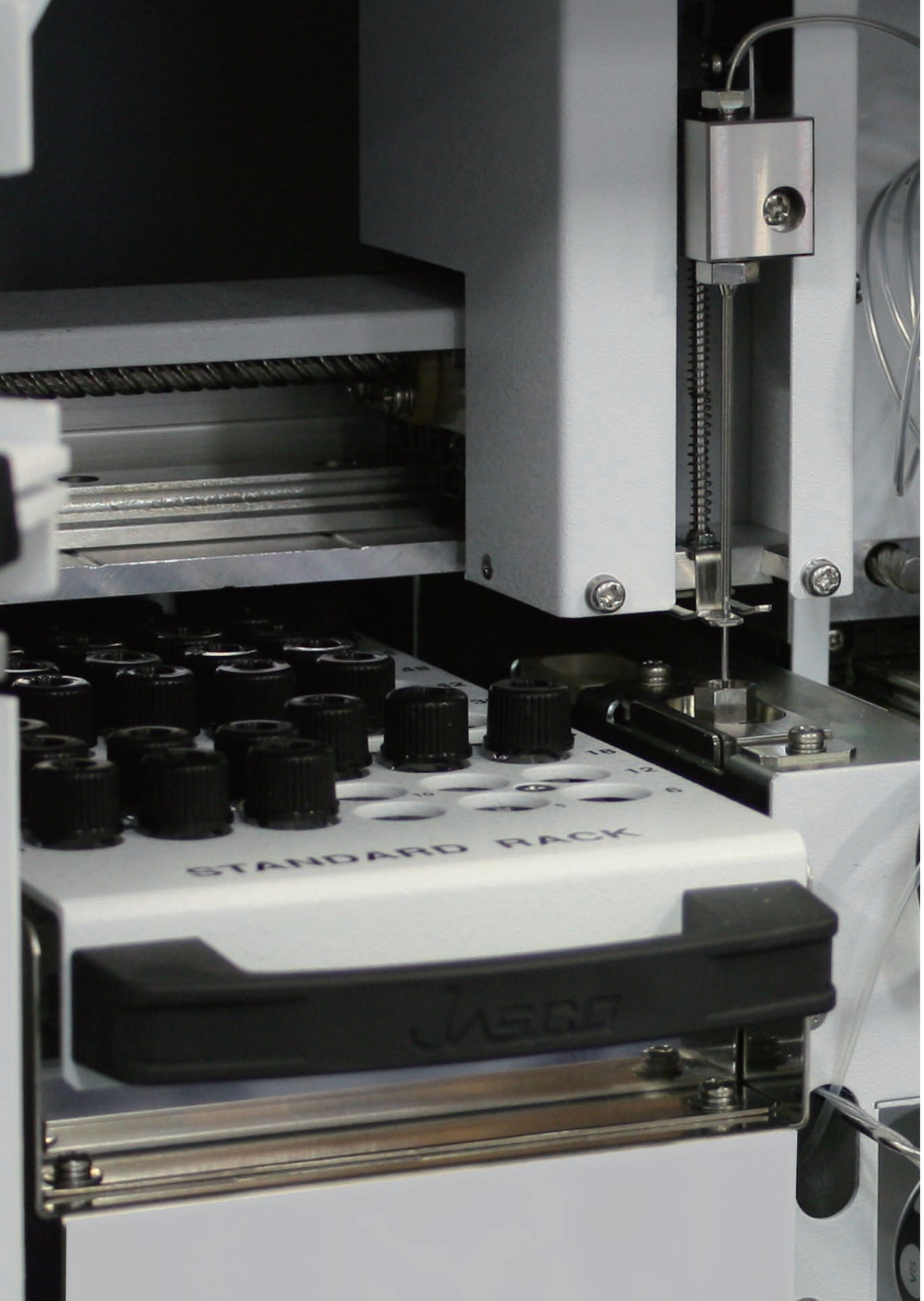
Analytical HPLC

LC-4000 Series

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.

