Spectrofluorometer
FP-8000 Series
In 1967, JASCO launched the FP-1, which was the first in a long line of spectrofluorometers. The FP-8000 Series is the latest comprehensive range of instruments, developed to provide accurate measurements for bio- and material sciences, from a simple entry level model for fluorescence spectral measurements and sensitive quantitation to the advanced models developed for demanding research applications including spectral correction and quantum yields.

The FP-8000 Series includes the powerful cross-platform Spectra Manager™ suite of software.

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Features of the FP-8000 Series

For scientists performing biomolecule structure studies, advanced materials research, and quantum yield calculations who need confidence in the spectral purity of their measurements under a variety of conditions, the FP-8000 Series Spectrofluorometers provide an optical bench designed specifically for high sensitivity measurements with an expanded, wide dynamic range and automatic band-pass filters to exclude higher order diffraction.

The FP-8000 Series includes 5 different models with a large variety of accessories designed to meet your experimental needs.

Advanced Features of the FP-8000 Series

- High throughput optical system
- Highest S/N performance
- Wide dynamic range (at least 6 orders of magnitude)
- Auto Gain and Auto Sensitivity Control System
- Automatic band-pass filters for higher-order diffraction
- High speed scanning
- Advanced digital signal processing
- Spectral Correction
- Spectral bandwidth down to 1 nm

Unique Features and Accessories

- Compact benchtop design
- Range of precise temperature control accessories
- Automatic polarizers to allow for automatic anisotropy measurements
- Quantum Yield Determination
- Automated Microplate Reader for rapid sample throughput
- Microsampling accessories for small volume samples
- Stopped-flow system allows for kinetic measurements
- Spectra Manager™ software for control and data analysis
- Flexible design allows for field upgrades as measurement requirements change

Versatility for a Wide Range of Applications

- Protein dynamics
- Quantitative analysis
- Cellular membrane studies
- Enzyme kinetics
- Carbon nanostructures
- Fluorescent materials
- Short lifetime phosphorescence measurements

FP-8500 Spectrofluorometer

The FP-8500 has the highest sensitivity and optimal spectral accuracy with a wide range of accessories for maximum flexibility in experimental design.

The FP-8500 is a high performance spectrofluorometer with an optimized optical design for very low stray light and a dynamic range of up to 6.5 orders of magnitude. It is exceptionally sensitive with a water Raman S/N ratio of 8,500:1 (RMS), which allows for fast measurements of samples with low level fluorescence. The high spectral resolution of 1.0 nm, automatic band-pass filters for exclusion of higher-order diffraction, and accurate spectral correction assures accurate measurements for the evaluation of advanced materials. The high-speed scanning enables fast measurements of 3D spectra and phosphorescence samples.

The FP-8500 optical bench has been developed to take advantage of the wide range of sampling accessories and applications, such as temperature-dependence, anisotropy, FRET, spectral correction, and quantum yields.

Options

- High sensitivity S/N 8,500:1 (RMS, water Raman)
- High-speed scanning up to 60,000 nm/min
- Wavelength range: 200 to 750 nm (850 nm optional)
- Validation accessory comes standard
FP-8200 Spectrofluorometer

A compact model for routine measurements such as spectral scanning, temperature dependent measurement and quantitation.

The FP-8200 is a general-purpose instrument. The simplified yet powerful design is perfect for users that require routine fluorescence measurements in a quality-control environment. The standard Auto-SCS and Auto-Gain features enable measurements to be obtained over a wide range of concentrations using only one method. Two graphical user interfaces are available: Spectra Manager™ cross-platform spectroscopy software that allows full system control of the instrument, separate from the data processing and analysis, and the intelligent remote module (iRM) with a color LCD touch screen.

- High sensitivity S/N > 4,500 (RMS, water Raman)
- Dynamic range up to six digits
- High speed scanning up to 20,000 nm/min
- Wavelength range: 200 to 750 nm (900 nm optional)
- Higher order diffraction band-pass filter (optional)

FP-8300 Spectrofluorometer

Sophisticated optical system with additional features for biological applications.

The FP-8300 is a user friendly spectrofluorometer with a wide range of accessories that are well suited to biological research. The standard automatic band-pass filters obtain spectra without the artificial peaks due to second order diffracted light. The Auto-Gain and Auto-SCS functions optimize the S/N for samples with large differences in signal intensity and concentration. Temperature control accessories can be used for thermal melting studies, providing researchers with fluorescence and thermodynamic data for conformational and folding studies. FRET measurements offer insight on binding and folding dynamics. The FP-8300’s automatic polarizers can perform fluorescence anisotropy measurements to provide information regarding fluorophore mobility. Kinetic and titration measurements can also be performed with the dedicated stopped-flow and autotitrator systems.

- High sensitivity S/N > 8,000:1 (RMS, water Raman)
- High resolution of 1.0 nm
- Wavelength range: 200 to 750 nm (900 nm optional)

FP-8600 Spectrofluorometer

For extended wavelength operation into the near infrared.

The FP-8600 spectrofluorometer uses a sensitive PMT to obtain data from the UV to the NIR regions. The excitation wavelength range of 200 to 850 and up to 1010 nm for fluorescence emission allows measurements of materials which have fluorescence in the NIR region, such as carbon nanotubes. The small instrument design incorporates high-speed scanning and automatic band-pass filters to exclude higher-order diffraction. The FP-8600 is also suitable for biological sample measurements when using an NIR fluorescence reagent to avoid auto-fluorescence.

- High sensitivity S/N > 3,500 (RMS, water Raman)
- High-speed scanning up to 120,000 nm/min
- Emission wavelength: 200 to 1010 nm (850 nm, Excitation)
- Validation accessory as standard

FP-8700 Spectrofluorometer

With a liquid nitrogen PMT detector for applications that require high sensitivity measurements into the near infrared (1700 nm).

The FP-8700 includes a liquid N₂ cooled PMT for enhanced sensitivity in the NIR region to 1400 nm (1700 nm as option).

- Liquid N₂ cooled PMT
- Excitation wavelength 200-850 nm
- Emission wavelength 300-1400 nm (1700 nm as option)
- Spectral correction
- Option for lower excitation
Instrument Performance

Highest Sensitivity

The high throughput optical system and low noise signal processing of the FP-8000 series provides users with a high S/N (signal-to-noise) performance of up to 8,500:1 (RMS). The advanced A/D converter enables rapid sampling and the high speed signal processing system that immediately converts the fluorescence signal from the detector to a digital signal without introducing any additional noise.

