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Detector Options

InGaAs Detectors (NIR Range)

A range of InGaAs detectors are available that cover the range 900 nm – 2050 nm.

Intensified Charge-Coupled Device (ICCD) Camera

The generation of spectra in kinetic mode by successive measurement at different wavelengths requires many excitation flashes. This can be problematic due to photo-degradation and stability of the sample over time. This can be overcome by upgrading to spectral mode and fitting an ICCD onto the instrument.



The ICCD detector has a high dynamic range and an ultra-low readout noise and can be controlled by the [L900 software](#).

Spectral Range: 180 nm – 850 nm (W-AGT photocathode)

Minimum Optical Gate Width: 7 ns

CCD Camera Specification

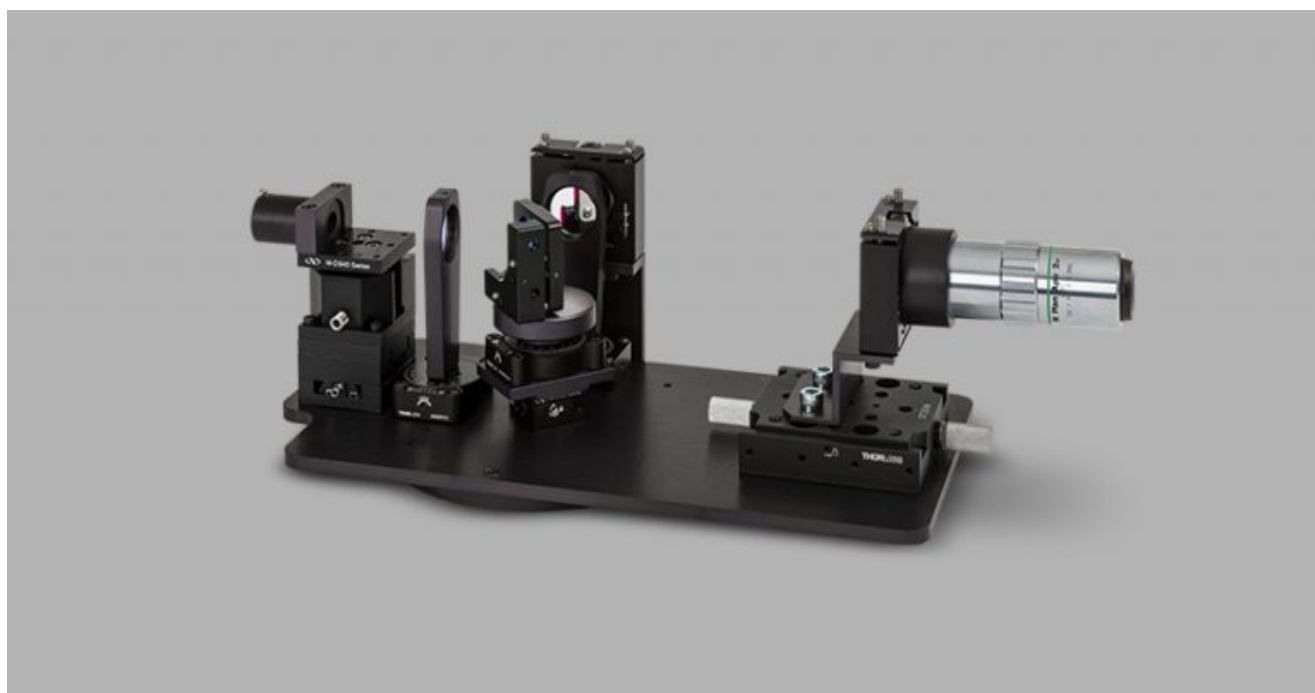
Full Number of Pixels: 1024 x 256

Number of Active Pixels: 960 x 255

Active Area: 25 mm x 6.7 mm

Cooling: -30°C (-40°C with additional coolant circulation)

Sample Measurement Modules



Temperature Control Options

Temperature control options are available to suit every need. These include:

A closed cycle water/coolant bath used with water cooled sample holders. The temperature range is -10°C to $+100^{\circ}\text{C}$.

A variety of TE Cooled sample holders are available covering the standard range from -10°C to $+105^{\circ}\text{C}$ or the extended range from -40°C to $+150^{\circ}\text{C}$. Other equipment may be required to reach the extremes of the ranges. Multiple cuvettes can be simultaneously cooled with some of the options.

A liquid nitrogen dewar (quartz) in mounting collar with light tight seal. A sample rod, containing the sample, will be immersed into the liquid nitrogen bath thus cooling the sample to 77 K.

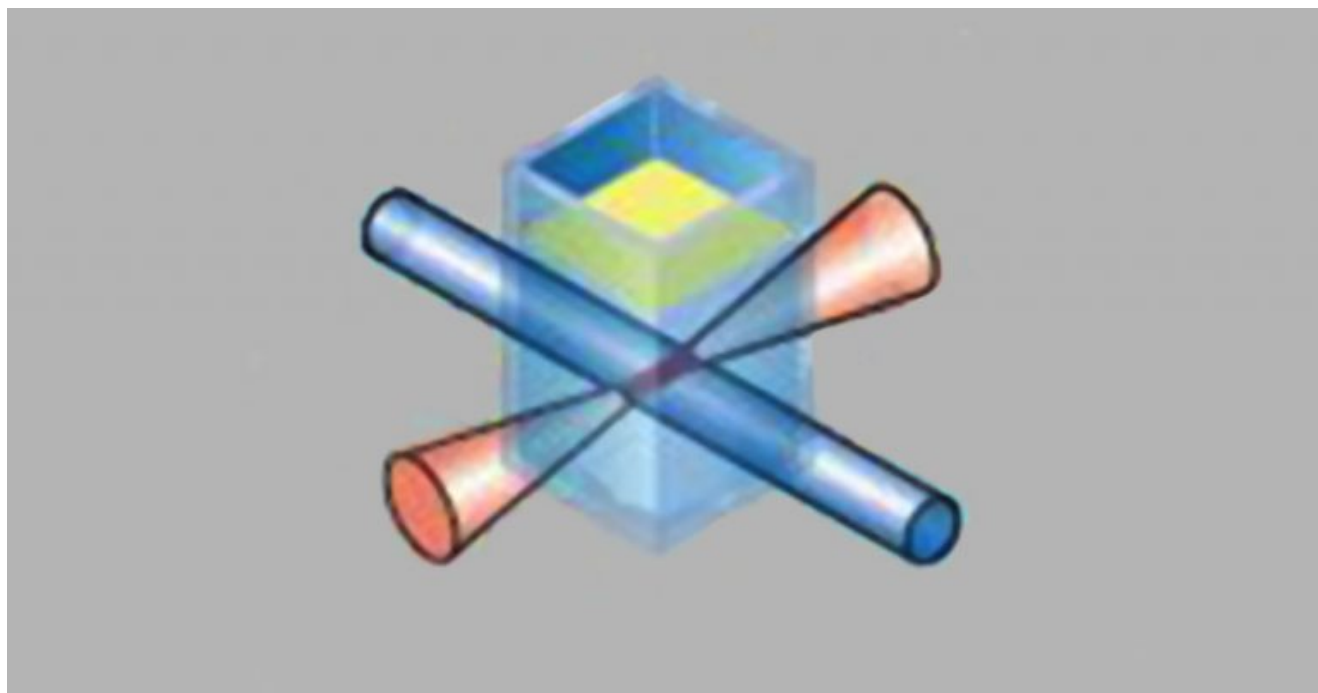
Liquid nitrogen and liquid helium cryostats are also available with ranges 77 K – 300 K and 3.4 K – 300 K. We also have extended versions which extend the temperature range to 500 K. The cryostats come with temperature controller, mounting flange and pedestal.