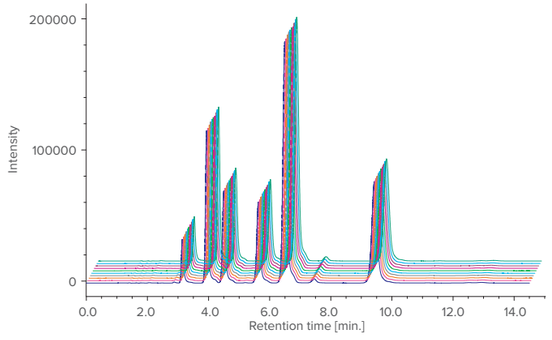
The concept of the integrated LC-4000 series HPLC provides key separation platforms at 30 MPa, 70 MPa and 130 MPa which correspond to conventional HPLC, the increasingly popular Rapid Analysis (RHPLC) and sub 2 µm UHPLC, respectively. Each platform is supplied with a dedicated pump and autosampler matched 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.

Table of contents

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).



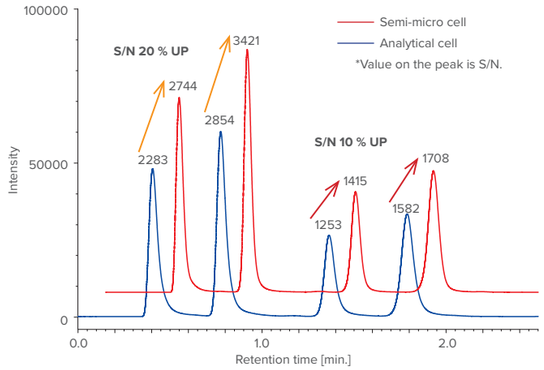
Flow rate accuracy of PU-4180 (1.0 mL/min., n = 10)

Peak retention time reproducibility of PU-4180 (n = 10)

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

Pioneering Optical Design

As a pioneer in optical spectroscopy dating back over 65 years, JASCO has been at the forefront of optical detection. Adapting designs from the most powerful spectrometers, JASCO has developed a range of HPLC detectors with unrivaled performance like the 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. In addition, JASCO offers RI (refractive index), PDA, OR (optical rotation), and MS detectors.



Peak shape comparison between semi-micro cell and analytical cell

Compact and Easy to Use

Despite the extra power delivered by the LC-4000 series HPLC, the standard footprint is only 300 mm 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 academic settings. For use with 5 µm columns.

Pressure:
- Up to 35 MPa

Options:
- Isocratic
- High Pressure Gradient
- Low Pressure Gradient
- Semi-micro option
- Autosampler up to 100 µL injections standard (Optional 1 mL injection and temperature control)
- Column Oven for various column lengths
- Detection: UV, PDA, FP, RI, CD, OR, MS

RHPLC

Designed for those requiring more sample throughput. For use with 2.5 µm coreshell, 3 µm and 5 µm columns.

Pressure:
- Up to 70 MPa

Options:
- Isocratic
- High Pressure Gradient
- Low Pressure Gradient
- Semi-micro option
- Autosampler up to 20 µL injections standard (Optional 1 mL injection and temperature control)
- Column Oven for various column lengths
- Detection: UV, PDA, FP, RI, CD, OR, MS

UHPLC

Designed for those requiring the highest sample throughput. For use with sub-2 µm columns.

Pressure:
- 0.05 to 2.0 mL/min.: Up to 100 MPa
- 0.05 to 1.5 mL/min.: Up to 130 MPa

Options:
- Isocratic
- High Pressure Gradient
- Autosampler up to 5 µL injections standard (Optional 1 mL injection and temperature control)
- Column Oven for various column lengths
- Detection: UV, PDA, FP, RI, CD, OR, MS

Detectors

UV-4070/4075
UV-Visible Detector
Both detectors offer simultaneous dual wavelength acquisition and spectra scanning.

