

High Performance Liquid Chromatograph

i-Series

Specifications



Maximum Reliability and Stability

— Fundamental functions assure analysis results —



Advanced

i-Series

High Performance Liquid Chromatograph

Use of Multiple Detectors Expands Application Range

The i-Series is equipped standard with both UV/VIS and photodiode array (PDA) detectors, either type can be selected. It can also be expanded with a fluorescence detector, differential refractive index detector, a compact LCMS-2050 mass spectrometer, or other detector.

Excellent Baseline Stability Unaffected by Circumstances

The UV/VIS detector and the PDA detector employ dual-temperature control (TC-Optics and flow cell) and provide measurements with a stable baseline hardly affected by room temperature fluctuation.

Supports High-Speed Multi-Analyte Processing

A 14-second injection cycle maximizes the number of samples that can be processed.

Moreover, a total of 1536 samples can be accommodated in right and left sample racks.

Autosampler Enhances Data Reliability

Excellent reproducibility for injection volumes less than 1 μL , wide linearity range and ultra-low carryover (<0.0025%) improve the reliability of data, especially for analyses of precious biological samples and direct analyses of concentrated samples.

Even if an Optional Detector is Added, the Installation Area Remains Small

Even if an optional detector is added, the installation area remains the same. That means a PDA detector, fluorescence detector, differential refractive index detector, or a compact mass spectrometer can be added to a UV detector model. Of course, data can be acquired simultaneously from the standard and added detectors. The i-Series offers excellent extendibility while still providing easy operability due to its integrated configuration.





Refined Usability

Control panel with a color LCD touch panel allows anyone to operate the instrument, regardless of experience level. Easily and reliably perform routine maintenance following on-screen instructions.

Displays Chromatogram in Real Time

The chromatogram real-time monitor allows the user to immediately confirm the success or failure of data, even in a computer-less laboratory environment.

Large Capacity Column Oven with Ultra Wide Temperature Range

Forced-air circulation method is used to support temperatures up to 90 °C for sugar analysis or other applications that require high temperatures. By adding the optional unit, stability can be improved at lower temperatures to enable even analysis at 10 °C in a typical laboratory environment. It also fits either three 300 mm long columns or six 100 mm long columns.

Quaternary Solvent Delivery Unit

A 10 μ L micro plunger ensures accurate quaternary gradient delivery. Optional reservoir switching valve further extends the solvent selection to seven so that the solvent for the flow path rinsing can be set.

Auto Shutdown Function Reduces Power Consumption

After analysis is complete, the auto shutdown function minimizes power consumption in standby mode and can reduce power consumption by at least 95% compared to normal standby mode.