If you already have a cryostat it may be possible to integrate it with your spectrometer.

Stopped-Flow Accessory

This is a rapid kinetic accessory for multi-mixing capabilities. It comprises sample handling unit fitted with three 1 ml (multi-mixing) drive syringes, 600 mm long umbilical, manually operated drive, square mixing/observation cuvette with standard dimensions (10 mm path way).

Sample Measurement Geometries



Cross-Beam Geometry

Standard sample holder of the LP980. Laser beam and probe beam intersect perpendicularly at the sample position. The sample holder is designed to accept standard fluorescence cuvettes. Cuvettes can be positioned so that the probe beam passes through the centre of the cuvette or close to the surface of the incoming laser beam. The sample can be cooled by an external water circulator.

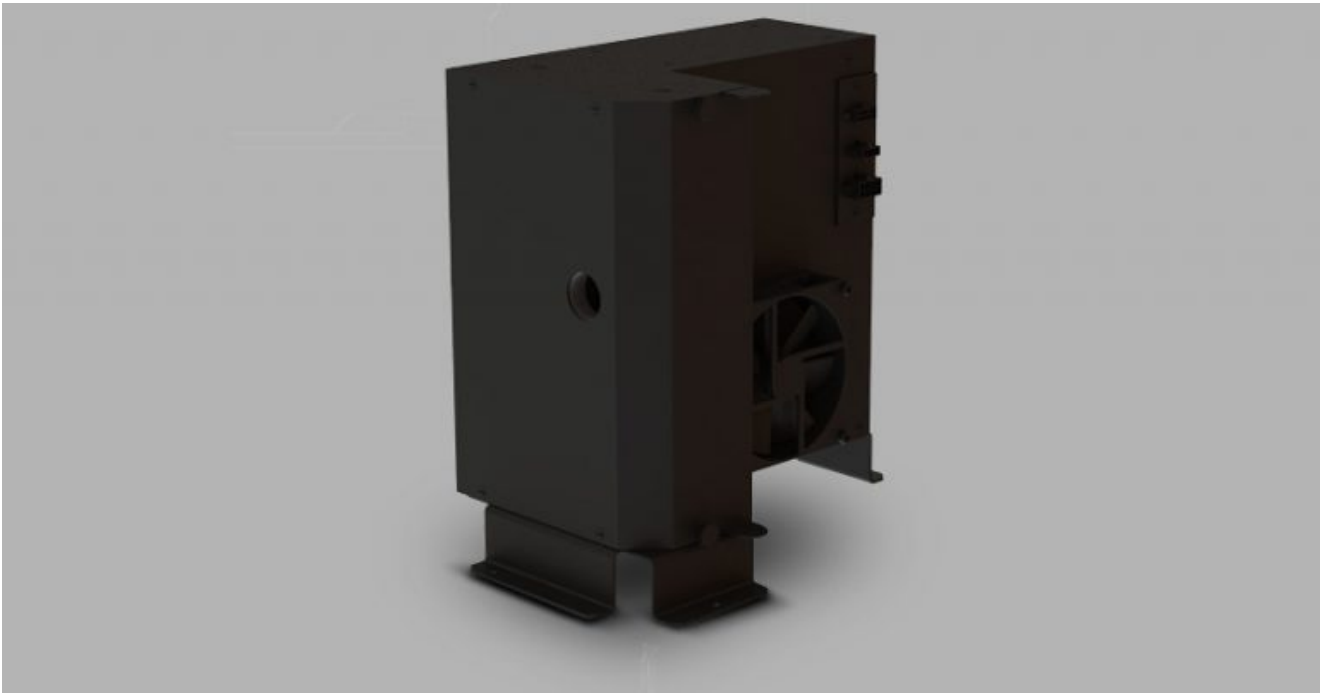
Diffuse Reflectance

A sample holder for solid, non-transparent samples to be measured in Laser Flash Photolysis. This option requires samples to show significant diffuse scattering.

Quasi Co-Linear Optics

A sample holder for low density liquid samples or gas samples to be measured in Laser Flash Photolysis. Laser beam and probe beam intersect in the sample in an angle of 3 degrees.

Light Source Options



Xenon Lamps

A broadband, stable light source for use as the probe source.