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

MD-4010/4015/4017
UV-Visible PDA Detectors
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 to 900 nm
MD-4015: 200 to 600 nm
MD-4017: 200 to 400 nm

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 to 700 nm

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 120 mL/min.
RI-4035 for RHPLC/UHPLC

OR-4090
Optical Rotation Detector
The optical rotation detector provides chiral detection for optically active isomers and chiral compounds that have no absorption.

Light source: Hg/Xe lamp

CD-4095
Circular Dichroism Detector
The world's only circular dichroism detector that provides the utmost sensitivity.

Wavelength range:
220 to 460 nm

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

Related Instruments

LCMS

Prep LCMS

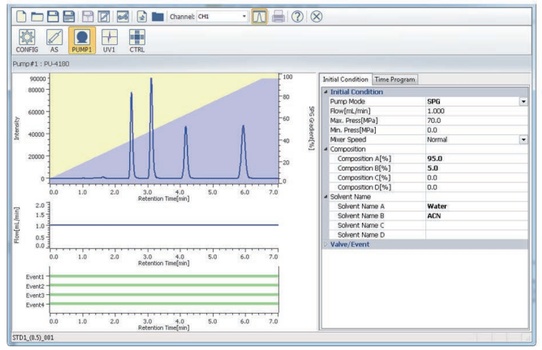
ChromNAV Ver. 2 Software

ChromNAV Ver. 2 (and ChromNAV CFR Ver. 2) are JASCO's next generation chromatography data system (CDS) 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 Ver. 2 is a universal CDS which can be used with any type of separation – HPLC, RHPLC, UHPLC, Prep LC, Analytical SFC and Prep SFC. ChromNAV Ver. 2 can also satisfy the demands of dedicated analyses or mutli-purpose systems.

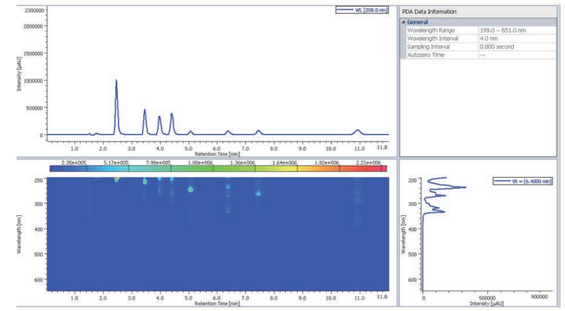
Control Method

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 Ver. 2 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.

Samples 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 off the oven temperature and even turn off the power on the system at the end of the sequence.

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.

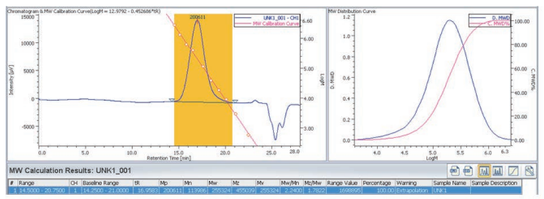
A comprehensive audit trail records the acquisition method along with the history of the instrument performance in each data file. This provides the user with a snap-shot of the condition of the system during the run and can indicate warnings about requirements for impending maintenance.

Optional Applications

- ChromNAV CFR Ver. 2 for CFR Part 11 compliance and electronic registration of data
- ChromNAV GPC/SEC for molecular weight dispersion calculations and determinations
- ChromNAV Herparin 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