Wide Dynamic Range

A wide dynamic range for luminescence measurements is obtained by using the Auto-Gain and Auto-SCS features, automatically adjusting the detector gain and sensitivity for optimum measurements.

Auto-Gain

Auto-Gain automatically adjusts the gain of a signal from the detector, so that the S/N is optimized throughout the entire scan range for spectral or time course measurements. Since quantum yield measurements can produce peaks that vary greatly in fluorescence intensity, the auto-gain function assures the accuracy of the measurement.

Auto-SCS

The Auto Sensitivity Control System (SCS) allows users to create calibration curves for a wide concentration range without having to manually change the instrument Sensitivity settings. Auto-SCS can obtain measurements of sub-picomolar to micromolar concentrations for fixed wavelength measurements and quantitative analyses.

Automatic Band-Pass Filter for Higher-Order Diffraction

The new automatic band-pass filters remove peaks originating from higher-order diffracted light to provide simple and reliable spectral acquisition and analysis. The band-pass filters can also be used for spectral corrections, 3D measurements, and quantum yield determination.

Spectral Correction

JASCO has developed a spectral correction system to provide greater accuracy covering a larger wavelength range. While traditionally Rhodamine B was used for spectral correction of the excitation spectra, the use of calibrated deuterium and tungsten halogen light sources and calibrated detector now provide corrected data which can be directly observed from the UV to NIR spectral regions.

Automatic Accessory Recognition

When an accessory is attached to the instrument sample compartment, Spectra Manager™ automatically recognizes the installed accessory. Previously used instrument parameters associated with the accessory are recalled and information such as the accessory name and serial number are logged with the measurement file information. The IQ start system in conjunction with IQ Accessory recognition allows rapid access to pre-defined analysis methods.
Temperature Control

Single-Position Peltier Cell Holders

ECH-813 | Air-Cooled Peltier Thermostatted Cell Holder with Stirrer
ETC-814 | Water-Cooled Peltier Thermostatted Cell Holder with Stirrer
ETC-815 | Water-Cooled Peltier Thermostatted Cell Holder with Stirrer

Specifications

<table>
<thead>
<tr>
<th>Model</th>
<th>ECH-813</th>
<th>ETC-814</th>
<th>ETC-815</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compatible Cells</td>
<td>Micro cell: 3x3 or 5x5 mm, Rectangular cell: 10x10 mm, 1 pc</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Temperature Control System</td>
<td>Heating/cooling system utilizing Peltier effect</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stirring System</td>
<td>Air-cooled or Water-cooled</td>
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<td></td>
</tr>
<tr>
<td>Temperature Setting Range</td>
<td>0 to 30 °C (10 °C steps)</td>
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</tr>
<tr>
<td>Temperature Control Range</td>
<td>0 to 100 °C (20 °C temperature compensation)</td>
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</tr>
<tr>
<td>Temperature Control Accuracy</td>
<td>±0.1 °C</td>
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<tr>
<td>Temperature Accuracy</td>
<td>±0.5 °C (20 to 40 °C), ±1 °C (&lt;20 °C and &gt;40 °C)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Standard Accessory</td>
<td>In-cell sensor</td>
<td></td>
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</tr>
</tbody>
</table>

Constant Temperature Cell Holders/Changers

CTH-807 | Water Thermostatted Cell Holder
STR-811 | Water Thermostatted Cell Holder with Stirrer
STR-812 | Water Thermostatted Cell Holder with Stirrer

Specifications

<table>
<thead>
<tr>
<th>Model Name</th>
<th>CTH-807</th>
<th>STR-811</th>
<th>STR-812</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compatible Cells</td>
<td>Micro cell: 3x3 or 5x5 mm, Rectangular cell: 10x10 mm, 1 pc</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Temperature Control System</td>
<td>Thermostatted water circulation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stirring System</td>
<td>Integrated variable speed magnetic stirrer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operating Temperature</td>
<td>5 to 90 °C</td>
<td></td>
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</tbody>
</table>

FCT-816 | Water Thermostatted Automatic 4-Position Turret Cell Changer
FCT-816S | Water Thermostatted Automatic 4-Position Turret Cell Changer with Stirrer
FCT-817 | Water Thermostatted Automatic 8-Position Turret Cell Changer
FCT-817S | Water Thermostatted Automatic 8-Position Turret Cell Changer with Stirrer

Specifications

<table>
<thead>
<tr>
<th>Model Name</th>
<th>FCT-816</th>
<th>FCT-817</th>
<th>FCT-816S</th>
<th>FCT-817S</th>
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<td>Compatible Cells</td>
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<td></td>
<td></td>
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<tr>
<td>Temperature Control System</td>
<td>Thermostatted water circulation</td>
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</tr>
<tr>
<td>Stirring System</td>
<td>Integrated variable speed magnetic stirrer</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Operating Temperature</td>
<td>5 to 90 °C</td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

CSP-828 | Sample Compartment Lid with Syringe Port
CSP-829 | Sample Compartment Lid with Syringe Port

Allows the addition of a reagent to the sample cell without opening and closing the sample compartment lid. It is recommended for use with cell holders that include an integrated stirrer, such as the STR-811/812, EHC-813 or ETC-814/815 cell holders.

Compatible syringe needle: 2 inch (50 mm)

*3 mm microcell cannot be used.

Other Temperature Control Accessories

CTU-100 | Mini Water Circulation Bath

Specifications

| Dimension | 110 W x 220 V x 10 cm |
| Temperature Control Range | 4 to 90 °C (ambient to 40 °C) |
| Temperature Sensor Accuracy | ±0.2 °C (at 20 °C) |
| Bath Capacity | 150 mL |
| Cooling/Heating Capacity | 57 W |

used with all FP-8000 Series
used only with FP-8200
used only with FP-8300
used only with FP-8500
used only with FP-8600 and FP-8700
used only with Spectra Manager™
purge is standard
Solid Sample Holders

The FDA-808 is used for solid and powder samples, the FLH-809 is used for films and solid samples, and the FPA-810 is dedicated to powder sample measurements and can also be used for micro powder samples.

