



# RF-5301PC

Shimadzu  
Spectrofluorophotometer



# World's Highest Level Performance and Windows™ Software

## From Routine Analysis to Research Employing the Highest Level of Sensitivity in the World!

Compared to adsorbance methods, fluorescence sensitivity is tens to thousands times better — this means that you can analyze nanogram to picogram samples with great results.

Fluorescence can also be used to identify a specific molecule in a complex background.

When the compound of interest does not exhibit natural fluorescence, functional group-specific probes may be used to label the compound and assist your research. The synchronous scanning mode allows mixtures of fluorochromes to be analyzed.

A PC directly controls the instrument for data acquisition and processing.

The Windows™ friendly operating environment allows you to perform measurement, data processing, editing and recording in one continuous operation with a click of the mouse. Using the Copy Graph function, measurement data or spectra may be easily transferred to word processing or spreadsheet software for preparation of documents or additional calculations.

The essence of fluorescence analysis is sensitivity. The high-throughput optical system in the RF-5301PC employs a blazed holographic grating, photomultiplier and digital circuit to provide the highest level S/N ratio attainable.



# Open Up a New Spectrum of Fluorescence Analysis.

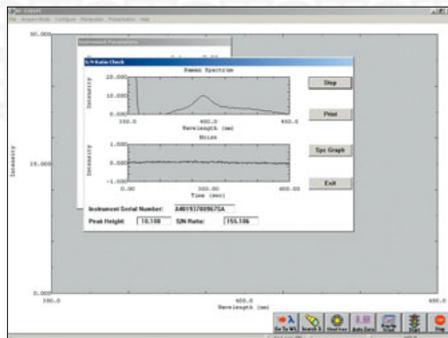
## High-Speed Scanning

High-speed scanning up to 5,500nm/min allows you to measure a spectrum in seconds. And since monochromator slewing is about 20,000nm/min, setting of two or more wavelengths can be performed quickly and easily.

## High Resolution and Extended Range

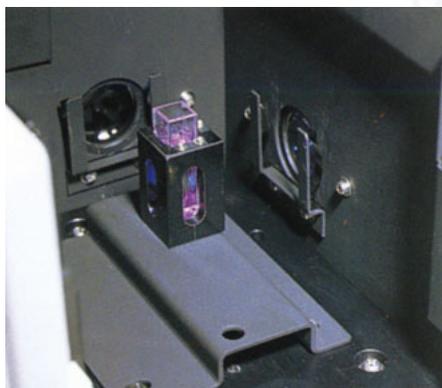
The bandpass on the RF-5301PC may be set as narrow as 1.5nm, which makes it possible to distinguish fluorescent peaks from the background emission. The wavelength range of 220 to 750nm can be extended to 900nm with an optional R-928 photomultiplier.

## Built-In Performance Checks



When the instrument is switched ON, operating conditions of the spectrophotometer are automatically verified. Separately, noise level (S/N ratio) and light source (Xenon lamp) usage are built-in features to help maintain the instrument in its optimum condition, providing absolute confidence in the quality of the data.

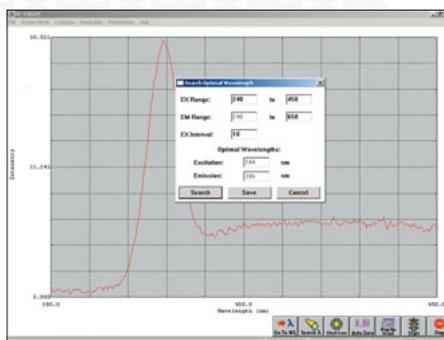
## Versatile Sample Compartment Size



The sample compartment measuring 140mm wide, 170mm deep and 140mm high, enables use of micro cells, high-sensitivity cells, LC flow cells, etc. for a wide range of applications.

## Unique High Performance Features in the RF-5301PC

The wavelength search function allows the optimum excitation and emission wavelengths to be found in about two minutes.



## Vertical Optics with Dynode Feedback

Vertical optics in the RF-5301PC minimize light loss in measurement with an LC flow cell, a micro cell or a small test tube. This design assures an exceptionally high signal-to-noise ratio and provides the ability to attain excellent analysis results using very small volumes of precious samples. The dynode feedback enhances the RF-5301PC performance by raising or lowering negative high voltage to the detector in response to different wavelengths. The dynode feedback, which expands the dynamic range of the signal detecting system, is significantly superior to ratio methods.