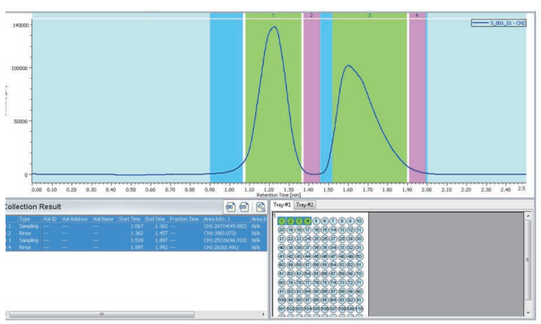
ChromNAV GPC/SEC

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

Single pump

Model	PU-4180 (HPLC/RHPLC)	PU-4185 (HPLC/RHPLC) (semi-micro type)	PU-4285 (UHPLC)
Applicable flow rate range	0.5 to 10.0 mL/min.	0.05 to 4.0 mL/min.	0.05 to 2.0 mL/min.
Maximum pressure	70 MPa (6.0 mL/min. or less) 35 MPa (10.0 mL/min. or less)	70 MPa (3.0 mL/min. or less) 40 MPa (4.0 mL/min. or less)	130 MPa (1.5 mL/min. or less) 100 MPa (2.0 mL/min. or less)
Flow rate accuracy	±1 % of setting value or ±2 µL/min. (whichever is larger) (0.5 to 10.0 mL/min.)	±1 % of setting value or ±2 µL/min. (whichever is larger) (0.05 to 4.0 mL/min.)	±1 % of setting value or ±2 µL/min. (whichever is larger) (0.05 to 2.0 mL/min.)
Flow rate precision (*Measured by chromatogram*)	0.05 % RSD or ±0.04 min. SD (whichever is larger) (0.5 to 5.0 mL/min.)	0.05 % RSD or ±0.04 min. SD (whichever is larger) (0.05 to 4.0 mL/min.)	0.05 % RSD or ±0.04 min. SD (whichever is larger) (0.1 to 2.0 mL/min.)
Low-pressure gradient option	Available	Available	-
Mixing accuracy	±0.8 % (5 to 95 %, 0.5 to 5.0 mL/min.)	±0.6 % (5 to 95 %, 0.2 to 1.0 mL/min.) ±1.2 % (5 to 95 %, up to 4.0 mL/min.)	-
Mixing precision	0.25 % RSD or ±0.02 min. SD (whichever is larger) (0.5 to 5.0 mL/min.)	0.15 % RSD or ±0.01 min. SD (whichever is larger) (0.2 to 4.0 mL/min.)	-
Dimensions, weight	300 (W) × 470 (D) × 150 (H) mm, approx. 13.8 kg	300 (W) × 470 (D) × 150 (H) mm, approx. 13.8 kg	300 (W) × 470 (D) × 150 (H) mm, approx. 15.3 kg
Required power	AC 100 to 240 V, 50/60 Hz, maximum 115 VA	AC 100 to 240 V, 50/60 Hz, maximum 115 VA	AC 100 to 240 V, 50/60 Hz, maximum 95 VA

Binary pump for high pressure gradient

Model	PU-4185-Binary*1 (HPLC/RHPLC) (semi-micro type)	PU-4285-Binary*1 (UHPLC)
Mixing accuracy	±0.4 % (5 to 95 %, 0.2 to 4.0 mL/min.)	±0.4 % (5 to 95 %, 0.2 to 2.0 mL/min.)
Mixing precision *Measured by chromatogram*	0.15 % RSD, or ±0.01 min. SD (whichever is larger) (0.2 to 4.0 mL/min.)	0.15 % RSD, or ±0.01 min. SD (whichever is larger) (0.2 to 2.0 mL/min.)
Dimensions, weight	300 (W) × 470 (D) × 150 (H) mm, approx. 22 kg	300 (W) × 470 (D) × 150 (H) mm, approx. 24 kg
Required power	AC 100 to 240 V, 50/60 Hz, maximum 130 VA	AC 100 to 240 V, 50/60 Hz, maximum 110 VA

*1 Other specification of each binary pump is the same as the one of each single pump.