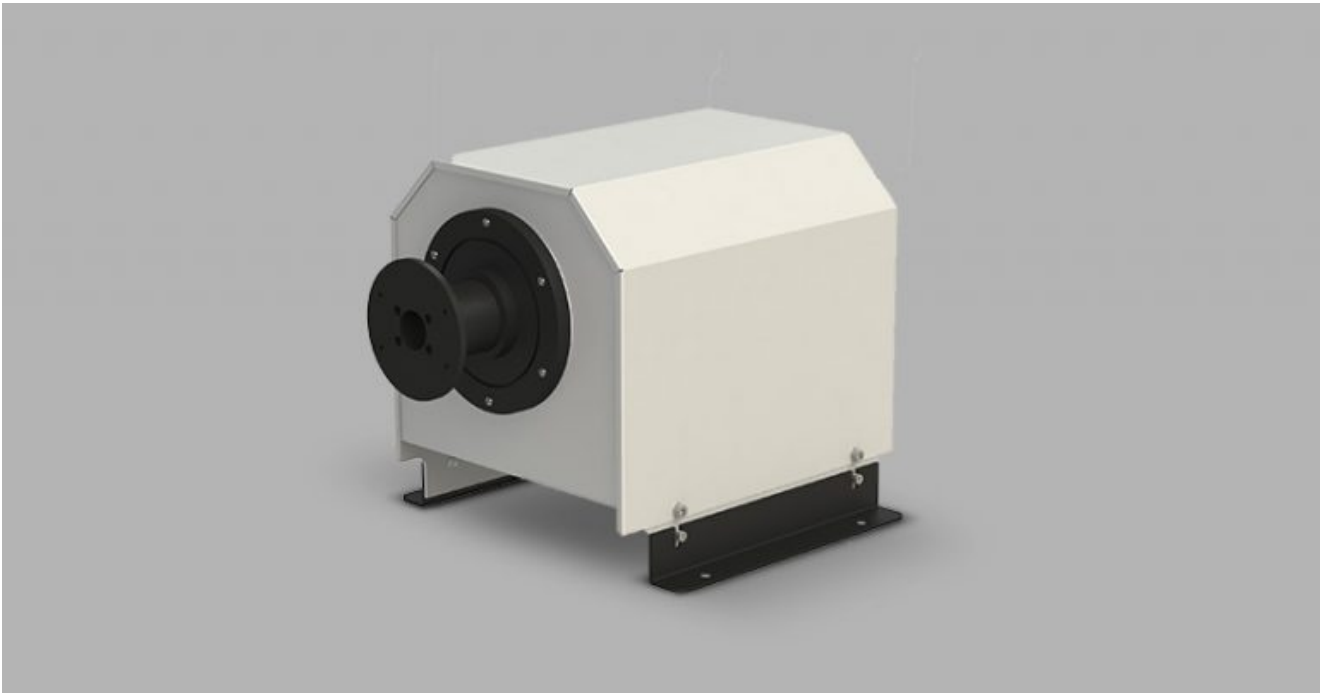
50 W Halogen Lamp

Replacement 50 W Halogen lamp for use with the LP920 probe source.

Lasers and Optical Parametric Oscillators (OPOs)

Short pulse, high peak power lasers for use as the pump source.

Detector Options



Photomultiplier Tubes (PMTs)

Single photon counting detectors comprise a single photon counting photomultiplier, together with an optimised dynode chain, mounted in a light tight cooled or un-cooled housing. The detectors include the coupling flange with the adaptive optics for direct compatibility with the FLS980, FS5, LifeSpec II and Mini-tau spectrometers.

A wide range of PMTs are available that can cover the spectral ranges up to 1700 nm.

Analogue Detectors

Analogue detectors are used either for high light level applications with the requirement for high dynamic range, or as alternative detectors in spectral ranges where photomultipliers are unavailable or too expensive. Depending on the required application, the analogue detectors come in a variety of housings with a variety of cooling options.

Analogue detectors find application either in the [FLS980](#) or the [LP980](#) to extend

the spectral coverage into the NIR to 5.5 μm . For steady state applications the diode is mounted in a two stage TE cooled housing with collection/focusing optics chopper and lock-in. For time-resolved applications, the diode is supplied in a two stage TE-cooled housing and with a digitising oscilloscope for data collection and averaging. The spectrometer's software comes with oscilloscope transfer mode for data download from the oscilloscope for subsequent analysis.

Sample Chamber Options



Temperature Control Options

Temperature control options are available to suit every need. These include:

A closed cycle water/coolant bath used with water cooled sample holders. The temperature range is -10°C to $+100^{\circ}\text{C}$.

A variety of TE Cooled sample holders are available covering the standard range from -10°C to $+105^{\circ}\text{C}$ or the extended range from -40°C to $+150^{\circ}\text{C}$. Other equipment may be required to reach the extremes of the ranges. Multiple cuvettes can be simultaneously cooled with some of the options.

A liquid nitrogen dewar (quartz) in mounting collar with light tight seal. A sample rod, containing the sample, will be immersed into the liquid nitrogen bath thus cooling the sample to 77 K.

Liquid nitrogen and liquid helium cryostats are also available with ranges 77 K – 300 K and 3.4 K – 300 K. We also have extended versions which extend the temperature range to 500 K. The cryostats come with temperature controller, mounting flange and pedestal.

Polarisation/Anisotropy

Excitation and Emission Glan Thompson polarising prisms are available in computer controlled mounts.

Integrating Sphere – Quantum Yield

Demountable integrating sphere supplied for quantum yield and reflection measurements of solutions or solid samples. The integrating sphere fits directly into the sample chamber and is supplied with a cuvette holder and a mount for powder samples.

Cryosphere – Quantum Yield

A light collection accessory incorporating an integrating sphere and Fluoracle software-controlled cryostat, to allow quantum yield measurements of solid and powder samples from 77 – 500K. The setup allows measurement of direct and indirect sample excitation. The Cryosphere is attached to the optical path of the **FLS1000** system via optical fibre bundles. Fibre bundles and launcher should be ordered separately.

Multi-well Plate Reader Module

The multi-well plate reader is an external module that is attached to the FLS980 to perform spectral measurement on multi-well plates. The module has been designed for 96-well plates. The plate reader module is coupled to the FLS sample chamber by means of a bifurcated optical fibre. The control of the module is fully automated from the software. A plate reader sample cassette is also available for the **FS5 spectrofluorometer** for 96-well plates only.

Titration Module

The titration accessory is based on a dual syringe Hamilton titrator.

Microscope Attachment

A combined microscope and imaging camera is excellent for measuring specific points within a sample and for imaging with monochromatic excitation / illumination. Imaging cameras are available for both visible and NIR regions up to 1700 nm. The microscope is attached to the spectrometer through fibre bundles and allows $\sim 1 \mu\text{m}$ spot measurements to be taken from the sample, using a single software package, and mapping.