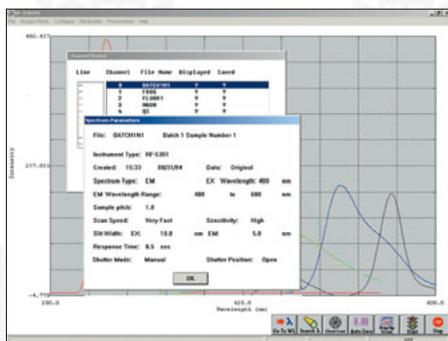
## Automatic Shutter Protects Sample

An automatic shutter in the RF-5301PC excitation path closes immediately when measurement ceases, thereby protecting the sample from photo-decomposition.

# Now You Can Really Put Your Data

## See the Difference with Windows™ Performance

Working in the Windows™ environment makes operation intuitive. The software is driven by pull-down menus displayed at the top of your screen that can be selected with just a click of the mouse. For the beginner, on-line HELP is available to guide you through each function. You can customize the software with SpeedBox™, an innovative tool that eliminates keystrokes and enables you to assign icons for commonly used menu commands. With the RF-5301PC software, storage, retrieval and other file management is quick and simple.



## Many Convenient and Time-Saving Features

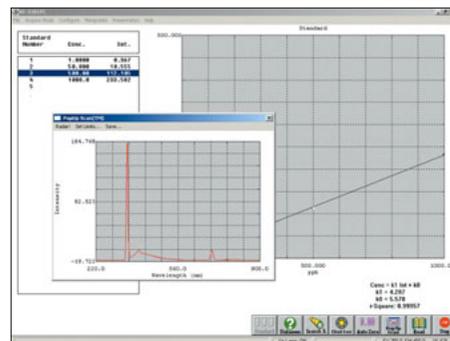
The RF-5301PC software is the ideal software to meet all your fluorescence research needs, from teaching to method development and quality assurance. Follow changes in intensity over time for kinetic assays or perform quantitative analysis on several samples. You'll save time and effort with features that allow for on-screen data manipulation.

## Quantitative Measurement Mode

Our quantitative analysis uses 1 to 20 known fluorescence standards to fit the best calibration curve to your data. Methods such as DNA quantification with Ethidium Bromide or Hoechst dye, OPA-derivatives of amino acids, cell viability assays and FITC or Rhodamine-labeled ligands are handled with ease. The results are instantly displayed on-screen, allowing you to read and average the relative fluorescence intensities of unknown samples. Optimize your analyses with first through third order curve fits. If desired, the curve may be forced through zero. To facilitate your calculations, the calibration curve is automatically generated and displayed graphically as well as in tabular form.

## Spectrum Measurement Mode

Perform emission and excitation scans with ease, or overlay the two for interpretation. Obtain and differentiate excitation and emission spectra using color and line pattern assignments. Zoom in using the mouse or zoom out with the radar function to autoscale all data on-screen. The software picks and tabulates peaks and valleys automatically. And if you need a fast spectral scan in any measurement mode, the PopUp Scan™ function displays it on-screen in seconds.

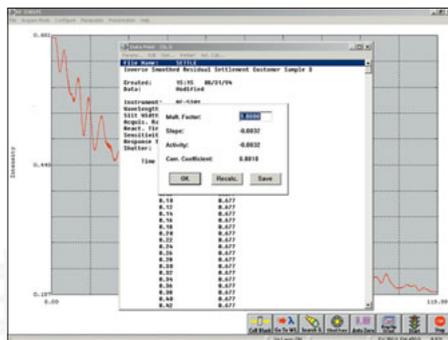


Up to 10 spectra may be displayed together on the screen—each discriminated by an individual color and line style. Then, arithmetic operations may be conducted among the spectra to uncover hidden information or smooth a curve.

# In Its Place.

## Time Course Measurement Mode

Working in Time Course allows you to monitor experimental changes and measure reaction rates such as dehydrogenase or  $\beta$ -galactosidase activity while the software provides mathematical support for rate calculations. Data can be collected every 0.02 seconds for the most timely results.