PU-4180

Specifications

Autosamplers

Model	AS-4050 (HPLC)
Sample injection method	Full Fill Loop Injection Method, Partially Fill Loop Injection Method (can inject without any sample loss)
Injection volume*1	0.1 to 100.0 µL (0.1 µL increments) (Sample loop replacement is required.) 1 to 1000 µL (1 µL increments) (Optional large volume injection kit is required.)
Sample loop	100 µL (standard)
Number of samples	60 (standard, 2.0 mL vials)
Reproducibility	0.3 % RSD or less (under specified conditions)
Injection accuracy	±0.1 % or less (can compensate the injection volume by the setting)
Carryover	0.01 % or less (under specified conditions)
Maximum usable pressure	30 MPa
Sample cooling and heating	Option: (Room temperature - 21) °C or 4 °C (whichever is higher) to 40 °C
Pre-column derivatization and dilution	Pre-programmed injection sequence (Two reagent pre-column derivatization is possible)
Dimensions, weight	300 (W) × 470 (D) × 300 (H) mm, without Sample Temperature Control Unit: approx. 21 kg with Sample Temperature Control Unit: approx. 25 kg
Required power	AC 100 to 240 V, 50/60 Hz, without Sample Temperature Control Unit: maximum 60 VA with Sample Temperature Control Unit: maximum 185 VA

Model	AS-4150 (HPLC/RHPLC)	AS-4250 (UHPLC)
Sample injection method	Full Fill Loop Injection Method, Partially Fill Loop Injection Method (can inject without any sample loss) Direct Line Injection Method (Optional tubing kit is required.)	
Injection volume*1	0.1 to 100.0 µL (0.1 µL increments) (Sample loop replacement is required.) 1 to 1000 µL (1 µL increments) (Optional large volume injection kit is required.)	
Sample loop	20 µL (standard)	5 µL (standard)
Number of samples	180 (standard, 2.0 mL vials)	
Reproducibility	0.25 % RSD or less (under specified conditions)	
Injection accuracy	±0.1 % or less (can compensate the injection volume by the setting)	
Carryover	0.01 % or less 0.005 % or less with multiple solvent flushing (under specified conditions)	
Maximum usable pressure	70 MPa*2	130 MPa*2
Sample cooling and heating	Option: (Room temperature - 21) °C or 4 °C (whichever is higher) to 40 °C	
Pre-column derivatization and dilution	Pre-programmed injection sequence (Two reagent pre-column derivatization is possible)	
Dimensions, weight	300 (W) × 470 (D) × 385.5 (H) mm without Sample Temperature Control Unit: approx. 25 kg with Sample Temperature Control Unit: approx. 34 kg	
Required power	AC 100 to 240 V, 50/60 Hz, without Sample Temperature Control Unit: maximum 75 VA with Sample Temperature Control Unit: maximum 350 VA	

*1 In Partially Fill Loop Injection Method, linearity for injection volume is up to half volume of the sample loop.
*2 35 MPa, when the flow route is changed to Direct Line Injection Method.

Detectors

Photo diode array

Model	MD-4010
Light source	Deuterium (D_2) lamp and Halogen (WI) lamp
Wavelength range	190 to 900 nm
Detector	1024 channels PDA
Slit width	1, 4, and 8 nm, selectable
Noise level	$\pm 0.3 \times 10^{-5}$ AU (under specified conditions)
Drift	$\pm 0.5 \times 10^{-3}$ AU/h (under specified conditions)
Absorbance linearity	2.0 AU or more (under specified conditions)
Data acquisition rate	Maximum 100 points/sec. (full wavelength range)
Flow cell temperature control	Available
PC communication	USB 2.0
Dimensions, weight	300 (W) × 470 (D) × 150 (H) mm,approx. 14.5 kg
Required power	AC 100 to 240 V, 50/60 Hz, maximum 180 VA