Specifications

Model	LC-2050 (UV model without sample cooler)	LC-2050C (UV model)	LC-2050C 3D (PDA model)	LC-2050C LT (detector-less model)	LC-2060C (UV model)	LC-2060C 3D (PDA model)	LC-2060C 3D MT (PDA model)
P/N	S228-65820-58	S228-65821-58	S228-65822-58	S228-65823-58	S228-65824-58	S228-65825-58	S228-65826-58
Pump	Degassing unit	Five Lines: Mobile phase 4 + Rinse solution 1 (Volume 400 µL)					
	Pumping method	Parallel-type double plunger					
	Pulsation	≤ 0.1 MPa (1.0 mL/min, 10 MPa, Water)					
	Flow rate setting range	0.0001 to 10 mL/min					
	Flow rate accuracy	≤ ±1% or ≤ ±2 µL/min, below whichever is greater (0.01 to 2 mL/min, Specified condition) ≤ ±2% (2 to 5 mL/min, Specified condition)			≤ ±1% or ≤ ±2 µL/min, below whichever is greater (0.01 to 2 mL/min, 1 to 40 MPa, Specified condition) ≤ ±2% or ≤ ±2 µL/min, below whichever is greater (0.01 to 3 mL/min, 40 to 60 MPa, Specified condition)		
	Flow rate precision	< 0.06 %RSD or < 0.02 minSD, below whichever is greater					
	Configuration	Four-solvent low-pressure gradient					
	Gradient / range of set concentrations	0 to 100%, in 0.1% steps					
	Gradient / concentration accuracy	±0.5% (0.1 to 2 mL/min, 1 to 20 MPa, Specified condition)					
	Gradient / concentration precision	±0.1% (1 mL/min, 10 MPa, Specified condition)					
	Maximum pressure	50 MPa (0.0001 to 3 mL/min) 44 MPa (3.0001 to 5 mL/min) 22 MPa (5.0001 to 10 mL/min)			70 MPa (0.0001 to 3 mL/min) 44 MPa (3.0001 to 5 mL/min) 22 MPa (5.0001 to 10 mL/min)		
	System Delay Volume	650 µL (Option: 460 µL, 1100 µL)			460 µL (Option: 650 µL, 1100 µL)		505 µL (Flow path 1) 765 µL (Flow path 2)
Autosampler	Injection method	Total-volume sample injection					
	Injection volume accuracy	±1% (50 µL, N = 10)					
	Injection volume setting range	0.1 to 100 µL (Option: 0.1 to 50 µL, 1 to 500 µL, 1 to 2,000 µL)			0.1 to 50 µL (Option: 0.1 to 100 µL, 1 to 500 µL, 1 to 2,000 µL)		
	Injection volume reproducibility	RSD < 0.20% (5.0–2000 µL) RSD < 0.25% (2.0–4.9 µL) RSD < 0.5% (1.0–1.9 µL) RSD < 1.0% (0.5–0.9 µL)					
	Cross-contamination	0.0025% (Caffeine, Specified condition)					
	Injection cycle time	Min. 14 sec (Specified condition)					
	Samples for processing	336 (1 mL), 216 (1.5 mL), 112 (4 mL), 4 (MTP/DWP)					
	Sample cooler	Not included	4 to 45°C (Room temperature needs to be 30°C or lower and the humidity 70% or less to go down to 4°C. Room temperature needs to be 15°C or higher to go up to 45°C.)				
	Injection linearity	> 0.9999 (1 to 100 µL, Specified condition)			> 0.9999 (1 to 50 µL, Standard Sample Loop, Specified condition), > 0.9999 (1 to 100 µL, 100 µL Sample Loop (Option), Specified condition)		
	Column Oven	Heating and cooling method	Forced air circulation method				
Containable column size		Six columns 100 mm long Three columns 300 mm long One 300 mm long column if a CTO unit (optional) for i-Series low-temperature analysis is installed. (When i-Series FCV piping kit for low temperature analysis (S228-80218-41) is installed, "1 pc, up to 300 mm L., or 2 pcs, up to 150 mm L.")					2 pieces at 100 to 300 mm
Temperature control range		Room temperature –12 °C (–15 °C if an optional unit is installed) to 90 °C					
Temperature control precision		±0.1°C					
Temperature Accuracy		±0.8°C (Specified condition)					
Flow rate switching valve	Max. 1 pc					Not allowed	

Model	LC-2050 (UV model without sample cooler)	LC-2050C (UV model)	LC-2060C (UV model)	
P/N	S228-65820-58	S228-65821-58	S228-65824-58	
UV Detector	Wavelength range	190 to 700 nm		
	Spectral bandwidth	8 nm		
	Wavelength accuracy	≤ ±1 nm		
	Wavelength reproducibility	≤ ±0.1 nm		
	Noise level	≤ ±2.5 × 10 ⁻⁶ AU, (250 nm, Specified condition)		
	Drift	≤ 100 × 10 ⁻⁶ AU/h (250 nm, Specified condition)		
	Simultaneous monitoring of 2 wavelengths	Enable (Any 2 wavelengths of 190 to 370 nm or 371 to 700 nm)		
	Linearity	Up to 2.5 AU (5%)		
	Sampling rate	Up to 100 Hz		
	Light source	Deuterium (D ₂) lamp		
	Flow cell	12 μL (10 mm, TC), 12 MPa	8 μL (10 mm, TC), 12 MPa	
	Option cell	High-Speed: 8 μL (10 mm, TC), Semi-micro: 2.5 μL (5mm, TC)	Conventional: 12 μL (10 mm, TC), Semi-micro: 2.5 μL (5 mm, TC)	