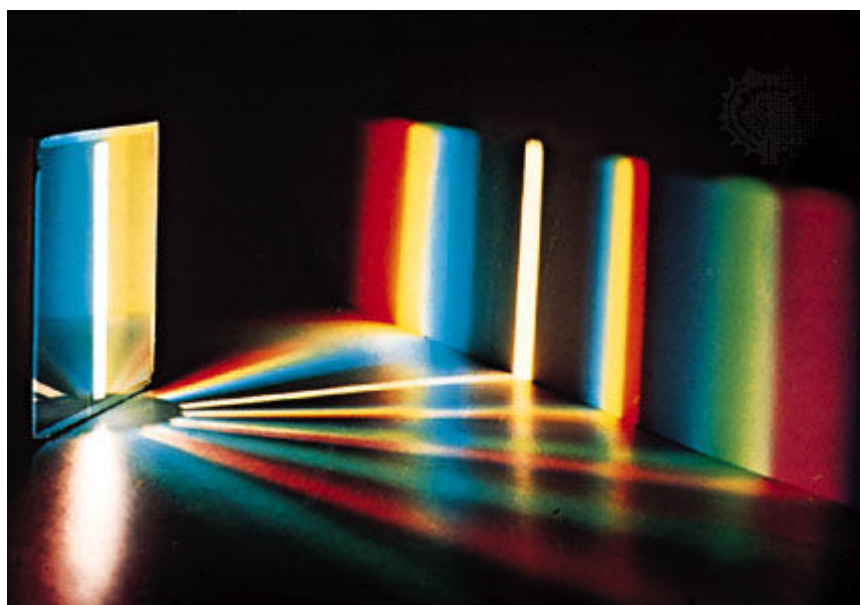
Fibre-Optic Remote Sensing

Fibre assemblies are available for remote measurements.

Stopped-Flow Accessory

This is a rapid kinetic accessory for multi-mixing capabilities. It comprises a sample handling unit fitted with three 1 ml (multi-mixing) drive syringes, 600 mm long umbilical, manually operated drive, square mixing/observation cuvette with standard dimensions (10 mm path way).

Monochromator Options



Diffraction Gratings

Our monochromators have triple grating turrets allowing up to three diffraction gratings to be permanently mounted within the monochromator. Standard gratings are generally chosen to cover the wavelength range of the detector. However, should you have more stringent requirements, such as requiring finer linear dispersion or an extended wavelength range, other diffraction gratings are available.

| Excitation Diffraction Gratings | Emission Diffraction Gratings | Wavelength Range |
|---------------------------------|--------------------------------|------------------|
| 1800 grooves/mm – blaze 250 nm | 1800 grooves/mm – blaze 250 nm | 200 nm – 900 nm |
| 1800 grooves/mm – blaze 500 nm | 1800 grooves/mm – blaze 500 nm | 200 nm – 900 nm |
| 1200 grooves/mm – blaze 300 nm | 1200 grooves/mm – blaze 300 nm | 250 nm – 1200 nm |
| 1200 grooves/mm – blaze 500 nm | 1200 grooves/mm – blaze 500 nm | 250 nm – 1200 nm |
| 1200 grooves/mm – blaze 750 nm | 1200 grooves/mm – blaze 750 nm | 350 nm – 1200 nm |

| Excitation Diffraction Gratings | Emission Diffraction Gratings | Wavelength Range |
|---------------------------------|--------------------------------|-------------------|
| 830 grooves/mm – blaze 1200 nm | 830 grooves/mm – blaze 1200 nm | 500 nm – 1800 nm |
| 600 grooves/mm – blaze 1000 nm | 600 grooves/mm – blaze 1000 nm | 800 nm – 2600 nm |
| | 300 grooves/mm – blaze 2000 nm | 1500 nm – 5600 nm |
| | 300 grooves/mm – blaze 3000 nm | 1500 nm – 5500 nm |
| | 300 grooves/mm – blaze 3500 nm | 1500 nm – 5600 nm |
| | 150 grooves/mm – blaze 4000 nm | 2400 nm – 8000 nm |

Light Source Options



Xenon Lamps

Continuous wavelength lamps for steady-state measurements, the excitation range is typically 230 nm to 1000 nm. Ozone generating lamps may be used to increase the lower range to 180 nm.

Microsecond Flash Lamp

Pulsed xenon microsecond flashlamps producing short microsecond pulses for phosphorescence decay measurements. The excitation range is typically 230 nm to 1000 nm.

Ultrafast Nanosecond Flash Lamp

Ultrafast nanosecond flashlamp for time-resolved fluorescence studies with decays of 100 ps – 50 us. The excitation range is gas dependent.

Picosecond Pulsed Diode Lasers and LEDs

We manufacture a range of picosecond pulsed laser diodes ([EPL Series](#)) and LEDs ([ELED Series](#)) for [Time Correlated Single Photon Counting \(TCSPC\)](#) measurements. Diodes are available over the UV-VIS spectrum starting at 250 nm and are pre-set with a range of repetition frequencies. The driver electronics are built into the light sources, eliminating the need for additional driver boxes and feature true “plug-and-play” usability.

Continuous Wave (CW) Lasers

Continuous wave lasers for use with the [FLS980 Fluorescence Spectrometer](#) and the [FS5 Spectrofluorometer](#). Some CW laser sources may also be pulsed by the spectrometer to allow, for example, upconversion decays with 808 nm and 980 nm excitation to be measured.

Vacuum Ultra-Violet (VUV) Light Sources

Vacuum Ultra-Violet (VUV) radiation is used to describe the spectrum below 190 nm, where few light sources readily emit and the atmosphere absorbs most of the wavelengths. Single wavelength and broad VUV spectrum options are available.

Configuration Options

Double Monochromators

Our systems can be equipped with double monochromators on either or both excitation and emission arms. The use of double monochromators increases the linear dispersion, and stray light suppression is improved over that achieved by single monochromators to give better signal to noise ratios. A double monochromator in the emission arm allows for up to three detectors mounted simultaneously with software-based selection; two detectors can be fitted after the double monochromator and one after the first of the two monochromators.