Model	MD-4015	MD-4017
Light source	Deuterium (D_2) lamp	
Wavelength range	200 to 600 nm	200 to 400 nm
Detector	512 channels PDA	
Slit width	4 nm, fixed	
Noise level	$\pm 0.3 \times 10^{-5}$ AU (under specified conditions	$\pm 0.7 \times 10^{-5}$ AU (under specified conditions)
Drift	$\pm 0.5 \times 10^{-3}$ AU/h (under specified condition)	$\pm 1.0 \times 10^{-3}$ AU/h (under specified conditions)
Absorbance linearity	2.0 AU or more (under specified conditions)	
Data acquisition rate	Maximum 100 points/sec. (full wavelength range)	Maximum 20 points/sec. (full wavelength range)
Flow cell temperature control	-	
PC communication	USB 2.0	
Dimensions, weight	300 (W) × 470 (D) × 150 (H) mm, approx. 13.5 kg	
Required power	AC 100 to 240 V, 50/60 Hz, maximum 150 VA	AC 100 to 240 V, 50/60 Hz, maximum 120 VA

AS-4050

AS-4250

MD-4010

Specifications

UV/Vis Absorption

Model	UV-4070	UV-4075
Monochromator	Czerny-Turner mounting	
Light source	Deuterium (D_2) lamp (190 to 370 nm) Halogen (WI) lamp (371 to 900 nm)	Deuterium (D_2) lamp
Wavelength range	190 to 900 nm	190 to 600 nm
Spectral bandwidth	8 nm	
Noise level	±0.2 × 10^{-5} ABU (under specified condition)	
Drift	1.0 × 10^{-4} ABU/h (under specified condition)	
Data output rate	100 Hz	
Flow cell temperature control	Available	
Dual wavelength detection	190 to 370 nm, 371 to 700 nm, or 701 to 900 nm (Selectable range), Maximum difference of two wavelengths is 150 nm	190 to 370 nm, 371 to 600 nm (Selectable range), Maximum difference of two wavelengths is 150 nm
Spectrum measurement	200 to 900 nm (D_2 & WI), 200 to 370 nm (D_2), 371 to 900 nm (WI)	200 to 600 nm (D_2)
Dimensions, weight	300 (W) × 470 (D) × 150 (H) mm, approx. 14 kg	
Required power	AC 100 to 240 V, 50/60 Hz, maximum 175 VA	AC 100 to 240 V, 50/60 Hz, maximum 125 VA

Fluorescence

Model	FP-4020	FP-4025
Light Source	150 W Xenon lamp (for measuring fluorescent intensity) Hg lamp (for checking wavelength accuracy)	
Wavelength range	200 to 700 nm*1	
Spectral bandwidth	Excitation side: 20 nm Emission side: 20 or 40 nm (selectable)	
Sensitivity	Raman peak of water : S/N > 2300 (under specified conditions)	Raman peak of water: S/N > 1400 (under specified conditions)
Response	12 steps in total: 0.01, 0.03, 0.05, 0.1, 0.3, 0.5, 1.0, 1.5, 2.0, 3.0, 5.0, and 10.0 sec.	
Flow cell temperature control	Available	-
Dual wavelength detection	Simultaneous fluorescent intensity detection at different two pairs of excitation and emission wavelengths (Difference between each pair of excitation and emission wavelengths must be 200 nm or less)	
Spectrum measurement	Excitation spectrum and emission spectrum measurement (spectrum storage: 10 excitation spectra and 10 emission spectra), spectrum output, and differential spectrum output	
Dimensions, weight	300 (W) × 470 (D) × 225 (H) mm, approx. 24 kg	
Required power	AC 100 to 240 V, 50/60 Hz, maximum 270 VA	AC 100 to 240 V, 50/60 Hz, maximum 230 VA

*1 High sensitivity detection at longer wavelength region (emission side) is available by the optional photomultiplier tube.

