80 VA	

ChromNAV 2.0

Language	English or Japanese
Windows OS	Windows 7 Professional 32/64 bit Windows 8.1 Professional 32/64 bit Windows 10 Professional 32/64 bit
Controllable hardware	LC-4000, XLC-3000, LC-2000, some LC-1500 and some LC-900. Control up to 4 systems.