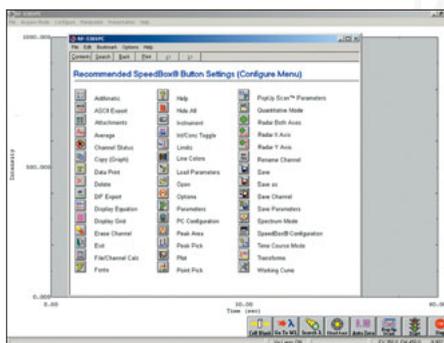


Time Course data may be added, subtracted, multiplied or divided by each other or a factor. High sensitivity, a stable baseline and a 20 bit high-resolution A/D converter mean reliable detection of small changes in fluorescence, allowing signal discrimination on small concentrations.

Activity calculations are also supported, making this measurement mode quite suitable for enzyme research.

## One-touch Operation with Speed Box™

For convenience of operation, frequently used functions can be assigned to an accelerator button.



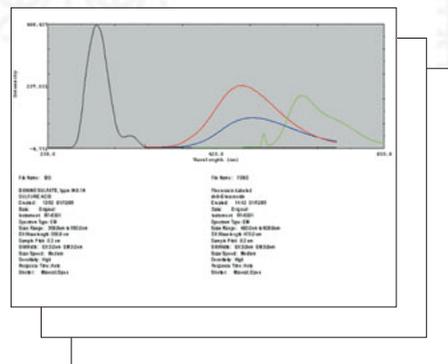
Then these function can be simply executed by clicking on the assigned button. Shape and position of buttons may be freely customized by the user.

## Simple, but Powerful for Extensive Data Processing

Operations such as first through fourth order derivative, mathematical smoothing functions, log conversions and offsets are easily performed with the RF-5301PC software. Display up to ten spectral curves simultaneously or use mathematical transformations to maximize your results. Select the source and destination channels along with the desired calculation and the results are redisplayed on the screen.

The obtained spectrum may be further analyzed using data processing functions, such as for performing spectral correction and extraction of hidden information. Any of these functions may be easily executed graphically using the mouse.

## Report Generation



Before you generate a report, you may choose to preview it on-screen. To store files for future use, simply save them to a disk or convert them to an ASCII file for accessibility by other software. Finally, when you're ready to print, the software offers the option of sending reports to either a dot matrix printer for rapid output of tables or to a graphics printer/plotter for publishable quality graphics and data.

Using "Copy&Paste", data may be pasted into other Windows applications, such as Word and Excel, to enable high-level report generation.

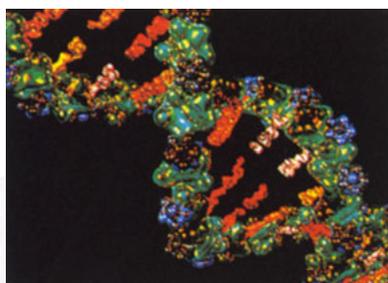


## Versatile Applications Make the RF-5301PC the Perfect Partner for Any Laboratory



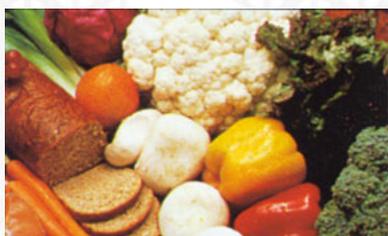
### Pharmaceuticals and Pharmacology

The RF-5301PC is excellent for the analysis of crude drugs; quality control of drugs; quality control of pharmaceuticals or studies on drug metabolism. Typically, studies would encompass: barbituric acid, tetracycline, reserpine, LSD, purine and pyrimidine analogs, porphyrins, etc.



### Biochemistry

The RF-5301PC is the instrument of choice for the detection and measurement of a wide variety of biological samples, even at trace quantity levels. Typical applications include: enzymes and coenzymes such as cytochrome oxidase, protein kinase, derivatized lipids, retionids, NADH, FAD, vitamins, nucleic acids, amino acids, chlorophyll, neurotransmitters, cell membranes and enzyme kinetics.



### Food Science

The RF-5301PC is especially suitable for the detection and measurement of trace components in a wide variety of foods. Typical applications include: amines and amino acids, fats, carbohydrates, coenzymes, antibiotics, food additives, edible oils and pesticides.



### Environmental Monitoring

A growing application of the RF-5301PC includes the monitoring, analysis and study of water, environmental and food pollutants. Typical studies include: polynuclear aromatics, phenols, oil contaminants and ground water effluents.



### Chemical Analysis

The RF-5301PC is the perfect alternative for the measurement of trace components of organic and inorganic compounds, unmeasurable by absorption spectrophotometry. Typical applications include: polymers, textiles, plastics, rubber, optical materials research, polynuclear aromatic compounds, petroleum products and kerosene.