Refractive Index

Model	RI-4030	RI-4035
Measurement system	Deflection type	
Refractive index range	1.00 to 1.75	
Noise level	0.2 × 10^{-8} RIU or less (under specified conditions)	0.5 × 10^{-8} RIU or less (under specified conditions)
Linearity	5.0 × 10^{-5} RIU (HIGH) 5.0 × 10^{-4} RIU (STD) 5.0 × 10^{-3} RIU (LOW) (under specified conditions)	5.0 × 10^{-5} RIU (HIGH) 5.0 × 10^{-4} RIU (STD) (under specified conditions)
Flow cell volume	10 µL	2.7 µL
Usable maximum flow rate	10 mL/min. (Tubing for Low Flow Rate) 120 mL/min. (Tubing for High Flow Rate) (solvent: H_2O)	1.2 mL/min. (solvent: H_2O)
Maximum pressure	0.1 MPa (Tubing for Low Flow Rate) 0.3 MPa (Tubing for High Flow Rate)	0.1 MPa
Temperature control	Available	
Dimensions, weight	300 (W) × 470 (D) × 150 (H) mm, approx. 15 kg	
Required power	AC 100 to 240 V, 50/60 Hz, maximum 80 VA	

Circular Dichroism

Model	CD-4095
Polarizer	Glan Taylor prism
Phase modulation	PEM (photo-elastic modulator) method
Light source	150 W Mercury Xenon lamp
Wavelength range	220 to 460 nm
Wavelength accuracy	±5 nm
Wavelength repeatability	±0.5 nm
Noise level	0.04 mdeg (under specified conditions)
Drift	0.1 mdeg/h (under specified conditions)
Data output rate	100 Hz
Spectrum measurement	220 to 460 nm
Dimensions, weight	300 (W) × 470 (D) × 225 (H) mm, approx. 21 kg
Required power	AC 100 to 240 V, 50/60 Hz, maximum 210 VA

UV-4070

FP-4020

RI-4030

Specifications

Optical Rotation

Model	OR-4090
Photometric system	Polarizer / analyzer open-loop modulation by faraday cell
Light source	150 W Mercury Xenon lamp
Measurement range	±50 mdeg (HIGH) ±500 mdeg (LOW) (under specified conditions)
Noise Level	0.02 mdeg (under specified conditions)
Drift	0.05 mdeg (under specified conditions)
Temperature control	Available
Dimensions, weight	300 (W) × 470 (D) × 225 (H) mm, approx. 24 kg
Required power	AC 100 to 240 V, 50/60 Hz, maximum 320 VA

CD-4095

OR-4090

Column Ovens

Model	CO-4060	CO-4065
Temperature control range	(Room temperature - 15) °C or 4 °C (whichever is higher) to 80 °C	(Room temperature - 15) °C or 4 °C (whichever is higher) to 90 °C
Temperature setting range	4 °C to 80 °C (0.1 °C increments)	4 °C to 90 °C (0.1 °C increments)
Temperature control precision	±0.1 °C (When the temperature is set to 40 °C)	
Column compartment dimensions	110 (W) × 105 (D) × 410 (H) mm	260 (W) × 120 (D) × 410 (H) mm
Optional column switching valve	-	Available (up to 10 positions)
Dimensions, weight	150 (W) × 470 (D) × 465 (H) mm, approx. 16 kg	300 (W) × 470 (D) × 465 (H) mm, approx. 25 kg
Required power	AC 100 to 240 V, 50/60 Hz, maximum 350 VA	AC 100 to 240 V, 50/60 Hz, maximum 660 VA

CO-4060

CO-4065

Model	CO-4061	CO-4062
Temperature control range	(Room temperature - 15) °C or 4 °C (whichever is higher) to 100 °C	
Temperature setting range	4 °C to 100 °C (0.1 °C increments)	
Temperature control precision	±0.1 °C (When the temperature is set to 40 °C)	
Column compartment Dimensions	270 (W) × 30 (D) × 60 (H) mm*1	260 (W) × 25 (D) × 105 (H) mm
Optional column switching valve	-	Available (up to 6 positions)
Dimensions, weight	300 (W) × 470 (D) × 150 (H) mm, approx. 10 kg	
Required power	AC 100 to 240 V, 50/60 Hz, maximum 160 VA	AC 100 to 240 V, 50/60 Hz, maximum 200 VA

*1 Width of column compartment can be extended to 380 mm by the optional kit.