**FDA-808 | Solid Sample Holder**

**FLH-809 | Film Holder**

**FPA-810 | Powder Sample Cell Holder**

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Ambient Temperature Cell Holders

**FUV-803 | Absorbance Measurement Cell Holder**

- **Specifications**
  - Wavelength Range: 200 to 400 nm depending on configuration

**FHM-804 | High Sensitivity Measurement Cell Holder**

The FHM-804 includes a reflection mirror used to improve light collection efficiency to increase the sensitivity of the fluorescence measurement.

**FSA-805 | 30 Degree Incident Angle Cell Holder for Triangle Cell**

**FSA-806 | 30 Degree Incident Angle Cell Holder for Rectangular Cell**

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**Solid Sample Holders**

The FDA-808 is used for solid and powder samples, the FLH-809 is used for films and solid samples, and the FPA-810 is dedicated to powder sample measurements and can also be used for micro powder samples.

**FDA-808 | Solid Sample Holder**

**FLH-809 | Film Holder**

**FPA-810 | Powder Sample Cell Holder**

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**PSH-002/102/103 | Optional Cells for FPA-810**

- **Specifications**
  - **Model**
    - PSH-002
    - PSH-102
    - PSH-103
  - **Cell size**
    - ø 16 mm
    - ø 8 mm
    - ø 5 mm
  - **Thickness**
    - 0.5 to 4 mm

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**250BP30 | Optional Bandpass Filter**

This bandpass filter can be mounted to the holder located on the excitation side of the solid sample block. The center wavelength is 250 nm, half bandwidth is 30 nm, with a 5 mm thickness and 25 mm cell size.

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**ACCESSORIES AND APPLICATIONS**

**Microsampling**

**FMH-857/802 Microcell Jackets and FMM-100/200 Microcells**

When sampling very small volumes, two microsampling accessories are available. The micro cell jacket and micro cell (FMH-801 and J/3-3.45/Q/3") is a 3x3 mm cell designed for sample volumes as small as 50 µL. The FMH-802 and J/3-5.45/Q/5" is a 5x5 mm quartz cell with 400 µL volume with a stir bar and 500 µL without.

**FMH-801 | 3 mm Micro Cell Jacket for J/3-3.45/Q/3"**  
3 mm Micro Quartz Cell

**FMH-802 | 5 mm Micro Cell Jacket for J/3-5.45/Q/5"**  
5 mm Micro Quartz Cell

The SAF-850/851 One-Drop accessory for the FP-8000 Series to measure micro-volume samples of protein and nucleic acids. The minimum sample volume is 5 µL for the 1 mm pathlength cell and measurement only takes 15 seconds.

**SAF-850 | One-Drop Measurement Accessory**

**SAF-851 | One-Drop Measurement Accessory**

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**One-Drop Fluorescence Measurement**

The SAF-850 (FP-8200) or SAF-851 (FP-8300/8500/8600) One-Drop measurement accessory offers quantitative analysis or simple spectrum measurements requiring a minimum sample volume of 5 µL. Without using a rectangular cell, easy and accurate measurements can be obtained with only one drop of sample from a pipette.

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*Manufactured by Starna.*
Integrating Spheres and Phosphorescence

Phosphorescence data can be obtained using a variety of measurement programs such as Spectra Measurement, Quantitative Calibration and Analysis, Fixed Wavelength Measurement, Time Course Measurement, and Phosphorescence Lifetime Measurement.

**IFS-834 | 60 mm dia. Integrating Sphere**
- Used for quantum efficiency measurements and color evaluation measurements of opaque solid or powder samples.

**ILF-835 | 100 mm dia. Integrating Sphere**
- Used for quantum efficiency measurements of liquids or thin membrane samples on a transparent substrate as well as opaque solid or powder samples.

**ILFC-847 | LN, Cooled 100 mm dia. Integrating Sphere**
- Used for quantum efficiency measurement of samples cooled with liquid nitrogen. It can also be used at ambient temperatures without liquid nitrogen.

**Cells for Integrating Spheres**
- **1 mm liquid cell**
  - Path length: 1 mm
  - Path width: 10 mm
  - Sample volume: 2 µL
- **2 mm liquid cell**
  - Path length: 2 mm
  - Path width: 10 mm
  - Sample volume: 400 µL
- **3 mm powder cell**
  - Cell size: 19 (H) x 10 (W) x 3 (T) mm

**Optional Spectral Correction Accessories**
- 3SC-842, 3SC-843

**PMU-830 | Liquid Nitrogen Cooling Unit**
- Used to measure samples cooled with liquid nitrogen.

**LPH-140 | Phosphorescence Measurement Cell Kit for Liquid Sample**
- Used to measure a sample located outside the sample compartment using either a 1 or 2 m optical fiber probe.

**PPH-150 | Phosphorescence Measurement Cell Kit for Powder Sample**

**CPH-160 | Phosphorescence Measurement Cell Kit for Solid Sample**

**CSH-831 | Cryostat Holder**
- Used with either the Optistat DN or DN-V by Oxford instruments.

**HPC-836 | High Temperature Powder Cell Unit**
- An internal heater provides temperature control for measuring the effects of temperature variation on the sample fluorescence intensity.

**OBF-832 | Optical Fiber Unit**
- Used to measure a sample located outside the sample compartment using either a 1 or 2 m optical fiber probe.

**EFA-833 | Epi-Fluorescence Unit**
- Used to irradiate a sample facing downward on the top of the accessory and to measure the samples epifluorescence. The minimum incident beam size is 1 x 1.5 mm with a 45° incident angle.