Geometries

If further detectors are required, the system can be configured in a T-geometry by the addition of a separate emission monochromator. This configuration can also be useful to provide a digital detection arm and an analogue detection arm.

Stopped Flow Accessory



Rapid kinetic accessory for multi-mixing capabilities. Comprises sample handling unit, fitted with three 1 ml drive syringes, 600 mm long umbilical, pneumatic drive system and square mixing/observation cuvette with standard dimensions (10 mm). Includes slotted sample chamber lid to allow the cuvette to be fitted to the FLS980. Manual control.

Product Description

Rapid kinetic accessory for multi-mixing capabilities. Comprises sample handling unit, fitted with three 1 ml drive syringes, 600 mm long umbilical, pneumatic drive system and square mixing/observation cuvette with standard dimensions (10 mm). Includes slotted sample chamber lid to allow the cuvette to be fitted to the FLS980. Manual control.

Multiwell-Plate Reader Module



The Multiwell-plate reader is an external module that is attached to the FS980 to perform spectral or time resolved measurements on multi-well plates. The multiwell plate reader module is coupled to the FLS980 by means of a bifurcated optical fibre. The control of the module is fully automated from the F980 software, temperature near the well plate is recorded. Spectral range depends on FLS980 spectrometer configuration and bifurcated fibre assembly. 96 well and 384 wells are available.

Product Description

The Multiwell-plate reader is an external module that is attached to the FS980 to perform spectral or time resolved measurements on multi-well plates. The multiwell plate reader module is coupled to the FLS980 by means of a bifurcated optical fibre. The control of the module is fully automated from the F980 software, temperature near the well plate is recorded. Spectral range depends on FLS980 spectrometer configuration and bifurcated fibre assembly. 96 well and 384 wells are available.

Titration Module



The titration accessory is based on a dual syringe Hamilton titrator (ML635) that is connected to the computer by RS232. The accessory comprise of two 1 ml syringes, connecting tubing, a flow cuvette and a light tight feed-through into the FLS980 sample chamber. Titration is controlled through the F980 software. Kinetic measurements with manual or automated titration steps and automated multiple spectral scanning are possible.

Product Description

The titration accessory is based on a dual syringe Hamilton titrator (ML635) that is connected to the computer by RS232. The accessory comprise of two 1 ml syringes, connecting tubing, a flow cuvette and a light tight feed-through into the FLS980 sample chamber. Titration is controlled through the F980 software. Kinetic measurements with manual or automated titration steps and automated multiple spectral scanning are possible.

Front Face Sample Holder



The front face sample holder has external adjustment for accurate sample positioning. The accessory comes with inserts for demountable cuvette film/slide clamp and holder for microsamples.

Options include:

Demountable sample clamp for front face measurement of powders.

Demountable sample clamp for thin films and slides.

Other Holder Options Include:

Front Face Sample Holder on Rotational Stage

Single position front face sample holder on rotational stage. The sample holder has been designed to study emission phenomena that depend on the angle of the sample orientation in respect to the emission or excitation path. Sample angle adjustable from outside the sample chamber. This sample holder is suitable for measuring front face emission on strongly absorbing samples in cuvettes. Two inserts are supplied, suitable for measurements of powders and film/slide samples.

Front Face Sample Clamp on a Rotational Stage

Single position front face sample clamp holder on rotational stage. The sample holder has been designed to study emission phenomena that depend on the angle of the sample orientation in respect to the emission or excitation path. Sample angle adjustable from outside the sample chamber. This sample holder is suitable for measuring front face emission on films or slides up to a thickness of 5 mm.

Front Face Sample Holder on XY Stage

Single position front face sample holder on XY stage. This sample holder is designed for film/slide samples that consist of a “grid” of individual samples, or for testing a sample’s homogeneity. X and Y position adjustable from outside sample chamber. This sample holder is suitable for measuring front face emission of cuvettes and films/slides.

Sample holder for powder samples (vertical excitation/emission)

Sample holder with removable powder tray and plane beam steering mirror. The mirror directs the excitation light quasi vertically onto the sample while the emission is collected and directed to the emission beam path using the same mirror. This assembly requires the mirror option in the sample chamber.

Product Description

The front face sample holder has external adjustment for accurate sample positioning. The accessory comes with inserts for demountable cuvette film/slide clamp and holder for microsamples.

Options include:

Demountable sample clamp for front face measurement of powders.

Demountable sample clamp for thin films and slides.

Other Holder Options Include:

Front Face Sample Holder on Rotational Stage

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Front Face Sample Clamp on a Rotational Stage

Single position front face sample clamp holder on rotational stage. The sample holder has been designed to study emission phenomena that depend on the angle of the sample orientation in respect to the emission or excitation path. Sample angle adjustable from outside the sample chamber. This sample holder is suitable for measuring front face emission on films or slides up to a thickness of 5 mm.