Model	LC-2050C 3D (PDA model)	LC-2060C 3D (PDA model)	LC-2060C 3D MT (PDA model)
P/N	S228-65822-58	S228-65825-58	S228-65826-58
PDA Detector	Wavelength range	190 to 800 nm	
	Spectral resolution	1.4 nm (Specified condition)	
	Slit width	1.2 nm, 8 nm	
	Device resolution	0.6 nm/pixel	
	Number of photodiode array elements	1024	
	Wavelength accuracy	≤ ±1 nm	
	Noise level	≤ ±3 × 10 ⁻⁶ AU (250 nm, reference: 350 nm, Specified condition)	
	Drift	≤ 500 × 10 ⁻⁶ AU/h (250 nm, reference: 350 nm, Specified condition)	
	Linearity	Up to 2 AU (5%)	
	Sampling rate	Up to 100 Hz	
	Light source	Deuterium (D ₂) lamp (Standard), tungsten (W) lamp (option)	
	Flow cell	10 μL (10mm, TC), 12 MPa	8 μL (10 mm, TC), 12 MPa
Option cell	High-Speed: 8 μL (10 mm, TC), Semi-micro: 2.5 μL (5 mm, TC)	Conventional: 10 μL (10 mm, TC), Semi-micro: 2.5 μL (5 mm, TC)	

Model	LC-2050 (UV model without sample cooler)	LC-2050C (UV model)	LC-2050C 3D (PDA model)	LC-2050C LT (detector-less model)	LC-2060C (UV model)	LC-2060C 3D (PDA model)	LC-2060C 3D MT (PDA model)
P/N	S228-65820-58	S228-65821-58	S228-65822-58	S228-65823-58	S228-65824-58	S228-65825-58	S228-65826-58
Miscellaneous	Dimensions	W410 × H605 × D500 mm (Not including reservoir tray height)					
	Weight	58 kg	63 kg	53 kg	63 kg	64 kg	
	Available pH range	1 to 13					
	Materials for parts in contact with liquids	Stainless steel (SUS316L, SUS316), FEP, PEEK, PTFE, perfluoroelastomer, ruby, sapphire, Hastelloy® C, GFP, ceramic, PFA, quartz, PPS			Stainless steel (SUS316L, SUS316), FEP, PEEK, PTFE, perfluoroelastomer, ruby, sapphire, Hastelloy C, UHMWPE, ceramic, PFA, quartz, PPS		
	Workstation	LabSolutions™ LC/GC Ver. 5.103 or later, LabSolutions DB/CS Ver. 6.103 or later (Incompatible with LCSolution™)					

Optional Detector Specifications



RID-20A

	RID-20A (S228-65306-58)
Reflective index measurement range	1 to 1.75 RIU
Noise level	≤ 2.5 nRIU
Drift	≤ 0.1 μRIU/h
Range	A mode: 0.01 to 500 μRIU P and L modes: 1 to 5000 μRIU
Response	No filtering, 0.05 to 10 sec, 11 steps
Polarity switching	With a switch
Zero adjustment	Auto zero, auto optical zero, baseline shift functions
Maximum operating flow rate	20 mL/min (150 mL/min with an option)
Temperature control of cell unit	30 to 60°C (0.01°C steps)
Cell capacity	9 μL
Material in contact with liquid	SUS316L, quartz, PTFE, Al ₂ O ₃ , ETFE
Maximum operating pressure	0.4 MPa (4 kgf/cm ²)
Operating temperature range	4 to 35°C
Dimensions and weight	W260 × D420 × H140 mm, 12 kg

Note: Hexafluoroisopropanol (HFIP) cannot be used as the mobile phase.



RF-20A/RF-20Axs

	RF-20A (S228-65304-58)	RF-20Axs (S228-65305-58)
Light source	Xenon lamp	Xenon lamp, low-pressure mercury lamp (To check wavelength accuracy)
Wavelength range	0, 200 to 650 nm	0, 200 to 750 nm
Spectral bandwidth	20 nm	
Wavelength accuracy	±2 nm	
Wavelength precision	±0.2 nm	
S/N	Water Raman peak S/N 1200 min. Low background S/N > 9000	Water Raman peak S/N 2000 min. Low background S/N > 12000
Cell capacity	12 μL, 2 MPa (approx. 20 kgf/cm ²), SUS316L, PTFE (fluororesin), quartz	
Cell temperature control range	—	4 to 40°C, 1°C steps
Cell temperature setting range	—	(Room temperature – 10°C) to 40°C
Functions	Four-wavelength detection, wavelength scanning	
Safety measures	Liquid-leakage sensor	
Operating temperature range	4 to 35°C	
Dimensions and weight	W260 × D420 × H210 mm, 16 kg	W260 × D420 × H210 mm, 18 kg