**Specifications**

<table>
<thead>
<tr>
<th>Model Name</th>
<th>IFS-834</th>
<th>ILF-835</th>
<th>ILFC-847</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inner Diameter</td>
<td>60 mm</td>
<td>100 mm</td>
<td>100 mm</td>
</tr>
<tr>
<td>Minimum Sample Size</td>
<td>20 x 20 x 0.5 (T) mm</td>
<td>20 x 20 x 0.5 (T) mm</td>
<td>20 x 20 x 0.5 (T) mm</td>
</tr>
<tr>
<td>Maximum Sample Size</td>
<td>60 x 50 x 25 (T) mm</td>
<td>30 x 20 x 6 (T) mm</td>
<td>30 x 20 x 6 (T) mm</td>
</tr>
</tbody>
</table>

**PMU-830**
- **Specifications**
  - Cooling Temperature: 77 K (-196°C)
  - Optional Cells: LPH-140, PPH-150, CPH-160

**LPH-140**
- **Specifications**
  - Tube Size: 5 mm O.D. x 178 mm
  - Cell Size: 7 mm x 0.4 or 1 mm
  - Sample Size: 5 (H) x 5 (W) x 1 (T) mm or 1 mm
  - Tubing Material: Synthetic quartz
  - Max Sample Size: 18 (H) x 10 (W) x 3 (T) mm

**PPH-150**
- **Specifications**
  - Tube Size: 5 mm O.D. x 178 mm
  - Cell Size: 7 mm x 0.4 or 1 mm
  - Sample Size: 5 (H) x 5 (W) x 1 (T) mm or 1 mm
  - Tubing Material: Synthetic quartz
  - Max Sample Size: 18 (H) x 10 (W) x 3 (T) mm

**CPH-160**
- **Specifications**
  - Tube Size: 5 mm O.D. x 178 mm
  - Cell Size: 7 mm x 0.4 or 1 mm
  - Sample Size: 5 (H) x 5 (W) x 1 (T) mm or 1 mm
  - Tubing Material: Synthetic quartz
  - Max Sample Size: 18 (H) x 10 (W) x 3 (T) mm

**CSH-831**
- **Specifications**
  - Tube Size: 5 mm O.D. x 178 mm
  - Cell Size: 7 mm x 0.4 or 1 mm
  - Sample Size: 5 (H) x 5 (W) x 1 (T) mm or 1 mm
  - Tubing Material: Synthetic quartz
  - Max Sample Size: 18 (H) x 10 (W) x 3 (T) mm

**HPC-836**
- **Specifications**
  - Tube Size: 5 mm O.D. x 178 mm
  - Cell Size: 7 mm x 0.4 or 1 mm
  - Sample Size: 5 (H) x 5 (W) x 1 (T) mm or 1 mm
  - Tubing Material: Synthetic quartz
  - Max Sample Size: 18 (H) x 10 (W) x 3 (T) mm

10 mm Rectangular Cell Holder
- Used to mount a 10 x 10 mm rectangular cell inside the IFS-835/ILFC-847 integrating spheres.

KBr Plate Sample Holder
- Used to sandwich a powder sample between two KBr plates (5 x 1 x 1 mm). This accessory can also be used for micro FTIR measurements.

**PMU-830**
- **Specifications**
  - Cooling Temperature: 77 K (-196°C)
  - Optional Cells: LPH-140, PPH-150, CPH-160

**LPH-140**
- **Specifications**
  - Tube Size: 5 mm O.D. x 178 mm
  - Cell Size: 7 mm x 0.4 or 1 mm
  - Sample Size: 5 (H) x 5 (W) x 1 (T) mm or 1 mm
  - Tubing Material: Synthetic quartz
  - Max Sample Size: 18 (H) x 10 (W) x 3 (T) mm

**PPH-150**
- **Specifications**
  - Tube Size: 5 mm O.D. x 178 mm
  - Cell Size: 7 mm x 0.4 or 1 mm
  - Sample Size: 5 (H) x 5 (W) x 1 (T) mm or 1 mm
  - Tubing Material: Synthetic quartz
  - Max Sample Size: 18 (H) x 10 (W) x 3 (T) mm

**CPH-160**
- **Specifications**
  - Tube Size: 5 mm O.D. x 178 mm
  - Cell Size: 7 mm x 0.4 or 1 mm
  - Sample Size: 5 (H) x 5 (W) x 1 (T) mm or 1 mm
  - Tubing Material: Synthetic quartz
  - Max Sample Size: 18 (H) x 10 (W) x 3 (T) mm

**CSH-831**
- **Specifications**
  - Tube Size: 5 mm O.D. x 178 mm
  - Cell Size: 7 mm x 0.4 or 1 mm
  - Sample Size: 5 (H) x 5 (W) x 1 (T) mm or 1 mm
  - Tubing Material: Synthetic quartz
  - Max Sample Size: 18 (H) x 10 (W) x 3 (T) mm

**HPC-836**
- **Specifications**
  - Tube Size: 5 mm O.D. x 178 mm
  - Cell Size: 7 mm x 0.4 or 1 mm
  - Sample Size: 5 (H) x 5 (W) x 1 (T) mm or 1 mm
  - Tubing Material: Synthetic quartz
  - Max Sample Size: 18 (H) x 10 (W) x 3 (T) mm
## ACCESSORIES AND APPLICATIONS

### Fluorescence Polarization Anisotropy

Fluorescence anisotropy occurs when a fluorophore emits different intensities of light dependent on the polarization angle of the incident light. Fluorescence anisotropy can be used to probe the structural flexibility of a fluorophore, which cannot be obtained by fluorescence spectroscopy alone.

### Polarizer/Filter Accessories

<table>
<thead>
<tr>
<th>Accessory</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>FDP-837</td>
<td>Automatic Polarizer</td>
</tr>
<tr>
<td>Wavelength range: 220 - 700 nm</td>
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<tr>
<td>FSP-838</td>
<td>Depolarization Plate</td>
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<tr>
<td>Wavelength range: 200 - 900 nm</td>
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<tr>
<td>FDP-223</td>
<td>Polarizer and Analyzer Accessory</td>
</tr>
<tr>
<td>Wavelength range: 220 - 700 nm</td>
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</tr>
<tr>
<td>FDP-243</td>
<td>Polarizer and Analyzer Accessory</td>
</tr>
<tr>
<td>Wavelength range: 400 - 700 nm</td>
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</tbody>
</table>

### Example of Anisotropy Measurement

A fluorescent dye (DPH) was added to a lipid bilayer and the degree of polarization was measured as a function of temperature, as well as the fluorescence intensity and anisotropy. The data obtained can be used to elucidate binding properties and phase transitions induced through vesicle interactions and the heat of temperature changes.