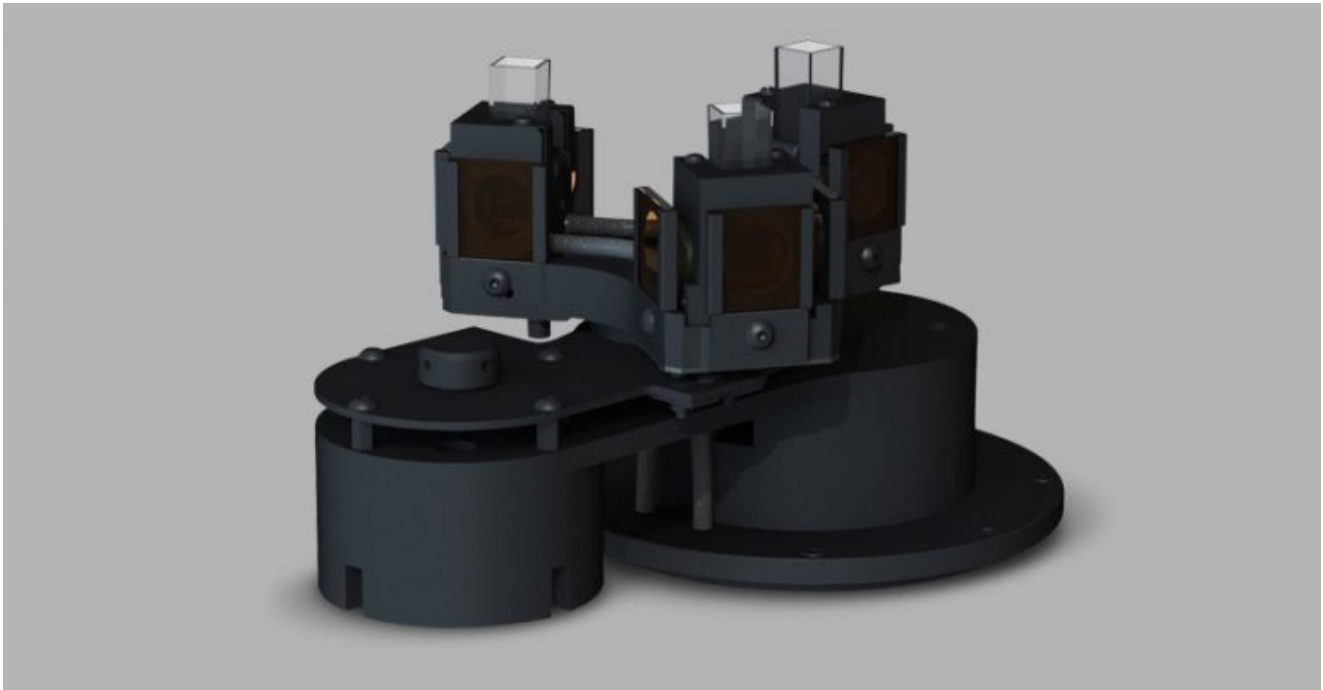
Front Face Sample Holder on XY Stage

Single position front face sample holder on XY stage. This sample holder is designed for film/slide samples that consist of a “grid” of individual samples, or for testing a sample’s homogeneity. X and Y position adjustable from outside sample chamber. This sample holder is suitable for measuring front face emission of cuvettes and films/slides.

Sample holder for powder samples (vertical excitation/emission)

Sample holder with removable powder tray and plane beam steering mirror. The mirror directs the excitation light quasi vertically onto the sample while the emission is collected and directed to the emission beam path using the same mirror. This assembly requires the mirror option in the sample chamber.

Three-Position Cuvette Holder



The three-position cuvette turret has coolant circulation and temperature probe. The turret is computer-controlled on a rotational stage, and all three positions are temperature adjustable by water/coolant circulation, with an integrated temperature probe for sample temperature monitoring by spectrometer operating software. Filter holders are provided for all three individual sample positions.

Product Description

The three-position cuvette turret has coolant circulation and temperature probe. The turret is computer-controlled on a rotational stage, and all three positions are temperature adjustable by water/coolant circulation, with an integrated temperature probe for sample temperature monitoring by spectrometer operating software. Filter holders are provided for all three individual sample positions.

Cuvette Holder



Single cuvette holder, temperature adjustable by water/coolant circulation, fitted with integrated probe for sample temperature monitoring by spectrometer operating software. Filter slots are provided for holding 50 mm square filters. This sample holder is included as part of the standard system.

Product Description

Single cuvette holder, temperature adjustable by water/coolant circulation, fitted with integrated probe for sample temperature monitoring by spectrometer operating software. Filter slots are provided for holding 50 mm square filters. This sample holder is included as part of the standard system.

Temperature Control Options



Temperature control options are available to suit every need. These include:
A closed cycle water/coolant bath to be used with water cooled sample holders.
The temperature range is $-10\text{ }^{\circ}\text{C}$ to $+100\text{ }^{\circ}\text{C}$.

A variety of TE Cooled sample holders are available covering the standard range from $-10\text{ }^{\circ}\text{C}$ to $+105\text{ }^{\circ}\text{C}$ or the extended range from $-40\text{ }^{\circ}\text{C}$ to $+150\text{ }^{\circ}\text{C}$. Other equipment may be required to reach the extremes of the ranges. Multiple cuvettes can be simultaneously cooled with some of the options.

A liquid nitrogen dewar (quartz) in mounting collar with light tight seal. A sample rod, containing the sample, will be immersed into the liquid nitrogen bath thus cooling the sample to 77 K .

Liquid nitrogen and liquid helium cryostats are also available with ranges $77\text{-}300\text{ K}$ and $3.4\text{ - }300\text{ K}$. They also have extended versions which extend the temperature range to 500 K . The cryostats come with temperature controller, mounting flange and pedestal.

If you already have a cryostat it may be possible to integrate it with your spectrometer.

Product Description

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Temperature control options are available to suit every need. These include:
A closed cycle water/coolant bath to be used with water cooled sample holders. The temperature range is -10 °C to +100 °C.

A variety of TE Cooled sample holders are available covering the standard range from -10 °C to +105 °C or the extended range from -40 °C to +150 °C. Other equipment may be required to reach the extremes of the ranges. Multiple cuvettes can be simultaneously cooled with some of the options.

A liquid nitrogen dewar (quartz) in mounting collar with light tight seal. A sample rod, containing the sample, will be immersed into the liquid nitrogen bath thus cooling the sample to 77 K.

Liquid nitrogen and liquid helium cryostats are also available with ranges 77-300 K and 3.4 – 300 K. They also have extended versions which extend the temperature range to 500K. The cryostats come with temperature controller, mounting flange and pedestal.

If you already have a cryostat it may be possible to integrate it with your spectrometer.