# Specifications



## Hardware Specifications

Light source	150W Xenon lamp. Ozone resolving type lamp housing.
Excitation and emission monochromators	Concave, blazed holographic grating, F/2.5, 1300 grooves/mm.
Wavelength scale	220-990nm.
Measuring wavelength range	220-750nm and 0 order as standard. 220-900nm with the optional R928 photomultiplier.
Spectral bandwidth	6-step selection of 1.5, 3, 5, 10, 15 and 20nm. (6nm bandwidth is available for half sample height on the excitation side only.)
Wavelength accuracy	±1.5nm.
Light source compensation	Dynode feedback system with monochromatic light monitoring.
Sensitivity	The S/N ratio is 150 or higher for the Raman line of distilled water (350nm excitation wavelength, 5nm spectral bandwidth, and 2-second response for 98% of the full scale).
Wavelength scanning	7-step selection of Survey (about 5500nm/min), Super (about 3000nm/min) Very Fast, Fast, Medium, Slow and Very Slow.
Wavelength slewing speed	About 20,000nm/min.
Response	8-step selection of 0.02, 0.03, 0.1, 0.25, 0.5, 2, 4 and 8 seconds for 98% of the full scale.
Sensitivity selection	2 steps of HIGH and LOW. (The sensitivity at HIGH is about 50 times that of LOW.)
Interface	RS-223C interface, interface for autosampler, and interface for sipper unit.
Dimensions and weight	667W x 530D x 270H mm; 43kg.
Power requirements	100, 120, 220, 240V; 50/60Hz; 400VA.
Operational temperature range	15-35°C
Operational humidity range	40-80% (Below 70% with temperature higher than 30°C).



## Software Specifications

Measurement	Excitation, emission and synchronous spectrum measurement, time-course measurement, quantitation, automatic search of optimal excitation and emission wavelengths, PopUp Scan™.
Data processing	Arithmetic calculation between spectrum and a constant, smoothing, 1st through 4th derivatives, 1/Y, logarithmic conversion, data printout (with or without activity value computation), peak pick, point pick, area calculation, averaging (in quantitation), generation of calibration curves of 1st through 3rd order.
Filing	Save, recall, and delete of data. Conversion into ASCII and DIF formats.
Data output	Automatic scale adjustment, readout of data at user-specified point, data printout (preview function provided), selection of colors and types of curves.
Maintenance	Automatic monitoring of signal-to-noise ratio, monitoring of the run time of light source lamp.
User interface	SpeedBox™ (assign icons for commonly used menu commands).
Other functions	Data exchange via clipboard, auto response control, automatic shutter.
PC requirements	IBM-PC/AT or 100% compatible; i486 or higher CPU; 8 Mbyte or larger main memory. Operates on MS-Windows version 3.1 or higher.

Windows is a registered trademark of Microsoft Corp.

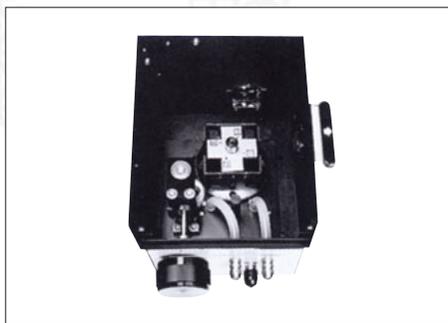
SpeedBox and PopUp Scan are registered trademarks of Shimadzu Scientific Instruments.



## A Wide Variety of Optional Accessories for the RF-5301PC

### Constant-Temperature Four Cell Holder

Cat. No. 206-24940-91



Keeps four sample cells at the desired constant temperature via connection to a water bath.

Note: Requires the Temperature Controlled Water Bath.

### Non-Fluorescent Cell

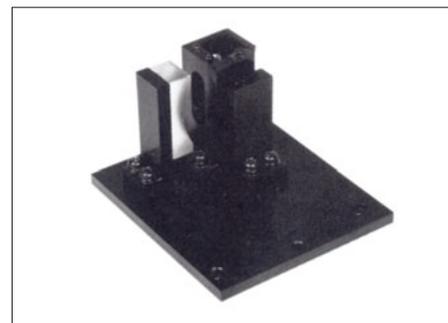
Cat. No. 200-34594-03



Provides a 10mm square non-fluorescent cell, polished on four sides. This cell is recommended for trace analysis particularly when low UV wavelengths are used for excitation. Does not fluoresce when excitation wavelengths from 240 to 260nm are used.