![Measuring Degree of Polarization of Liposome](image)

## ACCESSORIES AND APPLICATIONS

### Automated Titration and Stopped-Flow

#### Automated Titration

The auto titrator is used to monitor changes in the fluorescence intensity as a function of pH, chemical denaturant, or exogenous ligands. Dual syringes are employed and are each fitted with a valve for automated refilling and flushing during extended runs and for maintaining a constant cell volume. In addition, the titration measurement program automatically corrects for concentration.

<table>
<thead>
<tr>
<th>Accessory</th>
<th>Description</th>
</tr>
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<tbody>
<tr>
<td>ATS-826</td>
<td>Automatic Titration Unit</td>
</tr>
<tr>
<td>ATS-827</td>
<td>Automatic Titration Unit</td>
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</table>

### Specifications

<table>
<thead>
<tr>
<th>Specification</th>
<th>ATS-826</th>
<th>ATS-827</th>
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</thead>
<tbody>
<tr>
<td>Model</td>
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<tr>
<td>Compatible Cells</td>
<td>Micro cell 5 x 5 mm, rectangular cell 10 x 10 mm</td>
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<tr>
<td>Compatible Accessories</td>
<td>STR-811, ETC-814, STR-812, EHC-813, ETC-815</td>
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</tr>
<tr>
<td>Number of Syringes</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Syringe Volume Options</td>
<td>1.0 mL (standard), 2.5 mL</td>
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</tr>
<tr>
<td>Injection Accuracy</td>
<td>Greater than 99%</td>
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<tr>
<td>Injection Reproducibility</td>
<td>Less than 1%</td>
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<tr>
<td>Injection Pitch</td>
<td>0.1% of syringe volume</td>
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*The PC control software is included as standard.*

#### Stopped-Flow

The Stopped-Flow accessory is used to rapidly mix two or more solutions to trigger a chemical reaction. The reaction kinetics are then followed by monitoring the change in the fluorescence intensity.

<table>
<thead>
<tr>
<th>Accessory</th>
<th>Description</th>
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<tbody>
<tr>
<td>SFS-852/853/854/852T/853T/854T</td>
<td>Stopped-Flow Accessory</td>
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### Specifications

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<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Syringes</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Syringe Volume Options</td>
<td>10 mL (standard), 10, 25, 50 mL</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mixing Ratio</td>
<td>10 mL/10 mL</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Base Rate</td>
<td>20 ms</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Base Volume</td>
<td>5 mL/sec (10 mL syringe)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Temperature Control System</td>
<td>Heating/cooling system utilizing Peltier effect</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Peltier Heat Radiation</td>
<td>Water-cooled</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Temperature Setting Range</td>
<td>-15 to 80°C, Syringe 10 to 60°C</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Temperature Accuracy</td>
<td>±0.05°C (max)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Optional Accessories</td>
<td></td>
<td>50 µL, 100 µL, 500 µL delay line</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*The PC control software is included as standard.*

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Autosampling Systems
The autosampler system obtains automated measurement by combining an autosampler, syringe pump or sipper, and flow cell unit. Up to 192 liquid samples can be measured on all FP-8000 models, however, there are various rack options that can be used with either test tubes and/or vials. The system allows for automated scanning measurements at predetermined parameters using a flow cell. The PC control Spectra Manager™ software is included as standard.

<table>
<thead>
<tr>
<th>Rack</th>
<th>Compatible Test Tube and Vial</th>
<th>Min. No. of Samples</th>
</tr>
</thead>
<tbody>
<tr>
<td>SRA-811</td>
<td>15 mm O.D. Test Tube</td>
<td>15 mm O.D. test tube, 15 mm (O.D.) × 105 mm (H), 10 mL, 100 pcs/set</td>
</tr>
<tr>
<td>SRA-812</td>
<td>13 mm O.D. Test Tube</td>
<td>13 mm O.D. test tube, 13 mm (O.D.) × 100 mm (H), 7 mL, 100 pcs/set</td>
</tr>
<tr>
<td>SRA-813</td>
<td>12 mm O.D. Test Tube</td>
<td>12 mm O.D. test tube, 12 mm (O.D.) × 105 mm (H), 5 mL, 100 pcs/set</td>
</tr>
<tr>
<td>SRA-814</td>
<td>10 mm O.D. Test Tube</td>
<td>10 mm O.D. test tube, 10 mm (O.D.) × 90 mm (H), 3 mL, 100 pcs/set</td>
</tr>
<tr>
<td>SRA-818</td>
<td>Vial</td>
<td>Same top size: 2 mL, 100 pcs/set</td>
</tr>
<tr>
<td>SPA-817</td>
<td>Constant Temperature Microplate</td>
<td>96-well microplate, 250 μL</td>
</tr>
</tbody>
</table>

ASP-849 | Syringe Pump
Can be used in conjunction with ASU-800 and FSC-823/824 micro flow cell holder. The ASP-849 can be used with syringe volumes of 10. 25, 50, and 10.0 mL and has a reproducible volume delivery within ±1%.

FMP-825 | Microplate Reader
The FMP-825 Microplate reader can be used with the FP-8300 and FP-8500. Four standard measurements are available including Spectra Measurement, Quantitative Analysis, Time Course, and Fixed Wavelength. Quantitative Analysis can be used to create a calibration curve, as well as measure unknown samples in a single microplate while the Time Course Measurement software can be used to measure parallel kinetics for multiple samples.

QFS-821 | Vacuum Sipper
Specifications
- Cell Capacity: 250 μL
- Cell Material: Synthetic quartz
- Tubing Material: Teflon, SUS
- Carryover: Less than 2%
- Min Sample Requirement: 700 μL

SHP-819 | Peristaltic Sipper
Specifications
- Cell Capacity: 5 μL
- Cell Material: Synthetic quartz
- Tubing Material: PharmedTeflon, SUS
- Carryover: Less than 2%
- Min Sample Requirement: 700 μL

AWU-820 | Washing Unit
Optional washing unit for use with QFS-821/822 and SHP-819/820.
Spectra Manager™
Software Suite

Instrument Control
Drivers are included to control each spectroscopy instrument and parameter dialogs allow easy editing of pre-saved parameter files. Data acquired from each instrument is automatically loaded into the analysis program to free up the PC and control software to acquire more data during post-acquisition processing. Each instrument driver also has its own dedicated application for instrument hardware diagnostics and validation.