Sample Chamber Options

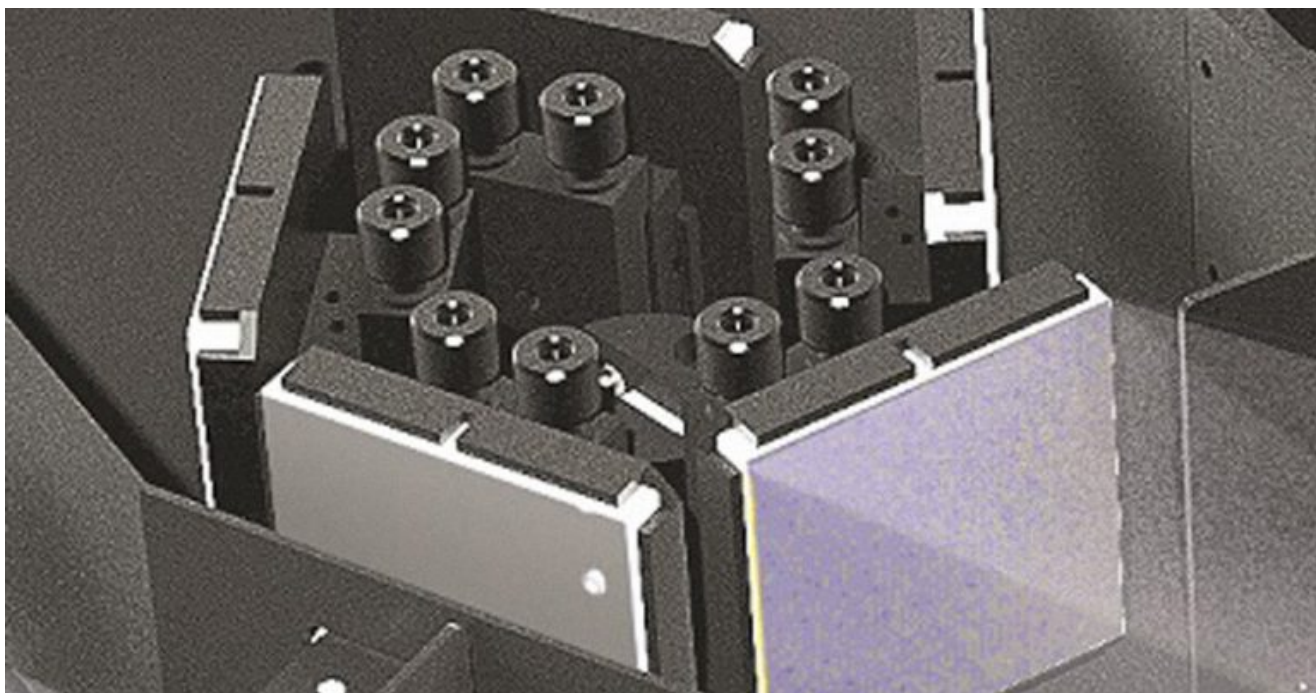


Plug and Play sample holders, temperature control options, polarizers, fibers for remote sensing and microscope accessories .

Product Description

Plug and Play sample holders, temperature control options, polarizers, fibers for remote sensing and microscope accessories .

Diffraction Gratings



The monochromators have triple grating turrets allowing up to three diffraction gratings to be permanently mounted within the monochromator. Standard gratings are generally chosen to cover the wavelength range of the detector. However, should you have more stringent requirements, such as requiring finer linear dispersion or an extended wavelength range, other diffraction gratings are available.

Product Description

The monochromators have triple grating turrets allowing up to three diffraction gratings to be permanently mounted within the monochromator. Standard gratings are generally chosen to cover the wavelength range of the detector. However, should you have more stringent requirements, such as requiring finer linear dispersion or an extended wavelength range, other diffraction gratings are available.

Technical Specifications

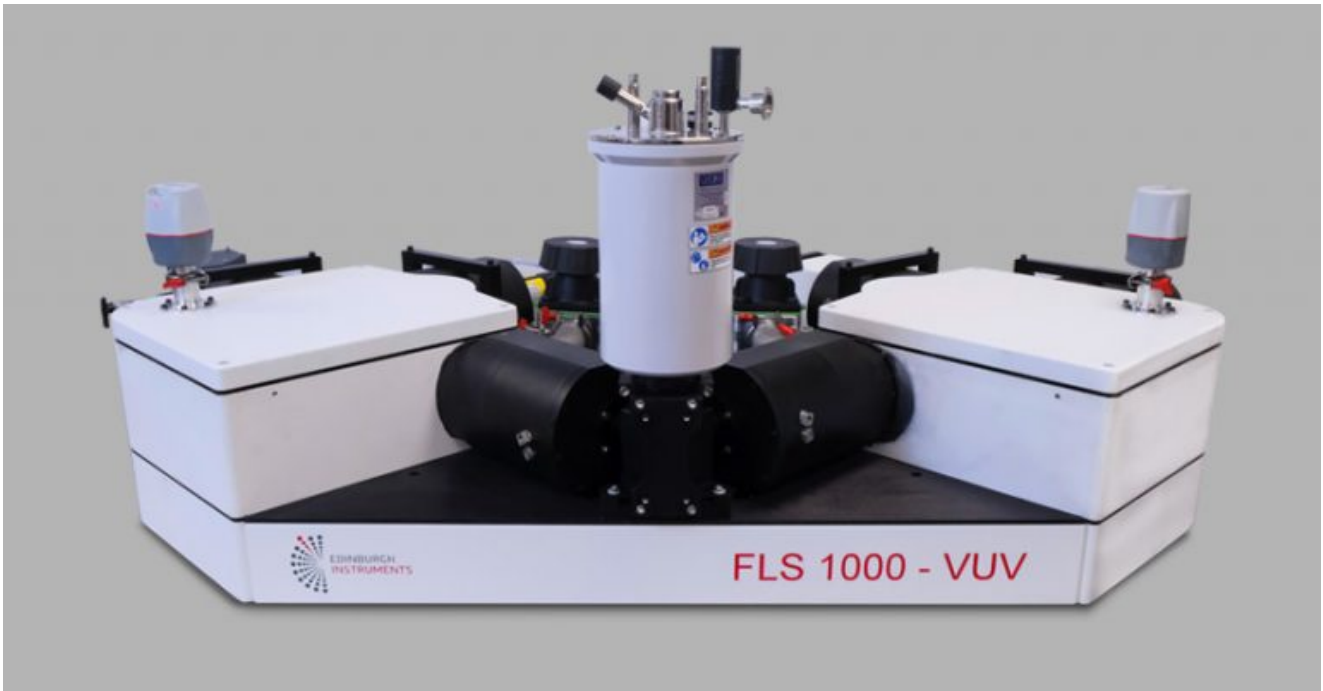
Excitation Monochromator Grating Options

1800 grooves/mm – blaze 250 nm
1800 grooves/mm – blaze 500 nm
1200 grooves/mm – blaze 300 nm
1200 grooves/mm – blaze 500 nm
1200 grooves/mm – blaze 750 nm
830 grooves/mm – blaze 1200 nm
600 grooves/mm – blaze 1000 nm

Emission Monochromator Grating Options

1800 grooves/mm – blaze 250 nm
1800 grooves/mm – blaze 500 nm
1200 grooves/mm – blaze 300 nm
1200 grooves/mm – blaze 500 nm
1200 grooves/mm – blaze 750 nm
830 grooves/mm – blaze 1200 nm
600 grooves/mm – blaze 1000 nm
300 grooves/mm – blaze 2000 nm
300 grooves/mm – blaze 3000 nm
300 grooves/mm – blaze 3500 nm
150 grooves/mm – blaze 4000 nm

Vacuum Ultra-Violet (VUV) Light Sources



Vacuum Ultra-Violet (VUV) radiation is used to describe the spectrum below 190 nm, where few light sources readily emit and the atmosphere absorbs most of the wavelengths. Single wavelength and broad VUV spectrum options are available.