Reaction Oven

Model	RO-4068
Temperature control range	(Room temperature + 10) °C to 200 °C
Temperature setting range	4 °C to 200 °C (0.1 °C increments)
Temperature control precision	±0.2 °C (When the temperature is set to 100 °C)
Reaction coil holder compartment dimensions	43 (W) × 354 (D) × 76 (H) mm
Dimensions, weight	300 (W) × 470 (D) × 150 (H) mm, approx. 12 kg
Required power	AC 100 to 240 V, 50/60 Hz, maximum 450 VA

Chromatography Data System

Model	ChromNAV Ver. 2 and ChromNAV CFR Ver. 2
Operating system	Windows® 7 Professional SP1 32bit / 64bit Windows® 8.1 Pro 32bit / 64bit Windows® 10 Pro 32bit / 64bit
Controllable hardware	LC-4000, X-LC 3000, LC-2000, some LC-1500 and some LC-900, Control up to 4 systems.
Language	English or Japanese

CO-4061

RO-4068

JASCO CORPORATION
2967-5, Ishikawa-machi, Hachioji-shi, Tokyo 192-8537 Japan
Tel: +81-42-649-5177 Fax:+81-42-646-4515 Web: www.jasco.co.jp
Japan

JASCO INTERNATIONAL CO., LTD.
11-10, Myojin-cho 1-chome, Hachioji-shi, Tokyo 192-0046, Japan
Tel: +81-42-649-3247 Fax: +81-42-649-3518 Web: www.jascoint.co.jp/english/
Australia, Hong Kong, India, Indonesia, Korea, Malaysia, New Zealand, Pakistan,
Philippines, Russia and CIS countries, Singapore, Taiwan, Thailand, Vietnam

JASCO INCORPORATED
28600 Mary' s Court, Easton, Maryland 21601, U.S.A.
Tel: +1-410-822-1220 Fax: +1-410-822-7526 Web: www.jascoinc.com
Argentina, Bolivia, Brazil, Canada, Chile, Colombia, Costa Rica, Guatemala, Mexico,
Paraguay, Peru, Puerto Rico, United States of America, Uruguay, Venezuela

JASCO EUROPE S.R.L.
Via Luigi Cadorna 1, 23894 Cremella (LC), Italy
Tel: +39-039-9215811 Fax: +39-039-9215835 Web: www.jasco-europe.com
JASCO Deutschland www.jasco.de | **JASCO UK** www.jasco.co.uk | **JASCO France** www.jascofrance.fr
JASCO Benelux www.jasco.nl | **JASCO Spain** www.jasco-spain.com
Algeria, Austria, Belgium, Cyprus, Denmark, Egypt, Finland, France, Germany, Greece, Hungary,
Israel, Italy, Jordan, Kuwait, Luxembourg, Morocco, Netherlands, Norway, Poland, Portugal, Romania,
Saudi Arabia, South Africa, Spain, Sweden Switzerland, Tunisia, Turkey,
United Arab Emirates, United Kingdom, Yemen

JASCO CHINA (SHANGHAI) CO., LTD.
Room No.D, 10F, World Plaza, 855 Pudong South Road, Pudong New Area, Shanghai, China
Tel: +86-21-6888-7871 Fax: +86-21-6888-7879 Web: www.jasco-global.com
China

ISO-9001
ISO-14001
CERTIFIED

Products described herein are designed and manufactured by ISO-9001 and ISO-14001 certified JASCO Corporation

E6402-2109