Flexible Display Features
User-friendly features include overlay printing in colors and patterns, autoscale mode, and style and font, as well as customized toolbars.

Data Processing and Spectral Analysis
View and process several types of measurement data files (UV/Vis/NIR, FTIR, Fluorescence, CD) in a single window, using a full range of data processing functions. Features include arithmetic operations, derivatives, peak detection and processing, smoothing, and baseline correction.

Report Publishing
JASCO Canvas allows users to create layout templates of spectral data and results to meet individual reporting requirements.

Macro Command Option
This software can be used to develop user-designed application programs for individual experimental set-up and routine measurements, including instrument control, data acquisition, post-acquisition data processing and reporting.

Secure Access with Spectra Manager™ CFR
Spectra Manager CFR provides secure access and compliance with 21 CFR Part II. System access requires a username and password, which are assigned by the Workgroup Manager. Individual levels determine the access to administrative tools that include instrument and analysis application installation, user and workgroup setup, security policies, as well as system and application history logs. Three levels of electronic signatures are required, including creation, review, and approval stages. An audit trail is assigned to every data file, recording any spectral data processing.

A SINGLE PLATFORM FOR EVERY INSTRUMENT.

JASCO is the only manufacturer to develop a powerful, cross-platform 64-bit Windows software package for controlling a wide range of spectroscopic instrumentation. Spectra Manager™ is a comprehensive lab companion for capturing and processing data, eliminating the need to learn multiple software programs and allowing data from more than one instrument to be analyzed and displayed together on the same platform.
Spectra Measurement

The FP-8000 series spectrofluorometer can measure five different types of spectra: emission, excitation, synchronous, single-beam emission and single-beam excitation in both fluorescence and phosphorescence* modes.

*Excludes FP-8200.

Time Course Measurement

The Time Course Measurement program is used for measuring temporal changes of fluorescence intensity at a fixed wavelength. Up to 100,000 hours (FP-8300/8500/8600) and 1,667 hours (FP-8200) of continuous measurements can be performed using a 60 minute and 60 second interval, respectively.

Quantitative Analysis

In the Quantitative Analysis software, optimal parameters from two photometric modes, emission and excitation, and three quantitation methods, no base (1 wavelength), one-point base (2 wavelengths) and two-point base (3 wavelengths) can be selected depending on the application. Other quantitative calibration curve methods such as log or spline functions are also available.

Fixed Wavelength Measurement

This program can be used to measure a sample's fluorescence or phosphorescence intensity at fixed excitation and emission wavelengths for up to four wavelengths.

Phosphorescence Lifetime Measurement

Measures changes in the phosphorescence of a sample briefly irradiated by the excitation source.

*Excludes FP-8200.

Interval Scan Measurement

Measures up to three spectra (fluorescence, excitation, and synchronous) and displays the results as either 2D or 3D spectra, as well as contour or color-coded plots.

Spectral Correction

Allows users to easily compare measured spectral data from several instruments as well as determine the quantum yield efficiency. Corrected spectra can be obtained immediately after the measurement is completed. The FP-8200/8300 require optional jigs for spectral correction. A Rhodamine B ethylene glycol solution is also included as a standard and additional sources for correction can be obtained separately.

Relative Quantum Yield

All models in the FP-8000 Series include a relative quantum yield calculation program as standard.

Absorbance Spectra Measurement

Obtain the transmittance, absorbance, or reflectance spectrum by measuring the synchronous spectrum of a sample. The optional FUV-803 Absorbance measurement cell block is required for absorbance and transmittance measurements while reflectance measurements require an integrating sphere.

3D Measurements

Allows for the simultaneous display of several different sets of data, including 2D, 3D, and synchronous spectra. The 3D plots can be viewed in Contour, Color 3D, and Color-mapping.

Validation

The validation program includes instrument test procedures in compliance with JIS (K 0120 2005) and JAAMAS (0004-2005). This program provides six performance tests including wavelength accuracy, wavelength repeatability, resolution, stray light, sensitivity, and photometric stability. The test results and procedures can be saved and/or printed.
Optional Software
Measurement Programs - From Data Acquisition to Data Processing and Analysis

FWTP-874 | Temperature Control Measurement
This application can be used to evaluate the melting temperatures of biological samples. The melting temperature, $T_m$, is calculated from the results of a time course measurement during a temperature change. The ETC-814/815 single position or PCT-818 Water-cooled Peltier thermostatted 4-position cell holders are required for use.

FWTS-872 | Temperature Interval Scan Measurement
This program is used to acquire excitation and emission spectra at a defined temperature interval with a temperature controlled accessory such as the ETC-814/815 single position or PCT-818 Water-cooled Peltier thermostatted 4-position cell holders.

VWKN-772 | Advanced Kinetics Analysis
This application program obtains a time course kinetic measurement and plots the data in various graphs, as well as calculates the maximum reaction velocity ($V_{max}$), Michaelis-Menten constant ($K_m$), and Hill constant ($n$). This program can be used with automated cell holders.

FWAP-875 | Fluorescence Polarization Measurement
The total fluorescence intensity (F), fluorescence anisotropy (r), and degree of polarization (P) can be measured using the FDP-837 automatic polarizer unit, providing auto-depolarization fixed wavelength measurements or auto-depolarization time course measurements.

FWQE-880 | Quantum Yield Calculation
Calculates the quantum yield of a sample with the use of an integrating sphere as well as the ESC-842 calibrated light source (W).

FWTC-873 | Dual-Wavelength Time Course Measurement
Enables time course measurements of the ratio of fluorescence intensities at two different wavelengths for either the excitation or emission. The calcium concentration calculation function in the program can also calculate the change in concentration of an intracellular ion.

FWFC-878 | Fluorescent Object Color Measurement
Enables evaluation of fluorescent sample color (fluorescent objective color) using the ISF-834 60 mm diameter integrating sphere, ESC-842 calibrated light source (W), or WRE-362 PMT. This program calculates the fluorescent sample color using a desired light source when the spectra of the various light sources are pre-registered. Spectral measurements are required in the range wider than 300 - 780 nm for excitation and 380 - 780 nm for emission.

FWLU-879 | Luminous Color Measurement
Obtains the luminescence or emission spectra of light emitting samples using either the ESC-842 Calibrated light source (W) or the WRE-362 PMT for wavelength expansion. Data analysis includes a colored chromaticity diagram and calculation of the correlated color temperature and color rendering index.