Product Description

Vacuum Ultra-Violet (VUV) radiation is used to describe the spectrum below 190 nm, where few light sources readily emit and the atmosphere absorbs most of the wavelengths. Single wavelength and broad VUV spectrum options are available.

Continuous Wave (CW) Lasers



Continuous wave lasers for use with the FLS980 & FS5. A TTL control pulse box is available for use with some CW lasers for lifetime measurements.

Product Description

Continuous wave lasers for use with the FLS980 & FS5. A TTL control pulse box is available for use with some CW lasers for lifetime measurements.

Picosecond Pulsed Diode Lasers and LEDs



We manufacture a range of picosecond pulsed laser diodes and LEDs for Time Correlated Single Photon Counting (TCSPC) measurements. Diodes are available over the UV-VIS spectrum starting at 250 nm and are pre-set with a range of repetition frequencies. The driver electronics are built into the light sources, eliminating the need for additional driver boxes and feature true “plug-and-play” usability.

Product Description

We manufacture a range of picosecond pulsed laser diodes and LEDs for Time Correlated Single Photon Counting (TCSPC) measurements. Diodes are available over the UV-VIS spectrum starting at 250 nm and are pre-set with a range of repetition frequencies. The driver electronics are built into the light sources, eliminating the need for additional driver boxes and feature true “plug-and-play” usability.

Xenon Lamps

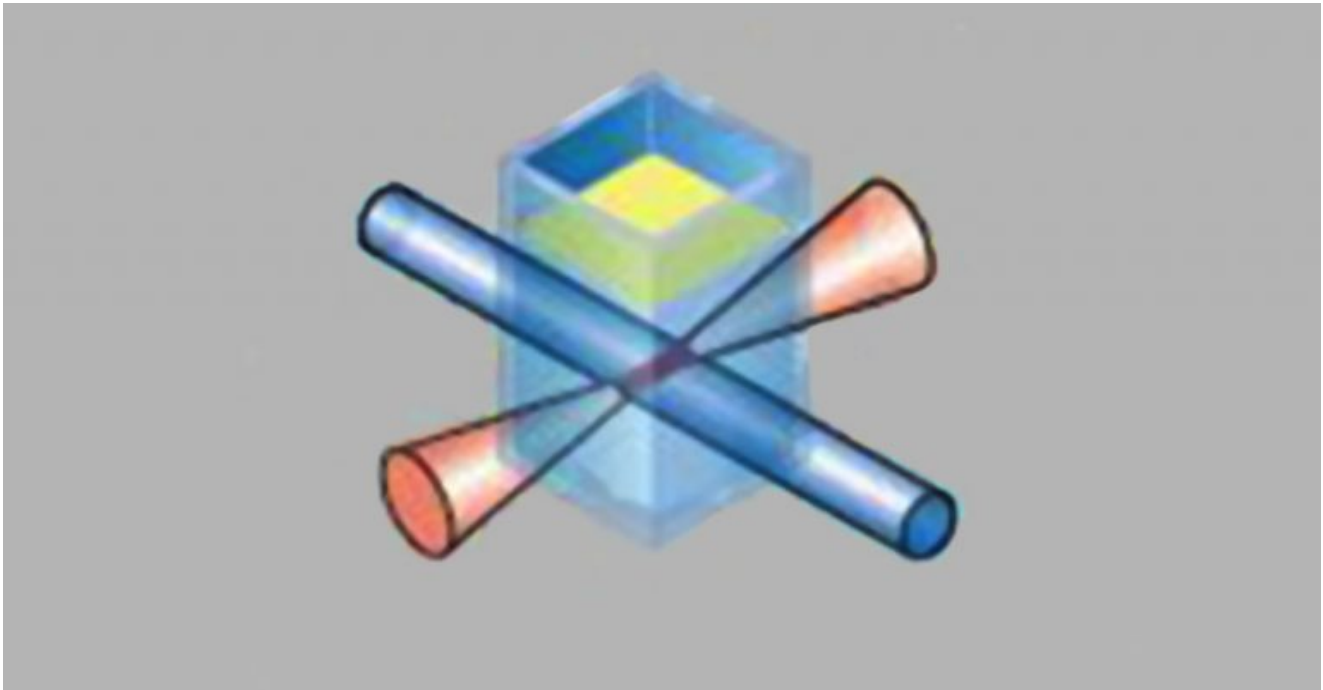


Continuous wavelength lamps for steady-state measurements, the excitation range is typically 230 nm to 1000 nm.

Product Description

Continuous wavelength lamps for steady-state measurements, the excitation range is typically 230 nm to 1000 nm.

Geometries



If further detectors are required, the system can be configured in a T-geometry by the addition of a separate emission monochromator. This configuration can also be useful to provide a digital detection arm and an analogue detection arm.

Product Description

If further detectors are required, the system can be configured in a T-geometry by the addition of a separate emission monochromator. This configuration can also be useful to provide a digital detection arm and an analogue detection arm.

Double Monochromators



Our systems can be equipped with double monochromators on either or both excitation and emission arms. The use of double monochromators increases the linear dispersion, and stray light suppression is improved over that achieved by single monochromators to give better signal to noise ratios. A double monochromator in the emission arm allows for up to three detectors mounted simultaneously with software-based selection; two detectors can be fitted after the double monochromator and one after the first of the two monochromators.

Product Description

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