ELSD-LT III

	ELSD-LT III (S228-65900-58)
Nebulizing Method	Siphon splitting
Light Source	Semiconductor laser
Detector	Photodiode
Temperature Setting Range	Room temperature to 100 °C
Nebulizer Gas	Air or nitrogen*
Mobile Phase Flow Rate (Standard Nebulizer)	0.2 to 2 mL/min
Operating Temperature Range	4 to 35 °C
Operating Humidity Range	20 to 85 %
Dimensions and weight	W 250 × D 530 × H 330 mm, 15.5 kg

* Supply gas at a pressure of about 350 kPa. An air compressor may also be used.
A filter (P/N: S228-45528-92) is also available for filtering out moisture and other matter from the compressor.

Main Optional Accessories

Solvent Delivery Units

Part Name	P/N	Description
FCV-11AL	S228-65611-58	This is the mobile phase selection valve (3 flow lines). An FCV-11AL connection kit is required to connect to an FCV-11AL unit.
FCV-11ALS	S228-65610-58	This is the mobile phase selection valve (1 flow line). An FCV-11AL connection kit is required to connect to an FCV-11AL unit.
FCV-11AL Connection Kit	S228-56249-41	This kit includes connector cables and other items necessary for connecting FCV-11AL and FCV-11ALS units.
780 µL Mixer Kit	S228-57313-41	This parts set includes a mixer and tubing for using TFA or other UV-absorbing substance as a mobile phase.
2 mL Mixer Kit	S228-57313-42	This parts set includes a mixer and tubing for using TFA or other UV-absorbing substance as a mobile phase.
Compatible Volume System Kit	S228-57796-42	This kit decreases the system volume to 650 µL.
Low Volume System Kit	S228-57796-43	This kit decreases the system volume to 460 µL.

Autosamplers

Part Name	P/N	Description
50 µL Sample Loop	S228-56074-44	This sample loop is used for injecting 50 µL volumes. (Standard configuration parts of LC-2060)
100 µL Sample Loop	S228-56074-42	This sample loop is used for injecting 100 µL volumes. (Standard configuration parts of LC-2050)
Optional 500 µL Sample Loop	S228-45405-41	This increases the injection volume to 500 µL.
Optional 2 mL Sample Loop	S228-45405-42	This increases the injection volume to 2 mL.
UHPLC Fitting (set of 1)	S228-56867-41	Fitting for inlet to high-pressure capacity column
UHPLC Fitting (set of 10)	S228-56867-43	Fitting for inlet to high-pressure capacity column
Sample Rack	S228-55735-41	Additional sample rack
Plate for 1 mL Sample Vials (set of 2)	S228-56197-41	Plate used to place 84 1 mL sample vials
Plate for 1.5 mL Sample Vials (set of 2)	S228-50830-92	Plate used to place 54 1.5 mL sample vials
Plate for 4 mL Sample Vials (set of 2)	S228-56197-42	Plate used to place 28 4 mL sample vials
Metal plate for 1.5ml Sample Vials (set of 1)	S228-61615-42	Plate used to place 54 1.5 mL sample vials