FWMC-883 | Macro Command
Executes a sequence of pre-programmed operations automatically, including parameter setting, measurements, analysis and printing.

iRM-900
Intelligent Remote Module

The iRM-900 intelligent remote module incorporates a color LCD touch screen to easily access all functions, which can be used for both the FP-8200 and FP-8300. The iRM-900 conveniently guides the operator through routines encompassing data acquisition to data processing. The obtained data can be automatically printed to USB PictBridge printers, or saved to a CF memory card for further processing on a PC.

- High quality color LCD display
- Operation using Touch Pen
- Enhanced quantitative analysis
- Equipped with instrument validation software
- Print to a USB printer

Standard Programs for the iRM-900
- Spectra Measurement
- Time Course Measurement
- Quantitative Analysis
- Fixed Wavelength Measurement
- Phosphorescence Lifetime Measurement
- Interval Scan Measurement
- Spectral Correction
- Relative Quantum Yield
- Absorbance Spectra Measurement
- 3D Measurements
- Validation

Optional Programs for the iRM-900
- FRTC-891 | Dual-Wavelength Time Course Measurement
- FRTP-892 | Temperature Control Measurement
- FRKN-893 | Advanced Kinetics Analysis
- FRAP-894 | Fluorescence Polarization Measurement
- FRMC-895 | Macro Command

IQ Accessory and IQ Start
User-friendly features include the IQ Accessory function for automatic accessory recognition and IQ Start for immediate start of pre-registered programs when conducting routine measurements.
## Specifications