### High Sensitivity Cell Holder

Cat. No. 204-26841-01



This cell holder enhances the sensitivity two to three times or more. This is recommended for low concentrations. The excitation and emission beams are repeatedly reflected through the sample to increase the excitation efficiency.

### Micro Cell Holder with Micro Cell

Cat. No. 204-27125



Permits measurement of samples as small as 400 $\mu$ L in volume. The cell is installed in an adapter of the same dimensions as an ordinary 10mm square cell, so it can be placed in the standard cell holder.

### Quartz Cell Polished on Four Sides

Cat. No. 200-34441



Provides a 10mm square cell, polished on four sides. Recommended for work in the visible range. This cell has a slight absorption at 260nm and shows small fluorescence intensity at 400nm.

### R-928-08 Photomultiplier

Cat. No. 200-75021



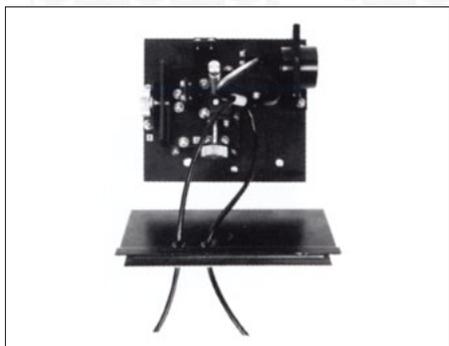
Extends the measuring wavelength range from 750 to 900nm.

### **Solid (Powder) Sample Holder**

**Cat. No. 204-26836-01**

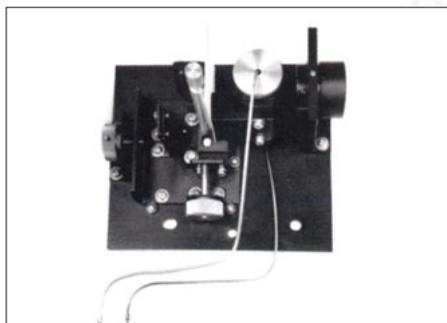


Provides a means to examine the fluorescence of a solid sample. The angle of the holder is designed to limit the reflected excitation beam from the emission monochromator. Standard accessories include a sample holder, quartz plate, powder sample plate, spacers and a sample fixing bar. Cutoff filters are included to reduce scattering further (UV-31, UV-35, UV-39, UV-Y43, UV-Y45, UV-Y47).



### **Flow-Thru Cell Unit for HPLC (12µL)**

**Cat. No. 204-05566**



With this attachment, the RF-5301PC is used as a highly sensitive spectral fluorescence monitor in HPLC. Free selection of the excitation and emission wavelengths permits selective detection. The mobile phase stream can be stopped for spectral measurement, so that chromatographic peaks can be qualitatively determined with higher reliability. The flow-thru cell is a square type with an inner volume as small as 12µL and is made of silica, ensuring minimized light scattering.

### **Flow Cell Unit (120µL) for LC Application**

**Cat. No. 204-06249**

The square micro-flow cell has an inner volume of 120µL and is made of silica to ensure minimum light scattering. The inlet and outlet tubes are both made of vinyl resin and are 0.5mm I.D. and 2mm O.D.

### **8mm dia. Test Tube Holder**

**Cat. No. 204-05853**



Holds a test tube, 8mm outer diameter and 45mm~100mm long. The minimum sample volume required is 400µL.

### **12mm dia. Test Tube Holder**

**Cat. No. 204-03293**



Holds a test tube, 12mm outer diameter and 60mm~100mm long.



## A Wide Variety of Optional Accessories for the RF-5301PC

### Bottom Rise Sample Stage

Cat. No. 204-04811



Raises the sample cell position in order to reduce the minimum sample volume to 1.5mL.

### Constant-Temperature Single Cell Holder with Stirrer

Cat. No. 206-24930-91 (100V)

Cat. No. 206-24930-92 (120V)

Cat. No. 206-24930-93 (220/240V)



Keeps the sample at the desired constant temperature during measurement by circulating temperature-controlled water (5~70°C) around the sample cell. The stirring option has variable speed control and the minimum sample volume is 2mL. Effective for fluorometry of suspended cell samples.