Column Ovens

Part Name	P/N	Description
Column Clamp ASSY B5	S228-15617-91	This set of clamps is for adding a column with an outside diameter between 6.4 and 9.5 mm.
Column Clamp ASSY B8	S228-15617-92	This set of clamps is for adding a column with an outside diameter between 9.5 and 12.7 mm.
FCV-14AH	S228-65614-58	Automatic column switching valve with 6 positions and 7 ports which are usable at a pressure of 34.3 MPa max (FCV-14AH) or 100 MPa max (FCV-34AH).
FCV-12AH	S228-65612-58	Automatic column switching valve with 2 positions and 6 ports which are usable at a pressure of 34.3 MPa max (FCV-12AH) or 100 MPa max (FCV-32AH).
FCV-32AH	S228-45166-46/58	Automatic column switching valve with 2 positions and 6 ports which are usable at a pressure of 34.3 MPa max (FCV-12AH) or 100 MPa max (FCV-32AH).
FCV Mounting Kit	S228-55765-XX	These parts kit are used to secure an valve unit inside the column oven. FCV-12AH: -41, FCV-14AH/34AH: -42, FCV-32AH: -43
CMD	S228-37281-41	This column management device is used to record information about columns.
CMD Cable	S228-39991	This cable is used to connect between the CMD and main units.
CTO Unit for i-Series Low-Temperature Analysis	S228-55575-48	This option is used for analysis with the column temperature at a room temperature –15 °C. Cannot be used for LC-2060C 3D MT. Automatic column switching valve can be used FCV-12AH/32AH.
FCV Tubing Kit for i-Series Low-Temperature Analysis	S228-80218-41	If an above optional unit for low-temperature analysis is installed and a flow channel switching valve is also added, then this holder and tubing kit is used to attach up to two columns (max. 150 mm long).

UV Detectors

Part Name	P/N	Description
Recycle Valve	S228-56808-41	This low-pressure flow-line selection valve is used to recycle mobile phase.
Flow Cell for UV Detectors	S228-56167-41	This cell is compatible with conventional analysis. (Standard configuration parts of LC-2050)
UHPLC Cell for UV Detectors	S228-45621-41	This cell is compatible with UHPLC analysis. (Standard configuration parts of LC-2060)
Semi-Micro Cell for UV Detectors	S228-45605-46	This cell is compatible with semi-micro analysis.

PDA Detectors

Part Name	P/N	Description
W Lamp ASSY for PDA Detectors	S228-57110-41	This assembly includes a tungsten lamp and its socket used for high-sensitivity analysis in the long-wavelength region.
Flow Cell for PDA Detectors	S228-42593-43	This cell is compatible with conventional analysis. (Standard configuration parts of LC-2050)
High-Speed Cell for PDA Detectors	S228-45618-54	This cell is compatible with fast analysis. (Standard configuration parts of LC-2060)
Semi-Micro Cell for PDA Detectors	S228-45605-47	This cell is compatible with semi-micro analysis.

Other Options

Part Name	P/N	Description
Earthquake Reinforcement Kit	S228-56298-41	This kit is used to reinforce how the reservoir tray is attached.
1 L Mobile Phase Bottles (set of 5)	S228-38583-42	This is a set of five one-liter reservoir bottles for holding mobile phases.
Optional Detector Attachment Kit	S228-56245-41	This kit contains a top plate and reservoir tray for installing an additional detector.
Optional Optical Board	S228-55518-41	This board is used to install additional connectors for optical link cables. It is used to install fluorescence detector RF-20A series and other detectors.
Camera ASSY for Autosampler	S228-55517-41	This camera is installed inside autosamplers. It allows you to monitor the needle action via the computer screen.
Optional AD Board	S228-55519-41	This is an analog-digital converter board. It is used to input the detector signal as an analog signal, such as when a non-Shimadzu detector is connected.
Touch Panel Protecting Sheet	S228-59212-41	Protecting sheet for touch panel.
Upgrade Kit UV	S228-58993-41	Kit for upgrade from LC-2050 (UV model with sample cooler) to LC-2060.
Upgrade Kit PDA	S228-58993-42	Kit for upgrade from LC-2050 (PDA model) to LC-2060.
Smart Automation Kit (4-mobile phase)	S228-26004-44	This kit includes FCV-14AH for up to six columns switching and other parts.
Smart Automation Kit (7-mobile phase)	S228-26004-43	This kit includes FCV-14AH for up to six columns switching, FCV-11AL for solvent delivery of seven mobile phases and other parts.



ANALYTICAL INTELLIGENCE

- Automated support functions utilizing digital technologies, such as M2M, IoT, and Artificial Intelligence (AI), that enable higher productivity and maximum reliability.
- Allows a system to monitor and diagnose itself, handle any issues during data acquisition without user input, and automatically behave as if it were operated by an expert.
- Supports the acquisition of high quality, reproducible data regardless of an operator's skill level for both routine and demanding applications.

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