**Model**

<table>
<thead>
<tr>
<th>Model</th>
<th>FP-8200</th>
<th>FP-8300</th>
<th>FP-8500</th>
<th>FP-8600</th>
<th>FP-8700</th>
</tr>
</thead>
<tbody>
<tr>
<td>Light Source</td>
<td>Xe lamp with shielded lamp house, 150 W</td>
<td>Integrated, selectable low pressure mercury lamp</td>
<td>Radio-photometer system using monochromatic light to monitor the intensity output of the Xe lamp</td>
<td>Spectra Manager™/CFR, iRM</td>
<td>Spectra Manager™/CFR</td>
</tr>
<tr>
<td>Photometric System</td>
<td>Radio-photometer system using monochromatic light to monitor the intensity output of the Xe lamp</td>
<td>Radio-photometer system using monochromatic light to monitor the intensity output of the Xe lamp</td>
<td>Spectra Manager™/CFR, iRM</td>
<td>Spectra Manager™/CFR</td>
<td></td>
</tr>
<tr>
<td>Monochromator</td>
<td>Holographic concave grating in modified Rowland mount</td>
<td>Holographic concave grating in modified Rowland mount</td>
<td>Spectra Manager™/CFR, iRM</td>
<td>Spectra Manager™/CFR</td>
<td></td>
</tr>
<tr>
<td>Wavelength Range (Standard)</td>
<td>Zero order, 200 - 750 nm</td>
<td>Zero order, 200 - 850 nm</td>
<td>Zero order, 200 - 850 nm</td>
<td>Spectra Manager™/CFR, iRM</td>
<td>Spectra Manager™/CFR</td>
</tr>
<tr>
<td>Wavelength Range (Optional)</td>
<td>Zero order, 200 - 900 nm</td>
<td>Zero order, 200 - 850 nm</td>
<td>N/A</td>
<td>option 1700nm</td>
<td>Spectra Manager™/CFR, iRM</td>
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<tr>
<td>Sensitivity (RMS)*</td>
<td>4,500:1</td>
<td>8,000:1</td>
<td>8,500:1</td>
<td>3,500:1</td>
<td>1400 nm - 8,000:1</td>
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<tr>
<td>1700 nm - 1,000:1</td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Resolution</td>
<td>2.5 nm (at 546.1 nm)</td>
<td>1.0 nm (at 546.1 nm)</td>
<td>1.0 nm (at 546.1 nm)</td>
<td>1.0 nm (at 546.1 nm)</td>
<td>1.0 nm (at 546.1 nm)</td>
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<tr>
<td>Band Width</td>
<td>2.5, 5, 10, 20 nm</td>
<td>1, 2.5, 5, 10, 20 nm</td>
<td>1, 2.5, 5, 10, 20, 40, L10, L20 nm</td>
<td>1, 2.5, 5, 10, 20, 40, L10, L20 nm</td>
<td>1, 2.5, 5, 10, 20, 40, L10, L20 nm</td>
</tr>
<tr>
<td>Wavelength Accuracy</td>
<td>±2.0 nm</td>
<td>±15 nm</td>
<td>±10 nm</td>
<td>±2.0 nm</td>
<td>±10 nm</td>
</tr>
<tr>
<td>Wavelength Repeatability</td>
<td>±1.5 nm</td>
<td>±1.0 nm</td>
<td>±1.0 nm</td>
<td>±1.0 nm</td>
<td>±1.0 nm</td>
</tr>
<tr>
<td>Wavelength Scan Speed</td>
<td>20, 50, 100, 200, 500, 1,000, 2,000, 5,000, 10,000, 20,000, 60,000 nm/min</td>
<td>10, 20, 50, 100, 200, 500, 1,000, 2,000, 5,000, 10,000, 20,000, 60,000 nm/min</td>
<td>10, 20, 50, 100, 200, 500, 1,000, 2,000, 5,000, 10,000, 20,000, 60,000 nm/min</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Slow Speed</td>
<td>30,000 nm/min</td>
<td>60,000 nm/min</td>
<td>60,000 nm/min</td>
<td>120,000 nm/min</td>
<td>120,000 nm/min</td>
</tr>
<tr>
<td>Response</td>
<td>20, 50, 100, 200, 500, 1000, 2,000, 5,000, 10,000, 20,000, 50,000, 1,000, 2,000, 5,000, 10,000, 20,000, 60,000 nm/min</td>
<td>10, 20, 50, 100, 200, 500, 1000, 2,000, 5,000, 10,000, 20,000, 60,000 nm/min</td>
<td>10, 20, 50, 100, 200, 500, 1000, 2,000, 5,000, 10,000, 20,000, 60,000 nm/min</td>
<td>10, 20, 50, 100, 200, 500, 1000, 2,000, 5,000, 10,000, 20,000, 60,000 nm/min</td>
<td>10, 20, 50, 100, 200, 500, 1000, 2,000, 5,000, 10,000, 20,000, 60,000 nm/min</td>
</tr>
<tr>
<td>Detector</td>
<td>Ex: Silicon photodiode, Em: PMT</td>
<td>Ex: Silicon PD, Em: LN2 Cooled PMT</td>
<td>Spectra Manager™/CFR, iRM</td>
<td>Spectra Manager™/CFR, iRM</td>
<td>Spectra Manager™/CFR, iRM</td>
</tr>
<tr>
<td>Photometric Range</td>
<td>-10,000 - 10,000</td>
<td>-10,000 - 10,000</td>
<td>Spectra Manager™/CFR, iRM</td>
<td>Spectra Manager™/CFR, iRM</td>
<td>Spectra Manager™/CFR, iRM</td>
</tr>
<tr>
<td>Sensitivity Selection</td>
<td>High, Medium, Low, Very Low, Manual, Auto SCS</td>
<td>High, Medium, Low, Very Low, Manual, Auto SCS</td>
<td>Spectra Manager™/CFR, iRM</td>
<td>Spectra Manager™/CFR, iRM</td>
<td>Spectra Manager™/CFR, iRM</td>
</tr>
<tr>
<td>Shutter Function</td>
<td>Standard (Automatic control)</td>
<td>Standard (Automatic control)</td>
<td>Spectra Manager™/CFR, iRM</td>
<td>Spectra Manager™/CFR, iRM</td>
<td>Spectra Manager™/CFR, iRM</td>
</tr>
<tr>
<td>Sample Imitating System</td>
<td>Horizontal illumination</td>
<td>Horizontal illumination</td>
<td>Spectra Manager™/CFR, iRM</td>
<td>Spectra Manager™/CFR, iRM</td>
<td>Spectra Manager™/CFR, iRM</td>
</tr>
<tr>
<td>Sample Compartment</td>
<td>10 mm rectangular cell holder, nitrogen purgeable</td>
<td>10 mm rectangular cell holder, nitrogen purgeable</td>
<td>Spectra Manager™/CFR, iRM</td>
<td>Spectra Manager™/CFR, iRM</td>
<td>Spectra Manager™/CFR, iRM</td>
</tr>
<tr>
<td>Recognition of ID Accessory</td>
<td>Standard</td>
<td>Standard</td>
<td>Spectra Manager™/CFR, iRM</td>
<td>Spectra Manager™/CFR, iRM</td>
<td>Spectra Manager™/CFR, iRM</td>
</tr>
<tr>
<td>Start Button</td>
<td>Standard</td>
<td>Standard</td>
<td>Spectra Manager™/CFR, iRM</td>
<td>Spectra Manager™/CFR, iRM</td>
<td>Spectra Manager™/CFR, iRM</td>
</tr>
<tr>
<td>Analog/Output</td>
<td>Standard</td>
<td>Standard</td>
<td>Spectra Manager™/CFR, iRM</td>
<td>Spectra Manager™/CFR, iRM</td>
<td>Spectra Manager™/CFR, iRM</td>
</tr>
<tr>
<td>Instrument Communication</td>
<td>USB 2.0</td>
<td>USB 2.0</td>
<td>Spectra Manager™/CFR, iRM</td>
<td>Spectra Manager™/CFR, iRM</td>
<td>Spectra Manager™/CFR, iRM</td>
</tr>
<tr>
<td>Control and Data Processing</td>
<td>Spectra Manager™/CFR, iRM</td>
<td>Spectra Manager™/CFR, iRM</td>
<td>Spectra Manager™/CFR, iRM</td>
<td>Spectra Manager™/CFR, iRM</td>
<td>Spectra Manager™/CFR, iRM</td>
</tr>
<tr>
<td>Spectral Correction</td>
<td>Option</td>
<td>Standard</td>
<td>Spectra Manager™/CFR, iRM</td>
<td>Spectra Manager™/CFR, iRM</td>
<td>Spectra Manager™/CFR, iRM</td>
</tr>
<tr>
<td>(Spectral correction using a Rhodamine B ethylene glycol solution is standard; other jigs for spectral correction are available separately as options.)</td>
<td>(Spectral correction using a Rhodamine B ethylene glycol solution is standard; other jigs for spectral correction are available separately as options.)</td>
<td>(Spectral correction using a Rhodamine B ethylene glycol solution is standard; other jigs for spectral correction are available separately as options.)</td>
<td>Spectra Manager™/CFR, iRM</td>
<td>Spectra Manager™/CFR, iRM</td>
<td>Spectra Manager™/CFR, iRM</td>
</tr>
<tr>
<td>Dimensions</td>
<td>490 (W) x 545 (D) x 270 (H) mm</td>
<td>520 (W) x 545 (D) x 270 (H) mm</td>
<td>570 (W) x 545 (D) x 270 (H) mm</td>
<td>895 (W) x 807 (D) x 270 (H) mm</td>
<td>895 (W) x 807 (D) x 270 (H) mm</td>
</tr>
<tr>
<td>Weight</td>
<td>33.6 kg</td>
<td>36 kg</td>
<td>39 kg</td>
<td>40 kg</td>
<td>40 kg</td>
</tr>
<tr>
<td>Power Requirement</td>
<td>270VA</td>
<td>270VA</td>
<td>270VA</td>
<td>270VA</td>
<td>270VA</td>
</tr>
<tr>
<td>Installation Environment</td>
<td>Temperature: 15 to 35°C, Humidity: Less than 85%</td>
<td>Temperature: 15 to 35°C, Humidity: Less than 85%</td>
<td>Spectra Manager™/CFR, iRM</td>
<td>Spectra Manager™/CFR, iRM</td>
<td>Spectra Manager™/CFR, iRM</td>
</tr>
</tbody>
</table>

* Typical specification.
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Kuwait, Lebanon, Luxembourg, Morocco, Netherlands, Norway, Poland, Portugal, Romania, Saudi Arabia, Spain,
Sweden Switzerland, Syria, Tunisia, Turkey, United Arab Emirates, United Kingdom, Yemen

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