Note: Does not include the Temperature Controlled Water Bath. Not applicable to samples having a specific gravity greatly different from that of the solvent.

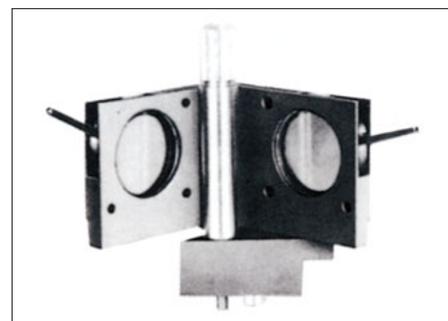
Note: The hose joint is applied to the 6~9mmID tube.

### Polarizer Attachment (for UV/Vis region)

Cat. No. 204-03290

### Polarizer Attachment (for Vis region)

Cat. No. 204-03290-01



Measurement of fluorescence polarization provides information on the size, fluidity and environments of fluorescent molecules. Permits reliable measurement of polarization characteristics over a wide wavelength range from 240nm to 800nm.

## NTT-2200P Constant-Temperature Water Circulator

Cat. No. 208-97263



Circulates temperature-controlled water to a constant-temperature cell holder.

- Temperature range: Ambient + 5°C to + 80°C
  - Temperature control precision:  $\pm 0.05^\circ\text{C}$
  - Max. pumping rate: 27/31 L/min, 9.5/13m (50/60Hz)
  - External circulation nozzle: 10.5mm OD (both outlet and return)
  - Tank capacity: About 10L (9L during use)
  - Safety features: Detection of over-temperature of Upper or Lower limits, Detection of heater wire malfunction, Protection of heating too little circulating water, Detection of sensor malfunction, Independent over heat protection, Over current circuit protector
  - Standard accessories: Lid with handles, Rubber hose (4m, 9mm ID), Hose clamps (4pc.), Instruction manual
  - Dimensions: 270W x 560H x 400D (mm)
  - Power requirements: 100VAC, 1250VA, with 1.7m power cord and grounded plug
- Note: Piping to Constant-Temperature Cell Holder (Cat. No. 206-24930-xx) is possible by the hose (9mm ID).

## Filter Set

Cat. No. 204-04691

Includes 8 filters: two broad-band interference filters U-340 and B-390 for isolation of excitation wavelengths of 300-380 and 350-450nm, respectively. Six cutoff filters: UV-29, L-41, Y-46, Y-50, O-56 and R-60 with approximately 50%T at 300, 420, 460, 500, 560 and 600nm, respectively.

## Spectra Correction Accessory

Cat. No. 204-07550

Used to correct excitation and emission spectra in the wavelength region from 250nm to 600nm, using rhodamine solution as the reference (quantum counter).

## Rectangular Flow Cell, 120 $\mu\text{L}$

Cat. No. 204-03285-04

Used for fluorescence monitoring of effluents in column chromatography. Made of fused silica. Requires adapter (Cat. No. 206-83934-91).

## ASC-5 Auto Sample Changer

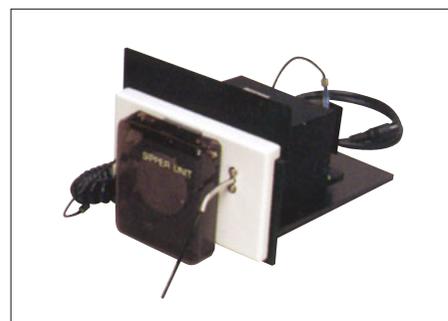
Cat. No. 206-23810-xx



Builds an automatic multi sample spectrophotometry system in combination with a sipper unit. Up to 100 test tubes are set together on the rack. The aspirating nozzle is programmable to move X, Y and Z (vertical) direction.

## Sipper Unit 5300

Cat. No. 206-24950-91



Aspirates solution samples using a peristaltic pump driven by a stepping motor, to be measured successively. Minimum sample volume is 2mL, linked operation with the ASC-5 Auto Sampler possible.



JQA-0376

Founded in 1875, Shimadzu Corporation, a leader in the development of advanced technologies, has a distinguished history of innovation built on the foundation of contributing to society through science and technology. We maintain a global network of sales, service, technical support and applications centers on six continents, and have established long-term relationships with a host of highly trained distributors located in over 100 countries. For information about Shimadzu, and to contact your local office, please visit our Web site at [www.shimadzu.com](http://www.shimadzu.com)



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